
goodram
industrial
EUROPEAN
MEMORY
EXPERT

About the Company

Goodram Industrial is a brand owned by Wilk Elektronik SA – a Polish memory manufacturer and distributor with over 35 years of experience in the memory business.

Known for its strict quality policy, flexibility and post-sales support, Wilk Elektronik SA is the only European memory manufacturer with its R&D department, state-of-the-art production site, test field and support team. All in-house, under one roof.

Goodram stands for quality, reliability and support – we believe that the industry needs customized solutions for very specific needs. Designing our own testing procedures ensures that the modules we produce are tailored to match our customers' needs perfectly. Add low MOQ, fixed BOM and long-term post-sales support to the mix to achieve the highest possible quality of customer service. It all boils down to guaranteeing our partners the highest reliability possible throughout the module's lifetime.

Key milestones

1991
Establishment of Wilk Elektronik SA

1995
Leads the DRAM market in Poland

2003
Launch of the Goodram memory production

2008
Introduction of SSDs to the product portfolio

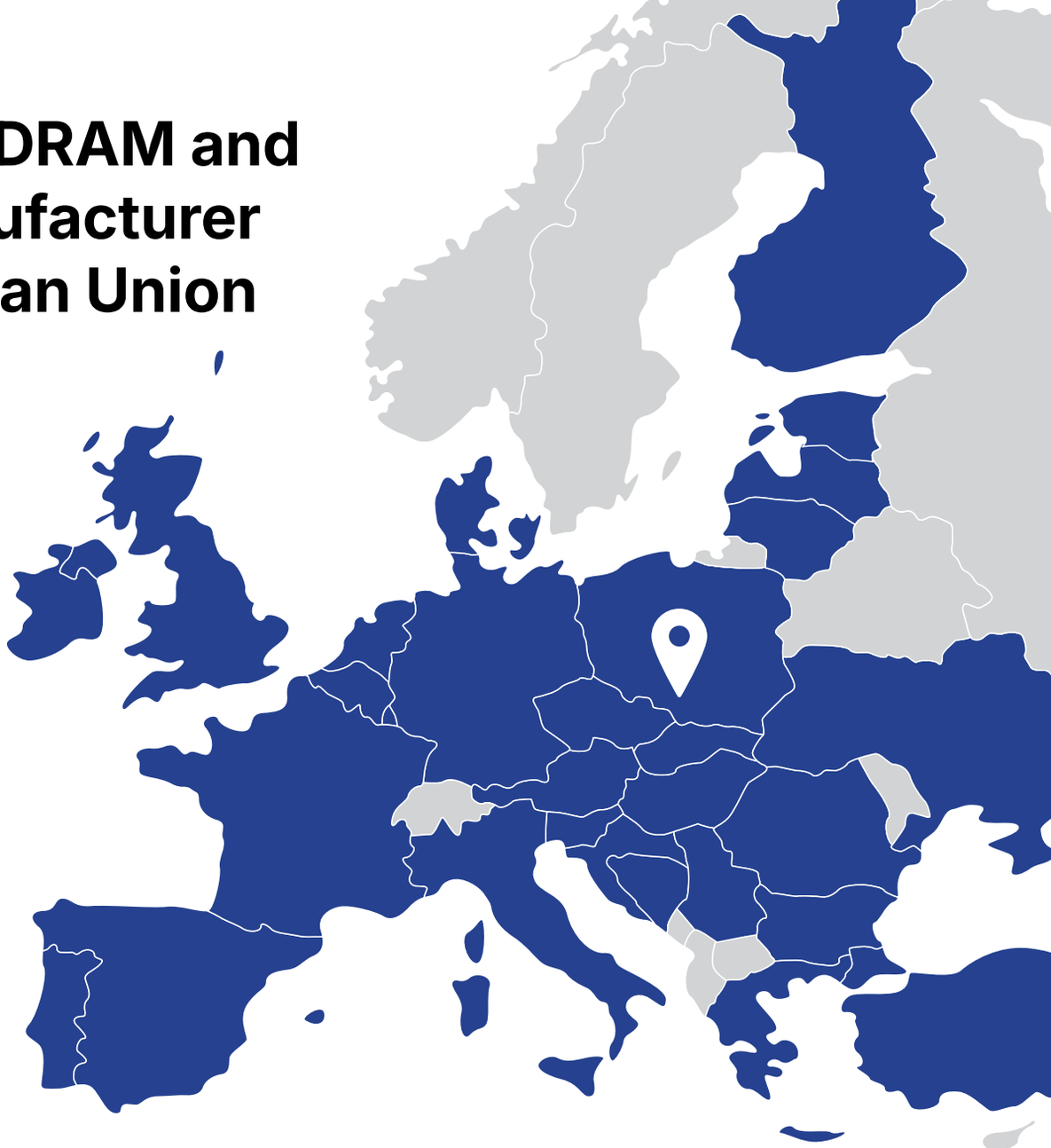
2013
Launch of the Goodram Industrial product line

2016
Launch of the IRDM gaming product line

2021
Major capacity expansion

2024
Launch of the Goodram Enterprise server product line

The only DRAM and SSD manufacturer in European Union



100%
EU market coverage

35 yrs
of experience in semiconductors market

100%
Wilk Family owned

20-35%
share of Wilk Elektronik brands in the Polish market

Core features

- EXTENDED TEMPERATURE RANGE
- PCN AND EOL MANAGEMENT
- MAJOR GRADE CHIPS
- FIXED BILL OF MATERIAL
- LONG TERM SUPPORT
- 100% TESTED

Applications of Goodram Industrial solutions

INDUSTRIAL AUTOMATION

HOME AUTOMATION

POINT-OF-SALE

WIRELESS SYSTEMS

INTERNET OF THINGS

PUBLIC COMMUNICATION

INDUSTRIAL COMPUTING

AUTOMOTIVE SOLUTIONS

VIDEO SECURITY SYSTEMS

HUMAN-MACHINE INTERFACES

CFast

CFast cards are compliant with the PCMCIA I or II standards with SATA interface. The card's controller, which is functionally compliant with typical SATA SSD controllers, offers low power consumption and data transfer rates of up to 550 MB/s. Other features include S.M.A.R.T., advanced power management methods and a DRAM cache. CFast is available with 3D TLC, 3D pSLC, MLC, pSLC and SLC NAND and its capacity may depend on the technology used. Its small size and housing suited for multiple applications make CFast a good solution for many mobile applications.

