NLAS5157

Ultra-Low 0.4 Ω SPDT Analog Switch

The NLAS5157 is Single Pole Double Throw (SPDT) switch designed for audio systems in portable applications. The NLAS5157 features Ultra−Low R_{ON} of 0.4 Ω typical at V_{CC} = 3.0 V and 0.15 Ω R_{ON} Flatness for +3.0 V supply across temperature. This device also has a broad V_{CC} operating range of 1.65 V to 4.5 V, ideal for battery−powered devices.

The NLAS5157 is protected on all pins with 8 kV Human Body Model ESD protection. This allows the device to be placed in a variety of locations, including near the interface, without risk of damage.

Features

- R_{ON} = 0.4 Ω Typical @ V_{CC} = 3.0 V
- V_{CC} Range: 1.65 V to 4.5 V
- 8 kV Human Body Model ESD on All Pins
- These are Pb−Free Devices

Typical Applications

- Mobile Phones
- Portable Devices

ON Semiconductor®

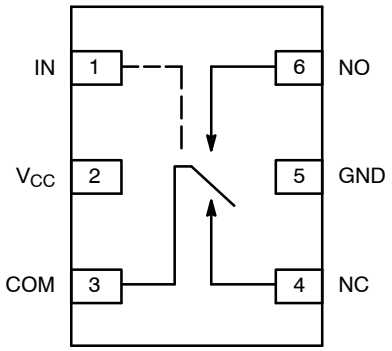
http://onsemi.com

UDFN6
CASE 517AQ

MARKING DIAGRAM

A = Specific Device Code*
(Rotated 90°)
M = Date Code

PIN ASSIGNMENTS



(Top View)

ORDERING INFORMATION

Device	Package	Shipping†
NLAS5157MUTCG	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.

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PIN DESCRIPTION

PIN #	Name	Direction	Description
1	IN	Input	Control Input Select Line
2	V_{CC}	Power	Voltage Supply
3	COM	I/O	Common Signal Line
4	NC	I/O	Normally Closed Signal Line
5	GND	Power	Ground
6	NO	I/O	Normally Open Signal Line

TRUTH TABLE

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

MAXIMUM RATINGS

Symbol	Pins	Rating	Value	Condition	Unit
V_{CC}	V_{CC}	Positive DC Supply Voltage	0.5 to +5.5		V
V_{IS}	NO, NC, or COM	Analog Signal Voltage	−0.5 to V_{CC} + 0.5		V
V_{IN}	IN	Control Input Voltage	−0.5 to +5.5		V
I_{IS_CON}	NO, NC, or COM	Analog Signal Continuous Current	±300	Closed Switch	mA
I_{IS_PK}	NO, NC, or COM	Analog Signal Peak Current	±500	10% Duty Cycle	mA
I_{IN}	IN	Control Input Current	±20		mA
T_{STG}		Storage Temperature Range	−65 to 150		°C

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.

RECOMMENDED OPERATING CONDITIONS

Symbol	Pins	Parameter	Value	Condition	Unit
V_{CC}	V_{CC}	Positive DC Supply Voltage	1.65 to 4.5		V
V_{IS}	NO, NC, or COM	Analog Signal Voltage	GND to V_{CC}		V
V_{IN}	IN	Control Input Voltage (OVT) Overvoltage Tolerance	GND to 4.5		V
T_A		Operating Temperature Range	−40 to +85		°C
t_r, t_f		Input Rise or Fall Time	20	V_{CC} = 1.6 V − 2.7 V	ns/V
			10	V_{CC} = 3.0 V − 4.5 V	

Minimum and maximum values are guaranteed through test or design across the **Recommended Operating Conditions**, where applicable. Typical values are listed for guidance only and are based on the particular conditions listed for each section, where applicable. These conditions are valid for all values found in the characteristics tables unless otherwise specified in the test conditions.

