



**AMD Family 10h
Desktop Processor
Power and Thermal Data Sheet**

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Table of Contents

Revision History	7
1 Overview	8
1.1 Organization	8
1.1.1 Ordering Part Number Description Section Overview	8
1.1.2 Thermal and Power Table Guide Overview	8
1.1.3 Thermal and Power Table Section Overview	9
1.1.4 Power Supply Specification Chapter Overview	9
1.2 Conventions	9
1.3 Definitions	10
2 AMD Phenom™ Processor	12
2.1 AMD Phenom™ Processor Ordering Part Number Description	12
2.2 AMD Phenom Processor Thermal and Power Table Guide	24
2.3 AMD Phenom Processor Thermal and Power Specifications	25
2.3.1 HD mmmm OB pnc GD (65 W, DT, AM2r2) Thermal and Power Specifications	26
2.3.2 HD mmmm WC pnc GD (95 W, DT, AM2r2) Thermal and Power Specifications	27
2.3.3 HD mmmm XA pnc GD (125 W, DT, AM2r2) Thermal and Power Specifications	30
2.3.4 HD mmmm WC pnc GH (95 W, DT, AM2r2) Thermal and Power Specifications	31
2.3.5 HD mmmm XA pnc GH (125 W, DT, AM2r2) Thermal and Power Specifications	39
2.3.6 HD mmmm FA pnc GH (140 W, DT, AM2r2) Thermal and Power Specifications	41
2.3.7 HD mmmm OD pnc GH (65 W, DT, AM2r2) Thermal and Power Specifications	42
2.3.8 HD mmmm WC pnc HH (95 W, DT, AM2r2) Thermal and Power Specifications	45
2.3.9 HD mmmm WC pnc HI (95 W, DT, AM2r2) Thermal and Power Specifications	46
2.3.10 HD mmmm XC pnc GI (125 W, DT, AM2r2) Thermal and Power Specifications	47
2.3.11 HD mmmm WF pnc GI (95 W, DT, AM3) Thermal and Power Specifications	48
2.3.12 HD mmmm OC pnc GI (65 W, DT, AM3) Thermal and Power Specifications	52
2.3.13 HD mmmm WF pnc GM (95 W, DT, AM3) Thermal and Power Specifications	54
2.3.14 HD mmmm FB pnc GM (125 W, 140 W, DT, AM3) Thermal and Power Specifications	55
2.3.15 HD mmmm WF pnc GR (95 W, DT, AM3) Thermal and Power Specifications	56
2.3.16 HD mmmm FB pnc GR (125 W, DT, AM3) Thermal and Power Specifications	58

3	AMD Athlon™ Processor	62
3.1	AMD Athlon™ Processor Ordering Part Number Description	62
3.2	AMD Athlon Processor Thermal and Power Table Guide	68
3.3	AMD Athlon Processor Thermal and Power Specifications	69
3.3.1	AD mmmm OC pnc GQ (65 W, DT, AM3) Thermal and Power Specifications	70
3.3.2	AD mmmm WF pnc GM (95 W, DT, AM3) Thermal and Power Specifications	71
3.3.3	AD mmmm OC pnc GM (65 W, DT, AM3) Thermal and Power Specifications	73
3.3.4	AD mmmm HD pnc GM (45 W, DT, AM3) Thermal and Power Specifications	76
3.3.5	AD mmmm SC pnc GM (25 W, DT, AM3) Thermal and Power Specifications	80
4	AMD Sempron™ Processor	82
4.1	AMD Sempron™ Processor Ordering Part Number Description	82
4.2	AMD Sempron Processor Thermal and Power Table Guide	85
4.3	AMD Sempron Processor Thermal and Power Specifications	86
4.3.1	SD mmmm HB pnc GM (45 W, DT, AM3) Thermal and Power Specifications	87
5	Power Supply Specifications	89
5.1	bsmmmmrr J ncdd – AM2r2 Power Supply Operating Conditions	89
5.2	bsmmmmrr K ncdd – AM3 Power Supply Operating Conditions	92
6	MTOPS	95
7	APP	96

List of Figures

Figure 1.	AMD Phenom™ Processor Ordering Part Number Diagram	12
Figure 2.	AMD Phenom Processor Ordering Part Number Example	12
Figure 3.	AMD Athlon™ Processor Ordering Part Number Diagram	62
Figure 4.	AMD Athlon Processor Ordering Part Number Example	62
Figure 5.	AMD Sempron™ Processor Ordering Part Number Diagram	82
Figure 6.	AMD Sempron Processor Ordering Part Number Example	82
Figure 7.	Socket AM2 AC and DC Transient Limits	90
Figure 8.	Socket AM3 AC and DC Transient Limits	93

List of Tables

Table 1.	AMD Phenom™ Processor Part Definition Options	13
Table 2.	AMD Phenom Processor Cache Size Options	13
Table 3.	AMD Phenom Processor Number of Cores	13
Table 4.	AMD Phenom Processor Package Options	13
Table 5.	AMD Phenom Processor Roadmap Options	14
Table 6.	AMD Phenom Processor Model Number Options	15
Table 7.	AMD Phenom Processor Thermal Profiles	17
Table 8.	AMD Phenom Processor Thermal and Power Table Guide	24
Table 9.	AMD Athlon™ Processor Part Definition Options	63
Table 10.	AMD Athlon Processor Cache Size Options	63
Table 11.	AMD Athlon Processor Number of Cores	63
Table 12.	AMD Athlon Processor Package Options	63
Table 13.	AMD Athlon Processor Roadmap Options	63
Table 14.	AMD Athlon Processor Model Number Options	64
Table 15.	AMD Athlon Processor Thermal Profiles	65
Table 16.	AMD Athlon Processor Thermal and Power Table Guide	68
Table 17.	AMD Sempron™ Processor Part Definition Options	83
Table 18.	AMD Sempron Processor Cache Size Options	83
Table 19.	AMD Sempron Processor Number of Cores	83
Table 20.	AMD Sempron Processor Package Options	83
Table 21.	AMD Sempron Processor Roadmap Options	83
Table 22.	AMD Sempron Processor Model Number Options	83
Table 23.	AMD Sempron Processor Thermal Profiles	84
Table 24.	AMD Sempron Processor Thermal and Power Table Guide	85
Table 25.	bsmmmmrr J ncdd DC Operating Conditions for VDD Power Supply	89
Table 26.	bsmmmmrr J ncdd AC Operating Conditions for VDD Power Supply	89
Table 27.	bsmmmmrr J ncdd Maximum Power-Up and Power-Down Conditions for Power Supplies	90
Table 28.	bsmmmmrr J ncdd AC and DC Operating Conditions for non-VDD Power Supplies	91
Table 29.	bsmmmmrr K ncdd DC Operating Conditions for VDD Power Supply	92
Table 30.	bsmmmmrr K ncdd AC Operating Conditions for VDD Power Supply	92
Table 31.	bsmmmmrr K ncdd Maximum Power-Up and Power-Down Conditions for Power Supplies	93
Table 32.	bsmmmmrr K ncdd AC and DC Operating Conditions for non-VDD Power Supplies	94
Table 33.	Composite Theoretical Performance (CTP) Calculation	95
Table 34.	Adjusted Peak Performance (APP) Calculation	96

Revision History

Date	Revision	Description
September 2010	3.46	<p>Seventh public release.</p> <ul style="list-style-type: none"> • Added OPNs to the AMD Phenom™ Processor, AMD Athlon™ Processor, and AMD Sempron™ Processor sections. • Added Thermal Profile W on page 66. • Updated thermal and power specifications for ADX445WFK32GM on page 72. • Updated Table 33 on page 95 (CTP) and Table 34 on page 96 (APP).
April 2010	3.40	<p>Sixth public release.</p> <ul style="list-style-type: none"> • Added OPNs to the AMD Phenom™ Processor section and to the AMD Athlon™ Processor section. • Added the AMD Sempron™ Processor section.
September 2009	3.33	<p>Fifth public release.</p> <ul style="list-style-type: none"> • Updated note to Table 28 on page 91 and Table 32 on page 94 in the Power Supply Specifications section.
June 2009	3.28	<p>Fourth public release.</p> <ul style="list-style-type: none"> • Added new OPNs to the AMD Phenom™ processor section. • Added the AMD Athlon™ processor section. • Added Section 5.2, AM3 Power Supply Operating Conditions. • Updated Table 34 on page 96 (APP).
January 2009	3.18	<p>Third public release.</p> <ul style="list-style-type: none"> • Added new 95-W, AM3 OPNs to the AMD Phenom™ Processor section.
January 2009	3.14	<p>Second public release.</p> <ul style="list-style-type: none"> • Added new OPNs to the AMD Phenom™ Processor section. • Added Table 27 on page 90.
October 2008	3.00	<p>Initial public release.</p>

1 Overview

This document contains processor thermal specifications and power specifications. The specifications in this document supersede those found in the power roadmaps. For all other electrical specifications, refer to the appropriate product data sheet and the *AMD Family 10h Processor Electrical Data Sheet*, order# 40014.

1.1 Organization

This document is organized into the following sections:

- Document overview (Section 1)
- One section for each brand represented in the desktop segment, containing the following subsections:
 - Ordering Part Number (OPN) description (content overview in Section 1.1.1)
 - Thermal and power specification tables (content overview in Section 1.1.3 on page 9)
- Power supply specifications (content overview in Section 1.1.4 on page 9)
- **MTOPS** section in Table 33 on page 95
- **APP** section in Table 34 on page 96

1.1.1 Ordering Part Number Description Section Overview

The Ordering Part Number (OPN) Description section contains a depiction and description of a valid OPN for the brand contained in that chapter. Each character or group of characters within an OPN has a specific meaning (for example, model number, socket compatibility). The meaning of each OPN character is detailed in the OPN description section. Each OPN identifies a processor with a unique thermal and power specification table entry.

The OPN description section also contains a full description of the Subsection Ordering Part Number (SOPN) abstraction characters for the brand contained in that chapter. SOPNs are used to group and organize OPNs into subsections for the thermal and power tables and power supply specifications. A definition of SOPNs is contained in Section 1.3 on page 10.

1.1.2 Thermal and Power Table Guide Overview

The thermal and power table guide section contains a table mapping SOPNs and the properties associated with their defined characters to the proper thermal and power table subsections and page numbers. This table is designed to be used as a quick reference for finding the appropriate subsection for the thermal and power tables corresponding to an SOPN.

1.1.3 Thermal and Power Table Section Overview

The thermal and power specification tables contain the thermal and power requirements for each OPN. This includes the information necessary for thermal management (for example, heat sink requirements, ambient temperature assumptions) and power delivery (for example, voltage and current, and power dissipation for each P-state).

The thermal and power specification tables are organized into subsections that correspond to Subsection Ordering Part Numbers (SOPNs). SOPNs for the thermal and power tables have the brand, power limit, and part definition characters defined. They are of the form **AB** mmmrrpnc **GH**. Each chapter provides a guide table that maps the SOPNs in the thermal and power tables within that chapter to the appropriate subsection number and page number. Within each subsection the OPNs are sorted by model number, socket compatibility, voltage, temperature, and cache size, respectively.

1.1.4 Power Supply Specification Chapter Overview

The power supply specification chapter contains the operating conditions and requirements for all voltage planes required by the processor. Power supply requirements are organized into subsections that correspond to socket infrastructure. The socket infrastructure of a particular OPN can be found in Table 5 on page 14.

1.2 Conventions

Following are conventions used with numbers.

- Binary numbers. Binary numbers are indicated by appending a “b” at the end, for example: 0110b.
- Decimal numbers. Unless specified otherwise, all numbers are decimal.
- Hexadecimal numbers. Hexadecimal numbers are indicated by appending an “h” to the end, for example: 45F8h.
- Underscores in numbers. Underscores are used to break up numbers to make them more readable, for example: 0110_1100b. They do not imply any operation.

1.3 Definitions

Following are some key definitions.

- **CPU COF.** CPU Current Operating Frequency.
- **CTP.** Composite Theoretical Performance.
- **Dual-plane.** Platforms in which the VDD and VDDNB (Northbridge) planes are isolated on the platform and controlled as separate voltages.
- **DP.** Dual Processor. Each link on DP models supports connections to I/O devices, and any one link or any sub-link can connect to another MP or DP processor.
- **MP.** Multiprocessor. Each link on MP models supports connections to I/O devices or an MP or DP processor. Systems are limited to the number of nodes supported by all the processors. Refer to the *BIOS and Kernel Developer's Guide (BKDG) for AMD Family 10h Processors*, order# 31116, for more details.
- **MTOPS.** Millions Of Theoretical Operations Per Second.
- **NB COF.** Northbridge Current Operating Frequency.
- **OPN.** Ordering Part Number. An OPN uniquely identifies a processor and its associated specifications in the thermal and power tables and power supply specifications section.
- **P-state.** Processor Performance State. P-states are valid combinations of CPU voltage, CPU COF, Northbridge voltage, and NB COF.
- **Single-plane.** Platforms in which all the VDD and VDDNB power planes are connected together on the platform and controlled as a single power plane.
- **SOPN.** Subsection Ordering Part Number. An SOPN is an OPN with a subset of defined characters. All defined characters in an SOPN are bolded and capitalized. All abstracted characters in an SOPN are in non-bolded lowercase. Information for any OPN that matches all of the defined characters in an SOPN is contained in that subsection. For example, OPN **AB**12344**CDE**5**FGH** appears under the subsection for SOPN **AB** mmmmmrrpnc **GH**. The abstracted (lowercase) character definitions for SOPNs are contained in the OPN description section of each chapter.
- **State.** Indicates the ACPI defined sleep state, power state, and performance state for the related specifications. 'x' indicates the related specifications are independent of the associated ACPI state. For example, S0.C0.P0 indicates sleep state 0, power state 0, and performance state 0. S3.Cx.Px indicates sleep state 3 entered from any power and performance state combination.
- **TDP.** Thermal Design Power. The thermal design power is the maximum power a processor can draw for a thermally significant period while running commercially useful software. The constraining conditions for TDP are specified in the notes in the thermal and power tables.
- **UP.** Uniprocessor. Each link on UP models supports connections to I/O devices.

- **VID_VDD.** The VID_VDD voltage is the VID-requested VDD supply level. Refer to the *BIOS and Kernel Developer's Guide (BKDG) for AMD Family 10h Processors*, order# 31116, for VID to voltage translation specifications.
- **VID_VDDNB.** The VID_VDDNB voltage is the VID-requested VDD Northbridge supply level. Refer to the *BIOS and Kernel Developer's Guide (BKDG) for AMD Family 10h Processors*, order# 31116, for VID to voltage translation specifications.

2 AMD Phenom™ Processor

The following sections contain the OPN description and thermal and power specifications for the AMD Phenom™ processor. Each column in the thermal and power tables represents a specific Ordering Part Number (OPN). Section 2.1 provides an example of the OPN structure for this processor family.

2.1 AMD Phenom™ Processor Ordering Part Number Description

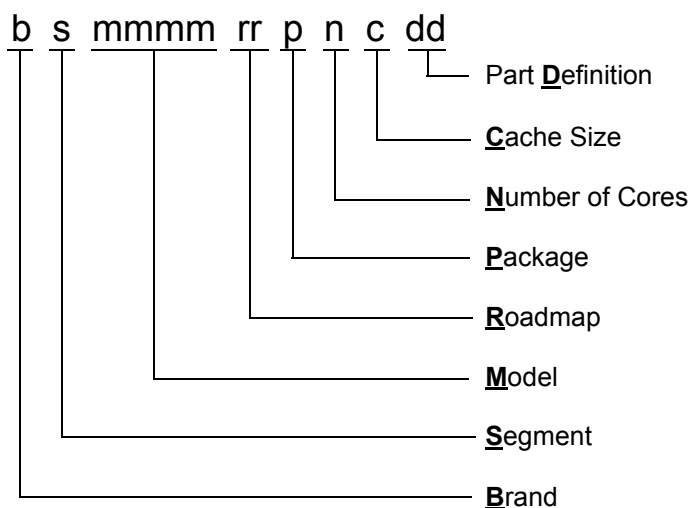


Figure 1. AMD Phenom™ Processor Ordering Part Number Diagram

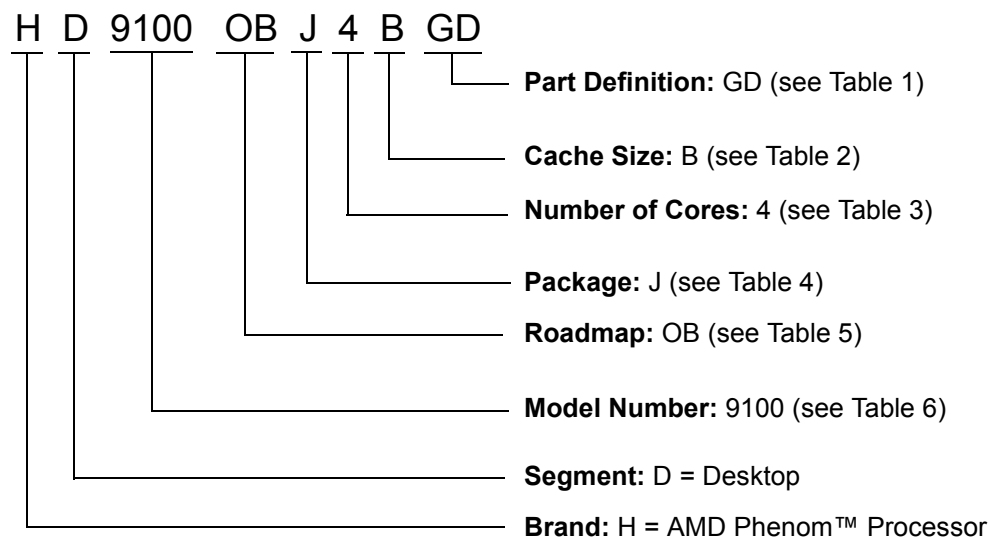


Figure 2. AMD Phenom™ Processor Ordering Part Number Example

Table 1. AMD Phenom™ Processor Part Definition Options

Part Definition	Revision	CPUID 8000_0001h EAX [31:0] (CPUID)
GD	Rev B2	00100F22h
GH	Rev B3	00100F23h
HH	Rev B2	00100F22h
HI	Rev B3	00100F23h
GI	Rev C2	00100F42h
GM	Rev C3	00100F43h
GR	Rev E0	00100FA0h

Table 2. AMD Phenom™ Processor Cache Size Options

OPN Character	L2 Cache Size	L3 Cache Size
B	512 KB	2048 KB
F	512 KB	4096 KB
D	512 KB	6144 KB

Table 3. AMD Phenom™ Processor Number of Cores

OPN Character	Number of Cores
2	2
3	3
4	4
6	6

Table 4. AMD Phenom™ Processor Package Options

OPN Character	Package
J	AM2r2
K	AM3

Table 5. AMD Phenom™ Processor Roadmap Options

OPN Character	Max TDP	Socket Infrastructure	IDD Max (VDD)	IDD Max (NB)	HS Class
OB	65 W	AM2r2	60 A	20 A	HS 65
WC	95 W	AM2r2	80 A	20 A	HS 65
WF	95 W	AM3	80 A	20 A	HS 65
XA	125 W	AM2r2	95 A	20 A	HS 78
FA	140 W	AM2r2	110 A	20 A	HS 78
FB	125 W, 140 W	AM3	110 A	20 A	HS 78
OD	65 W	AM2r2	60 A	20 A	HS 55
XC	125 W, Dual-Plane	AM2r2	95 A	20 A	HS 78
OC	65 W	AM3	60 A	20 A	HS 55

Table 6. AMD Phenom™ Processor Model Number Options

Model Number	Core Frequency	Single-Plane NB Frequency	Dual-Plane NB Frequency	Number of Cores	Max DDR Speed	Max HT Link Speed
9100	1800 MHz	1600 MHz	1600 MHz	4	800 MT/s	3200 MT/s
9150	1800 MHz	1600 MHz	1600 MHz	4	800 MT/s	3200 MT/s
9350	2000 MHz	1800 MHz	1800 MHz	4	800 MT/s	3600 MT/s
8250	1900 MHz	1800 MHz	1800 MHz	3	800 MT/s	3600 MT/s
8400	2100 MHz	1800 MHz	1800 MHz	3	800 MT/s	3600 MT/s
8450	2100 MHz	1800 MHz	1800 MHz	3	800 MT/s	3600 MT/s
9450	2100 MHz	1800 MHz	1800 MHz	4	800 MT/s	3600 MT/s
9500	2200 MHz	1800 MHz	1800 MHz	4	800 MT/s	3600 MT/s
9550	2200 MHz	1800 MHz	1800 MHz	4	800 MT/s	3600 MT/s
8550	2200 MHz	1800 MHz	1800 MHz	3	800 MT/s	3600 MT/s
8600	2300 MHz	1800 MHz	1800 MHz	3	800 MT/s	3600 MT/s
860B	2300 MHz	1800 MHz	1800 MHz	3	800 MT/s	3600 MT/s
9600	2300 MHz	1800 MHz	1800 MHz	4	800 MT/s	3600 MT/s
960B	2300 MHz	1800 MHz	1800 MHz	4	800 MT/s	3600 MT/s
960Z	2300 MHz	1800 MHz	1800 MHz	4	800 MT/s	3600 MT/s
9650	2300 MHz	1800 MHz	1800 MHz	4	800 MT/s	3600 MT/s
8650	2300 MHz	1800 MHz	1800 MHz	3	800 MT/s	3600 MT/s
8750	2400 MHz	1800 MHz	1800 MHz	3	800 MT/s	3600 MT/s
875B	2400 MHz	1800 MHz	1800 MHz	3	800 MT/s	3600 MT/s
875Z	2400 MHz	1800 MHz	1800 MHz	3	800 MT/s	3600 MT/s
9700	2400 MHz	2000 MHz	2000 MHz	4	800 MT/s	4000 MT/s
9750	2400 MHz	1800 MHz	1800 MHz	4	800 MT/s	3600 MT/s
975B	2400 MHz	1800 MHz	1800 MHz	4	800 MT/s	3600 MT/s
700E	2400 MHz	1600 MHz	2000 MHz	3	1333 MT/s	4000 MT/s
900E	2400 MHz	1600 MHz	2000 MHz	4	1333 MT/s	4000 MT/s
8850	2500 MHz	1800 MHz	1800 MHz	3	800 MT/s	3600 MT/s
9850	2500 MHz	1800 MHz	1800 MHz	4	800 MT/s	3600 MT/s
985B	2500 MHz	1800 MHz	1800 MHz	4	800 MT/s	3600 MT/s
985Z	2500 MHz	2000 MHz	2000 MHz	4	800 MT/s	4000 MT/s
X805	2500 MHz	1600 MHz	2000 MHz	4	1333 MT/s	4000 MT/s
705E	2500 MHz	1600 MHz	2000 MHz	3	1333 MT/s	4000 MT/s
905E	2500 MHz	1600 MHz	2000 MHz	4	1333 MT/s	4000 MT/s

Table 6. AMD Phenom™ Processor Model Number Options (Continued)

Model Number	Core Frequency	Single-Plane NB Frequency	Dual-Plane NB Frequency	Number of Cores	Max DDR Speed	Max HT Link Speed
995Z	2600 MHz	2000 MHz	2000 MHz	4	800 MT/s	4000 MT/s
X810	2600 MHz	1600 MHz	2000 MHz	4	1333 MT/s	4000 MT/s
X910	2600 MHz	1600 MHz	2000 MHz	4	1333 MT/s	4000 MT/s
X710	2600 MHz	1600 MHz	2000 MHz	3	1333 MT/s	4000 MT/s
T35T	2600 MHz	2000 MHz	2000 MHz	6	1333 MT/s	4000 MT/s
T45T	2700 MHz	2000 MHz	2000 MHz	6	1333 MT/s	4000 MT/s
X920	2800 MHz	1600 MHz	1800 MHz	4	1066 MT/s	3600 MT/s
Z720	2800 MHz	1600 MHz	2000 MHz	3	1333 MT/s	4000 MT/s
X925	2800 MHz	1600 MHz	2000 MHz	4	1333 MT/s	4000 MT/s
T55T	2800 MHz	2000 MHz	2000 MHz	6	1333 MT/s	4000 MT/s
Z940	3000 MHz	1600 MHz	1800 MHz	4	1066 MT/s	3600 MT/s
X545	3000 MHz	1600 MHz	2000 MHz	2	1333 MT/s	4000 MT/s
T75T	3000 MHz	2000 MHz	2000 MHz	6	1333 MT/s	4000 MT/s
Z550	3100 MHz	1600 MHz	2000 MHz	2	1333 MT/s	4000 MT/s
T90Z	3200 MHz	2000 MHz	2000 MHz	6	1333 MT/s	4000 MT/s
Z560	3300 MHz	1600 MHz	2000 MHz	2	1333 MT/s	4000 MT/s
Z970	3500 MHz	1600 MHz	2000 MHz	4	1333 MT/s	4000 MT/s

Table 7. AMD Phenom™ Processor Thermal Profiles

Thermal Profile	A
Heat Sink Thermal Resistance	0.29°C/W
Heat Sink Local Ambient	42°C
Profile Thermal Resistance	0.232°C/W
Profile Ambient	48°C
TDP	Tcase Max
0.0 W	55.0°C
5.0 W	55.0°C
10.0 W	55.0°C
15.0 W	55.0°C
20.0 W	55.0°C
25.0 W	55.0°C
30.0 W	55.0°C
35.0 W	56.1°C
40.0 W	57.3°C
45.0 W	58.4°C
50.0 W	59.6°C
55.0 W	60.8°C
60.0 W	61.9°C
65.0 W	63.1°C
70.0 W	64.2°C
75.0 W	65.4°C
80.0 W	66.6°C
85.0 W	67.7°C
90.0 W	68.9°C
95.0 W	70.0°C

Thermal Profile	B
Heat Sink Thermal Resistance	0.18°C/W
Heat Sink Local Ambient	38°C
Profile Thermal Resistance	0.136°C/W
Profile Ambient	44°C
TDP	Tcase Max
0.0 W	55.0°C
5.0 W	55.0°C
10.0 W	55.0°C
15.0 W	55.0°C
20.0 W	55.0°C
25.0 W	55.0°C
30.0 W	55.0°C
35.0 W	55.0°C
40.0 W	55.0°C
45.0 W	55.0°C
50.0 W	55.0°C
55.0 W	55.0°C
60.0 W	55.0°C
65.0 W	55.0°C
70.0 W	55.0°C
75.0 W	55.0°C
80.0 W	55.0°C
85.0 W	55.6°C
90.0 W	56.2°C
95.0 W	56.9°C
100.0 W	57.6°C
105.0 W	58.3°C
110.0 W	59.0°C
115.0 W	59.6°C
120.0 W	60.3°C
125.0 W	61.0°C

Note: The thermal profile is used to define the relationship between Tcase max and device-specific Thermal Design Power. The heat sink thermal resistance and heat sink local ambient values specify heat sink design targets. The profile thermal resistance and profile ambient values specify the relationship between part-specific power and part-specific Tcase Max. If the heat sink design targets are met, the thermal profile specifications are met.

