

Switch-mode Power Rectifier, 100 V, 40 A

MBR41H100CT, NRVBB41H100CT Series

Features and Benefits

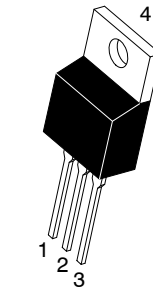
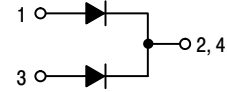
- Low Forward Voltage: 0.67 V @ 125°C
- Low Power Loss/High Efficiency
- High Surge Capacity
- 175°C Operating Junction Temperature
- 40 A Total (20 A Per Diode Leg)
- Guard-Ring for Stress Protection
- NRVBB Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant
- MBR41H100CTH and MBRB41H100CT-1H are Halide-Free

Applications

- Power Supply – Output Rectification
- Power Management
- Instrumentation

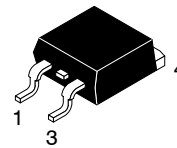
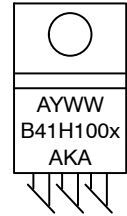
Mechanical Characteristics:

- Case: Epoxy, Molded
- Epoxy Meets UL 94 V-0 @ 0.125 in
- Weight (Approximately): 1.9 Grams (TO-220)
1.7 Grams (D²PAK-3)
1.5 Grams (TO-262)
- Finish: All External Surfaces Corrosion Resistant and Terminal Leads are Readily Solderable
- Lead Temperature for Soldering Purposes: 260°C Max. for 10 Seconds

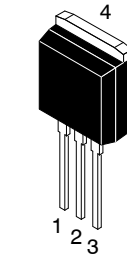
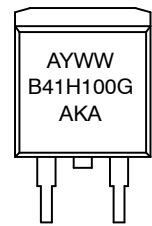


TO-220
CASE 221A
STYLE 6

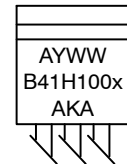
MARKING DIAGRAMS



D²PAK-3
CASE 418B
STYLE 3



I²PAK (TO-262)
CASE 418D
STYLE 3



A = Assembly Location
Y = Year
WW = Work Week
x = G or H
G = Pb-Free Package
H = Halide-Free Package
AKA = Polarity Designator

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 6 of this data sheet.

NOTE: Some of the devices on this data sheet have been **DISCONTINUED**. Please refer to the table on page 6.

MBR41H100CT, NRVBB41H100CT Series

MAXIMUM RATINGS (Per Diode Leg)

Rating	Symbol	Value	Unit
Peak Repetitive Reverse Voltage Working Peak Reverse Voltage DC Blocking Voltage	V_{RRM} V_{RWM} V_R	100	V
Average Rectified Forward Current (Rated V_R) $T_C = 150^\circ\text{C}$	$I_{F(AV)}$	20	A
Peak Repetitive Forward Current (Rated V_R , Square Wave, 20 kHz) $T_C = 145^\circ\text{C}$	I_{FRM}	40	A
Nonrepetitive Peak Surge Current (Surge applied at rated load conditions halfwave, single phase, 60 Hz)	I_{FSM}	350	A
Operating Junction Temperature (Note 1)	T_J	+175	$^\circ\text{C}$
Storage Temperature	T_{stg}	-65 to +175	$^\circ\text{C}$
Voltage Rate of Change (Rated V_R)	dv/dt	10,000	V/ μs
Controlled Avalanche Energy (see test conditions in Figures 10 and 11)	W_{AVAIL}	400	mJ
ESD Ratings: Machine Model = C Human Body Model = 3B		> 400 > 8000	V

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. The heat generated must be less than the thermal conductivity from Junction-to-Ambient: $dP_D/dT_J < 1/R_{\theta JA}$.

