

# NTR3A30PZ

## Power MOSFET

**-20 V, -2.9 A, Single P-Channel**  
**2.4 x 2.9 x 1.0 mm SOT-23 Package**

### Features

- Low  $R_{DS(on)}$  Solution in 2.4 mm x 2.9 mm Package
- ESD Diode-Protected Gate
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

### Applications

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

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

Parameter		Symbol	Value	Unit	
Drain-to-Source Voltage		$V_{DSS}$	-20	V	
Gate-to-Source Voltage		$V_{GS}$	$\pm 8$	V	
Drain Current (Note 1) Drain Current (Note 1)	Steady State	$I_D$	$T_A = 25^\circ\text{C}$	-2.9	A
			$T_A = 85^\circ\text{C}$	-2.1	
	$t \leq 5 \text{ s}$	$T_A = 25^\circ\text{C}$	-4.7		
Power Dissipation (Note 1)	Steady State	$P_D$	$T_A = 25^\circ\text{C}$	0.48	W
	$t \leq 5 \text{ s}$			1.25	
Pulsed Drain Current	$t_p = 10 \mu\text{s}$	$I_{DM}$	-8.8	A	
Operating Junction and Storage Temperature		$T_J, T_{STG}$	-55 to 150	$^\circ\text{C}$	
ESD HBM, JESD22-A114		$V_{ESD}$	2000	V	
Source Current (Body Diode) (Note 2)		$I_S$	-0.48	A	
Lead Temperature for Soldering Purposes (1/8 in 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.

### THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
Junction-to-Ambient - Steady State (Note 1)	$R_{\theta JA}$	260	$^\circ\text{C}/\text{W}$
Junction-to-Ambient - $t \leq 5 \text{ s}$ (Note 1)	$R_{\theta JA}$	100	

1. Surface-mounted on FR4 board using 1 in sq. pad size (Cu area = 1.127 in sq. [1 oz] including traces).
2. Pulse Test: pulse width  $\leq 300 \text{ ms}$ , duty cycle  $\leq 2\%$ .

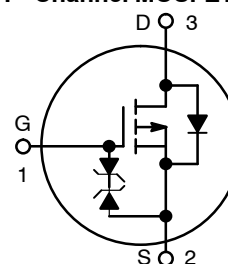


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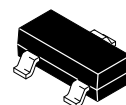
<http://onsemi.com>

$V_{(BR)DSS}$	$R_{DS(on)}$ Max	$I_D$ MAX
-20 V	38 m $\Omega$ @ -4.5 V	-2.9 A
	50 m $\Omega$ @ -2.5 V	
	73 m $\Omega$ @ -1.8 V	

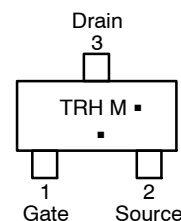
### P-Channel MOSFET



### MARKING DIAGRAM & PIN ASSIGNMENT



**SOT-23  
CASE 318  
STYLE 21**



TRH = Specific Device Code

M = Date Code\*

▪ = Pb-Free Package

(Note: Microdot may be in either location)

\*Date Code orientation may vary depending upon manufacturing location.

### ORDERING INFORMATION

Device	Package	Shipping†
NTR3A30PZT1G	SOT-23 (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 Specification Brochure, BRD8011/D.

# NTR3A30PZ

## ELECTRICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>						
Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	-20			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$	$I_D = -250\ \mu\text{A}, \text{ref to } 25^\circ\text{C}$		10.5		mV/°C
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS} = 0\text{ V}, V_{DS} = -20\text{ V}, T_J = 25^\circ\text{C}$			-1	$\mu\text{A}$
Gate-to-Source Leakage Current	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 5\text{ V}$			$\pm 10$	$\mu\text{A}$

