

# 1-Mb (128K x 8) Static RAM

## Features

- **Very high speed: 55 and 70 ns**
- **Wide voltage range: 2.2V to 3.6V**
- **Pin compatible with CY62128V**
- **Ultra-low active power**
  - Typical active current: 0.85 mA @ f = 1 MHz
  - Typical active current: 5 mA @ f = f<sub>MAX</sub>
- **Ultra-low standby power**
- **Easy memory expansion with  $\overline{CE}_1$ , CE<sub>2</sub>, and  $\overline{OE}$  features**
- **Automatic power-down when deselected**
- **Available in Pb-free and non Pb-free 32-lead SOIC, 32-lead TSOP and 32-lead Small TSOP, non Pb-free 32-lead Reverse TSOP packages**

## Functional Description<sup>[1]</sup>

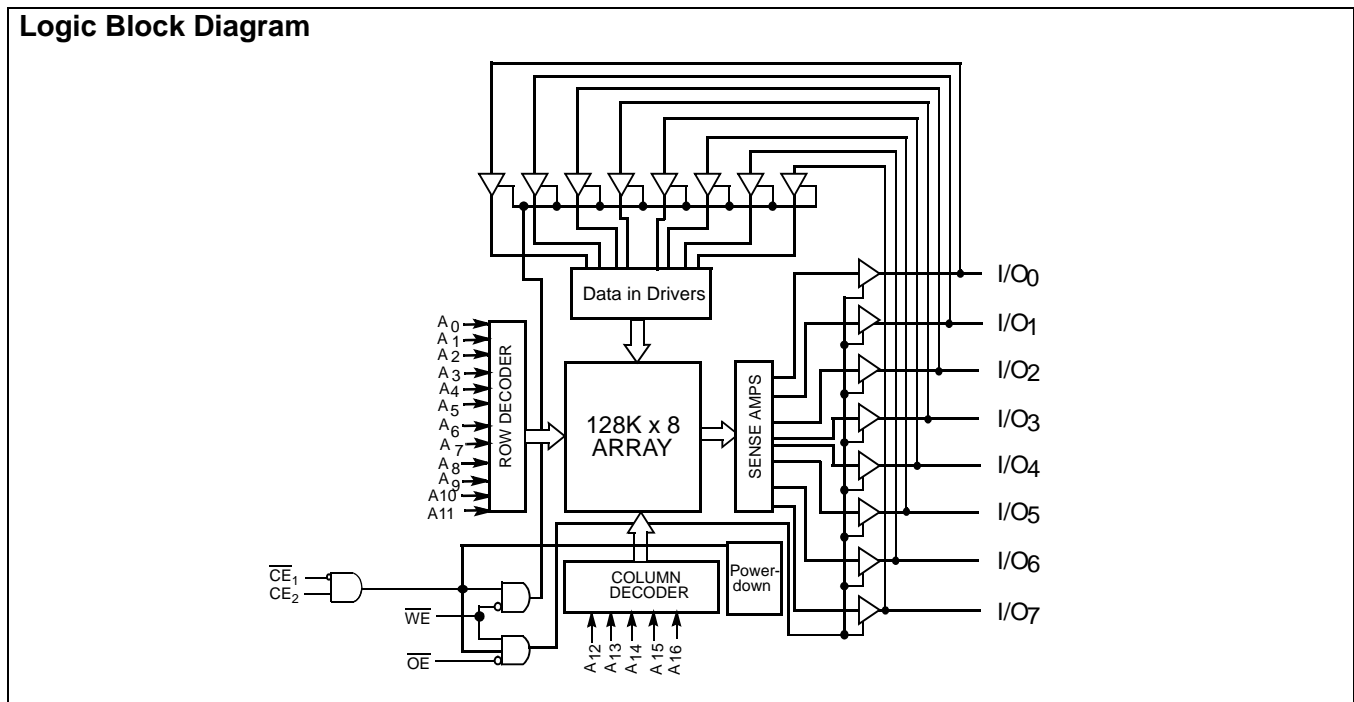
The CY62128DV30 is a high-performance CMOS static RAM organized as 128K words by 8 bits. This device features advanced circuit design to provide ultra-low active current. This is ideal for providing More Battery Life™ (MoBL<sup>®</sup>) in portable applications such as cellular telephones. The device

also has an automatic power-down feature that significantly reduces power consumption by 90% when addresses are not toggling. The device can be put into standby mode reducing power consumption by more than 99% when deselected Chip Enable 1 ( $\overline{CE}_1$ ) HIGH or Chip Enable 2 (CE<sub>2</sub>) LOW. The input/output pins (I/O<sub>0</sub> through I/O<sub>7</sub>) are placed in a high-impedance state when: deselected Chip Enable 1 ( $\overline{CE}_1$ ) HIGH or Chip Enable 2 (CE<sub>2</sub>) LOW, outputs are disabled (OE HIGH), or during a write operation (Chip Enable 1 ( $\overline{CE}_1$ ) LOW and Chip Enable 2 (CE<sub>2</sub>) HIGH and Write Enable (WE) LOW).

Writing to the device is accomplished by taking Chip Enable 1 ( $\overline{CE}_1$ ) LOW with Chip Enable 2 (CE<sub>2</sub>) HIGH and Write Enable (WE) LOW. Data on the eight I/O pins is then written into the location specified on the Address pin (A<sub>0</sub> through A<sub>16</sub>).

Reading from the device is accomplished by taking Chip Enable 1 ( $\overline{CE}_1$ ) LOW with Chip Enable 2 (CE<sub>2</sub>) HIGH and Output Enable ( $\overline{OE}$ ) LOW while forcing the Write Enable (WE) HIGH. Under these conditions, the contents of the memory location specified by the address pins will appear on the I/O pins.