THERMAL CHARACTERISTICS (Per Diode Leg)

Characteristic	Symbol	Value	Unit
Maximum Thermal Resistance Junction-to-Case Junction-to-Ambient	$R_{\theta JC}$ $R_{\theta JA}$	2.0 70	$^\circ\text{C}/\text{W}$

ELECTRICAL CHARACTERISTICS (Per Diode Leg)

Characteristic	Symbol	Value	Unit
Maximum Instantaneous Forward Voltage (Note 2) ($I_F = 20\text{ A}$, $T_C = 25^\circ\text{C}$) ($I_F = 20\text{ A}$, $T_C = 125^\circ\text{C}$) ($I_F = 40\text{ A}$, $T_C = 25^\circ\text{C}$) ($I_F = 40\text{ A}$, $T_C = 125^\circ\text{C}$)	V_F	0.80 0.67 0.90 0.76	V
Maximum Instantaneous Reverse Current (Note 2) (Rated DC Voltage, $T_C = 125^\circ\text{C}$) (Rated DC Voltage, $T_C = 25^\circ\text{C}$)	i_R	10 0.01	mA

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.

2. Pulse Test: Pulse Width = 300 μs , Duty Cycle $\leq 2.0\%$.

MBR41H100CT, NRVBB41H100CT Series

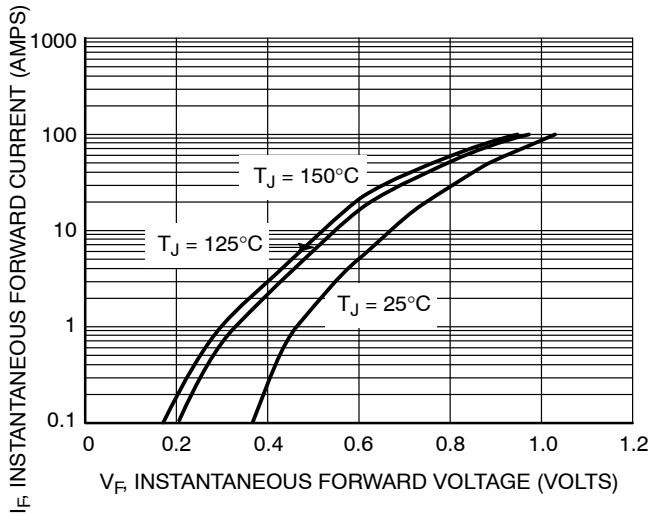


Figure 1. Typical Forward Voltage

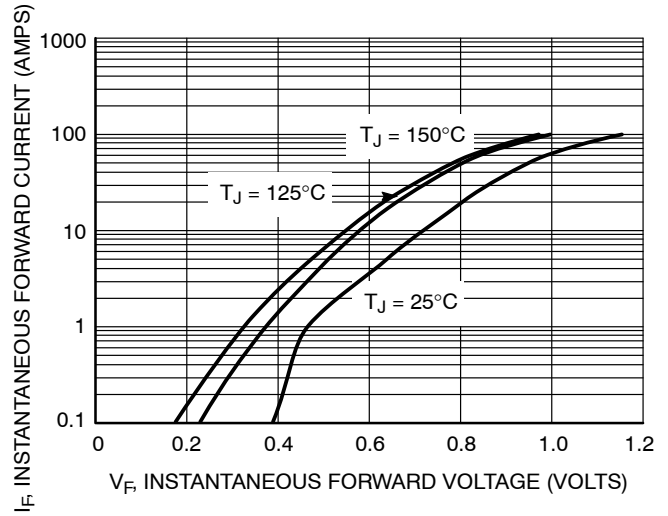


Figure 2. Maximum Forward Voltage

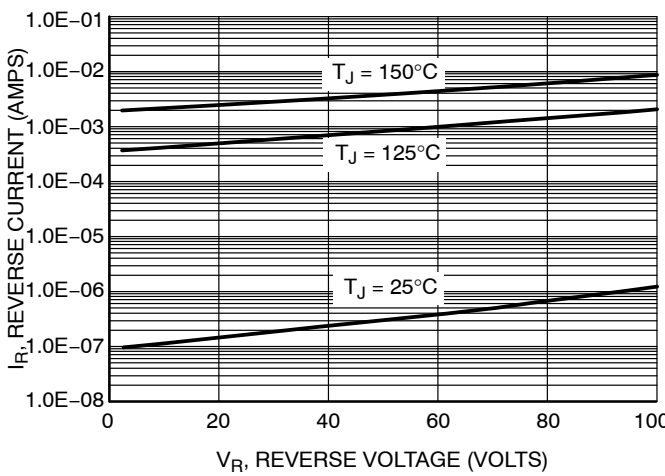


Figure 3. Typical Reverse Current

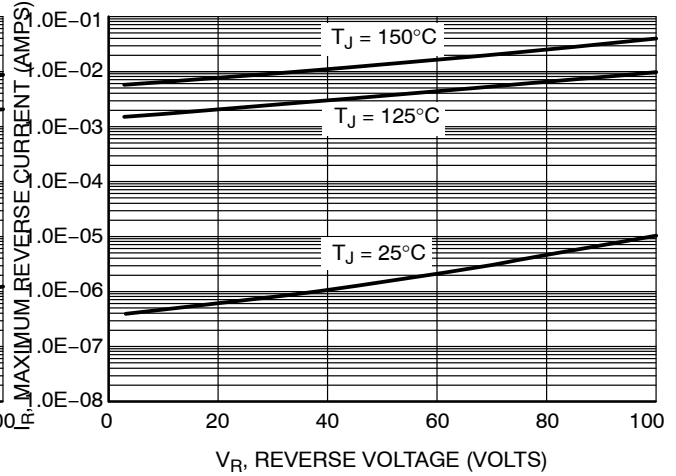


Figure 4. Maximum Reverse Current

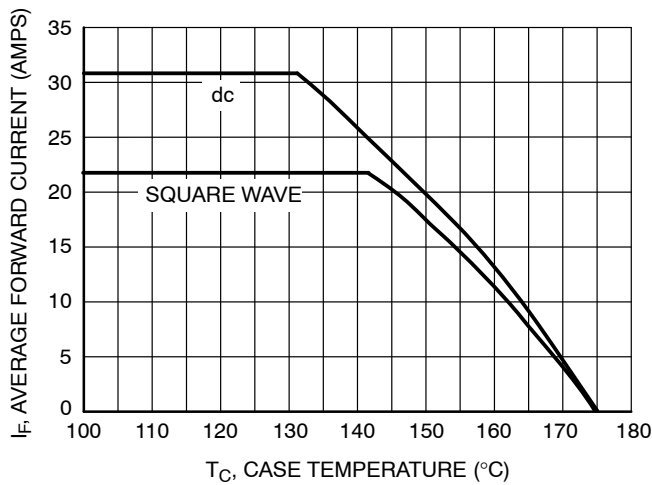


Figure 5. Current Derating

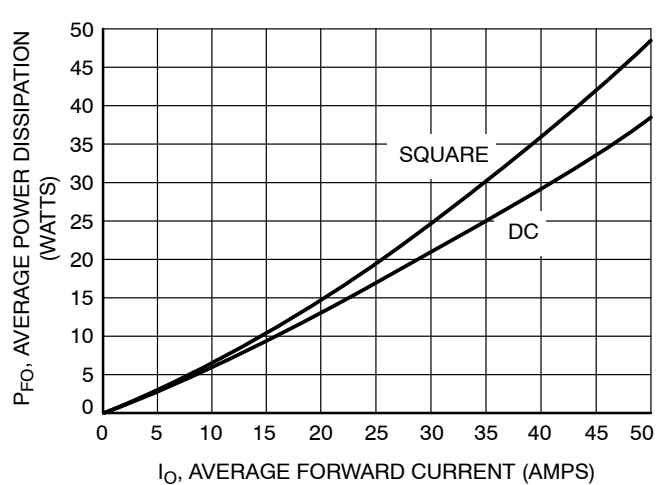


Figure 6. Forward Power Dissipation

MBR41H100CT, NRVBB41H100CT Series

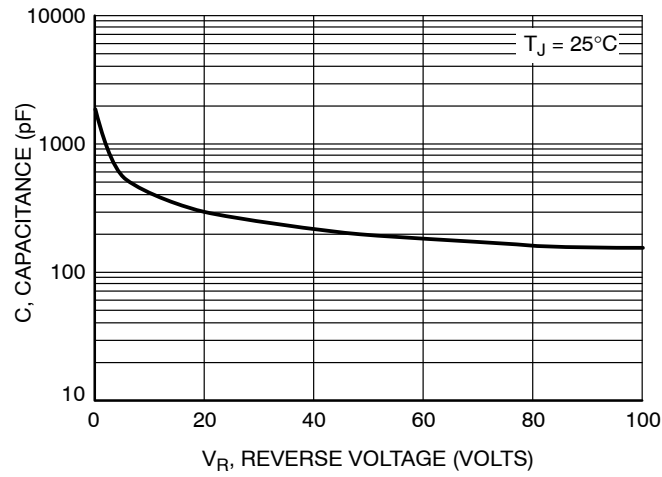


