

# 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'I and Ind'I)**
  - 275 mW (max.)
- **Low standby power (70 ns, LL version, Com'I and Ind'I)**
  - 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**

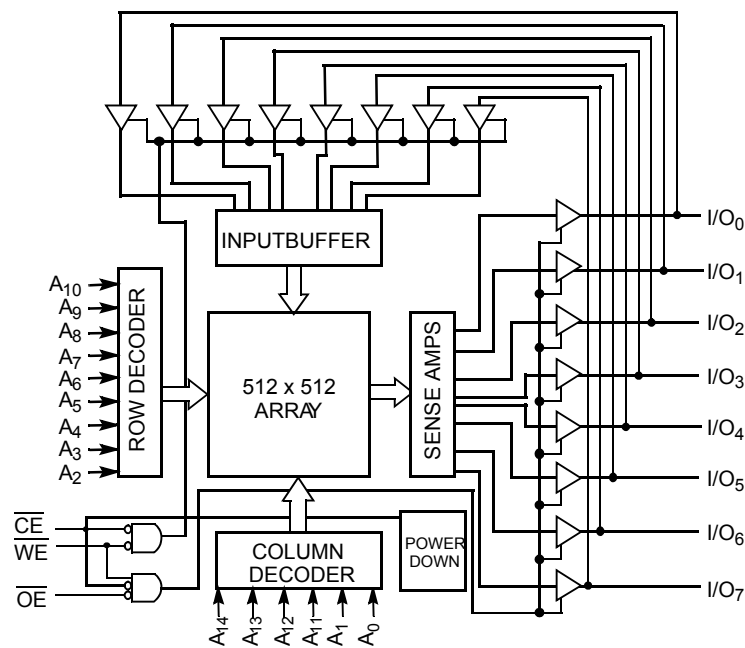
## Functional Description<sup>[1]</sup>

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

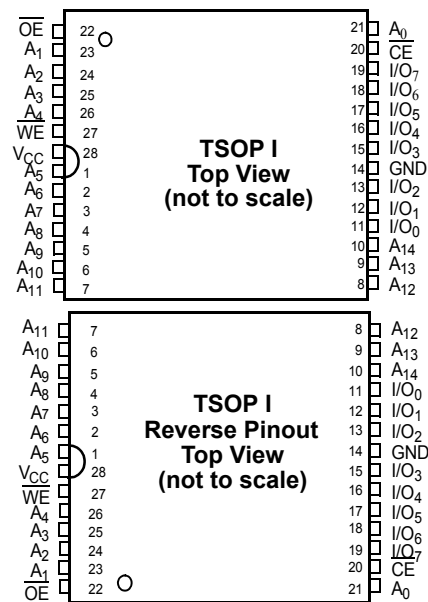
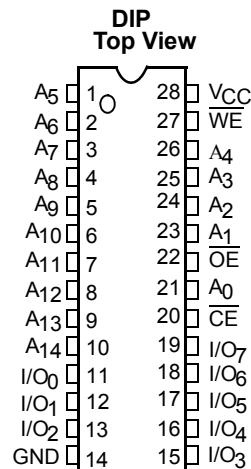
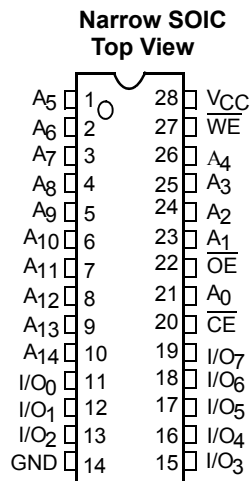


### Note:

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	A <sub>0</sub> -A <sub>14</sub> . Address Inputs
11-13, 15-19,	Input/Output	I/O <sub>0</sub> -I/O <sub>7</sub> . Data lines. Used as input or output lines depending on operation
27	Input/Control	WE. When selected LOW, a WRITE is conducted. When selected HIGH, a READ is conducted
20	Input/Control	CE. When LOW, selects the chip. When HIGH, deselects the chip
22	Input/Control	OE. 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	GND. Ground for the device
28	Power Supply	V <sub>CC</sub> . Power supply for the device

**Notes:**

- 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  $V_{CC} + 0.5V$   
 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**

