



CYPRESS

CY7C185A

8K x 8 Static RAM

Features

- High speed
— 20 ns
- CMOS for optimum speed/power
- Low active power
— 743 mW
- Low standby Power
— 220 mW
- TTL-compatible inputs and outputs
- Easy memory expansion with $\overline{CE}_1$, $\overline{CE}_2$ and OE features
- Automatic power-down when deselected

Functional Description

The CY7C185A 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 ($\overline{CE}_2$), an active LOW output enable ($\overline{OE}$), and three-state drivers. The device has an automatic power-down feature ($\overline{CE}_1$), reducing the power consumption by over 70% when deselected. The CY7C185A is in the standard 300-mil-wide DIP package and leadless chip carrier.

Writing to the device is accomplished when the chip enable one ($\overline{CE}_1$) and write enable ($\overline{WE}$) inputs are both LOW, and the chip enable two ($\overline{CE}_2$) input is HIGH.

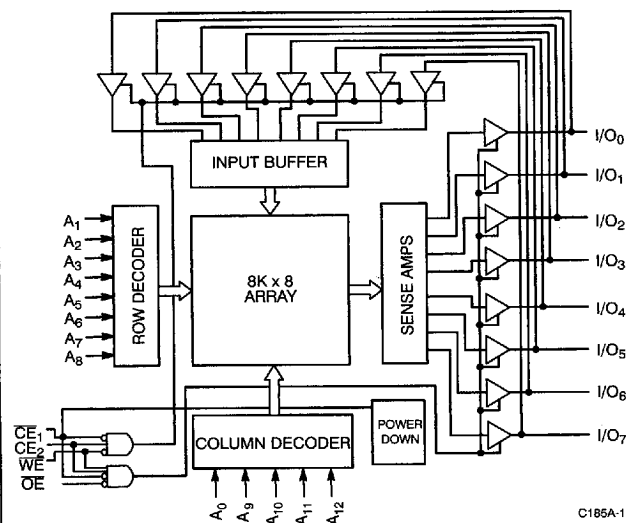
Data on the eight I/O pins (I/O_0 through I/O_7) is written into the memory location specified on the address pins (A_0 through A_{12}).

Reading the device is accomplished by taking chip enable one ($\overline{CE}_1$) and output enable ($\overline{OE}$) LOW, while taking write enable ($\overline{WE}$) and chip enable two ($\overline{CE}_2$) HIGH. Under these conditions, the contents of the memory location specified on the address pins will appear on the I/O pins.

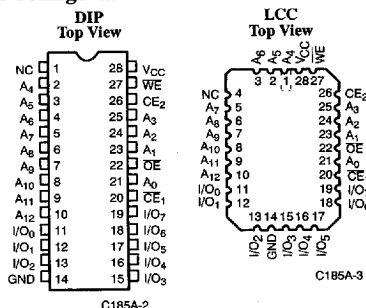
The I/O pins remain in a high-impedance state when chip enable one ($\overline{CE}_1$) or output enable ($\overline{OE}$) is HIGH, or write enable ($\overline{WE}$) or chip enable two ($\overline{CE}_2$) is LOW.

A die coat is used to ensure alpha immunity.

Logic Block Diagram



Pin Configurations



Selection Guide^[1]

		7C185A-15	7C185A-20	7C185A-25	7C185A-35	7C185A-45
Maximum Access Time (ns)		15	20	25	35	45
Maximum Operating Current (mA)	Military	170	135	125	125	125
Maximum Standby Current (mA)	Military	40/20	40/20	40/20	30/20	30/20

Shaded area contains advanced information.

Note:

1. For commercial specifications, see the CY7C185 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

(Pin 28 to Pin 14) -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}
Military ^[3]	-55°C to $+125^{\circ}\text{C}$	$5\text{V} \pm 10\%$

Electrical Characteristics Over the Operating Range^[4]

Parameter	Description	Test Conditions	7C185A-15		7C185A-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}	2.2	V _{CC}	V
V _{IL}	Input LOW Voltage ^[2]		-0.5	0.8	-0.5	0.8	V
I _{IX}	Input Load Current	$\text{GND} \leq V_I \leq V_{\text{CC}}$	-10	+10	-10	+10	μA
I _{OZ}	Output Leakage Current	$\text{GND} \leq V_I \leq V_{\text{CC}}$, Output Disabled	-10	+10	-10	+10	μA
I _{OS}	Output Short Circuit Current ^[5]	V _{CC} = Max., V _{OUT} = GND		-350		-300	mA
I _{CC}	V _{CC} Operating Supply Current	V _{CC} = Max. I _{OUT} = 0 mA		170		135	mA
I _{SB1}	Automatic $\overline{\text{CE}}_1$ Power-Down Current	Max. V _{CC} , $\overline{\text{CE}}_1 \geq V_{\text{IH}}$, Min. Duty Cycle = 100%		40		40	mA
I _{SB2}	Automatic $\overline{\text{CE}}_1$ Power-Down Current	Max. V _{CC} , $\overline{\text{CE}}_1 \geq V_{\text{CC}} - 0.3\text{V}$, V _{IN} $\geq$ V _{CC} - 0.3V or V _{IN} $\geq$ 0.3V		20		20	mA

Shaded area contains advanced information.

Notes:

2. V_{IL} (min.) = -3.0V for pulse durations less than 30 ns.

3. T_A is the "instant on" case temperature.

4. See the last page of this specification for Group A subgroup testing information.

5. 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^[4] (continued)

Parameter	Description	Test Conditions		7C185A-25		7C185A-35, 45		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}	2.2	V _{CC}	V
V _{IL}	Input LOW Voltage ^[2]			-0.5	0.8	-0.5	0.8	V
I _{IX}	Input Load Current	GND ≤ V _I ≤ V _{CC}		-10	+10	-10	+10	μA
I _{OZ}	Output Leakage Current	GND ≤ V _I ≤ V _{CC} , Output Disabled		-10	+10	-10	+10	μA
I _{OS}	Output Short Circuit Current ^[5]	V _{CC} = Max., V _{OUT} = GND			-300		-300	mA
I _{CC}	V _{CC} Operating Supply Current	V _{CC} = Max., I _{OUT} = 0 mA	Military		125		125	mA
I _{SB1}	Automatic $\overline{CE}_1$ Power-Down Current	Max. V _{CC} , $\overline{CE}_1 \geq V_{IH}$, Min. Duty Cycle = 100%	Military		40		30	mA
I _{SB2}	Automatic $\overline{CE}_1$ Power-Down Current	Max. V _{CC} $\overline{CE}_1 \geq V_{CC} - 0.3V$ $V_{IN} \geq V_{CC} - 0.3V$ or $V_{IN} \geq 0.3V$	Military		20		20	mA

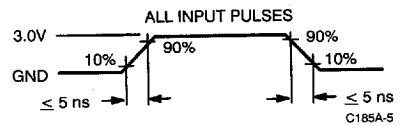
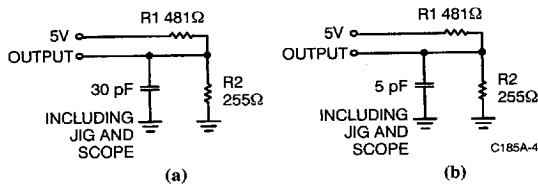
Capacitance^[6]

Parameter	Description	Test Conditions	Max.	Unit
C _{IN}	Input Capacitance	T _A = 25°C, f = 1 MHz, V _{CC} = 5.0V	10	pF
C _{OUT}	Output Capacitance		10	pF

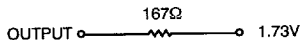
Note:

6. Tested initially and after any design or process changes that may affect these parameters.

AC Test Loads and Waveforms



Equivalent to: THÉVENIN EQUIVALENT



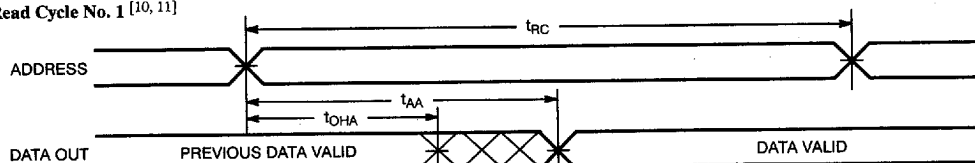
Switching Characteristics Over the Operating Range^[3, 7]

Parameter	Description	7C185A-15		7C185A-20		7C185A-25		7C185A-35		7C185A-45		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
READ CYCLE												
t _{RC}	Read Cycle Time	15		20		25		35		45		ns
t _{AA}	Address to Data Valid		15		20		25		35		45	ns
t _{OHA}	Data Hold from Address Change	3		3		3		3		3		ns
t _{ACE1}	CE ₁ LOW to Data Valid		15		20		25		35		45	ns
t _{ACE2}	CE ₂ HIGH to Data Valid		15		20		25		35		30	ns
t _{DOE}	OE LOW to Data Valid		7		10		12		15		20	ns
t _{LZOE}	OE LOW to Low Z	0		3		3		3		3		ns
t _{HZOE}	OE HIGH to High Z ^[8]		8		8		10		12		15	ns
t _{LZCE1}	CE ₁ LOW to Low Z ^[9]	3		5		5		5		5		ns
t _{LZCE2}	CE ₂ HIGH to Low Z	3		3		3		3		3		ns
t _{HZCE}	CE ₁ HIGH to High Z ^[8, 9] CE ₂ LOW to High Z		8		8		10		15		15	ns
t _{PU}	CE ₁ LOW to Power-Up	0		0		0		0		0		ns
t _{PD}	CE ₁ HIGH to Power-Down		15		20		20		20		25	ns
WRITE CYCLE ^[10]												
t _{WC}	Write Cycle Time	15		20		20		25		40		ns
t _{SCE1}	CE ₁ LOW to Write End	10		15		20		25		30		ns
t _{SCE2}	CE ₂ HIGH to Write End	10		15		20		25		30		ns
t _{AW}	Address Set-Up to Write End	10		15		20		25		30		ns
t _{HA}	Address Hold from Write End	0		0		0		0		0		ns
t _{SA}	Address Set-Up to Write Start	0		0		0		0		0		ns
t _{PWE}	WE Pulse Width	10		15		15		20		20		ns
t _{SD}	Data Set-Up to Write End	7		10		10		15		15		ns
t _{HD}	Data Hold from Write End	0		0		0		0		0		ns
t _{LZWE}	WE HIGH to Low Z	3		3		5		5		5		ns
t _{HZWE}	WE LOW to High Z ^[8]		7		7		7		10		15	ns

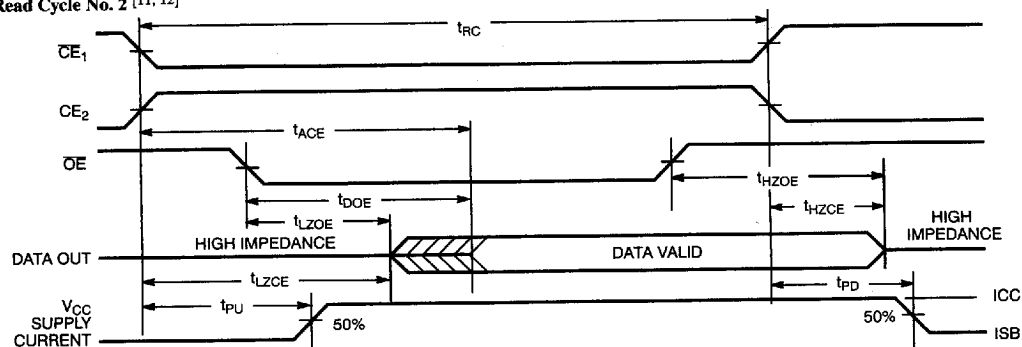
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Notes:

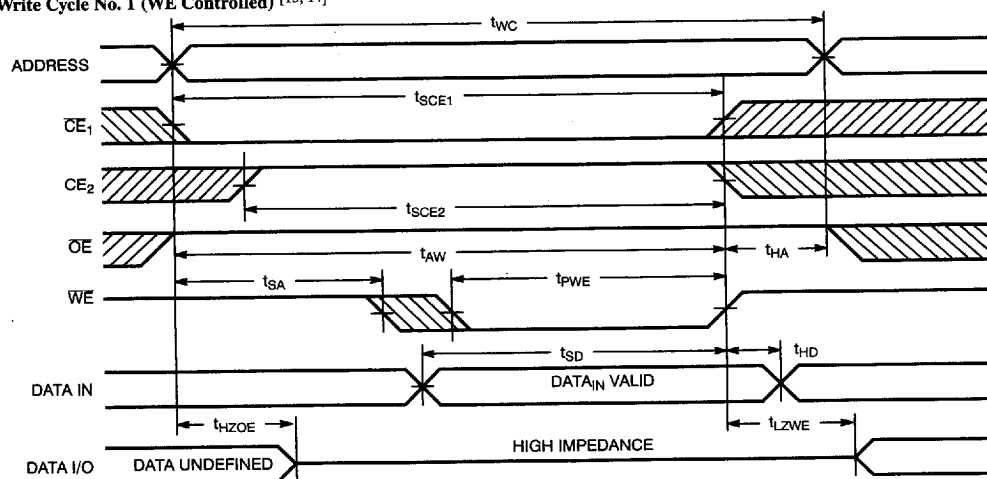
7. Test conditions assume signal transition time of 5 ns or less, timing reference levels of 1.5V, input pulse levels of 0 to 3.0V, and output loading of the specified I_{OL}/I_{OH} and 30-pF load capacitance.
8. t_{HZOE}, t_{HZCE}, and t_{HZWE} are specified with C_L = 5 pF as in part (b) of AC Test Loads. Transition is measured ±500 mV from steady-state voltage.
9. At any given temperature and voltage condition, t_{HZCE} is less than t_{LZCE} for any given device.
10. Device is continuously selected. OE, CE = V_{IL}. CE₂ = V_{IH}.

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


C185A-6

Read Cycle No. 2 [11, 12]


C185A-7

Write Cycle No. 1 (WE Controlled) [13, 14]


C185A-8

Notes:

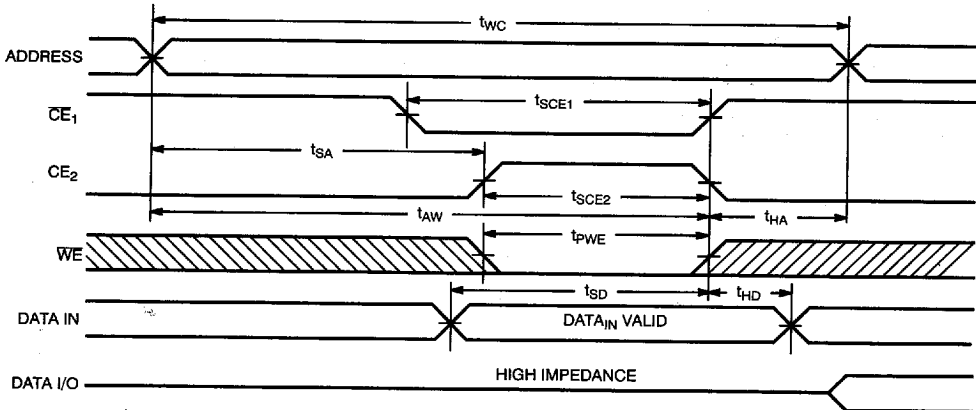
11. Address valid prior to or coincident with $\overline{CE}$ transition LOW.

12. $\overline{WE}$ is HIGH for read cycle.

13. The internal write time of the memory is defined by the overlap of $\overline{CE}_1$ LOW, $\overline{CE}_2$ HIGH, and $\overline{WE}$ LOW. Both signals must be LOW to initi-

ate 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.

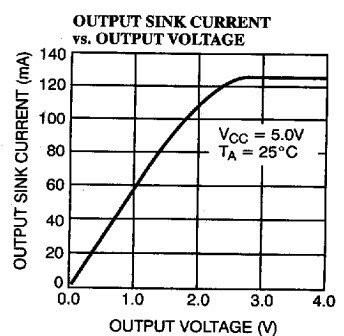
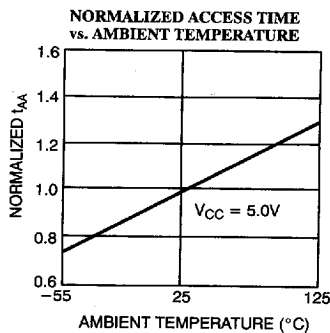
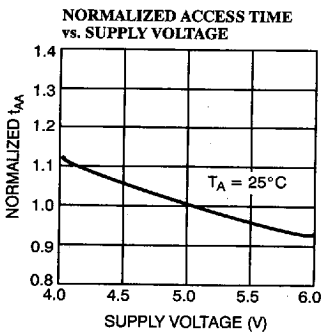
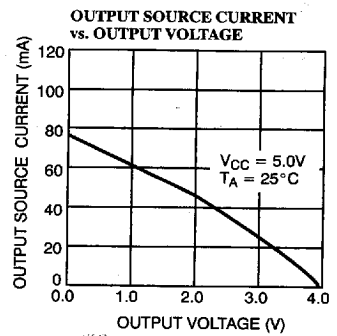
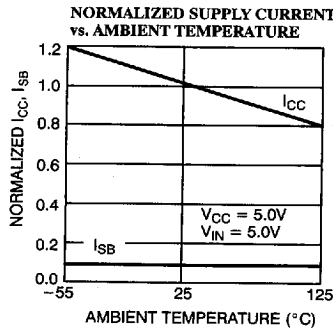
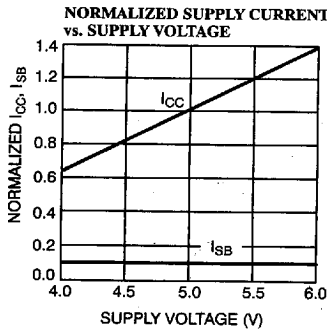
14. Data I/O is high impedance if $\overline{OE} = V_{IH}$.

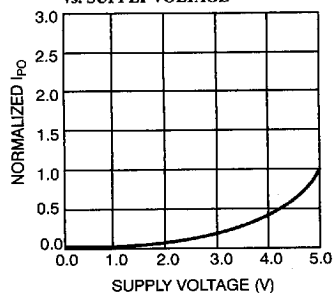
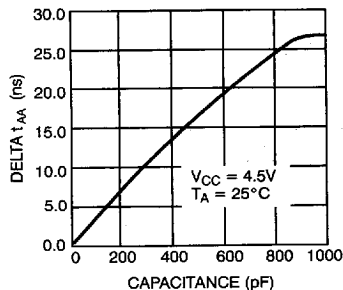
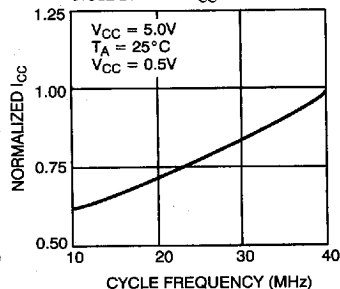
Switching Waveforms (continued)
Write Cycle No. 2 (CE Controlled) [13, 14, 15]


C185A-9

Note:

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

Typical DC and AC Characteristics


Typical DC and AC Characteristics (continued)
**TYPICAL POWER-ON CURRENT
vs. SUPPLY VOLTAGE**

**TYPICAL ACCESS TIME CHANGE
vs. OUTPUT LOADING**

NORMALIZED I_{CC} vs. CYCLE TIME

Truth Table

$\overline{CE}_1$	$\overline{CE}_2$	$\overline{WE}$	$\overline{OE}$	Input/Output	Mode
H	X	X	X	High Z	Deselect/Power-Down
X	L	X	X	High Z	Deselect
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

Ordering Information

Speed (ns)	Ordering Code	Package Name	Package Type	Operating Range
15	CY7C185A-15DMB	D22	28-Lead (300-Mil) CerDIP	Military
	CY7C185A-15LMB	L54	28-Pin Rectangular Leadless Chip Carrier	
20	CY7C185A-20DMB	D22	28-Lead (300-Mil) CerDIP	Military
	CY7C185A-20LMB	L54	28-Pin Rectangular Leadless Chip Carrier	
25	CY7C185A-25DMB	D22	28-Lead (300-Mil) CerDIP	Military
	CY7C185A-25LMB	L54	28-Pin Rectangular Leadless Chip Carrier	
35	CY7C185A-35DMB	D22	28-Lead (300-Mil) CerDIP	Military
	CY7C185A-35LMB	L54	28-Pin Rectangular Leadless Chip Carrier	
45	CY7C185A-45DMB	D22	28-Lead (300-Mil) CerDIP	Military
	CY7C185A-45LMB	L54	28-Pin Rectangular Leadless Chip Carrier	

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MILITARY SPECIFICATIONS
Group A Subgroup Testing
DC Characteristics

Parameter	Subgroups
V _{OH}	1, 2, 3
V _{OL}	1, 2, 3
V _{IH}	1, 2, 3
V _{IL} Max.	1, 2, 3
I _{IX}	1, 2, 3
I _{OZ}	1, 2, 3
I _{OS}	1, 2, 3
I _{CC}	1, 2, 3
I _{SB1}	1, 2, 3
I _{SB2}	1, 2, 3

Switching Characteristics

Parameter	Subgroups
READ CYCLE	
t _{RC}	7, 8, 9, 10, 11
t _{AA}	7, 8, 9, 10, 11
t _{OHA}	7, 8, 9, 10, 11
t _{ACE1}	7, 8, 9, 10, 11
t _{ACE2}	7, 8, 9, 10, 11
t _{DOE}	7, 8, 9, 10, 11
WRITE CYCLE	
t _{WC}	7, 8, 9, 10, 11
t _{SCE1}	7, 8, 9, 10, 11
t _{SCE2}	7, 8, 9, 10, 11
t _{AW}	7, 8, 9, 10, 11
t _{HA}	7, 8, 9, 10, 11
t _{SA}	7, 8, 9, 10, 11
t _{PWE}	7, 8, 9, 10, 11
t _{SD}	7, 8, 9, 10, 11
t _{HD}	7, 8, 9, 10, 11

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