



CYPRESS

CY7C1041CV33

256K x 16 Static RAM

Features

- Pin equivalent to CY7C1041BV33
- High speed
 - $t_{AA} = 10 \text{ ns}$
- Low active power
 - 324 mW (max.)
- 2.0V data retention
- Automatic power-down when deselected
- TTL-compatible inputs and outputs
- Easy memory expansion with $\overline{\text{CE}}$ and $\overline{\text{OE}}$ features

Functional Description^[1]

The CY7C1041CV33 is a high-performance CMOS Static RAM organized as 262,144 words by 16 bits.

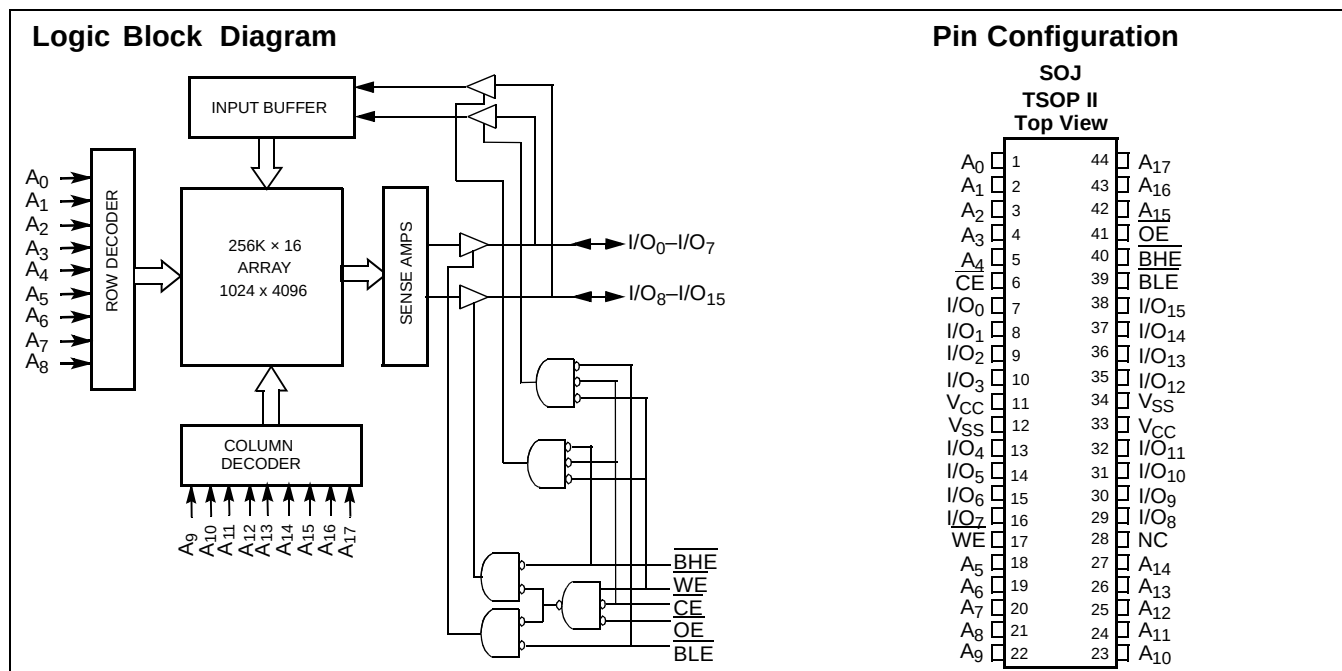
Writing to the device is accomplished by taking Chip Enable ($\overline{\text{CE}}$) and Write Enable ($\overline{\text{WE}}$) inputs LOW. If Byte LOW Enable (BLE) is LOW, then data from I/O pins ($\text{I/O}_0\text{--I/O}_7$), is written into the location specified on the address pins ($\text{A}_0\text{--A}_{17}$). If Byte

HIGH Enable ($\overline{\text{BHE}}$) is LOW, then data from I/O pins ($\text{I/O}_8\text{--I/O}_{15}$) is written into the location specified on the address pins ($\text{A}_0\text{--A}_{17}$).

Reading from the device is accomplished by taking Chip Enable ($\overline{\text{CE}}$) and Output Enable ($\overline{\text{OE}}$) LOW while forcing the Write Enable ($\overline{\text{WE}}$) HIGH. If Byte LOW Enable (BLE) is LOW, then data from the memory location specified by the address pins will appear on $\text{I/O}_0\text{--I/O}_7$. If Byte HIGH Enable (BHE) is LOW, then data from memory will appear on $\text{I/O}_8\text{--I/O}_{15}$. See the truth table at the back of this data sheet for a complete description of Read and Write modes.

