MOSFET - Power, Single N-Channel, SO8FL

40 V, 2.35 mΩ, 111 A

NTMFS2D3N04XM

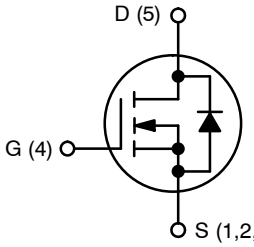
$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	I_D MAX
40 V	2.35 mΩ @ V_{GS} = 10 V	111 A

Features

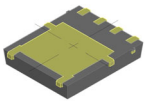
- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- Small Footprint (5 x 6 mm) with Compact Design
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

Applications

- Motor Drive
- Battery Protection
- Oring



N−CHANNEL MOSFET



DFN5 (SO8−FL)
CASE 488AA

MAXIMUM RATINGS (T_J = 25°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	T_C = 25°C	I_D	111	A
	T_C = 100°C		78	
Power Dissipation	T_C = 25°C	P_D	53	W
Continuous Drain Current $R_{\theta JA}$	T_A = 25°C	I_{DA}	29	A
	T_A = 100°C		21	
Pulsed Drain Current	T_C = 25°C, t_p = 10 μs	I_{DM}	682	A
Operating Junction and Storage Temperature Range		T_J, T_{STG}	−55 to +175	°C
Source Current (Body Diode)		I_S	76	A
Single Pulse Avalanche Energy (I_{PK} = 6.5 A)		E_{AS}	155	mJ
Lead Temperature for Soldering Purposes (1/8″ from case for 10 s)		T_L	260	°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.



2D3N4 = Specific Device Code
A = Assembly Location
Y = Year
W = Work Week
ZZ = Assembly Lot Code

ORDERING INFORMATION

See detailed ordering, marking and shipping information in the package dimensions section on page 5 of this data sheet.

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THERMAL CHARACTERISTICS

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction−to−Case (Note 2)	$R_{\theta JC}$	2.82	°C/W
Thermal Resistance, Junction−to−Ambient (Notes 1, 2)	$R_{\theta JA}$	41.1	

1. Surface mounted on FR4 board using 650 mm^2, 2 oz Cu pad.
2. 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°C unless otherwise specified)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Drain−to−Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 1 mA, T_J = 25°C	40			V
Drain−to−Source Breakdown Voltage Temperature Coefficient	$\Delta V_{(BR)DSS}/\Delta T_J$	I_D = 1 mA, Referenced to 25°C		15		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 40 V, T_J = 25°C			10	μA
		V_{DS} = 40 V, T_J = 125°C			100	
Gate−to−Source Leakage Current	I_{GSS}	V_{GS} = 20 V, V_{DS} = 0 V			100	nA
ON CHARACTERISTICS						
Drain−to−Source On Resistance	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 20 A, T_J = 25°C		2.03	2.35	mΩ
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = 60 μA, T_J = 25°C	2.5		3.5	V
Gate Threshold Voltage Temperature Coefficient	$\Delta V_{GS(TH)}/\Delta T_J$	V_{GS} = V_{DS}, I_D = 60 μA		−7.21		mV/°C
Forward Trans−conductance	g_{FS}	V_{DS} = 5 V, I_D = 20 A		89.2		S
CHARGES, CAPACITANCES & GATE RESISTANCE						
Input Capacitance	C_{ISS}	V_{GS} = 0 V, V_{DS} = 20 V, f = 1 MHz		1421		pF
Output Capacitance	C_{OSS}			1015		
Reverse Transfer Capacitance	C_{RSS}			24		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 10 V, V_{DD} = 20 V, I_D = 50 A		22.1		nC
Threshold Gate Charge	$Q_{G(TH)}$			4.18		
Gate−to−Source Charge	Q_{GS}			6.68		
Gate−to−Drain Charge	Q_{GD}			4.07		
Gate Resistance	R_G	f = 1 MHz		0.93		Ω
SWITCHING CHARACTERISTICS						
Turn−On Delay Time	$t_{d(ON)}$	Resistive Load, V_{GS} = 0/10 V, V_{DD} = 20 V, I_D = 50 A, R_G = 0 Ω		15.8		ns
Rise Time	t_r			5.19		
Turn−Off Delay Time	$t_{d(OFF)}$			22.2		
Fall Time	t_f			4.69		
SOURCE−TO−DRAIN DIODE CHARACTERISTICS						
Forward Diode Voltage	V_{SD}	V_{GS} = 0 V, I_S = 20 A, T_J = 25°C		0.82		V
		V_{GS} = 0 V, I_S = 20 A, T_J = 125°C		0.69		
Reverse Recovery Time	t_{RR}	V_{GS} = 0 V, I_S = 50 A, dI/dt = 100 A/μs, V_{DD} = 20 V		33.3		ns
Charge Time	t_a			14.6		
Discharge Time	t_b			18.7		
Reverse Recovery Charge	Q_{RR}			23.1		nC