## ON CHARACTERISTICS (Note 3)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = -250\ \mu\text{A}$	-0.4	-0.65	-1.0	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			10.5		mV/°C
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = -4.5\text{ V}, I_D = -3\text{ A}$		31	38	m $\Omega$
		$V_{GS} = -2.5\text{ V}, I_D = -2.5\text{ A}$		36	50	
		$V_{GS} = -1.8\text{ V}, I_D = -1.5\text{ A}$		51	73	
Forward Transconductance	$g_{FS}$	$V_{DS} = -5\text{ V}, I_D = -3\text{ A}$		30		S

## CHARGES AND CAPACITANCES

Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}, V_{DS} = -15\text{ V}$		1651		pF
Output Capacitance	$C_{oss}$			148		
Reverse Transfer Capacitance	$C_{rss}$			129		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = -4.5\text{ V}, V_{DS} = -15\text{ V}, I_D = -3\text{ A}$		17.6		nC
Threshold Gate Charge	$Q_{G(TH)}$			0.7		
Gate-to-Source Charge	$Q_{GS}$			2.4		
Gate-to-Drain Charge	$Q_{GD}$			4.9		

## SWITCHING CHARACTERISTICS (Note 4)

Turn-On Delay Time	$t_{d(on)}$	$V_{GS} = -4.5\text{ V}, V_{DS} = -15\text{ V}, I_D = -3\text{ A}, R_G = 6.0\ \Omega$		100		ns
Rise Time	$t_r$			208		
Turn-Off Delay Time	$t_{d(off)}$			1043		
Fall Time	$t_f$			552		

## DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	$V_{SD}$	$V_{GS} = 0\text{ V}, I_S = -0.4\text{ A}$	$T_J = 25^\circ\text{C}$		0.65	1.0	V
			$T_J = 125^\circ\text{C}$		0.47		

