CY62148DV30

4-Mbit (512K x 8) MoBL® Static RAM

Features

- Temperature Ranges
  - Industrial: –40 °C to 85 °C
- Very high speed: 55 ns
  - Wide voltage range: 2.20 V – 3.60 V
- Pin-compatible with CY62148CV25, CY62148CV30 and CY62148CV33
- Ultra low active power
  - Typical active current: 1.5 mA at f = 1 MHz
  - Typical active current: 8 mA at f = f_{max}(55-ns speed)
- Ultra low standby power
- Easy memory expansion with $\overline{CE}$, and $\overline{OE}$ features
- Automatic power-down when deselected
- Complementary metal oxide semiconductor (CMOS) for optimum speed/power
- Available in Pb-free 32-pin Small-outline integrated circuit (SOIC package)

Functional Description[1]

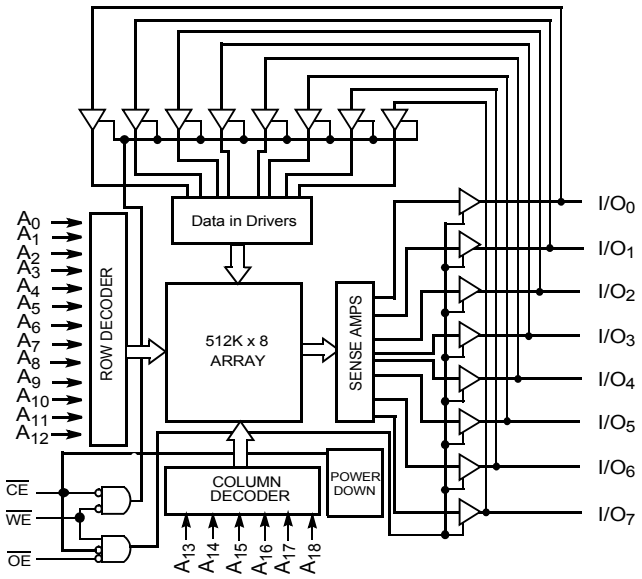
The CY62148DV30 is a high-performance CMOS static RAM organized as 512K words by 8 bits. This device features advanced circuit design to provide ultra-low active current. This is ideal for providing More Battery Life™ (MoBL®) in portable applications such as cellular telephones. The device also has an automatic power-down feature that significantly reduces power consumption. The device can be put into standby mode reducing power consumption when deselected ($\overline{CE}$ HIGH).The eight input and output pins (I/O_0 through I/O_7) are placed in a high-impedance state when:

- Deselected ($\overline{CE}$ HIGH)
- Outputs are disabled ($\overline{OE}$ HIGH)
- When the write operation is active($\overline{CE}$ LOW and $\overline{WE}$ LOW)

Write to the device by taking Chip Enable ($\overline{CE}$) and Write Enable ($\overline{WE}$) inputs LOW. 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_{18}).

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

Logic Block Diagram



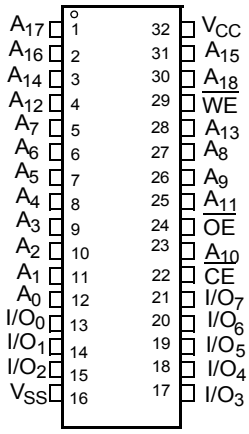
Note
1. For best practice recommendations, refer to the Cypress application note "*System Design Guidelines*" on http://www.cypress.com.

Contents

Pin Configuration

32-pin SOIC Pinout

Top View



Product Portfolio

Product	Range	V_{CC} Range (V)			Speed (ns)	Power Dissipation					
						Operating I_{CC} (mA)				Standby I_{SB2} (µA)	
						f = 1 MHz		f = f_{max}			
		Min	Typ[2]	Max		Typ[2]	Max	Typ[2]	Max	Typ[2]	Max
CY62148DV30LL	Industrial	2.2	3.0	3.6	55	1.5	3	8	10	2	8

Note
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.

