



CY7C185

8K x 8 Static RAM

Features

- High speed
— 15 ns
- Fast t_{DOE}
- Low active power
— 715 mW
- Low standby power
— 220 mW
- CMOS for optimum speed/power
- Easy memory expansion with $\overline{CE}_1$, CE_2 , and $\overline{OE}$ features
- TTL-compatible inputs and outputs
- Automatic power-down when deselected

Functional Description

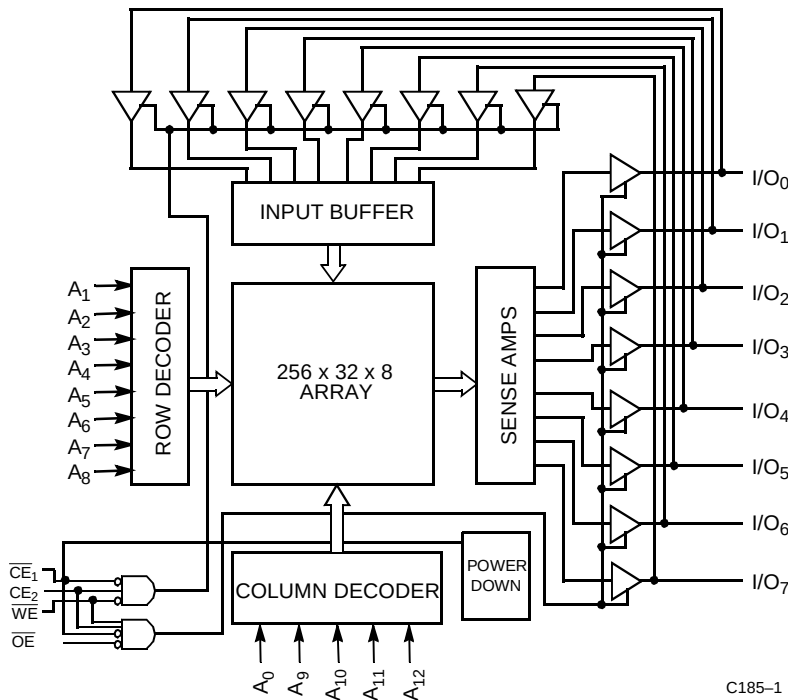
The CY7C185 is a high-performance CMOS static RAM organized as 8192 words by 8 bits. Easy memory expansion is

provided by an active LOW chip enable ($\overline{CE}_1$), an active HIGH chip enable (CE_2), and active LOW output enable ($\overline{OE}$) and three-state drivers. This device has an automatic power-down feature ($\overline{CE}_1$ or CE_2), reducing the power consumption by 70% when deselected. The CY7C185 is in a standard 300-mil-wide DIP, SOJ, or SOIC package.

An active LOW write enable signal ($\overline{WE}$) controls the writing/reading operation of the memory. When $\overline{CE}_1$ and $\overline{WE}$ inputs are both LOW and CE_2 is HIGH, data on the eight data input/output pins (I/O_0 through I/O_7) is written into the memory location addressed by the address present on the address pins (A_0 through A_{12}). Reading the device is accomplished by selecting the device and enabling the outputs, $\overline{CE}_1$ and $\overline{OE}$ active LOW, CE_2 active HIGH, while $\overline{WE}$ remains inactive or HIGH. Under these conditions, the contents of the location addressed by the information on address pins are present on the eight data input/output pins.

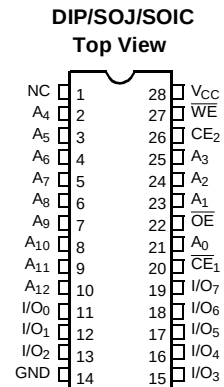
The input/output pins remain in a high-impedance state unless the chip is selected, outputs are enabled, and write enable ($\overline{WE}$) is HIGH. A die coat is used to insure alpha immunity.

Logic Block Diagram



C185-1

Pin Configurations



C185-2

Selection Guide^[1]

	7C185-15	7C185-20	7C185-25	7C185-35
Maximum Access Time (ns)	15	20	25	35
Maximum Operating Current (mA)	130	110	100	100
Maximum Standby Current (mA)	40/15	20/15	20/15	20/15

Note:

1. For military specifications, see the CY7C185A datasheet.

Maximum Ratings

(Above which the useful life may be impaired. For user guidelines, not tested.)

