

U.S. Patent No. 8,680,712 (“’712 Patent”)

Accused Products

Dell products (laptops¹ and docking stations²) made, used, sold, offered for sale, or imported into the United States by Dell that support USB-C Release 1.0 and later, such as the UltraSharp U4021QW Monitor, Alienware Aurora R14 Desktop, the Inspiron 3525, and the Inspiron 7435 Laptop (“Accused Products”), infringe at least Claim 1, 2, 5, 7, and 9 of the ’712 Patent.

Claim 1

Claim 1	Exemplary Infringement Evidence
[Ipre] A power delivery circuit configured to deliver power to one or more of a plurality of devices connected in a network, the power delivery circuitry comprising:	To the extent the preamble is limiting, each Accused Product comprises a power delivery circuit configured to deliver power to one or more of a plurality of devices connected in a network. For example, the exemplary Dell Inspiron 14 includes a USB-C DRP (dual role port). <i>See, e.g.:</i> Inspiron 14 2-in-1 Laptop

¹ Claims 1-2, 5, 7, 9.

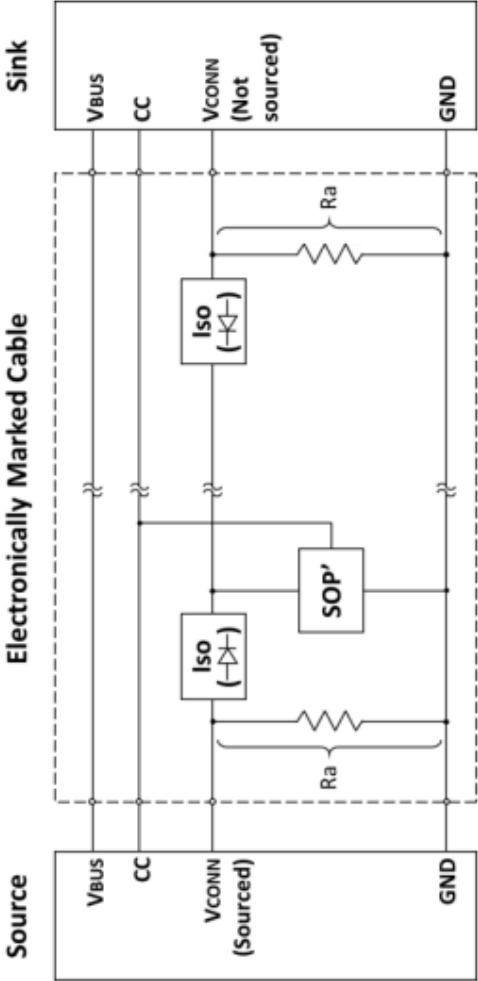
² Claims 1-2, 5, 7, 9.

Claim 1	Exemplary Infringement Evidence
	

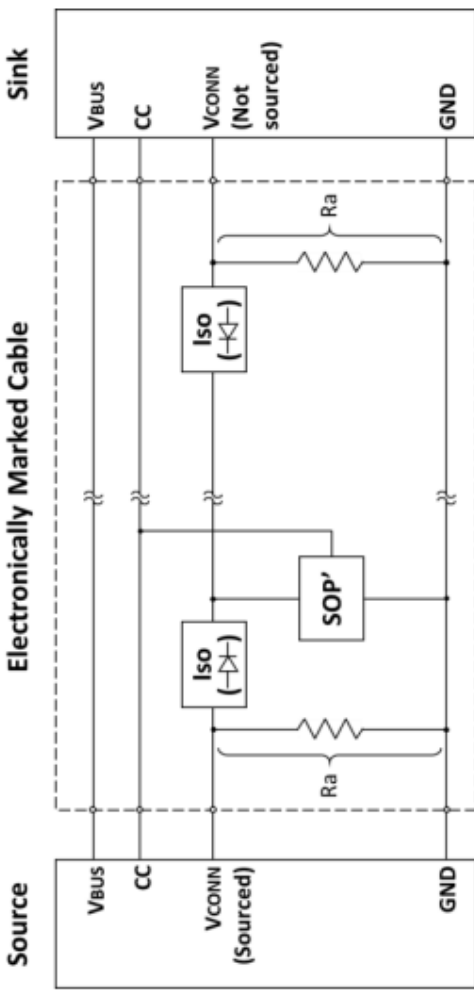
	Tech Specs Processor AMD Ryzen™ 5 7530U (19 MB total cache, 6 cores, 12 threads) Operating System (Dell Technologies recommends Windows 11 Pro for business) Windows 11 Home, English Graphics Card AMD Radeon™ Graphics
--	---

Claim 1	Exemplary Infringement Evidence
	Ports 1 HDMI 1.4 (The maximum resolution supported over HDMI is 1920x1080 @60Hz. No 4K2K output.) 2 USB 3.2 Gen 2 Type-C™ (DP/PowerDelivery) 1 USB 3.2 Gen 1 Type A 1 Universal Audio Jack  https://www.dell.com/en-us/shop/laptops/amd/spd/inspiron-14-7435-2-in-1-laptop For example, a USB-C DRP (dual role port) device such as a laptop, tablet, phone, monitor, dock/hub, storage device, power bank, or expansion card, comprises a USB-C DRP port as specified by the USB-C (USB Type-C) Standard. The USB-C DRP port conducts a discovery process to determine whether it needs to operate as a power source or power sink in a connection formed by the USB-C DRP port, a USB-C port of another USB-C device, and a USB-C eMarker cable connecting the two ports. When the USB-C DRP port operates as a power source, it sources VCONN and VBUS power respectively to the USB-C eMarker cables and the other USB-C port. When the USB-C DRP port operates as a power sink, the USB-C DRP does not source power to the USB-C eMarker cable or the other USB-C port. Instead, the other USB-C port sources VCONN and VBUS power respectively to the USB-C eMarker cable and the USB-C DRP port.

