

## 256K (32K x 8) Static RAM

### Features

- **High Speed**
  - 70 ns
- **Temperature Ranges**
  - Commercial: 0°C to 70°C
  - Industrial: -40°C to 85°C
  - Automotive: -40°C to 125°C
- **Low voltage range:**
  - 2.7V – 3.6V
- **Low active power and standby power**
- **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**
- **Available in a Pb-free and non Pb-free standard 28-pin narrow SOIC, 28-pin TSOP-1 and 28-pin Reverse TSOP-1 packages**

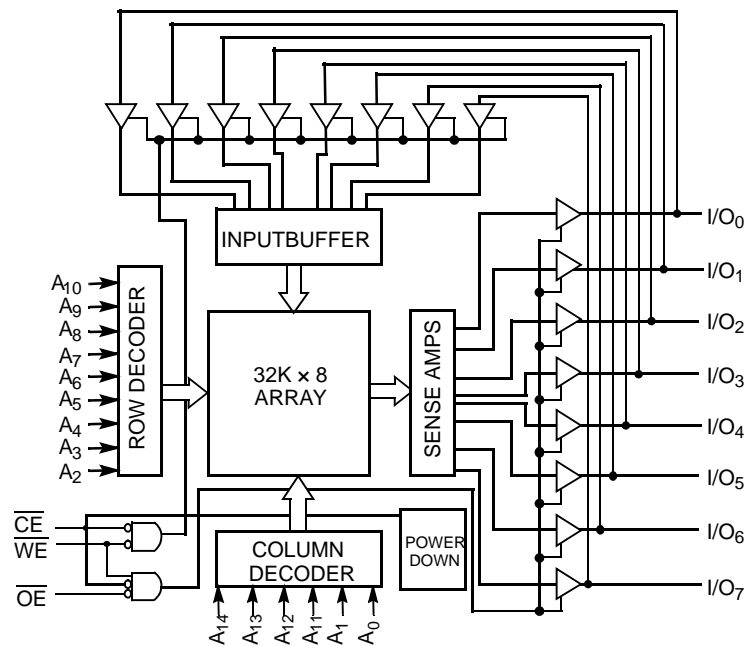
### Functional Description<sup>[1]</sup>

The CY62256V family is composed of two high-performance CMOS static RAM's 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 Tri-state drivers. These devices have an automatic power-down feature, reducing the power consumption by over 99% 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

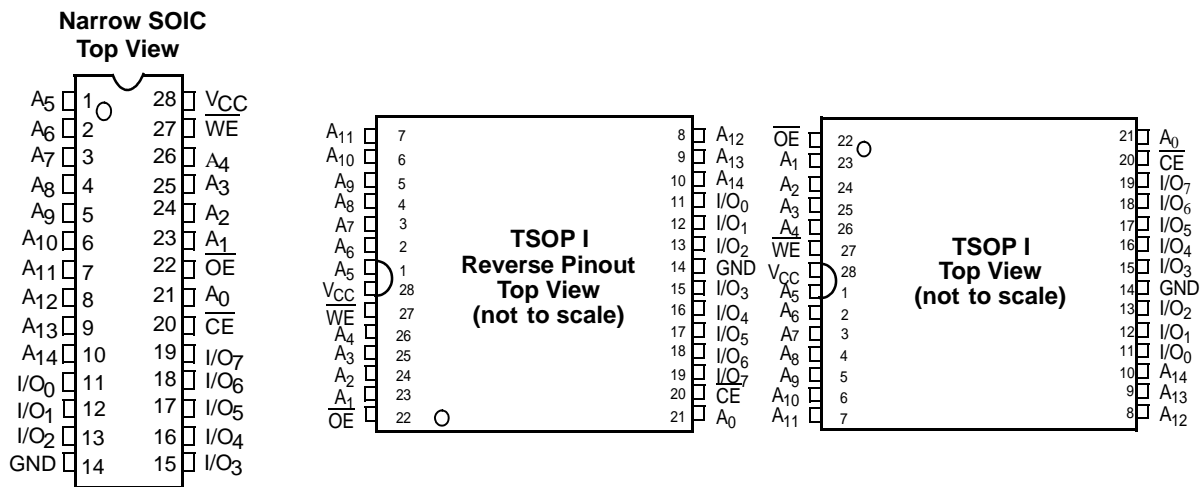


**Note:**

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

**Product Portfolio**

Product	Range	V <sub>CC</sub> Range (V)			Speed (ns)	Power Dissipation			
		Min.	Typ. <sup>[2]</sup>	Max.		Operating, I <sub>CC</sub> (mA)		Standby, I <sub>SB2</sub> (μA)	
						Typ. <sup>[2]</sup>	Max.	Typ. <sup>[2]</sup>	Max.
CY62256VLL	Com'l/Ind'l	2.7	3.0	3.6	70	11	30	0.1	5
	Automotive								130

