NLAS5123

SPDT, 1 Ω R_{ON} Switch

The NLAS5123 is a low R_{ON} SPDT analog switch. This device is designed for low operating voltage, high current switching of speaker output for cell phone applications. It can switch a balanced stereo output. The NLAS5123 can handle a balanced microphone/ speaker/ringtone generator in a monophone mode. The device contains a break−before−make (BBM) feature.

Features

- Single Supply Operation:
  1.65 V to 5.5 V V_{CC}
- Function Directly from LiON Battery
- R_{ON} Typical = 1.0 Ω @ V_{CC} = 4.5 V
- Low Static Power
- These are Pb−Free Devices

Typical Applications

- Cell Phone Speaker/Microphone Switching
- Ringtone−Chip/Amplifier Switching
- Stereo Balanced (Push−Pull) Switching

Important Information

- Continuous Current Rating Through each Switch ±300 mA
- 1.2 x 1.0 x 0.4P mm 6−Lead Thin DFN Package

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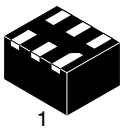
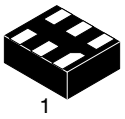
MARKING DIAGRAMS



WDFN6
MN SUFFIX
CASE 506AS

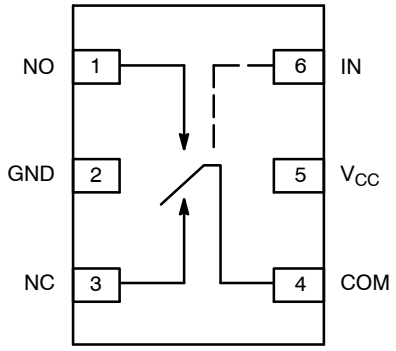
W = Specific Device Code
M = Date Code
▪ = Pb−Free Device



UDFN6
MU SUFFIX
CASE 517AA

X = Specific Device Code
M = Date Code
▪ = Pb−Free Device

PIN ASSIGNMENTS



(Top View)

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 8 of this data sheet.

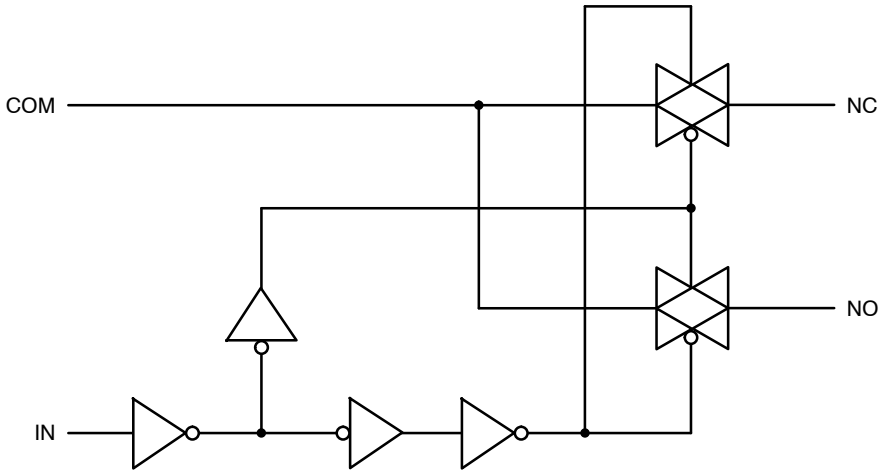


Figure 1. Input Equivalent Circuit

PIN DESCRIPTION

Pin Name	Description
NC, NO, COM	Data Ports
IN	Control Input

TRUTH TABLE

Control Input	Function
L	NC Connected to COM
H	NO Connected to COM

H = HIGH Logic Level.
L = LOW Logic Level.