Table 7. AMD Phenom™ Processor Thermal Profiles (Continued)

Thermal Profile	C
Heat Sink Class	HS65
Heat Sink Thermal Resistance	0.30°C/W
Heat Sink Local Ambient	42°C
Profile Thermal Resistance	0.242°C/W
Profile Ambient	48°C
TDP	Tcase Max
0.0 W	55.0°C
5.0 W	55.0°C
10.0 W	55.0°C
15.0 W	55.0°C
20.0 W	55.0°C
25.0 W	55.0°C
30.0 W	55.3°C
35.0 W	56.5°C
40.0 W	57.7°C
45.0 W	58.9°C
50.0 W	60.1°C
55.0 W	61.3°C
60.0 W	62.5°C
65.0 W	63.7°C
70.0 W	64.9°C
75.0 W	66.2°C
80.0 W	67.4°C
85.0 W	68.6°C
90.0 W	69.8°C
95.0 W	71.0°C

Thermal Profile	D
Heat Sink Thermal Resistance	0.29°C/W
Heat Sink Local Ambient	42°C
Profile Thermal Resistance	0.200°C/W
Profile Ambient	48°C
TDP	Tcase Max
0.0 W	55.0°C
5.0 W	55.0°C
10.0 W	55.0°C
15.0 W	55.0°C
20.0 W	55.0°C
25.0 W	55.0°C
30.0 W	55.0°C
35.0 W	55.0°C
40.0 W	56.0°C
45.0 W	57.0°C
50.0 W	58.0°C
55.0 W	59.0°C
60.0 W	60.0°C
65.0 W	61.0°C

Note: The thermal profile is used to define the relationship between Tcase max and device-specific Thermal Design Power. The heat sink thermal resistance and heat sink local ambient values specify heat sink design targets. The profile thermal resistance and profile ambient values specify the relationship between part-specific power and part-specific Tcase Max. If the heat sink design targets are met, the thermal profile specifications are met.

Table 7. AMD Phenom™ Processor Thermal Profiles (Continued)

Thermal Profile	E
Heat Sink Thermal Resistance	0.18°C/W
Heat Sink Local Ambient	38°C
Profile Thermal Resistance	0.143°C/W
Profile Ambient	44°C
TDP	Tcase Max
0.0 W	55.0°C
5.0 W	55.0°C
10.0 W	55.0°C
15.0 W	55.0°C
20.0 W	55.0°C
25.0 W	55.0°C
30.0 W	55.0°C
35.0 W	55.0°C
40.0 W	55.0°C
45.0 W	55.0°C
50.0 W	55.0°C
55.0 W	55.0°C
60.0 W	55.0°C
65.0 W	55.0°C
70.0 W	55.0°C
75.0 W	55.0°C
80.0 W	55.4°C
85.0 W	56.2°C
90.0 W	56.9°C
95.0 W	57.6°C
100.0 W	58.3°C
105.0 W	59.0°C
110.0 W	59.7°C
115.0 W	60.4°C
120.0 W	61.2°C
125.0 W	61.9°C
130.0 W	62.6°C
135.0 W	63.3°C
140.0 W	64.0°C

Thermal Profile	F
Heat Sink Thermal Resistance	0.42°C/W
Heat Sink Local Ambient	42°C
Profile Thermal Resistance	0.338°C/W
Profile Ambient	48°C
TDP	Tcase Max
0.0 W	55.0°C
5.0 W	55.0°C
10.0 W	55.0°C
15.0 W	55.0°C
20.0 W	55.0°C
25.0 W	56.5°C
30.0 W	58.1°C
35.0 W	59.8°C
40.0 W	61.5°C
45.0 W	63.2°C
50.0 W	64.9°C
55.0 W	66.6°C
60.0 W	68.3°C
65.0 W	70.0°C

Note: The thermal profile is used to define the relationship between Tcase max and device-specific Thermal Design Power. The heat sink thermal resistance and heat sink local ambient values specify heat sink design targets. The profile thermal resistance and profile ambient values specify the relationship between part-specific power and part-specific Tcase Max. If the heat sink design targets are met, the thermal profile specifications are met.

Table 7. AMD Phenom™ Processor Thermal Profiles (Continued)

Thermal Profile	G
Heat Sink Class	HS65
Heat Sink Thermal Resistance	0.44°C/W
Heat Sink Local Ambient	42°C
Profile Thermal Resistance	0.354°C/W
Profile Ambient	48°C
TDP	Tcase Max
0.0 W	55.0°C
5.0 W	55.0°C
10.0 W	55.0°C
15.0 W	55.0°C
20.0 W	55.1°C
25.0 W	56.9°C
30.0 W	58.6°C
35.0 W	60.4°C
40.0 W	62.2°C
45.0 W	63.9°C
50.0 W	65.7°C
55.0 W	67.5°C
60.0 W	69.2°C
65.0 W	71.0°C

Thermal Profile	H
Heat Sink Class	HS65
Heat Sink Thermal Resistance	0.32°C/W
Heat Sink Local Ambient	42°C
Profile Thermal Resistance	0.263°C/W
Profile Ambient	48°C
TDP	Tcase Max
0.0 W	55.0°C
5.0 W	55.0°C
10.0 W	55.0°C
15.0 W	55.0°C
20.0 W	55.0°C
25.0 W	55.0°C
30.0 W	55.9°C
35.0 W	57.2°C
40.0 W	58.5°C
45.0 W	59.8°C
50.0 W	61.2°C
55.0 W	62.5°C
60.0 W	63.8°C
65.0 W	65.1°C
70.0 W	66.4°C
75.0 W	67.7°C
80.0 W	69.0°C
85.0 W	70.4°C
90.0 W	71.7°C
95.0 W	73.0°C

Note: The thermal profile is used to define the relationship between Tcase max and device-specific Thermal Design Power. The heat sink thermal resistance and heat sink local ambient values specify heat sink design targets. The profile thermal resistance and profile ambient values specify the relationship between part-specific power and part-specific Tcase Max. If the heat sink design targets are met, the thermal profile specifications are met.

Table 7. AMD Phenom™ Processor Thermal Profiles (Continued)

Thermal Profile	I
Heat Sink Thermal Resistance	0.19°C/W
Heat Sink Local Ambient	38°C
Profile Thermal Resistance	0.144°C/W
Profile Ambient	44°C
TDP	Tcase Max
0.0 W	55.0°C
5.0 W	55.0°C
10.0 W	55.0°C
15.0 W	55.0°C
20.0 W	55.0°C
25.0 W	55.0°C
30.0 W	55.0°C
35.0 W	55.0°C
40.0 W	55.0°C
45.0 W	55.0°C
50.0 W	55.0°C
55.0 W	55.0°C
60.0 W	55.0°C
65.0 W	55.0°C
70.0 W	55.0°C
75.0 W	55.0°C
80.0 W	55.5°C
85.0 W	56.2°C
90.0 W	57.0°C
95.0 W	57.7°C
100.0 W	58.4°C
105.0 W	59.1°C
110.0 W	59.8°C
115.0 W	60.6°C
120.0 W	61.3°C
125.0 W	62.0°C

Thermal Profile	J
Heat Sink Class	HS55
Heat Sink Thermal Resistance	0.43°C/W
Heat Sink Local Ambient	42°C
Profile Thermal Resistance	0.338°C/W
Profile Ambient	48°C
TDP	Tcase Max
0.0 W	55.0°C
5.0 W	55.0°C
10.0 W	55.0°C
15.0 W	55.0°C
20.0 W	55.0°C
25.0 W	56.5°C
30.0 W	58.1°C
35.0 W	59.8°C
40.0 W	61.5°C
45.0 W	63.2°C
50.0 W	64.9°C
55.0 W	66.6°C
60.0 W	68.3°C
65.0 W	70.0°C

Note: The thermal profile is used to define the relationship between Tcase max and device-specific Thermal Design Power. The heat sink thermal resistance and heat sink local ambient values specify heat sink design targets. The profile thermal resistance and profile ambient values specify the relationship between part-specific power and part-specific Tcase Max. If the heat sink design targets are met, the thermal profile specifications are met.

Table 7. AMD Phenom™ Processor Thermal Profiles (Continued)

Thermal Profile	K
Heat Sink Class	HS55
Heat Sink Thermal Resistance	0.45°C/W
Heat Sink Local Ambient	42°C
Profile Thermal Resistance	0.369°C/W
Profile Ambient	48°C
TDP	Tcase Max
0.0 W	55.0°C
5.0 W	55.0°C
10.0 W	55.0°C
15.0 W	55.0°C
20.0 W	55.4°C
25.0 W	57.2°C
30.0 W	59.1°C
35.0 W	60.9°C
40.0 W	62.8°C
45.0 W	64.6°C
50.0 W	66.5°C
55.0 W	68.3°C
60.0 W	70.1°C
65.0 W	72.0°C

Thermal Profile	P
Heat Sink Class	HS65
Heat Sink Thermal Resistance	0.35°C/W
Heat Sink Local Ambient	42°C
Profile Thermal Resistance	0.275°C/W
Profile Ambient	48°C
TDP	Tcase Max
0.0 W	55.0°C
5.0 W	55.0°C
10.0 W	55.0°C
15.0 W	55.0°C
20.0 W	55.0°C
25.0 W	55.0°C
30.0 W	56.3°C
35.0 W	57.6°C
40.0 W	59.0°C
45.0 W	60.4°C
50.0 W	61.8°C
55.0 W	63.1°C
60.0 W	64.5°C
65.0 W	65.9°C
70.0 W	67.3°C
75.0 W	68.6°C
80.0 W	70.0°C

Note: The thermal profile is used to define the relationship between Tcase max and device-specific Thermal Design Power. The heat sink thermal resistance and heat sink local ambient values specify heat sink design targets. The profile thermal resistance and profile ambient values specify the relationship between part-specific power and part-specific Tcase Max. If the heat sink design targets are met, the thermal profile specifications are met.

Table 7. AMD Phenom™ Processor Thermal Profiles (Continued)

Thermal Profile	AD
Heat Sink Class	HS65
Heat Sink Thermal Resistance	0.30°C/W
Heat Sink Local Ambient	42.0°C
Profile Thermal Resistance	0.242°C/W
Profile Ambient	48.0°C
TDP	Tcase Max
0 W	55.0°C
10 W	55.0°C
20 W	55.0°C
30 W	55.3°C
40 W	57.7°C
50 W	60.1°C
60 W	62.5°C
70 W	64.9°C
80 W	67.4°C
90 W	69.8°C
95 W	71.0°C

Thermal Profile	AE
Heat Sink Class	HS78
Heat Sink Thermal Resistance	0.19°C/W
Heat Sink Local Ambient	38.0°C
Profile Thermal Resistance	0.144°C/W
Profile Ambient	44.0°C
TDP	Tcase Max
0 W	55.0°C
10 W	55.0°C
20 W	55.0°C
30 W	55.0°C
40 W	55.0°C
50 W	55.0°C
60 W	55.0°C
70 W	55.0°C
80 W	55.5°C
90 W	57.0°C
95 W	57.7°C
100 W	58.4°C
105 W	59.1°C
110 W	59.8°C
115 W	60.6°C
120 W	61.3°C
125 W	62.0°C

Note: The thermal profile is used to define the relationship between Tcase max and device-specific Thermal Design Power. The heat sink thermal resistance and heat sink local ambient values specify heat sink design targets. The profile thermal resistance and profile ambient values specify the relationship between part-specific power and part-specific Tcase Max. If the heat sink design targets are met, the thermal profile specifications are met.

2.2 AMD Phenom™ Processor Thermal and Power Table Guide

The thermal and power table guide shown in Table 8 maps SOPNs and the properties associated with their defined characters to the proper thermal and power table subsections and page numbers. This table is designed to be used as a quick reference for finding the appropriate subsection for the thermal and power tables corresponding to an SOPN.

Table 8. AMD Phenom™ Processor Thermal and Power Table Guide

SOPN	Power	Revision	Thermal/Power Tables
HD mmmm OB pnc GD	65 W	B2	Section 2.3.1 on page 26
HD mmmm WC pnc GD	95 W	B2	Section 2.3.2 on page 27
HD mmmm XA pnc GD	125 W	B2	Section 2.3.3 on page 30
HD mmmm WC pnc GH	95 W	B3	Section 2.3.4 on page 31
HD mmmm XA pnc GH	125 W	B3	Section 2.3.5 on page 39
HD mmmm FA pnc GH	140 W	B3	Section 2.3.6 on page 41
HD mmmm OD pnc GH	65 W	B3	Section 2.3.7 on page 42
HD mmmm WC pnc HH	95 W	B2	Section 2.3.8 on page 45
HD mmmm WC pnc HI	95 W	B3	Section 2.3.9 on page 46
HD mmmm XC pnc GI	125 W	C2	Section 2.3.10 on page 47
HD mmmm WF pnc GI	95 W	C2	Section 2.3.11 on page 48
HD mmmm OC pnc GI	65 W	C2	Section 2.3.12 on page 52
HD mmmm WF pnc GM	95 W	C3	Section 2.3.13 on page 54
HD mmmm FB pnc GM	125 W, 140 W	C3	Section 2.3.14 on page 55
HD mmmm WF pnc GR	95 W	E0	Section 2.3.15 on page 56
HD mmmm FB pnc GR	125 W	E0	Section 2.3.16 on page 58

2.3 AMD Phenom™ Processor Thermal and Power Specifications

The thermal and power specification tables contain the thermal and power requirements for each OPN. This includes the information necessary for thermal management (for example, heat sink requirements, temperature assumptions) and power delivery (for example, voltage, current, and power dissipation for each P-state). Refer to the *AMD Family 10h Processor Electrical Data Sheet*, order# 40014, for all other electrical specifications for the processor. Refer to the *BIOS and Kernel Developer's Guide (BKDG) for AMD Family 10h Processors*, order# 31116, for power management BIOS requirements.

Section 2.1 on page 12 provides an example of the OPN structure for processors documented in this chapter and Table 8 on page 24 provides a guide to OPN organization in the following subsections. Refer to Section 1.2 on page 9 and Section 1.3 on page 10 for numbering conventions and terminology definitions used in these tables.

2.3.1 HD mmmm OB pnc GD (65 W, DT, AM2r2) Thermal and Power Specifications

OPN			HD9100OBJ4BGD	
State	Specification ⁸	Notes	Single-Plane	Dual-Plane
S0.C0.Px	Tcase Max	1	55 °C to 61 °C	
	Tctl Max	2	70 °C	
	Tambient Min		5 °C	
	Thermal Profile		D	
	Startup P-State	5	S0.C0.P1	
	HTC P-State	4	S0.C0.P1	
S0.Cx.Px	NB COF	6,7	1600 MHz	1600 MHz
	VID_VDDNB	11,7	N/A	1.150 V
	IDDNB Max	12	N/A	9.6 A
S0.C0.P0	CPU COF	6	1800 MHz	
	TDP	3	65.0 W	65.0 W
	VID_VDD Min	9	1.100 V	1.100 V
	VID_VDD Max	9	1.150 V	1.150 V
	IDD Max	3,10	53.8 A	44.9 A
S0.C0.P1	CPU COF	6	900 MHz	
	TDP	3	46.3 W	39.3 W
	VID_VDD Min	9	1.100 V	1.000 V
	VID_VDD Max	9	1.150 V	1.000 V
	IDD Max	3,10	38.0 A	23.7 A
S0.C1.Pmin	IDD Max	3,10,14	14.6 A	3.5 A
S0	I/O Power	13	7.2 W	7.2 W
S3	I/O Power	13	350 mW	350 mW

The notes for this table are on page 60 and page 61.

2.3.2 HD mmmm WC pnc GD (95 W, DT, AM2r2) Thermal and Power Specifications

OPN			HD860WCJ3BGD HD860BWCJ3BGD		HD8400WCJ3BGD	
State	Specification ⁸	Notes	Single-Plane	Dual-Plane	Single-Plane	Dual-Plane
S0.C0.Px	Tcase Max	1	55 °C to 71 °C		55 °C to 71 °C	
	Tctl Max	2	70 °C		70 °C	
	Tambient Min		5 °C		5 °C	
	Thermal Profile		C		C	
	Startup P-State	5	S0.C0.P1		S0.C0.P1	
	HTC P-State	4	S0.C0.P1		S0.C0.P1	
S0.Cx.Px	NB COF	6,7	1800 MHz	1800 MHz	1800 MHz	1800 MHz
	VID_VDDNB	11,7	N/A	1.250 V	N/A	1.250 V
	IDDNB Max	12	N/A	14.5 A	N/A	15.2 A
S0.C0.P0	CPU COF	6	2300 MHz		2100 MHz	
	TDP	3	95.0 W	95.0 W	95.0 W	95.0 W
	VID_VDD Min	9	1.200 V	1.200 V	1.200 V	1.200 V
	VID_VDD Max	9	1.250 V	1.250 V	1.250 V	1.250 V
	IDD Max	3,10	73.4 A	60.3 A	73.3 A	59.6 A
S0.C0.P1	CPU COF	6	1150 MHz		1050 MHz	
	TDP	3	72.2 W	54.6 W	74.2 W	55.6 W
	VID_VDD Min	9	1.200 V	1.050 V	1.200 V	1.050 V
	VID_VDD Max	9	1.250 V	1.050 V	1.250 V	1.050 V
	IDD Max	3,10	56.3 A	30.5 A	57.7 A	30.6 A
S0.C1.Pmin	IDD Max	3,10,14	26.1 A	6.7 A	28.1 A	7.4 A
S0	I/O Power	13	7.2 W	7.2 W	7.2 W	7.2 W
S3	I/O Power	13	350 mW	350 mW	350 mW	350 mW

The notes for this table are on page 60 and page 61.

OPN			HD960WCJ4BGD HD960BWCJ4BGD		HD9500WCJ4BGD	
State	Specification ⁸	Notes	Single-Plane	Dual-Plane	Single-Plane	Dual-Plane
S0.C0.Px	Tcase Max	1	55 °C to 70 °C		55 °C to 70 °C	
	Tctl Max	2	70 °C		70 °C	
	Tambient Min		5 °C		5 °C	
	Thermal Profile		A		A	
	Startup P-State	5	S0.C0.P1		S0.C0.P1	
	HTC P-State	4	S0.C0.P1		S0.C0.P1	
S0.Cx.Px	NB COF	6,7	1800 MHz	1800 MHz	1800 MHz	1800 MHz
	VID_VDDNB	11,7	N/A	1.250 V	N/A	1.250 V
	IDDNB Max	12	N/A	12 A	N/A	15 A
S0.C0.P0	CPU COF	6	2300 MHz		2200 MHz	
	TDP	3	95 W	95 W	95 W	95 W
	VID_VDD Min	9	1.150 V	1.150 V	1.150 V	1.150 V
	VID_VDD Max	9	1.250 V	1.250 V	1.250 V	1.250 V
	IDD Max	3,10	75.2 A	65.6 A	75.6 A	65.3 A
S0.C0.P1	CPU COF	6	1150 MHz		1100 MHz	
	TDP	3	66.3 W	56.7 W	67.2 W	66.1 W
	VID_VDD Min	9	1.150 V	1.050 V	1.150 V	1.050 V
	VID_VDD Max	9	1.250 V	1.050 V	1.250 V	1.050 V
	IDD Max	3,10	53.7 A	35.5 A	56.4 A	40.8 A
S0.C1.Pmin	IDD Max	3,10,14	37.6 A	17.3 A	44.4 A	24.1 A
S0	I/O Power	13	7.2 W	7.2 W	7.2 W	7.2 W
S3	I/O Power	13	350 mW	350 mW	350 mW	350 mW

The notes for this table are on page 60 and page 61.

OPN			HD960ZWCJ4BGD	
State	Specification ⁸	Notes	Single-Plane	Dual-Plane
S0.C0.Px	Tcase Max	1	55 °C to 70 °C	
	Tctl Max	2	70 °C	
	Tambient Min		5 °C	
	Thermal Profile		A	
	Startup P-State	5	S0.C0.P1	
	HTC P-State	4	S0.C0.P1	
S0.Cx.Px	NB COF	6,7	1800 MHz	1800 MHz
	VID_VDDNB	11,7	N/A	1.250 V
	IDDNB Max	12	N/A	12.0 A
S0.C0.P0	CPU COF	6	2300 MHz	
	TDP	3	95.0 W	95.0 W
	VID_VDD Min	9	1.150 V	1.150 V
	VID_VDD Max	9	1.250 V	1.250 V
	IDD Max	3,10	75.2 A	65.6 A
S0.C0.P1	CPU COF	6	1150 MHz	
	TDP	3	66.3 W	56.7 W
	VID_VDD Min	9	1.150 V	1.050 V
	VID_VDD Max	9	1.250 V	1.050 V
	IDD Max	3,10	53.7 A	35.5 A
S0.C1.Pmin	IDD Max	3,10,14	37.6 A	17.3 A
S0	I/O Power	13	7.2 W	7.2 W
S3	I/O Power	13	350 mW	350 mW

The notes for this table are on page 60 and page 61.

2.3.3 HD mmmm XA pnc GD (125 W, DT, AM2r2) Thermal and Power Specifications

OPN			HD9700XAJ4BGD	
State	Specification ⁸	Notes	Single-Plane	Dual-Plane
S0.C0.Px	Tcase Max	1	55 °C to 61 °C	
	Tctl Max	2	70 °C	
	Tambient Min		5 °C	
	Thermal Profile		B	
	Startup P-State	5	S0.C0.P1	
	HTC P-State	4	S0.C0.P1	
S0.Cx.Px	NB COF	6,7	2000 MHz	2000 MHz
	VID_VDDNB	11,7	N/A	1.300 V
	IDDNB Max	12	N/A	16.8 A
S0.C0.P0	CPU COF	6	2400 MHz	
	TDP	3	125.0 W	125.0 W
	VID_VDD Min	9	1.200 V	1.200 V
	VID_VDD Max	9	1.300 V	1.300 V
	IDD Max	3,10	95.4 A	82.3 A
S0.C0.P1	CPU COF	6	1200 MHz	
	TDP	3	90.8 W	69.4 W
	VID_VDD Min	9	1.200 V	1.050 V
	VID_VDD Max	9	1.300 V	1.050 V
	IDD Max	3,10	71.6 A	41.1 A
S0.C1.Pmin	IDD Max	3,10,14	57.6 A	39.4 A
S0	I/O Power	13	7.2 W	7.2 W
S3	I/O Power	13	350 mW	350 mW

The notes for this table are on page 60 and page 61.

2.3.4 HD mmmm WC pnc GH (95 W, DT, AM2r2) Thermal and Power Specifications

OPN			HD8450WCJ3BGH		HD8550WCJ3BGH	
State	Specification ⁸	Notes	Single-Plane	Dual-Plane	Single-Plane	Dual-Plane
S0.C0.Px	Tcase Max	1	55 °C to 71 °C		55 °C to 71 °C	
	Tctl Max	2	70 °C		70 °C	
	Tambient Min		5 °C		5 °C	
	Thermal Profile		C		C	
	Startup P-State	5	S0.C0.P1		S0.C0.P1	
	HTC P-State	4	S0.C0.P1		S0.C0.P1	
S0.Cx.Px	NB COF	6,7	1800 MHz	1800 MHz	1800 MHz	1800 MHz
	VID_VDDNB	11,7	N/A	1.250 V	N/A	1.250 V
	IDDNB Max	12	N/A	15.2 A	N/A	14.9 A
S0.C0.P0	CPU COF	6	2100 MHz		2200 MHz	
	TDP	3	95.0 W	95.0 W	95.0 W	95.0 W
	VID_VDD Min	9	1.200 V	1.200 V	1.200 V	1.200 V
	VID_VDD Max	9	1.250 V	1.250 V	1.250 V	1.250 V
	IDD Max	3,10	73.3 A	59.6 A	73.4 A	59.9 A
S0.C0.P1	CPU COF	6	1050 MHz		1100 MHz	
	TDP	3	74.2 W	55.6 W	73.2 W	55.1 W
	VID_VDD Min	9	1.200 V	1.050 V	1.200 V	1.050 V
	VID_VDD Max	9	1.250 V	1.050 V	1.250 V	1.050 V
	IDD Max	3,10	57.7 A	30.6 A	57.0 A	30.5 A
S0.C1.Pmin	Core Power	15,18	15.5 W	7.8 W	14.7 W	7.4 W
	NB Power	17	16.5 W	19.0 W	16.1 W	18.6 W
	I/O Power	13	7.2 W	7.2 W	7.2 W	7.2 W
S0.C1E.Pmin	TDP	16	12.9 W	12.9 W	12.4 W	12.4 W
S3	I/O Power	13	350 mW	350 mW	350 mW	350 mW

The notes for this table are on page 60 and page 61.

