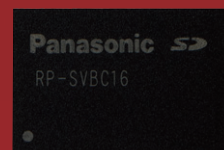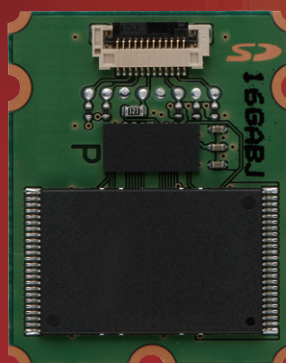# Panasonic

Industrial SD Memory

Extended Temperature   Power Failure Robustness   Program/Erase Endurance

- Specifications for industrial applications demanding high reliability.
- Various customization to meet customer requirements.
- B-to-B specialised support provided.

SD Memory

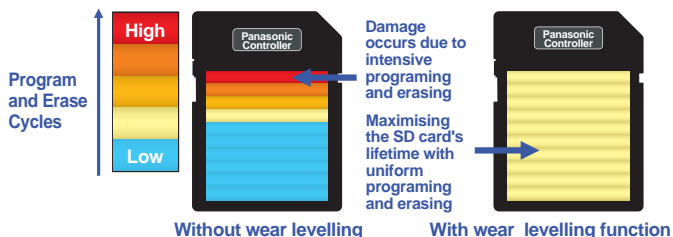# Panasonic SD Memory Offers the High Reliability Demanded for Industrial Use

High Reliability and Panasonic Controller Technology

■ Data Programming and Erase Endurance

Wear Levelling

● **Maximising SD Memory Life**

Static wear levelling controls written data, including fixed data. Various use cases eliminate intensive data writing and maximise the lifetime of the SD card.
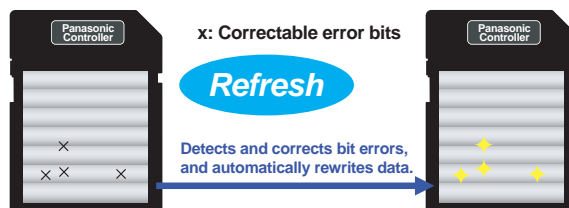

Without wear levelling　　With wear levelling function

Intelligent Data Writing

● **Dispersion of Writing Stress to NAND Flash Memory**

Intelligent data writing disperses the writing stress to NAND flash memory, to reduce program disturbances.

■ Secure Storage

Bit Error Auto Refresh

● **Withstanding Repeated Reading Operations**

Automatically refreshes the bit errors that accumulate over time, before they exceed the threshold. (Accumulated bit errors are detected from read data.)

* This function does not guarantee permanent data retention.

x: Correctable error bits

Refresh

Detects and corrects bit errors, and automatically rewrites data.

■ Power Failure Robustness

Recovery

● **Protects saved data and device**

Unique Panasonic algorithms minimise data damage in the event of a power interruption. Even in the event that an error is generated, the controller recovers the data, restoring it to the condition prior to the error, and preventing errors from reaching the entire SD memory area.

* Power Fail Robustness Mode firmware also available for more robust MLC system

Durable Performance

Panasonic SD memory features high endurance against static electricity, magnetism, and X-rays.

Temperature Resistance

Operation is assured even under harsh temperature conditions.

A usable temperature range of -40 °C to 85 °C maintains stable performance everywhere, from extremely cold to intensely hot climates.

Electrostatic Resistance

ICE 61000-4-2 compliance: Clears Electrostatic Discharge Immunity Tests of 150-pF energy storage capacitance, 15-kV aerial discharge, and 330-Ω discharge resistance.

Impact Resistance

High endurance against bending and twisting.

| Bending load resistance | 20 N (Newton) min. (SD standard: 10 N) |
| Twisting torque resistance | 0.3 N•m (Newton meter) min. (SD standard: 0.15 N•m) |

Magnetic Resistance

Minimal damage from magnetic forces.

Operable after being set onto a 1,000-gauss DC magnetic field for approx. 1 minute.

X-Ray Resistance

Data is protected from X-rays.

ISO 7816-1 compliance: Operable after 0.1 Gy (gray) of X-ray irradiation.

Water Resistance

JIS IPX7 compliance: Operable after submerging the product in water (tap water, 1-m depth) for 30 minutes.

* micro SD – Excluding SD adaptor use.
* Card only.

Built-in Fuse

The internal card fuse protects against excess current and abnormal heating.

Even if excess current or abnormal heating were to occur due to internal card damage caused by the device being used or the environment, the built-in fuse will operate to prevent the SD Memory Card from overheating or igniting.

