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Application Number	Herewith
Filing Date	Herewith
First Named Inventor	Ju Hwan Yi
Title	Bidirectional Transmission Of USB Data Using Audio/Video Data Channel
Art Unit	Not yet known
Examiner Name	Not yet known
Attorney Docket Number	30850-27614/US

SIGNATURE of Applicant or Patent Practitioner

Signature	/Dohyun Ahn/	Date (Optional)	April 8, 2015
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Title (if Applicant is a juristic entity)			
Applicant Name (if Applicant is a juristic entity)	Silicon Image, Inc.		

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BIDIRECTIONAL TRANSMISSION OF USB DATA USING AUDIO/VIDEO DATA CHANNEL

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CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims priority under 35 U.S.C. § 119(e) to U.S. Provisional Patent Application No. 61/979,483 filed on April 14, 2014, which is incorporated by reference herein in its entirety.

BACKGROUND

FIELD OF ART

[0002] This disclosure generally relates to data transmission, and, more particularly, to bidirectional transmission of Universal Serial Bus (USB) data using an Audio/Video (A/V) channel.

BACKGROUND

[0003] High-Definition Multimedia Interface (HDMI) and Mobile High-Definition Link (MHL) were designed to transfer uncompressed video and audio content from source devices to sink devices. The uncompressed video provides high video quality as long as the link (e.g., Transition Minimized Differential Signaling (TMDS) micro-USB) can support the full

bandwidth and latency needed. Recent changes in popular display technology have made it desirable to transmit HDMI or MHL data over USB enabled devices.

[0004] However, it is difficult to simultaneously transfer high resolution HDMI or MHL videos and USB data over USB links due to different bandwidth and latency requirements and limitations associated with USB, HDMI and MHL standards. Bandwidth for audio/video transmission becomes restrictive when USB data is transmitted along the same link. USB data requires narrow latency constraints while audio/video is latency insensitive. Digital video standards, such as HDMI and MHL do not provide synchronous mechanisms for bidirectional USB data exchange between a source device and a sink device.

[0005] Additionally, transmitting both A/V and USB over an auxiliary bus of a USB link does not meet the speed requirements of A/V or USB standards. Further, the requirements necessary for high speed transmission of HDMI or MHL across the auxiliary bus leaves the data susceptible to electro-magnetic interference and thus data corruption.

SUMMARY

[0006] Embodiments of the present disclosure are related to a source device and sink device for bidirectional transmission of USB data over an Audio/Video channel of a multimedia link. A source device sends a first unit of data to a sink device over a first physical channel of the multimedia link during a first time. The first unit of data is comprised of A/V data, and forward data that is compliant with USB standard. The source device can receive a second unit of data from the sink device over the physical channel of the multimedia link during a second time. The second unit of data includes backward data compliant with the USB standard. Additionally, the source device can send control data to the receiving sink device over a second physical channel of the multimedia link distinct from the first physical channel. The source device can also

receive control data sent from the sink device over the second physical channel of the multimedia link.

[0007] The source device sends a first synchronization signal of a first length after sending the first unit of data and before sending a third unit of data from the source device. The source device also sends a second synchronization signal of a second length longer than the first synchronization to initialize communication over the first physical channel before sending the first unit of data. Additionally, the source device detects a first synchronization signal of a first length for a predetermined amount of time after sending the first unit of data. The predetermined amount of time is tracked at the source device. A predetermined amount of forward data is buffered before assembling and sending the first unit of data. The first synchronization signal is received at the source device before receiving the second unit of data. The first synchronization signal is used to align symbol boundaries for the second unit of data.

[0008] The first time and the second time are separated by at least a predetermined amount of turnover time (ToT) greater than a sum of a turn-off time of a driver of the source device for communicating over the first physical channel, a turn-on time of a driver of the sink device for communicating over the first physical channel, and a channel delay time. The predetermined amount of time is tracked at the source device. Further, the source device sends another first synchronization signal of a the first length from the source device to the sink device after receiving the second unit of data and before sending a third unit of data from the source device to the second data, the third unit of data is compliant with the USB standard.

[0009] A sink device receives a first unit of data to over a first physical channel of the multimedia link during a first time. The first unit of data includes A/V data, and forward data that is compliant with USB standard. The sink device can send a second unit of data to the

source device over the physical channel of the multimedia link during a second time. The second unit of data includes backward data compliant with the USB standard. Additionally, the sink device can receive control data from the transmitting source device over a second physical channel of the multimedia link distinct from the first physical channel. The sink device can also send control data sent to the source device over the second physical channel of the multimedia link.

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BRIEF DESCRIPTION OF DRAWINGS

[0010] The disclosed embodiments have other advantages and features which will be more readily apparent from the detailed description, the appended claims, and the accompanying figures (or drawings).

[0011] Figure (FIG.) 1 is a block diagram illustrating a system including a source device, a sink device, and a multimedia link connecting the two devices, according to one embodiment.

[0012] FIG. 2 is a timing diagram illustrating a timing sequence of bidirectional USB data transmission over a multimedia link, according to one embodiment.

[0013] FIG. 3 is a diagram illustrating a frame of Audio/Video (A/V) data transmitted over a first physical channel, according to one embodiment.

[0014] FIG. 4 is a diagram illustrating buffering of a predetermined amount of USB data before assembling and sending the USB data, according to one embodiment.

[0015] FIG. 5 is a transactional diagram illustrating a method for bidirectional transmission of USB data over an A/V data channel of a multimedia link, according to one embodiment.

[0016] FIG. 6 is a block diagram illustrating an apparatus or system for bidirectional transmission of USB data over an A/V data channel of a multimedia link, according to one embodiment

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DETAILED DESCRIPTION

[0017] The Figures (FIGS.) and the following description relate to preferred embodiments by way of illustration only. It should be noted that from the following discussion, alternative embodiments of the structures and methods disclosed herein will be readily recognized as viable alternatives that may be employed without departing from the principles of what is claimed.

[0018] Reference will now be made in detail to several embodiments, examples of which are illustrated in the accompanying figures. It is noted that wherever practicable similar or like reference numbers may be used in the figures and may indicate similar or like functionality.

[0019] Embodiments relate to half-duplex bidirectional transmission of data compliant with a first standard (e.g., Universal Serial Bus (USB) standard) over a physical channel of a multimedia link for transmitting audio/video ("A/V") data compliant with a second standard (e.g., Mobile High-Definition Link (MHL) standard) between a source device and a sink device using time division multiplexing (TDM). The source device sends units of data including A/V data and forward data compliant with the first standard at first times whereas the sink device sends units of data including backward data compliant with the first standard at second times between transmissions from the source device. The first times do not overlap with the second times. Synchronization signals may be added to the first and second units of data to align character symbols embedded in the first and second units of data. In order to distribute slower bitrate USB data through faster TDM time slots, USB data is buffered prior to transmission within the units of data.

[0020] As described herein, a "unit of data" refers to a set of data having a defined number of bits. The number of bits may be fixed (e.g., 32 bits) or variable within a predetermined ranges (e.g., 5 bits to 34 bits). The unit of data may be a packet of data.

[0021] The term "forward" and "backward" described herein refer to the direction of data packet transmission. "Forward" refers to a direction of data transmitted from the source device to the sink device whereas "backward" refers to the direction of signals transmitted from the sink device to the source device.

SYSTEM FOR MULTIPLEXING OF USB DATA IN A/V STREAM

[0022] FIG. 1 is a block diagram illustrating a system 100 including a source device 110, a sink device 120, and a multimedia link 130 connecting the two devices, according to one embodiment. For the sake of explanation, the following embodiments are explained with reference to a modified version of Mobile High-Definition Link (MHL) as the multimedia link 130. However, the same principle can be applied to other standards such as High-Definition Multimedia Interface (HDMI) standard, a Digital Visual Interface (DVI) standard, and a DisplayPort standard.

[0023] The multimedia link 130 includes both a TMDS channel 131 and an eCBUS 132. The multimedia link 130 is different from links compliant with prior MHL standards in that USB data is transmitted via a transition-minimized differential signaling (TMDS) channel 131 for transmitting A/V data using bidirectional time division multiplexed (TDM) scheme instead of using eCBUS 132, as described below in detail with reference to FIG. 2.

[0024] The eCBUS 132 is bi-directional and full duplex such that the source device 110 and sink device 120 can transfer control data simultaneously. Control data transmitted over the eCBUS 140 can include, among others, display data channel (DDC) commands, enhanced display identification data (EDID) data, and content protection codes. Additionally, the eCBUS 132 may also carry clock data from the source device 110 to the sink device 120. Although eCBUS 132 is full duplex, the transmission speed of eCBUS 132 is slower than TMDS channel

131. Embodiments described herein use TMDS channel 131 capable of high-speed communication instead of eCBUS 132 to transmit USB data of high bitrate.

[0025] The source device 110 herein refers to a device that sends A/V data to other devices (e.g., sink device 120). The source device 110 may include, but is not limited to, a personal computer (e.g. tablet, notebook, ultrabook, laptop and desktop), a camcorder, a smart phone, a video game console, a television, and a set-top box.

[0026] The source device 110 may include, among other components, a transmitter 111, a receiver 112, a buffer 113, a control logic 114, a phase lock loop (PLL) 116, and a clock 115. The transmitter 111 is hardware, firmware, software or a combination thereof for encoding and sending packets of A/V and USB data from the source device 110 to a sink device 120 via a TMDS channel 131 of the multimedia link 130 and control data through an eCBUS 132 of the multimedia link 130. The transmitter 111 may perform functions such as buffering, digital-to-analog conversion, amplification, pre-driver logic and driver logic. Additionally, the transmitter 111 may receive buffered USB data from the buffer 113 for inclusion in an A/V stream sent to the sink device 120.

[0027] The receiver 112 is hardware, firmware, software or a combination thereof for decoding USB data received from the sink device 120 via the TMDS channel 131 and control data through an eCBUS 132. The receiver 112 receives USB data over the TMDS channel 131, for example, in a video data packet or a data island packet pursuant to the MHL standard. The receiver 112 may perform functions such as buffering, analog-to-digital conversion, filtering, mixing and amplification.

[0028] The buffer 113 is hardware, firmware, software or a combination thereof for accumulating data for sending via the transmitter 111 to the sink device 120. The buffer 113 may

be a first in, first out (FIFO) buffer. The buffer 113 may include any of a variety of one or more circuit elements to provide a high output impedance path to the transmitter 111. The buffer 113 circuitry may include a diode, amplifier and/or one or more transistors. USB buffering performed in the FIFO buffer 113 is described below in detail with reference to FIG. 5.

[0029] The control logic 114 is hardware, firmware, software or a combination thereof for generating data to be sent over the eCBUS 132 or TMDS channel 131 or processing data received via eCBUS 132 or TMDS channel 131. In one embodiment, control logic 114 detects whether the sink device 120 supports transmission of USB data over the TMDS channel 131. Based on such detection, control logic 114 may signal the transmitter 111 or receiver 112 to send or receive USB data via the TMDS channel 131.

[0030] The clock 115, in conjunction with a phase lock loop 116, performs the following functions: (i) provide timing and synchronization for internal components of the source device 110, (ii) provide timing and synchronization of data transmission over the TMDS 131 channel and eCBUS 132, and (iii) provide timing values for Time Division Multiplexing (TDM) windows in TMDS 131 channel.

[0031] The sink device 120 refers to a device for receiving A/V data from a source device. The sink device 120 may include, but are not limited to, television, monitor, and smart phone display unit. The sink device 120 may include, among other components, a transmitter 121, a receiver 122, a buffer 123, control logic 124, a phase lock loop (PLL) 126, and a clock 125. The functions and structures of these components in the sink device 120 are substantially the same as counterpart components of the source device 110 except that (i) transmitter 121 sends only USB data to the source device 110 over the TMDS channel 131 (ii) receiver 122 receives both USB data and A/V data over the TMDS channel 131 (iii) the tracking of a predetermined amount of

time is done in the source device. The detailed description of these components is omitted herein for the sake of brevity.

SCHEME FOR MULTIPLEXING OF USB DATA IN A/V STREAM

[0032] FIG. 2 is a timing diagram illustrating a bidirectional transmission of USB data within an A/V stream, according to one embodiment. FIG. 2 illustrates a transmission of an initial first forward data packet 210 from a source device 110, reception of the initial first forward data packet 210 by the sink device 120, a transmission of a backward data packet 220 by the sink device 120 and reception of the backward data packet 220 by the source device 110. Forward data packets transmitted after the initial first data packet 210 has the same format as second forward data packet 240.

[0033] The bidirectional transmission of USB data multiplexed within an A/V stream is synchronized using TDM windows. A TDM window is a recurrent time period during which forward data packets and backward data packets 220 may be transmitted in a half-duplex time division multiplexed manner. Each TDM window provides timing parameters for USB data transmission and reception to avoid data packet collision on a same TMDS channel 131. Each of the source device 110 and the sink device 120 maintain separate, independent and unaligned TDM windows.

[0034] The TDM windows include master TDM window 202 and referenced TDM window 204. The master TDM window 202 is used by the source device 110 to determine the end of incoming backward data packets 220 sent from the sink device 120. The time period of the master TDM window 202 may remain constant throughout data transmission. A referenced TDM window 204 is used by the sink device 120 to determine the end of incoming forward data packets sent from the source device 110. The time period of the referenced TDM window 204

may be of variable length, readjusting at the arrival of forward data packets.

[0035] The first forward data packet 210 includes a long synchronization signal 211, audio/video 212A data and USB-forward data 213A. The long synchronization signal 211 is a synchronization signal that initializes communication between the source device 110 and the sink device 120 at the beginning of TDM link establishment. The long synchronization signal 211 prepares the sink device 120 for the reception of A/V data 212A and USB-forward data 213A by aligning symbol boundaries of the long synchronization signal 211. The sink device 120 starts clock and data tracking for the first forward data packet 210 based on the long synchronization signal 211. Additionally, the sink device 120 starts its referenced TDM window 204 when the long synchronization signal 211 ends. In the first forward data 210 packet, A/V data 212A and USB-forward data 213A follow the long synchronization 211 signal. The A/V data 212A includes audio data, video pixels data, and auxiliary data. The byte sizes of the A/V data 212A vary depending on video resolution size. USB-forward data 213A, for example, includes 18 bytes of data that complies with the USB standard. The long synchronization signal 211, in one embodiment, may have a length of eight bytes.

[0036] The backward data packet 220 includes a short synchronization 221A signal and USB-backward data 222. The short synchronization 221A is shorter than the long synchronization signal 211. In one embodiment, the short synchronization signal 221A may have a length of five bytes. The backward data packet 220 is transmitted from the sink 120 device to the source device 110 between forward data packets. The short synchronization signal 221A includes character symbol data used to align symbol boundaries and start clock and data tracking for the USB-backward data 222. It is distinguished from the long synchronization 211 in its shorter byte length and it is not required to initialize communication between devices.

Additionally, the end of synchronization 221 data is used, by both devices to start their corresponding TDM windows. USB-backward data 222 includes of 18 bytes data that complies with the USB standard.

[0037] The second forward data packet 240 is similar to the first forward data 210 except that the second forward data includes a shorter synchronization signal 221B. The shorter synchronization signal 221B is substantially the same in function and structure as the short synchronization signal 221A in the backward data packet 220.

[0038] FIG. 2 also illustrates latency that occurs during bidirectional transmission of USB data multiplexed within an A/V stream. Prior to the transmission of forward or backward data packets, the corresponding device transmitter 111 is turned on for a period of time T_{on}. After the data packet is sent the transmitter 111 is turned off for a period of time T_{off}. A channel delay T_{ch} is the time period occurring between the transmissions of a data packet from a transmitter 111 of a source device 110 to its reception by a receiver 122 of a sink device 120. The delay T_{ch} is caused by the time need for a data packet to traverse the TMDS Channel 131. The summation of time between the turn-on time period T_{on}, turn-off time period T_{off}, and channel delay time period T_{ch} is the turn over time 230. T_{margin} represents a time period between the end of a backward data packet 220 and the beginning of a second forward data packet 240.

[0039] Although the communication is initiated by sending the first forward data 210 at the source device in the embodiment of FIG. 2, the sink device 120 may initiate the communication by sending backward data in other embodiments. In embodiments where the communication is initiated by sending the backward data, the long synchronization signal may be included in the included in the backward data instead of the forward data.

EXAMPLE STRUCTURE OF DATA IN A/V STREAM

[0040] FIG. 3 is a diagram illustrating a frame of data transmitted over a TMDS channel, according to one embodiment. A data frame 300 includes active video data 310 (480 lines of active video data in this particular example), as well as a vertical blanking period 320 between periods of active video data and horizontal blanking periods between lines of video data 325 (each line including 720 active pixels). The particular number of lines and pixels is dependent on the type and resolution of a video image. In some embodiments, in order to synchronize auxiliary data (e.g., character data) with the video data 325, the auxiliary data is encoded within the video data. In some embodiments, the auxiliary data is encoded by modifying the color space of a portion of the video data 310 to generate unused bits for the encoding of the auxiliary data.

[0041] In some embodiments, because the modification of the color space of the portion of video data used to encode the auxiliary data results in degradation of the video data, the portion of video data is chosen to reduce visual impact. In some embodiments, the portion of video data is chosen to be at a beginning or end (or both) of the video data such that the image display is affected only at, for example, the top or bottom (or both) of the image. In this illustration, the portion of video data utilized for encoding of auxiliary data may be a first line or lines 330 of the video data 310 or a last line or lines 335 of the video data such that the portion of the resulting image is affected only at the top of the image, the bottom of the image, or both the top and the bottom of the image. In some embodiments, the portion may also be encoded at a right or left edge of the image, with character data being encoded in multiple lines of the video data 310.

[0042] In some embodiments, a reduction image quality because of the encoding of auxiliary data is transitory because there is a need to convert the color space or reallocate bits only when sending new auxiliary data. With the high bandwidth of the video data, auxiliary data such as

closed captions may be sent in a single frame while conventional systems required multiple frames. Thus, in one example, a color space conversion may interrupt only a single frame per second, which is likely an imperceptible change to the viewer.

EXAMPLE USB BUFFERING

[0043] FIG. 4 is a diagram illustrating a buffering of USB-forward data for insertion into an A/V data stream, according to one embodiment. To include bi-directionally transmitted USB data of a slow rate (e.g., 600 Mbps) within A/V data stream of a high rate (e.g., 6.0 Gbps), buffering of the USB data is performed. Further, sending an empty USB data packet (null-USB packets) is not permitted under the USB standard. Hence, USB data is buffered as integer packets of one byte prior to transmission to account for a higher data rate of A/V data stream. The one byte USB data packets are then transmitted in each TDM window time period. USB data in both the forward and backward direction are buffered in the buffers 113,123 before being evenly distributed through TDM window s over the TMDS channel 131.

[0044] In one embodiment, the data packet of USB-forward data 213 and USB-backward data 221 are both 18 bytes in size. However, USB-forward data 213 and USB-backward data 221 are buffered at different rates to account for the presence or absence of A/V data 212. A USB-forward data 213 byte is sent as part of a USB-forward data transmission 404 that occurs every 11 TDM time slots 414. The USB-forward data 213 is transferred from the buffer 113 for transmission when at least four bytes have been. If a TDM time period passes before buffering begins, too much latency is added to the USB data transmission. If less than 4 bytes are buffered or buffering occurs during the middle of a TDM time period, not enough USB-forward data will be available to send through a TDM time slot. A USB-backward data byte is transmitted for every time slot because there is no A/V data to package with the USB-backward data 222 and

transmission occurs at much faster rates. Additionally, 18 bytes of USB-backward data are accumulated in the buffer 123 prior to the transmission.

EXAMPLE PROCESS FOR BIDIRECTIONAL TRANSMISSION OF USB DATA

[0045] FIG. 5 is a transactional diagram illustrating a method for the bidirectional exchange USB data in an A/V data channel, according to one embodiment. The source device 110 sends 505 a first forward data packet 210 over a TMDS channel 131 of a multimedia link 130 during a first time to a sink device 120. At the start of the first time the source device 110 enters a transmission state.

[0046] The source device 110 then transitions to a receive state after sending the first forward data packet 210 and prior to a second time. In the receive state the source device 110 turns on a counter and waits for a synchronization 221A signal send by the sink device 120.

[0047] During the first time the sink device 120 waits for a long synchronization 211 before transitioning into a receive state and starting a referenced TDM window 204. The sink device 120 receives 510 the first forward data packet 210 over the TMDS channel 131 of the multimedia link 130 from a source device 110. Based upon the referenced TDM window 204, the sink device 120 transitions to transmission state.

