

32K x 8 Static RAM

Features

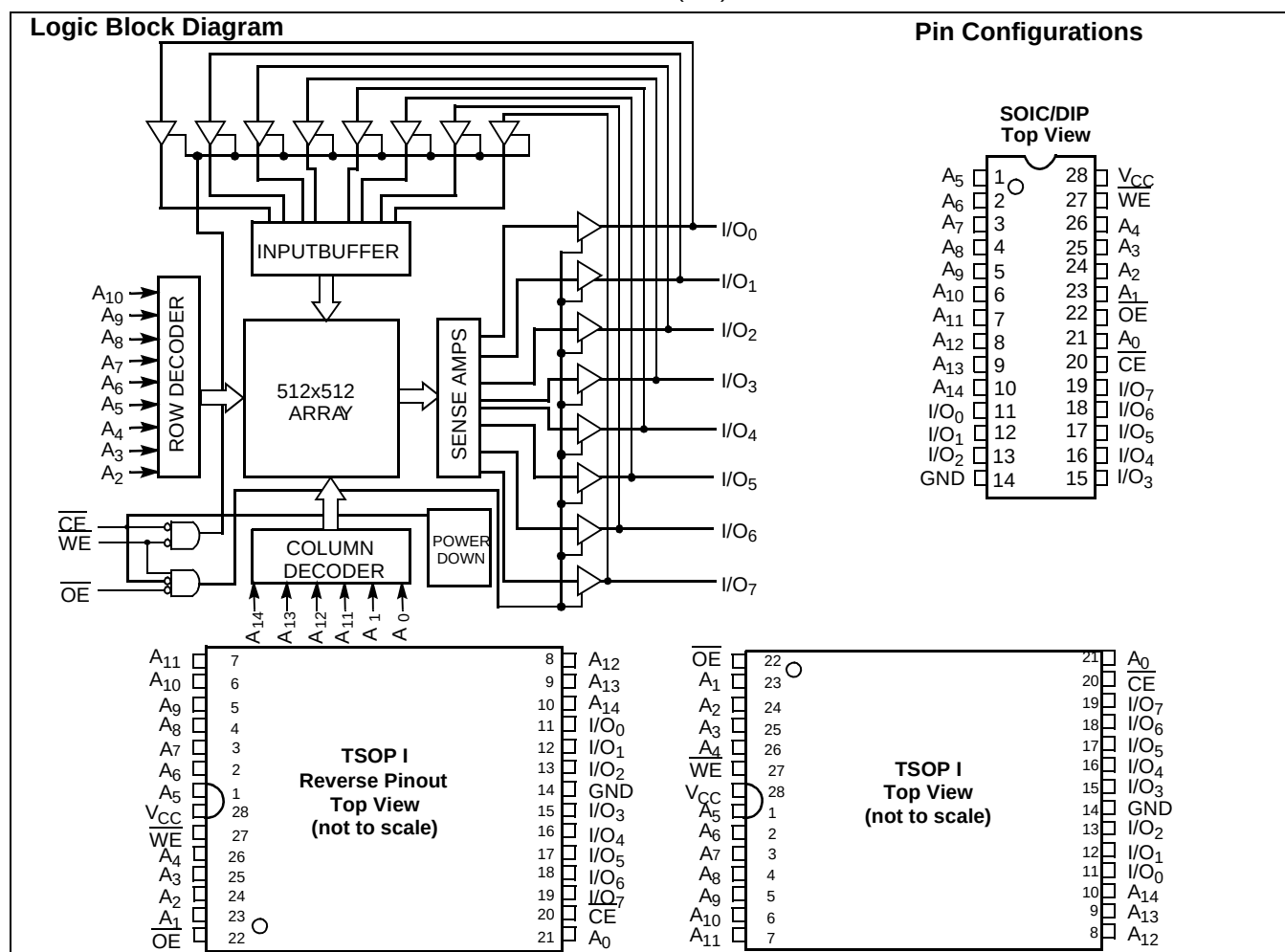
- High speed (55-ns and 70-ns availability)
- Voltage range
 - 4.5V–5.5V operation
- Low active power (70 ns, LL version)
 - 275 mW (max.)
- Low standby power (70 ns, LL version)
 - 28 μ W (max.)
- Easy memory expansion with $\overline{\text{CE}}$ and $\overline{\text{OE}}$ features
- TTL-compatible inputs and outputs
- Automatic power-down when deselected
- CMOS for optimum speed/power

Functional Description

The CY62256 is a high-performance CMOS static RAM organized as 32K words by 8 bits. Easy memory expansion is provided by an active LOW chip enable ($\overline{\text{CE}}$) and active LOW output enable ($\overline{\text{OE}}$) and three-state drivers. This device has an automatic power-down feature, reducing the power consumption by 99.9% when deselected. The CY62256 is in the standard 450-mil-wide (300-mil body width) SOIC, TSOP, Reverse TSOP and 600-mil PDIP packages.

An active LOW write enable signal ($\overline{\text{WE}}$) controls the writing/reading operation of the memory. When $\overline{\text{CE}}$ and $\overline{\text{WE}}$ 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, $\overline{\text{CE}}$ and $\overline{\text{OE}}$ active LOW, while $\overline{\text{WE}}$ 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 ($\overline{\text{WE}}$) is HIGH.



