



CYPRESS  
SEMICONDUCTOR

CY7C198  
CY7C199

32,768 x 8 Static R/W RAM

## Features

- Automatic power-down when deselected
- CMOS for optimum speed/power
- High speed
  - 25 ns
- Low active power
  - 880 mW
- Low standby power
  - 220 mW
- TTL-compatible inputs and outputs
- Capable of withstanding greater than 2000V electrostatic discharge

## Functional Description

The CY7C198 and CY7C199 are high-performance CMOS static RAMs organized as 32,768 words by 8 bits. Easy memory expansion is provided by an active LOW chip enable (CE) and active LOW output enable (OE) and three-state drivers. Both devices have an automatic power-down feature, reducing the power consumption by 75% when deselected. The CY7C199 is in the space-saving 300-mil-wide DIP package and leadless chip carrier. The CY7C198 is in the standard 600-mil-wide package.

An active LOW write enable signal (WE) controls the writing/reading operation of the memory. When CE and WE inputs are

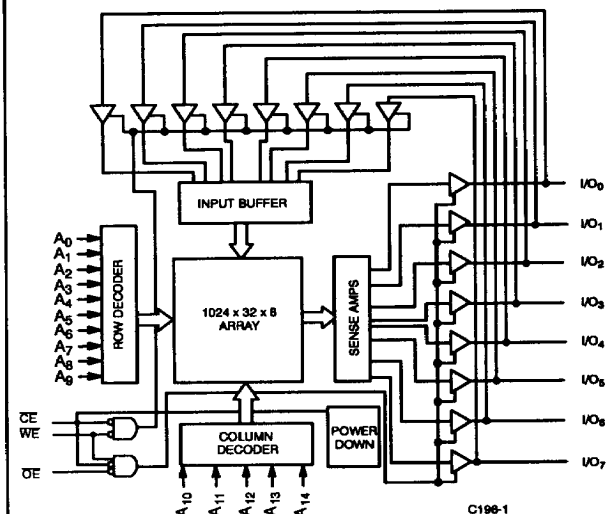
both LOW, data on the eight data input/output pins (I/O<sub>0</sub> through I/O<sub>7</sub>) is written into the memory location addressed by the address present on the address pins (A<sub>0</sub> through A<sub>14</sub>). Reading the device is accomplished by selecting the device and enabling the outputs, CE and OE active LOW, while WE remains inactive or HIGH. Under these conditions, the contents of the location addressed by the information on address pins is 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 (WE) is HIGH. A die coat is used to ensure alpha immunity.

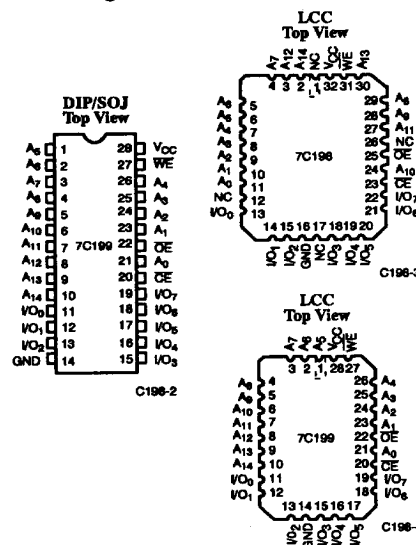
2

SRAMS

## Logic Block Diagram



## Pin Configurations



## Selection Guide

|                                |            | 7C198-12<br>7C199-12 | 7C198-15<br>7C199-15 | 7C198-20<br>7C199-20 | 7C198-25<br>7C199-25 | 7C198-35<br>7C199-35 | 7C198-45<br>7C199-45 | 7C198-55<br>7C199-55 |
|--------------------------------|------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| Maximum Access Time (ns)       |            | 12                   | 15                   | 20                   | 25                   | 35                   | 45                   | 55                   |
| Maximum Operating Current (mA) | Commercial | 160                  | 160                  | 160                  | 160                  | 150                  | 150                  | 150                  |
|                                | Military   |                      | 180                  | 180                  | 160                  | 160                  | 160                  | 160                  |
| Maximum Standby Current (mA)   |            | 40                   | 40                   | 40                   | 35                   | 35                   | 35                   | 35                   |

Shaded area contains advanced information.

