

NLASB3157

2:1 Multiplexer

The NLASB3157 is an advanced CMOS analog switch fabricated with silicon gate CMOS technology. It achieves very low propagation delay and $R_{DS(ON)}$ resistances while maintaining CMOS low power dissipation. Analog and digital voltages that may vary across the full power-supply range (from V_{CC} to GND). This device is a drop in replacement for the NC7SB3157.

The select pin has overvoltage protection that allows voltages above V_{CC} , up to 7.0 V to be present on the pin without damage or disruption of operation of the part, regardless of the operating voltage.

Features

- High Speed: $t_{PD} = 1.0$ ns (Typ) at $V_{CC} = 5.0$ V
- Low Power Dissipation: $I_{CC} = 2.0$ μ A (Max) at $T_A = 25^\circ$ C
- Standard CMOS Logic Levels
- High Bandwidth, Improved Linearity
- Switches Standard NTSC/PAL Video, Audio, SPDIF and HDTV
- May be used for Clock Switching, Data Mux'ing, etc.
- Low $R_{DS(ON)}$
- Break Before Make Circuitry, Prevents Inadvertent Shorts
- Can Switch Balanced Signal Pairs, e.g. LVDS > 200-Bits/Sec
- Latchup Performance Exceeds 300 mA
- Pin for Pin Drop in for NC7SB3157
- Tiny SC88 Package Only 2.0 x 2.1 mm
- ESD Performance: HBM > 2000 V; MM > 200 V

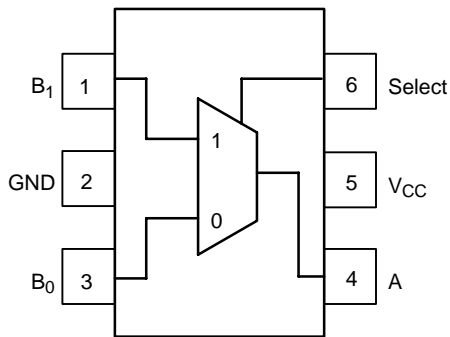


Figure 1. Pinout (Top View)



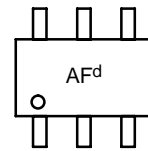
ON Semiconductor®

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SC88/SOT-363/SC-70
DF SUFFIX
CASE 419B

MARKING DIAGRAM



AF = Specific Device Code
d = Date Code

ORDERING INFORMATION

Device	Package	Shipping
NLASB3157DFT2	SC88/SOT-363/ SC-70	Tape & Reel

FUNCTION TABLE

Select Input	Function
L	B0 Connected to A
H	B1 Connected to A

NLASB3157

MAXIMUM RATINGS (Note 1)

Rating	Symbol	Value	Unit
Supply Voltage	V_{CC}	-0.5 to +7.0	V
DC Switch Voltage (Note 2)	V_S	-0.5 to $V_{CC} + 0.5$	V
DC Input Voltage (Note 2)	V_{IN}	-0.5 to + 7.0	V
DC Input Diode Current @ $V_{IN} < 0$ V	I_{IK}	-50	mA
DC Output Current	I_{OUT}	128	mA
DC V_{CC} or Ground Current	I_{CC}/I_{GND}	+100	mA
Storage Temperature Range	T_{stg}	-65 to +150	°C
Junction Temperature Under Bias	T_J	150	°C
Junction Lead Temperature (Soldering, 10 Seconds)	T_L	260	°C
Power Dissipation @ +85°C	P_D	180	mW

RECOMMENDED OPERATING CONDITIONS (Note 3)

Characteristic	Symbol	Min	Max	Unit
Supply Voltage Operating	V_{CC}	1.65	5.5	V
Select Input Voltage	V_{IN}	0	V_{CC}	V
Switch Input Voltage	V_{IN}	0	V_{CC}	V
Output Voltage	V_{OUT}	0	V_{CC}	V
Operating Temperature	T_A	-40	+85	°C
Input Rise and Fall Time Control Input $V_{CC} = 2.3$ V–3.6 V Control Input $V_{CC} = 4.5$ V–5.5 V	t_r, t_f	0	10 5	ns/V
Thermal Resistance	θ_{JA}	-	350	°C/W

1. Maximum ratings are DC values beyond which the device may be damaged or have its useful life impaired. The data sheet specifications should be met, without exception, to ensure that the system design is reliable over its power supply, temperature, and output/input loading variables. Fairchild does not recommend operation outside data sheet specifications.
2. The input and output negative voltage ratings may be exceeded if the input and output diode current ratings are observed.
3. Select input must be held HIGH or LOW, it must not float.

DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Test Conditions	V _{CC} (V)	T _A = +25°C			T _A = -40°C to +85°C		Unit
				Min	Typ	Max	Min	Max	
V _{IH}	HIGH Level Input Voltage		1.65–1.95 2.3–5.5	0.75 V _{CC} 0.7 V _{CC}			0.75 V _{CC} 0.7 V _{CC}		V
V _{IL}	LOW Level Input Voltage		1.65–1.95 2.3–5.5			0.25 V _{CC} 0.3 V _{CC}		0.25 V _{CC} 0.3 V _{CC}	V
I _{IN}	Input Leakage Current	0 ≤ V _{IN} ≤ 5.5 V	0–5.5		±0.05	±0.1		±1	μA
I _{OFF}	OFF State Leakage Current	0 ≤ A, B ≤ V _{CC}	1.65–5.5		±0.05	±0.1		±1	μA
R _{ON}	Switch On Resistance (Note 4)	V _{IN} = 0 V, I _O = 30 mA	4.5		8	12		14	Ω
		V _{IN} = 2.4 V, I _O = -30 mA			13	17		20	
		V _{IN} = 4.5 V, I _O = -30 mA			9	15		15	
		V _{IN} = 0 V, I _O = 24 mA	3.0		10	14		18	Ω
		V _{IN} = 3 V, I _O = -24 mA			12	18		18	
		V _{IN} = 0 V, I _O = 8 mA	2.3		13	18		22	Ω
		V _{IN} = 2.3 V, I _O = -8 mA			15	25		25	
		V _{IN} = 0 V, I _O = 4 mA	1.65		20	24		30	Ω
		V _{IN} = 1.65 V, I _O = -4 mA			20	40		40	
I _{CC}	Quiescent Supply Current All Channels ON or OFF	V _{IN} = V _{CC} or GND I _{OUT} = 0	5.5			1		10	μA
	Analog Signal Range		V _{CC}	0		V _{CC}	0	V _{CC}	V
R _{RANGE}	On Resistance Over Signal Range (Note 4) (Note 8)	I _A = -30 mA, 0 ≤ V _{Bn} ≤ V _{CC}	4.5					25	Ω
		I _A = -24 mA, 0 ≤ V _{Bn} ≤ V _{CC}	3.0					50	
		I _A = -8 mA, 0 ≤ V _{Bn} ≤ V _{CC}	2.3					100	
		I _A = -4 mA, 0 ≤ V _{Bn} ≤ V _{CC}	1.65					300	
ΔR _{ON}	On Resistance Match Between Channels (Note 4) (Note 5) (Note 6)	I _A = -30 mA, V _{Bn} = 3.15	4.5		0.15				Ω
		I _A = -24 mA, V _{Bn} = 2.1	3.0		0.2				
		I _A = -8 mA, V _{Bn} = 1.6	2.3		0.5				
		I _A = -4 mA, V _{Bn} = 1.15	1.65		0.5				
R _{flat}	On Resistance Flatness (Note 4) (Note 5) (Note 7)	I _A = -30 mA, 0 ≤ V _{Bn} ≤ V _{CC}	5.0		6				Ω
		I _A = -24 mA, 0 ≤ V _{Bn} ≤ V _{CC}	3.3		12				
		I _A = -8 mA, 0 ≤ V _{Bn} ≤ V _{CC}	2.5		28				
		I _A = -4 mA, 0 ≤ V _{Bn} ≤ V _{CC}	1.8		125				

4. Measured by the voltage drop between A and B pins at the indicated current through the switch. On Resistance is determined by the lower of the voltages on the two (A or B Ports).
5. Parameter is characterized but not tested in production.
6. ΔR_{ON} = R_{ON} max – R_{ON} min measured at identical V_{CC}, temperature and voltage levels.
7. Flatness is defined as the difference between the maximum and minimum value of On Resistance over the specified range of conditions.
8. Guaranteed by Design.

