

## Rochester Electronics Manufactured Components

Rochester branded components are manufactured using either die/wafers purchased from the original suppliers or Rochester wafers recreated from the original IP. All recreations are done with the approval of the OCM.

Parts are tested using original factory test programs or Rochester developed test solutions to guarantee product meets or exceed the OCM data sheet.

## Quality Overview

- ISO-9001
- AS9120 certification
- Qualified Manufacturers List (QML) MIL-PRF-35835
  - Class Q Military
  - Class V Space Level
- Qualified Suppliers List of Distributors (QSLD)
  - Rochester is a critical supplier to DLA and meets all industry and DLA standards.

Rochester Electronics, LLC is committed to supplying products that satisfy customer expectations for quality and are equal to those originally supplied by industry manufacturers.

The original manufacturer's datasheet accompanying this document reflects the performance and specifications of the Rochester manufactured version of this device. Rochester Electronics guarantees the performance of its semiconductor products to the original OEM specifications. 'Typical' values are for reference purposes only. Certain minimum or maximum ratings may be based on product characterization, design, simulation, or sample testing.

# 100316

## Low Power Quad Differential Line Driver with Cut-Off

### General Description

The 100316 is a quad differential line driver with output cut-off capability. The outputs are designed to drive a doubly terminated 50Ω transmission line (25Ω equivalent impedance) in an ECL backplane. The 100316 is ideal for driving low noise, differential ECL backplanes. A LOW on the output enable (OE) will set both the true and complementary outputs into a high impedance or cut-off state, isolating them from the backplane. The cut-off state is designed to be more negative than a normal ECL LOW state.

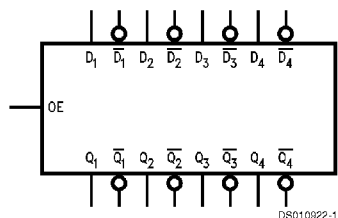
Unlike most 100K devices, the data inputs ( $D_n$ ,  $\bar{D}_n$ ) do not have input pull-down resistors. An internal reference supply ( $V_{BB}$ ) is available for single-ended operation.

### Features

- Differential inputs and outputs
- Output cut-off capability
- Drives 25Ω load
- $V_{BB}$  available for single-ended operation
- 2000V ESD protection
- Voltage compensated operating range = -4.2V to -5.7V
- Available to industrial grade temperature range

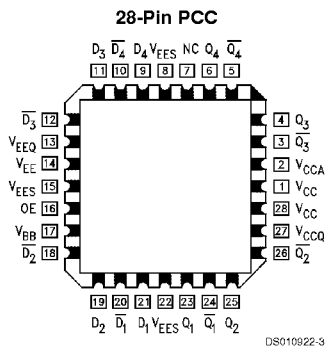
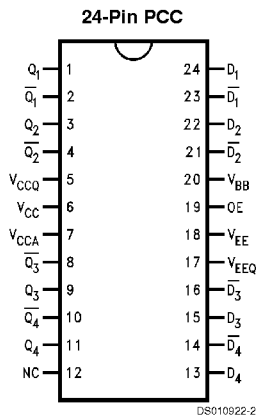
### Ordering Code:

### Logic Symbol



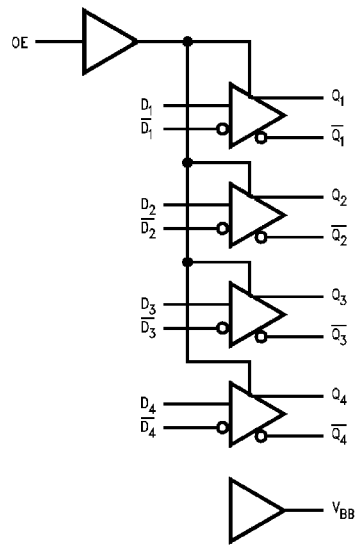
Pin Names	Description
$D_n$	Data Inputs
$Q_n$	Data Outputs
$\bar{Q}_n$	Complementary Data Outputs
OE	Output Enable

### Connection Diagrams



100316 Low Power Quad Differential Line Driver with Cut-Off

### Logic Diagram



DS010922-5

### Truth Table

Inputs			Outputs	
$D_n$	$\overline{D}_n$	OE	$Q_n$	$\overline{Q}_n$
L	H	H	L	H
H	L	H	H	L
X	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)