	CFast				
Flash type	3D TLC	3D pSLC	MLC	pSLC	SLC
Program/Erase cycles	3 000	50 000	3 000	20 000	60 000
Capacity	128 GB - 512 GB	32 GB – 256 GB	32 GB – 256 GB	16 GB – 64 GB	8 GB – 32 GB
Interface	SATA III				
Key features	Static and Dynamic Wear Levelling Bad Block Management TRIM S.M.A.R.T. NCQ Over-provisioning Low Power Management Thermal Sensor TCG Opal Built from major IC brands Fixed Bill of Material (optional) PCN and EOL notification				
Operating temperature (°C)	0 – 70 -40 – 85	0 – 70 -40 – 85	0 – 70 -25 – 85 -40 – 85		-25 – 85 -40 – 85
Storage temperature (°C)	-40 – 85				
Maximum transfer speed (MB/s)	Read: up to 550 Write: up to 490	Read: up to 550 Write: up to 500	Read: up to 555 Write: up to 465	Read: up to 545 Write: up to 465	Read: up to 540 Write: up to 305
Maximum power consumption (mW)	< 1550	< 1300	< 1550	< 1475	< 1700
MTBF (hours)	> 2 000 000	> 3 000 000	> 2 000 000		
Environmental test resistance	High/Low temperature High Humidity (55, 95% RH) Temperature Cycle (30 min, 20 cycles) Shock (1500 G, Half Sin Pulse) Vibration (80 – 2 000 Hz/20 G in 3 Axis) Free Fall (0.8 m) Torque (1.3 N/m, 30 sec/5 times) Bending (>50 N for 1 min/5 times) Contact ESD (±4 kV contact)				
Dimensions (L x W x H)(mm)	42.8 × 36.4 × 3.3				

CFexpress

CFexpress cards are currently the newest solution supported by Compact Flash Association, which is capable of fulfilling the most rigid demands of industrial customers. By offering excellent performance and wide compatibility, Goodram's CFexpress™ Type B Card also provides a wide range of capacities available for users. In addition, industrial-grade CFexpress™ cards are available for any applications under rigorous environmental conditions including extensive temperature, shock and vibration.

	CFexpress
Flash type	3D TLC
Program/Erase cycles	3 000
Capacity	15 GB – 1024 GB
Interface	PCIe NVMe 3.0 x2
Key features	PCIe NVMe gen3 ×2 Type B Slot Static and Dynamic Wear Levelling LDPC ECC Subpage Mode Flash Translation Layer Data Care Management Lifetime Enhancements Power Fail Data Loss Protection TRIM Active State Power Management Firmware upgrade S.M.A.R.T TCG Opal (optional) End-to-End Data Protection AES256 Encryption (optional) Built from major IC brands Fixed Bill of Material (optional) PCN and EOL notification
Operating temperature (°C)	-40 – 85
Storage temperature (°C)	-40 – 85
Maximum transfer speed (MB/s)	Read: up to 1 610 Write: up to 820
Maximum power consumption (mW)	< 760
MTBF (hours)	> 2 000 000
Environmental test resistance	High/Low temperature High Humidity (55, 95% RH) Temperature Cycle (30 min, 20 cycles) Shock (1 500 G, Half Sin Pulse) Vibration (80 – 2 000 Hz/20 G in 3 Axis) Free Fall (0.8 m.) Torque (1.3 N/m, 30 sec/5 times) Bending (>50N for 1 min/5 times) Contact ESD (±4 kV contact)
Dimensions (L x W x H)(mm)	38.5 × 29.6 × 3.8

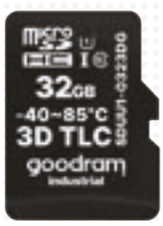
eMMC

eMMC (Embedded MultiMediaCard) is a type of small memory device used primarily in portable devices. Unlike portable microSD/SD cards or SSDs, the eMMC standard refers to a non-volatile memory chip embedded on the motherboard of a device. An eMMC is a compact storage device that is physically integrated into an application. Due to its small size, it can be successfully used in devices where SSD drives cannot be installed because of limited space. This includes not only mobile phones and tablets, but also advanced automotive and Internet of Things (IoT) applications.

	eMMC			
Form factor	153 Ball FBGA			
Flash type	3D TLC	3D pSLC	MLC	2D pSLC
Program/Erase cycles	3 000	30 000	3 000	20 000
Capacity	16 GB – 128 GB	8 GB – 32 GB	8 GB – 16 GB	4 GB – 8GB
Interface	eMMC 5.1			
Key features	Power Off Notification HS400 Speed Mode available Enhanced Device Lifetime Command Queuing Enhanced Strobe Cache Flushing Report BKOPS Control Cache Barrier RPMB Throughput Improvement Secure Write Protection Secure Erase and Trim commands available Enhanced Write Protection Built from major IC brands Fixed Bill of Material (optional) PCN and EOL notification Customized engraving (optional)			
Operating temperature (°C)	-25 – 85			
Storage temperature (°C)	-40 – 85			
Maximum transfer speed (MB/s)	Read: up to 320 Write: up to 260	Read: up to 320 Write: up to 260	Read: up to 225 Write: up to 140	Read: up to 225 Write: up to 140
Maximum power consumption (mW)	< 175			< 170
Dimensions (L x W x H)(mm)	11.5 × 13 × 1			

microSD/SD

MicroSD and SD cards are available in three capacity standards: SDSC (Standard Capacity), SDHC (High Capacity) and SDXC (extended Capacity) and with bus up to UHS-I. Selected models have an additional SPI interface. Small dimensions, low power consumption and wide range of available capacities (from 128 MB to 256 GB) and wide selection of NAND types (SLC, pSLC, MLC, 3D TLC and 3D pSLC) make microSD and SD cards a go-to storage solution for many industrial designers.



