

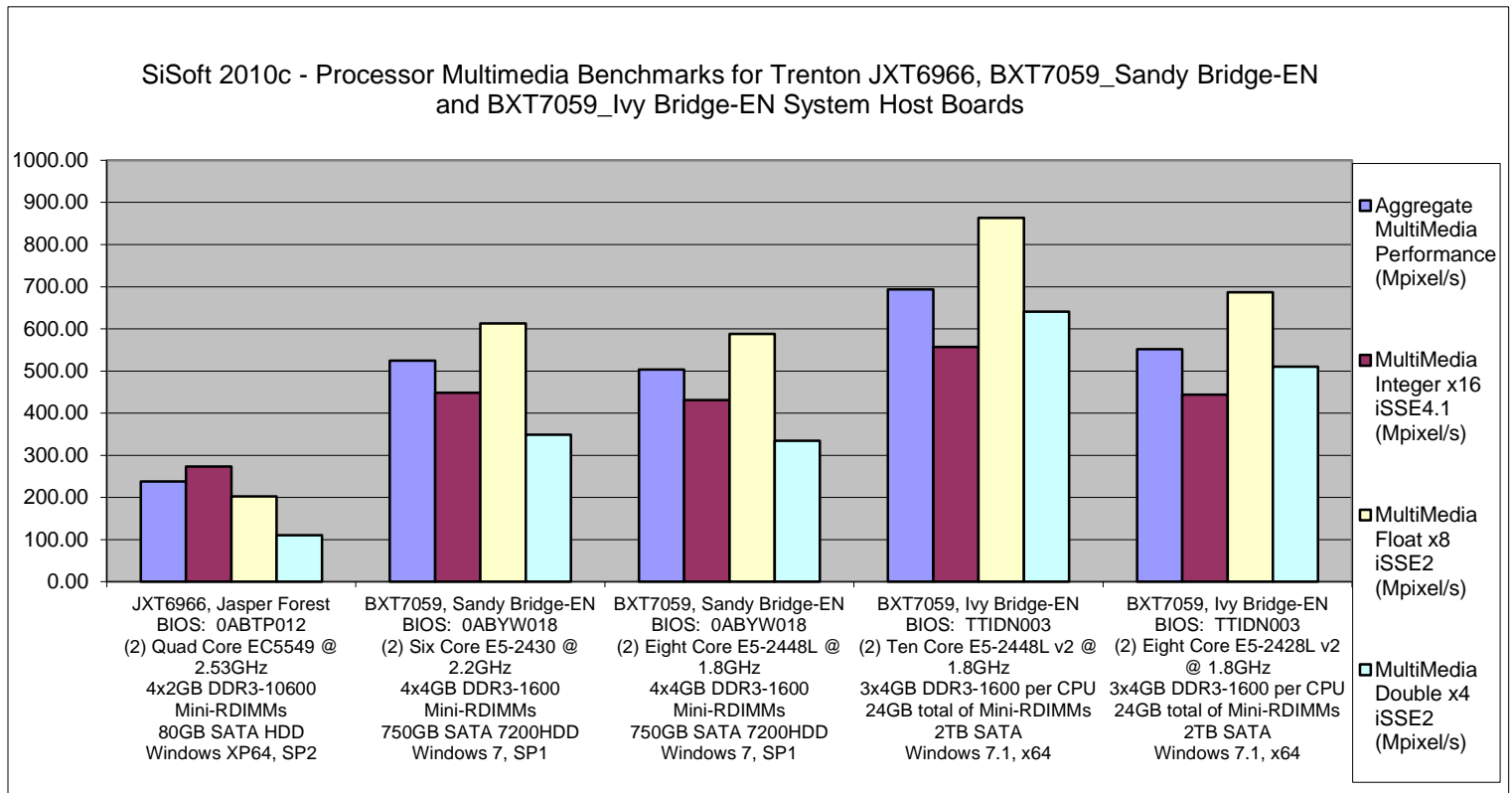
**Application Note:** Performance Benchmarks & Power Consumption Comparisons For Trenton BXT7059 System Host Board Using the Intel® Xeon® E5-2400 v2 Processor Family (Ivy Bridge-EN)

