



**AMD NPT Family 0Fh
Desktop Processor
Power and Thermal Data Sheet**

Publication # **33954**
Revision: **3.23**
Issue Date: **June 2007**

© 2005 – 2007 Advanced Micro Devices, Inc. All rights reserved.

The contents of this document are provided in connection with Advanced Micro Devices, Inc. (“AMD”) products. AMD makes no representations or warranties with respect to the accuracy or completeness of the contents of this publication and reserves the right to make changes to specifications and product descriptions at any time without notice. The information contained herein may be of a preliminary or advance nature and is subject to change without notice. No license, whether express, implied, arising by estoppel or otherwise, to any intellectual property rights is granted by this publication. Except as set forth in AMD’s Standard Terms and Conditions of Sale, AMD assumes no liability whatsoever, and disclaims any express or implied warranty, relating to its products including, but not limited to, the implied warranty of merchantability, fitness for a particular purpose, or infringement of any intellectual property right.

AMD’s products are not designed, intended, authorized or warranted for use as components in systems intended for surgical implant into the body, or in other applications intended to support or sustain life, or in any other application in which the failure of AMD’s product could create a situation where personal injury, death, or severe property or environmental damage may occur. AMD reserves the right to discontinue or make changes to its products at any time without notice.

Trademarks

AMD, the AMD Arrow logo, AMD Athlon, AMD Sempron, and combinations thereof are trademarks of Advanced Micro Devices, Inc.

HyperTransport is a licensed trademark of the HyperTransport Technology Consortium.

Other product names used in this publication are for identification purposes only and may be trademarks of their respective companies.

Contents

Revision History	8
1 Overview	10
1.1 Organization	10
1.1.1 Ordering Part Number Description Section Overview	10
1.1.2 Thermal and Power Table Guide Overview	10
1.1.3 Thermal and Power Table Section Overview	11
1.1.4 Power Supply Specification Chapter Overview	11
1.1.5 Power Limit Encoding Chapter Overview	11
1.2 Conventions	11
1.3 Definitions	12
2 AMD Athlon™ 64 X2 Dual-Core Processor	13
2.1 AMD Athlon™ 64 X2 Dual-Core Processor Ordering Part Number Description	13
2.2 AMD Athlon 64 X2 Dual-Core Processor Thermal and Power Table Guide	18
2.3 AMD Athlon 64 X2 Dual-Core Processor Thermal and Power Specifications	19
2.3.1 ADA mmmsvtc CU Thermal and Power Specifications	20
2.3.2 ADA mmmsvtc CS Thermal and Power Specifications	22
2.3.3 ADA mmmsvtc CZ Thermal and Power Specifications	24
2.3.4 ADD mmmsvtc CU Thermal and Power Specifications	26
2.3.5 ADO mmmsvtc CU Thermal and Power Specifications	27
2.3.6 ADO mmmsvtc CS Thermal and Power Specifications	29
2.3.7 ADO mmmsvtc CZ Thermal and Power Specifications	31
2.3.8 ADO mmmsvtc DD Thermal and Power Specifications	33
2.3.9 ADO mmmsvtc DL Thermal and Power Specifications	35
2.3.10 ADI mmmsvtc DD Thermal and Power Specifications	36
2.3.11 ADX mmmsvtc CZ Thermal and Power Specifications	37
3 AMD Athlon™ X2 Processor	39
3.1 AMD Athlon X2 Processor Ordering Part Number Description	39
3.2 AMD Athlon X2 Processor Thermal and Power Table Guide	43
3.3 AMD Athlon X2 Processor Thermal and Power Specifications	44
3.3.1 ADH mmmsvtc DD Thermal and Power Specifications	45
4 AMD Athlon™ 64 Processor	47
4.1 AMD Athlon 64 Processor Ordering Part Number Description	47
4.2 AMD Athlon 64 Processor Thermal and Power Table Guide	51
4.3 AMD Athlon 64 Processor Thermal and Power Specifications	52
4.3.1 ADA mmmsvtc CN Thermal and Power Specifications	53
4.3.2 ADA mmmsvtc CW Thermal and Power Specifications	55
4.3.3 ADA mmmsvtc DH Thermal and Power Specifications	57
4.3.4 ADD mmmsvtc CN Thermal and Power Specifications	58
4.3.5 ADH mmmsvtc DE Thermal and Power Specifications	59
5 AMD Athlon™ 64 FX Processor	61
5.1 AMD Athlon 64 FX Processor Ordering Part Number Description	61
5.2 AMD Athlon 64 FX Processor Thermal and Power Table Guide	65

5.3	AMD Athlon 64 FX Processor Thermal and Power Specifications	66
5.3.1	ADA mmmsvtc CS Thermal and Power Specifications	67
5.3.2	ADA mmmsvtc DI Thermal and Power Specifications	68
5.3.3	ADA mmmsvtc DJ Thermal and Power Specifications	69
6	AMD Sempron™ Processor	71
6.1	AMD Sempron™ Processor Ordering Part Number Description	71
6.2	AMD Sempron Processor Thermal and Power Table Guide	75
6.3	AMD Sempron Processor Thermal and Power Specifications	76
6.3.1	SDA mmmsvtc CN Thermal and Power Specifications	77
6.3.2	SDA mmmsvtc CW Thermal and Power Specifications	80
6.3.3	SDC mmmsvtc CM Thermal and Power Specifications	81
6.3.4	SDD mmmsvtc CN Thermal and Power Specifications	82
6.3.5	SDH mmmsvtc DE Thermal and Power Specifications	84
7	Power Supply Specifications	86
7.1	ispmmmm I tvccd - Socket AM2 Power Supply Operating Conditions	86
7.2	ispmmmm H tvccd - Socket S1 Power Supply Operating Conditions	88
8	Power Limit Encoding	90
9	MTOPS	92
10	APP	93

List of Figures

Figure 1. AMD Athlon™ 64 X2 Dual-Core Processor Ordering Part Number Diagram	13
Figure 2. AMD Athlon 64 X2 Dual-Core Processor Ordering Part Number Example ...	13
Figure 3. AMD Athlon X2 Processor Ordering Part Number Diagram	39
Figure 4. AMD Athlon X2 Processor Ordering Part Number Example	39
Figure 5. AMD Athlon 64 Processor Ordering Part Number Diagram	47
Figure 6. AMD Athlon 64 Processor Ordering Part Number Example	47
Figure 7. AMD Athlon 64 FX Processor Subsection Ordering Part Number Diagram ...	61
Figure 8. AMD Athlon 64 FX Processor Ordering Part Number Example	61
Figure 9. AMD Sempron™ Processor Ordering Part Number Diagram	71
Figure 10. AMD Sempron Processor Ordering Part Number Example	71

List of Tables

Table 1: AMD Athlon™ 64 X2 Dual-Core Processor Part Definition Options	14
Table 2: AMD Athlon 64 X2 Dual-Core Processor L2 Cache Size Options	14
Table 3: AMD Athlon 64 X2 Dual-Core Processor Temperature Options	14
Table 4: AMD Athlon 64 X2 Dual-Core Processor Operating Voltage	14
Table 5: AMD Athlon 64 X2 Dual-Core Processor Package Options	14
Table 6: AMD Athlon 64 X2 Dual-Core Processor Model Number Options	15
Table 7: AMD Athlon 64 X2 Dual-Core Processor Power Limit	15
Table 8: AMD Athlon 64 X2 Dual-Core Processor Thermal Profiles	16
Table 9: AMD Athlon 64 X2 Dual-Core Processor Thermal and Power Table Guide	18
Table 10: AMD Athlon X2 Processor Part Definition Options	40
Table 11: AMD Athlon X2 Processor L2 Cache Size Options	40
Table 12: AMD Athlon X2 Processor Temperature Options	40
Table 13: AMD Athlon X2 Processor Operating Voltage	40
Table 14: AMD Athlon X2 Processor Package Options	40
Table 15: AMD Athlon X2 Processor Model Number Options	41
Table 16: AMD Athlon X2 Processor Power Limit	41
Table 17: AMD Athlon X2 Processor Thermal Profiles	42
Table 18: AMD Athlon 64 Processor Thermal and Power Table Guide	43
Table 19: AMD Athlon 64 Processor Part Definition Options	48
Table 20: AMD Athlon 64 Processor L2 Cache Size Options	48
Table 21: AMD Athlon 64 Processor Temperature Options	48
Table 22: AMD Athlon 64 Processor Operating Voltage	48
Table 23: AMD Athlon 64 Processor Package Options	48
Table 24: AMD Athlon 64 Processor Model Number Options	49
Table 25: AMD Athlon 64 Processor Power Limit	49
Table 26: AMD Athlon 64 Processor Thermal Profiles	50
Table 27: AMD Athlon 64 Processor Thermal and Power Table Guide	51
Table 28: AMD Athlon 64 FX Processor Part Definition Options	62
Table 29: AMD Athlon 64 FX Processor L2 Cache Size Options	62
Table 30: AMD Athlon 64 FX Processor Temperature Options	62
Table 31: AMD Athlon 64 FX Processor Operating Voltage	62
Table 32: AMD Athlon 64 FX Processor Package Options	62
Table 33: AMD Athlon 64 FX Processor Model Number Options	62
Table 34: AMD Athlon 64 FX Processor Power Limit	63
Table 35: AMD Athlon 64 FX Processor Thermal Profile	64
Table 36: AMD Athlon 64 FX Processor Thermal and Power Table Guide	65
Table 37: AMD Sempron™ Processor Part Definition Options	72
Table 38: AMD Sempron Processor L2 Cache Size Options	72
Table 39: AMD Sempron Processor Temperature Options	72
Table 40: AMD Sempron Processor Operating Voltage	72
Table 41: AMD Sempron Processor Package Options	72
Table 42: AMD Sempron Processor Model Number Options	73
Table 43: AMD Sempron Processor Power Limit	73
Table 44: AMD Sempron Processor Thermal Profile	74

Table 45:AMD Sempron Processor Thermal and Power Table Guide	75
Table 46:ispmmmm I tvccd VDD Power Supply DC Operating Conditions	86
Table 47:ispmmmm I tvccd VDD Power Supply AC Operating Conditions	86
Table 48:ispmmmm I tvccd Non-VDD Power Supply AC and DC Operating Conditions	87
Table 49:ispmmmm H tvccd VDD Power Supply DC Operating Conditions	88
Table 50:ispmmmm H tvccd VDD Power Supply AC Operating Conditions	88
Table 51:ispmmmm H tvccd Non-VDD Power Supply AC and DC Operating Conditions	89
Table 52:Socket Compatibility Encodings	90
Table 53:Dual-Core Capability (CmpCap) Encodings	90
Table 54:Socket AM2 Processor Power Limit Encoding	90
Table 55:Socket S1g1 Processor Power Limit Encoding	91
Table 56:Composite Theoretical Performance (CTP) Calculations	92
Table 57:Adjusted Peak Performance (APP) Calculations	93

Revision History

Date	Revision	Description
June 2007	3.23	<p>Eleventh NDA Release.</p> <ul style="list-style-type: none"> Added new OPN to the <i>AMD Athlon™ 64 X2 Dual-Core Processor</i> section, ADA6000IAA6CZ. Added new OPNs to the <i>AMD Sempron™ Processor</i> section, SDH1100IAA3DE and SDH1150IAA3DE. Corrected S3 I/O errors on p. 34. Moved the ADHmmmxxvtc5DD OPNs to a new <i>AMD Athlon™ X2 Dual-Core Processor</i> section and added ADH2400IAA5DD to that section. These OPNs now have three vnums. <p>Material updated since the Rev. 3.16 is highlighted in red.</p>
April 2007	3.16	<p>Tenth NDA Release.</p> <ul style="list-style-type: none"> Added new OPNs to the <i>AMD Athlon™ 64 X2 Dual-Core Processor</i> section, ADO5200IAA5DD, ADH2300IAA5DD and ADH2350IAA5DD Added new OPN to the <i>AMD Sempron™ Processor</i> section, SDA3600IAA3CW.
March 2007	3.06	<p>Ninth NDA Release.</p> <ul style="list-style-type: none"> Added the APP section on page 93. Added new 9W OPN to the <i>AMD Sempron™ Processor</i> section, SDC2100HAX3CM. Added new OPN to the <i>AMD Athlon™ 64 FX Processor</i> section, ADAFX74GAA6DJ. Added Socket S1 Power Supply Operating Conditions. Revised intermediate P-state TDP for OPN SDD3500IAA2CN. Revised the VDD_ac power supply note for Table 47 on page 86 and for Table 50 on page 88. Revised Section 1.1.3 on page 11. Revised notes to Table 48 on page 87 and Table 51 on page 89.
February 2007	3.00	Initial public release.
January 2007	2.41	<p>Eighth NDA release.</p> <ul style="list-style-type: none"> Added new 45W OPNs to the <i>AMD Athlon™ 64 Processor</i> section. Added new 65 W OPN to the <i>AMD Athlon™ 64 X2 Dual-Core Processor</i> section. Revised Minimum Pstate power, IDDC1 Max @ Max P-state, IDDC1 Max @ Min P-state for several OPNs in all sections. Added new thermal Profile to the <i>AMD Athlon™ 64 Processor</i> section. Added C1E support to Rev G or later <i>AMD Athlon™ 64 X2 Dual-Cores</i>. Added new VDDIO_dc specification for OPN ADO3600IAA5DL. Revised the power limit encodings in Table 54 on page 90.

Date	Revision	Description
November 2006	2.36	Seventh NDA release. <ul style="list-style-type: none"> Added new 65W, 35W and 76W OPNs to the <i>AMD Athlon™ 64 X2 Dual-Core Processor</i> section. Added new Thermal Profile to the <i>AMD Athlon™ 64 X2 Dual-Core</i> section. Added new variable voltage option to <i>AMD Athlon™ 64 Processor 35W OPNs</i>. Added new variable voltage option to <i>AMD Sempron™ Processor 35W OPNs</i>. Added Package option to <i>AMD Athlon™ 64 FX Processor</i> section
September 2006	2.30	Sixth NDA release. <ul style="list-style-type: none"> Added thermal profile F to Table 35 on page 64. Added new 125W, 89 W, 65 W, 62W, and 35 W OPNs to the <i>AMD Athlon™ 64 X2 Dual-Core</i> section. Added new OPNs to the <i>AMD Athlon™ 64 FX Processor</i> section. Added new 62 W and 35 W OPNs to the <i>AMD Athlon™ 64 Processor</i> section. Added new power limit encodings.
July 2006	2.20	Fifth NDA release. Added new OPNs ADA5000IAA5CS and ADA5200IAA6CS.
June 2006	2.18	Fourth NDA release. Added new OPNs
April 2006	2.16	Third NDA release. <ul style="list-style-type: none"> Added thermal profiles D and E to Table 8 on page 16. Added new 89 W, 65 W, and 35 W OPNs to the <i>AMD Athlon™ 64 X2 Dual-Core</i> section. Added thermal profile E to Table 26 on page 50. Added new 35 W and 59 W OPNs to the <i>AMD Athlon™ 64 Processor</i> section. Corrected IDDC1 values for 62 W OPNs in the the <i>AMD Athlon™ 64 Processor</i> section. Added thermal profile E to Table 44 on page 74. Added new 35 W OPNs to the <i>AMD Sempron™ Processor</i> section. Removed power supply specifications for mobile parts.
March 2006	2.10	Modified cache size values in Table 24.
March 2006	2.08	Initial NDA release.

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 NPT Family 0Fh Processor Electrical Data Sheet*, order #31119.

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 11)
- Power supply specifications (content overview in Section 1.1.4 on page 11)
- Power limit encoding specifications (content overview in Section 1.1.5 on page 11)
- MTOPS section on page 92.

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 12.

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 **ABC** mmmmsvtc **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 SOPNs. SOPNs for the power supply specifications have the socket compatibility character defined. They are of the form ispmmmSvtcdd.

1.1.5 Power Limit Encoding Chapter Overview

A power limit is encoded into each processor. The power limit encoding section defines these encodings and their interpretation. Refer to the *BIOS and Kernel Developer's Guide for AMD NPT Family 0Fh Processors*, order #32559, for details on BIOS usage of the power limit encoding.

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.

- **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 processor voltage and frequency.
- **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 ABC1234DEF5GH appears under the subsection for SOPN **ABC**mmmmstvc**GH**. The abstracted (lowercase) character definitions for SOPNs are contained in the OPN description section of each chapter.
- **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.
- **VID_VDD**. The VID_VDD voltage is the VID[5:0] requested VDD supply level. Refer to the *BIOS and Kernel Developer's Guide for AMD NPT Family 0Fh Processors*, order #32559, for VID[5:0] to voltage translation specifications.

2 AMD Athlon™ 64 X2 Dual-Core Processor

The following sections contain the OPN description and thermal and power specifications for the AMD Athlon™ 64 X2 Dual-Core 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 Athlon™ 64 X2 Dual-Core Processor Ordering Part Number Description

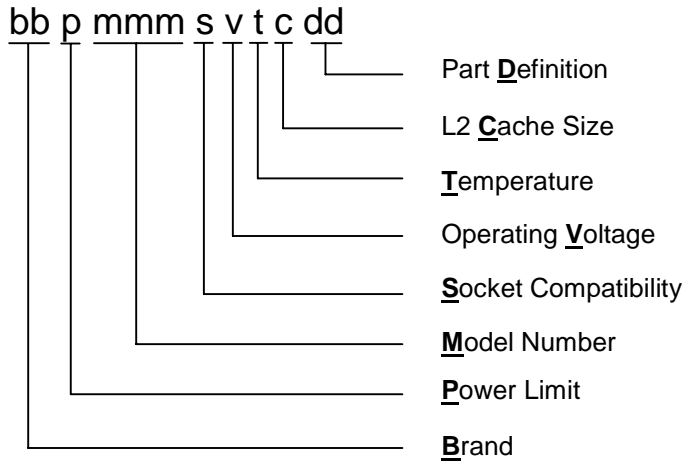


Figure 1. AMD Athlon™ 64 X2 Dual-Core Processor Ordering Part Number Diagram

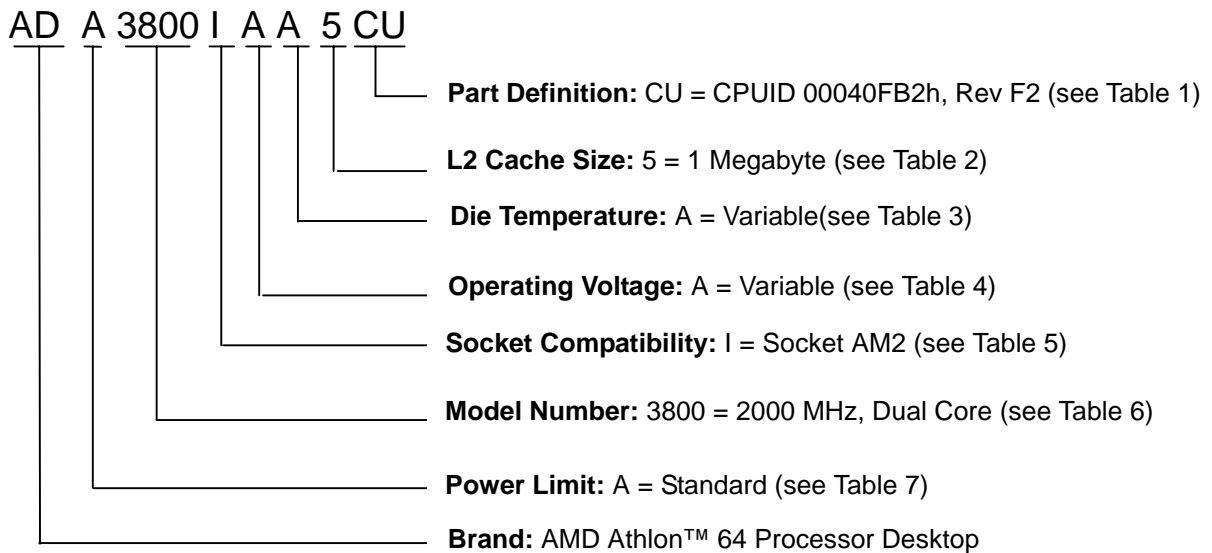


Figure 2. AMD Athlon™ 64 X2 Dual-Core Processor Ordering Part Number Example

Table 1: AMD Athlon™ 64 X2 Dual-Core Processor Part Definition Options

Part Definition	Revision	CPUID 8000_0001h EAX [31:0] (CPUID)
CU	Rev F2	00040FB2h
CS	Rev F2	00040F32h
CZ	Rev F3	00040F33h
DD	Rev G1	00060FB1h
DL	Rev G1	00060FB1h

