



128K x 8 Static RAM

Features

- Low voltage range:
 - 2.7V–3.6V (CY62128V)
 - 2.3V–2.7V (CY62128V25)
 - 1.6V–2.0V (CY62128V18)
- 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

Functional Description

The CY62128V family is composed of three high-performance CMOS static RAMs organized as 131,072 words by 8 bits. Easy memory expansion is provided by an active LOW Chip Enable ($\overline{CE}_1$), an active HIGH Chip Enable (CE_2), an active

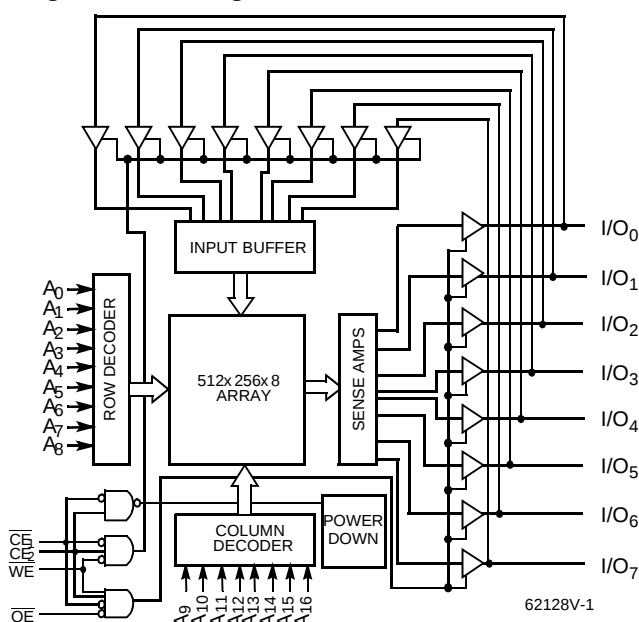
LOW Output Enable ($\overline{OE}$) and three-state drivers. These devices have an automatic power-down feature, reducing the power consumption by over 99% when deselected. The CY62128V family is available in the standard 450-mil-wide SOIC, 32-lead TSOP-I, and STSOP packages.

Writing to the device is accomplished by taking Chip Enable one ($\overline{CE}_1$) and Write Enable ($\overline{WE}$) inputs LOW and the Chip Enable two (CE_2) input HIGH. Data on the eight I/O pins (I/O_0 through I/O_7) is then written into the location specified on the address pins (A_0 through A_{16}).

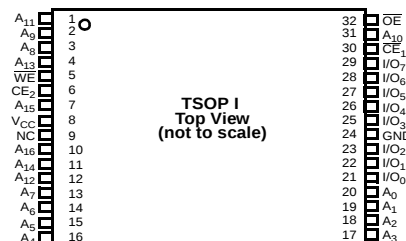
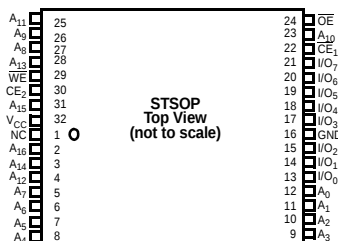
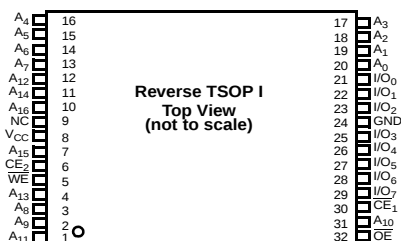
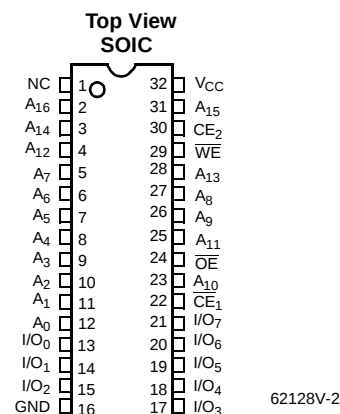
Reading from the device is accomplished by taking Chip Enable one ($\overline{CE}_1$) and Output Enable ($\overline{OE}$) LOW while forcing Write Enable ($\overline{WE}$) and Chip Enable two (CE_2) HIGH. Under these conditions, the contents of the memory location specified by the address pins will appear on the I/O pins.

The eight input/output pins (I/O_0 through I/O_7) are placed in a high-impedance state when the device is deselected ($\overline{CE}_1$ HIGH or CE_2 LOW), the outputs are disabled ($\overline{OE}$ HIGH), or during a write operation ($\overline{CE}_1$ LOW, CE_2 HIGH, and $\overline{WE}$ LOW).

