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DATA SHEET
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MOSFET - Power, Single N-Channel, SO8-FL

40 V, 0.52 mΩ, 414 A

NTMFS0D5N04XM

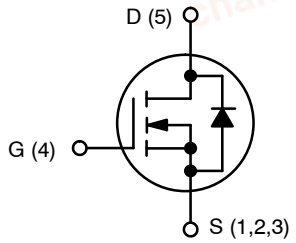
$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	I_D MAX
40 V	0.52 mΩ @ 10 V	414 A

Features

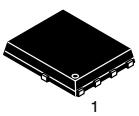
- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- Small Footprint (5 x 6 mm) with Compact Design
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

Applications

- Motor Drive
- Battery Protection
- Orings

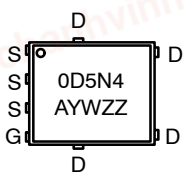


N−CHANNEL MOSFET



DFN5 (SO−8FL)
CASE 506FA

MARKING DIAGRAM



A = Assembly Location
Y = Year
W = Work Week
ZZ = Lot Traceabililty

ORDERING INFORMATION

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

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

Parameter		Symbol	Value	Unit
Drain−to−Source Voltage		V_{DSS}	40	V
Gate−to−Source Voltage		V_{GS}	±20	V
Continuous Drain Current	T_C = 25°C	I_D	414	A
	T_C = 100°C		293	
Power Dissipation	T_C = 25°C	P_D	163	W
Pulsed Drain Current	T_C = 25°C, t_p = 10 μs	I_{DM}	3152	A
Operating Junction and Storage Temperature Range		T_J, T_{STG}	−55 to +175	°C
Source Current (Body Diode)		I_S	251	A
Single Pulse Avalanche Energy	I_{PK} = 28.2 A	E_{AS}	1434	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.

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THERMAL CHARACTERISTICS

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction−to−Case (Note 2)	$R_{\theta JC}$	0.92	°C/W
Thermal Resistance, Junction−to−Ambient (Notes 1, 2)	$R_{\theta JA}$	38.9	

1. Surface−mounted on FR4 board using 650 mm^2 pad, 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 = 50 A, T_J = 25°C		0.43	0.52	mΩ
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = 240 μA, T_J = 25°C	2.5	3.0	3.5	V
Gate Threshold Voltage Temperature Coefficient	$\Delta V_{GS(TH)}/\Delta T_J$	V_{GS} = V_{DS}, I_D = 240 μA		−7.21		mV/°C
Forward Trans−conductance	g_{FS}	V_{DS} = 5 V, I_D = 50 A		267		S
CHARGES, CAPACITANCES & GATE RESISTANCE						
Input Capacitance	C_{ISS}	V_{DS} = 20 V, V_{GS} = 0 V, f = 1 MHz		6267		pF
Output Capacitance	C_{OSS}			4454		
Reverse Transfer Capacitance	C_{RSS}			89.3		
Total Gate Charge	$Q_{G(TOT)}$	V_{DD} = 20 V, I_D = 50 A, V_{GS} = 10 V		97.5		nC
Threshold Gate Charge	$Q_{G(TH)}$			18.4		
Gate−to−Source Charge	Q_{GS}			27.5		
Gate−to−Drain Charge	Q_{GD}			17.8		
Gate Resistance	R_G	f = 1 MHz		0.68		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		30		ns
Rise Time	t_r			9.73		
Turn−Off Delay Time	$t_{d(OFF)}$			46.1		
Fall Time	t_f			7.91		
SOURCE−TO−DRAIN DIODE CHARACTERISTICS						
Forward Diode Voltage	V_{SD}	I_S = 50 A, V_{GS} = 0 V, T_J = 25°C		0.8	1.2	V
		I_S = 50 A, V_{GS} = 0 V, T_J = 125°C		0.65		
Reverse Recovery Time	t_{RR}	V_{GS} = 0 V, I_S = 50 A, dI/dt = 100 A/μs, V_{DD} = 20 V		80.4		ns
Charge Time	t_a			45.7		
Discharge Time	t_b			34.6		
Reverse Recovery Charge	Q_{RR}			206		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.

