

Product Preview

256K x 4 Bit Static Random Access Memory

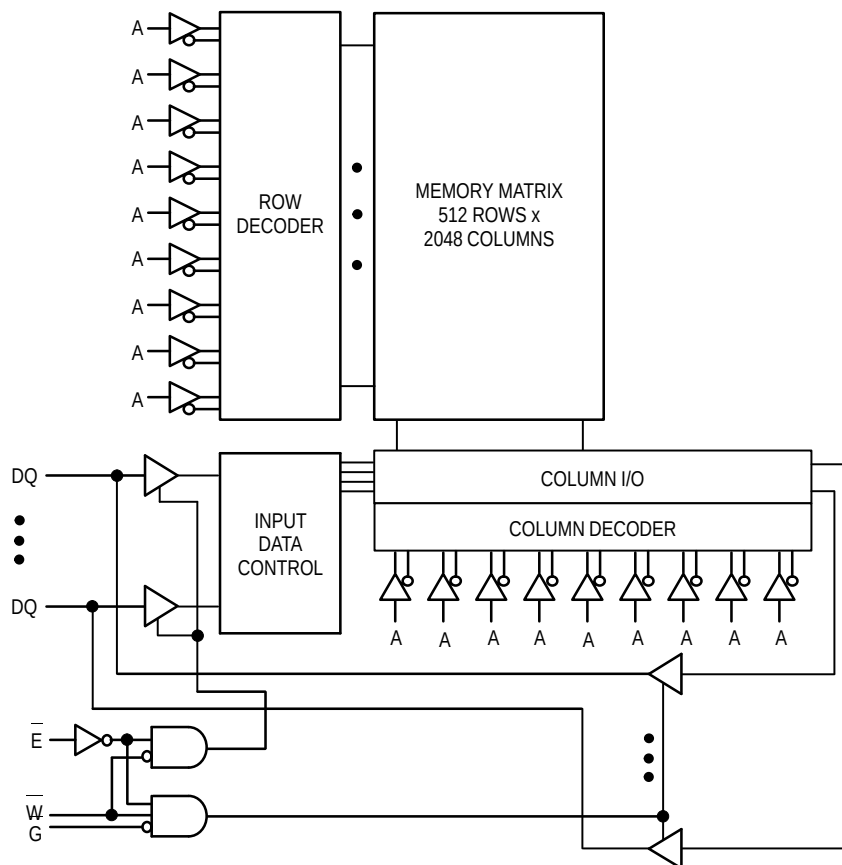
The MCM6229BB is a 1,048,576 bit static random access memory organized as 262,144 words of 4 bits. Static design eliminates the need for external clocks or timing strobes while CMOS circuitry reduces power consumption and provides for greater reliability.

The MCM6229BB is equipped with both chip enable ($\bar{E}$) and output enable ($\bar{G}$) pins, allowing for greater system flexibility and eliminating bus contention problems.

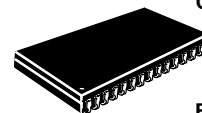
The MCM6229BB is available in 300 mil and 400 mil, 28 lead surface-mount SOJ packages.

- Single 5 V $\pm$ 10% Power Supply
- Fast Access Times: 15/17/20/25/35 ns
- Equal Address and Chip Enable Access Times
- All Inputs and Outputs are TTL Compatible and LVTTTL Compatible
- Three State Outputs
- Low Power Operation: 155/150/135/130/110 mA Maximum, Active AC

