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August 1991

100323•100323A
Low Power Hex Bus Driver

General Description

The 100323 is a monolithic device containing six bus drivers capable of driving terminated lines with terminations as low as 25Ω. To reduce crosstalk, each output has its own respective ground connection. Transition times were designed to be longer than on other F100K devices. The driver itself performs the positive logic AND of a data input (D_1–D_6) and the OR of two select inputs (E and either DE_1, DE_2, or DE_3).

Enabling of data is possible in multiples of two, i.e., 2, 4 or all 6 paths. All inputs have 50 kΩ pull-down resistors.

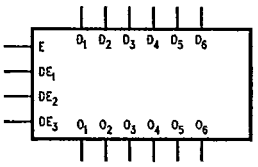
The output voltage LOW level is designed to be more negative than normal ECL outputs (cut off state). This allows an emitter-follower output transistor to turn off when the termination supply is −2.0V and thus present a high impedance to the data bus.

NOTE: All information for the 100323A is ADVANCED INFORMATION.

Features

- 50% power reduction of the 100123
- 2000V ESD protection
- −4.2V to −5.7V operating range
- Drives 25Ω load
- Available to industrial grade temperature range
- Tighter AC specifications available on the 100323A

Logic Symbol



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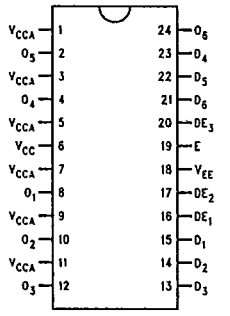
Pin Names	Description
D_1–D_6	Data Inputs
DE_1–DE_3	Dual Enable Inputs
E	Common Enable Input
O_1–O_6	Data Outputs

Connection Diagrams

24-Pin DIP



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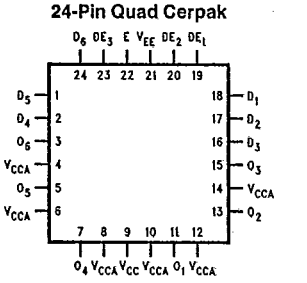
24-Pin Quad Cerpak



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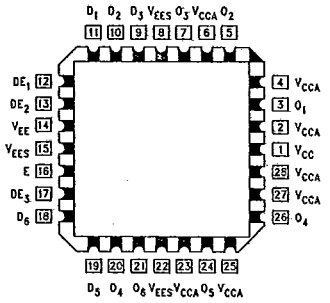
28-Pin PCC



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9000-2720

RRD-B20M121/Printed in U. S. A.

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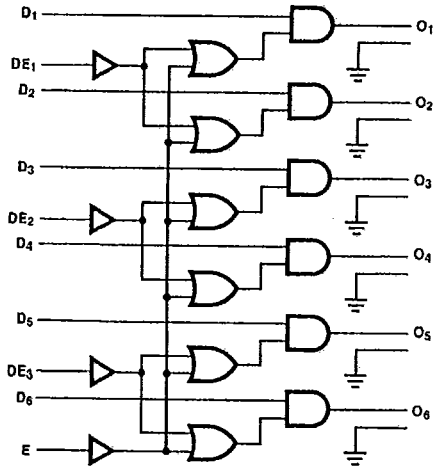
Logic Diagram



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Truth Table

E	DE_n	D_n	D_{n+1}	O_n	O_{n+1}
L	L	X	X	Cutoff	Cutoff
X	H	L	L	Cutoff	Cutoff
X	H	L	H	Cutoff	H
X	H	H	L	H	Cutoff
X	H	H	H	H	H
H	X	L	L	Cutoff	Cutoff
H	X	L	H	Cutoff	H
H	X	H	L	H	Cutoff
H	X	H	H	H	H

H = High
Cutoff = Lower-than-LOW state
L = Low
X = Don't Care

Absolute Maximum Ratings (Note 1)

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

Storage Temperature	−65°C to +150°C
Maximum Junction Temperature	
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 Last Passing Voltage (Min)	2000V

Recommended Operating Conditions

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Case Temperature	
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

Commercial Version—100323

DC Electrical Characteristics

V_{EE} = −4.2V to −5.7V, V_{CC} = V_{CCA} = GND, T_C = 0°C to +85°C (Note 3)