**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><math>\overline{WE}</math></b> . When selected LOW, a WRITE is conducted. When selected HIGH, a READ is conducted
20	Input/Control	<b><math>\overline{CE}</math></b> . When LOW, selects the chip. When HIGH, deselects the chip
22	Input/Control	<b><math>\overline{OE}</math></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 Tri-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 values are included for reference only and are not guaranteed or tested. Typical values are measured at V<sub>CC</sub> = V<sub>CC(typ.)</sub>, T<sub>A</sub> = 25°C, and t<sub>AA</sub> = 70 ns.

**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 +4.6V  
 DC Voltage Applied to Outputs in High-Z State<sup>[3]</sup> ..... -0.5V to  $V_{CC} + 0.5V$   
 DC Input Voltage<sup>[3]</sup> ..... -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**

Device	Range	Ambient Temperature ( $T_A$ ) <sup>[4]</sup>	$V_{CC}$
CY62256V	Commercial	0°C to +70°C	2.7V to 3.6V
	Industrial	-40°C to +85°C	
	Automotive	-40°C to +125°C	

**Electrical Characteristics** Over the Operating Range

Parameter	Description	Test Conditions	CY62256V-70			Unit	
			Min.	Typ. <sup>[2]</sup>	Max.		
$V_{OH}$	Output HIGH Voltage	$I_{OH} = -1.0 \text{ mA}$ , $V_{CC} = 2.7V$	2.4			V	
$V_{OL}$	Output LOW Voltage	$I_{OL} = 2.1 \text{ mA}$ , $V_{CC} = 2.7V$			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	$GND \leq V_{IN} \leq V_{CC}$	Com'l, Ind'l	-1	+1	$\mu A$	
			Automotive	-10	+10	$\mu A$	
$I_{OZ}$	Output Leakage Current	$GND \leq V_{IN} \leq V_{CC}$ , Output Disabled	Com'l, Ind'l	-1	+1	$\mu A$	
			Automotive	-10	+10	$\mu A$	
$I_{CC}$	$V_{CC}$ Operating Supply Current	$V_{CC} = 3.6V$ , $I_{OUT} = 0 \text{ mA}$ , $f = f_{Max} = 1/t_{RC}$	All ranges	11	30	mA	
$I_{SB1}$	Automatic CE Power-down Current— TTL Inputs	$V_{CC} = 3.6V$ , $\overline{CE} \geq V_{IH}$ , $V_{IN} \geq V_{IH}$ or $V_{IN} \leq V_{IL}$ , $f = f_{Max}$	All ranges	100	300	$\mu A$	
$I_{SB2}$	Automatic CE Power-down Current— CMOS Inputs	$V_{CC} = 3.6V$ , $\overline{CE} \geq V_{CC} - 0.3V$ , $V_{IN} \geq V_{CC} - 0.3V$ or $V_{IN} \leq 0.3V$ , $f = 0$	Com'l	0.1	5	$\mu A$	
			Ind'l		0.1		10
			Automotive		0.1		130

**Notes:**

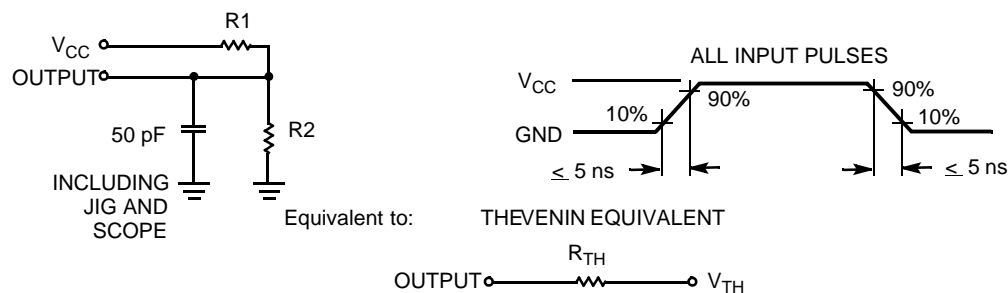
- $V_{IL}$  (min.) = -2.0V for pulse durations of less than 20 ns.
- $T_A$  is the "Instant-On" case temperature.

