CY7C192

64 K × 4 Static RAM with Separate IO

Features

- High speed
  - 15 ns
- CMOS for optimum speed/power
- Low active power
  - 860 mW
- Low standby power
  - 55 mW
- TTL-compatible inputs and outputs
- Automatic power down when deselected
- Available in Pb-free 28-pin Molded SOJ package

Functional Description

The CY7C192 is a high performance CMOS static RAM organized as 65,536 × 4 bits with separate IO. Easy memory expansion is provided by active LOW Chip Enable ($\overline{CE}$) and tri-state drivers. It has an automatic power down feature that reduces power consumption by 75% when deselected.

Writing to the device is accomplished when the Chip Enable ($\overline{CE}$) and Write Enable ($\overline{WE}$) inputs are both LOW.

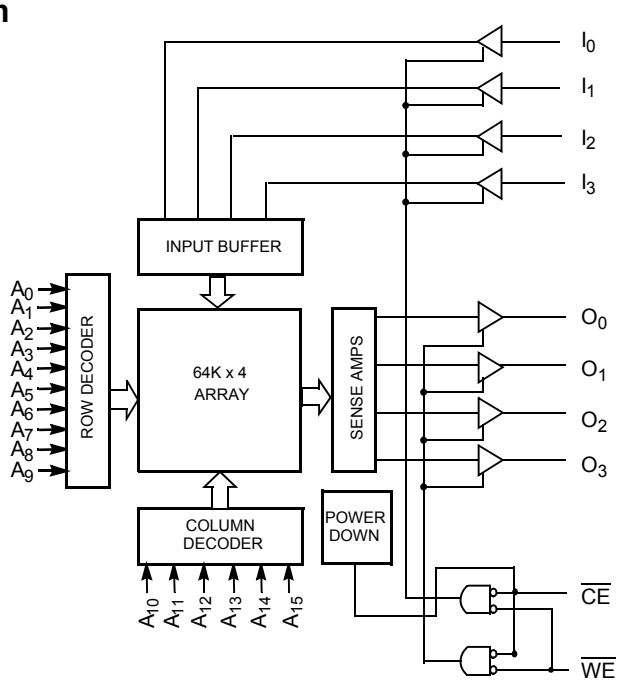
Data on the four input pins (I_0 through I_3) is written into the memory location specified on the address pins (A_0 through A_{15}).

Reading the device is accomplished by taking the Chip Enable ($\overline{CE}$) LOW while the Write Enable ($\overline{WE}$) remains HIGH. Under these conditions, the contents of the memory location specified on the address pins appears on the four data output pins.

The output pins stay in high impedance state when Write Enable ($\overline{WE}$) is LOW or Chip Enable ($\overline{CE}$) is HIGH.

A die coat ensures alpha immunity.

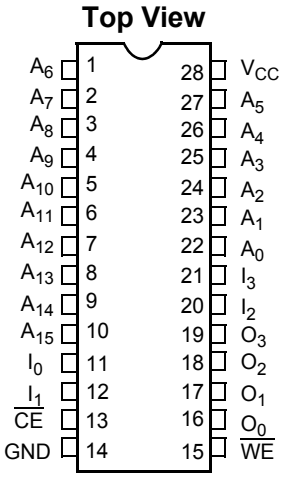
Logic Block Diagram



Contents

Pin Configurations

Figure 1. 28-pin Molded SOJ pinout



Selection Guide

Description	-15	Unit
Maximum Access Time	15	ns
Maximum Operating Current	145	mA
Maximum CMOS Standby Current	10	mA

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 [1] ..... –0.5 V to V_{CC} + 0.5 V

