

## 32K x 8 Power Switched and Reprogrammable PROM

## Features

- CMOS for optimum speed/power
- Windowed for reprogrammability
- High speed
  - 30 ns (Commercial)
  - 35 ns (Military)
- Low power
  - 660 mW (commercial)
  - 715 mW (military)
- Super low standby power
  - Less than 165 mW when deselected
- EPROM technology 100% programmable
- Slim 300-mil package (7C271)
- Direct replacement for bipolar PROMs
- Capable of withstanding >2001V static discharge

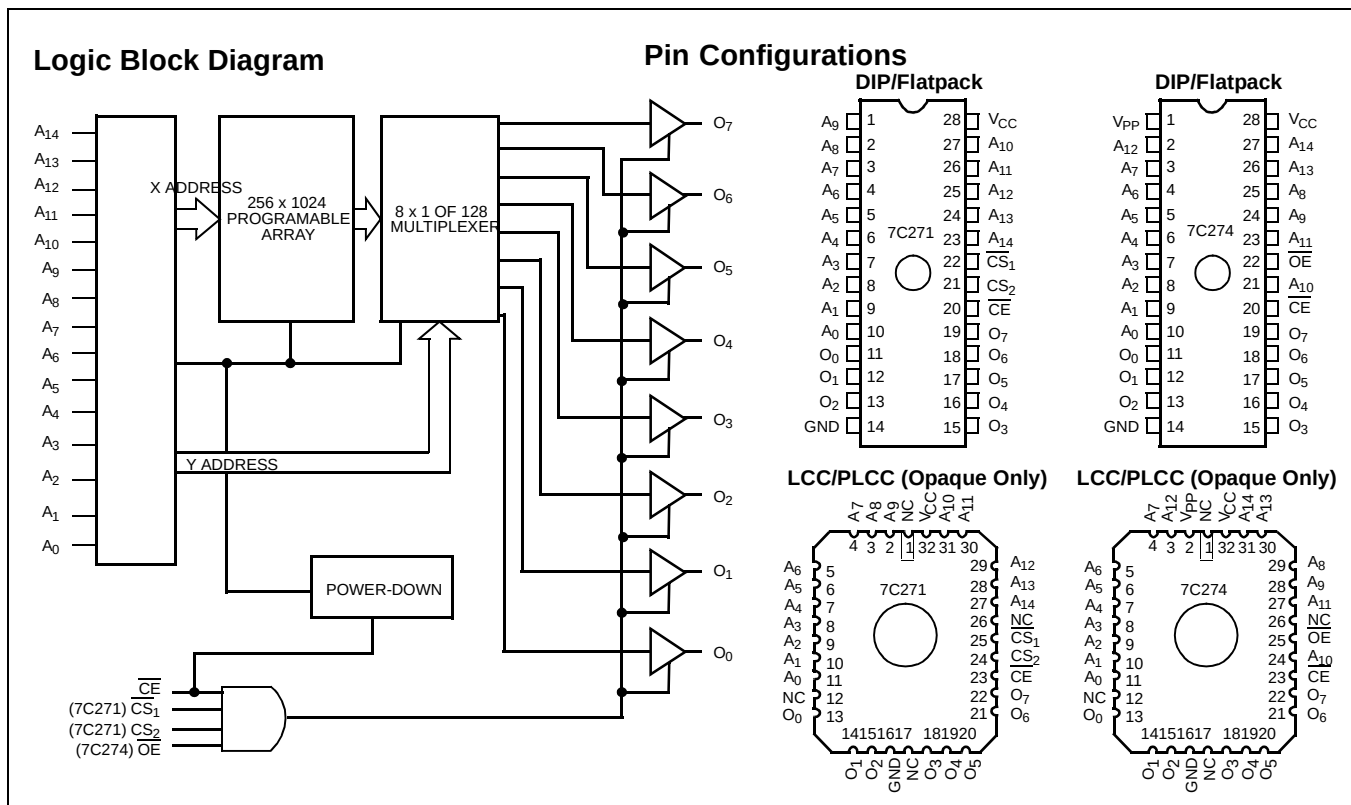
## Functional Description

The CY7C271 and CY7C274 are high-performance 32,768-word by 8-bit CMOS PROMs. When disabled ( $\overline{\text{CE}}$  HIGH), the 7C271/7C274 automatically powers down into a

low-power stand-by mode. The CY7C271 is packaged in the 300-mil slim package. The CY7C274 is packaged in the industry standard 600-mil package. Both the CY7C271 and CY7C274 are available in a cerDIP package equipped with an erasure window to provide for reprogrammability. When exposed to UV light, the PROM is erased and can be reprogrammed. The memory cells utilize proven EPROM floating gate technology and byte-wide intelligent programming algorithms.

The CY7C271 and CY7C274 offer the advantage of lower power, superior performance, and programming yield. The EPROM cell requires only 12.5V for the super voltage, and low current requirements allow for gang programming. The EPROM cells allow each memory location to be tested 100% because each location is written into, erased, and repeatedly exercised prior to encapsulation. Each PROM is also tested for AC performance to guarantee that after customer programming, the product will meet DC and AC specification limits.