Table 2: AMD Athlon™ 64 X2 Dual-Core Processor L2 Cache Size Options

OPN Character	Cache Size
4	512 KB
5	1 MB
6	2 MB

Table 3: AMD Athlon™ 64 X2 Dual-Core Processor Temperature Options

OPN Character	Temperature
A	Variable

Table 4: AMD Athlon™ 64 X2 Dual-Core Processor Operating Voltage

OPN Character	Operating Voltage
A	Variable

Table 5: AMD Athlon™ 64 X2 Dual-Core Processor Package Options

OPN Character	Package
I	Socket AM2 Processor

Table 6: AMD Athlon™ 64 X2 Dual-Core Processor Model Number Options

Package	Cache Size	Frequency	Model Number
Socket AM2 Processor	512 KB	2000 MHz	3600+
Socket AM2 Processor	1 MB	2000 MHz	3800+
Socket AM2 Processor	2 MB	2000 MHz	4000+
Socket AM2 Processor	1 MB	2200 MHz	4200+
Socket AM2 Processor	2 MB	2200 MHz	4400+
Socket AM2 Processor	1 MB	2400 MHz	4600+
Socket AM2 Processor	2 MB	2400 MHz	4800+
Socket AM2 Processor	1 MB	2600 MHz	5000+
Socket AM2 Processor	2 MB	2600 MHz	5200+
Socket AM2 Processor	1 MB	2800 MHz	5400+
Socket AM2 Processor	2 MB	2800 MHz	5600+
Socket AM2 Processor	2 MB	3000 MHz	6000+

Table 7: AMD Athlon™ 64 X2 Dual-Core Processor Power Limit

OPN Character	Power Limit
A	Standard
D	35 W
I	76 W
O	65 W
X	125 W

Table 8: AMD Athlon™ 64 X2 Dual-Core Processor Thermal Profiles

Thermal Profile	A
Heat Sink Thermal Resistance	0.31°C/W
Heat Sink Local Ambient	42°C
Profile Thermal Resistance	0.247°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	55.4°C
35.0 W	56.6°C
40.0 W	57.9°C
45.0 W	59.1°C
50.0 W	60.4°C
55.0 W	61.6°C
60.0 W	62.8°C
65.0 W	64.1°C
70.0 W	65.3°C
75.0 W	66.5°C
80.0 W	67.8°C
85.0 W	69.0°C
89.0 W	70.0°C

Thermal Profile	B
Heat Sink Thermal Resistance	0.20°C/W
Heat Sink Local Ambient	38°C
Profile Thermal Resistance	0.152°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	55.4°C
80.0 W	56.2°C
85.0 W	56.9°C
90.0 W	57.7°C
95.0 W	58.4°C
100.0 W	59.2°C
105.0 W	60.0°C
110.0 W	60.7°C
115.0 W	61.5°C
120.0 W	62.2°C
125.0 W	63.0°C

Thermal Profile	D
Heat Sink Thermal Resistance	0.46°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	G
Heat Sink Thermal Resistance	0.34°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
76.0 W	68.0°C

Thermal Profile	E
Heat Sink Thermal Resistance	0.65°C/W
Heat Sink Local Ambient	55°C
Profile Thermal Resistance	0.486°C/W
Profile Ambient	61°C
TDP	Tcase Max
0.0 W	61.0°C
5.0 W	63.4°C
10.0 W	65.9°C
15.0 W	68.3°C
20.0 W	70.7°C
25.0 W	73.2°C
30.0 W	75.6°C
35.0 W	78.0°C

Note: The thermal profile is used to define the relationship between Tcase max and device specific Thermal Design Power for processors specified in this document with Variable indicated by the Case Temperature OPN character. 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.

2.2 AMD Athlon™ 64 X2 Dual-Core Processor Thermal and Power Table Guide

The thermal and power table guide shown in Table 9 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 9: AMD Athlon™ 64 X2 Dual-Core Processor Thermal and Power Table Guide

SOPN	Power	Revision	Single/Dual-Core	Thermal/Power Tables
ADA mmmmsvtc CU	Standard	Rev F2	Dual Core	Section 2.3.1 on page 20
ADA mmmmsvtc CS	Standard	Rev F2	Dual Core	Section 2.3.2 on page 22
ADA mmmmsvtc CZ	Standard	Rev F3	Dual Core	Section 2.3.3 on page 24
ADD mmmmsvtc CU	35 W	Rev F2	Dual Core	Section 2.3.4 on page 26
ADO mmmmsvtc CU	65 W	Rev F2	Dual Core	Section 2.3.5 on page 27
ADO mmmmsvtc CS	65 W	Rev F2	Dual Core	Section 2.3.6 on page 29
ADO mmmmsvtc CZ	65 W	Rev F3	Dual Core	Section 2.3.7 on page 31
ADO mmmmsvtc DD	65 W	Rev G1	Dual Core	Section 2.3.8 on page 33
ADO mmmmsvtc DL	65 W	Rev G1	Dual Core	Section 2.3.9 on page 35
ADI mmmmsvtc DD	76 W	Rev G1	Dual Core	Section 2.3.10 on page 36
ADX mmmmsvtc CZ	125 W	Rev F3	Dual Core	Section 2.3.11 on page 37

2.3 AMD Athlon™ 64 X2 Dual-Core 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). For all other electrical specifications for the processor, refer to the *AMD NPT Family 0Fh Processor Electrical Data Sheet*, order #31119. For power management BIOS requirements, refer to the *BIOS and Kernel Developer's Guide for AMD NPT Family 0Fh Processors*, order #32559.

Section 2.1 on page 13 provides an example of the OPN structure for processors documented in this chapter and Table 9 on page 18 provides a guide to OPN organization in the following subsections. Refer to Section 1.2 on page 11 and Section 1.3 on page 12 for numbering conventions and terminology definitions used in these tables. Refer to Section 1.2 on page 11 for full document titles and order numbers for reference documentation.

2.3.1 ADA mmsvtc CU Thermal and Power Specifications

Parameter/OPN	Notes	ADA3800IAA5CU	ADA4200IAA5CU	ADA4600IAA5CU
Tcase Max	1	55°C to 70°C	55°C to 70°C	55°C to 70°C
Tcontrol Max	2	70°C	70°C	70°C
Minimum Tambient		5°C	5°C	5°C
Thermal Profile	3	A	A	A
Max P-State		2000 MHz	2200 MHz	2400 MHz
VID_VDD		1.300 V 1.350 V	1.300 V 1.350 V	1.300 V 1.350 V
IDD Max		66.2 A	66.2 A	66.2 A
Thermal Design Power	4,5	89.0 W	89.0 W	89.0 W
Intermediate P-State #1		1800 MHz	2000 MHz	2200 MHz
VID_VDD		1.250 V 1.300 V	1.250 V 1.300 V	1.250 V 1.300 V
IDD Max		56.2 A	56.5 A	56.8 A
Thermal Design Power	4,5	73.2 W	73.6 W	74.0 W
Intermediate P-State #2		N/A	1800 MHz	2000 MHz
VID_VDD			1.200 V 1.250 V	1.200 V 1.250 V
IDD Max			47.9 A	48.4 A
Thermal Design Power	4,5		60.5 W	61.1 W
Intermediate P-State #3		N/A	N/A	1800 MHz
VID_VDD				1.150 V 1.200 V
IDD Max				41.0 A
Thermal Design Power	4,5			50.2 W
Intermediate P-State #4		N/A	N/A	N/A
VID_VDD				
IDD Max				
Thermal Design Power	4,5			
Intermediate P-State #5		N/A	N/A	N/A
VID_VDD				
IDD Max				
Thermal Design Power	4,5			
Intermediate P-State #6		N/A	N/A	N/A
VID_VDD				
IDD Max				
Thermal Design Power	4,5			
Min P-State		1000 MHz	1000 MHz	1000 MHz
VID_VDD		1.100 V	1.100 V	1.100 V
IDD Max		30.5 A	28.8 A	27.2 A
Thermal Design Power	4,5	36.5 W	34.7 W	32.9 W
Halt/Stop Grant				
IDDC1 Max @ Max P-State	6,8	38.8 A	35.6 A	32.2 A
IDDC1 Max @ Min P-State	7,8	8.0 A	7.4 A	6.7 A
I/O Power	9,10	3.0 W	3.0 W	3.0 W
S3				
I/O Power	10,11,12	250 mW	250 mW	250 mW

The notes for this table are on page 38.

Parameter/OPN	Notes	ADA5000IAA5CU	
Tcase Max	1	55°C to 70°C	
Tcontrol Max	2	70°C	
Minimum Tambient		5°C	
Thermal Profile	3	A	
Max P-State		2600 MHz	
VID_VDD		1.300 V	1.350 V
IDD Max		66.2 A	
Thermal Design Power	4,5	89.0 W	
Intermediate P-State #1		2400 MHz	
VID_VDD		1.250 V	1.300 V
IDD Max		57.1 A	
Thermal Design Power	4,5	74.4 W	
Intermediate P-State #2		2200 MHz	
VID_VDD		1.200 V	1.250 V
IDD Max		49.0 A	
Thermal Design Power	4,5	61.8 W	
Intermediate P-State #3		2000 MHz	
VID_VDD		1.150 V	1.200 V
IDD Max		41.7 A	
Thermal Design Power	4,5	51.0 W	
Intermediate P-State #4		1800 MHz	
VID_VDD		1.150 V	1.150 V
IDD Max		39.0 A	
Thermal Design Power	4,5	47.9 W	
Intermediate P-State #5		N/A	
VID_VDD			
IDD Max			
Thermal Design Power	4,5		
Intermediate P-State #6		N/A	
VID_VDD			
IDD Max			
Thermal Design Power	4,5		
Min P-State		1000 MHz	
VID_VDD		1.100 V	
IDD Max		25.5 A	
Thermal Design Power	4,5	31.0 W	
Halt/Stop Grant			
IDDC1 Max @ Max P-State	6,8	29.0 A	
IDDC1 Max @ Min P-State	7,8	6.0 A	
I/O Power	9,10	3.0 W	
S3			
I/O Power	10,11,12	250 mW	

The notes for this table are on page 38.

2.3.2 ADA mmsvtc CS Thermal and Power Specifications

Parameter/OPN	Notes	ADA4000IAA6CS	ADA4400IAA6CS	ADA4800IAA6CS
Tcase Max	1	55°C to 70°C	55°C to 70°C	55°C to 70°C
Tcontrol Max	2	70°C	70°C	70°C
Minimum Tambient		5°C	5°C	5°C
Thermal Profile	3	A	A	A
Max P-State		2000 MHz	2200 MHz	2400 MHz
VID_VDD		1.300 V 1.350 V	1.300 V 1.350 V	1.300 V 1.350 V
IDD Max		66.2 A	66.2 A	66.2 A
Thermal Design Power	4,5	89.0 W	89.0 W	89.0 W
Intermediate P-State #1		1800 MHz	2000 MHz	2200 MHz
VID_VDD		1.250 V 1.300 V	1.250 V 1.300 V	1.250 V 1.300 V
IDD Max		56.2 A	56.5 A	56.8 A
Thermal Design Power	4,5	73.2 W	73.6 W	74.0 W
Intermediate P-State #2		N/A	1800 MHz	2000 MHz
VID_VDD			1.200 V 1.250 V	1.200 V 1.250 V
IDD Max			47.9 A	48.4 A
Thermal Design Power	4,5		60.5 W	61.1 W
Intermediate P-State #3		N/A	N/A	1800 MHz
VID_VDD				1.150 V 1.200 V
IDD Max				41.0 A
Thermal Design Power	4,5			50.2 W
Intermediate P-State #4		N/A	N/A	N/A
VID_VDD				
IDD Max				
Thermal Design Power	4,5			
Intermediate P-State #5		N/A	N/A	N/A
VID_VDD				
IDD Max				
Thermal Design Power	4,5			
Intermediate P-State #6		N/A	N/A	N/A
VID_VDD				
IDD Max				
Thermal Design Power	4,5			
Min P-State		1000 MHz	1000 MHz	1000 MHz
VID_VDD		1.100 V	1.100 V	1.100 V
IDD Max		30.5 A	28.8 A	27.2 A
Thermal Design Power	4,5	36.5 W	34.7 W	32.9 W
Halt/Stop Grant				
IDDC1 Max @ Max P-State	6,8	38.8 A	35.6 A	32.2 A
IDDC1 Max @ Min P-State	7,8	8.0 A	7.4 A	6.7 A
I/O Power	9,10	3.0 W	3.0 W	3.0 W
S3				
I/O Power	10,11,12	250 mW	250 mW	250 mW

The notes for this table are on page 38.

Parameter/OPN	Notes	ADA5000IAA5CS	ADA5200IAA6CS
Tcase Max	1	55°C to 70°C	55°C to 70°C
Tcontrol Max	2	70°C	70°C
Minimum Tambient		5°C	5°C
Thermal Profile	3	A	A
Max P-State		2600 MHz	2600 MHz
VID_VDD		1.300 V 1.350 V	1.300 V 1.350 V
IDD Max		66.2 A	66.2 A
Thermal Design Power	4,5	89.0 W	89.0 W
Intermediate P-State #1		2400 MHz	2400 MHz
VID_VDD		1.250 V 1.300 V	1.250 V 1.300 V
IDD Max		57.1 A	57.1 A
Thermal Design Power	4,5	74.4 W	74.4 W
Intermediate P-State #2		2200 MHz	2200 MHz
VID_VDD		1.200 V 1.250 V	1.200 V 1.250 V
IDD Max		49.0 A	49.0 A
Thermal Design Power	4,5	61.8 W	61.8 W
Intermediate P-State #3		2000 MHz	2000 MHz
VID_VDD		1.150 V 1.200 V	1.150 V 1.200 V
IDD Max		41.7 A	41.7 A
Thermal Design Power	4,5	51.0 W	51.0 W
Intermediate P-State #4		1800 MHz	1800 MHz
VID_VDD		1.150 V 1.150 V	1.150 V 1.150 V
IDD Max		39.0 A	39.0 A
Thermal Design Power	4,5	47.9 W	47.9 W
Intermediate P-State #5		N/A	N/A
VID_VDD			
IDD Max			
Thermal Design Power	4,5		
Intermediate P-State #6		N/A	N/A
VID_VDD			
IDD Max			
Thermal Design Power	4,5		
Min P-State		1000 MHz	1000 MHz
VID_VDD		1.100 V	1.100 V
IDD Max		25.5 A	25.5 A
Thermal Design Power	4,5	31.0 W	31.0 W
Halt/Stop Grant			
IDDC1 Max @ Max P-State	6,8	24.8 A	24.8 A
IDDC1 Max @ Min P-State	7,8	5.7 A	5.7 A
I/O Power	9,10	3.0 W	3.0 W
S3			
I/O Power	10,11,12	250 mW	250 mW

The notes for this table are on page 38.

2.3.3 ADA mmsvtc CZ Thermal and Power Specifications

Parameter/OPN	Notes	ADA5000IAA5CZ	ADA5200IAA6CZ	ADA5400IAA5CZ
Tcase Max	1	55°C to 70°C	55°C to 70°C	55°C to 70°C
Tcontrol Max	2	70°C	70°C	70°C
Minimum Tambient		5°C	5°C	5°C
Thermal Profile	3	A	A	A
Max P-State		2600 MHz	2600 MHz	2800 MHz
VID_VDD		1.300 V 1.350 V	1.300 V 1.350 V	1.300 V 1.350 V
IDD Max		66.2 A	66.2 A	66.2 A
Thermal Design Power	4,5	89.0 W	89.0 W	89.0 W
Intermediate P-State #1		2400 MHz	2400 MHz	2600 MHz
VID_VDD		1.250 V 1.300 V	1.250 V 1.300 V	1.250 V 1.300 V
IDD Max		57.1 A	57.1 A	57.4 A
Thermal Design Power	4,5	74.4 W	74.4 W	74.7 W
Intermediate P-State #2		2200 MHz	2200 MHz	2400 MHz
VID_VDD		1.200 V 1.250 V	1.200 V 1.250 V	1.200 V 1.250 V
IDD Max		49.0 A	49.0 A	49.6 A
Thermal Design Power	4,5	61.8 W	61.8 W	62.5 W
Intermediate P-State #3		2000 MHz	2000 MHz	2200 MHz
VID_VDD		1.150 V 1.200 V	1.150 V 1.200 V	1.150 V 1.200 V
IDD Max		41.7 A	41.7 A	42.4 A
Thermal Design Power	4,5	51.0 W	51.0 W	51.8 W
Intermediate P-State #4		1800 MHz	1800 MHz	2000 MHz
VID_VDD		1.150 V 1.150 V	1.150 V 1.150 V	1.150 V 1.150 V
IDD Max		39.0 A	39.0 A	39.7 A
Thermal Design Power	4,5	47.9 W	47.9 W	48.6 W
Intermediate P-State #5		N/A	N/A	1800 MHz
VID_VDD				1.150 V 1.150 V
IDD Max				36.8 A
Thermal Design Power	4,5			45.3 W
Intermediate P-State #6		N/A	N/A	N/A
VID_VDD				
IDD Max				
Thermal Design Power	4,5			
Min P-State		1000 MHz	1000 MHz	1000 MHz
VID_VDD		1.100 V	1.100 V	1.100 V
IDD Max		25.5 A	25.5 A	23.8 A
Thermal Design Power	4,5	31.0 W	31.0 W	29.2 W
Halt/Stop Grant				
IDDC1 Max @ Max P-State	6,8	24.8 A	24.8 A	21.5 A
IDDC1 Max @ Min P-State	7,8	5.7 A	5.7 A	5.0 A
I/O Power	9,10	3.0 W	3.0 W	3.0 W
S3				
I/O Power	10,11,12	250 mW	250 mW	250 mW

The notes for this table are on page 38.

Parameter/OPN	Notes	ADA5600IAA6CZ	ADA6000IAA6CZ
Tcase Max	1	55°C to 70°C	55°C to 70°C
Tcontrol Max	2	70°C	70°C
Minimum Tambient		5°C	5°C
Thermal Profile	3	A	A
Max P-State		2800 MHz	3000 MHz
VID_VDD		1.300 V 1.350 V	1.300 V 1.350 V
IDDC Max		66.2 A	66.2 A
Thermal Design Power	4,5	89.0 W	89.0 W
Intermediate P-State #1		2600 MHz	2800 MHz
VID_VDD		1.250 V 1.300 V	1.250 V 1.300 V
IDDC Max		57.4 A	58.2 A
Thermal Design Power	4,5	74.7 W	75.7 W
Intermediate P-State #2		2400 MHz	2600 MHz
VID_VDD		1.200 V 1.250 V	1.200 V 1.250 V
IDDC Max		49.6 A	51.0 A
Thermal Design Power	4,5	62.5 W	64.2 W
Intermediate P-State #3		2200 MHz	2400 MHz
VID_VDD		1.150 V 1.200 V	1.150 V 1.200 V
IDDC Max		42.4 A	44.3 A
Thermal Design Power	4,5	51.8 W	54.0 W
Intermediate P-State #4		2000 MHz	2200 MHz
VID_VDD		1.150 V 1.150 V	1.150 V 1.150 V
IDDC Max		39.7 A	40.6 A
Thermal Design Power	4,5	48.6 W	49.7 W
Intermediate P-State #5		1800 MHz	2000 MHz
VID_VDD		1.150 V 1.150 V	1.150 V 1.150 V
IDDC Max		36.8 A	37.9 A
Thermal Design Power	4,5	45.3 W	46.6 W
Intermediate P-State #6		N/A	1800 MHz
VID_VDD			1.150 V 1.150 V
IDDC Max			35.2 A
Thermal Design Power	4,5		43.5 W
Min P-State		1000 MHz	1000 MHz
VID_VDD		1.100 V	1.100 V
IDDC Max		23.8 A	21.9 A
Thermal Design Power	4,5	29.2 W	27.1 W
Halt/Stop Grant			
IDDC1 Max @ Max P-State	6,8	21.5 A	18.3 A
IDDC1 Max @ Min P-State	7,8	5.0 A	4.3 A
I/O Power	9,10	3.0 W	3.0 W
S3			
I/O Power	10,11,12	250 mW	250 mW

The notes for this table are on page 38.

