

MOSFET - Power, Single N-Channel, SO8-FL 40 V, 0.42 mΩ, 509 A

NTMFS0D4N04XM

Features

- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- Small Footprint (5x6 mm) with Compact Design
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

Applications

- Motor Drive
- Battery Protection
- ORing

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	$T_C = 25^{\circ}\text{C}$	I_D	509	A
	$T_C = 100^{\circ}\text{C}$		360	
Power Dissipation	$T_C = 25^{\circ}\text{C}$	P_D	197	W
Pulsed Drain Current	$T_C = 25^{\circ}\text{C}$, $t_p = 10\text{ }\mu\text{s}$	I_{DM}	4044	A
Operating Junction and Storage Temperature Range		T_J, T_{STG}	-55 to +175	$^{\circ}\text{C}$
Source Current (Body Diode)		I_S	202	A
Single Pulse Avalanche Energy	$I_{PK} = 38.6\text{ A}$	E_{AS}	2396	mJ
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)		T_L	260	$^{\circ}\text{C}$

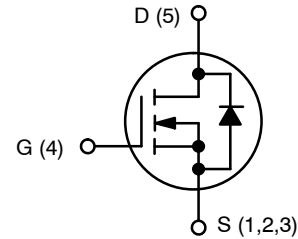
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

THERMAL CHARACTERISTICS

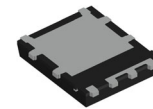
Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case (Note 2)	$R_{\theta JC}$	0.76	$^\circ\text{C/W}$
Thermal Resistance, Junction-to-Ambient (Notes 1, 2)	$R_{\theta JA}$	38.2	

1. Surface-mounted on FR4 board using 650 mm², 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.

$V_{(BR)DSS}$	$R_{DS(on)} \text{ MAX}$	$I_D \text{ MAX}$
40 V	0.42 mΩ @ 10 V	509 A

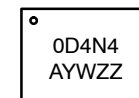


N-CHANNEL MOSFET



DFN5 (SO8-FL)
CASE 506FA

MARKING DIAGRAM



0D4N4 = 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 2 of this data sheet.

NTMFS0D4N04XM

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	V _{(BR)DSS}	V _{GS} = 0 V, I _D = 250 μA, T _J = 25°C	40			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	ΔV _{(BR)DSS} /ΔT _J	I _D = 250 μA, Referenced to 25°C		14.9		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		0.33	0.42	mΩ
Gate Threshold Voltage	V _{GS(TH)}	V _{GS} = V _{DS} , I _D = 330 μA, T _J = 25°C	2.5	3	3.5	V
Gate Threshold Voltage Temperature Coefficient	ΔV _{GS(TH)} /ΔT _J	V _{GS} = V _{DS} , I _D = 330 μA		-7.21		mV/°C
Forward Trans-conductance	g _{FS}	V _{DS} = 5 V, I _D = 50 A		286		S

CHARGES, CAPACITANCES & GATE RESISTANCE

Input Capacitance	C _{ISS}	V _{DS} = 20 V, V _{GS} = 0 V, f = 1 MHz		8577		pF
Output Capacitance	C _{OSS}			6090		
Reverse Transfer Capacitance	C _{RSS}			120		
Output Charge	Q _{OSS}	V _{DD} = 20 V, I _D = 50 A, V _{GS} = 10 V		183		nC
Total Gate Charge	Q _{G(TOT)}			133		
Threshold Gate Charge	Q _{G(TH)}			25.2		
Gate-to-Source Charge	Q _{GS}			37.2		
Gate-to-Drain Charge	Q _{GD}			24.2		
Gate Resistance	R _G	f = 1 MHz		0.42		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		34.5		ns
Rise Time	t _r			11.1		
Turn-Off Delay Time	t _{d(OFF)}			49.4		
Fall Time	t _f			13		

SOURCE-TO-DRAIN DIODE CHARACTERISTICS

Forward Diode Voltage	V _{SD}	I _S = 50 A, V _{GS} = 0 V, T _J = 25°C		0.79	1.2	V
		I _S = 50 A, V _{GS} = 0 V, T _J = 125°C		0.63		
Reverse Recovery Time	t _{RR}	V _{GS} = 0 V, I _S = 50 A, dI/dt = 100 A/μs, V _{DD} = 20 V		94.4		ns
Charge Time	t _a			55.3		
Discharge Time	t _b			39.1		
Reverse Recovery Charge	Q _{RR}			316		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.

DEVICE ORDERING INFORMATION

Device	Marking	Package	Shipping†
NTMFS0D4N04XMT1G	0D4N4	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.

