NTLUS3A39PZ

Power MOSFET

−20 V, −5.2 A, Single P−Channel, ESD, 1.6x1.6x0.55 mm UDFN μCool™ 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

- Optimized for Power Management Applications for Portable Products, Such as Cell Phones, PMP, Media Tablets, DSC, GPS, and Others
- Battery Switch
- High Side Load Switch

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

Parameter			Symbol	Value	Unit
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	−5.2	A
Continuous Drain Current (Note 1)	Steady State	T_A = 85°C		−3.7	
	t ≤ 5 s	T_A = 25°C		−6.4	
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	−3.4	A
		T_A = 85°C		−2.4	
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	−1	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.

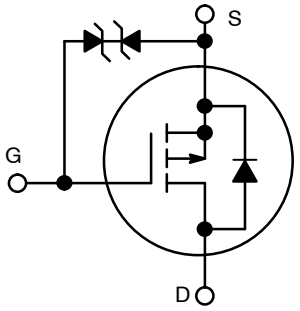
1. Surface Mounted on FR4 Board using 1 in sq pad size (Cu area = 1.127 in sq [2 oz] including traces).
2. Surface-mounted on FR4 board using the minimum recommended pad size of 30 mm^2, 2 oz. Cu.

ON Semiconductor®

http://onsemi.com

MOSFET

$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	I_D MAX
−20 V	39 mΩ @ −4.5 V	−5.2 A
	50 mΩ @ −2.5 V	
	81 mΩ @ −1.8 V	
	147 mΩ @ −1.5 V	



P−Channel MOSFET

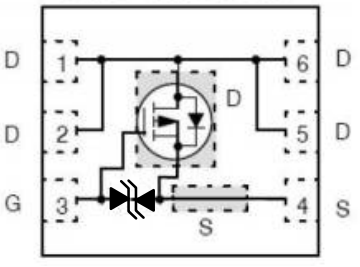
MARKING DIAGRAM

UDFN6
(μCOOL™)
CASE 517AU

AE = 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.

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
Junction-to-Ambient – Steady State (Note 3)	$R_{\theta JA}$	85	°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	

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.

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			13		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0 V, V_{DS} = −20 V	T_J = 25°C			−1.0	μA
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			30	39	mΩ
		V_{GS} = −2.5 V, I_D = −2.0 A			40	50	
		V_{GS} = −1.8 V, I_D = −1.2 A			55	81	
		V_{GS} = −1.5 V, I_D = −0.5 A			75	147	
Forward Transconductance	g_{FS}	V_{DS} = −5 V, I_D = −3.0 A			25		S
CHARGES, CAPACITANCES & GATE RESISTANCE							
Input Capacitance	C_{ISS}	V_{GS} = 0 V, f = 1 MHz, V_{DS} = −15 V			920		pF
Output Capacitance	C_{OSS}				85		
Reverse Transfer Capacitance	C_{RSS}				80		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = −4.5 V, V_{DS} = −15 V; I_D = −3.0 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, VGS = 4.5 V (Note 6)							
Turn-On Delay Time	$t_{d(ON)}$	V_{GS} = −4.5 V, V_{DD} = −15 V, I_D = −3.0 A, R_G = 1 Ω			7.2		ns
Rise Time	t_r				12.2		
Turn-Off Delay Time	$t_{d(OFF)}$				34.7		
Fall Time	t_f				34.8		
DRAIN-SOURCE DIODE CHARACTERISTICS							
Forward Diode Voltage	V_{SD}	V_{GS} = 0 V, I_S = −1.0 A	T_J = 25°C		0.67	1.0	V
			T_J = 125°C		0.56		
Reverse Recovery Time	t_{RR}	V_{GS} = 0 V, dis/dt = 100 A/μs, I_S = −1.0 A			11.1		ns
Charge Time	t_a				5.8		
Discharge Time	t_b				5.3		
Reverse Recovery Charge	Q_{RR}				4		nC

5. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.
6. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

