

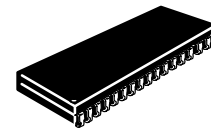
# MCM6205D

## 32K x 9 Bit Fast Static RAM

The MCM6205D is fabricated using Motorola's high-performance silicon-gate CMOS technology. Static design eliminates the need for external clocks or timing strobes, while CMOS circuitry reduces power consumption and provides for greater reliability.

This device meets JEDEC standards for functionality and pinout, and is available in a plastic small-outline J-leaded package.

- Single 5 V ± 10% Power Supply
- Fully Static — No Clock or Timing Strokes Necessary
- Fast Access Times: 15, 20, and 25 ns
- Equal Address and Chip Enable Access Times
- Output Enable ( $\bar{G}$ ) Feature for Increased System Flexibility and to Eliminate Bus Contention Problems
- Low Power Operation: 130 – 140 mA Maximum AC
- Fully TTL Compatible — Three State Output

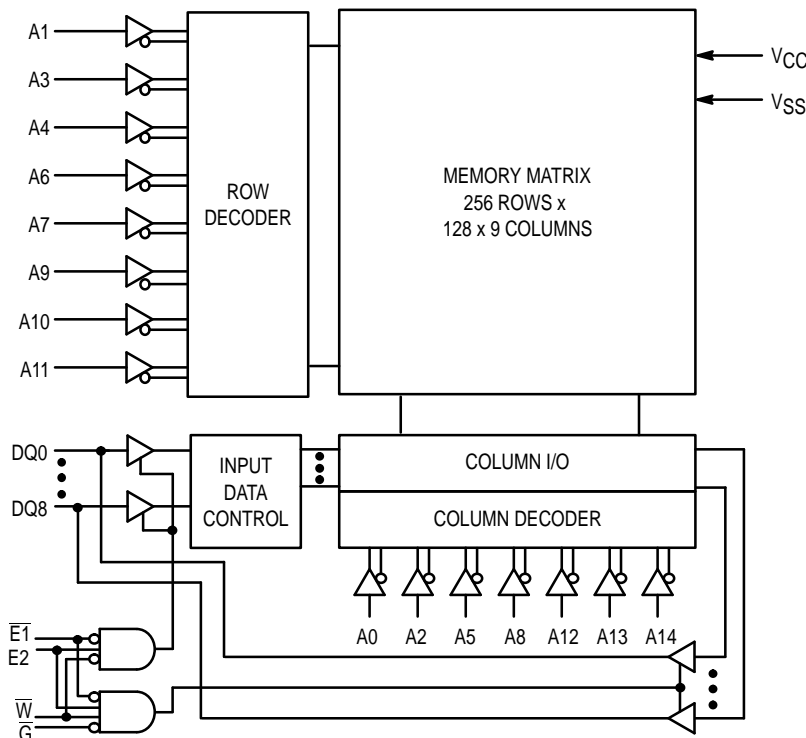


**J PACKAGE**  
300 MIL SOJ  
CASE 857-02

### PIN ASSIGNMENT

NC	1	32	VCC
NC	2	31	A14
A8	3	30	E2
A7	4	29	$\bar{W}$
A6	5	28	A13
A5	6	27	A9
A4	7	26	A10
A3	8	25	A11
A2	9	24	$\bar{G}$
A1	10	23	A12
A0	11	22	$\bar{E}1$
DQ0	12	21	DQ8
DQ1	13	20	DQ7
DQ2	14	19	DQ6
DQ3	15	18	DQ5
VSS	16	17	DQ4

### BLOCK DIAGRAM



### PIN NAMES

A0 – A14	Address Input
DQ0 – DQ8	Data Input/Data Output
$\bar{W}$	Write Enable
$\bar{G}$	Output Enable
$\bar{E}1, E2$	Chip Enable
NC	No Connection
VCC	Power Supply (+ 5 V)
VSS	Ground

**TRUTH TABLE** (X = Don't Care)

$\overline{E1}$	E2	$\overline{G}$	W	Mode	VCC Current	Output	Cycle
H	X	X	X	Not Selected	$I_{SB1}, I_{SB2}$	High-Z	—
X	L	X	X	Not Selected	$I_{SB1}, I_{SB2}$	High-Z	—
L	H	H	H	Output Disabled	$I_{CCA}$	High-Z	—
L	H	L	H	Read	$I_{CCA}$	$D_{out}$	Read Cycle
L	H	X	L	Write	$I_{CCA}$	High-Z	Write Cycle

**ABSOLUTE MAXIMUM RATINGS**

Rating	Symbol	Value	Unit
Power Supply Voltage	$V_{CC}$	- 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	$I_{out}$	$\pm 20$	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 — Plastic	$T_{stg}$	- 55 to + 125	°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 this high-impedance circuit.

