

# 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 kΩ pull-down resistors and all outputs are buffered.

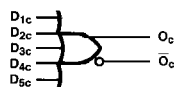
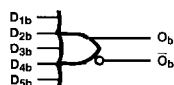
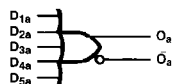
- 2000V ESD protection
- Pin/function compatible with 100101
- Voltage compensated operating range = -4.2V to -5.7V
- Available to MIL-STD-883
- Available to industrial grade temperature range

### Features

- 23% power reduction of the 100101

### Ordering Code:

### Logic Symbol

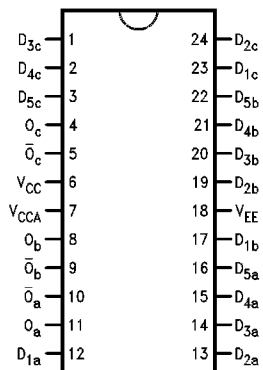


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Pin Names	Description
$D_{na}, D_{nb}, D_{nc}$	Data Inputs
$O_a, O_b, O_c$	Data Outputs
$\bar{O}_a, \bar{O}_b, \bar{O}_c$	Complementary Data Outputs

### Connection Diagrams

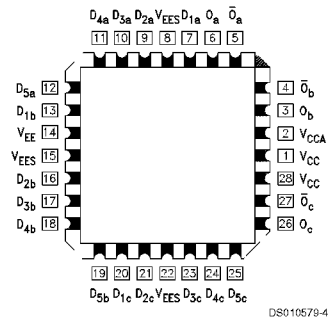
24-Pin DIP/SOIC



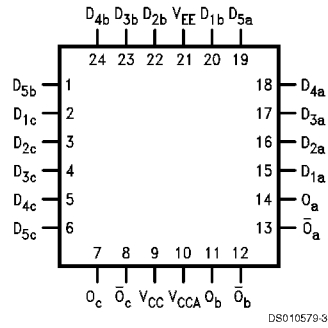
DS010579-2

## Connection Diagrams (Continued)

### 28-Pin PCC



### 24-Pin Quad Cerpak



## Absolute Maximum Ratings (Note 1)

Above which the useful life may be impaired

Storage Temperature ( $T_{STG}$ )	-65°C to +150°C
Maximum Junction Temperature ( $T_J$ )	
Ceramic	+175°C
Plastic	+150°C
$V_{EE}$ Pin Potential to Ground Pin	-7.0V to +0.5V
Input Voltage (DC)	$V_{EE}$ to +0.5V
Output Current (DC Output HIGH)	-50 mA
ESD (Note 2)	$\geq 2000V$

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

Symbol	Parameter	Min	Typ	Max	Units	Conditions	
$V_{OH}$	Output HIGH Voltage	-1025	-955	-870	mV	$V_{IN} = V_{IH(Max)}$ or $V_{IL(Min)}$	Loading with $50\Omega$ to $-2.0V$
$V_{OL}$	Output LOW Voltage	-1830	-1705	-1620	mV		
$V_{OHC}$	Output HIGH Voltage	-1035			mV	$V_{IN} = V_{IH(Min)}$ or $V_{IL(Max)}$	Loading with $50\Omega$ 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			$\mu A$	$V_{IN} = V_{IL(Min)}$	
$I_{IH}$	Input HIGH Current			240	$\mu A$	$V_{IN} = V_{IH(Max)}$	
$I_{EE}$	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

$V_{EE} = -4.2V$  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	0.50	1.10	0.50	1.15	0.50	1.20	ns	Figures 1, 2 (Note 4)
$t_{PHL}$	Data to Output								
$t_{TLH}$	Transition Time	0.40	1.20	0.40	1.20	0.40	1.20	ns	Figures 1, 2
$t_{THL}$	20% to 80%, 80% to 20%								

**Note 4:** The propagation delay specified is for single output switching. Delays may vary up to 100 ps with multiple outputs switching.

