

128K x 8 Static RAM

Features

- **High speed**
— $t_{AA} = 10, 12, 15$ ns
- **CMOS for optimum speed/power**
- **Center power/ground pinout**
- **Automatic power-down when deselected**
- **Easy memory expansion with CE and OE options**
- **Functionally equivalent to CY7C1019**

Functional Description

The CY7C1019B/10191B is a high-performance CMOS static RAM organized as 131,072 words by 8 bits. Easy memory expansion is provided by an active LOW Chip Enable (CE), an active LOW Output Enable (OE), and three-state drivers. This device has an automatic power-down feature that significantly reduces power consumption when deselected.

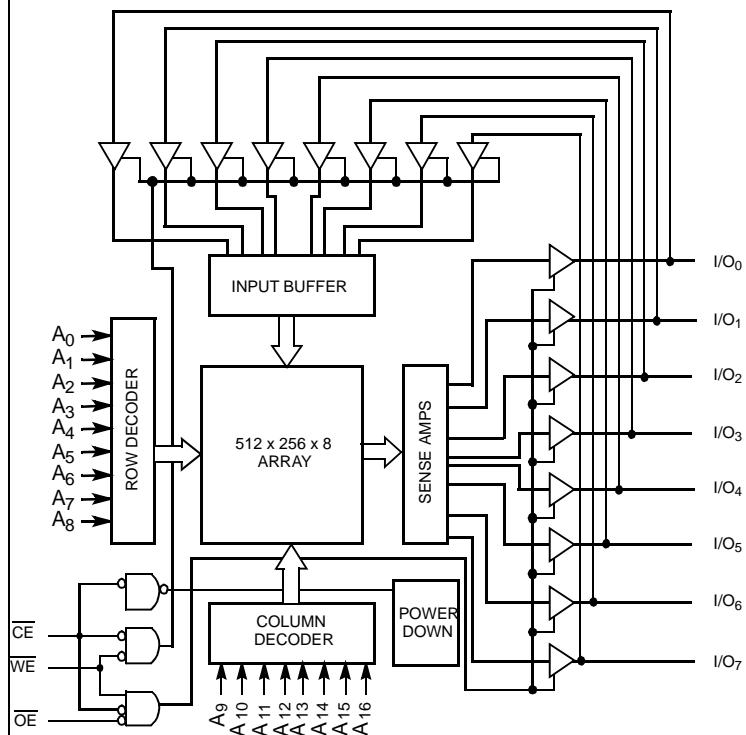
Writing to the device is accomplished by taking Chip Enable (CE) and Write Enable (WE) inputs LOW. Data on the eight I/O pins (I/O₀ through I/O₇) is then written into the location specified on the address pins (A₀ through A₁₆).

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

The eight input/output pins (I/O₀ through I/O₇) are placed in a high-impedance state when the device is deselected (CE HIGH), the outputs are disabled (OE HIGH), or during a write operation (CE LOW, and WE LOW).

The CY7C1019B/10191B is available in standard 32-pin TSOP Type II and 400-mil-wide SOJ packages. Customers should use part number CY7C10191B when ordering parts with 10 ns t_{AA}, and CY7C1019B when ordering 12 and 15 ns t_{AA}.

Logic Block Diagram



Pin Configurations

SOJ / TSOPII

Top View

A ₀	1	32	A ₁₆
A ₁	2	31	A ₁₅
A ₂	3	30	A ₁₄
A ₃	4	29	A ₁₃
CE	5	28	OE
I/O ₀	6	27	I/O ₇
I/O ₁	7	26	I/O ₆
V _{CC}	8	25	V _{SS}
V _{SS}	9	24	V _{CC}
I/O ₂	10	23	I/O ₅
I/O ₃	11	22	I/O ₄
WE	12	21	A ₁₂
A ₄	13	20	A ₁₁
A ₅	14	19	A ₁₀
A ₆	15	18	A ₉
A ₇	16	17	A ₈

Selection Guide

	7C1019B-10	7C1019B-12	7C1019B-15
Maximum Access Time (ns)	10	12	15
Maximum Operating Current (mA)	150	140	130
Maximum Standby Current (mA)	10	10	10
L	—	1	1

