CY62128BN

MoBL®

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 ($\overline{WE}$) inputs LOW and 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).
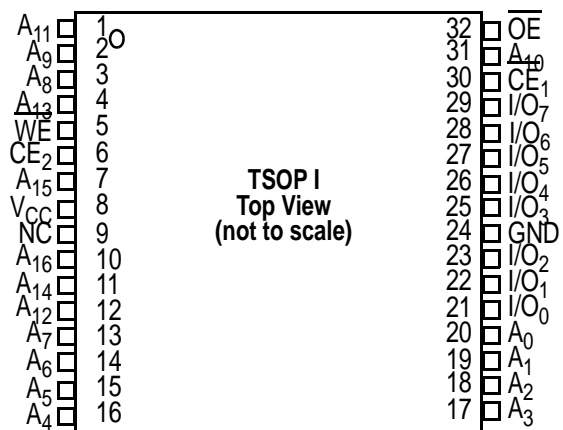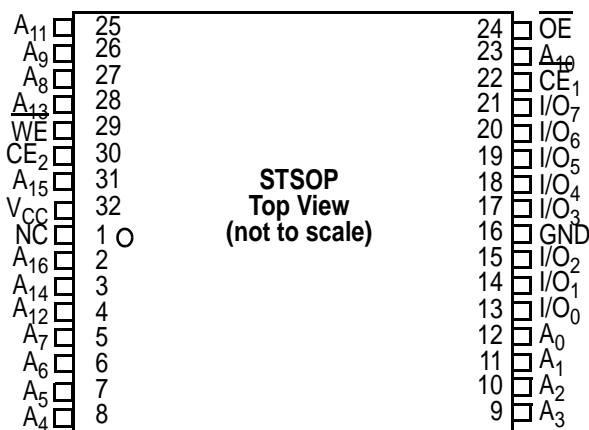
Logic Block Diagram
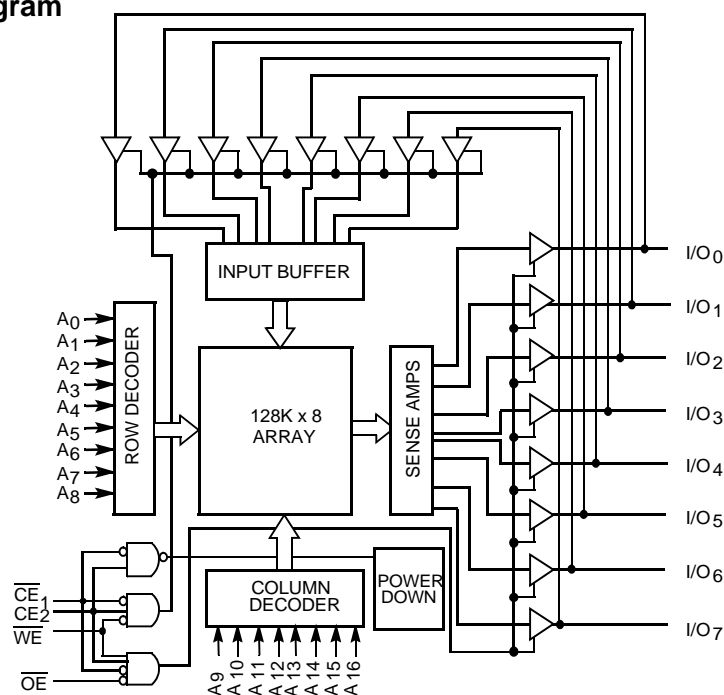
Pin Configuration
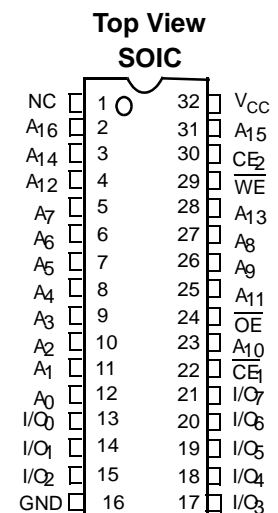
Note:
1. For best-practice recommendations, please refer to the Cypress application note "System Design Guidelines" on http://www.cypress.com.