Maximum Ratings

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

Storage Temperature -65°C to $+150^{\circ}\text{C}$

Ambient Temperature with
Power Applied 0°C to $+70^{\circ}\text{C}$

Supply Voltage to Ground Potential
(Pin 28 to Pin 14) -0.5V to $+7.0\text{V}$

DC Voltage Applied to Outputs
in High-Z State^[1] -0.5V to $V_{\text{CC}} + 0.5\text{V}$

DC Input Voltage^[1] -0.5V to $V_{\text{CC}} + 0.5\text{V}$

Output Current into Outputs (LOW) 20 mA

Static Discharge Voltage $> 2001\text{V}$
(per MIL-STD-883, Method 3015)

Latch-up Current $> 200\text{ mA}$

Operating Range

Range	Ambient Temperature	V_{CC}
Commercial	0°C to $+70^{\circ}\text{C}$	$5\text{V} \pm 10\%$
Industrial	-40°C to $+85^{\circ}\text{C}$	$5\text{V} \pm 10\%$

Electrical Characteristics Over the Operating Range

Parameter	Description	Test Conditions	CY62256-55			CY62256-70			Unit
			Min.	Typ. ^[2]	Max.	Min.	Typ. ^[2]	Max.	
V_{OH}	Output HIGH Voltage	$V_{\text{CC}} = \text{Min.}, I_{\text{OH}} = -1.0\text{ mA}$	2.4			2.4			V
V_{OL}	Output LOW Voltage	$V_{\text{CC}} = \text{Min.}, I_{\text{OL}} = 2.1\text{ mA}$			0.4			0.4	V
V_{IH}	Input HIGH Voltage		2.2		$V_{\text{CC}} + 0.5\text{V}$	2.2		$V_{\text{CC}} + 0.5\text{V}$	V
V_{IL}	Input LOW Voltage		-0.5		0.8	-0.5		0.8	V
I_{IX}	Input Leakage Current	$\text{GND} \leq V_{\text{I}} \leq V_{\text{CC}}$	-0.5		+0.5	-0.5		+0.5	μA
I_{OZ}	Output Leakage Current	$\text{GND} \leq V_{\text{O}} \leq V_{\text{CC}}, \text{Output Disabled}$	-0.5		+0.5	-0.5		+0.5	μA
I_{CC}	V_{CC} Operating Supply Current	$V_{\text{CC}} = \text{Max.}, I_{\text{OUT}} = 0\text{ mA}, f = f_{\text{MAX}} = 1/f_{\text{RC}}$		28	55		28	55	mA
			L	25	50		25	50	mA
			LL	25	50		25	50	mA
I_{SB1}	Automatic CE Power-down Current—TTL Inputs	Max. $V_{\text{CC}}, \text{CE} \geq V_{\text{IH}}, V_{\text{IN}} \geq V_{\text{IH}}$ or $V_{\text{IN}} \leq V_{\text{IL}}, f = f_{\text{MAX}}$		0.5	2		0.5	2	mA
			L	0.4	0.6		0.4	0.6	mA
			LL	0.3	0.5		0.3	0.5	mA
I_{SB2}	Automatic CE Power-down Current—CMOS Inputs	Max. $V_{\text{CC}}, \text{CE} \geq V_{\text{CC}} - 0.3\text{V}, V_{\text{IN}} \geq V_{\text{CC}} - 0.3\text{V}$ or $V_{\text{IN}} \leq 0.3\text{V}, f = 0$		1	5		1	5	mA
			L	2	50		2	50	μA
			LL	0.1	5		0.1	5	μA
		Indust'l Temp Range	LL	0.1	10		0.1	10	μA

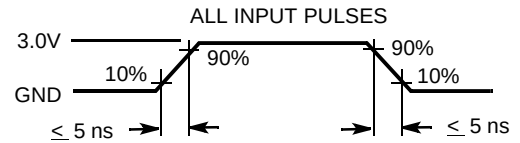
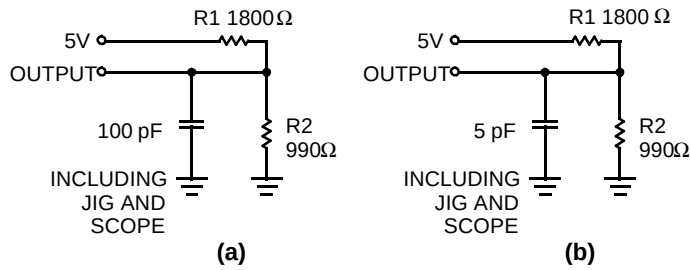
Capacitance^[3]

Parameter	Description	Test Conditions	Max.	Unit
C_{IN}	Input Capacitance	$T_{\text{A}} = 25^{\circ}\text{C}, f = 1\text{ MHz}, V_{\text{CC}} = 5.0\text{V}$	6	pF
C_{OUT}	Output Capacitance		8	pF

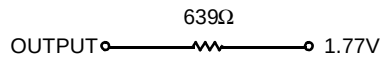
Notes:

- V_{IL} (min.) = -2.0V for pulse durations of less than 20 ns.
- Typical specifications are the mean values measured over a large sample size across normal production process variations and are taken at nominal conditions ($T_{\text{A}} = 25^{\circ}\text{C}, V_{\text{CC}}$). Parameters are guaranteed by design and characterization, and not 100% tested.
- Tested initially and after any design or process changes that may affect these parameters.

