

March 1997

### Features

- **Fast Access Time** . . . . . **70/85ns Max**
- **Low Standby Current** . . . . . **50 $\mu$ A Max**
- **Low Operating Current** . . . . . **50mA Max**
- **Data Retention at 2.0V** . . . . . **20 $\mu$ A Max**
- **TTL Compatible Inputs and Outputs**
- **JEDEC Approved Pinout**
- **No Clocks or Strobes Required**
- **Temperature Range** . . . . . **+55°C to +125°C**
- **Equal Cycle and Access Time**
- **Single 5V Supply**
- **Gated Inputs-No Pull-Up or Pull-Down Resistors Required**

### Description

The HM-65262 is a CMOS 16384 x 1-bit Static Random Access Memory manufactured using the Intersil Advanced SAJI V process. The device utilizes asynchronous circuit design for fast cycle times and ease of use. The HM-65262 is available in both JEDEC standard 20 pin, 0.300 inch wide Cerdip and 20 pad CLCC packages, providing high board-level packing density. Gated inputs lower standby current, and also eliminate the need for pull-up or pull-down resistors.

The HM-65262, a full CMOS RAM, utilizes an array of six transistor (6T) memory cells for the most stable and lowest possible standby supply current over the full military temperature range. In addition to this, the high stability of the 6T RAM cell provides excellent protection against soft errors due to noise and alpha particles. This stability also improves the radiation tolerance of the RAM over that of four transistor (4T) devices.

### Ordering Information

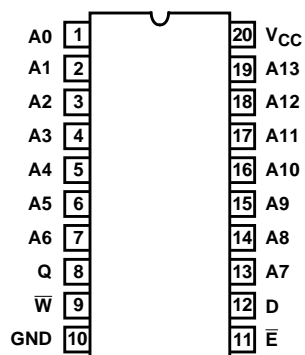
| PACKAGE     | TEMP. RANGE     | 70ns/20 $\mu$ A (NOTE 1) | 85ns/20 $\mu$ A (NOTE 1) | (NOTE 1)<br>85ns/400 $\mu$ A | PKG. NO. |
|-------------|-----------------|--------------------------|--------------------------|------------------------------|----------|
| CERDIP      | -40°C to +85°C  | HM1-65262B-9             | HM1-65262-9              | -                            | F20.3    |
| JAN #       | -55°C to +125°C | 29109BRA                 | 29103BRA                 | -                            | F20.3    |
| SMD#        | -55°C to +125°C | 8413203RA                | 8413201RA                | -                            | F20.3    |
| CLCC (SMD#) | -55°C to +125°C | 8413203YA                | 8413201YA                | -                            | J20.C    |

NOTE:

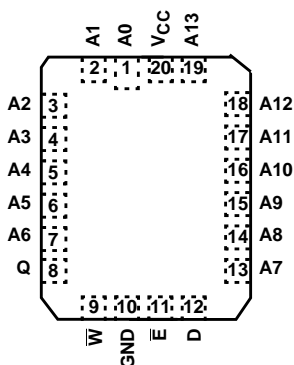
1. Access Time/Data Retention Supply Current.