DC Input Voltage[1] ..... –0.5 V to V_{CC} + 0.5 V

Output Current into Outputs (LOW) ..... 20 mA

Static Discharge Voltage (per MIL-STD-883, Method 3015) ..... > 900 V

Latch-Up Current ..... > 200 mA

Operating Range

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

Electrical Characteristics

Over the Operating Range

Parameter	Description	Test Conditions	-15		Unit
			Min	Max	
V_{OH}	Output HIGH Voltage	V_{CC} = Min, I_{OH} = –4.0 mA	2.4	–	V
V_{OL}	Output LOW Voltage	V_{CC} = Min, I_{OL} = 8.0 mA	–	0.4	V
V_{IH}	Input HIGH Voltage		2.2	V_{CC} + 0.3	V
V_{IL}	Input LOW Voltage [1]		–0.5	0.8	V
I_{IX}	Input Leakage Current	GND ≤ V_I ≤ V_{CC}	–5	+5	µA
I_{OZ}	Output Leakage Current	GND ≤ V_O ≤ V_{CC}, Output Disabled	–5	+5	µA
I_{CC}	V_{CC} Operating Supply Current	V_{CC} = Max, I_{OUT} = 0 mA, f = f_{MAX} = $1/t_{RC}$	–	145	mA
I_{SB1}	Automatic $\overline{CE}$ Power Down Current – TTL Inputs	Max V_{CC}, $\overline{CE}$ ≥ V_{IH}, V_{IN} ≥ V_{IH} or V_{IN} ≤ V_{IL}, f = f_{MAX}	–	30	mA
I_{SB2}	Automatic $\overline{CE}$ Power Down Current – CMOS Inputs	Max V_{CC}, $\overline{CE}$ ≥ V_{CC} – 0.3 V, V_{IN} ≥ V_{CC} – 0.3 V or V_{IN} ≤ 0.3 V, f = 0	–	10	mA

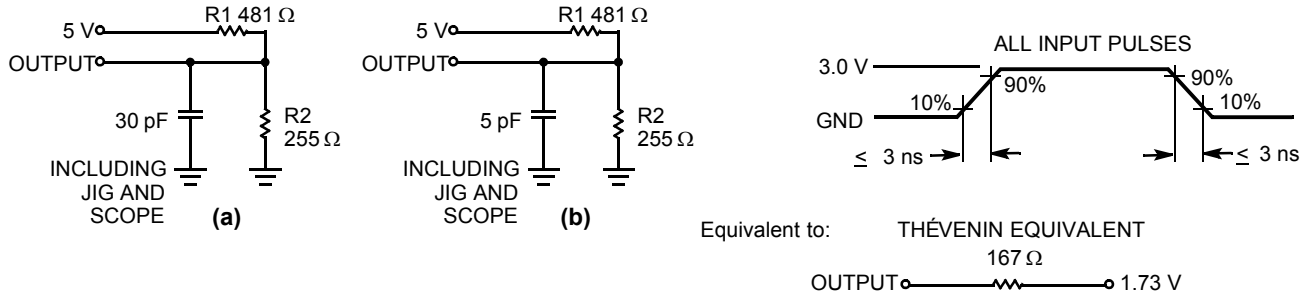
Capacitance

Parameter	Description	Test Conditions	Max	Unit
C_{IN} [3]	Input Capacitance	T_A = 25 °C, f = 1 MHz, V_{CC} = 5.0 V	8	pF
C_{OUT} [3]	Output Capacitance		10	pF

Notes
1. Minimum voltage is equal to –2.0 V for pulse durations of less than 20 ns.
2. T_A is the case temperature.
3. Tested initially and after any design or process changes that may affect these parameters.

