WCMS0808U1X

32K x 8 Static RAM

Features

- **Low voltage range:**
  - **2.7V – 3.6V**
- **Low active power and standby power**
- **Easy memory expansion with CE and OE features**
- **TTL-compatible inputs and outputs**
- **Automatic power-down when deselected**
- **CMOS for optimum speed/power**

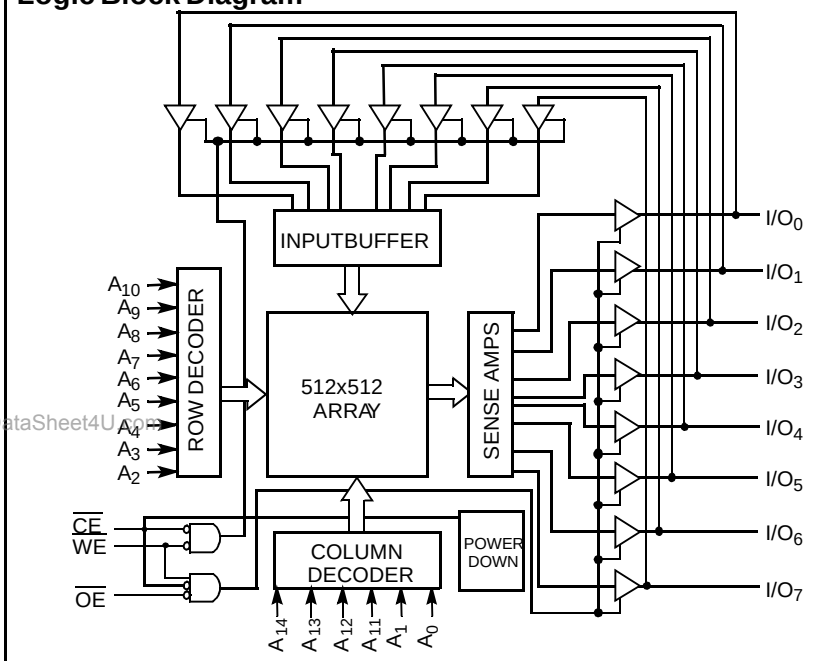
Functional Description

The WCMS0808U1X is composed of a high-performance CMOS static RAM organized as 32K words by 8 bits. Easy memory expansion is provided by an active LOW chip enable ($\overline{CE}$) and active LOW output enable ($\overline{OE}$) and three-state drivers. These devices have an automatic power-down feature, reducing the power consumption by over 99% when deselected. The WCMS0808U1X is available in the 450-mil-wide (300-mil body width) narrow SOIC and TSOP.

An active LOW write enable signal ($\overline{WE}$) controls the writing/reading operation of the memory. When $\overline{CE}$ and $\overline{WE}$ inputs are both LOW, data on the eight data input/output pins (I/O_0 through I/O_7) is written into the memory location addressed by the address present on the address pins (A_0 through A_{14}). Reading the device is accomplished by selecting the device and enabling the outputs, $\overline{CE}$ and $\overline{OE}$ active LOW, while $\overline{WE}$ remains inactive or HIGH. Under these conditions, the contents of the location addressed by the information on address pins are present on the eight data input/output pins.

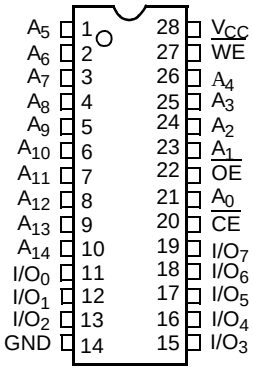
The input/output pins remain in a high-impedance state unless the chip is selected, outputs are enabled, and write enable ($\overline{WE}$) is HIGH.

Logic Block Diagram

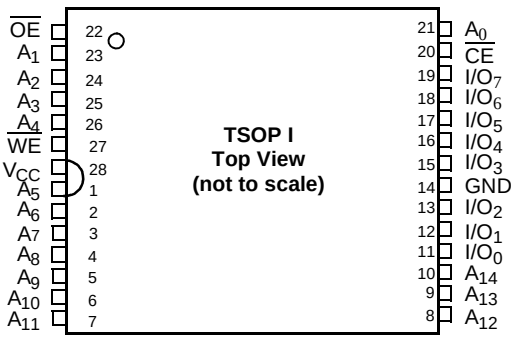


Pin Configurations

Narrow SOIC Top View



TSOP I Top View (not to scale)



Maximum Ratings

(Above which the useful life may be impaired. For user guidelines, not tested.)

