MOSFET - Power, Single N-Channel, STD Gate, µ8FL

40 V, 4.9 mΩ, 65 A

NTTFS4D9N04XM

$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	I_D MAX
40 V	4.9 mΩ @ V_{GS} = 10 V	65 A

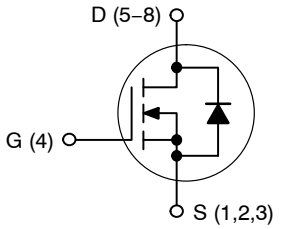
Features

- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- Small Footprint (3.3 x 3.3 mm) for Compact Design
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

Applications

- Motor Drive
- Battery Protection
- Synchronous Rectification

N−CHANNEL MOSFET



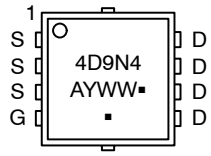
WDFN8
(µ8FL)
CASE 511AB

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_{DA}	65	A
	T_C = 100°C		46	
Power Dissipation	T_C = 25°C	P_D	38	W
Continuous Drain Current $R_{\theta JA}$	T_A = 25°C	I_D	18	A
	T_A = 100°C		13	
Pulsed Drain Current	T_C = 25°C, t_p = 10 µs	I_{DM}	390	A
Operating Junction and Storage Temperature Range		T_J, T_{STG}	−55 to +175	°C
Source Current (Body Diode)		I_S	32	A
Single Pulse Avalanche Energy (I_{PK} = 10 A)		E_{AS}	27	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.

MARKING DIAGRAM



4D9N4 = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week
▪ = Pb−Free Package

(Note: Microdot may be in either location)

ORDERING INFORMATION

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

THERMAL CHARACTERISTICS

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction−to−Case (Note 2)	$R_{\theta JC}$	3.91	°C/W
Thermal Resistance, Junction−to−Ambient (Notes 1, 2)	$R_{\theta JA}$	48.3	

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 = 10 A, T_J = 25°C		4.32	4.9	mΩ
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = 30 μA, T_J = 25°C	2.5	2.98	3.5	V
Gate Threshold Voltage Temperature Coefficient	$\Delta V_{GS(TH)}/\Delta T_J$	V_{GS} = V_{DS}, I_D = 30 μA		−7.29		mV/°C
Forward Trans−conductance	g_{FS}	V_{DS} = 5 V, I_D = 10 A		45		S
CHARGES, CAPACITANCES & GATE RESISTANCE						
Input Capacitance	C_{ISS}	V_{GS} = 0 V, V_{DS} = 20 V, f = 1 MHz		668		pF
Output Capacitance	C_{OSS}			478		
Reverse Transfer Capacitance	C_{RSS}			13.5		
Output Charge	Q_{OSS}	V_{GS} = 0 V, V_{DS} = 20 V		14.4		nC
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 10 V, V_{DD} = 20 V; I_D = 30 A		10.4		
Threshold Gate Charge	$Q_{G(TH)}$			2		
Gate−to−Source Charge	Q_{GS}			3.2		
Gate−to−Drain Charge	Q_{GD}			1.9		
Gate Resistance	R_G	f = 1 MHz		1.6		Ω
SWITCHING CHARACTERISTICS						
Turn−On Delay Time	$t_{d(ON)}$	Resistive Load, V_{GS} = 0/10 V, V_{DD} = 20 V, I_D = 30 A, R_G = 0 Ω		12		ns
Rise Time	t_r			4		
Turn−Off Delay Time	$t_{d(OFF)}$			16.3		
Fall Time	t_f			3.8		
SOURCE−TO−DRAIN DIODE CHARACTERISTICS						
Forward Diode Voltage	V_{SD}	V_{GS} = 0 V, I_S = 10 A, T_J = 25°C		0.8	1.2	V
		V_{GS} = 0 V, I_S = 10 A, T_J = 125°C		0.65		
Reverse Recovery Time	t_{RR}	V_{GS} = 0 V, I_S = 30 A, dI/dt = 100 A/μs, V_{DD} = 20 V		25		ns
Charge Time	t_a			8		
Discharge Time	t_b			17		
Reverse Recovery Charge	Q_{RR}			8.9		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

