



Intel® Xeon® Processor E3-1200 Product Family Memory Configuration Guide

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Intel® Xeon® Processor E3-1200 Product Family Memory Configuration Guide

DIMM Slots per Channel	DIMMs Populated per Channel	DIMM Type	POR Speeds	Ranks per DIMM (any combination)	Supported Board Layer
2	1	Unbuffered DDR3 ECC	1066, 1333	SR, DR	4
2	2	Unbuffered DDR3 ECC	1066, 1333	SR, DR	4

- **Support for UDIMMs only**; no support for LV DIMMs or RDIMMs
- **Non-ECC UDIMMs not supported** on server platforms; supported on workstation platforms
- Mixing ECC and non-ECC UDIMMs on the platform is **not supported**
- All channels in a system will run at the fastest common frequency
- Static CLTT supported via BMC (requires ECC DIMMs with thermal sensor)

Max Memory Possible**	1Gb DRAM Technology	2Gb DRAM Technology	4Gb DRAM Technology
Single Rank UDIMM	4GB (4x 1GB UDIMMs)	8GB (4x 2GB UDIMMs)	16GB (4x 4GB UDIMMs)
Dual Rank UDIMMs	8GB (4x 2GB UDIMMs)	16GB (4x 4GB UDIMMs)	32GB (4x 8GB UDIMMs)

Enables cost-optimized value platforms with up to 8GB/core

Intel® C200 Series Chipset Memory Support

Platform	DIMM Configuration	Intel® Xeon® processor E3-1200 product family	Intel® Core™ i3 processor series	Intel® Core™ i5-2400/2500 and i7-2600 processor series
Intel® C202 Chipset (Cougar Point Essential Server)	UDIMM Non-ECC	Not Supported	Not Supported	Not Supported
	UDIMM ECC	Supported	Supported	Not Supported
Intel® C204 Chipset (Cougar Point Standard Server)	UDIMM Mix ECC with Non-ECC	Not Supported	Not Supported	Not Supported
Intel® C206 Chipset (Cougar Point Workstation and Advanced Server)	UDIMM Non-ECC	Supported (Client OS) Not Supported (Server OS)	Supported (Client OS) Not Supported (Server OS)	Not Supported
	UDIMM ECC	Supported	Supported	Not Supported
	UDIMM Mix ECC with Non-ECC	Not Supported	Not Supported	Not Supported
Intel® 6 Series Chipset (Cougar Point Desktop)	UDIMM Non-ECC	Not Supported	Supported	Supported
	UDIMM ECC	Not Supported	Not Supported	Not Supported
	UDIMM Mix ECC with Non-ECC	Not Supported	Not Supported	Not Supported

Note: No RDIMM support; "Not Supported" configurations may still boot



Value of ECC Memory

- What is ECC Memory?
 - Error Correcting Code memory enables detection and correction of memory errors
- Why ECC Memory?
 - Memory errors cause system failures and security vulnerabilities¹
 - Overclocking and system age greatly increase failure rates²
 - Recurrent failures are common and happen quickly²
 - 97% occur within 10 days of first failure
- Do I need ECC memory?
 - ECC is crucial for reducing memory errors¹
 - ~4000 correctable errors per memory module per year

¹ <http://www.cs.toronto.edu/~bianca/papers/sigmetrics09.pdf>

² http://research.microsoft.com/en-us/um/redmond/events/fs2010/presentations/Nightingale_Large_Scale_Debugging_RFS_71310.pdf

Business Impact of Memory Errors

- Memory errors cause unplanned downtime that costs money
 - Average rate of memory error for a server with 4GB memory running 24x7 is **150 times a year**^{1,2}
 - If 10% of errors cause a system crash, and each crash interrupts business for 10 minutes, the cost is **\$4,300 to \$50,000 a year** for Windows-based server applications³
- Memory errors cause unpredictable business problems
 - Erroneous data affects accounting, inventory, health records, etc.
- Systems with ECC memory correct vast majority of errors
 - For a server with lifespan of 3 to 5 years, chance for system failure uncorrectable memory error is **less than 0.001%**^{1,2}

Why Take the Risk?
Choose a Real Server with ECC Memory

¹ X. Li, K. Shen, M. Huang, and L. Chu. A memory soft error measurement on production systems. In *USENIX Annual ggfTechnical Conf., 2007*.² Xin Li, Michael C. Huang, Kai Shen, Lingkun Chu. An Empirical Study of Memory Hardware Errors in A Server Farm. Proceedings of the 3rd workshop on on Hot Topics in System Dependability, 2007 ³2005 North American Linux and Windows TCO Comparison Report, Part 1



Key Messages for Intel® Xeon® Processor E3-1200 Product Family

- Server Class Memory Capacity
 - Up to 32GB (4x 8GB UDIMMs)
- Supports UDIMM ECC Memory
 - No support for LV DIMMs or RDIMMs
- ECC memory helps ensure 24x7 data availability
 - Memory errors can cause system crashes or bad data
 - ECC corrects up to 99.988% of all memory errors^{1,2}