[+] Feedb

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	A_0–A_{16}. Address Inputs
Input/Output	I/O_0–I/O_7. Data lines. Used as input or output lines depending on operation
Input/Control	$\overline{WE}$. Write Enable, Active LOW. When selected LOW, a WRITE is conducted. When selected HIGH, a READ is conducted.
Input/Control	$\overline{CE_1}$. Chip Enable 1, Active LOW.
Input/Control	CE_2. Chip Enable 2, Active HIGH.
Input/Control	$\overline{OE}$. 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℃, and t_{AA} = 70 ns.

[+] Feedb

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}, $\overline{CE}_1$ ≥ 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}, $\overline{CE}_1$ ≥ 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.

[+] Feedb

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
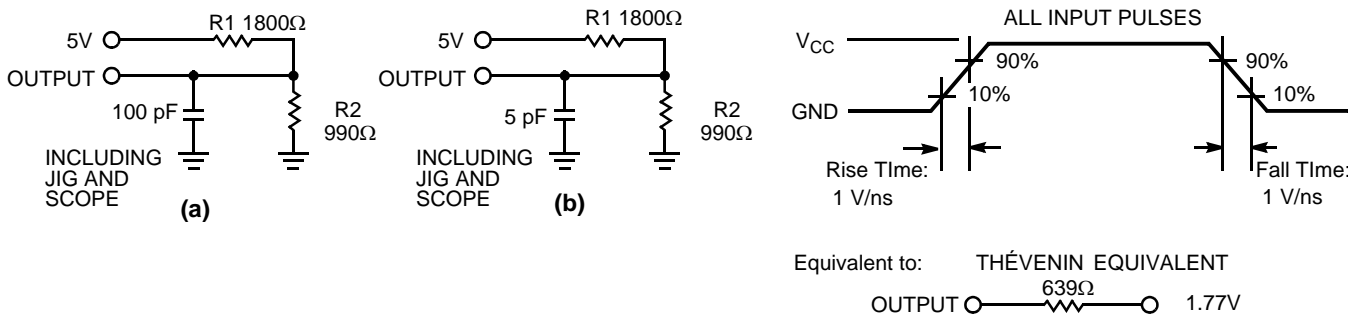
Data Retention Waveform
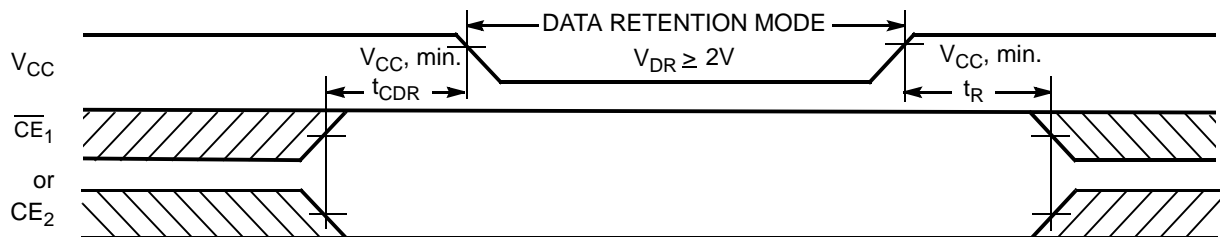
## Data Retention Characteristics (Over the Operating Range)

Parameter	Description	Conditions[6]		Min.	Typ.	Max.	Unit
V_{DR}	V_{CC} for Data Retention			2.0			V
I_{CCDR}	Data Retention Current	$V_{CC} = V_{DR} = 2.0V$, $\overline{CE}_1 \geq V_{CC} - 0.3V$, or $CE_2 \leq 0.3V$, $V_{IN} \geq V_{CC} - 0.3V$ or, $V_{IN} \leq 0.3V$	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.

[+] Feedb

## Switching Characteristics[7] Over the Operating Range

Parameter	Description	CY62128BN-55 Min.	CY62128BN-55 Max.	CY62128BN-70 Min.	CY62128BN-70 Max.	Unit
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]
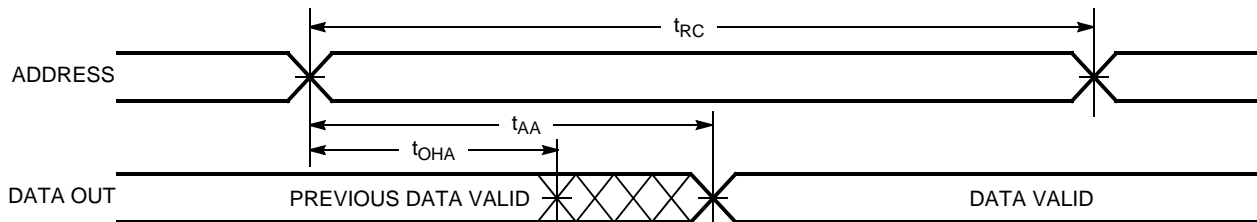
Notes:
7. Test conditions assume signal transition time of 5 ns or less, timing reference levels of 1.5V, input pulse levels of 0 to 3.0V, and output loading of the specified I_{OL}/I_{OH} and 100-pF load capacitance.
8. t_{HZOE}, t_{HZCE}, and t_{HZWE} are specified with a load capacitance of 5 pF as 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.

