

100307 Low Power Quint Exclusive OR/NOR Gate

General Description

The 100307 is monolithic quint exclusive-OR/NOR gate. The Function output is the wire-OR of all five exclusive-OR outputs. All inputs have 50 kΩ pull-down resistors.

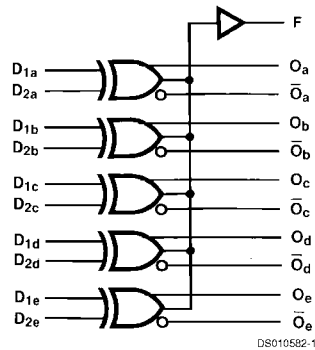
- 2000V ESD protection
- Pin/function compatible with 100107
- Voltage compensated operating range = -4.2V to -5.7V
- Available to industrial grade temperature range
- Available to MIL-STD-883

Features

- Low Power Operation

Ordering Code:

Logic Symbol



DS010582-1

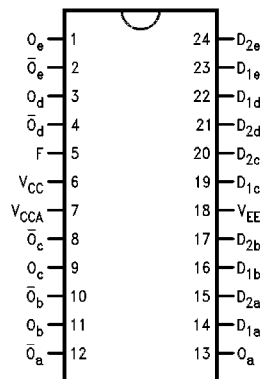
Logic Equation

$$F = (D_{1a} \oplus D_{2a}) + (D_{1b} \oplus D_{2b}) + (D_{1c} \oplus D_{2c}) + (D_{1d} \oplus D_{2d}) + (D_{1e} \oplus D_{2e})$$

Pin Names	Description
$D_{na}-D_{ne}$	Data Inputs
F	Function Output
O_a-O_e	Data Outputs
$\bar{O}_a-\bar{O}_e$	Complementary Data Outputs

Connection Diagrams

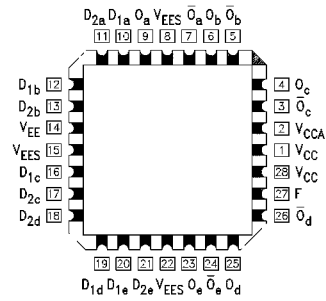
24-Pin DIP/SOIC



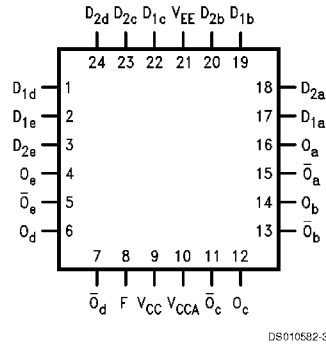
DS010582-2

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)	≥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 50Ω 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 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	$V_{IN} = V_{IL (Min)}$	
I_{IH}	Input HIGH Current $D_{2a}-D_{2e}$ $D_{1a}-D_{1e}$			250 350	μA	$V_{IN} = V_{IH (Max)}$	
I_{EE}	Power Supply Current	-69	-43	-30	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	0.55	1.90	0.55	1.80	0.55	1.90	ns	Figures 1, 2
t_{PHL}	$D_{2a}-D_{2e}$ to O, \bar{O}								
t_{PLH}	Propagation Delay	0.55	1.70	0.55	1.60	0.55	1.70		
t_{PHL}	$D_{1a}-D_{1e}$ to O, \bar{O}								
t_{PLH}	Propagation Delay	1.15	2.75	1.15	2.75	1.15	3.00		
t_{PHL}	Data to F								
t_{TLH}	Transition Time 20% to 80%, 80% to 20%	0.35	1.20	0.35	1.20	0.35	1.20	ns	
t_{THL}									

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 $D_{2a}-D_{2e}$ to O, \bar{O}	0.55	1.70	0.55	1.60	0.55	1.70	ns	Figures 1, 2
t_{PLH} t_{PHL}	Propagation Delay $D_{1a}-D_{1e}$ to O, \bar{O}	0.55	1.50	0.55	1.40	0.55	1.50	ns	
t_{PLH} t_{PHL}	Propagation Delay Data to F	1.15	2.55	1.15	2.55	1.15	2.80	ns	
t_{TLH} t_{THL}	Transition Time 20% to 80%, 80% to 20%	0.35	1.10	0.35	1.10	0.35	1.10	ns	

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 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	$V_{IN} = V_{IH(Max)}$ 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					μA	$V_{IN} = V_{IH(Max)}$	
			250		250			
			350		350			
I_{EE}	Power Supply Current	-69	-30	-69	-30	mA	Inputs Open	

