



1-Mbit (64K x 16) Static RAM

Features

- **Temperature Ranges**
 - Commercial: 0°C to 70°C
 - Industrial: -40°C to 85°C
 - Automotive: -40°C to 125°C
- **High speed**
 - $t_{AA} = 10$ ns (Commercial & Industrial)
 - $t_{AA} = 15$ ns (Automotive)
- **CMOS for optimum speed/power**
- **Low active power**
 - 825 mW (max.)
- **Automatic power-down when deselected**
- **Independent control of upper and lower bits**
- **Available in 44-pin TSOP II and 400-mil SOJ**
- **Also available in Lead (Pb)-Free 44-pin TSOP II**

Functional Description^[1]

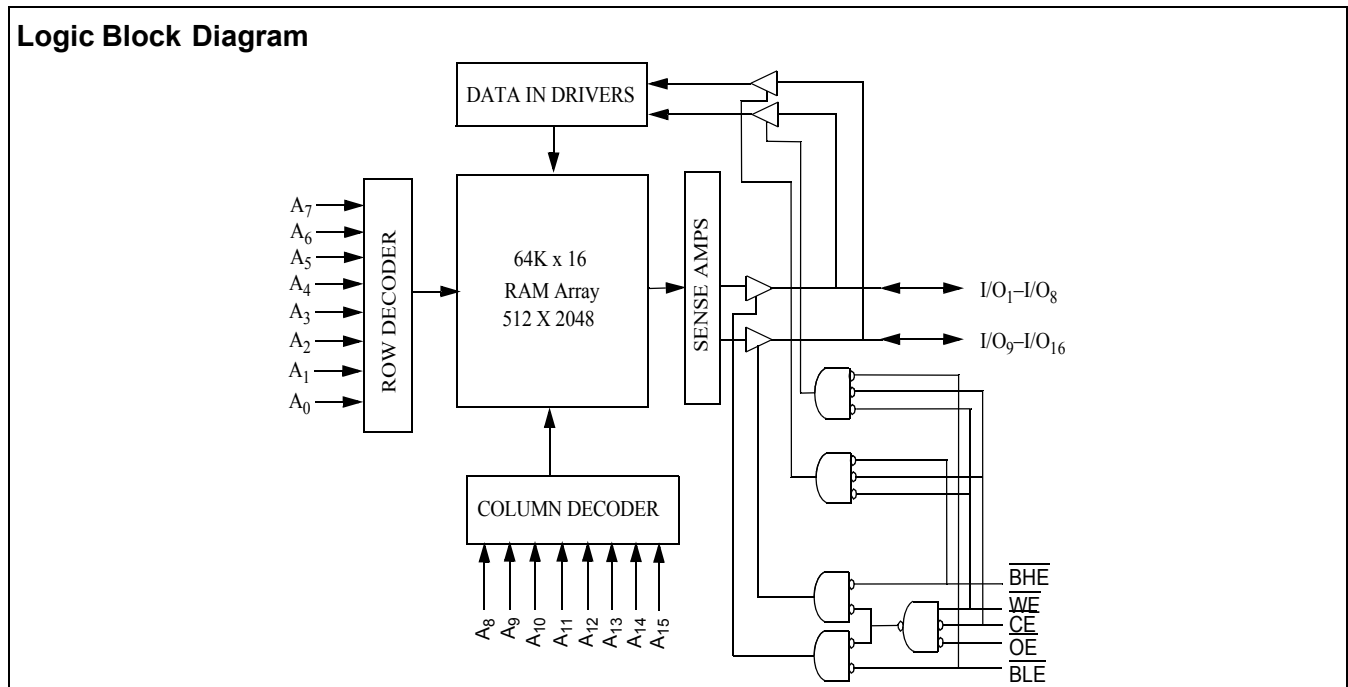
The CY7C1021B/10211B is a high-performance CMOS static RAM organized as 65,536 words by 16 bits. This device has an automatic power-down feature that significantly reduces power consumption when deselected.

Writing to the device is accomplished by taking Chip Enable (\overline{CE}) and Write Enable (\overline{WE}) inputs LOW. If Byte Low Enable (\overline{BLE}) is LOW, then data from I/O pins (I/O_1 through I/O_8), is written into the location specified on the address pins (A_0 through A_{15}). If Byte High Enable (\overline{BHE}) is LOW, then data from I/O pins (I/O_9 through I/O_{16}) is written into the location specified on the address pins (A_0 through A_{15}).