[0048] The sink device 120 sends 515 a backward data packet 220 over a TMDS channel 131 of a multimedia link 130 during a second time to a source device 110. The sink device 120 returns to the receive state and waits for the next synchronization 221B signal. If no synchronization 221A is received during a second time, the source device 110 waits for the master TDM window 202 to expire before returning to the transition state. If the synchronization 221A is received, the source device 110 receives 520 a backward data packet 220 over a TMDS channel 131 of a multimedia link 130 during a second time from the sink device 120.

[0049] Control data is sent 525 from the source device over an eCBUS channel 132 to a sink device 120, independent from forward and backward data sent over the TMDS channel 131. The control data is received 530 by a sink device 120 over the eCBUS channel 132 from a source device 110.

[0050] In an alternative embodiment, the sink device 120 initiates data transmission while using the master TDM window 202 to control data exchange timing. At the start of the first time the sink device 120 enters a transmission state. The sink device 120 sends 505 a backward data packet 220 over a TMDS channel 131 of a multimedia link 130 during a first time to a source device 110.

[0051] The sink device 120 then transitions to a receive state after sending the backward data packet 220 and prior to a second time. In the receive state the sink device 120 turns on a counter and waits for a synchronization 221B signal send by the source device 110.

[0052] During the first time the source device 110 waits to receive a long synchronization 211 before transitioning into a receive state and starting a referenced TDM window 204. The source device 110 receives 510 the backward packet 210 over the TMDS channel 131 of the multimedia link 130 from the sink device 120. Based upon the referenced TDM window 204, the source device 110 transitions to transmission state.

[0053] The source device 110 sends 515 a second forward packet 240 over a TMDS channel 131 of a multimedia link 130 during a second time to a sink device 120. The source device 110 returns to the receive state and waits for the next synchronization 221A signal. If no synchronization 221B is received during a second time, the sink device 120 waits for its master TDM window 202 to expire before returning to the transition state. If the synchronization 221B is received, the sink device 120 receives 520 a second forward data packet 220 over a TMDS

channel 131 of a multimedia link 130 during a second time from the source device 110

[0054]

COMPUTING MACHINE ARCHITECTURE

[0055] Figure (FIG.) 6 is a block diagram illustrating an apparatus or system for transmitting or receiving USB data encoded within an audio/video (A/V) data stream, according to one embodiment. An apparatus or system 600 (referred to here generally as an apparatus) comprises an interconnect or crossbar 602 or other communication means for transmission of data. The apparatus 600 may include a processing means such as one or more processor(s) 604 coupled with the interconnect 602 for processing information. The processor(s) 604 may comprise one or more physical processors and one or more logical processors. The interconnect 602 is illustrated as a single interconnect for simplicity, but may represent multiple different interconnects or buses and the component connections to such interconnects may vary. The interconnect 602 shown in FIG. 6 is an abstraction that represents any one or more separate physical buses, point-to-point connections, or both connected by appropriate bridges, adapters, or controllers.

[0056] In some embodiments, the system 600 further comprises a random access memory (RAM) or other dynamic storage device or element as a main memory 612 for storing information and instructions to be executed by the processor(s) 604. In some embodiments, main memory 612 may include active storage of applications including a browser application for using in network browsing activities by a user of the system 600. In some embodiments, main memory 612 of the system 600 may include certain registers or other special purpose memory.

[0057] The system 600 also may comprise a read only memory (ROM) 614 or other static storage device for storing static information and instructions for the processors 604. The apparatus 600 may include one or more non-volatile memory elements 616 for the storage of

certain elements, including, for example, flash memory and a hard disk or solid-state drive.

[0058] One or more transmitters 652 or receivers 654 may also be coupled to the interconnect 602. In some embodiments, the transmitters 652 or receivers 654 may include one or more ports 658 for the connection of other devices 660, such as the illustrated. In some embodiments, the system 600 includes control logic 656, where the control logic 656 provides for handling of the transmission or reception of USB data, where the handling of such data includes encoding the USB data into video data for transmission or extracting the USB data from received data.

[0059] The system 600 may also be coupled via the interconnect 602 to an output display 640. In some embodiments, the display 640 may include a liquid crystal display (LCD) or any other display technology, for displaying information or content to a user. In some environments, the display 640 may include a touch-screen that is also utilized as at least a part of an input device 630. In some environments, the display 640 may be or may include an audio device, such as a speaker for providing audio information.

[0060] The system 600 may also include a power device 620, which may comprise a power supply, a battery, a solar cell, a fuel cell, or other system or device for providing or generating power. The power provided by the power device or system 620 may be distributed as required to elements of the system 600.

[0061] While particular embodiments and applications have been illustrated and described, it is to be understood that the disclosed embodiments are not limited to the precise construction and components disclosed herein. Various modifications, changes and variations, may be made in the arrangement, operation and details of the method and apparatus disclosed herein.

CLAIMS

WHAT IS CLAIMED IS:

1. A method of transmitting data over a multimedia link, comprising:

sending a first unit of data from a source device to a sink device over a first physical channel of the multimedia link during a first time, the first unit of data comprising video data and forward data compliant with a standard;

receiving a second unit of data by the source device over the physical channel of the multimedia link during a second time, the second unit of data comprising backward data compliant with the standard; and

sending control data from the source device to the sink device over a second physical channel of the multimedia link distinct from the first physical channel.

2. The method of claim 1, further comprising sending a first synchronization signal of a first length after sending the first unit of data and before sending another first unit of data from the source device.

3. The method of claim 2, further comprising sending a second synchronization signal of a second length longer than the first synchronization to initialize communication over the first physical channel before sending the first unit of data.

4. The method of claim 1, further comprising detecting, by the source device, a first synchronization signal of a first length for a predetermined amount of time after sending the first unit of data, the first synchronization signal received at the source device before receiving the second unit of data.

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Page 21

5. The method of claim 4, further comprising aligning a boundary of a symbol in the second unit of data using the first synchronization signal.

6. The method of claim 4, wherein the first time and the second time are separated by at least a predetermined amount of turnover time (ToT) greater than a sum of a turn-off time of a driver of the source device for communicating over the first physical channel, a turn-on time of a driver of the sink device for communicating over the first physical channel, and a channel delay time.

7. The method of claim 4, wherein the standard comprises universal serial bus (USB) standard.

8. The method of claim 7, further comprising buffering a predetermined amount of the forward data before assembling and sending the first unit of data.

9. The method of claim 4, wherein the predetermined amount of time is tracked at the source device.

10. The method of claim 4, further comprising sending another first synchronization signal of the first length from the source device to the sink device after receiving the second unit of data and before sending another first unit of data from the source device to the second data, the other first unit of data compliant with the standard.

11. The method of claim 1, further comprising receiving control data from the sink device to the source device over a second physical channel of the multimedia link distinct from the first physical channel.

12. A method of transmitting data over a multimedia link, comprising

receiving a first unit of data from a source device by a sink device over a first physical channel of the multimedia link during a first time, the first unit of data comprising video data and forward communication data compliant with a standard;

sending a second unit of data from the sink device over the first physical channel of the multimedia link during a second time, the second unit of data comprising backward communication data compliant with the standard; and

receiving control data from the source device to the sink device over a second physical channel of the multimedia link distinct from the first physical channel.

13. The method of claim 12, further comprising receiving a first synchronization signal of a first length after receiving the first unit of data and before receiving a second unit of data from the source device.

14. The method of claim 13, further comprising detecting a second synchronization signal of a second length longer than the first synchronization to initialize communication over the first physical channel before receiving the first unit of data.

15. The method of claim 13, wherein the standard comprises universal serial bus (USB) standard.

16. The method of claim 13, wherein the first time and the second time are separated by at least a predetermined amount of turnover time (ToT) greater than a sum of a turn-off time of a driver of the source device for communicating over the first physical channel and a turn-on time of a driver of the sink device for communicating over the first physical channel.

17. The method of claim 13, further comprising buffering a predetermined amount of the backward data before assembling and sending the second unit of data.

18. The method of claim 13, further comprising receiving another first synchronization signal of the first length from the source device after sending the second unit of data and before receiving another first unit of data from the source device, the other first unit of data compliant with the standard.

19. The method of claim 12, further comprising aligning a boundary of a symbol in the first unit of data using the first synchronization signal.

20. The method of claim 13, further comprising sending a first synchronization signal of a first length after receiving the first unit of data to cause the source device to receive the first synchronization signal within a predetermined amount of time after the source device sends the first unit of data.

21. The method of claim 20, wherein the source device tracks the predetermined amount of time in the source device.

22. The method of claim 12, further comprising sending control data from the sink device to the source device over a second physical channel of the multimedia link distinct from the first physical channel.

23. A source device for communicating data with a sink device over a multimedia link, comprising:

a transmitter coupled to a first physical channel of the multimedia link and configured to send a first unit of data from the source device to the sink device over the first

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Page 24

physical channel during a first time, the first unit of data comprising video data and forward data compliant with a standard;

a receiver coupled to the first physical channel and configured to receive a second unit of data from the source device over the physical channel during a second time, the second unit of data comprising backward data compliant with the standard; and

a control signal transceiver coupled to a second physical channel of the multimedia link distinct from the first physical channel and configured to at least send control data from the source device to the sink device over the second physical channel.

24. A non-transitory computer readable storage medium storing instructions thereon, the instructions representing a digital design of a circuit comprising:

a transmitter coupled to a first physical channel of the multimedia link and configure to send a first unit of data from a source device to a sink device over the first physical channel during a first time, the first unit of data comprising video data and forward data compliant with a standard;

a receiver coupled to the first physical channel and configured to receive a second unit of data from the sink device over the physical channel during a second time, the second unit of data comprising backward data compliant with the standard; and

a control signal transceiver coupled to a second physical channel of the multimedia link distinct from the first physical channel and configured to at least send control data from the source device to the sink device over the second physical channel.

ABSTRACT

Embodiments relate to half-duplex bidirectional transmission of data compliant with a first standard (e.g., Universal Serial Bus (USB) standard) over a physical channel of a multimedia link for transmitting audio/video ("A/V") data compliant with a second standard (e.g., Mobile High-Definition Link (MHL) standard) between a source device and a sink device using time division multiplexing (TDM). The source device sends units of data including A/V data and forward data compliant with the first standard at first times whereas the sink device sends units of data including backward data compliant with the first standard at second times between transmissions from the source device. The first times do not overlap with the second times. Synchronization signals may be added to the first and second units of data to align character symbols embedded in the first and second units of data.

Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	Bidirectional Transmission Of USB Data Using Audio/Video Data Channel
First Named Inventor/Applicant Name:	Ju Hwan Yi
Filer:	Dohyun Ahn/Kimberly Woo
Attorney Docket Number:	30850-27614/US

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Utility application filing	1011	1	280	280
Utility Search Fee	1111	1	600	600
Utility Examination Fee	1311	1	720	720
Pages:				
Claims:				
Claims in Excess of 20	1202	4	80	320
Independent claims in excess of 3	1201	1	420	420
Miscellaneous-Filing:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**2340**

Electronic Acknowledgement Receipt	
EFS ID:	22008240
Application Number:	14681992
International Application Number:	
Confirmation Number:	1089
Title of Invention:	Bidirectional Transmission Of USB Data Using Audio/Video Data Channel
First Named Inventor/Applicant Name:	Ju Hwan Yi
Customer Number:	120363
Filer:	Dohyun Ahn
Filer Authorized By:	
Attorney Docket Number:	30850-27614/US
Receipt Date:	08-APR-2015
Filing Date:	
Time Stamp:	19:46:05
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$2340
RAM confirmation Number	5266
Deposit Account	192555
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees) Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)	

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Application Data Sheet	27614_US_ADS.pdf	1561329 4518e3bfae6146a368c7ec1aa721196feb483b6f	no	9
Warnings:					
Information:					
2	Drawings-only black and white line drawings	27614_US_Drawings.pdf	266325 fedd9962e45d128b7a55a0eca2fda86ba953e326	no	6
Warnings:					
Information:					
3	Oath or Declaration filed	27614_US_Declarations.pdf	1695349 4ef82739244d0e50140e2b8cf0a1e13e67a35381	no	7
Warnings:					
Information:					
4	Power of Attorney	27614_US_POA_82B.pdf	410976 df7c7e6208f56abb2f5ce1c1db66a172b158a1e0	no	2
Warnings:					
Information:					
5		27614_US_Specification.pdf	126716 0f8f0481e3c45e5d7ea6843cf1872a2a871ea41f	yes	24

Multipart Description/PDF files in .zip description

Document Description	Start	End
Specification	1	18
Claims	19	23
Abstract	24	24

Warnings:					
Information:					
6	Fee Worksheet (SB06)	fee-info.pdf	38199 833035b880e7a90c0e694326c345e3e8da7d47fb	no	2

Warnings:	
Information:	
Total Files Size (in bytes):	4098894

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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Electronic Acknowledgement Receipt	
EFS ID:	22008240
Application Number:	14681992
International Application Number:	
Confirmation Number:	1089
Title of Invention:	Bidirectional Transmission Of USB Data Using Audio/Video Data Channel
First Named Inventor/Applicant Name:	Ju Hwan Yi
Customer Number:	120363
Filer:	Dohyun Ahn
Filer Authorized By:	
Attorney Docket Number:	30850-27614/US
Receipt Date:	08-APR-2015
Filing Date:	
Time Stamp:	19:46:05
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$2340
RAM confirmation Number	5266
Deposit Account	192555
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees) Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)	

Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees)

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Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Application Data Sheet	27614_US_ADS.pdf	1561329 4518e3bfae6146a368c7ec1aa721196feb483b6f	no	9
Warnings:					
Information:					
2	Drawings-only black and white line drawings	27614_US_Drawings.pdf	266325 fedd9962e45d128b7a55a0eca2fda86ba953e326	no	6
Warnings:					
Information:					
3	Oath or Declaration filed	27614_US_Declarations.pdf	1695349 4ef82739244d0e50140e2b8cf0a1e13e67a35381	no	7
Warnings:					
Information:					
4	Power of Attorney	27614_US_POA_82B.pdf	410976 df7c7e6208f56abb2f5ce1c1db66a172b158a1e0	no	2
Warnings:					
Information:					
5		27614_US_Specification.pdf	126716 0f8f0481e3c45e5d7ea6843cf1872a2a871ea41f	yes	24

Multipart Description/PDF files in .zip description

Document Description	Start	End
Specification	1	18
Claims	19	23
Abstract	24	24

Warnings:					
Information:					
6	Fee Worksheet (SB06)	fee-info.pdf	38199 833035b880e7a90c0e694326c345e3e8da7d47fb	no	2

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Information:	
Total Files Size (in bytes):	4098894

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New Applications Under 35 U.S.C. 111
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National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	30850-27614/US
	Application Number	
Title of Invention	Bidirectional Transmission Of USB Data Using Audio/Video Data Channel	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Ju Hwan		Yi	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

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Mailing Address of Inventor:

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Postal Code	94085	Country i	US

Inventor 2 Remove

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Prefix	Given Name	Middle Name	Family Name	Suffix
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City	Sunnyvale	State/Province	CA	Country of Residence i	US

Mailing Address of Inventor:

Address 1	Silicon Image, Inc.
Address 2	1140 East Arques Avenue

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Postal Code	94085	Country i	US

Inventor 3 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
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Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	30850-27614/US
	Application Number	
Title of Invention	Bidirectional Transmission Of USB Data Using Audio/Video Data Channel	

City	San Jose	State/Province	CA	Country of Residence i	US

Mailing Address of Inventor:

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Postal Code	94085	Country i	US

Inventor 4 Remove

Legal Name

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	Min-Kyu		Kim	

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Inventor 5 Remove

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Residence Information (Select One) (•) US Residency ( ) Non US Residency ( ) Active US Military Service

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Postal Code	94085	Country i	US

Inventor 6 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Gyudong		Kim	

Residence Information (Select One) (•) US Residency ( ) Non US Residency ( ) Active US Military Service

City	Sunnyvale	State/Province	CA	Country of Residence i	US

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	30850-27614/US
	Application Number	
Title of Invention	Bidirectional Transmission Of USB Data Using Audio/Video Data Channel	

Mailing Address of Inventor:

Address 1	Silicon Image, Inc.		
Address 2	1140 East Arques Avenue		
City	Sunnyvale	**State/Province**	CA
Postal Code	94085	**Country** i	US

Inventor 7 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Hoon		Choi	

Residence Information (Select One) (•) US Residency ( ) Non US Residency ( ) Active US Military Service

City	Mountain View	**State/Province**	CA	**Country of Residence** i	US

Mailing Address of Inventor:

Address 1	Silicon Image, Inc.		
Address 2	1140 East Arques Avenue		
City	Sunnyvale	**State/Province**	CA
Postal Code	94085	**Country** i	US

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	120363		
Email Address	ptoc@fenwick.com	Add Email	Remove Email

Application Information:

Title of the Invention	Bidirectional Transmission Of USB Data Using Audio/Video Data Channel		
Attorney Docket Number	30850-27614/US	**Small Entity Status Claimed**	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	6	**Suggested Figure for Publication (if any)**	

Filing By Reference :

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	30850-27614/US
	Application Number	
Title of Invention	Bidirectional Transmission Of USB Data Using Audio/Video Data Channel	

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	◉ Customer Number	○ US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	120363		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the application number blank.

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
	Claims benefit of provisional	61979483	2014-04-14

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button. Add

Foreign Priority Information:

PTO/AIA/14 (12-13)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	30850-27614/US
	Application Number	
Title of Invention	Bidirectional Transmission Of USB Data Using Audio/Video Data Channel	

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55(d). When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX) [i] the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(h)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Remove

Application Number	Country [i]	Filing Date (YYYY-MM-DD)	Access Code [i] (if applicable)

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button. Add

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Authorization to Permit Access:

☒ Authorization to Permit Access to the Instant Application by the Participating Offices

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	30850-27614/US
	Application Number	
Title of Invention	Bidirectional Transmission Of USB Data Using Audio/Video Data Channel	

If checked, the undersigned hereby grants the USPTO authority to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the World Intellectual Property Office (WIPO), and any other intellectual property offices in which a foreign application claiming priority to the instant patent application is filed access to the instant patent application. See 37 CFR 1.14(c) and (h). This box should not be checked if the applicant does not wish the EPO, JPO, KIPO, WIPO, or other intellectual property office in which a foreign application claiming priority to the instant patent application is filed to have access to the instant patent application.

In accordance with 37 CFR 1.14(h)(3), access will be provided to a copy of the instant patent application with respect to: 1) the instant patent application-as-filed; 2) any foreign application to which the instant patent application claims priority under 35 U.S.C. 119(a)-(d) if a copy of the foreign application that satisfies the certified copy requirement of 37 CFR 1.55 has been filed in the instant patent application; and 3) any U.S. application-as-filed from which benefit is sought in the instant patent application.

In accordance with 37 CFR 1.14(c), access may be provided to information concerning the date of filing this Authorization.

