

CY62256

32Kx8 Static RAM

Features

- 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.)
- 55, 70 ns access time
- Easy memory expansion with CE and OE features
- TTL-compatible inputs and outputs
- Automatic power-down when deselected
- CMOS for optimum speed/power

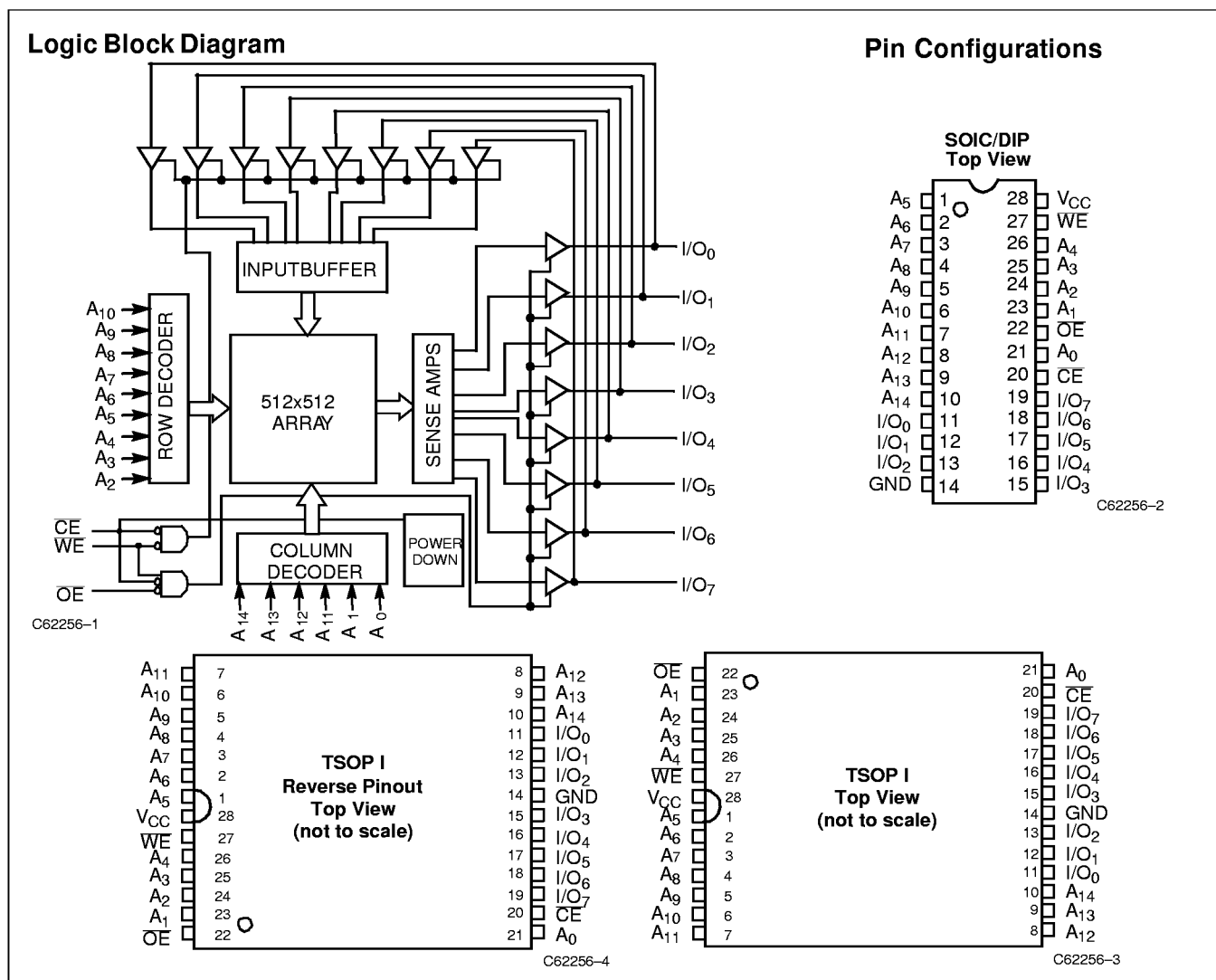
Functional Description

The CY62256 is a high-performance CMOS static RAM organized as 32,768 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. The CY62256 is in the standard 450-mil-wide (300-mil body width) SOIC, TSOP, and 600-mil PDIP packages.

