

## 256Kx1 Static RAM

### Features

- **High speed**  
— 12 ns
- **CMOS for optimum speed/power**
- **Low active power**  
— 880 mW
- **Low standby power**  
— 220 mW
- **TTL-compatible inputs and outputs**
- **Automatic power-down when deselected**

### Functional Description

The CY7C197 is a high-performance CMOS static RAM organized as 256K words by 1 bit. Easy memory expansion is pro-

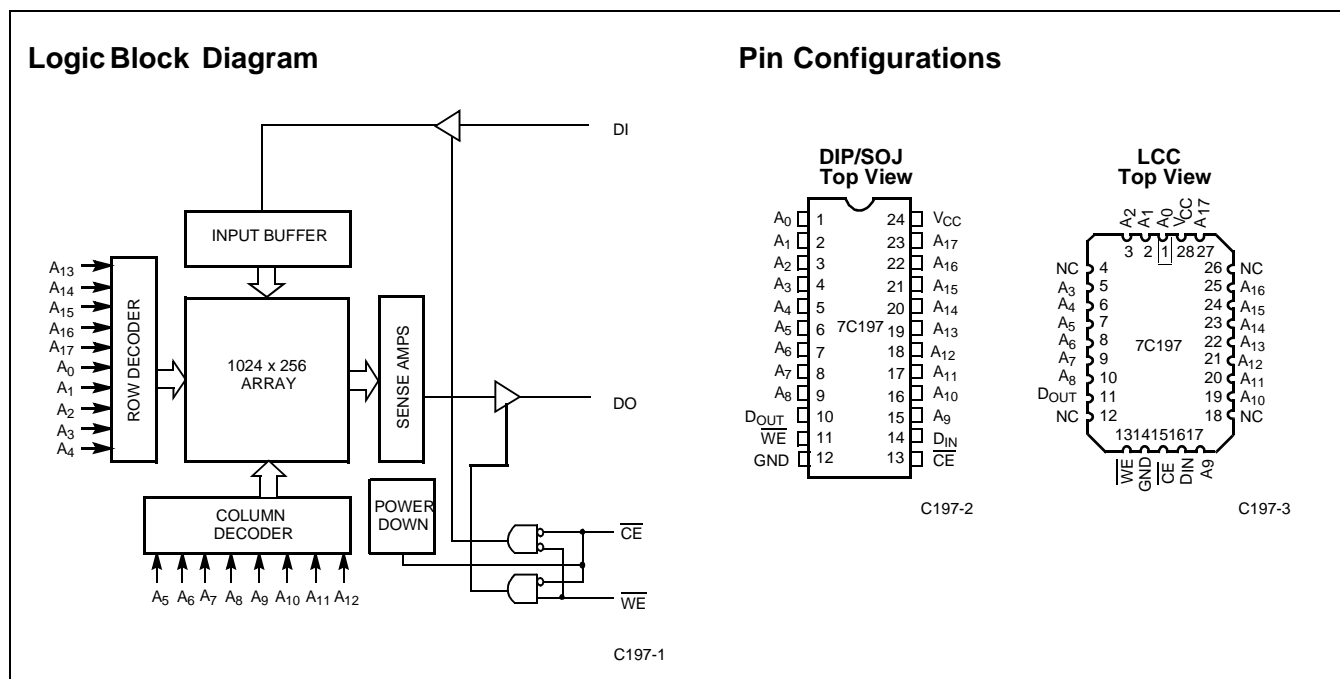
vided by an active LOW Chip Enable ( $\overline{CE}$ ) and three-state drivers. The CY7C197 has an automatic power-down feature, reducing the power consumption by 75% when deselected.

Writing to the device is accomplished when the Chip Enable ( $\overline{CE}$ ) and Write Enable ( $\overline{WE}$ ) inputs are both LOW. Data on the input pin ( $D_{IN}$ ) is written into the memory location specified on the address pins ( $A_0$  through  $A_{17}$ ).

Reading the device is accomplished by taking chip enable ( $\overline{CE}$ ) LOW while Write Enable ( $\overline{WE}$ ) remains HIGH. Under these conditions the contents of the memory location specified on the address pins will appear on the data output ( $D_{OUT}$ ) pin.

