

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
		$T_A = 85^{\circ}\text{C}$		−3.2	
	$t \leq 5\text{ s}$	$T_A = 25^{\circ}\text{C}$		−5.6	
Power Dissipation (Note 1)	Steady State	$T_A = 25^{\circ}\text{C}$	P_D	1.4	W
	$t \leq 5\text{ s}$	$T_A = 25^{\circ}\text{C}$		2.2	
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		$t_p = 10\text{ }\mu\text{s}$	I_{DM}	−13	A
Operating Junction and Storage Temperature			T_J , T_{STG}	−55 to 150	$^{\circ}\text{C}$
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 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. 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.

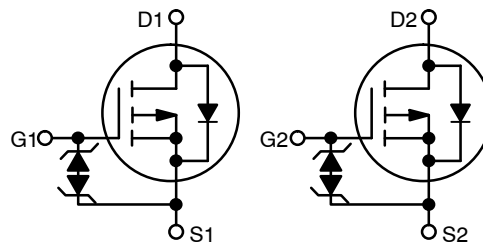


ON Semiconductor®

<http://onsemi.com>

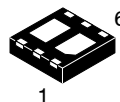
MOSFET

$V_{(BR)DS}$	$R_{DS(on)}$ 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	

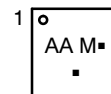


P-Channel MOSFET

MARKING DIAGRAM



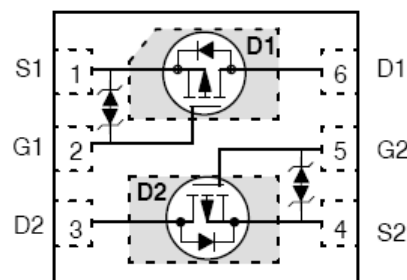
UDFN6
CASE 517BF
 μ COOL™



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	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$	-20			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$	$I_D = -250\text{ }\mu\text{A}$, ref to 25°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	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = -250\text{ }\mu\text{A}$	-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	$t_{d(ON)}$	$V_{GS} = -4.5\text{ V}, V_{DD} = -15\text{ V}, I_D = -3.0\text{ A}, R_G = 1\text{ }\Omega$		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}	$V_{GS} = 0\text{ V}, \text{dis}/dt = 100\text{ A}/\mu\text{s},$ $I_S = -1.0\text{ A}$			12.1		ns
Charge Time	t_a				6.4		
Discharge Time	t_b				5.7		
Reverse Recovery Charge	Q_{RR}				4.0		nC

3. 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.