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant 1 Remove

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

(•) Assignee	( ) Legal Representative under 35 U.S.C. 117	( ) Joint Inventor
( ) Person to whom the inventor is obligated to assign.	( ) Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor :

If the Applicant is an Organization check here. [X]

Organization Name	Silicon Image, Inc.		
Mailing Address Information:			
Address 1	1140 East Arques Avenue		
Address 2			
City	Sunnyvale	**State/Province**	CA
Country [i]	US	Postal Code	94085
Phone Number		Fax Number	

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	30850-27614/US
	Application Number	
Title of Invention	Bidirectional Transmission Of USB Data Using Audio/Video Data Channel	

Email Address	

Additional Applicant Data may be generated within this form by selecting the Add button. Add

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not subsitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication . An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

Remove

If the Assignee or Non-Applicant Assignee is an Organization check here. ☐

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1			
Address 2			
City		**State/Province**	
Country i		Postal Code	
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button. Add

Signature:

Remove

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications

Signature	/Dohyun Ahn/			Date (YYYY-MM-DD)	2015-04-08
First Name	Dohyun	Last Name	Ahn	Registration Number	63237

Additional Signature may be generated within this form by selecting the Add button. Add

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	30850-27614/US
	Application Number	
Title of Invention	Bidirectional Transmission Of USB Data Using Audio/Video Data Channel	

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

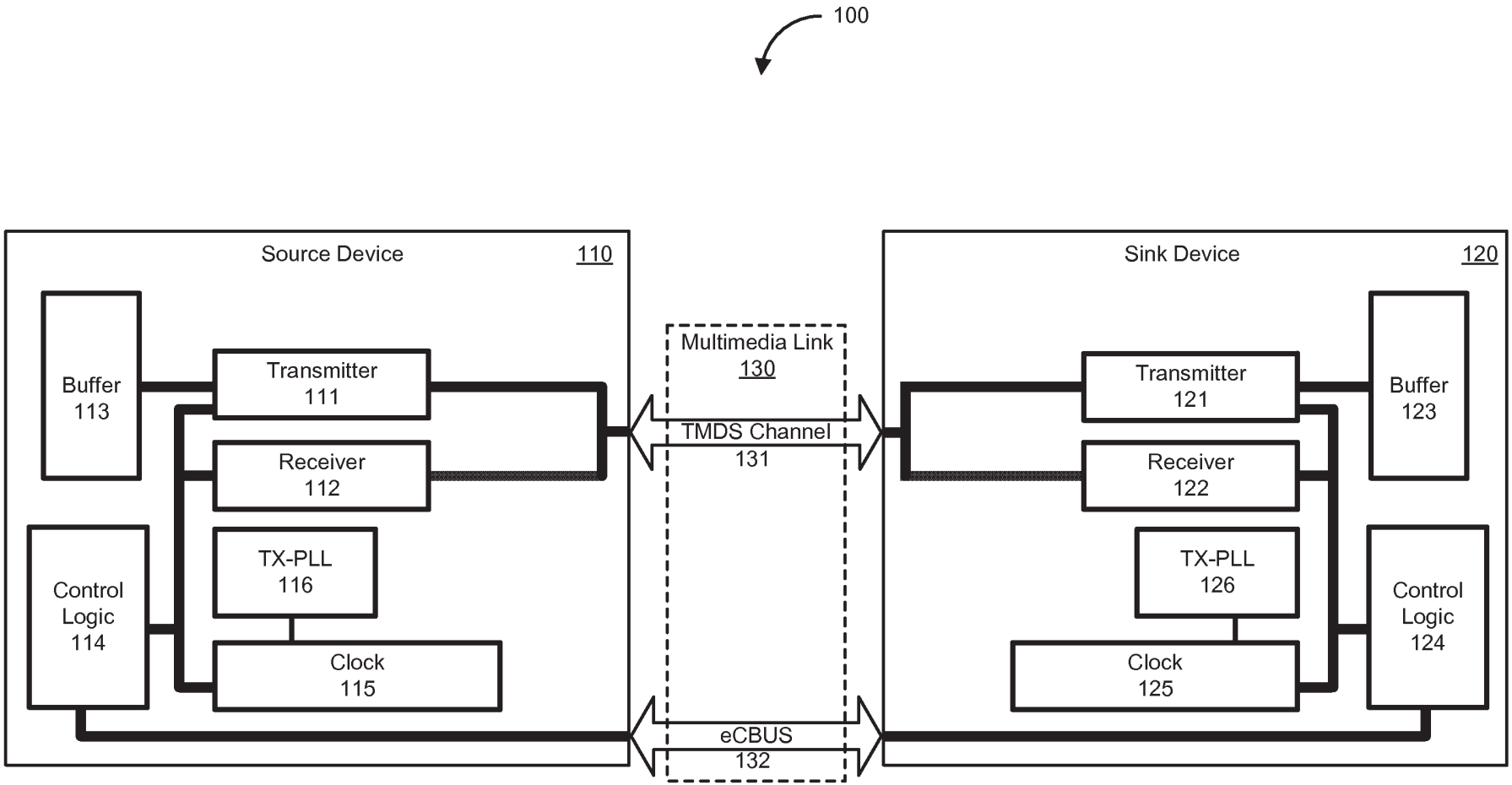

FIG. 1

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Page 44

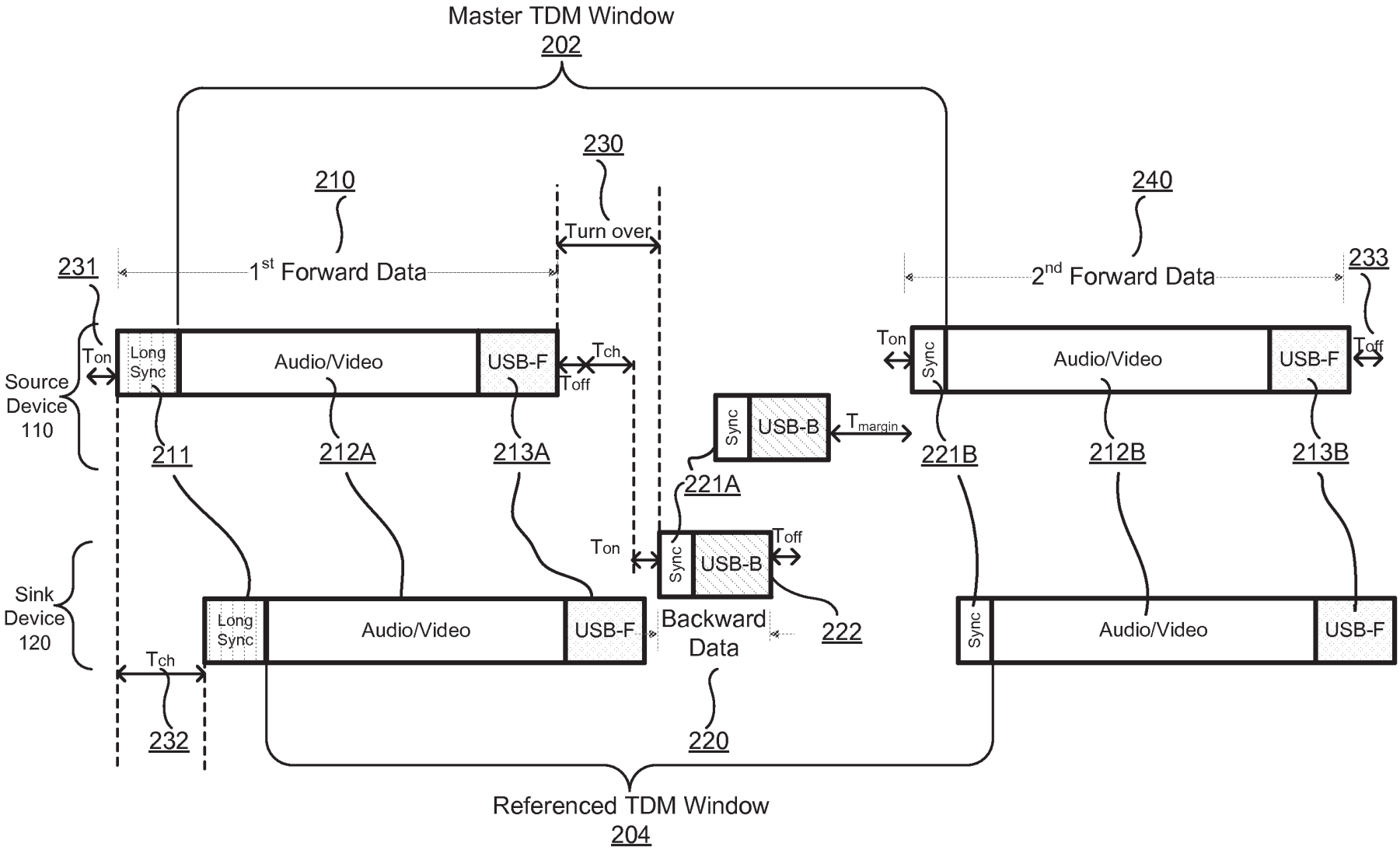

FIG. 2

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Page 45

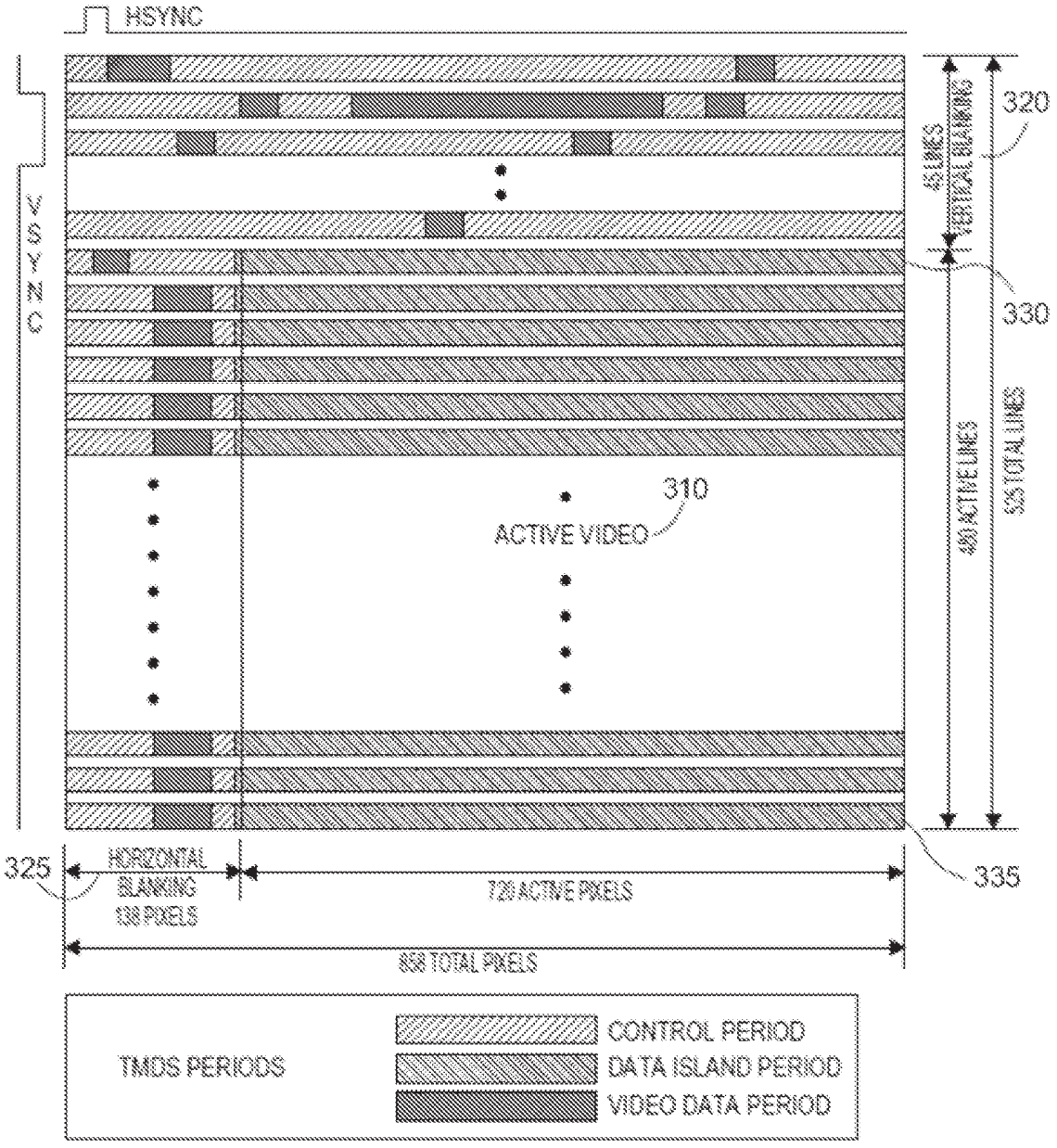
HSYNC
VSYNC
45 LINES VERTICAL BLANKING
320
330
480 ACTIVE LINES
525 TOTAL LINES
310
ACTIVE VIDEO
325
HORIZONTAL BLANKING 138 PIXELS
720 ACTIVE PIXELS
858 TOTAL PIXELS
335
TMDS PERIODS
CONTROL PERIOD
DATA ISLAND PERIOD
VIDEO DATA PERIOD

FIG. 3

300

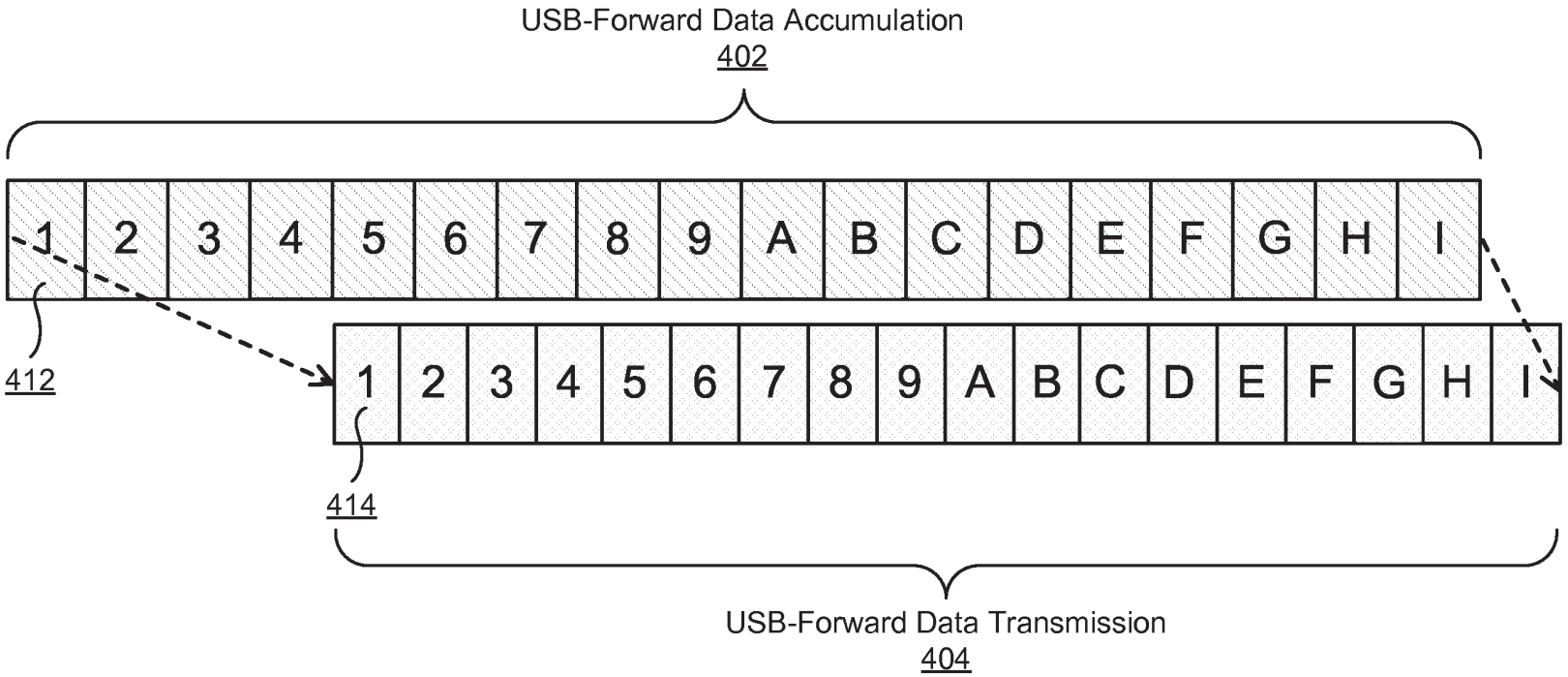

FIG. 4

400

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500

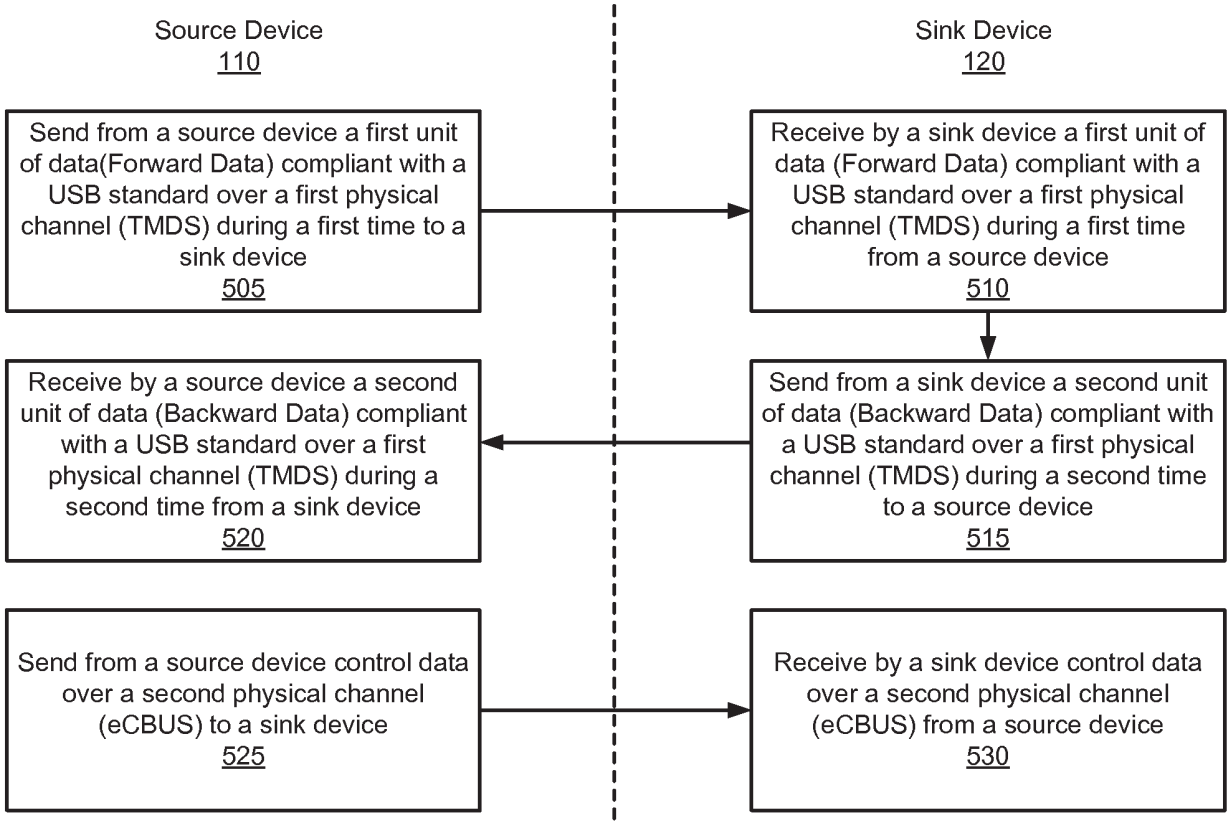

FIG. 5

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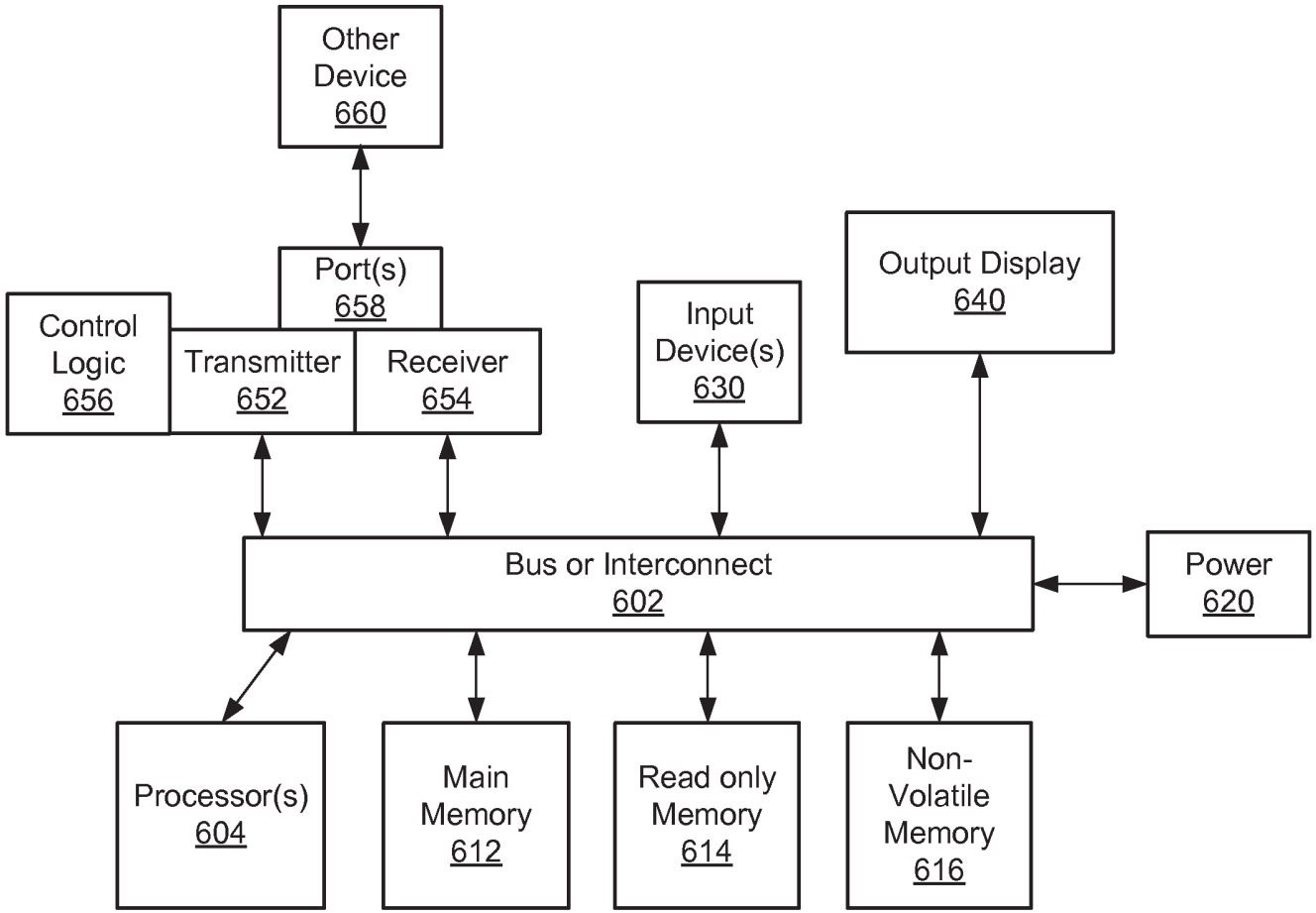