The output pin stays in a high-impedance state when Chip Enable ( $\overline{CE}$ ) is HIGH or Write Enable ( $\overline{WE}$ ) is LOW.

The CY7C197 utilizes a die coat to insure alpha immunity.



### Selection Guide

	7C197-12	7C197-15	7C197-20	7C197-25	7C197-35	7C197-45
Maximum Access Time (ns)	12	15	20	25	35	45
Maximum Operating Current (mA)	150	140	135	95	95	
Maximum Standby Current (mA)	30	30	30	30	30	30

### 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 to Ground Potential (Pin 24 to Pin 12)..... -0.5V to +7.0V  
 DC Voltage Applied to Outputs in High Z State<sup>[1]</sup> ..... -0.5V to  $V_{CC} + 0.5V$

DC Input Voltage<sup>[1]</sup>..... -0.5V to  $V_{CC} + 0.5V$   
 Output 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	$V_{CC}$
Commercial	0°C to +70°C	5V ± 10%

### Electrical Characteristics Over the Operating Range

Parameter	Description	Test Conditions	7C197-12		7C197-15		Unit
			Min.	Max.	Min.	Max.	
$V_{OH}$	Output HIGH Voltage	$V_{CC} = \text{Min.}, I_{OH} = -4.0 \text{ mA}$	2.4		2.4		V
$V_{OL}$	Output LOW Voltage	$V_{CC} = \text{Min.}, I_{OL} = 12.0 \text{ mA}$		0.4		0.4	V
$V_{IH}$	Input HIGH Voltage		2.2	$V_{CC} + 0.3V$	2.2	$V_{CC} + 0.3V$	V
$V_{IL}$	Input LOW Voltage <sup>[1]</sup>		-0.5	0.8	-0.5	0.8	V
$I_{IX}$	Input Load Current	$GND \leq V_I \leq V_{CC}$	-5	+5	-5	+5	µA
$I_{OZ}$	Output Leakage Current	$GND \leq V_O \leq V_{CC}$ , Output Disabled	-5	+5	-5	+5	µA
$I_{OS}$	Output Short Circuit Current <sup>[2]</sup>	$V_{CC} = \text{Max.}, V_{OUT} = GND$		-300		-300	mA
$I_{CC}$	$V_{CC}$ Operating Supply Current	$V_{CC} = \text{Max.}, I_{OUT} = 0 \text{ mA}, f = f_{MAX} = 1/t_{RC}$		150		140	mA
$I_{SB1}$	Automatic $\overline{CE}$ Power-Down Current—TTL Inputs <sup>[3]</sup>	Max. $V_{CC}$ , $\overline{CE} \geq V_{IH}$ , $V_{IN} \geq V_{IH}$ or $V_{IN} \leq V_{IL}$ , $f = f_{MAX}$		30		30	mA
$I_{SB2}$	Automatic $\overline{CE}$ Power-Down Current—CMOS Inputs <sup>[3]</sup>	Max. $V_{CC}$ , $\overline{CE} \geq V_{CC} - 0.3V$ , $V_{IN} \geq V_{CC} - 0.3V$ or $V_{IN} < 0.3V$		10		10	mA

