



MOTOROLA

MCM68766

Advance Information

8192 x 8-BIT UV ERASABLE PROM

The MCM68766 is a 65,536-bit Erasable and Electrically Reprogrammable PROM designed for system debug usage and similar applications requiring nonvolatile memory that could be reprogrammed periodically, or for replacing 64K ROMs for fast turnaround time. The transparent window on the package allows the memory content to be erased with ultraviolet light.

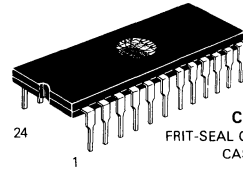
For ease of use, the device operates from a single power supply that has an output enable control and is pin-for-pin compatible with the MCM68366 mask programmable ROMs, which are available for large volume production runs of systems initially using the MCM68766.

- Single +5 V Power Supply
- Organized as 8192 Bytes of 8 Bits
- Fully TTL Compatible
- Maximum Access Time = 450 ns MCM68766
350 ns MCM68766-35
- Standard 24-Pin DIP for EPROM Upgradability
- Pin Compatible to MCM68366 Mask Programmable ROM
- Power Dissipation — 160 mA Maximum

MOS

(N-CHANNEL, SILICON-GATE)

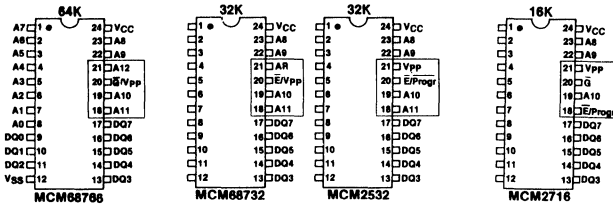
8192 x 8-BIT UV ERASABLE PROGRAMMABLE READ ONLY MEMORY



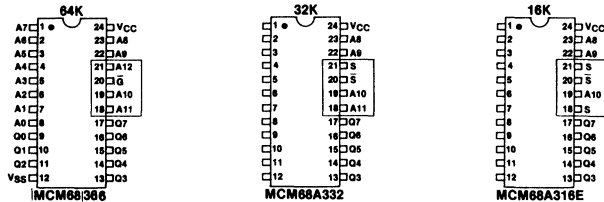
C SUFFIX
FRIT-SEAL CERAMIC PACKAGE
CASE 623A-02

L SUFFIX CERAMIC PACKAGE
ALSO AVAILABLE — CASE 716-07

MOTOROLA'S PIN-COMPATIBLE EPROM FAMILY

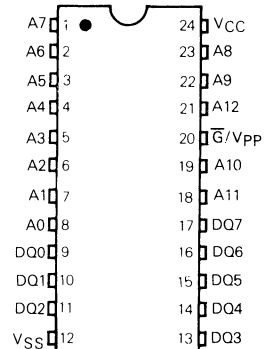


MOTOROLA'S PIN-COMPATIBLE ROM FAMILY



INDUSTRY STANDARD PINOUTS

PIN ASSIGNMENT



*Pin Names

A.....Address
DQ.....Data Input/Output
G/Vpp.....Output Enable/ Program

*New industry standard nomenclature

ABSOLUTE MAXIMUM RATINGS

| Rating | Value | Unit |
|--|-------------|------|
| Temperature Under Bias | -10 to +80 | °C |
| Operating Temperature Range | 0 to +70 | °C |
| Storage Temperature | -65 to +125 | °C |
| All Input or Output Voltages with Respect to V _{SS} | +6 to -0.3 | Vdc |
| V _{pp} Supply Voltage with Respect to V _{SS} | +28 to -0.3 | Vdc |

This device contains circuitry to protect the inputs against damage due to high static voltages or electric fields; however, it is advised that normal precautions be taken to avoid application of any voltage higher than maximum rated voltages to this high-impedance circuit.

NOTE: Permanent device damage may occur if ABSOLUTE MAXIMUM RATINGS are exceeded. Functional operation should be restricted to RECOMMENDED OPERATING CONDITIONS. Exposure to higher than recommended voltages for extended periods of time could affect device reliability.