## 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		
$t_{PLH}$	Propagation Delay	0.50	1.00	0.50	1.05	0.50	1.10	ns	Figures 1, 2 (Note 6)
$t_{PHL}$	Data to Output								
$t_{TLH}$	Transition Time	0.40	1.10	0.40	1.10	0.40	1.10	ns	Figures 1, 2
$t_{THL}$	20% to 80%, 80% to 20%								
$t_{OSHL}$	Maximum Skew Common Edge Output-to-Output Variation Data to Output Path		240		240		240	ps	PCC Only (Note 5)

## SOIC, PCC and Cerpak AC Electrical Characteristics (Continued)

$V_{EE} = -4.2V$  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		
$t_{OSLH}$	Maximum Skew Common Edge Output-to-Output Variation Data to Output Path	330		330		330		ps	PCC Only (Note 5)
$t_{OST}$	Maximum Skew Opposite Edge Output-to-Output Variation Data to Output Path	330		330		330		ps	PCC Only (Note 5)
$t_{PS}$	Maximum Skew Pin (Signal) Transition Variation Data to Output Path	230		230		230		ps	PCC Only (Note 5)

**Note 5:** 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 6:** 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 7)

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	$V_{IN} = V_{IH(Max)}$ or $V_{IL(Min)}$	Loading with $50\Omega$ 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 $50\Omega$ 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		$\mu A$	$V_{IN} = V_{IL(Min)}$	
$I_{IH}$	Input HIGH Current		240		240	$\mu A$	$V_{IN} = V_{IH(Max)}$	
$I_{EE}$	Power Supply Current	-29	-15	-29	-15	mA	Inputs Open	

**Note 7:** 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 Data to Output	0.40	1.00	0.50	1.05	0.50	1.10	ns	Figures 1, 2 (Note 8)
$t_{TLH}$	Transition Time 20% to 80%, 80% to 20%	0.30	1.10	0.40	1.10	0.40	1.10	ns	Figures 1, 2

**Note 8:** 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	$0^\circ C$ to $+125^\circ C$	$V_{IN} = V_{IH(Max)}$ or $V_{IL} (Min)$	Loading with $50\Omega$ to $-2.0V$	(Notes 9, 10, 11)
		-1085	-870	mV	$-55^\circ C$			
$V_{OL}$	Output LOW Voltage	-1830	-1620	mV	$0^\circ C$ to $+125^\circ C$	$V_{IN} = V_{IH(Min)}$ or $V_{IL} (Max)$	Loading with $50\Omega$ to $-2.0V$	(Notes 9, 10, 11)
		-1830	-1555	mV	$-55^\circ C$			
$V_{OHC}$	Output HIGH Voltage	-1035		mV	$0^\circ C$ to $+125^\circ C$	$V_{IN} = V_{IH(Min)}$ or $V_{IL} (Max)$	Loading with $50\Omega$ to $-2.0V$	(Notes 9, 10, 11)
		-1085		mV	$-55^\circ C$			
$V_{OLC}$	Output LOW Voltage		-1610	mV	$0^\circ C$ to $+125^\circ C$	$V_{IN} = V_{IH(Min)}$ or $V_{IL} (Max)$	Loading with $50\Omega$ to $-2.0V$	(Notes 9, 10, 11)
			-1555	mV	$-55^\circ C$			
$V_{IH}$	Input HIGH Voltage	-1165	-870	mV	$-55^\circ C$ to $+125^\circ C$	Guaranteed HIGH Signal for All Inputs	(Notes 9, 10, 11, 12)	
$V_{IL}$	Input LOW Voltage	-1830	-1475	mV	$-55^\circ C$ to $+125^\circ C$	Guaranteed LOW Signal for All Inputs	(Notes 9, 10, 11, 12)	
$I_{IL}$	Input LOW Current	0.50		$\mu A$	$-55^\circ C$ to $+125^\circ C$	$V_{EE} = -4.2V$ $V_{IN} = V_{IL(Min)}$	(Notes 9, 10, 11)	
$I_{IH}$	Input HIGH Current		240	$\mu A$	$0^\circ C$ to $+125^\circ C$	$V_{EE} = -5.7V$ $V_{IN} = V_{IH} (Max)$	(Notes 9, 10, 11)	
			340	$\mu A$	$-55^\circ C$			
$I_{EE}$	Power Supply Current	-32	-12	mA	$-55^\circ C$ to $+125^\circ C$	Inputs Open	(Notes 9, 10, 11)	

**Note 9:** 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 10:** 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 11:** 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 12:** Guaranteed by applying specified input condition and testing  $V_{OH}/V_{OL}$ .