**Date:** December 12, 2013

After January 9, 2014 the Trenton BXT7059 will officially support either two Intel® Xeon® E5-2400 (Sandy Bridge-EN) or two Intel® Xeon® E5-2400 v2 (Ivy Bridge-EN) series processors. The 22nm Intel® Micro-Architecture; utilized on the Ivy Bridge-EN processors, feature integrated memory controllers and PCI Express® 3.0 links. The BXT7059 board design uses the Intel® C604 Platform Controller Hub (PCH) formally known as Patsburg-B. While the Intel® Xeon® E5-2400 v2 (Ivy Bridge-EN) series processors are drop-in replacements for the previous generation CPUs, if an upgrade is desired for an existing BXT7059, then that board must be returned to our factory using the established RMA process. There are several component changes required for the upgrade and a new Ivy Bridge-EN BIOS will also be installed. Any new (Rev F or later) or upgraded BXT7059 is enabled to support either Sandy Bridge-EN or Ivy Bridge-EN processors.

The following benchmark comparison charts illustrate the significant performance advantages that are possible by utilizing the Ivy Bridge-EN processors on the [Trenton BXT7059](#) dual-processor system host board integrated into a rackmount computer system. A table is included that compares CPU power utilization comparisons for both processor architectures. This table points out the power savings per processor execution core offered by the 22nm Intel® Micro-Architecture used in the Intel® Xeon® E5-2400 v2 (Ivy Bridge-EN) series processors.\*

