

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:
($V_{INH} = 1.4 \text{ V} @ V_{CC} = 2.7 \text{ V to } 4.3 \text{ V}$)
- Low Power Consumption ($I_{CC} \leq 250 \text{ nA}$)
- Space Saving 1.4 mm x 1.8 mm Package UQFN Package
- This is a Pb-Free Device

Typical Applications

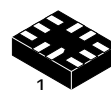
- Cellular Phones
- Portable Media Players



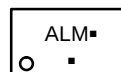
ON Semiconductor®

www.onsemi.com

MARKING DIAGRAM

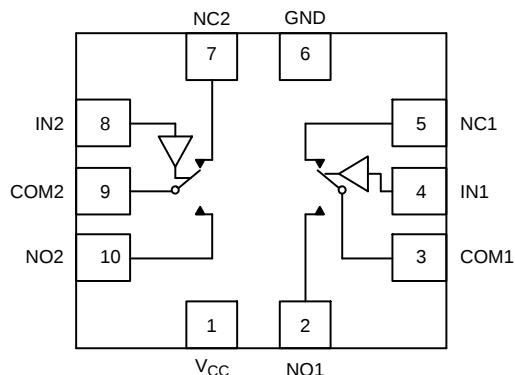


UQFN10
CASE 488AT



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.

NLAS2750

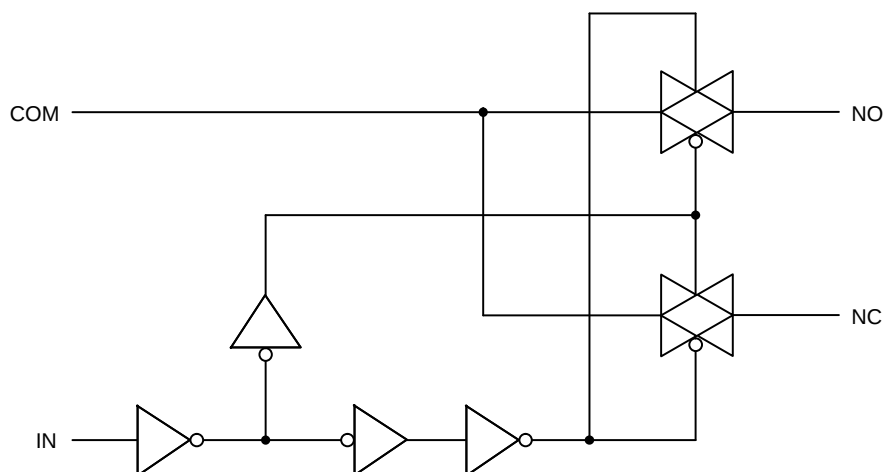


Figure 1. Logic Equivalent Circuit

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 JEDEC78)	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 $V_{CC} \geq 2.7$ 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.

NLAS2750

ELECTRICAL CHARACTERISTICS ($V_{CC} = 2.7\text{ V}$, $\pm 10\%$) (Note 4)

Symbol	Parameter	Test Conditions	Guaranteed Maximum Limit			Unit
			-40°C to 85°C			
			Min	Typ	Max	

ANALOG SWITCH

V_{IS}	Analog Signal Range (Note 5)		-2.5		V_{CC}	V
$R_{DS(on)}$	On-Resistance	$V_{CC} = 2.7\text{ V}$, $V_{IS} = (V_{CC} - 4.5\text{ V}), -1\text{ V}, 0\text{ V}$ $1\text{ V}, 2\text{ V}, V_{CC}$ $I_{IS} = 100\text{ mA}$		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	$V_{CC} = 2.7\text{ V}$, $V_{NC/NO} = -2.5\text{ V}$ or 2.5 V , $V_{COM} = 2.5\text{ V}$ 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	$V_{CC} = 5\text{ V}$ $V_{CC} = 2.7\text{ V}$ to 4.3 V	1.6 1.4			V
V_{INL}	Input Voltage Low	$V_{CC} = 2.7\text{ V}$ 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	$V_{CC} = 2.7\text{ V}$ 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 ($V_{CC} = 2.7\text{ V}$, $\pm 10\%$) (Note 4)

Symbol	Parameter	Test Conditions	Guaranteed Maximum Limit			Unit
			-40°C to 85°C			
			Min	Typ	Max	
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)