Storage Temperature ..... –65°C to +150°C

Ambient Temperature with Power Applied..... 0°C to +70°C

Supply Voltage to Ground Potential (Pin 28 to Pin 14)..... –0.5V to +4.6V

DC Voltage Applied to Outputs in High Z State[1]..... –0.5V to V_{CC} + 0.5V

DC Input Voltage[1]..... –0.5V to V_{CC} + 0.5V

Output Current into Outputs (LOW)..... 20 mA

Static Discharge Voltage..... >2001V (per MIL-STD-883, Method 3015)

Latch-Up Current..... >200 mA

Operating Range

Range	Ambient Temperature	V_{CC}
Industrial	–40°C to +85°C	2.7V to 3.6V

Product Portfolio

Product	V_{CC} Range			Speed	Power Dissipation (LL Devices)			
					Operating (I_{CC})		Standby (I_{SB2})	
	Min.	Typ.	Max.		Typ.	Max.	Typ.	Max.
WCMS0808U1X	2.7V	3.0	3.6V	70 ns	11 mA	30 mA	0.1 µA	40 µA

Electrical Characteristics Over the Operating Range

Parameter	Description	Test Conditions		WCMS0808U1X			Unit
				Min.	Typ.[1]	Max.	
V_{OH}	Output HIGH Voltage	V_{CC} = Min., I_{OH} = –1.0 mA		2.4			V
V_{OL}	Output LOW Voltage	V_{CC} = Min., I_{OL} = 2.1 mA				0.4	V
V_{IH}	Input HIGH Voltage			2.2		V_{CC} +0.3V	V
V_{IL}	Input LOW Voltage			–0.5		0.8	V
I_{IX}	Input Leakage Current	GND ≤ V_I ≤ V_{CC}		–1		+1	µA
I_{OZ}	Output Leakage Current	GND ≤ V_O ≤ V_{CC}, Output Disabled		–1		+1	µA
I_{CC}	V_{CC} Operating Supply Current	V_{CC} = 3.6V, I_{OUT} = 0 mA, f = f_{MAX} = $1/t_{RC}$	Ind'l		11	30	mA
I_{SB1}	Automatic CE Power-Down Current— TTL Inputs	Max. V_{CC}, $\overline{CE}$ ≥ V_{IH}, V_{IN} ≥ V_{IH} or V_{IN} ≤ V_{IL}, f = f_{MAX}	Ind'l		100	300	µA
I_{SB2}	Automatic CE Power-Down Current— CMOS Inputs	Max. V_{CC}, $\overline{CE}$ ≥ V_{CC} – 0.3V V_{IN} ≥ V_{CC} – 0.3V or V_{IN} ≤ 0.3V, f = 0	Ind'l		0.1	40	µA

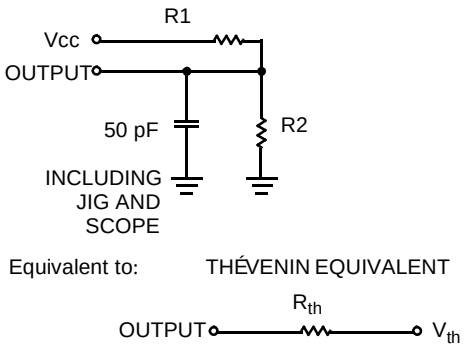
Capacitance[3]

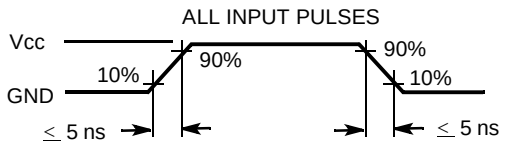
Parameter	Description	Test Conditions	Max.	Unit
C_{IN}	Input Capacitance	T_A = 25°C, f = 1 MHz, V_{CC} = 3.0V	6	pF
C_{OUT}	Output Capacitance		8	pF

Notes:

1. V_{IL} (min.) = –2.0V for pulse durations of less than 20 ns.
2. Typical values are included for reference only and are not guaranteed or tested. Typical values are measured at V_{CC} = Vcc Typ., T_A = 25°C, and t_{AA}=70ns.
3. Tested initially and after any design or process changes that may affect these parameters.

