

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**

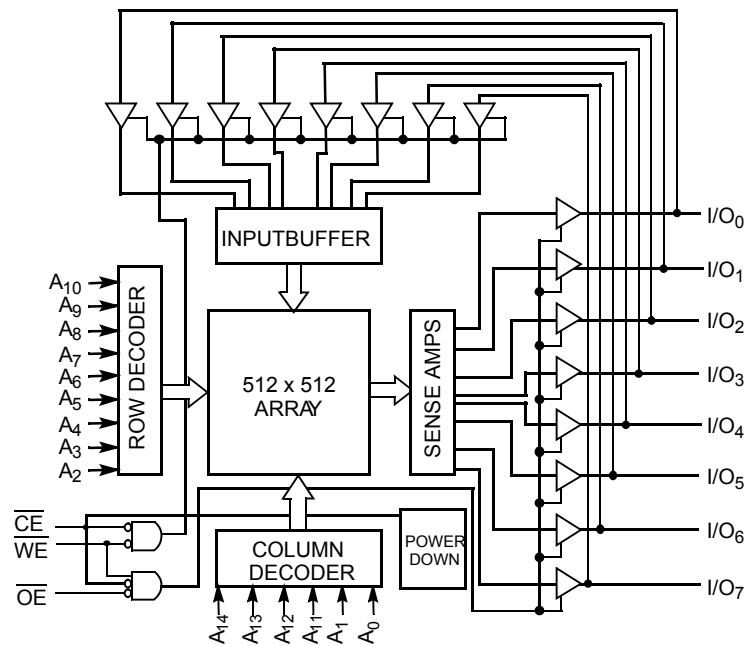
Functional Description^[1]

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

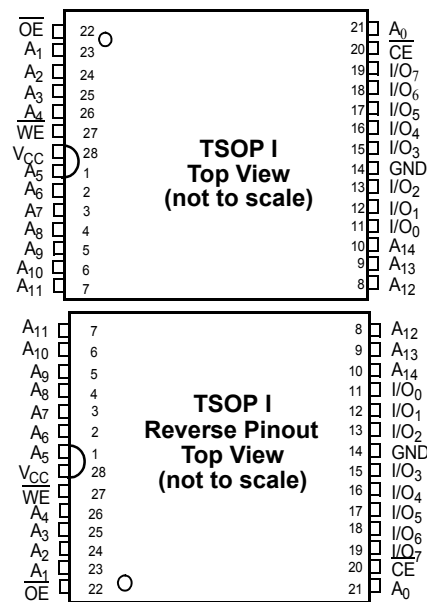
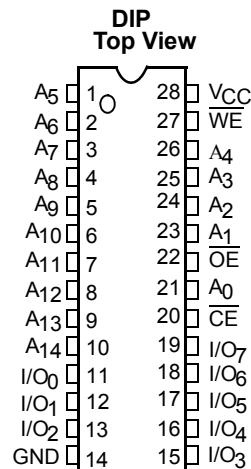
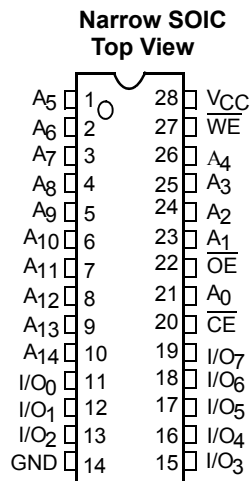


Note:

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

Product Portfolio

Product		V _{CC} Range (V)			Speed (ns)	Power Dissipation			
						Operating, I _{CC} (mA)		Standby, I _{SB2} (μA)	
		Min.	Typ. ^[2]	Max.		Typ. ^[2]	Max.	Typ. ^[2]	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 ₀ -A ₁₄ . Address Inputs
11-13, 15-19,	Input/Output	I/O ₀ -I/O ₇ . 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 _{CC} . 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_A = 25°C, V_{CC}). 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^[3] -0.5V to $V_{CC} + 0.5V$
 DC Input Voltage^[3] -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) ^[4]	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. ^[2]	Max.	Min.	Typ. ^[2]	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^[5]