Reading from the device is accomplished by taking Chip Enable (\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 will appear on I/O_1 to I/O_8 . If Byte High Enable (\overline{BHE}) is LOW, then data from memory will appear on I/O_9 to I/O_{16} . 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_1 through I/O_{16}) 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 CY7C1021B/10211B is available in standard 44-pin TSOP Type II and 400-mil-wide SOJ packages. Customers should use part number CY7C10211B when ordering parts with 10-ns t_{AA} , and CY7C1021B when ordering 12- and 15-ns t_{AA} .

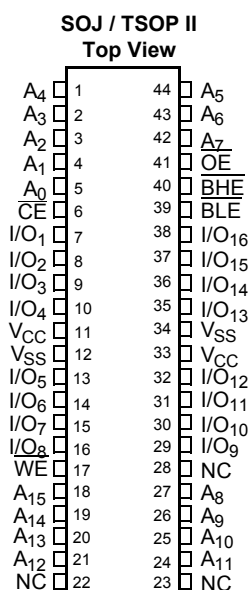


Note:

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

Selection Guide

		7C10211B-10	7C1021B-12	7C1021B-15
Maximum Access Time (ns)		10	12	15
Maximum Operating Current (mA)	Com'l / Ind'l	150	140	130
	Automotive	-	-	150
Maximum CMOS Standby Current (mA)	Com'l / Ind'l	10	10	10
	Automotive	-	-	15
	L Version	0.5	0.5	0.5

Pin Configurations

Pin Definitions

Pin Name	SOJ, TSOP—Pin Number	I/O Type	Description
A ₀ –A ₁₅	1–5, 18–21, 24–27, 42–44	Input	Address Inputs used to select one of the address locations.
I/O ₁ –I/O ₁₆	7–10, 13–16, 29–32, 35–38	Input/Output	Bidirectional Data I/O lines. Used as input or output lines depending on operation.
NC	22, 23, 28	No Connect	No Connects. Not connected to the die.
$\overline{\text{WE}}$	17	Input/Control	Write Enable Input, active LOW. When selected LOW, a Write is conducted. When deselected HIGH, a Read is conducted.
$\overline{\text{CE}}$	6	Input/Control	Chip Enable Input, active LOW. When LOW, selects the chip. When HIGH, deselects the chip.
$\overline{\text{BHE}}$, $\overline{\text{BLE}}$	39, 40	Input/Control	Byte Write Select Inputs, active LOW. $\overline{\text{BLE}}$ controls I/O ₈ –I/O ₁ , $\overline{\text{BHE}}$ controls I/O ₁₆ –I/O ₉ .
$\overline{\text{OE}}$	41	Input/Control	Output Enable, active LOW. Controls the direction of the I/O pins. When LOW, the I/O pins are allowed to behave as outputs. When deasserted HIGH, I/O pins are three-stated, and act as input data pins.
V _{SS}	12, 34	Ground	Ground for the device. Should be connected to ground of the system.
V _{CC}	11, 33	Power Supply	Power Supply inputs to the device.



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 +7.0V
 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

Static Discharge Voltage..... >2001V (per MIL-STD-883, Method 3015)

Latch-Up Current..... >200 mA

Operating Range

Range	Ambient Temperature (T _A) ^[3]	V _{CC}
Commercial	0°C to +70°C	5V ± 10%
Industrial	-40°C to +85°C	5V ± 10%
Automotive	-40°C to +125°C	5V ± 10%