Maximum Ratings

(Exceeding maximum ratings may impair the useful life of the device. 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 .....–0.3 V to $V_{CC(max)}$ + 0.3 V

DC voltage applied to outputs in High Z state[3, 4] .....–0.3 V to $V_{CC(max)}$ + 0.3 V

DC input voltage[3, 4].....–0.3 V to $V_{CC(max)}$ + 0.3 V

Output current into outputs (LOW) ..... 20 mA

Static discharge voltage..... > 2001V (per MIL-STD-883, method 3015)

Latch-up current .....> 200 mA

Operating Range

Product	Range	Ambient Temperature	V_{CC}[5]
CY62148DV30LL	Industrial	–40 °C to +85 °C	2.2 V to 3.6 V

Electrical Characteristics Over the Operating Range

Parameter	Description	Test Conditions		55 ns			Unit
				Min	Typ[2]	Max	
V_{OH}	Output HIGH voltage	I_{OH} = –0.1 mA	V_{CC} = 2.20 V	2.0	–	–	V
		I_{OH} = –1.0 mA	V_{CC} = 2.70 V	2.4	–	–	V
V_{OL}	Output LOW voltage	I_{OL} = 0.1 mA	V_{CC} = 2.20 V	–	–	0.4	V
		I_{OL} = 2.1 mA	V_{CC} = 2.70 V	–	–	0.4	V
V_{IH}	Input HIGH voltage	V_{CC} = 2.2 V to 2.7 V		1.8	–	V_{CC} + 0.3V	V
		V_{CC}= 2.7 V to 3.6 V		2.2	–	V_{CC} + 0.3V	V
V_{IL}	Input LOW voltage	V_{CC} = 2.2 V to 2.7 V		–0.3	–	0.6	V
		V_{CC}= 2.7 V to 3.6 V		–0.3	–	0.8	V
I_{IX}	Input leakage current	GND ≤ V_I ≤ V_{CC}		–1	–	+1	µA
I_{OZ}	Output leakage current	GND ≤ V_O ≤ V_{CC}, output disabled		–1	–	+1	µA
I_{CC}	V_{CC} operating supply current	f = f_{max} = $1/t_{RC}$	V_{CC} = $V_{CC(max)}$		8	10	mA
		f = 1 MHz	I_{OUT} = 0 mA CMOS levels	–	1.5	3	mA
I_{SB1}	Automatic CE Power-down current — CMOS inputs	$\overline{CE}$ ≥ V_{CC}–0.2 V, V_{IN}≥V_{CC}–0.2 V, V_{IN}≤0.2 V) f = f_{max} (address and data only), f = 0 ($\overline{OE}$, and $\overline{WE}$), V_{CC}=3.60 V		–	2	8	µA
I_{SB2}	Automatic CE Power-down current — CMOS inputs	$\overline{CE}$ ≥ V_{CC} – 0.2 V, V_{IN} ≥ V_{CC} – 0.2 V or V_{IN} ≤ 0.2 V, f = 0, V_{CC} = 3.60 V		–	2	8	µA

Notes

3. $V_{IL(min)}$ = –2.0 V for pulse durations less than 20 ns.
4. $V_{IH(max)}$ = V_{CC}+0.75 V for pulse durations less than 20 ns.
5. Full device AC operation assumes a 100 µs ramp time from 0 to $V_{CC(min)}$ and 200 µs wait time after V_{CC} stabilization.

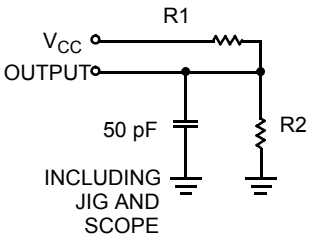
Capacitance

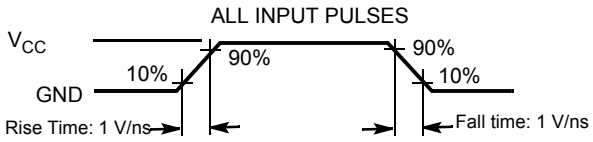
Parameter[6]	Description	Test Conditions	Max	Unit
C_{IN}	Input capacitance	T_A = 25 °C, f = 1 MHz, V_{CC} = $V_{CC(typ)}$	10	pF
C_{OUT}	Output capacitance		10	pF

Thermal Resistance

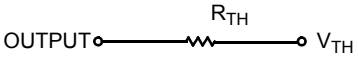
Parameter[6]	Description	Test Conditions	SOIC	Unit
Θ_{JA}	Thermal resistance (Junction to ambient)	Still air, soldered on a 3 x 4.5 inch, four-layer printed circuit board	55	°C/W
Θ_{JC}	Thermal resistance (Junction to case)		22	°C/W

