



CYPRESS

CY7C1061BV33

## 16-Mbit (1M x 16) Static RAM

### Features

- High speed
  - $t_{AA} = 8, 10, 12 \text{ ns}$
- Low active power
  - 1080 mW (max.)
- Operating voltages of  $3.3 \pm 0.3V$
- 2.0V data retention
- Automatic power-down when deselected
- TTL-compatible inputs and outputs

### Functional Description

The CY7C1061BV33 is a high-performance CMOS Static RAM organized as 1,048,576 words by 16 bits.

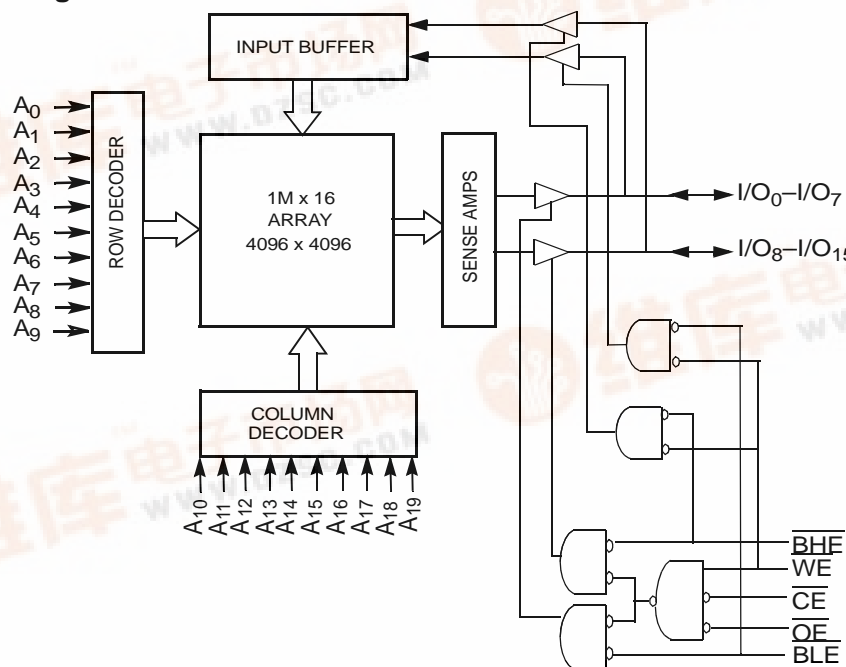
Writing to the device is accomplished by enabling the chip ( $\overline{CE}$  LOW) while forcing the Write Enable ( $\overline{WE}$ ) input LOW. If Byte Low Enable ( $\overline{BLE}$ ) is LOW, then data from I/O pins ( $I/O_0$  through  $I/O_7$ ), is written into the location specified on the address 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  $A_{19}$ ).

Reading from the device is accomplished by enabling the chip by taking  $\overline{CE}$  LOW while forcing the Output Enable ( $\overline{OE}$ ) LOW and 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 will appear on  $I/O_0$  to  $I/O_7$ . If Byte High Enable ( $\overline{BHE}$ ) is LOW, then data from memory will appear on  $I/O_8$  to  $I/O_{15}$ . See the truth table at the back of this data sheet for a complete description of Read and Write modes.

The input/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).

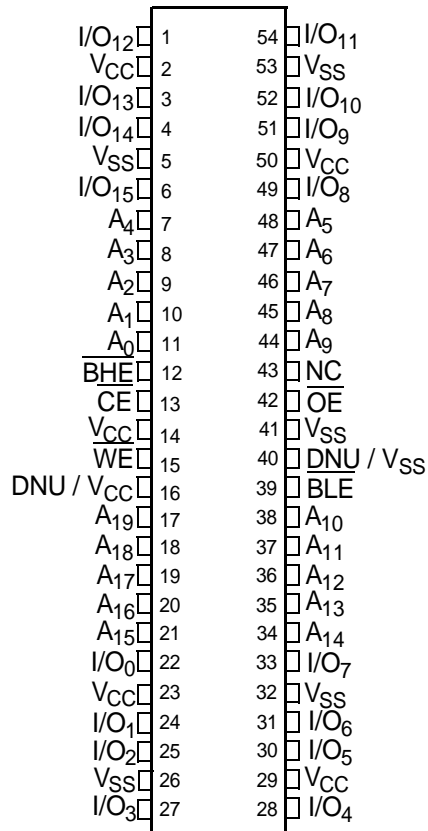
The CY7C1061BV33 is available in a 54-pin TSOP II package with center power and ground (revolutionary) pinout.