AC Test Loads and Waveforms



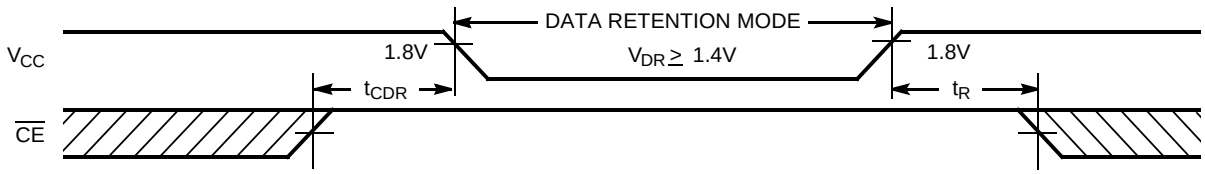


Parameters	3.3 V	Unit
R1	1103	KOhms
R2	1554	KOhms
RTH	645	KOhms
VTH	1.75V	Volts

Data Retention Characteristics (Over the Operating Range)

Parameter	Description	Conditions[4]	Min.	Typ.[2]	Max.	Unit
V_{DR}	V_{CC} for Data Retention		1.4			V
I_{CCDR}	Data Retention Current	V_{CC} = 1.6 $\overline{CE} \geq V_{CC} - 0.3V$, $V_{IN} \geq V_{CC} - 0.3V$ or $V_{IN} \leq 0.3V$		0.1	6	uA
t_{CDR}[3]	Chip Deselect to Data Retention Time		0			ns
t_R[3]	Operation Recovery Time		t_{RC}			ns

Data Retention Waveform



Switching Characteristics Over the Operating Range[5]

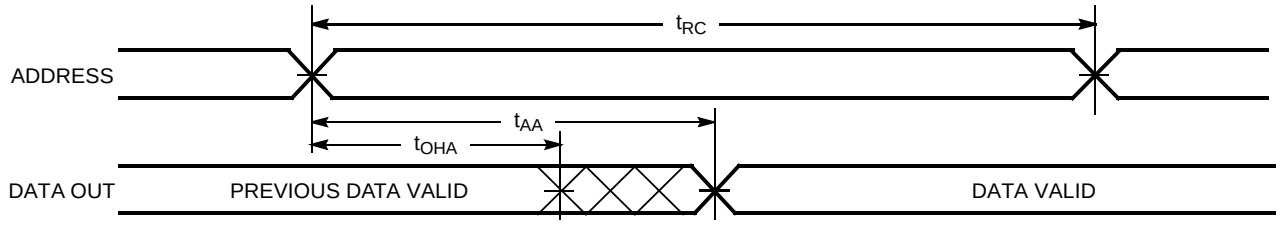
Parameter	Description	WCMS0808U1X		Unit
		Min.	Max.	
READ CYCLE				
t_{RC}	Read Cycle Time	70		ns
t_{AA}	Address to Data Valid		70	ns
t_{OHA}	Data Hold from Address Change	10		ns
t_{ACE}	$\overline{CE}$ LOW to Data Valid		70	ns
t_{DOE}	$\overline{OE}$ LOW to Data Valid		35	ns
t_{LZOE}	$\overline{OE}$ LOW to Low Z[6]	5		ns
t_{HZOE}	$\overline{OE}$ HIGH to High Z[6, 7]		25	ns
t_{LZCE}	$\overline{CE}$ LOW to Low Z[6]	10		ns
t_{HZCE}	$\overline{CE}$ HIGH to High Z[6, 7]		25	ns
t_{PU}	$\overline{CE}$ LOW to Power-Up	0		ns
t_{PD}	$\overline{CE}$ HIGH to Power-Down		70	ns
WRITE CYCLE[8,9]				
t_{WC}	Write Cycle Time	70		ns
t_{SCE}	$\overline{CE}$ LOW to Write End	60		ns
t_{AW}	Address Set-Up to Write End	60		ns
t_{HA}	Address Hold from Write End	0		ns
t_{SA}	Address Set-Up to Write Start	0		ns
t_{PWE}	$\overline{WE}$ Pulse Width	50		ns
t_{SD}	Data Set-Up to Write End	30		ns
t_{HD}	Data Hold from Write End	0		ns
t_{HZWE}	$\overline{WE}$ LOW to High Z[6, 7]		25	ns
t_{LZWE}	$\overline{WE}$ HIGH to Low Z[6]	10		ns

