



Designed Solutions
Driven by Innovation

DuraFlash[™]

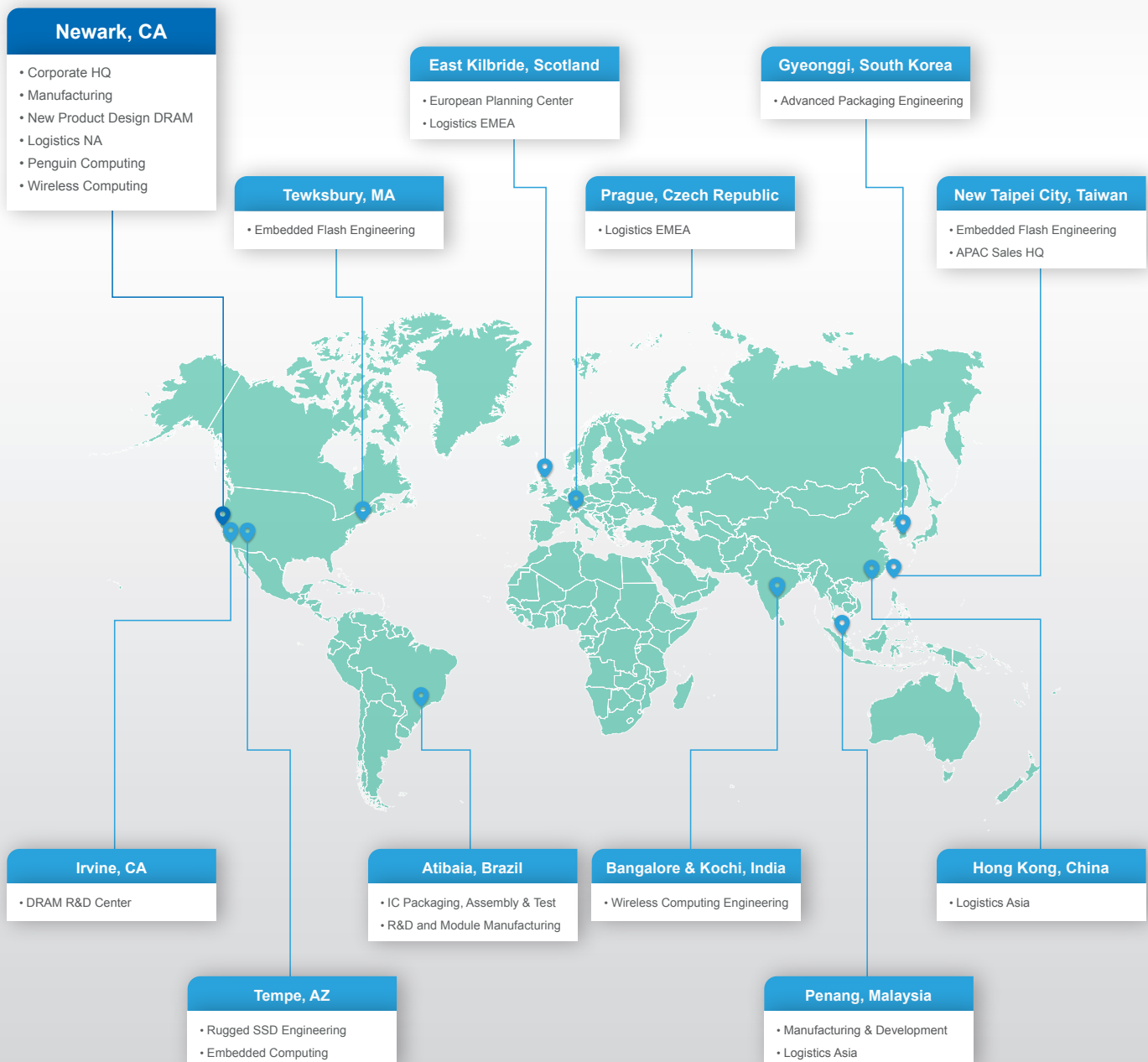
Flash Storage Products

About SMART Global Holdings

The SMART family of companies are global leaders in technology solutions serving the electronics industry for more than 25 years. Focused on providing extensive customer-specific design capabilities, technical support and value-added testing services, the SMART companies collaborate closely with global OEM customers throughout the design process and across projects to create solutions with differentiated requirements for demanding applications. The SMART companies lead the way in providing standard and custom products to today's leading global OEMs crossing all major electronic industries.

