

# NTGS3441T1

## Power MOSFET 1 Amp, 20 Volts

### P-Channel TSOP-6

#### Features

- Ultra Low  $R_{DS(on)}$
- Higher Efficiency Extending Battery Life
- Miniature TSOP-6 Surface Mount Package
- Pb-Free Package is Available

#### Applications

- Power Management in Portable and Battery-Powered Products, i.e.: Cellular and Cordless Telephones, and PCMCIA Cards

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

Rating	Symbol	Value	Unit
Drain-to-Source Voltage	$V_{DSS}$	-20	V
Gate-to-Source Voltage - Continuous	$V_{GS}$	$\pm 8.0$	V
Thermal Resistance Junction-to-Ambient (Note 1)	$R_{\theta JA}$	244	$^\circ\text{C/W}$
Total Power Dissipation @ $T_A = 25^\circ\text{C}$	$P_d$	0.5	W
Drain Current - Continuous @ $T_A = 25^\circ\text{C}$	$I_D$	-1.65	A
- Pulsed Drain Current ( $T_p < 10 \mu\text{s}$ )	$I_{DM}$	-10	A
Thermal Resistance Junction-to-Ambient (Note 2)	$R_{\theta JA}$	128	$^\circ\text{C/W}$
Total Power Dissipation @ $T_A = 25^\circ\text{C}$	$P_d$	1.0	W
Drain Current - Continuous @ $T_A = 25^\circ\text{C}$	$I_D$	-2.35	A
- Pulsed Drain Current ( $T_p < 10 \mu\text{s}$ )	$I_{DM}$	-14	A
Thermal Resistance Junction-to-Ambient (Note 3)	$R_{\theta JA}$	62.5	$^\circ\text{C/W}$
Total Power Dissipation @ $T_A = 25^\circ\text{C}$	$P_d$	2.0	W
Drain Current - Continuous @ $T_A = 25^\circ\text{C}$	$I_D$	-3.3	A
- Pulsed Drain Current ( $T_p < 10 \mu\text{s}$ )	$I_{DM}$	-20	A
Operating and Storage Temperature Range	$T_J, T_{stg}$	-55 to 150	$^\circ\text{C}$
Maximum Lead Temperature for Soldering Purposes for 10 Seconds	$T_L$	260	$^\circ\text{C}$

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

1. Minimum FR-4 or G-10 PCB, operating to steady state.
2. Mounted onto a 2" square FR-4 board (1 in sq, 2 oz. Cu. 0.06" thick single sided), operating to steady state.
3. Mounted onto a 2" square FR-4 board (1 in sq, 2 oz. Cu. 0.06" thick single sided),  $t < 5.0$  seconds.

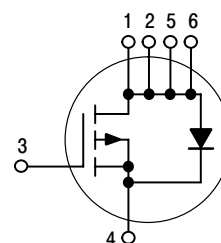


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**1 AMPERE  
20 VOLTS**  
 $R_{DS(on)} = 90 \text{ m}\Omega$

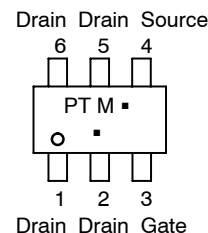
#### P-Channel



#### MARKING DIAGRAM & PIN ASSIGNMENT



TSOP-6  
CASE 318G  
STYLE 1



PT = 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†
NTGS3441T1	TSOP-6	3000 / Tape & Reel
NTGS3441T1G	TSOP-6 (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.

# NTGS3441T1

## ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise noted) (Notes 4 & 5)

Characteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Drain-Source Breakdown Voltage ( $V_{GS} = 0\text{ Vdc}$ , $I_D = -10\ \mu\text{A}$ )	$V_{(BR)DSS}$	-20	-	-	Vdc
Zero Gate Voltage Drain Current ( $V_{GS} = 0\text{ Vdc}$ , $V_{DS} = -20\text{ Vdc}$ , $T_J = 25^\circ\text{C}$ ) ( $V_{GS} = 0\text{ Vdc}$ , $V_{DS} = -20\text{ Vdc}$ , $T_J = 70^\circ\text{C}$ )	$I_{DSS}$	-	-	-1.0 -5.0	$\mu\text{Adc}$
Gate-Body Leakage Current ( $V_{GS} = -8.0\text{ Vdc}$ , $V_{DS} = 0\text{ Vdc}$ )	$I_{GSS}$	-	-	-100	nAdc
Gate-Body Leakage Current ( $V_{GS} = +8.0\text{ Vdc}$ , $V_{DS} = 0\text{ Vdc}$ )	$I_{GSS}$	-	-	100	nAdc

