

## Features

- True dual-ported memory cells, which allow simultaneous reads of the same memory location
- 1 K × 8 organization
- 0.65 micron CMOS for optimum speed and power
- High speed access: 15 ns
- Low operating power:  $I_{CC} = 110$  mA (maximum)
- Fully asynchronous operation
- Automatic power-down
- Master CY7C130/130A/CY7C131/131A easily expands data bus width to 16 or more bits using slave CY7C140/CY7C141
- $\overline{BUSY}$  output flag on CY7C130/130A/CY7C131/131A;  $\overline{BUSY}$  input on CY7C140/CY7C141
- $\overline{INT}$  flag for port-to-port communication
- Available in 48-pin DIP (CY7C130/130A/140), 52-pin PLCC, 52-pin TQFP
- Pb-free packages available

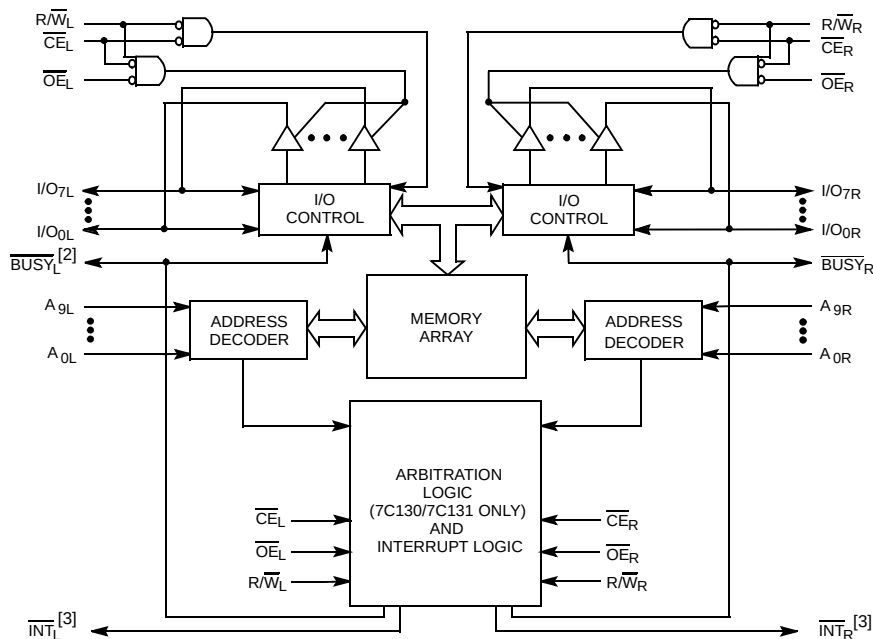
## Functional Description

The CY7C130/130A/CY7C131/131A/CY7C140<sup>[1]</sup> and CY7C141 are high speed CMOS 1 K by 8 dual-port static RAMs. Two ports are provided permitting independent access to any location in memory. The CY7C130/130A/CY7C131/131A can be used as either a standalone 8-bit dual-port static RAM or as a master dual-port RAM in conjunction with the CY7C140/CY7C141 slave dual-port device in systems requiring 16-bit or greater word widths. It is the solution to applications requiring shared or buffered data, such as cache memory for DSP, bit-slice, or multi-processor designs.

Each port has independent control pins; chip enable ( $\overline{CE}$ ), write enable ( $\overline{R/W}$ ), and output enable ( $\overline{OE}$ ). Two flags are provided on each port,  $\overline{BUSY}$  and  $\overline{INT}$ .  $\overline{BUSY}$  signals that the port is trying to access the same location currently being accessed by the other port.  $\overline{INT}$  is an interrupt flag indicating that data is placed in a unique location (3FF for the left port and 3FE for the right port). An automatic power down feature is controlled independently on each port by the chip enable ( $\overline{CE}$ ) pins.

The CY7C130/130A and CY7C140 are available in 48-pin DIP. The CY7C131/131A and CY7C141 are available in 52-pin PLCC, 52-pin Pb-free PLCC, 52-pin PQFP, and 52-pin Pb-free PQFP.

## Logic Block Diagram



### Notes

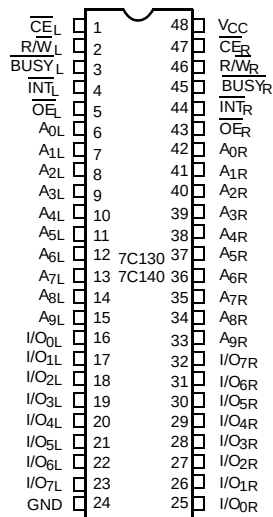
1. CY7C130 and CY7C130A are functionally identical; CY7C131 and CY7C131A are functionally identical.
2. CY7C130/130A/CY7C131/131A (Master):  $\overline{BUSY}$  is open drain output and requires pull-up resistor.  
CY7C140/CY7C141 (Slave):  $\overline{BUSY}$  is input.
3. Open drain outputs: pull-up resistor required.

## Contents

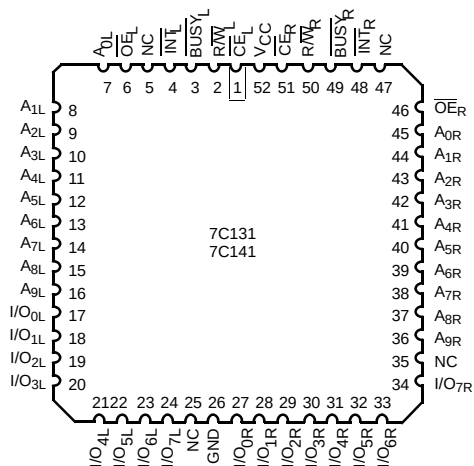
|                                                |           |                                                      |           |
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## Pin Configurations

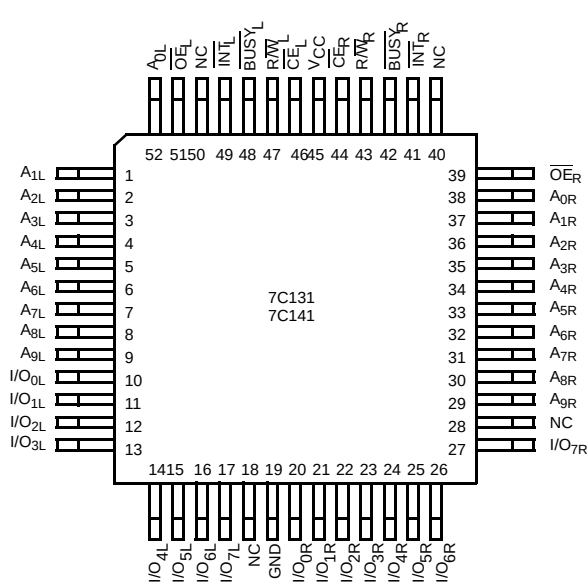
**Figure 1. Pin Diagram - DIP (Top View)**



**Figure 2. Pin Diagram - PLCC (Top View)**



**Figure 3. Pin Diagram - PQFP (Top View)**



## Pin Definitions

| Left Port               | Right Port              | Description           |
|-------------------------|-------------------------|-----------------------|
| $\overline{CE}_L$       | $\overline{CE}_R$       | Chip enable           |
| $R/W_L$                 | $R/W_R$                 | Read/write enable     |
| $\overline{OE}_L$       | $\overline{OE}_R$       | Output enable         |
| $A_{0L}-A_{11/12L}$     | $A_{0R}-A_{11/12R}$     | Address               |
| $I/O_{0L}-I/O_{15/17L}$ | $I/O_{0R}-I/O_{15/17R}$ | Data bus input/output |
| $INT_L$                 | $INT_R$                 | Interrupt flag        |
| $BUSY_L$                | $BUSY_R$                | Busy flag             |
| $V_{CC}$                |                         | Power                 |
| GND                     |                         | Ground                |

## Selection Guide

| Parameter                 |                           | 7C131-15 <sup>[4]</sup><br>7C131A-15<br>7C141-15 | 7C131-25 <sup>[4]</sup><br>7C141-25 | 7C130-30<br>7C130A-30<br>7C131-30<br>7C140-30<br>7C141-30 | 7C130-35<br>7C131-35<br>7C140-35<br>7C141-35 | 7C130-45<br>7C131-45<br>7C140-45<br>7C141-45 | 7C130-55<br>7C131-55<br>7C140-55<br>7C141-55 | Unit |
|---------------------------|---------------------------|--------------------------------------------------|-------------------------------------|-----------------------------------------------------------|----------------------------------------------|----------------------------------------------|----------------------------------------------|------|
| Maximum access time       |                           | 15                                               | 25                                  | 30                                                        | 35                                           | 45                                           | 55                                           | ns   |
| Maximum operating current | Commercial/<br>Industrial | 190                                              | 170                                 | 170                                                       | 120                                          | 120                                          | 110                                          | mA   |
| Maximum standby current   | Commercial/<br>Industrial | 75                                               | 65                                  | 65                                                        | 45                                           | 45                                           | 35                                           | mA   |

Shaded areas contain preliminary information.

### Note

4. 15 and 25 ns version available only in PLCC/PQFP packages.