FIG. 6

600

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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	BIDIRECTIONAL TRANSMISSION OF USB DATA USING AUDIO/VIDEO DATA CHANNEL

As the below named inventor, I hereby declare that:

This declaration is directed to:

- [■] The attached application, or
- [ ] United States application or PCT international application number _____

filed on _____.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: JU HWAN YI Date (Optional): 3/23/2015

Signature: _____

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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LEGAL NAME OF INVENTOR

Inventor: YOUNG IL KIM Date (Optional): 4/6/2014

Signature: _____

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

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LEGAL NAME OF INVENTOR

Inventor: GIJUNG AHN Date (Optional): 3/23/2015

Signature: _____

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

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LEGAL NAME OF INVENTOR

Inventor: MIN-KYU KIM Date (Optional): 3-23-2015

Signature: Min Kyu Kim

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

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LEGAL NAME OF INVENTOR

Inventor: DAEYUN SHIM Date (Optional) : _____

Signature: _____

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

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Title of Invention	BIDIRECTIONAL TRANSMISSION OF USB DATA USING AUDIO/VIDEO DATA CHANNEL

As the below named inventor, I hereby declare that:

This declaration is directed to:

- [x] The attached application, or
- [ ] United States application or PCT international application number _____ filed on _____.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: GYUDONG KIM Date (Optional): 3/23/2015

Signature: _____

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PTO/AIA/01 (06-12)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	BIDIRECTIONAL TRANSMISSION OF USB DATA USING AUDIO/VIDEO DATA CHANNEL

As the below named inventor, I hereby declare that:

This declaration is directed to:

- [■] The attached application, or
- [ ] United States application or PCT international application number _____

filed on _____.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

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LEGAL NAME OF INVENTOR

Inventor: Hoon CHOI Date (Optional): 3/23/2015

Signature: _____

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 14/681,992

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	280
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	600
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	720
TOTAL CLAIMS (37 CFR 1.16(i))	24 minus 20 =	* 4			OR	x 80 =	320
INDEPENDENT CLAIMS (37 CFR 1.16(h))	4 minus 3 =	* 1				x 420 =	420
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	2340

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE($)	ADDITIONAL FEE($)	OR	RATE($)	ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
14/681,992	04/08/2015	2827	2340	30850-27614/US	24	4

CONFIRMATION NO. 1089

120363
Silicon Image/FENWICK
801 California Street
Mountain View, CA 94041

FILING RECEIPT

OC000000074719136

Date Mailed: 04/23/2015

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Ju Hwan Yi, Sunnyvale, CA;
Young Il Kim, Sunnyvale, CA;
Gijung Ahn, San Jose, CA;
Min-Kyu Kim, Sunnyvale, CA;
Daeyun Shim, Saratoga, CA;
Gyudong Kim, Sunnyvale, CA;
Hoon Choi, Mountain View, CA;

Applicant(s)

Silicon Image, Inc., Sunnyvale, CA

Power of Attorney: The patent practitioners associated with Customer Number 120363

Domestic Priority data as claimed by applicant

This appln claims benefit of 61/979,483 04/14/2014

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access - A proper **Authorization to Permit Access to Application by Participating Offices** (PTO/SB/39 or its equivalent) has been received by the USPTO.

If Required, Foreign Filing License Granted: 04/20/2015

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 14/681,992**

Projected Publication Date: 10/15/2015

Non-Publication Request: No

Early Publication Request: No

Title

Bidirectional Transmission Of USB Data Using Audio/Video Data Channel

Preliminary Class

365

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

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The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit http://www.SelectUSA.gov or call +1-202-482-6800.

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UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
14/681,992	04/08/2015	Ju Hwan Yi	30850-27614/US

CONFIRMATION NO. 1089

PUBLICATION NOTICE

120363
Lattice Semiconductor/FENWICK
801 California Street
Mountain View, CA 94041

OC000000078061316

Title: Bidirectional Transmission Of USB Data Using Audio/Video Data Channel

Publication No.US-2015-0293879-A1
Publication Date:10/15/2015

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Office of Public Records. The Office of Public Records can be reached by telephone at (703) 308-9726 or (800) 972-6382, by facsimile at (703) 305-8759, by mail addressed to the United States Patent and Trademark Office, Office of Public Records, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently http://pair.uspto.gov/. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Office of Data Managment, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)				*Complete if Known*	
				Application Number	14/681,992
				Filing Date	April 8, 2015
				First Named Inventor	Ju Hwan Yi
				Art Unit	2185
				Confirmation Number	1089
				Examiner Name	Tim T. Vo
Sheet	1	of	2	Attorney Docket Number	30850-27614/US

U.S. PATENT DOCUMENTS				
		Document No.		
Examiner Initials*	Cite No.[1]	Number – Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document
	A1	US-2014/0016034 A1	01-16-2014	Cirstea
	A2	US-2013/0336334 A1	12-19-2013	Gilbert et al.
	A3	US-2013/0223293 A1	08-29-2013	Jones et al.
	A4	US-2009/0257367 A1	10-15-2009	Keppler et al.
	A5	US-2009/0245345 A1	10-01-2009	Lee et al.

FOREIGN PATENT DOCUMENTS					
		Foreign Patent Document			
Examiner Initials*	Cite No.[1]	Country Code[3] – Number[4] Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	T[6]

OTHER REFERENCES – NON-PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published	T[6]
	C1	PCT International Search Report, PCT Application No. PCT/US2015/024984, July 24, 2015, 11 pages.	

EXAMINER SIGNATURE	
Examiner Signature	
Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] Applicant's unique citation designation number (option). [2] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [3] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document.

[5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)				Complete if Known	
				Application Number	14/681,992
				Filing Date	April 8, 2015
				First Named Inventor	Ju Hwan Yi
				Art Unit	2185
				Confirmation Number	1089
				Examiner Name	Tim T. Vo
Sheet	2	of	2	Attorney Docket Number	30850-27614/US

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ This application relies, under 35 U.S.C. § 120, on the earlier filing date of prior application No. _____, filed _____ and the references cited therein are hereby referenced, but are not required to be provided in this application under 37 CFR § 1.98(d).

☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Dohyun Ahn/	Date (YYYY-MM-DD)	2015-11-09
Name/Print	Dohyun Ahn	Registration Number	63,237

30850/27614/DOCS/3788667.1

DELL/HP/LENOVO EXHIBIT 1002
Page 63

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

To:
DOHYUN AHN,

FENWICK & WEST LLP SILICON VALLEY CENTER 801 CALIFORNIA STREET MOUNTAIN VIEW CA 94041 USA

RECEIVED
PATENT DOCKETING
Fenwick & West
3:05 pm, Jul 27, 2015

PCT

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT AND THE WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

Date of mailing *(day/month/year)*	24 July 2015 (24.07.2015)
Applicant's or agent's file reference 27614/PCT 30851-	**FOR FURTHER ACTION** See paragraphs 1 and 4 below
International application No. **PCT/US2015/024984**	International filing date *(day/month/year)* **08 April 2015 (08.04.2015)**
Applicant **SILICON IMAGE, INC.**	

1. ☒ The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

   Filing of amendments and statement under Article 19:

   The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):

   When? The time limit for filing such amendments is normally two months from the date of transmittal of the international search report.

   How? Directly to the International Bureau of WIPO preferably through ePCT or on paper to, 34 chemin des Colombettes 1211 Geneva 20, Switzerland, Facsimile No.: +41 22 338 82 70

   For more detailed instructions, see *PCT Applicant's Guide*, International Phase, paragraphs 9.004 . 9-011.

2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.

3. ☐ **With regard to any protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

   ☐ the protest together with the decision thereon has been transmitted to the International Bureau together with any request to forward the texts of both the protest and the decision thereon to the designated Offices.

   ☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Reminders**

The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established. Following the expiration of 30 months from the priority date, these comments will also be made available to the public.

Shortly after the expiration of **18 months** from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau before the completion of the technical preparations for international publication (Rules 90*bis*.1 and 90*bis*.3).

Within **19 months** from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase **until 30 months** from the priority date (in some Offices even later); otherwise, the applicant must, **within 20 months** from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices. In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19 months. For details about the applicable time limits, Office by Office, see www.wipo.int/pct/en/texts/time_limits.html and the *PCT Applicant's Guide*, National Chapters.

Within **19 months** from the priority date, the applicant may request that a supplementary international search be carried out by an International Searching Authority, that offers this service (Rule 45*bis*.1). The procedure for requesting supplementary international search is described in the *PCT Applicant's Guide*, International Phase, paragraphs 8.006-8.032.

Name and mailing address of the ISA/KR International Application Division Korean Intellectual Property Office 189 Cheongsa-ro, Seo-gu, Daejeon Metropolitan City, 302-701, Republic of Korea	Authorized officer COMMISSIONER
Facsimile No. 82-42-472-7140	Telephone No. 82-42-481-8751

Form PCT/ISA/220 (July 2014)

* Attention

Copies of the documents cited in the international search report can be searched in the following Korean Intellectual Property Office English website for six months(expire date : **2016.01.24**) from the date of mailing of the international search report.

http://www.kipo.go.kr/en/ => PCT Services => PCT Services

ID : PCT international application number
PW : **Q3T9LW5E**

Inquiries related to PCT International Search Report or Written Opinion prepared by KIPO as an International Searching Authority can be answered not only by KIPO but also through IPKC (Intellectual Property Korea Center), located in Vienna, VA, which functions as a PCT Help Desk for PCT applicants.

Homepage: http://www.ipkcenter.com

Email: ipkc@ipkcenter.com

Notes to Form PCT/ISA/220 (July 2014)

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 27614/PCT	**FOR FURTHER ACTION**	see Form PCT/ISA/220 as well as, where applicable, item 5 below.
International application No. **PCT/US2015/024984**	International filing date *(day/month/year)* **08 April 2015 (08.04.2015)**	(Earliest) Priority Date *(day/month/year)* 14 April 2014 (14.04.2014)
Applicant **SILICON IMAGE, INC.**		

This International search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of **3** sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**
   a. With regard to the **language**, the international search was carried out on the basis of :
      ☒ the international application in the language in which it was filed
      ☐ a translation of the international application into _____ , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))
   b. ☒ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6*bis*(a)).
   c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.
2. ☐ **Certain claims were found unsearchable** (See Box No. II)
3. ☐ **Unity of invention is lacking** (See Box No. III)
4. With regard to the **title,**
   ☒ the text is approved as submitted by the applicant.
   ☐ the text has been established by this Authority to read as follows:
5. With regard to the **abstract,**
   ☒ the text is approved as submitted by the applicant.
   ☐ the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.
6. With regard to the drawings,
   a. the figure of the drawings to be published with the abstract is Figure No. 2
      ☒ as suggested by the applicant.
      ☐ as selected by this Authority, because the applicant failed to suggest a figure.
      ☐ as selected by this Authority, because this figure better characterizes the invention.
   b. ☐ none of the figures is to be published with the abstract.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2015/024984

A. CLASSIFICATION OF SUBJECT MATTER

H04N 21/436(2011.01)i, G06F 13/38(2006.01)i, H04J 3/02(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H04N 21/436; H04J 3/16; H04L 5/16; H04N 7/00; H04N 11/02; H04L 5/14; G06F 13/38; H04J 3/02

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models
Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal) & Keywords: Multimedia Link, USB data,TDM(time division multiplexing), half-duplex, synchronization

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2009-0245345 A1 (DONGYUN LEE et al.) 01 October 2009 See paragraphs [0038], [0059], [0060], [0066], [0071], [0075]; claims 5, 23; and figures 2, 4.	1,2,4,7,8,11-13,15,17,22-24
A		3,5,6,9,10,14,16,18-21
A	US 2013-0336334 A1 (SILICON IMAGE, INC.) 19 December 2013 See paragraphs [0031], [0055]; claim 9; and figure 10.	1-24
A	US 2009-0257367 A1 (DAVID KEPPLER et al.) 15 October 2009 See paragraphs [0011], [0032]; and figure 3.	1-24
A	US 2014-0016034 A1 (MADALIN CIRSTEA) 16 January 2014 See paragraphs [0032], [0046]; and figure 2.	1-24
A	US 2013-0223293 A1 (GRAEME P. JONES et al.) 29 August 2013 See paragraph [0028]; and figure 1.	1-24

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents,such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
23 July 2015 (23.07.2015)	**24 July 2015 (24.07.2015)**

Name and mailing address of the ISA/KR
International Application Division
Korean Intellectual Property Office
189 Cheongsa-ro, Seo-gu, Daejeon Metropolitan City, 302-701, Republic of Korea
Facsimile No. +82-42-472-7140

Authorized officer
LEE, Jin Ick
Telephone No. +82-42-481-5770

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2015/024984

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2009-0245345 A1	01/10/2009	CN 101855900 A	06/10/2010
		CN 101855900 B	18/06/2014
		JP 05516905 B2	11/06/2014
		JP 2011-515999 A	19/05/2011
		KR 10-2011-0058740 A	01/06/2011
		TW 200942032 A	01/10/2009
		TW I393443 B	11/04/2013
		US 8908576 B2	09/12/2014
		US 9030976 B2	12/05/2015
		WO 2009-120682 A2	01/10/2009
		WO 2009-120682 A3	14/01/2010
US 2013-0336334 A1	19/12/2013	CN 104365034 A	18/02/2015
		EP 2862290 A1	22/04/2015
		KR 10-2015-0030243 A	19/03/2015
		TW 201408024 A	16/02/2014
		WO 2013-188571 A1	19/12/2013
US 2009-0257367 A1	15/10/2009	US 2005-0266881 A1	01/12/2005
		US 2009-111498 A1	30/04/2009
		US 7630395 B2	08/12/2009
		US 8170054 B2	01/05/2012
US 2014-0016034 A1	16/01/2014	None	
US 2013-0223293 A1	29/08/2013	CN 104160669 A	19/11/2014
		EP 2817932 A1	31/12/2014
		JP 2015-508969 A	23/03/2015
		KR 10-2014-0130720 A	11/11/2014
		TW 201336233 A	01/09/2013
		WO 2013-126830 A1	29/08/2013

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Page 68

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:
DOHYUN AHN,

FENWICK & WEST LLP SILICON VALLEY CENTER 801
CALIFORNIA STREET MOUNTAIN VIEW CA 94041 USA

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

Date of mailing *(day/month/year)*	**24 July 2015 (24.07.2015)**
Applicant's or agent's file reference: 27614/PCT	**FOR FURTHER ACTION**: See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US2015/024984	**08 April 2015 (08.04.2015)**	14 April 2014 (14.04.2014)

International Patent Classification (IPC) or both national classification and IPC

H04N 21/436(2011.01)i, G06F 13/38(2006.01)i, H04J 3/02(2006.01)i

Applicant
SILICON IMAGE, INC.

1. This opinion contains indications relating to the following items:

- [x] Box No. I Basis of the opinion
- [ ] Box No. II Priority
- [ ] Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- [ ] Box No. IV Lack of unity of invention
- [x] Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- [ ] Box No. VI Certain documents cited
- [ ] Box No. VII Certain defects in the international application
- [ ] Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.
For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA/KR	Date of completion of this opinion	Authorized officer
International Application Division Korean Intellectual Property Office 189 Cheongsa-ro, Seo-gu, Daejeon Metropolitan City, 302-701, Republic of Korea Facsimile No. +82-42-472-7140	23 July 2015 (23.07.2015)	LEE, Jin Ick Telephone No. +82-42-481-5770

Form PCT/ISA/237 (cover sheet) (January 2015)

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US2015/024984

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of :

   ☒ the international application in the language in which it was filed

   ☐ a translation of the international application into which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

2. ☒ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a))

3. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:

   a. ☐ forming part of the international application as filed:
      ☐ in the form of an Annex C/ST.25 text file.
      ☐ on paper or in the form of an image file.

   b. ☐ furnished together with the international application under PCT Rule 13*ter*.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.

   c. ☐ furnished subsequent to the international filing date for the purposes of international search only:
      ☐ in the form of an Annex C/ST.25 text file (Rule 13*ter*.1(a)).
      ☐ on paper or in the form of an image file (Rule 13*ter*.1(b) and Administrative Instructions, Section 713).

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

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WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US2015/024984

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-24	YES
	Claims	NONE	NO
Inventive step (IS)	Claims	3,5-6,9-10,14,16,18-21	YES
	Claims	1-2,4,7-8,11-13,15,17,22-24	NO
Industrial applicability (IA)	Claims	1-24	YES
	Claims	NONE	NO

2. Citations and explanations :

Reference is made to the following documents:

D1: US 2009-0245345 A1 (DONGYUN LEE et al.) 01 October 2009
D2: US 2013-0336334 A1 (SILICON IMAGE, INC.) 19 December 2013
D3: US 2009-0257367 A1 (DAVID KEPPLER et al.) 15 October 2009
D4: US 2014-0016034 A1 (MADALIN CIRSTEA) 16 January 2014
D5: US 2013-0223293 A1 (GRAEME P. JONES et al.) 29 August 2013

2.1 Novelty (PCT Article 33(2)) and Inventive Step (PCT Article 33(3))

2.1.1 Claims 1-11

D1, which is considered to be the closest prior art to the subject matter of claim 1, discloses a method, comprising: transmitting at least one stream of supporting data between a first and a second node over one or more hybrid channels of a hybrid link, wherein the hybrid channel is a high-speed half-duplex channel made logically to a full-duplex bi-directional channel by alternating direction of transmission (see claims 5, 23; figure 4 in D1).

Claim 1 differs from D1 in sending control data from a source device to a sink device over a second physical channel of a multimedia link distinct from a first physical channel. However, the difference is merely a variation of the disclosure of D1, considering that a DIVA control can be implemented across various CE device manufacturers to ensure interoperability by requiring devices to support specific functions per device type (see paragraph [0066]; figure 2 in D1), and a person skilled in the art would arrive at the claimed invention by general experimentation alone without exercising any ingenuity. Therefore, claim 1 does not involve an inventive step under PCT Article 33(3).

Continued on Supplemental Box

Supplemental Box

In case **the space in any of the preceding boxes is not sufficient.**
Continuation of : Box No. V

The additional feature of claim 2, dependent on claim 1, can be easily derived from the feature of D1 (see paragraph [0060]; delivering, through the hybrid link, the clock signal, to aid synchronization between the first node and the second node such that the hybrid link delivers the data packet after the synchronization is established). Therefore, claim 2 lacks an inventive step under PCT Article 33(3).

The additional feature of claim 4, dependent on claim 1, can be easily derived from the feature of D1 (see paragraph [0059]; detecting a lock from the second node of the hybrid channel and switching, in the hybrid channel, between the reference clock and the sub-channels). Therefore, claim 4 lacks an inventive step under PCT Article 33(3).

The additional feature of claim 7, dependent on claim 4, can be easily derived from the feature of D1 (see paragraph [0071]; USB or Ethernet data can be sent directly through the DIVA data sub-channel). Therefore, claim 7 lacks an inventive step under PCT Article 33(3).

The additional feature of claim 8, dependent on claim 7, can be easily derived from the feature of D1 (see paragraph [0038]; the TMDS encoder 302 transmits forward video packets through transmission buffers 306; and the TMDS decoder receives transmitted forward video packets through receiver buffers). Therefore, claim 8 lacks an inventive step under PCT Article 33(3).

The additional feature of claim 11, dependent on claim 1, can be easily derived from the feature of D1 (see paragraph [0066], figure 2; DIVA control can be implemented across various CE device manufacturers to ensure interoperability by requiring devices to support specific functions per device type). Therefore, claim 11 lacks an inventive step under PCT Article 33(3).

The additional features of claims 3, 5, 6, 9 and 10, directly or indirectly dependent on claim 1, are not disclosed in any of the prior art documents, nor are they obvious by the documents, taken alone or in combination. Accordingly, claims 3, 5, 6, 9 and 10 are novel and involve an inventive step under PCT Article 33(2) and (3).