Logic Block Diagram



Pin Configurations



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^[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	1.6V to 3.6V
Industrial	-40°C to +85°C	1.6V to 3.6V

Product Portfolio

Product	V_{CC} Range			Speed	Power Dissipation (Commercial)			
					Operating (I_{CC})		Standby (I_{SB2})	
	Min.	Typ. ^[2]	Max.		Typ. ^[2]	Maximum	Typ. ^[2]	Maximum
CY62128V	2.7V	3.0V	3.6V	55, 70 ns	20 mA	40 mA	0.4 μ A	100 μ A (XL = 10 μ A)
CY62128V25	2.3V	2.5V	2.7V	100 ns	15 mA	20 mA	0.3 μ A	50 μ A (LL = 12 μ A)
CY62128V18	1.6V	1.8V	2.0V	200 ns	10 mA	15 mA	0.3 μ A	30 μ A (LL = 10 μ A)

Electrical Characteristics Over the Operating Range

Parameter	Description	Test Conditions		CY62128V-55/70			Unit	
				Min.	Typ. ^[2]	Max.		
V _{OH}	Output HIGH Voltage	V _{CC} = Min., I _{OH} = −1.0 mA		2.4			V	
V _{OL}	Output LOW Voltage	V _{CC} = Min., I _{OL} = 2.1 mA				0.4	V	
V _{IH}	Input HIGH Voltage			2		V _{CC} +0.5V	V	
V _{IL}	Input LOW Voltage			−0.5		0.8	V	
I _{IX}	Input Load Current	GND ≤ V _I ≤ V _{CC}		−1	±1	+1	μA	
I _{OZ}	Output Leakage Current	GND ≤ V _O ≤ V _{CC} , Output Disabled		−1	±1	+1	μA	
I _{CC}	V _{CC} Operating Supply Current	V _{CC} = Max., I _{OUT} = 0 mA, f = f _{MAX} = 1/t _{RC}	Com'l, 70 ns	L		20	40	mA
				LL, XL		20	40	
			Ind'l, 55 ns	LL		23	50	
				Ind'l, 70 ns	L		20	
			LL			20	40	
			I _{SB1}	Automatic CE Power-Down Current— TTL Inputs	Max. V _{CC} , $\overline{CE} \geq V_{IH}$, V _{IN} ≥ V _{IH} or V _{IN} ≤ V _{IL} , f = f _{MAX}	Com'l, 70 ns	L	
LL, XL		15					300	
Coml, 55 ns	LL					17	350	
	Ind'l	L					15	300
LL						15	300	

Notes:

- $V_{IL}(\text{min.}) = -2.0V$ for pulse durations of less than 20 ns.
- Typical values are included for reference only and are not guaranteed or tested. Typical values are measured at $V_{CC} = V_{CC} \text{ Typ.}, T_A = 25^\circ\text{C}$.

Electrical Characteristics Over the Operating Range (continued)

Parameter	Description	Test Conditions			CY62128V-55/70			Unit
					Min.	Typ. ^[2]	Max.	
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	Com'l	L	0.4	100	μA	
				LL		15	μA	
				XL		10	μA	
			Ind'l	L		100	μA	
				LL		30	μA	

Electrical Characteristics Over the Operating Range

Parameter	Description	Test Conditions	CY62128V25-100			CY62128V18-200			Unit
			Min.	Typ. ^[2]	Max.	Min.	Typ. ^[2]	Max.	
V_{OH}	Output HIGH Voltage	$V_{CC} = \text{Min.}, I_{OH} = -0.1 \text{ mA}$	2.4			0.8* V_{CC}			V
V_{OL}	Output LOW Voltage	$V_{CC} = \text{Min.}, I_{OL} = 0.1 \text{ mA}$			0.4			0.2	V
V_{IH}	Input HIGH Voltage		2		$V_{CC} + 0.5$	0.7* V_{CC}		$V_{CC} + 0.3$	V
V_{IL}	Input LOW Voltage		-0.5		0.8	-0.5		0.3* V_{CC}	V
I_{IX}	Input Load Current	$GND \leq V_I \leq V_{CC}$	-1	± 1	+1	-1	± 0.1	+1	μA
I_{OZ}	Output Leakage Current	$GND \leq V_O \leq V_{CC}$, Output Disabled	-1	± 1	+1	-1	± 0.1	+1	μA
I_{CC}	V_{CC} Operating Supply Current	Max. V_{CC} , $I_{OUT} = 0 \text{ mA}$, $f = f_{MAX} = 1/t_{RC}$	L	15	20		10	15	mA
			LL						
I_{SB1}	Automatic CE Power-Down Current—TTL Inputs	Max. V_{CC} , $\overline{CE} \geq V_{IH}$, $V_{IN} \geq V_{IH}$ or $V_{IN} \leq V_{IL}$, $f = f_{MAX}$	L	15	300		5	100	μA
			LL						
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 $V_{IN} \leq 0.3V$, $f = 0$	L	0.4	50		0.4	30	μA
			LL		12			10	μA
		Indust'l Temp Range	LL		24			20	μA

