

1-Mbit (128K x 8) Static RAM

Features

- **Temperature Ranges**
 - Commercial: 0°C to 70°C
 - Industrial: -40°C to 85°C
 - Automotive-A: -40°C to 85°C
 - Automotive-E: -40°C to 125°C
- **4.5V–5.5V operation**
- **CMOS for optimum speed/power**
- **Low active power**
(70 ns Commercial, Industrial, Automotive-A)
 - 82.5 mW (max.) (15 mA)
- **Low standby power**
(55/70 ns Commercial, Industrial, Automotive-A)
 - 110 μW (max.) (15 μA)
- **Automatic power-down when deselected**
- **TTL-compatible inputs and outputs**
- **Easy memory expansion with \overline{CE}_1 , CE_2 , and \overline{OE} options**
- **Available in Pb-free and non-Pb-free 32-pin (450 mil-wide) SOIC, 32-pin STSOP and 32-pin TSOP-I**

Functional Description^[1]

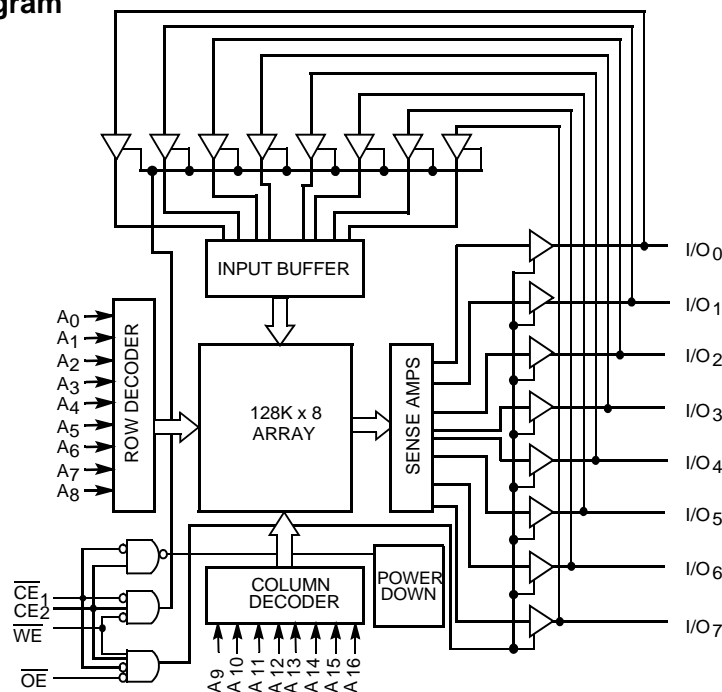
The CY62128BN is a high-performance CMOS static RAM organized as 128K words by 8 bits. Easy memory expansion is provided by an active LOW Chip Enable (\overline{CE}_1), an active HIGH Chip Enable (CE_2), an active LOW Output Enable (\overline{OE}), and tri-state drivers. This device has an automatic power-down feature that reduces power consumption by more than 75% when deselected.

Writing to the device is accomplished by taking Chip Enable One (\overline{CE}_1) and Write Enable (WE) inputs LOW and Chip Enable Two (CE_2) input HIGH. Data on the eight I/O pins (I/O₀ through I/O₇) is then written into the location specified on the address pins (A₀ through A₁₆).

Reading from the device is accomplished by taking Chip Enable One (\overline{CE}_1) and Output Enable (\overline{OE}) LOW while forcing Write Enable (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.

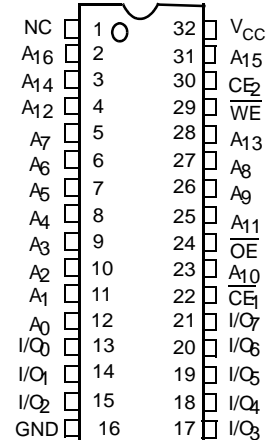
The eight input/output pins (I/O₀ through I/O₇) are placed in a high-impedance state when the device is deselected (\overline{CE}_1 HIGH or CE_2 LOW), the outputs are disabled (\overline{OE} HIGH), or during a write operation (\overline{CE}_1 LOW, CE_2 HIGH, and WE LOW).