2.1.2 Claims 12-22

D1, which is considered to be the closest prior art to the subject matter of claim 12, discloses a method, comprising: transmitting at least one stream of supporting data between a first and a

Continued on The Next Page

Supplemental Box

In case **the space in any of the preceding boxes is not sufficient.**
Continuation of : Previous Page

second node over one or more hybrid channels of a hybrid link, wherein the hybrid channel is a high-speed half-duplex channel made logically to a full-duplex bi-directional channel by alternating direction of transmission (see claims 5, 23; figure 4 in D1).

Claim 12 differs from D1 in receiving control data from a source device to a sink device over a second physical channel of a multimedia link distinct from a first physical channel. However, the difference is merely a variation of the disclosure of D1, considering that a DIVA control can be implemented across various CE device manufacturers to ensure interoperability by requiring devices to support specific functions per device type (see paragraph [0066]; figure 2 in D1), and a person skilled in the art would arrive at the claimed invention by general experimentation alone without exercising any ingenuity. Therefore, claim 12 does not involve an inventive step under PCT Article 33(3).

The additional feature of claim 13, dependent on claim 12, can be easily derived from the feature of D1 (see paragraph [0060]; delivering, through the hybrid link, the clock signal, to aid synchronization between the first node and the second node such that the hybrid link delivers the data packet after the synchronization is established). Therefore, claim 13 lacks an inventive step under PCT Article 33(3).

The additional feature of claim 15, dependent on claim 13, can be easily derived from the feature of D1 (see paragraph [0071]; USB or Ethernet data can be sent directly through the DIVA data sub-channel). Therefore, claim 15 lacks an inventive step under PCT Article 33(3).

The additional feature of claim 17, dependent on claim 13, can be easily derived from the feature of D1 (see paragraph [0038]; the TMDS encoder 302 transmits forward video packets through transmission buffers 306; and the TMDS decoder receives transmitted forward video packets through receiver buffers). Therefore, claim 17 lacks an inventive step under PCT Article 33(3).

The additional feature of claim 22, dependent on claim 12, can be easily derived from the feature of D1 (see paragraph [0066], figure 2; DIVA control can be implemented across various CE device manufacturers to ensure interoperability by requiring devices to support specific functions per device type). Therefore, claim 22 lacks an inventive step under PCT Article 33(3).

Continued on The Next Page

Supplemental Box

In case **the space in any of the preceding boxes is not sufficient.**
Continuation of : Previous Page

The additional features of claims 14, 16, and 18-21, directly or indirectly dependent on claim 12, are not disclosed in any of the prior art documents, nor are they obvious by the documents, taken alone or in combination. Accordingly, claims 14, 16, and 18-21 are novel and involve an inventive step under PCT Article 33(2) and (3).

2.1.3 Claim 23

The subject matter of claim 23 relates to a source device and has substantially the same technical features as claim 1, differing only in the category. Accordingly, the same reasoning as in claim 1 applies to claim 23. Therefore, claim 23 does not involve an inventive step under PCT Article 33(3).

2.1.4 Claim 24

The subject matter of claim 24 relates to a non-transitory computer readable storage medium and has substantially the same technical features as claim 12, differing only in the category. Accordingly, the same reasoning as in claim 12 applies to claim 24. Therefore, claim 24 does not involve an inventive step under PCT Article 33(3).

2.2 Industrial Applicability (PCT Article 33(4))

Claims 1-24 are industrially applicable under PCT Article 33(4).

Electronic Acknowledgement Receipt

EFS ID:	24019795
Application Number:	14681992
International Application Number:	
Confirmation Number:	1089
Title of Invention:	Bidirectional Transmission Of USB Data Using Audio/Video Data Channel
First Named Inventor/Applicant Name:	Ju Hwan Yi
Customer Number:	120363
Filer:	Dohyun Ahn
Filer Authorized By:	
Attorney Docket Number:	30850-27614/US
Receipt Date:	09-NOV-2015
Filing Date:	08-APR-2015
Time Stamp:	18:51:03
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	27614_IDS.pdf	181950 7231099eeebb539660cdb914f934e0f1235065d1	no	2

Warnings:	
Information:	

This is not an USPTO supplied IDS fillable form					
2	Non Patent Literature	27614_PCT_ISR_WO_2015-07-24.pdf	295680 b43d26346d7f73b7af31c5e7a691f6f7b21c34fd	no	11
Warnings:					
Information:					
			Total Files Size (in bytes):	477630	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)				*Complete if Known*	
				Application Number	14/681,992
				Filing Date	April 8, 2015
				First Named Inventor	Ju Hwan Yi
				Applicant	Silicon Image, Inc.
				Art Unit	2185
				Confirmation Number	1089
				Examiner Name	Tim T. Vo
Sheet	1	of	2	Attorney Docket Number	30850-27614/US

U.S. PATENT DOCUMENTS				
		Document No.		
Examiner Initials*	Cite No.[1]	Number – Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document
	A1	US-6564269	05-13-2003	Martin

FOREIGN PATENT DOCUMENTS					
		Foreign Patent Document			
Examiner Initials*	Cite No.[1]	Country Code[3] – Number[4] Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	T[6]

OTHER REFERENCES – NON-PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published	T[6]

EXAMINER SIGNATURE	
Examiner Signature	
Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] Applicant's unique citation designation number (option). [2] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [3] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document.

[5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)				Complete if Known	
				Application Number	14/681,992
				Filing Date	April 8, 2015
				First Named Inventor	Ju Hwan Yi
				Applicant	Silicon Image, Inc.
				Art Unit	2185
				Confirmation Number	1089
				Examiner Name	Tim T. Vo
Sheet	2	of	2	Attorney Docket Number	30850-27614/US

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ This application relies, under 35 U.S.C. § 120, on the earlier filing date of prior application No. _____, filed _____ and the references cited therein are hereby referenced, but are not required to be provided in this application under 37 CFR § 1.98(d).

☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Dohyun Ahn/	Date (YYYY-MM-DD)	2016-09-12
Name/Print	Dohyun Ahn	Registration Number	63,237

30850/27614/DOCS/4107007.1

DELL/HP/LENOVO EXHIBIT 1002
Page 78

Electronic Acknowledgement Receipt

EFS ID:	26892543
Application Number:	14681992
International Application Number:	
Confirmation Number:	1089
Title of Invention:	Bidirectional Transmission Of USB Data Using Audio/Video Data Channel
First Named Inventor/Applicant Name:	Ju Hwan Yi
Customer Number:	120363
Filer:	Dohyun Ahn
Filer Authorized By:	
Attorney Docket Number:	30850-27614/US
Receipt Date:	12-SEP-2016
Filing Date:	08-APR-2015
Time Stamp:	18:22:59
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	27614_IDS.pdf	183202 d7e67508bdf82fb5af58a9162cfbe37630d65ee9	no	2

Warnings:

Information:	
This is not an USPTO supplied IDS fillable form	
Total Files Size (in bytes):	183202

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/681,992	04/08/2015	Ju Hwan Yi	30850-27614/US	1089

120363 7590 04/10/2017

Lattice Semiconductor/FENWICK
801 California Street
Mountain View, CA 94041

EXAMINER	
UNELUS, ERNEST	

ART UNIT	PAPER NUMBER
2181	

NOTIFICATION DATE	DELIVERY MODE
04/10/2017	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ptoc@fenwick.com

Office Action Summary	Application No. 14/681,992	Applicant(s) YI ET AL.	
	Examiner ERNEST UNELUS	Art Unit 2181	AIA (First Inventor to File) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _____.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☐ Claim(s) _____ is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☐ Claim(s) _____ is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

DETAILED ACTION

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

The instant application having Application No. 14/681,992 has a total of 24 claims pending in the application; there are 4 independent claims and 20 dependent claims, all of which are ready for examination by the examiner.

INFORMATION CONCERNING OATH/DECLARATION

Oath/Declaration

The applicant's oath/declaration has been reviewed by the examiner and is found to conform to the requirements prescribed in **37 C.F.R. 1.63.**

INFORMATION CONCERNING DRAWINGS

Drawings

The applicant's drawings submitted are acceptable for examination purposes.

ACKNOWLEDGEMENT OF REFERENCES CITED BY APPLICANT

As required by **M.P.E.P. 609(C)**, the applicant's submissions of the Information Disclosure Statements November 05, 2015 and September 12, 2016 are acknowledged by the examiner and the cited references have been considered in the examination of the claims now

pending. As required by **M.P.E.P 609 C(2)**, a copy of the PTOL-1449 initialed and dated by the examiner is attached to the instant office action.

REJECTIONS BASED ON PRIOR ART

Claim Rejections - 35 USC § 102

In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a)(1) the claimed invention was patented, described in a printed publication, or in public use, on sale or otherwise available to the public before the effective filing date of the claimed invention.

1. **Claims 1-24** are rejected under 35 U.S.C. 102(a)(1) as being anticipated by Kobayashi (US pub. 2007/0201492), hereinafter, "Kobayashi".

At the outset, Applicant is reminded that claims subject to examination will be given their broadest reasonable interpretation in light of the supporting disclosure. In re Morris, 127 F.3d 1048, 1054-55, 44 USPQ2d 1023,1027-28 (Fed. Cir. 1997). With this in mind, the discussion will focus on how the terms and relationships between the terms in the claims are met by the references.

2. As per **claims 1, 12, 23 and 24**, Kobayashi discloses a method of transmitting data over a multimedia link **(physical link 106, as disclose in fig. 5B and paragraph 0054)**, comprising: sending a first unit of data **(a stream, as discloses in paragraph 0055)** from a source device

(source device 202) to a sink device **(sink device 204 of fig. 5B)** over a first physical channel **(channel 520 of fig. 5B, as discloses in paragraph 0070)** of the multimedia link during a first time, the first unit of data comprising video data and forward data compliant with a standard **(see paragraph 0055)**; receiving a second unit of data **(a data in uni-directional back channel 524 from the sink device 204 to the source device 202, as discloses in paragraph 0070 and fig. 5B)** by the source device over the physical channel of the multimedia link during a second time **(see paragraph 0079)**, the second unit of data comprising backward data compliant with the standard **(see paragraphs 0070 and 0079)**; and sending control data from the source device to the sink device over a second physical channel **(channel 522)** of the multimedia link distinct from the first physical channel **(see paragraphs 0051 and 0054 and fig. 31)**.

3. As per **claims 2 and 13**, Kobayashi discloses "The method of claim 1" **[See rejection to claim 1 above]**, further comprising sending a first synchronization signal of a first length after sending the first unit of data and before sending another first unit of data from the source device **(see paragraphs 0071 and 0079)**.

4. As per **claims 3, 14 and** , Kobayashi discloses, further comprising sending a second synchronization signal of a second length longer than the first synchronization to initialize communication over the first physical channel before sending the first unit of data **(see paragraphs 0071 and 0079)**.

5. As per **claim 4**, Kobayashi discloses, further comprising detecting, by the source device, a first synchronization signal of a first length for a predetermined amount of time after sending the first unit of data, the first synchronization signal received at the source device before receiving the second unit of data **(see paragraphs 0071 and 0079)**.

6. As per **claim 5**, Kobayashi discloses, further comprising aligning a boundary of a symbol in the second unit of data using the first synchronization signal **(see paragraph 0086)**.

7. As per **claims 6 and 16**, Kobayashi discloses, wherein the first time and the second time are separated by at least a predetermined amount of turnover time (ToT) **(note, ToT is not a well-known term in the art)** greater than a sum of a turn-off time of a driver of the source device for communicating over the first physical channel, a turn-on time of a driver of the sink device for communicating over the first physical channel, and a channel delay time **(see paragraph 0061)**.

8. As per **claims 7 and 15**, Kobayashi discloses wherein the standard comprises universal serial bus (USB) standard **(see paragraph 0070)** .

9. As per **claim 8**, Kobayashi discloses, further comprising buffering a predetermined amount of the forward data before assembling and sending the first unit of data **(see paragraph 0067)**.

10. As per **claims 9 and 21**, Kobayashi discloses wherein the predetermined amount of time is tracked at the source device **(see paragraph 0061)**.

11. As per **claims 10 and 18**, Kobayashi discloses, further comprising sending another first synchronization signal of the first length from the source device to the sink device after receiving the second unit of data and before sending another first unit of data from the source device to the second data, the other first unit of data compliant with the standard **(see paragraphs 0071 and 0079)**.

12. As per **claim 11**, Kobayashi discloses, further comprising receiving control data from the sink device to the source device over a second physical channel of the multimedia link distinct from the first physical channel **(see paragraphs 0051 and 0054 and fig. 31)**.

13. As per **claim 17**, Kobayashi discloses, further comprising buffering a predetermined amount of the backward data before assembling and sending the second unit of data **(see paragraph 0067)**.

14. As per **claim 19**, Kobayashi discloses, further comprising aligning a boundary of a symbol in the first unit of data using the first synchronization signal (**see paragraph 0086**).

15. As per **claim 20**, Kobayashi discloses, further comprising sending a first synchronization signal of a first length after receiving the first unit of data to cause the source device to receive

the first synchronization signal within a predetermined amount of time after the source device sends the first unit of data **(see paragraphs 0071 and 0079)**.

16. As per **claim 22**, Kobayashi discloses, further comprising sending control data from the sink device to the source device over a second physical channel of the multimedia link distinct from the first physical channel **(see paragraphs 0071 and 0079)**.

CLOSING COMMENTS

CONCLUSION

a. STATUS OF CLAIMS IN THE APPLICATION

The following is a summary of the treatment and status of all claims in the application as recommended by **M.P.E.P. 707.07(i):**

a (1) CLAIMS REJECTED IN THE APPLICATION

Per the instant office action, claims 1-24 have received a first action on the merits and are subject of a first action non-final.

b. DIRECTION OF FUTURE CORRESPONDENCES

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ernest Unelus whose telephone number is (571) 272-8596. The examiner can normally be reached on Monday to Friday 9:00 AM to 5:00PM.

IMPORTANT NOTE

If attempts to reach the above noted Examiner by telephone are unsuccessful, the Examiner's supervisor, Mr. Idriss Alrobaye, can be reached at the following

telephone number: Area Code (571) 270-1023.

The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through private PAIR only. For more information about the PMR system, see her//pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217- 91 97 (toll-free).

/Ernest Unelus/
Primary Examiner
Art Unit 2181

Notice of References Cited	Application/Control No. 14/681,992	Applicant(s)/Patent Under Reexamination YI ET AL.	
	Examiner ERNEST UNELUS	Art Unit 2181	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-2007/0201492 A1	08-2007	Kobayashi; Osamu	G06F3/14	370/395.64
	B	US-				
	C	US-				
	D	US-				
	E	US-				
	F	US-				
	G	US-				
	H	US-				
	I	US-				
	J	US-				
	K	US-				
	L	US-				
	M	US-				

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	Examiner	Art Unit

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES		
Search Notes	Date	Examiner

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	5	tmds and (twoway or (two near way) or bidirectional$4 or "bi" near directional) with (mode or state) with (path or line or lane or link) and video with audio and usb and hdmi and source with sink and G06F3/14.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/04/03 14:43
L3	72665	Young Kim.in. or "Min-Kyu" Kim.in. Gyudong Kim.in. Ju Hwan Yi.in. or Gijung Ahn.in. or Daeyun Shim.in. or Hoon Choi.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	NEAR	ON	2017/04/03 14:46
L4	1	3 and (twoway or (two near way) or bidirectional$4 or ("bi" near directional) or (full near duplex)) with (mode or state) with (path or line or lane or link) and video with audio and usb and (hdmi displayport) and source with sink	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/04/03 14:46
S34	16	tmds and (twoway or (two near way) or bidirectional$4) with (mode or state) with (path or line or lane or link) and video with audio and usb and hdmi and source with sink	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/04/03 00:05
S35	22	tmds and (twoway or (two near way) or bidirectional$4 or "bi" near directional) with (mode or state) with (path or line or lane or link) and video with audio and usb and hdmi and source with sink	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/04/03 00:12
S36	6	S35 not S34	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/04/03 00:12
S37	22	tmds and (twoway or (two near way) or bidirectional$4 or ("bi" near directional) or (full near duplex)) with (mode or state) with (path or line or lane or link) and video with audio and usb and (hdmi displayport) and source with sink	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/04/03 07:53
S38	62	(twoway or (two near way) or	US-PGPUB;	OR	ON	2017/04/03

		bidirectional$4 or ("bi" near directional) or (full near duplex)) with (mode or state) with (path or line or lane or link) and video with audio and usb and (hdmi displayport) and source with sink	USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			07:54
S39	2	("2012/0151537").URPN.	USPAT	OR	OFF	2017/04/03 07:56
S40	48	(twoway or (two near way) or bidirectional$4 or ("bi" near directional) or (full near duplex)) with (mode or state) with (path or line or lane or link) and video with audio and usb and (hdmi displayport) and source with sink and multimedia	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/04/03 08:49
S41	2	(twoway or (two near way) or bidirectional$4 or ("bi" near directional) or (full near duplex)) with (path or line or lane or link) and ((video with audio) or stream) and usb and (hdmi or displayport) and source with sink and ernest	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/04/03 09:04
S42	15	("20070201492" | "20080172501" | "20080205519" | "20090187686" | "20090278763" | "20100183004" | "20100271389" | "20100272102" | "20110087806" | "20120079162" | "20120146989" | "20120317607" | "7904620" | "8068485" | "8151018").PN. OR ("9323698").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2017/04/03 09:08
S43	34	("2007/0201492").URPN.	USPAT	OR	OFF	2017/04/03 09:30
S44	1	"20070201492" and video with audio	USPAT	OR	OFF	2017/04/03 10:05
S45	2	"20070201492" and video with audio	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/04/03 10:05
S46	2	("20150293879").PN.	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2017/04/03 11:32
S47	2	"20070201492" and video with audio with stream	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/04/03 12:05

4/3/2017 2:47:40 PM
C:\Users\eunelus\Documents\EAST\Workspaces\14681992.wsp

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14681992	YI ET AL.
	Examiner	Art Unit
	ERNEST UNELUS	2181

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	04/03/2017								
	1	✓								
	2	✓								
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	24	✓								

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120363 7590 06/28/2017

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06/28/2017	ELECTRONIC

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ptoc@fenwick.com

Applicant-Initiated Interview Summary	Application No.	Applicant(s)	
	14/681,992	YI ET AL.	
	Examiner	Art Unit	
	ERNEST UNELUS	2181	

All participants (applicant, applicant's representative, PTO personnel):

(1) *ERNEST UNELUS*.

(2) *Eric Zhou (Reg. #. 68,842)*.

(3) *Dohyun Ahn (Reg. #. 63,237)*.

(4) _____.

Date of Interview: *22 June 2017*.

Type: ☒ Telephonic ☐ Video Conference
☐ Personal [copy given to: ☐ applicant ☐ applicant's representative]

Exhibit shown or demonstration conducted: ☐ Yes ☒ No.
If Yes, brief description: _____.

Issues Discussed ☐101 ☐112 ☒102 ☐103 ☐Others
(For each of the checked box(es) above, please describe below the issue and detailed description of the discussion)

Claim(s) discussed: *1*.

Identification of prior art discussed: *2007/0201492 to Kobayashi*.

Substance of Interview
(For each issue discussed, provide a detailed description and indicate if agreement was reached. Some topics may include: identification or clarification of a reference or a portion thereof, claim interpretation, proposed amendments, arguments of any applied references etc...)

Applicant described the invention as a TMDS channel that's transmitting video and audio data in only one direction and transmitting USB data bidirectionally at a higher bandwidth.

Applicant recordation instructions: The formal written reply to the last Office action must include the substance of the interview. (See MPEP section 713.04). If a reply to the last Office action has already been filed, applicant is given a non-extendable period of the longer of one month or thirty days from this interview date, or the mailing date of this interview summary form, whichever is later, to file a statement of the substance of the interview

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

☐ Attachment

/ERNEST UNELUS/ Primary Examiner, Art Unit 2181	

Summary of Record of Interview Requirements

Manual of Patent Examining Procedure (MPEP), Section 713.04, Substance of Interview Must be Made of Record
A complete written statement as to the substance of any face-to-face, video conference, or telephone interview with regard to an application must be made of record in the application whether or not an agreement with the examiner was reached at the interview.

Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews
Paragraph (b)

In every instance where reconsideration is requested in view of an interview with an examiner, a complete written statement of the reasons presented at the interview as warranting favorable action must be filed by the applicant. An interview does not remove the necessity for reply to Office action as specified in §§ 1.111, 1.135. (35 U.S.C. 132)

37 CFR §1.2 Business to be transacted in writing.
All business with the Patent or Trademark Office should be transacted in writing. The personal attendance of applicants or their attorneys or agents at the Patent and Trademark Office is unnecessary. The action of the Patent and Trademark Office will be based exclusively on the written record in the Office. No attention will be paid to any alleged oral promise, stipulation, or understanding in relation to which there is disagreement or doubt.

