

# NL7SZ19

## 1-to-2 Decoder/ Demultiplexer

The NL7SZ19 is a 1-to-2 decoder. When the output enable ( $\bar{E}$ ) is Low, the device passes data at input A to outputs Y0 (true) and Y1 (complement). The NL7SZ19 can also be used as a 1-to-2 demultiplexer. As a demultiplexer, data at input  $\bar{E}$  is routed to either Y0 or Y1 depending on the state of A. The device operates over the voltage range from 1.65 V to 5.5 V. The device is fabricated in sub-micron CMOS for high speed and fast decode times. Both inputs and outputs are in high impedance state, when supply voltage is powered down. Both inputs are tolerant of voltages up to 5.5 V, regardless of operating voltage. This device is suitable for low power decoding in a variety of applications.

### Features

- High-Speed Propagation Delay:  
 $t_{PD}$  2.7 nS (Typ), Load 50 pF @ 5.0 V
- 32 mA Output Drive Capability @ 5.0 V
- Power Down Impedance: Inputs/Outputs in High-Z
- Broad  $V_{CC}$  Operating Range: 1.65 V to 5.5 V
- Surface Mount Technology: SC-70, 6-Lead and UDFN6 Packaging
- OVT\* on I/Os
- Pb-Free Package is Available

### Typical Applications

- Cell Phones
- PDAs
- Digital Cameras
- Video Cameras

### Important Information

- ESD Protection: Human Body Model >2000 V
- Latchup Max Rating: 300 mA
- Pin to Pin Compatible with NC7SZ19

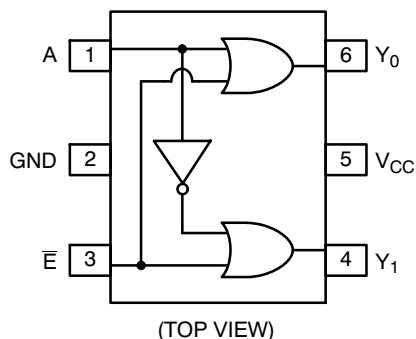


Figure 1. Pinout

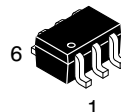
\*Over Voltage Tolerance (OVT) enables input and output pins to function outside (higher) of their operating voltages, with no damage to the devices or to signal integrity.



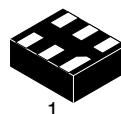
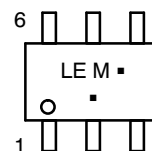
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### MARKING DIAGRAM



SOT-363/SC70-6/SC-88  
DF SUFFIX  
CASE 419B



UDFN6  
MU SUFFIX  
CASE 517AA



LE, U = Device Marking  
M = Date Code\*  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

\*Date Code orientation may vary depending upon manufacturing location.

### PIN/FUNCTION TABLE

Pin	Function Description	
	As Decoder	As Demultiplexer
A	Address	Select
$\bar{E}$	Output Enable	Data
Y <sub>0</sub>	Output 0	Output 0
Y <sub>1</sub>	Output 1	Output 1

### TRUTH TABLE

$\bar{E}$	A	Y <sub>0</sub> = A + $\bar{E}$	Y <sub>1</sub> = $\bar{A}$ + $\bar{E}$
L	L	L	H
L	H	H	L
H	H	H	H
H	L	H	H

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

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## MAXIMUM RATINGS

Symbol	Rating	Value	Unit
V <sub>CC</sub>	DC Supply Voltage	-0.5 to +7.0	V
V <sub>IN</sub>	DC Input Voltage	-0.5 to +7.0	V
V <sub>OUT</sub>	DC Output Voltage	-0.5 to +7.0	V
I <sub>IK</sub>	DC Input Diode Current @ V <sub>1</sub> < -0.5 V	-50	mA
I <sub>OK</sub>	DC Output Diode Current @ V <sub>1</sub> < -0.5 V	-50	mA
I <sub>OUT</sub>	DC Output Sink Current	± 50	mA
I <sub>CC</sub>	DC Supply Current per Supply Pin	± 100	mA
I <sub>GND</sub>	DC Ground Current per Ground Pin	± 100	mA
T <sub>STG</sub>	Storage Temperature Range	-65 to +150	°C
T <sub>L</sub>	Lead Temperature, 1 mm from Case for 10 Seconds	260	°C
T <sub>J</sub>	Junction Temperature Under Bias	+150	°C
θ <sub>JA</sub>	Thermal Resistance (Note 1)	250	°C/W
P <sub>D</sub>	Power Dissipation in Still Air at 85°C	180	mW
MSL	Moisture Sensitivity	Level 1	-
F <sub>R</sub>	Flammability Rating Oxygen Index: 28 to 34	UL 94 V-0 @ 0125 in	-
V <sub>ESD</sub>	ESD Withstand Voltage Human Body Model (Note 2) Machine Model (Note 3) Charged Device Model (Note 4)	> 2000 > 150 n/a	V

