

Features

- High speed
 - $t_{AA} = 10 \text{ ns}$
- Low active power
 - $I_{CC} = 175 \text{ mA}$ at 100 MHz
- Low CMOS standby power
 - $I_{SB2} = 25 \text{ mA}$
- Operating voltages of $3.3 \pm 0.3 \text{ V}$
- 2.0 V data retention
- Automatic Power-down when deselected
- TTL compatible inputs and outputs
- Easy memory expansion with \overline{CE} and \overline{OE} features
- Available in Pb-free 54-pin TSOP II package

Functional Description

The CY7C10612DV33 is a high performance CMOS Static RAM organized as 1,048,576 words by 16 bits.

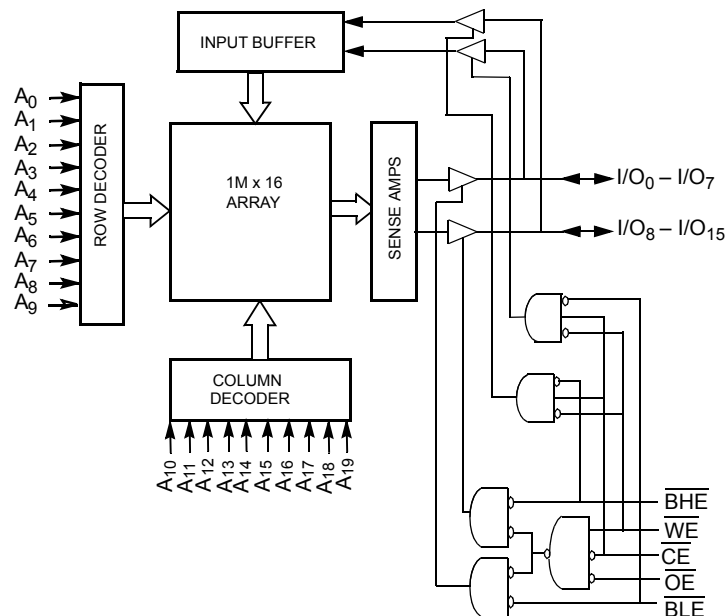
To write to the device, take Chip Enables (\overline{CE}) and Write Enable (\overline{WE}) input LOW. If Byte Low Enable (\overline{BLE}) is LOW, then data from I/O pins (I/O_0 through I/O_7), is written into the location specified on the address pins (A_0 through A_{19}). If Byte High Enable (\overline{BHE}) is LOW, then data from I/O pins (I/O_8 through I/O_{15}) is written into the location specified on the address pins (A_0 through A_{19}).

To read from the device, take Chip Enables (\overline{CE}) and Output Enable (\overline{OE}) LOW while forcing the Write Enable (\overline{WE}) HIGH. If Byte Low Enable (\overline{BLE}) is LOW, then data from the memory location specified by the address pins appears on I/O_0 to I/O_7 . If Byte High Enable (\overline{BHE}) is LOW, then data from memory appears on I/O_8 to I/O_{15} . See Truth Table on page 10 for a complete description of Read and Write modes.

The input or output pins (I/O_0 through I/O_{15}) are placed in a high impedance state when the device is deselected (\overline{CE} HIGH), the outputs are disabled (\overline{OE} HIGH), the \overline{BHE} and \overline{BLE} are disabled (\overline{BHE} , \overline{BLE} HIGH), or during a write operation (\overline{CE} LOW and \overline{WE} LOW).

The CY7C10612DV33 is available in a 54-pin TSOP II package with center power and ground (revolutionary) pinout.

Logic Block Diagram



Contents

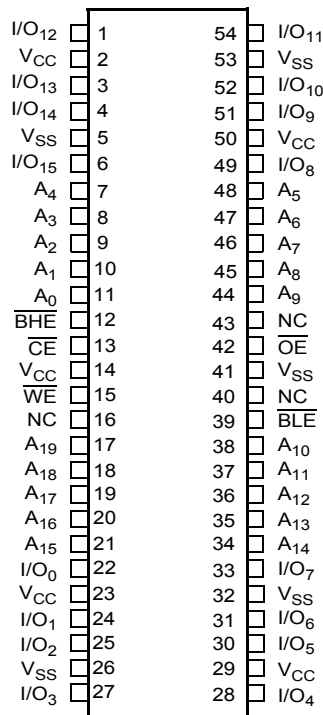
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Selection Guide

Description	-10	Unit
Maximum Access Time	10	ns
Maximum Operating Current	175	mA
Maximum CMOS Standby Current	25	mA

Pin Configuration

Figure 1. 54-pin TSOP II (Top View) [1]



Note

1. NC pins are not connected on the die.

Maximum Ratings

Exceeding maximum ratings may shorten the useful life of the device. User guidelines are not tested.

