

NTLUD3A50PZ

Power MOSFET

-20 V, -5.6 A, μ Cool™ Dual P-Channel, 2.0x2.0x0.55 mm UDFN Package

Features

- UDFN Package with Exposed Drain Pads for Excellent Thermal Conduction
- Low $R_{DS(on)}$
- Low Profile UDFN 2.0x2.0x0.55 mm for Board Space Saving
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

Applications

- High Side Load Switch
- Reverse Current Protection
- Battery Switch
- Optimized for Power Management Applications for Portable Products, such as Cell Phones, PMP, DSC, GPS, and others

MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise stated)

Parameter		Symbol	Value	Units	
Drain-to-Source Voltage		V_{DSS}	-20	V	
Gate-to-Source Voltage		V_{GS}	± 8.0	V	
Continuous Drain Current (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	I_D	-4.4	A
				$T_A = 85^\circ\text{C}$	
	$t \leq 5$ s	$T_A = 25^\circ\text{C}$	-5.6		
Power Dissipation (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	P_D	1.4	W
				$T_A = 25^\circ\text{C}$	
	$t \leq 5$ s	$T_A = 25^\circ\text{C}$			
Continuous Drain Current (Note 2)	Steady State	$T_A = 25^\circ\text{C}$	I_D	-2.8	A
		$T_A = 85^\circ\text{C}$		-2.0	
Power Dissipation (Note 2)		$T_A = 25^\circ\text{C}$	P_D	0.5	W
Pulsed Drain Current		$t_p = 10 \mu\text{s}$	I_{DM}	-13	A
Operating Junction and Storage Temperature		T_J, T_{STG}	-55 to 150	$^\circ\text{C}$	
ESD (HBM, JESD22-A114) (MM, JESD22-A114)		V_{ESD}	1400 200	V	
Source Current (Body Diode) (Note 2)		I_S	-1.0	A	
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)		T_L	260	$^\circ\text{C}$	

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. Surface Mounted on FR4 Board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces) based on both FETs on.
2. Surface-mounted on FR4 board using the minimum recommended pad size of 30 mm², 1 oz. Cu based on both FETs on.

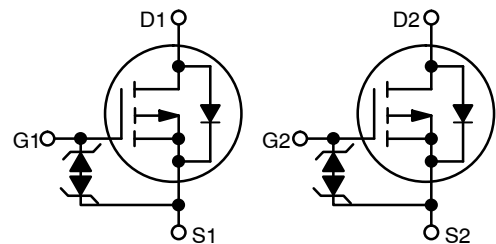


ON Semiconductor®

<http://onsemi.com>

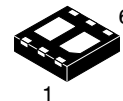
MOSFET

$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	I_D MAX
-20 V	50 m Ω @ -4.5 V	-5.6 A
	70 m Ω @ -2.5 V	
	115 m Ω @ -1.8 V	
	175 m Ω @ -1.5 V	

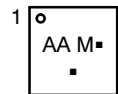


P-Channel MOSFET

MARKING DIAGRAM



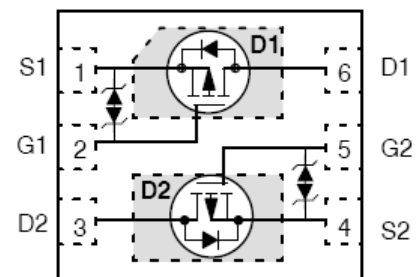
UDFN6
CASE 517BF
 μ COOL™



AA = Specific Device Code
M = Date Code
▪ = Pb-Free Package

(Note: Microdot may be in either location)

PIN CONNECTIONS



(Top View)

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

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THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Units
Junction-to-Ambient – Steady State (Note 3)	$R_{\theta JA}$	91	°C/W
Junction-to-Ambient – $t \leq 5$ s (Note 3)	$R_{\theta JA}$	57	
Junction-to-Ambient – Steady State min Pad (Note 4)	$R_{\theta JA}$	228	

ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = -250\ \mu\text{A}$	-20			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$	$I_D = -250\ \mu\text{A}, \text{ref to } 25^\circ\text{C}$		-13		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0\text{ V}, V_{DS} = -20\text{ V}$			-1.0	μA
Gate-to-Source Leakage Current	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 5.0\text{ V}$			± 5.0	μA