BLOCK DIAGRAM



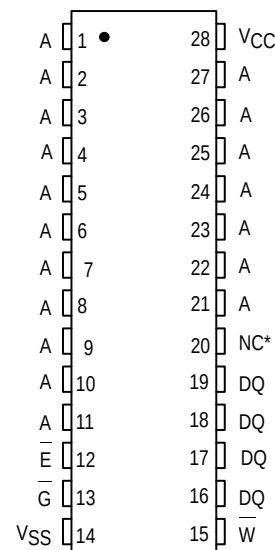
MCM6229BB



XJ PACKAGE
400 MIL SOJ
CASE 810-03

EJ PACKAGE
300 MIL SOJ
CASE 810B-03

PIN ASSIGNMENTS



PIN NAMES

A		Address Inputs
W		Write Enable
G		Output Enable
E		Chip Enable
DQ		Data Inputs/Outputs
VCC		+ 5 V Power Supply
VSS		Ground
NC*		No Connection

*If not used for no connect, then do not exceed voltages of -0.5 to $V_{CC} + 0.5$ V. This pin is used for manufacturing diagnostics.

This document contains information on a new product under development. Motorola reserves the right to change or discontinue this product without notice.

11/7/96

TRUTH TABLE

E	G	W	Mode	I/O Pin	Cycle	Current
H	X	X	Not Selected	High-Z	—	I _{SB1} , I _{SB2}
L	H	H	Output Disabled	High-Z	—	I _{CCA}
L	L	H	Read	D _{out}	Read	I _{CCA}
L	X	L	Write	D _{in}	Write	I _{CCA}

H = High, L = Low, X = Don't Care

ABSOLUTE MAXIMUM RATINGS (See Note)

Rating	Symbol	Value	Unit
Power Supply Voltage Relative to V _{SS}	V _{CC}	− 0.5 to 7.0	V
Voltage Relative to V _{SS} for Any Pin Except V _{CC}	V _{in} , V _{out}	− 0.5 to V _{CC} + 0.5	V
Output Current (per I/O)	I _{out}	± 20	mA
Power Dissipation	P _D	1.0	W
Temperature Under Bias	T _{bias}	− 10 to + 85	°C
Operating Temperature	T _A	0 to + 70	°C
Storage Temperature	T _{stg}	− 55 to + 150	°C

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.

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 these high-impedance circuits.

This CMOS memory circuit has been designed to meet the dc and ac specifications shown in the tables, after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse air flow of at least 500 linear feet per minute is maintained.

DC OPERATING CONDITIONS AND CHARACTERISTICS

(V_{CC} = 5.0 V ± 10%, T_A = 0 to 70°C, Unless Otherwise Noted)

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Min	Max	Unit
Supply Voltage (Operating Voltage Range)	V _{CC}	4.5	5.5	V
Input High Voltage	V _{IH}	2.2	V _{CC} + 0.3**	V
Input Low Voltage	V _{IL}	− 0.5*	0.8	V

* V_{IL} (min) = − 0.5 V dc; V_{IL} (min) = − 2.0 V ac (pulse width ≤ 20 ns).

** V_{IH} (max) = V_{CC} + 0.3 V dc; V_{IH} (max) = V_{CC} + 2 V ac (pulse width ≤ 20 ns).

DC CHARACTERISTICS AND SUPPLY CURRENTS

Parameter	Symbol	Min	Max	Unit
Input Leakage Current (All Inputs, V _{in} = 0 to V _{CC})	I _{lkg(I)}	—	± 1	μA
Output Leakage Current (E = V _{IH} , V _{out} = 0 to V _{CC})	I _{lkg(O)}	—	± 1	μA
AC Active Supply Current (I _{out} = 0 mA, all inputs = V _{IL} or V _{IH} , V _{IL} = 0, V _{IH} ≥ 3 V, cycle time ≥ t _{AVAV} min, V _{CC} = max)	I _{CCA}	—	155 150 135 130 110	mA
AC Standby Current (V _{CC} = max, E = V _{IH} , f = f _{max})	I _{SB1}	—	45 40 35 30 25	mA
CMOS Standby Current (E ≥ V _{CC} − 0.2 V, V _{in} ≤ V _{SS} + 0.2 V or ≥ V _{CC} − 0.2 V, V _{CC} = max, f = 0 MHz)	I _{SB2}	—	5	mA
Output Low Voltage (I _{OL} = + 8.0 mA)	V _{OL}	—	0.4	V
Output High Voltage (I _{OH} = − 4.0 mA)	V _{OH}	2.4	—	V