## 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	0.25	1.70	0.30	1.50	0.30	1.80	ns	<i>Figures 1, 2</i>	(Notes 13, 14, 15, 17)
$t_{PHL}$	Data to Output									
$t_{TLH}$	Transition Time	0.30	1.20	0.30	1.20	0.30	1.20	ns		(Note 16)
$t_{THL}$	20% to 80%, 80% to 20%									

**Note 13:** 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.

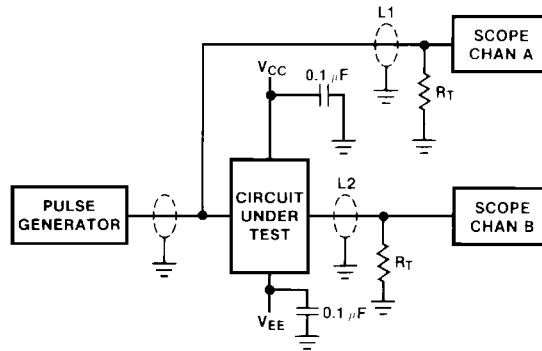
**Note 14:** Screen tested 100% on each device at  $+25^\circ C$  temperature only, Subgroup A9.

**Note 15:** 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 16:** Not tested at  $+25^\circ C$ ,  $+125^\circ C$ , and  $-55^\circ C$  temperature (design characterization data).

**Note 17:** The propagation delay specified is for single output switching. Delays may vary up to 100 ps with multiple outputs switching.

## Test Circuitry



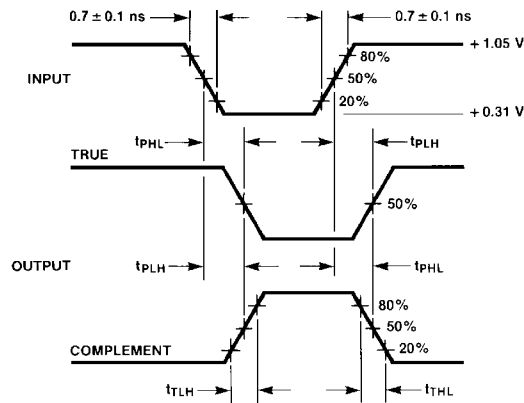
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### Notes:

$V_{CC}, V_{CCA} = +2V, V_{EE} = -2.5V$   
 $L1$  and  $L2$  = equal length  $50\Omega$  impedance lines  
 $R_T = 50\Omega$  terminator internal to scope  
 Decoupling  $0.1 \mu F$  from GND to  $V_{CC}$  and  $V_{EE}$   
 All unused outputs are loaded with  $50\Omega$  to GND  
 $C_L$  = Fixture and stray capacitance  $\leq 3 pF$

