



CY7C194 CY7C195 CY7C196

64K x 4 Static RAM

Features

- **High speed**
— 12 ns
- **Output enable (\overline{OE}) feature (7C195 and 7C196)**
- **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

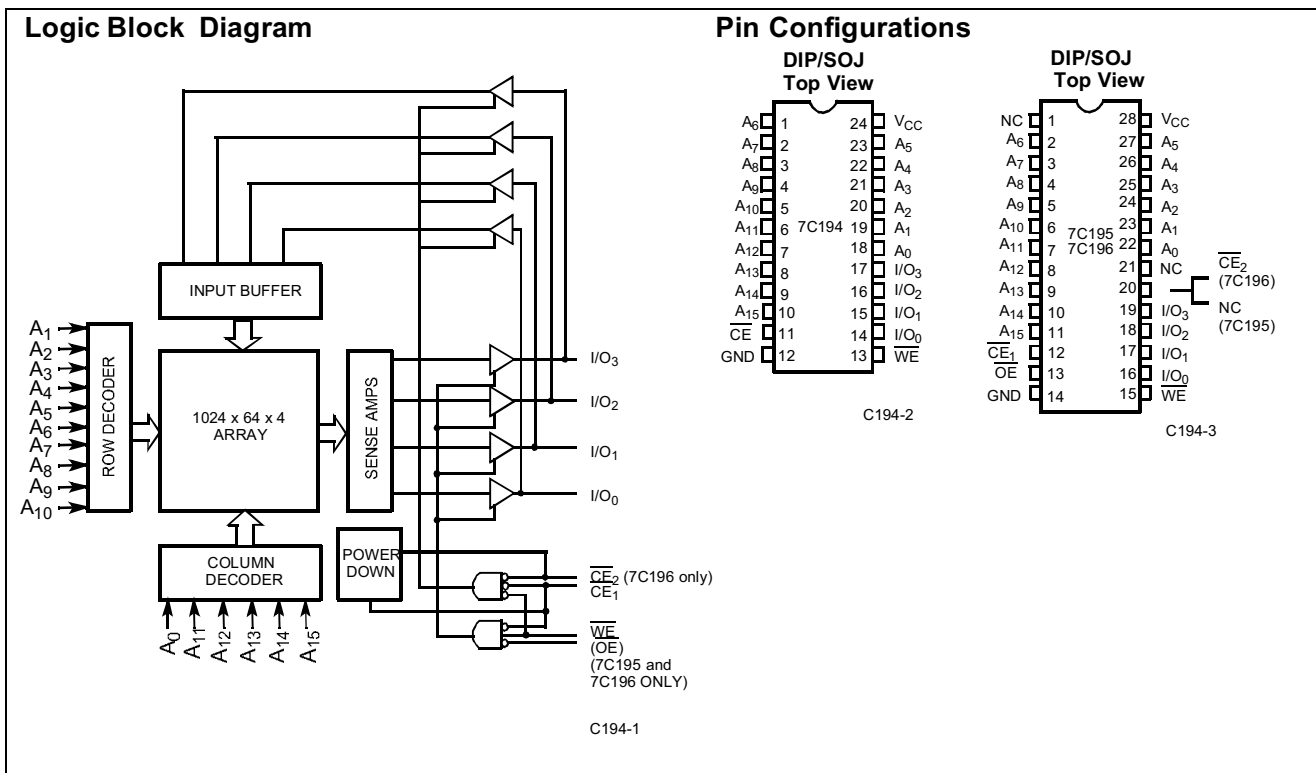
The CY7C194, CY7C195, and CY7C196 are high-performance CMOS static RAMs organized as 65,536 by 4 bits. Easy memory expansion is provided by active LOW Chip En-

able(s) (\overline{CE} on the CY7C194 and CY7C195, \overline{CE}_1 , \overline{CE}_2 on the CY7C196) and three-state drivers. They have an automatic power-down feature, reducing the power consumption by 75% when deselected.

Writing to the device is accomplished when the Chip Enable(s) (\overline{CE} on the CY7C194 and CY7C195, \overline{CE}_1 , \overline{CE}_2 on the CY7C196) and Write Enable (\overline{WE}) inputs are both LOW. Data on the four input pins (I/O₀ through I/O₃) is written into the memory location, specified on the address pins (A₀ through A₁₅).

Reading the device is accomplished by taking the Chip Enable(s) (\overline{CE} on the CY7C194 and CY7C195, \overline{CE}_1 , \overline{CE}_2 on the CY7C196) 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 four data I/O pins.

A die coat is used to ensure alpha immunity.