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} t_{PHL}	Propagation Delay $D_{2a}-D_{2e}$ to O, \bar{O}	0.45	1.70	0.55	1.60	0.55	1.70	ns	Figures 1, 2
t_{PLH} t_{PHL}	Propagation Delay $D_{1a}-D_{1e}$ to O, \bar{O}	0.45	1.50	0.55	1.40	0.55	1.50	ns	
t_{PLH} t_{PHL}	Propagation Delay Data to F	1.05	2.55	1.15	2.55	1.15	2.80	ns	
t_{TLH} t_{THL}	Transition Time 20% to 80%, 80% to 20%	0.35	1.10	0.35	1.10	0.35	1.10	ns	

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 50Ω to $-2.0V$	1, 2, 3
		-1085	-870	mV	$-55^\circ C$			
V_{OL}	Output LOW Voltage	-1830	-1620	mV	$0^\circ C$ to $+125^\circ C$			
		-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 50Ω to $-2.0V$	1, 2, 3
		-1085		mV	$-55^\circ C$			
V_{OLC}	Output LOW Voltage		-1610	mV	$0^\circ C$ to $+125^\circ C$			
			-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	1, 2, 3, 4	
V_{IL}	Input LOW Voltage	-1830	-1475	mV	$-55^\circ C$ to $+125^\circ C$	Guaranteed LOW Signal for All Inputs	1, 2, 3, 4	
I_{IL}	Input LOW Current	0.50		μA	$-55^\circ C$ to $+125^\circ C$	$V_{EE} = -4.2V$ $V_{IN} = V_{IL}$ (Min)	1, 2, 3	
I_{IH}	Input High Current $D_{2a}-D_{2e}$ $D_{1a}-D_{1e}$		250	μA	$0^\circ C$ to $+125^\circ C$	$V_{EE} = -5.7V$ $V_{IN} = V_{IH}$ (Max)	1, 2, 3	
			350	μA	$-55^\circ C$			
	$D_{2a}-D_{2e}$ $D_{1a}-D_{1e}$		350	μA	$-55^\circ C$			
			500	μA	$-55^\circ C$			
I_{EE}	Power Supply Current	-75	-25	mA	$-55^\circ C$ to $+125^\circ C$	Inputs Open	1, 2, 3	

Note 5: 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 6: 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 7: 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 8: 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	0.30	2.10	0.40	1.90	0.40	2.40	ns	Figures 1, 2	1, 2, 3
t_{PHL}	$D_{2a}-D_{2e}$ to O, \bar{O}									
t_{PLH}	Propagation Delay	0.30	1.90	0.40	1.80	0.40	2.20	ns		
t_{PHL}	$D_{1a}-D_{1e}$ to O, \bar{O}									
t_{PLH}	Propagation Delay	0.80	2.90	0.90	2.80	0.90	3.40	ns		
t_{PHL}	Data to F									4
t_{TLH}	Transition Time	0.20	1.70	0.30	1.60	0.20	1.70	ns		
t_{THL}	20% to 80%, 80% to 20%									

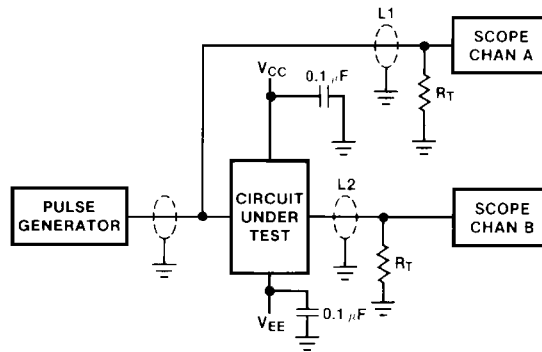
Note 9: F100K 300 Series cold temperature testing is performed by temperature soaking (to guarantee junction temperature equals $-55^\circ C$), then testing immediately after power-up. This provides "cold start" specs which can be considered a worst case condition at cold temperatures.