Range	Ambient Temperature ( $T_A$ ) <sup>[4]</sup>	$V_{CC}$
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.	
$V_{OH}$	Output HIGH Voltage	$V_{CC} = \text{Min.}, I_{OH} = -1.0 \text{ mA}$	2.4			2.4			V
$V_{OL}$	Output LOW Voltage	$V_{CC} = \text{Min.}, I_{OL} = 2.1 \text{ mA}$			0.4			0.4	V
$V_{IH}$	Input HIGH Voltage		2.2		$V_{CC} + 0.5V$	2.2		$V_{CC} + 0.5V$	V
$V_{IL}$	Input LOW Voltage		-0.5		0.8	-0.5		0.8	V
$I_{IX}$	Input Leakage Current	$GND \leq V_I \leq V_{CC}$	-0.5		+0.5	-0.5		+0.5	μA
$I_{OZ}$	Output Leakage Current	$GND \leq V_O \leq V_{CC}$ , Output Disabled	-0.5		+0.5	-0.5		+0.5	μA
$I_{CC}$	$V_{CC}$ Operating Supply Current	$V_{CC} = \text{Max.}, I_{OUT} = 0 \text{ mA}, f = f_{MAX} = 1/t_{RC}$		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. $V_{CC}$ , $\overline{CE} \geq V_{IH}$ , $V_{IN} \geq V_{IH}$ or $V_{IN} \leq V_{IL}$ , $f = f_{MAX}$		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. $V_{CC}$ , $\overline{CE} \geq V_{CC} - 0.3V$ , $V_{IN} \geq V_{CC} - 0.3V$ , or $V_{IN} \leq 0.3V$ , $f = 0$		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>**

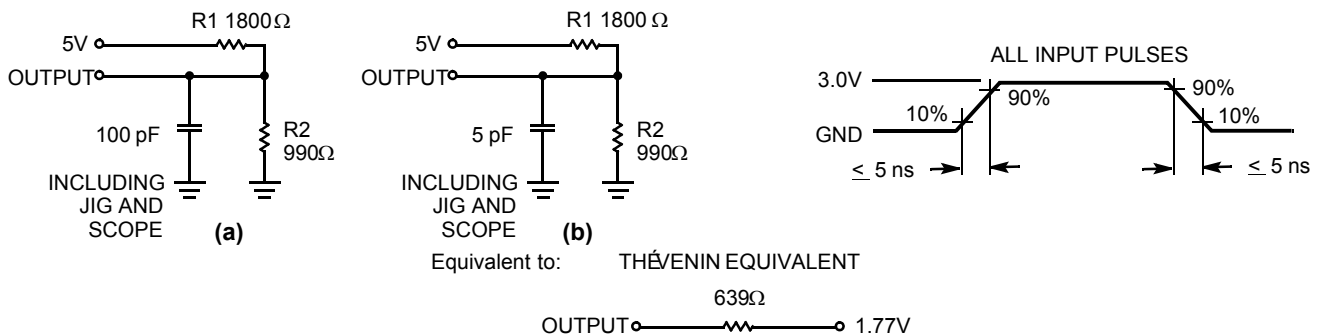
Parameter	Description	Test Conditions	Max.	Unit
$C_{IN}$	Input Capacitance	$T_A = 25^\circ\text{C}, f = 1 \text{ MHz}, V_{CC} = 5.0V$	6	pF
$C_{OUT}$	Output Capacitance		8	pF

**Notes:**

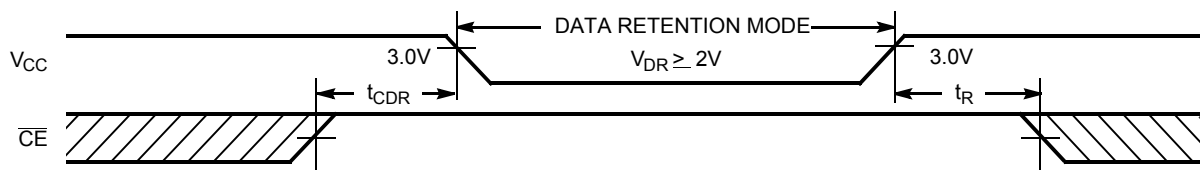
- $V_{IL}$  (min.) = -2.0V for pulse durations of less than 20 ns.
- $T_A$  is the "Instant-On" case temperature.
- Tested initially and after any design or process changes that may affect these parameters.

