

100301

Low Power Triple 5-Input OR/NOR Gate

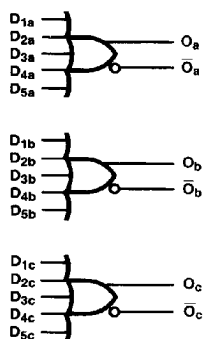
General Description

The 100301 is a monolithic triple 5-input OR/NOR gate. All inputs have 50 k Ω pull-down resistors and all outputs are buffered.

Features

- 23% power reduction of the 100101
- 2000V ESD protection
- Pin/function compatible with 100101
- Voltage compensated operating range = -4.2V to -5.7V
- Available to MIL-STD-883
- Available to industrial grade temperature range

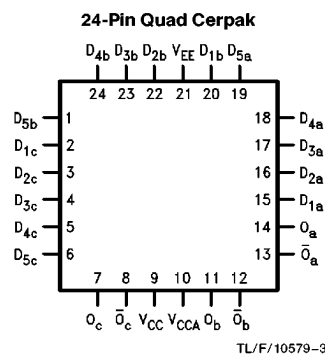
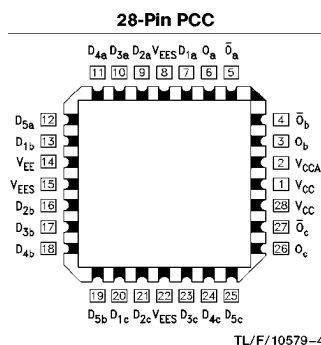
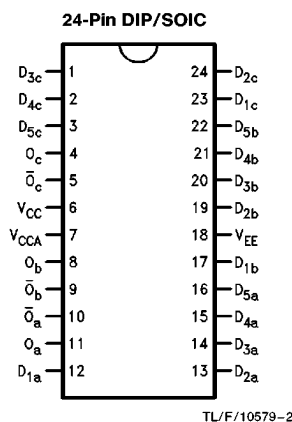
Logic Symbol



TL/F/10579-1

Pin Names	Description
D _{1a} , D _{1b} , D _{1c}	Data Inputs
O _a , O _b , O _c	Data Outputs
$\bar{O}_a$, $\bar{O}_b$, $\bar{O}_c$	Complementary Data Outputs

Connection Diagrams



Absolute Maximum Ratings

Above which the useful life may be impaired (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Storage Temperature (T_{STG}) -65°C to $+150^{\circ}\text{C}$

Maximum Junction Temperature (T_J)
Ceramic $+175^{\circ}\text{C}$
Plastic $+150^{\circ}\text{C}$

V_{EE} Pin Potential to Ground Pin -7.0V to $+0.5\text{V}$

Input Voltage (DC) V_{EE} to $+0.5\text{V}$

Output Current (DC Output HIGH) -50 mA

ESD (Note 2) $\geq 2000\text{V}$

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.

Recommended Operating Conditions

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

Commercial Version

DC Electrical Characteristics

$V_{EE} = -4.2\text{V}$ to -5.7V , $V_{CC} = V_{CCA} = \text{GND}$, $T_C = 0^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ (Note 3)

Symbol	Parameter	Min	Typ	Max	Units	Conditions	
V_{OH}	Output HIGH Voltage	-1025	-955	-870	mV	$V_{IN} = V_{IH(\text{Max})}$ or $V_{IL(\text{Min})}$	Loading with 50Ω to -2.0V
V_{OL}	Output LOW Voltage	-1830	-1705	-1620	mV		
V_{OHC}	Output HIGH Voltage	-1035			mV	$V_{IN} = V_{IH(\text{Min})}$ or $V_{IL(\text{Max})}$	Loading with 50Ω to -2.0V
V_{OLC}	Output LOW Voltage			-1610	mV		
V_{IH}	Input HIGH Voltage	-1165		-870	mV	Guaranteed HIGH Signal for All Inputs	
V_{IL}	Input LOW Voltage	-1830		-1475	mV	Guaranteed LOW Signal for All Inputs	
I_{IL}	Input LOW Current	0.50			μA	$V_{IN} = V_{IL(\text{Min})}$	
I_{IH}	Input HIGH Current			240	μA	$V_{IN} = V_{IH(\text{Max})}$	
I_{EE}	Power Supply Current	-29	-17	-15	mA	Inputs Open	