**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> = V <sub>CC(typ.)</sub>	6	pF
C <sub>OUT</sub>	Output Capacitance		8	pF

**Thermal Resistance**

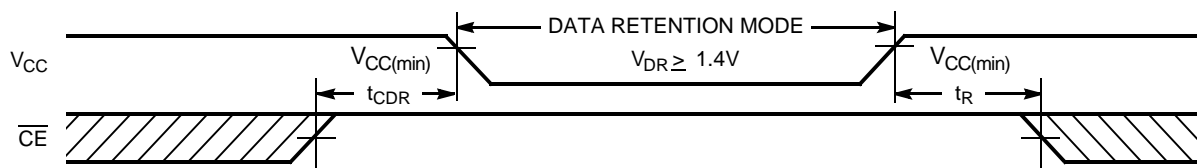
Parameter	Description	Test Conditions	SOIC	TSOPI	RTSOPI	Unit
θ <sub>JA</sub>	Thermal Resistance (Junction to Ambient) <sup>[6]</sup>	Still Air, soldered on a 3 × 4.5 inch, 2-layer printed circuit board	68.45	87.62	87.62	°C/W
θ <sub>JC</sub>	Thermal Resistance (Junction to Case) <sup>[5]</sup>		26.94	23.73	23.73	°C/W

**AC Test Loads and Waveforms**


Parameter	3.3V	Units
R1	1100	Ohms
R2	1500	Ohms
R <sub>TH</sub>	645	Ohms
V <sub>TH</sub>	1.750	Volts

**Data Retention Characteristics (Over the Operating Range)**

Parameter	Description	Conditions <sup>[6]</sup>	Min.	Typ. <sup>[2]</sup>	Max.	Unit
V <sub>DR</sub>	V <sub>CC</sub> for Data Retention		1.4			V
I <sub>CCDR</sub>	Data Retention Current	V <sub>CC</sub> = 1.4V, $\overline{CE} \geq V_{CC} - 0.3V$ , V <sub>IN</sub> ≥ V <sub>CC</sub> - 0.3V or V <sub>IN</sub> ≤ 0.3V	Com'l	0.1	3	μA
			Ind'l	0.1	6	
			Auto	0.1	50	
t <sub>CDR</sub> <sup>[6]</sup>	Chip Deselect to Data Retention Time		0			ns
t <sub>R</sub> <sup>[6]</sup>	Operation Recovery Time		t <sub>RC</sub>			ns

**Data Retention Waveform**

**Notes:**

5. Tested initially and after any design or process changes that may affect these parameters.
6. No input may exceed V<sub>CC</sub> + 0.3V.

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

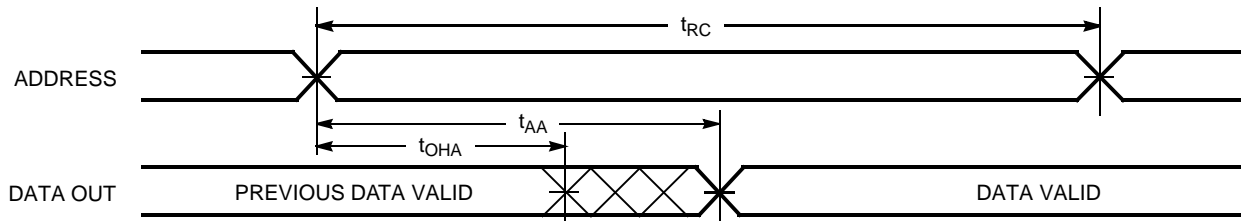
Parameter	Description	CY62256V-70		Unit
		Min.	Max.	
<b>Read Cycle</b>				
$t_{RC}$	Read Cycle Time	70		ns
$t_{AA}$	Address to Data Valid		70	ns
$t_{OHA}$	Data Hold from Address Change	10		ns
$t_{ACE}$	$\overline{CE}$ LOW to Data Valid		70	ns
$t_{DOE}$	$\overline{OE}$ LOW to Data Valid		35	ns
$t_{LZOE}$	$\overline{OE}$ LOW to Low-Z <sup>[8]</sup>	5		ns
$t_{HZOE}$	$\overline{OE}$ HIGH to High-Z <sup>[8, 9]</sup>		25	ns
$t_{LZCE}$	$\overline{CE}$ LOW to Low-Z <sup>[8]</sup>	10		ns
$t_{HZCE}$	$\overline{CE}$ HIGH to High-Z <sup>[8, 9]</sup>		25	ns
$t_{PU}$	$\overline{CE}$ LOW to Power-up	0		ns
$t_{PD}$	$\overline{CE}$ HIGH to Power-down		70	ns
<b>Write Cycle<sup>[10, 11]</sup></b>				
$t_{WC}$	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 <sup>[8, 9]</sup>		25	ns
$t_{LZWE}$	$\overline{WE}$ HIGH to Low-Z <sup>[8]</sup>	10		ns

