NTLUS3A90PZ

MOSFET – Power, Single, P-Channel, ESD, μCool, UDFN, 1.6x1.6x0.55 mm
-20 V, -5.0 A

ON Semiconductor®

http://onsemi.com

Features

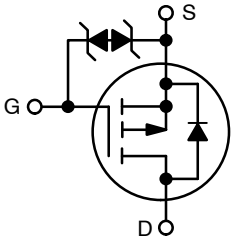
- UDFN Package with Exposed Drain Pads for Excellent Thermal Conduction
- Low Profile UDFN 1.6x1.6x0.55 mm for Board Space Saving
- Lowest RDS(on) in 1.6x1.6 Package
- ESD Protected
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

Applications

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

MOSFET

$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	I_D MAX
−20 V	62 mΩ @ −4.5 V	−5.0 A
	95 mΩ @ −2.5 V	
	140 mΩ @ −1.8 V	
	230 mΩ @ −1.5 V	



P−Channel MOSFET

MAXIMUM RATINGS (T_J = 25°C unless otherwise stated)

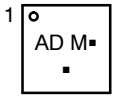
Parameter			Symbol	Value	Units
Drain-to-Source Voltage			V_{DSS}	−20	V
Gate-to-Source Voltage			V_{GS}	±8.0	V
Continuous Drain Current (Note 1)	Steady State	T_A = 25°C	I_D	−4.0	A
		T_A = 85°C		−2.9	
	t ≤ 5 s	T_A = 25°C		−5.0	
Power Dissipation (Note 1)	Steady State	T_A = 25°C	P_D	1.5	W
	t ≤ 5 s	T_A = 25°C		2.3	
Continuous Drain Current (Note 2)	Steady State	T_A = 25°C	I_D	−2.6	A
		T_A = 85°C		−1.9	
Power Dissipation (Note 2)		T_A = 25°C	P_D	0.6	W
Pulsed Drain Current		tp = 10 μs	I_{DM}	−17	A
Operating Junction and Storage Temperature			T_J, T_{STG}	-55 to 150	°C
Source Current (Body Diode) (Note 2)			I_S	−0.84	A
Lead Temperature for Soldering Purposes (1/8″ from case for 10 s)			T_L	260	°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 [2 oz] including traces).
2. Surface-mounted on FR4 board using the minimum recommended pad size of 30 mm^2, 2 oz. Cu.

MARKING DIAGRAM

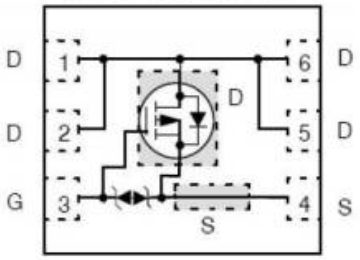
UDFN6
CASE 517AU
μCOOL™



AD = 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)	$R_{\theta JA}$	84	°C/W
Junction-to-Ambient – t ≤ 5 s (Note 3)	$R_{\theta JA}$	55	
Junction-to-Ambient – Steady State min Pad (Note 4)	$R_{\theta JA}$	200	

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified)

Parameter	Symbol	Test Condition		Min	Typ	Max	Units
OFF CHARACTERISTICS							
Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = −250 μA		−20			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$	I_D = −250 μA, ref to 25°C			−8.0		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0 V, V_{DS} = −20 V	T_J = 25°C			−1.0	μA
			T_J = 85°C			−10	
Gate-to-Source Leakage Current	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±8.0 V				±10	μA
ON CHARACTERISTICS (Note 5)							
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = −250 μA		−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 V, I_D = −4.0 A			54	62	mΩ
		V_{GS} = −2.5 V, I_D = −2.0 A			74	95	
		V_{GS} = −1.8 V, I_D = −1.2 A			104	140	
		V_{GS} = −1.5 V, I_D = −0.5 A			137	230	
Forward Transconductance	g_{FS}	V_{DS} = −10 V, I_D = −3.0 A			10		S
CHARGES, CAPACITANCES & GATE RESISTANCE							
Input Capacitance	C_{ISS}	V_{GS} = 0 V, f = 1 MHz, V_{DS} = −10 V			950		pF
Output Capacitance	C_{OSS}				90		
Reverse Transfer Capacitance	C_{RSS}				85		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = −4.5 V, V_{DS} = −10 V; I_D = −3.0 A			12.3		nC
Threshold Gate Charge	$Q_{G(TH)}$				0.9		
Gate-to-Source Charge	Q_{GS}				1.6		
Gate-to-Drain Charge	Q_{GD}				3.3		
SWITCHING CHARACTERISTICS, VGS = 4.5 V (Note 6)							
Turn-On Delay Time	$t_{d(ON)}$	V_{GS} = −4.5 V, V_{DD} = −10 V, I_D = −3.0 A, R_G = 1 Ω			7.9		ns
Rise Time	t_r				15.7		
Turn-Off Delay Time	$t_{d(OFF)}$				34.8		
Fall Time	t_f				28.5		
DRAIN-SOURCE DIODE CHARACTERISTICS							
Forward Diode Voltage	VSD	V_{GS} = 0 V, I_S = −1.0 A	T_J = 25°C		0.74	1.2	V
			T_J = 125°C		0.62		
Reverse Recovery Time	t_{RR}	V_{GS} = 0 V, dis/dt = 100 A/μs, I_S = −1.0 A			11.8		ns
Charge Time	t_a				8.5		
Discharge Time	t_b				3.3		
Reverse Recovery Charge	Q_{RR}				6.0		nC