<b>ON CHARACTERISTICS</b>					
Gate Threshold Voltage ( $V_{DS} = V_{GS}$ , $I_D = -250\ \mu\text{Adc}$ )	$V_{GS(th)}$	-0.45	-1.05	-1.50	Vdc
Static Drain-Source On-State Resistance ( $V_{GS} = -4.5\text{ Vdc}$ , $I_D = -3.3\text{ Adc}$ ) ( $V_{GS} = -2.5\text{ Vdc}$ , $I_D = -2.9\text{ Adc}$ )	$R_{DS(on)}$	-	0.069 0.117	0.090 0.135	$\Omega$
Forward Transconductance ( $V_{DS} = -10\text{ Vdc}$ , $I_D = -3.3\text{ Adc}$ )	$g_{FS}$	-	6.8	-	Mhos

<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	$(V_{DS} = -5.0\text{ Vdc}$ , $V_{GS} = 0\text{ Vdc}$ , $f = 1.0\text{ MHz}$ )	$C_{ISS}$	-	480	-	pF
Output Capacitance		$C_{OSS}$	-	265	-	pF
Reverse Transfer Capacitance		$C_{RSS}$	-	100	-	pF

<b>SWITCHING CHARACTERISTICS</b>						
Turn-On Delay Time	$(V_{DD} = -20\text{ Vdc}$ , $I_D = -1.6\text{ Adc}$ , $V_{GS} = -4.5\text{ Vdc}$ , $R_g = 6.0\ \Omega$ )	$t_{d(on)}$	-	13	25	ns
Rise Time		$t_r$	-	23.5	45	ns
Turn-Off Delay Time		$t_{d(off)}$	-	27	50	ns
Fall Time		$t_f$	-	24	45	ns
Total Gate Charge	$(V_{DS} = -10\text{ Vdc}$ , $V_{GS} = -4.5\text{ Vdc}$ , $I_D = -3.3\text{ Adc}$ )	$Q_{tot}$	-	6.2	14	nC
Gate-Source Charge		$Q_{gs}$	-	1.3	-	nC
Gate-Drain Charge		$Q_{gd}$	-	2.5	-	nC

<b>BODY-DRAIN DIODE RATINGS</b>						
Diode Forward On-Voltage	$(I_S = -1.6\text{ Adc}$ , $V_{GS} = 0\text{ Vdc}$ )	$V_{SD}$	-	-0.88	-1.2	Vdc
Diode Forward On-Voltage	$(I_S = -3.3\text{ Adc}$ , $V_{GS} = 0\text{ Vdc}$ )	$V_{SD}$	-	-0.98	-	Vdc
Reverse Recovery Time	$(I_S = -1.6\text{ Adc}$ , $dI_S/dt = 100\text{ A}/\mu\text{s}$ )	$t_{rr}$	-	30	60	ns

- Indicates Pulse Test: P.W. = 300  $\mu\text{sec}$  max, Duty Cycle = 2%.
- Handling precautions to protect against electrostatic discharge are mandatory.