**Notes:**

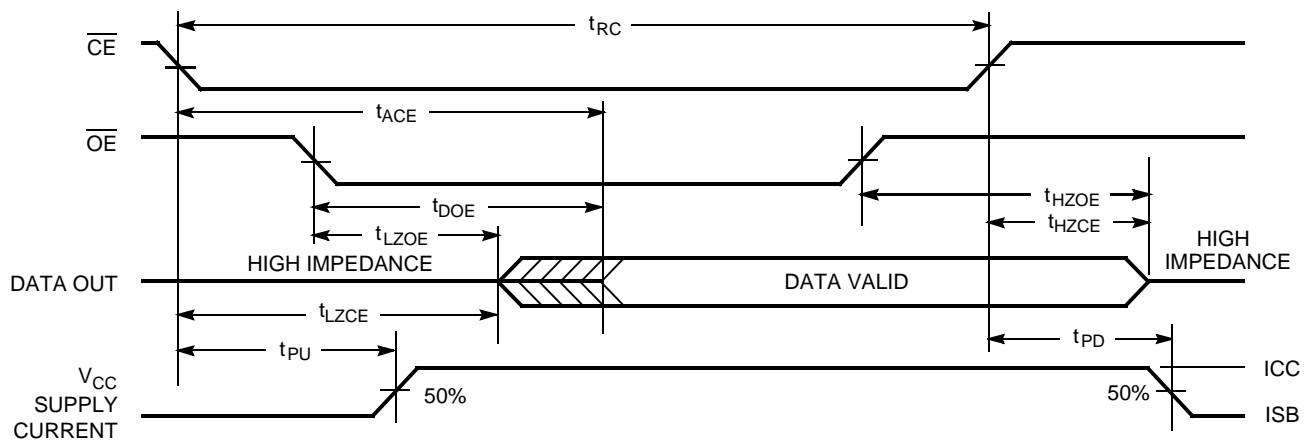
7. Test conditions assume signal transition time of 5 ns or less timing reference levels of  $V_{CC}/2$ , input pulse levels of 0 to  $V_{CC}$ , and output loading of the specified  $I_{OL}/I_{OH}$  and 50 pF load capacitance.
8. At any given temperature and voltage condition,  $t_{HZCE}$  is less than  $t_{LZCE}$ ,  $t_{HZOE}$  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  $\pm 200$  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  $t_{SD}$ .

### Switching Waveforms

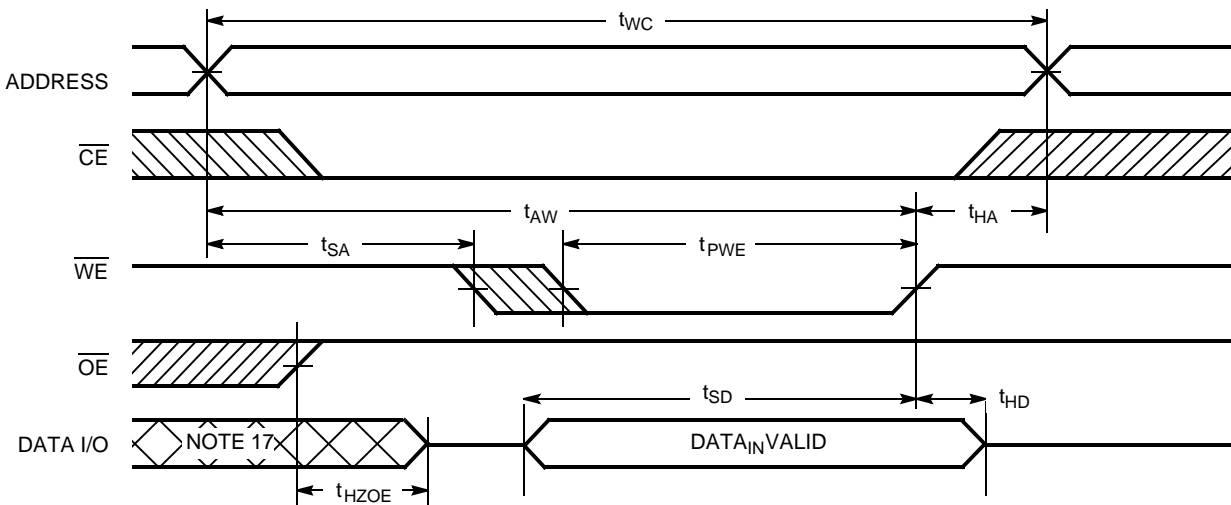
#### Read Cycle No. 1 (Address Transition Controlled)<sup>[12, 13]</sup>