3. Surface-mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [2 oz] including traces).
4. Surface-mounted on FR4 board using the minimum recommended pad size of 30 mm^2, 2 oz. Cu.
5. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.
6. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

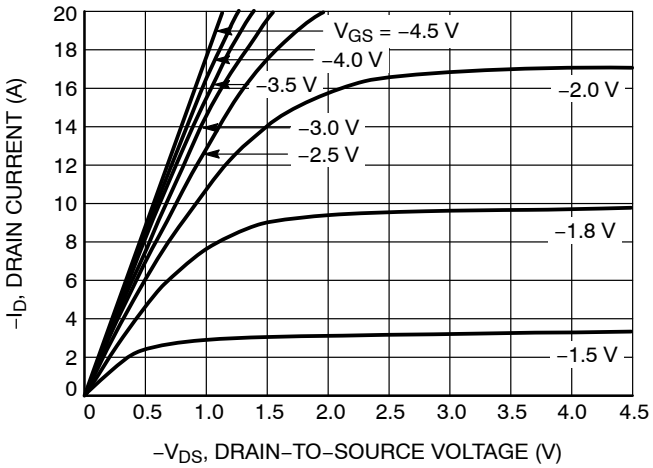


Figure 1. On−Region Characteristics

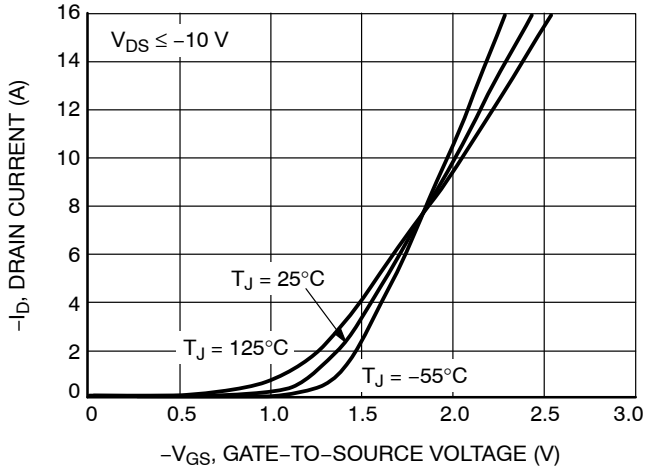


Figure 2. Transfer Characteristics

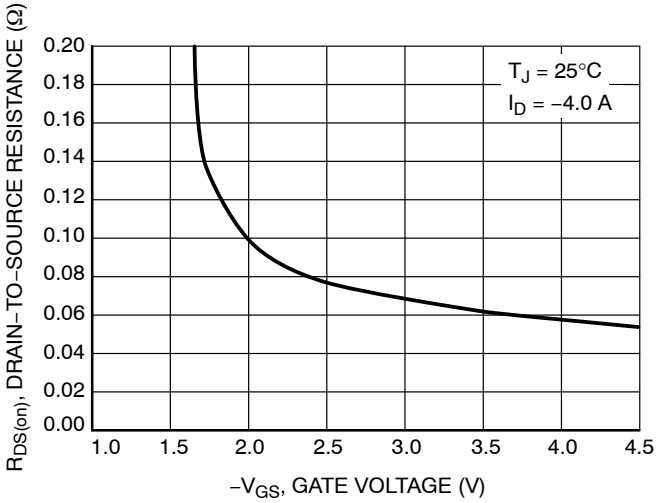


Figure 3. On−Resistance vs. Gate−to−Source Voltage

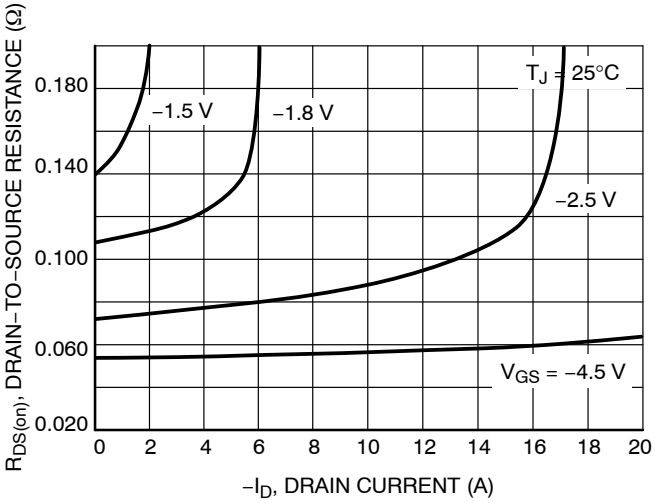


Figure 4. On−Resistance vs. Drain Current and Gate Voltage

