

MOSFET – Power, N-Channel 100 V, 201 A, 4.2 mΩ

NTB004N10G

Features

- Low $R_{DS(on)}$
- High Current Capability
- Wide SOA
- These Devices are Pb-Free and are RoHS Compliant

Applications

- Hot Swap in 48 V Systems

MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ Unless otherwise specified)

Parameter			Symbol	Value	Unit
Drain-to-Source Voltage			V _{DSS}	100	V
Gate-to-Source Voltage – Continuous			V _{GS}	± 20	V
Continuous Drain Current R _{θJC}	Steady State	T _C = 25°C	I _D	201	A
		T _C = 100°C		142	
Power Dissipation R _{θJC}	Steady State	T _C = 25°C	P _D	340	W
Pulsed Drain Current	t _p = 100 μs		I _{DM}	3002	A
Operating Junction and Storage Temperature Range			T _J , T _{stg}	–55 to +175	°C
Source Current (Body Diode)			I _S	283	A
Single Pulse Drain-to-Source Avalanche Energy (V _{DD} = 50 Vdc, V _{GS} = 10 Vdc, I _{L(pk)} = 102 A, L = 0.1 mH, R _G = 25 Ω)			E _{AS}	520	mJ
Lead Temperature for Soldering Purposes, 1/8" from Case for 10 Seconds			T _L	260	°C

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
Junction-to-Case (Drain) Steady State	$R_{\theta JC}$	0.44	$^\circ\text{C/W}$
Junction-to-Ambient (Note 1)	$R_{\theta JA}$	62.5	

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 1 sq in pad size, (Cu Area 1.127 sq in [2 oz] including traces).

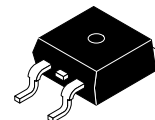
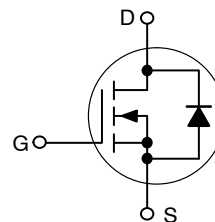


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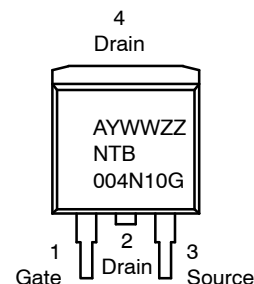
$V_{(BR)DSS}$	$R_{DS(ON)} \text{ MAX}$	$I_D \text{ MAX}$ (Note 1)
100 V	4.2 mΩ @ 10 V	201 A

N-Channel



D²PAK
CASE 418AJ
STYLE 2

MARKING DIAGRAM & PIN ASSIGNMENT



A = Assembly Site Code
Y = Year Code
WW = Week Code
ZZ = 2-digit Assembly Lot Code
NTB004N10G = Specific Device Code

ORDERING INFORMATION

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

NTB004N10G

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

Characteristics	Symbol	Test Condition	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	100			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$			32.7		mV/ $^\circ\text{C}$
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0\text{ V}, V_{DS} = 80\text{ V}$	$T_J = 25^\circ\text{C}$		1.0	μA
			$T_J = 150^\circ\text{C}$		100	
Gate-to-Source Leakage Current	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			± 100	nA

ON CHARACTERISTICS (Note 2)

Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS} = V_{DS}, I_D = 500\text{ }\mu\text{A}$	2.0	2.8	4.0	V
Negative Threshold Temperature Coefficient	$V_{GS(th)}/T_J$			-10.5		mV/ $^\circ\text{C}$
Drain-to-Source On-Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 100\text{ A}$	$T_J = 25^\circ\text{C}$	3.4	4.2	m Ω
			$T_J = 175^\circ\text{C}$	6.82		m Ω
Forward Transconductance	g_{FS}	$V_{DS} = 10\text{ V}, I_D = 100\text{ A}$		70		S

