CY62128V Family

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

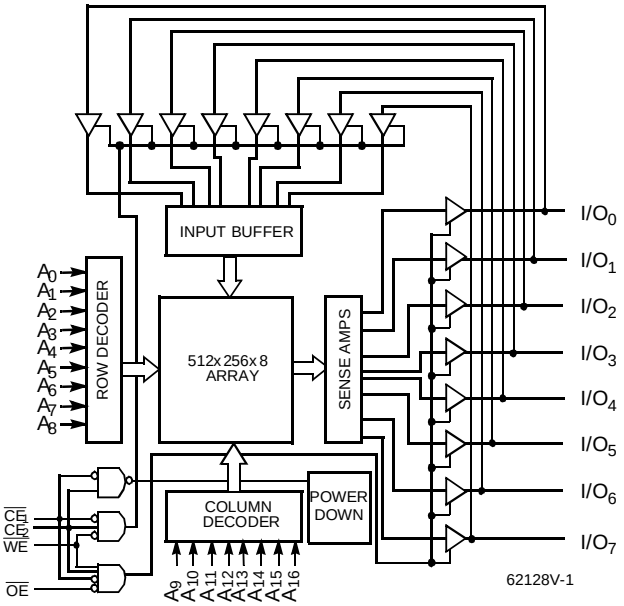
The CY62128V family is composed of three high-performance CMOS static RAMs organized as 131,072 words by 8 bits. Easy memory expansion is provided by an active LOW Chip Enable ($\overline{CE}_1$), an active HIGH Chip Enable (CE_2), an active LOW Output Enable ($\overline{OE}$) and three-state drivers.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

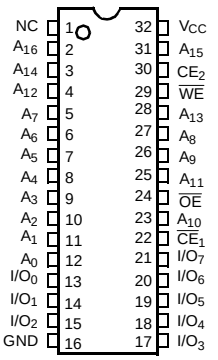
Logic Block Diagram



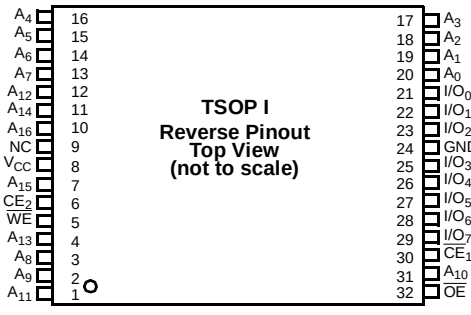
62128V-1

Pin Configurations

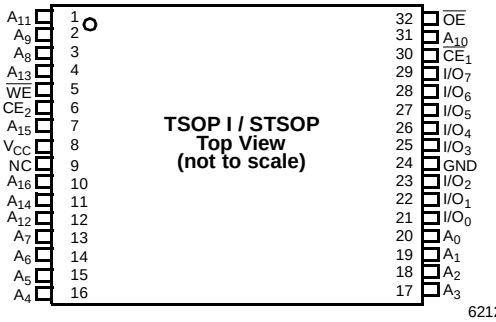
Top View
SOIC



62128V-2



62128V-3



62128V-4

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 µA	100 µA (XL = 10 µA)
CY62128V25	2.3V	2.5V	2.7V	100 ns	15 mA	20 mA	0.3 µA	50 µA (LL = 12 µA)
CY62128V18	1.6V	1.8V	2.0V	200 ns	10 mA	15 mA	0.3 µA	30 µA (LL = 10 µA)

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	40	
				LL		20	40	
I_{SB1}	Automatic CE Power-Down Current—TTL Inputs	Max. V_{CC}, $\overline{CE}$ ≥ V_{IH}, V_{IN} ≥ V_{IH} or V_{IN} ≤ V_{IL}, f = f_{MAX}	Com'l, 70 ns	L		15	300	µA
				LL, XL		15	300	
			Coml, 55 ns	LL		17	350	
			Ind'l	L		15	300	
				LL		15	300	

Notes:
1. V_{IL} (min.) = –2.0V for pulse durations of less than 20 ns.
2. Typical values are included for reference only and are not guaranteed or tested. Typical values are measured at V_{CC} = V_{CC} Typ., T_A = 25°C.