Selection Guide

	7C194-12 7C195-12 7C196-12	7C194-15 7C195-15 7C196-15	7C194-20 7C195-20 7C196-20	7C194-25 7C195-25 7C196-25	7C194-35 7C195-35 7C196-35	7C194-45 7C196-45
Maximum Access Time (ns)	12	15	20	25	35	45
Maximum Operating Current (mA)	155	145	135	115	115	
Maximum Standby Current (mA)	30	30	30	30	30	30

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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 -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 $V_{CC} + 0.5V$

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 ^[2]	V_{CC}
Commercial	0°C to +70°C	5V ± 10%

Electrical Characteristics Over the Operating Range

Parameter	Description	Test Conditions	7C194-12 7C195-12 7C196-12		7C194-15 7C195-15 7C196-15		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	$V_{CC} = \text{Min.}, I_{OL} = 8.0 \text{ mA}$		0.4		0.4	V
V_{IH}	Input HIGH Voltage		2.2	$V_{CC} + 0.3V$	2.2	$V_{CC} + 0.3V$	V
$V_{IL}^{[1]}$	Input LOW Voltage		-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 ^[3]	$V_{CC} = \text{Max.},$ $V_{OUT} = GND$		-300		-300	mA
I_{CC}	V_{CC} Operating Supply Current	$V_{CC} = \text{Max.}, I_{OUT} = 0 \text{ mA},$ $f = f_{MAX} = 1/t_{RC}$		155		145	mA
I_{SB1}	Automatic \overline{CE} Power-Down Current —TTL Inputs ^[4]	Max. $V_{CC}, \overline{CE}_{1,2} \geq V_{IH},$ $V_{IN} \geq V_{IH}$ or $V_{IN} \leq V_{IL}, f = f_{MAX}$		30		30	mA
I_{SB2}	Automatic \overline{CE} Power-Down Current —CMOS Inputs ^[4]	Max. $V_{CC}, \overline{CE}_{1,2} \geq V_{CC} - 0.3V,$ $V_{IN} \geq V_{CC} - 0.3V$ or $V_{IN} \leq 0.3V, f = 0$		10		10	mA

Notes:

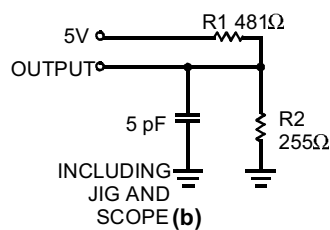
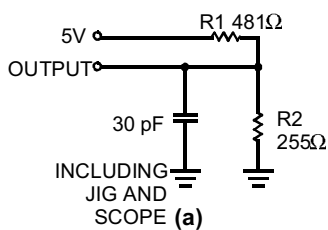
- Minimum voltage is equal to -2.0V for pulse durations of less than 20 ns.
- T_A is the "Instant On" case temperature.
- Not more than 1 output should be shorted at one time. Duration of the short circuit should not exceed 30 seconds.
- A pull-up resistor to V_{CC} on the \overline{CE} input is required to keep the device deselected during V_{CC} power-up, otherwise I_{SB} will exceed values given.


Electrical Characteristics Over the Operating Range (continued)

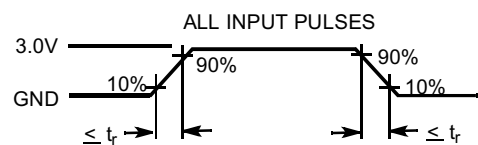
Parameter	Description	Test Conditions	7C194-20 7C195-20 7C196-20		7C194-25, 35, 45 7C195-25, 35 7C196-25, 35, 45		Unit
			Min.	Max.	Min.	Max.	
V_{OH}	Output HIGH Voltage	$V_{CC} = \text{Min.}, I_{OH} = -4.0 \text{ mA}$	2.4		2.4		V
V_{OL}	Output LOW Voltage	$V_{CC} = \text{Min.}, I_{OL} = 8.0 \text{ mA}$		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		-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 ^[3]	$V_{CC} = \text{Max.},$ $V_{OUT} = GND$		-300		-300	mA
I_{CC}	V_{CC} Operating Supply Current	$V_{CC} = \text{Max.}, I_{OUT} = 0 \text{ mA},$ $f = f_{MAX} = 1/t_{RC}$		135		115	mA
I_{SB1}	Automatic \overline{CE} Power-Down Current —TTL Inputs ^[4]	Max. $V_{CC}, \overline{CE}_{1,2} \geq V_{IH},$ $V_{IN} \geq V_{IH}$ or $V_{IN} \leq V_{IL}, f = f_{MAX}$		30		30	mA
I_{SB2}	Automatic \overline{CE} Power-Down Current —CMOS Inputs ^[4]	Max. $V_{CC}, \overline{CE}_{1,2} \geq V_{CC} - 0.3V,$ $V_{IN} \geq V_{CC} - 0.3V$ or $V_{IN} \leq 0.3V, f = 0$		15		15	mA

Capacitance^[5]

Parameter	Description	Test Conditions	Max.	Unit
C_{IN}	Input Capacitance	$T_A = 25^\circ\text{C}, f = 1 \text{ MHz},$ $V_{CC} = 5.0V$	8	pF
C_{OUT}	Output Capacitance		10	pF

AC Test Loads and Waveforms^[6]


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C194-5

Equivalent to: THÉVENIN EQUIVALENT
 167Ω
 OUTPUT $\text{---} 1.73V$

Notes:

- Tested initially and after any design or process changes that may affect these parameters.
- $t_r = \leq 3 \text{ ns}$ for the -12 and -15 speeds. $T_r = \leq 5 \text{ ns}$ for the -20 and slower speeds.