AC Test Loads and Waveforms





Equivalent to: THÉVENIN EQUIVALENT

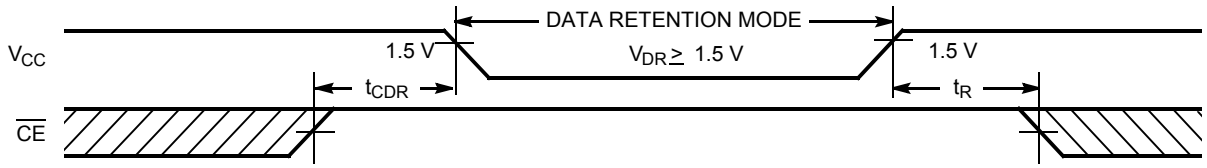


Parameters	2.5 V (2.2 V – 2.7 V)	3.0 V (2.7 V – 3.6 V)	Unit
R1	16667	1103	Ω
R2	15385	1554	Ω
R_{TH}	8000	645	Ω
V_{TH}	1.20	1.75	V

Data Retention Characteristics (Over the Operating Range)

Parameter	Description	Conditions	Min	Typ[7]	Max	Unit
V_{DR}	V_{CC} for data retention		1.5	–	–	V
I_{CCDR}	Data retention current	V_{CC} = 1.5 V, $\overline{CE} \geq V_{CC} - 0.2$ V, $V_{IN} \geq V_{CC} - 0.2$ V or $V_{IN} \leq 0.2$ V	–		6	µA
t_{CDR}[6]	Chip deselect to data retention time		0	–	–	ns
t_R[8]	Operation recovery time		55	–	–	ns

Data Retention Waveform



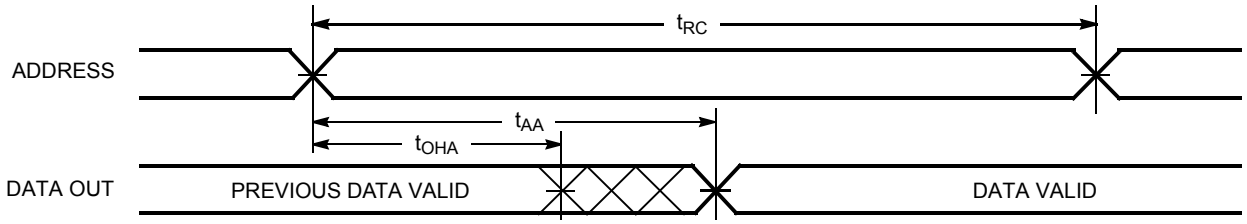
Notes
6. Tested initially and after any design or process changes that may affect these parameters.
7. Typical values are included for reference only and are not guaranteed or tested. Typical values are measured at V_{CC} = $V_{CC(typ)}$, T_A = 25 °C
8. Full Device AC operation requires linear V_{CC} ramp from V_{DR} to $V_{CC(min)} \geq 100$ µs or stable at $V_{CC(min)} \geq 100$ µs.

Switching Characteristics (Over the Operating Range)

Parameter[9]	Description	55 ns		Unit
		Min	Max	
Read Cycle				
t_{RC}	Read cycle time	55	–	ns
t_{AA}	Address to data valid	–	55	ns
t_{OHA}	Data hold from address change	10	–	ns
t_{ACE}	$\overline{CE}$ LOW to data valid	–	55	ns
t_{DOE}	$\overline{OE}$ LOW to data valid	–	25	ns
t_{LZOE}	$\overline{OE}$ LOW to Low Z[10]	5	–	ns
t_{HZOE}	$\overline{OE}$ HIGH to High Z[10,11]	–	20	ns
t_{LZCE}	$\overline{CE}$ LOW to Low Z[10]	10	–	ns
t_{HZCE}	$\overline{CE}$ HIGH to High Z[10, 11]	–	20	ns
t_{PU}	$\overline{CE}$ LOW to power-up	0	–	ns
t_{PD}	$\overline{CE}$ HIGH to power-up	–	55	ns
Write Cycle[12]				
t_{WC}	Write cycle time	55	–	ns
t_{SCE}	$\overline{CE}$ LOW to write end	40	–	ns
t_{AW}	Address set-up to write end	40	–	ns
t_{HA}	Address hold from write end	0	–	ns
t_{SA}	Address set-up to write start	0	–	ns
t_{PWE}	$\overline{WE}$ pulse width	40	–	ns
t_{SD}	Data set-up to write end	25	–	ns
t_{HD}	Data hold from write end	0	–	ns
t_{HZWE}	$\overline{WE}$ LOW to High Z[10, 11]	–	20	ns
t_{LZWE}	$\overline{WE}$ HIGH to Low Z[10]	10	–	ns