**Dual-Processor Multimedia Benchmarks**

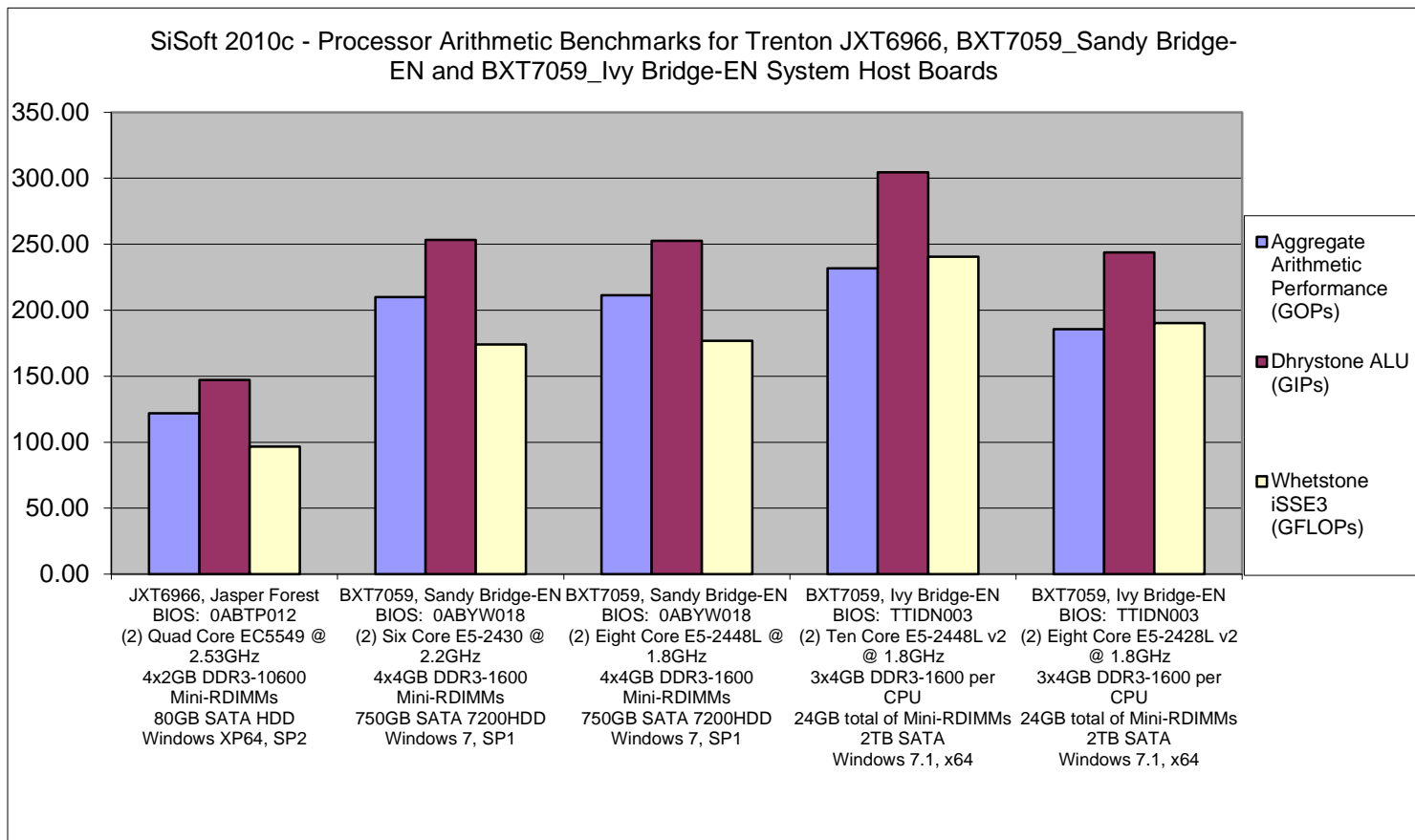


When comparing processor performance, the v2 designation in the Ivy Bridge-EN processor name becomes critically important. For example, an Intel® Xeon® E5-2448L (Sandy Bridge-EN) has eight cores on the processor die while an Intel® Xeon® E5-2448L v2 (Ivy Bridge-EN) has ten cores.

The processor multimedia benchmark test focuses on the board’s ability to process video information. These benchmark test results illustrate how the 22nm micro-architecture improvements on the Ivy Bridge-EN