



CY62256

# 256K (32K x 8) Static RAM

## Features

- **Temperature Ranges**
  - Commercial: 0°C to 70°C
  - Industrial: -40°C to 85°C
  - Automotive: -40°C to 125°C
- **High speed: 55 ns and 70 ns**
- **Voltage range: 4.5V-5.5V operation**
- **Low active power (70 ns, LL version, Com'l and Ind'l)**
  - 275 mW (max.)
- **Low standby power (70 ns, LL version, Com'l and Ind'l)**
  - 28 μW (max.)
- **Easy memory expansion with  $\overline{CE}$  and  $\overline{OE}$  features**
- **TTL-compatible inputs and outputs**
- **Automatic power-down when deselected**
- **CMOS for optimum speed/power**
- **Package available in a standard 450-mil-wide (300-mil body width) 28-lead narrow SOIC, 28-lead TSOP-1, 28-lead reverse TSOP-1, and 600-mil 28-lead PDIP packages**
- **Also available in Lead-free packages**

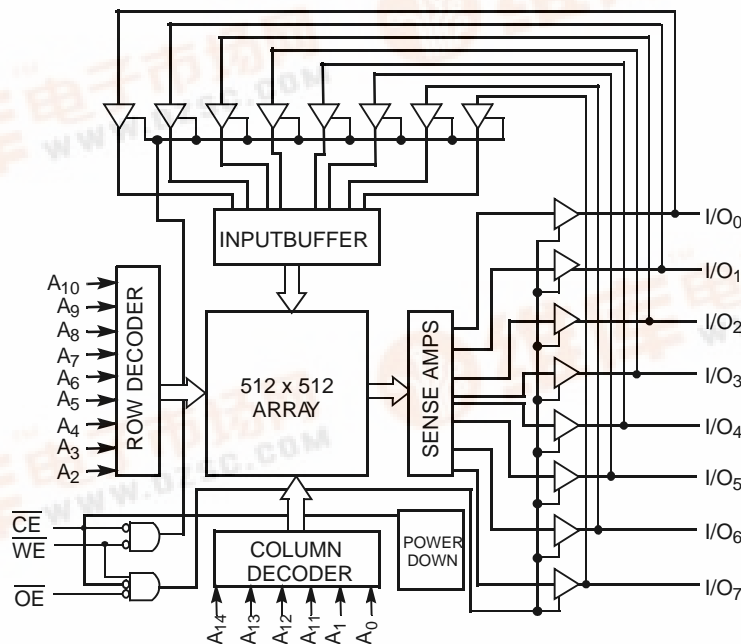
## Functional Description<sup>[1]</sup>

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 ( $\overline{CE}$ ) and active LOW output enable ( $\overline{OE}$ ) and three-state drivers. This device has an automatic power-down feature, reducing the power consumption by 99.9% when deselected.

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



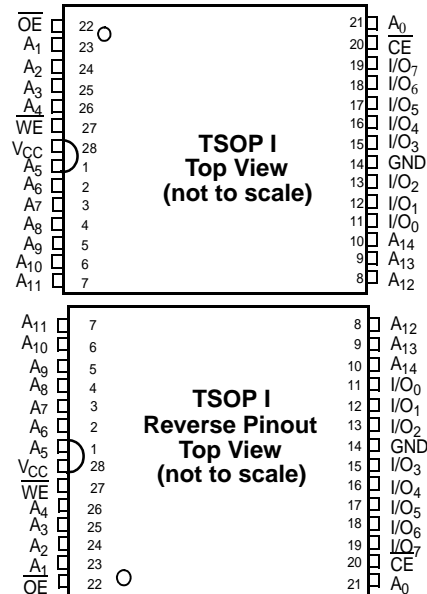
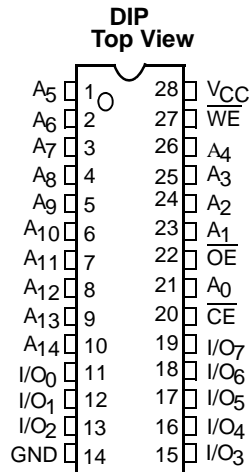
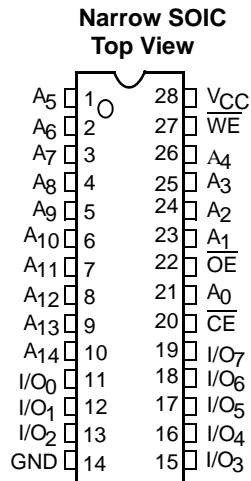
**Note:**

1. For best practice recommendations, please refer to the Cypress application note "System Design Guidelines" on <http://www.cypress.com>.



**Product Portfolio**

Product		V <sub>CC</sub> Range (V)			Speed (ns)	Power Dissipation			
						Operating, I <sub>CC</sub> (mA)		Standby, I <sub>SB2</sub> (μA)	
		Min.	Typ. <sup>[2]</sup>	Max.		Typ. <sup>[2]</sup>	Max.	Typ. <sup>[2]</sup>	Max.
CY62256	Commercial	4.5	5.0	5.5	70	28	55	1	5
CY62256L	Com'l / Ind'l				55/70	25	50	2	50
CY62256LL	Commercial				70	25	50	0.1	5
CY62256LL	Industrial				55/70	25	50	0.1	10
CY62256LL	Automotive				55	25	50	0.1	15

**Pin Configurations**

**Pin Definitions**

Pin Number	Type	Description
1–10, 21, 23–26	Input	<b>A<sub>0</sub>–A<sub>14</sub></b> . Address Inputs
11–13, 15–19,	Input/Output	<b>I/O<sub>0</sub>–I/O<sub>7</sub></b> . Data lines. Used as input or output lines depending on operation
27	Input/Control	<b>WE</b> . When selected LOW, a WRITE is conducted. When selected HIGH, a READ is conducted
20	Input/Control	<b>CE</b> . When LOW, selects the chip. When HIGH, deselects the chip
22	Input/Control	<b>OE</b> . Output Enable. Controls the direction of the I/O pins. When LOW, the I/O pins behave as outputs. When deasserted HIGH, I/O pins are three-stated, and act as input data pins
14	Ground	<b>GND</b> . Ground for the device
28	Power Supply	<b>V<sub>CC</sub></b> . Power supply for the device

**Note:**

2. Typical specifications are the mean values measured over a large sample size across normal production process variations and are taken at nominal conditions (T<sub>A</sub> = 25°C, V<sub>CC</sub>). Parameters are guaranteed by design and characterization, and not 100% tested.