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AC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Test Conditions	V _{CC} (V)	T _A = +25°C			T _A = -40°C to +85°C		Unit	Figure Number
				Min	Typ	Max	Min	Max		
t _{PHL} t _{PLH}	Propagation Delay Bus to Bus (Note 10)	V _I = OPEN	1.65–1.95 2.3–2.7 3.0–3.6 4.5–5.5			1.2 0.8 0.3		1.2 0.8 0.3	ns	Figures 2, 3
t _{PZL} t _{PZH}	Output Enable Time Turn On Time (A to B _n)	V _I = 2 × V _{CC} for t _{PZL} V _I = 0 V for t _{PZH}	1.65–1.95 2.3–2.7 3.0–3.6 4.5–5.5	7 3.5 2.5 1.7		70 32 21 13	7 3.5 2.5 1.7	70 35 23 15	ns	Figures 2, 3
t _{PLZ} t _{PHZ}	Output Disable Time Turn Off Time (A Port to B Port)	V _I = 2 × V _{CC} for t _{PLZ} V _I = 0 V for t _{PHZ}	1.65–1.95 2.3–2.7 3.0–3.6 4.5–5.5	3 2 1.5 0.8		13.7 8.1 6.7 6.1	3 2 1.5 0.8	13.8 8.2 7 6.2	ns	Figures 2, 3
t _{B–M}	Break Before Make Time (Note 9)		1.65–1.95 2.3–2.7 3.0–3.6 4.5–5.5	0.5 0.5 0.5 0.5			0.5 0.5 0.5 0.5		ns	Figure 4
Q	Charge Injection (Note 9)	C _L = 0.1 nF, V _{GEN} = 0 V R _{GEN} = 0 Ω	5.0 3.3		7 3				pC	Figure 5
OIRR	Off Isolation (Note 11)	R _L = 50 Ω f = 10 MHz	1.65–5.5		–57				dB	Figure 6
Xtalk	Crosstalk	R _L = 50 Ω f = 10 MHz	1.65–5.5		–54				dB	Figure 7
BW	–3 dB Bandwidth	R _L = 50 Ω	1.65–5.5		250				MHz	Figure 10
THD	Total Harmonic Distortion (Note 9)	R _L = 600 Ω 0.5 V _{P–P} f = 600 Hz to 20 kHz	5		0.011				%	

CAPACITANCE (Note 12)

Symbol	Parameter	Test Conditions	Typ	Max	Unit	Figure Number
C _{IN}	Select Pin Input Capacitance	V _{CC} = 0 V	2.3		pF	
C _{IO–B}	B Port Off Capacitance	V _{CC} = 5.0 V	6.5		pF	Figure 8
C _{IOA–ON}	A Port Capacitance when Switch is Enabled	V _{CC} = 5.0 V	18.5		pF	Figure 9

9. Guaranteed by Design.

10. This parameter is guaranteed by design but not tested. The bus switch contributes no propagation delay other than the RC delay of the On Resistance of the switch and the 50 pF load capacitance, when driven by an ideal voltage source (zero output impedance).

11. Off Isolation = 20 log₁₀ [V_A/V_{Bn}].

12. T_A = +25°C, f = 1 MHz, Capacitance is characterized but not tested in production.

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AC Loading and Waveforms

NOTE: Input driven by 50 Ω source terminated in 50 Ω
 NOTE: C_L includes load and stray capacitance
 NOTE: Input PRR = 1.0 MHz; $t_W = 500$ ns

