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

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Revision History

Date	Revision	Description
February 2007	3.00	Initial public 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 9)
- Power supply specifications (content overview in Section 1.1.4 on page 9)
- MTOPS section on page 71.

1.1.1 Ordering Part Number Description Section Overview

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

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

1.1.2 Thermal and Power Table Guide Overview

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

1.1.3 Thermal and Power Table Section Overview

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

The thermal and power specification tables are organized into subsections that correspond to Subsection Ordering Part Numbers (SOPNs). SOPNs for the thermal and power tables have the brand, power limit, and part definition characters defined. They are of the form **ABC** mmmmsvtc **GH**. A thermal and power table guide table is provided in each chapter that maps SOPNs to the appropriate subsection number and page number within that chapter. 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 ispmmmm**S**vtcdd.

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

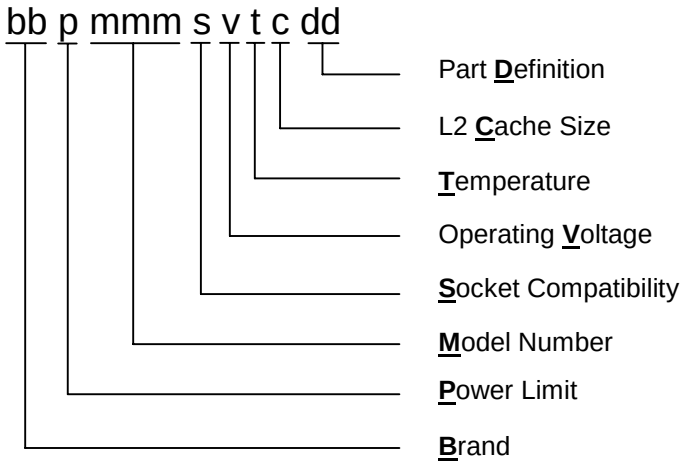

Figure 1. AMD Athlon™ 64 X2 Dual-Core Processor Ordering Part Number Diagram

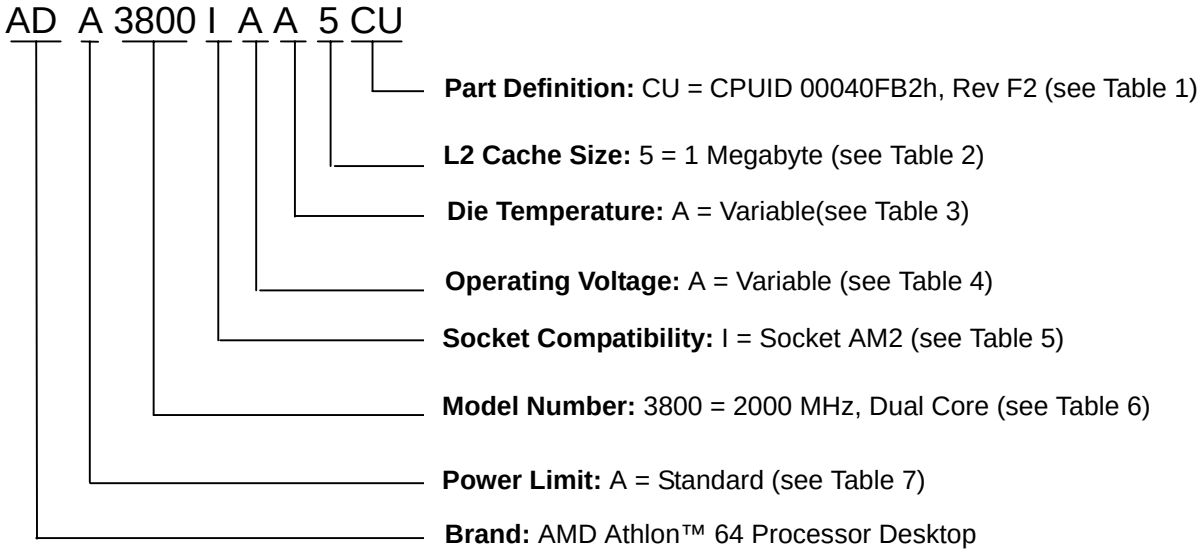

Figure 2. AMD Athlon™ 64 X2 Dual-Core Processor Ordering Part Number Example

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

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
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	**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. If the heat sink design targets are met, the thermal profile specifications are met.*

