

## 100364 Low Power 16-Input Multiplexer

### General Description

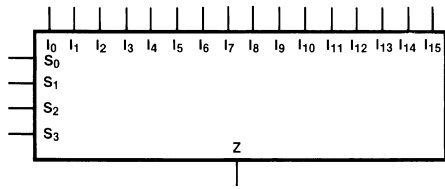
The 100364 is a 16-input multiplexer. Data paths are controlled by four Select lines ( $S_0$ – $S_3$ ). Their decoding is shown in the truth table. Output data polarity is the same as the selected input data. All inputs have 50 k $\Omega$  pulldown resistors.

- 2000V ESD protection
- Pin/function compatible with 100164
- Voltage compensated operating range =  $-4.2V$  to  $-5.7V$
- Available to industrial grade temperature range
- Standard Microcircuit Drawing (SMD) 5962-9459201

### Features

- 35% power reduction of the 100164

### Logic Symbol

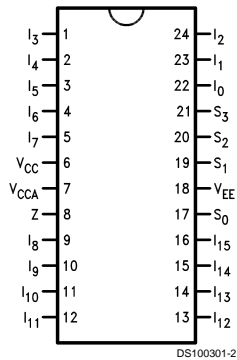


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Pin Names	Description
$I_0$ – $I_{15}$	Data Inputs
$S_0$ – $S_3$	Select Inputs
Z	Data Output

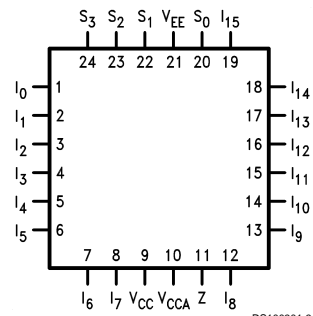
### Connection Diagrams

24-Pin DIP



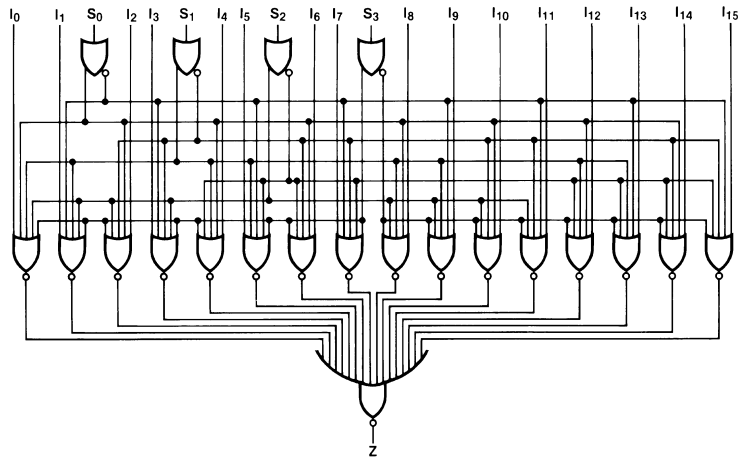
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24-Pin Quad Cerpak



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# Logic Diagram



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## 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)

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

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
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)	≥ 2000V

## Recommended Operating Conditions

Case Temperature ( $T_C$ )	
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.

## 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°C to +125°C	$V_{IN} = V_{IH}$ (Max) or $V_{IL}$ (Min)	Loading with 50Ω to -2.0V	(Notes 3, 4, 5)
		-1085	-870	mV	-55°C			
$V_{OL}$	Output LOW Voltage	-1830	-1620	mV	0°C to +125°C			
		-1830	-1555	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 50Ω to -2.0V	(Notes 3, 4, 5)
		-1085		mV	-55°C			
$V_{OLC}$	Output LOW Voltage		-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 3, 4, 5, 6)	
$V_{IL}$	Input LOW Voltage	-1830	-1475	mV	-55°C to +125°C	Guaranteed LOW Signal for All Inputs	(Notes 3, 4, 5, 6)	
$I_{IL}$	Input LOW Current	0.50		μA	-55°C to +125°C	$V_{EE} = -4.2V$ $V_{IN} = V_{IL}$ (Min)	(Notes 3, 4, 5)	
$I_{IH}$	Input HIGH Current		300	μA	0°C to +125°C	$V_{EE} = -5.7V$ $V_{IN} = V_{IH}$ (Max)	(Notes 3, 4, 5)	
			450	μA	-55°C			
$I_{EE}$	Power Supply Current	-95	-35	mA	-55°C to +125°C	Inputs Open	(Notes 3, 4, 5)	

**Note 3:** 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 4:** Screen tested 100% on each device at -55°C, +25°C, and +125°C, Subgroups, 1, 2, 3, 7 and 8.

**Note 5:** Sampled 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 6:** 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 7, 8, 9)
$t_{PHL}$	$I_0$ - $I_{15}$ 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 10)
$t_{THL}$	20% to 80%, 80% to 20%									

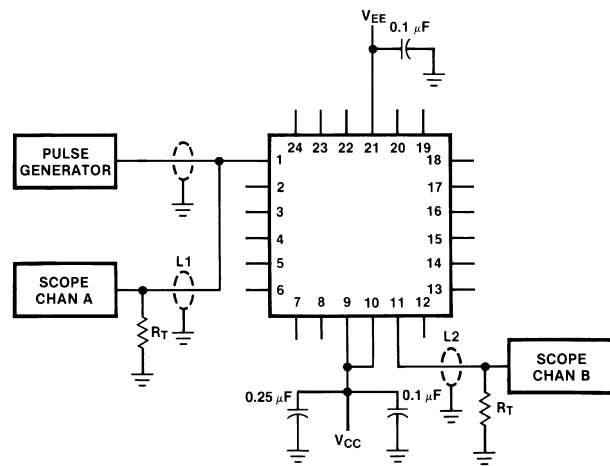
**Note 7:** F100K 300 Series cold temperature testing is performed by temperature soaking (to guarantee junction temperature equals  $-55^\circ C$ ), then testing immediately without allowing for the junction temperature to stabilize due to heat dissipation after power-up. This provides "cold start" specs which can be considered a worst case condition at cold temperatures.

