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
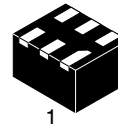- Stereo Balanced (Push−Pull) Switching

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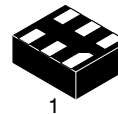- 1.2 x 1.0 x 0.4P mm 6−Lead Thin DFN Package

ON Semiconductor®

http://onsemi.com

MARKING DIAGRAMS

WDFN6
MN SUFFIX
CASE 506AS

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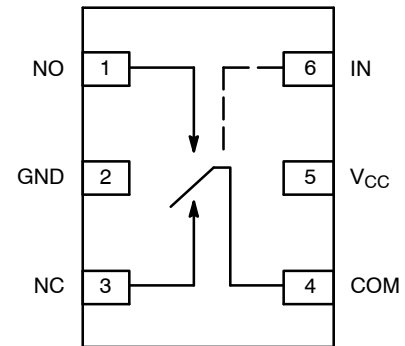
W = Specific Device Code
M = Date Code
▪ = Pb−Free Device

UDFN6
MU SUFFIX
CASE 517AA

X M
• ▪

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

PIN ASSIGNMENTS

NO — 1	6 — IN
GND — 2	5 — V$_{CC}$
NC — 3	4 — COM

(Top View)

ORDERING INFORMATION
See detailed ordering and shipping information in the package dimensions section on page 8 of this data sheet.
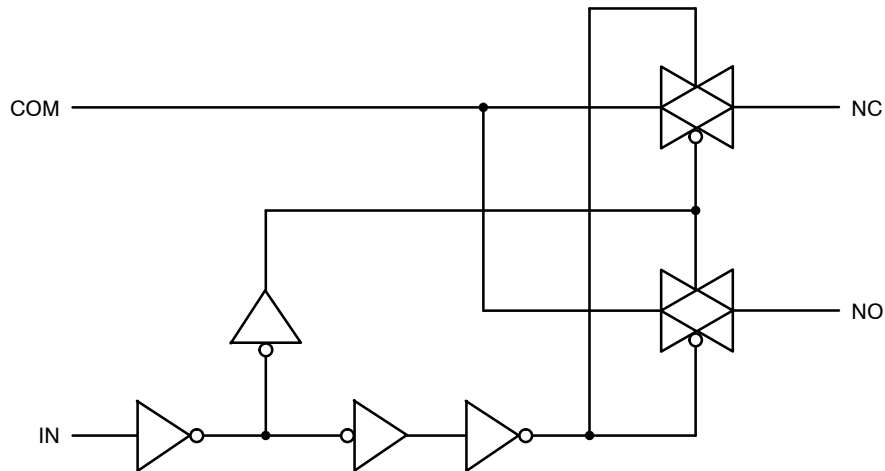
NLAS5123

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	$0 \leq V_{IN} \leq 5.5$ V	0–5.5			±0.1		±1	μA
I_{OFF}	OFF State Leakage Current (Note 7)	$0 \leq$ NO, NC, COM $\leq V_{CC}$	5.5	−2.0		+2.0		±20	nA
I_{ON}	ON State Leakage Current (Note 7)	$0 \leq$ NO, NC, COM $\leq V_{CC}$	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

Symbol	Parameter	Test Conditions	V_{CC} (V)	T_A = +25°C			T_A = −40°C to +85°C		Unit
				Min	Typ	Max	Min	Max	
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. ΔR_{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).