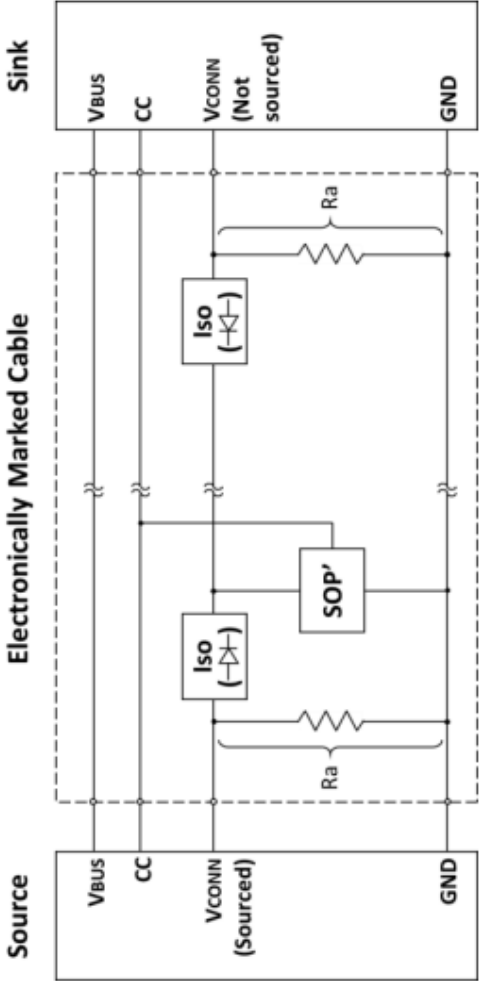
Claim 1	Exemplary Infringement Evidence Figure 4-23 DRP to Sink Functional Model See USB Type-C Cable and Connector Specification Release 2.0, Figure 4-23, pg. 199; see also Release 1.0, Figure 4-20, pg. 134.
---------	---

Claim 1	Exemplary Infringement Evidence
	Figure 4-41 Electronically Marked Cable with VCONN connected through the cable  See USB Type-C Cable and Connector Specification Release 2.0, Figure 4-41, pg. 231; see also Release 1.0, Figure 4-34, pg. 148.

Claim 1	Exemplary Infringement Evidence
	“All USB Full-Featured Type-C cables shall be electronically marked. USB 2.0 Type-C cables may be electronically marked. An eMarker is element in an Electronically Marked Cable that returns information about the cable in response to a USB PD Discover Identity command.” See USB Type-C Cable and Connector Specification Release 2.0, Section 4.9, pg. 231; <i>see also</i> Release 1.0, Section 4.9, pg. 147. “Try.SRC and Try.SNK are intended to ensure more predictable power roles when initially connecting two DRPs, especially if the port partner does not support USB PD. For example, a [DRP] small mobile device may want to implement Try.SNK, so that when attaching to a DRP laptop, the mobile device will always initially be the power sink. Similarly, a [DRP]laptop or Power Bank may wish to implement Try.SRC to ensure it always sources power to attached DRPs.” See USB Type-C Cable and Connector Specification Release 2.0, Section 4.5.1.4.1, pg. 159. “A Sinking Host is a special sub-class of a DRP that is capable of consuming power [from an attached source], but is not capable of acting as a USB device. For example a hub’s DRP or a notebook’s DRP that operates as a host but not as a device. ... A Sourcing Device is a special sub-class of a DRP that is capable of supplying power, but is not capable of acting as a USB host. For example a hub’s UFP or a monitor’s UFP that operates as a device but not as a host.” See USB Type-C Cable and Connector Specification Release 2.0, Sections 4.8.3 and 4.8.4, pg. 227; <i>see also</i> Release 1.0, Sections 4.8.3 and 4.8.4, pgs. 146-147.
[1a] a voltage source configured to generate a voltage;	Each Accused Product comprises a voltage source configured to generate a voltage.

Claim 1	Exemplary Infringement Evidence “Once the connection between host and device is established, the CC pin (CC1 or CC2) in the receptacle that is not connected via the CC wire through the standard cable is repurposed to source VCONN to power circuits in the plug needed to implement Electronically Marked Cables (see Section 4.9), VCONN-Powered Accessories and VCONN-Powered USB Devices. Initially, the source supplies VCONN and the source of VCONN may be swapped using USB PD VCONN_Swap.” See USB Type-C Cable and Connector Specification Release 2.0, Section 2.5, pg. 36; see <i>also</i> Release 1.0, Section 2.5, pg. 23. Figure 4-41 Electronically Marked Cable with VCONN connected through the cable  See USB Type-C Cable and Connector Specification Release 2.0, Figure 4-41, pg. 231; see <i>also</i> Release 1.0, Figure 4-34, pg. 148.
----------------	---

Claim 1	Exemplary Infringement Evidence Each Accused Product comprises a power relay switch configured to relay, when closed, the voltage generated by the voltage source to one or more of the connected devices. For example, USB-C DRP port includes switching networks in both of its CC1 and CC2 signal paths. When the USB-C DRP port is operating as a power source, one of the CC1 and CC2 signal paths is not being used for the full CC signal path. The port controller of the USB-C DRP port controls the switching network in the unused signal path to repurpose that signal path as a VCONN signal path and provide VCONN power to the eMarker chip of the USB-C eMarker cable. See, e.g., Figure 4-23 DRP to Sink Functional Model See USB Type-C Cable and Connector Specification Release 2.0, Figure 4-23, pg. 199; see also Release 1.0, Figure 4-20, pg. 134.
----------------	--

Claim 1	Exemplary Infringement Evidence
	“Once the connection between host and device is established, the CC pin (CC1 or CC2) in the receptacle that is not connected via the CC wire through the standard cable is repurposed to source VCONN to power circuits in the plug needed to implement Electronically Marked Cables (see Section 4.9), VCONN-Powered Accessories and VCONN-Powered USB Devices. Initially, the source supplies VCONN and the source of VCONN may be swapped using USB PD VCONN_Swap.” See USB Type-C Cable and Connector Specification Release 2.0, Section 2.5, pg. 36; see <i>also</i> Release 1.0, Section 2.5, pg. 23. Figure 4-41 Electronically Marked Cable with VCONN connected through the cable  See USB Type-C Cable and Connector Specification Release 2.0, Figure 4-41, pg. 231; see <i>also</i> Release 1.0, Figure 4-34, pg. 148.

