



# 64K (8K x 8) Static RAM

## Features

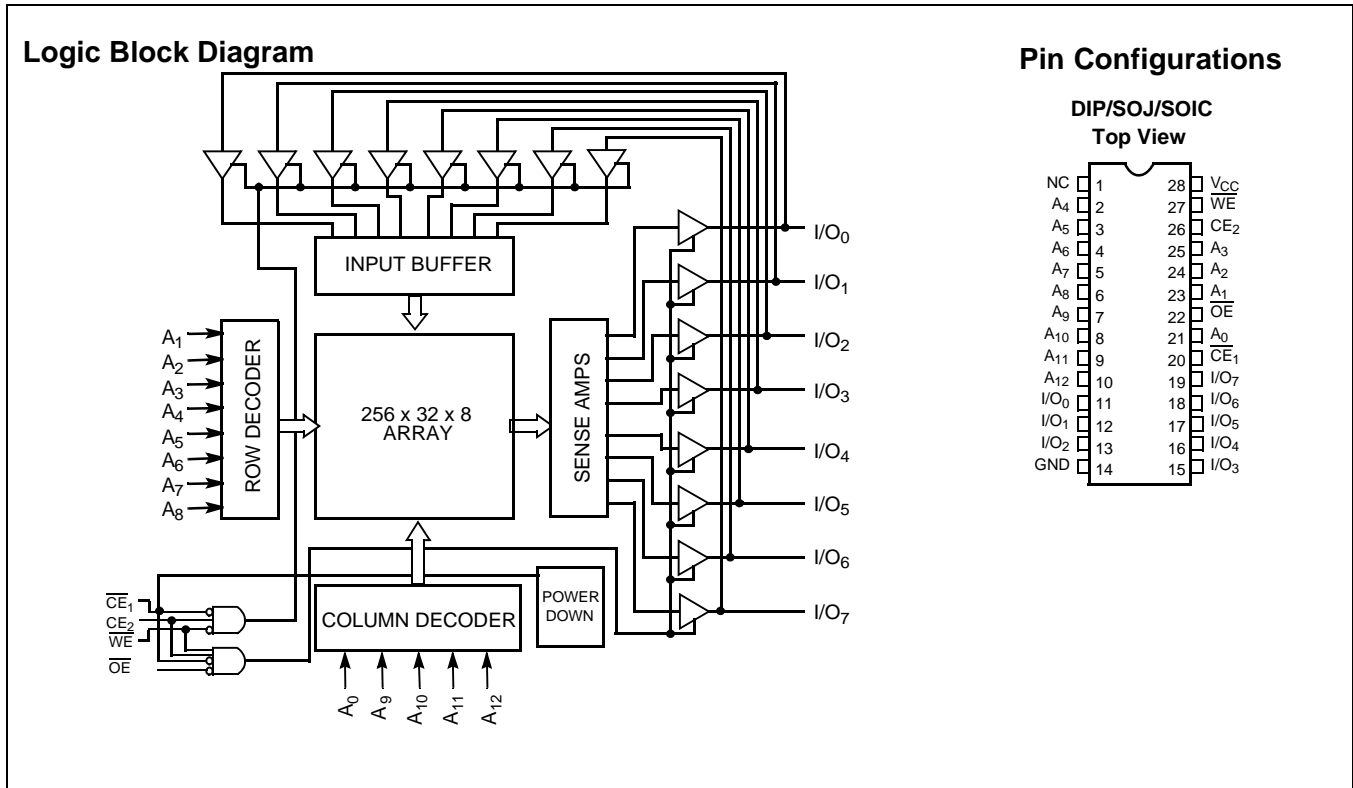
- Pin- and function-compatible with CY7C185
- High speed
  - $t_{AA} = 10 \text{ ns}$
- Low active power
  - $I_{CC} = 60 \text{ mA @ } 10 \text{ ns}$
- Low CMOS standby power
  - $I_{SB2} = 3 \text{ mA}$
- CMOS for optimum speed/power
- Data Retention at 2.0V
- Easy memory expansion with  $\overline{CE}_1$ ,  $CE_2$ , and  $\overline{OE}$  features
- TTL-compatible inputs and outputs
- Automatic power-down when deselected
- Available in Lead (Pb)-Free Packages

## Functional Description<sup>[1]</sup>

The CY7C185D 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 when deselected.

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. The CY7C185D is in a standard 28-pin 300-mil-wide DIP, SOJ, or SOIC Pb-Free package.



**Note:**

1. For guidelines on SRAM system design, please refer to the 'System Design Guidelines' Cypress application note, available on the internet at [www.cypress.com](http://www.cypress.com).

