IBM 486DX2 CPUs

486DX2 Style CPUs with 8K WriteBack Cache, On-Chip FPU, Advanced Power Management, and 3.3 Volt Technology

IBM ®

Application Note

Revision Summary: This revision adds part numbers and descriptive information pertaining to product design revision level 4.4 and deletes text references to specific voltages.

Product Overview

The IBM Microelectronics 486DX2 microprocessors are advanced 486DX2 microprocessors. The 486DX2 CPU operates at twice the external bus speed. The "486DX2" designation refers to the IBM 486DX2 microprocessor; the "-V" suffix indicates the CPU operates on a power supply lower than 5 volts.

The CPUs in the 486DX2-V family are high speed CPUs attaining clock-doubled core speeds of up to 80 MHz. Use of the lower voltage CPUs reduces power consumption by more than half compared to using the standard 5 volt CPUs. Designed into the lower voltage family is the ability for the data, address and control pins to interface to either 3-volt or 5-volt logic.

The 486DX2 8K Byte cache can be configured to run in traditional write-through mode or in the higher performance write-back mode. Write-back mode eliminates unnecessary external memory write cycles offering up to 15% higher overall performance (80 MHz, PC Bench 8.0) than write-through mode.

The 486DX2 supports 8, 16 and 32-bit data types and operates in real, virtual 8086 and protected modes. The CPU can access up to 4 GBytes of physical memory using a 32-bit burst mode bus. Floating point instructions are parallel processed using an on-chip math coprocessor.

The 486DX2 CPUs are an ideal design solution for low-powered "Green PC" desktops as well as portable computers. These microprocessors typically draw only 2 mA, while the input clock is stopped in suspend mode, due to their static design. System Management Mode (SMM) allows the implementation of transparent system power management or the software emulation of I/O peripheral devices.

The family of 486DX2 parts, including their operating frequency, voltage and package types is listed in the table on the following page.

486DX2 Part Numbers Rev. 1.8, 1.9, 1.91, 4.0 and 4.1						
Part Number	**Vcc (V)**	**Frequency(MHz) Bus**	**Internal**	**Package QFP**	**PGA**	**AC Specification**
IBM26BL486DX2-V50GP	3.3	25	50		x	Table 2-5 (Addendum)
IBM26BL486DX2-V50QP	3.3	25	50	x		Table 2-5 (Addendum)
IBM26BL486DX2-V66GP	3.3	33	66		x	Table 2-6 (Addendum)
IBM26BL486DX2-V66QP	3.3	33	66	x		Table 2-6 (Addendum)
IBM26BL486DX2-3-6V66GP	3.6	33	66		x	Table 2-6 (Addendum)
IBM26BL486DX2-3-6V66QP	3.6	33	66	x		Table 2-6 (Addendum)
IBM26BL486DX2-V80GP	3.3	40	80		x	Table 2-7 (Addendum)
IBM26BL486DX2-50GP	5	25	50		x	Table 4-7 (Databook)
IBM26BL486DX2-66GP	5	33	66		x	Table 4-8 (Databook)
Rev. 4.2						
IBM26486-V150GA	3.3	25	50		x	Table 2-5 (Addendum)
IBM26486-V150QA	3.3	25	50	x		Table 2-5 (Addendum)
IBM26486-V266GA	3.3	33	66		x	Table 2-6 (Addendum)
IBM26486-V266QA	3.3	33	66	x		Table 2-6 (Addendum)
IBM26486-V466GA	3.6	33	66		x	Table 2-6 (Addendum)
IBM26486-V466QA	3.6	33	66	x		Table 2-6 (Addendum)
IBM26486-V666GA	3.45/3.6	33	66		x	Table 2-6 (Addendum)
IBM26486-V666QA	3.45/3.6	33	66	x		Table 2-6 (Addendum)
IBM26486-V580GA	4	40	80		x	Table 2-7 (Addendum)
Rev. 4.4						
IBM26486-2V266GB	3.33	33	66		*x*	*Table 2-6 (Addendum)*
IBM26486-2V366GB	3.45	33	66		*x*	*Table 2-6 (Addendum)*
IBM26486-2V380GB	3.45	40	80		*x*	*Table 2-7 (Addendum)*

- **HIGH SPEED 3.3, 3.6, 4.0 VOLT VERSIONS**
  - Clock doubled core speeds up to 80 MHz
  - Advanced 3.3, 3.45, 3.6 & 4.0 volt CMOS Process technology
  - I/O buffers interface to either 3.3 or 5 volt logic

- **IMPROVED 486DX2 PERFORMANCE**
  - Integrated FPU 10% faster thn 80486DX (Power Meter Whetstone)
  - 40 and 50 MHz bus speeds for fast local bus systems

- **INDUSTRY STANDARD 486 COMPATIBILITY**
  - 486DX socket and instruction set compatible
  - Runs DOS, Windows, OS/2, UNIX
  - Standard 168-pin PGA or 208-pin QFP package

- **ON-CHIP 8K-BYTE WRITE-BACK CACHE**
  - Up to 15% higher performance than write-through (PC Bench 8.0,80 MHz)
  - Industry wide write-back chipset support
  - Burst mode write capability
  - Configurable as write-back or write-through

- **ADVANCED POWER MANAGEMENT**
  - Fast SMI interrupt with separate memory space
  - Fully static design permits dynamic clock control
  - Software or hardware initated low-power suspend mode
  - Automatic FPU power down mode

The IBM BLUE LIGHTNING 486DX2 3 volt and 5 volt CPUs are advanced, 486DX2 compatible processors. These CPUs incorporate an on-chip 8K-Byte write-back cache and an integrated math co-processor.

The high speed 3.3, 3.45, 3.6 and 4.0 volt 486DX2-V family enables clock speeds up to 80 MHz. The advanced low voltage process technology power consumption is less than half the power consumption of standard 5 volt CPUs. Data, address and control pins are designed for either 3.3 or 5 volt operation.

The on-chip write-back cache allows up to 15% higher performance by eliminating unnecessary external write cycles. On traditional write-through CPUs these external write cycles can create bus bottlenecks affecting system-wide performance.

The integrated floating point unit based on Cyrix's® FasMath™ architecture improves performance up to 10% over the 80486DXs measured using Power Meter Whetstone test.

These processors are designed to meet the power management requirements in the newest generation of low-powered desktops and notebooks. Power is saved not only by using low voltage power but by taking advantage of advanced power managemant features such as static cicuitry, SMM and automatic FPU power-down. Fast entry and exit of SMM allows frequent use of the SMM feature without noticeable performance degradation.

This CPU family maintains compatibility with the installed base of x86 software and provides essential socket compatibility with the 486DX2.