MMFT2N25E

Product Preview

High Energy Power FET

N−Channel Enhancement−Mode Silicon Gate

This advanced high voltage MOSFET is designed to withstand high energy in the avalanche mode and switch efficiently. This new high energy device also offers a drain−to−source diode with fast recovery time. Designed for high voltage, high speed switching applications such as power supplies, PWM motor controls and other inductive loads, the avalanche energy capability is specified to eliminate the guesswork in designs where inductive loads are switched and offer additional safety margin against unexpected voltage transients.

- Avalanche Energy Capability Specified at Elevated Temperature
- Internal Source−to−Drain Diode Designed to Replace External Zener Transient Suppressor − Absorbs High Energy in the Avalanche Mode
- Source−to−Drain Diode Recovery Time Comparable to Discrete Fast Recovery Diode

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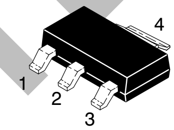
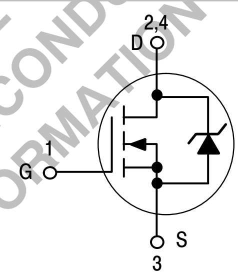
POWER FET
2.0 AMPERES, 250 VOLTS
$R_{DS(on)}$ = 3.5 Ω



CASE 318E−04, STYLE 3
TO−261AA



MAXIMUM RATINGS (T_C = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Drain−to−Source Voltage	V_{DSS}	250	Vdc
Drain−to−Gate Voltage, R_{GS} = 1.0 mΩ	V_{DGR}	250	Vdc
Gate−to−Source Voltage — Continuous	V_{GS}	±20	Vdc
Gate−to−Source Voltage — Single Pulse (tp ≤ 50 μS)	V_{GSM}	±40	Vdc
Drain Current — Continuous @ T_C = 25°C — Continuous @ T_C = 100°C — Single Pulse (tp ≤ 10 μS)	I_D I_D I_{DM}	2.0 0.6 7.0	Adc Apk
Total Power Dissipation @ T_C = 25°C Derate above 25°C Total P_D @ T_A = 25°C mounted on 1″ Sq. Drain Pad on FR−4 Bd. Material Total P_D @ T_A = 25°C mounted on 0.7″ Sq. Drain Pad on FR−4 Bd. Material Total P_D @ T_A = 25°C mounted on min. Drain Pad on FR−4 Bd. Material	P_D	0.77 6.2 1.0 1.2 0.8	Watts mW/°C Watts
Operating and Storage Temperature Range	T_J, T_{stg}	−55 to 150	°C

UNCLAMPED DRAIN−TO−SOURCE AVALANCHE CHARACTERISTICS (T_J < 150°C)

Single Pulse Drain−to−Source Avalanche Energy — Starting T_J = 25°C (V_{DD} = 80 V, V_{GS} = 10 V, Peak I_L= 4.0 Apk, L = 3.0 mH, R_G = 25 Ω)	E_{AS}	 26	mJ

THERMAL CHARACTERISTICS

— Junction−to−Ambient on 1″ Sq. Drain Pad on FR−4 Bd. Material — Junction−to−Ambient on 0.7″ Sq. Drain Pad on FR−4 Bd. Material — Junction−to−Ambient on min. Drain Pad on FR−4 Bd. Material	$R_{\theta JA}$	90 103 162	°C/W
Maximum Lead Temperature for Soldering Purposes, 1/8″ from case for 10 seconds	T_L	260	°C

This document contains information on a product under development. ON Semiconductor reserves the right to change or discontinue this product without notice.

