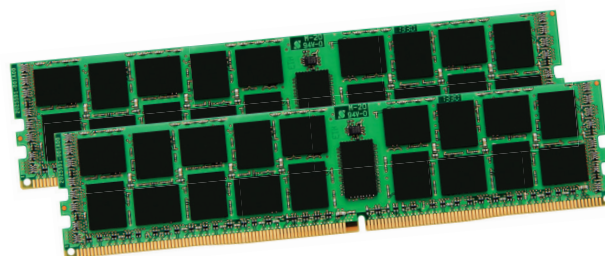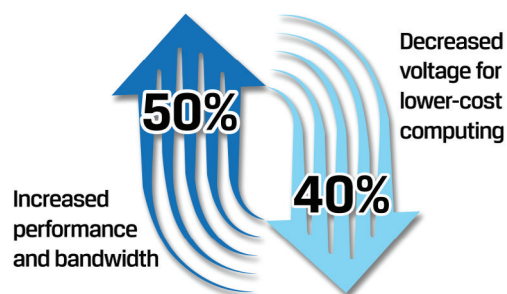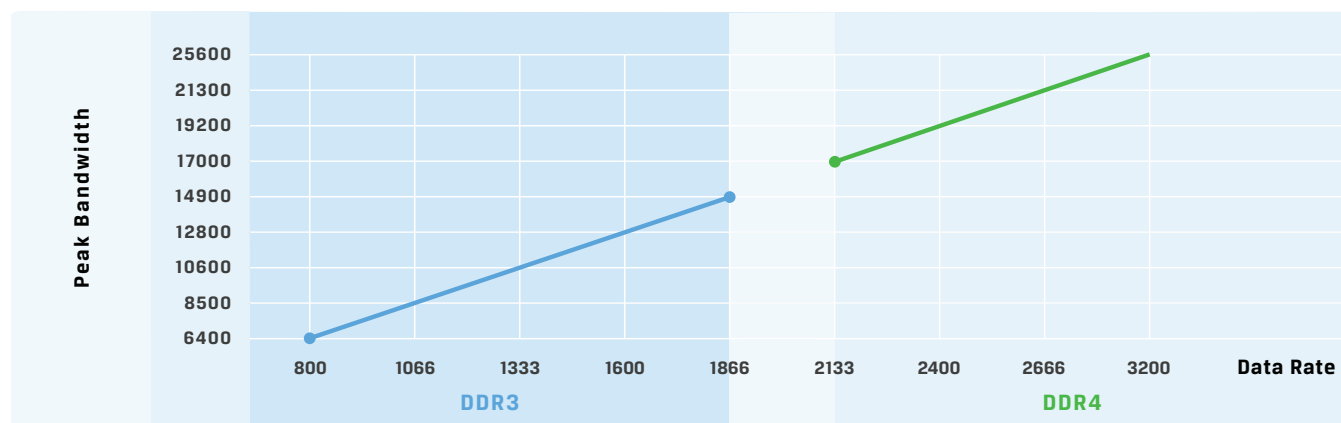# DDR4 Overview

With DDR3 reaching its limits in a world that demands higher performance and increased bandwidth, a new generation of DDR SDRAM has arrived. DDR4 delivers higher performance, higher DIMM capacities, improved data integrity and lower power consumption.

Achieving more than 2Gbps per pin and consuming less power than DDR3L (DDR3 Low Voltage), DDR4 provides up to 50 percent increased performance and bandwidth while decreasing the power consumption of your overall computing environment. This represents a significant improvement over previous memory technologies and a power savings up to 40 percent.

In addition to optimized performance and greener, low-cost computing, DDR4 also provides cyclic redundancy checks (CRC) for improved data reliability, on-chip parity detection for integrity verification of 'command and address' transfers over a link, enhanced signal integrity and other robust RAS features.