**Notes:**

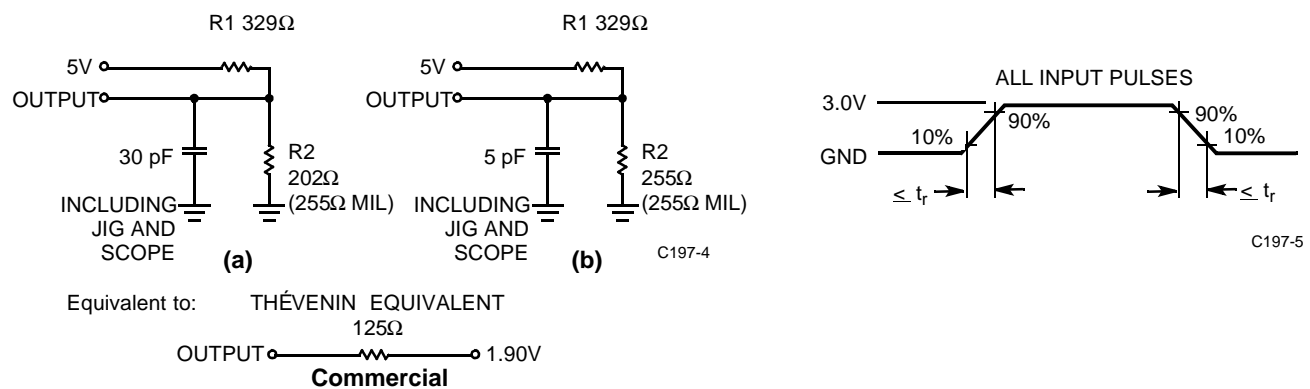
- $V_{(min.)} = -2.0V$  for pulse durations of less than 20 ns.
- Not more than one output should be shorted at one time. Duration of the short circuit should not exceed 30 seconds.
- A pull-up resistor to  $V_{CC}$  on the  $\overline{CE}$  input is required to keep the device deselected during  $V_{CC}$  power-up, otherwise  $I_{SB}$  will exceed values given.

**Electrical Characteristics** Over the Operating Range (continued)

Parameter	Description	Test Conditions	7C197-20		7C197-25, 35, 45		Unit
			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		V
V <sub>OL</sub>	Output LOW Voltage	V <sub>CC</sub> = Min., I <sub>OL</sub> = 12.0 mA		0.4		0.4	V
V <sub>IH</sub>	Input HIGH Voltage		2.2	V <sub>CC</sub> + 0.3V	2.2	V <sub>CC</sub> + 0.3V	V
V <sub>IL</sub>	Input LOW Voltage <sup>[1]</sup>		-0.5	0.8	-0.5	0.8	V
I <sub>IX</sub>	Input Load Current	GND ≤ V <sub>I</sub> ≤ V <sub>CC</sub>	-5	+5	-5	+5	μA
I <sub>OZ</sub>	Output Leakage Current	GND ≤ V <sub>O</sub> ≤ V <sub>CC</sub> , Output Disabled	-5	+5	-5	+5	μA
I <sub>OS</sub>	Output Short Circuit Current <sup>[2]</sup>	V <sub>CC</sub> = Max., V <sub>OUT</sub> = GND		-300		-300	mA
I <sub>CC</sub>	V <sub>CC</sub> Operating Supply Current	V <sub>CC</sub> = Max., I <sub>OUT</sub> = 0 mA, f = f <sub>MAX</sub> = 1/t <sub>RC</sub>		135		95	mA
I <sub>SB1</sub>	Automatic $\overline{CE}$ Power Down Current—TTL Inputs <sup>[3]</sup>	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>		30		30	mA
I <sub>SB2</sub>	Automatic $\overline{CE}$ Power-Down Current—CMOS Inputs <sup>[3]</sup>	Max. V <sub>CC</sub> , $\overline{CE} \geq V_{CC} - 0.3V$ , V <sub>IN</sub> ≥ V <sub>CC</sub> - 0.3V or V <sub>IN</sub> < 0.3V		15		15	mA

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

Parameter	Description	Test Conditions	Max.	Unit
C <sub>IN</sub>	Input Capacitance	T <sub>A</sub> = 25°C, f = 1 MHz, V <sub>CC</sub> = 5.0V	8	pF
C <sub>OUT</sub>	Output Capacitance		10	pF

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

**Notes:**

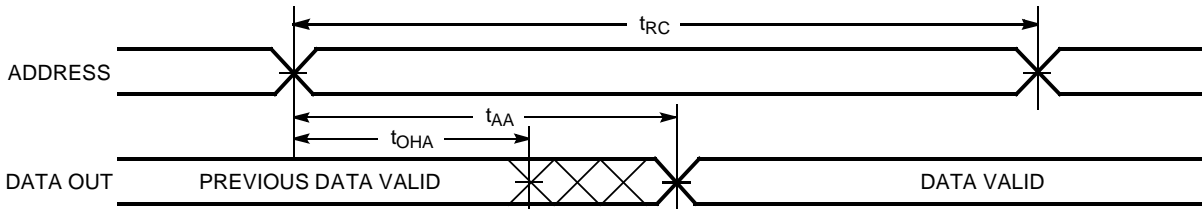
4. Tested initially and after any design or process changes that may affect these parameters.
5. t<sub>r</sub> = ≤ 3 ns for the -12 and -15 speeds. t<sub>r</sub> = ≤ 5 ns for the -20 and slower speeds.

