SMART®
Modular Technologies

DuraFlash
ME2
SATA
2.5" SSD

SMART®
Modular Technologies

DuraFlash
SP2800
PCIe NVMe
M.2 2280 SSD

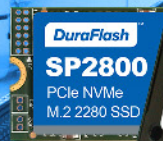**DuraFlash**
ME2
SATA
M.2 2242 SSD

SMART
Modular Technologies

Designed Solutions
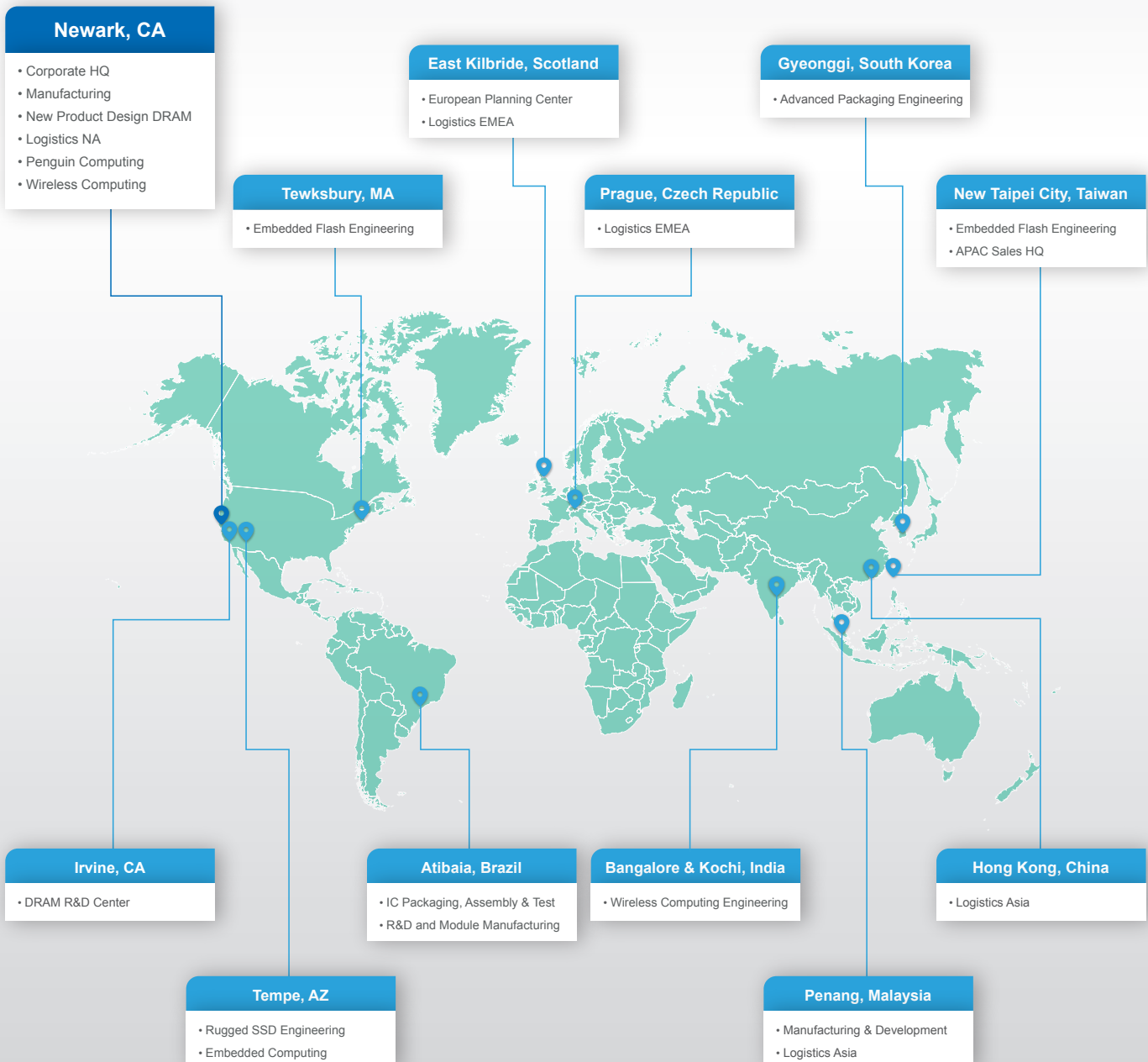# Driven by Innovation

DuraFlash™

Flash Storage Products

About SGH and SMART Modular Technologies

SGH (SMART Global Holdings, Inc.) is a NASDAQ listed holding company (NASDAQ:SGH). Over the past few years, the SGH business units have evolved and grown into as leading designers and manufacturers of electronics for Intelligent Computing, Specialty Memory, and LED Solutions. SGH's success is based on a customer-focused approach characterized by a commitment to raise the bar, execute with discipline and focus on what's next.

As an SGH company, SMART Modular is a global leader in specialty memory products including memory modules, solid-state storage products, and hybrid solutions. SMART has been serving the industry for over 30 years, providing standard, ruggedized and custom memory and storage solutions that meet the needs of diverse applications in high-growth markets.