50% Increased performance and bandwidth

Decreased voltage for lower-cost computing **40%**

Technology at a Glance

Peak Bandwidth	Data Rate
25600	
21300	
19200	
17000	
14900	
12800	
10600	
8500	
6400	

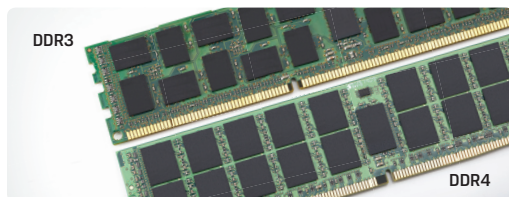Data Rate: 800, 1066, 1333, 1600, 1866 — DDR3
2133, 2400, 2666, 3200 — DDR4

DDR4 Details

Please note that there are subtle differences between DDR3 and DDR4 modules.

Key notch difference

The key notch on a DDR4 module is in a different location from the key notch on a DDR3 module. Both notches are located on the insertion edge but the notch location on the DDR4 is slightly different, to prevent the module from being installed into an incompatible board or platform.

Increased thickness
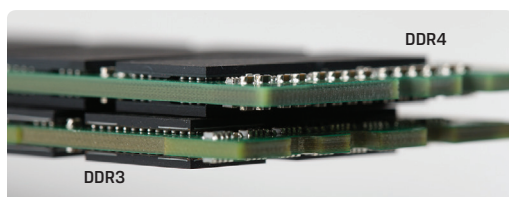
DDR4 modules are slightly thicker than DDR3, to accommodate more signal layers.

Curved edge
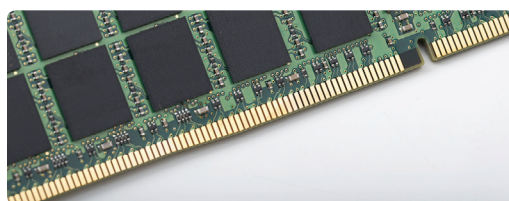
DDR4 modules feature a curved edge to help with insertion and alleviate stress on the PCB during memory installation.

Specifications at a Glance

Description	DDR3	DDR4	Advantage
Chip Densities	512Mb – 8Mb	4Gb – 16Gb	Larger DIMM Capacities
Data Rates	800Mb/s – 2133Mb/s	1600Mb/s – 3200Mb/s	Migration to Higher-Speed I/O
Voltage	1.5V	1.2V	Reduced Memory Power Demand
Low Voltage Standard	Yes (DDR3 at 1.35V)	Anticipated at 1.05V	Memory Power Reductions
Internal Banks	8	16	More Banks
Bank Groups (BG)	0	4	Faster Burst Accesses
VREF Inputs	2 – DQs and CMD/ADDR	1 – CMD/ADDR	VREFDQ Now Internal
tCK – DLL Enabled	300MHz – 800MHz	667MHz – 1.6GHz	Higher Data Rates
tCK – DLL Disabled	10MHz – 125MHz (optional)	Undefined to 125MHz	DLL-off Now fully supported
Read Latency	AL + CL	AL + CL	Expanded Values
Write Latency	AL + CWL	AL + CWL	Expanded Values
DQ Driver (ALT)	40Ω	48 Ω	Optimal for PtP Applications
DQ Bus	SSTL15	POD12	Less I/O Noise and Power
RTT Values (in Ω)	120, 60, 40, 30, 20	240, 120, 80, 60, 48, 40, 34	Support for Higher Data Rates
RTT Not Allowed	READ Bursts	Disables During Read Bursts	Ease of Use
ODT Modes	Nominal, Dynamic	Nominal, Dynamic, Park	Add'l Control Mode; OTF Value Change
ODT Control	ODT Signaling Required	ODT Signaling NOT Required	Ease of ODT Control; Allows Non-ODT Routing, PtP Apps
Multi-Purpose Register	Four Registers – 1 Defined, 3 RFU	Four Registers – 3 Defined, 1 RFU	Provides Additional Specialty Readout
DIMM Types	RDIMM, LRDIMM, UDIMM, SODIMM	RDIMM, LRDIMM, UDIMM/ SODIMM	
DIMM Pins	240 (R, LR, U); 204 (SODIMM)	288 (R, LR, U); 260 (SODIMM)	
RAS	ECC	CRC, Parity, Addressability, GDM	More RAS Features, Improved Data Integrity

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