NTMFS0D4N04XM

TYPICAL CHARACTERISTICS

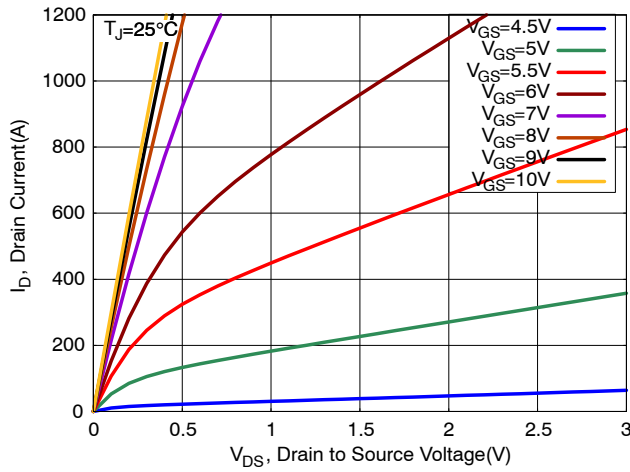


Figure 1. On-Region Characteristics

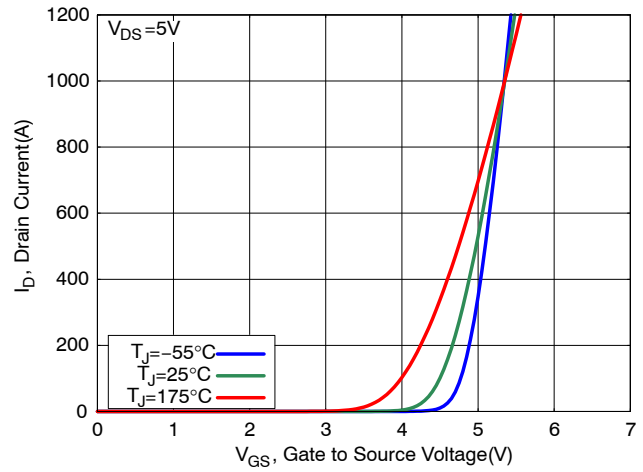


Figure 2. Transfer Characteristics

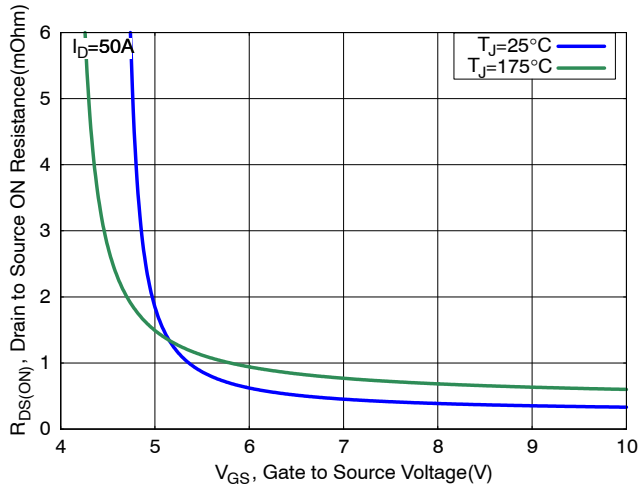


Figure 3. On-Resistance vs. Gate Voltage

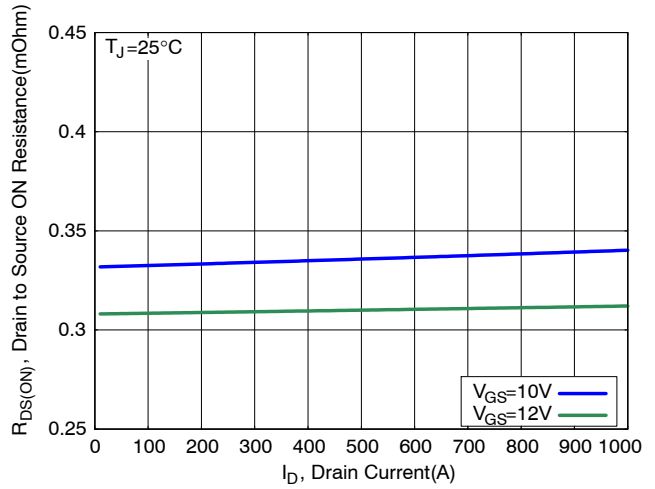