3. Pulse Test: pulse width  $\leq 300\text{ ms}$ , duty cycle  $\leq 2\%$ .

4. Switching characteristics are independent of operating junction temperatures.

# NTR3A30PZ

## TYPICAL CHARACTERISTICS

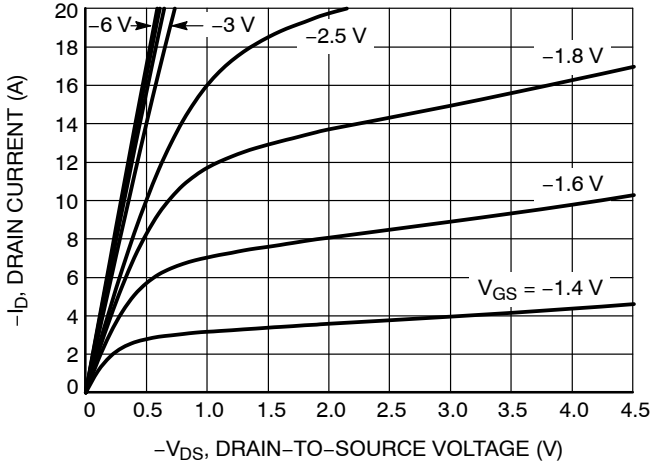


Figure 1. On-Region Characteristics

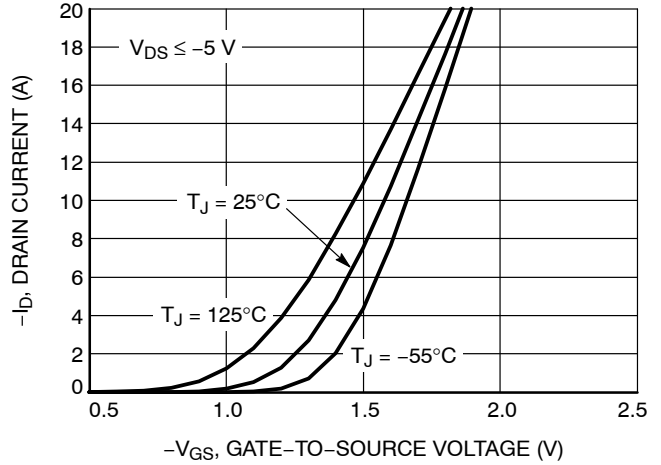


Figure 2. Transfer Characteristics

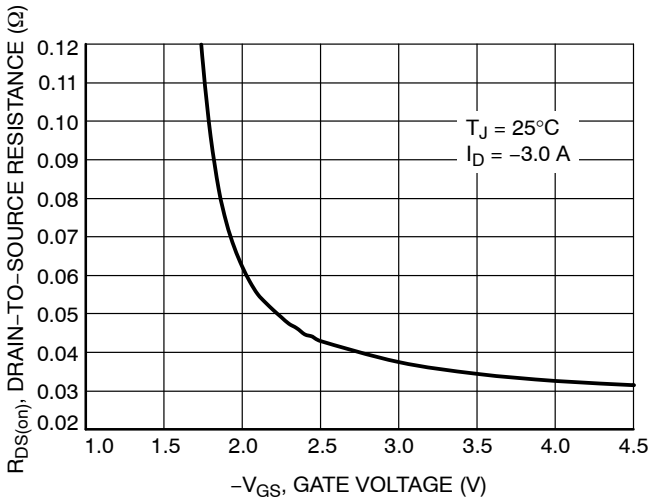


Figure 3. On-Resistance vs. Gate-to-Source Voltage

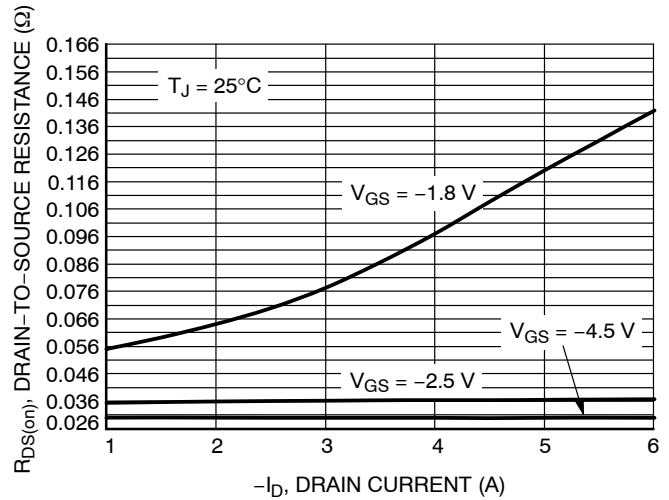


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

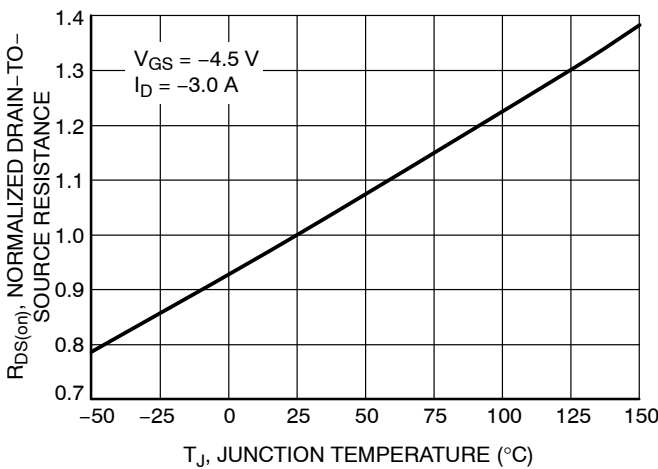


