



CY27C128

128K (16K 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

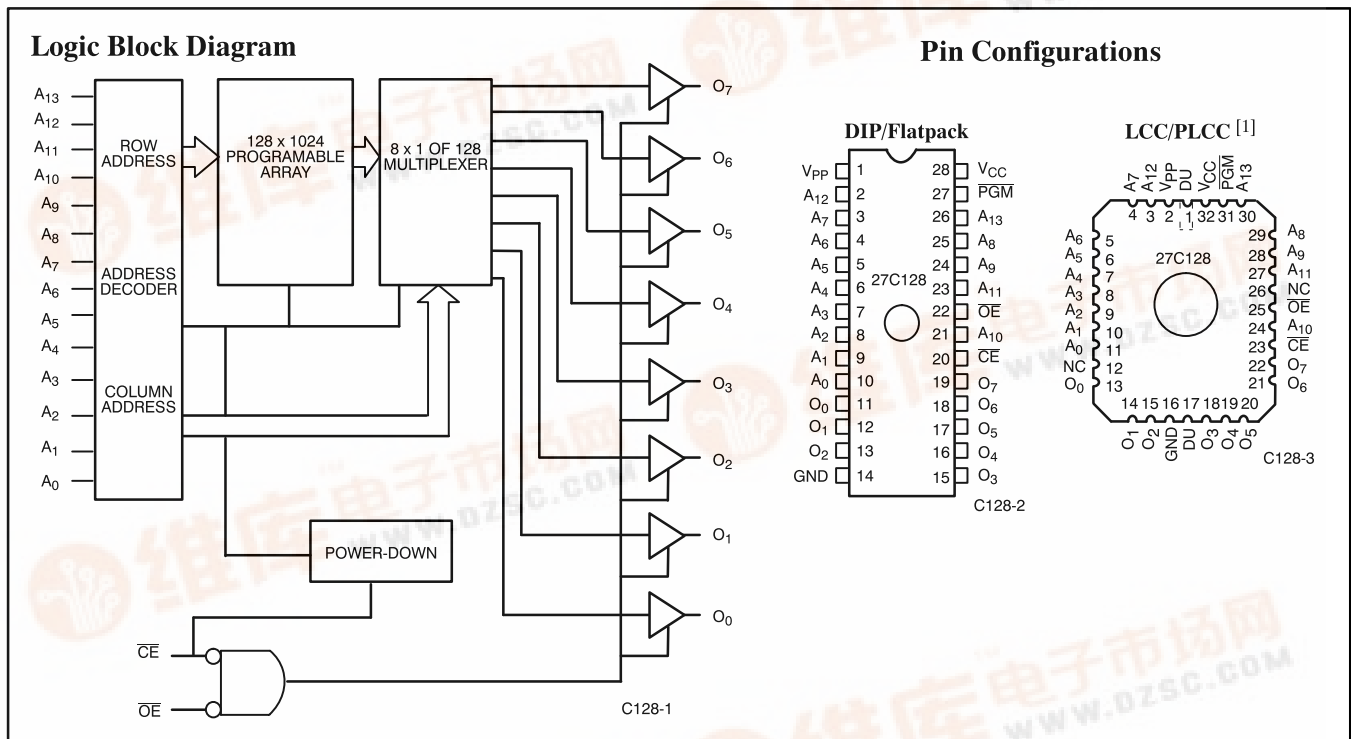
The CY27C128 is a high-performance 16,384-word by 8-bit CMOS EPROM. When disabled (\overline{CE} HIGH), the

CY27C128 automatically powers down into a low-power stand-by mode. The CY27C128 is packaged in the industry standard 600-mil DIP and LCC packages. The CY27C128 is also available in a Cer-DIP 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 CY27C128 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 CY27C128 is accomplished by placing active LOW signals on \overline{OE} and \overline{CE} . The contents of the memory location addressed by the address lines ($A_0 - A_{13}$) will become available on the output lines ($O_0 - O_7$).