OPN			HD8650WCJ3BGH		HD860BWCJ3BGH	
State	Specification ⁸	Notes	Single-Plane	Dual-Plane	Single-Plane	Dual-Plane
S0.C0.Px	Tcase Max	1	55 °C to 71 °C		55 °C to 71 °C	
	Tctl Max	2	70 °C		70 °C	
	Tambient Min		5 °C		5 °C	
	Thermal Profile		C		C	
	Startup P-State	5	S0.C0.P1		S0.C0.P1	
	HTC P-State	4	S0.C0.P1		S0.C0.P1	
S0.Cx.Px	NB COF	6,7	1800 MHz	1800 MHz	1800 MHz	1800 MHz
	VID_VDDNB	11,7	N/A	1.250 V	N/A	1.250 V
	IDDNB Max	12	N/A	14.5 A	N/A	12.8 A
S0.C0.P0	CPU COF	6	2300 MHz		2300 MHz	
	TDP	3	95.0 W	95.0 W	95.0 W	95.0 W
	VID_VDD Min	9	1.200 V	1.200 V	1.250 V	1.250 V
	VID_VDD Max	9	1.250 V	1.250 V	1.250 V	1.250 V
	IDD Max	3,10	73.4 A	60.3 A	72.4 A	59.6 A
S0.C0.P1	CPU COF	6	1150 MHz		1150 MHz	
	TDP	3	72.2 W	54.6 W	72.2 W	48.7 W
	VID_VDD Min	9	1.200 V	1.050 V	1.250 V	1.050 V
	VID_VDD Max	9	1.250 V	1.050 V	1.250 V	1.050 V
	IDD Max	3,10	56.3 A	30.5 A	54.2 A	26.9 A
S0.C1.Pmin	Core Power	15,18	13.8 W	7.0 W	12.0 W	5.0 W
	NB Power	17	15.8 W	18.2 W	16.0 W	16.0 W
	I/O Power	13	7.2 W	7.2 W	7.2 W	7.2 W
S0.C1E.Pmin	TDP	16	12.0 W	12.0 W	9.7 W	9.7 W
S3	I/O Power	13	350 mW	350 mW	350 mW	350 mW

The notes for this table are on page 60 and page 61.

OPN			HD8750WCJ3BGH		HD875BWCJ3BGH	
State	Specification ⁸	Notes	Single-Plane	Dual-Plane	Single-Plane	Dual-Plane
S0.C0.Px	Tcase Max	1	55 °C to 71 °C		55 °C to 71 °C	
	Tctl Max	2	70 °C		70 °C	
	Tambient Min		5 °C		5 °C	
	Thermal Profile		C		C	
	Startup P-State	5	S0.C0.P1		S0.C0.P1	
	HTC P-State	4	S0.C0.P1		S0.C0.P1	
S0.Cx.Px	NB COF	6,7	1800 MHz	1800 MHz	1800 MHz	1800 MHz
	VID_VDDNB	11,7	N/A	1.250 V	N/A	1.250 V
	IDDNB Max	12	N/A	14.2 A	N/A	12.5 A
S0.C0.P0	CPU COF	6	2400 MHz		2400 MHz	
	TDP	3	95.0 W	95.0 W	95.0 W	95.0 W
	VID_VDD Min	9	1.200 V	1.200 V	1.250 V	1.250 V
	VID_VDD Max	9	1.250 V	1.250 V	1.250 V	1.250 V
	IDD Max	3,10	73.5 A	60.6 A	72.4 A	59.9 A
S0.C0.P1	CPU COF	6	1200 MHz		1200 MHz	
	TDP	3	71.3 W	54.2 W	71.3 W	48.3 W
	VID_VDD Min	9	1.200 V	1.050 V	1.250 V	1.050 V
	VID_VDD Max	9	1.250 V	1.050 V	1.250 V	1.050 V
	IDD Max	3,10	55.6 A	30.4 A	53.4 A	26.8 A
S0.C1.Pmin	Core Power	15,18	13.1 W	6.6 W	11.1 W	4.6 W
	NB Power	17	15.5 W	17.8 W	15.6 W	15.6 W
	I/O Power	13	7.2 W	7.2 W	7.2 W	7.2 W
S0.C1E.Pmin	TDP	16	11.6 W	11.6 W	9.3 W	9.3 W
S3	I/O Power	13	350 mW	350 mW	350 mW	350 mW

The notes for this table are on page 60 and page 61.

OPN			HD875ZWCJ3BGH		HD8850WCJ3BGH	
State	Specification ⁸	Notes	Single-Plane	Dual-Plane	Single-Plane	Dual-Plane
S0.C0.Px	Tcase Max	1	55 °C to 71 °C		55 °C to 71 °C	
	Tctl Max	2	70 °C		70 °C	
	Tambient Min		5 °C		5 °C	
	Thermal Profile		C		C	
	Startup P-State	5	S0.C0.P1		S0.C0.P1	
	HTC P-State	4	S0.C0.P1		S0.C0.P1	
S0.Cx.Px	NB COF	6,7	1800 MHz	1800 MHz	1800 MHz	1800 MHz
	VID_VDDNB	11,7	N/A	1.250 V	N/A	1.250 V
	IDDNB Max	12	N/A	14.2 A	N/A	13.9 A
S0.C0.P0	CPU COF	6	2400 MHz		2500 MHz	
	TDP	3	95.0 W	95.0 W	95.0 W	95.0 W
	VID_VDD Min	9	1.200 V	1.200 V	1.200 V	1.200 V
	VID_VDD Max	9	1.250 V	1.250 V	1.250 V	1.250 V
	IDD Max	3,10	73.5 A	60.6 A	73.6 A	61.0 A
S0.C0.P1	CPU COF	6	1200 MHz		1250 MHz	
	TDP	3	71.3 W	54.2 W	70.4 W	53.7 W
	VID_VDD Min	9	1.200 V	1.050 V	1.200 V	1.050 V
	VID_VDD Max	9	1.250 V	1.050 V	1.250 V	1.050 V
	IDD Max	3,10	55.6 A	30.4 A	54.9 A	30.3 A
S0.C1.Pmin	Core Power	15,18	13.1 W	6.6 W	12.3 W	6.2 W
	NB Power	17	15.5 W	17.8 W	15.1 W	17.4 W
	I/O Power	13	7.2 W	7.2 W	7.2 W	7.2 W
S0.C1E.Pmin	TDP	16	11.6 W	11.6 W	11.1 W	11.1 W
S3	I/O Power	13	350 mW	350 mW	350 mW	350 mW

The notes for this table are on page 60 and page 61.

OPN			HD9850WCJ4BGH		HD985BWCJ4BGH	
State	Specification ⁸	Notes	Single-Plane	Dual-Plane	Single-Plane	Dual-Plane
S0.C0.Px	Tcase Max	1	55 °C to 70 °C		55 °C to 70 °C	
	Tctl Max	2	70 °C		70 °C	
	Tambient Min		5 °C		5 °C	
	Thermal Profile		A		A	
	Startup P-State	5	S0.C0.P1		S0.C0.P1	
	HTC P-State	4	S0.C0.P1		S0.C0.P1	
S0.Cx.Px	NB COF	6,7	1800 MHz	1800 MHz	1800 MHz	1800 MHz
	VID_VDDNB Min	11,7	N/A	1.200 V	N/A	1.225 V
	VID_VDDNB Max	11,7	N/A	1.250 V	N/A	1.250 V
	IDDNB Max	12	N/A	11.1 A	N/A	10.1 A
S0.C0.P0	CPU COF	6	2500 MHz		2500 MHz	
	TDP	3	95.0 W	95.0 W	95.0 W	95.0 W
	VID_VDD Min	9	1.200 V	1.200 V	1.225 V	1.225 V
	VID_VDD Max	9	1.250 V	1.250 V	1.250 V	1.250 V
	IDD Max	3,10	74.1 A	63.8 A	73.9 A	63.8 A
S0.C0.P1	CPU COF	6	1250 MHz		1250 MHz	
	TDP	3	63.6 W	49.6 W	63.6 W	46.6 W
	VID_VDD Min	9	1.200 V	1.050 V	1.225 V	1.050 V
	VID_VDD Max	9	1.250 V	1.050 V	1.250 V	1.050 V
	IDD Max	3,10	49.3 A	29.7 A	48.3 A	28.3 A
S0.C1.Pmin	Core Power	15,18	24.5 W	21.5 W	16.6 W	14.6 W
	NB Power	17	12.5 W	16.3 W	12.3 W	12.3 W
	I/O Power	13	7.2 W	7.2 W	7.2 W	7.2 W
S0.C1E.Pmin	TDP	16	10.0 W	10.0 W	12.3 W	12.3 W
S3	I/O Power	13	350 mW	350 mW	350 mW	350 mW

The notes for this table are on page 60 and page 61.

OPN			HD9750WCJ4BGH		HD975BWCJ4BGH	
State	Specification ⁸	Notes	Single-Plane	Dual-Plane	Single-Plane	Dual-Plane
S0.C0.Px	Tcase Max	1	55 °C to 70 °C		55 °C to 70 °C	
	Tctl Max	2	70 °C		70 °C	
	Tambient Min		5 °C		5 °C	
	Thermal Profile		A		A	
	Startup P-State	5	S0.C0.P1		S0.C0.P1	
	HTC P-State	4	S0.C0.P1		S0.C0.P1	
S0.Cx.Px	NB COF	6,7	1800 MHz	1800 MHz	1800 MHz	1800 MHz
	VID_VDDNB	11,7	N/A	1.250 V	N/A	1.250 V
	IDDNB Max	12	N/A	13.5 A	N/A	11.6 A
S0.C0.P0	CPU COF	6	2400 MHz		2400 MHz	
	TDP	3	95.0 W	95.0 W	95.0 W	95.0 W
	VID_VDD Min	9	1.150 V	1.150 V	1.200 V	1.200 V
	VID_VDD Max	9	1.250 V	1.250 V	1.250 V	1.250 V
	IDD Max	3,10	75.2 A	64.0 A	74.0 A	63.4 A
S0.C0.P1	CPU COF	6	1200 MHz		1200 MHz	
	TDP	3	65.3 W	56.9 W	64.7 W	50.3 W
	VID_VDD Min	9	1.150 V	1.050 V	1.200 V	1.050 V
	VID_VDD Max	9	1.250 V	1.050 V	1.250 V	1.050 V
	IDD Max	3,10	52.8 A	33.8 A	50.2 A	29.8 A
S0.C1.Pmin	Core Power	15,18	25.9 W	22.7 W	21.1 W	18.0 W
	NB Power	17	12.9 W	16.9 W	12.8 W	14.5 W
	I/O Power	13	7.2 W	7.2 W	7.2 W	7.2 W
S0.C1E.Pmin	TDP	16	10.6 W	10.6 W	8.1 W	8.1 W
S3	I/O Power	13	350 mW	350 mW	350 mW	350 mW

The notes for this table are on page 60 and page 61.

OPN			HD960BWCJ4BGH		HD9650WCJ4BGH	
State	Specification ⁸	Notes	Single-Plane	Dual-Plane	Single-Plane	Dual-Plane
S0.C0.Px	Tcase Max	1	55 °C to 70 °C		55 °C to 70 °C	
	Tctl Max	2	70 °C		70 °C	
	Tambient Min		5 °C		5 °C	
	Thermal Profile		A		A	
	Startup P-State	5	S0.C0.P1		S0.C0.P1	
	HTC P-State	4	S0.C0.P1		S0.C0.P1	
S0.Cx.Px	NB COF	6,7	1800 MHz	1800 MHz	1800 MHz	1800 MHz
	VID_VDDNB	11,7	N/A	1.250 V	N/A	1.250 V
	IDDNB Max	12	N/A	12.0 A	N/A	14.0 A
S0.C0.P0	CPU COF	6	2300 MHz		2300 MHz	
	TDP	3	95.0 W	95.0 W	95.0 W	95.0 W
	VID_VDD Min	9	1.200 V	1.200 V	1.150 V	1.150 V
	VID_VDD Max	9	1.250 V	1.250 V	1.250 V	1.250 V
	IDD Max	3,10	73.9 A	62.9 A	75.1 A	63.5 A
S0.C0.P1	CPU COF	6	1150 MHz		1150 MHz	
	TDP	3	65.8 W	50.9 W	66.1 W	57.6 W
	VID_VDD Min	9	1.200 V	1.050 V	1.150 V	1.050 V
	VID_VDD Max	9	1.250 V	1.050 V	1.250 V	1.050 V
	IDD Max	3,10	51.1 A	29.9 A	53.6 A	34.0 A
S0.C1.Pmin	Core Power	15,18	22.7 W	19.1 W	27.4 W	23.8 W
	NB Power	17	13.2 W	15.0 W	13.3 W	17.5 W
	I/O Power	13	7.2 W	7.2 W	7.2 W	7.2 W
S0.C1E.Pmin	TDP	16	8.7 W	8.7 W	11.2 W	11.2 W
S3	I/O Power	13	350 mW	350 mW	350 mW	350 mW

The notes for this table are on page 60 and page 61.

OPN			HD9550WCJ4BGH	
State	Specification ⁸	Notes	Single-Plane	Dual-Plane
S0.C0.Px	Tcase Max	1	55 °C to 70 °C	
	Tctl Max	2	70 °C	
	Tambient Min		5 °C	
	Thermal Profile		A	
	Startup P-State	5	S0.C0.P1	
	HTC P-State	4	S0.C0.P1	
S0.Cx.Px	NB COF	6,7	1800 MHz	1800 MHz
	VID_VDDNB	11,7	N/A	1.250 V
	IDDNB Max	12	N/A	14.4 A
S0.C0.P0	CPU COF	6	2200 MHz	
	TDP	3	95.0 W	95.0 W
	VID_VDD Min	9	1.150 V	1.150 V
	VID_VDD Max	9	1.250 V	1.250 V
	IDD Max	3,10	74.9 A	63.0 A
S0.C0.P1	CPU COF	6	1100 MHz	
	TDP	3	67.0 W	58.3 W
	VID_VDD Min	9	1.150 V	1.050 V
	VID_VDD Max	9	1.250 V	1.050 V
	IDD Max	3,10	54.4 A	34.1 A
S0.C1.Pmin	Core Power	15,18	28.9 W	24.9 W
	NB Power	17	13.7 W	18.0 W
	I/O Power	13	7.2 W	7.2 W
S0.C1E.Pmin	TDP	16	11.9 W	11.9 W
S3	I/O Power	13	350 mW	350 mW

The notes for this table are on page 60 and page 61.

2.3.5 HD mmmm XA pnc GH (125 W, DT, AM2r2) Thermal and Power Specifications

OPN			HD985ZXAJ4BGH		HD9750XAJ4BGH	
State	Specification ⁸	Notes	Single-Plane	Dual-Plane	Single-Plane	Dual-Plane
S0.C0.Px	Tcase Max	1	55 °C to 61 °C		55 °C to 61 °C	
	Tctl Max	2	70 °C		70 °C	
	Tambient Min		5 °C		5 °C	
	Thermal Profile		B		B	
	Startup P-State	5	S0.C0.P1		S0.C0.P1	
	HTC P-State	4	S0.C0.P1		S0.C0.P1	
S0.Cx.Px	NB COF	6,7	2000 MHz	2000 MHz	1800 MHz	1800 MHz
	VID_VDDNB	11,7	N/A	1.300 V	N/A	1.300 V
	IDDNB Max	12	N/A	18.4 A	N/A	18.3 A
S0.C0.P0	CPU COF	6	2500 MHz		2400 MHz	
	TDP	3	125.0 W	125.0 W	125.0 W	125.0 W
	VID_VDD Min	9	1.200 V	1.200 V	1.200 V	1.200 V
	VID_VDD Max	9	1.300 V	1.300 V	1.300 V	1.300 V
	IDD Max	3,10	95.0 A	80.1 A	95.0 A	80.2 A
S0.C0.P1	CPU COF	6	1250 MHz		1200 MHz	
	TDP	3	89.4 W	69.7 W	90.7 W	70.2 W
	VID_VDD Min	9	1.200 V	1.050 V	1.200 V	1.050 V
	VID_VDD Max	9	1.300 V	1.050 V	1.300 V	1.050 V
	IDD Max	3,10	70.2 A	39.4 A	71.2 A	39.9 A
S0.C1.Pmin	Core Power	15,18	40.8 W	32.3 W	42.2 W	33.0 W
	NB Power	17	17.9 W	23.9 W	17.7 W	23.8 W
	I/O Power	13	7.2 W	7.2 W	7.2 W	7.2 W
S0.C1E.Pmin	TDP	16	13.6 W	13.6 W	14.5 W	14.5 W
S3	I/O Power	13	350 mW	350 mW	350 mW	350 mW

The notes for this table are on page 60 and page 61.

OPN			HD9850XAJ4BGH		HD995ZXAJ4BGH	
State	Specification ⁸	Notes	Single-Plane	Dual-Plane	Single-Plane	Dual-Plane
S0.C0.Px	Tcase Max	1	55 °C to 61 °C		55 °C to 61 °C	
	Tctl Max	2	70 °C		70 °C	
	Tambient Min		5 °C		5 °C	
	Thermal Profile		B		B	
	Startup P-State	5	S0.C0.P1		S0.C0.P1	
	HTC P-State	4	S0.C0.P1		S0.C0.P1	
S0.Cx.Px	NB COF	6,7	2000 MHz	2000 MHz	2000 MHz	2000 MHz
	VID_VDDNB	11,7	N/A	1.300 V	N/A	1.300 V
	IDDNB Max	12	N/A	18.4 A	N/A	17.8 A
S0.C0.P0	CPU COF	6	2500 MHz		2600 MHz	
	TDP	3	125.0 W	125.0 W	125.0 W	125.0 W
	VID_VDD Min	9	1.200 V	1.200 V	1.200 V	1.200 V
	VID_VDD Max	9	1.300 V	1.300 V	1.300 V	1.300 V
	IDD Max	3,10	95.0 A	80.1 A	95.0 A	80.5 A
S0.C0.P1	CPU COF	6	1250 MHz		1300 MHz	
	TDP	3	89.4 W	69.7 W	88.2 W	68.9 W
	VID_VDD Min	9	1.200 V	1.050 V	1.200 V	1.050 V
	VID_VDD Max	9	1.300 V	1.050 V	1.300 V	1.050 V
	IDD Max	3,10	70.2 A	39.4 A	69.2 A	39.3 A
S0.C1.Pmin	Core Power	15,18	40.8 W	32.3 W	39.0 W	31.1 W
	NB Power	17	17.9 W	23.9 W	17.5 W	22.2 W
	I/O Power	13	7.2 W	7.2 W	7.2 W	7.2 W
S0.C1E.Pmin	TDP	16	13.7 W	13.7 W	13.1 W	13.1 W
S3	I/O Power	13	350 mW	350 mW	350 mW	350 mW

The notes for this table are on page 60 and page 61.

2.3.6 HD mmmm FA pnc GH (140 W, DT, AM2r2) Thermal and Power Specifications

OPN			HD995ZFAJ4BGH ¹⁹	
State	Specification ⁸	Notes	Single-Plane	Dual-Plane
S0.C0.Px	Tcase Max	1	55 °C to 64 °C	
	Tctl Max	2	70 °C	
	Tambient Min		5 °C	
	Thermal Profile		E	
	Startup P-State	5	S0.C0.P1	
	HTC P-State	4	S0.C0.P1	
S0.Cx.Px	NB COF	6,7	2000 MHz	2000 MHz
	VID_VDDNB	11,7	N/A	1.300 V
	IDDNB Max	12	N/A	18.1 A
S0.C0.P0	CPU COF	6	2600 MHz	
	TDP	3	140.0 W	140.0 W
	VID_VDD Min	9	1.250 V	1.250 V
	VID_VDD Max	9	1.300 V	1.300 V
	IDD Max	3,10	105.9 A	89.6 A
S0.C0.P1	CPU COF	6	1300 MHz	
	TDP	3	102.6 W	69.8 W
	VID_VDD Min	9	1.250 V	1.050 V
	VID_VDD Max	9	1.300 V	1.050 V
	IDD Max	3,10	78.5 A	39.8 A
S0.C1.Pmin	Core Power	15,18	44.2 W	31.8 W
	NB Power	17	20.4 W	23.5 W
	I/O Power	13	7.2 W	7.2 W
S0.C1E.Pmin	TDP	16	13.4 W	13.4 W
S3	I/O Power	13	350 mW	350 mW

The notes for this table are on page 60 and page 61.

2.3.7 HD mmmm OD pnc GH (65 W, DT, AM2r2) Thermal and Power Specifications

OPN			HD8450ODJ3BGH		HD8250ODJ3BGH	
State	Specification ⁸	Notes	Single-Plane	Dual-Plane	Single-Plane	Dual-Plane
S0.C0.Px	Tcase Max	1	55 °C to 71 °C		55 °C to 71 °C	
	Tctl Max	2	70 °C		70 °C	
	Tambient Min		5 °C		5 °C	
	Thermal Profile		G		G	
	Startup P-State	5	S0.C0.P1		S0.C0.P1	
	HTC P-State	4	S0.C0.P1		S0.C0.P1	
S0.Cx.Px	NB COF	6,7	1800 MHz	1800 MHz	1800 MHz	1800 MHz
	VID_VDDNB	11,7	N/A	1.200 V	N/A	1.200 V
	IDDNB Max	12	N/A	11.0 A	N/A	11.6 A
S0.C0.P0	CPU COF	6	2100 MHz		1900 MHz	
	TDP	3	65.0 W	65.0 W	65.0 W	65.0 W
	VID_VDD Min	9	1.125 V	1.125 V	1.125 V	1.125 V
	VID_VDD Max	9	1.200 V	1.200 V	1.200 V	1.200 V
	IDD Max	3,10	51.8 A	42.1 A	51.6 A	41.4 A
S0.C0.P1	CPU COF	6	1050 MHz		950 MHz	
	TDP	3	46.7 W	39.1 W	48.2 W	40.1 W
	VID_VDD Min	9	1.125 V	1.000 V	1.125 V	1.000 V
	VID_VDD Max	9	1.200 V	1.000 V	1.200 V	1.000 V
	IDD Max	3,10	37.5 A	21.5 A	38.7 A	21.6 A
S0.C1.Pmin	Core Power	15,18	5.5 W	3.2 W	6.8 W	3.9 W
	NB Power	17	10.9 W	13.2 W	11.4 W	13.9 W
	I/O Power	13	7.2 W	7.2 W	7.2 W	7.2 W
S0.C1E.Pmin	TDP	16	8.6 W	8.6 W	9.6 W	9.6 W
S3	I/O Power	13	350 mW	350 mW	350 mW	350 mW

The notes for this table are on page 60 and page 61.

OPN			HD9150DJ4BGH		HD9350DJ4BGH	
State	Specification ⁸	Notes	Single-Plane	Dual-Plane	Single-Plane	Dual-Plane
S0.C0.Px	Tcase Max	1	55 °C to 70 °C		55 °C to 70 °C	
	Tctl Max	2	70 °C		70 °C	
	Tambient Min		5 °C		5 °C	
	Thermal Profile		F		F	
	Startup P-State	5	S0.C0.P1		S0.C0.P1	
	HTC P-State	4	S0.C0.P1		S0.C0.P1	
S0.Cx.Px	NB COF	6,7	1600 MHz	1600 MHz	1800 MHz	1800 MHz
	VID_VDDNB	11,7	N/A	1.125 V	N/A	1.125 V
	IDDNB Max	12	N/A	10.1 A	N/A	9.8 A
S0.C0.P0	CPU COF	6	1800 MHz		2000 MHz	
	TDP	3	65.0 W	65.0 W	65.0 W	65.0 W
	VID_VDD Min	9	1.075 V	1.075 V	1.075 V	1.075 V
	VID_VDD Max	9	1.125 V	1.125 V	1.125 V	1.125 V
	IDD Max	3,10	54.9 A	45.8 A	55.0 A	46.0 A
S0.C0.P1	CPU COF	6	900 MHz		1000 MHz	
	TDP	3	47.2 W	41.7 W	45.5 W	40.5 W
	VID_VDD Min	9	1.075 V	1.000 V	1.075 V	1.000 V
	VID_VDD Max	9	1.125 V	1.000 V	1.125 V	1.000 V
	IDD Max	3,10	39.7 A	25.9 A	38.1 A	25.0 A
S0.C1.Pmin	Core Power	15,18	17.8 W	16.0 W	15.4 W	14.1 W
	NB Power	17	9.9 W	11.3 W	9.2 W	10.5 W
	I/O Power	13	7.2 W	7.2 W	7.2 W	7.2 W
S0.C1E.Pmin	TDP	16	10.6 W	10.6 W	8.8 W	8.8 W
S3	I/O Power	13	350 mW	350 mW	350 mW	350 mW

The notes for this table are on page 60 and page 61.

