Bulletin PD-20404 07/04

International
IOR Rectifier

MBRS140TRPbF

SCHOTTKY RECTIFIER 1 Amp

$I_{F(AV)}$ = 1.0Amp
V_R = 40V

Major Ratings and Characteristics

Characteristics	Value	Units
$I_{F(AV)}$ Rectangular waveform	1.0	A
V_{RRM}	40	V
I_{FSM} @ tp = 5 µs sine	380	A
V_F @ 1.0 Apk, T_J=125°C	0.53	V
T_J range	- 55 to 150	°C

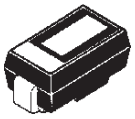
Description/ Features

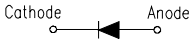
The MBRS140TRPbF surface-mount Schottky rectifier has been designed for applications requiring low forward drop and very small foot prints on PC boards. Typical applications are in disk drives, switching power supplies, converters, free-wheeling diodes, battery charging, and reverse battery protection.

- Small foot print, surface mountable
- Low forward voltage drop
- High frequency operation
- Guard ring for enhanced ruggedness and long term reliability
- Lead-Free ("PbF" suffix)

Case Styles

MBRS140TRPbF





SMB

Voltage Ratings

	Part number	MBRS140TRPbF
V_R	Max. DC Reverse Voltage (V)	40
V_{RWM}	Max. Working Peak Reverse Voltage (V)	

Absolute Maximum Ratings

	Parameters	Value	Units	Conditions	
$I_{F(AV)}$	Max. Average Forward Current	1.0	A	50% duty cycle @ T_L = 119 °C, rectangular wave form	
I_{FSM}	Max. Peak One Cycle Non-Repetitive	380	A	5µs Sine or 3µs Rect. pulse	Following any rated load condition and with rated V_{RRM} applied
	Surge Current	40		10ms Sine or 6ms Rect. pulse	
E_{AS}	Non- Repetitive Avalanche Energy	3.0	mJ	T_J = 25 °C, I_{AS} = 1A, L = 6mH	
I_{AR}	Repetitive Avalanche Current	1.0	A	Current decaying linearly to zero in 1 µsec Frequency limited by T_J max. Va = 1.5 x Vr typical	

Electrical Specifications

	Parameters	Typ.	Max	Units	Conditions	
V_{FM}	Max. Forward Voltage Drop (1)	0.52	0.6	V	@ 1A	T_J = 25 °C
		0.70	0.77	V	@ 2A	
		0.48	0.53	V	@ 1A	T_J = 125 °C
		0.63	0.71	V	@ 2A	
I_{RM}	Max. Reverse Leakage Current (1)	-	0.1	mA	T_J = 25°C	V_R = rated V_R
		-	4.0	mA	T_J = 125°C	
C_T	Max. Junction Capacitance	-	80	pF	V_R = 5V_{DC}(test signal range 100KHz to 1Mhz)25°C	
L_S	Typical Series Inductance	-	2.0	nH	Measured lead to lead 5mm from package body	
dv/dt	Max. Voltage Rate of Change (Rated V_R)	-	10000	V/µs		

(1) Pulse Width < 300µs, Duty Cycle < 2%

Thermal-Mechanical Specifications

	Parameters	Value	Units	Conditions
T_J	Max. Junction Temperature Range(*)	-55 to 150	°C	
T_{stg}	Max. Storage Temperature Range	-55 to 150	°C	
R_{thJL}	Max. Thermal Resistance Junction to Lead (**)	36	°C/W	DC operation (See Fig. 4)
R_{thJA}	Max. Thermal Resistance Junction to Ambient	80	°C/W	DC operation
wt	Approximate Weight	0.10 (0.003)	g (oz.)	
	Case Style	SMB		Similar to DO-214AA
	Device Marking	IR14		

(*) $\frac{dPtot}{dTj} < \frac{1}{Rth(j\text{-}a)}$ thermal runaway condition for a diode on its own heatsink