Reading the 7C271 is accomplished by placing active LOW signals on CS<sub>1</sub> and CE, and an active HIGH on CS<sub>2</sub>. Reading the 7C274 is accomplished by placing active LOW signals on OE and CE. The contents of the memory location addressed by the address lines (A<sub>0</sub>–A<sub>14</sub>) will become available on the output lines (O<sub>0</sub>–O<sub>7</sub>).



## Selection Guide

|                           |          | 7C274-30 | 7C271-35<br>7C274-35 | 7C271-45<br>7C274-45 | 7C271-55 | Unit |
|---------------------------|----------|----------|----------------------|----------------------|----------|------|
| Maximum Access Time       |          | 30       | 35                   | 45                   | 55       | ns   |
| Maximum Operating Current | Com'l    | 120      | 120                  | 120                  | 120      | mA   |
|                           | Military |          | 130                  | 130                  | 130      | mA   |
| Standby Current           | Com'l    | 30       | 30                   | 30                   | 30       | mA   |
|                           | Military |          | 40                   | 40                   | 40       | mA   |

### Maximum Ratings<sup>[1]</sup>

(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 ..... -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

DC Program Voltage ..... 13.0V

Static Discharge Voltage..... >2001V  
(per MIL-STD-883, Method 3015)

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

UV Exposure ..... 7258 Wsec/cm<sup>2</sup>

### Operating Range

| Range                   | Ambient Temperature | V <sub>CC</sub> |
|-------------------------|---------------------|-----------------|
| Commercial              | 0°C to +70°C        | 5V ±10%         |
| Military <sup>[2]</sup> | -55°C to +125°C     | 5V ±10%         |

### Electrical Characteristics Over the Operating Range<sup>[3]</sup>

| Parameter        | Description                                 | Test Conditions                                                                                | 7C271- 35, 45, 55<br>7C274-30, 35, 45, |                 | Unit |
|------------------|---------------------------------------------|------------------------------------------------------------------------------------------------|----------------------------------------|-----------------|------|
|                  |                                             |                                                                                                | Min.                                   | Max.            |      |
| V <sub>OH</sub>  | Output HIGH Voltage                         | V <sub>CC</sub> = Min., I <sub>OH</sub> = −2.0 mA                                              | 2.4                                    |                 | V    |
| V <sub>OL</sub>  | Output LOW Voltage                          | V <sub>CC</sub> = Min., I <sub>OL</sub> = 8.0 mA <sup>[4]</sup>                                |                                        | 0.4             | V    |
| V <sub>IH</sub>  | Input HIGH Level                            | Guaranteed Input Logical HIGH Voltage for All Inputs                                           | 2.0                                    | V <sub>CC</sub> | V    |
| V <sub>IL</sub>  | Input LOW Level                             | Guaranteed Input Logical LOW Voltage for All Inputs                                            |                                        | 0.8             | V    |
| I <sub>IX</sub>  | Input Current                               | GND ≤ V <sub>IN</sub> ≤ V <sub>CC</sub>                                                        | −10                                    | +10             | μA   |
| I <sub>OZ</sub>  | Output Leakage Current                      | GND ≤ V <sub>OUT</sub> ≤ V <sub>CC</sub> , Output Disabled                                     | −40                                    | +40             | μA   |
| I <sub>OS</sub>  | Output Short Circuit Current <sup>[5]</sup> | V <sub>CC</sub> = Max., V <sub>OUT</sub> = GND                                                 | −20                                    | −90             | mA   |
| I <sub>CC</sub>  | Power Supply Current                        | V <sub>CC</sub> = Max., V <sub>IN</sub> = 2.0V,<br>I <sub>OUT</sub> = 0 mA, CE=V <sub>IL</sub> | Commercial                             | 120             | mA   |
|                  |                                             |                                                                                                | Military                               | 130             |      |
| I <sub>SB</sub>  | Standby Supply Current                      | V <sub>CC</sub> = Max., CE = V <sub>IH</sub> ,<br>I <sub>OUT</sub> = 0 mA                      | Commercial                             | 30              | mA   |
|                  |                                             |                                                                                                | Military                               | 40              |      |
| V <sub>PP</sub>  | Programming Supply Voltage                  |                                                                                                | 12                                     | 13              | V    |
| I <sub>PP</sub>  | Programming Supply Current                  |                                                                                                |                                        | 50              | mA   |
| V <sub>IHP</sub> | Input HIGH Programming Voltage              |                                                                                                | 3.0                                    |                 | V    |
| V <sub>ILP</sub> | Input LOW Programming Voltage               |                                                                                                |                                        | 0.4             | V    |

