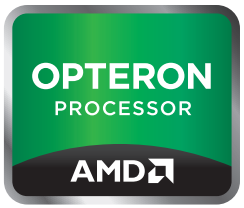
AMD Opteron™ 6200 Series Processor Quick Reference Guide

The world's first 16-core x86 processor, delivering a rich mix of performance, scalability and efficiency for today's highly threaded computing environments[1].

AMD Opteron™ 6200 Series Processor



KEY FEATURES

- **New Core Architecture** — drives more core density[1] and greater throughput[2]
- **AMD Turbo CORE Technology** — allows processors to independently boost their clock speeds, scaling frequency up 500MHz-1GHz+ automatically to respond to the need for more application performance[3]
- **Flex FP** — delivers 256-bit floating point processing with more throughput for both 128-bit and 256-bit technical applications[4]
- **AMD Virtualization™ (AMD-V™) Technology 2.0** — heightens virtualization efficiency with new enhancements to the AMD-V™ suite of virtualization to optimize data center rack space and help minimize management tasks

END USER BENEFITS

Unleash unprecedented performance of highly threaded applications through massive, industry-leading core density

- A new 16-core architecture for the next generation of scalable business critical applications, featuring an innovative design that drives more core density and greater throughput with up to 160% more cores than the competition[5]
- The modular design features up to 33% more cores[6] and greater throughput[7] in a smaller silicon footprint[8] than AMD's current products, bringing high performance throughput for scalable computing environments like virtualization, HPC, web/cloud clusters and database applications
- Performance features designed for leadership across threaded workloads and price/performance leadership across even more workloads
- Straight-through computing helps ensure that there are no bottlenecks or compromises — when the workload grows up to 16 tasks each has their own dedicated core, with maximum memory and I/O speed available on every processor SKU regardless of the price

Today's highly threaded applications demand more scalability and the AMD Opteron™ 6000 Series platform delivers the most cores in the industry[5]

- As user loads increase for web/cloud, database applications or virtualized environments, AMD Opteron™ 6200 Series processors can continue to seamlessly handle growing workloads and allow balanced scaling up to 16 cores per processor.
- Straight-through computing ensures the memory and I/O architecture supports the power of more cores.
- Break HPC barriers with the ability to scale to higher core counts with fewer nodes[9].

Bring unparalleled efficiency to your processing, power and financial budgets

- Optimize data center floor space and power requirements with up to 16 cores, dramatically boosting processing efficiency[10] allowing enterprises to do more work with fewer systems.[11]
- Straight-through computing capability gives compute-intensive applications like database, HPC and Java dedicated processing resources.
- New instructions help streamline software development by minimizing code differences between platforms and help more efficiently process applications, especially media encoding and streaming, that utilizes complex SSE codes.

1 Comparison of 16-core AMD Opteron™ 6200 Series processor with 8-core Intel Xeon E5-2600 Series processor and 10-core Intel Xeon E7 Series processors according to www.intc.com/pricelist.cfm as of 4/12/12. SVR-30

2 TPC and TPC-C are trademarks of the Transaction Processing Performance Council. The results stated above reflect results published on http://www.tpc.org as of November 28, 2011. The comparison presented above is based on the best performing two-socket servers using AMD Opteron™ processor Models 6282 SE and 6176 SE, operating at each processor's default frequency. For the latest TPC-C results, visit http://www.tpc.org. Performance (tpmc) = 1,207,982, 2 x AMD Opteron™ processors Model 6282 SE: http://www.tpc.org/tpcc/results/tpcc_result_detail.asp?id=111111501. Performance (tpmc) = 705,652, 2 x AMD Opteron™ processors Model 6176 SE: http://www.tpc.org/tpcc/results/tpcc_result_detail.asp?id=110040801. SVR-16

3 AMD Opteron 6200 Series processors experience all core boost of up to 500 MHz (P2 base to P1 boost state) and up to 1.3 GHz max turbo boost (half or fewer cores boost from P2 to P0 boost state). SVR-27

4 Based on two 2.7 GHz AMD Opteron 6200 Series processors, each with 16 128-bit FPUs each able to handle 4 instructions per cycle or 8 256-bit Flex FP units handling 8 instructions per cycle. SVR-29

5 Comparison of 16-core AMD Opteron™ 6200 Series processor with 8-core Intel Xeon E5-2600 Series processor and 10-core Intel Xeon E7 Series processors according to www.intc.com/pricelist.cfm as of 4/12/12. SVR-30

6 Comparison of 12-core AMD Opteron 6100 Series processors and 16-core AMD Opteron 6200 Series processors. SVR-5

7 TPC and TPC-C are trademarks of the Transaction Processing Performance Council. The results stated above reflect results published on http://www.tpc.org as of November 28, 2011. The comparison presented above is based on the best performing two-socket servers using AMD Opteron™ processor Models 6282 SE and 6176 SE, operating at each processor's default frequency. For the latest TPC-C results, visit http://www.tpc.org. Performance (tpmc) = 1,207,982, 2 x AMD Opteron™ processors Model 6282 SE: http://www.tpc.org/tpcc/results/tpcc_result_detail.asp?id=111111501. Performance (tpmc) = 705,652, 2 x AMD Opteron™ processors Model 6176 SE: http://www.tpc.org/tpcc/results/tpcc_result_detail.asp?id=110040801. SVR-16

8 Based on AMD Opteron 6100 Series processor at 2x 346 mm^2 vs. AMD Opteron 6200 Series processor at 2x 316mm^2. SVR-36

9 Twelve 2P servers with AMD Opteron 6176 SE @ 2.3 GHz offer 2650 GFLOPs total performance. Nine 2P servers with AMD Opteron 6276 @ 2.3 GHz offer 2650 GFLOPs for the same amount of total processing power in 25% fewer servers. SVR-35

