# **ON Semiconductor**

# Is Now



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# Single 2-Input Non-Inverting Multiplexer

# **NL17SZ157**

The NL17SZ157 is a single 2-input non-inverting multiplexer operating from a 1.65 to 5.5 V supply.

#### **Features**

- $\bullet$  Designed for 1.65 V to 5.5 V  $V_{CC}$  Operation
- 2.4 ns  $t_{PD}$  at  $V_{CC} = 5 \text{ V (Typ)}$
- Inputs/Outputs Overvoltage Tolerant up to 5.5 V
- I<sub>OFF</sub> Supports Partial Power Down Protection
- Source/Sink 32 mA at 4.5 V
- Available in SC-88, SC-74 and UDFN6 Packages
- Chip Complexity < 100 FETs
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

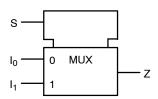
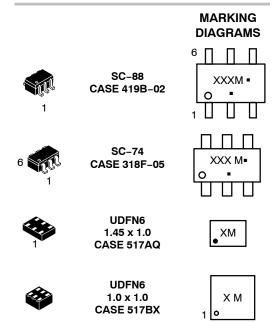


Figure 1. Logic Symbol



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X, XXX = Specific Device Code M = Date Code\*

■ = Pb-Free Package

(Note: Microdot may be in either location)

\*Date Code orientation and/or position may vary depending upon manufacturing location.

### **ORDERING INFORMATION**

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

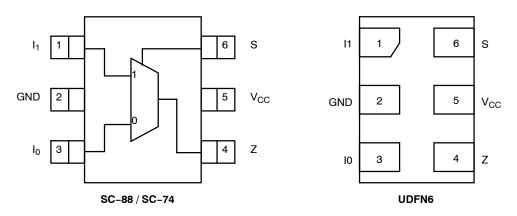


Figure 2. Pinout (Top View)

# **PIN ASSIGNMENT**

Pin	Function
1	l1
2	GND
3	10
4	Z
5	V <sub>CC</sub>
6	S

# **FUNCTION TABLE**

Inputs			Output	
S	I <sub>1</sub>	I <sub>0</sub>	$Z = (I_0) \cdot (\overline{S}) + (I_1) \cdot (S)$	
L	X	L	L	
L	X	Н	Н	
Н	L	Х	L	
Н	Н	Х	Н	

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

#### **MAXIMUM RATINGS**

Symbol	Charact	Value	Unit	
V <sub>CC</sub>	DC Supply Voltage		-0.5 to +6.5	V
V <sub>IN</sub>	DC Input Voltage		-0.5 to +6.5	V
V <sub>OUT</sub>	DC Output Voltage	Active-Mode (High or Low State) Tri-State Mode (Note 1) Power-Down Mode (V <sub>CC</sub> = 0 V)	-0.5 to V <sub>CC</sub> + 0.5 -0.5 to +6.5 -0.5 to +6.5	V
I <sub>IK</sub>	DC Input Diode Current	V <sub>IN</sub> < GND	-50	mA
I <sub>OK</sub>	DC Output Diode Current	V <sub>OUT</sub> < GND	-50	mA
I <sub>OUT</sub>	DC Output Source/Sink Current		±50	mA
I <sub>CC</sub> or I <sub>GND</sub>	DC Supply Current per Supply Pin or Gr	ound Pin	±100	mA
T <sub>STG</sub>	Storage Temperature Range	-65 to +150	°C	
TL	Lead Temperature, 1 mm from Case for	10 secs	260	°C
TJ	Junction Temperature Under Bias		+150	°C
$\theta_{\sf JA}$	Thermal Resistance (Note 2)	SC-88 SC-74 UDFN6	377 320 154	°C/W
P <sub>D</sub>	Power Dissipation in Still Air	SC-88 SC-74 UDFN6	332 390 812	mW
MSL	Moisture Sensitivity		Level 1	-
F <sub>R</sub>	Flammability Rating	Oxygen Index: 28 to 34	UL 94 V-0 @ 0.125 in	-
V <sub>ESD</sub>	ESD Withstand Voltage (Note 3)	Human Body Model Charged Device Model	2000 1000	V
I <sub>Latchup</sub>	Latchup Performance (Note 4)		± 100	mA

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.

