256K (32K x 8) Static RAM

Features

- Pin- and function-compatible with CY7C199C
- High speed
  - t_{AA} = 10 ns
- Low active power
  - I_{CC} = 80 mA @ 10 ns
- Low CMOS standby power
  - I_{SB2} = 3 mA
- 2.0V Data Retention
- Automatic power-down when deselected
- CMOS for optimum speed/power
- TTL-compatible inputs and outputs
- Easy memory expansion with $\overline{CE}$ and $\overline{OE}$ features
- Available in Pb-free 28-pin 300-Mil wide Molded SOJ and 28-pin TSOP I packages

Functional Description [1]

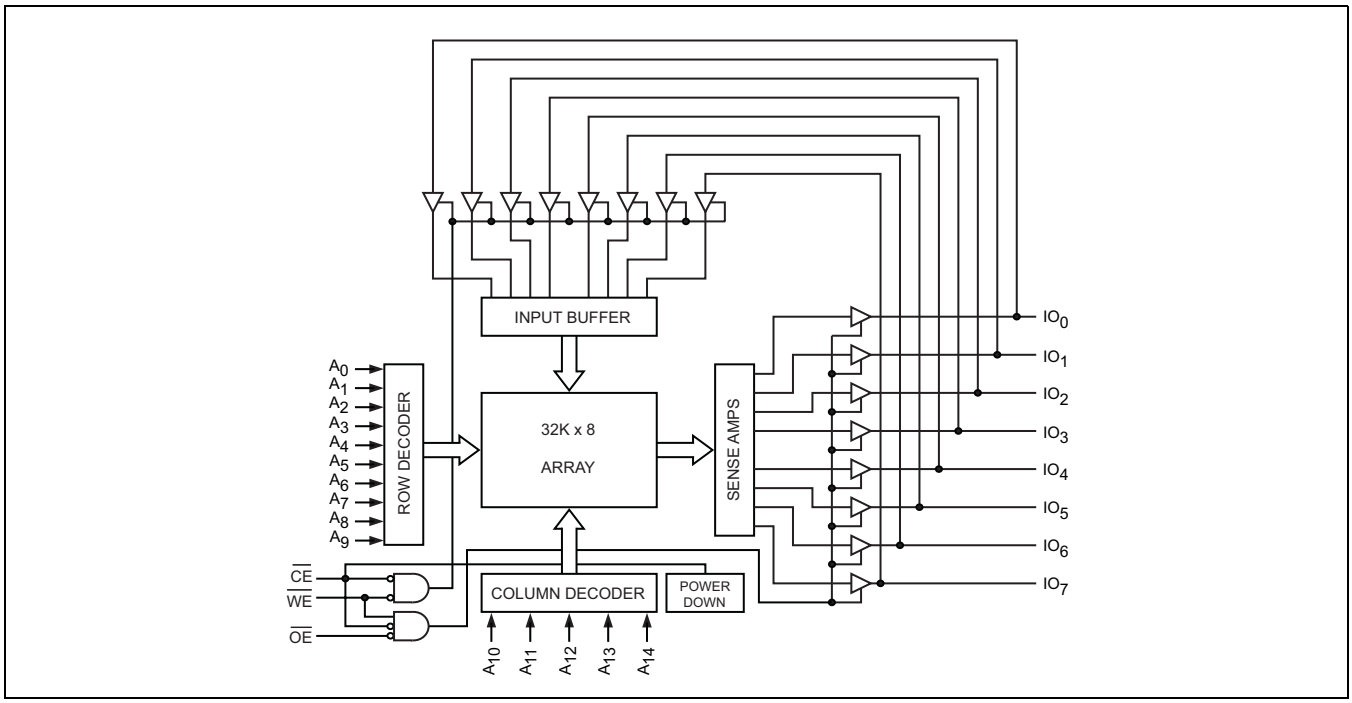
The CY7C199D is a high-performance CMOS static RAM organized as 32,768 words by 8 bits. Easy memory expansion is provided by an active LOW Chip Enable ($\overline{CE}$), an active LOW Output Enable ($\overline{OE}$) and tri-state drivers. This device has an automatic power-down feature, reducing the power consumption when deselected. The input and output pins (IO_0 through IO_7) are placed in a high-impedance state when:

- Deselected ($\overline{CE}$ HIGH)
- Outputs are disabled ($\overline{OE}$ HIGH)
- When the write operation is active($\overline{CE}$ LOW and $\overline{WE}$ LOW)

Write to the device by taking Chip Enable ($\overline{CE}$) and Write Enable ($\overline{WE}$) inputs LOW. Data on the eight IO pins (IO_0 through IO_7) is then written into the location specified on the address pins (A_0 through A_{14}).

