



**THE DATASHEET OF  
NC7SZ157L6X**



# NC7SZ157

## TinyLogic UHS 2-Input Non-Inverting Multiplexer

### Description

The NC7SZ157 is a single, high performance, 2-to-1 CMOS non-inverting multiplexer from ON Semiconductor's Ultra-High Speed series of TinyLogic. The device is fabricated with advanced CMOS technology to achieve ultra high speed with high output drive while maintaining low static power dissipation over a broad  $V_{CC}$  operating range. The device is specified to operate over the 1.65 V to 5.5 V  $V_{CC}$  operating range. The inputs and outputs are high impedance when  $V_{CC}$  is 0 V. Inputs tolerate voltages up to 5.5 V independent of  $V_{CC}$  operating range.

### Features

- Broad  $V_{CC}$  Operating Range: 1.65 V to 5.5 V
- Ultra High-Speed
- Power Down High-Impedance Inputs / Outputs
- Over-Voltage Tolerance Inputs Facilitate 5 V to 3 V Translation
- Proprietary Noise / EMI Reduction Circuitry
- Ultra-Small MicroPak™ Packages
- Space-Saving SC70 Package
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

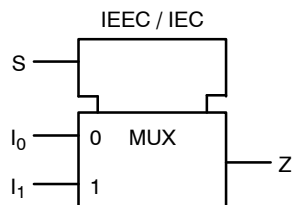


Figure 1. Logic Symbol



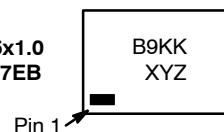
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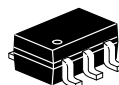
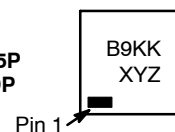
### MARKING DIAGRAMS



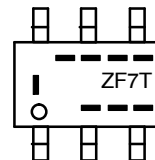
SIP6 1.45x1.0  
CASE 127EB



UDFN6  
1.0x1.0, 0.35P  
CASE 517DP



SC-88  
(SC-70 6 Lead)  
1.25x2  
CASE 419AD-01



- B9, ZF7 = Specific Device Code
- KK = 2-Digit Lot Run Traceability Code
- XY = 2-Digit Date Code Format
- Z = Assembly Plant Code
- = Year Coding Scheme
- |--- = Plant Code Identifier
- T = Die Run Code
- = Eight-Week Datacoding Scheme

### ORDERING INFORMATION

See detailed ordering, marking and shipping information in the package dimensions section on page 6 of this data sheet.

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## Pin Configurations

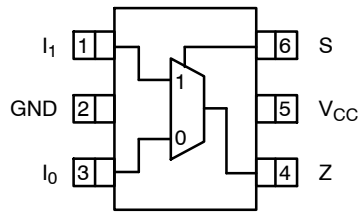


Figure 2. SC70 (Top View)

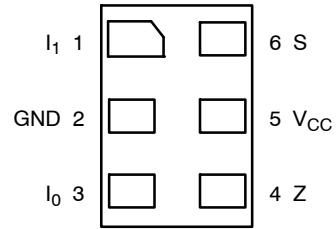
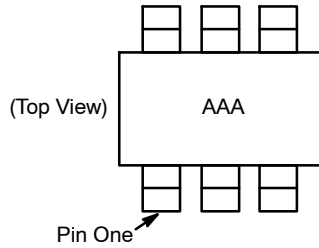


Figure 3. MicroPak (Top Through View)



NOTES:

1. AAA represents product code top mark (see Ordering Information).
2. Orientation of top mark determines pin one location.
3. Reading the top mark left to right, pin one is the lower left pin.

Figure 4. Pin 1 Orientation

### PIN DEFINITIONS

Pin # SC70	Pin # MicroPak	Name	Description
1	1	I <sub>1</sub>	Data Input
2	2	GND	Ground
3	3	I <sub>0</sub>	Data Input
4	4	Z	Output
5	5	V <sub>CC</sub>	Supply Voltage
6	6	S	Control Input

### FUNCTION TABLE

Inputs			Output
S	I <sub>1</sub>	I <sub>0</sub>	Z = (I <sub>0</sub> ) · (S) + (I <sub>1</sub> ) · (S)
L	X	L	L
L	X	H	H
H	L	X	L
H	H	X	H