Electrical Characteristics Over the Operating Range

Parameter	Description	Test Conditions	7C10211B-10		7C1021B-12		7C1021B-15		Unit	
			Min.	Max.	Min.	Max.	Min.	Max.		
V _{OH}	Output HIGH Voltage	V _{CC} = Min., I _{OH} = -4.0 mA	2.4		2.4		2.4		V	
V _{OL}	Output LOW Voltage	V _{CC} = Min., I _{OL} = 8.0 mA		0.4		0.4		0.4	V	
V _{IH}	Input HIGH Voltage		2.2	6.0	2.2	6.0	2.2	6.0	V	
V _{IL}	Input LOW Voltage ^[2]		-0.5	0.8	-0.5	0.8	-0.5	0.8	V	
I _{Ix}	Input Load Current	GND ≤ V _I ≤ V _{CC}	Com'l / Ind'l	-1	+1	-1	+1	-1	+1	μA
			Automotive	-	-	-	-	-4	+4	μA
I _{OZ}	Output Leakage Current	GND ≤ V _I ≤ V _{CC} , Output Disabled	Com'l / Ind'l	-1	+1	-1	+1	-1	+1	μA
			Automotive	-	-	-	-	-4	+4	μA
I _{OS}	Output Short Circuit Current ^[4]	V _{CC} = Max., V _{OUT} = GND		-300		-300		-300	mA	
I _{CC}	V _{CC} Operating Supply Current	V _{CC} = Max., I _{OUT} = 0 mA, f = f _{MAX} = 1/t _{RC}	Com'l / Ind'l		150		140		130	mA
			Automotive		-		-		150	mA
I _{SB1}	Automatic CE Power-Down Current—TTL Inputs	Max. V _{CC} , $\overline{CE} \geq V_{IH}$, V _{IN} ≥ V _{IH} or V _{IN} ≤ V _{IL} , f = f _{MAX}	Com'l / Ind'l		40		40		40	mA
			Automotive		-		-		50	mA
I _{SB2}	Automatic CE Power-Down Current—CMOS Inputs	Max. V _{CC} , $\overline{CE} \geq V_{CC} - 0.3V$, V _{IN} ≥ V _{CC} - 0.3V, or V _{IN} ≤ 0.3V, f = 0	Com'l / Ind'l		10		10		10	mA
			Automotive		-		-		15	mA
			L Version		0.5		0.5		0.5	mA

Thermal Resistance^[5]

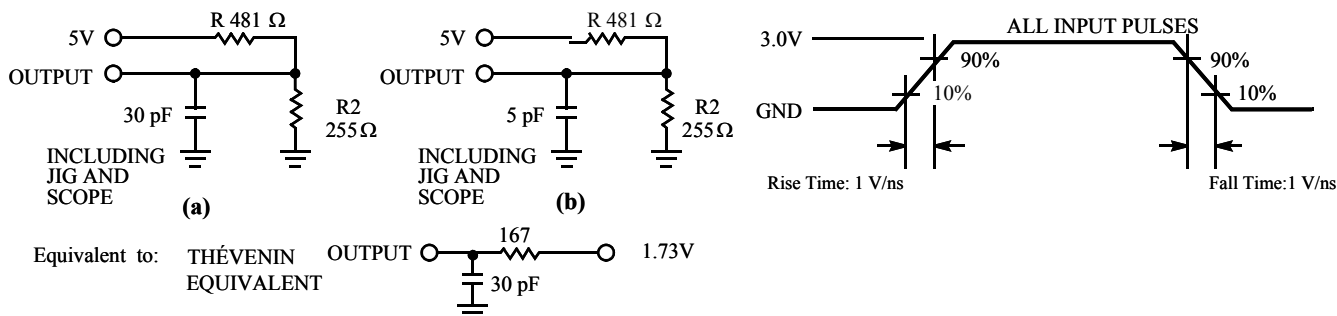
Parameter	Description	Test Conditions	44-lead SOJ	44-lead TSOP-II	Unit
θ _{JA}	Thermal Resistance (Junction to Ambient)	Test conditions follow standard test methods and procedures for measuring thermal impedance, per EIA / JESD51.	64.32	76.89	°C/W
θ _{JC}	Thermal Resistance (Junction to Case)		31.03	14.28	°C/W

Notes:

- V_{IL} (min.) = -2.0V and V_{IH} (max) = V_{CC} + 0.5V for pulse durations of less than 20 ns.
- T_A is the "Instant On" case temperature.
- Not more than one output should be shorted at one time. Duration of the short circuit should not exceed 30 seconds.
- Tested initially and after any design or process changes that may affect these parameters.