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Measured with minimum pad spacing on an FR4 board, using 10 mm-by-1 inch, 2 ounce copper trace no air flow.
2. Tested to EIA/JESD22-A114-A.
3. Tested to EIA/JESD22-A115-A.
4. Tested to JESD22-C101-A.

## RECOMMENDED OPERATING CONDITIONS

Symbol	Rating	Value	Unit
V <sub>CC</sub>	DC Supply Voltage	1.65 to 5.5	V
V <sub>CC</sub>	DC Supply Voltage, Data Retention	1.5 to 5.5	V
V <sub>IN</sub>	Input Voltage	0 to 5.5	V
V <sub>OUT</sub>	Output Voltage	0 to 5.5	V
T <sub>A</sub>	Operating Temperature	-40 to 85	°C
t <sub>r</sub> , t <sub>f</sub>	Input Rise and Fall Times V <sub>CC</sub> @ 1.8 ± 0.15 V V <sub>CC</sub> @ 2.5 ± 0.2 V V <sub>CC</sub> @ 3.3 ± 0.3 V V <sub>CC</sub> @ 5.0 ± 0.5 V	0 to 20 0 to 20 0 to 10 0 to 5	nS/V
θ <sub>JA</sub>	Thermal Resistance	350	°C/W

## ORDERING INFORMATION

Device Order Number	Package	Shipping†
NL7SZ19DFT2	SC70-6	3000 / Tape & Reel
NL7SZ19DFT2G	SC70-6 (Pb-Free)	3000 / Tape & Reel
NL7SZ19MUR2G	UDFN6 (Pb-Free)	3000 / 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.

DC ELECTRICAL CHARACTERISTICS

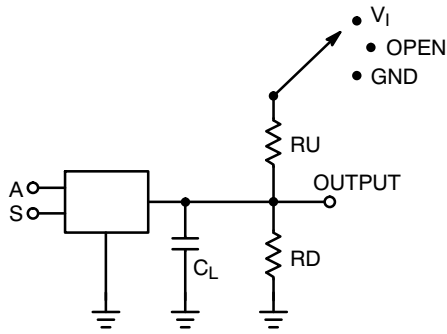
Symbol	Parameter	Condition		V <sub>CC</sub> (V)	T <sub>A</sub> = 25°C			T <sub>A</sub> = -40°C to 85°C		Unit
					Min	Typ	Max	Min	Max	
V <sub>IH</sub>	High-Level Input Voltage			1.65 2.3 to 5.5	0.75 V <sub>CC</sub> 0.70 V <sub>CC</sub>			0.75 V <sub>CC</sub> 0.70 V <sub>CC</sub>		V
V <sub>IL</sub>	Low-Level Output Voltage			1.65 2.3–5.5			0.25 V <sub>CC</sub> 0.30 V <sub>CC</sub>		0.25 V <sub>CC</sub> 0.30 V <sub>CC</sub>	V
V <sub>OH</sub>	High-Level Output Voltage	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OH</sub> = -100 μA	1.65	1.55	1.65		1.55		V
				2.3	2.20	2.30		2.20		
				3.0	2.90	3.00		2.90		
				4.5	4.40	4.50		4.40		
			I <sub>OH</sub> = -3.0 mA I <sub>OH</sub> = -8.0 mA I <sub>OH</sub> = -16 mA I <sub>OH</sub> = -24 mA I <sub>OH</sub> = -32 mA	1.65	1.29	1.47		1.29		
				2.3	1.90	2.10		1.90		
				3.0	2.40	2.75		2.40		
	3.0	2.30	2.63		2.30					
	4.5	3.80	4.15		3.80					
V <sub>OL</sub>	Low-Level Output Voltage	V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub>	I <sub>OL</sub> = 100 μA	1.65		0.0	0.10		0.10	V
				2.3		0.0	0.10		0.10	
				3.0		0.0	0.10		0.10	
				4.5		0.0	0.10		0.10	
			I <sub>OL</sub> = 3.0 mA I <sub>OL</sub> = 8.0 mA I <sub>OL</sub> = 16 mA I <sub>OL</sub> = 24 mA I <sub>OL</sub> = 32 mA	1.65		0.09	0.24		0.24	
				2.3		0.12	0.30		0.30	
				3.0		0.20	0.40		0.40	
	3.0		0.30	0.55		0.55				
	4.5		0.32	0.55		0.55				
I <sub>IN</sub>	Input Leakage Current	V <sub>IN</sub> = 5.5 V, GND		0.0 to 5.5			± 0.1		± 1.0	μA
I <sub>OFF</sub>	Power-Off Leakage Current	V <sub>IN</sub> or V <sub>OUT</sub> = 5.5 V		0.0			1.0		10	μA
I <sub>CC</sub>	Quiescent Supply Current	V <sub>IN</sub> = 5.5 V, GND		1.65 to 5.5			1.0		10	μA