OPN			HD9450ODJ4BGH	
State	Specification ⁸	Notes	Single-Plane	Dual-Plane
S0.C0.Px	Tcase Max	1	55 °C to 70 °C	
	Tctl Max	2	70 °C	
	Tambient Min		5 °C	
	Thermal Profile		F	
	Startup P-State	5	S0.C0.P1	
	HTC P-State	4	S0.C0.P1	
S0.Cx.Px	NB COF	6,7	1800 MHz	1800 MHz
	VID_VDDNB	11,7	N/A	1.125 V
	IDDNB Max	12	N/A	9.4 A
S0.C0.P0	CPU COF	6	2100 MHz	
	TDP	3	65.0 W	65.0 W
	VID_VDD Min	9	1.075 V	1.075 V
	VID_VDD Max	9	1.125 V	1.125 V
	IDD Max	3,10	55.1 A	46.4 A
S0.C0.P1	CPU COF	6	1050 MHz	
	TDP	3	44.7 W	39.9 W
	VID_VDD Min	9	1.075 V	1.000 V
	VID_VDD Max	9	1.125 V	1.000 V
	IDD Max	3,10	37.4 A	24.8 A
S0.C1.Pmin	Core Power	15,18	14.5 W	13.5 W
	NB Power	17	9.3 W	10.6 W
	I/O Power	13	7.2 W	7.2 W
S0.C1E.Pmin	TDP	16	8.1 W	8.1 W
S3	I/O Power	13	350 mW	350 mW

The notes for this table are on page 60 and page 61.

2.3.8 HD mmmm WC pnc HH (95 W, DT, AM2r2) Thermal and Power Specifications

OPN			HD8400WCJ3BHH	
State	Specification ⁸	Notes	Single-Plane	Dual-Plane
S0.C0.Px	Tcase Max	1	55 °C to 71 °C	
	Tctl Max	2	70 °C	
	Tambient Min		5 °C	
	Thermal Profile		C	
	Startup P-State	5	S0.C0.P1	
	HTC P-State	4	S0.C0.P1	
S0.Cx.Px	NB COF	6,7	1800 MHz	1800 MHz
	VID_VDDNB	11,7	N/A	1.250 V
	IDDNB Max	12	N/A	15.2 A
S0.C0.P0	CPU COF	6	2100 MHz	
	TDP	3	95.0 W	95.0 W
	VID_VDD Min	9	1.200 V	1.200 V
	VID_VDD Max	9	1.250 V	1.250 V
	IDD Max	3,10	73.3 A	59.6 A
S0.C0.P1	CPU COF	6	1050 MHz	
	TDP	3	74.2 W	55.6 W
	VID_VDD Min	9	1.200 V	1.050 V
	VID_VDD Max	9	1.250 V	1.050 V
	IDD Max	3,10	57.7 A	30.6 A
S0.C1.Pmin	Core Power	15,18	15.5 W	7.8 W
	NB Power	17	16.5 W	19.0 W
	I/O Power	13	7.2 W	7.2 W
S0.C1E.Pmin	TDP	16	12.9 W	12.9 W
S3	I/O Power	13	350 mW	350 mW

The notes for this table are on page 60 and page 61.

2.3.9 HD mmmm WC pnc HI (95 W, DT, AM2r2) Thermal and Power Specifications

OPN			HD8550WCJ3BHI	
State	Specification ⁸	Notes	Single-Plane	Dual-Plane
S0.C0.Px	Tcase Max	1	55 °C to 71 °C	
	Tctl Max	2	70 °C	
	Tambient Min		5 °C	
	Thermal Profile		C	
	Startup P-State	5	S0.C0.P1	
	HTC P-State	4	S0.C0.P1	
S0.Cx.Px	NB COF	6,7	1800 MHz	1800 MHz
	VID_VDDNB	11,7	N/A	1.250 V
	IDDNB Max	12	N/A	14.9 A
S0.C0.P0	CPU COF	6	2200 MHz	
	TDP	3	95.0 W	95.0 W
	VID_VDD Min	9	1.200 V	1.200 V
	VID_VDD Max	9	1.250 V	1.250 V
	IDD Max	3,10	73.4 A	59.9 A
S0.C0.P1	CPU COF	6	1100 MHz	
	TDP	3	73.2 W	55.1 W
	VID_VDD Min	9	1.200 V	1.050 V
	VID_VDD Max	9	1.250 V	1.050 V
	IDD Max	3,10	57.0 A	30.5 A
S0.C1.Pmin	Core Power	15,18	14.7 W	7.4 W
	NB Power	17	16.1 W	18.6 W
	I/O Power	13	7.2 W	7.2 W
S0.C1E.Pmin	TDP	16	12.4 W	12.4 W
S3	I/O Power	13	350 mW	350 mW

The notes for this table are on page 60 and page 61.

2.3.10 HD mmmm XC pnc GI (125 W, DT, AM2r2) Thermal and Power Specifications

OPN			HDX920XCJ4DGI ¹⁹		HDZ940XCJ4DGI ¹⁹	
State	Specification ⁸	Notes	Single-Plane	Dual-Plane	Single-Plane	Dual-Plane
S0.C0.Px	Tcase Max	1	55 °C to 62 °C		55 °C to 62 °C	
	Tctl Max	2	70 °C		70 °C	
	Tambient Min		5 °C		5 °C	
	Thermal Profile		I		I	
	Startup P-State	5	S0.C0.P3		S0.C0.P3	
	HTC P-State	4	S0.C0.P3		S0.C0.P3	
S0.Cx.Px	NB COF	6,7	1600 MHz	1800 MHz	1600 MHz	1800 MHz
	VID_VDDNB Min	11,7	N/A	1.150 V	N/A	1.150 V
	VID_VDDNB Max	11,7	N/A	1.300 V	N/A	1.300 V
	IDDNB Max	12	N/A	20.0 A	N/A	20.0 A
S0.C0.P0	CPU COF	6	2800 MHz		3000 MHz	
	TDP	3,7	140.8 W	125.0 W	139.6 W	125.0 W
	VID_VDD Min	9	1.225 V	1.225 V	1.225 V	1.225 V
	VID_VDD Max	9	1.425 V	1.425 V	1.425 V	1.425 V
	IDD Max	3,10	102.5 A	78.9 A	102.3 A	79.4 A
S0.C0.P1	CPU COF	6	2100 MHz		2300 MHz	
	TDP	3,7	94.7 W	91.4 W	94.9 W	91.7 W
	VID_VDD Min	9	1.150 V	1.125 V	1.150 V	1.125 V
	VID_VDD Max	9	1.325 V	1.325 V	1.325 V	1.325 V
	IDD Max	3,10	77.6 A	55.2 A	77.7 A	56.0 A
S0.C0.P2	CPU COF	6	1600 MHz		1800 MHz	
	TDP	3,7	88.7 W	70.1 W	88.9 W	70.8 W
	VID_VDD Min	9	1.150 V	1.025 V	1.150 V	1.025 V
	VID_VDD Max	9	1.225 V	1.225 V	1.225 V	1.225 V
	IDD Max	3,10	72.4 A	39.3 A	72.5 A	40.1 A
S0.C0.P3	CPU COF	6	800 MHz		800 MHz	
	TDP	3,7	79.2 W	52.7 W	77.0 W	48.8 W
	VID_VDD Min	9	1.150 V	0.925 V	1.150 V	0.875 V
	VID_VDD Max	9	1.150 V	1.150 V	1.150 V	1.150 V
	IDD Max	3,10	64.1 A	24.9 A	62.1 A	21.4 A
S0.C1.Pmin	Core Power (Pre-Flush)	20	39.7 W	8.8 W	38.7 W	6.9 W
	Core Power (Post-Flush)	20	36.8 W	6.3 W	35.8 W	4.8 W
	NB Power	17	30.4 W	22.3 W	31.0 W	22.3 W
	I/O Power	13	5.5 W	5.5 W	5.5 W	5.5 W
S0.C1E.Pmin	TDP	16	19.7 W	11.4 W	18.9 W	10.4 W
S3	I/O Power	13	350 mW	350 mW	350 mW	350 mW

The notes for this table are on page 60 and page 61.

2.3.11 HD mmmm WF pnc GI (95 W, DT, AM3) Thermal and Power Specifications

OPN			HDX805WFK4FGI ¹⁹		HDX810WFK4FGI ¹⁹	
State	Specification ⁸	Notes	Single-Plane	Dual-Plane	Single-Plane	Dual-Plane
S0.C0.Px	Tcase Max	1	55 °C to 71 °C		55 °C to 71 °C	
	Tctl Max	2	70 °C		70 °C	
	Tambient Min		5 °C		5 °C	
	Thermal Profile		C		C	
	Startup P-State	5	S0.C0.P3		S0.C0.P3	
	HTC P-State	4	S0.C0.P3		S0.C0.P3	
S0.Cx.Px	NB COF	6,7	1600 MHz	2000 MHz	1600 MHz	2000 MHz
	VID_VDDNB Min	11,7	N/A	1.150 V	N/A	1.150 V
	VID_VDDNB Max	11,7	N/A	1.300 V	N/A	1.300 V
	IDDNB Max	12	N/A	20.0 A	N/A	20.0 A
S0.C0.P0	CPU COF	6	2500 MHz		2600 MHz	
	TDP	3,7	104.0 W	95.0 W	104.0 W	95.0 W
	VID_VDD Min	9	1.150 V	1.150 V	1.150 V	1.150 V
	VID_VDD Max	9	1.425 V	1.425 V	1.425 V	1.425 V
	IDD Max	3,10	75.8 A	58.7 A	75.8 A	58.9 A
S0.C0.P1	CPU COF	6	1800 MHz		1900 MHz	
	TDP	3,7	85.5 W	71.7 W	85.5 W	71.7 W
	VID_VDD Min	9	1.150 V	1.050 V	1.150 V	1.050 V
	VID_VDD Max	9	1.325 V	1.325 V	1.325 V	1.325 V
	IDD Max	3,10	68.5 A	40.5 A	68.5 A	40.8 A
S0.C0.P2	CPU COF	6	1300 MHz		1400 MHz	
	TDP	3,7	79.5 W	57.2 W	79.5 W	57.2 W
	VID_VDD Min	9	1.150 V	0.950 V	1.150 V	0.950 V
	VID_VDD Max	9	1.225 V	1.225 V	1.225 V	1.225 V
	IDD Max	3,10	63.3 A	28.3 A	63.3 A	28.7 A
S0.C0.P3	CPU COF	6	800 MHz		800 MHz	
	TDP	3,7	73.5 W	48.4 W	72.3 W	47.6 W
	VID_VDD Min	9	1.150 V	0.875 V	1.150 V	0.875 V
	VID_VDD Max	9	1.150 V	1.150 V	1.150 V	1.150 V
	IDD Max	3,10	58.1 A	20.2 A	57.1 A	19.9 A
S0.C1.Pmin	Core Power (Pre-Flush)	20	37.5 W	6.6 W	36.5 W	6.5 W
	Core Power (Post-Flush)	20	34.6 W	4.4 W	33.5 W	4.3 W
	NB Power	17	22.3 W	22.3 W	22.3 W	22.3 W
	I/O Power	13	6.7 W	6.7 W	6.7 W	6.7 W
S0.C1E.Pmin	TDP	16	17.5 W	10.0 W	17.0 W	9.9 W
S3	I/O Power	13	350 mW	350 mW	350 mW	350 mW

The notes for this table are on page 60 and page 61.

OPN			HDX910WFK4DGI ¹⁹		HDX925WFK4DGI ¹⁹	
State	Specification ⁸	Notes	Single-Plane	Dual-Plane	Single-Plane	Dual-Plane
S0.C0.Px	Tcase Max	1	55 °C to 71 °C		55 °C to 71 °C	
	Tctl Max	2	70 °C		70 °C	
	Tambient Min		5 °C		5 °C	
	Thermal Profile		C		C	
	Startup P-State	5	S0.C0.P3		S0.C0.P3	
	HTC P-State	4	S0.C0.P3		S0.C0.P3	
S0.Cx.Px	NB COF	6,7	1600 MHz	2000 MHz	1600 MHz	2000 MHz
	VID_VDDNB Min	11,7	N/A	1.150 V	N/A	1.150 V
	VID_VDDNB Max	11,7	N/A	1.300 V	N/A	1.300 V
	IDDNB Max	12	N/A	20.0 A	N/A	20.0 A
S0.C0.P0	CPU COF	6	2600 MHz		2800 MHz	
	TDP	3,7	104.0 W	95.0 W	103.1 W	95.0 W
	VID_VDD Min	9	1.150 V	1.150 V	1.150 V	1.150 V
	VID_VDD Max	9	1.425 V	1.425 V	1.425 V	1.425 V
	IDD Max	3,10	75.8 A	58.9 A	75.8 A	59.5 A
S0.C0.P1	CPU COF	6	1900 MHz		2100 MHz	
	TDP	3,7	85.5 W	71.7 W	85.5 W	72.2 W
	VID_VDD Min	9	1.150 V	1.050 V	1.150 V	1.050 V
	VID_VDD Max	9	1.325 V	1.325 V	1.325 V	1.325 V
	IDD Max	3,10	68.5 A	40.8 A	68.5 A	41.6 A
S0.C0.P2	CPU COF	6	1400 MHz		1600 MHz	
	TDP	3,7	79.5 W	57.2 W	79.5 W	58.0 W
	VID_VDD Min	9	1.150 V	0.950 V	1.150 V	0.950 V
	VID_VDD Max	9	1.225 V	1.225 V	1.225 V	1.225 V
	IDD Max	3,10	63.3 A	28.7 A	63.3 A	29.6 A
S0.C0.P3	CPU COF	6	800 MHz		800 MHz	
	TDP	3,7	72.3 W	47.6 W	70.0 W	46.1 W
	VID_VDD Min	9	1.150 V	0.875 V	1.150 V	0.850 V
	VID_VDD Max	9	1.150 V	1.150 V	1.150 V	1.125 V
	IDD Max	3,10	57.1 A	19.9 A	55.0 A	18.1 A
S0.C1.Pmin	Core Power (Pre-Flush)	20	36.5 W	6.5 W	35.5 W	5.6 W
	Core Power (Post-Flush)	20	33.5 W	4.3 W	32.5 W	3.6 W
	NB Power	17	22.3 W	22.3 W	22.3 W	22.3 W
	I/O Power	13	6.7 W	6.7 W	6.7 W	6.7 W
S0.C1E.Pmin	TDP	16	17.0 W	9.9 W	16.1 W	9.5 W
S3	I/O Power	13	350 mW	350 mW	350 mW	350 mW

The notes for this table are on page 60 and page 61.

OPN			HDX710WFK3DGI ¹⁹		HDZ720WFK3DGI ¹⁹	
State	Specification ⁸	Notes	Single-Plane	Dual-Plane	Single-Plane	Dual-Plane
S0.C0.Px	Tcase Max	1	55 °C to 73 °C		55 °C to 73 °C	
	Tctl Max	2	70 °C		70 °C	
	Tambient Min		5 °C		5 °C	
	Thermal Profile		H		H	
	Startup P-State	5	S0.C0.P3		S0.C0.P3	
	HTC P-State	4	S0.C0.P3		S0.C0.P3	
S0.Cx.Px	NB COF	6,7	1600 MHz	2000 MHz	1600 MHz	2000 MHz
	VID_VDDNB Min	11,7	N/A	1.150 V	N/A	1.150 V
	VID_VDDNB Max	11,7	N/A	1.300 V	N/A	1.300 V
	IDDNB Max	12	N/A	20.0 A	N/A	20.0 A
S0.C0.P0	CPU COF	6	2600 MHz		2800 MHz	
	TDP	3,7	107.4 W	95.0 W	106.5 W	95.0 W
	VID_VDD Min	9	1.150 V	1.150 V	1.150 V	1.150 V
	VID_VDD Max	9	1.425 V	1.425 V	1.425 V	1.425 V
	IDD Max	3,10	75.9 A	57.1 A	75.8 A	57.5 A
S0.C0.P1	CPU COF	6	1900 MHz		2100 MHz	
	TDP	3,7	87.6 W	72.2 W	87.6 W	72.6 W
	VID_VDD Min	9	1.150 V	1.050 V	1.150 V	1.050 V
	VID_VDD Max	9	1.325 V	1.325 V	1.325 V	1.325 V
	IDD Max	3,10	70.3 A	40.0 A	70.3 A	40.5 A
S0.C0.P2	CPU COF	6	1400 MHz		1600 MHz	
	TDP	3,7	83.1 W	57.8 W	83.1 W	58.5 W
	VID_VDD Min	9	1.150 V	0.950 V	1.150 V	0.950 V
	VID_VDD Max	9	1.225 V	1.225 V	1.225 V	1.225 V
	IDD Max	3,10	66.4 A	28.5 A	66.4 A	29.1 A
S0.C0.P3	CPU COF	6	800 MHz		800 MHz	
	TDP	3,7	77.7 W	48.8 W	75.9 W	47.2 W
	VID_VDD Min	9	1.150 V	0.875 V	1.150 V	0.850 V
	VID_VDD Max	9	1.150 V	1.150 V	1.150 V	1.125 V
	IDD Max	3,10	61.8 A	20.5 A	60.2 A	18.7 A
S0.C1.Pmin	Core Power (Pre-Flush)	20	39.6 W	7.9 W	38.7 W	6.9 W
	Core Power (Post-Flush)	20	36.6 W	5.2 W	35.8 W	4.4 W
	NB Power	17	22.3 W	22.3 W	22.3 W	22.3 W
	I/O Power	13	6.7 W	6.7 W	6.7 W	6.7 W
S0.C1E.Pmin	TDP	16	19.6 W	10.5 W	19.0 W	10.4 W
S3	I/O Power	13	350 mW	350 mW	350 mW	350 mW

The notes for this table are on page 60 and page 61.

OPN			HDZ550WFK2DGI ¹⁹		HDX545WFK2DGI ¹⁹	
State	Specification ⁸	Notes	Single-Plane	Dual-Plane	Single-Plane	Dual-Plane
S0.C0.Px	Tcase Max	1	55 °C to 70 °C		55 °C to 70 °C	
	Tctl Max	2	70 °C		70 °C	
	Tambient Min		5 °C		5 °C	
	Thermal Profile		P		P	
	Startup P-State	5	S0.C0.P3		S0.C0.P3	
	HTC P-State	4	S0.C0.P3		S0.C0.P3	
S0.Cx.Px	NB COF	6,7	1600 MHz	2000 MHz	1600 MHz	2000 MHz
	VID_VDDNB Min	11,7	N/A	1.050 V	N/A	1.050 V
	VID_VDDNB Max	11,7	N/A	1.150 V	N/A	1.150 V
	IDDNB Max	12	N/A	15.1 A	N/A	15.3 A
S0.C0.P0	CPU COF	6	3100 MHz		3000 MHz	
	TDP	3,7	94.0 W	80.0 W	94.3 W	80.0 W
	VID_VDD Min	9	1.200 V	1.200 V	1.200 V	1.200 V
	VID_VDD Max	9	1.425 V	1.425 V	1.425 V	1.425 V
	IDD Max	3,10	67.8 A	50.1 A	67.9 A	50.0 A
S0.C0.P1	CPU COF	6	2400 MHz		2300 MHz	
	TDP	3,7	65.6 W	60.7 W	65.6 W	60.7 W
	VID_VDD Min	9	1.100 V	1.100 V	1.100 V	1.100 V
	VID_VDD Max	9	1.325 V	1.325 V	1.325 V	1.325 V
	IDD Max	3,10	49.2 A	35.8 A	49.1 A	35.6 A
S0.C0.P2	CPU COF	6	1900 MHz		1800 MHz	
	TDP	3,7	49.8 W	48.3 W	49.7 W	48.3 W
	VID_VDD Min	9	1.050 V	1.000 V	1.050 V	1.000 V
	VID_VDD Max	9	1.225 V	1.225 V	1.225 V	1.225 V
	IDD Max	3,10	41.1 A	26.1 A	41.0 A	25.9 A
S0.C0.P3	CPU COF	6	800 MHz		800 MHz	
	TDP	3,7	44.5 W	35.4 W	44.9 W	36.8 W
	VID_VDD Min	9	1.050 V	0.850 V	1.050 V	0.875 V
	VID_VDD Max	9	1.075 V	1.075 V	1.100 V	1.100 V
	IDD Max	3,10	36.0 A	14.4 A	36.4 A	15.6 A
S0.C1.Pmin	Core Power (Pre-Flush)	20	23.9 W	5.7 W	24.2 W	6.3 W
	Core Power (Post-Flush)	20	21.5 W	3.3 W	21.8 W	3.8 W
	NB Power	17	14.9 W	14.9 W	15.1 W	15.1 W
	I/O Power	13	6.7 W	6.7 W	6.7 W	6.7 W
S0.C1E.Pmin	TDP	16	9.2 W	6.7 W	9.4 W	7.0 W
S3	I/O Power	13	350 mW	350 mW	350 mW	350 mW

The notes for this table are on page 60 and page 61.

2.3.12 HD mmmm OC pnc GI (65 W, DT, AM3) Thermal and Power Specifications

OPN			HD900EOCK4DGI ¹⁹		HD905EOCK4DGI ¹⁹	
State	Specification ⁸	Notes	Single-Plane	Dual-Plane	Single-Plane	Dual-Plane
S0.C0.Px	Tcase Max	1	55 °C to 70 °C		55 °C to 70 °C	
	Tctl Max	2	70 °C		70 °C	
	Tambient Min		5 °C		5 °C	
	Thermal Profile		J		J	
	Startup P-State	5	S0.C0.P3		S0.C0.P3	
	HTC P-State	4	S0.C0.P3		S0.C0.P3	
S0.Cx.Px	NB COF	6,7	1600 MHz	2000 MHz	1600 MHz	2000 MHz
	VID_VDDNB Min	11,7	N/A	1.050 V	N/A	1.050 V
	VID_VDDNB Max	11,7	N/A	1.100 V	N/A	1.100 V
	IDDNB Max	12	N/A	14.6 A	N/A	14.3 A
S0.C0.P0	CPU COF	6	2400 MHz		2500 MHz	
	TDP	3,7	69.5 W	65.0 W	69.2 W	65.0 W
	VID_VDD Min	9	1.050 V	1.025 V	1.050 V	1.025 V
	VID_VDD Max	9	1.250 V	1.250 V	1.250 V	1.250 V
	IDD Max	3,10	58.0 A	43.0 A	58.0 A	43.2 A
S0.C0.P1	CPU COF	6	1800 MHz		1900 MHz	
	TDP	3,7	60.8 W	51.7 W	60.6 W	54.2 W
	VID_VDD Min	9	1.050 V	0.950 V	1.050 V	0.975 V
	VID_VDD Max	9	1.175 V	1.175 V	1.200 V	1.200 V
	IDD Max	3,10	49.5 A	31.9 A	49.5 A	34.0 A
S0.C0.P2	CPU COF	6	1400 MHz		1400 MHz	
	TDP	3,7	55.7 W	44.7 W	54.4 W	44.0 W
	VID_VDD Min	9	1.050 V	0.900 V	1.050 V	0.900 V
	VID_VDD Max	9	1.125 V	1.125 V	1.125 V	1.125 V
	IDD Max	3,10	45.9 A	25.6 A	45.1 A	25.1 A
S0.C0.P3	CPU COF	6	800 MHz		800 MHz	
	TDP	3,7	48.9 W	37.7 W	47.8 W	35.9 W
	VID_VDD Min	9	1.050 V	0.850 V	1.050 V	0.825 V
	VID_VDD Max	9	1.075 V	1.075 V	1.050 V	1.050 V
	IDD Max	3,10	40.6 A	18.6 A	39.8 A	17.3 A
S0.C1.Pmin	Core Power (Pre-Flush)	20	24.1 W	5.6 W	23.6 W	5.0 W
	Core Power (Post-Flush)	20	21.7 W	3.7 W	21.2 W	3.2 W
	NB Power	17	N/A	14.8 W	N/A	14.5 W
	I/O Power	13	6.7 W	6.7 W	6.7 W	6.7 W
S0.C1E.Pmin	TDP	16	10.4 W	7.0 W	10.1 W	6.6 W
S3	I/O Power	13	350 mW	350 mW	350 mW	350 mW

The notes for this table are on page 60 and page 61.