Storage Temperature ( $T_{STG}$ )	-65°C to +150°C
Maximum Junction Temperature ( $T_J$ )	
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. Function 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  $-5.7V$ ,  $V_{CC} = V_{CCA} = GND$ ,  $T_C = 0^\circ C$  to  $+85^\circ C$  (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 $25\Omega$ to $-2.0V$
$V_{OL}$	Output LOW Voltage	-1830	-1705	-1620	mV	or $V_{IL (Min)}$
$V_{OHC}$	Output HIGH Voltage	-1035			mV	$V_{IN} = V_{IH (Min)}$ Loading with $25\Omega$ to $-2.0V$
$V_{OLC}$	Output LOW Voltage			-1610	mV	or $V_{IL (Max)}$
$V_{OLZ}$	Cut-Off LOW Voltage			-1950	mV	$V_{IN} = V_{IH (Min)}$ or $V_{IL (Max)}$ OE = LOW
$V_{BB}$	Output Reference Voltage	-1380	-1320	-1260	mV	$I_{VBB} = -1$ mA
$V_{DIFF}$	Input Voltage Differential	150			mV	Required for Full Output Swing
$V_{CM}$	Common Mode Voltage	$V_{CC} - 2.0$		$V_{CC} - 0.5$	V	
$V_{IH}$	Single-Ended Input High Voltage	-1110		-870	mV	Guaranteed HIGH Signal for All Inputs (with one input tied to $V_{BB}$ ) $V_{BB (Max)} + V_{DIFF}$
$V_{IL}$	Single-Ended Input Low Voltage	-1830		-1530	mV	Guaranteed LOW Signal for All Inputs (with one input tied to $V_{BB}$ ) $V_{BB (Min)} - V_{DIFF}$
$I_{IL}$	Input LOW Current	0.50			$\mu A$	$V_{IN} = V_{IL (Min)}$
$I_{IH}$	Input HIGH Current $D_N$			250	$\mu A$	$V_{IN} = V_{IH (Max)}$ , $D_1 = V_{BB}$ , $\overline{D}_1 = V_{IL (Min)}$
$I_{IHZ}$	Input HIGH Current OE			360	$\mu A$	$V_{IN} = V_{IH (Max)}$ , $D_1 = V_{BB}$ , $\overline{D}_1 = V_{IL (Min)}$
$I_{CBO}$	Input Leakage Current	-10			$\mu A$	$V_{IN} = V_{EE}$ , $D_1 = V_{BB}$ , $\overline{D}_1 = V_{IL (Min)}$
$I_{EE}$	Power Supply Current, Normal	-85		-30	mA	$D_1 = V_{BB}$ , $\overline{D}_1 = V_{IL (Min)}$
$I_{EEZ}$	Power Supply Current, Cut-Off	-152		-75	mA	$D_1-D_4 = V_{BB}$ , $\overline{D}_1-\overline{D}_4 = V_{IL (Min)}$ , 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.