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Switching Characteristics Over the Operating Range^[7]

Parameter	Description	7C194-12 7C195-12 7C196-12		7C194-15 7C195-15 7C196-15		7C194-20 7C195-20 7C196-20		7C194-25 7C195-25 7C196-25		7C194-35 7C195-35 7C196-35		7C194-45 7C196-45		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
READ CYCLE														
t _{RC}	Read Cycle Time	12		15		20		25		35		45		ns
t _{AA}	Address to Data Valid		12		15		20		25		35		45	ns
t _{OHA}	Output Hold from Address Change	3		3		3		3		3		3		ns
t _{ACE1} , t _{ACE2}	CE LOW to Data Valid		12		15		20		25		35		45	ns
t _{DOE}	OE LOW to Data Valid		5		7		9		10		16		16	ns
t _{LZOE}	OE LOW to Low Z		0		0		0		3		3		3	ns
t _{HZOE}	OE HIGH to High Z ^[8]		5		7		9		11		15		15	ns
t _{LZCE1} , t _{LZCE2}	CE LOW to Low Z ^[8]	3		3		3		3		3		3		ns
t _{HZCE1} , t _{HZCE2}	CE HIGH to High Z ^[8,8]		5		7		9		11		15		15	ns
t _{PU}	CE LOW to Power-Up	0		0		0		0		0		0		ns
t _{PD}	CE HIGH to Power-Down		12		15		20		25		35		45	ns
WRITE CYCLE^[10]														
t _{WC}	Write Cycle Time	12		15		20		25		35		45		ns
t _{SCE}	CE LOW to Write End	9		10		15		18		22		22		ns
t _{AW}	Address Set-Up to Write End	9		10		15		20		25		35		ns
t _{HA}	Address Hold from Write End	0		0		0		0		0		0		ns
t _{SA}	Address Set-Up to Write Start	0		0		0		0		0		0		ns
t _{PWE}	WE Pulse Width	8		9		15		18		22		22		ns
t _{SD}	Data Set-Up to Write End	8		9		10		10		15		15		ns
t _{HD}	Data Hold from Write End	0		0		0		0		0		0		ns
t _{LZWE}	WE HIGH to Low Z ^[8]	3		3		3		3		3		3		ns
t _{HZWE}	WE LOW to High Z ^[8, 9]		7		7		10		13		15		20	ns

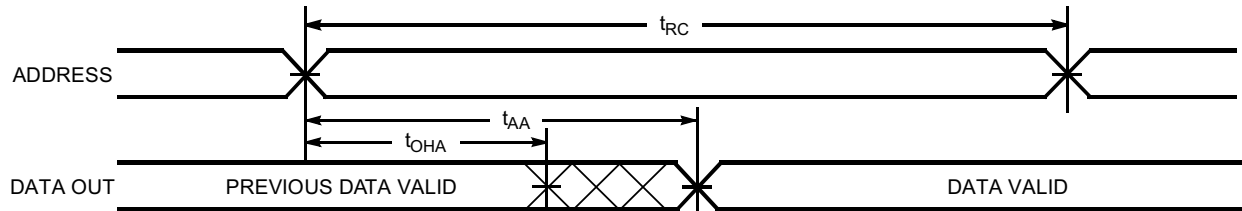
Notes:

- 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_{OL}/I_{OH} and 30-pF load capacitance.
- t_{HZOE}, t_{HZCE}, and t_{HZWE} are specified with C_L = 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_{LZCE} 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 CE₁ LOW, CE₂ LOW, and WE LOW. All signals must be LOW to initiate a write and any 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.