OPN			HD700EOCK3DGI ¹⁹		HD705EOCK3DGI ¹⁹	
State	Specification ⁸	Notes	Single-Plane	Dual-Plane	Single-Plane	Dual-Plane
S0.C0.Px	Tcase Max	1	55 °C to 72 °C		55 °C to 72 °C	
	Tctl Max	2	70 °C		70 °C	
	Tambient Min		5 °C		5 °C	
	Thermal Profile		K		K	
	Startup P-State	5	S0.C0.P3		S0.C0.P3	
	HTC P-State	4	S0.C0.P3		S0.C0.P3	
S0.Cx.Px	NB COF	6,7	1600 MHz	2000 MHz	1600 MHz	2000 MHz
	VID_VDDNB Min	11,7	N/A	1.050 V	N/A	1.050 V
	VID_VDDNB Max	11,7	N/A	1.100 V	N/A	1.100 V
	IDDNB Max	12	N/A	16.4 A	N/A	16.1 A
S0.C0.P0	CPU COF	6	2400 MHz		2500 MHz	
	TDP	3,7	71.3 W	65.0 W	71.0 W	65.0 W
	VID_VDD Min	9	1.050 V	1.025 V	1.050 V	1.025 V
	VID_VDD Max	9	1.250 V	1.250 V	1.250 V	1.250 V
	IDD Max	3,10	58.1 A	41.3 A	58.1 A	41.6 A
S0.C0.P1	CPU COF	6	1800 MHz		1900 MHz	
	TDP	3,7	64.7 W	52.8 W	64.5 W	55.4 W
	VID_VDD Min	9	1.050 V	0.950 V	1.050 V	0.950 V
	VID_VDD Max	9	1.175 V	1.175 V	1.175 V	1.175 V
	IDD Max	3,10	50.7 A	31.2 A	50.7 A	33.4 A
S0.C0.P2	CPU COF	6	1300 MHz		1300 MHz	
	TDP	3,7	59.2 W	44.1 W	58.0 W	45.4 W
	VID_VDD Min	9	1.050 V	0.875 V	1.050 V	0.875 V
	VID_VDD Max	9	1.100 V	1.100 V	1.100 V	1.100 V
	IDD Max	3,10	47.3 A	23.4 A	46.7 A	24.6 A
S0.C0.P3	CPU COF	6	800 MHz		800 MHz	
	TDP	3,7	54.2 W	39.0 W	53.1 W	37.3 W
	VID_VDD Min	9	1.050 V	0.825 V	1.050 V	0.800 V
	VID_VDD Max	9	1.050 V	1.050 V	1.050 V	1.025 V
	IDD Max	3,10	44.0 A	18.4 A	43.4 A	17.1 A
S0.C1.Pmin	Core Power (Pre-Flush)	20	27.4 W	6.3 W	26.9 W	5.6 W
	Core Power (Post-Flush)	20	25.0 W	4.1 W	24.6 W	3.5 W
	NB Power	17	N/A	16.5 W	N/A	16.3 W
	I/O Power	13	6.7 W	6.7 W	6.7 W	6.7 W
S0.C1E.Pmin	TDP	16	12.3 W	7.8 W	12.0 W	7.4 W
S3	I/O Power	13	350 mW	350 mW	350 mW	350 mW

The notes for this table are on page 60 and page 61.

2.3.13 HD mmmm WF pnc GM (95 W, DT, AM3) Thermal and Power Specifications

OPN			HDZ560WFK2DGM ²¹	
State	Specification ⁸	Notes	Single-Plane	Dual-Plane
S0.C0.Px	Tcase Max	1	55 °C to 70 °C	
	Tctl Max	2	70 °C	
	Tambient Min		5 °C	
	Thermal Profile		P	
	Startup P-State	5	S0.C0.P3	
	HTC P-State	4	S0.C0.P3	
S0.Cx.Px	NB COF	6,7	1600 MHz	2000 MHz
	VID_VDDNB Min	11,7	N/A	1.150 V
	VID_VDDNB Max	11,7	N/A	1.250 V
	IDDNB Max	12	N/A	15.4 A
S0.C0.P0	CPU COF	6	800 MHz	3300 MHz
	TDP	3,7	35.3 W	80.0 W
	VID_VDD Min	9	1.150 V	1.225 V
	VID_VDD Max	9	1.250 V	1.425 V
	IDD Max	3,10	41.9 A	46.9 A
S0.C0.P1	CPU COF	6	N/A	2600 MHz
	TDP	3,7	N/A	64.2 W
	VID_VDD Min	9	N/A	1.150 V
	VID_VDD Max	9	N/A	1.325 V
	IDD Max	3,10	N/A	35.5 A
S0.C0.P2	CPU COF	6	N/A	2200 MHz
	TDP	3,7	N/A	53.9 W
	VID_VDD Min	9	N/A	1.075 V
	VID_VDD Max	9	N/A	1.250 V
	IDD Max	3,10	N/A	27.8 A
S0.C0.P3	CPU COF	6	N/A	800 MHz
	TDP	3,7	N/A	35.3 W
	VID_VDD Min	9	N/A	0.875 V
	VID_VDD Max	9	N/A	1.050 V
	IDD Max	3,10	N/A	12.3 A
S0.C1.Pmin	Core Power (Pre-Flush)	20	N/A	5.0 W
	Core Power (Post-Flush)	20	N/A	3.2 W
	NB Power	17	N/A	10.7 W
	I/O Power	13	N/A	6.7 W
S0.C1E.Pmin	TDP	16	N/A	6.6 W
S3	I/O Power	13	N/A	350 mW

The notes for this table are on page 60 and page 61.

2.3.14 HD mmmm FB pnc GM (125 W, 140 W, DT, AM3) Thermal and Power Specifications

OPN			HDZ970FBK4DGM ²¹	
State	Specification ⁸	Notes	Single-Plane	Dual-Plane
S0.C0.Px	Tcase Max	1	55 °C to 62 °C	
	Tctl Max	2	70 °C	
	Tambient Min		5 °C	
	Thermal Profile		1	
	Startup P-State	5	S0.C0.P0	
	HTC P-State	4	S0.C0.P0	
S0.Cx.Px	NB COF	6,7	1600 MHz	2000 MHz
	VID_VDDNB Min	11,7	N/A	1.050 V
	VID_VDDNB Max	11,7	N/A	1.150 V
	IDDNB Max	12	N/A	17.0 A
S0.C0.P0	CPU COF	6	800 MHz	3500 MHz
	TDP	3,7	52.1 W	125.0 W
	VID_VDD Min	9	1.050 V	1.225 V
	VID_VDD Max	9	1.050 V	1.425 V
	IDD Max	3,10	43.2 A	60.5 A
S0.C0.P1	CPU COF	6	N/A	2800 MHz
	TDP	3,7	N/A	94.1 W
	VID_VDD Min	9	N/A	1.125 V
	VID_VDD Max	9	N/A	1.350 V
	IDD Max	3,10	N/A	60.5 A
S0.C0.P2	CPU COF	6	N/A	2200 MHz
	TDP	3,7	N/A	71.6 W
	VID_VDD Min	9	N/A	1.050 V
	VID_VDD Max	9	N/A	1.250 V
	IDD Max	3,10	N/A	45.3 A
S0.C0.P3	CPU COF	6	N/A	800 MHz
	TDP	3,7	N/A	39.6 W
	VID_VDD Min	9	N/A	0.825 V
	VID_VDD Max	9	N/A	1.050 V
	IDD Max	3,10	N/A	17.2 A
S0.C1.Pmin	Core Power (Pre-Flush)	20	N/A	5.9 W
	Core Power (Post-Flush)	20	N/A	4.7 W
	NB Power	17	N/A	8.2 W
	I/O Power	13	N/A	6.7 W
S0.C1E.Pmin	TDP	16	N/A	8.1 W
S3	I/O Power	13	350 mW	350 mW

The notes for this table are on page 60 and page 61.

2.3.15 HD mmmm WF pnc GR (95 W, DT, AM3) Thermal and Power Specifications

OPN			HDT35TWFK6DGR ²¹		HDT55TWFK6DGR ²¹	
State	Specification ⁸	Notes	Single-Plane	Dual-Plane	Single-Plane	Dual-Plane
S0.C0.Px	Tcase Max	1	55 °C to 71 °C		55 °C to 71 °C	
	Tctl Max	2	70 °C		70 °C	
	Tambient Min		5 °C		5 °C	
	Thermal Profile		AD		AD	
	Startup P-State	5	S0.C0.P0	S0.C0.P3	S0.C0.P0	S0.C0.P3
	HTC P-State	4	S0.C0.P0	S0.C0.P3	S0.C0.P0	S0.C0.P3
S0.Cx.Px	NB COF	6,7	2000 MHz	2000 MHz	2000 MHz	2000 MHz
	VID_VDDNB Min	11,7	N/A	1.050 V	N/A	1.050 V
	VID_VDDNB Max	11,7	N/A	1.175 V	N/A	1.175 V
	IDDNB Max	12	N/A	15.4 A	N/A	14.9 A
S0.C0.Pb0	CPU COF	6	N/A	3100 MHz	N/A	3300 MHz
	C-State Count	23	N/A	3	N/A	3
	TDP	22	N/A	95.0 W	N/A	95.0 W
	VID_VDD Min	9	N/A	1.225 V	N/A	1.225 V
	VID_VDD Max	9	N/A	1.425 V	N/A	1.425 V
	IDD Max	3,10	N/A	80.0 A	N/A	80.0 A
S0.C0.P0	CPU COF	6	800 MHz	2600 MHz	800 MHz	2800 MHz
	TDP	3,7	47.8 W	95.0 W	46.3 W	95.0 W
	VID_VDD Min	9	0.975 V	1.075 V	0.975 V	1.075 V
	VID_VDD Max	9	1.175 V	1.375 V	1.175 V	1.375 V
	IDD Max	3,10	27.9 A	68.7 A	26.9 A	70.0 A
S0.C0.P1	CPU COF	6	N/A	2000 MHz	N/A	2200 MHz
	TDP	3,7	N/A	78.3 W	N/A	78.4 W
	VID_VDD Min	9	N/A	1.050 V	N/A	1.050 V
	VID_VDD Max	9	N/A	1.350 V	N/A	1.350 V
	IDD Max	3,10	N/A	54.8 A	N/A	56.6 A
S0.C0.P2	CPU COF	6	N/A	1400 MHz	N/A	1500 MHz
	TDP	3,7	N/A	59.9 W	N/A	58.5 W
	VID_VDD Min	9	N/A	1.000 V	N/A	1.000 V
	VID_VDD Max	9	N/A	1.300 V	N/A	1.300 V
	IDD Max	3,10	N/A	39.9 A	N/A	40.2 A
S0.C0.P3	CPU COF	6	N/A	800 MHz	N/A	800 MHz
	TDP	3,7	N/A	47.8 W	N/A	46.3 W
	VID_VDD Min	9	N/A	0.975 V	N/A	0.975 V
	VID_VDD Max	9	N/A	1.175 V	N/A	1.175 V
	IDD Max	3,10	N/A	27.9 A	N/A	26.9 A
S0.C1.Pmin	Core Power (Pre-Flush)	20	N/A	13.0 W	N/A	12.4 W
	Core Power (Post-Flush)	20	N/A	9.8 W	N/A	9.2 W
	NB Power	17	N/A	9.7 W	N/A	9.4 W
	I/O Power	13	N/A	6.1 W	N/A	6.1 W
S0.C1E.Pmin	TDP	16	N/A	12.1 W	N/A	11.4 W
S3	I/O Power	13	N/A	300 mW	N/A	300 mW

The notes for this table are on page 60 and page 61.

OPN			HDT45TWFK6DGR ²¹	
State	Specification ⁸	Notes	Single-Plane	Dual-Plane
S0.C0.Px	Tcase Max	1	55 °C to 71 °C	
	Tctl Max	2	70 °C	
	Tambient Min		5 °C	
	Thermal Profile		AD	
	Startup P-State	5	S0.C0.P0	S0.C0.P3
	HTC P-State	4	S0.C0.P0	S0.C0.P3
S0.Cx.Px	NB COF	6,7	2000 MHz	2000 MHz
	VID_VDDNB Min	11,7	N/A	1.050 V
	VID_VDDNB Max	11,7	N/A	1.175 V
	IDDNB Max	12	N/A	15.2 A
S0.C0.Pb0	CPU COF	6	N/A	3200 MHz
	C-State Count	23	N/A	3
	TDP	22	N/A	95.0 W
	VID_VDD Min	9	N/A	1.225 V
	VID_VDD Max	9	N/A	1.425 V
	IDD Max	3,10	N/A	80.0 A
S0.C0.P0	CPU COF	6	800 MHz	2700 MHz
	TDP	3,7	47.1 W	95.0 W
	VID_VDD Min	9	0.975 V	1.075 V
	VID_VDD Max	9	1.175 V	1.375 V
	IDD Max	3,10	27.4 A	69.5 A
S0.C0.P1	CPU COF	6	N/A	2000 MHz
	TDP	3,7	N/A	76.4 W
	VID_VDD Min	9	N/A	1.050 V
	VID_VDD Max	9	N/A	1.350 V
	IDD Max	3,10	N/A	54.0 A
S0.C0.P2	CPU COF	6	N/A	1400 MHz
	TDP	3,7	N/A	58.3 W
	VID_VDD Min	9	N/A	1.000 V
	VID_VDD Max	9	N/A	1.300 V
	IDD Max	3,10	N/A	39.3 A
S0.C0.P3	CPU COF	6	N/A	800 MHz
	TDP	3,7	N/A	47.1 W
	VID_VDD Min	9	N/A	0.975 V
	VID_VDD Max	9	N/A	1.175 V
	IDD Max	3,10	N/A	27.4 A
S0.C1.Pmin	Core Power (Pre-Flush)	20	N/A	12.7 W
	Core Power (Post-Flush)	20	N/A	9.5 W
	NB Power	17	N/A	9.6 W
	I/O Power	13	N/A	6.1 W
S0.C1E.Pmin	TDP	16	N/A	11.8 W
S3	I/O Power	13	N/A	300 mW

The notes for this table are on page 60 and page 61.

2.3.16 HD mmmm FB pnc GR (125 W, DT, AM3) Thermal and Power Specifications

OPN			HDT55TFBK6DGR ²¹		HDT90ZFBK6DGR ²¹	
State	Specification ⁸	Notes	Single-Plane	Dual-Plane	Single-Plane	Dual-Plane
S0.C0.Px	Tcase Max	1	55 °C to 62 °C		55 °C to 62 °C	
	Tctl Max	2	70 °C		70 °C	
	Tambient Min		5 °C		5 °C	
	Thermal Profile		AE		AE	
	Startup P-State	5	S0.C0.P0	S0.C0.P3	S0.C0.P0	S0.C0.P3
	HTC P-State	4	S0.C0.P0	S0.C0.P3	S0.C0.P0	S0.C0.P3
S0.Cx.Px	NB COF	6,7	2000 MHz	2000 MHz	2000 MHz	2000 MHz
	VID_VDDNB Min	11,7	N/A	1.050 V	N/A	1.050 V
	VID_VDDNB Max	11,7	N/A	1.175 V	N/A	1.175 V
	IDDNB Max	12	N/A	17.0 A	N/A	16.2 A
S0.C0.Pb0	CPU COF	6	N/A	3300 MHz	N/A	3600 MHz
	C-State Count	23	N/A	3	N/A	3
	TDP	22	N/A	125.0 W	N/A	125.0 W
	VID_VDD Min	9	N/A	1.250 V	N/A	1.250 V
	VID_VDD Max	9	N/A	1.475 V	N/A	1.475 V
	IDD Max	3,10	N/A	95.0 A	N/A	95.0 A
S0.C0.P0	CPU COF	6	800 MHz	2800 MHz	800 MHz	3200 MHz
	TDP	3,7	55.4 W	125.0 W	53.1 W	125.0 W
	VID_VDD Min	9	1.000 V	1.150 V	1.000 V	1.150 V
	VID_VDD Max	9	1.225 V	1.475 V	1.225 V	1.475 V
	IDD Max	3,10	32.9 A	89.7 A	31.4 A	92.8 A
S0.C0.P1	CPU COF	6	N/A	2200 MHz	N/A	2400 MHz
	TDP	3,7	N/A	101.0 W	N/A	98.5 W
	VID_VDD Min	9	N/A	1.100 V	N/A	1.100 V
	VID_VDD Max	9	N/A	1.400 V	N/A	1.400 V
	IDD Max	3,10	N/A	69.5 A	N/A	69.9 A
S0.C0.P2	CPU COF	6	N/A	1500 MHz	N/A	1600 MHz
	TDP	3,7	N/A	77.3 W	N/A	75.7 W
	VID_VDD Min	9	N/A	1.050 V	N/A	1.050 V
	VID_VDD Max	9	N/A	1.325 V	N/A	1.325 V
	IDD Max	3,10	N/A	50.9 A	N/A	50.4 A
S0.C0.P3	CPU COF	6	N/A	800 MHz	N/A	800 MHz
	TDP	3,7	N/A	55.4 W	N/A	53.1 W
	VID_VDD Min	9	N/A	1.000 V	N/A	1.000 V
	VID_VDD Max	9	N/A	1.225 V	N/A	1.225 V
	IDD Max	3,10	N/A	32.9 A	N/A	31.4 A
S0.C1.Pmin	Core Power (Pre-Flush)	20	N/A	16.4 W	N/A	15.4 W
	Core Power (Post-Flush)	20	N/A	12.9 W	N/A	12.0 W
	NB Power	17	N/A	10.8 W	N/A	10.3 W
	I/O Power	13	N/A	6.1 W	N/A	6.1 W
S0.C1E.Pmin	TDP	16	N/A	15.8 W	N/A	14.8 W
S3	I/O Power	13	N/A	300 mW	N/A	300 mW

The notes for this table are on page 60 and page 61.

OPN			HDT75TFBK6DGR ²¹	
State	Specification ⁸	Notes	Single-Plane	Dual-Plane
S0.C0.Px	Tcase Max	1	55 °C to 62 °C	
	Tctl Max	2	70 °C	
	Tambient Min		5 °C	
	Thermal Profile		AE	
	Startup P-State	5	S0.C0.P0	S0.C0.P3
	HTC P-State	4	S0.C0.P0	S0.C0.P3
S0.Cx.Px	NB COF	6,7	2000 MHz	2000 MHz
	VID_VDDNB Min	11,7	N/A	1.050 V
	VID_VDDNB Max	11,7	N/A	1.175 V
	IDDNB Max	12	N/A	16.5 A
S0.C0.Pb0	CPU COF	6	N/A	3500 MHz
	C-State Count	23	N/A	3
	TDP	22	N/A	125.0 W
	VID_VDD Min	9	N/A	1.250 V
	VID_VDD Max	9	N/A	1.475 V
	IDD Max	3,10	N/A	95.0 A
S0.C0.P0	CPU COF	6	800 MHz	3000 MHz
	TDP	22	53.8 W	125.0 W
	VID_VDD Min	9	1.000 V	1.150 V
	VID_VDD Max	9	1.225 V	1.475 V
	IDD Max	3,10	31.9 A	91.5 A
S0.C0.P1	CPU COF	6	N/A	2300 MHz
	TDP	22	N/A	99.5 W
	VID_VDD Min	9	N/A	1.100 V
	VID_VDD Max	9	N/A	1.400 V
	IDD Max	3,10	N/A	69.5 A
S0.C0.P2	CPU COF	6	N/A	1600 MHz
	TDP	22	N/A	77.0 W
	VID_VDD Min	9	N/A	1.050 V
	VID_VDD Max	9	N/A	1.325 V
	IDD Max	3,10	N/A	51.2 A
S0.C0.P3	CPU COF	6	N/A	800 MHz
	TDP	22	N/A	53.8 W
	VID_VDD Min	9	N/A	1.000 V
	VID_VDD Max	9	N/A	1.225 V
	IDD Max	3,10	N/A	31.9 A
S0.C1.Pmin	Core Power (Pre-Flush)	20	N/A	15.7 W
	Core Power (Post-Flush)	20	N/A	12.1 W
	NB Power	17	N/A	10.3 W
	I/O Power	13	N/A	6.1 W
S0.C1E.Pmin	TDP	16	N/A	14.4 W
S3	I/O Power	13	N/A	300 mW

The notes for this table are on page 60 and page 61.

AMD Phenom™ Processor Thermal and Power Specification Table Notes:

1. *Tcase Max* is the maximum case temperature specification which is a physical value in degrees Celsius. *Tcase Max* can be any valid *Tcase Max* value in the range specified for the corresponding OPN.
2. *Tctl Max* (maximum control temperature) is a non-physical temperature on an arbitrary scale that can be used for system thermal management policies. Refer to the BIOS and Kernel Developer's Guide (BKDG) for AMD Family 10h Processors, order# 31116.
3. The processor thermal solution should be designed to accommodate thermal design power (TDP) at *Tcase Max*. TDP is measured under the conditions of all cores operating at CPU COF, *Tcase Max*, and VDD at the voltage requested by the processor. TDP includes all power dissipated on-die from VDD, VDDNB, VDDIO, VLDT, VTT, and VDDA. TDP is not the maximum power of the processor.
4. *P-state limit when HTC is active*. Refer to the BIOS and Kernel Developer's Guide (BKDG) for AMD Family 10h Processors, order# 31116 for more information.
5. Hardware transitions the part to startup *P-state* at cold boot. During initialization, the startup NB COF and VID_VDDNB values may differ from those of the startup *P-state*. Please see the BIOS and Kernel Developer's Guide (BKDG) for AMD Family 10h Processors, order# 31116 for detailed power sequencing information.
6. Frequency reported to the OS is rounded to the nearest 100-MHz boundary.
7. During initialization, the startup NB COF and VID_VDDNB values may differ from those of the startup *P-state*. Please see the BIOS and Kernel Developer's Guide (BKDG) For AMD Family 10h Processors, order# 31116 for specific power sequencing information.
8. Specifications for multi-core processors assume equivalent *P-states* (voltage and frequency) and equivalent *Tcase* conditions for all cores. Refer to the BIOS and Kernel Developer's Guide (BKDG) for AMD Family 10h Processors, order #31116, for details on *P-state* operation for multi-core processors.
9. Variable voltage, any valid voltage between VID_VDD Min and VID_VDD Max is allowed.
10. TDP IDD conditions: single-plane platforms supply IDD and IDDNB tied together and use the IDD Max specification.
11. Single-plane platforms have VID_VDD and VID_VDDNB tied together, and use the VID_VDD specification.
12. TDP IDDNB conditions: single-plane platforms supply IDD and IDDNB tied together and use the IDDNB Max specification.
13. Thermal Design Power dissipated by the processor VDDIO and VTT power planes only. Assumes VDDIO = 1.8 V and VTT = VDDIO / 2.
14. Refer to erratum 308 in the Revision Guide for AMD Family 10h Processors, order# 41322 for the appropriate clock divisor setting.
15. Assumes 50°C, Min *P-state* VID_VDD, core clock divider set to 128, and L2 and data cache scrubbing disabled. Refer to the BIOS and Kernel Developer's Guide (BKDG) for AMD Family 10h Processors, order# 31116 for recommended settings.
16. Assumes 35°C, min *P-state* VID_VDD, core clock divider set to 16, HyperTransport™ links disconnected, memory in self-refresh mode, and DDR2 SDRAM interface tristated. Recommended settings in the BIOS and Kernel Developer's Guide (BKDG) for AMD Family 10h Processors, order# 31116, provide improved power values.
17. Thermal Design Power dissipated by the processor at min *P-state* VID_VDDNB.
18. Thermal Design Power dissipated by the processor at min *P-state* VID_VDD.
19. This product is recommended for dual-plane platforms only.
20. Core Power (Pre-Flush) and (Post-Flush) refers to the Cache Flush On Halt feature described in the BIOS and Kernel Developer's Guide (BKDG) for AMD Family 10h Processors, order# 31116. Core Power pre-flush and post-flush values are based on the recommended BKDG settings. Actual C1 idle core power varies with system usage according to the following equation:

$$C1 \text{ idle Core Power} = F3xDC[CashFlushOnHaltTmr]/OS \text{ timer tick interval} * \text{Core Power (Pre-Flush)} + (1 - F3xDC[CachFlushOnHaltTmr]/OS \text{ timer tick interval} * \text{Core Power (Post-Flush)})$$
 The default Microsoft® Windows Vista® timer tick interval is 15.6 ms. This interval varies between operating systems and within an operating system depending on usage.
21. Valid for dual-plane operation only.

AMD Phenom™ Processor Thermal and Power Specification Table Notes (Continued):

22. *The processor thermal solution should be designed to accommodate thermal design power (TDP) at Tcase Max. TDP in this state is measured at Tcase Max and VDD at the voltage requested by the processor with the number of cores in the C1 state specified by C-State Count. TDP includes all power dissipated on-die from VDD, VDDNB, VDDIO, VLDT, VTT, and VDDA. Due to increased power density in the state, the processor has an increased probability of hardware thermal control (HTC) activation compared to S0.C0.P1 at the same ambient temperature. TDP is not the maximum power of the processor.*
23. *C-State Count indicates the minimum number of cores in the C1 state required for the remaining cores to enter this P-state. Refer to F4x164[CstateCnt] in the BIOS and Kernel Developer's Guide (BKDG) for AMD Family 10h Processors, order# 31116, for more details about the entry requirements into this P-state.*

3 AMD Athlon™ Processor

The following sections contain the OPN description and thermal and power specifications for the AMD Athlon™ Processor. Each column in the thermal and power tables represents a specific Ordering Part Number (OPN). Section 3.1 provides an example of the OPN structure for this processor family.

