SWITCHMODE Power Rectifier 100 V, 40 A

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
- AEC-Q101 Qualified and PPAP Capable
- NRVBB Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements
- All Packages are Pb–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-220AB)

1.7 Grams (D²PAK)

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



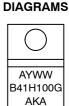
ON Semiconductor®

http://onsemi.com





TO-220AB CASE 221A PLASTIC STYLE 6



MARKING



D²PAK CASE 418B STYLE 3





I²PAK (TO-262) CASE 418D PLASTIC STYLE 3



A = Assembly Location

Y = Year
WW = Work Week
G = Pb-Free Package
AKA = Polarity Designator

ORDERING INFORMATION

Device	Package	Shipping [†]
MBR41H100CTG	TO-220 (Pb-Free)	50 Units/Rail
MBRB41H100CT-1G	TO-262 (Pb-Free)	50 Units/Rail
MBRB41H100CTT4G	D ² PAK (Pb-Free)	800/Tape & Reel
NRVBB41H100CTT4G	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.

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

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) $T_C = 150$ °C	I _{F(AV)}	20	Α
Peak Repetitive Forward Current (Rated V _R , Square Wave, 20 kHz) T _C = 145°C	I _{FRM}	40	Α
Nonrepetitive Peak Surge Current (Surge applied at rated load conditions halfwave, single phase, 60 Hz)	I _{FSM}	350	Α
Operating Junction Temperature (Note 1)	T _J	+175	°C
Storage Temperature	T _{stg}	- 65 to +175	°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 _{AVAL}	400	mJ
ESD Ratings: Machine Model = C Human Body Model = 3B		> 400 > 8000	V

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

THERMAL CHARACTERISTICS (Per Diode Leg)

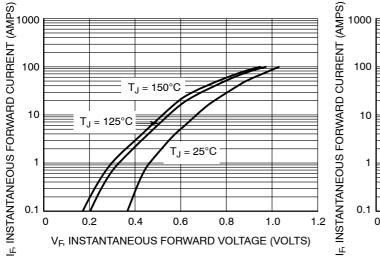
Characteristic	Symbol	Value	Unit
Maximum Thermal Resistance Junction-to-Case Junction-to-Ambient	R _{θJC} R _{θJA}	2.0 70	°C/W

ELECTRICAL CHARACTERISTICS (Per Diode Leg)

Characteristic	Symbol	Value	Unit
Maximum Instantaneous Forward Voltage (Note 2) $ \begin{array}{l} (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}) \end{array} $	VF	0.80 0.67 0.90 0.76	V
Maximum Instantaneous Reverse Current (Note 2) (Rated DC Voltage, $T_C = 125^{\circ}C$) (Rated DC Voltage, $T_C = 25^{\circ}C$)	i _R	10 0.01	mA

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

^{2.} Pulse Test: Pulse Width = 300 μs, Duty Cycle ≤ 2.0%.



100 T_J = 150°C

T_J = 125°C

T_J = 25°C

T_J = 25°C

V_F INSTANTANEOUS FORWARD VOLTAGE (VOLTS)