Storage Temperature	-65 °C to +150 °C
Ambient Temperature with Power Applied	-55 °C to +125 °C
Supply Voltage on V_{CC} Relative to GND [2]	-0.5 V to +4.6 V
DC Voltage Applied to Outputs in High Z State [2]	-0.5 V to $V_{CC} + 0.5$ V

DC Input Voltage [2]	-0.5 V to $V_{CC} + 0.5$ V
Current into Outputs (LOW)	20 mA
Static Discharge Voltage (MIL-STD-883, Method 3015)	> 2001 V
Latch Up Current	> 200 mA

Operating Range

Range	Ambient Temperature	V_{CC}
Industrial	-40 °C to +85 °C	3.3 V ± 0.3 V

DC Electrical Characteristics

Over the Operating Range

Parameter	Description	Test Conditions	-10		Unit
			Min	Max	
V_{OH}	Output HIGH voltage	Min V_{CC} , $I_{OH} = -4.0$ mA	2.4	-	V
V_{OL}	Output LOW voltage	Min V_{CC} , $I_{OL} = 8.0$ mA	-	0.4	V
V_{IH}	Input HIGH voltage		2.0	$V_{CC} + 0.3$	V
V_{IL}	Input LOW voltage [2]		-0.3	0.8	V
I_{IX}	Input leakage current	$GND \leq V_{IN} \leq V_{CC}$	-1	+1	μA
I_{OZ}	Output leakage current	$GND \leq V_{OUT} \leq V_{CC}$, Output disabled	-1	+1	μA
I_{CC}	V_{CC} operating supply current	$V_{CC} = \text{Max}$, $f = f_{MAX} = 1/t_{RC}$, $I_{OUT} = 0$ mA, CMOS levels	-	175	mA
I_{SB1}	Automatic CE power-down current – TTL inputs	Max V_{CC} , $\overline{CE} \geq V_{IH}$, $V_{IN} \geq V_{IH}$ or $V_{IN} \leq V_{IL}$, $f = f_{MAX}$	-	30	mA
I_{SB2}	Automatic CE power-down current – CMOS Inputs	Max V_{CC} , $\overline{CE} \geq V_{CC} - 0.3$ V, $V_{IN} \geq V_{CC} - 0.3$ V, or $V_{IN} \leq 0.3$ V, $f = 0$	-	25	mA

Capacitance

Parameter [3]	Description	Test Conditions	54-pin TSOP II	Unit
C_{IN}	Input capacitance	$T_A = 25$ °C, $f = 1$ MHz, $V_{CC} = 3.3$ V	6	pF
C_{OUT}	I/O capacitance		8	pF

Thermal Resistance

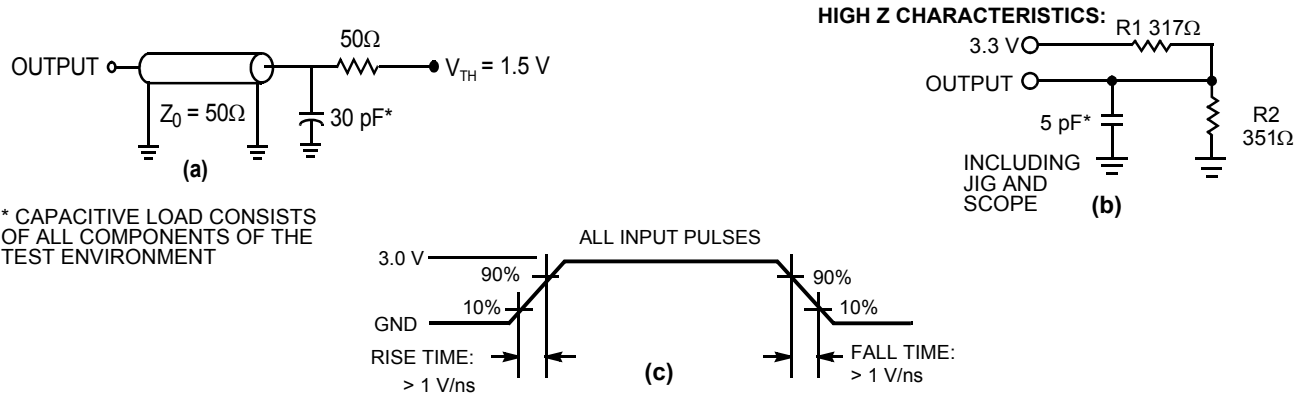
Parameter [3]	Description	Test Conditions	54-pin TSOP II	Unit
Θ_{JA}	Thermal resistance (junction to ambient)	Still air, soldered on a 3 × 4.5 inch, four layer printed circuit board	24.18	°C/W
Θ_{JC}	Thermal resistance (junction to case)		5.40	°C/W

Note

- $V_{IL(\min)} = -2.0$ V and $V_{IH(\max)} = V_{CC} + 2$ V for pulse durations of less than 20 ns.
- Tested initially and after any design or process changes that may affect these parameters.