NLAS5123

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)	$V_{IS} = 1.5$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			20 15		25 20	ns	3, 4
t_{BBM}	Break Before Make Time (Note 8)	$V_{IS} = 1.5$V, $R_L = 50$ 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.
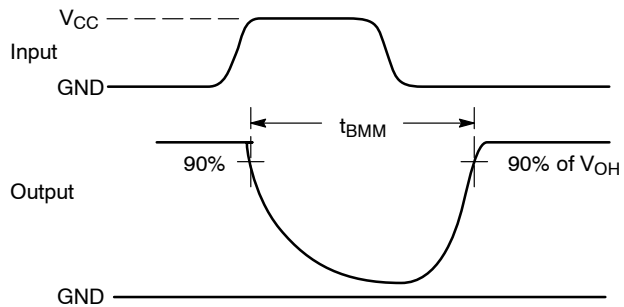
NLAS5123

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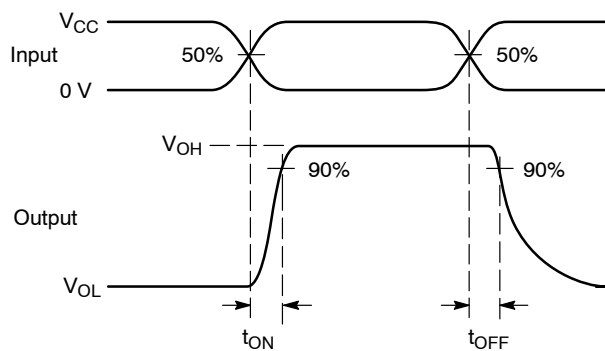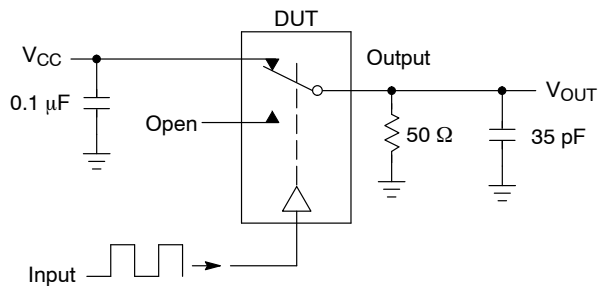

Figure 3. t_{ON}/t_{OFF}
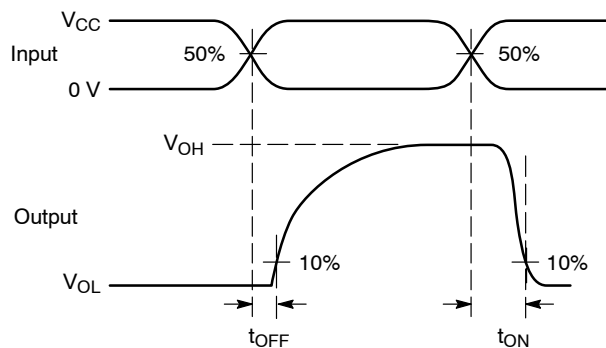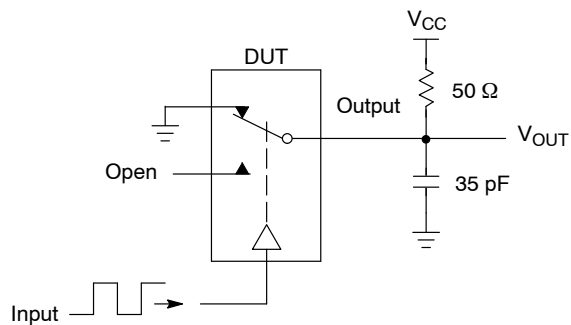