MAXIMUM RATINGS

Symbol	Rating	Value	Unit
V_{CC}	Positive DC Supply Voltage	−0.5 to +6.0	V
V_{IS}	Analog Input Voltage (V_{NO}, V_{NC}, or V_{COM})	−0.5 to V_{CC} +0.5	V
V_{IN}	Digital Select Input Voltage	−0.5 to +6.0	V
I_{anl1}	Continuous DC Current from COM to NC/NO	±300	mA
$I_{anl-pk1}$	Peak Current from COM to NC/NO, 10 Duty Cycles (Note 1)	±500	mA
I_{clmp}	Continuous DC Current into COM/NC/NO with respect to V_{CC} or GND	±100	mA

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. Defined as 10% ON, 90% off duty cycle.

RECOMMENDED OPERATING CONDITIONS

Symbol	Rating		Min	Max	Unit
V_{CC}	Positive DC Supply Voltage		1.65	5.5	V
V_{IS}	Analog Input Voltage (NC, NO, COM)		0	V_{CC}	V
V_{IN}	Digital Select Input Voltage (IN)		0	V_{CC}	V
T_A	Operating Temperature Range		−40	85	°C
t_r, t_f	Input Rise or Fall Time, SELECT	V_{CC} = 3.0 V V_{CC} = 5.5 V		20 10	ns/V

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		2.7 4.5				2.0 2.4		V
V_{IL}	LOW Level Input Voltage		2.7 4.5					0.6 0.8	V
I_{IN}	Input Leakage Current	0 ≤ V_{IN} ≤ 5.5 V	0−5.5			±0.1		±1	μA
I_{OFF}	OFF State Leakage Current (Note 7)	0 ≤ NO, NC, COM ≤ V_{CC}	5.5	−2.0		+2.0		±20	nA
I_{ON}	ON State Leakage Current (Note 7)	0 ≤ NO, NC, COM ≤ V_{CC}	5.5	−4.0		+4.0		±40	nA
R_{ON}	Switch On Resistance (Note 2)	I_O = 100 mA, V_{IS} = 0 V to V_{CC}	2.7			1.7		2.0	Ω
		I_O = 100 mA, V_{IS} = 0 V to V_{CC}	4.5			1.0		1.2	
I_{CC}	Quiescent Supply Current All Channels ON or OFF	V_{IN} = V_{CC} or GND, I_{OUT} = 0	5.5			0.5		1.0	μA
Analog Signal Range									
ΔR_{ON}	On Resistance Match Between Channels (Notes 2, 3, 4)	I_A = 100 mA, V_{IS} = 1.5 V	2.7		0.15				Ω
		I_A = 100 mA, V_{IS} = 2.5 V	4.5		0.12			0.15	
R_{flat}	On Resistance Flatness (Notes 2, 3, 5)	I_A = 100 mA, V_{IS} = 0 V to V_{CC}	2.7		0.4				Ω
		I_A = 100 mA, V_{IS} = 0 V to V_{CC}	4.5		0.3			0.4	

2. Measured by the voltage drop between NC/NO and COM pins at the indicated current through the switch. On Resistance is determined by the lower of the voltages on the two (NO, NC, COM).
3. Parameter is characterized but not tested in production.
4. $\Delta R_{ON} = R_{ON}$ max − R_{ON} min measured at identical V_{CC}, temperature and voltage levels.
5. Flatness is defined as the difference between the maximum and minimum value of On Resistance over the specified range of conditions.
6. Guaranteed by Design.
7. 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).