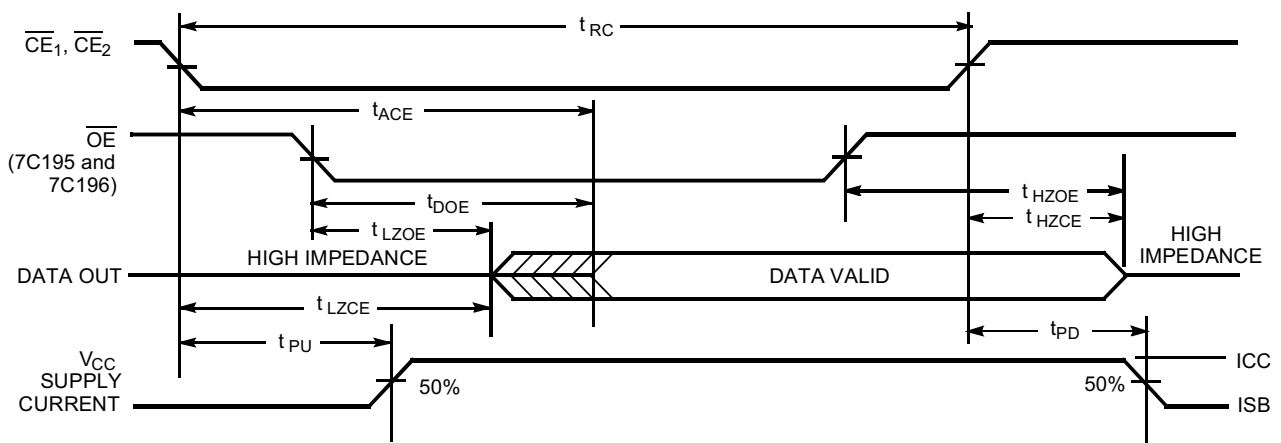
Switching Waveforms

Read Cycle No. 1^[11, 12]



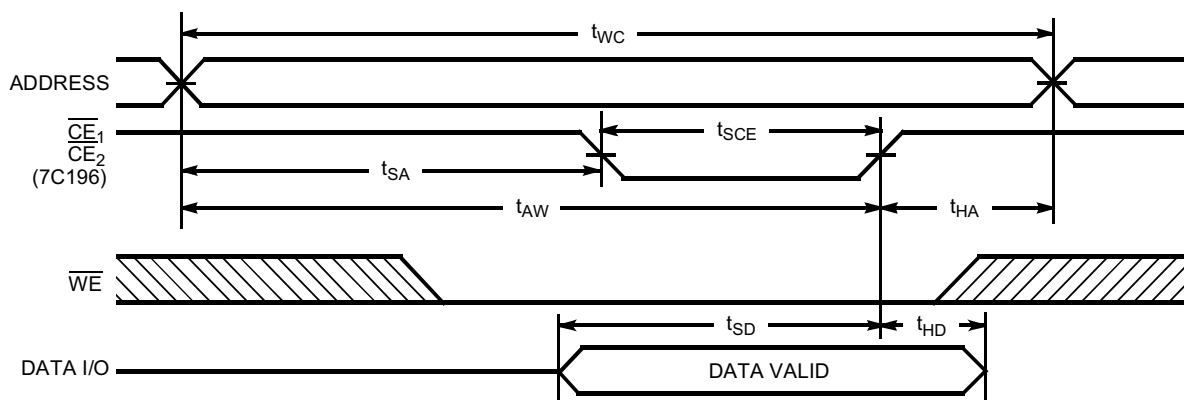
C194-8

Read Cycle No. 2^[11, 13]



C194-6

Write Cycle No. 1 (CE Controlled)^[10, 14, 15]



C194-7

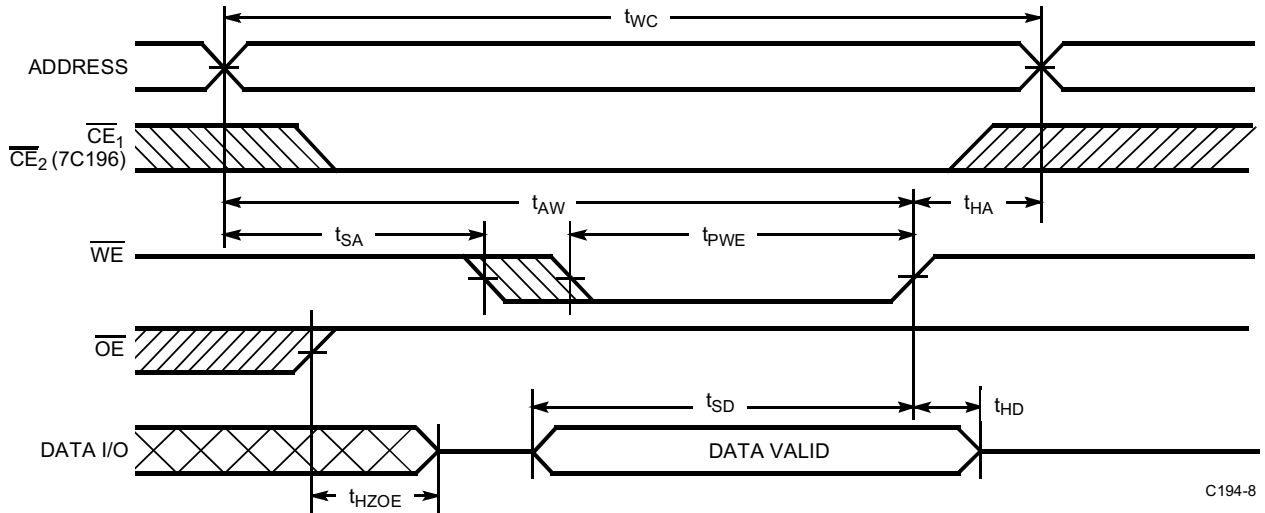
Notes:

11. \overline{WE} is HIGH for read cycle.
12. Device is continuously selected: $\overline{CE}_1 = V_{IL}$, $\overline{CE}_2 = V_{IL}$ (7C196), and $\overline{OE} = V_{IL}$ (7C195 and 7C196).
13. Address valid prior to or coincident with \overline{CE}_1 and \overline{CE}_2 transition LOW.
14. Data I/O will be high impedance if $\overline{OE} = V_{HI}$ (7C195 and 7C196).
15. If any \overline{CE} goes HIGH simultaneously with \overline{WE} HIGH, the output remains in a high-impedance state.