Symbol	Parameter	Min	Typ	Max	Units	Conditions	
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	
V_{OH}	Output HIGH Voltage	−1025	−955	−870	mV	V_{IN} = $V_{IH\ (max)}$ or $V_{IL\ (min)}$	Loading with 25Ω to −2.0V
V_{OHC}	Output HIGH Voltage	−1035			mV	V_{IN} = $V_{IH\ (min)}$ or $V_{IL\ (max)}$	Loading with 25Ω to −2.0V
V_{OLZ}	Cut-Off LOW Voltage			−1950	mV	V_{IN} = $V_{IH\ (min)}$ or $V_{IL\ (max)}$	Loading with 25Ω to −2.0V
I_{IL}	Input LOW Current	0.50			μA	V_{IN} = $V_{IL\ (min)}$	
I_{IH}	Input HIGH Current			240	μA	V_{IN} = $V_{IH\ (max)}$	
I_{EE}	Power Supply Current	−121	−91	−57	mA	Inputs Open	

Note 1: Absolute maximum ratings are 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.

Note 3: The specified limits represent "worst case" values 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.

Dual-In-Line Package AC Electrical Characteristics

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

Symbol	Parameter	T_C = 0°C		T_C = +25°C		T_C = +85°C		Units	Conditions
		Min	Max	Min	Max	Min	Max		
t_{PZH}	Propagation Delay	1.90	3.60	1.90	3.60	2.00	3.80	ns	*Figures 1* and *2*
t_{PHZ}	Data to Output	1.30	2.70	1.30	2.70	1.50	2.70		
t_{PZH}	Propagation Delay	1.90	3.60	1.90	3.60	2.00	3.90	ns	
t_{PHZ}	Dual Enable to Output	1.60	3.00	1.60	3.00	1.70	3.40		
t_{PZH}	Propagation Delay	1.80	3.50	1.80	3.50	2.00	3.80	ns	
t_{PHZ}	Common Enable to Output	1.50	2.90	1.50	2.90	1.60	3.00		
t_{TZH}	Transition Time	0.50	1.80	0.50	1.80	0.50	1.80	ns	
t_{THZ}	20% to 80%, 80% to 20%	0.35	1.40	0.35	1.40	0.35	1.40		

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Commercial Version—100323 (Continued)

PCC and Cerpak AC Electrical Characteristics

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

Symbol	Parameter	T_C = 0°C		T_C = +25°C		T_C = +85°C		Units	Conditions
		Min	Max	Min	Max	Min	Max		
t_{PZH} t_{PHZ}	Propagation Delay Data to Output	1.90 1.30	3.40 2.50	1.90 1.30	3.40 2.50	2.00 1.50	3.60 2.70	ns	*Figures 1* and *2*
t_{PZH} t_{PHZ}	Propagation Delay Dual Enable to Output	1.90 1.60	3.40 2.80	1.90 1.60	3.40 2.80	2.00 1.70	3.70 3.00	ns	
t_{PZH} t_{PHZ}	Propagation Delay Common Enable to Output	1.80 1.50	3.30 2.70	1.80 1.50	3.30 2.70	2.00 1.60	3.60 2.80	ns	
t_{TZH} t_{THZ}	Transition Time 20% to 80%, 80% to 20%	0.50 0.35	1.70 1.30	0.50 0.35	1.70 1.20	0.50 0.35	1.70 1.30	ns	

Note: The specified limits represent the value for the parameter. Since these values normally occur at the temperature extremes, additional noise immunity and guard banding 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—100323A

PCC AC Electrical Characteristics

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

Symbol	Parameter	T_C = 0°C		T_C = +25°C		T_C = +85°C		Units	Conditions
		Min	Max	Min	Max	Min	Max		
t_{PZH} t_{PHZ}	Propagation Delay Data to Output								
t_{PZH} t_{PHZ}	Propagation Delay Data Enable to Output								
t_{PZH} t_{PHZ}	Progagation Delay Common Enable to Output								
t_{TZH} t_{THZ}	Transition Time 20% to 80%, 80% to 20%								
t_{SG-G}	Skew, Gate to Gate								