[+] Feedb

Switching Waveforms (continued)

Read Cycle No. 2 ($\overline{OE}$ Controlled)[12, 13]
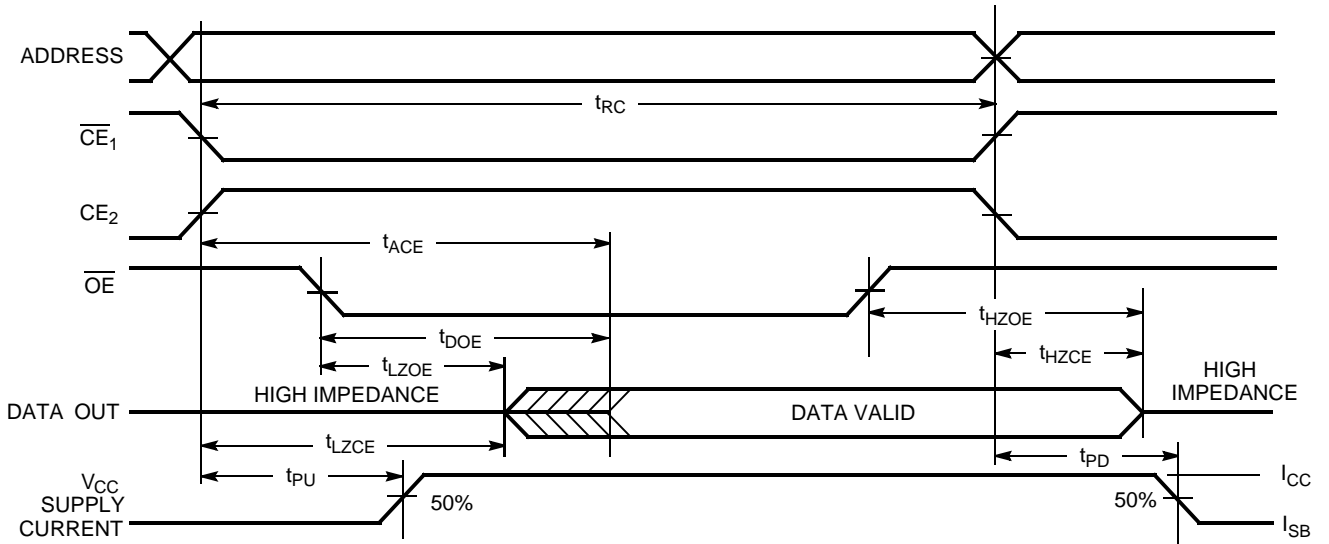
Write Cycle No. 1 ($\overline{CE}_1$ or CE_2 Controlled)[14, 15]
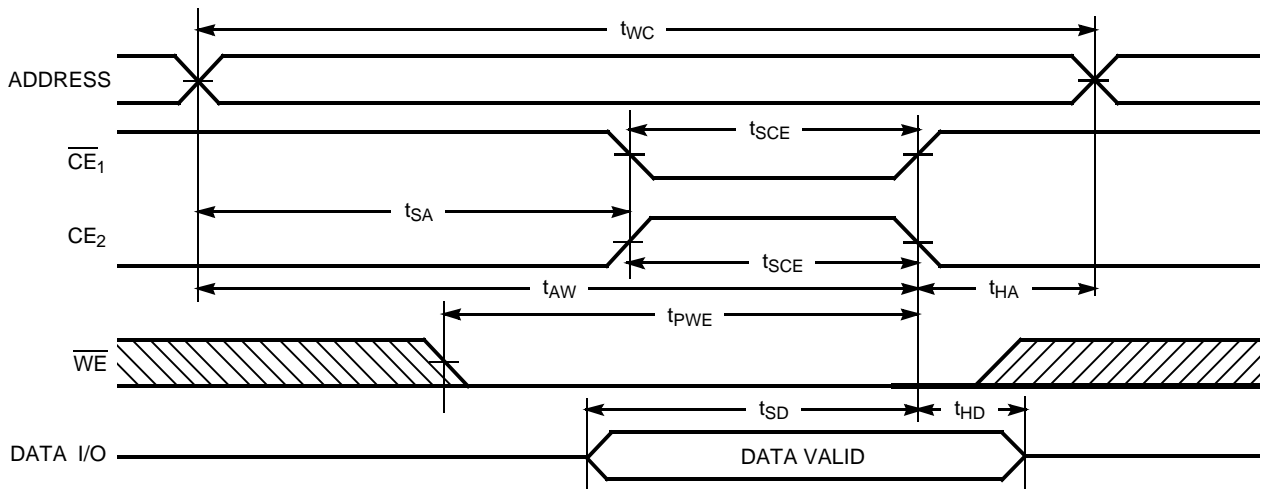
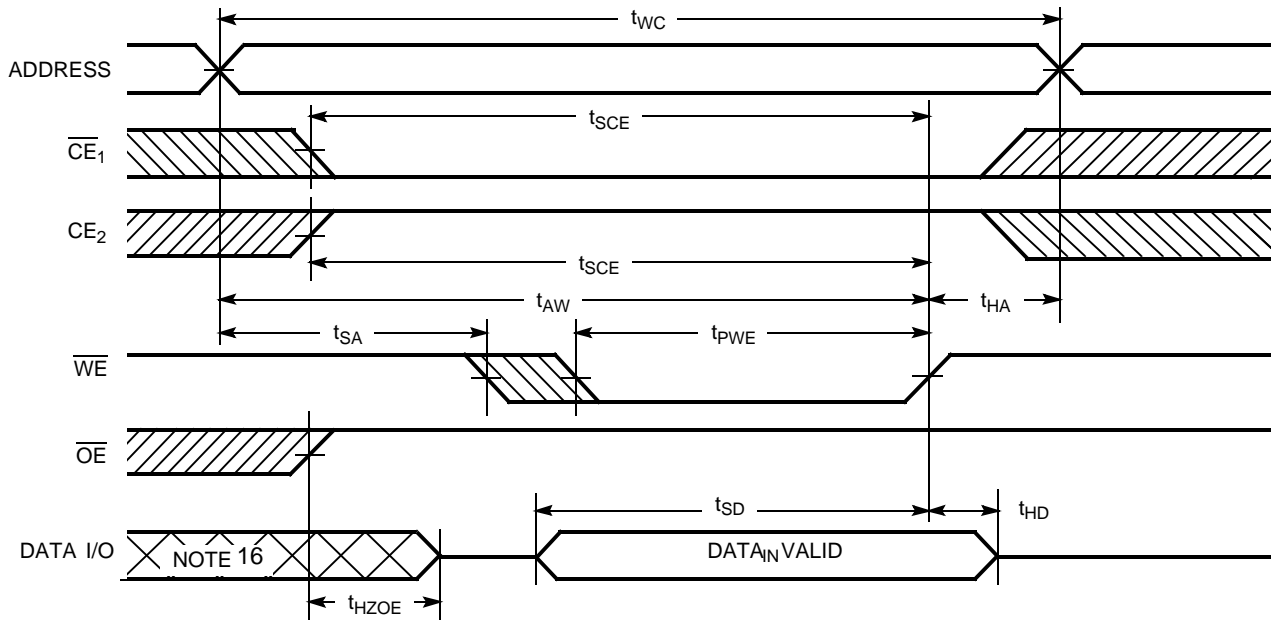
Notes:
13. Address valid prior to or coincident with $\overline{CE}_1$ transition LOW and CE_2 transition HIGH.
14. Data I/O is high impedance if $\overline{OE} = V_{IH}$.
15. If $\overline{CE}_1$ goes HIGH or CE_2 goes LOW simultaneously with $\overline{WE}$ going HIGH, the output remains in a high-impedance state.