## Maximum Ratings<sup>[5]</sup>

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 (pin 48 to pin 24) ..... -0.5 V to +7.0 V

DC voltage applied to outputs in high Z State ..... -0.5 V to +7.0 V

DC input voltage ..... -3.5 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 <sub>CC</sub> |
|-------------------------|---------------------|-----------------|
| Commercial              | 0 °C to +70 °C      | 5 V ± 10%       |
| Industrial              | -40 °C to +85 °C    | 5 V ± 10%       |
| Military <sup>[6]</sup> | -55 °C to +125 °C   | 5 V ± 10%       |

## Electrical Characteristics

Over the Operating Range<sup>[7]</sup>

| Parameter        | Description                                     | Test Conditions                                                                                                                                                                                             | 7C131-15 <sup>[4]</sup><br>7C131A-15<br>7C141-15 |      | 7C130-30 <sup>[4]</sup><br>7C130A-30<br>7C131-25,30<br>7C140-30<br>7C141-25,30 |      | 7C130-35,45<br>7C131-35,45<br>7C140-35,45<br>7C141-35,45 |      | 7C130-55<br>7C131-55<br>7C140-55<br>7C141-55 |      | Unit |
|------------------|-------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|------|--------------------------------------------------------------------------------|------|----------------------------------------------------------|------|----------------------------------------------|------|------|
|                  |                                                 |                                                                                                                                                                                                             | Min                                              | Max  | 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                                                      | —    | 2.4                                          | —    | V    |
| V <sub>OL</sub>  | Output LOW voltage                              | I <sub>OL</sub> = 4.0 mA                                                                                                                                                                                    | —                                                | 0.4  | —                                                                              | 0.4  | —                                                        | 0.4  | —                                            | 0.4  | V    |
|                  |                                                 | I <sub>OL</sub> = 16.0 mA <sup>[8]</sup>                                                                                                                                                                    | —                                                | 0.5  | —                                                                              | 0.5  | —                                                        | 0.5  | —                                            | 0.5  | V    |
| V <sub>IH</sub>  | Input HIGH voltage                              |                                                                                                                                                                                                             | 2.2                                              | —    | 2.2                                                                            | —    | 2.2                                                      | —    | 2.2                                          | —    | V    |
| V <sub>IL</sub>  | Input LOW voltage                               |                                                                                                                                                                                                             | —                                                | 0.8  | —                                                                              | 0.8  | —                                                        | 0.8  | —                                            | 0.8  | V    |
| I <sub>IX</sub>  | Input leakage current                           | GND ≤ V <sub>I</sub> ≤ V <sub>CC</sub>                                                                                                                                                                      | -5                                               | +5   | -5                                                                             | +5   | -5                                                       | +5   | -5                                           | +5   | μA   |
| I <sub>OZ</sub>  | Output leakage current                          | GND ≤ V <sub>O</sub> ≤ V <sub>CC</sub> , output disabled                                                                                                                                                    | -5                                               | +5   | -5                                                                             | +5   | -5                                                       | +5   | -5                                           | +5   | μA   |
| I <sub>OS</sub>  | Output short circuit current <sup>[9, 10]</sup> | V <sub>CC</sub> = Max,<br>V <sub>OUT</sub> = GND                                                                                                                                                            | —                                                | -350 | —                                                                              | -350 | —                                                        | -350 | —                                            | -350 | mA   |
| I <sub>CC</sub>  | V <sub>CC</sub> operating supply current        | CE = V <sub>IL</sub> , outputs open, f = f <sub>MAX</sub> <sup>[11]</sup>                                                                                                                                   | —                                                | 190  | —                                                                              | 170  | —                                                        | 120  | —                                            | 110  | mA   |
| I <sub>SB1</sub> | Standby current both ports, TTL inputs          | CE <sub>L</sub> and CE <sub>R</sub> ≥ V <sub>IH</sub> , f = f <sub>MAX</sub> <sup>[11]</sup>                                                                                                                | —                                                | 75   | —                                                                              | 65   | —                                                        | 45   | —                                            | 35   | mA   |
| I <sub>SB2</sub> | Standby current one port, TTL inputs            | CE <sub>L</sub> or CE <sub>R</sub> ≥ V <sub>IH</sub> , active port outputs open, f = f <sub>MAX</sub> <sup>[11]</sup>                                                                                       | —                                                | 135  | —                                                                              | 115  | —                                                        | 90   | —                                            | 75   | mA   |
| I <sub>SB3</sub> | Standby current both ports, CMOS inputs         | Both ports CE <sub>L</sub> and CE <sub>R</sub> ≥ V <sub>CC</sub> - 0.2 V, V <sub>IN</sub> ≥ V <sub>CC</sub> - 0.2 V or V <sub>IN</sub> ≤ 0.2 V, f = 0                                                       | —                                                | 15   | —                                                                              | 15   | —                                                        | 15   | —                                            | 15   | mA   |
| I <sub>SB4</sub> | Standby current one port, CMOS inputs           | One port CE <sub>L</sub> or CE <sub>R</sub> ≥ V <sub>CC</sub> - 0.2 V, V <sub>IN</sub> ≥ V <sub>CC</sub> - 0.2 V or V <sub>IN</sub> ≤ 0.2 V, active port outputs open, f = f <sub>MAX</sub> <sup>[11]</sup> | —                                                | 125  | —                                                                              | 105  | —                                                        | 85   | —                                            | 70   | mA   |

Shaded areas contain preliminary information.

### Notes

5. The voltage on any input or I/O pin cannot exceed the power pin during power up.

6. T<sub>A</sub> is the "instant on" case temperature

7. See the last page of this specification for Group A subgroup testing information.

8. BUSY and INT pins only.

9. Duration of the short circuit should not exceed 30 seconds.

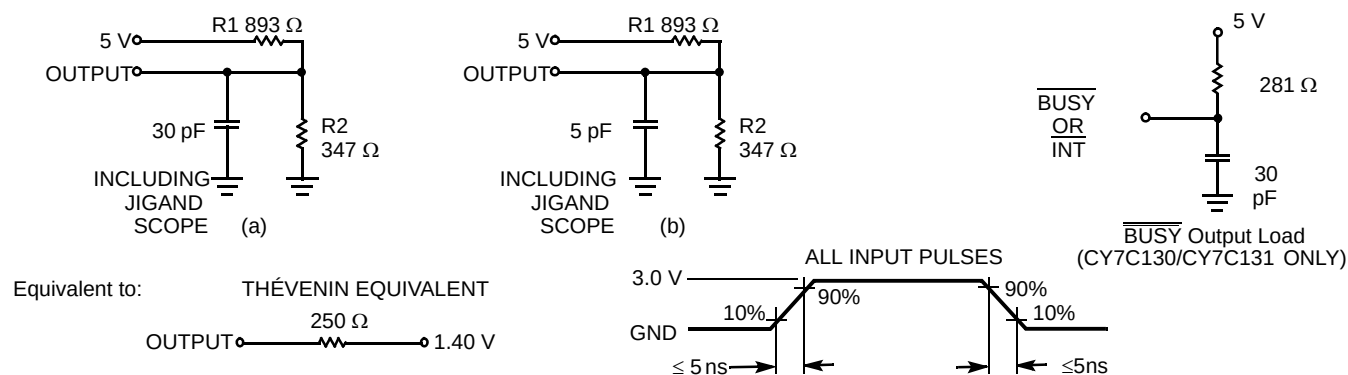
10. This parameter is guaranteed but not tested.

11. At f = f<sub>MAX</sub>, address and data inputs are cycling at the maximum frequency of read cycle of 1/t<sub>RC</sub> and using AC Test Waveforms input levels of GND to 3 V.

## Capacitance<sup>[10]</sup>

| Parameter | Description        | Test Conditions                                                                      | Max | Unit |
|-----------|--------------------|--------------------------------------------------------------------------------------|-----|------|
| $C_{IN}$  | Input capacitance  | $T_A = 25\text{ }^{\circ}\text{C}$ , $f = 1\text{ MHz}$ ,<br>$V_{CC} = 5.0\text{ V}$ | 15  | pF   |
| $C_{OUT}$ | Output capacitance |                                                                                      | 10  | pF   |