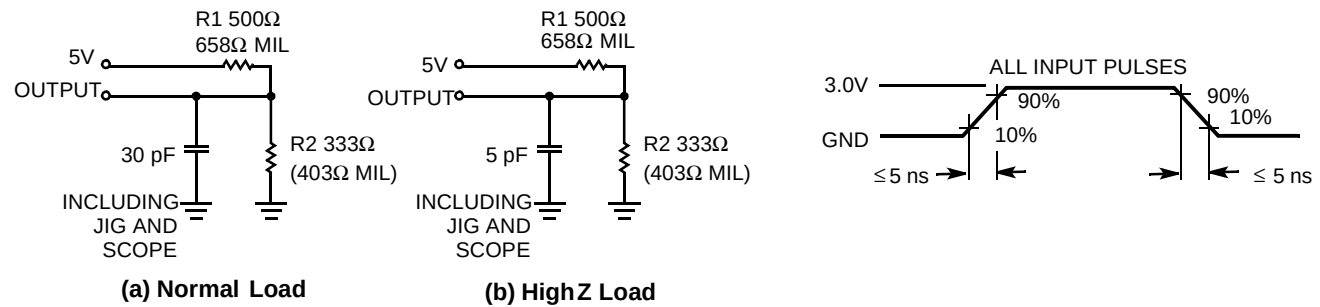
#### Notes:

- The voltage on any input or I/O pin cannot exceed the power pin during power-up.
- T<sub>A</sub> is the "instant on" case temperature.
- See the last page of this specification for Group A subgroup testing information.
- 6.0 mA military
- For test purposes, not more than one output at a time should be shorted. Short circuit test duration should not exceed 30 seconds.

## Capacitance<sup>[6]</sup>

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

## AC Test Loads and Waveforms<sup>[6]</sup>



Equivalent to: THÉVENIN EQUIVALENT



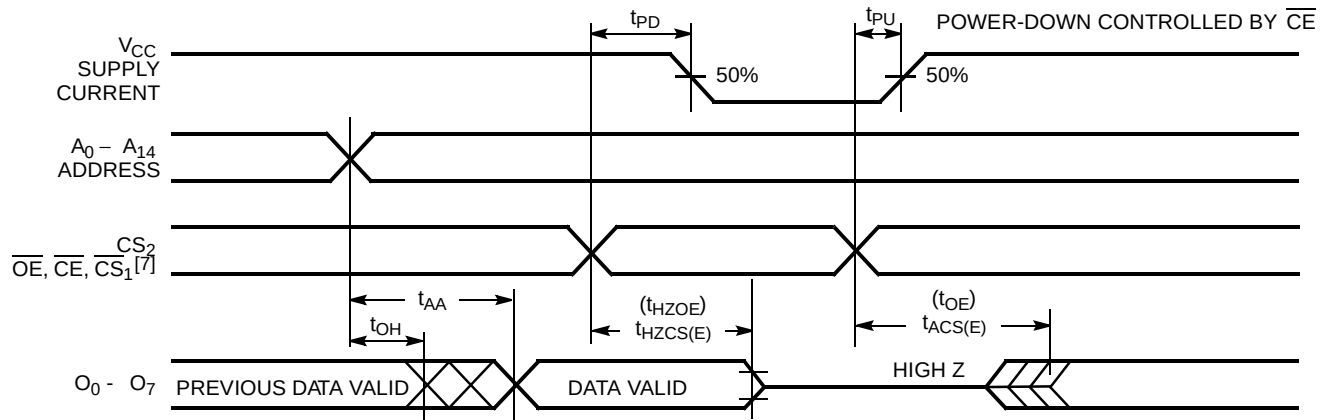
## Switching Characteristics Over the Operating Range<sup>[3,6]</sup>

| Parameter  | Description                                                                     | 7C274-30 |      | 7C271-35<br>7C274-35 |      | 7C271-45<br>7C274-45 |      | 7C271-55 |      | Unit |
|------------|---------------------------------------------------------------------------------|----------|------|----------------------|------|----------------------|------|----------|------|------|
|            |                                                                                 | Min.     | Max. | Min.                 | Max. | Min.                 | Max. | Min.     | Max. |      |
| $t_{AA}$   | Address to Output Valid                                                         |          | 30   |                      | 35   |                      | 45   |          | 55   | ns   |
| $t_{HZCS}$ | Chip Select Inactive to High Z ( $\overline{CS}_1$ and $CS_2$ , 7C271 Only)     |          | 20   |                      | 25   |                      | 30   |          | 30   | ns   |
| $t_{ACS}$  | Chip Select Active to Output Valid ( $\overline{CS}_1$ and $CS_2$ , 7C271 Only) |          | 20   |                      | 25   |                      | 30   |          | 30   | ns   |
| $t_{HZOE}$ | Output Enable Inactive to High Z ( $\overline{OE}$ , 7C274 Only)                |          | 20   |                      | 20   |                      | 25   |          | 25   | ns   |
| $t_{OE}$   | Output Enable Active to Output Valid ( $\overline{OE}$ , 7C274 Only)            |          | 20   |                      | 20   |                      | 25   |          | 25   | ns   |
| $t_{HZCE}$ | Chip Enable Inactive to High Z ( $\overline{CE}$ Only)                          |          | 35   |                      | 40   |                      | 50   |          | 60   | ns   |
| $t_{ACE}$  | Chip Enable Active to Output Valid ( $\overline{CE}$ Only)                      |          | 35   |                      | 40   |                      | 50   |          | 60   | ns   |
| $t_{PU}$   | Chip Enable Active to Power Up                                                  | 0        |      | 0                    |      | 0                    |      | 0        |      | ns   |
| $t_{PD}$   | Chip Enable Inactive to Power Down                                              |          | 35   |                      | 40   |                      | 50   |          | 60   | ns   |
| $t_{OH}$   | Output Hold from Address Change                                                 | 0        |      | 0                    |      | 0                    |      | 0        |      | ns   |

Note:

6. See Introduction to CMOS PROMs for general information on testing.

## Switching Waveform



**Note:**

7.  $\overline{CS_2}$  and  $\overline{CS_1}$  are used on the 7C271 only.  $\overline{OE}$  is used on the 7C274 only.