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 ^[1]	—0.5V to +7.0V
DC Voltage Applied to Outputs in High Z State ^[1]	—0.5V to V_{CC} + 0.5V
DC Input Voltage ^[1]	—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 ^[2]	V_{CC}
Commercial	0°C to +70°C	5V ± 10%
Industrial	—40°C to +85°C	5V ± 10%

Electrical Characteristics

 Over the Operating Range

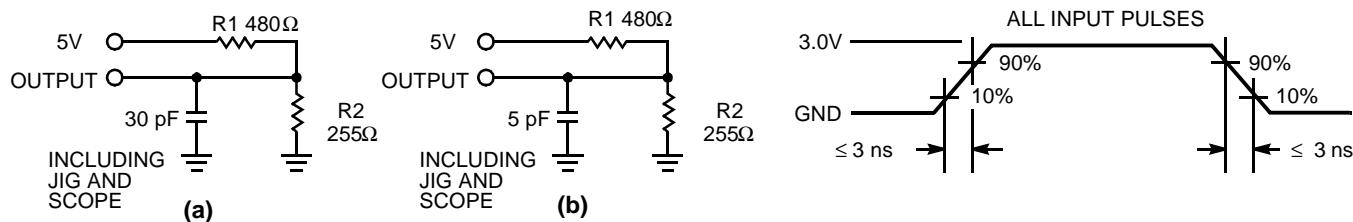
Parameter	Description	Test Conditions	7C1019B-10		7C1019B-12		7C1019B-15		Unit
			Min.	Max.	Min.	Max.	Min.	Max.	
V_{OH}	Output HIGH Voltage	V_{CC} = Min., I_{OH} = —4.0 mA	2.4		2.4		2.4		V
V_{OL}	Output LOW Voltage	V_{CC} = Min., I_{OL} = 8.0 mA		0.4		0.4		0.4	V
V_{IH}	Input HIGH Voltage		2.2	V_{CC} + 0.3	2.2	V_{CC} + 0.3	2.2	V_{CC} + 0.3	V
V_{IL}	Input LOW Voltage ^[1]		—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	μA
I_{OZ}	Output Leakage Current	$GND \leq V_I \leq V_{CC}$, Output Disabled	—5	+5	—5	+5	—5	+5	μA
I_{CC}	V_{CC} Operating Supply Current	V_{CC} = Max., I_{OUT} = 0 mA, $f = f_{MAX} = 1/t_{RC}$		150		140		130	mA
I_{SB1}	Automatic CE Power-Down Current — TTL Inputs	V_{CC} , $\overline{CE} \geq V_{IH}$, $V_{IN} \geq V_{IH}$ or $V_{IN} \leq V_{IL}$, $f = f_{MAX}$		40		40		40	mA
			L		20		20		
I_{SB2}	Automatic CE Power-Down Current — CMOS Inputs	V_{CC} , $\overline{CE} \geq V_{CC} - 0.3V$, $V_{IN} \geq V_{CC} - 0.3V$, or $V_{IN} \leq 0.3V$, $f = 0$		10		10		10	mA
			L		—		1		

Capacitance^[3]

Parameter	Description	Test Conditions	Max.	Unit
C_{IN}	Input Capacitance	$T_A = 25^\circ C$, $f = 1$ MHz, $V_{CC} = 5.0V$	6	pF
C_{OUT}	Output Capacitance		8	pF

Notes:

1. V_{IL} (min.) = —2.0V for pulse durations of less than 20 ns.
2. T_A is the "Instant On" case temperature.
3. Tested initially and after any design or process changes that may affect these parameters.