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.





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 0°C to +70°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^[1] -0.5V to V_{CC} + 0.5V
- DC Input Voltage^[1] -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	V _{CC}
Commercial	0°C to +70°C	5V ± 10%
Industrial	-40°C to +85°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} = Min., I _{OH} = -1.0 mA	2.4			2.4			V
V _{OL}	Output LOW Voltage	V _{CC} = Min., I _{OL} = 2.1 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 Load Current	GND ≤ V _I ≤ V _{CC}	-0.5		+0.5	-0.5		+0.5	μA
I _{OZ}	Output Leakage Current	GND ≤ V _O ≤ V _{CC} , Output Disabled	-0.5		+0.5	-0.5		+0.5	μA
I _{CC}	V _{CC} Operating Supply Current	V _{CC} = Max., I _{OUT} = 0 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} , CE ≥ V _{IH} , V _{IN} ≥ V _{IH} or V _{IN} ≤ 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} , CE ≥ V _{CC} - 0.3V, V _{IN} ≥ V _{CC} - 0.3V or V _{IN} ≤ 0.3V, 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	

Shaded area contains preliminary information.

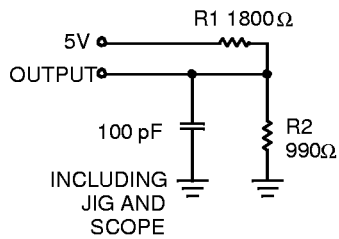
Capacitance^[3]

Parameter	Description	Test Conditions	Max.	Unit
C _{IN}	Input Capacitance	T _A = 25°C, f = 1 MHz, V _{CC} = 5.0V	6	pF
C _{OUT}	Output Capacitance		8	pF

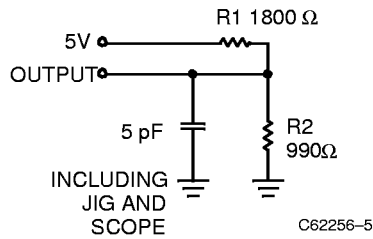
Note:

- 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_A = 25°C, V_{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

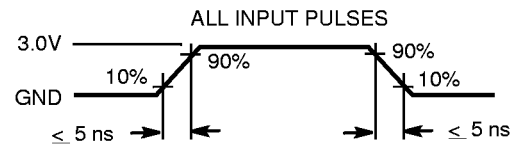


(a)



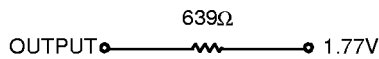
(b)

C62256-5



C62256-6

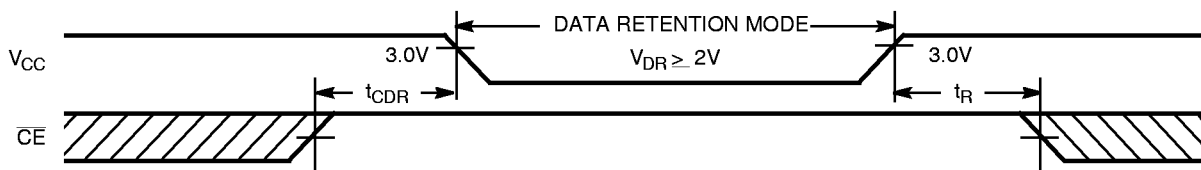
Equivalent to: THÉVENIN EQUIVALENT



Data Retention Characteristics

Parameter	Description	Conditions ^[4]	Min.	Typ. ^[2]	Max.	Unit	
V_{DR}	V_{CC} for Data Retention	$V_{CC} = 3.0V,$ $CE \geq V_{CC} - 0.3V,$ $V_{IN} \geq V_{CC} - 0.3V$ or $V_{IN} \leq 0.3V$	2.0			V	
I_{CCDR}	Data Retention Current		L		2	50	μA
			LL		0.1	5	μA
			LL Indust'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



C62256-7

Note:

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



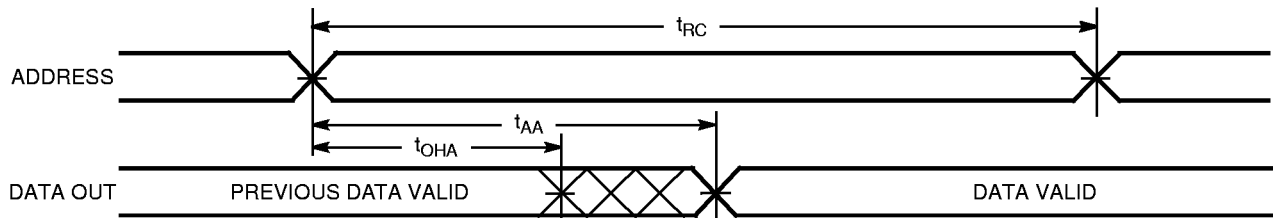
Switching Characteristics Over the Operating Range^[5]

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

Shaded area contains preliminary information.