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Drain−to−Source Breakdown Voltage (V_{GS} = 0, I_D = 0.25 mA)	BV_{DSS}	250	—	—	Vdc
Temperature Coefficient (Positive)		—	324	—	V/°C
Zero Gate Voltage Drain Current (V_{DS} = 250 V, V_{GS} = 0)	I_{DSS}	—	—	10	µAdc
(V_{DS} = 250 V, V_{GS} = 0, T_J = 125°C)		—	—	100	
Gate−Body Leakage Current (V_{GS} = ±20 V, V_{DS} = 0)	I_{GSS}	—	—	100	nAdc
ON CHARACTERISTICS (1)					
Gate Threshold Voltage (V_{DS} = V_{GS}, I_D = 0.25 mA)	$V_{GS(th)}$	2.0	2.8	4.0	Vdc
Threshold Temperature Coefficient (Negative)		—	5.7	—	mV/°C
Static Drain−to−Source On−Resistance (V_{GS} = 10 V, I_D = 1.0 Adc)	$R_{DS(on)}$	—	2.1	3.5	Ohms
Drain−to−Source On−Voltage (V_{GS} = 10 V, I_D = 2.0 A)	$V_{DS(on)}$	—	—	8.40	Vdc
(V_{GS} = 10 V, I_D = 1.0 A, T_J = 125°C)		—	—	7.35	
Forward Transconductance (V_{DS} = 8.0 V, I_D = 2.0 Adc)	g_{FS}	0.44	1.2	—	mhos
DYNAMIC CHARACTERISTICS					
Input Capacitance (V_{DS} = 25 V, V_{GS} = 0, f = 1.0 MHz)	C_{iss}	—	137	190	pF
Output Capacitance	C_{oss}	—	30	40	
Transfer Capacitance	C_{rss}	—	7.0	10	
SWITCHING CHARACTERISTICS (1)					
Turn−On Delay Time (V_{DS} = 125 V, I_D = 2.0 A, R_G = 9.1 Ohms, V_{GS} = 10 V)	$t_{d(on)}$	—	9.2	20	ns
Rise Time	t_r	—	6.6	10	
Turn−Off Delay Time	$t_{d(off)}$	—	13	30	
Fall Time	t_f	—	8.5	20	
Gate Charge (V_{DS} = 200 V, I_D = 2.0 A, V_{GS} = 10 V)	Q_T	—	4.7	10	nC
	Q_1	—	1.3	—	
	Q_2	—	3.2	—	
	Q_3	—	2.3	—	
SOURCE−DRAIN DIODE CHARACTERISTICS					
Forward On−Voltage (I_S = 2.0 A, V_{GS} = 0 V)	V_{SD}	—	0.94	2.0	Vdc
(I_S = 2.0 A, V_{GS} = 0 V, T_J = 125°C)	V_{SD}	—	0.83	—	
Reverse Recovery Time (I_S = 2.0 A, dI_S/dt = 100 A/µs)	t_{rr}	—	104	—	nS
	t_a	—	63	—	
	t_b	—	41	—	
Reverse Recovery Stored Charge	q_{rr}	—	0.365	—	µC

(1) Pulse Test: Pulse Width ≤ 300 µS, Duty Cycle ≤ 2%.