AC Test Loads and Waveforms


Equivalent to: THÉVENIN EQUIVALENT

Switching Characteristics^[4] Over the Operating Range

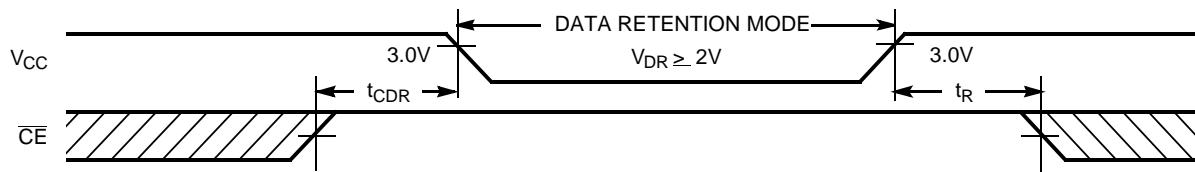
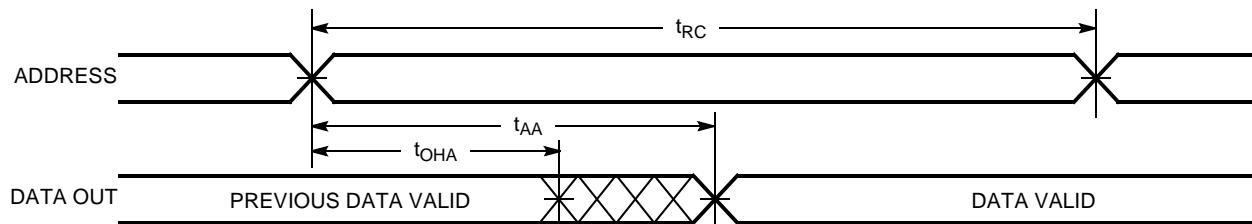
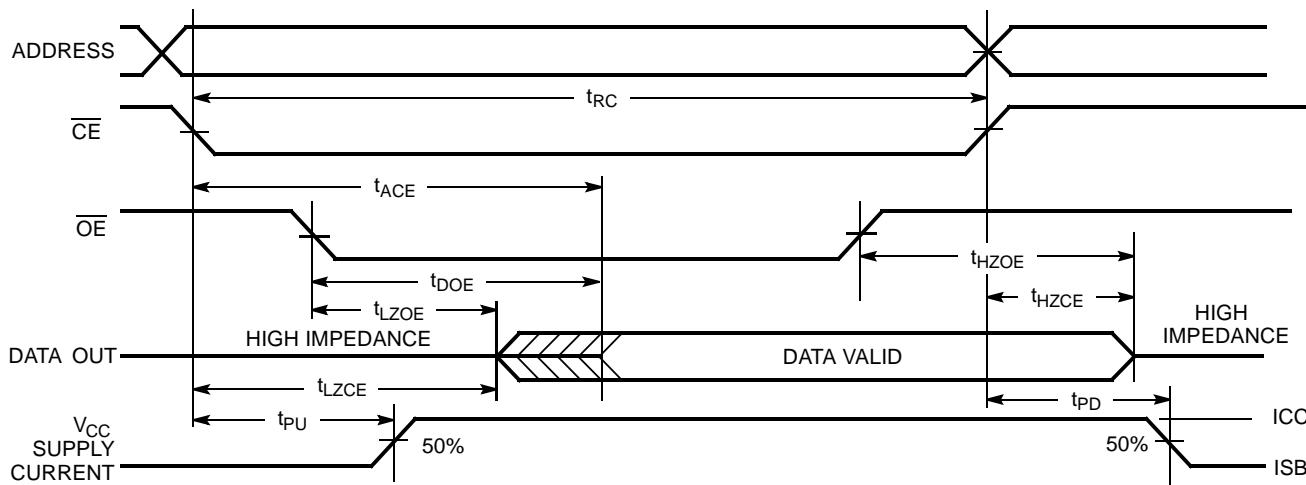
Parameter	Description	7C1019B-10		7C1019B-12		7C1019B-15		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	
Read Cycle								
t_{RC}	Read Cycle Time	10		12		15		ns
t_{AA}	Address to Data Valid		10		12		15	ns
t_{OHA}	Data Hold from Address Change	3		3		3		ns
t_{ACE}	\overline{CE} LOW to Data Valid		10		12		15	ns
t_{DOE}	\overline{OE} LOW to Data Valid		5		6		7	ns
t_{LZOE}	\overline{OE} LOW to Low Z	0		0		0		ns
t_{HZOE}	\overline{OE} HIGH to High Z ^[5, 6]		5		6		7	ns
t_{LZCE}	\overline{CE} LOW to Low Z ^[6]	3		3		3		ns
t_{HZCE}	\overline{CE} HIGH to High Z ^[5, 6]		5		6		7	ns
t_{PU}	\overline{CE} LOW to Power-Up	0		0		0		ns
t_{PD}	\overline{CE} HIGH to Power-Down		10		12		15	ns
Write Cycle^[7, 8]								
t_{WC}	Write Cycle Time	10		12		15		ns
t_{SCE}	\overline{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_{PWE}	\overline{WE} Pulse Width	7		8		10		ns
t_{SD}	Data Set-Up to Write End	5		6		8		ns
t_{HD}	Data Hold from Write End	0		0		0		ns
t_{LZWE}	\overline{WE} HIGH to Low Z ^[6]	3		3		3		ns
t_{HZWE}	\overline{WE} LOW to High Z ^[5, 6]		5		6		7	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.
- t_{HZOE} , 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.
- At any given temperature and voltage condition, t_{HZCE} is less than t_{LZOE} , t_{HZOE} is less than t_{LZWE} , 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 CE LOW and WE LOW. CE and WE 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 (WE controlled, OE LOW) is the sum of t_{HZWE} and t_{SD} .

