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**COMPUTEX**  
TAIPEI

# Highlights for 2019 Computex

PHISON Team, May 2019



## Consumer SSD Solutions

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SSD



# PS5016-E16

Next Gen Performance Next Gen Interface

- PCIe Gen4x4, NVMe 1.3 Interface
- DDR4
- 8 CH with 32 CEs, up to 8TB
- Support 3D TLC / QLC NAND Flash
- Phison 4th Gen LDPC & RAID ECC
- Support AES256 / TCG OPAL2.0 / Pyrite
- Heatsink for controller
- Form Factor: M.2 2280

## Sequential Performance

Read 5000 MB/s

Write 4400 MB/s

# AMD + PHISON + Ecosystem Partners Announced PCIe 4.0 Era is NOW

PHISON CEO  
K.S. Pua

AMD CEO  
Dr. Lisa Su



AMD CEO Dr. Lisa Su Keynote Speech  
at Computex on 5/27



# PS5012-E12

Excellent Performance Beyond Your Imagination

- PCIe Gen3x4, NVMe 1.3 Interface
- DDR3L / DDR4
- E12 : 8 CH with 32 CEs, up to 8TB  
E12C: 4 CH with 16 CEs, up to 1TB
- Support 3D TLC / QLC NAND Flash
- Phison 3rd Gen LDPC & RAID ECC
- Support AES256 / TCG OPAL2.0 / Pyrite
- Form Factor: M.2 2280 / HHHL AIC / U.2

## Sequential Performance

Read 3400 MB/s

Write 3200 MB/s

## 4K Random Performance

Read 700K IOPS

Write 600K IOPS

SSD

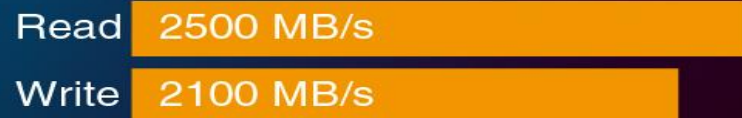


# PS5013-E13T

## Superior Performance & HMB Support

- PCIe Gen3x4, NVMe 1.3 Interface
- DRAM-Less
- 4 CH with 16 CEs, up to 2TB
- Support 3D TLC / QLC NAND Flash
- Host Memory Buffer (HMB) support
- Phison 4th Gen LDPC & RAID ECC
- Support AES256 / TCG OPAL2.0 / Pyrite
- SmartZIP™ support
- Form Factor: M.2 2242 / M.2 2280 / BGA SSD / CFX™

### Sequential Performance



### 4K Random Performance





# PS3113-S13T

Extreme Speed SATA SSD with DRAM-Less

- SATA III Interface
- DRAM-Less
- 4 CH with 16 CEs, up to 2TB
- Support 3D TLC / QLC NAND Flash
- Phison 4th Gen LDPC & RAID ECC
- Support AES256 / TCG OPAL2.0
- Low power DEVSLP < 5mW
- SmartZIP™ support
- Form Factor: 2.5" / M.2 2280

## Sequential Performance

Read 550 MB/s

Write 520 MB/s

## 4K Random Performance

Read 95K IOPS

Write 90K IOPS



# QLC Enabling in SSD

## PS5013-E13T

Capacity	Bics4 QLC mono die	Seq R(128K) MB/s	Seq W(128K) MB/s	Random R(4K) IOPS	Random W(4K) IOPS
512 GB	1.33Tb	1400	440	40K	98K
1024 GB	1.33Tb	1600	860	85K	195K
1920 GB	1.33Tb	2100	1700	160K	380K

## PS5013-S13T

Capacity	Bics4 QLC mono die	Seq R(128K) MB/s	Seq W(128K) MB/s	Random R(4K) IOPS	Random W(4K) IOPS
512 GB	1.33Tb	550	435	280	320
1024 GB	1.33Tb	550	515	390	350
1920 GB	1.33Tb	550	520	400	360