### Pinouts

**HM-65262 (CERDIP)**  
TOP VIEW

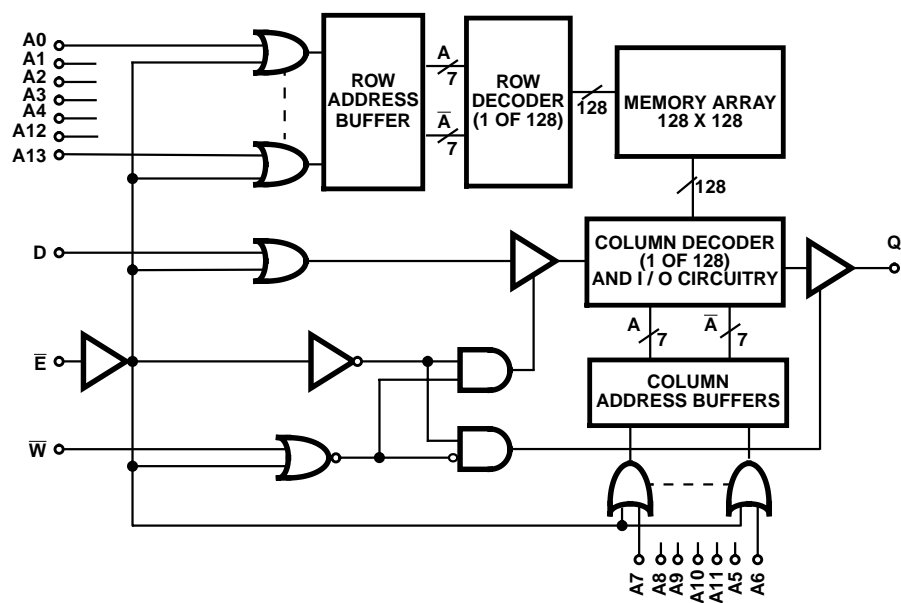


**HM-65262 (CLCC)**  
TOP VIEW



| A0 - A13             | Address Input          |
|----------------------|------------------------|
| $\bar{E}$            | Chip Enable/Power Down |
| Q                    | Data Out               |
| D                    | Data In                |
| V <sub>SS</sub> /GND | Ground                 |
| V <sub>CC</sub>      | Power (+5)             |
| $\bar{W}$            | Write Enable           |

### Functional Diagram



# HM-65262

## Absolute Maximum Ratings

Supply Voltage ..... +7.0V  
 Input or Output Voltage Applied for all grades ..... -0.3V to  $V_{CC} + 0.3V$   
 Typical Derating Factor ..... 5mA/MHz Increase in ICCOP  
 ESD Classification ..... Class 1

## Thermal Information

Thermal Resistance (Typical)  
 Cerdip Package .....  $\theta_{JA}$  66°C/W  $\theta_{JC}$  13°C/W  
 CLCC Package ..... 75°C/W 18°C/W  
 Maximum Storage Temperature Range ..... -65°C to +150°C  
 Maximum Junction Temperature ..... +175°C  
 Maximum Lead Temperature (Soldering 10s) ..... +300°C

## Die Characteristics

Gate Count ..... 26256 Gates

**CAUTION:** Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

## Operating Conditions

Operating Voltage Range ..... +4.5V to +5.5V      Operating Temperature Range  
 HM-65262B-9, HM-65262-9, HM-65262C-9 ..... -40°C to +85°C

## DC Electrical Specifications $V_{CC} = 5V \pm 10\%$ ; $T_A = -40^\circ C$ to $+85^\circ C$ (HM-65262B-9, HM-65262-9, HM-65262C-9)

| SYMBOL | PARAMETER                         | LIMITS         |                | UNITS   | TEST CONDITIONS                                                                |
|--------|-----------------------------------|----------------|----------------|---------|--------------------------------------------------------------------------------|
|        |                                   | MIN            | MAX            |         |                                                                                |
| ICCSB1 | Standby Supply Current            | -od            | 50             | $\mu A$ | HM-65262B-9, HM-65262-9, IO = 0mA, $\bar{E} = V_{CC} - 0.3V$ , $V_{CC} = 5.5V$ |
|        |                                   | -              | 900            | $\mu A$ | HM-65262C-9, IO = 0mA, $\bar{E} = V_{CC} - 0.3V$ , $V_{CC} = 5.5V$             |
| ICCSB  | Standby Supply Current            | -              | 5              | mA      | $\bar{E} = 2.2V$ , IO = 0mA, $V_{CC} = 5.5V$                                   |
| ICCEN  | Enabled Supply Current            | -              | 50             | mA      | $\bar{E} = 0.8V$ , IO = 0mA, $V_{CC} = 5.5V$                                   |
| ICCOP  | Operating Supply Current (Note 1) | -              | 50             | mA      | $\bar{E} = 0.8V$ , IO = 0mA, f = 1MHz, $V_{CC} = 5.5V$                         |
| ICCDR  | Data Retention Supply Current     | -              | 20             | $\mu A$ | HM-65262B-9, HM-65262-9, $V_{CC} = 2.0V$ , $\bar{E} = V_{CC}$                  |
|        |                                   | -              | 400            | $\mu A$ | HM-65262C-9, $V_{CC} = 2.0V$ , $\bar{E} = V_{CC}$                              |
| ICCDR1 | Data Retention Supply Current     | -              | 30             | $\mu A$ | HM-65262B-9, HM-65262-9, $V_{CC} = 3.0V$ , $\bar{E} = V_{CC}$                  |
|        |                                   | -              | 550            | $\mu A$ | HM-65262C-9, $V_{CC} = 3.0V$ , $\bar{E} = V_{CC}$                              |
| VCCDR  | Data Retention Supply Voltage     | 2.0            | -              | V       |                                                                                |
| II     | Input Leakage Current             | -1.0           | +1.0           | $\mu A$ | VI = $V_{CC}$ or GND, $V_{CC} = 5.5V$                                          |
| IOZ    | Output Leakage Current            | -1.0           | +1.0           | $\mu A$ | VIO = $V_{CC}$ or GND, $V_{CC} = 5.5V$                                         |
| VIL    | Input Low Voltage                 | -0.3           | 0.8            | V       | $V_{CC} = 4.5V$                                                                |
| VIH    | Input High Voltage                | 2.2            | $V_{CC} + 0.3$ | V       | $V_{CC} = 5.5V$                                                                |
| VOL    | Output Low Voltage                | -              | 0.4            | V       | IO = 8.0mA, $V_{CC} = 4.5V$                                                    |
| VOH1   | Output High Voltage               | 2.4            | -              | V       | IO = -4.0mA, $V_{CC} = 4.5V$                                                   |
| VOH2   | Output High Voltage (Note 2)      | $V_{CC} - 0.4$ | -              | V       | IO = -100 $\mu A$ , $V_{CC} = 4.5V$                                            |