**Commercial Version  
DIP AC Electrical Characteristics**

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

Symbol	Parameter	$T_C = 0^\circ C$		$T_C = +25^\circ C$		$T_C = +85^\circ C$		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	<i>Figures 1, 2</i>
$t_{PHL}$	Data to Output								
$t_{PZH}$	Propagation Delay	1.80	4.20	1.80	4.20	1.80	4.20	ns	
$t_{PHZ}$	OE to Output	1.20	3.10	1.20	3.10	1.20	3.10		
$t_{TLH}$	Transition Time, $D_N$ to $Q_N$	0.45	1.70	0.45	1.70	0.45	1.70	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	$T_C = 0^\circ C$		$T_C = +25^\circ C$		$T_C = +85^\circ C$		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	<i>Figures 1, 2</i>
$t_{PHL}$	Data to Output								
$t_{PZH}$	Propagation Delay	1.8	4.00	1.8	4.00	1.8	4.00	ns	
$t_{PHZ}$	OE to Output	1.2	2.90	1.2	2.90	1.2	2.90		
$t_{TLH}$	Transition Time, $D_N$ to $Q_N$	0.45	1.50	0.45	1.50	0.45	1.50	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	$T_C = -40^\circ C$		$T_C = 0^\circ C$ to $+85^\circ C$		Units	Conditions
		Min	Max	Min	Max		
$V_{OH}$	Output HIGH Voltage	-1085	-870	-1025	-870	mV	$V_{IN} = V_{IH (Max)}$ Loading with $25\Omega$ to $-2.0V$
$V_{OL}$	Output LOW Voltage	-1830	-1585	-1830	-1620	mV	or $V_{IL (Min)}$
$V_{OHC}$	Output HIGH Voltage	-1095		-1035		mV	$V_{IN} = V_{IH (Min)}$ Loading with $25\Omega$ to $-2.0V$
$V_{OLC}$	Output LOW Voltage		-1575		-1610	mV	or $V_{IL (Max)}$
$V_{OLZ}$	Cut-Off LOW Voltage		-1900		-1950	mV	OE = LOW, $V_{IN} = V_{IH (Min)}$ or $V_{IL (Max)}$
$V_{BB}$	Output Reference Voltage	-1395	-1255	-1380	-1260	mV	$I_{VBB} = -1$ mA
$V_{DIFF}$	Input Voltage Differential	150		150		mV	Required for Full Output Swing
$V_{CM}$	Common Mode Voltage	$V_{CC} - 2.0$	$V_{CC} - 0.5$	$V_{CC} - 2.0$	$V_{CC} - 0.5$	V	
$V_{IH}$	Single-Ended Input High Voltage	-1115	-870	-1110	-870	mV	Guaranteed HIGH Signal for All Inputs (with one input tied to $V_{BB}$ ) $V_{BB (Max)} + V_{DIFF}$
$V_{IL}$	Single-Ended Input Low Voltage	-1830	-1535	-1830	-1530	mV	Guaranteed LOW Signal for All Inputs (with one input tied to $V_{BB}$ ) $V_{BB (Min)} - V_{DIFF}$
$I_{IL}$	Input LOW Current	0.50		0.50		$\mu A$	$V_{IN} = V_{IL (Min)}$
$I_{IH}$	Input HIGH Current, $D_N$		240		240	$\mu A$	$V_{IN} = V_{IH (Max)}$ , $D_1 = V_{BB}$ ,
$I_{IHZ}$	Input HIGH Current, OE		360		360	$\mu A$	$\bar{D}_1 = V_{IL (Min)}$
$I_{CBO}$	Input Leakage Current	-10		-10		$\mu A$	$V_{IN} = V_{EE}$ , $D_1 = V_{BB}$ ,
							$\bar{D}_1 = V_{IL (Min)}$
$I_{EE}$	Power Supply Current, Normal	-85	-30	-85	-30	mA	$D_1 = V_{BB}$ , $\bar{D}_1 = V_{IL (Min)}$
$I_{EEZ}$	Power Supply Current, Cut-Off	-152	-75	-152	-75	mA	$D_1 - D_4 = V_{BB}$ , $\bar{D}_1 - \bar{D}_4 = V_{IL (Min)}$ , 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	$T_C = -40^\circ C$		$T_C = +25^\circ C$		$T_C = +85^\circ C$		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	1.80	4.00	1.80	4.00	1.80	4.00	ns	
$t_{PHZ}$	OE to Output	1.20	2.90	1.20	2.90	1.20	2.90	ns	
$t_{TLH}$	Transition Time	0.45	1.50	0.45	1.50	0.45	1.50	ns	
$t_{THL}$	20% to 80%, 80% to 20%								