## Erase Characteristics

Wavelengths of light less than 4000 angstroms begin to erase the CY7C271 and CY7C274 in the windowed package. For this reason, an opaque label should be placed over the window if the PROM is exposed to sunlight or fluorescent lighting for extended periods of time.

The recommended dose of ultraviolet light for erasure is a wavelength of 2537 angstroms for a minimum dose (UV intensity  $\times$  exposure time) of 25 Wsec/cm<sup>2</sup>. For an ultraviolet lamp with a 12 mW/cm<sup>2</sup> power rating, the exposure time would be approximately 35 minutes. The CY7C271 or CY7C274 needs to be within 1

inch of the lamp during erasure. Permanent damage may result if the PROM is exposed to high-intensity UV light for an extended period of time. 7258 Wsec/cm<sup>2</sup> is the recommended maximum dosage.

## Programming Modes

Programming support is available from Cypress as well as from a number of third-party software vendors. For detailed programming information, including a listing of software packages, please see the PROM Programming Information located at the end of this section. Programming algorithms can be obtained from any Cypress representative.

**Table 1. CY7C271 Mode Selection**

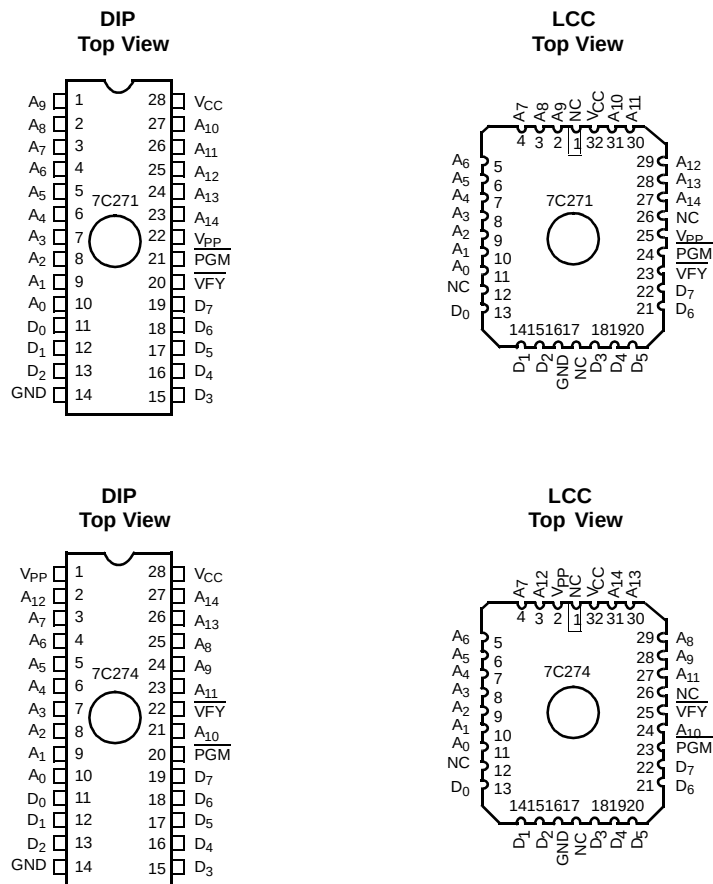
| Mode            | Pin Function <sup>[8]</sup> |              |                  |                                    |                   |                    |
|-----------------|-----------------------------|--------------|------------------|------------------------------------|-------------------|--------------------|
|                 | Read or Output Disable      | $A_{14}-A_0$ | CE               | $\overline{CS_2}$                  | $\overline{CS_1}$ | $O_7-O_0$          |
|                 | Other                       | $A_{14}-A_0$ | V <sub>FY</sub>  | PGM                                | V <sub>PP</sub>   | D <sub>7-D_0</sub> |
| Read            |                             | $A_{14}-A_0$ | V <sub>IL</sub>  | V <sub>IH</sub>                    | V <sub>IL</sub>   | $O_7-O_0$          |
| Power Down      |                             | $A_{14}-A_0$ | V <sub>IH</sub>  | X                                  | X                 | High Z             |
| Output Disable  |                             | $A_{14}-A_0$ | X                | V <sub>IL</sub>                    | X                 | High Z             |
| Output Disable  |                             | $A_{14}-A_0$ | X                | X                                  | V <sub>IH</sub>   | High Z             |
| Program         |                             | $A_{14}-A_0$ | V <sub>IHP</sub> | V <sub>ILP</sub>                   | V <sub>PP</sub>   | D <sub>7-D_0</sub> |
| Program Verify  |                             | $A_{14}-A_0$ | V <sub>ILP</sub> | V <sub>IHP</sub> /V <sub>ILP</sub> | V <sub>PP</sub>   | $O_7-O_0$          |
| Program Inhibit |                             | $A_{14}-A_0$ | V <sub>IHP</sub> | V <sub>IHP</sub>                   | V <sub>PP</sub>   | High Z             |
| Blank Check     |                             | $A_{14}-A_0$ | V <sub>ILP</sub> | V <sub>IHP</sub> /V <sub>ILP</sub> | V <sub>PP</sub>   | $O_7-O_0$          |

