

# MOSFET - Power, N-Channel

## 100 V, 4.2 mΩ, 201 A

### 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			$V_{GS}$	$\pm 20$	V
Continuous Drain Current $R_{\theta JC}$	Steady State	$T_C = 25^\circ\text{C}$	$I_D$	201	A
		$T_C = 100^\circ\text{C}$		142	
Power Dissipation $R_{\theta JC}$	Steady State	$T_C = 25^\circ\text{C}$	$P_D$	340	W
Pulsed Drain Current	$t_p = 10 \mu\text{s}$		$I_{DM}$	3002	A
Operating Junction and Storage Temperature Range			$T_J, T_{stg}$	-55 to +175	$^\circ\text{C}$
Source Current (Body Diode)			$I_S$	283	A
Single Pulse Drain-to-Source Avalanche Energy ( $V_{DD} = 50 \text{ Vdc}$ , $V_{GS} = 10 \text{ Vdc}$ , $I_{L(pk)} = 102 \text{ A}$ , $L = 0.1 \text{ mH}$ , $R_G = 25 \Omega$ )			$E_{AS}$	520	mJ
Lead Temperature for Soldering Purposes, 1/8" from Case for 10 Seconds			$T_L$	260	$^\circ\text{C}$

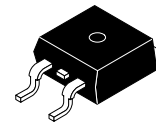
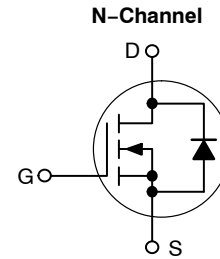
#### THERMAL RESISTANCE RATINGS

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.

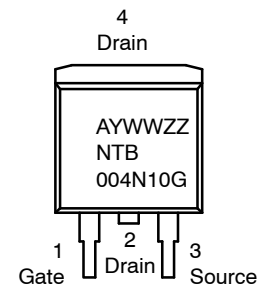
1. Surface mounted on FR4 board using 1 sq in pad size, (Cu Area 1.127 sq in [2 oz] including traces).

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



D<sup>2</sup>PAK  
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<sub>J</sub> = 25°C Unless otherwise specified)

Characteristics	Symbol	Test Condition	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>						
Drain-to-Source Breakdown Voltage	V <sub>(BR)DSS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA	100			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	V <sub>(BR)DSS</sub> /T <sub>J</sub>			83.2		mV/°C
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 80 V	T <sub>J</sub> = 25°C		1.0	μA
			T <sub>J</sub> = 150°C		100	
Gate-to-Source Leakage Current	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±20 V			±100	nA

## ON CHARACTERISTICS (Note 2)

Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 500 μA	2.0	2.8	4.0	V
Negative Threshold Temperature Coefficient	V <sub>GS(th)</sub> /T <sub>J</sub>			-10.5		mV/°C
Drain-to-Source On-Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 100 A	T <sub>J</sub> = 25°C	3.4	4.2	mΩ
			T <sub>J</sub> = 175°C	6.82		mΩ
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 100 A		70		S

## CHARGES, CAPACITANCES & GATE RESISTANCE

Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 50 V, V <sub>GS</sub> = 0 V, f = 1 MHz		11900		pF
Output Capacitance	C <sub>oss</sub>			1170		
Reverse Transfer Capacitance	C <sub>rss</sub>			147		
Total Gate Charge	Q <sub>G(TOT)</sub>	V <sub>GS</sub> = 10 V, V <sub>DS</sub> = 50 V, I <sub>D</sub> = 100 A		175		nC
Threshold Gate Charge	Q <sub>G(TH)</sub>			78.4		
Gate-to-Source Charge	Q <sub>GS</sub>			67.3		
Gate-to-Drain Charge	Q <sub>GD</sub>			40.8		
Plateau Voltage	V <sub>GP</sub>			6.0		
Gate Resistance	R <sub>G</sub>	V <sub>OSC</sub> = 100 mV, V <sub>GS</sub> = 0 V, f = 1 MHz		0.445		Ω