CHARGES, CAPACITANCES & GATE RESISTANCE

Input Capacitance	C_{iss}	$V_{DS} = 50\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		11900		pF
Output Capacitance	C_{oss}			1170		
Reverse Transfer Capacitance	C_{rss}			147		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 10\text{ V}, V_{DS} = 50\text{ V}, I_D = 100\text{ A}$		175		nC
Threshold Gate Charge	$Q_{G(TH)}$			78.4		
Gate-to-Source Charge	Q_{GS}			67.3		
Gate-to-Drain Charge	Q_{GD}			40.8		
Plateau Voltage	V_{GP}			6.0		
Gate Resistance	R_G	$V_{OSC} = 100\text{ mV}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		0.445		Ω

SWITCHING CHARACTERISTICS, $V_{GS} = 10\text{ V}$ (Note 3)

Turn-On Delay Time	$t_{d(on)}$	$V_{GS} = 10\text{ V}, V_{DD} = 50\text{ V}, I_D = 100\text{ A}, R_G = 4.7\text{ }\Omega$		43		ns
Rise Time	t_r			64.5		
Turn-Off Delay Time	$t_{d(off)}$			84.7		
Fall Time	t_f			30		

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$I_S = 100\text{ A}$	$T_J = 25^\circ\text{C}$		0.9	1.2	V
			$T_J = 125^\circ\text{C}$		0.77		
Reverse Recovery Time	t_{rr}	$V_{GS} = 0\text{ V}, I_S = 100\text{ A}, dI_{SD}/dt = 100\text{ A}/\mu\text{s}$		76.6		ns	
Charge Time	t_a			46.4			
Discharge Time	t_b			30.2			
Reverse Recovery Charge	Q_{RR}			157		nC	