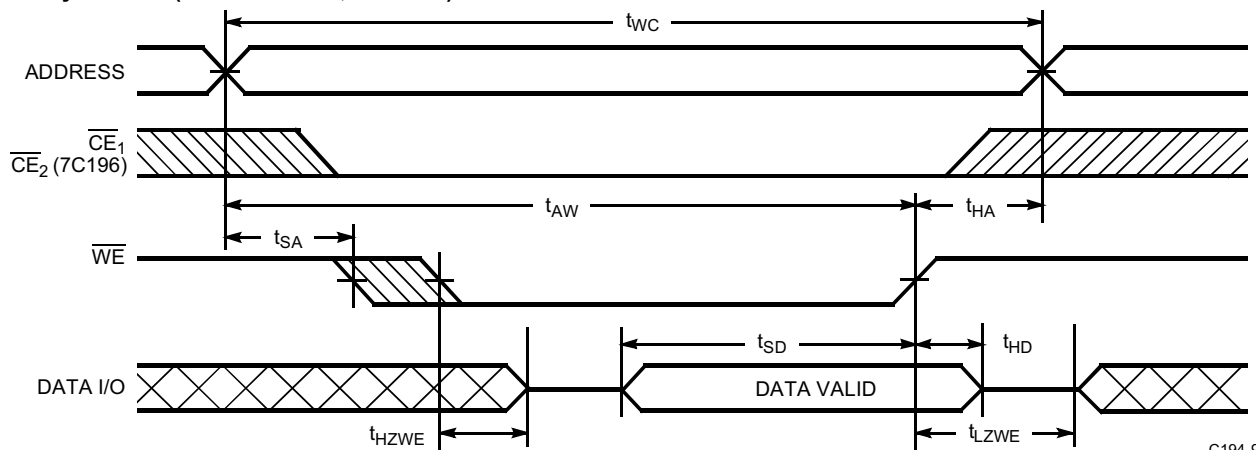
Switching Waveforms (continued)

Write Cycle No. 2 (\overline{WE} Controlled, \overline{OE} HIGH During Write for 7C195 and 7C196 only) [10, 14, 15]



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Write Cycle No. 3 (\overline{WE} Controlled, \overline{OE} LOW) [15, 16]