AC Test Loads and Waveforms



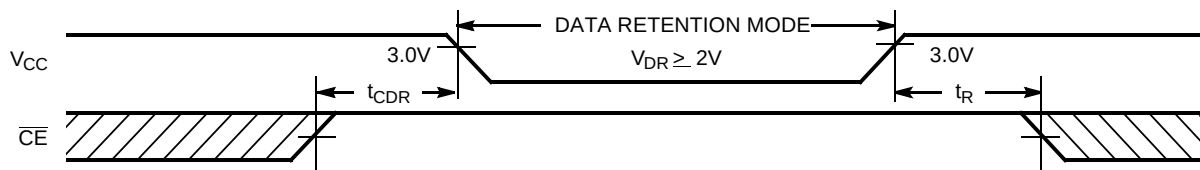
Equivalent to: THÉVENIN EQUIVALENT



Data Retention Characteristics

Parameter	Description		Conditions ^[4]	Min.	Typ. ^[2]	Max.	Unit
V_{DR}	V_{CC} for Data Retention			2.0			V
I_{CCDR}	Data Retention Current	L	$V_{CC} = 3.0V$, $CE \geq V_{CC} - 0.3V$, $V_{IN} \geq V_{CC} - 0.3V$, or $V_{IN} \leq 0.3V$		2	50	μA
		LL			0.1	5	μA
		LL Ind'l			0.1	10	μA
$t_{CDR}^{[3]}$	Chip Deselect to Data Retention Time			0			ns
$t_R^{[3]}$	Operation Recovery Time			t_{RC}			ns

Data Retention Waveform

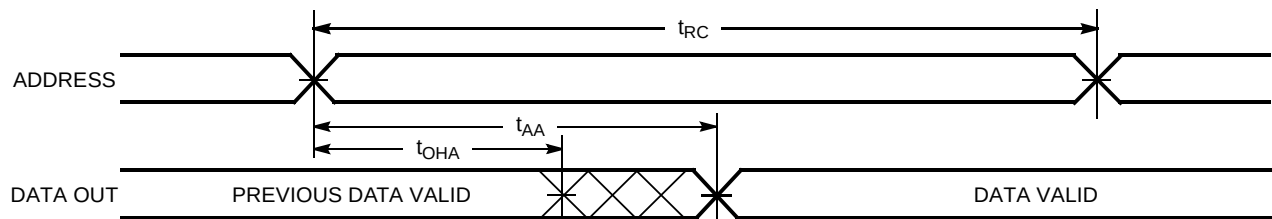


Note:

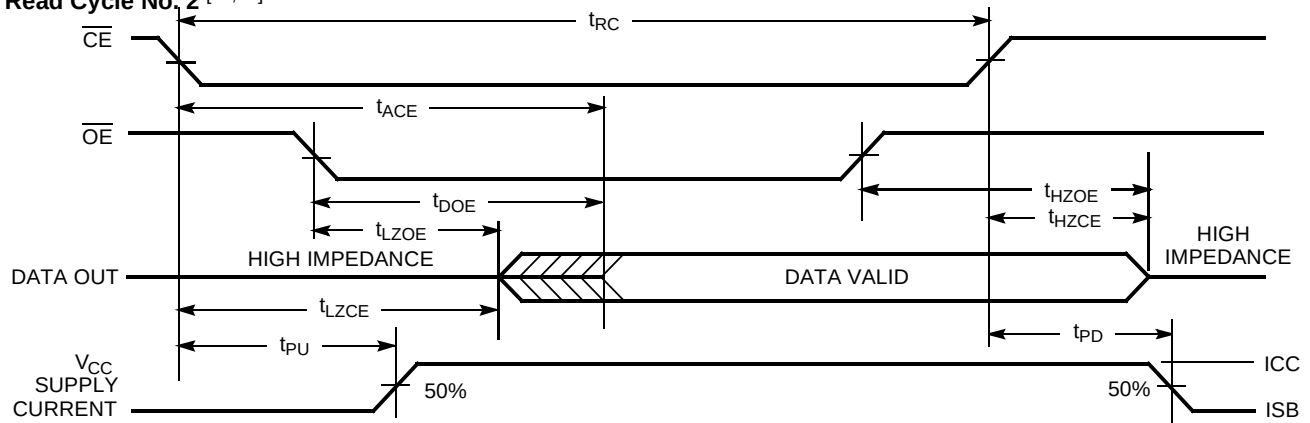
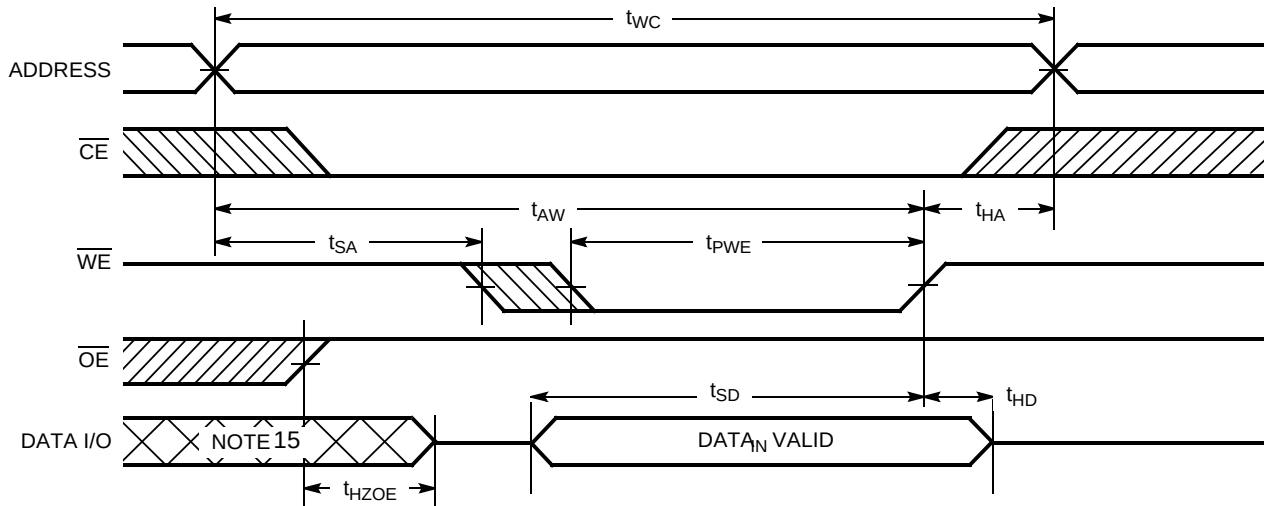
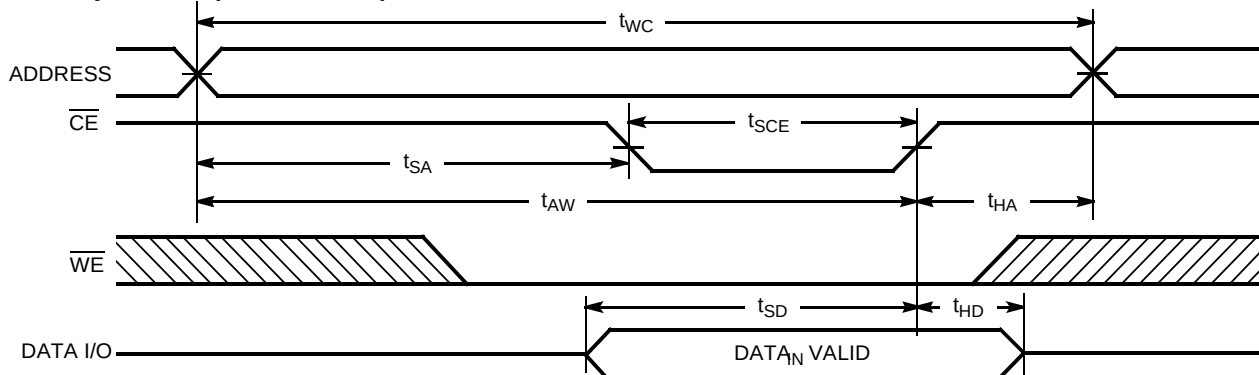
4. No input may exceed $V_{CC} + 0.5V$.

Switching Characteristics Over the Operating Range^[5]

Parameter	Description	CY62256–55		CY62256–70		Unit
		Min.	Max.	Min.	Max.	
Read Cycle						
t _{RC}	Read Cycle Time	55		70		ns
t _{AA}	Address to Data Valid		55		70	ns
t _{OHA}	Data Hold from Address Change	5		5		ns
t _{ACE}	CE LOW to Data Valid		55		70	ns
t _{DOE}	OE LOW to Data Valid		25		35	ns
t _{LZOE}	OE LOW to Low-Z ^[6]	5		5		ns
t _{HZOE}	OE HIGH to High-Z ^[6, 7]		20		25	ns
t _{LZCE}	CE LOW to Low-Z ^[6]	5		5		ns
t _{HZCE}	CE HIGH to High-Z ^[6, 7]		20		25	ns
t _{PU}	CE LOW to Power-up	0		0		ns
t _{PD}	CE HIGH to Power-down		55		70	ns
Write Cycle ^[8, 9]						
t _{WC}	Write Cycle Time	55		70		ns
t _{SCE}	CE LOW to Write End	45		60		ns
t _{AW}	Address Set-up to Write End	45		60		ns
t _{HA}	Address Hold from Write End	0		0		ns
t _{SA}	Address Set-up to Write Start	0		0		ns
t _{PWE}	WE Pulse Width	40		50		ns
t _{SD}	Data Set-up to Write End	25		30		ns
t _{HD}	Data Hold from Write End	0		0		ns
t _{HZWE}	WE LOW to High-Z ^[6, 7]		20		25	ns
t _{LZWE}	WE HIGH to Low-Z ^[6]	5		5		ns

Switching Waveforms
Read Cycle No. 1^[10,11]

Notes:

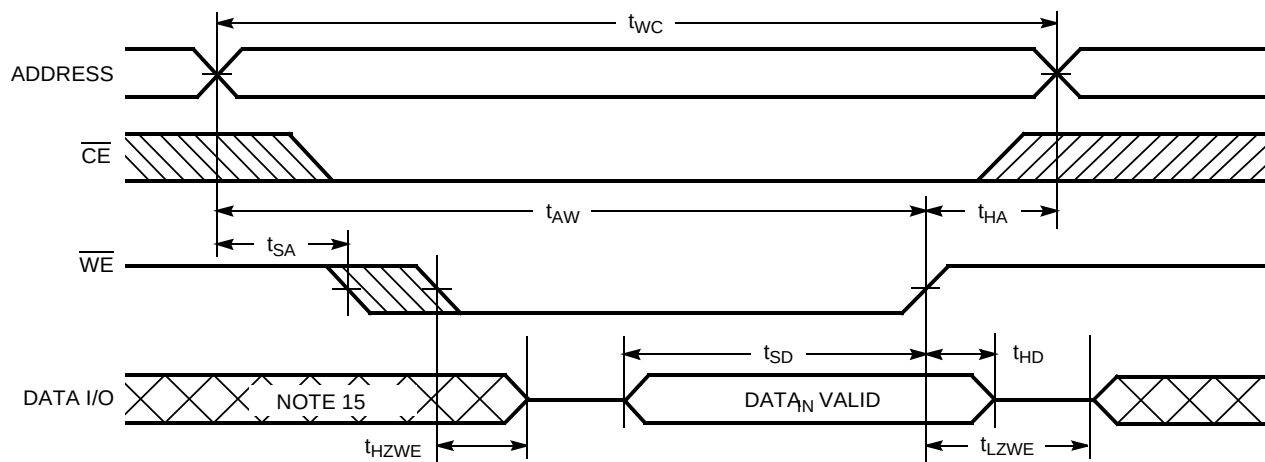
- Test conditions assume signal transition time of 5 ns or less, timing reference levels of 1.5V, input pulse levels of 0 to 3.0V, and output loading of the specified I_{OL}/I_{OH} and 100-pF load capacitance.
- At any given temperature and voltage condition, t_{HZCE} is less than t_{LZCE} , t_{HZOE} is less than t_{LZOE} , and t_{HZWE} is less than t_{LZWE} for any given device.
- 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 ± 500 mV from steady-state voltage.
- 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.
- The minimum Write cycle time for Write cycle #3 ($\overline{WE}$ controlled, $\overline{OE}$ LOW) is the sum of t_{HZWE} and t_{SD} .
- Device is continuously selected. $\overline{OE}$, $\overline{CE} = V_{IL}$.
- $\overline{WE}$ is HIGH for Read cycle.

Switching Waveforms (continued)
Read Cycle No. 2 ^[11,12]

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

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

Notes:

12. Address valid prior to or coincident with $\overline{\text{CE}}$ transition LOW.
13. Data I/O is high impedance if $\text{OE} = \overline{\text{V}_{IH}}$.
14. If $\overline{\text{CE}}$ goes HIGH simultaneously with $\overline{\text{WE}}$ HIGH, the output remains in a high-impedance state.

Switching Waveforms (continued)