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TYPICAL CHARACTERISTICS

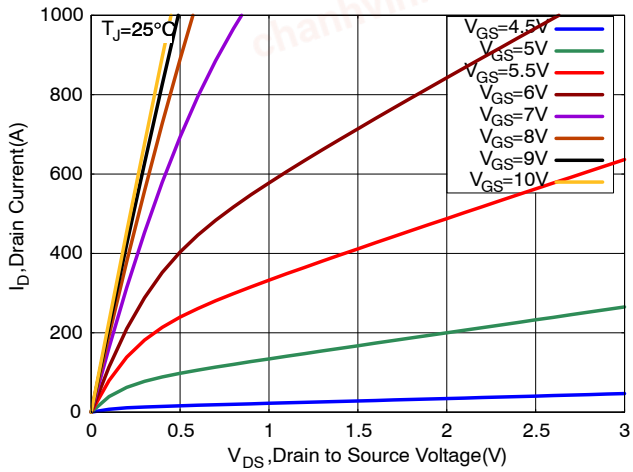


Figure 1. On−Region Characteristics

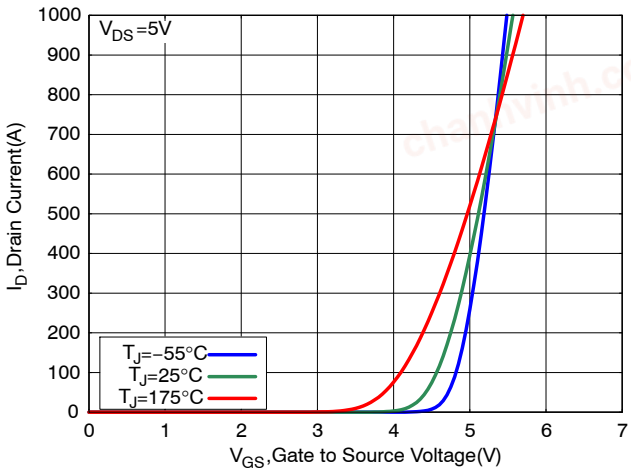


Figure 2. Transfer Characteristics

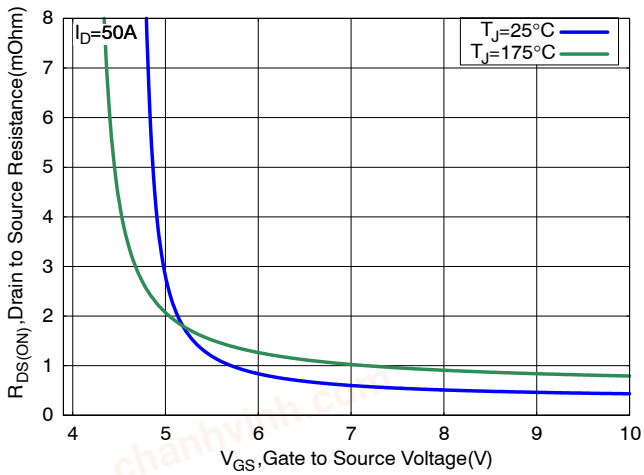


Figure 3. On−Resistance vs. Gate Voltage

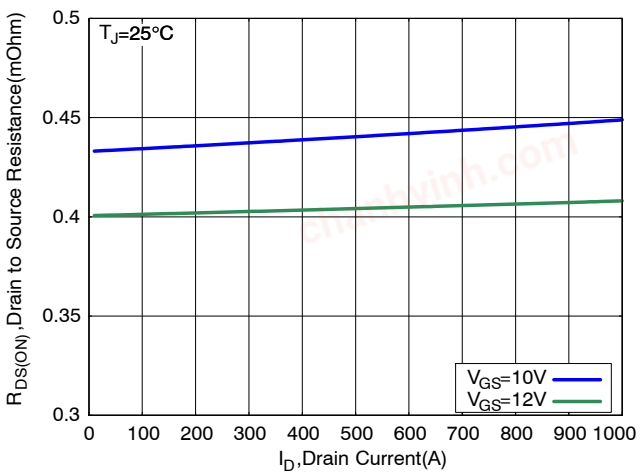