**Selection Guide**

	<b>CY7C185D-10</b>	<b>CY7C185D-12</b>	<b>CY7C185D-15</b>	<b>Unit</b>
Maximum Access Time	10	12	15	ns
Maximum Operating Current	60	50	40	mA
Maximum Standby Current	3	3	3	mA



**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<sup>[2]</sup> ..... -0.5V to V<sub>CC</sub> + 0.5V

DC Input Voltage<sup>[2]</sup>..... -0.5V to V<sub>CC</sub> + 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 <sub>CC</sub>
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	7C185D-10		7C185D-12		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> = 8.0 mA		0.4		0.4	V
V <sub>IH</sub>	Input HIGH Voltage		2.0	V <sub>CC</sub> + 0.3V	2.0	V <sub>CC</sub> + 0.3V	V
V <sub>IL</sub>	Input LOW Voltage <sup>[2]</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>	-1	+1	-1	+1	μA
I <sub>OZ</sub>	Output Leakage Current	GND ≤ V <sub>I</sub> ≤ V <sub>CC</sub> , Output Disabled	-1	+1	-1	+1	μA
I <sub>OS</sub>	Output Short Circuit Current <sup>[3]</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		60		50	mA
I <sub>SB1</sub>	Automatic Power-down Current	Max. V <sub>CC</sub> , CE <sub>1</sub> ≥ V <sub>IH</sub> or CE <sub>2</sub> ≤ V <sub>IL</sub> Min. Duty Cycle = 100%		10		10	mA
I <sub>SB2</sub>	Automatic Power-down Current	Max. V <sub>CC</sub> , CE <sub>1</sub> ≥ V <sub>CC</sub> - 0.3V, or CE <sub>2</sub> ≤ 0.3V V <sub>IN</sub> ≥ V <sub>CC</sub> - 0.3V or V <sub>IN</sub> ≤ 0.3V		3.0		3.0	mA
Parameter	Description	Test Conditions	7C185D-15		Unit		
			Min.	Max.			
V <sub>OH</sub>	Output HIGH Voltage	V <sub>CC</sub> = Min., I <sub>OH</sub> = -4.0 mA		2.4		V	
V <sub>OL</sub>	Output LOW Voltage	V <sub>CC</sub> = Min., I <sub>OL</sub> = 8.0 mA			0.4	V	
V <sub>IH</sub>	Input HIGH Voltage			2.0	V <sub>CC</sub> + 0.3V	V	
V <sub>IL</sub>	Input LOW Voltage <sup>[2]</sup>			-0.5	0.8	V	
I <sub>IX</sub>	Input Load Current	GND ≤ V <sub>I</sub> ≤ V <sub>CC</sub>		-1	+1	μA	
I <sub>OZ</sub>	Output Leakage Current	GND ≤ V <sub>I</sub> ≤ V <sub>CC</sub> , Output Disabled		-1	+1	μA	
I <sub>OS</sub>	Output Short Circuit Current <sup>[3]</sup>	V <sub>CC</sub> = Max., V <sub>OUT</sub> = GND			-300	mA	
I <sub>CC</sub>	V <sub>CC</sub> Operating Supply Current	V <sub>CC</sub> = Max., I <sub>OUT</sub> = 0 mA			40	mA	
I <sub>SB1</sub>	Automatic Power-down Current	Max. V <sub>CC</sub> , CE <sub>1</sub> ≥ V <sub>IH</sub> or CE <sub>2</sub> ≤ V <sub>IL</sub> Min. Duty Cycle = 100%			10	mA	
I <sub>SB2</sub>	Automatic Power-down Current	Max. V <sub>CC</sub> , CE <sub>1</sub> ≥ V <sub>CC</sub> - 0.3V or CE <sub>2</sub> ≤ 0.3V V <sub>IN</sub> ≥ V <sub>CC</sub> - 0.3V or V <sub>IN</sub> ≤ 0.3V			3.0	mA	