**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 ..... -55°C to +125°C
- Supply Voltage to Ground Potential (Pin 28 to Pin 14) ..... -0.5V to +7.0V
- DC Voltage Applied to Outputs in High-Z State<sup>[3]</sup> ..... -0.5V to V<sub>CC</sub> + 0.5V
- DC Input Voltage<sup>[3]</sup> ..... -0.5V to V<sub>CC</sub> + 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 (T <sub>A</sub> ) <sup>[4]</sup>	V <sub>CC</sub>
Commercial	0°C to +70°C	5V ± 10%
Industrial	-40°C to +85°C	5V ± 10%
Automotive	-40°C to +125°C	5V ± 10%

**Electrical Characteristics Over the Operating Range**

Parameter	Description	Test Conditions	CY62256-55			CY62256-70			Unit
			Min.	Typ. <sup>[2]</sup>	Max.	Min.	Typ. <sup>[2]</sup>	Max.	
V <sub>OH</sub>	Output HIGH Voltage	V <sub>CC</sub> = Min., I <sub>OH</sub> = -1.0 mA	2.4			2.4			V
V <sub>OL</sub>	Output LOW Voltage	V <sub>CC</sub> = Min., I <sub>OL</sub> = 2.1 mA			0.4			0.4	V
V <sub>IH</sub>	Input HIGH Voltage		2.2		V <sub>CC</sub> + 0.5V	2.2		V <sub>CC</sub> + 0.5V	V
V <sub>IL</sub>	Input LOW Voltage		-0.5		0.8	-0.5		0.8	V
I <sub>IX</sub>	Input Leakage Current	GND ≤ V <sub>I</sub> ≤ V <sub>CC</sub>	-0.5		+0.5	-0.5		+0.5	μA
I <sub>OZ</sub>	Output Leakage Current	GND ≤ V <sub>O</sub> ≤ V <sub>CC</sub> , Output Disabled	-0.5		+0.5	-0.5		+0.5	μA
I <sub>CC</sub>	V <sub>CC</sub> Operating Supply Current	V <sub>CC</sub> = Max., I <sub>OUT</sub> = 0 mA, f = f <sub>MAX</sub> = 1/t <sub>RC</sub>		28	55	28	55	mA	
			L	25	50	25	50	mA	
			LL	25	50	25	50	mA	
I <sub>SB1</sub>	Automatic CE Power-down Current—TTL Inputs	Max. V <sub>CC</sub> , CE ≥ V <sub>IH</sub> , V <sub>IN</sub> ≥ V <sub>IH</sub> or V <sub>IN</sub> ≤ V <sub>IL</sub> , f = f <sub>MAX</sub>		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 <sub>SB2</sub>	Automatic CE Power-down Current—CMOS Inputs	Max. V <sub>CC</sub> , CE ≥ V <sub>CC</sub> - 0.3V, V <sub>IN</sub> ≥ V <sub>CC</sub> - 0.3V, or V <sub>IN</sub> ≤ 0.3V, f = 0		1	5	1	5	mA	
			L	2	50	2	50	μA	
			LL	0.1	5	0.1	5	μA	
			LL - Ind'l	0.1	10	0.1	10	μA	
			LL - Auto	0.1	15			μA	

**Capacitance<sup>[5]</sup>**

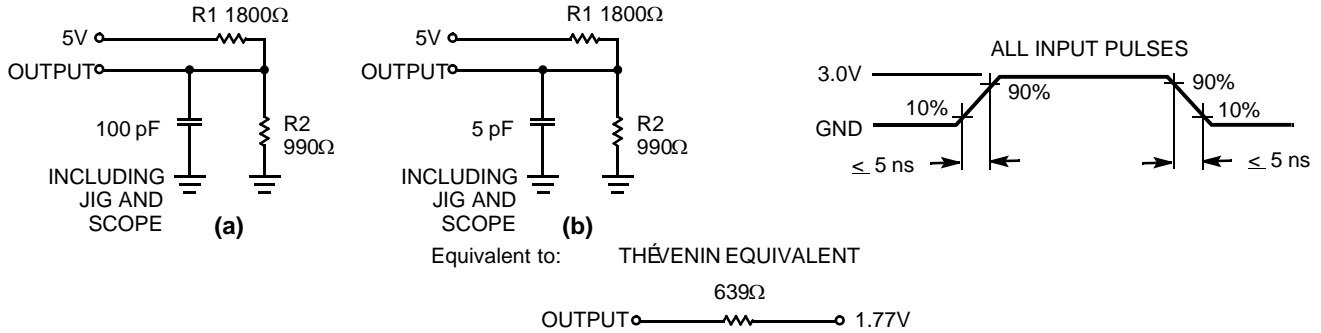
Parameter	Description	Test Conditions	Max.	Unit
C <sub>IN</sub>	Input Capacitance	T <sub>A</sub> = 25°C, f = 1 MHz, V <sub>CC</sub> = 5.0V	6	pF
C <sub>OUT</sub>	Output Capacitance		8	pF

