

DDR4 SO-DIMM — Technical Specification

Seller Edition | Core specifications, speed grade guide, rank and capacity reference, compatibility, packaging and aftersales notes

Version 1.0 | Date: 2026-09-24 | Applies to: 260-pin DDR4 unbuffered SO-DIMM, 4 GB to 32 GB, DDR4-2133 to DDR4-3200

Note: Values marked with ★ must be confirmed against the actual product and measured data and replaced with your factory figures before shipping. Timing, current and temperature figures are JEDEC reference values for this product class, not per-unit guaranteed values. Achieved speed depends on the platform, the memory controller, the BIOS setting and the number of modules installed; a DDR4-3200 module will run at 2933, 2666 or lower if the host system does not support the higher bin.

1. Product Overview

This product is a 260-pin DDR4 unbuffered SO-DIMM memory module for laptops, mini PCs, all-in-one computers and compact embedded systems. It follows the JEDEC DDR4 SDRAM standard (JESD79-4) and the 260-pin SO-DIMM module outline (MO-310), and is backward compatible with lower DDR4 speed bins: a DDR4-3200 module will negotiate down to DDR4-2933, 2666, 2400 or 2133 on platforms that do not support 3200 MT/s.

- **Key selling points:** plug-and-play upgrade with no soldering, 1.2 V low-voltage operation, up to 25.6 GB/s peak bandwidth per channel at DDR4-3200, 30 µin hard-gold contacts for reliable mating, JEDEC-standard SPD programmed on a 512-byte EEPROM
- **Positioning:** mainstream value-to-mid range upgrade memory, balancing price, capacity and compatibility
- **Typical applications:** laptop and notebook upgrades, mini PC and NUC upgrades, all-in-one and POS terminals, industrial and embedded computing, mobile workstations (ECC variant)

2. Core Specifications

Item	Specification	Notes
Product name	DDR4 SO-DIMM	260-pin unbuffered memory module
Memory type	DDR4 SDRAM, unbuffered (UDIMM)	Non-ECC standard; ECC variant on request
Form factor standard	JEDEC MO-310, 260-pin SO-DIMM	Not interchangeable with DDR3 (204-pin) or DDR5 (262-pin) SO-DIMM
Pin count	260 pins, 0.5 mm contact pitch	Gold-plated contacts
Speed grades	2133 / 2400 / 2666 / 2933 / 3200 MT/s ★	Higher bins (3600+) on request with XMP
Module naming	PC4-17000 / 19200 / 21300 / 23400 / 25600	See section 3 for the naming map
Capacities	4 / 8 / 16 / 32 GB per module ★	64 GB module only with 32 Gb dies, availability to be confirmed
Kit options	Single module, 2 × kits, dual-channel matched kits ★	State whether the kit is factory matched
Rank and organisation	1Rx16, 1Rx8, 2Rx8 ★	See section 4
Data width	64-bit non-ECC (72-bit with ECC)	Single 64-bit channel per module
CAS latency	CL15 / CL17 / CL19 / CL21 / CL22	Matches the JEDEC standard bin
Supply voltage, VDD	1.2 V nominal (1.14 V to 1.26 V)	VDDQ follows VDD
Supply voltage, VPP	2.5 V nominal (2.375 V to 2.75 V)	Word line boost supply
SPD supply, VDDSPD	2.2 V to 3.6 V ★	Typically 3.3 V from the host
Module dimensions	69.6 ± 0.15 mm × 30.0 ± 0.15 mm ★	Length × height, bare PCB
Module thickness	3.7 mm max ★	At the tallest component
PCB thickness	1.0 mm ★	Confirm final board stack-up with your factory
Contact plating	30 µin (0.76 µm) hard gold ★	3 µin economy option available
SPD EEPROM	512-byte class, JEDEC EE1004 / TSE2004av	Organised as 2 × 256-byte pages