1. The read/write speed is by estimation. / 2. The data rate of BiCS4 QLC is 667 MT/s .





## Gaming SSD Solutions

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SSD



# PS5016-E16

Next Gen Performance Next Gen Interface

- PCIe Gen4x4, NVMe 1.3 Interface
- DDR4
- 8 CH with 32 CEs, up to 8TB
- Support 3D TLC / QLC NAND Flash
- Phison 4th Gen LDPC & RAID ECC
- Support AES256 / TCG OPAL2.0 / Pyrite
- Heatsink for controller
- Form Factor: M.2 2280

**E16 + RGB Solution**  
**CS Sample Starts from Q3/E**

## Sequential Performance

Read 5000 MB/s

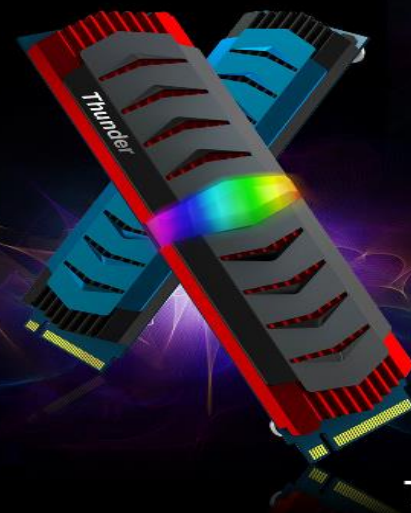
Write 4400 MB/s

# MADE FOR ESPORTS

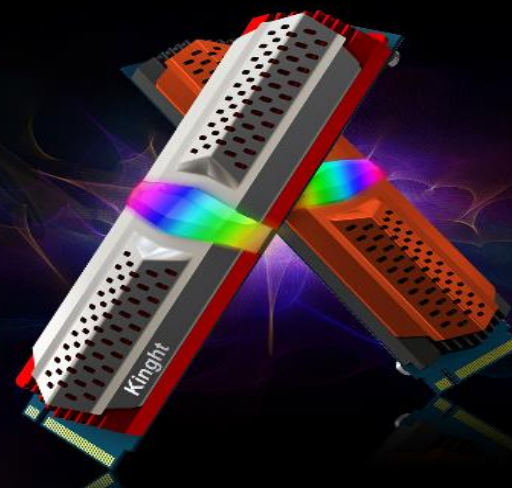
## M.2 SERIES

Extraordinary High Speed Experience

Form Factor	M.2 2280
Controller	PS5012-E12
Interface	PCIe Gen3x4 NVMe
Capacity (up to)	2TB
Seq. Read/Write (up to)	3400/3200 MB/s
Ran. Read/ Write (up to)	700K/600K IOPS
Operating Temp.	0°C~70°C



THUNDER



KNIGHT

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# MADE FOR ESPORTS HHHL SERIES

Extraordinary High Speed Experience

Form Factor	HHHL AIC
Controller	PS5012-E12
Interface	PCIe Gen3x4 NVMe
Capacity (up to)	8TB
Seq. Read/Write (up to)	3400/3200 MB/s
Ran. Read/ Write (up to)	700K/600K IOPS
Operating Temp.	0°C~70°C

