

# NTD6415ANL

## N-Channel Power MOSFET 100 V, 23 A, 56 mΩ, Logic Level

### Features

- Low  $R_{DS(on)}$
- 100% Avalanche Tested
- AEC-Q101 Qualified
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

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

Parameter			Symbol	Value	Unit
Drain-to-Source Voltage			$V_{DSS}$	100	V
Gate-to-Source Voltage - Continuous			$V_{GS}$	$\pm 20$	V
Continuous Drain Current	Steady State	$T_C = 25^\circ\text{C}$	$I_D$	23	A
		$T_C = 100^\circ\text{C}$		16	
Power Dissipation	Steady State	$T_C = 25^\circ\text{C}$	$P_D$	83	W
Pulsed Drain Current	$t_p = 10 \mu\text{s}$		$I_{DM}$	80	A
Operating and Storage Temperature Range			$T_J, T_{stg}$	-55 to +175	$^\circ\text{C}$
Source Current (Body Diode)			$I_S$	23	A
Single Pulse Drain-to-Source Avalanche Energy ( $V_{DD} = 50 \text{ Vdc}$ , $V_{GS} = 10 \text{ Vdc}$ , $I_{L(pk)} = 23 \text{ A}$ , $L = 0.3 \text{ mH}$ , $R_G = 25 \Omega$ )			$E_{AS}$	79	mJ
Lead Temperature for Soldering Purposes, 1/8" from Case for 10 Seconds			$T_L$	260	$^\circ\text{C}$

### THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
Junction-to-Case (Drain) - Steady State	$R_{\theta JC}$	1.8	$^\circ\text{C/W}$
Junction-to-Ambient - Steady State (Note 1)	$R_{\theta JA}$	39	

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.

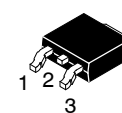
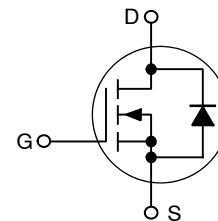
1. Surface mounted on FR4 board using 1 sq in pad size, (Cu Area 1.127 sq in [2 oz] including traces).



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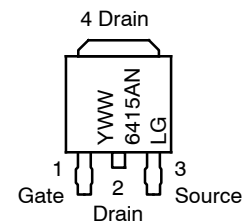
<http://onsemi.com>

$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	$I_D$ MAX
100 V	56 mΩ @ 4.5 V	23 A
	52 mΩ @ 10 V	



DPAK  
CASE 369AA  
STYLE 2

### MARKING DIAGRAM & PIN ASSIGNMENT



6415ANL = Device Code  
Y = Year  
WW = Work Week  
G = Pb-Free Package

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

# NTD6415ANL

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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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 V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA, T <sub>J</sub> = -40°C	100 92			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	V <sub>(BR)DSS</sub> /T <sub>J</sub>			115		mV/°C
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 100 V			1.0 100	μA
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 2)

Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 250 μA	1.0		2.0	V
Negative Threshold Temperature Coefficient	V <sub>GS(TH)</sub> /T <sub>J</sub>			4.8		mV/°C
Drain-to-Source On-Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 10 A V <sub>GS</sub> = 10 V, I <sub>D</sub> = 10 A		44 43	56 52	mΩ
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> = 5.0 V, I <sub>D</sub> = 10 A		24		S

### CHARGES, CAPACITANCES AND GATE RESISTANCE

Input Capacitance	C <sub>ISS</sub>	V <sub>GS</sub> = 0 V, f = 1.0 MHz, V <sub>DS</sub> = 25 V		1024		pF
Output Capacitance	C <sub>OSS</sub>			156		
Reverse Transfer Capacitance	C <sub>RSS</sub>			70		
Total Gate Charge	Q <sub>G(TOT)</sub>	V <sub>GS</sub> = 4.5 V, V <sub>DS</sub> = 80 V, I <sub>D</sub> = 23 A		20		nC
Threshold Gate Charge	Q <sub>G(TH)</sub>			1.1		
Gate-to-Source Charge	Q <sub>GS</sub>			3.1		
Gate-to-Drain Charge	Q <sub>GD</sub>			14		
Total Gate Charge	Q <sub>G(TOT)</sub>	V <sub>GS</sub> = 10 V, V <sub>DS</sub> = 80 V, I <sub>D</sub> = 23 A		35		nC