Logic Block Diagram



Pin Configuration

Top View SOIC



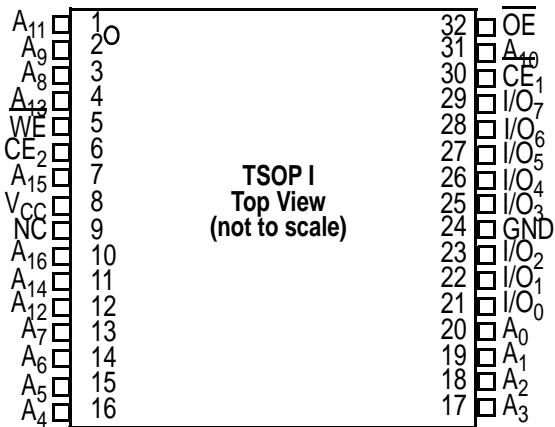
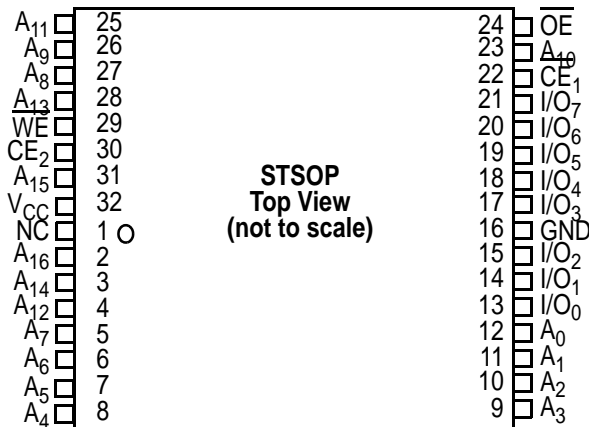
Note:

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			
		Min.	Typ. ^[2]	Max.		Operating, I _{CC} (mA)		Standby, I _{SB2} (μA)	
						Typ. ^[2]	Max.	Typ. ^[2]	Max.
CY62128BNLL	Commercial	4.5	5.0	5.5	55	7.5	20	2.5	15
					70	6	15	2.5	15
	Industrial				55	7.5	20	2.5	15
					70	6	15	2.5	15
	Automotive-A				70	6	15	2.5	15
	Automotive-E				70	6	25	2.5	25

Pin Configurations



Pin Definitions

Input	A₀–A₁₆ . Address Inputs
Input/Output	I/O₀–I/O₇ . Data lines. Used as input or output lines depending on operation
Input/Control	WE . Write Enable, Active LOW. When selected LOW, a WRITE is conducted. When selected HIGH, a READ is conducted.
Input/Control	CE₁ . Chip Enable 1, Active LOW.
Input/Control	CE₂ . Chip Enable 2, Active HIGH.
Input/Control	OE . Output Enable, Active LOW. Controls the direction of the I/O pins. When LOW, the I/O pins behave as outputs. When deasserted HIGH, I/O pins are tri-stated, and act as input data pins
Ground	GND . Ground for the device
Power Supply	V_{CC} . Power supply for the device

Note:

2. Typical values are included for reference only and are not tested or guaranteed. Typical values are an average of the distribution across normal production variations as measured at V_{CC} = 5.0V, T_A = 25 °C, and t_{AA} = 70 ns.

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 on V_{CC} to Relative GND^[3] -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
- 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	
Automotive-A	-40°C to +85°C	
Automotive-E	-40°C to +125°C	

Electrical Characteristics Over the Operating Range

Parameter	Description	Test Conditions	-55			-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} + 0.3	2.2		V _{CC} + 0.3	V	
V _{IL}	Input LOW Voltage ^[3]		-0.3		0.8	-0.3		0.8	V	
I _{IX}	Input Leakage Current	GND ≤ V _I ≤ V _{CC}	Commercial/Industrial	-1		+1	-1		+1	μA
			Automotive-A				-1		+1	μA
			Automotive-E				-10		+10	μA
I _{OZ}	Output Leakage Current	GND ≤ V _I ≤ V _{CC} , Output Disabled	Commercial/Industrial	-1		+1	-1		+1	μA
			Automotive-A				-1		+1	μA
			Automotive-E				-10		+10	μA
I _{CC}	V _{CC} Operating Supply Current	V _{CC} = Max., I _{OUT} = 0 mA, f = f _{MAX} = 1/t _{RC}	Commercial/Industrial		7.5	20		6	15	mA
			Automotive-A					6	15	mA
			Automotive-E					6	25	mA
I _{SB1}	Automatic CE Power-down Current —TTL Inputs	Max. V _{CC} , CE ₁ ≥ V _{IH} or CE ₂ ≤ V _{IL} , V _{IN} ≥ V _{IH} or V _{IN} ≤ V _{IL} , f = f _{MAX}	Commercial/Industrial		0.1	2		0.1	1	mA
			Automotive-A					0.1	1	mA
			Automotive-E					0.1	2	mA
I _{SB2}	Automatic CE Power-down Current —CMOS Inputs	Max. V _{CC} , CE ₁ ≥ V _{CC} - 0.3V, or CE ₂ ≤ 0.3V, V _{IN} ≥ V _{CC} - 0.3V, or V _{IN} ≤ 0.3V, f = 0	Commercial/Industrial		2.5	15		2.5	15	μA
			Automotive-A					2.5	15	μA
			Automotive-E					2.5	25	μA

Notes:

- 3. V_{IL} (min.) = -2.0V for pulse durations of less than 20 ns.
- 4. T_A is the "Instant On" case temperature.