Storage Temperature -65°C to $+150^{\circ}\text{C}$
 Ambient Temperature with
 Power Applied -55°C to $+125^{\circ}\text{C}$
 Supply Voltage to Ground Potential -0.5V to $+7.0\text{V}$
 DC Voltage Applied to Outputs
 in High Z State^[2] -0.5V to $+7.0\text{V}$
 DC Input Voltage^[2] -0.5V to $+7.0\text{V}$

Output Current into Outputs (LOW) 20 mA
 Static Discharge Voltage $>2001\text{V}$
 (per MIL-STD-883, Method 3015)
 Latch-Up Current $>200\text{ mA}$

Operating Range

Range	Ambient Temperature	V _{CC}
Commercial	0°C to $+70^{\circ}\text{C}$	$5\text{V} \pm 10\%$
Industrial	-40°C to $+85^{\circ}\text{C}$	$5\text{V} \pm 10\%$

Electrical Characteristics Over the Operating Range

Parameter	Description	Test Conditions	7C185-15		7C185-20		Unit
			Min.	Max.	Min.	Max.	
V _{OH}	Output HIGH Voltage	V _{CC} = Min., I _{OH} = -4.0 mA	2.4		2.4		V
V _{OL}	Output LOW Voltage	V _{CC} = Min., I _{OL} = 8.0 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 ^[2]		-0.5	0.8	-0.5	0.8	V
I _{IX}	Input Load Current	$\text{GND} \leq V_I \leq V_{\text{CC}}$	-5	+5	-5	+5	μA
I _{OZ}	Output Leakage Current	$\text{GND} \leq V_I \leq V_{\text{CC}}$, Output Disabled	-5	+5	-5	+5	μA
I _{OS}	Output Short Circuit Current ^[3]	V _{CC} = Max., V _{OUT} = GND		-300		-300	mA
I _{CC}	V _{CC} Operating Supply Current	V _{CC} = Max., I _{OUT} = 0 mA		130		110	mA
I _{SB1}	Automatic Power-Down Current	Max. V _{CC} , $\overline{\text{CE}}_1 \geq V_{\text{IH}}$ or $\text{CE}_2 \leq V_{\text{IL}}$ Min. Duty Cycle = 100%	40		20		mA
I _{SB2}	Automatic Power-Down Current	Max. V _{CC} , $\overline{\text{CE}}_1 \geq V_{\text{CC}} - 0.3\text{V}$, or $\text{CE}_2 \leq 0.3\text{V}$ V _{IN} $\geq V_{\text{CC}} - 0.3\text{V}$ or V _{IN} $\leq 0.3\text{V}$	15		15		mA

Notes:

- Minimum voltage is equal to -3.0V for pulse durations less than 30 ns.
- Not more than 1 output should be shorted at one time. Duration of the short circuit should not exceed 30 seconds.

Electrical Characteristics Over the Operating Range (continued)

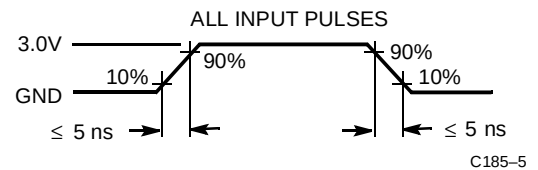
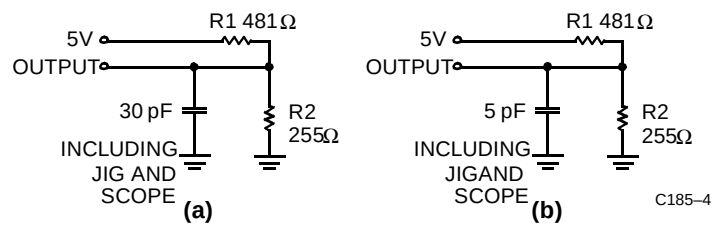
Parameter	Description	Test Conditions	7C185-25		7C185-35		Unit
			Min.	Max.	Min.	Max.	
V_{OH}	Output HIGH Voltage	$V_{CC} = \text{Min.}, I_{OH} = -4.0 \text{ mA}$	2.4		2.4		V
V_{OL}	Output LOW Voltage	$V_{CC} = \text{Min.}, I_{OL} = 8.0 \text{ mA}$		0.4		0.4	V
V_{IH}	Input HIGH Voltage		2.2	$V_{CC} + 0.3V$	2.2	$V_{CC} + 0.3V$	V
V_{IL}	Input LOW Voltage ^[2]		-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	$GND \leq V_I \leq V_{CC}$, 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	$V_{CC} = \text{Max.},$ $I_{OUT} = 0 \text{ mA}$		100		100	mA
I_{SB1}	Automatic Power-Down Current	Max. V_{CC} , $\overline{CE}_1 \geq V_{IH}$ or $CE_2 \leq V_{IL}$ Min. Duty Cycle=100%		20		20	mA
I_{SB2}	Automatic Power-Down Current	Max. V_{CC} , $\overline{CE}_1 \geq V_{CC} - 0.3V$ or $CE_2 \leq 0.3V$ $V_{IN} \geq V_{CC} - 0.3V$ or $V_{IN} \leq 0.3V$		15		15	mA