**Table 2. CY7C274 Mode Selection**

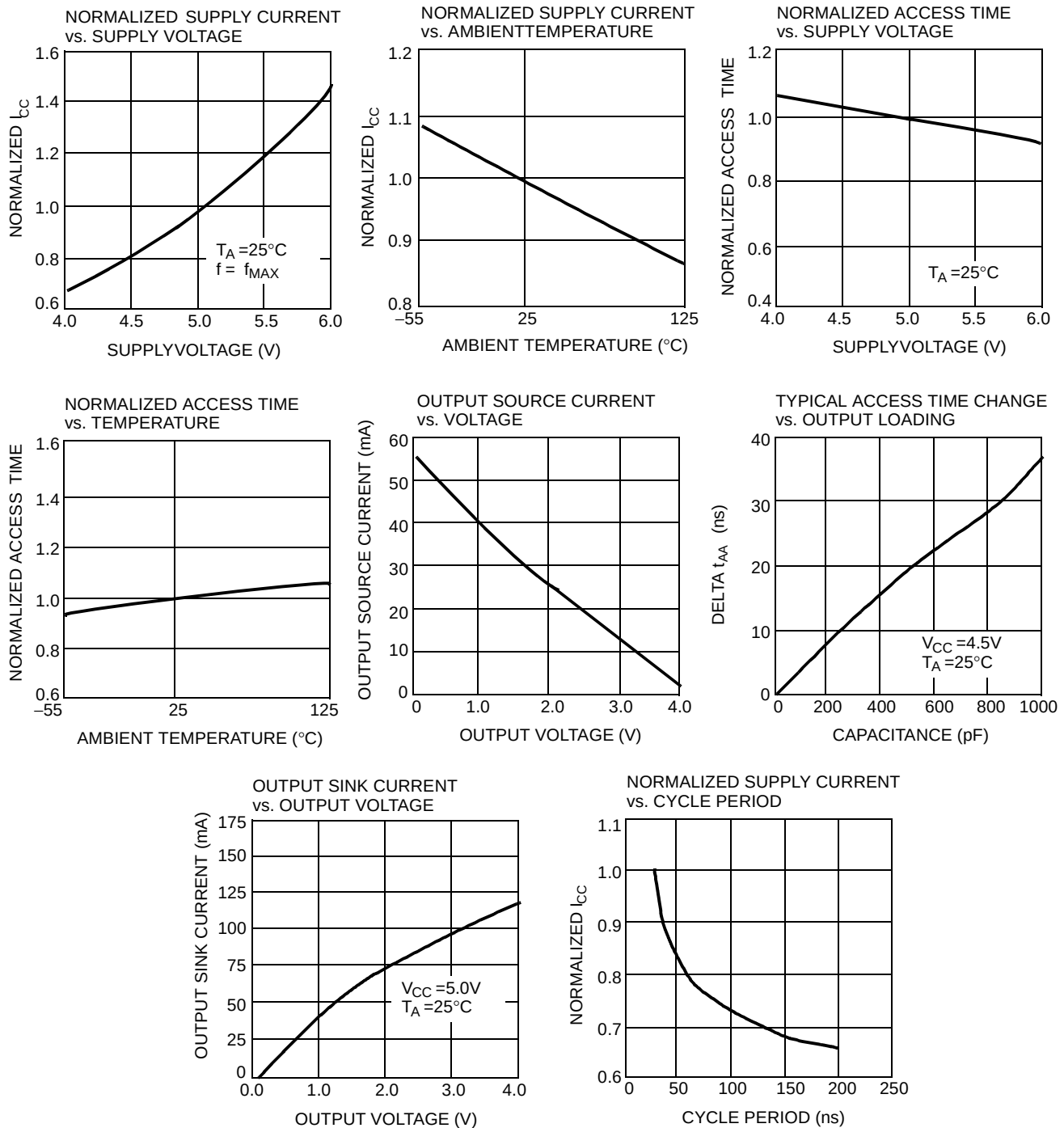
| Mode            | Pin Function <sup>[8]</sup> |                                 |                  |                                    |                 |                                |
|-----------------|-----------------------------|---------------------------------|------------------|------------------------------------|-----------------|--------------------------------|
|                 | Read or Output Disable      | A <sub>14</sub> –A <sub>0</sub> | OE               | CE                                 | V <sub>PP</sub> | O <sub>7</sub> –O <sub>0</sub> |
|                 | Other                       | A <sub>14</sub> –A <sub>0</sub> | VFY              | PGM                                | V <sub>PP</sub> | D <sub>7</sub> –D <sub>0</sub> |
| Read            |                             | A <sub>14</sub> –A <sub>0</sub> | V <sub>IL</sub>  | V <sub>IL</sub>                    | Note 9          | O <sub>7</sub> –O <sub>0</sub> |
| Output Disable  |                             | A <sub>14</sub> –A <sub>0</sub> | V <sub>IH</sub>  | X                                  | X               | High Z                         |
| Power Down      |                             | A <sub>14</sub> –A <sub>0</sub> | X                | V <sub>IH</sub>                    | X               | High Z                         |
| Program         |                             | A <sub>14</sub> –A <sub>0</sub> | V <sub>IHP</sub> | V <sub>ILP</sub>                   | V <sub>PP</sub> | D <sub>7</sub> –D <sub>0</sub> |
| Program Verify  |                             | A <sub>14</sub> –A <sub>0</sub> | V <sub>ILP</sub> | V <sub>IHP</sub> /V <sub>ILP</sub> | V <sub>PP</sub> | O <sub>7</sub> –O <sub>0</sub> |
| Program Inhibit |                             | A <sub>14</sub> –A <sub>0</sub> | V <sub>IHP</sub> | V <sub>IHP</sub>                   | V <sub>PP</sub> | High Z                         |
| Blank Check     |                             | A <sub>14</sub> –A <sub>0</sub> | V <sub>ILP</sub> | V <sub>IHP</sub> /V <sub>ILP</sub> | V <sub>PP</sub> | O <sub>7</sub> –O <sub>0</sub> |