Notes:

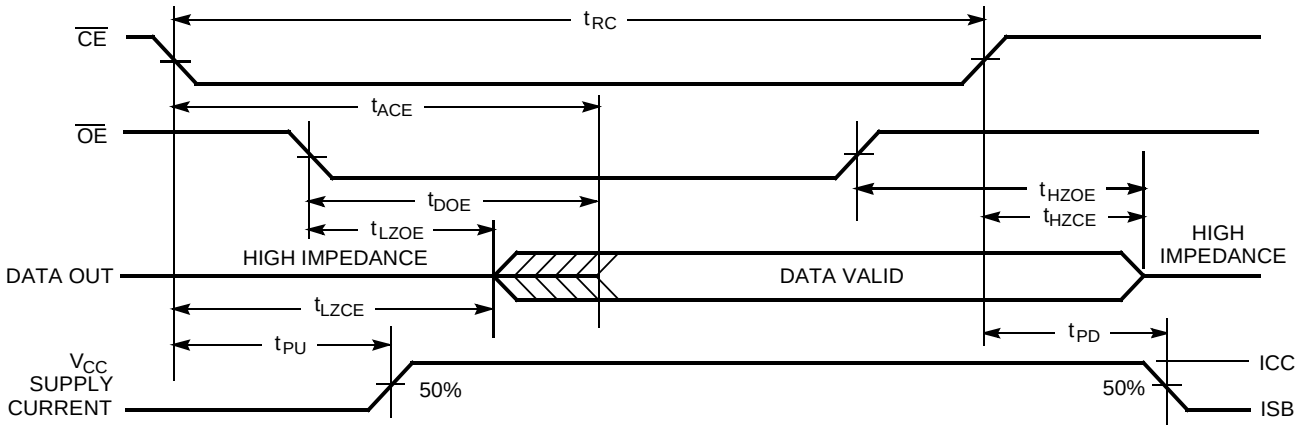
4. No input may exceed V_{CC}+0.3V.
5. Test conditions assume signal transition time of 5 ns or less timing reference levels of Vcc/2, input pulse levels of 0 to Vcc, and output loading of the specified I_{OL}/I_{OH} and 100-pF load capacitance.
6. At any given temperature and voltage condition, t_{HZCE} is less than t_{LZCE}, t_{HZOE} is less than t_{LZOE}, and t_{HZWE} is less than t_{LZWE} for any given device.
7. t_{HZOE}, t_{HZCE}, and t_{HZWE} are specified with C_L = 5 pF as in part (b) of AC Test Loads. Transition is measured ±200 mV from steady-state voltage.
8. The internal write time of the memory is defined by the overlap of $\overline{CE}$ LOW and $\overline{WE}$ LOW. Both signals must be LOW to initiate a write and either signal can terminate a write by going HIGH. The data input set-up and hold timing should be referenced to the rising edge of the signal that terminates the write.
9. The minimum write cycle time for write cycle #3 ($\overline{WE}$ controlled, $\overline{OE}$ LOW) is the sum of t_{HZWE} and t_{SD}

Switching Waveforms

Read Cycle No. 1[10, 11]



Read Cycle No. 2 [11, 12]