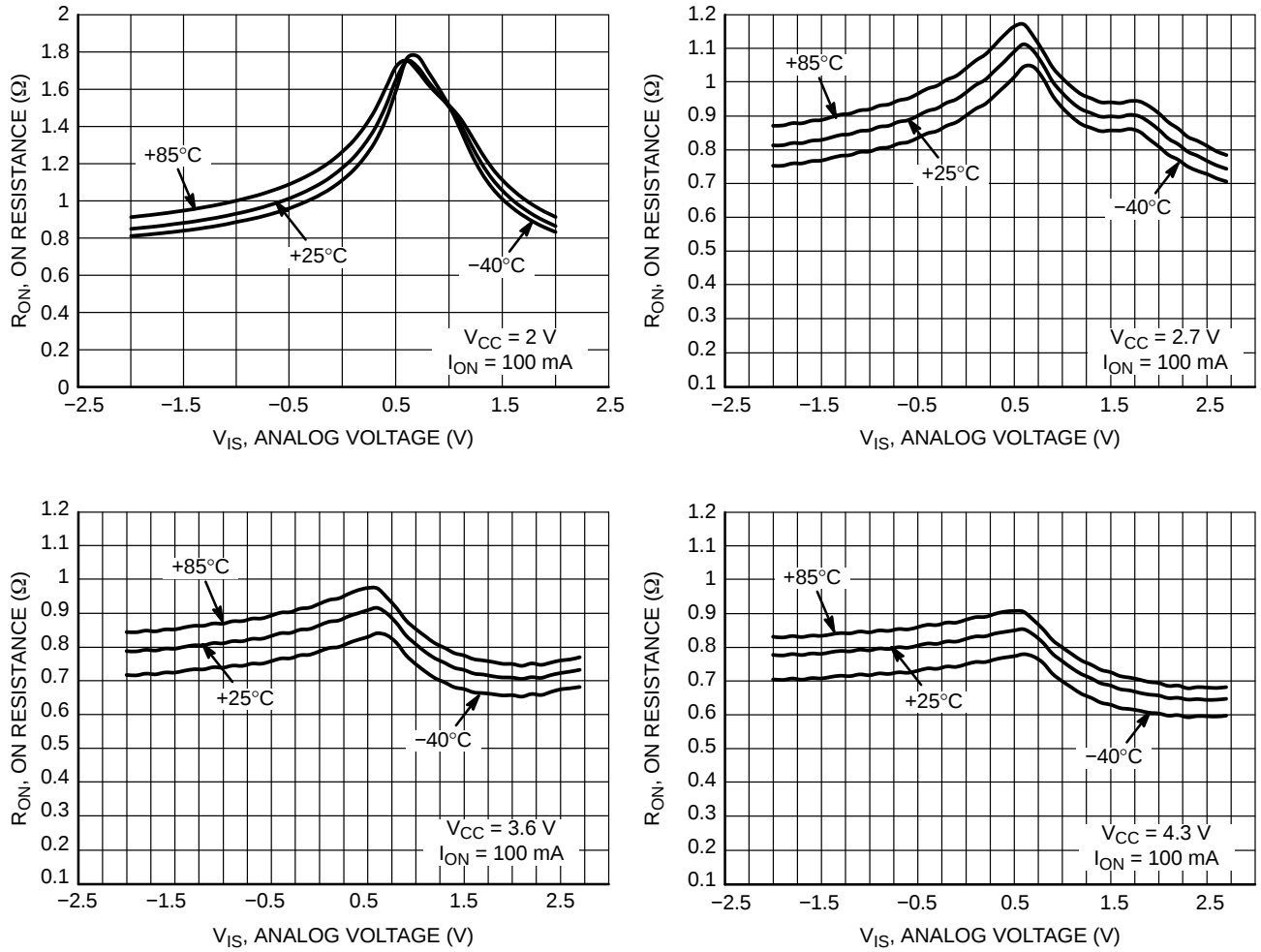


Figure 2. On Resistance (R_{ON}) vs. Analog Input Voltage (V_{IS})

NLAS2750

TYPICAL CHARACTERISTICS

(25°C, unless otherwise specified)

