Mobile 5th Generation Intel® Core™ Processor Series

Application Power Guidelines Addendum

Supporting the 5th Generation Intel® Core™ Processor Series based on U-Processor Line and H-Processor Lines

December 2014

Document Number: 331570-001

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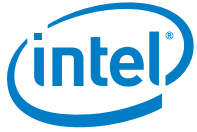
Revision History

Date	Revision	Description
December 2014	001	Initial release

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1 Introduction

This document provides power numbers for the 5th Generation Intel® Core™ Processor Series for mobile processors while running real life applications. This document supplements the specifications published in the product datasheet.

Use these Application Power Guidelines for reference purposes only. The power data elements provided in this document are not design points or technical specifications and should not be used as such.

Table 1 provides definitions for Application Power Guidelines terms and acronyms used in this document.

1.1 Terminology

Table 1. Terminology

Term	Description
APG	Application Power Guidelines
NDA	Non-Disclosure Agreement
SKU	Stock Keeping Unit
TAT	Thermal Analysis Tool
TDP	Thermal Design Power

1.2   Reference Documents

Refer to the documents in Table 2 for the titles and locations of key related technical documents.

Table 2.   Reference Documents

| Document	Document Number
Intel® Embedded Application Power Guideline Whitepaper	324759
Intel® Embedded Application Power Guidelines Refresh Whitepaper	554966
5th Generation Intel® Core™ Processor Family and Intel® Core™ M Processor Family External Design Specification (EDS) – Volume 1 of 2	514405
5th Generation Intel® Core™ Processor Family, Intel® Core™ M Processor Family, and Broadwell H-Processor (2-chip) External Design Specification (EDS) – Volume 2 of 2	514525
5th Generation Intel® Core™ Processor Family (Broadwell Y) and Intel® Core™ Processor Family (Broadwell Y) Platform Design Guide (PDG)	514849
Intel® Broadwell Client Platform Thermal Management Design Guide	524987

NOTE: Contact your local Intel representative(s) for the most recent revision of these documents

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2 Application Power Guidelines

The Application Power Guidelines (APG) data listed in this document is intended to reflect the typical use conditions. Factors such as temperature, platform configuration, and other variables can influence power usage. Specific information about the platforms and test configurations is provided to enable a repeatable power measurement.
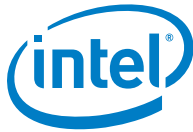
2.1 Intel® Core™ Processor i7-5650U Application Power Guidelines

Figure 1 indicates the Application Power Guidelines for various embedded applications for the Intel® Core™ Processor i7-5650U with a 15W TDP specification.

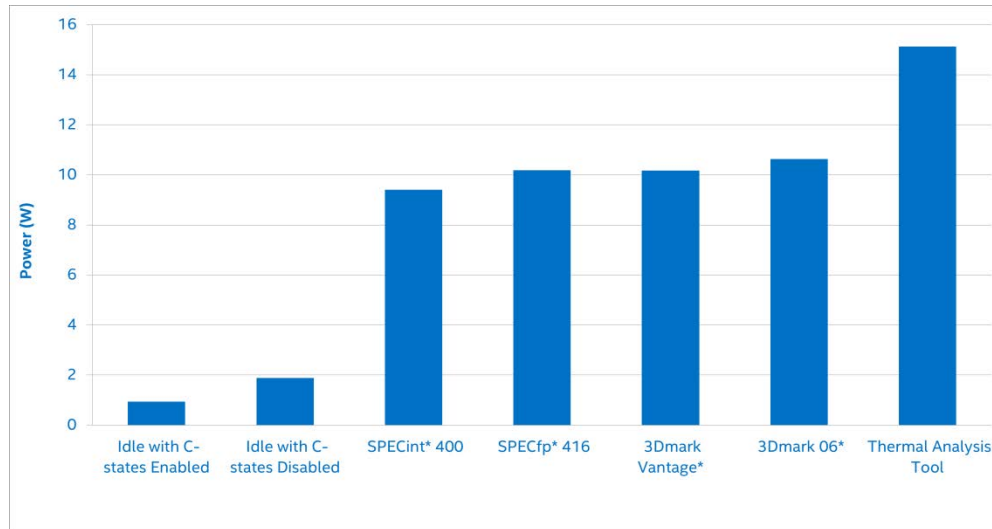**Figure 1. Intel® Core™ Processor i7-5650U Application Power Guidelines**