Item	Specification	Notes
Thermal sensor	Optional on-module TS ★	Required for extended temperature grades
Operating temperature	TC = 0 °C to +85 °C ★	85 °C to 95 °C only with 2× refresh rate
Storage temperature	-55 °C to +100 °C ★	
Operating humidity	10% – 90% RH (non-condensing)	
Module power	Idle approx. 0.5 W, active approx. 3 W ★	Per module, platform dependent
Typical lifespan	No wear-out mechanism (no write cycles limit)	Unlimited erase/write cycles, DRAM architecture
Warranty	12 months (36 months or lifetime option) ★	Confirm the wording you actually offer

3. Speed, Bandwidth and Naming Reference

The JEDEC naming convention encodes both the speed bin and the standard latency. Buyers frequently confuse the MHz figure with the PC4 number, so include both in the listing.

Speed grade	JEDEC suffix	Standard CL	Clock period tCK	Peak bandwidth per channel	PC4 name
DDR4-2133	-2133P	CL15	0.9375 ns	17,066 MB/s	PC4-17000
DDR4-2400	-2400T	CL17	0.833 ns	19,200 MB/s	PC4-19200
DDR4-2666	-2666V	CL19	0.750 ns	21,333 MB/s	PC4-21300
DDR4-2933	-2933Y	CL21	0.682 ns	23,466 MB/s	PC4-23400
DDR4-3200	-3200AA	CL22	0.625 ns	25,600 MB/s	PC4-25600

Sales note: bandwidth is quoted per channel. Two modules in dual-channel mode double the usable bandwidth, but only if the platform and the CPU actually support two channels — a single module in a dual-channel laptop runs single-channel regardless of its speed grade.

Gaming and enthusiast bins	Tested latency	Tested voltage	Notes
DDR4-3600	CL18 / CL19 / CL20 ★	1.35 V ★	Requires XMP support on the platform
DDR4-4000	CL19 / CL20 ★	1.35 V ★	Not every laptop BIOS exposes XMP
DDR4-3200 CL16	CL16-18-18-38 ★	1.35 V ★	XMP profile; default JEDEC bin remains CL22

Sales note: bins above DDR4-3200 are overclock profiles, not JEDEC standard. On a laptop whose BIOS hides XMP, the module will fall back to the default JEDEC bin. Never advertise "3600 MHz" without stating the XMP requirement.

4. Capacity, Rank and Organisation

Rank and organisation determine both price and, in some cases, achievable speed. This table can be used directly in customer service replies.

Capacity	Organisation	Rank	DRAM devices	Notes
4 GB	1Rx16	Single	4 × x16	Entry level; x16 devices have 8 banks and slightly lower efficiency
8 GB	1Rx8	Single	8 × x8	Best-selling entry capacity, full 16-bank interleaving
8 GB	1Rx16	Single	4 × x16	Lower-cost alternative to 1Rx8
16 GB	2Rx8	Dual	16 × x8	Best-selling capacity for dual-rank capable platforms
16 GB	1Rx8	Single	8 × x8	Built on 16 Gb dies; the lowest-power 16 GB option
32 GB	2Rx8	Dual	16 × x8	Built on 16 Gb dies; the standard 32 GB build
32 GB	1Rx8 ★	Single	8 × x8	Built on 32 Gb dies; availability varies by die supply
64 GB ★	2Rx8 ★	Dual	16 × x8	Built on 32 Gb dies; confirm platform support before selling

Related variants	Interface	Data width	Notes
Non-ECC SO-DIMM	260-pin	64-bit	Standard consumer and commercial laptops
ECC SO-DIMM	260-pin ★	72-bit	Mobile workstations and entry servers; requires ECC-capable platform
U-DIMM (desktop)	288-pin	64-bit	Different form factor — never mix in one listing

Sales note: rank matters to buyers more than it used to. On some older or low-end platforms a dual-rank (2Rx8) module runs at a lower speed than a single-rank module of the same bin, and some 3rd-generation Intel mobile platforms cap total rank count. Ask the buyer for the exact laptop model before recommending 32 GB dual-rank parts.