2

MODE SELECTION

| Mode | Pin Number | | | |
|----------------|-----------------|--------------------|---|--------------------|
| | 9-11, 13-17, DQ | 12 V _{SS} | 20 \bar{G}/V_{PP} | 24 V _{CC} |
| Read | Data Out | V _{SS} | V _{IL} | V _{CC} |
| Output Disable | High-Z | V _{SS} | V _{IH} | V _{CC} |
| Program | Data In | V _{SS} | Pulsed V _{ILP} to V _{IHP} | V _{CC} |

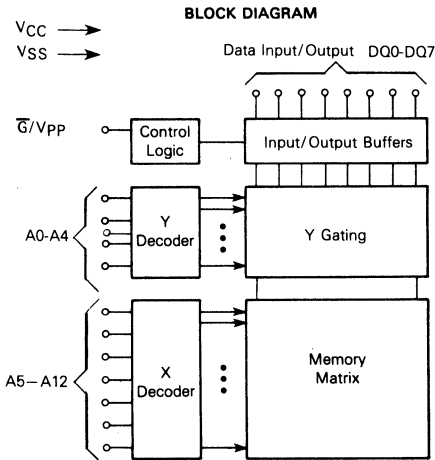
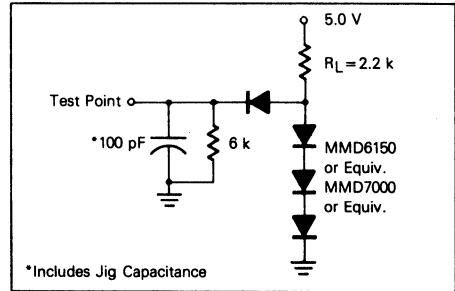


FIGURE 1 — AC TEST LOAD



CAPACITANCE (f = 1.0 MHz, T_A = 25°C, V_{CC} = 5 V periodically sampled rather than 100% tested)

| Characteristic | Symbol | Typ | Max | Unit |
|--|------------------|-----|-----|------|
| Input Capacitance (V _{in} = 0 V) Except \overline{G}/V_{PP} | C _{in} | 4.0 | 6.0 | pF |
| Input Capacitance (\overline{G}/V_{PP}) | C _{in} | 60 | 100 | pF |
| Output Capacitance (V _{out} = 0 V) | C _{out} | 8.0 | 12 | pF |

Capacitance measured with a Boonton Meter or effective capacitance calculated from the equation: C = I_d/ΔV.

DC OPERATING CONDITIONS AND CHARACTERISTICS
(Full operating voltage and temperature range unless otherwise noted)

RECOMMENDED DC OPERATING CONDITIONS

| Parameter | Symbol | Min | Nom | Max | Unit |
|--------------------|-----------------|-------------|------------|-----------------------|------|
| Supply Voltage | V _{CC} | 4.75 4.5 | 5.0 5.0 | 5.25 5.5 | Vdc |
| Input High Voltage | V _{IH} | 2.0 | — | V _{CC} + 1.0 | Vdc |
| Input Low Voltage | V _{IL} | -0.1 | — | 0.8 | Vdc |

DC OPERATING CHARACTERISTICS

| Characteristic | Condition | Symbol | Min | Typ | Max | Units |
|---|--------------------------------|-----------------------------------|-----|-----|------|-------|
| Address Input Sink Current | V _{in} = 5.25 V | I _{in} | — | — | 10 | μA |
| Output Leakage Current | V _{out} = 5.25 V | I _{LO} | — | — | 10 | μA |
| \overline{G}/V_{PP} Input Sink Current | $\overline{G}/V_{PP} = 0.4$ V | I _{GL} | — | — | 100 | μA |
| | $\overline{G}/V_{PP} = 2.4$ V | I _{GH} = I _{PL} | — | — | 400 | μA |
| V _{CC} Supply Current (Outputs Open) | $\overline{G}/V_{PP} = V_{IL}$ | I _{CC} | — | — | 160 | mA |
| Output Low Voltage | I _{OL} = 2.1 mA | V _{OL} | — | — | 0.45 | V |
| Output High Voltage | I _{OH} = -400 μA | V _{OH} | 2.4 | — | — | V |