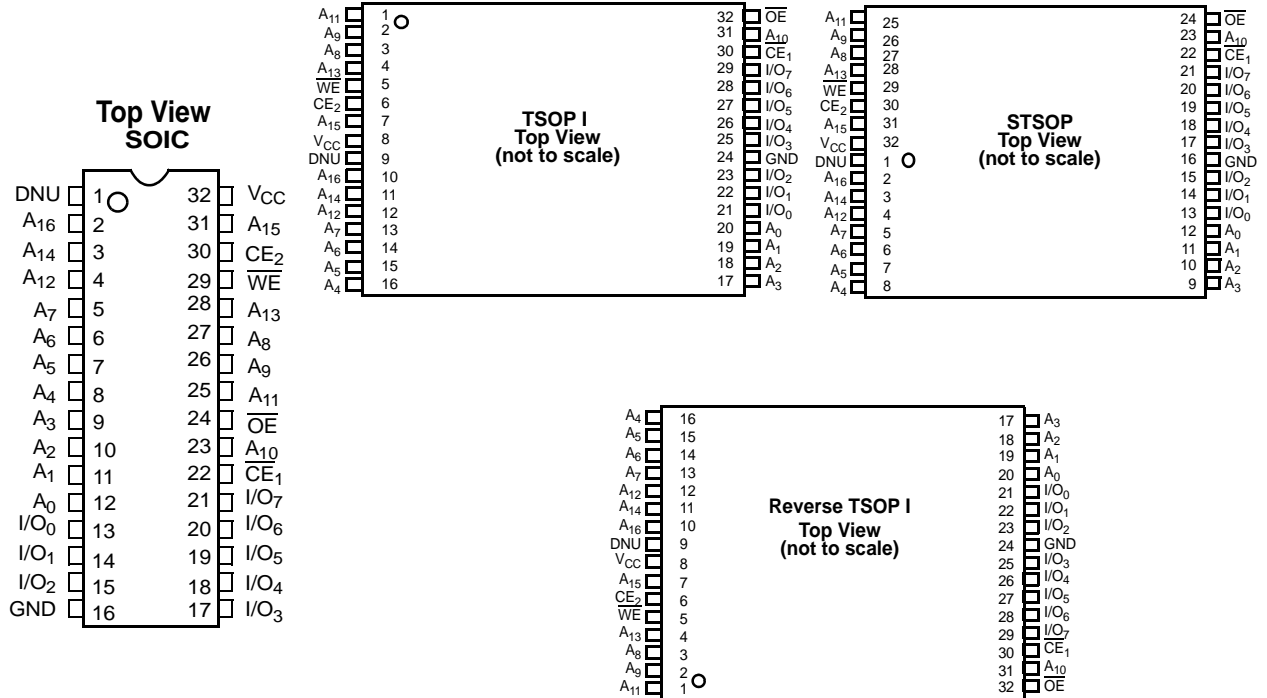
The eight input/output pins (I/O<sub>0</sub> through I/O<sub>7</sub>) are placed in a high-impedance state when the device is deselected ( $\overline{CE}_1$  HIGH or CE<sub>2</sub> LOW), the outputs are disabled (OE HIGH) or during a write operation (CE<sub>1</sub> LOW, CE<sub>2</sub> HIGH), and WE LOW).



**Note:**

1. For best-practice recommendations, please refer to the Cypress application note "System Design Guidelines" on <http://www.cypress.com>.

Pin Configurations<sup>[2]</sup>



Product Portfolio

Product	V <sub>CC</sub> Range (V)			Speed (ns)	Power Dissipation					
					Operating, I <sub>CC</sub> (mA)				Standby, I <sub>SB2</sub> (μA)	
	Min.	Typ.	Max.		f = 1 MHz		f = f <sub>MAX</sub>			
					Typ. <sup>[4]</sup>	Max.	Typ. <sup>[4]</sup>	Max.	Typ. <sup>[4]</sup>	Max.
CY62128DV30L	2.2	3.0	3.6	55/70	0.85	1.5	5	10	1.5	5
CY62128DV30LL				55/70	0.85	1.5	5	10	1.5	4

Notes:

- NC pins are not connected to the die.
- DNU pins have to be left floating or tied to V<sub>SS</sub> to ensure proper application.
- Typical values are included for reference only and are not guaranteed or tested. Typical values are measured at V<sub>CC</sub> = V<sub>CC(typ)</sub>, T<sub>A</sub> = 25°C.

**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 .....	-0.3V to 3.9V
DC Voltage Applied to Outputs in High-Z State <sup>[5]</sup> .....	-0.3V to $V_{CC} + 0.3V$

DC Input Voltage <sup>[5]</sup> .....	-0.3V to $V_{CC} + 0.3V$
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 ( $T_A$ )	$V_{CC}$ <sup>[6]</sup>
Industrial	-40°C to +85°C	2.2V to 3.6V

