

# Switch-mode Schottky Power Rectifier

250 V, 40 A

## MBR40250G, MBR40250TG, MBRF40250TG, MBRB40250TG

#### **Features**

- 250 V Blocking Voltage
- Low Forward Voltage Drop,  $V_F = 0.86 \text{ V}$
- Soft Recovery Characteristic,  $T_{RR}$  < 35 ns
- Stable Switching Performance Over Temperature
- These Devices are Pb-Free and are RoHS Compliant

#### **Benefits**

- Reduces or Eliminates Reverse Recovery Oscillations
- Minimizes Need for EMI Filtering
- Reduces Switching Losses
- Improved Efficiency

#### **Applications**

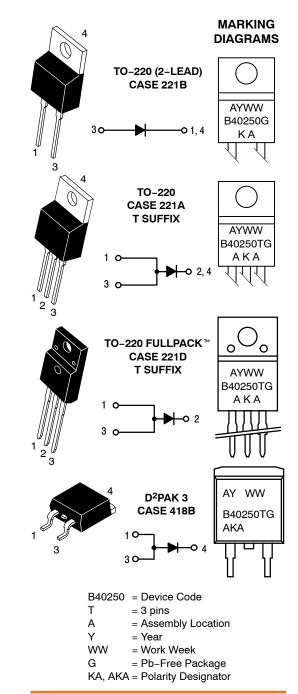
- Power Supply
- · Power Management
- Automotive
- Instrumentation

#### **Mechanical Characteristics**

- Case: Epoxy, Molded
- Weight: 1.9 grams (approximately)
- Finish: All External Surfaces Corrosion Resistant and Terminal Leads are Readily Solderable

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- Lead Temperature for Soldering Purposes: 260°C Max. for 10 Seconds
- Epoxy Meets UL 94 V-0 at 0.125 in



#### ORDERING INFORMATION

See detailed ordering and shipping information on page 4 of this data sheet.

## MBR40250G, MBR40250TG, MBRF40250TG, MBRB40250TG

#### **MAXIMUM RATINGS**

Rating	Symbol	Value	Unit
Peak Repetitive Reverse Voltage Working Peak Reverse Voltage DC Blocking Voltage	V <sub>RRM</sub> V <sub>RWM</sub> V <sub>R</sub>	250	V
Average Rectified Forward Current (Rated $V_R$ ) $T_C$ = 82°C MBR40250, MBR40250T, MBRB40250T (Rated $V_R$ ) $T_C$ = 46°C MBRF40250T	I <sub>F(AV)</sub>	40	А
Peak Repetitive Forward Current (Rated $V_R$ , Square Wave, 20 kHz) $T_C$ = 82°C MBR40250, MBR40250T, MBRB40250T (Rated $V_R$ , Square Wave, 20 kHz) $T_C$ = 46°C MBRF40250T	I <sub>FRM</sub>	80	А
Nonrepetitive Peak Surge Current (Surge applied at rated load conditions halfwave, single phase, 60 Hz)	I <sub>FSM</sub>	150	А
Storage Temperature	T <sub>stg</sub>	-65 to +175	°C
Operating Junction Temperature	$T_J$	-65 to +150	°C
Voltage Rate of Change (Rated V <sub>R</sub> )	dv/dt	10,000	V/μs

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.

#### THERMAL CHARACTERISTICS

Characteristic	Symbol	Value	Unit
Maximum Thermal Resistance			°C/W
Junction-to-Case	$R_{ heta JC}$		
MBR40250(T) and MBRB40250T	****	2.0	
MBRF40250		3.0	
Junction-to-Ambient	$R_{ heta JA}$		
MBR40250(T)		60	
MBRF40250		50	
MBRB40250T		50	