ESD PROTECTION

Pins	Description	Minimum Voltage
All Pins	Human Body Model	7 kV

DC ELECTRICAL CHARACTERISTICS

CONTROL INPUT (Typical: T = 25°C; V_{CC} = 3.0 V)

Symbol	Pins	Parameter	Test Conditions	V_{CC} (V)	–40°C to +85°C			Unit
					Min	Typ	Max	
V_{IH}	IN	Control Input High		1.8 – 2.7 3.0 4.5	1.0 1.3 1.6			V
V_{IL}	IN	Control Input Low		1.8 – 2.7 3.0 4.5			0.4 0.5 0.6	V
I_{IN}	IN	Control Input Leakage	$0 \le V_{IN} \le V_{CC}$	4.5		±0.1	±0.5	μA

SUPPLY CURRENT AND LEAKAGE (Typical: T = 25°C; V_{CC} = 3.0 V)

Symbol	Pins	Parameter	Test Conditions	V_{CC} (V)	–40°C to +85°C			Unit
					Min	Typ	Max	
$I_{NO/NC}$ (OFF)	NC, NO	OFF State Leakage	$V_{IN} = V_{IL}$ or V_{IH} $V_{NC/NO}$ = 0.3 V V_{COM} = 4.0 V	4.5		±10	±100	nA
I_{COM} (ON)	COM	ON State Leakage	$V_{IN} = V_{IL}$ or V_{IH} V_{NO} = 0.3 V or 4.0 V with V_{NC} Floating or V_{NC} = 0.3 V or 4.0 V with V_{NO} Floating V_{COM} = 0.3 V or 4.0 V	4.5		±20	±100	nA
I_{CC}	V_{CC}	Quiescent Supply	V_{IN} and $V_{IS} = V_{CC}$ or GND I_D = 0 A	1.65 – 4.5		±0.1	±1.0	μA
I_{OFF}	IN	Power Off Leakage	V_{IN} = 4.5 V or GND	0		±0.5	±1.0	μA

ON RESISTANCE (Typical: T = 25°C; V_{CC} = 3.0 V)

Symbol	Pins	Parameter	Test Conditions	V_{CC} (V)	–40°C to +85°C			Unit
					Min	Typ	Max	
R_{ON}	NO, NC COM	ON Resistance	I_{ON} = –100 mA V_{IS} = 0 to V_{CC}	3.0 4.5		0.4 0.35	0.6 0.5	Ω
R_{FLAT}	NO, NC COM	R_{ON} Flatness	I_{ON} = –100 mA V_{IS} = 0 to V_{CC}	3.0 4.5		0.12 0.15	0.16 0.17	Ω
ΔR_{ON}	NO, NC COM	R_{ON} Matching	I_{ON} = –100 mA V_{IS} = 0 to V_{CC}	3.0 4.5		0.08 0.08	0.1 0.1	Ω

AC ELECTRICAL CHARACTERISTICS

TIMING/FREQUENCY (Typical: T = 25°C; V_{CC} = 3.0 V, R_L = 50 Ω, C_L = 35 pF, f = 1 MHz)

Symbol	Pins	Parameter	Test Conditions	V_{CC} (V)	–40°C to +85°C			Unit
					Min	Typ	Max	
t_{ON}	IN to NC or NO	Turn On Time		2.3 – 4.3		30	40	ns
t_{OFF}	IN to NC or NO	Turn Off Time		2.3 – 4.53		18	25	ns
t_{BBM}	IN to NC or NO	Break Before Make		3.0	2	15		ns
BW		–3dB Bandwidth	C_L = 5 pF	1.65 – 4.5		36		MHz

ISOLATION AND THD (Typical: T = 25°C; V_{CC} = 3.0 V, RL = 50 Ω, CL = 5 pF, f = 1 MHz)

Symbol	Pins	Parameter	Test Conditions	V_{CC} (V)	–40°C to +85°C			Unit
					Min	Typ	Max	
Q		Charge Injection	V_{IN} = V_{CC} to GND R_{IS} = 0 Ω, C_L = 1.0 nF Q = C_L – ΔV_{OUT}	1.65 – 4.3		38		pC
THD		Total Harmonic Distortion	F_{IS} = 20 Hz to 20 kHz R_L = R_{gen} = 600 Ω, C_L = 1.0 pF V_{IS} = 1.0 V_{PP}	3.0		0.02		%
O_{IRR}	NO	Off Isolation	V_{IN} = 0 V_{NO} or V_{NC} (pk–pk) = 1.0 V	1.65 – 4.5		–54		dB
Xtalk	COM to COMy	Non–Adjacent Channel	V_{NO} or V_{NC} (pk–pk) = 1.0 V	1.65 – 4.5		–54		dB