**DC Electrical Characteristics (Over the Operating Range)**

Parameter	Description	Test Conditions	CY62128DV30-55/70			Unit	
			Min.	Typ. <sup>[4]</sup>	Max.		
$V_{OH}$	Output HIGH Voltage	$2.2 \leq V_{CC} \leq 2.7$	$I_{OH} = -0.1$ mA	2.0		V	
		$2.7 \leq V_{CC} \leq 3.6$	$I_{OH} = -1.0$ mA	2.4			
$V_{OL}$	Output LOW Voltage	$2.2 \leq V_{CC} \leq 2.7$	$I_{OL} = 0.1$ mA		0.4	V	
		$2.7 \leq V_{CC} \leq 3.6$	$I_{OL} = 2.1$ mA		0.4		
$V_{IH}$	Input HIGH Voltage	$2.2 \leq V_{CC} \leq 2.7$		1.8	$V_{CC} + 0.3$	V	
		$2.7 \leq V_{CC} \leq 3.6$		2.2	$V_{CC} + 0.3$		
$V_{IL}$	Input LOW Voltage	$2.2 \leq V_{CC} \leq 2.7$		-0.3	0.6	V	
		$2.7 \leq V_{CC} \leq 3.6$		-0.3	0.8		
$I_{IX}$	Input Leakage Current	$GND \leq V_I \leq V_{CC}$		-1	+1	$\mu$ A	
$I_{OZ}$	Output Leakage Current	$GND \leq V_O \leq V_{CC}$ , Output Disabled		-1	+1	$\mu$ A	
$I_{CC}$	$V_{CC}$ Operating Supply Current	$f = f_{MAX} = 1/t_{RC}$	$V_{CC} = 3.6V$ , $I_{OUT} = 0mA$ , CMOS level		5	10	mA
		$f = 1$ MHz			0.85	1.5	
$I_{SB1}$	Automatic CE Power-down Current – CMOS Inputs	$\overline{CE}_1 \geq V_{CC} - 0.2V$ , $CE_2 \leq 0.2V$ , $V_{IN} \geq V_{CC} - 0.2V$ , $V_{IN} \leq 0.2V$ , $f = f_{MAX}$ (Address and Data Only), $f = 0$ (OE, WE,)	L		1.5	5	$\mu$ A
			LL		1.5	4	
$I_{SB2}$	Automatic CE Power-down Current – CMOS Inputs	$\overline{CE}_1 \geq V_{CC} - 0.2V$ , $CE_2 \leq 0.2V$ , $V_{IN} \geq V_{CC} - 0.2V$ or $V_{IN} \leq 0.2V$ , $f = 0$ , $V_{CC}=3.6V$	L		1.5	5	$\mu$ A
			LL		1.5	4	

**Capacitance<sup>[7]</sup>**

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

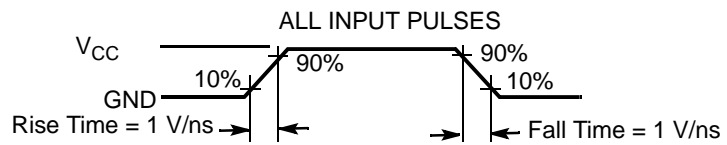
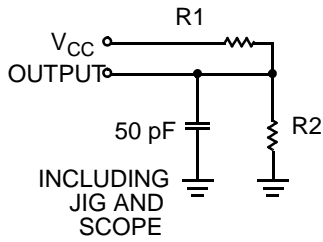
**Thermal Resistance<sup>[7]</sup>**

Parameter	Description	Test Conditions	SOIC	TSOP I	RTSOP	STSOP	Unit
$\theta_{JA}$	Thermal Resistance (Junction to Ambient)	Still Air, soldered on a 3 x 4.5 inch, two-layer printed circuit board	69	93	93	65	$^\circ C/W$
$\theta_{JC}$	Thermal Resistance (Junction to Case)		34	17	17	15	$^\circ C/W$

**Notes:**

- $V_{IL(min)}$  = -2.0V for pulse durations less than 20 ns.  $V_{IH(max)}$  =  $V_{CC} + 0.75V$  for pulse durations less than 20 ns.
- Full device operation requires linear ramp of  $V_{CC}$  from 0V to  $V_{CC(min)}$  and  $V_{CC}$  must be stable at  $V_{CC(min)}$  for 500  $\mu$  s.
- Tested initially and after any design or process changes that may affect these parameters.

AC Test Loads and Waveforms<sup>[8]</sup>



Equivalent to: THEVENIN EQUIVALENT

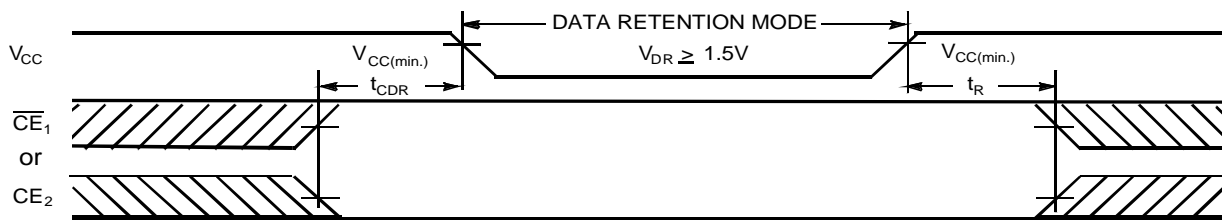


Parameters	2.5V (2.2V - 2.7V)	3.0V (2.7V - 3.6V)	Unit
R1	16600	1103	$\Omega$
R2	15400	1554	$\Omega$
R <sub>TH</sub>	8000	645	$\Omega$
V <sub>TH</sub>	1.20	1.75	V

Data Retention Characteristics

Parameter	Description	Conditions	Min.	Typ. <sup>[4]</sup>	Max.	Unit
V <sub>DR</sub>	V <sub>CC</sub> for Data Retention		1.5			V
I <sub>CCDR</sub>	Data Retention Current	V <sub>CC</sub> = 1.5V, $\overline{CE}_1 \geq V_{CC} - 0.2V$ , $CE_2 \leq 0.2V$ , V <sub>IN</sub> $\geq V_{CC} - 0.2V$ or V <sub>IN</sub> $\leq 0.2V$	L		4	$\mu A$
			LL		3	
t <sub>CDR</sub> <sup>[4]</sup>	Chip Deselect to Data Retention Time		0			ns
t <sub>R</sub> <sup>[8]</sup>	Operation Recovery Time		100			$\mu s$

Data Retention Waveform



Note:

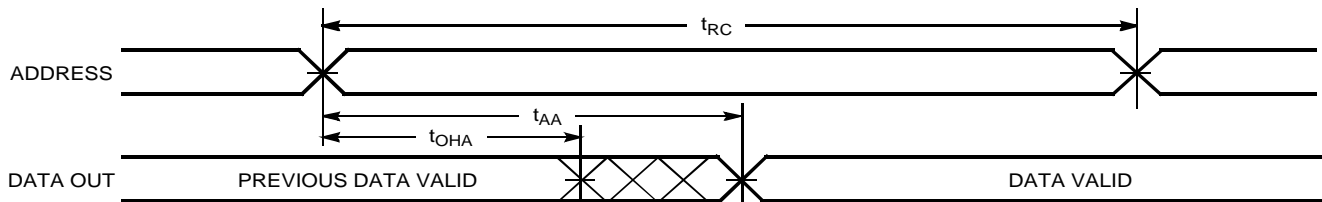
8. Full device operation requires linear V<sub>CC</sub> ramp from V<sub>DR</sub> to V<sub>CC(min.)</sub> > 100  $\mu s$ .