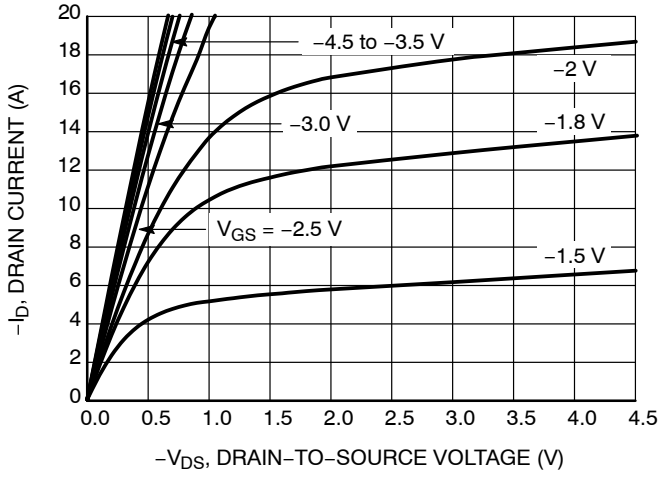


Figure 1. On−Region Characteristics

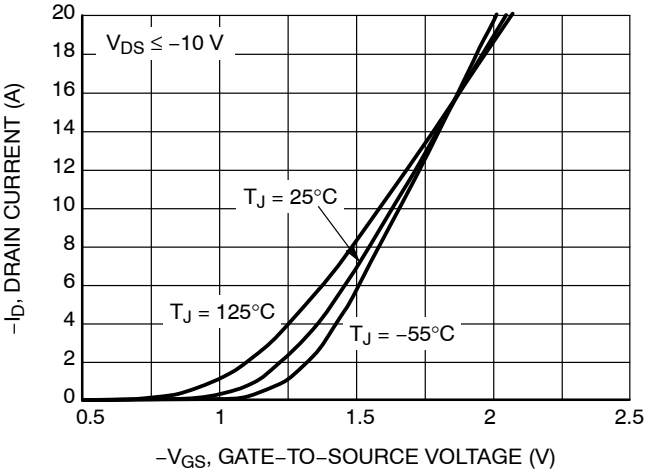


Figure 2. Transfer Characteristics

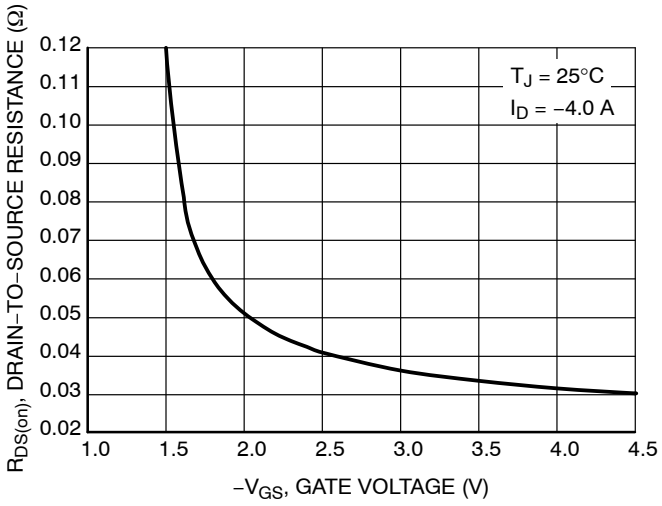


Figure 3. On−Resistance vs. Gate−to−Source Voltage

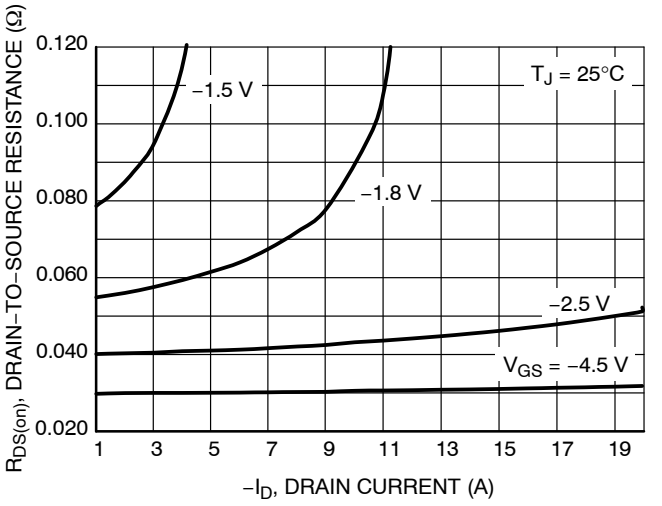


Figure 4. On−Resistance vs. Drain Current and Gate Voltage

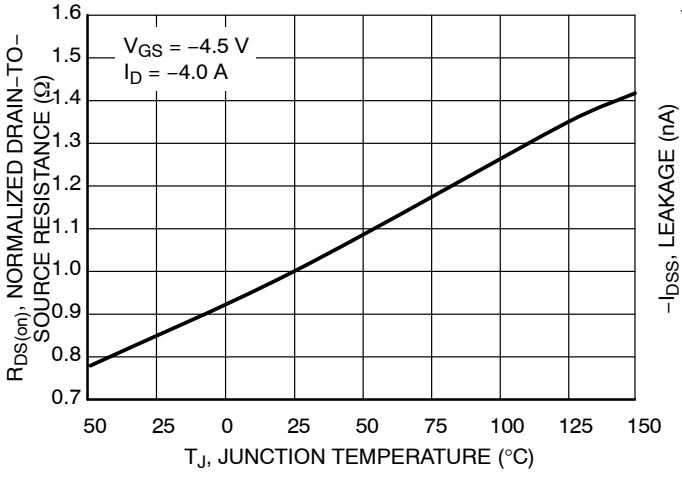


Figure 5. On−Resistance Variation with Temperature

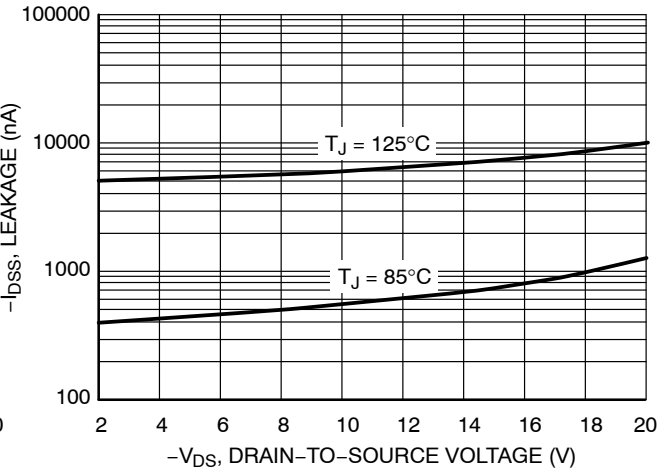


Figure 6. Drain−to−Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

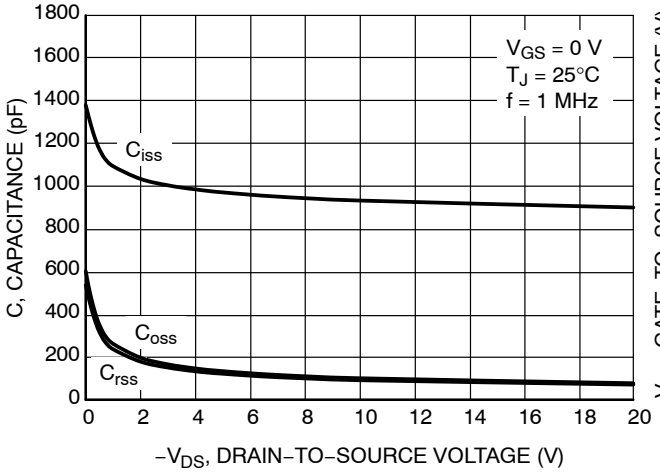


Figure 7. Capacitance Variation