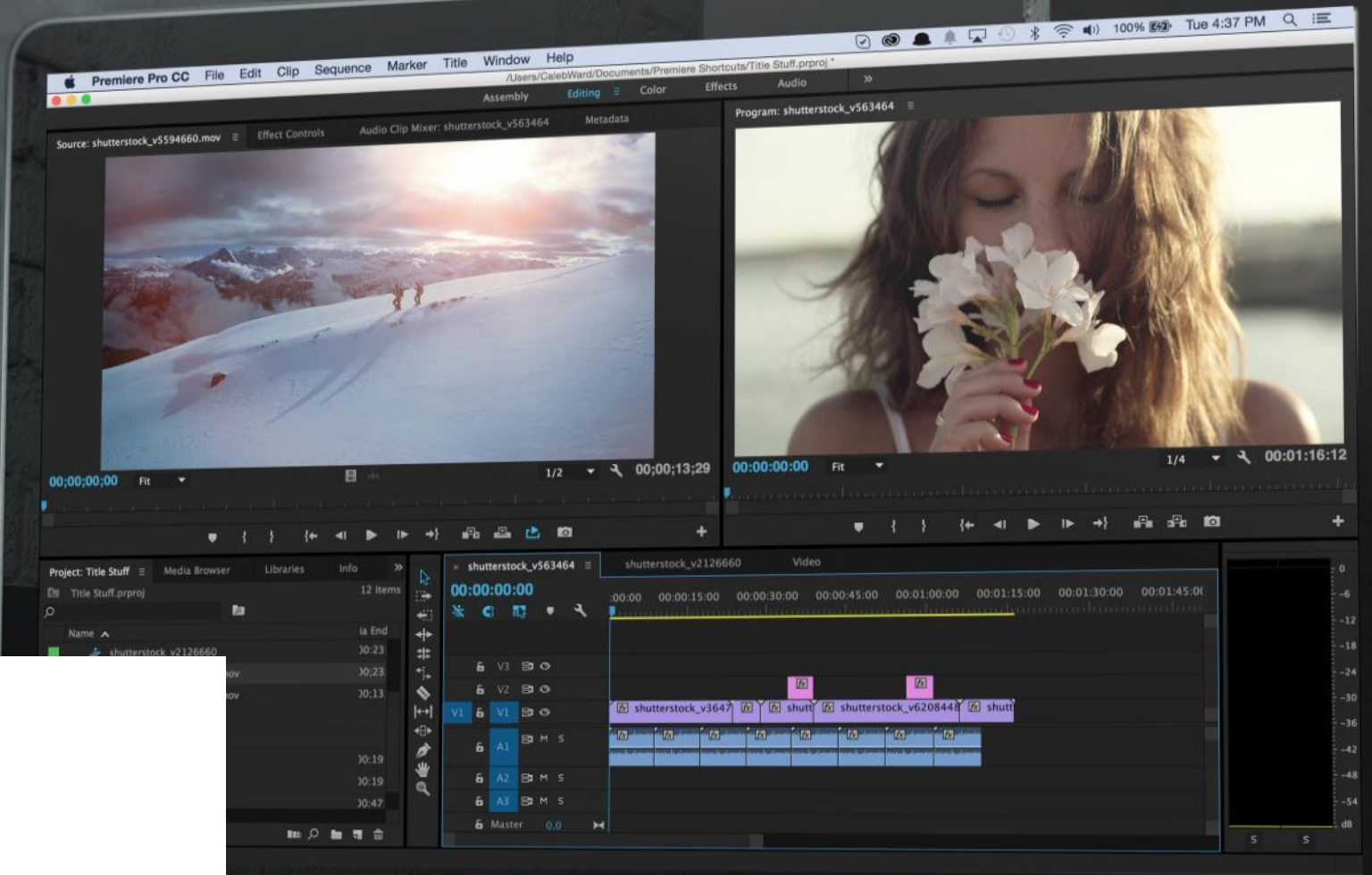


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## External SSD Solutions

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# Thunderbolt™ External SSD

Unprecedented Portable Performance



**THUNDERBOLT™**

Product Name	PT30	PT32
Controller	PS5008-E8	PS5012-E12
Bridge	PCIe to Thunderbolt™	PCIe to Thunderbolt™
Connector Interface	Thunderbolt™3	Thunderbolt™3
Connector Type	Type C	Type C
Capacity	Up to 1TB	Up to 2TB
Sequential Read/Write (up to)	1600/1000 (MB/s)	2800/2100 (MB/s)
Power Consumption	< 7W Max	< 9W Max
Operating System	Windows / Mac	Windows / Mac