AC Test Loads and Waveforms

Figure 2. AC Test Loads and Waveforms



Switching Characteristics

Over the Operating Range

Parameter [4]	Description	-15		Unit
		Min	Max	
Read Cycle				
t_{RC}	Read Cycle Time	15	–	ns
t_{AA}	Address to Data Valid	–	15	ns
t_{OHA}	Output Hold from Address Change	3	–	ns
t_{ACE}	$\overline{CE}$ LOW to Data Valid	–	15	ns
t_{LZCE}	$\overline{CE}$ LOW to Low Z [5]	3	–	ns
t_{HZCE}	$\overline{CE}$ HIGH to High Z [5, 6]	–	7	ns
t_{PU}	$\overline{CE}$ LOW to Power Up	0	–	ns
t_{PD}	$\overline{CE}$ HIGH to Power Down	–	15	ns
Write Cycle [7]				
t_{WC}	Write Cycle Time	15	–	ns
t_{SCE}	$\overline{CE}$ LOW to Write End	10	–	ns
t_{AW}	Address Setup to Write End	10	–	ns
t_{HA}	Address Hold from Write End	0	–	ns
t_{SA}	Address Setup to Write Start	0	–	ns
t_{PWE}	$\overline{WE}$ Pulse Width	9	–	ns
t_{SD}	Data Setup to Write End	9	–	ns
t_{HD}	Data Hold from Write End	0	–	ns
t_{LZWE}	$\overline{WE}$ HIGH to Low Z [5]	3	–	ns
t_{HZWE}	$\overline{WE}$ LOW to High Z [5, 6]	–	7	ns

Notes

4. Test conditions assume signal transition time of 3 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. At any temperature and voltage condition, t_{HZCE} is less than t_{LZCE}, $t_{HZW\E}$ is less than t_{LZWE} for any given device. These parameters are guaranteed by design and not 100% tested.
6. t_{HZCE} and t_{HZWE} are specified with C_L = 5 pF as in part (b) of Figure 2. Transition is measured ±500 mV from steady-state voltage.
7. The internal write time of the memory is defined by the overlap of $\overline{CE}$ LOW and $\overline{WE}$ LOW. Both signals must be LOW 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 3. Read Cycle No. 1 [8, 9]

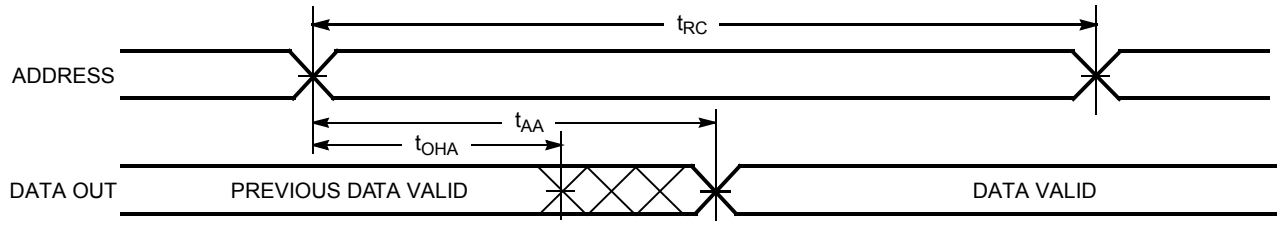


Figure 4. Read Cycle No. 2 [8, 10]