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 18
ADA mmmmsvtc **CS**	Standard	Rev F2	Dual Core	Section 2.3.2 on page 20
ADA mmmmsvtc **CZ**	Standard	Rev F3	Dual Core	Section 2.3.3 on page 21
ADD mmmmsvtc **CU**	35 W	Rev F2	Dual Core	Section 2.3.4 on page 23
ADO mmmmsvtc **CU**	65 W	Rev F2	Dual Core	Section 2.3.5 on page 24
ADO mmmmsvtc **CS**	65 W	Rev F2	Dual Core	Section 2.3.6 on page 26
ADO mmmmsvtc **CZ**	65 W	Rev F3	Dual Core	Section 2.3.7 on page 27
ADO mmmmsvtc **DD**	65 W	Rev G1	Dual Core	Section 2.3.8 on page 29
ADX mmmmsvtc **CZ**	125 W	Rev F3	Dual Core	Section 2.3.9 on page 31

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 11 provides an example of the OPN structure for processors documented in this chapter and Table 9 on page 16 provides a guide to OPN organization in the following subsections. Refer to Section 1.2 on page 9 and Section 1.3 on page 10 for numbering conventions and terminology definitions used in these tables. Refer to Section 1.2 on page 9 for full document titles and order numbers for reference documentation.

2.3.1 ADA mmmsvtc 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 32.

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 32.

2.3.2 ADA mmmsvtc CS Thermal and Power Specifications

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 32.

2.3.3 ADA mmmsvtc 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 32.

Parameter/OPN	Notes	ADA5600IAA6CZ
Tcase Max	1	55°C to 70°C
Tcontrol Max	2	70°C
Minimum Tambient		5°C
Thermal Profile	3	A
Max P-State		2800 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		2600 MHz
VID_VDD		1.250 V | 1.300 V
IDD Max		57.4 A
Thermal Design Power	4,5	74.7 W
Intermediate P-State #2		2400 MHz
VID_VDD		1.200 V | 1.250 V
IDD Max		49.6 A
Thermal Design Power	4,5	62.5 W
Intermediate P-State #3		2200 MHz
VID_VDD		1.150 V | 1.200 V
IDD Max		42.4 A
Thermal Design Power	4,5	51.8 W
Intermediate P-State #4		2000 MHz
VID_VDD		1.150 V | 1.150 V
IDD Max		39.7 A
Thermal Design Power	4,5	48.6 W
Intermediate P-State #5		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
VID_VDD		|
IDD Max		
Thermal Design Power	4,5	
Min P-State		1000 MHz
VID_VDD		1.100 V
IDD Max		23.8 A
Thermal Design Power	4,5	29.2 W
Halt/Stop Grant		
IDDC1 Max @ Max P-State	6,8	21.5 A
IDDC1 Max @ Min P-State	7,8	5.0 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 32.

2.3.4 ADD mmmsvtc CU Thermal and Power Specifications

Parameter/OPN	Notes	ADD3800IAA5CU
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		1.075 V | 1.100 V
IDD Max		29.8 A
Thermal Design Power	4,5	35.0 W
Intermediate P-State #1		1800 MHz
VID_VDD		1.025 V | 1.050 V
IDD Max		26.4 A
Thermal Design Power	4,5	30.1 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		15.3 A
Thermal Design Power	4,5	18.3 W
Halt/Stop Grant		
IDDC1 Max @ Max P-State	6,8	5.6 A
IDDC1 Max @ Min P-State	7,8	2.0 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 32.

2.3.5 ADO mmmsvtc 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 32.

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 32.

2.3.6 ADO mmmsvtc CS Thermal and Power Specifications

Parameter/OPN	Notes	ADO3800IAA5CS	ADO4600IAA5CS
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		2000 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		1800 MHz	2200 MHz
VID_VDD		1.150 V | 1.200 V	1.150 V | 1.200 V
IDD Max		43.8 A	44.4 A
Thermal Design Power	4,5	53.4 W	54.1 W
Intermediate P-State #2		N/A	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		N/A	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	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		28.7 A	24.8 A
Thermal Design Power	4,5	34.6 W	30.3 W
Halt/Stop Grant			
IDDC1 Max @ Max P-State	6,8	23.4 A	17.7 A
IDDC1 Max @ Min P-State	7,8	7.6 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 32.