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

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

Symbol	Parameter	$T_C = 0^{\circ}\text{C}$		$T_C = +25^{\circ}\text{C}$		$T_C = +85^{\circ}\text{C}$		Units	Conditions
		Min	Max	Min	Max	Min	Max		
t_{PLH} t_{PHL}	Propagation Delay Data to Output	0.50	1.10	0.50	1.15	0.50	1.20	ns	Figures 1 and 2 (Note 1)
t_{TLH} t_{THL}	Transition Time 20% to 80%, 80% to 20%	0.40	1.20	0.40	1.20	0.40	1.20	ns	Figures 1 and 2

Note 1: The propagation delay specified is for single output switching. Delays may vary up to 100 ps with multiple outputs switching.

Commercial Version (Continued)

SOIC, PCC and Cerpak 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} t_{PHL}	Propagation Delay Data to Output	0.50	1.00	0.50	1.05	0.50	1.10	ns	Figures 1 and 2 (Note 2)
t_{TLH} t_{THL}	Transition Time 20% to 80%, 80% to 20%	0.40	1.10	0.40	1.10	0.40	1.10	ns	Figures 1 and 2
t_{OSHL}	Maximum Skew Common Edge Output-to-Output Variation Data to Output Path		240		240		240	ps	PCC Only (Note 1)
t_{OSLH}	Maximum Skew Common Edge Output-to-Output Variation Data to Output Path		330		330		330	ps	PCC Only (Note 1)
t_{OST}	Maximum Skew Opposite Edge Output-to-Output Variation Data to Output Path		330		330		330	ps	PCC Only (Note 1)
t_{PS}	Maximum Skew Pin (Signal) Transition Variation Data to Output Path		230		230		230	ps	PCC Only (Note 1)

Note 1: Output-to-Output Skew is defined as the absolute value of the difference between the actual propagation delay for any outputs within the same packaged device. The specifications apply to any outputs switching in the same direction either HIGH to LOW (t_{OSHL}), or LOW to HIGH (t_{OSLH}), or in opposite directions both HL and LH (t_{OST}). Parameters t_{OST} and t_{PS} guaranteed by design.

Note 2: The propagation delay specified is for single output switching. Delays may vary up to 100 ps with multiple outputs switching.

Industrial Version

PCC DC Electrical Characteristics

$V_{EE} = -4.2V$ to $-5.7V$, $V_{CC} = V_{CCA} = GND$, $T_C = -40^\circ C$ to $+85^\circ C$ (Note 3)

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)} or V _{IL(Min)}	Loading with 50Ω to −2.0V
V _{OL}	Output LOW Voltage	−1830	−1575	−1830	−1620	mV		
V _{OHC}	Output HIGH Voltage	−1095		−1035		mV	V _{IN} = V _{IH(Min)} or V _{IL(Max)}	Loading with 50Ω to −2.0V
V _{OLC}	Output LOW Voltage		−1565		−1610	mV		
V _{IH}	Input HIGH Voltage	−1170	−870	−1165	−870	mV	Guaranteed HIGH Signal for All Inputs	
V _{IL}	Input LOW Voltage	−1830	−1480	−1830	−1475	mV	Guaranteed LOW Signal for All Inputs	
I _{IL}	Input LOW Current	0.50		0.50		μA	V _{IN} = V _{IL(Min)}	
I _{IH}	Input HIGH Current		240		240	μA	V _{IN} = V _{IH(Max)}	
I _{EE}	Power Supply Current	−29	−15	−29	−15	mA	Inputs Open	

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.

Industrial Version (Continued)**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} t_{PHL}	Propagation Delay Data to Output	0.40	1.00	0.50	1.05	0.50	1.10	ns	Figures 1 and 2 (Note 1)
t_{TLH} t_{THL}	Transition Time 20% to 80%, 80% to 20%	0.30	1.10	0.40	1.10	0.40	1.10	ns	Figures 1 and 2

Note 1: The propagation delay specified is for single output switching. Delays may vary up to 100 ps with multiple outputs switching.