FIGURE 1. AC Test Circuit

## Switching Waveforms

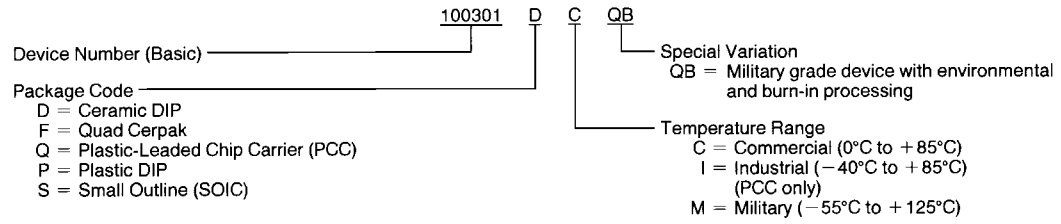


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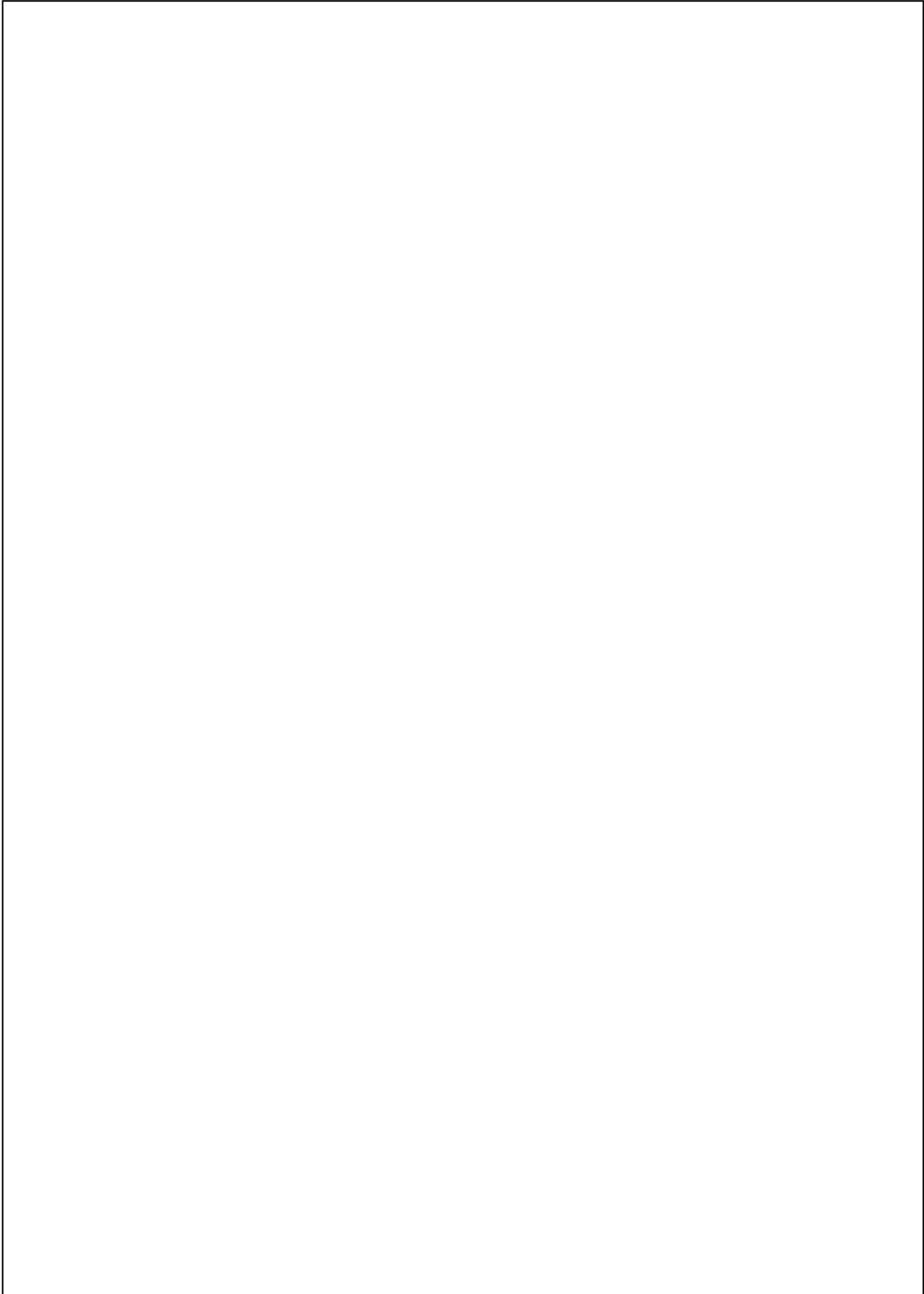
FIGURE 2. Propagation Delay and Transition Times