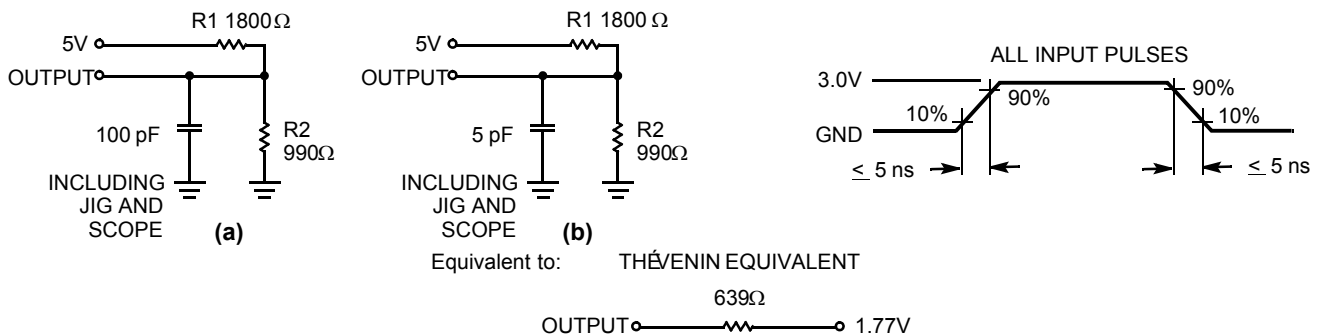
Parameter	Description	Test Conditions	Max.	Unit
C_{IN}	Input Capacitance	$T_A = 25^\circ\text{C}, f = 1 \text{ MHz}, V_{CC} = 5.0V$	6	pF
C_{OUT}	Output Capacitance		8	pF

Notes:

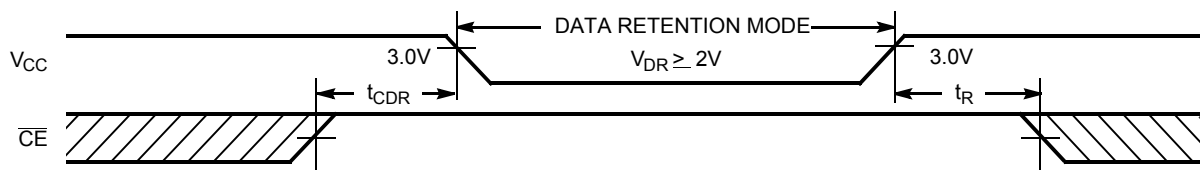
- V_{IL} (min.) = -2.0V for pulse durations of less than 20 ns.
- T_A is the "Instant-On" case temperature.
- Tested initially and after any design or process changes that may affect these parameters.

Thermal Resistance

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

AC Test Loads and Waveforms

Data Retention Characteristics

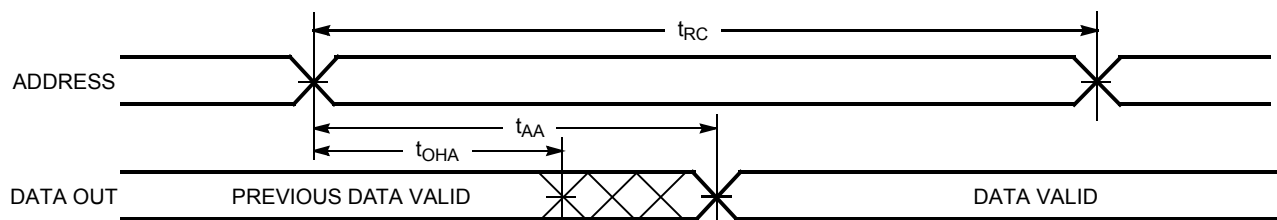
Parameter	Description	Conditions ^[6]	Min.	Typ. ^[2]	Max.	Unit
V_{DR}	V_{CC} for Data Retention		2.0			V
I_{CCDR}	Data Retention Current	L	$V_{CC} = 3.0V, CE \geq V_{CC} - 0.3V,$ $V_{IN} \geq V_{CC} - 0.3V, \text{ or } V_{IN} \leq 0.3V$	2	50	μA
		LL		0.1	5	μA
		LL - Ind'l		0.1	10	μA
		LL - Auto		0.1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

