

# EMIPAK 1B PressFit Power Module

## 1200 V AC Line Input Rectification, Flexible Configuration, 20 A



**EMIPAK 1B**  
(package example)

**FEATURES**

- MOAT standard recovery diode
- Exposed Al<sub>2</sub>O<sub>3</sub> substrate with low thermal resistance
- Very low forward voltage drop
- Low internal inductances
- Qualified using AQG324 guideline as reference
- PressFit pins locking technology  
PATENT(S): [www.vishay.com/patents](http://www.vishay.com/patents)
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT

PRIMARY CHARACTERISTICS	
D1 - D12	
V <sub>RRM</sub>	1200 V
V <sub>FM</sub> typical at 20 A	1.29 V
I <sub>O</sub> at T <sub>SINK</sub> = 97 °C	20 A
Package	EMIPAK 1B
Circuit configuration	6 x independent diodes legs for AC line input rectification
Type	Modules - diode, high voltage

**DESCRIPTION**

The EMIPAK 1B package is easy to use thanks to the PressFit pins. The exposed substrate provides improved thermal performance.

The optimized layout also helps to minimize stray parameters, allowing for better EMI performance.

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS
Operating junction temperature	T <sub>J</sub>		150	°C
Storage temperature range	T <sub>Stg</sub>		-40 to +150	
RMS isolation voltage	V <sub>ISOL</sub>	T <sub>J</sub> = 25 °C, all terminals shorted, f = 50 Hz, t = 1 s	3500	V
D1 - D12				
Maximum DC output current	I <sub>F(AV)</sub>	T <sub>SINK</sub> = 25 °C	33	A
		T <sub>SINK</sub> = 80 °C	23	
Power dissipation	P <sub>D</sub>	T <sub>SINK</sub> = 25 °C	87	W
		T <sub>SINK</sub> = 80 °C	49	
Maximum peak one cycle forward non-repetitive surge current	I <sub>FSM</sub>	10 ms sine or 6 ms rectangular pulse, T <sub>J</sub> = 150 °C, no voltage reapplied	230	A
		8.3 ms sine, T <sub>J</sub> = 150 °C, no voltage reapplied	241	A
Maximum I <sup>2</sup> t capability for fusing	I <sup>2</sup> t	No voltage reapplied, t = 10 ms	264	A <sup>2</sup> s
		No voltage reapplied, t = 8.3 ms	241	
Maximum I <sup>2</sup> √t capability for fusing	I <sup>2</sup> √t	t = 0.1 ms to 10 ms, no voltage reapplied	2647	A <sup>2</sup> √s
Repetitive peak reverse voltage	V <sub>RRM</sub>		1200	V
Low level value of threshold voltage	V <sub>F(TO)1</sub>	(16.7 % × I <sub>F(AV)</sub> ) < I < x I <sub>F(AV)</sub> , T <sub>J</sub> = T <sub>J</sub> maximum	0.92	V
High level value of threshold voltage	V <sub>F(TO)2</sub>	(I > x I <sub>F(AV)</sub> ), T <sub>J</sub> = T <sub>J</sub> maximum	1.10	
Low level value of forward slope resistance	r <sub>f1</sub>	(16.7 % × I <sub>F(AV)</sub> ) < I < x I <sub>F(AV)</sub> , T <sub>J</sub> = T <sub>J</sub> maximum	51.3	mΩ
High level value of forward slope resistance	r <sub>f2</sub>	(I > x I <sub>F(AV)</sub> ), T <sub>J</sub> = T <sub>J</sub> maximum	50.8	

**PATENT(S):** [www.vishay.com/patents](http://www.vishay.com/patents)

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<b>ELECTRICAL SPECIFICATIONS</b> ( $T_J = 25\text{ }^\circ\text{C}$ unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
<b>D1 - D12</b>						
Forward voltage drop	$V_{FM}$	$I_F = 20\text{ A}$	-	1.29	1.90	V
		$I_F = 20\text{ A}, T_J = 150\text{ }^\circ\text{C}$	-	1.26	-	
Breakdown voltage	$V_{BR}$	$I_R = 500\text{ }\mu\text{A}$	1200	-	-	V
Reverse leakage current	$I_{RM}$	$V_R = 1200\text{ V}$	-	1.0	100	$\mu\text{A}$
		$V_R = 1200\text{ V}, T_J = 150\text{ }^\circ\text{C}$	-	900	-	

