

MOSFET - Power, Single N-Channel, STD Gate, SO8FL

40 V, 1.65 mΩ, 154 A

NTMFS1D7N04XM

Features

- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- Small Footprint (5 x 6 mm) with Compact Design
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

Applications

- Motor Drive
- Battery Protection
- Synchronous Rectification

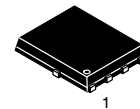
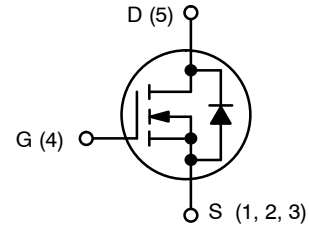
MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise stated)

Parameter	Symbol	Value	Unit
Drain-to-Source Voltage	V_{DSS}	40	V
Gate-to-Source Voltage	DC V_{GS}	± 20	V
Continuous Drain Current	I_D	$T_C = 25^\circ\text{C}$	154
		$T_C = 100^\circ\text{C}$	110
Power Dissipation	$T_C = 25^\circ\text{C}$	P_D	75
Pulsed Drain Current	$T_C = 25^\circ\text{C}$, $t_p = 10 \mu\text{s}$	I_{DM}	900
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 to +175	$^\circ\text{C}$
Source Current (Body Diode)	I_S	105	A
Single Pulse Avalanche Energy ($I_{PK} = 8.3 \text{ A}$)	E_{AS}	665	mJ
Lead Temperature for Soldering Purposes	T_L	260	$^\circ\text{C}$

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

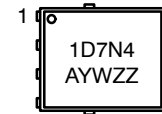
$V_{(BR)DSS}$	$R_{DS(ON)} \text{ MAX}$	$I_D \text{ MAX}$
40 V	1.65 mΩ @ 10 V	154 A

N-CHANNEL MOSFET



DFN5 5x6, 1.27P (SO-8FL)
CASE 488AA

MARKING DIAGRAM



1D7N4 = Specific Device Code
A = Assembly Location
Y = Year
W = Work Week
ZZ = Lot Traceability

ORDERING INFORMATION

See detailed ordering, marking and shipping information on page 5 of this data sheet.

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THERMAL CHARACTERISTICS

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case (Note 2)	$R_{\theta JC}$	2	°C/W
Thermal Resistance, Junction-to-Ambient (Notes 1, 2)	$R_{\theta JA}$	41	

- Surface-mounted on FR4 board using 650 mm², 2 oz Cu pad.
- The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}, T_J = 25^\circ\text{C}$	40			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$\Delta V_{(BR)DSS} / \Delta T_J$	$I_D = 1\text{ mA}$. Referenced to 25°C		15		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 40\text{ V}, T_J = 25^\circ\text{C}$			1.0	μA
		$V_{DS} = 40\text{ V}, T_J = 125^\circ\text{C}$			20	
Gate-to-Source Leakage Current	I_{GSS}	$V_{GS} = 20\text{ V}, V_{DS} = 0\text{ V}$			100	nA

ON CHARACTERISTICS

Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 14\text{ A}, T_J = 25^\circ\text{C}$		1.4	1.65	mΩ
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 70\text{ }\mu\text{A}, T_J = 25^\circ\text{C}$	2.5		3.5	V
Gate Threshold Voltage Temperature Coefficient	$\Delta V_{GS(TH)} / \Delta T_J$	$V_{GS} = V_{DS}, I_D = 70\text{ }\mu\text{A}$		-7		mV/°C
Forward Transconductance	g_{FS}	$V_{DS} = 5\text{ V}, I_D = 14\text{ A}$		77		S

CHARGES, CAPACITANCES & GATE RESISTANCE

Input Capacitance	C_{ISS}	$V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$		1840		pF
Output Capacitance	C_{OSS}			1186		
Reverse Transfer Capacitance	C_{RSS}			19		
Output Charge	Q_{OSS}	$V_{GS} = 10\text{ V}, V_{DD} = 32\text{ V}; I_D = 14\text{ A}$		46		nC
Total Gate Charge	$Q_{G(TOT)}$			29		
Threshold Gate Charge	$Q_{G(TH)}$			5		
Gate-to-Source Charge	Q_{GS}			8		
Gate-to-Drain Charge	Q_{GD}			6		
Gate Resistance	R_G	$f = 1\text{ MHz}$		0.7		Ω