Figure 4. On−Resistance vs. Drain Current

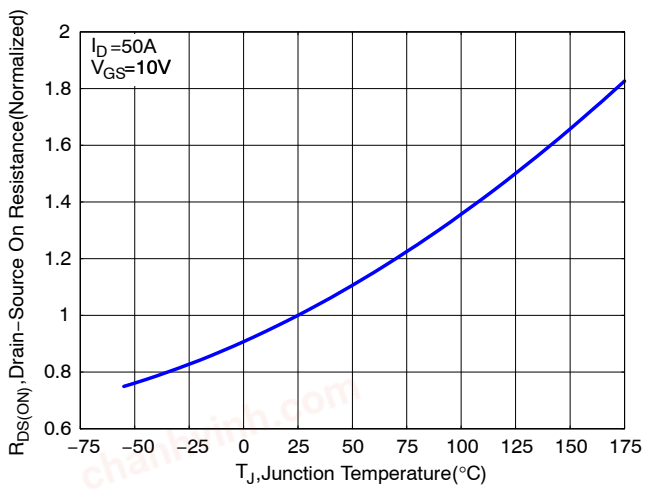


Figure 5. Normalized ON Resistance vs. Junction Temperature

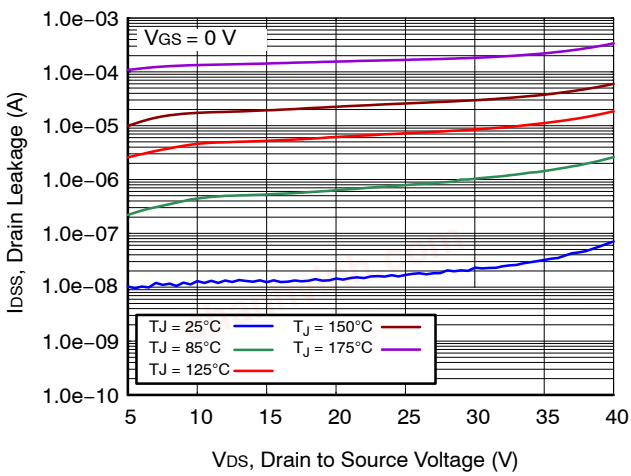


Figure 6. Drain Leakage vs. Drain to Source Voltage

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TYPICAL CHARACTERISTICS (continued)

