Final Program Book

제 27회 The 27th Korean Conference on Semiconductors
한국반도체학술대회

Intelligent Semiconductor for Technology Convergence

2020년 2월 12일[수] – 14일[금]

강원도 하이원 그랜드호텔[컨벤션타워]

주관 | 연세대학교 YONSEI UNIVERSITY, KSIA 한국반도체산업협회, COSAR 한국반도체연구조합

주최 | KPS 한국물리학회 The Korean Physical Society, MRS 한국재료학회, 대한전기학회, IEIE 대한전자공학회, IDEC 반도체설계교육센터, ISE 반도체공학회, 한국반도체디스플레이기술학회 The Korean Society of Semiconductor & Display Technology

후원 | GWCVB 강원국제회의센터, SAMSUNG, SK 하이닉스, DB하이텍, ASML, TEL, Applied Materials, WONIK IPS, Lam Research, ETRI, Synopsys Silicon to Software, PSK, 케이케이테크, SEMILAB, AUROS Technology, Silicon Works, TechwidU Technology with you, semi, EUGENETEC, NEXTIN Solutions, WAVICE, NPP NEW POWER PLASMA, dialog Semiconductor, IEEE Electron Device Society Korea Chapter, IEEE SSC Seoul Chapter

Program at a Glance

2월 12일(수)	5층		
	컨벤션홀 L	에메랄드	사파이어
10:30~13:00	Short Course I "Trends and Challenges in Nanoelectronics"		
13:00~14:00	점심 [그랜드볼룸 III / 4층] *Short Course I 참가자께만 제공		
14:00~18:00	Short Course I "Trends and Challenges in Nanoelectronics"	Short Course II "원자층증착(ALD)과 원자층식각(ALE) 공정 및 소재"	Short Course III "차세대 컴퓨팅을 위한 인공지능 반도체 기술"

2월 13일(목)	5층						6층							전시
	컨벤션홀 W	Room A 에메랄드 I	Room B 에메랄드 II+III	Room C 사파이어 I	Room D 사파이어 II+III	Room E 루비 II	Room F 스페이드 I	Room G 스페이드 II+III	Room H 하트 I	Room I 하트 II	Room J 하트 III	Room K 다이아몬드 I	Room L 다이아몬드 II	
09:00~10:30	ETRI 특별세션 (9:00~10:45)	TA1-E Compound Semiconductor Technology I	TB1-F Emerging Device Technology I	TC1-R Semiconductor Software Optimization	TD1-G Modeling of Semiconductor Devices	TE1-L Analog	TF1-C 2D Materials	TG1-K Devices for Neuromorphic Computing I	TH1-N System & Circuit Design Analysis and Optimization	TI1-S Selected Papers on Chip Design Contest	TJ1-M RF Design I	TK1-D Thin Film Process I	TL1-J 페로브스카이트 LED - I	
10:30~10:45	휴식 (& 커피, 다과)													
10:45~12:30	KAERI 특별세션 (11:00~12:00)	TA2-E Compound Semiconductor Technology II	TB2-F New Applications of Silicon Technology	TC2-H Image Engineering & Sensors	TD2-G Atomistic Modeling	★TE2-SS Beyond 7-nm Technology	TF2-B Patterning Technology: Photolithography and Etch	TG2-K Emerging Memory I	TH2-J 뉴로모픽 소자 - I	TI2-A Interconnect & Packaging	TJ2-M RF Design II	TK2-D Thin Film Process II	TL2-J 소자 적용 나노 소재	
12:30~14:00	점심 [그랜드볼룸 / 4층]													
14:00~14:50	기조강연 I [컨벤션홀 K+W / 5층] "Wide Bandgap Semiconductors: The New Revolution in Power Electronics" Prof. Florin Udrea (Cambridge Univ., UK)													
14:50~15:00	휴식													
15:00~15:50	기조강연 II [컨벤션홀 K+W / 5층] "Technology Opportunities toward Next-Generation Computing" Dr. Myung-hee Na (IMEC, Belgium)													
15:50~16:00	휴식 (& 커피, 다과)													
16:00~17:45	[TP1] 포스터 세션 I [컨벤션홀 L 및 로비 / 5층]													
17:45~18:00	휴식													
18:00~20:00	만찬 [컨벤션홀 K+W / 5층]													
20:00~22:00	Rump Session I [에메랄드홀 / 5층] "파운드리 산업의 미래"						Rump Session II [사파이어홀 / 5층] "반도체 교육과 연구 이대로 좋은가?"							

