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SEMICONDUCTOR™

October 1989  
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# 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 $\Omega$  pull-down resistors.

### Features

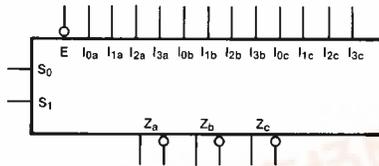
- 35% power reduction of the 100171
- 2000V ESD protection
- Pin/function compatible with 100171
- Voltage compensated operating range = -4.2V to -5.7V
- Available to industrial grade temperature range

### Ordering Code:

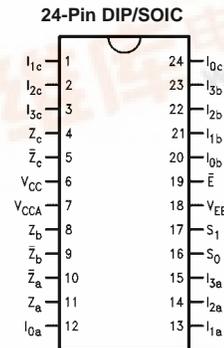
Order Number	Package Number	Package Description
100371SC	M24B	24-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300 Wide
100371PC	N24E	24-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-010, 0.400 Wide
10371QC	V28A	28-Lead Plastic Lead Chip Carrier (PLCC), JEDEC MO-047, 0.450 Square
10371QI	V28A	28-Lead Plastic Lead Chip Carrier (PLCC), JEDEC MO-047, 0.450 Square Industrial Temperature Range (-40°C to +85°C)

Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

### Logic Symbol

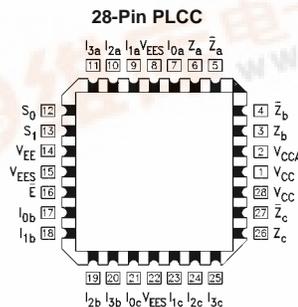


### Connection Diagrams



### Pin Descriptions

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



100371 Low Power Triple 4-Input Multiplexer with Enable



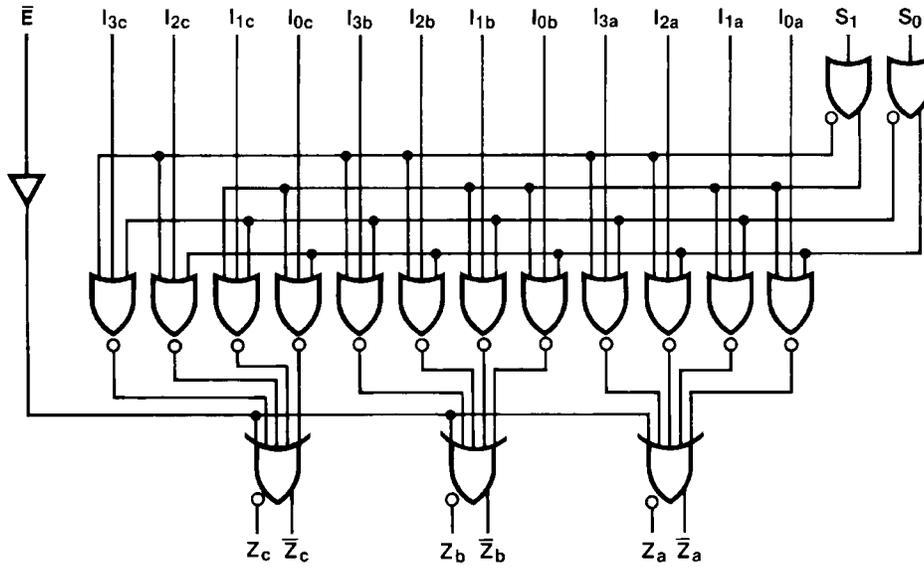
100371

**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

**Logic Diagram**



**Absolute Maximum Ratings**(Note 1)

Storage Temperature ( $T_{STG}$ )	-65°C to +150°C
Maximum Junction Temperature ( $T_J$ )	+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
Supply Voltage ( $V_{EE}$ )		-5.7V to -4.2V

**Note 1:** The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the Electrical Characteristics tables are not guaranteed at the absolute maximum rating. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

**Note 2:** ESD testing conforms to MIL-STD-883, Method 3015.

**Commercial Version****DC Electrical Characteristics** (Note 3)

$V_{EE} = -4.2V$  to  $-5.7V$ ,  $V_{CC} = V_{CCA} = GND$ ,  $T_C = 0^\circ C$  to  $+85^\circ C$

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	$V_{IN} = V_{IL}$ (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)
						$I_{0X} - I_{3X}$ $S_0, S_1, \bar{E}$
$I_{EE}$	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.