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 mfg. 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



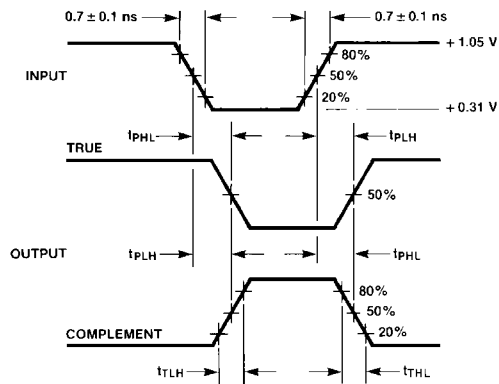
DS010582-5

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 50Ω to GND
 C_L = Fixture and stray capacitance ≤ 3 pF

FIGURE 1. AC Test Circuit

Switching Waveforms

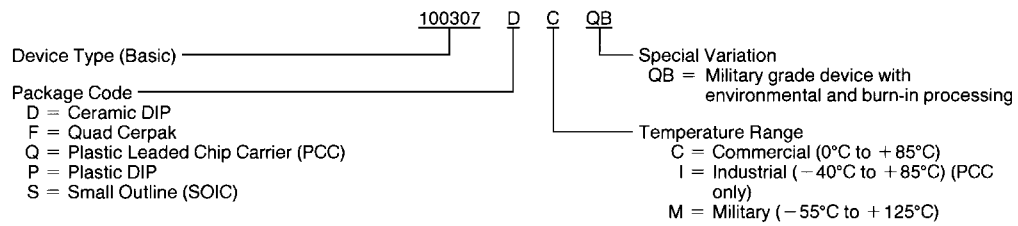


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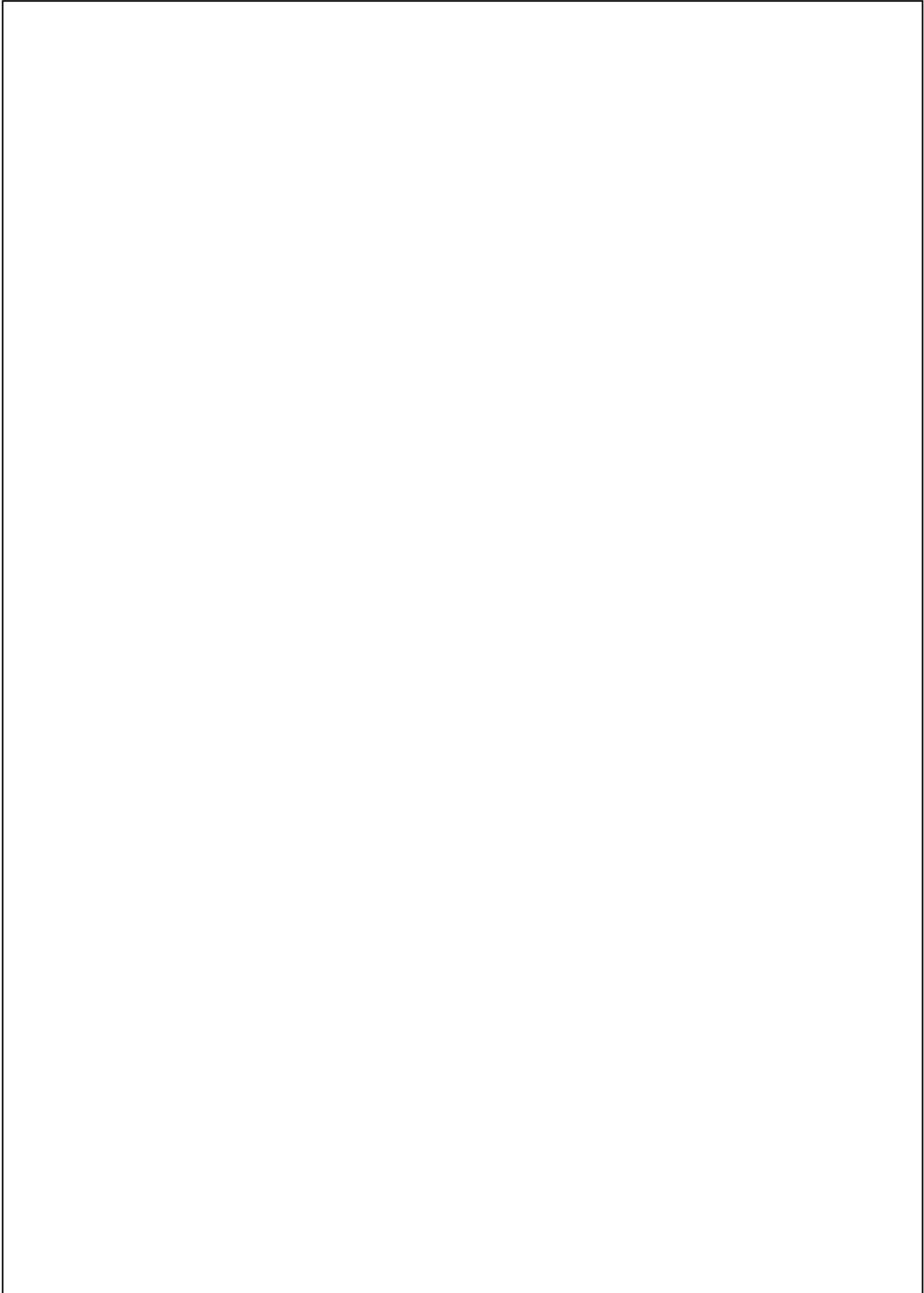
FIGURE 2. Propagation Delay and Transition Times