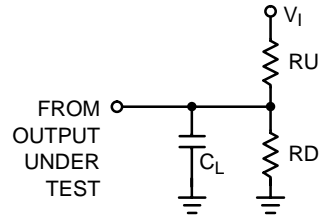


Figure 2. AC Test Circuit

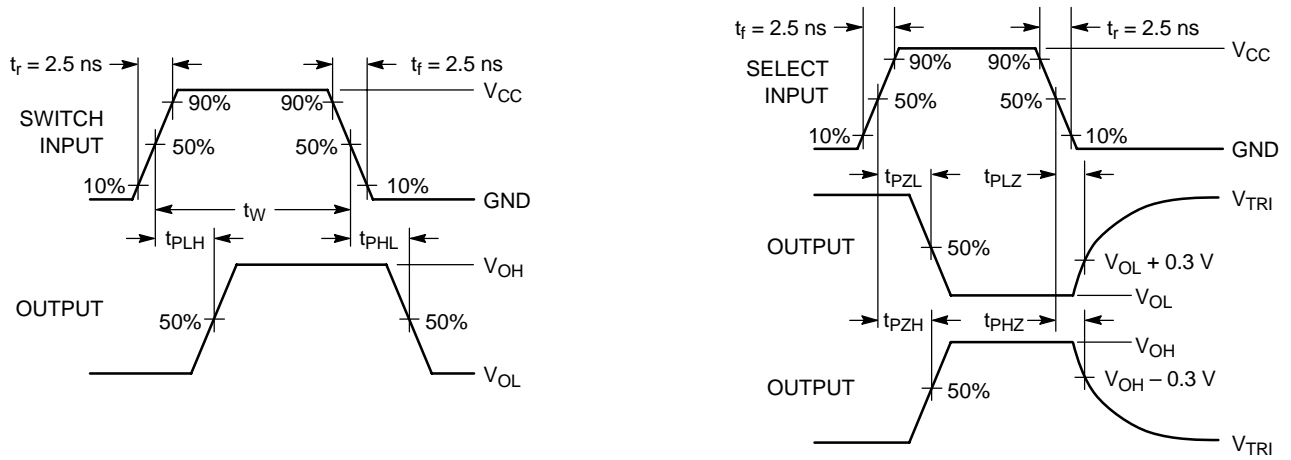


Figure 3. AC Waveforms



Figure 4. Break Before Make Interval Timing

AC Loading and Waveforms

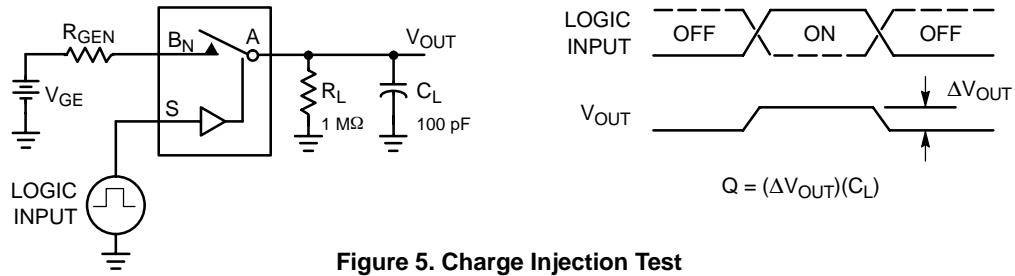


Figure 5. Charge Injection Test

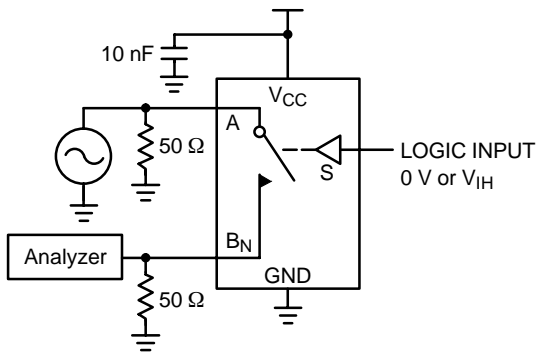


Figure 6. Off Isolation

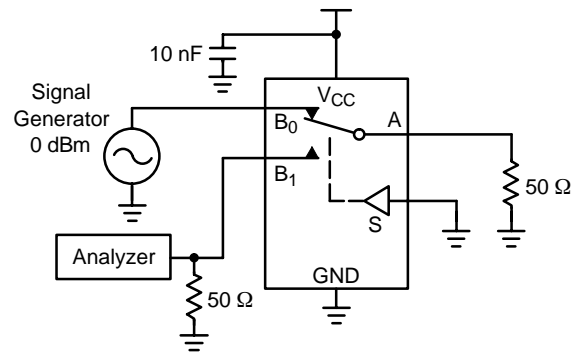


Figure 7. Crosstalk

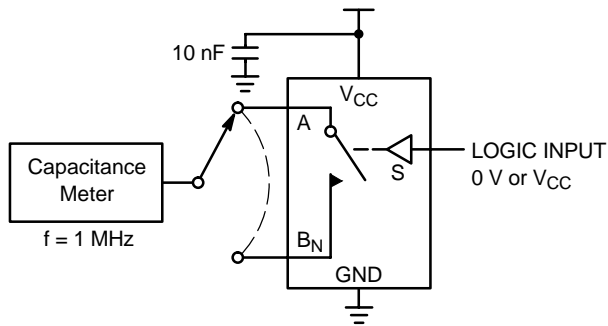


Figure 8. Channel Off Capacitance

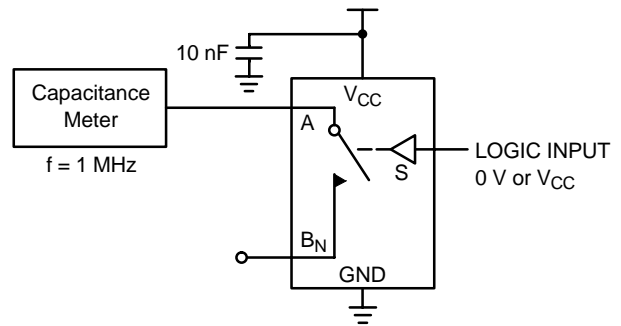


Figure 9. Channel On Capacitance

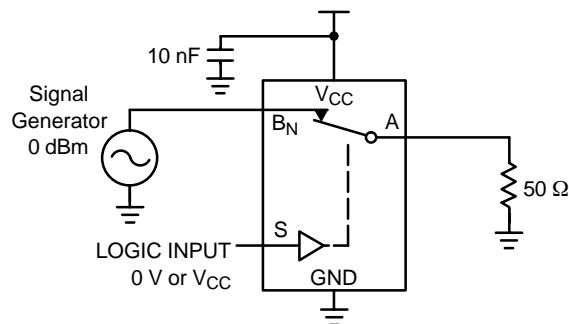
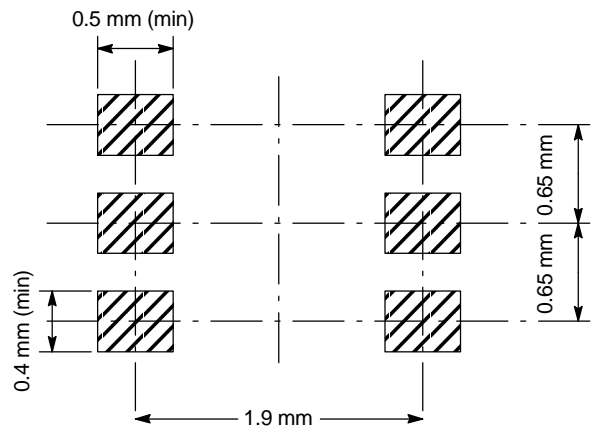
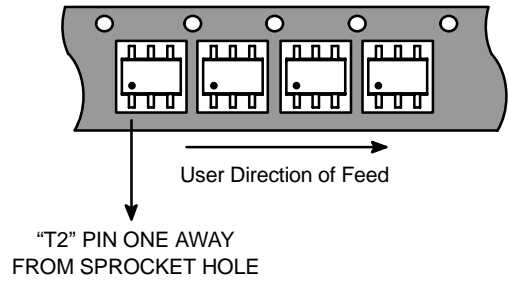