Data Retention Waveform

Notes:

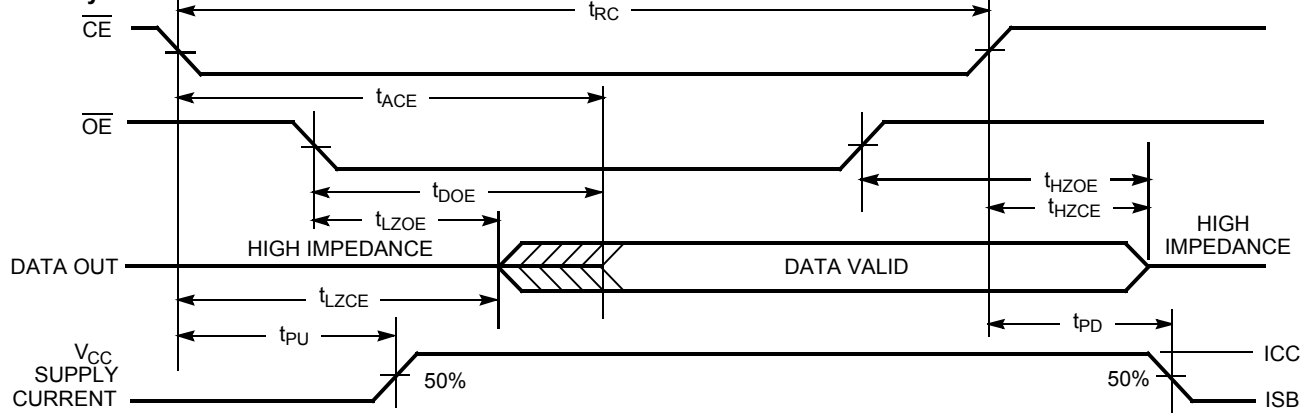
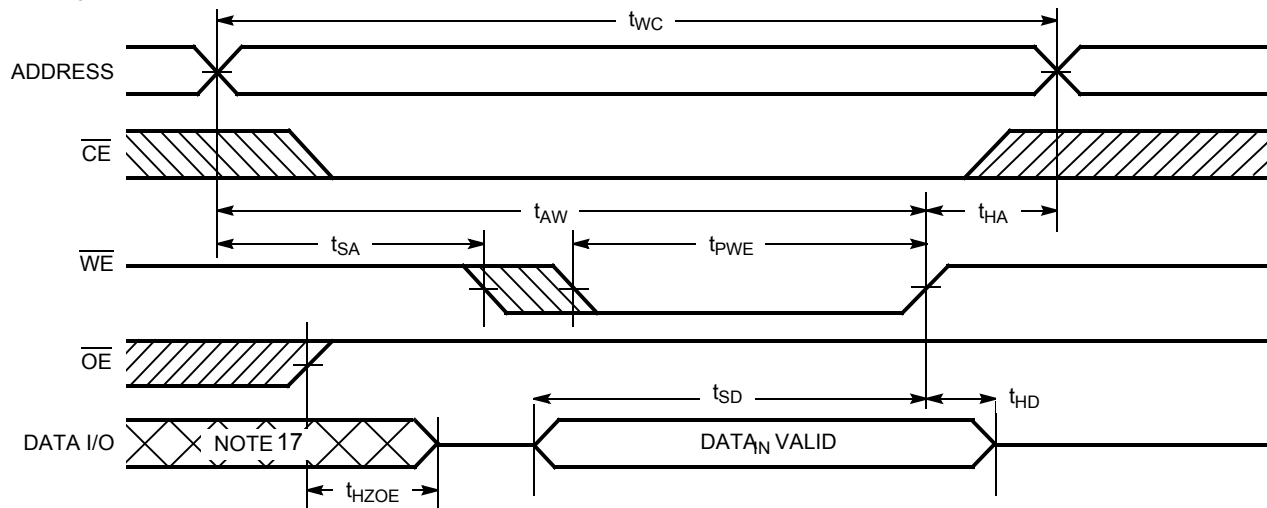
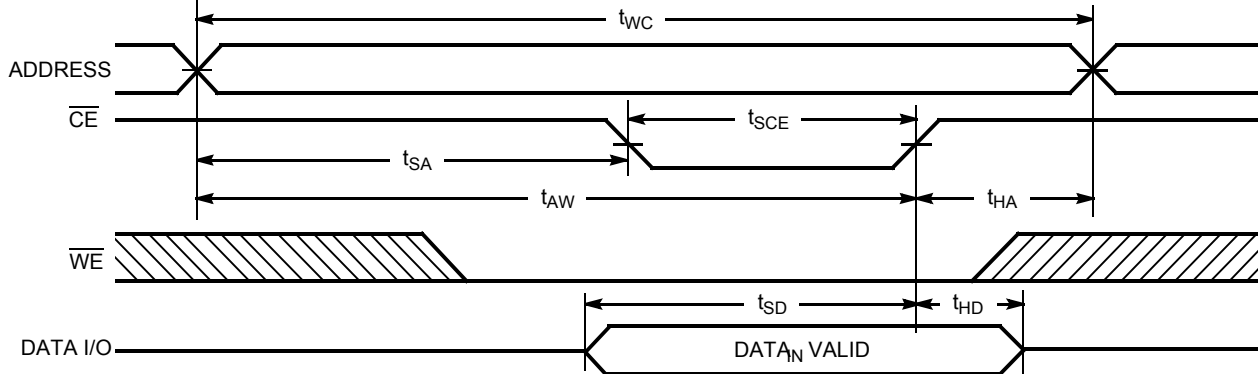
6. No input may exceed $V_{CC} + 0.5V$.