**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)
$t_{PHL}$	$I_{0X} - I_{3X}$ 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	
$t_{PHL}$	$\bar{E}$ to Output								
$t_{TLH}$	Transition Time	0.35	1.20	0.35	1.20	0.35	1.20	ns	Figures 1, 2
$t_{THL}$	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** (Continued)  
**SOIC and PLCC 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 $I_{0x}-I_{3x}$ to Output	0.45	1.30	0.45	1.30	0.45	1.40	ns	Figures 1, 2 (Note 5)
$t_{PLH}$ $t_{PHL}$	Propagation Delay $S_0, S_1$ to Output	0.90	2.20	0.90	2.20	1.00	2.40	ns	
$t_{PLH}$ $t_{PHL}$	Propagation Delay $\bar{E}$ to Output	0.65	2.10	0.65	2.10	0.75	2.20	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	Figures 1, 2
$t_{OSHL}$	Maximum Skew Common Edge Output-to-Output Variation Data to Output Path		400		400		400	ps	PLCC only (Note 6)
$t_{OSLH}$	Maximum Skew Common Edge Output-to-Output Variation Data to Output Path		490		490		490	ps	PLCC only (Note 6)
$t_{OST}$	Maximum Skew Opposite Edge Output-to-Output Variation Data to Output Path		490		490		490	ps	PLCC only (Note 6)
$t_{PS}$	Maximum Skew Pin (Signal) Transition Variation Data to Output Path		430		430		430	ps	PLCC only (Note 6)

**Note 5:** The propagation delay specified is for single output switching. Delays may vary up to 300 ps with multiple outputs switching.

**Note 6:** 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.

## Industrial Version

### PLCC DC Electrical Characteristics (Note 7)

$V_{EE} = -4.2V$  to  $-5.7V$ ,  $V_{CC} = V_{CCA} = GND$ ,  $T_C = -40^\circ C$  to  $+85^\circ C$

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 $50\Omega$ 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 $50\Omega$ 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		$\mu A$	$V_{IN} = V_{IL}$ (Min)	
$I_{IH}$	Input HIGH Current	$I_{0X-I_{3X}}$ $S_0, S_1, \bar{E}$		340 300		$\mu A$	$V_{IN} = V_{IH}$ (Max)	
$I_{EE}$	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.

### PLCC AC Electrical Characteristics

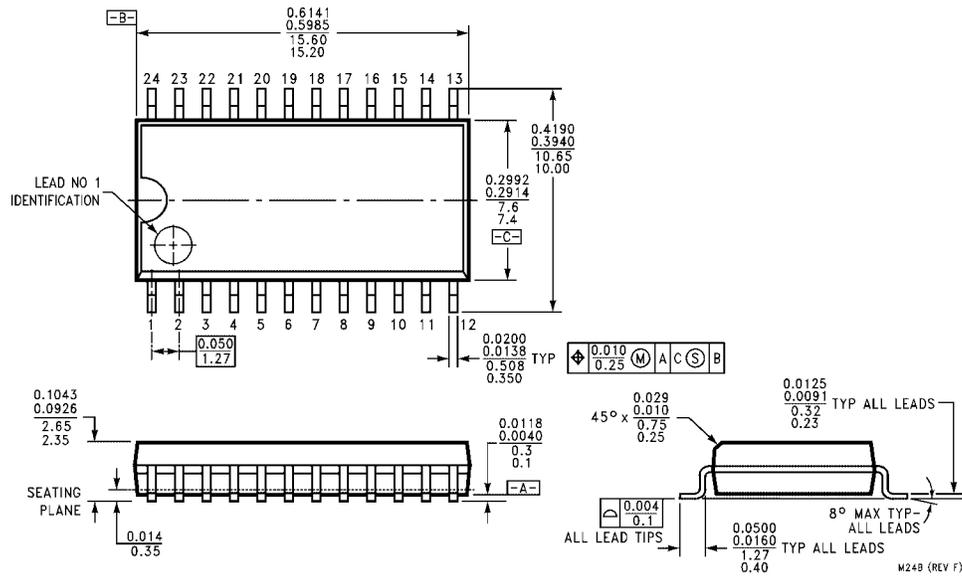
$V_{EE} = -4.2V$  to  $-5.7V$ ,  $V_{CC} = V_{CCA} = GND$

