CY7C185

64-Kbit (8 K × 8) Static RAM

Features

- High speed
  - 15 ns
- Fast t_{DOE}
- Low active power
  - 715 mW
- Low standby power
  - 85 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
- Available in non Pb-free 28-pin (300-Mil) Molded SOJ, 28-pin (300-Mil) Molded SOIC and Pb-free 28-pin (300-Mil) Molded DIP

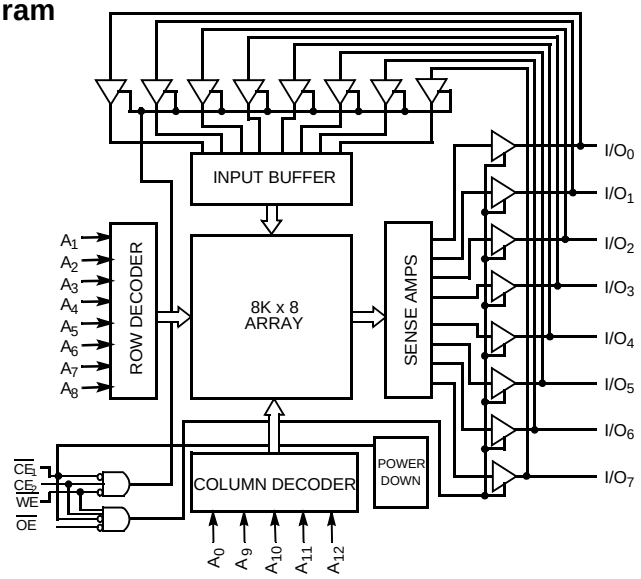
Functional Description

The CY7C185[1] 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 tri-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 or output pins.

The input or 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



Selection Guide

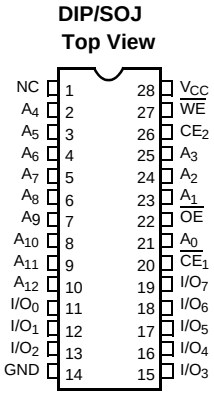
Description	-15	-20	-35
Maximum Access Time (ns)	15	20	35
Maximum Operating Current (mA)	130	110	100
Maximum CMOS Standby Current (mA)	15	15	15

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.

Contents

Pin Configuration



Maximum Ratings

Exceeding maximum ratings may shorten the useful life of the device. User guidelines are not tested.

Storage temperature ..... –65°C to +150°C

Ambient temperature with power applied ..... –55°C to +125°C

Supply voltage to ground potential .....–0.5 V to +7.0 V

DC voltage applied to outputs in High Z State[2] .....–0.5 V to +7.0 V

DC input voltage[2] .....–0.5 V to +7.0 V

Output current into outputs (LOW) ..... 20 mA

Static discharge voltage..... >2001 V (per MIL-STD-883, Method 3015)

Latch-up current ..... >200 mA

Operating Range

Range	Ambient Temperature	V_{CC}
Commercial	0°C to +70°C	5 V ± 10%
Industrial	–40°C to +85°C	5 V ± 10%