The input/output pins ($\text{I/O}_0\text{--I/O}_{15}$) are placed in a high-impedance state when the device is deselected ($\overline{\text{CE}}$ HIGH), the outputs are disabled ($\overline{\text{OE}}$ HIGH), the BHE and BLE are disabled (BHE, BLE HIGH), or during a Write operation ($\overline{\text{CE}}$ LOW, and $\overline{\text{WE}}$ LOW).

The CY7C1041CV33 is available in a standard 44-pin 400-mil-wide body width SOJ and 44-pin TSOP II package with center power and ground (revolutionary) pinout, as well as a 48-ball fine-pitch ball grid array (FBGA) package.



Selection Guide

		-8	-10	-12	-15	-20	Unit
Maximum Access Time		8	10	12	15	20	ns
Maximum Operating Current	Commercial	100	90	85	80	75	mA
	Industrial	110	100	95	90	85	mA
Maximum CMOS Standby Current	Commercial/ Industrial	10	10	10	10	10	mA

Shaded areas contain advance information.

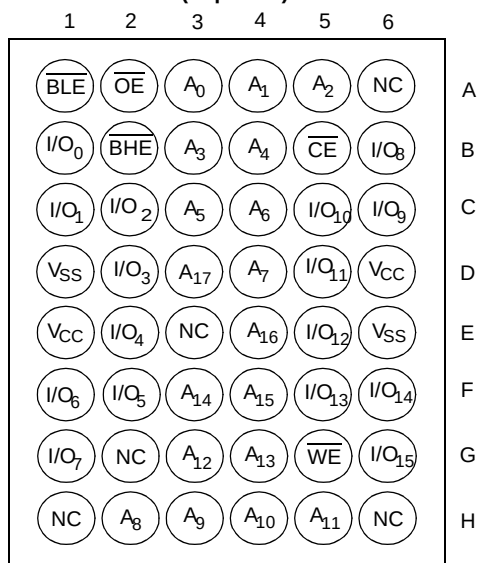
Note:

- For guidelines on SRAM system design, please refer to the "System Design Guidelines" Cypress application note, available on the internet at www.cypress.com.

Pin Configurations

48-ball Mini FBGA

(Top View)



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^[2] -0.5V to +4.6V

DC Voltage Applied to Outputs in High-Z State^[2] -0.5V to $V_{CC} + 0.5V$

DC Input Voltage^[2] -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		-15		-20		Unit
			Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
V_{OH}	Output HIGH Voltage	$V_{CC} = \text{Min.}, I_{OH} = -4.0 \text{ mA}$	2.4		2.4		2.4		2.4		2.4		V
V_{OL}	Output LOW Voltage	$V_{CC} = \text{Min.}, I_{OL} = 8.0 \text{ mA}$		0.4		0.4		0.4		0.4		0.4	V
V_{IH}	Input HIGH Voltage		2.0	$V_{CC} + 0.3$	2.0	$V_{CC} + 0.3$	2.0	$V_{CC} + 0.3$	2.0	$V_{CC} + 0.3$	2.0	$V_{CC} + 0.3$	V
$V_{IL}^{[2]}$	Input LOW Voltage		-0.3	0.8	-0.3	0.8	-0.3	0.8	-0.3	0.8	-0.3	0.8	V
I_{IX}	Input Load Current	$GND \leq V_I \leq V_{CC}$	-1	+1	-1	+1	-1	+1	-1	+1	-1	+1	μA
I_{OZ}	Output Leakage Current	$GND \leq V_{OUT} \leq V_{CC}$, Output Disabled	-1	+1	-1	+1	-1	+1	-1	+1	-1	+1	μA
I_{CC}	V_{CC} Operating Supply Current	$V_{CC} = \text{Max.}, f = f_{MAX} = 1/t_{RC}$	Comm'l	100		90		85		80		75	mA
		Indus.		110		100		95		90		85	
I_{SB1}	Automatic CE Power-down Current —TTL Inputs	Max. V_{CC} , $CE \geq V_{IH}$, $V_{IN} \geq V_{IH}$ or $V_{IN} \leq V_{IL}$, $f = f_{MAX}$		40		40		40		40		40	mA
I_{SB2}	Automatic CE Power-down Current —CMOS Inputs	Max. V_{CC} , $CE \geq V_{CC} - 0.3V$, $V_{IN} \geq V_{CC} - 0.3V$, or $V_{IN} \leq 0.3V$, $f = 0$	Comm'l Indus.	10		10		10		10		10	mA

Shaded areas contain advance information.