4. Surface-mounted on FR4 board using the minimum recommended pad size of 30 mm², 1 oz. Cu based on both FETs on.

5. Pulse Test: pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.

6. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

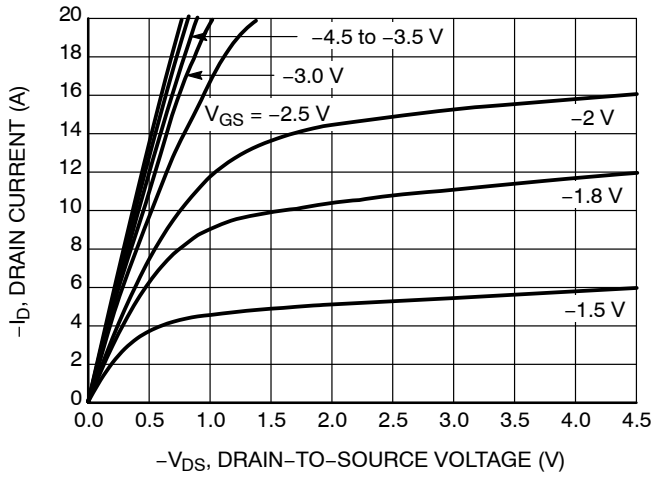


Figure 1. On-Region Characteristics

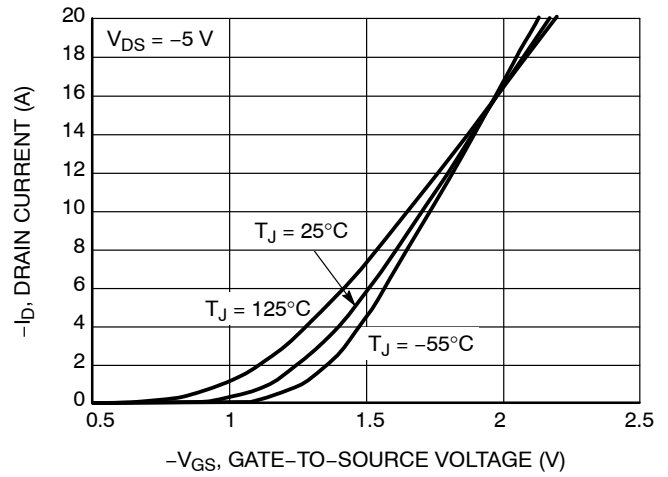


Figure 2. Transfer Characteristics

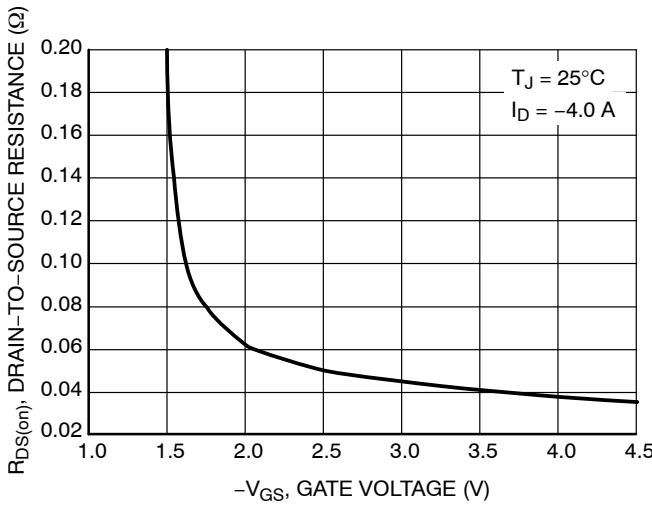


Figure 3. On-Resistance vs. Gate-to-Source Voltage