SMART Modular delivers solutions to a broad customer base, including OEMs in computing, networking, communications, storage, mobile, military, aerospace and industrial markets. Focused on providing extensive customer-specific design capabilities, technical support and value-added testing services, SMART collaborates closely with their global OEM customers throughout the design process and across multiple projects to create solutions for demanding applications with differentiated requirements. For more information, visit SMART Modular's website at **www.smartm.com**

Newark, CA
- Corporate HQ
- Manufacturing
- New Product Design DRAM
- Logistics NA
- Penguin Computing
- Wireless Computing

East Kilbride, Scotland
- European Planning Center
- Logistics EMEA

Gyeonggi, South Korea
- Advanced Packaging Engineering

Tewksbury, MA
- Embedded Flash Engineering

Prague, Czech Republic
- Logistics EMEA

New Taipei City, Taiwan
- Embedded Flash Engineering
- APAC Sales HQ

Irvine, CA
- DRAM R&D Center

Atibaia, Brazil
- IC Packaging, Assembly & Test
- R&D and Module Manufacturing

Bangalore & Kochi, India
- Wireless Computing Engineering

Hong Kong, China
- Logistics Asia

Tempe, AZ
- Rugged SSD Engineering
- Embedded Computing

Penang, Malaysia
- Manufacturing & Development
- Logistics Asia

Application-Ready Solutions

SMART Modular Technologies has developed a comprehensive product line of DRAM and Flash memory technologies that span a variety of form factors to help customers take their innovative ideas from the design stage through manufacturing and the supply chain. SMART RUGGED offers high-performance, high-capacity solid state drives ("SSDs") for defense, aerospace and industrial automation markets. SMART Modular's presence in the U.S., Europe, Asia and Latin America enables us to provide our customers with proven expertise in supply chain management, international logistics and asset management worldwide.

Data Center
Secure storage memory requires data protection and encryption capabilities that are available in a range of speeds, densities, form factors and technologies. SMART Modular has a host of DuraFlash choices for data center applications.

Networking
Requiring small to standard form factors, networking applications have strict footprint and thermal specifications. DuraFlash removable and embedded solutions with low latency provide high performance and signal integrity for networking applications.

Industrial Internet of Things
Industrial applications need replacement storage solutions with extended life cycles. Key requirement features include reliability, security and performance. DuraFlash PCIe NVMe, embedded, and microSD removable solutions are just some of the industrial Flash options customers can choose from with SMART Modular.

Transportation
Memory applications for the transportation industry demand a flexible range of options, whether it's performing in harsh environments or for synchronized computing. SMART Modular's DuraFlash options can accommodate any vehicle telematics application whether it requires a standard or small form factor.
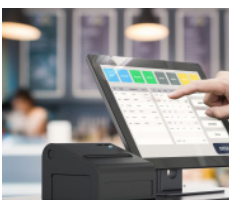
POS / Gaming
Gaming applications typically require memory with compact form factors, reduced voltage demands, high performance and high reliability. DuraFlash embedded and removable memory products provide a wide variety of solutions for POS and gaming applications.
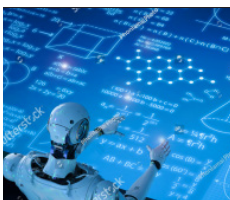
Artificial Intelligence / High-Performance Computing
Data intensive applications like AI and HPC generate and process large amounts of data, while requiring low latency and high performance. SMART Modular's DuraFlash embedded and removable drives are designed for compute intensive, high throughput and high capacity storage applications.

Military / Aerospace
Key memory needs for defense require rugged and durable designs with proven reliability in extreme conditions, e.g., shock, vibration, dust and humidity. DuraFlash M.2 SATA is an ideal option for demanding defense applications. Applications requiring higher levels of security and sanitization should consider the SMART RUGGED's line of 2.5" SSDs specifically designed for defense and aerospace.

DuraFlash™

Durable and Reliable Flash Solutions

With DuraFlash, SMART Modular is committed in offering a wide range of Flash storage form factors designed and manufactured to meet the heavy demands of accelerating embedded applications in the telecom, networking, storage, industrial control, medical, IIoT, transportation, and video surveillance market segments. SMART Modular's extensive capabilities and attention to detail integrate quality controls and stringent processes into all aspects of its design, procurement and manufacturing cycle. The process begins with the selection of specialized material and component suppliers that meet SMART Modular's strict requirements, to finished products, which are subjected to a rigorous design verification test (DVT) process requiring every unit to pass an extensive checklists of criteria, and final inspection for release.
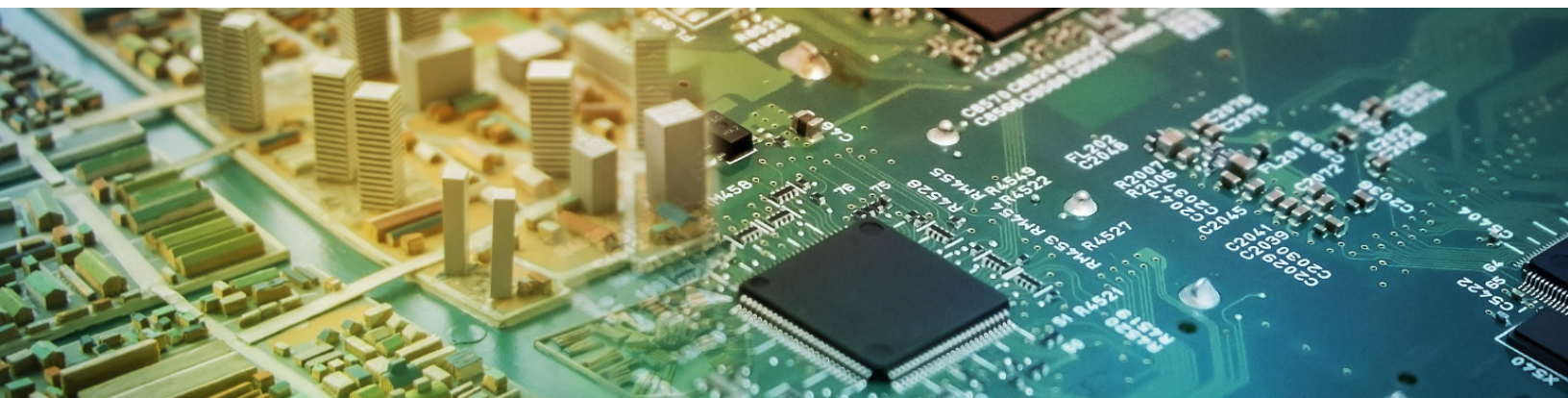
Value-Added Features:

- Optimized for Enterprise and Industrial Applications
- Available in C Temp (0°C to +70°C) and I Temp (-40°C to +85°C)
- Multiple NAND Options: TLC, eTLC, MLC, SLC, and pSLC

- Extensive Burn-In to Ensure Field Reliability
- Customized Options with Advanced Features Available
- SafeDATA™ Technology Safeguards In-Flight Data During Sudden Power Loss (SPL)
- Available in Broad Range of Capacities

DuraFlash Product Family

DuraFlash SSDs	DuraFlash BGA	DuraFlash Cards	DuraFlash USB	Enterprise/ Data Center SSDs
• 2.5"	• eMMC	• SD Cards	• eUSB	• EDSFF
• M.2		• microSD Cards	• USB Flash Drives	
• mSATA		• CF Cards		
• Slim SATA				

◖ DuraFlash

High Performance

- Offers high quality, performance and reliability expected in crucial industrial and enterprise applications

- Optimized for consistent performance during continuous duty cycles and heavy workload applications

- Boot drives and data storage for networking, storage server, data communications, transportation, video, and CCTV industries

ME2	(2.5" SATA / M.2 SATA / mSATA / Slim SATA)
R800	(2.5" SATA / M.2 2280 SATA)
S1800	(M.2 2280 PCIe NVMe / U.2 PCIe NVMe)
SP2800	(M.2 PCIe NVMe / U.2 PCIe NVMe)

Balanced Power and Performance

- Designed for general computing required reliability and durability in industrial applications

- N200 offers multiple form factors for various embedded applications

- RP1700 is compliant with NVMe 1.3 PCIe Gen3 x4 interface specifications to optimize the access performance

N200	(2.5" SATA / M.2 SATA / mSATA)
RP1700	(M.2 PCIe NVMe)

Enterprise/Data Center

- Lower latency
- Hot swap
- Lower power consumption and higher endurance
- Built for sustained performance
- Enterprise/data center workloads
- 24/7 consistent input/output operations
- Built-in power-loss protection

MDC7000	(EDSFF PCIe NVMe)

SMART
Modular Technologies

DuraFlash™
ME2
SATA
2.5" SSD

DuraFlash™
ME2
SATA
Slim SATA SSD

DuraFlash™
ME2
SATA
mSATA SSD

DuraFlash™
ME2
SATA
M.2 2280 SSD

DuraFlash™
ME2
SATA
M.2 2242 SSD

SMART®
Modular Technologies

SSD Product Family with Proprietary NVMSentry™ Firmware

ME2 SATA SSD Lineup

2.5" SATA   M.2 2242 & M.2 2280 SATA   Slim SATA (MO-297)   mSATA (MO-300A)

A Full Range of Form Factor Options

Endurance Up To 1 DWPD for Five Years

The Latest Generation 3D NAND Technology

Incorporate SMART's Proprietary NVMSentry™ Firmware to Provide High Flexibility for Customization

SMART's Proprietary SafeDATA™ Advanced Power Loss Data Protection Technology Available

For more information, please visit: **www.smartm.com**

2.5" SATA

DuraFlash 2.5" SATA solid state drives bring the advantages of non-volatile memory to embedded computing applications. The 2.5" SATA products are offered in Triple-Level Cell (TLC) 3D NAND and provide excellent sustained read/write performance in both commercial and industrial temperature ranges.

Specifications		ME2	N200	R800
Interface		SATA III 6Gb/s		
Form Factor		2.5"		
Max. Performance	Read	540MB/s	550MB/s	550MB/s
	Write	450MB/s	500MB/s	530MB/s
Capacity		240GB-1920GB	128GB-1TB	480GB-7680GB
DRAM		V	-	V
Input Voltage		5V ± 10%		
Data Integrity	SafeDATA	Optional	-	Optional
	Advanced Error Detection & Correction	V	V	V
Security	AES 256 Encryption	V	-	V
	TCG OPAL 2.0	V	-	V
	Security Erase (ATA)	V	V	V
Reliability	MTBF	> 2,000,000 hours		> 1,500,000 hours
	Shock Operating	1500 g half-sine, 0.5 msec, 1 shock along each axis, X, Y, Z in each direction		
	Vibration Operating	20G 80-2000Hz, 1.52mm 20-80Hz, 3 axis		
	Operating Temperature*	C/I Temp	C Temp	C/I Temp
Durability	DWPD (for 5 Years)	1 (Enterprise Workload)	0.4 (Client Workload)	0.3 (Enterprise Workload)
	Pseudo-SLC	-	-	-
	Thermal Throttling	V	V	V
	Wear-Leveling / Garbage Collection / TRIM	V	V	V

Recommended/Suggested Applications

• NAS / SAN storage systems

• x86 server-storage appliances

• Distributed scale-out cloud servers

• Telecom and networking routers and switches

*C Temp (0˚C to +70˚C) ; E Temp (-25˚C to +85˚C) ; I Temp (-40˚C to +85˚C)

◼ M.2 2242 SATA

DuraFlash M.2 SATA embedded SSDs are designed for applications requiring reliable internal storage, yet constrained by small footprints. DuraFlash M.2 drives offer best-in-class sequential and random read/write performance in transaction intensive applications. M.2 SATA can be easily integrated into a host system without any special BIOS modifications or additional device drivers.