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.

TYPICAL CHARACTERISTICS

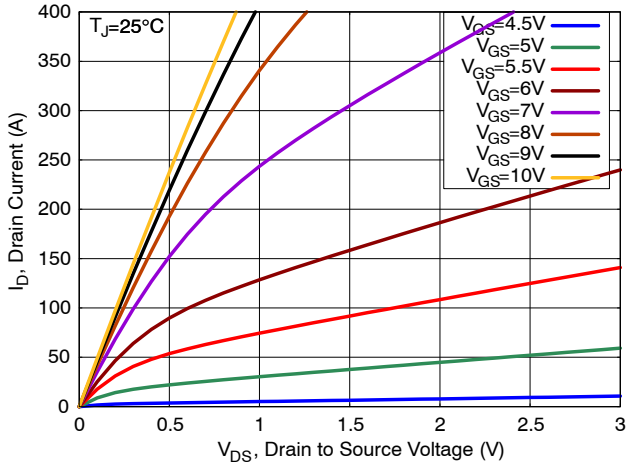


Figure 1. On−Region Characteristics

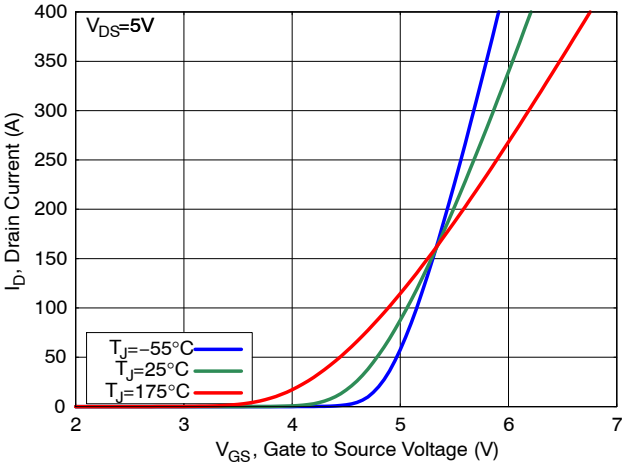


Figure 2. Transfer Characteristics

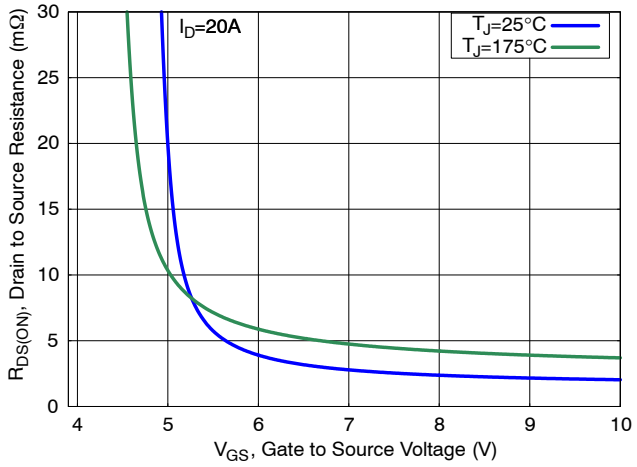


Figure 3. On−Resistance vs. V_{GS}

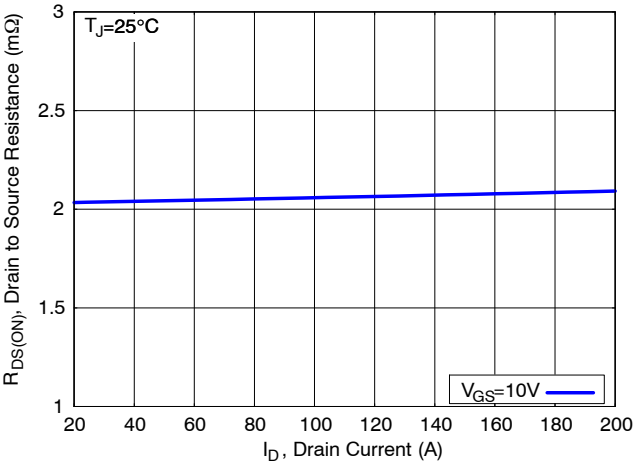