(**) Mounted 1 inch square PCB

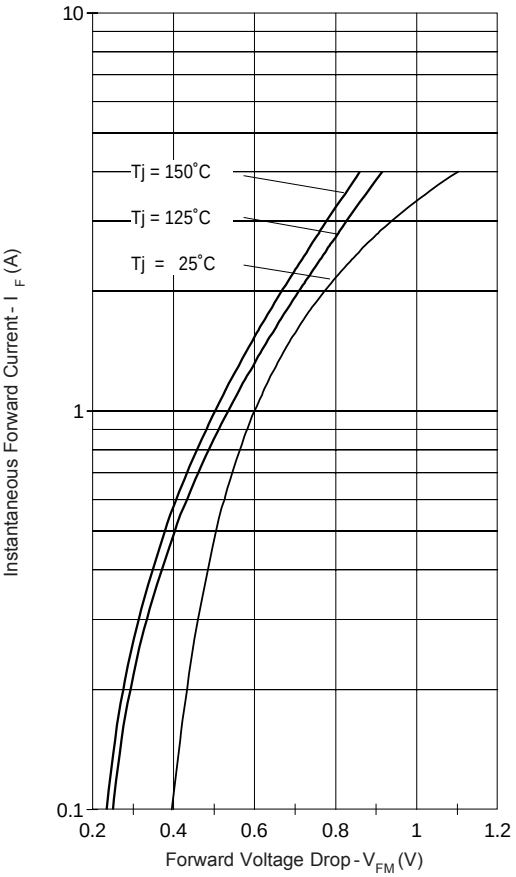


Fig. 1 - Maximum Forward Voltage Drop Characteristics

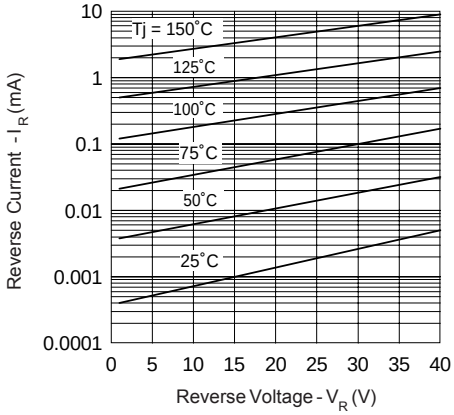


Fig. 2 - Typical Peak Reverse Current Vs. Reverse Voltage

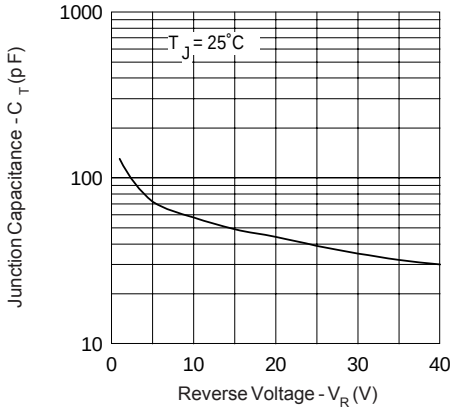


Fig. 3 - Typical Junction Capacitance Vs. Reverse Voltage

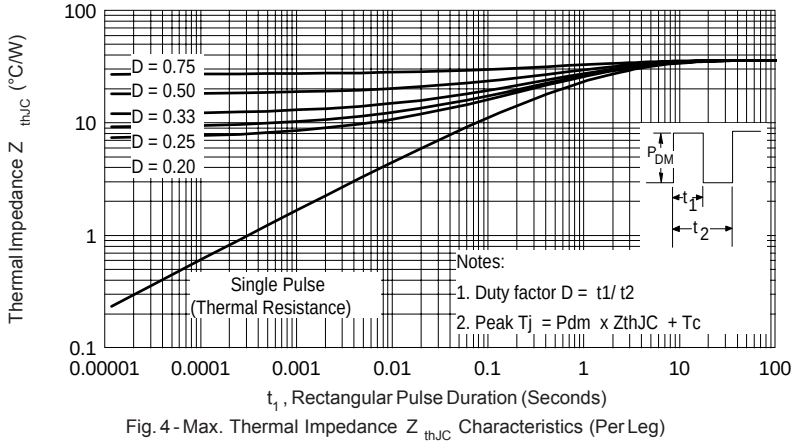


Fig. 4 - Max. Thermal Impedance Z_{thJC} Characteristics (Per Leg)