ON CHARACTERISTICS (Note 5)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = -250\ \mu\text{A}$	-0.4		-1.0	V
Negative Threshold Temp. Coefficient	$V_{GS(TH)}/T_J$			3.0		mV/°C
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = -4.5\text{ V}, I_D = -4.0\text{ A}$		37	50	m Ω
		$V_{GS} = -2.5\text{ V}, I_D = -3.0\text{ A}$		46	70	
		$V_{GS} = -1.8\text{ V}, I_D = -2.0\text{ A}$		63	115	
		$V_{GS} = -1.5\text{ V}, I_D = -1.0\text{ A}$		86	175	
Forward Transconductance	g_{FS}	$V_{DS} = -5.0\text{ V}, I_D = -3.0\text{ A}$		16		S

CHARGES AND CAPACITANCES

Input Capacitance	C_{ISS}	$V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{DS} = -15\text{ V}$		920		pF
Output Capacitance	C_{OSS}			85		
Reverse Transfer Capacitance	C_{RSS}			80		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = -4.5\text{ V}, V_{DS} = -15\text{ V}; I_D = -3.0\text{ A}$		10.4		nC
Threshold Gate Charge	$Q_{G(TH)}$			0.5		
Gate-to-Source Charge	Q_{GS}			1.2		
Gate-to-Drain Charge	Q_{GD}			3.0		

SWITCHING CHARACTERISTICS, $V_{GS} = 4.5\text{ V}$ (Note 6)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = -4.5\text{ V}, V_{DD} = -15\text{ V}, I_D = -3.0\text{ A}, R_G = 1\ \Omega$		7.0		ns
Rise Time	t_r			12		
Turn-Off Delay Time	$t_{d(OFF)}$			39		
Fall Time	t_f			30		

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	VSD	$V_{GS} = 0\text{ V}, I_S = -1.0\text{ A}$	$T_J = 25^\circ\text{C}$		-0.67	-1.0	V
			$T_J = 125^\circ\text{C}$		-0.56		
Reverse Recovery Time	t_{RR}	$V_{GS} = 0\text{ V}, \text{dis}/\text{dt} = 100\text{ A}/\mu\text{s}, I_S = -1.0\text{ A}$			12.1		ns
Charge Time	t_a				6.4		
Discharge Time	t_b				5.7		
Reverse Recovery Charge	Q_{RR}				4.0		nC

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.

- Surface-mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces) based on both FETs on.
- Surface-mounted on FR4 board using the minimum recommended pad size of 30 mm², 1 oz. Cu based on both FETs on.
- Pulse Test: pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.
- Switching characteristics are independent of operating junction temperatures.