**Thermal Resistance**

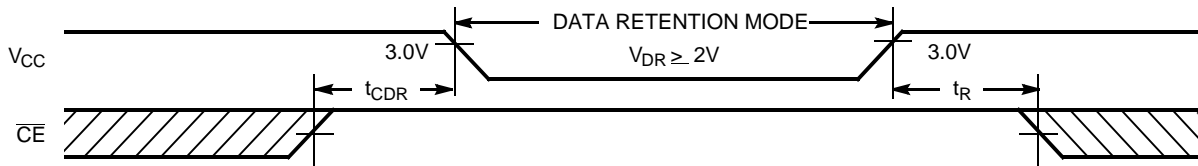
Parameter	Description	Test Conditions	DIP	SOIC	TSOP	RTSOP	Unit
θ <sub>JA</sub>	Thermal Resistance (Junction to Ambient) <sup>[5]</sup>	Still Air, soldered on a 4.25 x 1.125 inch, 4-layer printed circuit board	75.61	76.56	93.89	93.89	°C/W
θ <sub>JC</sub>	Thermal Resistance (Junction to Case) <sup>[5]</sup>		43.12	36.07	24.64	24.64	°C/W

**Notes:**

3. V<sub>IL</sub> (min.) = -2.0V for pulse durations of less than 20 ns.
4. T<sub>A</sub> is the "Instant-On" case temperature.
5. Tested initially and after any design or process changes that may affect these parameters.

**AC Test Loads and Waveforms**

**Data Retention Characteristics**

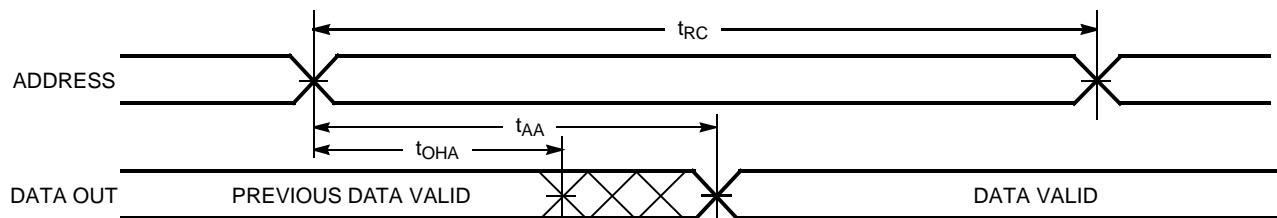
Parameter	Description	Conditions <sup>[6]</sup>	Min.	Typ. <sup>[2]</sup>	Max.	Unit
$V_{DR}$	$V_{CC}$ for Data Retention		2.0			V
$I_{CCDR}$	Data Retention Current	L	$V_{CC} = 3.0V, CE \geq V_{CC} - 0.3V,$ $V_{IN} \geq V_{CC} - 0.3V, \text{ or } V_{IN} \leq 0.3V$	2	50	$\mu A$
		LL		0.1	5	$\mu A$
		LL - Ind'l		0.1	10	$\mu A$
		LL - Auto		0.1	10	$\mu A$
$t_{CDR}^{[5]}$	Chip Deselect to Data Retention Time		0			ns
$t_R^{[5]}$	Operation Recovery Time		$t_{RC}$			ns