Capacitance^[5]

Parameter	Description	Test Conditions	Max.	Unit
C _{IN}	Input Capacitance	T _A = 25°C, f = 1 MHz, V _{CC} = 5.0V	8	pF
C _{OUT}	Output Capacitance		8	pF

AC Test Loads and Waveforms

Switching Characteristics^[6] Over the Operating Range

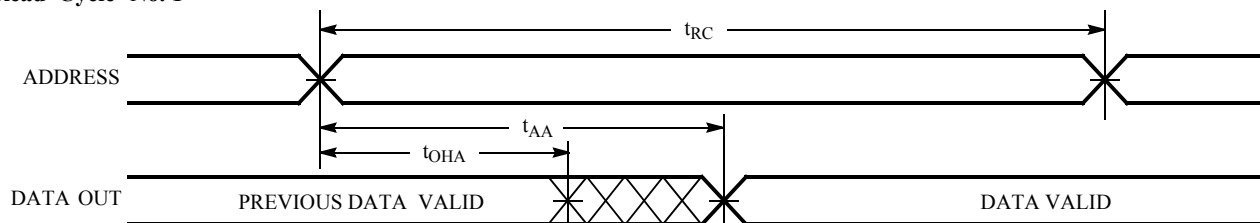
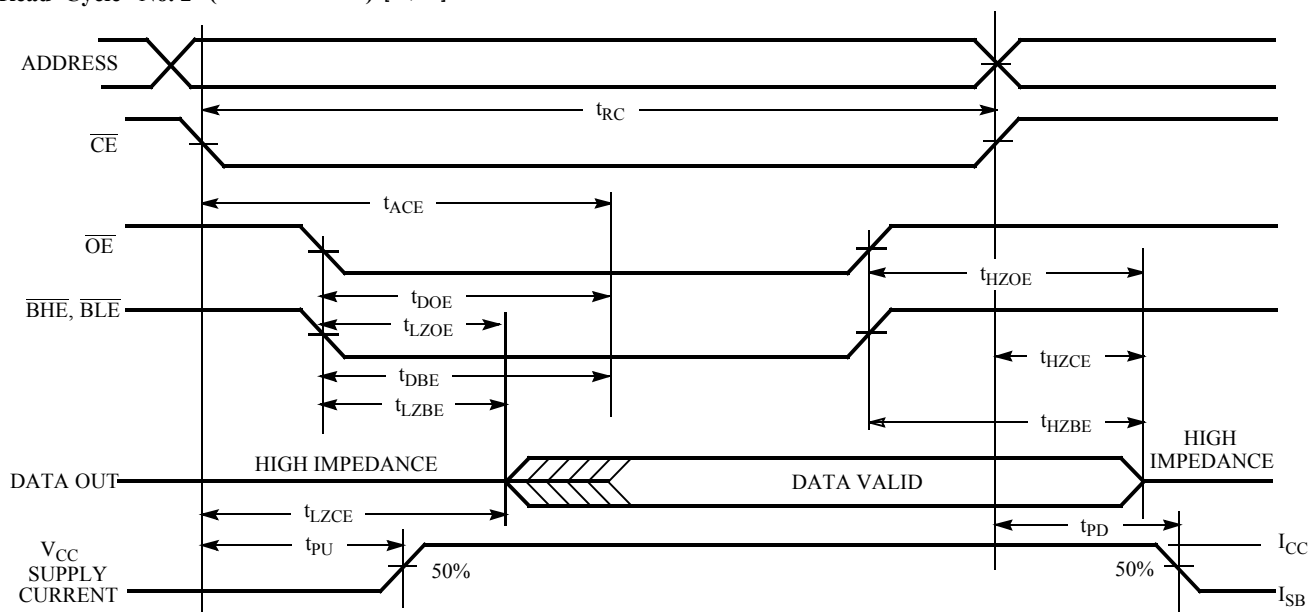
Parameter	Description	7C10211B-10		7C1021B-12		7C1021B-15		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	
Read Cycle								
t _{RC}	Read Cycle Time	10		12		15		ns
t _{AA}	Address to Data Valid		10		12		15	ns
t _{OHA}	Data Hold from Address Change	3		3		3		ns
t _{ACE}	CE LOW to Data Valid		10		12		15	ns
t _{DOE}	OE LOW to Data Valid		5		6		7	ns
t _{LZOE}	OE LOW to Low Z ^[7]	0		0		0		ns
t _{HZOE}	OE HIGH to High Z ^[7, 8]		5		6		7	ns
t _{LZCE}	CE LOW to Low Z ^[7]	3		3		3		ns
t _{HZCE}	CE HIGH to High Z ^[7, 8]		5		6		7	ns
t _{PU}	CE LOW to Power-Up	0		0		0		ns
t _{PD}	CE HIGH to Power-Down		10		12		15	ns
t _{DBE}	Byte Enable to Data Valid		5		6		7	ns
t _{LZBE}	Byte Enable to Low Z	0		0		0		ns
t _{HZBE}	Byte Disable to High Z		5		6		7	ns
Write Cycle^[9]								
t _{WC}	Write Cycle Time	10		12		15		ns
t _{SCE}	CE LOW to Write End	8		9		10		ns
t _{AW}	Address Set-Up to Write End	7		8		10		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 _{SD}	Data Set-Up to Write End	5		6		8		ns
t _{HD}	Data Hold from Write End	0		0		0		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_{OL}/I_{OH} and 30-pF load capacitance.
- 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.
- t_{HZOE}, t_{HZBE}, t_{HZCE}, and t_{HZWE} are specified with a load capacitance of 5 pF as in part (b) of AC Test Loads. Transition is measured ±500 mV from steady-state voltage.
- The internal write time of the memory is defined by the overlap of CE LOW, WE LOW and BHE / BLE LOW. CE, WE and BHE / BLE must be LOW to initiate a write, and the transition 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.