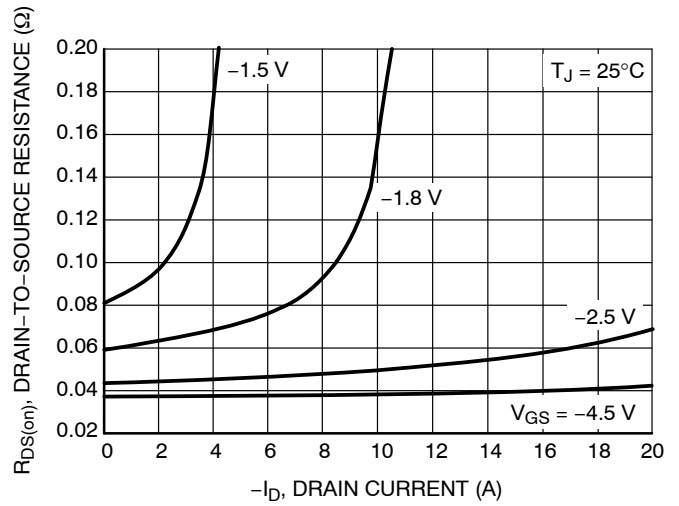


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

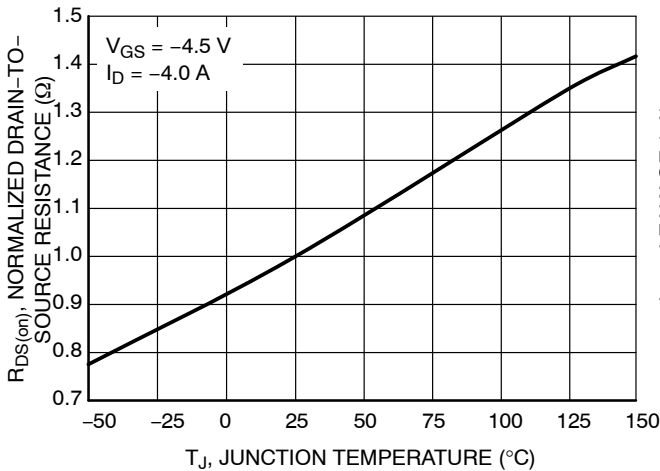


Figure 5. On-Resistance Variation with Temperature

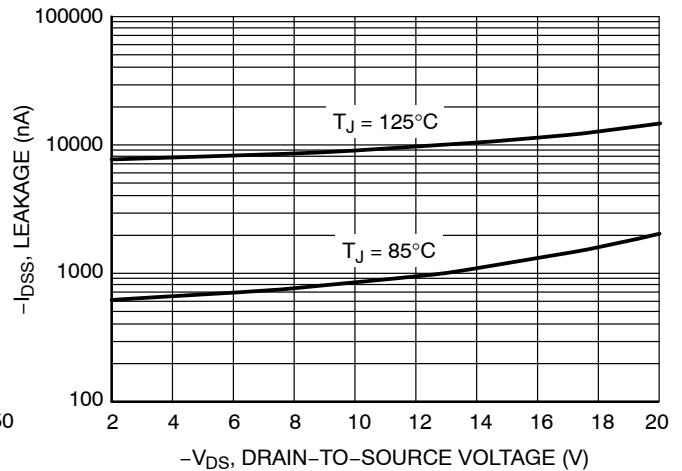


Figure 6. Drain-to-Source Leakage Current vs. Voltage

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TYPICAL CHARACTERISTICS

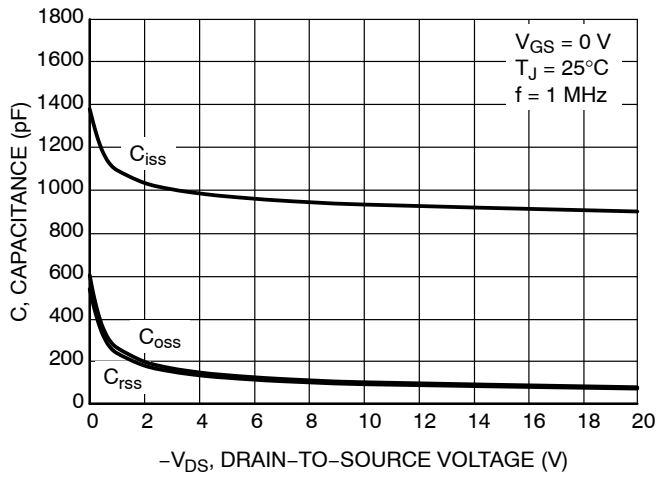


Figure 7. Capacitance Variation

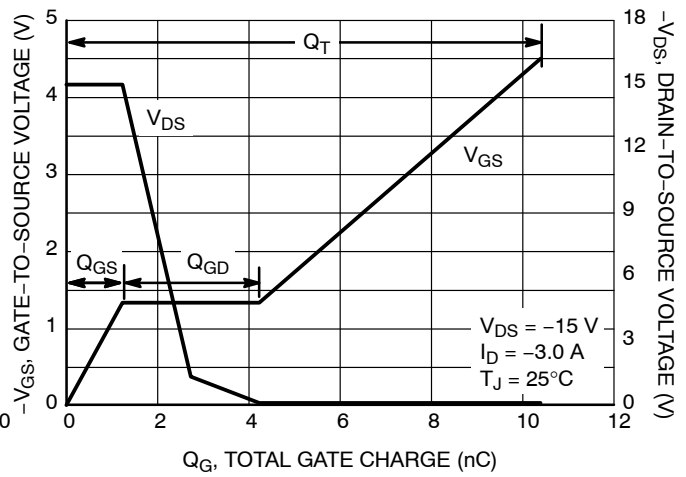