AC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Condition	V <sub>CC</sub>	T <sub>A</sub> = 25°C			T <sub>A</sub> = -40°C to 85°C		Unit	Figure
				Min	Typ	Max	Min	Max		
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay A or • to Y <sub>0</sub> or Y <sub>1</sub>	C <sub>L</sub> = 15 pF R <sub>D</sub> = 1.0 MΩ	1.8 ± 0.15 2.5 ± 0.2 3.3 ± 0.3 5.0 ± 0.5	2.5 1.2 0.8 0.5	6.2 3.6 2.9 2.4	10.5 6.0 4.1 3.2	2.5 1.2 0.8 0.5	11 6.4 4.5 3.5	nS	Figures 1 & 3
		C <sub>L</sub> = 50 pF R <sub>D</sub> = 500 Ω	3.3 ± 0.3 5.0 ± 0.5	1.2 0.8	3.2 2.7	5.1 4.0	1.2 0.8	5.4 4.3	nS	Figures 1 & 3
C <sub>IN</sub>	Input Capacitance		0		2.3				pF	
C <sub>PD</sub>	Power Dissipation Capacitance	Note 5	3.3 5.0		10.5 12.8				pF	Figure 2

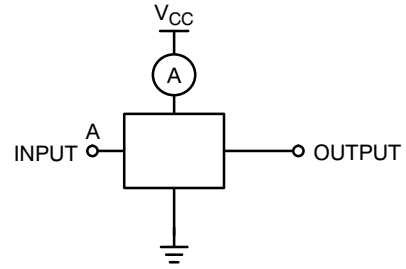
5. C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is derived from dynamic operating current consumption (I<sub>CCD</sub>) at no output loading and operating at 50% duty cycle (see Figure 2). C<sub>PD</sub> is related to I<sub>CCD</sub> dynamic operating current by the expression: I<sub>CCD</sub> = (C<sub>PD</sub>) (V<sub>CC</sub>) (f<sub>IN</sub>) + (I<sub>CCD</sub>Static).