#### Read Cycle No. 2 ( $\overline{OE}$ Controlled)<sup>[13, 14]</sup>



#### Write Cycle No. 1 ( $\overline{WE}$ Controlled)<sup>[10, 15, 16]</sup>

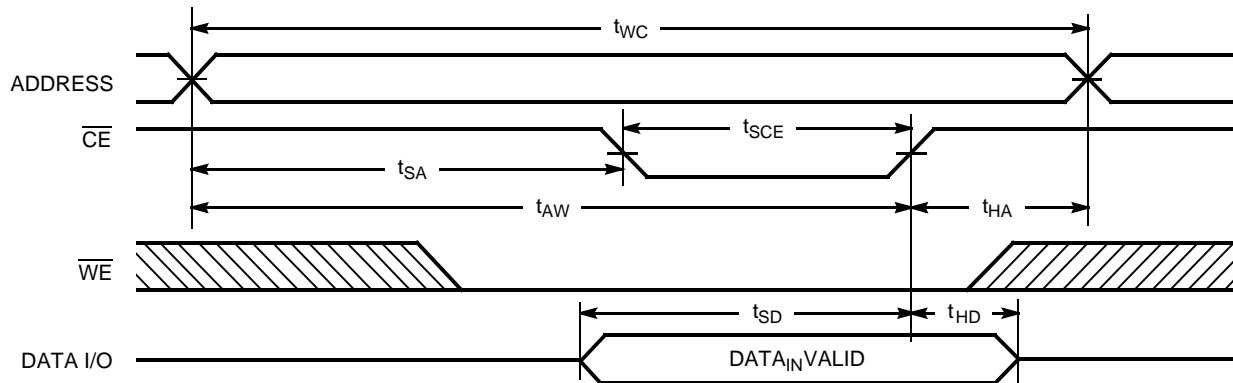


**Notes:**

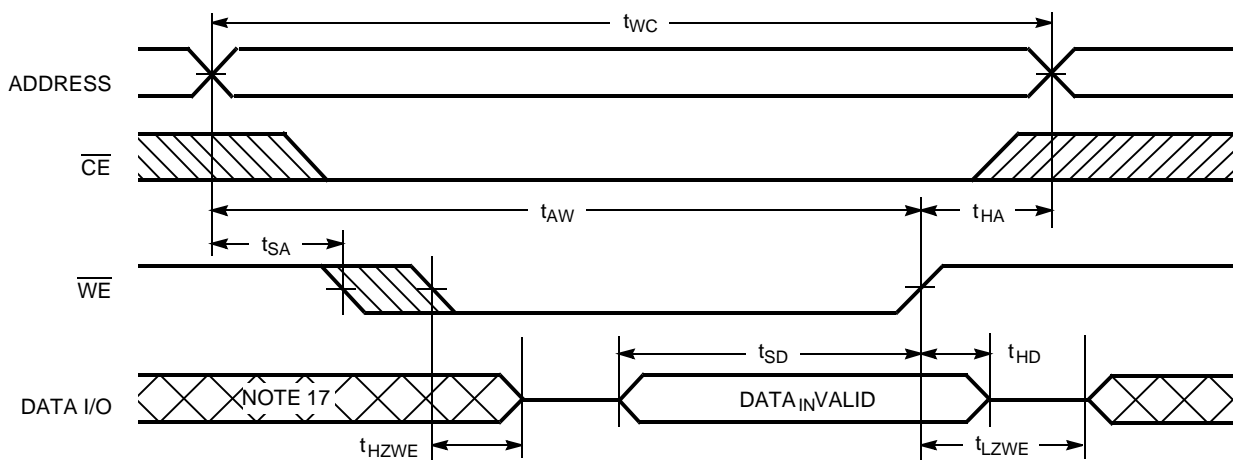
- 12. Device is continuously selected.  $\overline{OE}$ ,  $\overline{CE} = V_{IL}$ .
- 13.  $\overline{WE}$  is HIGH for read cycle.
- 14. Address valid prior to or coincident with  $\overline{CE}$  transition LOW.
- 15. Data I/O is high impedance if  $\overline{OE} = V_{IH}$ .
- 16. If  $\overline{CE}$  goes HIGH simultaneously with  $\overline{WE}$  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)