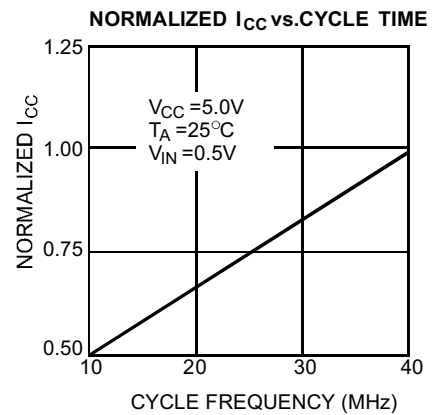
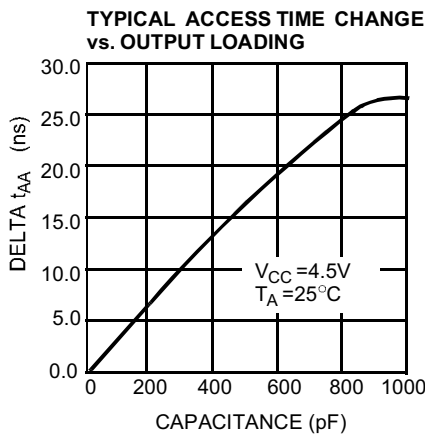
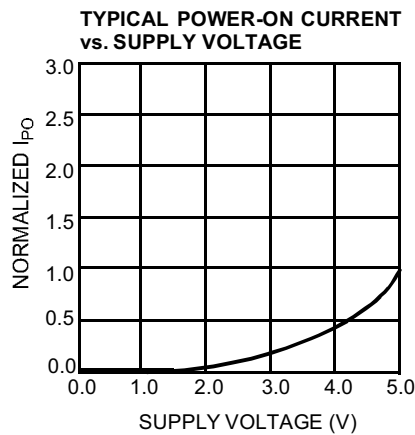
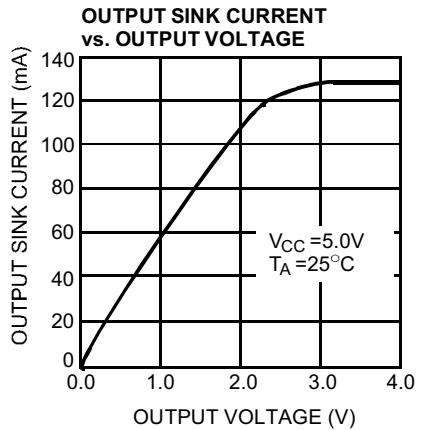
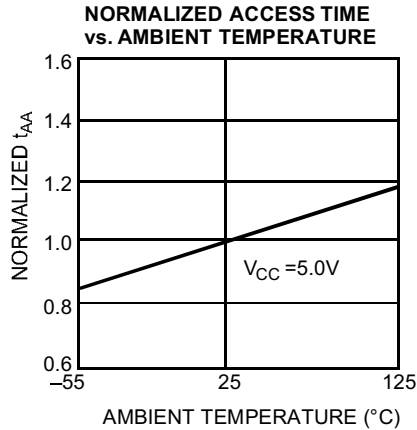
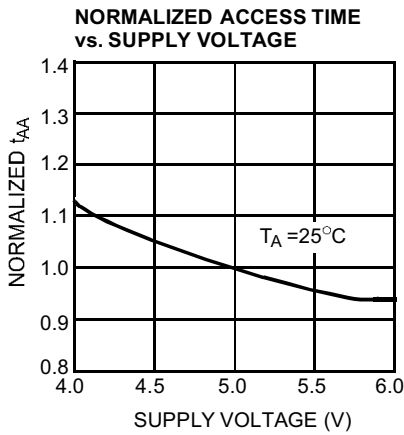
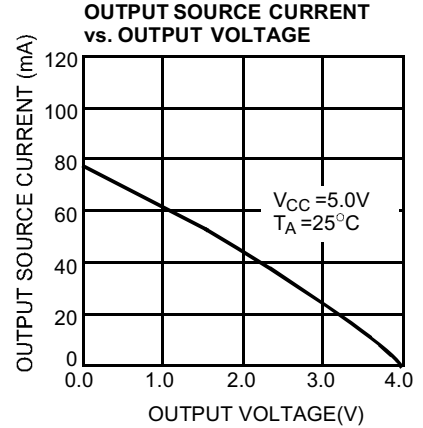
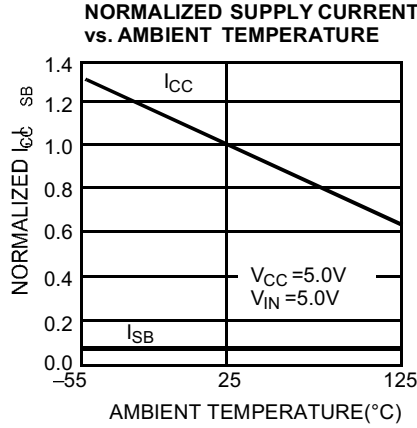
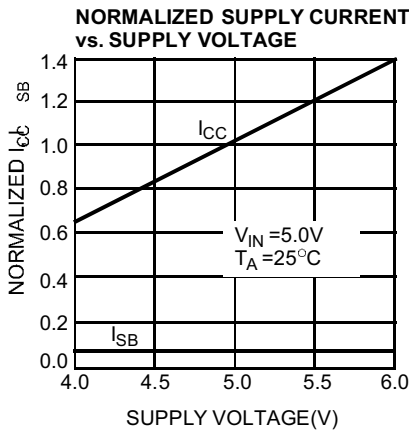
C194-9

Note:

16. 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} .



Typical DC and AC Characteristics



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7C194 Truth Table

\overline{CE}	\overline{WE}	Data I/O	Mode	Power
H	X	High Z	Deselect/Power-Down	Standby (I_{SB})
L	H	Data Out	Read	Active (I_{CC})
L	L	Data In	Write	Active (I_{CC})

7C195 Truth Table

CE_1	\overline{WE}	\overline{OE}	Data I/O	Mode	Power
H	X	X	High Z	Deselect/Power-Down	Standby (I_{SB})
L	H	L	Data Out	Read	Active (I_{CC})
L	L	X	Data In	Write	Active (I_{CC})
L	H	H	High Z	Deselect	Active (I_{CC})

7C196 Truth Table

CE_1	CE_2	\overline{WE}	\overline{OE}	Data I/O	Mode	Power
H	X	X	X	High Z	Deselect/Power-Down	Standby (I_{SB})
X	H	X	X			
L	L	H	L	Data Out	Read	Active (I_{CC})
L	L	L	X	Data In	Write	Active (I_{CC})
L	L	H	H	High Z	Deselect	Active (I_{CC})

