



James Ting

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James Ting · 1st

Data Center Advisor

APR 24, 2019



Shih-Yuan (SY) Wang · 2:40 PM

Dear James,

W&Wsens Devices Inc. based in Los Altos California, has developed Silicon and Germanium on Silicon Photodetectors compatible with CMOS technology for high speed, high efficiency optical data communications. Our technology is also applicable to monolithically integrated LiDAR solutions (time-of-flight photo-sensor / 3D imaging). We are currently engaging in M&A discussions and are being represented by





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Best Regards,

SY Wang

CTO & Co-Founder

W&Wsens Devices Inc.

4546 El Camino, Suite 215

Los Altos, CA 94022

sywang@me.com

www.wwsensdevcies.com





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APR 25, 2019



James Ting • 1:24 PM

Shih-Yuan

I'm on vacation. Please contact me week of May 6. jim

AUG 14, 2019



Shih-Yuan (SY) Wang • 5:07 PM

Hi Jim,

Attached below are 3 decks (DCI, LiDAR, Integration) outlining W&Wsens Devices break through technology of high speed AND high efficiency Silicon PD / APD using light trapping. Our thin Si PD / APD is fully compatible with standard CMOS / BiCMOS manufacturing enabling single chip integration to reduce costs and improve performance. We would like to meet with you to discuss W&W break through technology further. Please let us know when you are free to connect, thanks again.





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MAR 3, 2020



Shih-Yuan (SY) Wang • 11:57 AM

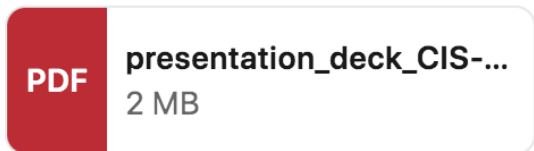
Hi James,

Hope all is well. please let me know when is a good time for us to connect. Attached below is our updated CIS-ToF deck.

Thanks.

Best,

SY



James Ting • 3:56 PM

Hi SY - I don't open unsolicited presentations. Let's have a Zoom call first. Jim



Shih-Yuan (SY) Wang • 5:03 PM

Hi Jim.





James Ting

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Shih-Yuan (SY) Wang • 5:03 PM

Hi Jim,

No problem - could you advise a few dates / times that would work for us to connect via Zoom. Look forward to speaking soon.

Best,
SY



James Ting • 5:37 PM

how about 10am Thursday, March 12. my work email is jim.ting@partner.samsung.com



Shih-Yuan (SY) Wang • 7:09 PM

Hi Jim,

10am on Thursday March 12th works well. My email address connected to zoom is wang006@gmail.com. I'll send you an invite on zoom for that date and time. Thanks and look forward to speaking then.



- Dear James, W&Wsens Devices Inc. based in Los Altos California, has developed Silicon and Germanium on Silicon Photodetectors compatible with CMOS technology for high speed, high efficiency optical data communications. Our technology is also applicable to monolithically integrated LiDAR solutions (time-of-flight photo-sensor / 3D imaging). We are currently engaging in M&A discussions and are being represented by Bank of America Merrill Lynch headed by Marco Chisari. Please see the attached deck for an outline of our technology and intellectual property portfolio. Feel free to reach out to any of the members listed below to schedule an initial phone conference. Best Regards, SY Wang CTO & Co-Founder W&Wsens Devices Inc. 4546 El Camino, Suite 215 Los Altos, CA 94022 sywang@me.com www.wwsensdevcies.com Marco Chisari Global Co-Head, Semiconductor Investment Banking Bank of America Merrill Lynch 3075B Hansen Way Palo Alto, CA 94304 marco.chisari@baml.com M 408.212.1441 Lihan Wang Vice President Strategy & Business Development W&Wsens Devices Inc. 4546 El Camino, Suite 215 Los Altos CA 94022 lihanw@gmail.com M 650.704.1273

[W&Wsens intro deck 3 21 compressed.pdf](#)

[3 MB](#)

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- APR 25, 2019 James Ting sent the following messages at 1:24 PM



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Shih-Yuan

- I'm on vacation. Please contact me week of May 6. jim
- AUG 14, 2019 Shih-Yuan (SY) Wang sent the following messages at 5:07 PM



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[Shih-Yuan \(SY\) Wang](#) 5:07 PM

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Best, SY Wang CTO & Co-Founder W&Wsens Devices Inc. 4546 El Camino, Suite 215 Los Altos, CA 94022 sywang@me.com
www.wwsensdevices.com Lihan Wang Vice President Strategy & Business Development W&Wsens Devices Inc. 4546 El Camino, Suite 215 Los Altos CA 94022 lihanw@gmail.com M 650.704.1273

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- MAR 3, 2020



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[Shih-Yuan \(SY\) Wang](#) 11:57 AM

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-

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lihan wang

Sent - Gmail May 14, 2019 at 1:40 PM

LW

W&Wsens Devices Inc. Introduction

[Details](#)

To: jim.ting@ssi.samsung.com, Cc: Shih-Yuan Wang

Dear James,

W&Wsens Devices Inc. based in Los Altos California, has developed Silicon and Germanium on Silicon photodetectors compatible with CMOS technology for high speed, high efficiency optical data communications. Our technology is also applicable to monolithically integrated LiDAR solutions (Time-of-Flight & 3D imaging) . We are currently engaging in M&A discussions and are being represented by Bank of America Merrill Lynch headed by Marco Chisari. See the attached deck for an outline of our technology and intellectual property portfolio. Please feel free to reach out to any of the members listed below to schedule an initial phone conference.