■ Applications by Model

	Data Protection•				Card Endurance						
	Wear Levelling	Intelligent Data Writing	Refresh	Recovery	Temperature Resistance	Electrostatic Resistance	Impact Resistance	Magnetic Resistance	X-Ray Resistance	Water Resistance	Fuse
FX Series	●	●	●	●	-40 °C to +85 °C	●	●	●	●	—	●
P Series	●	●	●	●		●	●	●	●	—	●
microSD/ KC Series	●	●	●	●		●	●	●	●	●	●
eSD (Flexible connection type)	●	●	●	●		●	●	●	●	—	—
eSD (Semiconductor mounting type)	●	●	●	●		●	●	●	●	—	—

* Based on Panasonic test results. Protection may not be possible in certain usage environments. The data stored inside a card cannot be guaranteed.
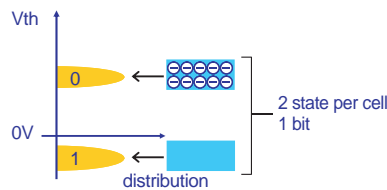
Industrial Use SD Memory Line-up

SLC and MLC

The NAND flash memory that is used in SD Memory Cards has Single Level Cells (SLC), which each store 1 bit of data, and Multi Level Cells (MLC), which each store 2 bits. The FX Series use SLCs to provide superior data retention and reliability.
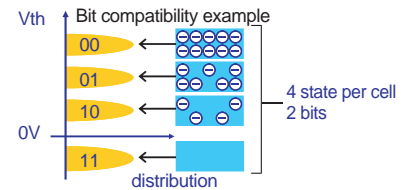
SLC States of FG stored with electron: 2

V_{th}
0
0V
1
distribution
2 state per cell 1 bit

MLC States of FG stored with electron: 4

Bit compatibility example
V_{th}
00
01
10
0V
11
distribution
4 state per cell 2 bits

SLC FX Series

* 128MB/512MB SLC line-up also available

CLASS 6

RP-SDF02G

SDHC UHS-I

UHS Speed Class 1

CLASS 10
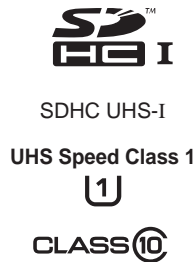
RP-SDF04G **RP-SDF08G** **RP-SDF16G★**

■ Performance Specifications

Model		RP-SDF02G	RP-SDF04G	RP-SDF08G	RP-SDF16G
Capacity*1		2 GB	4 GB	8 GB	16 GB
Flash Memory	Type	Single-Level Cell (SLC) NAND Flash Memory			
SD Physical Specification		Ver.3.01 (No UHS-I Compliant)	Ver. 3.01 (UHS-I Compliant)		
Speed Class		SD Speed Class 6	SD Speed Class10, UHS Speed Grade 1		
Transfer Rate (Max)*2	Read	22 MB/s	90 MB/s	95 MB/s	
	Write	20 MB/s	40 MB/s	80 MB/s	
Operating Temperature		-40 to +85 ˚C			
Controller		by Panasonic			
	Functions	Static Wear Levelling, Intelligent Data Writing, Recovery Function from Power Failure, Refresh Function			
Size		32.0 x 24.0 mm			

★ Release date under consideration   *1: SD Memory utilise a portion of the memory for copy protection and other purposes. Therefore Usable capacity will be less. *2: Speed performance is subject to change.

MLC PC Series

GD Series

CLASS 4

RP-SDPC04 **RP-SDPC08** **RP-SDPC16**

SDHC SDXC CLASS 10

RP-SDGD32★ **RP-SDGD64★**

■ Performance Specifications

Model		RP-SDPC04	RP-SDPC08	RP-SDPC16
Capacity*1		4 GB	8 GB	16 GB
Flash Memory	Type	Multi-Level Cell (MLC) NAND Flash Memory		
SD Physical Specification		Ver.3.01 (No UHS-I Compliant)		
Speed Class		SD Speed Class 4		
Transfer Rate (Max)*2	Read	22 MB/s		
	Write	12 MB/s		
Operating Temperature		-40 to +85 ˚C		
Controller		by Panasonic		
	Functions	Static Wear Levelling, Intelligent Data Writing, Recovery Function from Power Failure, Refresh Function		
Size		32.0 x 24.0 mm		

★ Release date under consideration   *1: SD Memory utilise a portion of the memory for copy protection and other purposes. Therefore Usable capacity will be less.
*2: Speed performance is subject to change.