#### **ELECTRICAL CHARACTERISTICS**

Characteristic	Symbol	Value	Unit
Maximum Instantaneous Forward Voltage (Note 1) $I_F$ = 20 A, $T_C$ = 25°C $I_F$ = 20 A, $T_C$ = 125°C $I_F$ = 40 A, $T_C$ = 25°C $I_F$ = 40 A, $T_C$ = 125°C	V <sub>F</sub>	0.86 0.71 0.97 0.86	V
Maximum Instantaneous Reverse Current (Note 1) Rated DC Voltage, $T_C = 25^{\circ}C$ Rated DC Voltage, $T_C = 125^{\circ}C$	I <sub>R</sub>	0.25 30	mA
Maximum Reverse Recovery Time $I_F = 1.0$ A, di/dt = 50 A/ $\mu$ s, $T_C = 25^{\circ}C$	t <sub>rr</sub>	35	ns

#### **DYNAMIC CHARACTERISTICS**

Capacitance V <sub>B</sub> = -5.0 V, T <sub>C</sub> = 25°C, Frequency = 1.0 MHz	C <sub>T</sub>	500	pF
$V_R = -5.0 \text{ V}$ , $I_C = 25^{\circ}\text{C}$ , Frequency = 1.0 MHz		500	

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.

1. Pulse Test: Pulse Width = 300 µs, Duty Cycle ≤ 2.0%.

#### MBR40250G, MBR40250TG, MBRF40250TG, MBRB40250TG

#### **TYPICAL CHARACTERISTICS**

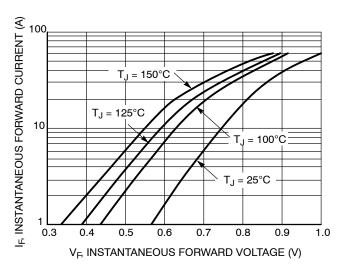
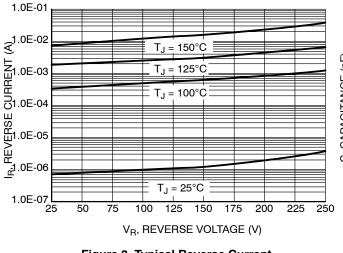


Figure 1. Typical Forward Voltage

Figure 2. Maximum Forward Voltage



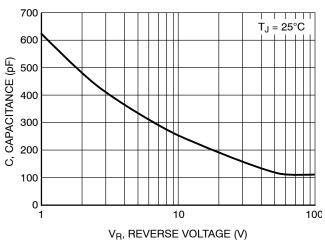
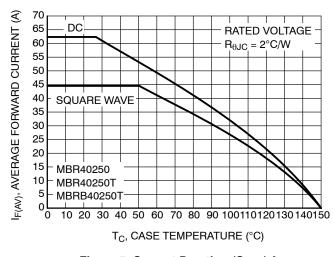


Figure 3. Typical Reverse Current

Figure 4. Typical Capacitance



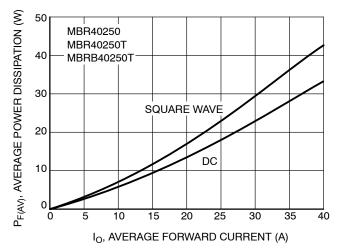
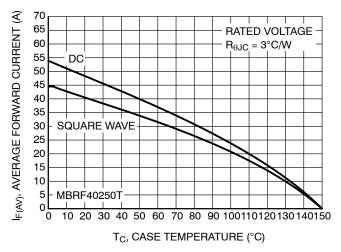


Figure 5. Current Derating (Case) for MBR40250, MBR40250T and MBRB40250T

Figure 6. Forward Power Dissipation for MBR40250, MBR40250T and MBRB40250T

### MBR40250G, MBR40250TG, MBRF40250TG, MBRB40250TG

#### **TYPICAL CHARACTERISTICS**



P<sub>F(AV)</sub>, AVERAGE POWER DISSIPATION (W) 50 MBRF40250T 40 30 SQUARE WAVE 20 DC 10 15 20 25 35 30 40  $I_{O}$ , AVERAGE FORWARD CURRENT (A)