Capacitance^[3]

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

Notes:

- Minimum voltage is -2.0V for pulse durations of less than 20 ns.
- Tested initially and after any design or process changes that may affect these parameters.

AC Switching Characteristics^[4] Over the Operating Range

Parameter	Description	-8		-10		-12		-15		-20		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
Read Cycle												
t _{power} ^[5]	V _{CC} (typical) to the first access	1		1		1		1		1		μs
t _{RC}	Read Cycle Time	8		10		12		15		20		ns
t _{AA}	Address to Data Valid		8		10		12		15		20	ns
t _{OHA}	Data Hold from Address Change	3		3		3		3		3		ns
t _{ACE}	$\overline{CE}$ LOW to Data Valid		8		10		12		15		20	ns
t _{DOE}	$\overline{OE}$ LOW to Data Valid		4		5		6		7		8	ns
t _{LZOE}	$\overline{OE}$ LOW to Low-Z	0		0		0		0		0		ns
t _{HZOE}	$\overline{OE}$ HIGH to High-Z ^[6, 7]		4		5		6		7		8	ns
t _{LZCE}	$\overline{CE}$ LOW to Low-Z ^[7]	3		3		3		3		3		ns
t _{HZCE}	$\overline{CE}$ HIGH to High-Z ^[6, 7]		4		5		6		7		8	ns
t _{PU}	$\overline{CE}$ LOW to Power-Up	0		0		0		0		0		ns
t _{PD}	$\overline{CE}$ HIGH to Power-Down		8		10		12		15		20	ns
t _{DBE}	Byte Enable to Data Valid		4		5		6		7		8	ns
t _{LZBE}	Byte Enable to Low-Z	0		0		0		0		0		ns
t _{HZBE}	Byte Disable to High-Z		6		6		6		7		8	ns
Write Cycle ^[8, 9]												
t _{WC}	Write Cycle Time	8		10		12		15		20		ns
t _{SCE}	$\overline{CE}$ LOW to Write End	6		7		8		10		10		ns
t _{AW}	Address Set-Up to Write End	6		7		8		10		10		ns
t _{HA}	Address Hold from Write End	0		0		0		0		0		ns
t _{SA}	Address Set-Up to Write Start	0		0		0		0		0		ns
t _{PWE}	$\overline{WE}$ Pulse Width	6		7		8		10		10		ns
t _{SD}	Data Set-Up to Write End	4		5		6		7		8		ns
t _{HD}	Data Hold from Write End	0		0		0		0		0		ns
t _{LZWE}	$\overline{WE}$ HIGH to Low-Z ^[7]	3		3		3		3		3		ns
t _{HZWE}	$\overline{WE}$ LOW to High-Z ^[6, 7]		4		5		6		7		8	ns
t _{BW}	Byte Enable to End of Write	6		7		8		10		10		ns

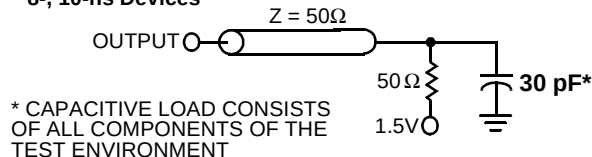
Shaded areas contain advance information.

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.
- t_{POWER} gives the minimum amount of time that the power supply should be at typical V_{CC} values until the first memory access can be performed.
- t_{HZOE} , t_{HZCE} , and t_{HZWE} are specified with a load capacitance of 5 pF as in part (d) of AC Test Loads. Transition is measured ± 500 mV from steady-state voltage.
- 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.
- The internal Write time of the memory is defined by the overlap of $\overline{CE}$ LOW, and $\overline{WE}$ LOW. $\overline{CE}$ and $\overline{WE}$ must be LOW to initiate a Write, and the transition of either 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 ($\overline{WE}$ controlled, $\overline{OE}$ LOW) is the sum of t_{HZWE} and t_{SD} .