	microSD					SD				
Flash type	3D TLC	3D pSLC	MLC	pSLC	SLC	3D TLC	3D pSLC	MLC	pSLC	SLC
Program/Erase cycles	3 000	30 000	3 000	20 000	60 000	3 000	30 000	3 000	20 000	60 000
Capacity	16 – 256 GB	16 – 128 GB	4 – 64 GB	2 GB – 32 GB	128 MB – 4 GB	32 – 256 GB	16 – 128 GB	4 – 128 GB	2 – 64 GB	128 MB – 32 GB
Interface	UHS-I			High Speed for 2 GB, Rest UHS-I	128 MB – 2 GB High Speed 4 GB UHS-I	UHS-I				128 MB – 2 GB High Speed 4 GB – 32 GB UHS-I
Key features	Static and Dynamic Wear Levelling Bad Block Management S.M.A.R.T. Auto-Read Refresh Data Clone System (only for MLC) Built from major IC brands Fixed Bill of Material (optional) PCN and EOL notification									
Operating temperature (°C)	-25 – 85 -40 – 85									
Storage temperature (°C)	-40 – 85									
Maximum transfer speed (MB/s)	Read: up to 95 Write: up to 80		Read: up to 95 Write: up to 90		Read: up to 20 Write: up to 20	Read: up to 95 Write: up to 80		Read: up to 95 Write: up to 90		Read: up to 65 Write: up to 55
Maximum power consumption (mA)	< 400									
MTBF	> 3 000 000									
Environmental test resistance	High/Low temperature High Humidity (55, 95% RH) Temperature Cycle (30 min, 20 cycles) Shock (1 500 G, Half Sin Pulse) Vibration (80 – 2 000 Hz/20 G in 3 Axis) Free Fall (1.5 m) Torque (0.1 N/m, 30 sec/5 times) Bending (>10 N for 1 min/5 times) Salt Spray (3% NaCl, 35°C/24 h) Waterproof (IPX7, 1 m immersion for 30 minutes) X-Ray (70 – 140 keV for 30 minutes) Switch Cycle (0.4 – 0.5 N/1 000 times) Durability test (EIA 364-13 10 000 times) Contact ESD (±4 kV contact 25 times, ±8 kV air 10 times)									
Dimensions (L x W x H)(mm)	15 × 11 × 1					32 × 24 × 2.1				

USB Flash Drive

USB Flash Drives are available in many housing options and with wide selection of NAND types (SLC, pSLC, MLC, 3D TLC). As the USB 3.2 gen. 1 interface is supported by nearly all personal computers and embedded applications, these devices are used as storage media for operating systems, data and application keys. Backwards compatibility with USB 2.0 and USB 1.1 provides flexibility for designers and administrators.

	Industrial USB Flash Drive			
Flash type	3D TLC	MLC	pSLC	SLC
Program/Erase cycles	3 000	3 000	20 000	60 000
Capacity	16 GB – 256 GB	4 GB – 256 GB	2 GB – 128 GB	128 MB – 32 GB
Interface	USB 2.0/USB 3.2 gen. 1 (USB 1.1/USB 2.0 compatible)			
Key features	Wear Levelling Bad Block Management ECC Built from major IC brands Fixed Bill of Material (optional) PCN and EOL notification			
Operating temperature (°C)	0 – 70 -25 – 85 -40 – 85			
Storage temperature (°C)	-40 – 85			
Maximum transfer speed (MB/s)	Read: up to 265 Write: up to 175	Read: up to 190 Write: up to 130	Read: up to 150 Write: up to 125	Read: up to 170 Write: up to 120
Maximum power consumption (mA) (PCBA)	< 220	< 210		< 120
Maximum transfer speed (MB/s) (uCOB)	Read: up to 220 Write: up to 100	Read: up to 190 Write: up to 85	Read: up to 140 Write: up to 100	Read: up to 65 Write: up to 50
Maximum power consumption (mA) (uCOB)	< 187	< 130		< 90
MTBF (hours)	> 2 000 000			
Environmental test resistance	High/Low temperature High Humidity (55, 95% RH) Temperature Cycle (30 min, 20 cycles) Shock (1 500 G, Half Sin Pulse) Vibration (80 – 2 000 Hz/20 G in 3 Axis) Free Fall (1.1 m) Torque (0.5 N/m, 30 sec/5 times) Bending (>50 N for 1 min/5 times) Durability test (Extraction/Insertion 5 000 times) Contact ESD (±4 kV contact 25 times)			
Dimensions (L x W x H)(mm)	55.8 × 18.6 × 9.6*			

*Dimensions for standard housing. Wide selection of housings is available.

2.5″ SATA Solid State Drive

2.5″ SATA is the most common form factor of Solid State Drives. All SSDs can be configured with 3D TLC, 3D pSLC, MLC, pSLC and SLC NAND Flash. They provide up to 550 MB/s of fast data transfer, low power consumption and advanced power management modes. With ruggedness resulting from absence of moving parts and low power consumption, Solid State Drives are optimal for both desktop and mobile applications.

	2.5″ SATA Solid State Drive				
Flash type	3D TLC	3D pSLC	MLC	pSLC	SLC
Program/Erase cycles	3 000	50 000	3 000	20 000	60 000
Capacity	64 GB – 2 TB	32 GB – 512 GB	4 GB – 512 GB	8 GB – 256 GB	8 GB – 128 GB
Interface	SATA III				
Key features	Static and Dynamic Wear Levelling Bad Block Management TRIM S.M.A.R.T. NCQ Over-provisioning Low Power Management Thermal Throttling DEVSLP Mode (optional) PLP (optional) Built from major IC brands Fixed Bill of Material (optional) PCN and EOL notification				
Operating temperature (°C)	0 – 70 -40 – 85	0 – 70 -40 – 85	0 – 70 -25 – 85 -40 – 85		-25 – 85 -40 – 85
Storage temperature (°C)	-40 – 85				
Maximum transfer speed (MB/s)	Read: up to 550 Write: up to 500	Read: up to 550 Write: up to 510	Read: up to 550 Write: up to 490	Read: up to 545 Write: up to 465	Read: up to 540 Write: up to 425
Maximum power consumption (mW)	< 1 750	< 1 450	< 2 650	< 2 630	< 2 300
MTBF (hours)	> 2 000 000	> 3 000 000	> 2 000 000		
Environmental test resistance	High/Low temperature High Humidity (55, 95% RH) Temperature Cycle (30 min, 20 cycles) Shock (1 500 G, Half Sin Pulse) Vibration (80 – 2 000 Hz/20 G in 3 Axis) Free Fall (0.8 m) Torque (0.1 N/m, 30 sec/5 times) Bending (>20 N for 1 min/5 times) Contact ESD (±4 kV contact 25 times)				
Dimensions (L x W x H)(mm)	100 × 69.85 × 7				

mSATA Solid State Drive

SSD mSATA is a type of Flash memory that can be installed directly on the motherboard. It is 80% smaller than the 2.5", thus it takes up minimal space. Compatibility with the SATA I, II and III standards means that these devices can be installed in any device having an mSATA port. As with the entire range of SSD memories, the absence of moving parts and low power consumption make it an optimum choice of data storage medium in mobile systems.