MLC KC Series

microSDHC UHS-I

RP-SMKC04   **RP-SMKC08**   **RP-SMKC16**

■ Performance Specifications

Model		RP-SMKC04	RP-SMKC08	RP-SMKC16
Capacity*1		4 GB	8 GB	16 GB
Flash Memory	Type	Multi-Level Cell (MLC) NAND Flash Memory		
SD Physical Specification		Ver. 3.01 (UHS-I Compliant)		
Speed Class		SD Speed Class 2, UHS Speed Grade 0		
Transfer Rate (Max)*2	Read	45 MB/s		
	Write	6 MB/s		
Operating Temperature		-40 to +85 ˚C		
Controller		by Panasonic		
	Functions	Static Wear Levelling, Intelligent Data Writing, Recovery Function from Power Failure, Refresh Function		
Size		15.0 x 11.0 mm (Max)		

*1: SD Memory utilise a portion of the memory for copy protection and other purposes. Therefore Usable capacity will be less. *2: Speed performance is subject to change.
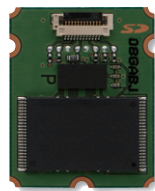
MLC eSD (Flexible Connection Type)

Products converted to SLC are also available on demand.
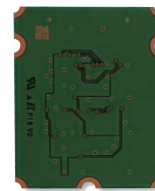Form factor of module can be customized.
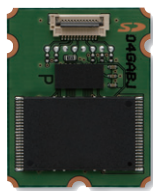
RP-SD04GP (4 GB) **RP-SD08GP** (8 GB) **RP-SD16GP** (16 GB) (Rear surface)

Performance Specifications

Model		RP-SD04GP	RP-SD08GP	RP-SD16GP
Capacity*1		4 GB	8 GB	16 GB
Flash Memory	Type	Multi-Level Cell (MLC) NAND Flash Memory		
SD Physical Specification		Ver. 3.01 (No UHS-I Compliant)		
Speed Class		SD Speed Class 4		
Transfer Rate (Max)*2	Read	22 MB/s		
	Write	12 MB/s		
Operating Temperature		-40 to +85 ˚C		
Controller		by Panasonic		
	Functions	Static Wear Levelling, Intelligent Data Writing, Recovery Function from Power Failure, Refresh Function		
Size		30.0 x 24.0 mm		

*1: SD Memory utilise a portion of the memory for copy protection and other purposes. Therefore Usable capacity will be less. *2: Speed performance is subject to change.
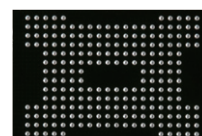
MLC eSD (Semiconductor Mounting Type)

SDHC UHS-I

RP-SVBC04 (4 GB) **RP-SVBC08** (8 GB) **RP-SVBC16** (16 GB) (Rear surface) (224 pin)

Performance Specifications

Model		RP-SVBC04	RP-SVBC08	RP-SVBC16
Capacity*1		4 GB	8 GB	16 GB
Flash Memory	Type	Multi-Level Cell (MLC) NAND Flash Memory		
SD Physical Specification		Ver. 3.01 (UHS-I Compliant)		
Speed Class		SD Speed Class 2, UHS Speed Grade 0		
Transfer Rate (Max)*2	Read	90 MB/s		
	Write	6 MB/s		
Operating Temperature		-40 to +85 ˚C		
Controller		by Panasonic		
	Functions	Static Wear Levelling, Intelligent Data Writing, Recovery Function from Power Failure, Refresh Function		
Size		18.0 x 12.2 mm		

*1: SD Memory utilise a portion of the memory for copy protection and other purposes. Therefore Usable capacity will be less. *2: Speed performance is subject to change.

Environmental Specifications (Common to all models)

Tempe-rature	(Operating)	-40 to +85 ˚C	Vibration	15 Gp-p
	(Non-operating)	-40 to +85 ˚C (1,000 h)	Shock	1,000 G
Humidity		5 to 95 % (No condensation)	RoHS Directive Compatibility	

Applicable EMC Standards
1) VCCI Class B (Option B)
2) FCC Part 15 Class B (Verification)
3) EC Directive 89/336/EEC
   EN55022: 2006 Class B
   EN55024: 1998 +A1: 2001 +A2: 2003
4) AS/NZS CISPR Pub22: 2006

• Panasonic industrial use SD memory has a unique Panasonic function that reports data such as bad blocks, writing cycles, and the SD memory internal connection status.
• A special B to B support system also allows Panasonic to offer consultation concerning customisation upon customer request.

For details, consult a salesperson.