[+] Feedb

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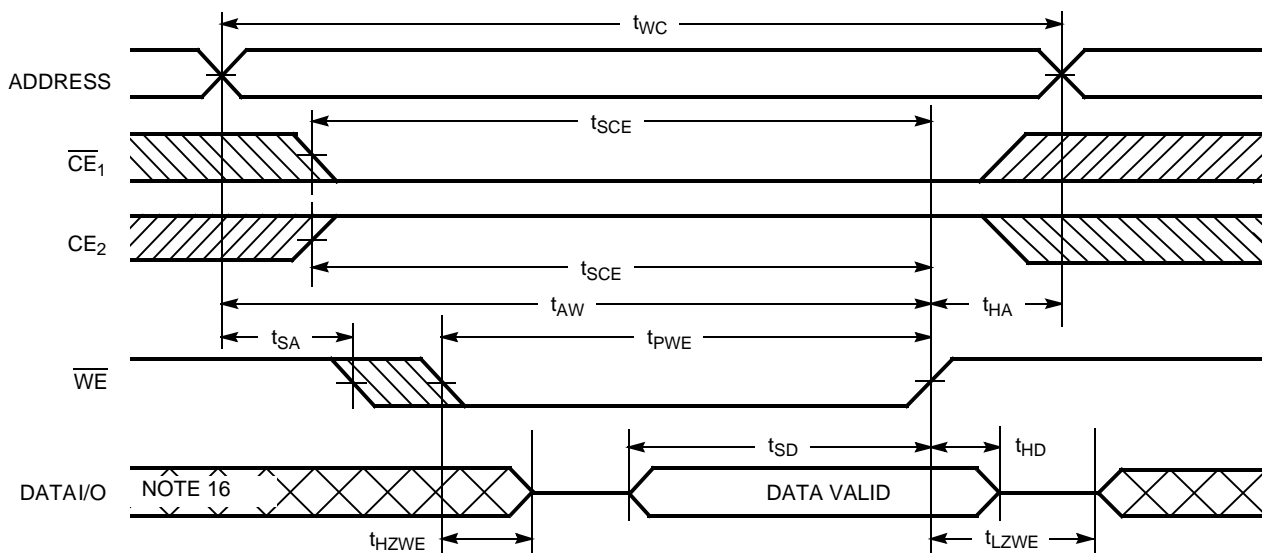
Note:
16. During this period the I/Os are in the output state and input signals should not be applied.

[+] Feedb

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 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	
	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	
	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	
	CY62128BNLL-70ZAXI		32-pin STSOP (Pb-Free)	
	CY62128BNLL-70ZI	51-85056	32-pin TSOP Type I	
	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)	
	CY62128BNLL-70SXE	51-85081	32-pin 450-Mil SOIC (Pb-Free)	Automotive-E
	CY62128BNLL-70ZAXE	51-85094	32-pin STSOP (Pb-Free)	