Ordering Information

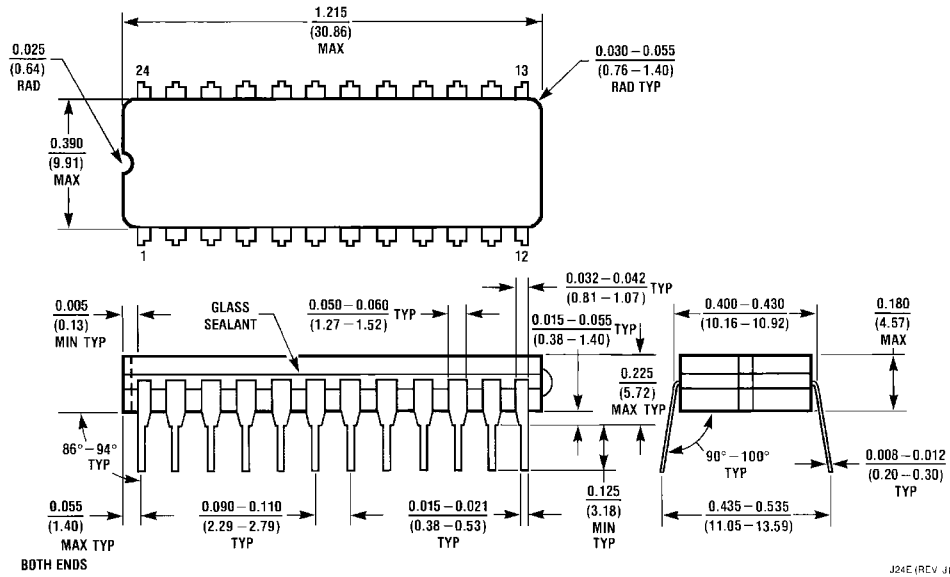
The device number is used to form part of a simplified purchasing code where a package type and temperature range are defined as follows:



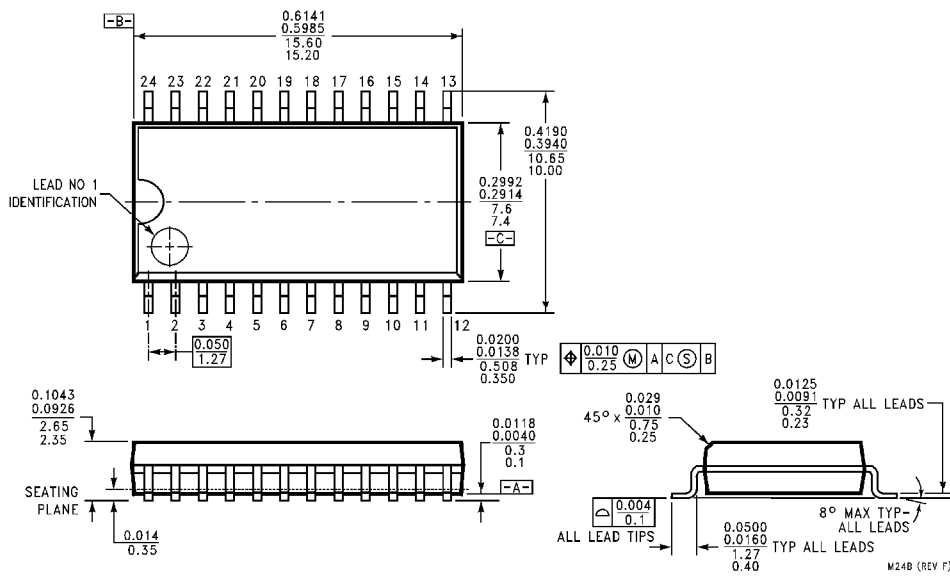
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Physical Dimensions inches (millimeters) unless otherwise noted

