NLAS2750

Low Voltage Dual SPDT Analog Switch with Negative Swing Audio Capability

The NLAS2750 is a dual SPDT low on−resistance analog switch. It can operate from a single 1.8 V to 5.0 V power supply. It is a bi−directional switch that can switch a negative voltage swing audio signal without requiring a coupling capacitor. With a single power supply, the audio signal can swing over the range from −2.5 V to V_{CC}.

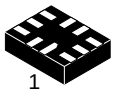
Features

- Capable to Switch Negative Swing Audio Signals Without Requiring a DC Blocking Capacitor
- Low On−resistance (R_{ON})
- Low Voltage Digital Control Logic: (V_{INH} = 1.4 V @ V_{CC} = 2.7 V to 4.3 V)
- Low Power Consumption ($I_{CC} \leq$ 250 nA)
- Space Saving 1.4 mm x 1.8 mm Package UQFN Package
- This is a Pb−Free Device

Typical Applications

- Cellular Phones
- Portable Media Players

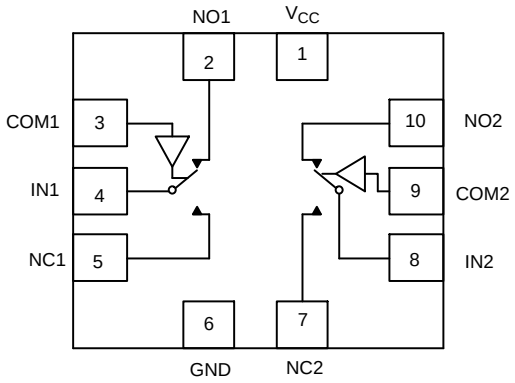
MARKING DIAGRAM



UQFN10
CASE 488AT

AL = Specific Device Code
M = Date Code/Assembly Location
▪ = Pb−Free Device

(Note: Microdot may be in either location)



FUNCTION TABLE

IN1 (Pin 4)	IN2 (Pin 8)	Function
0	X	COM1 = NC1
1	X	COM1 = NO1
X	0	COM2 = NC2
X	1	COM2 = NO2

ORDERING INFORMATION

See detailed ordering and shipping information on page 7 of this data sheet.