Read from the device by taking Chip Enable ($\overline{CE}$) and Output Enable ($\overline{OE}$) LOW while forcing Write Enable ($\overline{WE}$) HIGH. Under these conditions, the contents of the memory location specified by the address pins appears on the IO pins.

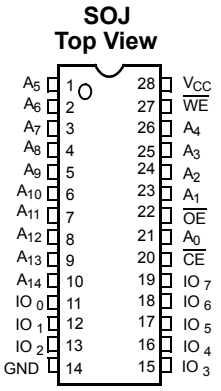
Logic Block Diagram

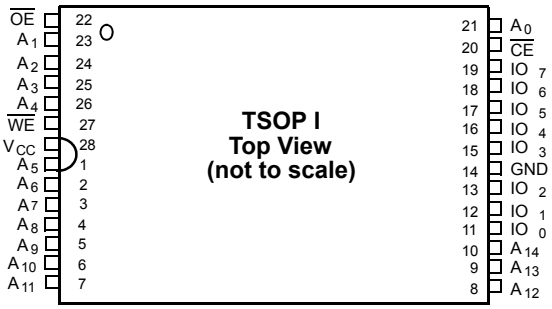


Note:

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.

Pin Configurations





Selection Guide

	CY7C199D-10	Unit
Maximum Access Time	10	ns
Maximum Operating Current	80	mA
Maximum CMOS Standby Current	3	mA

Maximum Ratings

Exceeding the maximum ratings may impair the useful life of the device. These user guidelines are not tested.

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

Ambient Temperature with Power Applied.....–55°C to +125°C

Supply Voltage on V_{CC} to Relative GND [2] ... –0.5V to +6.0V

DC Voltage Applied to Outputs in High-Z State [2].....–0.5V to V_{CC} + 0.5V

DC Input Voltage [2] .....–0.5V to V_{CC} + 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_{CC}	Speed
Industrial	–40°C to +85°C	5V ± 0.5V	10 ns

Electrical Characteristics (Over the Operating Range)

Parameter	Description	Test Conditions		7C199D-10 Min	7C199D-10 Max	Unit
V_{OH}	Output HIGH Voltage	I_{OH}=–4.0 mA		2.4		V
V_{OL}	Output LOW Voltage	I_{OL}=8.0 mA			0.4	V
V_{IH}	Input HIGH Voltage [2]			2.0	V_{CC} + 0.5	V
V_{IL}	Input LOW Voltage [2]			–0.5	0.8	V
I_{IX}	Input Leakage Current	GND ≤ V_I ≤ V_{CC}		–1	+1	µA
I_{OZ}	Output Leakage Current	GND ≤ V_O ≤ V_{CC}, Output Disabled		–1	+1	µA
I_{CC}	V_{CC} Operating Supply Current	V_{CC} = Max, I_{OUT} = 0 mA, f = f_{max} = $1/t_{RC}$	100 MHz		80	mA
			83 MHz		72	mA
			66 MHz		58	mA
			40 MHz		37	mA
I_{SB1}	Automatic 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}			10	mA
I_{SB2}	Automatic CE Power-down Current— CMOS Inputs	Max V_{CC}, $\overline{CE}$ ≥ V_{CC} – 0.3V V_{IN} ≥ V_{CC} – 0.3V or V_{IN} ≤ 0.3V, f = 0			3	mA

Note:

2. V_{IL}(min) = –2.0V and V_{IH}(max) = V_{CC} + 1V for pulse durations of less than 5 ns.

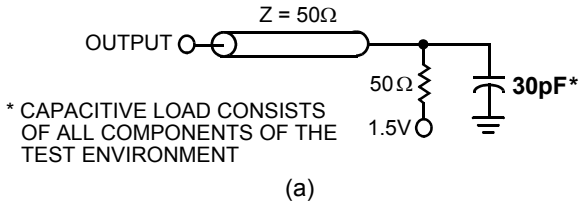
Capacitance [3]

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

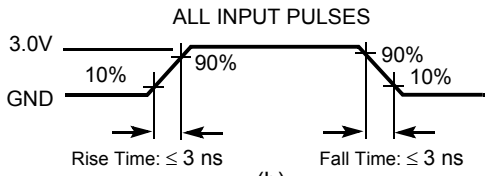
Thermal Resistance [3]

Parameter	Description	Test Conditions	SOJ	TSOP I	Unit
Θ_{JA}	Thermal Resistance (Junction to Ambient)	Still Air, soldered on a 3 × 4.5 inch, four-layer printed circuit board	59.16	54.65	°C/W
Θ_{JC}	Thermal Resistance (Junction to Case)		40.84	21.49	°C/W

AC Test Loads and Waveforms [4]

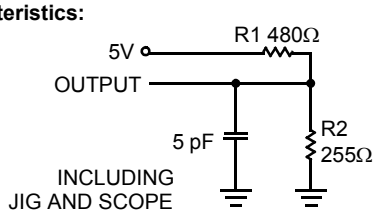


(a)



(b)

High-Z characteristics:



(c)

Notes:

3. Tested initially and after any design or process changes that may affect these parameters.
4. AC characteristics (except High-Z) are tested using the load conditions shown in Figure (a). High-Z characteristics are tested for all speeds using the test load shown in Figure (c).

Switching Characteristics (Over the Operating Range) [5]

Parameter	Description	7C199D-10		Unit
		Min	Max	
Read Cycle				
t_{power} [6]	V_{CC}(typical) to the first access	100		µs
t_{RC}	Read Cycle Time	10		ns
t_{AA}	Address to Data Valid		10	ns
t_{OHA}	Data Hold from Address Change	3		ns
t_{ACE}	$\overline{CE}$ LOW to Data Valid		10	ns
t_{DOE}	$\overline{OE}$ LOW to Data Valid		5	ns
t_{LZOE} [7]	$\overline{OE}$ LOW to Low-Z	0		ns
t_{HZOE} [7, 8]	$\overline{OE}$ HIGH to High-Z		5	ns
t_{LZCE} [7]	$\overline{CE}$ LOW to Low-Z	3		ns
t_{HZCE} [7, 8]	$\overline{CE}$ HIGH to High-Z		5	ns
t_{PU} [9]	$\overline{CE}$ LOW to Power-up	0		ns
t_{PD} [9]	$\overline{CE}$ HIGH to Power-down		10	ns
Write Cycle [10, 11]				
t_{WC}	Write Cycle Time	10		ns
t_{SCE}	$\overline{CE}$ LOW to Write End	7		ns
t_{AW}	Address Set-up to Write End	7		ns
t_{HA}	Address Hold from Write End	0		ns
t_{SA}	Address Set-up to Write Start	0		ns
t_{PWE}	$\overline{WE}$ Pulse Width	7		ns
t_{SD}	Data Set-up to Write End	5		ns
t_{HD}	Data Hold from Write End	0		ns
t_{HZWE} [7]	$\overline{WE}$ LOW to High-Z		6	ns
t_{LZWE} [7, 8]	$\overline{WE}$ HIGH to Low-Z	3		ns

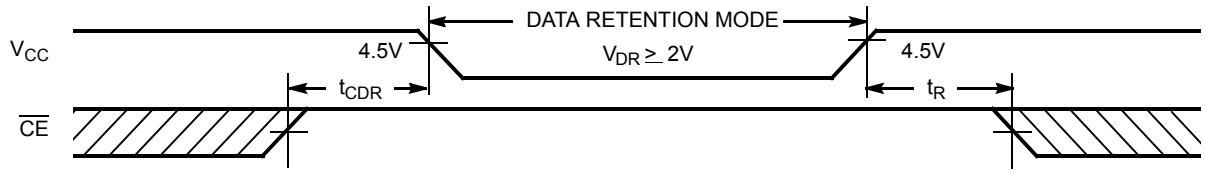
Notes:

5. Test conditions assume signal transition time of 3 ns or less for all speeds, 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.
6. 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.
7. At any given temperature and voltage condition, t_{HZCE} is less than t_{LZCE}, t_{HZOE} is less than t_{LZOE}, and t_{HZWE} is less than t_{LZWE} for any given device.
8. t_{HZOE}, t_{HZCE}, and t_{HZWE} are specified with C_L = 5 pF as in part (b) of "AC Test Loads and Waveforms [4]" on page 4. Transition is measured ±200 mV from steady-state voltage.
9. This parameter is guaranteed by design and is not tested.
10. 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 set-up and hold timing should be referenced to the rising edge of the signal that terminates the write.
11. The minimum write cycle time for Write Cycle No. 3 ($\overline{WE}$ controlled, $\overline{OE}$ LOW) is the sum of t_{HZWE} and t_{SD}.

Data Retention Characteristics (Over the Operating Range)

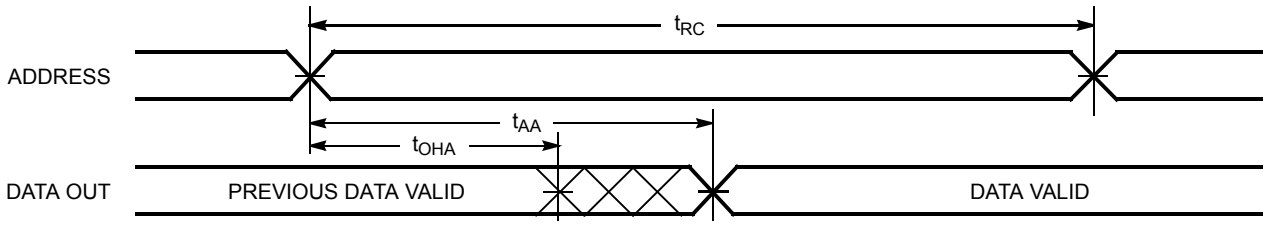
Parameter	Description	Conditions	Min	Max	Unit
V_{DR}	V_{CC} for Data Retention	$V_{CC} = V_{DR} = 2.0V$, $\overline{CE} \geq V_{CC} - 0.3V$, $V_{IN} \geq V_{CC} - 0.3V$ or $V_{IN} \leq 0.3V$	2.0		V
I_{CCDR}	Data Retention Current			3	mA
t_{CDR} [3]	Chip Deselect to Data Retention Time		0		ns
t_R [12]	Operation Recovery Time		t_{RC}		ns

Data Retention Waveform

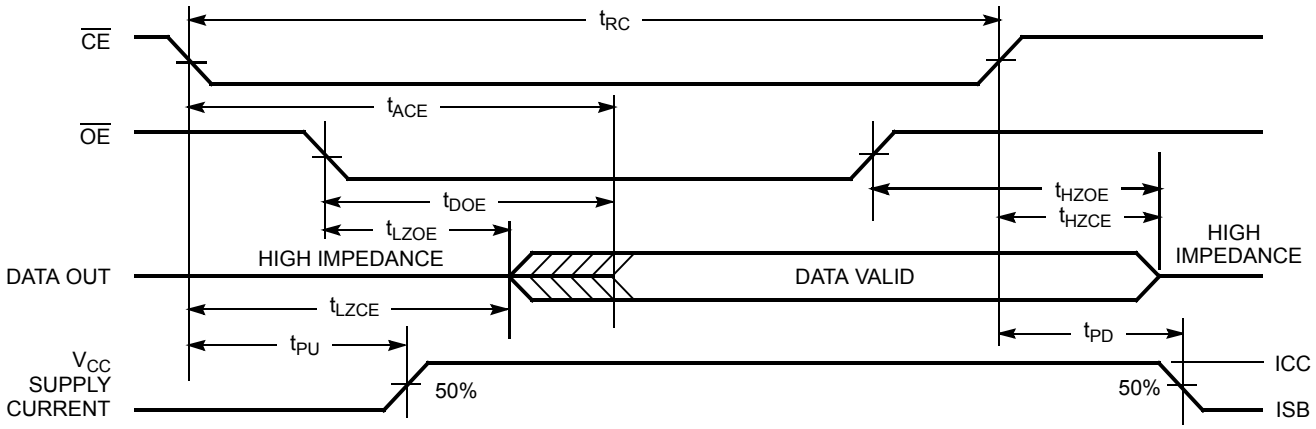


Switching Waveforms

Read Cycle No. 1 (Address Transition Controlled) [13, 14]