Figure 7. Capacitance

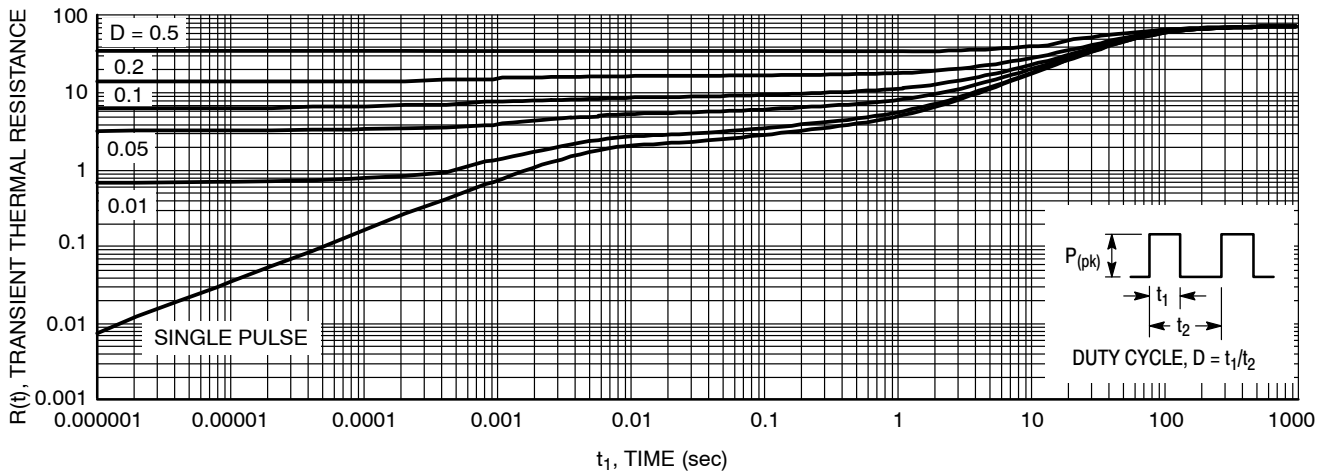


Figure 8. Thermal Response Junction-to-Ambient

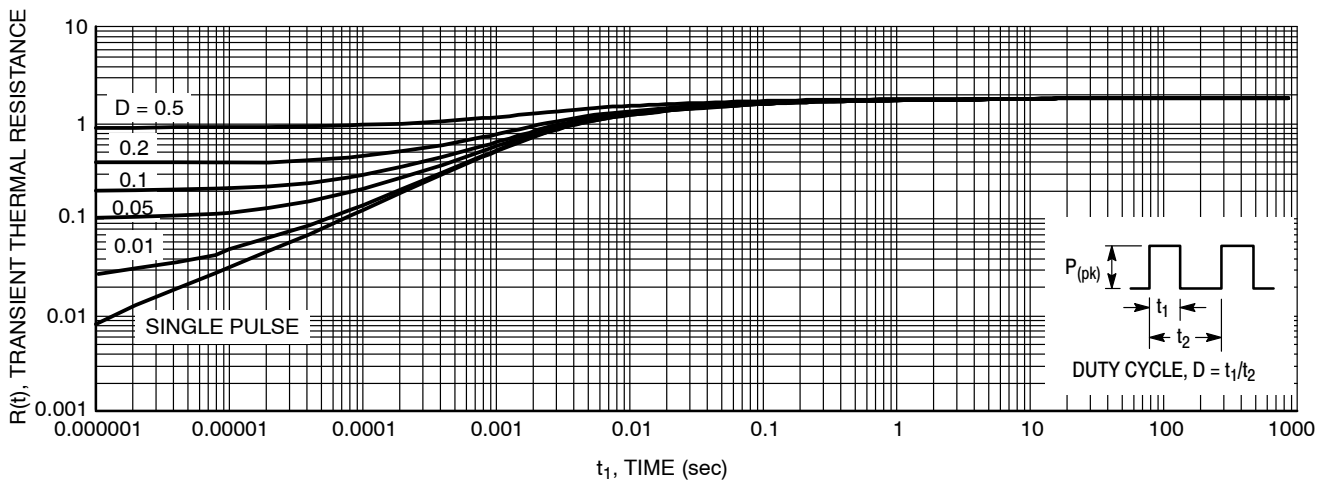


Figure 9. Thermal Response Junction-to-Case

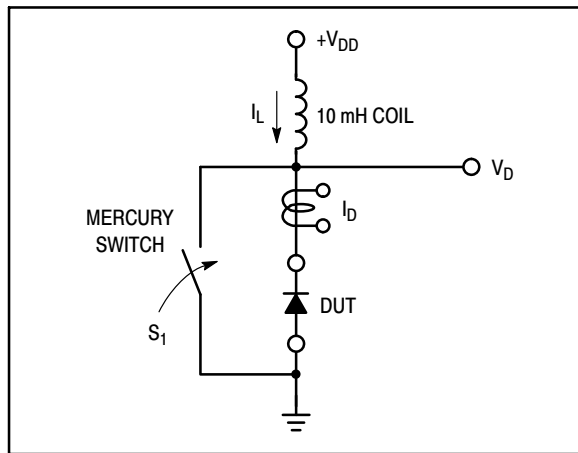


Figure 10. Test Circuit

The unclamped inductive switching circuit shown in Figure 10 was used to demonstrate the controlled avalanche capability of this device. A mercury switch was used instead of an electronic switch to simulate a noisy environment when the switch was being opened.

When S_1 is closed at t_0 the current in the inductor I_L ramps up linearly; and energy is stored in the coil. At t_1 the switch is opened and the voltage across the diode under test begins to rise rapidly, due to di/dt effects, when this induced voltage reaches the breakdown voltage of the diode, it is clamped at BV_{DUT} and the diode begins to conduct the full load current which now starts to decay linearly through the diode, and goes to zero at t_2 .

By solving the loop equation at the point in time when S_1 is opened; and calculating the energy that is transferred to the diode it can be shown that the total energy transferred is equal to the energy stored in the inductor plus a finite amount of energy from the V_{DD} power supply while the diode is in breakdown (from t_1 to t_2) minus any losses due to finite component resistances. Assuming the component resistive