Figure 4. On−Resistance vs. Drain Current and Gate Voltage

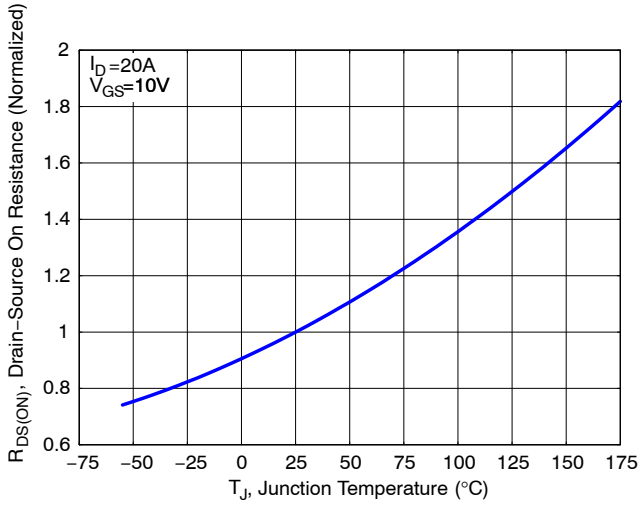


Figure 5. On−Resistance Variation with Temperature

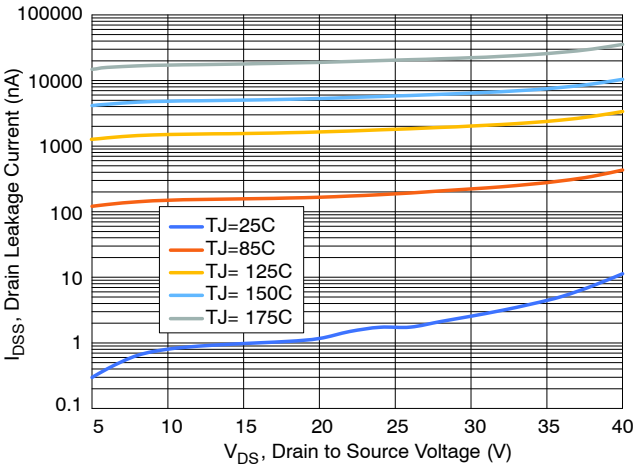


Figure 6. Drain−to−Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

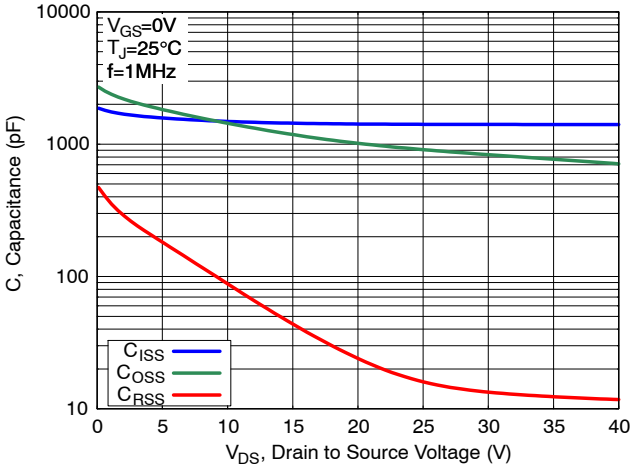


Figure 7. Capacitance Characteristics

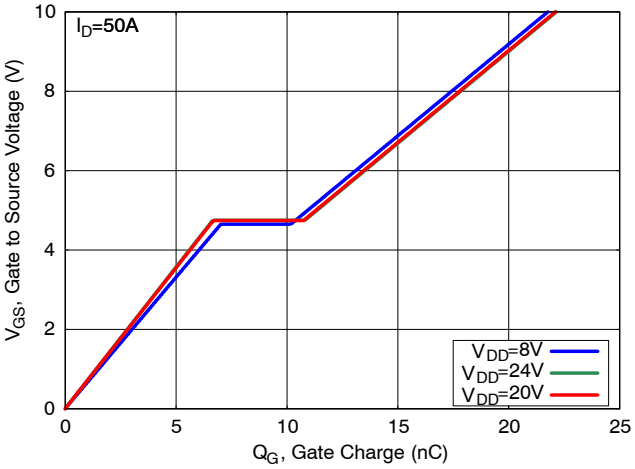