2.3.7 ADO mmmsvtc 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 32.

Parameter/OPN	Notes	ADO5200IAA6CZ
Tcase Max	1	55°C to 72°C
Tcontrol Max	2	70°C
Minimum Tambient		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 32.

2.3.8 ADO mmmsvtc 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-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 32.

Parameter/OPN	Notes	ADO4800IAA5DD			ADO5000IAA5DD		
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		2500 MHz			2600 MHz		
VID_VDD		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		
Thermal Design Power	4,5	65.0 W			65.0 W		
Intermediate P-State #1		2400 MHz			2400 MHz		
VID_VDD		1.275 V	1.300 V	1.325 V	1.250 V	1.275 V	1.300 V
IDD Max		44.6 A			41.4 A		
Thermal Design Power	4,5	59.9 W			54.8 W		
Intermediate P-State #2		2200 MHz			2200 MHz		
VID_VDD		1.225 V	1.250 V	1.275 V	1.200 V	1.225 V	1.250 V
IDD Max		38.5 A			35.8 A		
Thermal Design Power	4,5	50.2 W			45.9 W		
Intermediate P-State #3		2000 MHz			2000 MHz		
VID_VDD		1.175 V	1.200 V	1.225 V	1.150 V	1.175 V	1.200 V
IDD Max		33.0 A			30.6 A		
Thermal Design Power	4,5	41.8 W			38.2 W		
Intermediate P-State #4		1800 MHz			1800 MHz		
VID_VDD		1.125 V	1.150 V	1.175 V	1.150 V	1.125 V	1.150 V
IDD Max		28.0 A			28.0 A		
Thermal Design Power	4,5	34.5 W			35.2 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		18.5 A			17.8 A		
Thermal Design Power	4,5	23.3 W			22.6 W		
Halt/Stop Grant							
IDDC1 Max @ Max P-State	6,8	17.9 A			16.6 A		
IDDC1 Max @ Min P-State	7,8	4.6 A			4.4 A		
I/O Power	9,10	3.0 W			3.0 W		
C1E/S1 Min P-State VID_VDD	13						
IDDC1E Max		3.27 A			3.04 A		
I/O Power	9,10	350 mW			350 mW		
S3							
I/O Power	10,11,12	250 mW			250.0 W		

The notes for this table are on page 32.

2.3.9 ADX mmmsvtc 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 32.

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 40.

3 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 3.1 provides an example of the OPN structure for this processor family.