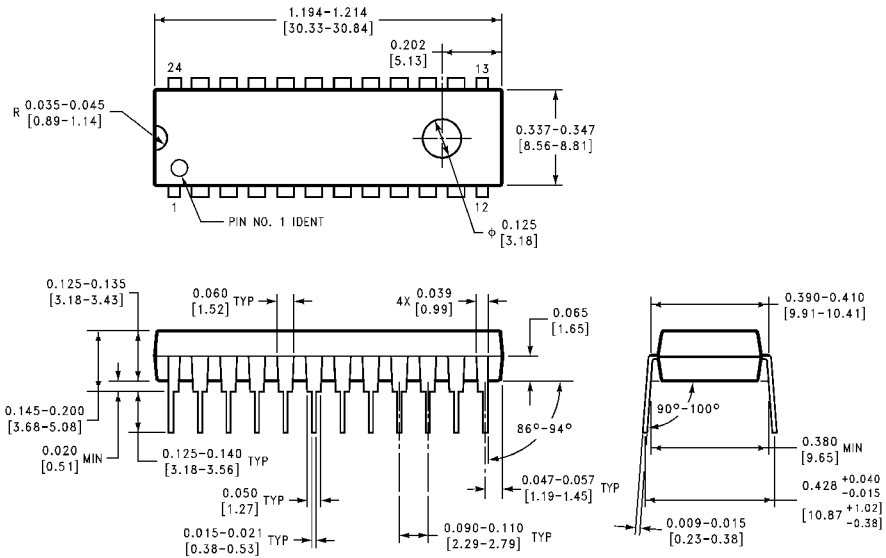


24-Pin Ceramic Dual-In-Line Package (D)
Package Number J24E



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

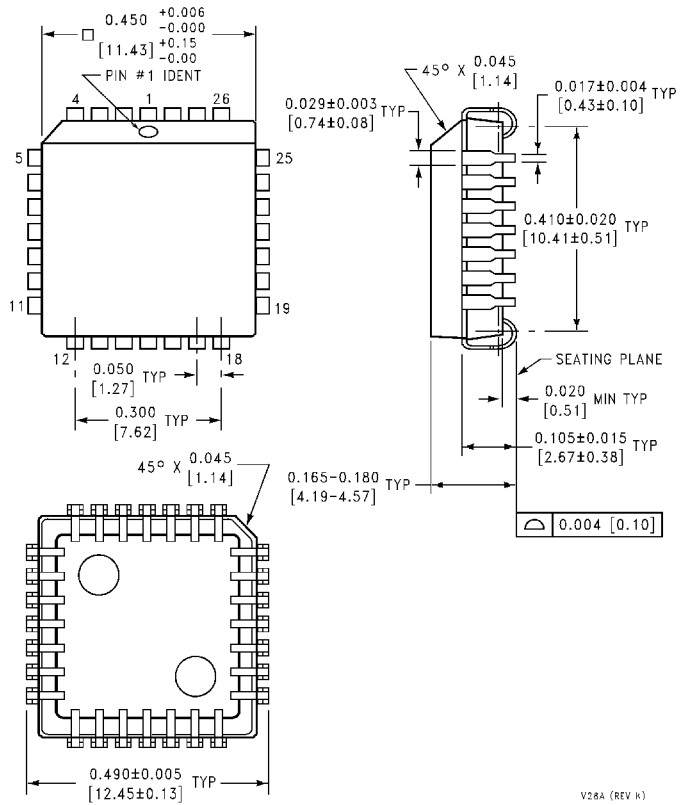
Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



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

N24E (REV A)

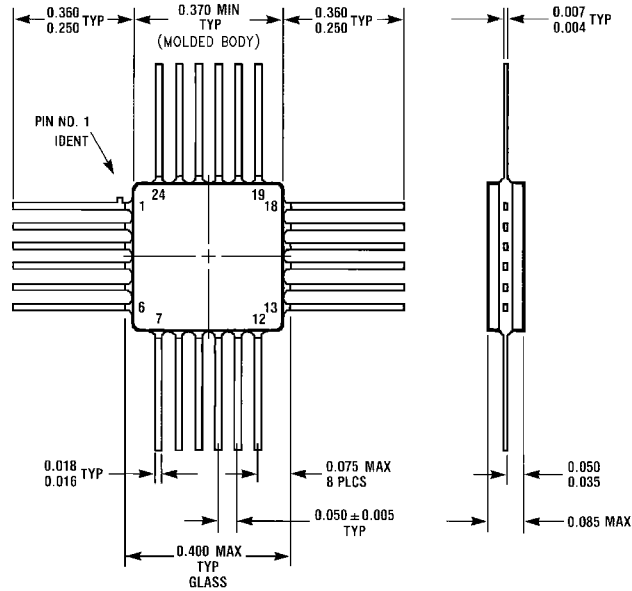
Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



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

V28A (REV K)

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



W24B (REV D)

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

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