Electrical Characteristics

Over the Operating Range

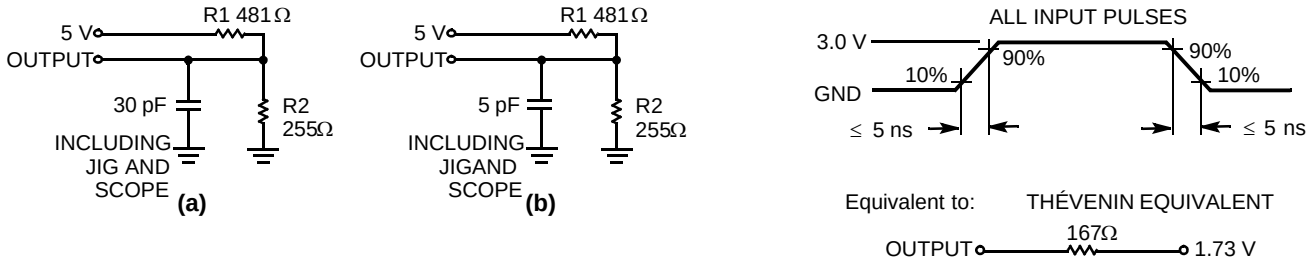
Parameter	Description	Test Conditions	–15		–20		–35		Unit
			Min	Max	Min	Max	Min	Max	
V_{OH}	Output HIGH Voltage	V_{CC} = Min., I_{OH} = –4.0 mA	2.4		2.4		2.4		V
V_{OL}	Output LOW Voltage	V_{CC} = Min., I_{OL} = 8.0 mA		0.4		0.4		0.4	V
V_{IH}	Input HIGH Voltage		2.2	V_{CC} + 0.3 V	2.2	V_{CC} + 0.3 V	2.2	V_{CC} + 0.3 V	V
V_{IL}	Input LOW Voltage[2]		–0.5	0.8	–0.5	0.8	–0.5	0.8	V
I_{IX}	Input Leakage Current	GND ≤ V_I ≤ V_{CC}	–5	+5	–5	+5	–5	+5	µA
I_{OZ}	Output Leakage Current	GND ≤ V_I ≤ V_{CC}, Output Disabled	–5	+5	–5	+5	–5	+5	µA
I_{CC}	V_{CC} Operating Supply Current	V_{CC} = Max., I_{OUT} = 0 mA		130		110		100	mA
I_{SB1}	Automatic Power-down Current	Max. V_{CC}, $\overline{CE_1}$ ≥ V_{IH} or CE_2 ≤ V_{IL} Min. Duty Cycle =100%		40		20		20	mA
I_{SB2}	Automatic Power-down Current	Max. V_{CC}, $\overline{CE_1}$ ≥ V_{CC} – 0.3 V, or CE_2 ≤ 0.3 V V_{IN} ≥ V_{CC} – 0.3 V or V_{IN} ≤ 0.3 V		15		15		15	mA

Capacitance

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

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

Figure 1. AC Test Loads and Waveforms



Notes
2. Minimum voltage is equal to –3.0 V for pulse durations less than 30 ns.
3. Tested initially and after any design or process changes that may affect these parameters.

Switching Characteristics Over the Operating Range[4]

Parameter	Description	-15		-20		-35		Unit
		Min	Max	Min	Max	Min	Max	
Read Cycle								
t_{RC}	Read Cycle Time	15		20		35		ns
t_{AA}	Address to Data Valid		15		20		35	ns
t_{OHA}	Data Hold from Address Change	3		5		5		ns
t_{ACE1}	$\overline{CE}_1$ LOW to Data Valid		15		20		35	ns
t_{ACE2}	CE_2 HIGH to Data Valid		15		20		35	ns
t_{DOE}	$\overline{OE}$ LOW to Data Valid		8		9		15	ns
t_{LZOE}	$\overline{OE}$ LOW to Low Z	3		3		3		ns
t_{HZOE}	$\overline{OE}$ HIGH to High Z[5]		7		8		10	ns
t_{LZCE1}	$\overline{CE}_1$ LOW to Low Z[6]	3		5		5		ns
t_{LZCE2}	CE_2 HIGH to Low Z	3		3		3		ns
t_{HZCE}	$\overline{CE}_1$ HIGH to High Z[5, 6] CE_2 LOW to High Z		7		8		10	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		15		20		20	ns
Write Cycle[7]								
t_{WC}	Write Cycle Time	15		20		35		ns
t_{SCE1}	$\overline{CE}_1$ LOW to Write End	12		15		20		ns
t_{SCE2}	CE_2 HIGH to Write End	12		15		20		ns
t_{AW}	Address Setup to Write End	12		15		25		ns
t_{HA}	Address Hold from Write End	0		0		0		ns
t_{SA}	Address Setup to Write Start	0		0		0		ns
t_{PWE}	$\overline{WE}$ Pulse Width	12		15		20		ns
t_{SD}	Data Setup to Write End	8		10		12		ns
t_{HD}	Data Hold from Write End	0		0		0		ns
t_{HZWE}	$\overline{WE}$ LOW to High Z[5]		7		7		8	ns
t_{LZWE}	$\overline{WE}$ HIGH to Low Z	3		5		5		ns

Notes

4. Test conditions assume signal transition time of 5 ns or less, timing reference levels of 1.5 V, input pulse levels of 0 to 3.0 V, and output loading of the specified I_{OL}/I_{OH} and 30-pF load capacitance.
5. 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.
6. At any temperature and voltage condition, t_{HZCE} is less than t_{LZCE1} and t_{LZCE2} for any given device.
7. 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 setup and hold timing must be referenced to the rising edge of the signal that terminates the write.