CAPACITANCE (Typical: T = 25°C; V_{CC} = 3.0 V, R_L = 50 Ω, C_L = 5 pF, f = 1 MHz)

Symbol	Pins	Parameter	Test Conditions	V_{CC} (V)	–40°C to +85°C			Unit
					Min	Typ	Max	
C_{IN}	IN	Control Input		0 V		3.5		pF
C_{ON}	NC to COM	Through Switch	V_{IN} = 0V	3.0 V		95		pF
C_{OFF}	NC, NC	Unselected Port	V_{IS} = 3.0V, V_{IN} = 3.0 V	3.0 V		47		pF

TYPICAL CHARACTERISTICS

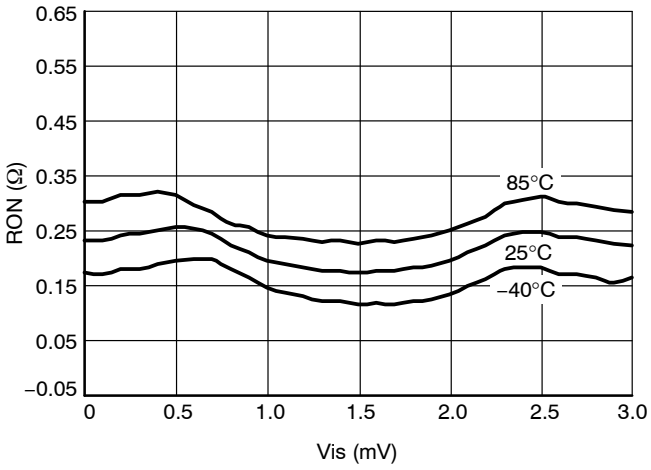


Figure 1. RON vs. Vin @ Vcc = 3.0 V, All Temps