2.3.4 ADD mmsvtc CU Thermal and Power Specifications

Parameter/OPN	Notes	ADD3400IAA5CU	ADD3800IAA5CU	ADD4200IAA5CU
Tcase Max	1	55°C to 78°C	55°C to 78°C	55°C to 78°C
Tcontrol Max	2	70°C	70°C	70°C
Minimum Tambient		5°C	5°C	5°C
Thermal Profile	3	E	E	E
Max P-State		1800 MHz	2000 MHz	2200 MHz
VID_VDD		1.075 V 1.100 V	1.075 V 1.100 V	1.075 V 1.100 V
IDD Max		29.8 A	29.8 A	29.8 A
Thermal Design Power	4,5	35.0 W	35.0 W	35.0 W
Intermediate P-State #1		N/A	1800 MHz	2000 MHz
VID_VDD			1.025 V 1.050 V	1.025 V 1.050 V
IDD Max			26.4 A	26.5 A
Thermal Design Power	4,5		30.1 W	30.2 W
Intermediate P-State #2		N/A	N/A	1800 MHz
VID_VDD				1.025 V 1.050 V
IDD Max				23.8 A
Thermal Design Power	4,5			27.4 W
Intermediate P-State #3		N/A	N/A	N/A
VID_VDD				
IDD Max				
Thermal Design Power	4,5			
Intermediate P-State #4		N/A	N/A	N/A
VID_VDD				
IDD Max				
Thermal Design Power	4,5			
Intermediate P-State #5		N/A	N/A	N/A
VID_VDD				
IDD Max				
Thermal Design Power	4,5			
Intermediate P-State #6		N/A	N/A	N/A
VID_VDD				
IDD Max				
Thermal Design Power	4,5			
Min P-State		1000 MHz	1000 MHz	1000 MHz
VID_VDD		1.000 V	1.000 V	1.000 V
IDD Max		17.1 A	15.3 A	13.4 A
Thermal Design Power	4,5	20.1 W	18.3 W	16.4 W
Halt/Stop Grant				
IDDC1 Max @ Max P-State	6,8	8.1 A	5.6 A	3.2 A
IDDC1 Max @ Min P-State	7,8	2.8 A	2.0 A	1.1 A
I/O Power	9,10	3.0 W	3.0 W	3.0 W
S3				
I/O Power	10,11,12	250 mW	250 mW	250 mW

The notes for this table are on page 38.

2.3.5 ADO mmsvtc CU Thermal and Power Specifications

Parameter/OPN	Notes	ADO3600IAA4CU	ADO3800IAA5CU	ADO4200IAA5CU
Tcase Max	1	55°C to 72°C	55°C to 72°C	55°C to 72°C
Tcontrol Max	2	70°C	70°C	70°C
Minimum Tambient		5°C	5°C	5°C
Thermal Profile	3	D	D	D
Max P-State		2000 MHz	2000 MHz	2200 MHz
VID_VDD		1.200 V 1.250 V	1.200 V 1.250 V	1.200 V 1.250 V
IDD Max		51.7 A	51.7 A	51.7 A
Thermal Design Power	4,5	65.0 W	65.0 W	65.0 W
Intermediate P-State #1		1800 MHz	1800 MHz	2000 MHz
VID_VDD		1.150 V 1.200 V	1.150 V 1.200 V	1.150 V 1.200 V
IDD Max		43.8 A	43.8 A	44.1 A
Thermal Design Power	4,5	53.4 W	53.4 W	53.7 W
Intermediate P-State #2		N/A	N/A	1800 MHz
VID_VDD				1.150 V 1.150 V
IDD Max				41.0 A
Thermal Design Power	4,5			50.1 W
Intermediate P-State #3		N/A	N/A	N/A
VID_VDD				
IDD Max				
Thermal Design Power	4,5			
Intermediate P-State #4		N/A	N/A	N/A
VID_VDD				
IDD Max				
Thermal Design Power	4,5			
Intermediate P-State #5		N/A	N/A	N/A
VID_VDD				
IDD Max				
Thermal Design Power	4,5			
Intermediate P-State #6		N/A	N/A	N/A
VID_VDD				
IDD Max				
Thermal Design Power	4,5			
Min P-State		1000 MHz	1000 MHz	1000 MHz
VID_VDD		1.100 V	1.100 V	1.100 V
IDD Max		28.7 A	28.7 A	26.8 A
Thermal Design Power	4,5	34.6 W	34.6 W	32.5 W
Halt/Stop Grant				
IDDC1 Max @ Max P-State	6,8	23.4 A	23.4 A	20.6 A
IDDC1 Max @ Min P-State	7,8	7.6 A	7.6 A	6.6 A
I/O Power	9,10	3.0 W	3.0 W	3.0 W
S3				
I/O Power	10,11,12	250 mW	250 mW	250 mW

The notes for this table are on page 38.

Parameter/OPN	Notes	ADO4600IAA5CU
Tcase Max	1	55°C to 72°C
Tcontrol Max	2	70°C
Minimum Tambient		5°C
Thermal Profile	3	D
Max P-State		2400 MHz
VID_VDD		1.200 V 1.250 V
IDD Max		51.7 A
Thermal Design Power	4,5	65.0 W
Intermediate P-State #1		2200 MHz
VID_VDD		1.150 V 1.200 V
IDD Max		44.4 A
Thermal Design Power	4,5	54.1 W
Intermediate P-State #2		2000 MHz
VID_VDD		1.150 V 1.150 V
IDD Max		41.2 A
Thermal Design Power	4,5	50.4 W
Intermediate P-State #3		1800 MHz
VID_VDD		1.150 V 1.150 V
IDD Max		38.1 A
Thermal Design Power	4,5	46.8 W
Intermediate P-State #4		N/A
VID_VDD		
IDD Max		
Thermal Design Power	4,5	
Intermediate P-State #5		N/A
VID_VDD		
IDD Max		
Thermal Design Power	4,5	
Intermediate P-State #6		N/A
VID_VDD		
IDD Max		
Thermal Design Power	4,5	
Min P-State		1000 MHz
VID_VDD		1.100 V
IDD Max		24.8 A
Thermal Design Power	4,5	30.3 W
Halt/Stop Grant		
IDDC1 Max @ Max P-State	6,8	17.7 A
IDDC1 Max @ Min P-State	7,8	5.7 A
I/O Power	9,10	3.0 W
S3		
I/O Power	10,11,12	250 mW

The notes for this table are on page 38.

2.3.6 ADO mmsvtc CS Thermal and Power Specifications

Parameter/OPN	Notes	ADO3800IAA5CS	ADO4000IAA6CS	ADO4400IAA6CS
Tcase Max	1	55°C to 72°C	55°C to 72°C	55°C to 72°C
Tcontrol Max	2	70°C	70°C	70°C
Minimum Tambient		5°C	5°C	5°C
Thermal Profile	3	D	D	D
Max P-State		2000 MHz	2000 MHz	2200 MHz
VID_VDD		1.200 V 1.250 V	1.200 V 1.250 V	1.200 V 1.250 V
IDD Max		51.7 A	51.7 A	51.7 A
Thermal Design Power	4,5	65.0 W	65.0 W	65.0 W
Intermediate P-State #1		1800 MHz	1800 MHz	2000 MHz
VID_VDD		1.150 V 1.200 V	1.150 V 1.200 V	1.150 V 1.200 V
IDD Max		43.8 A	43.8 A	44.1 A
Thermal Design Power	4,5	53.4 W	53.4 W	53.7 W
Intermediate P-State #2		N/A	N/A	1800 MHz
VID_VDD				1.150 V 1.150 V
IDD Max				41.0 A
Thermal Design Power	4,5			50.1 W
Intermediate P-State #3		N/A	N/A	N/A
VID_VDD				
IDD Max				
Thermal Design Power	4,5			
Intermediate P-State #4		N/A	N/A	N/A
VID_VDD				
IDD Max				
Thermal Design Power	4,5			
Intermediate P-State #5		N/A	N/A	N/A
VID_VDD				
IDD Max				
Thermal Design Power	4,5			
Intermediate P-State #6		N/A	N/A	N/A
VID_VDD				
IDD Max				
Thermal Design Power	4,5			
Min P-State		1000 MHz	1000 MHz	1000 MHz
VID_VDD		1.100 V	1.100 V	1.100 V
IDD Max		28.7 A	28.7 A	26.8 A
Thermal Design Power	4,5	34.6 W	34.6 W	32.5 W
Halt/Stop Grant				
IDDC1 Max @ Max P-State	6,8	23.4 A	23.4 A	20.6 A
IDDC1 Max @ Min P-State	7,8	7.6 A	7.6 A	6.6 A
I/O Power	9,10	3.0 W	3.0 W	3.0 W
S3				
I/O Power	10,11,12	250 mW	250 mW	250 mW

The notes for this table are on page 38.

Parameter/OPN	Notes	ADO4600IAA5CS	ADO4800IAA6CS
Tcase Max	1	55°C to 72°C	55°C to 72°C
Tcontrol Max	2	70°C	70°C
Minimum Tambient		5°C	5°C
Thermal Profile	3	D	D
Max P-State		2400 MHz	2400 MHz
VID_VDD		1.200 V 1.250 V	1.200 V 1.250 V
IDD Max		51.7 A	51.7 A
Thermal Design Power	4,5	65.0 W	65.0 W
Intermediate P-State #1		2200 MHz	2200 MHz
VID_VDD		1.150 V 1.200 V	1.150 V 1.200 V
IDD Max		44.4 A	44.4 A
Thermal Design Power	4,5	54.1 W	54.1 W
Intermediate P-State #2		2000 MHz	2000 MHz
VID_VDD		1.150 V 1.150 V	1.150 V 1.150 V
IDD Max		41.2 A	41.2 A
Thermal Design Power	4,5	50.4 W	50.4 W
Intermediate P-State #3		1800 MHz	1800 MHz
VID_VDD		1.150 V 1.150 V	1.150 V 1.150 V
IDD Max		38.1 A	38.1 A
Thermal Design Power	4,5	46.8 W	46.8 W
Intermediate P-State #4		N/A	N/A
VID_VDD			
IDD Max			
Thermal Design Power	4,5		
Intermediate P-State #5		N/A	N/A
VID_VDD			
IDD Max			
Thermal Design Power	4,5		
Intermediate P-State #6		N/A	N/A
VID_VDD			
IDD Max			
Thermal Design Power	4,5		
Min P-State		1000 MHz	1000 MHz
VID_VDD		1.100 V	1.100 V
IDD Max		24.8 A	24.8 A
Thermal Design Power	4,5	30.3 W	30.3 W
Halt/Stop Grant			
IDDC1 Max @ Max P-State	6,8	17.7 A	17.7 A
IDDC1 Max @ Min P-State	7,8	5.7 A	5.7 A
I/O Power	9,10	3.0 W	3.0 W
S3			
I/O Power	10,11,12	250 mW	250 mW

The notes for this table are on page 38.

2.3.7 ADO mmsvtc CZ Thermal and Power Specifications

Parameter/OPN	Notes	ADO3800IAA5CZ	ADO4600IAA5CZ	ADO5000IAA5CZ
Tcase Max	1	55°C to 72°C	55°C to 72°C	55°C to 72°C
Tcontrol Max	2	70°C	70°C	70°C
Minimum Tambient		5°C	5°C	5°C
Thermal Profile	3	D	D	D
Max P-State		2000 MHz	2400 MHz	2600 MHz
VID_VDD		1.200 V 1.250 V	1.200 V 1.250 V	1.200 V 1.250 V
IDD Max		51.7 A	51.7 A	51.7 A
Thermal Design Power	4,5	65.0 W	65.0 W	65.0 W
Intermediate P-State #1		1800 MHz	2200 MHz	2400 MHz
VID_VDD		1.150 V 1.200 V	1.150 V 1.200 V	1.150 V 1.200 V
IDD Max		43.8 A	44.4 A	44.9 A
Thermal Design Power	4,5	53.4 W	54.1 W	54.6 W
Intermediate P-State #2		N/A	2000 MHz	2200 MHz
VID_VDD			1.150 V 1.150 V	1.150 V 1.150 V
IDD Max			41.2 A	41.6 A
Thermal Design Power	4,5		50.4 W	50.8 W
Intermediate P-State #3		N/A	1800 MHz	2000 MHz
VID_VDD			1.150 V 1.150 V	1.150 V 1.150 V
IDD Max			38.1 A	38.8 A
Thermal Design Power	4,5		46.8 W	47.6 W
Intermediate P-State #4		N/A	N/A	1800 MHz
VID_VDD				1.150 V 1.150 V
IDD Max				35.7 A
Thermal Design Power	4,5			44.1 W
Intermediate P-State #5		N/A	N/A	N/A
VID_VDD				
IDD Max				
Thermal Design Power	4,5			
Intermediate P-State #6		N/A	N/A	N/A
VID_VDD				
IDD Max				
Thermal Design Power	4,5			
Min P-State		1000 MHz	1000 MHz	1000 MHz
VID_VDD		1.100 V	1.100 V	1.100 V
IDD Max		28.7 A	24.8 A	22.9 A
Thermal Design Power	4,5	34.6 W	30.3 W	28.2 W
Halt/Stop Grant				
IDDC1 Max @ Max P-State	6,8	23.4 A	17.7 A	14.8 A
IDDC1 Max @ Min P-State	7,8	7.6 A	5.7 A	4.8 A
I/O Power	9,10	3.0 W	3.0 W	3.0 W
S3				
I/O Power	10,11,12	250 mW	250 mW	250 mW

The notes for this table are on page 38.

Parameter/OPN	Notes	ADO5200IAA6CZ	
T _{case} Max	1	55°C to 72°C	
T _{control} Max	2	70°C	
Minimum T _{ambient}		5°C	
Thermal Profile	3	D	
Max P-State		2600 MHz	
VID_VDD		1.200 V	1.250 V
IDD Max		51.7 A	
Thermal Design Power	4,5	65.0 W	
Intermediate P-State #1		2400 MHz	
VID_VDD		1.150 V	1.200 V
IDD Max		44.9 A	
Thermal Design Power	4,5	54.6 W	
Intermediate P-State #2		2200 MHz	
VID_VDD		1.150 V	1.150 V
IDD Max		41.6 A	
Thermal Design Power	4,5	50.8 W	
Intermediate P-State #3		2000 MHz	
VID_VDD		1.150 V	1.150 V
IDD Max		38.8 A	
Thermal Design Power	4,5	47.6 W	
Intermediate P-State #4		1800 MHz	
VID_VDD		1.150 V	1.150 V
IDD Max		35.7 A	
Thermal Design Power	4,5	44.1 W	
Intermediate P-State #5		N/A	
VID_VDD			
IDD Max			
Thermal Design Power	4,5		
Intermediate P-State #6		N/A	
VID_VDD			
IDD Max			
Thermal Design Power	4,5		
Min P-State		1000 MHz	
VID_VDD		1.100 V	
IDD Max		22.9 A	
Thermal Design Power	4,5	28.2 W	
Halt/Stop Grant			
IDDC1 Max @ Max P-State	6,8	14.8 A	
IDDC1 Max @ Min P-State	7,8	4.8 A	
I/O Power	9,10	3.0 W	
S3			
I/O Power	10,11,12	250 mW	

The notes for this table are on page 38.

2.3.8 ADO mmsvtc DD Thermal and Power Specifications

Parameter/OPN	Notes	ADO3600IAA5DD			ADO4000IAA5DD			ADO4400IAA5DD		
Tcase Max	1	55°C to 72°C			55°C to 72°C			55°C to 72°C		
Tcontrol Max	2	70°C			70°C			70°C		
Minimum Tambient		5°C			5°C			5°C		
Thermal Profile	3	D			D			D		
Max P-State		1900 MHz			2100 MHz			2300 MHz		
VID_VDD		1.200 V	1.250 V	1.300 V	1.250 V	1.300 V	1.325 V	1.250 V	1.300 V	1.325 V
IDD Max		51.7 A			49.6 A			49.6 A		
Thermal Design Power	4,5	65.0 W			65.0 W			65.0 W		
Intermediate P-State #1		1800 MHz			2000 MHz			2200 MHz		
VID_VDD		1.175 V	1.225 V	1.275 V	1.225 V	1.275 V	1.300 V	1.225 V	1.275 V	1.300 V
IDD Max		47.7 A			45.9 A			46.0 A		
Thermal Design Power	4,5	59.0 W			59.2 W			59.4 W		
Intermediate P-State #2		N/A			1800 MHz			2000 MHz		
VID_VDD					1.175 V	1.225 V	1.250 V	1.175 V	1.225 V	1.250 V
IDD Max					38.8 A			39.2 A		
Thermal Design Power	4,5				48.6 W			49.1 W		
Intermediate P-State #3		N/A			N/A			1800 MHz		
VID_VDD								1.125 V	1.175 V	1.200 V
IDD Max								33.3 A		
Thermal Design Power	4,5							40.5 W		
Intermediate P-State #4		N/A			N/A			N/A		
VID_VDD										
IDD Max										
Thermal Design Power	4,5									
Intermediate P-State #5		N/A			N/A			N/A		
VID_VDD										
IDD Max										
Thermal Design Power	4,5									
Intermediate P-State #6		N/A			N/A			N/A		
VID_VDD										
IDD Max										
Thermal Design Power	4,5									
Min P-S state		1000 MHz			1000 MHz			1000 MHz		
VID_VDD		1.100 V			1.100 V			1.100 V		
IDD Max		31.5 A			24.7 A			23.4 A		
Thermal Design Power	4,5	37.6 W			30.2 W			28.7 W		
Halt/Stop Grant										
IDDC1 Max @ Max P-State	6,8	32.2 A			26.5 A			24.1 A		
IDDC1 Max @ Min P-State	7,8	11.2 A			7.8 A			7.1 A		
I/O Power	9,10	3.0 W			3.0 W			3.0 W		
C1E/S1 Min P-State VID_VDD	13									
IDDC1E Max		8.52 A			5.80 A			5.27 A		
I/O Power	9,10	350 mW			350 mW			350 mW		
S3										
I/O Power	10,11,12	250 mW			250 mW			250 mW		

The notes for this table are on page 38.

Parameter/OPN	Notes	ADO4800IAA5DD			ADO5000IAA5DD			ADO5200IAA5DD		
Tcase Max	1	55°C to 72°C			55°C to 72°C			55°C to 72°C		
Tcontrol Max	2	70°C			70°C			70°C		
Minimum Tambient		5°C			5°C			5°C		
Thermal Profile	3	D			D			D		
Max P-State		2500 MHz			2600 MHz			2700 MHz		
VID_VDD		1.300 V	1.325 V	1.350 V	1.300 V	1.325 V	1.350 V	1.300 V	1.325 V	1.350 V
IDD Max		47.7 A			47.7 A			47.7 A		
Thermal Design Power	4,5	65.0 W			65.0 W			65.0 W		
Intermediate P-State #1		2400 MHz			2400 MHz			2600 MHz		
VID_VDD		1.275 V	1.300 V	1.325 V	1.250 V	1.275 V	1.300 V	1.275 V	1.300 V	1.325 V
IDD Max		44.6 A			41.4 A			44.8 A		
Thermal Design Power	4,5	59.9 W			54.8 W			60.1 W		
Intermediate P-State #2		2200 MHz			2200 MHz			2400 MHz		
VID_VDD		1.225 V	1.250 V	1.275 V	1.200 V	1.225 V	1.250 V	1.225 V	1.250 V	1.275 V
IDD Max		38.5 A			35.8 A			38.9 A		
Thermal Design Power	4,5	50.2 W			45.9 W			50.7 W		
Intermediate P-State #3		2000 MHz			2000 MHz			2200 MHz		
VID_VDD		1.175 V	1.200 V	1.225 V	1.150 V	1.175 V	1.200 V	1.175 V	1.200 V	1.225 V
IDD Max		33.0 A			30.6 A			33.6 A		
Thermal Design Power	4,5	41.8 W			38.2 W			42.5 W		
Intermediate P-State #4		1800 MHz			1800 MHz			2000 MHz		
VID_VDD		1.125 V	1.150 V	1.175 V	1.150 V	1.125 V	1.150 V	1.125 V	1.150 V	1.175 V
IDD Max		28.0 A			28.0 A			28.8 A		
Thermal Design Power	4,5	34.5 W			35.2 W			35.4 W		
Intermediate P-State #5		N/A			N/A			1800 MHz		
VID_VDD								1.125 V	1.150 V	1.125 V
IDD Max								26.1 A		
Thermal Design Power	4,5							32.4 W		
Intermediate P-State #6		N/A			N/A			N/A		
VID_VDD										
IDD Max										
Thermal Design Power	4,5									
Min P-State		1000 MHz			1000 MHz			1000 MHz		
VID_VDD		1.100 V			1.100 V			1.100 V		
IDD Max		18.5 A			17.8 A			17.3 A		
Thermal Design Power	4,5	23.3 W			22.6 W			22.0 W		
Halt/Stop Grant										
IDDC1 Max @ Max P-State	6,8	17.9 A			16.6 A			15.4 A		
IDDC1 Max @ Min P-State	7,8	4.6 A			4.4 A			4.0 A		
I/O Power	9,10	3.0 W			3.0 W			3.0 W		
C1E/S1 Min P-State VID_VDD	13									
IDDC1E Max		3.27 A			3.04 A			2.80 A		
I/O Power	9,10	350 mW			350 mW			350 mW		
S3										
I/O Power	10,11,12	250 mW			250 mW			250 mW		

The notes for this table are on page 38.

