

## 100364 Low Power 16-Input Multiplexer

### General Description

The 100364 is a 16-input multiplexer. Data paths are controlled by four Select lines ( $S_0$ – $S_3$ ). Their decoding is shown in the truth table. Output data polarity is the same as the selected input data. All inputs have 50 k $\Omega$  pulldown resistors.

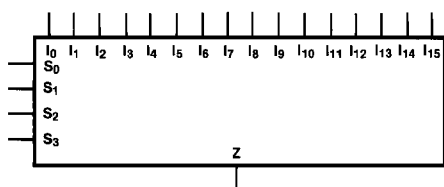
- 2000V ESD protection
- Pin/function compatible with 100164
- Voltage compensated operating range =  $-4.2V$  to  $-5.7V$
- Available to industrial grade temperature range
- Available to MIL-STD-883

### Features

- 35% power reduction of the 100164

### Ordering Code:

### Logic Symbol

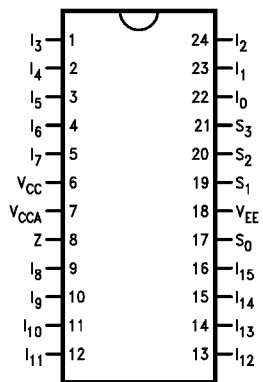


DS010265-1

Pin Names	Description
$I_0$ – $I_{15}$	Data Inputs
$S_0$ – $S_3$	Select Inputs
Z	Data Output

### Connection Diagrams

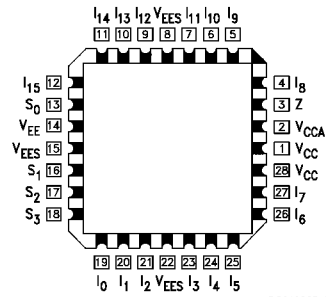
24-Pin DIP



DS010265-2

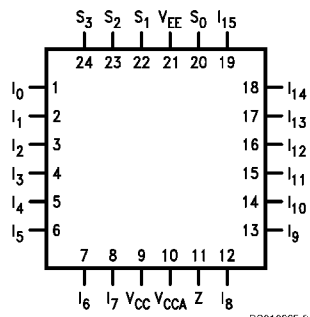
## Connection Diagrams (Continued)

28-Pin PCC



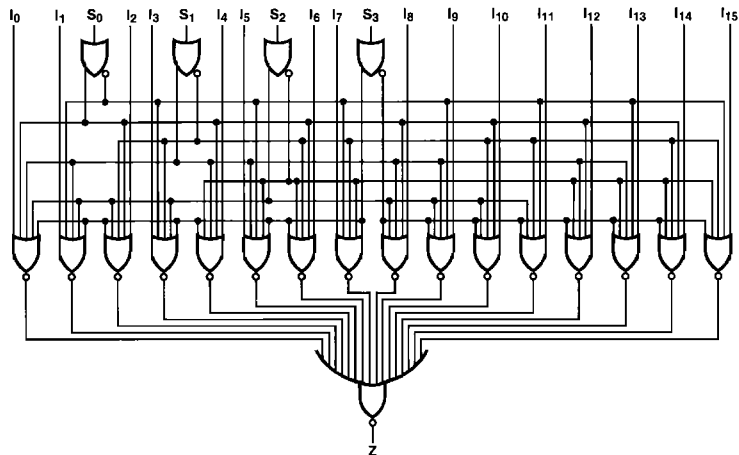
DS010265-4

24-Pin Quad Cerpak



DS010265-3

## Logic Diagram



DS010265-5

## Truth Table

Select Inputs				Output
S <sub>0</sub>	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	Z
L	L	L	L	I <sub>0</sub>
H	L	L	L	I <sub>1</sub>
L	H	L	L	I <sub>2</sub>
H	H	L	L	I <sub>3</sub>
L	L	H	L	I <sub>4</sub>
H	L	H	L	I <sub>5</sub>
L	H	H	L	I <sub>6</sub>
H	H	H	L	I <sub>7</sub>
L	L	L	H	I <sub>8</sub>
H	L	L	H	I <sub>9</sub>
L	H	L	H	I <sub>10</sub>
H	H	L	H	I <sub>11</sub>
L	L	H	H	I <sub>12</sub>
H	L	H	H	I <sub>13</sub>
L	H	H	H	I <sub>14</sub>
H	H	H	H	I <sub>15</sub>