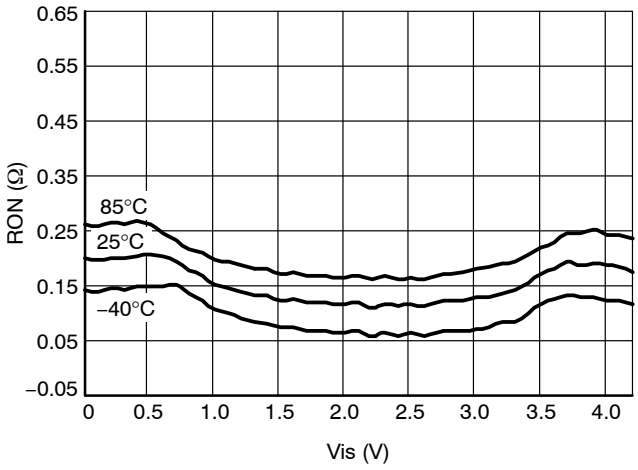


Figure 2. RON vs. Vin @ Vcc = 4.3 V, All Temps

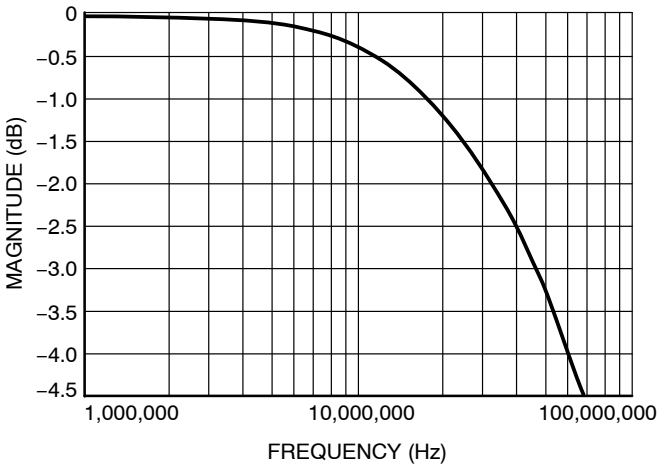


Figure 3. Bandwidth vs. Frequency

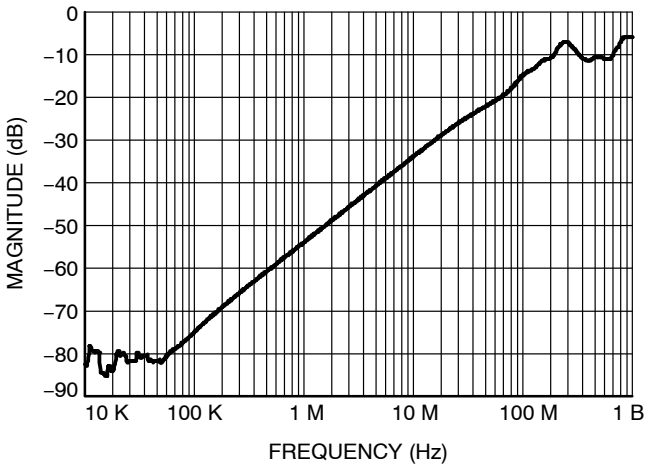


Figure 4. Cross−Talk vs. Frequency @ 25°C

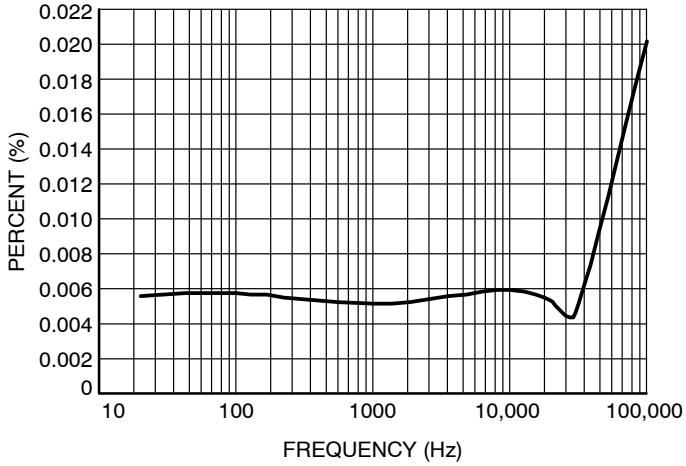


Figure 5. THD vs. Frequency @ Vin = 1 Vpp

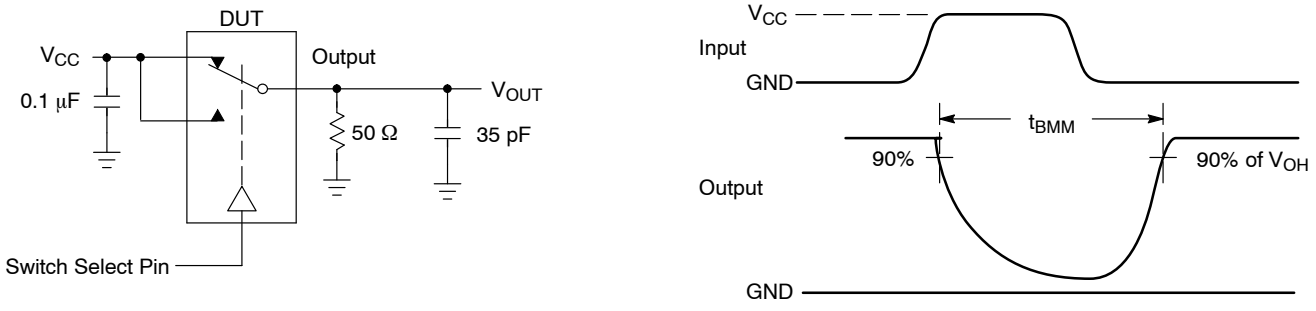


Figure 6. t_{BBM} (Time Break−Before−Make)