# USB 3.2 External SSD Series

Owing External SSD Drive to Catch Speedy and High-quality Life

## USB 3.2 Gen1

### SU30



- PS3111-S11T Controller
- Capacity up to 1TB
- Seq. Read/Write up to 400/350 MB/s
- Micro-B connector
- MP Already

## USB 3.2 Gen2

### PU31



- PS5008-E8/PS5012-E12 Controller
- Capacity up to 2TB
- Seq. Read/Write up to 1000/950 MB/s
- Type-C Connector
- MP Already

## USB 3.2 Gen2x2

### U17

Housing Design  
Coming Soon

- PS2251-17 Controller
- Capacity up to 2TB
- Seq. Read/Write up to 1300/1100 MB/s
- Type-C Connector
- 2019/Q4 ES

A photograph of a server room with blue lighting. The server racks are open, revealing various server components and cables. The perspective is from a low angle, looking down a row of racks.

## Enterprise SSD Solutions

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# PS5012-E12DC Enterprise PCIe Gen3x4 NVMe SSD Solution

Ultra High Performance

- ◆ PCIe Gen 3x4 NVMe 1.3 Interface
- ◆ Capacity up to 3840GB
- ◆ Support 3D TLC
- ◆ LDPC 3.0 ECC Engine
- ◆ Power Loss Data Protection
- ◆ End-to-End Data Protection
- ◆ Encryption
- ◆ Support U.2/ M.2 2280/ M.2 22110 (w/ p-Fail) Form Factors

Sustained Sequential Performance (MB/s)

Read **3200**

Write **1000**

Sustained 4K Random Performance (IOPS)

Read **450K**

Write **70K**

# PS3112-S12DC Enterprise SATA III SSD Solution

## Supreme Performance

- ◆ SATA III Interface
- ◆ Capacity up to 3840GB
- ◆ Support 3D TLC
- ◆ LDPC 3.0 ECC Engine
- ◆ Power Loss Data Protection
- ◆ End-to-End Data Protection
- ◆ Encryption
- ◆ Support 2.5" Form Factor

Sustained Sequential Performance (MB/s)

Read **530**

Write **500**

Sustained 4K Random Performance (IOPS)

Read **98K**

Write **65K**



## USB Solutions



# PS2251-17 (U17)

Pioneering USB 3.2 Gen2x2 Controller



- USB 3.2 Gen 2x2 Interface with 20Gbps Bandwidth
- 2 CH; Up to 16CEs; Up to 2TB
- Up to 1300 MB/s Sequential Performance
- Up to 200K IOPS 4K Performance
- Support 3D TLC/QLC NAND Flash
- 216-Ball TFBGA
- Support Toggle 3.0 & ONFI 4.0
- Phison 4th Gen LDPC & RAID ECC
- SmartZIP™ Support
- AES256 Support
- 2019/Q4 ES



# USB 3.0 Security Solution

Security Level 

## PS2251-13

- For General Use
- Data Protection
- AES Encryption



Data Encryption



Health Care

Security Level 

## PS2251-15

- For Enterprise / Government / Military
- AES Encryption
- FIPS 140-2 Compliant



Content Protection



Server Access

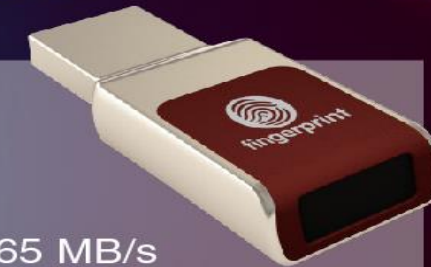


# Finger Secured USB Drive

Secure Your Secret with A Single Touch



- PS2251-13 Controller
- 16GB – 64GB
- Seq. Read/Write up to 80/65 MB/s
- USB 3.2 Gen1 Interface
- AES Encrypted NAND Flash Storage
- Effective Sensing Pixels: 103 x 52 pixels
- False Acceptance Rate (FAR)<sup>1</sup> < 1/50000
- False Recognition Rate (FRR)<sup>2</sup> < 3%
- Average True Matching Time < 300 ms



1. The false acceptance rate, or FAR, is the measure of the likelihood that the biometric security system will incorrectly accept an access attempt by an unauthorized user.  
2. The false recognition rate, or FRR, is the measure of the likelihood that the biometric security system will incorrectly reject an access attempt by an authorized user.



SD Card Solutions

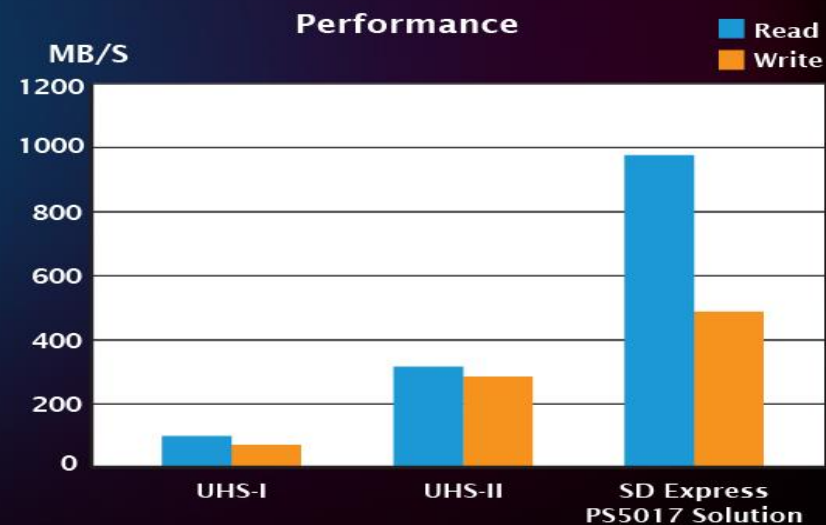
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## SD Express Card

Extreme Performance in PCIe Interface

<b>PS5017 + 3D NAND</b>	
Support Flash I/F	ONFi/Toggle 2.0
Support Flash	3D TLC/QLC
Capacity	Up to 512GB
Throughput	PCIe G3x1
Performance	Sequential R/W 900/500 MB/s (Tentative)







# VideoMate2 VSC30 Memory Card

Best Solution for Video Surveillance

## PS8131+ BiCS3 TLC

- Certificated for Edge Storage
- High Endurance (Low WAF)
- E.g. 32GB = 7500 hour of recording! (full HD @ 26Mbps)
- Sustained Performance



Capacity	Read	Write	TBW	
			Normal Card	VideoMate2
32GB	100	70	16.8	31.8
64GB	100	95	33.6	63.6
128GB	100	95	67.1	127.3
256GB	100	95	134.2	254.3

TBW Measured by Garmin E530





# UHS-II VSC90 Memory Card

Bring It Home for High-End Application

- PS8601 + 3D TLC
- 32GB – 256GB
- Video Speed Class: V60/V90
- Read: 290 \*MB/s Write: 250 MB/s