Switching Waveforms

Figure 2. Read Cycle No.1[8,9]

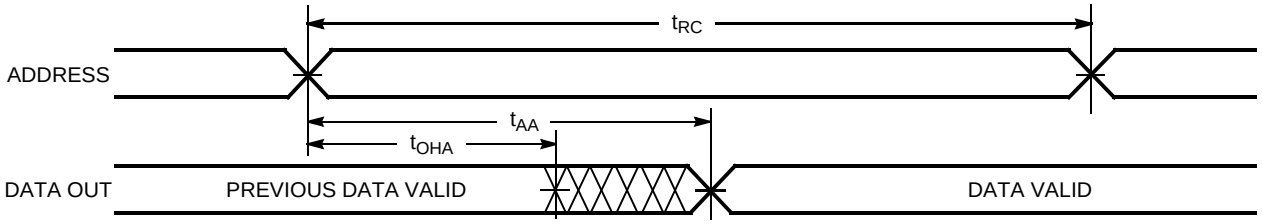
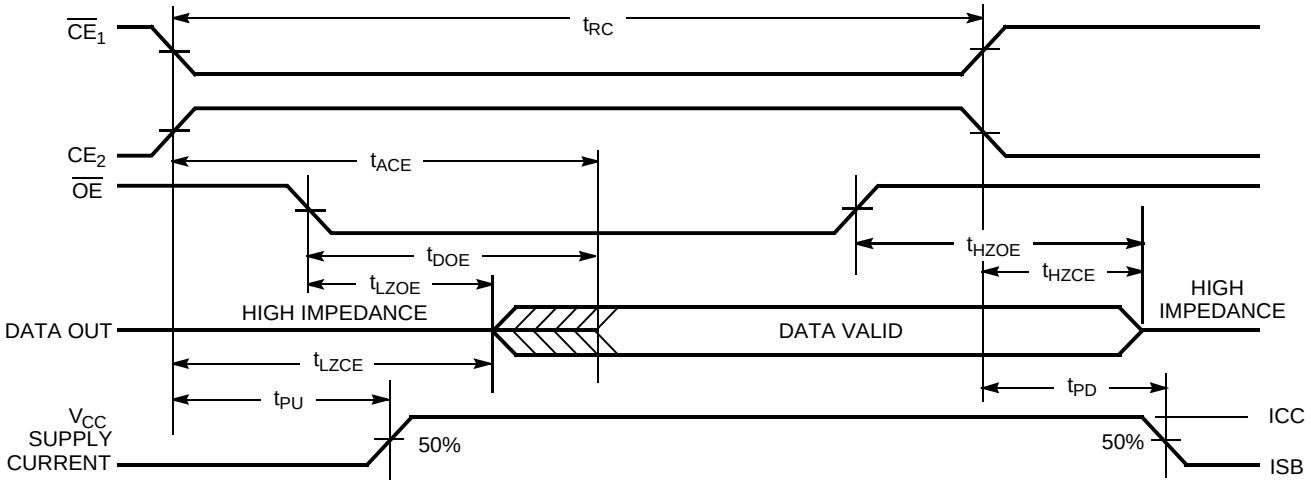


Figure 3. Read Cycle No.2[10,11]



Notes

8. Device is continuously selected. $\overline{OE}$, $\overline{CE_1}$ = V_{IL}. CE_2 = V_{IH}.
9. $\overline{WE}$ is HIGH for read cycle.
10. 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}.
11. 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 setup and hold timing must be referenced to the rising edge of the signal that terminates the write.

Switching Waveforms (continued)

Figure 4. Write Cycle No. 1 ($\overline{WE}$ Controlled)[9,11]