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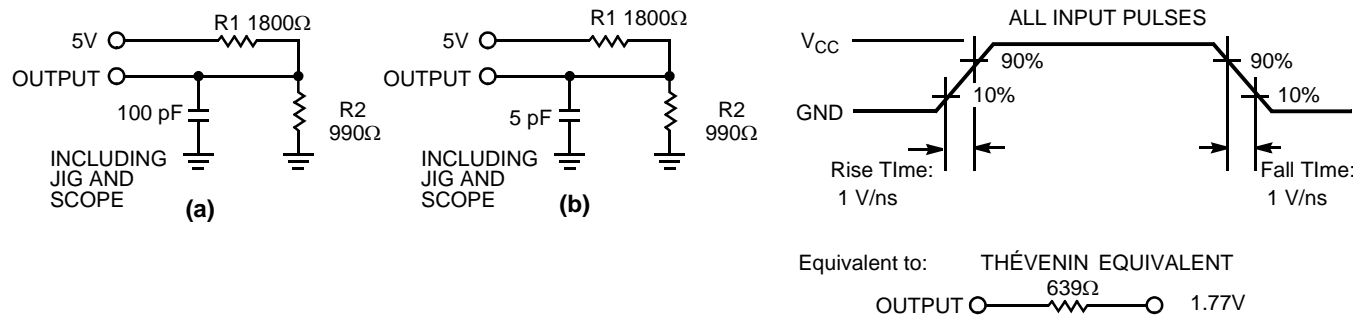
Capacitance^[5]

Parameter	Description	Test Conditions	Max.	Unit
C _{IN}	Input Capacitance	T _A = 25°C, f = 1 MHz, V _{CC} = 5.0V	9	pF
C _{OUT}	Output Capacitance		9	pF

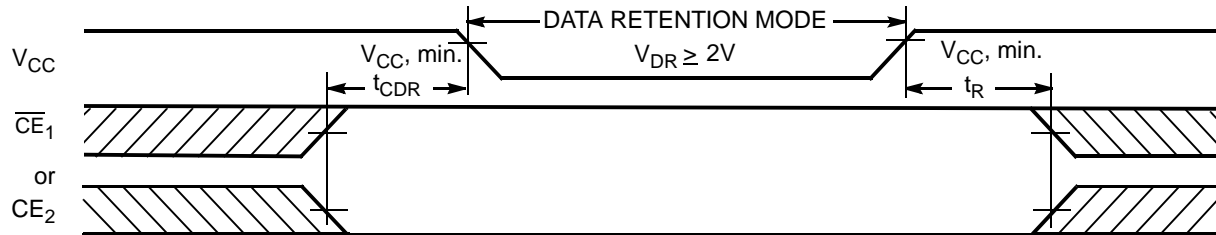
Thermal Resistance^[5]

Parameter	Description	Test Conditions	32 SOIC	32 STSOP	32 TSOP	Unit
Θ _{JA}	Thermal Resistance (Junction to Ambient)	Test conditions follow standard test methods and procedures for measuring thermal impedance, per EIA / JESD51.	66.17	105.14	97.44	°C/W
Θ _{JC}	Thermal Resistance (Junction to Case)		30.87	14.09	26.05	°C/W

AC Test Loads and Waveforms



Data Retention Waveform



Data Retention Characteristics (Over the Operating Range)

Parameter	Description	Conditions ^[6]	Min.	Typ.	Max.	Unit
V _{DR}	V _{CC} for Data Retention		2.0			V
I _{CCDR}	Data Retention Current	V _{CC} = V _{DR} = 2.0V, CE ₁ ≥ V _{CC} - 0.3V, or CE ₂ ≤ 0.3V, V _{IN} ≥ V _{CC} - 0.3V or, V _{IN} ≤ 0.3V	Commercial/ Industrial Automotive-A	1.5	15	μA
			Automotive-E	1.5	25	μA
t _{CDR}	Chip Deselect to Data Retention Time		0			ns
t _R	Operation Recovery Time		70			ns

Note:

- 5. Tested initially and after any design or process changes that may affect these parameters.
- 6. No input may exceed V_{CC} + 0.5V.

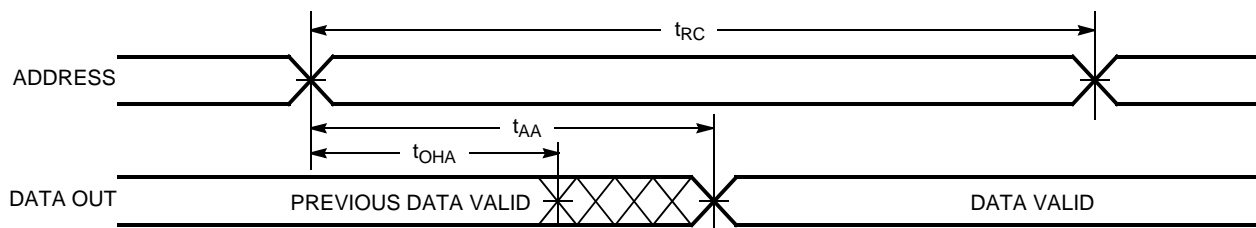
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Switching Characteristics^[7] Over the Operating Range