# NTGS3441T1

## TYPICAL ELECTRICAL CHARACTERISTICS

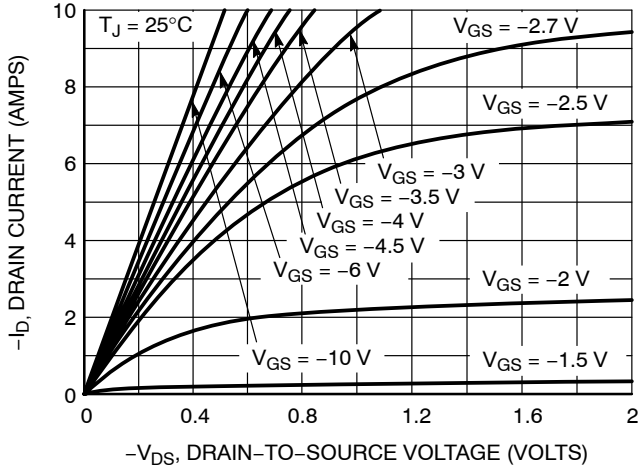


Figure 1. On-Region Characteristics

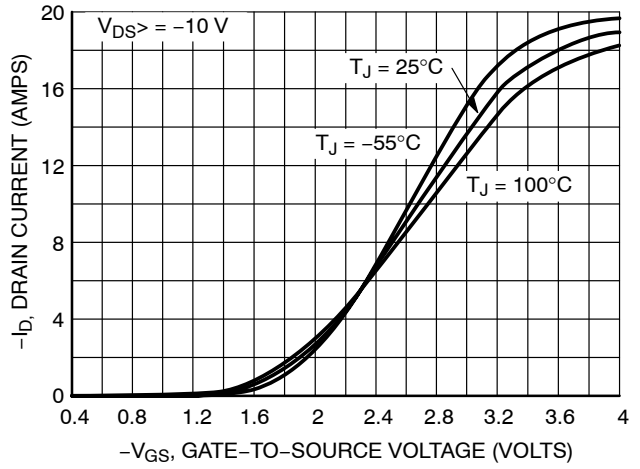


Figure 2. Transfer Characteristics

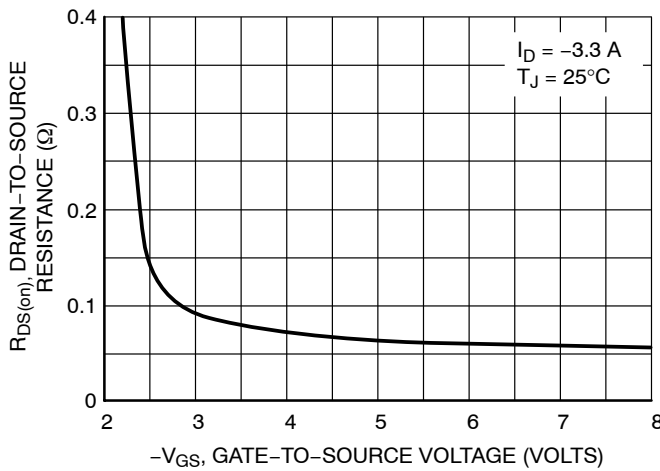