3.1 AMD Athlon™ Processor Ordering Part Number Description

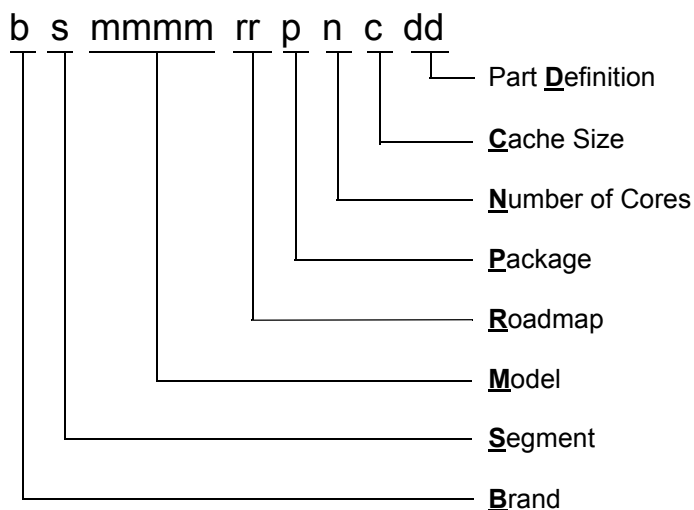


Figure 3. AMD Athlon™ Processor Ordering Part Number Diagram

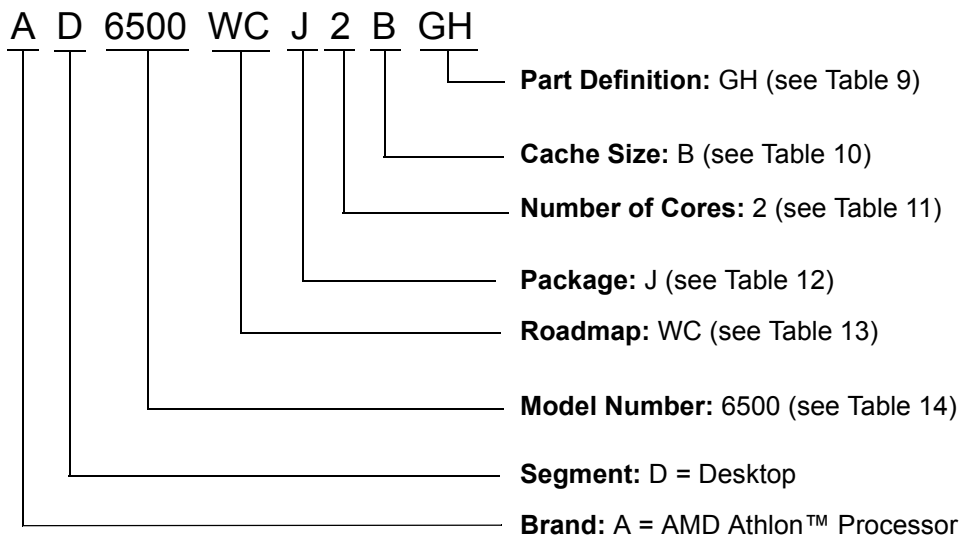


Figure 4. AMD Athlon™ Processor Ordering Part Number Example

Table 9. AMD Athlon™ Processor Part Definition Options

Part Definition	Revision	CPUID 8000_0001h EAX [31:0] (CPUID)
GQ	Rev C2	00100F62h
GM	Rev C3	00100F43h, 00100F53h, 00100F63h

Table 10. AMD Athlon™ Processor Cache Size Options

OPN Character	L2 Cache Size	L3 Cache Size
2	512 KB	0 KB
3	1024 KB	0 KB

Table 11. AMD Athlon™ Processor Number of Cores

OPN Character	Number of Cores
2	2
3	3
4	4

Table 12. AMD Athlon™ Processor Package Options

OPN Character	Package
K	AM3

Table 13. AMD Athlon™ Processor Roadmap Options

OPN Character	Max TDP	Socket Infrastructure	IDD Max (VDD)	IDD Max (NB)	HS Class
HD	45 W	AM3	45 A	20 A	HS 44
OC	65 W	AM3	60 A	20 A	HS 55
WF	95 W	AM3	80 A	20 A	HS 65
SC	25 W	AM3	20 A	20 A	HS 27

Table 14. AMD Athlon™ Processor Model Number Options

Model Number	Core Frequency	Single-Plane NB Frequency	Dual-Plane NB Frequency	Number of Cores	Max DDR Speed	Max HT Link Speed
270U	2000 MHz	1800 MHz	1800 MHz	2	1333 MT/s	3600 MT/s
610E	2400 MHz	1600 MHz	2000 MHz	4	1333 MT/s	4000 MT/s
415E	2500 MHz	1600 MHz	2000 MHz	3	1333 MT/s	4000 MT/s
615E	2500 MHz	1600 MHz	2000 MHz	4	1333 MT/s	4000 MT/s
420E	2600 MHz	1600 MHz	2000 MHz	3	1333 MT/s	4000 MT/s
X220	2800 MHz	1600 MHz	2000 MHz	2	1066 MT/s	4000 MT/s
245E	2900 MHz	1600 MHz	2000 MHz	2	1333 MT/s	4000 MT/s
X250	3000 MHz	1600 MHz	2000 MHz	2	1066 MT/s	4000 MT/s
X640	3000 MHz	1600 MHz	2000 MHz	4	1333 MT/s	4000 MT/s
X645	3100 MHz	1600 MHz	2000 MHz	4	1333 MT/s	4000 MT/s
250E	3000 MHz	1600 MHz	2000 MHz	2	1333 MT/s	4000 MT/s
X445	3100 MHz	1600 MHz	2000 MHz	3	1333 MT/s	4000 MT/s
X260	3200 MHz	1600 MHz	2000 MHz	2	1333 MT/s	4000 MT/s
X450	3200 MHz	1600 MHz	2000 MHz	3	1333 MT/s	4000 MT/s
X265	3300 MHz	1600 MHz	2000 MHz	2	1333 MT/s	4000 MT/s

Table 15. AMD Athlon™ Processor Thermal Profiles

Thermal Profile	N
Heat Sink Class	HS55
Heat Sink Thermal Resistance	0.48°C/W
Heat Sink Local Ambient	42°C
Profile Thermal Resistance	0.400°C/W
Profile Ambient	48°C
TDP	Tcase Max
0.0 W	55.0°C
5.0 W	55.0°C
10.0 W	55.0°C
15.0 W	55.0°C
20.0 W	56.0°C
25.0 W	58.0°C
30.0 W	60.0°C
35.0 W	62.0°C
40.0 W	64.0°C
45.0 W	66.0°C
50.0 W	68.0°C
55.0 W	70.0°C
60.0 W	72.0°C
65.0 W	74.0°C

Thermal Profile	S
Heat Sink Class	HS44
Heat Sink Thermal Resistance	0.66°C/W
Heat Sink Local Ambient	42°C
Profile Thermal Resistance	0.533°C/W
Profile Ambient	48°C
TDP	Tcase Max
0.0 W	55.0°C
5.0 W	55.0°C
10.0 W	55.0°C
15.0 W	56.0°C
20.0 W	58.7°C
25.0 W	61.3°C
30.0 W	64.0°C
35.0 W	66.7°C
40.0 W	69.3°C
45.0 W	72.0°C

Note: The thermal profile is used to define the relationship between Tcase max and device-specific Thermal Design Power. The heat sink thermal resistance and heat sink local ambient values specify heat sink design targets. The profile thermal resistance and profile ambient values specify the relationship between partspecific power and part-specific Tcase Max. If the heat sink design targets are met, the thermal profile specifications are met.

Table 15: AMD Athlon™ Processor Thermal Profiles (Continued)

Thermal Profile	W
Heat Sink Class	HS27
Heat Sink Thermal Resistance	1.56°C/W
Heat Sink Local Ambient	42°C
Profile Thermal Resistance	1.320°C/W
Profile Ambient	48°C
TDP	Tcase Max
0.0 W	55.0°C
5.0 W	55.0°C
10.0 W	61.2°C
15.0 W	67.8°C
20.0 W	74.4°C
25.0 W	81.0°C

Thermal Profile	Z
Heat Sink Class	HS65
Heat Sink Thermal Resistance	0.34°C/W
Heat Sink Local Ambient	42°C
Profile Thermal Resistance	0.284°C/W
Profile Ambient	48°C
TDP	Tcase Max
0.0 W	55.0°C
5.0 W	55.0°C
10.0 W	55.0°C
15.0 W	55.0°C
20.0 W	55.0°C
25.0 W	55.1°C
30.0 W	56.5°C
35.0 W	57.9°C
40.0 W	59.4°C
45.0 W	60.8°C
50.0 W	62.2°C
55.0 W	63.6°C
60.0 W	65.0°C
65.0 W	66.5°C
70.0 W	67.9°C
75.0 W	69.3°C
80.0 W	70.7°C
85.0 W	72.1°C
90.0 W	73.6°C
95.0 W	75.0°C

Note: The thermal profile is used to define the relationship between Tcase max and device-specific Thermal Design Power. The heat sink thermal resistance and heat sink local ambient values specify heat sink design targets. The profile thermal resistance and profile ambient values specify the relationship between partspecific power and part-specific Tcase Max. If the heat sink design targets are met, the thermal profile specifications are met.

Table 15: AMD Athlon™ Processor Thermal Profiles (Continued)

Thermal Profile	AA
Heat Sink Class	HS65
Heat Sink Thermal Resistance	0.30°C/W
Heat Sink Local Ambient	42°C
Profile Thermal Resistance	0.242°C/W
Profile Ambient	48°C
TDP	Tcase Max
0.0 W	55.0 °C
5.0 W	55.0 °C
10.0 W	55.0 °C
15.0 W	55.0 °C
20.0 W	55.0 °C
25.0 W	55.0 °C
30.0 W	55.3 °C
35.0 W	56.5 °C
40.0 W	57.7 °C
45.0 W	58.9 °C
50.0 W	60.1 °C
55.0 W	61.3 °C
60.0 W	62.5 °C
65.0 W	63.7 °C
70.0 W	64.9 °C
75.0 W	66.2 °C
80.0 W	67.4 °C
85.0 W	68.6 °C
90.0 W	69.8 °C
95.0 W	71.0 °C

Thermal Profile	AB
Heat Sink Class	HS44
Heat Sink Thermal Resistance	0.65°C/W
Heat Sink Local Ambient	42°C
Profile Thermal Resistance	0.533°C/W
Profile Ambient	48°C
TDP	Tcase Max
0.0 W	55.0 °C
5.0 W	55.0 °C
10.0 W	55.0 °C
15.0 W	56.0 °C
20.0 W	58.7 °C
25.0 W	61.3 °C
30.0 W	64.0 °C
35.0 W	66.7 °C
40.0 W	69.3 °C
45.0 W	72.0 °C

Note: The thermal profile is used to define the relationship between Tcase max and device-specific Thermal Design Power. The heat sink thermal resistance and heat sink local ambient values specify heat sink design targets. The profile thermal resistance and profile ambient values specify the relationship between partspecific power and part-specific Tcase Max. If the heat sink design targets are met, the thermal profile specifications are met.

3.2 AMD Athlon™ Processor Thermal and Power Table Guide

The thermal and power table guide shown in Table 16 maps SOPNs and the properties associated with their defined characters to the proper thermal and power table subsections and page numbers. This table is designed to be used as a quick reference for finding the appropriate subsection for the thermal and power tables corresponding to an SOPN.

Table 16. AMD Athlon™ Processor Thermal and Power Table Guide

SOPN	Power	Revision	Thermal/Power Tables
AD mmmm OC pnc GQ	65 W	C2	Section 3.3.1 on page 70
AD mmmm WF pnc GM	95 W	C3	Section 3.3.2 on page 71
AD mmmm OC pnc GM	65 W	C3	Section 3.3.3 on page 73
AD mmmm HD pnc GM	45 W	C3	Section 3.3.4 on page 76
AD mmmm SC pnc GM	25 W	C3	Section 3.3.5 on page 80

3.3 AMD Athlon™ Processor Thermal and Power Specifications

The thermal and power specification tables contain the thermal and power requirements for each OPN. This includes the information necessary for thermal management (for example, heat sink requirements, temperature assumptions) and power delivery (for example, voltage, current, and power dissipation for each P-state). Refer to the *AMD Family 10h Processor Electrical Data Sheet*, order# 40014, for all other electrical specifications for the processor. Refer to the *BIOS and Kernel Developer's Guide (BKDG) for AMD Family 10h Processors*, order# 31116, for power management BIOS requirements.

Section 3.1 on page 62 provides an example of the OPN structure for processors documented in this chapter and Table 16 on page 68 provides a guide to OPN organization in the following subsections. Refer to Section 1.2 on page 9 and Section 1.3 on page 10 for numbering conventions and terminology definitions used in these tables.

3.3.1 AD mmmm OC pnc GQ (65 W, DT, AM3) Thermal and Power Specifications

OPN			ADX250OCK23GQ ¹⁹	
State	Specification ⁸	Notes	Single-Plane	Dual-Plane
S0.C0.Px	Tcase Max	1	55 °C to 74 °C	
	Tctl Max	2	70 °C	
	Tambient Min		5 °C	
	Thermal Profile		N	
	Startup P-State	5	S0.C0.P3	
	HTC P-State	4	S0.C0.P3	
S0.Cx.Px	NB COF	6,7	1600 MHz	2000 MHz
	VID_VDDNB Min	11,7	N/A	1.150 V
	VID_VDDNB Max	11,7	N/A	1.200 V
	IDDNB Max	12	N/A	3.7 A
S0.C0.P0	CPU COF	6	3000 MHz	
	TDP	3,7	61.8 W	60.2 W
	VID_VDD Min	9	1.200 V	1.200 V
	VID_VDD Max	9	1.425 V	1.425 V
	IDD Max	3,10	45.0 A	41.6 A
S0.C0.P1	CPU COF	6	2300 MHz	
	TDP	3,7	55.4 W	51.2 W
	VID_VDD Min	9	1.125 V	1.100 V
	VID_VDD Max	9	1.325 V	1.325 V
	IDD Max	3,10	40.7 A	30.2 A
S0.C0.P2	CPU COF	6	1800 MHz	
	TDP	3,7	51.7 W	37.2 W
	VID_VDD Min	9	1.125 V	1.000 V
	VID_VDD Max	9	1.225 V	1.225 V
	IDD Max	3,10	37.7 A	21.8 A
S0.C0.P3	CPU COF	6	800 MHz	
	TDP	3,7	44.3 W	23.1 W
	VID_VDD Min	9	1.125 V	0.850 V
	VID_VDD Max	9	1.125 V	1.075 V
	IDD Max	3,10	31.5 A	11.8 A
S0.C1.Pmin	Core Power (Pre-Flush)	20	18.8 W	3.7 W
	Core Power (Post-Flush)	20	17.6 W	2.9 W
	NB Power	17	N/A	1.7 W
	I/O Power	13	6.5 W	6.5 W
S0.C1E.Pmin	TDP	16	13.4 W	3.5 W
S3	I/O Power	13	350 mW	350 mW

The notes for this table are on page 81.

3.3.2 AD mmmm WF pnc GM (95 W, DT, AM3) Thermal and Power Specifications

OPN			ADX640WFK42GM ¹⁹		ADX645WFK42GM ¹⁹	
State	Specification ⁸	Notes	Single-Plane	Dual-Plane	Single-Plane	Dual-Plane
S0.C0.Px	Tcase Max	1	55 °C to 71 °C		55 °C to 71 °C	
	Tctl Max	2	70 °C		70 °C	
	Tambient Min		5 °C		5 °C	
	Thermal Profile		AA		AA	
	Startup P-State	5	S0.C0.P3		S0.C0.P3	
	HTC P-State	4	S0.C0.P3		S0.C0.P3	
S0.Cx.Px	NB COF	6,7	1600 MHz	2000 MHz	1600 MHz	2000 MHz
	VID_VDDNB Min	11,7	N/A	1.125 V	N/A	1.125 V
	VID_VDDNB Max	11,7	N/A	1.175 V	N/A	1.175 V
	IDDNB Max	12	N/A	12.8 A	N/A	12.4 A
S0.C0.P0	CPU COF	6	3000 MHz		3100 MHz	
	TDP	3,7	99.4 W	95.0 W	99.0 W	95.0 W
	VID_VDD Min	9	1.200 V	1.200 V	1.200 V	1.200 V
	VID_VDD Max	9	1.400 V	1.400 V	1.400 V	1.400 V
	IDD Max	3,10	75.9 A	70.1 A	75.7 A	63.7 A
S0.C0.P1	CPU COF	6	2300 MHz		2400 MHz	
	TDP	3,7	70.8 W	68.5 W	70.9 W	68.6 W
	VID_VDD Min	9	1.125 V	1.100 V	1.125 V	1.100 V
	VID_VDD Max	9	1.300 V	1.300 V	1.300 V	1.300 V
	IDD Max	3,10	57.0 A	49.2 A	57.1 A	44.9 A
S0.C0.P2	CPU COF	6	1800 MHz		1900 MHz	
	TDP	3,7	64.1 W	51.6 W	64.2 W	51.8 W
	VID_VDD Min	9	1.125 V	1.000 V	1.125 V	1.000 V
	VID_VDD Max	9	1.200 V	1.200 V	1.200 V	1.200 V
	IDD Max	3,10	51.0 A	34.8 A	51.1 A	31.9 A
S0.C0.P3	CPU COF	6	800 MHz		800 MHz	
	TDP	3,7	50.6 W	33.4 W	49.3 W	32.7 W
	VID_VDD Min	9	1.125 V	0.850 V	1.125 V	0.850 V
	VID_VDD Max	9	1.150 V	1.050 V	1.150 V	1.050 V
	IDD Max	3,10	39.0 A	17.2 A	37.9 A	14.8 A
S0.C1.Pmin	Core Power (Pre-Flush)	20	20.1 W	5.5 W	19.4 W	4.5 W
	Core Power (Post-Flush)	20	17.6 W	3.9 W	16.9 W	3.0 W
	NB Power	17	N/A	9.4 W	N/A	2.4 W
	I/O Power	13	6.7 W	6.7 W	6.7 W	6.7 W
S0.C1E.Pmin	TDP	16	10.9 W	5.1 W	9.4 W	4.5 W
S3	I/O Power	13	350 mW	350 mW	350 mW	350 mW

The notes for this table are on page 81.

OPN			ADX445WFK32GM ¹⁹		ADX450WFK32GM ¹⁹	
State	Specification ⁸	Notes	Single-Plane	Dual-Plane	Single-Plane	Dual-Plane
S0.C0.Px	Tcase Max	1	55 °C to 75 °C		55 °C to 75 °C	
	Tctl Max	2	70 °C		70 °C	
	Tambient Min		5 °C		5 °C	
	Thermal Profile		Z		Z	
	Startup P-State	5	S0.C0.P3		S0.C0.P3	
	HTC P-State	4	S0.C0.P3		S0.C0.P3	
S0.Cx.Px	NB COF	6,7	1600 MHz	2000 MHz	1600 MHz	2000 MHz
	VID_VDDNB Min	11,7	N/A	1.125 V	N/A	1.125 V
	VID_VDDNB Max	11,7	N/A	1.200 V	N/A	1.175 V
	IDDNB Max	12	N/A	16.4 A	N/A	14.9 A
S0.C0.P0	CPU COF	6	3100 MHz		3200 MHz	
	TDP	3,7	103.4 W	95.0 W	103.0 W	95.0 W
	VID_VDD Min	9	1.200 V	1.200 V	1.200 V	1.200 V
	VID_VDD Max	9	1.500 V	1.500 V	1.500 V	1.500 V
	IDD Max	3,10	77.1 A	59.3 A	77.0 A	59.6 A
S0.C0.P1	CPU COF	6	2400 MHz		2500 MHz	
	TDP	3,7	75.4 W	70.7 W	73.5 W	70.7 W
	VID_VDD Min	9	1.125 V	1.100 V	1.125 V	1.100 V
	VID_VDD Max	9	1.400 V	1.400 V	1.400 V	1.400 V
	IDD Max	3,10	59.7 A	41.9 A	59.4 A	42.3 A
S0.C0.P2	CPU COF	6	1900 MHz		2000 MHz	
	TDP	3,7	70.0 W	55.1 W	69.1 W	57.3 W
	VID_VDD Min	9	1.125 V	1.000 V	1.125 V	1.025 V
	VID_VDD Max	9	1.300 V	1.300 V	1.325 V	1.325 V
	IDD Max	3,10	55.4 A	30.0 A	55.4 A	32.1 A
S0.C0.P3	CPU COF	6	800 MHz		800 MHz	
	TDP	3,7	59.3 W	38.1 W	58.5 W	37.4 W
	VID_VDD Min	9	1.125 V	0.850 V	1.125 V	0.850 V
	VID_VDD Max	9	1.175 V	1.150 V	1.150 V	1.150 V
	IDD Max	3,10	46.8 A	15.4 A	46.0 A	15.2 A
S0.C1.Pmin	Core Power (Pre-Flush)	20	26.9 W	5.2 W	26.5 W	5.1 W
	Core Power (Post-Flush)	20	24.2 W	3.7 W	23.7 W	3.7 W
	NB Power	17	N/A	11.8 W	N/A	11.6 W
	I/O Power	13	6.7 W	6.7 W	6.7 W	6.7 W
S0.C1E.Pmin	TDP	16	14.9 W	7.6 W	14.6 W	7.4 W
S3	I/O Power	13	350 mW	350 mW	350 mW	350 mW

The notes for this table are on page 81.

3.3.3 AD mmmm OC pnc GM (65 W, DT, AM3) Thermal and Power Specifications

OPN			ADX260OCK23GM ¹⁹	
State	Specification ⁸	Notes	Single-Plane	Dual-Plane
S0.C0.Px	Tcase Max	1	55 °C to 74 °C	
	Tctl Max	2	70 °C	
	Tambient Min		5 °C	
	Thermal Profile		N	
	Startup P-State	5	S0.C0.P3	
	HTC P-State	4	S0.C0.P3	
S0.Cx.Px	NB COF	6,7	1600 MHz	2000 MHz
	VID_VDDNB Min	11,7	N/A	1.150 V
	VID_VDDNB Max	11,7	N/A	1.175 V
	IDDNB Max	12	N/A	4.0 A
S0.C0.P0	CPU COF	6	3200 MHz	
	TDP	3,7	61.8 W	60.2 W
	VID_VDD Min	9	1.200 V	1.200 V
	VID_VDD Max	9	1.400 V	1.400 V
	IDD Max	3,10	44.9 A	41.1 A
S0.C0.P1	CPU COF	6	2500 MHz	
	TDP	3,7	45.0 W	43.5 W
	VID_VDD Min	9	1.100 V	1.100 V
	VID_VDD Max	9	1.300 V	1.300 V
	IDD Max	3,10	34.2 A	29.5 A
S0.C0.P2	CPU COF	6	1900 MHz	
	TDP	3,7	41.1 W	31.9 W
	VID_VDD Min	9	1.100 V	1.000 V
	VID_VDD Max	9	1.200 V	1.200 V
	IDD Max	3,10	30.8 A	20.8 A
S0.C0.P3	CPU COF	6	800 MHz	
	TDP	3,7	34.0 W	19.3 W
	VID_VDD Min	9	1.100 V	0.825 V
	VID_VDD Max	9	1.125 V	1.025 V
	IDD Max	3,10	24.5 A	9.9 A
S0.C1.Pmin	Core Power (Pre-Flush)	20	15.1 W	3.4 W
	Core Power (Post-Flush)	20	13.2 W	2.5 W
	NB Power	17	N/A	2.1 W
	I/O Power	13	6.5 W	6.5 W
S0.C1E.Pmin	TDP	16	9.4 W	4.4 W
S3	I/O Power	13	350 mW	350 mW

The notes for this table are on page 81.

OPN			ADX265OCK23GM ¹⁹	
State	Specification ⁸	Notes	Single-Plane	Dual-Plane
S0.C0.Px	Tcase Max	1	55 °C to 74 °C	
	Tctl Max	2	70 °C	
	Tambient Min		5 °C	
	Thermal Profile		N	
	Startup P-State	5	S0.C0.P3	
	HTC P-State	4	S0.C0.P3	
S0.Cx.Px	NB COF	6,7	1800 MHz	2000 MHz
	VID_VDDNB Min	11,7	N/A	1.175 V
	VID_VDDNB Max	11,7	N/A	1.175 V
	IDDNB Max	12	N/A	4.2 A
S0.C0.P0	CPU COF	6	3300 MHz	
	TDP	3,7	62.1 W	60.2 W
	VID_VDD Min	9	1.200 V	1.200 V
	VID_VDD Max	9	1.500 V	1.500 V
	IDD Max	3,10	44.9 A	40.9 A
S0.C0.P1	CPU COF	6	2600 MHz	
	TDP	3,7	48.4 W	43.6 W
	VID_VDD Min	9	1.150 V	1.100 V
	VID_VDD Max	9	1.400 V	1.400 V
	IDD Max	3,10	36.4 A	29.5 A
S0.C0.P2	CPU COF	6	1900 MHz	
	TDP	3,7	43.7 W	31.5 W
	VID_VDD Min	9	1.150 V	1.000 V
	VID_VDD Max	9	1.300 V	1.300 V
	IDD Max	3,10	32.3 A	20.4 A
S0.C0.P3	CPU COF	6	800 MHz	
	TDP	3,7	36.7 W	19.1 W
	VID_VDD Min	9	1.150 V	0.825 V
	VID_VDD Max	9	1.150 V	1.125 V
	IDD Max	3,10	26.3 A	9.6 A
S0.C1.Pmin	Core Power (Pre-Flush)	20	19.7 W	3.8 W
	Core Power (Post-Flush)	20	18.1 W	3.0 W
	NB Power	17	N/A	2.1 W
	I/O Power	13	6.5 W	6.5 W
S0.C1E.Pmin	TDP	16	12.1 W	4.3 W
S3	I/O Power	13	350 mW	350 mW

The notes for this table are on page 81.