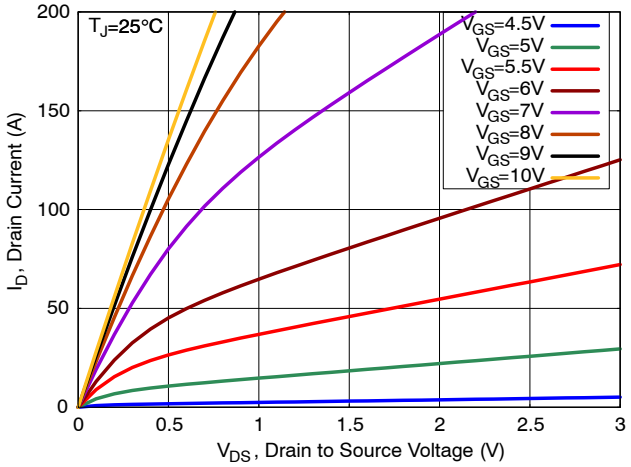


Figure 1. On−Region Characteristics

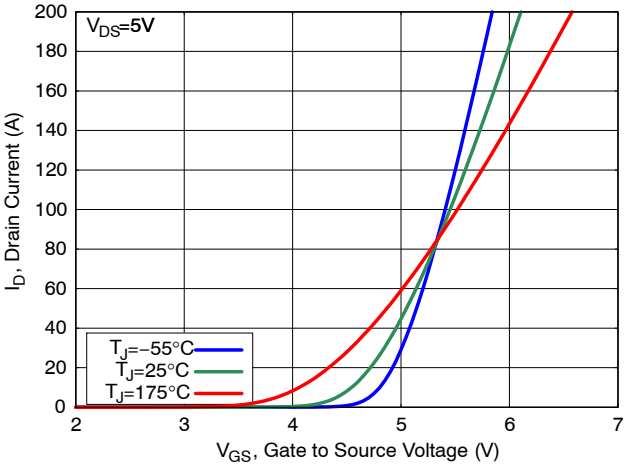


Figure 2. Transfer Characteristics

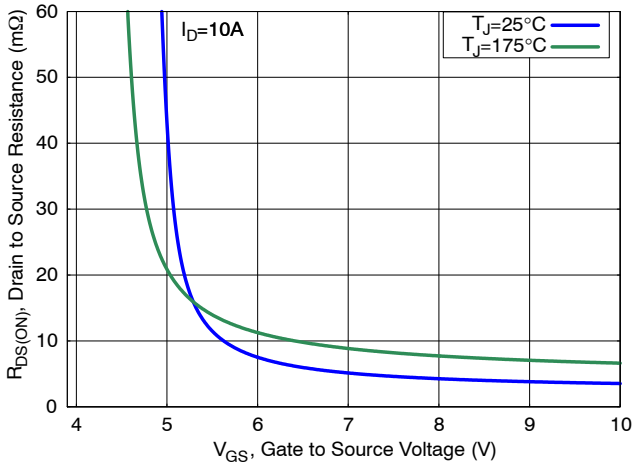


Figure 3. On−Resistance vs. Gate Voltage

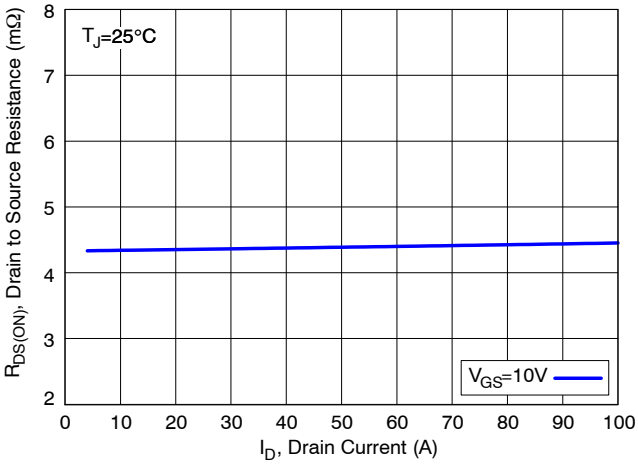


Figure 4. On−Resistance vs. Drain Current

