

# NTLUS020N03C

## Power MOSFET

30 V, 13 mΩ, 8.2 A, Single N-Channel,  
1.6x1.6x0.55 mm μCool UDFN6 Package

### Features

- UDFN Package with Exposed Drain Pads for Excellent Thermal Conduction
- Low Profile UDFN 1.6 x 1.6 x 0.55 mm for Board Space Saving
- Ultra Low  $R_{DS(on)}$
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

### Applications

- Power Load Switch
- Wireless Charging
- DC-DC Converters
- Motor Drive

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

Parameter		Symbol	Value	Unit	
Drain-to-Source Voltage		$V_{DSS}$	30	V	
Gate-to-Source Voltage		$V_{GS}$	$\pm 20$	V	
Continuous Drain Current $R_{\theta JA}$ (Note 1, 3)	Steady State	$T_A = 25^\circ\text{C}$	$I_D$	8.2	A
		$T_A = 85^\circ\text{C}$		5.9	
		$T_A = 25^\circ\text{C}$	$P_D$	1.52	W
Continuous Drain Current $R_{\theta JA}$ (Note 2, 3)	Steady State	$T_A = 25^\circ\text{C}$	$I_D$	5.3	A
		$T_A = 85^\circ\text{C}$		3.8	
		$T_A = 25^\circ\text{C}$	$P_D$	0.65	W
Pulsed Drain Current		$t_p = 10 \mu\text{s}$	$I_{DM}$	24	A
Operating Junction and Storage Temperature		$T_J, T_{STG}$	-55 to 150	$^\circ\text{C}$	
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.

### THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
Junction-to-Ambient – Steady State (Note 1, 3)	$R_{\theta JA}$	82.5	$^\circ\text{C/W}$
Junction-to-Ambient – Steady State min Pad (Note 2, 3)	$R_{\theta JA}$	194.8	

1. Surface-mounted on FR4 board using 1 in<sup>2</sup> pad size, 2 oz Cu pad.
2. Surface-mounted on FR4 board using the min pad size, 2 oz Cu pad.
3. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
4. This device does not have ESD protection diode.

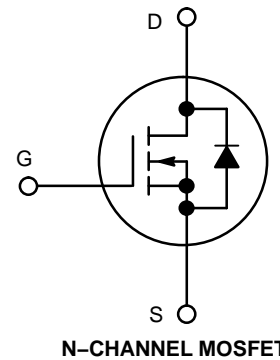


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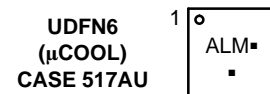
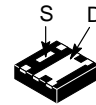
[www.onsemi.com](http://www.onsemi.com)

### MOSFET

$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	$I_D$ MAX
30 V	13 mΩ @ 10 V	8.2 A
	18 mΩ @ 4.5 V	



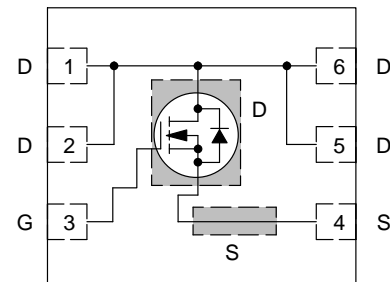
### MARKING DIAGRAM



AL = 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.

# NTLUS020N03C

## ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25°C unless otherwise specified)

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
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### OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	V <sub>(BR)DSS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA	30			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	V <sub>(BR)DSS</sub> /T <sub>J</sub>	I <sub>D</sub> = 250 μA, ref to 25°C		13.4		mV/°C
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 24 V	T <sub>J</sub> = 25°C		1.0	μA
			T <sub>J</sub> = 125°C		10	
Gate-to-Source Leakage Current	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = 20 V			100	nA

### ON CHARACTERISTICS (Note 5)

Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 250 μA	1.2		2.2	V
Negative Threshold Temp. Coefficient	V <sub>GS(TH)</sub> /T <sub>J</sub>	I <sub>D</sub> = 250 μA, ref to 25°C		-4.2		mV/°C
Drain-to-Source On Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 8.0 A		10	13	mΩ
		V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 8 A		14	18	
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> = 1.5 V, I <sub>D</sub> = 8 A		24		S