<b>INTERNAL NTC - THERMISTOR SPECIFICATIONS</b>				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUE	UNITS
Resistance	$R_{25}$	$T_C = 25\text{ }^\circ\text{C}$	5000	$\Omega$
	$R_{100}$	$T_C = 100\text{ }^\circ\text{C}$	$493 \pm 5\%$	
B-value	$B_{25/50}$	$R_2 = R_{25} \text{ exp. } [B_{25/50}(1/T_2 - 1/(298.15\text{K}))]$	$3375 \pm 5\%$	K
Maximum operating temperature			220	$^\circ\text{C}$
Dissipation constant			2	$\text{mW}/^\circ\text{C}$
Thermal time constant			8	s

<b>THERMAL AND MECHANICAL SPECIFICATIONS</b>					
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNITS
D1 - D12 - thermal resistance junction to sink (per diode) <sup>(1)</sup>	$R_{thJS}$	-	1.19	-	$^\circ\text{C}/\text{W}$
Case to sink thermal resistance (per module) <sup>(1)</sup>		-	0.1	-	
Mounting torque (M4)		2	-	3	Nm
Weight		-	28	-	g

**Note**

<sup>(1)</sup> Mounting surface flat, smooth, and greased,  $\lambda_{grease} = 0.67\text{ W/mK}$

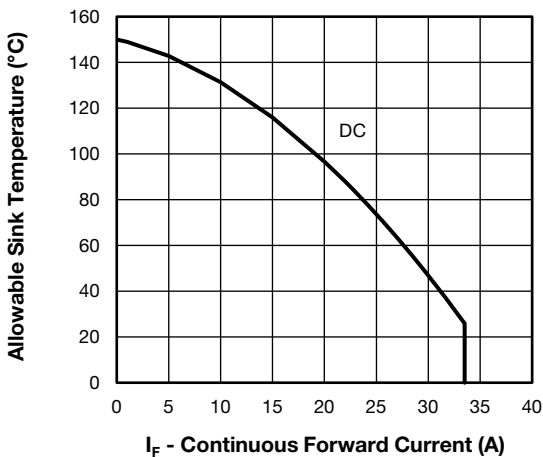


Fig. 1 - Allowable Sink Temperature vs. Continuous Forward Current (Forward Current vs. Sink Temperature)

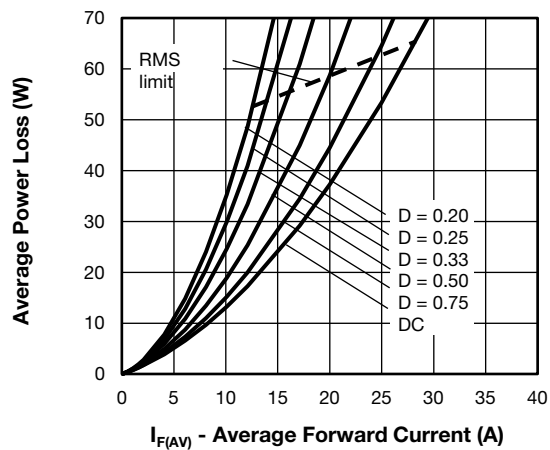


Fig. 2 - Average Power Loss vs. Average Forward Current (Forward Power Loss Characteristics)

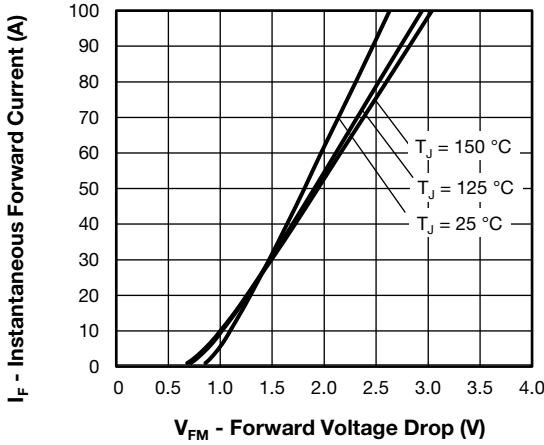


Fig. 3 - Typical Forward Voltage Drop vs. Instantaneous Forward Current (Per Diode)