5. Electrical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Supply voltage	VDD / VDDQ	1.14	1.20	1.26	V	VDDQ tracks VDD
Word line supply	VPP	2.375	2.50	2.75	V	Separate 2.5 V rail
SPD supply	VDDSPD	2.2	3.3 ★	3.6	V	Host supplied
Input high voltage, command	VIH	0.85	–	–	V	Referenced to VDD
Input low voltage, command	VIL	–	–	0.15	V	Referenced to VDD
Termination resistance	RZQ	240	240	240	Ω	ZQ calibration resistor on the PCB
Burst length	BL	8	–	8	–	BL8 or BC4 via MR0
Refresh interval	tREFI	–	7.8	–	μs	At TC ≤ 85 °C
Refresh interval, hot	tREFI	–	3.9	–	μs	2× refresh for 85 °C to 95 °C
Idle power	P(idle)	–	0.5 ★	–	W	Per module
Active power	P(active)	–	3.0 ★	–	W	Per module, workload dependent

Sales note: ECC memory only delivers error correction when the host platform and the CPU support it. An ECC SO-DIMM in a non-ECC laptop behaves as an ordinary module in most cases, but it will not detect errors. Always confirm platform support before selling ECC parts.

6. Mechanical and Pinout Reference

Item	Specification	Notes
Module outline	JEDEC MO-310	260-pin SO-DIMM
Length	69.6 ± 0.15 mm ★	
Height	30.0 ± 0.15 mm ★	Standard profile; 26.7 mm low-profile is not defined for 260-pin
Thickness	3.7 mm max ★	Measure the tallest device
Contact pitch	0.5 mm	Gold-plated fingers
Keyway	Single key, DDR4 SO-DIMM specific	Physically blocks DDR3 and DDR5 modules
Insertion cycles	25 mating cycles min ★	JEDEC reference; the slot is not a connector
Retention	Two side clips on the host socket	Module is inserted at approximately 25° to 30° then pressed down
PCB layers	8 or 10 layers ★	Higher layer counts are used for high-bin and dual-rank parts

Signal group	Signals (summary)	Notes
Data	DQ0 to DQ63, DQS0 to DQS7 (differential strobes), DM / DBI	64-bit channel, 8 bits per strobe group
Address and command	A[17:0], BA[1:0], BG[1:0], ACT_n, CS_n, CKE, ODT, CK_t / CK_c	4 bank groups × 4 banks for x4 / x8 devices

Signal group	Signals (summary)	Notes
Control	RESET_n, ALERT_n	Boundary scan and error alert
SPD interface	SCL, SDA	I ² C bus to the 512-byte EEPROM
Thermal	TS pins or an on-module sensor	Optional ★
Power and ground	VDD, VDDQ, VPP, VDDSPD, VSS	See section 5

7. SPD Programming and BIOS Interaction

The SPD EEPROM is what makes the module "visible" to the system. An incorrectly programmed SPD is the most common cause of a module that works but reports the wrong speed, or will not boot at all.

Item	Specification	Notes
EEPROM type	512-byte class, EE1004 / TSE2004av compatible	Accessed as 2 pages of 256 bytes
Interface	I ² C, up to 1 MHz	Address 0x50 / 0x51 (page select)
Contents	Capacity, organisation, timing, voltage, manufacturer ID, serial number	Programmed per JEDEC SPD annex
XMP profiles	Available on enthusiast parts ★	Two profiles; 1.35 V test voltage typical
Write protection	Software write protect enabled after programming ★	Prevents field corruption
Vendor ID	Your own JEDEC ID required ★	Required for OEM and brand supply
Serial numbering	Unique per module ★	Enables per-unit traceability
Thermal sensor	Optional, with an SPD-defined threshold ★	Required for the platform to read the module temperature and apply hot-temperature refresh

Sales note: for OEM and brand supply, confirm that your factory programs your own manufacturer ID and serial number into the SPD. Buyers and repair channels do read the SPD, and a copied module ID is an instant credibility problem.