### CHARGES & CAPACITANCES

Input Capacitance	C <sub>ISS</sub>	V <sub>GS</sub> = 0 V, f = 1 MHz, V <sub>DS</sub> = 15 V		620		pF
Output Capacitance	C <sub>OSS</sub>			280		
Reverse Transfer Capacitance	C <sub>RSS</sub>			15		
Total Gate Charge	Q <sub>G(TOT)</sub>	V <sub>GS</sub> = 4.5 V, V <sub>DS</sub> = 15 V; I <sub>D</sub> = 8 A		5		nC
Threshold Gate Charge	Q <sub>G(TH)</sub>			0.8		
Gate-to-Source Charge	Q <sub>GS</sub>			1.8		
Gate-to-Drain Charge	Q <sub>GD</sub>			1.6		
Total Gate Charge	Q <sub>G(TOT)</sub>	V <sub>GS</sub> = 10 V, V <sub>DS</sub> = 15 V; I <sub>D</sub> = 8 A		11		nC

### SWITCHING CHARACTERISTICS, V<sub>GS</sub> = 4.5 V (Note 6)

Turn-On Delay Time	t <sub>d(ON)</sub>	V <sub>GS</sub> = 4.5 V, V <sub>DD</sub> = 15 V, I <sub>D</sub> = 8 A, R <sub>G</sub> = 6 Ω		9		ns
Rise Time	t <sub>r</sub>			26		
Turn-Off Delay Time	t <sub>d(OFF)</sub>			13		
Fall Time	t <sub>f</sub>			3		

### SWITCHING CHARACTERISTICS, V<sub>GS</sub> = 10 V (Note 6)

Turn-On Delay Time	t <sub>d(ON)</sub>	V <sub>GS</sub> = 10 V, V <sub>DD</sub> = 15 V, I <sub>D</sub> = 8 A, R <sub>G</sub> = 6 Ω		6		ns
Rise Time	t <sub>r</sub>			24		
Turn-Off Delay Time	t <sub>d(OFF)</sub>			16		
Fall Time	t <sub>f</sub>			2.3		

### DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V <sub>SD</sub>	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 8 A	T <sub>J</sub> = 25°C		0.8	1	V
			T <sub>J</sub> = 125°C		0.7		
Reverse Recovery Time	t <sub>RR</sub>	V <sub>GS</sub> = 0 V, dI <sub>S</sub> /dt = 100 A/μs, I <sub>S</sub> = 8 A		23		ns	
Charge Time	t <sub>a</sub>			12			
Discharge Time	t <sub>b</sub>			11			
Reverse Recovery Charge	Q <sub>RR</sub>			10		nC	

5. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.

6. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

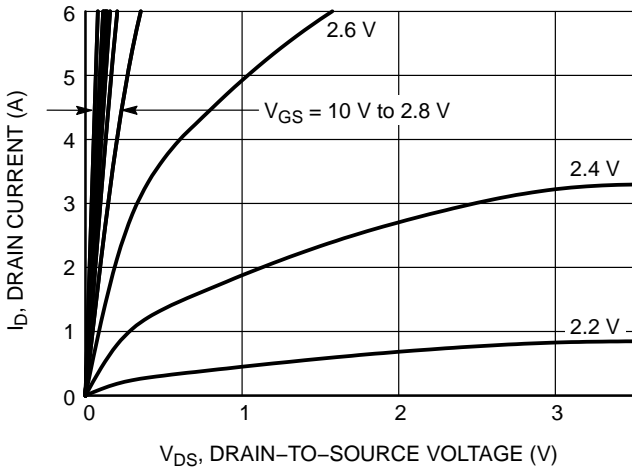


Figure 1. On-Region Characteristics

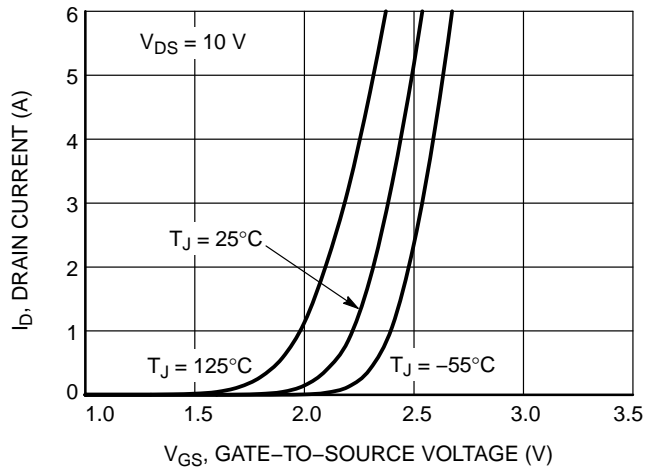


Figure 2. Transfer Characteristics

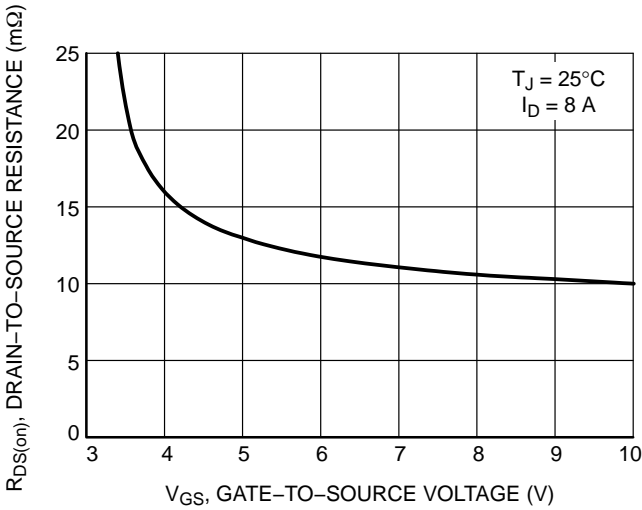


Figure 3. On-Resistance vs. Gate-to-Source Voltage

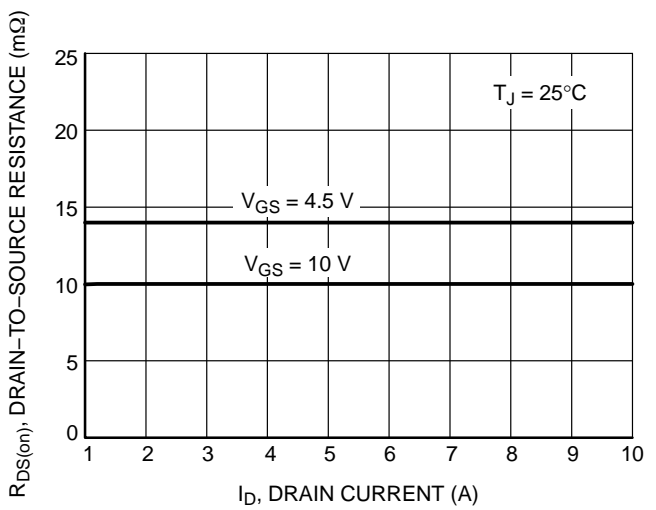


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

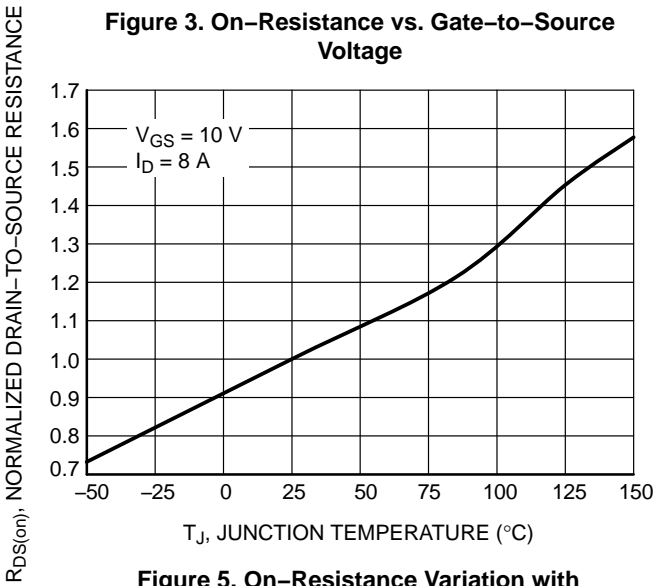


Figure 5. On-Resistance Variation with Temperature

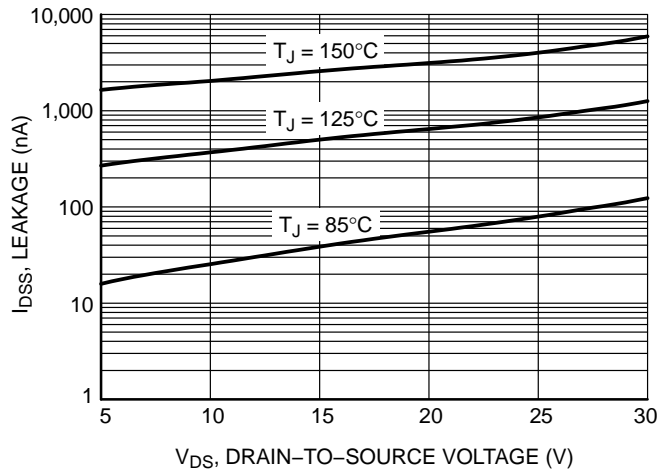