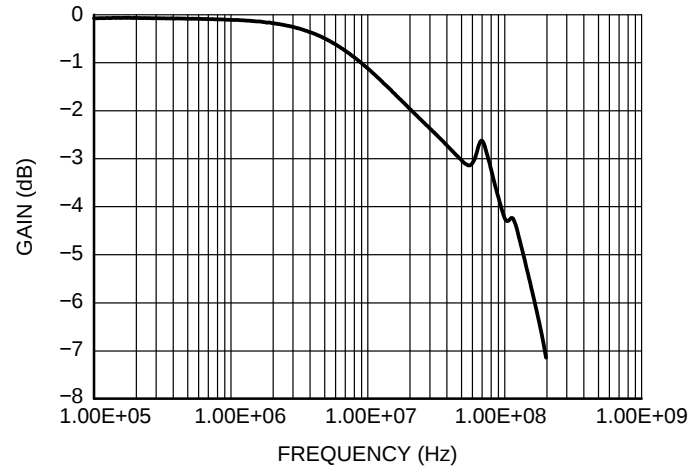


Figure 3. Bandwidth Measurement – Gain vs. Frequency

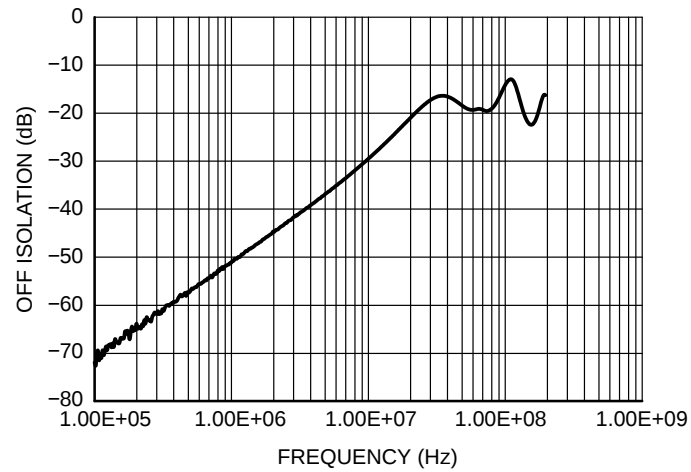


Figure 4. Off Isolation Measurement

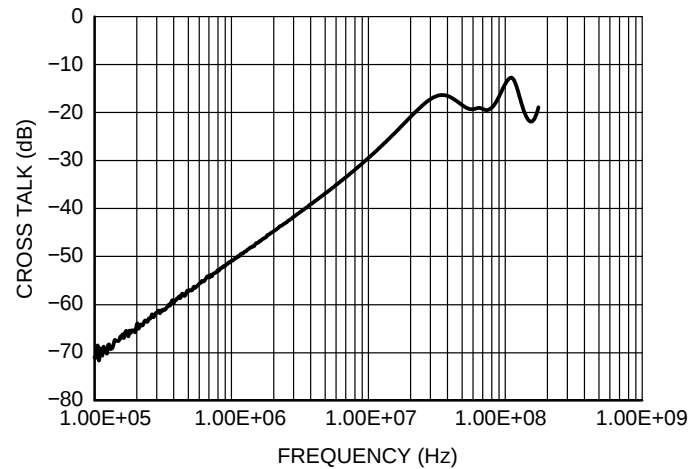


Figure 5. Cross Talk Measurement

TEST CIRCUITS

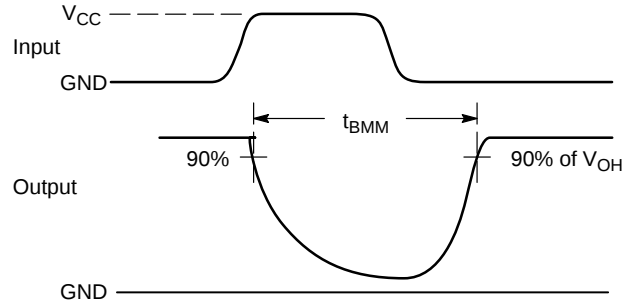
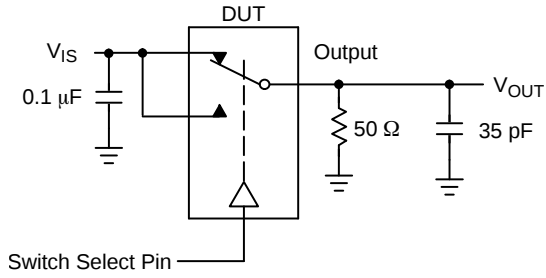


Figure 6. t_{BMM} (Time Break-Before-Make)