**Switching Characteristics** (Over the Operating Range)<sup>[9]</sup>

Parameter	Description	CY62128DV30-55		CY62128DV30-70		Unit
		Min.	Max.	Min.	Max.	
<b>Read Cycle</b>						
t <sub>RC</sub>	Read Cycle Time	55		70		ns
t <sub>AA</sub>	Address to Data Valid		55		70	ns
t <sub>OHA</sub>	Data Hold from Address Change	10		10		ns
t <sub>ACE</sub>	$\overline{CE}_1$ LOW or CE <sub>2</sub> HIGH to Data Valid		55		70	ns
t <sub>DOE</sub>	$\overline{OE}$ LOW to Data Valid		25		35	ns
t <sub>LZOE</sub>	$\overline{OE}$ LOW to Low Z <sup>[10]</sup>	5		5		ns
t <sub>HZOE</sub>	$\overline{OE}$ HIGH to High Z <sup>[10, 11]</sup>		20		25	ns
t <sub>LZCE</sub>	$\overline{CE}_1$ LOW or CE <sub>2</sub> HIGH to Low Z <sup>[10]</sup>	10		10		ns
t <sub>HZCE</sub>	$\overline{CE}_1$ HIGH or CE <sub>2</sub> LOW to High Z <sup>[10, 11]</sup>		20		25	ns
t <sub>PU</sub>	$\overline{CE}_1$ LOW or CE <sub>2</sub> HIGH to Power-up	0		0		ns
t <sub>PD</sub>	$\overline{CE}_1$ HIGH or CE <sub>2</sub> LOW to Power-down		55		70	ns
<b>Write Cycle<sup>[12]</sup></b>						
t <sub>WC</sub>	Write Cycle Time	55		70		ns
t <sub>SCE</sub>	$\overline{CE}_1$ LOW or CE <sub>2</sub> HIGH to Write End	40		60		ns
t <sub>AW</sub>	Address Set-up to Write End	40		60		ns
t <sub>HA</sub>	Address Hold from Write End	0		0		ns
t <sub>SA</sub>	Address Set-up to Write Start	0		0		ns
t <sub>PWE</sub>	$\overline{WE}$ Pulse Width	40		50		ns
t <sub>SD</sub>	Data Set-up to Write End	25		30		ns
t <sub>HD</sub>	Data Hold from Write End	0		0		ns
t <sub>HZWE</sub>	$\overline{WE}$ LOW to High Z <sup>[10, 11]</sup>		20		25	ns
t <sub>LZWE</sub>	$\overline{WE}$ HIGH to Low Z <sup>[10]</sup>	10		10		ns