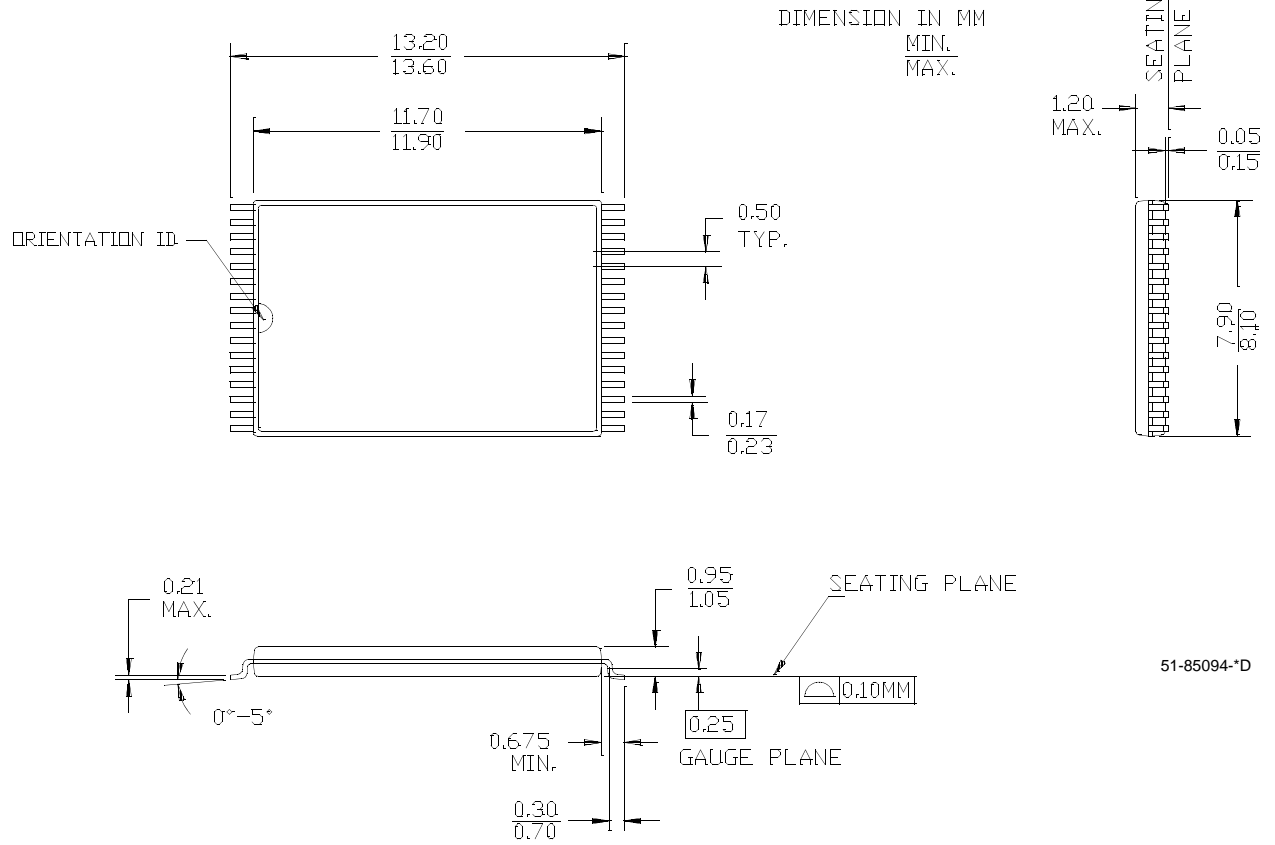Please contact your local Cypress sales representative for availability of these parts

[+] Feedb

Package Diagrams

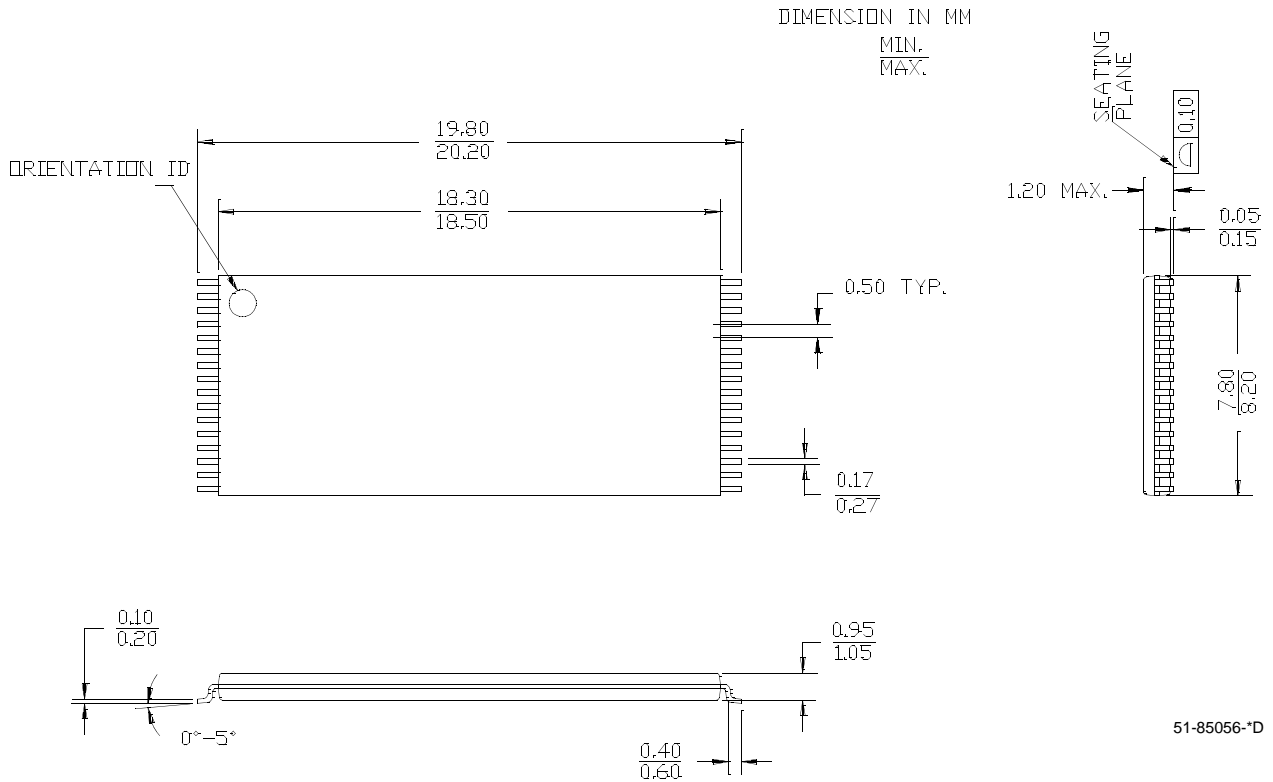**32-pin (450 Mil) Molded SOIC (51-85081)**