### SWITCHING CHARACTERISTICS (Note 3)

Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>GS</sub> = 4.5 V, V <sub>DD</sub> = 80 V, I <sub>D</sub> = 23 A, R <sub>G</sub> = 6.1 Ω		11		ns
Rise Time	t <sub>r</sub>			91		
Turn-Off Delay Time	t <sub>d(off)</sub>			40		
Fall Time	t <sub>f</sub>			71		

### DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V <sub>SD</sub>	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 23 A	T <sub>J</sub> = 25°C T <sub>J</sub> = 125°C	0.87 0.74	1.2	V
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> = 23 A		64		ns
Charge Time	T <sub>a</sub>			40		
Discharge Time	T <sub>b</sub>			24		
Reverse Recovery Charge	Q <sub>RR</sub>			152		

2. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.

3. Switching characteristics are independent of operating junction temperatures.

### ORDERING INFORMATION

Device	Package	Shipping†
NTD6415ANLT4G	DPAK (Pb-Free)	2500 / Tape & Reel

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

# NTD6415ANL

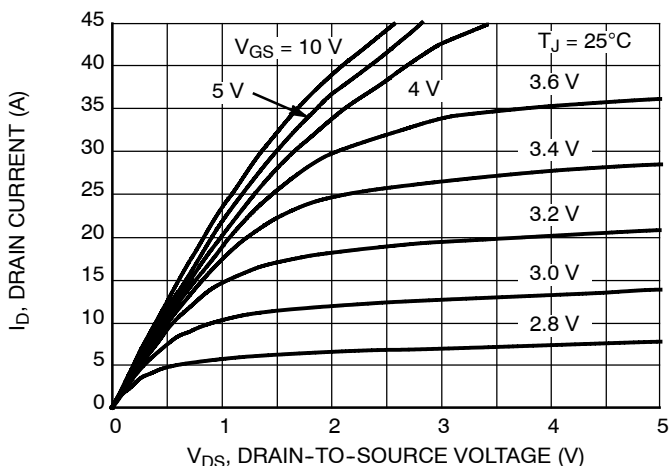


Figure 1. On-Region Characteristics

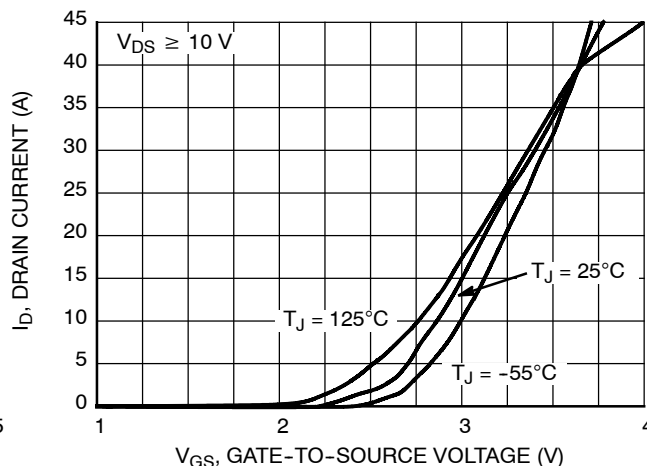


Figure 2. Transfer Characteristics

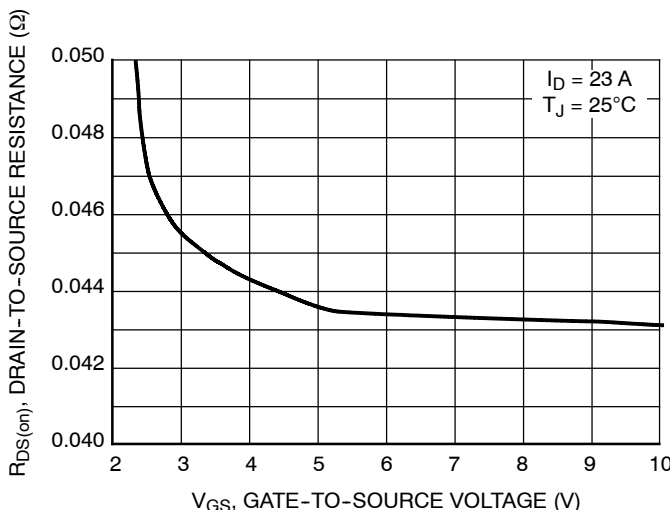


Figure 3. On-Region versus Gate Voltage

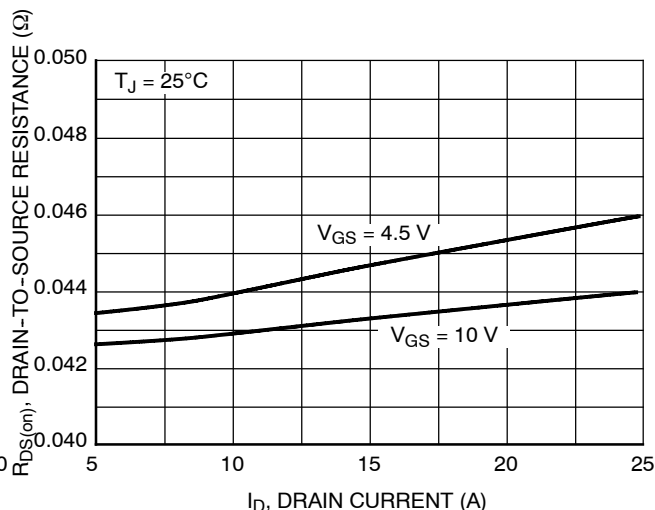


Figure 4. On-Resistance versus Drain Current and Gate Voltage

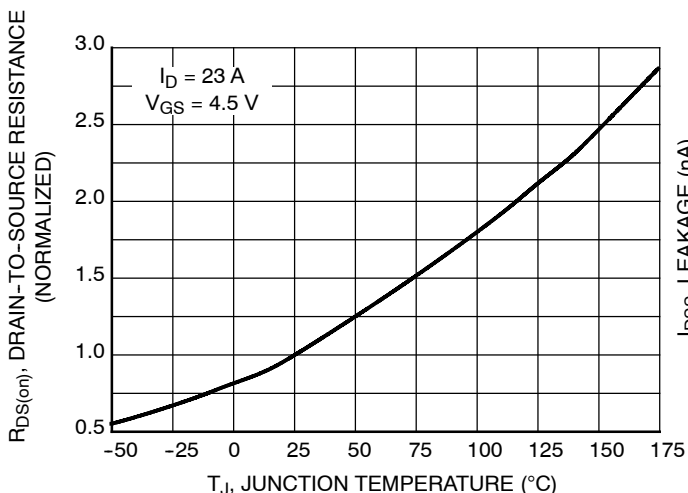


Figure 5. On-Resistance Variation with Temperature

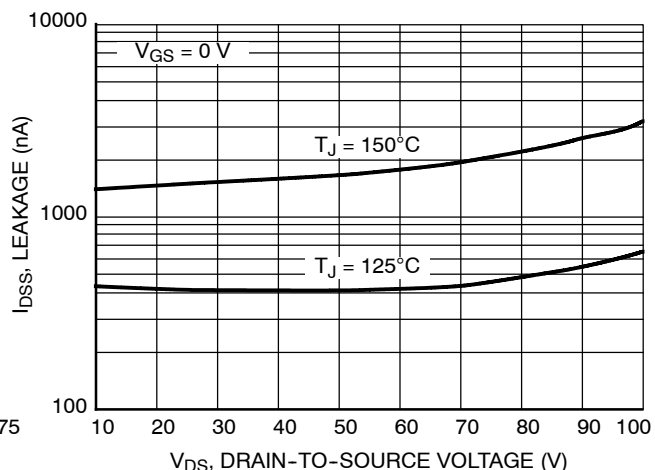


Figure 6. Drain-to-Source Leakage Current versus Voltage

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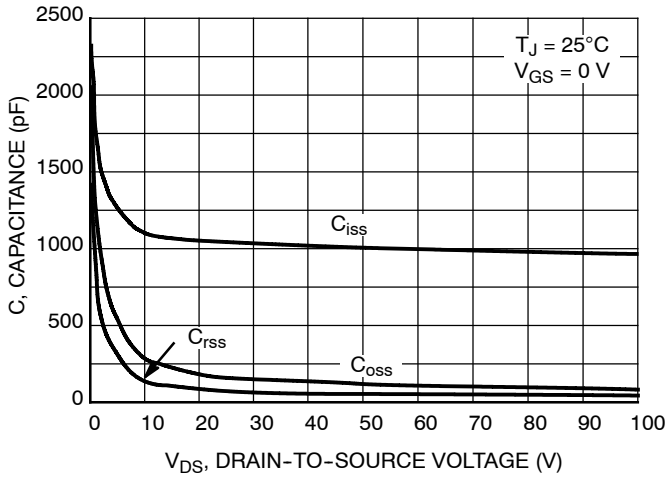