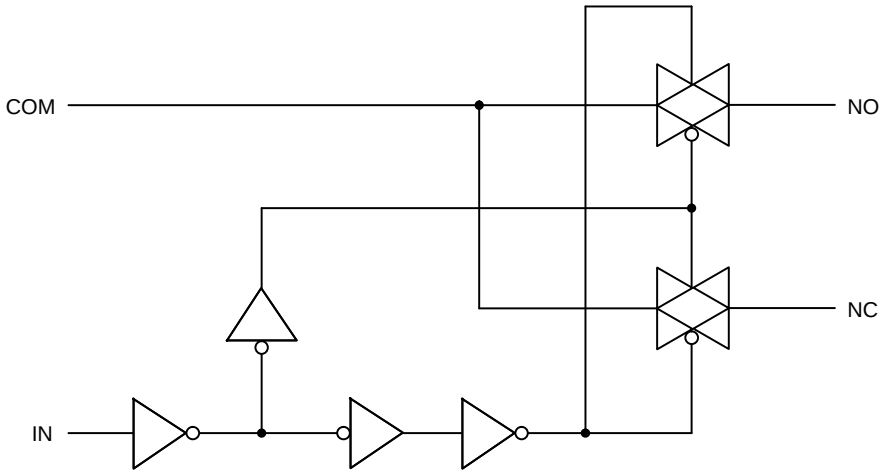


Figure 1. Logic Equivalent Circuit

MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC}	Positive DC Supply Voltage	−0.3 to +6.5	V
V_{IS}	Analog Input Voltage (COM, NO, NC) (Notes 1 and 2)	Min. $V_{IS} = V_{CC}$ − 6.5 V or −2.5 V (whichever is greater) Max. $V_{IS} = V_{CC}$ + 0.3 V	V
V_{IN}	Digital (IN1, IN2)	−0.3 to +6.5	V
I_{CC}	Current (GND, V_{CC})	50	mA
I_{IS}	Continuous Switch Current (COM, NO, NC) (Note 1)	±250	mA
I_{ISP}	Peak Switch Current (Pulsed at 1 ms, 10% Duty Cycle)	±500	mA
T_{STG}	Storage Temperature	−65 to +150	°C
P_D	Power Dissipation	200	mW
V_{ESD}	ESD (Human Body Model) All pins I/O to GND	 6 8	kV
I_{LU}	Latch−up (per JESD78)	300	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. Signals on COM, NO, NC, exceeding V_{CC} will be clamped by internal diodes. Limit forward diode current to maximum current ratings.
2. The algebraic convention whereby the most negative value is a minimum and the most positive a maximum is used in this data sheet.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
V_{CC}	Power Supply Range	1.8	5.5	V
V_{IN}	Digital Select Input Voltage Overvoltage Tolerance (OVT) (IN1, IN2)	GND	5.5	V
V_{IS}	Analog Input Voltage (NC, NO, COM) (Note 3)	−2.5	V_{CC}	V
T_A	Operating Temperature Range	−40	+85	°C
t_r, t_f	Input Rise or Fall Time (IN1, IN2) V_{CC} < 2.7 V V_{CC} ≥ 2.7 V		 20 10	ns/V

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.

3. The voltage across the switch should be ≤ 5.5 V.

ELECTRICAL CHARACTERISTICS (V_{CC} = 2.7 V, ±10%) (Note 4)

Symbol	Parameter	Test Conditions	Guaranteed Maximum Limit −40°C to 85°C Min	Typ	Max	Unit
ANALOG SWITCH						
V_{IS}	Analog Signal Range (Note 5)		−2.5		V_{CC}	V
$R_{DS(on)}$	On−Resistance	V_{CC} = 2.7 V, V_{IS} = (V_{CC} − 4.5 V), −1 V, 0 V 1 V, 2 V, V_{CC} I_{IS} = 100 mA		0.6	1.3	Ω
ΔR_{ON}	On−Resistance Match			0.1		Ω
R_{ON} Flatness	On−Resistance Resistance Flatness			0.37		Ω
$I_{NO/NC(off)}$	Switch Off Leakage Current	V_{CC} = 2.7 V, $V_{NC/NO}$ = −2.5 V or 2.5 V, V_{COM} = 2.5 V or −2.5 V		50		nA
$I_{COM(off)}$					±250	nA
$I_{COM(on)}$	Channel On Leakage Current			50	±250	nA
DIGITAL CONTROL						
V_{INH}	Input Voltage High	V_{CC} = 5 V V_{CC} = 2.7 V to 4.3 V	1.6 1.4			V
V_{INL}	Input Voltage Low	V_{CC} = 2.7 V to 5 V			0.6	V
C_{IN}	Input Capacitance			5		pF
I_{INL} or I_{INH}	Input Current	V_{IN} = 0 or V_{CC}			±1	μA
POWER CONSUMPTION						
I_{CC}	Maximum Quiescent Supply Current	V_{CC} = 2.7 V to 4.3 V		50	±250	nA

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.

4. Typical values are measured at 25°C and are for design aid only, not guaranteed nor subject to production testing.
5. Guaranteed by design, not subject to production testing.