Electrical Characteristics Over the Operating Range

Parameter	Description	Test Conditions			CY62128V-55/70 Min.	CY62128V-55/70 Typ.[2]	CY62128V-55/70 Max.	Unit
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	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

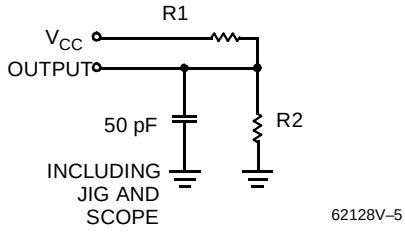
Parameter	Description	Test Conditions		CY62128V25-100 Min.	CY62128V25-100 Typ.[2]	CY62128V25-100 Max.	CY62128V18-200 Min.	CY62128V18-200 Typ.[2]	CY62128V18-200 Max.	Unit
V_{OH}	Output HIGH Voltage	V_{CC} = Min., I_{OH} = –0.1 mA		2.4			0.8* V_{CC}			V
V_{OL}	Output LOW Voltage	V_{CC} = Min., I_{OL} = 0.1 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 ≤ V_I ≤ V_{CC}		–1	±1	+1	–1	±0.1	+1	µA
I_{OZ}	Output Leakage Current	GND ≤ V_O ≤ V_{CC}, Output Disabled		–1	±1	+1	–1	±0.1	+1	µA
I_{CC}	V_{CC} Operating Supply Current	V_{CC} = Max., I_{OUT} = 0 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

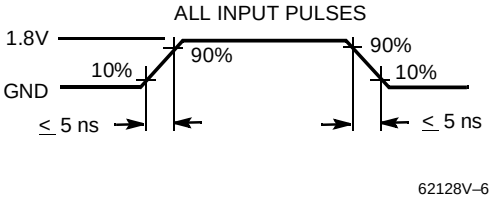
Capacitance[3]

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

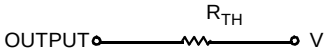
Note:
3. Tested initially and after any design or process changes that may affect these parameters.

AC Test Loads and Waveforms





Equivalent to: THÉVENIN EQUIVALENT

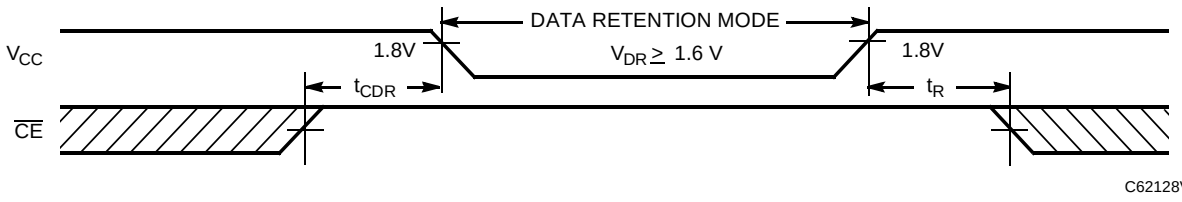


Parameters	3.3V	2.5V	1.8V	Unit
R1	1213	15909	10800	Ohms
R2	1378	4487	4154	Ohms
R_{TH}	645	3500	3000	Ohms
V_{TH}	1.75V	0.55V	0.50V	Volts

Data Retention Characteristics (Over the Operating Range)

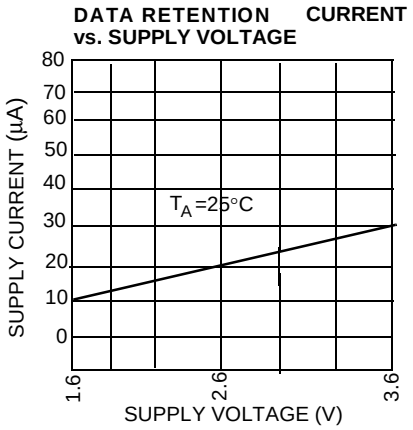
Parameter	Description			Conditions[4]	Min.	Typ.[2]	Max.	Unit
V_{DR}	V_{CC} for Data Retention				1.6			V
I_{CCDR}	Data Retention Current	Com'l	L	V_{CC} = 2V $\overline{CE} \geq V_{CC} - 0.3V$, $V_{IN} \geq V_{CC} - 0.3V$ or $V_{IN} \leq 0.3V$ No input may exceed V_{CC}+0.3V		0.4	10	µA
			LL, XL				10	µA
		Ind'l	L				20	µA
			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