### 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 (Pin 28 to Pin 14) | – 0.5V to +7.0V  |
| DC Voltage Applied to Outputs in High Z State         | – 0.5V to +7.0V  |
| DC Input Voltage                                      | – 3.0V to +7.0V  |
| 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 <sub>CC</sub> |
|-------------------------|---------------------|-----------------|
| Commercial              | 0°C to +70°C        | 5V ± 10%        |
| Military <sup>[1]</sup> | – 55°C to +125°C    | 5V ± 10%        |

### Electrical Characteristics Over the Operating Range<sup>[2]</sup>

| Parameters       | Description                                 | Test Conditions                                                                                                                                    | 7C198–12<br>7C199–12 |                 | 7C198–15<br>7C199–15 |                 | 7C198–20<br>7C199–20 |                 | Units |
|------------------|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------------|----------------------|-----------------|----------------------|-----------------|-------|
|                  |                                             |                                                                                                                                                    | Min.                 | Max.            | 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                  |                 | 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             |                      | 0.4             | V     |
| V <sub>IH</sub>  | Input HIGH Voltage                          |                                                                                                                                                    | 2.2                  | V <sub>CC</sub> | 2.2                  | V <sub>CC</sub> | 2.2                  | V <sub>CC</sub> | V     |
| V <sub>IL</sub>  | Input LOW Voltage                           |                                                                                                                                                    | –0.5                 | 0.8             | –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>                                                                                                             | –10                  | +10             | –10                  | +10             | –10                  | +10             | μA    |
| I <sub>OZ</sub>  | Output Leakage Current                      | GND ≤ V <sub>I</sub> ≤ V <sub>CC</sub> , Output Disabled                                                                                           | –10                  | +10             | –10                  | +10             | –10                  | +10             | μA    |
| I <sub>OS</sub>  | Output Short Circuit Current <sup>[3]</sup> | V <sub>CC</sub> = Max., V <sub>OUT</sub> = GND                                                                                                     |                      | –300            |                      | –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, f = f <sub>MAX</sub> = 1/t <sub>RC</sub>                                                          | Com'l                | 160             |                      | 160             |                      | 160             | mA    |
|                  |                                             |                                                                                                                                                    | Mil                  |                 |                      | 180             |                      | 180             |       |
| I <sub>SB1</sub> | Automatic CE Power-Down Current—TTL Inputs  | Max. V <sub>CC</sub> , $\overline{CE} \geq V_{IH}$ , V <sub>IN</sub> ≥ V <sub>IH</sub> or V <sub>IN</sub> ≤ V <sub>IL</sub> , f = f <sub>MAX</sub> |                      | 40              |                      | 40              |                      | 40              | mA    |
| I <sub>SB2</sub> | Automatic CE Power-Down Current—CMOS Inputs | Max. V <sub>CC</sub> , $\overline{CE} \geq V_{CC} - 0.3V$ , V <sub>IN</sub> ≥ V <sub>CC</sub> – 0.3V or V <sub>IN</sub> ≤ 0.3V, f = 0              |                      | 20              |                      | 20              |                      | 20              | mA    |

Shaded area contains advanced information.

#### Notes:

1. T<sub>A</sub> is the “instant on” case temperature.
2. See the last page of this specification for Group A subgroup testing information.
3. Not more than one output should be shorted at one time. Duration of the short circuit should not exceed 30 seconds.

**Electrical Characteristics** Over the Operating Range<sup>[2]</sup> (continued)

| Parameters       | Description                                 | Test Conditions                                                                                                                                       | 7C198–25<br>7C199–25 |                 | 7C198–35, 45, 55<br>7C199–35, 45, 55 |                 | Units |
|------------------|---------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------------|--------------------------------------|-----------------|-------|
|                  |                                             |                                                                                                                                                       | 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                          |                                                                                                                                                       | 2.2                  | V <sub>CC</sub> | 2.2                                  | V <sub>CC</sub> | V     |
| V <sub>IL</sub>  | Input LOW Voltage                           |                                                                                                                                                       | –3.0                 | 0.8             | –3.0                                 | 0.8             | V     |
| I <sub>IX</sub>  | Input Load Current                          | GND ≤ V <sub>I</sub> ≤ V <sub>CC</sub>                                                                                                                | –10                  | +10             | –10                                  | +10             | μA    |
| I <sub>OZ</sub>  | Output Leakage Current                      | GND ≤ V <sub>I</sub> ≤ V <sub>CC</sub> , Output Disabled                                                                                              | –10                  | +10             | –10                                  | +10             | 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,<br>f = f <sub>MAX</sub> = 1/t <sub>RC</sub>                                                          | Com <sup>1</sup>     | 160             |                                      | 150             | mA    |
|                  |                                             |                                                                                                                                                       | Mil                  | 160             |                                      | 160             |       |
| I <sub>SB1</sub> | Automatic CE Power-Down Current—TTL Inputs  | Max. V <sub>CC</sub> , $\overline{CE} \geq V_{IH}$ , V <sub>IN</sub> ≥ V <sub>IH</sub><br>or V <sub>IN</sub> ≤ V <sub>IL</sub> , f = f <sub>MAX</sub> |                      | 35              |                                      | 35              | mA    |
| I <sub>SB2</sub> | Automatic CE Power-Down Current—CMOS Inputs | Max. V <sub>CC</sub> , $\overline{CE} \geq V_{CC} - 0.3V$<br>V <sub>IN</sub> ≥ V <sub>CC</sub> – 0.3V or V <sub>IN</sub> ≤ 0.3V, f = 0                |                      | 20              |                                      | 20              | mA    |