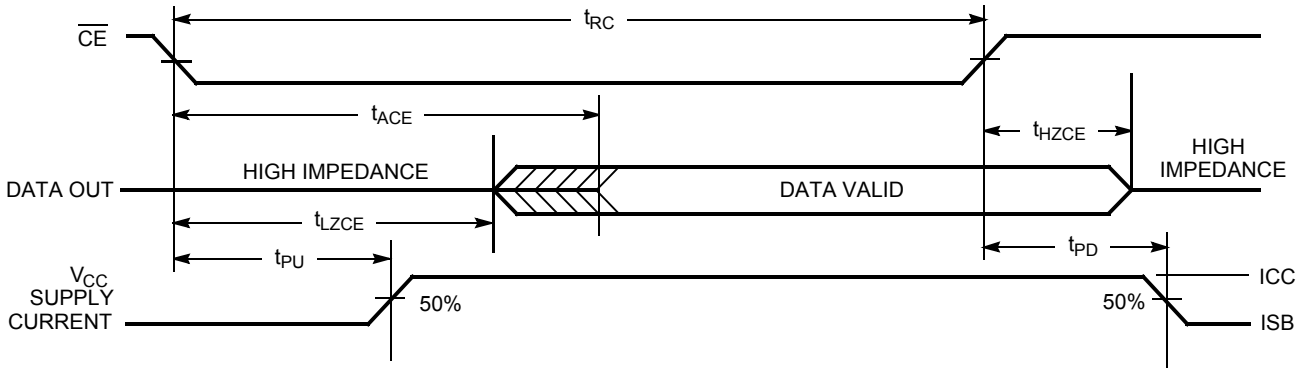
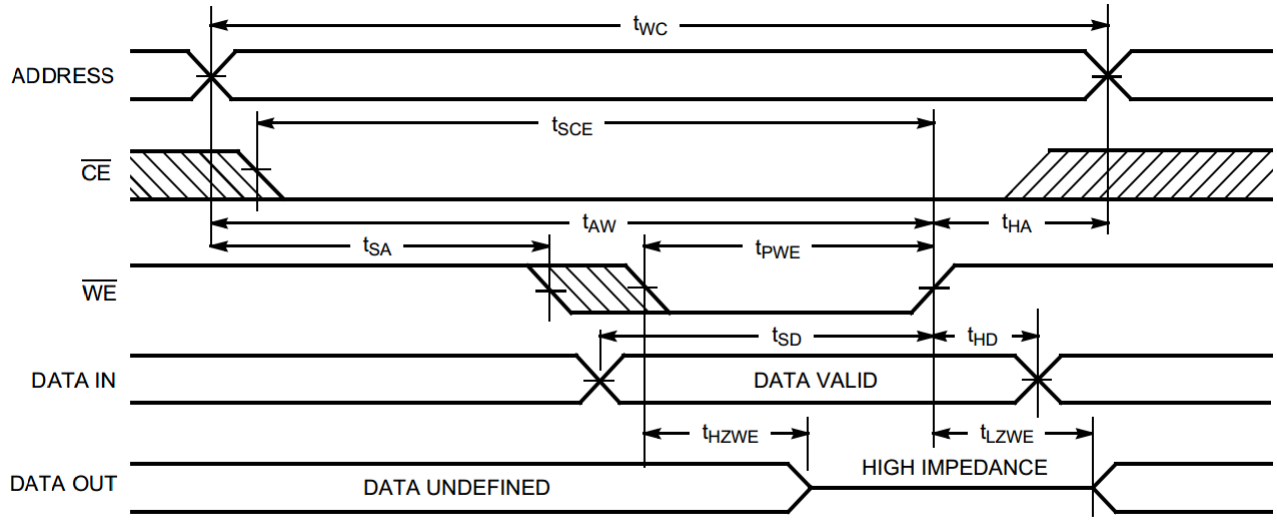


Figure 5. Write Cycle No. 1 (WE Controlled) [11]