**Data Retention Waveform**

**Note:**

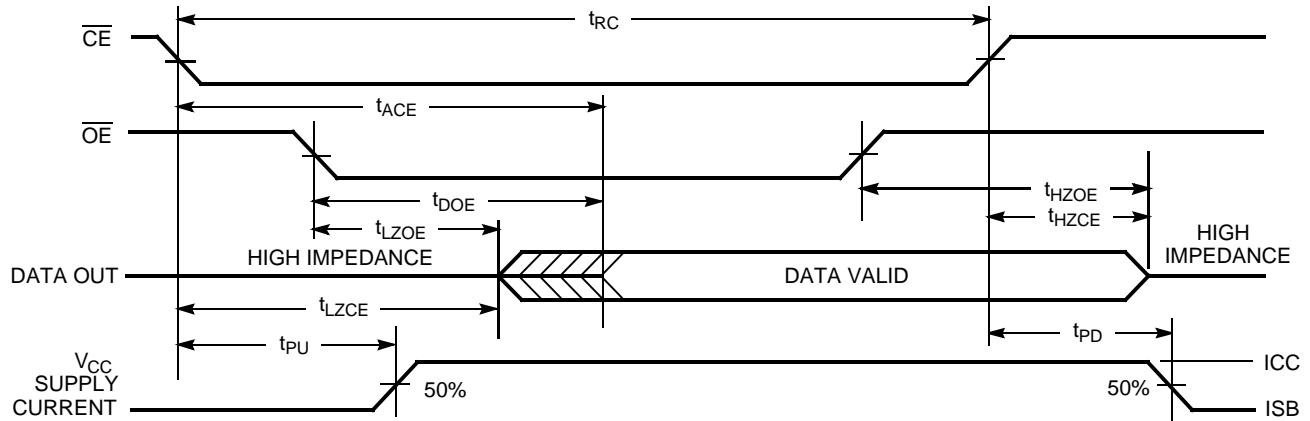
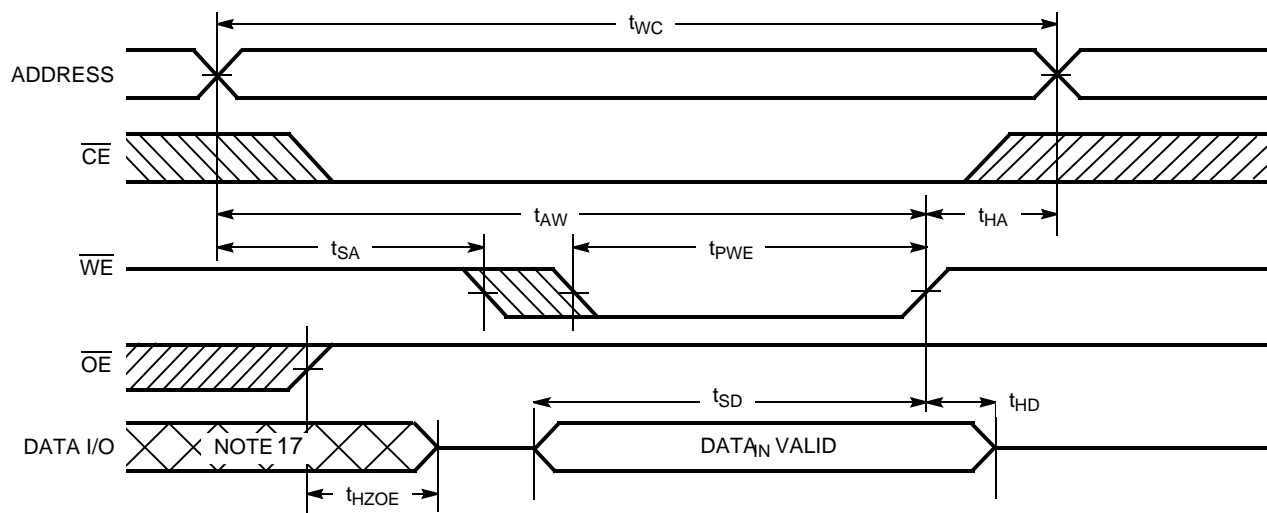
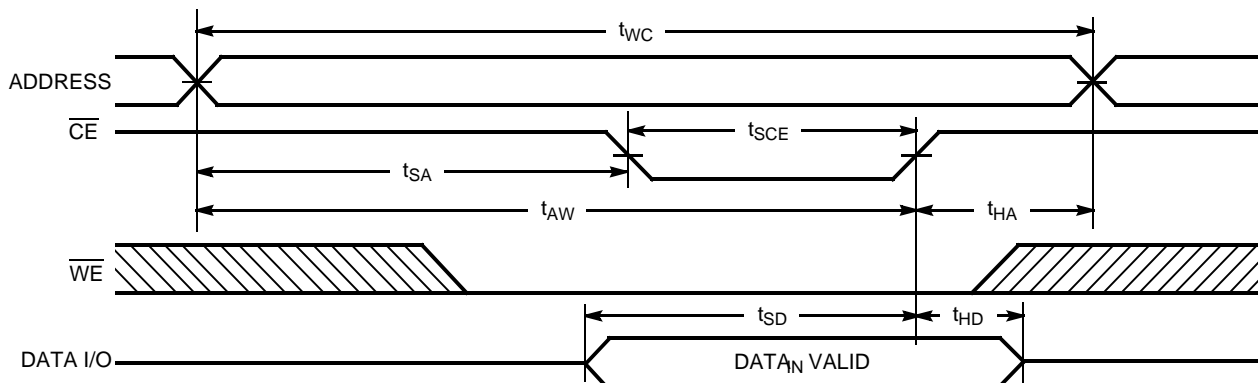
6. No input may exceed  $V_{CC} + 0.5V$ .

**Switching Characteristics** Over the Operating Range<sup>[7]</sup>

Parameter	Description	CY62256-55		CY62256-70		Unit
		Min.	Max.	Min.	Max.	
<b>Read Cycle</b>						
$t_{RC}$	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
$t_{ACE}$	$\overline{CE}$ LOW to Data Valid		55		70	ns
$t_{DOE}$	$\overline{OE}$ LOW to Data Valid		25		35	ns
$t_{LZOE}$	$\overline{OE}$ LOW to Low-Z <sup>[8]</sup>	5		5		ns
$t_{HZOE}$	$\overline{OE}$ HIGH to High-Z <sup>[8, 9]</sup>		20		25	ns
$t_{LZCE}$	$\overline{CE}$ LOW to Low-Z <sup>[8]</sup>	5		5		ns
$t_{HZCE}$	$\overline{CE}$ HIGH to High-Z <sup>[8, 9]</sup>		20		25	ns
$t_{PU}$	$\overline{CE}$ LOW to Power-up	0		0		ns
$t_{PD}$	$\overline{CE}$ HIGH to Power-down		55		70	ns
<b>Write Cycle<sup>[10, 11]</sup></b>						
$t_{WC}$	Write Cycle Time	55		70		ns
$t_{SCE}$	$\overline{CE}$ 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
$t_{PWE}$	$\overline{WE}$ 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
$t_{HZWE}$	$\overline{WE}$ LOW to High-Z <sup>[8, 9]</sup>		20		25	ns
$t_{LZWE}$	$\overline{WE}$ HIGH to Low-Z <sup>[8]</sup>	5		5		ns

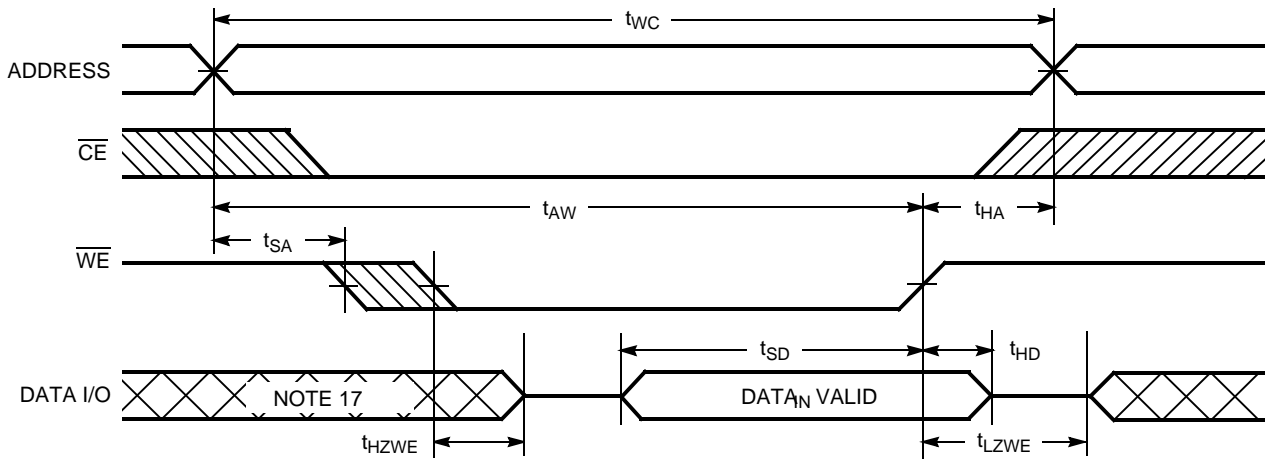
**Switching Waveforms**
**Read Cycle No. 1<sup>[12, 13]</sup>**