**Thermal Resistance**

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

**AC Test Loads and Waveforms**

**Data Retention Characteristics**

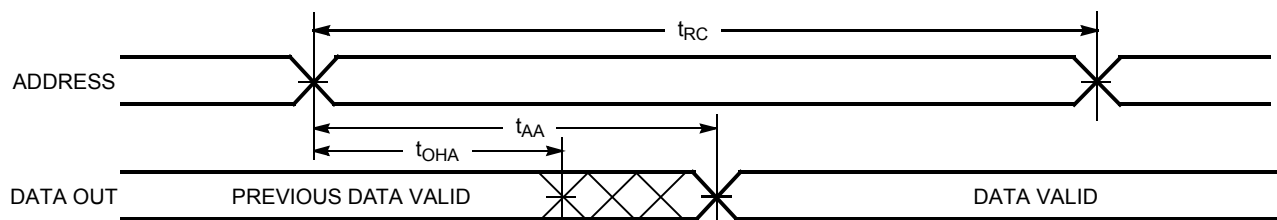
Parameter	Description	Conditions <sup>[6]</sup>	Min.	Typ. <sup>[2]</sup>	Max.	Unit
$V_{DR}$	$V_{CC}$ for Data Retention		2.0			V
$I_{CCDR}$	Data Retention Current	L	$V_{CC} = 3.0V, CE \geq V_{CC} - 0.3V,$ $V_{IN} \geq V_{CC} - 0.3V, \text{ or } V_{IN} \leq 0.3V$	2	50	$\mu A$
		LL		0.1	5	$\mu A$
		LL - 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**

**Notes:**

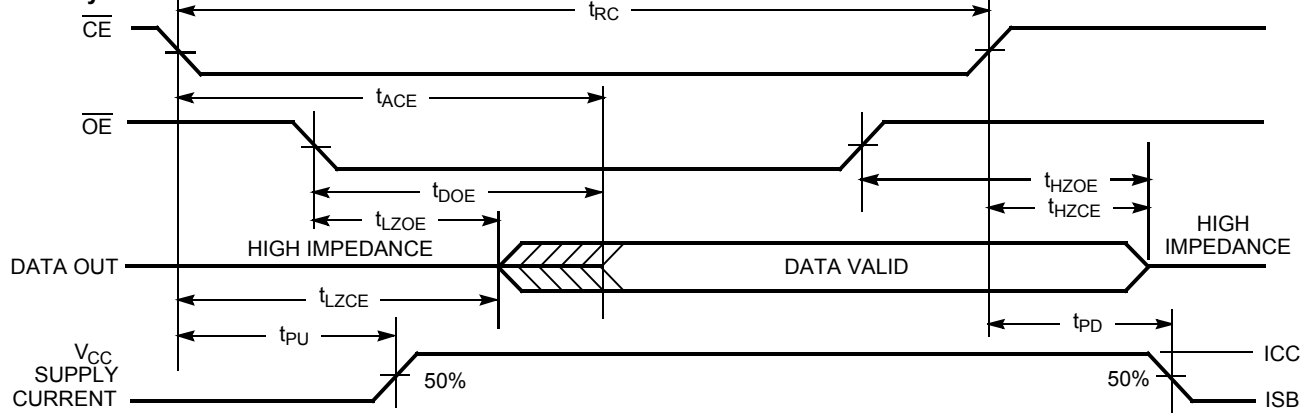
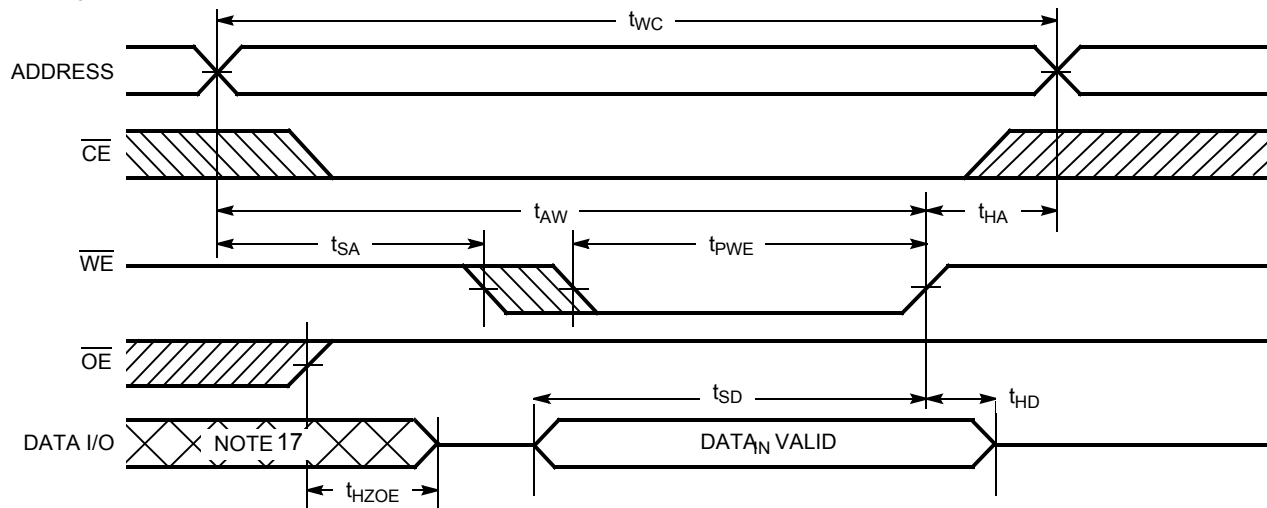
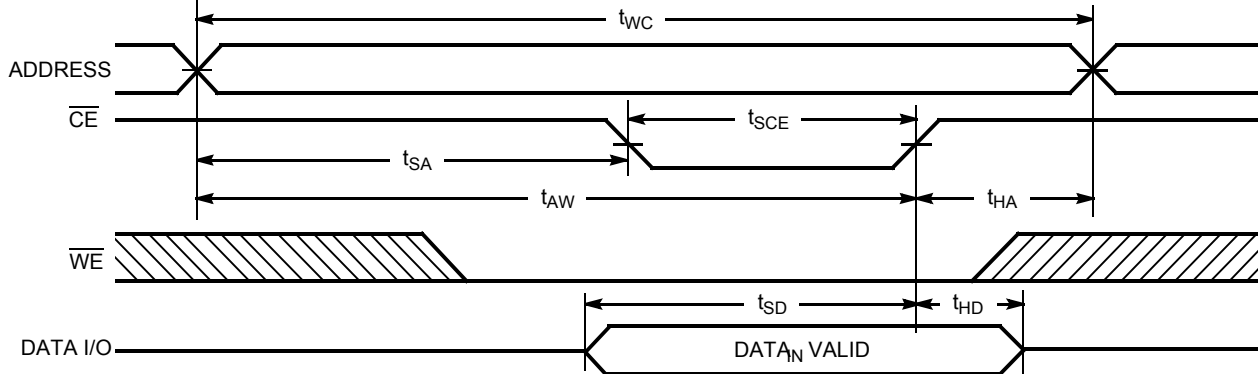
6. No input may exceed  $V_{CC} + 0.5V$ .