processors, when coupled with additional processor cores, enables more efficient processing of information between processors and over the DMI2 CPU-to-PCH data path.

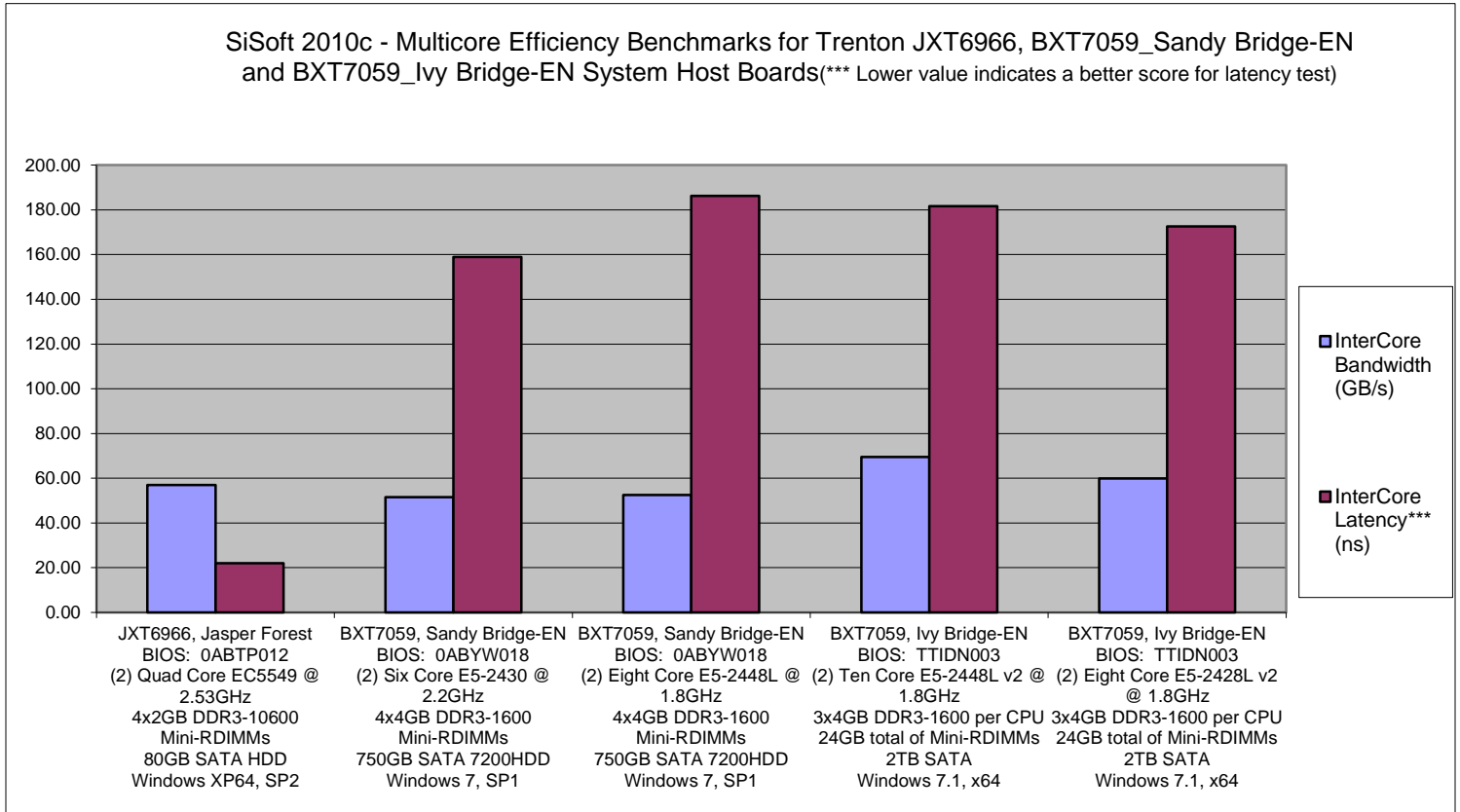
These test results illustrate an aggregate multi-media performance increase of approximately 10% with the Intel® Xeon® E5-2428L v2 (Ivy Bridge-EN) architecture compared to the equivalent Intel® Xeon® E5-2448L (Sandy Bridge-EN) architecture and an increase of 131% compared to the Intel® Xeon® EC5549 (Jasper Forest) quad-core processor micro-architecture.

