



# Intel® Xeon® Processor 5600 Series

What's new about the Intel® Xeon® Processor 5600 Series (*formerly codenamed Westmere-EP*)?

- **True Six-Core Dual-Socket Servers**  
*The new Intel Xeon Processor 5600 offers true six-core CPUs with up to 12 threads and up to 12MB cache. Quad-core processors with up to 8 threads and 12MB of cache are also available in the 5600 series.*
- **32nm Process Technology**  
*Based on Nehalem architecture, the 5600 Series is built on the 32nm high-k metal gate process.*
- **Intel® Intelligent Power Technology**  
*IPT automatically shifts the CPU and memory into the lowest available power state, reducing energy costs.*
- **Intel® Turbo Boost Technology**  
*Turbo Boost delivers additional performance automatically when needed by taking advantage of the processor's power and thermal headroom. This enables increased performance of both multi-threaded and single-threaded workloads.*
- **Intel® Hyper-Threading Technology**  
*Hyper-Threading allows thread-level parallelism on each processor, resulting in more efficient use of processor resources. With higher processing throughput, you enjoy substantially improved performance.*
- **DDR3 Memory**  
*The move to DDR3 memory offers increased performance due to higher memory speeds, and reduced power consumption compared to FB-DDR2 memory operating at the same speed.*

**Dramatically Increased Performance**

**Dramatically Decreased Energy Consumption**

**Expert included.**



# Intel® Xeon® Processor 5600 Series

## Product Specifications

Process	TDP <sup>1</sup>	CPU Number	Frequency	Cores / Threads	Cache	Link Speed	Max Mem Speed	Turbo Boost <sup>2</sup>	HT
32nm	130W	<b>X5680</b>	<b>3.33 GHz</b>	<b>6 / 12</b>	12MB	6.4 GT/s	1333 MHz	<b>1 / 1 / 1 / 1 / 2 / 2</b>	Yes
		X5677	3.46 GHz	4 / 8				1 / 1 / 2 / 2	
	95W	<b>X5670</b>	<b>2.93 GHz</b>	<b>6 / 12</b>	12MB	6.4 GT/s	1333 MHz	<b>2 / 2 / 2 / 2 / 3 / 3</b>	Yes
		X5667	3.06 GHz	4 / 8				2 / 2 / 3 / 3	
		<b>X5660</b>	<b>2.80 GHz</b>	<b>6 / 12</b>				<b>2 / 2 / 2 / 2 / 3 / 3</b>	
		<b>X5650</b>	<b>2.66 GHz</b>	<b>6 / 12</b>				<b>2 / 2 / 2 / 2 / 3 / 3</b>	
	80W	E5640	2.26 GHz	4 / 8	12MB	5.86 GT/s	1066 MHz	1 / 1 / 2 / 2	Yes
		E5630	2.53 GHz	4 / 8					
		E5620	2.40 GHz	4 / 8					
	LOW POWER	<b>60W</b>	<b>L5640</b>	<b>2.66 GHz</b>	<b>6 / 12</b>	12MB	5.86 GT/s	1333 MHz	<b>2 / 2 / 3 / 3 / 4 / 4</b>
40W		L5630	2.13 GHz	4 / 8	1 / 1 / 2 / 2				Yes
40W		L5609	1.86 GHz	4 / 4	4.8 GT/s				1066 MHz
45nm	80W	E5507	2.26 GHz	4 / 4	4MB	4.8 GT/s	800 MHz	No	No
		E5506	2.13 GHz	4 / 2					
		E5503	2.00 GHz	2 / 2					