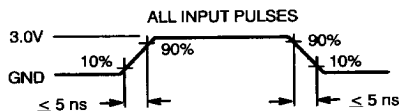
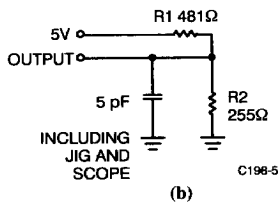
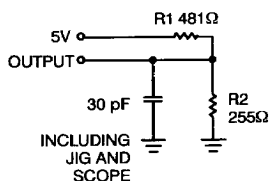
**Capacitance<sup>[4]</sup>**

| Parameters       | Description        | Test Conditions                                             | Max. | Units |
|------------------|--------------------|-------------------------------------------------------------|------|-------|
| C <sub>IN</sub>  | Input Capacitance  | T <sub>A</sub> = 25°C, f = 1 MHz,<br>V <sub>CC</sub> = 5.0V | 10   | pF    |
| C <sub>OUT</sub> | Output Capacitance |                                                             | 10   | pF    |

**Note:**

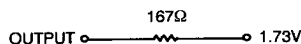
4. Tested initially and after any design or process changes that may affect these parameters.

**AC Test Loads and Waveforms**



C198-6

Equivalent to: THÉVENIN EQUIVALENT



**Switching Characteristics** Over the Operating Range<sup>[2, 5]</sup>

| Parameters                    | Description                         | 7C198–12<br>7C199–12 |      | 7C198–15<br>7C199–15 |      | 7C198–20<br>7C199–20 |      | Units |
|-------------------------------|-------------------------------------|----------------------|------|----------------------|------|----------------------|------|-------|
|                               |                                     | Min.                 | Max. | Min.                 | Max. | Min.                 | Max. |       |
| READ CYCLE                    |                                     |                      |      |                      |      |                      |      |       |
| t <sub>RC</sub>               | Read Cycle Time                     | 12                   |      | 15                   |      | 20                   |      | ns    |
| t <sub>AA</sub>               | Address to Data Valid               |                      | 12   |                      | 15   |                      | 20   | ns    |
| t <sub>OHA</sub>              | Data Hold from AddressChange        | 3                    |      | 3                    |      | 3                    |      | ns    |
| t <sub>ACE</sub>              | CE LOW to Data Valid                |                      | 12   |                      | 15   |                      | 20   | ns    |
| t <sub>DOE</sub>              | OE LOW to Data Valid                |                      | 6    |                      | 8    |                      | 10   | ns    |
| t <sub>LZOE</sub>             | OE LOW to Low Z <sup>[7]</sup>      | 0                    |      | 0                    |      | 0                    |      | ns    |
| t <sub>HZOE</sub>             | OE HIGH to High Z <sup>[6, 7]</sup> |                      | 7    |                      | 8    |                      | 10   | ns    |
| t <sub>LZCE</sub>             | CE LOW to Low Z <sup>[7]</sup>      | 3                    |      | 3                    |      | 3                    |      | ns    |
| t <sub>HZCE</sub>             | CE HIGH to High Z <sup>[6, 7]</sup> |                      | 7    |                      | 8    |                      | 10   | ns    |
| t <sub>PU</sub>               | CE LOW to Power-Up                  | 0                    |      | 0                    |      | 0                    |      | ns    |
| t <sub>PD</sub>               | CE HIGH to Power-Down               |                      | 12   |                      | 15   |                      | 20   | ns    |
| WRITE CYCLE <sup>[8, 9]</sup> |                                     |                      |      |                      |      |                      |      |       |
| t <sub>WC</sub>               | Write Cycle Time                    | 12                   |      | 15                   |      | 20                   |      | ns    |
| t <sub>SCE</sub>              | CE LOW to Write End                 | 9                    |      | 10                   |      | 15                   |      | ns    |
| t <sub>AW</sub>               | Address Set-Up to Write End         | 9                    |      | 10                   |      | 15                   |      | ns    |
| t <sub>HA</sub>               | Address Hold from Write End         | 0                    |      | 0                    |      | 0                    |      | ns    |
| t <sub>SA</sub>               | Address Set-Up to Write Start       | 0                    |      | 0                    |      | 0                    |      | ns    |
| t <sub>PWE</sub>              | WE Pulse Width                      | 9                    |      | 10                   |      | 15                   |      | ns    |
| t <sub>SD</sub>               | Data Set-Up to Write End            | 7                    |      | 8                    |      | 10                   |      | ns    |
| t <sub>HD</sub>               | Data Hold from Write End            | 0                    |      | 0                    |      | 0                    |      | ns    |
| t <sub>HZWE</sub>             | WE LOW to High Z <sup>[6]</sup>     |                      | 7    |                      | 7    |                      | 10   | ns    |
| t <sub>LZWE</sub>             | WE HIGH to Low Z <sup>[7]</sup>     | 3                    |      | 3                    |      | 3                    |      | ns    |