AC Test Loads and Waveforms

Figure 2. AC Test Loads and Waveforms [4]



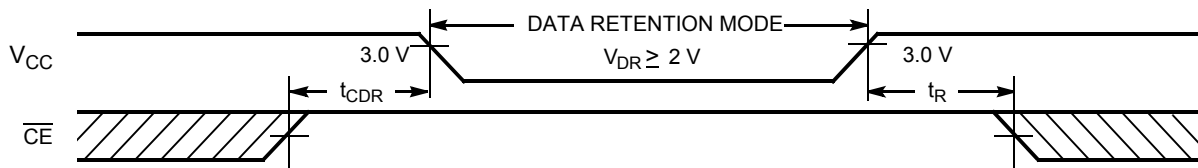
Data Retention Characteristics

Over the Operating Range

Parameter	Description	Conditions	Min	Typ [5]	Max	Unit
V_{DR}	V_{CC} for data retention		2	–	–	V
I_{CCDR}	Data retention current	$V_{CC} = 2\text{ V}$, $\overline{CE} \geq V_{CC} - 0.2\text{ V}$, $V_{IN} \geq V_{CC} - 0.2\text{ V}$ or $V_{IN} \leq 0.2\text{ V}$	–	–	25	mA
$t_{CDR}^{[6]}$	Chip deselect to data retention time		0	–	–	ns
$t_R^{[7]}$	Operation recovery time		t_{RC}	–	–	ns

Data Retention Waveform

Figure 3. Data Retention Waveform



Notes

- 4. Valid SRAM operation does not occur until the power supplies have reached the minimum operating V_{DD} (3.0 V). 100 μs (t_{power}) after reaching the minimum operating V_{DD} , normal SRAM operation begins including reduction in V_{DD} to the data retention (V_{CCDR} , 2.0 V) voltage.
- 5. Typical values are included for reference only and are not guaranteed or tested. Typical values are measured at $V_{CC} = V_{CC(typ)}$, $T_A = 25\text{ }^\circ\text{C}$.
- 6. Tested initially and after any design or process changes that may affect these parameters.
- 7. Full device operation requires linear V_{CC} ramp from V_{DR} to $V_{CC(min.)} \geq 50\text{ }\mu\text{s}$ or stable at $V_{CC(min.)} \geq 50\text{ }\mu\text{s}$.

AC Switching Characteristics

Over the Operating Range

Parameter ^[4]	Description	-10		Unit
		Min	Max	
Read Cycle				
t_{power}	V_{CC} (typical) to the first access ^[5]	100	–	μ s
t_{RC}	Read cycle time	10	–	ns
t_{AA}	Address to data valid	–	10	ns
t_{OHA}	Data hold from address change	3	–	ns
t_{ACE}	\overline{CE} LOW to data valid	–	10	ns
t_{DOE}	\overline{OE} LOW to data valid	–	5	ns
t_{LZOE}	\overline{OE} LOW to low Z	1	–	ns
t_{HZOE}	\overline{OE} HIGH to high Z ^[6]	–	5	ns
t_{LZCE}	\overline{CE} LOW to low Z ^[6]	3	–	ns
t_{HZCE}	\overline{CE} HIGH to high Z ^[6]	–	5	ns
t_{PU}	\overline{CE} LOW to power-up ^[7]	0	–	ns
t_{PD}	\overline{CE} HIGH to power-down ^[7]	–	10	ns
t_{DBE}	Byte enable to data valid	–	5	ns
t_{LZBE}	Byte enable to low Z	1	–	ns
t_{HZBE}	Byte disable to high Z	–	5	ns
Write Cycle ^[8, 9]				
t_{WC}	Write cycle time	10	–	ns
t_{SCE}	\overline{CE} LOW to write end	7	–	ns
t_{AW}	Address setup to write end	7	–	ns
t_{HA}	Address hold from write end	0	–	ns
t_{SA}	Address setup to write start	0	–	ns
t_{PWE}	\overline{WE} pulse width	7	–	ns
t_{SD}	Data setup to write end	5.5	–	ns
t_{HD}	Data hold from write end	0	–	ns
t_{LZWE}	\overline{WE} HIGH to low Z ^[6]	3	–	ns
t_{HZWE}	\overline{WE} LOW to high Z ^[6]	–	5	ns
t_{BW}	Byte enable to end of write	7	–	ns