**Switching Waveforms**

**Read Cycle No. 1 (Address Transition Controlled)<sup>[13, 14]</sup>**

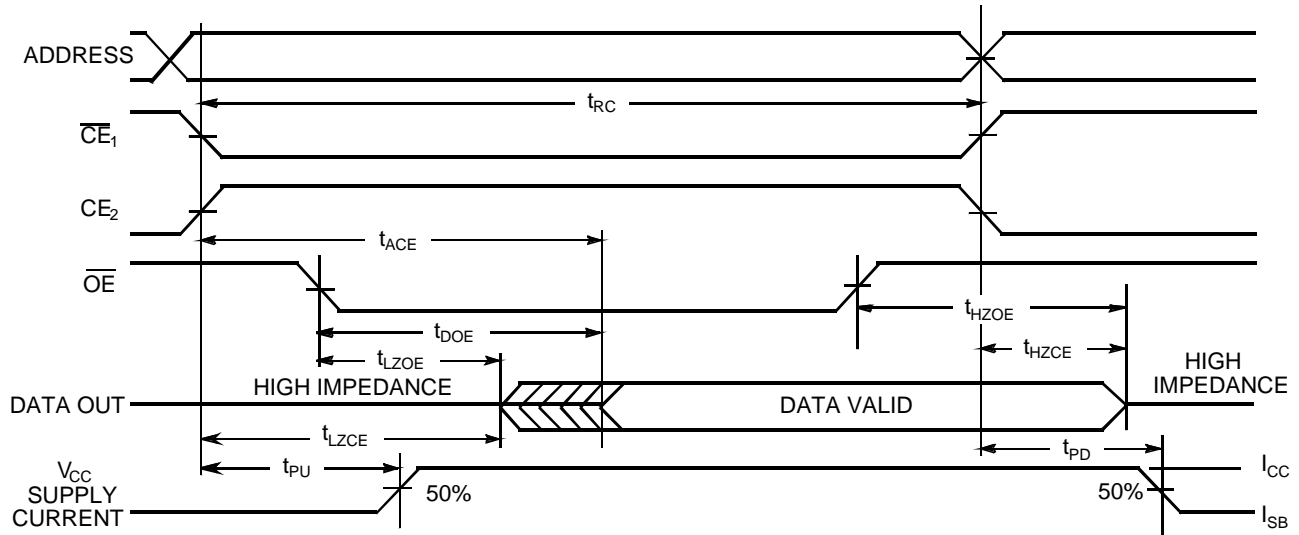


**Notes:**

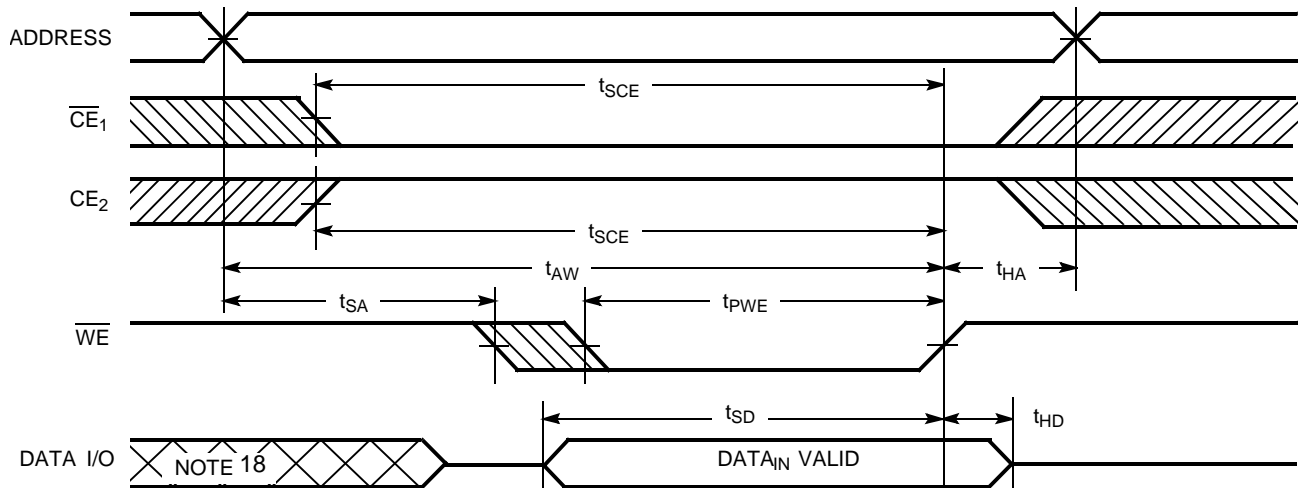
9. Test conditions assume signal transition time of 1V/ns or less, timing reference levels of  $V_{CC(typ.)}/2$ , input pulse levels of 0 to  $V_{CC(typ.)}$ , and output loading of the specified  $I_{OL}$ .
10. At any given temperature and voltage condition, t<sub>HZCE</sub> is less than t<sub>LZCE</sub>, t<sub>HZBE</sub> is less than t<sub>LZBE</sub>, t<sub>HZOE</sub> is less than t<sub>LZOE</sub>.
11. t<sub>HZOE</sub>, t<sub>HZCE</sub>, t<sub>HZBE</sub>, and t<sub>HZWE</sub> transitions are measured when the outputs enter a high-impedance state.
12. The internal write time of the memory is defined by the overlap of  $\overline{WE}$ ,  $\overline{CE}_1 = V_{IL}$ , and  $CE_2 = V_{IH}$ . All signals.
13. Device is continuously selected.  $\overline{OE}$ ,  $CE_1 = V_{IL}$ ,  $CE_2 = V_{IH}$ .
14.  $\overline{WE}$  is HIGH for Read cycle.