H = HIGH Voltage Level  
L = LOW Voltage Level

## 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
Pin Potential to Ground Pin ( $V_{EE}$ )	-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 1)

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	0.5			μA	$V_{IN} = V_{IL}$ (Min)	
$I_{IH}$	Input HIGH Current			300	μA	$V_{IN} = V_{IH}$ (Max)	
$I_{EE}$	Power Supply Current	-89		-45	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 operate 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	0.90	2.00	0.90	2.00	0.90	2.10	ns	Figures 1, 2
$t_{PHL}$	$I_0$ - $I_{15}$ to Output								
$t_{PLH}$	Propagation Delay	1.40	2.80	1.40	2.80	1.50	2.90		
$t_{PHL}$	$S_0, S_1$ to Output								
$t_{PLH}$	Propagation Delay	1.00	2.20	1.00	2.20	1.10	2.40		
$t_{PHL}$	$S_2, S_3$ 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%								

## 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	0.90	1.80	0.90	1.80	0.90	1.90	ns	
$t_{PHL}$	$I_0$ - $I_3$ to Output								

## 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		
$t_{PLH}$	Propagation Delay	1.40	2.60	1.40	2.60	1.50	2.70	ns	Figures 1, 2
$t_{PHL}$	$S_0, S_1$ to Output								
$t_{PLH}$	Propagation Delay	1.00	2.00	1.00	2.00	1.10	2.20	ns	
$t_{PHL}$	$S_2, S_3$ to Output								
$t_{TLH}$	Transition Time	0.35	1.10	0.35	1.10	0.35	1.10	ns	
$t_{THL}$	20% to 80%, 80% to 20%								

## 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 6)

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)	Loading with $50\Omega$ to $-2.0V$
$V_{OL}$	Output LOW Voltage	-1830	-1575	-1830	-1620	mV	or $V_{IL}$ (Min)	
$V_{OHC}$	Output HIGH Voltage	-1095		-1035		mV	$V_{IN} = V_{IH}$ (Min)	Loading with $50\Omega$ to $-2.0V$
$V_{OLC}$	Output LOW Voltage		-1565		-1610	mV	or $V_{IL}$ (Max)	
$V_{IH}$	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	0.5		0.5		$\mu A$	$V_{IN} = V_{IL}$ (Min)	
$I_{IH}$	Input HIGH Current		325		325	$\mu A$	$V_{IN} = V_{IH}$ (Max)	
$I_{EE}$	Power Supply Current	-89	-45	-89	-45	mA	Inputs Open	

**Note 4:** 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 5:** ESD testing conforms to MIL-STD-883, Method 3015.

**Note 6:** 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	0.90	1.80	0.90	1.80	0.90	1.90	ns	Figures 1, 2
$t_{PHL}$	$I_0-I_{15}$ to Output								
$t_{PLH}$	Propagation Delay	1.20	2.60	1.40	2.60	1.50	2.70	ns	
$t_{PHL}$	$S_0, S_1$ to Output								
$t_{PLH}$	Propagation Delay	0.80	2.10	1.00	2.00	1.10	2.20	ns	
$t_{PHL}$	$S_2, S_3$ to Output								
$t_{TLH}$	Transition Time	0.20	1.20	0.35	1.10	0.35	1.10	ns	
$t_{THL}$	20% to 80%, 80% to 20%								