Claim 1	Exemplary Infringement Evidence
[1c] a signature resistor connected to the switch and configured to detect a power source from one or more of the connected devices; and	Each Accused Product comprises a signature resistor connected to the switch and configured to detect a power source from one or more of the connected devices. For example, when determining whether the USB-C DRP port is to operate as a power sink, the port controller configures the switching networks in both signal paths to present Rd pull down resistors to detect whether the USB-C port of the other USB-C device is attached as a power source and whether the USB-C eMarker cable is attached as a power sink. The other USB-C port is attached as a power source to the USB-C DRP port if a Rd pull down resistors at the USB-C DRP port and a Rp pull up resistor at the other USB-C port combine in one of the CC1 and CC2 signal paths to provide a source-to-DRP pull up signature on that signal path. The USB-C eMarker cable is not attached as a power sink to the USB-C DRP port if a Rd pull down resistor at the USB-C DRP port and a Ra pull down resistor at the USB-C eMarker cable combine in the other signal path to provide a DRP-to-cable ground or open signature on that signal path. <i>See, e.g.,</i>

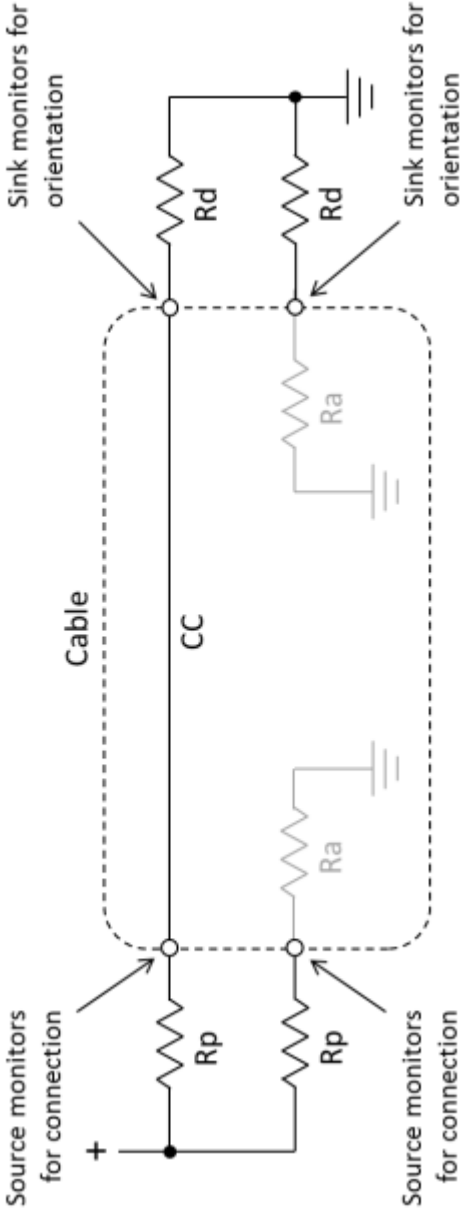
Claim 1	Exemplary Infringement Evidence Figure 4-22 Source to DRP Functional Model See USB Type-C Cable and Connector Specification Release 2.0, Figure 4-22, pg. 198; see also Release 1.0, Figure 4-19, pg. 132. “The following describes the behavior when a Source is connected to a DRP. 1. Source and DRP in the unattached state • DRP alternates between Unattached.SRC and Unattached.SNK 2. Source transitions from Unattached.SRC to Attached.SRC through AttachWait.SRC • Source detects the DRP’s pull-down on CC and enters AttachWait.SRC. After tCCDebounce it then enters Attach.SRC.
----------------	--

Claim 1	Exemplary Infringement Evidence
	• Source turns on VBUS and VCONN 3. DRP transitions from Unattached.SNK to Attached.SNK through AttachWait.SNK • DRP in Unattached.SNK detects pull up on CC and enters AttachWait.SNK. After that state persists for tCCDebounce and it detects VBUS, it enters Attached.SNK.” See USB Type-C Cable and Connector Specification Release 2.0, Section 4.5.3.1.2, pg. 198; see also Release 1.0, Section 4.5.3.1.2, pg. 132. Figure 4-5 Pull-Up/Pull-Down CC Model See USB Type-C Cable and Connector Specification Release 2.0, Figure 4-5, pg. 151; see also Release 1.0, Figure 4-5, pg. 107.