2. Pulse Test: Pulse Width $\leq 300\text{ }\mu\text{s}$, Duty Cycle $\leq 2\%$.

3. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

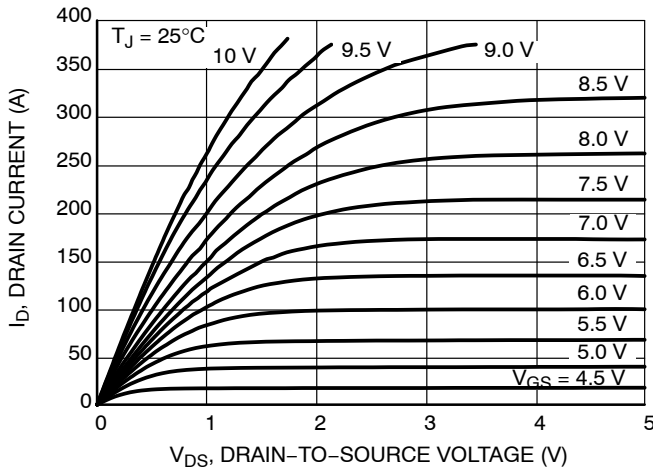


Figure 1. On-Region Characteristics

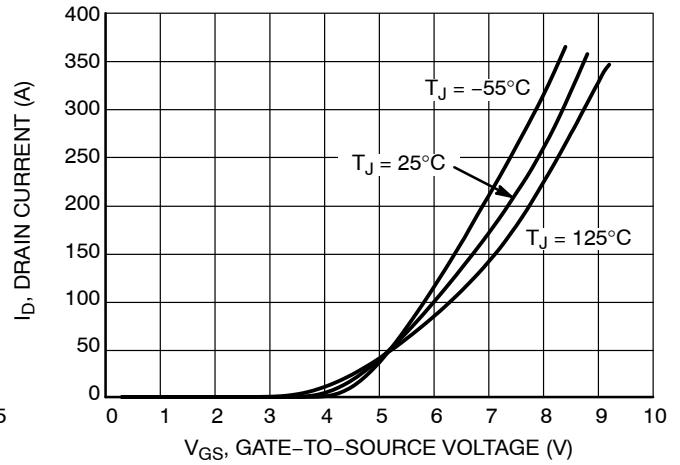


Figure 2. Transfer Characteristics

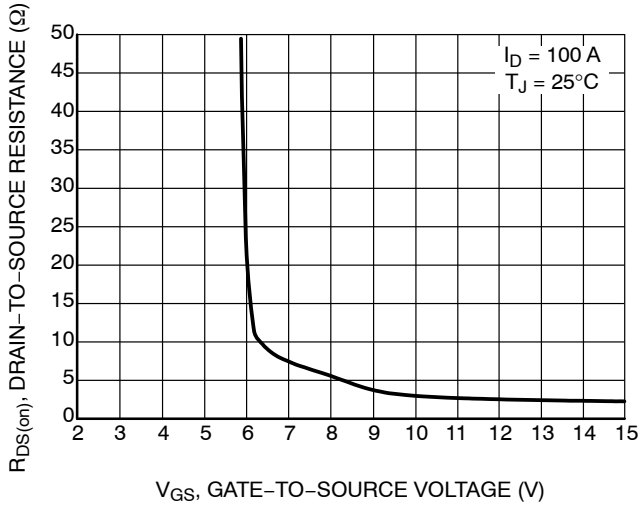


Figure 3. On-Region versus Gate Voltage

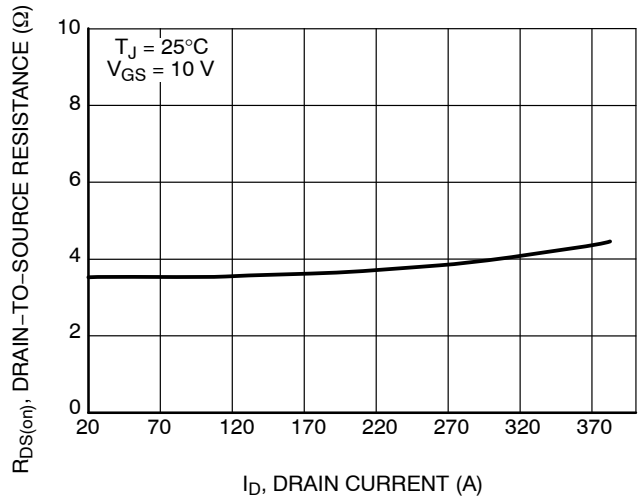


Figure 4. On-Region versus Drain Current and Gate Voltage

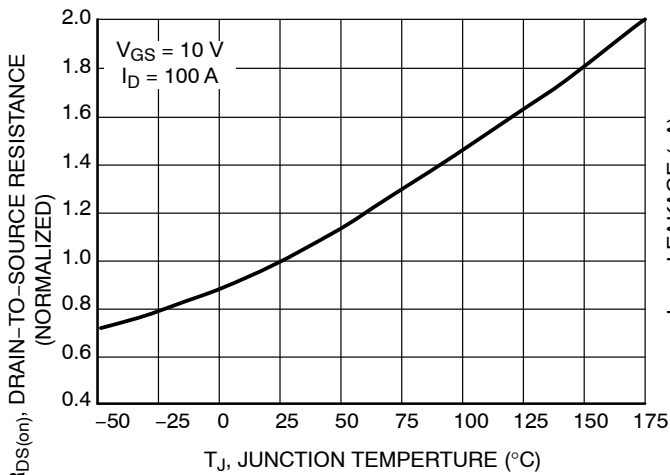


Figure 5. On-Resistance Variation with Temperature