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Ordering Information

Speed (ns)	Ordering Code	Package Name	Package Type	Operating Range
12	CY7C194-12PC	P13	24-Lead (300-Mil) Molded DIP	Commercial
	CY7C194-12VC	V13	24-Lead Molded SOJ	
15	CY7C194-15PC	P13	24-Lead (300-Mil) Molded DIP	Commercial
	CY7C194-15VC	V13	24-Lead Molded SOJ	
20	CY7C194-20PC	P13	24-Lead (300-Mil) Molded DIP	Commercial
	CY7C194-20VC	V13	24-Lead Molded SOJ	
25	CY7C194-25PC	P13	24-Lead (300-Mil) Molded DIP	Commercial
	CY7C194-25VC	V13	24-Lead Molded SOJ	
35	CY7C194-35PC	P13	24-Lead (300-Mil) Molded DIP	Commercial
	CY7C194-35VC	V13	24-Lead Molded SOJ	
45	CY7C194-45PC	P13	24-Lead (300-Mil) Molded DIP	Commercial
	CY7C194-45VC	V13	24-Lead Molded SOJ	

Speed (ns)	Ordering Code	Package Name	Package Type	Operating Range
12	CY7C195-12PC	P21	28-Lead (300-Mil) Molded DIP	Commercial
	CY7C195-12VC	V21	28-Lead Molded SOJ	
15	CY7C195-15PC	P21	28-Lead (300-Mil) Molded DIP	Commercial
	CY7C195-15VC	V21	28-Lead Molded SOJ	
20	CY7C195-20PC	P21	28-Lead (300-Mil) Molded DIP	Commercial
	CY7C195-20VC	V21	28-Lead Molded SOJ	
25	CY7C195-25PC	P21	28-Lead (300-Mil) Molded DIP	Commercial
	CY7C195-25VC	V21	28-Lead Molded SOJ	
35	CY7C195-35PC	P21	28-Lead (300-Mil) Molded DIP	Commercial
	CY7C195-35VC	V21	28-Lead Molded SOJ	
45	CY7C195-45PC	P21	28-Lead (300-Mil) Molded DIP	Commercial
	CY7C195-45VC	V21	28-Lead Molded SOJ	

Speed (ns)	Ordering Code	Package Name	Package Type	Operating Range
12	CY7C196-12PC	P21	28-Lead (300-Mil) Molded DIP	Commercial
	CY7C196-12VC	V21	28-Lead Molded SOJ	
15	CY7C196-15PC	P21	28-Lead (300-Mil) Molded DIP	Commercial
	CY7C196-15VC	V21	28-Lead Molded SOJ	
20	CY7C196-20PC	P21	28-Lead (300-Mil) Molded DIP	Commercial
	CY7C196-20VC	V21	28-Lead Molded SOJ	
25	CY7C196-25PC	P21	28-Lead (300-Mil) Molded DIP	Commercial
	CY7C196-25VC	V21	28-Lead Molded SOJ	
35	CY7C196-35PC	P21	28-Lead (300-Mil) Molded DIP	Commercial
	CY7C196-35VC	V21	28-Lead Molded SOJ	

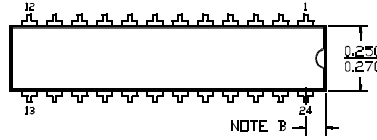
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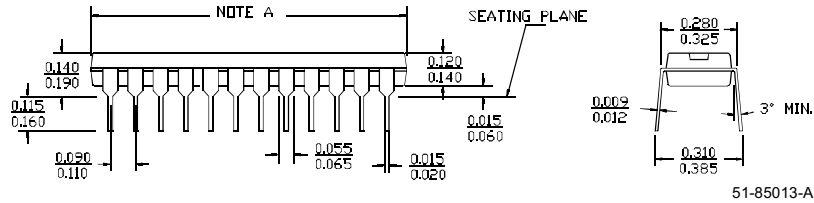
Package Diagrams

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

DIMENSIONS IN INCHES MIN.
MAX.

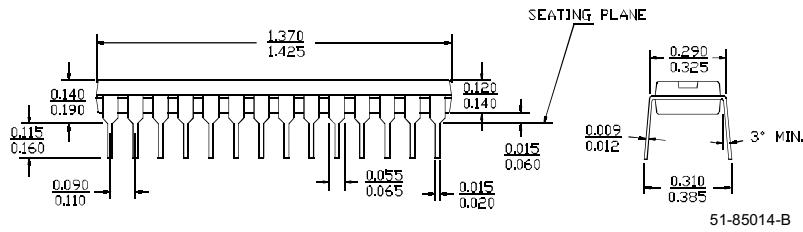
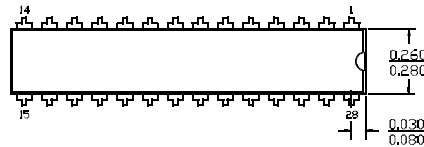


	P 13	P 13A
NOTE A	1.170 1.200	1.230 1.260
NOTE B	0.030 0.050	0.060 0.080



28-Lead (300-Mil) Molded DIP P21

DIMENSIONS IN INCHES MIN.
MAX.