Notes

- Test conditions assume signal transition time of 3 ns or less, timing reference levels of 1.5 V, and input pulse levels of 0 to 3.0 V. Test conditions for the read cycle use output loading shown in part a) of Figure 2 on page 5, unless specified otherwise.
- t_{POWER} gives the minimum amount of time that the power supply is at typical V_{CC} values until the first memory access is performed.
- t_{HZOE} , t_{HZCE} , t_{HZWE} , t_{HZBE} , t_{LZOE} , t_{LZCE} , t_{LZWE} , and t_{LZBE} are specified with a load capacitance of 5 pF as in (b) of Figure 2 on page 5. Transition is measured ± 200 mV from steady state voltage.
- These parameters are guaranteed by design and are not tested.
- The internal write time of the memory is defined by the overlap of \overline{WE} , $\overline{CE} = V_{IL}$. Chip enable must be active and \overline{WE} and byte enables must be LOW to initiate a write, and the transition of any of these signals can terminate. The input data setup and hold timing should be referenced to the edge of the signal that terminates the write.
- The minimum write cycle time for Write Cycle No. 2 (\overline{WE} controlled, \overline{OE} LOW) is the sum of t_{HZWE} and t_{SD} .

Switching Waveforms

Figure 4. Read Cycle No. 1 (Address Transition Controlled) [10, 11]

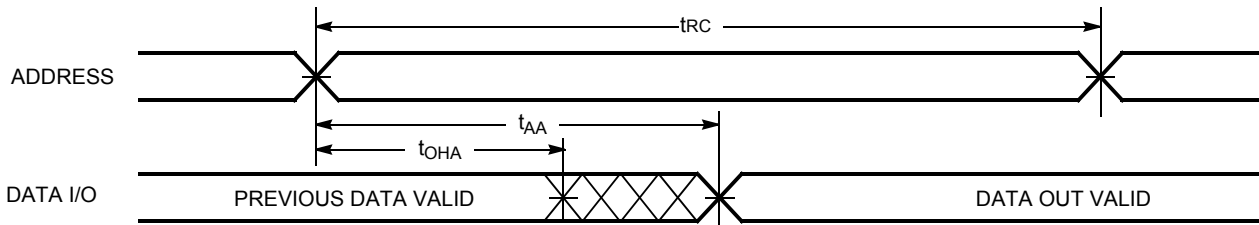
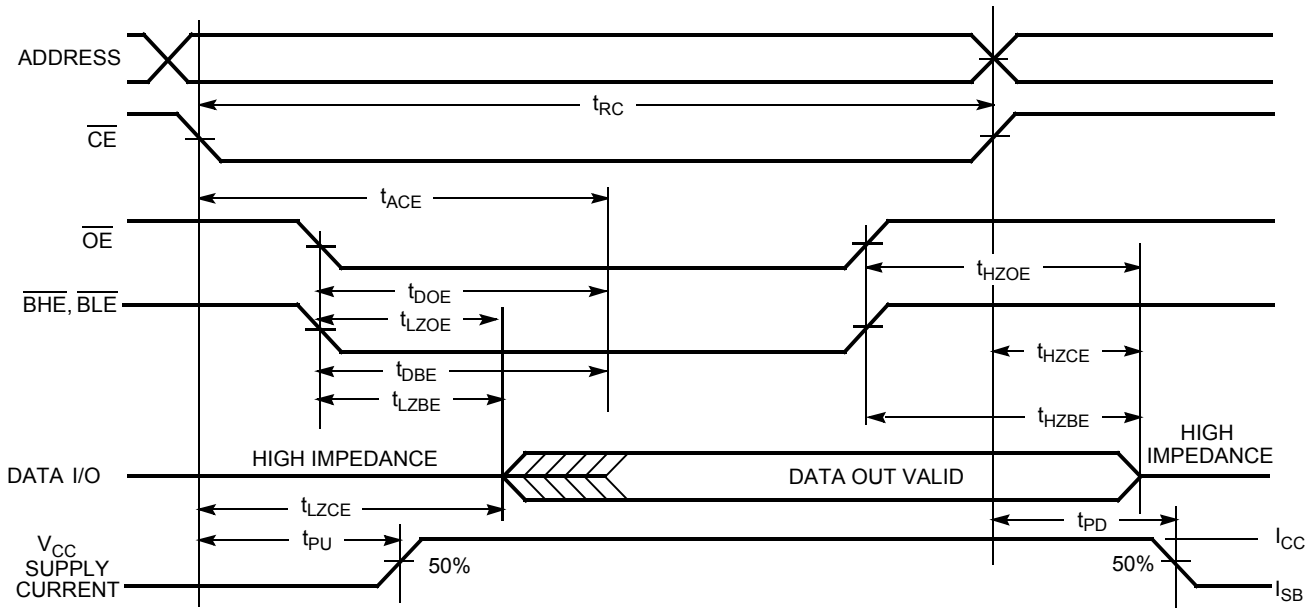