## SWITCHING CHARACTERISTICS, V<sub>GS</sub> = 10 V (Note 3)

Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>GS</sub> = 10 V, V <sub>DD</sub> = 50 V, I <sub>D</sub> = 100 A, R <sub>G</sub> = 4.7 Ω		43		ns
Rise Time	t <sub>r</sub>			64.5		
Turn-Off Delay Time	t <sub>d(off)</sub>			84.7		
Fall Time	t <sub>f</sub>			30		

## DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V <sub>SD</sub>	I <sub>S</sub> = 100 A	T <sub>J</sub> = 25°C	0.9	1.2	V
			T <sub>J</sub> = 125°C	0.77		
Reverse Recovery Time	t <sub>rr</sub>	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 100 A, dI <sub>SD</sub> /dt = 100 A/μs		76.6		ns
Charge Time	t <sub>a</sub>			46.4		
Discharge Time	t <sub>b</sub>			30.2		
Reverse Recovery Charge	Q <sub>RR</sub>			157		

2. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.
3. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

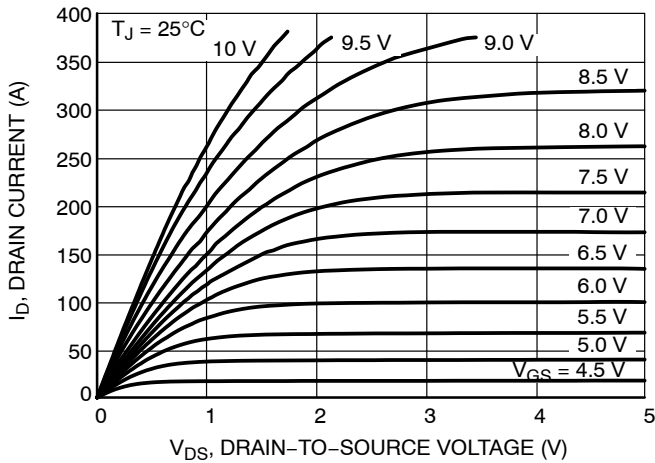


Figure 1. On-Region Characteristics

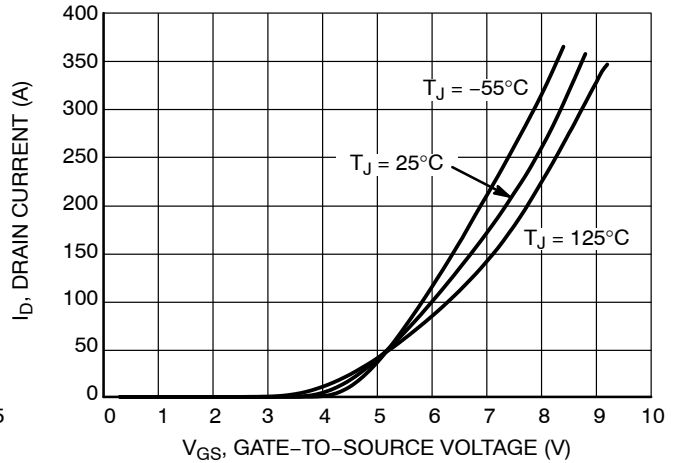


Figure 2. Transfer Characteristics

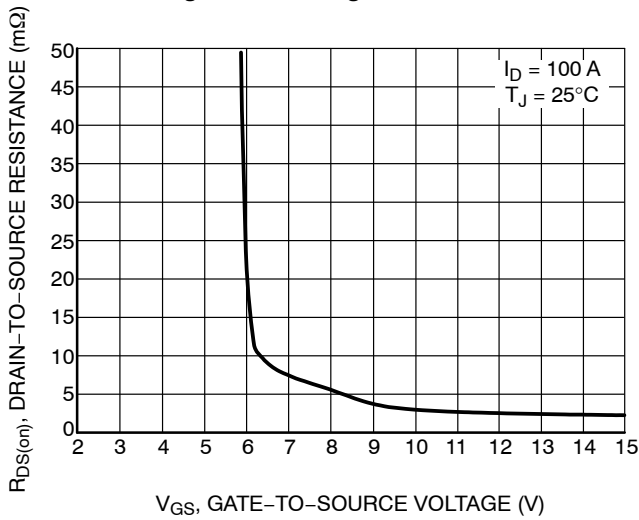


Figure 3. On-Region versus Gate Voltage

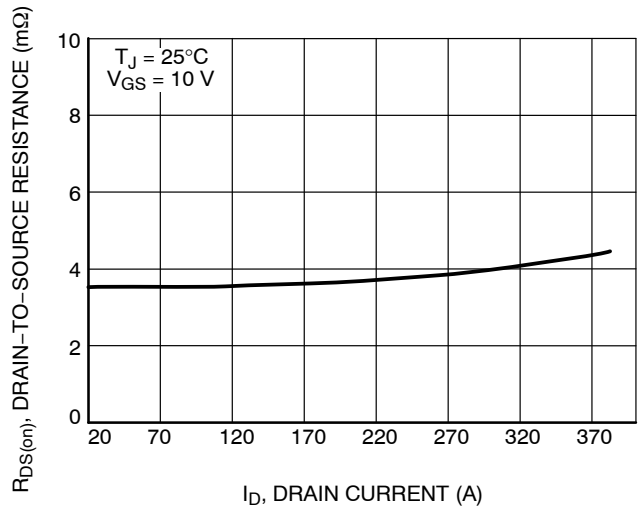


Figure 4. On-Region versus Drain Current and Gate Voltage