- 1. Applicable to devices with outputs that may be tri-stated.
- Measured with minimum pad spacing on an FR4 board, using 10mm-by-1inch, 2 ounce copper trace no air flow per JESD51-7.
   HBM tested to ANSI/ESDA/JEDEC JS-001-2017. CDM tested to EIA/JESD22-C101-F. JEDEC recommends that ESD qualification to EIA/JESD22-A115-A (Machine Model) be discontinued per JEDEC/JEP172A.
- 4. Tested to EIA/JESD78 Class II.

# RECOMMENDED OPERATING CONDITIONS

Symbol	Characteristics			Max	Unit
V <sub>CC</sub>	Positive DC Supply Voltage		1.65	5.5	V
V <sub>IN</sub>	DC Input Voltage		0	5.5	V
V <sub>OUT</sub>	DC Output Voltage	Active-Mode (High or Low State) Tri-State Mode (Note 1) Power-Down Mode (V <sub>CC</sub> = 0 V)	0 0 0	V <sub>CC</sub> 5.5 5.5	
T <sub>A</sub>	Operating Temperature Range		-55	+125	°C
t <sub>r</sub> , t <sub>f</sub>	Input Rise and Fall Time	$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$ $V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$ $V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$ $V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	0 0 0	20 20 10 5	ns

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.

# DC ELECTRICAL CHARACTERISTICS

			V <sub>CC</sub>	Т,	4 = 25°(		-55°C ≤ T	<sub>A</sub> ≤ 125°C	
Symbol	Parameter	Condition	(V)	Min	Тур	Max	Min	Max	Units
V <sub>IH</sub>	High-Level Input		1.65 to 1.95	0.65 V <sub>CC</sub>	_	_	0.65 V <sub>CC</sub>	_	V
	Voltage		2.3 to 5.5	0.70 V <sub>CC</sub>	-	_	0.70 V <sub>CC</sub>	-	
V <sub>IL</sub>	Low-Level Input		1.65 to 1.95	-	-	0.35 V <sub>CC</sub>	-	0.35 V <sub>CC</sub>	٧
	Voltage		2.3 to 5.5	-	-	0.30 V <sub>CC</sub>	-	0.30 V <sub>CC</sub>	
V <sub>OH</sub>	High-Level Output Voltage	$\begin{split} V_{IN} &= V_{IH} \text{ or } V_{IL} \\ I_{OH} &= -100  \mu\text{A} \\ I_{OH} &= -4 \text{ mA} \\ I_{OH} &= -8 \text{ mA} \\ I_{OH} &= -16 \text{ mA} \\ I_{OH} &= -24 \text{ mA} \\ I_{OH} &= -32 \text{ mA} \end{split}$	1.65 to 5.5 1.65 2.3 3 3 4.5	V <sub>CC</sub> - 0.1 1.29 1.9 2.4 2.3 3.8	V <sub>CC</sub> 1.52 2.1 2.7 2.5 4	- - - - -	V <sub>CC</sub> - 0.1 1.29 1.9 2.4 2.3 3.8	- - - - -	V
V <sub>OL</sub>	Low-Level Output Voltage	$\begin{split} &V_{IN} = V_{IH} \text{ or } V_{IL} \\ &I_{OH} = 100  \mu\text{A} \\ &I_{OH} = 4 \text{ mA} \\ &I_{OH} = 8 \text{ mA} \\ &I_{OH} = 16 \text{ mA} \\ &I_{OH} = 24 \text{ mA} \\ &I_{OH} = 32 \text{ mA} \end{split}$	1.65 to 5.5 1.65 2.3 3 3 4.5	- - - -	- 0.08 0.12 0.24 0.26 0.31	0.1 0.24 0.3 0.4 0.55 0.55	- - - -	0.1 0.24 0.3 0.4 0.55 0.55	V
I <sub>IN</sub>	Input Leakage Current	V <sub>IN</sub> = 5.5 V or GND	1.65 to 5.5	-	-	±0.1	-	±1.0	μΑ
l <sub>OFF</sub>	Power Off Leakage Current	V <sub>IN</sub> = 5.5 V or V <sub>OUT</sub> = 5.5 V	0	-	-	1.0	-	10	μΑ
I <sub>CC</sub>	Quiescent Supply Current	V <sub>IN</sub> = V <sub>CC</sub> or GND	5.5	-	_	1.0	-	10	μΑ

