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# MOSFET - N-Channel Shielded Gate PowerTrench®

150 V, 5.0 mΩ, 139 A

## NTB5D0N15MC

### Features

- Shielded Gate MOSFET Technology
- Max  $R_{DS(on)} = 5.0\text{ m}\Omega$  at  $V_{GS} = 10\text{ V}$ ,  $I_D = 97\text{ A}$
- 50% Lower  $Q_{rr}$  than other MOSFET Suppliers
- Lowers Switching Noise/EMI
- 100% UIL Tested
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

### Typical Applications

- Synchronous Rectification for ATX / Server / Telecom PSU
- Motor Drives and Uninterruptible Power Supplies
- Micro Solar Inverter

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

Parameter			Symbol	Value	Unit
Drain-to-Source Voltage			V <sub>DSS</sub>	150	V
Gate-to-Source Voltage			V <sub>GS</sub>	±20	V
Continuous Drain Current R <sub>θJC</sub> (Note 2)	Steady State	T <sub>C</sub> = 25°C	I <sub>D</sub>	139	A
Power Dissipation R <sub>θJC</sub> (Note 2)			P <sub>D</sub>	214	W
Continuous Drain Current R <sub>θJA</sub> (Notes 1, 2)	Steady State	T <sub>A</sub> = 25°C	I <sub>D</sub>	18	A
Power Dissipation R <sub>θJA</sub> (Notes 1, 2)			P <sub>D</sub>	3.8	W
Pulsed Drain Current	T <sub>C</sub> = 25°C, t <sub>p</sub> = 100 μs		I <sub>DM</sub>	761	A
Operating Junction and Storage Temperature Range			T <sub>J</sub> , T <sub>stg</sub>	-55 to +175	°C
Single Pulse Drain-to-Source Avalanche Energy (I <sub>L</sub> = 26 A <sub>pk</sub> , L = 3 mH)			E <sub>AS</sub>	1014	mJ
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)			T <sub>L</sub>	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.

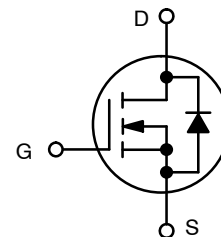
1. Surface-mounted on FR4 board using a 1 in<sup>2</sup>, 2 oz. Cu pad.
2. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.



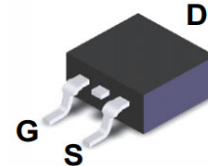
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$V_{(BR)DSS}$	$R_{DS(ON)}\text{ MAX}$	$I_D\text{ MAX}$
150 V	5.0 mΩ @ 10 V	139 A



N-CHANNEL MOSFET



D2PAK3  
TO-263  
CASE 418AJ

### MARKING DIAGRAM

NTB5D0  
N15MC  
AYWWZZ

NTB5D0N15MC = Specific Device Code  
A = Assembly Location  
Y = Year  
WW = Work Week  
ZZ = Lot Traceability

### ORDERING INFORMATION

Device	Package	Shipping†
NTB5D0N15MC	D2PAK (Pb-Free)	800 / 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.

# NTB5D0N15MC

## THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction-to-Case – Steady State (Note 2)	$R_{\theta JC}$	0.7	°C/W
Junction-to-Ambient – Steady State (Notes 1, 2)	$R_{\theta JA}$	40	

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	150			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$	$I_D = 250\text{ }\mu\text{A}$ , ref to $25^\circ\text{C}$		76		mV/°C
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS} = 0\text{ V}, V_{DS} = 120\text{ V}$			1.0	$\mu\text{A}$
Gate-to-Source Leakage Current	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA

### ON CHARACTERISTICS

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 532\text{ }\mu\text{A}$	2.5		4.5	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$	$I_D = 532\text{ }\mu\text{A}$ , ref to $25^\circ\text{C}$		-8.5		mV/°C
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 97\text{ A}$		3.8	5	m $\Omega$
Forward Transconductance	$g_{FS}$	$V_{DS} = 10\text{ V}, I_D = 97\text{ A}$		146		S