Claim 1	Exemplary Infringement Evidence									
	“Initially, a Source exposes independent Rp terminations on its CC1 and CC2 pins, and a Sink exposes independent Rd terminations on its CC1 and CC2 pins, the Source-to-Sink combination of this circuit configuration represents a valid connection. To detect this, the Source monitors CC1 and CC2 for a voltage lower than its unterminated voltage – the choice of Rp is a function of the pull-up termination voltage and the Source’s detection circuit. This indicates that either a Sink, a powered cable, or a Sink connected via a powered cable has been attached. Prior to application of VCONN, a powered cable exposes Ra on its VCONN pin. Ra represents the load on VCONN plus any resistive elements to ground. In some cable plugs it might be a pure resistance and in others it may be simply the load. ... Once the Sink is powered, the Sink monitors CC1 and CC2 for a voltage greater than its local ground. The CC pin that is at a higher voltage (i.e. pulled up by Rp in the Source) indicates the orientation of the plug.” See USB Type-C Cable and Connector Specification Release 2.0, Section 4.5.1.2.1, pgs. 151-152; see <i>also</i> Release 1.0, Section 4.5.1.2.1, pg. 108. Table 4-15 Sink Port CC Pin State <table><tr><th>CC Pin State</th><th>Port partner CC Termination</th><th>Voltage Detected on CC when port asserts Rd</th></tr><tr><td>SNK.Rp</td><td>Rp</td><td>Above minimum vRd-Connect</td></tr><tr><td>SNK.Open</td><td>Open, Ra, Rd</td><td>Below maximum vRa</td></tr></table> See USB Type-C Cable and Connector Specification Release 2.0, Table 4-15, pg. 169.	CC Pin State	Port partner CC Termination	Voltage Detected on CC when port asserts Rd	SNK.Rp	Rp	Above minimum vRd-Connect	SNK.Open	Open, Ra, Rd	Below maximum vRa
CC Pin State	Port partner CC Termination	Voltage Detected on CC when port asserts Rd								
SNK.Rp	Rp	Above minimum vRd-Connect								
SNK.Open	Open, Ra, Rd	Below maximum vRa								

Claim 1	Exemplary Infringement Evidence
[1d] a load detector connected to the switch and configured to read a load current flowing therethrough so as to detect a load in one of the connected devices, and to extract information about the connected device based on the load current;	Each Accused Product comprises a load detector connected to the switch and configured to read a load current flowing therethrough so as to detect a load in one of the connected devices, and to extract information about the connected device based on the load current. For example, when determining whether the USB-C DRP port is to operate as a power source, the port controller configures the switching networks in both of the CC1 and CC2 signal paths to present Rp pull up resistors to detect whether the USB-C eMarker cable is attached as a power sink and whether the USB-C port of the other USB-C device is attached as a power sink. The USB-C eMarker cable is attached as a power sink to the USB-C DRP port if a Rp pull up resistor at the USB-C DRP port and a Ra pull down resistor at the USB-C eMarker cable combine to provide a DRP-to-cable pull down on one of the CC1 and CC2 signal paths. The other USB-C port is attached as a power sink to the USB-C DRP port if a Rp pull up resistor at the USB-C DRP port and a Rd pull down resistor at the other USB-C port combine to provide a DRP-to-sink pull down on the other signal path. The port controller detects these pull downs by monitoring the currents in the CC1 and CC2 signal paths. <i>See, e.g.,</i>

Claim 1	Exemplary Infringement Evidence Figure 4-23 DRP to Sink Functional Model See USB Type-C Cable and Connector Specification Release 2.0, Figure 4-23, pg. 199; see also Release 1.0, Figure 4-20, pg. 134. “The following describes the behavior when a Source is connected to a DRP. 1. Source and DRP in the unattached state • DRP alternates between Unattached.SRC and Unattached.SNK 2. Source transitions from Unattached.SRC to Attached.SRC through AttachWait.SRC • Source detects the DRP’s pull-down on CC and enters AttachWait.SRC. After tCCDebounce it then enters Attach.SRC.
---------	--

Claim 1	Exemplary Infringement Evidence
	- Source turns on VBUS and VCONN 3. DRP transitions from Unattached.SNK to Attached.SNK through AttachWait.SNK - DRP in Unattached.SNK detects pull up on CC and enters AttachWait.SNK. After that state persists for tCCDebounce and it detects VBUS, it enters Attached.SNK.” <i>See USB Type-C Cable and Connector Specification Release 2.0, Section 4.5.3.1.2, pg. 198; see also Release 1.0, Section 4.5.3.1.2, pg. 132.</i> Figure 4-5 Pull-Up/Pull-Down CC Model  <i>See USB Type-C Cable and Connector Specification Release 2.0, Figure 4-5, pg. 151; see also Release 1.0, Figure 4-5, pg. 107.</i>

Claim 1	Exemplary Infringement Evidence
	“Initially, a Source exposes independent Rp terminations on its CC1 and CC2 pins, and a Sink exposes independent Rd terminations on its CC1 and CC2 pins, the Source-to-Sink combination of this circuit configuration represents a valid connection. To detect this, the Source monitors CC1 and CC2 for a voltage lower than its unterminated voltage – the choice of Rp is a function of the pull-up termination voltage and the Source’s detection circuit. This indicates that either a Sink, a powered cable, or a Sink connected via a powered cable has been attached. Prior to application of VCONN, a powered cable exposes Ra on its VCONN pin. Ra represents the load on VCONN plus any resistive elements to ground. In some cable plugs it might be a pure resistance and in others it may be simply the load. ... Once the Sink is powered, the Sink monitors CC1 and CC2 for a voltage greater than its local ground. The CC pin that is at a higher voltage (i.e. pulled up by Rp in the Source) indicates the orientation of the plug.” See USB Type-C Cable and Connector Specification Release 2.0, Section 4.5.1.2.1, pgs. 151-152; see <i>also</i> Release 1.0, Section 4.5.1.2.1, pg. 108.