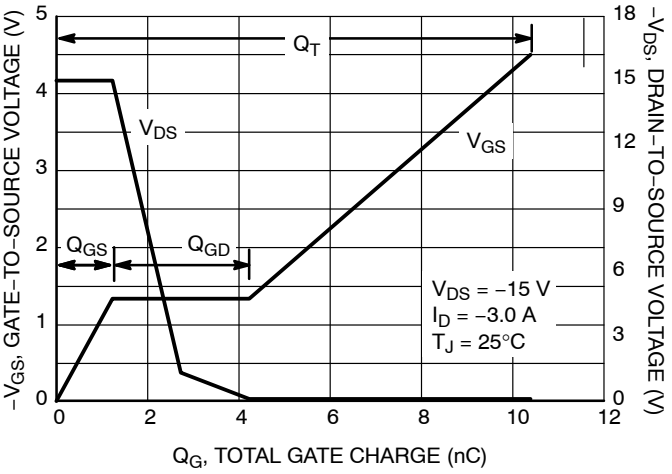


Figure 8. Gate−to−Source and Drain−to−Source Voltage vs. Total Charge

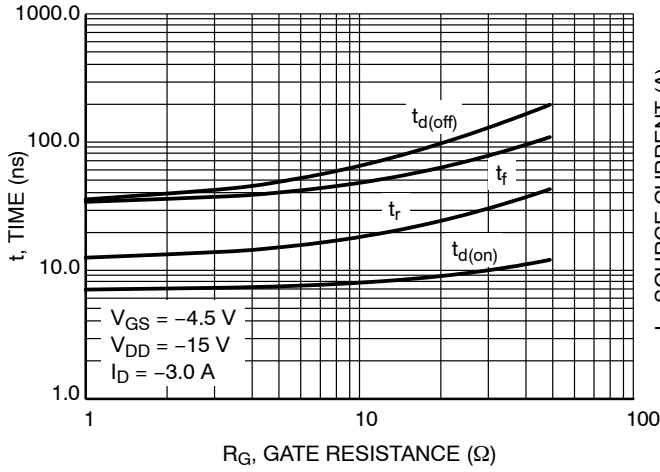


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

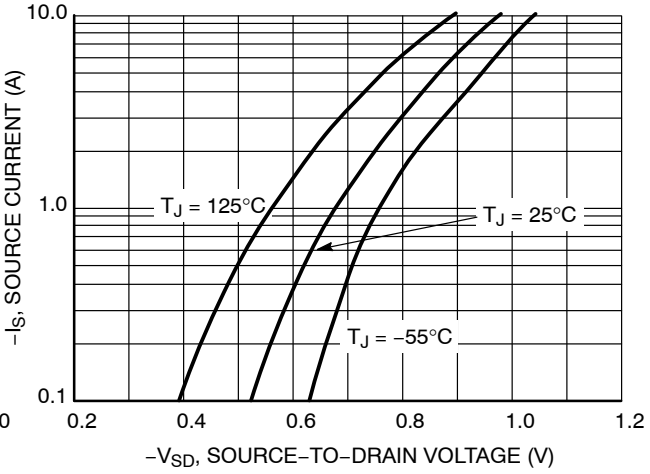


Figure 10. Diode Forward Voltage vs. Current

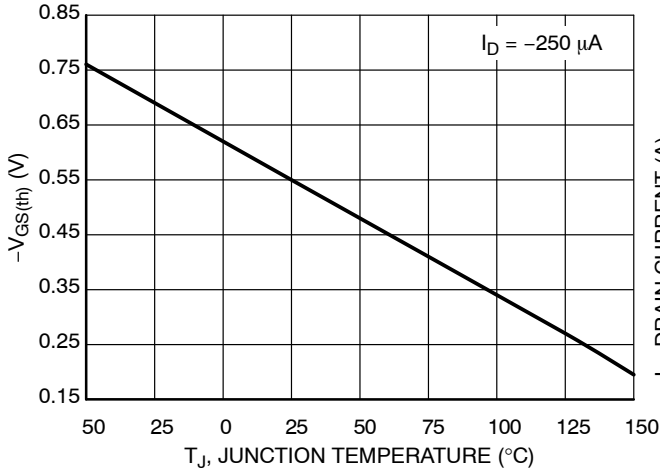


Figure 11. Threshold Voltage

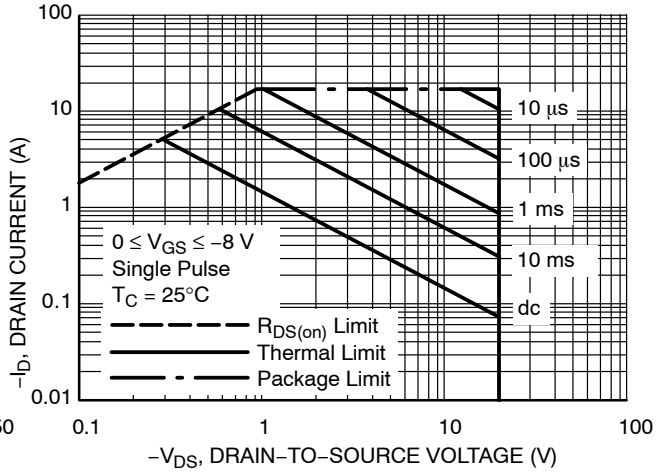


Figure 12. Maximum Rated Forward Biased Safe Operating Area

TYPICAL CHARACTERISTICS

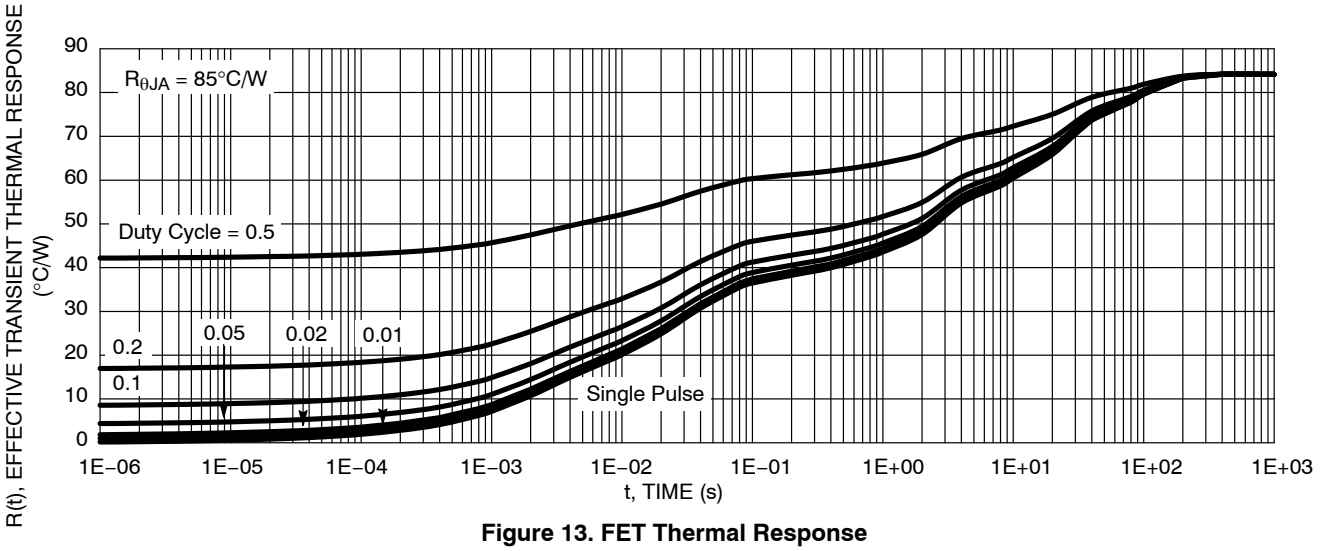


Figure 13. FET Thermal Response

DEVICE ORDERING INFORMATION

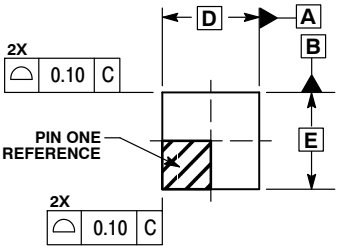