	mSATA Solid State Drive				
Flash type	3D TLC	3D pSLC	MLC	pSLC	SLC
Program/Erase cycles	3 000	50 000	3 000	20 000	60 000
Capacity	64 GB – 2 TB	32 GB – 512 GB	4 GB – 512 GB	2 GB – 512 GB	8 GB – 128 GB
Interface	SATA III				
Key features	Static and Dynamic Wear Levelling Bad Block Management TRIM S.M.A.R.T. NCQ Over-provisioning Low Power Management Thermal Throttling DEVSLP Mode (optional) Built from major IC brands Fixed Bill of Material (optional) PCN and EOL notification				
Operating temperature (°C)	0 – 70 -40 – 85			0 – 70 -25 – 85 -40 – 85	0 – 70 -40 – 85
Storage temperature (°C)	-40 – 85				
Maximum transfer speed (MB/s)	Read: up to 550 Write: up to 510		Read: up to 550 Write: up to 490		Read: up to 540 Write: up to 425
Maximum power consumption (mW)	< 1 750	< 1 350	< 2 690		< 2 250
MTBF (hours)	> 2 000 000	> 2 500 000	> 2 000 000		
Environmental test resistance	High/Low temperature High Humidity (55, 95% RH) Temperature Cycle (30 min, 20 cycles) Shock (1 500 G, Half Sin Pulse) Vibration (80 – 2 000 Hz/20 G in 3 Axis) Free Fall (0.8 m) Torque (0.1 N/m, 30 sec/5 times) Bending (>20 N for 1 min/5 times) Contact ESD (±4 kV contact 25 times)				
Dimensions (L x W x H)(mm)	50.8 × 29.85 × 4				

M.2 SATA Solid State Drive

M.2 is another type of SSD with SATA or NVMe interface. M.2 SATA Solid State Drive can be installed directly onto the motherboard. It can be configured with 3D TLC, 3D pSLC, MLC, pSLC and SLC NAND and PCBA can be delivered in two sizes: 42 × 22 mm and 80 × 22 mm. Small footprint, lack of moving parts and low power consumption make the M.2 SATA SSD a great solution for mobile applications. Other form factors (2260, 22110) available upon request.

	M.2 SATA Solid State Drive								
	M.2 2242					M.2 2280			
Flash type	3D TLC	3D pSLC	MLC	pSLC	SLC	3D TLC	3D pSLC	pSLC	SLC
Program/Erase cycles	3 000	50 000	3 000	20 000	60 000	3 000	50 000	20 000	60 000
Capacity	64 – 1 TB	32 GB – 256 GB	4 GB – 512 GB	16 GB – 256 GB	8 GB – 64 GB	64 GB – 2 TB	32 GB – 512 GB	2 GB – 256 GB	8 GB – 128 GB
Interface	SATA III								
Key features	Static and Dynamic Wear Levelling - Bad Block Management - TRIM - S.M.A.R.T. - NCQ Over-provisioning - Low Power Management - Thermal Throttling - DEVSLP Mode (optional) - PLP (optional) Built from major IC brands - Fixed Bill of Material (optional) - PCN and EOL notification								
Operating temperature (°C)	0 – 70 -40 – 85				-25 – 85 -40 – 85	0 – 70 -40 – 85		0 – 70 -40 – 85	-25 – 85 -40 – 85
Storage temperature (°C)	-40 – 85								
Maximum transfer speed (MB/s)	Read: up to 550 Write: up to 510		Read: up to 555 Write: up to 490	Read: up to 545 Write: up to 460	Read: up to 540 Write: up to 320	Read: up to 550 Write: up to 510			Read: up to 540 Write: up to 425
Maximum power consumption (mA)	< 1 750	< 1 350	< 2 100	< 2 630	< 1 950	< 1 800	< 1 300		< 2 280
MTBF (hours)	> 2 000 000	> 3 000 000	> 2 000 000				> 3 000 000		
Environmental test resistance	High/Low temperature, High Humidity (55, 95% RH), Temperature Cycle (30 min, 20 cycles), Shock (1 500 G, Half Sin Pulse), Vibration (80 – 2 000 Hz/20 G in 3 Axis), Free Fall (0.8 m), Torque (0.1 N/m, 30 sec/5 times), Bending (>20 N for 1 min/5 times), Contact ESD (±4 kV contact 25 times)								
Dimensions (L x W x H)(mm)	42 × 22 × 3.8					80 × 22 × 3.8			

M.2 NVMe Solid State Drive

	M.2 NVMe Solid State Drive							
Interface	NVMe PCIe 4×4				NVMe PCIe 3×4			
Form factor	M.2 2230	M.2 2242	M.2 2280		M.2 2242		M.2 2280	
Flash type	3D TLC		3D TLC	3D pSLC	3D TLC	3D pSLC	3D TLC	3D pSLC
Program/Erase cycles	3 000	3 000	50 000	20 000	3 000	50 000	3 000	50 000
Capacity	256 GB – 512 GB	128 GB – 2 TB	128 GB – 2 TB	120 GB – 960 GB	128 GB – 2 TB	32 GB – 512 GB	128 GB – 2 TB	32 GB – 512 GB
Advanced features	Dynamic SLC Cache TCG Opal/Pyrite (optional) ETEDPP (End-to-End Data Path Protection) Read Only Mode Built from major IC brands Fixed Bill of Material (optional) PCN and EOL notification			TCG Pyrite/Opal (optional) NVMe Format Physical Presence (SID) (optional) Manufacturer's Secure ID (MSID)- Read Only Mode Built from major IC brands Fixed Bill of Material (optional) PCN and EOL notification	Dynamic SLC cache - TCG Pyrite/OPAL (optional) Secure Erase and Crypto Erase - Media Wear Indicator Read Only Mode - Physical Presence SID (optional) PLP (optional) - Built from major IC brands Fixed Bill of Material (optional) - PCN and EOL notification			
Operating temperature (°C)	0 – 70 -40 – 85				0 – 70	0 – 70 -40 – 85	0 – 70	0 – 70 -40 – 85
Storage temperature (°C)	-40 – 85							
Maximum transfer speed (MB/s)	Read: up to 4 900 Write: up to 3 200	Read: up to 4 900 Write: up to 3 700		Read: up to 7 200 Write: up to 6 500	Read: up to 2 450 Write: up to 1900			
Maximum power consumption (mA)	< 5 200	< 5 300		< 2 630	< 3 900		< 4 000	
MTBF (hours)	> 2 000 000							
Dimensions (L x W x H)(mm)	30 × 22 × 2.15	42 × 22 × 3.8	80 × 22 × 3.8	80 × 22 × 1.35	42 × 22 × 3.8		80 × 22 × 3.8	