Switching Characteristics^[6] Over the Operating Range (continued)

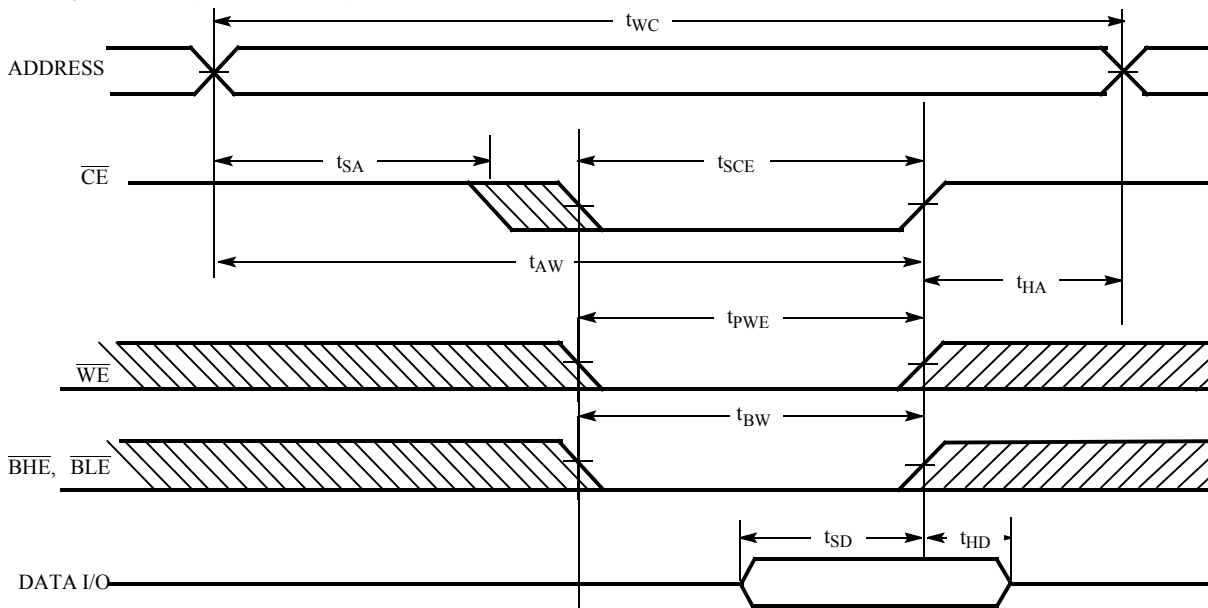
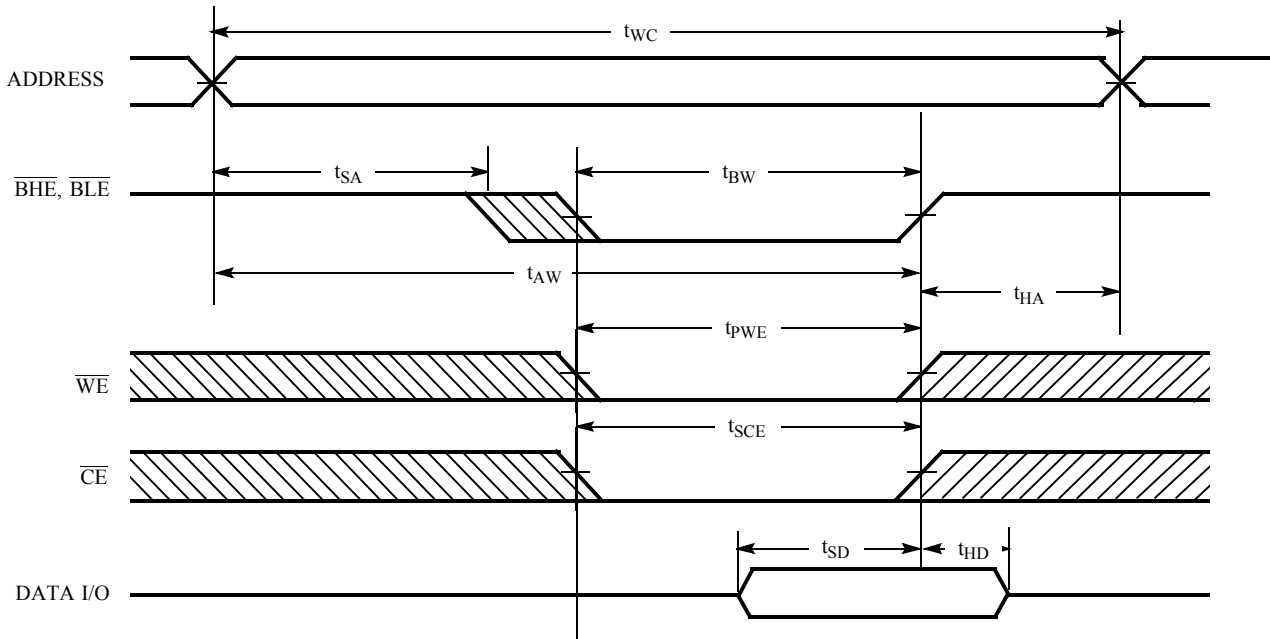
Parameter	Description	7C10211B-10		7C1021B-12		7C1021B-15		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	
t_{LZWE}	\overline{WE} HIGH to Low Z ^[7]	3		3		3		ns
t_{HZWE}	\overline{WE} LOW to High Z ^[7, 8]		5		6		7	ns
t_{BW}	Byte Enable to End of Write	7		8		9		ns