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

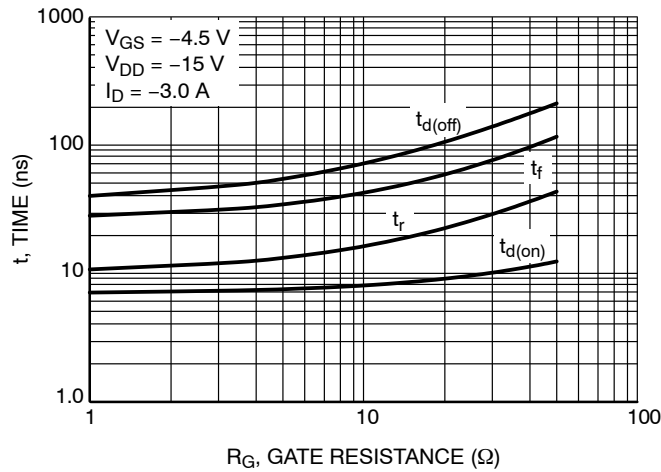


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

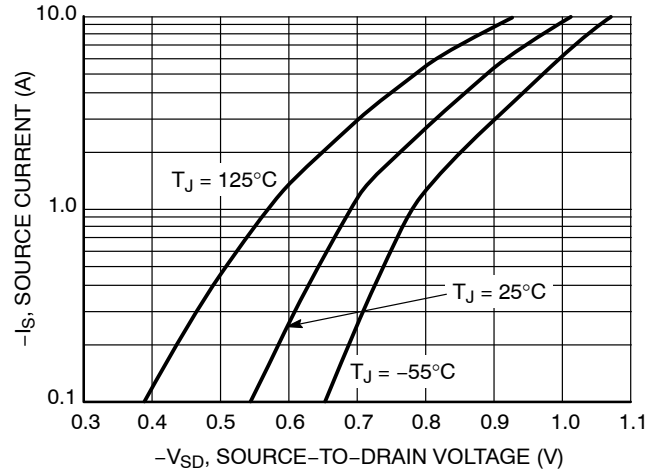


Figure 10. Diode Forward Voltage vs. Current

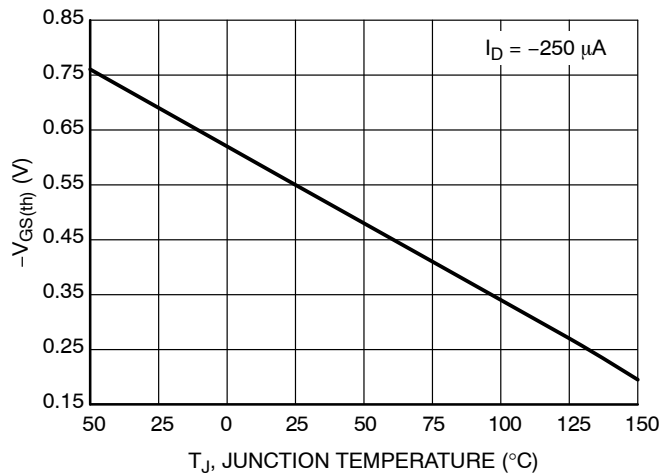


Figure 11. Threshold Voltage

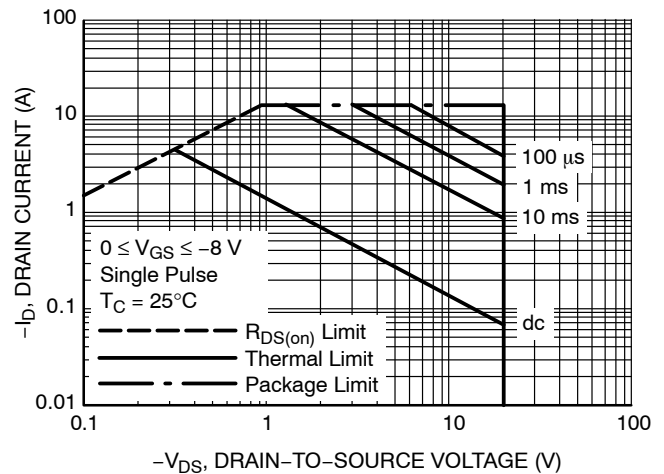


Figure 12. Maximum Rated Forward Biased Safe Operating Area

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TYPICAL CHARACTERISTICS