**Notes:**

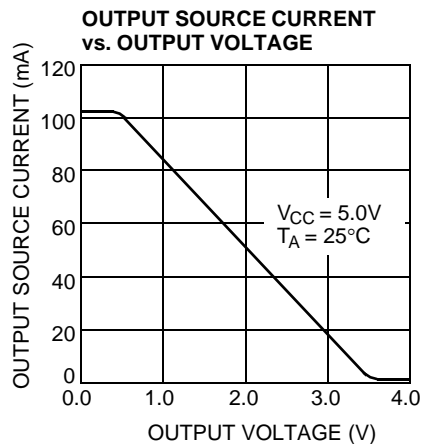
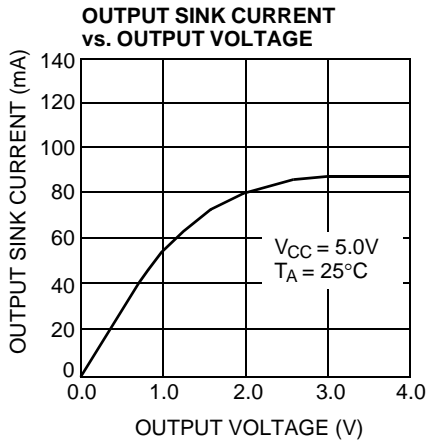
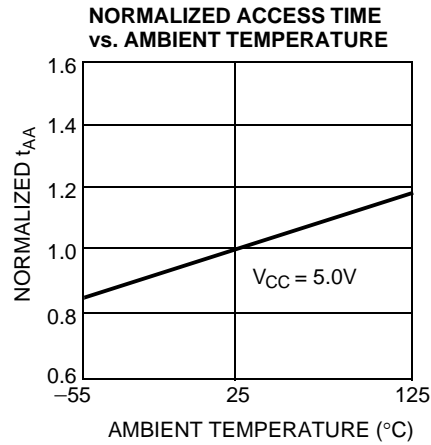
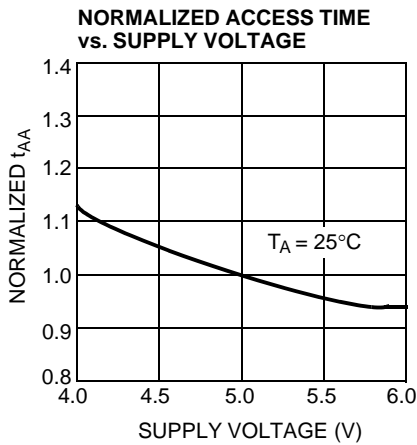
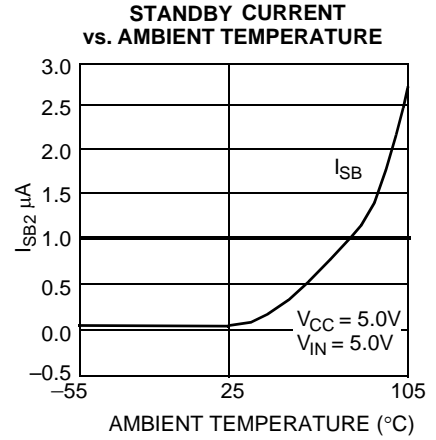
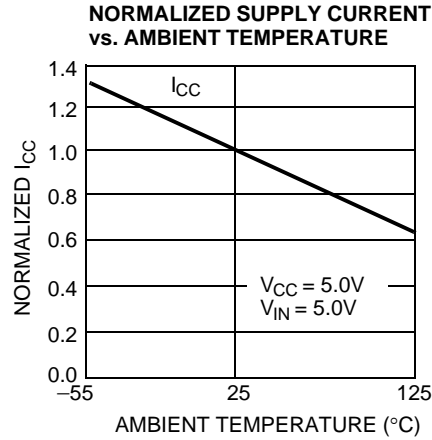
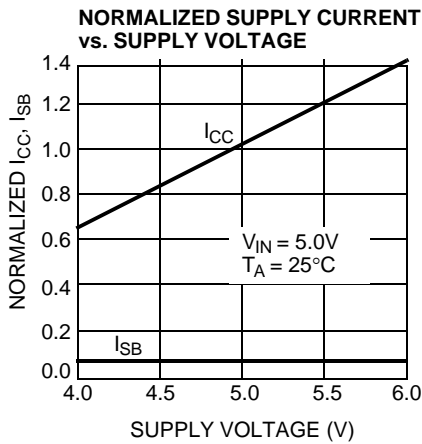
7. Test conditions assume signal transition time of 5 ns or less, timing reference levels of 1.5V, input pulse levels of 0 to 3.0V, and output loading of the specified  $I_{OL}/I_{OH}$  and 100-pF load capacitance.
8. At any given temperature and voltage condition,  $t_{HZCE}$  is less than  $t_{LZCE}$ ,  $t_{HZOE}$  is less than  $t_{LZOE}$ , and  $t_{HZWE}$  is less than  $t_{LZWE}$  for any given device.
9.  $t_{HZOE}$ ,  $t_{HZCE}$ , and  $t_{HZWE}$  are specified with  $C_L = 5$  pF as in (b) of AC Test Loads. Transition is measured  $\pm 500$  mV from steady-state voltage.
10. 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.
11. The minimum Write cycle time for Write Cycle #3 ( $\overline{WE}$  controlled,  $\overline{OE}$  LOW) is the sum of  $t_{HZWE}$  and  $t_{SD}$ .
12. Device is continuously selected.  $\overline{OE}$ ,  $\overline{CE} = V_{IL}$ .
13.  $\overline{WE}$  is HIGH for Read cycle.