Figure 8. Gate−to−Source Voltage vs. Total Charge

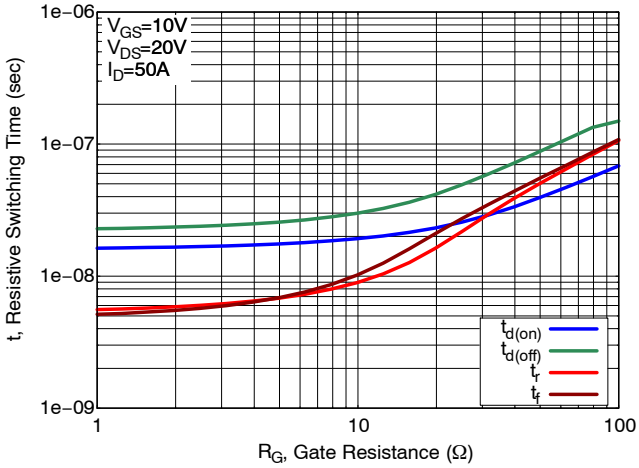


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

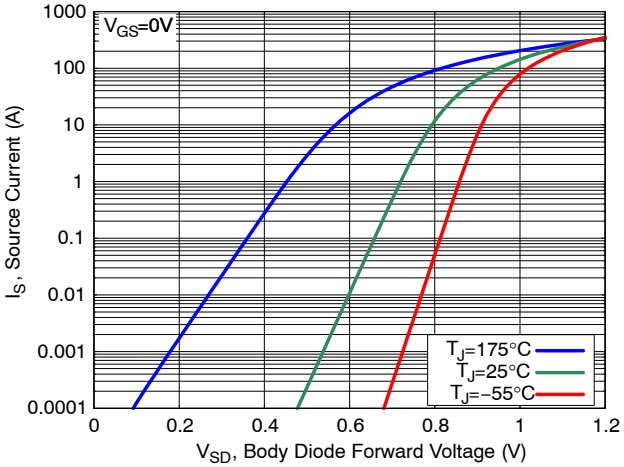


Figure 10. Diode Forward Voltage vs. Current

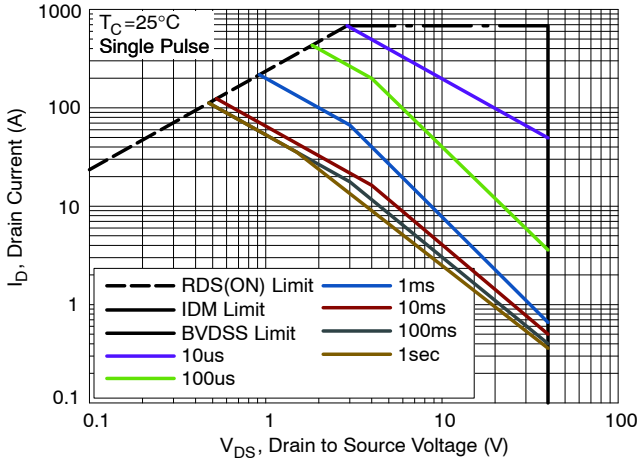


Figure 11. Safe Operating Area (SOA)

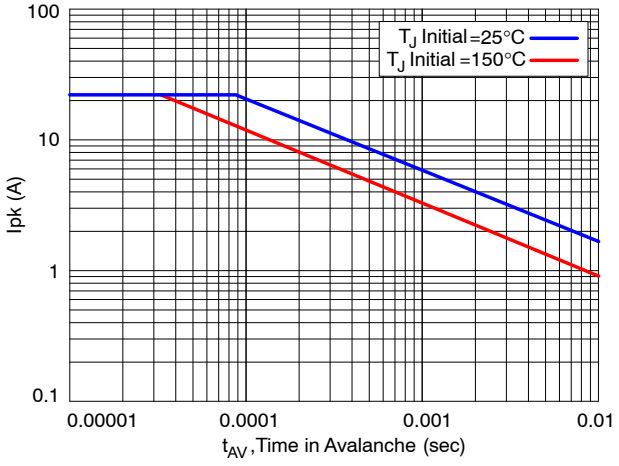


Figure 12. Avalanche Current vs Pulse Time (UIS)