Figure 4. t_{ON}/t_{OFF}

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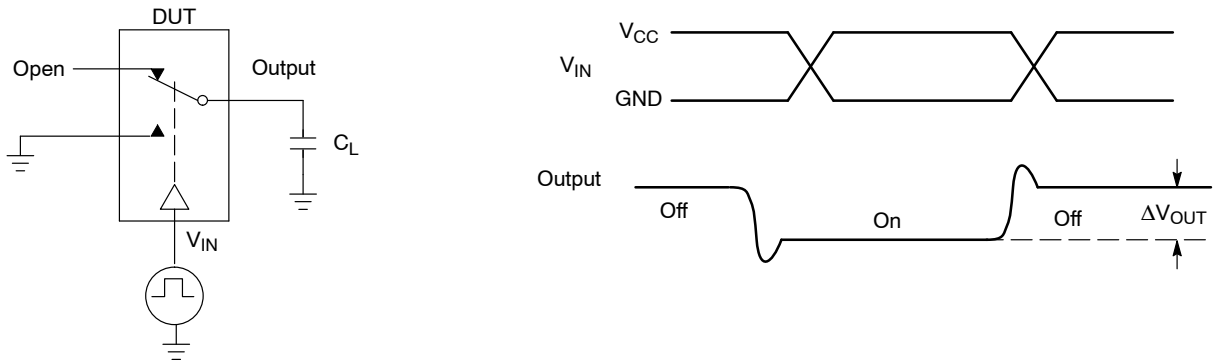
$$V_{ISO} = \text{Off Channel Isolation} = 20 \, \text{Log} \left(\frac{V_{OUT}}{V_{IN}} \right) \text{ for } V_{IN} \text{ at 100 kHz}$$