The genesis of SMART Global Holdings began with SMART Modular Technologies, a global leader in specialty memory solutions. For almost three decades, SMART Modular has delivered solutions to a broad and diverse customer base comprised of OEMs that compete in the computing, networking, communications, storage, mobile and industrial markets.

With Penguin Computing, SMART Embedded, SMART Wireless, and SMART Supply Chain Services, SMART Global Holdings also serves the HPC, ruggedized embedded, telecom and global supply chain logistics and freight forwarding markets. For more information, visit SMART Global Holdings' website at www.smartm.com



■ 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.



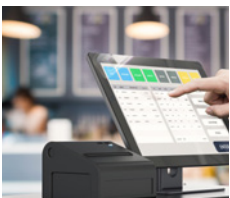
Industrial Internet of Things

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.

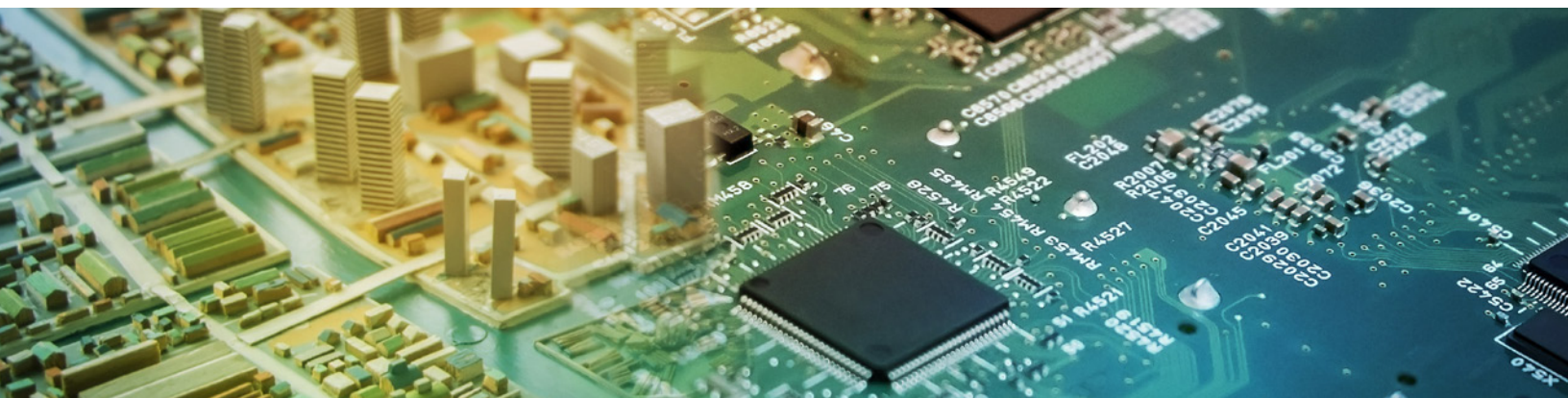


Military / Aerospace

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.