Figure 5. On-Resistance Variation with Temperature

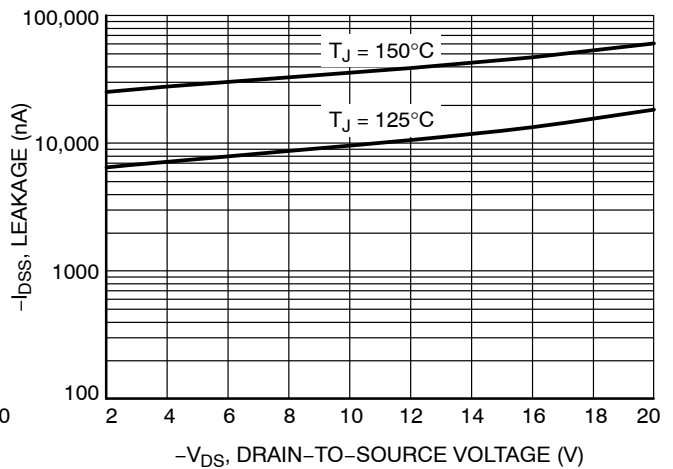


Figure 6. Drain-to-Source Leakage Current vs. Voltage

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## TYPICAL CHARACTERISTICS

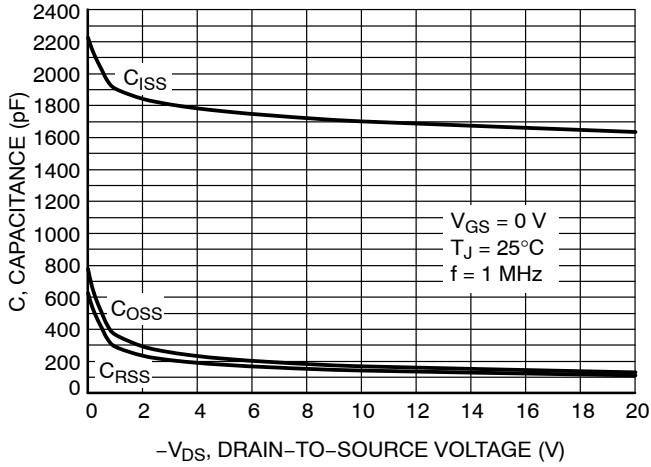


Figure 7. Capacitance Variation

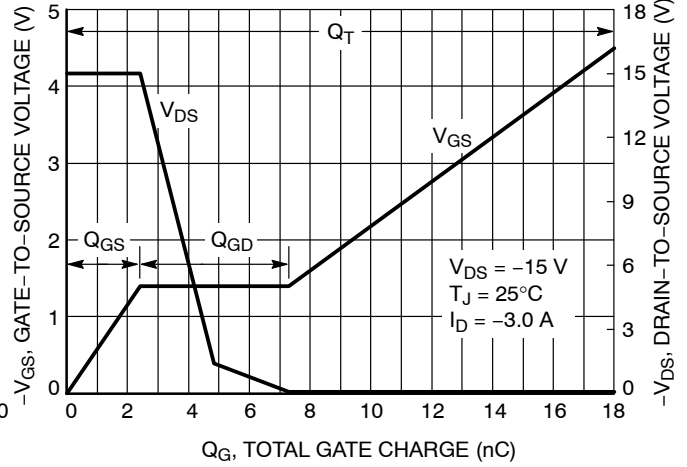


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

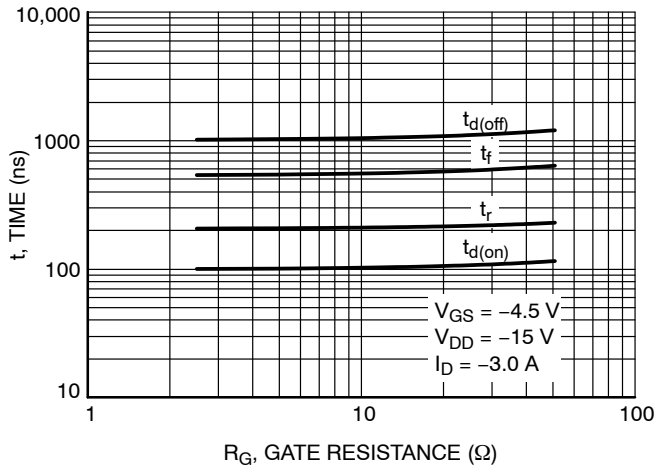


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

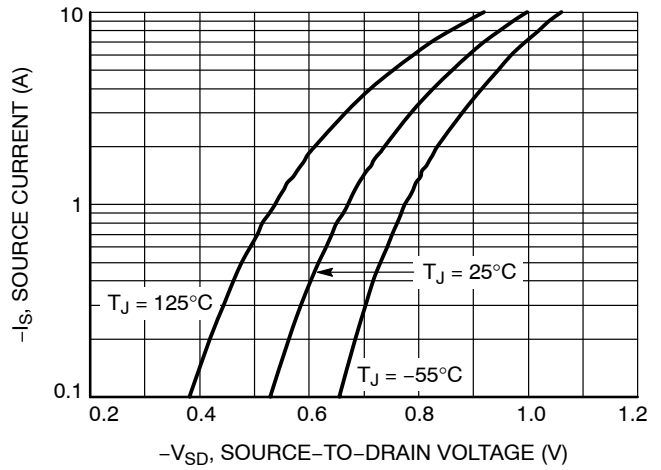