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

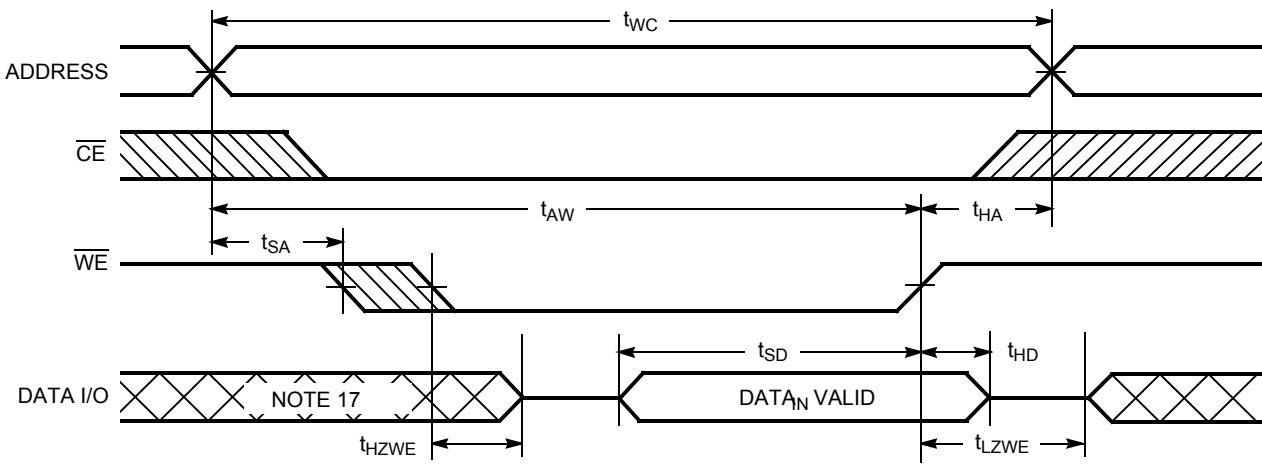
Parameter	Description	CY62256-55		CY62256-70		Unit
		Min.	Max.	Min.	Max.	
<b>Read Cycle</b>						
$t_{RC}$	Read Cycle Time	55		70		ns
$t_{AA}$	Address to Data Valid		55		70	ns
$t_{OHA}$	Data Hold from Address Change	5		5		ns
$t_{ACE}$	CE LOW to Data Valid		55		70	ns
$t_{DOE}$	OE LOW to Data Valid		25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