### Logic Block Diagram



**Selection Guide**

		<b>-8</b>	<b>-10</b>	<b>-12</b>	<b>Unit</b>
Maximum Access Time		8	10	12	ns
Maximum Operating Current	Commercial	300	275	260	mA
	Industrial	300	275	260	
Maximum CMOS Standby Current	Commercial/Industrial	50	50	50	mA

**Pin Configurations<sup>[1,2]</sup>**
**54-pin TSOP II (Top View)**

**Notes:**

1. DNU / V<sub>CC</sub> Pin (#16) has to be left floating or connected to V<sub>CC</sub> and DNU / V<sub>SS</sub> Pin (#40) has to be left floating or connected to V<sub>SS</sub> to ensure proper application.
2. NC – No Connect Pins are not connected to the die.



## 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<sup>[3]</sup> .... -0.5V to +4.6V

DC Voltage Applied to Outputs

in High-Z State<sup>[3]</sup> ..... -0.5V to  $V_{CC} + 0.5V$

DC Input Voltage<sup>[3]</sup> ..... -0.5V to  $V_{CC} + 0.5V$

Current into Outputs (LOW) ..... 20 mA

## Operating Range

Range	Ambient Temperature	$V_{CC}$
Commercial	0°C to +70°C	3.3V ± 0.3V
Industrial	-40°C to +85°C	

## DC Electrical Characteristics Over the Operating Range

Parameter	Description	Test Conditions		-8		-10		-12		Unit
				Min.	Max.	Min.	Max.	Min.	Max.	
V <sub>OH</sub>	Output HIGH Voltage	V <sub>CC</sub> = Min., I <sub>OH</sub> = −4.0 mA		2.4		2.4		2.4		V
V <sub>OL</sub>	Output LOW Voltage	V <sub>CC</sub> = Min., I <sub>OL</sub> = 8.0 mA			0.4		0.4		0.4	V
V <sub>IH</sub>	Input HIGH Voltage			2.0	V <sub>CC</sub> + 0.3	2.0	V <sub>CC</sub> + 0.3	2.0	V <sub>CC</sub> + 0.3	V
V <sub>IL</sub>	Input LOW Voltage <sup>[3]</sup>			−0.3	0.8	−0.3	0.8	−0.3	0.8	V
I <sub>IX</sub>	Input Load Current	GND ≤ V <sub>I</sub> ≤ V <sub>CC</sub>		−1	+1	−1	+1	−1	+1	μA
I <sub>OZ</sub>	Output Leakage Current	GND ≤ V <sub>OUT</sub> ≤ V <sub>CC</sub> , Output Disabled		−1	+1	−1	+1	−1	+1	μA
I <sub>CC</sub>	V <sub>CC</sub> Operating Supply Current	V <sub>CC</sub> = Max., f = f <sub>MAX</sub> = 1/t <sub>RC</sub>	Commercial		300		275		260	mA
			Industrial		300		275		260	mA
I <sub>SB1</sub>	Automatic CE Power-down Current — TTL Inputs	Max. V <sub>CC</sub> , $\overline{CE} \geq V_{IH}$ V <sub>IN</sub> ≥ V <sub>IH</sub> or V <sub>IN</sub> ≤ V <sub>IL</sub> , f = f <sub>MAX</sub>			70		70		70	mA
I <sub>SB2</sub>	Automatic CE Power-down Current — CMOS Inputs	Max. V <sub>CC</sub> , CE ≥ V <sub>CC</sub> − 0.3V, V <sub>IN</sub> ≥ V <sub>CC</sub> − 0.3V, or V <sub>IN</sub> ≤ 0.3V, f = 0		Commercial/ Industrial	50		50		50	mA