**Figure 4. AC Test Loads and Waveforms**



## Switching Characteristics

Over the Operating Range<sup>[12, 13]</sup>

| Parameter                   | Description                               | 7C131-15 <sup>[14]</sup><br>7C131A-15<br>7C141-15 |     | 7C130-25 <sup>[14]</sup><br>7C131-25<br>7C140-25<br>7C141-25 |     | 7C130-30<br>7C130A-30<br>7C131-30<br>7C140-30<br>7C141-30 |     | Unit |
|-----------------------------|-------------------------------------------|---------------------------------------------------|-----|--------------------------------------------------------------|-----|-----------------------------------------------------------|-----|------|
|                             |                                           | Min                                               | Max | Min                                                          | Max | Min                                                       | Max |      |
| Read Cycle                  |                                           |                                                   |     |                                                              |     |                                                           |     |      |
| t <sub>RC</sub>             | Read cycle time                           | 15                                                | –   | 25                                                           | –   | 30                                                        | –   | ns   |
| t <sub>AA</sub>             | Address to data valid <sup>[15]</sup>     | –                                                 | 15  | –                                                            | 25  | –                                                         | 30  | ns   |
| t <sub>OHA</sub>            | Data hold from address change             | 0                                                 | –   | 0                                                            | –   | 0                                                         | –   | ns   |
| t <sub>ACE</sub>            | CE LOW to data valid <sup>[15]</sup>      | –                                                 | 15  | –                                                            | 25  | –                                                         | 30  | ns   |
| t <sub>DOE</sub>            | OE LOW to data valid <sup>[15]</sup>      | –                                                 | 10  | –                                                            | 15  | –                                                         | 20  | ns   |
| t <sub>LZOE</sub>           | OE LOW to low Z <sup>[16, 17, 18]</sup>   | 3                                                 | –   | 3                                                            | –   | 3                                                         | –   | ns   |
| t <sub>HZOE</sub>           | OE HIGH to high Z <sup>[16, 17, 18]</sup> | –                                                 | 10  | –                                                            | 15  | –                                                         | 15  | ns   |
| t <sub>LZCE</sub>           | CE LOW to low Z <sup>[16, 17, 18]</sup>   | 3                                                 | –   | 5                                                            | –   | 5                                                         | –   | ns   |
| t <sub>HZCE</sub>           | CE HIGH to high Z <sup>[16, 17, 18]</sup> | –                                                 | 10  | –                                                            | 15  | –                                                         | 15  | ns   |
| t <sub>PU</sub>             | CE LOW to power-up <sup>[16]</sup>        | 0                                                 | –   | 0                                                            | –   | 0                                                         | –   | ns   |
| t <sub>PD</sub>             | CE HIGH to power-down <sup>[16]</sup>     | –                                                 | 15  | –                                                            | 25  | –                                                         | 25  | ns   |
| Write Cycle <sup>[19]</sup> |                                           |                                                   |     |                                                              |     |                                                           |     |      |
| t <sub>WC</sub>             | Write cycle time                          | 15                                                | –   | 25                                                           | –   | 30                                                        | –   | ns   |
| t <sub>SCE</sub>            | CE LOW to write end                       | 12                                                | –   | 20                                                           | –   | 25                                                        | –   | ns   |
| t <sub>AW</sub>             | Address setup to write end                | 12                                                | –   | 20                                                           | –   | 25                                                        | –   | ns   |
| t <sub>HA</sub>             | Address hold from write end               | 2                                                 | –   | 2                                                            | –   | 2                                                         | –   | ns   |
| t <sub>SA</sub>             | Address setup to write start              | 0                                                 | –   | 0                                                            | –   | 0                                                         | –   | ns   |
| t <sub>PWE</sub>            | R/W pulse width                           | 12                                                | –   | 15                                                           | –   | 25                                                        | –   | ns   |
| t <sub>SD</sub>             | Data setup to write end                   | 10                                                | –   | 15                                                           | –   | 15                                                        | –   | ns   |
| t <sub>HD</sub>             | Data hold from write end                  | 0                                                 | –   | 0                                                            | –   | 0                                                         | –   | ns   |
| t <sub>HZWE</sub>           | R/W LOW to high Z <sup>[18]</sup>         | –                                                 | 10  | –                                                            | 15  | –                                                         | 15  | ns   |
| t <sub>LZWE</sub>           | R/W HIGH to low Z <sup>[18]</sup>         | 0                                                 | –   | 0                                                            | –   | 0                                                         | –   | ns   |

Shaded areas contain preliminary information.

### Notes

12. See the last page of this specification for Group A subgroup testing information.
13. Test conditions assume signal transition times 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.
14. 15 and 25 ns version available only in PLCC/PQFP packages.
15. AC Test Conditions use  $V_{OH} = 1.6$  V and  $V_{OL} = 1.4$  V.
16. This parameter is guaranteed but not tested.
17. At any given temperature and voltage condition for any given device,  $t_{HZCE}$  is less than  $t_{LZCE}$  and  $t_{HZOE}$  is less than  $t_{LZOE}$ .
18.  $t_{LZCE}$ ,  $t_{LZWE}$ ,  $t_{HZOE}$ ,  $t_{LZOE}$ ,  $t_{HZCE}$  and  $t_{HZWE}$  are tested with  $C_L = 5$  pF as in part (b) of AC Test Loads. Transition is measured  $\pm 500$  mV from steady state voltage.
19. The internal write time of the memory is defined by the overlap of CS LOW and R/W 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 should be referenced to the rising edge of the signal that terminates the write.

## Switching Characteristics

Over the Operating Range<sup>[12, 13]</sup> (continued)

| Parameter                       | Description                                     | 7C131-15 <sup>[14]</sup><br>7C131A-15<br>7C141-15 |         | 7C130-25 <sup>[14]</sup><br>7C131-25<br>7C140-25<br>7C141-25 |         | 7C130-30<br>7C130A-30<br>7C131-30<br>7C140-30<br>7C141-30 |         | Unit |
|---------------------------------|-------------------------------------------------|---------------------------------------------------|---------|--------------------------------------------------------------|---------|-----------------------------------------------------------|---------|------|
|                                 |                                                 | Min                                               | Max     | Min                                                          | Max     | Min                                                       | Max     |      |
| Busy/Interrupt Timing           |                                                 |                                                   |         |                                                              |         |                                                           |         |      |
| t <sub>BLA</sub>                | BUSY LOW from address match                     | –                                                 | 15      | –                                                            | 20      | –                                                         | 20      | ns   |
| t <sub>BHA</sub>                | BUSY HIGH from address mismatch <sup>[20]</sup> | –                                                 | 15      | –                                                            | 20      | –                                                         | 20      | ns   |
| t <sub>BLC</sub>                | BUSY LOW from CE LOW                            | –                                                 | 15      | –                                                            | 20      | –                                                         | 20      | ns   |
| t <sub>BHC</sub>                | BUSY HIGH from CE HIGH <sup>[20]</sup>          | –                                                 | 15      | –                                                            | 20      | –                                                         | 20      | ns   |
| t <sub>PS</sub>                 | Port set-up for priority                        | 5                                                 | –       | 5                                                            | –       | 5                                                         | –       | ns   |
| t <sub>WB</sub> <sup>[21]</sup> | R/W LOW after BUSY LOW                          | 0                                                 | –       | 0                                                            | –       | 0                                                         | –       | ns   |
| t <sub>WH</sub>                 | R/W HIGH after BUSY HIGH                        | 13                                                | –       | 20                                                           | –       | 30                                                        | –       | ns   |
| t <sub>BDD</sub>                | BUSY HIGH to valid data                         | –                                                 | 15      | –                                                            | 25      | –                                                         | 30      | ns   |
| t <sub>DDD</sub>                | Write data valid to read data valid             | –                                                 | Note 22 | –                                                            | Note 22 | –                                                         | Note 22 | ns   |
| t <sub>WDD</sub>                | Write pulse to data delay                       | –                                                 | Note 22 | –                                                            | Note 22 | –                                                         | Note 22 | ns   |
| Interrupt Timing                |                                                 |                                                   |         |                                                              |         |                                                           |         |      |
| t <sub>WINS</sub>               | R/W to INTERRUPT set time                       | –                                                 | 15      | –                                                            | 25      | –                                                         | 25      | ns   |
| t <sub>EINS</sub>               | CE to INTERRUPT set time                        | –                                                 | 15      | –                                                            | 25      | –                                                         | 25      | ns   |
| t <sub>INS</sub>                | Address to INTERRUPT set time                   | –                                                 | 15      | –                                                            | 25      | –                                                         | 25      | ns   |
| t <sub>OINR</sub>               | OE to INTERRUPT reset time <sup>[20]</sup>      | –                                                 | 15      | –                                                            | 25      | –                                                         | 25      | ns   |
| t <sub>EINR</sub>               | CE to INTERRUPT reset time <sup>[20]</sup>      | –                                                 | 15      | –                                                            | 25      | –                                                         | 25      | ns   |
| t <sub>INR</sub>                | Address to INTERRUPT reset time <sup>[20]</sup> | –                                                 | 15      | –                                                            | 25      | –                                                         | 25      | ns   |

Shaded areas contain preliminary information.

### Notes

20. These parameters are measured from the input signal changing, until the output pin goes to a high-impedance state.

21. CY7C140/CY7C141 only.

22. A write operation on Port A, where Port A has priority, leaves the data on Port B's outputs undisturbed until one access time after one of the following:

BUSY on Port B goes HIGH.

Port B's address is toggled.

CE for Port B is toggled.

R/W for Port B is toggled during valid read.