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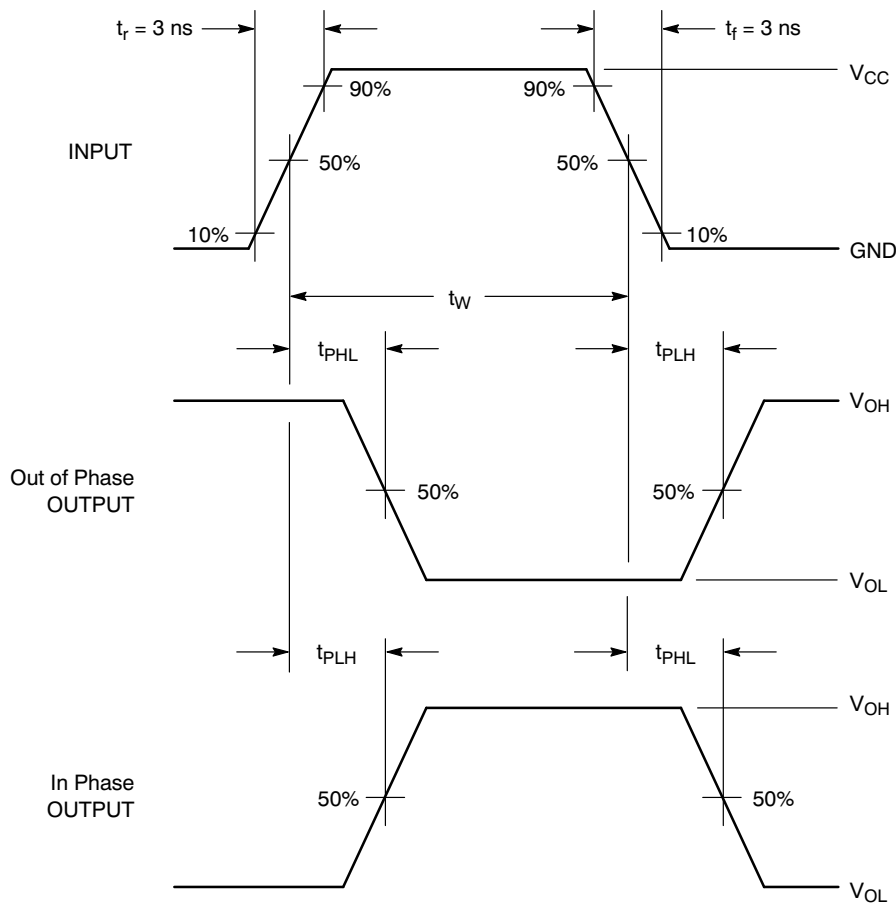
**Figure 1. AC Test Circuit**

$C_L$  Includes Load and Stray Capacitance  
Input PRR = 1.0 MHz;  $t_W = 500$  ns



**Figure 2.  $I_{CCD}$  Test Circuit**

Input = AC Waveform;  $t_r = t_f = 1.8$  nS  
PRR = 10 MHz; Duty Cycle = 50%  
S Input = GND or x