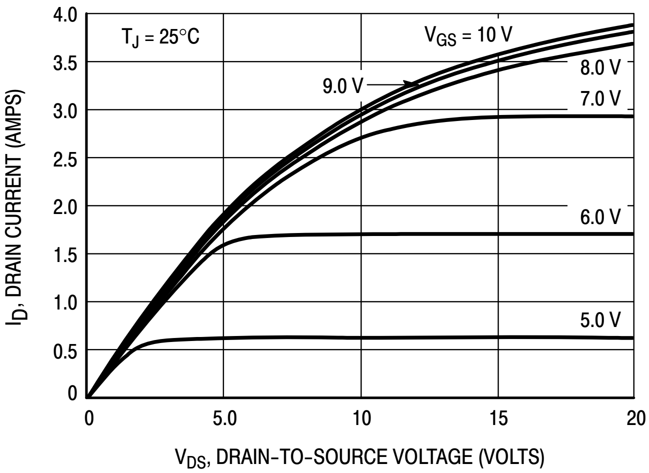


Figure 1. On−Region Characteristics

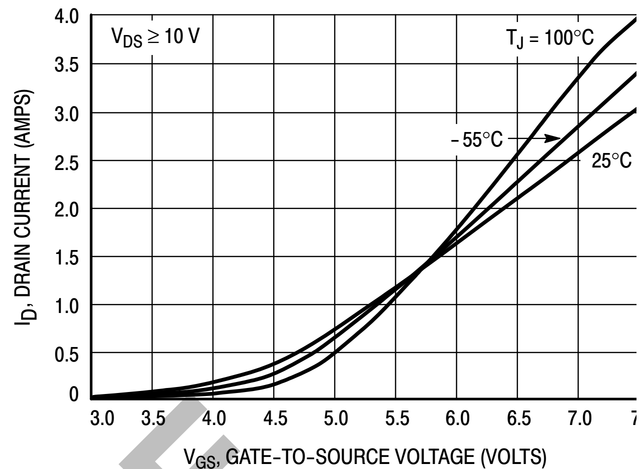


Figure 2. Transfer Characteristics

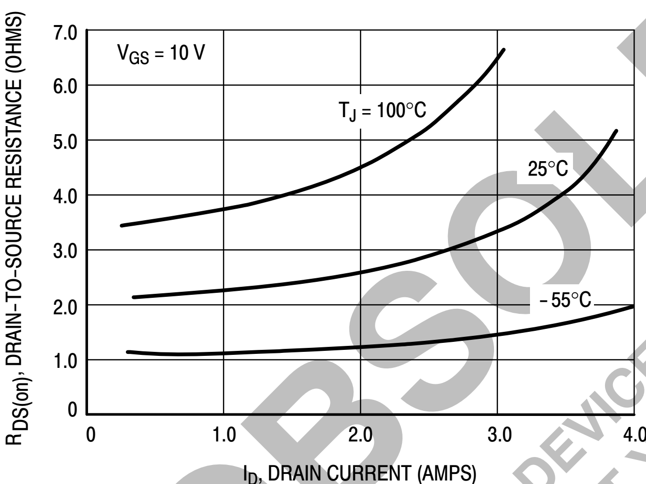


Figure 3. On−Resistance versus Drain Current and Temperature

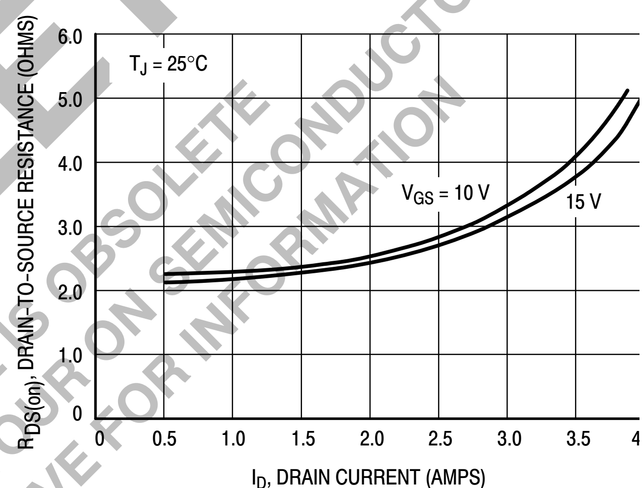


Figure 4. On−Resistance versus Drain Current and Gate Voltage

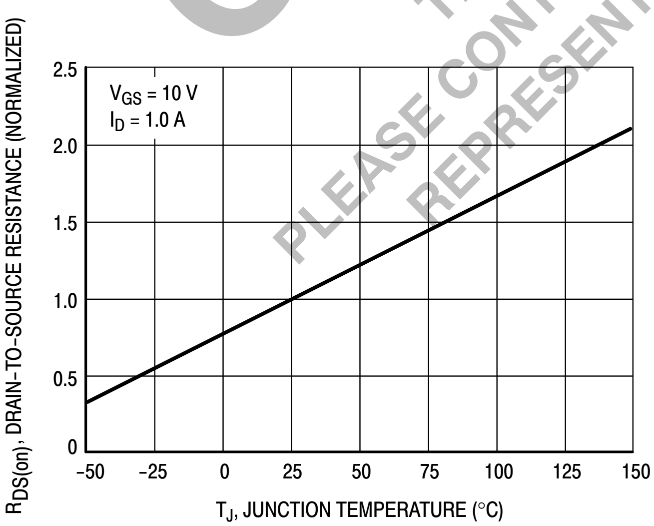


Figure 5. On−Resistance Variation versus Temperature

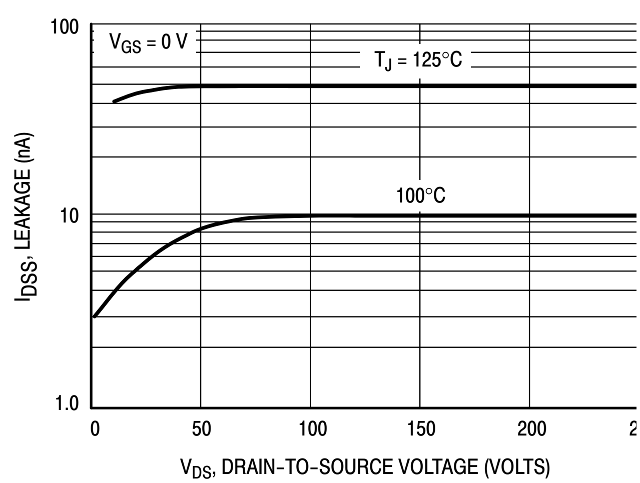