Selection Guide

| | 27C128-45 | 27C128-55 | 27C128-70 | 27C128-90 | 27C128-120 | 27C128-150 | 27C128-200 |
|---|-----------|-----------|-----------|-----------|------------|------------|------------|
| Maximum Access Time (ns) | 45 | 55 | 70 | 90 | 120 | 150 | 200 |
| Maximum Operating Current (mA) ^[2] | Com'l | 45 | 45 | 45 | 45 | 45 | 45 |
| | Mil | 55 | 55 | 55 | 55 | 55 | 55 |
| Standby Current (mA) | Com'l | 15 | 15 | 15 | 15 | 15 | 15 |
| | Mil | 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 |

Notes: 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. 2. Add 2 mA/MHz for AC power component.





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 (per MIL-STD-883, Method 3015) >2001V

Latch-Up Current >200 mA
 UV Exposure 7258 Wsec/cm²

Operating Range

| Range | Ambient Temperature | V _{CC} |
|---------------------------|---------------------|-----------------|
| Commercial | 0°C to +70°C | 5V ±10% |
| Industrial ^[3] | -40°C to +85°C | 5V ±10% |
| Military ^[4] | -55°C to +125°C | 5V ±10% |

Electrical Characteristics Over the Operating Range^[5]

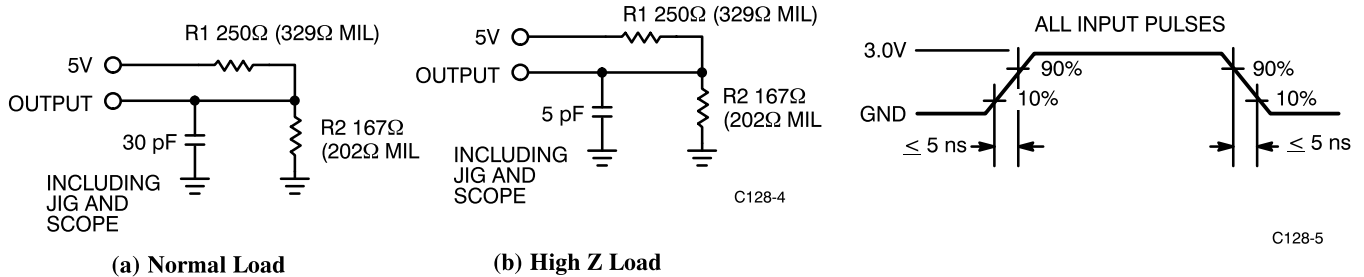
| Parameter | Description | Test Conditions | 27C128-45, 55, 70, 90, 120, 150, 200 | | Unit | |
|------------------|---|--|--------------------------------------|-----------------|------|----|
| | | | Min. | Max. | | |
| V _{OH} | Output HIGH Voltage | V _{CC} = Min., I _{OH} = -4.0 mA | 2.4 | | V | |
| V _{OL} | Output LOW Voltage | V _{CC} = Min., I _{OL} = 16.0 mA ^[6] | | 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 ^[7] | V _{CC} = Max., V _{OUT} = GND | -20 | -90 | mA | |
| I _{CC} | Power Supply Current ^[2] | 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^[8]

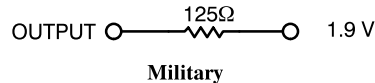
| Parameter | Description | Test Conditions | Max. | Unit |
|------------------|--------------------|---|------|------|
| C _{IN} | Input Capacitance | T _A = 25°C, f = 1 MHz, V _{CC} = 5.0V | 10 | pF |
| C _{OUT} | Output Capacitance | | 10 | pF |

Notes:

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

AC Test Loads and Waveforms


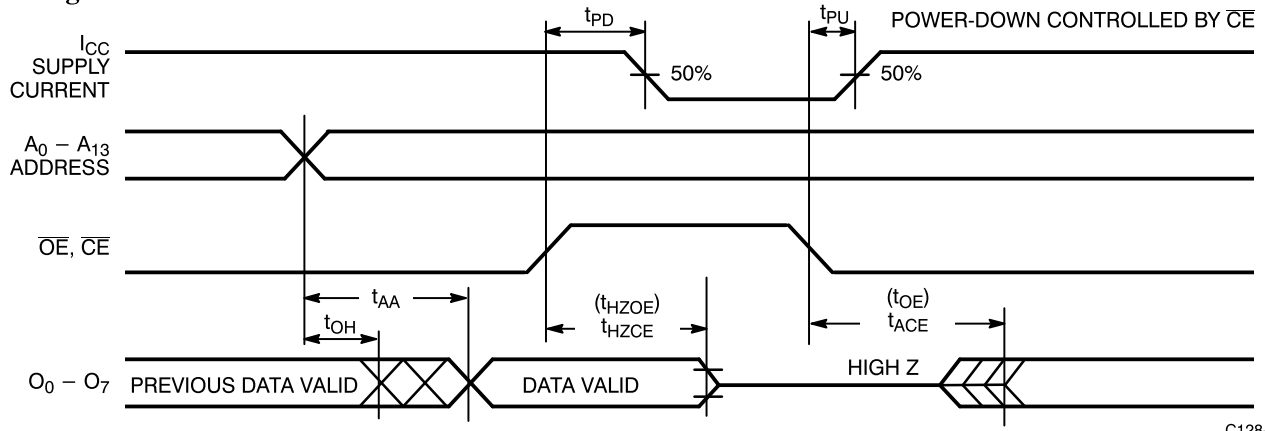
Equivalent to: THÉVENIN EQUIVALENT


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

| Parameter | Description | 27C128-45 | | 27C128-55 | | 27C128-70 | | 27C128-90 | | Unit |
|-------------------|--------------------------------------|-----------|------|-----------|------|-----------|------|-----------|------|------|
| | | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | |
| t _{AA} | Address to Output Valid | | 45 | | 55 | | 70 | | 90 | ns |
| t _{HZOE} | Output 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] (continued)

| Parameter | Description | 27C128-120 | | 27C128-150 | | 27C128-200 | | Unit |
|-------------------|--------------------------------------|------------|------|------------|------|------------|------|------|
| | | Min. | Max. | Min. | Max. | Min. | Max. | |
| t _{AA} | Address to Output Valid | | 120 | | 150 | | 200 | ns |
| t _{HZOE} | Output 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


C128-6

Erasure Characteristics

Wavelengths of light less than 4000 Å begin to erase the 27C128 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/cm² power rating, the exposure time would be approximately 35 minutes. The CY27C128 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/cm² 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.