### CHARGES, CAPACITANCES & GATE RESISTANCE

Input Capacitance	$C_{ISS}$	$V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{DS} = 75\text{ V}$		6300		pF
Output Capacitance	$C_{OSS}$			1900		
Reverse Transfer Capacitance	$C_{RSS}$			13		
Gate-Resistance	$R_G$			1.1	2.2	$\Omega$
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 10\text{ V}, V_{DS} = 75\text{ V}; I_D = 97\text{ A}$		75		nC
Threshold Gate Charge	$Q_{G(TH)}$			18		
Gate-to-Source Charge	$Q_{GS}$			31		
Gate-to-Drain Charge	$Q_{GD}$			10		
Plateau Voltage	$V_{GP}$			5.4		V
Output Charge	$Q_{OSS}$	$V_{DD} = 75\text{ V}, V_{GS} = 0\text{ V}$		227		nC

### SWITCHING CHARACTERISTICS (Note 3)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 10\text{ V}, V_{DD} = 75\text{ V}, I_D = 97\text{ A}, R_G = 4.7\text{ }\Omega$		32		ns
Rise Time	$t_r$			14		
Turn-Off Delay Time	$t_{d(OFF)}$			45		
Fall Time	$t_f$			9.0		

### DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	$V_{SD}$	$V_{GS} = 0\text{ V}, I_S = 97\text{ A}$	$T_J = 25^\circ\text{C}$		0.96	1.2	V
Reverse Recovery Time	$t_{RR}$	$V_{GS} = 0\text{ V}, V_{DD} = 75\text{ V}, dI_S/dt = 100\text{ A}/\mu\text{s}, I_S = 97\text{ A}$		92			ns
Reverse Recovery Charge	$Q_{RR}$			189			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.

3. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

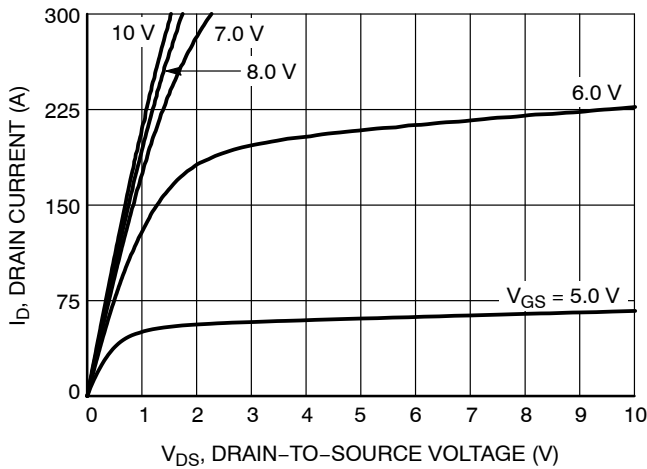


Figure 1. On-Region Characteristics

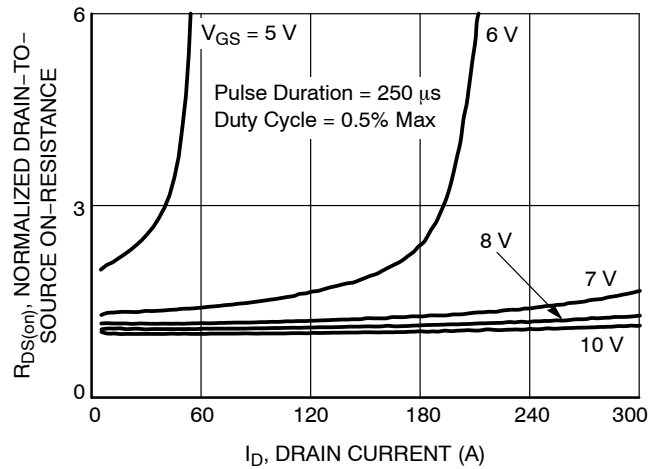


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

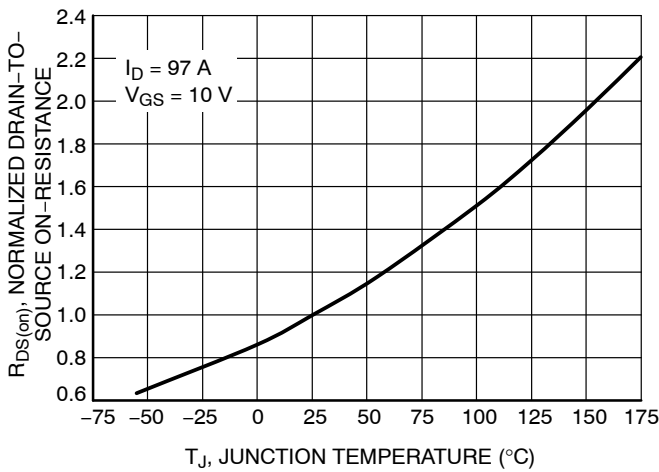


Figure 3. Normalized On-Resistance vs. Junction Temperature

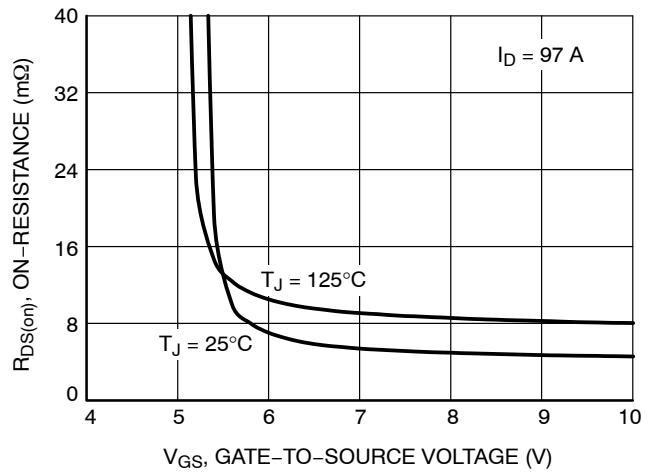