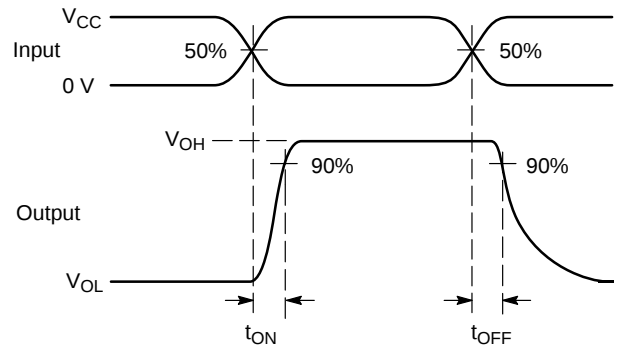
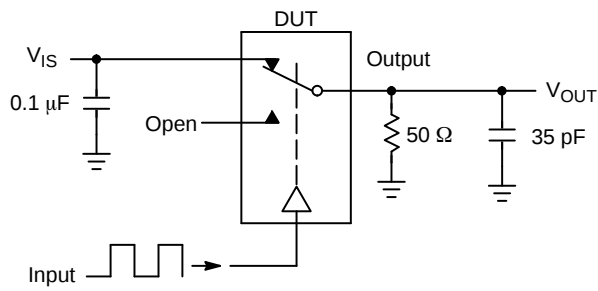


Figure 7. t_{ON}/t_{OFF}

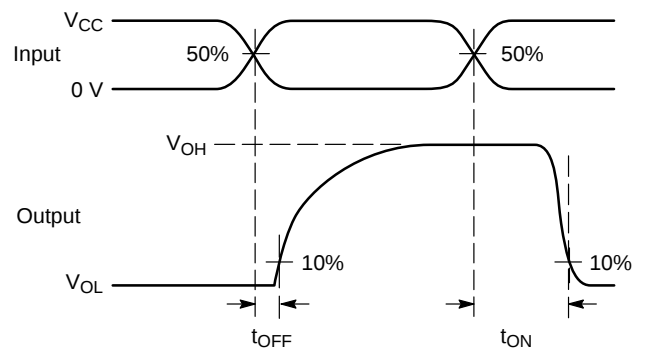
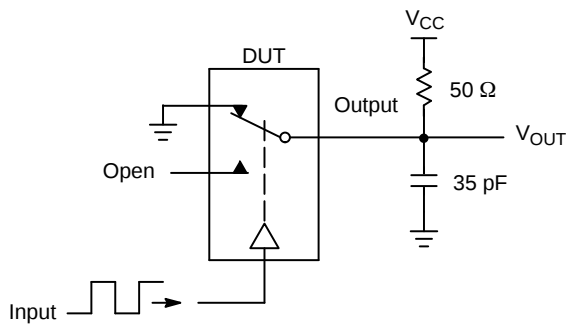
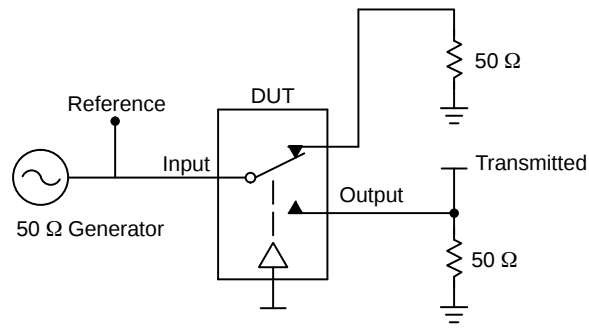


Figure 8. t_{ON}/t_{OFF}

NLAS2750



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.