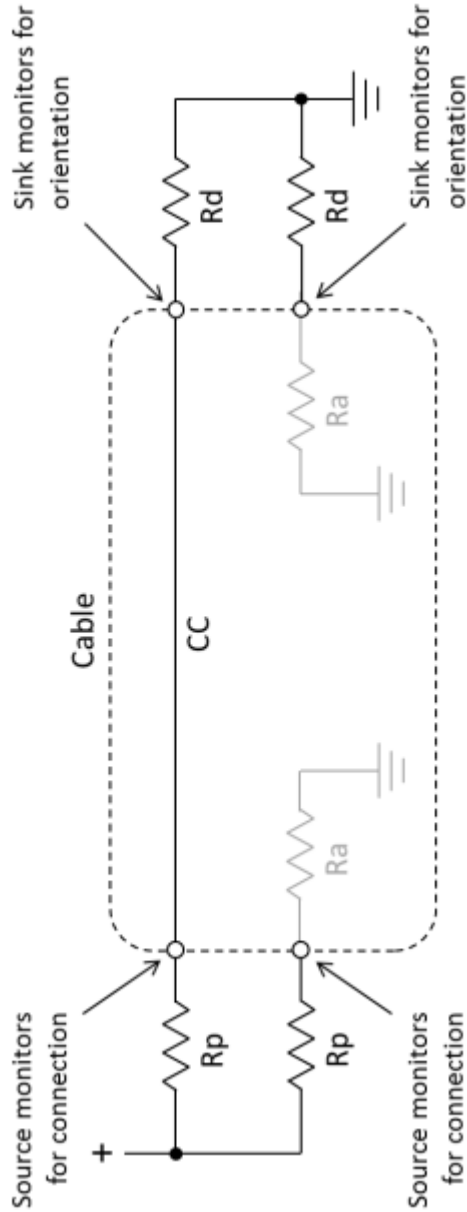
Table 4-14 Source Port CC Pin State

CC Pin State	Port partner CC Termination	Voltage Detected on CC when port asserts Rp
SRC.Open	Open, Rp	Above vOPEN
SRC.Rd	Rd	Within the vRd range (i.e., between minimum vRd and maximum vRd)
SRC.Ra	Ra	Below maximum vRa

Claim 1	Exemplary Infringement Evidence
	See USB Type-C Cable and Connector Specification Release 2.0, Table 4-14, pg. 169.
[1e] wherein the information extracted by the load detector comprises information regarding whether the connected device is powered on or powered off, and whether or not the connected device needs a supply of power.	In each Accused Product, the information extracted by the load detector comprises information regarding whether the connected device is powered on or powered off, and whether or not the connected device needs a supply of power. For example, the port controller determines whether or not the USB-C eMarker cable is a sink to the USB-C port of the other device, and whether or not the USB-C eMarker cable is a sink to the USB-C DRP port by monitoring the currents in both the CC1 and CC2 signal paths. For example, when the port controller detects both a DRP-to-sink pull down signature from a Rd pull down resistor and a DRP-to-cable pull down signature from a Ra pull down resistor on the CC1 and CC2 signal paths, it knows that the eMarker cable is not a sink to the other USB-C port, but is a sink to the USB-C DRP port. Conversely, when the port controller detects both a DRP-to-source pull up signature from a Rp pull up resistor and a DRP-to-cable ground or open on the CC1 and CC2 signal paths, it knows that the eMarker cable is a sink to the other USB-C port, but will not be a sink to the USB-C DRP port. <i>See, e.g.,</i>

Claim 1		Exemplary Infringement Evidence	
Table 4-10 Source Perspective			
CC1	CC2	State	Position
Open	Open	Nothing attached	N/A
Rd	Open	Sink attached	①
Open	Rd		②
Open	Ra	Powered cable without Sink attached	①
Ra	Open		②
Rd	Ra	Powered cable with Sink, VCONN-Powered Accessory (VPA) , or VCONN-Powered USB Device (VPD) attached	①
Ra	Rd		②
Rd	Rd	Debug Accessory Mode attached (Appendix B)	N/A
Ra	Ra	Audio Adapter Accessory Mode attached (Appendix A)	N/A

See USB Type-C Cable and Connector Specification Release 2.0, Table 4-10, pg. 152.

Claim 1	Exemplary Infringement Evidence Figure 4-5 Pull-Up/Pull-Down CC Model  See USB Type-C Cable and Connector Specification Release 2.0, Figure 4-5, pg. 151; see also Release 1.0, Figure 4-5, pg. 107. Table 4-15 Sink Port CC Pin State <table><tr><th>CC Pin State</th><th>Port partner CC Termination</th><th>Voltage Detected on CC when port asserts Rd</th></tr><tr><td>SNK.Rp</td><td>Rp</td><td>Above minimum vRd-Connect</td></tr><tr><td>SNK.Open</td><td>Open, Ra, Rd</td><td>Below maximum vRa</td></tr></table> See USB Type-C Cable and Connector Specification Release 2.0, Table 4-15, pg. 169.	CC Pin State	Port partner CC Termination	Voltage Detected on CC when port asserts Rd	SNK.Rp	Rp	Above minimum vRd-Connect	SNK.Open	Open, Ra, Rd	Below maximum vRa
CC Pin State	Port partner CC Termination	Voltage Detected on CC when port asserts Rd								
SNK.Rp	Rp	Above minimum vRd-Connect								
SNK.Open	Open, Ra, Rd	Below maximum vRa								

Claim 1	Exemplary Infringement Evidence	
	Powered cable	A cable with electronics in the plug that requires VCONN indicated by the presence of <u>Ra</u> between the VCONN pin and ground.
See USB Type-C Cable and Connector Specification Release 2.0, Section 1-5, pg. 27; see also Release 1.0, Section 1-5, pg. 16.		