**Note:**

8. X can be V<sub>IL</sub> (V<sub>ILP</sub>) or V<sub>IH</sub> (V<sub>IHP</sub>).  
9. V<sub>PP</sub> should be tied to V<sub>CC</sub> ±5% in read mode.


**Figure 1. Programming Pinouts**

## Typical DC and AC Characteristics



C271-14

## Ordering Information

| Speed (ns) | Ordering Code | Package Name | Package Type                                      | Operating Range |
|------------|---------------|--------------|---------------------------------------------------|-----------------|
| 30         | CY7C274-30WC  | W16          | 28-Lead (600-Mil) Windowed CerDIP                 | Commercial      |
| 35         | CY7C271-35WMB | W22          | 28-Lead (300-Mil) Windowed CerDIP                 | Military        |
|            | CY7C274-35QMB | Q55          | 32-Pin Windowed Rectangular Leadless Chip Carrier |                 |
| 45         | CY7C271-45QMB | Q55          | 32-Pin Windowed Rectangular Leadless Chip Carrier |                 |
|            | CY7C271-45WMB | W22          | 28-Lead (300-Mil) Windowed CerDIP                 | Commercial      |
|            | CY7C274-45JC  | J65          | 32-Lead Plastic Leaded Chip Carrier               |                 |
|            | CY7C274-45WMB | W16          | 28-Lead (600-Mil) Windowed CerDIP                 | Military        |
| 55         | CY7C271-55WMB | W22          | 28-Lead (300-Mil) Windowed CerDIP                 |                 |
|            | CY7C271-55QMB | Q55          | 32-Pin Windowed Rectangular Leadless Chip Carrier |                 |

## MILITARY SPECIFICATIONS

### Group A Subgroup Testing

### DC Characteristics

| Parameter | Subgroups |
|-----------|-----------|
| $V_{OH}$  | 1, 2, 3   |
| $V_{OL}$  | 1, 2, 3   |
| $V_{IH}$  | 1, 2, 3   |
| $V_{IL}$  | 1, 2, 3   |
| $I_{IX}$  | 1, 2, 3   |
| $I_{OZ}$  | 1, 2, 3   |
| $I_{CC}$  | 1, 2, 3   |
| $I_{SB}$  | 1, 2, 3   |

### Switching Characteristics

| Parameter        | Subgroups       |
|------------------|-----------------|
| $t_{AA}$         | 7, 8, 9, 10, 11 |
| $t_{ACS}^{[10]}$ | 7, 8, 9, 10, 11 |
| $t_{OE}^{[11]}$  | 7, 8, 9, 10, 11 |
| $t_{ACE}$        | 7, 8, 9, 10, 11 |

**Note:**

10. 7C271 only ( $\overline{CS}_1$  and  $CS_2$ ).

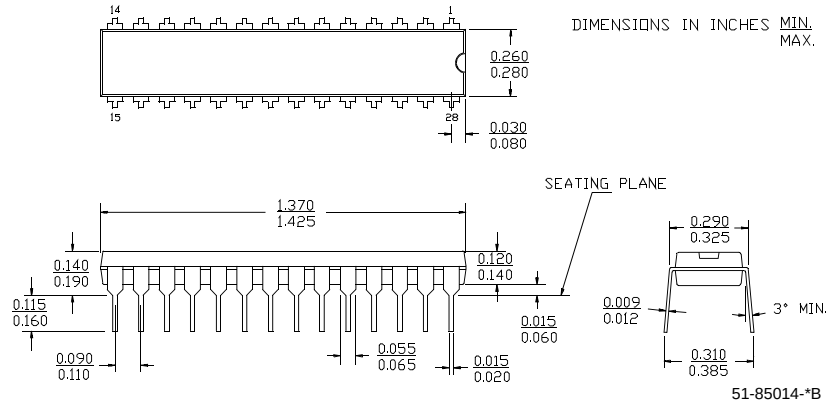
11. 7C274 only.