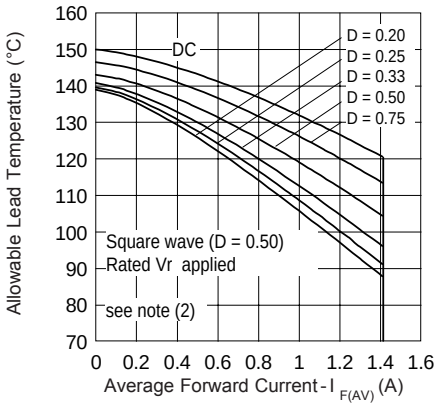


Fig. 4 - Maximum Average Forward Current
Vs. Allowable Lead Temperature

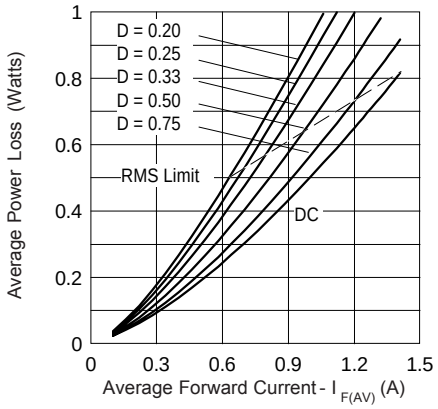


Fig. 5 - Maximum Average Forward Dissipation
Vs. Average Forward Current

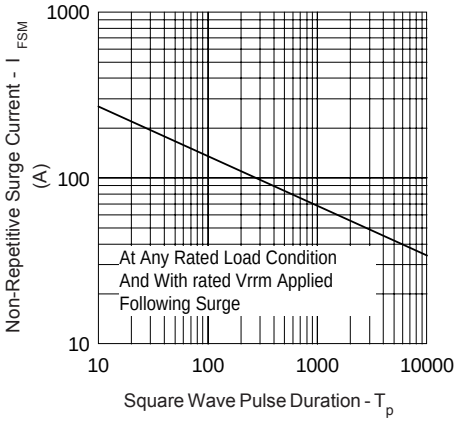
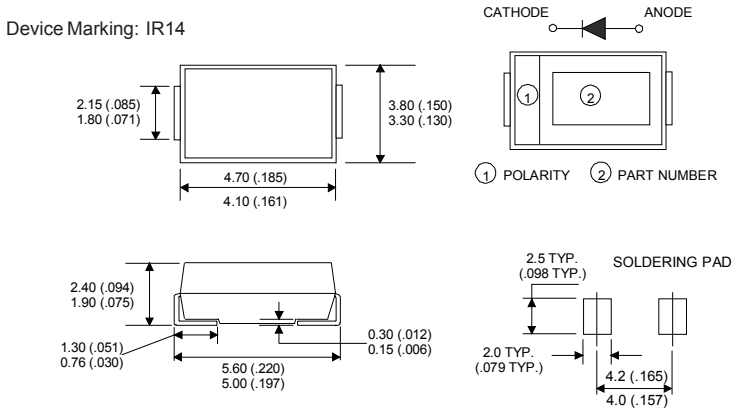


Fig. 6 - Maximum Peak Surge Forward Current Vs. Pulse Duration

(2) Formula used: $T_C = T_J - (Pd + Pd_{REV}) \times R_{thJC}$;
Pd = Forward Power Loss = $I_{F(AV)} \times V_{FM} @ (I_{F(AV)} / D)$ (see Fig. 6);
Pd_{REV} = Inverse Power Loss = $V_{R1} \times I_R (1 - D)$; $I_R @ V_{R1}$ = 80% rated V_R