## 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 7, 8, 9)
		-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 $50\Omega$ to $-2.0V$	(Notes 7, 8, 9)
		-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		(Notes 7, 8, 9, 10)
$V_{IL}$	Input LOW Voltage	-1830	-1475			mV	$-55^{\circ}C$ to $+125^{\circ}C$	Guaranteed LOW Signal for All Inputs		(Notes 7, 8, 9, 10)
$I_{IL}$	Input LOW Current	0.50				$\mu A$	$-55^{\circ}C$ to $+125^{\circ}C$	$V_{EE} = -4.2V$ $V_{IN} = V_{IL}$ (Min)		(Notes 7, 8, 9)
$I_{IH}$	Input HIGH Current		300			$\mu A$	$0^{\circ}C$ to $+125^{\circ}C$	$V_{EE} = -5.7V$ $V_{IN} = V_{IH}$ (Max)		(Notes 7, 8, 9)
			450			$\mu A$	$-55^{\circ}C$			
$I_{EE}$	Power Supply Current	-95	-35			mA	$-55^{\circ}C$ to $+125^{\circ}C$	Inputs Open		(Notes 7, 8, 9)

**Note 7:** 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 8:** 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 9:** Sampled 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 10:** 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	0.50	2.60	0.60	2.40	0.60	2.80	ns	Figures 1, 2	(Notes 11, 12, 13)
$t_{PHL}$	$I_0 - I_{15}$ to Output									
$t_{PLH}$	Propagation Delay	0.70	3.30	0.90	3.10	1.00	3.50	ns		
$t_{PHL}$	$S_0, S_1$ to Output									
$t_{PLH}$	Propagation Delay	0.50	2.90	0.70	2.60	0.60	3.00	ns		
$t_{PHL}$	$S_2, S_3$ to Output									
$t_{TLH}$	Transition Time	0.20	1.20	0.20	1.20	0.20	1.20	ns		(Note 14)
$t_{THL}$	20% to 80%, 80% to 20%									

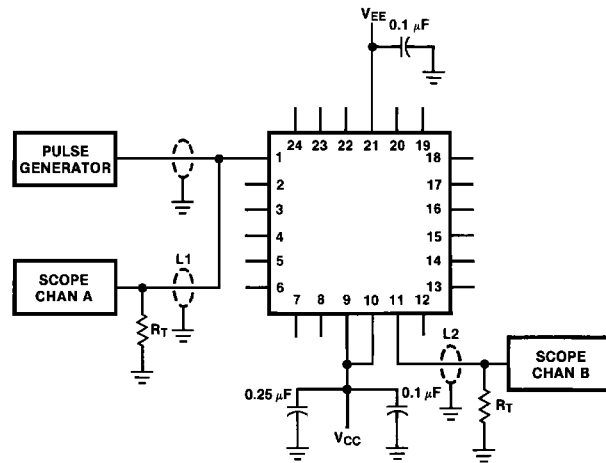
**Note 11:** F100K 300 Series cold temperature testing is performed by temperature soaking (to guarantee junction temperature equals  $-55^{\circ}C$ ), then testing immediately without allowing for the junction temperature to stabilize due to heat dissipation after power-up. This provides "cold start" specs which can be considered a worst case condition at cold temperatures.

**Note 12:** Screen tested 100% on each device at  $+25^{\circ}C$ , temperature only, Subgroup A9.

**Note 13:** Sample tested (Method 5005, Table I) on each Mfg. lot at  $+25^{\circ}C$ , Subgroup A9, and at  $+125^{\circ}C$ , and  $-55^{\circ}C$  temp., Subgroups A10 and A11.

**Note 14:** Not tested at  $+25^{\circ}C$ ,  $+125^{\circ}C$  and  $-55^{\circ}C$  temperature (design characterization data).

