# CY27C256

## 32K x 8-Bit CMOS EPROM

### Features

- **Wide speed range**
  - **— 45 ns to 200 ns (commercial and military)**
- **Low power**
  - **— 248 mW (commercial)**
  - **— 303 mW (military)**
- **Low standby power**
  - **— Less than 83 mW when deselected**
- **±10% Power supply tolerance**

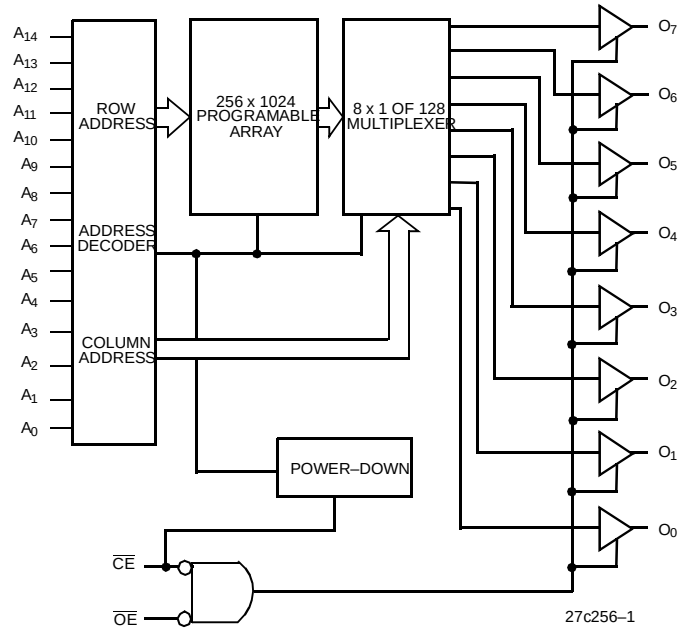
### Functional Description

The CY27C256 is a high-performance 32,768-word by 8-bit CMOS EPROM. When disabled ($\overline{CE}$ HIGH), the CY27C256 automatically powers down into a low-power stand-by mode. The CY27C256 is packaged in the industry standard 600-mil DIP, PLCC, and TSOP packages. The CY27C256 is also available in a CerDIP package equipped with an erasure window to provide for reprogrammability. When exposed to UV light, the EPROM is erased and can be reprogrammed. The memory cells utilize proven EPROM floating gate technology and byte-wide intelligent programming algorithms.

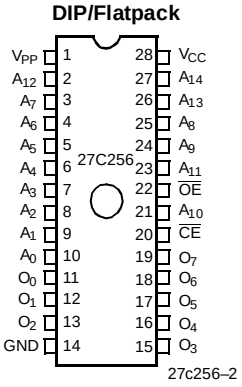
The CY27C256 offers the advantage of lower power and superior performance and programming yield. The EPROM cell requires only 12.5V for the super voltage, and low current requirements allow for gang programming. The EPROM cells allow each memory location to be tested 100% because each location is written into, erased, and repeatedly exercised prior to encapsulation. Each EPROM is also tested for AC performance to guarantee that after customer programming, the product will meet both DC and AC specification limits.

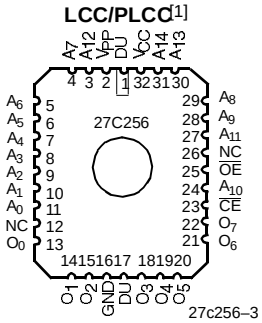
Reading the CY27C256 is accomplished by placing active LOW signals on $\overline{OE}$ and $\overline{CE}$. The contents of the memory location addressed by the address lines ($A_0$ - $A_{14}$) will become available on the output lines ($O_0$ - $O_7$).

### Logic Block Diagram




### Pin Configurations




**Note:**

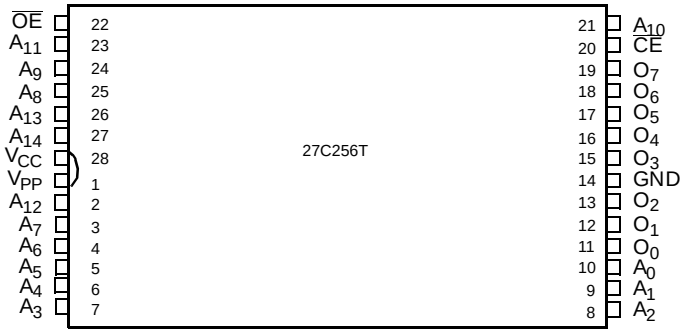
1. For PLCC only: Pins 1 and 17 are common and tied to the die attach pad. They must therefore be DU (don't use) for the PLCC package.