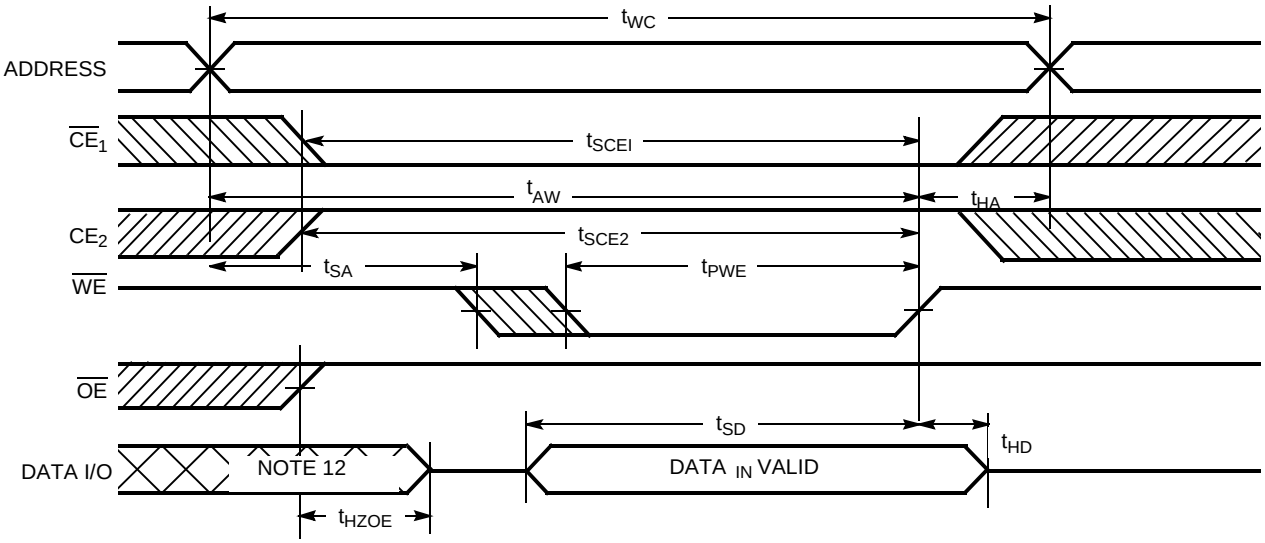
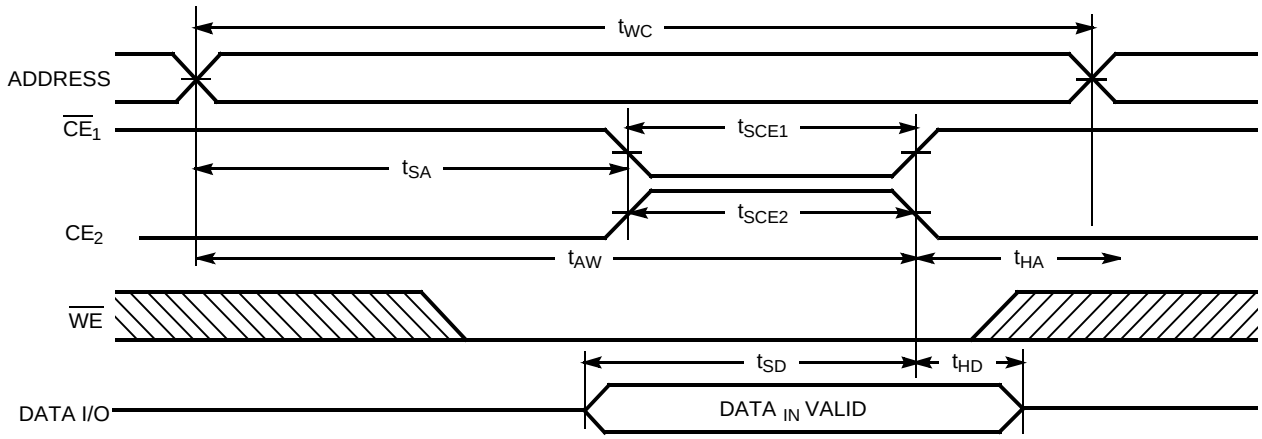


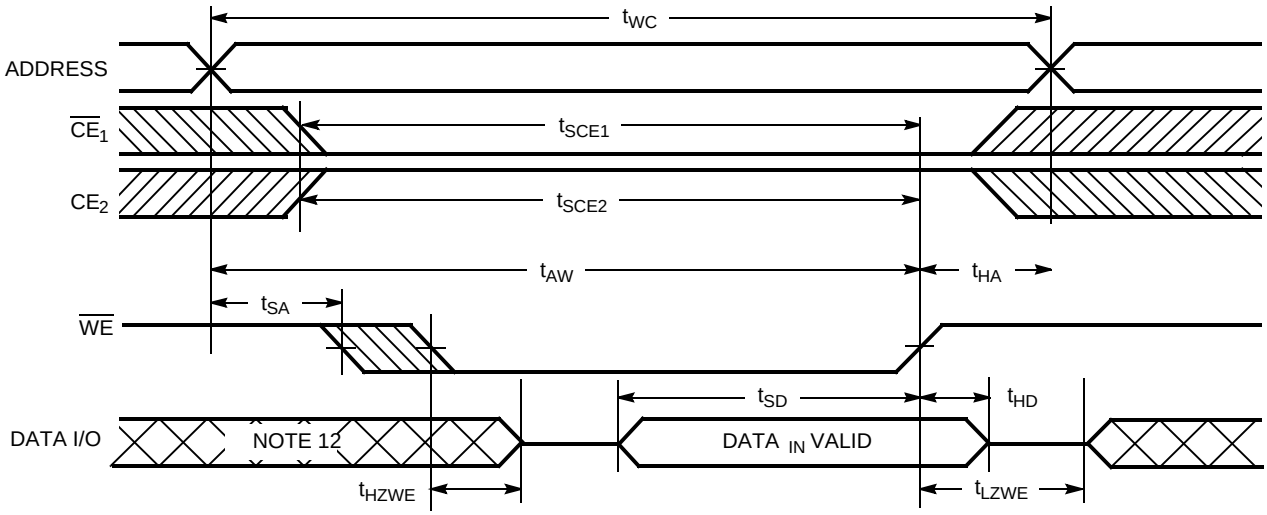
Figure 5. Write Cycle No. 2 ($\overline{CE}$ Controlled)[11,12,13]