Switching Characteristics Over the Operating Range^[7]

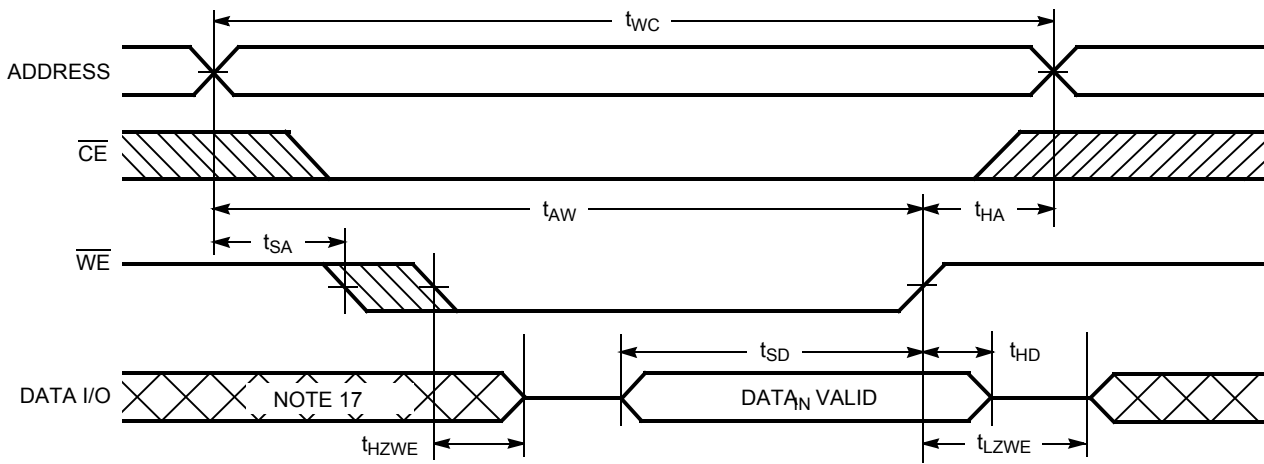
Parameter	Description	CY62256-55		CY62256-70		Unit
		Min.	Max.	Min.	Max.	
Read Cycle						
t_{RC}	Read Cycle Time	55		70		ns
t_{AA}	Address to Data Valid		55		70	ns
t_{OHA}	Data Hold from Address Change	5		5		ns
t_{ACE}	CE LOW to Data Valid		55		70	ns
t_{DOE}	OE LOW to Data Valid		25		35	ns
t_{LZOE}	OE LOW to Low-Z ^[8]	5		5		ns
t_{HZOE}	OE HIGH to High-Z ^[8, 9]		20		25	ns
t_{LZCE}	CE LOW to Low-Z ^[8]	5		5		ns
t_{HZCE}	CE HIGH to High-Z ^[8, 9]		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^[10, 11]						
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 ^[8, 9]		20		25	ns
t_{LZWE}	WE HIGH to Low-Z ^[8]	5		5		ns