## 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:

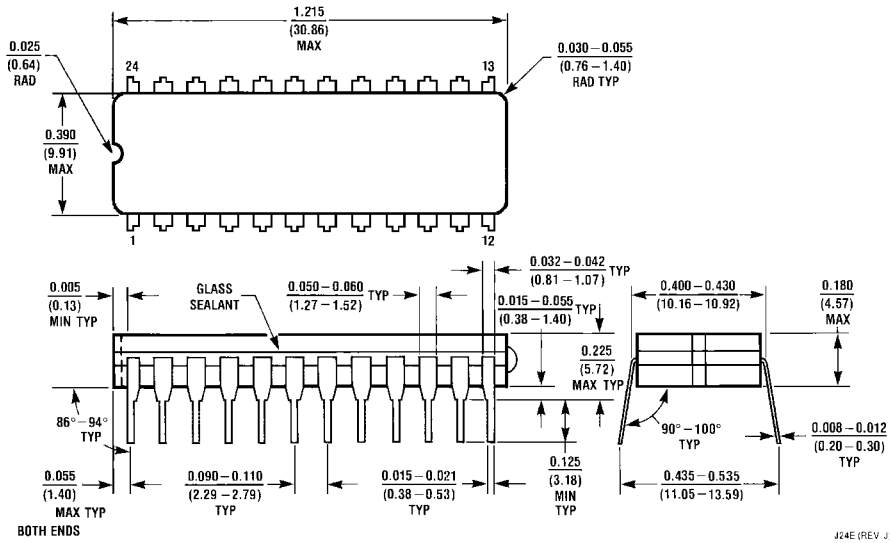


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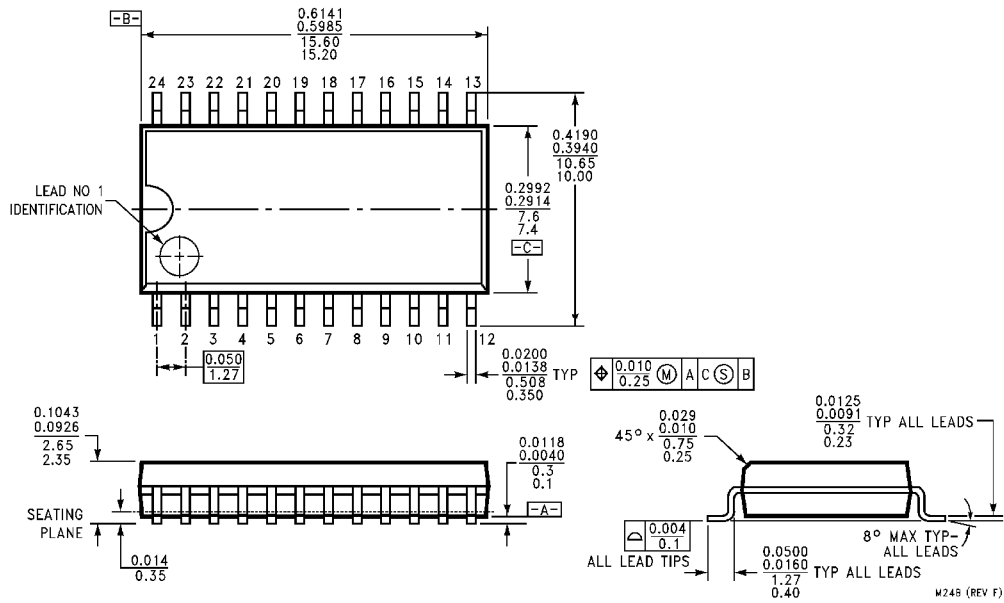