Switching Waveforms

Figure 1. Read Cycle No. 1 (Address Transition Controlled)[13, 14]



Notes

9. Test Conditions for all parameters other than three-state parameters assume signal transition time of 3 ns or less (1 V/ns), 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}/I_{OH} as shown in the "AC Test Loads and Waveforms" on page 5.
10. 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.
11. t_{HZOE}, t_{HZCE}, and t_{HZWE} transitions are measured when the output enter a high impedance state.
12. The internal write time of the memory is defined by the overlap of $\overline{WE}$, $\overline{CE}$ = V_{IL}. All signals must be ACTIVE to initiate a write and any of these signals can terminate a write by going INACTIVE. The data input set-up and hold timing should be referenced to the edge of the signal that terminates the write.
13. Device is continuously selected. $\overline{OE}$, $\overline{CE}$ = V_{IL}.
14. $\overline{WE}$ is HIGH for read cycle.

Switching Waveforms (continued)

Figure 2. Read Cycle No. 2 ($\overline{OE}$ Controlled)[15, 16]

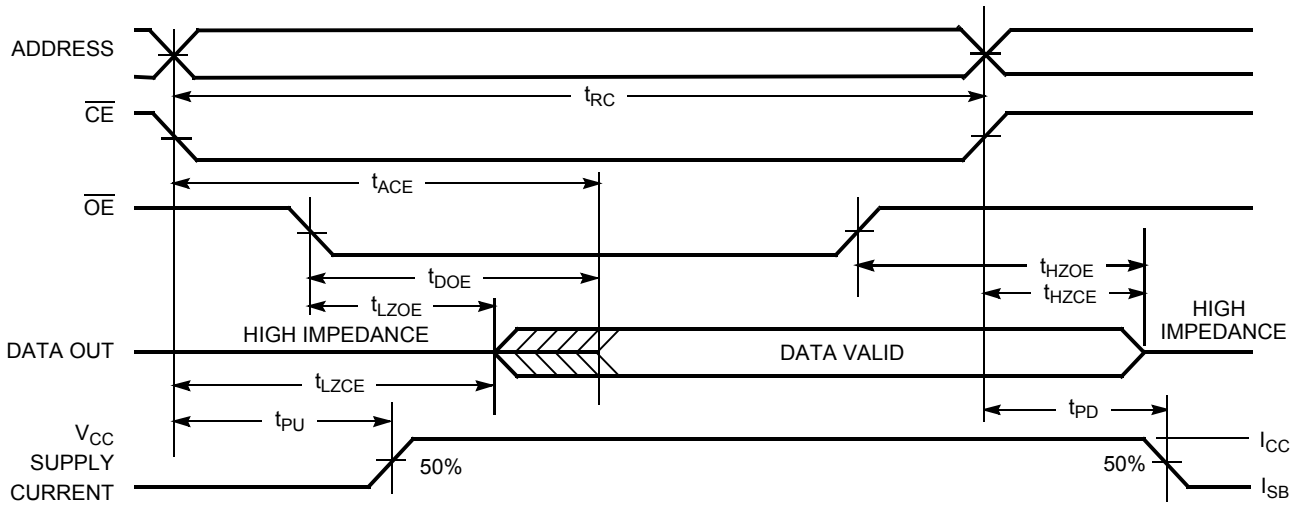
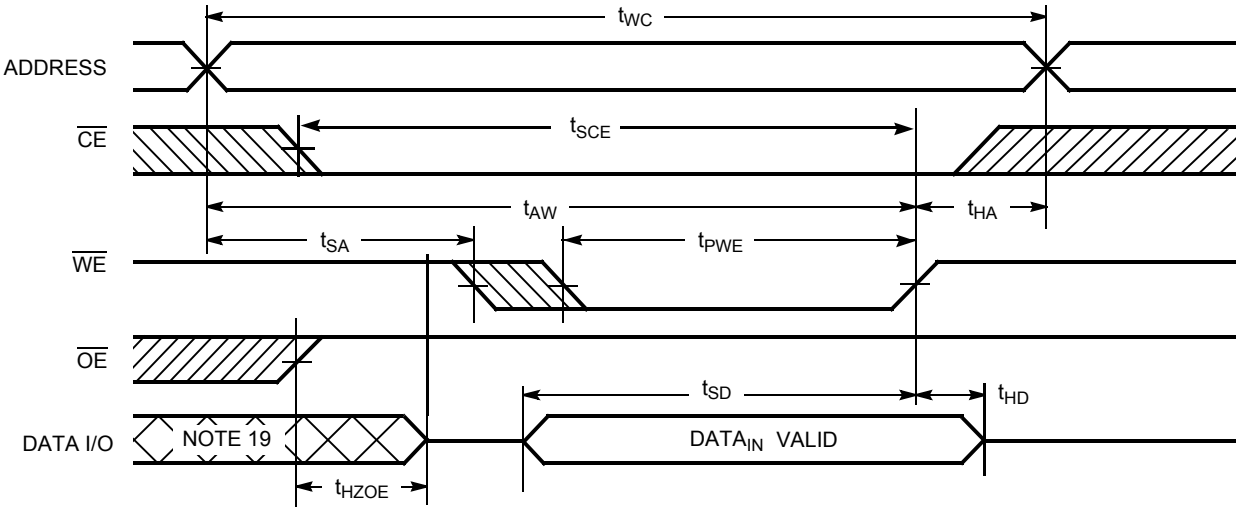