Device	Package	Shipping†
NTLUS3A39PZTAG	UDFN6 (Pb−Free)	3000 / Tape & Reel
NTLUS3A39PZTBG	UDFN6 (Pb−Free)	3000 / Tape & Reel

†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.

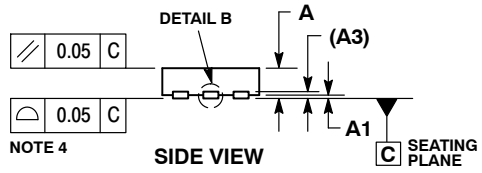
NTLUS3A39PZ

PACKAGE DIMENSIONS

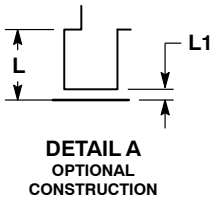
UDFN6 1.6x1.6, 0.5P
CASE 517AU
ISSUE O



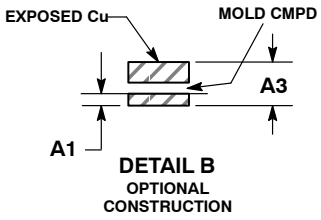
TOP VIEW



SIDE VIEW



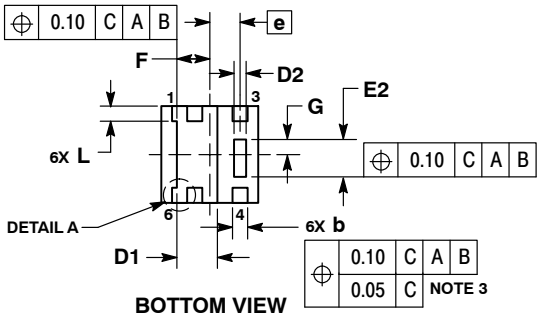
DETAIL A
OPTIONAL CONSTRUCTION



DETAIL B
OPTIONAL CONSTRUCTION

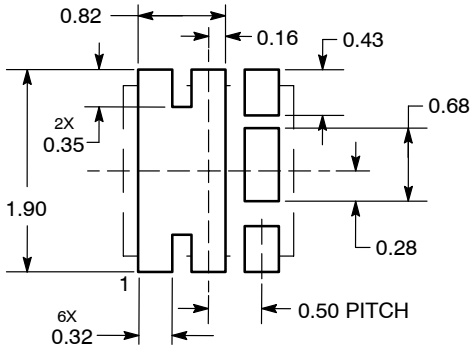
NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 mm FROM TERMINAL.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

	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



BOTTOM VIEW

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.

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

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
Phone: 303−675−2175 or 800−344−3860 Toll Free USA/Canada
Fax: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800−282−9855 Toll Free USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81−3−5817−1050

ON Semiconductor Website: **www.onsemi.com**

Order Literature: http://www.onsemi.com/orderlit

For additional information, please contact your local Sales Representative