## Military Version—Preliminary DC Electrical Characteristics (Note 7)

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

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	(Notes 5, 6, 7)		
		-1085		-870	mV	-55°C					
$V_{OL}$	Output LOW Voltage	-1830		-1620	mV	0°C to +125°C	$V_{IN} = V_{IH (Min)}$ or $V_{IL (Max)}$	Loading with 25Ω to -2.0V			
		-1830		-1555	mV	-55°C					
$V_{OHC}$	Output HIGH Voltage	-1035			mV	0°C to +125°C			OE = LOW $V_{IN} = V_{IH (Min)}$ or $V_{IL (Max)}$	Loading with 25Ω to -2.0V	(Notes 5, 6, 7)
		-1085			mV	-55°C					
$V_{OLC}$	Output LOW Voltage			-1610	mV	0°C to +125°C	OE = LOW $V_{IN} = V_{IH (Min)}$ or $V_{IL (Max)}$	Loading with 25Ω to -2.0V			
				-1555	mV	-55°C					
$V_{OLZ}$	Cut-Off LOW Voltage			-1900	mV	0°C to +125°C			OE = LOW $V_{IN} = V_{IH (Min)}$ or $V_{IL (Max)}$	Loading with 25Ω to -2.0V	(Notes 5, 6, 7)
				-1950	mV	-55°C					
$V_{BB}$	Output Reference Voltage			-1260	mV	0°C to +125°C	$I_{VBB} = 0 \mu A$ , $V_{EE} = 4.2V$	(Notes 5, 6, 7)			
		-1380	-1320	-1260	mV	0°C to +125°C	$I_{VBB} = -250 \mu A$ , $V_{EE} = -5.7V$	(Notes 5, 6, 7)			
		-1396			mV	-55°C	$I_{VBB} = -350 \mu A$ , $V_{EE} = -5.7V$	(Notes 5, 6, 7)			
$V_{DIFF}$	Input Voltage Differential	150			mV	-55°C to +125°C	Required for Full Output Swing	(Notes 5, 6, 7)			
$V_{CM}$	Common Mode Voltage	$V_{CC} - 2.0$		$V_{CC} - 0.5$	V	-55°C to +125°C		(Notes 5, 6, 7)			
$V_{IH}$	Single-Ended Input High Voltage	-1165		-870	mV	-55°C to +125°C	Guaranteed HIGH Signal for All Inputs (with $\overline{D}_n$ tied to $V_{BB}$ )	(Notes 5, 6, 7, 8)			
$V_{IL}$	Single-Ended Input Low Voltage	-1830		-1475	mV	-55°C to +125°C	Guaranteed LOW Signal for All Inputs (with $\overline{D}_n$ tied to $V_{BB}$ )	(Notes 5, 6, 7, 8)			
$I_{IH}$	Input HIGH Current, $D_N$			75	$\mu A$	0°C to +125°C	$V_{IN} = V_{IH (Max)}$ , $D_1 = V_{BB}$ , $\overline{D}_1 = V_{IL (Min)}$	(Notes 5, 6, 7)			
				95	$\mu A$	-55°C					
$I_{IHZ}$	Input HIGH Current, OE			360	$\mu A$	-55°C to +125°C	$V_{IN} = V_{IH (Max)}$ , $D_1 = V_{BB}$ , $\overline{D}_1 = V_{IL (Min)}$	(Notes 5, 6, 7)			
$I_{CBO}$	Input Leakage Current	-10			$\mu A$	-55°C to +125°C	$V_{IN} = V_{EE}$ , $D_1 = V_{BB}$ , $\overline{D}_1 = V_{IL (Min)}$	(Notes 5, 6, 7)			
$I_{EE}$	Power Supply Current, Normal	-90		-30	mA	-55°C to +125°C	$D_1 = V_{BB}$ , $\overline{D}_1 = V_{IL (Min)}$	(Notes 5, 6, 7)			
$I_{EEZ}$	Power Supply Current, Cut-Off	-180		-75	mA	-55°C to +125°C	$D_1 - D_2 = V_{BB}$ , $\overline{D}_1 - \overline{D}_2 = V_{IL (Min)}$ , 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  $V_{OH}/V_{OL}$ .

## Military Version—Preliminary AC Electrical Characteristics

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

Symbol	Parameter	$T_C = -55^\circ C$		$T_C = +25^\circ C$		$T_C = +125^\circ C$		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									
$t_{PZH}$	Propagation Delay	0.70	4.20	0.70	4.20	0.70	4.20	ns		
$t_{PHZ}$	OE to Output	0.70	3.20	0.70	3.20	0.70	3.20	ns		
$t_{TLH}$	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%									