3.1 AMD Athlon™ 64 Processor Ordering Part Number Description

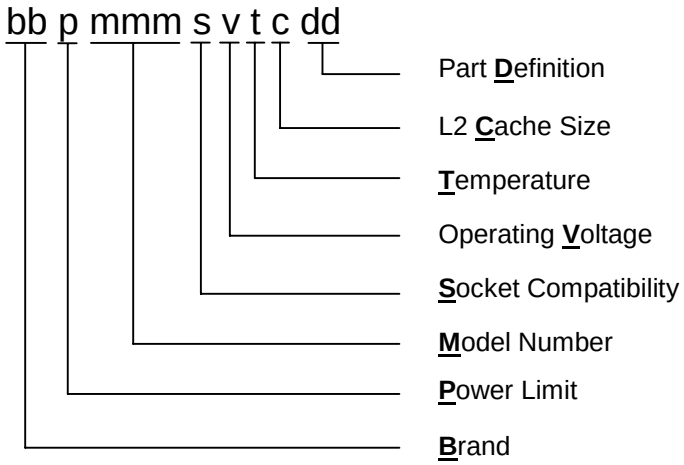

Figure 3. AMD Athlon™ 64 Processor Ordering Part Number Diagram

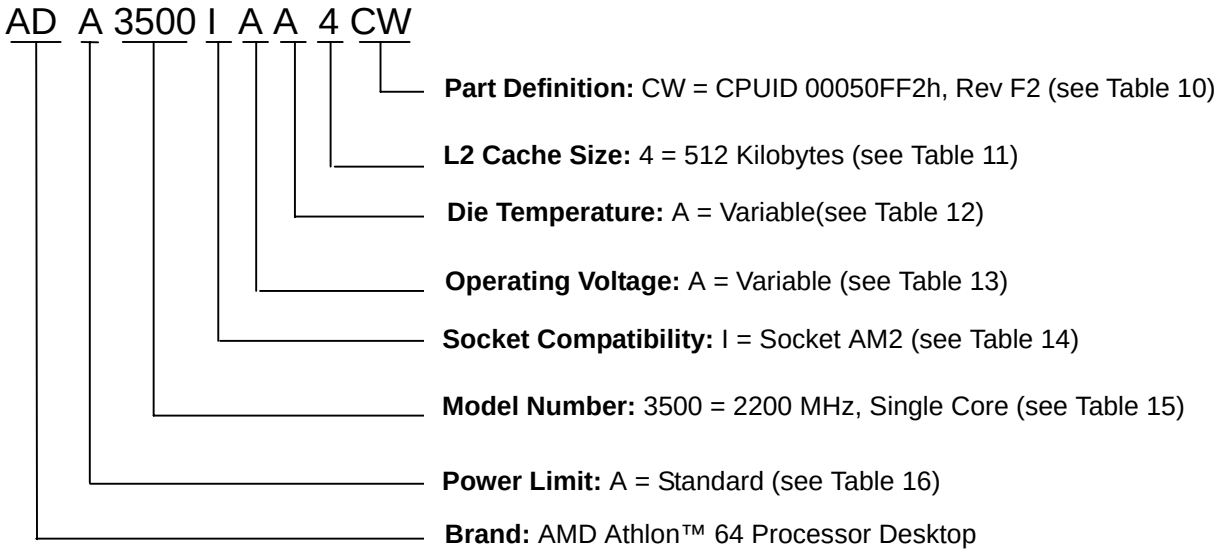

Figure 4. AMD Athlon™ 64 Processor Ordering Part Number Example

Table 10: 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 11: AMD Athlon™ 64 Processor L2 Cache Size Options

OPN Character	Cache Size
4	512 KB

Table 12: AMD Athlon™ 64 Processor Temperature Options

OPN Character	Temperature
A	Variable

Table 13: AMD Athlon™ 64 Processor Operating Voltage

OPN Character	Operating Voltage
A	Variable

Table 14: AMD Athlon™ 64 Processor Package Options

OPN Character	Package
I	Socket AM2 Processor

Table 15: 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 16: AMD Athlon™ 64 Processor Power Limit

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

Table 17: 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. If the heat sink design targets are met, the thermal profile specifications are met.*

3.2 AMD Athlon™ 64 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
ADA mmmmsvtc **CN**	Standard	Rev F2	Single Core	Section 3.3.1 on page 39
ADA mmmmsvtc **CW**	Standard	Rev F2	Single Core	Section 3.3.2 on page 41
ADA mmmmsvtc **DH**	Standard	Rev F3	Single Core	Section 3.3.3 on page 43
ADD mmmmsvtc **CN**	35 W	Rev F2	Single Core	Section 3.3.4 on page 44
ADH mmmmsvtc **DE**	45 W	Rev G1	Single Core	Section 3.3.5 on page 45

3.3 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 3.1 on page 33 provides an example of the OPN structure for processors documented in this chapter and Table 18 on page 37 provides a guide to OPN organization in the following subsections. Refer to Section 1.2 on page 9 and Section 1.3 on page 10 for numbering conventions and terminology definitions used in these tables. Refer to Section 1.2 on page 9 for full document titles and order numbers for reference documentation.

3.3.1 ADA mmmsvtc 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 46.

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 46.

3.3.2 ADA mmmsvtc 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 46.

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 46.

3.3.3 ADA mmmsvtc DH Thermal and Power Specifications

Parameter/OPN	Notes	ADA4000IAA4DH		
Tcase Max	1	55°C to 69°C		
Tcontrol Max	2	70°C		
Minimum Tambient		5°C		
Thermal Profile	3	C		
Max P-State		2600 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		2400 MHz		
VID_VDD		1.200 V	1.300 V	1.350 V
IDD Max		39.0 A		
Thermal Design Power	4,5	49.8 W		
Intermediate P-State #2		2200 MHz		
VID_VDD		1.150 V	1.250 V	1.300 V
IDD Max		33.7 A		
Thermal Design Power	4,5	41.8 W		
Intermediate P-State #3		2000 MHz		
VID_VDD		1.150 V	1.200 V	1.250 V
IDD Max		31.0 A		
Thermal Design Power	4,5	38.7 W		
Intermediate P-State #4		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		
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		21.0 A		
Thermal Design Power	4,5	26.1 W		
Halt/Stop Grant				
IDDC1 Max @ Max P-State	6,8	25.2 A		
IDDC1 Max @ Min P-State	7,8	6.7 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 46.