**Switching Waveforms (continued)**
**Read Cycle No. 2**<sup>[13, 14]</sup>

**Write Cycle No. 1 (WE Controlled)**<sup>[10, 15, 16]</sup>

**Write Cycle No. 2 (CE Controlled)**<sup>[10, 15, 16]</sup>

**Notes:**

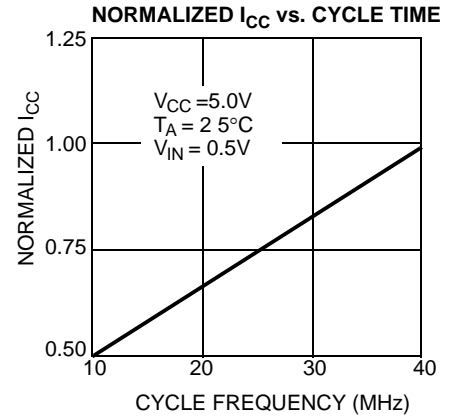
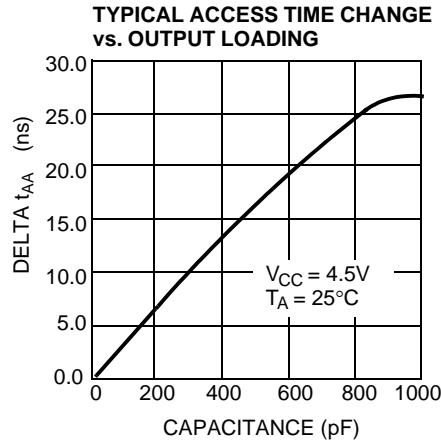
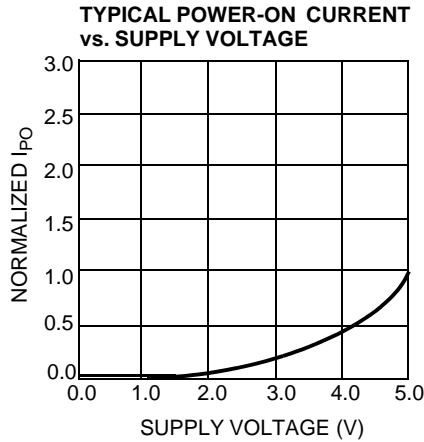
14. Address valid prior to or coincident with  $\overline{CE}$  transition LOW.
15. Data I/O is high impedance if  $\overline{OE} = V_{IH}$ .
16. If CE goes HIGH simultaneously with WE HIGH, the output remains in a high-impedance state.
17. During this period, the I/Os are in output state and input signals should not be applied.

**Switching Waveforms** (continued)

**Write Cycle No. 3 ( $\overline{WE}$  Controlled,  $\overline{OE}$  LOW)**<sup>[11, 16]</sup>


**Typical DC and AC Characteristics**




**Typical DC and AC Characteristics** (continued)

**Truth Table**

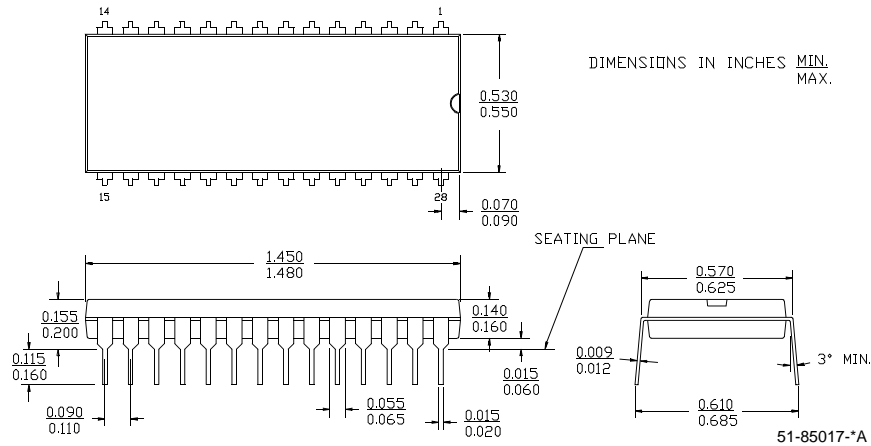
$\overline{CE}$	$\overline{WE}$	$\overline{OE}$	Inputs/Outputs	Mode	Power
H	X	X	High-Z	Deselect/Power-down	Standby ( $I_{SB}$ )
L	H	L	Data Out	Read	Active ( $I_{CC}$ )
L	L	X	Data In	Write	Active ( $I_{CC}$ )
L	H	H	High-Z	Output Disabled	Active ( $I_{CC}$ )