Military Version**DC Electrical Characteristics** $V_{EE} = -4.2V$ to $-5.7V$, $V_{CC} = V_{CCA} = GND$, $T_C = -55^{\circ}C$ to $+125^{\circ}C$

Symbol	Parameter	Min	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 50Ω to −2.0V	1, 2, 3
		− 1085	− 870	mV	− 55°C			
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 50Ω to −2.0V	1, 2, 3
		− 1085		mV	− 55°C			
V _{OLC}	Output LOW Voltage		− 1610	mV	0°C to + 125°C			
			− 1555	mV	− 55°C			
V _{IH}	Input HIGH Voltage	− 1165	− 870	mV	− 55°C to + 125°C	Guaranteed HIGH Signal for All Inputs		1, 2, 3, 4
V _{IL}	Input LOW Voltage	− 1830	− 1475	mV	− 55°C to + 125°C	Guaranteed LOW Signal for All Inputs		1, 2, 3, 4
I _{IL}	Input LOW Current	0.50		μA	− 55°C to + 125°C	V _{EE} = − 4.2V V _{IN} = V _{IL(Min)}		1, 2, 3
I _{IH}	Input HIGH Current		240	μA	0°C to + 125°C	V _{EE} = − 5.7V V _{IN} = V _{IH} (Max)		1, 2, 3
			340	μA	− 55°C			
I _{EE}	Power Supply Current	− 32	− 12	mA	− 55°C to + 125°C	Inputs Open		1, 2, 3

Note 1: F100K 300 Series cold temperature testing is performed by temperature soaking (to guarantee junction temperature equals $-55^{\circ}C$), 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 2: Screen tested 100% on each device at $-55^{\circ}C$, $+25^{\circ}C$, and $+125^{\circ}C$, Subgroups 1, 2, 3, 7, and 8.

Note 3: Sample tested (Method 5005, Table I) on each manufactured lot at $-55^{\circ}C$, $+25^{\circ}C$, and $+125^{\circ}C$, Subgroups A1, 2, 3, 7, and 8.

Note 4: Guaranteed by applying specified input condition and testing V_{OH}/V_{OL} .

Military Version (Continued)

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} t_{PHL}	Propagation Delay Data to Output	0.25	1.70	0.30	1.50	0.30	1.80	ns	Figures 1 and 2	1, 2, 3, 5
t_{TLH} t_{THL}	Transition Time 20% to 80%, 80% to 20%	0.30	1.20	0.30	1.20	0.30	1.20	ns		4

Note 1: 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.

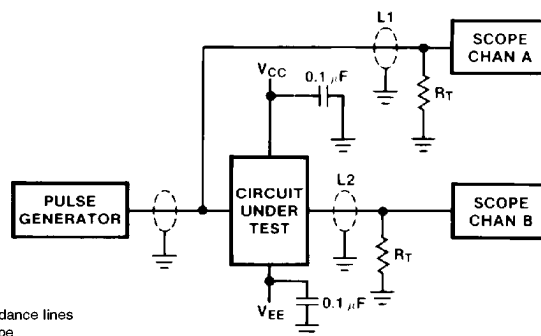
Note 2: Screen tested 100% on each device at $+25^\circ C$ temperature only, Subgroup A9.

Note 3: 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 4: Not tested at $+25^\circ C$, $+125^\circ C$, and $-55^\circ C$ temperature (design characterization data).

Note 5: The propagation delay specified is for single output switching. Delays may vary up to 100 ps with multiple outputs switching.