2.3.9 ADO mmmsvtc DL Thermal and Power Specifications

Parameter/OPN	Notes	ADO3600IAA5DL ¹⁴		
Tcase Max	1	55°C to 72°C		
Tcontrol Max	2	70°C		
Minimum Tambient		5°C		
Thermal Profile	3	D		
Max P-State		1900 MHz		
VID_VDD		1.200 V	1.300 V	1.350 V
IDD Max		51.7 A		
Thermal Design Power	4,5	65.0 W		
Intermediate P-State #1		1800 MHz		
VID_VDD		1.175 V	1.275 V	1.325 V
IDD Max		47.8 A		
Thermal Design Power	4,5	59.2 W		
Intermediate P-State #2		N/A		
VID_VDD				
IDD Max				
Thermal Design Power	4,5			
Intermediate P-State #3		N/A		
VID_VDD				
IDD Max				
Thermal Design Power	4,5			
Intermediate P-State #4		N/A		
VID_VDD				
IDD Max				
Thermal Design Power	4,5			
Intermediate P-State #5		N/A		
VID_VDD				
IDD Max				
Thermal Design Power	4,5			
Intermediate P-State #6		N/A		
VID_VDD				
IDD Max				
Thermal Design Power	4,5			
Min P-State		1000 MHz		
VID_VDD		1.100 V		
IDD Max		31.5 A		
Thermal Design Power	4,5	37.6 W		
Halt/Stop Grant				
IDDC1 Max @ Max P-State	6,8	32.2 A		
IDDC1 Max @ Min P-State	7,8	11.2 A		
I/O Power	9,10	3.0 W		
C1E/S1 Min P-State VID_VDD	13			
IDDC1E Max		8.52 A		
I/O Power	9,10	350 mW		
S3				
I/O Power	10,11,12	250 mW		

The notes for this table are on page 38.

2.3.10 ADI mmsvtc DD Thermal and Power Specifications

Parameter/OPN	Notes	ADIS200IAA5DD		
Tcase Max	1	55°C to 68°C		
Tcontrol Max	2	70°C		
Minimum Tambient		5°C		
Thermal Profile	3	G		
Max P-State		2700 MHz		
VID_VDD		1.325 V	1.350 V	1.375 V
IDD Max		55.1 A		
Thermal Design Power	4,5	76.0 W		
Intermediate P-State #1		2600 MHz		
VID_VDD		1.300 V	1.325 V	1.350 V
IDD Max		51.5 A		
Thermal Design Power	4,5	69.9 W		
Intermediate P-State #2		2400 MHz		
VID_VDD		1.250 V	1.275 V	1.300 V
IDD Max		44.4 A		
Thermal Design Power	4,5	58.5 W		
Intermediate P-State #3		2200 MHz		
VID_VDD		1.200 V	1.225 V	1.250 V
IDD Max		38.2 A		
Thermal Design Power	4,5	48.8 W		
Intermediate P-State #4		2000 MHz		
VID_VDD		1.150 V	1.175 V	1.200 V
IDD Max		32.7 A		
Thermal Design Power	4,5	40.6 W		
Intermediate P-State #5		1800 MHz		
VID_VDD		1.150 V	1.125 V	1.150 V
IDD Max		30.7 A		
Thermal Design Power	4,5	37.5 W		
Intermediate P-State #6		N/A		
VID_VDD				
IDD Max				
Thermal Design Power	4,5			
Min P-State		1000 MHz		
VID_VDD		1.100 V		
IDD Max		19.5 A		
Thermal Design Power	4,5	24.4 W		
Halt/Stop Grant				
IDDC1 Max @ Max P-State	6,8	22.0 A		
IDDC1 Max @ Min P-State	7,8	5.2 A		
I/O Power	9,10	3.0 W		
C1E/S1 Min P-State VID_VDD	13			
IDDC1E Max		3.69 A		
I/O Power	9,10	350 mW		
S3				
I/O Power	10,11,12	250 mW		

The notes for this table are on page 38.

2.3.11 ADX mmsvtc CZ Thermal and Power Specifications

Parameter/OPN	Notes	ADX6000IAA6CZ
Tcase Max	1	55°C to 63°C
Tcontrol Max	2	70°C
Minimum Tambient		5°C
Thermal Profile	3	B
Max P-State		3000 MHz
VID_VDD		1.350 V 1.400 V
IDD Max		90.4 A
Thermal Design Power	4,5	125.0 W
Intermediate P-State #1		2800 MHz
VID_VDD		1.300 V 1.350 V
IDD Max		81.5 A
Thermal Design Power	4,5	108.9 W
Intermediate P-State #2		2600 MHz
VID_VDD		1.250 V 1.300 V
IDD Max		70.5 A
Thermal Design Power	4,5	91.1 W
Intermediate P-State #3		2400 MHz
VID_VDD		1.200 V 1.250 V
IDD Max		60.8 A
Thermal Design Power	4,5	75.9 W
Intermediate P-State #4		2200 MHz
VID_VDD		1.150 V 1.200 V
IDD Max		52.0 A
Thermal Design Power	4,5	62.8 W
Intermediate P-State #5		2000 MHz
VID_VDD		1.150 V 1.150 V
IDD Max		49.2 A
Thermal Design Power	4,5	59.6 W
Intermediate P-State #6		1800 MHz
VID_VDD		1.150 V 1.150 V
IDD Max		46.3 A
Thermal Design Power	4,5	56.3 W
Min P-State		1000 MHz
VID_VDD		1.100 V
IDD Max		30.4 A
Thermal Design Power	4,5	36.4 W
Halt/Stop Grant		
IDDC1 Max @ Max P-State	6,8	39.8 A
IDDC1 Max @ Min P-State	7,8	7.6 A
I/O Power	9,10	3.0 W
S3		
I/O Power	10,11,12	250 mW

The notes for this table are on page 38.

AMD Athlon™ 64 X2 Dual-Core 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. Tcontrol 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 for AMD NPT Family 0Fh Processors, order #32559.
3. Thermal Design Power (TDP) and IDD max are the limits at the highest Tcase max in the specified range for the corresponding OPN. Products conform to the TDP and IDD Max limits at all valid nominal voltages. The relationship of Tcase max and Thermal Profile to TDP for a specific device is defined in Table 8.
4. Thermal Design Power (TDP) is measured under the conditions of Tcase Max, IDD Max, and VDD=VID_VDD, and include all power dissipated on-die from VDD, VDDIO, VLDT, VTT, and VDDA.
5. Thermal Design Power (TDP) specifications for dual-core processors assume equivalent P-states (voltage and frequency) and equivalent Tcase conditions for both cores. Refer to the BIOS and Kernel Developer's Guide for AMD NPT Family 0Fh Processors, order #32559, for details on P-state operation for dual-core processors.
6. Assumes Tcase max, max P-state VID_VDD, clock divider set to 32.
7. Assumes 50°C, min P-state VID_VDD, clock divider set to 32.
8. IDDC1 specifications for dual-core processors assume equivalent voltage, clock divisor, and Tcase conditions for both cores.
9. Thermal Design Power dissipated by the processor VDDIO, VTT, VLDT, and VDDA power planes only.
10. Assumes VDDIO = 1.8 V and VTT = VDDIO / 2.
11. Assumes 35°C, VDD, VDDA, and VLDT supplies are off, VDDIO and VTT are powered, memory in self-refresh mode, and DDR SDRAM interface tri-stated except CKE pins.
12. Thermal Design Power dissipated by the processor VDDIO and VTT power planes only.
13. Assumes 35°C, min P-state VID_VDD, clock divider set to 512, HyperTransport™ links disconnected, memory in self-refresh mode, DDR SDRAM interface tri-stated except CKE pins.
14. This OPN requires additional power supply considerations as shown in the Table 60.

3 AMD Athlon™ X2 Processor

The following sections contain the OPN description and thermal and power specifications for the AMD Athlon™ X2 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™ X2 Processor Ordering Part Number Description

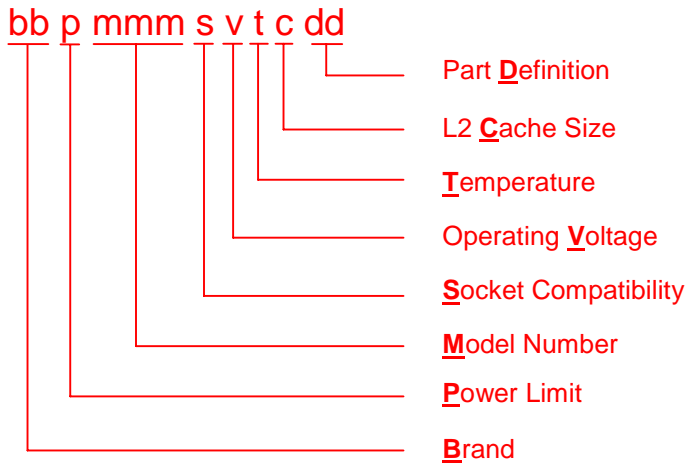


Figure 3. AMD Athlon™ X2 Processor Ordering Part Number Diagram

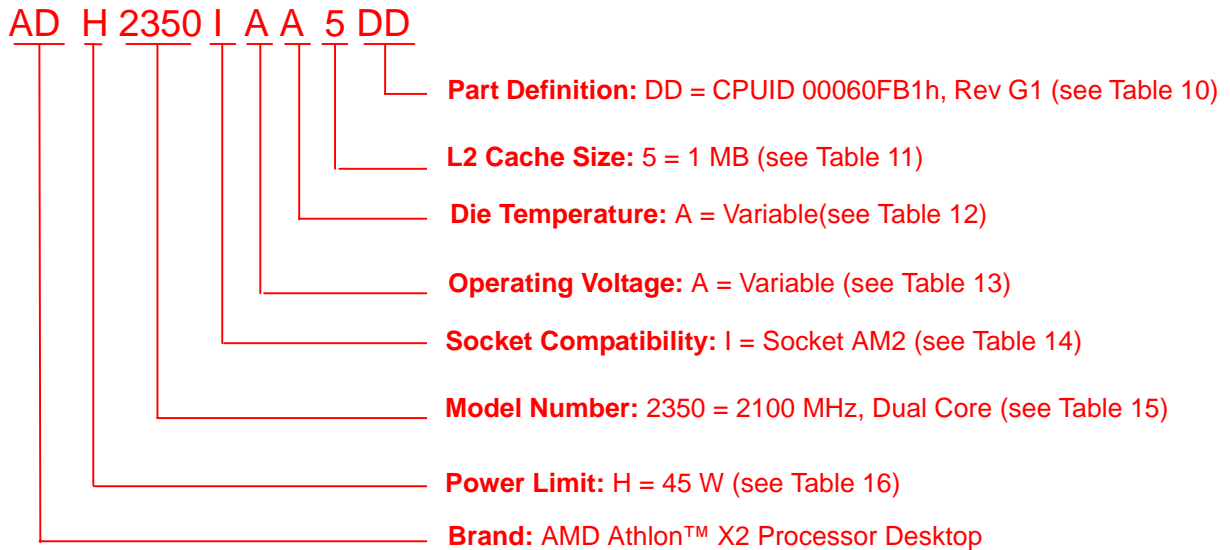


Figure 4. AMD Athlon™ X2 Processor Ordering Part Number Example

Table 10: AMD Athlon™ X2 Processor Part Definition Options

Part Definition	Revision	CPUID 8000_0001h EAX [31:0] (CPUID)
DD	Rev G1	00060FB1h

Table 11: AMD Athlon™ X2 Processor L2 Cache Size Options

OPN Character	Cache Size
5	1 MB

Table 12: AMD Athlon™ X2 Processor Temperature Options

OPN Character	Temperature
A	Variable

Table 13: AMD Athlon™ X2 Processor Operating Voltage

OPN Character	Operating Voltage
A	Variable

Table 14: AMD Athlon™ X2 Processor Package Options

OPN Character	Package
I	Socket AM2 Processor

Table 15: AMD Athlon™ X2 Processor Model Number Options

Package	Cache Size	Frequency	Model Number
Socket AM2 Processor	1 MB	1900 MHz	2300+
Socket AM2 Processor	1 MB	2100 MHz	2350+
Socket AM2 Processor	1 MB	2300 MHz	2400+

Table 16: AMD Athlon™ X2 Processor Power Limit

OPN Character	Power Limit
H	45 W

Table 17: AMD Athlon™ X2 Processor Thermal Profiles

Thermal Profile	I
Heat Sink Thermal Resistance	0.51°C/W
Heat Sink Local Ambient	55°C
Profile Thermal Resistance	0.378°C/W
Profile Ambient	61°C
TDP	Tcase Max
0.0 W	61.0°C
5.0 W	62.9°C
10.0 W	64.8°C
15.0 W	66.7°C
20.0 W	68.6°C
25.0 W	70.5°C
30.0 W	72.3°C
35.0 W	74.2°C
40.0 W	76.1°C
45.0 W	78.0°C

Note: The thermal profile is used to define the relationship between Tcase max and device specific Thermal Design Power for processors specified in this document with Variable indicated by the Case Temperature OPN character. 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.

3.2 AMD Athlon™ X2 Processor Thermal and Power Table Guide

The thermal and power table guide shown in Table 18 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 18: AMD Athlon™ 64 Processor Thermal and Power Table Guide

SOPN	Power	Revision	Single/Dual-Core	Thermal/Power Tables
ADH mmmmsvtc DD	45 W	Rev G1	Dual Core	Section 3.3.1 on page 45

3.3 AMD Athlon™ X2 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). For all other electrical specifications for the processor, refer to the *AMD NPT Family 0Fh Processor Electrical Data Sheet*, order #31119. For power management BIOS requirements, refer to the *BIOS and Kernel Developer's Guide for AMD NPT Family 0Fh Processors*, order #32559.

Section 3.1 on page 39 provides an example of the OPN structure for processors documented in this chapter and Table 18 on page 43 provides a guide to OPN organization in the following subsections. Refer to Section 1.2 on page 11 and Section 1.3 on page 12 for numbering conventions and terminology definitions used in these tables. Refer to Section 1.2 on page 11 for full document titles and order numbers for reference documentation.

3.3.1 ADH mmsvtc DD Thermal and Power Specifications

Parameter/OPN	Notes	ADH2300IAA5DD			ADH2350IAA5DD			ADH2400IAA5DD		
Tcase Max	1	61°C to 78°C			61°C to 78°C			61°C to 78°C		
Tcontrol Max	2	70°C			70°C			70°C		
Minimum Tambient		5°C			5°C			5°C		
Thermal Profile	3	I			I			I		
Max P-State		1900 MHz			2100 MHz			2300 MHz		
VID_VDD		1.150 V	1.200 V	1.250 V	1.150 V	1.200 V	1.250 V	1.150 V	1.200 V	1.250 V
IDD Max		36.5 A			36.5 A			36.5 A		
Thermal Design Power	4,5	45.0 W			45.0 W			45.0 W		
Intermediate P-State #1		1800 MHz			2000 MHz			2200 MHz		
VID_VDD		1.125 V	1.175 V	1.225 V	1.125 V	1.175 V	1.225 V	1.125 V	1.175 V	1.225 V
IDD Max		33.8 A			34.0 A			34.1 A		
Thermal Design Power	4,5	41.0 W			41.2 W			41.4 W		
Intermediate P-State #2		N/A			1800 MHz			2000 MHz		
VID_VDD					1.125 V	1.125 V	1.175 V	1.125 V	1.125 V	1.175 V
IDD Max					31.7 A			31.8 A		
Thermal Design Power	4,5				38.7 W			38.8 W		
Intermediate P-State #3		N/A			N/A			1800 MHz		
VID_VDD								1.125 V	1.125 V	1.125 V
IDD Max								29.9 A		
Thermal Design Power	4,5							36.6 W		
Intermediate P-State #4		N/A			N/A			N/A		
VID_VDD										
IDD Max										
Thermal Design Power	4,5									
Intermediate P-State #5		N/A			N/A			N/A		
VID_VDD										
IDD Max										
Thermal Design Power	4,5									
Intermediate P-State #6		N/A			N/A			N/A		
VID_VDD										
IDD Max										
Thermal Design Power	4,5									
Min P-State		1000 MHz			1000 MHz			1000 MHz		
VID_VDD		1.100 V			1.100 V			1.100 V		
IDD Max		24.1 A			22.5 A			20.7 A		
Thermal Design Power	4,5	29.5 W			27.7 W			25.8 W		
Halt/Stop Grant										
IDDC1 Max @ Max P-State	6,8	17.8 A			15.8 A			13.7 A		
IDDC1 Max @ Min P-State	7,8	7.5 A			6.6 A			5.8 A		
I/O Power	9,10	3.0 W			3.0 W			3.0 W		
S3										
I/O Power	10,11,12	250 mW			250 mW			250 mW		

The notes for this table are on page 46.

AMD Athlon™ X2 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. Tcontrol 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 for AMD NPT Family 0Fh Processors, order #32559.
3. Thermal Design Power (TDP) and IDD max are the limits at the highest Tcase max in the specified range for the corresponding OPN. Products conform to the TDP and IDD Max limits at all valid nominal voltages. The relationship of Tcase max and Thermal Profile to TDP for a specific device is defined in Table 17.
4. Thermal Design Power (TDP) is measured under the conditions of Tcase Max, IDD Max, and VDD=VID_VDD, and include all power dissipated on-die from VDD, VDDIO, VLDT, VTT, and VDDA.
5. Thermal Design Power (TDP) specifications for dual-core processors assume equivalent P-states (voltage and frequency) and equivalent Tcase conditions for both cores. Refer to the *BIOS and Kernel Developer's Guide for AMD NPT Family 0Fh Processors*, order #32559, for details on P-state operation for dual-core processors.
6. Assumes Tcase max, max P-state VID_VDD, clock divider set to 32.
7. Assumes 50°C, min P-state VID_VDD, clock divider set to 32.
8. IDDC1 specifications for dual-core processors assume equivalent voltage, clock divisor, and Tcase conditions for both cores.
9. Thermal Design Power dissipated by the processor VDDIO, VTT, VLDT, and VDDA power planes only.
10. Assumes VDDIO = 1.8 V and VTT = VDDIO / 2.
11. Assumes 35°C, VDD, VDDA, and VLDT supplies are off, VDDIO and VTT are powered, memory in self-refresh mode, and DDR SDRAM interface tri-stated except CKE pins.
12. Thermal Design Power dissipated by the processor VDDIO and VTT power planes only.