**Switching Waveforms (continued)**

**Read Cycle No. 2 ( $\overline{OE}$  Controlled)<sup>[11, 14, 15]</sup>**



**Write Cycle No. 1 ( $\overline{WE}$  Controlled)<sup>[12, 16, 17, 18]</sup>**

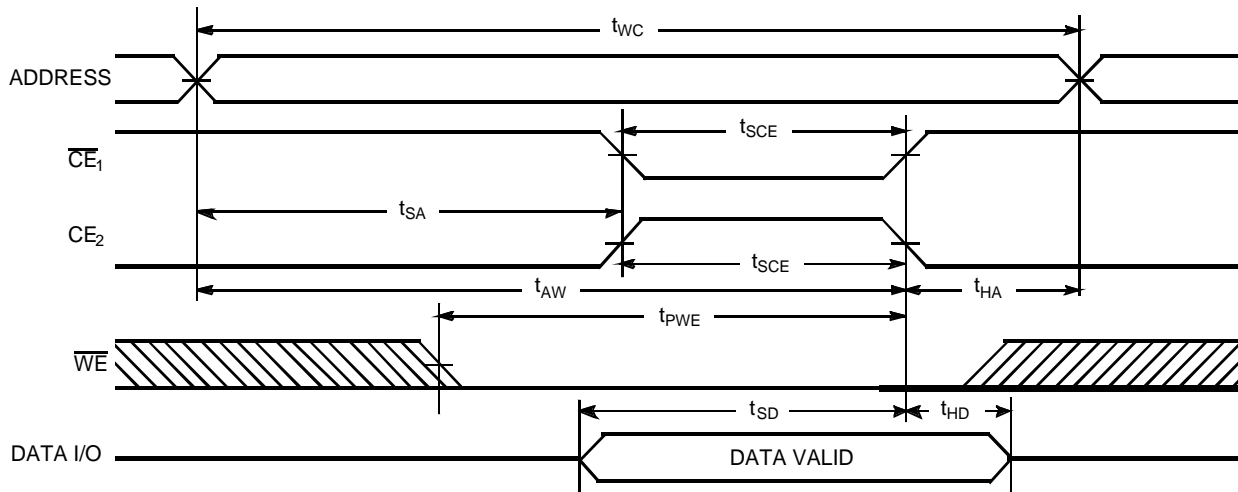


**Notes:**

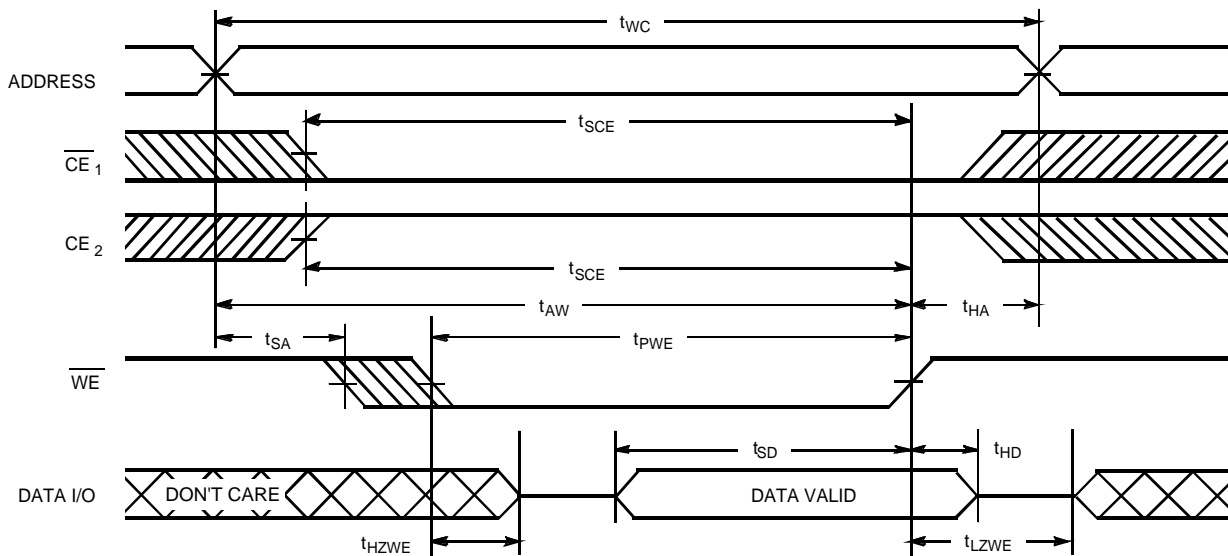
- 15. Address valid prior to or coincident with  $\overline{CE}_1$  transition LOW and  $CE_2$  transition HIGH.
- 16. Data I/O is high-impedance if  $\overline{OE} = V_{IH}$ .
- 17. If  $\overline{CE}_1$  goes HIGH or  $CE_2$  goes LOW simultaneously with  $\overline{WE}$  HIGH, the output remains in a high-impedance state.
- 18. During the DON'T CARE period in the DATA I/O waveform, the I/Os are in output state and input signals should not be applied.

Switching Waveforms (continued)

Write Cycle No. 2 ( $\overline{CE}_1$  or  $\overline{CE}_2$  Controlled)<sup>[12, 16, 17, 18]</sup>



Write Cycle No. 3 ( $\overline{WE}$  Controlled,  $\overline{OE}$  LOW)<sup>[10, 16, 17]</sup>



Truth Table

$\overline{CE}_1$	$\overline{CE}_2$	$\overline{WE}$	$\overline{OE}$	I/O <sub>0</sub> -I/O <sub>7</sub>	M <sub>ODE</sub>	Power
H	X	X	X	High Z	Deselet/Power-down	Standby (I <sub>SB</sub> )
X	L	X	X	High Z	Deselet/Power-down	Standby (I <sub>SB</sub> )
L	H	H	L	Data out	Read	Active (I <sub>CC</sub> )
L	H	H	H	High Z	Output Disabled	Active (I <sub>CC</sub> )
L	H	L	X	Data In	Write	Active (I <sub>CC</sub> )