2월 14일(금)	5층					6층						5-6층	
	Room A 에메랄드 I	Room B 에메랄드 II+III	Room C 사파이어 I	Room D 사파이어 II+III	Room E 루비 II	Room F 스페이드 I	Room G 스페이드 II+III	Room H 하트 I	Room I 하트 II	Room J 하트 III	Room K 다이아몬드 I	Room L 다이아몬드 II	로비
09:00~10:30	FA1-E Compound Semiconductor Technology III	FB1-F Emerging Device Technology II	FC1-H OLED & Display Technology	FD1-G Characterization of Semiconductor Devices	FE1-I Gas Sensing Technology	FF1-C Wide Bandgap Materials I (Ga2O3 & etc)	FG1-K Emerging Memory II	FH1-Q Nanoanalysis and Characterization	FI1-P Low Dimensional Materials: Peorperties and Energy Device Applications	FJ1-D 2-dimensional System I	FK1-D Ferroelectric Materials	FL1-J 페로브스카이트 양자점	
10:30~10:45	휴식 (& 커피, 다과)												
10:45~12:30	FA2-D Artificial Intelligent Circuits and Systems	FB2-F Neuromorphic Technology	FC2-H Oxide Thin-Film Transistors	FD2-G TCAD Simulation and Beyond	FE2-I Chemical and Biological Sensors	FF2-C Wide Bandgap Materials II (SiC, diamond & etc)	FG2-K Devices for Neuromorphic Computing II	FH2-Q Metrology, Inspection, and Yield Enhancement	FI2-P Next Generation Battery Devices	FJ2-D 2-dimensional System II	FK2-D Thin Film Process III	FL2-J 페로브스카이트 LED - II	전시
12:30~14:00	점심 [그랜드볼룸 / 4층]												
14:00~15:30	[FP1] 포스터 세션 II [컨벤션홀 L 및 로비 / 5층]												
15:30~15:45	휴식												
15:45~17:30	FA3-D VLSI System Design and Application	FB3-F Nano-electromechanical and 3D Integration Technology	FC3-H TFTs & Display Technology	FD3-G Compact Modeling	FE3-I MEMS and Sensor Systems for Biomedical Applications	FF3-C Wide Bandgap Materials III (Oxide & Nitride)	FG3-K Emerging Memory III	FH3-J 양자점 & 뉴로모픽 소자 - II	FI3-P Photo-Catalytic Mateirlas for Energy Devices	FJ3-D Memory Devices	FK3-D Thin Film Transistors	FL3-J 이차원 물질	
17:30~17:45	폐회식 [Room B(에메랄드 II+III) / 5층]												

	분과
A	Interconnect & Package
B	Patterning
C	Material Growth & Characterization
D	Thin Film Process Technology
E	Compound Semiconductors
F	Silicon and Group-IV Devices and Integration Technology
G	Device & Process Modeling, Simulation and Reliability
H	Display and Imaging Technologies
I	MEMS & Sensor Systems
J	Nano-Science & Technology
K	Memory (Design & Process Technology)
L	Analog Design
M	RF and Wireless Design
N	VLSI CAD
O	System LSI Design
P	Device for Energy (Solar Cell, Power Device, Battery, etc.)
Q	Metrology, Inspection, and Yield Enhancement
R	Semiconductor Software
S	Chip Design Contest
SS	Special Session

요일		세션룸		세션순서		분과	
T	목요일	A	Room A	1	첫번째 세션	A	M
F	금요일	B	Room B	2	두번째 세션	B	N
		C	Room C	3	세번째 세션	C	O
		D	Room D			D	P
		E	Room E			E	Q
		F	Room F			F	R
		G	Room G			G	S
		H	Room H			H	SS
		I	Room I			I	
		J	Room J			J	
		K	Room K			K	
		L	Room L			L	

※ TA1-E: 목요일 Room A에서 첫타임에 진행되는 E분과의 세션

※ FB1-F-1: 금요일 Room B에서 첫타임에 진행되는 F분과 세션의 첫번째 발표

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The 27th Korean Conference on Semiconductors