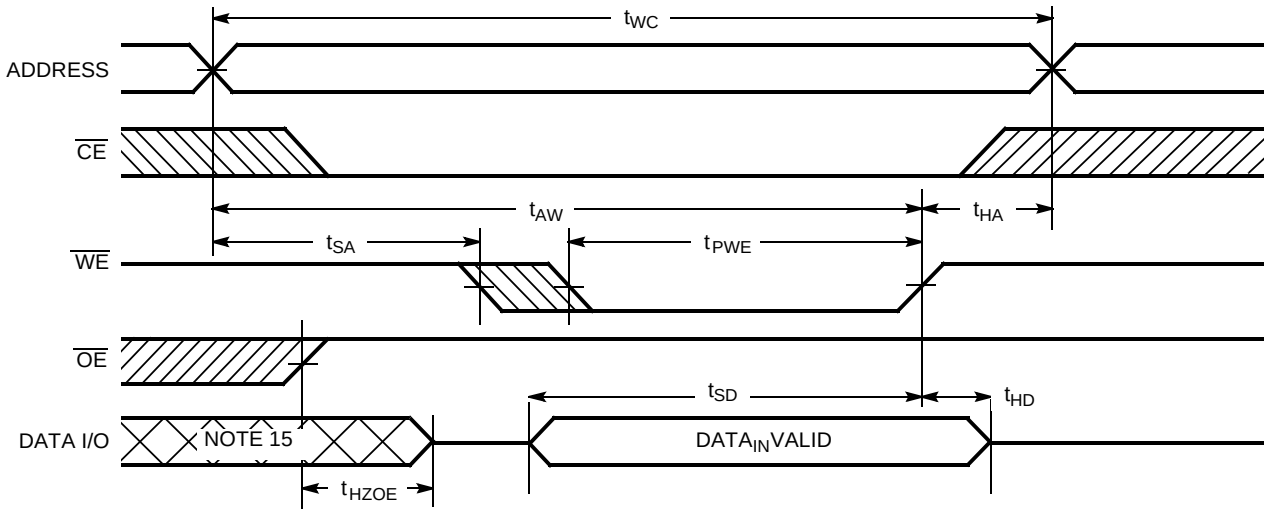


Notes:

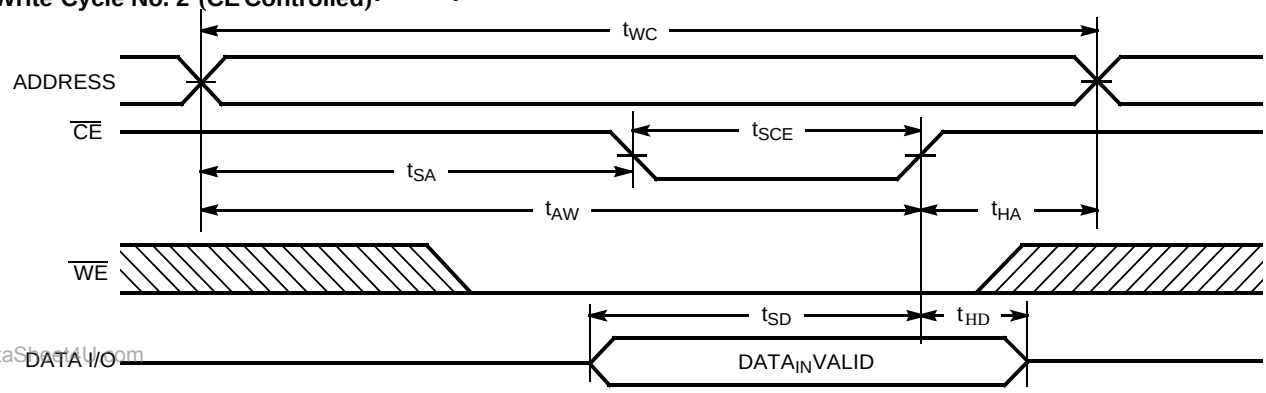
10. Device is continuously selected. $\overline{OE}$, $\overline{CE}$ = V_{IL}.
11. $\overline{WE}$ is HIGH for read cycle.
12. Address valid prior to or coincident with $\overline{CE}$ transition LOW.

Switching Waveforms (continued)

Write Cycle No. 1 ($\overline{WE}$ Controlled)[8, 13, 14]



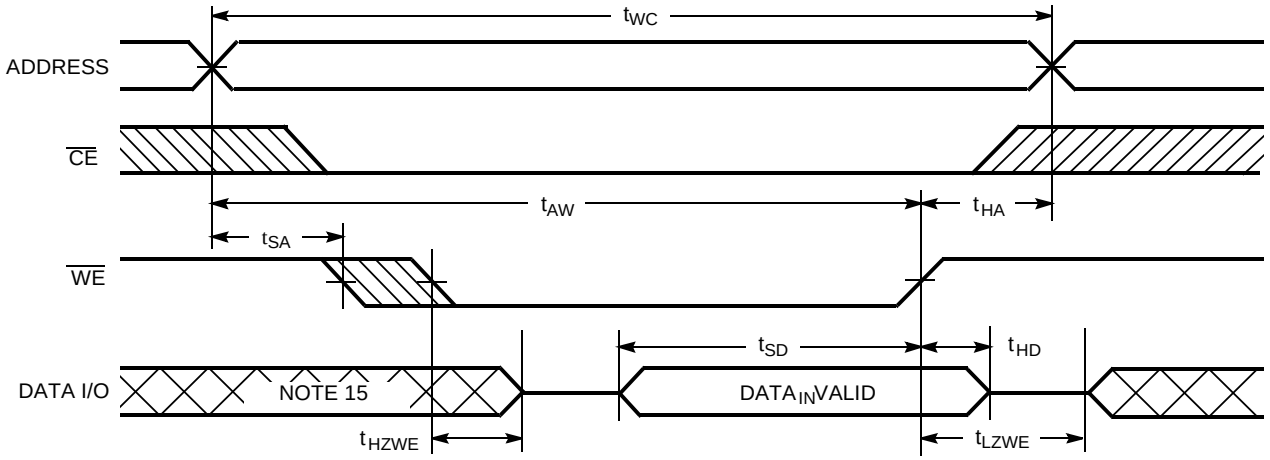
Write Cycle No. 2 ($\overline{CE}$ Controlled)[8, 13, 14]