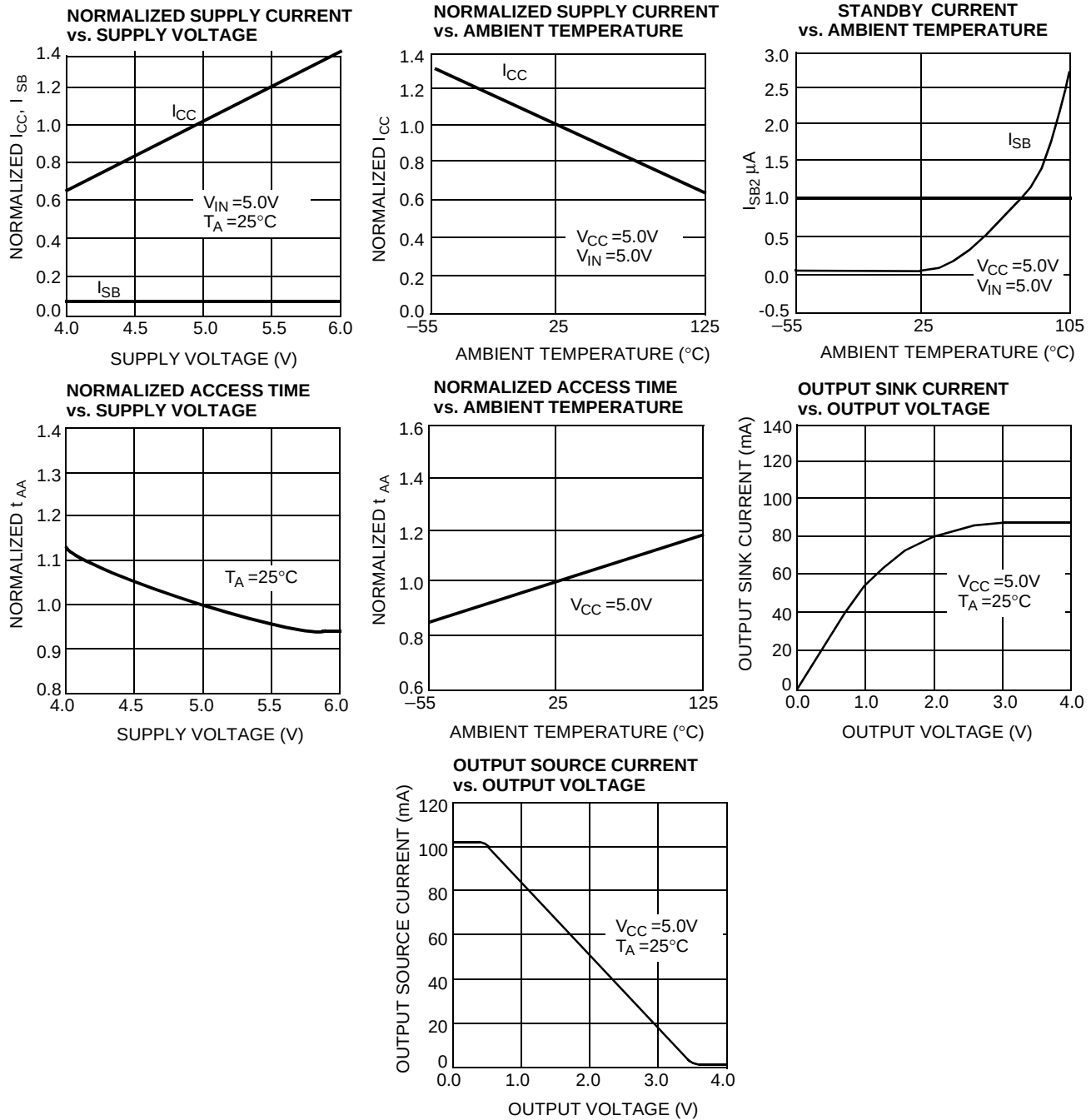
Write Cycle No. 3 ($\overline{\text{WE}}$ Controlled, $\overline{\text{OE}}$ LOW) ^[9,14]

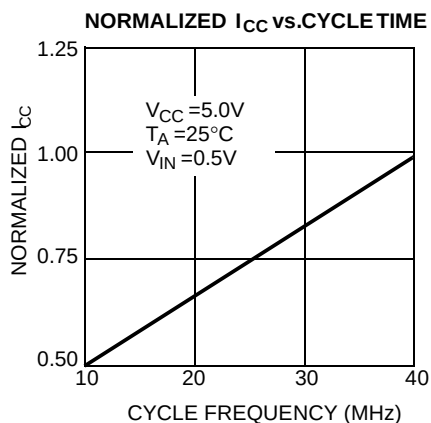
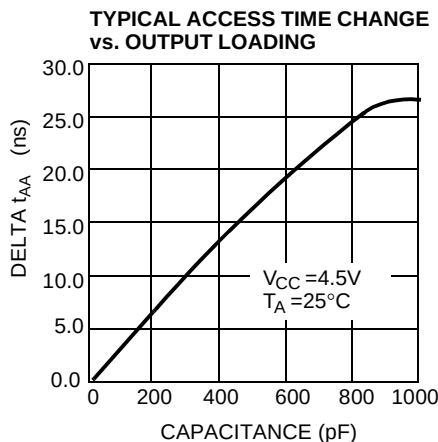
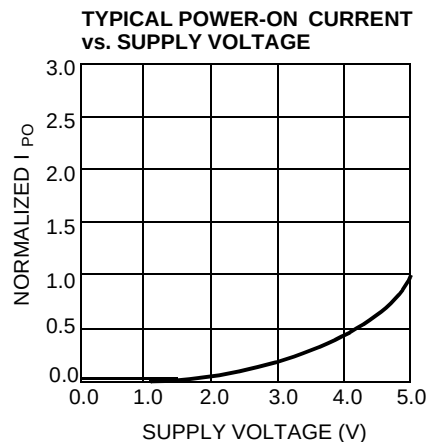


Note:

15. During this period, the I/Os are in output state and input signals should not be applied.

Typical DC and AC Characteristics



Typical DC and AC Characteristics (continued)

Truth Table

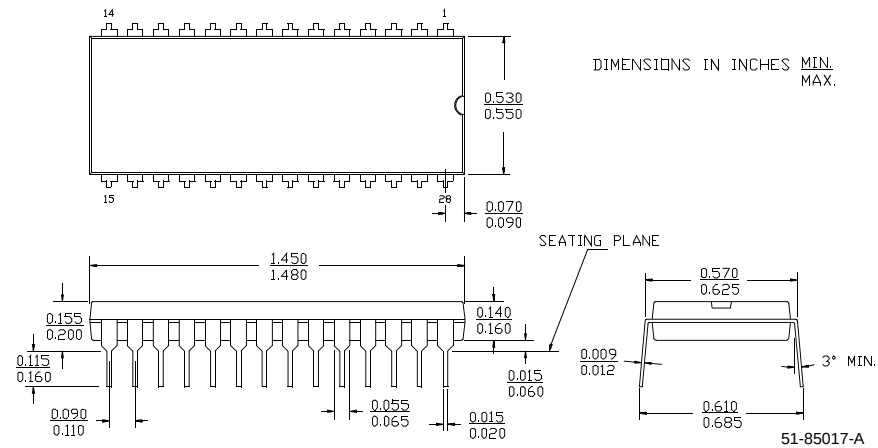
CE	WE	OE	Inputs/Outputs	Mode	Power
H	X	X	High-Z	Deselect/Power-down	Standby (I_{SB})
L	H	L	Data Out	Read	Active (I_{CC})
L	L	X	Data In	Write	Active (I_{CC})
L	H	H	High-Z	Deselect, Output Disabled	Active (I_{CC})