Switching Waveforms

Read Cycle No. 1^[10,11]



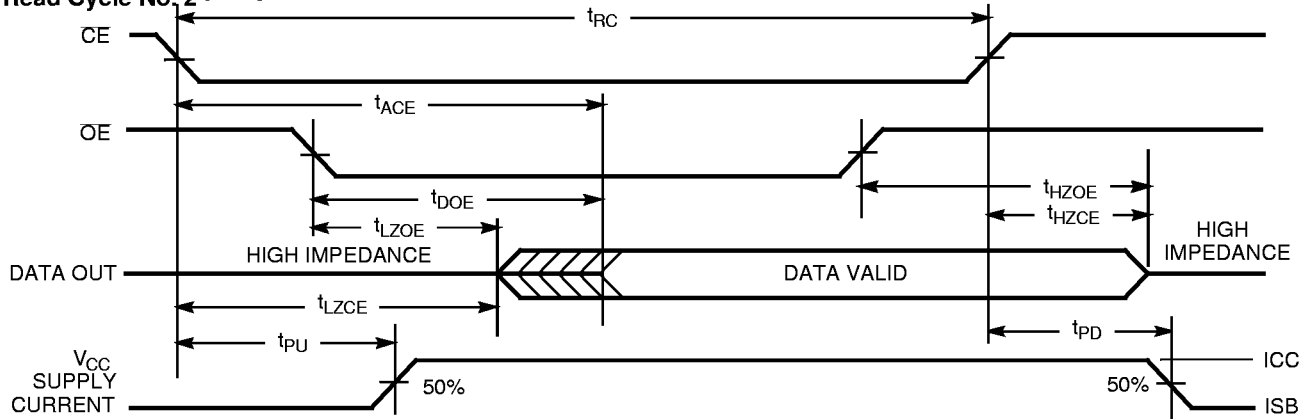
C62256-8

Notes:

5. 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.
6. 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.
7. 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.
8. 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.
9. The minimum write cycle time for write cycle #3 (WE controlled, OE LOW) is the sum of t_{HZWE} and t_{SD}.
10. Device is continuously selected. OE, CE = V_{IL}.
11. WE is HIGH for read cycle.

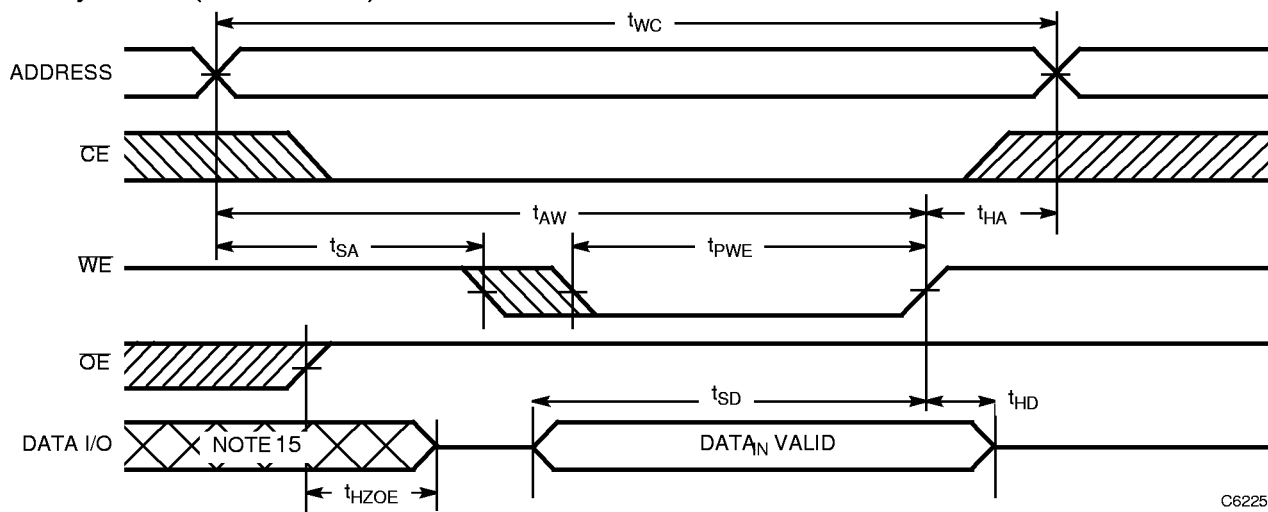
Switching Waveforms (continued)