3.3.4 ADD mmmsvtc CN Thermal and Power Specifications

Parameter/OPN	Notes	ADD3500IAA4CN		
Tcase Max	1	55°C to 78°C		
Tcontrol Max	2	70°C		
Minimum Tambient		5°C		
Thermal Profile	3	E		
Max P-State		2200 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		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		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		
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		11.3 A		
Thermal Design Power	4,5	14.3 W		
Halt/Stop Grant				
IDDC1 Max @ Max P-State	6,8	11.1 A		
IDDC1 Max @ Min P-State	7,8	2.5 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 46.

3.3.5 ADH mmmsvtc 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 46.

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

4.1 AMD Athlon™ 64 FX Processor Ordering Part Number Description

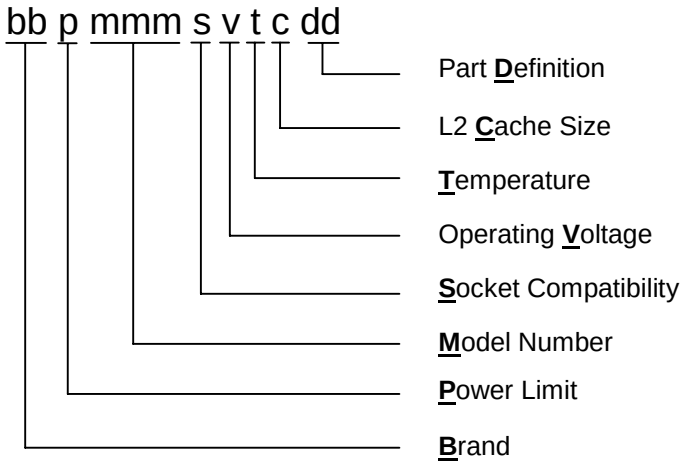

Figure 5. AMD Athlon™ 64 FX Processor Subsection Ordering Part Number Diagram

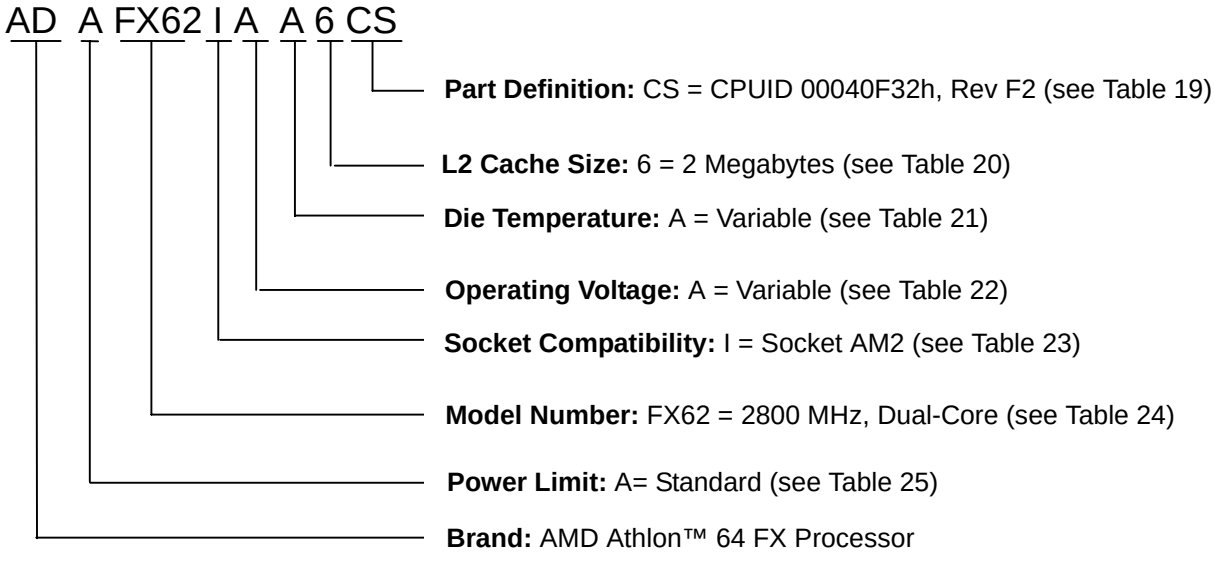

Figure 6. AMD Athlon™ 64 FX Processor Ordering Part Number Example

Table 19: 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

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

OPN Character	Cache Size
6	2 MB

Table 21: AMD Athlon™ 64 FX Processor Temperature Options

OPN Character	Temperature
A	Variable

Table 22: AMD Athlon™ 64 FX Processor Operating Voltage

OPN Character	Operating Voltage
A	Variable

Table 23: AMD Athlon™ 64 FX Processor Package Options

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

Table 24: 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 24: 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 25: AMD Athlon™ 64 FX Processor Power Limit