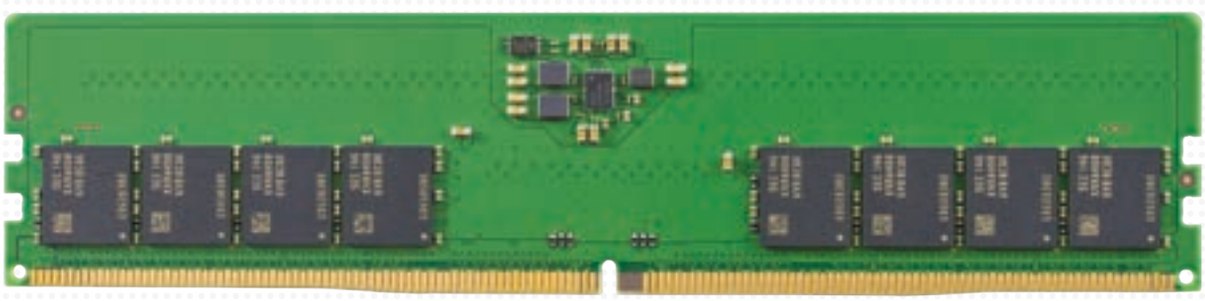
DRAM

Goodram Industrial offers a comprehensive range of industrial memory modules spanning from the early DDR1 generation to the latest DDR5 technology. Within its industrial series, the brand provides a variety of form factors including long DIMMs or SODIMMs, along with optional features such as ECC support, extended temperature range capabilities, and a fixed bill of materials. Goodram Industrial prioritizes adherence to the Product Change Notification procedure, ensuring that clients are informed of any alterations to the bill of materials, particularly for orders spanning extended durations. Its tailored solutions cater to a diverse array of industrial applications including industrial computing, automation, automotive systems, home automation, point-of-sale (POS) systems, Internet of Things (IoT), and healthcare applications.

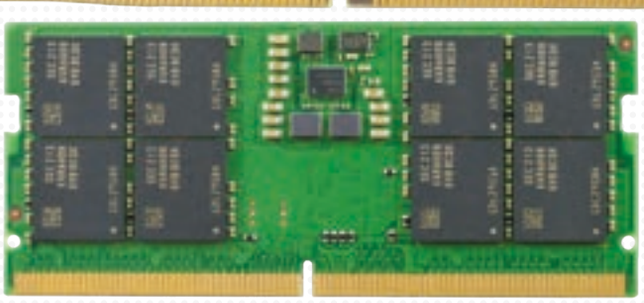
DDR5 SDRAM

The latest advancement in the DDR family, DDR5 boasts a maximum transfer speed of 6 400 MT/s, achieved by lowering the voltage to 1.1 V, reducing overall power consumption by up to 15%. Incorporating a power management IC (PMIC) on the module and implementing on-die error-correction code (ODECC) enhances reliability and efficiency. Additionally, DDR5 introduces two sets of 36-bit channels (72-bit for ECC modules), doubling the bandwidth for improved memory access speed and efficiency in industrial environments.

DDR5 DIMM



DDR5 SODIMM



	DDR5 Memory Modules			
Module type	UDIMM	UDIMM ECC	SODIMM	SODIMM ECC
Capacity	8 GB – 32 GB	16 GB – 32 GB	8 GB – 32 GB	16 GB – 32 GB
Data Rate	4 800 MT/s 5 200 MT/s 5 600 MT/s 6 400 MT/s	4 800 MT/s 5 200 MT/s 5 600 MT/s 6 400 MT/s	4 800 MT/s 5 200 MT/s 5 600 MT/s 6 400 MT/s	4 800 MT/s 5 200 MT/s 5 600 MT/s 6 400 MT/s
Number of pins	288-pin	288-pin	262-pin	262-pin
Width	64 Bits	72 Bits	64 Bits	72 Bits
Voltage	1.1 V		1.1 V	
PCB Height	31.25 mm		30 mm	
Operating temperature (°C)	0 – 85		0 – 85	
Extended temperature (°C)	-40 – 85		-40 – 85	
On Die ECC	Yes	Yes	Yes	Yes
Power Management IC	Yes	Yes	Yes	Yes
Fixed Bill of Material	*	*	*	*
EOL, PCN notification	Yes	Yes	Yes	Yes
Conformal Coating	*	*	*	*

*optional

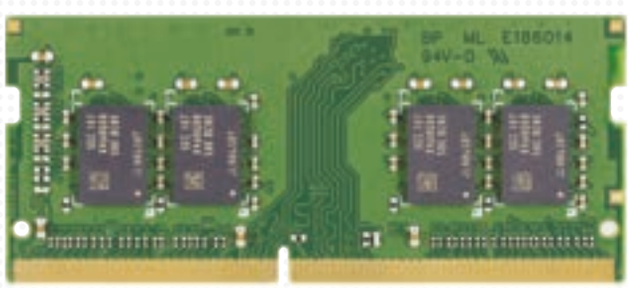
DRAM

DDR4 SDRAM

Currently the most prevalent type, DDR4 introduced innovative features such as a POD12 interface and CRC on the data bus, enabling transfer rates exceeding 3 200 MT/s. With transfer rates up to 25 600 MB/s, DDR4 became an ideal choice for high-performance industrial systems, prioritizing speed and reliability.