Figure 3. On-Resistance vs. Gate-to-Source Voltage

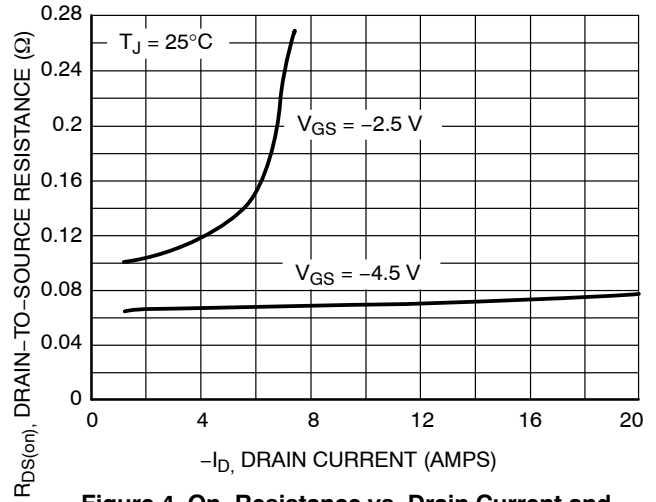


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

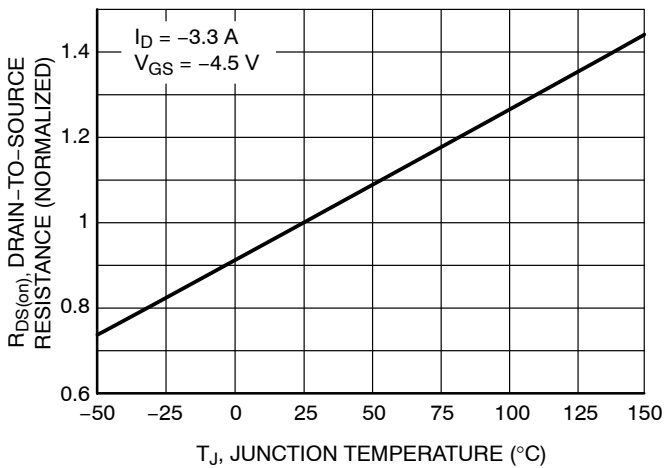