<sup>1</sup> TDP is Thermal Design Power

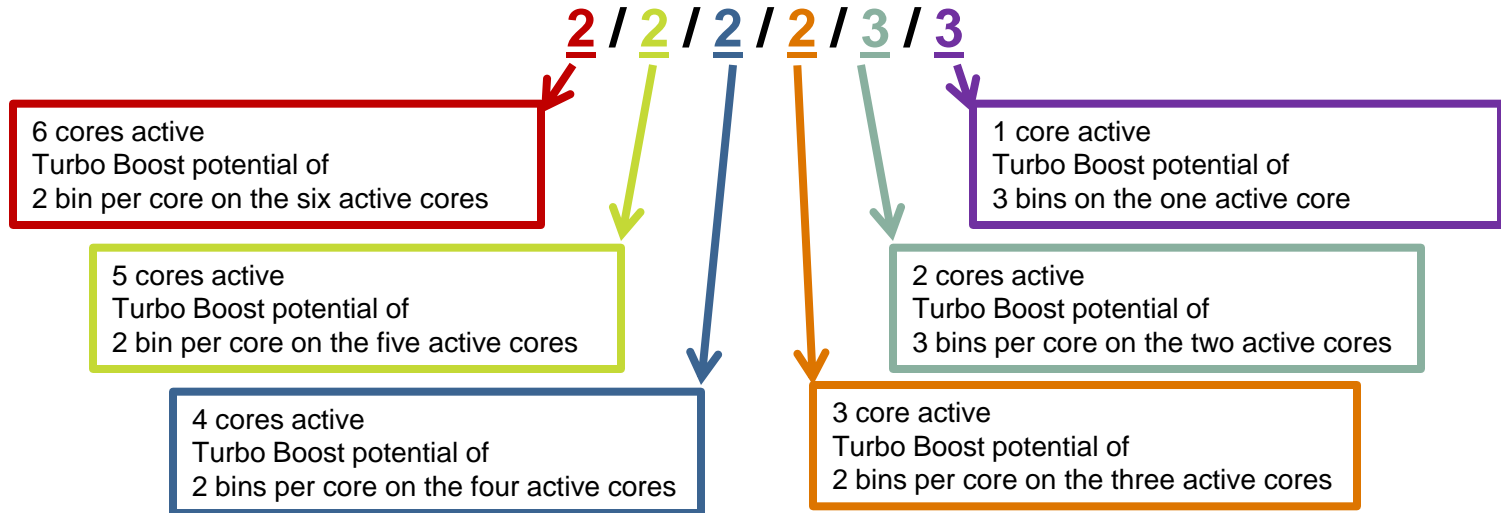
<sup>2</sup> Max Turbo Boost frequency based on number of 133-MHz increments above base frequency (+2 = 0.266 GHz, +3 = 0.400 GHz). See pages 3 and 4 for information about interpreting the Turbo Boost specification.

Expert included.



# Intel® Xeon® Processor 5600 Series

## Interpreting the Turbo Boost Specification



- This example is based on the Intel Xeon processor 5670: 6 cores, 2.93 GHz, with a Turbo Boost specification of  $2 / 2 / 2 / 2 / 3 / 3$ .
- When thermal headroom exists or a core is idle, Turbo Boost increases the base frequency of the cores.
- The frequency increases take place in increments (“bins”) of 133 MHz (.133 GHz).
- The first number corresponds to the boost potential of 2 bins per core when all six cores are active. The second number refers to the boost potential of 2 bins per core when five cores are active. The third number refers the boost potential of 2 bins per core when four cores are active. The fourth number refers to the boost potential of 2 bins per core when three cores are active. The fifth number refers to the boost potential of 3 bins per core when two cores are active. The sixth number refers to the boost potential of 3 bins when one core is active.

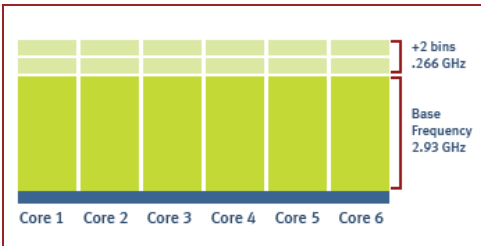


# Intel® Xeon® Processor 5600 Series

## Interpreting the Turbo Boost Specification

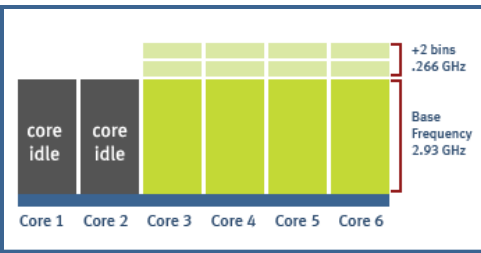
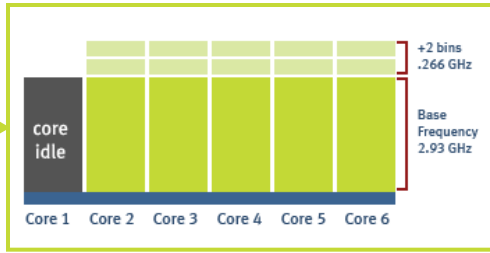
**2 / 2 / 2 / 2 / 3 / 3**