Ordering Information

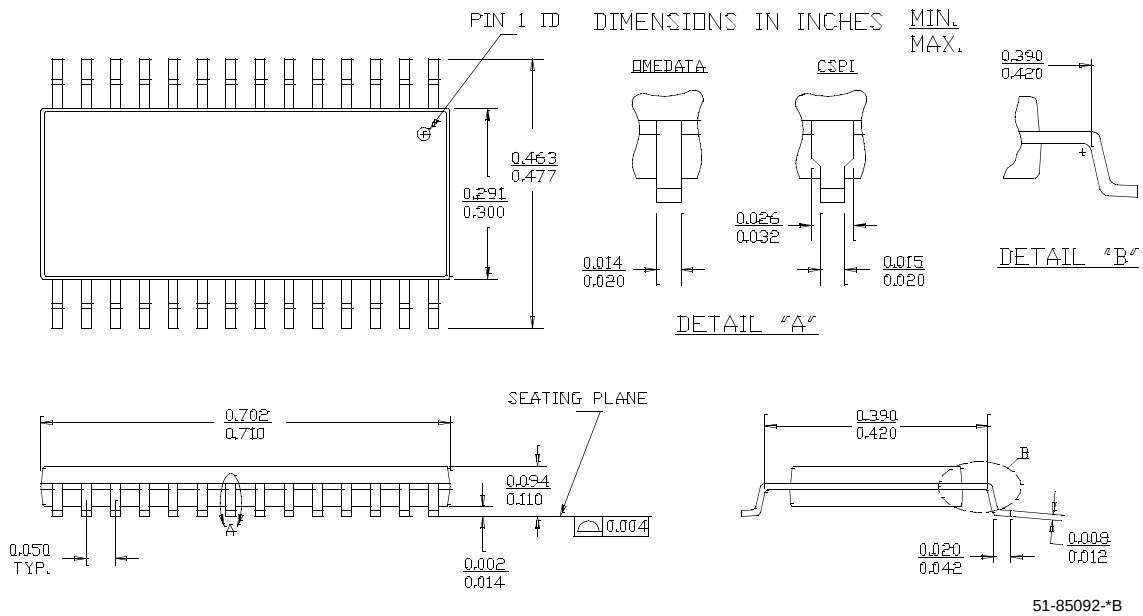
Speed (ns)	Ordering Code	Package Name	Package Type	Operating Range
55	CY62256LL-55SNI	SN28	28-lead (300-Mil Narrow Body) Thin Small Outline Package	Industrial
	CY62256LL-55ZI	Z28	28-lead Thin Small Outline Package	
70	CY62256-70SNC	SN28	28-lead (300-Mil Narrow Body) Thin Small Outline Package	Commercial
	CY62256L-70SNC			
	CY62256LL-70SNC			
	CY62256L-70SNI			Industrial
	CY62256LL-70SNI			
	CY62256LL-70ZC	Z28	28-lead Thin Small Outline Package	Commercial
	CY62256LL-70ZI	Z28		Industrial
	CY62256-70PC	P15	28-lead (600-Mil) Molded DIP	Commercial
	CY62256L-70PC			
	CY62256LL-70PC			
	CY62256LL-70ZRI	ZR28	28-lead Reverse Thin Small Outline Package	Industrial