Specifications		ME2	N200
Interface		SATA III 6Gb/s	
Form Factor		M.2 2242-D3-B-M	M.2 2242-D5-B-M
Max. Performance	Read	540MB/s	550MB/s
	Write	450MB/s	500MB/s
Capacity		240GB-960GB	128GB-512GB
DRAM		V	-
Input Voltage		3.3V ± 5%	
Data Integrity	SafeDATA	-	-
	Advanced Error Detection & Correction	V	V
Security	AES 256 Encryption	V	-
	TCG OPAL 2.0	V	-
	Security Erase (ATA)	V	V
Reliability	MTBF	> 2,000,000 hours	
	Shock Operating	1500 g half-sine, 0.5 msec, 1 shock along each axis, X, Y, Z in each direction	
	Vibration Operating	20G 80-2000Hz, 1.52mm 20-80Hz, 3 axis	
	Operating Temperature*	C/I Temp	C Temp
Durability	DWPD (for 5 Years)	1 (Enterprise Workload)	0.4 (Client Workload)
	Pseudo-SLC	-	-
	Thermal Throttling	V	V
	Wear-Leveling / Garbage Collection / TRIM	V	V

Recommended/Suggested Applications

• Personal PC   • Communications   • Embedded computing   • POS   • Industrial

*C Temp (0°C to +70°C) ; E Temp (-25°C to +85°C) ; I Temp (-40°C to +85°C)

M.2 2280 SATA

DuraFlash M.2 SATA embedded SSDs are designed for applications requiring reliable internal storage, yet constrained by small footprints. DuraFlash M.2 drives offer best-in-class sequential and random read/write performance in transaction intensive applications. M.2 SATA can be easily integrated into a host system without any special BIOS modifications or additional device drivers. SafeDATA Technology safeguards data against corruption during power loss.

Specifications		ME2	N200	R800
Interface		SATA III 6Gb/s		
Form Factor		M.2 2280-D3-B-M	M.2 2280-S3-B-M	M.2 2280-D2-B-M
Max. Performance	Read	540MB/s	550MB/s	550MB/s
	Write	450MB/s	500MB/s	530MB/s
Capacity		240GB-1920GB	128GB-1TB	480GB-1920GB
DRAM		V	-	V
Input Voltage		3.3V ± 5%		
Data Integrity	SafeDATA	Optional	-	Optional
	Advanced Error Detection & Correction	V	V	V
Security	AES 256 Encryption	V	-	V
	TCG OPAL 2.0	V	-	V
	Security Erase (ATA)	V	V	V
Reliability	MTBF	> 2,000,000 hours		> 1,500,000 hours
	Shock Operating	1500 g half-sine, 0.5 msec, 1 shock along each axis, X, Y, Z in each direction		
	Vibration Operating	20G 80-2000Hz, 1.52mm 20-80Hz, 3 axis		
	Operating Temperature*	C/I Temp	C Temp	C/I Temp
Durability	DWPD (for 5 Years)	1 (Enterprise Workload)	0.4 (Client Workload)	0.3 (Enterprise Workload)
	Pseudo-SLC	-	-	-
	Thermal Throttling	V	V	V
	Wear-Leveling / Garbage Collection / TRIM	V	V	V

Recommended/Suggested Applications

• Personal PC   • Communications   • Embedded computing   • POS   • Industrial

*C Temp (0˚C to +70˚C) ; E Temp (-25˚C to +85˚C) ; I Temp (-40˚C to +85˚C)

mSATA

DuraFlash mSATA solid state drives provide economic yet highly reliable mass storage, which are ideally suited for use in a wide variety of OEM storage applications requiring multiple supply chains, design, interoperability, rapid time to market and long product life cycles. The mSATA embedded drives are fully MO-300 compliant.

Specifications		ME2	N200
Interface		SATA III 6Gb/s	
Form Factor		mSATA (MO-300A)	
Max. Performance	Read	540MB/s	550MB/s
	Write	450MB/s	500MB/s
Capacity		240GB-1920GB	64GB-1TB
DRAM		V	-
Input Voltage		3.3V ± 5%	
Data Integrity	SafeDATA	-	-
	Advanced Error Detection & Correction	V	V
Security	AES 256 Encryption	V	-
	TCG OPAL 2.0	V	-
	Security Erase (ATA)	V	V
Reliability	MTBF	> 2,000,000 hours	
	Shock Operating	1500 g half-sine, 0.5 msec, 1 shock along each axis, X, Y, Z in each direction	
	Vibration Operating	20G 80-2000Hz, 1.52mm 20-80Hz, 3 axis	
	Operating Temperature*	C/I Temp	C Temp
Durability	DWPD (for 5 Years)	1 (Enterprise Workload)	0.4 (Client Workload)
	Pseudo-SLC	-	-
	Thermal Throttling	V	V
	Wear-Leveling / Garbage Collection / TRIM	V	V

Recommended/Suggested Applications

• NAS / SAN storage systems
• x86 server-storage appliances
• Distributed scale-out cloud servers

*C Temp (0˚C to +70˚C) ; E Temp (-25˚C to +85˚C) ; I Temp (-40˚C to +85˚C)