Table 3. Intel® Core™ Processor i7-5650U Application Power Guidelines

Application/Benchmark	Processor Power (W)	Junction Temperature (°C)
Idle with C-states Enabled	0.9	40
Idle with C-states Disabled	1.9	40
SPECint* 400	9.4	89
SPECfp* 416	10.2	90
3DMark Vantage*	10.2	84
3DMark06*	10.2	84
Thermal Analysis Tool	15.1	90

NOTES:

1. Software and workloads used in performance tests may have been optimized for performance only on Intel® microprocessors. Performance tests, such as SYSmark* and MobileMark*, are measured using specific computer systems, components, software, operations, and functions. Any change to any of those factors may cause results to vary. Consult additional information and performance tests to fully evaluate all potential purchases, including the performance of that product when combined with other products. For more information go to http://www.intel.com/performance.
2. Test Configuration: Presented results are from a single sample. The data was not post-processed to account for part-to-part variation. Intel internal testing as of December 2014.
3. Platform: Intel® Core™ i7-5650U Processor (multichip package).
4. BIOS Revision: BDW.E1R1.86C.0076.R00.1405112006.
5. Memory: 2x 2GB 1Rx8 PC3L-12800S-11-11-B2 DDR3 DIMMS 1600MHz.
6. Operating System: Windows 7* x64 and Linux* Ubuntu* 12.04 (kernel 3.11.0-15-generic).
7. Additional Configuration details are listed Section 3 Configuration and Disclaimer.

2.2 Intel® Core™ Processor i5-5350U Application Power Guidelines

Figure 2 indicates the Application Power Guidelines for various embedded applications for the Intel® Core™ Processor i5-5350U with a 15W TDP specification.

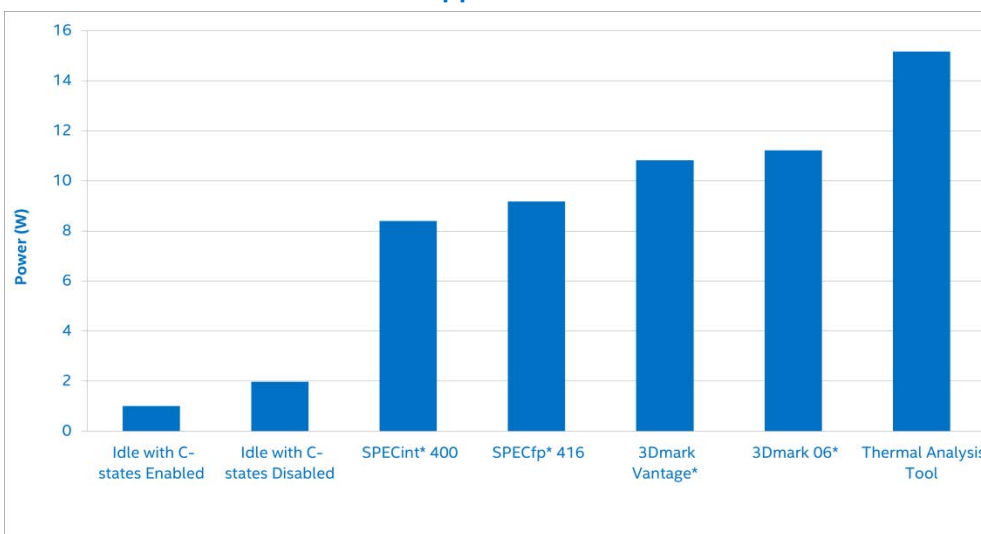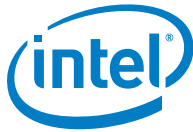**Figure 2. Intel® Core™ Processor i5-5350U Application Power Guidelines**

Table 4. Intel® Core™ Processor i5-5350U Application Power Guidelines

Application/Benchmark	Processor Power (W)	Junction Temperature (°C)
Idle with C-states Enabled	1.0	40
Idle with C-states Disabled	2.0	40
SPECint* 400	8.4	87
SPECfp* 416	9.2	89
3DMark Vantage*	10.8	85
3DMark06*	11.2	84
Thermal Analysis Tool	15.2	91

