

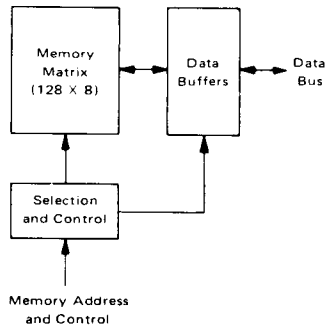
## 128 × 8-Bit Random-Access Memory

The MCM6810 is a byte-organized memory designed for use in bus-organized systems. It is fabricated with N-channel silicon-gate technology. For ease of use, the device operates from a single power supply, has compatibility with TTL and DTL, and needs no clocks or refreshing because of static operation.

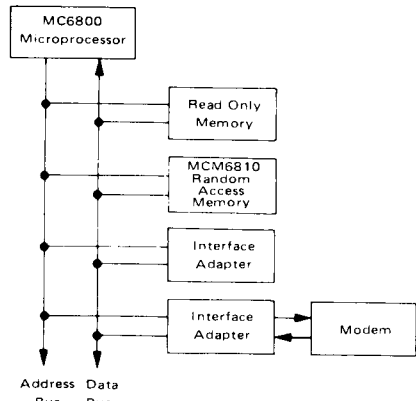
The memory is compatible with the M6800 Microcontroller Family, providing random storage in byte increments. Memory expansion is provided through multiple Chip Select inputs.

- Organized as 128 Bytes of 8 Bits
- Static Operation
- Bidirectional Three-State Data Input/Output
- Six Chip Select Inputs (Four Active Low, Two Active High)
- Single 5-Vol Power Supply
- TTL Compatible
- Maximum Access Time = 450 ns — MCM6810  
360 ns — MCM68A10  
250 ns — MCM68B10

**MCM6810 RANDOM ACCESS MEMORY  
BLOCK DIAGRAM**



**M6800 MICROCOMPUTER FAMILY  
BLOCK DIAGRAM**



#### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Supply Voltage	$V_{CC}$	-0.3 to +7.0	V
Input Voltage	$V_{in}$	-0.3 to +7.0	V
Operating Temperature Range MCM6810, MCM68A10, MCM68B10 MCM6810C, MCM68A10C	$T_A$	$T_L$ to $T_H$ 0 to +70 -40 to +85	°C
Storage Temperature Range	$T_{stg}$	-65 to +150	°C

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. Reliability of operation is enhanced if unused inputs are tied to an appropriate logic voltage (e.g., either  $V_{SS}$  or  $V_{CC}$ ).

#### THERMAL CHARACTERISTICS

Characteristic	Symbol	Value	Unit
Thermal Resistance Plastic	$\theta_{JA}$	120	°C/W
Cerdip		65	

#### POWER CONSIDERATIONS

The average chip-junction temperature,  $T_J$ , in °C can be obtained from:

$$T_J = T_A + (P_D \cdot \theta_{JA}) \quad (1)$$

where:

- $T_A$  = Ambient Temperature, °C
- $\theta_{JA}$  = Package Thermal Resistance, Junction-to-Ambient, °C/W
- $P_D$  =  $P_{INT} + P_{PORT}$
- $P_{INT}$  =  $I_{CC} \times V_{CC}$ , Watts — Chip Internal Power
- $P_{PORT}$  = Port Power Dissipation, Watts — User Determined

For most applications  $P_{PORT} < P_{INT}$  and can be neglected.  $P_{PORT}$  may become significant if the device is configured to drive Darlington bases or sink LED loads.

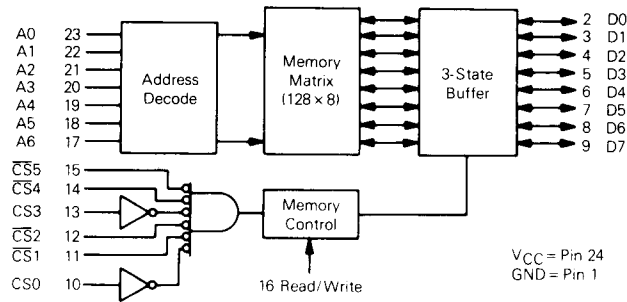
An approximate relationship between  $P_D$  and  $T_J$  (if  $P_{PORT}$  is neglected) is:

$$P_D = K \div (T_J + 273^\circ\text{C}) \quad (2)$$

$$\text{Solving equations (1) and (2) for } K \text{ gives } K = P_D \cdot (T_A + 273^\circ\text{C}) + \theta_{JA} \cdot P_D^2 \quad (3)$$

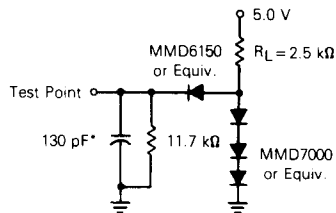
where  $K$  is a constant pertaining to the particular part.  $K$  can be determined from equation (3) by measuring  $P_D$  (at equilibrium) for a known  $T_A$ . Using this value of  $K$ , the values of  $P_D$  and  $T_J$  can be obtained by solving equations (1) and (2) iteratively for any value of  $T_A$ .