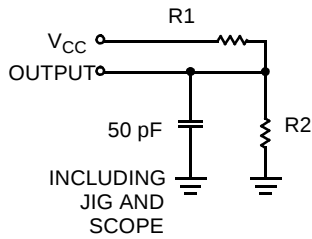
Capacitance^[3]

Parameter	Description	Test Conditions	Max.	Unit
C_{IN}	Input Capacitance	$T_A = 25^\circ C$, $f = 1 \text{ MHz}$, $V_{CC} = 3.0V$	6	pF
C_{OUT}	Output Capacitance		8	pF

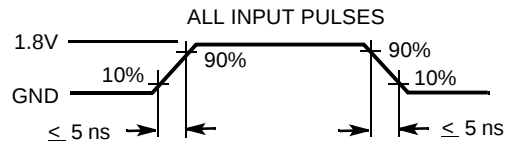
Note:

3. Tested initially and after any design or process changes that may affect these parameters.

AC Test Loads and Waveforms

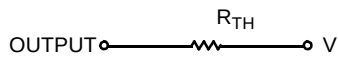


62128V-5



62128V-6

Equivalent to: THÉVENIN EQUIVALENT

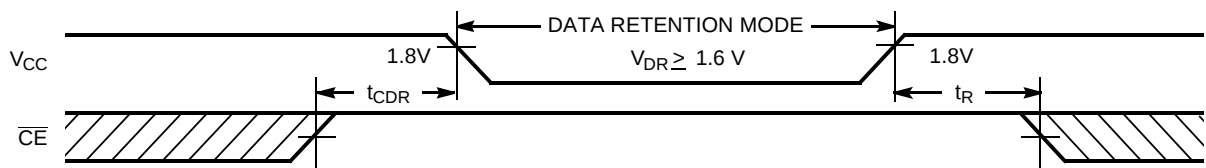


Parameters	3.3V	2.5V	1.8V	Unit
R1	1213	15909	10800	Ohms
R2	1378	4487	4154	Ohms
R _{TH}	645	3500	3000	Ohms
V _{TH}	1.75V	0.55V	0.50V	Volts

Data Retention Characteristics (Over the Operating Range)

Parameter	Description		Conditions ^[4]	Min.	Typ. ^[2]	Max.	Unit
V _{DR}	V _{CC} for Data Retention			1.6			V
I _{CCDR}	Data Retention Current	Com'I	L	$V_{CC} = 2V$ $CE \geq V_{CC} - 0.3V$, $V_{IN} \geq V_{CC} - 0.3V$ or $V_{IN} \leq 0.3V$ No input may exceed $V_{CC} + 0.3V$	0.4	10	μA
		LL, XL				10	μA
			L			20	μA
		Ind'I	LL			20	μA
t _{CDR} ^[3]	Chip Deselect to Data Retention Time			0			ns
t _R	Operation Recovery Time			t _{RC}			ns

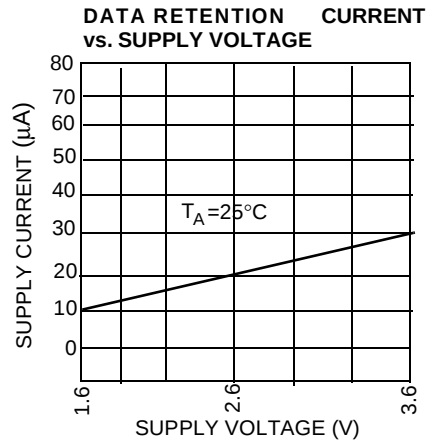
Data Retention Waveform



C62128V-7

Note:

4. No input may exceed $V_{CC} + 0.3V$.

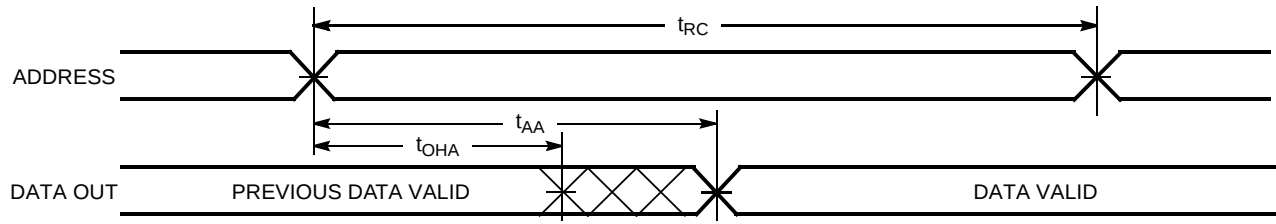
Data Retention Current Graph (for "L" version only)