AC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Test Conditions	V_{CC} (V)	T_A = +25°C			T_A = −40°C to +85°C		Unit	Figure #
				Min	Typ	Max	Min	Max		
t_{PHL} t_{PLH}	Propagation Delay Bus−to−Bus (Note 9)	V_{IN} = V_{IH} or V_{IL}	2.7 4.5			2.0 0.3			ns	
t_{ON}	Output Enable Time Turn On Time (COM to NO or NC)	V_{IS} = 1.5 V, R_L = 50 Ω, C_L = 35 pF V_{IS} = 3.0 V, R_L = 50 Ω, C_L = 35 pF	2.7 4.5			30 20		35 25	ns	3, 4
t_{OFF}	Output Disable Time Turn Off Time (COM to NO, NC)	V_{IS} = 1.5V, R_L = 50 Ω, C_L = 35 pF V_{IS} = 3.0 V, R_L = 50 Ω, C_L = 35 pF	2.7 4.5			20 15		25 20	ns	3, 4
t_{BBM}	Break Before Make Time (Note 8)	V_{IS} = 1.5V, R_L = 50 Ω, C_L = 35 pF	2.7 4.5	0.5 0.5			0.5 0.5		ns	2
Q	Charge Injection (Note 8)	C_L = 1.0 nF, V_{GEN} = 0 V R_{GEN} = 0 Ω	2.7 4.5		26 48				pC	6
O_{IRR}	Off Isolation (Note 10)	R_L = 50 Ω f = 1.0 MHz	2.7 – 5.5		−62				dB	5
X_{talk}	Crosstalk	R_L = 50 Ω f = 1.0 MHz	2.7 – 5.5		−70				dB	7
BW	−3 dB Bandwidth	R_L = 50 Ω	2.7 – 5.5		55				MHz	8
THD	Total Harmonic Distortion (Note 8)	R_L = 600 Ω 0.5 V_{P-P} f = 20 Hz to 20 kHz	2.7 – 5.5		0.012				%	9

8. Guaranteed by Design.
9. 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).
10. Off Isolation = 20 $\log_{10}$ [$V_{COM}/V_{NO,NC}$].

CAPACITANCE (Note 11)

Symbol	Parameter	Test Conditions	Typ	Max	Unit
C_{IN}	Select Pin Input Capacitance	V_{CC} = 0 V, f = 1 MHz	2.0		pF
$C_{NC/NO}$	NC, NO Port Off Capacitance	V_{CC} = 4.5 V, f = 1 MHz	20		pF
C_{COM}	COM Port Capacitance when Switch is Enabled	V_{CC} = 4.5 V, f = 1 MHz	55		pF

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

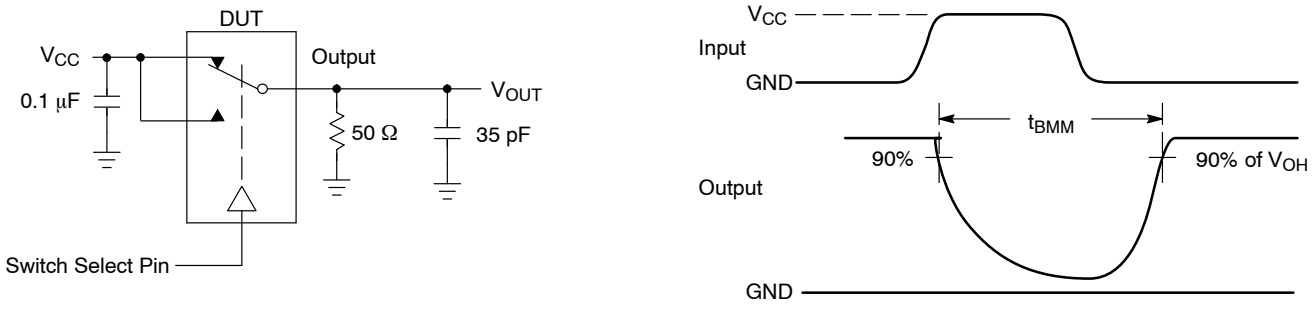


Figure 2. t_{BBM} (Time Break−Before−Make)