Slim SATA

DuraFlash Slim SATA solid state drives provide economic yet highly reliable mass storage, which are ideally suited for use in a wide variety of OEM storage applications requiring multiple supply chains, design, interoperability, rapid time to market and long product life cycles. The Slim SATA embedded drives are fully MO-297 compliant.
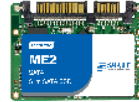
Specifications		ME2
Interface		SATA III 6Gb/s
Form Factor		Slim SATA (MO-297)
Max. Performance	Read	540MB/s
	Write	450MB/s
Capacity		240GB-1920GB
DRAM		V
Input Voltage		3.3V ± 5%
Data Integrity	SafeDATA	-
	Advanced Error Detection & Correction	V
Security	AES 256 Encryption	V
	TCG OPAL 2.0	V
	Security Erase (ATA)	V
Reliability	MTBF	> 2,000,000 hours
	Shock Operating	1500G half-sine, 0.5 msec, 1 shock along each axis, X, Y, Z in each direction
	Vibration Operating	20G 80-2000Hz, 1.52mm 20-80Hz, 3 axis
	Operating Temperature*	C/I Temp
Durability	DWPD (for 5 Years)	1 (Enterprise Workload)
	Pseudo-SLC	-
	Thermal Throttling	V
	Wear-Leveling / Garbage Collection / TRIM	V

Recommended/Suggested Applications

• NAS / SAN storage systems

• x86 server-storage appliances

• Distributed scale-out cloud servers

*C Temp (0˚C to +70˚C) ; E Temp (-25˚C to +85˚C) ; I Temp (-40˚C to +85˚C)

M.2 PCIe NVMe

DuraFlash M.2 PCIe NVMe modules are specifically applicable for server, storage cache/ accelerators, and data communications applications requiring reliable internal storage with a small footprint. Utilizing a PCIe Base 3.1 interface, M.2 PCIe NVMe modules are easily integrated into a host system without any special BIOS modifications or additional device drivers.

Specifications		RP1700	RP1700	S1800	SP2800
Interface		PCIe Gen3 x4			
Form Factor		M.2 2280-S2-M	M.2 2242-D2-M	M.2 2280-D2-M	M.2 2280-D3-M M.2 22110-D3-M
Max. Performance	Read	2450MB/s	2280MB/s	3200MB/s	3300MB/s
	Write	1850MB/s	1050MB/s	1000MB/s	2600MB/s
Capacity		256GB-2TB	128GB-256GB	480GB-1920GB	240GB-1920GB
DRAM		-	-	V	V
Input Voltage		3.3V± 5%			
Data Integrity	SafeDATA	-	-	-	Optional
	Advanced Error Detection & Correction	V	V	V	V
Security	AES 256 Encryption	V	V	V	V
	TCG OPAL 2.0	V	V	V	V
	Security Erase (ATA)	V	V	V	V
Reliability	MTBF	> 1,500,000 hours			> 2,000,000 hours
	Shock Operating	1500 g half-sine, 0.5 msec, 1 shock along each axis, X, Y, Z in each direction			
	Vibration Operating	20G 80-2000Hz, 1.52mm 20-80Hz, 3 axis			
	Operating Temperature*	C Temp	C Temp	C Temp	C/I Temp
Durability	DWPD (for 5 Years)	0.4 (Client Workload)	0.4 (Client Workload)	0.3 (Enterprise Workload)	0.3/1** (Enterprise Workload)
	Pseudo-SLC	-	-	-	-
	Thermal Throttling	V	V	V	V
	Wear-Leveling / Garbage Collection / TRIM	V	V	V	V

Recommended/Suggested Applications

• Industrial

• Networking

• Data communications

*C Temp (0˚C to +70˚C) ; E Temp (-25˚C to +85˚C) ; I Temp (-40˚C to +85˚C)   **Endurance varies by Flash solutions

U.2 PCIe NVMe

DuraFlash U.2 PCIe NVMe modules are specifically applicable for server, storage cache/accelerators, and data communications applications requiring reliable internal storage with a small footprint. Utilizing a PCIe Base 3.1 interface, U.2 PCIe NVMe modules are easily integrated into a host system without any special BIOS modifications or additional device drivers.

Specifications		S1800	SP2800
Interface		PCIe Gen3 x4	
Form Factor		U.2	
Max. Performance	Read	3200MB/s	3300MB/s
	Write	1000MB/s	2600MB/s
Capacity		480GB-7680GB	240GB-1920GB
DRAM		V	V
Input Voltage		12V ± 10%	
Data Integrity	SafeDATA	-	Optional
	Advanced Error Detection & Correction	V	V
Security	AES 256 Encryption	V	V
	TCG OPAL 2.0	V	V
	Security Erase (ATA)	V	V
Reliability	MTBF	> 1,500,000 hours	> 2,000,000 hours
	Shock Operating	1500 g half-sine, 0.5 msec, 1 shock along each axis, X, Y, Z in each direction	
	Vibration Operating	20G 80-2000Hz, 1.52mm 20-80Hz, 3 axis	
	Operating Temperature*	C Temp	C/I Temp
Durability	DWPD (for 5 Years)	0.3 (Enterprise Workload)	0.3/1** (Enterprise Workload)
	Pseudo-SLC	-	-
	Thermal Throttling	V	V
	Wear-Leveling / Garbage Collection / TRIM	V	V

Recommended/Suggested Applications

• Industrial

• Networking

• Data communications

*C Temp (0˚C to +70˚C) ; E Temp (-25˚C to +85˚C) ; I Temp (-40˚C to +85˚C)   **Endurance varies by Flash solutions

EDSFF PCIe NVMe
(Enterprise and Data Center SSDs)

SMART Modular's Enterprise and Data Center SSDs are an ideal solution for capturing, storing and analyzing very large amounts of data. The high performance, latest form factors and 12V operation are specifically optimized for scale-out main storage in servers. They fit vertically in 1U servers to provide improved cooling and maximum system capacity.