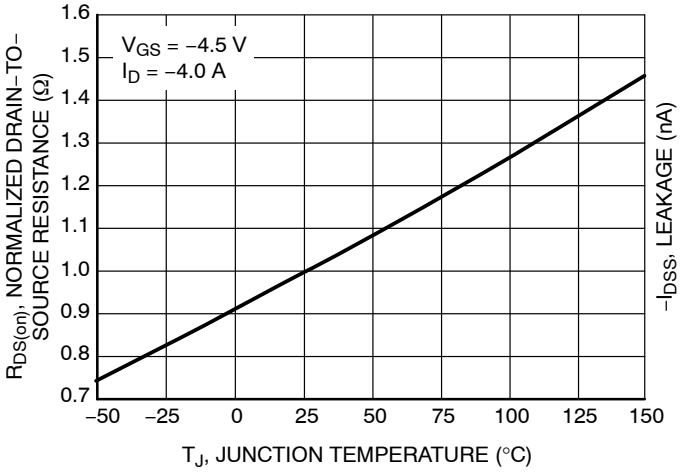


Figure 5. On−Resistance Variation with Temperature

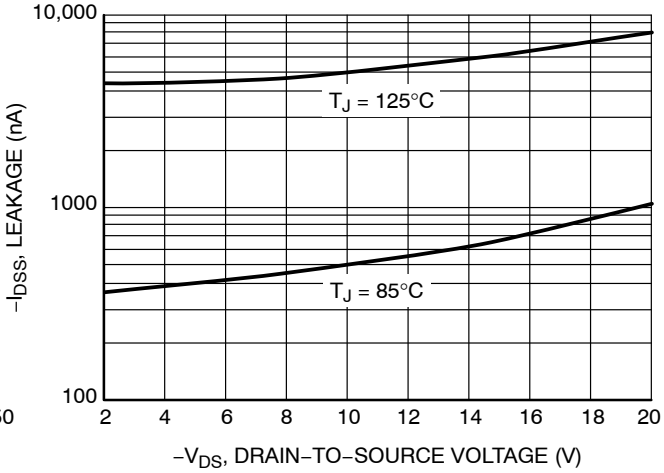


Figure 6. Drain−to−Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

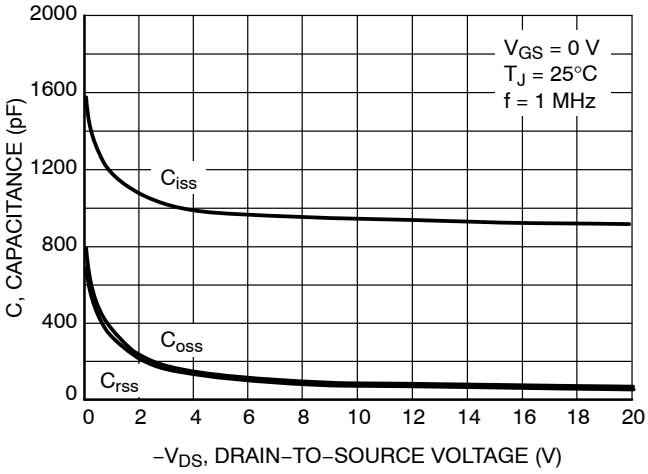


Figure 7. Capacitance Variation

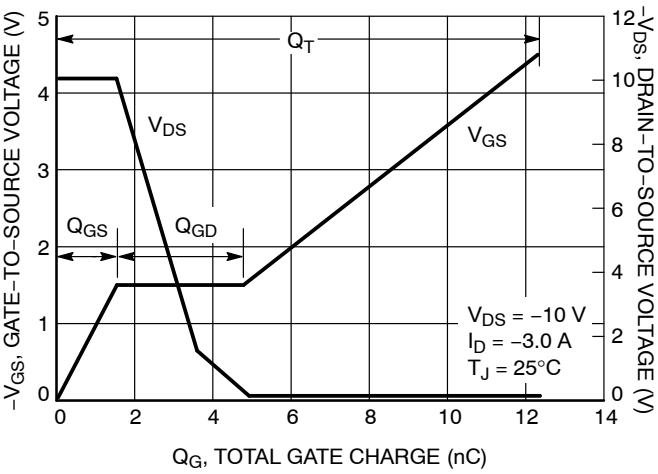


Figure 8. Gate−to−Source and Drain−to−Source Voltage vs. Total Charge

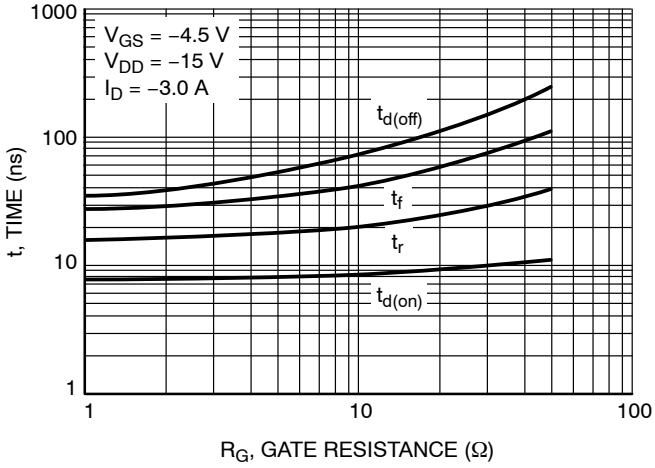


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

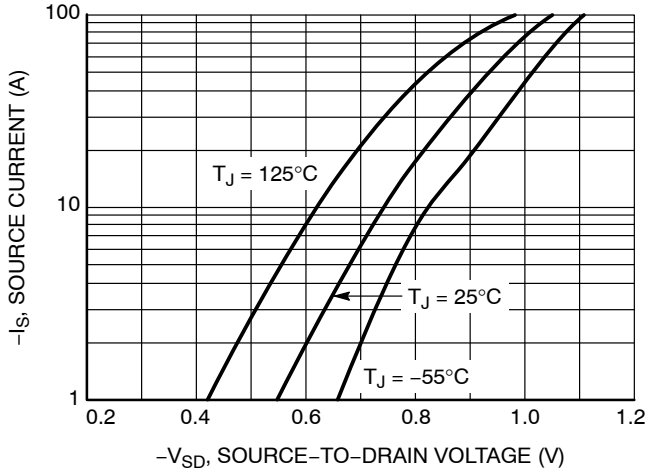


Figure 10. Diode Forward Voltage vs. Current

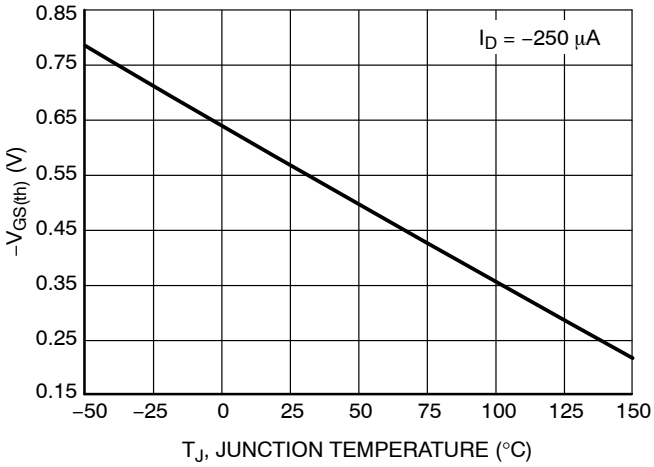