## Capacitance<sup>[4]</sup>

Parameter	Package	Description	Test Conditions	Max.	Unit
$C_{IN}$	Z54	Input Capacitance	$T_A = 25^\circ\text{C}, f = 1 \text{ MHz}, V_{CC} = 3.3V$	6	pF
$C_{OUT}$	Z54	I/O Capacitance		8	pF

## Thermal Resistance<sup>[4]</sup>

Parameter	Description	Test Conditions	54-pin TSOP-II	Unit
$\Theta_{JA}$	Thermal Resistance (Junction to Ambient)	Test conditions follow standard test methods and procedures for measuring thermal impedance, per EIA / JESD51.	49.95	°C/W
$\Theta_{JC}$	Thermal Resistance (Junction to Case)		3.34	°C/W

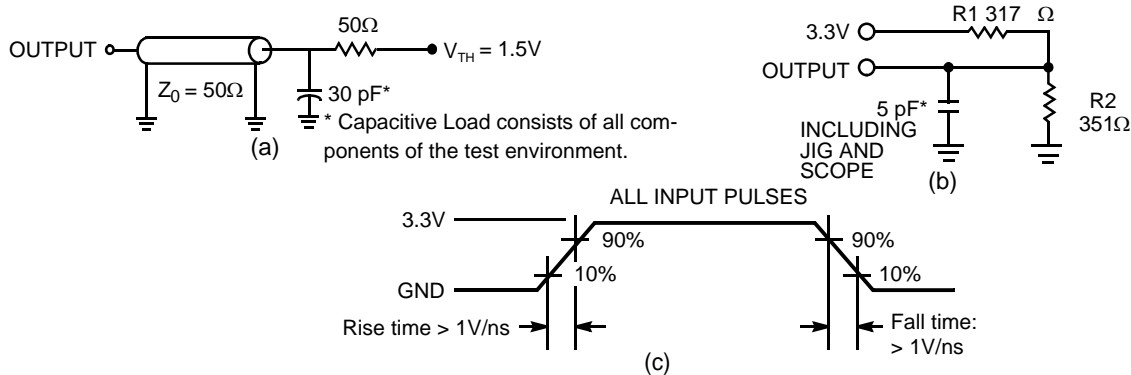
### Notes:

3.  $V_{IL}(\text{min.}) = -2.0V$  and  $V_{IH}(\text{max.}) = V_{CC} + 0.5V$  for pulse durations of less than 20 ns.

4. Tested initially and after any design or process changes that may affect these parameters.

5. Valid SRAM operation does not occur until the power supplies have reached the minimum operating  $V_{DD}$  (3.0V). As soon as 1ms ( $T_{power}$ ) after reaching the minimum operating  $V_{DD}$ , normal SRAM operation can begin including reduction in  $V_{DD}$  to the data retention ( $V_{CCDR}$ , 2.0V) voltage.