Figure 7. Current Derating (Case) for MBRF40250T

Figure 8. Forward Power Dissipation for MBRF40250T

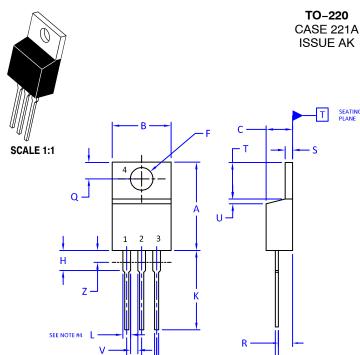
#### **ORDERING INFORMATION**

Device	Package	Shipping <sup>†</sup>
MBR40250G	TO-220 (2-LEAD) (Pb-Free)	50 Units / Rail
MBR40250TG	TO-220 (Pb-Free)	50 Units / Rail
MBRF40250TG	TO-220 FULLPACK (Pb-Free)	50 Units / Rail
MBRB40250TG	D <sup>2</sup> PAK 3 (Pb-Free)	50 Units / Rail
MBRB40250TT4G	D <sup>2</sup> PAK 3 (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.

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21A AK

**DATE 13 JAN 2022** 

#### NOTES:

- 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 2009.
- 2. CONTROLLING DIMENSION: INCHES
- 3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

#### 4. MAX WIDTH FOR F102 DEVICE = 1.35MM

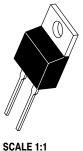
	INCHES		MILLIMI	ETERS
DIM	MIN.	MAX.	MIN.	MAX.
Α	0.570	0.620	14.48	15.75
В	0.380	0.415	9.66	10.53
С	0.160	0.190	4.07	4.83
D	0.025	0.038	0.64	0.96
F	0.142	0.161	3.60	4.09
G	0.095	0.105	2.42	2.66
Н	0.110	0.161	2.80	4.10
J	0.014	0.024	0.36	0.61
К	0.500	0.562	12.70	14.27
L	0.045	0.060	1.15	1.52
N	0.190	0.210	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	1.41
Т	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27
V	0.045		1.15	
Z		0.080		2.04

STYLE 1: PIN 1. 2. 3. 4.	BASE COLLECTOR EMITTER COLLECTOR	STYLE 2: PIN 1. 2. 3. 4.	EMITTER	STYLE 3: PIN 1. 2. 3. 4.	CATHODE ANODE GATE ANODE	STYLE 4: PIN 1. 2. 3. 4.	MAIN TERMINAL 1 MAIN TERMINAL 2 GATE MAIN TERMINAL 2
STYLE 5: PIN 1. 2. 3. 4.	GATE DRAIN SOURCE DRAIN	STYLE 6: PIN 1. 2. 3. 4.	CATHODE ANODE	STYLE 7: PIN 1. 2. 3. 4.	ANODE	2. 3.	CATHODE ANODE EXTERNAL TRIP/DELAY ANODE
STYLE 9: PIN 1. 2. 3. 4.	GATE COLLECTOR EMITTER COLLECTOR	STYLE 10: PIN 1. 2. 3. 4.	GATE	STYLE 11: PIN 1. 2. 3. 4.		STYLE 12 PIN 1. 2. 3. 4.	MAIN TERMINAL 1 MAIN TERMINAL 2

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TO-220, 2-LEAD CASE 221B-04 ISSUE F

**DATE 12 APR 2013** 

#### NOTES:

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

	INCHES		MILLIN	IETERS
DIM	MIN	MAX	MIN	MAX
Α	0.595	0.620	15.11	15.75
В	0.380	0.405	9.65	10.29
С	0.160	0.190	4.06	4.82
D	0.025	0.039	0.64	1.00
F	0.142	0.161	3.61	4.09
G	0.190	0.210	4.83	5.33
Н	0.110	0.130	2.79	3.30
J	0.014	0.025	0.36	0.64
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.14	1.52
Q	0.100	0.120	2.54	3.04
R	0.080	0.110	2.04	2.79
S	0.045	0.055	1.14	1.39
T	0.235	0.255	5.97	6.48
U	0.000	0.050	0.000	1.27

Q

STYLE 1: PIN 1. CATHODE 2. N/A 3. ANODE

STYLE 2: PIN 1. ANODE 2. N/A 3. CATHODE 4. ANODE

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SCALE 1:1

3. CATHODE

#### TO-220 FULLPAK CASE 221D-03 ISSUE K

**DATE 27 FEB 2009** 

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**AYWW** 

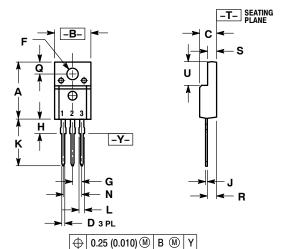
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AKA

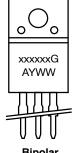
- NOTES:
  1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982. 2. CONTROLLING DIMENSION: INCH
- 221D-01 THRU 221D-02 OBSOLETE, NEW STANDARD 221D-03.