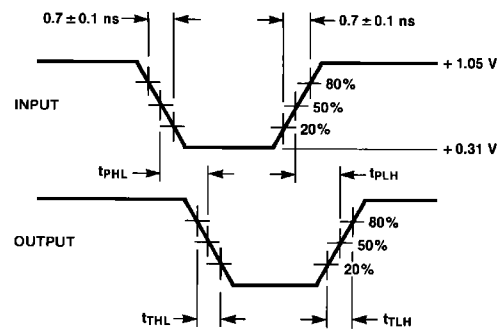
## Test Circuit



DS010265-6

FIGURE 1. AC Test Circuit

## Switching Waveforms



DS010265-7

**Note 15:**  $V_{CC}$ ,  $V_{CCA} = +2V$ ,  $V_{EE} = -2.5V$

**Note 16:** L1 and L2 = Equal length 50Ω impedance lines

**Note 17:**  $R_T = 50\Omega$  terminator internal to scope

**Note 18:** Decoupling 0.1  $\mu F$  from GND to  $V_{CC}$  and  $V_{EE}$

**Note 19:** All unused outputs are loaded with 50Ω to GND

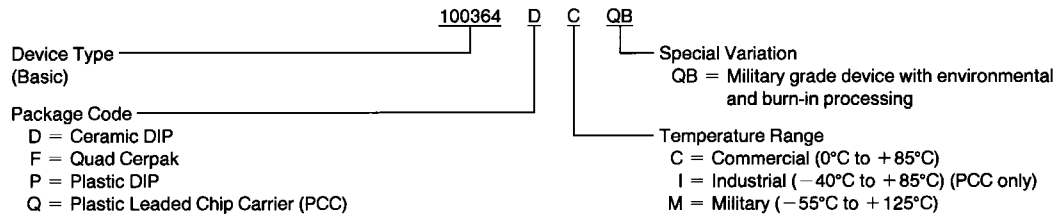
**Note 20:**  $C_L$  = Fixture and stray capacitance  $\leq 3$  pF