## Capacitance $T_A = +25^\circ C$

| SYMBOL | PARAMETER                         | MAX | UNITS | TEST CONDITIONS                                         |
|--------|-----------------------------------|-----|-------|---------------------------------------------------------|
| CI     | Input Capacitance (Note 2)        | 10  | pF    | f = 1MHz, All measurements are referenced to device GND |
| CIO    | Input/Output Capacitance (Note 2) | 12  | pF    |                                                         |

### NOTES:

1. Typical derating 5mA/MHz increase in ICCOP.
2. Tested at initial design and after major design changes.

## HM-65262

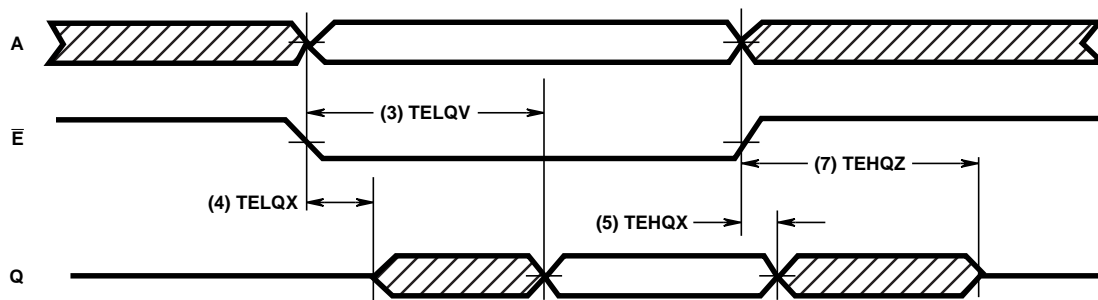
### AC Electrical Specifications $V_{CC} = 5V$ 10%, $T_A = -40^{\circ}C$ to $+85^{\circ}C$ (HM-65262B-9, HM-65262-9, HM-65262C-9)