DDR4 DIMM

DDR4 SODIMM



	DDR4 Memory Modules			
Module type	UDIMM	UDIMM ECC	SODIMM	SODIMM ECC
Capacity	4 GB – 32 GB	4 GB – 32 GB	4 GB – 32 GB	4 GB – 32 GB
Data Rate	2 133 MT/s 2 400 MT/s 2 666 MT/s 2 933 MT/s 3 200 MT/s	2 133 MT/s 2 400 MT/s 2 666 MT/s 2 933 MT/s 3 200 MT/s	2 133 MT/s 2 400 MT/s 2 666 MT/s 2 933 MT/s 3 200 MT/s	2 133 MT/s 2 400 MT/s 2 666 MT/s 2 933 MT/s 3 200 MT/s
Number of pins	288-pin	288-pin	260-pin	260-pin
Width	64 Bits	72 Bits	64 Bits	72 Bits
Voltage	1.2 V		1.2 V	
PCB Height	31.25 mm		30 mm	
PCB VLP Height	19 mm		19 mm	
Operating temperature (°C)	0 – 85		0 – 85	
Extended temperature (°C)	-40 – 85		-40 – 85	
Fixed Bill of Material	*	*	*	*
EOL, PCN notification	Yes	Yes	Yes	Yes
Conformal Coating	*	*	*	*

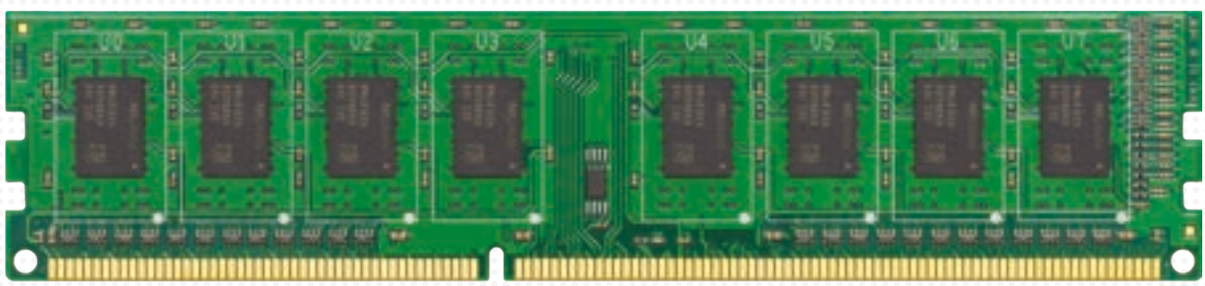
*optional

DRAM

DDR3 SDRAM

DDR3 marked a significant leap forward, offering lower power consumption and higher capacity for a wide range of industrial applications. With transfer rates of 1 866 MT/s facilitated by a “fly-by” bus design, DDR3 optimized performance while meeting industrial demands.

DDR3 DIMM



DDR3 SODIMM

	DDR3 Memory Modules			
Module type	UDIMM	UDIMM ECC	SODIMM	SODIMM ECC
Capacity	2 GB – 8 GB	2 GB – 8 GB	2 GB – 8 GB	2 GB – 8 GB
Data Rate	1066 MT/s 1333 MT/s 1600 MT/s 1866 MT/s	1066 MT/s 1333 MT/s 1600 MT/s 1866 MT/s	1066 MT/s 1333 MT/s 1600 MT/s 1866 MT/s	1066 MT/s 1333 MT/s 1600 MT/s 1866 MT/s
Number of pins	240-pin	240-pin	204-pin	204-pin
Width	64 Bits	72 Bits	64 Bits	72 Bits
Voltage	1.35 V, 1.5 V		1.35 V, 1.5 V	
PCB Height	30 mm		30 mm	
Operating temperature (°C)	0 – 85		0 – 85	
Extended temperature (°C)	-40 – 85		-40 – 85	
Fixed Bill of Material	*	*	*	*
EOL, PCN notification	Yes	Yes	Yes	Yes
Conformal Coating	*	*	*	*

*optional

DRAM

DDR2 SDRAM

The second generation brought improvements in power consumption by operating at reduced supply voltage. Running at a data rate of 800 MT/s, DDR2 achieved transfer rates of up to 6 400 MB/s, enhancing efficiency while maintaining compatibility.

DDR2 SODIMM

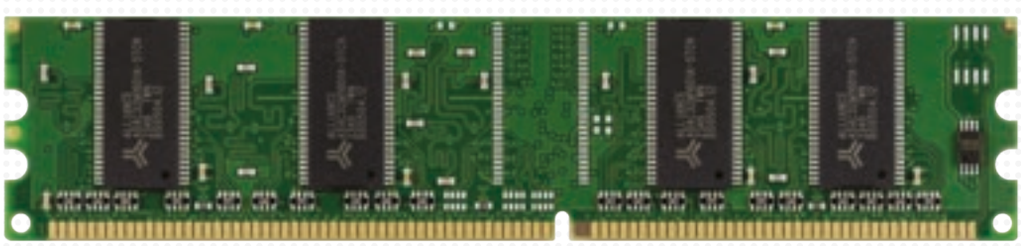
	DDR2 Memory Modules	
Module type	UDIMM	SODIMM
Capacity	512 MB – 2 GB	512 MB – 2 GB
Data Rate	400 MT/s, 533 MT/s, 667 MT/s, 800 MT/s	400 MT/s, 533 MT/s, 667 MT/s, 800 MT/s
Number of pins	240-pin	200-pin
Width	64 Bits	
Voltage	1.8 V	
PCB Height	30 mm	30 mm
Operating temperature (°C)	0 – 85	
Fixed Bill of Material	*	*
EOL, PCN notification	Yes	Yes
Conformal Coating	*	*

*optional

DDR1 SDRAM

The first member of the DDR family introduced a synchronous interface active on both edges of the clock signal. With a data rate of 400 MT/s and a transfer rate of 3 200 MB/s over a 64-bit bus, DDR1 laid the foundation for subsequent generations.