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

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



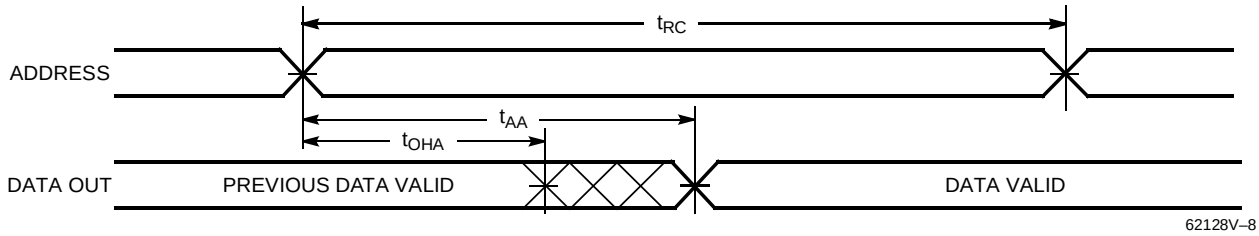
Switching Characteristics Over the Operating Range[5]

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

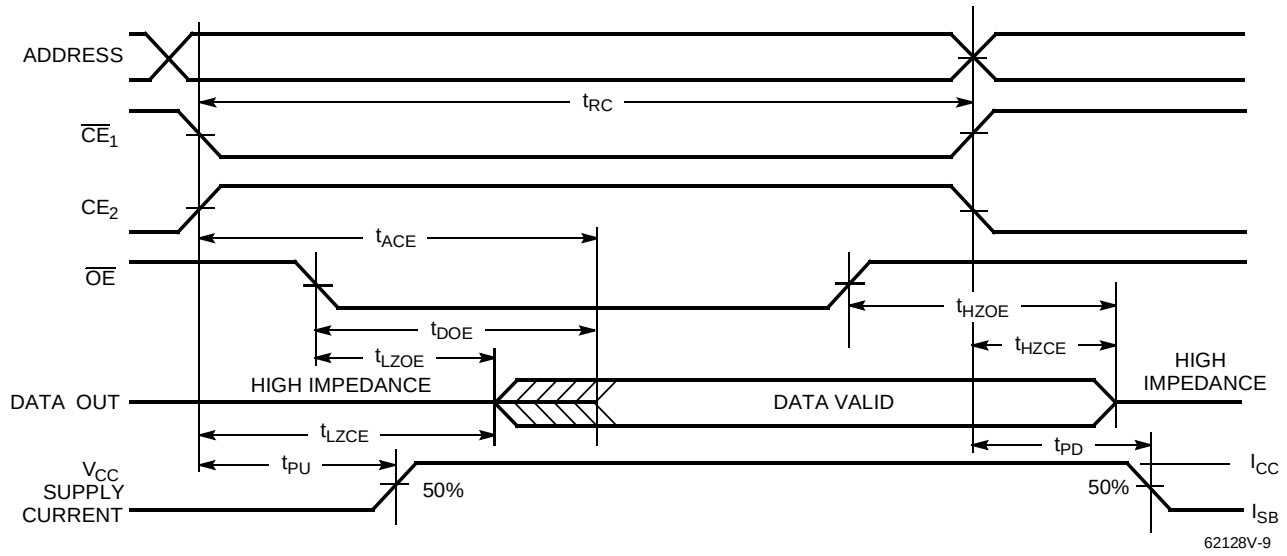
5. Test conditions assume signal transition time of 5 ns or less timing reference levels of 1.5V, input pulse levels of 0 to 3.0V, and output loading of the specified I_{OL}/I_{OH} and 100-pF load capacitance.
6. At any given temperature and voltage condition, t_{HZCE} is less than t_{LZCE}, t_{HZOE} 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 ±200 mV from steady-state voltage.
8. The internal write time of the memory is defined by the overlap of $\overline{CE}_1$ LOW, CE_2 HIGH, and $\overline{WE}$ LOW. $\overline{CE}_1$ and $\overline{WE}$ signals must be LOW and CE_2 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.
9. 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