Read Cycle No. 2 [11,12]



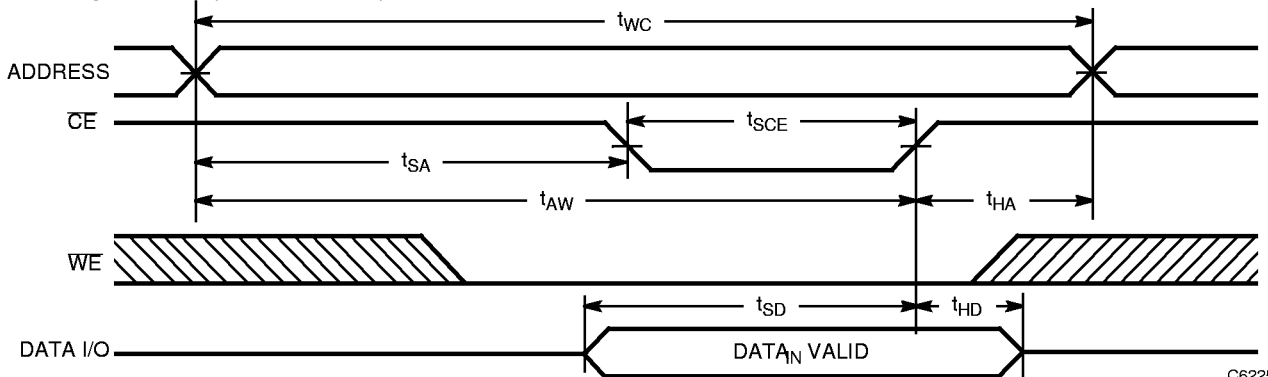
C62256-9

Write Cycle No. 1 (WE Controlled) [8,13,14]



C62256-10

Write Cycle No. 2 (CE Controlled) [8,13,14]



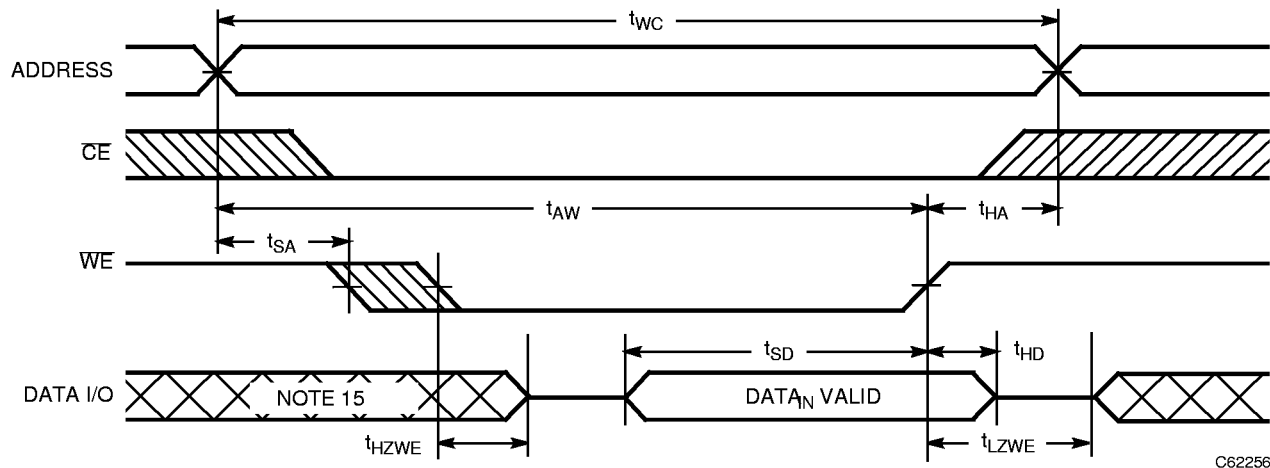
C62256-11

Notes:

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

Switching Waveforms (continued)

Write Cycle No. 3 (WE Controlled, OE LOW) ^[9,14]

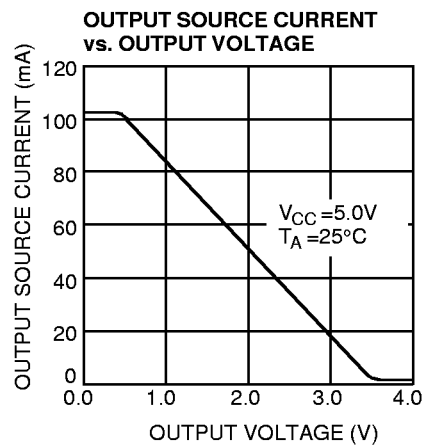
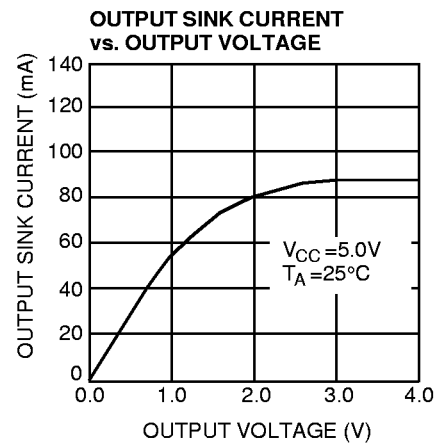
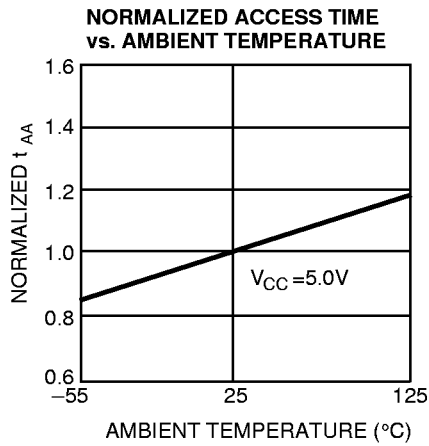
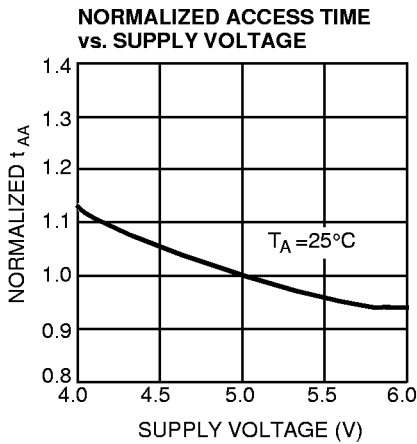
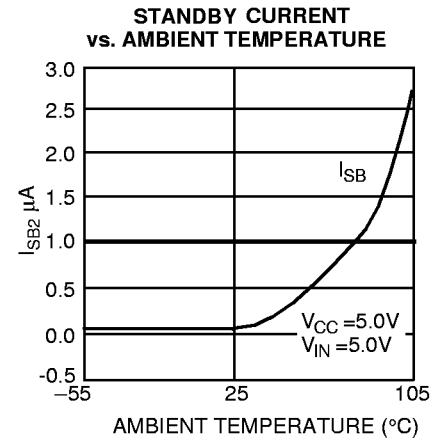
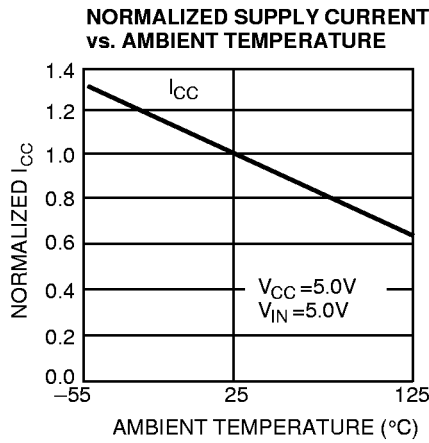
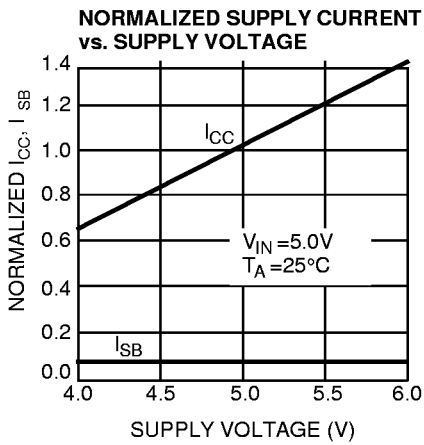