Capacitance^[4]

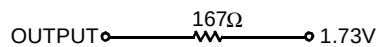
Parameter	Description	Test Conditions	Max.	Unit
C_{IN}	Input Capacitance	$T_A = 25^\circ\text{C}, f = 1 \text{ MHz},$ $V_{CC} = 5.0V$	7	pF
C_{OUT}	Output Capacitance		7	pF

Note:

4. 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 Over the Operating Range^[5]

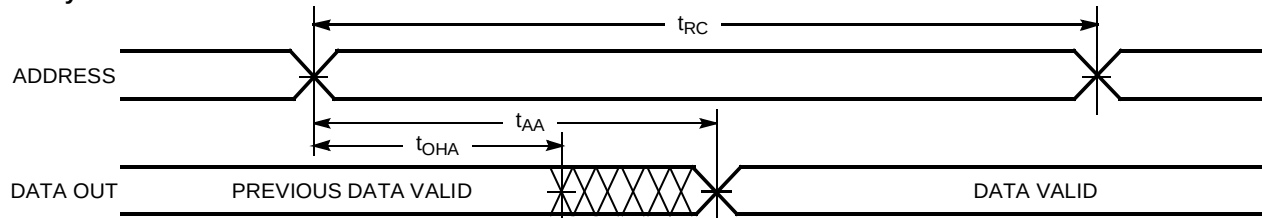
Parameter	Description	7C185-15		7C185-20		7C185-25		7C185-35		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
READ CYCLE										
t _{RC}	Read Cycle Time	15		20		25		35		ns
t _{AA}	Address to Data Valid		15		20		25		35	ns
t _{OHA}	Data Hold from Address Change	3		5		5		5		ns
t _{ACE1}	$\overline{CE}_1$ LOW to Data Valid		15		20		25		35	ns
t _{ACE2}	CE ₂ HIGH to Data Valid		15		20		25		35	ns
t _{DOE}	$\overline{OE}$ LOW to Data Valid		8		9		12		15	ns
t _{LZOE}	$\overline{OE}$ LOW to Low Z	3		3		3		3		ns
t _{HZOE}	$\overline{OE}$ HIGH to High Z ^[6]		7		8		10		10	ns
t _{LZCE1}	$\overline{CE}_1$ LOW to Low Z ^[7]	3		5		5		5		ns
t _{LZCE2}	CE ₂ HIGH to Low Z	3		3		3		3		ns
t _{HZCE}	$\overline{CE}_1$ HIGH to High Z ^[6, 7] CE ₂ LOW to High Z		7		8		10		10	ns
t _{PU}	$\overline{CE}_1$ LOW to Power-Up CE ₂ to HIGH to Power-Up	0		0		0		0		ns
t _{PD}	$\overline{CE}_1$ HIGH to Power-Down CE ₂ LOW to Power-Down		15		20		20		20	ns
WRITE CYCLE ^[8]										
t _{WC}	Write Cycle Time	15		20		25		35		ns
t _{SCE1}	$\overline{CE}_1$ LOW to Write End	12		15		20		20		ns
t _{SCE2}	CE ₂ HIGH to Write End	12		15		20		20		ns
t _{AW}	Address Set-Up to Write End	12		15		20		25		ns
t _{HA}	Address Hold from Write End	0		0		0		0		ns
t _{SA}	Address Set-Up to Write Start	0		0		0		0		ns
t _{PWE}	$\overline{WE}$ Pulse Width	12		15		15		20		ns
t _{SD}	Data Set-Up to Write End	8		10		10		12		ns
t _{HD}	Data Hold from Write End	0		0		0		0		ns
t _{HZWE}	$\overline{WE}$ LOW to High Z ^[6]		7		7		7		8	ns
t _{LZWE}	$\overline{WE}$ HIGH to Low Z	3		5		5		5		ns

Notes:

- Test conditions assume signal transition time of 5 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 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_{LZCE1} and t_{LZCE2} for any given device.
- The internal write time of the memory is defined by the overlap of CE₁ LOW, CE₂ HIGH, and WE LOW. All 3 signals must be active 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.

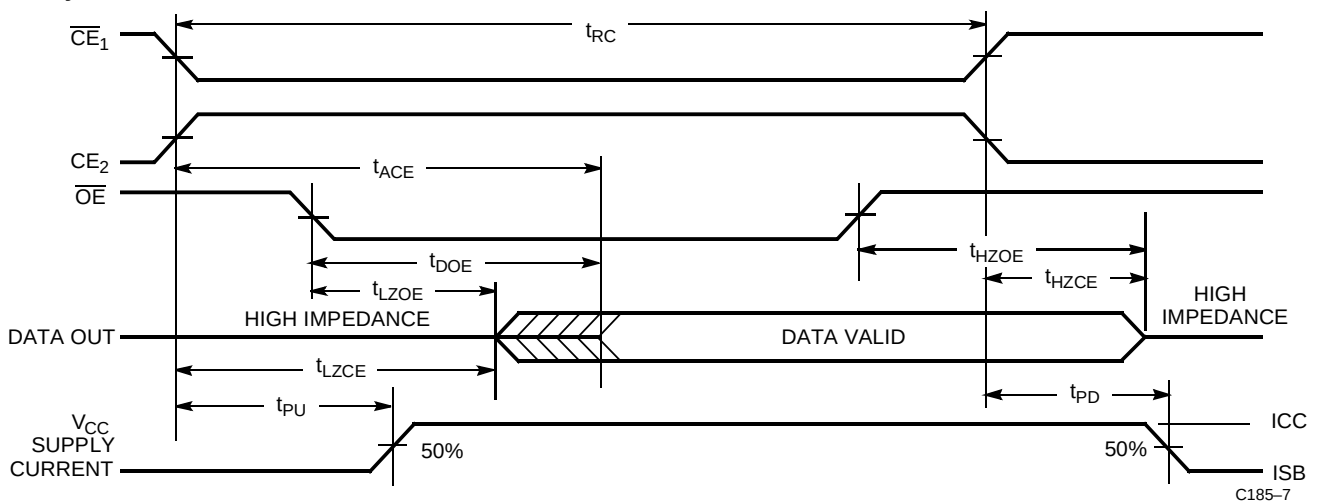
Switching Waveforms

Read Cycle No.1^[9,10]



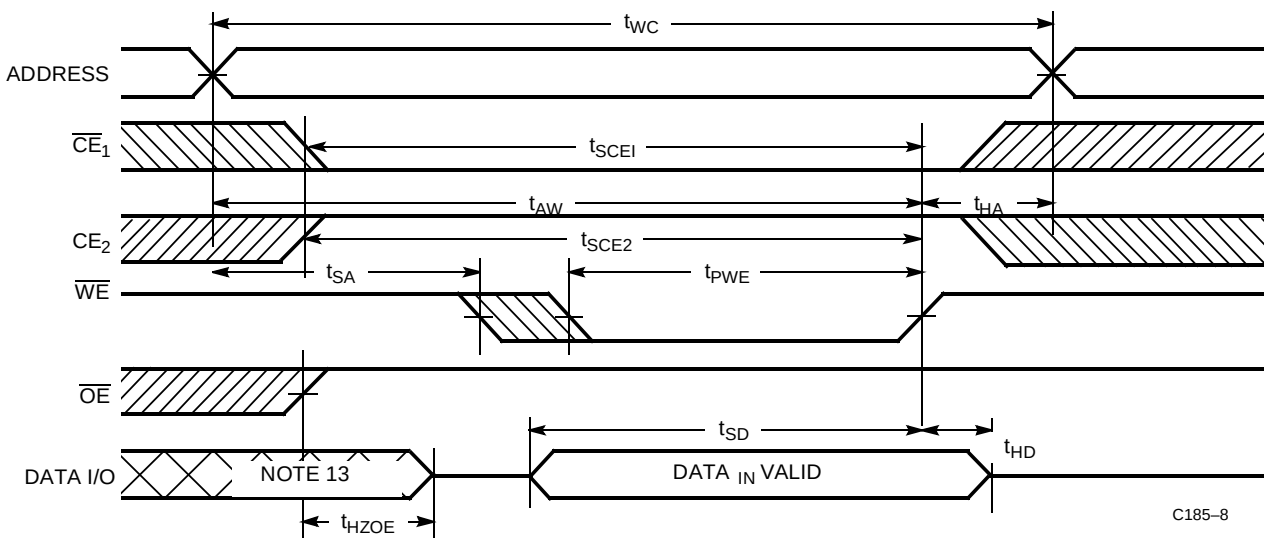
C185-6

Read Cycle No.2^[11,12]



C185-7

Write Cycle No. 1 ($\overline{WE}$ Controlled)^[10,12]



C185-8

9. Device is continuously selected. $\overline{OE}$, $\overline{CE}_1 = V_{IL}$. $CE_2 = V_{IH}$.

10. WE is HIGH for read cycle.

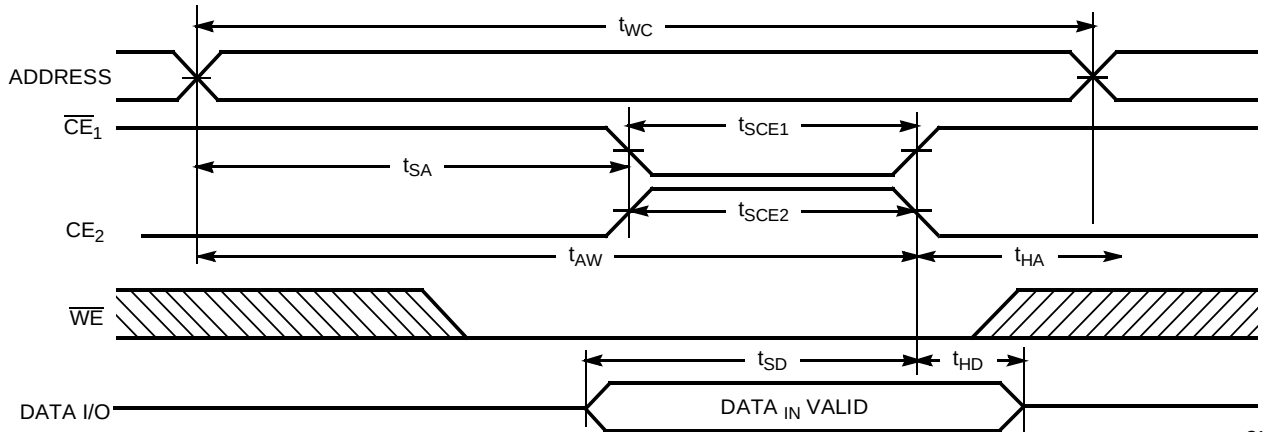
11. Data I/O is High Z if $\overline{OE} = V_{IH}$, $\overline{CE}_1 = V_{IH}$, $\overline{WE} = V_{IL}$, or $CE_2 = V_{IL}$.

12. The internal write time of the memory is defined by the overlap of $\overline{CE}_1$ LOW, CE_2 HIGH and $\overline{WE}$ LOW. $\overline{CE}_1$ and $\overline{WE}$ must be LOW and CE_2 must be HIGH to initiate write. A write can be terminated by $\overline{CE}_1$ or $\overline{WE}$ going HIGH or CE_2 going LOW. The data input set-up and hold timing should be referenced to the rising edge of the signal that terminates the write.

13. During this period, the I/Os are in the output state and input signals should not be applied.

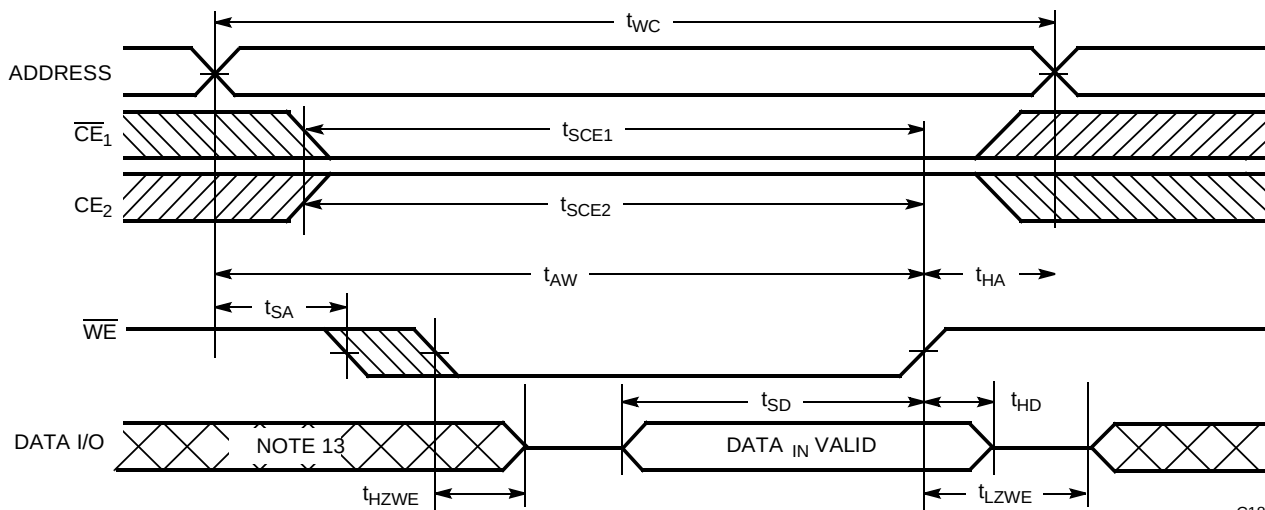
Switching Waveforms (continued)

Write Cycle No. 2 ($\overline{CE}$ Controlled)^[12,13,14]



C185-9

Write Cycle No. 3 ($\overline{WE}$ Controlled, $\overline{OE}$ LOW)^[12,13,14,15]

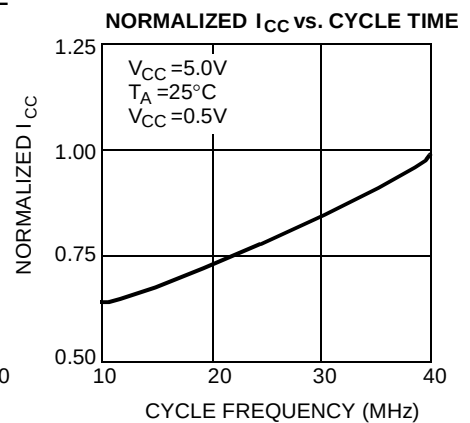
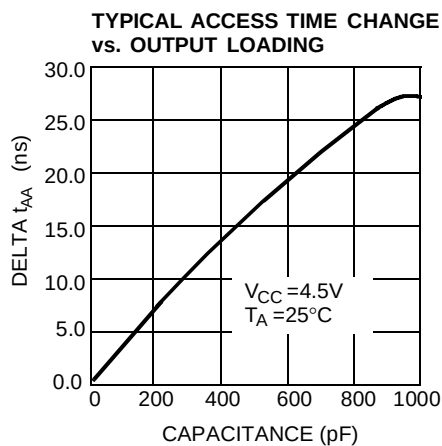
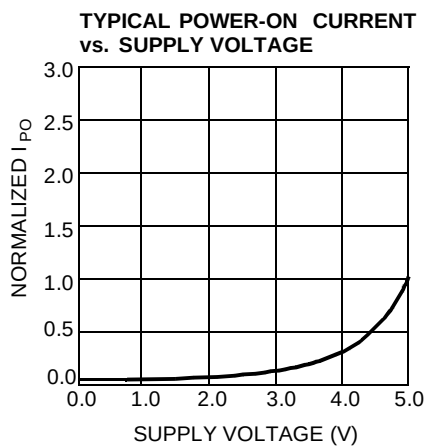
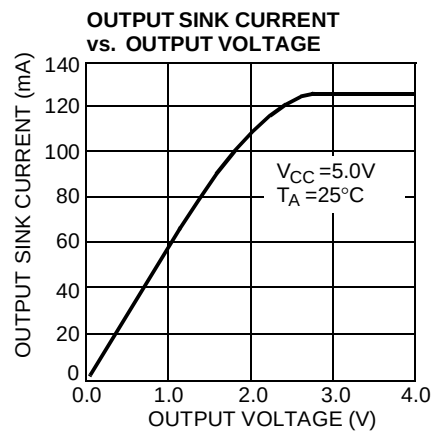
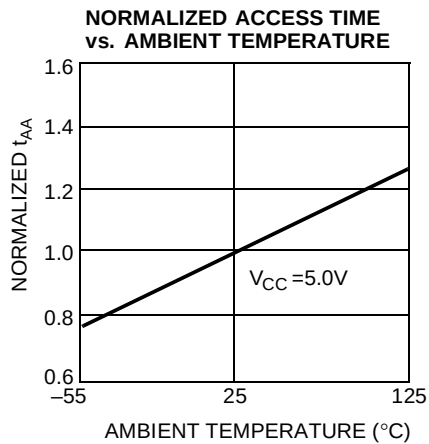
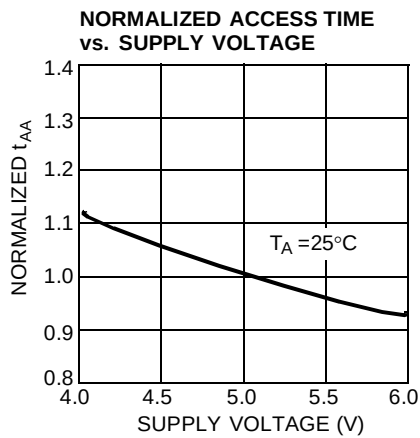
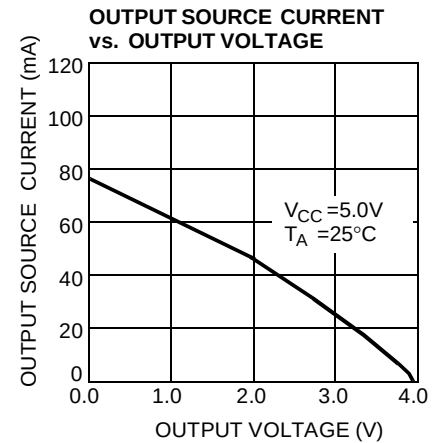
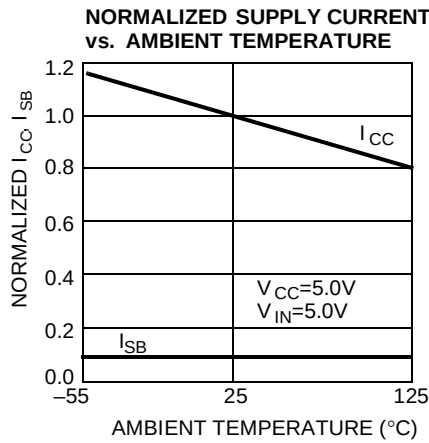
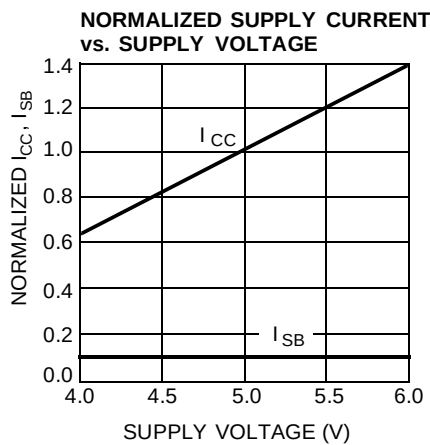


C185-10

Notes:

14. The minimum write cycle time for write cycle #3 ($\overline{WE}$ controlled, $\overline{OE}$ LOW) is the sum of t_{HZWE} and t_{SD} .
15. If $\overline{CE}_1$ goes HIGH or $\overline{CE}_2$ goes LOW simultaneously with $\overline{WE}$ HIGH, the output remains in a high-impedance state.

Typical DC and AC Characteristics



Truth Table

CE ₁	CE ₂	WE	OE	Input/Output	Mode
H	X	X	X	High Z	Deselect/Power-Down
X	L	X	X	High Z	Deselect/Power-Down
L	H	H	L	Data Out	Read
L	H	L	X	Data In	Write
L	H	H	H	High Z	Deselect

Address Designators

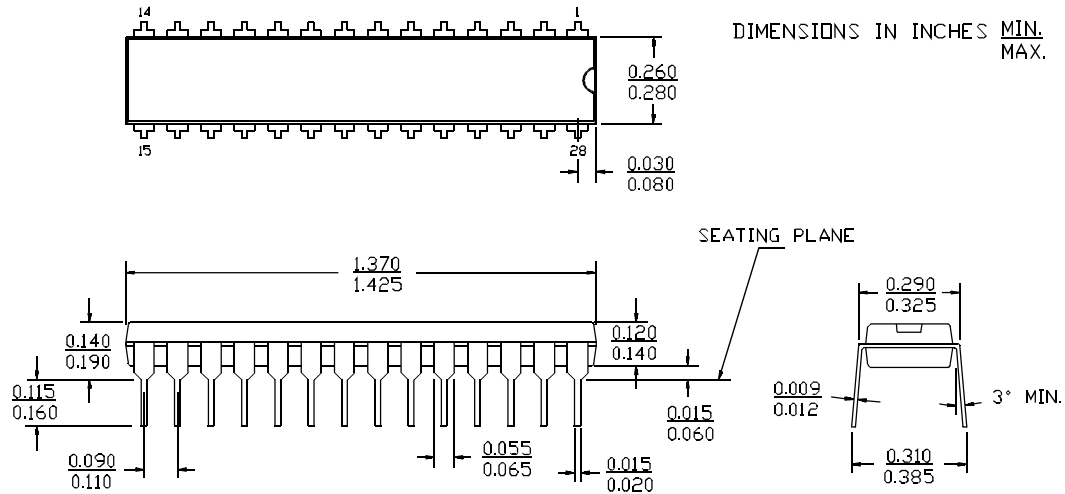
Address Name	Address Function	Pin Number
A4	X3	2
A5	X4	3
A6	X5	4
A7	X6	5
A8	X7	6
A9	Y1	7
A10	Y4	8
A11	Y3	9
A12	Y0	10
A0	Y2	21
A1	X0	23
A2	X1	24
A3	X2	25

Ordering Information

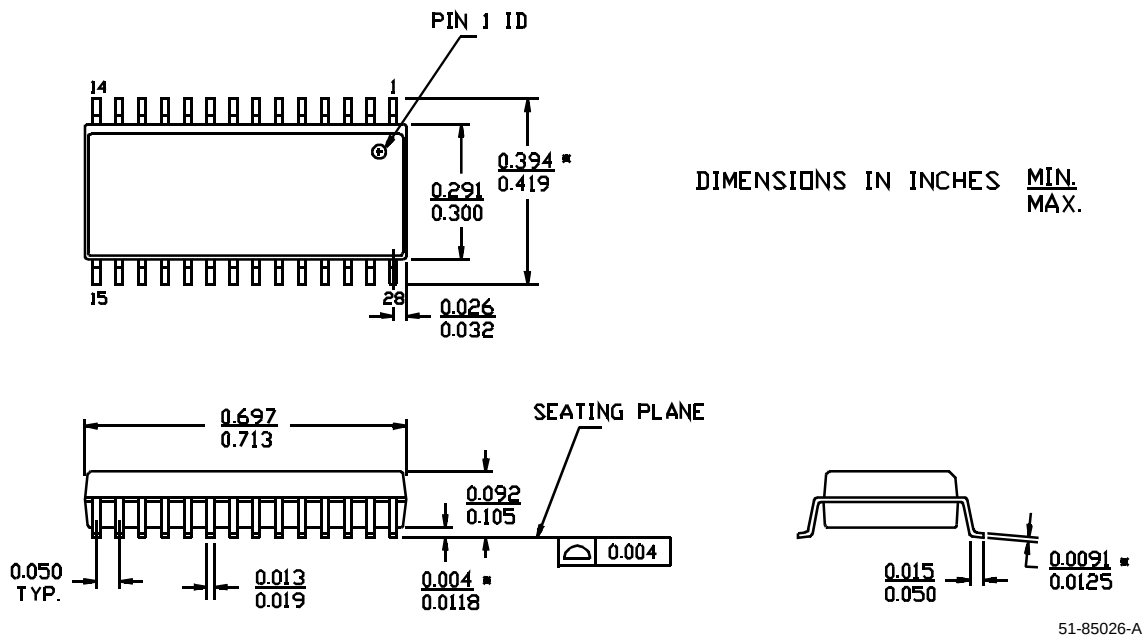
Speed (ns)	Ordering Code	Package Name	Package Type	Operating Range
15	CY7C185-15PC	P21	28-Lead (300-Mil) Molded DIP	Commercial
	CY7C185-15SC	S21	28-Lead Molded SOIC	
	CY7C185-15VC	V21	28-Lead Molded SOJ	
	CY7C185-15VI	V21	28-Lead Molded SOJ	Industrial
20	CY7C185-20PC	P21	28-Lead (300-Mil) Molded DIP	Commercial
	CY7C185-20SC	S21	28-Lead Molded SOIC	
	CY7C185-20VC	V21	28-Lead Molded SOJ	
	CY7C185-20VI	V21	28-Lead Molded SOJ	Industrial
25	CY7C185-25PC	P21	28-Lead (300-Mil) Molded DIP	Commercial
	CY7C185-25SC	S21	28-Lead Molded SOIC	
	CY7C185-25VC	V21	28-Lead Molded SOJ	
	CY7C185-25VI	V21	28-Lead Molded SOJ	Industrial
35	CY7C185-35PC	P21	28-Lead (300-Mil) Molded DIP	Commercial
	CY7C185-35SC	S21	28-Lead Molded SOIC	
	CY7C185-35VC	V21	28-Lead Molded SOJ	
	CY7C185-35VI	V21	28-Lead Molded SOJ	Industrial

Package Diagrams

28-Lead (300-Mil) Molded DIP P21



28-Lead (300-Mil) Molded SOIC S21



Package Diagrams (continued)
28-Lead (300-Mil) Molded SOJ V21

DIMENSIONS IN INCHES MIN.
MAX.