Data Retention Characteristics Over the Operating Range (L Version Only)

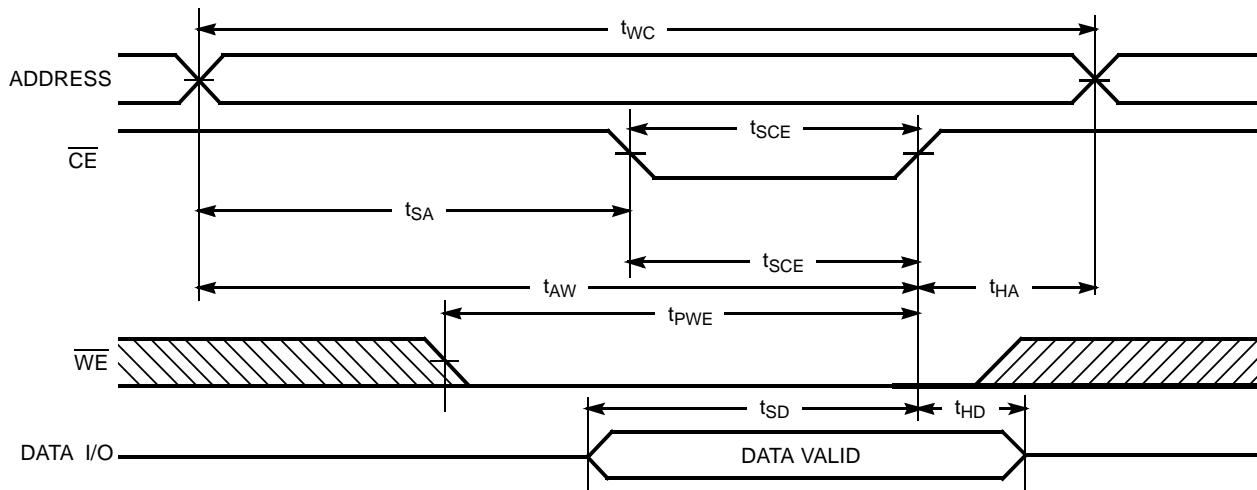
Parameter	Description	Conditions	Min.	Max.	Unit
V_{DR}	V_{CC} for Data Retention	No input may exceed $V_{CC} + 0.5V$ $V_{CC} = V_{DR} = 2.0V$, $\overline{CE} \geq V_{CC} - 0.3V$, $V_{IN} \geq V_{CC} - 0.3V$ or $V_{IN} \leq 0.3V$	2.0		V
I_{CCDR}	Data Retention Current			300	μA
$t_{CDR}^{[3]}$	Chip Deselect to Data Retention Time		0		ns
t_R	Operation Recovery Time		200		μs

Data Retention Waveform

Switching Waveforms
Read Cycle No. 1^[9, 10]

Read Cycle No. 2 (\overline{OE} Controlled)^[10, 11]