### SMD Cross Reference

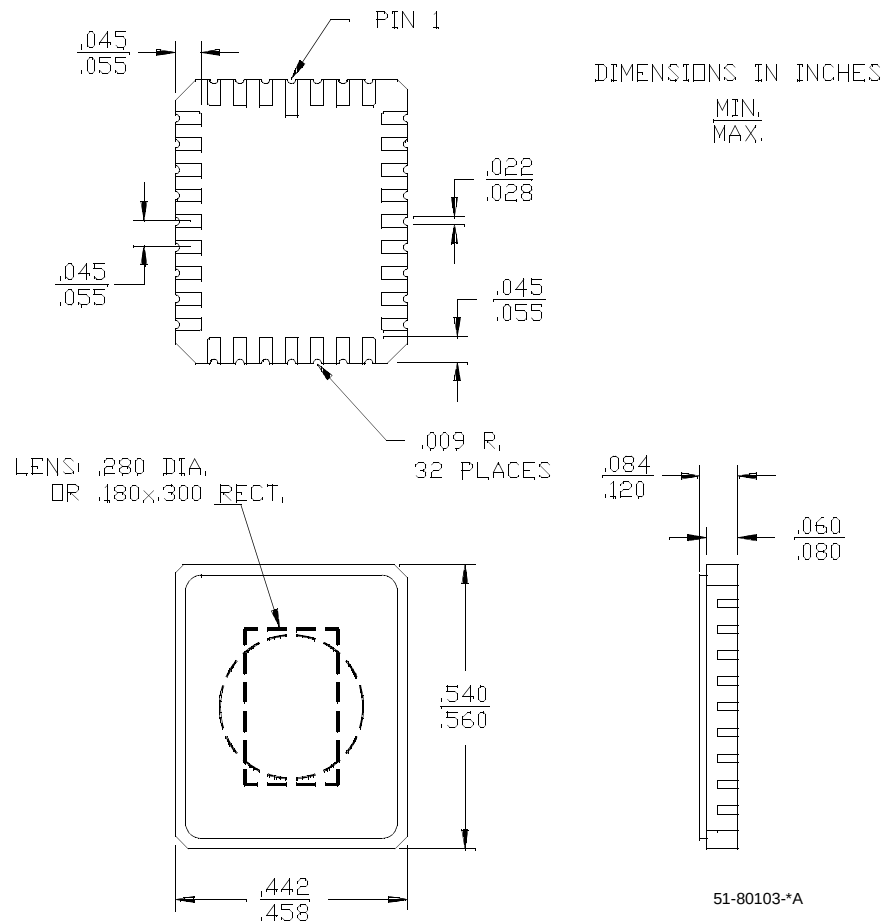
| SMD Number | Suffix | Cypress Number |
|------------|--------|----------------|
| 5962-89817 | 01ZX   | CY7C271-55QMB  |
| 5962-89817 | 02XX   | CY7C271-45WMB  |
| 5962-89817 | 02ZX   | CY7C271-45QMB  |

## Package Diagrams

### 28-Lead (300-Mil) Molded DIP P21



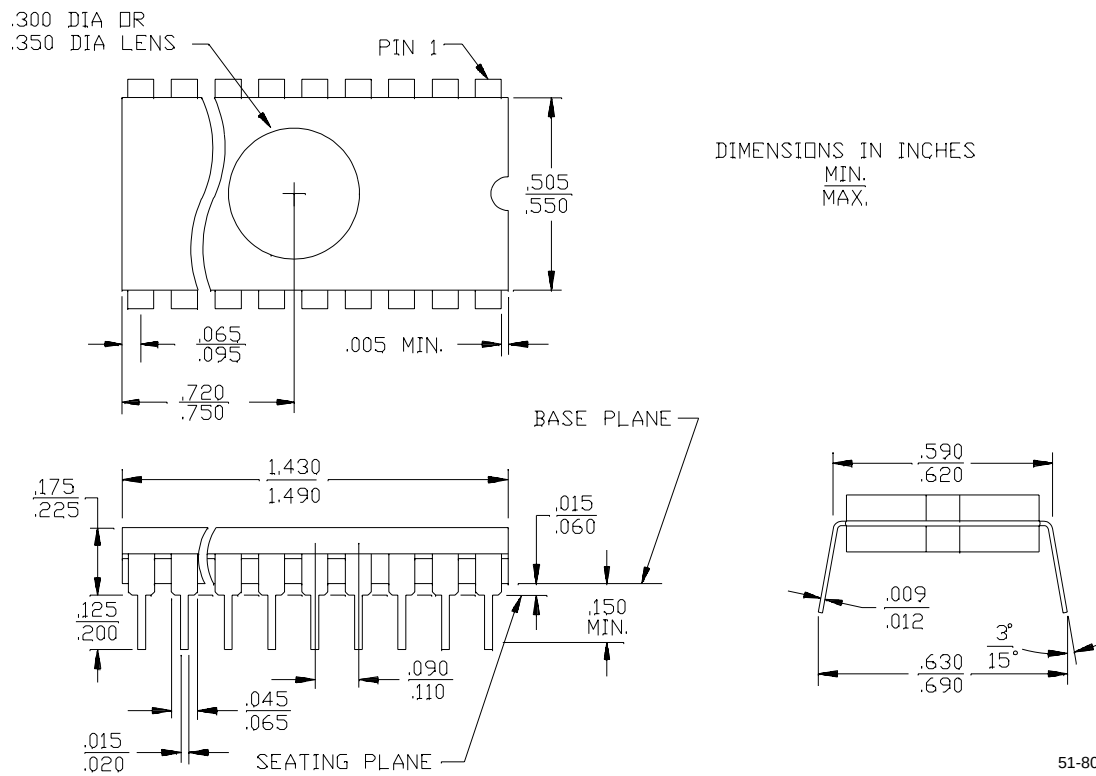
### 32-Pin Windowed Rectangular Leadless Chip Carrier Q55 MIL-STD-1835 C-12