구두 I 포스터

발표 안내

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한국반도체학술대회

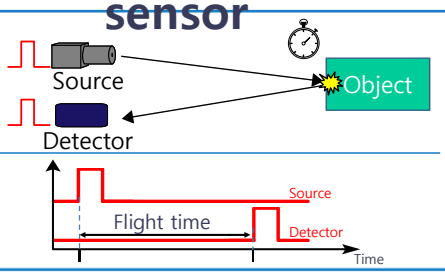
FP1-166	**Self-Powered Pressure Sensor with Silk-based Piezoelectric Film for Wearable Electronics** Minhyun Jung[1], Kwang-jae Lee[2], Jae-wook Kang[2], and Sanghun Jeon[1] *[1]School of Electrical Engineering, KAIST, [2]Department of Flexible and Printable Electronics, Jeonbuk National University*
FP1-167	**Sensing Characteristics of the MOSFET-type Gas Sensor with Sputtered WO_3 Sensing Layer** Yujeong Jeong[1], Seongbin Hong[1], Gyuweon Jung[1], Dongkyu Jang[1], Wonjun Shin[1], Jinwoo Park[1], Seung-Ik Han[2], Hyungtak Seo[2], and Jong-Ho Lee[1] *[1]Department of Electrical Engineering, and Inter-University Semiconductor Research Center, Seoul National University, [2]Department of Energy Systems Research, Ajou University*
FP1-168	**Skin Deformation Detection Sensor for the AR Headset Hands-free Interface** Jaekwang Cha, Jinhyuk Kim, and Shiho Kim *School of Integrated Technology, and Yonsei Institute of Convergence Technology, Yonsei University*
FP1-169	**The Construct of RF Dielectrophoretic System for Observing Cellular Behavior above a Few Hundreds MHz** Sang Hyun Lee, Kang In Yeo, Seungyeop Choi, and Sang Woo Lee *Department of Biomedical Engineering, Yonsei University*
FP1-170	**Time-of-flight Sensor 시스템 구축 및 성능 평가** Eunsung Park[1,2], Woo-young Choi[1], and Myung-jae Lee[2] *[1]Department of Electrical and Electronic Engineering, Yonsei University, [2]Post-silicon Semiconductor Institute, KIST*
FP1-171	**Waveguide Piezoelectric Micromachined Ultrasonic Transducers (PMUTs) Using Single-crystalline PMN-PZT Thin Film for Ultrasonic Fingerprint/vein Co-recognition** Jin Soo Park[1,2], Soo Young Jung[3,4], Seung-hyub Baek[3], and Byung Chul Lee[1] *[1]Center for BioMicrosystems, KIST, [2]Department of Electrical Engineering, Korea University, [3]Center for Electronic Materials, KIST, [4]Department of Material Science and Engineering, Seoul National University*
FP1-172	**Wireless, Skin-mountable Wearable EMG Sensor for Human-Machine Interface** Sunggu Kang, Minsu Song, and Jeonghyun Kim *Department of Electronic Convergence Engineering, Kwangwoon University*
FP1-173	**고에너지 이온주입을 이용한 35μm 단위 픽셀 크기를 갖는 실리콘 광증배 (SiPM)소자** 원종일[1], 박건식[1], 조두형[1], 고상춘[1], 이성현[1], 최병건[2], 박성모[2], 박경환[2] *[1]ETRI 반도체융합부품연구실, [2]ETRI 초경량지능형반도체연구실*
FP1-174	**금속 나노파티클이 기능화된 브랜치 형태 나노와이어의 가스센싱 특성 향상** Hyoun Woo Kim[1,2], Myung Sik Choi[1], Jae Hoon Bang[1], Seungmin Han[1], Ha Young Lee[1], and Han Gil Na[1] *[1]Division of Materials Science and Engineering, Hanyang University, [2]The Research Institute of Industrial Science, Hanyang University*

Time-of-Flight Sensor 시스템 구축 및 성능 평가

Eun-sung Park, Woo-Young Choi and Myung-Jae Lee*
Advanced Semiconductor Devices and Systems(ADS) Lab, KIST, Korea
Email: es.park@kist.re.kr*, mj.lee@kist.re.kr

Korea Institute of Science and Technology

Time-of-Flight sensor



From a pulse of light reflected by an object
We can get distance from object to receiver

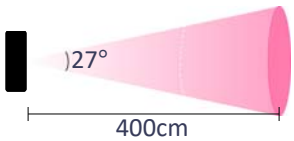
Speed of light 'c' $= 3 \times 10^8 m/s$
Time of flight (ToF) = 20ns $(20 \times 10^{-9} s)$

Distance $D = c \times \frac{ToF}{2} = 3\ m$

VL53L1X

ToF sensor from *STMicroelectronics*

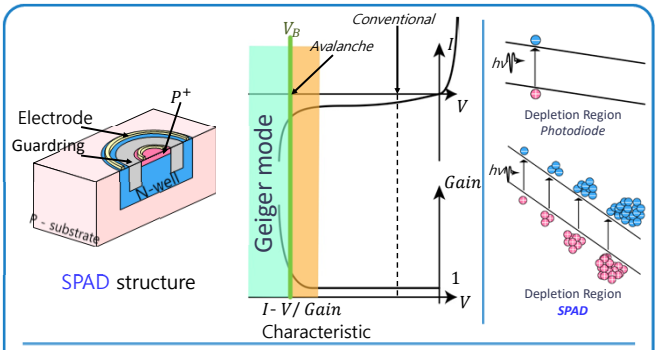
- Size : 4.9 x 2.5 x 1.5 mm
- Emitter : 940 nm invisible laser
- SPAD receiving array(16x16) with integrated lens
- Programmable with Nucleo evaluation board