DDR1 DIMM



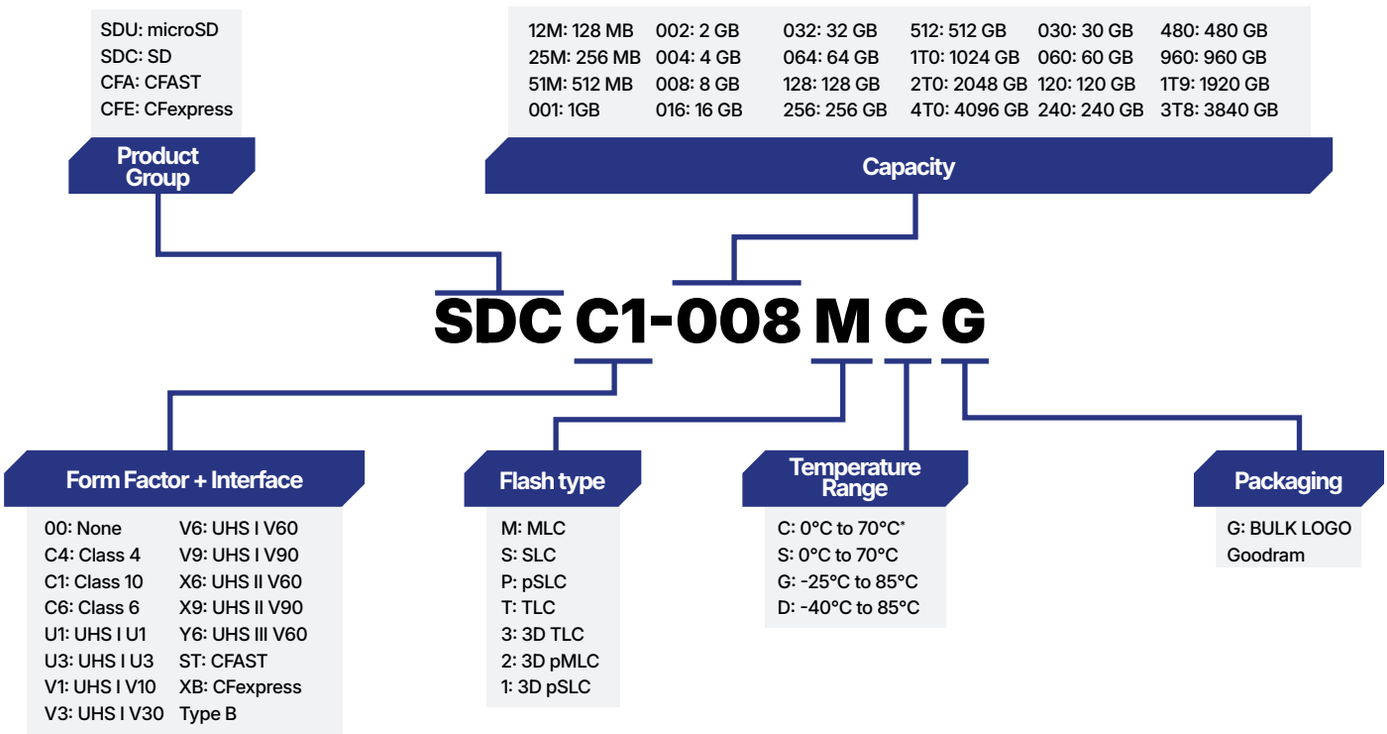
	DDR1 Memory Modules	
Module type	UDIMM	SODIMM
Capacity	128 MB – 1 GB	128 MB – 1 GB
Data Rate	200 MT/s, 266 MT/s, 333 MT/s, 400 MT/s	200 MT/s, 266 MT/s, 333 MT/s, 400 MT/s
Number of pins	184-pin	144-pin
Width	64 Bits	
Voltage	2.5 V	
PCB Height	29.5 mm	31.75 mm
Operating temperature (°C)	0 – 70	
Fixed Bill of Material	*	*
EOL, PCN notification	Yes	Yes
Conformal Coating	*	*

*optional

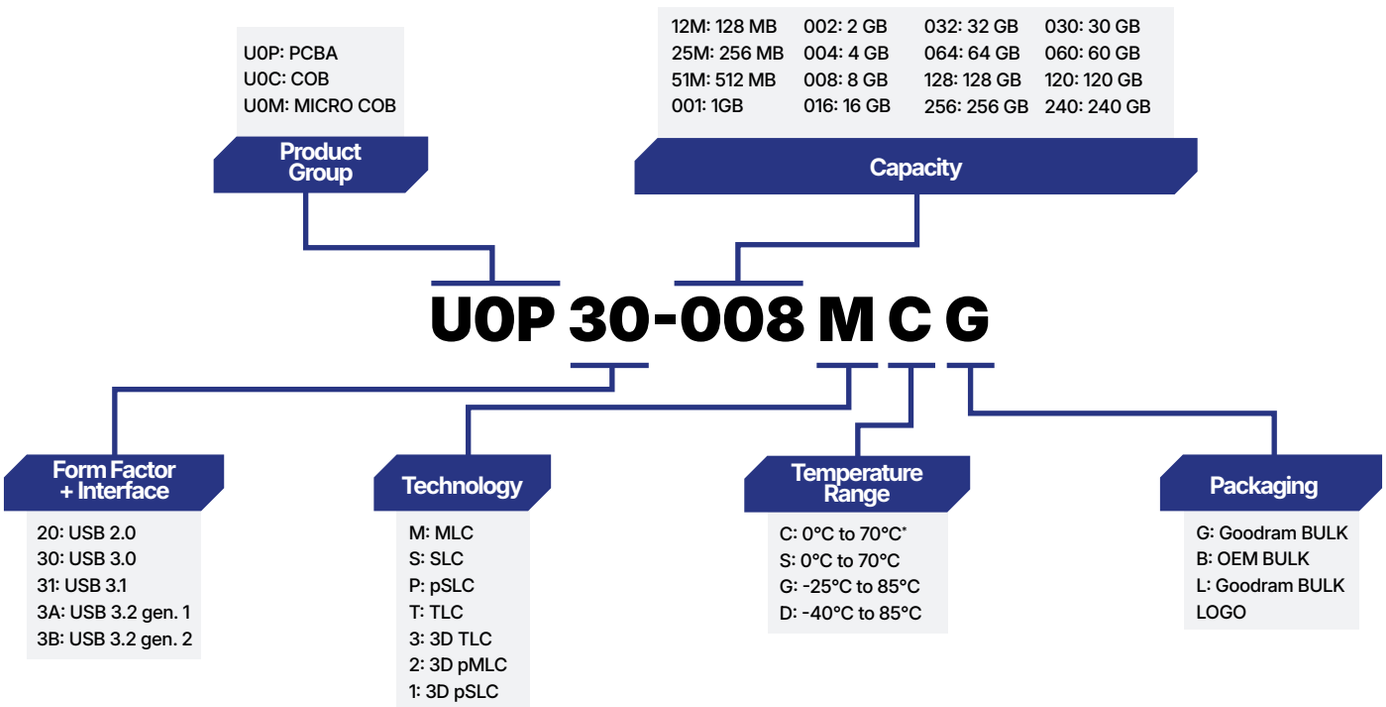
Part number decoder

Flash Memory (Memory Cards)