Package Diagrams (continued)

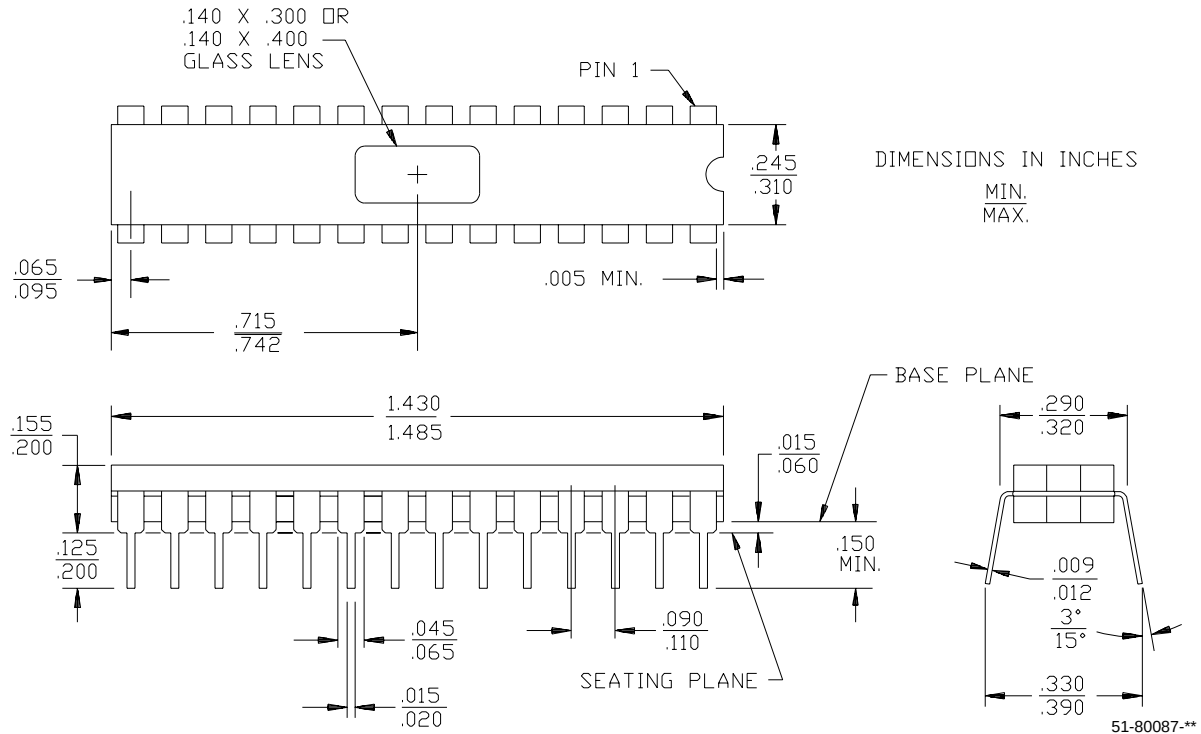
**28-Lead (600-Mil) Windowed CerDIP W16**  
MIL-STD-1835 D-10 Config. A



51-80020-\*\*

Package Diagrams (continued)

**28-Lead (300-Mil) Windowed CerDIP W22**  
MIL-STD-1835 D-15 Config. A



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**Document History Page**

| Document Title: CY7C271 CY7C274 32K x 8 Power Switched and Reprogrammable PROM<br>Document Number: 38-04008 |         |            |                 |                                                               |
|-------------------------------------------------------------------------------------------------------------|---------|------------|-----------------|---------------------------------------------------------------|
| REV.                                                                                                        | ECN NO. | Issue Date | Orig. of Change | Description of Change                                         |
| **                                                                                                          | 113864  | 3/8/02     | DSG             | Change from Spec number: 38-00068 to 38-04008                 |
| A*                                                                                                          | 118899  | 10/10/02   | GBI             | Updating Ordering Information                                 |
| *B                                                                                                          | 122249  | 12/27/02   | RBI             | Add power up requirements to Operating Conditions information |