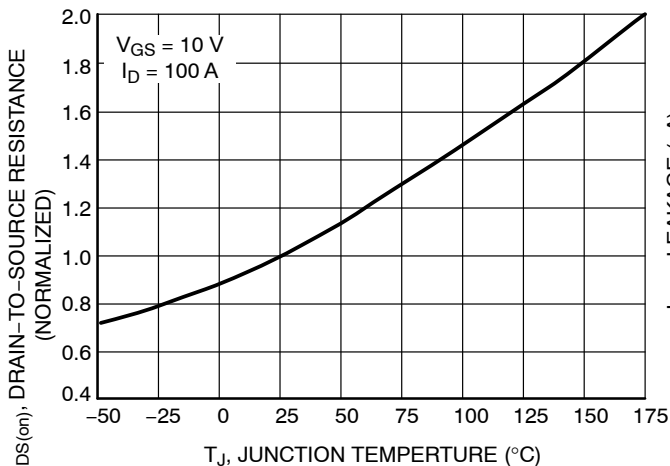


Figure 5. On-Resistance Variation with Temperature

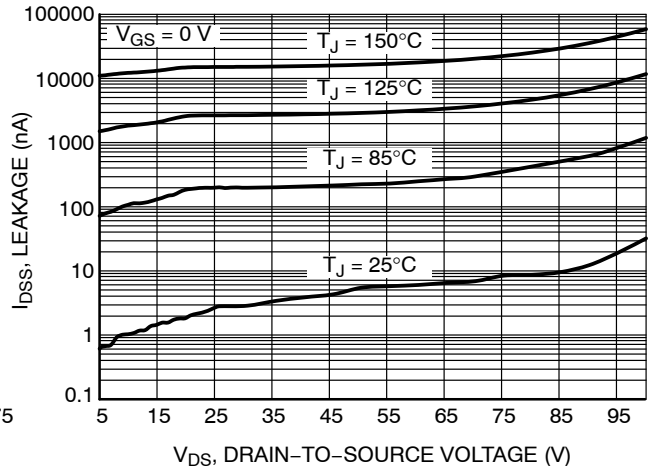


Figure 6. Drain-to-Source Leakage Current versus Voltage

TYPICAL CHARACTERISTICS

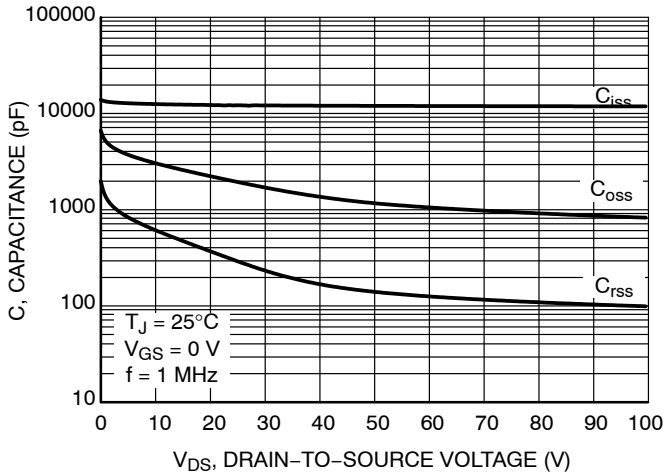


Figure 7. Capacitance Variation

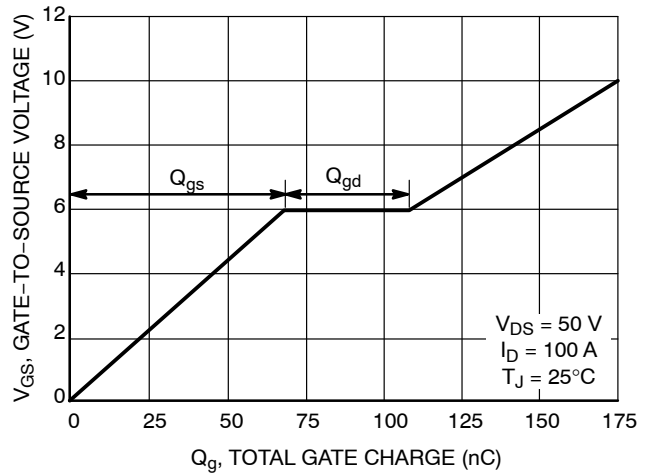


Figure 8. Gate-to-Source and Drain-to-Source Voltage versus Total Charge

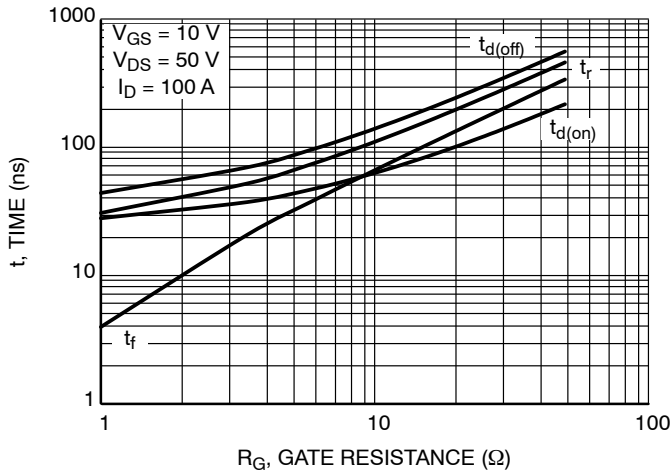


Figure 9. Resistive Switching Time Variation versus Gate Resistance

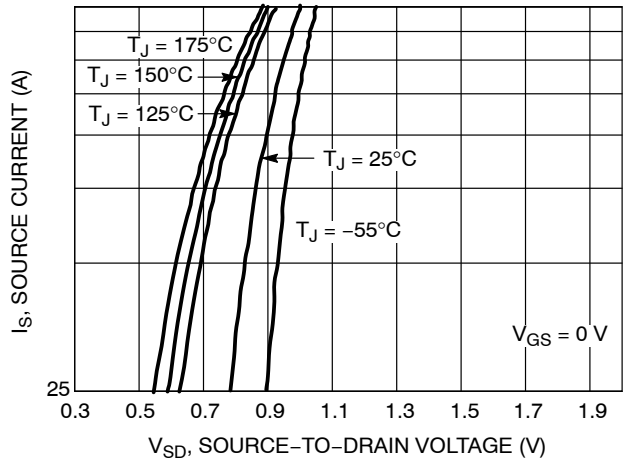