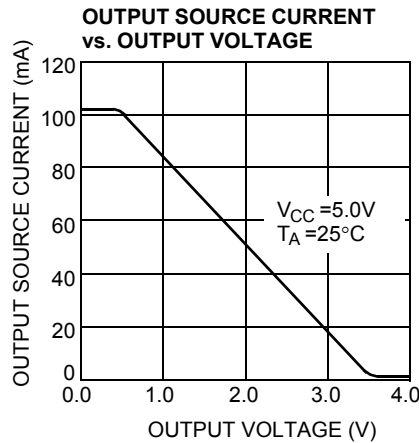
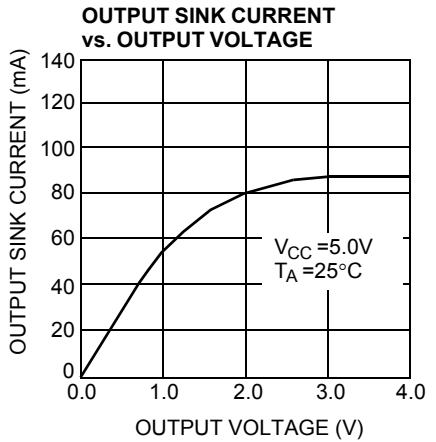
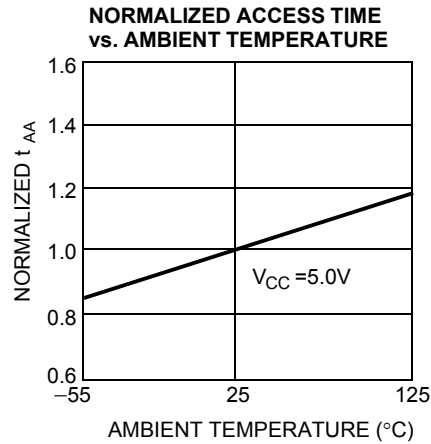
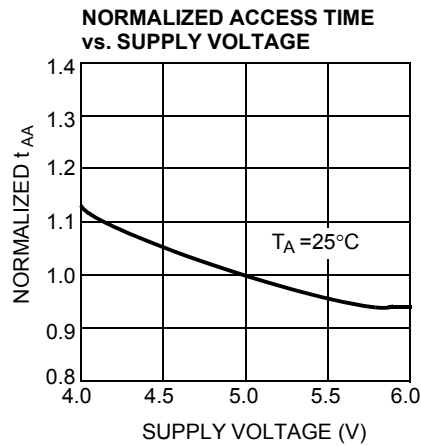
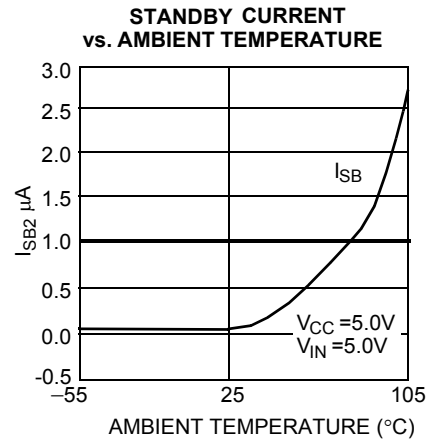
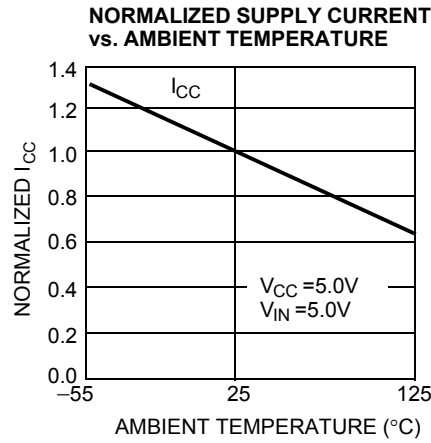
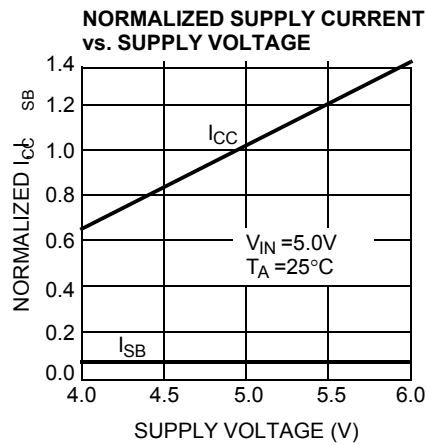
**Switching Waveforms**
**Read Cycle No. 1<sup>[12, 13]</sup>**