Base Frequency: 2.93 GHz  
Incremental Increase: .133 GHz



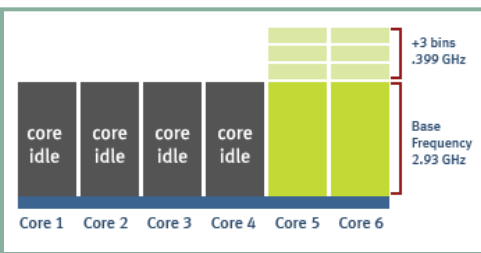
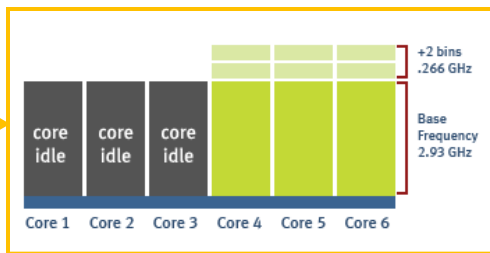
**In Use:** 6 cores  
**Turbo Boost:** 2 bins  
**Boosted Frequency:** 3.2 GHz

**In Use:** 5 cores  
**Turbo Boost:** 2 bins  
**Boosted Frequency:** 3.2 GHz



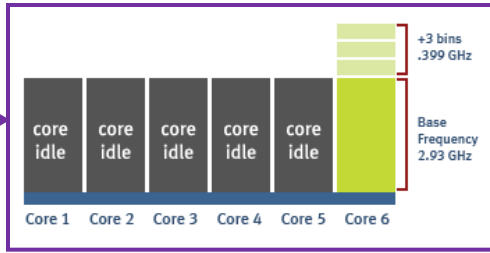
**In Use:** 4 cores  
**Turbo Boost:** 2 bins  
**Boosted Frequency:** 3.2 GHz

**In Use:** 3 cores  
**Turbo Boost:** 2 bins  
**Boosted Frequency:** 3.2 GHz



**In Use:** 2 cores  
**Turbo Boost:** 3 bins  
**Boosted Frequency:** 3.3 GHz

**In Use:** 1 core  
**Turbo Boost:** 3 bins  
**Boosted Frequency:** 3.3 GHz



Expert included.



# Intel® Xeon® Processor 5600 Series

## Matching Processor to Memory: Selection Guidance



**Memory Technology**  
*Assumes use of 8GB DIMMs*  
*Valid for single- or dual-rank DIMMs*

**CPU Features**

**12 MB Cache**  
**6.4 GT/s QPI**  
**Turbo Boost**  
**Hyper-Threading**

**12 MB Cache**  
**5.86 GT/s QPI**  
**TurboBoost**  
**Hyper-Threading**

**12 MB Cache**  
**4.8 GT/s QPI**

**4 MB Cache**  
**4.8 GT/s QPI**

Maximum Bandwidth		
DDR3 1333		
10.6 GB/s		
96 MB		
130W	<b>X5680</b>	6 cores, 3.33 GHz
	<b>X5677</b>	4 cores, 3.46 GHz
95W	<b>X5670</b>	6 cores, 2.93 GHz
	<b>X5667</b>	4 cores, 3.06 GHz
	<b>X5660</b>	6 cores, 2.80 GHz
	<b>X5650</b>	6 cores, 2.66 GHz
60W	<b>L5640</b>	6 cores, 2.26 GHz

Balanced Price / Performance		
DDR3 1066		
8.5 GB/s		
96 MB		
80W	<b>E5640</b>	4 cores, 2.66 GHz
	<b>E5630</b>	4 cores, 2.53 GHz
	<b>E5620</b>	4 cores, 2.40 GHz
40W	<b>L5630</b>	4 cores, 2.13 GHz
40W	<b>L5609</b>	4 cores, 1.86 GHz

