MOTOROLA

MCM68764
MCM68A764

Advance Information

MOS

(N-CHANNEL, SILICON-GATE)

8192 X 8-BIT
UV ERASABLE PROM

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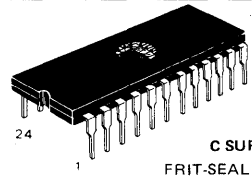
8192 X 8-BIT UV ERASABLE PROM

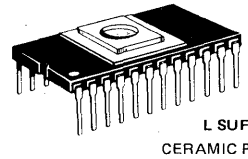
The MCM68764/68A764 is a 65,536-bit Erasable and Electrically Reprogrammable PROM designed for system debug usage and similar applications requiring nonvolatile memory that could be reprogrammed periodically or for replacing 64K ROMs for fast turnaround time. The transparent window on the package allows the memory content to be erased with ultraviolet light.

For ease of use, the device operates from a single power supply and has a static power-down mode. Pin-for-pin mask programmable ROMs are available for large volume production runs of systems initially using the MCM68764/68A764.

- Single +5 V Power Supply
- Automatic Power-down Mode (Standby) with Chip Enable
- Organized as 8192 Bytes of 8 Bits
- Low Power Dissipation
- Fully TTL Compatible
- Maximum Access Time = 450 ns MCM68764
  350 ns MCM68A764
- Standard 24-Pin DIP for EPROM Upgradability
- Pin Compatible to MCM68A364 Mask Programmable ROM



C SUFFIX
FRIT-SEAL PACKAGE
CASE 623A

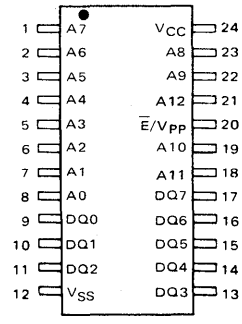


L SUFFIX
CERAMIC PACKAGE
CASE 716

MODE SELECTION

Mode	PIN NUMBER			
	9-11, 13-17, DQ	12 V_{SS}	20 $\overline{E}/V_{PP}$	24 V_{CC}
Read	Data out	V_{SS}	V_{IL}	V_{CC}
Output Disable	Hi-Z	V_{SS}	V_{IH}	V_{CC}
Standby	Hi-Z	V_{SS}	V_{IH}	V_{CC}
Program	Data in	V_{SS}	Pulsed V_{ILP} to V_{IHP}	V_{CC}

PIN ASSIGNMENT



*PIN NAMES	
A	Address
DQ	Data Input/Output
$\overline{E}/V_{PP}$	Chip Enable/Program
$\overline{G}$	Output Enable

*New industry standard nomenclature

ABSOLUTE MAXIMUM RATINGS (1)

Rating	Value	Unit
Temperature Under Bias	–10 to +80	°C
Storage Temperature	–65 to +125	°C
All Input or Output Voltages with Respect to V_{SS} during Read	+ 6 to –0.3	Vdc
V_{PP} Supply Voltage with Respect to V_{SS}	+28 to –0.3	Vdc

NOTE 1: 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.

This is advance information and specifications are subject to change without notice.

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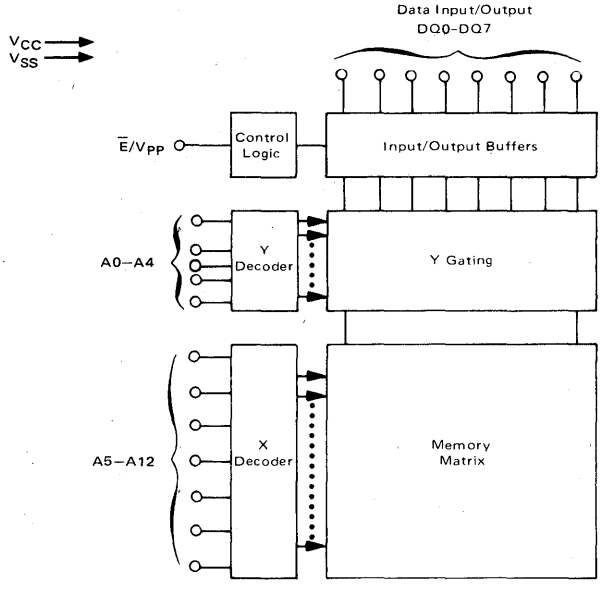
BLOCK DIAGRAM



DC OPERATING CONDITIONS AND CHARACTERISTICS

(Full operating voltage and temperature range unless otherwise noted)

RECOMMENDED DC READ OPERATING CONDITIONS (T_A = 0° to +70°C)