**Dual-Processor Arithmetic Benchmarks**



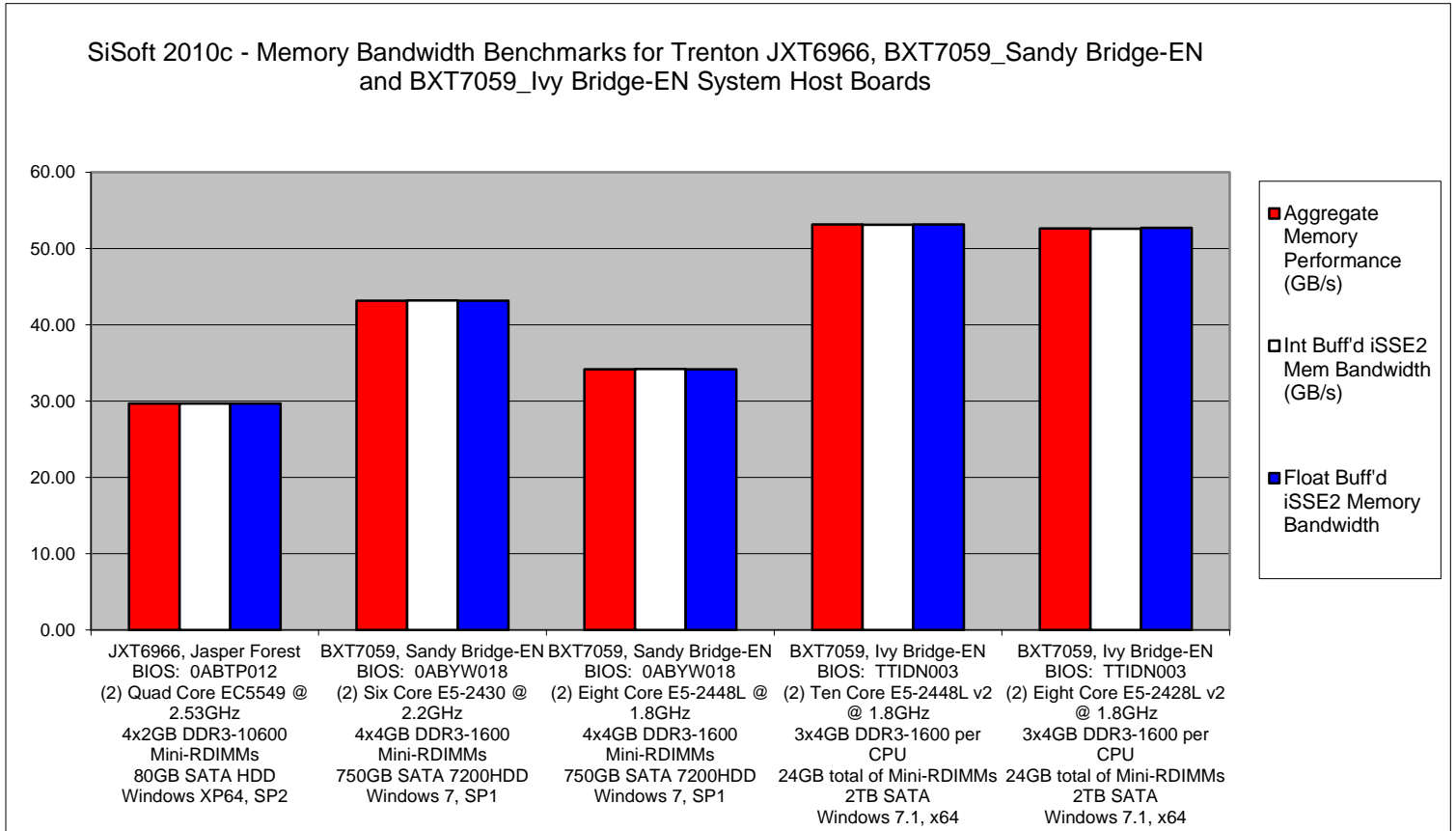
On a strict apples-to-apples comparison of equivalent Ivy Bridge-EN and Sandy Bridge-EN processors, our arithmetic benchmarking tests did not yield compelling performance improvements. However, your actual system-wide performance for specific application software may show more dramatic results. For example, the arithmetic benchmark results clearly illustrates how taking advantage of the additional processor cores made available in the Intel® Xeon® E5-2448L v2 processors; by virtue of the 22nm Intel® Micro-Architecture, enables system host boards like the BXT7059 to process more instructions compared to previous Intel® Xeon® processor technologies.