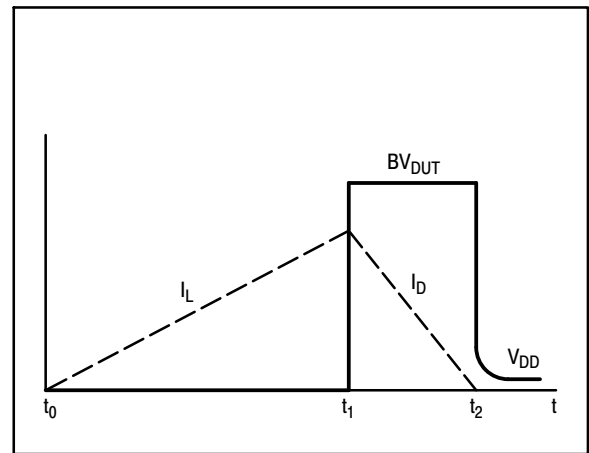


Figure 11. Current-Voltage Waveforms

elements are small Equation (1) approximates the total energy transferred to the diode. It can be seen from this equation that if the V_{DD} voltage is low compared to the breakdown voltage of the device, the amount of energy contributed by the supply during breakdown is small and the total energy can be assumed to be nearly equal to the energy stored in the coil during the time when S_1 was closed, Equation (2).

EQUATION (1):

$$W_{AVAL} \approx \frac{1}{2} L I_{LPK}^2 \left(\frac{BV_{DUT}}{BV_{DUT} - V_{DD}} \right)$$

EQUATION (2):

$$W_{AVAL} \approx \frac{1}{2} L I_{LPK}^2$$

MBR41H100CT, NRVBB41H100CT Series

ORDERING INFORMATION

Device	Package	Shipping†
MBR41H100CTG	TO-220 (Pb-Free)	50 Units / Rail

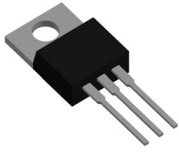
DISCONTINUED (Note 3)

MBR41H100CTH	TO-220 (Halide-Free)	50 Units / Rail
MBRB41H100CT-1G	I ² PAK (Pb-Free)	50 Units / Rail
MBRB41H100CT-1H	I ² PAK (Halide-Free)	50 Units / Rail
MBRB41H100CTT4G	D ² PAK 3 (Pb-Free)	800 Units / Tape & Reel
NRVBB41H100CTT4G*	D ² PAK 3 (Pb-Free)	800 Units / 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.

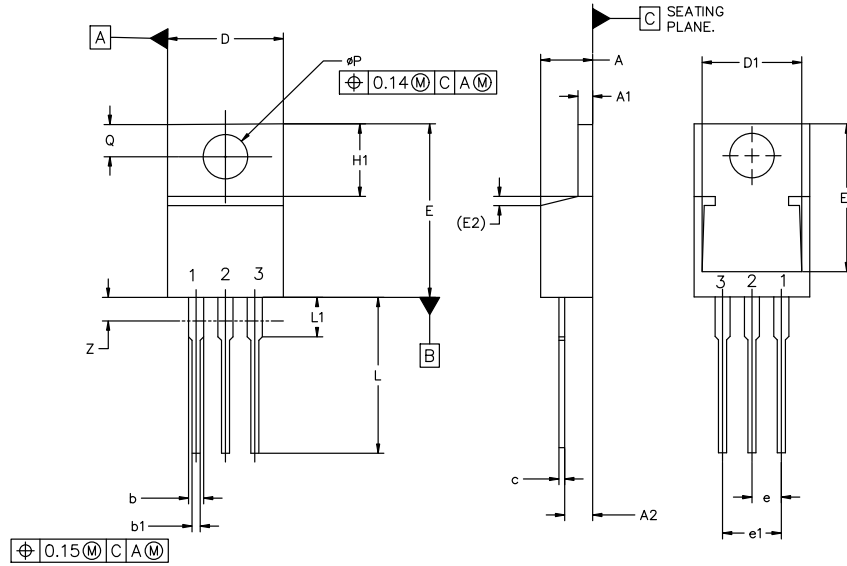
*NRVBB Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable.

3. **DISCONTINUED:** These devices are not recommended for new design. Please contact your **onsemi** representative for information. The most current information on these devices may be available on www.onsemi.com.