Notes
12. During this period, the I/Os are in the output state and input signals must not be applied.
13. The minimum write cycle time for write cycle #3 ($\overline{WE}$ controlled, $\overline{OE}$ LOW) is the sum of t_{HZWE} and t_{SD}.

Switching Waveforms (continued)

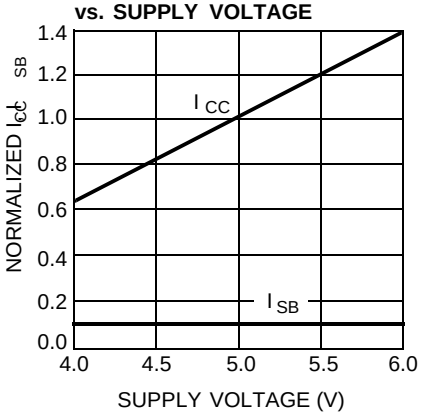
Figure 6. Write Cycle No. 3 ($\overline{WE}$ Controlled, $\overline{OE}$ LOW)[11,12,13,14]



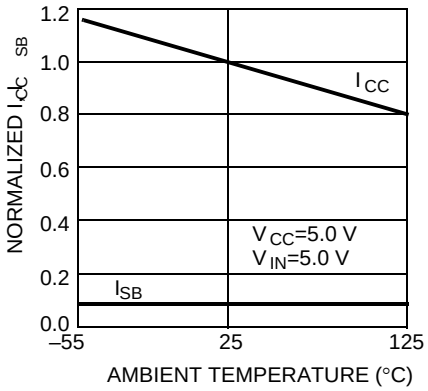
Note
14. If $\overline{CE_1}$ goes HIGH or CE_2 goes LOW simultaneously with $\overline{WE}$ HIGH, the output remains in a high-impedance state.

Typical DC and AC Characteristics

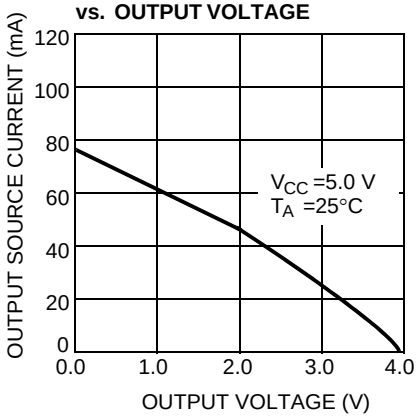
NORMALIZED SUPPLY CURRENT vs. SUPPLY VOLTAGE



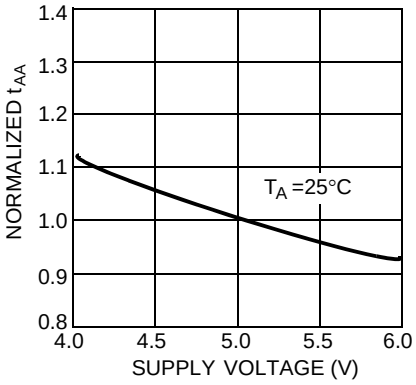
NORMALIZED SUPPLY CURRENT vs. AMBIENT TEMPERATURE



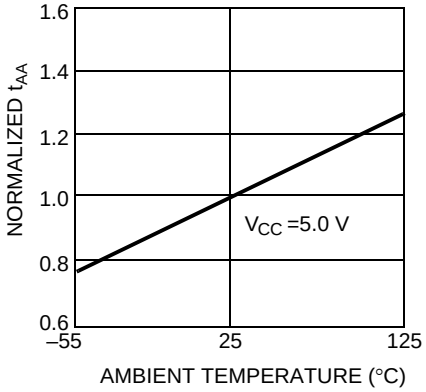
OUTPUT SOURCE CURRENT vs. OUTPUT VOLTAGE