## BLOCK DIAGRAM

DC ELECTRICAL CHARACTERISTICS ( $V_{CC}=5.0\text{ Vdc} \pm 5\%$ ,  $V_{SS}=0$ ,  $T_A=T_L$  to  $T_H$  unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
Input High Voltage	$V_{IH}$	$V_{SS}+2.0$	$V_{CC}$	V
Input Low Voltage	$V_{IL}$	$V_{SS}-0.3$	$V_{SS}+0.8$	V
Input Current ( $A_n$ , R/W, $\overline{CS}_n$ ) ( $V_{IN}=0$ to $5.25\text{ V}$ )	$I_{IN}$	—	2.5	$\mu\text{A}$
Output High Voltage ( $I_{OH} = -205\text{ }\mu\text{A}$ )	$V_{OH}$	2.4	—	V
Output Low Voltage ( $I_{OL} = 1.6\text{ mA}$ )	$V_{OL}$	—	0.4	V
Output Leakage Current (Three-State) ( $CS=0.8\text{ V}$ or $\overline{CS}=2.0\text{ V}$ , $V_{OUT}=0.4\text{ V}$ to $2.4\text{ V}$ )	$I_{TS}$	—	10	$\mu\text{A}$
Supply Current ( $V_{CC}=5.25\text{ V}$ , All Other Pins Grounded)				
1.0 MHz	$I_{CC}$	—	80	mA
1.5, 2.0 MHz			100	
Input Capacitance ( $A_n$ , R/W, $CS_n$ , $\overline{CS}_n$ ) ( $V_{IN}=0$ , $T_A=25^\circ\text{C}$ , $f=1.0\text{ MHz}$ )	$C_{IN}$	—	7.5	pF
Output Capacitance ( $D_n$ ) ( $V_{OUT}=0$ , $T_A=25^\circ\text{C}$ , $f=1.0\text{ MHz}$ , $CS_0=0$ )	$C_{OUT}$	—	12.5	pF

## AC TEST LOAD



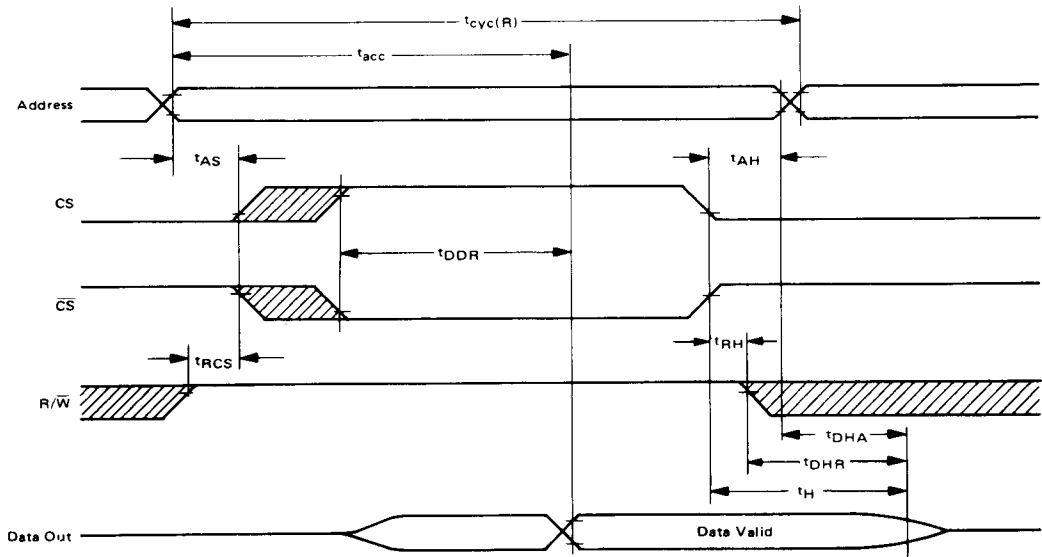
\*Includes Jig Capacitance

## AC OPERATING CONDITIONS AND CHARACTERISTICS

READ CYCLE ( $V_{CC}=5.0\text{ V} \pm 5\%$ ,  $V_{SS}=0$ ,  $T_A=T_L$  to  $T_H$  unless otherwise noted.)