Figure 6. Drain-to-Source Leakage Current vs. Voltage

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## TYPICAL CHARACTERISTICS

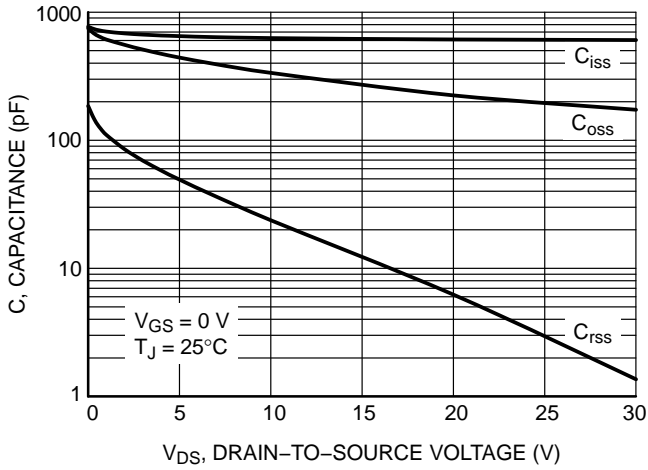


Figure 7. Capacitance Variation

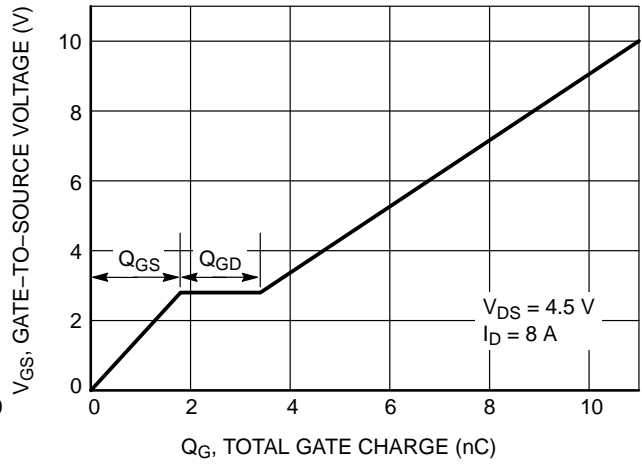


Figure 8. Gate-to-Source vs. Total Charge

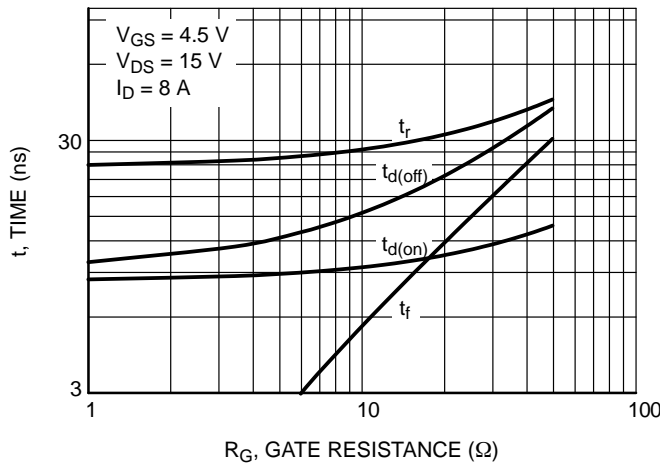


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

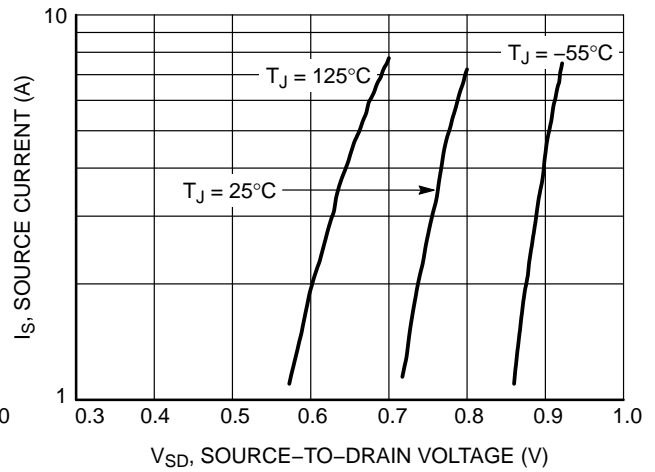


Figure 10. Diode Forward Voltage vs. Current

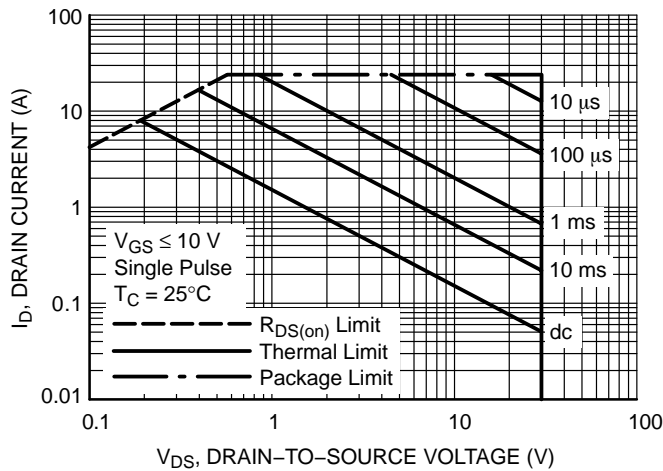