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

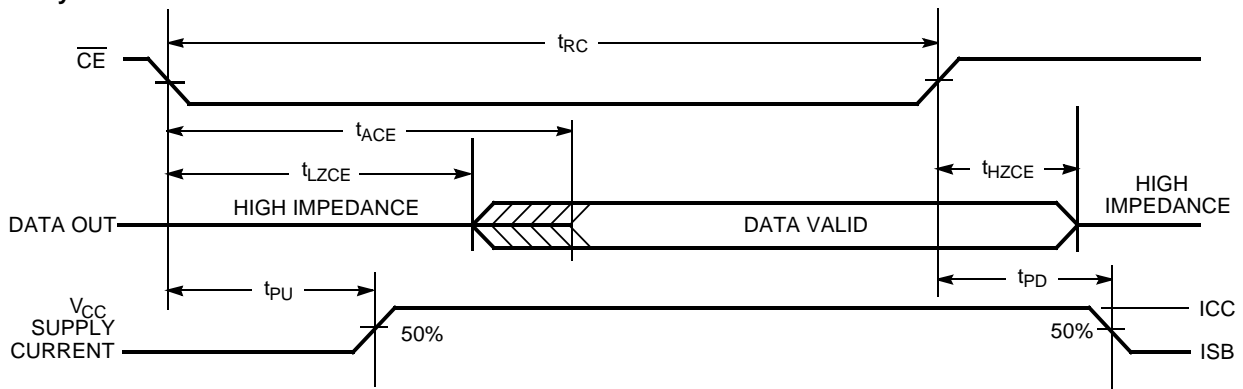
Parameter	Description	7C197-12		7C197-15		7C197-20		7C197-25		7C197-35		7C197-45		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
<b>READ CYCLE</b>														
t <sub>RC</sub>	Read Cycle Time	12		15		20		25		35		45		ns
t <sub>AA</sub>	Address to Data Valid		12		15		20		25		35		45	ns
t <sub>OHA</sub>	Output Hold from Address Change	3		3		3		3		3		3		ns
t <sub>ACE</sub>	$\overline{CE}$ LOW to Data Valid		12		15		20		25		35		45	ns
t <sub>LZCE</sub>	$\overline{CE}$ LOW to Low Z <sup>[7]</sup>	3		3		3		3		3		3		ns
t <sub>HZCE</sub>	$\overline{CE}$ HIGH to High Z <sup>[7, 8]</sup>		5		7	0	9	0	11	0	15	0	15	ns
t <sub>PU</sub>	$\overline{CE}$ LOW to Power-Up	0		0		0		0		0		0		ns
t <sub>PD</sub>	$\overline{CE}$ HIGH to Power-Down		12		15		20		20		25		30	ns
<b>WRITE CYCLE<sup>[9]</sup></b>														
t <sub>WC</sub>	Write Cycle Time	12		15		20		25		35		45		ns
t <sub>SCE</sub>	$\overline{CE}$ LOW to Write End	9		10		15		20		30		40		ns
t <sub>AW</sub>	Address Set-Up to Write End	9		10		15		20		30		40		ns
t <sub>HA</sub>	Address Hold from Write End	0		0		0		0		0		0		ns
t <sub>SA</sub>	Address Set-Up to Write Start	0		0		0		0		0		0		ns
t <sub>PWE</sub>	$\overline{WE}$ Pulse Width	8		9		15		20		25		30		ns
t <sub>SD</sub>	Data Set-Up to Write End	8		9		10		15		17		20		ns
t <sub>HD</sub>	Data Hold from Write End	0		0		0		0		0		0		ns
t <sub>LZWE</sub>	$\overline{WE}$ HIGH to Low Z <sup>[7]</sup>	2		2		3		3		3		3		ns
t <sub>HZWE</sub>	$\overline{WE}$ LOW to High Z <sup>[7, 8]</sup>		7		7	0	10	0	11	0	15	0	15	ns