8. Platform Compatibility

Platform	Support	Notes
Intel 6th to 10th generation Core mobile	Full ★	Skylake to Comet Lake, DDR4 SO-DIMM standard
Intel 11th to 14th generation Core mobile	Full ★	Some 11th generation parts also appear with DDR4 and LPDDR4X variants
Intel Alder Lake / Raptor Lake desktop (SO-DIMM boards)	Partial ★	Requires a DDR4 SO-DIMM motherboard variant
AMD Ryzen mobile (Zen to Zen 4)	Full ★	Confirm the socket generation, as AMD also shipped LPDDR4X soldered variants
AMD Ryzen desktop (AM4)	Partial ★	Requires DDR4; AM5 is DDR5 only
Mini PC / NUC / industrial SBC	Variable	Confirm the SODIMM variant and channel count with the vendor
Apple Intel Macs with SO-DIMM slots	Limited ★	Soldered on most models after 2015 — verify per model
DDR3 or DDR5 platforms	Not supported	Different pin count, key and voltage

Sales note: DDR4 and DDR5 are not interchangeable, and neither is DDR3. The most frequent return reason in this category is a buyer ordering DDR4 for a DDR5 laptop (or the reverse). Put the socket generation in the first listing image.

9. Reliability and Quality Testing

Test	Specification	Notes
100% functional test	Full-capacity write and read at the rated bin ★	Per module before packing

Test	Specification	Notes
Burn-in	4 to 12 hours at elevated temperature ★	Confirm your factory's standard
Error check	Pattern and address-inverse test ★	ECC parts additionally checked with error injection
Thermal cycling	-40 °C to +85 °C, 100 cycles ★	Tray level
Solder joint inspection	100% AOI, X-ray on BGA samples ★	DRAM packages are BGA
Anti-sulfuration	Available ★	Recommended for industrial and long-life applications
ESD control	ANSI/ESD S20.20 handling ★	Modules ship in an anti-static bag
RoHS / REACH	Compliant ★	Keep the report current
Removed parts	None	Do not mix recycled dies into new modules

10. Packaging and Shipping

Item	Specification	Notes
Retail packaging	Colour-printed box with an anti-static clamshell ★	Custom artwork on request
Bulk packaging	Anti-static tray or ESD bag, non-retail ★	OEM and channel supply
Anti-static bag	Metallised shielding bag ★	Required for air freight
Inner box	20 pcs ★	
Master carton	200 pcs ★	Confirm with your factory
Carton dimensions	Approx. 42 × 30 × 24 cm ★	
Gross weight	Approx. 6 kg ★	
Modules per kit	1 or 2, matched before packing ★	
MOQ	500 pcs ★	Custom SPD, artwork and capacity mixes negotiated separately
Lead time	15 to 25 days ★	Longer for high bins, ECC parts and custom SPD
Barcode	EAN-13 or customer-specific	Barcode file required in advance
Moisture sensitivity	Not moisture sensitive	But avoid condensation during transport

Sales note: memory is a small, high-value item and a common theft and swap target. Use sealed anti-static packaging with a tamper-evident label, and photograph the SPD serial number before shipping for dispute protection.

11. Certifications and Compliance

Certification	Status	Notes
CE	Available ★	EU market
FCC	Available ★	US market
RoHS	Available ★	Restricted hazardous substances
REACH	Available ★	EU chemicals regulation
UKCA	Available on request ★	UK market
WEEE / packaging directive	Available on request ★	EU and German market
JEDEC compliance statement	Available ★	Declare JESD79-4 and MO-310
Anti-sulfuration report	Available ★	Industrial grades
Conflict minerals declaration	Available ★	Requested by larger buyers
Test report	Available ★	Issued by a CNAS-accredited laboratory

12. Frequently Asked Questions

1. My module is DDR4-3200 but the system reports 2666 MHz. Is it faulty?

No. DDR4 operates at the highest common speed between the module SPD and the platform. If the CPU or chipset only supports DDR4-2666, the module will run at 2666. Check the platform specification before treating it as a fault.