Figure 5. On-Resistance Variation with Temperature

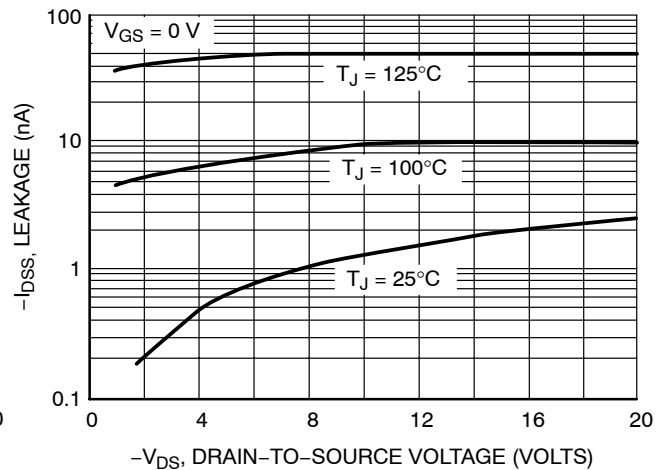
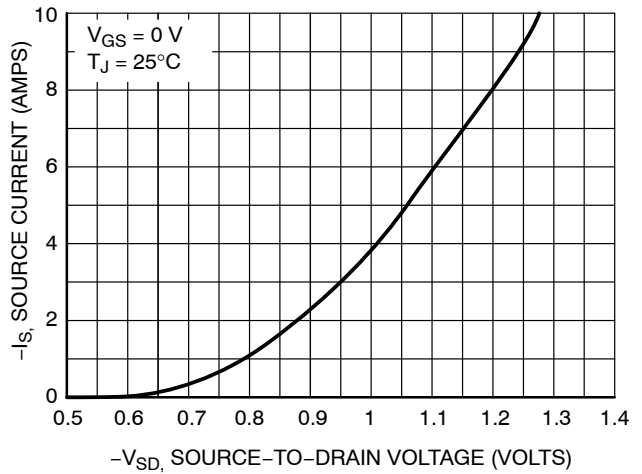
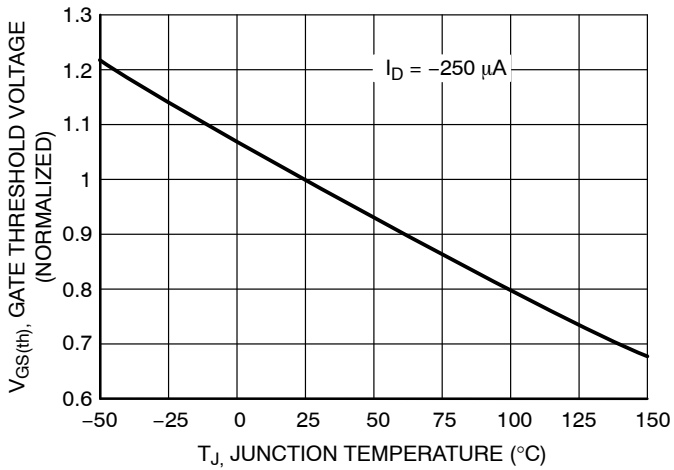
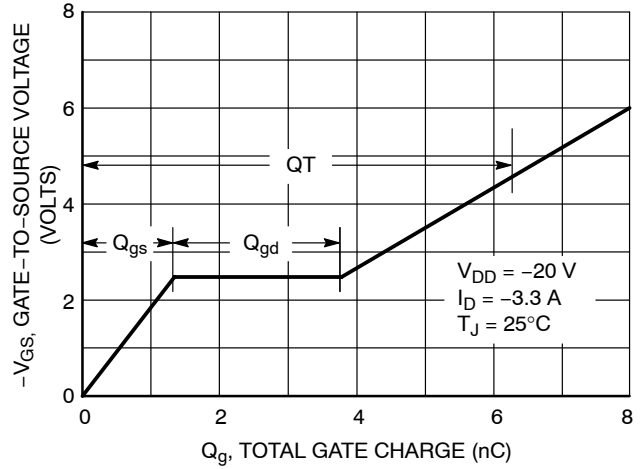
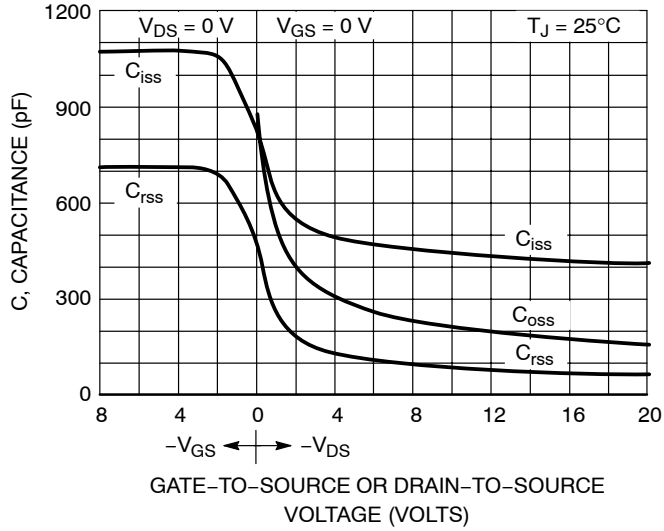