## Selection Guide

| | | 27C256-45 | 27C256-55 | 27C256-70 | 27C256-90 | 27C256-120 | 27C256-150 | 27C256-200 |
|---|---|---|---|---|---|---|---|---|
| Maximum Access Time (ns) | | 45 | 55 | 70 | 90 | 120 | 150 | 200 |
| Maximum Operating Current (mA) | Com'l | 45 | 45 | 45 | 45 | 45 | 45 | 45 |
| | Mil | 55 | 55 | 55 | 55 | 55 | 55 | 55 |
| Standby Current (mA) | Com'l | 15 | 15 | 15 | 15 | 15 | 15 | 15 |
| | Mil | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Chip Select Time (ns) | | 45 | 55 | 70 | 90 | 120 | 150 | 200 |
| Output Enable Time (ns) | | 15 | 20 | 25 | 30 | 30 | 40 | 40 |

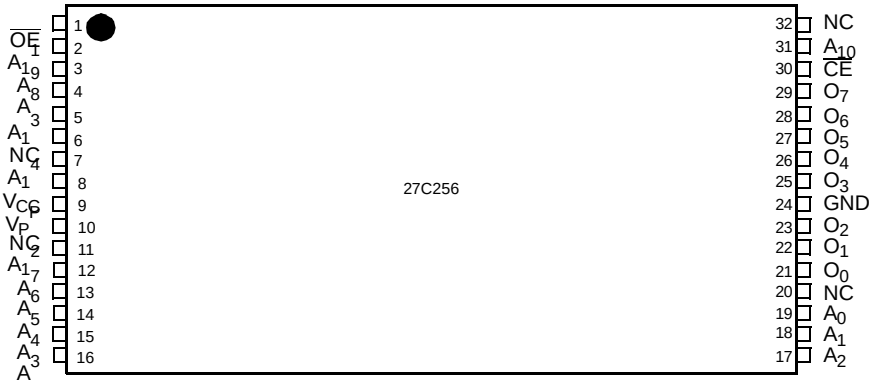
## Pin Configurations

**28-Pin TSOP**
**Top View**




27c256–4

**32-Pin TSOP**
**Top View**




27c256–5

## Maximum Ratings

(Above which the useful life may be impaired. For user guidelines, not tested.)

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

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

Supply Voltage to Ground Potential.....-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$^2$

## Operating Range

| Range | Ambient Temperature | $V_{CC}$ |
|---|---|---|
| Commercial | 0°C to +70°C | 5V ±10% |
| Industrial[2] | -40°C to +85°C | 5V ±10% |
| Military[3] | -55°C to +125°C | 5V ±10% |

## Electrical Characteristics Over the Operating Range[4]

| Parameter | Description | Test Conditions | | 27C256-45, 55, 70, 90, 120, 150, 200 Min. | 27C256-45, 55, 70, 90, 120, 150, 200 Max. | Unit |
|---|---|---|---|---|---|---|
| $V_{OH}$ | Output HIGH Voltage | $V_{CC}$ = Min., $I_{OH}$ = –4.0 mA | | 2.4 | | V |
| $V_{OL}$ | Output LOW Voltage | $V_{CC}$ = Min., $I_{OL}$ = 16.0 mA[5] | | | 0.4 | V |
| $V_{IH}$ | Input HIGH Level | Guaranteed Input Logical HIGH Voltage for All Inputs | | 2.0 | $V_{CC}$ | V |
| $V_{IL}$ | Input LOW Level | Guaranteed Input Logical LOW Voltage for All Inputs | | –0.3 | 0.8 | V |
| $I_{IX}$ | Input Current | GND ≤ $V_{IN}$ ≤ $V_{CC}$ | | –10 | +10 | µA |
| $I_{OZ}$ | Output Leakage Current | GND ≤ $V_{OUT}$ ≤ $V_{CC}$, Output Disabled | Commercial | –10 | +10 | µA |
| | | | Military | –40 | +40 | |
| $I_{OS}$ | Output Short Circuit Current[6] | $V_{CC}$ = Max., $V_{OUT}$ = GND | | –20 | –90 | mA |
| $I_{CC}$ | Power Supply Current | $V_{CC}$ = Max., $V_{IN}$ =$V_{IH}$, $I_{OUT}$ = 0 mA, $\overline{CE}$=$V_{IL}$, $\overline{OE}$ = $V_{IH}$ | Commercial | | 45 | mA |
| | | | Military | | 55 | |
| $I_{SB}$ | Standby Supply Current | $V_{CC}$ = Max., $\overline{CE}$ = $V_{IH}$ | Commercial | | 15 | mA |
| | | | Military | | 20 | |
| $V_{PP}$ | Programming Supply Voltage | | | 12 | 13 | V |
| $I_{PP}$ | Programming Supply Current | | | | 50 | mA |
| $V_{IHP}$ | Input HIGH Programming Voltage | | | 3.0 | | V |
| $V_{ILP}$ | Input LOW Programming Voltage | | | | 0.4 | V |