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

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## ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter		Min	Max	Unit
V <sub>CC</sub>	Supply Voltage		-0.5	6.5	V
V <sub>IN</sub>	DC Input Voltage		-0.5	6.5	V
V <sub>OUT</sub>	DC Output Voltage		-0.5	6.5	V
I <sub>IK</sub>	DC Input Diode Current	V <sub>IN</sub> ≤ 0.5 V	-	-50	mA
I <sub>OK</sub>	DC Output Diode Current	V <sub>OUT</sub> ≤ -0.5 V	-	-50	mA
I <sub>OUT</sub>	DC Output Current		-	±50	mA
I <sub>CC</sub> or I <sub>GND</sub>	DC V <sub>CC</sub> or Ground Current		-	±50	mA
T <sub>STG</sub>	Storage Temperature Range		-65	+150	°C
T <sub>J</sub>	Junction Temperature Under Bias		-	+150	°C
T <sub>L</sub>	Junction Lead Temperature (Soldering, 10 Seconds)		-	+260	°C
P <sub>D</sub>	Power Dissipation at +85°C	SC70-6	-	190	mW
		MicroPak-6	-	327	
		MicroPak2™-6	-	327	
ESD	Human Body Model, JEDEC: JESD22-A114		-	4000	V
	Charge Device Model, JEDEC: JESD22-C101		-	2000	

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

## RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Conditions	Min	Max	Unit
V <sub>CC</sub>	Supply Voltage Operating		1.65	5.50	V
	Supply Voltage Data Retention		1.50	5.50	
V <sub>IN</sub>	Input Voltage		0	5.5	V
V <sub>OUT</sub>	Output Voltage		0	V <sub>CC</sub>	V
T <sub>A</sub>	Operating Temperature		-40	+85	°C
t <sub>r</sub> , t <sub>f</sub>	Input Rise and Fall Times	V <sub>CC</sub> at 1.8 V ±0.15 V, 2.5 V ±0.2 V	0	20	ns/V
		V <sub>CC</sub> at 3.3 V ±0.3 V	0	10	
		V <sub>CC</sub> at 5.0 V ±0.5 V	0	5	
θ <sub>JA</sub>	Thermal Resistance	SC70-6	-	659	°C/W
		MicroPak	-	382	
		MicroPak2	-	382	°C/W

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

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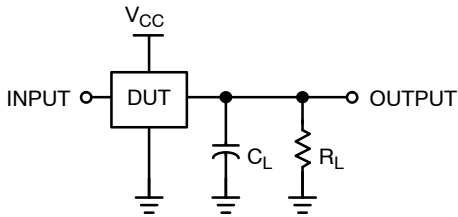
## DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	V <sub>CC</sub> (V)	Conditions	T <sub>A</sub> = +25°C			T <sub>A</sub> = -40 to +85°C		Unit		
				Min	Typ	Max	Min	Max			
V <sub>IH</sub>	HIGH Level Input Voltage	1.65 to 1.95		0.65 V <sub>CC</sub>	-	-	0.65 V <sub>CC</sub>	-	V		
		2.30 to 5.50		0.70 V <sub>CC</sub>	-	-	0.70 V <sub>CC</sub>	-			
V <sub>IL</sub>	LOW Level Input Voltage	1.65 to 1.95		-	-	0.35 V <sub>CC</sub>	-	0.35 V <sub>CC</sub>	V		
		2.30 to 5.50		-	-	0.30 V <sub>CC</sub>	-	0.30 V <sub>CC</sub>			
V <sub>OH</sub>	HIGH Level Output Voltage	1.65	V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub>	I <sub>OH</sub> = -100 μA	1.55	1.65	-	1.55	-	V	
		2.30			2.20	2.30	-	2.20	-		
		3.00			2.90	3.00	-	2.90	-		
		4.50			4.40	4.50	-	4.40	-		
		1.65		I <sub>OH</sub> = -4 mA	1.29	1.52	-	1.29	-		
		2.30			1.90	2.15	-	1.90	-		
		3.00			2.40	2.80	-	2.40	-		
		3.00			2.30	3.68	-	2.30	-		
		4.50			I <sub>OH</sub> = -24 mA	2.30	3.68	-	2.30		-
					I <sub>OH</sub> = -32 mA	3.90	4.20	-	3.80		-
V <sub>OL</sub>	LOW Level Output Voltage	1.65	V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub>	I <sub>OL</sub> = 100 μA	-	0	0.10	-	0.10	V	
		2.30			-	0	0.10	-	0.10		
		3.00			-	0	0.10	-	0.10		
		4.50			-	0	0.10	-	0.10		
		1.65		I <sub>OL</sub> = 4 mA	-	0.08	0.24	-	0.24		
		2.30			-	0.10	0.30	-	0.30		
		3.00			-	0.15	0.40	-	0.40		
		3.00			-	0.22	0.55	-	0.55		
		4.50			I <sub>OL</sub> = 24 mA	-	0.22	0.55	-		0.55
					I <sub>OL</sub> = 32 mA	-	0.22	0.55	-		0.55
I <sub>IN</sub>	Input Leakage Current	1.65 to 5.5		V <sub>IN</sub> = 5.5 V, GND	-	-	±0.1	-	±1	μA	
I <sub>OFF</sub>	Power Off Leakage Current	0		V <sub>IN</sub> or V <sub>OUT</sub> = 5.5 V	-	-	1.0	-	10	μA	
I <sub>CC</sub>	Quiescent Supply Current	1.65 to 5.50		V <sub>IN</sub> = 5.5 V, GND	-	-	-	-	10	μA	