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**

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

**RECOMMENDED OPERATING CONDITIONS**

Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage (Operating Voltage Range)	$V_{CC}$	4.5	5.0	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

\*  $V_{IL} \text{ (min)} = -0.5 \text{ V dc}$ ;  $V_{IL} \text{ (min)} = -2.0 \text{ V ac}$  (pulse width  $\leq 20 \text{ ns}$ )

\*\*  $V_{IH} \text{ (max)} = V_{CC} + 0.3 \text{ V dc}$ ;  $V_{IH} \text{ (max)} = V_{CC} + 2.0 \text{ V ac}$  (pulse width  $\leq 20 \text{ ns}$ )

**DC CHARACTERISTICS**

Parameter	Symbol	Min	Max	Unit
Input Leakage Current (All Inputs, $V_{in} = 0 \text{ to } V_{CC}$ )	$I_{lkg(I)}$	—	$\pm 1$	$\mu\text{A}$
Output Leakage Current ( $\overline{E1} = V_{IH}$ or $\overline{G} = V_{IH}$ or $E2 = V_{IL}$ , $V_{out} = 0 \text{ to } V_{CC}$ )	$I_{lkg(O)}$	—	$\pm 1$	$\mu\text{A}$
Output High Voltage ( $I_{OH} = -4.0 \text{ mA}$ )	$V_{OH}$	2.4	—	V
Output Low Voltage ( $I_{OL} = 8.0 \text{ mA}$ )	$V_{OL}$	—	0.4	V

**POWER SUPPLY CURRENTS**

Parameter	Symbol	- 15	- 20	- 25	Unit
AC Active Supply Current ( $I_{out} = 0 \text{ mA}$ , $V_{CC} = \text{Max}$ , $f = f_{max}$ )	$I_{CCA}$	140	135	130	mA
AC Standby Current ( $\overline{E1} = V_{IH}$ , or $E2 = V_{IL}$ , $V_{CC} = \text{Max}$ , $f = f_{max}$ )	$I_{SB1}$	40	40	35	mA
CMOS Standby Current ( $V_{CC} = \text{Max}$ , $f = 0 \text{ MHz}$ , $\overline{E1} \geq V_{CC} - 0.2 \text{ V}$ or $E2 \leq V_{SS} + 0.2 \text{ V}$ , $V_{in} \leq V_{SS} + 0.2 \text{ V}$ , or $\geq V_{CC} - 0.2 \text{ V}$ )	$I_{SB2}$	20	20	20	mA

**CAPACITANCE** (f = 1 MHz, dV = 3 V, T<sub>A</sub> = 25°C, Periodically sampled rather than 100% tested)

Characteristic	Symbol	Max	Unit
Address Input Capacitance	C <sub>in</sub>	6	pF
Control Pin Input Capacitance ( $\overline{E1}$ , E2, $\overline{G}$ , $\overline{W}$ )	C <sub>in</sub>	8	pF
I/O Capacitance	C <sub>I/O</sub>	8	pF

**AC OPERATING CONDITIONS AND CHARACTERISTICS**

(V<sub>CC</sub> = 5.0 V ± 10%, T<sub>A</sub> = 0 to + 70°C, Unless Otherwise Noted)

Input Timing Measurement Reference Level ..... 1.5 V  
 Input Pulse Levels ..... 0 to 3.0 V  
 Input Rise/Fall Time ..... 5 ns

Output Timing Measurement Reference Level ..... 1.5 V  
 Output Load ..... Figure 1A Unless Otherwise Noted