C62256-12

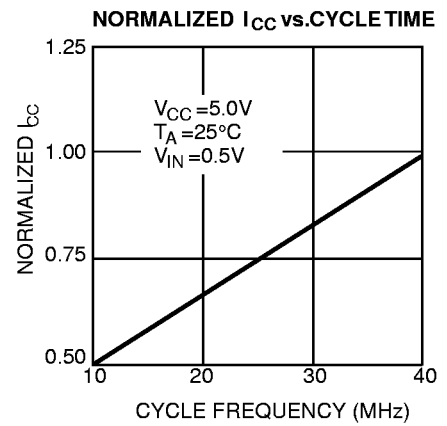
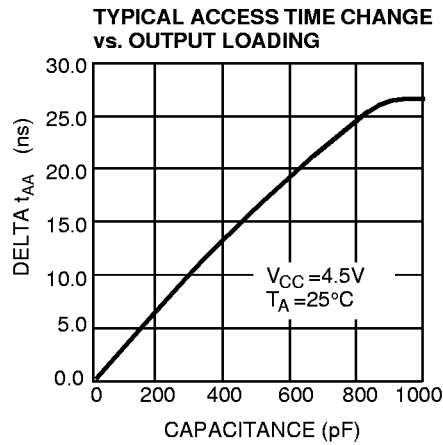
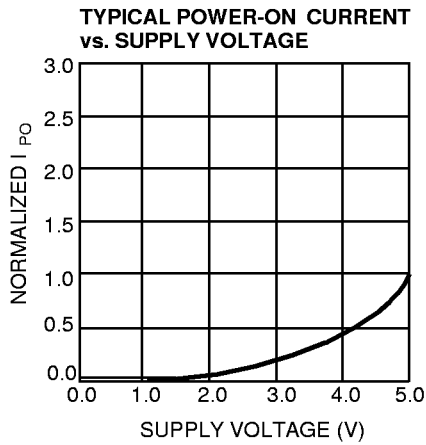
Note:

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

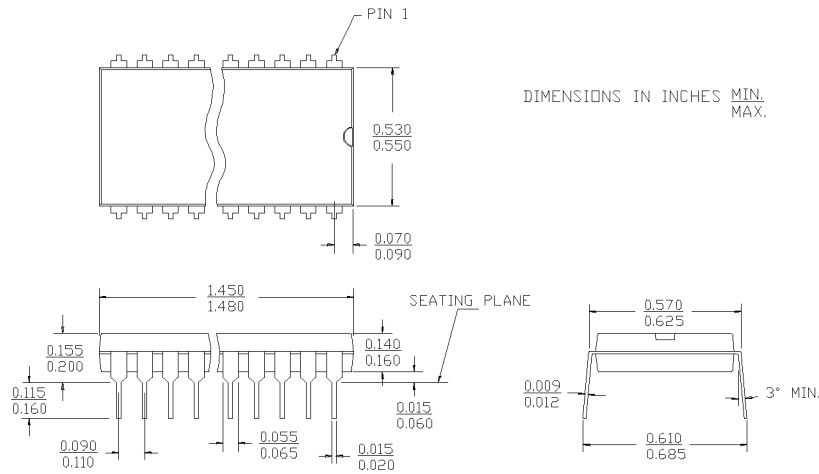
Speed (ns)	Ordering Code	Package Name	Package Type	Operating Range
55	CY62256-55SNC	S22	28-Lead 450-Mil (300-Mil Body Width) SOIC	Commercial
	CY62256L-55SNC	S22	28-Lead 450-Mil (300-Mil Body Width) SOIC	
	CY62256LL-55SNC	S22	28-Lead 450-Mil (300-Mil Body Width) SOIC	
	CY62256-55ZRC	ZR28	28-Lead Reverse Thin Small Outline Package	
	CY62256L-55ZRC	ZR28	28-Lead Reverse Thin Small Outline Package	
	CY62256LL-55ZRC	ZR28	28-Lead Reverse Thin Small Outline Package	
	CY62256-55ZC	Z28	28-Lead Thin Small Outline Package	
	CY62256L-55ZC	Z28	28-Lead Thin Small Outline Package	
	CY62256LL-55ZC	Z28	28-Lead Thin Small Outline Package	
	CY62256-55PC	P15	28-Lead (600-Mil) Molded DIP	
70	CY62256-70SNC	S22	28-Lead 450-Mil (300-Mil Body Width) SOIC	Commercial
	CY62256L-70SNC	S22	28-Lead 450-Mil (300-Mil Body Width) SOIC	
	CY62256LL-70SNC	S22	28-Lead 450-Mil (300-Mil Body Width) SOIC	
	CY62256-70SNI	S22	28-Lead 450-Mil (300-Mil Body Width) SOIC	Industrial
	CY62256L-70SNI	S22	28-Lead 450-Mil (300-Mil Body Width) SOIC	
	CY62256LL-70SNI	S22	28-Lead 450-Mil (300-Mil Body Width) SOIC	
	CY62256-70ZC	Z28	28-Lead Thin Small Outline Package	Commercial
	CY62256L-70ZC	Z28	28-Lead Thin Small Outline Package	
	CY62256LL-70ZC	Z28	28-Lead Thin Small Outline Package	
	CY62256-70ZI	Z28	28-Lead Thin Small Outline Package	Industrial
	CY62256L-70ZI	Z28	28-Lead Thin Small Outline Package	
	CY62256LL-70ZI	Z28	28-Lead Thin Small Outline Package	
	CY62256-70PC	P15	28-Lead (600-Mil) Molded DIP	Commercial
	CY62256L-70PC	P15	28-Lead (600-Mil) Molded DIP	
	CY62256LL-70PC	P15	28-Lead (600-Mil) Molded DIP	
	CY62256-70ZRC	ZR28	28-Lead Reverse Thin Small Outline Package	
	CY62256L-70ZRC	ZR28	28-Lead Reverse Thin Small Outline Package	
	CY62256LL-70ZRC	ZR28	28-Lead Reverse Thin Small Outline Package	

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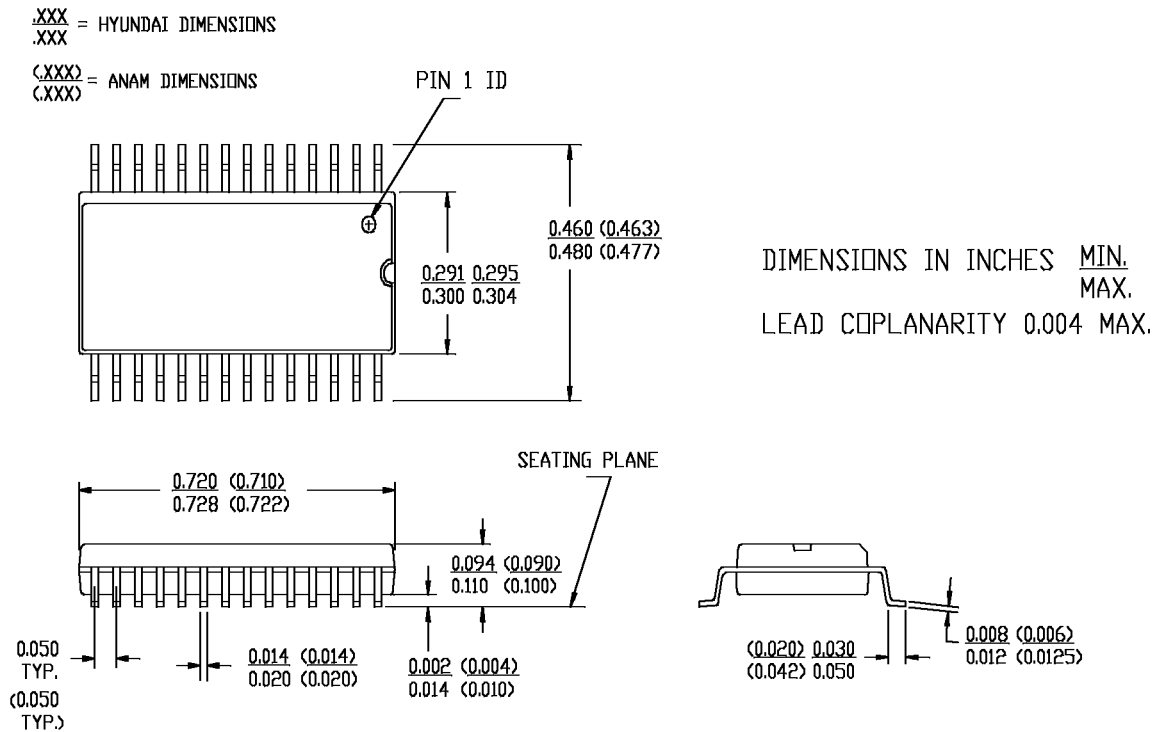
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Package Diagrams