The action of the Patent and Trademark Office cannot be based exclusively on the written record in the Office if that record is itself incomplete through the failure to record the substance of interviews.

It is the responsibility of the applicant or the attorney or agent to make the substance of an interview of record in the application file, unless the examiner indicates he or she will do so. It is the examiner's responsibility to see that such a record is made and to correct material inaccuracies which bear directly on the question of patentability.

Examiners must complete an Interview Summary Form for each interview held where a matter of substance has been discussed during the interview by checking the appropriate boxes and filling in the blanks. Discussions regarding only procedural matters, directed solely to restriction requirements for which interview recordation is otherwise provided for in Section 812.01 of the Manual of Patent Examining Procedure, or pointing out typographical errors or unreadable script in Office actions or the like, are excluded from the interview recordation procedures below. Where the substance of an interview is completely recorded in an Examiners Amendment, no separate Interview Summary Record is required.

The Interview Summary Form shall be given an appropriate Paper No., placed in the right hand portion of the file, and listed on the "Contents" section of the file wrapper. In a personal interview, a duplicate of the Form is given to the applicant (or attorney or agent) at the conclusion of the interview. In the case of a telephone or video-conference interview, the copy is mailed to the applicant's correspondence address either with or prior to the next official communication. If additional correspondence from the examiner is not likely before an allowance or if other circumstances dictate, the Form should be mailed promptly after the interview rather than with the next official communication.

The Form provides for recordation of the following information:
- Application Number (Series Code and Serial Number)
- Name of applicant
- Name of examiner
- Date of interview
- Type of interview (telephonic, video-conference, or personal)
- Name of participant(s) (applicant, attorney or agent, examiner, other PTO personnel, etc.)
- An indication whether or not an exhibit was shown or a demonstration conducted
- An identification of the specific prior art discussed
- An indication whether an agreement was reached and if so, a description of the general nature of the agreement (may be by attachment of a copy of amendments or claims agreed as being allowable). Note: Agreement as to allowability is tentative and does not restrict further action by the examiner to the contrary.
- The signature of the examiner who conducted the interview (if Form is not an attachment to a signed Office action)

It is desirable that the examiner orally remind the applicant of his or her obligation to record the substance of the interview of each case. It should be noted, however, that the Interview Summary Form will not normally be considered a complete and proper recordation of the interview unless it includes, or is supplemented by the applicant or the examiner to include, all of the applicable items required below concerning the substance of the interview.

A complete and proper recordation of the substance of any interview should include at least the following applicable items:
1) A brief description of the nature of any exhibit shown or any demonstration conducted,
2) an identification of the claims discussed,
3) an identification of the specific prior art discussed,
4) an identification of the principal proposed amendments of a substantive nature discussed, unless these are already described on the Interview Summary Form completed by the Examiner,
5) a brief identification of the general thrust of the principal arguments presented to the examiner,
   (The identification of arguments need not be lengthy or elaborate. A verbatim or highly detailed description of the arguments is not required. The identification of the arguments is sufficient if the general nature or thrust of the principal arguments made to the examiner can be understood in the context of the application file. Of course, the applicant may desire to emphasize and fully describe those arguments which he or she feels were or might be persuasive to the examiner.)
6) a general indication of any other pertinent matters discussed, and
7) if appropriate, the general results or outcome of the interview unless already described in the Interview Summary Form completed by the examiner.

Examiners are expected to carefully review the applicant's record of the substance of an interview. If the record is not complete and accurate, the examiner will give the applicant an extendable one month time period to correct the record.

Examiner to Check for Accuracy

If the claims are allowable for other reasons of record, the examiner should send a letter setting forth the examiner's version of the statement attributed to him or her. If the record is complete and accurate, the examiner should place the indication, "Interview Record OK" on the paper recording the substance of the interview along with the date and the examiner's initials.

IN THE UNITED STATES
PATENT AND TRADEMARK OFFICE

INVENTORS::	JU HWAN YI, YOUNG IL KIM, GIJUNG AHN, MIN-KYU KIM, DAEYUN SHIM, GYODONG KIM AND HOON CHOI
APPLICATION NO.:	14/681,992
FILING DATE:	April 8, 2015
TITLE:	Bidirectional Transmission Of USB Data Using Audio/Video Data Channel
EXAMINER:	Ernest Unelus
GROUP ART UNIT:	2181
CONFIRMATION NO.:	1089
ATTY. DKT. NO.:	30850-27614/US

CERTIFICATE OF ELECTRONIC (EFS-WEB) TRANSMISSION

I hereby certify that this correspondence is being transmitted via the Office electronic filing system in accordance with 37 C.F.R. § 1.8(a)(i)(C) from the Pacific Time Zone of the United States on the local date shown below.

Dated: July 12, 2017 By: /Eric Zhou/
Eric Zhou, Reg. No.: 68,842

AMENDMENT A

In response to the Non-final Office Action mailed April 10, 2017, please amend the above-referenced application as indicated in the following pages:

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AMENDMENTS TO THE CLAIMS

1. **(Currently Amended)** A method of transmitting data over a multimedia link, comprising:

sending a first unit of data from a source device to a sink device over a first physical channel of the multimedia link during a first time, the first unit of data comprising video data and forward data compliant with a first standard comprising a universal serial bus (USB) standard and different from a standard of the video data;

receiving a second unit of data by the source device over the first physical channel of the multimedia link during a second time, the second unit of data comprising backward data compliant with the first standard; and

sending control data from the source device to the sink device over a second physical channel of the multimedia link distinct from the first physical channel.

2. (Original) The method of claim 1, further comprising sending a first synchronization signal of a first length after sending the first unit of data and before sending another first unit of data from the source device.

3. (Original) The method of claim 2, further comprising sending a second synchronization signal of a second length longer than the first synchronization to initialize communication over the first physical channel before sending the first unit of data.

4. (Original) The method of claim 1, further comprising detecting, by the source device, a first synchronization signal of a first length for a predetermined amount of time after sending the first unit of data, the first synchronization signal received at the source device before receiving the second unit of data.

5. (Original) The method of claim 4, further comprising aligning a boundary of a symbol in the second unit of data using the first synchronization signal.

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6. (Original) The method of claim 4, wherein the first time and the second time are separated by at least a predetermined amount of turnover time (ToT) greater than a sum of a turn-off time of a driver of the source device for communicating over the first physical channel, a turn-on time of a driver of the sink device for communicating over the first physical channel, and a channel delay time.

7. **(Cancelled)**

8. **(Currently Amended)** The method of claim 4[[7]], further comprising buffering a predetermined amount of the forward data before assembling and sending the first unit of data.

9. (Original) The method of claim 4, wherein the predetermined amount of time is tracked at the source device.

10. **(Currently Amended)** The method of claim 4, further comprising sending another first synchronization signal of the first length from the source device to the sink device after receiving the second unit of data and before sending another first unit of data from the source device to the second data, the other first unit of data compliant with the first standard.

11. (Original) The method of claim 1, further comprising receiving control data from the sink device to the source device over a second physical channel of the multimedia link distinct from the first physical channel.

12. **(Currently Amended)** A method of transmitting data over a multimedia link, comprising:

receiving a first unit of data from a source device by a sink device over a first physical channel of the multimedia link during a first time, the first unit of data comprising video data and forward communication data compliant with a first standard comprising a universal serial bus (USB) standard and different from a standard of the video data;

sending a second unit of data from the sink device over the first physical channel of the multimedia link during a second time, the second unit of data

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comprising backward communication data compliant with the first standard; and

receiving control data from the source device to the sink device over a second physical channel of the multimedia link distinct from the first physical channel.

13. (Original) The method of claim 12, further comprising receiving a first synchronization signal of a first length after receiving the first unit of data and before receiving a second unit of data from the source device.

14. (Original) The method of claim 13, further comprising detecting a second synchronization signal of a second length longer than the first synchronization to initialize communication over the first physical channel before receiving the first unit of data.

15. (**Cancelled**)

16. (Original) The method of claim 13, wherein the first time and the second time are separated by at least a predetermined amount of turnover time (ToT) greater than a sum of a turn-off time of a driver of the source device for communicating over the first physical channel and a turn-on time of a driver of the sink device for communicating over the first physical channel.

17. (Original) The method of claim 13, further comprising buffering a predetermined amount of the backward data before assembling and sending the second unit of data.

18. (**Currently Amended**) The method of claim 13, further comprising receiving another first synchronization signal of the first length from the source device after sending the second unit of data and before receiving another first unit of data from the source device, the other first unit of data compliant with the first standard.

19. (Original) The method of claim 12, further comprising aligning a boundary of a symbol in the first unit of data using the first synchronization signal.

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20. (Original) The method of claim 13, further comprising sending a first synchronization signal of a first length after receiving the first unit of data to cause the source device to receive the first synchronization signal within a predetermined amount of time after the source device sends the first unit of data.

21. (Original) The method of claim 20, wherein the source device tracks the predetermined amount of time in the source device.

22. (Original) The method of claim 12, further comprising sending control data from the sink device to the source device over a second physical channel of the multimedia link distinct from the first physical channel.

23. (**Currently Amended**) A source device for communicating data with a sink device over a multimedia link, comprising:

a transmitter coupled to a first physical channel of the multimedia link and configured to send a first unit of data from the source device to the sink device over the first physical channel during a first time, the first unit of data comprising video data and forward data compliant with a first standard comprising a universal serial bus (USB) standard and different from a standard of the video data;

a receiver coupled to the first physical channel and configured to receive a second unit of data from the source device over the first physical channel during a second time, the second unit of data comprising backward data compliant with the first standard; and

a control signal transceiver coupled to a second physical channel of the multimedia link distinct from the first physical channel and configured to at least send control data from the source device to the sink device over the second physical channel.

24. (**Currently Amended**) A non-transitory computer readable storage medium storing instructions thereon, the instructions representing a digital design of a circuit comprising:

a transmitter coupled to a first physical channel of the multimedia link and configured to send a first unit of data from a source device to a sink device over the first physical channel during a first time, the first unit of data comprising video data and forward data compliant with a first standard comprising a universal serial bus (USB) standard and different from a standard of the video data;

a receiver coupled to the first physical channel and configured to receive a second unit of data from the sink device over the first physical channel during a second time, the second unit of data comprising backward data compliant with the first standard; and

a control signal transceiver coupled to a second physical channel of the multimedia link distinct from the first physical channel and configured to at least send control data from the source device to the sink device over the second physical channel.

REMARKS

Claims 1-24 were presented for examination and were pending in this application. In the Non-final Office Action dated April 10, 2017, claims 1-24 were rejected.

With this amendment, claims 1, 8, 10, 12, 18, and 23-24 are amended, claims 7 and 15 are canceled. No new matter has been added.

The Applicants thank the Examiner for examination of the claims pending in this application and address the Examiner's comments below.

Summary of Substance of Interview

Applicant wishes to thank Examiner Ernest Unelus for conducting a telephonic interview regarding this application with Applicant's representatives Dohyun Ahn (Reg. No. 63,237) and Eric Zhou (Reg. No. 68,842) on June 22, 2017. During the interview, Examiner Unelus and Applicant's representatives discussed the subject matter of the application and proposed amendments to the claims. Examiner Unelus indicated that an amendment based upon dependent claim 7 indicating that the first standard comprises a USB standard would appear to overcome the current rejection, but that additional search and consideration would be performed upon receipt of a formal response.

Response To Rejection of Claims under 35 U.S.C. § 102

Claims 1-24 are rejected under 35 U.S.C. 102(a)(l) as being anticipated by Kobayashi (US pub. 2007/0201492), hereinafter, "Kobayashi". Applicant respectfully traverses the rejection.

Claim 1, as currently amended, recites at least the following elements.

> sending a first unit of data from a source device to a sink device over a first physical channel of the multimedia link during a first time, the first unit of data comprising video data and forward data compliant with a first

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standard comprising a universal serial bus (USB) standard and different from a standard of the video data;

receiving a second unit of data by the source device over the first physical channel of the multimedia link during a second time, the second unit of data comprising backward data compliant with the first standard....

Applicant respectfully submits that claim 1, as amended, is patentable over Kobayashi, at least because Kobayashi does not disclose or suggest a "first physical channel" over which "a first unit of data comprising video data and forward data compliant with a first standard comprising a universal serial bus (USB) standard and different from a standard of the video data" is sent from the source device to the sink device, and a "second unit of data comprising backward data compliant with the first standard" is received by the source device, as recited in claim 1.

In rejecting claim 1, the Office Action cites Kobayashi, indicating that the channel 520 of Kobayashi corresponds to the first physical channel of claim 1. *See Office Action, p. 4*. However, to the extent that the channel 520 can be considered the first physical channel, there is no disclosure in Kobayashi of video data being transmitted over the channel 520. In fact, paragraph [0070] of Kobayashi refers to the channel 520 as an "auxiliary channel" using for transmitting "various support functions," with no disclosure of any video data being transmitted over the channel 520.

Applicant respectfully submits that there is no disclosure in Kobayashi of a first physical channel that is used to both send video data and USB standard data from source to sink and to receive USB standard data at the source. For example, Kobayashi describes sending video data over a first channel (e.g., main link 222), but only describes receiving USB data over a second, different channel (e.g., an auxiliary channel, such as auxiliary channel 224 or auxiliary channel 524). *See, e.g., Kobayashi, FIGs. 2A-2B, 5A-5B*. Because Kobayashi does not describe a single

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physical channel over which both video data is sent and data compliant with the first standard (e.g., USB data) is sent and received, Kobayashi does not anticipate claim 1.

Therefore, for at least these reasons, Applicant respectfully submits that claim 1 and its dependent claims are allowable over the cited reference.

In addition, for substantially similar reasons, Applicant respectfully submits that claims 12, 23, 24, and their respective dependent claims are also allowable over the cited reference.

Applicants respectfully invite Examiner to contact Applicants' representative at the number provided below if Examiner believes it will expedite prosecution.

Respectfully submitted,

Dated: July 12, 2017

/Eric Zhou/

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Electronic Patent Application Fee Transmittal

Application Number:	14681992
Filing Date:	08-Apr-2015
Title of Invention:	Bidirectional Transmission Of USB Data Using Audio/Video Data Channel
First Named Inventor/Applicant Name:	Ju Hwan Yi
Filer:	Eric Zhou/Laura Dean
Attorney Docket Number:	30850-27614/US

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension - 1 month with $0 paid	1251	1	200	200
Miscellaneous:				
			Total in USD ($)	**200**

Electronic Acknowledgement Receipt

EFS ID:	29763390
Application Number:	14681992
International Application Number:	
Confirmation Number:	1089
Title of Invention:	Bidirectional Transmission Of USB Data Using Audio/Video Data Channel
First Named Inventor/Applicant Name:	Ju Hwan Yi
Customer Number:	120363
Filer:	Eric Zhou
Filer Authorized By:	
Attorney Docket Number:	30850-27614/US
Receipt Date:	12-JUL-2017
Filing Date:	08-APR-2015
Time Stamp:	16:28:19
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$200
RAM confirmation Number	071317INTEFSW00003413192555
Deposit Account	192555
Authorized User	Eric Zhou
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.16 (National application filing, search, and examination fees) 37 CFR 1.17 (Patent application and reexamination processing fees)	

37 CFR 1.19 (Document supply fees)

37 CFR 1.20 (Post Issuance fees)

37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		27614_US_Amendment_A.pdf	112079 1209f7b0971fef6f44d9f4b1942013946946 5cf0	yes	9

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1
	Claims	2	6
	Applicant Arguments/Remarks Made in an Amendment	7	9

Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30625 82db10832b205ddc1ea45d77f22d4c44d16 9db28	no	2
Warnings:					
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		Total Files Size (in bytes):	142704		

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PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 14/681,992	Filing Date 04/08/2015	☐ To be Mailed

ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	07/12/2017	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 22	Minus	** 24	= 0	X $80 =	0
	Independent (37 CFR 1.16(h))	* 4	Minus	***4	= 0	X $420 =	0
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	0

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
GYZELL P. JOHNSON SMITH

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**
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NOTICE OF ALLOWANCE AND FEE(S) DUE

120363 7590 08/25/2017
Lattice Semiconductor/FENWICK
801 California Street
Mountain View, CA 94041

EXAMINER	
UNELUS, ERNEST	
ART UNIT	PAPER NUMBER
2181	

DATE MAILED: 08/25/2017

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/681,992	04/08/2015	Ju Hwan Yi	30850-27614/US	1089

TITLE OF INVENTION: Bidirectional Transmission Of USB Data Using Audio/Video Data Channel

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$960	$0	$0	$960	11/27/2017

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
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INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

120363 7590 08/25/2017
Lattice Semiconductor/FENWICK
801 California Street
Mountain View, CA 94041

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

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I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/681,992	04/08/2015	Ju Hwan Yi	30850-27614/US	1089

TITLE OF INVENTION: Bidirectional Transmission Of USB Data Using Audio/Video Data Channel

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$960	$0	$0	$960	11/27/2017

EXAMINER	ART UNIT	CLASS-SUBCLASS
UNELUS, ERNEST	2181	710-308000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
- ❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.
1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. The following fee(s) are submitted:
- ❑ Issue Fee
- ❑ Publication Fee (No small entity discount permitted)
- ❑ Advance Order - # of Copies _____

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- ❑ A check is enclosed.
- ❑ Payment by credit card. Form PTO-2038 is attached.
- ❑ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
- ❑ Applicant certifying micro entity status. See 37 CFR 1.29
  NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
- ❑ Applicant asserting small entity status. See 37 CFR 1.27
  NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
- ❑ Applicant changing to regular undiscounted fee status.
  NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

PTOL-85 Part B (10-13) Approved for use through 10/31/2013. OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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Page 114

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/681,992	04/08/2015	Ju Hwan Yi	30850-27614/US	1089

120363 7590 08/25/2017

Lattice Semiconductor/FENWICK
801 California Street
Mountain View, CA 94041

EXAMINER	
UNELUS, ERNEST	
ART UNIT	PAPER NUMBER
2181	

DATE MAILED: 08/25/2017

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 14/681,992	Applicant(s) YI ET AL.	
	Examiner ERNEST UNELUS	Art Unit 2181	AIA (First Inventor to File) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *Examiner's amendment*.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on_____.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are *1-6, 8-14 and 16-24*. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some *c) ☐ None of the:
   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
4. ☒ Interview Summary (PTO-413), Paper No./Mail Date *20170818* .
5. ☒ Examiner's Amendment/Comment
6. ☒ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/ERNEST UNELUS/
Primary Examiner, Art Unit 2181

DETAILED ACTION

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Mr. Eric Zhou (Reg. No. 68,842) on August 10, 2017. The examiner proposed amendments to better place the application in condition for allowance, particularly adding the limitation that prior arts fail to teach. Mr. Zhou agreed.

The application has been amended as follows:

Listing of Claims:

1. **(Currently Amended)** A method of transmitting data over a multimedia link, comprising:

over a first physical channel of the multimedia link:

sending ~~a first~~ forward units of data from a source device to a sink device

~~over a first physical channel of the multimedia link~~ during [[a]] one or more first time periods, the ~~first~~ forward units of data comprising video data and forward data compliant with a first

standard comprising a universal serial bus (USB) standard and different from a standard of the video data;

receiving ~~a second~~ backward units of data ~~by~~ at the source device from the sink device ~~over the first physical channel of the multimedia link~~ during [[a]] one or more second time periods, the ~~second~~ backward units of data comprising backward data compliant with the first standard; and

over a second physical channel of the multimedia link distinct from the first physical channel:

sending control data from the source device to the sink device ~~over a second physical channel of the multimedia link distinct from the first physical channel~~.

2. (**Currently Amended**) The method of claim 1, further comprising sending a first synchronization signal of a first length after sending ~~the~~ a first forward unit of data of the forward units of data, and before sending another ~~first~~ forward unit of data from the source device.

3. (**Currently Amended**) The method of claim 2, further comprising sending a second synchronization signal of a second length longer than the first synchronization to initialize communication over the first physical channel before sending the first forward unit of data.

4. (**Currently Amended**) The method of claim 1, further comprising detecting, by the source device, a first synchronization signal of a first length for a predetermined amount of time after sending ~~the~~ a first forward unit of data of the forward units of data, the first synchronization signal received at the source device before receiving ~~the second~~ a first backward unit of data of the backward units of data.

5. (**Currently Amended**) The method of claim 4, further comprising aligning a boundary of a symbol in the ~~second~~ first backward unit of data using the first synchronization signal.