Figure 11. Threshold Voltage

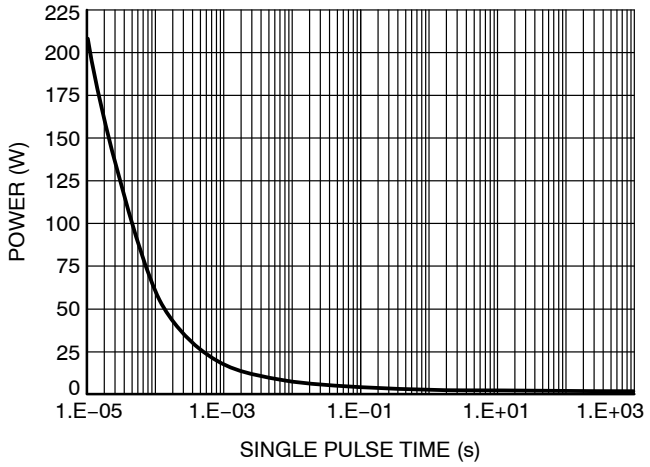


Figure 12. Single Pulse Maximum Power Dissipation

TYPICAL CHARACTERISTICS

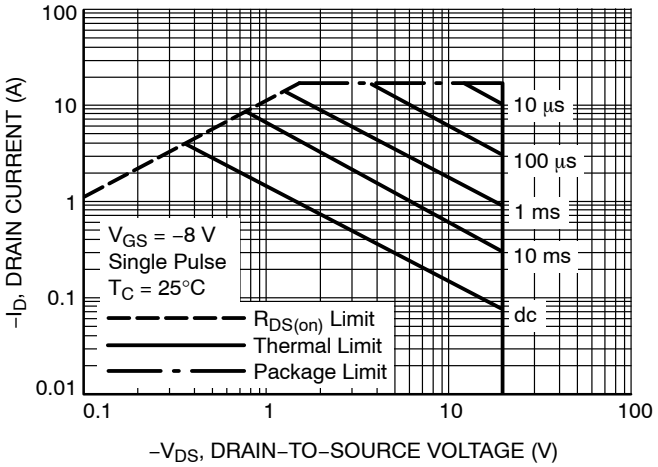


Figure 13. Maximum Rated Forward Biased Safe Operating Area

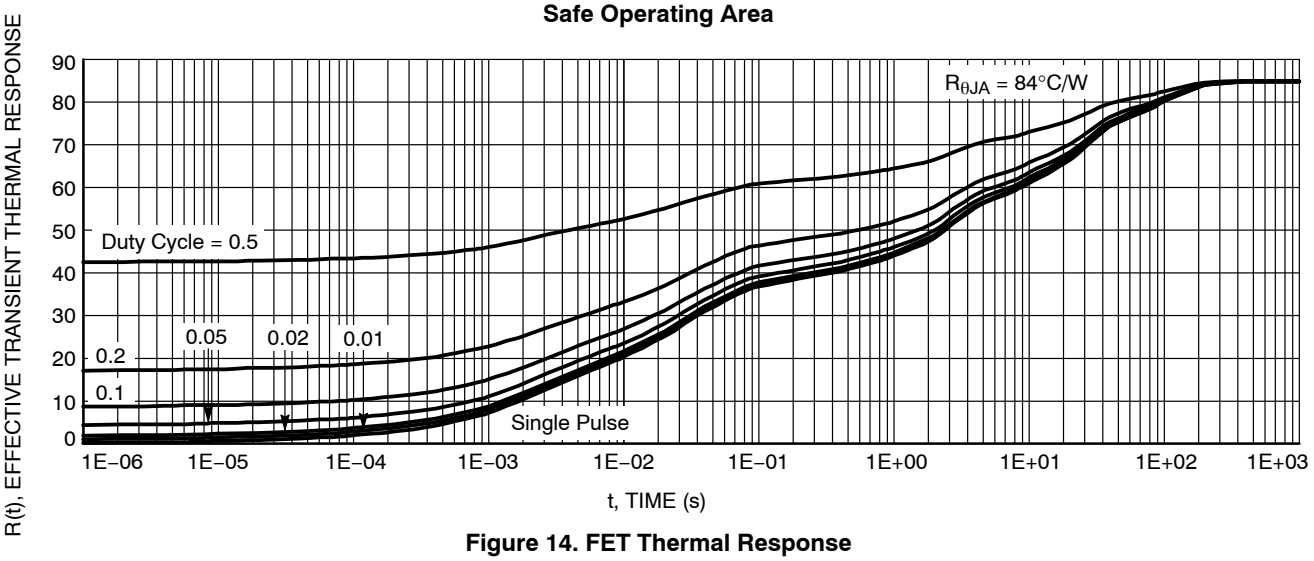


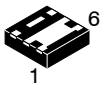
Figure 14. FET Thermal Response

DEVICE ORDERING INFORMATION

Device	Package	Shipping†
NTLUS3A90PZTAG	UDFN6 (Pb−Free)	3000 / Tape & Reel
NTLUS3A90PZTBG	UDFN6 (Pb−Free)	3000 / Tape & Reel

μCool is a trademark of Semiconductor Components Industries, LLC (SCILLC).