Maximum Capacity		
DDR3 800		
6.4 GB/s		
144 MB		
130W	<b>X5680</b>	6 cores, 3.33 GHz
	<b>X5677</b>	4 cores, 3.46 GHz
95W	<b>X5670</b>	6 cores, 2.93 GHz
	<b>X5667</b>	4 cores, 3.06 GHz
	<b>X5660</b>	6 cores, 2.80 GHz
	<b>X5650</b>	6 cores, 2.66 GHz
60W	<b>L5640</b>	6 cores, 2.26 GHz
80W	<b>E5640</b>	4 cores, 2.66 GHz
	<b>E5630</b>	4 cores, 2.53 GHz
	<b>E5620</b>	4 cores, 2.40 GHz
40W	<b>L5630</b>	4 cores, 2.13 GHz
40W	<b>L5609</b>	4 cores, 1.86 GHz
80W	<b>E5507</b>	4 cores, 2.26 GHz
	<b>E5506</b>	4 cores, 2.16 GHz
	<b>E5503</b>	2 cores, 2.00 GHz

Expert included.

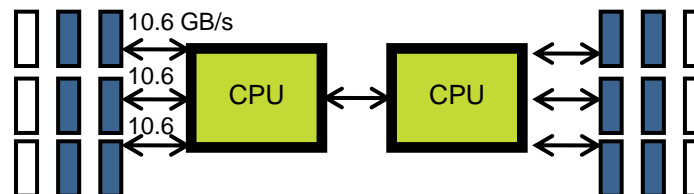


# Intel® Xeon® Processor 5600 Series

## Memory Population Scenarios

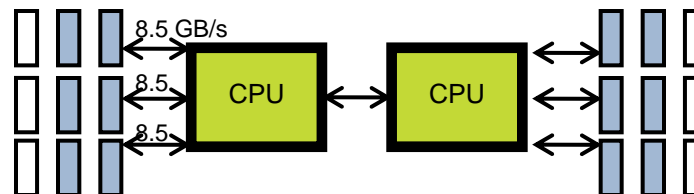
### Maximum Bandwidth:

- DDR3 1333 across 3 channels per CPU
- 1 or 2 DIMMs per channel (up to 12 DIMMs)
- DDR3 1333 memory performance requires one of the following processors: X5680, X5677, X5670, X5667, X5660, X5650, L5640



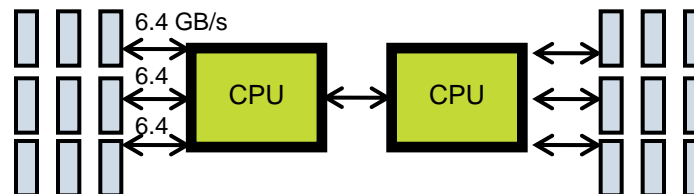
### Price / Performance Balance:

- DDR3 1066 across 3 channels per CPU
- 1 or 2 DIMMs per channel (up to 12 DIMMs)
- DDR3 1066 memory performance requires one of the following processors: E5640, E5630, E5620, L5630, L5609



### Maximum Capacity:

- DDR3 800 across 3 channels per CPU
- Up to 3 DIMMs per channel (18 DIMMs)  
*(18 DIMMs available only on selected mainboards.)*



For maximum bandwidth, you want the fastest memory speed, which requires one of the more advanced CPU SKUs. Since 1333MHz memory performance is only supported at up to 2 DIMMs per channel, depending on CPU frequency, the maximum installation with 2 CPUs would be 12 DIMMs.

For maximum capacity, you want to be able to install as many DIMMs as possible. Populating 3 DIMMs per channel will result in the memory running at a maximum of 800MHz, meaning you can choose any of the Xeon 5600 SKUs, since they all support 800MHz or higher, and will clock down memory speed, if necessary, to support 3 DIMMs per channel.

Using any quad-rank DIMMS:

Configurations with 1 DIMM per channel will operate at 1066 MHz.

Configurations with 2 or 3 DIMMs/channel will make all DIMMs operate at 800 MHz.