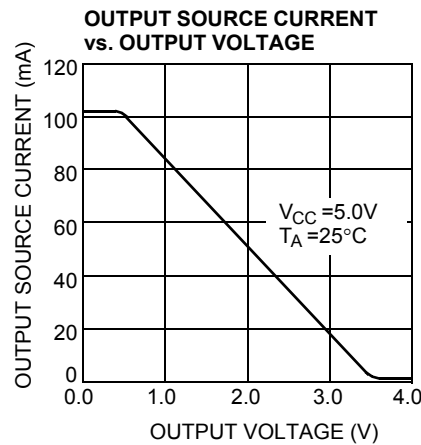
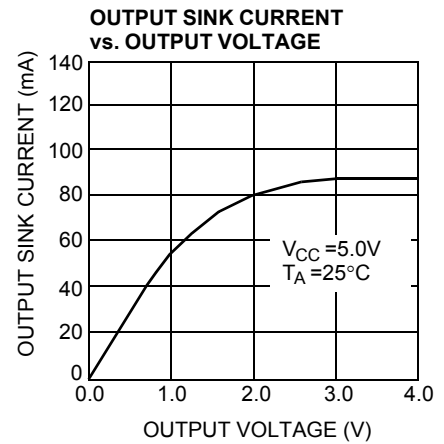
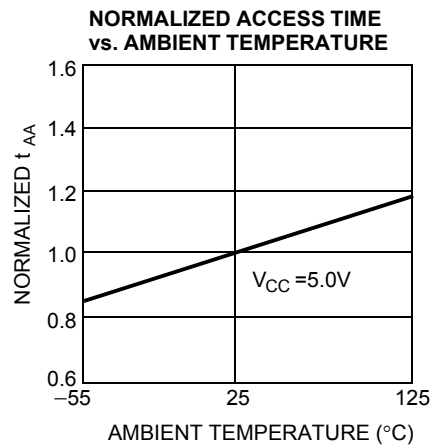
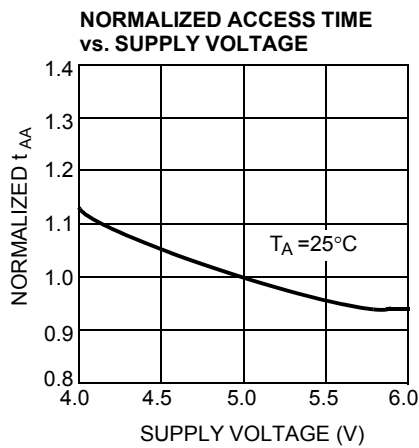
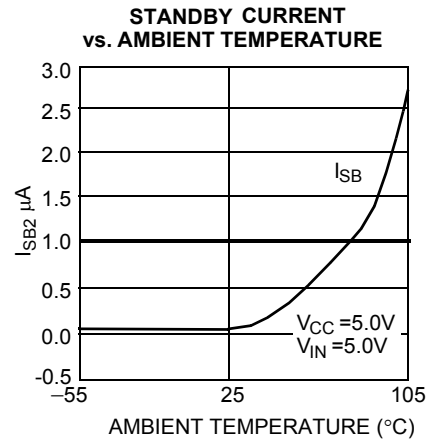
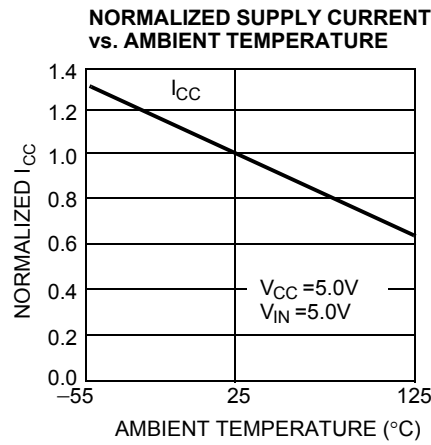
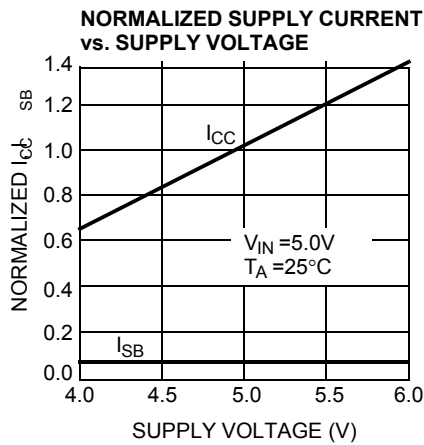
Switching Waveforms
Read Cycle No. 1^[12, 13]

