

100371

Low Power Triple 4-Input Multiplexer with Enable

General Description

The 100371 contains three 4-input multiplexers which share a common decoder (inputs S_0 and S_1). Output buffer gates provide true and complement outputs. A HIGH on the Enable input ($\bar{E}$) forces all true outputs LOW (see Truth Table). All inputs have 50 k Ω pull-down resistors.

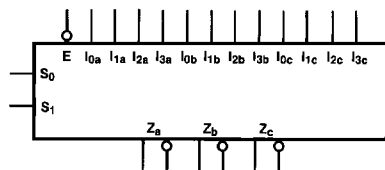
- 2000V ESD protection
- Pin/function compatible with 100171
- Voltage compensated operating range = -4.2V to -5.7V
- Available to industrial grade temperature range

Features

- 35% power reduction of the 100171

Ordering Code:

Logic Symbol

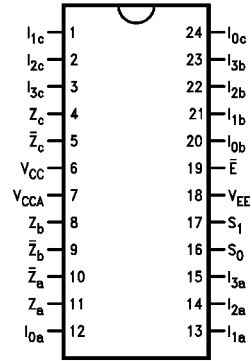


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Pin Names	Description
$I_{0x}-I_{3x}$	Data Inputs
S_0, S_1	Select Inputs
$\bar{E}$	Enable Input (Active LOW)
Z_a-Z_c	Data Outputs
$\bar{Z}_a-\bar{Z}_c$	Complementary Data Outputs

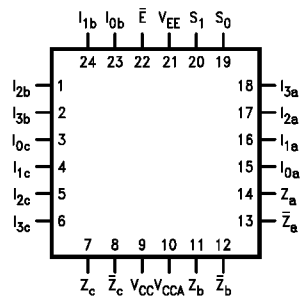
Connection Diagrams

24-Pin DIP/SOIC



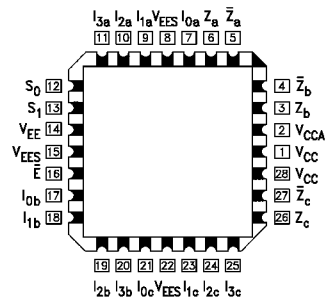
DS010148-2

24-Pin Quad Cerpak



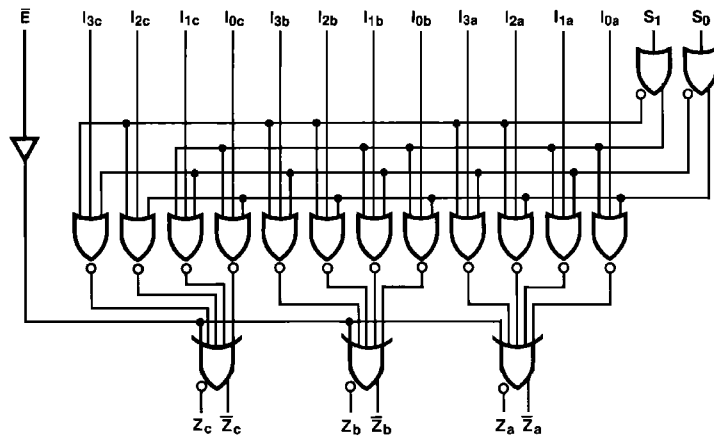
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28-Pin PCC



DS010148-4

Logic Diagram



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Truth Table

Inputs			Outputs
$\bar{E}$	S_0	S_1	Z_n
L	L	L	I_{0x}
L	H	L	I_{1x}
L	L	H	I_{2x}
L	H	H	I_{3x}
H	X	X	L

H = HIGH Voltage Level
L = LOW Voltage Level
X = Don't Care

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
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)	Loading with 50Ω 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 50Ω to −2.0V
V _{OLC}	Output LOW Voltage			−1610	mV	or V _{IL} (Max)	
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			340 300	μA	V _{IN} = V _{IH} (Max)	
	I _{OX} −I _{3X} S ₀ , S ₁ , $\overline{E}$						
I _{EE}	Power Supply Current	−75		−39	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.