51-85081-*B

[+] Feedb
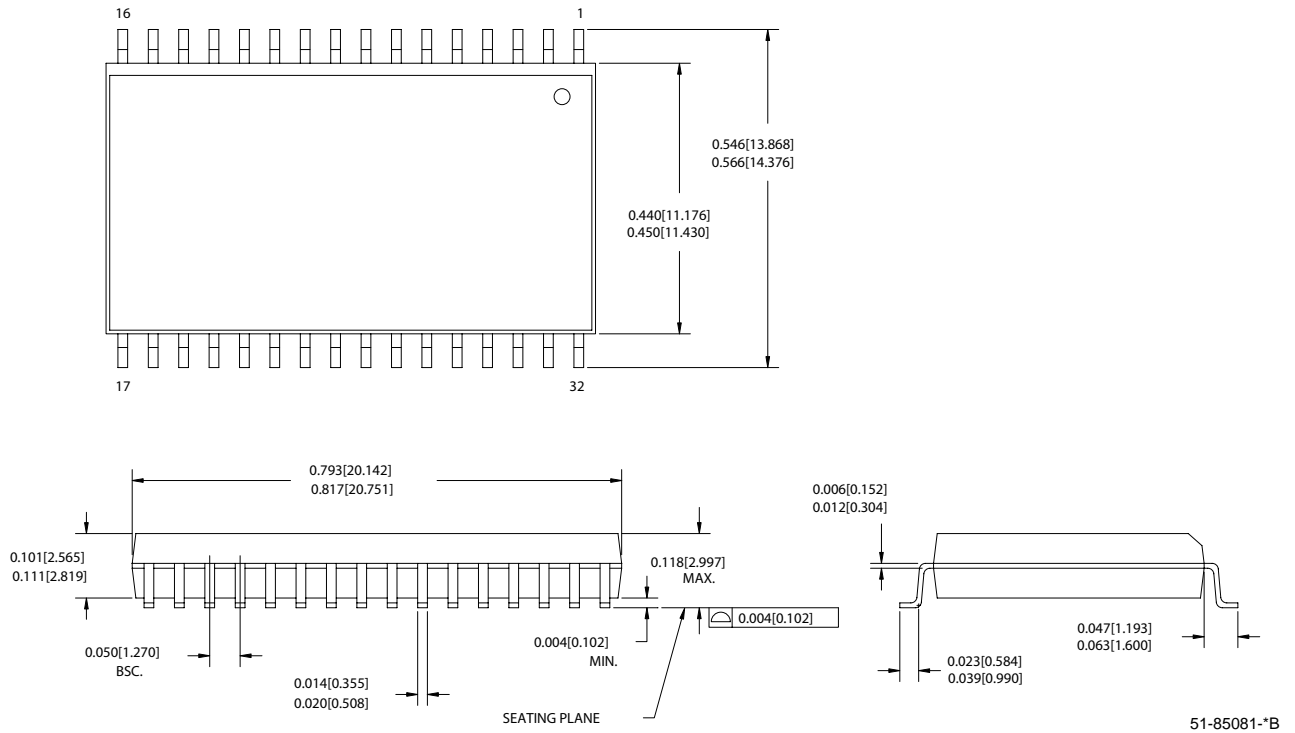
Package Diagrams (continued)

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

DIMENSION IN MM
MIN.
MAX.

51-85094-*D

[+] Feedb

Package Diagrams (continued)

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

51-85056-*D

All product and company names mentioned in this document are the trademarks of their respective holders.

[+] Feedb

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

[+] Feedb