| SYMBOL      | PARAMETER                        | LIMITS      |     |            |     |             |     | UNITS | TEST<br>CONDITIONS |
|-------------|----------------------------------|-------------|-----|------------|-----|-------------|-----|-------|--------------------|
|             |                                  | HM-65262B-9 |     | HM-65262-9 |     | HM-65262C-9 |     |       |                    |
|             |                                  | MIN         | MAX | MIN        | MAX | MIN         | MAX |       |                    |
| READ CYCLE  |                                  |             |     |            |     |             |     |       |                    |
| (1) TAVAX   | Read/Cycle Time                  | 70          | -   | 85         | -   | 85          | -   | ns    | (Notes 1, 3)       |
| (2) TAVQV   | Address Access Time              | -           | 70  | -          | 85  | -           | 85  | ns    | (Notes 1, 3)       |
| (3) TELQV   | Chip Enable Access Time          | -           | 70  | -          | 85  | -           | 85  | ns    | (Notes 1, 3)       |
| (4) TELQX   | Chip Enable Output Enable Time   | 5           | -   | 5          | -   | 5           | -   | ns    | (Notes 2, 3)       |
| (5) TEHQX   | Chip Disable Output Hold Time    | 5           | -   | 5          | -   | 5           | -   | ns    | (Notes 2, 3)       |
| (6) TAXQX   | Address Invalid Output Hold Time | 5           | -   | 5          | -   | 5           | -   | ns    | (Notes 2, 3)       |
| (7) TEHQZ   | Chip Enable Output Disable Time  | -           | 30  | -          | 30  | -           | 30  | ns    | (Notes 2, 3)       |
| WRITE CYCLE |                                  |             |     |            |     |             |     |       |                    |
| (8) TAVAX   | Write Cycle Time                 | 70          | -   | 85         | -   | 85          | -   | ns    | (Notes 1, 3)       |
| (9) TELWH   | Chip Selection to End of Write   | 55          | -   | 65         | -   | 65          | -   | ns    | (Notes 1, 3)       |
| (10) TWLWH  | Write Enable Pulse Width         | 40          | -   | 45         | -   | 45          | -   | ns    | (Notes 1, 3)       |
| (11) TAVWL  | Address Setup Time               | 0           | -   | 0          | -   | 0           | -   | ns    | (Notes 1, 3)       |
| (12) TWHAX  | Address Hold Time                | 0           | -   | 0          | -   | 0           | -   | ns    | (Notes 1, 3)       |
| (13) TDVWH  | Data Setup Time                  | 30          | -   | 35         | -   | 35          | -   | ns    | (Notes 1, 3)       |
| (14) TWHDX  | Data Hold Time                   | 0           | -   | 0          | -   | 0           | -   | ns    | (Notes 1, 3)       |
| (15) TWLQZ  | Write Enable Output Disable Time | -           | 30  | -          | 30  | -           | 30  | ns    | (Notes 2, 3)       |
| (16) TWHQX  | Write Disable Output Enable Time | 0           | -   | 0          | -   | 0           | -   | ns    | (Notes 2, 3)       |
| (17) TAVWH  | Address Valid to End of Write    | 55          | -   | 65         | -   | 65          | -   | ns    | (Notes 1, 3)       |
| (18) TAVEL  | Address Setup Time               | 0           | -   | 0          | -   | 0           | -   | ns    | (Notes 1, 3)       |
| (19) TEHAX  | Address Hold Time                | 0           | -   | 0          | -   | 0           | -   | ns    | (Notes 1, 3)       |
| (20) TAVEH  | Address Valid to End of Write    | 55          | -   | 65         | -   | 65          | -   | ns    | (Notes 1, 3)       |
| (21) TELEH  | Enable Pulse Width               | 55          | -   | 65         | -   | 65          | -   | ns    | (Notes 1, 3)       |
| (22) TWLEH  | Write Enable Pulse Setup Time    | 40          | -   | 45         | -   | 45          | -   | ns    | (Notes 1, 3)       |
| (23) TDVEH  | Chip Setup Time                  | 30          | -   | 35         | -   | 35          | 0   | ns    | (Notes 1, 3)       |
| (24) TEHDX  | Data Hold Time                   | 0           | -   | 0          | -   | 0           | -   | ns    | (Notes 1, 3)       |

#### NOTES:

- Input pulse levels: 0 to 3.0V; Input rise and fall times: 5ns (max); Input and output timing reference level: 1.5V; Output load: 1 TTL gate equivalent and  $C_L = 50pF$  (min) - for  $C_L$  greater than 50pF, access time is derated by 0.15ns per pF.
- Tested at initial design and after major design changes.
- $V_{CC} = 4.5$  and 5.5V.

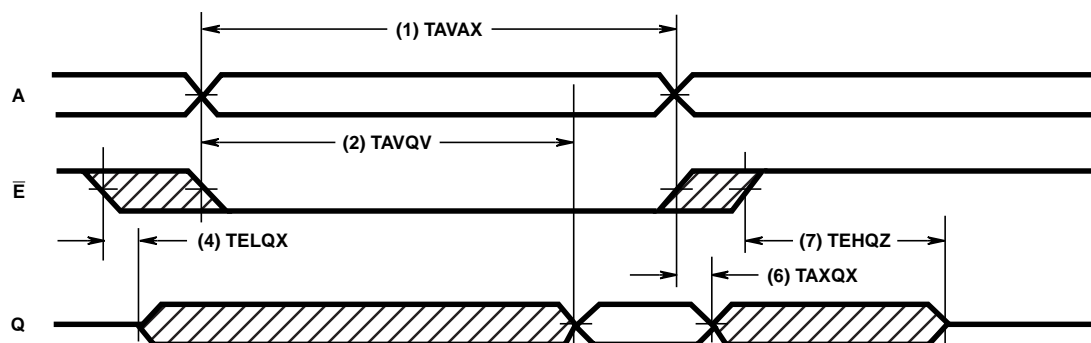
## Timing Waveforms



NOTE:

1.  $\overline{W}$  is high for entire cycle and D is ignored. Address is stable by the time  $\overline{E}$  goes low and remains valid until  $\overline{E}$  goes high.