**READ CYCLE** (See Notes 1 and 2)

Parameter	Symbol	MCM6205D-15		MCM6205D-20		MCM6205D-25		Unit	Notes
		Min	Max	Min	Max	Min	Max		
Read Cycle Time	t <sub>AVAV</sub>	15	—	20	—	25	—	ns	3
Address Access Time	t <sub>AVQV</sub>	—	15	—	20	—	25	ns	
Enable Access Time	t <sub>ELQV</sub>	—	15	—	20	—	25	ns	4
Output Enable Access Time	t <sub>GLQV</sub>	—	8	—	10	—	12	ns	
Output Hold from Address Change	t <sub>AXQX</sub>	4	—	4	—	4	—	ns	
Enable Low to Output Active	t <sub>ELQX</sub>	4	—	4	—	4	—	ns	5, 6, 7
Enable High to Output High-Z	t <sub>EHQZ</sub>	0	8	0	9	0	10	ns	5, 6, 7
Output Enable Low to Output Active	t <sub>GLQX</sub>	0	—	0	—	0	—	ns	5, 6, 7
Output Enable High to Output High-Z	t <sub>GHQZ</sub>	0	7	0	8	0	10	ns	5, 6, 7
Power Up Time	t <sub>ELICCH</sub>	0	—	0	—	0	—	ns	
Power Down Time	t <sub>EHICCL</sub>	—	15	—	20	—	25	ns	

**NOTES:**

1.  $\overline{W}$  is high for read cycle.
2.  $\overline{E1}$  and E2 are represented by  $\overline{E}$  in this data sheet. E2 is of opposite polarity to  $\overline{E}$ .
3. All timings are referenced from the last valid address to the first transitioning address.
4. Addresses valid prior to or coincident with  $\overline{E}$  going low.
5. At any given voltage and temperature, t<sub>EHQZ</sub> (max) is less than t<sub>ELQX</sub> (min), and t<sub>GHQZ</sub> (max) is less than t<sub>GLQX</sub> (min), both for a given device and from device to device.
6. Transition is measured ± 500 mV from steady-state voltage with load of Figure 1B.
7. This parameter is sampled and not 100% tested.
8. Device is continuously selected ( $\overline{E1} = V_{IL}$ , E2 = V<sub>IH</sub>,  $\overline{G} = V_{IL}$ ).

**AC TEST LOADS**

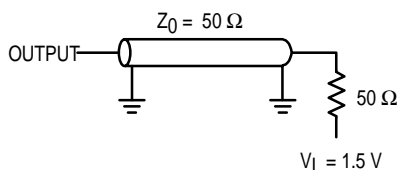


Figure 1A

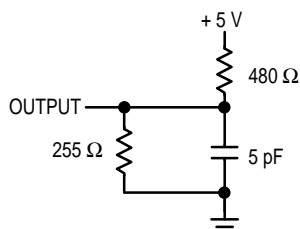
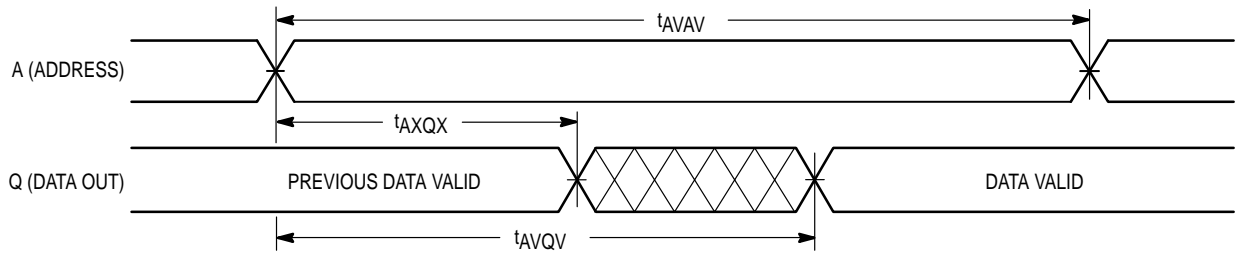