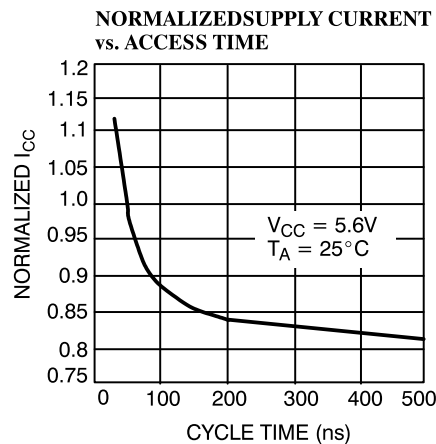
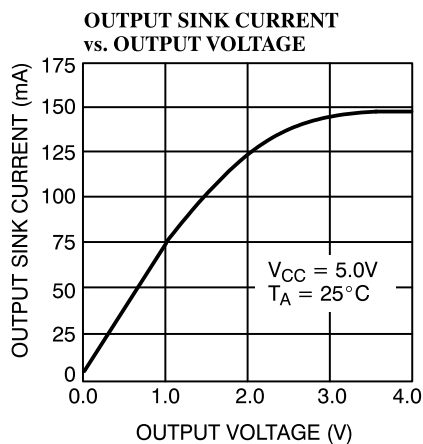
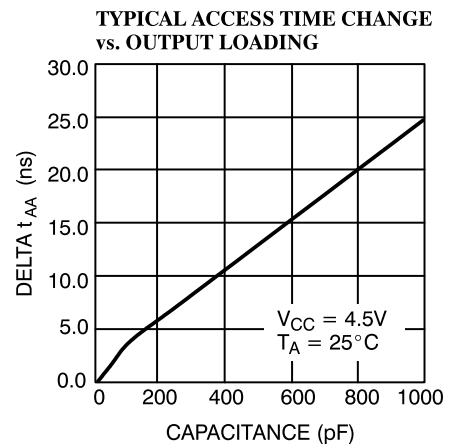
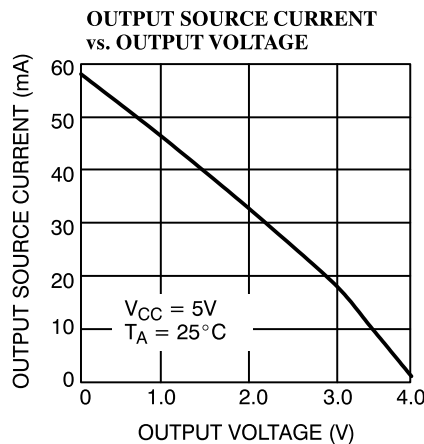
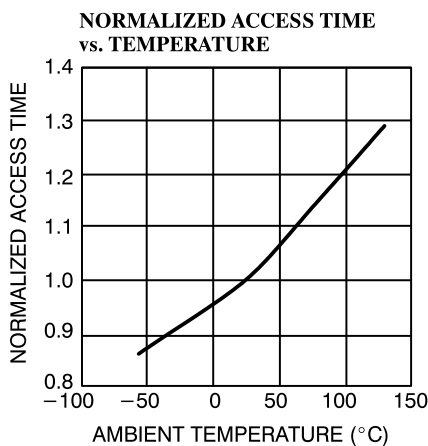
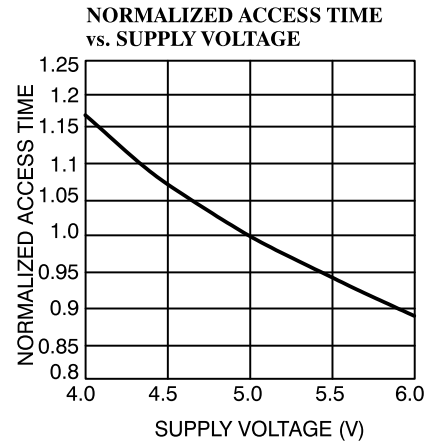
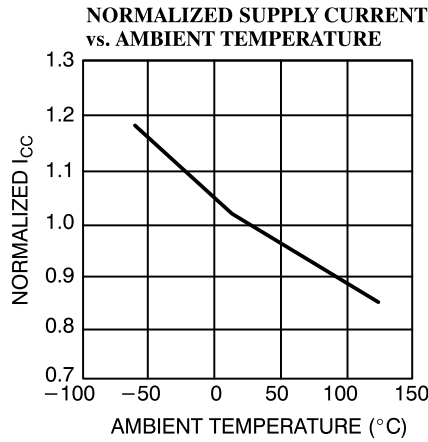
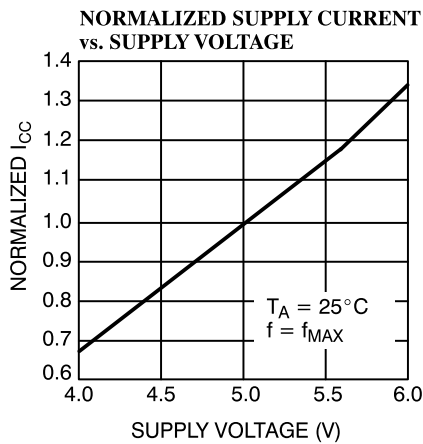
Table 1. CY27C128 Mode Selection