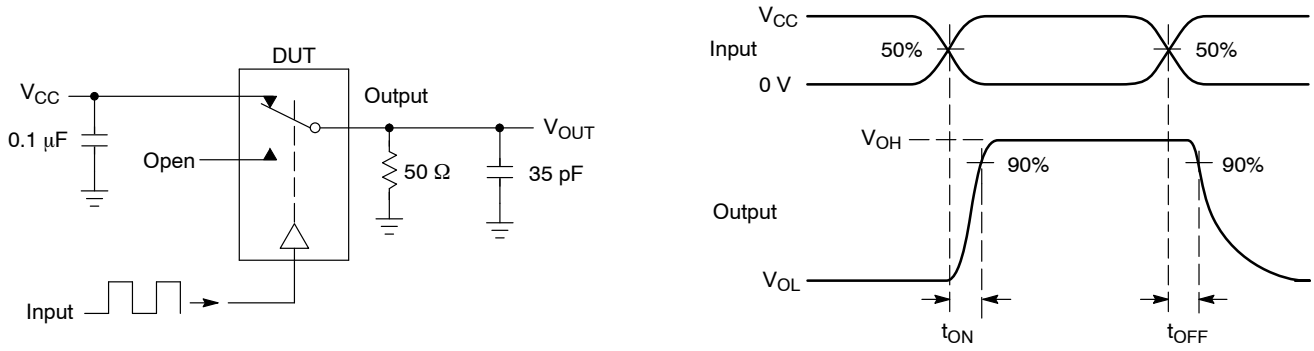


Figure 3. t_{ON}/t_{OFF}

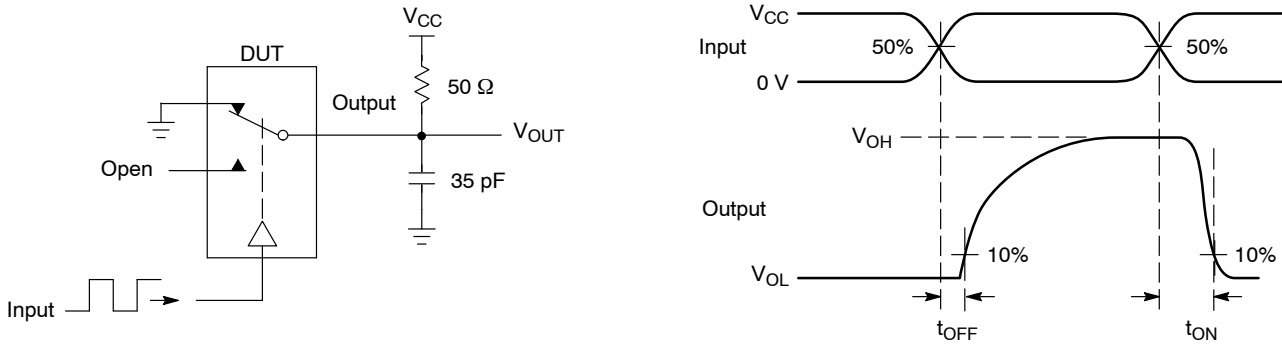
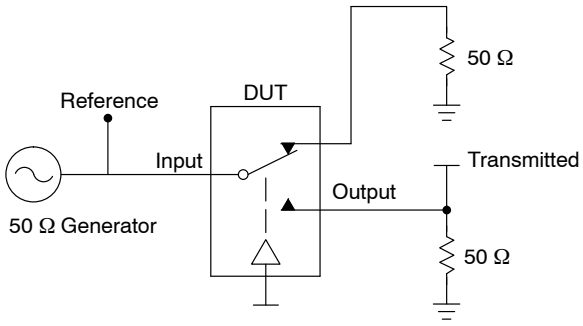


Figure 4. t_{ON}/t_{OFF}



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 Log $\left(\frac{V_{OUT}}{V_{IN}}\right)$ for V_{IN} at 100 kHz

V_{ONL} = On Channel Loss = 20 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 5. Off Channel Isolation/On Channel Loss (BW)/Crosstalk (On Channel to Off Channel)/V_{ONL}