Switching Characteristics Over the Operating Range^[5]

Parameter	Description	62128V-55		62128V-70		62128V25-100		62128V18-200		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
READ CYCLE										
t _{RC}	Read Cycle Time	55		70		100		200		ns
t _{AA}	Address to Data Valid		55		70		100		200	ns
t _{OHA}	Data Hold from Address Change	5		10		10		10		ns
t _{ACE}	$\overline{CE}$ LOW to Data Valid		55		70		100		200	ns
t _{DOE}	$\overline{OE}$ LOW to Data Valid		20		35		75		125	ns
t _{LZOE}	$\overline{OE}$ LOW to Low Z ^[6]	10		10		10		10		ns
t _{HZOE}	$\overline{OE}$ HIGH to High Z ^[6, 7]		20		25		50		75	ns
t _{LZCE}	$\overline{CE}$ LOW to Low Z ^[6]	10		10		10		10		ns
t _{HZCE}	$\overline{CE}$ HIGH to High Z ^[6, 7]		20		25		50		75	ns
t _{PU}	$\overline{CE}$ LOW to Power-Up	0		0		0		0		ns
t _{PD}	$\overline{CE}$ HIGH to Power-Down		55		70		100		200	ns
WRITE CYCLE ^[8, 9]										
t _{WC}	Write Cycle Time	55		70		100		200		ns
t _{SCE}	$\overline{CE}$ LOW to Write End	45		60		100		190		ns
t _{AW}	Address Set-Up to Write End	45		60		100		190		ns
t _{HA}	Address Hold from Write End	0		0		0		0		ns
t _{SA}	Address Set-Up to Write Start	0		0		0		0		ns
t _{PWE}	$\overline{WE}$ Pulse Width	45		55		90		125		ns
t _{SD}	Data Set-Up to Write End	25		30		60		100		ns
t _{HD}	Data Hold from Write End	0		0		0		0		ns
t _{HZWE}	$\overline{WE}$ LOW to High Z ^[6, 7]		20		25		50		100	ns
t _{LZWE}	$\overline{WE}$ HIGH to Low Z ^[6]	5		5		10		15		ns

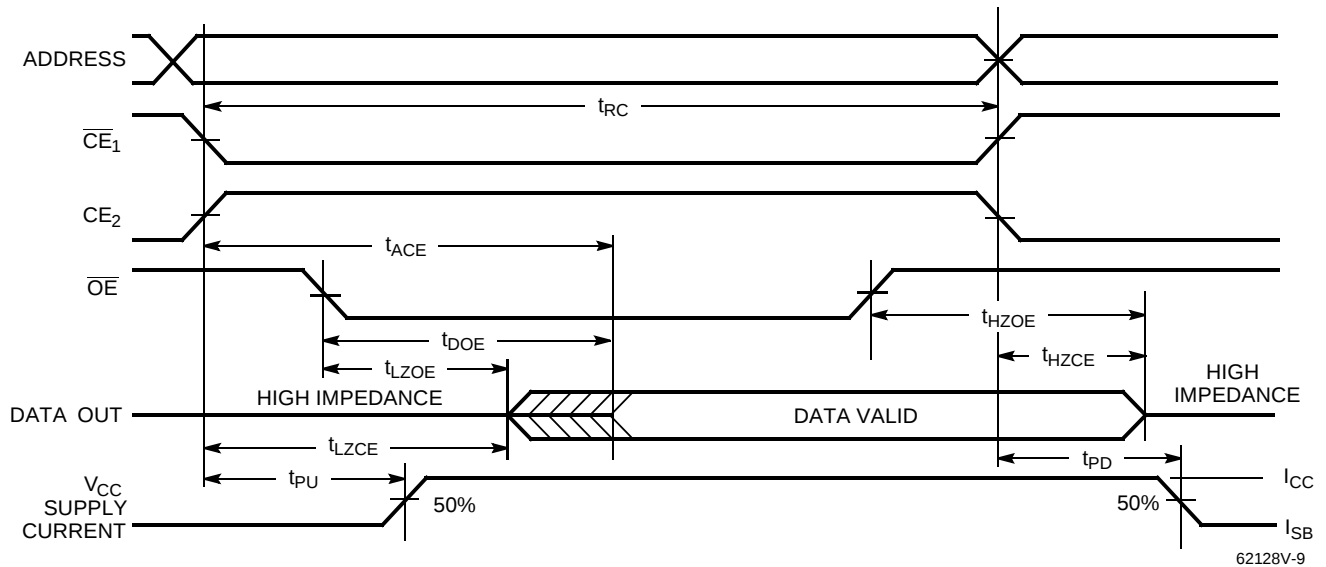
- Test conditions assume signal transition time of 5 ns or less timing reference levels of 1.5V, input pulse levels of 0 to 3.0V, and output loading of the specified I_{OL}/I_{OH} and 100-pF load capacitance.
- At any given temperature and voltage condition, t_{HZCE} is less than t_{LZCE}, t_{HZOE} is less than t_{LZOE}, and t_{HZWE} is less than t_{LZWE} for any given device.
- 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 ±200 mV from steady-state voltage.
- The internal write time of the memory is defined by the overlap of CE₁ LOW, CE₂ HIGH, and WE LOW. CE₁ and WE signals must be LOW and CE₂ HIGH 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.
- The minimum write cycle time for write cycle #3 (WE controlled, OE LOW) is the sum of t_{HZWE} and t_{SD}.