Switching Waveforms
Read Cycle No. 1 ^[10, 11]

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

Notes:

10. Device is continuously selected. \overline{OE} , \overline{CE} , \overline{BHE} and/or $\overline{BLE} = V_{IL}$.

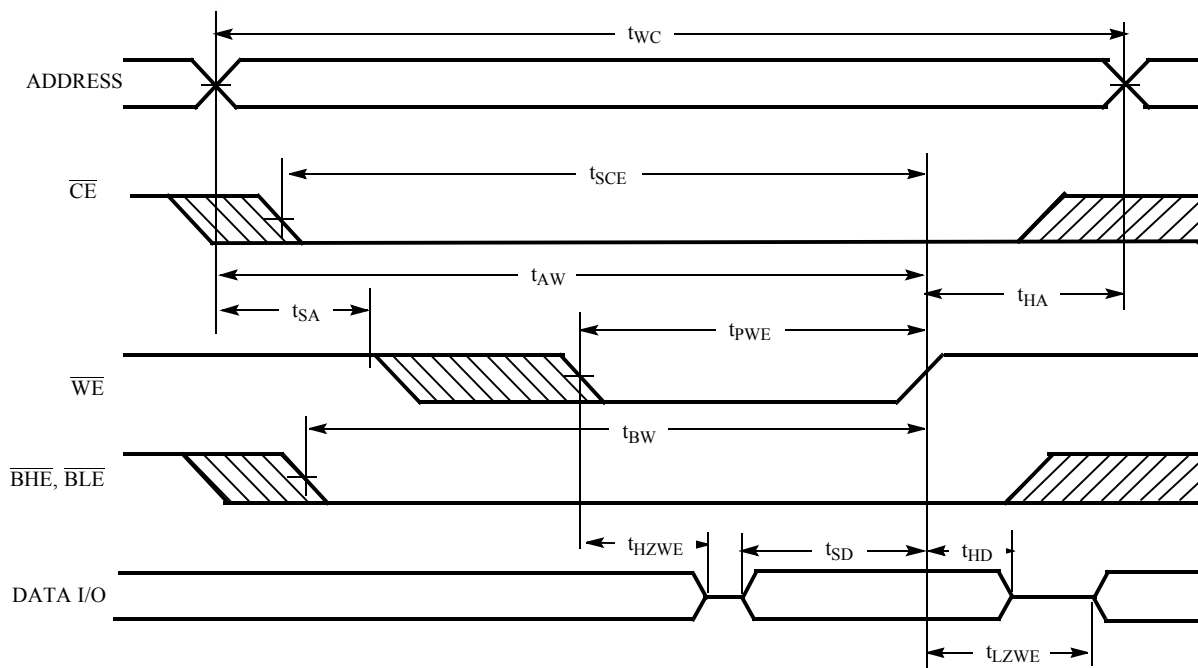
11. \overline{WE} is HIGH for read cycle.