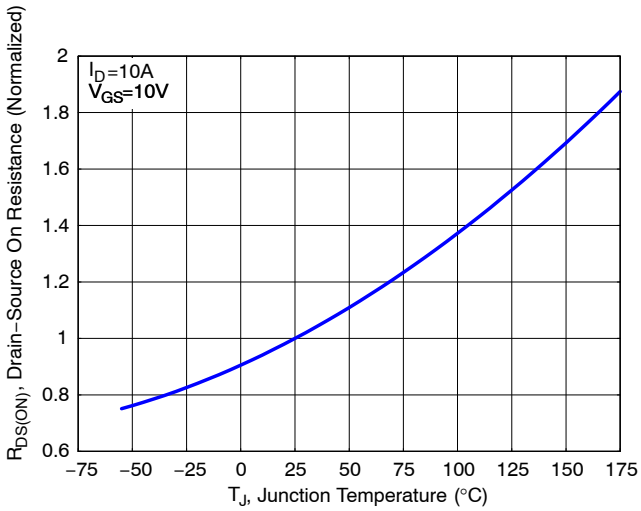


Figure 5. Normalized ON Resistance vs. Junction Temperature

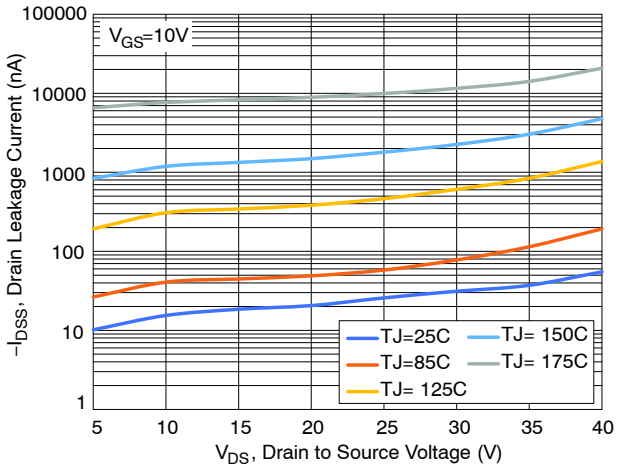


Figure 6. Drain−to−Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

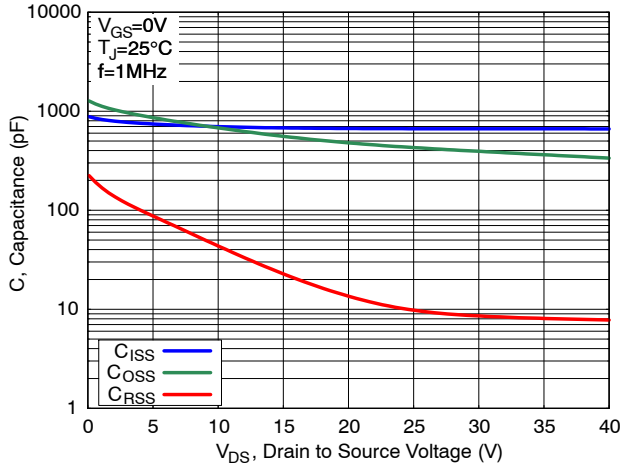


Figure 7. Capacitance Characteristics