Figure 4. On-Resistance vs. Gate-to-Source Voltage

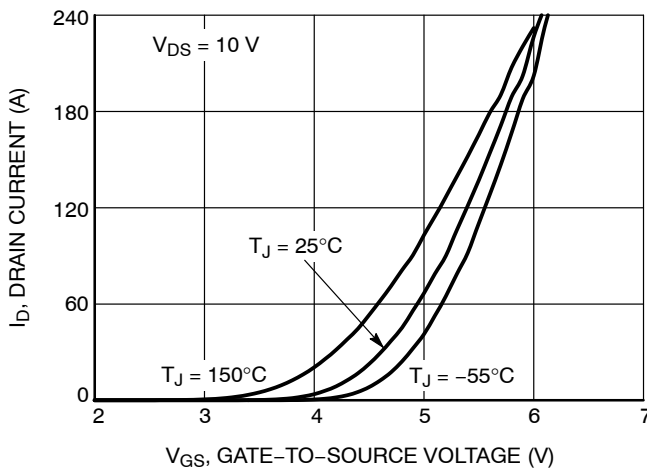


Figure 5. Transfer Characteristics

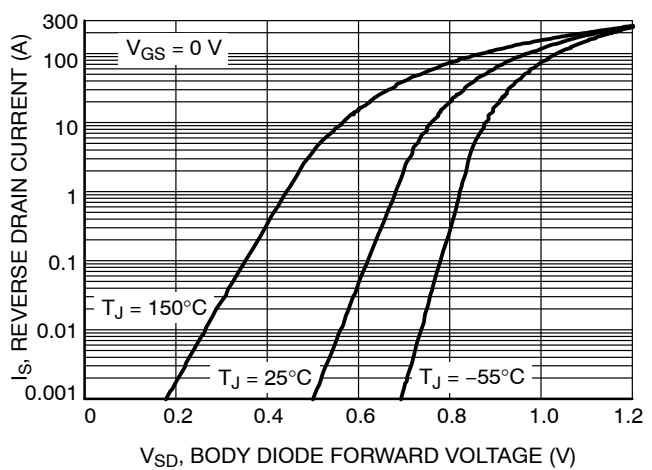


Figure 6. Source-to-Drain Diode Forward Voltage vs. Source Current

# NTB5D0N15MC

## TYPICAL CHARACTERISTICS

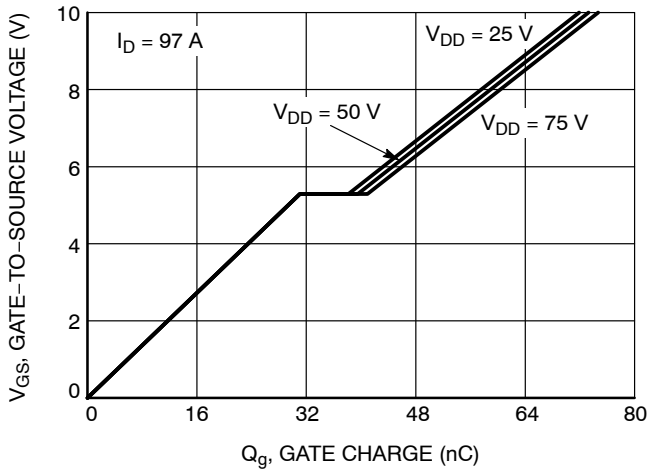


Figure 7. Gate Charge Characteristics

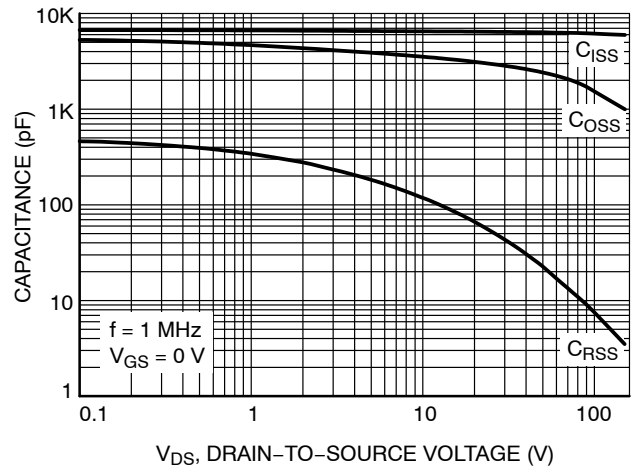