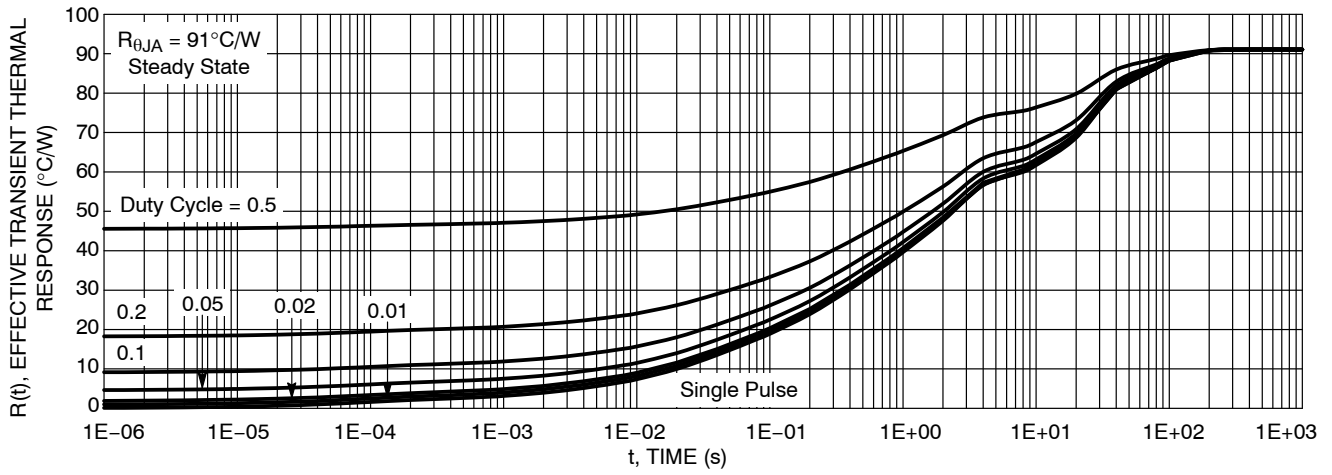


Figure 13. FET Thermal Response

DEVICE ORDERING INFORMATION

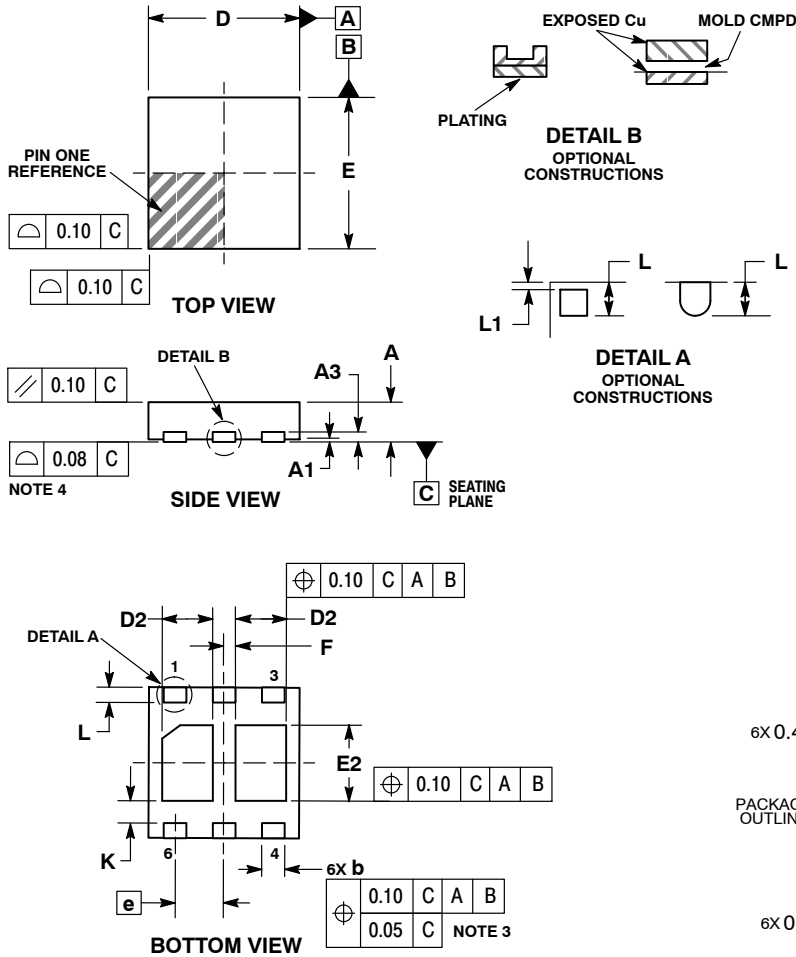
Device	Package	Shipping [†]
NTLUD3A50PZTAG	UDFN6 (Pb-Free)	3000 / Tape & Reel
NTLUD3A50PZTBG	UDFN6 (Pb-Free)	3000 / Tape & Reel

[†]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

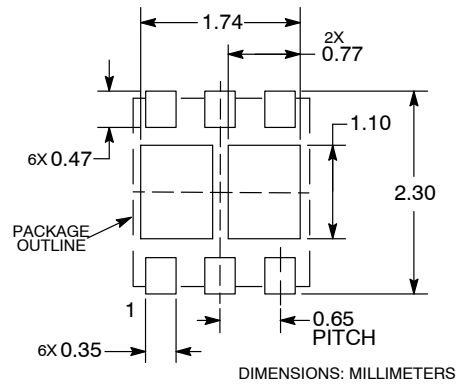


NOTES:

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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