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	0.45	1.50	0.45	1.50	0.45	1.60	ns	Figures 1, 2 (Note 4)
t_{PHL}	$I_{OX}-I_{3X}$ to Output								
t_{PLH}	Propagation Delay	0.90	2.40	0.90	2.40	1.00	2.60	ns	
t_{PHL}	S_0, S_1 to Output								
t_{PLH}	Propagation Delay	0.65	2.30	0.65	2.30	0.75	2.40	ns	Figures 1, 2
t_{PHL}	$\bar{E}$ to Output								
t_{TLH}	Transition Time	0.35	1.20	0.35	1.20	0.35	1.20	ns	
t_{THL}	20% to 80%, 80% to 20%								

Note 4: The propagation delay specified is for single output switching. Delays may vary up to 300 ps with multiple outputs switching.

Commercial Version 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	0.45	1.30	0.45	1.30	0.45	1.40	ns	Figures 1, 2 (Note 6)
t_{PHL}	$I_{OX}-I_{3X}$ to Output								
t_{PLH}	Propagation Delay	0.90	2.20	0.90	2.20	1.00	2.40	ns	
t_{PHL}	S_0, S_1 to Output								
t_{PLH}	Propagation Delay	0.65	2.10	0.65	2.10	0.75	2.20	ns	Figures 1, 2
t_{PHL}	$\bar{E}$ to Output								
t_{TLH}	Transition Time	0.35	1.10	0.35	1.10	0.35	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		400		400		400	ps	PCC only (Note 5)
t_{OSLH}	Maximum Skew Common Edge Output-to-Output Variation Data to Output Path		490		490		490	ps	PCC only (Note 5)
t_{OST}	Maximum Skew Opposite Edge Output-to-Output Variation Data to Output Path		490		490		490	ps	PCC only (Note 5)
t_{PS}	Maximum Skew Pin (Signal) Transition Variation Data to Output Path		430		430		430	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 300 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° 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						V _{IN} = V _{IH} (Max)	
	I _{OX} −I _{3X} S ₀ , S ₁ , $\overline{E}$		340 300		340 300	μA		
I _{EE}	Power Supply Current	−75	−35	−75	−39	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.

Industrial Version 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	0.40	1.30	0.45	1.30	0.45	1.40	ns	Figures 1, 2 (Note 8)
t_{PHL}	$I_{OX}-I_{3X}$ to Output								
t_{PLH}	Propagation Delay	0.70	2.20	0.90	2.20	1.00	2.40	ns	
t_{PHL}	S_0, S_1 to Output								
t_{PLH}	Propagation Delay	0.65	2.10	0.65	2.10	0.75	2.20	ns	Figures 1, 2
t_{PHL}	$\bar{E}$ to Output								
t_{TLH}	Transition Time	0.20	1.60	0.35	1.10	0.35	1.10	ns	Figures 1, 2
t_{THL}	20% to 80%, 80% to 20%								

Note 8: The propagation delay specified is for single output switching. Delays may vary up to 300 ps with multiple outputs switching.

Military Version—Preliminary 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 (Max) or V _{IL} (Min)	Loading with 50Ω to -2.0V	(Notes 9, 10, 11)
V _{OL}	Output LOW Voltage	-1085	-870	mV	-55°C			
		-1830	-1620	mV	0°C to +125°C			
V _{OHC}	Output HIGH Voltage	-1830	-1555	mV	-55°C	V _{IN} = V _{IH} (Min) or V _{IL} (Max)	Loading with 50Ω to -2.0V	(Notes 9, 10, 11)
		-1035		mV	0°C to +125°C			
V _{OLC}	Output LOW Voltage	-1085		mV	-55°C			
			-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		(Notes 9, 10, 11, 12)
V _{IL}	Input LOW Voltage	-1830	-1475	mV	-55°C to +125°C	Guaranteed LOW Signal for All Inputs		(Notes 9, 10, 11, 12)
I _{IL}	Input LOW Current	0.50		μA	-55°C to +125°C	V _{EE} = -4.2V V _{IN} = V _{IL} (Min)		(Notes 9, 10, 11)
I _{IH}	Input HIGH Current					V _{EE} = -5.7V V _{IN} = V _{IH} (Max)		(Notes 9, 10, 11)
	I _{ox} -I _{3x}		340	μA	0°C to +125°C			
	S ₀ , S ₁ , $\bar{E}$		300					
	I _{ox} -I _{3x}		490	μA	-55°C	V _{EE} = -5.7V V _{IN} = V _{IH} (Max)		(Notes 9, 10, 11)
			450					
I _{EE}	Power Supply Current	-80	-30	mA	-55°C to +125°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 1, 2, 3, 7, and 8.