Specifications		MDC7000
Interface		PCIe Gen3 x4
Form Factor		EDSFF E1.S
Max. Performance	Read	3000MB/s
	Write	1350MB/s
Capacity		960GB-7680GB 800GB-6400GB
DRAM		V
Input Voltage		12V ± 10%
Data Integrity	SafeDATA	V
	Advanced Error Detection & Correction	V
Security	AES 256 Encryption	V
	TCG OPAL 2.0	V
	Security Erase (ATA)	V
Reliability	MTBF	> 2,000,000 hours
	Shock Operating	1500 g half-sine, 0.5 msec, 1 shock along each axis, X, Y, Z in each direction
	Vibration Operating	20G 80-2000Hz, 1.52mm 20-80Hz, 3 axis
	Operating Temperature*	C Temp
Durability	DWPD (for 5 Years)	1/3** (Enterprise Workload)
	Pseudo-SLC	Optional
	Thermal Throttling	V
	Wear-Leveling / Garbage Collection / TRIM	V

Recommended/Suggested Applications

• Data center
• Networking

• Data communications
• AI analytics

• Cloud computing

*C Temp (0˚C to +70˚C) ; E Temp (-25˚C to +85˚C) ; I Temp (-40˚C to +85˚C)   **Endurance varies by Flash solutions

BGA eMMC 5.1

DuraFlash BGA eMMC 5.1 is designed to meet the rigid requirements of the industrial, medical and networking markets where technical support, extended life, and stable road maps are critical. eMMC is a soldered down Flash storage solution that combines NAND Flash memory, an embedded MMC (MultiMediaCard) controller, and advanced firmware in a small BGA (Ball Grid Array) package that provides stable, yet cost-effective high-density embedded storage.

Specifications		BGAE340	BGAE540
Interface		eMMC v5.1 (HS400)	
Form Factor		BGA	
Max. Performance	Read	170MB/s	320MB/s
	Write	10MB/s	TLC: 45MB/s pSLC: 215MB/s
Capacity		4GB	16GB-128GB
Input Voltage		1.8V± 10%	
Ball Counts		153	100/153
Operating Temperature*		I Temp	I Temp

Recommended/Suggested Applications

- Factory automation
- Networking appliances
- Medical devices
- POS terminals
- RFID scanners
- Single-board computers
- Telecom infrastructure
- IIoT

CF Cards

DuraFlash industrial and commercial temperature CF cards are designed for networking, telecommunications and data communications applications. DuraFlash CF products are also a natural fit for mobile and embedded computing, medical, automotive and industrial applications.
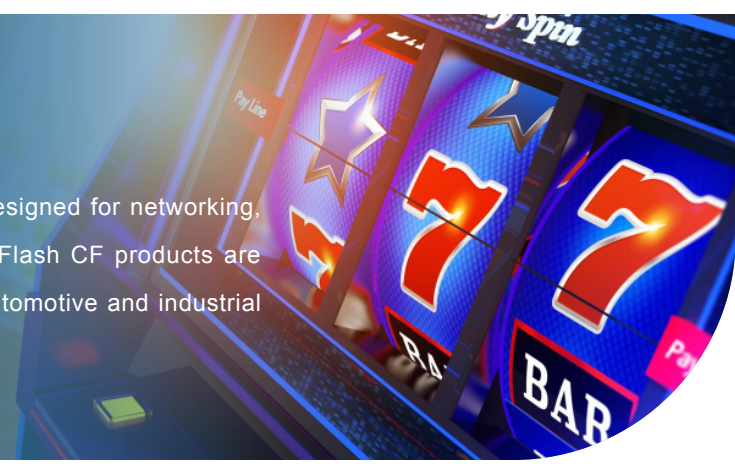
Specifications		H9	XL
Interface		CF 6.1	CF 4.1
From Factor		CompactFlash	
NAND Type		SLC	
Max. Performance	Read	100MB/s	30MB/s
	Write	70MB/s	12MB/s
Capacity		64MB-64GB	128MB-8GB
Operating Temperature*		C/I Temp	C/I Temp

Recommended/Suggested Applications

- Gaming
- Communications
- Defense
- Industrial control equipment
- Networking
- Printers

*C Temp (0˚C to +70˚C) ; E Temp (-25˚C to +85˚C) ; I Temp (-40˚C to +85˚C)

Memory Cards

DuraFlash SD and microSD memory cards are robust and reliable solutions for solid state storage needs. By incorporating on-board error detection and correction algorithms, and static and dynamic wear-leveling techniques, DuraFlash memory card products ensure years of reliable operation over its product lifespan. SD cards are offered in commercial and industrial temperature versions, and specifically designed to meet strict industrial operating and environmental requirements.