**Note 21:** Pin numbers shown are for flatpak; for DIP see logic symbol

FIGURE 2. Propagation Delay and Transition Times

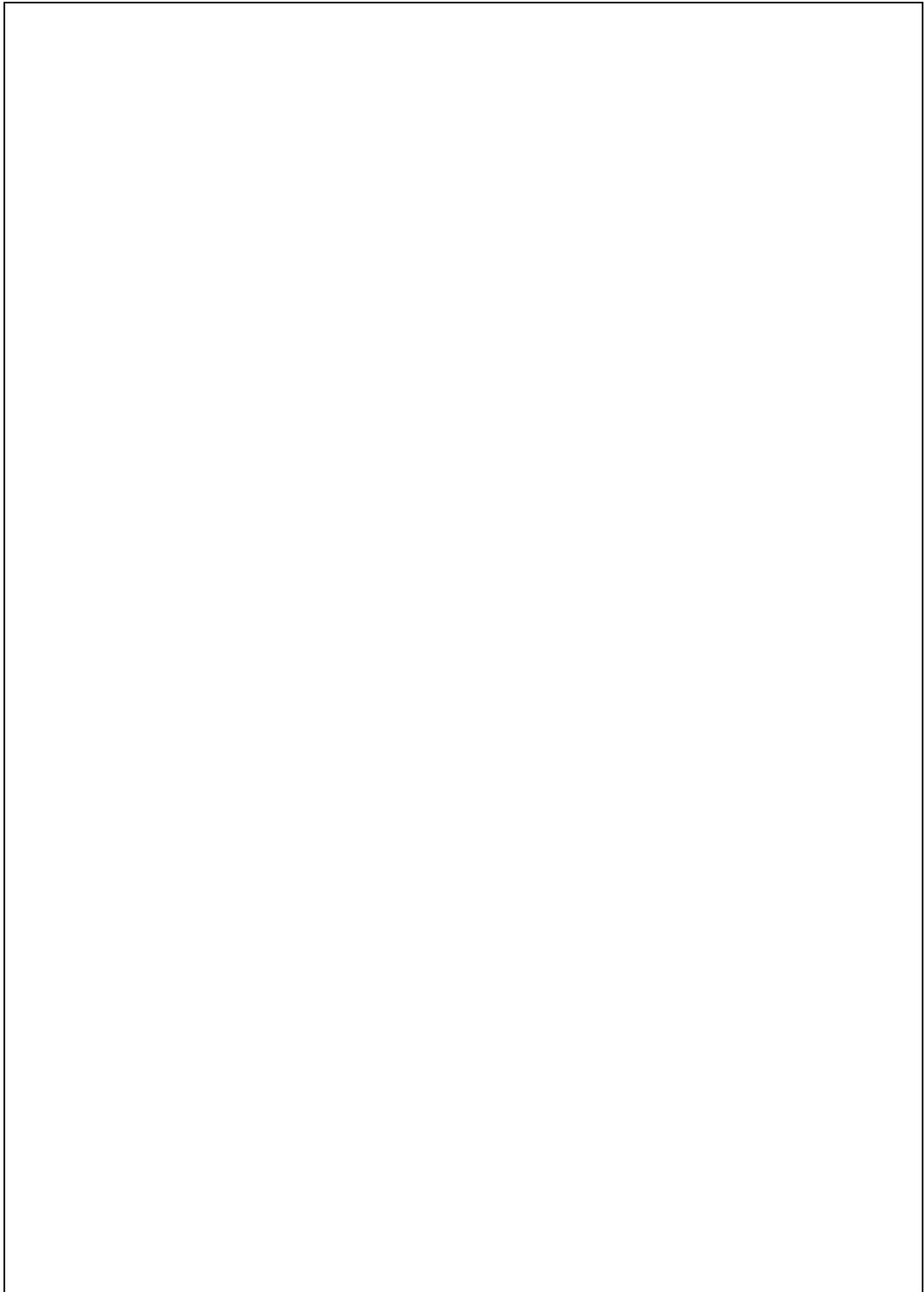
## Ordering Information

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

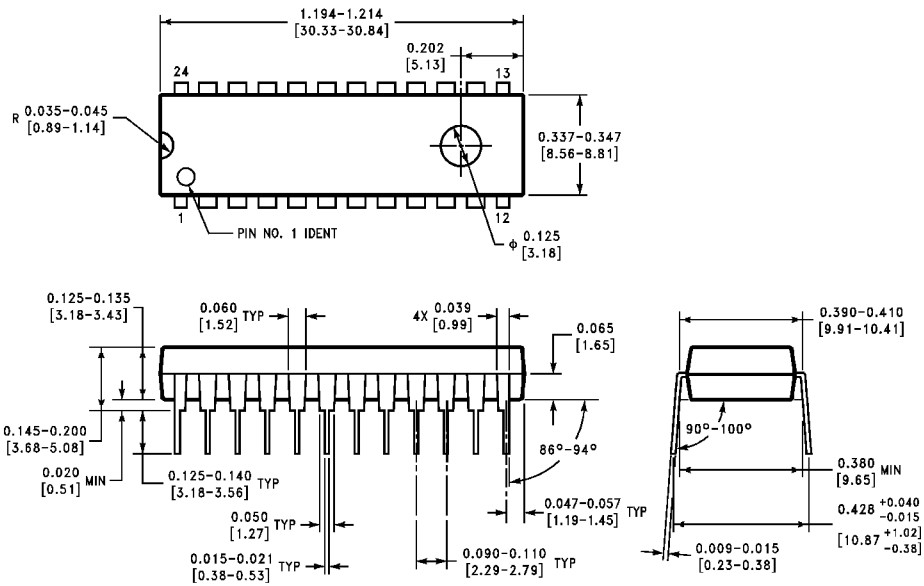
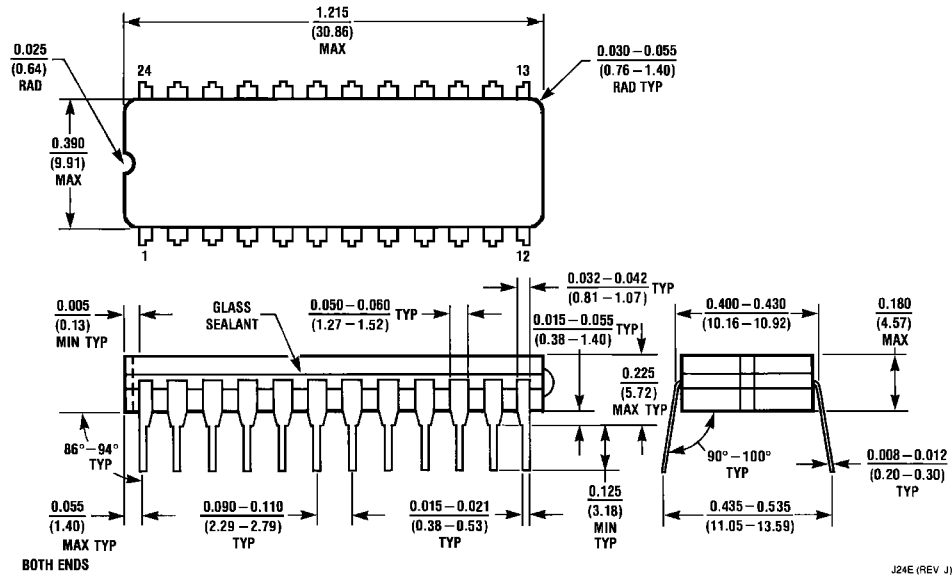