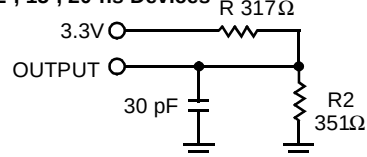
AC Test Loads and Waveforms^[10]

8-, 10-ns Devices



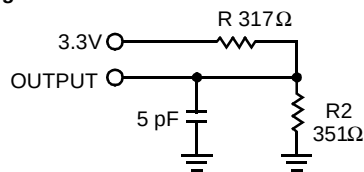
(a)

12-, 15-, 20-ns Devices

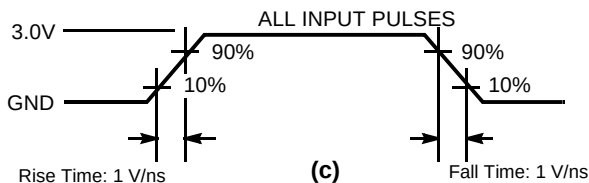


(b)

High-Z Characteristics



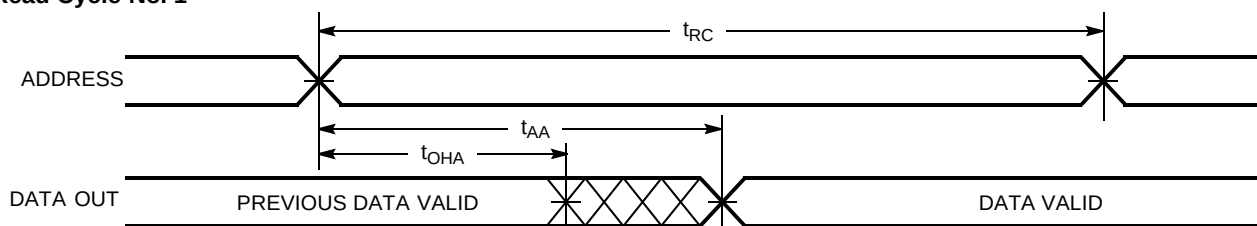
(d)



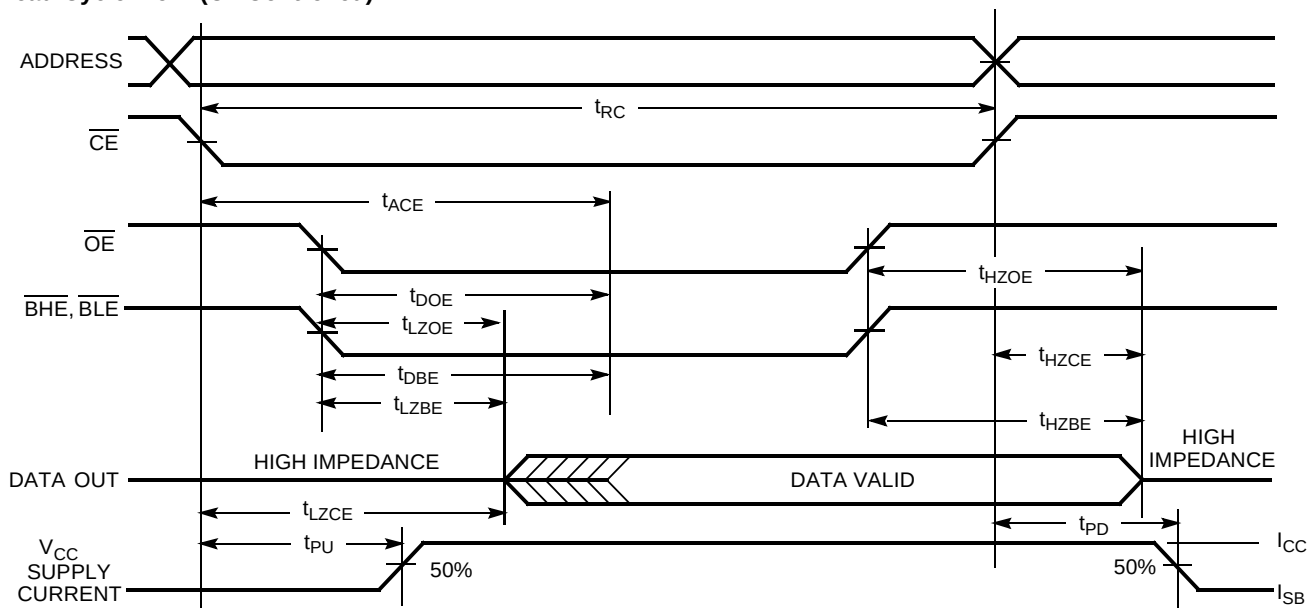
(c)

Switching Waveforms

Read Cycle No. 1^[11, 12]