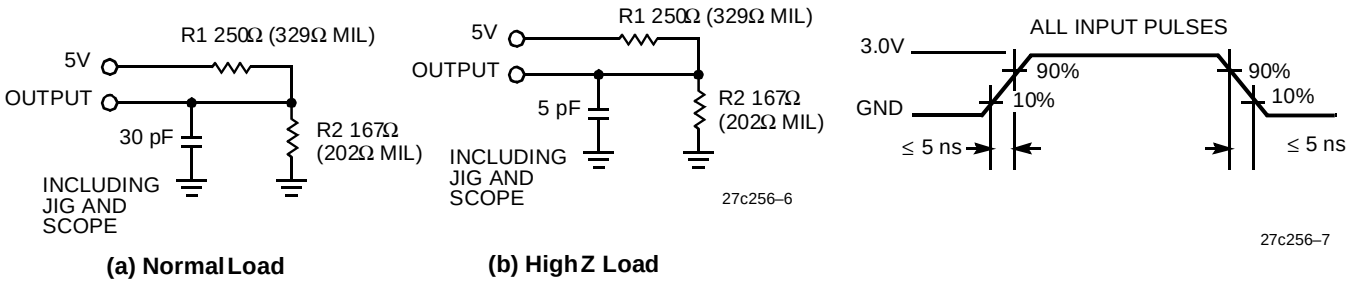
## Capacitance[7]

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

**Notes:**

2. Contact a Cypress representative for information on industrial temperature range specifications.
3. $T_A$ is the "instant on" case temperature.
4. See the last page of this specification for Group A subgroup testing information.
5. $I_{OL}$=12.0 mA for military devices.
6. For test purposes, not more than one output at a time should be shorted. Short circuit test duration should not exceed 30 seconds.
7. See Introduction to CMOS PROMs in this Data Book for general information on testing.