Shaded area contains advanced information.

**Notes:**

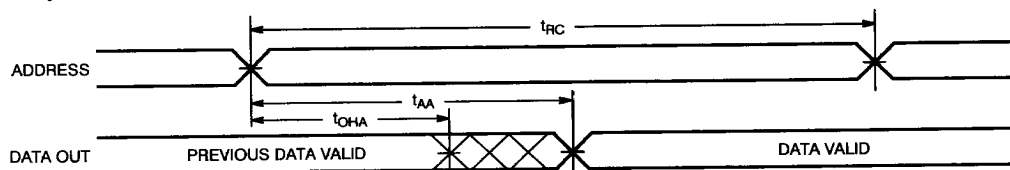
- Test conditions assume signal transition time of 5 ns or less, timing reference levels of 1.5V, input pulse levels of 0 to 3.0V, and output loading of the specified I<sub>OL</sub>/I<sub>OH</sub> and 30-pF load capacitance.
- t<sub>HZOE</sub>, t<sub>HZCE</sub>, and t<sub>HZWE</sub> are specified with C<sub>L</sub> = 5 pF as in part (b) of AC Test Loads. Transition is measured  $\pm 500$  mV from steady state voltage.
- At any given temperature and voltage condition, t<sub>HZCE</sub> is less than t<sub>LZCE</sub>, t<sub>HZOE</sub> is less than t<sub>LZOE</sub>, and t<sub>HZWE</sub> is less than t<sub>LZWE</sub> for any given device.
- 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.
- The minimum write cycle time for write cycle #3 ( $\overline{WE}$  controlled,  $\overline{OE}$  LOW) is the sum of t<sub>HZWE</sub> and t<sub>SD</sub>.

Switching Characteristics Over the Operating Range<sup>2, 5)</sup> (continued)