Claim 2

Claim 2	Exemplary Infringement Evidence	
[2] The power delivery circuit of claim 1, further comprising a controller that controls opening and closing of the power relay switch.	Each Accused Product includes the power delivery circuit of claim 1, further comprising a controller that controls opening and closing of the power relay switch. For example, the PD controller monitors the connection to detect the removal of the the sink device. Upon such a detection, the source device removes any power that is applied to the VBUS and VCONN pins, opening the power relay switch (e.g. relay FET on the VBUS and relay switch on the VCONN). In this case, the source device transition from the Attached.SRC state via the UnattachedWait.SRC state to the Unattached. SRC state. Conversely, when the source device detects a connection with a sink device, the power relay switch is closed and power is provided to the sink device. In this case, the source device transitions from the Unattached.SRC state through the Attachwait.SRC state and finally to the Attached.SRC state. <i>See e.g.:</i> The Source monitors the CC wire for the loss of pull-down termination to detect detach. If the Sink is removed, the Source port removes any voltage applied to VBUS and VCONN, resets its interface configuration and resumes looking for a new Sink attach. <i>See USB Type-C Cable and Connector Specification Release 2.0, Section 4.5.1.2.1, pg. 153.</i>	

Claim 2	Exemplary Infringement Evidence Figure 4-11 DRP Functional Model for CC1 and CC2 Referring to Figure 4-11, a port that can alternate between DFP and UFP behaviors has the following functional characteristics: 1. The DRP uses a FET to enable/disable power delivery across VBUS and initially when in Source mode has VBUS disabled.
---------	---

Claim 2	Exemplary Infringement Evidence
	2. The DRP uses switches for presenting as a Source or Sink. 3. The DRP has logic used during initial attach to toggle between Source and Sink operation: a. Until a specific stable state is established, the DRP alternates between exposing itself as a Source and Sink. The timing of this process is dictated by a period (tDRP), percentage of time that a DRP exposes Rp (dcSRC.DRP) and role transition time (tDRPTransition). b. When the DRP is presenting as a Source, it follows Source operation to detect an attached Sink – if a Sink is detected, it applies VBUS, VCONN, and continues to operate as a Source (e.g., cease alternating). c. When the DRP is presenting as a Sink, it monitors VBUS to detect that it is attached to a Source – if a Source is detected, it continues to operate as a Sink (cease alternating). 4. If the DRP supports advanced functions (USB Power Delivery and/or Alternate Modes), USB PD communication is required. <i>See USB Type-C Cable and Connector Specification Release 2.0, Section 4.5.1.3.3, pg. 157-157</i>

Claim 2	Exemplary Infringement Evidence Figure 4-15 Connection State Diagram: DRP <pre> stateDiagram-v2 [*] --> ErrorRecovery : Directed from any state ErrorRecovery --> Unattached.SNK : tErrorRecovery ErrorRecovery --> Disabled : Directed from any state Disabled --> [*] : Directed from any state Unattached.SNK --> Unattached.SRC : DRP Toggle Unattached.SNK --> AttachWait.SNK : Source Detected Unattached.SNK --> AttachWait.SNK : Source Removed AttachWait.SNK --> Attached.SNK : tCCDebounce and VBUS Detected AttachWait.SNK --> Unattached.SNK : Sink Removed AttachWait.SNK --> AttachWait.SRC : Vbus at vSafe0V and Sink Detected for tCCDebounce AttachWait.SRC --> Attached.SRC : Sink Removed Attached.SNK --> Attached.SNK : Received PS_RDY from original Source for USB PD PR_Swap Attached.SNK --> Attached.SRC : USB PD PR_Swap was accepted Attached.SNK --> Unattached.SNK : VBUS Removed Attached.SRC --> Unattached.SRC : Connection Removed Unattached.SRC --> Unattached.SNK : Connection Detected Unattached.SRC --> AttachWait.SNK : DRP Toggle </pre> See USB Type-C Cable and Connector Specification Release 2.0, pg. 165
---------	--

Claim 5

Claim 5	Exemplary Infringement Evidence
[5] The power delivery circuit of claim 1, wherein the load detector is further configured to detect removal of one of the plurality of devices from the network.	Each Accused Product includes the power delivery circuit of claim 1, wherein the load detector is further configured to detect removal of one of the plurality of devices from the network. For example, the source device in a USB-C connection serves as a controller, monitoring the connection to detect the removal of the the sink device. Upon such a detection, the source device removes any power that is applied to the VBUS and VCONN pins, opening the power relay switch. In this case, the source device transition from the Attached.SRC state via the UnattachedWait.SRC state to the Unattached. SRC state. <i>See e.g.:</i> The Source monitors the CC wire for the loss of pull-down termination to detect detach. If the Sink is removed, the Source port removes any voltage applied to VBUS and VCONN, resets its interface configuration and resumes looking for a new Sink attach <i>See USB Type-C Cable and Connector Specification Release 2.0, Section 4.5.1.2.1, pg. 153.</i>