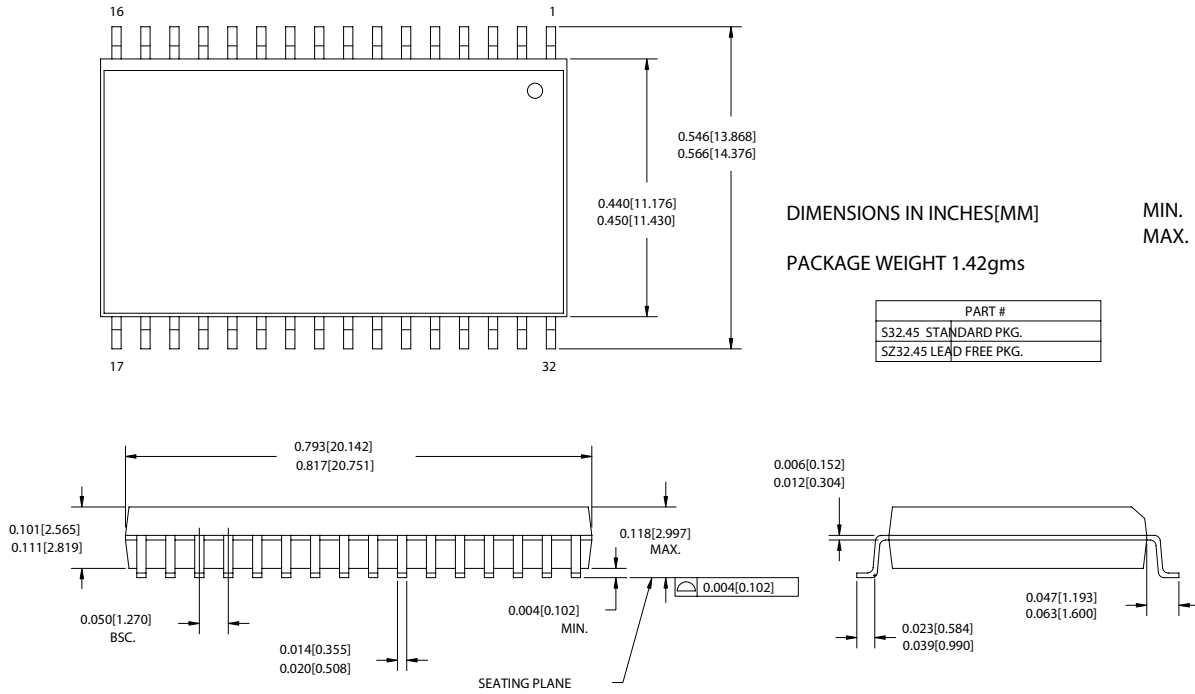
**Ordering Information**

Speed (ns)	Ordering Code	Package Diagram	Package Type	Operating Range
55	CY62128DV30L-55SI	51-85081	32-lead SOIC	Industrial
	CY62128DV30LL-55SI	51-85081	32-lead SOIC	
	CY62128DV30LL-55SXI	51-85081	32-lead SOIC (Pb-Free)	
	CY62128DV30L-55ZI	51-85056	32-lead TSOP Type 1	
	CY62128DV30LL-55ZI	51-85056	32-lead TSOP Type 1	
	CY62128DV30LL-55ZXI	51-85056	32-lead TSOP Type 1 (Pb-Free)	
	CY62128DV30L-55ZAI	51-85094	32-lead Small TSOP	
	CY62128DV30LL-55ZAI	51-85094	32-lead Small TSOP	
	CY62128DV30LL-55ZAXI	51-85094	32-lead Small TSOP (Pb-Free)	
	CY62128DV30L-55ZRI	51-85089	32-lead Reverse TSOP	
	CY62128DV30LL-55ZRI	51-85089	32-lead Reverse TSOP	
	CY62128DV30LL-55ZRXI	51-85089	32-lead Reverse TSOP	
	70	CY62128DV30L-70SI	51-85081	
CY62128DV30LL-70SI		51-85081	32-lead SOIC	
CY62128DV30LL-70SXI		51-85081	32-lead SOIC (Pb-Free)	
CY62128DV30L-70ZI		51-85056	32-lead TSOP Type 1	
CY62128DV30LL-70ZI		51-85056	32-lead TSOP Type 1	
CY62128DV30LL-70ZXI		51-85056	32-lead TSOP Type 1 (Pb-Free)	
CY62128DV30L-70ZAI		51-85094	32-lead Small TSOP	
CY62128DV30LL-70ZAI		51-85094	32-lead Small TSOP	
CY62128DV30LL-70ZAXI		51-85094	32-lead Small TSOP (Pb-Free)	
CY62128DV30L-70ZRI		51-85089	32-lead Reverse TSOP	
CY62128DV30LL-70ZRI		51-85089	32-lead Reverse TSOP	