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

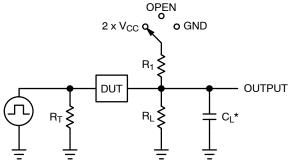
# **AC ELECTRICAL CHARACTERISTICS**

					$T_A = +25^{\circ}C$ $T_A$		T <sub>A</sub> = -40 to +85°C		
Symbol	Parameter	V <sub>CC</sub> (V)	Conditions	Min	Тур	Max	Min	Max	Unit
t <sub>PLH</sub> , t <sub>PHL</sub>	Propagation Delay, S to Z	1.65 to 1.95	C <sub>L</sub> = 15 pF,	-	6.0	11.5	-	12.0	ns
	(Figure 3, 4)	2.3 to 2.7	$R_L = 1 M\Omega$ ,	-	3.5	6.1	-	6.5	
		3.0 to 3.6		-	2.6	4.1	-	4.5	
		4.5 to 5.5		-	1.9	3.2	-	3.5	
	Propagation Delay, I <sub>n</sub> to Z (Figure 3, 4)	1.65 to 1.95	$C_L$ = 15 pF, $R_L$ = 1M $\Omega$ ,	-	5.9	10.0	-	10.5	
		2.3 to 2.7		-	3.5	5.8	-	6.1	
		3.0 to 3.6		-	2.6	3.9	-	4.2	
		4.5 to 5.5		-	1.9	3.1	-	3.3	
	Propagation Delay, S to Z	3.0 to 3.6	C <sub>L</sub> = 50 pF,	-	3.2	4.8	-	5.2	
	(Figure 3, 4)	4.5 to 5.5	$R_L = 500 \Omega$	-	2.4	3.8	-	4.1	
	Propagation Delay, I <sub>n</sub> to Z	3.0 to 3.6	C <sub>L</sub> = 50 pF,	-	3.2	4.6	-	5.0	
	(Figure 3, 4)	4.5 to 5.5	$R_L = 500 \Omega$ ,	-	2.4	3.7	-	4.0	

# **CAPACITIVE CHARACTERISTICS**

Symbol	Parameter	Condition	Typical	Units
C <sub>IN</sub>	Input Capacitance	$V_{CC} = 5.5 \text{ V}, V_{IN} = 0 \text{ V or } V_{CC}$	2.5	pF
C <sub>OUT</sub>	Output Capacitance	$V_{CC} = 5.5 \text{ V}, V_{IN} = 0 \text{ V or } V_{CC}$	4.0	pF
C <sub>PD</sub>	Power Dissipation Capacitance (Note 5)	10 MHz, $V_{CC} = 5.5 \text{ V}$ , $V_{IN} = 0 \text{ V or } V_{CC}$	4.0	pF

 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>CC</sub>static).



Test	Switch Position	C <sub>L</sub> , pF	$R_L, \Omega$	R <sub>1</sub> , Ω	
t <sub>PLH</sub> / t <sub>PHL</sub>	Open	See AC Characteristics Table			
t <sub>PLZ</sub> / t <sub>PZL</sub>	2 x V <sub>CC</sub>	50	500	500	
t <sub>PHZ</sub> / t <sub>PZH</sub>	GND	50	500	500	

X = Don't Care

 $C_L$  includes probe and jig capacitance  $R_T$  is  $Z_{OUT}$  of pulse generator (typically 50  $\Omega)$  f = 1 MHz

Figure 3. Test Circuit

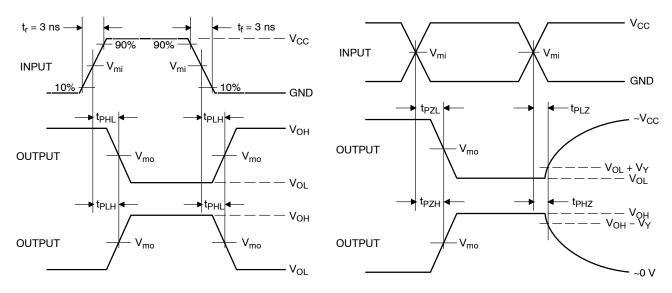


Figure 4. Switching Waveforms

		V <sub>m</sub>		
V <sub>CC</sub> , V	V <sub>mi</sub> , V	t <sub>PLH</sub> , t <sub>PHL</sub> t <sub>PZL</sub> , t <sub>PLZ</sub> , t <sub>PZH</sub> , t <sub>PHZ</sub>		V <sub>Y</sub> , V
1.65 to 1.95	V <sub>CC</sub> / 2	V <sub>CC</sub> / 2	V <sub>CC</sub> / 2	0.15
2.3 to 2.7	V <sub>CC</sub> / 2	V <sub>CC</sub> / 2	V <sub>CC</sub> / 2	0.15
3.0 to 3.6	V <sub>CC</sub> / 2	V <sub>CC</sub> / 2	V <sub>CC</sub> / 2	0.3
4.5 to 5.5	V <sub>CC</sub> /2	V <sub>CC</sub> / 2	V <sub>CC</sub> / 2	0.3