DYNAMIC CHARACTERISTICS (V_{CC} = 2.7 V, ±10%) (Note 4)

Symbol	Parameter	Test Conditions	Guaranteed Maximum Limit −40°C to 85°C Min	Typ	Max	Unit
t_{BBM}	Break−Before−Make Time (Notes 6 and 7)	V_{CC} = 2.7 V, V_{IS} = 1.5 V, R_L = 50 Ω, C_L = 35 pF	1000	1250		ns
$t_{ON(EN)}$	Enable Turn−On Time (Notes 6 and 7)			80	150	ns
$t_{OFF(EN)}$	Enable Turn−Off Time (Notes 6 and 7)			110	130	ns
Q_{INJ}	Charge Injection (Note 6)	C_L = 1 nF, R_{GEN} = 0 Ω, V_{GEN} = 0 V		60		pC
OIRR	Off−Isolation (Note 6)	V_{CC} = 2.7 V, R_L = 50 Ω, C_L = 5 pF, f = 300 kHz		−58		dB
X_{TALK}	Crosstalk (Notes 6 and 8)			−61		dB
BW	Bandwidth (Note 6)	V_{CC} = 2.7 V, R_L = 50 Ω, −3 dB		44		MHz
$C_{NC/NO(off)}$	Channel−Off Capacitance (Note 6)	V_{CC} = 2.7 V, f = 1 MHz		25		pF
$C_{COM/NC/NO(on)}$	Channel−On Capacitance (Note 6)			75		pF

6. Guaranteed by design, not subject to production testing.
7. V_{IS} = input voltage to perform proper function.
8. Crosstalk Measured between channels.

TYPICAL CHARACTERISTICS

(25°C, unless otherwise specified)