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TYPICAL CHARACTERISTICS

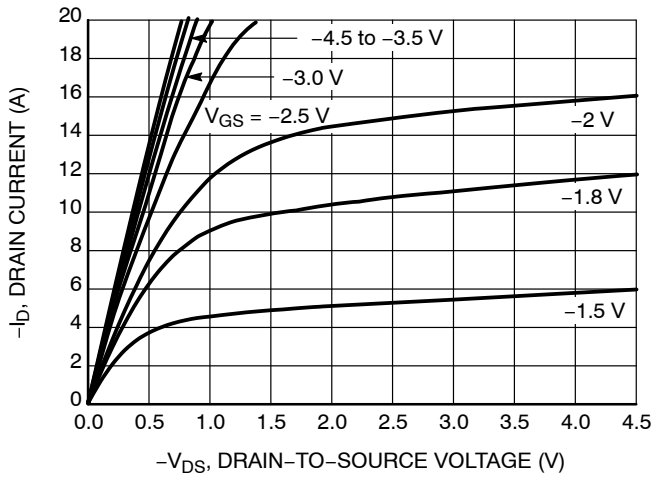


Figure 1. On-Region Characteristics

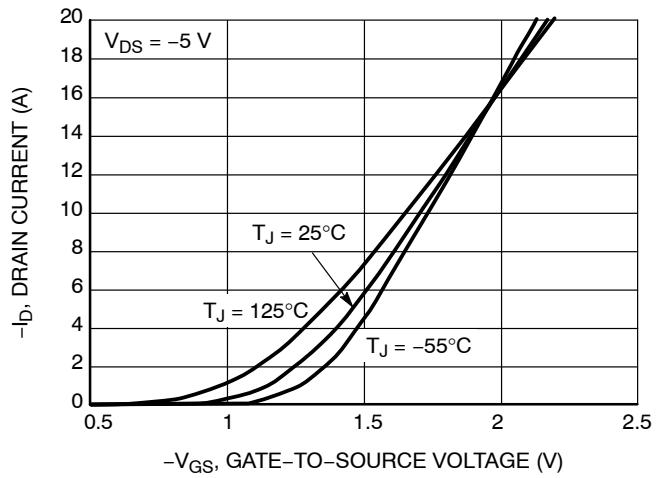


Figure 2. Transfer Characteristics

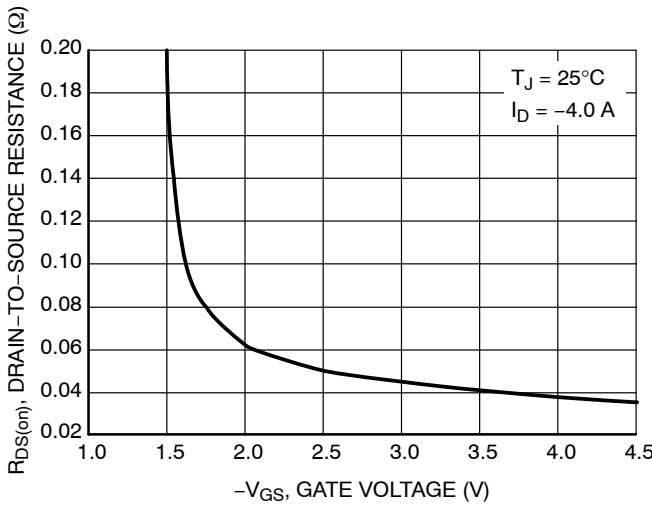