Figure 10. Diode Forward Voltage vs. Current

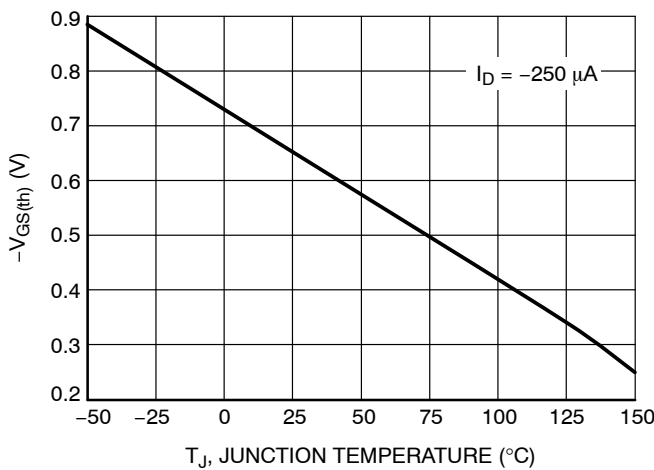


Figure 11. Threshold Voltage

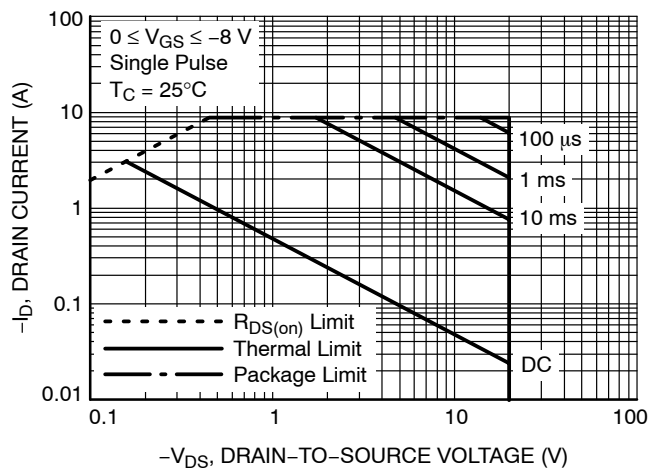


Figure 12. Maximum Rated Forward Biased Safe Operating Area

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## TYPICAL CHARACTERISTICS

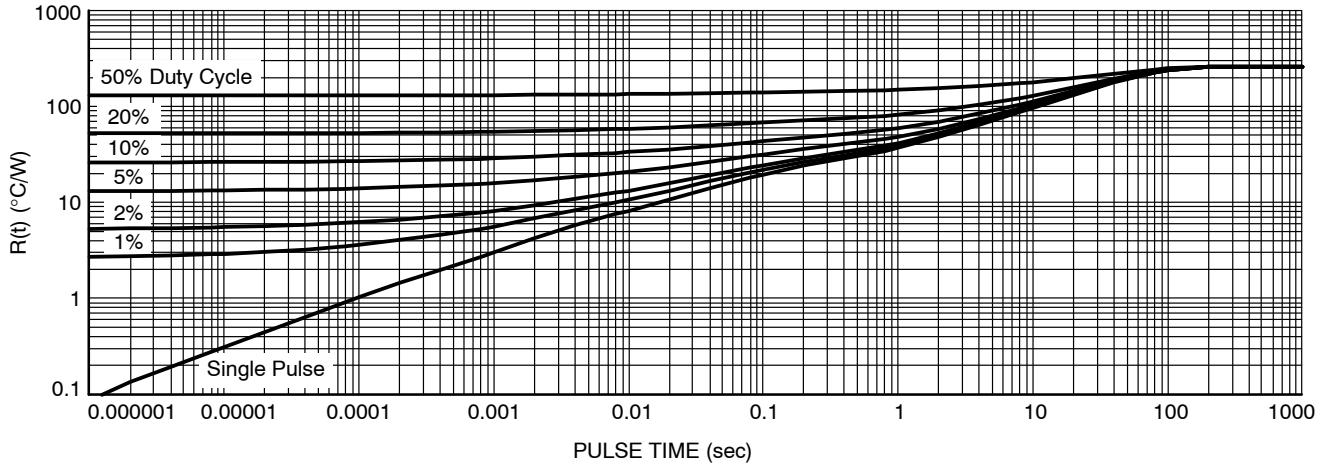
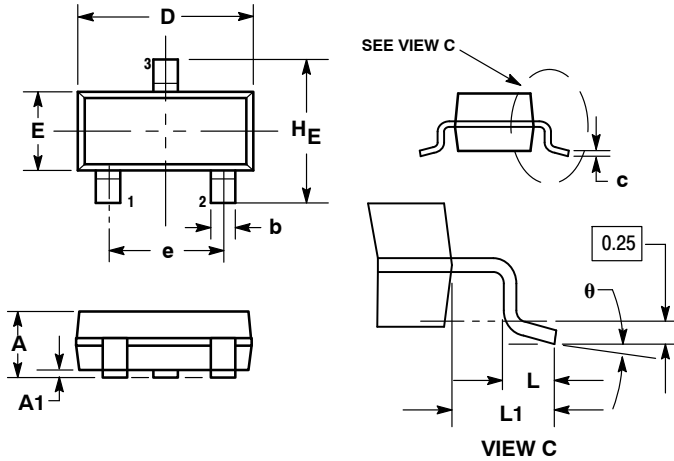


Figure 13. FET Thermal Response

# NTR3A30PZ

## PACKAGE DIMENSIONS

SOT-23 (TO-236)  
CASE 318-08  
ISSUE AP



NOTES:

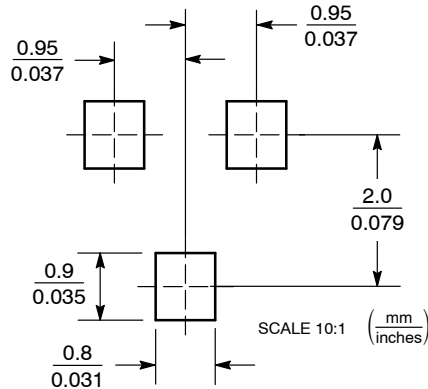
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.89	1.00	1.11	0.035	0.040	0.044
A1	0.01	0.06	0.10	0.001	0.002	0.004
b	0.37	0.44	0.50	0.015	0.018	0.020
c	0.09	0.13	0.18	0.003	0.005	0.007
D	2.80	2.90	3.04	0.110	0.114	0.120
E	1.20	1.30	1.40	0.047	0.051	0.055
e	1.78	1.90	2.04	0.070	0.075	0.081
L	0.10	0.20	0.30	0.004	0.008	0.012
L1	0.35	0.54	0.69	0.014	0.021	0.029
HE	2.10	2.40	2.64	0.083	0.094	0.104
θ	0°	---	10°	0°	---	10°

STYLE 21:

1. GATE
2. SOURCE
3. DRAIN

### SOLDERING FOOTPRINT\*



\*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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