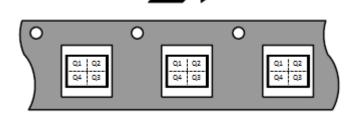
# **DEVICE ORDERING INFORMATION**

Device	Packages	Specific Device Code	Pin 1 Orientation (See below)	Shipping <sup>†</sup>
NL17SZ157DFT2G (In Development)	SC-88	TBD	Q4	3000 / Tape & Reel
NL17SZ157DBVT1G	SC-74	AR	Q4	3000 / Tape & Reel
NL17SZ157MU1TCG (In Development)	UDFN6, 1.45 x 1.0, 0.5P	TBD	Q4	3000 / Tape & Reel
NL17SZ157MU3TCG (In Development)	UDFN6, 1.0 x 1.0, 0.35P	TBD	Q4	3000 / Tape & Reel

<sup>†</sup>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.

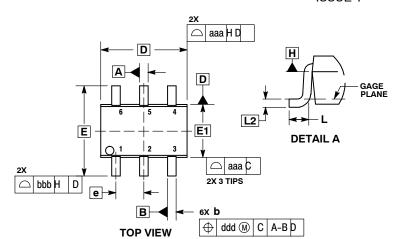
# Pin 1 Orientation in Tape and Reel

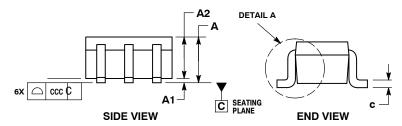
# Direction of Feed



#### PACKAGE DIMENSIONS

### SC-88/SC70-6/SOT-363 CASE 419B - 02 **ISSUE Y**





- NOTES:

  1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.

  2. CONTROLLING DIMENSION: MILLIMETERS.

  3. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.20 PER END.

  4. DIMENSIONS D AND E1 AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY AND DATUM H.

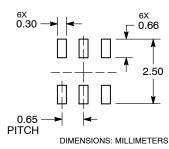
  5. DATUMS A AND B ARE DETERMINED AT DATUM H.

  6. DIMENSIONS D AND C APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.08 AND 0.15 FROM THE TIP.

  7. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 TOTAL IN EXCESS OF DIMENSION D AT MAXIMUM MATERIAL CONDITION. THE DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OF THE FOOT. RADIUS OF THE FOOT.

	MILLIMETERS				INCHES	3
DIM	MIN	NOM	MAX	MIN	NOM	MAX
Α			<del>- 1</del> .10			0.043
A1	0.00		0.10	0.000		0.004
A2	0.70	0.90	1.00	0.027	0.035	0.039
b	0.15	0.20	0.25	0.006	0.008	0.010
С	0.08	0.15	0.22	0.003	0.006	0.009
D	1.80	2.00	2.20	0.070	0.078	0.086
Е	2.00	2.10	2.20	0.078	0.082	0.086
E1	1.15	1.25	1.35	0.045	0.049	0.053
е	-	0.65 BS	С	0	.026 BS	С
L	0.26	0.36	0.46	0.010	0.014	0.018
L2		0.15 BS	C		0.006 BS	SC
aaa	0.15				0.006	
bbb	0.30				0.012	
ccc	0.10			0.004		
ddd		0.10			0.004	

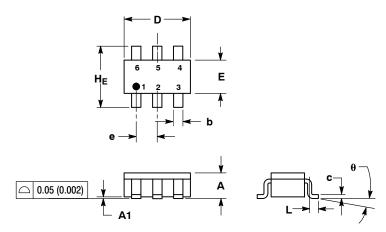
#### **RECOMMENDED SOLDERING FOOTPRINT\***



<sup>\*</sup>For additional information on our Pb - Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

# **PACKAGE DIMENSIONS**

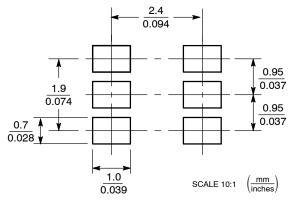
SC-74 CASE 318F-05 ISSUE N



- NOTES:
  1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH
  THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM
  THICKNESS OF BASE MATERIAL.
  4. 318F-01, -02, -03, -04 OBSOLETE. NEW STANDARD 318F-05.