(SD, microSD, CFast, CFexpress)



USB Flash Drive

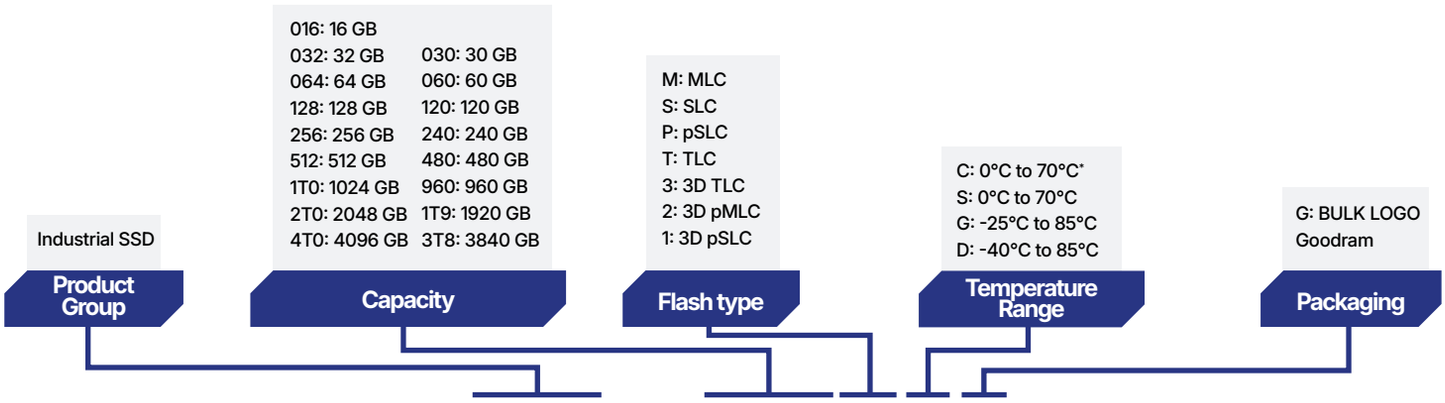


Carbon grade available upon request

Part number decoder

Flash Memory (SSD)

(2,5" SATA, mSATA, M.2 SATA, M.2 PCIe)



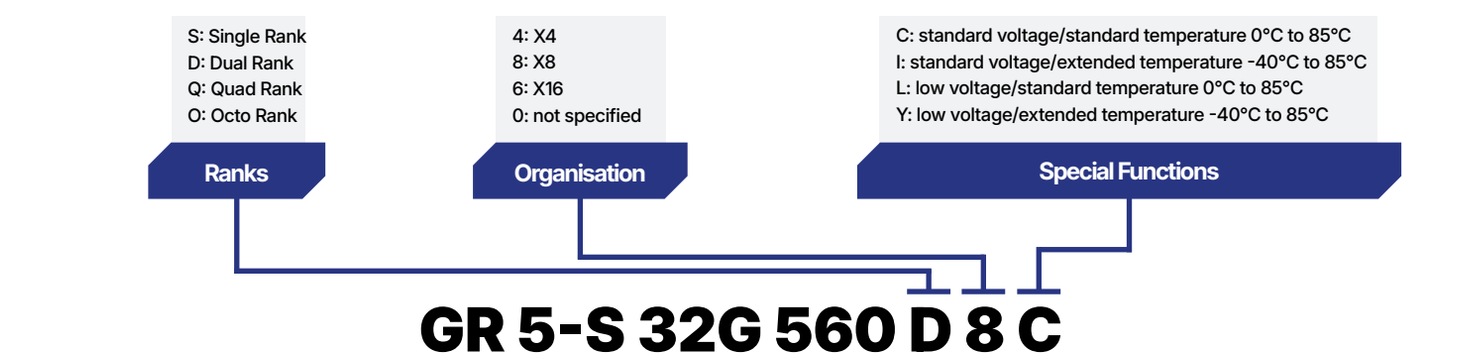
Form Factor + Interface

10: 2.5" SATA 7mm SSD*	83: M.2 PCIe NVMe gen3 ×2 2230	93: M.2 PCIe NVMe gen3 ×4 2230	A3: M.2 PCIe NVMe gen4 ×4 2230
40: mSATA	84: M.2 PCIe NVMe gen3 ×2 2240	94: M.2 PCIe NVMe gen3 ×4 2240	A4: M.2 PCIe NVMe gen4 ×4 2240
73: M.2 SATA 2230	86: M.2 PCIe NVMe gen3 ×2 2260	96: M.2 PCIe NVMe gen3 ×4 2260	A6: M.2 PCIe NVMe gen4 ×4 2260
74: M.2 SATA 2242	88: M.2 PCIe NVMe gen3 ×2 2280	98: M.2 PCIe NVMe gen3 ×4 2280	A8: M.2 PCIe NVMe gen4 ×4 2280
76: M.2 SATA 2260	81: M.2 PCIe NVMe gen3 ×2 22110	91: M.2 PCIe NVMe gen3 ×4 22110	A1: M.2 PCIe NVMe gen4 ×4 22110
78: M.2 SATA 2280			
71: M.2 SATA 22110			

*VLP - 1.8" available upon special request

DRAM Memory

(UDIMM, SODIMM)



Prefix

GR: Goodram

Technology

1: DDR SDRAM
2: DDR2 SDRAM
3: DDR3 SDRAM
4: DDR4 SDRAM
5: DDR5 SDRAM

Module Type

D: DIMM
E: DIMM with ECC
R: Registered
V: ECC VLP*
U: DIMM VLP*
L: LRDIMM
S: SO-DIMM
A: SO-DIMM ECC

Capacity

128: 128 GB
256: 256 GB
512: 512 GB
1G: 1GB
2G: 2GB
4G: 4GB
8G: 8GB
16G: 16GB
32G: 32GB
64G: 64GB

Speed Performance

333: DDR1 333	213: DDR4 2133
400: DDR1 400	240: DDR4 2400
667: DDR2 667	266: DDR4 2666
800: DDR2 800	293: DDR4 2933
106: DDR3 1066	320: DDR4 3200
133: DDR3 1333	480: DDR5 4800
160: DDR3 1600	560: DDR5 5600
186: DDR3 1866	640: DDR5 6400

*VLP - Very Low Profile

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