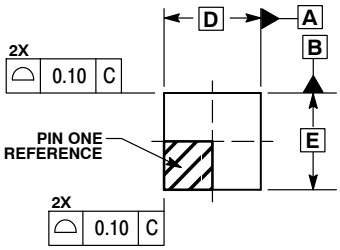
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.



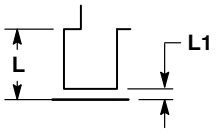
SCALE 4:1

UDFN6 1.6x1.6, 0.5P
CASE 517AU
ISSUE O

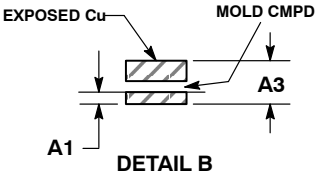
DATE 16 OCT 2008



TOP VIEW



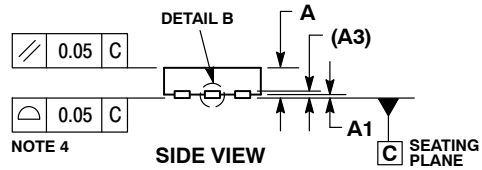
DETAIL A
OPTIONAL CONSTRUCTION



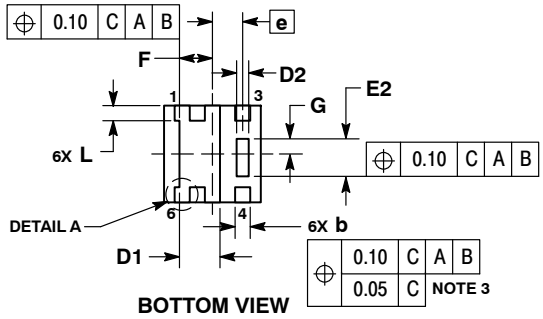
DETAIL B
OPTIONAL CONSTRUCTION

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 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	0.13 REF	
b	0.20	0.30
D	1.60 BSC	
E	1.60 BSC	
e	0.50 BSC	
D1	0.62	0.72
D2	0.15	0.25
E2	0.57	0.67
F	0.55 BSC	
G	0.25 BSC	
L	0.20	0.30
L1	---	0.15

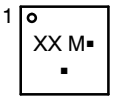


SIDE VIEW



BOTTOM VIEW

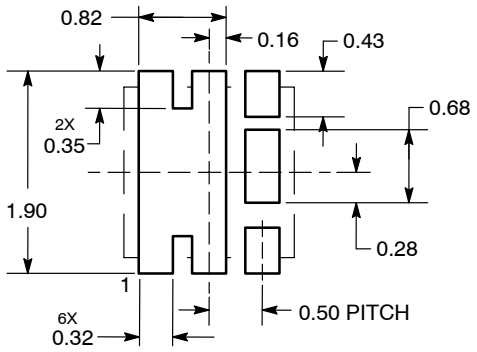
GENERIC MARKING DIAGRAM*



XX = Specific Device Code
M = Date Code
▪ = Pb−Free Package
(Note: Microdot may be in either location)

*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. Some products may not follow the Generic Marking.

SOLDERMASK DEFINED MOUNTING FOOTPRINT*



DIMENSIONS: MILLIMETERS

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

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DESCRIPTION:	UDFN6 1.6x1.6, 0.5P	PAGE 1 OF 1

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