Figure 4. On-Resistance vs. Drain Current

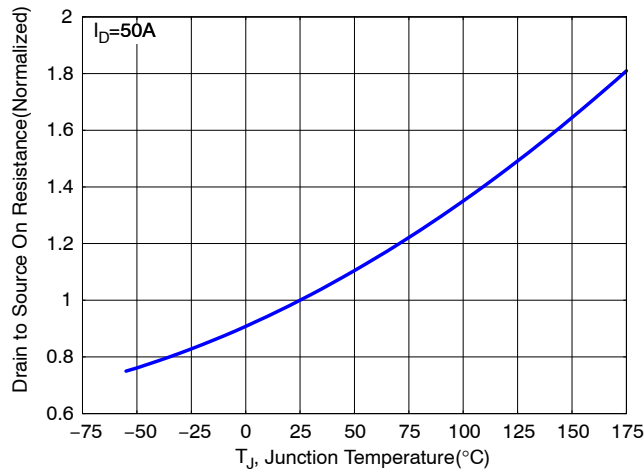


Figure 5. Normalized ON Resistance vs. Junction Temperature

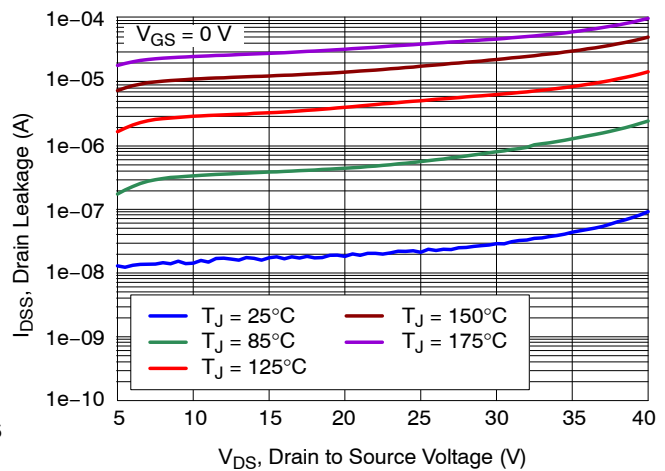


Figure 6. Drain to Source Voltage vs Drain Leakage

NTMFS0D4N04XM

TYPICAL CHARACTERISTICS (CONTINUED)