## AC Test Loads and Waveforms<sup>[5]</sup>



## AC Switching Characteristics Over the Operating Range<sup>[6]</sup>

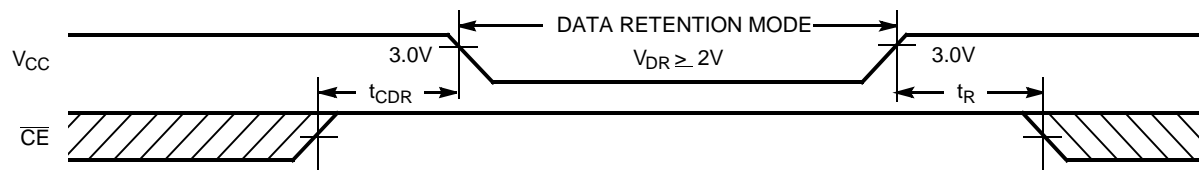
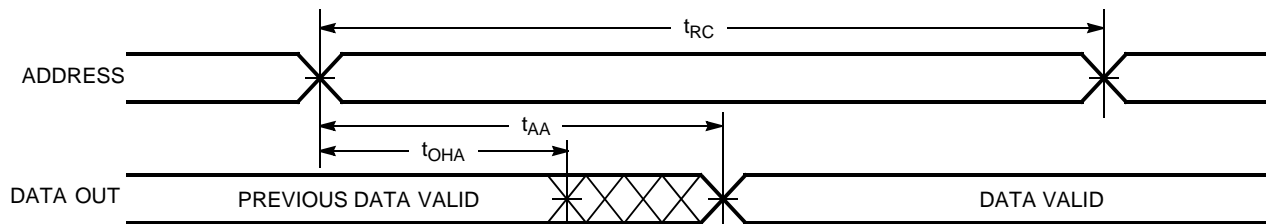
Parameter	Description	-8		-10		-12		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	
Read Cycle								
t <sub>power</sub>	V <sub>CC</sub> (typical) to the first access <sup>[7]</sup>	1		1		1		ms
t <sub>RC</sub>	Read Cycle Time	8		10		12		ns
t <sub>AA</sub>	Address to Data Valid		8		10		12	ns
t <sub>OHA</sub>	Data Hold from Address Change	3		3		3		ns
t <sub>ACE</sub>	$\overline{\text{CE}}$ LOW to Data Valid		8		10		12	ns
t <sub>DOE</sub>	$\overline{\text{OE}}$ LOW to Data Valid		5		5		6	ns
t <sub>LZOE</sub>	$\overline{\text{OE}}$ LOW to Low-Z	1		1		1		ns
t <sub>HZOE</sub>	$\overline{\text{OE}}$ HIGH to High-Z <sup>[8]</sup>		5		5		6	ns
t <sub>LZCE</sub>	$\overline{\text{CE}}$ LOW to Low-Z <sup>[8]</sup>	3		3		3		ns
t <sub>HZCE</sub>	$\overline{\text{CE}}$ HIGH to High-Z <sup>[8]</sup>		5		5		6	ns
t <sub>PU</sub>	$\overline{\text{CE}}$ LOW to Power-Up <sup>[9]</sup>	0		0		0		ns
t <sub>PD</sub>	$\overline{\text{CE}}$ HIGH to Power-Down <sup>[9]</sup>		8		10		12	ns
t <sub>DBE</sub>	Byte Enable to Data Valid		5		5		6	ns
t <sub>LZBE</sub>	Byte Enable to Low-Z	1		1		1		ns
t <sub>HZBE</sub>	Byte Disable to High-Z		5		5		6	ns
Write Cycle <sup>[10, 11]</sup>								
t <sub>WC</sub>	Write Cycle Time	8		10		12		ns
t <sub>SCE</sub>	$\overline{\text{CE}}$ LOW to Write End	6		7		8		ns