Notes:

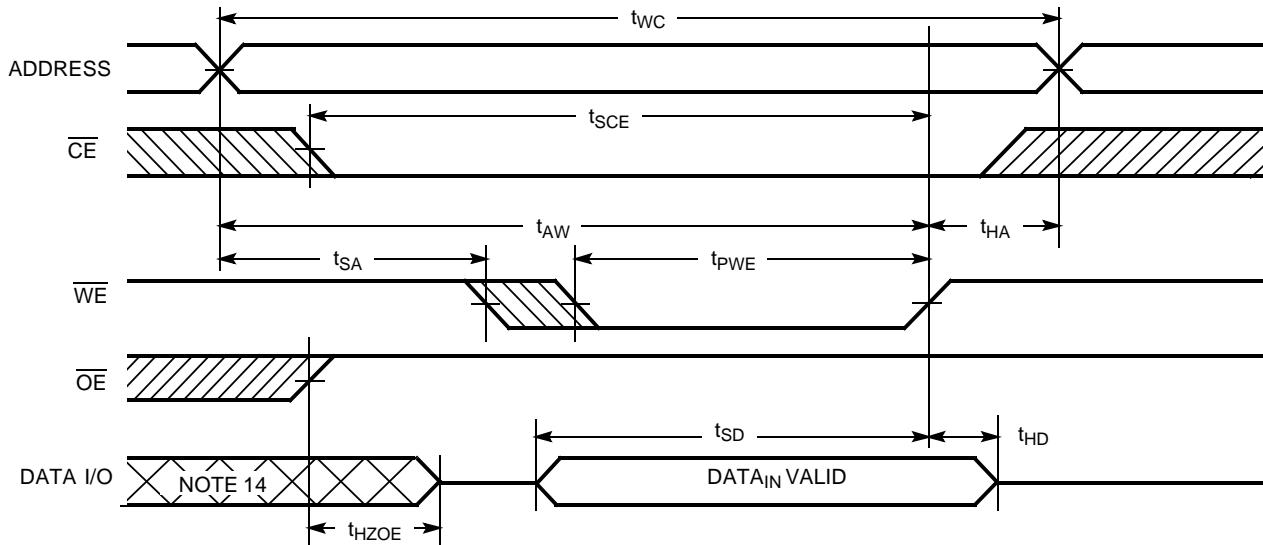
9. Device is continuously selected. \overline{OE} , $\overline{CE} = V_{IL}$.
10. WE is HIGH for read cycle.
11. Address valid prior to or coincident with \overline{CE} transition LOW.

Switching Waveforms (continued)

Write Cycle No. 1 ($\overline{\text{CE}}$ Controlled)^[12, 13]



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

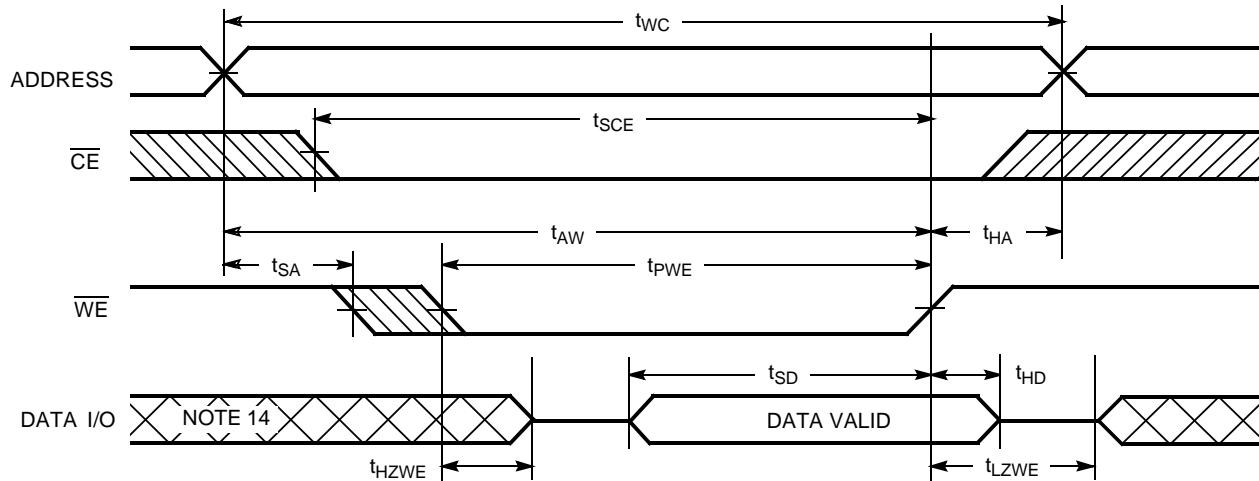


Notes:

12. Data I/O is high impedance if $\overline{\text{OE}} = \text{V}_{IH}$.
13. If $\overline{\text{CE}}$ goes HIGH simultaneously with WE going HIGH, the output remains in a high-impedance state.
14. During this period the I/Os are in the output state and input signals should not be applied.

Switching Waveforms (continued)

Write Cycle No. 3 ($\overline{\text{WE}}$ Controlled, $\overline{\text{OE}}$ LOW)^[13]

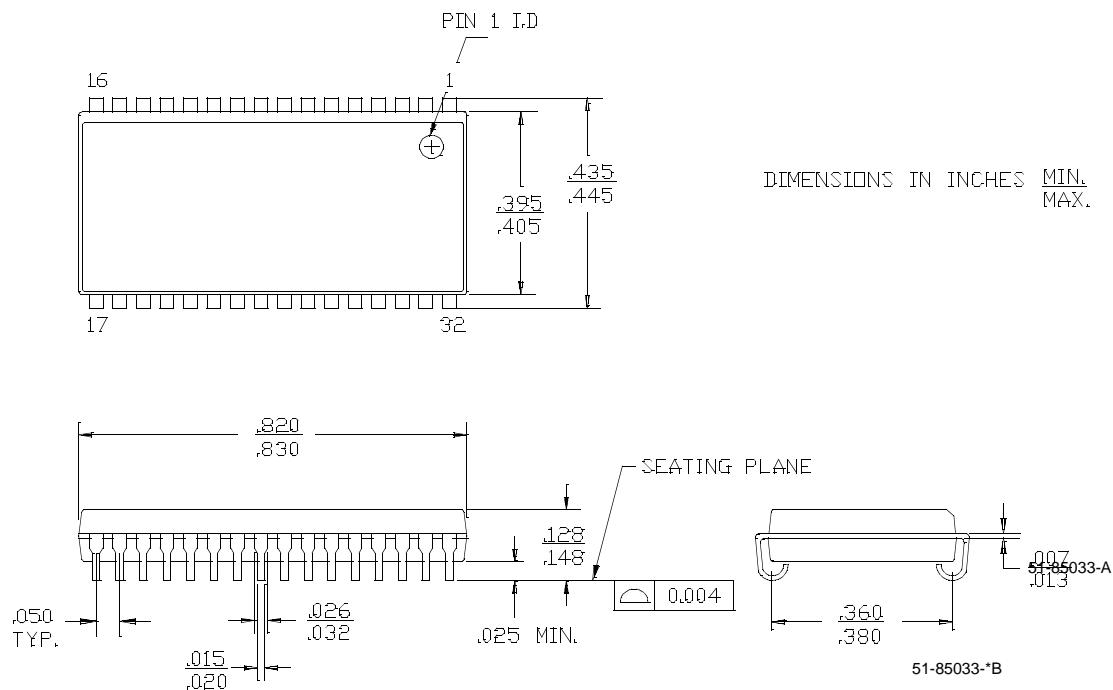


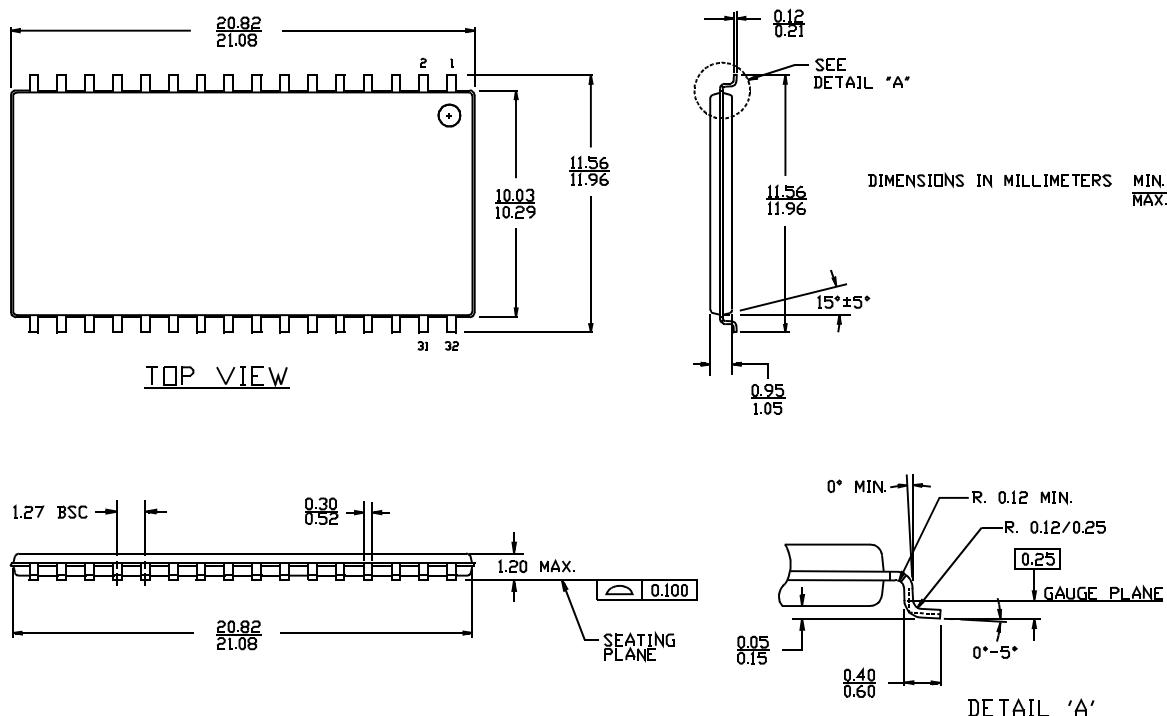
Truth Table

CE	OE	WE	I/O ₀ -I/O ₇	Mode	Power
H	X	X	High Z	Power-Down	Standby (I _{SB})
X	X	X	High Z	Power-Down	Standby (I _{SB})
L	L	H	Data Out	Read	Active (I _{CC})
L	X	L	Data In	Write	Active (I _{CC})
L	H	H	High Z	Selected, Outputs Disabled	Active (I _{CC})

Ordering Information

Speed (ns)	Ordering Code	Package Name	Package Type	Operating Range
10	CY7C1019B-10VC	V33	32-Lead 400-Mil Molded SOJ	Commercial
12	CY7C1019B-12VC	V33	32-Lead 400-Mil Molded SOJ	Commercial
	CY7C1019B-12ZC	ZS32	32-Lead TSOP Type II	Commercial
15	CY7C1019B-15VC	V33	32-Lead 400-Mil Molded SOJ	Commercial
	CY7C1019B-15VI	V33	32-Lead 400-Mil Molded SOJ	Industrial
	CY7C1019B-15ZC	ZS32	32-Lead TSOP Type II	Commercial
	CY7C1019B-15ZI	ZS32	32-Lead TSOP Type II	Industrial

Package Diagrams
32-Lead (400-Mil) Molded SOJ V33


Package Diagrams (continued)
32-Lead TSOP II ZS32


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**CY7C1019B/
CY7C10191B**

Document Title: CY7C1019B/CY7C10191B 128K x 8 Static RAM
Document Number: 38-05026

REV.	ECN NO.	Issue Date	Orig. of Change	Description of Change
**	109949	09/25/01	SZV	Change from Spec number: 38-01115 to 38-05026
*A	116170	08/14/02	HGK	<ol style="list-style-type: none">1. SOJ (400-mil) package outline replacing incorrect SOJ package2. Pin for pin compatible with CY7C10193. Industrial packages added to Ordering Information