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

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)
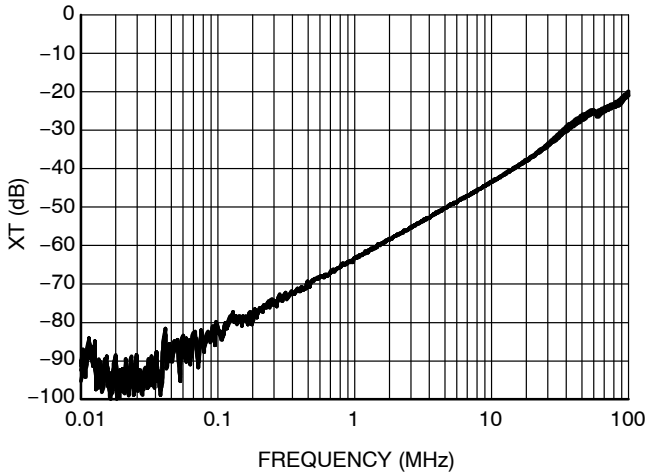
Figure 7. Cross Talk vs. Frequency
@ V$_{CC}$ = 4.5 V
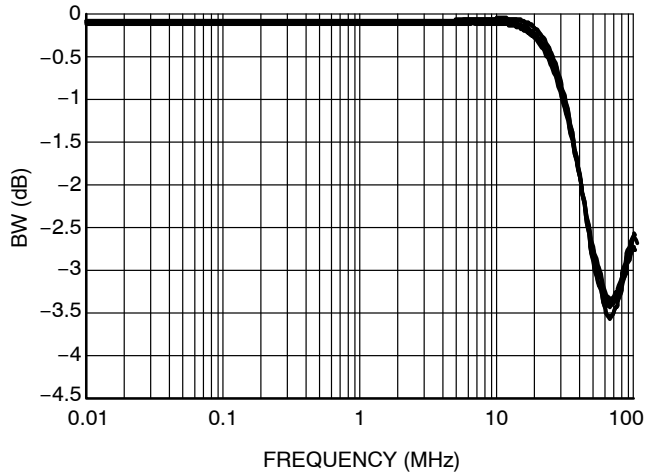
Figure 8. Bandwidth vs. Frequency
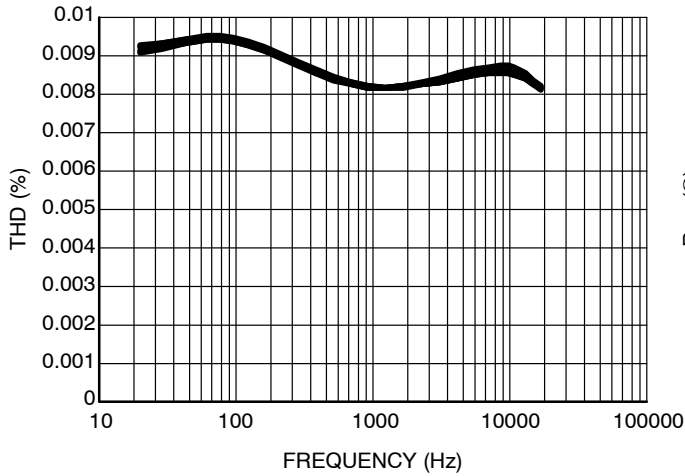
Figure 9. Total Harmonic Distortion
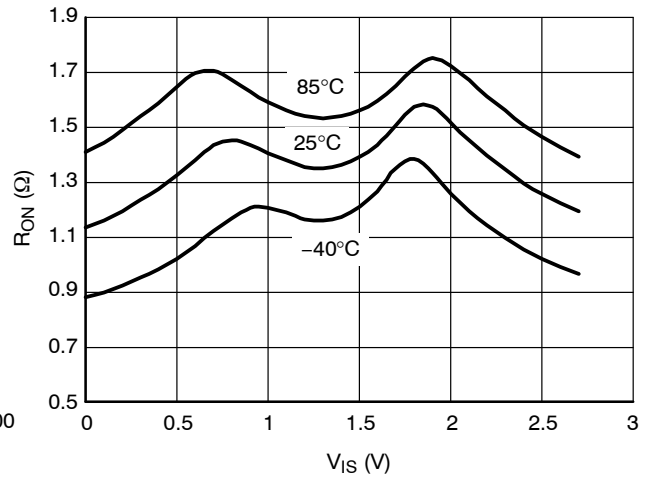
Figure 10. On−Resistance vs. Input Voltage
@ V$_{CC}$ = 2.7 V
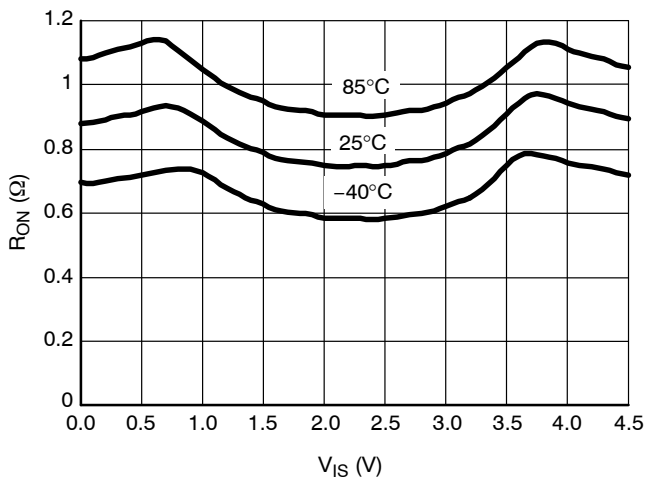
Figure 11. On−Resistance vs. Input Voltage
@ V$_{CC}$ = 4.5 V
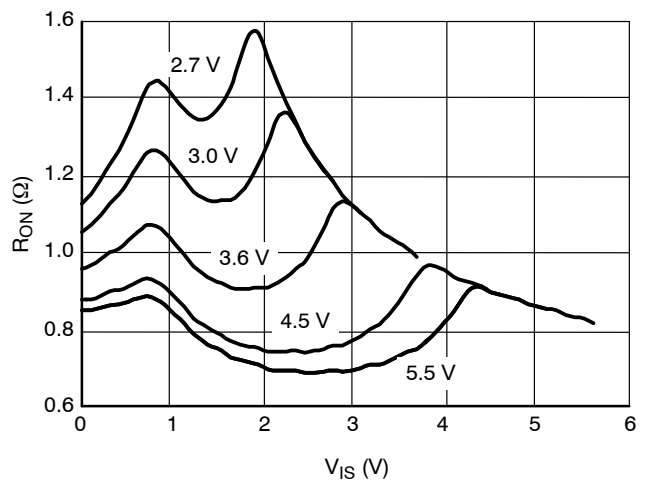
Figure 12. On−Resistance vs. Input Voltage

NLAS5123

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.