Figure 3. On-Resistance vs. Gate-to-Source Voltage

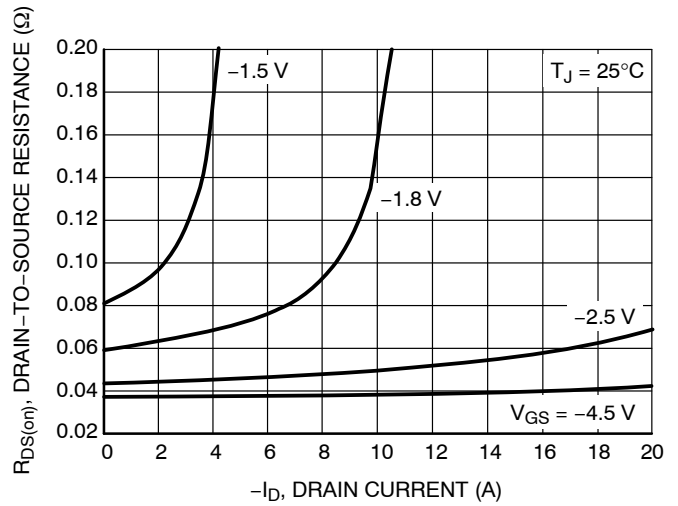


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

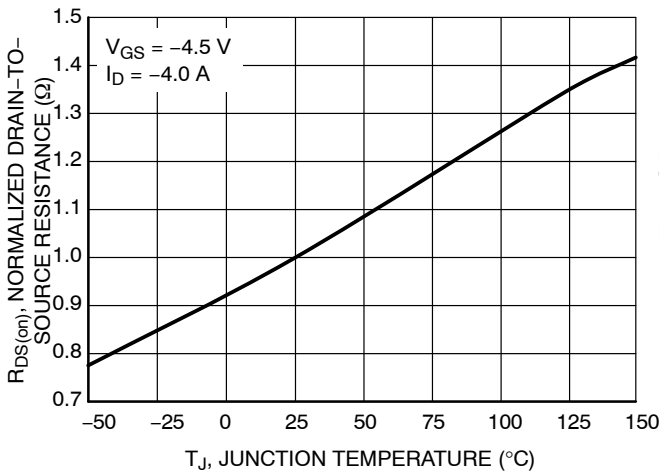


Figure 5. On-Resistance Variation with Temperature

