# Microprocessors, Embedded Controllers and Integrated Processors

**MOTOROLA**

## Motorola M68000 Family Upward Compatible 16-/32-Bit Microprocessors

### MC68020, 32-Bit HCMOS Microprocessor

The 020 has a full 32-bit internal and 32-bit external, regular, symmetrical architecture. It offers all the functionality of the M68000 Family MPUs and maintains software user-code compatibility. The unique on-chip instruction cache helps provide burst-mode operation to 12.5 MIPS. The 020 is the proven leader in high performance systems in office automation, engineering workstations, fault tolerant computers, parallel processors, telephone switching systems, and intelligent controllers.

| Mfr.'s Type<br>114 Lead PGA (Gold Lead) | Operating Frequency (MHz) | MIPS | MFLOPS | Address Range (Bytes) | Data Bus (Bit) | Instruction Cache (Bytes) | Data Cache (Bytes) | Burst Mode | General Purpose Registers | Address Modes | On-Chip MMU | Floating Point Solution |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MC68020RC16E | 16 | 5.5 | 0.25 | 4 G | 32 | 256 | N/A | N/A | 16 | 18 | No | 68882 |
| MC68020RC20E | 20 | 5.5 | 0.25 | 4 G | 32 | 256 | N/A | N/A | 16 | 18 | No | 68882 |
| MC68020RC25E | 25 | 5.5 | 0.25 | 4 G | 32 | 256 | N/A | N/A | 16 | 18 | No | 68882 |
| MC68020RC33E | 33 | 5.5 | 0.25 | 4 G | 32 | 256 | N/A | N/A | 16 | 18 | No | 68882 |

### MC68030, Second Generation 32-Bit HCMOS Microprocessor

The 030 contains two independent 32-bit address buses and two 32-bit data buses which allows the the CPU, caches, MMU, and the bus controller to operate in parallel. This makes it possible for the 030 to simultaneously access an instruction from the instruction cache, data from the data cache and instruction/data from external memory. Performance is further enhanced by on-chip 256 byte instruction and data caches, on-chip MMU, and enhanced bus controller.

| Mfr.'s Type<br>132 Lead CQFP (Gull Wing) | 128 PGA (Gold Lead) | Operating Frequency (MHz) | MIPS | MFLOPS | Address Range (Bytes) | Data Bus (Bit) | Instruction Cache (Bytes) | Data Cache (Bytes) | Burst Mode | General Purpose Registers | Address Modes | On-Chip MMU | Floating Point Solution |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| — | MC68030RC20C | 20 | 12 | 0.5 | 4 G | 32 | 256 | 256 | 16 Byte R | 16 | 18 | Yes | 68882 |
| MC68030FE25C | MC68030RC25C | 25 | 12 | 0.5 | 4 G | 32 | 256 | 256 | 16 Byte R | 16 | 18 | Yes | 68882 |
| — | MC68030RC33C | 33 | 12 | 0.5 | 4 G | 32 | 256 | 256 | 16 Byte R | 16 | 18 | Yes | 68882 |
| — | MC68030RC40C | 40 | 12 | 0.5 | 4 G | 32 | 256 | 256 | 16 Byte R | 16 | 18 | Yes | 68882 |
| — | MC68030RC50C | 50 | 12 | 0.5 | 4 G | 32 | 256 | 256 | 16 Byte R | 16 | 18 | Yes | 68882 |

### MC68040, Third Generation 32-Bit HCMOS Microprocessor

The 040 is a virtual memory microprocessor employing multiple, concurrent execution units and a highly integrated architecture. On a single chip, the 040 integrates a MC68030 compatible integer unit, an IEEE 754 compatible floating point unit (FPU) and fully independent instruction and data demand-paged memory units (MMUs), including independent 4 K-byte instruction and data caches. A high degree of parallelism is achieved through use of multiple independent execution pipelines, multiple internal buses, and a full Harvard architecture, including separate physical caches for instruction and data accesses. The 040 also directly supports cache coherency in multimaster applications with dedicated on-chip bus snooping logic.

| Mfr.'s Type<br>184 Lead CQFP (Gull Wing) | 179 Lead PGA (Gold Lead) | Operating Frequency (MHz) | MIPS | MFLOPS | Address Range (Bytes) | Data Bus (Bit) | Instruction Cache (Bytes) | Data Cache (Bytes) | Burst Mode | General Purpose Registers | Address Modes | On-Chip MMU | Floating Point Solution |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MC68040FE25 | MC68040RC25 | 25 | 35 | 3.5 | 4 G | 32 | 4 K | 4 K | 16 Byte R/W | 16 | 18 | Yes* | On-Chip |

*Separate Instruction/Data.