Figure 5. Read Cycle No. 2 (\overline{OE} Controlled) [11, 12]



Notes

- 10. The device is continuously selected. \overline{OE} , \overline{CE} = V_{IL} , \overline{BHE} , \overline{BLE} or both = V_{IL} .
- 11. \overline{WE} is HIGH for read cycle.
- 12. Address valid before or similar to \overline{CE} transition LOW.

Switching Waveforms (continued)

Figure 6. Write Cycle No. 1 ($\overline{\text{CE}}$ Controlled) [13, 14]

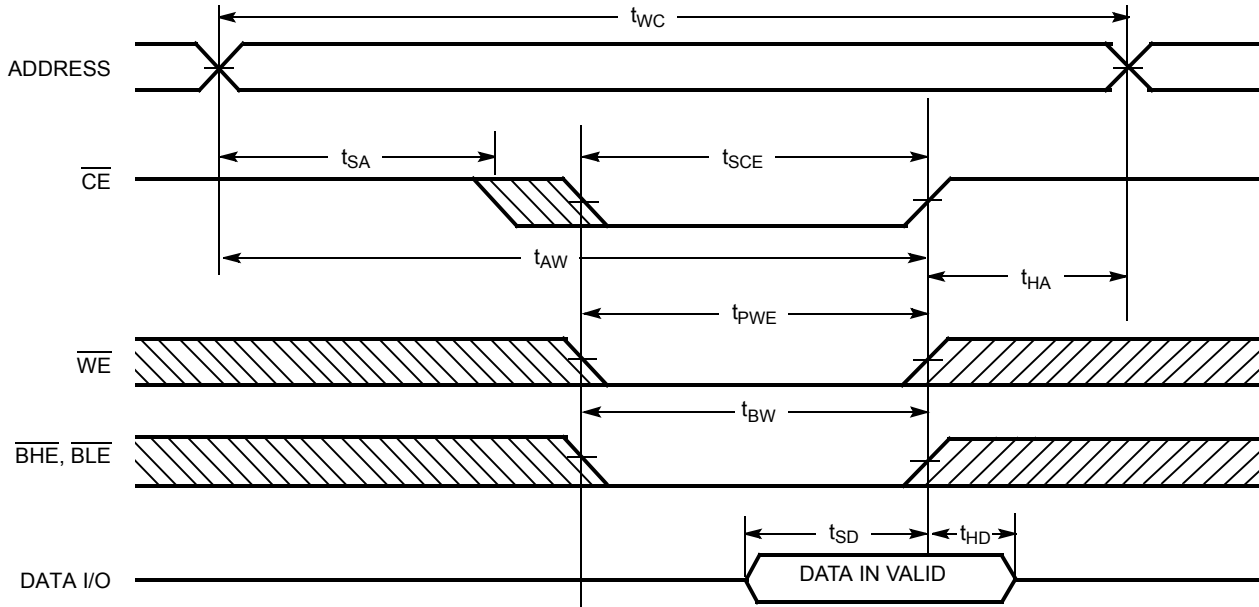
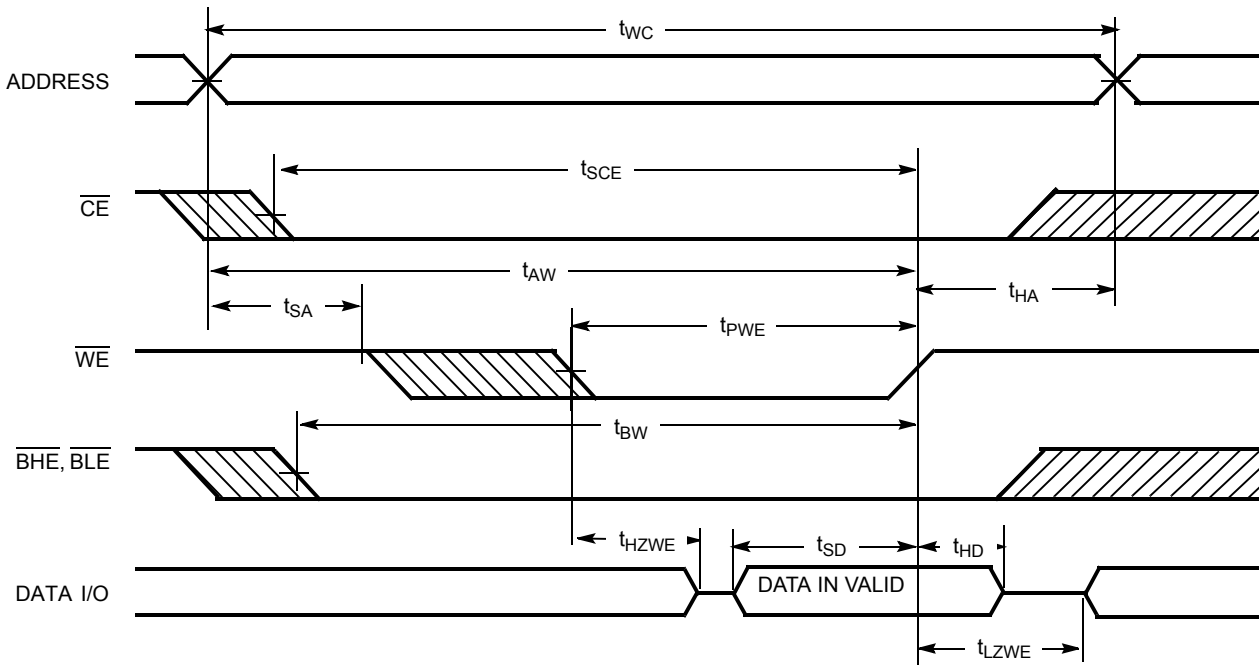