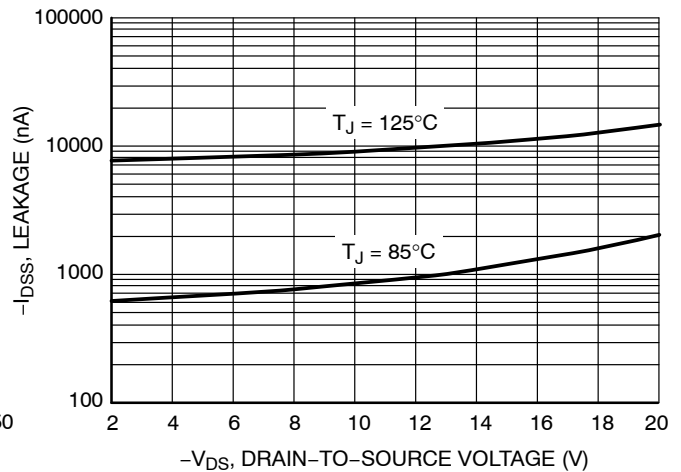
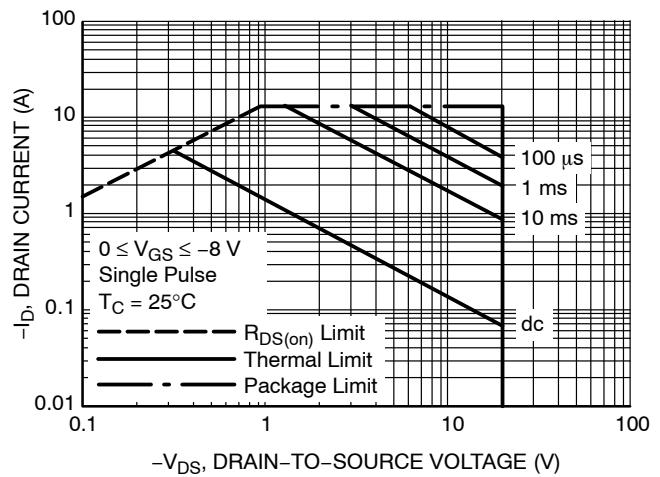
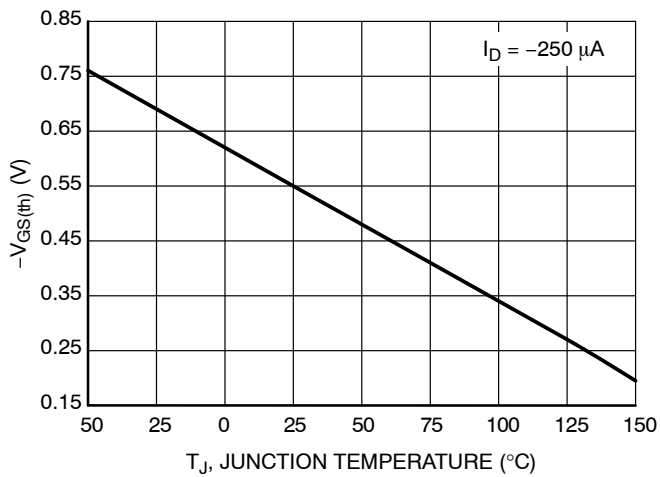
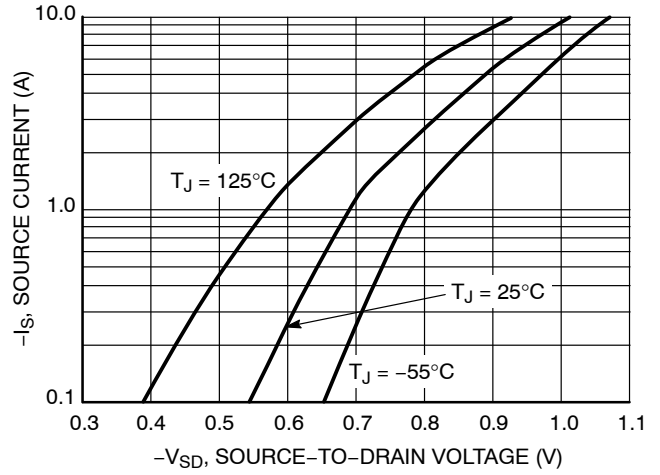
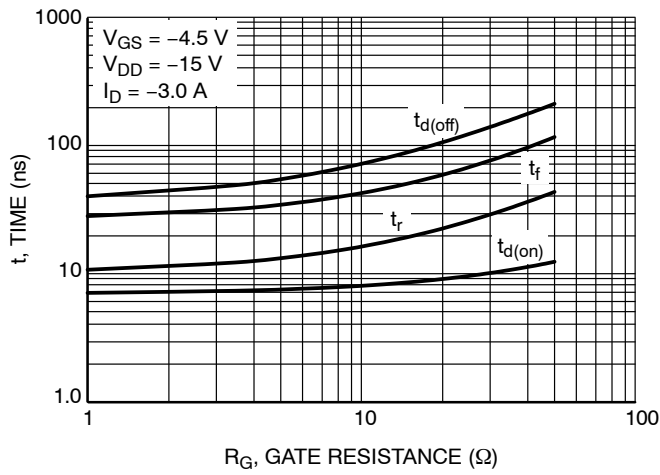
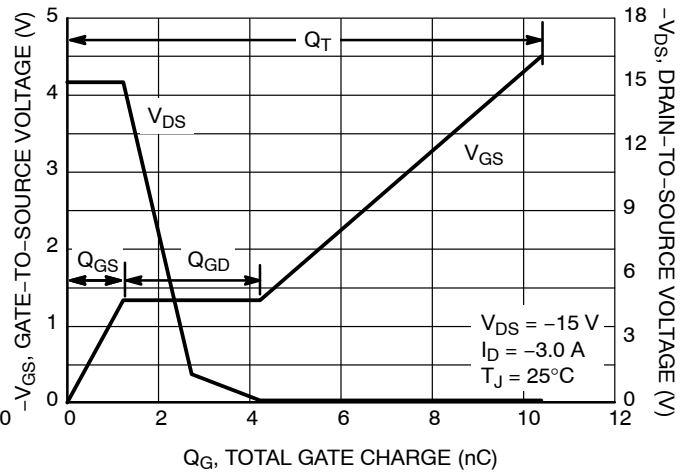
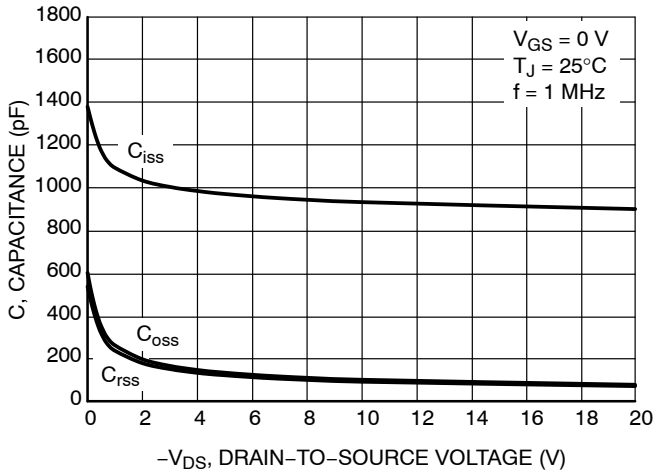