**Notes:**

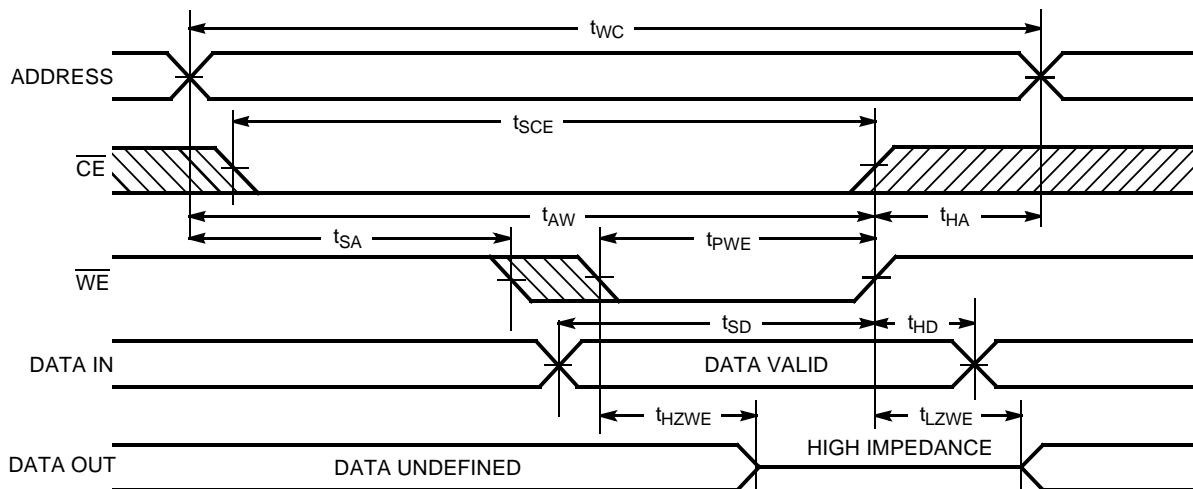
6. Test conditions assume signal transition time of 3 ns or less for -12 and -15 speeds and 5 ns or less for -20 and slower speeds, timing reference levels of 1.5V, input pulse levels of 0 to 3.0V, and output loading of the specified I<sub>OL</sub>/I<sub>OH</sub> and 30-pF load capacitance.
7. At any given temperature and voltage condition, t<sub>HZCE</sub> is less than t<sub>LZCE</sub> and t<sub>HZWE</sub> is less than t<sub>LZWE</sub> for any given device.
8. t<sub>HZCE</sub> and t<sub>HZWE</sub> are specified with C<sub>L</sub> = 5 pF as in part (b) in AC Test Loads and Waveforms. Transition is measured ±500 mV from steady-state voltage.
9. The internal write time of the memory is defined by the overlap of  $\overline{CE}$  LOW and  $\overline{WE}$  LOW. Both signals must be LOW to initiate a write and either signal can terminate a write by going HIGH. The data input set-up and hold timing should be referenced to the rising edge of the signal that terminates the write.

**Switching Waveforms**
**Read Cycle No. 1** <sup>[10, 11]</sup>


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**Read Cycle No. 2** <sup>[10]</sup>