Figure 10. Bandwidth

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32 DFT2 (SC88) Reel Configuration/Orientation

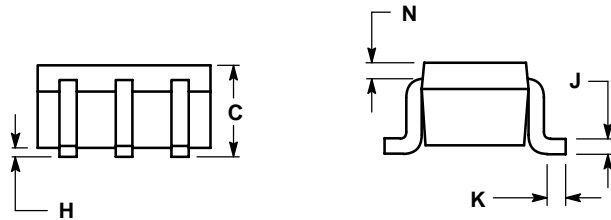
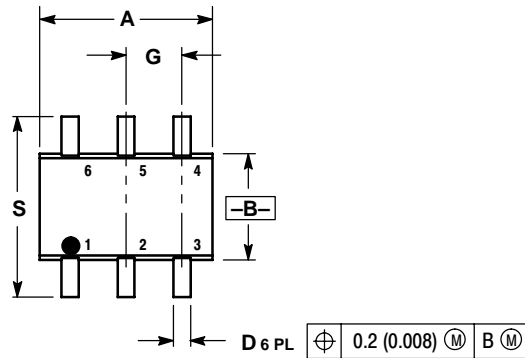


SC-88/SOT-363/SC70

NLASB3157

PACKAGE DIMENSIONS


SC88/SOT-363/SC-70
DF SUFFIX
CASE 419B-02
ISSUE K



NOTES:

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

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.071	0.087	1.80	2.20
B	0.045	0.053	1.15	1.35
C	0.031	0.043	0.80	1.10
D	0.004	0.012	0.10	0.30
G	0.026 BSC		0.65 BSC	
H	---	0.004	---	0.10
J	0.004	0.010	0.10	0.25
K	0.004	0.012	0.10	0.30
N	0.008 REF		0.20 REF	
S	0.079	0.087	2.00	2.20

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