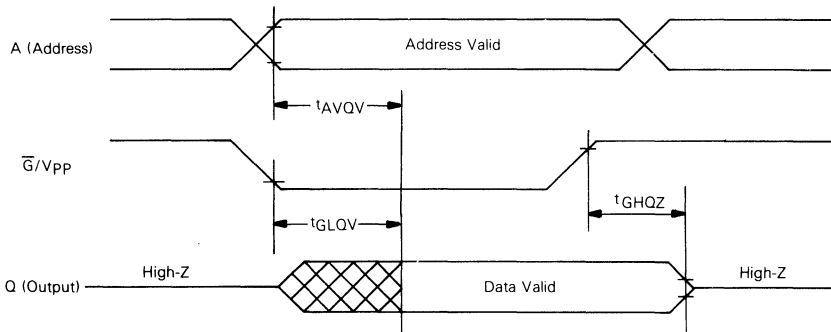
AC OPERATING CONDITIONS AND CHARACTERISTICS

(Full operating voltage and temperature range unless otherwise noted)

Input Pulse Levels.....0.8 Volt and 2.2 Volts
 Input Rise and Fall Times.....20 ns
 Input Timing Levels.....1.0 Volt and 2 Volts
 Output Timing Levels.....0.8 Volt and 2 Volts
 Output Load.....See Figure 1

| Characteristic | Condition | Symbol | MCM68766-35 | | MCM68766 | | Units |
|--------------------------------|-------------------------|-------------------|-------------|-----|----------|-----|-------|
| | | | Min | Max | Min | Max | |
| Address Valid to Output Valid | $\overline{G} = V_{IL}$ | t _{AVQV} | — | 350 | — | 450 | ns |
| \overline{G} to Output Valid | — | t _{GLQV} | — | 150 | — | 150 | ns |
| \overline{G} to Hi-Z Output | — | t _{GHQZ} | 0 | 100 | 0 | 100 | ns |
| Data Hold from Address | $\overline{G} = V_{IL}$ | t _{AXDX} | 0 | — | 0 | — | ns |

READ MODE TIMING DIAGRAM



DC PROGRAMMING CONDITIONS AND CHARACTERISTICS

($T_A = 25 \pm 5^\circ\text{C}$)

RECOMMENDED PROGRAMMING OPERATING CONDITIONS

| Parameter | Symbol | Min | Nom | Max | Unit |
|---|-----------|------|----------|--------------|------|
| Supply Voltage | V_{CC} | 4.75 | 5.0 | 5.25 | Vdc |
| Input High Voltage for All Addresses and Data | V_{IH} | 2.2 | — | $V_{CC} + 1$ | Vdc |
| Input Low Voltage for All Addresses and Data | V_{IL} | -0.1 | — | 0.8 | Vdc |
| Program Pulse Input High Voltage | V_{IHP} | 24 | 25 | 26 | Vdc |
| Program Pulse Input Low Voltage | V_{ILP} | 2.0 | V_{CC} | 6.0 | Vdc |

PROGRAMMING OPERATION DC CHARACTERISTICS

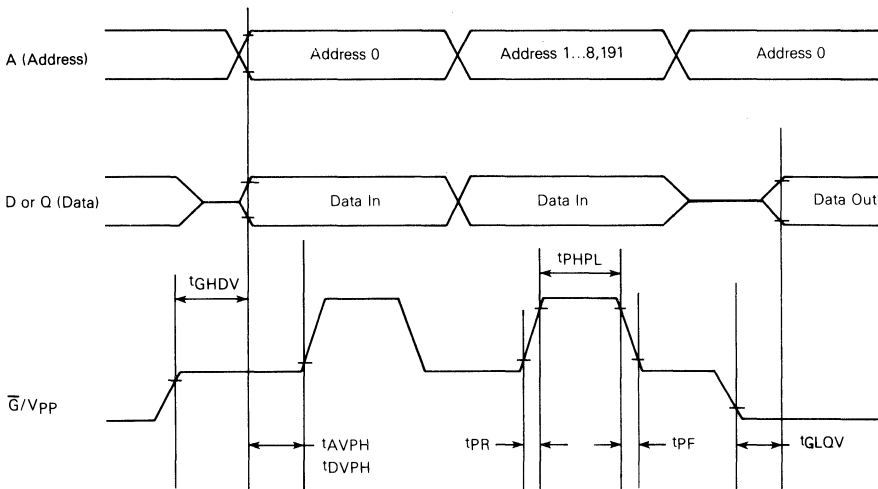
| Characteristic | Condition | Symbol | Min | Typ | Max | Unit |
|---|--------------------------|-------------------|-----|-----|-----|--------------------|
| Address Input Sink Current | $V_{in} = 5.25\text{ V}$ | I_{LI} | — | — | 10 | μA_{dc} |
| V_{pp} Program Pulse Supply Current ($V_{pp} = 25\text{ V} \pm 1\text{ V}$) | — | I_{PH} | — | — | 30 | mA_{dc} |
| V_{pp} Supply Current ($V_{pp} = 2.4\text{ V}$) | — | $I_{PL} = I_{GH}$ | — | — | 400 | μA |
| V_{CC} Supply Current ($V_{pp} = 5\text{ V}$) | — | I_{CC} | — | — | 160 | mA_{dc} |