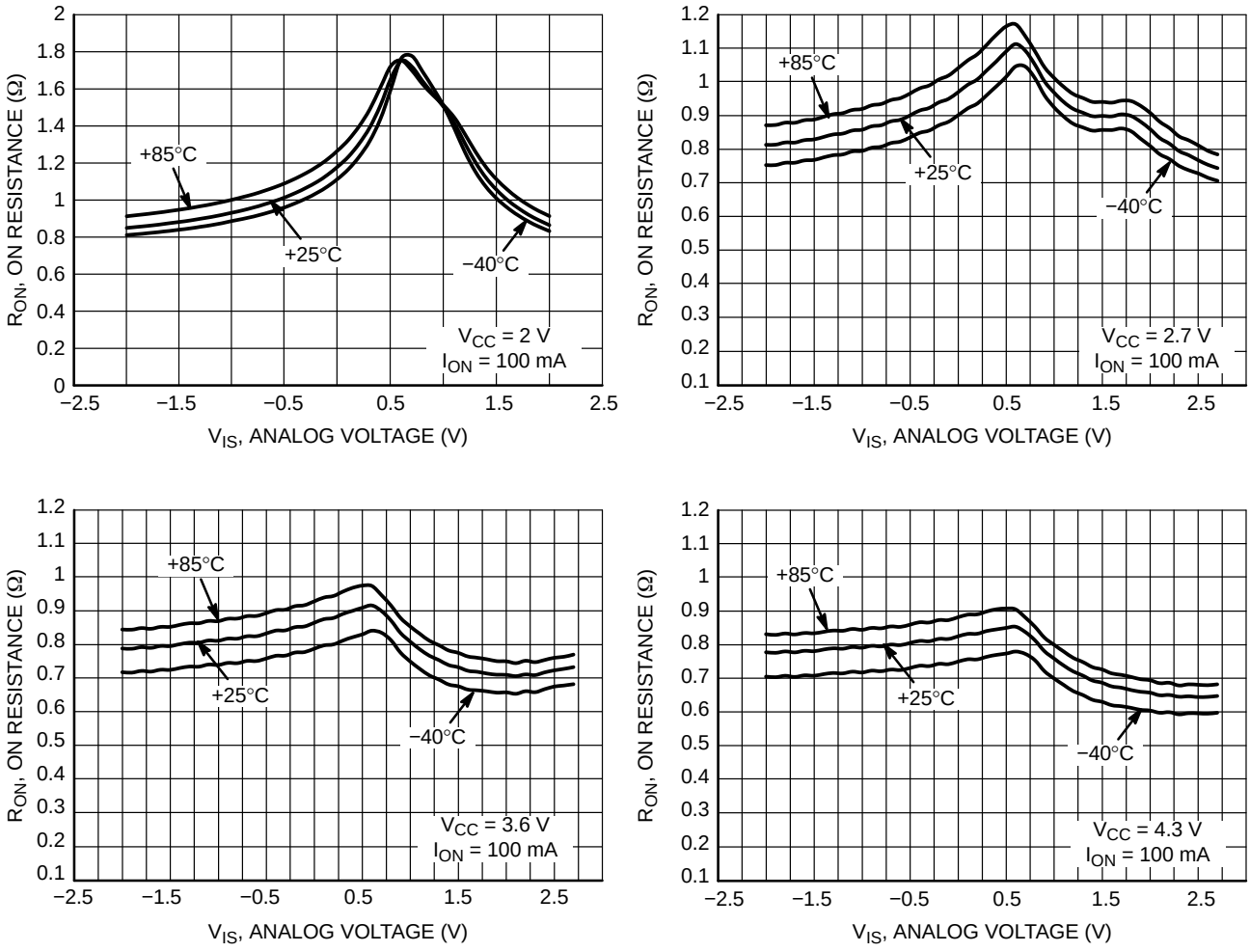


Figure 2. On Resistance (R_{ON}) vs. Analog Input Voltage (V_{IS})

TYPICAL CHARACTERISTICS

(25°C, unless otherwise specified)