4 AMD Athlon™ 64 Processor

The following sections contain the OPN description and thermal and power specifications for the AMD Athlon™ 64 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 Athlon™ 64 Processor Ordering Part Number Description

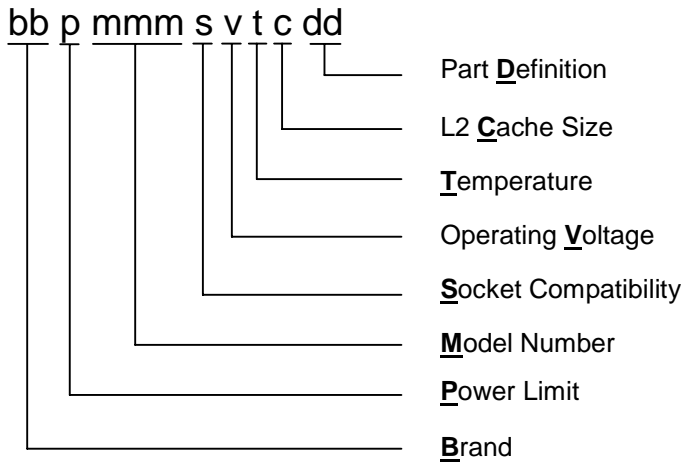


Figure 5. AMD Athlon™ 64 Processor Ordering Part Number Diagram

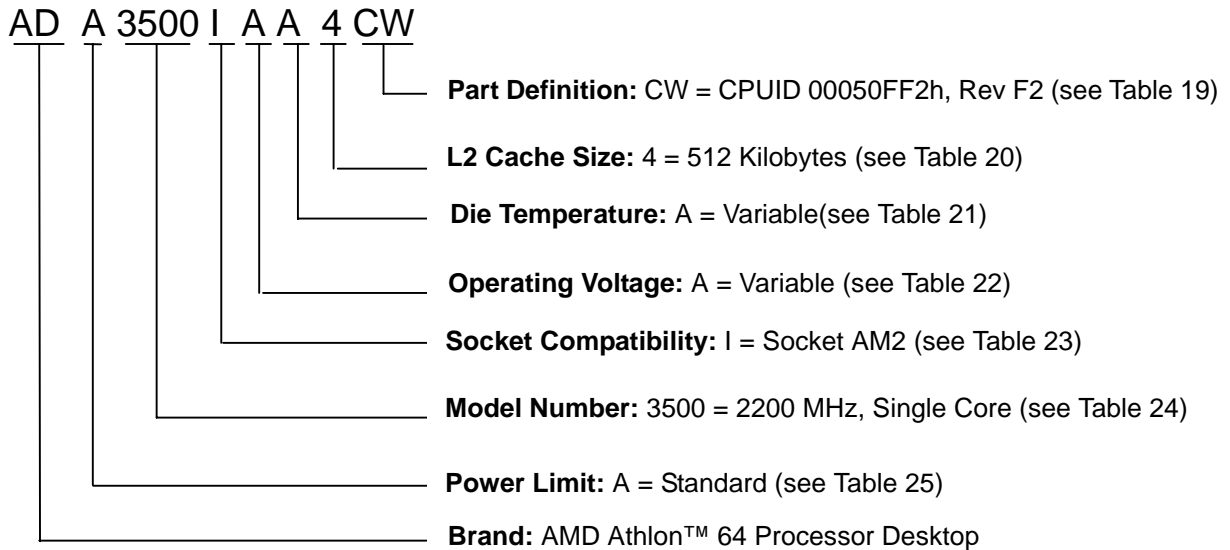


Figure 6. AMD Athlon™ 64 Processor Ordering Part Number Example

Table 19: AMD Athlon™ 64 Processor Part Definition Options

Part Definition	Revision	CPUID 8000_0001h EAX [31:0] (CPUID)
CN	Rev F2	00040FF2h
CW	Rev F2	00050FF2h
DE	Rev G1	00070FF1h
DH	Rev F3	00050FF3h

Table 20: AMD Athlon™ 64 Processor L2 Cache Size Options

OPN Character	Cache Size
4	512 KB

Table 21: AMD Athlon™ 64 Processor Temperature Options

OPN Character	Temperature
A	Variable

Table 22: AMD Athlon™ 64 Processor Operating Voltage

OPN Character	Operating Voltage
A	Variable

Table 23: AMD Athlon™ 64 Processor Package Options

OPN Character	Package
I	Socket AM2 Processor

Table 24: AMD Athlon™ 64 Processor Model Number Options

Package	Cache Size	Frequency	Model Number
Socket AM2 Processor	512 KB	1800 MHz	3000+
Socket AM2 Processor	512 KB	2000 MHz	3200+
Socket AM2 Processor	512 KB	2200 MHz	3500+
Socket AM2 Processor	512 KB	2400 MHz	3800+
Socket AM2 Processor	2 MB	2000 MHz	4000+

Table 25: AMD Athlon™ 64 Processor Power Limit

OPN Character	Power Limit
A	Standard
D	35 W
H	45 W

Table 26: AMD Athlon™ 64 Processor Thermal Profiles

Thermal Profile	C
Heat Sink Thermal Resistance	0.45°C/W
Heat Sink Local Ambient	42°C
Profile Thermal Resistance	0.356°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	58.7°C
35.0 W	60.5°C
40.0 W	62.2°C
45.0 W	64.0°C
50.0 W	65.8°C
55.0 W	67.6°C
59.0 W	69.0°C

Thermal Profile	E
Heat Sink Thermal Resistance	0.65°C/W
Heat Sink Local Ambient	55°C
Profile Thermal Resistance	0.486°C/W
Profile Ambient	61°C
TDP	Tcase Max
0.0 W	61.0°C
5.0 W	63.4°C
10.0 W	65.9°C
15.0 W	68.3°C
20.0 W	70.7°C
25.0 W	73.2°C
30.0 W	75.6°C
35.0 W	78.0°C

Thermal Profile	H
Heat Sink Thermal Resistance	0.50°C/W
Heat Sink Local Ambient	42°C
Profile Thermal Resistance	0.378°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	55.6°C
25.0 W	57.5°C
30.0 W	59.3°C
35.0 W	61.2°C
40.0 W	63.1°C
45.0 W	65.0°C

Note: The thermal profile is used to define the relationship between Tcase max and device specific Thermal Design Power for processors specified in this document with Variable indicated by the Case Temperature OPN character. 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.

4.2 AMD Athlon™ 64 Processor Thermal and Power Table Guide

The thermal and power table guide shown in Table 27 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 27: AMD Athlon™ 64 Processor Thermal and Power Table Guide

SOPN	Power	Revision	Single/Dual-Core	Thermal/Power Tables
ADA mmmmsvtc CN	Standard	Rev F2	Single Core	Section 4.3.1 on page 53
ADA mmmmsvtc CW	Standard	Rev F2	Single Core	Section 4.3.2 on page 55
ADA mmmmsvtc DH	Standard	Rev F3	Single Core	Section 4.3.3 on page 57
ADD mmmmsvtc CN	35 W	Rev F2	Single Core	Section 4.3.4 on page 58
ADH mmmmsvtc DE	45 W	Rev G1	Single Core	Section 4.3.5 on page 59

4.3 AMD Athlon™ 64 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). For all other electrical specifications for the processor, refer to the *AMD NPT Family 0Fh Processor Electrical Data Sheet*, order #31119. For power management BIOS requirements, refer to the *BIOS and Kernel Developer's Guide for AMD NPT Family 0Fh Processors*, order #32559.

Section 4.1 on page 47 provides an example of the OPN structure for processors documented in this chapter and Table 27 on page 51 provides a guide to OPN organization in the following subsections. Refer to Section 1.2 on page 11 and Section 1.3 on page 12 for numbering conventions and terminology definitions used in these tables. Refer to Section 1.2 on page 11 for full document titles and order numbers for reference documentation.

4.3.1 ADA mmsvtc CN Thermal and Power Specifications

Parameter/OPN	Notes	ADA3000IAA4CN			ADA3200IAA4CN			ADA3500IAA4CN		
Tcase Max	1	55°C to 69°C			55°C to 69°C			55°C to 69°C		
Tcontrol Max	2	70°C			70°C			70°C		
Minimum Tambient		5°C			5°C			5°C		
Thermal Profile	3	C			C			C		
Max P-State		1800 MHz			2000 MHz			2200 MHz		
VID_VDD		1.250 V	1.350 V	1.400 V	1.250 V	1.350 V	1.400 V	1.250 V	1.350 V	1.400 V
IDD Max		44.8 A			44.8 A			44.8 A		
Thermal Design Power	4,5	59.0 W			59.0 W			59.0 W		
Intermediate P-State #1		N/A			1800 MHz			2000 MHz		
VID_VDD					1.200 V	1.300 V	1.350 V	1.200 V	1.300 V	1.350 V
IDD Max					40.2 A			40.2 A		
Thermal Design Power	4,5				51.2 W			51.2 W		
Intermediate P-State #2		N/A			N/A			1800 MHz		
VID_VDD								1.150 V	1.250 V	1.300 V
IDD Max								34.3 A		
Thermal Design Power	4,5							42.4 W		
Intermediate P-State #3		N/A			N/A			N/A		
VID_VDD										
IDD Max										
Thermal Design Power	4,5									
Intermediate P-State #4		N/A			N/A			N/A		
VID_VDD										
IDD Max										
Thermal Design Power	4,5									
Intermediate P-State #5		N/A			N/A			N/A		
VID_VDD										
IDD Max										
Thermal Design Power	4,5									
Intermediate P-State #6		N/A			N/A			N/A		
VID_VDD										
IDD Max										
Thermal Design Power	4,5									
Min P-State		1000 MHz			1000 MHz			1000 MHz		
VID_VDD		1.100 V			1.100 V			1.100 V		
IDD Max		25.5 A			24.4 A			23.4 A		
Thermal Design Power	4,5	31.0 W			29.8 W			28.7 W		
Halt/Stop Grant										
IDDC1 Max @ Max P-State	6,8	31.3 A			29.8 A			28.3 A		
IDDC1 Max @ Min P-State	7,8	8.3 A			7.9 A			7.5 A		
I/O Power	9,10	3.0 W			3.0 W			3.0 W		
S3										
I/O Power	10,11,12	250 mW			250 mW			250 mW		

The notes for this table are on page 60.

Parameter/OPN	Notes	ADA3800IAA4CN		
Tcase Max	1	55°C to 69°C		
Tcontrol Max	2	70°C		
Minimum Tambient		5°C		
Thermal Profile	3	C		
Max P-State		2400 MHz		
VID_VDD		1.250 V	1.350 V	1.400 V
IDD Max		44.8 A		
Thermal Design Power	4,5	59.0 W		
Intermediate P-State #1		2200 MHz		
VID_VDD		1.200 V	1.300 V	1.350 V
IDD Max		40.3 A		
Thermal Design Power	4,5	51.4 W		
Intermediate P-State #2		2000 MHz		
VID_VDD		1.150 V	1.250 V	1.300 V
IDD Max		34.5 A		
Thermal Design Power	4,5	42.7 W		
Intermediate P-State #3		1800 MHz		
VID_VDD		1.150 V	1.200 V	1.250 V
IDD Max		31.2 A		
Thermal Design Power	4,5	38.9 W		
Intermediate P-State #4		N/A		
VID_VDD				
IDD Max				
Thermal Design Power	4,5			
Intermediate P-State #5		N/A		
VID_VDD				
IDD Max				
Thermal Design Power	4,5			
Intermediate P-State #6		N/A		
VID_VDD				
IDD Max				
Thermal Design Power	4,5			
Min P-State		1000 MHz		
VID_VDD		1.100 V		
IDD Max		22.4 A		
Thermal Design Power	4,5	27.6 W		
Halt/Stop Grant				
IDDC1 Max @ Max P-State	6,8	26.8 A		
IDDC1 Max @ Min P-State	7,8	7.1 A		
I/O Power	9,10	3.0 W		
S3				
I/O Power	10,11,12	250 mW		

The notes for this table are on page 60.

4.3.2 ADA mmsvtc CW Thermal and Power Specifications

Parameter/OPN	Notes	ADA3000IAA4CW			ADA3200IAA4CW			ADA3500IAA4CW		
Tcase Max	1	55°C to 69°C			55°C to 69°C			55°C to 69°C		
Tcontrol Max	2	70°C			70°C			70°C		
Minimum Tambient		5°C			5°C			5°C		
Thermal Profile	3	C			C			C		
Max P-State		1800 MHz			2000 MHz			2200 MHz		
VID_VDD		1.250 V	1.350 V	1.400 V	1.250 V	1.350 V	1.400 V	1.250 V	1.350 V	1.400 V
IDD Max		44.8 A			44.8 A			44.8 A		
Thermal Design Power	4,5	59.0 W			59.0 W			59.0 W		
Intermediate P-State #1		N/A			1800 MHz			2000 MHz		
VID_VDD					1.200 V	1.300 V	1.350 V	1.200 V	1.300 V	1.350 V
IDD Max					40.2 A			40.2 A		
Thermal Design Power	4,5				51.2 W			51.2 W		
Intermediate P-State #2		N/A			N/A			1800 MHz		
VID_VDD								1.150 V	1.250 V	1.300 V
IDD Max								34.3 A		
Thermal Design Power	4,5							42.4 W		
Intermediate P-State #3		N/A			N/A			N/A		
VID_VDD										
IDD Max										
Thermal Design Power	4,5									
Intermediate P-State #4		N/A			N/A			N/A		
VID_VDD										
IDD Max										
Thermal Design Power	4,5									
Intermediate P-State #5		N/A			N/A			N/A		
VID_VDD										
IDD Max										
Thermal Design Power	4,5									
Intermediate P-State #6		N/A			N/A			N/A		
VID_VDD										
IDD Max										
Thermal Design Power	4,5									
Min P-State		1000 MHz			1000 MHz			1000 MHz		
VID_VDD		1.100 V			1.100 V			1.100 V		
IDD Max		25.5 A			24.4 A			23.4 A		
Thermal Design Power	4,5	31.0 W			29.8 W			28.7 W		
Halt/Stop Grant										
IDDC1 Max @ Max P-State	6,8	31.3 A			29.8 A			28.3 A		
IDDC1 Max @ Min P-State	7,8	8.3 A			7.9 A			7.5 A		
I/O Power	9,10	3.0 W			3.0 W			3.0 W		
S3										
I/O Power	10,11,12	250 mW			250 mW			250 mW		

The notes for this table are on page 60.

Parameter/OPN	Notes	ADA3800IAA4CW			ADA4000IAA4CW		
Tcase Max	1	55°C to 69°C			55°C to 69°C		
Tcontrol Max	2	70°C			70°C		
Minimum Tambient		5°C			5°C		
Thermal Profile	3	C			C		
Max P-State		2400 MHz			2600 MHz		
VID_VDD		1.250 V	1.350 V	1.400 V	1.250 V	1.350 V	1.400 V
IDD Max		44.8 A			44.8 A		
Thermal Design Power	4,5	59.0 W			59.0 W		
Intermediate P-State #1		2200 MHz			2400 MHz		
VID_VDD		1.200 V	1.300 V	1.350 V	1.200 V	1.300 V	1.350 V
IDD Max		40.3 A			39.0 A		
Thermal Design Power	4,5	51.4 W			49.8 W		
Intermediate P-State #2		2000 MHz			2200 MHz		
VID_VDD		1.150 V	1.250 V	1.300 V	1.150 V	1.250 V	1.300 V
IDD Max		34.5 A			33.7 A		
Thermal Design Power	4,5	42.7 W			41.8 W		
Intermediate P-State #3		1800 MHz			2000 MHz		
VID_VDD		1.150 V	1.200 V	1.250 V	1.150 V	1.200 V	1.250 V
IDD Max		31.2 A			31.0 A		
Thermal Design Power	4,5	38.9 W			38.7 W		
Intermediate P-State #4		N/A			1800 MHz		
VID_VDD					1.150 V	1.150 V	1.200 V
IDD Max					29.7 A		
Thermal Design Power	4,5				37.2 W		
Intermediate P-State #5		N/A			N/A		
VID_VDD							
IDD Max							
Thermal Design Power	4,5						
Intermediate P-State #6		N/A			N/A		
VID_VDD							
IDD Max							
Thermal Design Power	4,5						
Min P-State		1000 MHz			1000 MHz		
VID_VDD		1.100 V			1.100 V		
IDD Max		22.4 A			21.0 A		
Thermal Design Power	4,5	27.6 W			26.1 W		
Halt/Stop Grant							
IDDC1 Max @ Max P-State	6,8	26.8 A			25.2 A		
IDDC1 Max @ Min P-State	7,8	7.1 A			6.7 A		
I/O Power	9,10	3.0 W			3.0 W		
S3							
I/O Power	10,11,12	250 mW			250 mW		

The notes for this table are on page 60.

4.3.3 ADA mmsvtc DH Thermal and Power Specifications

Parameter/OPN	Notes	ADA3500IAA4DH			ADA3800IAA4DH			ADA4000IAA4DH		
Tcase Max	1	55°C to 69°C			55°C to 69°C			55°C to 69°C		
Tcontrol Max	2	70°C			70°C			70°C		
Minimum Tambient		5°C			5°C			5°C		
Thermal Profile	3	C			C			C		
Max P-State		2200 MHz			2400 MHz			2600 MHz		
VID_VDD		1.250 V	1.350 V	1.400 V	1.250 V	1.350 V	1.400 V	1.250 V	1.350 V	1.400 V
IDD Max		44.8 A			44.8 A			44.8 A		
Thermal Design Power	4,5	59.0 W			59.0 W			59.0 W		
Intermediate P-State #1		2000 MHz			2200 MHz			2400 MHz		
VID_VDD		1.200 V	1.300 V	1.350 V	1.200 V	1.300 V	1.350 V	1.200 V	1.300 V	1.350 V
IDD Max		40.2 A			40.3 A			39.0 A		
Thermal Design Power	4,5	51.2 W			51.4 W			49.8 W		
Intermediate P-State #2		1800 MHz			2000 MHz			2200 MHz		
VID_VDD		1.150 V	1.250 V	1.300 V	1.150 V	1.250 V	1.300 V	1.150 V	1.250 V	1.300 V
IDD Max		34.3 A			34.5 A			33.7 A		
Thermal Design Power	4,5	42.4 W			42.7 W			41.8 W		
Intermediate P-State #3		N/A			1800 MHz			2000 MHz		
VID_VDD					1.150 V	1.200 V	1.250 V	1.150 V	1.200 V	1.250 V
IDD Max					31.2 A			31.0 A		
Thermal Design Power	4,5				38.9 W			38.7 W		
Intermediate P-State #4		N/A			N/A			1800 MHz		
VID_VDD								1.150 V	1.150 V	1.200 V
IDD Max								29.7 A		
Thermal Design Power	4,5							37.2 W		
Intermediate P-State #5		N/A			N/A			N/A		
VID_VDD										
IDD Max										
Thermal Design Power	4,5									
Intermediate P-State #6		N/A			N/A			N/A		
VID_VDD										
IDD Max										
Thermal Design Power	4,5									
Min P-State		1000 MHz			1000 MHz			1000 MHz		
VID_VDD		1.100 V			1.100 V			1.100 V		
IDD Max		23.4 A			22.4 A			21.0 A		
Thermal Design Power	4,5	28.7 W			27.6 W			26.1 W		
Halt/Stop Grant										
IDDC1 Max @ Max P-State	6,8	28.3 A			26.8 A			25.2 A		
IDDC1 Max @ Min P-State	7,8	7.5 A			7.1 A			6.7 A		
I/O Power	9,10	3.0 W			3.0 W			3.0 W		
S3										
I/O Power	10,11,12	250 mW			250 mW			250 mW		

The notes for this table are on page 60.