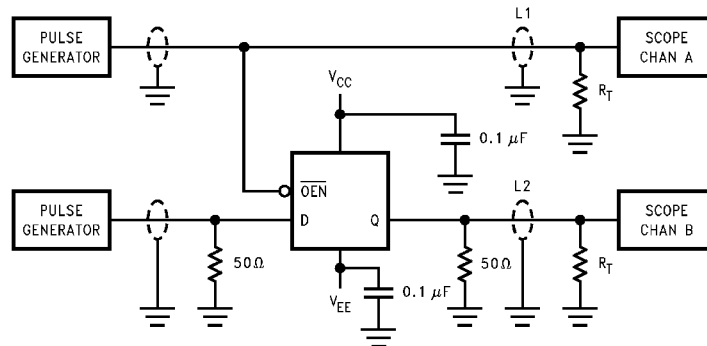
**Note 9:** F100K 300 Series cold temperature testing is performed by temperature soaking (to guarantee junction temperature equals  $-55^\circ C$ ), then testing immediately after power-up. This provides "cold start" specs which can be considered a worst case condition at cold temperatures.

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

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

**Note 12:** Not tested at  $+25^\circ C$ ,  $+125^\circ C$  and  $-55^\circ C$  temperature (design characterization data).

## Test Circuitry



DS010922-6

### Notes:

$V_{CC}$ ,  $V_{CCA} = +2V$ ,  $V_{EE} = -2.5V$

L1 and L2 = equal length 50Ω impedance lines

$R_T = 50\Omega$  terminator internal to scope

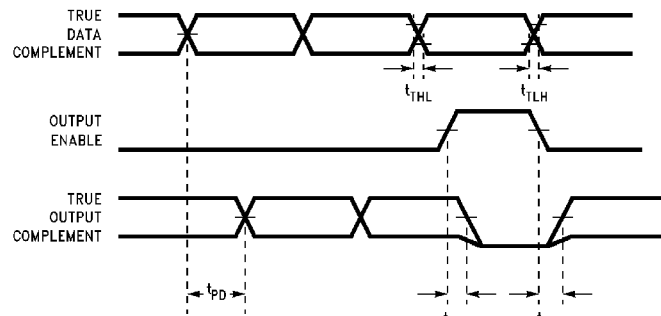
Decoupling 0.1 μF from GND to  $V_{CC}$  and  $V_{EE}$

All unused outputs are loaded with 25Ω to GND

$C_L$  = Fixture and stray capacitance  $\leq 3$  pF

FIGURE 1. AC Test Circuit

## Switching Waveforms



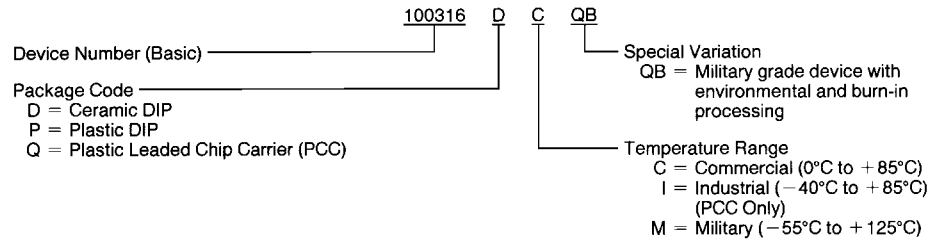
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FIGURE 2. Propagation Delay, Cut-Off and Transition Times