### Notes:

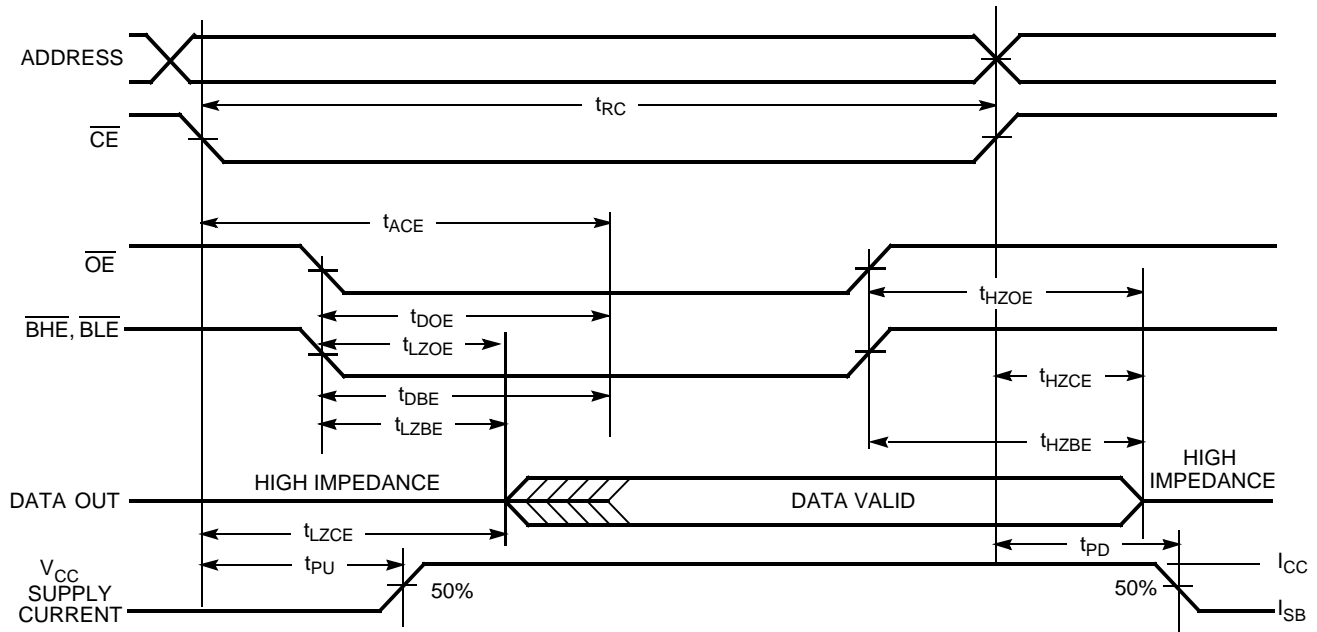
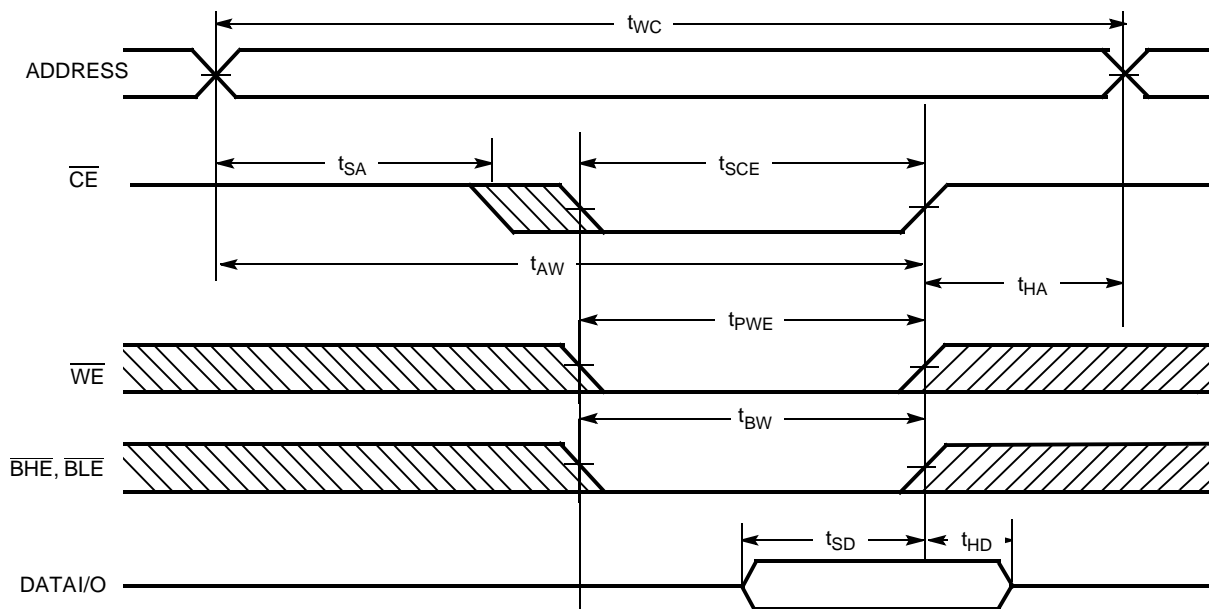
- Test conditions assume signal transition time of 3 ns or less, timing reference levels of 1.5V, input pulse levels of 0 to 3.0V, and output loading of the specified I<sub>OL</sub>/I<sub>OH</sub> and specified transmission line loads. Test conditions for the Read cycle use output loading shown in part a) of the AC test loads, unless specified otherwise.
- This part has a voltage regulator which steps down the voltage from 3V to 2V internally. t<sub>power</sub> time has to be provided initially before a Read/Write operation is started.
- t<sub>HZOE</sub>, t<sub>HZCE</sub>, t<sub>HZBE</sub>, t<sub>LZOE</sub>, t<sub>LZCE</sub>, t<sub>LZBE</sub> are specified with a load capacitance of 5 pF as in (b) of AC Test Loads. 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  $\overline{\text{CE}}$  LOW and  $\overline{\text{WE}}$  LOW. Chip enables must be active and  $\overline{\text{WE}}$  and byte enables must be LOW 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.
- The minimum Write cycle time for Write Cycle No. 3 ( $\overline{\text{WE}}$  controlled,  $\overline{\text{OE}}$  LOW) is the sum of t<sub>HZWE</sub> and t<sub>SD</sub>.