Figure 3. Write Cycle No. 1 ($\overline{WE}$ Controlled)[17, 18]



Notes
15. $\overline{WE}$ is HIGH for read cycle.
16. Address valid prior to or coincident with $\overline{CE}$ transition LOW.
17. Data I/O is high impedance if $\overline{OE}$ = V_{IH}.
18. If $\overline{CE}$ goes HIGH simultaneously with $\overline{WE}$ HIGH, the output remains in high-impedance state.
19. During this period, the I/Os are in output state and input signals should not be applied.

Switching Waveforms (continued)

Figure 4. Write Cycle No. 2 ($\overline{CE}$ Controlled)[20, 21]

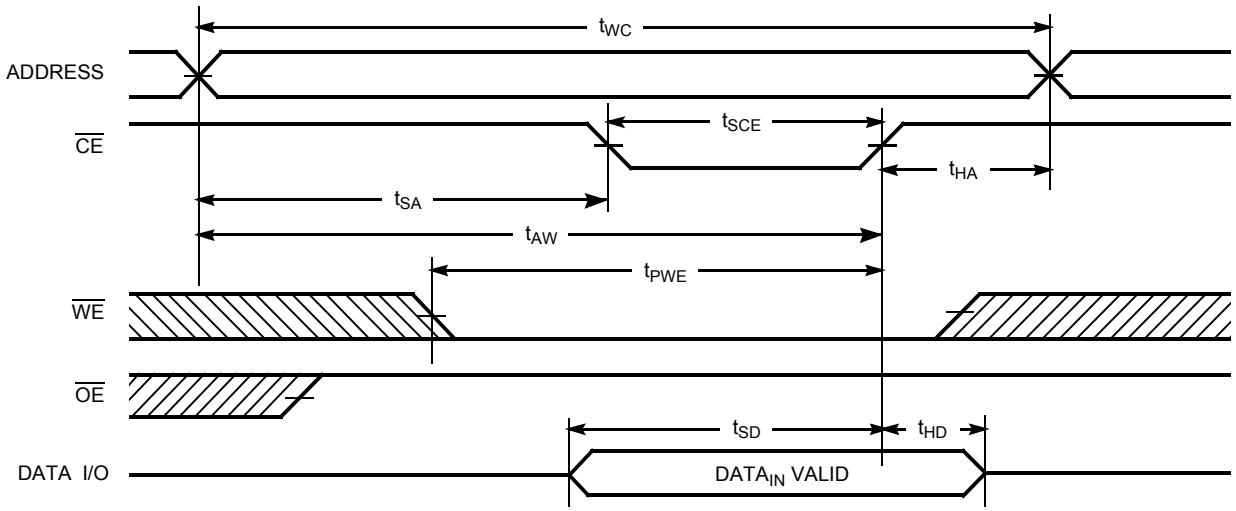
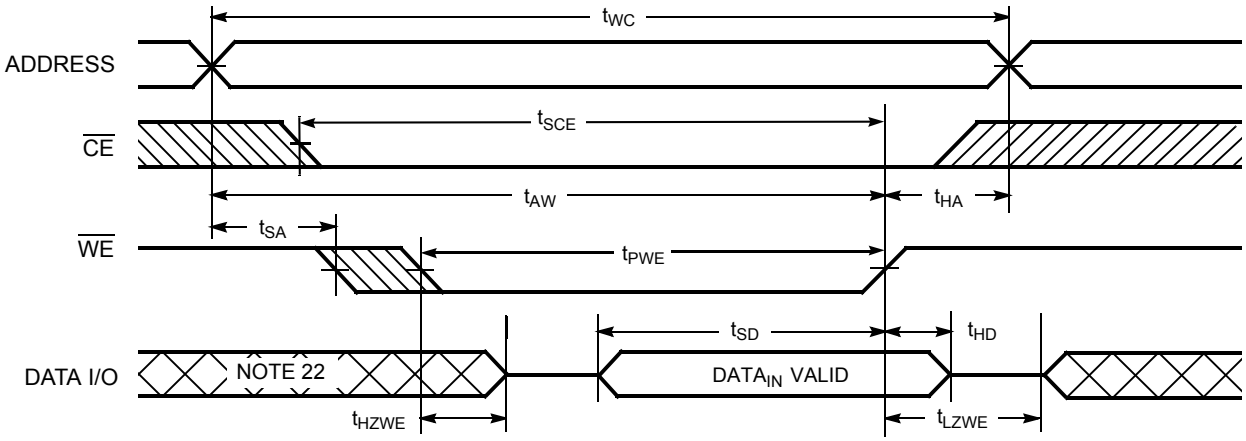