Figure 6. Drain-to-Source Leakage Current vs. Voltage

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## TYPICAL ELECTRICAL CHARACTERISTICS



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## TYPICAL ELECTRICAL CHARACTERISTICS

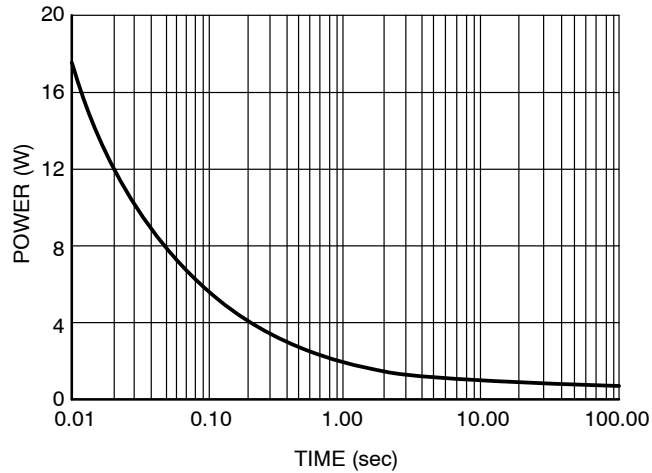


Figure 11. Single Pulse Power

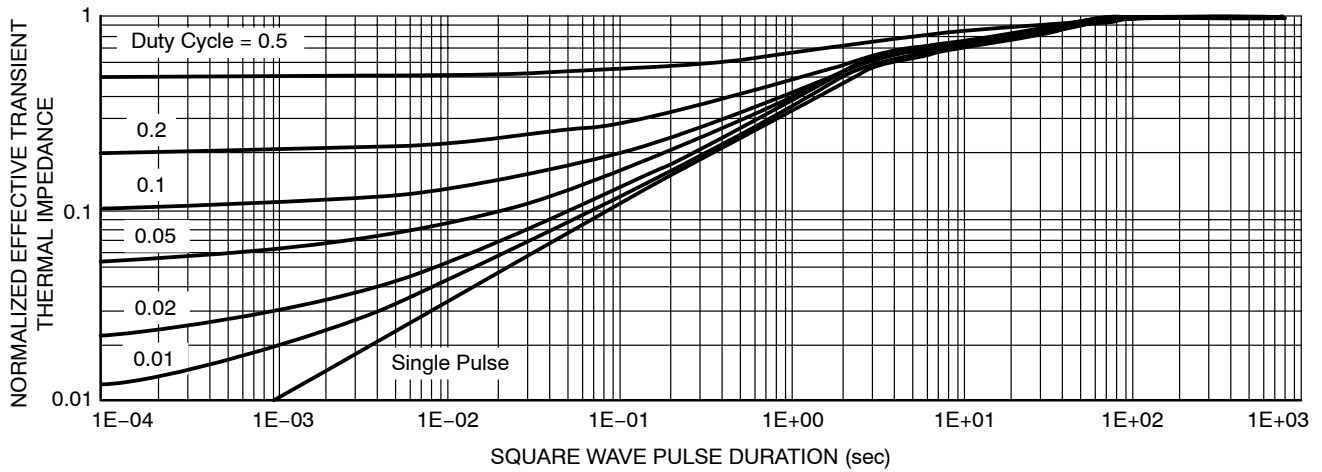
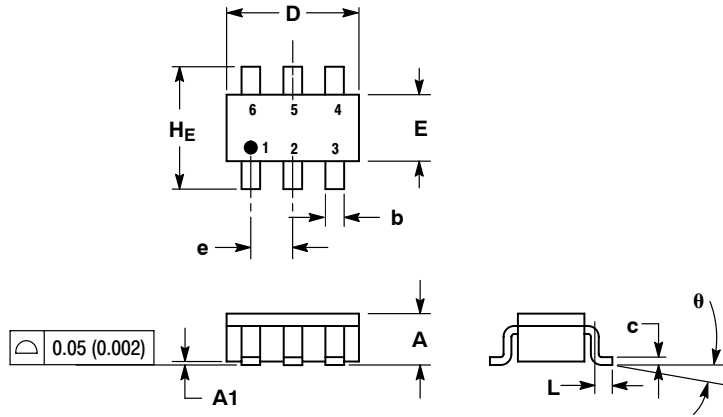


Figure 12. Normalized Thermal Transient Impedance, Junction-to-Ambient

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## PACKAGE DIMENSIONS

TSOP-6  
CASE 318G-02  
ISSUE P



### NOTES:

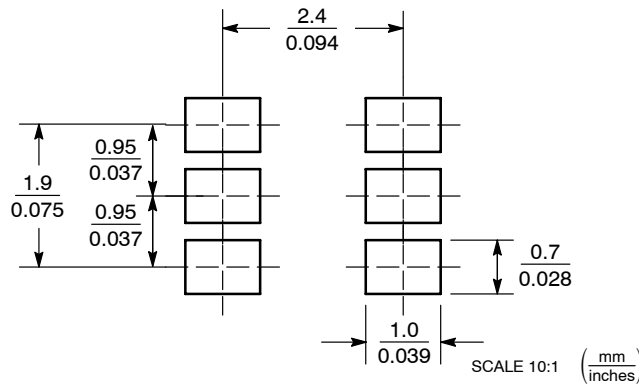
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.90	1.00	1.10	0.035	0.039	0.043
A1	0.01	0.06	0.10	0.001	0.002	0.004
b	0.25	0.38	0.50	0.010	0.014	0.020
c	0.10	0.18	0.26	0.004	0.007	0.010
D	2.90	3.00	3.10	0.114	0.118	0.122
E	1.30	1.50	1.70	0.051	0.059	0.067
e	0.85	0.95	1.05	0.034	0.037	0.041
L	0.20	0.40	0.60	0.008	0.016	0.024
HE	2.50	2.75	3.00	0.099	0.108	0.118
θ	0°	-	10°	0°	-	10°

### STYLE 1:

1. DRAIN
2. DRAIN
3. GATE
4. SOURCE
5. DRAIN
6. 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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