CAPACITANCE ($f = 1.0 \text{ MHz}$, $dV = 3.0 \text{ V}$, $T_A = 25^\circ\text{C}$, Periodically Sampled Rather Than 100% Tested)

Characteristic	Symbol	Typ	Max	Unit
Input Capacitance	All Inputs Except Clocks and DQs			
	C_{in}	4	6	pF
I/O Capacitance	E, G, and W			
	C_{ck}	5	8	pF
I/O Capacitance	DQ			
	$C_{I/O}$	5	8	pF

AC OPERATING CONDITIONS AND CHARACTERISTICS

($V_{CC} = 5.0 \text{ V} \pm 10\%$, $T_A = 0 \text{ to } +70^\circ\text{C}$, Unless Otherwise Noted)

Input Pulse Levels	0 to 3.0 V	Output Timing Measurement Reference Level	1.5 V
Input Rise/Fall Time	2 ns	Output Load	See Figure 1a
Input Timing Measurement Reference Level	1.5 V		

READ CYCLE TIMING (See Notes 1, 2, and 3)

Parameter	Symbol	6229BB-15		6229BB-17		6229BB-20		6229BB-25		6229BB-35		Unit	Notes
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max		
Read Cycle Time	t_{AVAV}	15	—	17	—	20	—	25	—	35	—	ns	3
Address Access Time	t_{AVQV}	—	15	—	17	—	20	—	25	—	35	ns	
Enable Access Time	t_{ELQV}	—	15	—	17	—	20	—	25	—	35	ns	4
Output Enable Access Time	t_{GLQV}	—	6	—	7	—	7	—	8	—	8	ns	
Output Hold from Address Change	t_{AXQX}	3	—	3	—	3	—	3	—	3	—	ns	
Enable Low to Output Active	t_{ELQX}	5	—	5	—	5	—	5	—	5	—	ns	5, 6, 7
Output Enable Low to Output Active	t_{GLQX}	0	—	0	—	0	—	0	—	0	—	ns	5, 6, 7
Enable High to Output High-Z	t_{EHQZ}	0	6	0	7	0	7	0	8	0	8	ns	5, 6, 7
Output Enable High to Output High-Z	t_{GHQZ}	0	6	0	7	0	7	0	8	0	8	ns	5, 6, 7

NOTES:

1. W is high for read cycle.
2. Product sensitivities to noise require proper grounding and decoupling of power supplies as well as minimization or elimination of bus contention conditions during read and write cycles.
3. All timings are referenced from the last valid address to the first transitioning address.
4. Addresses valid prior to or coincident with E going low.
5. At any given voltage and temperature, t_{EHQZ} max is less than t_{ELQX} min, and t_{GHQZ} max is less than t_{GLQX} min, both for a given device and from device to device.
6. Transition is measured $\pm 500 \text{ mV}$ from steady-state voltage with load of Figure 1b.
7. This parameter is sampled and not 100% tested.
8. Device is continuously selected ($E \leq V_{IL}$, $G \leq V_{IL}$).