AC ELECTRICAL CHARACTERISTICS

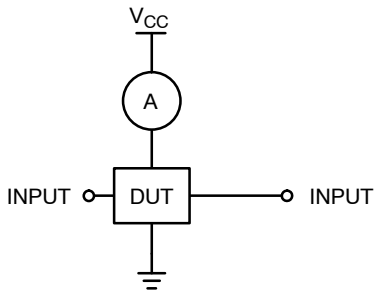
Symbol	Parameter	V <sub>CC</sub> (V)	Conditions	T <sub>A</sub> = +25°C			T <sub>A</sub> = -40 to +85°C		Unit
				Min	Typ	Max	Min	Max	
t <sub>PLH</sub> , t <sub>PHL</sub>	Propagation Delay S to Z (Figure 5, 6)	1.80 ±0.15	C <sub>L</sub> = 15 pF, R <sub>L</sub> = 1 MΩ,	-	6.0	11.5	-	12.0	ns
		2.50 ±0.20		-	3.5	6.1	-	6.5	
		3.30 ±0.30		-	2.6	4.1	-	4.5	
		5.00 ±0.50		-	1.9	3.2	-	3.5	
	Propagation Delay I <sub>n</sub> to Z (Figure 5, 6)	1.80 ±0.15	C <sub>L</sub> = 15 pF, R <sub>L</sub> = 1MΩ,	-	5.9	10.0	-	10.5	
		5.00 ±0.50		-	3.5	5.8	-	6.1	
		3.30 ±0.30		-	2.6	3.9	-	4.2	
		5.00 ±0.50		-	1.9	3.1	-	3.3	
	Propagation Delay S to Z (Figure 5, 6)	3.30 ±0.30	C <sub>L</sub> = 50 pF, R <sub>L</sub> = 500 Ω,	-	3.2	4.8	-	5.2	
		5.00 ±0.50		-	2.4	3.8	-	4.1	
	Propagation Delay I <sub>n</sub> to Z (Figure 5, 6)	3.30 ±0.30	C <sub>L</sub> = 50 pF, R <sub>L</sub> = 500 Ω,	-	3.2	4.6	-	5.0	
		5.00 ±0.50		-	2.4	3.7	-	4.0	
C <sub>IN</sub>	Input Capacitance	0.00		-	2	-	-	-	pF
C <sub>PD</sub>	Power Dissipation Capacitance (Note 4) (Figure 7)	3.30		-	14	-	-	-	pF
		5.00		-	17	-	-	-	

4. C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is derived from dynamic operating current consumption (I<sub>CCD</sub>) at no output loading and operating at 50% duty cycle. C<sub>PD</sub> is related to I<sub>CCD</sub> dynamic operating current by the expression:  
I<sub>CCD</sub> = (C<sub>PD</sub>) (V<sub>CC</sub>) (f<sub>IN</sub>) + (I<sub>CCstatic</sub>).



NOTE:  
5. C<sub>L</sub> includes load and stray capacitance; inputs PRR = 1.0 MHz, t<sub>W</sub> = 500 ns.

Figure 5. AC Test Circuit



NOTE:  
6. Input = AC Waveform; PRR = Variable; Duty Cycle = 50%.