Test Circuitry



Notes:

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

$L1$ and $L2$ = equal length 50 Ω 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 50 Ω to GND

C_L = Fixture and stray capacitance ≤ 3 pF

TL/F/10579-5

FIGURE 1. AC Test Circuit

Switching Waveforms

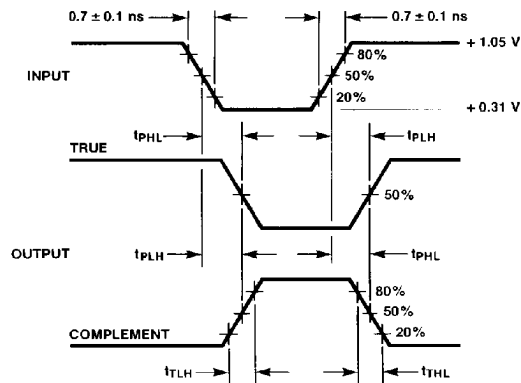
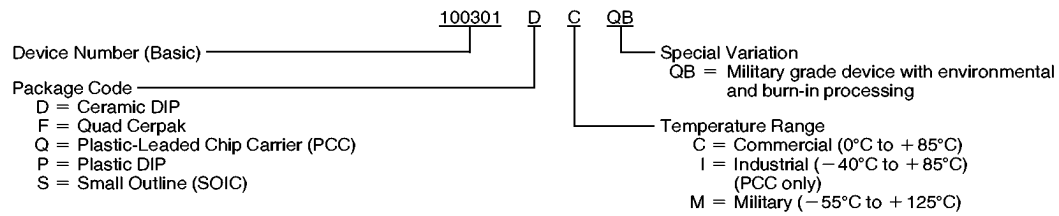


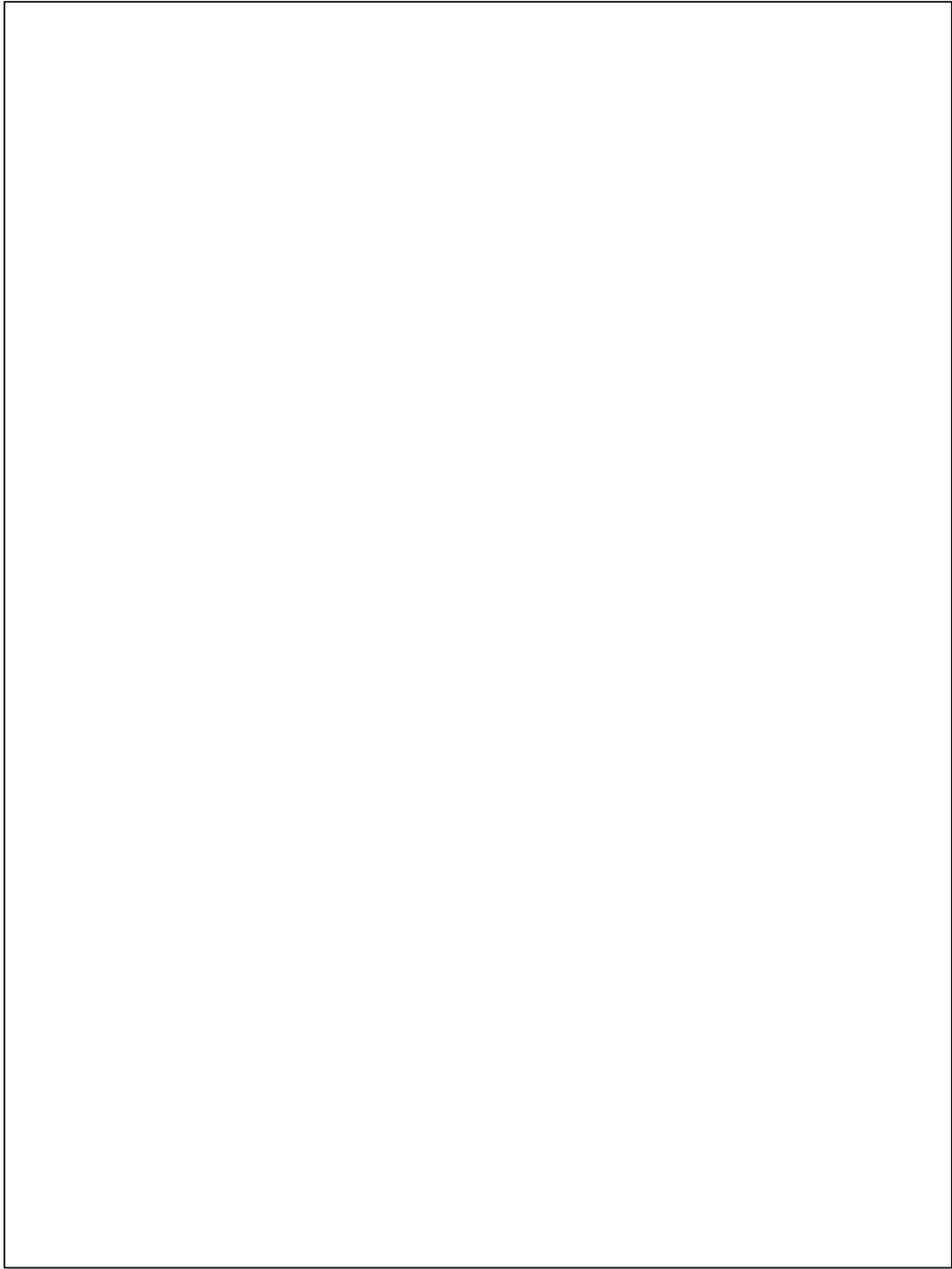
FIGURE 2. Propagation Delay and Transition Times