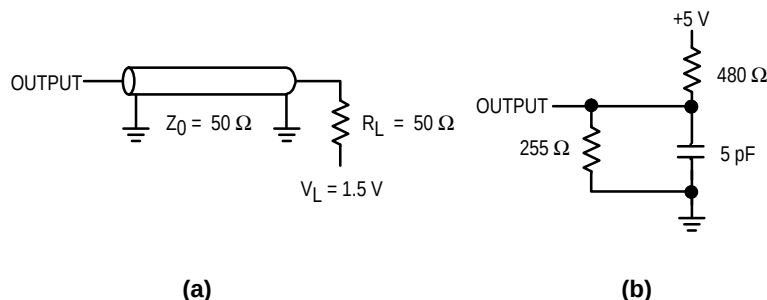
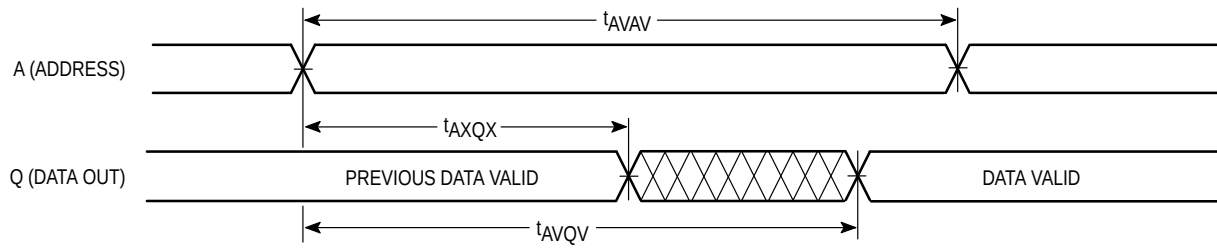


Figure 1. AC Test Loads

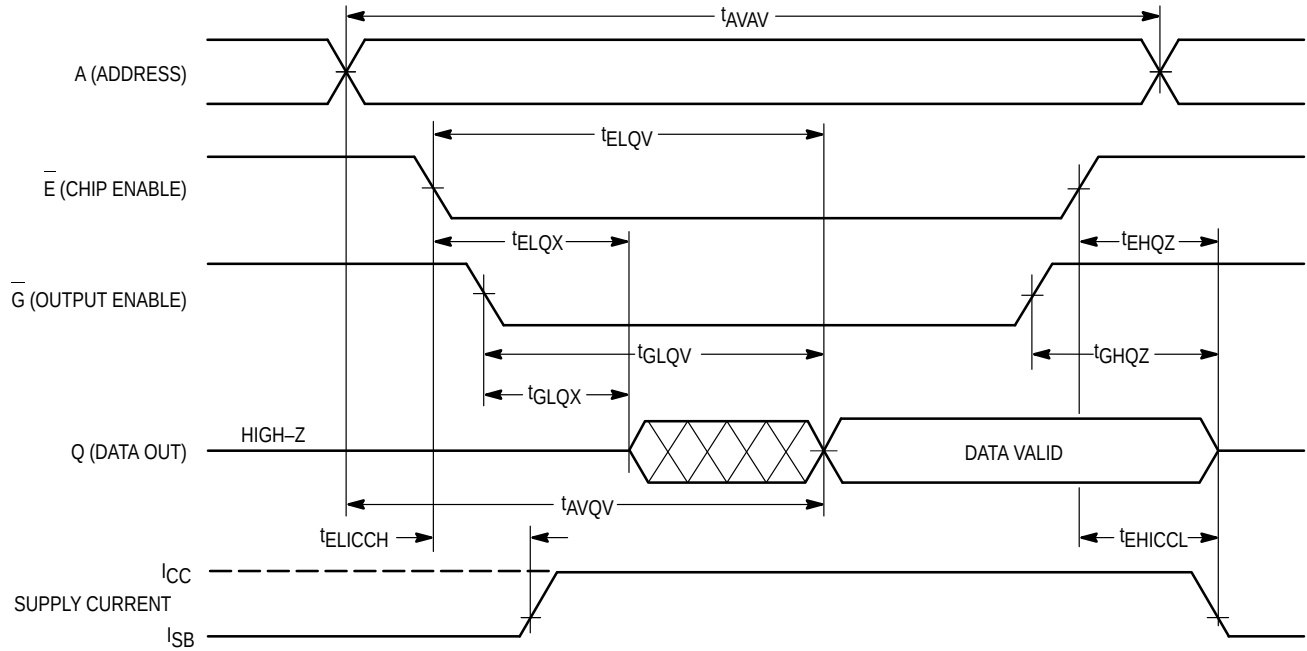
TIMING LIMITS

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. 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.