Read Cycle No. 2 ($\overline{OE}$ Controlled) [14, 15]

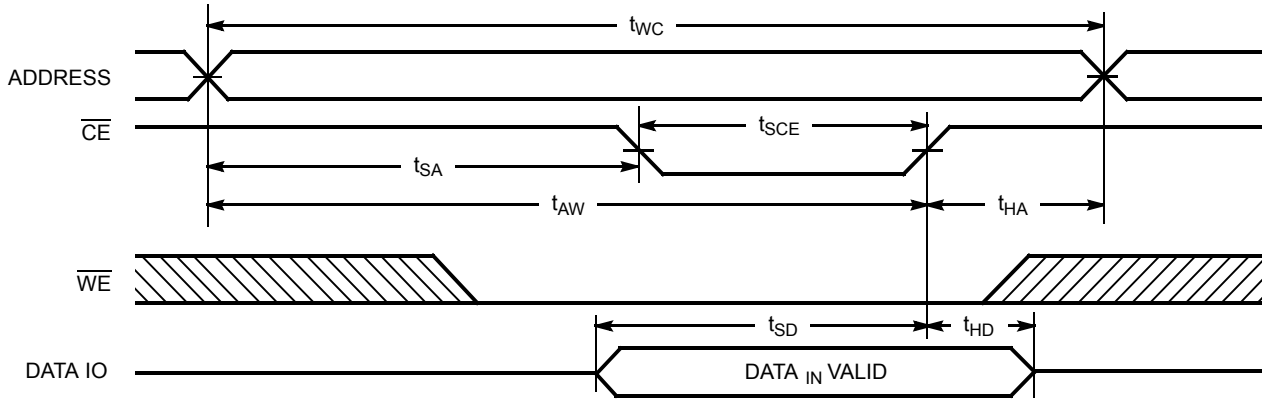


Notes:

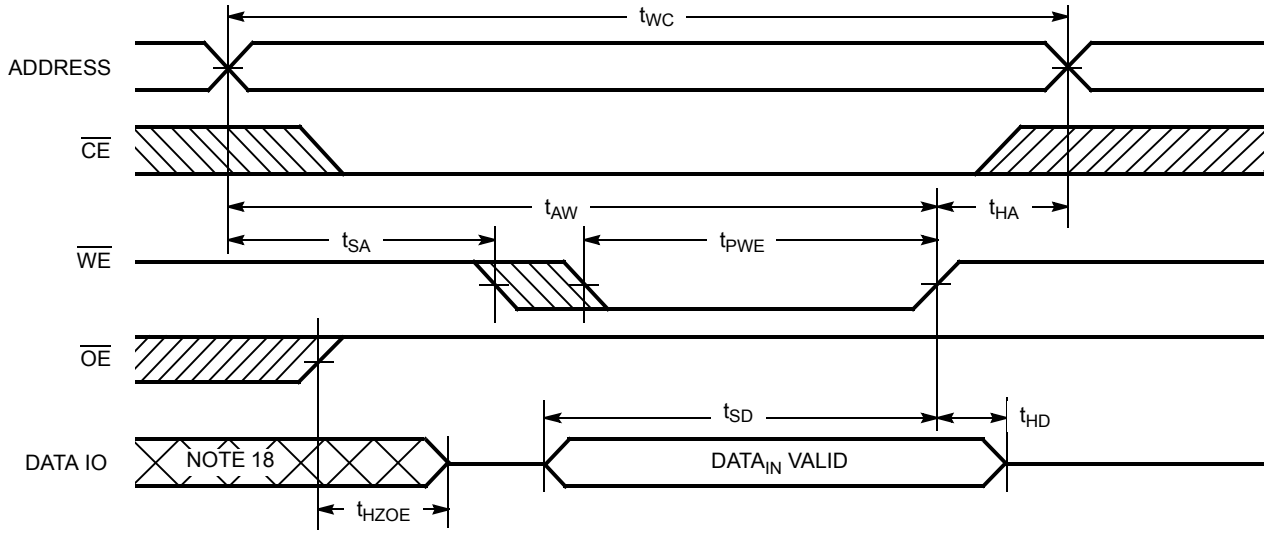
12. Full device operation requires linear V_{CC} ramp from V_{DR} to $V_{CC(min)} \geq 50\ \mu s$ or stable at $V_{CC(min)} \geq 50\ \mu s$.
13. Device is continuously selected. $\overline{OE}$, $\overline{CE} = V_{IL}$.
14. $\overline{WE}$ is HIGH for read cycle.
15. Address valid prior to or coincident with $\overline{CE}$ transition LOW.