**Ordering Information**

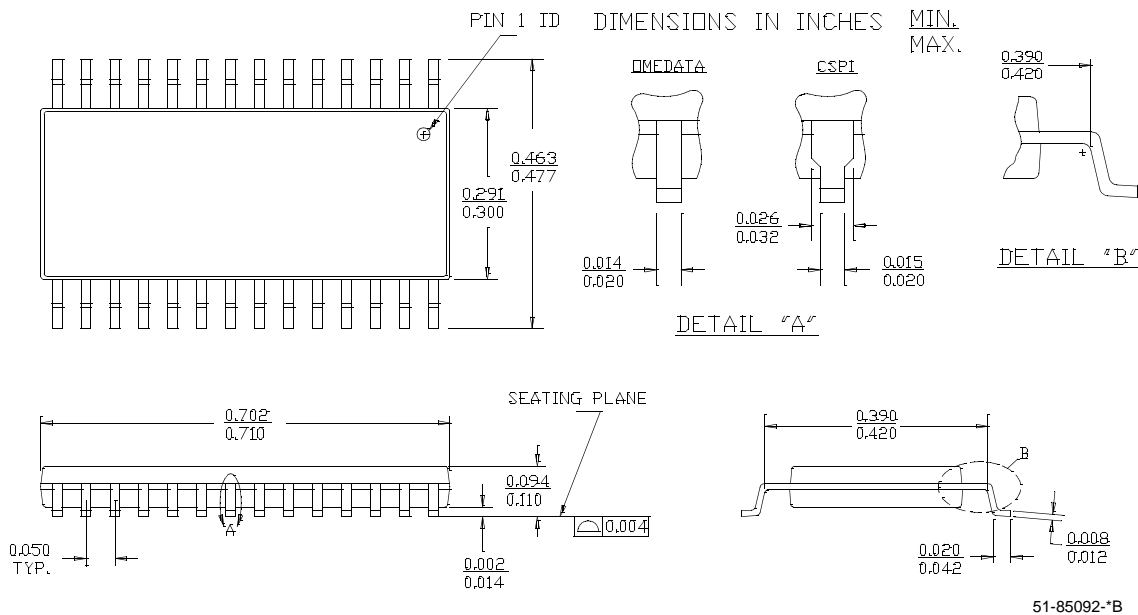
Speed (ns)	Ordering Code	Package Name	Package Type	Operating Range
55	CY62256LL-55SNI	SN28	28-lead (300-Mil Narrow Body) Narrow SOIC	Industrial
	CY62256LL-55SNXI	SN28	28-lead (300-Mil Narrow Body) Narrow SOIC (Pb-Free)	
	CY62256LL-55ZI	Z28	28-lead Thin Small Outline Package	
	CY62256LL-55ZXI	Z28	28-lead Thin Small Outline Package (Pb-Free)	
	CY62256LL-55SNE	SN28	28-lead (300-Mil Narrow Body) Narrow SOIC	Automotive
	CY62256LL-55SNXE	SN28	28-lead (300-Mil Narrow Body) Narrow SOIC (Pb-Free)	
	CY62256LL-55ZE	Z28	28-lead Thin Small Outline Package	
	CY62256LL-55ZXE	Z28	28-lead Thin Small Outline Package (Pb-Free)	
	CY62256LL-55ZRE	ZR28	28-lead Reverse Thin Small Outline Package	
	CY62256LL-55ZRXE	ZR28	28-lead Reverse Thin Small Outline Package (Pb-Free)	
70	CY62256-70SNC	SN28	28-lead (300-Mil Narrow Body) Narrow SOIC	Commercial
	CY62256L-70SNC	SN28	28-lead (300-Mil Narrow Body) Narrow SOIC	
	CY62256L-70SNXC	SN28	28-lead (300-Mil Narrow Body) Narrow SOIC (Pb-Free)	
	CY62256LL-70SNC	SN28	28-lead (300-Mil Narrow Body) Narrow SOIC	
	CY62256LL-70SNXC	SN28	28-lead (300-Mil Narrow Body) Narrow SOIC (Pb-Free)	
	CY62256L-70SNI	SN28	28-lead (300-Mil Narrow Body) Narrow SOIC	Industrial
	CY62256L-70SNXI	SN28	28-lead (300-Mil Narrow Body) Narrow SOIC (Pb-Free)	
	CY62256LL-70SNI	SN28	28-lead (300-Mil Narrow Body) Narrow SOIC	
	CY62256LL-70SNXI	SN28	28-lead (300-Mil Narrow Body) Narrow SOIC (Pb-Free)	
	CY62256LL-70ZC	Z28	28-lead Thin Small Outline Package	Commercial
	CY62256LL-70ZXC	Z28	28-lead Thin Small Outline Package (Pb-Free)	
	CY62256LL-70ZI	Z28	28-lead Thin Small Outline Package	Industrial
	CY62256LL-70ZXI	Z28	28-lead Thin Small Outline Package (Pb-Free)	
	CY62256-70PC	P15	28-lead (600-Mil) Molded DIP	Commercial
	CY62256L-70PC	P15	28-lead (600-Mil) Molded DIP	
	CY62256L-70PXC	P15	28-lead (600-Mil) Molded DIP (Pb-Free)	
	CY62256LL-70PC	P15	28-lead (600-Mil) Molded DIP	
	CY62256LL-70PXC	P15	28-lead (600-Mil) Molded DIP (Pb-Free)	
	CY62256LL-70ZRI	ZR28	28-lead Reverse Thin Small Outline Package	Industrial
	CY62256LL-70ZRXI	ZR28	28-lead Reverse Thin Small Outline Package (Pb-Free)	