Switching Waveforms (continued)

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

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

Notes:

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

Switching Waveforms (continued)

Write Cycle No. 3 (\overline{WE} Controlled, LOW)

Truth Table

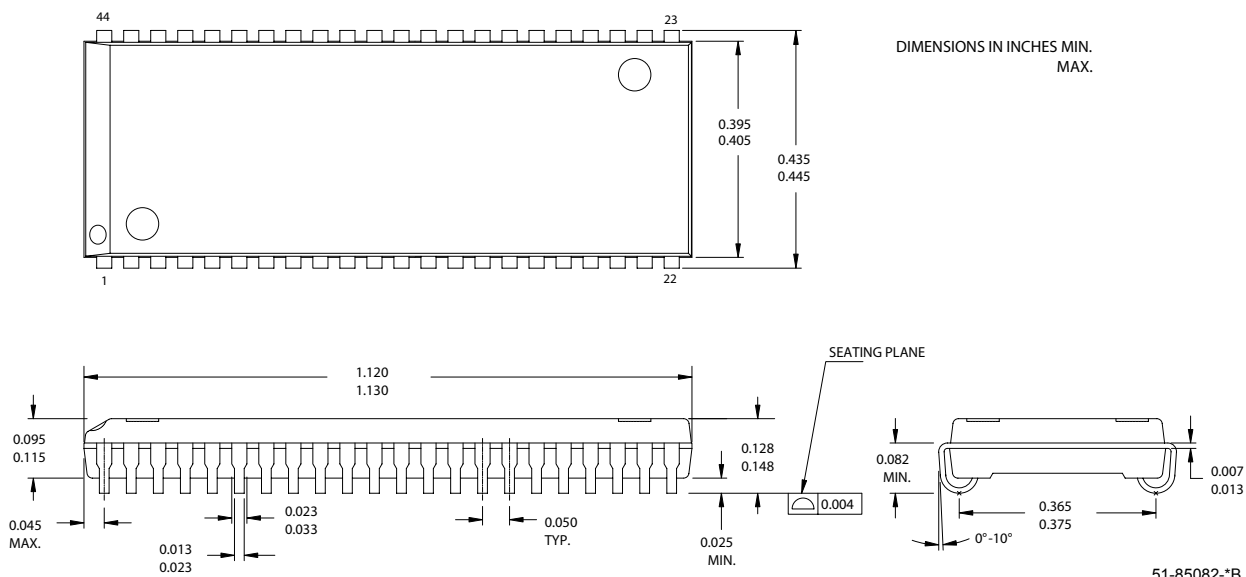
CE	OE	WE	BLE	BHE	I/O ₁ -I/O ₈	I/O ₉ -I/O ₁₆	Mode	Power
H	X	X	X	X	High Z	High Z	Power-Down	Standby (I_{SB})
L	L	H	L	L	Data Out	Data Out	Read - All bits	Active (I_{CC})
			L	H	Data Out	High Z	Read - Lower bits only	Active (I_{CC})
			H	L	High Z	Data Out	Read - Upper bits only	Active (I_{CC})
L	X	L	L	L	Data In	Data In	Write - All bits	Active (I_{CC})
			L	H	Data In	High Z	Write - Lower bits only	Active (I_{CC})
			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})
L	X	X	H	H	High Z	High Z	Selected, Outputs Disabled	Active (I_{CC})