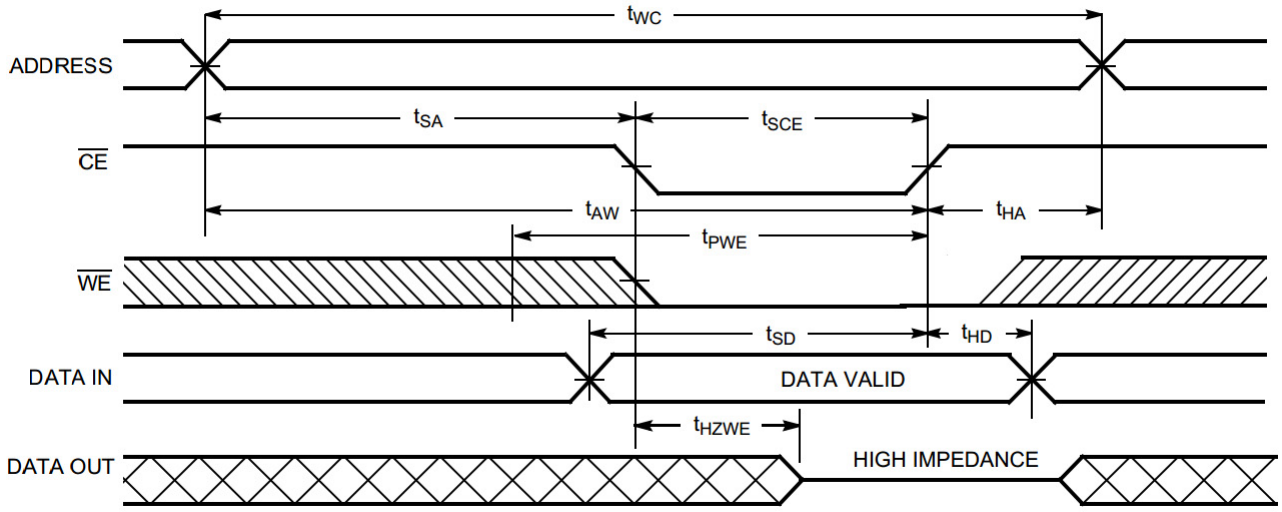


Notes

8. WE is HIGH for read cycle.
9. Device is continuously selected, CE = V_{IL}.
10. Address valid prior to or coincident with CE transition LOW.
11. The internal write time of the memory is defined by the overlap of CE LOW and WE LOW. Both signals must be LOW 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 (continued)

Figure 6. Write Cycle No. 2 ($\overline{CE}$ Controlled) [12, 13]

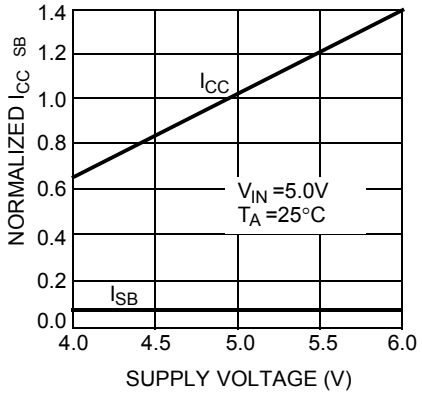


Notes

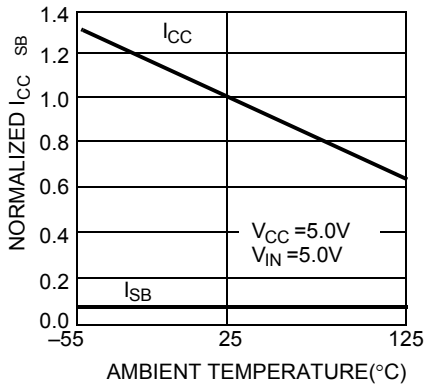
12. The internal write time of the memory is defined by the overlap of $\overline{CE}$ LOW and $\overline{WE}$ LOW. Both signals must be LOW to initiate a write and either signal can terminate a write by going HIGH. The data input setup and hold timing must be referenced to the rising edge of the signal that terminates the write.
13. If $\overline{CE}$ goes HIGH simultaneously with $\overline{WE}$ HIGH, the output remains in a high impedance state.

Typical DC and AC Characteristics

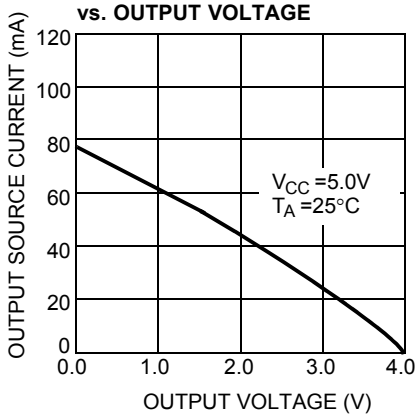
NORMALIZED SUPPLY CURRENT vs. SUPPLY VOLTAGE