## Physical Dimensions inches (millimeters) unless otherwise noted

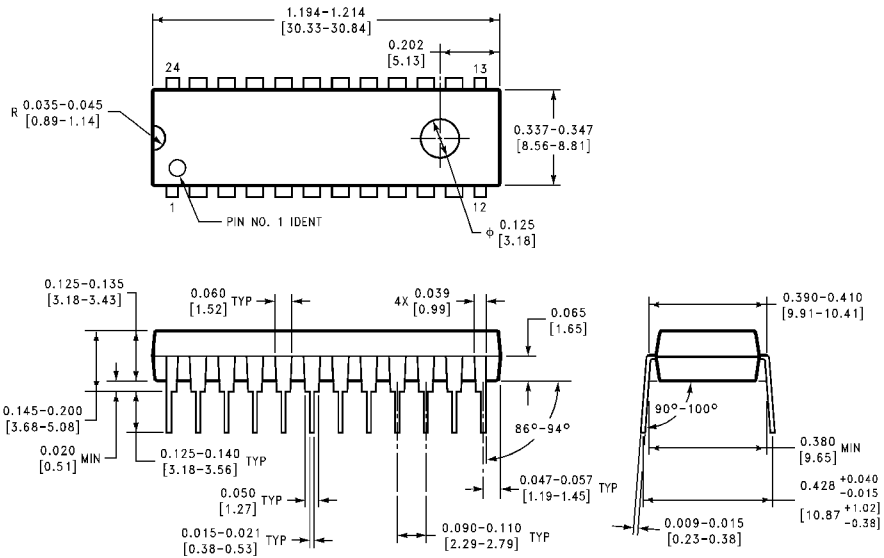


**24-Lead Ceramic Dual-In-Line Package (0.400" Wide) (D)  
Package Number J24E**



**24-Lead Molded Package (0.300" Wide) (S)  
Package Number M24B**

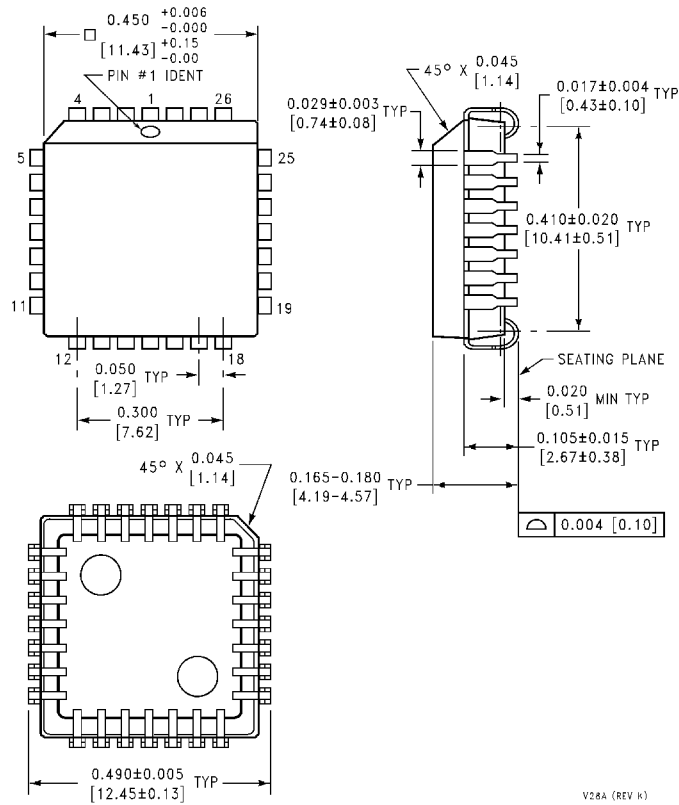
**Physical Dimensions** inches (millimeters) unless otherwise noted (Continued)



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

N24E (REV A)

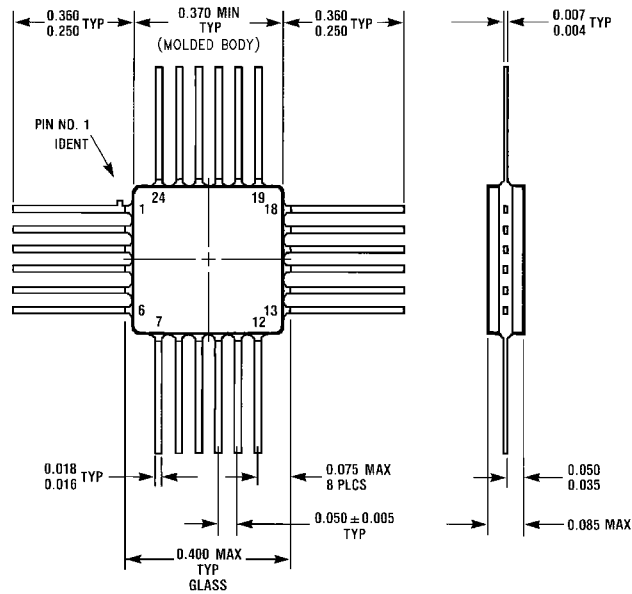
**Physical Dimensions** inches (millimeters) unless otherwise noted (Continued)



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

V28A (REV K)

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



W24B (REV D)

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

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