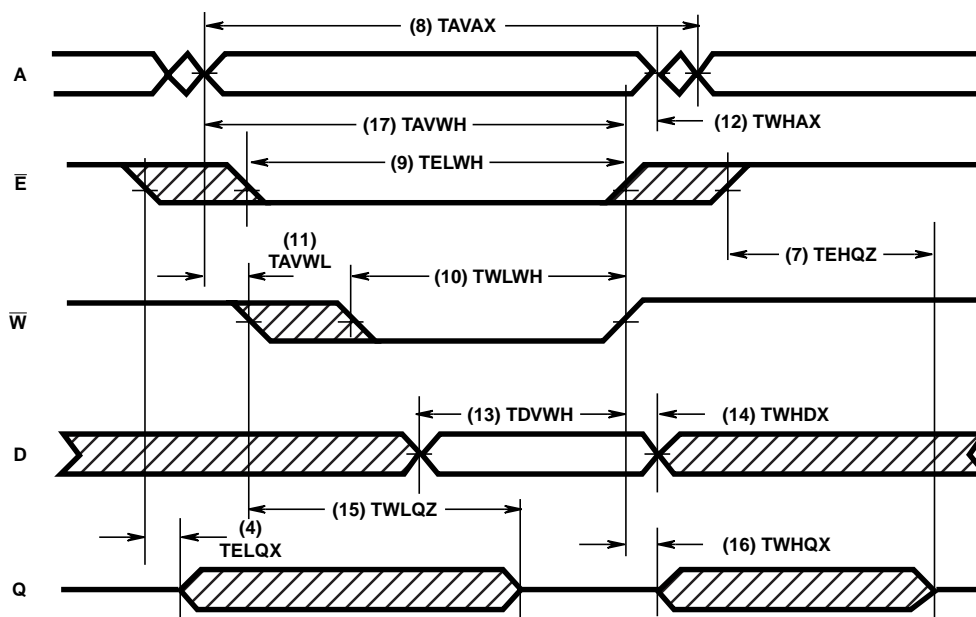
FIGURE 1. READ CYCLE 1: CONTROLLED BY  $\overline{E}$



NOTE:

1.  $\overline{W}$  is high for the entire cycle and D is ignored.  $\overline{E}$  is stable prior to A becoming valid and after A becomes invalid.

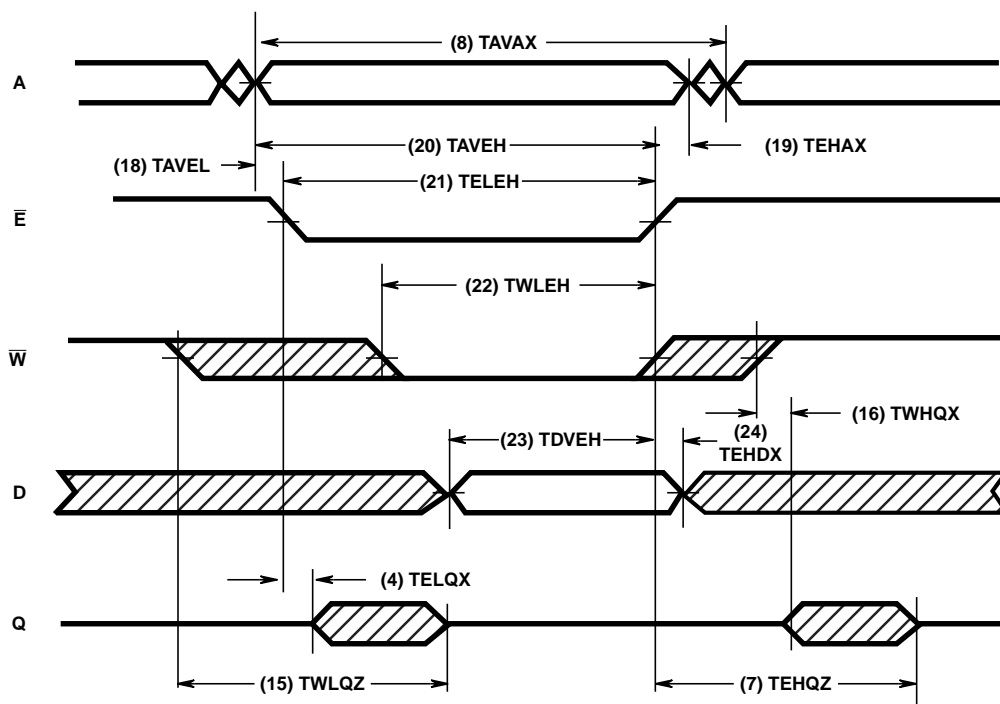
FIGURE 2. READ CYCLE 2: CONTROLLED BY ADDRESS