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
- SafeDATATM Technology Safeguards In-Flight Data During Sudden Power Loss (SPL)
- Available in Broad Range of Capacities

DuraFlash Product Family



DuraFlash SSDs

- 2.5"
- M.2
- mSATA
- Slim SATA
- SATA DOM



DuraFlash BGA

- eMMC



DuraFlash Cards

- SD Cards
- microSD Cards
- CF Cards
- CFAST Cards



DuraFlash USB

- eUSB
- USB Flash Drives



Enterprise/ Data Center SSDs

- EDSFF
- U.2

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
- M1400 is compliant with NVMe 1.3 PCIe Gen3 x2 interface specifications to optimize the access performance

N200

(2.5" SATA / M.2 SATA / mSATA / Slim SATA / CFast)

M1400

(M.2 2280 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 / U.2 PCIe NVMe)





First 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

For Networking, Data Communication and
Industrial Embedded Markets

Support C-Temp (0°C to +70°C)
and I-Temp (-40°C to +85°C)

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

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

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	N200v	R800v
Interface		SATA III 6Gb/s		
Form Factor		2.5"		
Max. Performance	Read	560MB/s	550MB/s	550MB/s
	Write	520MB/s	500MB/s	530MB/s
Capacity		240GB-1920GB	32GB-1TB	240GB-7680GB
DRAM		V	-	V
Input Voltage		5V \pm 10%		
Data Integrity	SafeDATA	Optional	-	Optional
	Advanced Error Detection & Correction	V	V	V
	AES 256 Encryption	V	-	V
Security	TCG OPAL 2.0	V	-	V
	Security Erase (ATA)	V	V	V
Reliability	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/I Temp	C/I Temp
Durability	DWPD (for 5 Years)	0.3/1** (Enterprise Workload)	0.4 (Client Workload)	0.3 (Enterprise Workload)
	Pseudo-SLC	-	Optional	-
	Thermal Throttling	V	V	V
	Wear-Leveling / Garbage Collection / TRIM	V	V	V

Recommended/Suggested Applications

- NAS / SAN storage systems
- Distributed scale-out cloud servers
- x86 server-storage appliances
- 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) **Endurance varies by Flash solutions

M.2 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	N200v	R800v
Interface		SATA III 6Gb/s		
Form Factor		M.2 2280		
Max. Performance	Read	560MB/s	550MB/s	550MB/s
	Write	500MB/s	500MB/s	530MB/s
Capacity		240GB-1920GB	32GB-1TB	240GB-1920GB
DRAM		V	-	V
Input Voltage		3.3V \pm 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	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/I Temp	C/I Temp
Durability	DWPD (for 5 Years)	0.3/1** (Enterprise Workload)	0.4 (Client Workload)	0.3 (Enterprise Workload)
	Pseudo-SLC	-	Optional	-
	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) **Endurance varies by Flash solutions

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	N200v
Interface		SATA III 6Gb/s	
Form Factor		mSATA	
Max. Performance	Read	560MB/s	550MB/s
	Write	520MB/s	500MB/s
Capacity		240GB-1920GB	32GB-1TB
DRAM		V	-
Input Voltage		3.3V \pm 5%	
Data Integrity	SafeDATA	Optional	-
	Advanced Error Detection & Correction	V	V
	AES 256 Encryption	V	-
Security	TCG OPAL 2.0	V	-
	Security Erase (ATA)	V	V
Reliability	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/I Temp
Durability	DWPD (for 5 Years)	0.3 (Enterprise Workload)	0.4 (Client Workload)
	Pseudo-SLC	-	Optional
	Thermal Throttling	V	V
	Wear-Leveling / Garbage Collection / TRIM	V	V

Recommended/Suggested Applications

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

*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	N200v
Interface		SATA III 6Gb/s	
Form Factor		Slim SATA	
Max. Performance	Read	560MB/s	550MB/s
	Write	520MB/s	490MB/s
Capacity		240GB-1920GB	32GB-256GB
DRAM		V	V
Input Voltage		5V \pm 10%	5V \pm 5%
Data Integrity	SafeDATA	Optional	Optional
	Advanced Error Detection & Correction	V	V
	AES 256 Encryption	V	V
Security	TCG OPAL 2.0	V	V
	Security Erase (ATA)	V	V
Reliability	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/I Temp
Durability	DWPD (for 5 Years)	0.3 (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
- Distributed scale-out cloud servers
- x86 server-storage appliances