Figure 11. Maximum Rated Forward Biased Safe Operating Area

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## TYPICAL CHARACTERISTICS

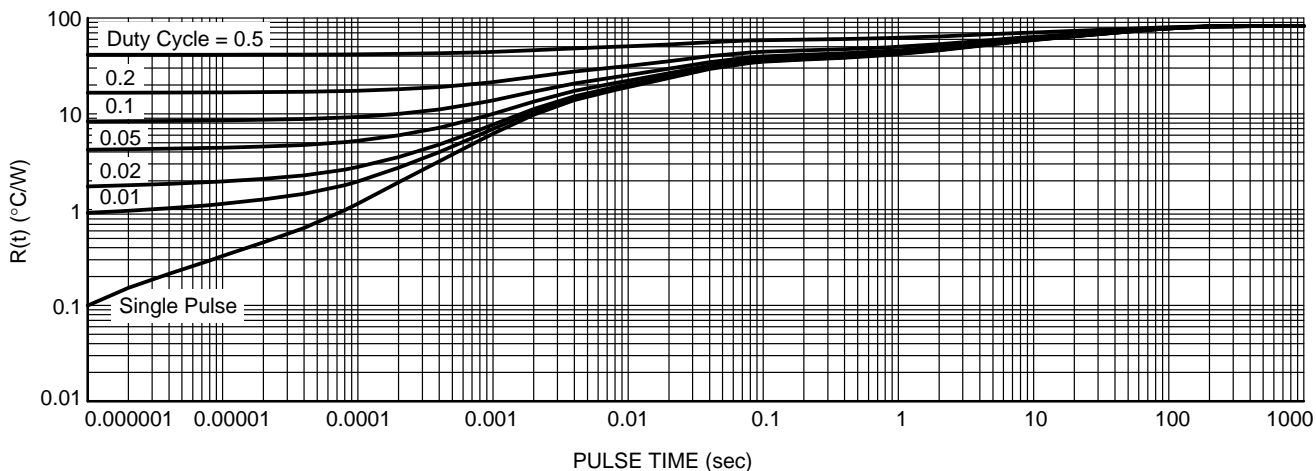


Figure 12. Thermal Response

### DEVICE ORDERING INFORMATION

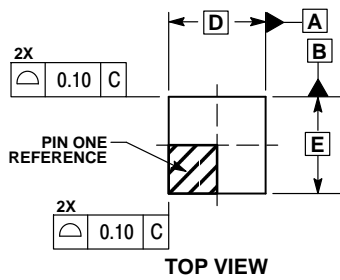
Device	Package	Shipping†
NTLUS020N03CTAG	UDFN6 (Pb-Free)	3000 / Tape & Reel

†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.

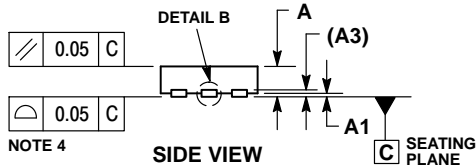
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## PACKAGE DIMENSIONS