4.3.4 ADD mmsvtc CN Thermal and Power Specifications

Parameter/OPN	Notes	ADD3000IAA4CN			ADD3500IAA4CN		
Tcase Max	1	55°C to 78°C			55°C to 78°C		
Tcontrol Max	2	70°C			70°C		
Minimum Tambient		5°C			5°C		
Thermal Profile	3	E			E		
Max P-State		1800 MHz			2200 MHz		
VID_VDD		1.200 V	1.250 V	1.300 V	1.200 V	1.250 V	1.300 V
IDD Max		26.7 A			26.7 A		
Thermal Design Power	4,5	35.0 W			35.0 W		
Intermediate P-State #1		N/A			2000 MHz		
VID_VDD					1.150 V	1.200 V	1.250 V
IDD Max					23.2 A		
Thermal Design Power	4,5				29.7 W		
Intermediate P-State #2		N/A			1800 MHz		
VID_VDD					1.100 V	1.150 V	1.200 V
IDD Max					19.9 A		
Thermal Design Power	4,5				24.9 W		
Intermediate P-State #3		N/A			N/A		
VID_VDD							
IDD Max							
Thermal Design Power	4,5						
Intermediate P-State #4		N/A			N/A		
VID_VDD							
IDD Max							
Thermal Design Power	4,5						
Intermediate P-State #5		N/A			N/A		
VID_VDD							
IDD Max							
Thermal Design Power	4,5						
Intermediate P-State #6		N/A			N/A		
VID_VDD							
IDD Max							
Thermal Design Power	4,5						
Min P-State		1000 MHz			1000 MHz		
VID_VDD		1.000 V			1.000 V		
IDD Max		12.6 A			11.3 A		
Thermal Design Power	4,5	15.6 W			14.3 W		
Halt/Stop Grant							
IDDC1 Max @ Max P-State	6,8	14.0 A			11.1 A		
IDDC1 Max @ Min P-State	7,8	3.1 A			2.5 A		
I/O Power	9,10	3.0 W			3.0 W		
S3							
I/O Power	10,11,12	250 mW			250 mW		

The notes for this table are on page 60.

4.3.5 ADH mmsvtc DE Thermal and Power Specifications

Parameter/OPN	Notes	ADH3200IAA4DE			ADH3500IAA4DE			ADH3800IAA4DE		
Tcase Max	1	55°C to 65°C			55°C to 65°C			55°C to 65°C		
Tcontrol Max	2	70°C			70°C			70°C		
Minimum Tambient		5°C			5°C			5°C		
Thermal Profile	3	H			H			H		
Max P-State		2000 MHz			2200 MHz			2400 MHz		
VID_VDD		1.250 V	1.300 V	1.350 V	1.250 V	1.300 V	1.350 V	1.250 V	1.300 V	1.350 V
IDD Max		33.6 A			33.6 A			33.6 A		
Thermal Design Power	4,5	45.0 W			45.0 W			45.0 W		
Intermediate P-State #1		1800 MHz			2000 MHz			2200 MHz		
VID_VDD		1.200 V	1.250 V	1.300 V	1.200 V	1.250 V	1.300 V	1.200 V	1.250 V	1.300 V
IDD Max		28.7 A			28.8 A			28.9 A		
Thermal Design Power	4,5	37.4 W			37.5 W			37.7 W		
Intermediate P-State #2		N/A			1800 MHz			2000 MHz		
VID_VDD					1.150 V	1.200 V	1.250 V	1.150 V	1.200 V	1.250 V
IDD Max					24.5 A			24.9 A		
Thermal Design Power	4,5				31.2 W			31.6 W		
Intermediate P-State #3		N/A			N/A			1800 MHz		
VID_VDD								1.150 V	1.150 V	1.200 V
IDD Max								23.3 A		
Thermal Design Power	4,5							29.8 W		
Intermediate P-State #4		N/A			N/A			N/A		
VID_VDD										
IDD Max										
Thermal Design Power	4,5									
Intermediate P-State #5		N/A			N/A			N/A		
VID_VDD										
IDD Max										
Thermal Design Power	4,5									
Intermediate P-State #6		N/A			N/A			N/A		
VID_VDD										
IDD Max										
Thermal Design Power	4,5									
Min P-State		1000 MHz			1000 MHz			1000 MHz		
VID_VDD		1.100 V			1.100 V			1.100 V		
IDD Max		18.0 A			17.4 A			16.7 A		
Thermal Design Power	4,5	22.8 W			22.1 W			21.4 W		
Halt/Stop Grant										
IDDC1 Max @ Max P-State	6,8	22.9 A			21.7 A			20.5 A		
IDDC1 Max @ Min P-State	7,8	6.8 A			6.5 A			6.1 A		
I/O Power	9,10	3.0 W			3.0 W			3.0 W		
S3										
I/O Power	10,11,12	250 mW			250 mW			250 mW		

The notes for this table are on page 60.

AMD Athlon™ 64 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. Tcontrol 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 for AMD NPT Family 0Fh Processors, order #32559.
3. Thermal Design Power (TDP) and IDD max are the limits at the highest Tcase max in the specified range for the corresponding OPN. Products conform to the TDP and IDD Max limits at all valid nominal voltages. The relationship of Tcase max and Thermal Profile to TDP for a specific device is defined in Table 26.
4. Thermal Design Power (TDP) is measured under the conditions of Tcase Max, IDD Max, and VDD=VID_VDD, and include all power dissipated on-die from VDD, VDDIO, VLDT, VTT, and VDDA.
5. Thermal Design Power (TDP) specifications for dual-core processors assume equivalent P-states (voltage and frequency) and equivalent Tcase conditions for both cores. Refer to the BIOS and Kernel Developer's Guide for AMD NPT Family 0Fh Processors, order #32559, for details on P-state operation for dual-core processors.
6. Assumes Tcase max, max P-state VID_VDD, clock divider set to 32.
7. Assumes 50°C, min P-state VID_VDD, clock divider set to 32.
8. IDDC1 specifications for dual-core processors assume equivalent voltage, clock divisor, and Tcase conditions for both cores.
9. Thermal Design Power dissipated by the processor VDDIO, VTT, VLDT, and VDDA power planes only.
10. Assumes VDDIO = 1.8 V and VTT = VDDIO / 2.
11. Assumes 35°C, VDD, VDDA, and VLDT supplies are off, VDDIO and VTT are powered, memory in self-refresh mode, and DDR SDRAM interface tri-stated except CKE pins.
12. Thermal Design Power dissipated by the processor VDDIO and VTT power planes only.

5 AMD Athlon™ 64 FX Processor

The following sections contain the OPN description and thermal and power specifications for the AMD Athlon™ 64 FX Processor. Each column in the thermal and power tables represents a specific Ordering Part Number (OPN). Section 5.1 provides an example of the OPN structure for this processor family.

5.1 AMD Athlon™ 64 FX Processor Ordering Part Number Description

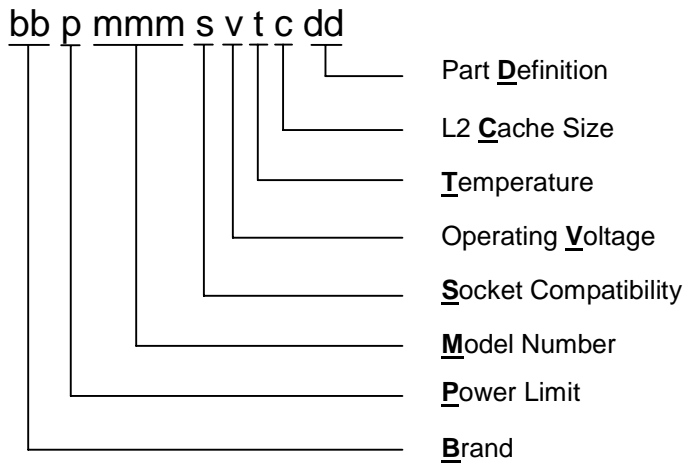


Figure 7. AMD Athlon™ 64 FX Processor Subsection Ordering Part Number Diagram

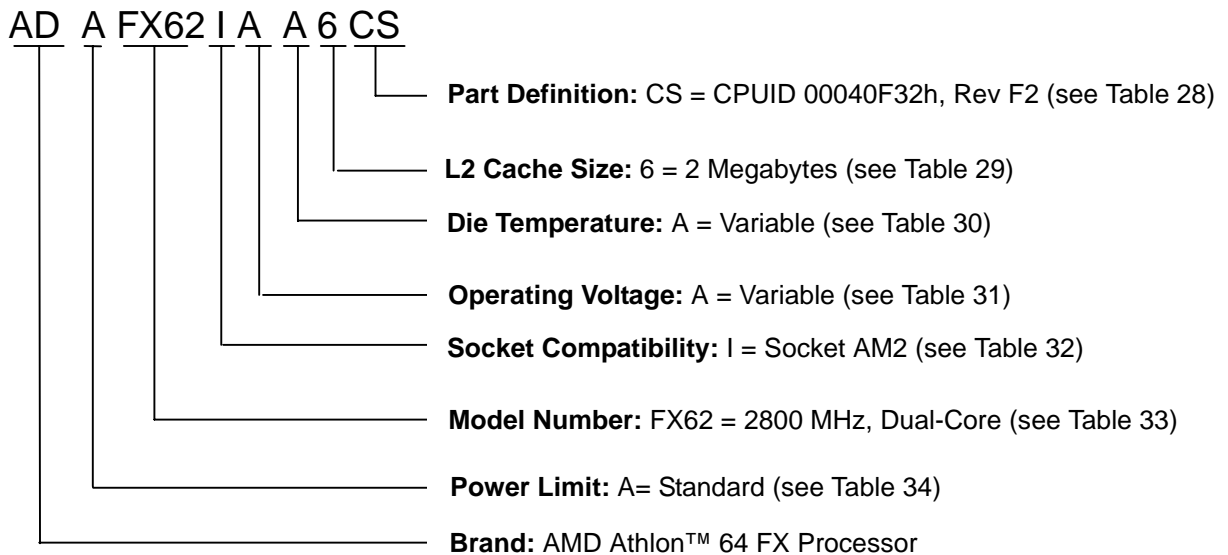


Figure 8. AMD Athlon™ 64 FX Processor Ordering Part Number Example

Table 28: AMD Athlon™ 64 FX Processor Part Definition Options

Part Definition	Revision	CPUID 8000_0001h EAX [31:0] (CPUID)
CS	Rev F2	00040F32h
DI	Rev F3	000C0F13h
DJ	Rev F3	000C0F13h

Table 29: AMD Athlon™ 64 FX Processor L2 Cache Size Options

OPN Character	Cache Size
6	2 MB

Table 30: AMD Athlon™ 64 FX Processor Temperature Options

OPN Character	Temperature
A	Variable

Table 31: AMD Athlon™ 64 FX Processor Operating Voltage

OPN Character	Operating Voltage
A	Variable

Table 32: AMD Athlon™ 64 FX Processor Package Options

OPN Character	Package
G	Fr3 (1207) Processor
I	Socket AM2 Processor

Table 33: AMD Athlon™ 64 FX Processor Model Number Options

Package	Cache Size	Frequency	Model Number
Socket AM2 Processor	2 MB	2800 MHz	FX62
Socket F(1207) Processor	2 MB	2600 MHz	FX70
Socket F(1207) Processor	2 MB	2800 MHz	FX72

Table 33: AMD Athlon™ 64 FX Processor Model Number Options (Continued)

Package	Cache Size	Frequency	Model Number
Socket F(1207) Processor	2 MB	3000 MHz	FX74

Table 34: AMD Athlon™ 64 FX Processor Power Limit

OPN Character	Power Limit
A	Standard

Table 35: AMD Athlon™ 64 FX Processor Thermal Profile

Thermal Profile	B
Heat Sink Thermal Resistance	0.20°C/W
Heat Sink Local Ambient	38°C
Profile Thermal Resistance	0.152°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	55.4°C
80.0 W	56.2°C
85.0 W	56.9°C
90.0 W	57.7°C
95.0 W	58.4°C
100.0 W	59.2°C
105.0 W	60.0°C
110.0 W	60.7°C
115.0 W	61.5°C
120.0 W	62.2°C
125.0 W	63.0°C

Thermal Profile	F
Heat Sink Thermal Resistance	0.14°C/W
Heat Sink Local Ambient	31°C
Profile Thermal Resistance	0.096°C/W
Profile Ambient	37°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	55.0°C
90.0 W	55.0°C
95.0 W	55.0°C
100.0 W	55.0°C
105.0 W	55.0°C
110.0 W	55.0°C
115.0 W	55.0°C
120.0 W	55.0°C
125.0 W	55.0°C

Note: The thermal profile is used to define the relationship between Tcase max and device specific Thermal Design Power for processors specified in this document with Variable indicated by the Case Temperature OPN character. 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.

5.2 AMD Athlon™ 64 FX Processor Thermal and Power Table Guide

The thermal and power table guide shown in Table 36 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 36: AMD Athlon™ 64 FX Processor Thermal and Power Table Guide

SOPN	Power	Revision	Single/Dual-Core	Thermal/Power Tables
ADA mmmmsvtc CS	Standard	Rev F2	Dual-Core	Section 5.3.1 on page 67
ADA mmmmsvtc DI	Standard	Rev F3	Dual-Core	Section 5.3.2 on page 68
ADA mmmmsvtc DJ	Standard	Rev F3	Dual-Core	Section 5.3.3 on page 69

5.3 AMD Athlon™ 64 FX 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). For all other electrical specifications for the processor, refer to the *AMD NPT Family 0Fh Processor Electrical Data Sheet*, order #31119. For power management BIOS requirements, refer to the *BIOS and Kernel Developer's Guide for AMD NPT Family 0Fh Processors*, order #32559.

Section 5.1 on page 61 provides an example of the OPN structure for processors documented in this chapter and Table 36 on page 65 provides a guide to OPN organization in the following subsections. Refer to Section 1.2 on page 11 and Section 1.3 on page 12 for numbering conventions and terminology definitions used in these tables. Refer to Section 1.2 on page 11 for full document titles and order numbers for reference documentation.

5.3.1 ADA mmsvtc CS Thermal and Power Specifications

Parameter/OPN	Notes	ADAFX62IAA6CS	
Tcase Max	1	55°C to 63°C	
Tcontrol Max	2	70°C	
Minimum Tambient		5°C	
Thermal Profile	3	B	
Max P-State		2800 MHz	
VID_VDD		1.350 V	1.400 V
IDD Max		90.4 A	
Thermal Design Power	4,5	125.0 W	
Intermediate P-State #1		2600 MHz	
VID_VDD		1.300 V	1.350 V
IDD Max		81.5 A	
Thermal Design Power	4,5	108.9 W	
Intermediate P-State #2		2400 MHz	
VID_VDD		1.250 V	1.300 V
IDD Max		70.2 A	
Thermal Design Power	4,5	90.7 W	
Intermediate P-State #3		2200 MHz	
VID_VDD		1.200 V	1.250 V
IDD Max		60.2 A	
Thermal Design Power	4,5	75.2 W	
Intermediate P-State #4		2000 MHz	
VID_VDD		1.150 V	1.200 V
IDD Max		51.3 A	
Thermal Design Power	4,5	62.0 W	
Intermediate P-State #5		1800 MHz	
VID_VDD		1.150 V	1.150 V
IDD Max		48.7 A	
Thermal Design Power	4,5	59.0 W	
Intermediate P-State #6		N/A	
VID_VDD			
IDD Max			
Thermal Design Power	4,5		
Min P-State		1000 MHz	
VID_VDD		1.100 V	
IDD Max		31.8 A	
Thermal Design Power	4,5	38.0 W	
Halt/Stop Grant			
IDDC1 Max @ Max P-State	6,8	48.7 A	
IDDC1 Max @ Min P-State	7,8	8.6 A	
I/O Power	9,10	3.0 W	
S3			
I/O Power	10,11,12	250 mW	

The notes for this table are on page 70.

5.3.2 ADA mmsvtc DI Thermal and Power Specifications

Parameter/OPN	Notes	ADAFX70GAA6DI	ADAFX72GAA6DI	ADAFX74GAA6DI
Tcase Max	1	55°C to 63°C	55°C to 63°C	55°C to 56°C
Tcontrol Max	2	70°C	70°C	70°C
Minimum Tambient		5°C	5°C	5°C
Thermal Profile	3	B	B	F
Max P-State		2600 MHz	2800 MHz	3000 MHz
VID_VDD		1.300 V 1.350 V	1.350 V 1.400 V	1.350 V 1.400 V
IDD Max		93.1 A	89.6 A	89.6 A
Thermal Design Power	4,5	125.0 W	125.0 W	125.0 W
Intermediate P-State #1		2400 MHz	2600 MHz	2800 MHz
VID_VDD		1.250 V 1.300 V	1.300 V 1.350 V	1.300 V 1.350 V
IDD Max		79.7 A	80.9 A	80.9 A
Thermal Design Power	4,5	103.6 W	109.2 W	109.2 W
Intermediate P-State #2		2200 MHz	2400 MHz	2600 MHz
VID_VDD		1.200 V 1.250 V	1.250 V 1.300 V	1.250 V 1.300 V
IDD Max		68.0 A	69.8 A	70.2 A
Thermal Design Power	4,5	85.6 W	91.3 W	91.8 W
Intermediate P-State #3		2000 MHz	2200 MHz	2400 MHz
VID_VDD		1.150 V 1.200 V	1.200 V 1.250 V	1.200 V 1.250 V
IDD Max		57.7 A	60.1 A	60.7 A
Thermal Design Power	4,5	70.3 W	76.1 W	76.8 W
Intermediate P-State #4		1800 MHz	2000 MHz	2200 MHz
VID_VDD		1.150 V 1.150 V	1.150 V 1.200 V	1.150 V 1.200 V
IDD Max		54.0 A	51.3 A	52.1 A
Thermal Design Power	4,5	66.1 W	63.0 W	63.9 W
Intermediate P-State #5		N/A	1800 MHz	2000 MHz
VID_VDD			1.150 V 1.150 V	1.150 V 1.150 V
IDD Max			48.3 A	49.1 A
Thermal Design Power	4,5		59.6 W	60.5 W
Intermediate P-State #6		N/A	N/A	1800 MHz
VID_VDD				1.150 V 1.150 V
IDD Max				46.2 A
Thermal Design Power	4,5			57.1 W
Min P-State		1000 MHz	1000 MHz	1000 MHz
VID_VDD		1.100 V	1.100 V	1.100 V
IDD Max		37.2 A	31.4 A	29.8 A
Thermal Design Power	4,5	44.9 W	38.5 W	36.8 W
Halt/Stop Grant				
IDDC1 Max @ Max P-State	6,8	51.7 A	42.5 A	39.1 A
IDDC1 Max @ Min P-State	7,8	11.6 A	8.1 A	7.5 A
I/O Power	9,10	4.0 W	4.0 W	4.0 W
S3				
I/O Power	10,11,12	250 mW	250 mW	250 mW

The notes for this table are on page 70.

5.3.3 ADA mmsvtc DJ Thermal and Power Specifications

Parameter/OPN	Notes	ADAFX74GAA6DJ
T _{case} Max	1	55°C to 63°C
T _{control} Max	2	70°C
Minimum T _{ambient}		5°C
Thermal Profile	3	B
Max P-State		3000 MHz
VID_VDD		1.350 V 1.400 V
IDDC Max		89.6 A
Thermal Design Power	4,5	125.0 W
Intermediate P-State #1		2800 MHz
VID_VDD		1.300 V 1.350 V
IDDC Max		80.9 A
Thermal Design Power	4,5	109.2 W
Intermediate P-State #2		2600 MHz
VID_VDD		1.250 V 1.300 V
IDDC Max		70.2 A
Thermal Design Power	4,5	91.8 W
Intermediate P-State #3		2400 MHz
VID_VDD		1.200 V 1.250 V
IDDC Max		60.7 A
Thermal Design Power	4,5	76.8 W
Intermediate P-State #4		2200 MHz
VID_VDD		1.150 V 1.200 V
IDDC Max		52.1 A
Thermal Design Power	4,5	63.9 W
Intermediate P-State #5		2000 MHz
VID_VDD		1.150 V 1.150 V
IDDC Max		49.1 A
Thermal Design Power	4,5	60.5 W
Intermediate P-State #6		1800 MHz
VID_VDD		1.150 V 1.150 V
IDDC Max		46.2 A
Thermal Design Power	4,5	57.1 W
Min P-State		1000 MHz
VID_VDD		1.100 V
IDDC Max		29.8 A
Thermal Design Power	4,5	36.8 W
Halt/Stop Grant		
IDDC1 Max @ Max P-State	6,8	39.1 A
IDDC1 Max @ Min P-State	7,8	7.5 A
I/O Power	9,10	4.0 W
S3		
I/O Power	10,11,12	250 mW

The notes for this table are on page 70.