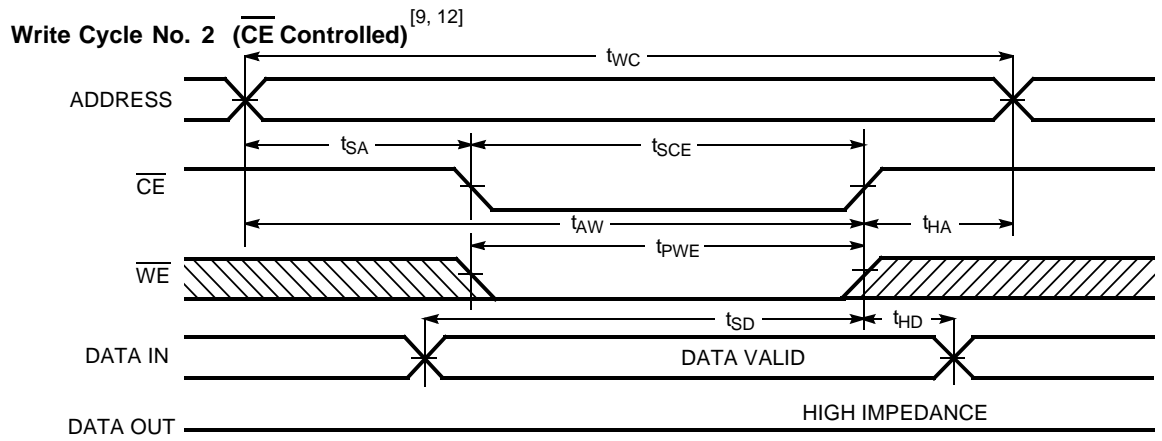
C197-7

**Write Cycle No. 1 ( $\overline{WE}$  Controlled)** <sup>[9]</sup>


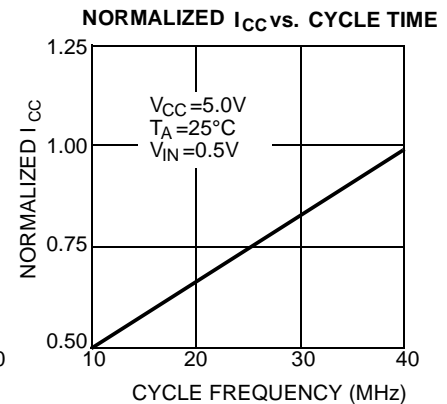
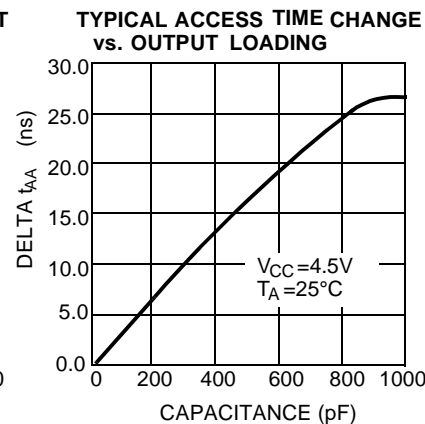
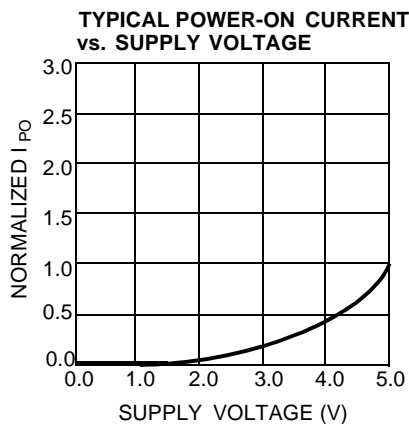
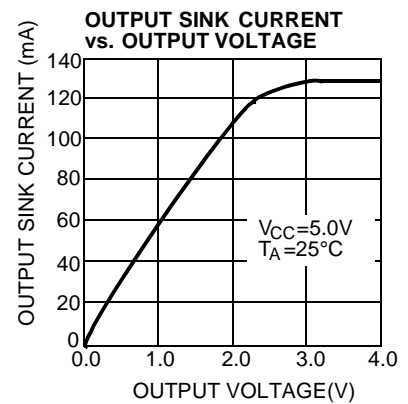