Figure 6. Drain−to−Source Leakage Current versus Voltage

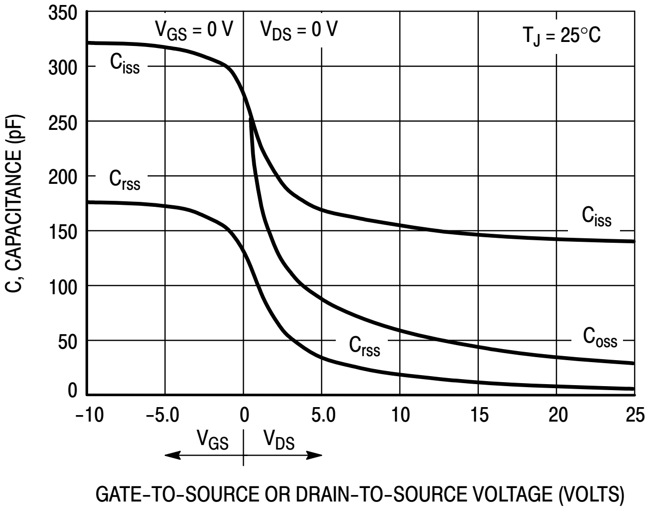


Figure 7. Capacitance Variation

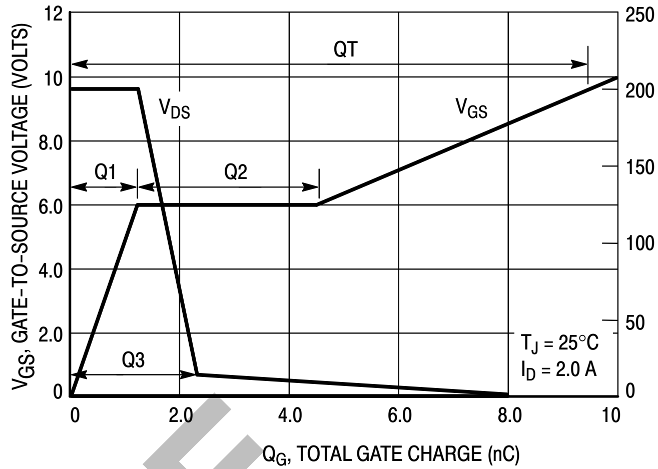


Figure 8. Gate−to−Source and Drain−to−Source Voltage versus Total Charge

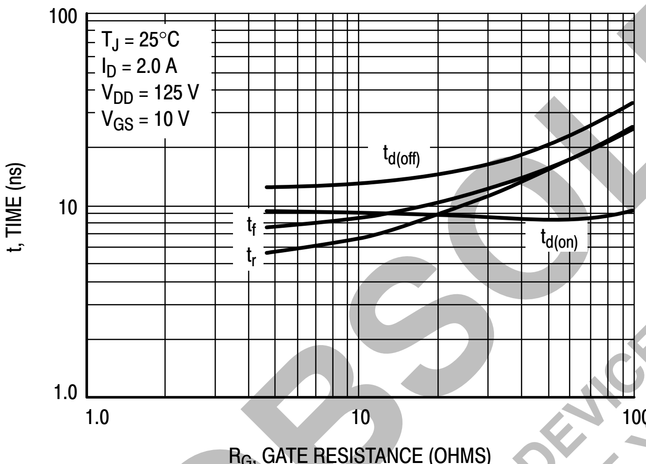


Figure 9. Resistive Switching Time Variation versus Gate Resistance

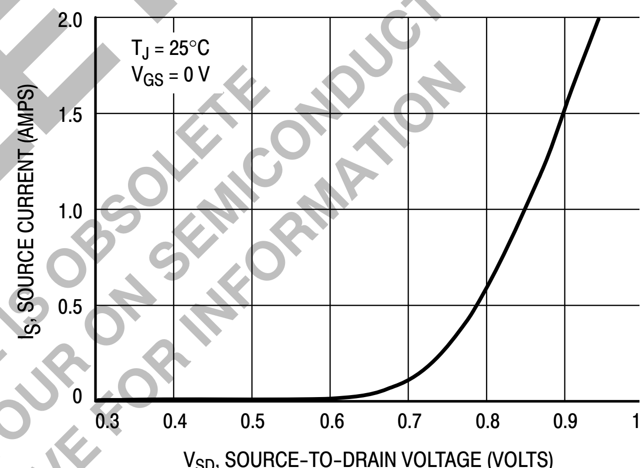


Figure 10. Diode Forward Voltage versus Current

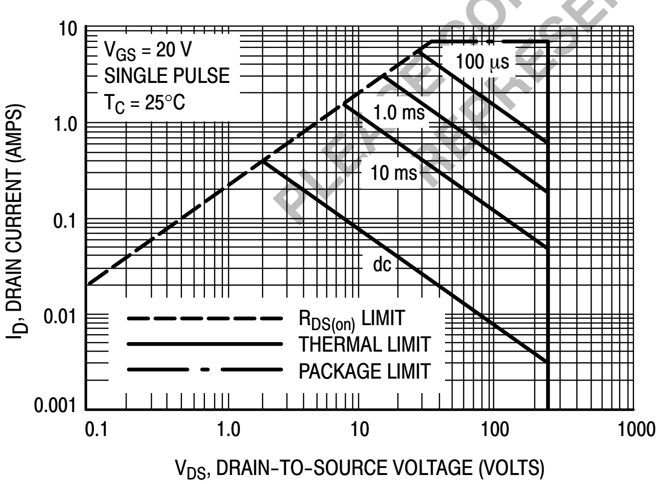