Figure 5. Write Cycle No. 3 ($\overline{WE}$ Controlled, $\overline{OE}$ LOW)[21]



Truth Table

$\overline{CE}$	$\overline{WE}$	$\overline{OE}$	Inputs/Outputs	Mode	Power
H	X	X	High Z	Deselect/Power-down	Standby (I_{SB})
L	H	L	Data out (I/O_0-I/O_7)	Read	Active (I_{CC})
L	H	H	High Z	Output disabled	Active (Icc)
L	L	X	Data in (I/O_0-I/O_7)	Write	Active (Icc)

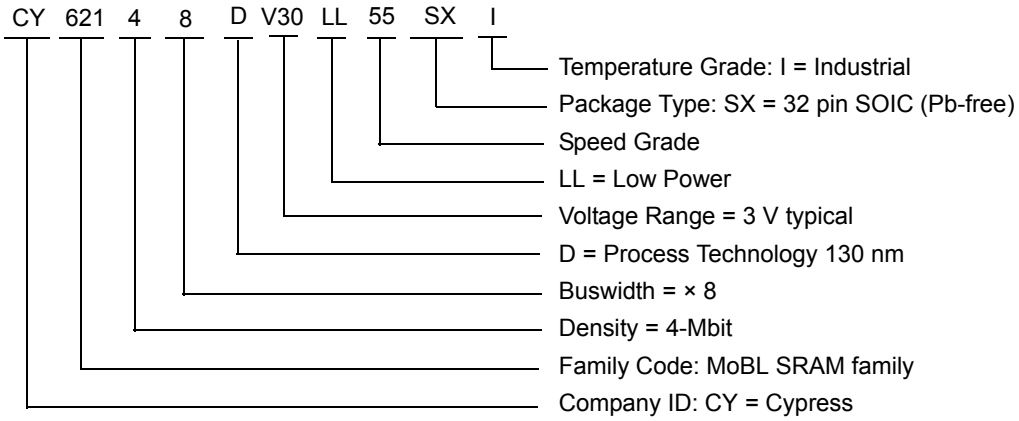
Notes
20. Data I/O is high impedance if $\overline{OE}$ = V_{IH}.
21. If $\overline{CE}$ goes HIGH simultaneously with $\overline{WE}$ HIGH, the output remains in high-impedance state.
22. During this period, the I/Os are in output state and input signals should not be applied.