AC PROGRAMMING OPERATING CONDITIONS AND CHARACTERISTICS

| Characteristic | Symbol | Min | Max | Unit |
|---------------------------------------|------------|-----|-----|---------------|
| Address Setup Time | t_{AVPH} | 2.0 | — | μs |
| Data Setup Time | t_{DVPH} | 2.0 | — | μs |
| Output Enable to Valid Data | t_{GLQV} | 150 | — | ns |
| Output Disable to Data In | t_{GHDV} | 2.0 | — | μs |
| Program Pulse Width | t_{PHPL} | 1.9 | 2.1 | ms |
| Program Pulse Rise Time | t_{PR} | 0.5 | 2.0 | μs |
| Program Pulse Fall Time | t_{PF} | 0.5 | 2.0 | μs |
| Cumulative Programming Time Per Word* | t_{CP} | 12 | 50 | ms |

*Block mode programming must be used. Block mode programming is defined as one program pulse applied to each of the 8,192 address locations in sequence. Multiple blocks are used to accumulate programming time (t_{CP}).

PROGRAMMING OPERATION TIMING DIAGRAM



PROGRAMMING INSTRUCTIONS

After the completion of an ERASE operation, every bit in the device is in the "1" state (represented by Output High). Data are entered by programming zeros (Output Low) into the required bits. The words are addressed the same way as in the READ operation. A programmed "0" can only be changed to a "1" by ultraviolet light erasure.

To set the memory up for Program Mode, the \bar{G}/V_{pp} input (Pin 20) should be between +2.0 and +6.0 V, which will three-state the outputs and allow data to be set up on the DQ terminals. The V_{CC} voltage is the same as for the Read operation. Only "0's" will be programmed when "0's" and "1's" are entered in the 8-bit data word.

After address and data setup, 25-volt programming pulse (V_{IH} to V_{IHP}) is applied to the \bar{G}/V_{pp} input. The program pulse width is 2 ms and the maximum program pulse amplitude is 26 V.

Multiple MCM68766s may be programmed in parallel by connecting like inputs and applying the program pulse to the \bar{G}/V_{pp} inputs. Different data may be programmed into multiple MCM68766s connected in parallel by selectively applying the programming pulse only to the MCM68766s to be programmed.

READ OPERATION

After access time, data is valid at the outputs in the Read mode. With $\bar{G}/V_{pp} = "0"$ the outputs are enabled; with $\bar{G}/V_{pp} = "1"$ the outputs are three-stated.

Multiple MCM68766s may share a common data bus with like outputs OR-tied together. In this configuration only one \bar{G}/V_{pp} input should be low and no other device outputs should be active on the same bus. This will prevent data contention on the bus.

ERASING INSTRUCTIONS

The MCM68766 can be erased by exposure to high intensity shortwave ultraviolet light, with a wavelength of 2537 angstroms. The recommended integrated dose (i.e., UV-intensity X exposure time) is 15 Ws/cm². As an example, using the "Model 30-000" UV Eraser (Turner Designs, Mountain View, CA 94043) the ERASE-time is 36 minutes. The lamps should be used without shortwave filters and the MCM68766 should be positioned about one inch away from the UV-tubes.