OPN Character	Power Limit
A	Standard

Table 26: 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. If the heat sink design targets are met, the thermal profile specifications are met.*

4.2 AMD Athlon™ 64 FX ProcessorThermal 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 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 4.3.1 on page 53
ADA mmmmsvtc **DI**	Standard	Rev F3	Dual-Core	Section 4.3.2 on page 54

4.3 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 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 9 and Section 1.3 on page 10 for numbering conventions and terminology definitions used in these tables. Refer to Section 1.2 on page 9 for full document titles and order numbers for reference documentation.

4.3.1 ADA mmmsvtc 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 55.

4.3.2 ADA mmmsvtc 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 55.

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 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.

5 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 5.1 provides an example of the OPN structure for this processor family.

5.1 AMD Sempron™ Processor Ordering Part Number Description

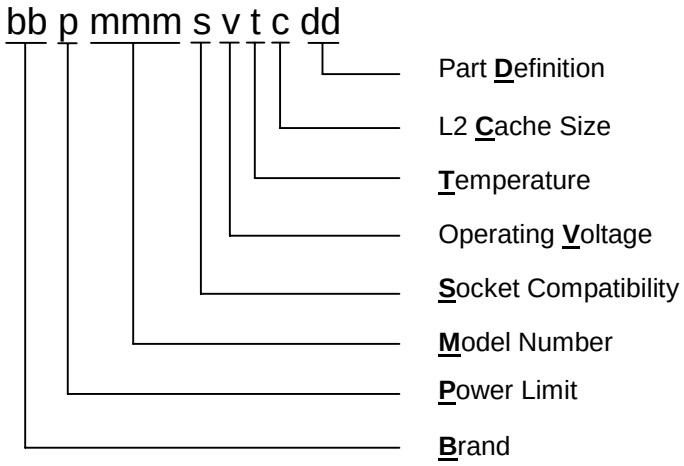

Figure 7. AMD Sempron™ Processor Ordering Part Number Diagram

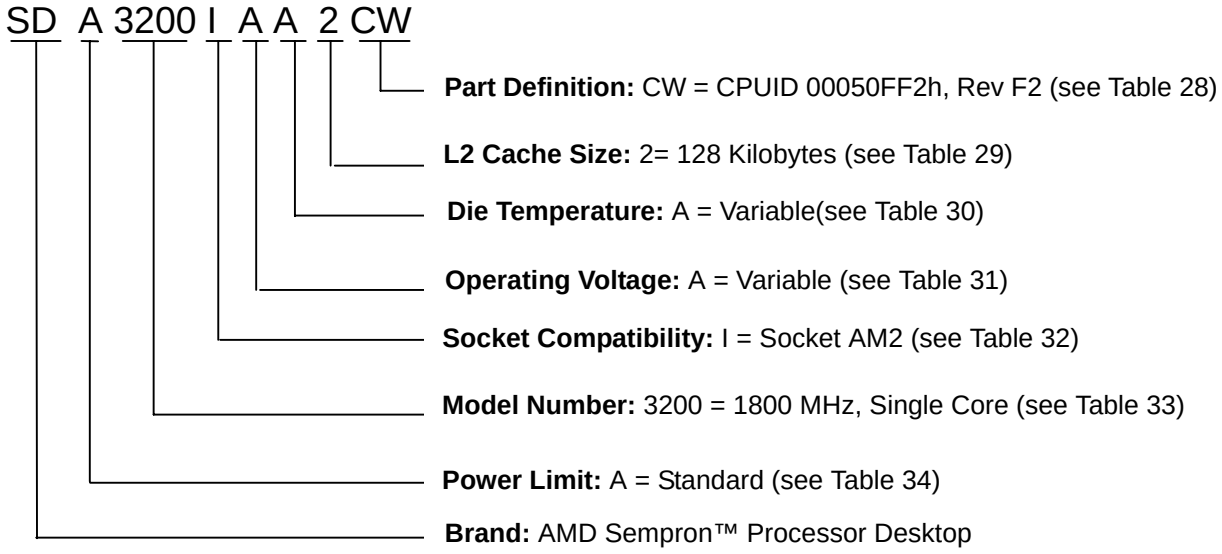

Figure 8. AMD Sempron™ Processor Ordering Part Number Example

Table 28: AMD Sempron™ Processor Part Definition Options

Part Definition	Revision	CPUID 8000_0001h EAX [31:0] (CPUID)
CN	Rev F2	00040FF2h
CW	Rev F2	00050FF2h