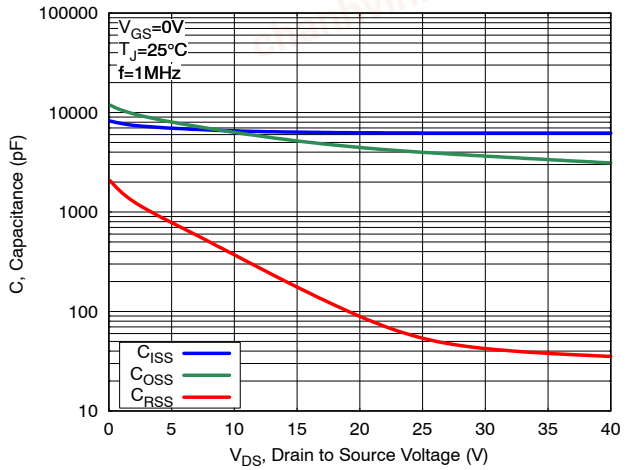


Figure 7. Capacitance Characteristics

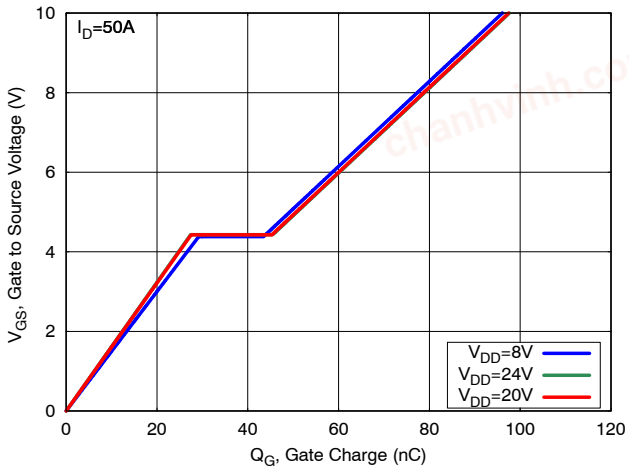


Figure 8. Gate Charge Characteristics

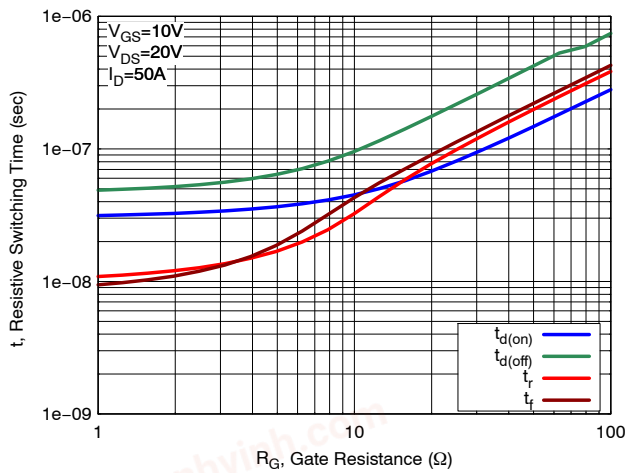


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

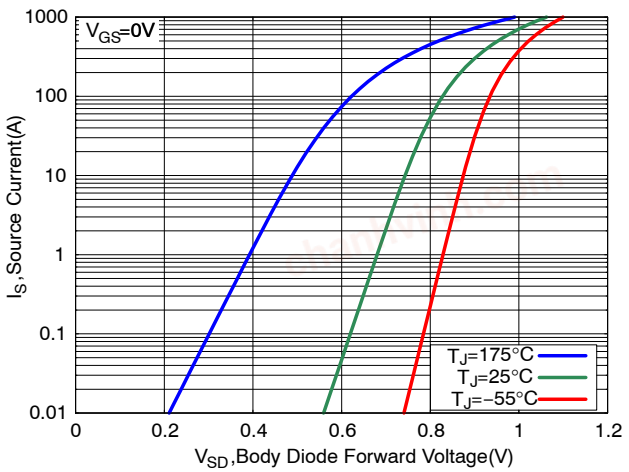


Figure 10. Diode Forward Characteristics

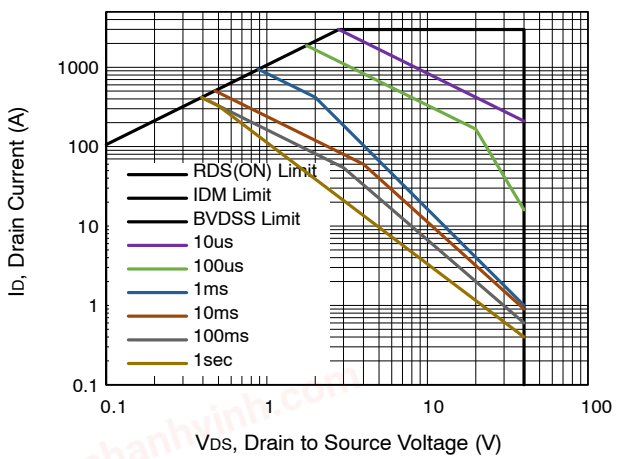


Figure 11. Maximum Rated Forward Biased Safe Operating Area

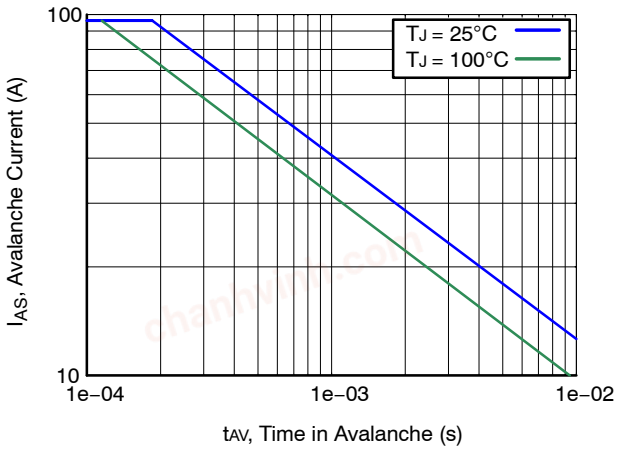


Figure 12. Ipeak vs. Time in Avalanche

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TYPICAL CHARACTERISTICS (continued)