	INCHES		MILLIN	IETERS
DIM	MIN	MAX	MIN	MAX
Α	0.617	0.635	15.67	16.12
В	0.392	0.419	9.96	10.63
C	0.177	0.193	4.50	4.90
D	0.024	0.039	0.60	1.00
F	0.116	0.129	2.95	3.28
G	0.100 BSC		2.54	BSC
Н	0.118	0.135	3.00	3.43
J	0.018	0.025	0.45	0.63
K	0.503	0.541	12.78	13.73
L	0.048	0.058	1.23	1.47
N	0.200	BSC	5.08	BSC
Q	0.122	0.138	3.10	3.50
R	0.099	0.117	2.51	2.96
S	0.092	0.113	2.34	2.87
U	0.239	0.271	6.06	6.88

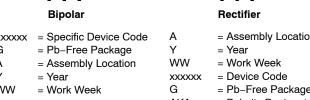
#### **MARKING DIAGRAMS**



STYLE 1: PIN 1. GATE STYLE 2: PIN 1. BASE STYLE 3: PIN 1. ANODE 2. COLLECTOR 3. EMITTER CATHODE
 ANODE 2. DRAIN 2. 3. SOURCE STYLE 6: PIN 1. MT 1 2. MT 2 3. GATE STYLE 4: PIN 1. CATHODE STYLE 5: PIN 1. CATHODE 2. ANODE 3. GATE ANODE



= Assembly Location xxxxxx = Specific Device Code G = Pb-Free Package Υ = Year = Assembly Location = Work Week Α WW Υ = Year XXXXXX = Device Code = Work Week = Pb-Free Package WW G AKA = Polarity Designator



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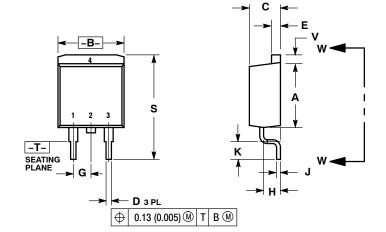




D<sup>2</sup>PAK 3 CASE 418B-04 **ISSUE L** 

**DATE 17 FEB 2015** 

#### SCALE 1:1



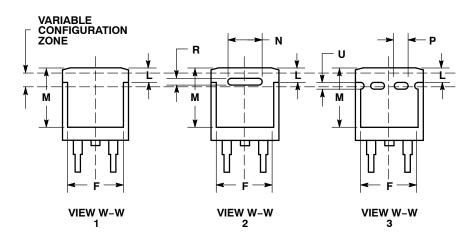
- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
   CONTROLLING DIMENSION: INCH.
- 3. 418B-01 THRU 418B-03 OBSOLETE,

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
C	0.160	0.190	4.06	4.83
D	0.020	0.035	0.51	0.89
Е	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
7	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	
Ρ	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 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

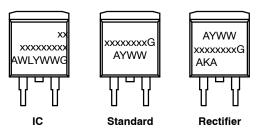
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**DATE 17 FEB 2015** 

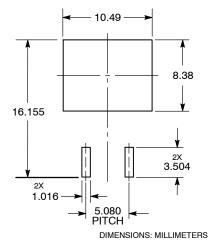
# GENERIC MARKING DIAGRAM\*



xx = Specific Device Code A = Assembly Location

WL = Wafer Lot
Y = Year
WW = Work Week
G = Pb-Free Package
AKA = Polarity Indicator

#### **SOLDERING FOOTPRINT\***



\*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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<sup>\*</sup>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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