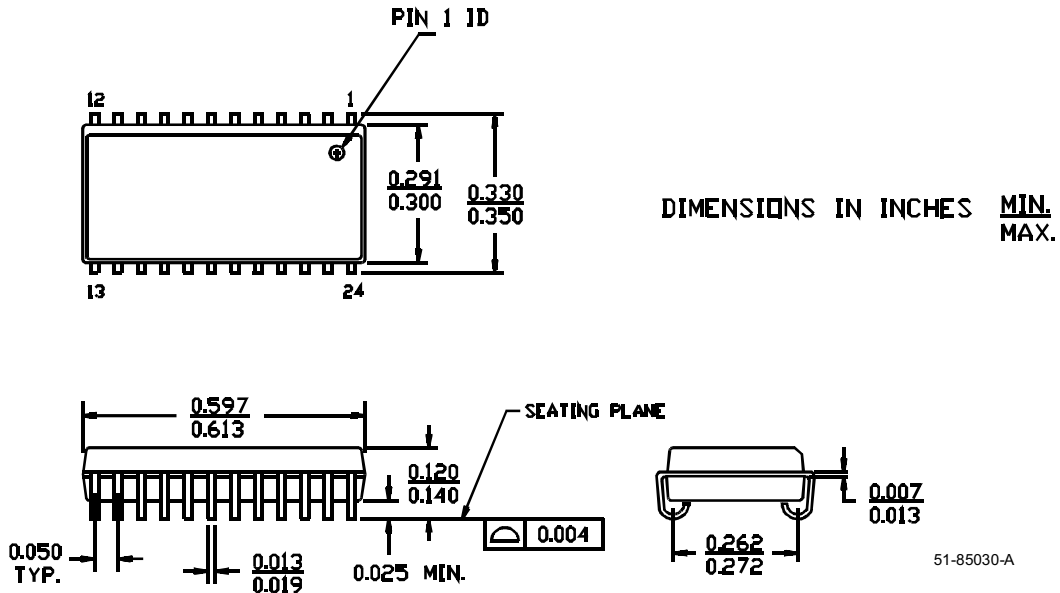


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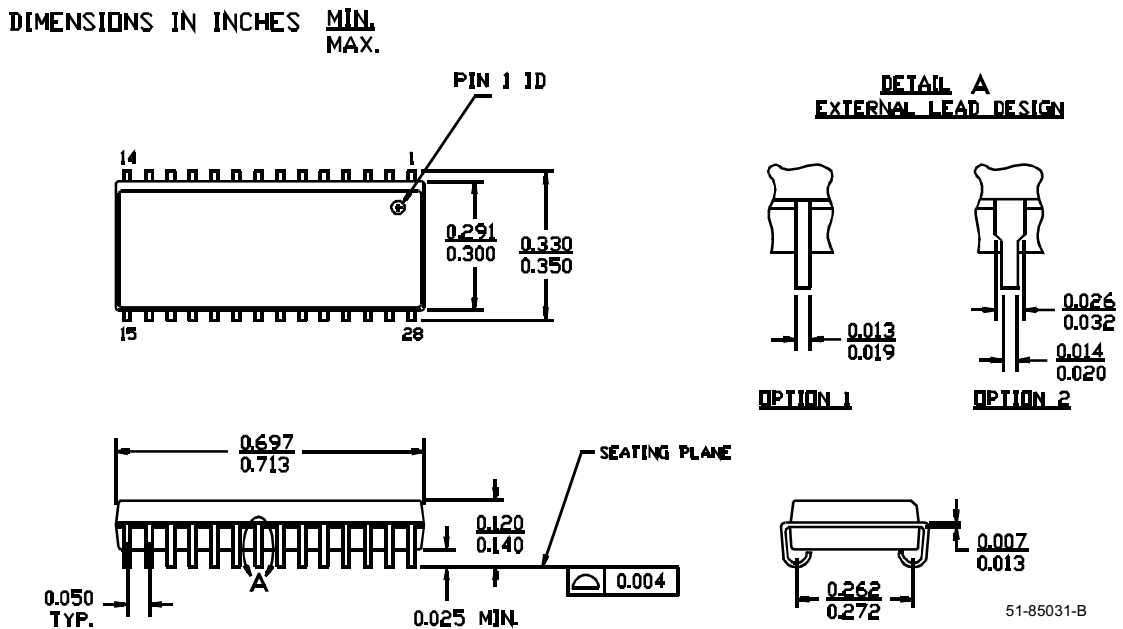


Package Diagrams (continued)

24-Lead (300-Mil) Molded SOJ V13



28-Lead (300-Mil) Molded SOJ V21



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CY7C196



Document Title: CY7C194/CY7C195/CY7C196 64K x 4 Static RAM Document Number: 38-05162				
REV.	ECN NO.	Issue Date	Orig. of Change	Description of Change
**	110172	09/29/01	SZV	Change from Spec number: 38-00081 to 38-05162