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)
$t_{PHL}$	$I_{0X-I_{3X}}$ to Output								
$t_{PLH}$	Propagation Delay	0.70	2.20	0.90	2.20	1.00	2.40		
$t_{PHL}$	$S_0, S_1$ to Output								
$t_{PLH}$	Propagation Delay	0.65	2.10	0.65	2.10	0.75	2.20		
$t_{PHL}$	$\bar{E}$ 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%								

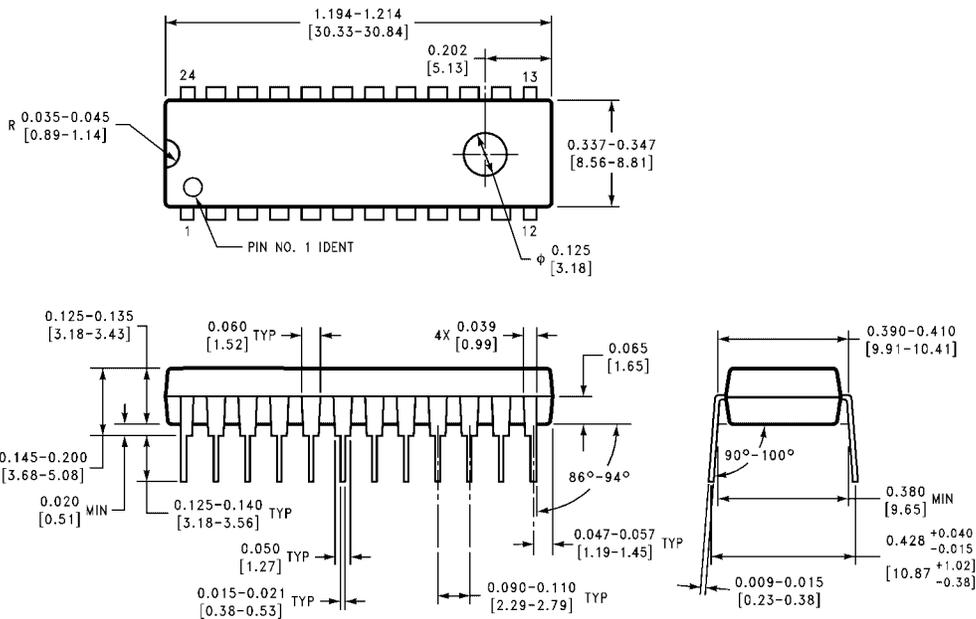
**Note 8:** The propagation delay specified is for single output switching. Delays may vary up to 300 ps with multiple outputs switching.



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

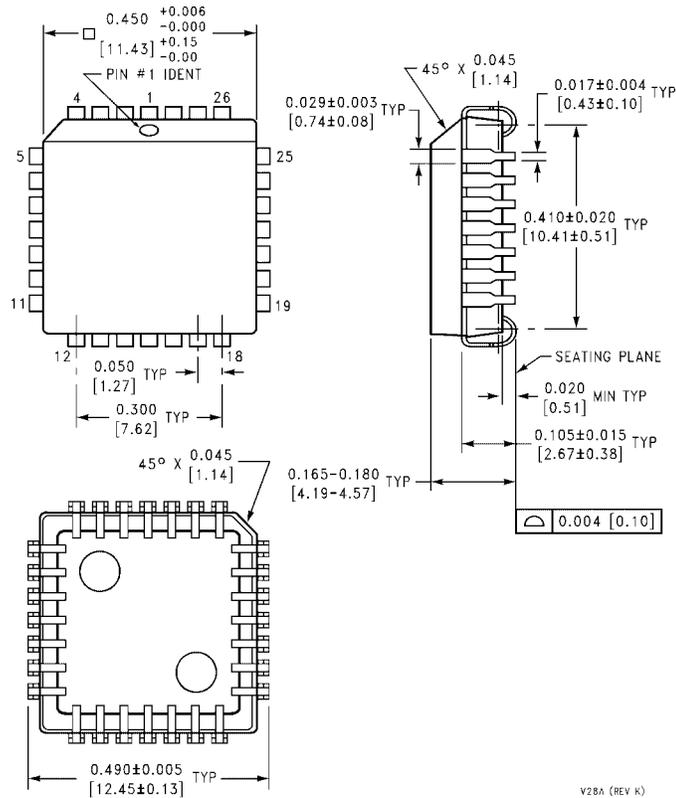


**24-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300 Wide  
Package Number M24B**



**24-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-010, 0.400 Wide  
Package Number N24E**

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



**28-Lead Plastic Lead Chip Carrier (PLCC), JEDEC MO-047, 0.450 Square Package Number V28A**

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