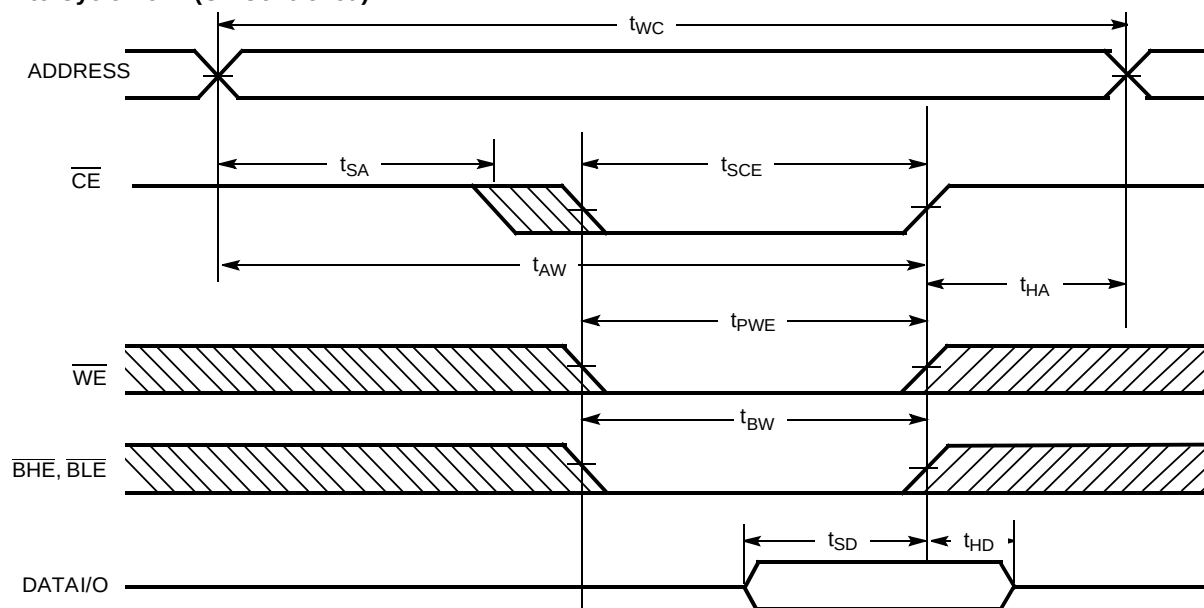
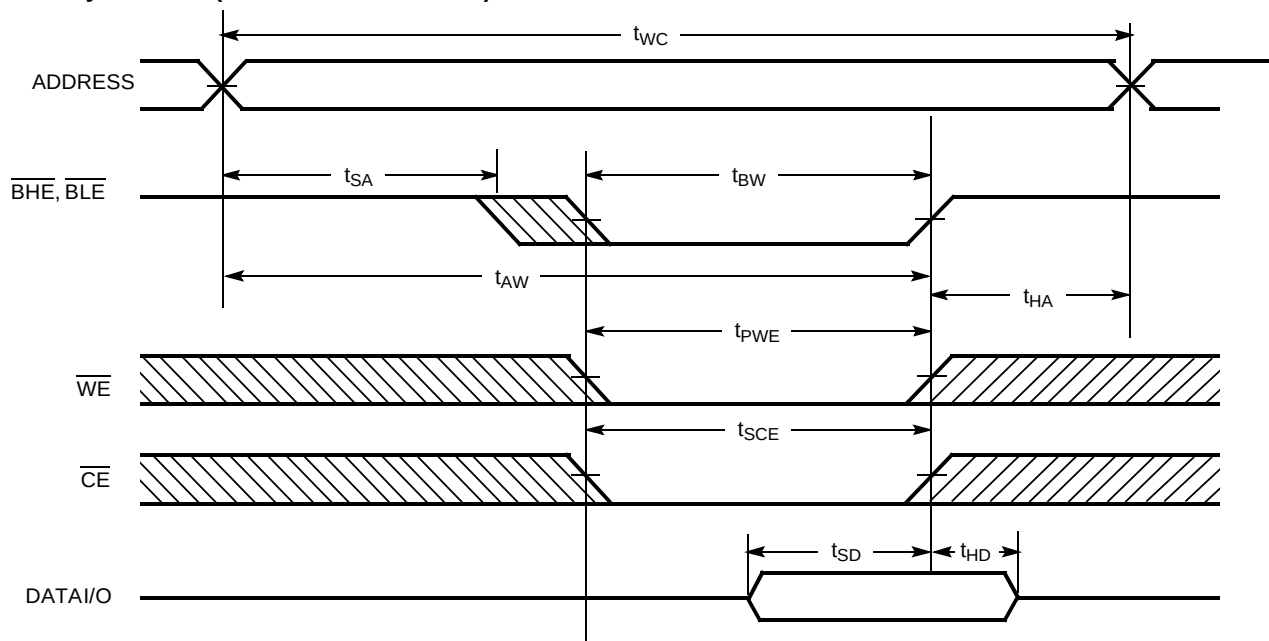