Figure 7. Write Cycle No. 2 ($\overline{\text{WE}}$ Controlled, $\overline{\text{OE}}$ LOW) [13, 14]

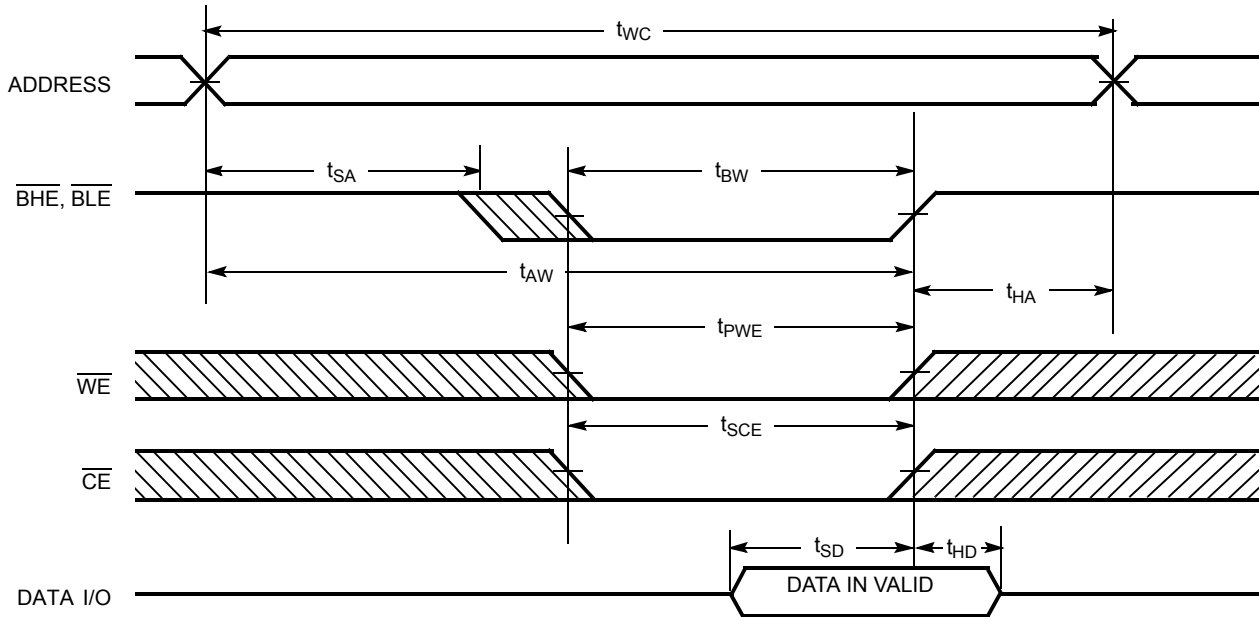


Notes

- 13. Data I/O is high impedance if $\overline{\text{OE}}$, $\overline{\text{BHE}}$, and/or $\overline{\text{BLE}} = V_{IH}$.
- 14. If $\overline{\text{CE}}$ goes HIGH simultaneously with $\overline{\text{WE}}$ going HIGH, the output remains in a high impedance state.

Switching Waveforms (continued)

Figure 8. Write Cycle No. 3 ($\overline{\text{BLE}}$ or $\overline{\text{BHE}}$ Controlled) ^[15]



Note

15. Data I/O is high impedance if $\overline{\text{OE}}$, $\overline{\text{BHE}}$, and/or $\overline{\text{BLE}} = V_{IH}$.