## AC Test Loads and Waveforms




Equivalent to: THÉVENIN EQUIVALENT

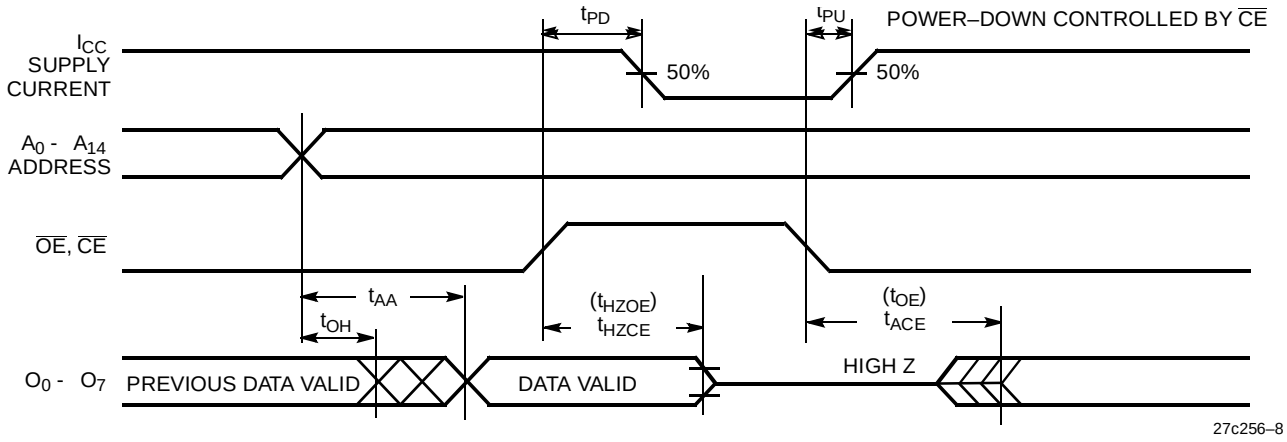

## Switching Characteristics Over the Operating Range[4,7]

| Parameter | Description | 27C256-45 | | 27C256-*55* | | 27C256-70 | | 27C256-90 | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | |
| $t_{AA}$ | Address to Output Valid | | 45 | | 55 | | 70 | | 90 | ns |
| $t_{HZOE}$ | Outpout Enable Inactive to High Z | | 15 | | 20 | | 25 | | 25 | ns |
| $t_{OE}$ | Output Enable Active to Output Valid | | 15 | | 20 | | 25 | | 30 | ns |
| $t_{HZCE}$ | Chip Enable Inactive to High Z | | 20 | | 25 | | 25 | | 25 | ns |
| $t_{ACE}$ | Chip Enable Active to Output Valid | | 45 | | 55 | | 70 | | 90 | ns |
| $t_{PU}$ | Chip Enable Active to Power Up | 0 | | 0 | | 0 | | 0 | | ns |
| $t_{PD}$ | Chip Enable Inactive to Power Down | | 45 | | 55 | | 70 | | 90 | ns |
| $t_{OH}$ | Output Hold from Address Change | 0 | | 0 | | 0 | | 0 | | ns |

## Switching Characteristics Over the Operating Range[4, 7]

| Parameter | Description | 27C256-120 | | 27C256-150 | | 27C256-200 | | Unit |
|---|---|---|---|---|---|---|---|---|
| | | Min. | Max. | Min. | Max. | Min. | Max. | |
| $t_{AA}$ | Address to Output Valid | | 120 | | 150 | | 200 | ns |
| $t_{HZOE}$ | Outpout Enable Inactive to High Z | | 30 | | 30 | | 30 | ns |
| $t_{OE}$ | Output Enable Active to Output Valid | | 30 | | 40 | | 40 | ns |
| $t_{HZCE}$ | Chip Enable Inactive to High Z | | 30 | | 30 | | 30 | ns |
| $t_{ACE}$ | Chip Enable Active to Output Valid | | 120 | | 150 | | 200 | ns |
| $t_{PU}$ | Chip Enable Active to Power Up | 0 | | 0 | | 0 | | ns |
| $t_{PD}$ | Chip Enable Inactive to Power Down | | 120 | | 150 | | 200 | ns |
| $t_{OH}$ | Output Hold from Address Change | 0 | | 0 | | 0 | | ns |

## Switching Waveform




## Erasure Characteristics

Wavelengths of light less than 4000 Å begin to erase the 27C256 in the windowed package. For this reason, an opaque label should be placed over the window if the EPROM 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 Å for a minimum dose (UV intensity multiplied by exposure time) of 25 Wsec/cm2. For an ultraviolet lamp with a 12 mW/cm$^2$ power rating, the exposure time would be approximately 35 minutes. The CY27C256 needs to be within 1 inch of the lamp during erasure. Permanent damage may result if the EPROM is exposed to high-intensity UV light for an extended period of time. 7258 Wsec/cm$^2$ 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 EPROM Programming Information located at the end of this section. Programming algorithms can be obtained from any Cypress representative.

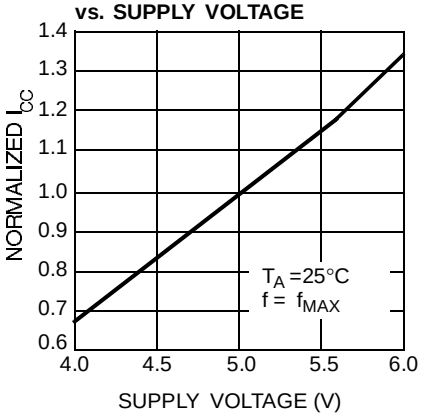
**Table 1. CY27C256 Mode Selection.**

| Mode | Pin Function[8] | | | | |
|---|---|---|---|---|---|
| | $A_{14}$-$A_0$ | $\overline{OE}$ | $\overline{CE}$ | $V_{PP}$ | $O_7$-$O_0$ |
| Read | $A_{14}$-$A_0$ | $V_{IL}$ | $V_{IL}$ | X[9] | $O_7$-$O_0$ |
| Output Disable | $A_{14}$-$A_0$ | $V_{IH}$ | $V_{IL}$ | X | High Z |
| Power Down | $A_{14}$-$A_0$ | X | $V_{IH}$ | X | High Z |