Figure 8. Capacitance vs. Drain-to-Source Voltage

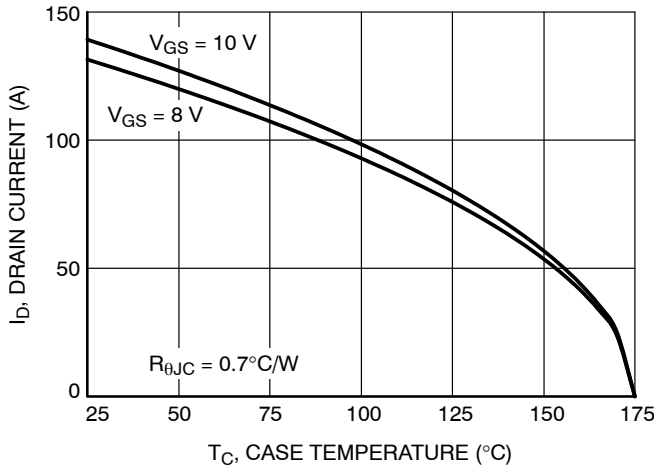


Figure 9. Drain Current vs. Case Temperature

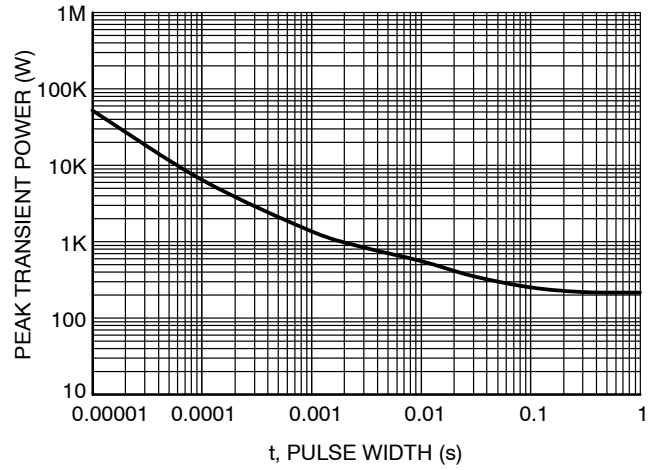


Figure 10. Peak Power

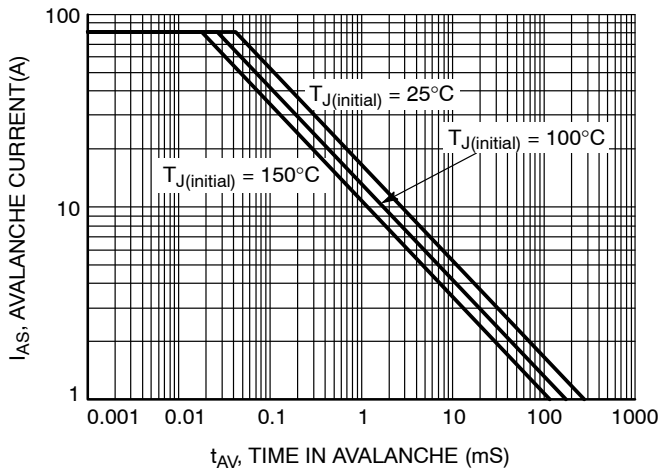


Figure 11. Unclamped Inductive Switching Capability

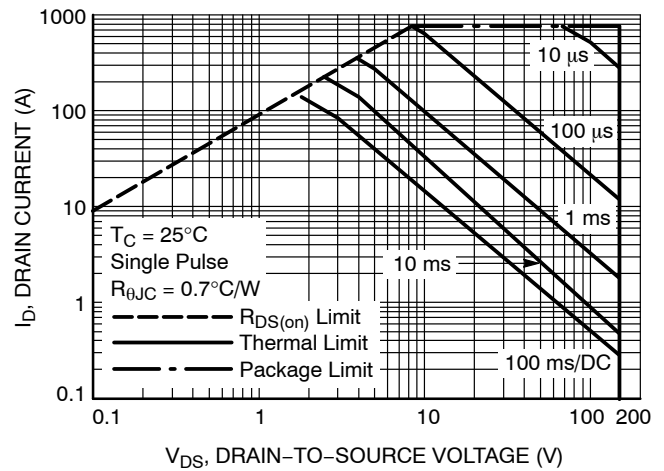
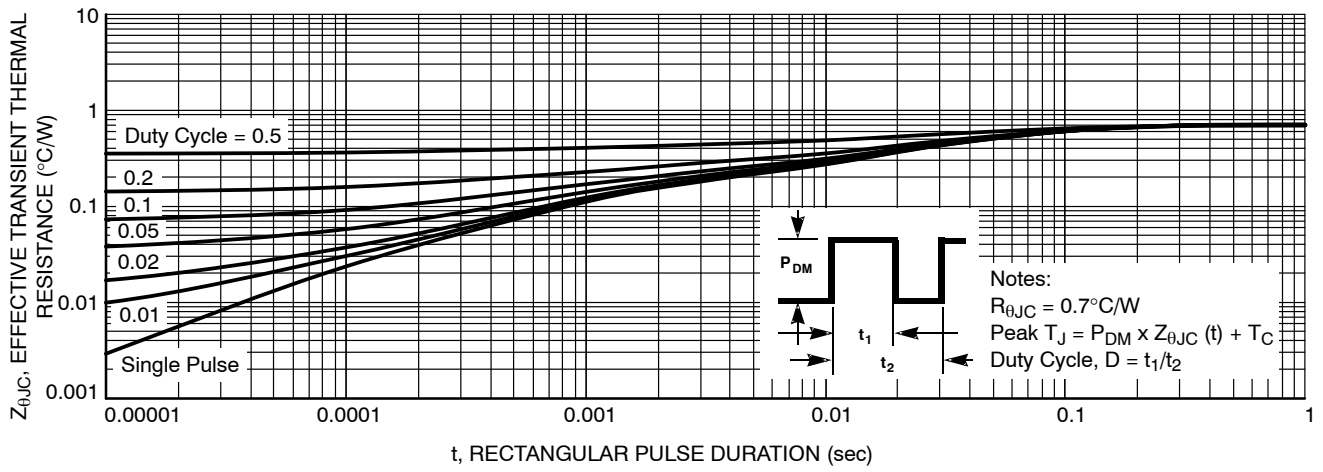