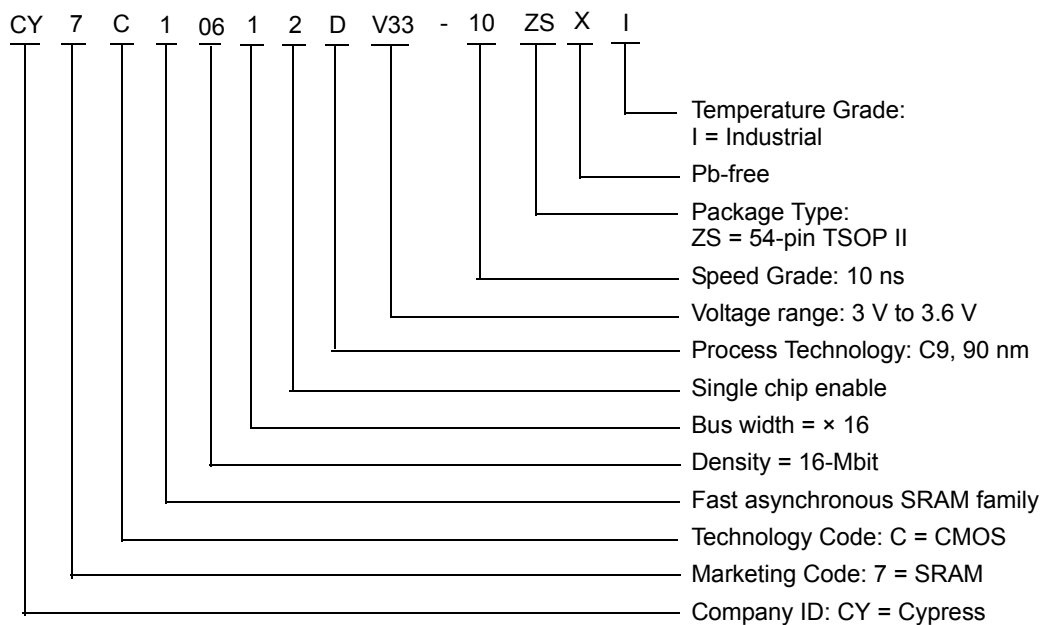
Truth Table

\overline{CE}	\overline{OE}	\overline{WE}	\overline{BLE}	\overline{BHE}	I/O ₀ -I/O ₇	I/O ₈ -I/O ₁₅	Mode	Power
H	X	X	X	X	High Z	High Z	Power-down	Standby (I _{SB})
L	L	H	L	L	Data Out	Data Out	Read all bits	Active (I _{CC})
L	L	H	L	H	Data Out	High Z	Read lower bits only	Active (I _{CC})
L	L	H	H	L	High Z	Data Out	Read upper bits only	Active (I _{CC})
L	X	L	L	L	Data In	Data In	Write all bits	Active (I _{CC})
L	X	L	L	H	Data In	High Z	Write lower bits only	Active (I _{CC})
L	X	L	H	L	High Z	Data In	Write upper bits only	Active (I _{CC})
L	H	H	X	X	High Z	High Z	Selected, outputs disabled	Active (I _{CC})