*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		M1400	S1800	SP2800
Interface		PCIe Gen3 x2	PCIe Gen3 x4	PCIe Gen3 x4
Form Factor		M.2 2280	M.2 2280	M.2 22110 M.2 2280
Max. Performance	Read	1600MB/s	3200MB/s	3300MB/s
	Write	1000MB/s	1000MB/s	2600MB/s
Capacity		120GB-960GB	240GB-1920GB	240GB-1920GB
DRAM		V	V	V
Input Voltage			3.3V ± 5%	
Data Integrity	SafeDATA	-	Optional	Optional
	Advanced Error Detection & Correction	V	V	V
	AES 256 Encryption	-	V	V
Security	TCG OPAL 2.0	-	V	V
	Security Erase (ATA)	V	V	V
Reliability	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/I Temp	C/I Temp
Durability	DWPD (for 5 Years)	0.5 (Client Workload)	0.3 (Enterprise Workload)	0.3/1** (Enterprise Workload)
	Pseudo-SLC	-	-	-
	Thermal Throttling	V	V	V
	Wear-Leveling / Garbage Collection / TRIM	V	V	V

Recommended/Suggested Applications

- Industrial
- Networking
- Data communications

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		240GB-3840GB	240GB-1920GB
DRAM		V	V
Input Voltage		12V ± 10%	
Data Integrity	SafeDATA	Optional	Optional
	Advanced Error Detection & Correction	V	V
	AES 256 Encryption	V	V
Security	TCG OPAL 2.0	V	V
	Security Erase (ATA)	V	V
Reliability	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/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

■ EDSFF / U.2 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 U.2
Max. Performance	Read	3000MB/s
	Write	1350MB/s
Capacity		800GB-7680GB
DRAM		V
Input Voltage		12V ± 10%
Data Integrity	SafeDATA	V
	Advanced Error Detection & Correction	V
	AES 256 Encryption	V
Security	TCG OPAL 2.0	V
	Security Erase (ATA)	V
Reliability	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	-
	Thermal Throttling	V
	Wear-Leveling / Garbage Collection / TRIM	V

Recommended/Suggested Applications

- Data center
- Data communications
- Cloud computing
- Networking
- AI analytics

*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		BGAE240	BGAE440
Interface		eMMC v5.0	eMMC v5.1
Form Factor		BGA	
Max. Performance	Read	270MB/s	315MB/s
	Write	95MB/s	235MB/s
Capacity		4GB to 64GB	16GB to 256GB
Ball Counts		100/153	
Input Voltage		3.3V ± 5%	
Reliability	Error Correction	BCH	LDPC
	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*	W/I Temp	E/I Temp
Durability	Pseudo-SLC	-	V
	Thermal Throttling	-	-
	Wear-Leveling / Garbage Collection / TRIM	V	V

Recommended/Suggested Applications

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

*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	
NAND Type	SLC	MLC	TLC	pSLC (TLC)
Capacity	512MB-32GB	8GB-128GB	16GB-256GB	4GB-64GB
Operating Temperature*	C/I Temp	C/I Temp	C/E/I Temp	C/E/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	
NAND Type	SLC	TLC	pSLC (TLC)
Capacity	1GB-4GB	16GB-256GB	4GB-64GB
Operating Temperature*	E/I Temp	C/E/I Temp	C/E/I 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)

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 CF Card
Interface		CF 6.1
NAND Type		SLC
Max. Performance	Read	100MB/s
	Write	70MB/s
Capacity		64MB-64GB
Operating Temperature*		C/I Temp



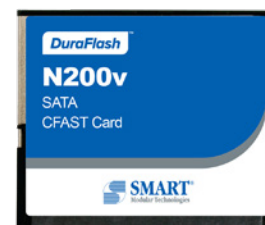
Recommended/Suggested Applications

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

CFast Cards

DuraFlash N200v CFast Cards are a solid state drive product with 3D NAND Flash memory. Designed for server, storage cache/accelerators, networking, and data communications applications, CFast Cards are ideal for applications requiring reliable internal storage with a small footprint.