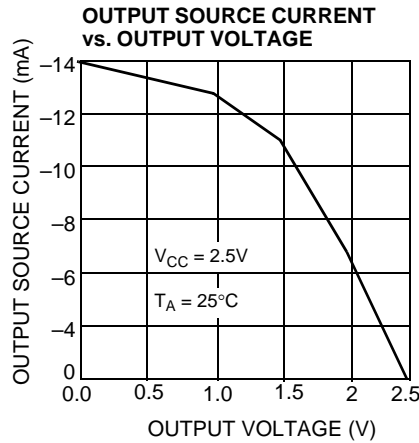
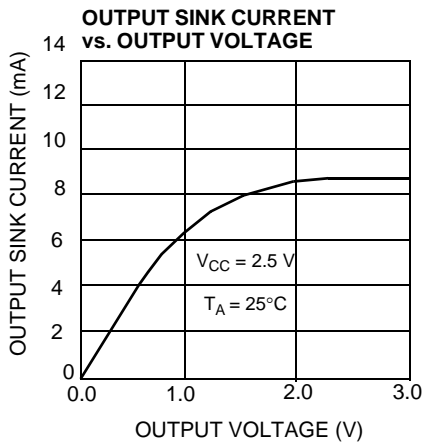
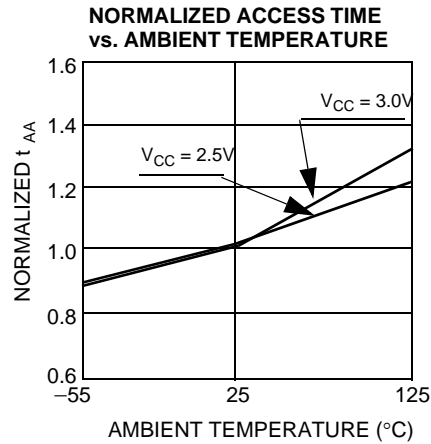
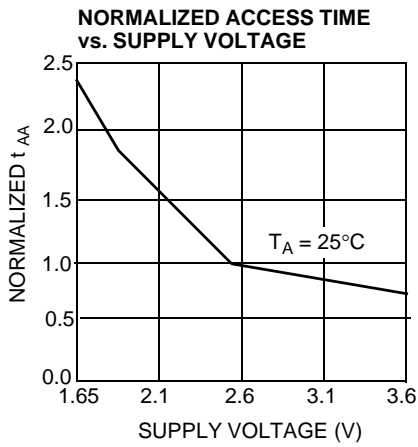
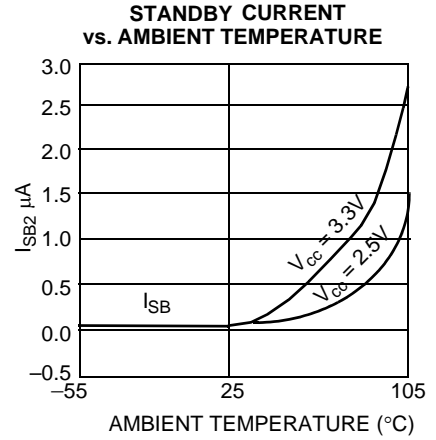
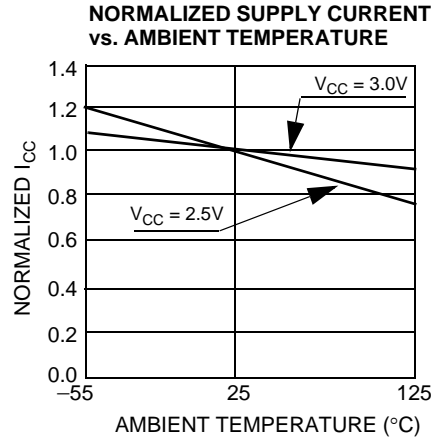
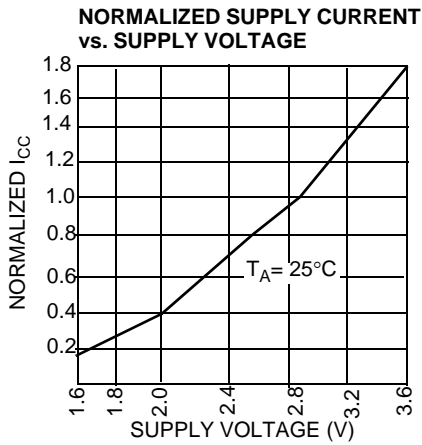
Write Cycle No. 2 ( $\overline{\text{CE}}$  Controlled)<sup>[10, 15, 16]</sup>