Parameter	Description	CY62128BN-55		CY62128BN-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}	\overline{CE}_1 LOW to Data Valid, CE_2 HIGH to Data Valid		55		70	ns
t_{DOE}	\overline{OE} LOW to Data Valid		20		35	ns
t_{LZOE}	\overline{OE} LOW to Low Z	0		0		ns
t_{HZOE}	\overline{OE} HIGH to High Z ^[7, 9]		20		25	ns
t_{LZCE}	\overline{CE}_1 LOW to Low Z, CE_2 HIGH to Low Z ^[9]	5		5		ns
t_{HZCE}	\overline{CE}_1 HIGH to High Z, CE_2 LOW to High Z ^[8, 9]		20		25	ns
t_{PU}	\overline{CE}_1 LOW to Power-up, CE_2 HIGH to Power-up	0		0		ns
t_{PD}	\overline{CE}_1 HIGH to Power-down, CE_2 LOW to Power-down		55		70	ns
WRITE CYCLE^[10]						
t_{WC}	Write Cycle Time	55		70		ns
t_{SCE}	\overline{CE}_1 LOW to Write End, CE_2 HIGH 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}	\overline{WE} Pulse Width	45		50		ns
t_{SD}	Data Set-up to Write End	25		30		ns
t_{HD}	Data Hold from Write End	0		0		ns
t_{LZWE}	\overline{WE} HIGH to Low Z ^[9]	5		5		ns
t_{HZWE}	\overline{WE} LOW to High Z ^[8, 9]		20		25	ns

Switching Waveforms

Read Cycle No.1^[11, 12]

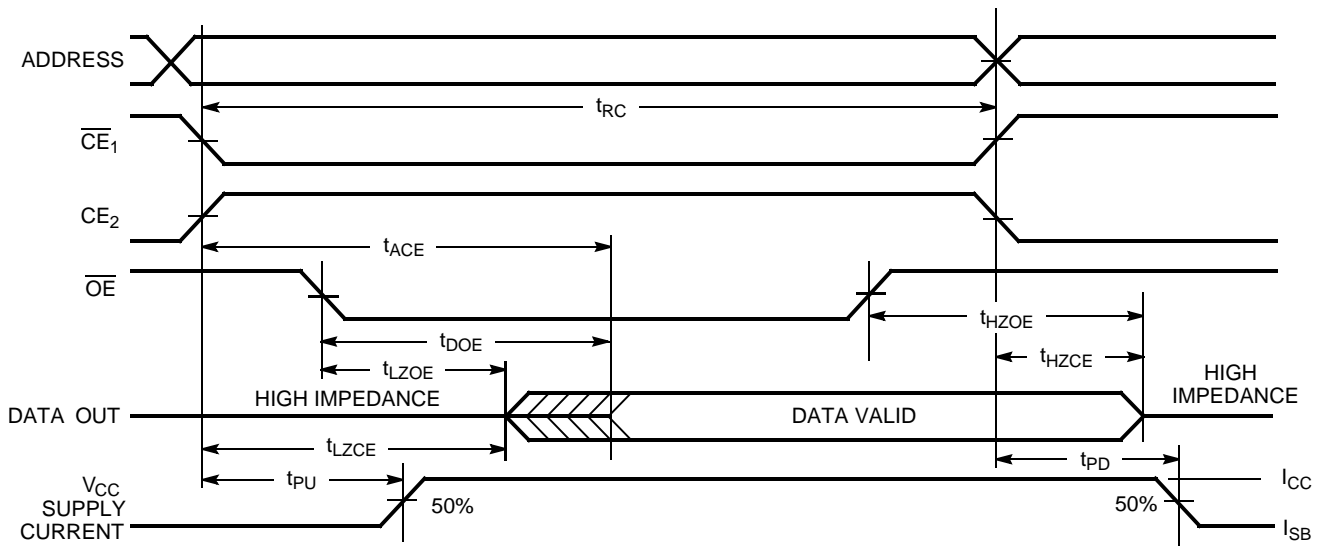


Notes:

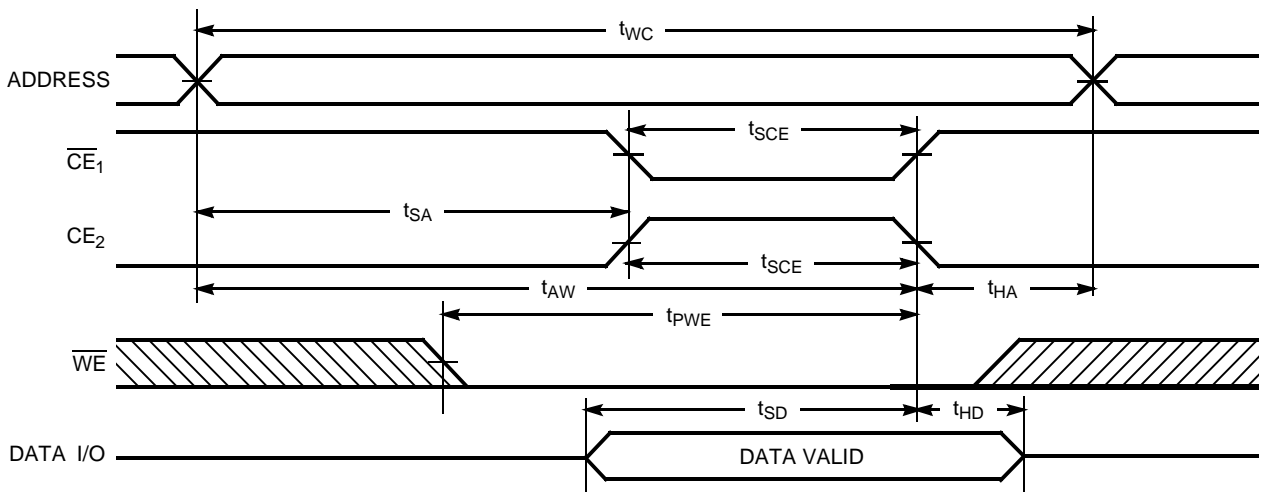
7. Test conditions assume signal transition time of 5 ns or less, timing reference levels of 1.5V, input pulse levels of 0 to 3.0V, and output loading of the specified I_{OL}/I_{OH} and 100-pF load capacitance.
8. t_{HZOE} , t_{HZCE} , and t_{HZWE} are specified with a load capacitance of 5 pF as in (b) of AC Test Loads. Transition is measured ± 500 mV from steady-state voltage.
9. 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.
10. 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} must be LOW and CE_2 HIGH to initiate a write, and the transition of any of these signals can terminate the write. The input data set-up and hold timing should be referenced to the leading edge of the signal that terminates the write.
11. Device is continuously selected. \overline{OE} , $\overline{CE}_1 = V_{IL}$, $CE_2 = V_{IH}$.
12. \overline{WE} is HIGH for read cycle.

Switching Waveforms (continued)

Read Cycle No. 2 (\overline{OE} Controlled)^[12, 13]



Write Cycle No. 1 (\overline{CE}_1 or CE_2 Controlled)^[14, 15]



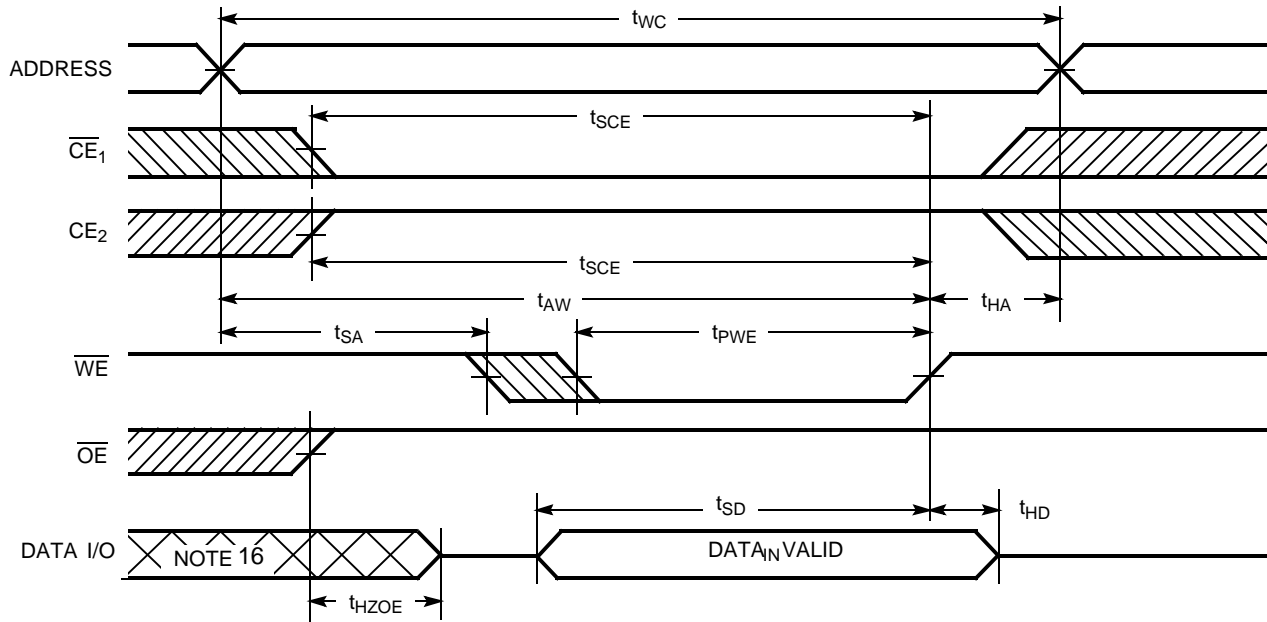
Notes:

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

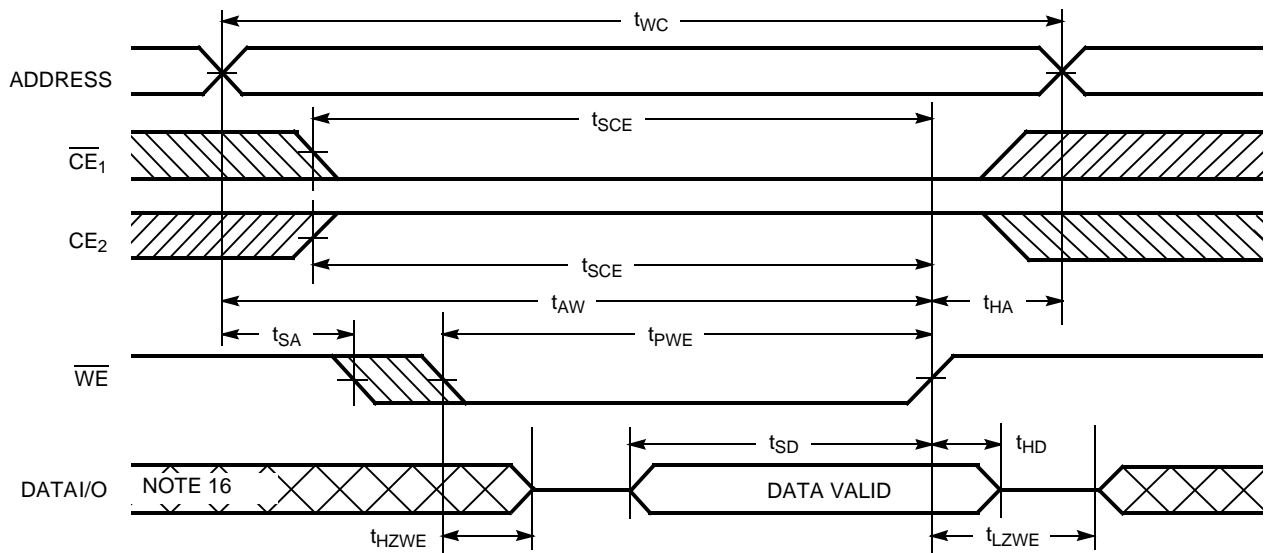
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Switching Waveforms (continued)

Write Cycle No. 2 (\overline{WE} Controlled, \overline{OE} HIGH During Write)^[14, 15]



Write Cycle No.3 (\overline{WE} Controlled, \overline{OE} LOW)^[14, 15]



Note:
16. During this period the I/Os are in the output state and input signals should not be applied.

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Truth Table

\overline{CE}_1	\overline{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

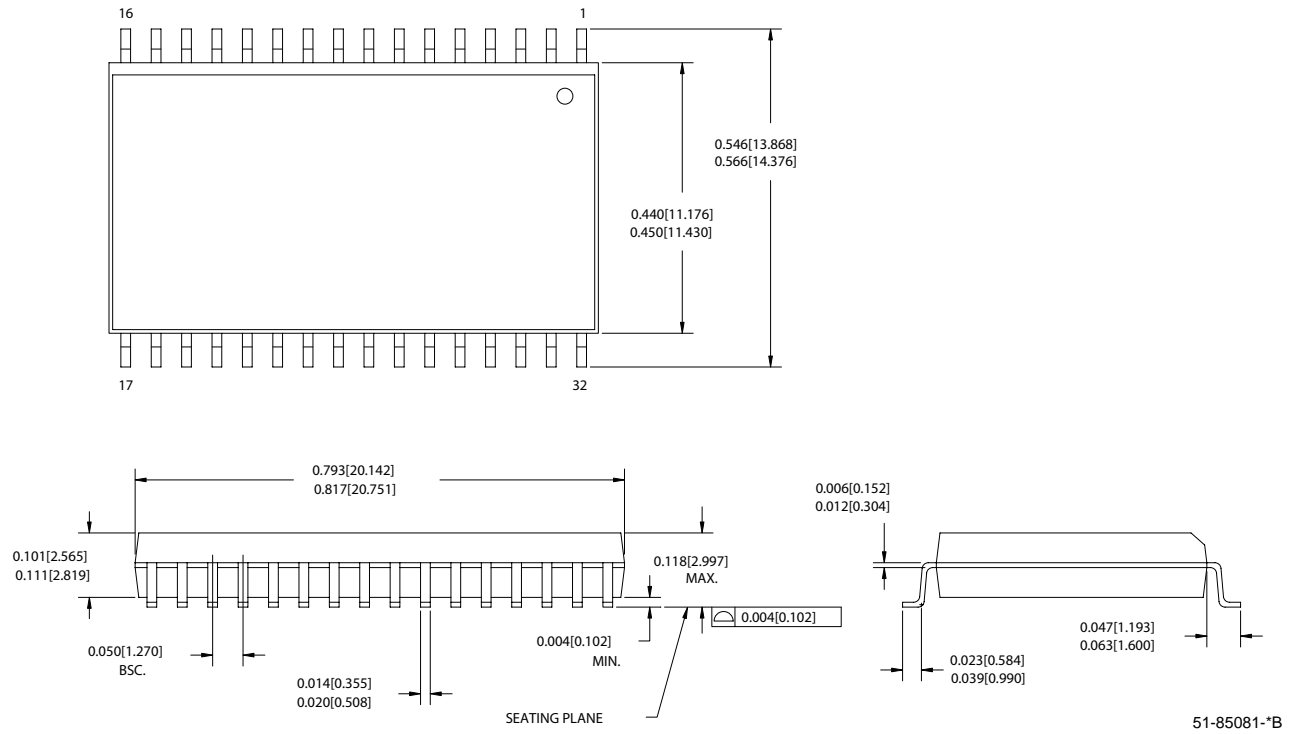
Speed (ns)	Ordering Code	Package Diagram	Package Type	Operating Range
55	CY62128BNLL-55SC	51-85081	32-pin 450-Mil SOIC	Commercial
	CY62128BNLL-55SXC		32-pin 450-Mil SOIC (Pb-Free)	
	CY62128BNLL-55SI		32-pin 450-Mil SOIC	Industrial
	CY62128BNLL-55SXI		32-pin 450-Mil SOIC (Pb-Free)	
	CY62128BNLL-55ZAI	51-85094	32-pin STSOP	
	CY62128BNLL-55ZAXI	32-pin STSOP (Pb-Free)		
	CY62128BNLL-55ZI	51-85056	32-pin TSOP Type I	Industrial
	CY62128BNLL-55ZXI	32-pin TSOP Type I (Pb-Free)		
70	CY62128BNLL-70SC	51-85081	32-pin 450-Mil SOIC	Commercial
	CY62128BNLL-70SXC		32-pin 450-Mil SOIC (Pb-Free)	
	CY62128BNLL-70ZC	51-85056	32-pin TSOP Type I	Industrial
	CY62128BNLL-70ZXC		32-pin TSOP Type I (Pb-Free)	
	CY62128BNLL-70SI	51-85081	32-pin 450-Mil SOIC	Industrial
	CY62128BNLL-70SXI		32-pin 450-Mil SOIC (Pb-Free)	
	CY62128BNLL-70ZAI	51-85094	32-pin STSOP	Industrial
	CY62128BNLL-70ZAXI		32-pin STSOP (Pb-Free)	
	CY62128BNLL-70ZI	51-85056	32-pin TSOP Type I	Industrial
	CY62128BNLL-70ZXI		32-pin TSOP Type I (Pb-Free)	
	CY62128BNLL-70ZXA	51-85056	32-pin TSOP Type I (Pb-Free)	Automotive-A
	CY62128BNLL-70SXA	51-85081	32-pin 450-Mil SOIC (Pb-Free)	Automotive-E
	CY62128BNLL-70SXE	51-85081	32-pin 450-Mil SOIC (Pb-Free)	
	CY62128BNLL-70ZAXE	51-85094	32-pin STSOP (Pb-Free)	