Read Cycle No. 2 ($\overline{\text{OE}}$ Controlled) ^[12, 13]

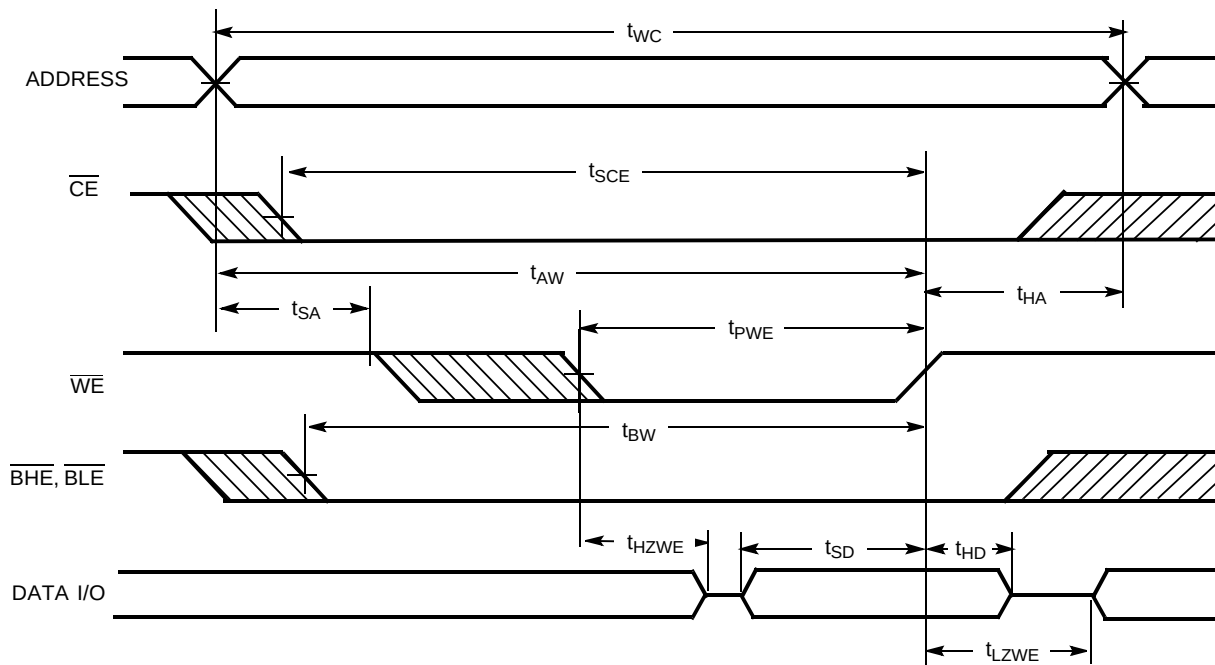


Notes:

10. AC characteristics (except High-Z) for all 8-ns and 10-ns parts are tested using the load conditions shown in Figure (a). All other speeds are tested using the Thevenin load shown in Figure (b). High-Z characteristics are tested for all speeds using the test load shown in Figure (d).
11. Device is continuously selected. OE, CE, BHE and/or BHE = V_{IL} .
12. WE is HIGH for Read cycle.
13. Address valid prior to or coincident with $\overline{\text{CE}}$ transition LOW.

Switching Waveforms (continued)
Write Cycle No. 1 ($\overline{\text{CE}}$ Controlled)^[14, 15]

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

Notes:

14. Data I/O is high-impedance if $\overline{\text{OE}}$ or $\overline{\text{BHE}}$ and/or $\overline{\text{BLE}} = V_{IH}$.
15. 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.3 ($\overline{WE}$ Controlled, $\overline{OE}$ LOW)