| Switching Characteristics Over the Operating Range (Continued) |                                                  |                      |      |                      |      |                      |      |                      |      |       |  |
|----------------------------------------------------------------|--------------------------------------------------|----------------------|------|----------------------|------|----------------------|------|----------------------|------|-------|--|
| Parameters                                                     | Description                                      | 7C198-25<br>7C199-25 |      | 7C198-35<br>7C199-35 |      | 7C198-45<br>7C199-45 |      | 7C198-55<br>7C199-55 |      | Units |  |
|                                                                |                                                  | Min.                 | Max. | Min.                 | Max. | Min.                 | Max. | Min.                 | Max. |       |  |
| READ CYCLE                                                     |                                                  |                      |      |                      |      |                      |      |                      |      |       |  |
| t <sub>RC</sub>                                                | Read Cycle Time                                  | 25                   |      | 35                   |      | 45                   |      | 55                   |      | ns    |  |
| t <sub>AA</sub>                                                | Address to Data Valid                            |                      | 25   |                      | 35   |                      | 45   |                      | 55   | ns    |  |
| t <sub>OHA</sub>                                               | Data Hold from Address Change                    | 3                    |      | 3                    |      | 3                    |      | 3                    |      | ns    |  |
| t <sub>ACE</sub>                                               | $\overline{CE}$ LOW to Data Valid                |                      | 25   |                      | 35   |                      | 45   |                      | 55   | ns    |  |
| t <sub>DOE</sub>                                               | $\overline{OE}$ LOW to Data Valid                |                      | 15   |                      | 20   |                      | 20   |                      | 20   | ns    |  |
| t <sub>LZOE</sub>                                              | $\overline{OE}$ LOW to Low Z <sup>[7]</sup>      | 3                    |      | 3                    |      | 3                    |      | 3                    |      | ns    |  |
| t <sub>HZOE</sub>                                              | $\overline{OE}$ HIGH to High Z <sup>[6, 7]</sup> |                      | 13   |                      | 15   |                      | 20   |                      | 25   | ns    |  |
| t <sub>LZCE</sub>                                              | $\overline{CE}$ LOW to Low Z <sup>[7]</sup>      | 3                    |      | 3                    |      | 3                    |      | 3                    |      | ns    |  |
| t <sub>HZCE</sub>                                              | $\overline{CE}$ HIGH to High Z <sup>[6, 7]</sup> |                      | 13   |                      | 15   |                      | 20   |                      | 25   | ns    |  |
| t <sub>PU</sub>                                                | $\overline{CE}$ LOW to Power-Up                  | 0                    |      | 0                    |      | 0                    |      | 0                    |      | ns    |  |
| t <sub>PD</sub>                                                | $\overline{CE}$ HIGH to Power-Down               |                      | 20   |                      | 20   |                      | 25   |                      | 25   | ns    |  |
| WRITE CYCLE <sup>[8, 9]</sup>                                  |                                                  |                      |      |                      |      |                      |      |                      |      |       |  |
| t <sub>WC</sub>                                                | Write Cycle Time                                 | 25                   |      | 35                   |      | 45                   |      | 50                   |      | ns    |  |
| t <sub>SCE</sub>                                               | $\overline{CE}$ LOW to Write End                 | 20                   |      | 30                   |      | 40                   |      | 50                   |      | ns    |  |
| t <sub>AW</sub>                                                | Address Set-Up to Write End                      | 20                   |      | 30                   |      | 40                   |      | 50                   |      | ns    |  |
| t <sub>HA</sub>                                                | Address Hold from Write End                      | 0                    |      | 0                    |      | 0                    |      | 0                    |      | ns    |  |
| t <sub>SA</sub>                                                | Address Set-Up to Write Start                    | 0                    |      | 0                    |      | 0                    |      | 0                    |      | ns    |  |
| t <sub>PWE</sub>                                               | $\overline{WE}$ Pulse Width                      | 20                   |      | 25                   |      | 30                   |      | 40                   |      | ns    |  |
| t <sub>SD</sub>                                                | Data Set-Up to Write End                         | 15                   |      | 17                   |      | 20                   |      | 25                   |      | ns    |  |
| t <sub>HD</sub>                                                | Data Hold from Write End                         | 0                    |      | 0                    |      | 0                    |      | 0                    |      | ns    |  |
| t <sub>HZWE</sub>                                              | $\overline{WE}$ LOW to High Z <sup>[6]</sup>     |                      | 13   |                      | 15   |                      | 20   |                      | 25   | ns    |  |
| t <sub>LZWE</sub>                                              | $\overline{WE}$ HIGH to Low Z <sup>[7]</sup>     | 3                    |      | 3                    |      | 3                    |      | 3                    |      | ns    |  |

## Switching Waveforms

Read Cycle No. 1<sup>[10, 11]</sup>



C198-7

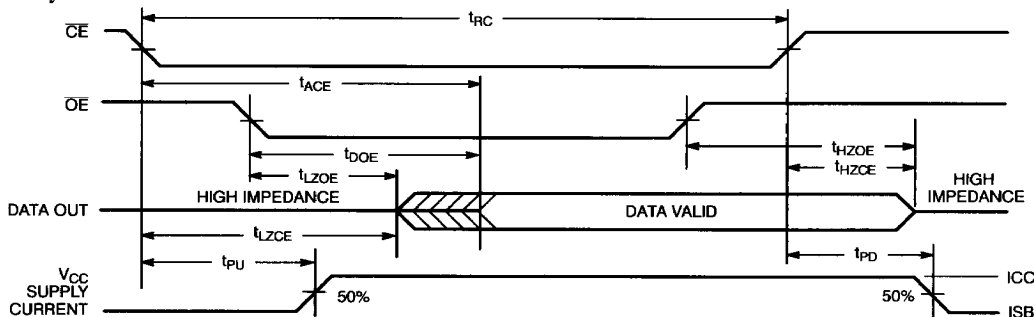
**Notes:**

10. Device is continuously selected.  $\overline{OE}$ ,  $\overline{CE}$  =  $V_{IL}$ .

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

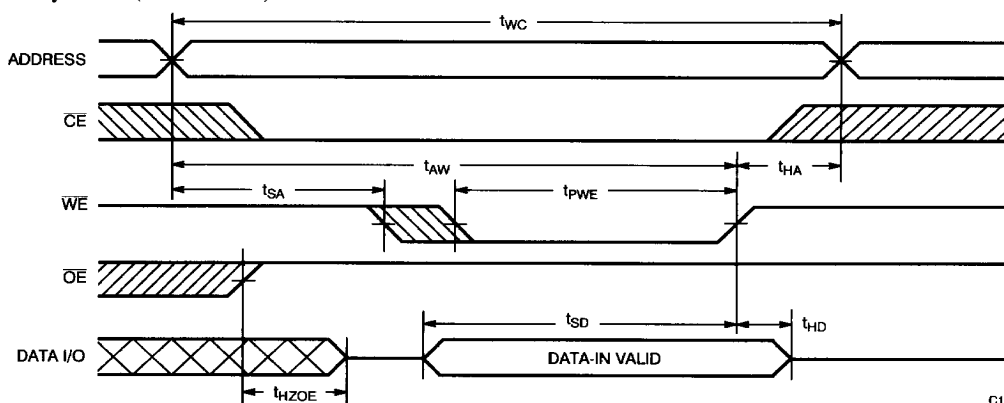
## Switching Waveforms (continued)