TL/F/10579-6

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:





Technical drawing of a 24-pin connector showing top, side, and detail views with dimensions in inches and millimeters.

Top View Dimensions:

- Overall width: 1.215 (30.86) MAX
- Pin pitch: 0.025 (0.64) RAD
- Pin 1 location: 0.390 (9.91) MAX
- Pin 13 location: 0.030 - 0.055 (0.76 - 1.40) RAD TYP

Side View Dimensions:

- Pin pitch: 0.005 (0.13) MIN TYP
- Glass sealant
- Pin pitch: 0.050 - 0.060 (1.27 - 1.52) TYP
- Pin pitch: 0.032 - 0.042 (0.81 - 1.07) TYP
- Pin pitch: 0.015 - 0.055 (0.38 - 1.40) TYP
- Pin pitch: 0.225 (5.72) MAX TYP
- Pin pitch: 0.015 - 0.021 (0.38 - 0.53) TYP
- Pin pitch: 0.125 (3.18) MIN TYP
- Pin pitch: 0.400 - 0.430 (10.16 - 10.92)
- Pin pitch: 0.180 (4.57) MAX
- Pin pitch: 0.008 - 0.012 (0.20 - 0.30) TYP
- Pin pitch: 0.435 - 0.535 (11.05 - 13.59)

Detail View Dimensions:

- Pin pitch: 0.055 (1.40) MAX TYP
- Pin pitch: 0.090 - 0.110 (2.29 - 2.79) TYP
- Pin pitch: 0.015 - 0.021 (0.38 - 0.53) TYP
- Pin pitch: 0.125 (3.18) MIN TYP
- Pin pitch: 0.400 - 0.430 (10.16 - 10.92)
- Pin pitch: 0.180 (4.57) MAX
- Pin pitch: 0.008 - 0.012 (0.20 - 0.30) TYP
- Pin pitch: 0.435 - 0.535 (11.05 - 13.59)

Other Dimensions:

- Pin pitch: 0.005 (0.13) MIN TYP
- Pin pitch: 0.055 (1.40) MAX TYP
- Pin pitch: 0.090 - 0.110 (2.29 - 2.79) TYP
- Pin pitch: 0.015 - 0.021 (0.38 - 0.53) TYP
- Pin pitch: 0.125 (3.18) MIN TYP
- Pin pitch: 0.400 - 0.430 (10.16 - 10.92)
- Pin pitch: 0.180 (4.57) MAX
- Pin pitch: 0.008 - 0.012 (0.20 - 0.30) TYP
- Pin pitch: 0.435 - 0.535 (11.05 - 13.59)

Notes:

- BOTH ENDS
- 90° - 100° TYP

Revision: 424E (REV. J)

The drawing illustrates the mechanical specifications of a 24-pin DIP package. The top view shows a rectangular body with 24 pins (12 on each side) and a circular lead identification feature. Dimensions include a body width of 0.6141 inches (15.60 mm) and a pin pitch of 0.0985 inches (2.50 mm). The side view shows a package height of 0.4180 inches (10.65 mm) and a lead height of 0.2992 inches (7.6 mm). The lead detail view shows a lead thickness of 0.0118 inches (0.3 mm) and a lead width of 0.029 inches (0.75 mm) at a 45-degree angle. The package is marked with a date code (M), lot number (A), and serial number (S) in a circular arrangement.