Note 12: 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	0.30	1.90	0.40	1.70	0.30	2.00	ns	Figures 1, 2	(Notes 13, 14, 15, 17)
t_{PHL}	$I_{Ox}-I_{3x}$ to Output									
t_{PLH}	Propagation Delay	0.40	2.70	0.60	2.40	0.50	2.90	ns		
t_{PHL}	S_O, S_1 to Output									
t_{PLH}	Propagation Delay	0.50	2.70	0.60	2.40	0.50	2.90	ns		(Note 16)
t_{PHL}	$\bar{E}$ to Output									
t_{TLH}	Transition Time	0.20	1.60	0.30	1.50	0.20	1.60	ns		
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.

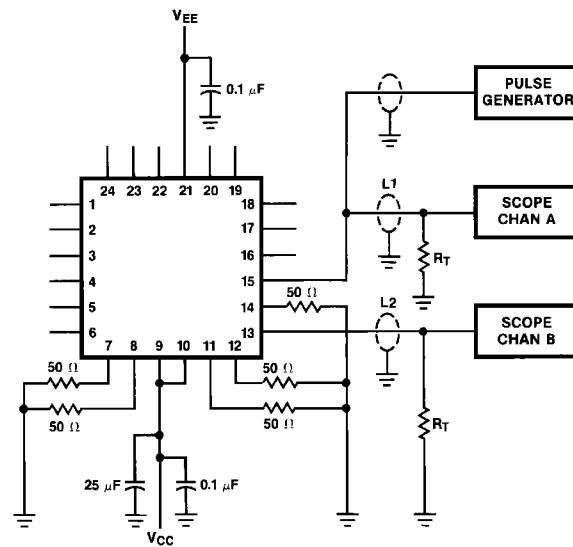
Note 14: Screen tested 100% on each device at $+25^\circ C$ temperature only, Subgroup A9.

Note 15: Sample tested (Method 5005, Table I) on each mfg. 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 300 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 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

Pin numbers shown are for flatpak; for DIP see logic symbol

FIGURE 1. AC Test Circuit

Switching Waveforms

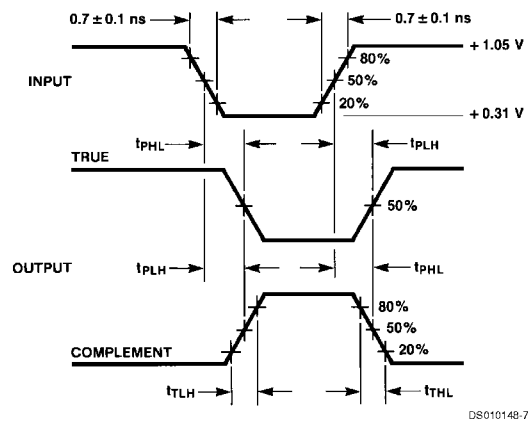


FIGURE 2. Propagation Delay and Transition Times

Ordering Information

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

100371	D	C	QB
Device Type (Basic)			Special Variations
Package Code			QB = Military grade device with environmental and burn-in processing.
D = Ceramic DIP			Temperature Range
F = Quad Cerpak			C = Commercial (0°C to +85°C)
P = Plastic DIP			I = Industrial (-40°C to +85°C) PCC Only
Q = Plastic Leaded Chip Carrier (PCC)			M = Military (-55°C to +125°C)
S = Small Outline (SOIC)			

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inches (millimeters) unless otherwise noted