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

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

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}

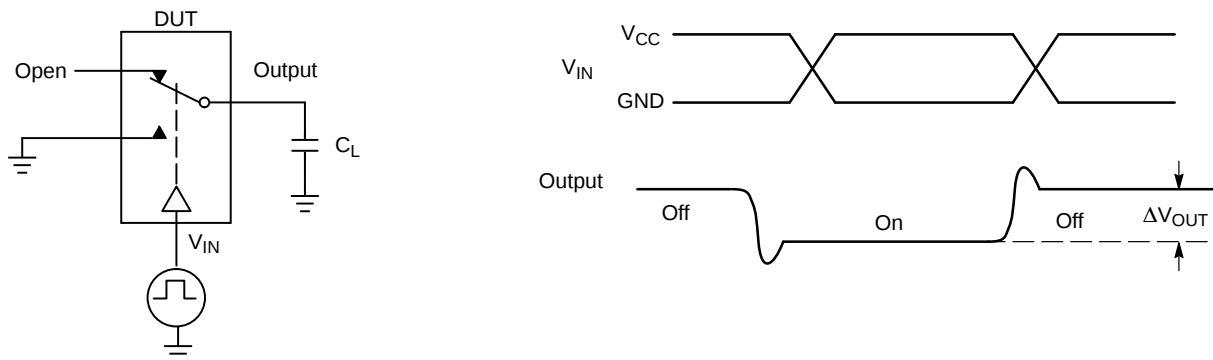
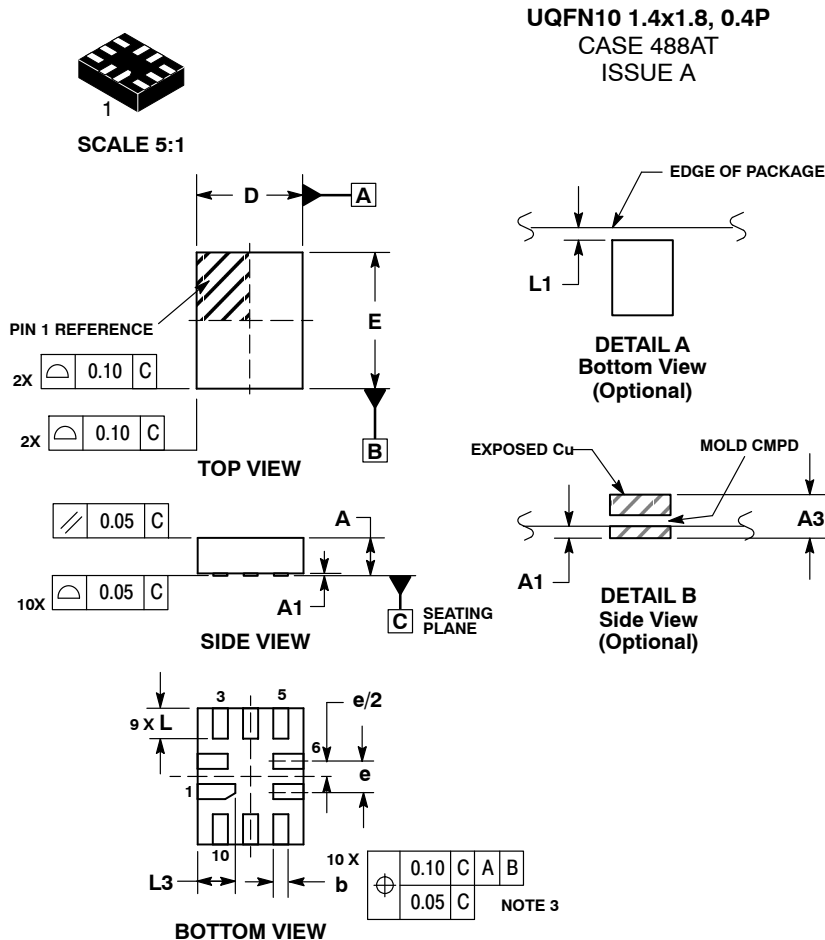


Figure 10. Charge Injection: (Q)

ORDERING INFORMATION

Device	Package	Shipping [†]
NLAS2750MUTAG	UQFN10 (Pb-Free)	3000 / Tape & Reel

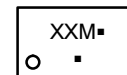
[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.



- 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.

DIM	MILLIMETERS	
	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

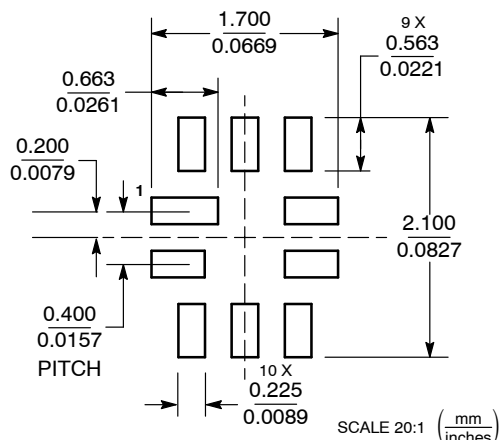
GENERIC MARKING DIAGRAM*



- XX = Specific Device Code
M = Date Code
▪ = Pb-Free Package
(Note: Microdot may be in either location)

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present.

MOUNTING FOOTPRINT



DOCUMENT NUMBER:	98AON22493D	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	10 PIN UQFN, 1.4 X 1.8, 0.4P	PAGE 1 OF 1

onsemi and Onsemi are trademarks of Semiconductor Components Industries, LLC dba onsemi or its subsidiaries in the United States and/or other countries. onsemi reserves the right to make changes without further notice to any products herein. onsemi makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does onsemi assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. onsemi does not convey any license under its patent rights nor the rights of others.

onsemi, **Onsemi**, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:

Technical Library: www.onsemi.com/design/resources/technical-documentation
onsemi Website: www.onsemi.com

ONLINE SUPPORT: www.onsemi.com/support

For additional information, please contact your local Sales Representative at
www.onsemi.com/support/sales