\*Measured by customized card reader

**Burst Mode**  
Photo Shooting



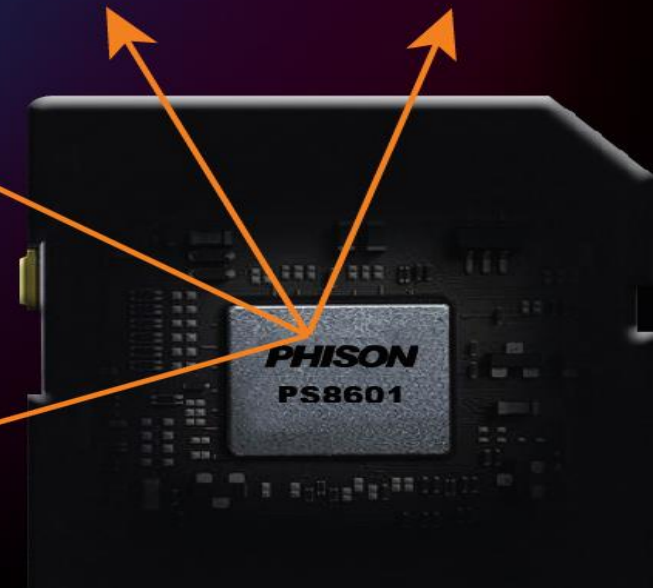
**4K/8K**  
Video Recording



**High-End DSC**  
FUJIFILM X-H1  
Olympus E-M5 Mark II  
Panasonic DC-GH5  
SONY α7R III etc.



**High Quality Video**  
360 degree camera  
VR





# 1100x Memory Card

Highest Read Performance  
UHS-I SD/microSD

## PS8229+ BiCS3 TLC

- SD6.1 UHS-I Interface
- Support 3D TLC
- Capacity Up to 256GB
- Sequential Read Up to 165 MB/s by A Customized Card Reader
- Estimated IOPS: R5000/W3000





## eMMC & UFS Solutions

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# Nano Memory Card

Phison Controller Technology

- An innovative storage solution for smartphones
- Socket size is 45% smaller than a microSD card
- Capacity up to 256GB
- Sequential Read/Write up to 90/82 MB/s
- Random Read/Write up to 2800/5700 IOPS
- Support 3D TLC

## Size Comparison





# UFS Solutions

## SSD Performance for Mobile Devices



**PS8317 eUFS 3.0**

- UFS 3.0, 2-ch @1,200 MT/s
- M-PHY 4.1, HS-Gear 4B x 2-Lanes
- Capacity up to 512 GB(3D TLC NAND Flash)
- Seq. Read/Write up to 1750/810 MB/s
- 4KB Ran. Read QD8 up to 60K IOPS
- Ran. Read/Write QD32 up to 81K/150K IOPS
- Phison 4th Gen. LDPC ECC



**PS8313 eUFS 2.1**

- UFS 2.1, 2ch, 4CE @667MT/s
- M-PHY 3.0, HS-Gear 3B x 2-Lanes
- Capacity up to 256 GB (3D TLC NAND Flash)
- Seq. Read/Write up to 920/520 MB/s
- 4KB Ran. Read QD8 up to 48.5K IOPS
- Ran. Read/Write QD32 up to 67K/93.5K IOPS
- LDPC ECC



**PS8313 UFS Card 1.0**

- UFS 2.1, 2ch, 4CE @667MT/s
- M-PHY 3.0, HS-Gear 3B x 1-Lane
- Capacity up to 256 GB (3D TLC NAND Flash)
- Seq. Read/Write up to 515/485 MB/s
- 4KB Ran. Read QD8 up to 48.5K IOPS
- Ran. Read/Write QD32 up to 67K/93.5K IOPS
- LDPC ECC



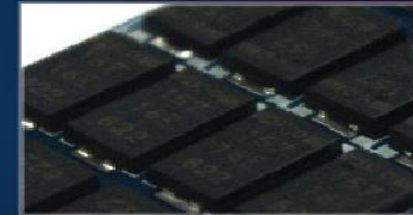
# Embedded Solutions

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## Edge Computing Sustained Storage Device

Controller	PS5012-E12DI	PS3112-S12DI
Interface	PCIe Gen3x4	SATA III
DRAM	DDR4	
NAND	3D TLC	
Capacity	256GB - 8TB	
Sustained Sequential Read/Write Performance	3200/1000 MB/s	530/500 MB/s
Sustained Random 4KB Read/Write Performance	400K/30K IOPS	90K/25K IOPS
Power Loss Protection	Optional: Power Loss Protection Design	
ECC	LDPC Gen3 / SmartECC™	
Security	AES / TCG Opal / Pyrite	AES / TCG Opal
Form Factor	U.2/ M.2 2280	2.5"/ M.2 2280/ M.2 2242