Parameter		Symbol	Min	Nom	Max	Unit
Supply Voltage*	MCM68764	V_{CC}	4.75	5.0	5.25	Vdc
	MCM68A764		4.5	5.0	5.5	
Input High Voltage		V_{IH}	2.0	–	V_{CC} +1.0	Vdc
Input Low Voltage		V_{IL}	–0.1	–	0.8	Vdc

READ OPERATING DC CHARACTERISTICS

Characteristic	Condition	Symbol	Min	Typ	Max	Unit
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
E/Vpp Input Sink Current	$\overline{E}/V_{PP} = V_{IL}$	I_{EL}	–	–	10	μA
	$\overline{E}/V_{PP} = V_{IH}$	$I_{EH} = I_{PL}$	–	–	200	μA
	$\overline{E}/V_{PP} = V_{IHP}$	I_{PH}	–	–	30	mA
V_{CC} Supply Current (Active)	$\overline{E}/V_{PP} = V_{IL}$	I_{CC1}	–	–	160	mA
V_{CC} Supply Current (Standby)	$\overline{E}/V_{PP} = V_{IH}$	I_{CC2}	–	–	25	mA
Output Low Voltage	I_{OL} = 2.1 mA	V_{OL}	–	0.1	0.45	V
Output High Voltage	I_{OH} = –400 μA	V_{OH}	2.4	4.0	–	V

CAPACITANCE

(f = 1.0 MHz, T_A = 25°C, periodically sampled rather than 100% tested.)

Characteristic	Symbol	Typ	Max	Unit
Input Capacitance (V_{in} = 0 V)	C_{in}	4.0	6.0	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: $C = \frac{I\Delta_t}{\Delta V}$.

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.

DC PROGRAMMING CONDITIONS AND CHARACTERISTICS

(T_A = 0 to +70°C, V_{CC} = 5.0 V ±5%)

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}	2.0	–	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

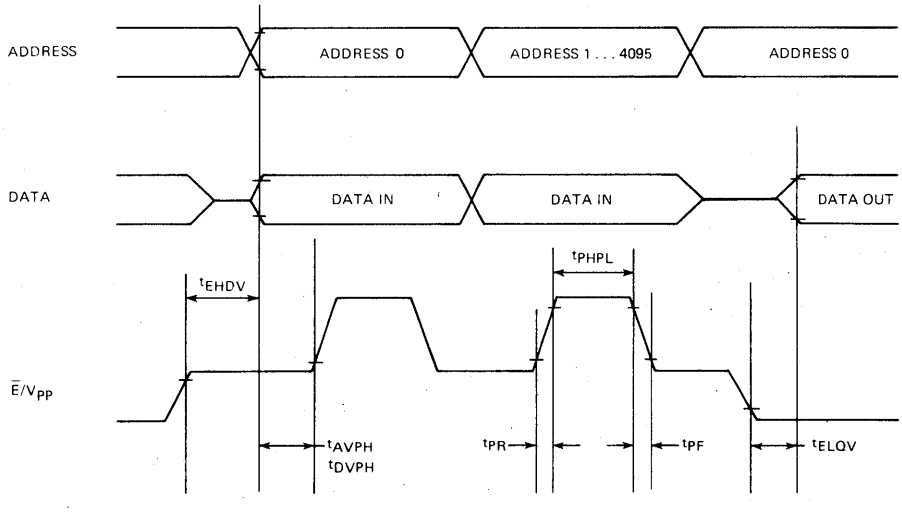
Characteristic	Condition	Symbol	Min	Typ	Max	Unit
Address Input Sink Current	V_{in} = 5.25 V	I_{LI}	–	–	10	μAdc
Program Pulse Current (V_{PP} = 25 V)		I_{PH}	–	–	30	mAdc
V_{PP} Programming Pulse Current (V_{PP} = 5 V)		I_{PL} = I_{EH}	–	–	200	μA
V_{CC} Supply Current		I_{CC}	–	–	160	mAdc

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
Chip Enable to Valid Data	t_{ELQV}	450	–	ns
Chip Disable to Data In	t_{EHDV}	2.0	–	μs
Program Pulse Width*	t_{PHPL}	1.0	55	ms
Program Pulse Rise Time	t_{PR}	0.5	2.0	μs
Program Pulse Fall Time	t_{PF}	0.5	2.0	μs

*The minimum programming time is twice the programming time after successful verification of the programmed pattern, but maximum programming time is 55 ms.