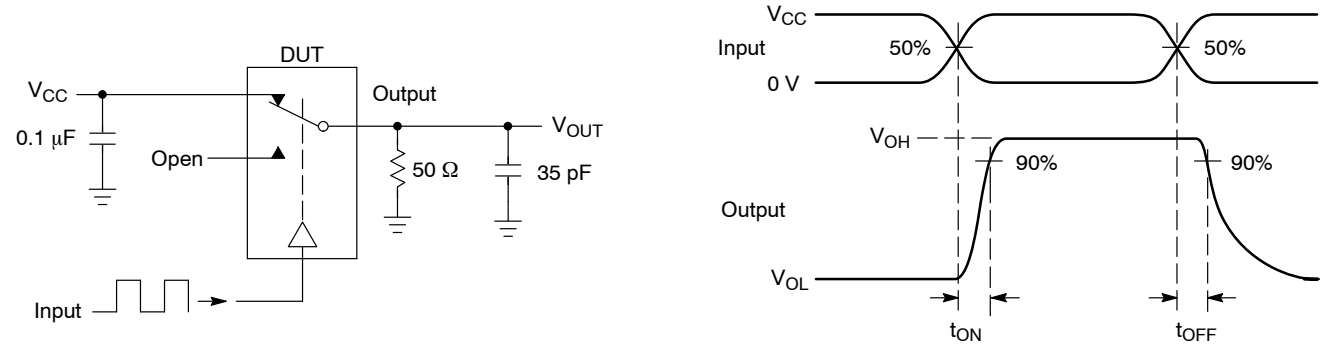


Figure 7. t_{ON}/t_{OFF}

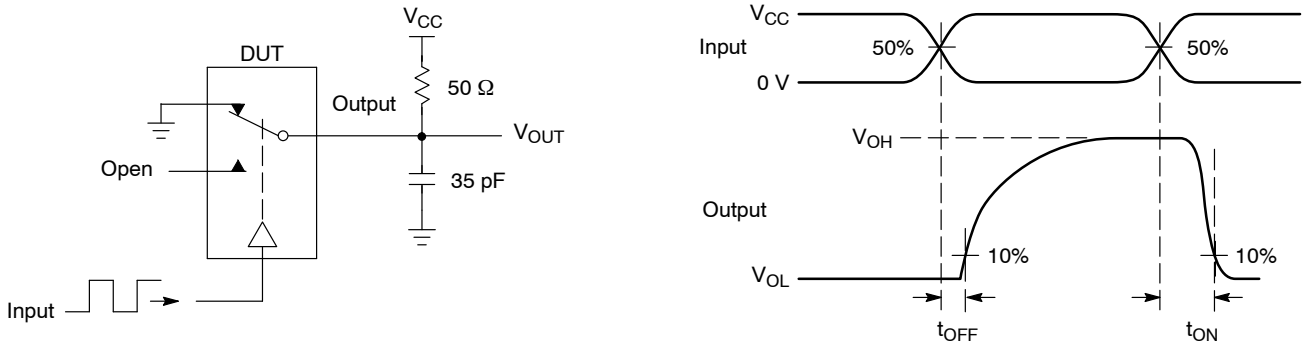
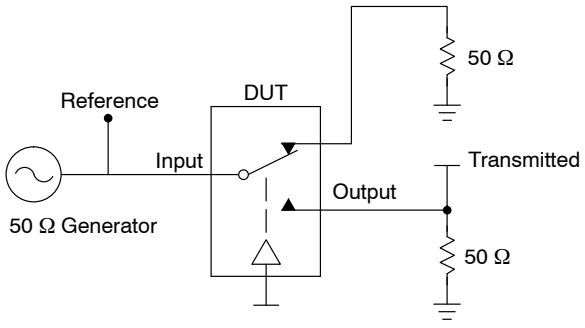