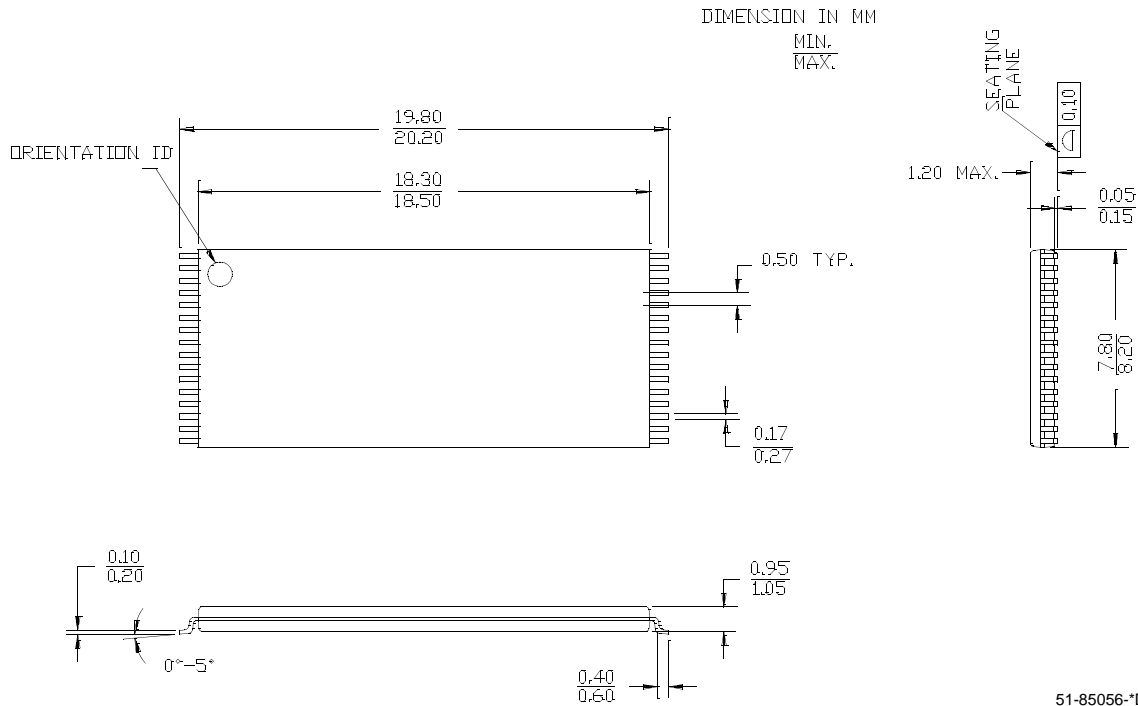
**Package Diagrams**

**32-Lead (450-Mil) SOIC (51-85081)**



51-85081-B

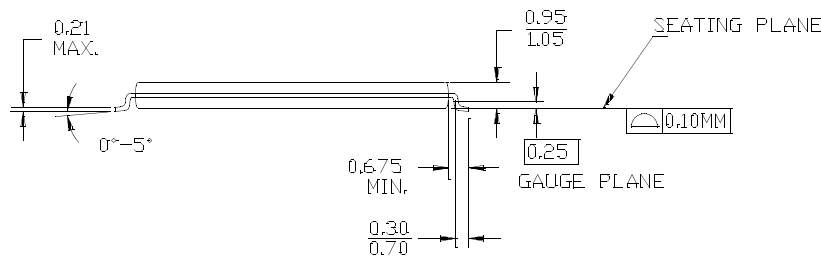
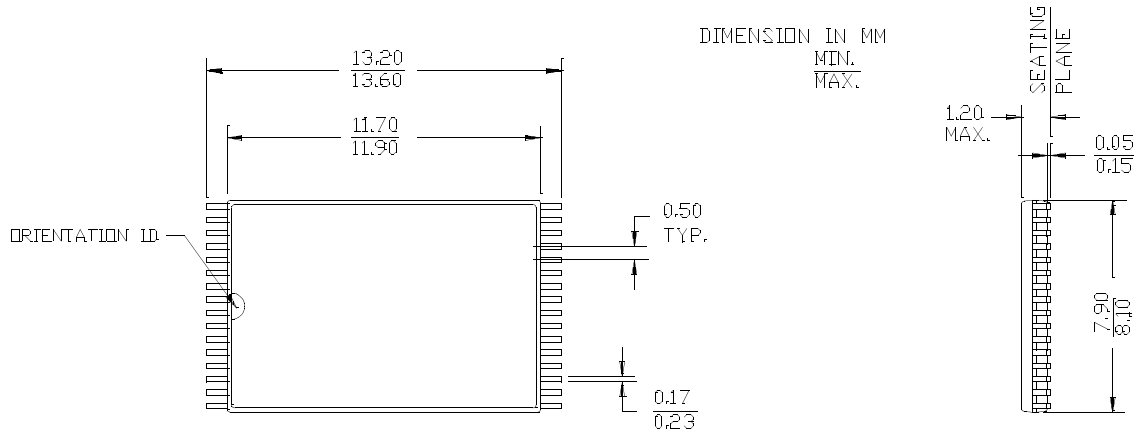
**32-Lead TSOP Type I (8 x 20 mm) (51-85056)**



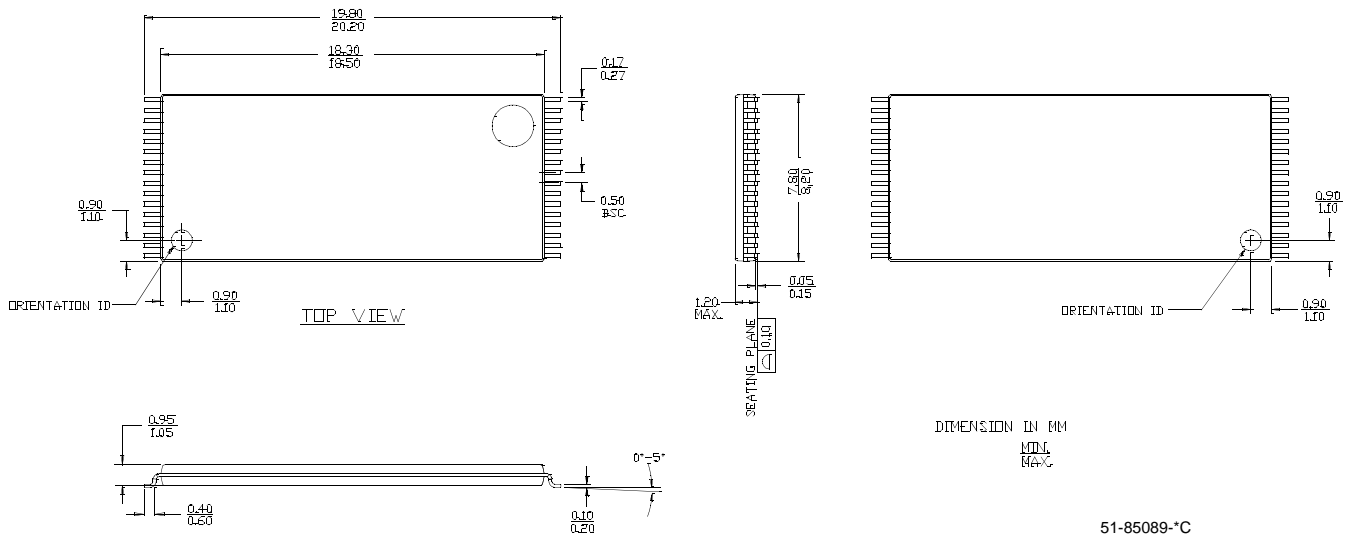
51-85056-D

**Package Diagrams** (continued)

**32-Lead STSOP (8 x 13.4 mm) (51-85094)**



**32-Lead RTSOP (51-85089)**



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**Document History Page**

Document Title: CY62128DV30 1-Mb (128K x 8) Static RAM				
Document Number: 38-05231				
REV.	ECN NO.	Issue Date	Orig. of Change	Description of Change
**	117691	08/27/02	JUI	New Data Sheet
*A	127314	5/27/03	MPR	Changed from Advance Information to Preliminary Changed Isb2 to 5 $\mu$ A (L), 4 $\mu$ A (LL) Changed Iccdr to 4 $\mu$ A (L), 3 $\mu$ A (LL) Changed Cin from 6 pF to 8 pF
*B	128342	07/23/03	JUI	Changed from Preliminary to Final Add 70-ns speed, updated ordering information
*C	129002	08/29/03	CDY	Changed Icc 1 MHz typ from 0.5 mA to 0.85 mA
*D	347394	See ECN	PCI	Added Lead-Free Packages in Ordering Information Table
*E	395936	See ECN	SYT	Changed address of Cypress Semiconductor Corporation on Page# 1 from "3901 North First Street" to "198 Champion Court" Corrected CE <sub>1</sub> and CE <sub>2</sub> waveforms on Write Cycle No.1 on Page# 6. Edited the Write Cycle No.1 switching waveform Data I/O to include Don't Care Condition on Page# 6 Updated the ordering information on Page # 8
*F	428906	See ECN	AJU	Added Thermal Resistance numbers for RTSOP package Updated Ordering Information table by replacing Package Name column with Package Diagram
*G	464721	See ECN	NXR	Updated the Block Diagram on page # 1
*H	470383	See ECN	NXR	Changed pin# 1 of SOIC and STSOP I, pin # 9 of TSOP I and RTSOP I from NC to DNU and added footnote# 3