### Read Cycle No. 2<sup>[11, 12]</sup>



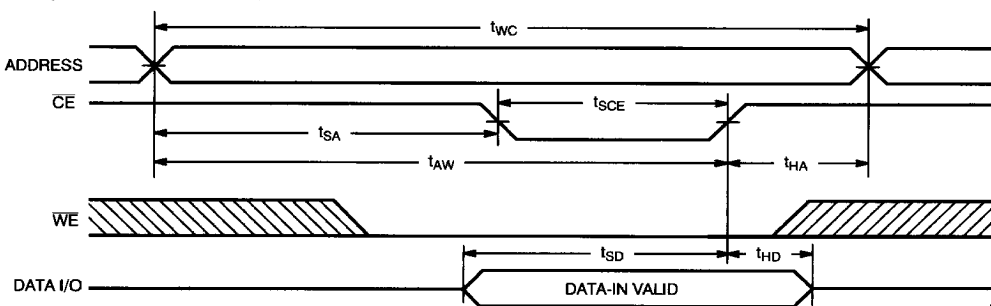
C198-8

### Write Cycle No. 1 ( $\overline{WE}$ Controlled)<sup>[8, 13, 14]</sup>



C198-9

### Write Cycle No. 2 ( $\overline{CE}$ Controlled)<sup>[8, 13, 14]</sup>



C198-10

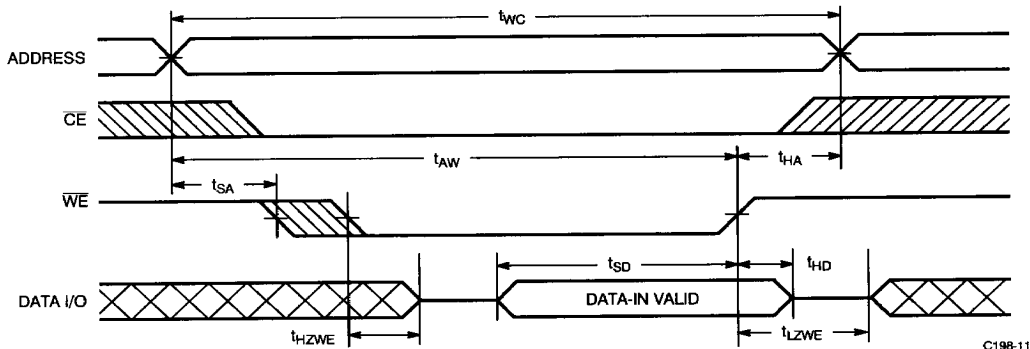
#### Notes:

12. Address valid prior to or coincident with  $\overline{CE}$  transition LOW.  
13. Data I/O is high impedance if  $\overline{OE} = V_{IH}$ .

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

## Switching Waveforms (continued)

Write Cycle No. 3 ( $\overline{WE}$  Controlled,  $\overline{OE}$  LOW) [9, 14]