AMD Athlon™ 64 FX 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. Tcontrol 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 for AMD NPT Family 0Fh Processors, order #32559.
3. Thermal Design Power (TDP) and IDD max are the limits at the highest Tcase max in the specified range for the corresponding OPN. Products conform to the TDP and IDD Max limits at all valid nominal voltages. The relationship of Tcase max and Thermal Profile to TDP for a specific device is defined in Table 35.
4. Thermal Design Power (TDP) is measured under the conditions of Tcase Max, IDD Max, and VDD=VID_VDD, and include all power dissipated on-die from VDD, VDDIO, VLDT, VTT, and VDDA.
5. Thermal Design Power (TDP) specifications for dual-core processors assume equivalent P-states (voltage and frequency) and equivalent Tcase conditions for both cores. Refer to the BIOS and Kernel Developer's Guide for AMD NPT Family 0Fh Processors, order #32559, for details on P-state operation for dual-core processors.
6. Assumes Tcase max, max P-state VID_VDD, clock divider set to 32.
7. Assumes 50°C, min P-state VID_VDD, clock divider set to 32.
8. IDDC1 specifications for dual-core processors assume equivalent voltage, clock divisor, and Tcase conditions for both cores.
9. Thermal Design Power dissipated by the processor VDDIO, VTT, VLDT, and VDDA power planes only.
10. Assumes VDDIO = 1.8 V and VTT = VDDIO / 2.
11. Assumes 35°C, VDD, VDDA, and VLDT supplies are off, VDDIO and VTT are powered, memory in self-refresh mode, and DDR SDRAM interface tri-stated except CKE pins.

6 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 6.1 provides an example of the OPN structure for this processor family.

6.1 AMD Sempron™ Processor Ordering Part Number Description

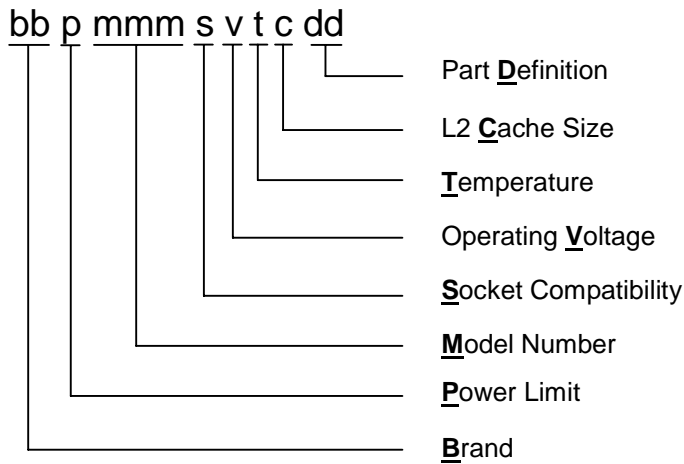


Figure 9. AMD Sempron™ Processor Ordering Part Number Diagram

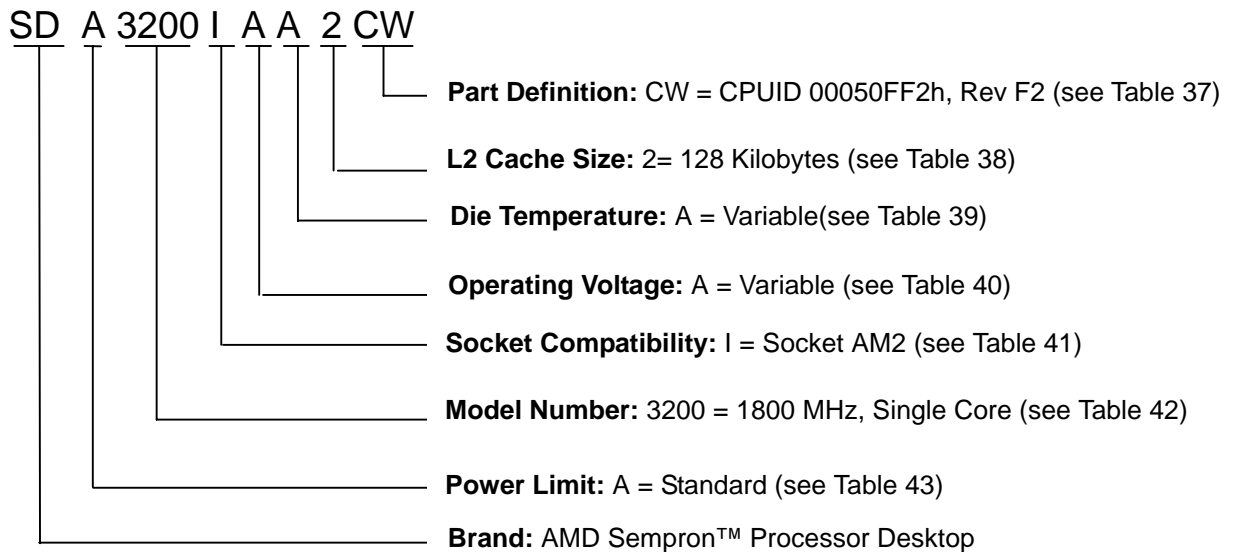


Figure 10. AMD Sempron™ Processor Ordering Part Number Example

Table 37: AMD Sempron™ Processor Part Definition Options

Part Definition	Revision	CPUID 8000_0001h EAX [31:0] (CPUID)
CM	Rev F2	00040FC2h
CN	Rev F2	00040FF2h
CW	Rev F2	00050FF2h
DE	Rev G1	00070FF1h

Table 38: AMD Sempron™ Processor L2 Cache Size Options

OPN Character	Cache Size
2	128 KB
3	256 KB

Table 39: AMD Sempron™ Processor Temperature Options

OPN Character	Temperature
A	Variable
X	95°C

Table 40: AMD Sempron™ Processor Operating Voltage

OPN Character	Operating Voltage
A	Variable

Table 41: AMD Sempron™ Processor Package Options

OPN Character	Package
H	Socket S1g1 Processor
I	Socket AM2 Processor

Table 42: AMD Sempron™ Processor Model Number Options

Package	Cache Size	Frequency	Model Number
Socket S1g1 Processor	256 KB	1000 MHz	2100+
Socket AM2 Processor	128 KB	1600 MHz	2800+
Socket AM2 Processor	256 KB	1600 MHz	3000+
Socket AM2 Processor	128 KB	1800 MHz	3200+
Socket AM2 Processor	256 KB	1800 MHz	3400+
Socket AM2 Processor	128 KB	2000 MHz	3500+
Socket AM2 Processor	256 KB	2000 MHz	3600+
Socket AM2 Processor	256 KB	2200 MHz	3800+
Socket AM2 Processor	256 KB	1900 MHz	1100+
Socket AM2 Processor	256 KB	2000 MHz	1150+

Table 43: AMD Sempron™ Processor Power Limit

OPN Character	Power Limit
A	Standard
C	9 W
D	35 W
H	45 W

Table 44: AMD Sempron™ Processor Thermal Profile

Thermal Profile	H
Heat Sink Thermal Resistance	0.50°C/W
Heat Sink Local Ambient	42°C
Profile Thermal Resistance	0.378°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	55.6°C
25.0 W	57.5°C
30.0 W	59.3°C
35.0 W	61.2°C
40.0 W	63.1°C
45.0 W	65.0°C

Thermal Profile	E
Heat Sink Thermal Resistance	0.65°C/W
Heat Sink Local Ambient	55°C
Profile Thermal Resistance	0.486°C/W
Profile Ambient	61°C
TDP	Tcase Max
0.0 W	61.0°C
5.0 W	63.4°C
10.0 W	65.9°C
15.0 W	68.3°C
20.0 W	70.7°C
25.0 W	73.2°C
30.0 W	75.6°C
35.0 W	78.0°C

Thermal Profile	C
Heat Sink Thermal Resistance	0.45°C/W
Heat Sink Local Ambient	42°C
Profile Thermal Resistance	0.356°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	58.7°C
35.0 W	60.5°C
40.0 W	62.2°C
45.0 W	64.0°C
50.0 W	65.8°C
55.0 W	67.6°C
59.0 W	69.0°C

Thermal Profile	J
Heat Sink Thermal Resistance	0.53°C/W
Heat Sink Local Ambient	55°C
Profile Thermal Resistance	0.400°C/W
Profile Ambient	61°C
TDP	Tcase Max
0.0 W	61.0°C
5.0 W	63.0°C
10.0 W	65.0°C
15.0 W	67.0°C
20.0 W	69.0°C
25.0 W	71.0°C
30.0 W	73.0°C
35.0 W	75.0°C
40.0 W	77.0°C
45.0 W	79.0°C

Note: The thermal profile is used to define the relationship between Tcase max and device specific Thermal Design Power for processors specified in this document with Variable indicated by the Case Temperature OPN character. 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.

6.2 AMD Sempron™ Processor Thermal and Power Table Guide

The thermal and power table guide shown in Table 45 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 45: AMD Sempron™ Processor Thermal and Power Table Guide

SOPN	Power	Revision	Single/Dual-Core	Thermal/Power Tables
SDA mmmmsvyc CN	Standard	Rev F2	Single Core	Section 6.3.1 on page 77
SDA mmmmsvyc CW	Standard	Rev F2	Single Core	Section 6.3.2 on page 80
SDC mmmmsvyc CM	35W	Rev F2	Single Core	Section 6.3.3 on page 81
SDD mmmmsvyc CN	35W	Rev F2	Single Core	Section 6.3.4 on page 82
SDH mmmmsvyc DE	45W	Rev G1	Single Core	Section 6.3.4 on page 82

6.3 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). For all other electrical specifications for the processor, refer to the *AMD NPT Family 0Fh Processor Electrical Data Sheet*, order #31119. For power management BIOS requirements, refer to the *BIOS and Kernel Developer's Guide for AMD NPT Family 0Fh Processors*, order #32559.

Section 6.1 on page 71 provides an example of the OPN structure for processors documented in this chapter and Table 45 on page 75 provides a guide to OPN organization in the following subsections. Refer to Section 1.2 on page 11 and Section 1.3 on page 12 for numbering conventions and terminology definitions used in these tables. Refer to Section 1.2 on page 11 for full document titles and order numbers for reference documentation.

6.3.1 SDA mmmsvtc CN Thermal and Power Specifications

Parameter/OPN	Notes	SDA2800IAA2CN			SDA3000IAA3CN			SDA3200IAA2CN		
T _{case} Max	1	55°C to 69°C			55°C to 69°C			55°C to 69°C		
T _{control} Max	2	70°C			70°C			70°C		
Minimum T _{ambient}		5°C			5°C			5°C		
Thermal Profile	3	C			C			C		
Max P-State		1600 MHz			1600 MHz			1800 MHz		
VID_VDD		1.250 V	1.350 V	1.400 V	1.250 V	1.350 V	1.400 V	1.250 V	1.350 V	1.400 V
IDD Max		44.8 A			44.8 A			44.8 A		
Thermal Design Power	4,5	59.0 W			59.0 W			59.0 W		
Intermediate P-State #1		N/A			N/A			N/A		
VID_VDD										
IDD Max										
Thermal Design Power	4,5									
Intermediate P-State #2		N/A			N/A			N/A		
VID_VDD										
IDD Max										
Thermal Design Power	4,5									
Intermediate P-State #3		N/A			N/A			N/A		
VID_VDD										
IDD Max										
Thermal Design Power	4,5									
Intermediate P-State #4		N/A			N/A			N/A		
VID_VDD										
IDD Max										
Thermal Design Power	4,5									
Intermediate P-State #5		N/A			N/A			N/A		
VID_VDD										
IDD Max										
Thermal Design Power	4,5									
Intermediate P-State #6		N/A			N/A			N/A		
VID_VDD										
IDD Max										
Thermal Design Power	4,5									
Min P-State		N/A			N/A			1000 MHz		
VID_VDD								1.100 V		
IDD Max								24.4 A		
Thermal Design Power	4,5							29.8 W		
Halt/Stop Grant										
IDDC1 Max @ Max P-State	6,8	32.8 A			32.8 A			31.3 A		
IDDC1 Max @ Min P-State	7,8	N/A			N/A			8.3 A		
I/O Power	9,10	3.0 W			3.0 W			3.0 W		
S3										
I/O Power	10,11,12	250 mW			250 mW			250 mW		

The notes for this table are on page 85.

Parameter/OPN	Notes	SDA3400IAA3CN			SDA3500IAA2CN			SDA3600IAA3CN		
Tcase Max	1	55°C to 69°C			55°C to 69°C			55°C to 69°C		
Tcontrol Max	2	70°C			70°C			70°C		
Minimum Tambient		5°C			5°C			5°C		
Thermal Profile	3	C			C			C		
Max P-State		1800 MHz			2000 MHz			2000 MHz		
VID_VDD		1.250 V	1.350 V	1.400 V	1.250 V	1.350 V	1.400 V	1.250 V	1.350 V	1.400 V
IDD Max		44.8 A			44.8 A			44.8 A		
Thermal Design Power	4,5	59.0 W			59.0 W			59.0 W		
Intermediate P-State #1		N/A			1800 MHz			1800 MHz		
VID_VDD					1.200 V	1.300 V	1.350 V	1.200 V	1.300 V	1.350 V
IDD Max					40.3 A			40.3 A		
Thermal Design Power	4,5				51.3 W			51.3 W		
Intermediate P-State #2		N/A			N/A			N/A		
VID_VDD										
IDD Max										
Thermal Design Power	4,5									
Intermediate P-State #3		N/A			N/A			N/A		
VID_VDD										
IDD Max										
Thermal Design Power	4,5									
Intermediate P-State #4		N/A			N/A			N/A		
VID_VDD										
IDD Max										
Thermal Design Power	4,5									
Intermediate P-State #5		N/A			N/A			N/A		
VID_VDD										
IDD Max										
Thermal Design Power	4,5									
Intermediate P-State #6		N/A			N/A			N/A		
VID_VDD										
IDD Max										
Thermal Design Power	4,5									
Min P-State		1000 MHz			1000 MHz			1000 MHz		
VID_VDD		1.100 V			1.100 V			1.100 V		
IDD Max		24.4 A			23.5 A			23.5 A		
Thermal Design Power	4,5	29.8 W			28.9 W			28.9 W		
Halt/Stop Grant										
IDDC1 Max @ Max P-State	6,8	31.3 A			29.8 A			29.8 A		
IDDC1 Max @ Min P-State	7,8	8.3 A			7.9 A			7.9 A		
I/O Power	9,10	3.0 W			3.0 W			3.0 W		
S3										
I/O Power	10,11,12	250 mW			250 mW			250 mW		

The notes for this table are on page 85.

Parameter/OPN	Notes	SDA3800IAA3CN		
Tcase Max	1	55°C to 69°C		
Tcontrol Max	2	70°C		
Minimum Tambient		5°C		
Thermal Profile	3	C		
Max P-S tate		2200 MHz		
VID_VDD		1.250 V	1.350 V	1.400 V
IDD Max		44.8 A		
Thermal Design Power	4,5	59.0 W		
Intermediate P-S tate #1		2000 MHz		
VID_VDD		1.200 V	1.300 V	1.350 V
IDD Max		40.3 A		
Thermal Design Power	4,5	51.3 W		
Intermediate P-S tate #2		1800 MHz		
VID_VDD		1.150 V	1.250 V	1.300 V
IDD Max		34.3 A		
Thermal Design Power	4,5	42.5 W		
Intermediate P-S tate #3		N/A		
VID_VDD				
IDD Max				
Thermal Design Power	4,5			
Intermediate P-S tate #4		N/A		
VID_VDD				
IDD Max				
Thermal Design Power	4,5			
Intermediate P-S tate #5		N/A		
VID_VDD				
IDD Max				
Thermal Design Power	4,5			
Intermediate P-S tate #6		N/A		
VID_VDD				
IDD Max				
Thermal Design Power	4,5			
Min P-S tate		1000 MHz		
VID_VDD		1.100 V		
IDD Max		22.7 A		
Thermal Design Power	4,5	28.0 W		
Halt/Stop Grant				
IDDC1 Max @ Max P-State	6,8	28.8 A		
IDDC1 Max @ Min P-State	7,8	7.5 A		
I/O Power	9,10	3.0 W		
S3				
I/O Power	10,11,12	250 mW		

The notes for this table are on page 85.

6.3.2 SDA mmmsvtc CW Thermal and Power Specifications

Parameter/OPN	Notes	SDA3200IAA2CW			SDA3400IAA3CW			SDA3600IAA3CW		
Tcase Max	1	55°C to 69°C			55°C to 69°C			55°C to 69°C		
Tcontrol Max	2	70°C			70°C			70°C		
Minimum Tambient		5°C			5°C			5°C		
Thermal Profile	3	C			C			C		
Max P-State		1800 MHz			1800 MHz			2000 MHz		
VID_VDD		1.250 V	1.350 V	1.400 V	1.250 V	1.350 V	1.400 V	1.250 V	1.350 V	1.400 V
IDD Max		44.8 A			44.8 A			44.8 A		
Thermal Design Power	4,5	59.0 W			59.0 W			59.0 W		
Intermediate P-State #1		N/A			N/A			1800 MHz		
VID_VDD								1.200 V	1.300 V	1.350 V
IDD Max								40.3 A		
Thermal Design Power	4,5							51.3 W		
Intermediate P-State #2		N/A			N/A			N/A		
VID_VDD										
IDD Max										
Thermal Design Power	4,5									
Intermediate P-State #3		N/A			N/A			N/A		
VID_VDD										
IDD Max										
Thermal Design Power	4,5									
Intermediate P-State #4		N/A			N/A			N/A		
VID_VDD										
IDD Max										
Thermal Design Power	4,5									
Intermediate P-State #5		N/A			N/A			N/A		
VID_VDD										
IDD Max										
Thermal Design Power	4,5									
Intermediate P-State #6		N/A			N/A			N/A		
VID_VDD										
IDD Max										
Thermal Design Power	4,5									
Min P-State		1000 MHz			1000 MHz			1000 MHz		
VID_VDD		1.100 V			1.100 V			1.100 V		
IDD Max		24.4 A			24.4 A			23.5 A		
Thermal Design Power	4,5	29.8 W			29.8 W			28.9 W		
Halt/Stop Grant										
IDDC1 Max @ Max P-State	6,8	31.3 A			31.3 A			29.8 A		
IDDC1 Max @ Min P-State	7,8	8.3 A			8.3 A			7.9 A		
I/O Power	9,10	3.0 W			3.0 W			3.0 W		
S3										
I/O Power	10,11,12	250 mW			250 mW			250 mW		

The notes for this table are on page 85.

6.3.3 SDC mmmsvtc CM Thermal and Power Specifications

Parameter/OPN	Notes	SDC2100HAX3CM	
T _{die} Max		95°C	
T _{ambient}		0°C to 35°C	
T _{rise}		10°C	
Thermal Resistance (die-amb)		5.56°C/W	
Max P-State		1000 MHz	
VID_VDD		0.825 V	0.850 V
IDD Max		7.3 A	
Thermal Design Power	4,5	9.0 W	
Intermediate P-State #1		N/A	
VID_VDD			
IDD Max			
Thermal Design Power	4,5		
Intermediate P-State #2		N/A	
VID_VDD			
IDD Max			
Thermal Design Power	4,5		
Intermediate P-State #3		N/A	
VID_VDD			
IDD Max			
Thermal Design Power	4,5		
Intermediate P-State #4		N/A	
VID_VDD			
IDD Max			
Thermal Design Power	4,5		
Intermediate P-State #5		N/A	
VID_VDD			
IDD Max			
Thermal Design Power	4,5		
Intermediate P-State #6		N/A	
VID_VDD			
IDD Max			
Thermal Design Power	4,5		
Min P-State		N/A	
VID_VDD			
IDD Max			
Thermal Design Power	4,5		
Halt/Stop Grant			
IDDC1 Max @ Max P-State	6,8	2.8 A	
IDDC1 Max @ Min P-State	7,8	N/A	
I/O Power	9,10	3.0 W	
S3			
I/O Power	10,11,12	250 mW	

The notes for this table are on page 85.