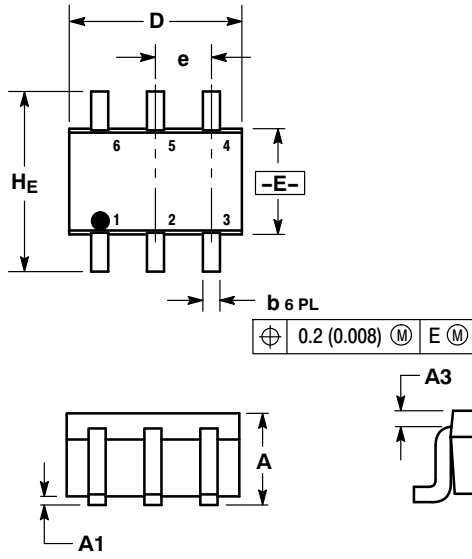


**Figure 3. AC Waveforms**

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## PACKAGE DIMENSIONS

SC-88/SC70-6/SOT-363  
CASE 419B-02  
ISSUE W

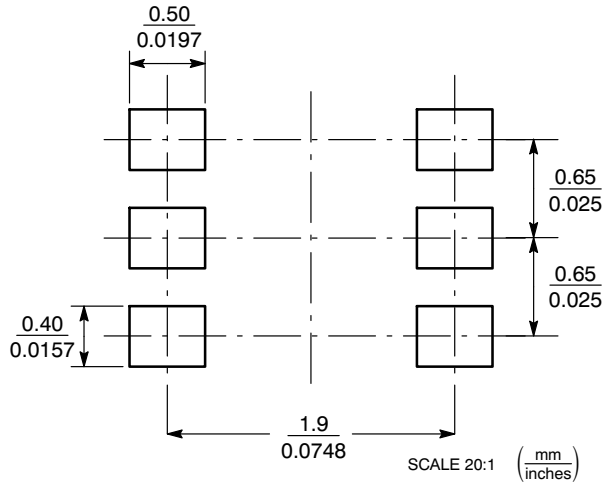


### NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 419B-01 OBSOLETE, NEW STANDARD 419B-02.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.80	0.95	1.10	0.031	0.037	0.043
A1	0.00	0.05	0.10	0.000	0.002	0.004
A3	0.20 REF			0.008 REF		
b	0.10	0.21	0.30	0.004	0.008	0.012
C	0.10	0.14	0.25	0.004	0.005	0.010
D	1.80	2.00	2.20	0.070	0.078	0.086
E	1.15	1.25	1.35	0.045	0.049	0.053
e	0.65 BSC			0.026 BSC		
L	0.10	0.20	0.30	0.004	0.008	0.012
H <sub>E</sub>	2.00	2.10	2.20	0.078	0.082	0.086

## SOLDERING FOOTPRINT\*



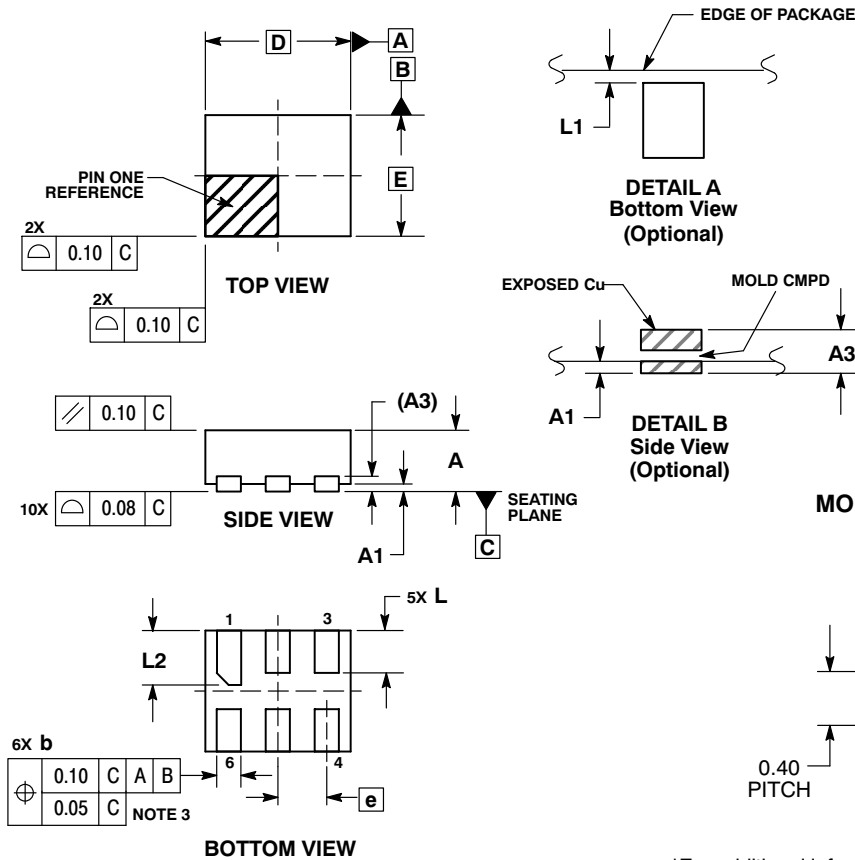
## SC-88/SC70-6/SOT-363

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

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## PACKAGE DIMENSIONS

UDFN6, 1.2x1.0, 0.4P  
CASE 517AA-01  
ISSUE C

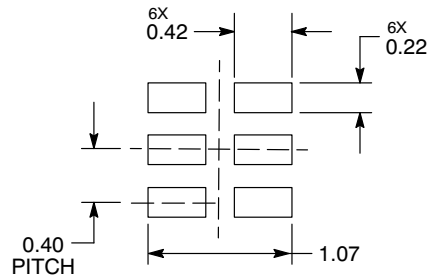


### NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.25 AND 0.30 mm FROM TERMINAL.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

MILLIMETERS		
DIM	MIN	MAX
A	0.45	0.55
A1	0.00	0.05
A3	0.127 REF	
b	0.15	0.25
D	1.20 BSC	
E	1.00 BSC	
e	0.40 BSC	
L	0.30	0.40
L1	0.00	0.15
L2	0.40	0.50

### MOUNTING FOOTPRINT\*



DIMENSIONS: MILLIMETERS

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

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