NOTES:
1. Software and workloads used in performance tests may have been optimized for performance only on Intel® microprocessors. Performance tests, such as SYSmark* and MobileMark*, are measured using specific computer systems, components, software, operations, and functions. Any change to any of those factors may cause results to vary. Consult additional information and performance tests to fully evaluate all potential purchases, including the performance of that product when combined with other products. For more information go to http://www.intel.com/performance.
2. Test Configuration: Presented results are from a single sample. The data was not post-processed to account for part-to-part variation. Intel internal testing as of December 2014.
3. Platform: Intel® Core™ i5-5350U Processor (multichip package).
4. BIOS Revision: BDW.E1R1.86C.0076.R00.1405112006.
5. Memory: 2x 2GB 1Rx8 PC3L-12800S-11-11-B2 DDR3 DIMMS 1600MHz.
6. Operating System: Windows 7* x64 and Linux* Ubuntu* 12.04 (kernel 3.11.0-15-generic).
7. Additional Configuration details are listed Section 3 Configuration and Disclaimer.

2.3 Intel® Core™ Processor i3-5010U Application Power Guidelines

Figure 3 indicates the Application Power Guidelines for various embedded applications for the Intel® Core™ Processor i3-5010U with a 15W TDP specification.

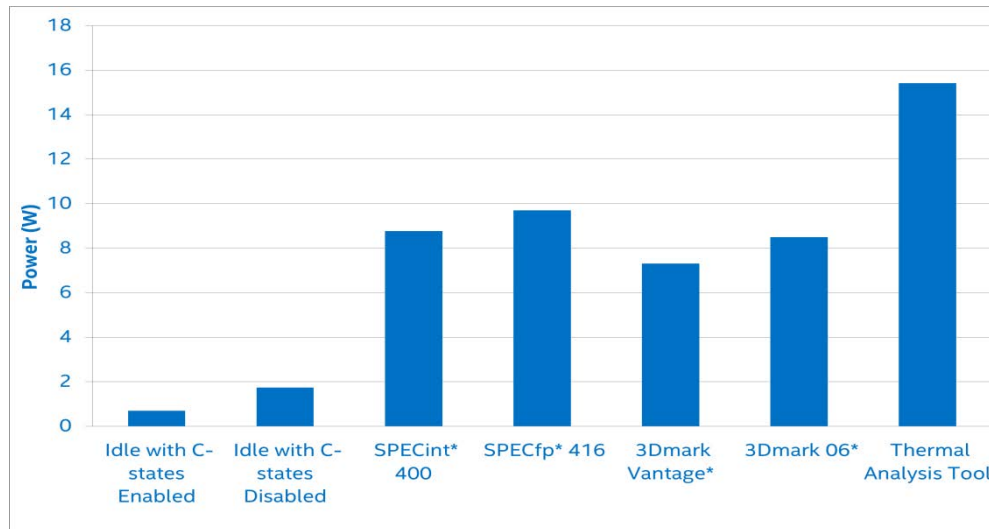**Figure 3. Intel® Core™ Processor i3-5010U Application Power Guidelines**

Table 5. Intel® Core™ Processor i3-5010U Application Power Guidelines

Application/Benchmark	Processor Power (W)	Junction Temperature (°C)
Idle with C-states Enabled	0.7	80
Idle with C-states Disabled	1.7	80
SPECint* 400	8.8	88
SPECfp* 416	9.7	89
3DMark Vantage*	7.3	82
3DMark06*	8.5	82
Thermal Analysis Tool	15.4	89

NOTES:
1. Software and workloads used in performance tests may have been optimized for performance only on Intel microprocessors. Performance tests, such as SYSmark* and MobileMark*, are measured using specific computer systems, components, software, operations, and functions. Any change to any of those factors may cause the results to vary. Consult other information and performance tests for assistance in fully evaluating all potential purchases, including the performance of that product when combined with other products. For more information go to http://www.intel.com/performance.
2. Test Configuration: Presented results are from a single sample. The data was not post-processed to account for part-to-part variation. Intel internal testing as of October 2014.
3. Platform: Intel® Core™ i3-5010U Processor (multichip package).
4. BIOS Revision: BDW.E1R1.86C.0076.R00.1405112006.
5. Memory: 2x 2GB 1Rx8 PC3L-12800S-11-11-B2 DDR3 DIMMS 1600MHz.
6. Operating System: Windows 7* x64 and Linux* Ubuntu* 12.04 (kernel 3.11.0-15-generic).
7. Additional Configuration details are listed in Section 3 Configuration and Disclaimer.
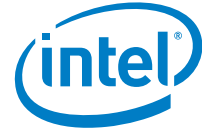
3 Configuration and Disclaimer

Values presented represent a typical or average processor SKU and do not guarantee that a customer will achieve these exact values for each silicon sample. These values are not intended to replace TDP, nor are they intended to be used for reliability assessments. Individual test results may vary.