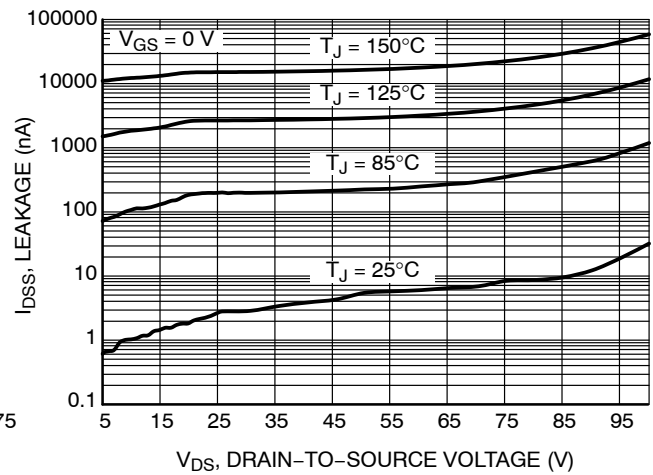


Figure 6. Drain-to-Source Leakage Current versus Voltage

TYPICAL CHARACTERISTICS

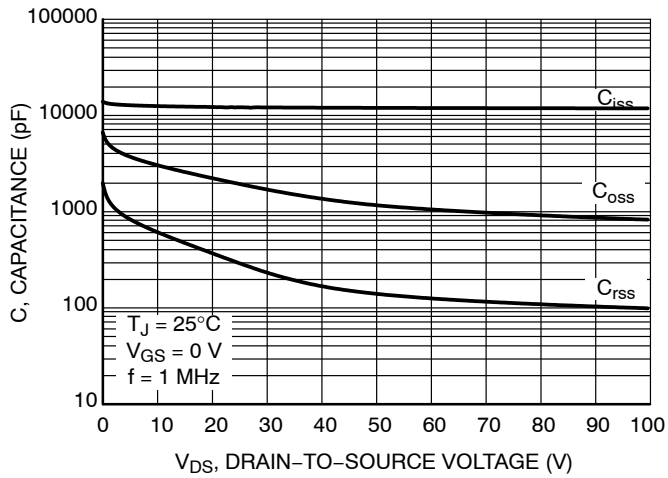


Figure 7. Capacitance Variation

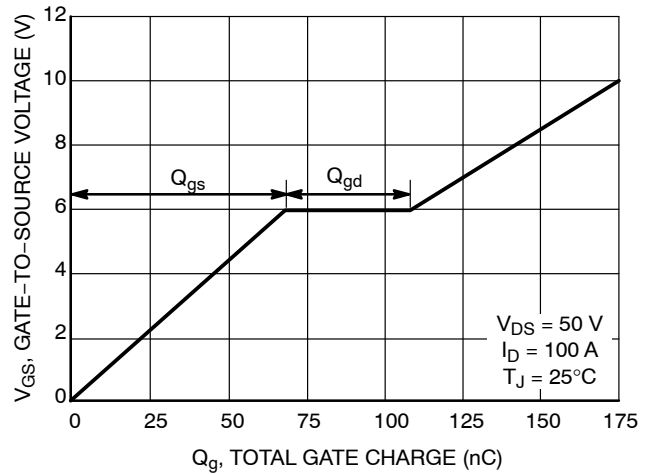


Figure 8. Gate-to-Source and Drain-to-Source Voltage versus Total Charge

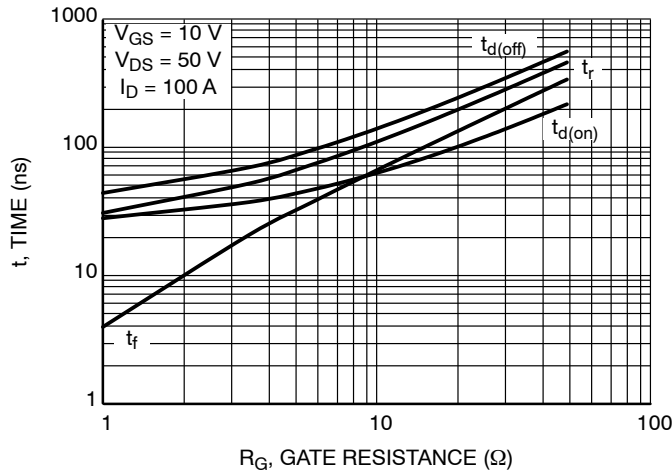


Figure 9. Resistive Switching Time Variation versus Gate Resistance

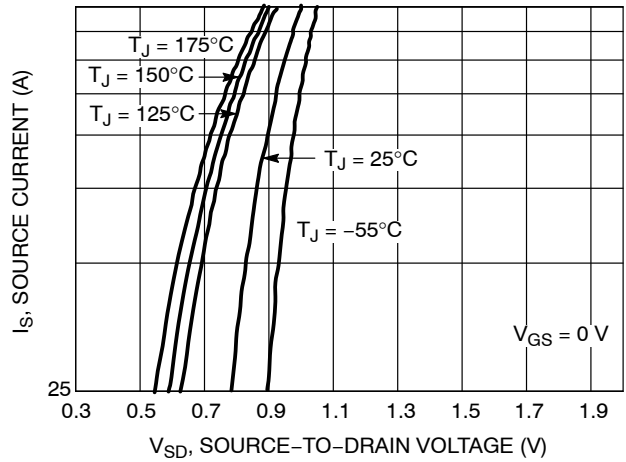


Figure 10. Diode Forward Voltage versus Current

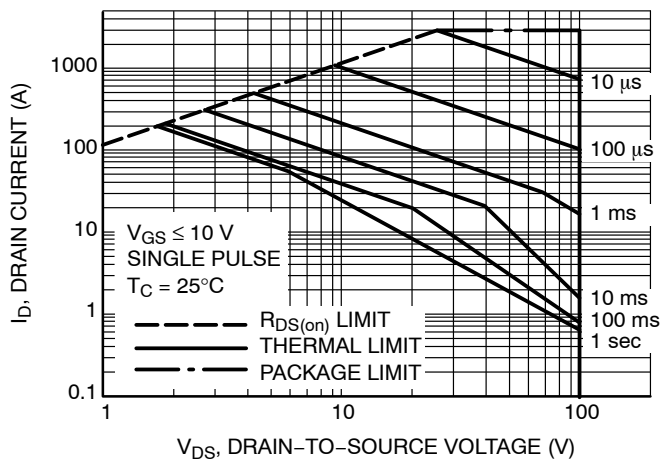