Industrial Version—100323—Preliminary

DC Electrical Characteristics

V_{EE} = −4.2V to −5.7V, V_{CC} = V_{CCA} = GND, T_C = −40°C to +85°C (Note 1)

Symbol	Parameter	T_C = −40°C		T_C = 0°C to +85°C		Units	Conditions	
		Min	Max	Min	Max			
V_{IH}	Input HIGH Voltage	−1165	−870	−1165	−870	mV	Guaranteed High Signal for All Inputs	
V_{IL}	Input LOW Voltage	−1830	−1475	−1830	−1475	mV	Guaranteed Low Signal for All Inputs	
V_{OH}	Output HIGH Voltage	−1085	−870	−1025	−870	mV	V_{IN} = $V_{IH\ (max)}$ or $V_{IL\ (min)}$	Loading with 25Ω to −2.0V
V_{OHC}	Output HIGH Voltage	−1095		−1035		mV	V_{IN} = $V_{IH\ (min)}$ or $V_{IL\ (max)}$	Loading with 25Ω to −2.0V
V_{OLZ}	Cut-Off LOW Voltage		−1900		−1950	mV	V_{IN} = $V_{IH\ (min)}$ or $V_{IL\ (max)}$	Loading with 25Ω to −2.0V
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	−121	−57	−121	−57	mA	Inputs Open	

Industrial Version—100323—Preliminary (Continued)

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PCC AC Electrical Characteristics

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

Symbol	Parameter	T_C = −40°C		T_C = +25°C		T_C = +85°C		Units	Conditions
		Min	Max	Min	Max	Min	Max		
t_{PZH} t_{PHZ}	Propagation Delay Data to Output	1.80 1.20	3.40 2.50	1.90 1.30	3.40 2.50	2.00 1.50	3.60 2.70	ns	*Figures 1* and *2*
t_{PZH} t_{PHZ}	Propagation Delay Data Enable to Output	1.80 1.50	3.40 2.80	1.90 1.60	3.40 2.80	2.00 1.70	3.70 3.00	ns	
t_{PZH} t_{PHZ}	Propagation Delay Common Enable to Output	1.70 1.40	3.30 2.70	1.80 1.50	3.30 2.70	2.00 1.60	3.60 2.80	ns	
t_{TZH} t_{THZ}	Transition Time 20% to 80%, 80% to 20%	0.40 0.25	1.70 1.30	0.50 0.35	1.70 1.20	0.50 0.35	1.70 1.30	ns	

Note: 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.

Military Version—100323—Preliminary

DC Electrical Characteristics

V_{EE} = −4.2V to −5.7V, V_{CC} = V_{CCA} = GND, T_C = −55°C to +125°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 25Ω to −2.0V	1, 2, 3
		−1085	−870	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 25Ω 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_{OLZ}	Cut-Off LOW Voltage		−1950	mV	0°C to +125°C	V_{IN} = $V_{IH\ (min)}$ or $V_{IL\ (max)}$	Loading with 25Ω to −2.0V	1, 2, 3
			−1850		−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	−145 −150	−55	mA	−55°C to +125°C	Inputs Open V_{EE} = −4.2V to −4.8V V_{EE} = −4.2V to −5.7V		1, 2, 3

Note 1: 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 2: Screen tested 100% on each device at −55°C, +25°C, and +125°C, Subgroups 1, 2, 3, 7, and 8.

Note 3: 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 4: Guaranteed by applying specified input condition and testing V_{OH}/V_{OL}.

Military Version—100323—Preliminary (Continued)

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AC Electrical Characteristics—All Packages