Figure 7. I<sub>CCD</sub> Test Circuit

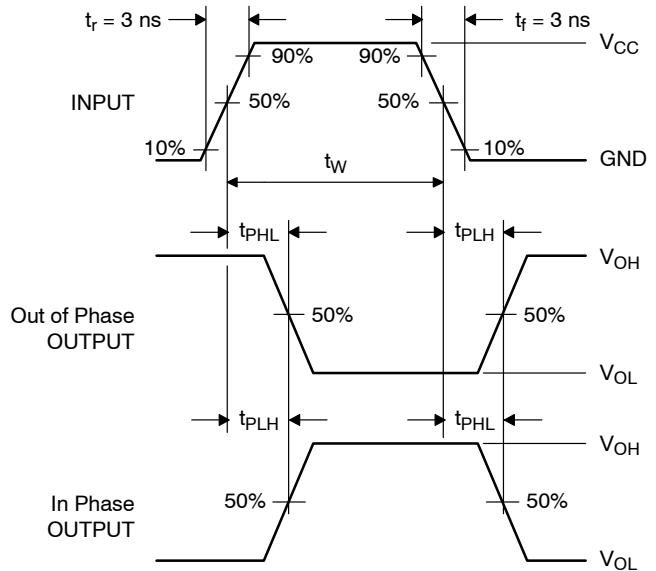


Figure 6. AC Waveforms

# NC7SZ157

## DEVICE ORDERING INFORMATION

Device	Top Mark	Packages	Shipping†
NC7SZ157P6X	ZF7	6-Lead SC70, EIAJ SC-88, 1.25 mm Wide	3000 / Tape & Reel
NC7SZ157L6X	B9	6-Lead MicroPak, 1.00 mm Wide	5000 / Tape & Reel
NC7SZ157FHX	B9	6-Lead, MicroPak2, 1x1 mm Body, .35 mm Pitch	5000 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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# MECHANICAL CASE OUTLINE

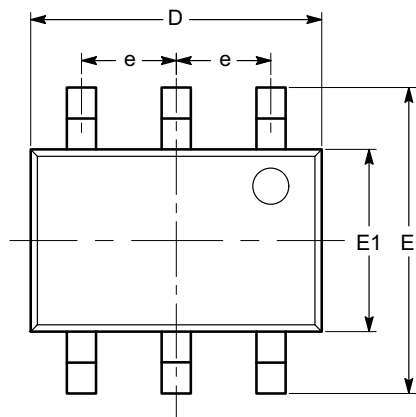
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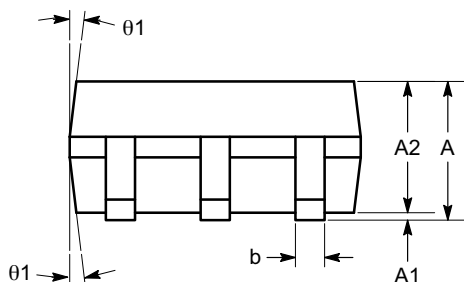
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CASE 419AD-01  
ISSUE A

DATE 07 JUL 2010

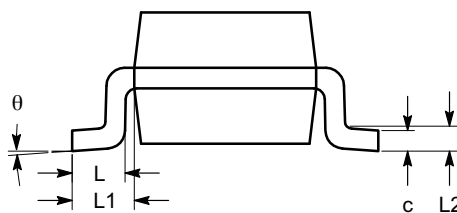


TOP VIEW

SYMBOL	MIN	NOM	MAX
A	0.80		1.10
A1	0.00		0.10
A2	0.80		1.00
b	0.15		0.30
c	0.10		0.18
D	1.80	2.00	2.20
E	1.80	2.10	2.40
E1	1.15	1.25	1.35
e	0.65 BSC		
L	0.26	0.36	0.46
L1	0.42 REF		
L2	0.15 BSC		
$\theta$	0°		8°
$\theta_1$	4°		10°



SIDE VIEW



END VIEW

**Notes:**

- (1) All dimensions are in millimeters. Angles in degrees.
- (2) Complies with JEDEC MO-203.