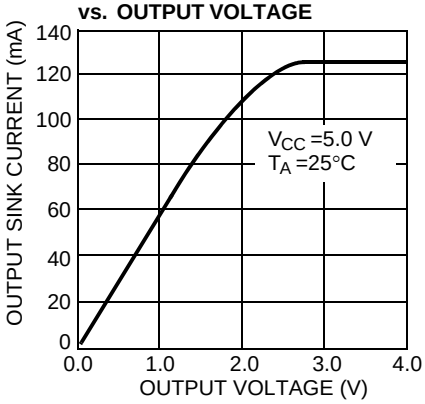
NORMALIZED ACCESS TIME vs. SUPPLY VOLTAGE



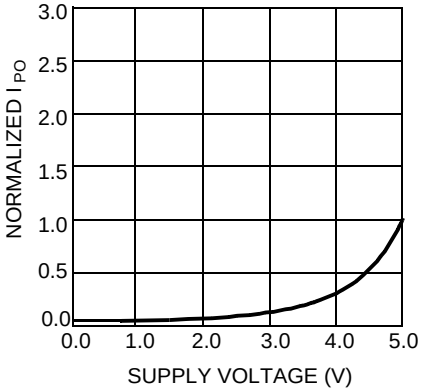
NORMALIZED ACCESS TIME vs. AMBIENT TEMPERATURE



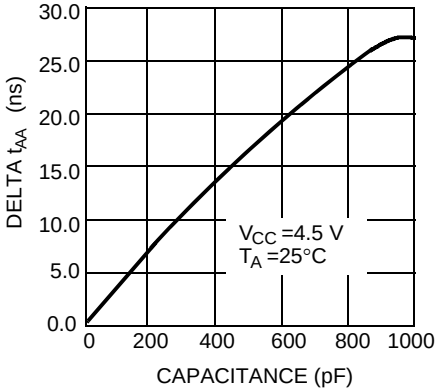
OUTPUT SINK CURRENT vs. OUTPUT VOLTAGE



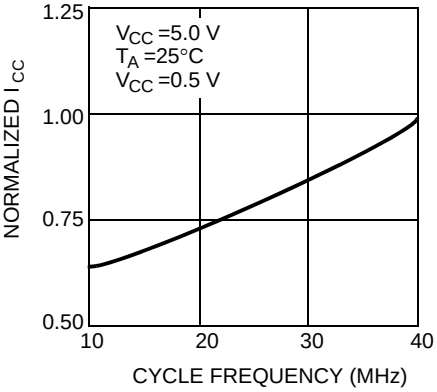
TYPICAL POWER-ON CURRENT vs. SUPPLY VOLTAGE



TYPICAL ACCESS TIME CHANGE vs. OUTPUT LOADING



NORMALIZED I_{CC} vs. CYCLE TIME



Truth Table

$\overline{CE_1}$	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

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	CY7C185-15VI	51-85031	28-pin (300-Mil) Molded SOJ	Industrial
20	CY7C185-20PXC	51-85014	28-pin (300-Mil) Molded DIP (Pb-free)	Commercial
35	CY7C185-35SC	51-85026	28-pin (300-Mil) Molded SOIC	Commercial

Ordering Code Definitions

CY 7 C 1 85 - XX XX X

- Temperature Range: X = C or I
  C = Commercial; I = Industrial
- Package Type: XX = V or PX or S
  V = 28-pin Molded SOJ
  PX = 28-pin Molded DIP (Pb-free)
  S = 28-pin Molded SOIC
- Speed: 15 ns or 20 ns or 35 ns
- 85 = 64 Kbit density with datawidth × 8 bits
- 1 = Fast Asynchronous SRAM family
- Technology Code: C = CMOS
- 7 = SRAM
- CY = Cypress

Package Diagrams

Figure 7. 28-pin (300-Mil) PDIP (51-85014)