Figure 7. Capacitance Variation

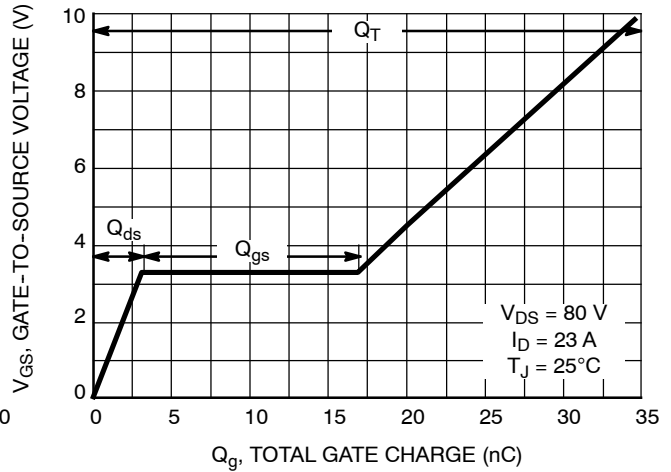


Figure 8. Gate-to-Source Voltage and Drain-to-Source Voltage versus Total Charge

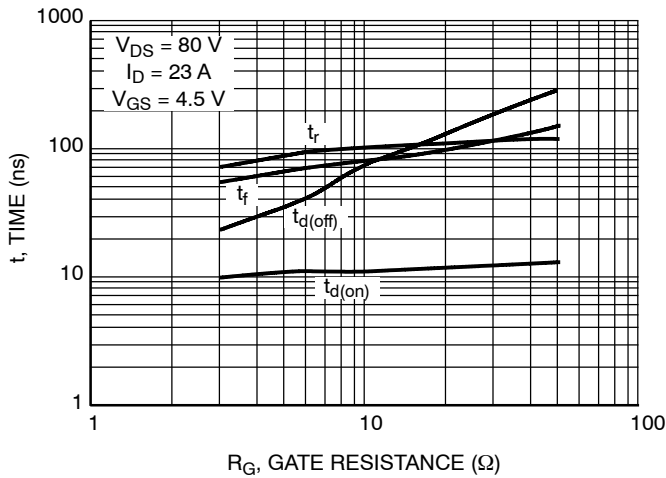


Figure 9. Resistive Switching Time Variation versus Gate Resistance

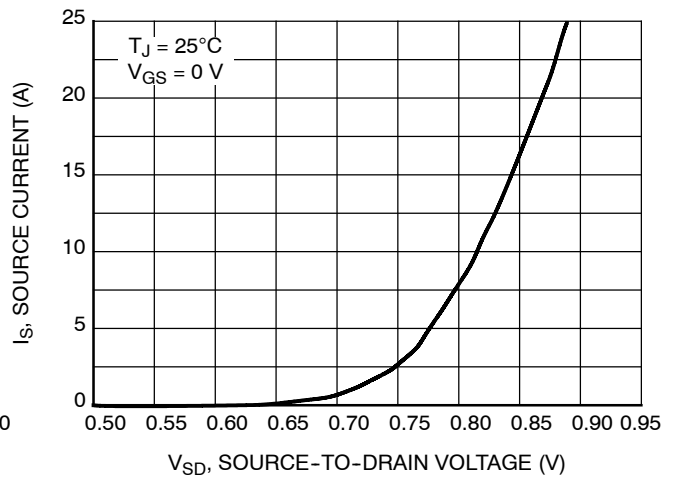


Figure 10. Diode Forward Voltage versus Current

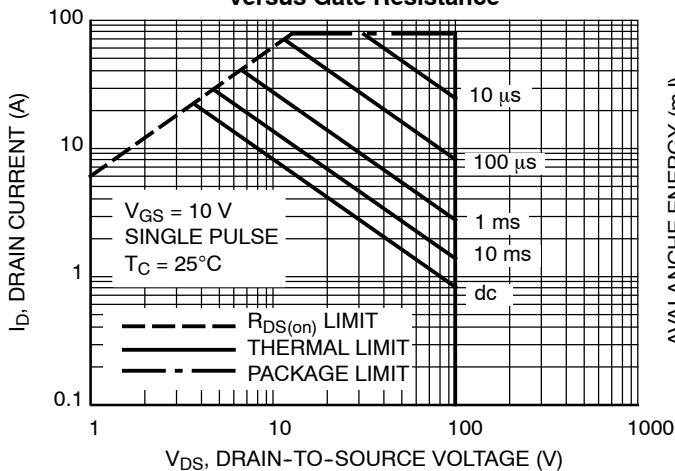


Figure 11. Maximum Rated Forward Biased Safe Operating Area

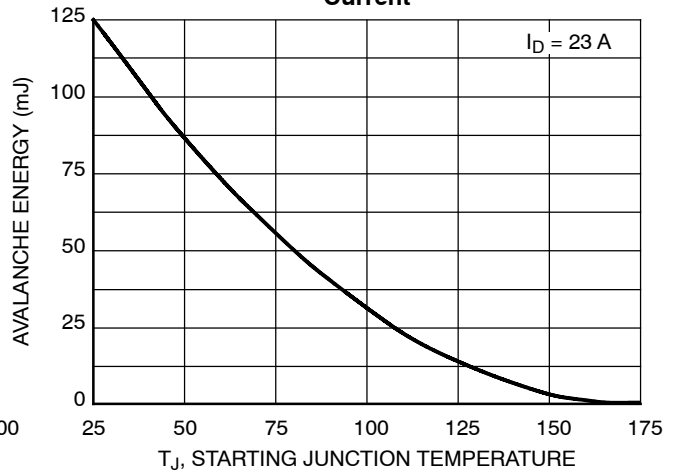