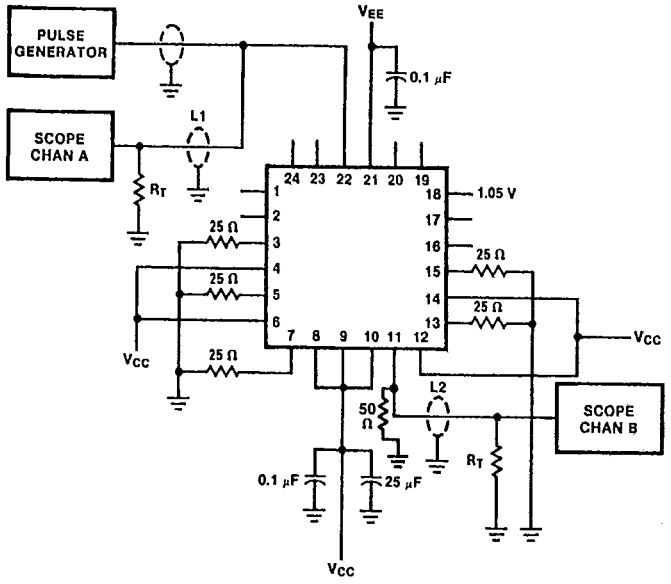
V_{EE} = −4.2V to −5.7V, V_{CC} = V_{CCA} = GND

Symbol	Parameter	T_C = −55°C		T_C = +25°C		T_C = +125°C		Units	Conditions
		Min	Max	Min	Max	Min	Max		
t_{PZH} t_{PHZ}	Propagation Delay Data to Output	1.70 1.10	4.00 3.10	1.70 1.10	4.00 3.10	1.80 1.30	4.20 3.10	ns	*Figures 1* and *2*
t_{PZH} t_{PHZ}	Propagation Delay Data Enable to Output	1.70 1.40	4.00 3.40	1.70 1.40	4.00 3.40	1.80 1.50	4.30 3.80	ns	
t_{PZH} t_{PHZ}	Propagation Delay Common Enable to Output	1.60 1.30	3.90 3.30	1.60 1.30	3.90 3.30	1.80 1.40	4.20 3.40	ns	
t_{TZH} t_{THZ}	Transition Time 20% to 80%, 80% to 20%	0.40 0.25	2.20 1.80	0.40 0.25	2.20 1.80	0.40 0.25	2.20 1.80	ns	

Note 1: The specified limits represent the "worst case" value for the parameter. Since these "worst case" values normally occur at the temperature extremes, additional noise immunity and guard banding can be achieved by decreasing the allowable system operating ranges.

Note 2: Conditions for testing shown in the tables are chosen to guarantee operation under "worst case" conditions.

Test Circuitry



Notes:

V_{CC}, V_{CCA} = +2V, V_{EE} = −2.5V

L1 and L2 = equal length 50Ω impedance lines

R_T = 50Ω 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 ≤ 3 pF

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

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FIGURE 1. AC Test Circuit

Timing Waveform

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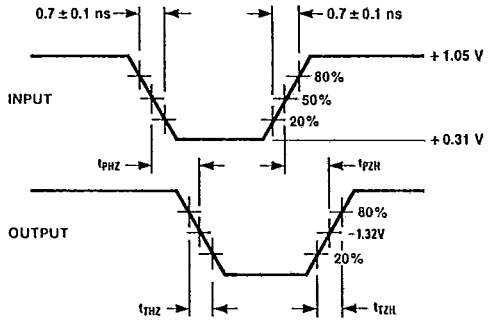

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FIGURE 2. Propagation Delay and Transition Times

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:

100323 or 100323A D C QR

Device Number (Basic)

Package Code
- D = Ceramic Dual-In-Line
- F = Quad Cerpak
- Q = Plastic-Leaded Chip Carrier (PLCC)

Special Variations
- QR = Commercial grade device with burn-in
- QB = Military grade device with environmental and burn-in processing

Temperature Range
- C = Commercial (0°C to +85°C)
- I = Industrial (−40°C to +85°C) (PCC Only)
- M = Military (−55°C to +125°C)

Physical Dimensions inches (millimeters)