Please contact your local Cypress sales representative for availability of these parts

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Package Diagrams

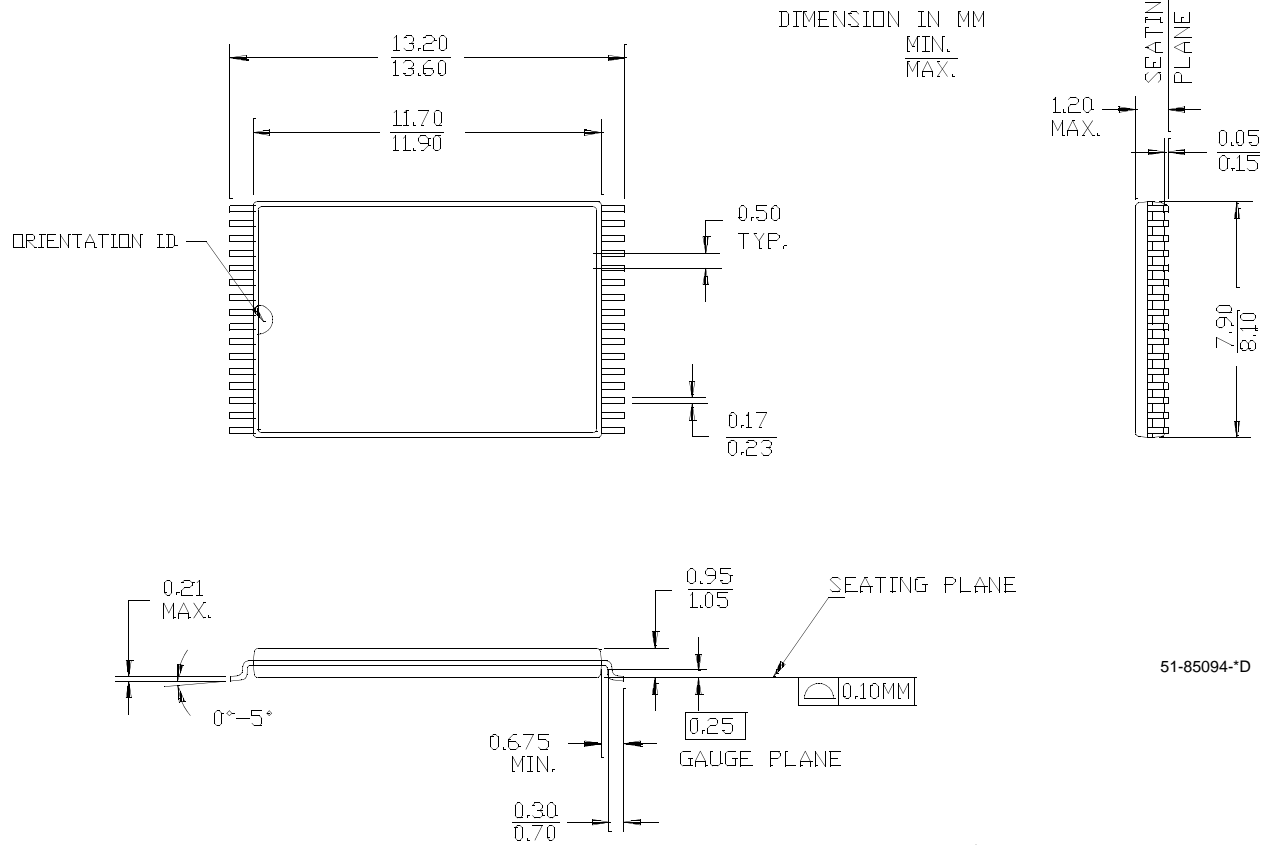
32-pin (450 Mil) Molded SOIC (51-85081)