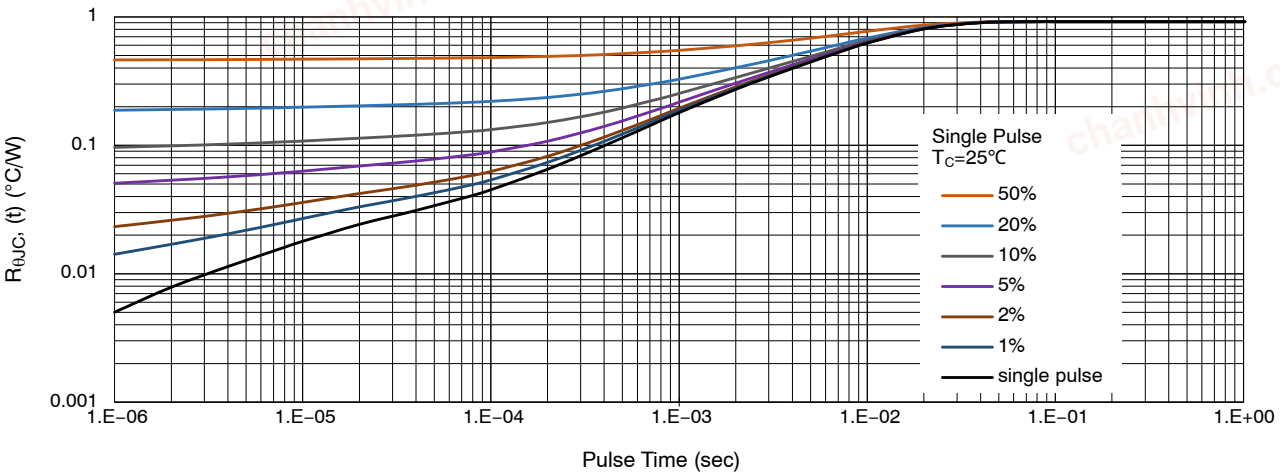


Figure 13. Thermal Response

DEVICE ORDERING INFORMATION

Device	Marking	Package	Shipping†
NTMFS0D5N04XMT1G	0D5N4	DFN5 (Pb−Free)	1500 / Tape & Reel

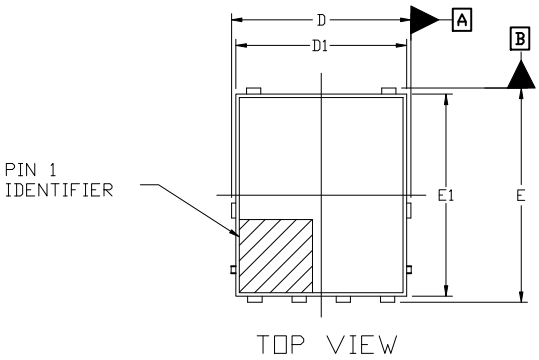
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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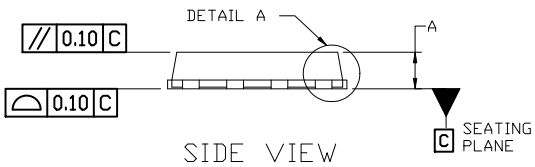
NTMFS0D5N04XM

PACKAGE DIMENSIONS

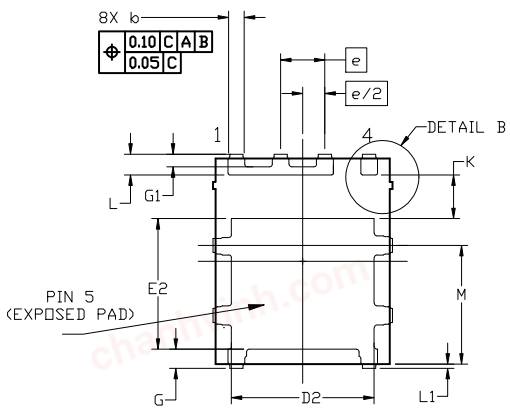
DFN5 5x6, 1.27P
CASE 506FA
ISSUE O



TOP VIEW

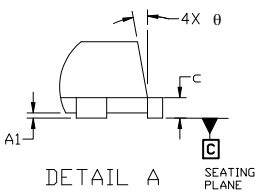


SIDE VIEW

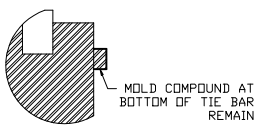


BOTTOM VIEW

NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

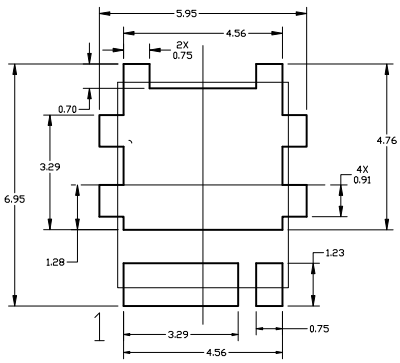


DETAIL A



DETAIL B

	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	4.80	5.00	5.20
D2	3.90	4.10	4.30
E	6.00	6.15	6.30
E1	5.70	5.90	6.10
E2	3.55	3.75	3.95
e	1.27 BSC		
G	0.50	0.55	0.70
G1	0.26	0.36	0.46
k	1.10	1.25	1.40
L	0.50	0.60	0.70
L1	0.150 REF		
M	3.00	3.40	3.80
θ	0°	---	12°



RECOMMENDED
MOUNTING 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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