Figure 1B

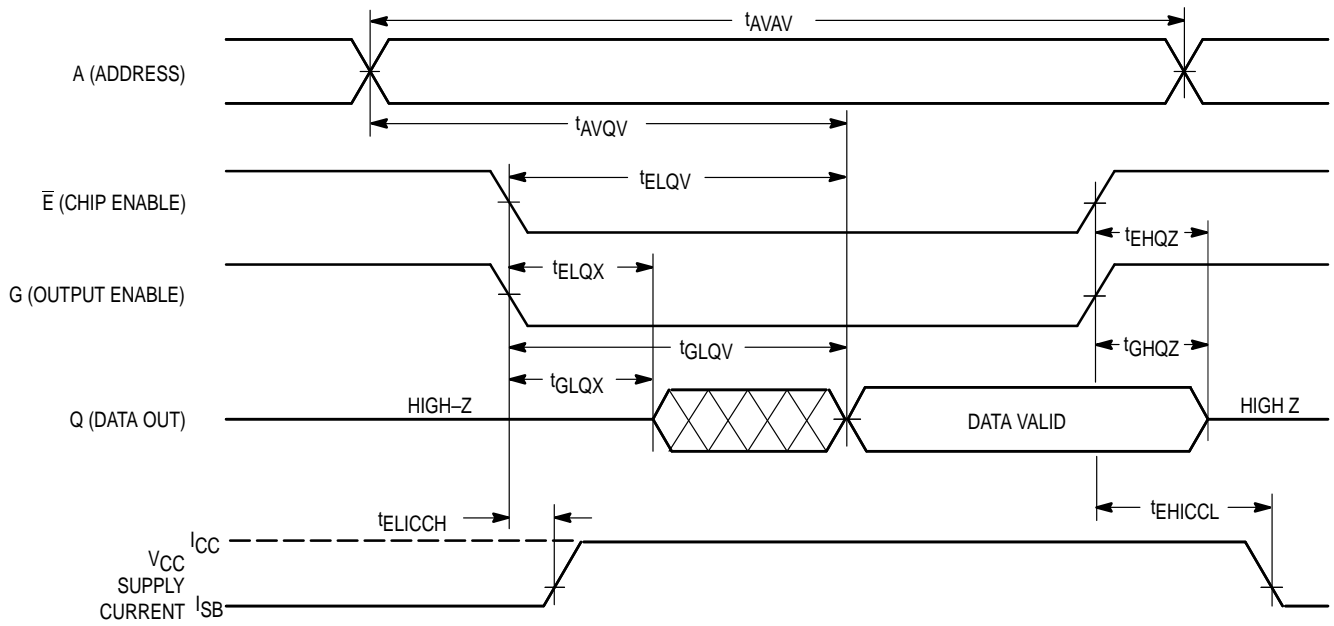
**TIMING LIMITS**

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.

**READ CYCLE 1 (See Note 8)**



**READ CYCLE 2 (See Note 4)**



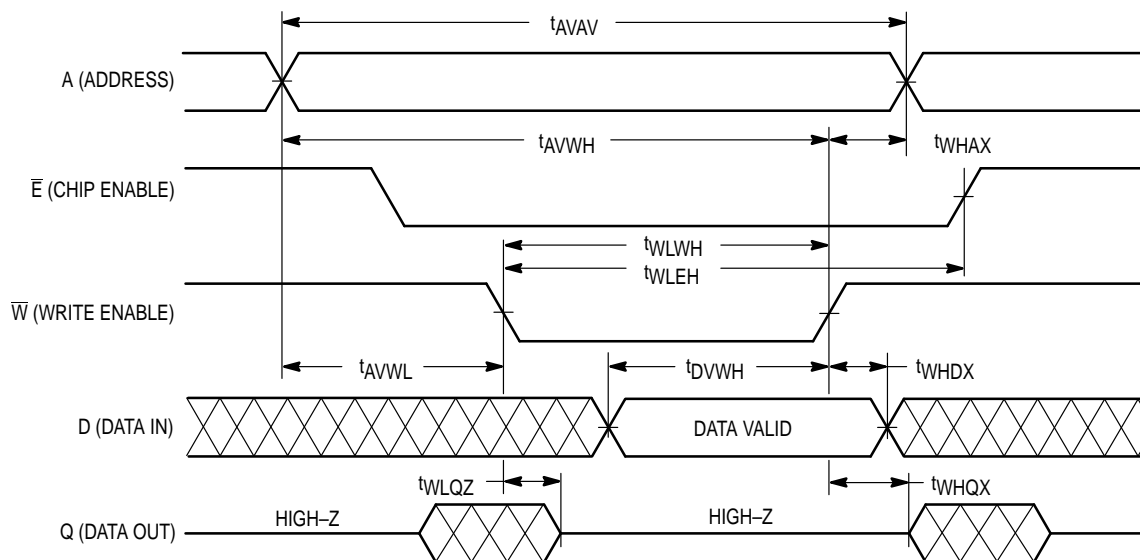
**WRITE CYCLE 1** ( $\overline{W}$  Controlled, See Notes 1, 2, and 3)