Ordering Information

Speed (ns)	Ordering Code	Package Name	Package Type	Operating Range
10	CY7C10211B-10VC	V34	44-Lead (400-Mil) Molded SOJ	Commercial
	CY7C10211B-10ZC	Z44	44-Lead TSOP Type II	Commercial
	CY7C10211BL-10ZC	Z44	44-Lead TSOP Type II	Commercial
12	CY7C1021B-12VC	V34	44-Lead (400-Mil) Molded SOJ	Commercial
	CY7C1021B-12VI	V34	44-Lead (400-Mil) Molded SOJ	Industrial
	CY7C1021BL-12VC	V34	44-Lead (400-Mil) Molded SOJ	Commercial
	CY7C1021B-12ZC	Z44	44-Lead TSOP Type II	Commercial
	CY7C1021B-12ZI	Z44	44-Lead TSOP Type II	Industrial
	CY7C1021BL-12ZC	Z44	44-Lead TSOP Type II	Commercial

Ordering Information (continued)

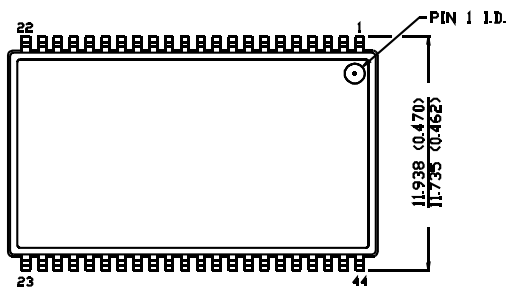
Speed (ns)	Ordering Code	Package Name	Package Type	Operating Range
15	CY7C1021B-15VC	V34	44-pin (400-Mil) Molded SOJ	Commercial
	CY7C1021B-15VI	V34	44-pin (400-Mil) Molded SOJ	Industrial
	CY7C1021BL-15VC	V34	44-pin (400-Mil) Molded SOJ	Commercial
	CY7C1021B-15VE	V34	44-pin (400-Mil) Molded SOJ	Automotive
	CY7C1021B-15ZC	Z44	44-pin TSOP Type II	Commercial
	CY7C1021B-15ZXC	Z44	Lead (Pb)-Free, 44-pin TSOP Type II	Commercial
	CY7C1021B-15ZI	Z44	44-pin TSOP Type II	Industrial
	CY7C1021BL-15ZC	Z44	44-pin TSOP Type II	Commercial
	CY7C1021B-15ZE	Z44	44-pin TSOP Type II	Automotive

Package Diagrams
44-Lead (400-Mil) Molded SOJ V34


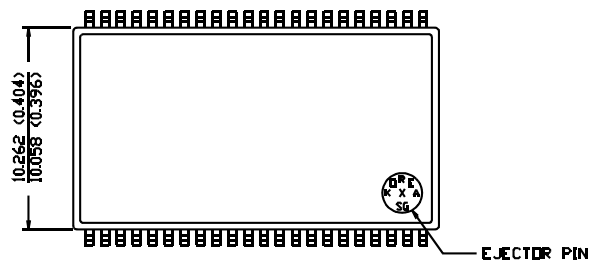
Package Diagrams (continued)

44-Pin TSOP II Z44

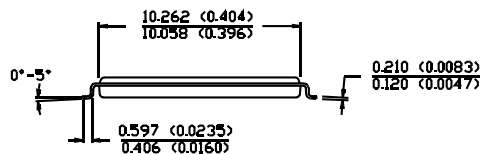
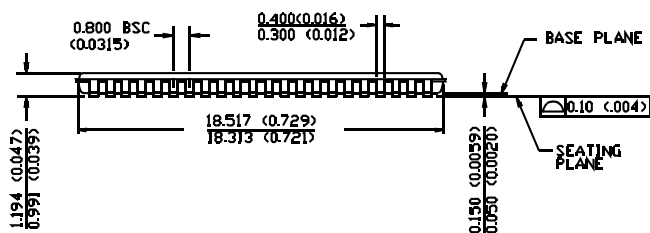
DIMENSION IN MM (INCH)
MAX
MIN



TOP VIEW



BOTTOM VIEW



51-85087-*A

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Document History Page

Document Title: CY7C1021B/CY7C10211B 64K x 16 Static RAM Document Number: 38-05145				
REV.	ECN NO.	Issue Date	Orig. of Change	Description of Change
**	109889	09/22/01	SZV	Change from Spec number: 38-00951 to 38-05145
*A	238454	See ECN	RKF	1) Added Automotive Specs to Data Sheet 2) Added Pb-Free device offering in the Ordering Information