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

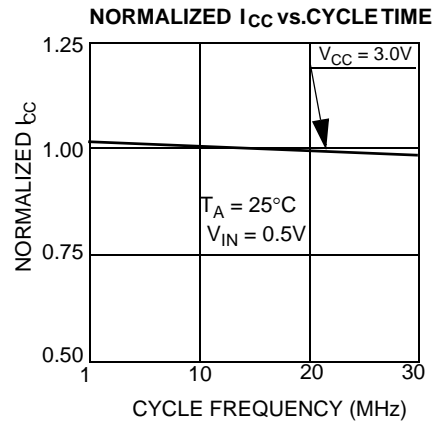
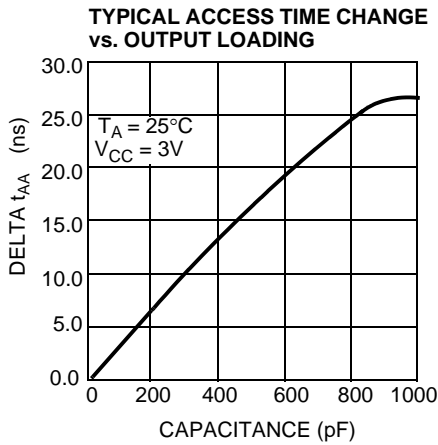


Typical DC and AC Characteristics





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



**Truth Table**

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

**Ordering Information**

Speed (ns)	Ordering Code	Package Diagram	Package Type	Operating Range
70	CY62256VLL-70SNC	51-85092	28-pin (300-mil Narrow Body) SNC	Commercial
	CY62256VLL-70SNXC		28-pin (300-mil Narrow Body) SNC (Pb-Free)	
	CY62256VLL-70ZC	51-85071	28-pin TSOP I	
	CY62256VLL-70ZXC		28-pin TSOP I (Pb-Free)	
	CY62256VLL-70SNXI	51-85092	28-pin (300-mil Narrow Body) SNC (Pb-Free)	Industrial
	CY62256VLL-70ZI	51-85071	28-pin TSOP I	
	CY62256VLL-70ZXI		28-pin TSOP I (Pb-Free)	
	CY62256VLL-70ZRI	51-85074	28-pin Reverse TSOP I	
	CY62256VLL-70ZRXI		28-pin Reverse TSOP I (Pb-Free)	
	CY62256VLL-70SNE	51-85092	28-pin (300-mil Narrow Body) SNC	Automotive
	CY62256VLL-70SNXE		28-pin (300-mil Narrow Body) SNC (Pb-Free)	
	CY62256VLL-70ZE	51-85071	28-pin TSOP I	
	CY62256VLL-70ZXE		28-pin TSOP I (Pb-Free)	
	CY62256VLL-70ZRE	51-85074	28-pin Reverse TSOP I	
	CY62256VLL-70ZRXE		28-pin Reverse TSOP I (Pb-Free)	