DS010295-8

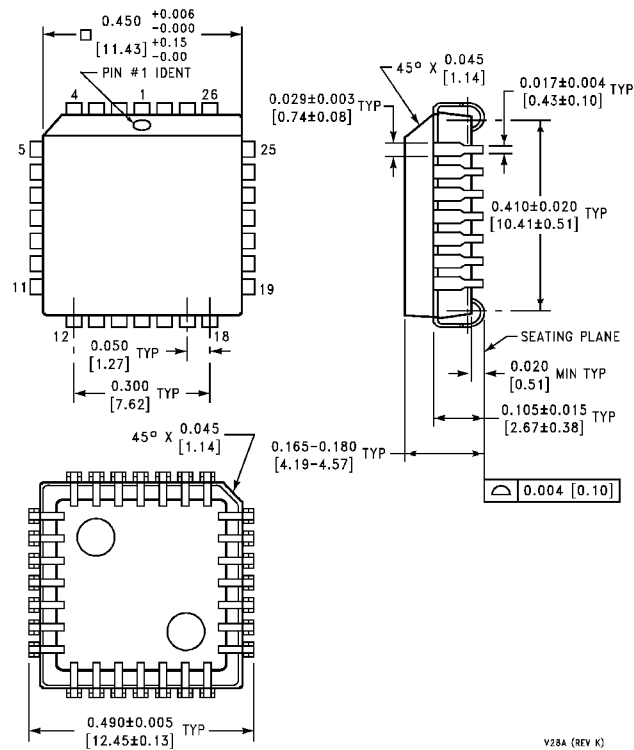




**Physical Dimensions** inches (millimeters) unless otherwise noted



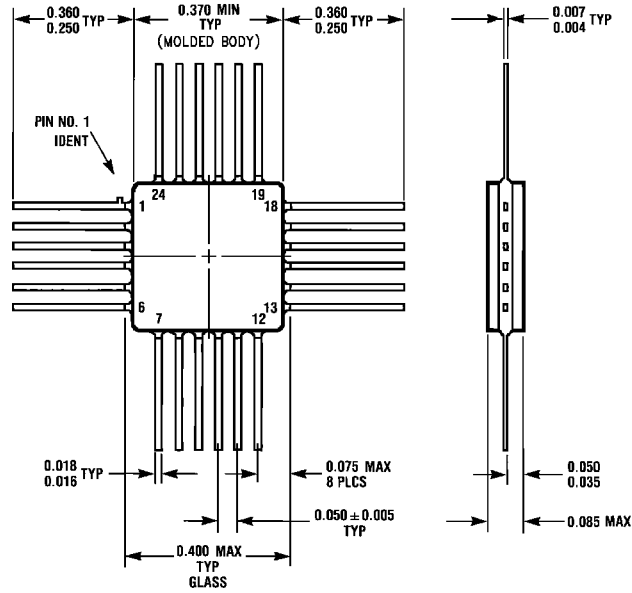
**Physical Dimensions** inches (millimeters) unless otherwise noted (Continued)



**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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