### MC68LC040

The MC68LC040 is a compatible integer unit and MMU. It is the ideal solution for cost sensitive computer or sophisticated embedded applications.

| MC68LC040FE25 | MC68LC040RC25A | 25 | 27 | N/A | 4 G | 32 | 4 K | 4 K | 16 Byte R/W | 16 | 18 | Yes | No |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MC68LC040FE33 | MC68LC040RC33 | 33 | 36 | N/A | 4 G | 32 | 4 K | 4 K | 16 Byte R/W | 16 | 18 | Yes | No |

### MC68882, Enhanced Floating Point Coprocessor

The MC68882 is pin-to-pin hardware and software compatible with the MC68881 Floating Point Coprocessor and implements a variety of performance enhancements including dual-ported registers and an advanced pipeline. Additional enhancements allows execution of multiple instructions in parallel for 2-4 times the Floating Point performance of the MC68881.

| Mfr.'s Type<br>68 Lead PGA (Gold Lead) | Operating Frequency (MHz) | Mfr.'s Type<br>68 Lead PGA (Gold Lead) | Operating Frequency (MHz) |
|---|---|---|---|
| MC68882RC25A | 25 | MC68882RC33A | 33 |

## High Performance 68 K Embedded Controllers

### MC68EC040, 32-Bit High Performance Embedded Controller

High performance 32-bit MPU with on-chip instruction and data cache provides high speed access for control routines and data. The EC040 utilizes a low cost DRAM bus interface and also supports multimaster/multiprocessor systems with bus snooping.

| Mfr.'s Type<br>184 Lead CQFP (Gull Wing) | 179 Lead PGA (Gold Lead) | Operating Frequency (MHz) | MIPS | Address Range (Bytes) | Instruction Cache (Bytes) | Data Cache (Bytes) | Burst Fill Caches (Bytes) | General Purpose Registers | Address Modes | Floating Point Hardware |
|---|---|---|---|---|---|---|---|---|---|---|
| MC68EC040FE25A | MC68EC040RC25 | 25 | 27 | 4 G | 4 K | 4 K | 16 | 16 | 18 | 68040 |
| MC68EC040FE33 | MC68EC040RC33 | 33 | 36 | 4 G | 4 K | 4 K | 16 | 16 | 18 | 68040 |

## High Performance 68 K Integrated Processors

### MC68306, Integrated 68EC00 Processor

The 68306 includes a 68EC000 core processor, a 68681 Dual Universal Asynchronous Receiver Transmitter (DUART), system integration functions and a DRAM controller. The on-chip DRAM controller gives the 68306 the simplest interface to DRAM based designs. The DRAM controller easily accommodates 64 Mbytes of memory. The 68306 saves time in the design cycle by providing valuable 68000 system components in one chip.

| Mfr.'s Type<br>132 Lead PQ (Gull Wing) | 144 Lead TQFP | Operating Frequency (MHz) | Core Processor | DMA | Serial Processor | Time Processor Unit | Flash EEPROM | Serial I/O | Timers | A/D Converter | SRAM | DRAM Controller | Glue Logic (SIM) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MC68306FC16B | MC68306PV16B | 16 | 68EC000 | N/A | N/A | N/A | N/A | Yes | N/A | N/A | N/A | Yes | Yes |

### MC68340, Integrated Multiprotocol Processor with DMA

The MC68340 features a CPU32 core and a high speed two channel, 32-bit Direct Memory Access (DMA) controller that eliminates the usual bus arbitration and synchronization delays, maximizing data throughout (25-Mbytes per second on a 16-bit bus. It also contains a SIM, a 68681/2681 compatible DUART, two identical counters/timers each with a 16-bit counter and an 8-bit prescaler with 80 ns resolution.

| Mfr.'s Type<br>144 Lead CQFP (Gull Wing) | Operating Frequency (MHz) | Core Processor | DMA | Serial Processor | Time Processor Unit | Flash EEPROM | Serial I/O | Timers | A/D Converter | SRAM | DRAM Controller | Glue Logic (SIM) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MC68340FE16E | 16 | CPU32 | Yes | N/A | N/A | N/A | Yes | 2 | N/A | N/A | N/A | Yes |
| MC68340FE25E | 25 | CPU32 | Yes | N/A | N/A | N/A | Yes | 2 | N/A | N/A | N/A | Yes |

*3.3 Volt Version.

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