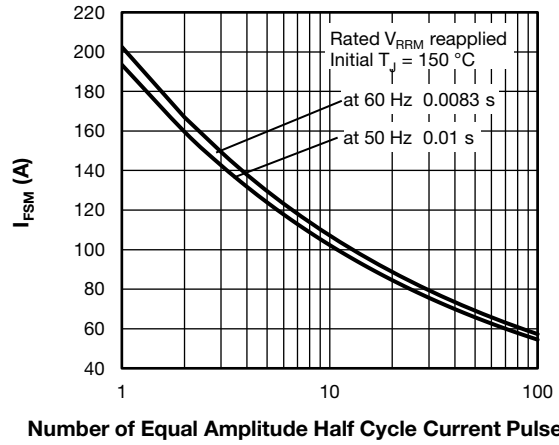


Fig. 5 -  $I_{FSM}$  vs.  $N$   
(Non-Repetitive Peak Forward Surge Current vs. Number Pulses)

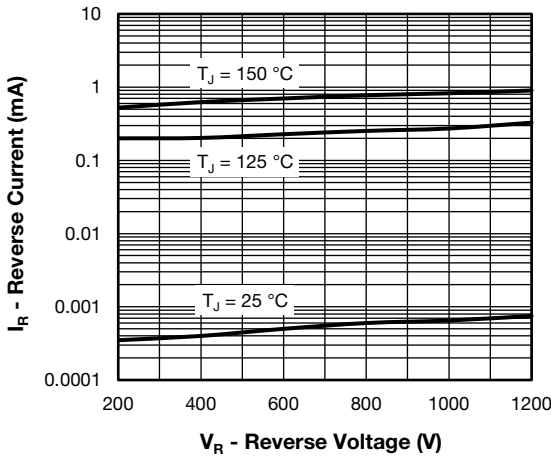


Fig. 4 - Typical Reverse Current vs. Reverse Voltage (Per Diode)

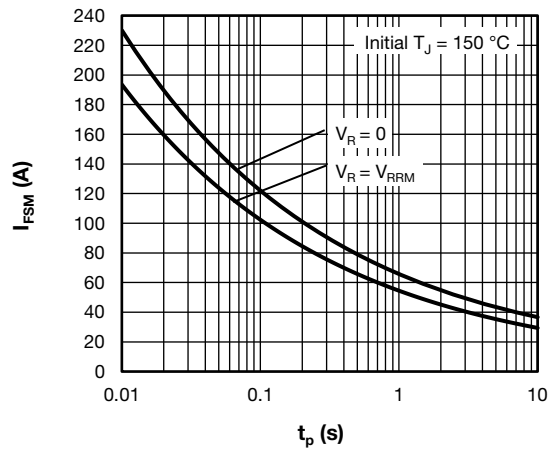


Fig. 6 -  $I_{FSM}$  vs.  $t_p$   
(Non-Repetitive Peak Forward Surge Current vs. Pulse Duration)

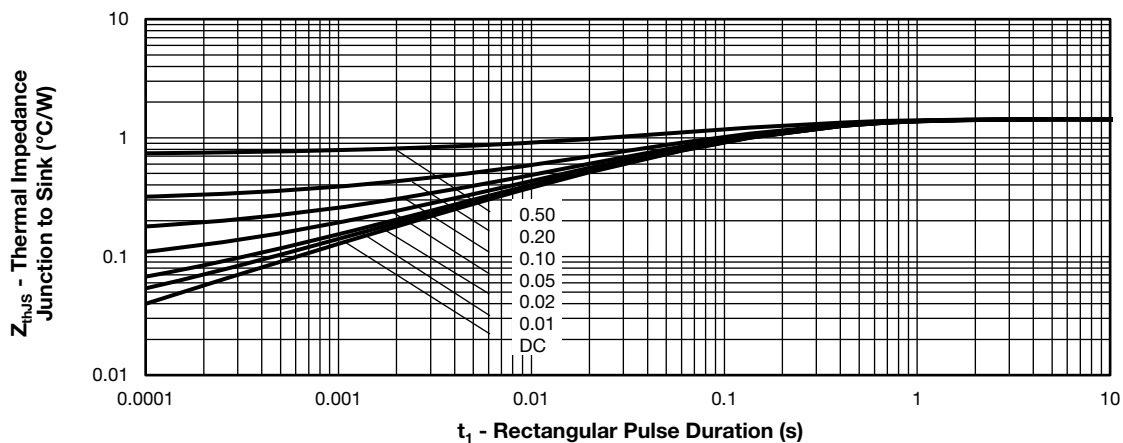
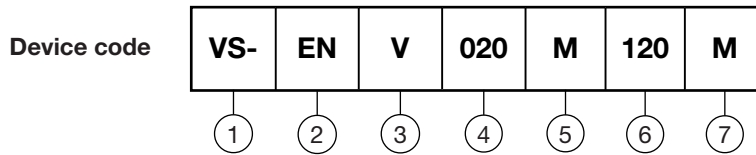