10 According to AMD internal engineering estimates, the AMD Opteron™ 6200 Series processors will deliver up to 35% greater throughput in the same general power/thermal envelopes as AMD Opteron 6100 Series processors. SVR-34

11 Twelve 2P servers with AMD Opteron 6176 SE @ 2.3 GHz offer 2650 GFLOPs total performance. Nine 2P servers with AMD Opteron 6276 @ 2.3 GHz offer 2650 GFLOPs for the same amount of total processing power in 25% fewer servers. SVR-35

AMD

AMD Opteron™ 6200 Series Processor Quick Reference Guide

AMD Opteron™ 6200 Series Processor Product Specifications

Model Number	Core Count	Core Frequency	All Core Boost Frequency	AMD Turbo CORE Max Frequency	North Bridge	L2 Cache	L3 Cache	TDP
6284 SE*	16	2.7 GHz	3.1 GHz	3.4 GHz	2.0 GHz	8 x 2 MB	16 MB	140W
6282 SE	16	2.6 GHz	3.0 GHz	3.3 GHz	2.0 GHz	8 x 2 MB	16 MB	140W
6278*	16	2.4 GHz	2.7 GHz	3.3 GHz	2.0 GHz	8 x 2 MB	16 MB	115W
6276	16	2.3 GHz	2.6 GHz	3.2 GHz	2.0 GHz	8 x 2 MB	16 MB	115W
6274	16	2.2 GHz	2.5 GHz	3.1 GHz	2.0 GHz	8 x 2 MB	16 MB	115W
6272	12	2.1 GHz	2.4 GHz	3.0 GHz	2.0 GHz	8 x 2 MB	16 MB	115W
6262 HE	16	1.6 GHz	2.1 GHz	2.9 GHz	1.8 GHz	8 x 2 MB	16 MB	85W
6238	12	2.6 GHz	2.9 GHz	3.2 GHz	2.0 GHz	6 x 2 MB	16MB	115W
6234	12	2.4 GHz	2.7 GHz	3.0 GHz	2.0 GHz	6 x 2 MB	16 MB	115W
6220	8	3.0 GHz	3.3 GHz	3.6 GHz	2.0 GHz	4 x 2 MB	16 MB	115W
6212	8	2.6 GHz	2.9 GHz	3.2 GHz	2.0 GHz	4 x 2 MB	16 MB	115W
6204	4	2.3 GHz	N/A	N/A	2.0 GHz	2 x 2 MB	16 MB	115W

*New SKUs available with Speed Bump Launch 2012

AMD Opteron™ 6200 Series Processor Product Specifications

Cache Sizes	**Total Cache:** 32MB (16 core), 28MB (12 core), 24MB (8 core), 20 MB (4 core) **L1 Cache:** 16KB/core + 64KB instruction/module **L2 Cache:** 1MB (per core) **L3 Cache:** 16MB (per socket)
Process Technology	32-nanometer SOI (silicon-on-insulator) technology
HyperTransport™ Technology 3.0	4X HT3 links with peak bandwidth of 6.4 GT/s per link
Memory	Integrated DDR3 memory controller — Up to 102.4 GB/s memory bandwidth per CPU for Socket G34
Number of Channels/ Types of Memory	Quad Channel support for U/RDDR3 up to DDR3-1600 and ULV (1.25V) RDDR3 up to DDR3-1333 and LRDIMM up to DDR3-1333
Die Size	316mm^2
Packaging	Socket G34 — 1944-pin organic Land Grid Array (LGA)

AMD SR5650, SR5670, SR5690 I/O Hub Product Specifications

Model Number	Processor Interface	PCI Express®	Number of PCIe® Ports/ Engines	Virtualization	Error Detection/Isolation	Max TDP/ Idle (w/c1e)	Process Technology	Package
SR5650	HyperTransport™ 3.0 technology (5.2GT/s)	v2.0	22 lanes/ 8 engines	AMD-Vi (IOMMU 1.26)	HyperTransport error handling, PCIe® Advanced Error Reporting, PCIe® end-to-end Cycle Redundancy Check	12.6W/ 5.4W	TSMC 65nm	29 x 29mm FCBGA
SR5670	HyperTransport™ 3.0 technology (5.2GT/s)	v2.0	30 lanes/ 9 engines	AMD-Vi (IOMMU 1.26)	HyperTransport error handling, PCIe® Advanced Error Reporting, PCIe® end-to-end Cycle Redundancy Check	15.4W/ 5.75W	TSMC 65nm	29 x 29mm FCBGA
SR5690	HyperTransport™ 3.0 technology (5.2GT/s)	v2.0	42 lanes/ 11 engines	AMD-Vi (IOMMU 1.26)	HyperTransport error handling, PCIe® Advanced Error Reporting, PCIe® end-to-end Cycle Redundancy Check	18W/6.15W	TSMC 65nm	29 x 29mm FCBGA

AMD SP5100 Southbridge Product Specifications

USB Ports	12 USB 2.0 + 2 USB 1.1
PCI Bus Support	PCI rev 2.3
Serial ATA	AHCI 1.1 SATA 3.0Gb/s with SW RAID Support
SATA Ports	6 (can be independently disabled)
Max TDP/Idle	4W/1W
Process Technology	TSMC .13um
Package	528 ball FCBGA, 21x21mm, 0.8mm pitch

* Using HyperTransport™ technology
** ACP stands for Average CPU power. See www.amd.com/ACP

AMD