Notes:

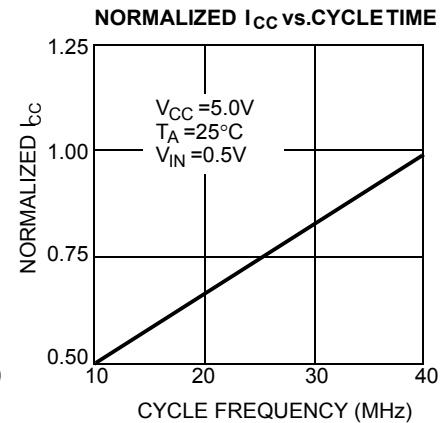
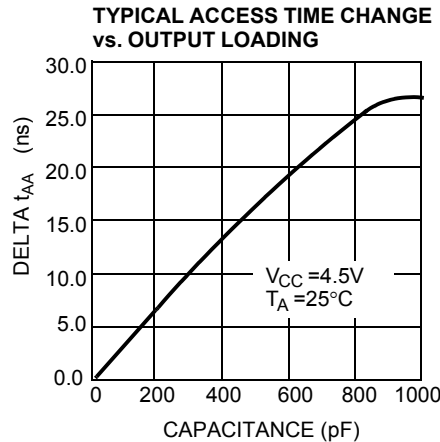
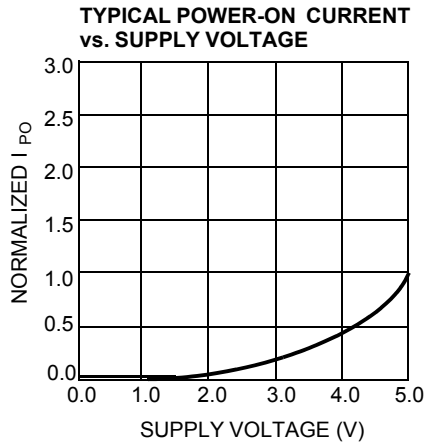
7. Test conditions assume signal transition time of 5 ns or less, timing reference levels of 1.5V, input pulse levels of 0 to 3.0V, and output loading of the specified I_{OL}/I_{OH} and 100-pF load capacitance.
8. At any given temperature and voltage condition, t_{HZCE} is less than t_{LZCE} , t_{HZOE} 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 ± 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 (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 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

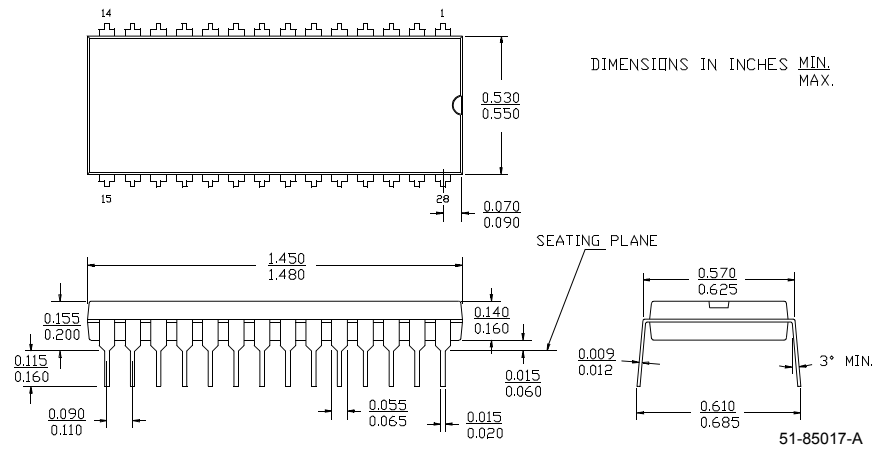
CE	WE	OE	Inputs/Outputs	Mode	Power
H	X	X	High-Z	Deselect/Power-down	Standby (I_{SB})
L	H	L	Data Out	Read	Active (I_{CC})
L	L	X	Data In	Write	Active (I_{CC})
L	H	H	High-Z	Output Disabled	Active (I_{CC})