Truth Table

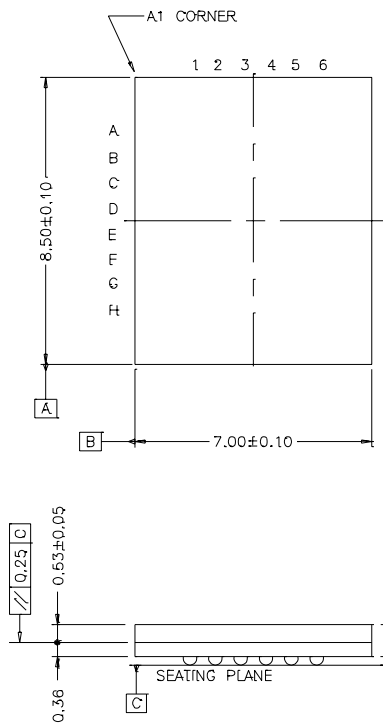
$\overline{CE}$	$\overline{OE}$	$\overline{WE}$	$\overline{BLE}$	$\overline{BHE}$	I/O ₀ -I/O ₇	I/O ₈ -I/O ₁₅	Mode	Power
H	X	X	X	X	High-Z	High-Z	Power-down	Standby (I_{SB})
L	L	H	L	L	Data Out	Data Out	Read All Bits	Active (I_{CC})
L	L	H	L	H	Data Out	High-Z	Read Lower Bits Only	Active (I_{CC})
L	L	H	H	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

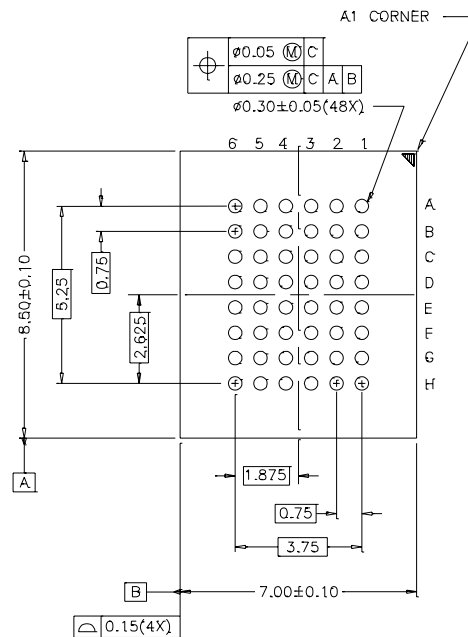
CY7C1041CV33				
Speed (ns)	Ordering Code	Package Name	Package Type	Operating Range
10	CY7C1041CV33-10BAC	BA48B	48-ball Fine Pitch BGA	Commercial
	CY7C1041CV33-10VC	V34	44-lead (400-mil) Molded SOJ	
	CY7C1041CV33-10ZC	Z44	44-pin TSOP II Z44	
	CY7C1041CV33-10BAI	BA48B	48-ball Fine Pitch BGA	Industrial
	CY7C1041CV33-10VI	V34	44-lead (400-mil) Molded SOJ	
	CY7C1041CV33-10ZI	Z44	44-pin TSOP II Z44	
12	CY7C1041CV33-12BAC	BA48B	48-ball Fine Pitch BGA	Commercial
	CY7C1041CV33-12VC	V34	44-lead (400-mil) Molded SOJ	
	CY7C1041CV33-12ZC	Z44	44-pin TSOP II Z44	
	CY7C1041CV33-12BAI	BA48B	48-ball Fine Pitch BGA	Industrial
	CY7C1041CV33-12VI	V34	44-lead (400-mil) Molded SOJ	
	CY7C1041CV33-12ZI	Z44	44-pin TSOP II Z44	
15	CY7C1041CV33-15BAC	BA48B	48-ball Fine Pitch BGA	Commercial
	CY7C1041CV33-15VC	V34	44-lead (400-mil) Molded SOJ	
	CY7C1041CV33-15ZC	Z44	44-pin TSOP II Z44	
	CY7C1041CV33-15BAI	BA48B	48-ball Fine Pitch BGA	Industrial
	CY7C1041CV33-15VI	V34	44-lead (400-mil) Molded SOJ	
	CY7C1041CV33-15ZI	Z44	44-pin TSOP II Z44	
20	CY7C1041CV33-20BAC	BA48B	48-ball Fine Pitch BGA	Commercial
	CY7C1041CV33-20VC	V34	44-lead (400-mil) Molded SOJ	
	CY7C1041CV33-20ZC	Z44	44-pin TSOP II Z44	
	CY7C1041CV33-20BAI	BA48B	48-ball Fine Pitch BGA	Industrial
	CY7C1041CV33-20VI	V34	44-lead (400-mil) Molded SOJ	
	CY7C1041CV33-20ZI	Z44	44-pin TSOP II Z44	