**AC Switching Characteristics** Over the Operating Range (continued)<sup>[6]</sup>

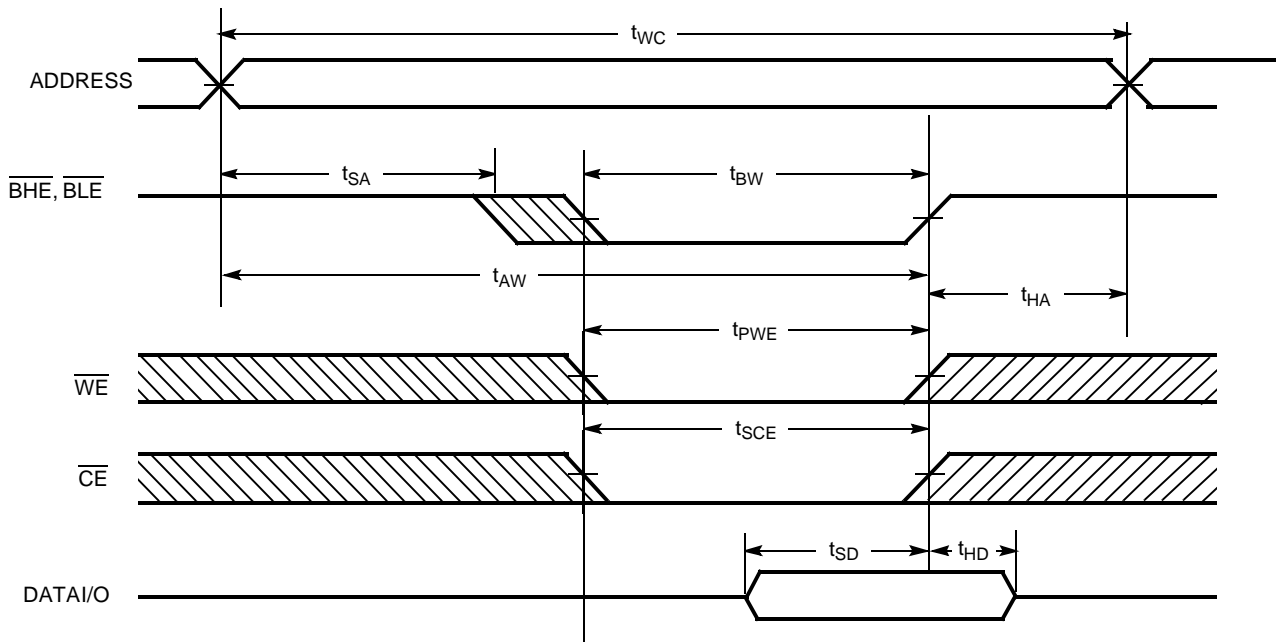
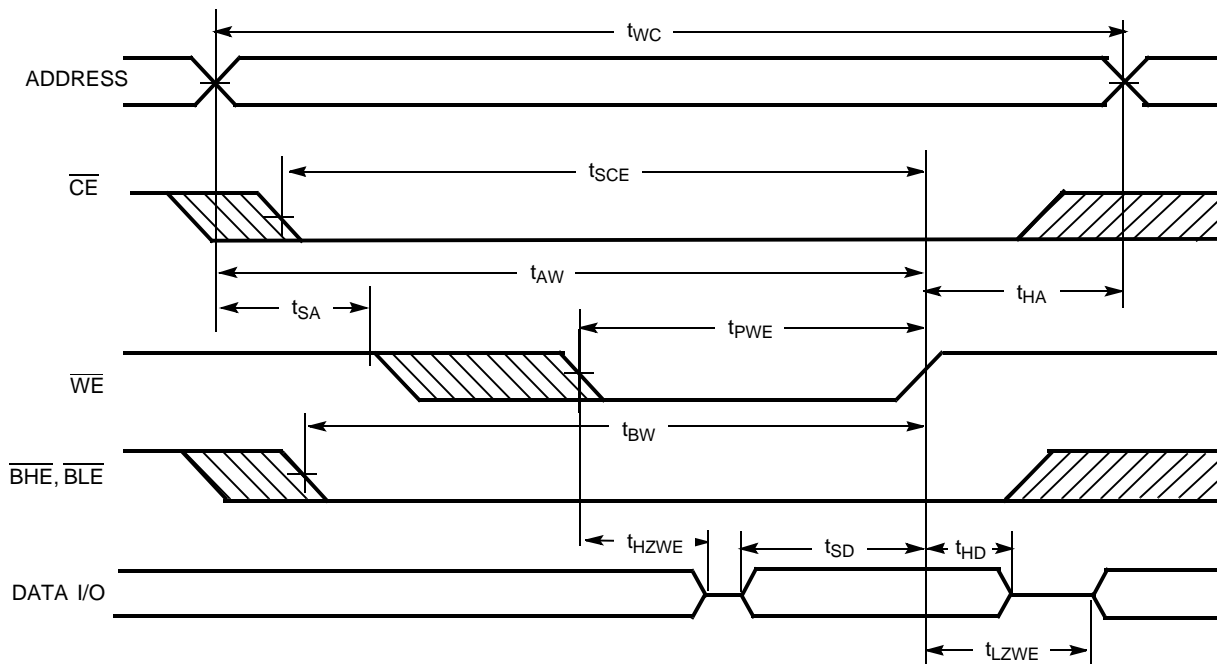
Parameter	Description	-8		-10		-12		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	
$t_{AW}$	Address Set-up to Write End	6		7		8		ns
$t_{HA}$	Address Hold from Write End	0		0		0		ns
$t_{SA}$	Address Set-up to Write Start	0		0		0		ns
$t_{PWE}$	$\overline{WE}$ Pulse Width	6		7		8		ns
$t_{SD}$	Data Set-up to Write End	5		5.5		6		ns
$t_{HD}$	Data Hold from Write End	0		0		0		ns
$t_{LZWE}$	$\overline{WE}$ HIGH to Low-Z <sup>[8]</sup>	3		3		3		ns
$t_{HZWE}$	$\overline{WE}$ LOW to High-Z <sup>[8]</sup>		5		5		6	ns
$t_{BW}$	Byte Enable to End of Write	6		7		8		ns