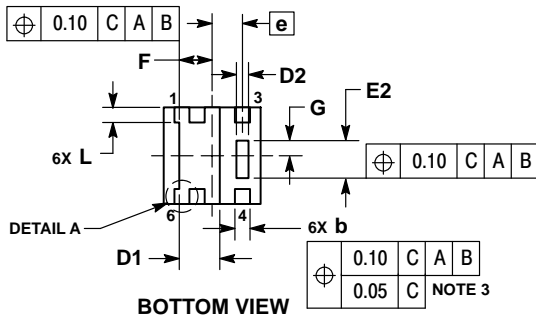
### UDFN6 1.6x1.6, 0.5P CASE 517AU ISSUE O



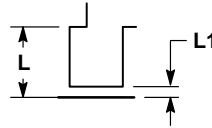
TOP VIEW



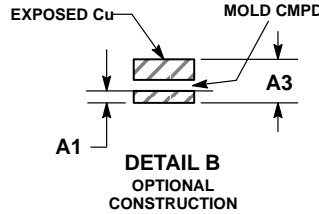
SIDE VIEW



BOTTOM VIEW



DETAIL A  
OPTIONAL  
CONSTRUCTION



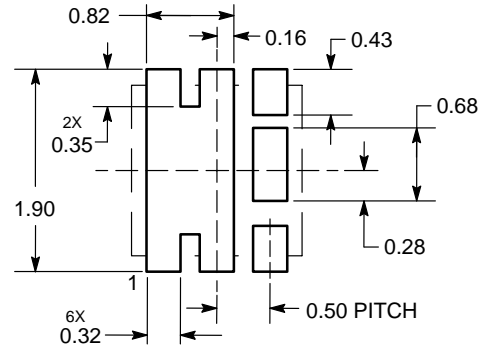
DETAIL B  
OPTIONAL  
CONSTRUCTION

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

### SOLDERMASK DEFINED 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.

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