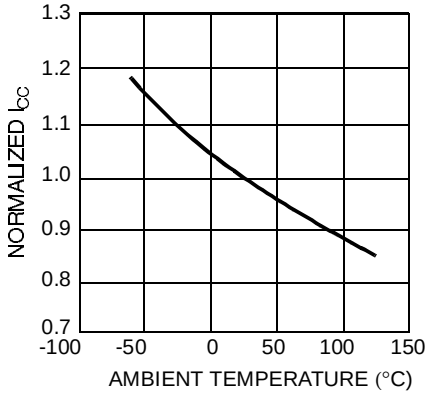
**Notes:**
8. X can be $V_{IL}$ or $V_{IH}$
9. $V_{PP}$ should not exceed $V_{CC}$ in read mode.

## Typical DC and AC Characteristics

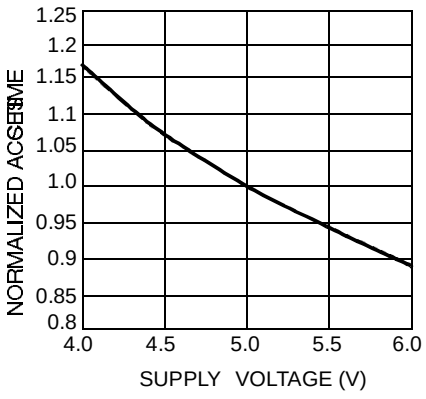
**NORMALIZED SUPPLY CURRENT vs. SUPPLY VOLTAGE**