6.3.4 SDD mmsvtc CN Thermal and Power Specifications

Parameter/OPN	Notes	SDD3000IAA3CN			SDD3200IAA2CN			SDD3400IAA3CN		
Tcase Max	1	55°C to 78°C			55°C to 78°C			55°C to 78°C		
Tcontrol Max	2	70°C			70°C			70°C		
Minimum Tambient		5°C			5°C			5°C		
Thermal Profile	3	E			E			E		
Max P-State		1600 MHz			1800 MHz			1800 MHz		
VID_VDD		1.200 V	1.250 V	1.300 V	1.200 V	1.250 V	1.300 V	1.200 V	1.250 V	1.300 V
IDD Max		26.7 A			26.7 A			26.7 A		
Thermal Design Power	4,5	35.0 W			35.0 W			35.0 W		
Intermediate P-State #1		N/A			N/A			N/A		
VID_VDD										
IDD Max										
Thermal Design Power	4,5									
Intermediate P-State #2		N/A			N/A			N/A		
VID_VDD										
IDD Max										
Thermal Design Power	4,5									
Intermediate P-State #3		N/A			N/A			N/A		
VID_VDD										
IDD Max										
Thermal Design Power	4,5									
Intermediate P-State #4		N/A			N/A			N/A		
VID_VDD										
IDD Max										
Thermal Design Power	4,5									
Intermediate P-State #5		N/A			N/A			N/A		
VID_VDD										
IDD Max										
Thermal Design Power	4,5									
Intermediate P-State #6		N/A			N/A			N/A		
VID_VDD										
IDD Max										
Thermal Design Power	4,5									
Min P-State		N/A			1000 MHz			1000 MHz		
VID_VDD					1.000 V			1.000 V		
IDD Max					12.6 A			12.6 A		
Thermal Design Power	4,5				15.6 W			15.6 W		
Halt/Stop Grant										
IDDC1 Max @ Max P-State	6,8	15.4 A			14.0 A			14.0 A		
IDDC1 Max @ Min P-State	7,8	N/A			3.1 A			3.1 A		
I/O Power	9,10	3.0 W			3.0 W			3.0 W		
S3										
I/O Power	10,11,12	250 mW			250 mW			250 mW		

The notes for this table are on page 85.

Parameter/OPN	Notes	SDD3500IAA2CN		
Tcase Max	1	55°C to 78°C		
Tcontrol Max	2	70°C		
Minimum Tambient		5°C		
Thermal Profile	3	E		
Max P-State		2000 MHz		
VID_VDD		1.200 V	1.250 V	1.300 V
IDD Max		26.7 A		
Thermal Design Power	4,5	35.0 W		
Intermediate P-State #1		1800 MHz		
VID_VDD		1.150 V	1.200 V	1.250 V
IDD Max		23.0 A		
Thermal Design Power	4,5	29.4 W		
Intermediate P-State #2		N/A		
VID_VDD				
IDD Max				
Thermal Design Power	4,5			
Intermediate P-State #3		N/A		
VID_VDD				
IDD Max				
Thermal Design Power	4,5			
Intermediate P-State #4		N/A		
VID_VDD				
IDD Max				
Thermal Design Power	4,5			
Intermediate P-State #5		N/A		
VID_VDD				
IDD Max				
Thermal Design Power	4,5			
Intermediate P-State #6		N/A		
VID_VDD				
IDD Max				
Thermal Design Power	4,5			
Min P-State		1000 MHz		
VID_VDD		1.000 V		
IDD Max		12.0 A		
Thermal Design Power	4,5	15.0 W		
Halt/Stop Grant				
IDDC1 Max @ Max P-State	6,8	12.5 A		
IDDC1 Max @ Min P-State	7,8	2.8 A		
I/O Power	9,10	3.0 W		
S3				
I/O Power	10,11,12	250 mW		

The notes for this table are on page 85.

6.3.5 SDH mmsvtc DE Thermal and Power Specifications

Parameter/OPN	Notes	SDH1100IAA3DE			SDH1150IAA3DE		
Tcase Max	1	55°C to 65°C			61°C to 75°C		
Tcontrol Max	2	70°C			70°C		
Minimum Tambient		5°C			5°C		
Thermal Profile	3	H			J		
Max P-State		1900 MHz			2000 MHz		
VID_VDD		1.350 V	1.300 V	1.250 V	1.350 V	1.300 V	1.250 V
IDD Max		31.1 A			31.1 A		
Thermal Design Power	4,5	45.0 W			45.0 W		
Intermediate P-State #1		1800 MHz			1800 MHz		
VID_VDD		1.325 V	1.275 V	1.250 V	1.300 V	1.250 V	1.200 V
IDD Max		28.7 A			26.5 A		
Thermal Design Power	4,5	41.0 W			37.4 W		
Intermediate P-State #2		N/A			N/A		
VID_VDD							
IDD Max							
Thermal Design Power	4,5						
Intermediate P-State #3		N/A			N/A		
VID_VDD							
IDD Max							
Thermal Design Power	4,5						
Intermediate P-State #4		N/A			N/A		
VID_VDD							
IDD Max							
Thermal Design Power	4,5						
Intermediate P-State #5		N/A			N/A		
VID_VDD							
IDD Max							
Thermal Design Power	4,5						
Intermediate P-State #6		N/A			N/A		
VID_VDD							
IDD Max							
Thermal Design Power	4,5						
Min P-State		1000 MHz			1000 MHz		
VID_VDD		1.100 V			1.100 V		
IDD Max		18.5 A			18.0 A		
Thermal Design Power	4,5	23.3 W			22.8 W		
Halt/Stop Grant							
IDDC1 Max @ Max P-State	6,8	22.7 A			22.9 A		
IDDC1 Max @ Min P-State	7,8	6.1 A			6.8 A		
I/O Power	9,10	3.0 W			3.0 W		
S3							
I/O Power	10,11,12	250 mW			250 mW		

The notes for this table are on page 85.

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. Tcontrol 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 for AMD NPT Family 0Fh Processors, order #32559.
3. Thermal Design Power (TDP) and IDD max are the limits at the highest Tcase max in the specified range for the corresponding OPN. Products conform to the TDP and IDD Max limits at all valid nominal voltages. The relationship of Tcase max and Thermal Profile to TDP for a specific device is defined in Table 44.
4. Thermal Design Power (TDP) is measured under the conditions of Tcase Max, IDD Max, and VDD=VID_VDD, and include all power dissipated on-die from VDD, VDDIO, VLDT, VTT, and VDDA.
5. Thermal Design Power (TDP) specifications for dual-core processors assume equivalent P-states (voltage and frequency) and equivalent Tcase conditions for both cores. Refer to the BIOS and Kernel Developer's Guide for AMD NPT Family 0Fh Processors, order #32559, for details on P-state operation for dual-core processors.
6. Assumes Tcase max, max P-state VID_VDD, clock divider set to 32.
7. Assumes 50°C, min P-state VID_VDD, clock divider set to 32.
8. IDDC1 specifications for dual-core processors assume equivalent voltage, clock divisor, and Tcase conditions for both cores.
9. Thermal Design Power dissipated by the processor VDDIO, VTT, VLDT, and VDDA power planes only.
10. Assumes VDDIO = 1.8 V and VTT = VDDIO / 2.
11. Assumes 35°C, VDD, VDDA, and VLDT supplies are off, VDDIO and VTT are powered, memory in self-refresh mode, and DDR SDRAM interface tri-stated except CKE pins.

7 Power Supply Specifications

7.1 ispmmmm I tvccd - Socket AM2 Power Supply Operating Conditions

Table 46: ispmmmm I tvccd VDD Power Supply DC Operating Conditions

Symbol	Parameter	Units	Min	Typ	Max	Notes
VID_VDD	VID Requested VDD Supply Level	V	Refer to the thermal/power and BIOS tables under the appropriate SOPN section for this OPN specific parameter.			1
VDD_dc	VDD Supply Voltage	V	VID_VDD - 50 mV	VID_VDD	VID_VDD + 50 mV	
VDD_PON	VDD Supply Voltage before PWROK assertion during power-on.	V	1.050 V	1.100 V	MaxVID	2, 3
IDD	VDD Power Supply Current	A	Refer to the thermal/power tables under the appropriate SOPN section for this OPN specific parameter.			

Notes:

- 1) The processor drives a VID code corresponding to this voltage.
- 2) The processor's VID[5:0] outputs select VDD_PON nom before PWROK is asserted. Transients up to MaxVID are allowed.
- 3) MaxVID is reported in MSRC001_0042 (FIDVID_STATUS).

Table 47: ispmmmm I tvccd VDD Power Supply AC Operating Conditions

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

Notes:

- 1) Transient duration below VDD_dc min is limited to < 5 μ s. Transient duration above VDD_dc max is limited to < 10% duty cycle. Test by probing differentially at COREFB_H and COREFB_L with 20MHz scope bandwidth limit.

Table 48: ispmmmm I tvccd Non-VDD Power Supply AC and DC Operating Conditions

Symbol	Parameter	Units	Min	Typ	Max	Notes
VDDIO_dc	VDDIO Supply Voltage for DDR2 electricals	V	1.7	1.8	1.9	7
VDDIO_dc	VDDIO Supply Voltage for DDR2 electricals for OPN ADO3600IAA5DL	V	1.77	1.8	1.9	7
VDDIO_ac	VDDIO supply voltage	V	VDDIO_dc -150 mV		VDDIO_dc +150 mV	5, 6
VLDT	VLDT Supply Voltage	V	1.14	1.2	1.26	
VTT_dc	VTT Supply Voltage for DDR2 electricals	V	0.85	0.9	0.95	8
VTT_ac	VTT Supply Voltage	V	VTT_dc -75 mV		VTT_dc +75 mV	5, 6
VDDA	VDDA Supply Voltage	V	2.4	2.5	2.6	
IDDIO1	VDDIO Power Supply Current	A			3.6	3, 9
IDDIO2	VDDIO Power Supply Current in S3 State	mA			120	
ITT1	VTT Power Supply Current	A			1.75	2, 4, 9
ITT2	VTT Power Supply Current in S3 State	mA		0		
ILDT	VLDT Power Supply Current	mA			500	1, 9
IDDA	VDDA Power Supply Current	mA			250	9

Notes:

- 1) ILDT is specified for one 16x16-bit HyperTransport™ link operating at 2.0 GT/s.
- 2) VTT must both sink and source current.
- 3) VDDIO current is consumed by I, O, I/O switching current and on-chip functions (PDL, DLL, level-shifters, etc.).
- 4) VTT current is consumed by I, O, I/O switching current and on-chip functions (PDL, DLL, level-shifters, etc.).
- 5) VDDIO_ac and VTT_ac parameters are measured over 60 seconds time frame with all data bus bits switching.
- 6) Power supply A/C measurements use a 20-MHz scope bandwidth limit.
- 7) 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 1.7 V.
- 8) 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 has to 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.
- 9) This specification reflects the values published in the appropriate power roadmap document.

7.2 ispmmmm H tvccd - Socket S1 Power Supply Operating Conditions

Table 49: ispmmmm H tvccd VDD Power Supply DC Operating Conditions

Symbol	Parameter	Units	Min	Typ	Max	Notes
VID_VDD	VID Requested VDD Supply Level	V	Refer to the thermal/power and BIOS tables under the appropriate SOPN section for this OPN specific parameter.			1
VDD_lps	VDD Supply Voltage in the lowest frequency P-state (minimum P-state)	V	VID_VDD -25 mV	VID_VDD	VID_VDD + 25 mV	
VDD_ips	VDD Supply Voltage in all intermediate frequency P-states	V	VID_VDD -25 mV	VID_VDD	VID_VDD + 55 mV	
VDD_hps	VDD Supply Voltage in the highest frequency P-state (maximum P-state)	V	VID_VDD -25 mV	VID_VDD	VID_VDD + 55 mV	
VDD_PON	VDD Supply Voltage before PWROK assertion during power-on.	V	1.050 V	1.100 V	MaxVID	2, 3
IDDD	VDD Power Supply Current	A	Refer to the thermal/power tables under the appropriate SOPN section for this OPN specific parameter.			

Notes:

- 1) The processor drives a VID code corresponding to this voltage.
- 2) The processor's VID[5:0] outputs select VDD_PON nom before PWROK is asserted. Transients up to MaxVID are allowed.
- 3) MaxVID is reported in MSRC001_0042 (FIDVID_STATUS).

Table 50: ispmmmm H tvccd VDD Power Supply AC Operating Conditions

Symbol	Parameter	Units	Min	Typ	Max	Notes
VDD_ac	VDD Supply Voltage	V	VID_VDD -125 mV		VID_VDD + 125 mV	1

Notes:

- 1) Transient duration below VDD_dc min is limited to <math><5 \mu\text{s}</math>. Transient duration above VDD_dc max is limited to <math><100\mu\text{s}</math> and <math><50\%</math> duty cycle. Test by probing differentially the processor's VDD_FB_H/L signals using a 20 MHz scope bandwidth limit.

Table 51: ispmmm H tvccd Non-VDD Power Supply AC and DC Operating Conditions

Symbol	Parameter	Units	Min	Typ	Max	Notes
VDDIO_dc	VDDIO Supply Voltage for DDR2 electricals	V	1.7	1.8	1.9	7
VDDIO_ac	VDDIO supply voltage	V	VDDIO_dc -150 mV		VDDIO_dc +150 mV	5, 6
VLDT	VLDT Supply Voltage	V	1.14	1.2	1.26	
VTT_dc	VTT Supply Voltage for DDR2 electricals	V	0.85	0.9	0.95	8
VTT_ac	VTT Supply Voltage	V	VTT_dc -75 mV		VTT_dc +75 mV	5, 6
VDDA	VDDA Supply Voltage	V	2.4	2.5	2.6	
IDDIO1	VDDIO Power Supply Current	A			3.6	3, 9
IDDIO2	VDDIO Power Supply Current in S3 State	mA			120	
ITT1	VTT Power Supply Current	A			1.75	2, 4, 9
ITT2	VTT Power Supply Current in S3 State	mA		0		
ILD1	VLDT Power Supply Current	mA			500	1, 9
IDDA	VDDA Power Supply Current	mA			40	9

Notes:

- 1) ILDT is specified for one 16x16-bit HyperTransport™ link operating at 1.6 GT/s.
- 2) VTT must both sink and source current.
- 3) VDDIO current is consumed by I, O, I/O switching current and on-chip functions (PDL, DLL, level-shifters, etc.).
- 4) VTT current is consumed by I, O, I/O switching current and on-chip functions (PDL, DLL, level-shifters, etc.).
- 5) VDDIO_ac and VTT_ac parameters are measured over 60 seconds time frame with all data bus bits switching.
- 6) Power supply A/C measurements use a 20-MHz scope bandwidth limit.
- 7) 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 1.7 V.
- 8) 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 have to 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.
- 9) This specification reflects the values published in the appropriate power roadmap document.

8 Power Limit Encoding

The power limit is encoded in the BrandID field returned by the CPUID instruction (CPUID Fn8000_0001 EBX[8:6,14] = PwrLmt[3:0]). The following tables specify the unique encodings for PwrLmt[3:0] by socket compatibility and dual-core capability (CmpCap). The PwrLmt[3:0] encoding is used by BIOS for optional features. For details on BIOS usage of the power limit encoding, refer to the *BIOS and Kernel Developer's Guide for AMD NPT Family 0Fh Processors*, order #32559. The PwrLmt[3:0] encoding should not be used for thermal design purposes.

Socket compatibility and dual-core capability (CmpCap) must be used in conjunction with the PwrLmt[3:0] encoding to determine the associated power limit. Table 52 defines the socket compatibility encodings and Table 53 defines the dual-core capability (CmpCap) encodings.

Table 52: Socket Compatibility Encodings

Socket	Encoding
Socket AM2	11b
Socket S1	00b

Table 53: Dual-Core Capability (CmpCap) Encodings

CmpCap	Encoding
Single-Core	00b
Dual-Core	01b

Table 54: Socket AM2 Processor Power Limit Encoding

OPN Character	Power Limit	PwrLmt[3:0]
A	62 W	8h (CmpCap = 00b)
A	89 W	8h (CmpCap = 01b)
A	103 W	Ah (CmpCap = 01b)
A	125 W	Ch (CmpCap = 01b)
D	35 W	4h (CmpCap = 00b)
D	35 W	2h (CmpCap = 01b)
H	45 W	5h (CmpCap = 00b)
H	45 W	3h (CmpCap = 01b)
I	76 W	7h (CmpCap = 01b)
O	65 W	6h (CmpCap = 01b)
X	125 W	Ch (CmpCap = 01b)
N	62 W	4h (CmpCap = 01b)

Table 55: Socket S1g1 Processor Power Limit Encoding

OPN Character	Power Limit	PwrLmt[3:0]
S	25 W	6h (CmpCap = 00b)
D	35 W	Ch (CmpCap = 00b)
D	35 W	Ch (CmpCap = 01b)

9 MTOPS

Table 56 shows the Composite Theoretical Performance (CTP) calculations ("Calculations") for the AMD Athlon™ 64 X2 Dual-Core processor, Athlon 64™ processor, AMD Athlon™ 64 FX processor, and AMD Sempron™ processor. 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).

All Calculations contained herein are subject to change without notice. AMD makes no representation or warranty as to the accuracy or reliability of such Calculations.

THESE CALCULATIONS ARE PROVIDED "AS IS" AND AMD MAKES NO WARRANTIES WHATSOEVER, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTY OF MERCHANTABILITY, NONINFRINGEMENT, FITNESS FOR ANY PARTICULAR PURPOSE OR ANY WARRANTY OTHERWISE ARISING OUT OF AMD PROVIDING OR ANY PARTY'S USE OF THE CALCULATIONS.

Furthermore, AMD shall have no liability for any losses or damages including direct, indirect, special, punitive, incidental, or consequential, such as but not limited to, loss of anticipated profits or other economic loss occurring in connection with use of the Calculations, even if AMD has been advised in advance of the possibility of such damages. No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted herein.

Table 56: Composite Theoretical Performance (CTP) Calculations

Frequency	MTOPS Single-Core	MTOPS Dual-Core
800	2,467	4,667
900	2,775	5,250
1000	3,084	5,834
1100	3,392	6,417
1200	3,700	7,000
1300	4,009	7,584
1400	4,317	8,167
1500	4,625	8,750
1600	4,934	9,334
1700	5,242	9,917
1800	5,550	10,500
1900	5,859	11,084
2000	6,167	11,667
2100	6,475	12,250
2200	6,784	12,834
2300	7,092	13,417
2400	7,400	14,000
2500	7,709	14,584
2600	8,017	15,167
2700	8,325	15,750
2800	8,634	16,334
2900	8,942	16,917
3000	9,250	17,500

10 APP

Table 57 shows the Adjusted Peak Performance (APP) calculations ("Calculations") for the AMD Athlon™ 64 X2 Dual-Core processor, Athlon 64™ processor, AMD Athlon™ 64 FX processor, and AMD Sempron™ 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).

All Calculations contained herein are subject to change without notice. AMD makes no representation or warranty as to the accuracy or reliability of such Calculations.

THESE CALCULATIONS ARE PROVIDED "AS IS" AND AMD MAKES NO WARRANTIES WHATSOEVER, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTY OF MERCHANTABILITY, NONINFRINGEMENT, FITNESS FOR ANY PARTICULAR PURPOSE OR ANY WARRANTY OTHERWISE ARISING OUT OF AMD PROVIDING OR ANY PARTY'S USE OF THE CALCULATIONS.

Furthermore, AMD shall have no liability for any losses or damages including direct, indirect, special, punitive, incidental, or consequential, such as but not limited to, loss of anticipated profits or other economic loss occurring in connection with use of the Calculations, even if AMD has been advised in advance of the possibility of such damages. No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted herein.

Table 57: Adjusted Peak Performance (APP) Calculations

Frequency	APP Single-Core	APP Dual-Core
800	0.0005	0.0010
900	0.0005	0.0011
1000	0.0006	0.0012
1100	0.0007	0.0013
1200	0.0007	0.0014
1300	0.0008	0.0016
1400	0.0008	0.0017
1500	0.0009	0.0018
1600	0.0010	0.0019
1700	0.0010	0.0020
1800	0.0011	0.0022
1900	0.0011	0.0023
2000	0.0012	0.0024
2100	0.0013	0.0025
2200	0.0013	0.0026
2300	0.0014	0.0028
2400	0.0014	0.0029
2500	0.0015	0.0030
2600	0.0016	0.0031
2700	0.0016	0.0032
2800	0.0017	0.0034
2900	0.0017	0.0035
3000	0.0018	0.0036