Figure 11. Maximum Rated Forward Biased Safe Operating Area

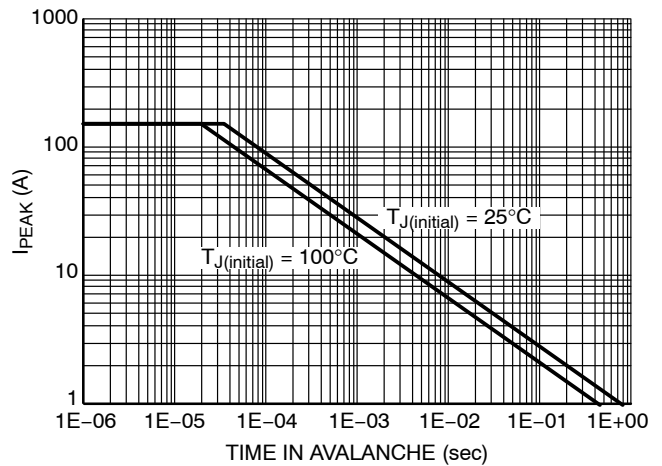


Figure 12. I_{PEAK} vs. Time in Avalanche

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TYPICAL CHARACTERISTICS

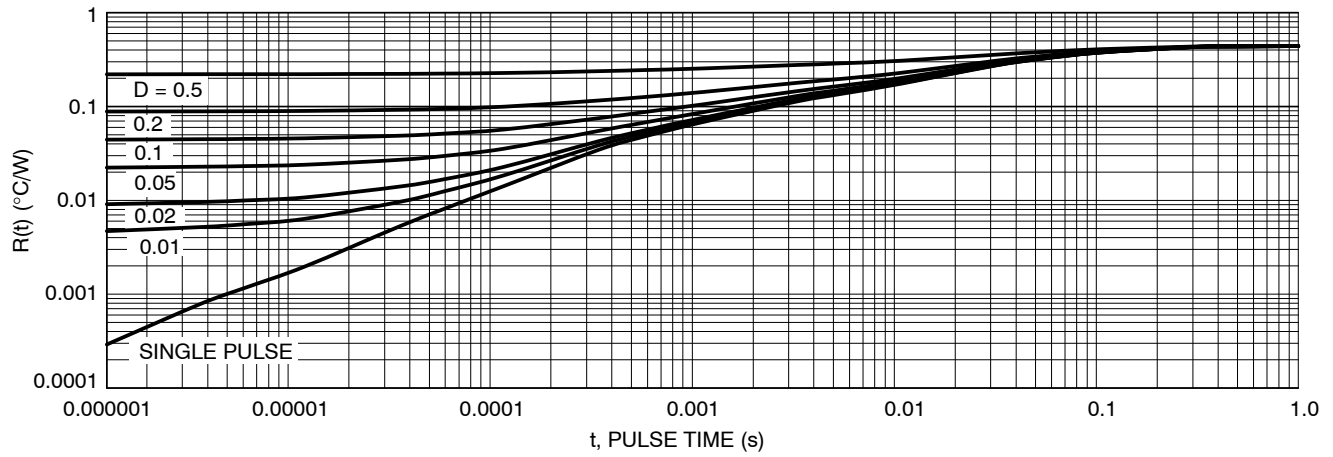


Figure 13. Thermal Response

ORDERING INFORMATION

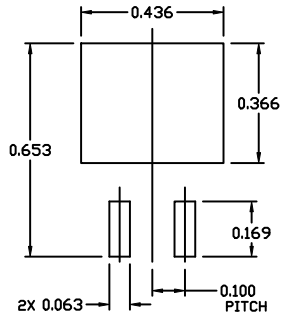
Device	Package	Shipping [†]
NTB004N10G	D ² PAK (Pb-Free)	800 / Tape & Reel

[†]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.

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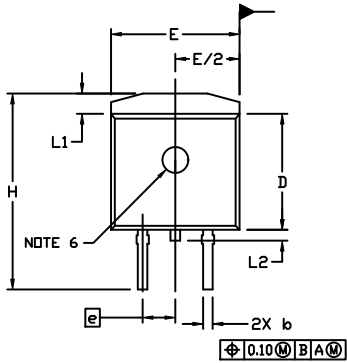