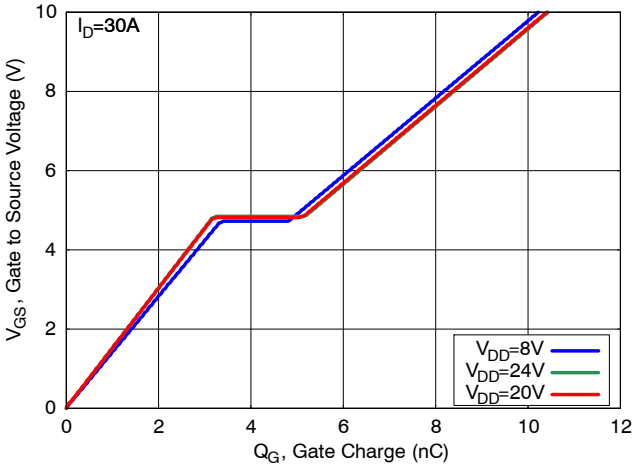


Figure 8. Gate Charge Characteristics

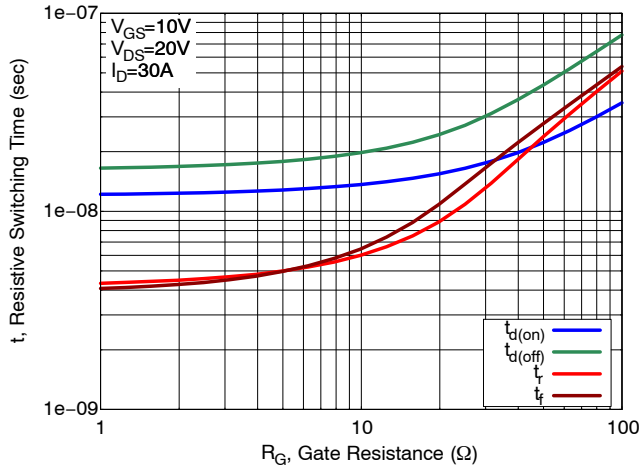


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

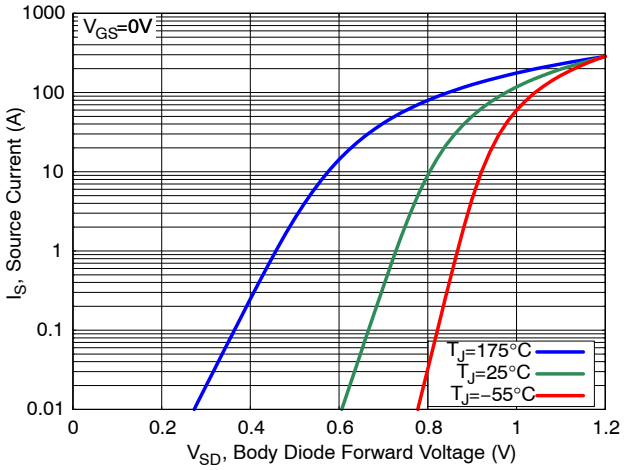


Figure 10. Diode Forward Characteristics

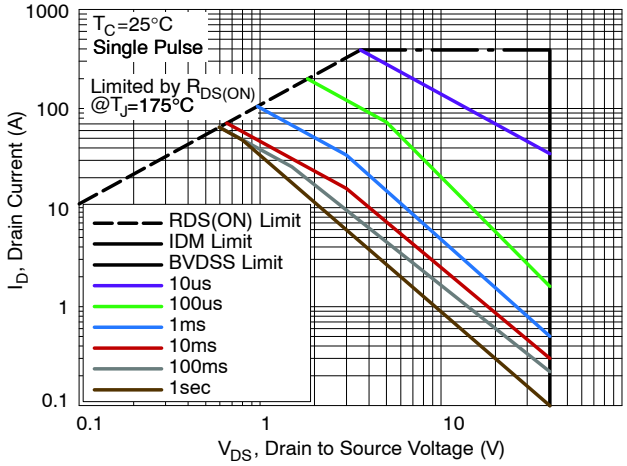


Figure 11. Safe Operating Area (SOA)