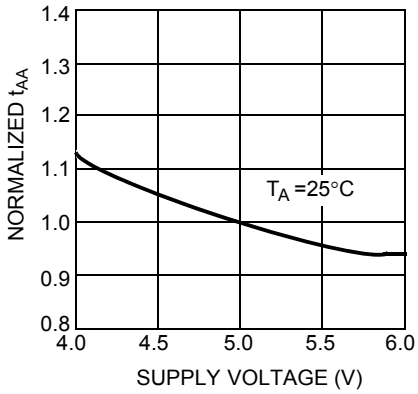
NORMALIZED SUPPLY CURRENT vs. AMBIENT TEMPERATURE



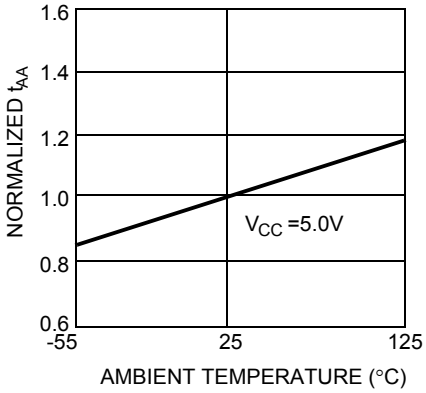
OUTPUT SOURCE CURRENT vs. OUTPUT VOLTAGE



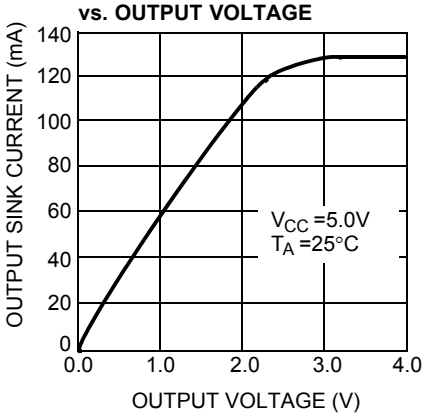
NORMALIZED ACCESS TIME vs. SUPPLY VOLTAGE



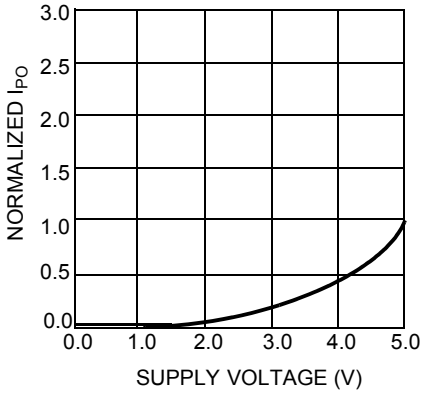
NORMALIZED ACCESS TIME vs. AMBIENT TEMPERATURE



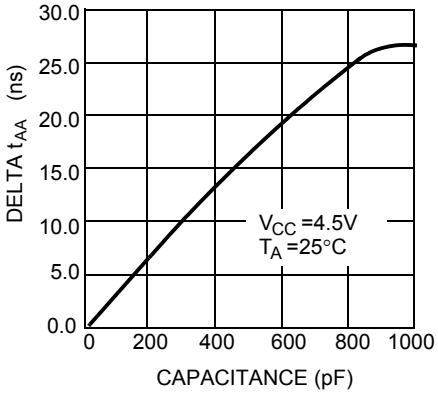
OUTPUT SINK CURRENT vs. OUTPUT VOLTAGE



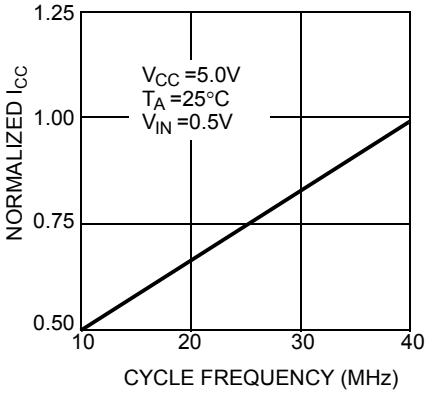
TYPICAL POWER ON CURRENT vs. SUPPLY VOLTAGE