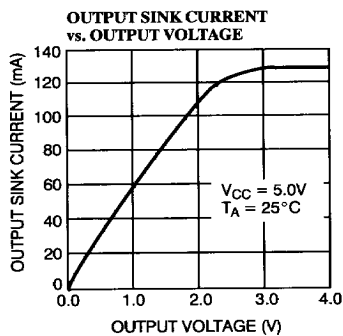
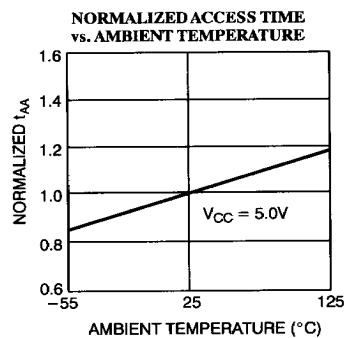
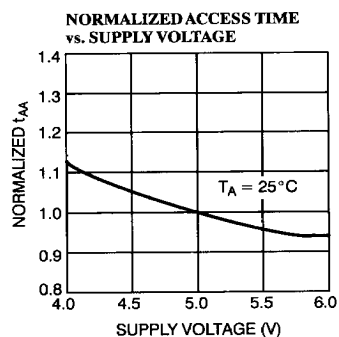
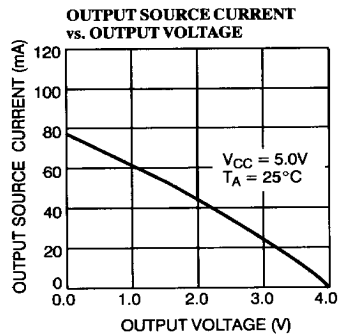
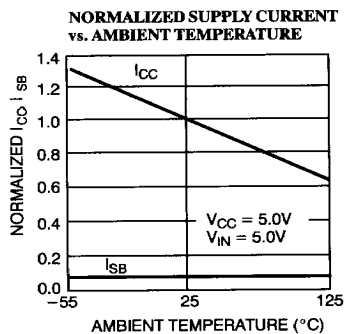
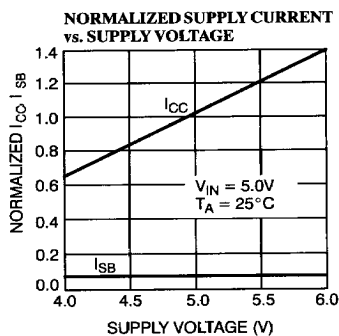


C198-11

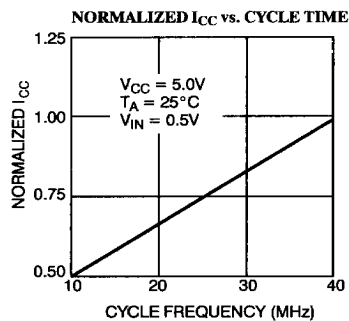
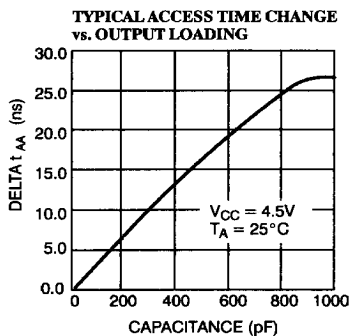
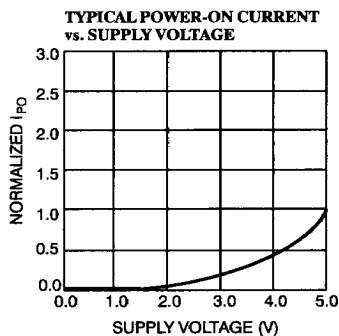
2

SRAMs

## Typical DC and AC Characteristics



**Typical DC and AC Characteristics (continued)**



**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 Type | Operating Range |
|------------|---------------|--------------|-----------------|
| 12         | CY7C198-12DC  | D16          | Commercial      |
|            | CY7C198-12LC  | L55          |                 |
|            | CY7C198-12PC  | P15          |                 |
| 15         | CY7C198-15DC  | D16          | Commercial      |
|            | CY7C198-15LC  | L55          |                 |
|            | CY7C198-15PC  | P15          |                 |
|            | CY7C198-15DMB | D16          | Military        |
|            | CY7C198-15LMB | L55          |                 |
| 20         | CY7C198-20DC  | D16          | Commercial      |
|            | CY7C198-20LC  | L55          |                 |
|            | CY7C198-20PC  | P15          |                 |
|            | CY7C198-20DMB | D16          | Military        |
|            | CY7C198-20LMB | L55          |                 |
| 25         | CY7C198-25DC  | D16          | Commercial      |
|            | CY7C198-25LC  | L55          |                 |
|            | CY7C198-25PC  | P15          |                 |
| 35         | CY7C198-35DC  | D16          | Commercial      |
|            | CY7C198-35LC  | L55          |                 |
|            | CY7C198-35PC  | P15          |                 |
|            | CY7C198-35DMB | D16          | Military        |
|            | CY7C198-35LMB | L55          |                 |
| 45         | CY7C198-45DC  | D16          | Commercial      |
|            | CY7C198-45LC  | L55          |                 |
|            | CY7C198-45PC  | P15          |                 |
|            | CY7C198-45DMB | D16          | Military        |
|            | CY7C198-45LMB | L55          |                 |
| 55         | CY7C198-55DC  | D16          | Commercial      |
|            | CY7C198-55LC  | L55          |                 |
|            | CY7C198-55PC  | P15          |                 |
|            | CY7C198-55DMB | D16          | Military        |
|            | CY7C198-55LMB | L55          |                 |

Shaded area contains advanced information.