Ordering Information

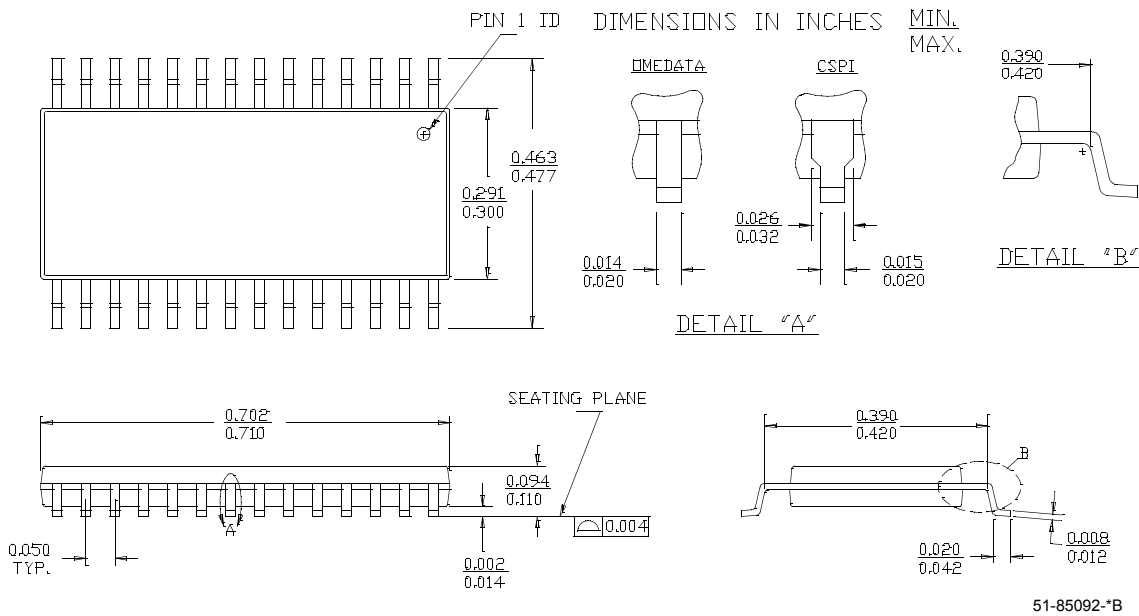
Speed (ns)	Ordering Code	Package Name	Package Type	Operating Range
55	CY62256LL-55SNI	SN28	28-lead (300-Mil Narrow Body) Narrow SOIC	Industrial
	CY62256LL-55ZI	Z28	28-lead Thin Small Outline Package	
	CY62256LL-55SNE	SN28	28-lead (300-Mil Narrow Body) Narrow SOIC	Automotive
	CY62256LL-55ZE	Z28	28-lead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