READ CYCLE 1 (See Notes 1, 2, 3, and 9)



READ CYCLE 2 (See Notes 3 and 5)



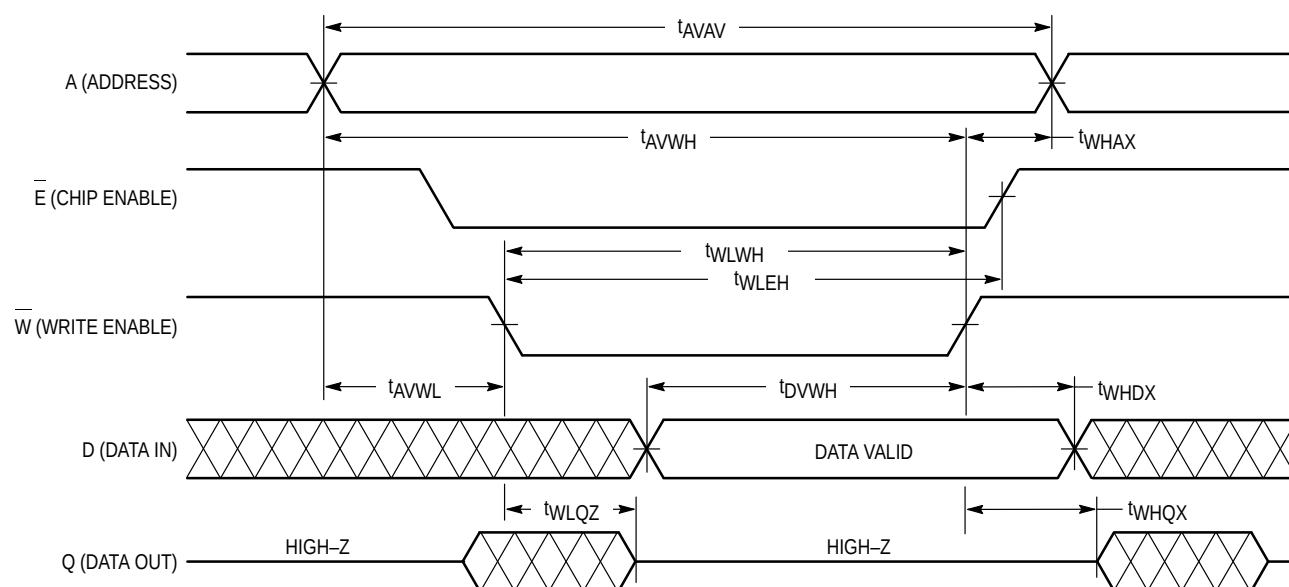
WRITE CYCLE 1 ($\overline{W}$ Controlled, See Notes 1, 2, 3, and 4)

Parameter	Symbol	6229BB-15		6229BB-17		6229BB-20		6229BB-25		6229BB-35		Unit	Notes
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max		
Write Cycle Time	t_{AVAV}	15	—	17	—	20	—	25	—	35	—	ns	4
Address Setup Time	t_{AVWL}	0	—	0	—	0	—	0	—	0	—	ns	
Address Valid to End of Write	t_{AVWH}	12	—	14	—	15	—	17	—	20	—	ns	
Write Pulse Width	t_{WLWH} , t_{WLEH}	12	—	14	—	15	—	17	—	20	—	ns	
Data Valid to End of Write	t_{DVWH}	7	—	8	—	9	—	10	—	11	—	ns	
Data Hold Time	t_{WDHX}	0	—	0	—	0	—	0	—	0	—	ns	
Write Low to Data High-Z	t_{WLQZ}	—	6	—	7	—	7	—	8	—	8	ns	5, 6, 7
Write High to Output Active	t_{WHQX}	5	—	5	—	5	—	5	—	5	—	ns	5, 6, 7
Write Recovery Time	t_{WHAX}	0	—	0	—	0	—	0	—	0	—	ns	