Characteristic	Symbol	MCM6810		MCM68A10		MCM68B10		Unit
		Min	Max	Min	Max	Min	Max	
Read Cycle Time	$t_{cyc}(R)$	450	—	360	—	250	—	ns
Access Time	$t_{acc}$	—	450	—	360	—	250	ns
Address Setup Time	$t_{AS}$	20	—	20	—	20	—	ns
Address Hold Time	$t_{AH}$	0	—	0	—	0	—	ns
Data Delay Time (Read)	$t_{DDR}$	—	230	—	220	—	180	ns
Read to Select Delay Time	$t_{RCS}$	0	—	0	—	0	—	ns
Data Hold from Address	$t_{DHA}$	10	—	10	—	10	—	ns
Output Hold Time	$t_H$	10	—	10	—	10	—	ns
Data Hold from Read	$t_{DHR}$	10	80	10	60	10	60	ns
Read Hold from Chip Select	$t_{RH}$	0	—	0	—	0	—	ns

## READ CYCLE TIMING



## NOTES:

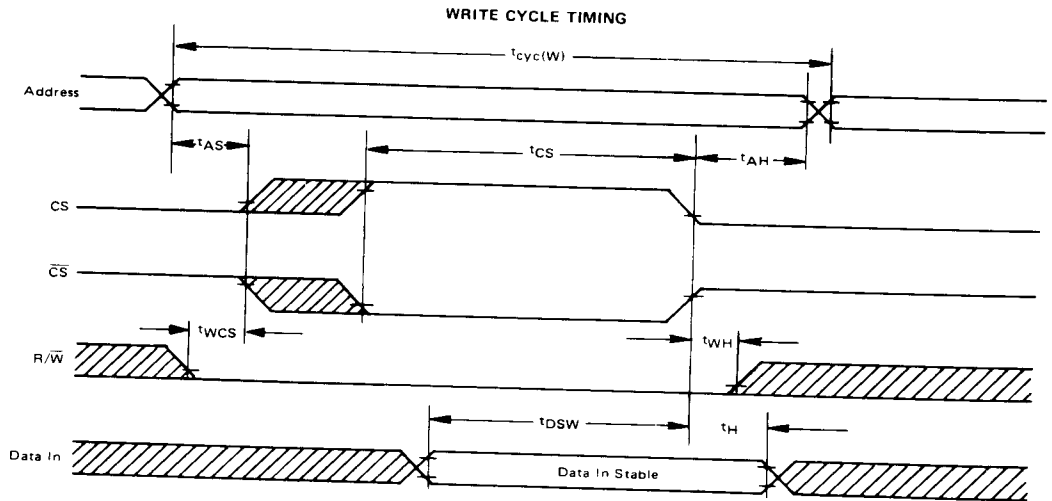
1. Voltage levels shown are  $V_L \leq 0.4$  V,  $V_H \geq 2.4$  V, unless otherwise specified.
2. Measurement points shown are 0.8 V and 2.0 V, unless otherwise specified.
3. CS and  $\overline{CS}$  have same timing.

= Don't Care

WRITE CYCLE ( $V_{CC} = 5.0$  V  $\pm 5\%$ ,  $V_{SS} = 0$ ,  $T_A = T_L$  to  $T_H$  unless otherwise noted.)

Characteristic	Symbol	MCM6810		MCM68A10		MCM68B10		Unit
		Min	Max	Min	Max	Min	Max	
Write Cycle Time	$t_{cyc}(W)$	450	—	360	—	250	—	ns
Address Setup Time	$t_{AS}$	20	—	20	—	20	—	ns
Address Hold Time	$t_{AH}$	0	—	0	—	0	—	ns
Chip Select Pulse Width	$t_{CS}$	300	—	250	—	210	—	ns
Write to Chip Select Delay Time	$t_{WCS}$	0	—	0	—	0	—	ns
Data Setup Time (Write)	$t_{DSW}$	190	—	80	—	60	—	ns
Input Hold Time	$t_H$	10	—	10	—	10	—	ns
Write Hold Time from Chip Select	$t_{WH}$	0	—	0	—	0	—	ns

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= Don't Care

## ORDERING INFORMATION

Package Type	Frequency (MHz)	Temperature	Order Number
Plastic P Suffix	1.0	0°C to 70°C	MCM6810P
	1.0	-40°C to 85°C	MCM6810CP
	1.5	0°C to 70°C	MCM68A10P
	1.5	-40°C to 85°C	MCM68A10CP
	2.0	0°C to 70°C	MCM68B10P
Cerdip S Suffix	1.0	0°C to 70°C	MCM6810S
	1.0	-40°C to 85°C	MCM6810CS
	1.5	0°C to 70°C	MCM68A10S
	1.5	-40°C to 85°C	MCM68A10CS
	2.0	0°C to 70°C	MCM68B10S

## PIN ASSIGNMENTS