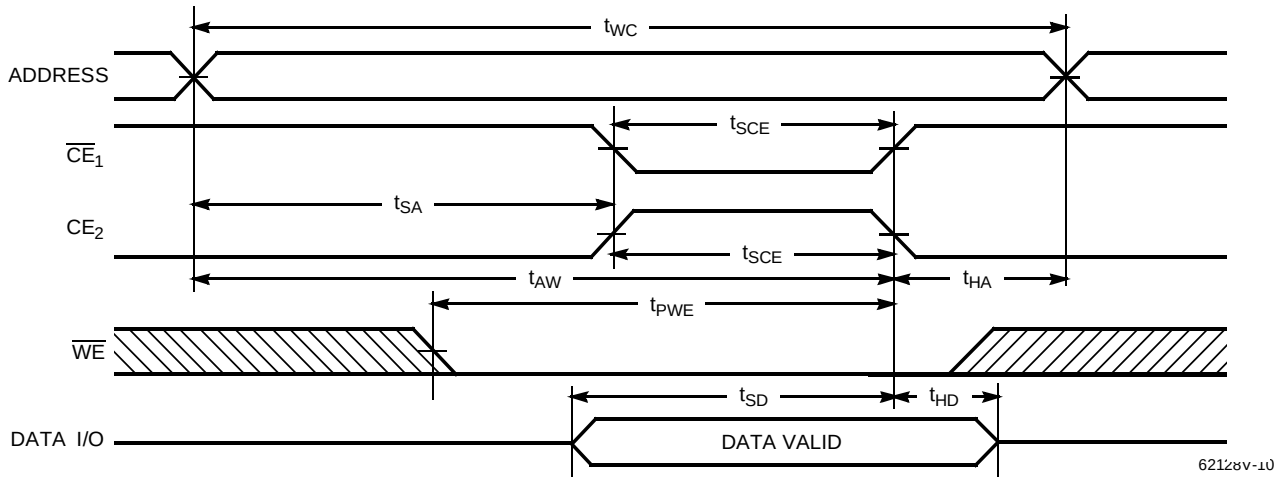
Read Cycle No. 1[10, 11]



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



Write Cycle No. 1 ($\overline{CE_1}$ or CE_2 Controlled)[13,14]

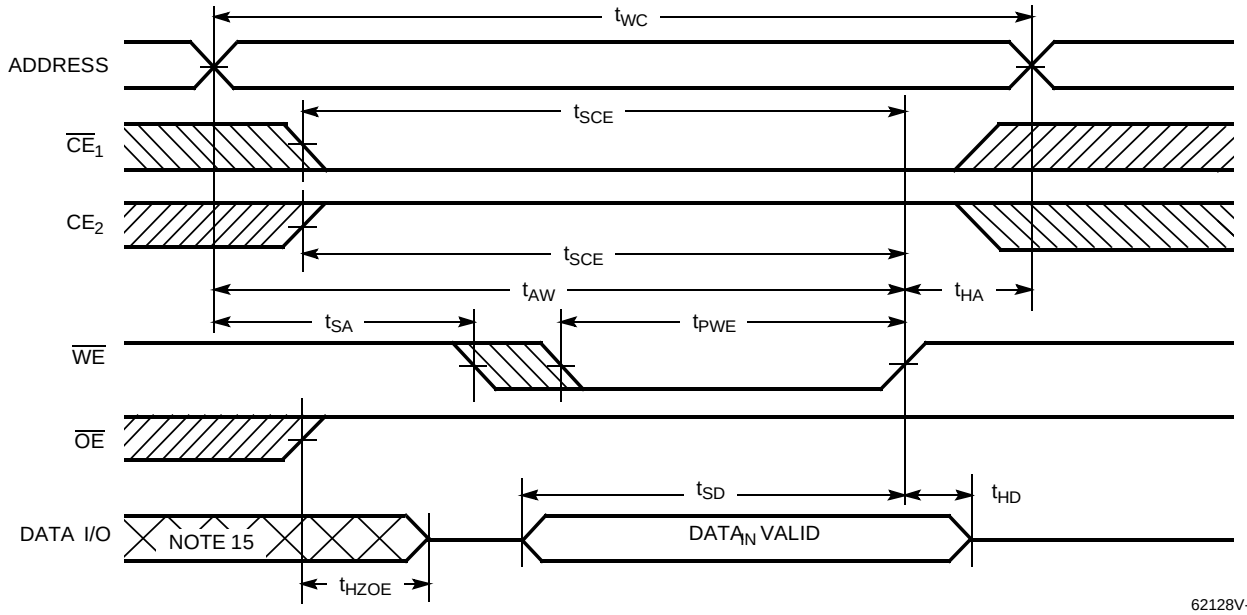


Notes:

10. Device is continuously selected. $\overline{OE}$, $\overline{CE}$ = V_{IL}, 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]



Note:

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

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})

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	S34		
	CY62128VL-70ZC	Z32	32-Lead TSOP Type 1	
	CY62128VLL-70ZC	Z32		
	CY62128VXL-70ZC	Z32		
	CY62128VL-70ZAC	ZA32	32-Lead STSOP Type 1	
	CY62128VLL-70ZAC	ZA32		
	CY62128VL-70ZRC	ZR32	32-Lead Reverse TSOP 1	
	CY62128VLL-70ZRC	ZR32		
70	CY62128VL-70SI	S34	32-Lead 450-Mil SOIC	Industrial
	CY62128VLL-70SI	S34		
	CY62128VL-70ZI	Z32	32-Lead TSOP Type 1	
	CY62128VLL-70ZI	Z32		
	CY62128VL-70ZAI	ZA32	32-Lead STSOP Type 1	
	CY62128VLL-70ZAI	ZA32		
	CY62128VL-70ZRI	ZR32	32-Lead Reverse TSOP 1	
	CY62128VLL-70ZRI	ZR32		
100	CY62128V25L-100SC	S34	32-Lead 450-Mil SOIC	Commercial
	CY62128V25LL-100SC	S34		
	CY62128V25L-100ZC	Z32	32-Lead TSOP Type 1	
	CY62128V25LL-100ZC	Z32		
	CY62128V25L-100ZAC	ZA32	32-Lead STSOP Type 1	
	CY62128V25LL-100ZAC	ZA32		
	CY62128V25L-100ZRC	ZR32	32-Lead Reverse TSOP 1	
	CY62128V25LL-100ZRC	ZR32		
100	CY62128V25L-100SI	S34	32-Lead 450-Mil SOIC	Industrial
	CY62128V25LL-100SI	S34		
	CY62128V25L-100ZI	Z32	32-Lead TSOP Type 1	
	CY62128V25LL-100ZI	Z32		
	CY62128V25L-100ZAI	ZA32	32-Lead STSOP Type 1	
	CY62128V25LL-100ZAI	ZA32		
	CY62128V25L-100ZRI	ZR32	32-Lead Reverse TSOP 1	
	CY62128V25LL-100ZRI	ZR32		
200	CY62128V18L-200SC	S34	32-Lead 450-Mil SOIC	Commercial
	CY62128V18LL-200SC	S34		
	CY62128V18L-200ZC	Z32	32-Lead TSOP Type 1	
	CY62128V18LL-200ZC	Z32		
	CY62128V18L-200ZAC	ZA32	32-Lead STSOP Type 1	
	CY62128V18LL-200ZAC	ZA32		
	CY62128V18L-200ZRC	ZR32	32-Lead Reverse TSOP 1	
	CY62128V18LL-200ZRC	ZR32		

Ordering Information (continued)

Speed (ns)	Ordering Code	Package Name	Package Type	Operating Range
200	CY62128V18L-200SI	S34	32-Lead 450-Mil SOIC	Industrial
	CY62128V18LL-200SI	S34		
	CY62128V18L-200ZI	Z32	32-Lead TSOP Type 1	
	CY62128V18LL-200ZI	Z32		
	CY62128V18L-200ZAI	ZA32	32-Lead STSOP Type 1	
	CY62128V18LL-200ZAI	ZA32		
	CY62128V18L-200ZRI	ZR32	32-Lead Reverse TSOP 1	
	CY62128V18LL-200ZRI	ZR32		