NOTES:

1. A write occurs during the overlap of $\overline{E}$ low and $\overline{W}$ low.
2. Product sensitivities to noise require proper grounding and decoupling of power supplies as well as minimization or elimination of bus contention conditions during read and write cycles.
3. If G goes low coincident with or after $\overline{W}$ goes low, the output will remain in a high-impedance state.
4. All timings are referenced from the last valid address to the first transitioning address.
5. Transition is measured ± 500 mV from steady-state voltage with load of Figure 1b.
6. This parameter is sampled and not 100% tested.
7. At any given voltage and temperature, t_{WLQZ} max is less than t_{WHQX} min both for a given device and from device to device.

WRITE CYCLE 1 ($\overline{W}$ Controlled See Notes 1, 2, 3, and 4)



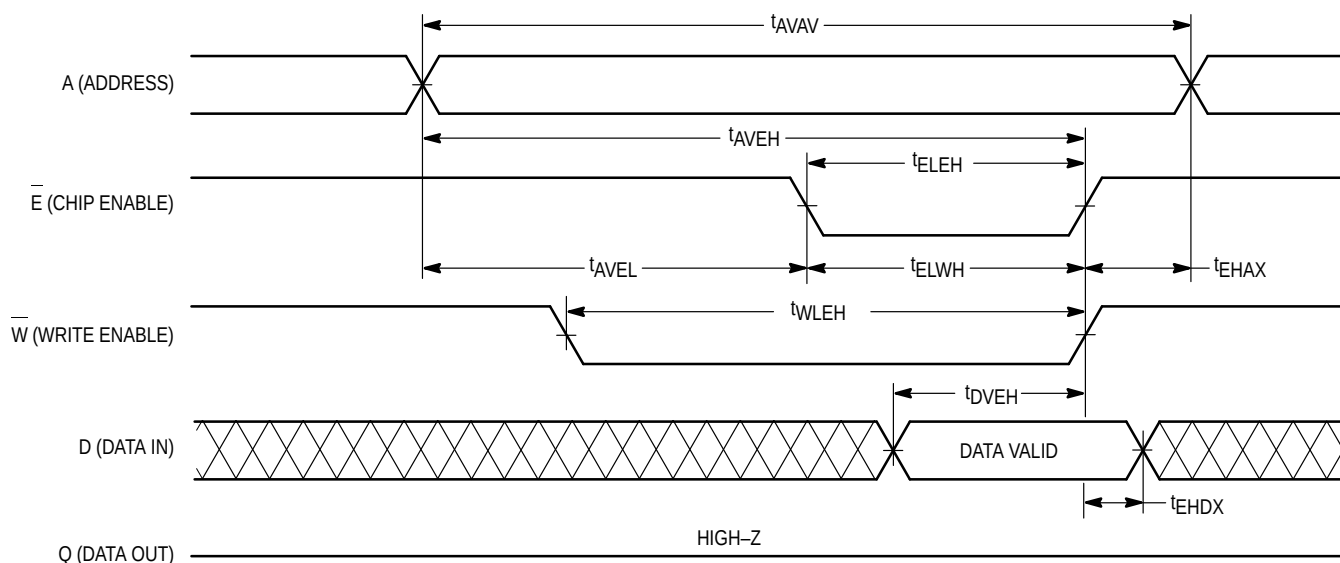
WRITE CYCLE 2 ($\overline{E}$ Controlled, See Notes 1, 2, and 3)