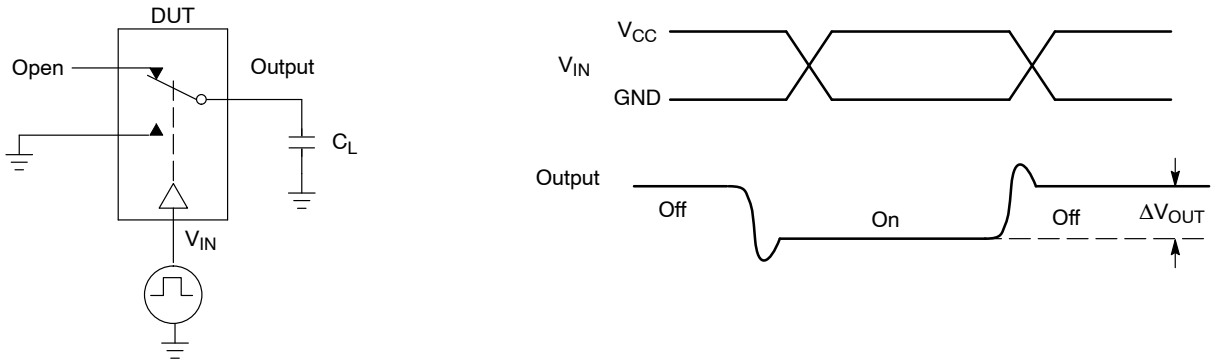


Figure 6. Charge Injection: (Q)