Specifications		N200v
Interface		SATA III 6Gb/s
NAND Type		TLC
Max. Performance	Read	550MB/s
	Write	490MB/s
Capacity		32GB-256GB
Operating Temperature*		C/I Temp



Recommended/Suggested Applications

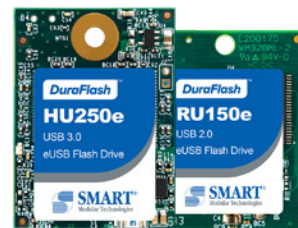
- Industrial
- Server/Storage cache accelerators
- Networking
- Data communications

*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	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	240MB/s
	Write	29MB/s	90MB/s
Capacity		1GB-16GB	16GB-256GB
Operating Temperature*		C Temp	C/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)

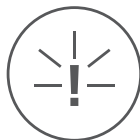
SMART RUGGED

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



Shock & Vibration



Security



Conformal Coat



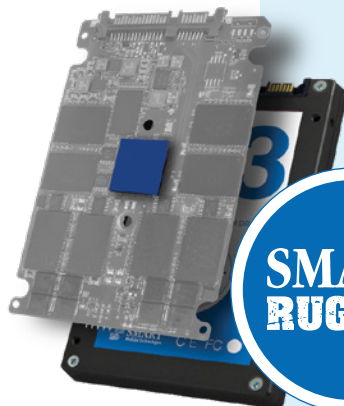
Humidity
Condensation



Altitude



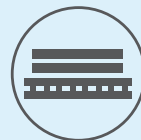
Industrial
Temperature



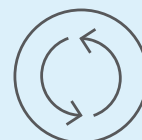
Optional



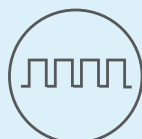
Specific
Shock & Vibration



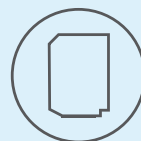
Underfill & Staking



Leaded Process



Custom FW



Custom HW



Extreme
Temperature
Screening

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
	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°C¹	2M Hours, Telcordia 25°C¹		3M Hours (M4) >2M Hours (M4P)	1.5M Hours
Data Reliability		1 in 10¹⁷ bits read		1 in 10¹⁷ bits read		1 in 10¹⁷ bits read	1 in 10¹⁷ bits read	1 in 10¹⁷ bits read		Up to 66 bits in 1K bytes (M4) Up to 120 bits in 2K bytes (M4P)	1 in 10¹⁵ 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
	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 Temperature⁵		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 axis³		50g half-sine, 11 ms, 3 shocks along each axis³		50g half-sine, 11 ms, 3 shocks along each axis	50g half-sine, 11 ms, 3 shocks along each axis³	50g half-sine, 11 ms, 3 shocks along each axis³		50g half-sine, 11 ms, 3 shocks along each axis	1000g half-sine, 0.5 ms
Operating Vibration		10g rms, 10-2000Hz³		16.4g rms, 10-2,000 Hz 10g rms, 10-2000Hz³		16.4g rms, 10-2,000 Hz	16.4g rms, 10-2,000 Hz³	16.4g rms, 10-2,000 Hz³		16.4g rms, 10-2,000 Hz	16.4g rms, 10-2,000 Hz
Relative Humidity		5% - 95% non-condensing³		5%-95% non-condensing		5%-95% non-condensing	5%-95% non-condensing³	5%-95% non-condensing³		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		-	-	-	-	-	V⁴	V⁴	V⁴	-	-
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	-
Navy NAVSO P-5239-26		V	V	V	-	V	V	-	-	V	V
Air Force AFSSI-5020		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)



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