Outline Table



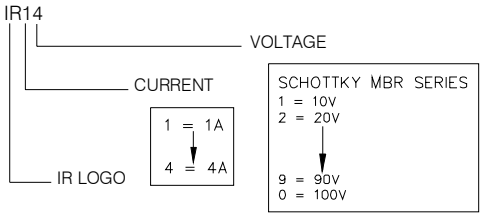
Outline SMB

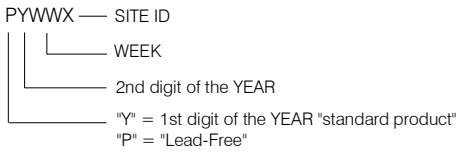
Dimensions in millimeters and (inches)

For recommended footprint and soldering techniques refer to application note #AN-994

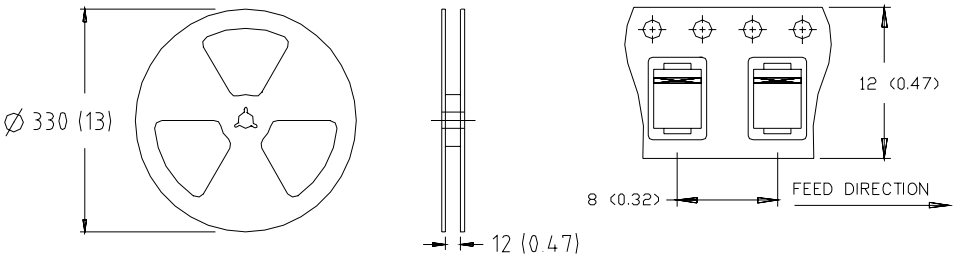
Marking & Identification

Each device has 2 rows for identification. The first row designates the device as manufactured by International Rectifier, indicated by the letters "IR", and the Part Number (indicates the current, the voltage rating and Schottky Generation). The second row indicates the year, the week of manufacturing and the Site ID.





Tape & Reel Information



Dimensions in millimetres and (inches)

Ordering Information Table

Device Code

MBR	S	1	40	TR	PbF
1	2	3	4	5	6

1	-	Schottky MBR Series
2	-	S = SMB
3	-	Current Rating (1 = 1 A)
4	-	Voltage Rating (40 = 40V)
5	-	TR = Tape & Reel (3000 pieces)
6	-	• none = Standard Production • PbF = Lead-Free

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MBRS140TR
*****************************************
*    This model has been developed by     *
*   Wizard SPICE MODEL GENERATOR (1999)   *
*      (International Rectifier Corporation)  *
*         Contain Proprietary Information  *
*****************************************
* SPICE Model Diode is composed by a      *
* simple diode plus paralled VCG2T        *
*****************************************
.SUBCKT MBRS140TR ANO CAT
D1 ANO 1 DMOD (0.00472)
*Define diode model
.MODEL DMOD D(IS=1.97976145988308E-04A,N=1.26859975252172,BV=52V,
+ IBV=0.398018928721903A,RS= 0.00064192,CJO=4.04605589057834E-08,
+ VJ=1.033218502959,XTI=2, EG=0.793941654518305)
*****************************************
*Implementation of VCG2T
VX 1 2 DC 0V
R1 2 CAT TRES 1E-6
.MODEL TRES RES(R=1,TC1=-5.28209710108381)
GP1 ANO CAT VALUE={-ABS(I(VX))*(EXP((((-4.223696E-03/-5.282097)*((V(2,CAT)*1E6)/(I(VX)+1E-6)-
1))+1)*8.300212E-02*ABS(V(ANO,CAT)))-1)}
*****************************************
.ENDS MBRS140TR

Thermal Model Subcircuit
.SUBCKT MBRS140TR  5 1

CTHERM1     5    4     2.37E+00
CTHERM2     4    3     2.83E+01
CTHERM3     3    2     3.25E+02
CTHERM4     2    1     1.15E+04

RTHERM1     5    4     1.18E+01
RTHERM2     4    3     1.55E+01
RTHERM1     3    2     7.12E+00
RTHERM1     2    1     1.32E+00


.ENDS MBRS140TR
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Data and specifications subject to change without notice.
This product has been designed and qualified for Industrial Level and Lead-Free.
Qualification Standards can be found on IR's Web site.

International
IOR Rectifier

IR WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245, USA Tel: (310) 252-7105
TAC Fax: (310) 252-7309
07/04

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