Figure 10. Diode Forward Voltage versus Current

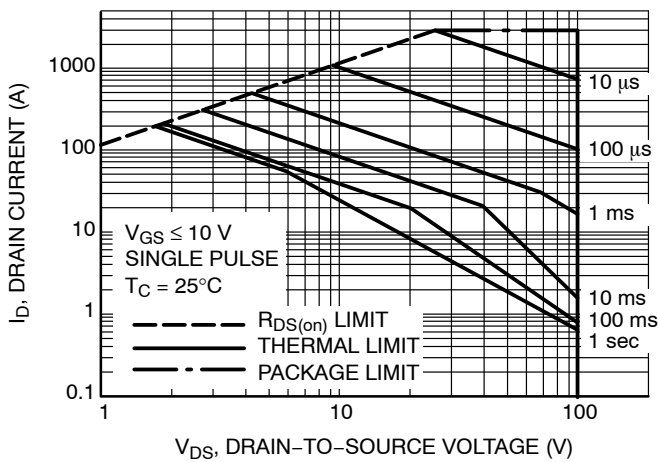


Figure 11. Maximum Rated Forward Biased Safe Operating Area

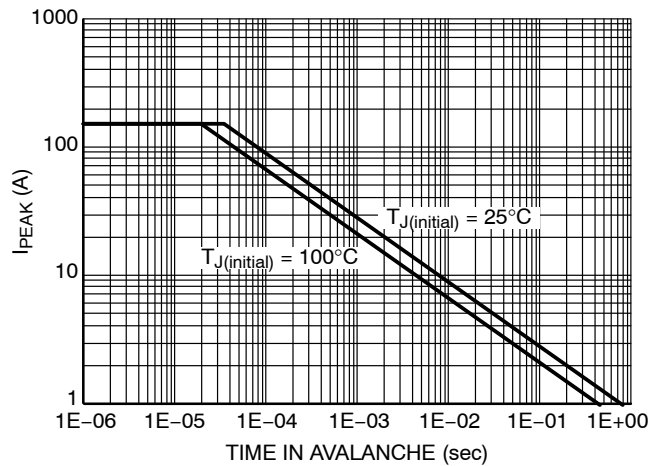


Figure 12.  $I_{PEAK}$  vs. Time in Avalanche

# NTB004N10G

## TYPICAL CHARACTERISTICS

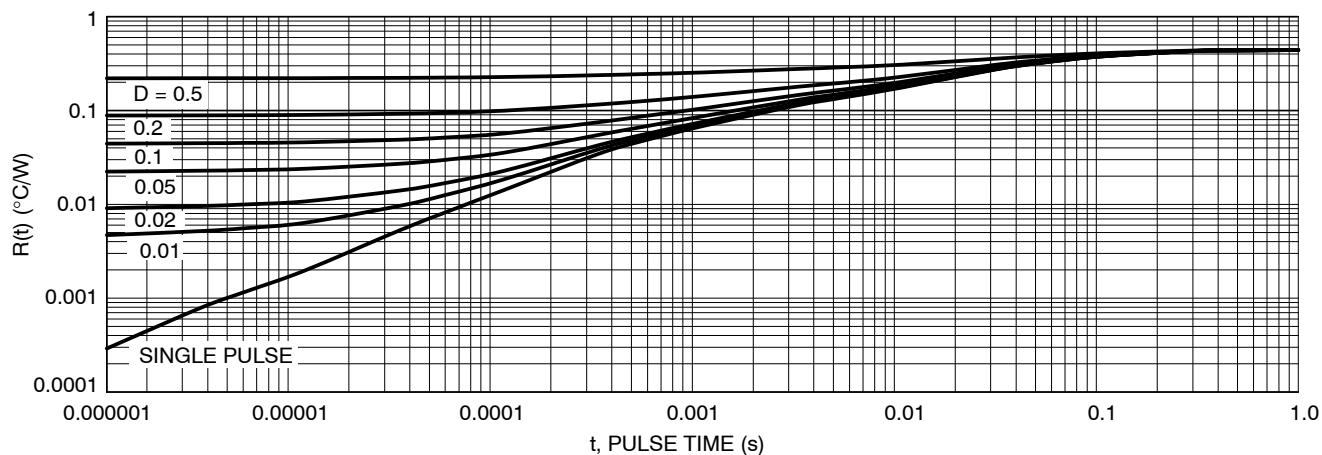


Figure 13. Thermal Response

### ORDERING INFORMATION

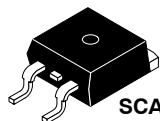
Device	Package	Shipping <sup>†</sup>
NTB004N10G	D <sup>2</sup> PAK (Pb-Free)	800 / Tape & Reel

<sup>†</sup>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.

# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

ON Semiconductor®



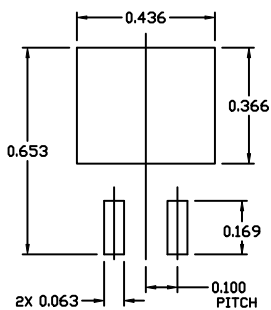
SCALE 1:1

### D<sup>2</sup>PAK-3 (TO-263, 3-LEAD)

#### CASE 418AJ

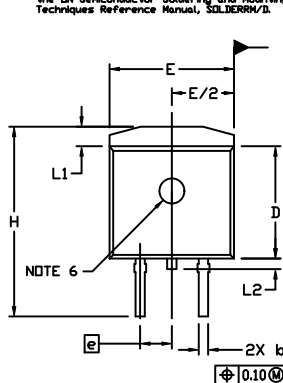
#### ISSUE F

DATE 11 MAR 2021



#### RECOMMENDED MOUNTING FOOTPRINT

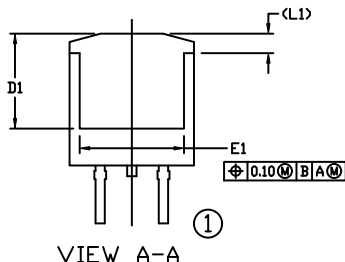
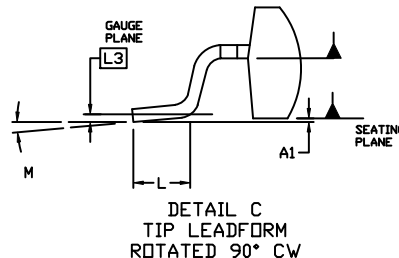
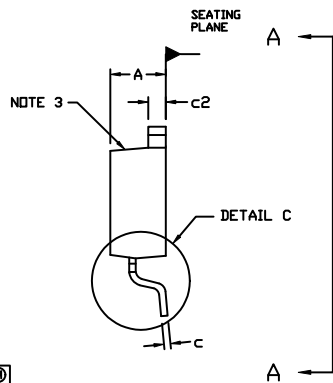
For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



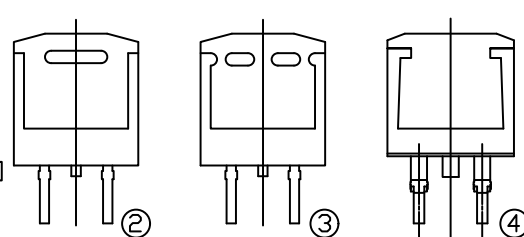
#### NOTES:

- DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
- CONTROLLING DIMENSION: INCHES
- CHAMFER OPTIONAL.
- 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.
- THERMAL PAD CONTOUR IS OPTIONAL WITHIN DIMENSIONS E, L1, D1, AND E1.
- OPTIONAL MOLD FEATURE.
- 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	0*	8*	0*	8*

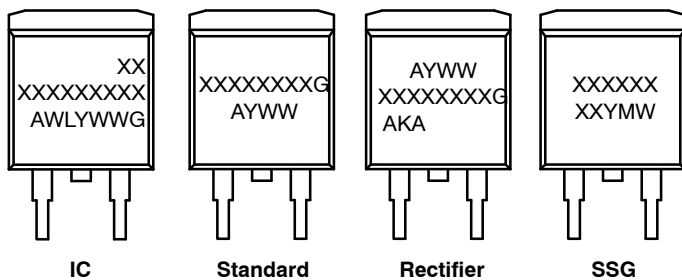


VIEW A-A



VIEW A-A  
OPTIONAL CONSTRUCTIONS

#### GENERIC MARKING DIAGRAMS\*



IC

Standard

Rectifier

SSG

- XXXXXX = Specific Device Code
- A = Assembly Location
- WL = Wafer Lot
- Y = Year
- WW = Work Week
- W = Week Code (SSG)
- M = Month Code (SSG)
- G = Pb-Free Package
- AKA = Polarity Indicator

\*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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