Notes:
13. Data I/O is high impedance if $\overline{OE} = V_{IH}$.
14. If $\overline{CE}$ goes HIGH simultaneously with $\overline{WE}$ HIGH, the output remains in a high-impedance state.
15. During this period, the I/Os are in output state and input signals should not be applied.

Switching Waveforms (continued)

Write Cycle No. 3 ($\overline{WE}$ Controlled, $\overline{OE}$ LOW)[9, 14]



Truth Table

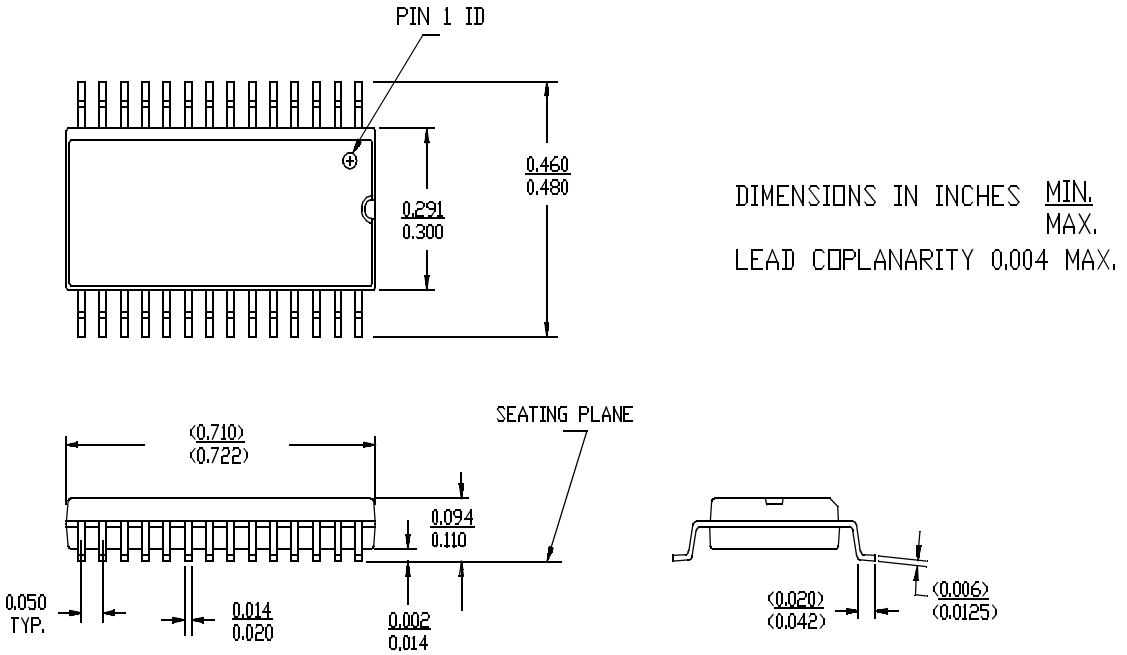
$\overline{CE}$	$\overline{WE}$	$\overline{OE}$	Inputs/Outputs	Mode	Power
H	X	X	High Z	Deselect/Power-Down	Standby (I_{SB})
L	H	L	Data Out	Read	Active (I_{CC})
L	L	X	Data In	Write	Active (I_{CC})
L	H	H	High Z	Deselect, Output Disabled	Active (I_{CC})