**Note 8:** Screen tested 100% on each device at  $+25^\circ C$ , temperature only, Subgroup A9.

**Note 9:** 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 10:** Not tested at  $+25^\circ C$ ,  $+125^\circ C$  and  $-55^\circ C$  temperature (design characterization data).

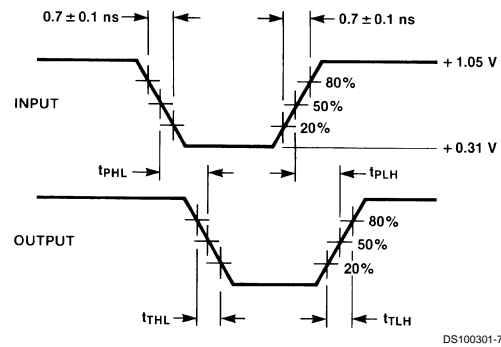
## Test Circuit



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FIGURE 1. AC Test Circuit

## Switching Waveforms



**Note 11:**  $V_{CC}, V_{CCA} = +2V, V_{EE} = -2.5V$

**Note 12:** L1 and L2 = Equal length 50 $\Omega$  impedance lines

**Note 13:**  $R_T = 50\Omega$  terminator internal to scope

**Note 14:** Decoupling 0.1  $\mu F$  from GND to  $V_{CC}$  and  $V_{EE}$

**Note 15:** All unused outputs are loaded with 50 $\Omega$  to GND

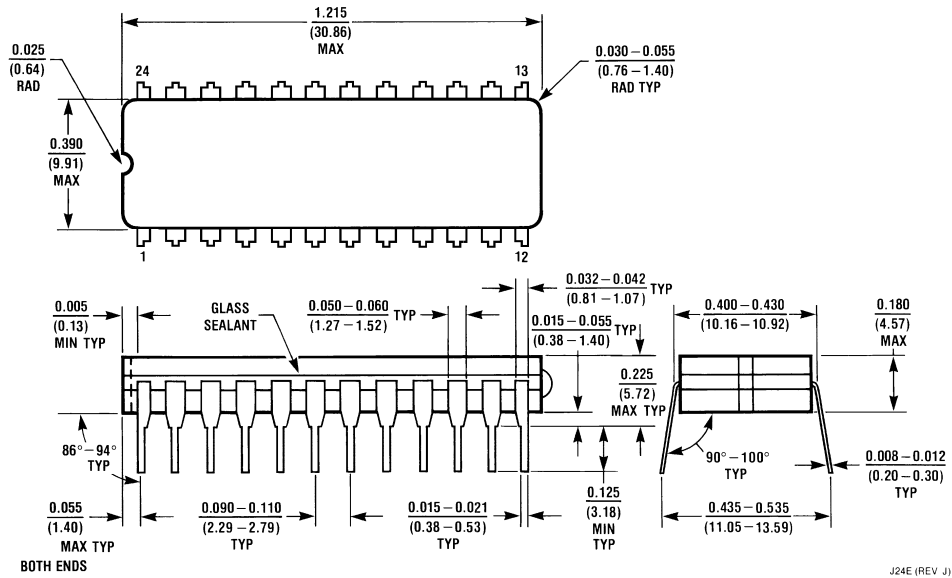
**Note 16:**  $C_L$  = Fixture and stray capacitance  $\leq 3$  pF

**Note 17:** Pin numbers shown are for flatpak; for DIP see logic symbol

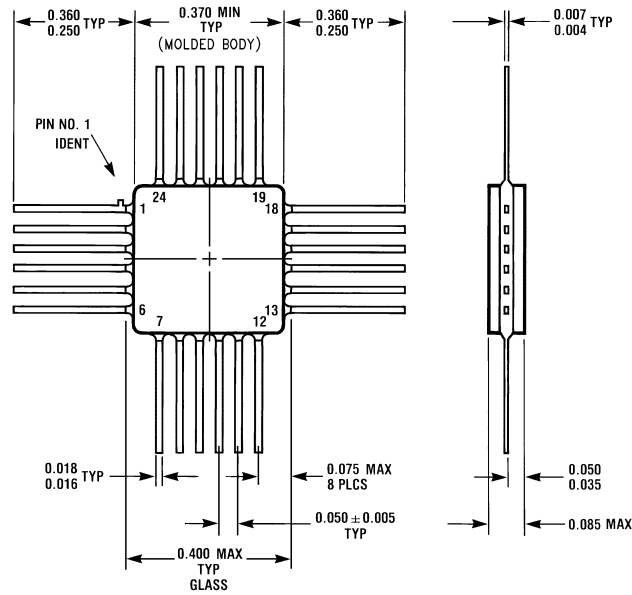
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**FIGURE 2. Propagation Delay and Transition Times**

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



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



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

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