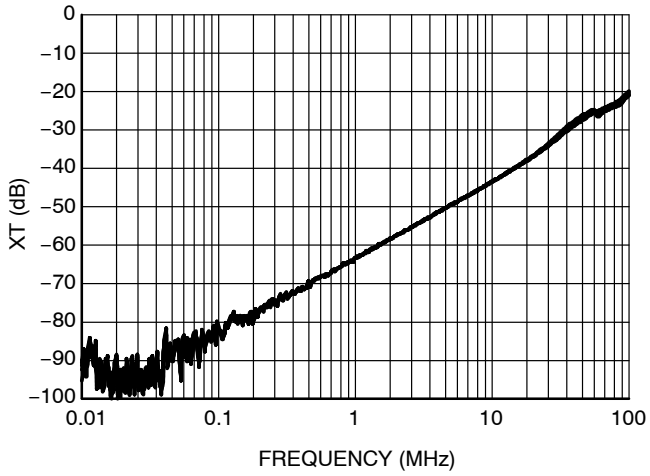


Figure 7. Cross Talk vs. Frequency @ V_{CC} = 4.5 V

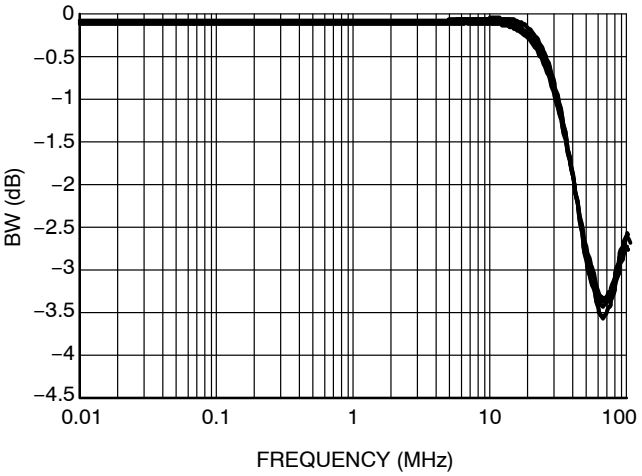


Figure 8. Bandwidth vs. Frequency

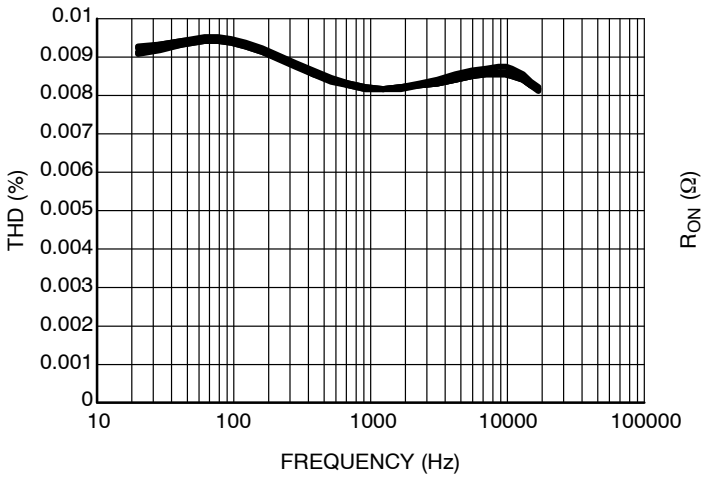


Figure 9. Total Harmonic Distortion

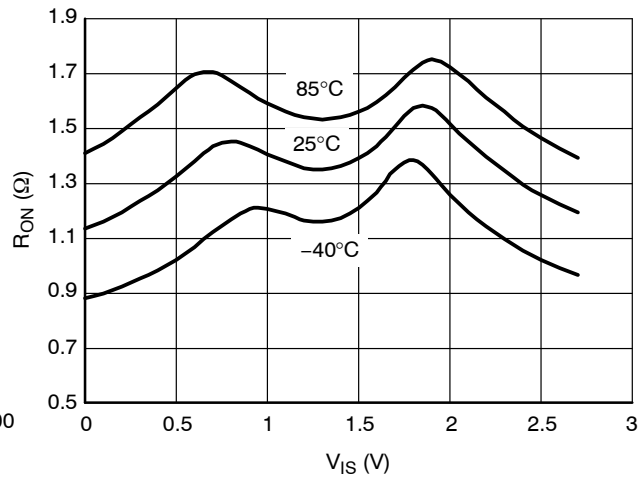


Figure 10. On−Resistance vs. Input Voltage @ V_{CC} = 2.7 V

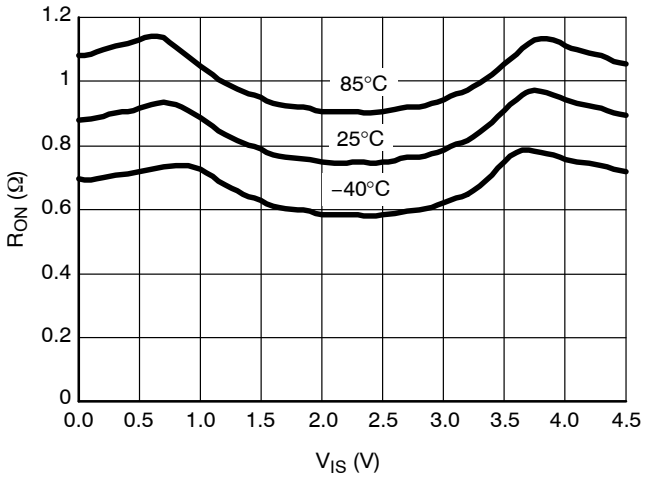


Figure 11. On−Resistance vs. Input Voltage @ V_{CC} = 4.5 V

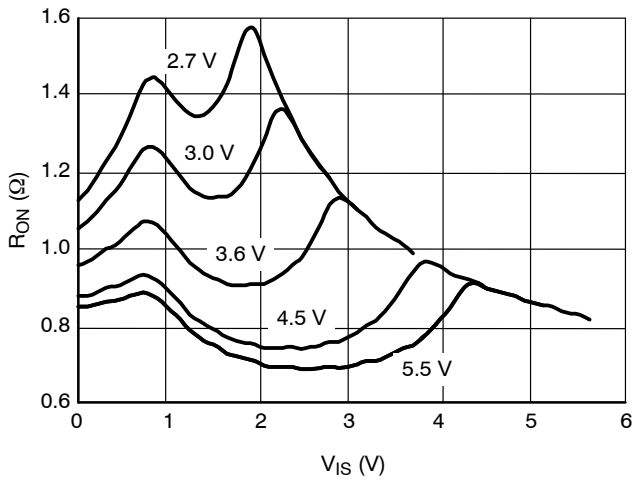