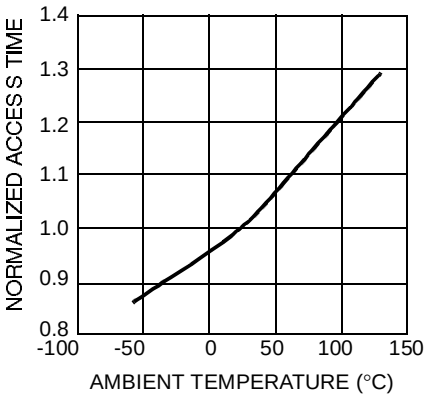

**NORMALIZED SUPPLY CURRENT vs. AMBIENT TEMPERATURE**



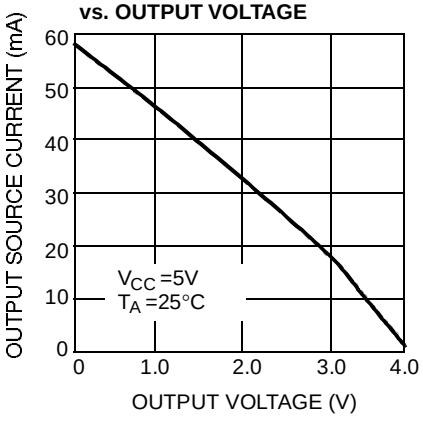

**NORMALIZED ACCESS TIME vs. SUPPLY VOLTAGE**



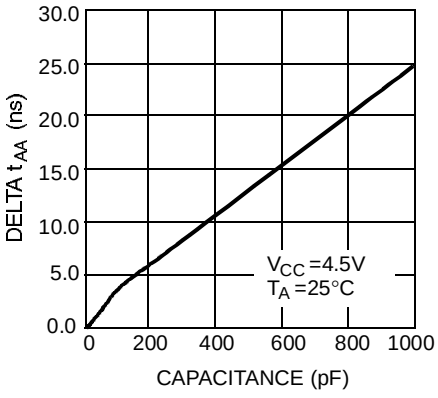

**NORMALIZED ACCESS TIME vs. TEMPERATURE**



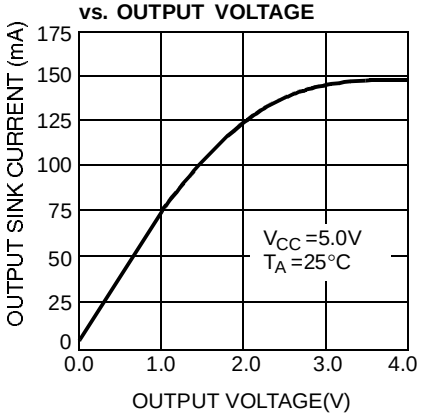

**OUTPUT SOURCE CURRENT vs. OUTPUT VOLTAGE**



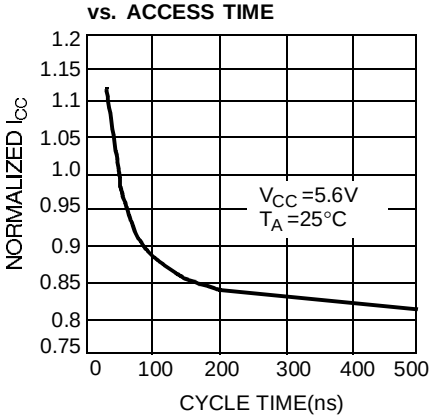

**TYPICAL ACCESS TIME CHANGE vs. OUTPUT LOADING**




**OUTPUT SINK CURRENT vs. OUTPUT VOLTAGE**




**NORMALIZED SUPPLY CURRENT vs. ACCESS TIME**



## Ordering Information[10]

| Speed (ns) | Ordering Code | Package Name | Package Type | Operating Range |
|---|---|---|---|---|
| 45 | CY27C256-45JC | J65 | 32-Pin Rectangular Plastic Leaded Chip Carrier | Commercial |
| | CY27C256-45PC | P15 | 28-Lead (600-Mil) Molded DIP | |
| | CY27C256-45WC | W16 | 28-Lead (600-Mil) Windowed CerDIP | |
| | CY27C256-45ZC | Z32 | 32-Lead Thin Small Outline Package | |
| | CY27C256-45WMB | W16 | 28-Lead (600-Mil) Windowed CerDIP | Military |
| 55 | CY27C256-55JC | J65 | 32-Pin Rectangular Plastic Leaded Chip Carrier | Commercial |
| | CY27C256-55PC | P15 | 28-Lead (600-Mil) Molded DIP | |
| | CY27C256-55WC | W16 | 28-Lead (600-Mil) Windowed CerDIP | |
| | CY27C256-55ZC | Z32 | 32-Lead Thin Small Outline Package | |
| | CY27C256-55WMB | W16 | 28-Lead (600-Mil) Windowed CerDIP | Military |
| 70 | CY27C256-70JC | J65 | 32-Pin Rectangular Plastic Leaded Chip Carrier | Commercial |
| | CY27C256-70PC | P15 | 28-Lead (600-Mil) Molded DIP | |
| | CY27C256-70WC | W16 | 28-Lead (600-Mil) Windowed CerDIP | |
| | CY27C256-70ZC | Z32 | 32-Lead Thin Small Outline Package | |
| | CY27C256-70WMB | W16 | 28-Lead (600-Mil) Windowed CerDIP | Military |
| 90 | CY27C256-90JC | J65 | 32-Pin Rectangular Plastic Leaded Chip Carrier | Commercial |
| | CY27C256-90PC | P15 | 28-Lead (600-Mil) Molded DIP | |
| | CY27C256-90WC | W16 | 28-Lead (600-Mil) Windowed CerDIP | |
| | CY27C256-90ZC | Z32 | 32-Lead Thin Small Outline Package | |
| | CY27C256-90WMB | W16 | 28-Lead (600-Mil) Windowed CerDIP | Military |
| 120 | CY27C256-120JC | J65 | 32-Pin Rectangular Plastic Leaded Chip Carrier | Commercial |
| | CY27C256-120PC | P15 | 28-Lead (600-Mil) Molded DIP | |
| | CY27C256-120WC | W16 | 28-Lead (600-Mil) Windowed CerDIP | |
| | CY27C256-120ZC | Z32 | 32-Lead Thin Small Outline Package | |
| | CY27C256-120WMB | W16 | 28-Lead (600-Mil) Windowed CerDIP | Military |
| 150 | CY27C256-150JC | J65 | 32-Pin Rectangular Plastic Leaded Chip Carrier | Commercial |
| | CY27C256-150PC | P15 | 28-Lead (600-Mil) Molded DIP | |
| | CY27C256-150WC | W16 | 28-Lead (600-Mil) Windowed CerDIP | |
| | CY27C256-150ZC | Z32 | 32-Lead Thin Small Outline Package | |
| | CY27C256-150WMB | W16 | 28-Lead (600-Mil) Windowed CerDIP | Military |
| 200 | CY27C256-200JC | J65 | 32-Pin Rectangular Plastic Leaded Chip Carrier | Commercial |
| | CY27C256-200PC | P15 | 28-Lead (600-Mil) Molded DIP | |
| | CY27C256-200WC | W16 | 28-Lead (600-Mil) Windowed CerDIP | |
| | CY27C256-200ZC | Z32 | 32-Lead Thin Small Outline Package | |
| | CY27C256-200WMB | W16 | 28-Lead (600-Mil) Windowed CerDIP | Military |

**Notes:**

10. Most of these products are available in industrial temperature range. Contact a Cypress representative for specifications and product availability.

