

APPENDIX D



Nx586
Processor
Databook

Nx586™ Processor Databook

PRELIMINARY
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Contents

Preface	v
Notation.....	v
Related Publications.....	vii
The Nx586 Processor Features	1
Nx586 Processor with Floating-Point Execution Unit Features	2
Nx586 Signals	4
Nx586 Pinouts by Signal Names	6
Nx586 Pinouts by PGA Pin Numbers	9
Nx586 Pinouts by JEDEC Pin Numbers	11
Nx586 NexBus/NexBus5 Signals	17
NexBus/NexBus5 Arbitration	17
NexBus/NexBus5 Cycle Control.....	19
NexBus Cache Control	21
NexBus Transceivers	23
NexBus/NexBus5 Address and Data	24
Nx586 L2 Cache Signals.....	29
Nx586 System Signals.....	30
Nx586 Clocks.....	30
Nx586 Interrupts and Reset	32
Nx586 Test and Reserved Signals	33
Nx586 Alphabetical Signal Summary.....	34
Hardware Architecture	41
Bus Structure	41
Processor Bus.....	42
L2 Cache Bus.....	45
Internal 64-bit Execution Unit Bus	45
Operating Frequencies.....	46
Internal Architecture	47

Storage Hierarchy	48
Transaction Ordering	51
Cache and Memory Subsystem	52
Characteristics.....	52
Level-2 Cache Power-on RESET Configurations	53
Cache Coherency	54
State Transitions.....	55
Invalid State	57
Shared State	58
Exclusive State.....	58
Modified State.....	59
Interrupts	59
Clock Generation	60
Bus Operations	61
Level-2 Asynchronous SRAM Accesses.....	61
Level-2 Synchronous SRAM Accesses.....	63
NexBus and NexBus ⁵ Arbitration and Address Phase	64
NexBus Basic Operations.....	64
NexBus ⁵ Single-Qword Memory Operations	66
NexBus ⁵ Cache Line Memory Operations	71
NexBus ⁵ I/O Operations	71
NexBus ⁵ Interrupt-Acknowledge Sequence	71
NexBus ⁵ Halt and Shutdown Operations.....	72
Obtaining Exclusive Use Of Cache Blocks.....	73
NexBus ⁵ Intervenor Operations.....	74
Modified Cache-Block Hit During Single-Qword Operations	74
Modified Cache-Block Hit During Four-Qword (Block) Operations	75
Electrical Data.....	77
Mechanical Data	79
Glossary.....	83
Index	89

Figures

Figure 1	Nx586 Functional Block Diagram.....	3
Figure 2	Nx586 Signal Organization.....	5
Figure 3	Nx586 Pin List. By Signal Name.....	6
Figure 4	Nx586 Pin List. By PGA Pin Name.....	9
Figure 5	Nx586 Pin List. By JEDEC Pin Name.....	11
Figure 6	Nx586 PGA Pinout Diagram (Top View).....	13
Figure 7	Nx586 PGA Pinout Diagram (Bottom View).....	14
Figure 8	Nx586 JEDEC Pinout Diagram (Top View).....	15
Figure 9	Nx586 JEDEC Pinout Diagram (Bottom View).....	16
Figure 10	NexBus/NexBus5 Address and Status Phase.....	24
Figure 11	Byte-Enable Usage during I/O Transfers.....	26
Figure 12	Byte-Enable Usage during Memory Transfers.....	26
Figure 13	Bus-Cycle Types.....	27
Figure 14	Nx586 Bus Structure Diagram.....	41
Figure 15	Nx586 Basic System Diagram.....	42
Figure 16	Nx586 with Systems Logic containing NexBus Transceivers.....	43
Figure 17	Example System with the Nx586 and NexBus5.....	44
Figure 18	System Clocking Relationships.....	46
Figure 19	Nx586 Internal Architecture.....	47
Figure 20	Storage Hierarchy (Reads).....	49
Figure 21	Storage Hierarchy (Writes).....	50
Figure 22	Cache Characteristics.....	52
Figure 23	L2 Cache SRAM Interface Modes.....	53
Figure 24	Basic Cache-State Transitions.....	55
Figure 25	Cache State Controls.....	56
Figure 26	Bus Snooping.....	57
Figure 27	Clocking Modes.....	60
Figure 28	Level-2 Asynchronous Cache Read and Write.....	62
Figure 29	Level-2 to Level-1 Asynchronous Cache Line Fill.....	62
Figure 30	Level-2 Synchronous Cache Read and Write.....	63
Figure 31	Fastest NexBus Single-Qword Read.....	65
Figure 32	Fastest NexBus Single-Qword Write.....	65
Figure 33	Fastest NexBus5 Single-Qword Read.....	67

Figure 34 Fast NexBus⁵ Single-Qword Read with a delayed GXACK.....67

Figure 37 Fastest NexBus⁵ Single-Qword Write.....70

Figure 38 NexBus⁵ Single-Qword Write With Wait States.....70

Figure 39 Interrupt Acknowledge Cycle72

Figure 40 Halt and Shutdown Encoding.....72

Figure 41 NexBus⁵ Single-Qword Read Hits Modified Cache Block.....75

Figure 42 Nx586 Package Diagram (top).....80

Figure 43 Nx586 Package Diagram (side).....81

Figure 44 Nx586 Package Diagram (bottom).....82

Preface

This databook covers the Nx586™ processor (called *the processor*). The databook is written for system designers considering the use of these devices in their designs. We assume an experienced audience, familiar not only with system design conventions but also with the x86 architecture. The *Glossary* at the end of the book defines NexGen's terminology, and the *Index* gives quick access to the subject matter.