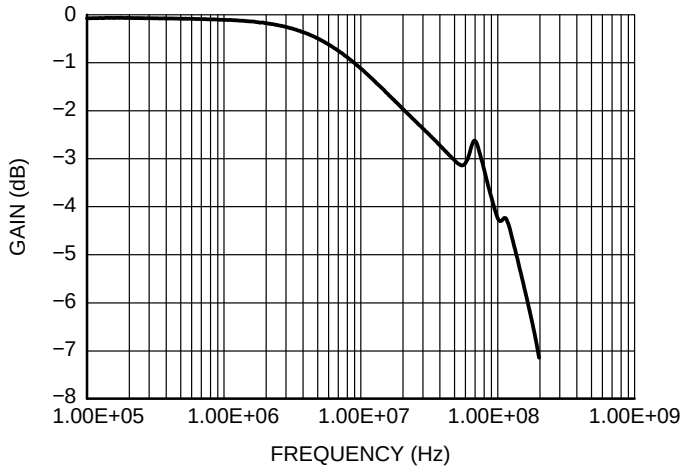


Figure 3. Bandwidth Measurement − Gain vs. Frequency

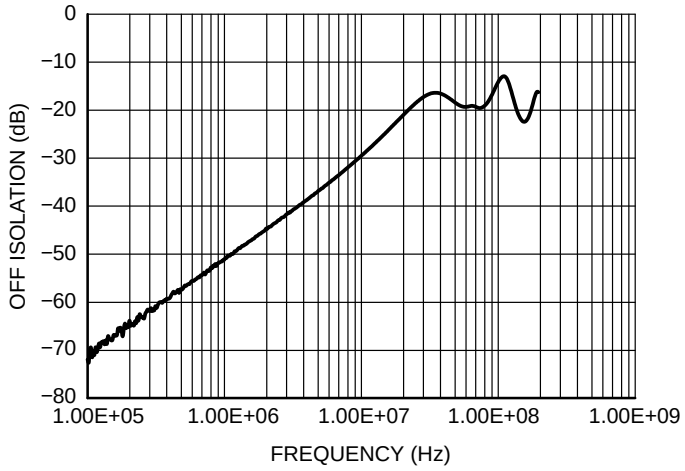


Figure 4. Off Isolation Measurement

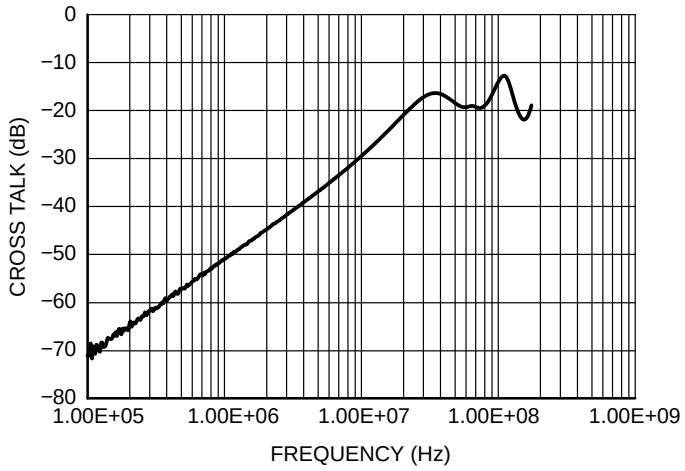


Figure 5. Cross Talk Measurement

TEST CIRCUITS

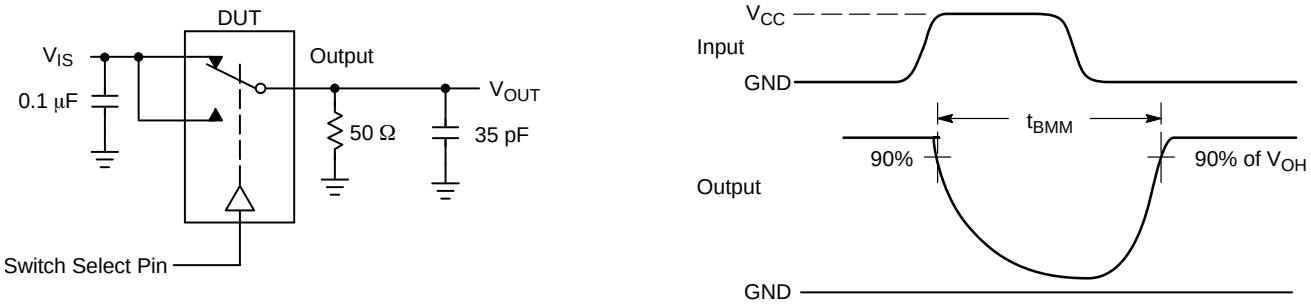


Figure 6. t_{BBM} (Time Break−Before−Make)