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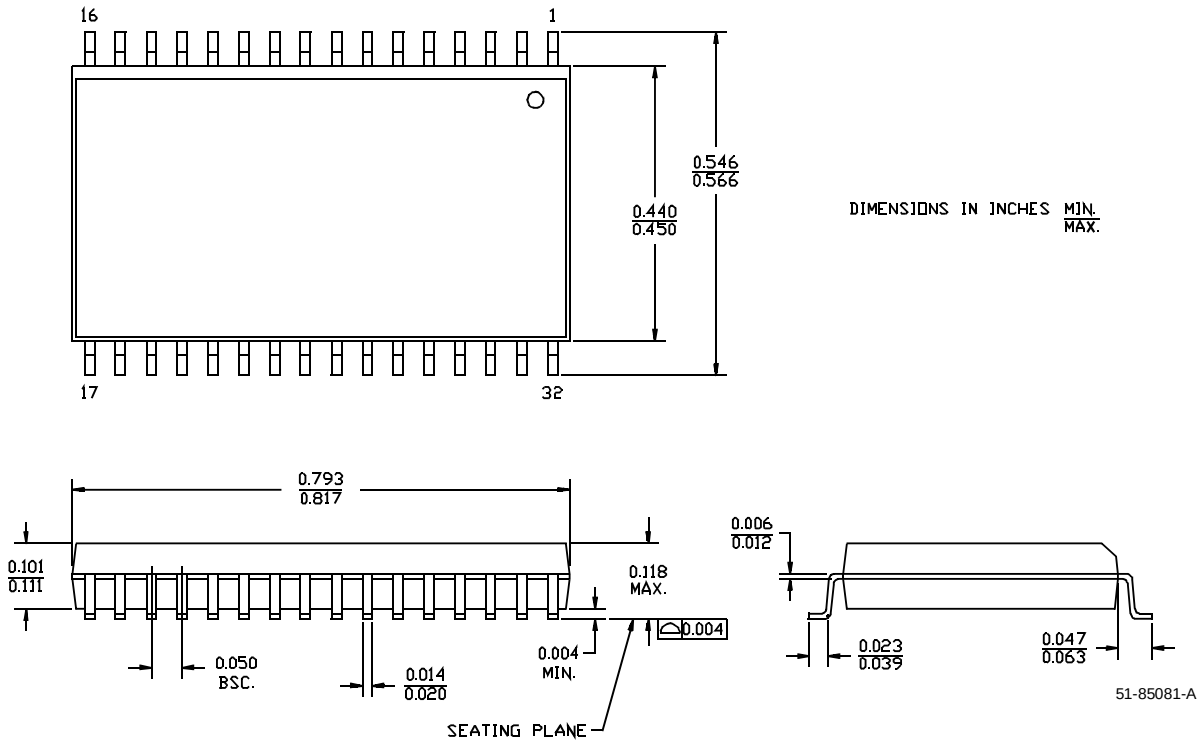
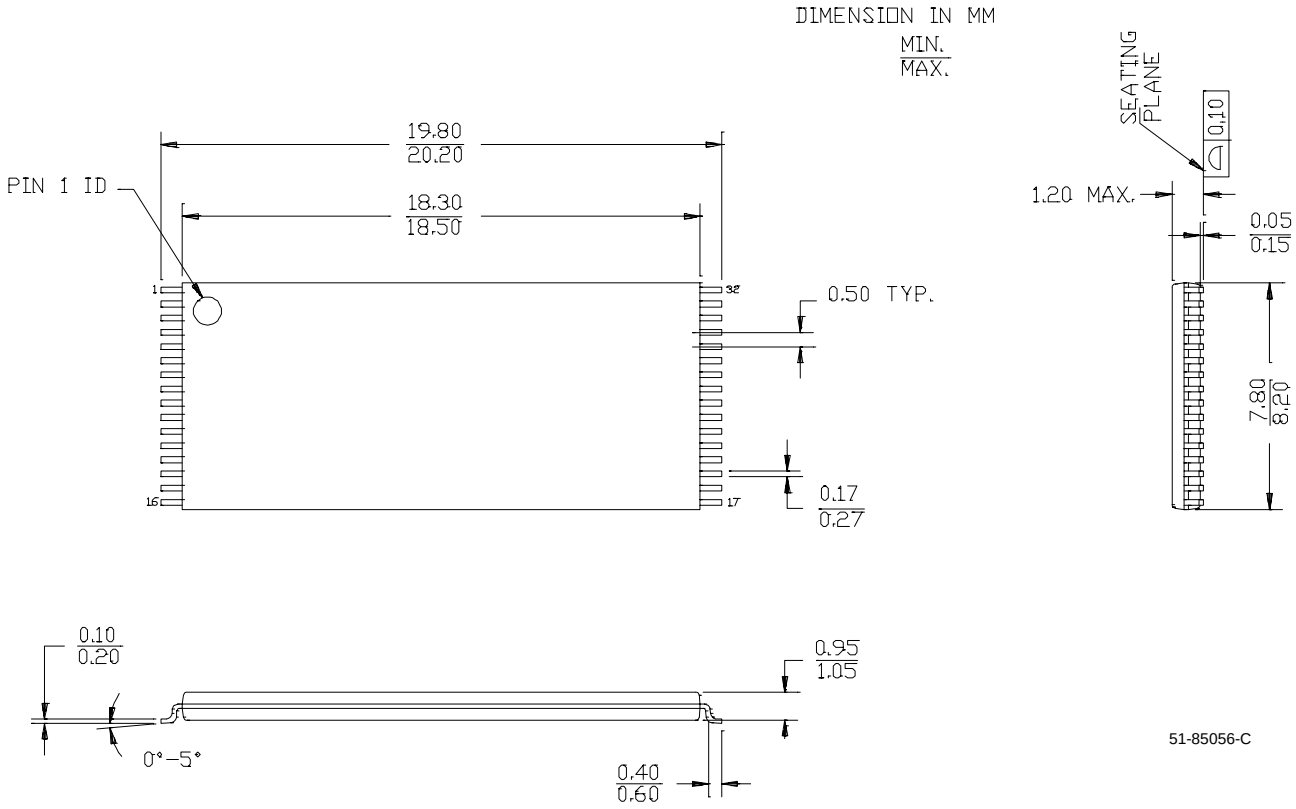
Package Diagrams