Switching Waveforms

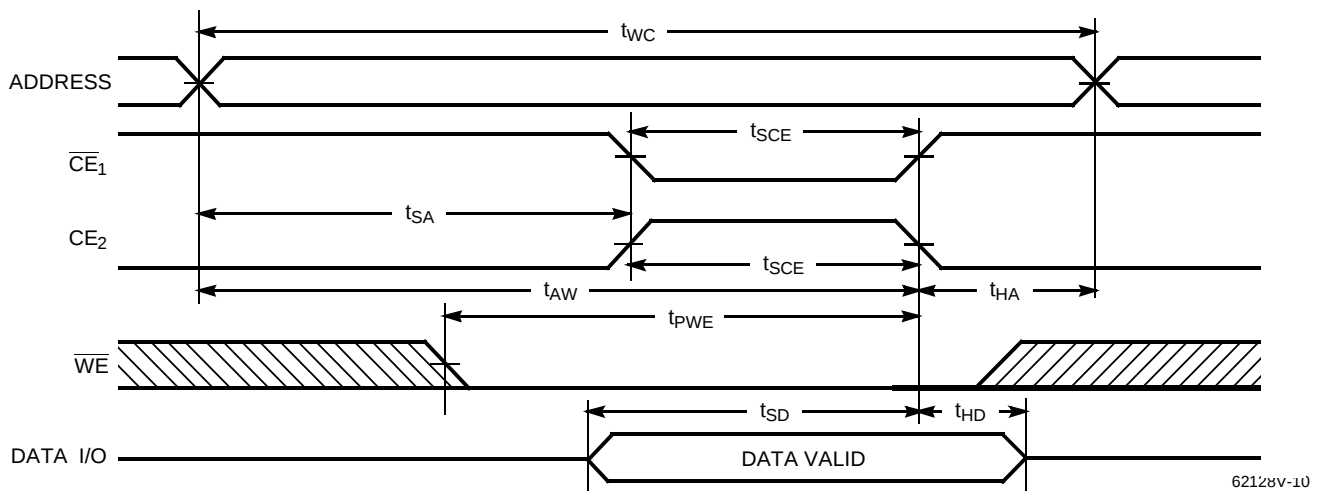
Read Cycle No. 1^[10, 11]



Read Cycle No. 2 ($\overline{OE}$ Controlled)^[11, 12]