Package Diagrams
48-ball (7.00 mm x 8.5 mm x 1.2 mm) FBGA BA48B

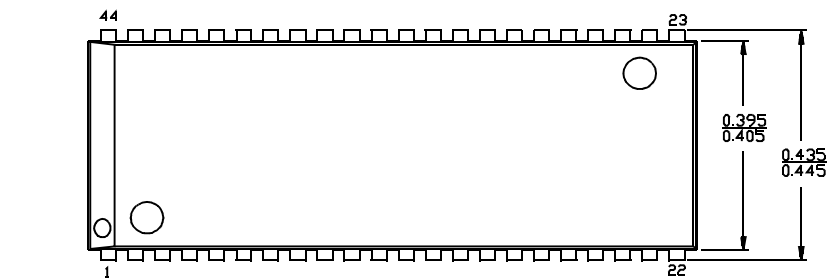
TOP VIEW



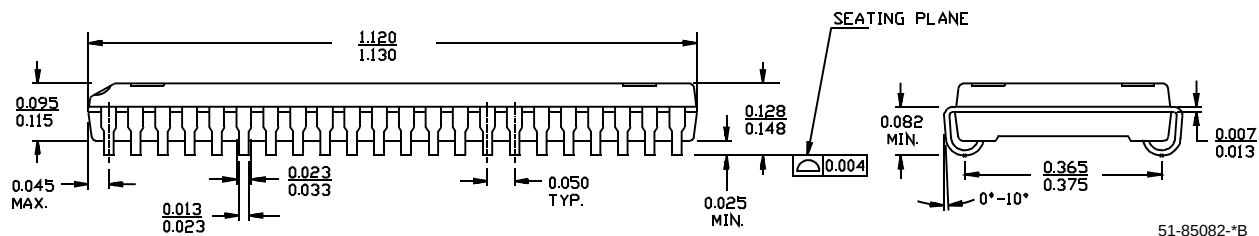
BOTTOM VIEW



51-85106-*D

44-lead (400-mil) Molded SOJ V34


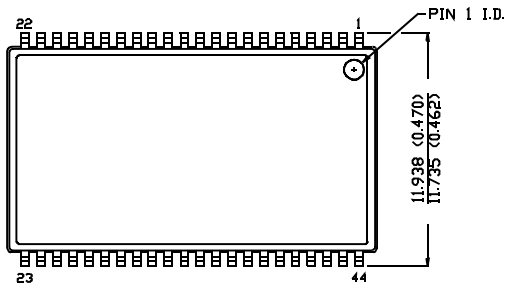
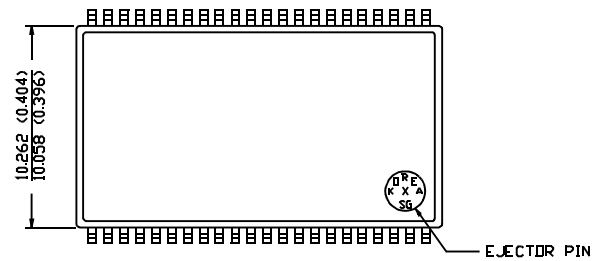
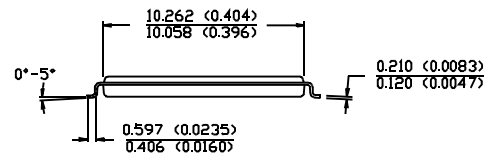
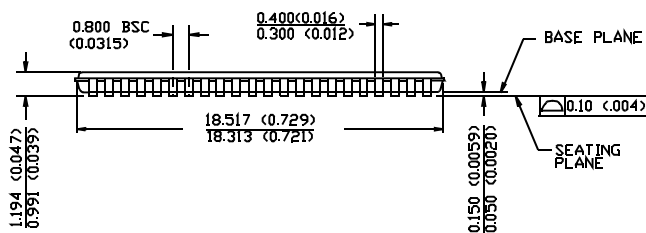
DIMENSIONS IN INCHES MIN. MAX.



51-85082-*B

Package Diagrams (continued)

44-pin TSOP II Z44

 DIMENSION IN MM (INCH)
 MAX
 MIN.

TOP VIEW

BOTTOM VIEW


51-85087-*A

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Document History Page

Document Title: CY7C1041CV33 256K x 16 Static RAM Document Number: 38-05134				
REV.	ECN NO.	Issue Date	Orig. of Change	Description of Change
**	109513	12/13/01	HGK	New Data Sheet
*A	112440	12/20/01	BSS	Updated 51-85106 from revision *A to *C
*B	112859	03/25/02	DFP	Added CY7C1042CV33 in BGA package Removed 1042 BGA option pin ACC Final Data Sheet
*C	116477	09/16/02	CEA	Add applications foot note to data sheet
*D	119797	10/21/02	DFP	Added 20-ns speed bin