SWITCHING CHARACTERISTICS

Turn-On Delay Time	$t_{d(ON)}$	Resistive Load, $V_{GS} = 10\text{ V}, V_{DD} = 32\text{ V},$ $I_D = 14\text{ A}, R_G = 0\text{ }\Omega$		7		ns
Rise Time	t_r			13		
Turn-Off Delay Time	$t_{d(OFF)}$			10		
Fall Time	t_f			17		

SOURCE-TO-DRAIN DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{GS} = 0\text{ V}, I_S = 14\text{ A}, T_J = 25^\circ\text{C}$		0.78	1.2	V
		$V_{GS} = 0\text{ V}, I_S = 14\text{ A}, T_J = 125^\circ\text{C}$		0.62		
Reverse Recovery Time	t_{RR}	$V_{GS} = 0\text{ V}, di/dt = 100\text{ A}/\mu\text{s},$ $I_S = 14\text{ A}, V_{DD} = 32\text{ V}$		41		ns
Charge Time	t_a			17		
Discharge Time	t_b			24		
Reverse Recovery Charge	Q_{RR}			37		

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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TYPICAL CHARACTERISTICS

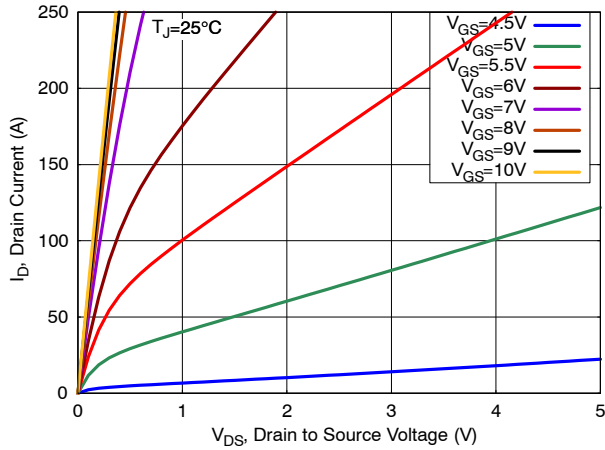


Figure 1. On-Region Characteristics

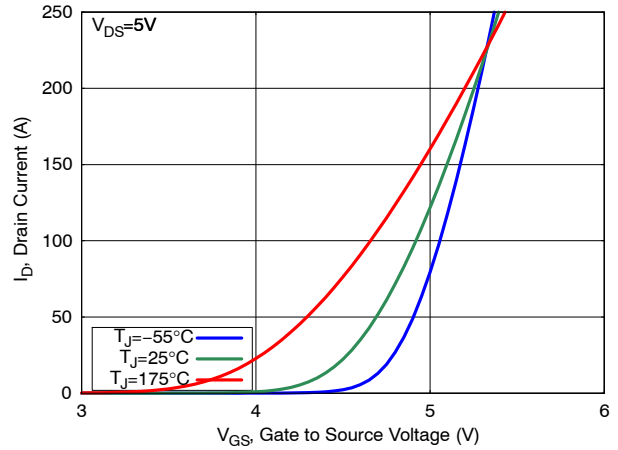


Figure 2. Transfer Characteristics

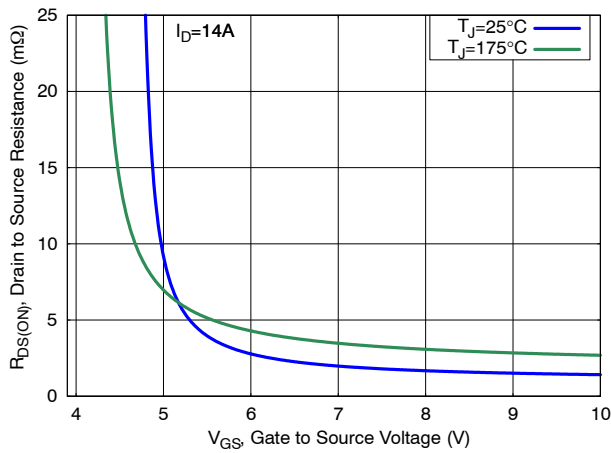


Figure 3. On-Resistance vs. Gate Voltage

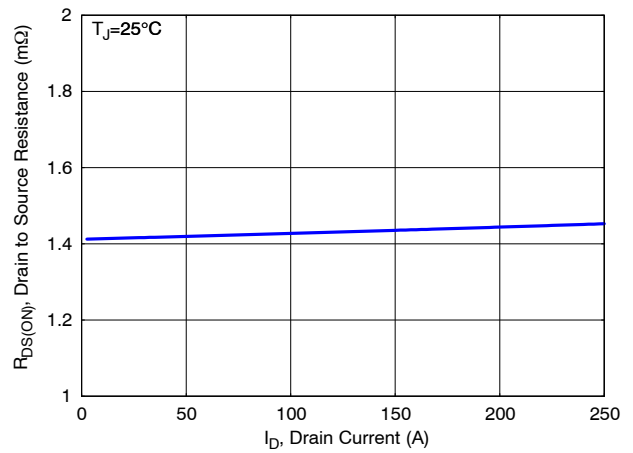


Figure 4. On-Resistance vs. Drain Current

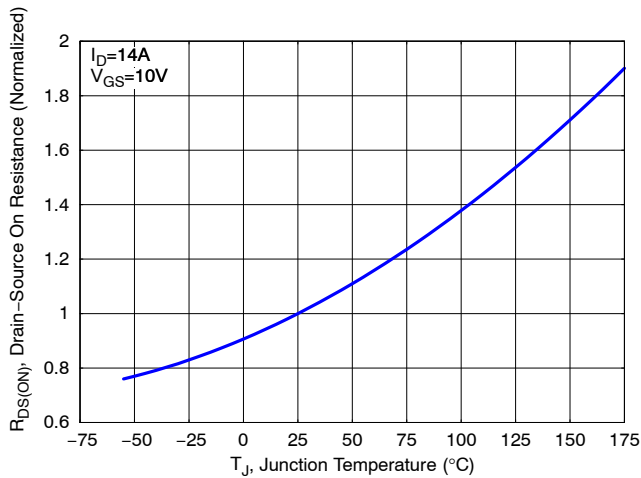


Figure 5. Normalized ON Resistance vs. Junction Temperature

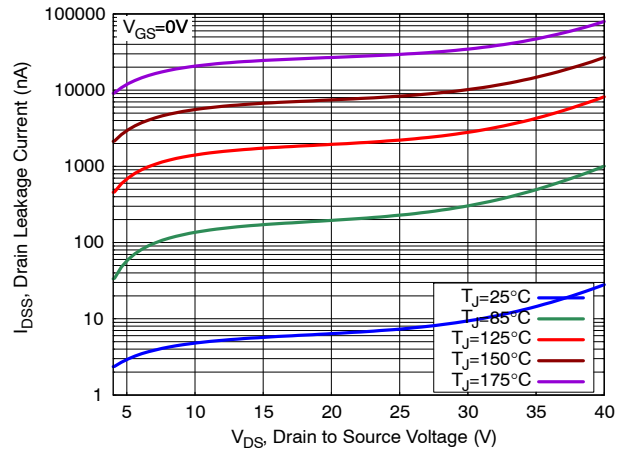


Figure 6. Drain Leakage Current vs. Drain Voltage

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TYPICAL CHARACTERISTICS (continued)