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

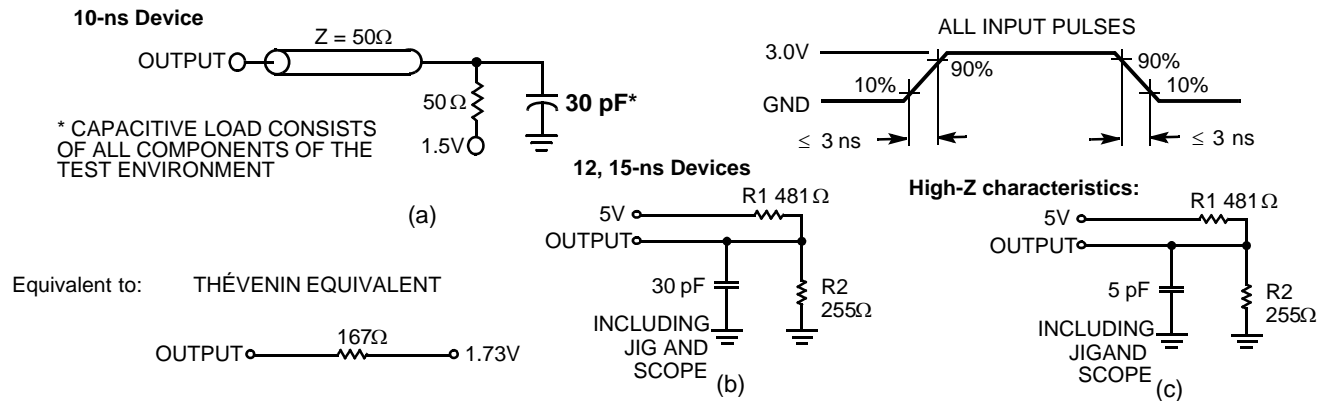
Parameter	Description	Test Conditions	Max.	Unit
C <sub>IN</sub>	Input Capacitance	T <sub>A</sub> = 25°C, f = 1 MHz, V <sub>CC</sub> = 5.0V	7	pF
C <sub>OUT</sub>	Output Capacitance		7	pF

**Notes:**

- V<sub>IL</sub> (min.) = -2.0V and V<sub>IH</sub>(max) = V<sub>CC</sub> + 2V for pulse durations of less than 20 ns.
- Not more than 1 output should be shorted at one time. Duration of the short circuit should not exceed 30 seconds.
- Tested initially and after any design or process changes that may affect these parameters.

**Thermal Resistance<sup>[4]</sup>**

Parameter	Description	Test Conditions	All-Packages	Unit
$\Theta_{JA}$	Thermal Resistance (Junction to Ambient) <sup>[4]</sup>	Still Air, soldered on a 3 x 4.5 inch, two-layer printed circuit board	TBD	°C/W
$\Theta_{JC}$	Thermal Resistance (Junction to Case) <sup>[4]</sup>		TBD	°C/W

**AC Test Loads and Waveforms**

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

Parameter	Description	7C185D-10		7C185D-12		7C185D-15		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	
<b>Read Cycle</b>								
$t_{power}^{[5]}$	$V_{CC}$ (typical) to the first access	100		100		100		$\mu$ s
$t_{RC}$	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
$t_{ACE1}$	$\overline{CE}_1$ LOW to Data Valid		10		12		15	ns
$t_{ACE2}$	$CE_2$ HIGH to Data Valid		10		12		15	ns
$t_{DOE}$	$\overline{OE}$ LOW to Data Valid		5		6		8	ns
$t_{LZOE}$	$\overline{OE}$ LOW to Low Z	3		3		3		ns
$t_{HZOE}$	$\overline{OE}$ HIGH to High Z <sup>[7]</sup>		5		6		7	ns
$t_{LZCE1}$	$\overline{CE}_1$ LOW to Low Z <sup>[8]</sup>	3		3		3		ns
$t_{LZCE2}$	$CE_2$ HIGH to Low Z	3		3		3		ns
$t_{HZCE}$	$\overline{CE}_1$ HIGH to High Z <sup>[7, 8]</sup> $CE_2$ LOW to High Z		5		6		7	ns
$t_{PU}$	$\overline{CE}_1$ LOW to Power-Up $CE_2$ to HIGH to Power-Up	0		0		0		ns
$t_{PD}$	$\overline{CE}_1$ HIGH to Power-Down $CE_2$ LOW to Power-Down		10		12		15	ns

**Notes:**

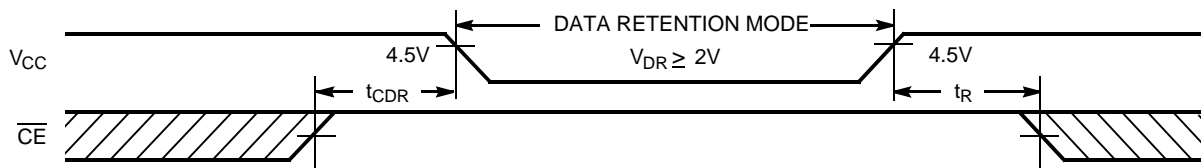
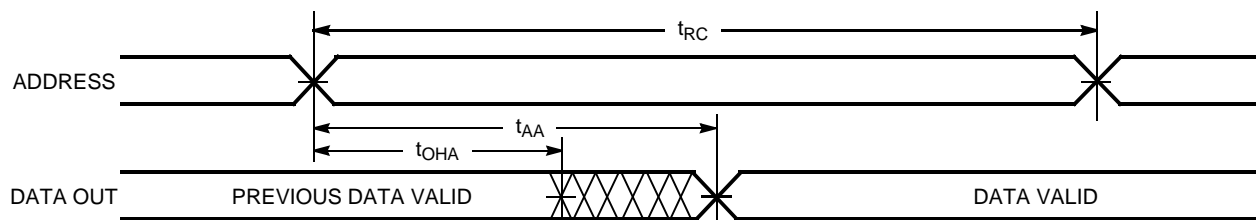
- $t_{power}$  gives the minimum amount of time that the power supply should be at typical  $V_{CC}$  values until the first memory access can be performed.
- Test conditions assume signal transition time of 3 ns or less, timing reference levels of 1.5V, input pulse levels of 0 to 3.0V, and output loading of the specified  $I_{OL}/I_{OH}$  and 30-pF load capacitance.
- $t_{HZOE}$ ,  $t_{HZCE}$ , and  $t_{HZWE}$  are specified with  $C_L = 5$  pF as in part (b) of AC Test Loads. Transition is measured  $\pm 200$  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.

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

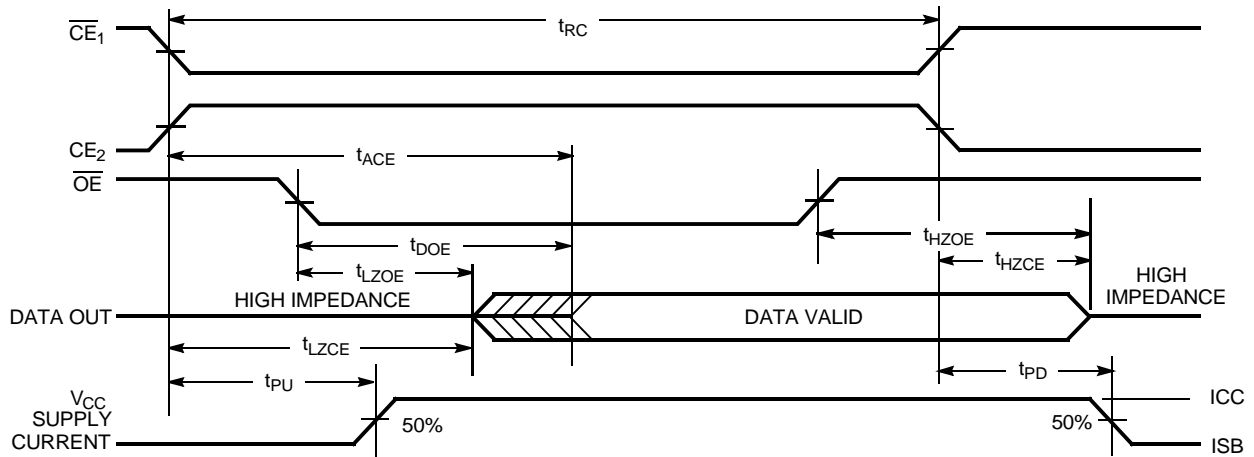
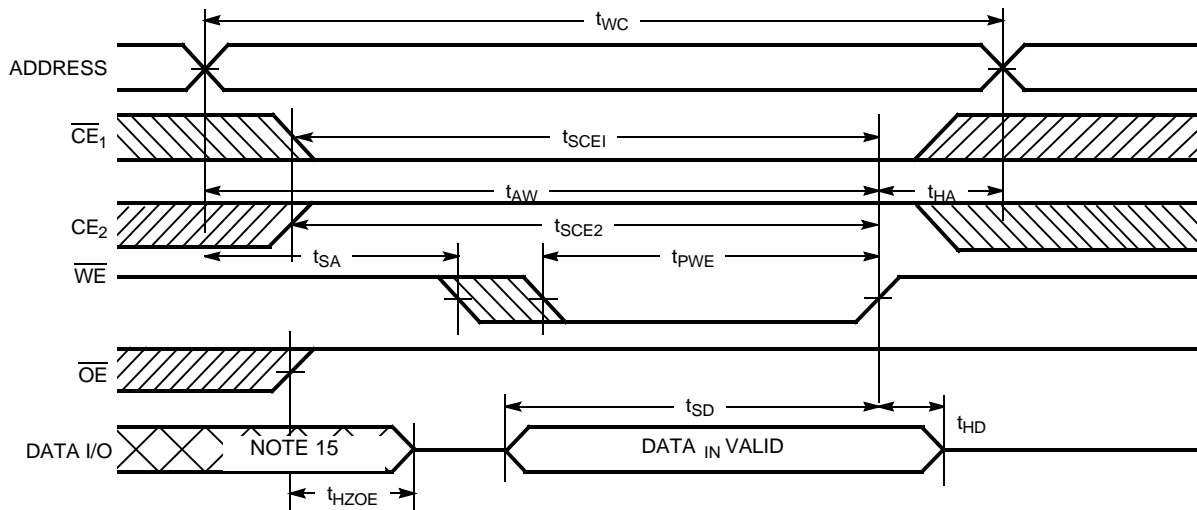
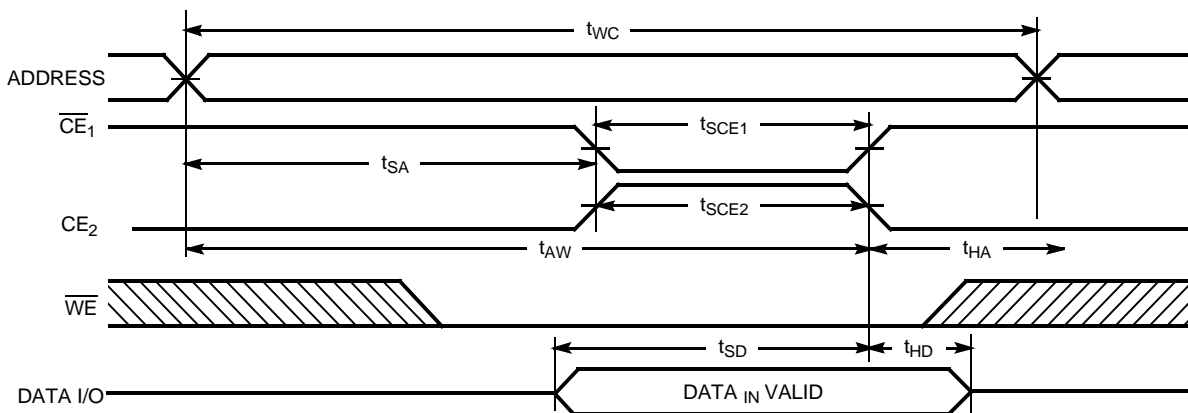
Parameter	Description	7C185D-10		7C185D-12		7C185D-15		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	
<b>Write Cycle<sup>[9]</sup></b>								
$t_{WC}$	Write Cycle Time	10		12		15		ns
$t_{SCE1}$	$\overline{CE}_1$ LOW to Write End	8		10		12		ns
$t_{SCE2}$	$CE_2$ HIGH to Write End	8		10		12		ns
$t_{AW}$	Address Set-up to Write End	7		10		12		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		10		12		ns
$t_{SD}$	Data Set-up to Write End	6		7		8		ns
$t_{HD}$	Data Hold from Write End	0		0		0		ns
$t_{HZWE}$	$\overline{WE}$ LOW to High Z <sup>[7]</sup>		6		6		7	ns
$t_{LZWE}$	$\overline{WE}$ HIGH to Low Z	3		3		3		ns

**Data Retention Characteristics** (Over the Operating Range)

Parameter	Description	Conditions	Min.	Max.	Unit
$V_{DR}$	$V_{CC}$ for Data Retention		2.0		V
$I_{CCDR}$	Data Retention Current	Non-L, Com'l / Ind'l	$V_{CC} = V_{DR} = 2.0V$ , $CE \geq V_{CC} - 0.3V$ , $V_{IN} \geq V_{CC} - 0.3V$ or $V_{IN} \leq 0.3V$	3	mA
		L-Version Only		1.2	mA
$t_{CDR}$ <sup>[4]</sup>	Chip Deselect to Data Retention Time		0		ns
$t_R$ <sup>[10]</sup>	Operation Recovery Time		$t_{RC}$		ns

**Data Retention Waveform**

**Switching Waveforms**
**Read Cycle No.1<sup>[11,12]</sup>**

**Notes:**

9. The internal write time of the memory is defined by the overlap of  $\overline{CE}_1$  LOW,  $CE_2$  HIGH, and  $\overline{WE}$  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.
10. Full device operation requires linear  $V_{CC}$  ramp from  $V_{DR}$  to  $V_{CC(min.)} \geq 50 \mu s$  or stable at  $V_{CC(min.)} \geq 50 \mu s$ .
11. Device is continuously selected.  $OE$ ,  $\overline{CE}_1 = V_{IL}$ .  $CE_2 = V_{IH}$ .
12.  $\overline{WE}$  is HIGH for read cycle.

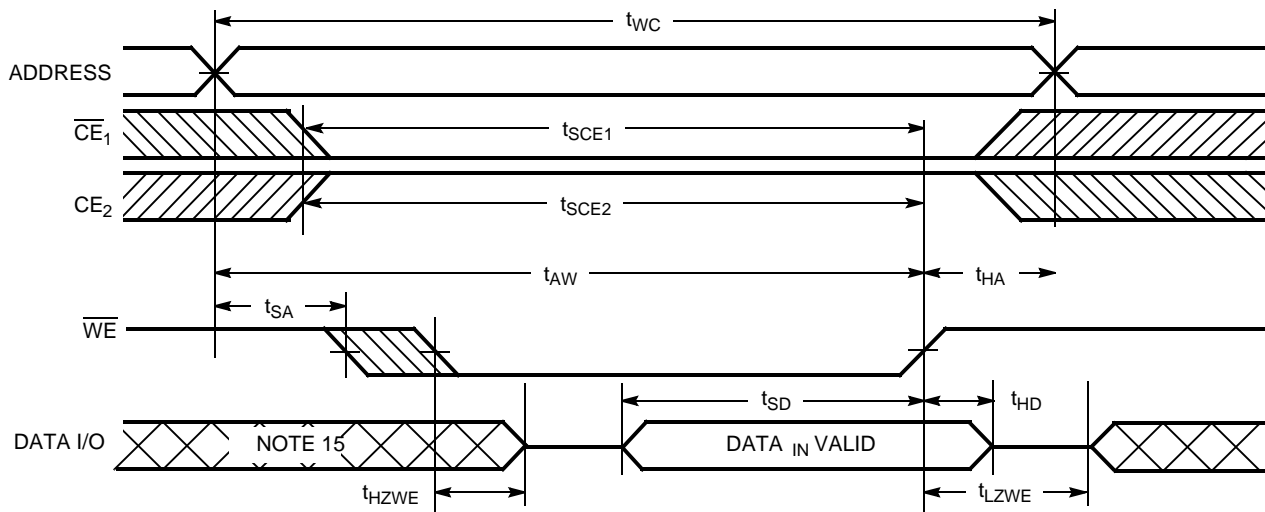
**Switching Waveforms (continued)**
**Read Cycle No.2<sup>[13,14]</sup>**

**Write Cycle No. 1 (WE Controlled)<sup>[12,14]</sup>**

**Write Cycle No. 2 (CE Controlled)<sup>[14,15,16]</sup>**

**Notes:**

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

14. 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.

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

16. The minimum write cycle time for write cycle #3 (WE controlled,  $\overline{OE}$  LOW) is the sum of  $t_{HZWE}$  and  $t_{SD}$ .

**Switching Waveforms (continued)**
**Write Cycle No. 3 ( $\overline{WE}$  Controlled,  $\overline{OE}$  LOW)<sup>[14,15,16,17]</sup>**

**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/Power-down
L	H	H	L	Data Out	Read
L	H	L	X	Data In	Write
L	H	H	H	High Z	Deselect

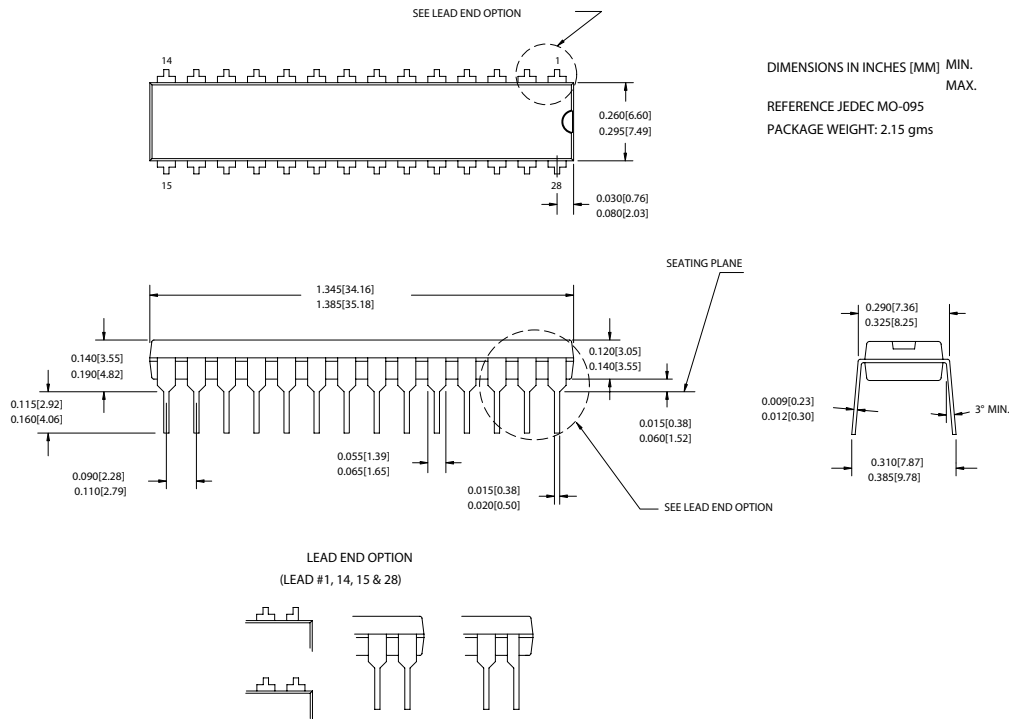
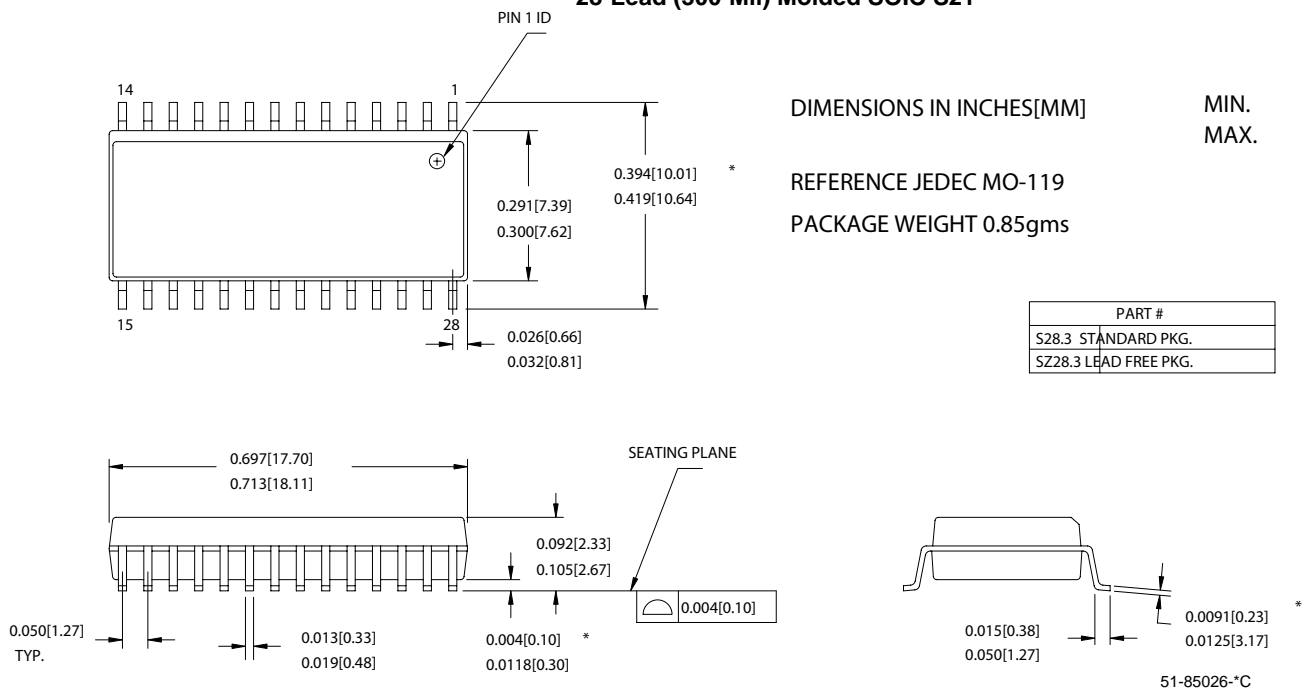
**Ordering Information**

Speed (ns)	Ordering Code	Package Name	Package Type	Operating Range
10	CY7C185D-10PXC	P21	28-Lead (300-Mil) Molded DIP (Pb-Free)	Commercial
	CY7C185D-10SXC	S21	28-Lead Molded SOIC (Pb-Free)	
	CY7C185D-10VXC	V21	28-Lead Molded SOJ (Pb-Free)	
	CY7C185D-10VXI	V21	28-Lead Molded SOJ (Pb-Free)	Industrial
12	CY7C185D-12PXC	P21	28-Lead (300-Mil) Molded DIP (Pb-Free)	Commercial
	CY7C185D-12SXC	S21	28-Lead Molded SOIC (Pb-Free)	
	CY7C185D-12VXC	V21	28-Lead Molded SOJ (Pb-Free)	
	CY7C185D-12VXI	V21	28-Lead Molded SOJ (Pb-Free)	Industrial
15	CY7C185D-15PXC	P21	28-Lead (300-Mil) Molded DIP (Pb-Free)	Commercial
	CY7C185D-15SXC	S21	28-Lead Molded SOIC (Pb-Free)	
	CY7C185D-15VXC	V21	28-Lead Molded SOJ (Pb-Free)	
	CY7C185D-15VXI	V21	28-Lead Molded SOJ (Pb-Free)	Industrial

Shaded areas contain advance information. Please contact your local Cypress sales representative for availability of these parts.

**Note:**

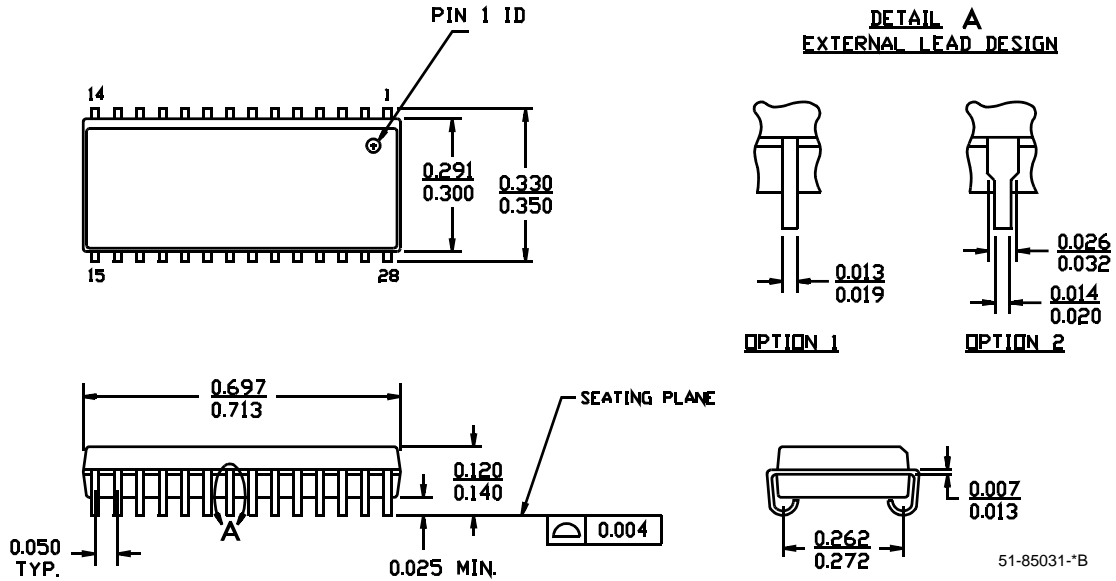
 17. If  $\overline{CE}_1$  goes HIGH or  $\overline{CE}_2$  goes LOW simultaneously with  $\overline{WE}$  HIGH, the output remains in a high-impedance state.

**Package Diagrams**
**28-Lead (300-Mil) PDIP P21**

**28-Lead (300-Mil) Molded SOIC S21**




**Package Diagrams** (continued)

28-Lead (300-Mil) Molded SOJ V21  
 DIMENSIONS IN INCHES MIN.  
MAX.



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**Document History Page**

<b>Document Title: CY7C185D 64K (8K x 8) Static RAM (Preliminary)</b> <b>Document Number: 38-05466</b>				
<b>REV.</b>	<b>ECN NO.</b>	<b>Issue Date</b>	<b>Orig. of Change</b>	<b>Description of Change</b>
**	201560	See ECN	SWI	Advance Datasheet for C9 IPP
*A	233715	See ECN	RKF	DC parameters are modified as per EROS (Spec # 01-2165) Pb-free offering in Ordering Information
*B	262950	See ECN	RKF	Added T <sub>power</sub> Spec in Switching Characteristics table Added Data Retention Characteristics table and waveforms Shaded Ordering Information
*C	307593	See ECN	RKF	1) Reduced Speed bins to -10, -12 and -15 ns 2) Added 'Industrial' grade parts to the Ordering Info on Page #6