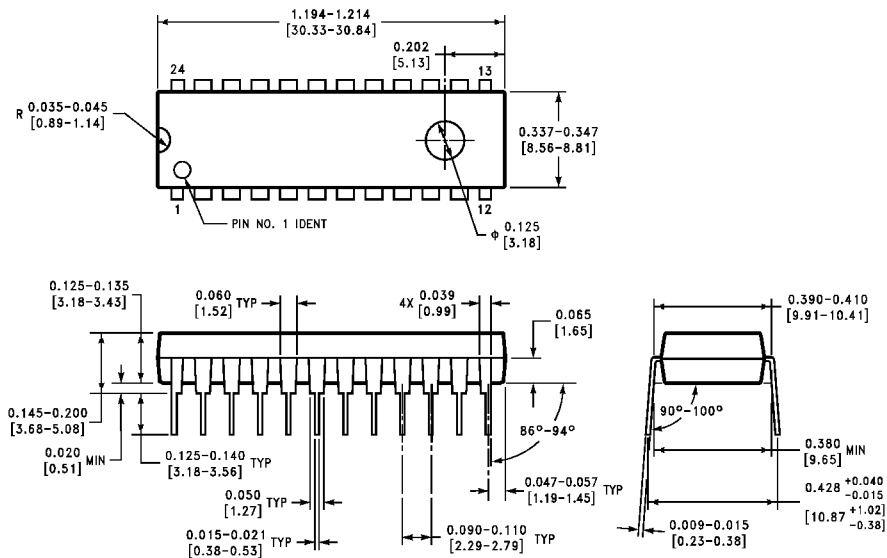


24-Lead Ceramic Dual-In-Line Package (D)
Package Number J24E



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

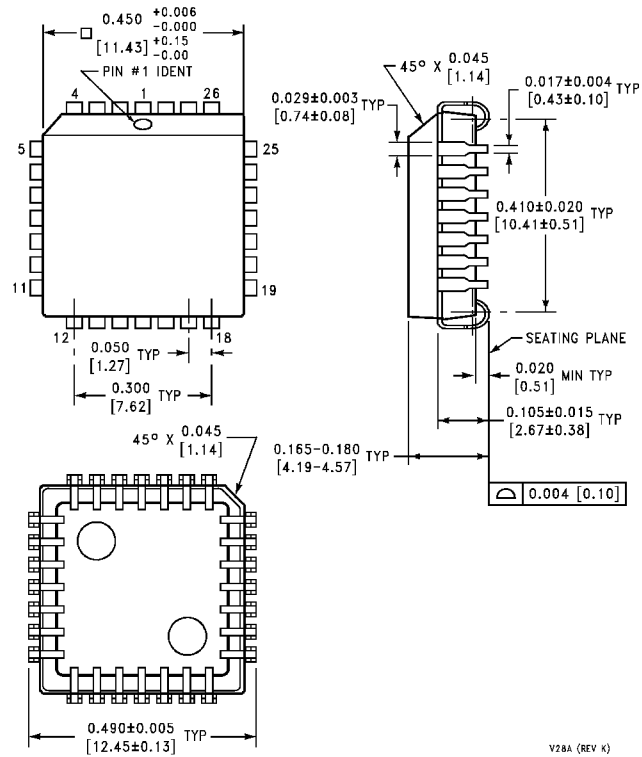
Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



N24E (REV A)

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

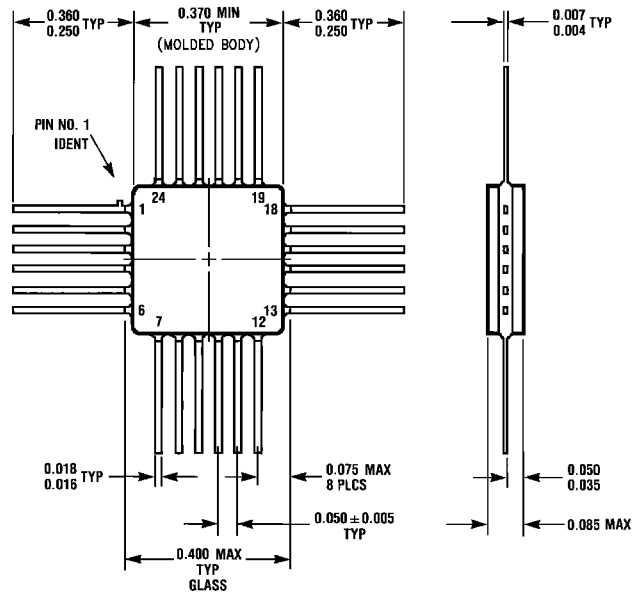
Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



V28A (REV K)

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

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



W24B (REV D)

24-Lead Ceramic Flatpak (F)
Package Number W24B

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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.

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