Parameter	Symbol	6229BB-15		6229BB-17		6229BB-20		6229BB-25		6229BB-35		Unit	Notes
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max		
Write Cycle Time	t_{AVAV}	15	—	17	—	20	—	25	—	35	—	ns	4
Address Setup Time	t_{AVEL}	0	—	0	—	0	—	0	—	0	—	ns	
Address Valid to End of Write	t_{AVEH}	12	—	14	—	15	—	17	—	20	—	ns	
Enable to End of Write	t_{ELEH} , t_{ELWH}	12	—	14	—	15	—	17	—	20	—	ns	5, 6
Write Pulse Width	t_{WLEH}	12	—	14	—	15	—	17	—	20	—	ns	
Data Valid to End of Write	t_{DVEH}	7	—	8	—	9	—	10	—	11	—	ns	
Data Hold Time	t_{EHDH}	0	—	0	—	0	—	0	—	0	—	ns	
Write Recovery Time	t_{EHAX}	0	—	0	—	0	—	0	—	0	—	ns	

NOTES:

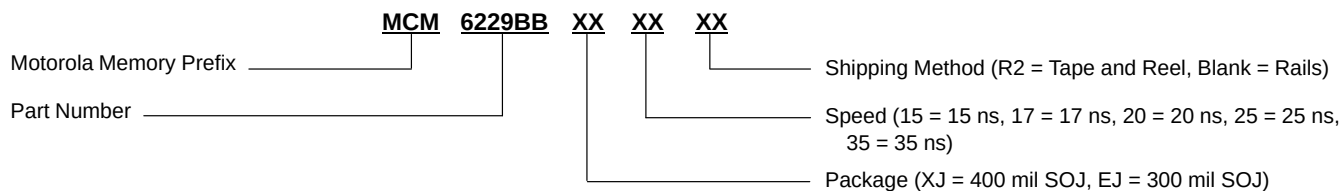
1. A write occurs during the overlap of $\overline{E}$ low and $\overline{W}$ low.
2. Product sensitivities to noise require proper grounding and decoupling of power supplies as well as minimization or elimination of bus contention conditions during read and write cycles.
3. If $\overline{G}$ goes low coincident with or after $\overline{W}$ goes low, the output will remain in a high-impedance state.
4. All timings are referenced from the last valid address to the first transitioning address.
5. If $\overline{E}$ goes low coincident with or after $\overline{W}$ goes low, the output will remain in a high-impedance state.
6. If $\overline{E}$ goes high coincident with or before $\overline{W}$ goes high, the output will remain in a high-impedance state.

WRITE CYCLE 2 ($\overline{E}$ Controlled See Notes 1, 2, 3, and 4)



ORDERING INFORMATION

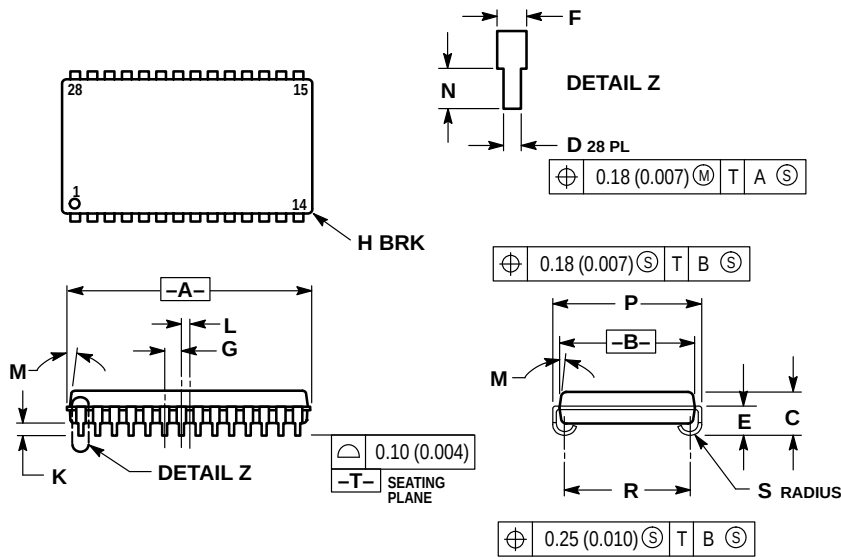
(Order by Full Part Number)