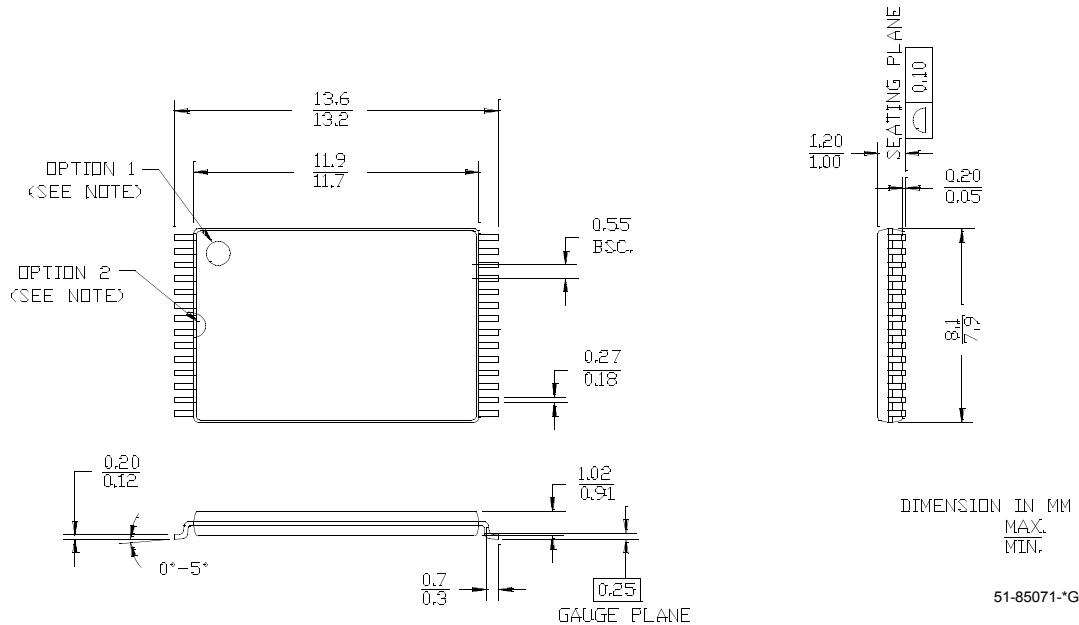


28-lead (300-mil) SNC (Narrow Body) SN28

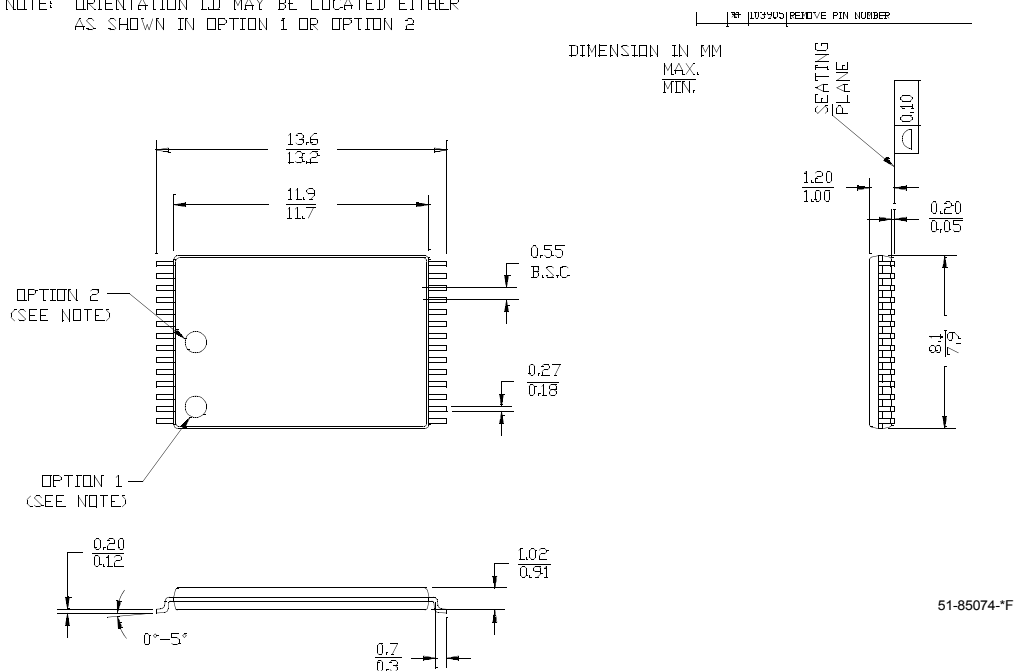


Package Diagrams (continued)
28-lead Thin Small Outline Package Type 1 (8 x 13.4 mm) Z28

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