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.

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**Dramatically Increased Performance**

**Dramatically Decreased Energy Consumption**
# Intel® Xeon® Processor 5600 Series

## Product Specifications

<table>
<thead>
<tr>
<th>Process</th>
<th>TDP¹</th>
<th>CPU</th>
<th>Frequency</th>
<th>Cores / Threads</th>
<th>Cache</th>
<th>Link Speed</th>
<th>Max Mem Speed</th>
<th>Turbo Boost ²</th>
<th>HT</th>
</tr>
</thead>
<tbody>
<tr>
<td>32nm</td>
<td>130W</td>
<td>X5680</td>
<td>3.33 GHz</td>
<td>6 / 12</td>
<td>12MB</td>
<td>6.4 GT/s</td>
<td>1333 MHz</td>
<td>1 / 1 / 1 / 1 / 2 / 2</td>
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<tr>
<td></td>
<td></td>
<td>X5677</td>
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<td></td>
<td></td>
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<td></td>
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<tr>
<td></td>
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<td></td>
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<td>1.86 GHz</td>
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<td>45nm</td>
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<td>80W</td>
<td>E5506</td>
<td>2.13 GHz</td>
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<td>800 MHz</td>
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<td>E5503</td>
<td>2.00 GHz</td>
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<td></td>
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</tr>
</tbody>
</table>

¹ TDP is Thermal Design Power

² 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.
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 to 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

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

Base Frequency: 2.93 GHz
Incremental Increase: 0.133 GHz
## Matching Processor to Memory: Selection Guidance

### Intel® Xeon® Processor 5600 Series

#### Memory Technology

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

#### CPU Features

<table>
<thead>
<tr>
<th>12 MB Cache</th>
<th>6.4 GT/s QPI</th>
<th>Turbo Boost</th>
<th>Hyper-Threading</th>
</tr>
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<tbody>
<tr>
<td>130W X5680</td>
<td>6 cores, 3.33 GHz</td>
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</tr>
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<td>6 cores, 3.06 GHz</td>
<td>4 cores, 2.80 GHz</td>
<td></td>
</tr>
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<tr>
<th>12 MB Cache</th>
<th>4.8 GT/s QPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>40W L5609</td>
<td>4 cores, 1.86 GHz</td>
</tr>
</tbody>
</table>

#### Maximum Bandwidth

- DDR3 1333
  - 10.6 GB/s
  - 96 MB

- DDR3 1066
  - 8.5 GB/s
  - 96 MB

#### Balanced Price / Performance

- DDR3 800
  - 6.4 GB/s
  - 144 MB

- DDR3 800
  - 6.4 GB/s
  - 144 MB

### 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.
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.

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

Population Scenario
Interleave the first 3 DIMMs equally across the 3 channels and add the 4th 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 4th DIMM is used, your performance will be reduced to the equivalent of a single channel.

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.
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
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

Toll Free: 866.352.1173

www.siliconmechanics.com