Ordering Information

Speed (ns)	Ordering Code	Package Name	Package Type	Operating Range
70	WCMS0808U1X -NF70	N28	28-Lead 450-Mil (300-Mil Body Width) narrow SOIC	Industrial
	WCMS0808U1X-TF70	T28	28-Lead Thin Small Outline Package	

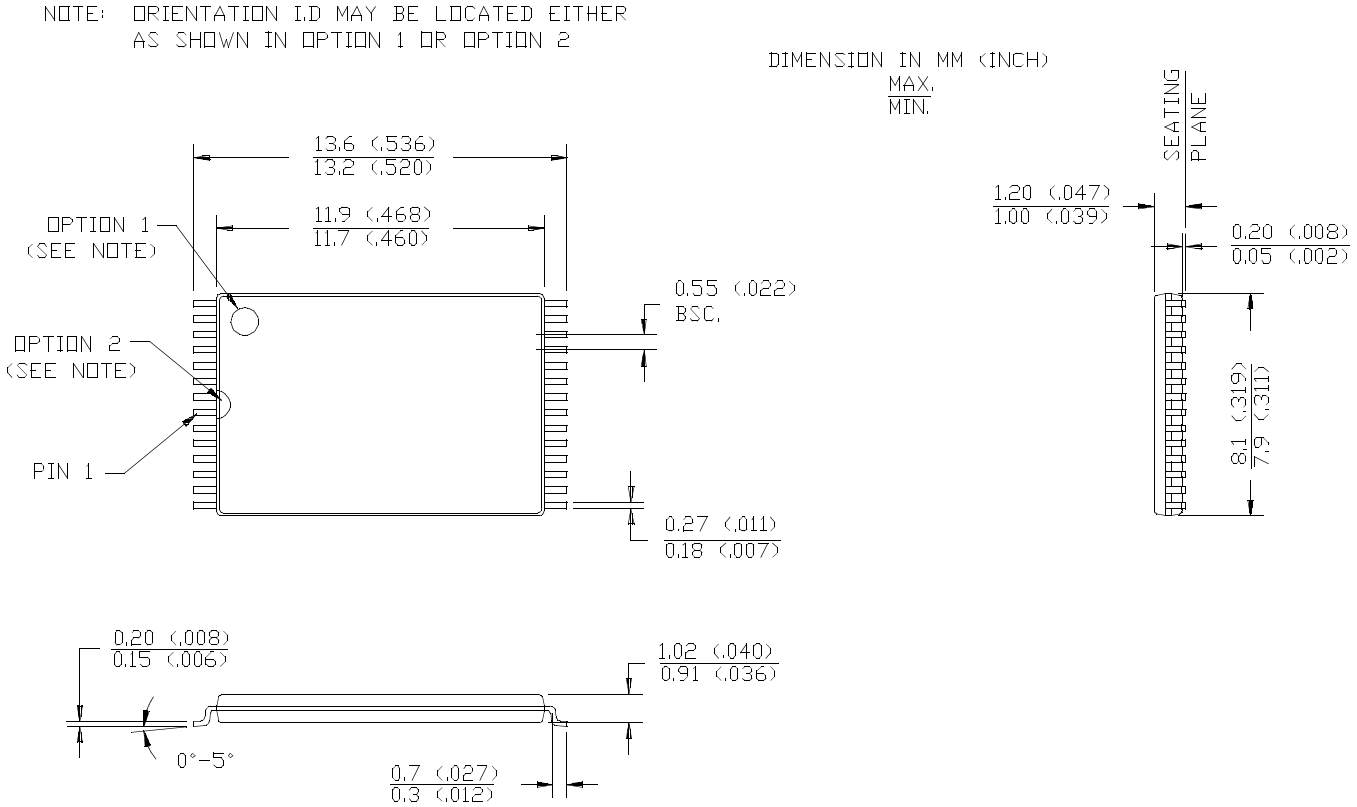
Package Diagrams

28-Lead 450-Mil (300-Mil Body Width) SOIC, N28



Package Diagrams (continued)

28-Lead Thin Small Outline Package, T28



Document Title: WCMS0808U1X, 32K x 8 Static RAM					
REV.	**Spec #**	**ECN #**	**Issue Date**	**Orig. of Change**	**Description of Change**
**	38-14009	115224	1/17/02	MGN	New Datasheet