**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 CE LOW and 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 (WE controlled, OE LOW) is the sum of  $t_{HZWE}$  and  $t_{SD}$ .
12. Device is continuously selected.  $\overline{OE}$ ,  $\overline{CE} = V_{IL}$ .
13. WE is HIGH for Read cycle.

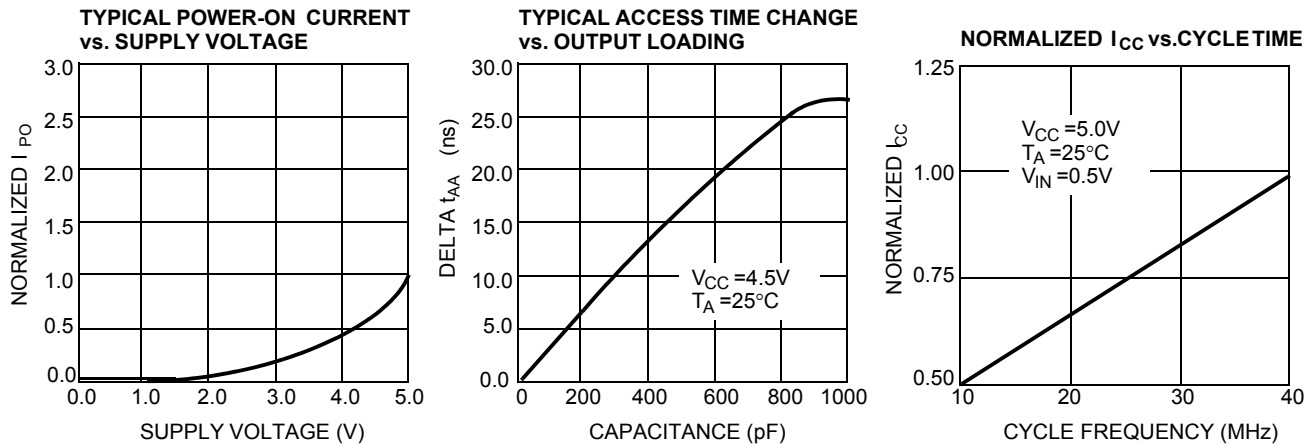
**Switching Waveforms (continued)**
**Read Cycle No. 2** [13, 14]

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

**Write Cycle No. 2 ( $\overline{CE}$  Controlled)** [10, 15, 16]

**Notes:**

14. Address valid prior to or coincident with  $\overline{CE}$  transition LOW.
15. Data I/O is high impedance if  $OE = V_{IH}$ .
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. 3 ( $\overline{WE}$  Controlled,  $\overline{OE}$  LOW)** [11, 16]