2. The laptop will not boot after installation.

Re-seat the module: fully insert at an angle until the gold fingers disappear, then press down until both side clips click. If it still does not boot, test the module alone in slot 1, then reset BIOS defaults. On some platforms a first boot with new memory takes 30 to 60 seconds while the memory is retrained — do not power off during this period.

3. Can I mix this module with the one already installed?

Mixing capacities is supported on most platforms, and the system will run the pair in flex mode. Mixing different speed bins, ranks or voltages is not recommended: the pair will fall back to the slower bin and, on some platforms, may not boot at all. For guaranteed dual-channel operation, sell a factory-matched kit.

4. What is the difference between 1Rx8 and 2Rx8?

1Rx8 (single rank) has 8 DRAM devices addressed as one rank; 2Rx8 (dual rank) has 16 devices addressed as two ranks. Dual rank can offer slightly higher effective bandwidth on some platforms, while single rank is generally easier on older memory controllers and consumes less power. Both are 64-bit modules.

5. Why is 4 GB sometimes slower than expected?

A 4 GB module is usually built as 1Rx16 on four x16 devices. x16 devices have 8 banks instead of 16, which reduces bank-level parallelism and can cost a few percent of real-world performance. This is a design characteristic, not a defect.

6. The stated capacity is larger than what Windows shows.

Memory is never fully available to the operating system: the BIOS, integrated graphics, and the memory reserved for the platform reduce the usable figure. A 16 GB module typically shows about 15.6 to 15.8 GB usable. This is normal and is not short capacity.

7. Do I need ECC memory?

ECC detects and corrects single-bit errors and is required for mobile workstations and servers. Consumer laptops do not support ECC, so an ECC module will not provide error correction there. Confirm the platform before selling or recommending ECC parts.

8. Does the module need a heatsink?

No. DDR4 SO-DIMM modules at 1.2 V run cool under normal conditions and are cooled by the laptop chassis airflow. A heatsink is only meaningful for overclocked or high-bin modules in poorly ventilated systems, and on most laptops a heatsink will simply not fit.

9. What does the warranty cover?

Failures under normal use within the warranty period: modules that fail to POST, produce repeated errors under test, or fail a memory diagnostic. Physical damage, burnt contacts from reverse insertion, liquid damage, damage from an unstable overclock, and modules returned with the serial label removed are not covered.

13. Handling, Installation and Care

- Discharge static before handling: touch a grounded metal object or wear an anti-static wrist strap
- Hold the module by the edges; never touch the gold contacts with bare fingers
- Disconnect the battery or unplug the power adapter before opening the service panel
- Insert at approximately 25° to 30°, then press down until both clips click into place
- Never force the module — the DDR4 SO-DIMM keyway is offset and an inverted fit will not seat
- Keep the module in the anti-static bag when not installed; long-term storage at 10 °C to 30 °C is recommended
- Run a memory diagnostic after installation and note the result on the packing slip
- Do not clean the contacts with abrasive material; a clean pencil eraser or isopropyl alcohol is acceptable
- When returning under warranty, include the original packaging and the serial number label

Disclaimer: The specifications in this document are reference values for the mainstream product class and follow the JEDEC DDR4 SDRAM standard (JESD79-4) and the 260-pin SO-DIMM module outline (MO-310). Items marked with ★ must be verified against the actual product and measured data. Achieved speed, latency and power consumption are affected by the host platform, memory controller, BIOS setting, module count, ambient temperature and workload, and actual results may vary. This document is provided for sales and product selection reference only and does not constitute a product quality commitment or a legally binding offer.