28-Lead (600-Mil) Molded DIP P15



28-Lead 450-Mil (300-Mil Body Width) SOIC S22

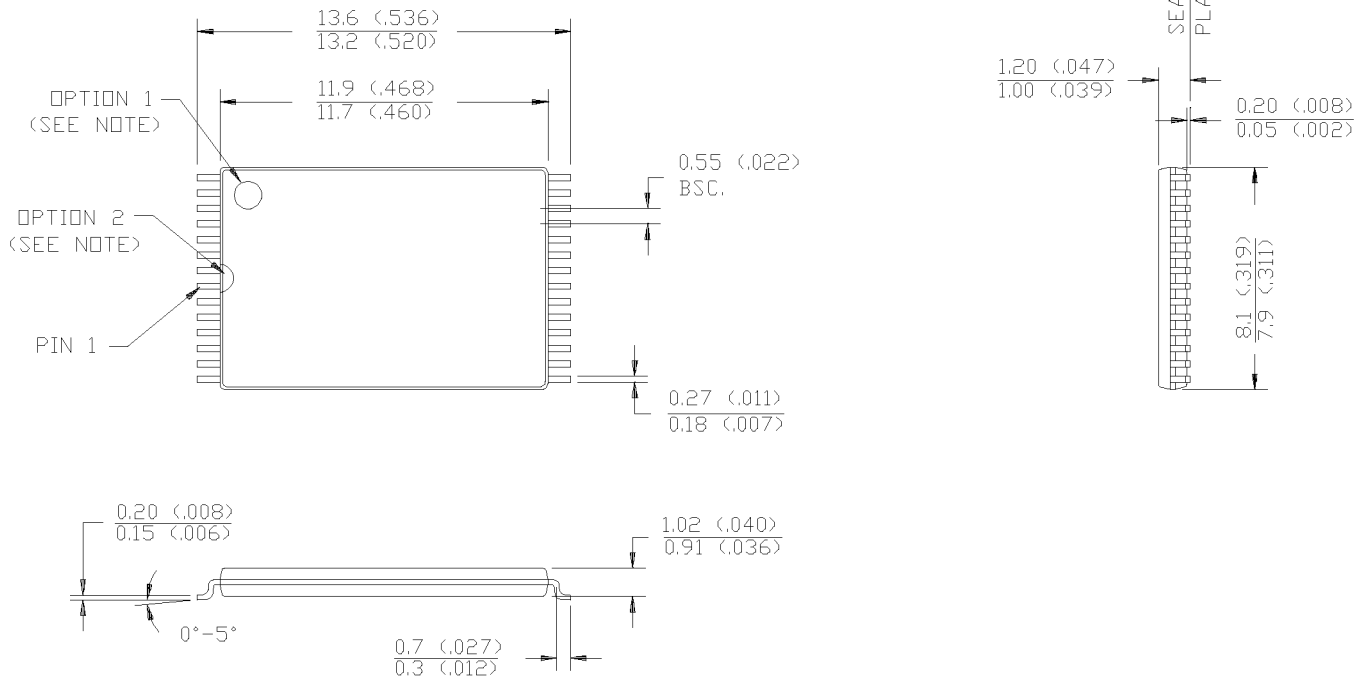


Package Diagrams (continued)

28-Lead Thin Small Outline Package Z28

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

DIMENSION IN MM (INCH)
MAX.
MIN.





Package Diagrams (continued)

28-Lead Reverse Thin Small Outline Package ZR28

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

DIMENSION IN MM (INCH)
MAX.
MIN.