PROGRAMMING OPERATION TIMING DIAGRAM



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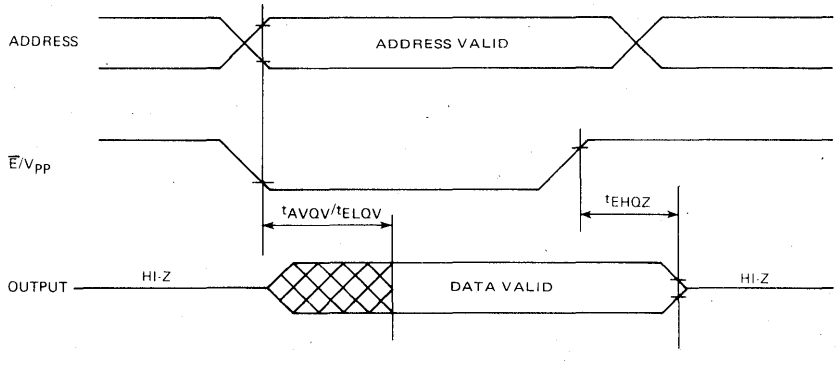
AC OPERATING CONDITIONS AND CHARACTERISTICS

(Full operating voltage and temperature range unless otherwise noted)

Input Pulse Levels . . . . . 0.8 Volt to 2.2 Volts
Input Rise and Fall Times . . . . . 20 ns
Input Timing Levels . . . . . 1 Volt and 2 Volts
Output Timing Levels . . . . . 0.8 Volt to 2 Volts
Output Load . . . . . 100 pF + 1 74 Series TTL Load

Characteristic	Condition	Symbol	MCM68A764		MCM68764		Units
			Min	Max	Min	Max	
Address Valid to Output Valid	$\overline{E} = V_{IL}$	t_{AVQV}	–	350	–	450	ns
E to Output Valid		t_{ELQV}	–	350	–	450	ns
E to Hi-Z Output		t_{EHQZ}	0	100	0	100	ns
Data Hold from Address	$\overline{E} = V_{IL}$	t_{AXDX}	0	–	0	–	ns

READ MODE 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 $\overline{E}$/Vpp input (Pin 20) should be between +2.0 and +6.0 V, which will tristate the outputs and allow data to be setup 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 $\overline{E}$/Vpp input. A program pulse is applied to each address location to be programmed. Locations may be programmed individually, sequentially, or at random. The maximum program pulse width is 55 ms and the maximum program pulse amplitude is 26.0 V.

Multiple MCM68764s may be programmed in parallel by connecting like inputs and applying the program pulse to the $\overline{E}$/Vpp inputs. Different data may be programmed into multiple MCM68764s connected in parallel by selectively applying the programming pulse only to the MCM68764s to be programmed.

READ OPERATION

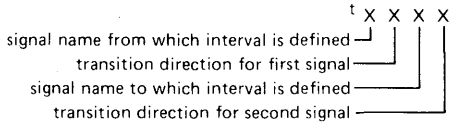
After access time, data is valid at the outputs in the Read mode. A single input ($\overline{E}$/Vpp) enables the outputs and puts the chip in active or standby mode. With $\overline{E}$/Vpp = "0" the outputs are enabled and the chip is in active mode, with $\overline{E}$/Vpp = "1" the outputs are tristated and the chip is in standby mode. During standby mode, the power dissipation is reduced from 880 mW to 132 mW.

Multiple MCM68764 may share a common data bus with like outputs OR-tied together. In this configuration the $\overline{E}$/Vpp input should be high on all unselected MCM 68764s to prevent data contention.

ERASING INSTRUCTIONS

The MCM68764 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/cm^2. 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 MCM68764 should be positioned about one inch away from the UV-tubes.

TIMING PARAMETER ABBREVIATIONS



The transition definitions used in this data sheet are:

- H = transition to high
- L = transition to low
- V = transition to valid
- X = transition to invalid or don't care
- Z = transition to off (high impedance)

TIMING LIMITS

The table of timing values shows either a minimum or a maximum limit for each parameter. Input requirements are specified from the external system point of view. Thus, address setup time is shown as a minimum since the system must supply at least that much time (even though most devices do not require it). On the other hand, responses from the memory are specified from the device point of view. Thus, the access time is shown as a maximum since the device never provides data later than that time.

WAVEFORMS

Waveform Symbol	Input	Output
——— ———	MUST BE VALID	WILL BE VALID
⟍⟍⟍⟍	CHANGE FROM H TO L	WILL CHANGE FROM H TO L
⟋⟋⟋⟋	CHANGE FROM L TO H	WILL CHANGE FROM L TO H
⟋⟍⟋⟍	DON'T CARE ANY CHANGE PERMITTED	CHANGING STATE UNKNOWN
——⟩		HIGH IMPEDANCE