# 16Gbit DRAM Cheat Sheet

At the beginning of Q4 2019, DRAM semiconductor suppliers started introducing the next generation high density DRAM for DDR4. This means that DRAM is transitioning from 8Gbit to 16Gbit technology.

Based on new wafer lithography (below 20nm), these new components;

☐ Double the RAM density available
☐ Allow higher capacity memory modules to be created
☐ Provide lower power usage (per Gigabyte)

DRAM differences between Gbit and GB:

Gbit (Gigabit)
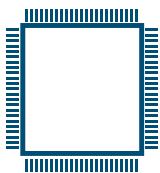
This measures the density of the chip within a DRAM module

1 bit is the smallest unit of data on a Chip.

A 8Gbit chip contains 8192 Million bits.

GB (Gigabyte)

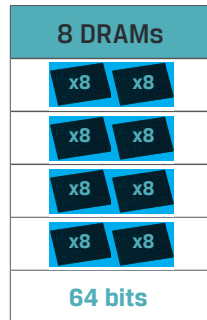This is the capacity of the DRAM module

1GB = 8Gbit

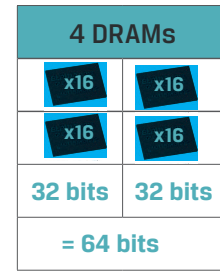# How we can build the same capacity with different density chips

4GB DRAM (512x8) in 2 Ranks

16 DRAMs			
x8	x8	x8	x8
x8	x8	x8	x8
x8	x8	x8	x8
x8	x8	x8	x8
64 bits		64 bits	

8GB DRAM (1024x8) in 1 Rank

8 DRAMs	
x8	x8
x8	x8
x8	x8
x8	x8
64 bits	

16GB DRAM (1024x16) in 1 Rank

4 DRAMs	
x16	x16
x16	x16
32 bits	32 bits
= 64 bits	

Module Types with 16Gbit DRAM

- ☐ 8GB Unbuffered DIMM / SODIMM (1Rx16)
- ☐ 16GB Unbuffered DIMM / SODIMM (1Rx8)
- ☐ 32GB Unbuffered DIMM / SODIMM (2Rx8)
- ☐ 16GB ECC Unbuffered DIMM / SODIMM (1Rx8)
- ☐ 32GB ECC Unbuffered DIMM / SODIMM (2Rx8)
- ☐ 16GB ECC Registered DIMM (1Rx8)
- ☐ 32GB ECC Registered DIMM (2Rx8)
- ☐ 32GB ECC Registered DIMM (1Rx4)
- ☐ 64GB ECC Registered DIMM (2Rx4)

Whilst this transition provides many benefits to server and computing power, not all platforms are supported with this new technology, so here is a guide to the key things to remember:

Intel

Server	Speed	16Gbit
2020 Intel Server Platform	3200	Yes
Purley w/ Cascade Lake (Xeon x2xx Series)	2933	Yes
Purley w/ Skylake (Xeon x1xx Series)	2666	No

High end-Desktop / Workstation	Speed	16Gbit
Cascade Lake-X (X299X / C621)	2933	Yes
Skylake-X (X299)	2666	No

Client (Desktop / Mobile)	Speed	16Gbit
Next Gen 2020 Intel Desktop/Mobile	3200	Yes
Comet-Lake-S / Whiskey Lake-U	2933	Yes
Coffee Lake-S (300 Series)	2666	Yes
Coffee Lake-S / Kabylake-S (200 Series)	2400	*
Skylake-S / Kabylake-S (100 Series)	2133	No

* BIOS/MRC patch available, but not validated by Intel. As a result, it is up to those that implement them to fully validate their own design. The risk is the sole responsibility of the ODM/OEM.

AMD

Server	Speed	16Gbit
EPYC 7xx2 Series (ROME)	3200	Yes
EPYC 7xx1 Series (NAPLES)	2666	Yes

High end-Desktop / Workstation	Speed	16Gbit
Ryzen Threadripper "3900" Series TRX40/80, WRX80 (Castle Peak)	3200	Yes
Ryzen Threadripper 2900 Series X399 (Colfax)	2666	Yes
Ryzen Threadripper 1900 Series X399 (Whitehaven)	2666	Yes

Desktop	Speed	16Gbit
Ryzen 3rd Gen (Matisse) X570	3200	Yes
Ryzen 2nd Gen (Pinnacle Ridge) X470	2666	Yes
Ryzen 1st Gen (Summit Ridge) X370	2400	Yes
Ryzen 1st Gen (Raven Ridge) X370	2400	Yes

Mobile	Speed	16Gbit
Ryzen 3rd Gen Mobile (TBA)	3200	Yes
Ryzen 2nd Gen (Picasso)	2666	Yes
Ryzen 1st Gen (Raven Ridge)	2400	Yes

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*Information is correct as of July 2020 and is subject to change