Figure 12. On−Resistance vs. Input Voltage

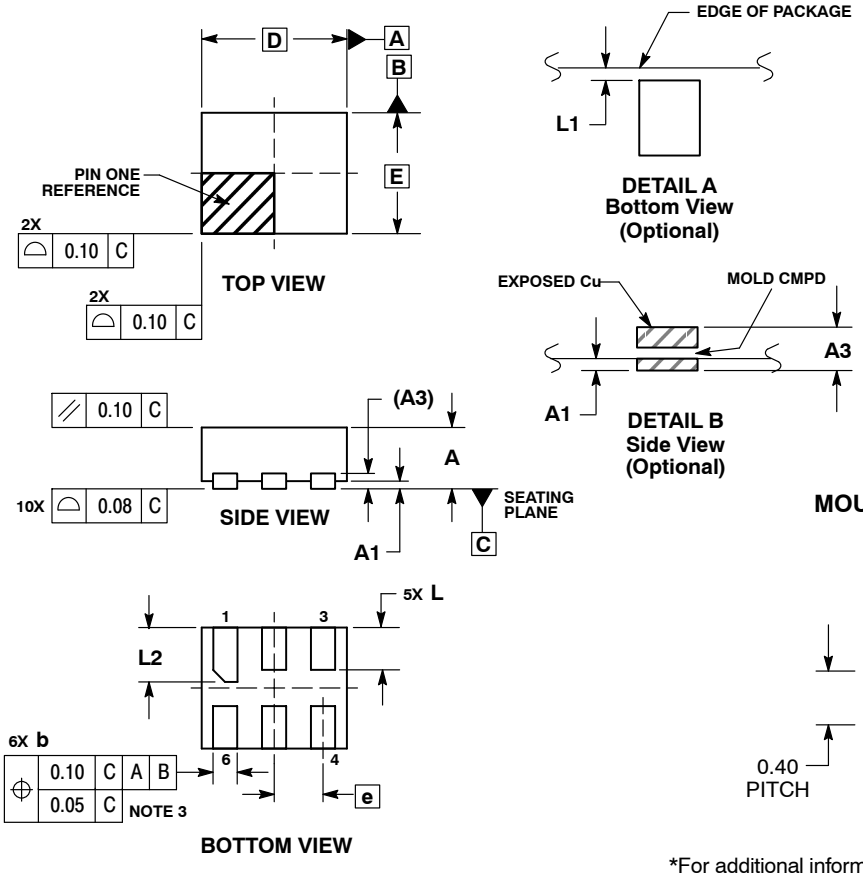
DEVICE ORDERING INFORMATION

Device Order Number	Device Nomenclature					Package Type	Tape & Reel Size†
	Circuit Indicator	Technology	Device Function	Package Suffix	Tape & Reel Suffix		
NLAS5123MNR2G	NL	AS	5123	MN	2	WDFN6 (Pb−Free)	3000 / Tape & Reel
NLAS5123MUR2G	NL	AS	5123	MU	2	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.

PACKAGE DIMENSIONS

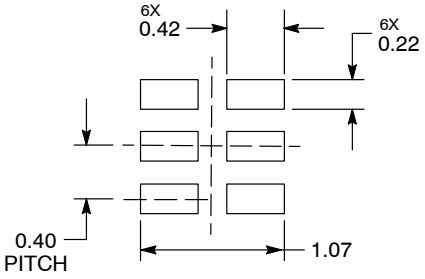
UDFN6, 1.2x1.0, 0.4P
CASE 517AA−01
ISSUE C