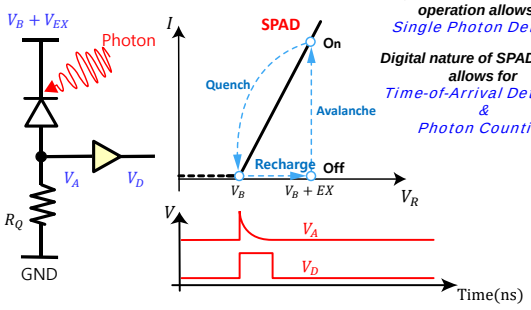


Distance Mode	Max.Distance (cm)
Short	136
Medium	290
Long	360

- Distance ranging up to 400 cm
- Typical full field of view(FoV) : 27° (When using 16x16 SPAD array)
- 3 type distance measurement mode (short, medium long mode)
- Programmable Region of Interest (ROI) size on the receiving array,

SPAD Overview *Single-Photon Avalanche Diode*





Very high gain of Geiger-mode operation allows for Single Photon Detection

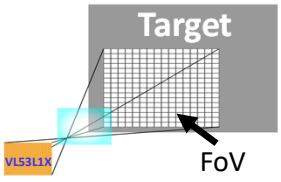
Digital nature of SPAD output allows for Time-of-Arrival Detection & Photon Counting

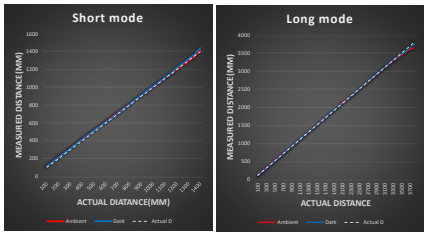
Result

(1) Distance measurement

In order to test the reliability of the VL53L1X sensor, the distance was measured in short mode and long mode. The condition of ambient light is same as data sheet noted.
(Dark : ***0 lux***, Ambient light : ***400 lux***)

Test condition	
Target size	Cover the FoV
RoI	16x16

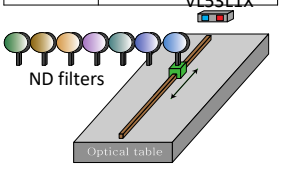


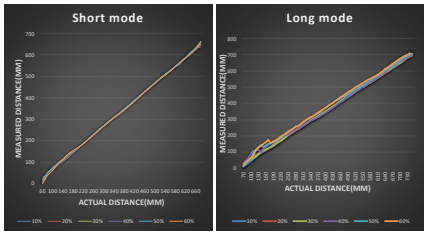


(2) Reflective dependence

In order to test the reflective dependence of VL53L1X, the target has changed to Neutral density filter and distance is measured until 660~730cm that FoV can cover.

Test condition	
Target type	ND filter (5x5 cm)
RoI	16x16

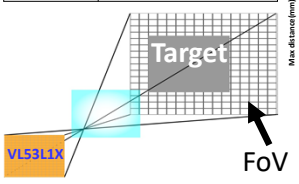




(3) Size of target

Distance measurement was performed to get the data of how far does Vl53L1x can detect if target is smaller that FoV.

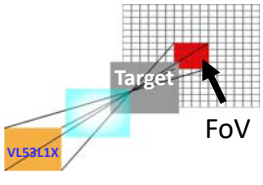
Test condition	
Target size	Smaller than FoV
RoI	16x16

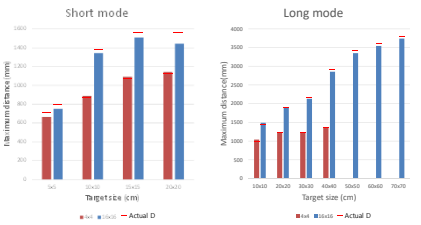


(4) Programmable RoI

RoI was changed to see the change of the maximum measurable distance. RoI is programmable from 4x4 to 16x16.

Test condition	
Target size	Smaller than FoV
RoI	4x4 / 16x16





Conclusion

(1) Distance measurement
- **Accurate no matter what condition (dark/light) it's in:** max error < 20mm (same as data sheet)
-> ***Reliable in indoor/outdoor applications***

(2) Reflective something
- **Negligible reflectivity dependence** on accuracy
-> Reliable various-object measurement thanks to SPAD-based ToF technology

(3) Size of target
- **VL53L1X cannot measure an object if its size smaller than FoV**, although it's pretty close!
-> ***Limited applications! Need to be solved!!***

(4) Programmable RoI
- VL53L1X-based system can be optimized for each application.
- ***Smaller RoI results in shorter distance & worse accuracy***