Figure 1. Typical Forward Voltage

Figure 2. Maximum Forward Voltage

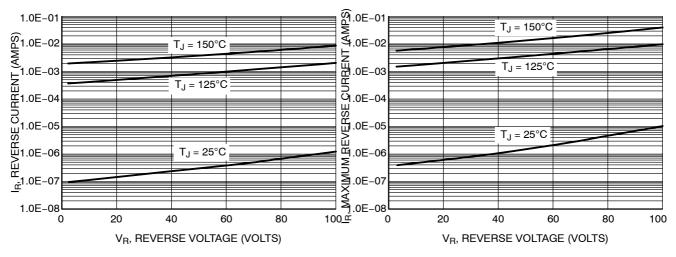


Figure 3. Typical Reverse Current

Figure 4. Maximum Reverse Current

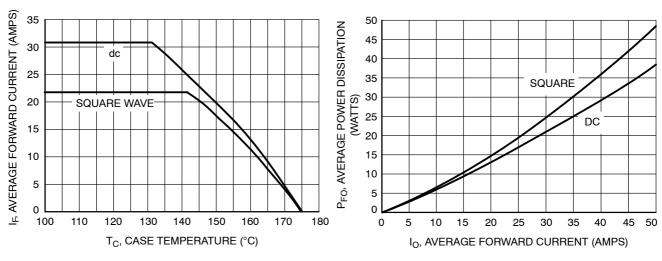


Figure 5. Current Derating

Figure 6. Forward Power Dissipation

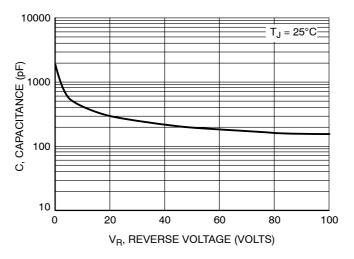


Figure 7. Capacitance

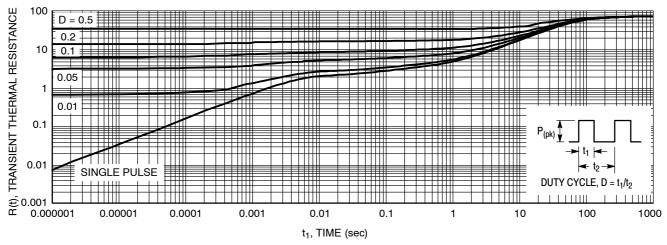


Figure 8. Thermal Response Junction-to-Ambient

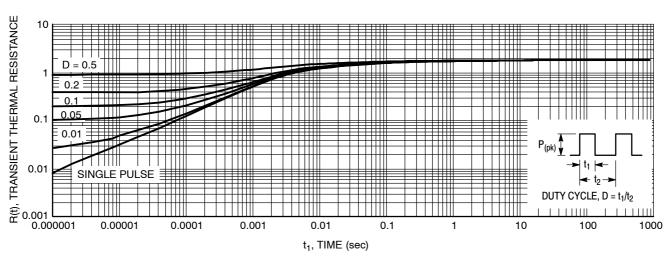


Figure 9. Thermal Response Junction-to-Case

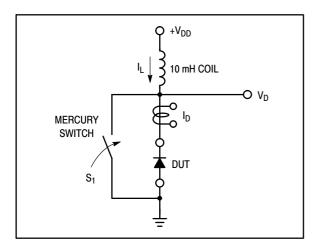


Figure 10. Test Circuit

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

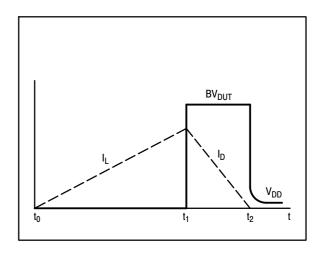


Figure 11. Current-Voltage Waveforms

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):

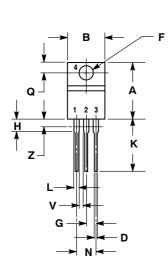
$$W_{AVAL} \approx \frac{1}{2} LI_{LPK}^2 \left(\frac{BV_{DUT}}{BV_{DUT}V_{DD}} \right)$$

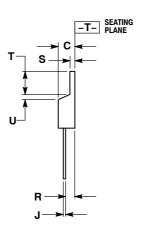
EQUATION (2):

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

PACKAGE DIMENSIONS

TO-220 CASE 221A-09 **ISSUE AG**





- NOTES:
 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
Α	0.570	0.620	14.48	15.75
В	0.380	0.405	9.66	10.28
С	0.160	0.190	4.07	4.82
D	0.025	0.036	0.64	0.91
F	0.142	0.161	3.61	4.09
G	0.095	0.105	2.42	2.66
Н	0.110	0.161	2.80	4.10
_	0.014	0.025	0.36	0.64
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.15	1.52
N	0.190	0.210	4.83	5.33
Q	0.100	0.120	2.54	3.04
R	0.080	0.110	2.04	2.79
S	0.045	0.055	1.15	1.39
T	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27
٧	0.045		1.15	
Z		0.080		2.04

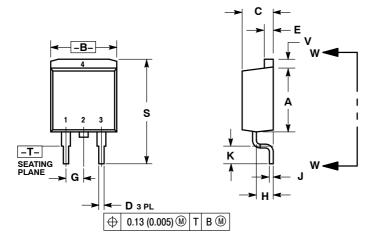
STYLE 6:

- PIN 1. ANODE 2. CATHODE

 - ANODE CATHODE

PACKAGE DIMENSIONS

D²PAK 3 CASE 418B-04 **ISSUE K**



NOTES:

- NOTES:

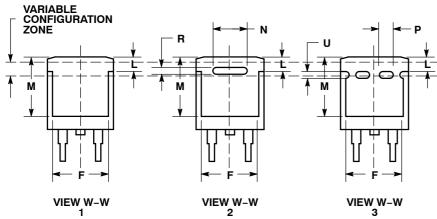
 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.

 2. CONTROLLING DIMENSION: INCH.

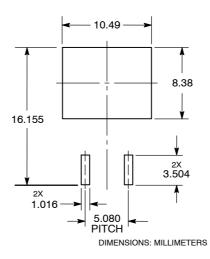
 3. 418B-01 THRU 418B-03 OBSOLETE, NEW STANDARD 418B-04.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
Α	0.340	0.380	8.64	9.65
В	0.380	0.405	9.65	10.29
С	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	
Н	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	
М	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

- STYLE 3: PIN 1. ANODE 2. CATHODE 3. ANODE 4. CATHODE



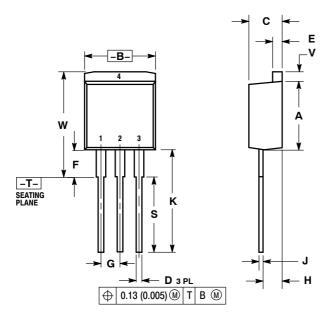
SOLDERING FOOTPRINT*



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

PACKAGE DIMENSIONS

I2PAK (TO-262) CASE 418D-01 ISSUE D



NOTES:

- DIMENSIONING AND TOLERANCING PER ANSI Y14 5M 1982
- 2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS		
DIM	MIN	MAX	MIN	MAX	
Α	0.335	0.380	8.51	9.65	
В	0.380	0.406	9.65	10.31	
С	0.160	0.185	4.06	4.70	
D	0.026	0.035	0.66	0.89	
E	0.045	0.055	1.14	1.40	
F	0.122 REF		3.10 REF		
G	0.100 BSC		2.54 BSC		
Н	0.094	0.110	2.39	2.79	
J	0.013	0.025	0.33	0.64	
K	0.500	0.562	12.70	14.27	
S	0.390 REF		9.90 REF		
٧	0.045	0.070	1.14	1.78	
W	0.522	0.551	13.25	14.00	

STYLE 3:

- PIN 1. ANODE 2. CATHODE 3. ANODE
 - 4. CATHODE

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105318, г. Москва, ул. Щербаковская д. 3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

Skype отдела продаж:

moschip.ru moschip.ru_6 moschip.ru 4 moschip.ru 9