SD Cards

Specifications		XL+	RD230
Interface		SD 3.01	SD 6.1
Form Factor		SD Card	
NAND Type		SLC	TLC
Max. Performance	Read	49MB/s	95MB/s
	Write	38MB/s	55MB/s
Capacity		4GB-32GB	32GB-256GB
Operating Temperature*		C/I Temp	I Temp

Recommended/Suggested Applications

• Automotive telematics, navigation, and infotainment

• Digital commercial camcorders

• Telecom and communications

• Embedded computing

• Medical equipment

microSD Cards

| Specifications		RD130m	RD230m	RD530m
Interface		SD 3.01	SD 6.1	SD 6.1
Form Factor		microSD Card		
NAND Type		SLC	TLC	TLC
Max. Performance	Read	68MB/s	95MB/s	100MB/s
	Write	50MB/s	55MB/s	90MB/s
Capacity		1GB-4GB	32GB-256GB	64GB-256GB
Operating Temperature*		E/I temp	I Temp	C Temp

Recommended/Suggested Applications

• Automotive telematics, navigation, and infotainment

• Telecom and communications

• Embedded computing

• Digital commercial camcorders

• Industrial meters and industrial control

• Medical equipment

• Gaming

*C Temp (0˚C to +70˚C) ; E Temp (-25˚C to +85˚C) ; I Temp (-40˚C to +85˚C)

eUSB Flash Drives

DuraFlash industrial-grade embedded USB (eUSB) Flash Drives feature a small form factor, low power consumption, and fast access times. Applications include single-board computing for defense, telecom, networking, ATCA compute blades, general networking, and standard server applications.

Specifications		RU150e	HU250e
Interface		USB 2.0	USB 3.0
NAND Type		SLC	
Max. Performance	Read	35MB/s	150MB/s
	Write	27MB/s	90MB/s
Capacity		1GB-32GB	8GB-32GB
Operating Temperature*		C/I Temp	I Temp
Connector		Pin pitch 2.54mm, H: 7.50mm Pin pitch 2.54mm, H: 9.78mm Pin pitch 2.00mm, H: 3.68mm	Pin pitch 2.00mm, H: 3.68mm Pin pitch 2.54mm, H: 7.42mm
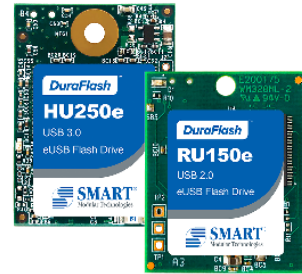
Recommended/Suggested Applications

• Single-board computers for defense, gaming and industrial control applications

• ATCA compute blades

• Industry standard servers

USB Flash Drives

USB Flash Drives address the need for enhanced reliability with the industry's best-in-class read and write speeds, providing reliable operation over the product life cycle. DuraFlash USB Flash Drives offer both USB 2.0 and USB 3.0 high speed bus protocols, and are designed as the main boot and storage devices in embedded systems.

Specifications		RU150	RU350
Interface		USB 2.0	USB 3.0
NAND Type		SLC	TLC
Max. Performance	Read	34MB/s	270MB/s
	Write	27MB/s	65MB/s
Capacity		1GB-16GB	16GB-256GB
Operating Temperature*		C Temp	I Temp
Connector		Type A	Type A

Recommended/Suggested Applications

• Single-board computers for defense, gaming and industrial control applications

• Telecom and networking routers and switches

• ATCA compute blades

• Networking

• Industry standard servers

*C Temp (0˚C to +70˚C) ; E Temp (-25˚C to +85˚C) ; I Temp (-40˚C to +85˚C)
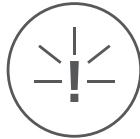
SMART RUGGED

WHEN FAILURE IS NOT AN OPTION

SMART RUGGED pioneered secure, ruggedized solid-state drives and continues to be a technology leader, employing current and next-generation defense-focused designs with physical ruggedization, conformal coating, HW-based erase triggers on each end of the drives, and more. Utilizing Flash technology backed with proven world-class support, SMART RUGGED designs and manufactures high performance military and industrial SSDs with military standard encryption, secure data elimination and write-protect features.

Standard

Security

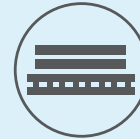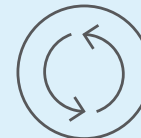Shock & Vibration

Conformal Coat

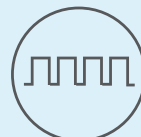Humidity Condensation

Altitude

Industrial Temperature

Optional

Specific Shock & Vibration

Underfill & Staking

Leaded Process

Custom FW
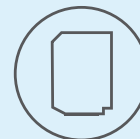
Custom HW

Extreme Temperature Screening
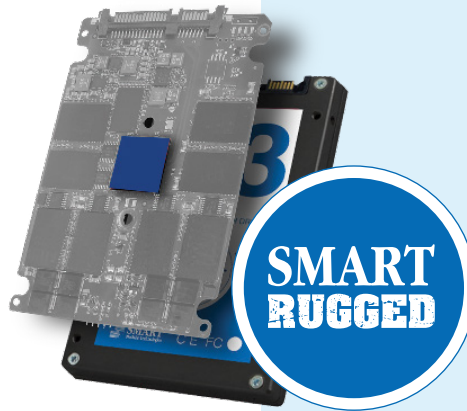
SMART RUGGED