TO-220-3 10.10x15.12x4.45, 2.54P
CASE 221A
ISSUE AL

DATE 05 FEB 2025



$\varnothing 0.15 \text{ (M)}$ C A (M)

MILLIMETERS			
DIM	MIN	NOM	MAX
A	4.07	4.45	4.83
A1	1.15	1.28	1.41
A2	2.04	2.42	2.79
b	1.15	1.34	1.52
b1	0.64	0.80	0.96
c	0.36	0.49	0.61
D	9.66	10.10	10.53
D1	8.43	8.63	8.83
E	14.48	15.12	15.75
E1	12.58	12.78	12.98
E2	1.27 REF		

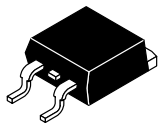
MILLIMETERS			
DIM	MIN	NOM	MAX
e	2.42	2.54	2.66
e1	4.83	5.08	5.33
H1	5.97	6.22	6.47
L	12.70	13.49	14.27
L1	2.80	3.45	4.10
Q	2.54	2.79	3.04
$\varnothing P$	3.60	3.85	4.09
Z	---	---	3.48

- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
 2. CONTROLLING DIMENSION: MILLIMETERS.
 3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

- | | | | |
|--|--|---|--|
| <p>STYLE 1:
PIN 1. BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR</p> | <p>STYLE 2:
PIN 1. BASE
2. EMITTER
3. COLLECTOR
4. EMITTER</p> | <p>STYLE 3:
PIN 1. CATHODE
2. ANODE
3. GATE
4. ANODE</p> | <p>STYLE 4:
PIN 1. MAIN TERMINAL 1
2. MAIN TERMINAL 2
3. GATE
4. MAIN TERMINAL 2</p> |
| <p>STYLE 5:
PIN 1. GATE
2. DRAIN
3. SOURCE
4. DRAIN</p> | <p>STYLE 6:
PIN 1. ANODE
2. CATHODE
3. ANODE
4. CATHODE</p> | <p>STYLE 7:
PIN 1. CATHODE
2. ANODE
3. CATHODE
4. ANODE</p> | <p>STYLE 8:
PIN 1. CATHODE
2. ANODE
3. EXTERNAL TRIP/DELAY
4. ANODE</p> |
| <p>STYLE 9:
PIN 1. GATE
2. COLLECTOR
3. EMITTER
4. COLLECTOR</p> | <p>STYLE 10:
PIN 1. GATE
2. SOURCE
3. DRAIN
4. SOURCE</p> | <p>STYLE 11:
PIN 1. DRAIN
2. SOURCE
3. GATE
4. SOURCE</p> | <p>STYLE 12:
PIN 1. MAIN TERMINAL 1
2. MAIN TERMINAL 2
3. GATE
4. NOT CONNECTED</p> |

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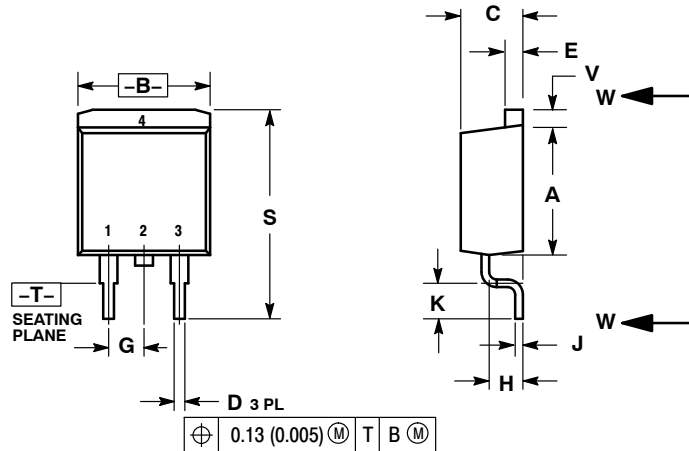
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D²PAK 3
CASE 418B-04
ISSUE L

DATE 17 FEB 2015

SCALE 1:1

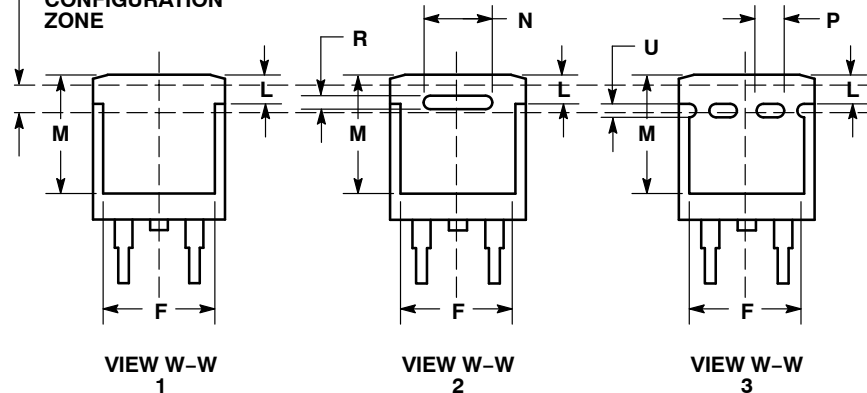


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 418B-01 THRU 418B-03 OBSOLETE, NEW STANDARD 418B-04.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.340	0.380	8.64	9.65
B	0.380	0.405	9.65	10.29
C	0.160	0.190	4.06	4.83
D	0.020	0.035	0.51	0.89
E	0.045	0.055	1.14	1.40
F	0.310	0.350	7.87	8.89
G	0.100	BSC	2.54	BSC
H	0.080	0.110	2.03	2.79
J	0.018	0.025	0.46	0.64
K	0.090	0.110	2.29	2.79
L	0.052	0.072	1.32	1.83
M	0.280	0.320	7.11	8.13
N	0.197	REF	5.00	REF
P	0.079	REF	2.00	REF
R	0.039	REF	0.99	REF
S	0.575	0.625	14.60	15.88
V	0.045	0.055	1.14	1.40

VARIABLE CONFIGURATION ZONE



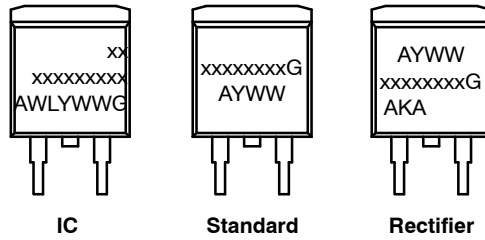
- | | | | | | |
|---|--|--|---|--|---|
| STYLE 1:
PIN 1. BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR | STYLE 2:
PIN 1. GATE
2. DRAIN
3. SOURCE
4. DRAIN | STYLE 3:
PIN 1. ANODE
2. CATHODE
3. ANODE
4. CATHODE | STYLE 4:
PIN 1. GATE
2. COLLECTOR
3. EMITTER
4. COLLECTOR | STYLE 5:
PIN 1. CATHODE
2. ANODE
3. CATHODE
4. ANODE | STYLE 6:
PIN 1. NO CONNECT
2. CATHODE
3. ANODE
4. CATHODE |
|---|--|--|---|--|---|

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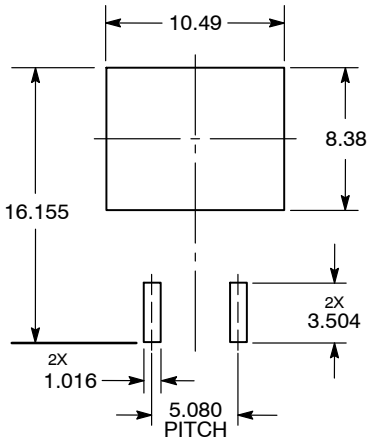
**GENERIC
MARKING DIAGRAM***



- xx = Specific Device Code
- A = Assembly Location
- WL = Wafer Lot
- Y = Year
- WW = Work Week
- 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.

SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

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

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