Figure 11. Maximum Rated Forward Biased Safe Operating Area

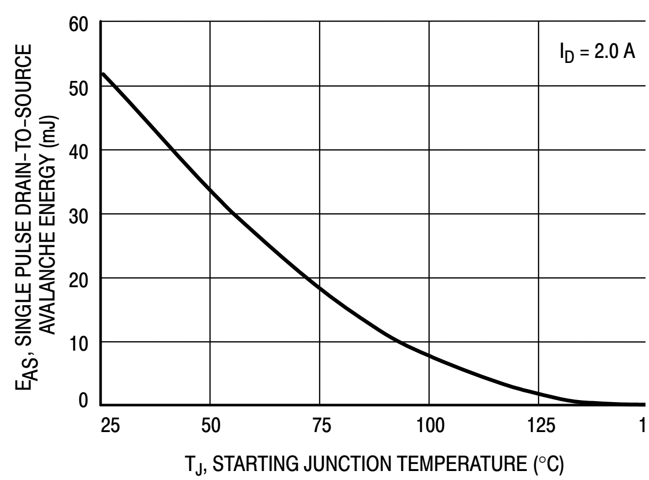


Figure 12. Maximum Avalanche Energy versus Starting Junction Temperature

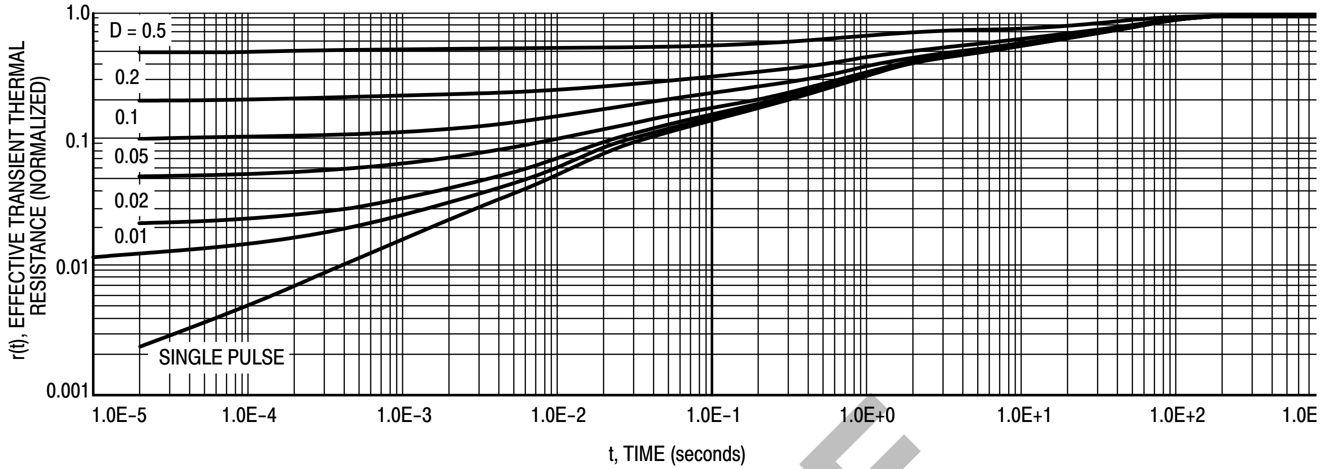
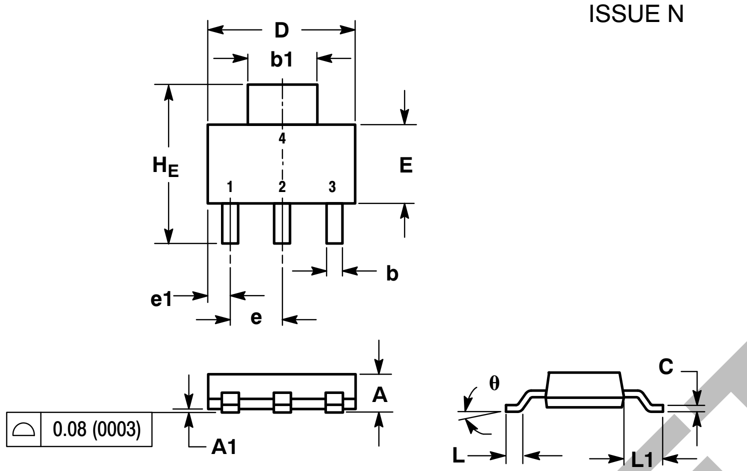


Figure 13. Thermal Response

PACKAGE DIMENSIONS

SOT−223 (TO−261)
CASE 318E−04
ISSUE N

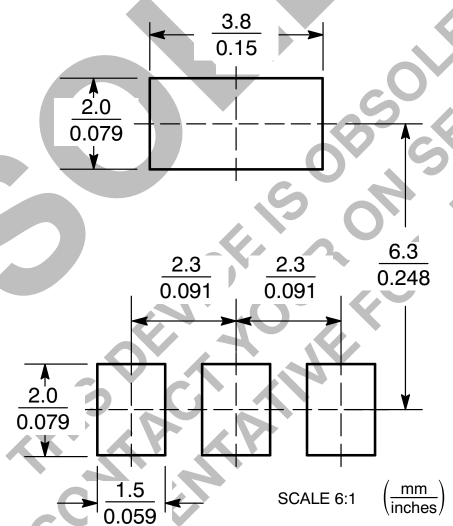


NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCH.

	MILLIMETERS			INCHES		
DIM	MIN	NOM	MAX	MIN	NOM	MAX
A	1.50	1.63	1.75	0.060	0.064	0.068
A1	0.02	0.06	0.10	0.001	0.002	0.004
b	0.60	0.75	0.89	0.024	0.030	0.035
b1	2.90	3.06	3.20	0.115	0.121	0.126
c	0.24	0.29	0.35	0.009	0.012	0.014
D	6.30	6.50	6.70	0.249	0.256	0.263
E	3.30	3.50	3.70	0.130	0.138	0.145
e	2.20	2.30	2.40	0.087	0.091	0.094
e1	0.85	0.94	1.05	0.033	0.037	0.041
L	0.20	------		0.008	------	
L1	1.50	1.75	2.00	0.060	0.069	0.078
H_E	6.70	7.00	7.30	0.264	0.276	0.287
θ	0°	−	10°	0°	−	10°

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