Software and workloads used in performance tests may have been optimized for performance only on Intel® processors. Performance tests, such as SYSmark* and MobileMark*, are measured using specific computer systems, components, software, operations, and functions. Any change to any of those factors may cause the results to vary. You should consult other information and performance tests to assist you in fully evaluating your contemplated purchases, including the performance of that product when combined with other products.

3.1 Application Power Guidelines Configuration

The following list defines the Application Power Guidelines Configuration.

- The results presented in this document are collected on a single sample. The data has not been post processed to account for part-to-part variation.

- Platform:
  – Platform 1: Intel® Core™ Processor i7-5650U (multichip package).
  – Platform 2: Intel® Core™ Processor i7-5350U (multichip package).
  – Platform 3: Intel® Core™ Processor i3-5010U (multichip package).

- BIOS Revision: BDW.E1R1.86C.0076.R00.1405112006.

- Memory: 2x 2GB 1Rx8 PC3L-12800S-11-11-B2 DDR3 DIMMS 1600MHz

- Windows* Benchmarks: 3DMark* 06, 3DMark* Vantage, Thermal Analysis Tool (TAT) (rev 5.0.1010 IA-60%+GFX-100%)).

- Linux* Ubuntu* Benchmarks: SPEC* CPU2006v1.2 (SPECint* 400.Perlbench, SPECfp* 416.Gamess) with supporting SSE42, AVX, and AVX 2.0 binaries.

- The Intel® Turbo Boost Technology for the Intel® Architecture (IA) was disabled in the BIOS for all Platforms. In the Operating System, "Power Saver" was selected in the Power options under the control panel options. For idle measurement with C-states disabled, the "Power saver" option was also selected.

- Medusa* IV-8 Thermal Chiller set at 40^{0}C for the Idle workloads and 80^{0}C for all other workloads. Temperature settings are based on Embedded Use Condition Operating temperature estimates.

- The Application Power Guideline testing was conducted by Intel.

- For more information, go to http://www.intel.com/performance.

3.2 Additional Considerations

The following list details additional key relevant considerations.

- In the case of any conflicting information, the datasheet supersedes this document.

- The temperature values are mean temperatures measured through the duration of the test.

- Application Power Guidelines Configuration data is provided for repeatability of the test.

- SPEC CPU2006* is an industrial standard benchmark designed to provide performance measurements that can be used to compare compute-intensive workloads on different computer systems. The SPEC CPU2006* test on Intel® microprocessors is measured using particular, well-configured systems. These results may or may not reflect the relative performance of Intel® microprocessors in systems with different hardware or software designs or configurations (including compilers). Buyers should consult other sources of information, including system benchmarks, to evaluate the performance of systems they are considering purchasing. For more information about SPEC CPU2006*, visit http://www.spec.org/cpu2006/.

- 3DMark06* is a 3D graphics benchmark, designed for DirectX* 9.0. It includes four graphics tests, two CPU tests, and several feature tests. The CPU tests measure the contribution of the processor on a 3D graphical, while the graphics test measures game simulation performance. Power was measured while running Graphic Test 1: Return to Proxycon. For more information about 3DMark06*, visit http://www.futuremark.com/benchmarks/3dmark/all.

- 3DMarkVantage* is a 3D graphics benchmark, designed for DirectX*10. It includes two graphics tests, two CPU tests, and six feature tests. The CPU test covers physics simulation and artificial intelligence while the graphics test measures various visual techniques. Power was measured while running Graphic Test 1-Jane Nash in the performance preset. For more information about 3Dmark06 please visit www.futuremark.com/benchmarks/3dmark-vantage.

- Thermal Analysis Tool (TAT) is developed by Intel   to generate TDP-like workloads on a system. A Non-Disclosure Agreement (NDA) is required for usage.

- The idle power reported above is while displaying the Windows* desktop screen.

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