Claim 5

Exemplary Infringement Evidence

Table 4-5 VCONN Source Characteristics

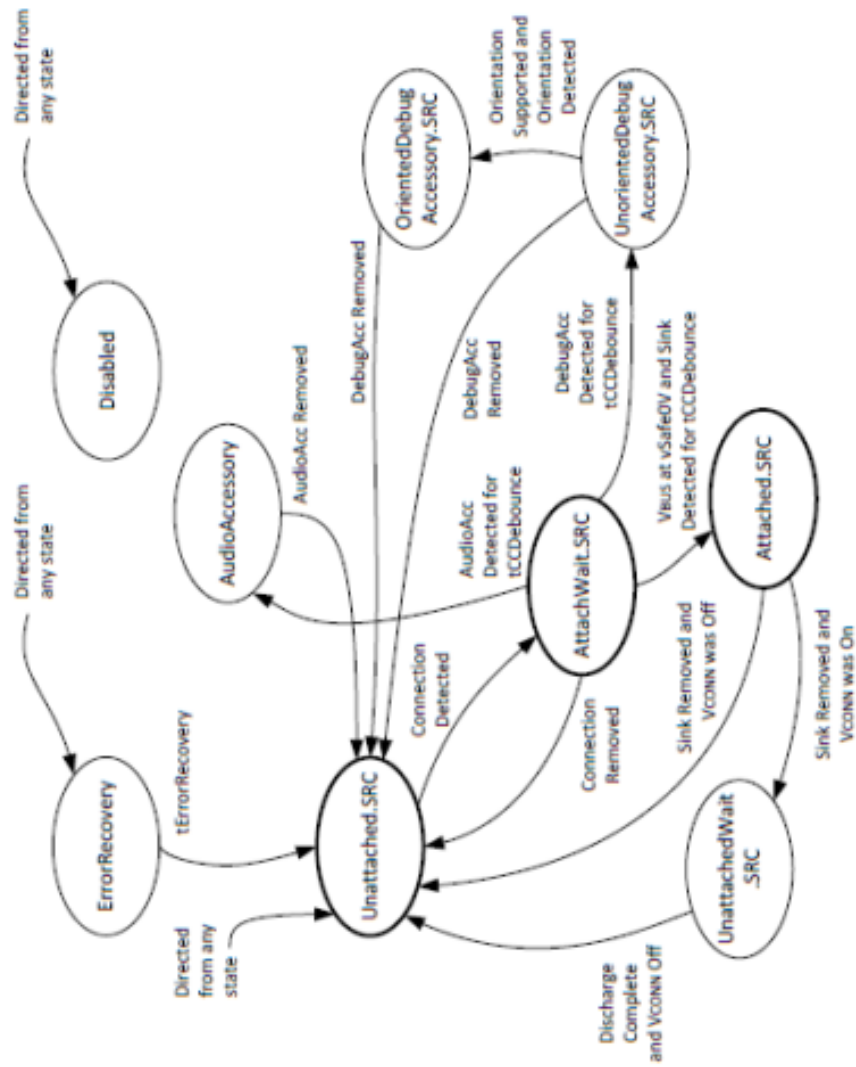
	Minimum	Maximum	Notes
vVCONNValid	3.0 V	5.5 V	The voltage range over which VCONN is considered valid.
Power for Sources with TX/RX Signals	x1 1 W		Source may latch-off VCONN if excessive power is drawn beyond the specified inrush and mode wattage.
	x2 1.5 W		Source may disable VCONN per Table 4-4. Alternate modes may require higher power.
Power for Sources with VPD support	1 W		Source may latch-off VCONN if excessive power is drawn beyond the specified inrush and mode wattage.
Power for Sources in USB Suspend or without TX/RX Signals	100 mW		Minimum power Source must provide in USB Suspend or without TX/RX signals. Source may disable VCONN per Table 4-4.
Rdch	30 Ω	6120 Ω	Discharge resistance applied in UnattachedWaitSRC between the CC pin being discharged and GND.

To aid in reducing the power associated with supplying VCONN, a Source is allowed to either not source VCONN or turn off VCONN under any of the following conditions:

- [Ra](#) is not detected on the CC pin after [tCCDebounce](#) when the other CC pin is in the [SRC.Rd](#) state, or
- if there is no GoodCRC response to [USB PD](#) Discover Identity messages sent to SOP'.

See USB Type-C Cable and Connector Specification Release 2.0, Table 4-5, pg. 144.

Figure 4-12 Connection State Diagram: Source



See USB Type-C Cable and Connector Specification Release 2.0, Figure 4-12, pg. 162;

Claim 5

Exemplary Infringement Evidence

Table 4-10 Source Perspective

CC1	CC2	State	Position
Open	Open	Nothing attached	N/A
Rd	Open	Sink attached	①
Open	Rd		②
Open	Ra	Powered cable without Sink attached	①
Ra	Open		②
Rd	Ra	Powered cable with Sink, VCONN-Powered Accessory (VPA), or VCONN-Powered USB Device (VPD) attached	①
Ra	Rd		②
Rd	Rd	Debug Accessory Mode attached (Appendix B)	N/A
Ra	Ra	Audio Adapter Accessory Mode attached (Appendix A)	N/A

See USB Type-C Cable and Connector Specification Release 2.0, Table 4-10, pg. 152;

Claim 7	Exemplary Infringement Evidence
[7pre] A method of delivering power to one of a plurality of	Each Accused Product practices the method of delivering power to one of a plurality of devices connected in a daisy chain.

Claim 7	Exemplary Infringement Evidence
devices connected in a daisy chain, the method comprising:	For example, the exemplary Dell Inspiron 14 includes a USB-C DRP (dual role port) that connects to a USB hub such as a monitor. The USB hub may then connect to additional USB devices such as a microphone or a webcam, thereby comprising a daisy chain connection. <i>See [1pre]</i>
[7a] detecting a load in a first device of the plurality of devices including detecting a load current flowing through the load; extracting information from the first device based on the detected load current; and	Each Accused Product detects a load in a first device of the plurality of devices including detecting a load current flowing through the load and extracts information from the first device based on the detected load current. <i>See [1d]</i>
[7b] relaying power to the first device based on the extracted information;	Each Accused Product relays power to the first device based on the extracted information. For example, the port controller determines whether or not the USB-C eMarker cable is a sink to the USB-C port of the other device, and whether or not the USB-C eMarker cable is a sink to the USB-C DRP port by monitoring the currents in both the CC1 and CC2 signal paths. For example, when the port controller detects both a DRP-to-sink pull down signature from a Rd pull down resistor and a DRP-to-cable pull down signature from a Ra pull down resistor on the CC1 and CC2 signal paths, it knows that the eMarker cable is not a sink to the other USB-C port, but is a sink to the USB-C DRP port. Conversely, when the port controller detects both a DRP-to-source pull up signature from a Rp pull up resistor and a DRP-to-cable ground or open on the CC1 and CC2 signal paths, it knows that the eMarker cable is a sink to the other USB-C port, but will not be a sink to the USB-C DRP port. <i>See, e.g.,</i>