NexGen's Applications Engineering Department welcomes your questions and will be glad to provide assistance. In particular, they can recommend system parts that have been tested and proven to work with NexGen™ products.

Notation

The following notation and conventions are used in this book:

Devices and Bus Names

- *Processor or CPU*—The Nx586 processor described in this book.
- NxVL™ Systems Logic—The NxVL system controller described in the *NxVL System Controller Databook*.
- NxPCI™ Systems Logic—The NxPCI system controller described in the *NxPCI System Controller Databook*.
- NxMC™ Memory Logic—The NxMC memory controller described in the *NxMC Memory Controller Databook*.
- NexBus⁵ System Bus—The NexGen system bus, including its multiplexed address/status and data bus (NxAD<63:0>) and related control signals.
- NexBus Processor Bus—The Nx586 processor bus, including its multiplexed address/status and data bus (AD<63:0>) and related control signals.

Signals and Timing Diagrams

- Active-Low Signals—Signal names that are followed by an asterisk, such as ALE*, indicate active-low signals. They are said to be "asserted" or "active" in their low-voltage state and "negated" or "inactive" in their high-voltage state.

- **Active-High Signals**—Signal names, such as GALE, that indicate active-high signals. They are said to be "asserted" or "active" in their high-voltage state and "negated" or "inactive" in their low-voltage state.
- **Bus Signals**—In signal names, the notation $\langle n:m \rangle$ represents bits n through m of a bus.
- **Reserved Bits and Signals**—Signals or bus bits marked "reserved" must be driven inactive or left unconnected, as indicated in the signal descriptions. These bits and signals are reserved by NexGen for future implementations. When software reads registers with reserved bits, the reserved bits must be masked. When software writes such registers, it must first read the register and change only the non-reserved bits before writing back to the register.
- **Source**—In timing diagrams, the left-hand column indicates the "Source" of each signal. This is the chip or logic that outputs the signal. When signals are driven by multiple sources, all sources are shown, in the order in which they drive the signal. In some cases, signals take on different names as outputs are logically ORed in group-signal logic.
- **Tri-state®**—In timing diagrams, signal ranges that are high impedance are shown as a straight horizontal line half-way between the high and low level.
- **Invalid and Don't Care**—In timing diagrams, signal ranges that are invalid or don't care are filled with a screen pattern.

Data

- **Quantities**—A word is two bytes (16 bits), a dword or doubleword is four bytes (32 bits), and a qword or quadword is eight bytes (64 bits).
- **Addressing**—Memory is addressed as a series of bytes on eight-byte (64-bit) boundaries, in which each byte can be separately enabled.
- **Abbreviations**—The following notation is used for bits and bytes:

Bits	b	as in "64b/qword"
Bytes	B	as in "32B/block"
kilo	k	as in "4kB/page"
Mega	M	as in "1Mb/sec"
Giga	G	as in "4GB of memory space"
- **Little Endian Convention**—The byte with the address $xx\dots xx00$ is in the least-significant byte position (little end). In byte diagrams, bit positions are numbered from right to left: the little end is on the right and the big end is on the left. Data structure diagrams in memory show small addresses at the bottom and high addresses at the top. When data items are "aligned," bit notation on a 64-bit data bus maps directly to bit notation in 64-bit-wide memory. Because byte addresses increase from right to left, strings appear in reverse order when illustrated according to the little-endian convention.
- **Bit Ranges**—In a range of bits, the highest and lowest bit numbers are separated by a colon, as in $\langle 63:0 \rangle$.
- **Bit Values**—Bits can either be *set* to 1 or *cleared* to 0.

- *Hexadecimal and Binary Numbers*—Unless the context makes interpretation clear, hexadecimal numbers are followed by an *h*, binary numbers are followed by a *b*, and decimal numbers are followed by a *d*.

Related Publications

The following books treat various aspects of computer architecture, hardware design, and programming that may be useful for your understanding of NexGen products:

NexGen Products

- *NxVL System Controller Databook*, NexGen, Milpitas, CA, Tel: (408) 435-0202.
- *NxPCI System Controller Databook*, NexGen, Milpitas, CA, Tel: (408) 435-0202.
- *NxMC Memory Controller Databook*, NexGen, Milpitas, CA, Tel: (408) 435-0202.

Bus Standards

- VESA VL-Bus Version 2.0, Video Electronics Standards Association, San Jose CA 1993.
- PCI Local Bus Specification Revision 2.0, Peripheral Component Interconnect Special Interest Group, Hillsboro, Oregon, 1993.

x86 Architecture

- John Crawford and Patrick Gelsinger, *Programming the 80386*, Sybex, San Francisco, 1987.
- Rakesh Agarwal, *80x86 Architecture & Programming*, Volumes I and II, Prentice-Hall, Englewood Cliffs, NJ, 1991.

General References

- John L. Hennessy and David A. Patterson, *Computer Architecture*, Morgan Kaufmann Publishers, San Mateo, CA, 1990.