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*

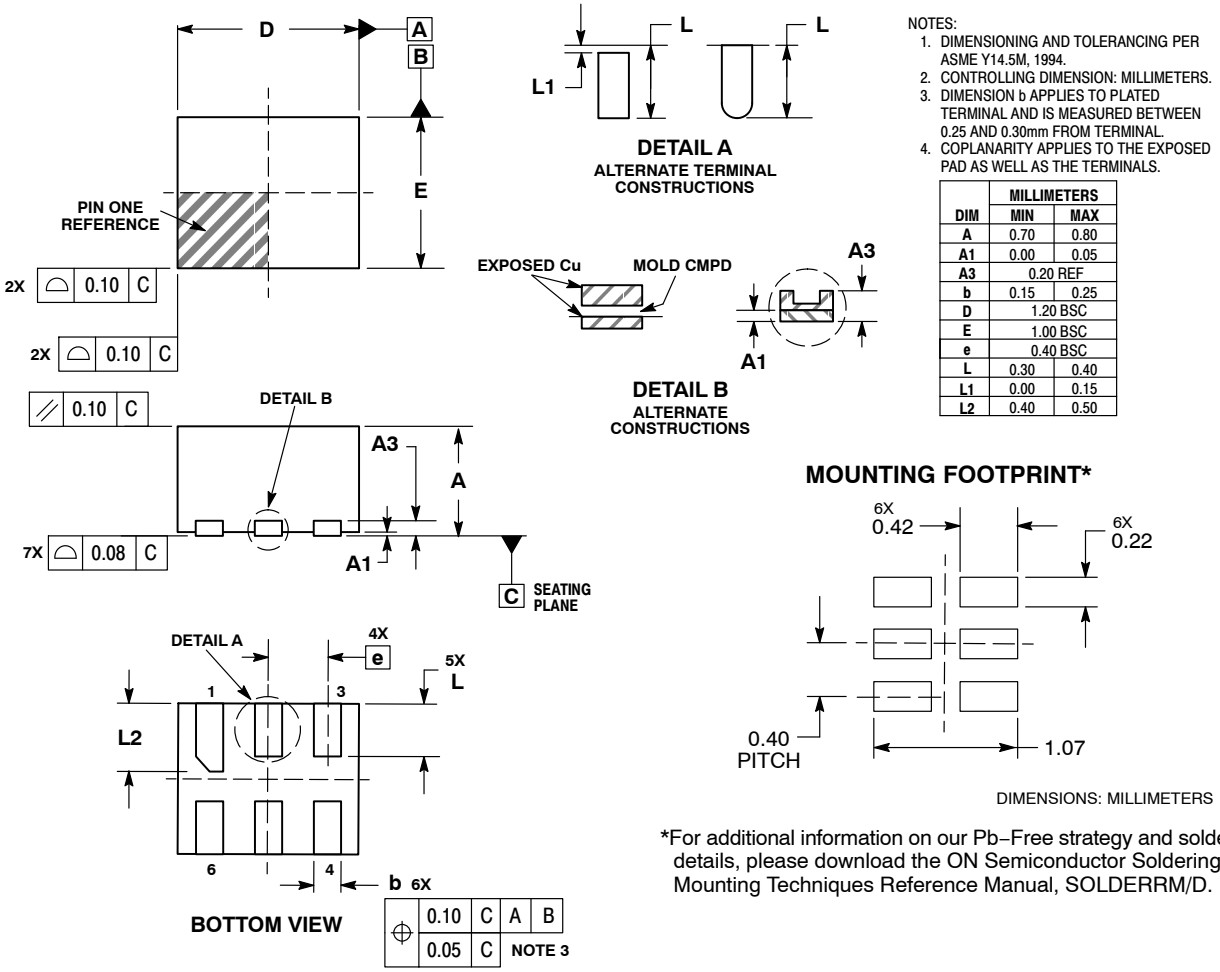


DIMENSIONS: MILLIMETERS

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

PACKAGE DIMENSIONS

WDFN6 1.2x1.0, 0.4P
CASE 506AS−01
ISSUE C



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4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

	MILLIMETERS	
DIM	MIN	MAX
A	0.70	0.80
A1	0.00	0.05
A3	0.20 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.

PUBLICATION ORDERING INFORMATION

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NLAS5123/D