Package Diagrams

28-lead (600-mil) Molded DIP P15

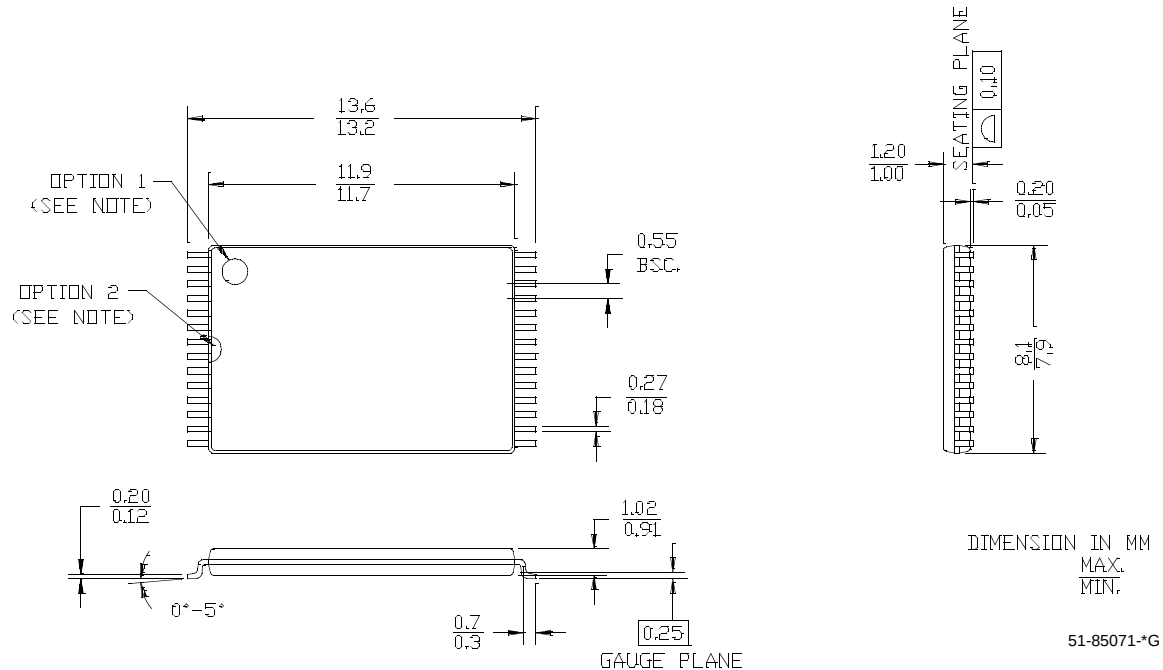


28-lead (300-mil) SNC (Narrow Body) SN28

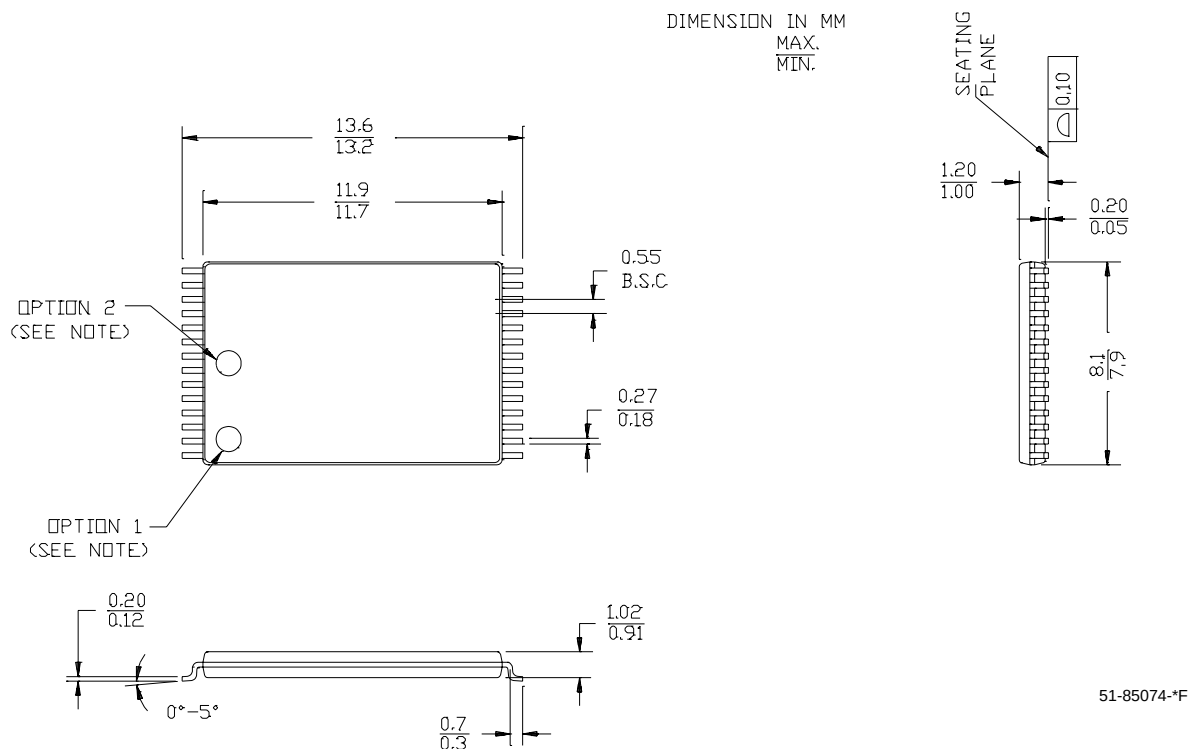


Package Diagrams (continued)
28-lead Thin Small Outline Package Type 1 (8 x 13.4 mm) Z28

NOTE: ORIENTATION I.D. MAY BE LOCATED EITHER
AS SHOWN IN OPTION 1 OR OPTION 2


28-lead Reverse Type 1 Thin Small Outline Package (8 x 13.4 mm) ZR28

NOTE: ORIENTATION I.D. MAY BE LOCATED EITHER
AS SHOWN IN OPTION 1 OR OPTION 2



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Document Title: CY62256 32K x 8 Static RAM
Document Number: 38-05248

REV.	ECN NO.	Issue Date	Orig. of Change	Description of Change
**	113454	03/06/02	MGN	Change from Spec number: 38-00455 to 38-05248 Remove obsolete parts from ordering info, standardize format
*A	115227	05/23/02	GBI	Changed SN Package Diagram