Ordering Information

Speed (ns)	Ordering Code	Package Diagram	Package Type	Operating Range
55	CY62148DV30LL-55SXI	51-85081	32-pin SOIC (Pb-free)	Industrial

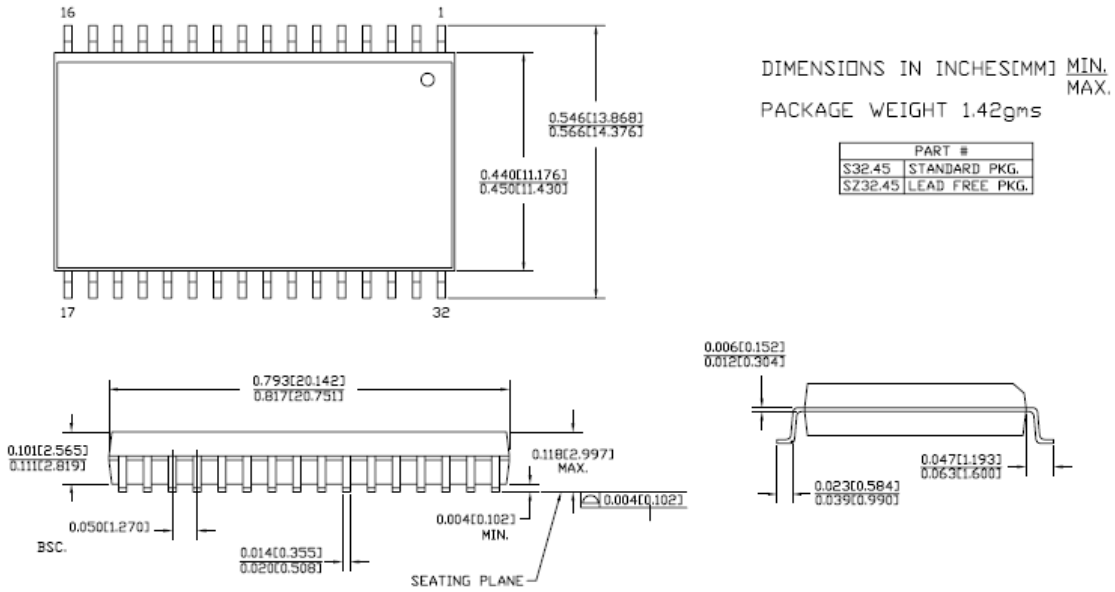
Contact your local Cypress sales representative for availability of these parts

Ordering Code Definition



Package Diagrams

32-pin (450 MIL) Molded SOIC, 51-85081



51-85081 *C

Acronyms

Acronym	Description
CMOS	complementary metal oxide semiconductor
I/O	input/output
MoBL	more battery life
SOIC	small-outline integrated circuit
SRAM	static random access memory

Document Conventions

Units of Measure

Symbol	Unit of Measure
ns	nano seconds
V	volts
µA	micro amperes
mA	milli amperes
pF	pico Farad
°C	degree Celsius
W	watts

Document History Page

Document Title:CY62148DV30, 4-Mbit (512K x 8) MoBL® Static RAM Document Number: 38-05341				
REV.	**ECN NO.**	**Issue Date**	**Orig. of Change**	**Description of Change**
**	127480	06/17/03	HRT	Created new data sheet
*A	131041	01/23/04	CBD	Changed from Advance to Preliminary
*B	222180	See ECN	AJU	Changed from Preliminary to Final Added 70 ns speed bin Modified footnote #6 and #12 Removed MAX value for V_{DR} on “Data Retention Characteristics” table Modified input and output capacitance values Added Pb-free ordering information Removed 32-pin STSOP package
*C	498575	See ECN	NXR	Added Automotive-A Operating Range Removed SOIC package from Product Offering Updated Ordering Information Table
*D	729917	See ECN	VKN	Added SOIC package and its related information Updated Ordering Information Table
*E	2896036	03/19/10	AJU	Removed inactive parts from Ordering Information. Added Table of Contents. Updated Packaging Information Updated links in Sales, Solutions, and Legal Information.
*F	3166059	02/08/2011	RAME	Removed Automotive related info Removed 70 ns speed bin related info Remove TSOP and VFBGA package related info Updated as per new template Added Acronyms and Units of Measure table Added Ordering Code Definitiondetails

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