Switching Waveforms (continued)

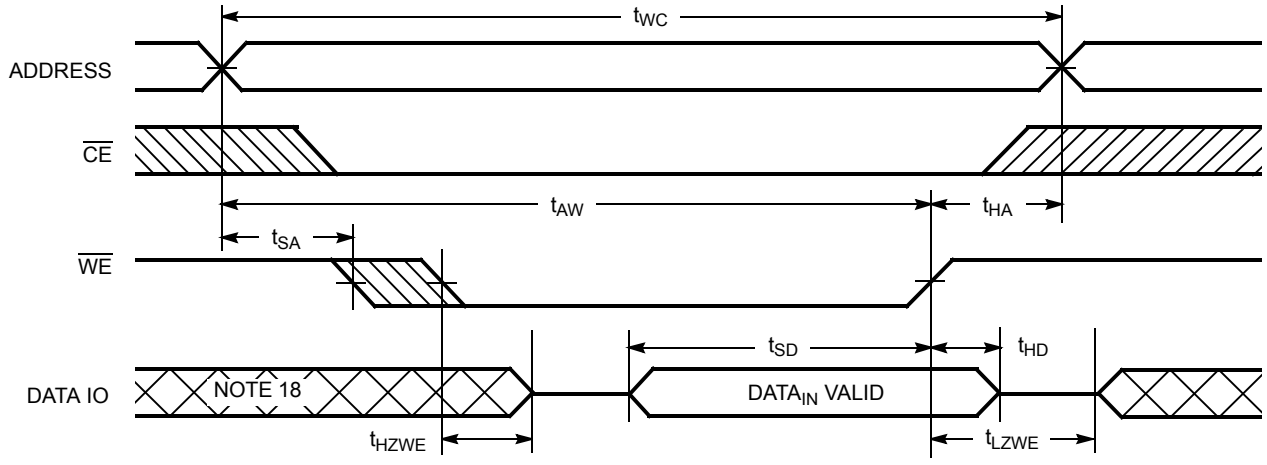
Write Cycle No. 1 ($\overline{CE}$ Controlled) [10, 16, 17]



Write Cycle No. 2 ($\overline{WE}$ Controlled) [10, 16, 17]



Write Cycle No. 3 ($\overline{WE}$ Controlled, $\overline{OE}$ LOW) [11, 17]



Notes:

16. Data IO is high impedance if $\overline{OE} = V_{IH}$.
17. If $\overline{CE}$ goes HIGH simultaneously with $\overline{WE}$ HIGH, the output remains in a high-impedance state.
18. During this period the IOs are in the output state and input signals should not be applied.