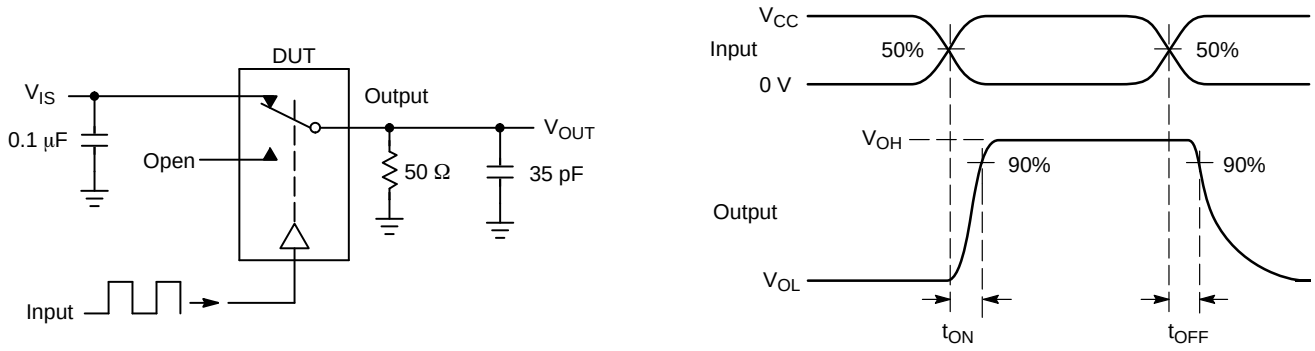


Figure 7. t_{ON}/t_{OFF}

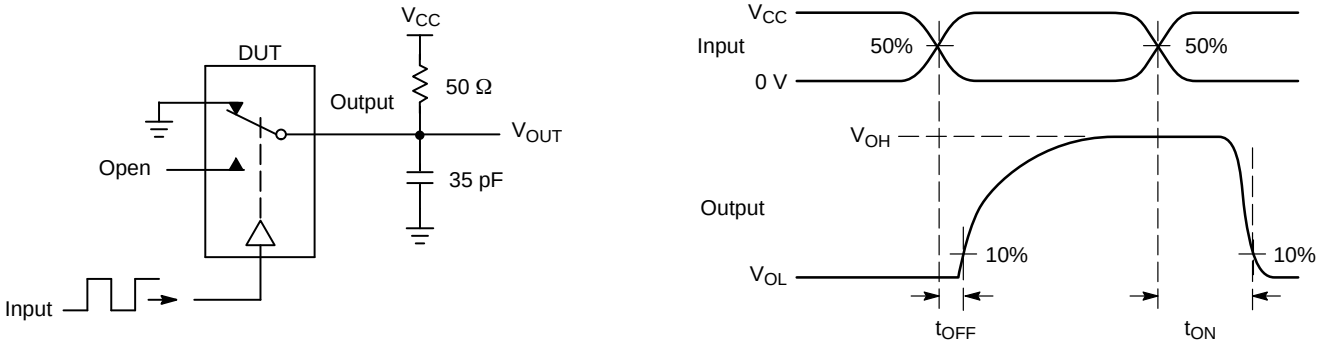
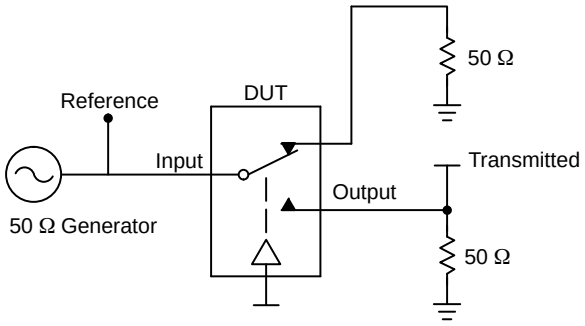


Figure 8. t_{ON}/t_{OFF}



Channel switch control/s test socket is normalized. Off isolation is measured across an off channel. On loss is the bandwidth of an On switch. V_{ISO}, Bandwidth and V_{ONL} are independent of the input signal direction.

V_{ISO} = Off Channel Isolation = $20\ \text{Log}\left(\frac{V_{OUT}}{V_{IN}}\right)$ for V_{IN} at 100 kHz

V_{ONL} = On Channel Loss = $20\ \text{Log}\left(\frac{V_{OUT}}{V_{IN}}\right)$ for V_{IN} at 100 kHz to 50 MHz

Bandwidth (BW) = the frequency 3 dB below V_{ONL}
V_{CT} = Use V_{ISO} setup and test to all other switch analog input/outputs terminated with 50 Ω

Figure 9. Off Channel Isolation/On Channel Loss (BW)/Crosstalk (On Channel to Off Channel)/V_{ONL}