WDFN6 1.2x1.0, 0.4P
CASE 506AS
ISSUE D

DATE 27 AUG 2013

SCALE 4:1
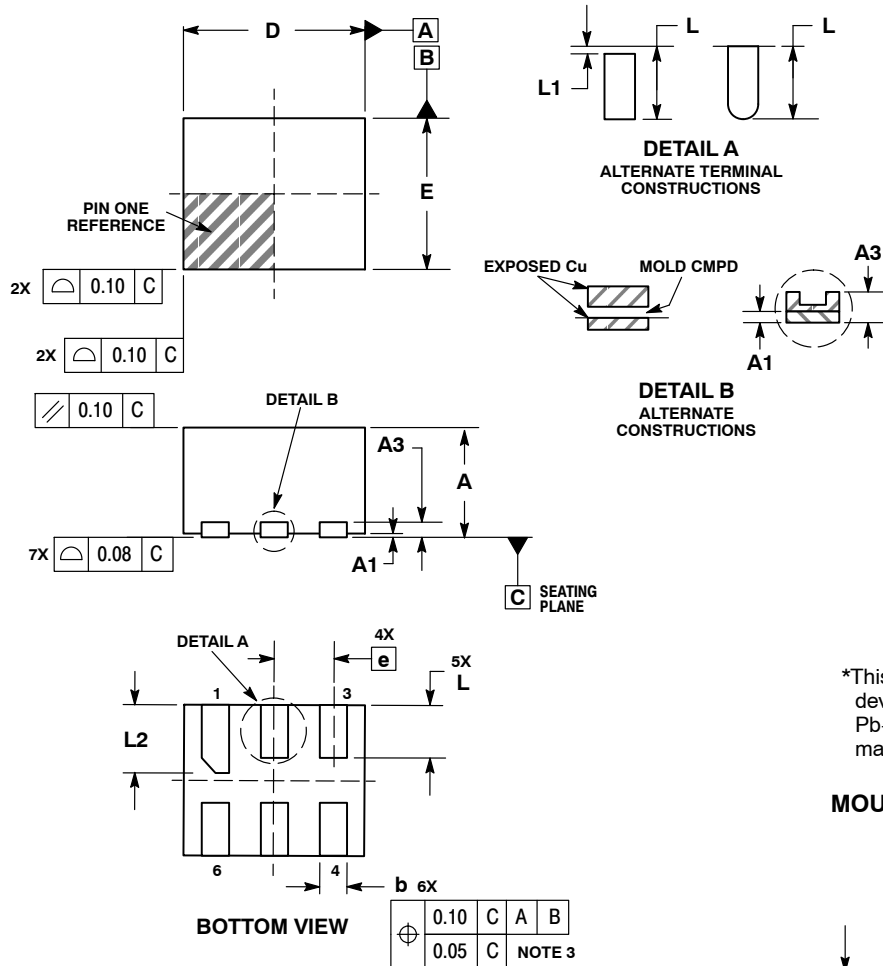
DETAIL A
ALTERNATE TERMINAL CONSTRUCTIONS

PIN ONE REFERENCE

2X | △ | 0.10 | C

2X | △ | 0.10 | C

∥ | 0.10 | C

DETAIL B

EXPOSED Cu   MOLD CMPD

DETAIL B
ALTERNATE CONSTRUCTIONS

7X | △ | 0.08 | C

C SEATING PLANE

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 0.30mm FROM TERMINAL.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

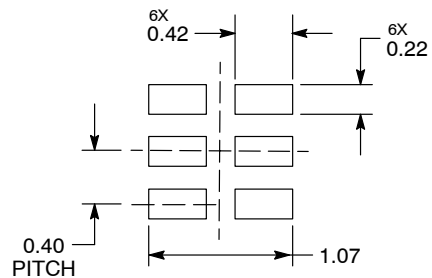| DIM	MILLIMETERS	
	MIN	MAX
A	0.70	0.80
A1	0.00	0.05
A3	0.20 REF	
b	0.15	0.25
D	1.20 BSC	
E	1.00 BSC	
e	0.40 BSC	
L	0.30	0.40
L1	0.00	0.15
L2	0.40	0.50

GENERIC MARKING DIAGRAM*

X M

X = Specific Device Code
M = Date Code

*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.