32-Lead (450 MIL) Molded SOIC S34



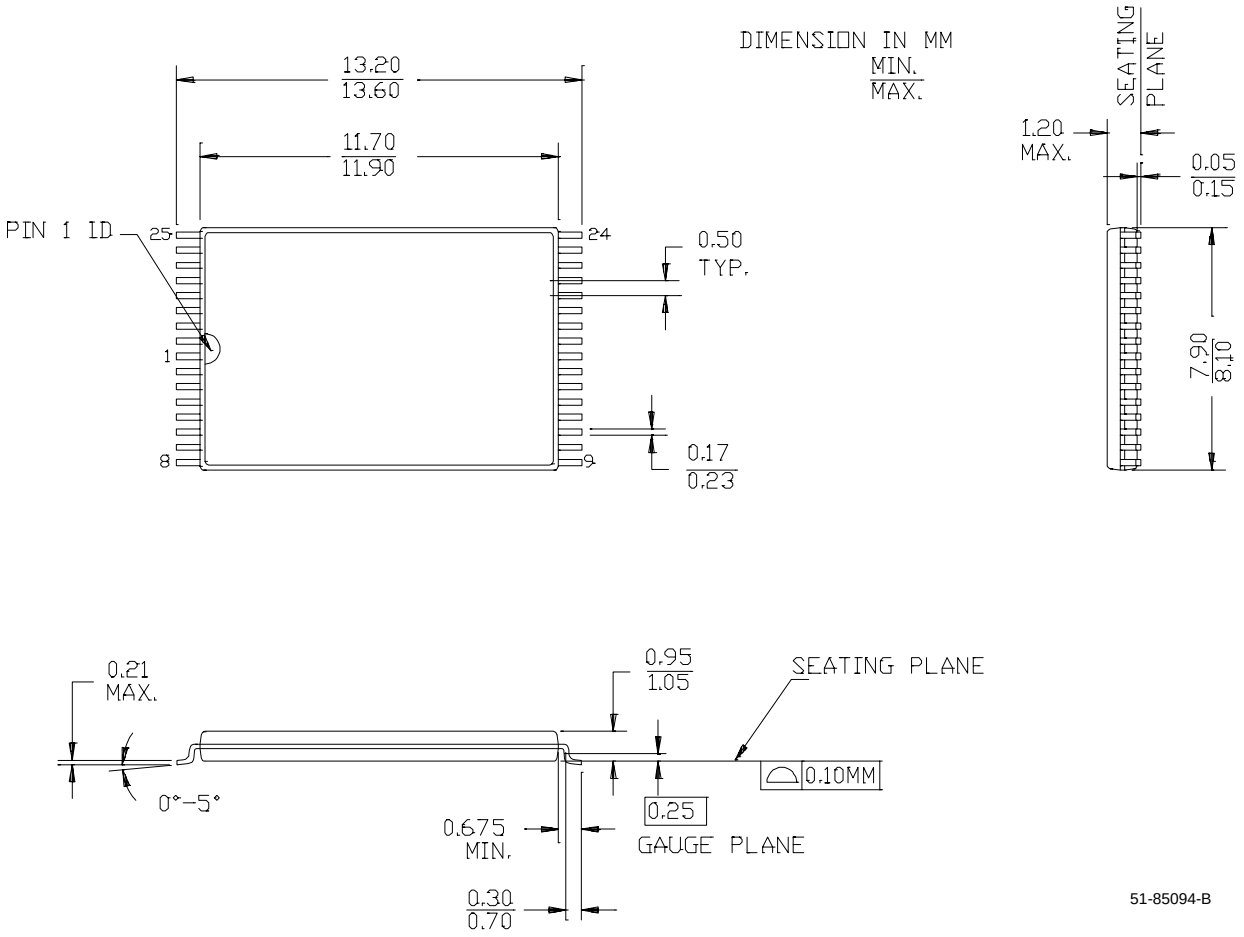
Package Diagrams (continued)