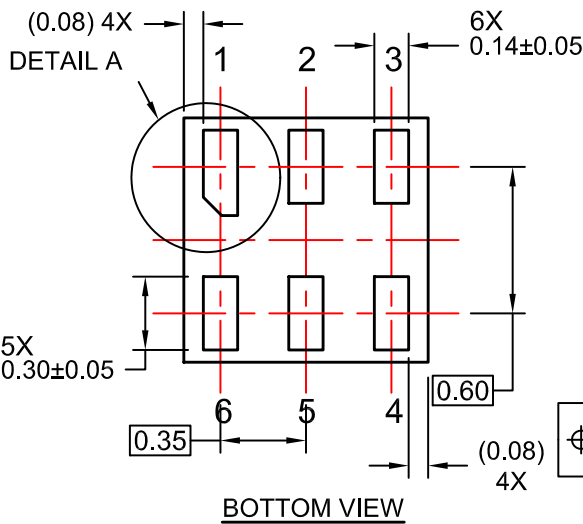
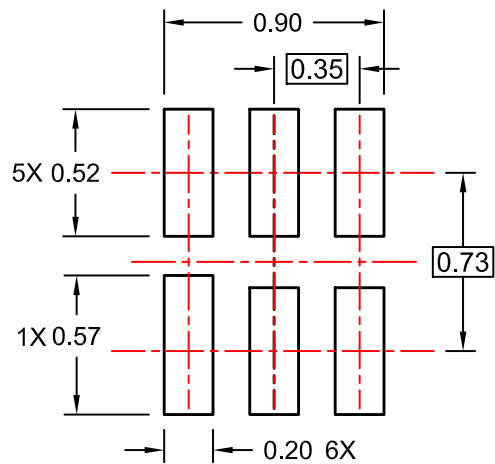
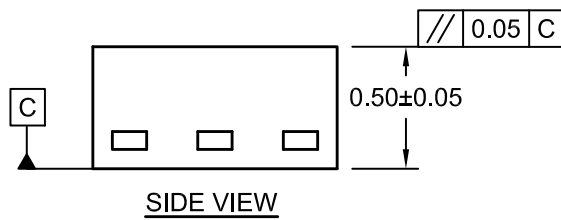
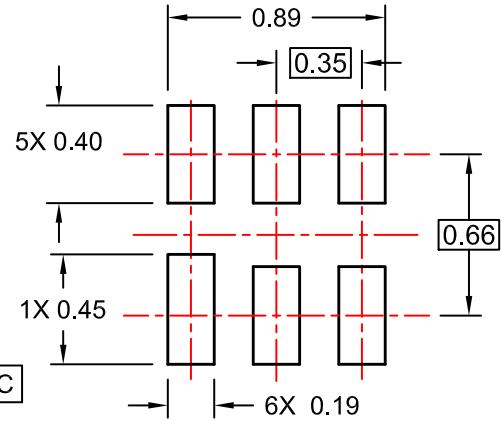
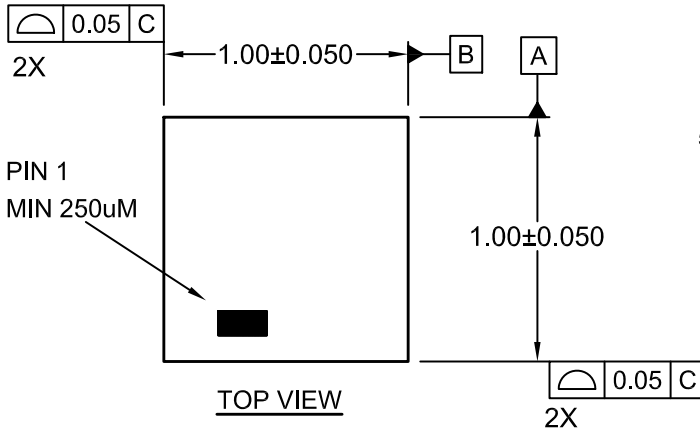
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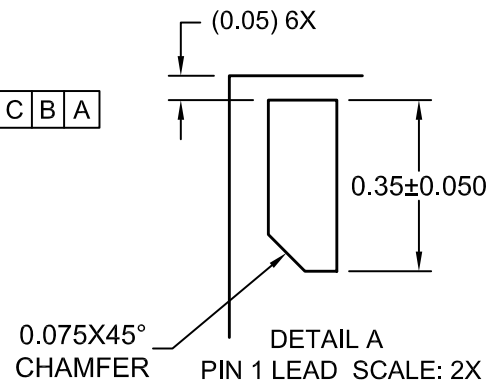


**UDFN6 1.0X1.0, 0.35P**  
CASE 517DP  
ISSUE O

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**ALTERNATIVE LAND PATTERN FOR UNIVERSAL APPLICATION**



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