AMD Geode™ NX Processors

BIOS Considerations

Application Note

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Contacts

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Trademarks

1 Introduction

The AMD Geode™ NX processors are based on AMD Athlon™ processor technology that is optimized for low power operation. While totally software compatible with mainstream AMD Athlon processors, AMD Geode NX processors should not be considered interchangeable, as they share features found in different models of standard voltage Athlon processors. Because the Geode NX processors are energy efficient, they need special considerations in processor detection and power control. Existing standard BIOSs will not detect these processors in the correct manner, as the extended CPU feature set is inconsistent with mainstream AMD Athlon device definitions.

2 Processor Recognition

Boards that are designed for these low power processors may be damaged if a standard AMD Athlon processor is installed on the board, and the installed processor may overheat and fail. To avoid any confusion or damage that may result from recognizing AMD Geode NX processors as standard voltage AMD Athlon processors, CPUID support for Geode NX processors must be unique and not simply added to the standard AMD Athlon processor recognition code. If this is not done, Geode NX processors may not be recognized correctly, as they do not adhere to model recognition rules of mainstream Athlon devices.

BIOS for Geode NX processors should disable any code that modifies and or displays the processor name string according to the guidelines in Appendix B of the *AMD Processor Recognition Application Note*, publication# 20734. The name string returned by CPUID 8000_0002h – 8000_0004h should remain unchanged, and read AMD ATHLON™.

AMD uses a power performance rating to define the relative performance/power ratio of embedded processors. This is different than the PR rating used to measure processor performance of full power PCs. The frequency displayed by BIOS in an embedded Geode NX system should report the actual processor core frequency, not the power performance rating.

AMD Geode NX processors have the MP(19) bits set in the extended feature flags in EDX after CPUID 8000_0001h, and have power management feature bits [2:0] set in EDX after CPUID 8000_0007h. It is recommended that these bits be checked to insure the identity of the installed processor. The AMDCPUID utility can be used to display all of the CPUID fields. This tool is available on the AMD website in the Processors Support and Downloads area.

3 AMD PowerNow!™ Technology

AMD PowerNow!™ technology is supported on all of the Geode NX processors, even though the voltage may remain constant for some models. The maximum Frequency ID on Geode NX processors may be higher than the starting FID of the processor. As soon as practical after reset, the BIOS should switch the processor to the max FID to insure the best performance during initialization. After the OS has gained control, it may modify the FID/VID as the load dictates.

The FIDVID_STATUS Register is MSR C001_0042h and is formatted as shown in Table 1. All other bits are reserved. A complete description of the FID/VID change procedure can be found in the *AMD BIOS and Kernel Developer's Guide for the AMD Athlon 64 and AMD Opteron Processors*, publication# 26094.

Table 1. FIDVID_STATUS Register Definitions

Bits	Description
52-48	MAX VID
44-40	START VID
36-32	CURR VID
31	FID/VID Pending
28-24	Max Ramp VID
21-16	Max FID
13-8	START FID
5-0	CURR FID

If BIOS supports AMD PowerNow! technology, during post it will search BIOS memory for standard AMD PowerNow! tables that match the installed processor. The processor core frequency, the max FID, and CPUID are used as arguments to determine if the table matches the installed processor. Once a match has been made, the table is stored in the F000 segment. If the BIOS supports ACPI, the equivalent 2.0 version processor control tables (_PCT,_PSS,_PPC) are copied into ACPI memory space. The Geode NX processors are described in Table 2.

Table 2. AMD Geode™ NX Processors

	NX-1750	NX-1500	NX-1250
CPUID	681	681	681
FSB Frequency	133	133	133
StartFID	6X	6X	6X
MaxFID	10.5X	7.5X	5X
StartupVID	1.25V	1.0V	1.1V
MaxVID	1.25V	1.0V	1.1V
Max Watts	25.0W	9.0W	9.0W
Min Watts	3.0W	3.0W	3.0W

The AMD supplied utility, PSCHECK, available on the AMD Processor NDA website, can be used to check the operability of the generated tables. The AMD PowerNow!™ Dashboard can be used to illustrate the power savings under Microsoft® Windows®. This utility is available on the AMD website in the Processors Support and Downloads area. For more information on using PowerNow! with AMD Geode™ NX processors, see the *AMD Geode™ NX DB1500 Development Board Enabling AMD PowerNow!™ Technology & S2K Processor Bus Disconnect Power Saving Features Application Not*e, publication# 32334.

The suggested AMD PowerNow! state tables for the Geode NX processors are presented in Table 3.

Table 3. AMD PowerNow!™ State Tables

Device	Multiplier @ V	Watts
NX1250	5x @ 1.1V	9W
NX1500	5x @ 1.0V	5.94W
	6x @ 1.0V	7.2W
	7.5x @ 1.0V	9W
NX1750	5x @ 1.05V	12W
	7.5x @ 1.05V	17.75W
	9x @ 1.2V	21.5W
	10.5x @ 1.25V	25W

While the NX1250 has only one state, it is suggested that it be included in BIOS support to reduce complexity and to insure any future power handling changes include this model without logic changes. The table entry for Watts is used by programming to show power savings.

4 Other Power Saving Methods

4.1 S2K Disconnect

The high speed bi-directional S2K bus connects the processor to the North Bridge. When the processor is halted, the bus can be disconnected, reducing power consumption. This is accomplished by the North Bridge when a ‘HALT Special Cycle’ from the processor is detected. When the processor comes out of its halt condition, the bus will be restarted automatically. This feature may not be available on your North Bridge solution, but if present it should be enabled.

4.2 Processor Throttling

Legacy power management often used the Stop Clock processor pin to stop the processor for small intervals. This is accomplished by a South Bridge capable of asserting the Stop Clock pin for a programmed period of time, resulting in an effective duty cycle. This method reduces performance and energy consumption without regard to the program load. This method can be used for emergency thermal management in unforeseen hostile environments.