## Switching Characteristics

Over the Operating Range<sup>[23, 24]</sup>

| Parameter                   | Description                               | 7C130-35<br>7C131-35<br>7C140-35<br>7C141-35 |     | 7C130-45<br>7C131-45<br>7C140-45<br>7C141-45 |     | 7C130-55<br>7C131-55<br>7C140-55<br>7C141-55 |     | Unit |
|-----------------------------|-------------------------------------------|----------------------------------------------|-----|----------------------------------------------|-----|----------------------------------------------|-----|------|
|                             |                                           | Min                                          | Max | Min                                          | Max | Min                                          | Max |      |
| Read Cycle                  |                                           |                                              |     |                                              |     |                                              |     |      |
| t <sub>RC</sub>             | Read cycle time                           | 35                                           | –   | 45                                           | –   | 55                                           | –   | ns   |
| t <sub>AA</sub>             | Address to data valid <sup>[25]</sup>     | –                                            | 35  | –                                            | 45  | –                                            | 55  | ns   |
| t <sub>OHA</sub>            | Data hold from address change             | 0                                            | –   | 0                                            | –   | 0                                            | –   | ns   |
| t <sub>ACE</sub>            | CE LOW to data valid <sup>[25]</sup>      | –                                            | 35  | –                                            | 45  | –                                            | 55  | ns   |
| t <sub>DOE</sub>            | OE LOW to data valid <sup>[25]</sup>      | –                                            | 20  | –                                            | 25  | –                                            | 25  | ns   |
| t <sub>LZOE</sub>           | OE LOW to low Z <sup>[26, 27, 28]</sup>   | 3                                            | –   | 3                                            | –   | 3                                            | –   | ns   |
| t <sub>HZOE</sub>           | OE HIGH to high Z <sup>[26, 27, 28]</sup> | –                                            | 20  | –                                            | 20  | –                                            | 25  | ns   |
| t <sub>LZCE</sub>           | CE LOW to low Z <sup>[26, 27, 28]</sup>   | 5                                            | –   | 5                                            | –   | 5                                            | –   | ns   |
| t <sub>HZCE</sub>           | CE HIGH to high Z <sup>[26, 27, 28]</sup> | –                                            | 20  | –                                            | 20  | –                                            | 25  | ns   |
| t <sub>PU</sub>             | CE LOW to power-up <sup>[26]</sup>        | 0                                            | –   | 0                                            | –   | 0                                            | –   | ns   |
| t <sub>PD</sub>             | CE HIGH to power-down <sup>[26]</sup>     | –                                            | 35  | –                                            | 35  | –                                            | 35  | ns   |
| Write Cycle <sup>[29]</sup> |                                           |                                              |     |                                              |     |                                              |     |      |
| t <sub>WC</sub>             | Write cycle time                          | 35                                           | –   | 45                                           | –   | 55                                           | –   | ns   |
| t <sub>SCE</sub>            | CE LOW to write end                       | 30                                           | –   | 35                                           | –   | 40                                           | –   | ns   |
| t <sub>AW</sub>             | Address set-up to write end               | 30                                           | –   | 35                                           | –   | 40                                           | –   | ns   |
| t <sub>HA</sub>             | Address hold from write end               | 2                                            | –   | 2                                            | –   | 2                                            | –   | ns   |
| t <sub>SA</sub>             | Address set-up to write start             | 0                                            | –   | 0                                            | –   | 0                                            | –   | ns   |
| t <sub>PWE</sub>            | R/W pulse width                           | 25                                           | –   | 30                                           | –   | 30                                           | –   | ns   |
| t <sub>SD</sub>             | Data set-up to write end                  | 15                                           | –   | 20                                           | –   | 20                                           | –   | ns   |
| t <sub>HD</sub>             | Data hold from write end                  | 0                                            | –   | 0                                            | –   | 0                                            | –   | ns   |
| t <sub>HZWE</sub>           | R/W LOW to high Z <sup>[28]</sup>         | –                                            | 20  | –                                            | 20  | –                                            | 25  | ns   |
| t <sub>LZWE</sub>           | R/W HIGH to low Z <sup>[28]</sup>         | 0                                            | –   | 0                                            | –   | 0                                            | –   | ns   |

### Notes

23. See the last page of this specification for Group A subgroup testing information.

24. Test conditions assume signal transition times 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.

25. AC Test Conditions use  $V_{OH} = 1.6$  V and  $V_{OL} = 1.4$  V.

26. This parameter is guaranteed but not tested.

27. At any given temperature and voltage condition for any given device,  $t_{HZCE}$  is less than  $t_{LZCE}$  and  $t_{HZOE}$  is less than  $t_{LZOE}$ .

28.  $t_{LZCE}$ ,  $t_{LZWE}$ ,  $t_{HZOE}$ ,  $t_{LZOE}$ ,  $t_{HZCE}$  and  $t_{HZWE}$  are tested with  $C_L = 5$  pF as in part (b) of AC Test Loads. Transition is measured  $\pm 500$  mV from steady state voltage.

29. The internal write time of the memory is defined by the overlap of CS LOW and R/W 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 should be referenced to the rising edge of the signal that terminates the write.

## Switching Characteristics

Over the Operating Range<sup>[23, 24]</sup> (continued)

| Parameter                       | Description                                     | 7C130-35<br>7C131-35<br>7C140-35<br>7C141-35 |         | 7C130-45<br>7C131-45<br>7C140-45<br>7C141-45 |         | 7C130-55<br>7C131-55<br>7C140-55<br>7C141-55 |         | Unit |
|---------------------------------|-------------------------------------------------|----------------------------------------------|---------|----------------------------------------------|---------|----------------------------------------------|---------|------|
|                                 |                                                 | Min                                          | Max     | Min                                          | Max     | Min                                          | Max     |      |
| Busy/Interrupt Timing           |                                                 |                                              |         |                                              |         |                                              |         |      |
| t <sub>BLA</sub>                | BUSY LOW from address match                     | –                                            | 20      | –                                            | 25      | –                                            | 30      | ns   |
| t <sub>BHA</sub>                | BUSY HIGH from address mismatch <sup>[30]</sup> | –                                            | 20      | –                                            | 25      | –                                            | 30      | ns   |
| t <sub>BLC</sub>                | BUSY LOW from CE LOW                            | –                                            | 20      | –                                            | 25      | –                                            | 30      | ns   |
| t <sub>BHC</sub>                | BUSY HIGH from CE HIGH <sup>[30]</sup>          | –                                            | 20      | –                                            | 25      | –                                            | 30      | ns   |
| t <sub>PS</sub>                 | Port set-up for priority                        | 5                                            | –       | 5                                            | –       | 5                                            | –       | ns   |
| t <sub>WB</sub> <sup>[31]</sup> | R/W LOW after BUSY LOW                          | 0                                            | –       | 0                                            | –       | 0                                            | –       | ns   |
| t <sub>WH</sub>                 | R/W HIGH after BUSY HIGH                        | 30                                           | –       | 35                                           | –       | 35                                           | –       | ns   |
| t <sub>BDD</sub>                | BUSY HIGH to valid data                         | –                                            | 35      | –                                            | 45      | –                                            | 45      | ns   |
| t <sub>DDD</sub>                | Write data valid to read data valid             | –                                            | Note 32 | –                                            | Note 32 | –                                            | Note 32 | ns   |
| t <sub>WDD</sub>                | Write pulse to data delay                       | –                                            | Note 32 | –                                            | Note 32 | –                                            | Note 32 | ns   |
| Interrupt Timing                |                                                 |                                              |         |                                              |         |                                              |         |      |
| t <sub>WINS</sub>               | R/W to INTERRUPT set time                       | –                                            | 25      | –                                            | 35      | –                                            | 45      | ns   |
| t <sub>EINS</sub>               | CE to INTERRUPT set time                        | –                                            | 25      | –                                            | 35      | –                                            | 45      | ns   |
| t <sub>INS</sub>                | Address to INTERRUPT set time                   | –                                            | 25      | –                                            | 35      | –                                            | 45      | ns   |
| t <sub>OINR</sub>               | OE to INTERRUPT reset time <sup>[20]</sup>      | –                                            | 25      | –                                            | 35      | –                                            | 45      | ns   |
| t <sub>EINR</sub>               | CE to INTERRUPT reset time <sup>[20]</sup>      | –                                            | 25      | –                                            | 35      | –                                            | 45      | ns   |
| t <sub>INR</sub>                | Address to INTERRUPT reset time <sup>[20]</sup> | –                                            | 25      | –                                            | 35      | –                                            | 45      | ns   |

### Notes

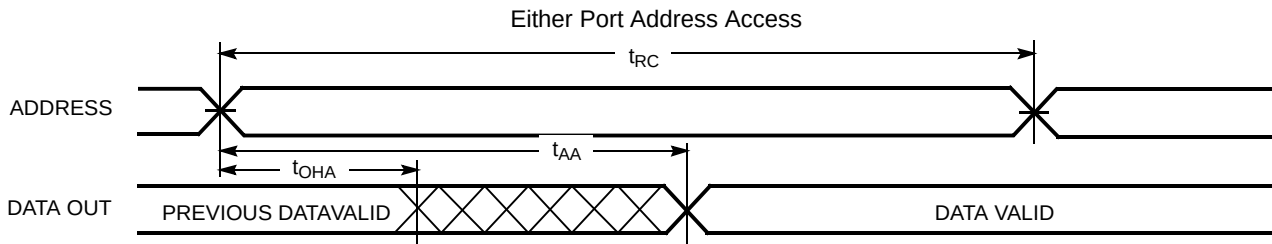
30. These parameters are measured from the input signal changing, until the output pin goes to a high-impedance state.

31. CY7C140/CY7C141 only.

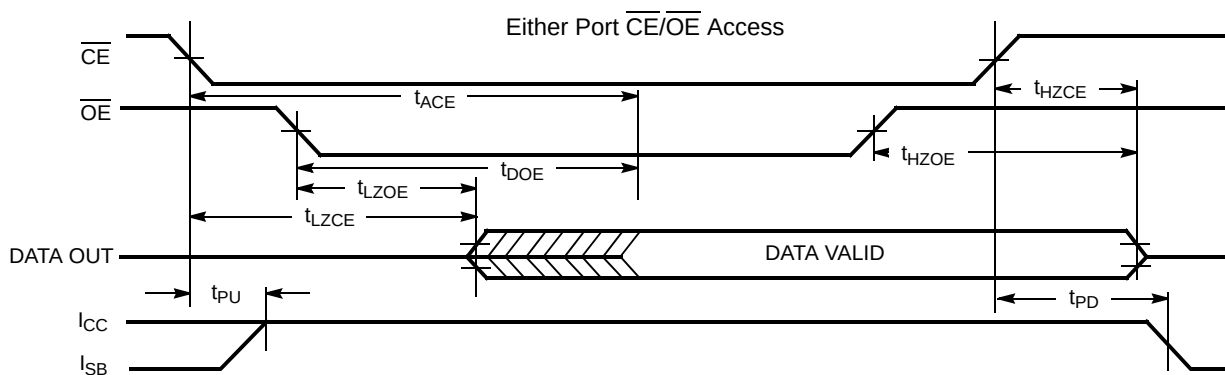
32. A write operation on Port A, where Port A has priority, leaves the data on Port B's outputs undisturbed until one access time after one of the following:  
 BUSY on Port B goes HIGH.  
 Port B's address is toggled.  
 CE for Port B is toggled.  
 R/W for Port B is toggled during valid read.