Ordering Information

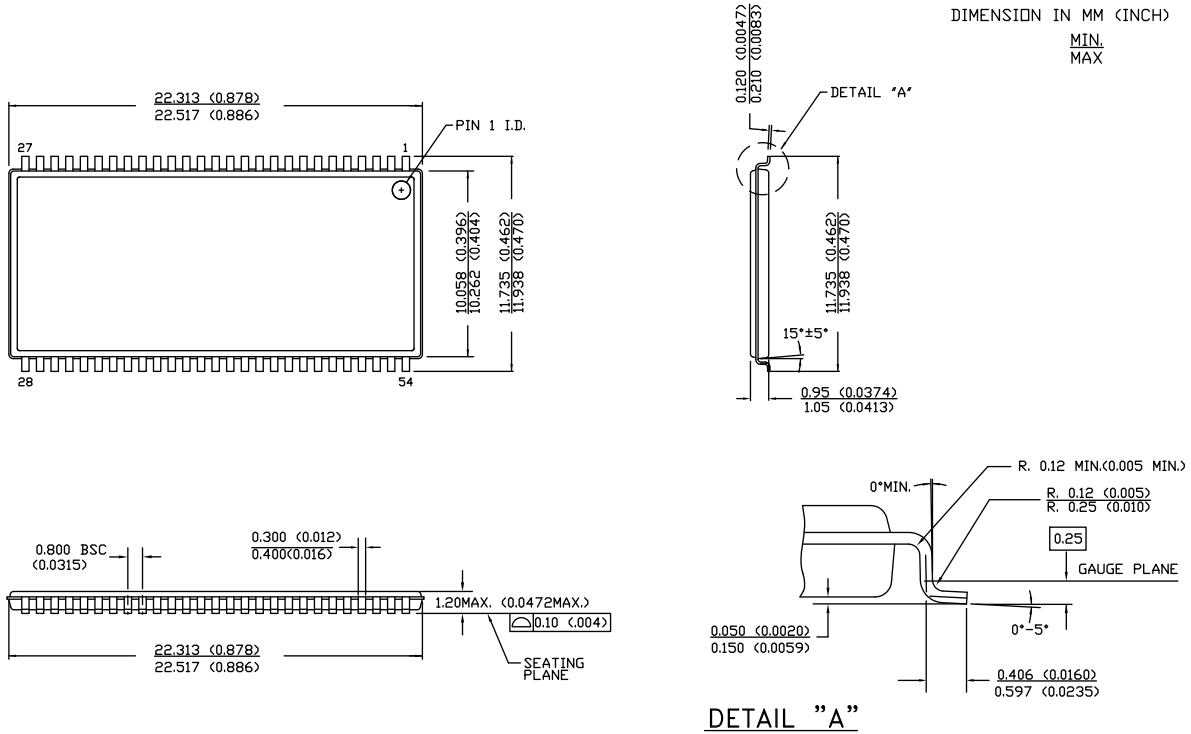
Speed (ns)	Ordering Code	Package Diagram	Package Type	Operating Range
10	CY7C10612DV33-10ZSXI	51-85160	54-pin TSOP II (Pb-free)	Industrial

Ordering Code Definitions



Package Diagrams

Figure 9. 54-pin TSOP Type II (22.4 × 11.84 × 1.0 mm) Z54-II Package Outline, 51-85160



51-85160 *C

Acronyms

Table 1. Acronyms Used in this Document

Acronym	Description
BHE	byte high enable
BLE	byte low enable
CE	chip enable
CMOS	complementary metal oxide semiconductor
I/O	input/output
OE	output enable
SRAM	static random access memory
TSOP	thin small outline package
TTL	transistor-transistor logic
WE	write enable

Document Conventions

Units of Measure

Table 2. Units of Measure

Symbol	Unit of Measure
°C	degree Celsius
MHz	megahertz
μA	microampere
μs	microsecond
mA	milliampere
mm	millimeter
mV	millivolt
ns	nanosecond
Ω	ohm
%	percent
pF	picofarad
V	volt
W	watt

Document History Page

Document Title: CY7C10612DV33, 16-Mbit (1 M × 16) Static RAM Document Number: 001-49315				
Rev.	ECN No.	Orig. of Change	Submission Date	Description of Change
**	2589743	VKN / PYRS	10/15/08	New datasheet
*A	2718906	VKN	06/15/09	Post to external web
*B	3128718	PRAS	01/05/11	Template updates. Style changes. IO changed to I/O through out the document. Under Data Retention Characteristics on Page 6, "Typ" is associated with a new footnote # 10. Included ordering code definitions, Acronyms and units of measure tables. Updated package diagram from ** to *A.
*C	3412972	TAVA	10/18/2011	Updated Features . Updated DC Electrical Characteristics . Updated Switching Waveforms . Updated Package Diagrams . Updated in new template.

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