Figure 12. Maximum Avalanche Energy versus Starting Junction Temperature

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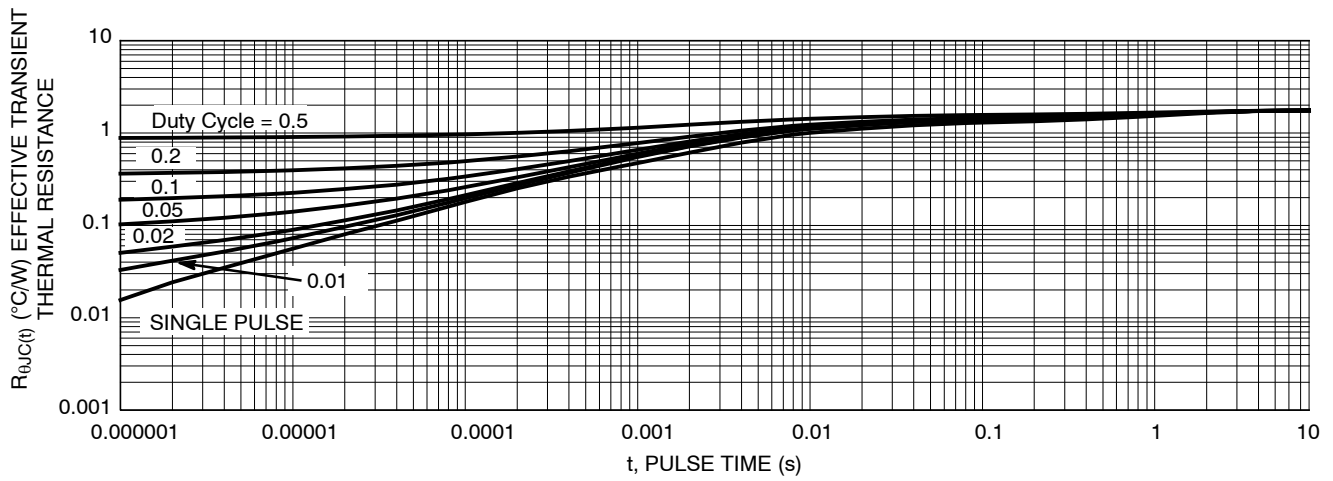
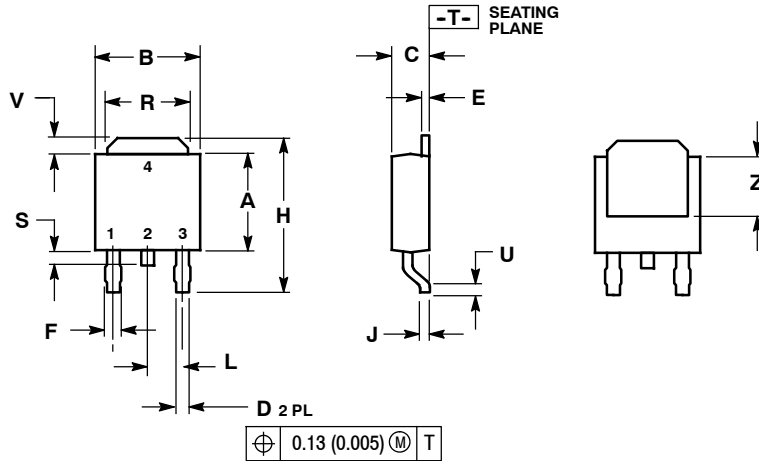


Figure 13. Thermal Response

# NTD6415ANL

## PACKAGE DIMENSIONS

### DPAK (SINGLE GUAGE) CASE 369AA-01 ISSUE A

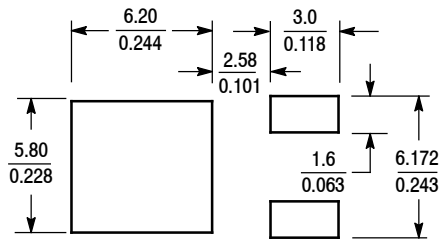


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.235	0.245	5.97	6.22
B	0.250	0.265	6.35	6.73
C	0.086	0.094	2.19	2.38
D	0.025	0.035	0.63	0.89
E	0.018	0.024	0.46	0.61
F	0.030	0.045	0.77	1.14
H	0.386	0.410	9.80	10.40
J	0.018	0.023	0.46	0.58
L	0.090 BSC		2.29 BSC	
R	0.180	0.215	4.57	5.45
S	0.024	0.040	0.60	1.01
U	0.020	---	0.51	---
V	0.035	0.050	0.89	1.27
Z	0.155	---	3.93	---

- STYLE 2:
1. GATE
  2. DRAIN
  3. SOURCE
  4. DRAIN

### SOLDERING FOOTPRINT\*



SCALE 3:1  $\left(\frac{\text{mm}}{\text{inches}}\right)$

\*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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