| Speed (ns) | Ordering Code | Package Type | Operating Range |
|------------|---------------|--------------|-----------------|
| 12         | CY7C199-12DC  | D22          | Commercial      |
|            | CY7C199-12LC  | L54          |                 |
|            | CY7C199-12PC  | P21          |                 |
|            | CY7C199-12VC  | V21          |                 |
| 15         | CY7C199-15DC  | D22          | Commercial      |
|            | CY7C199-15LC  | L54          |                 |
|            | CY7C199-15PC  | P21          |                 |
|            | CY7C199-15VC  | V21          | Military        |
|            | CY7C199-15DMB | D22          |                 |
|            | CY7C199-15KMB | K74          |                 |
| 20         | CY7C199-20DC  | D22          | Commercial      |
|            | CY7C199-20LC  | L54          |                 |
|            | CY7C199-20PC  | P21          |                 |
|            | CY7C199-20VC  | V21          | Military        |
|            | CY7C199-20DMB | D22          |                 |
|            | CY7C199-20KMB | K74          |                 |
| 25         | CY7C199-25DC  | D22          | Commercial      |
|            | CY7C199-25LC  | L54          |                 |
|            | CY7C199-25PC  | P21          |                 |
|            | CY7C199-25VC  | V21          |                 |
| 25         | CY7C199-25DMB | D22          | Military        |
|            | CY7C199-25KMB | K74          |                 |
|            | CY7C199-25L54 | L54          |                 |
|            | CY7C199-25L54 | L54          |                 |
| 35         | CY7C199-35DC  | D22          | Commercial      |
|            | CY7C199-35LC  | L54          |                 |
|            | CY7C199-35PC  | P21          |                 |
|            | CY7C199-35VC  | V21          | Military        |
|            | CY7C199-35DMB | D22          |                 |
|            | CY7C199-35KMB | K74          |                 |
| 45         | CY7C199-35LMB | L54          | Commercial      |
|            | CY7C199-45DC  | D22          |                 |
|            | CY7C199-45LC  | L54          |                 |
|            | CY7C199-45PC  | P21          | Military        |
|            | CY7C199-45VC  | V21          |                 |
|            | CY7C199-45DMB | D22          |                 |
| 55         | CY7C199-45KMB | K74          | Commercial      |
|            | CY7C199-45LMB | L54          |                 |
|            | CY7C199-55DC  | D22          |                 |
|            | CY7C199-55LC  | L54          | Military        |
|            | CY7C199-55PC  | P21          |                 |
|            | CY7C199-55VC  | V21          |                 |
| 55         | CY7C199-55DMB | D22          | Military        |
|            | CY7C199-55KMB | K74          |                 |
|            | CY7C199-55LMB | L54          |                 |
|            | CY7C199-55LMB | L54          |                 |

Shaded area contains advanced information.

## MILITARY SPECIFICATIONS

### Group A Subgroup Testing

#### DC Characteristics

| Parameters           | Subgroups |
|----------------------|-----------|
| V <sub>OH</sub>      | 1, 2, 3   |
| V <sub>OL</sub>      | 1, 2, 3   |
| V <sub>IH</sub>      | 1, 2, 3   |
| V <sub>IL</sub> Max. | 1, 2, 3   |
| I <sub>IX</sub>      | 1, 2, 3   |
| I <sub>OZ</sub>      | 1, 2, 3   |
| I <sub>CC</sub>      | 1, 2, 3   |
| I <sub>SB1</sub>     | 1, 2, 3   |
| I <sub>SB2</sub>     | 1, 2, 3   |

#### Switching Characteristics

| Parameters         | Subgroups       |
|--------------------|-----------------|
| <b>READ CYCLE</b>  |                 |
| t <sub>RC</sub>    | 7, 8, 9, 10, 11 |
| t <sub>AA</sub>    | 7, 8, 9, 10, 11 |
| t <sub>OHA</sub>   | 7, 8, 9, 10, 11 |
| t <sub>ACE</sub>   | 7, 8, 9, 10, 11 |
| t <sub>DOE</sub>   | 7, 8, 9, 10, 11 |
| <b>WRITE CYCLE</b> |                 |
| t <sub>WC</sub>    | 7, 8, 9, 10, 11 |
| t <sub>SCE</sub>   | 7, 8, 9, 10, 11 |
| t <sub>AW</sub>    | 7, 8, 9, 10, 11 |
| t <sub>HA</sub>    | 7, 8, 9, 10, 11 |
| t <sub>SA</sub>    | 7, 8, 9, 10, 11 |
| t <sub>PWE</sub>   | 7, 8, 9, 10, 11 |
| t <sub>SD</sub>    | 7, 8, 9, 10, 11 |
| t <sub>HD</sub>    | 7, 8, 9, 10, 11 |

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