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Best Regards,

SY Wang
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W&Wsens Devices Inc.
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www.wwsensdevices.com

Marco Chisari
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3075B Hansen Way
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Lihan Wang
Vice President Strategy & Business Development
W&Wsens Devices Inc.

lihan wang



Sent - Gmail August 14, 2019 at 5:12 PM



Thin Silicon PD/APD for DCI/LiDAR

To: jim.ting@ssi.samsung.com

Attached below are 3 decks (DCI, LiDAR, Integration) outlining W&Wsens Devices break through technology of high speed AND high efficiency Silicon PD / APD using light trapping. Our thin Si PD / APD is fully compatible with standard CMOS / BiCMOS manufacturing enabling single chip integration to reduce costs and improve performance. We would like to meet with you to discuss W&W break through technology further.

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W&W Monolithic
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☆ lihan wang



Sent - Gmail February 20, 2020 at 2:37 PM

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WWSens CIS-ToF deck

To: jim.ting@ssi.samsung.com, Cc: Shih-Yuan Wang

James,

W&W is the first to demonstrate high efficiency and low jitter in thin silicon photosensors using photon / light trapping technology that is fully compatible with current state of the art CMOS manufacturing.

Extremely low jitter in the 10s of pico seconds allows for high depth resolution in the millimeter range for applications such as 3D imaging and AR/VR and robotics.

W&W has developed an extensive global IP portfolio for light trapping technology in thin silicon photosensors such as PD / APD / SPAD – please see page 6 of our presentation deck.

Lastly, our light trapping technology to enhance IR sensitivity in thin silicon has been corroborated by Sony – paper attached.

Thanks, and we look forward to further discussions with your team.

Best,
Lihan



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IR sensitivity
enhanc...s 2.pdf

Lihan Wang
VP Strategy & Business Development
W&Wsens Devices Inc.
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Los Altos, CA 94022
M 650.704.1273
www.wwsensdevices.com

From: Jim (James) Ting jim.ting@partner.samsung.com
Subject: RE: WWsens Devices
Date: March 24, 2020 at 5:54 PM
To: lihan wang lihanw@gmail.com
Cc: Shih-Yuan Wang sywang@me.com, Bob Wang spbob.wang@gmail.com



Thanks Lihan. I'll let Memory BU planning know. Stay safe!

Jim

From: lihan wang [<mailto:lihanw@gmail.com>]
Sent: Tuesday, March 24, 2020 4:35 PM
To: Jim (James) Ting <jim.ting@partner.samsung.com>
Cc: Shih-Yuan Wang <sywang@me.com>; Bob Wang <spbob.wang@gmail.com>
Subject: WWsens Devices

Hi Jim,

Thanks for your response - we hope you and your family remain safe and healthy.

Our IP portfolio is very extensive and enforceable because our technology is different from surface texturing such as black silicon (SiOynx) and relies on a completely new invention where the micro holes behave like a low Q resonator with a Q factor ranging from 5 - 50 such that the spectrum is very broad. This allows a single micro hole in a pixel to enhance the sensitivity. This technology is new for CIS and also allows for very low jitter for ToF applications.

At this time many major companies are keen on our technology and we following a path of non-exclusive licensing. It may be in Samsung's best interest to acquire a non-exclusive license from W&Wsens Devices in the event that Samsung uses this technology for their future CIS-ToF IR applications, so that Samsung will not be excluded from using this technology.

However we are also open for Samsung to acquire our IP completely at this point in time.

Best,
Lihan

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M 650.704.1273
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lihan wang



Wwsens CIS paper

Sent - Gmail

November 30, 2020 at 12:15 PM

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To: jim.ting@ssi.samsung.com, jim.ting@partner.samsung.com, Cc: Shih-Yuan Wang

Hi Jim,

I hope you and your family continue to remain well. Attached please find a pre-print of our CIS paper submitted to IEEE Sensors Journal. The significance of these new results show that a single microhole in a small pixel (either and inverted pyramid or funnel shaped) have optical efficiencies superior than inverted pyramid arrays as disclosed by Sony whos structure is also disclosed in our patent application.

In this paper we made a detailed comparison of pixels with inverted pyramid arrays and pixels with a single microhole of various shapes. As you can see in table 1 a microhole with a cross section shape of a funnel obtained 71% optical efficiency at 850 nm and 62% OE at 940 nm – these results were obtained using the Lumerical program.

The thickness of the Si is 3 microns for pixel size of 1.12 micron x 1.12 micron.

We will be happy to discuss these results with you and your team, thanks.

Best,
Lihan



wwsens cis
paper .pdf

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☆ lihan wang



Sent - Gmail January 4, 2021 at 3:16 PM

[Details](#)



WWSens Partnerships

To: jim.ting@ssi.samsung.com, Cc: SHIH-YUAN WANG

Hi Jim,

Happy new year - I hope you and your family are well and healthy.

Attached please find our new W&Wsens presentation deck and paper on CMOS image sensors submitted to IEEE sensors journal. Our focus now is on CMOS image sensors, in particular high resolution CIS for pixel sizes about 1um x 1um, and where a single microhole per pixel can be 220% higher optical efficiency than a comparable flat pixel. Our technology has been corroborated by Sony, Samsung and numerous universities and where we hold an extensive global IP portfolio.

In addition to CIS our technology is applicable to LiDAR and optical interconnects operating at 56Gb/s or higher per PD, and where a PD array can easily achieve 1Tb/s.

We would like to explore with you possible partnership, licensing and / or investment with Samsung in using this technology for CMOS image sensors. As you can see our technology is fully CMOS compatible and where the microhole has a diameter of approximately 700 - 900 nm allowing these pixels to be fabricated at a low technology node. We look forward to hearing from you soon.

Best,
Lihan



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