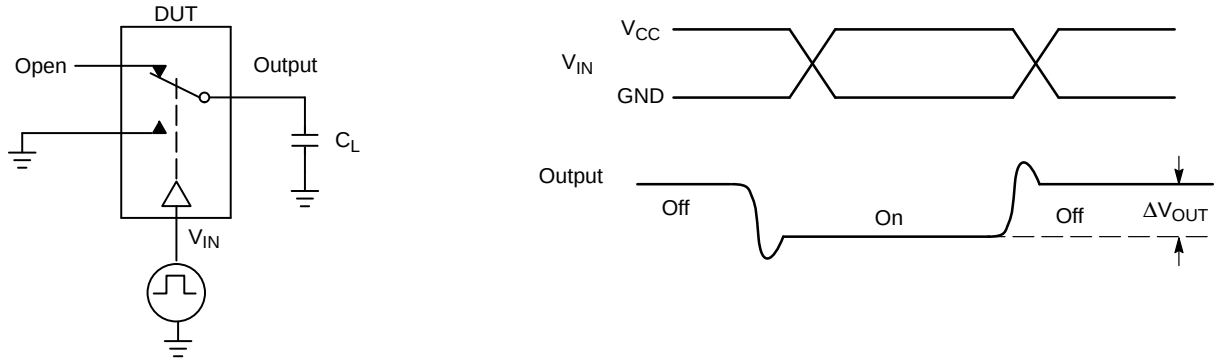


Figure 10. Charge Injection: (Q)

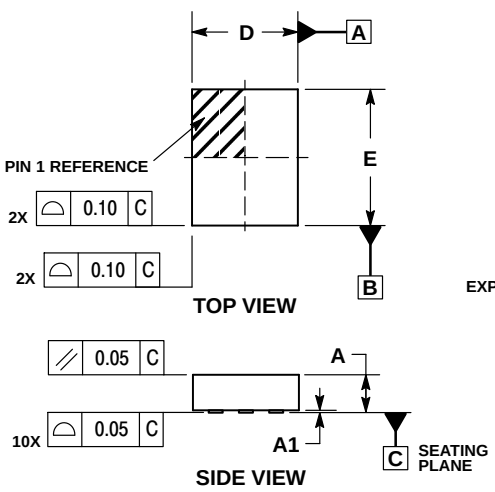
ORDERING INFORMATION

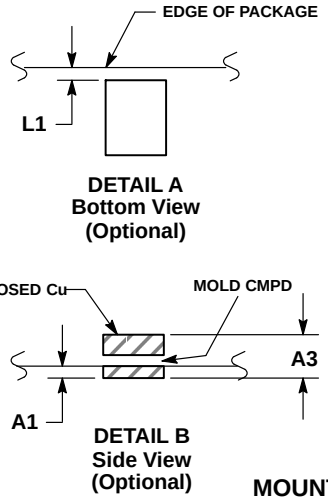
Device	Package	Shipping†
NLAS2750MUTAG	UQFN10 (Pb−Free)	3000 / Tape & Reel

†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.

PACKAGE DIMENSIONS

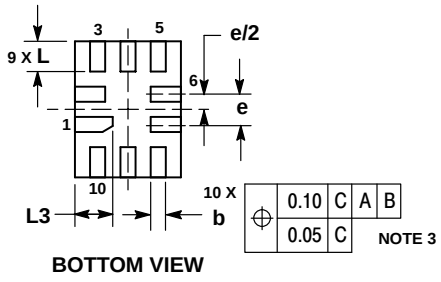
UQFN10 1.4x1.8, 0.4P
CASE 488AT
ISSUE A



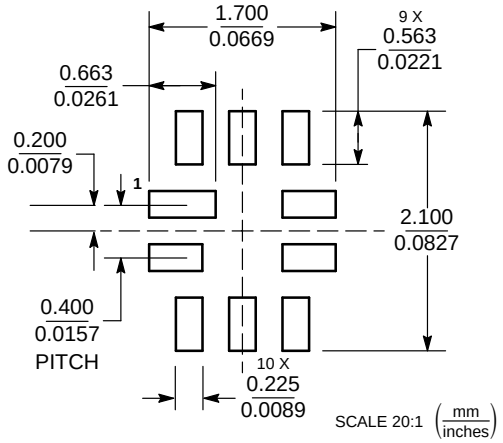


NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.25 AND 0.30 MM FROM TERMINAL.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

	MILLIMETERS	
DIM	MIN	MAX
A	0.45	0.60
A1	0.00	0.05
A3	0.127 REF	
b	0.15	0.25
D	1.40 BSC	
E	1.80 BSC	
e	0.40 BSC	
L	0.30	0.50
L1	0.00	0.15
L3	0.40	0.60



MOUNTING FOOTPRINT*



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