**Dual-Processor Multicore Efficiency Benchmarks**



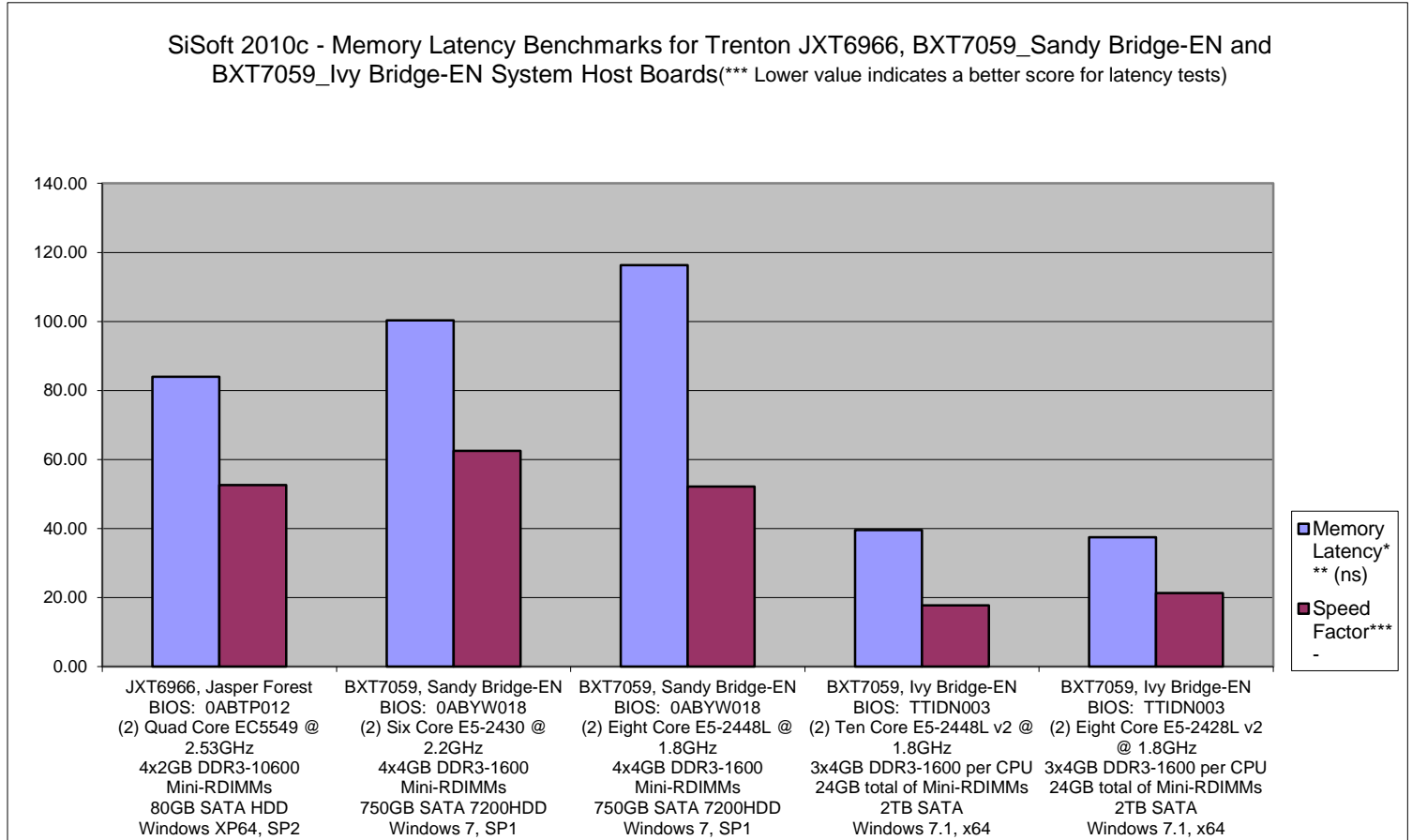
With the InterCore Latency performance measure, a smaller number indicates a better performance score, i.e. a reduction in inter-core latency delays. These test results show an overall improvement in reduced inter-core latency times of approximately 8% with the Intel® Xeon® E5-2428L v2 (Ivy Bridge-EN) compared to the equivalent Intel® Xeon® E5-2448L (Sandy Bridge-EN) processor. It is interesting to note that even with an additional two processing cores, the 10-core Intel® Xeon® E5-2448L v2 has a slightly lower inter-core latency than the eight-core Intel® Xeon® E5-2448L. With only four processing cores, it makes sense that the quad-core Intel® Xeon® EC5549 (Jasper Forest) processors would have the lowest inter-core latency of all the processors compared.

**Dual-Processor Memory Bandwidth Benchmarks**



In this test the 22nm micro-architecture CPUs (i.e. Ivy Bridge-EN) clearly outperforms the 32nm Sandy Bridge-EN micro-architecture. The three-channel memory interface implementation per CPU is virtually identical for both processor classes on the BXT7059 board; therefore, the performance gain shown here is directly attributable to the advantages of the 22nm Intel® Micro-Architecture. The memory bandwidth performance for the BXT7059's three-channel memory interface when using the Intel® Xeon® E5-2400 v2 series outperforms the Intel® Xeon® E5-2400 series by a factor of 54%.

**Dual-Processor Memory Latency Benchmarks**



Again, a smaller number indicates a better performance score (i.e. a reduction in memory interface latency delays) when running this benchmark. This test result shows an overall improvement in reduced memory latency times of approximately 210% with the Intel® Xeon® E5-2400 v2 series (Ivy Bridge-EN) architecture compared to the Intel® Xeon® E5-2400 series (Sandy Bridge-EN) architecture.

**\*NOTE:** This benchmark information is provided for comparison purposes only. Actual system performance is application dependent and will vary.