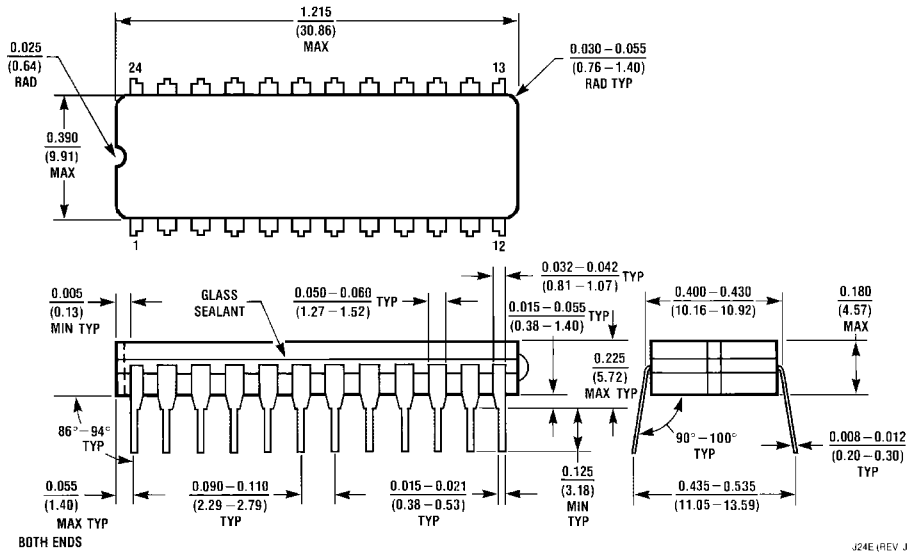
## Ordering Information

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

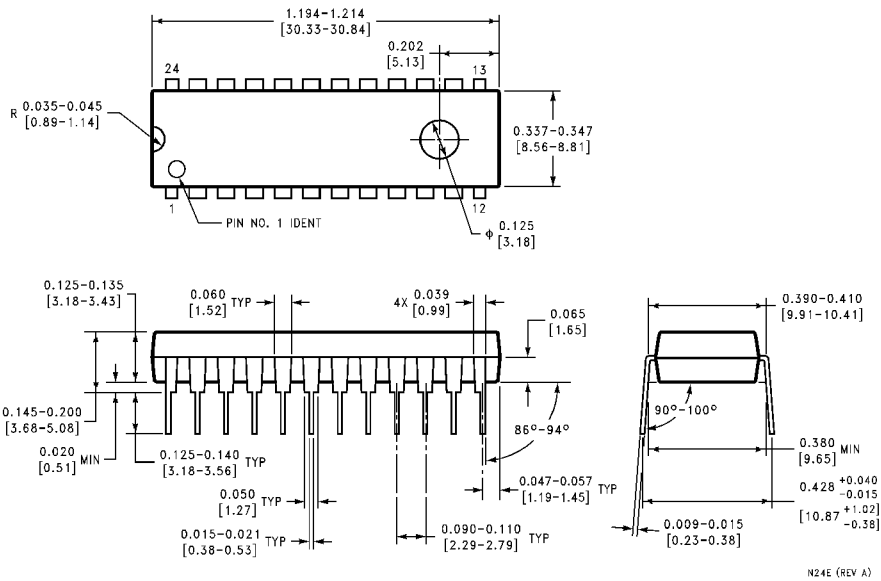


DS010922-8

**Physical Dimensions** inches (millimeters) unless otherwise noted

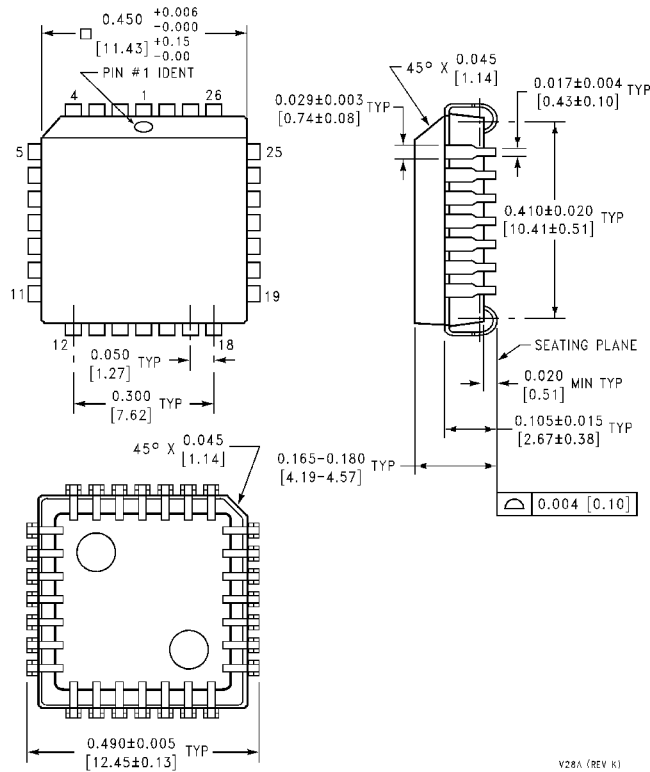


**24-Lead Ceramic Dual-In-Line Package (D)  
 Package Number J24E**



**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**

V28A (REV K)

**LIFE SUPPORT POLICY**

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1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
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