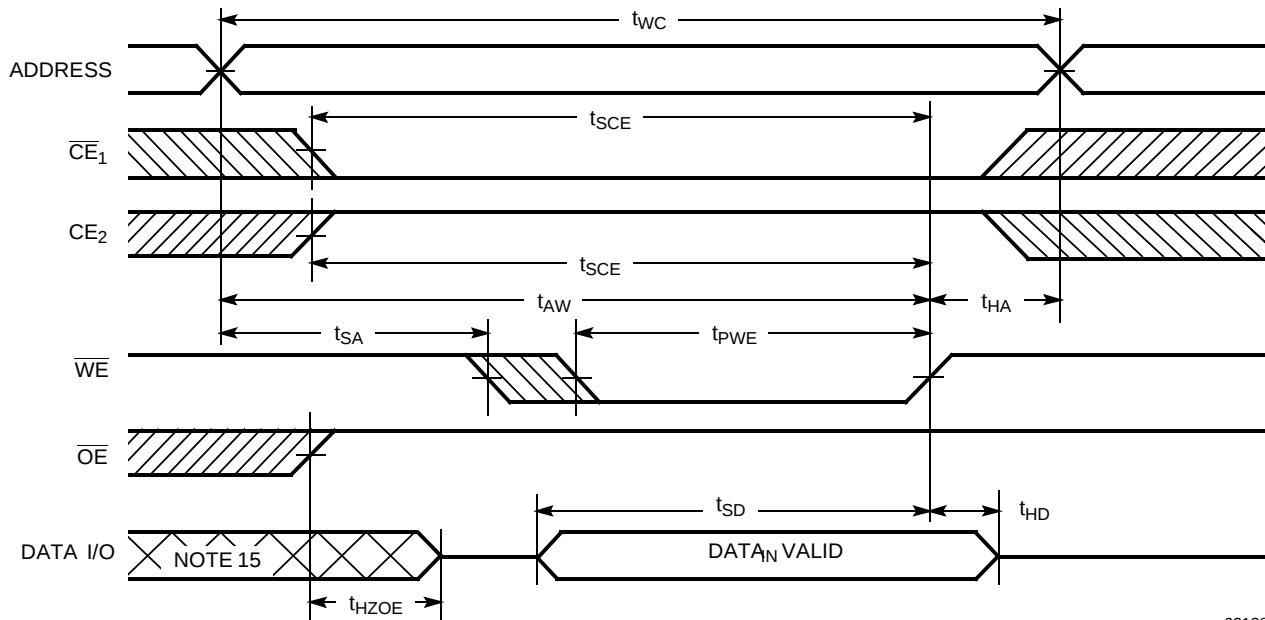


Write Cycle No. 1 ($\overline{CE}_1$ or CE_2 Controlled)^[13, 14]



Notes:

10. Device is continuously selected. $\overline{OE}$, $\overline{CE}_1$, $CE_2 = V_{IH}$.
11. $\overline{WE}$ is HIGH for read cycle.
12. Address valid prior to or coincident with $\overline{CE}_1$ transition LOW and CE_2 transition HIGH.
13. Data I/O is high impedance if $\overline{OE} = V_{IH}$.
14. If $\overline{CE}_1$ goes HIGH or CE_2 goes LOW simultaneously with $\overline{WE}$ HIGH, the output remains in a high-impedance state.

Switching Waveforms (continued)
Write Cycle No. 2 ($\overline{WE}$ Controlled, $\overline{OE}$ HIGH During Write)^[13, 14]


62128V-11

Truth Table

$\overline{CE}_1$	CE_2	$\overline{OE}$	$\overline{WE}$	I/O ₀ –I/O ₇	Mode	Power
H	X	X	X	High Z	Power-Down	Standby (I_{SB})
X	L	X	X	High Z	Power-Down	Standby (I_{SB})
L	H	L	H	Data Out	Read	Active (I_{CC})
L	H	X	L	Data In	Write	Active (I_{CC})
L	H	H	H	High Z	Selected, Outputs Disabled	Active (I_{CC})

Note:

15. During this period, the I/Os are in output state and input signals should not be applied.

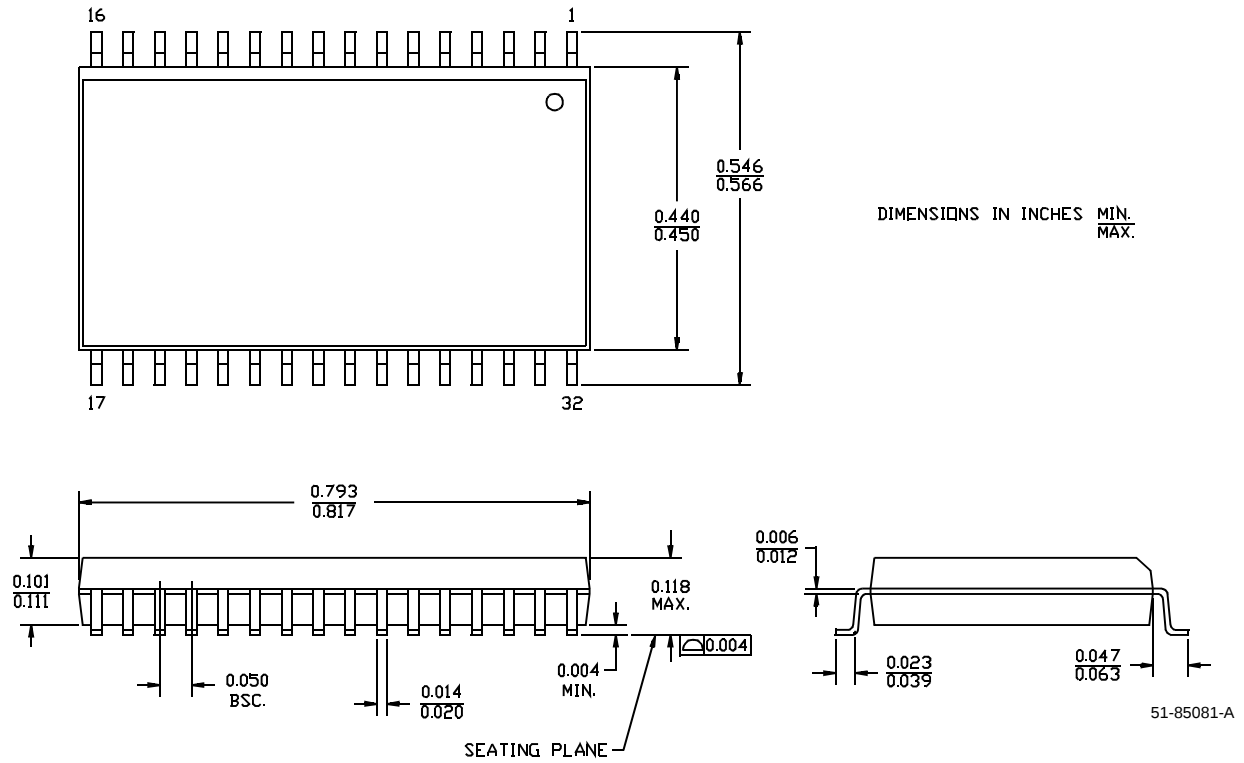
Ordering Information

Speed (ns)	Ordering Code	Package Name	Package Type	Operating Range
55	CY62128VLL-55ZAI	ZA32	32-Lead STSOP Type 1	Industrial
70	CY62128VL-70SC	S34	32-Lead 450-Mil SOIC	Commercial
	CY62128VLL-70SC			
	CY62128VL-70ZC	Z32	32-Lead TSOP Type 1	
	CY62128VLL-70ZC			
	CY62128VL-70ZAC	ZA32	32-Lead STSOP Type 1	
	CY62128VLL-70ZAC			
	CY62128VLL-70ZRC	ZR32	32-Lead Reverse TSOP Type 1	
	CY62128VLL-70SI	S34	32-Lead 450-Mil SOIC	Industrial
	CY62128VL-70ZI	Z32	32-Lead TSOP Type 1	
	CY62128VLL-70ZI			
	CY62128VL-70ZAI	ZA32	32-Lead STSOP Type 1	
	CY62128VLL-70ZAI			
	CY62128VLL-70ZRI	ZR32	32-Lead Reverse TSOP Type 1	
200	CY62128V18L-200ZC	Z32	32-Lead TSOP Type 1	Commercial
	CY62128V18L-200ZAI	ZA32	32-Lead STSOP Type 1	Industrial
	CY62128V18LL-200ZAI			

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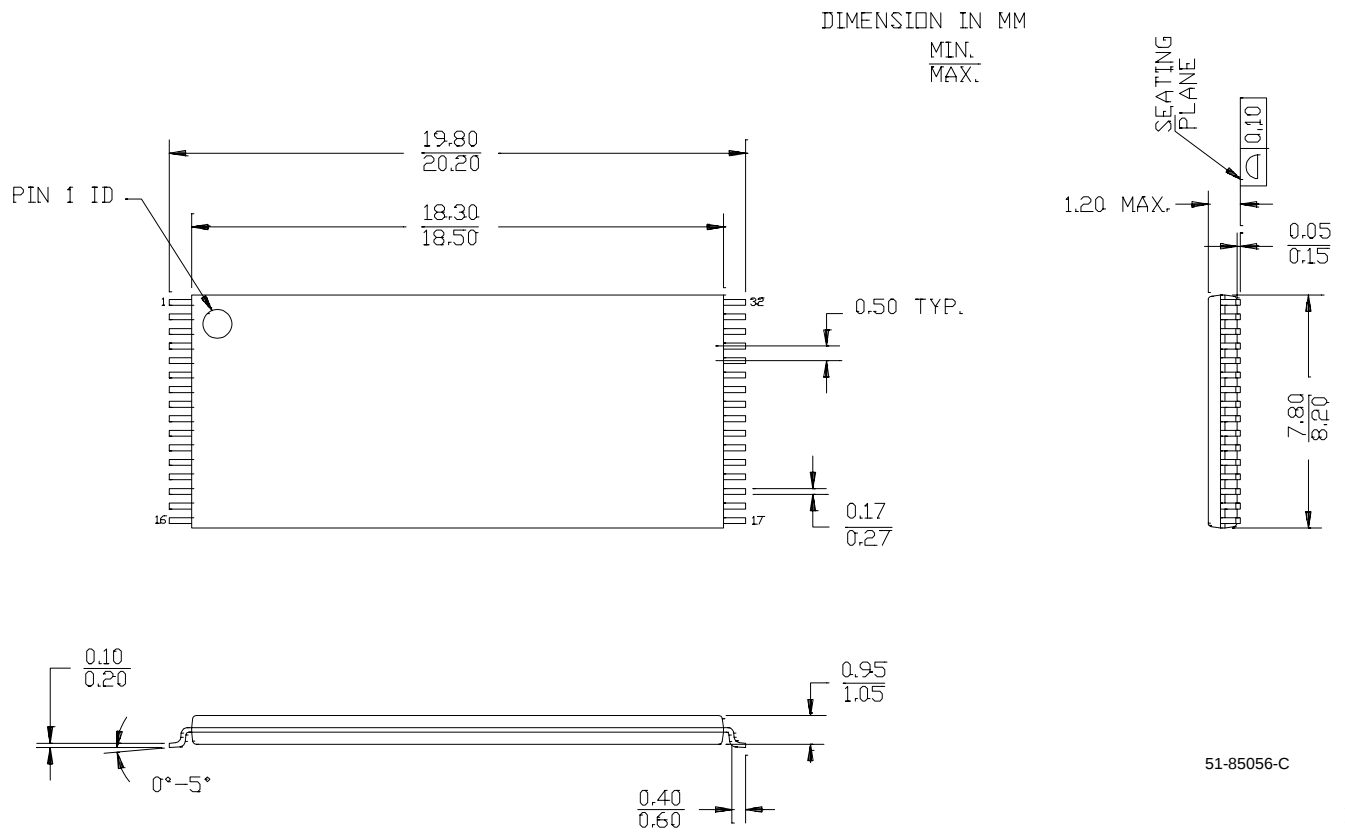
Package Diagrams