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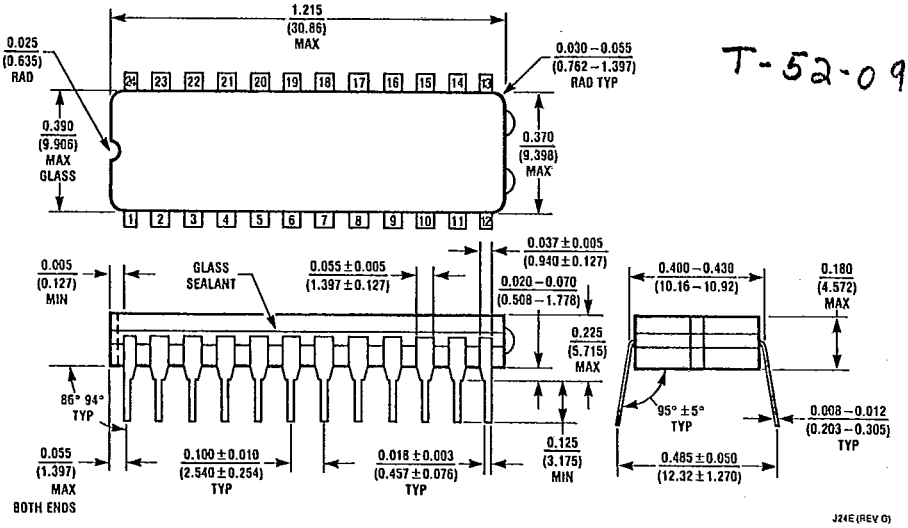
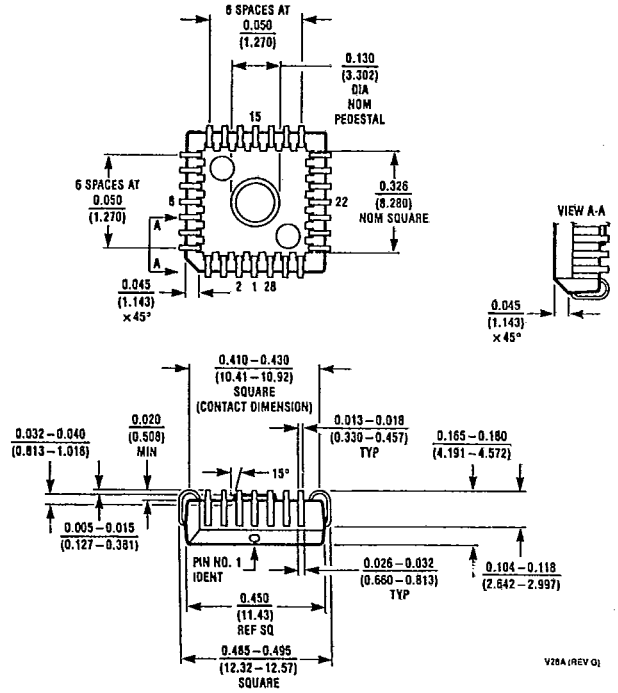


24 Lead Ceramic Dual-In-Line Package (0.400" Wide) (D)
NS Package Number J24E



28 Lead Plastic Chip Carrier (Q)
NS Package Number V28A

Note: Pedestal as shown on base is not available for F100K ECL products.

Physical Dimensions inches (millimeters) (Continued)

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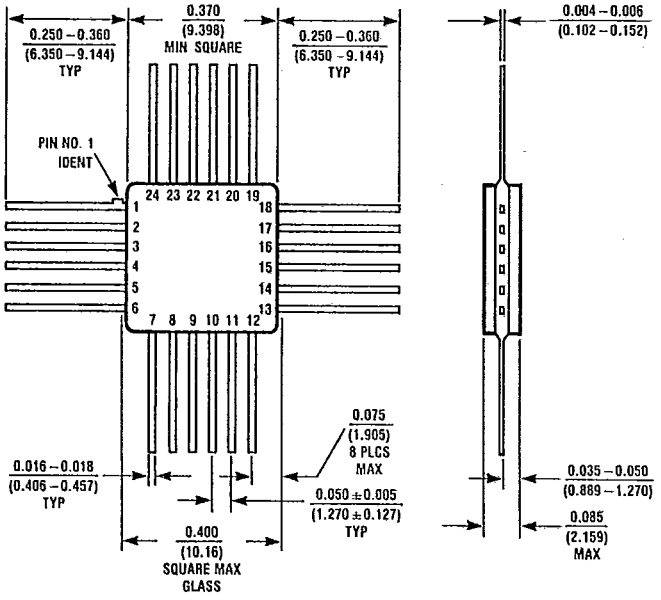

24 Lead Quad Cerpak (F)
NS Package Number W24B

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