## Ordering Information (continued)

| Speed (ns) | Ordering Code | Package Name | Package Type | Operating Range |
|---|---|---|---|---|
| 45 | CY27C256T-45WC | W22 | 28-Lead (300-Mil) Windowed CerDIP | Commercial |
| | CY27C256T-45ZC | Z28 | 28-Thin Small Outline Package | |
| | CY27C256T-45WMB | W22 | 28-Lead (300-Mil) Windowed CerDIP | Military |
| 55 | CY27C256T-55WC | W22 | 28-Lead (300-Mil) Windowed CerDIP | Commercial |
| | CY27C256T-55ZC | Z28 | 28-Thin Small Outline Package | |
| | CY27C256T-55WMB | W22 | 28-Lead (300-Mil) Windowed CerDIP | Military |
| 70 | CY27C256T-70WC | W22 | 28-Lead (300-Mil) Windowed CerDIP | Commercial |
| | CY27C256T-70ZC | Z28 | 28-Thin Small Outline Package | |
| | CY27C256T-70WMB | W22 | 28-Lead (300-Mil) Windowed CerDIP | Military |

## 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 |
| $t_{OE}$ | 7, 8, 9, 10, 11 |
| $t_{ACE}$ | 7, 8, 9, 10, 11 |

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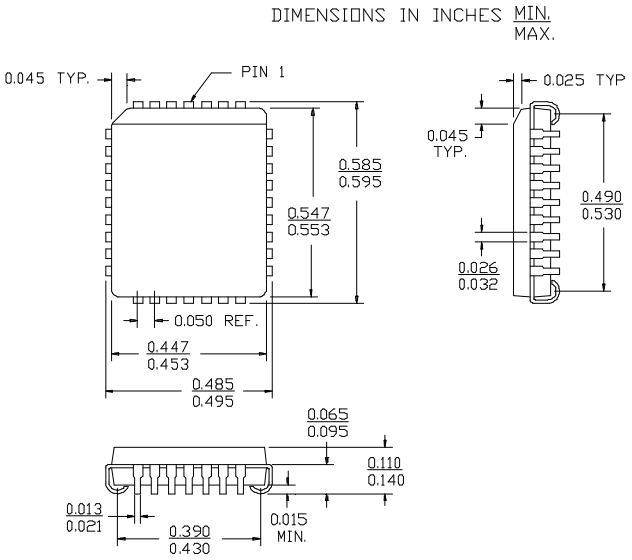
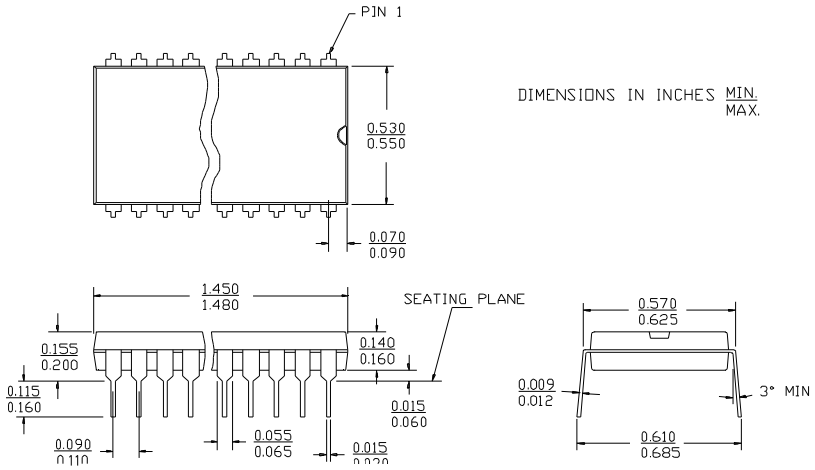
## Package Diagrams