32-Lead (450 MIL) Molded SOIC S34



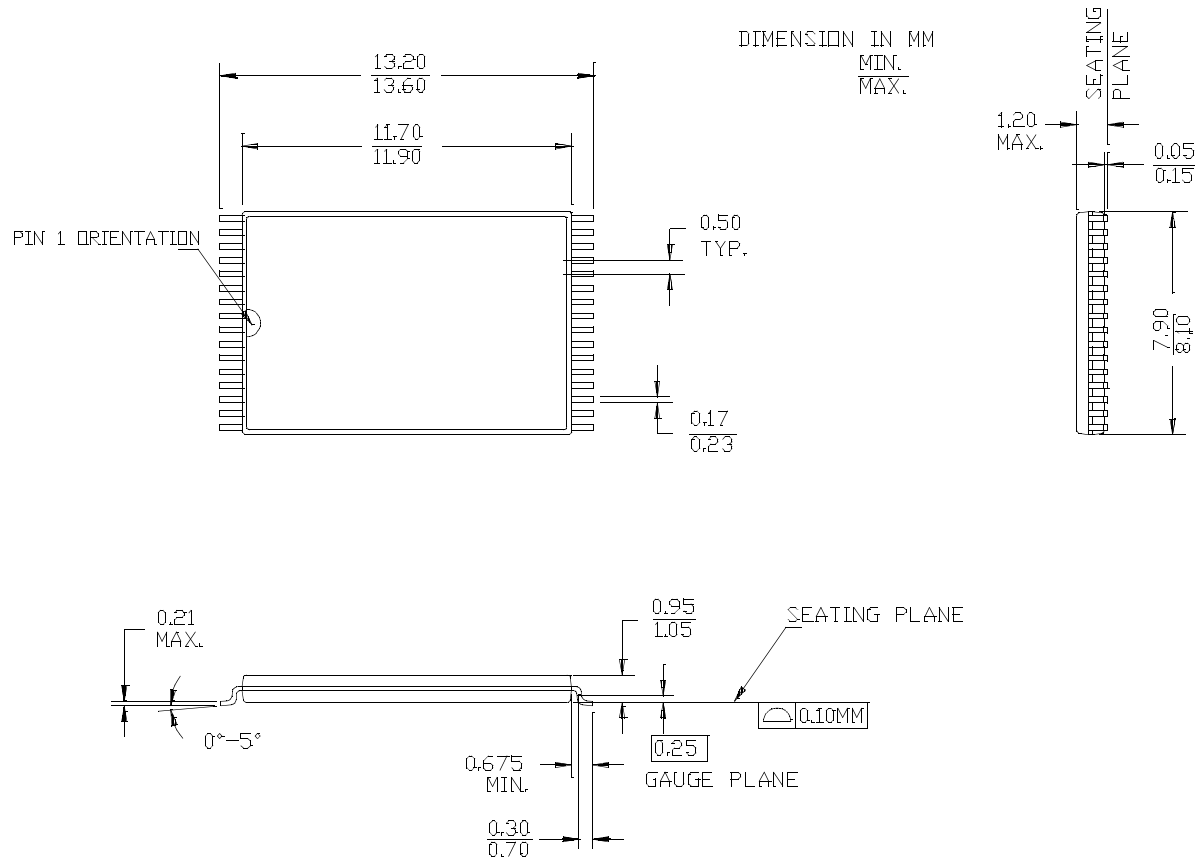
Package Diagrams

32-Lead Thin Small Outline Package Z32



Package Diagrams

32-Lead Shrunk Thin Small Outline Package ZA32



51-85094-C

Package Diagrams
32-Lead Reverse Thin Small Outline Package ZR32