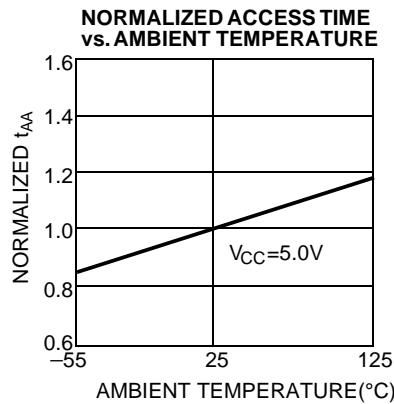
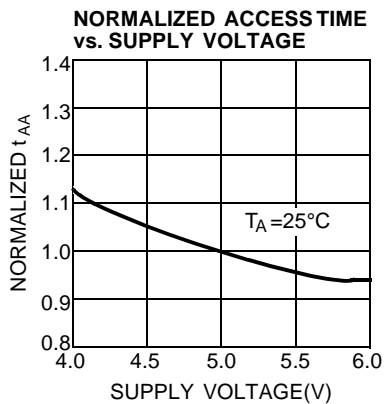
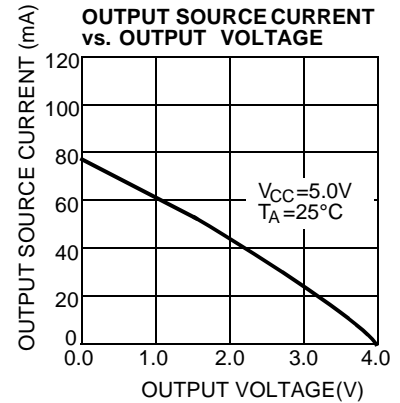
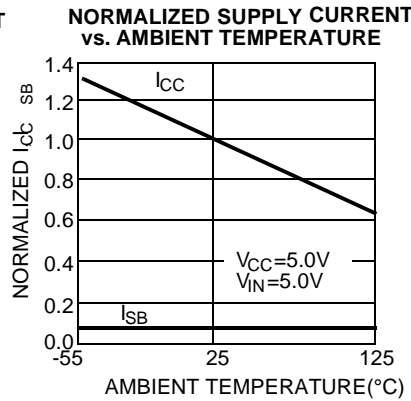
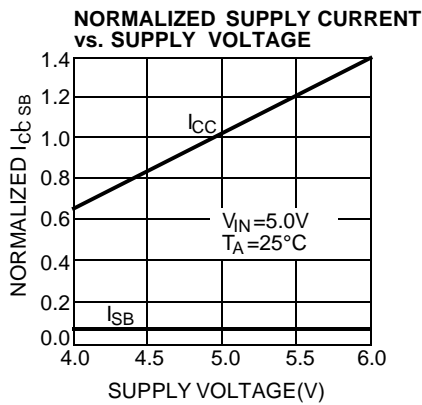
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**Notes:**