**Real Servers with ECC Memory
Protect Your Business Investment**

¹ X. Li, K. Shen, M. Huang, and L. Chu. A memory soft error measurement on production systems. In *USENIX Annual ggfTechnical Conf., 2007*.² Xin Li, Michael C. Huang, Kai Shen, Lingkun Chu. An Empirical Study of Memory Hardware Errors in A Server Farm. Proceedings of the 3rd workshop on Hot Topics in System Dependability, 2007



Backup



Intel® Xeon® Processor E3-1200 Platform Overview

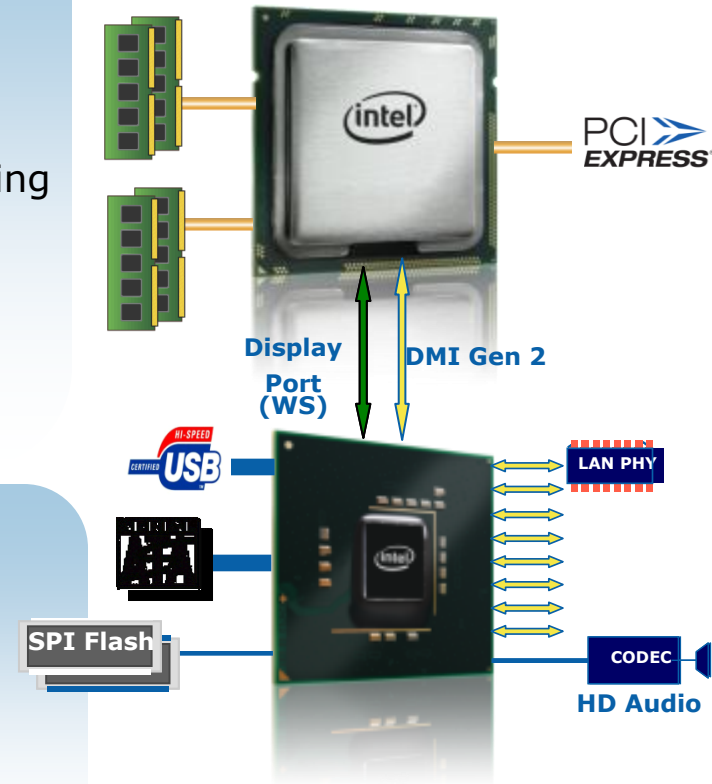


Intel® Xeon® Processor E3-1200 Product Family Key Features¹

- Next-Generation 32nm Intel® Microarchitecture
- Intel® Turbo Boost 2.0 Technology for dynamic frequency scaling
- Intel® Hyper-Threading technology for 8 thread processing with quad core performance frequency scaling
- Up to 8MB of Intel® Smart Cache
- Integrated memory controller for 2 channels of DDR3
- Up to 4 UDIMMs of memory, up to 1333 MHz of speed
- Flexible PCI Express* 2.0 Configurations: 1x16+1x4 , 2x8+1x4, or 4x4

Intel® C200 Series Chipset Key Features

- New single chip architecture
- Up to 8 PCI Express 2.0 x1 Ports (5.0 GT/s) for flexible device support
- Up to 2 (6Gb/s) ports plus 4 (3Gb/s) ports with Intel® Rapid Storage Technology for RAID 0/1/5/10
- Up to 12 USB 2.0 Ports with integrated USB 2.0 Rate Matching Hub



Not all features are available on every processor SKU



Google Report: Key Findings

- Memory errors much more common than previously thought
 - About 1/3 of Google's systems had at least one correctable memory error a year
 - Memory errors are one of the most common hardware problems to lead to machine crashes
- Correctable errors are strongly correlated by memory module
 - A DIMM that sees a correctable error is up to 200 times more likely to see another correctable error in the same month
- Memory error rates are strongly correlated with system utilization and age
- Consequence of a memory error is system dependent
 - In systems without ECC memory, a memory error can lead to a machine crash or applications using corrupted data

Source: DRAM Errors in the Wild: A Large-Scale Field Study © 2009 Google Inc.
<http://www.cs.toronto.edu/~bianca/papers/sigmetrics09.pdf>



Microsoft Report: Key Findings

“Overall, we found operating system crashes due to hardware failures to be much more frequent than we had expected.”

“While ECC memory will detect and correct single-bit failures, that vast majority of commodity machines have no such protection. Unfortunately, ECC memory is seen as a premium part. Therefore, most machines remain vulnerable.”

“Once a machine suffers a single hardware failure, the probability of another hardware failure increases by two orders of magnitude.”

Source: Cycles, Cells and Platters: An empirical analysis of hardware failures on a million commodity PCs © 2009 Microsoft Corporation
http://research.microsoft.com/en-us/um/redmond/events/fs2010/presentations/Nightingale_Large_Scale_Debugging_RFS_71310.pdf