| Mode | Pin Function ^[9] | | | | | |
|----------------|----------------------------------|-----------------|-----------------|-----------------|---------|---------------------------------|
| | A ₁₃ - A ₀ | \overline{OE} | \overline{CE} | V _{PP} | PGM | O ₇ - O ₀ |
| Read | A ₁₃ - A ₀ | V _{IL} | V _{IL} | X | Note 10 | O ₇ - O ₀ |
| Output Disable | A ₁₃ - A ₀ | V _{IH} | X | X | Note 10 | High Z |
| Power Down | A ₁₃ - A ₀ | X | V _{IH} | X | Note 10 | High Z |

Notes:

9. X must be either V_{IL} or V_{IH}.

10. X must be either V_{IL} or V_{IH} (must not switch).

Typical DC and AC Characteristics




Ordering Information^[11]

| Speed (ns) | Ordering Code | Package Name | Package Type | Operating Range |
|------------|-----------------|--------------|--|-----------------|
| 45 | CY27C128-45JC | J65 | 32-Pin Rectangular Plastic Leaded Chip Carrier | Commercial |
| | CY27C128-45PC | P15 | 28-Lead (600-Mil) Molded DIP | |
| | CY27C128-45WC | W16 | 28-Lead (600-Mil) Windowed CerDIP | |
| | CY27C128-45WMB | W16 | 28-Lead (600-Mil) Windowed CerDIP | Military |
| 55 | CY27C128-55JC | J65 | 32-Pin Rectangular Plastic Leaded Chip Carrier | Commercial |
| | CY27C128-55PC | P15 | 28-Lead (600-Mil) Molded DIP | |
| | CY27C128-55WC | W16 | 28-Lead (600-Mil) Windowed CerDIP | |
| | CY27C128-55WMB | W16 | 28-Lead (600-Mil) Windowed CerDIP | Military |
| 70 | CY27C128-70JC | J65 | 32-Pin Rectangular Plastic Leaded Chip Carrier | Commercial |
| | CY27C128-70PC | P15 | 28-Lead (600-Mil) Molded DIP | |
| | CY27C128-70WC | W16 | 28-Lead (600-Mil) Windowed CerDIP | |
| | CY27C128-70WMB | W16 | 28-Lead (600-Mil) Windowed CerDIP | Military |
| 90 | CY27C128-90JC | J65 | 32-Pin Rectangular Plastic Leaded Chip Carrier | Commercial |
| | CY27C128-90PC | P15 | 28-Lead (600-Mil) Molded DIP | |
| | CY27C128-90WC | W16 | 28-Lead (600-Mil) Windowed CerDIP | |
| | CY27C128-90WMB | W16 | 28-Lead (600-Mil) Windowed CerDIP | Military |
| 120 | CY27C128-120JC | J65 | 32-Pin Rectangular Plastic Leaded Chip Carrier | Commercial |
| | CY27C128-120PC | P15 | 28-Lead (600-Mil) Molded DIP | |
| | CY27C128-120WC | W16 | 28-Lead (600-Mil) Windowed CerDIP | |
| | CY27C128-120WMB | W16 | 28-Lead (600-Mil) Windowed CerDIP | Military |
| 150 | CY27C128-150JC | J65 | 32-Pin Rectangular Plastic Leaded Chip Carrier | Commercial |
| | CY27C128-150PC | P15 | 28-Lead (600-Mil) Molded DIP | |
| | CY27C128-150WC | W16 | 28-Lead (600-Mil) Windowed CerDIP | |
| | CY27C128-150WMB | W16 | 28-Lead (600-Mil) Windowed CerDIP | Military |
| 200 | CY27C128-200JC | J65 | 32-Pin Rectangular Plastic Leaded Chip Carrier | Commercial |
| | CY27C128-200PC | P15 | 28-Lead (600-Mil) Molded DIP | |
| | CY27C128-200WC | W16 | 28-Lead (600-Mil) Windowed CerDIP | |
| | CY27C128-200WMB | W16 | 28-Lead (600-Mil) Windowed CerDIP | Military |