**Typical DC and AC Characteristics**




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

**Truth Table**

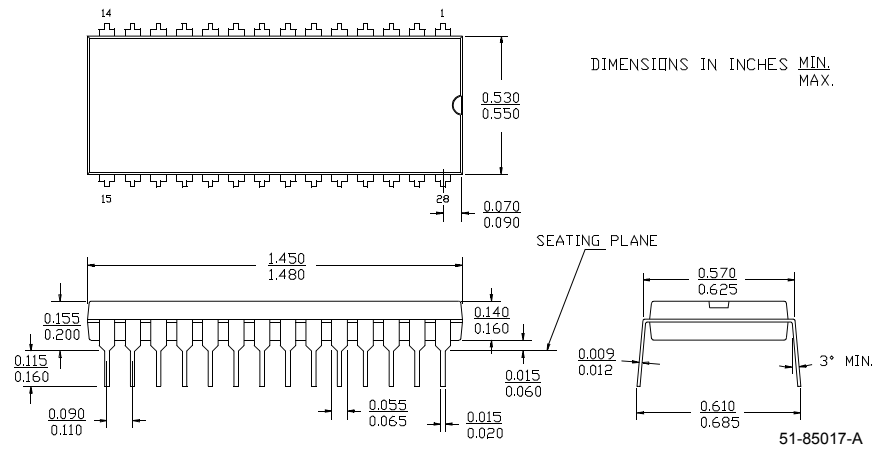
CE	WE	OE	Inputs/Outputs	Mode	Power
H	X	X	High-Z	Deselect/Power-down	Standby ( $I_{SB}$ )
L	H	L	Data Out	Read	Active ( $I_{CC}$ )
L	L	X	Data In	Write	Active ( $I_{CC}$ )
L	H	H	High-Z	Output Disabled	Active ( $I_{CC}$ )

**Ordering Information**

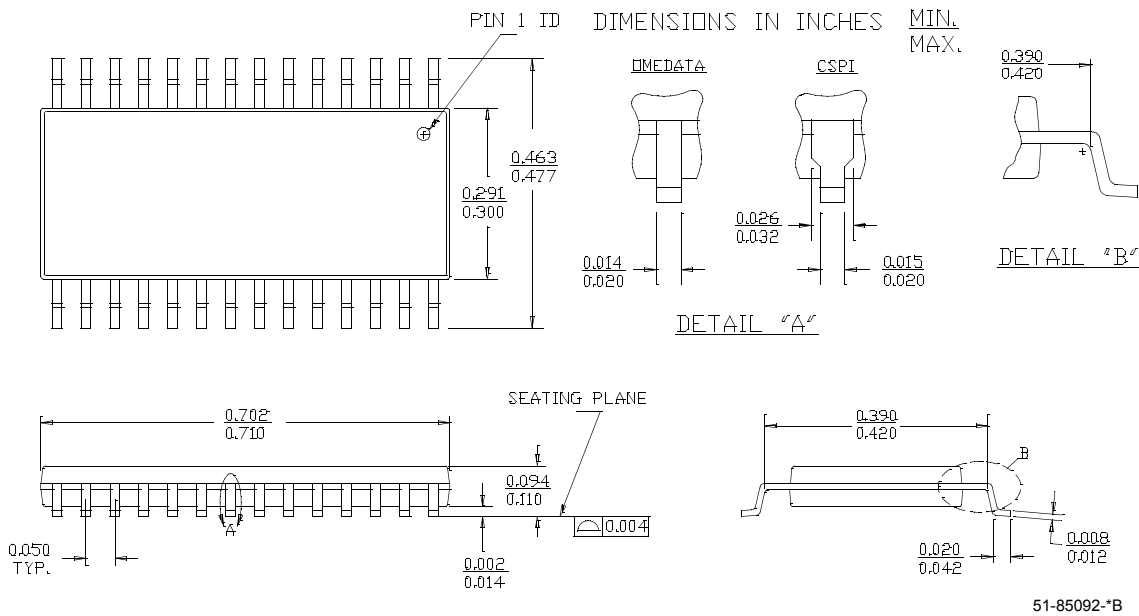
Speed (ns)	Ordering Code	Package Name	Package Type	Operating Range
55	CY62256LL-55SNI	SN28	28-lead (300-Mil Narrow Body) Narrow SOIC	Industrial
	CY62256LL-55ZI	Z28	28-lead Thin Small Outline Package	
	CY62256LL-55SNE	SN28	28-lead (300-Mil Narrow Body) Narrow SOIC	Automotive
	CY62256LL-55ZE	Z28	28-lead Thin Small Outline Package	
	CY62256LL-55ZRE	ZR28	28-lead Reverse Thin Small Outline Package	
70	CY62256-70SNC	SN28	28-lead (300-Mil Narrow Body) Narrow SOIC	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