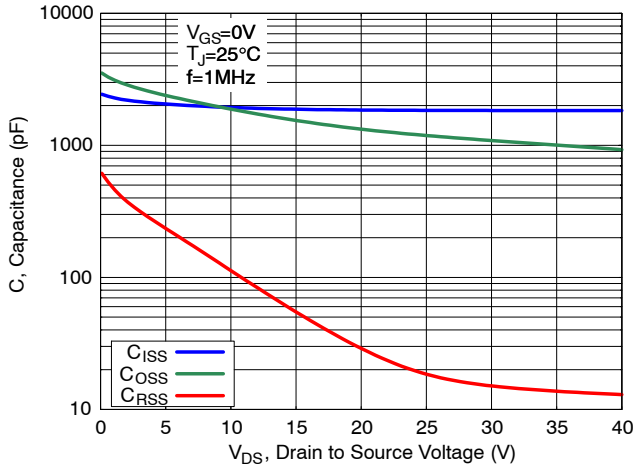


Figure 7. Capacitance Characteristics

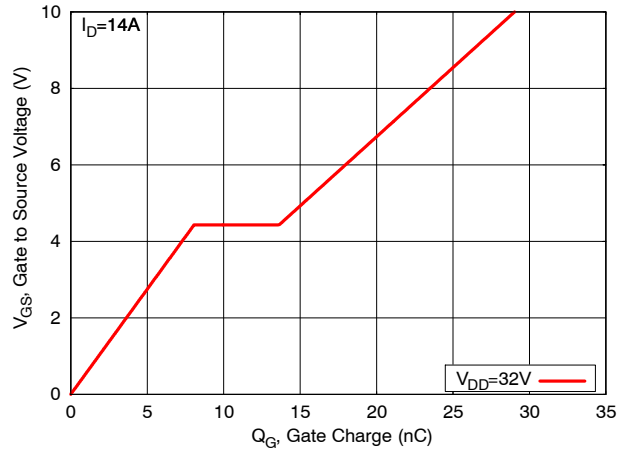


Figure 8. Gate Charge Characteristics

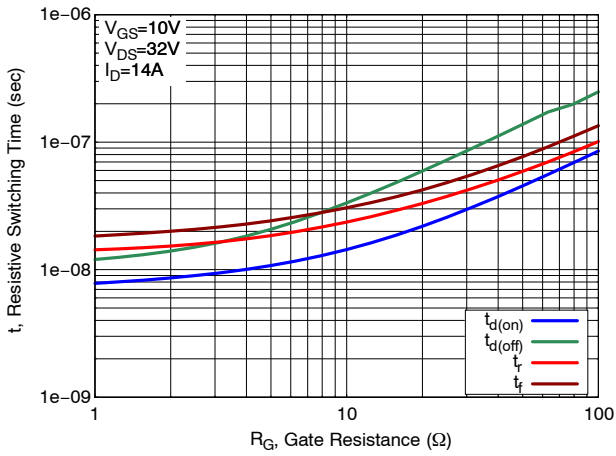


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

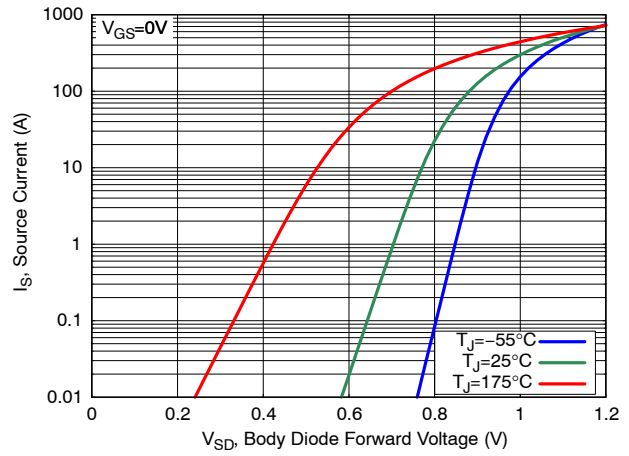


Figure 10. Diode Forward Characteristics

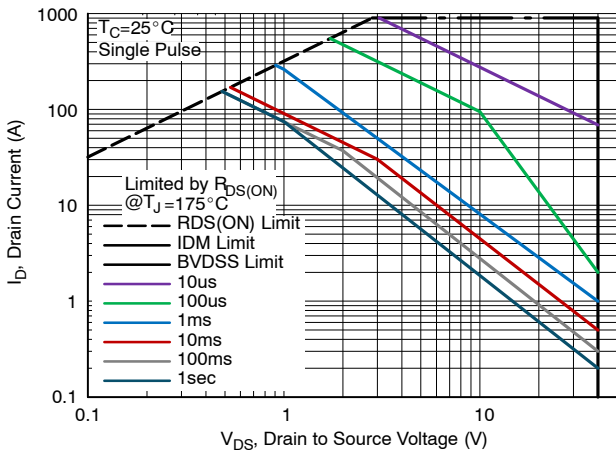


Figure 11. Maximum Rated Forward Biased Safe Operating Area

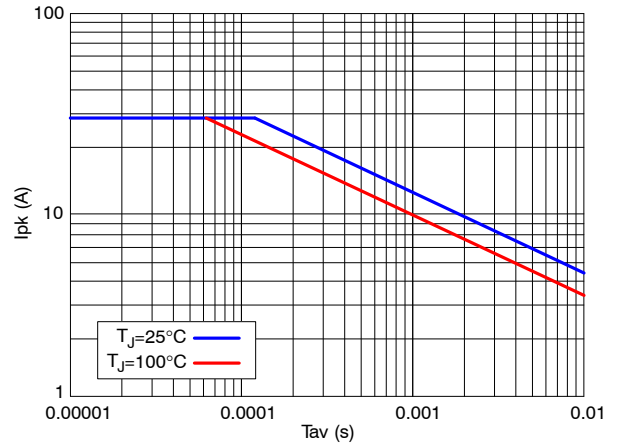


Figure 12. UIS

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TYPICAL CHARACTERISTICS (continued)