Figure 6. Drain-to-Source Leakage Current vs. Voltage

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TYPICAL CHARACTERISTICS



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TYPICAL CHARACTERISTICS

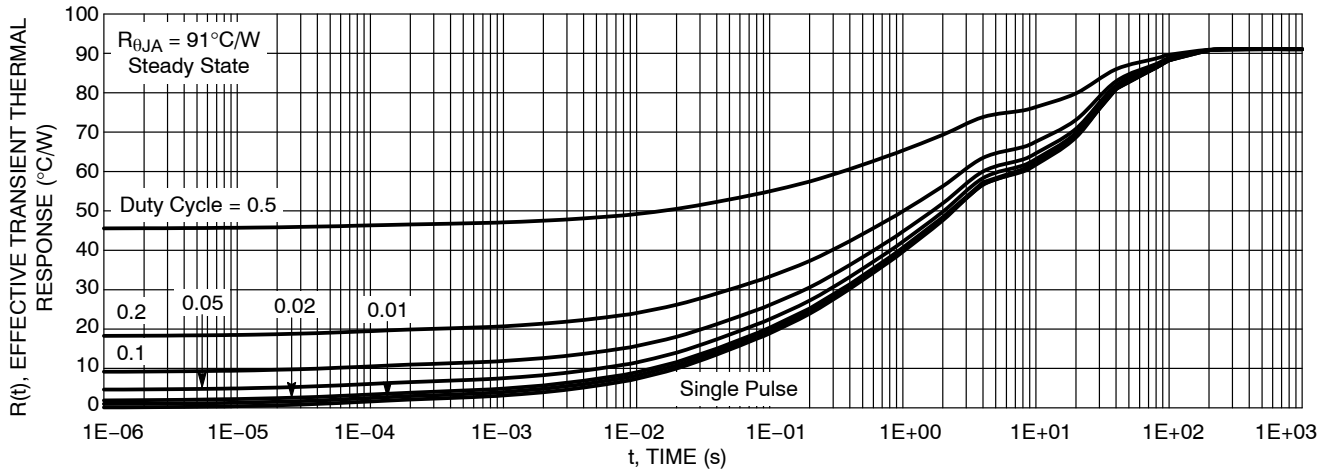


Figure 13. FET Thermal Response

DEVICE ORDERING INFORMATION

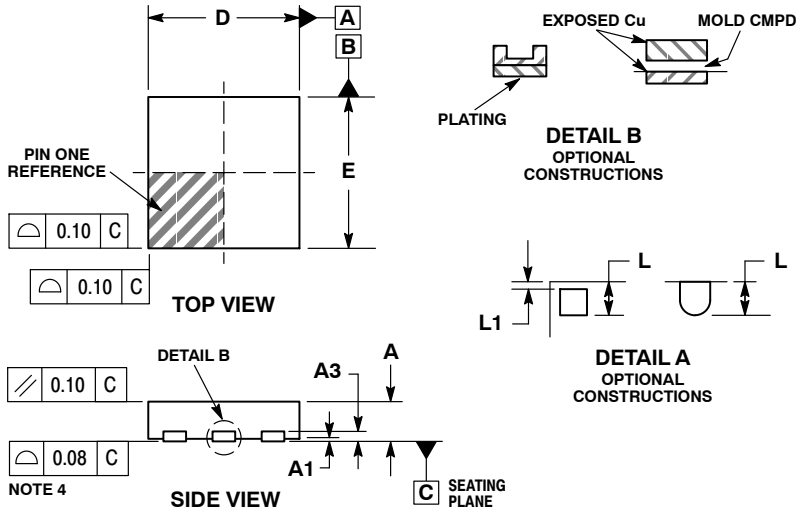
Device	Package	Shipping [†]
NTLUD3A50PZTAG	UDFN6 (Pb-Free)	3000 / Tape & Reel
NTLUD3A50PZTBG	UDFN6 (Pb-Free)	3000 / Tape & Reel

[†]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.

NTLUD3A50PZ

PACKAGE DIMENSIONS

UDFN6 2x2, 0.65P
CASE 517BF
ISSUE B

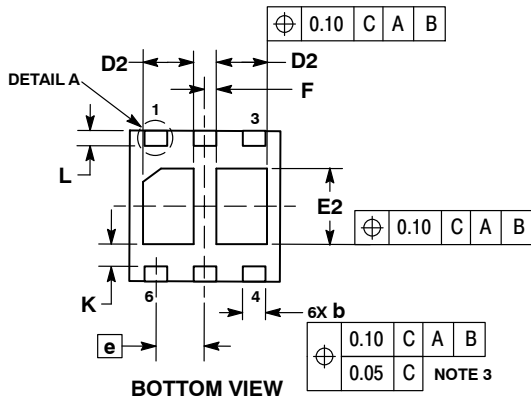
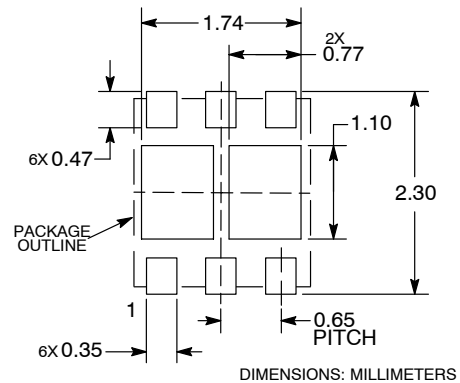


NOTES:

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.
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	0.13 REF	
b	0.25	0.35
D	2.00 BSC	
D2	0.57	0.77
E	2.00 BSC	
E2	0.90	1.10
e	0.65 BSC	
F	0.15 BSC	
K	0.25 REF	
L	0.20	0.30
L1	---	0.10

RECOMMENDED MOUNTING FOOTPRINT



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