DETAIL A

4X e
5X L

BOTTOM VIEW

b 6X

⊕ | 0.10 | C | A | B
  | 0.05 | C | NOTE 3

STYLE 1:
PIN 1. DRAIN
2. DRAIN
3. GATE
4. SOURCE
5. DRAIN
6. DRAIN

MOUNTING FOOTPRINT*

6X 0.42
6X 0.22
0.40 PITCH
1.07

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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DESCRIPTION:	WDFN6, 1.2 X 1.0, 0.4 P		PAGE 1 OF 1

UDFN6, 1.2x1.0, 0.4P
CASE 517AA–01
ISSUE D

DATE 03 SEP 2010
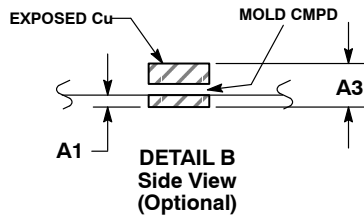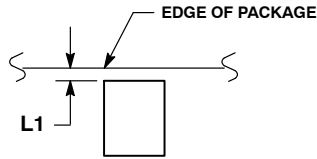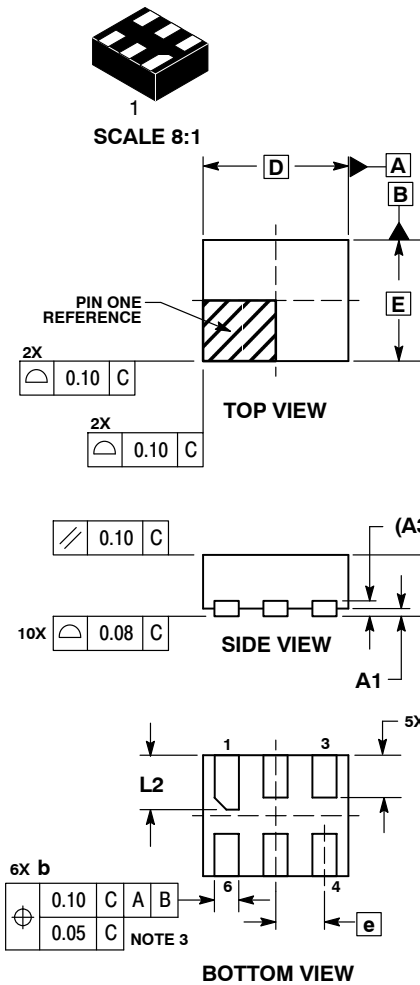
SCALE 8:1

1

D A B

PIN ONE REFERENCE

E

2X ⌒ 0.10 C

2X ⌒ 0.10 C

TOP VIEW

// 0.10 C

(A3)

A

10X ⌒ 0.08 C

SIDE VIEW

A1

SEATING PLANE C

5X L

1 3

L2

6X b

⊕ 0.10 C A B
  0.05 C NOTE 3

6 4

e

BOTTOM VIEW

EDGE OF PACKAGE

L1

DETAIL A
Bottom View
(Optional)

EXPOSED Cu   **MOLD CMPD**

A3

A1

DETAIL B
Side View
(Optional)

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	0.55
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

GENERIC MARKING DIAGRAM*

X M

X = Specific Device Code
M = Date Code

*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*

6X
0.42

6X
0.22

0.40
PITCH

1.07

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.

DOCUMENT NUMBER:	98AON22068D	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.	
DESCRIPTION:	6 PIN UDFN, 1.2X1.0, 0.4P		PAGE 1 OF 1

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
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Phone: 011 421 33 790 2910

Europe, Middle East and Africa Technical Support:
Phone: 00421 33 790 2910
For additional information, please contact your local Sales Representative

◊