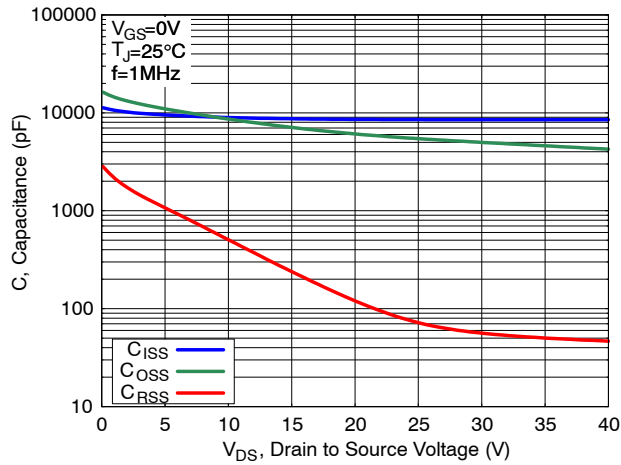


Figure 7. Capacitance Characteristics

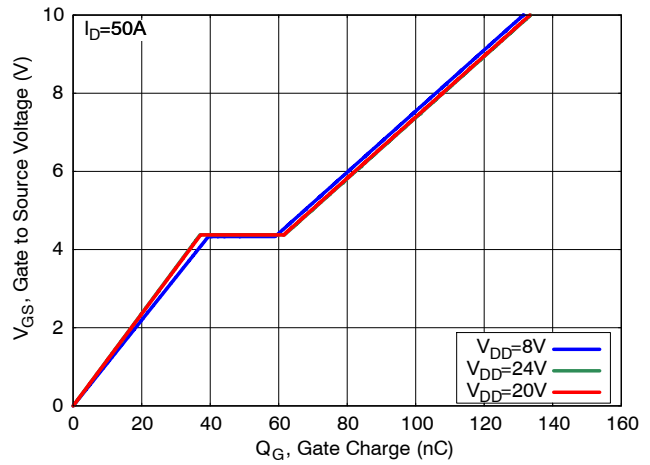


Figure 8. Gate Charge Characteristics

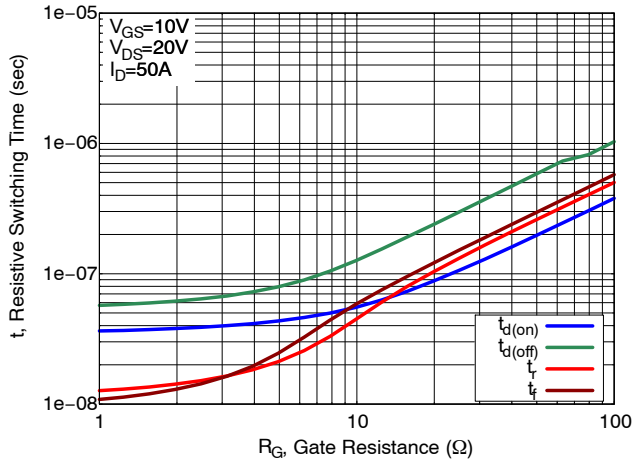


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

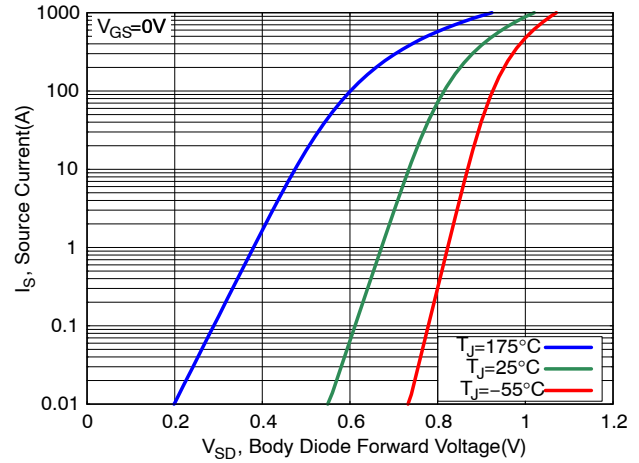


Figure 10. Diode Forward Characteristics

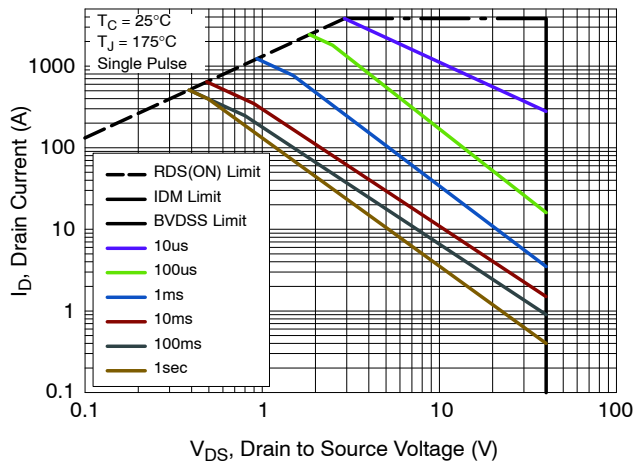


Figure 11. Safe Operating Area (SOA)

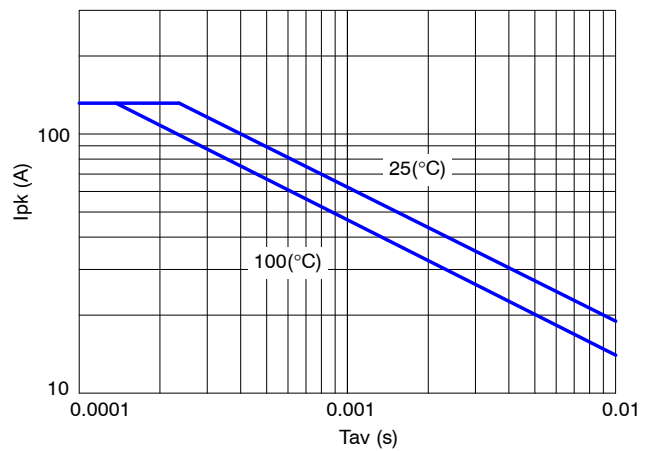


Figure 12. Avalanche Current vs. Pulse Time (UIS)

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TYPICAL CHARACTERISTICS (CONTINUED)