## Switching Waveforms

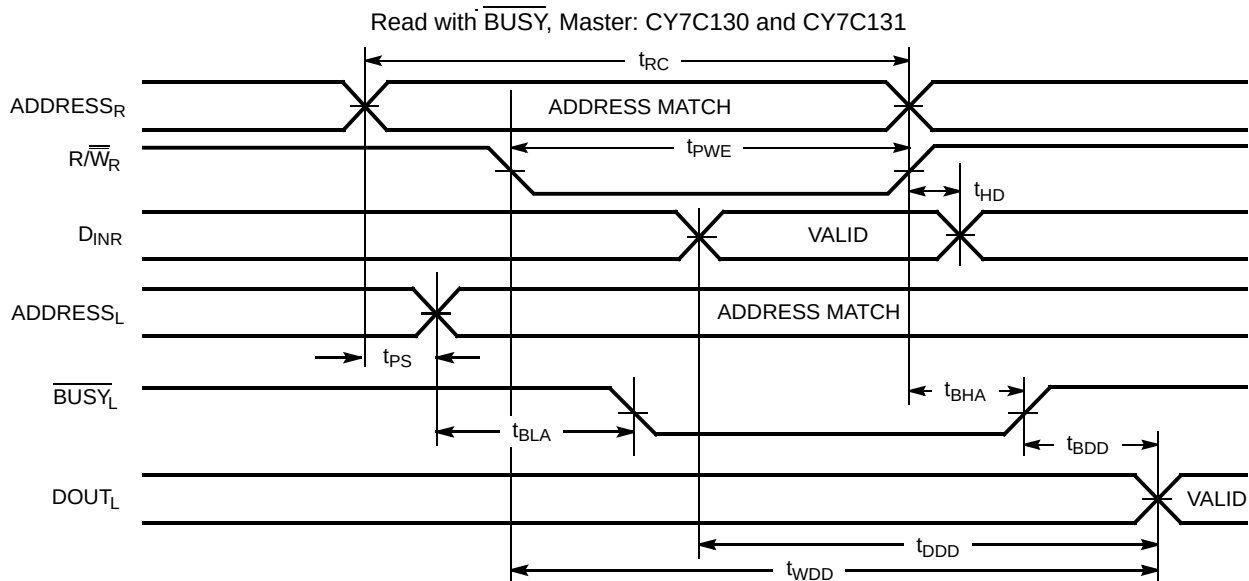
**Figure 5. Read Cycle No. 1<sup>[33, 34]</sup>**



**Figure 6. Read Cycle No. 2<sup>[33, 35]</sup>**



**Figure 7. Read Cycle No. 3<sup>[34]</sup>**



### Notes

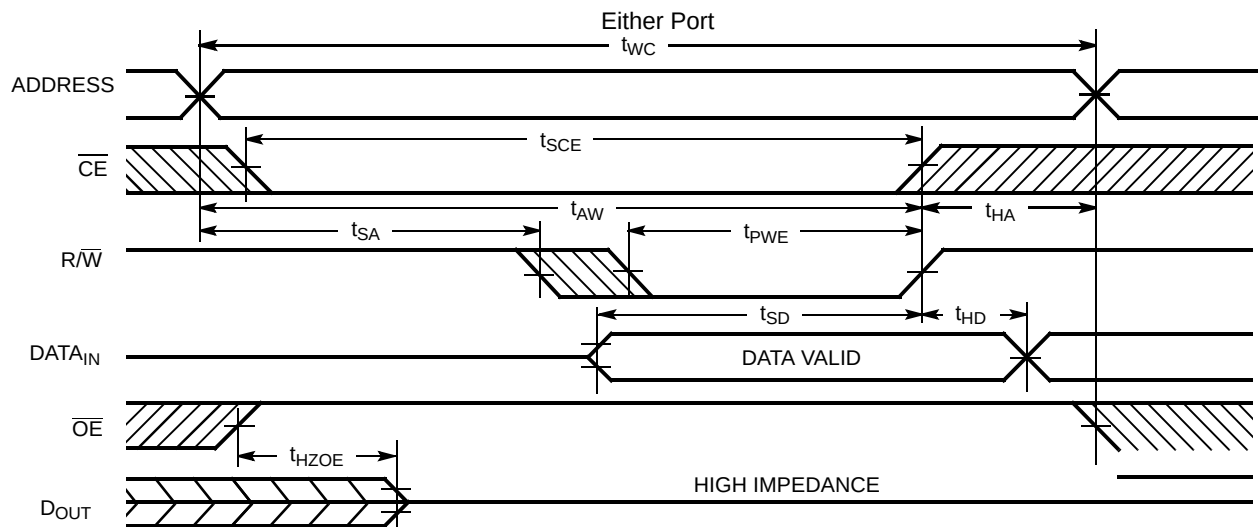
33.  $R/\overline{W}$  is HIGH for read cycle.

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

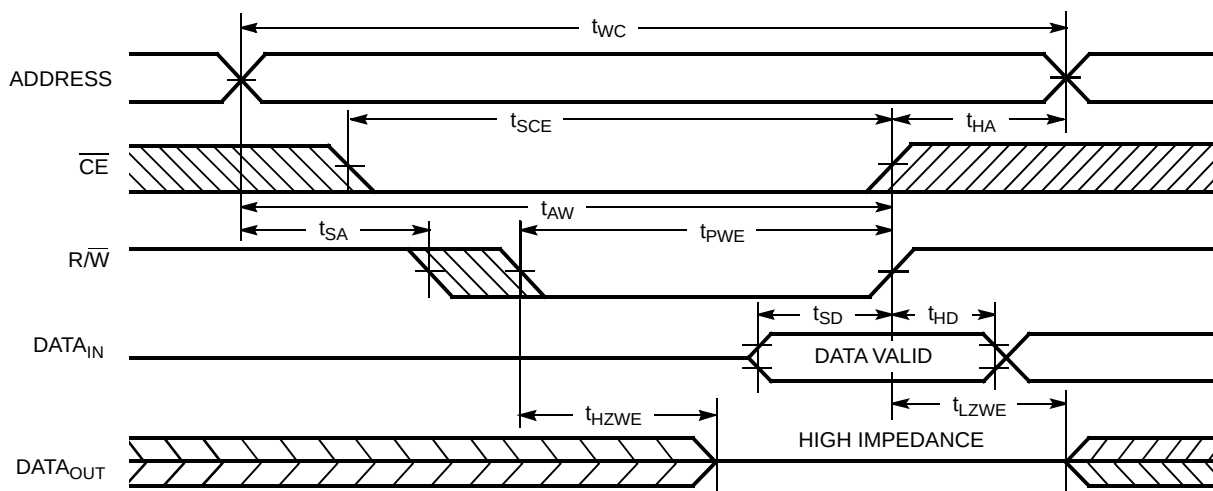
35. Address valid prior to or coincident with  $\overline{CE}$  transition LOW.

## Switching Waveforms (continued)

**Figure 8. Write Cycle No. 1 (OE Three-States Data I/Os—Either Port)**<sup>[36, 37]</sup>



**Figure 9. Write Cycle No. 2 (R/W Three-States Data I/Os—Either Port)**<sup>[38, 39]</sup>



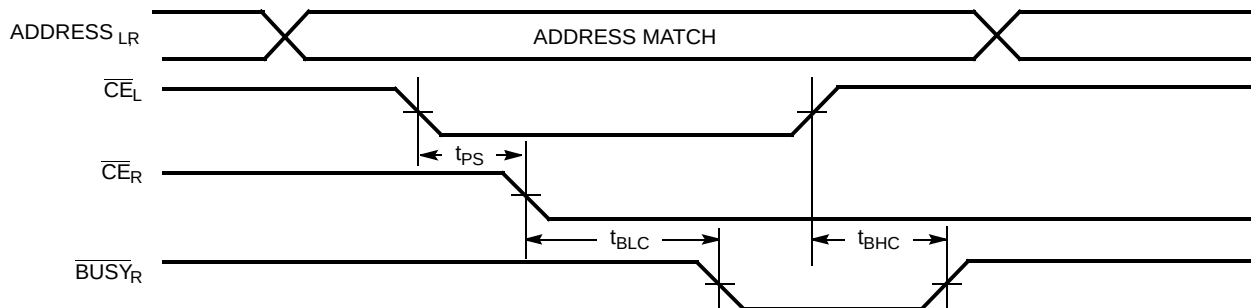
### Notes

36. The internal write time of the memory is defined by the overlap of  $\overline{CS}$  LOW and  $R/\overline{W}$  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 should be referenced to the rising edge of the signal that terminates the write.
37. If OE is LOW during a R/W controlled write cycle, the write pulse width must be the larger of  $t_{PWE}$  or  $t_{HZWE} + t_{SD}$  to allow the data I/O pins to enter high impedance and for data to be placed on the bus for the required  $t_{SD}$ .
38. These parameters are measured from the input signal changing, until the output pin goes to a high-impedance state.
39. If the CE LOW transition occurs simultaneously with or after the R/W LOW transition, the outputs remain in the high impedance state.

## Switching Waveforms (continued)

Figure 10. Busy Timing Diagram No. 1 ( $\overline{\text{CE}}$  Arbitration)

$\overline{\text{CE}}_{\text{L}}$  Valid First:



$\overline{\text{CE}}_{\text{R}}$  Valid First:

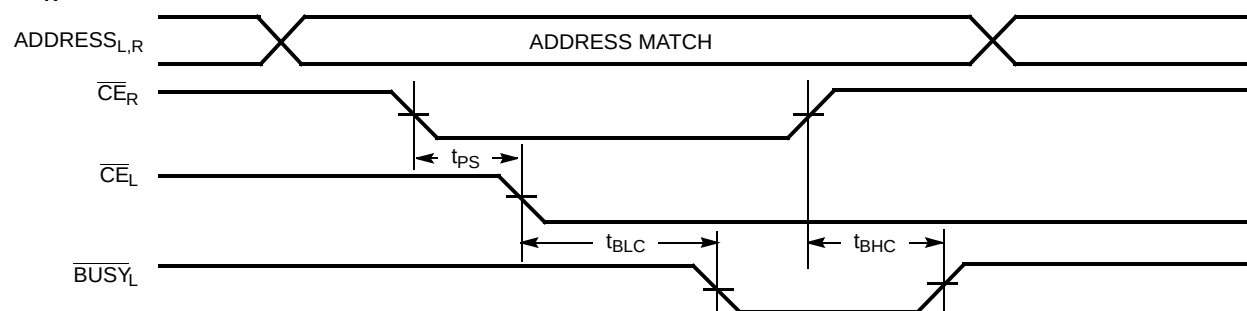
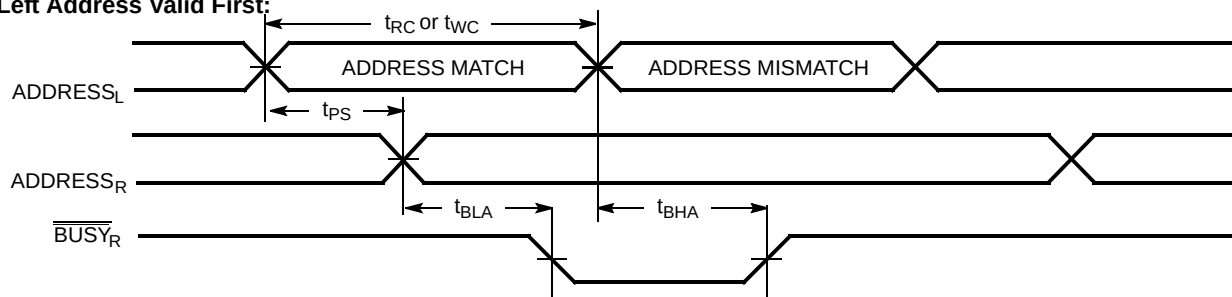
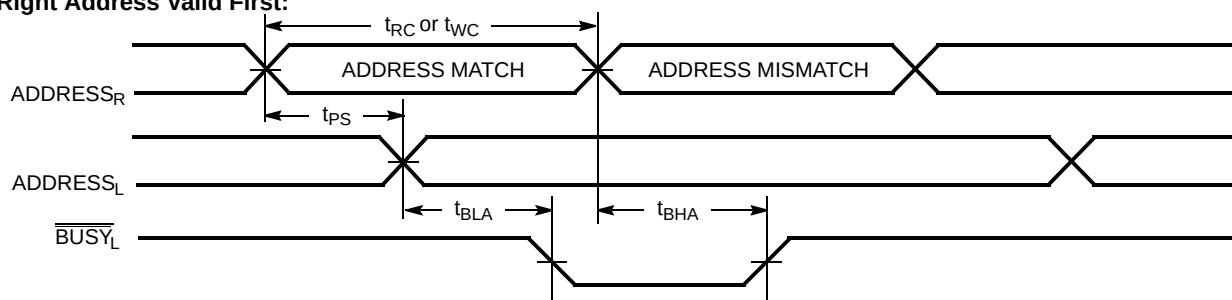


Figure 11. Busy Timing Diagram No. 2 (Address Arbitration)

Left Address Valid First:



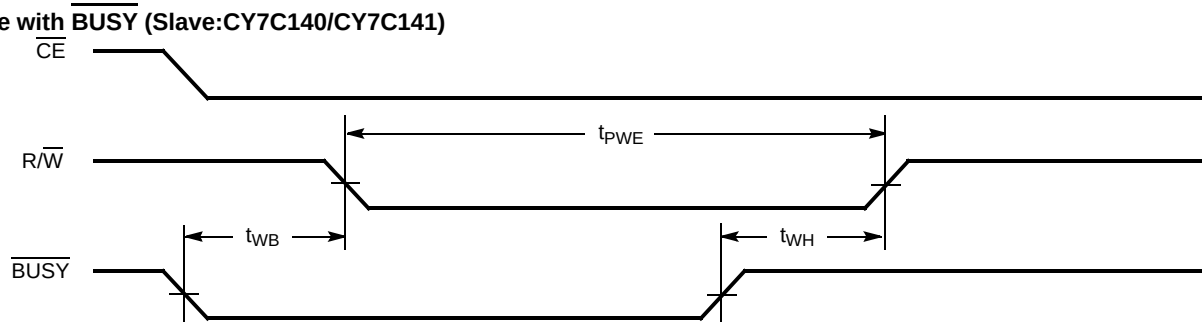
Right Address Valid First:



## Switching Waveforms *(continued)*

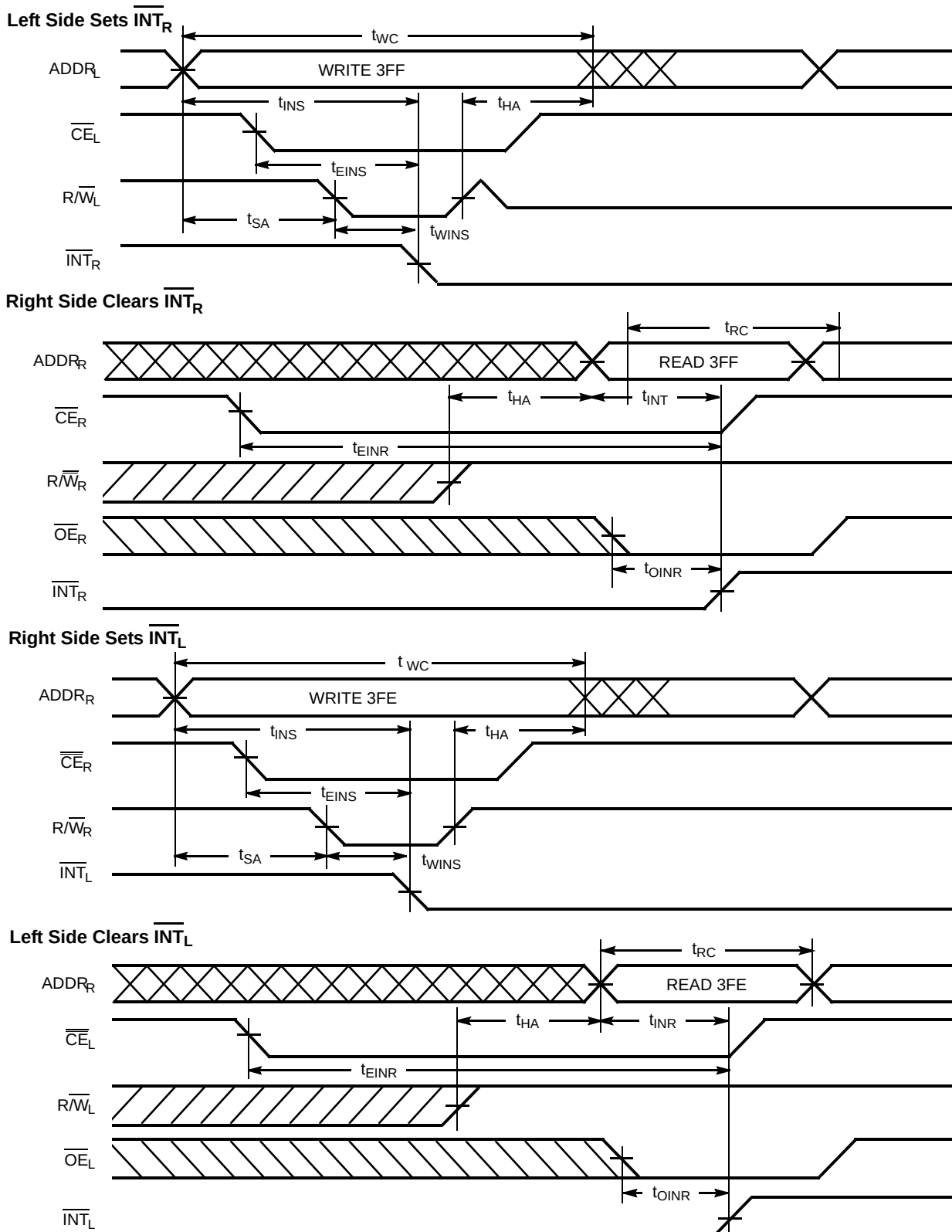
**Figure 12. Busy Timing Diagram No. 3**

Write with  $\overline{\text{BUSY}}$  (Slave: CY7C140/CY7C141)

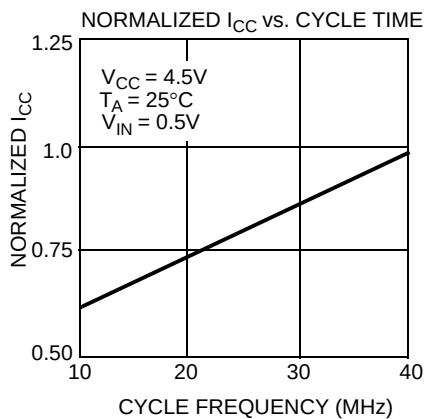
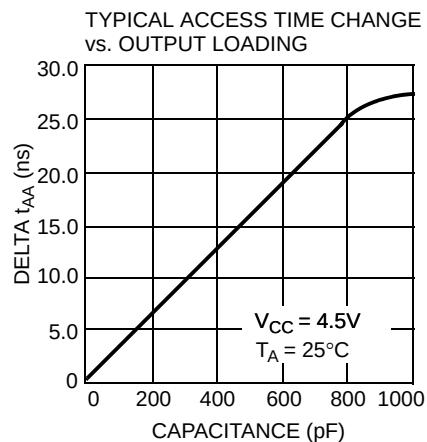
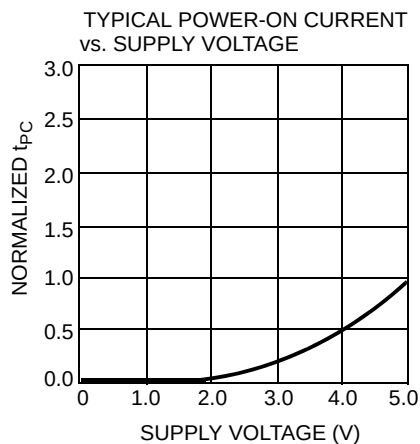
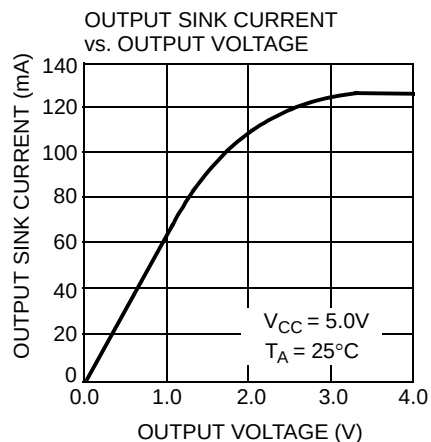
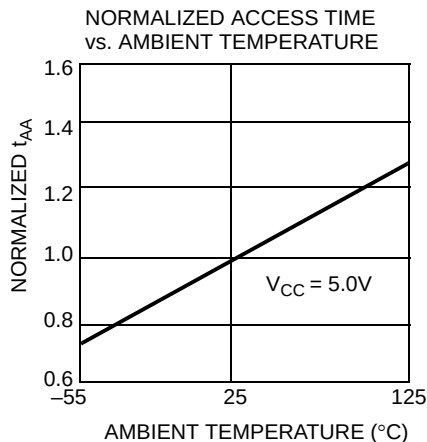
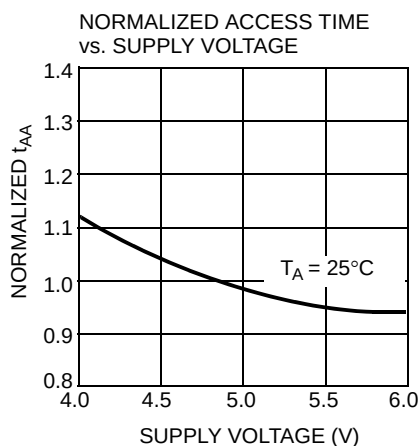
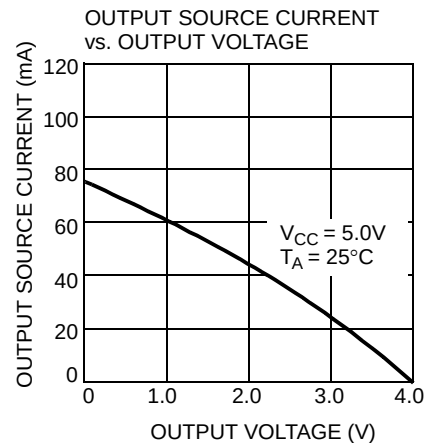
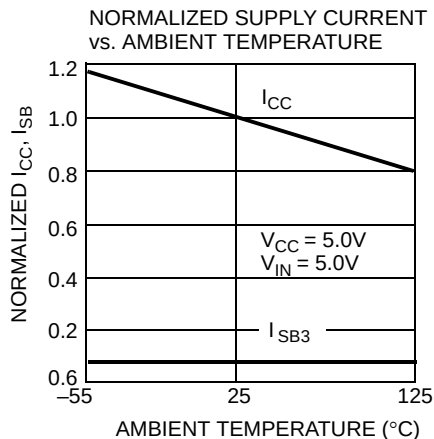
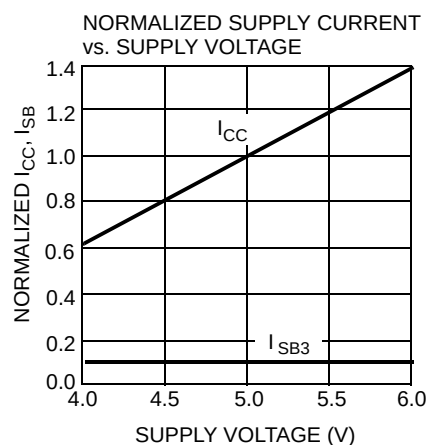


## Switching Waveforms (continued)

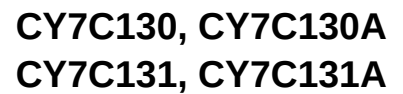
Figure 13. Interrupt Timing Diagrams



## Typical DC and AC Characteristics







| Speed (ns) | Ordering Code  | Package Name | Package Type                               | Operating Range |
|------------|----------------|--------------|--------------------------------------------|-----------------|
| 55         | CY7C130-55PC   | P25          | 48-pin (600 Mil) Molded DIP                | Commercial      |
| 15         | CY7C131A-15JXI | J69          | 52-pin Pb-free Plastic Leaded Chip Carrier | Industrial      |
|            | CY7C131-15NXI  | N52          | 52-pin Pb-free Plastic Quad Flatpack       |                 |
| 25         | CY7C131-25JXC  | J69          | 52-pin Pb-free Plastic Leaded Chip Carrier | Commercial      |
|            | CY7C131-25NXC  | N52          | 52-pin Pb-free Plastic Quad Flatpack       |                 |
| 55         | CY7C131-55JXC  | J69          | 52-pin Pb-free Plastic Leaded Chip Carrier | Commercial      |
|            | CY7C131-55NXC  | N52          | 52-pin Pb-free Plastic Quad Flatpack       |                 |
|            | CY7C131-55JXI  | J69          | 52-pin Pb-free Plastic Leaded Chip Carrier | Industrial      |
|            | CY7C131-55NXI  | N52          | 52-pin Pb-free Plastic Quad Flatpack       |                 |

The diagram illustrates the components of the part number CY7C131A-15PXXJXN:

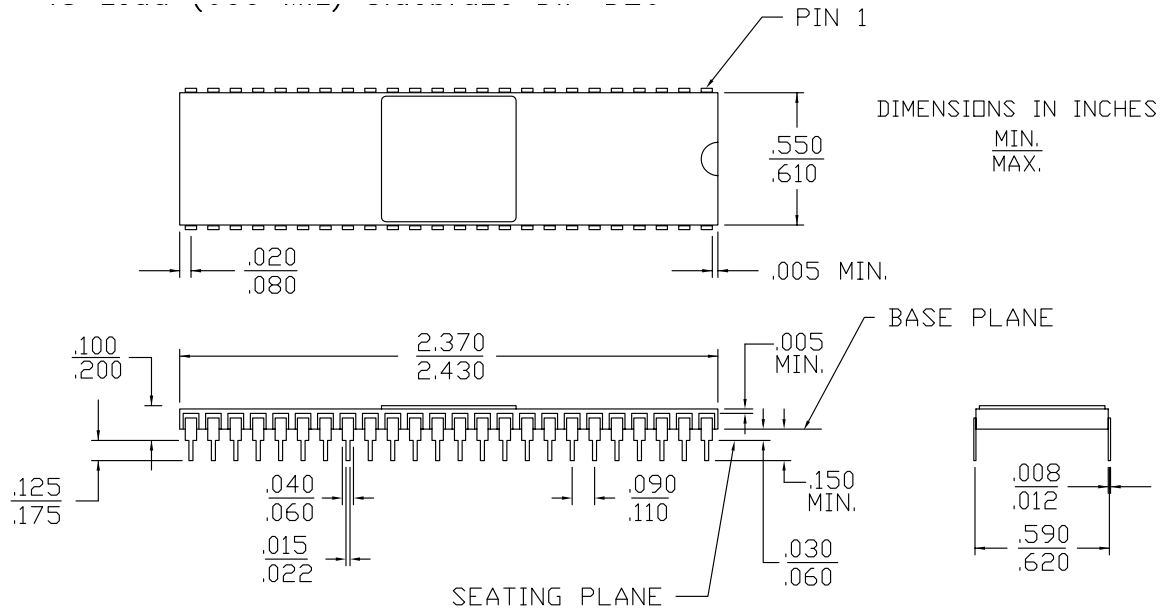
- CY7C**: Cypress SRAMs
- 13XX**: Part number identifier (131 or 131A)
- XX**: Speed (55, 15, or 25 ns)
- XX**: Package type (P, JX, or NX)
- X**: Temperature Range (C for Commercial, I for Industrial)

Additional details from the diagram:

- P = 48-pin Molded DIP
- JX = 52-pin Plastic Leaded Chip Carrier (Pb-free)
- NX = 52-pin Plastic Quad Flatpack (Pb-free)
- N = 52-pin Plastic Quad Flatpack