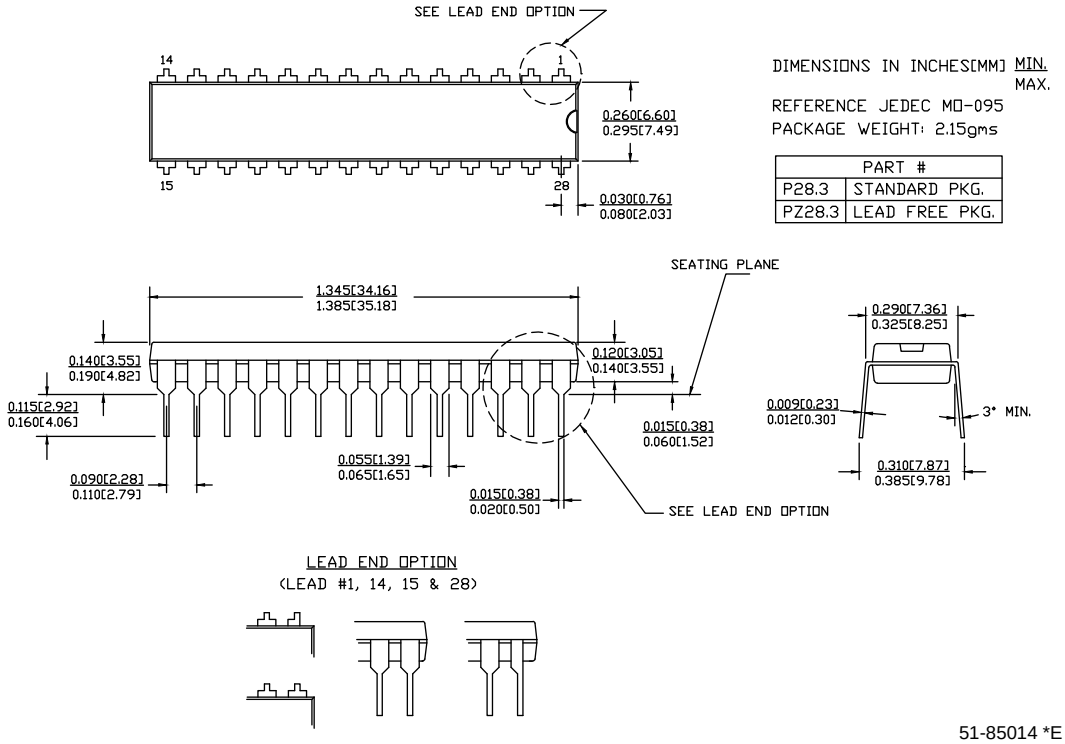
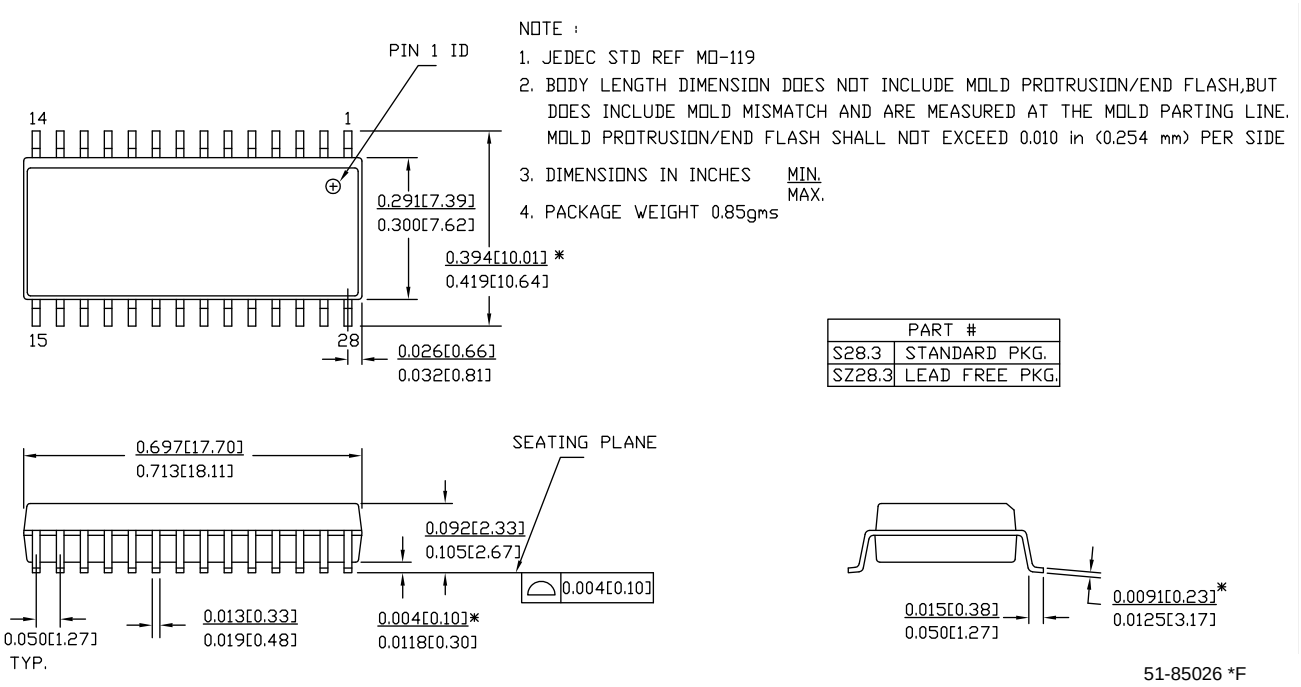
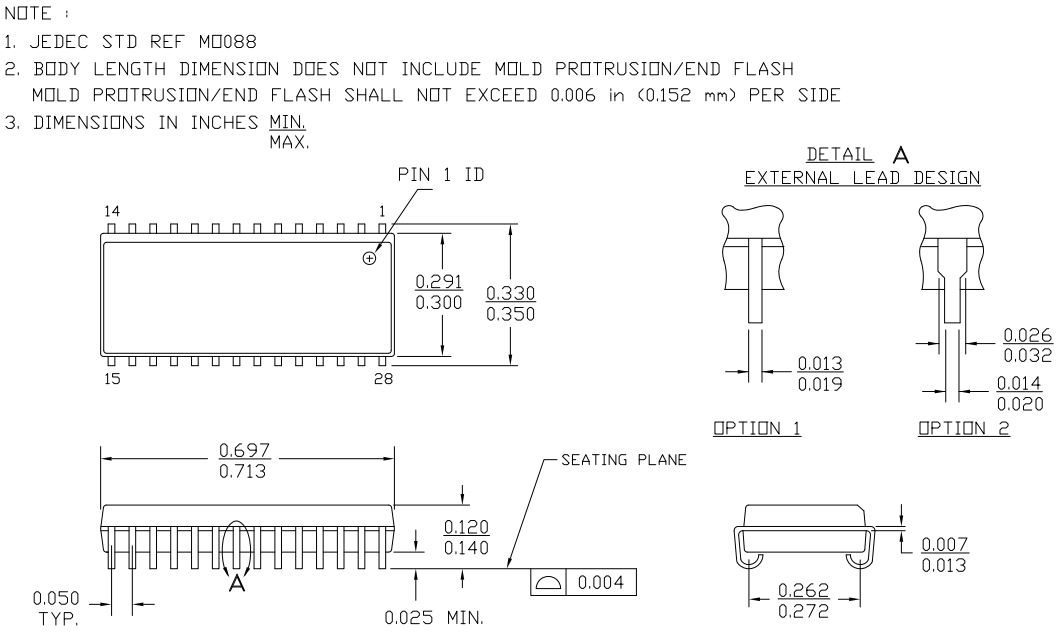