Exemplary Infringement Evidence																																												
Claim 7	<table><tr><th colspan="4">Table 4-10 Source Perspective</th></tr><tr><th>CC1</th><th>CC2</th><th>State</th><th>Position</th></tr><tr><td>Open</td><td>Open</td><td>Nothing attached</td><td>N/A</td></tr><tr><td>Rd</td><td>Open</td><td rowspan="2">Sink attached</td><td>①</td></tr><tr><td>Open</td><td>Rd</td><td>②</td></tr><tr><td>Open</td><td>Ra</td><td rowspan="2">Powered cable without Sink attached</td><td>①</td></tr><tr><td>Ra</td><td>Open</td><td>②</td></tr><tr><td>Rd</td><td>Ra</td><td rowspan="2">Powered cable with Sink, <u>VCONN-Powered Accessory (VPA)</u>, or <u>VCONN-Powered USB Device (VPD)</u> attached</td><td>①</td></tr><tr><td>Ra</td><td>Rd</td><td>②</td></tr><tr><td>Rd</td><td>Rd</td><td>Debug Accessory Mode attached (<u>Appendix B</u>)</td><td>N/A</td></tr><tr><td>Ra</td><td>Ra</td><td>Audio Adapter Accessory Mode attached (<u>Appendix A</u>)</td><td>N/A</td></tr></table>			Table 4-10 Source Perspective				CC1	CC2	State	Position	Open	Open	Nothing attached	N/A	Rd	Open	Sink attached	①	Open	Rd	②	Open	Ra	Powered cable without Sink attached	①	Ra	Open	②	Rd	Ra	Powered cable with Sink, <u>VCONN-Powered Accessory (VPA)</u> , or <u>VCONN-Powered USB Device (VPD)</u> attached	①	Ra	Rd	②	Rd	Rd	Debug Accessory Mode attached (<u>Appendix B</u>)	N/A	Ra	Ra	Audio Adapter Accessory Mode attached (<u>Appendix A</u>)	N/A
Table 4-10 Source Perspective																																												
CC1	CC2	State	Position																																									
Open	Open	Nothing attached	N/A																																									
Rd	Open	Sink attached	①																																									
Open	Rd		②																																									
Open	Ra	Powered cable without Sink attached	①																																									
Ra	Open		②																																									
Rd	Ra	Powered cable with Sink, <u>VCONN-Powered Accessory (VPA)</u> , or <u>VCONN-Powered USB Device (VPD)</u> attached	①																																									
Ra	Rd		②																																									
Rd	Rd	Debug Accessory Mode attached (<u>Appendix B</u>)	N/A																																									
Ra	Ra	Audio Adapter Accessory Mode attached (<u>Appendix A</u>)	N/A																																									

See USB Type-C Cable and Connector Specification Release 2.0, Table 4-10, pg. 152.

Claim 7

Exemplary Infringement Evidence

Figure 4-5 Pull-Up/Pull-Down CC Model

The diagram illustrates the electrical model for a USB Type-C cable's CC (Configuration Channel) pins. A central horizontal line represents the 'Cable' (CC). On the left side, there are two connection points. The top one is labeled 'Source monitors for connection' and is connected to a positive terminal (+) through a resistor R_p . The bottom one is also labeled 'Source monitors for connection' and is connected to ground through a resistor R_p . On the right side, there are two connection points. The top one is labeled 'Sink monitors for orientation' and is connected to ground through a resistor R_d . The bottom one is also labeled 'Sink monitors for orientation' and is connected to ground through a resistor R_d . A dashed box encloses the central cable line and the two right-side connection points. A resistor R_a is shown connected between the top and bottom lines of the dashed box, with one end connected to ground.

See USB Type-C Cable and Connector Specification Release 2.0, Figure 4-5, pg. 151; see also Release 1.0, Figure 4-5, pg. 107.

Table 4-15 Sink Port CC Pin State

CC Pin State	Port partner CC Termination	Voltage Detected on CC when port asserts Rd
SNK.Rp	Rp	Above minimum vRd-Connect
SNK.Open	Open, Ra, Rd	Below maximum vRa

See USB Type-C Cable and Connector Specification Release 2.0, Table 4-15, pg. 169.

Claim 7	Exemplary Infringement Evidence	
	Powered cable	A cable with electronics in the plug that requires VCONN indicated by the presence of Ra between the VCONN pin and ground.
	See USB Type-C Cable and Connector Specification Release 2.0, Section 1-5, pg. 27; <i>see also</i> Release 1.0, Section 1-5, pg. 16. When Ra is detected, the source is required to source VCONN. <i>See, e.g.:</i> The Source has to be able to differentiate between the presence of Rd and Ra to know whether there is a Sink attached and where to apply VCONN. The Source is not required to source VCONN unless Ra is detected. See USB Type-C Cable and Connector Specification Release 2.0, Section 4.5.1.2.1, pg. 152.	
[7d] wherein the information extracted comprises information regarding whether the first device is powered on or powered off, and whether or not the first device needs a supply of power.	Each Accused Product practices the method of delivering power to one of a plurality of devices connected in a daisy chain wherein the information extracted comprises information regarding whether the first device is powered on or powered off, and whether or not the first device needs a supply of power. See [1e]	

Claim 9	Exemplary Infringement Evidence	
[9pre] The method of claim 7, further comprising: detecting removal of a device of the plurality of devices.	Each Accused Product practices the method of claim 7. See [5]	