## Dual-Processor BXT7059 Power Usage Comparisons

Before listing the power requirements for the various processor options available on Trenton's BXT7059 system host board, let's take a look at the various processor specifications:

Max. DDR3 Speed	Processor	Cores / Threads	Cache	Long-Life Availability	Maximum Thermal Design Power (TDP)	Operating Temperature Range*
<b>Intel Xeon E5-2400 v2 Series Processors (Ivy Bridge-EN) with the 22nm Intel Micro-Architecture</b>						
DDR3-1600	Intel® Xeon® E5-2430 v2	6 / 12	15MB	Yes	80W	0°C to 50°C
DDR3-1600	Intel® Xeon® E5-2448L v2	10 / 20	25MB	Yes	70W	0°C to 50°C
DDR3-1600	Intel® Xeon® E5-2428L v2	8 / 16	20MB	Yes	60W	0°C to 50°C
DDR3-1600	Intel® Xeon® E5-2418L v2	6 / 12	15MB	Yes	50W	0°C to 50°C
<b>Intel Xeon E5-2400 Series Processors (Sandy Bridge-EN) with the 32nm Intel Micro-Architecture</b>						
DDR3-1600	Intel® Xeon® E5-2448L	8 / 16	20MB	Yes	70W	0°C to 50°C
DDR3-1333	Intel® Xeon® E5-2430	6 / 12	15MB	Yes	95W	0°C to 50°C
DDR3-1333	Intel® Xeon® E5-2428L	6 / 12	15MB	Yes	60W	0°C to 50°C
DDR3-1333	Intel® Xeon® E5-2418L	4 / 8	10MB	Yes	50W	0°C to 50°C

\*Requires a continuous airflow across the board of 350LFM.

Required voltage rail current and thermal design power are somewhat related processor specs. Notice how the TDP ratings are less for the processors built on the 22nm micro-architecture. Now let's take a look at the power requirements for each BXT7059 processor option.

Typical values\* - 100% stress state with 24GB of DDR3 system memory installed:

Processor Type – Two Installed	Processor Speed	+5V	+12V	+3.3V
Intel® Xeon® E5-2430 v2	2.5GHz	1.72A	12.32A	3.21A
Intel® Xeon® E5-2448L v2	1.8GHz	1.68A	12.60A	3.11A
Intel® Xeon® E5-2428L v2	1.8GHz	1.72A	10.07A	3.23A
Intel® Xeon® E5-2418L v2	2.0GHz	1.62A	8.31A	3.19A
Intel® Xeon® E5-2430	2.2GHz	1.34A	15.11A	4.55A
Intel® Xeon® E5-2407	2.2GHz	1.31A	8.86A	4.21A
Intel® Xeon® E5-2448L	1.8GHz	1.37A	11.60A	4.49A
Intel® Xeon® E5-2428L	1.8GHz	1.34A	10.27A	4.55A

Typical values\* - Static desktop (system idle) state with 24GB of DDR3 system memory installed:

Processor Type – Two Installed	Processor Speed	+5V	+12V	+3.3V
Intel® Xeon® E5-2430 v2	2.5GHz	1.56A	5.22A	3.21A
Intel® Xeon® E5-2448L v2	1.8GHz	1.66A	5.58A	3.03A
Intel® Xeon® E5-2428L v2	1.8GHz	1.58A	4.96A	3.05A
Intel® Xeon® E5-2418L v2	2.0GHz	1.48A	4.13A	2.98A
Intel® Xeon® E5-2430	2.2GHz	1.30A	3.73A	4.15A
Intel® Xeon® E5-2407	2.2GHz	1.22A	3.08A	3.89A
Intel® Xeon® E5-2448L	1.8GHz	1.34A	4.06A	4.11A
Intel® Xeon® E5-2428L	1.8GHz	1.30A	3.89A	4.18A

\* Typical power numbers; actual power numbers will vary as a function of the specific BXT7059 system configuration design. Tolerance for each power supply voltage is +/- 5%.

Hopefully, you find this information helpful as you assess the system performance requirements of your particular system applications. For additional information contact Trenton toll-free in the U.S. at 1-800-875-6031 or worldwide at +1-770-287-3100. Please visit our website at [www.TrentonSystems.com](http://www.TrentonSystems.com) or follow us on:

