FAIRCHILD SEMICONDUCTOR™

March 1998

# 100319
# Low Power Hex Line Driver with Cut-Off

## General Description

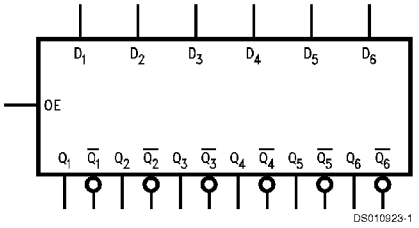
The 100319 is a Hex Line Driver with output cut-off capability. The 100319 has single ended ECL inputs and differential ECL outputs, designed to drive a differential, doubly terminated 50Ω transmission line (25Ω equivalent impedance) in an ECL backplane. A LOW on the Output Enable (OE) will set both the true and complementary outputs, to a high impedance or cut-off state. The cut-off state is designed to be more negative than a normal ECL LOW state.

## Features

- Differential outputs
- Output cut-off capability
- Drives a 25Ω ECL load
- 2000V ESD protection
- Voltage compensated range = –4.2V to –5.7V
- Available to industrial grade temperature range

## Ordering Code:

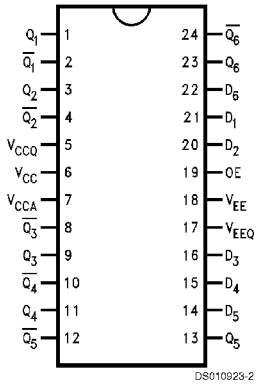
## Logic Symbol



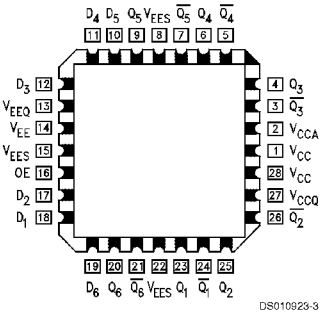

| Pin Names | Description |
|---|---|
| $D_n$ | Data Inputs |
| $Q_n$ | Data Outputs |
| $\overline{Q}_n$ | Complementary Data Outputs |
| OE | Output Enable |

## Connection Diagrams

**24-Pin PCC**

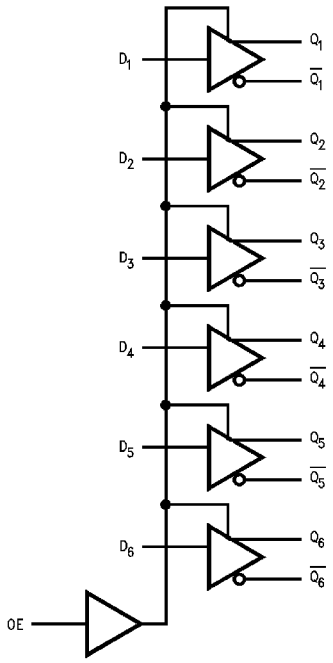



**28-Pin PCC**



## Logic Diagram

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## Truth Table

| Inputs | | Outputs | |
|---|---|---|---|
| $D_n$ | OE | $Q_n$ | $\overline{Q_n}$ |
| L | H | L | H |
| H | H | H | L |
| X | L | Cut-Off | Cut-Off |

H = HIGH Voltage Level
L = LOW Voltage Level
X = Don't Care
Cut-off = Lower-than-Low State

## Absolute Maximum Ratings (Note 1)

Above which the useful life may be impaired

| | |
|---|---|
| Storage Temperature ($T_{STG}$) | −65°C to +150°C |
| Maximum Junction Temperture ($T_J$) | |
| Ceramic | +175°C |
| Plastic | +150°C |
| Pin Potential to Ground Pin ($V_{EE}$) | −7.0V to +0.5V |
| Input Voltage (DC) | $V_{EE}$ to +0.5V |
| Output Current (DC Output HIGH) | −100 mA |
| ESD (Note 2) | ≥2000V |

## Recommended Operating Conditions

| | |
|---|---|
| Case Temperature ($T_C$) | |
| Commercial | 0°C to +85°C |
| Industrial | −40°C to +85°C |
| Military | −55°C to +125°C |
| Supply Voltage ($V_{EE}$) | −5.7V to −4.2V |

**Note 1:** Absolute maximum ratings are those values beyond which the device may be damaged or have its useful life impaired. Functional operation under these conditions is not implied.