Truth Table

$\overline{CE}$	$\overline{WE}$	$\overline{OE}$	Inputs/Outputs	Mode	Power
H	X	X	High Z	Deselect/Power-down	Standby (I_{SB})
L	H	L	Data Out	Read	Active (I_{CC})
L	L	X	Data In	Write	Active (I_{CC})
L	H	H	High Z	Deselect, Output disabled	Active (I_{CC})

Ordering Information

Speed (ns)	Ordering Code	Package Diagram	Package Type	Operating Range
10	CY7C199D-10VXI	51-85031	28-pin (300-Mil) Molded SOJ (Pb-Free)	Industrial
	CY7C199D-10ZXI	51-85071	28-pin TSOP Type I (Pb-free)	

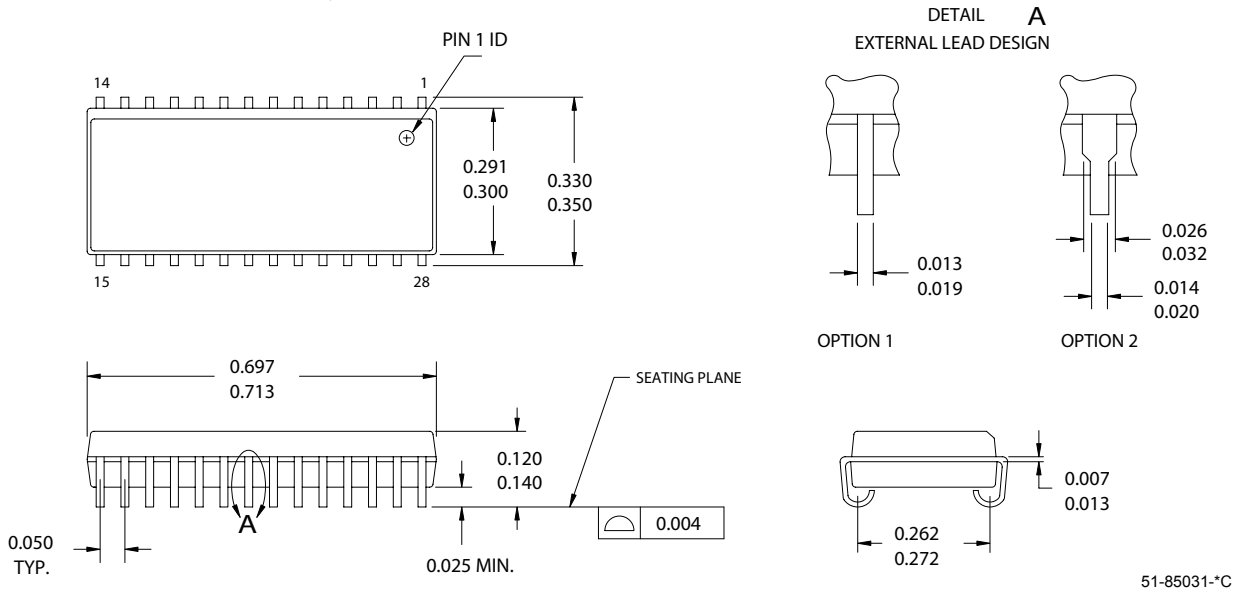
Please contact your local Cypress sales representative for availability of these parts.