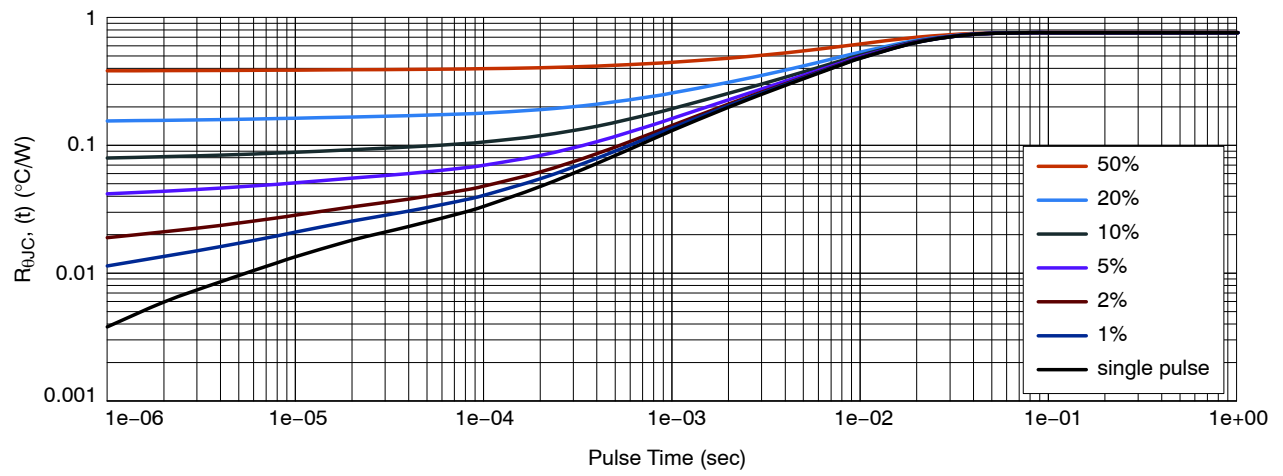
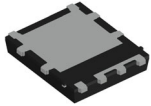
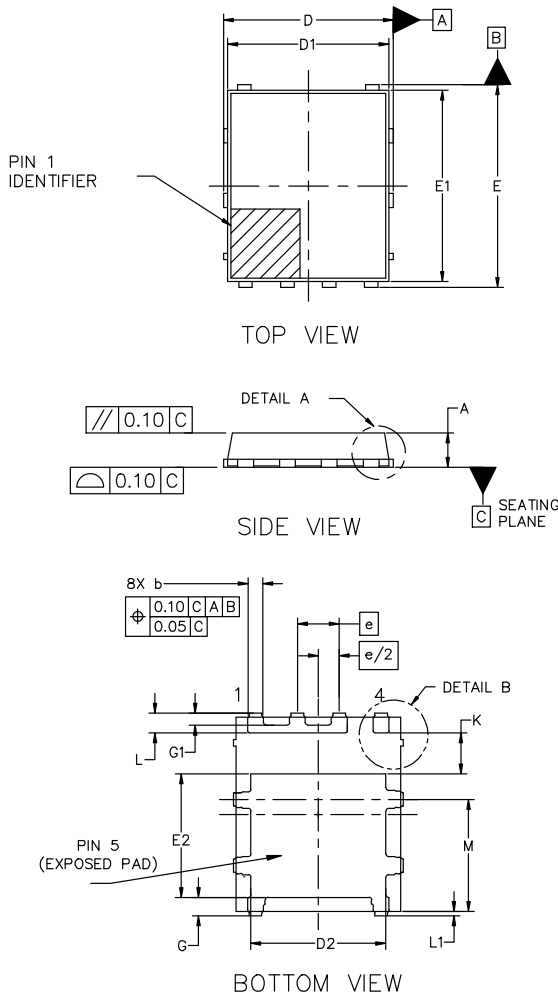


Figure 13. Thermal Response


DFN5 5.00x5.90x1.00, 1.27P
CASE 506FA
ISSUE A

DATE 03 OCT 2024

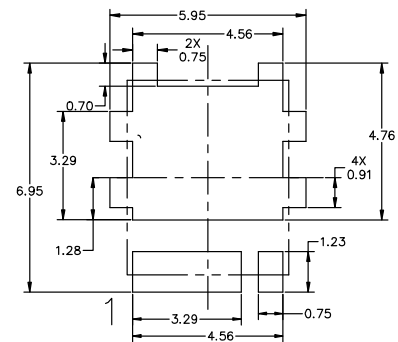
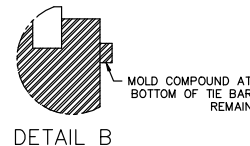
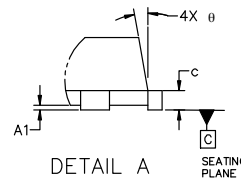


NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

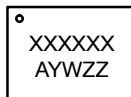
MILLIMETERS

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	4.80	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 onsemi Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

GENERIC MARKING DIAGRAM*


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

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "•", may or may not be present. Some products may not follow the Generic Marking.

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