Package Diagrams

28-lead (600-mil) Molded DIP P15

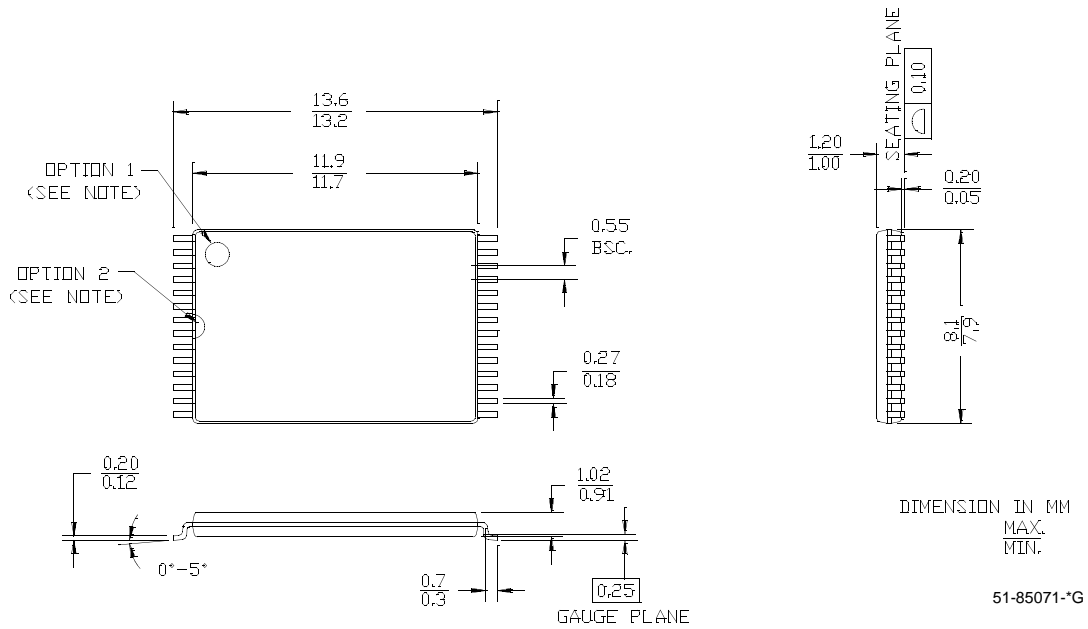


28-lead (300-mil) SNC (Narrow Body) SN28

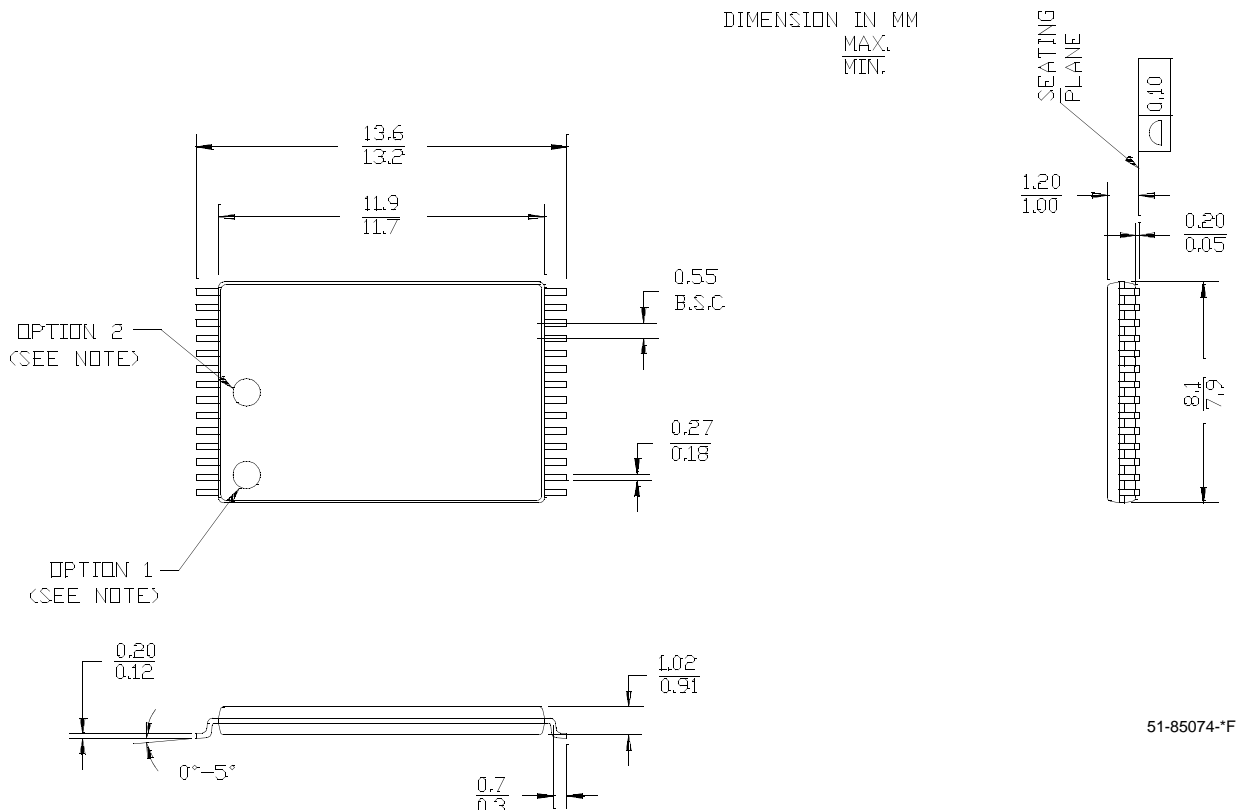


**Package Diagrams (continued)**
**28-lead Thin Small Outline Package Type 1 (8 x 13.4 mm) Z28**

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 (8x13.4 mm) ZR28**

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



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**Document History Page**

<b>Document Title: CY62256 256K (32K x 8) Static RAM</b> <b>Document Number: 38-05248</b>				
<b>REV.</b>	<b>ECN NO.</b>	<b>Issue Date</b>	<b>Orig. of Change</b>	<b>Description of Change</b>
**	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
*B	116506	09/04/02	GBI	Added footnote 1. Corrected package description in Ordering Information table
*C	238448	See ECN	AJU	Added Automotive product information
*D	344595	See ECN	SYT	Added Pb-Free packages on page# 10
*E	395936	See ECN	SYT	Changed address of Cypress Semiconductor Corporation on Page# 1 from "3901 North First Street" to "198 Champion Court" Added CY62256L-70SNXI package in the Ordering Information on Page # 10



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