TYPICAL CHARACTERISTICS

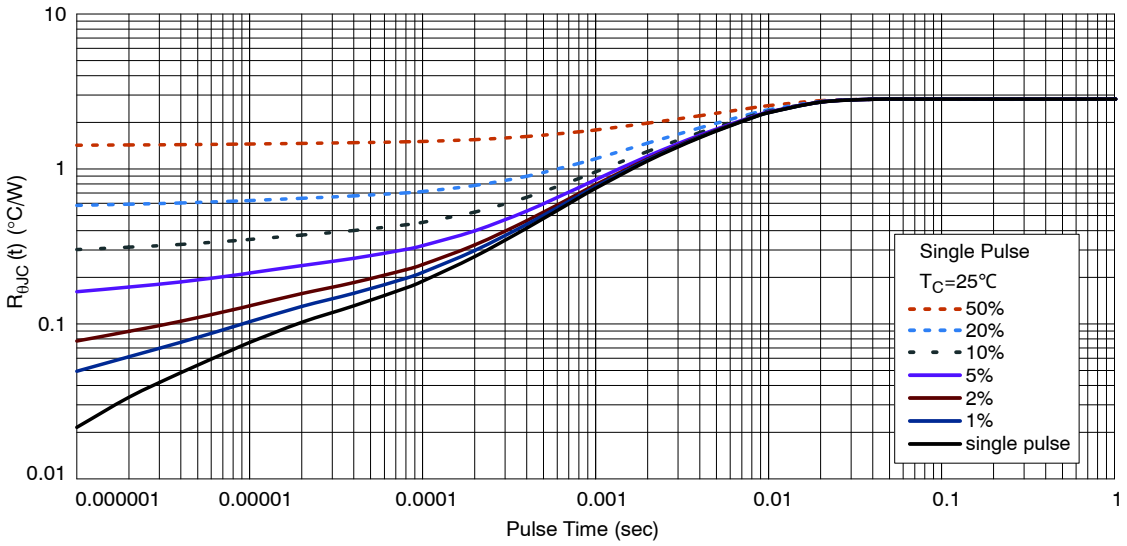


Figure 13. Transient Thermal Response

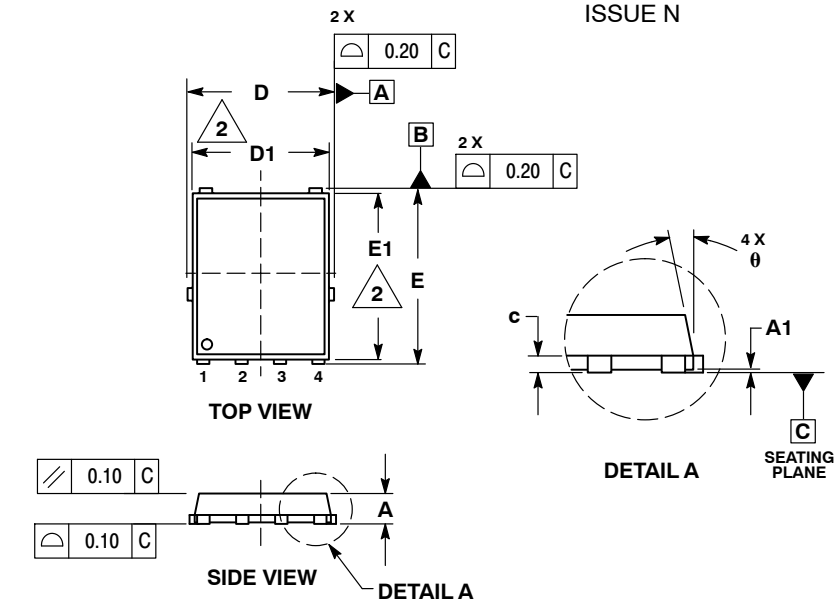
ORDERING INFORMATION

Device	Marking	Package	Shipping†
NTMFS2D3N04XMT1G	2D3N4	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.

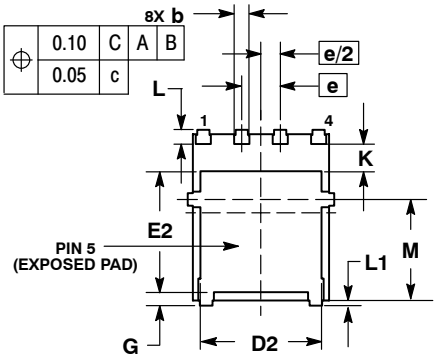
PACKAGE DIMENSIONS

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.

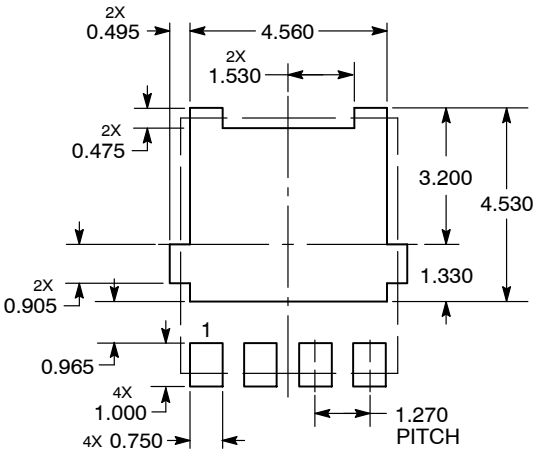
	MILLIMETERS		
DIM	MIN	NOM	MAX
A	0.90	1.00	1.10
A1	0.00	---	0.05
b	0.33	0.41	0.51
c	0.23	0.28	0.33
D	5.00	5.15	5.30
D1	4.70	4.90	5.10
D2	3.80	4.00	4.20
E	6.00	6.15	6.30
E1	5.70	5.90	6.10
E2	3.45	3.65	3.85
e	1.27 BSC		
G	0.51	0.575	0.71
K	1.20	1.35	1.50
L	0.51	0.575	0.71
L1	0.125 REF		
M	3.00	3.40	3.80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



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

RECOMMENDED SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

*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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