TYPICAL ACCESS TIME CHANGE vs. OUTPUT LOADING



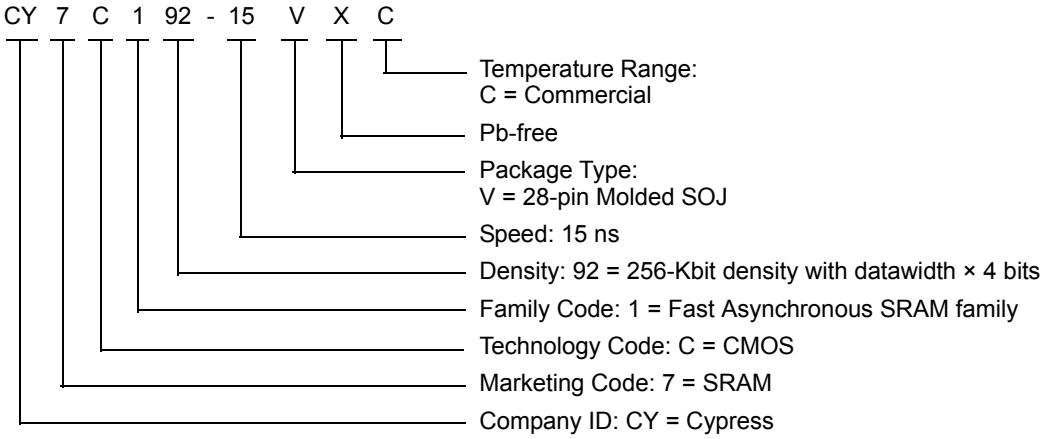
NORMALIZED I_{CC} vs. CYCLE TIME



Ordering Information

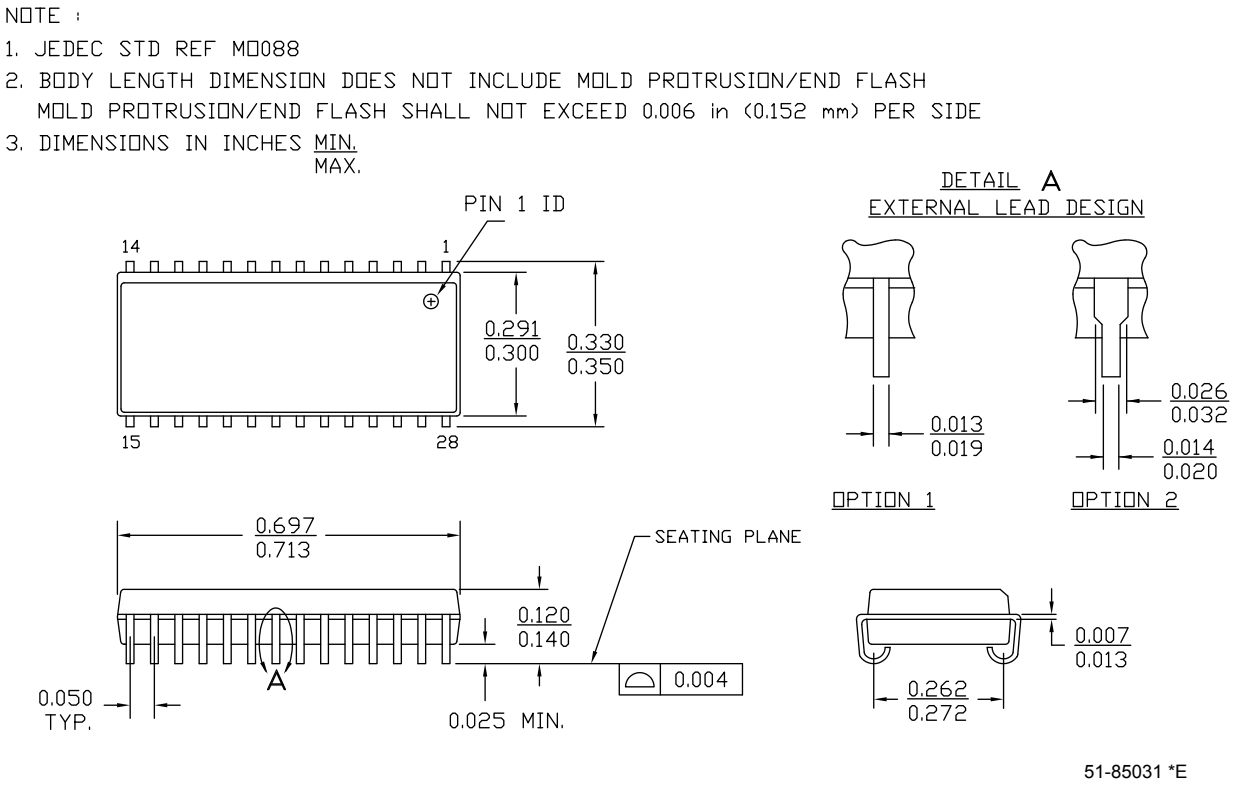
Speed (ns)	Ordering Code	Package Diagram	Package Type	Operating Range
15	CY7C192-15VXC	51-85031	28-pin Molded SOJ (Pb-free)	Commercial