PACKAGE DIMENSIONS

D²PAK-3 (TO-263, 3-LEAD) CASE 418AJ ISSUE E



RECOMMENDED MOUNTING FOOTPRINT

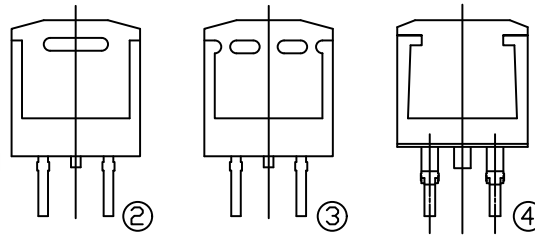
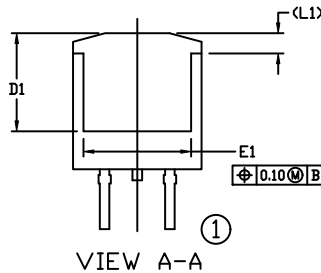
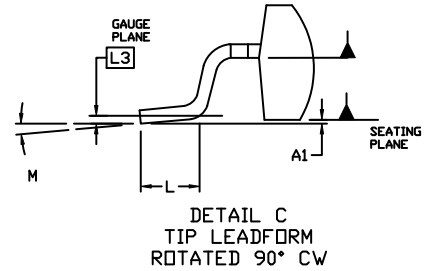
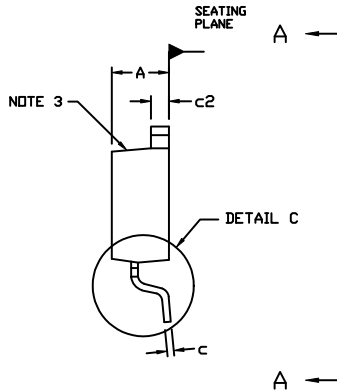
■ For additional information on our Pb-free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERM/D.



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. Ⓢ, Ⓣ ... 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°



VIEW A-A OPTIONAL CONSTRUCTIONS

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