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Package Diagrams (continued)

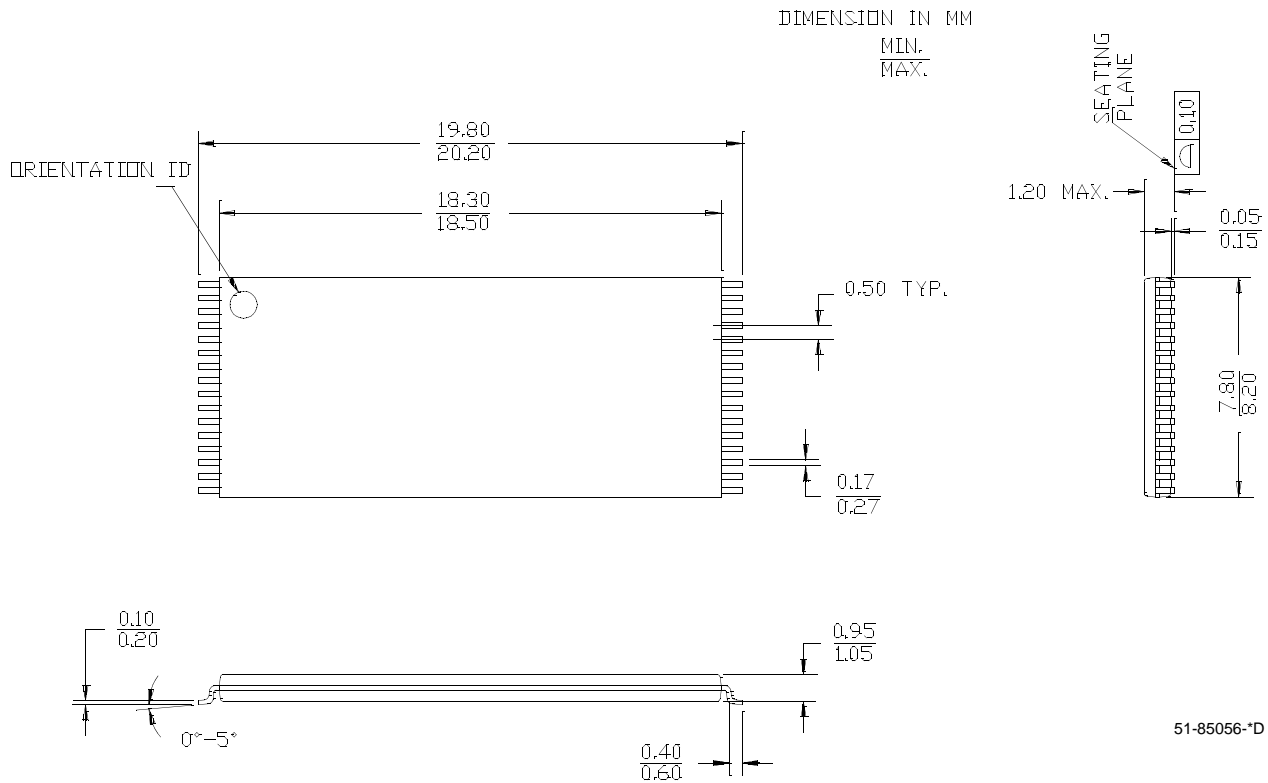
32-pin STSOP (8 x 13.4 mm) (51-85094)



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Package Diagrams (continued)

32-pin TSOP Type I (8 x 20 mm) (51-85056)



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Document History Page

Document Title: CY62128BN MoBL® 1-Mbit (128K x 8) Static RAM				
Document Number: 001-06498				
REV.	ECN NO.	Issue Date	Orig. of Change	Description of Change
**	426503	See ECN	NXR	New Data Sheet
*A	488954	See ECN	NXR	Added Automotive product Removed RTSOP Package Updated ordering Information table

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