### 32-Lead Plastic Leaded Chip Carrier J65

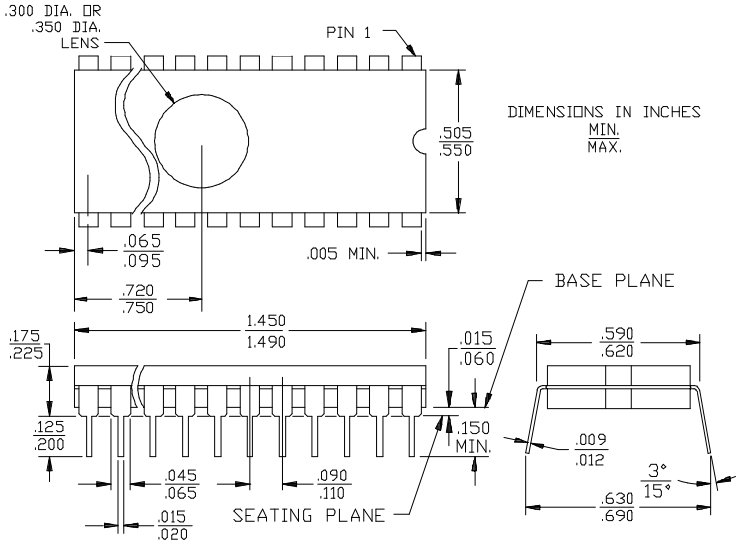



### 28-Lead (600-Mil) Molded DIP P15

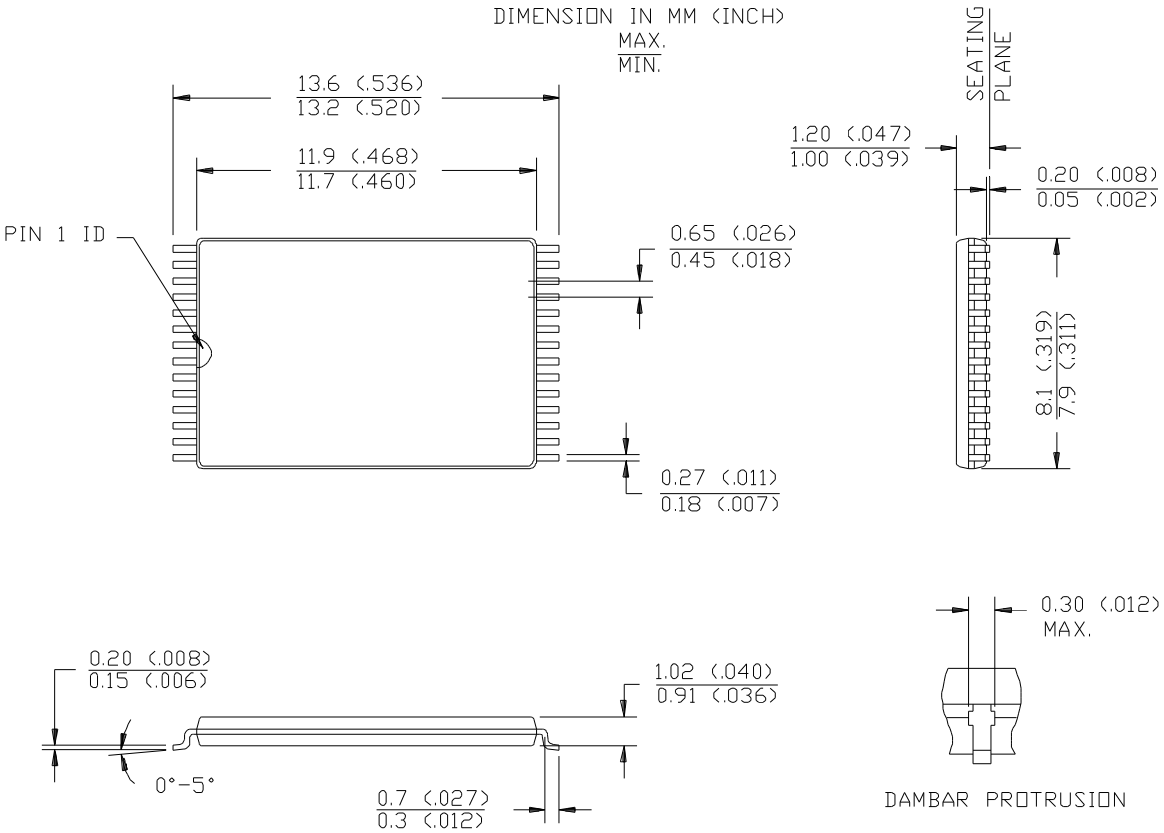


## Package Diagrams (Continued)

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




**28-Lead Thin Small Outline Package Z28**



## Package Diagrams (Continued)

**32-Lead Thin Small Outline Package Z32**