NOTE:

1. In this mode,  $\overline{E}$  rises after  $\overline{W}$ . The address must remain stable whenever both  $\overline{E}$  and  $\overline{W}$  are low.

FIGURE 3. WRITE CYCLE 1: CONTROLLED BY  $\overline{W}$  (LATE WRITE)

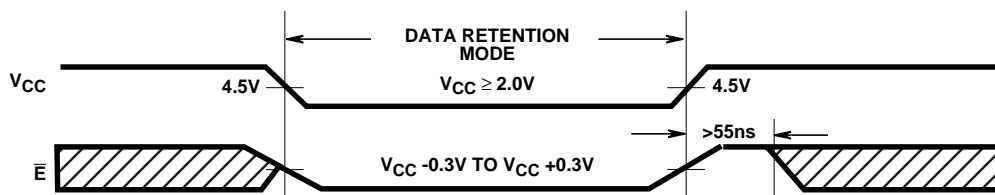
**Timing Waveforms (Continued)****NOTE:**

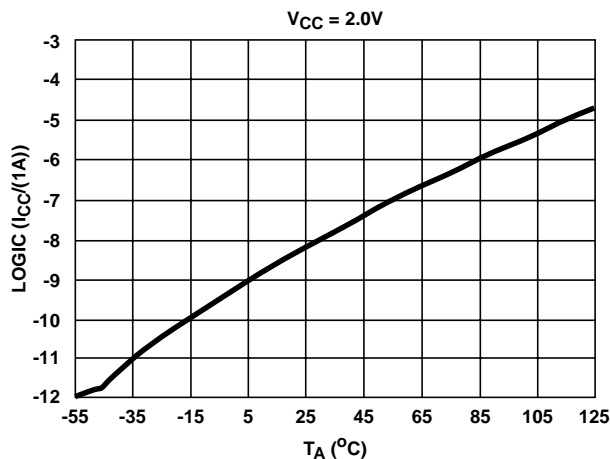
1. In this mode,  $\bar{W}$  rises after  $\bar{E}$ . If  $\bar{W}$  falls before  $\bar{E}$  by a time exceeding TWLQZ (Max) TELQX (Min), and rises after  $\bar{E}$  by a time exceeding TEHQZ (Max) TWHQZ (Min), then Q will remain in the high impedance state throughout the cycle.

**FIGURE 4. WRITE CYCLE 2: CONTROLLED BY  $\bar{E}$  (EARLY WRITE)****Low Voltage Data Retention**

Intersil CMOS RAMs are designed with battery backup in mind. Data retention voltage and supply current are guaranteed over temperature. The following rules ensure data retention:

1. Chip Enable ( $\bar{E}$ ) must be held high during data retention; within  $V_{CC}$  to  $V_{CC} + 0.3V$ .
2. On RAMs which have selects or output enables (e.g., S, G), one of the selects or output enables should be held in the deselected state to keep the RAM outputs high impedance, minimizing power dissipation.
3. Inputs which are to be held high (e.g.,  $\bar{E}$ ) must be kept between  $V_{CC} + 0.3V$  and 70% of  $V_{CC}$  during the power up and down transitions.
4. The RAM can begin operation > 55ns after  $V_{CC}$  reaches the minimum operating voltage (4.5V).

**FIGURE 5. DATA RETENTION TIMING**

**Typical Performance Curve**FIGURE 6. TYPICAL ICCDR vs T<sub>A</sub>

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