	MILLIMETERS			INCHES		
DIM	MIN	NOM	MAX	MIN	NOM	MAX
Α	0.90	1.00	1.10	0.035	0.039	0.043
A1	0.01	0.06	0.10	0.001	0.002	0.004
b	0.25	0.37	0.50	0.010	0.015	0.020
С	0.10	0.18	0.26	0.004	0.007	0.010
D	2.90	3.00	3.10	0.114	0.118	0.122
E	1.30	1.50	1.70	0.051	0.059	0.067
е	0.985	0.95	11.05	0.084	0.037	0.10241
L	0.20	0.40	0.60	0.008	0.016	0.024
HE	2.50	2.75	3.00	0.099	0.108	0.118
θ		_			_	

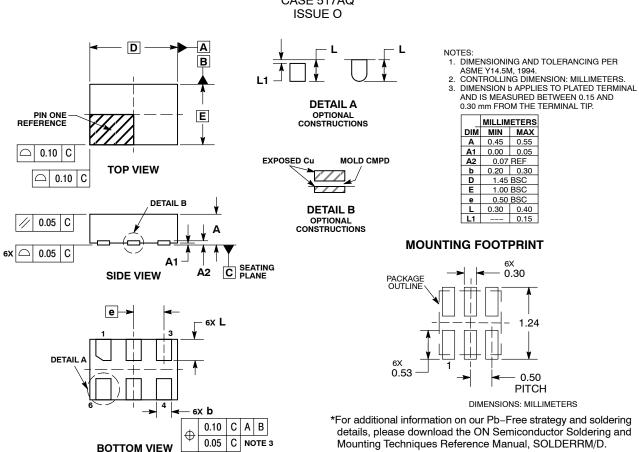
# **SOLDERING FOOTPRINT\***



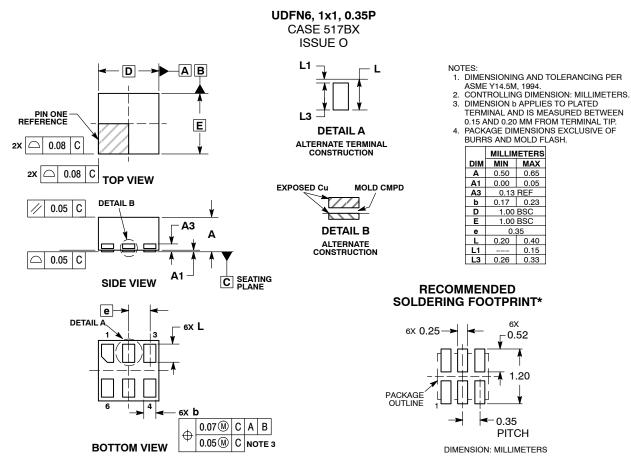
<sup>\*</sup>For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

#### **PACKAGE DIMENSIONS**

# **UDFN6, 1.45x1.0, 0.5P**CASE 517AQ ISSUE O



#### PACKAGE DIMENSIONS



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NTE4028B NTE4514B NTE4515B NTE4543B NTE4547B NTE74LS249 NLV74HC4851AMNTWG MC74LVX257DG
M74HCT4851ADWR2G AP4373AW5-7-01 NL7SZ19DBVT1G MC74LVX257DTR2G 74VHC4066AFT(BJ) 74VHCT138AFT(BJ)
74HC158D.652 74HC4052D(BJ) 74VHC138MTC COMX-CAR-P1 JM38510/65852BEA 74VHC138MTCX 74HC138D(BJ)
NL7SZ19DFT2G 74AHCT138T16-13 74LCX138FT(AJ) 74LCX157FT(AJ) NL7SZ18MUR2G PCA9540BD,118 QS3VH16233PAG8
SNJ54HC251J SN54LS139AJ SN74CBTLV3257PWG4 SN74ALS156DR SN74AHCT139PWR 74HC251D.652 74HC257D.652