Package Diagrams

Figure 1. 28-pin (300-Mil) Molded SOJ, 51-85031

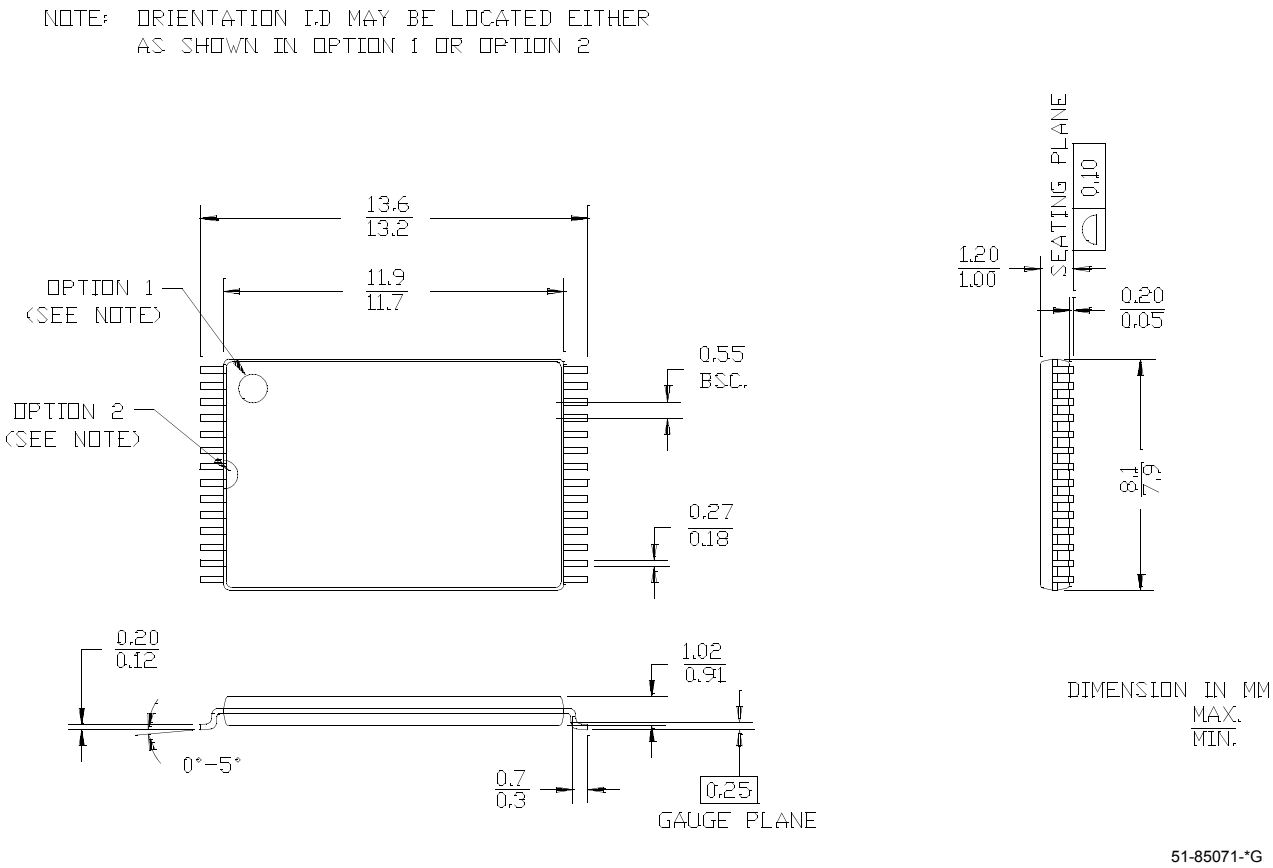
NOTE :

1. JEDEC STD REF MO088
2. BODY LENGTH DIMENSION DOES NOT INCLUDE MOLD PROTRUSION/END FLASH
   MOLD PROTRUSION/END FLASH SHALL NOT EXCEED 0.006 in (0.152 mm) PER SIDE
3. DIMENSIONS IN INCHES MIN.
   MAX.



Package Diagrams (continued)

Figure 2. 28-pin Thin Small Outline Package Type 1 (8x13.4 mm), 51-85071



Document History Page

Document Title: CY7C199D, 256K (32K x 8) Static RAM Document Number: 38-05471				
REV.	**ECN NO.**	**Issue Date**	**Orig. of Change**	**Description of Change**
**	201560	See ECN	SWI	Advance Information data sheet for C9 IPP
*A	233728	See ECN	RKF	DC parameters modified as per EROS (Spec # 01-02165) Pb-free Offering in Ordering Information
*B	262950	See ECN	RKF	Removed 28-LCC Pinout and Package Diagrams Added Data Retention Characteristics table Added T_{power} Spec in Switching Characteristics table Shaded Ordering Information
*C	307594	See ECN	RKF	Reduced Speed bins to -10, -12 and -15 ns
*D	820660	See ECN	VKN	Converted from Preliminary to Final Removed 12 ns and 15 ns speed bin Removed Commercial Operating range Removed “L” part Removed 28-pin PDIP and 28-pin SOIC package Changed Overshoot spec from V_{CC}+2V to V_{CC}+1V in footnote #2 Changed I_{CC} spec from 60 mA to 80 mA for 100 MHz speed bin Added I_{CC} specs for 83 MHz, 66 MHz and 40 MHz speed bins Updated Thermal Resistance table Updated Ordering Information Table