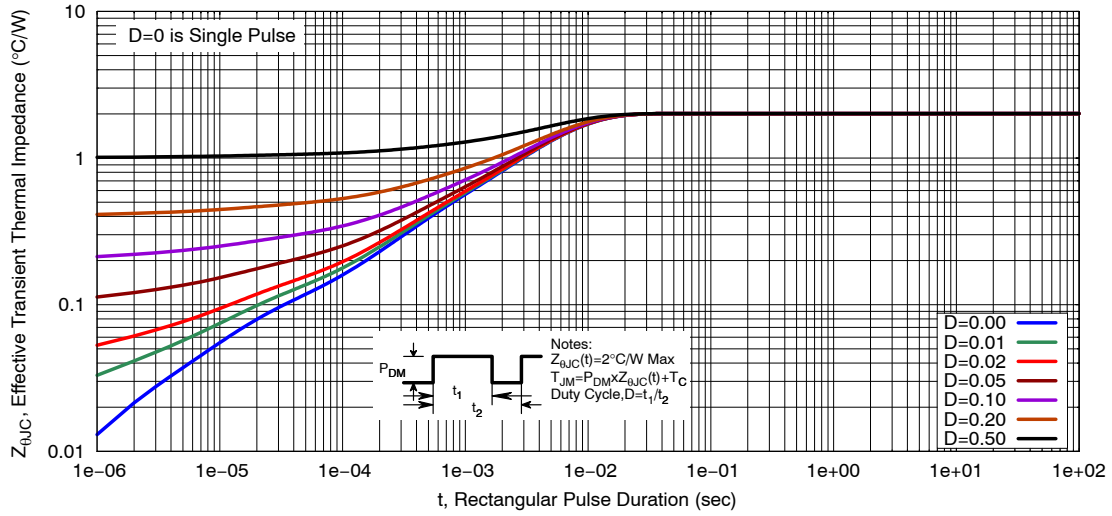


Figure 13. Transient Thermal Response

DEVICE ORDERING INFORMATION

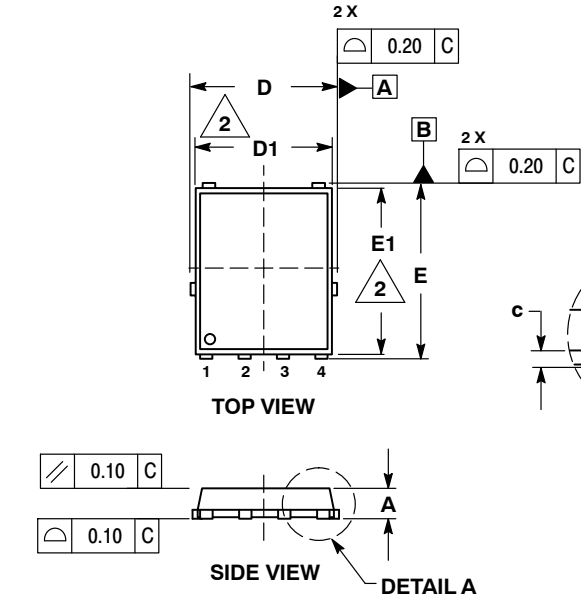
Device	Marking	Package	Shipping†
NTMFS1D7N04XMT1G	1D7N4	DFN5 (Pb-Free)	1500 / Tape & Reel

†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.

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PACKAGE DIMENSIONS

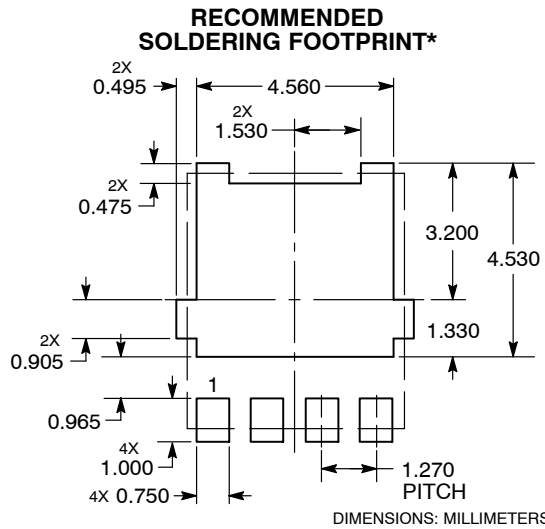
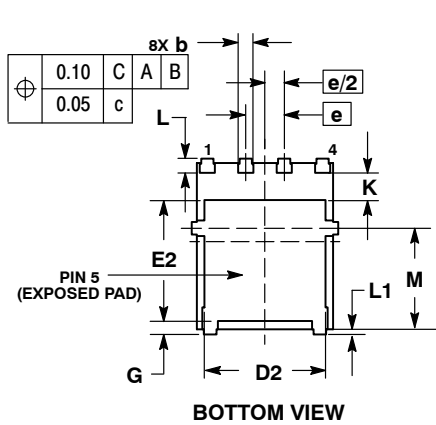
DFN5 5x6, 1.27P
(SO-8FL)
CASE 488AA
ISSUE N



NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION D1 AND E1 DO NOT INCLUDE MOLD FLASH PROTRUSIONS OR GATE BURRS.

DIM	MILLIMETERS		
	MIN	NOM	MAX
A	0.90	1.00	1.10
A1	0.00	---	0.05
b	0.33	0.41	0.51
c	0.23	0.28	0.33
D	5.00	5.15	5.30
D1	4.70	4.90	5.10
D2	3.80	4.00	4.20
E	6.00	6.15	6.30
E1	5.70	5.90	6.10
E2	3.45	3.65	3.85
e	1.27 BSC		
G	0.51	0.575	0.71
K	1.20	1.35	1.50
L	0.51	0.575	0.71
L1	0.125 REF		
M	3.00	3.40	3.80
θ	0°	---	12°



DIMENSIONS: MILLIMETERS

STYLE 1:

- PIN 1. SOURCE
- 2. SOURCE
- 3. SOURCE
- 4. GATE
- 5. DRAIN

STYLE 2:

- PIN 1. ANODE
- 2. ANODE
- 3. ANODE
- 4. NO CONNECT
- 5. CATHODE

*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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