**Data Retention Waveform**

**Switching Waveforms**
**Read Cycle No. 1<sup>[12, 13]</sup>**

**Notes:**

12. Device is continuously selected.  $\overline{OE}$ ,  $\overline{CE}$ ,  $\overline{BHE}$  and/or  $\overline{BHE} = V_{IL}$ .  
 13.  $\overline{WE}$  is HIGH for Read cycle.

**Switching Waveforms (continued)**
**Read Cycle No. 2 ( $\overline{\text{OE}}$  Controlled)<sup>[13, 14]</sup>**

**Write Cycle No. 1 ( $\overline{\text{CE}}$  Controlled)<sup>[15, 16]</sup>**

**Notes:**

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

**Switching Waveforms (continued)**
**Write Cycle No. 2 ( $\overline{\text{BLE}}$  or  $\overline{\text{BHE}}$  Controlled)**

**Write Cycle No. 3 ( $\overline{\text{WE}}$  Controlled,  $\overline{\text{OE}}$  LOW)<sup>[15, 16]</sup>**


**Truth Table**

<b>CE</b>	<b>OE</b>	<b>WE</b>	<b>BLE</b>	<b>BHE</b>	<b>I/O<sub>0</sub>–I/O<sub>7</sub></b>	<b>I/O<sub>8</sub>–I/O<sub>15</sub></b>	<b>Mode</b>	<b>Power</b>
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 ( $I_{CC}$ )

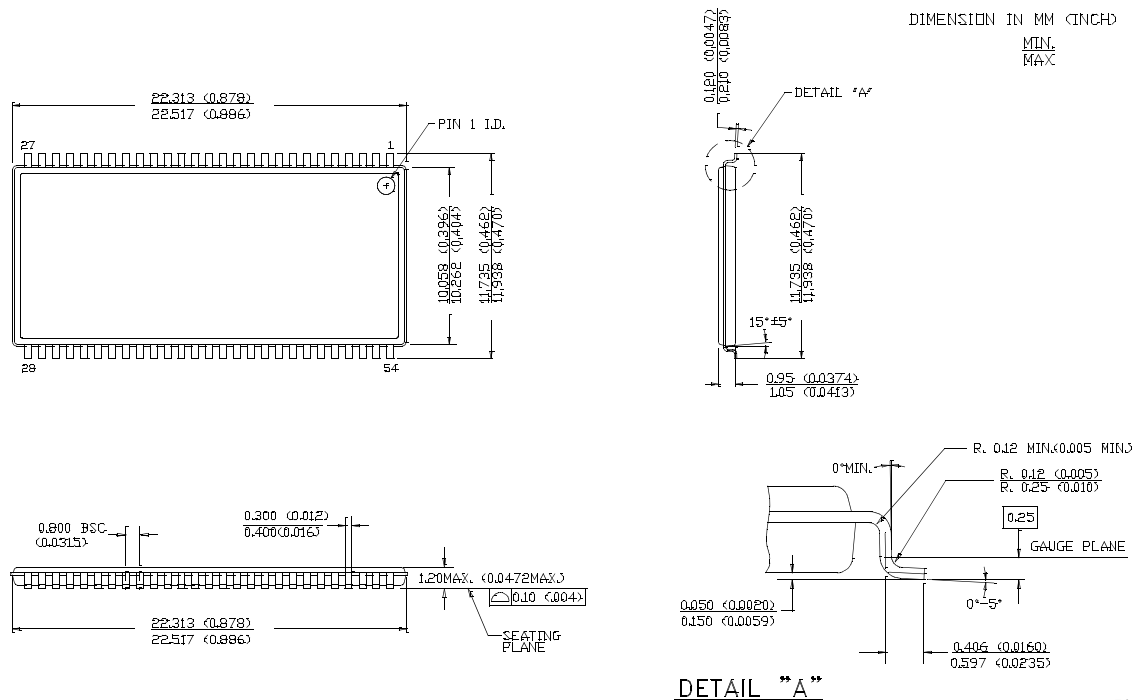
**Ordering Information**

<b>Speed (ns)</b>	<b>Ordering Code</b>	<b>Package Name</b>	<b>Package Type</b>	<b>Operating Range</b>
8	CY7C1061BV33-8ZC	Z54-II	54-pin TSOP II	Commercial
	CY7C1061BV33-8ZI			Industrial
10	CY7C1061BV33-10ZC	Z54-II	54-pin TSOP II	Commercial
	CY7C1061BV33-10ZI			Industrial
12	CY7C1061BV33-12ZC	Z54-II	54-pin TSOP II	Commercial
	CY7C1061BV33-12ZI			Industrial



## Package Diagram

### 54-lead Thin Small Outline Package, Type II Z54-II



51-85160-\*\*

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**Document History Page**

<b>Document Title: CY7C1061BV33 16-Mbit (1M x 16) Static RAM</b> <b>Document Number: 38-05693</b>				
<b>REV.</b>	<b>ECN NO.</b>	<b>Issue Date</b>	<b>Orig. of Change</b>	<b>Description of Change</b>
**	283950	See ECN	RKF	New data sheet
*A	309453	See ECN	RKF	Final data sheet

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