Figure 8. 28-pin (300-Mil) Molded SOIC (51-85026)



Package Diagrams (continued)

Figure 9. 28-pin (300-Mil) Molded SOJ (51-85031)



Acronyms

Acronym	Description
CE	chip enable
CMOS	Complementary metal oxide semiconductor
I/O	Input/output
OE	output enable
SRAM	Static random access memory
SOJ	Small Outline J-Lead
TSOP	Thin Small Outline Package
VFBGA	Very Fine-Pitch Ball Grid Array

Document Conventions

Units of Measure

Symbol	Unit of Measure
ns	nano seconds
V	Volts
µA	micro Amperes
mA	milli Amperes
mV	milli Volts
mW	milli Watts
MHz	Mega Hertz
pF	pico Farad
°C	degree Celcius
W	Watts

Document History Page

Document Title: CY7C185, 64-Kbit (8 K × 8) Static RAM Document Number: 38-05043				
Revision	**ECN**	**Submission Date**	**Orig. of Change**	**Description of Change**
**	107145	09/10/01	SZV	Change from Spec number: 38-00037 to 38-05043
*A	116470	09/16/02	CEA	Add applications foot note to data sheet
*B	486744	See ECN	NXR	Changed Low standby power from 220mW to 85mW Changed the description of I_{IX} from Input Load Current to Input Leakage Current in DC Electrical Characteristics table Removed I_{OS} parameter from DC Electrical Characteristics table Updated the Ordering Information table
*C	2263686	See ECN	VKN/AESA	Removed 25 ns speed bin Updated the Ordering Information table as per the current product offerings
*D	3105329	12/09/2010	AJU	Added Ordering Code Definitions. Updated Package Diagrams.
*E	3235800	04/20/2011	PRAS	Template changes. Added Acronyms and Units of Measure. Updated package diagram spec 51-85026 to *F.

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