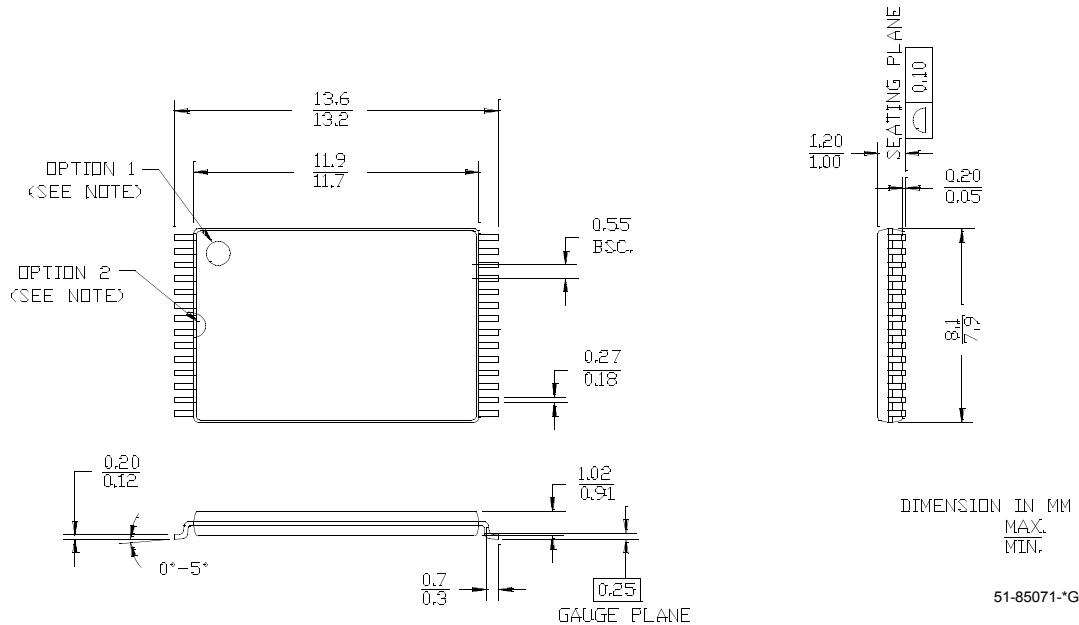


28-lead (300-mil) SNC (Narrow Body) SN28

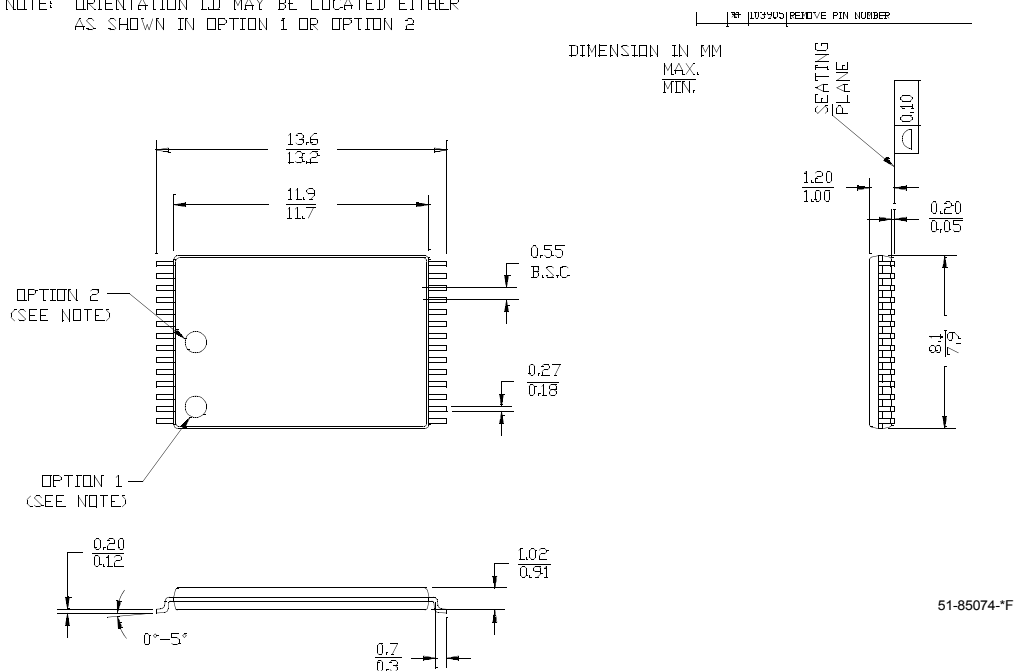


**Package Diagrams (continued)**
**28-lead Thin Small Outline Package Type 1 (8 x 13.4 mm) Z28**

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 256K (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
*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