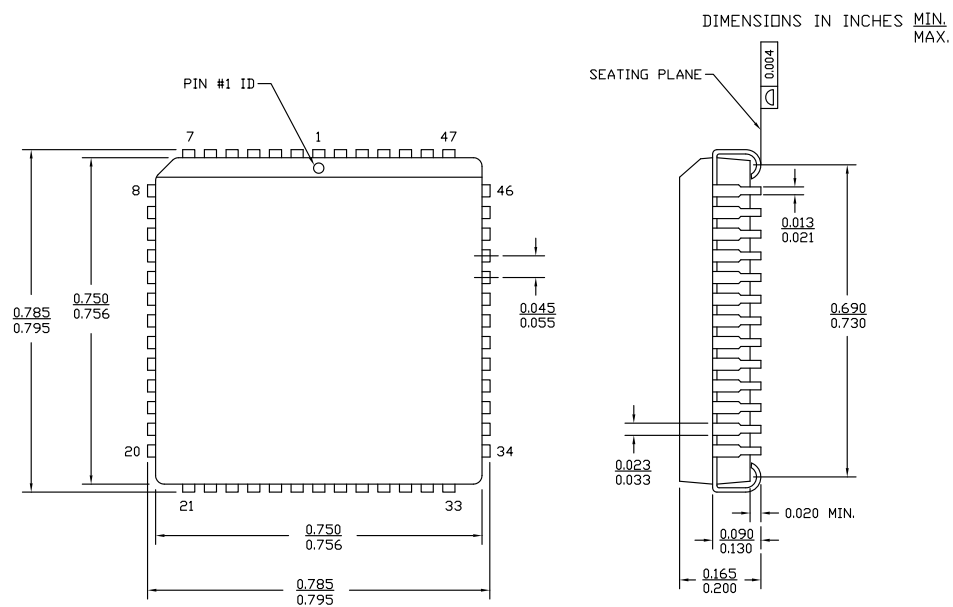
## Package Diagrams

**Figure 14. 48-pin (600 Mil) Sidebrazed DIP D26**



51-80044 \*B

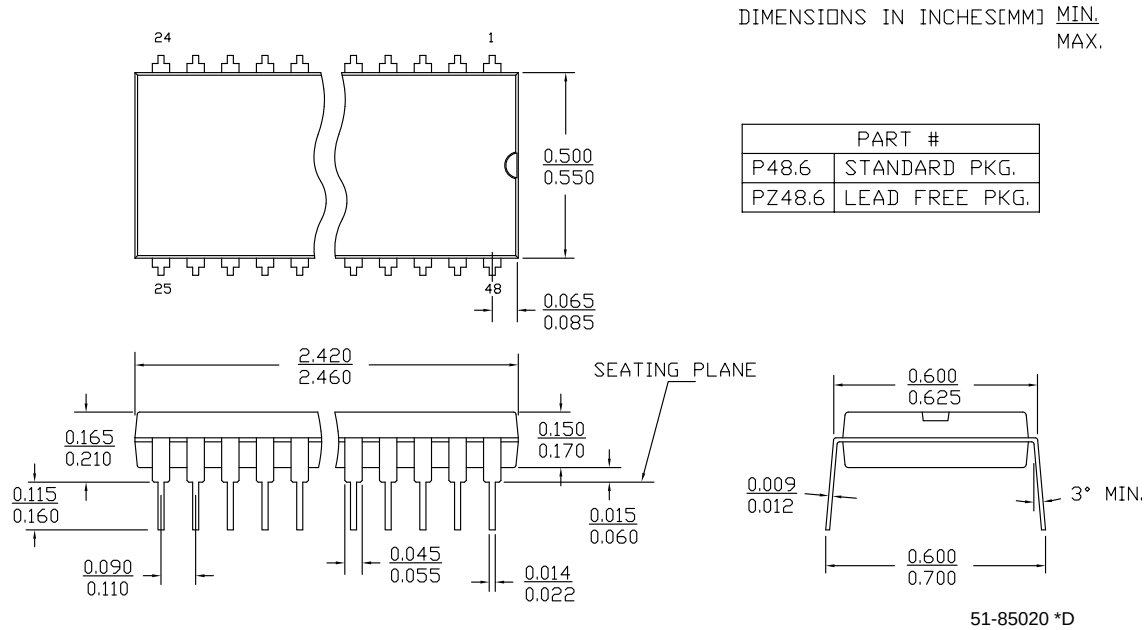
**Figure 15. 52-pin Pb-free Plastic Leaded Chip Carrier J69**



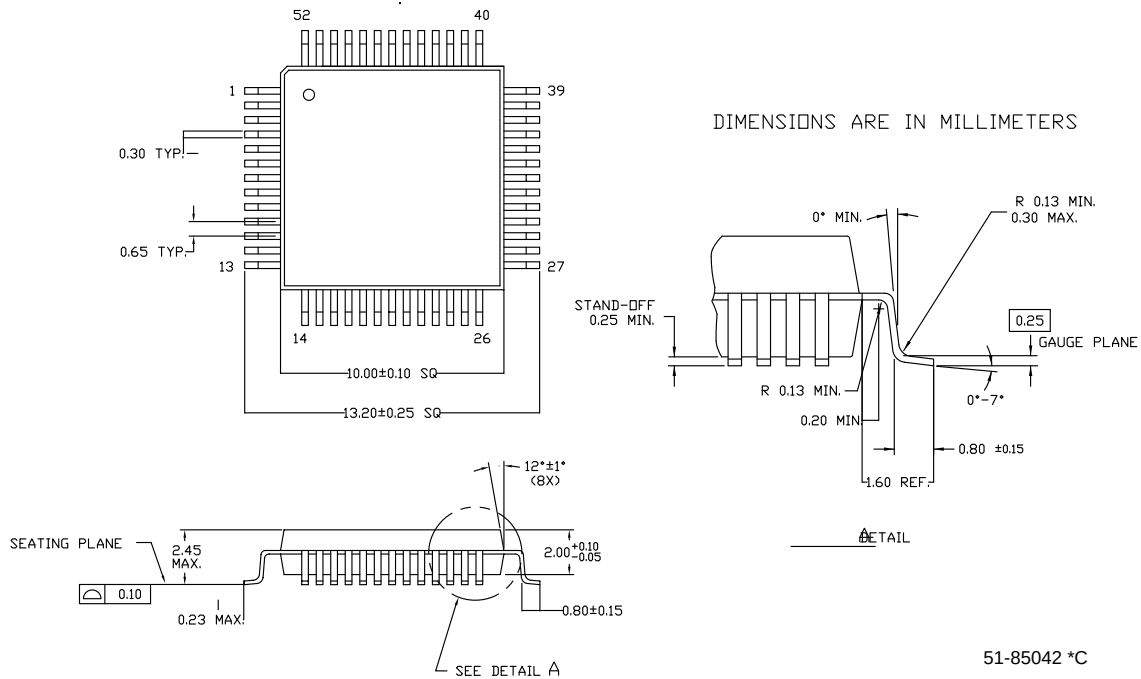
51-85004 \*C

**Package Diagrams** (continued)

**Figure 16. 48-pin (600 Mil) Molded DIP P25**



**Figure 17. 52-pin Pb-free Plastic Quad Flatpack N52**



## Acronyms

| Acronym | Description                             |
|---------|-----------------------------------------|
| CE      | chip enable                             |
| CMOS    | complementary metal oxide semiconductor |
| DIP     | dual in-line package                    |
| I/O     | input/output                            |
| OE      | output enable                           |
| PLCC    | plastic leaded chip carrier             |
| PQFP    | plastic quad flat pack                  |
| SRAM    | static random access memory             |
| TQFP    | thin quad flat pack                     |
| TTL     | Transistor–transistor logic             |

## Document Conventions

### Units of Measure

| Symbol | Unit of Measure |
|--------|-----------------|
| °C     | degree Celcius  |
| MHz    | megahertz       |
| μA     | microamperes    |
| mA     | milliamperes    |
| ms     | milliseconds    |
| mV     | millivolts      |
| ns     | nanoseconds     |
| pF     | picofarad       |
| V      | volts           |
| W      | watts           |

## Document History Page

| Document Title: CY7C130/CY7C130A/CY7C131/CY7C131A 1K x 8 Dual-Port Static RAM<br>Document Number: 38-06002 |         |                 |                 |                                                                                                                                                                                                                                                                       |
|------------------------------------------------------------------------------------------------------------|---------|-----------------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Rev.                                                                                                       | ECN No. | Orig. of Change | Submission Date | Description of Change                                                                                                                                                                                                                                                 |
| **                                                                                                         | 110169  | SZV             | 09/29/01        | Change from Spec number: 38-00027 to 38-06002                                                                                                                                                                                                                         |
| *A                                                                                                         | 122255  | RBI             | 12/26/02        | Power up requirements added to Maximum Ratings Information                                                                                                                                                                                                            |
| *B                                                                                                         | 236751  | YDT             | See ECN         | Removed cross information from features section                                                                                                                                                                                                                       |
| *C                                                                                                         | 325936  | RUJ             | See ECN         | Added pin definitions table, 52-pin PQFP package diagram and Pb-free information                                                                                                                                                                                      |
| *D                                                                                                         | 393153  | YIM             | See ECN         | Added CY7C131-15JI to ordering information<br>Added Pb-Free parts to ordering information:<br>CY7C131-15JXI                                                                                                                                                           |
| *E                                                                                                         | 2623540 | VKN/PYRS        | 12/17/08        | Added CY7C130A and CY7C131A parts<br>Removed military information<br>Updated ordering information table                                                                                                                                                               |
| *F                                                                                                         | 2897217 | RAME            | 03/22/2010      | Updated Ordering Information<br>Updated Package Diagrams                                                                                                                                                                                                              |
| *G                                                                                                         | 3054633 | ADMU            | 10/11/2010      | Updated <a href="#">Ordering Information</a> and added <a href="#">Ordering Code Definitions</a> .<br>Updated <a href="#">Package Diagrams</a> .<br>Added <a href="#">Acronyms</a> and <a href="#">Units of Measure</a> .<br>Minor edits and updated in new template. |
| *H                                                                                                         | 3402163 | ADMU            | 10/12/2011      | Removed pruned part CY7C131-25NC from <a href="#">Ordering Information</a><br>Updated <a href="#">Package Diagrams</a> .                                                                                                                                              |

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