SMART RUGGED SSD LINE-UP

	T5EN		T5E		S5E	T5PF	T5PFLC		M4 & M4P	M1HC
Interface	PCIe		SATA		SATA	SATA	SATA		SATA	SATA
From Factor	U.2	M.2 2280	2.5"	M.2 2280	2.5"	2.5"	2.5"	M.2 2280	2.5"	2.5"
NAND Flash Type	3D TLC		3D TLC		SLC	3D TLC	3D TLC		MLC	MLC
Capacity — 3D TLC	480GB-7,680GB	480GB-3,840GB	120GB-3,840GB	120GB-1,920GB	60GB-480GB	480GB-3,840GB	120GB-1,920GB	240GB-960GB	240GB-1,920GB	1TB-8TB
Capacity — pSLC	160GB-2,560GB	160GB-1,280GB	40GB-1,280GB	40GB-640GB	-	-	-	-	-	-
Sustained Read/Write Performance	3,200MB/s Read, 1,600MB/s Write		520MB/s Read, 500MB/s Write		530MB/s Read, 490MB/s Write	500MB/s Read, 470MB/s Write	500MB/s Read, 470MB/s Write		500MB/s Read (M4), 260MB/s Write (M4) 525MB/s Read (M4P), 500MB/s Write (M4P)	520MB/s Read 500MB/s Write
Reliability										
MTBF	2M Hours, Telcordia 25°C		2M Hours, Telcordia 25°C		2M Hours, Telcordia 25°C	2M Hours, Telcordia 25°C[1]	2M Hours, Telcordia 25°C[1]		3M Hours (M4) >2M Hours (M4P)	1.5M Hours
Data Reliability	1 in 10^{17} bits read		1 in 10^{17} bits read		1 in 10^{17} bits read	1 in 10^{17} bits read	1 in 10^{17} bits read		Up to 66 bits in 1K bytes (M4) Up to 120 bits in 2K bytes (M4P)	1 in 10^{15} bits read
Data Retention	10 years @ 25°C		10 years @ 25°C		10 years @ 25°C	10 years @ 25°C	10 years @ 25°C		1 year at 55°C (M4) 10 years at 40°C (M4P)	1 year @ 30°C
Endurance — 3D TLC	1,000 TDW		1,000 TDW		30,000 TDW	2,100 TDW	2,100 TDW		1,200 TDW (M4) 2,100 TDW (M4P)	250 TDW
Endurance — pSLC	10,000 TDW		10,000 TDW		-	-	-		-	-
Power Loss Protection	pFail	No pFail	pFail	No pFail	pFail	pFail	pFail		pFail	Fast Flush of Cached Data
Warranty	1 Year		1 Year		1 Year	1 Year	1 Year		1 Year	1 Year
Environmental										
Operating Temperature[5]	I-Temp		I-Temp		I-Temp	C/I-Temp	C/I-Temp		I-Temp	I-Temp
Storage Temperature	-45°C to +95°C		-55°C to +90°C		-55°C to +95°C	-55°C to +95°C	-55°C to +95°C		-55°C to +95°C	-55°C to +95°C
Operating Shock	50g half-sine, 11 ms, 3 shocks along each axis[3]		50g half-sine, 11 ms, 3 shocks along each axis[3]		50g half-sine, 11 ms, 3 shocks along each axis	50g half-sine, 11 ms, 3 shocks along each axis[3]	50g half-sine, 11 ms, 3 shocks along each axis[3]		50g half-sine, 11 ms, 3 shocks along each axis	1000g half-sine, 0.5 ms
Operating Vibration	10g rms, 10-2000Hz[3]		16.4g rms, 10-2,000 Hz	10g rms, 10-2000Hz[3]	16.4g rms, 10-2,000 Hz	16.4g rms, 10-2,000 Hz[3]	16.4g rms, 10-2,000 Hz[3]		16.4g rms, 10-2,000 Hz	16.4g rms, 10-2,000 Hz
Relative Humidity	5% - 95% non-condensing[3]		5%-95% non-condensing		5%-95% non-condensing	5%-95% non-condensing[3]	5%-95% non-condensing[3]		5%-95% non-condensing	5%-95% non-condensing
Altitude	24,384 m (80,000 ft)[3]		24,384m (80,000 ft)		24,384 m (80,000 ft)	24,384 m (80,000 ft)	24,384 m (80,000 ft)		24,384 m (80,000 ft)	24,384 m (80,000 ft)
Conformal Coating	Optional		Optional		Optional	Optional	Optional		Optional	Optional
Security (Protection & Data Elimination)										
ATA Password	-	-	V	V	V	V	V	V	V	V
AES 256-bit	V	V	V	V	V	V	V	V	V	V
Write Protect	V	V	V	Optional	V	V	-	-	V	V
External HW Trigger	V	V	V	-	V	V	-	-	V	V
Erase Key and Flash	V	V	V	-	V	V	-	-	V	V
TCG Opal 2.0	V	V	V	V	V	V	V	V	-	-
FIPS 140-2	-	-	-	-	-	V[4]	V[4]	V[4]	-	-
MIL Erase Sequences										
NSA-9-12	V	V	V	-	V	-	-	-	V	V
DoD NISPOM 5220.22-M	V	V	V	-	V	V	-	-	V	V
DoD NISPOM 5220.22-M-Sup 1	V	V	V	-	V	V	-	-	-	V
NSA/CSS Manual 130-2	V	V	V	-	V	V	-	-	V	V
NSA/CSS Manual 9-12	V	V	V	-	V	V	-	-	V	V
Army AR 380-19	V	V	V	-	-	V	-	-	V	V
Navy NAVSO P-5239-26	V	V	V	-	V	V	-	-	V	V
Air Force AFSSI-5020	V	V	V	-	V	V	-	-	V	V
RCC –TG IRIG 106-07	V	V	V	-	V	-	-	-	-	-

1 Estimated. Official MTBF pending
2 Based on 128 KByte block transfers and continuous, sequential writes to the drive. The number does not include file system overhead, which may vary depending on the file system. The total life span of the drive depends on both the write endurance numbers and MTBF. TDW → Total Drive Writes = (Terabytes Written) *1000 / (Drive Capacity GB)
3 Testing Pending
4 FIPS 140-2 Inside
5 C-Temp (0°C to +70°C); I-Temp (-40°C to +85°C)

A Global Leader in Specialty Memory, Storage and Hybrid Solutions

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