Ordering Code Definitions



Package Diagram

Figure 7. 28-pin SOJ (300 Mils) V28.3 (Molded SOJ V21) Package Outline, 51-85031



Acronyms

Acronym	Description
$\overline{CE}$	Chip Enable
CMOS	Complementary Metal Oxide Semiconductor
I/O	Input/Output
SOJ	Small Outline J-lead
SRAM	Static Random Access Memory
TTL	Transistor-Transistor Logic
$\overline{WE}$	Write Enable

Document Conventions

Units of Measure

Symbol	Unit of Measure
°C	degree Celcius
MHz	megahertz
µA	microampere
mA	milliampere
mm	millimeter
ms	millisecond
mW	milliwatt
ns	nanosecond
Ω	ohm
%	percent
pF	picofarad
V	volt
W	watt

Document History Page

Document Title: CY7C192, 64 K × 4 Static RAM with Separate IO Document Number: 38-05047				
Rev.	**ECN No.**	**Issue Date**	**Orig. of Change**	**Description of Change**
**	107149	09/10/01	SZV	Change Spec number from: 38-00076 to 38-05047
*A	359716	See ECN	AJU	Changed Static Discharge Voltage limit in the Maximum Ratings section (page 2) from 2001V to 900V Removed references to CY7C191
*B	419549	See ECN	AJU	Added Pb-free parts to the Ordering Information table and replaced the Package Name column with Package Diagram
*C	492500	See ECN	NXR	Removed 20 ns and 25 ns speed bins Changed the Low active power from 220 mW to 55 mW 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 Removed 28-Lead (300-Mil) PDIP package from product offering Updated Ordering Information table
*D	2104606	See ECN	VKN/AESA	Removed 12 ns speed bin
*E	2956606	06/18/2010	KAO	Removed inactive part from Ordering Information Updated Package Diagram. Added Sales, Solutions, and Legal Information.
*F	3105329	12/09/2010	AJU	Added Ordering Code Definitions.
*G	3217855	04/06/2011	PRAS	Added Acronyms and Units of Measure. Updated in new template.
*H	3271782	06/01/2011	PRAS	Updated Features.
*I	3974483	04/19/2013	MEMJ	Updated Switching Waveforms (Updated Figure 5, Figure 6). Updated Package Diagram: spec 51-85031 – Changed revision from *D to *E. Completing Sunset Review.

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