**Power Loss Protection (p-Fail)**



**Security Mechanism (AES/TCG Opal)**



**High Speed & Low Latency**





## Intelligent Factory

Excellent and Robust Boot Performance

Controller	PS3113-S13T	PS5013-E13T
Interface	SATA III	PCIe Gen3x4
DRAM	N/A	N/A (HMB Supported)
NAND	3D TLC	
Capacity	128GB-2TB	128GB - 2TB
ECC	LDPC Gen4+RAID ECC	LDPC Gen4 + RAID ECC
Security	AES/TCG Opal/ Pyrite (Optional)	
Form Factor	2.5"/ M.2 2280	M.2 2280 / M.2 2242 / M.2 2230 BGA SSD / CFX™



**Wide Temperature Range**



**LDPC Gen4 + RAID**



**3D TLC Supported**

# Embedded Solutions for Automotive

	eMMC	UFS	BGA SSD
Controller	PS8229	PS8317	PS5013-E13T
Package	153 balls	153 balls	324 balls
Dimension	11.5 x 13.0 mm	11.5 x 13.0 mm	11.5 x 13.0 mm
Interface	eMMC 5.1	UFS 3.0	PCIe Gen3x2
Capacity	8GB ~128GB	64GB ~ 512GB	128GB ~ 512GB
Sequential Read/Write(Up to)	310 / 200 MB/s	750 / 480 MB/s	1700 / 1100 MB/s
Certification	AEC-Q100 Grade 3	AEC-Q100 Grade 3	JEDEC 22
Schedule	CS: Ready (MP: July'19)	CS: Q1'2020	CS: Q1'2020



**Digital Cluster & Infotainment**



**ADAS**

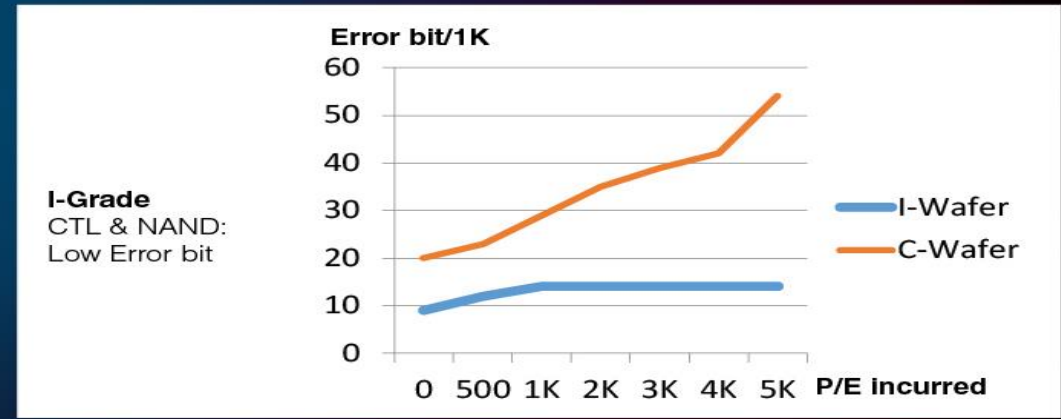


**AR Navigation**



# Industrial Grade 3D NAND Memory Card

High Reliability from Inside Out



Industrial Solutions	
<b>I-Grade FW</b> High Data Reliability	<b>Features</b> Data Check + A1/VSC
	<b>Controller</b> PS8131 PS8229 (ISO 26262)
	<b>Capacity</b> 32GB – 256GB (pSLC available)



**THANK YOU**

**Let's Enable More NAND Applications Together**

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