Full Part Numbers —	MCM6229BBXJ15	MCM6229BBXJ15R2	MCM6229BBEJ15	MCM6229BBEJ15R2
	MCM6229BBXJ17	MCM6229BBXJ17R2	MCM6229BBEJ17	MCM6229BBEJ17R2
	MCM6229BBXJ20	MCM6229BBXJ20R2	MCM6229BBEJ20	MCM6229BBEJ20R2
	MCM6229BBXJ25	MCM6229BBXJ25R2	MCM6229BBEJ25	MCM6229BBEJ25R2
	MCM6229BBXJ35	MCM6229BBXJ35R2	MCM6229BBEJ35	MCM6229BBEJ35R2

PACKAGE DIMENSIONS

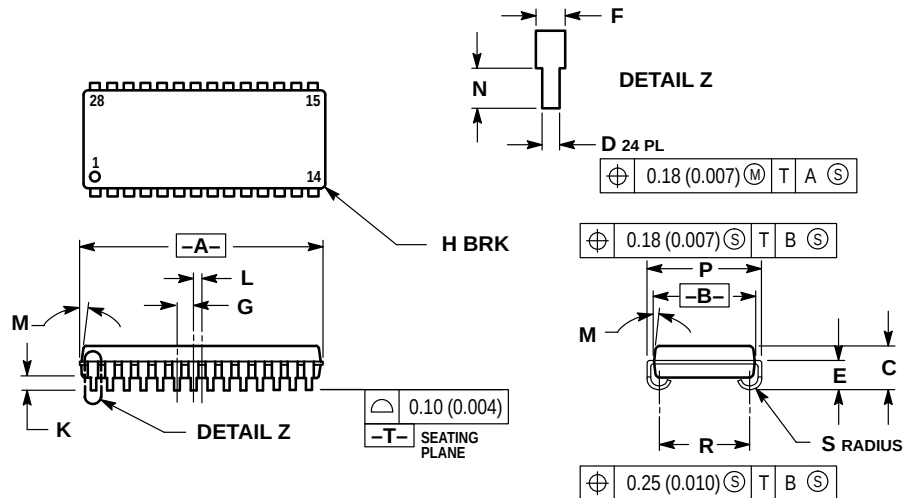
28 LEAD
400 MIL SOJ
CASE 810-03



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION. MOLD PROTRUSION SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
 4. DIMENSION R TO BE DETERMINED AT DATUM -T-.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.720	0.730	18.29	18.54
B	0.395	0.405	10.04	10.28
C	0.128	0.148	3.26	3.75
D	0.015	0.020	0.39	0.50
E	0.088	0.098	2.24	2.48
F	0.026	0.032	0.67	0.81
G	0.050 BSC		1.27 BSC	
H	—	0.020	—	0.50
K	0.035	0.045	0.89	1.14
L	0.025 BSC		0.64 BSC	
M	0°	5°	0°	5°
N	0.030	0.045	0.76	1.14
P	0.435	0.445	11.05	11.30
R	0.360	0.380	9.15	9.65
S	0.030	0.040	0.77	1.01

**28 LEAD
300 MIL SOJ
CASE 810B-03**



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION. MOLD PROTRUSION SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION R TO BE DETERMINED AT DATUM -T-.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.720	0.730	18.29	18.54
B	0.295	0.305	7.50	7.74
C	0.128	0.148	3.26	3.75
D	0.015	0.020	0.39	0.50
E	0.088	0.098	2.24	2.48
F	0.026	0.032	0.67	0.81
G	0.050 BSC		1.27 BSC	
H	—	0.020	—	0.50
K	0.035	0.045	0.89	1.14
L	0.025 BSC		0.64 BSC	
M	0°	10°	0°	10°
N	0.030	0.045	0.76	1.14
P	0.330	0.340	8.38	8.64
R	0.260	0.270	6.60	6.86
S	0.030	0.040	0.77	1.01

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