OPN			ADX220OCK22GM ¹⁹	
State	Specification ⁸	Notes	Single-Plane	Dual-Plane
S0.C0.Px	Tcase Max	1	55 °C to 74 °C	
	Tctl Max	2	70 °C	
	Tambient Min		5 °C	
	Thermal Profile		N	
	Startup P-State	5	S0.C0.P3	
	HTC P-State	4	S0.C0.P3	
S0.Cx.Px	NB COF	6,7	1600 MHz	2000 MHz
	VID_VDDNB Min	11,7	N/A	1.125 V
	VID_VDDNB Max	11,7	N/A	1.200 V
	IDDNB Max	12	N/A	17.4 A
S0.C0.P0	CPU COF	6	2800 MHz	
	TDP	3,7	69.7 W	65.0 W
	VID_VDD Min	9	1.100 V	1.050 V
	VID_VDD Max	9	1.400 V	1.400 V
	IDD Max	3,10	56.9 A	43.6 A
S0.C0.P1	CPU COF	6	2100 MHz	
	TDP	3,7	64.8 W	55.5 W
	VID_VDD Min	9	1.100 V	1.000 V
	VID_VDD Max	9	1.250 V	1.250 V
	IDD Max	3,10	52.9 A	35.0 A
S0.C0.P2	CPU COF	6	1600 MHz	
	TDP	3,7	61.6 W	50.6 W
	VID_VDD Min	9	1.100 V	0.975 V
	VID_VDD Max	9	1.150 V	1.150 V
	IDD Max	3,10	49.9 A	28.4 A
S0.C0.P3	CPU COF	6	800 MHz	
	TDP	3,7	56.5 W	41.7 W
	VID_VDD Min	9	1.100 V	0.900 V
	VID_VDD Max	9	1.100 V	0.950 V
	IDD Max	3,10	45.3 A	18.7 A
S0.C1.Pmin	Core Power (Pre-Flush)	20	27.2 W	7.8 W
	Core Power (Post-Flush)	20	25.1 W	6.4 W
	NB Power	17	N/A	12.7 W
	I/O Power	13	6.7 W	6.7 W
S0.C1E.Pmin	TDP	16	14.9 W	8.7 W
S3	I/O Power	13	350 mW	350 mW

The notes for this table are on page 81.

3.3.4 AD mmmm HD pnc GM (45 W, DT, AM3) Thermal and Power Specifications

OPN			AD415EHDK32GM ¹⁹		AD420EHDK32GM ¹⁹	
State	Specification ⁸	Notes	Single-Plane	Dual-Plane	Single-Plane	Dual-Plane
S0.C0.Px	Tcase Max	1	55 °C to 72 °C		55 °C to 72 °C	
	Tctl Max	2	70 °C		70 °C	
	Tambient Min		5 °C		5 °C	
	Thermal Profile		AB		AB	
	Startup P-State	5	S0.C0.P3		S0.C0.P3	
	HTC P-State	4	S0.C0.P3		S0.C0.P3	
S0.Cx.Px	NB COF	6,7	1600 MHz	2000 MHz	1600 MHz	2000 MHz
	VID_VDDNB Min	11,7	N/A	1.100 V	N/A	1.100 V
	VID_VDDNB Max	11,7	N/A	1.100 V	N/A	1.100 V
	IDDNB Max	12	N/A	3.9 A	N/A	3.1 A
S0.C0.P0	CPU COF	6	2500 MHz		2600 MHz	
	TDP	3,7	50.0 W	45.0 W	45.4 W	45.0 W
	VID_VDD Min	9	1.050 V	1.000 V	1.050 V	1.000 V
	VID_VDD Max	9	1.250 V	1.250 V	1.250 V	1.250 V
	IDD Max	3,10	41.2 A	34.4 A	35.7 A	33.3 A
S0.C0.P1	CPU COF	6	2100 MHz		2200 MHz	
	TDP	3,7	46.7 W	35.5 W	40.9 W	35.6 W
	VID_VDD Min	9	1.050 V	0.925 V	1.050 V	0.925 V
	VID_VDD Max	9	1.175 V	1.175 V	1.175 V	1.175 V
	IDD Max	3,10	38.1 A	26.7 A	32.6 A	25.9 A
S0.C0.P2	CPU COF	6	1800 MHz		1900 MHz	
	TDP	3,7	44.2 W	28.8 W	38.5 W	29.0 W
	VID_VDD Min	9	1.050 V	0.850 V	1.050 V	0.850 V
	VID_VDD Max	9	1.100 V	1.100 V	1.100 V	1.100 V
	IDD Max	3,10	35.8 A	21.0 A	30.3 A	20.5 A
S0.C0.P3	CPU COF	6	800 MHz		800 MHz	
	TDP	3,7	36.1 W	20.5 W	29.5 W	19.3 W
	VID_VDD Min	9	1.050 V	0.775 V	1.050 V	0.775 V
	VID_VDD Max	9	1.050 V	1.025 V	1.050 V	1.025 V
	IDD Max	3,10	28.0 A	12.3 A	21.7 A	11.2 A
S0.C1.Pmin	Core Power (Pre-Flush)	20	13.6 W	3.7 W	10.4 W	3.6 W
	Core Power (Post-Flush)	20	11.5 W	2.5 W	8.2 W	2.2 W
	NB Power	17	N/A	2.9 W	N/A	2.2 W
	I/O Power	13	6.7 W	6.7 W	6.7 W	6.7 W
S0.C1E.Pmin	TDP	16	7.3 W	2.6 W	4.9 W	2.1 W
S3	I/O Power	13	350 mW	350 mW	350 mW	350 mW

The notes for this table are on page 81.

OPN			AD610EHDK42GM ¹⁹		AD615EHDK42GM ¹⁹	
State	Specification ⁸	Notes	Single-Plane	Dual-Plane	Single-Plane	Dual-Plane
S0.C0.Px	Tcase Max	1	55 °C to 72 °C		55 °C to 72 °C	
	Tctl Max	2	70 °C		70 °C	
	Tambient Min		5 °C		5 °C	
	Thermal Profile		AB		AB	
	Startup P-State	5	S0.C0.P3		S0.C0.P3	
	HTC P-State	4	S0.C0.P3		S0.C0.P3	
S0.Cx.Px	NB COF	6,7	1600 MHz	2000 MHz	1600 MHz	2000 MHz
	VID_VDDNB Min	11,7	N/A	1.100 V	N/A	1.100 V
	VID_VDDNB Max	11,7	N/A	1.100 V	N/A	1.100 V
	IDDNB Max	12	N/A	3.2 A	N/A	2.5 A
S0.C0.P0	CPU COF	6	2400 MHz		2500 MHz	
	TDP	3,7	49.6 W	45.0 W	45.0 W	45.0 W
	VID_VDD Min	9	1.050 V	1.000 V	1.050 V	1.000 V
	VID_VDD Max	9	1.250 V	1.250 V	1.250 V	1.250 V
	IDD Max	3,10	40.9 A	35.1 A	35.8 A	33.9 A
S0.C0.P1	CPU COF	6	1900 MHz		2100 MHz	
	TDP	3,7	44.2 W	34.2 W	40.0 W	35.2 W
	VID_VDD Min	9	1.050 V	0.925 V	1.050 V	0.925 V
	VID_VDD Max	9	1.175 V	1.175 V	1.175 V	1.175 V
	IDD Max	3,10	35.7 A	26.1 A	31.7 A	26.2 A
S0.C0.P2	CPU COF	6	1700 MHz		1800 MHz	
	TDP	3,7	42.0 W	28.2 W	36.7 W	28.4 W
	VID_VDD Min	9	1.050 V	0.850 V	1.050 V	0.850 V
	VID_VDD Max	9	1.100 V	1.100 V	1.100 V	1.100 V
	IDD Max	3,10	33.6 A	21.1 A	28.6 A	20.6 A
S0.C0.P3	CPU COF	6	800 MHz		800 MHz	
	TDP	3,7	32.2 W	19.3 W	25.9 W	17.9 W
	VID_VDD Min	9	1.050 V	0.775 V	1.050 V	0.775 V
	VID_VDD Max	9	1.050 V	1.025 V	1.050 V	1.025 V
	IDD Max	3,10	24.3 A	11.7 A	18.3 A	10.3 A
S0.C1.Pmin	Core Power (Pre-Flush)	20	10.7 W	3.0 W	7.5 W	2.8 W
	Core Power (Post-Flush)	20	8.4 W	1.8 W	5.2 W	1.3 W
	NB Power	17	N/A	2.4 W	N/A	1.8 W
	I/O Power	13	6.7 W	6.7 W	6.7 W	6.7 W
S0.C1E.Pmin	TDP	16	5.2 W	1.9 W	2.9 W	1.3 W
S3	I/O Power	13	350 mW	350 mW	350 mW	350 mW

The notes for this table are on page 81.

OPN			AD245EHDK23GM ¹⁹	
State	Specification ⁸	Notes	Single-Plane	Dual-Plane
S0.C0.Px	Tcase Max	1	55 °C to 72 °C	
	Tctl Max	2	70 °C	
	Tambient Min		5 °C	
	Thermal Profile		S	
	Startup P-State	5	S0.C0.P3	
	HTC P-State	4	S0.C0.P3	
S0.Cx.Px	NB COF	6,7	1600 MHz	2000 MHz
	VID_VDDNB Min	11,7	N/A	1.125 V
	VID_VDDNB Max	11,7	N/A	1.125 V
	IDDNB Max	12	N/A	3.1 A
S0.C0.P0	CPU COF	6	2900 MHz	
	TDP	3,7	46.0 W	45.0 W
	VID_VDD Min	9	1.150 V	1.150 V
	VID_VDD Max	9	1.400 V	1.400 V
	IDD Max	3,10	33.3 A	30.4 A
S0.C0.P1	CPU COF	6	2100 MHz	
	TDP	3,7	34.9 W	31.9 W
	VID_VDD Min	9	1.100 V	1.050 V
	VID_VDD Max	9	1.250 V	1.250 V
	IDD Max	3,10	25.8 A	20.8 A
S0.C0.P2	CPU COF	6	1500 MHz	
	TDP	3,7	31.2 W	24.6 W
	VID_VDD Min	9	1.100 V	0.975 V
	VID_VDD Max	9	1.150 V	1.150 V
	IDD Max	3,10	22.5 A	15.0 A
S0.C0.P3	CPU COF	6	800 MHz	
	TDP	3,7	26.9 W	18.0 W
	VID_VDD Min	9	1.100 V	0.875 V
	VID_VDD Max	9	1.100 V	1.000 V
	IDD Max	3,10	16.9 A	8.4 A
S0.C1.Pmin	Core Power (Pre-Flush)	20	10.7 W	3.2 W
	Core Power (Post-Flush)	20	9.0 W	2.3 W
	NB Power	17	N/A	1.7 W
	I/O Power	13	6.5 W	6.5 W
S0.C1E.Pmin	TDP	16	6.5 W	3.7 W
S3	I/O Power	13	350 mW	350 mW

The notes for this table are on page 81.

OPN			AD250EHDK23GM ¹⁹	
State	Specification ⁸	Notes	Single-Plane	Dual-Plane
S0.C0.Px	Tcase Max	1	55 °C to 72 °C	
	Tctl Max	2	70 °C	
	Tambient Min		5 °C	
	Thermal Profile		S	
	Startup P-State	5	S0.C0.P3	
	HTC P-State	4	S0.C0.P3	
S0.Cx.Px	NB COF	6,7	1600 MHz	2000 MHz
	VID_VDDNB Min	11,7	N/A	1.125 V
	VID_VDDNB Max	11,7	N/A	1.125 V
	IDDNB Max	12	N/A	3.1 A
S0.C0.P0	CPU COF	6	3000 MHz	
	TDP	3,7	45.9 W	45.0 W
	VID_VDD Min	9	1.150 V	1.150 V
	VID_VDD Max	9	1.400 V	1.400 V
	IDD Max	3,10	33.3 A	30.5 A
S0.C0.P1	CPU COF	6	2200 MHz	
	TDP	3,7	34.9 W	32.0 W
	VID_VDD Min	9	1.100 V	1.050 V
	VID_VDD Max	9	1.250 V	1.250 V
	IDD Max	3,10	25.9 A	20.9 A
S0.C0.P2	CPU COF	6	1700 MHz	
	TDP	3,7	31.9 W	25.5 W
	VID_VDD Min	9	1.100 V	0.975 V
	VID_VDD Max	9	1.150 V	1.150 V
	IDD Max	3,10	23.1 A	15.6 A
S0.C0.P3	CPU COF	6	800 MHz	
	TDP	3,7	26.4 W	17.1 W
	VID_VDD Min	9	1.100 V	0.850 V
	VID_VDD Max	9	1.100 V	0.975 V
	IDD Max	3,10	16.4 A	7.7 A
S0.C1.Pmin	Core Power (Pre-Flush)	20	10.3 W	2.8 W
	Core Power (Post-Flush)	20	8.7 W	2.0 W
	NB Power	17	N/A	1.7 W
	I/O Power	13	6.5 W	6.5 W
S0.C1E.Pmin	TDP	16	6.3 W	3.4 W
S3	I/O Power	13	350 mW	350 mW

The notes for this table are on page 81.

3.3.5 AD mmmm SC pnc GM (25 W, DT, AM3) Thermal and Power Specifications

OPN			AD270USCK23GM ¹⁹	
State	Specification ⁸	Notes	Single-Plane	Dual-Plane
S0.C0.Px	Tcase Max	1	55 °C to 81 °C	
	Tctl Max	2	70 °C	
	Tambient Min		5 °C	
	Thermal Profile		W	
	Startup P-State	5	S0.C0.P2	
	HTC P-State	4	S0.C0.P2	
S0.Cx.Px	NB COF	6,7	1800 MHz	1800 MHz
	VID_VDDNB Min	11,7	N/A	1.050 V
	VID_VDDNB Max	11,7	N/A	1.050 V
	IDDNB Max	12	N/A	2.0 A
S0.C0.P0	CPU COF	6	2000 MHz	
	TDP	3,7	25.0 W	25.0 W
	VID_VDD Min	9	1.050 V	1.000 V
	VID_VDD Max	9	1.150 V	1.150 V
	IDD Max	3,10	17.7 A	15.7 A
S0.C0.P1	CPU COF	6	1600 MHz	
	TDP	3,7	22.4 W	20.7 W
	VID_VDD Min	9	1.050 V	0.950 V
	VID_VDD Max	9	1.100 V	1.100 V
	IDD Max	3,10	15.3 A	12.2 A
S0.C0.P2	CPU COF	6	800 MHz	
	TDP	3,7	17.3 W	13.8 W
	VID_VDD Min	9	1.050 V	0.825 V
	VID_VDD Max	9	1.050 V	0.975 V
	IDD Max	3,10	10.4 A	6.1 A
S0.C1.Pmin	Core Power (Pre-Flush)	20	4.8 W	1.7 W
	Core Power (Post-Flush)	20	3.4 W	0.8 W
	NB Power	17	N/A	1.2 W
	I/O Power	13	6.4 W	6.4 W
S0.C1E.Pmin	TDP	16	2.4 W	1.8 W
S3	I/O Power	13	350 mW	350 mW

The notes for this table are on page 81.

AMD Athlon™ Processor Thermal and Power Specification Table Notes:

1. *Tcase Max* is the maximum case temperature specification which is a physical value in degrees Celsius. *Tcase Max* can be any valid *Tcase Max* value in the range specified for the corresponding OPN.
2. *Tctl Max* (maximum control temperature) is a non-physical temperature on an arbitrary scale that can be used for system thermal management policies. Refer to the BIOS and Kernel Developer's Guide (BKDG) for AMD Family 10h Processors, order# 31116.
3. The processor thermal solution should be designed to accommodate thermal design power (TDP) at *Tcase Max*. TDP is measured under the conditions of all cores operating at CPU COF, *Tcase Max*, and VDD at the voltage requested by the processor. TDP includes all power dissipated on-die from VDD, VDDNB, VDDIO, VLDT, VTT, and VDDA. TDP is not the maximum power of the processor.
4. *P-state limit when HTC is active*. Refer to the BIOS and Kernel Developer's Guide (BKDG) for AMD Family 10h Processors, order# 31116 for more information.
5. Hardware transitions the part to startup *P-state* at cold boot. During initialization, the startup NB COF and VID_VDDNB values may differ from those of the startup *P-state*. Please see the BIOS and Kernel Developer's Guide (BKDG) for AMD Family 10h Processors, order# 31116 for detailed power sequencing information.
6. Frequency reported to the OS is rounded to the nearest 100-MHz boundary.
7. During initialization, the startup NB COF and VID_VDDNB values may differ from those of the startup *P-state*. Please see the BIOS and Kernel Developer's Guide (BKDG) For AMD Family 10h Processors, order# 31116 for specific power sequencing information.
8. Specifications for multi-core processors assume equivalent *P-states* (voltage and frequency) and equivalent *Tcase* conditions for all cores. Refer to the BIOS and Kernel Developer's Guide (BKDG) for AMD Family 10h Processors, order #31116, for details on *P-state* operation for multi-core processors.
9. Variable voltage, any valid voltage between VID_VDD Min and VID_VDD Max is allowed.
10. TDP IDD conditions: single-plane platforms supply IDD and IDDNB tied together and use the IDD Max specification.
11. Single-plane platforms have VID_VDD and VID_VDDNB tied together, and use the VID_VDD specification.
12. TDP IDDNB conditions: single-plane platforms supply IDD and IDDNB tied together and use the IDDNB Max specification.
13. Thermal Design Power dissipated by the processor VDDIO and VTT power planes only. Assumes $VDDIO = 1.8\text{ V}$ and $VTT = VDDIO / 2$.
14. Refer to erratum 308 in the Revision Guide for AMD Family 10h Processors, order# 41322 for the appropriate clock divisor setting.
15. Assumes 50°C, Min *P-state* VID_VDD, core clock divider set to 128, and L2 and data cache scrubbing disabled. Refer to the BIOS and Kernel Developer's Guide (BKDG) for AMD Family 10h Processors, order# 31116 for recommended settings.
16. Assumes 35°C, min *P-state* VID_VDD, core clock divider set to 16, HyperTransport™ links disconnected, memory in self-refresh mode, and DDR2 SDRAM interface tristated. Recommended settings in the BIOS and Kernel Developer's Guide (BKDG) for AMD Family 10h Processors, order# 31116, provide improved power values.
17. Thermal Design Power dissipated by the processor at min *P-state* VID_VDDNB.
18. Thermal Design Power dissipated by the processor at min *P-state* VID_VDD.
19. This product is recommended for dual-plane platforms only.
20. Core Power (Pre-Flush) and (Post-Flush) refers to the Cache Flush On Halt feature described in the BIOS and Kernel Developer's Guide (BKDG) for AMD Family 10h Processors, order# 31116. Core Power pre-flush and post-flush values are based on the recommended BKDG settings. Actual C1 idle core power varies with system usage according to the following equation:

$$C1\text{ idle Core Power} = F3xDC[CashFlushOnHaltTmr]/OS\text{ timer tick interval} * \text{Core Power (Pre-Flush)} + (1 - F3xDC[CachFlushOnHaltTmr]/OS\text{ timer tick interval} * \text{Core Power (Post-Flush)})$$

The default Microsoft® Windows Vista® timer tick interval is 15.6 ms. This interval varies between operating systems and within an operating system depending on usage.
21. Valid for dual-plane operation only.

4 AMD Sempron™ Processor

The following sections contain the OPN description and thermal and power specifications for the AMD Sempron™ Processor. Each column in the thermal and power tables represents a specific Ordering Part Number (OPN). Section 4.1 provides an example of the OPN structure for this processor family.

4.1 AMD Sempron™ Processor Ordering Part Number Description

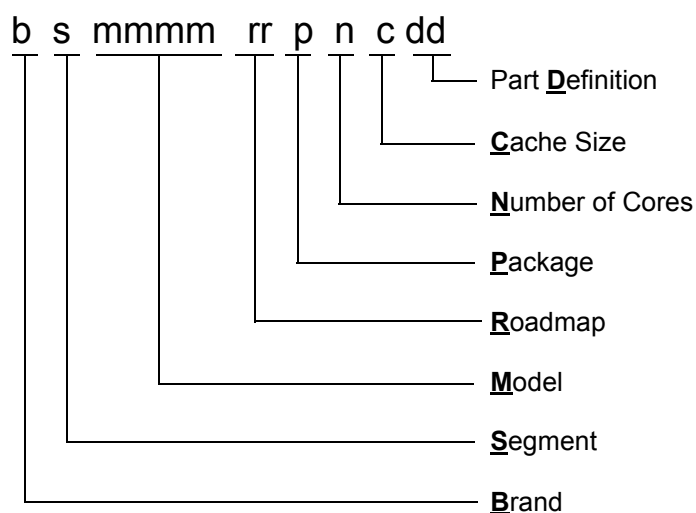


Figure 5. AMD Sempron™ Processor Ordering Part Number Diagram

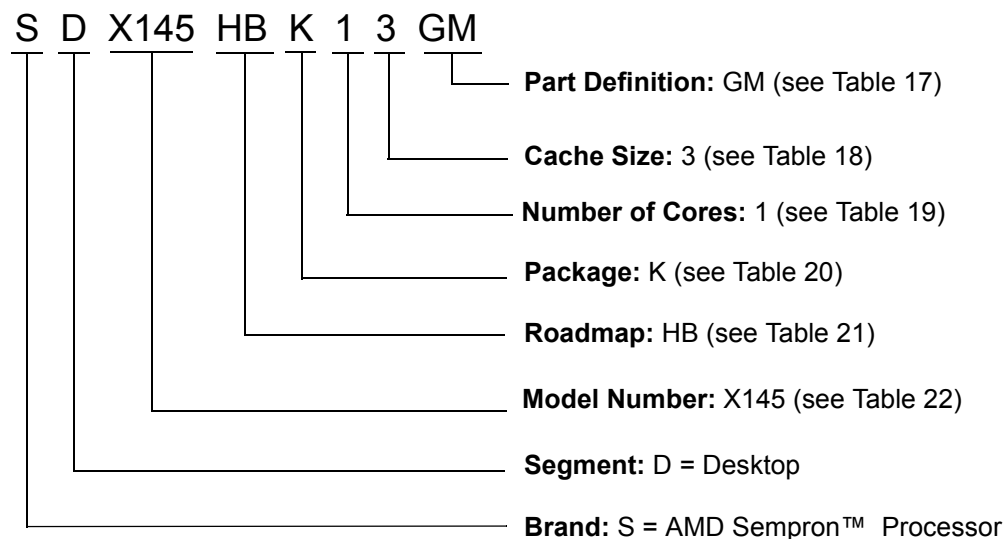


Figure 6. AMD Sempron™ Processor Ordering Part Number Example

Table 17. AMD Sempron™ Processor Part Definition Options

Part Definition	Revision	CPUID 8000_0001h EAX [31:0] (CPUID)
GM	Rev C3	00100F63h

Table 18. AMD Sempron™ Processor Cache Size Options

OPN Character	L2 Cache Size	L3 Cache Size
3	1024 KB	0 KB

Table 19. AMD Sempron™ Processor Number of Cores

OPN Character	Number of Cores
1	1

Table 20. AMD Sempron™ Processor Package Options

OPN Character	Package
K	AM3

Table 21. AMD Sempron™ Processor Roadmap Options

OPN Character	Max TDP	Socket Infrastructure	IDD Max (VDD)	IDD Max (NB)	HS Class
HB	45 W	AM3	45 A	20 A	HS 55

Table 22. AMD Sempron™ Processor Model Number Options

Model Number	Core Frequency	Single-Plane NB Frequency	Dual-Plane NB Frequency	Number of Cores	Max DDR Speed	Max HT Link Speed
X145	2800 MHz	1600 MHz	2000 MHz	1	1066 MT/s	4000 MT/s

Table 23. AMD Sempron™ Processor Thermal Profiles

Thermal Profile	R
Heat Sink Class	HS55
Heat Sink Thermal Resistance	0.51°C/W
Heat Sink Local Ambient	42°C
Profile Thermal Resistance	0.366°C/W
Profile Ambient	48°C
TDP	Tcase Max
0.0 W	55.0°C
5.0 W	55.0°C
10.0 W	55.0°C
15.0 W	55.0°C
20.0 W	55.3°C
25.0 W	57.2°C
30.0 W	59.0°C
35.0 W	60.8°C
41.0 W	63.0°C

Note: The thermal profile is used to define the relationship between Tcase max and device-specific Thermal Design Power. The heat sink thermal resistance and heat sink local ambient values specify heat sink design targets. The profile thermal resistance and profile ambient values specify the relationship between part-specific power and part-specific Tcase Max. If the heat sink design targets are met, the thermal profile specifications are met. AMD Athlon™ Processor Thermal Profiles

4.2 AMD Sempron™ Processor Thermal and Power Table Guide

The thermal and power table guide shown in Table 24 maps SOPNs and the properties associated with their defined characters to the proper thermal and power table subsections and page numbers. This table is designed to be used as a quick reference for finding the appropriate subsection for the thermal and power tables corresponding to an SOPN.