32-Lead Thin Small Outline Package Z32



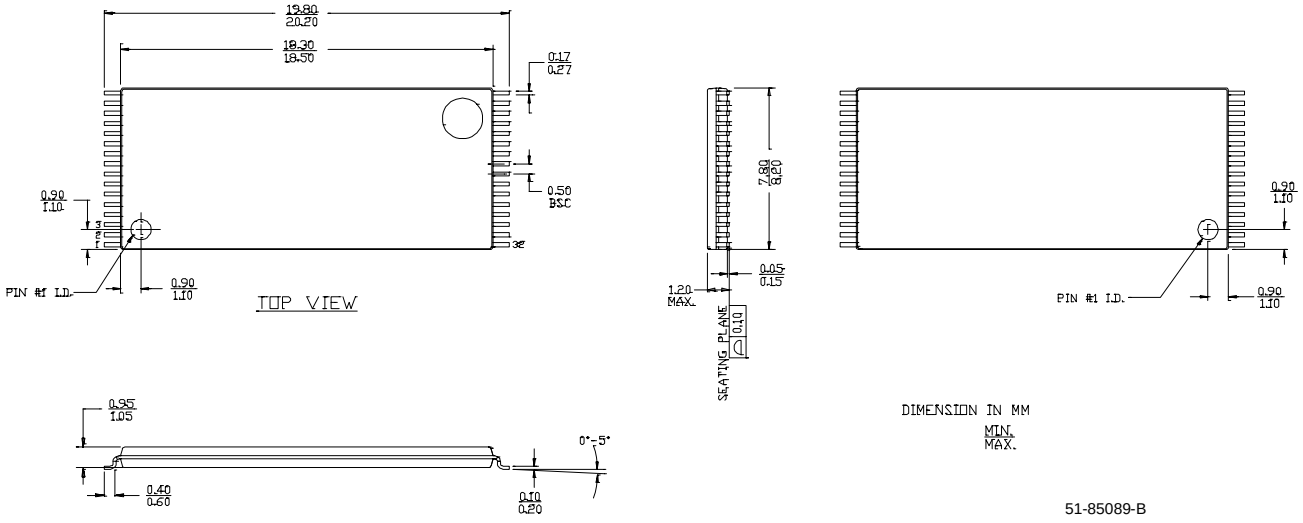
Package Diagrams (continued)

32-Lead Shrunk Thin Small Outline Package ZA32



Package Diagrams (continued)

32-Lead Reverse Thin Small Outline Package ZR32



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