**Note 2:** ESD testing conforms to MIL-STD-883, Method 3015.

## Commercial Version DC Electrical Characteristics

$V_{EE}$ = −4.2V to −5.7V, $V_{CC}$ = $V_{CCA}$ = GND, $T_C$ = 0°C to +85°C (Note 3)

| Symbol | Parameter | Min | Typ | Max | Units | Conditions | |
|---|---|---|---|---|---|---|---|
| $V_{OH}$ | Output HIGH Voltage | −1025 | −955 | −870 | mV | $V_{IN}$ = $V_{IH(Max)}$ | Loading with |
| $V_{OL}$ | Output LOW Voltage | −1830 | −1705 | −1620 | mV | or $V_{IL(Min)}$ | 25Ω to −2.0V |
| $V_{OHC}$ | Output HIGH Voltage | −1035 | | | mV | $V_{IN}$ = $V_{IH(Min)}$ | Loading with |
| $V_{OLC}$ | Output LOW Voltage | | | −1610 | mV | or $V_{IL(Max)}$ | 25Ω to −2.0V |
| $V_{OLZ}$ | Cut-Off LOW Voltage | | | −1950 | mV | $V_{IN}$ = $V_{IH(Min)}$ or $V_{IL(Max)}$ | OE = LOW |
| $V_{IH}$ | Input HIGH Voltage | −1110 | | −870 | mV | Guaranteed HIGH Signal for All Inputs | |
| $V_{IL}$ | Input LOW Voltage | −1830 | | −1530 | mV | Guaranteed LOW Signal for All Inputs | |
| $I_{IL}$ | Input LOW Current | | | 100 | µA | $V_{IN}$ = $V_{IL(Min)}$ | |
| $I_{IH}$ | Input HIGH Current | | | 360 | µA | $V_{IN}$ = $V_{IH(Max)}$ | |
| $I_{EE}$ | Power Supply Current, Normal | −119 | | −30 | mA | | |
| $I_{EEZ}$ | Power Supply Current, Cut-Off | −219 | | −75 | mA | Inputs Open, OE = LOW | |

**Note 3:** The specified limits represent the "worst case" value for the parameter. Since these values normally occur at the temperature extremes, additional noise immunity and guardbanding can be achieved by decreasing the allowable system operating ranges. Conditions for testing shown in the tables are chosen to guarantee operation under "worst case" conditions.

## DIP AC Electrical Characteristics

$V_{EE}$ = −4.2V to −5.7V, $V_{CC}$ = $V_{CCA}$ = GND

| Symbol | Parameter | $T_C$ = 0°C | | $T_C$ = +25°C | | $T_C$ = +85°C | | Units | Conditions |
|---|---|---|---|---|---|---|---|---|---|
| | | Min | Max | Min | Max | Min | Max | | |
| $t_{PLH}$ | Propagation Delay | 0.65 | 2.30 | 0.65 | 2.30 | 0.65 | 2.30 | ns | |
| $t_{PHL}$ | Data to Output | | | | | | | | |
| $t_{PZH}$ | Propagation Delay | 1.8 | 4.3 | 1.8 | 4.3 | 1.8 | 4.3 | ns | *Figures 1, 2* |
| $t_{PHZ}$ | OE to Output | 1.2 | 3.1 | 1.2 | 3.1 | 1.2 | 3.1 | | |
| $t_{TLH}$ | Transition Time | 0.45 | 1.50 | 0.45 | 1.50 | 0.45 | 1.50 | ns | |
| $t_{THL}$ | 20% to 80%, 80% to 20% | | | | | | | | |

## PCC AC Electrical Characteristics

$V_{EE}$ = −4.2V to −5.7V, $V_{CC}$ = $V_{CCA}$ = GND

| Symbol | Parameter | $T_C$ = 0°C | | $T_C$ = +25°C | | $T_C$ = +85°C | | Units | Conditions |
|---|---|---|---|---|---|---|---|---|---|
| | | Min | Max | Min | Max | Min | Max | | |
| $t_{PLH}$ | Propagation Delay | 0.65 | 2.10 | 0.65 | 2.10 | 0.65 | 2.10 | ns | |
| $t_{PHL}$ | Data to Output | | | | | | | | |
| $t_{PZH}$ | Propagation Delay | 1.8 | 4.1 | 1.8 | 4.1 | 1.8 | 4.1 | ns | *Figures 1, 2* |
| $t_{PHZ}$ | OE to Output | 1.2 | 2.9 | 1.2 | 2.9 | 1.2 | 2.9 | | |
| $t_{TLH}$ | Transition Time | 0.45 | 1.30 | 0.45 | 1.30 | 0.45 | 1.30 | ns | |
| $t_{THL}$ | 20% to 80%, 80% to 20% | | | | | | | | |

## Industrial Version
## PCC DC Electrical Characteristics

$V_{EE}$ = −4.2V to −5.7V, $V_{CC}$ = $V_{CCA}$ = GND (Note 4)

| Symbol | Parameter | $T_C$ = −40°C | | $T_C$ = 0°C to +85°C | | Units | Conditions | |
|---|---|---|---|---|---|---|---|---|
| | | Min | Max | Min | Max | | | |
| $V_{OH}$ | Output HIGH Voltage | −1085 | −870 | −1025 | −870 | mV | $V_{IN}$ = $V_{IH(Max)}$ | Loading with |
| $V_{OL}$ | Output LOW Voltage | −1830 | −1575 | −1830 | −1620 | mV | or $V_{IL(Min)}$ | 25Ω to −2.0V |
| $V_{OHC}$ | Output HIGH Voltage | −1095 | | −1035 | | mV | $V_{IN}$ = $V_{IH(Min)}$ | Loading with |
| $V_{OLC}$ | Output LOW Voltage | | −1565 | | −1610 | mV | or $V_{IL(Max)}$ | 25Ω to −2.0V |
| $V_{IH}$ | Input HIGH Voltage | −1115 | −870 | −1110 | −870 | mV | Guaranteed HIGH Signal for All Inputs | |
| $V_{OLZ}$ | Cut-Off LOW Voltage | | −1900 | | −1950 | mV | $V_{IN}$ = $V_{IH(Min)}$ or $V_{IL(Max)}$ | OE = LOW |
| $V_{IL}$ | Input LOW Voltage | −1830 | −1535 | −1830 | −1530 | mV | Guaranteed LOW Signal for All Inputs | |
| $I_{IL}$ | Input LOW Current | | 130 | | 100 | µA | $V_{IN}$ = $V_{IL(Min)}$ | |
| $I_{IH}$ | Input HIGH Current | | 360 | | 360 | µA | $V_{IN}$ = $V_{IH(Max)}$ | |
| $I_{EE}$ | Power Supply Current, Normal | −119 | −30 | −119 | −30 | mA | | |
| $I_{EEZ}$ | Power Supply Current, Cut-Off | −219 | −75 | −219 | −75 | mA | Inputs Open OE = LOW | |

**Note 4:** The specified limits represent the "worst case" value for the parameter. Since these values normally occur at the temperature extremes, additional noise immunity and guardbanding can be achieved by decreasing the allowable system operating ranges. Conditions for testing shown in the tables are chosen to guarantee operation under "worst case" conditions.

## PCC AC Electrical Characteristics

$V_{EE}$ = −4.2V to −5.7V, $V_{CC}$ = $V_{CCA}$ = GND

| Symbol | Parameter | $T_C$ = −40°C | | $T_C$ = +25°C | | $T_C$ = +85°C | | Units | Conditions |
|---|---|---|---|---|---|---|---|---|---|
| | | Min | Max | Min | Max | Min | Max | | |
| $t_{PLH}$ | Propagation Delay | 0.65 | 2.10 | 0.65 | 2.10 | 0.65 | 2.10 | ns | *Figures 1, 2* |
| $t_{PHL}$ | Data to Output | | | | | | | | |
| $t_{PZH}$ | Propagation Delay | 1.8 | 4.1 | 1.8 | 4.1 | 1.8 | 4.1 | ns | |
| $t_{PHZ}$ | OE to Output | 1.2 | 2.9 | 1.2 | 2.9 | 1.2 | 2.9 | | |
| $t_{TLH}$ | Transition Time | 0.45 | 1.30 | 0.45 | 1.30 | 0.45 | 1.30 | ns | |
| $t_{THL}$ | 20% to 80%, 80% to 20% | | | | | | | | |

## Military Version—Preliminary
## DC Electrical Characteristics

$V_{EE}$ = −4.2V to −5.7V, $V_{CC}$ = $V_{CCA}$ = GND (Note 7)

| Symbol | Parameter | Min | Typ | Max | Units | $T_C$ | Conditions | | Notes |
|---|---|---|---|---|---|---|---|---|---|
| $V_{OH}$ | Output HIGH Voltage | −1025 | | −870 | mV | 0°C to +125°C | $V_{IN}$ = $V_{IH(Max)}$ or $V_{IL(Min)}$ | Loading with 25Ω to −2.0V | |
| | | −1085 | | −870 | mV | −55°C | | | (Notes 5, 6, 7) |
| $V_{OL}$ | Output LOW Voltage | −1830 | | −1620 | mV | 0°C to +125°C | | | |
| | | −1830 | | −1555 | mV | −55°C | | | |
| $V_{OHC}$ | Output HIGH Voltage | −1035 | | | mV | 0°C to +125°C | $V_{IN}$ = $V_{IH(Min)}$ or $V_{IL(Max)}$ | Loading with 25Ω to −2.0V | |
| | | −1085 | | | mV | −55°C | | | (Notes 5, 6, 7) |
| $V_{OLC}$ | Output LOW Voltage | | | −1610 | mV | 0°C to +125°C | | | |
| | | | | −1555 | mV | −55°C | | | |
| $V_{OLZ}$ | Cut-Off LOW Voltage | | | −1900 | mV | 0°C to +125°C | $V_{IN}$ = $V_{IH(Min)}$ or $V_{IL(Max)}$ | OE = LOW | (Notes 5, 6, 7) |
| | | | | −1950 | mV | −55°C | | | |
| $V_{IH}$ | Input HIGH Voltage | −1165 | | −870 | mV | −55°C to +125°C | Guaranteed HIGH Signal for All Inputs | | (Notes 5, 6, 7, 8) |
| $V_{IL}$ | Input LOW Voltage | −1830 | | −1475 | mV | −55°C to +125°C | Guaranteed LOW Signal for All Inputs | | (Notes 5, 6, 7, 8) |
| $I_{IH}$ | Input HIGH Current | | | 50 | µA | 0°C to +125°C | $V_{IN}$ = $V_{IH(Max)}$ | | (Notes 5, 6, 7) |
| | | | | 70 | µA | −55°C | | | |
| $I_{EE}$ | Power Supply Current, | −70 | | −40 | mA | −55°C to +125°C | | | |
| $I_{EEZ}$ | Power Supply Current, Cut-Off | −180 | | −130 | mA | −55°C to +125°C | Inputs Open, OE = LOW | | (Notes 5, 6, 7) |

**Note 5:** F100K 300 Series cold temperature testing is performed by temperature soaking (to guarantee junction temperature equals −55°C), then testing immediately without allowing for the junction temperature to stabilize due to heat dissipation after power-up. This provides "cold start" specs which can be considered a worst case condition at cold temperatures.

**Note 6:** Screen tested 100% on each device at −55°C, +25°C, and +125°C, Subgroups 1, 2, 3, 7, and 8.

**Note 7:** Sample tested (Method 5005, Table I) on each manufactured lot at −55°C, +25°C, and +125°C, Subgroups A1, 2, 3, 7, and 8.

**Note 8:** Guaranteed by applying specified input condition and testing $V_{OH}$/$V_{OL}$.

## AC Electrical Characteristics—Preliminary

$V_{EE}$ = −4.2V to −5.7V, $V_{CC}$ = $V_{CCA}$ = GND

| Symbol | Parameter | $T_C$ = −55°C | | $T_C$ = +25°C | | $T_C$ = +125°C | | Units | Conditions | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Min | Max | Min | Max | Min | Max | | | |
| $t_{PLH}$ | Propagation Delay | 0.40 | 2.50 | 0.50 | 2.40 | 0.50 | 2.90 | ns | *Figures 1, 2* | (Notes 9, 10, 11) |
| $t_{PHL}$ | Data to Output | | | | | | | | | |
| $t_{TLH}$ | Transition Time | 0.20 | 1.70 | 0.20 | 1.70 | 0.20 | 1.50 | ns | | (Note 12) |
| $t_{THL}$ | 20% to 80%, 80% to 20% | | | | | | | | | |

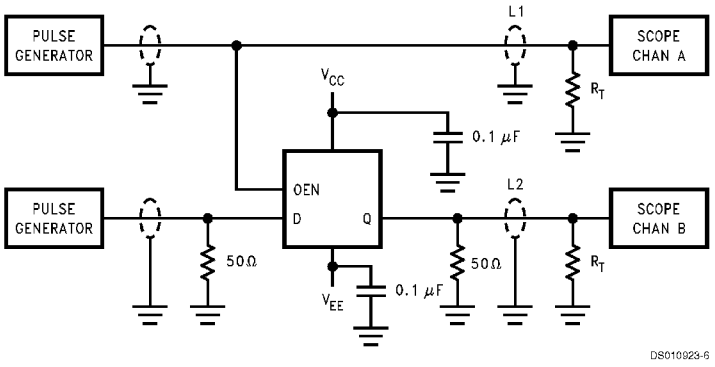
**Note 9:** F100K 300 Series cold temperature testing is performed by temperature soaking (to guarantee junction temperature equals −55°C), then testing immediately after power-up. This provides "cold start" specs which can be considered a worst case condition at cold temperatures.

**Note 10:** Screen tested 100% on each device at +25°C temperature only, Subgroup A9.

**Note 11:** Sample tested (Method 5005, Table I) on each manufactured lot at +25°C, Subgroup A9, and at +125°C and −55°C temperatures, Subgroups A10 and A11.

**Note 12:** Not tested at +25°C, +125°C and −55°C temperature (design characterization data).

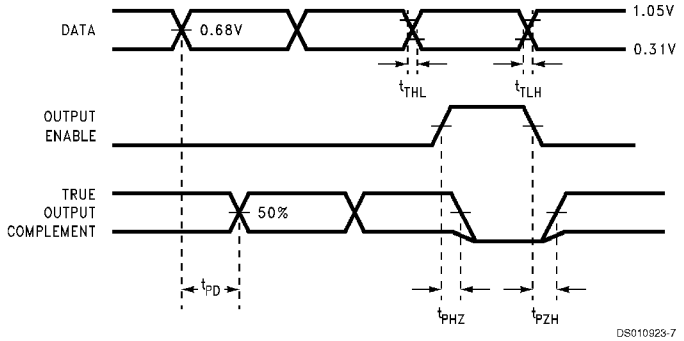
## Test Circuitry




**Notes:**
$V_{CC}$, $V_{CCA}$ = +2V, $V_{EE}$ = –2.5V
L1 and L2 = equal length 50Ω impedance lines
$R_T$ = 50Ω terminator internal to scope
Decoupling 0.1 μF from GND to $V_{CC}$ and $V_{EE}$
All unused outputs are loaded with 25Ω to GND
$C_L$ = Fixture and stray capacitance ≤ 3 pF

**FIGURE 1. AC Test Circuit**

## Switching Waveforms

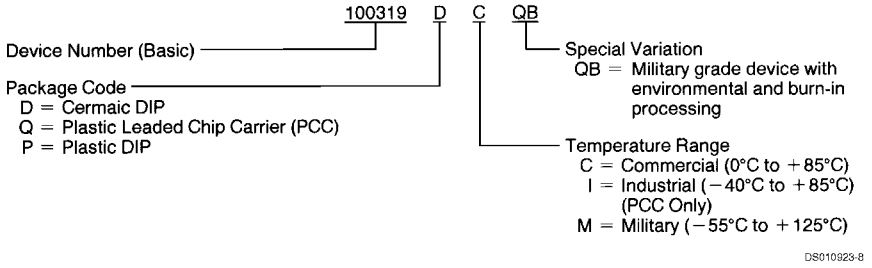



**Note:** The output AC measurement point for cut-off propagation delay testing = the 50% voltage point between active $V_{OL}$ and $V_{OH}$.

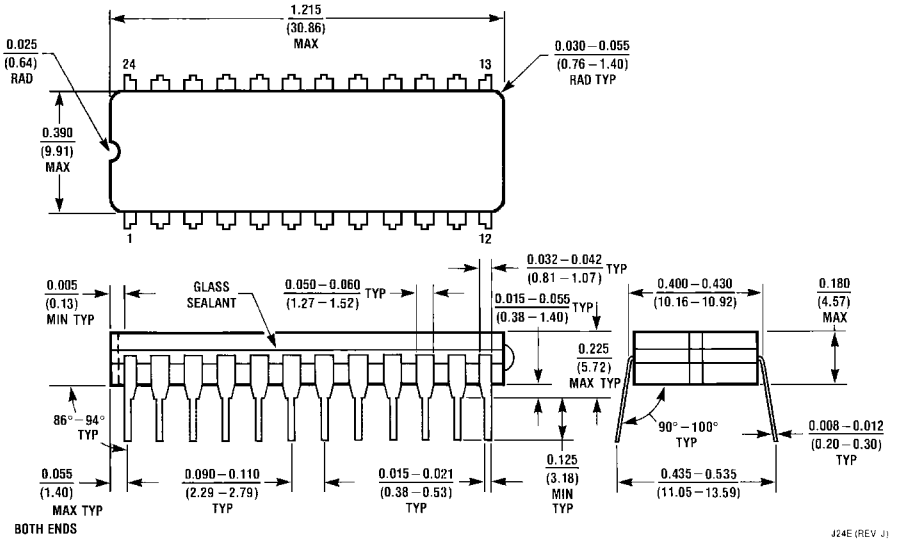
**FIGURE 2. Propagation Delay, Cut-Off and Transition Times**

## Ordering Information

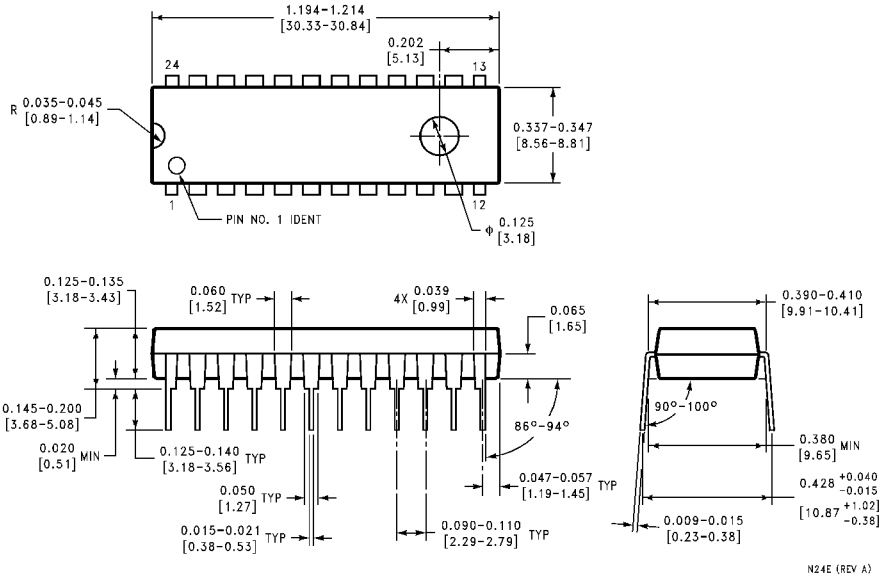
The device number is used to form part of a simplified purchasing code where a package type and temperature range are defined as follows:



## Physical Dimensions inches (millimeters) unless otherwise noted

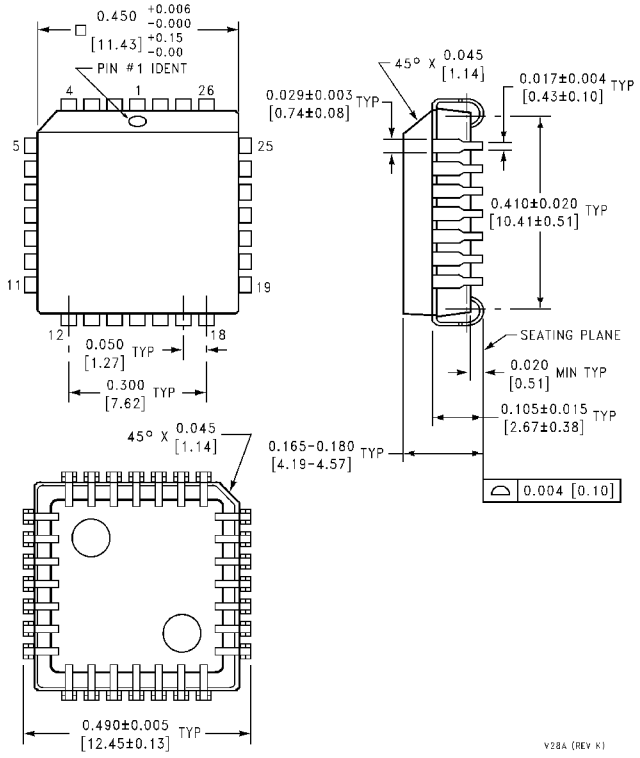



**24-Lead Ceramic Dual-In-Line Package (0.400" Wide) (D)**
**Package Number J24E**




**24-Lead Plastic Dual-In-Line Package (P)**
**Package Number N24E**

## Physical Dimensions inches (millimeters) unless otherwise noted (Continued)




**28-Lead Plastic Chip Carrier (Q)**
**Package Number V28A**

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2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

**Fairchild Semiconductor Corporation**
**Americas**
Customer Response Center
Tel: 1-888-522-5372

**Fairchild Semiconductor Europe**
Fax: +49 (0) 1 80-530 85 86
Email: europe.support@nsc.com
Deutsch Tel: +49 (0) 8 141-35-0
English Tel: +44 (0) 1 793-85-68-56
Italy Tel: +39 (0) 2 57 5631

**Fairchild Semiconductor Hong Kong Ltd.**
13th Floor, Straight Block,
Ocean Centre, 5 Canton Rd.
Tsimshatsui, Kowloon
Hong Kong
Tel: +852 2737-7200
Fax: +852 2314-0061

**National Semiconductor Japan Ltd.**
Tel: 81-3-5620-6175
Fax: 81-3-5620-6179

www.fairchildsemi.com