10.  $\overline{WE}$  is HIGH for read cycle.
11. Device is continuously selected,  $\overline{CE} = V_{IL}$ .

**Switching Waveforms (continued)**

**Note:**

12. If  $\overline{\text{CE}}$  goes HIGH simultaneously with  $\overline{\text{WE}}$  HIGH, the output remains in a high-impedance state.

**Typical DC and AC Characteristics**


**CY7C197 Truth Table**

<b>CE</b>	<b>WE</b>	<b>Input/Output</b>	<b>Mode</b>
H	X	High Z	Deselect/Power-Down
L	H	Data Out	Read
L	L	Data In	Write

**Ordering Information**

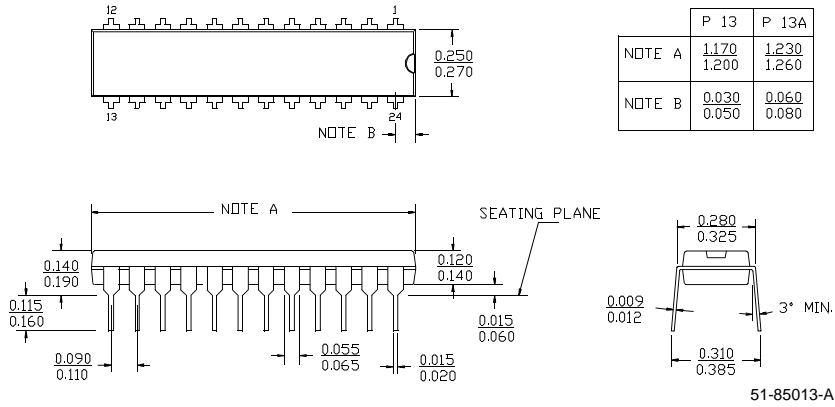
<b>Speed (ns)</b>	<b>Ordering Code</b>	<b>Package Name</b>	<b>Package Type</b>	<b>Operating Range</b>
12	CY7C197-12PC	P13	24-Lead (300-Mil) Molded DIP	Commercial
	CY7C197-12VC	V13	24-Lead Molded SOJ	
15	CY7C197-15PC	P13	24-Lead (300-Mil) Molded DIP	Commercial
	CY7C197-15VC	V13	24-Lead Molded SOJ	
20	CY7C197-20PC	P13	24-Lead (300-Mil) Molded DIP	Commercial
	CY7C197-20VC	V13	24-Lead Molded SOJ	
25	CY7C197-25PC	P13	24-Lead (300-Mil) Molded DIP	Commercial
	CY7C197-25VC	V13	24-Lead Molded SOJ	
35	CY7C197-35PC	P13	24-Lead (300-Mil) Molded DIP	Commercial
	CY7C197-35VC	V13	24-Lead Molded SOJ	
45	CY7C197-45PC	P13	24-Lead (300-Mil) Molded DIP	Commercial
	CY7C197-45VC	V13	24-Lead Molded SOJ	



Package Diagrams

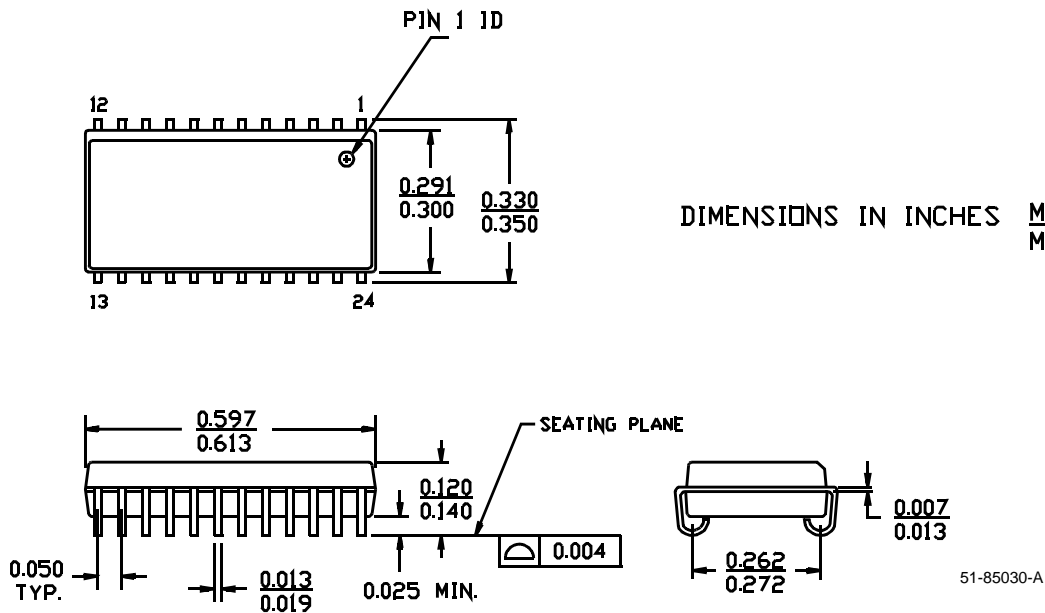
24-Lead (300-Mil) Molded DIP P13/P13A

DIMENSIONS IN INCHES MIN.  
MAX.



24-Lead (300-Mil) Molded SOJ V13

DIMENSIONS IN INCHES MIN.  
MAX.



<b>Document Title: CY7C197 256K x 1 Static RAM</b> <b>Document Number: 38-05049</b>				
<b>REV.</b>	<b>ECN NO.</b>	<b>Issue Date</b>	<b>Orig. of Change</b>	<b>Description of Change</b>
**	107151	09/10/01	SZV	Change from Spec number: 38-00078 to 38-05049