Table 29: AMD Sempron™ Processor L2 Cache Size Options

OPN Character	Cache Size
2	128 KB
3	256 KB

Table 30: AMD Sempron™ Processor Temperature Options

OPN Character	Temperature
A	Variable

Table 31: AMD Sempron™ Processor Operating Voltage

OPN Character	Operating Voltage
A	Variable

Table 32: AMD Sempron™ Processor Package Options

OPN Character	Package
I	Socket AM2 Processor

Table 33: AMD Sempron™ Processor Model Number Options

Package	Cache Size	Frequency	Model Number
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+

Table 34: AMD Sempron™ Processor Power Limit

OPN Character	Power Limit
A	Standard
D	35 W

Table 35: AMD Sempron™ Processor Thermal Profile

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

***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. If the heat sink design targets are met, the thermal profile specifications are met.*

5.2 AMD Sempron™ 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 Sempron™ Processor Thermal and Power Table Guide

SOPN	Power	Revision	Single/Dual-Core	Thermal/Power Tables
SDA mmmmsvtc **CN**	Standard	Rev F2	Single Core	Section 5.3.1 on page 62
SDA mmmmsvtc **CW**	Standard	Rev F2	Single Core	Section 5.3.2 on page 65
SDD mmmmsvtc **CN**	35W	Rev F2	Single Core	Section 5.3.3 on page 66

5.3 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 5.1 on page 56 provides an example of the OPN structure for processors documented in this chapter and Table 36 on page 60 provides a guide to OPN organization in the following subsections. Refer to Section 1.2 on page 9 and Section 1.3 on page 10 for numbering conventions and terminology definitions used in these tables. Refer to Section 1.2 on page 9 for full document titles and order numbers for reference documentation.

5.3.1 SDA mmmsvtc CN Thermal and Power Specifications

Parameter/OPN	Notes	SDA2800IAA2CN			SDA3000IAA3CN			SDA3200IAA2CN		
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		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 67.

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 67.

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-State		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-State #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-State #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-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		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 67.

5.3.2 SDA mmmsvtc CW Thermal and Power Specifications

Parameter/OPN	Notes	SDA3200IAA2CW			SDA3400IAA3CW		
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		1800 MHz			1800 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		N/A			N/A		
VID_VDD							
IDD Max							
Thermal Design Power	4,5						
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		24.4 A			24.4 A		
Thermal Design Power	4,5	29.8 W			29.8 W		
Halt/Stop Grant							
IDDC1 Max @ Max P-State	6,8	31.3 A			31.3 A		
IDDC1 Max @ Min P-State	7,8	8.3 A			8.3 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 67.

5.3.3 SDD mmmsvtc 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 67.

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 67.

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 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 Power Supply Specifications

6.1 ispmmmm **I** tvcdd **- Socket AM2 Power Supply Operating Conditions**

Table 37: ispmmmm **I** tvcdd **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 38: ispmmmm **I** tvcdd **VDD Power Supply AC Operating Conditions**

ispmmmmItvcdd AC Operating Conditions for VDD Power Supply

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

Notes:
1) Power supply A/C measurements use a 20-MHz scope bandwidth limit.

Table 39: ispmmmm **I** tvcdd **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		
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 guarantee 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 MTOPS

Table 40 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).

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Table 40: Composite Theoretical Performance (CTP) Calculations

Frequency	MTOPS Single-Core	MTOPS Dual-Core
800	2,467	4,667
1000	3,084	5,834
1200	3,700	7,000
1400	4,317	8,167
1600	4,934	9,334
1800	5,550	10,500
2000	6,167	11,667
2200	6,784	12,834
2400	7,400	14,000
2600	8,017	15,167
2800	8,634	16,334
3000	9,250	17,500