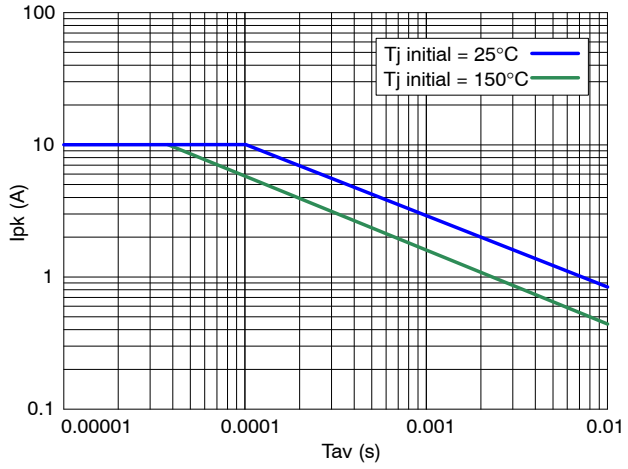


Figure 12. Avalanche Current vs. Pulse Time (UIS)

TYPICAL CHARACTERISTICS

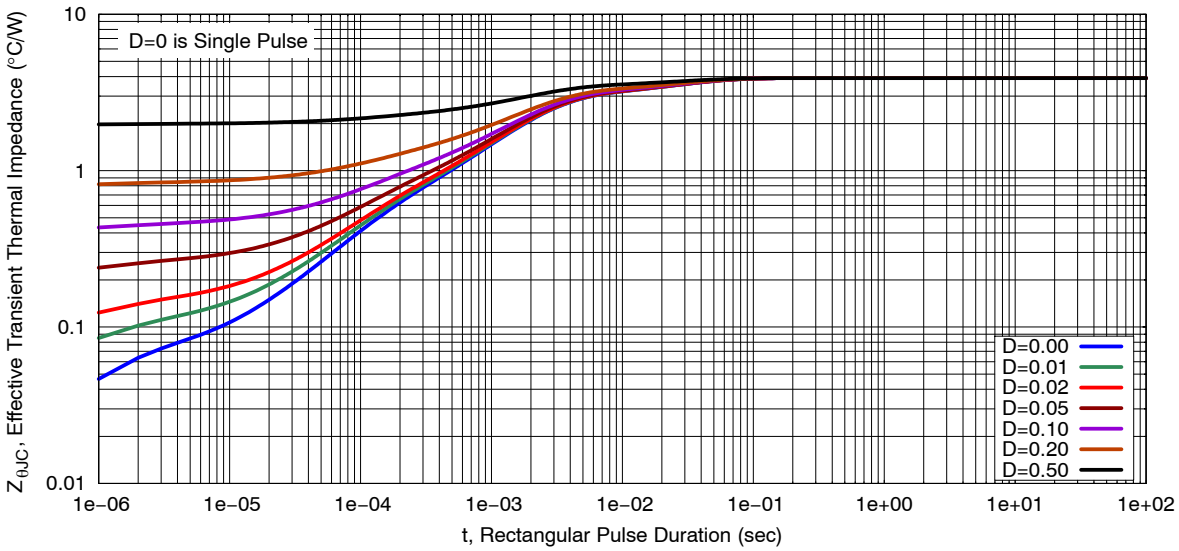


Figure 13. Transient Thermal Response

ORDERING INFORMATION

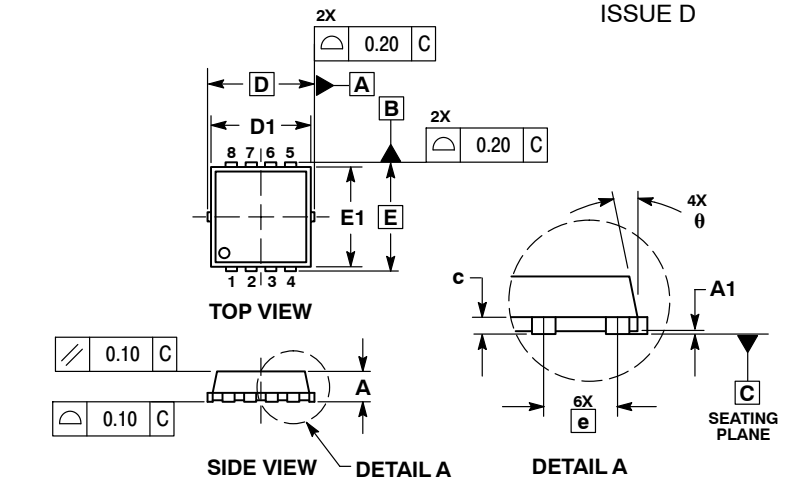
Device	Marking	Package	Shipping†
NTTFS4D9N04XMTAG	4D9N4	WDFN8 (Pb−Free)	1500 / Tape & Reel

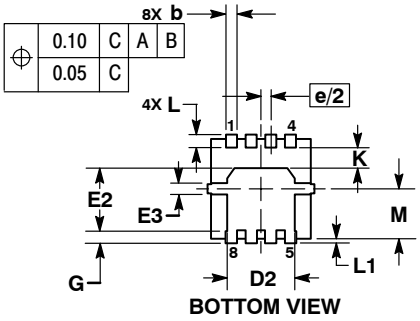
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

NTTFS4D9N04XM

PACKAGE DIMENSIONS

WDFN8 3.3x3.3, 0.65P
CASE 511AB
ISSUE D

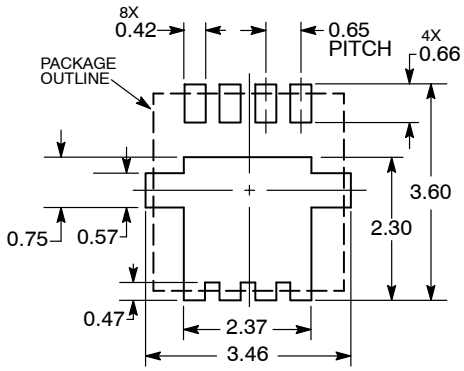




NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION D1 AND E1 DO NOT INCLUDE MOLD FLASH PROTRUSIONS OR GATE BURRS.

	MILLIMETERS			INCHES		
DIM	MIN	NOM	MAX	MIN	NOM	MAX
A	0.70	0.75	0.80	0.028	0.030	0.031
A1	0.00	---	0.05	0.000	---	0.002
b	0.23	0.30	0.40	0.009	0.012	0.016
c	0.15	0.20	0.25	0.006	0.008	0.010
D	3.30 BSC			0.130 BSC		
D1	2.95	3.05	3.15	0.116	0.120	0.124
D2	1.98	2.11	2.24	0.078	0.083	0.088
E	3.30 BSC			0.130 BSC		
E1	2.95	3.05	3.15	0.116	0.120	0.124
E2	1.47	1.60	1.73	0.058	0.063	0.068
E3	0.23	0.30	0.40	0.009	0.012	0.016
e	0.65 BSC			0.026 BSC		
G	0.30	0.41	0.51	0.012	0.016	0.020
K	0.65	0.80	0.95	0.026	0.032	0.037
L	0.30	0.43	0.56	0.012	0.017	0.022
L1	0.06	0.13	0.20	0.002	0.005	0.008
M	1.40	1.50	1.60	0.055	0.059	0.063
θ	0 °	---	12 °	0 °	---	12 °

SOLDERING FOOTPRINT*



DIMENSION: MILLIMETERS

*For additional information on our Pb−Free strategy and soldering details, please download the **onsemi** Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:
Technical Library: www.onsemi.com/design/resources/technical−documentation
onsemi Website: www.onsemi.com

ONLINE SUPPORT: www.onsemi.com/support
For additional information, please contact your local Sales Representative at www.onsemi.com/support/sales

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