Figure 8. t_{ON}/t_{OFF}



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

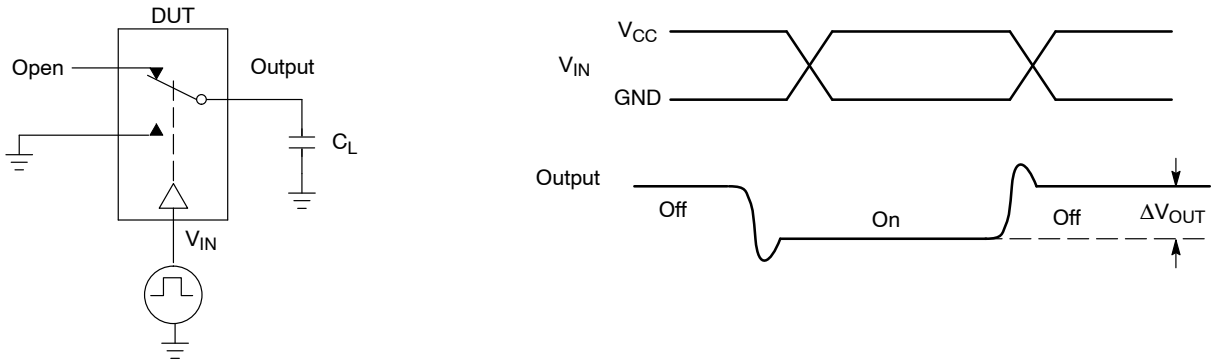


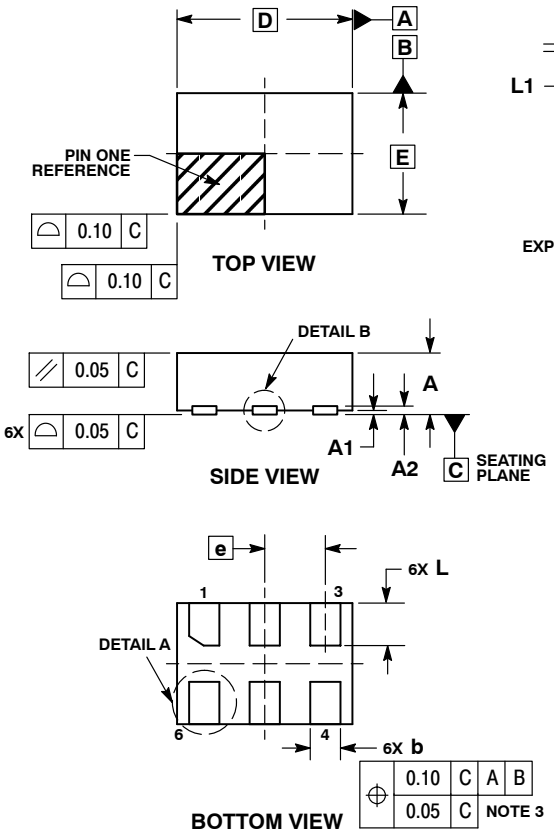
Figure 10. Charge Injection: (Q)

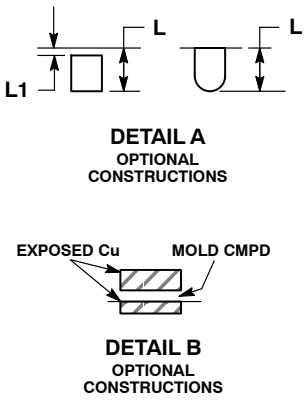
MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

UDFN6, 1.45x1.0, 0.5P
CASE 517AQ
ISSUE O

SCALE 4:1

DATE 15 MAY 2008

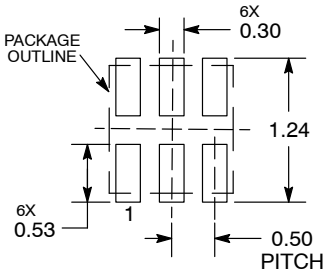




NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 mm FROM THE TERMINAL TIP.

	MILLIMETERS	
DIM	MIN	MAX
A	0.45	0.55
A1	0.00	0.05
A2	0.07 REF	
b	0.20	0.30
D	1.45 BSC	
E	1.00 BSC	
e	0.50 BSC	
L	0.30	0.40
L1	---	0.15

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.

GENERIC MARKING DIAGRAM*

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.

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DESCRIPTION:	**UDFN6, 1.45x1.0, 0.5P**		**PAGE 1 OF 1**

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