Table 24. AMD Sempron™ Processor Thermal and Power Table Guide

SOPN	Power	Revision	Thermal/Power Tables
SD mmmm HB pnc GM	45 W	C3	Section 4.3.1 on page 87

4.3 AMD Sempron™ Processor Thermal and Power Specifications

The thermal and power specification tables contain the thermal and power requirements for each OPN. This includes the information necessary for thermal management (for example, heat sink requirements, temperature assumptions) and power delivery (for example, voltage, current, and power dissipation for each P-state). Refer to the *AMD Family 10h Processor Electrical Data Sheet*, order# 40014, for all other electrical specifications for the processor. Refer to the *BIOS and Kernel Developer's Guide (BKDG) for AMD Family 10h Processors*, order# 31116, for power management BIOS requirements.

Section 4.1 on page 82 provides an example of the OPN structure for processors documented in this chapter and Table 24 on page 85 provides a guide to OPN organization in the following subsections. Refer to Section 1.2 on page 9 and Section 1.3 on page 10 for numbering conventions and terminology definitions used in these tables.

4.3.1 SD mmmm HB pnc GM (45 W, DT, AM3) Thermal and Power Specifications

OPN			SDX145HBK13GM ¹⁹	
State	Specification	Notes	Single-Plane	Dual-Plane
S0.C0.Px	Tcase Max	1	55 °C to 63 °C	
	Tctl Max	2	70 °C	
	Tambient Min		5 °C	
	Thermal Profile		R	
	Startup P-State	5	S0.C0.P3	
	HTC P-State	4	S0.C0.P3	
S0.Cx.Px	NB COF	6,7	1600 MHz	2000 MHz
	VID_VDDNB Min	11,7	N/A	1.175 V
	VID_VDDNB Max	11,7	N/A	1.175 V
	IDDNB Max	12	N/A	4.4 A
S0.C0.P0	CPU COF	6	2800 MHz	
	TDP	3,7	42.0 W	41.0 W
	VID_VDD Min	9	1.100 V	1.100 V
	VID_VDD Max	9	1.350 V	1.350 V
	IDD Max	3,10	30.1 A	26.7 A
S0.C0.P1	CPU COF	6	2000 MHz	
	TDP	3,7	36.9 W	30.3 W
	VID_VDD Min	9	1.050 V	1.000 V
	VID_VDD Max	9	1.250 V	1.250 V
	IDD Max	3,10	27.6 A	18.7 A
S0.C0.P2	CPU COF	6	1600 MHz	
	TDP	3,7	35.5 W	23.9 W
	VID_VDD Min	9	1.050 V	0.900 V
	VID_VDD Max	9	1.150 V	1.150 V
	IDD Max	3,10	26.4 A	13.6 A
S0.C0.P3	CPU COF	6	800 MHz	
	TDP	3,7	32.7 W	19.4 W
	VID_VDD Min	9	1.050 V	0.825 V
	VID_VDD Max	9	1.075 V	1.075 V
	IDD Max	3,10	23.9 A	9.5 A
S0.C1.Pmin	Core Power (Pre-Flush)	20	15.9 W	4.1 W
	Core Power (Post-Flush)	20	14.1 W	2.9 W
	NB Power	17	N/A	2.2 W
	I/O Power	13	6.5 W	6.5 W
S0.C1E.Pmin	TDP	16	9.8 W	4.9 W
S3	I/O Power	13	350 mW	350 mW

The notes for this table are on page 88.

AMD Sempron™ Processor Thermal and Power Specification Table Notes:

1. *Tcase Max is the maximum case temperature specification which is a physical value in degrees Celsius. Tcase Max can be any valid Tcase Max value in the range specified for the corresponding OPN.*
2. *Tctl Max (maximum control temperature) is a non-physical temperature on an arbitrary scale that can be used for system thermal management policies. Refer to the BIOS and Kernel Developer's Guide (BKDG) for AMD Family 10h Processors, order# 31116.*
3. *The processor thermal solution should be designed to accommodate thermal design power (TDP) at Tcase Max. TDP is measured under the conditions of all cores operating at CPU COF, Tcase Max, and VDD at the voltage requested by the processor. TDP includes all power dissipated on-die from VDD, VDDNB, VDDIO, VLDT, VTT, and VDDA. TDP is not the maximum power of the processor.*
4. *P-state limit when HTC is active. Refer to the BIOS and Kernel Developer's Guide (BKDG) for AMD Family 10h Processors, order# 31116 for more information.*
5. *Hardware transitions the part to startup P-state at cold boot. During initialization, the startup NB COF and VID_VDDNB values may differ from those of the startup P-state. Please see the BIOS and Kernel Developer's Guide (BKDG) for AMD Family 10h Processors, order# 31116 for detailed power sequencing information.*
6. *Frequency reported to the OS is rounded to the nearest 100-MHz boundary.*
7. *During initialization, the startup NB COF and VID_VDDNB values may differ from those of the startup P-state. Please see the BIOS and Kernel Developer's Guide (BKDG) For AMD Family 10h Processors, order# 31116 for specific power sequencing information.*
8. *Specifications for multi-core processors assume equivalent P-states (voltage and frequency) and equivalent Tcase conditions for all cores. Refer to the BIOS and Kernel Developer's Guide (BKDG) for AMD Family 10h Processors, order #31116, for details on P-state operation for multi-core processors.*
9. *Variable voltage, any valid voltage between VID_VDD Min and VID_VDD Max is allowed.*
10. *TDP IDD conditions: single-plane platforms supply IDD and IDDNB tied together and use the IDD Max specification.*
11. *Single-plane platforms have VID_VDD and VID_VDDNB tied together, and use the VID_VDD specification.*
12. *TDP IDDNB conditions: single-plane platforms supply IDD and IDDNB tied together and use the IDDNB Max specification.*
13. *Thermal Design Power dissipated by the processor VDDIO and VTT power planes only. Assumes VDDIO = 1.8 V and VTT = VDDIO / 2.*
14. *Refer to erratum 308 in the Revision Guide for AMD Family 10h Processors, order# 41322 for the appropriate clock divisor setting.*
15. *Assumes 50°C, Min P-state VID_VDD, core clock divider set to 128, and L2 and data cache scrubbing disabled. Refer to the BIOS and Kernel Developer's Guide (BKDG) for AMD Family 10h Processors, order# 31116 for recommended settings.*
16. *Assumes 35°C, min P-state VID_VDD, core clock divider set to 16, HyperTransport™ link s disconnected, memory in self-refresh mode, and DDR2 SDRAM interface tristated. Recommended settings in the BIOS and Kernel Developer's Guide (BKDG) for AMD Family 10h Processors, order# 31116, provide improved power values.*
17. *Thermal Design Power dissipated by the processor at min P-state VID_VDDNB.*
18. *Thermal Design Power dissipated by the processor at min P-state VID_VDD.*
19. *This product is recommended for dual-plane platforms only.*
20. *Core Power (Pre-Flush) and (Post-Flush) refers to the Cache Flush On Halt feature described in the BIOS and Kernel Developer's Guide (BKDG) for AMD Family 10h Processors, order# 31116. Core Power pre-flush and post-flush values are based on the recommended BKDG settings. Actual C1 idle core power varies with system usage according to the following equation:

$$C1 \text{ idle Core Power} = F3xDC[CashFlushOnHaltTmr]/OS \text{ timer tick interval} * \text{Core Power (Pre-Flush)} + (1 - F3xDC[CachFlushOnHaltTmr]/OS \text{ timer tick interval} * \text{Core Power (Post-Flush)})$$
The default Microsoft® Windows Vista® timer tick interval is 15.6 ms. This interval varies between operating systems and within an operating system depending on usage.*

5 Power Supply Specifications

For socket infrastructures not covered by this document refer to the *AMD Infrastructure Roadmap*, order# 41842.

5.1 bsmmmrr J ncdd – AM2r2 Power Supply Operating Conditions

Table 25. bsmmmrr J ncdd DC Operating Conditions for VDD Power Supply

Symbol	Parameter	Units	Min	Typ	Max	Notes
VID_VDD	VID-Requested VDD Supply Level	V	Refer to the thermal/power tables under the appropriate SOPN section for this OPN-specific parameter.			
VDD_dc	DC Tolerance - VDD Supply Voltage	V	VID_VDD – 50 mV	VID_VDD	VID_VDD + 50 mV	
VDD_PON	Metal Mask VID	V	0.95	1.00	MaxVID_VDD	1,2
VDDNB_dc	VDDNB Supply voltage	V	VID_VDDNB – 50 mV	VID_VDDNB	VID_VDDNB + 50 mV	
VID_VDDNB	VDDNB Supply voltage	V	Refer to the thermal/power tables under the appropriate SOPN section for this OPN-specific parameter.			
VDDNB_PON	Metal Mask VDDNB	V	0.95	1.00	MaxVID_VDDNB	1,2

Notes:

- 1) After PWROK assertion, the VID signals change from the Metal Mask VID to the value programmed during device manufacturing.
- 2) MaxVID is reported in MSRC001_0071 (COFVID_STATUS).

Table 26. bsmmmrr J ncdd AC Operating Conditions for VDD Power Supply

Symbol	Parameter	Units	Min	Typ	Max	Notes
VDD_ac	VDD Supply Voltage	V	VID_VDD – 140 mV	VID_VDD	VID_VDD + 150 mV	1
VDDNB_ac	VDDNB Supply Voltage	V	VID_VDDNB – 140 mV	VID_VDDNB	VID_VDDNB + 150 mV	1

Notes:

- 1) The voltage set-point must be contained within the DC specification in order to ensure proper operation. Voltage ripple and transient events outside the DC specification must remain within the AC specification at all times. Transients above dc max must return to within the DC specification within 30 μ S and must stay under a triangle described by the AC limit at one end and the DC limit at the other, as shown in Figure 7 on page 90.

Table 27. bsmmmrrr J ncdd Maximum Power-Up and Power-Down Conditions for Power Supplies

Symbol	Parameter	Units	Max
VDDIO	VDDIO Supply Voltage for DDR2 electricals	V	2.05
VDDIO	VDDIO Supply Voltage for DDR3 electricals	V	1.65
VLDT	VLDT Supply Voltage	V	1.32
VDDA	VDDA Supply Voltage	V	2.70
VDD, VDDNB	VDD, VDDNB Supply Voltage	V	Max AC Voltage

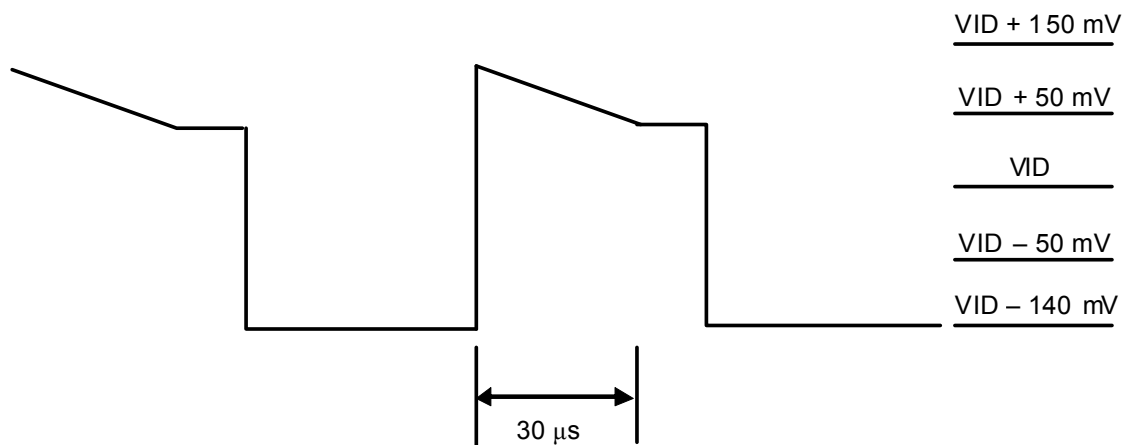


Figure 7. Socket AM2 AC and DC Transient Limits

Table 28. bsmmmrr J nccd AC and DC Operating Conditions for non-VDD Power Supplies

Symbol	Parameter	Units	Min	Typ	Max	Notes
VDDIO_dc	VDDIO Supply Voltage for DDR2 electricals	V	1.70	1.80	1.90	1
VDDIO_ac	VDDIO Supply voltage	V	VDDIO_dc – 150 mV	VDDIO_dc	VDDIO_dc + 150 mV	2, 3
VLDT	VLDT Supply Voltage	V	1.14	1.20	1.26	12
VTT_dc	VTT Supply Voltage for DDR2 electricals	V	0.85	0.90	0.95	4
VTT_ac	VTT Supply Voltage	V	VTT_dc – 75mV	VTT_dc	VTT_dc + 75mV	2, 3
VDDA	VDDA Supply Voltage	V	2.40	2.50	2.60	
IDDIO1	VDDIO Power Supply Current	A			3.60	7, 9
ITT1	VTT Power Supply Current	A			1.75	6, 8, 9
ILD1	VLDT Power Supply Current	A			1.40/ link	5, 9
					0.65/ link	9,10,11
IDDA	VDDA Power Supply Current	mA			250	9

Notes:

- 1) All voltages are referenced to VSS. In order to ensure proper functionality, DC voltage regulator must be set accordingly to ensure that VDDIO_dc level measured at the VDDIO_FB_H/L pins does not exceed the specified maximum and minimum range. As such, factors such as voltage regulator inaccuracy and IR drop must be carefully considered and compensated for. For example, if the inaccuracy and IR drop amounts to 50 mV, then the voltage regulator setting for VDDIO should not be lower than 1.75 V to avoid violating the VDDIO_dc minimum spec of 1.70 V.
- 2) VDDIO_ac and VTT_ac parameters are measured over 60 seconds time frame with all data bus bits switching.
- 3) Power supply A/C measurements use a 20-MHz scope bandwidth limit.
- 4) All voltages are referenced to VSS. Voltage regulator for VTT must be set accordingly so that VTT_dc level measured at the processor VTT_SENSE pin tracks 0.5*VDDIO_dc and stays within the specified maximum and minimum range. Factors such as voltage regulator inaccuracy and IR drop must be carefully considered and compensated for. For example, if the inaccuracy and IR drop amounts to 20 mV, the voltage regulator setting must be set 20 mV higher so that VTT still tracks 0.5*VDDIO_dc and stays within the range of 0.85 V and 0.95 V.
- 5) ILDT is specified for one 16x16-bit Gen3 link.
- 6) VTT must both sink and source current.
- 7) VDDIO current is consumed by I, O, I/O switching current and on-chip functions (PDL, DLL, level-shifters, etc.).
- 8) VTT current is consumed by I, O, I/O switching current and on-chip functions (PDL, DLL, level-shifters, etc.).
- 9) This specification reflects the values published in the appropriate power roadmap document.
- 10) ILDT is specified for each unconnected HyperTransport™ link or for each 16x16 bit Gen1 HyperTransport link operating at max 2.0 GT/s or less.
- 11) Please refer to erratum 396.
- 12) Tolerances apply to both VLDT_dc and VLDT_ac conditions.

5.2 bsmmmrr K ncdd – AM3 Power Supply Operating Conditions

Table 29. bsmmmrr K ncdd DC Operating Conditions for VDD Power Supply

Symbol	Parameter	Units	Min	Typ	Max	Notes
VID_VDD	VID-Requested VDD Supply Level	V	Refer to the thermal/power tables under the appropriate SOPN section for this OPN-specific parameter.			
VDD_dc	DC Tolerance - VDD Supply Voltage	V	VID_VDD -50 mV	VID_VDD	VID_VDD + 50 mV	
VDD_PON	Metal Mask VID	V	0.95	1.00	MaxVID_VDD	1,2
VDDNB_dc	VDDNB Supply voltage	V	VID_VDDNB -50 mV	VID_VDDNB	VID_VDDNB + 50 mV	
VID_VDDNB	VDDNB Supply voltage	V	Refer to the thermal/power tables under the appropriate SOPN section for this OPN-specific parameter.			
VDDNB_PON	Metal Mask VDDNB	V	0.95	1.00	MaxVID_VDD	1,2

Notes:

- 1) After PWROK assertion, the VID signals change from the Metal Mask VID to the value programmed during device manufacturing.
- 2) MaxVID is reported in MSRC001_0071 (COFVID_STATUS).

Table 30. bsmmmrr K ncdd AC Operating Conditions for VDD Power Supply

Symbol	Parameter	Units	Min	Typ	Max	Notes
VDD_ac	VDD Supply Voltage	V	VID_VDD -140 mV	VID_VDD	VID_VDD + 150 mV	1
VDDNB_ac	VDDNB Supply Voltage	V	VID_VDDNB -140 mV	VID_VDDNB	VID_VDDNB + 150 mV	1

Notes:

- 1) The voltage set-point must be contained within the DC specification in order to ensure proper operation. Voltage ripple and transient events outside the DC specification must remain within the AC specification at all times. Transients above dc max must return to within the DC specification within 30 μ s and must stay under a triangle described by the AC limit at one end and the DC limit at the other, as shown in Figure 8 on page 93.

Table 31. bsmmmrrr K ncdd Maximum Power-Up and Power-Down Conditions for Power Supplies

Symbol	Parameter	Units	Max
VDDIO	VDDIO Supply Voltage for DDR2 electricals	V	2.05
VDDIO	VDDIO Supply Voltage for DDR3 electricals	V	1.65
VLDT	VLDT Supply Voltage	V	1.32
VDDA	VDDA Supply Voltage	V	2.70
VDD, VDDNB	VDD, VDDNB Supply Voltage	V	Max AC Voltage

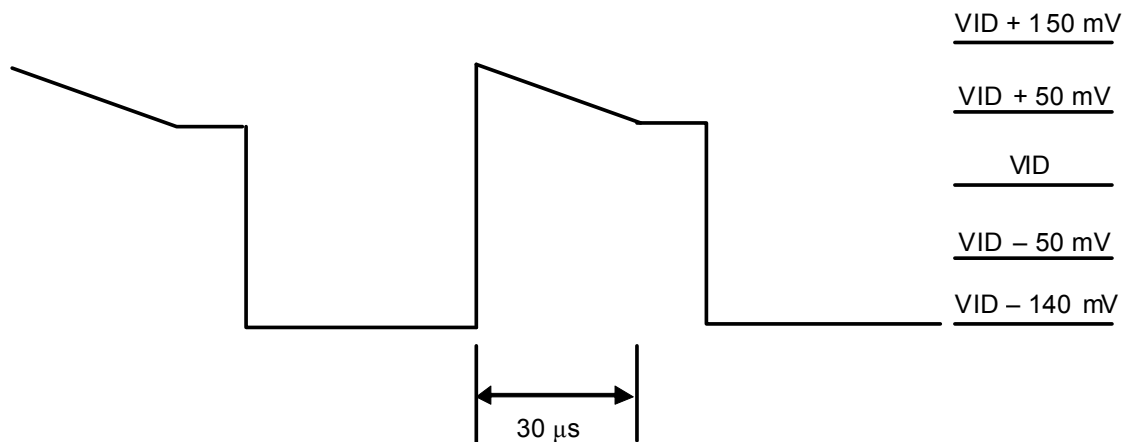


Figure 8. Socket AM3 AC and DC Transient Limits

Table 32. bsmmmrrr K ncdd AC and DC Operating Conditions for non-VDD Power Supplies

Symbol	Parameter	Units	Min	Typ	Max	Notes
VDDIO_dc	VDDIO Supply Voltage for DDR3 electricals	V	1.375	1.500	1.625	1
VDDIO_ac	VDDIO Supply voltage	V	VDDIO_dc – 125 mV	VDDIO_dc	VDDIO_dc + 125 mV	2, 3
VLDT	VLDT Supply Voltage	V	1.14	1.20	1.26	12
VDDR_dc	VDDR Supply Voltage for DDR3 electricals	V	1.14	1.20	1.26	4
VDDR_ac	VDDR Supply Voltage	V	VDDR_dc – 60mV	VDDR_dc	VDDR_dc + 60mV	2, 3
VDDA	VDDA Supply Voltage	V	2.40	2.50	2.60	
IDDIO1	VDDIO Power Supply Current	A			3.60	7, 9
IDDR	VDDR Power Supply Current	A			1.75	6, 8, 9
ILD1	VLDT Power Supply Current	A			1.40/ link	5, 9
					0.65/ link	9,10,11
IDDA	VDDA Power Supply Current	mA				9

Notes:

- 1) All voltages are referenced to VSS. In order to ensure proper functionality, DC voltage regulator must be set accordingly to ensure that VDDIO_dc level measured at the VDDIO_FB_H/L pins does not exceed the specified maximum and minimum range. As such, factors such as voltage regulator inaccuracy and IR drop must be carefully considered and compensated for. For example, if the inaccuracy and IR drop amounts to 50 mV, then the voltage regulator setting for VDDIO should not be lower than 1.425 V to avoid violating the VDDIO_dc minimum spec of 1.375 V.
- 2) VDDIO_ac and VDDR_ac parameters are measured over 60 seconds time frame with all data bus bits switching.
- 3) Power supply A/C measurements use a 20-MHz scope bandwidth limit.
- 4) All voltages are referenced to VSS. Voltage regulator for VDDR must be set accordingly so that VDDR_dc level measured at the processor with VDDR_SENSE pin stay within the specified maximum and minimum DC tolerance limits. Factors such as voltage regulator inaccuracy and IR drop must be carefully considered and compensated for to ensure the VDDR stays within the specified DC tolerance limits.
- 5) ILDT is specified for one 16x16-bit Gen3 link.
- 6) VDDR must both sink and source current.
- 7) VDDIO current is consumed by I, O, I/O switching current and on-chip functions (PDL, DLL, level-shifters, etc.).
- 8) VDDR current is consumed by I, O, I/O switching current and on-chip functions (PDL, DLL, level-shifters, etc.).
- 9) This specification reflects the values published in the appropriate power roadmap document.
- 10) ILDT is specified for one 16x16-bit HyperTransport™ link operating at 2.0 GT/s.
- 11) Please refer to erratum 396.
- 12) Tolerances apply to both VLDT_dc and VLDT_ac conditions.

6 MTOPS

Table 33 shows Composite Theoretical Performance (CTP) calculations. The calculations are stated in Millions of Theoretical Operations per Second (MTOPS) and are based upon a formula in the United States Department of Commerce Export Administration Regulations 15 CFR 774 (Advisory Note 4 for Category 4).

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Table 33. Composite Theoretical Performance (CTP) Calculation

Frequency	MTOPS Single-Core	MTOPS Dual-Core	MTOPS Triple-Core	MTOPS Quad-Core	MTOPS Six-Core
1600	8,667	16,267	23,867	31,467	46,667
1700	9,209	17,284	25,359	33,434	49,584
1800	9,750	18,300	26,850	35,400	52,500
1900	10,292	19,317	28,342	37,367	55,417
2000	10,834	20,334	29,834	39,334	58,334
2100	11,375	21,350	31,325	41,300	61,250
2200	11,917	22,367	32,817	43,267	64,167
2300	12,459	23,384	34,309	45,234	67,084
2400	13,000	24,400	35,800	47,200	70,000
2500	13,542	25,417	37,292	49,167	72,917
2600	14,084	26,434	38,784	51,134	75,834
2700	14,625	27,450	40,275	53,100	78,750
2800	15,167	28,467	41,767	55,067	81,667
2900	15,709	29,484	43,259	57,034	84,584
3000	16,250	30,500	44,750	59,000	87,500
3100	16,792	31,517	46,242	60,967	90,417
3200	17,334	32,534	47,734	62,934	93,334
3300	17,875	33,550	49,225	64,900	96,250
3400	18,417	34,567	50,717	66,867	99,167

7 APP

Table 34 shows the Adjusted Peak Performance (APP) calculations for the AMD Phenom™ processor and the AMD Athlon™ processor. The calculations are stated in millions of Weighted Teraflops (WT) and are based upon a formula in the United States Department of Commerce Export Administration Regulations 15 CFR 774 (Advisory Note 4 for Category 4).

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Table 34. Adjusted Peak Performance (APP) Calculation

Frequency	APP Single-Core	APP Dual-Core	APP Triple-Core	APP Quad-Core	APP Six-Core
1600	0.0019	0.0038	0.0058	0.0077	0.0115
1700	0.0020	0.0041	0.0061	0.0082	0.0122
1800	0.0022	0.0043	0.0065	0.0086	0.0130
1900	0.0023	0.0046	0.0068	0.0091	0.0137
2000	0.0024	0.0048	0.0072	0.0096	0.0144
2100	0.0025	0.0050	0.0076	0.0101	0.0151
2200	0.0026	0.0053	0.0079	0.0106	0.0158
2300	0.0028	0.0055	0.0083	0.0110	0.0166
2400	0.0029	0.0058	0.0086	0.0115	0.0173
2500	0.0030	0.0060	0.0090	0.0120	0.0180
2600	0.0031	0.0062	0.0094	0.0125	0.0187
2700	0.0032	0.0065	0.0097	0.0130	0.0194
2800	0.0034	0.0067	0.0101	0.0134	0.0202
2900	0.0035	0.0070	0.0104	0.0139	0.0209
3000	0.0036	0.0072	0.0108	0.0144	0.0216
3100	0.0037	0.0074	0.0112	0.0149	0.0223
3200	0.0038	0.0077	0.0115	0.0154	0.0230
3300	0.0040	0.0079	0.0119	0.0158	0.0238
3400	0.0041	0.0082	0.0122	0.0163	0.0245