Figure 12. Forward Bias Safe Operating Area

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## TYPICAL CHARACTERISTICS

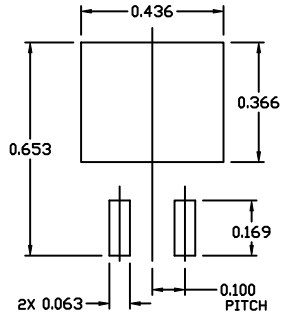


**Figure 13. Transient Thermal Impedance**

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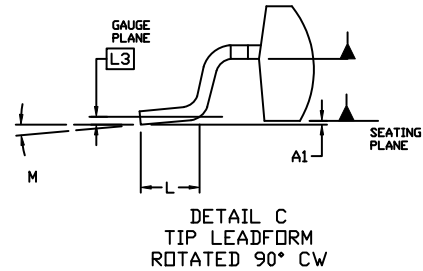
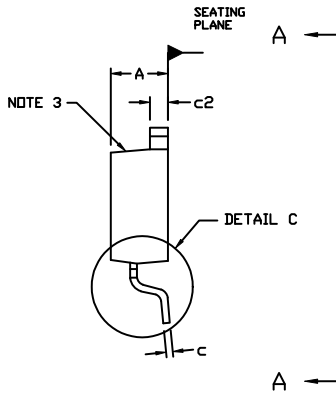
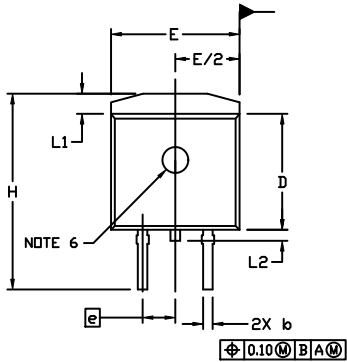
## PACKAGE DIMENSIONS

### D<sup>2</sup>PAK-3 (TO-263, 3-LEAD) CASE 418AJ ISSUE E



#### RECOMMENDED MOUNTING FOOTPRINT

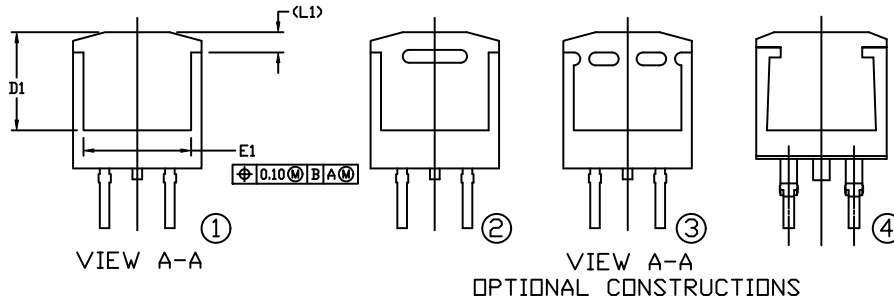
■ For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



#### NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: INCHES
3. CHAMFER OPTIONAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.005 PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY AT DATUM H.
5. THERMAL PAD CONTOUR IS OPTIONAL WITHIN DIMENSIONS E, L1, D1, AND E1.
6. OPTIONAL MOLD FEATURE.
7. ①, ② ... OPTIONAL CONSTRUCTION FEATURE CALL OUTS.

DIM	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.160	0.190	4.06	4.83
A1	0.000	0.010	0.00	0.25
b	0.020	0.039	0.51	0.99
c	0.012	0.029	0.30	0.74
c2	0.045	0.065	1.14	1.65
D	0.330	0.380	8.38	9.65
D1	0.260	---	6.60	---
E	0.380	0.420	9.65	10.67
E1	0.245	---	6.22	---
e	0.100	BSC	2.54	BSC
H	0.575	0.625	14.60	15.88
L	0.070	0.110	1.78	2.79
L1	---	0.066	---	1.68
L2	---	0.070	---	1.78
L3	0.010	BSC	0.25	BSC
M	-8°	8°	-8°	8°



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