Parameter	Symbol	MCM6205D-15		MCM6205D-20		MCM6205D-25		Units	Notes
		Min	Max	Min	Max	Min	Max		
Write Cycle Time	$t_{AVAV}$	15	—	20	—	25	—	ns	4
Address Setup Time	$t_{AVWL}$	0	—	0	—	0	—	ns	
Address Valid to End of Write	$t_{AVWH}$	12	—	15	—	20	—	ns	
Write Pulse Width	$t_{WLWH}$ , $t_{WLEH}$	12	—	15	—	20	—	ns	
Write Pulse Width, $\overline{G}$ High	$t_{WLWH}$ , $t_{WLEH}$	10	—	12	—	15	—	ns	5
Data Valid to End of Write	$t_{DVWH}$	7	—	8	—	10	—	ns	
Data Hold Time	$t_{WHDX}$	0	—	0	—	0	—	ns	
Write Low to Output High-Z	$t_{WLQZ}$	0	7	0	8	0	10	ns	6, 7, 8
Write High to Output Active	$t_{WHQX}$	4	—	4	—	4	—	ns	6, 7, 8
Write Recovery Time	$t_{WHAX}$	0	—	0	—	0	—	ns	

NOTES:

1. A write occurs during the overlap of  $\overline{E}$  low and  $\overline{W}$  low.
2.  $\overline{E1}$  and  $\overline{E2}$  are represented by  $\overline{E}$  in this data sheet.  $\overline{E2}$  is of opposite polarity to  $\overline{E}$ .
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  $\overline{G} \geq V_{IH}$ , the output will remain in a high impedance state.
6. 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.
7. Transition is measured  $\pm 500$  mV from steady-state voltage with load of Figure 1B.
8. This parameter is sampled and not 100% tested.

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



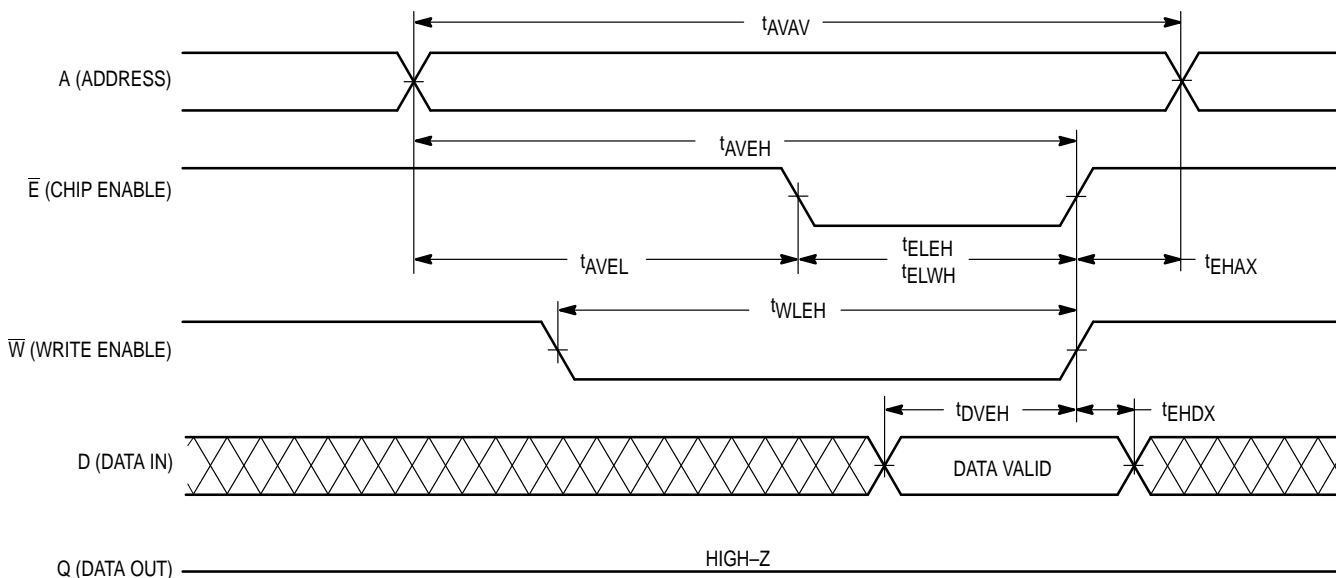
**WRITE CYCLE 2** ( $\bar{E}$  Controlled, See Notes 1 and 2)