Note:

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



MILITARY SPECIFICATIONS
Group A Subgroup Testing

DC Characteristics

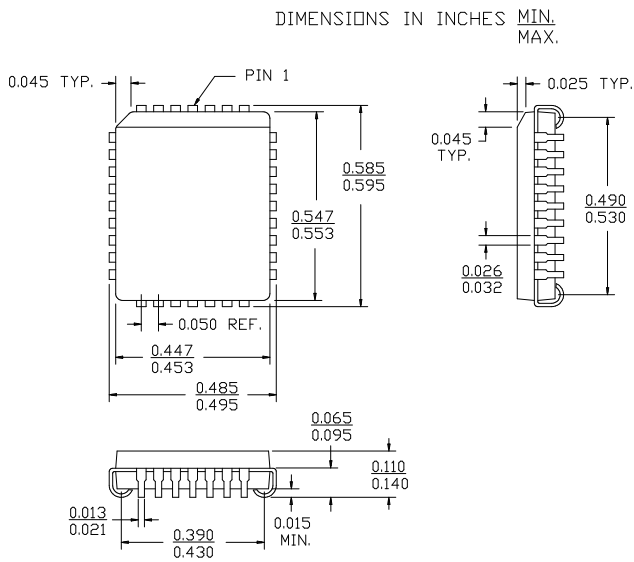
| Parameter | Subgroups |
|-----------------|-----------|
| V _{OH} | 1, 2, 3 |
| V _{OL} | 1, 2, 3 |
| V _{IH} | 1, 2, 3 |
| V _{IL} | 1, 2, 3 |
| I _{Ix} | 1, 2, 3 |
| I _{OZ} | 1, 2, 3 |
| I _{CC} | 1, 2, 3 |
| I _{SB} | 1, 2, 3 |

Switching Characteristics

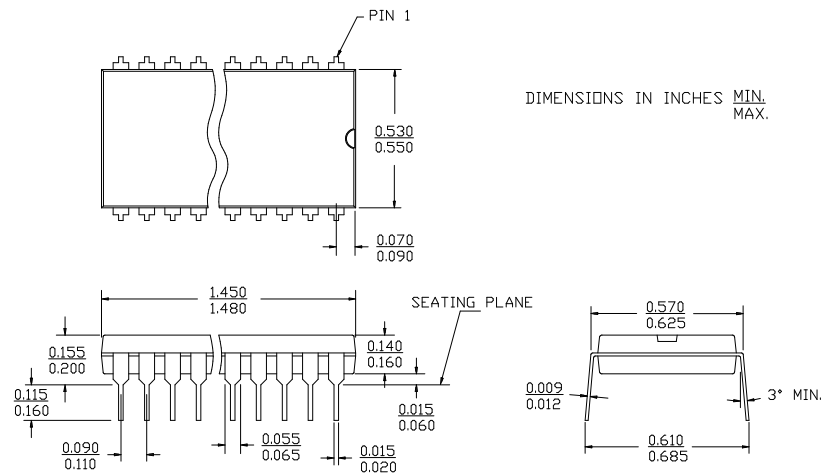
| Parameter | Subgroups |
|------------------|-----------------|
| t _{AA} | 7, 8, 9, 10, 11 |
| t _{OE} | 7, 8, 9, 10, 11 |
| t _{ACE} | 7, 8, 9, 10, 11 |

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