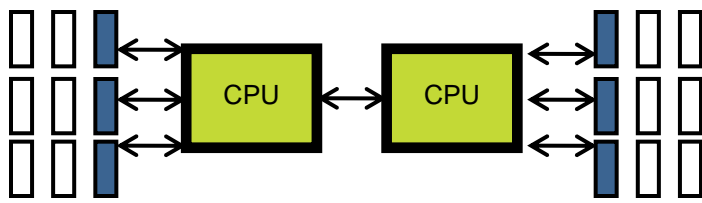


# Intel® Xeon® Processor 5600 Series

## Balanced vs. Unbalanced Memory Population Considerations

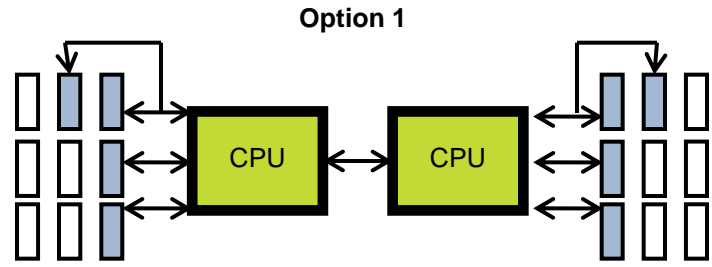
### Recommended: Balanced Memory Population

- Use a “balanced” platform configuration: populate the same number of DIMMs for each channel and each socket.
- Use identical DIMM types throughout the platform: same size, speed, and number of ranks.



Balanced 1-1-1 Memory Population

### Alternatives: Unbalanced Memory Population “2-1-1” (not recommended)



Option 1

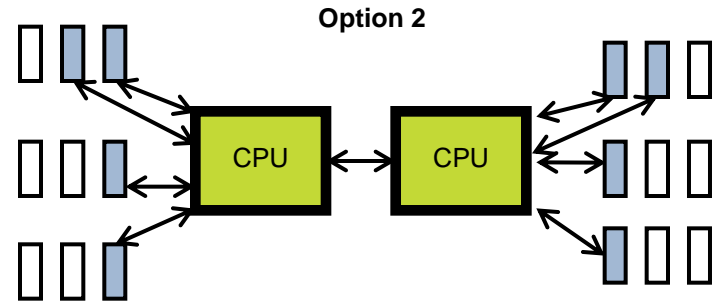
#### Population Scenario

Interleave the first 3 DIMMs equally across the 3 channels and add the 4<sup>th</sup> DIMM to the first channel.

#### Performance Consideration: Unpredictable Performance

If your application uses only the first three DIMMs, your results will be the same as in a balanced 1-1-1 memory population scenario.

If the 4<sup>th</sup> DIMM is used, your performance will be reduced to the equivalent of a single channel.



Option 2

#### Population Scenario

Interleave across all four DIMMs equally.

#### Performance Consideration: Bandwidth Bottleneck

For every memory request the application makes to channels 2 and 3, channel 1 will need to handle two requests.

The doubled number of requests to channel 1 will result in a bottleneck of your bandwidth.

Expert included.



# Intel® Xeon® Processor 5600 Series

Silicon Mechanics Products with Intel® Xeon® Processor 5600 Series CPUs

## Rackmount Servers

### 1U Servers

- [Rackform iServ R304](#)
- [Rackform iServ R308](#)
- [Rackform iServ R331](#)
- [Rackform iServ R335](#)
- [Rackform iServ R350](#)

### 2U Servers

- [Rackform iServ R346](#)
- [Rackform iServ R348](#)

### 3U Server

- [Rackform iServ R362](#)

## High-Density 1U and 2U Twins

- [Rackform iServ R4210](#)
- [Rackform iServ R4210-IB](#)
- [Rackform iServ R4410](#)
- [Rackform iServ R4410-IB](#)

## Storage Servers

- [Storform iServ R513](#)
- [Storform iServ R515](#)
- [Storform iServ R516](#)
- [Storform iServ R518](#)

## GPU Workstation

- [Hyperform HPCg R2504](#)

Expert included.



# Intel® Xeon® Processor 5600 Series

---

Contact Silicon Mechanics

For answers regarding processor selection, memory matching, or other questions you may have, contact one of the Experts at Silicon Mechanics:

Email: [sales@siliconmechanics.com](mailto:sales@siliconmechanics.com)

Toll Free: 866.352.1173

[www.siliconmechanics.com](http://www.siliconmechanics.com)

Expert included.