Top View Dimensions:

- Overall Width: 0.6141 (15.60)
- Pin Pitch: 0.0985 (2.50)
- Pin 1 Identification: 0.2992 (7.6)
- Lead Identification Feature: 0.2992 (7.6)

Side View Dimensions:

- Package Height: 0.4180 (10.65)
- Lead Height: 0.2992 (7.6)
- Lead Thickness: 0.0118 (0.3)
- Lead Width: 0.029 (0.75)

Lead Detail View Dimensions:

- Lead Thickness: 0.0118 (0.3)
- Lead Width: 0.029 (0.75)
- Lead Angle: 45°
- Lead Tip Radius: 0.004 (0.1)

Markings:

- DATE CODE (M)
- LOT NUMBER (A)
- SERIAL NUMBER (S)

8

Physical Dimensions inches (millimeters) (Continued)

24

R 0.035-0.045
[0.89-1.14]

PIN NO. 1 IDENT

13

12

0.125
[3.18]

1.194-1.214
[30.33-30.84]

0.202
[5.13]

0.337-0.347
[8.56-8.81]

0.125-0.135
[3.18-3.43]

0.060
[1.52] TYP

4X 0.039
[0.99]

0.065
[1.65]

0.145-0.200
[3.68-5.08]

0.020
[0.51] MIN

0.125-0.140
[3.18-3.56] TYP

0.050
[1.27] TYP

0.015-0.021
[0.38-0.53] TYP

0.047-0.057
[1.19-1.45] TYP

0.090-0.110
[2.29-2.79] TYP

86°-94°

90°-100°

0.390-0.410
[9.91-10.41]

0.380 MIN
[9.65]

0.428 +0.040
-0.015
[10.87 +1.02
-0.38]

0.009-0.015
[0.23-0.38]

N24E (REV A)

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

0.450 +0.006
-0.009
[11.43]

PIN #1 IDENT

4

1

26

5

25

11

19

12

18

0.050
[1.27] TYP

0.300
[7.62] TYP

45° X 0.045
[1.14]

0.165-0.180
[4.19-4.57] TYP

0.029±0.003
[0.74±0.08] TYP

45° X 0.045
[1.14]

0.017±0.004 TYP
[0.43±0.10]

0.410±0.020 TYP
[10.41±0.51]

SEATING PLANE

0.020
[0.51] MIN TYP

0.105±0.015 TYP
[2.67±0.38]

0.004 [0.10]

0.490±0.005
[12.45±0.13] TYP

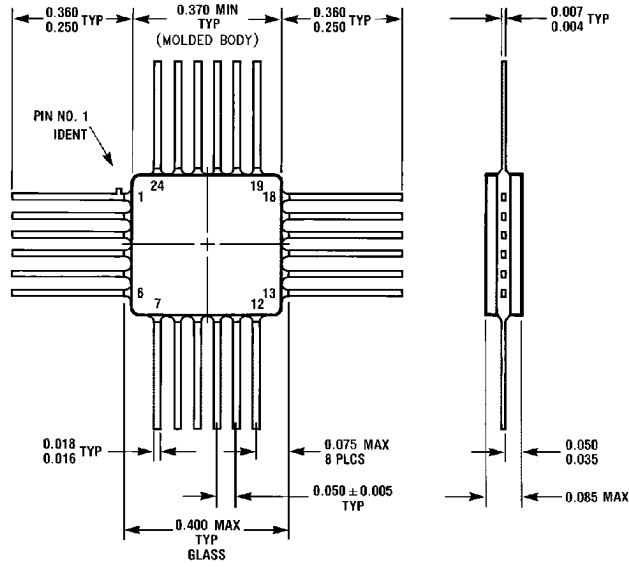
V28A (REV K)

28-Lead Plastic Chip Carrier (Q)

NS Package Number V28A

Physical Dimensions inches (millimeters) (Continued)

Lit. # 114900



W24B (REV D)

**24-Lead Quad Cerpak (F)
NS Package Number W24B**

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2. A critical component is 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.



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