6. (Original) The method of claim 4, wherein the first time and the second time are separated by at least a predetermined amount of turnover time (ToT) greater than a sum of a turn-off time of a driver of the source device for communicating over the first physical channel, a turn-on time of a driver of the sink device for communicating over the first physical channel, and a channel delay time.

7. (Cancelled)

8. (**Currently Amended**) The method of claim 4, further comprising buffering a predetermined amount of the forward data before assembling and sending ~~the~~ a first forward unit of data of the forward units of data.

9. (Original) The method of claim 4, wherein the predetermined amount of time is tracked at the source device.

10. (**Currently Amended**) The method of claim 4, further comprising sending another first synchronization signal of the first length from the source device to the sink device after receiving the ~~second~~ first backward unit of data and before sending another ~~first~~ forward unit of data from the source device to the ~~second data~~ sink device, the other ~~first~~ forward unit of data comprising data compliant with the first standard.

11. (**Currently Amended**) The method of claim 1, further comprising receiving control data from the sink device to the source device over [[a]] the second physical channel of the multimedia link distinct from the first physical channel.

12. (**Currently Amended**) A method of transmitting data over a multimedia link, comprising:

over a first physical channel of the multimedia link:

receiving ~~a first~~ forward units of data from a source device by a sink device ~~over a first physical channel of the multimedia link~~ during

[[a]] one or more first time periods, the forward ~~first~~ units of data comprising video data and forward communication data compliant with a first standard comprising a universal serial bus (USB) standard and different from a standard of the video data;

sending ~~a second~~ backward units of data from the sink device to the source device ~~over the first physical channel of the multimedia link~~ during [[a]] one or more second time periods, the ~~second~~ backward units of data comprising backward communication data compliant with the first standard; and

over a second physical channel of the multimedia link distinct from the first physical channel:

receiving control data from the source device to the sink device ~~over a second physical channel of the multimedia link distinct from the first physical channel~~.

13. (**Currently Amended**) The method of claim 12, further comprising receiving a first synchronization signal of a first length after receiving ~~the~~ a first forward unit of data of the forward units of data, and before receiving a second forward unit of data from the source device.

14. (**Currently Amended**) The method of claim 13, further comprising detecting a second synchronization signal of a second length longer than the first synchronization to initialize communication over the first physical channel before receiving the first forward unit of data.

15. (Cancelled)

16. (Original) The method of claim 13, wherein the first time and the second time are separated by at least a predetermined amount of turnover time (ToT) greater than a sum of a turn-off time of a driver of the source device for communicating over the first physical channel and a turn-on time of a driver of the sink device for communicating over the first physical channel.

17. (**Currently Amended**) The method of claim 13, further comprising buffering a predetermined amount of the backward data before assembling and sending ~~the second~~ a first backward unit of data of the backward units of data.

18. (**Currently Amended**) The method of claim 13, further comprising receiving another first synchronization signal of the first length from the source device after sending ~~the~~ a ~~second~~ backward unit of data and before receiving another ~~first~~ forward unit of data from the source device, the other ~~first~~ forward unit of data comprising data compliant with the first standard.

19. (**Currently Amended**) The method of claim 12, further comprising aligning a boundary of a symbol in ~~the~~ a first forward unit of data of the forward units of data using the first synchronization signal.

20. (**Currently Amended**) The method of claim 13, further comprising sending a first synchronization signal of a first length after receiving the first forward unit of data to cause the source device to receive the first synchronization signal within a predetermined amount of time after the source device sends the first forward unit of data.

21. (Original) The method of claim 20, wherein the source device tracks the predetermined amount of time in the source device.

22. (**Currently Amended**) The method of claim 12, further comprising sending control data from the sink device to the source device over [[a]] the second physical channel of the multimedia link distinct from the first physical channel.

23. (**Currently Amended**) A source device for communicating data with a sink device over a multimedia link, comprising:

a transmitter coupled to a first physical channel of the multimedia link and configured to send ~~a first~~ forward units of data from the source device to the sink device over the first physical channel during [[a]] one or more

first time periods, the ~~first~~ forward units of data comprising video data and forward data compliant with a first standard comprising a universal serial bus (USB) standard and different from a standard of the video data;

a receiver coupled to the first physical channel and configured to receive ~~a second~~ backward units of data ~~from~~ at the source device from the sink device over the first physical channel during [[a]] one or more second time periods, the ~~second~~ backward units of data comprising backward data compliant with the first standard; and

a control signal transceiver coupled to a second physical channel of the multimedia link distinct from the first physical channel and configured to at least send control data from the source device to the sink device over the second physical channel.

24. (**Currently Amended**) A non-transitory computer readable storage medium storing instructions thereon, the instructions representing a digital design of a circuit comprising:

a transmitter coupled to a first physical channel of the multimedia link and configured to send ~~a first~~ forward units of data from a source device to a sink device over the first physical channel during [[a]] one or more first time periods, the ~~first~~ forward units of data comprising video data and forward data compliant with a first standard comprising a universal serial bus (USB) standard and different from a standard of the video data;

a receiver coupled to the first physical channel and configured to receive ~~a second~~ backward units of data at the source device from the sink device over the first physical channel during [[a]] one or more second time periods, the ~~second~~ backward units of data comprising backward data compliant with the first standard; and

a control signal transceiver coupled to a second physical channel of the multimedia link distinct from the first physical channel and configured to at least send control data from the source device to the sink device over the second physical channel.

ALLOWABLE SUBJECT MATTER

The primary reason for allowance of claims 1, 12, 23 and 24 in the instant application is that prior arts do not teach a TMDS channel that's transmitting video in only one direction and transmitting USB data bidirectionally at a higher bandwidth.

The remaining claims 2-6, 8-11, 13-14 and 16-22 are allowed by virtue of their dependencies on the independent claims. Hence, the examiner has allowed claims 1-6, 8-14 and 16-24.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

CLOSING COMMENTS

Conclusion

a. STATUS OF CLAIMS IN THE APPLICATION

The following is a summary of the treatment and status of all claims in the application as recommended by **M.P.E.P. 707.07(i)**:

a(1) CLAIMS ALOWED IN THE APPLICATION

Per the instant office action, claims 1-6, 8-14 and 16-24 have been allowed.

b. DIRECTION OF FUTURE CORRESPONDENCES

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ernest Unelus whose telephone number is (571) 272-8596. The examiner can normally be reached on Monday to Friday 9:00 AM to 5:00 PM.

IMPORTANT NOTE

If attempts to reach the above noted Examiner by telephone are unsuccessful, the Examiner's supervisor, Mr. Idriss Alrobaye, can be reached at the following telephone number: Area Code (571) 270-1023.

The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PMR system, see her//pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217- 91 97 (toll-free).

/Ernest Unelus/
Primary Examiner
Art Unit 2181

Examiner-Initiated Interview Summary	Application No.	Applicant(s)	
	14/681,992	YI ET AL.	
	Examiner	Art Unit	
	ERNEST UNELUS	2181	

All participants (applicant, applicant's representative, PTO personnel):

(1) *ERNEST UNELUS*. (3)_____.

(2) *Eric Zhou (Reg. #. 68,842)*. (4)_____.

Date of Interview: *10 August 2017*.

Type: ☒ Telephonic ☐ Video Conference
☐ Personal [copy given to: ☐ applicant ☐ applicant's representative]

Exhibit shown or demonstration conducted: ☐ Yes ☒ No.
If Yes, brief description: _____.

Issues Discussed ☐101 ☐112 ☐102 ☐103 ☐Others
(For each of the checked box(es) above, please describe below the issue and detailed description of the discussion)

Claim(s) discussed: *1*.

Identification of prior art discussed: _____.

Substance of Interview
(For each issue discussed, provide a detailed description and indicate if agreement was reached. Some topics may include: identification or clarification of a reference or a portion thereof, claim interpretation, proposed amendments, arguments of any applied references etc...)

The primary reason for allowance of claims 1, 12, 23 and 24 in the instant application is that prior arts do not teach a TMDS channel that's transmitting video in only one direction and transmitting USB data bidirectionally at a higher bandwidth.

Applicant recordation instructions: It is not necessary for applicant to provide a separate record of the substance of interview.

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

☐ Attachment

/ERNEST UNELUS/ Primary Examiner, Art Unit 2181	

Notice of References Cited	Application/Control No. 14/681,992	Applicant(s)/Patent Under Reexamination YI ET AL.	
	Examiner ERNEST UNELUS	Art Unit 2181	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-2013/0336334 A1	12-2013	Gilbert; Jeffrey M.	H04J3/16	370/458
*	B	US-2013/0335430 A1	12-2013	Douglas; David W.	G09G5/006	345/520
	C	US-				
	D	US-				
	E	US-				
	F	US-				
	G	US-				
	H	US-				
	I	US-				
	J	US-				
	K	US-				
	L	US-				
	M	US-				

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14681992	YI ET AL.
	Examiner	Art Unit
	ERNEST UNELUS	2181

CPC- SEARCHED		
Symbol	Date	Examiner
G09G 5/006; 2370/04, 047, 10; 13/4068 and G06F 3/14	8/18/2017	E.U

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

SEARCH NOTES		
Search Notes	Date	Examiner
EAST search: US-PGPUB; USPAT; USPAT; USOCR; EPO; JPO; DERWENT	8/18/2017	E.U
Inventor search utilizing PE2E and EAST	8/18/2017	E.U
CPC search of G09G 5/006; 2370/04, 047, 10; 13/4068 and G06F 3/14	8/18/2017	E.U

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
G09G	5/006	8/18/2017	E.U
G06F	3/14	8/18/2017	E.U

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BIB DATA SHEET

CONFIRMATION NO. 1089

SERIAL NUMBER	FILING or 371(c) DATE RULE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
14/681,992	04/08/2015	710	2181	30850-27614/US

APPLICANTS

Silicon Image, Inc., Sunnyvale, CA;

INVENTORS

Ju Hwan Yi, Sunnyvale, CA;
Young Il Kim, Sunnyvale, CA;
Gijung Ahn, San Jose, CA;
Min-Kyu Kim, Sunnyvale, CA;
Daeyun Shim, Saratoga, CA;
Gyudong Kim, Sunnyvale, CA;
Hoon Choi, Mountain View, CA;

**** CONTINUING DATA ***************************

This appln claims benefit of 61/979,483 04/14/2014

**** FOREIGN APPLICATIONS ***************************

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ****

04/20/2015

Foreign Priority claimed ☐ Yes ☑ No 35 USC 119(a-d) conditions met ☐ Yes ☐ No Verified and Acknowledged /ERNEST UNELUS/ Examiner's Signature	☐ Met after Allowance E.U. Initials	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
		CA	6	~~24~~ 22	4

ADDRESS

Lattice Semiconductor/FENWICK
801 California Street
Mountain View, CA 94041
UNITED STATES

TITLE

Bidirectional Transmission Of USB Data Using Audio/Video Data Channel

FILING FEE RECEIVED		
2340	FEES: Authority has been given in Paper No._____ to charge/credit DEPOSIT ACCOUNT No._____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14681992	YI ET AL.
	Examiner	Art Unit
	ERNEST UNELUS	2181

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	04/03/2017	08/18/2017							
1	1	✓	=							
2	2	✓	=							
3	3	✓	=							
4	4	✓	=							
5	5	✓	=							
6	6	✓	=							
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14	16	✓	=							
15	17	✓	=							
16	18	✓	=							
17	19	✓	=							
18	20	✓	=							
19	21	✓	=							
20	22	✓	=							
21	23	✓	=							
22	24	✓	=							

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	45	tmds with ((two near way) or bidirectional$4 or twoway or "bi-directional") and video and usb	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/08/18 09:15
L2	39	tmds with ((two near way) or bidirectional$4 or twoway or "bi-directional") and video and usb and hdmi	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/08/18 09:31
L3	0	tmds with ((two near way) or bidirectional$4 or twoway or "bi-directional") with video with usb and hdmi	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/08/18 09:47
L4	0	tmds with ((two near way) or bidirectional$4 or twoway or "bi-directional") with video with usb	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/08/18 09:48
L5	298	((two near way) or bidirectional$4 or twoway or "bi-directional") with video with usb	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/08/18 09:48
L6	42	((two near way) or bidirectional$4 or twoway or "bi-directional") with video with usb and hdmi	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/08/18 09:48
L7	17	((two near way) or bidirectional$4 or twoway or "bi-directional") with video with usb with (link or lane or line) and hdmi	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/08/18 11:34
L8	27	G09G5/006.cpc. and video with usb with	US-PGPUB;	OR	ON	2017/08/18

		(link or lane or line) and hdmi	USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			12:52
L9	36	G09G5/006.cpc. and video with usb with (link or lane or line or channel) and hdmi	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/08/18 13:52
L10	9	9 not 8	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/08/18 13:52
L11	40	G09G2370/04,10,047.cpc. and video with usb with (link or lane or line or channel) and hdmi	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/08/18 13:56
L12	21	G06F3/14.cpc. and video with usb with (link or lane or line or channel) and hdmi	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/08/18 13:56
L13	11	G06F13/4068.cpc. and video with usb with (link or lane or line or channel) and hdmi	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/08/18 13:56
L14	73402	Young Kim.in. or "Min-Kyu" Kim.in. Gyudong Kim.in. Ju Hwan Yi.in. or Gijung Ahn.in. or Daeyun Shim.in. or Hoon Choi.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	NEAR	ON	2017/08/18 14:05
L15	5	14 and video with usb with (link or lane or line or channel) and hdmi	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/08/18 14:06
L16	50	(twoway or (two near way) or bidirectional$4 or ("bi" near directional) or (full near duplex)) with (mode or state) with (path or line or lane or link) and video with audio and usb and (hdmi displayport) and source with sink and	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	ON	2017/08/18 14:18

		multimedia	IBM_TDB			
L17	27	(twoway or (two near way) or bidirectional$4 or ("bi" near directional) or (full near duplex)) with (mode or state) with (path or line or lane or link) and video with usb and (hdmi displayport) and source with sink and multimedia	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/08/18 14:19
L18	5	(twoway or (two near way) or bidirectional$4 or ("bi" near directional) or (full near duplex)) with video with usb and (hdmi displayport) with (path or line or lane or link) and source with sink and multimedia	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/08/18 14:21
L19	9	H04N5/765.cpc. and video with usb with (link or lane or line or channel) and hdmi	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/08/18 14:56

8/ 18/ 2017 2:57:15 PM
C:\ Users\ eunelus\ Documents\ EAST\ Workspaces\ 14681992.wsp

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14681992	YI ET AL.
	Examiner	**Art Unit**
	ERNEST UNELUS	2181

CPC										
Symbol									**Type**	**Version**
G06F		13	/	4278					F	2013-01-01
G06F		13	/	4068					I	2013-01-01
G09G		5	/	006					I	2013-01-01
G06F		3	/	14					I	2013-01-01
G09G		2370	/	04					A	2013-01-01
G09G		2370	/	10					A	2013-01-01
G09G		2370	/	047					A	2013-01-01
			/							
			/							
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			/							
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			/							
			/							

CPC Combination Sets										
Symbol									**Type**	**Set**	**Ranking**	**Version**
			/									
			/									

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	22	
/ERNEST UNELUS/ Primary Examiner.Art Unit 2181	08/18/2017	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14681992	YI ET AL.
	Examiner	**Art Unit**
	ERNEST UNELUS	2181

US ORIGINAL CLASSIFICATION		INTERNATIONAL CLASSIFICATION										
CLASS	SUBCLASS	CLAIMED					NON-CLAIMED					
		G	0	6	F	13 / 14 (2006.01.01)						
CROSS REFERENCE(S)												
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)											

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	22	
/ERNEST UNELUS/ Primary Examiner.Art Unit 2181	08/18/2017	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14681992	YI ET AL.
	Examiner	**Art Unit**
	ERNEST UNELUS	2181

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1	15	17												
2	2	16	18												
3	3	17	19												
4	4	18	20												
5	5	19	21												
6	6	20	22												
	7	21	23												
7	8	22	24												
8	9														
9	10														
10	11														
11	12														
12	13														
13	14														
	15														
14	16														

NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 22	
/ERNEST UNELUS/ Primary Examiner.Art Unit 2181 (Primary Examiner)	08/18/2017 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 1

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)				*Complete if Known*	
				Application Number	14/681,992
				Filing Date	April 8, 2015
				First Named Inventor	Ju Hwan Yi
				Art Unit	2185
				Confirmation Number	1089
				Examiner Name	Tim T. Vo
Sheet	1	of	2	Attorney Docket Number	30850-27614/US

U.S. PATENT DOCUMENTS				
		Document No.		
Examiner Initials*	Cite No.[1]	Number – Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document
	A1	US-2014/0016034 A1	01-16-2014	Cirstea
	A2	US-2013/0336334 A1	12-19-2013	Gilbert et al.
	A3	US-2013/0223293 A1	08-29-2013	Jones et al.
	A4	US-2009/0257367 A1	10-15-2009	Keppler et al.
	A5	US-2009/0245345 A1	10-01-2009	Lee et al.

FOREIGN PATENT DOCUMENTS					
		Foreign Patent Document			
Examiner Initials*	Cite No.[1]	Country Code[3] – Number[4] Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	T[6]

OTHER REFERENCES – NON-PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published	T[6]
	C1	PCT International Search Report, PCT Application No. PCT/US2015/024984, July 24, 2015, 11 pages.	

EXAMINER SIGNATURE	
Examiner Signature	/ERNEST UNELUS/
Date Considered	04/03/2017

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] Applicant's unique citation designation number (option). [2] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [3] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document.

[5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language translation is attached.

1

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /E.U/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)				Complete if Known	
				Application Number	14/681,992
				Filing Date	April 8, 2015
				First Named Inventor	Ju Hwan Yi
				Art Unit	2185
				Confirmation Number	1089
				Examiner Name	Tim T. Vo
Sheet	2	of	2	Attorney Docket Number	30850-27614/US

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ This application relies, under 35 U.S.C. § 120, on the earlier filing date of prior application No. _____, filed _____ and the references cited therein are hereby referenced, but are not required to be provided in this application under 37 CFR § 1.98(d).

☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Dohyun Ahn/	Date (YYYY-MM-DD)	2015-11-09
Name/Print	Dohyun Ahn	Registration Number	63,237

30850/27614/DOCS/3788667.1

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /E.U/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)				Complete if Known	
				Application Number	14/681,992
				Filing Date	April 8, 2015
				First Named Inventor	Ju Hwan Yi
				Applicant	Silicon Image, Inc.
				Art Unit	2185
				Confirmation Number	1089
				Examiner Name	Tim T. Vo
Sheet	1	of	2	Attorney Docket Number	30850-27614/US

U.S. PATENT DOCUMENTS				
		Document No.		
Examiner Initials*	Cite No.[1]	Number – Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document
	A1	US-6564269	05-13-2003	Martin

FOREIGN PATENT DOCUMENTS					
		Foreign Patent Document			
Examiner Initials*	Cite No.[1]	Country Code[3] – Number[4] Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	T[6]

OTHER REFERENCES – NON-PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published	T[6]

EXAMINER SIGNATURE	
Examiner Signature	/ERNEST UNELUS/
Date Considered	04/03/2017

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] Applicant's unique citation designation number (option). [2] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [3] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document.

[5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /E.U/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)				Complete if Known	
				Application Number	14/681,992
				Filing Date	April 8, 2015
				First Named Inventor	Ju Hwan Yi
				Applicant	Silicon Image, Inc.
				Art Unit	2185
				Confirmation Number	1089
				Examiner Name	Tim T. Vo
Sheet	2	of	2	Attorney Docket Number	30850-27614/US

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ This application relies, under 35 U.S.C. § 120, on the earlier filing date of prior application No. _____, filed _____ and the references cited therein are hereby referenced, but are not required to be provided in this application under 37 CFR § 1.98(d).

☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Dohyun Ahn/	Date (YYYY-MM-DD)	2016-09-12
Name/Print	Dohyun Ahn	Registration Number	63,237

30850/27614/DOCS/4107007.1

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /E.U/

Document Description: Application Data Sheet to update/correct info
Doc Code: ADS.CORR

CORRECTED ADS FORM

Application Number	14681992
Title of Invention	Bidirectional Transmission Of USB Data Using Audio/Video Data Channel

Inventor Information

****If no data is shown, no data has been corrected****

	Data of Record	Updated Data
Order Number	1	
Name	Ju Hwan Yi	
Residence Information		
Residency	us-residency	
City	Sunnyvale	
State	CA	
Country of Residence	US	
Mailing Address of Inventor		
Address 1	~~Silicon Image, Inc.~~	Lattice Semiconductor Corporation
Address 2	~~1140 East Arques Avenue~~	111 SW 5th Avenue, Suite 700
City,State/Province, Postal Code	~~Sunnyvale CA 94085~~	Portland OR 97204
Country	US	

Corrected ADS 1.0

Document Description: Application Data Sheet to update/correct info
Doc Code: ADS.CORR

	Data of Record	Updated Data
Order Number	2	
Name	Young Il Kim	
Residence Information		
Residency	us-residency	
City	Sunnyvale	
State	CA	
Country of Residence	US	
Mailing Address of Inventor		
Address 1	~~Silicon Image, Inc.~~	Lattice Semiconductor Corporation
Address 2	~~1140 East Arques Avenue~~	111 SW 5th Avenue, Suite 700
City,State/Province, Postal Code	~~Sunnyvale CA 94085~~	Portland OR 97204
Country	US	

Corrected ADS 1.0

Document Description: Application Data Sheet to update/correct info
Doc Code: ADS.CORR

	Data of Record	Updated Data
Order Number	3	
Name	Gijung Ahn	
Residence Information		
Residency	us-residency	
City	San Jose	
State	CA	
Country of Residence	US	
Mailing Address of Inventor		
Address 1	~~Silicon Image, Inc.~~	Lattice Semiconductor Corporation
Address 2	~~1140 East Arques Avenue~~	111 SW 5th Avenue, Suite 700
City,State/Province, Postal Code	~~Sunnyvale CA 94085~~	Portland OR 97204
Country	US	

Corrected ADS 1.0

Document Description: Application Data Sheet to update/correct info
Doc Code: ADS.CORR

	Data of Record	Updated Data
Order Number	4	
Name	Min-Kyu Kim	
Residence Information		
Residency	us-residency	
City	Sunnyvale	
State	CA	
Country of Residence	US	
Mailing Address of Inventor		
Address 1	~~Silicon Image, Inc.~~	Lattice Semiconductor Corporation
Address 2	~~1140 East Arques Avenue~~	111 SW 5th Avenue, Suite 700
City,State/Province, Postal Code	~~Sunnyvale CA 94085~~	Portland OR 97204
Country	US	

Document Description: Application Data Sheet to update/correct info
Doc Code: ADS.CORR

	Data of Record	Updated Data
Order Number	5	
Name	Daeyun Shim	
Residence Information		
Residency	us-residency	
City	Saratoga	
State	CA	
Country of Residence	US	
Mailing Address of Inventor		
Address 1	~~Silicon Image, Inc.~~	Lattice Semiconductor Corporation
Address 2	~~1140 East Arques Avenue~~	111 SW 5th Avenue, Suite 700
City,State/Province, Postal Code	~~Sunnyvale CA 94085~~	Portland OR 97204
Country	US	

Corrected ADS 1.0

Document Description: Application Data Sheet to update/correct info
Doc Code: ADS.CORR

	Data of Record	Updated Data
Order Number	6	
Name	Gyudong Kim	
Residence Information		
Residency	us-residency	
City	Sunnyvale	
State	CA	
Country of Residence	US	
Mailing Address of Inventor		
Address 1	~~Silicon Image, Inc.~~	Lattice Semiconductor Corporation
Address 2	~~1140 East Arques Avenue~~	111 SW 5th Avenue, Suite 700
City,State/Province, Postal Code	~~Sunnyvale CA 94085~~	Portland OR 97204
Country	US	

Document Description: Application Data Sheet to update/correct info
Doc Code: ADS.CORR

	Data of Record	Updated Data
Order Number	7	
Name	Hoon Choi	
Residence Information		
Residency	us-residency	
City	Mountain View	
State	CA	
Country of Residence	US	
Mailing Address of Inventor		
Address 1	~~Silicon Image, Inc.~~	Lattice Semiconductor Corporation
Address 2	~~1140 East Arques Avenue~~	111 SW 5th Avenue, Suite 700
City,State/Province, Postal Code	~~Sunnyvale CA 94085~~	Portland OR 97204
Country	US	

Application Information

	Data of Record	Updated Data
Title of Invention	Bidirectional Transmission Of USB Data Using Audio/ Video Data Channel	
Attorney Docket Number	30850-27614/US	
Entity Type	Regular Undiscounted	

Domestic Benefit/National Stage Information

****If no data is shown, no data has been corrected****

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121,365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S. C. 119(e) or 120, and 37 CFR 1.78(a).

Corrected ADS 1.0

Document Description: Application Data Sheet to update/correct info
Doc Code: ADS.CORR

		Data of Record	Updated Data
	Prior Application Status		
	Application Number		
	Continuity Type		
	Prior Application Number		
	Filing Date (YYYY-MM-DD)		
	Patent Number		
	Issue Date (YYYY-MM-DD)		

Foreign Priority Information

****If no data is shown, no data has been corrected****

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX) the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

		Data of Record	Updated Data
	Application Number		
	Country		
	Filing Date		
	Access Code		

Applicant Information

****If no data is shown, no data has been corrected****
Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

	Data of Record	Updated Data
Applicant Type	ASG	

Corrected ADS 1.0

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is		
Name of the Deceased or Legally Incapacitated Inventor		
Applicant is an Organization	Yes	
Name		
Organization Name	~~Silicon Image, Inc.~~	Lattice Semiconductor Corporation
Address 1		111 SW 5th Avenue, Suite 700
Address 2		
City,State/Province,Postal Code	~~Sunnyvale CA~~	Portland OR 97204
Country	US	
Phone Number		
Fax Number		
Email Address		

Assignee Information including Non-Applicant Assignee Information

****If no data is shown, no data has been corrected****
Providing this information in the application data sheet does not substitute for compliance with any requirement of part 3 of Title 37 of the CFR to have an assignment recorded in the Office

	Data of Record	Updated Data
Order		
Applicant is an Organization		
Name		

Organization Name		
Mailing Address		
Address 1		
Address 2		
City,State/Province,Postal Code		
Country		
Phone Number		
Fax Number		
Email Address		

Signature

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b).

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Eric Y. Zhou/	Registration Number	68842
First Name	Eric Y.	Last Name	Zhou

Electronic Patent Application Fee Transmittal

Application Number:	14681992
Filing Date:	08-Apr-2015
Title of Invention:	Bidirectional Transmission Of USB Data Using Audio/Video Data Channel
First Named Inventor/Applicant Name:	
Filer:	Eric Zhou
Attorney Docket Number:	30850-27614/US

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
PROCESSING FEE, EXCEPT PROV. APPLS.	1830	1	140	140
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**140**

Electronic Acknowledgement Receipt

EFS ID:	30839338
Application Number:	14681992
International Application Number:	
Confirmation Number:	1089
Title of Invention:	Bidirectional Transmission Of USB Data Using Audio/Video Data Channel
First Named Inventor/Applicant Name:	
Customer Number:	120363
Filer:	Eric Zhou
Filer Authorized By:	
Attorney Docket Number:	30850-27614/US
Receipt Date:	02-NOV-2017
Filing Date:	08-APR-2015
Time Stamp:	17:53:08
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$140
RAM confirmation Number	110317INTEFSW00004720192555
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Miscellaneous Incoming Letter	27614_US_Request_for_Change_of_Applicant.pdf	91031 70a86f021b21de3da2ee4d11f6dbcb95da58a302	no	2
Warnings:					
Information:					
2	Miscellaneous Incoming Letter	27614_US_POA82AB.pdf	209803 da0b6d01f37b68e5ec3e129495dc4ce62e783d6a	no	3
Warnings:					
Information:					
3	Assignee showing of ownership per 37 CFR 3.73	27614_US_373_Statement.pdf	79170 f0919d113c4366f8c19c5f171adc714608f882cb	no	3
Warnings:					
Information:					
4	Application Data Sheet to update/ correct info	CorrectedADS.pdf	120621 d4f003b5a2e3252664253af346cc8472baaad424	no	10
Warnings:					
Information:					
5	Fee Worksheet (SB06)	fee-info.pdf	30616 6765b14a589f74b4a1f68d8ad3ae17199e0742d0	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	531241		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES
PATENT AND TRADEMARK OFFICE

INVENTORS:	Ju Hwan Yi, Young Il Kim, Gijung Ahn, Min-kyu Kim, Daeyun Shim, Gyudong Kim and Hoon Choi
APPLICATION NO.:	14/681,992
FILING DATE:	April 8, 2015
TITLE:	Bidirectional Transmission Of USB Data Using Audio/Video Data Channel
EXAMINER:	Ernest Unelus
GROUP ART UNIT:	2181
CONFIRMATION NO.:	1089
ATTY. DKT. NO.:	30850-27614/US

REQUEST TO CHANGE APPLICANT PURSUANT TO 37 CFR § 1.46(c)

Pursuant to 37 C.F.R. §1.46(c), please change the Applicant for this application as follows:

- Original listed Applicant(s): **Silicon Image, Inc.**
- New Applicant(s): **Lattice Semiconductor Corporation**

Please find enclosed:

- A newly-executed Application Data Sheet listing the new Applicant;
- A statement under 37 CFR § 3.73(c); and
- A Power of Attorney executed by the new Applicant.

Please charge any applicable charges or fees associated with this request to Deposit Account No. 19-2555.

Respectfully submitted,

Dated: November 2, 2017

/Eric Zhou /

Eric Y. Zhou, Reg. No.: 68,842
Fenwick & West LLP
801 California Street
Mountain View, CA 94041
Direct: (650) 335-7116
Fax (650) 938-5200

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82A (07-13)
Approved for use through 11/30/2014. OMB 0651-0051
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.

Application Number	14/681,992
Filing Date	April 8, 2015
First Named Inventor	Ju Hwan Yi
Title	Bidirectional Transmission Of USB Data Using Audio/Video Data Channel
Art Unit	2181
Examiner Name	Ernest Unelus
Attorney Docket Number	30850-27614/US

SIGNATURE of Applicant or Patent Practitioner

Signature	/Eric Zhou/	Date (Optional)	11/2/2017
Name	Eric Y. Zhou	Registration Number	68,842
Title (if Applicant is a juristic entity)	Agent for Applicant/Assignee		
Applicant Name (if Applicant is a juristic entity)	Lattice Semiconductor Corporation		

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.

☑ *Total of one forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82B (07-13)
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POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

☑ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above: 120363

OR

☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:

☑ The address associated with the above-mentioned Customer Number

OR

☐ The address associated with Customer Number:

OR

Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

Lattice Semiconductor Corporation

☐ Inventor or Joint Inventor (title not required below)

☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)

☑ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)

☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature		Date (Optional)	8/21/15
Name	Byron Milstead		
Title	Vice President and General Counsel		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☑ Total of one forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

PTO/AIA/96 (08-12)
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STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: Ju Hwan Yi, Young Il Kim, Gijung Ahn, Min-kyu Kim, Daeyun Shim, Gyudong Kim and Hoon Choi

Application No./Patent No.: 14/681,992 Filed/Issue Date: April 8, 2015

Titled: Bidirectional Transmission Of USB Data Using Audio/Video Data Channel

Lattice Semiconductor Corporation, a Corporation

(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1. ☑ The assignee of the entire right, title, and interest.

2. ☐ An assignee of less than the entire right, title, and interest (check applicable box):

   ☐ The extent (by percentage) of its ownership interest is _____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.

   ☐ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (*e.g.*, bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

A. ☐ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or for which a copy thereof is attached.

B. ☑ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: Ju Hwan Yi, et al. To: Silicon Image, Inc.

   The document was recorded in the United States Patent and Trademark Office at Reel 035364, Frame 0038, or for which a copy thereof is attached.

2. From: Silicon Image, Inc. To: Lattice Semiconductor Corporation

   The document was recorded in the United States Patent and Trademark Office at Reel 036419, Frame 0792, or for which a copy thereof is attached.

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PTO/AIA/96 (08-12)
Approved for use through 01/31/2013. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(c)

3. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

4. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

5. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

6. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☐ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Eric Zhou/	11/2/2017
Signature	Date
Eric Y. Zhou, Reg. No.: 68,842	Agent for Assignee
Printed or Typed Name	Title or Registration Number

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
14/681,992	04/08/2015	Ju Hwan Yi	30850-27614/US

CONFIRMATION NO. 1089

120363
Lattice Semiconductor/FENWICK
801 California Street
Mountain View, CA 94041

POA ACCEPTANCE LETTER

OC000000095251238

Date Mailed: 11/13/2017

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 11/02/2017.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/hteffera/

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
14/681,992	04/08/2015	2181	2340	30850-27614/US	24	4

CONFIRMATION NO. 1089
CORRECTED FILING RECEIPT

120363
Lattice Semiconductor/FENWICK
801 California Street
Mountain View, CA 94041

OC000000093381753

Date Mailed: 11/13/2017

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Ju Hwan Yi, Sunnyvale, CA;
Young Il Kim, Sunnyvale, CA;
Gijung Ahn, San Jose, CA;
Min-Kyu Kim, Sunnyvale, CA;
Daeyun Shim, Saratoga, CA;
Gyudong Kim, Sunnyvale, CA;
Hoon Choi, Mountain View, CA;

Applicant(s)

Lattice Semiconductor Corporation, Portland, OR;

Power of Attorney: The patent practitioners associated with Customer Number 120363

Domestic Priority data as claimed by applicant

This appln claims benefit of 61/979,483 04/14/2014

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: No

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 04/20/2015

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 14/681,992**

Projected Publication Date: Not Applicable

Non-Publication Request: No

Early Publication Request: No

Title

Bidirectional Transmission Of USB Data Using Audio/Video Data Channel

Preliminary Class

710

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific

countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop

technology, manufacture products, deliver services, and grow your business, visit http://www.SelectUSA.gov or call +1-202-482-6800.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

120363 7590 08/25/2017
Lattice Semiconductor/FENWICK
801 California Street
Mountain View, CA 94041

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission
I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/681,992	04/08/2015	Ju Hwan Yi	30850-27614/US	1089

TITLE OF INVENTION: Bidirectional Transmission Of USB Data Using Audio/Video Data Channel

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$960	$0	$0	$960	11/27/2017

EXAMINER	ART UNIT	CLASS-SUBCLASS
UNELUS, ERNEST	2181	710-308000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.
1 Fenwick & West LLP
2
3

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE: Lattice Semiconductor Corporation
(B) RESIDENCE: (CITY and STATE OR COUNTRY): Porland, Oregon

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:
☒ Issue Fee
☐ Publication Fee (No small entity discount permitted)
☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**
☐ A check is enclosed.
☐ Payment by credit card. Form PTO-2038 is attached.
☒ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number 192555 (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
☐ Applicant certifying micro entity status. See 37 CFR 1.29
NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
☐ Applicant asserting small entity status. See 37 CFR 1.27
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
☐ Applicant changing to regular undiscounted fee status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /Eric Zhou/ Date November 11, 2017
Typed or printed name Eric Y. Zhou Registration No. 68,842

PTOL-85 Part B (10-13) Approved for use through 10/31/2013. OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

DELL/HP/LENOVO EXHIBIT 1002
Page 169

Electronic Patent Application Fee Transmittal

Application Number:	14681992
Filing Date:	08-Apr-2015
Title of Invention:	Bidirectional Transmission Of USB Data Using Audio/Video Data Channel
First Named Inventor/Applicant Name:	Ju Hwan Yi
Filer:	Eric Zhou/Donnae Self
Attorney Docket Number:	30850-27614/US

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
UTILITY APPL ISSUE FEE	1501	1	960	960

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**960**

Electronic Acknowledgement Receipt

EFS ID:	31014478
Application Number:	14681992
International Application Number:	
Confirmation Number:	1089
Title of Invention:	Bidirectional Transmission Of USB Data Using Audio/Video Data Channel
First Named Inventor/Applicant Name:	Ju Hwan Yi
Customer Number:	120363
Filer:	Eric Zhou
Filer Authorized By:	
Attorney Docket Number:	30850-27614/US
Receipt Date:	21-NOV-2017
Filing Date:	08-APR-2015
Time Stamp:	14:24:22
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$960
RAM confirmation Number	112217INTEFSW00000815192555
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	27614_US_Issue_Fee_Transmittal.pdf	77662 a3b780f7b9279de19c71ef16c6e38ceb90158788	no	1
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30629 261c01ef487794dd9081ef97c91098cc123f942f	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	108291		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/681,992	12/26/2017	9852103	30850-27614/US	1089

120363 7590 12/06/2017

Lattice Semiconductor/FENWICK
801 California Street
Mountain View, CA 94041

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 249 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

Ju Hwan Yi, Sunnyvale, CA;
Lattice Semiconductor Corporation, Portland, OR;
Young Il Kim, Sunnyvale, CA;
Gijung Ahn, San Jose, CA;
Min-Kyu Kim, Sunnyvale, CA;
Daeyun Shim, Saratoga, CA;
Gyudong Kim, Sunnyvale, CA;
Hoon Choi, Mountain View, CA;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

IN THE UNITED STATES

PATENT AND TRADEMARK OFFICE

APPLICANT(S)	Lattice Semiconductor Corporation
PATENT NO.:	9,852,103
ISSUE DATE:	December 26, 2017
SERIAL NO.:	14/681,992
FILING DATE:	April 8, 2015
TITLE:	Bidirectional Transmission Of USB Data Using Audio/Video Data Channel
ATTY. DKT. NO.:	30850-27614/US

REQUEST FOR CERTIFICATE OF CORRECTION

The following errors, as more fully described below, appear in this patent.

On page 13, column 10, Claim 3, line 24, delete "first synchronization to" and insert --first synchronization signal to--.

On page 14, column 11, Claim 13, line 20, delete "first synchronization to" and insert --first synchronization signal to--.

Attached hereto is Form PTO/SB/44.

☐ No fee is due for the correction, since the errors were made by the Patent and Trademark Office.

☒ These errors occurred in good faith. Correction thereof does not involve such changes in the patent as would constitute new matter or would require re-examination. A Certificate of Correction is requested. Attached is payment of $150.00 for this Certificate of Correction.

Respectfully submitted,

Dated: June 14, 2018

/ Eric Zhou/

Eric Y. Zhou, Reg. No.: 68,842
FENWICK & WEST LLP
801 California Street
Mountain View, CA 94041
Tel. (650) 335-7116
Fax (650) 938-5200

PTO/SB/44 (09-07)
Approved for use through 08/31/2013. OMB 0651-0033
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.
(Also Form PTO-1050)

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 9,852,103

APPLICATION NO.: 14/681,992

ISSUE DATE : December 26, 2017

INVENTOR(S) : Ju Hwan Yi, Young Il Kim, Gijung Ahn, Min-Kyu Kim, Daeyun Shim, Gyudong Kim and Hoon Choi

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

On page 13, column 10, Claim 3, line 24, delete "first synchronization to" and insert --first synchronization signal to--.

On page 14, column 11, Claim 13, line 20, delete "first synchronization to" and insert --first synchronization signal to--.

MAILING ADDRESS OF SENDER (Please do not use customer number below):

Eric Y. Zhou, Reg. No.: 68,842
Fenwick & West LLP, 801 California Street
Mountain View, CA 94041

This collection of information is required by 37 CFR 1.322, 1.323, and 1.324. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1.0 hour to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Attention Certificate of Corrections Branch, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal

Application Number:	14681992
Filing Date:	08-Apr-2015
Title of Invention:	Bidirectional Transmission Of USB Data Using Audio/Video Data Channel
First Named Inventor/Applicant Name:	Ju Hwan Yi
Filer:	Eric Zhou/Donnae Self
Attorney Docket Number:	30850-27614/US

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
CERTIFICATE OF CORRECTION	1811	1	150	150

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**150**

Electronic Acknowledgement Receipt

EFS ID:	32909821
Application Number:	14681992
International Application Number:	
Confirmation Number:	1089
Title of Invention:	Bidirectional Transmission Of USB Data Using Audio/Video Data Channel
First Named Inventor/Applicant Name:	Ju Hwan Yi
Customer Number:	120363
Filer:	Eric Zhou
Filer Authorized By:	
Attorney Docket Number:	30850-27614/US
Receipt Date:	15-JUN-2018
Filing Date:	08-APR-2015
Time Stamp:	13:21:23
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$150
RAM confirmation Number	061518INTEFSW00010571192555
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Certificate of Correction	27614_US_Request_for_Certificate_of_Correction.pdf	222604 d8d7a3f5b8f9a60015a2a8fff1b4072a5184c858	no	4
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30492 6731ced218424c4651d807159d999121ceb1c934	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	253096		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 9,852,103 B2
APPLICATION NO. : 14/681992
DATED : December 26, 2017
INVENTOR(S) : Jun Hwan Yi et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In the Claims

Column 10, Claim 3, Line 24, delete "first synchronization to" and insert --first synchronization signal to --.

Column 11, Claim 13, Line 20, delete "first synchronization to" and insert --first synchronization signal to --.

Signed and Sealed this
Seventeenth Day of July, 2018

Andrei Iancu
Director of the United States Patent and Trademark Office