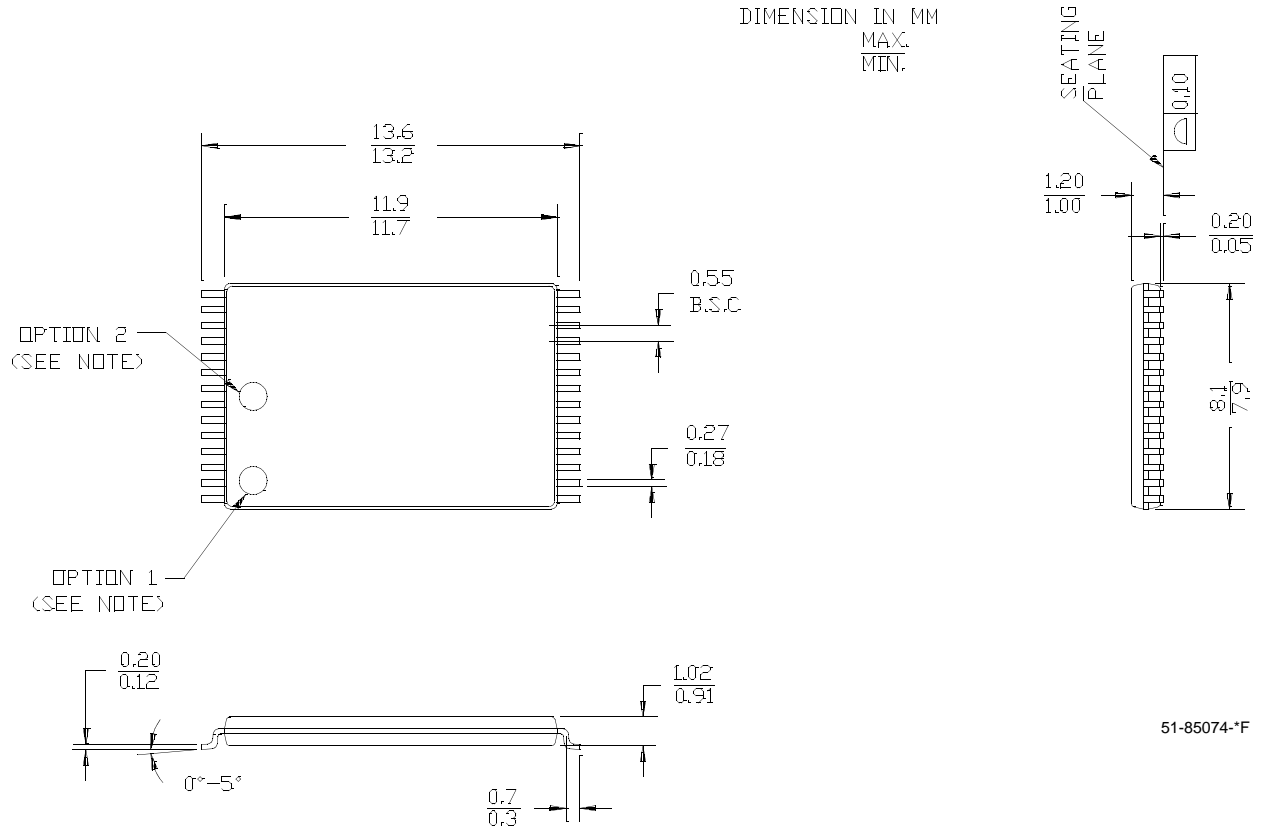
Please contact your local Cypress sales representative for availability of these parts



Package Diagrams (continued)

28-pin Reverse Thin Small Outline Package Type 1 (8 × 13.4 mm) (51-85074)

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



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**Document History Page**

Document Title: CY62256V, 256K (32K x 8) Static RAM Document Number: 38-05057				
REV.	ECN NO.	Issue Date	Orig. of Change	Description of Change
**	107248	09/10/01	SZV	Changed from spec number: 38-00519 to 38-05057
*A	111445	11/01/01	MGN	Removed obsolete parts. Change to standard format
*B	115229	05/23/02	GBI	Changed SN package diagram
*C	116507	09/04/02	GBI	Added footnote 1 Clarified I <sub>CC</sub> spec for V <sub>CC(typ)</sub> = 2.5V
*D	239134	See ECN	AJU	Added Automotive product information
*E	344595	See ECN	SYT	Added Pb-Free packages on page# 10
*F	493277	See ECN	VKN	Changed address of Cypress Semiconductor Corporation on Page# 1 from "3901 North First Street" to "198 Champion Court" Removed part # CY62256V25LL from the product offering Updated Ordering Information Table