Parameter	Symbol	MCM6205D-15		MCM6205D-20		MCM6205D-25		Unit	Notes
		Min	Max	Min	Max	Min	Max		
Write Cycle Time	$t_{AVAV}$	15	—	20	—	25	—	ns	3
Address Setup Time	$t_{AVEH}$	0	—	0	—	0	—	ns	
Address Valid to End of Write	$t_{AVEH}$	12	—	15	—	20	—	ns	
Enable to End of Write	$t_{ELEH}$ , $t_{ELWH}$	10	—	12	—	15	—	ns	4, 5
Data Valid to End of Write	$t_{DVEH}$	7	—	8	—	10	—	ns	
Data Hold Time	$t_{EHDX}$	0	—	0	—	0	—	ns	
Write Recovery Time	$t_{EHAX}$	0	—	0	—	0	—	ns	

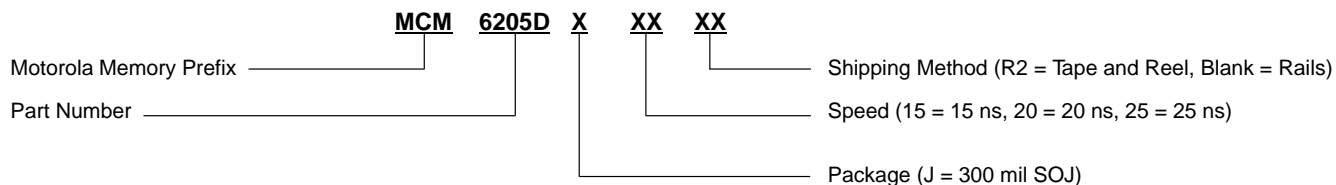
**NOTES:**

1. A write occurs during the overlap of  $\bar{E}$  low and  $\bar{W}$  low.
2.  $\bar{E}1$  and  $E2$  are represented by  $\bar{E}$  in this data sheet.  $E2$  is of opposite polarity to  $\bar{E}$ .
3. All timings are referenced from the last valid address to the first transitioning address.
4. If  $\bar{E}$  goes low coincident with or after  $\bar{W}$  goes low, the output will remain in a high impedance state.
5. If  $\bar{E}$  goes high coincident with or before  $\bar{W}$  goes high, the output will remain in a high impedance state.

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



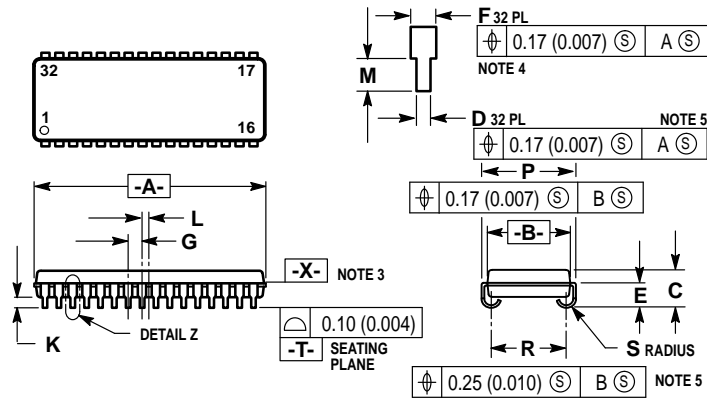
**ORDERING INFORMATION**  
(Order by Full Part Number)



Full Part Numbers — MCM6205DJ15    MCM6205DJ15R2  
 MCM6205DJ20    MCM6205DJ20R2  
 MCM6205DJ25    MCM6205DJ25R2

# PACKAGE DIMENSIONS


**CASE 857-02  
32 LEAD  
300 MIL SOJ**



**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DATUM PLANE -X- LOCATED AT TOP OF MOLD PARTING LINE AND COINCIDENT WITH TOP OF LEAD, WHERE LEAD EXITS BODY.
4. TO BE DETERMINED AT PLANE -X-.
5. TO BE DETERMINED AT PLANE -T-.
6. DIMENSION A & B DO NOT INCLUDE MOLD PROTRUSION. MOLD PROTRUSION SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
7. 857-01 IS OBSOLETE, NEW STANDARD 857-02.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	20.83	21.08	0.820	0.830
B	7.50	7.74	0.295	0.305
C	3.26	3.75	0.128	0.148
D	0.41	0.50	0.016	0.020
E	2.24	2.48	0.088	0.098
F	0.67	0.81	0.026	0.032
G	1.27 BSC		0.050 BSC	
K	0.89	1.14	0.035	0.045
L	0.64 BSC		0.025 BSC	
N	0.76	1.14	0.030	0.045
P	8.38	8.64	0.330	0.340
R	6.60	6.86	0.260	0.270
S	0.77	1.01	0.030	0.040

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**MCM6205D/D**