Fig. 7 -  $Z_{thJS}$  Thermal Impedance Junction to Sink vs.  $t_1$  Rectangular Pulse Duration  
(Maximum Thermal Impedance  $Z_{thJS}$  Characteristics Per Diode)

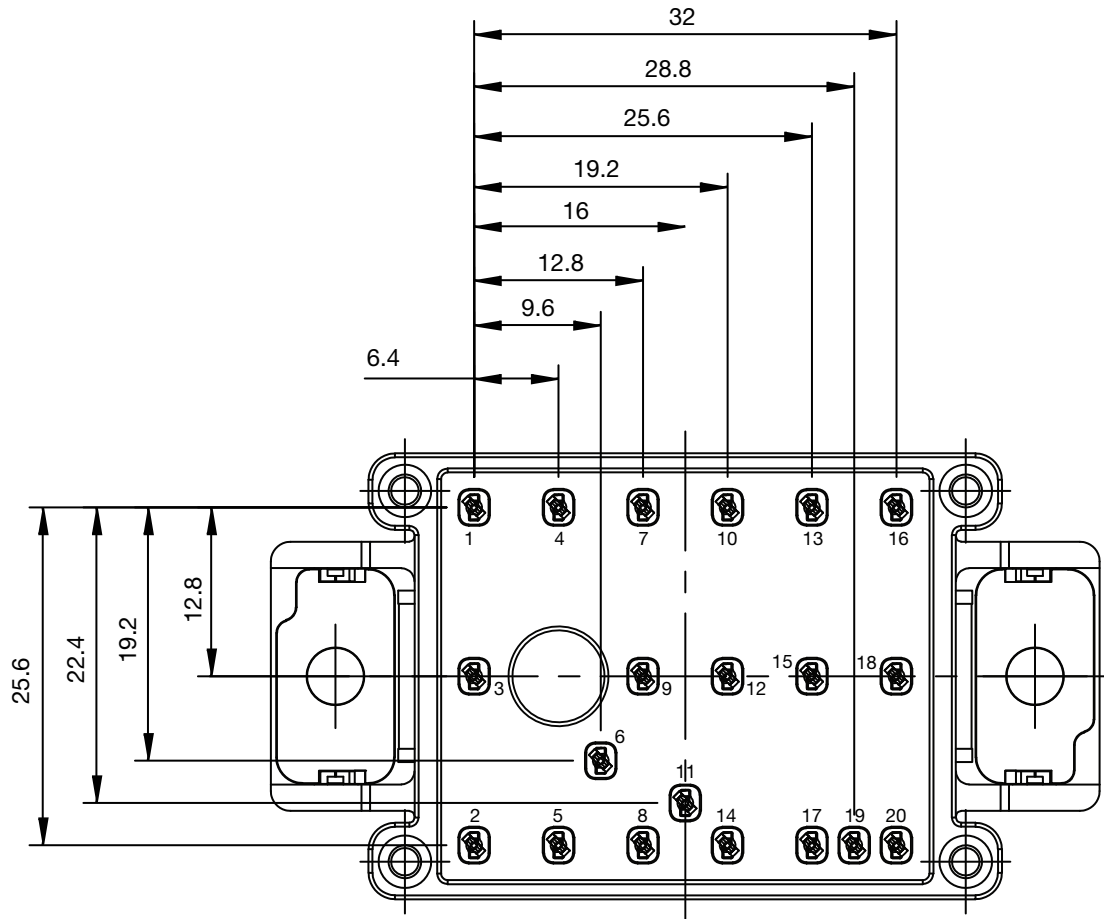
**ORDERING INFORMATION TABLE**


- 1** - Vishay Semiconductors product
- 2** - Package indicator (EN = EMIPAK 1B)
- 3** - Circuit configuration (V = 6 x independent diodes legs for AC line input rectification)
- 4** - Current rating (020 = 20 A)
- 5** - Switch die technology (M = MOAT standard recovery diode)
- 6** - Voltage rating (120 = 1200 V)
- 7** - Diode technology (M = MOAT standard recovery diode)

CIRCUIT CONFIGURATION		
CIRCUIT DESCRIPTION	CIRCUIT CONFIGURATION CODE	CIRCUIT DRAWING
6 x independent diodes legs for AC line input rectification	V	



PACKAGE



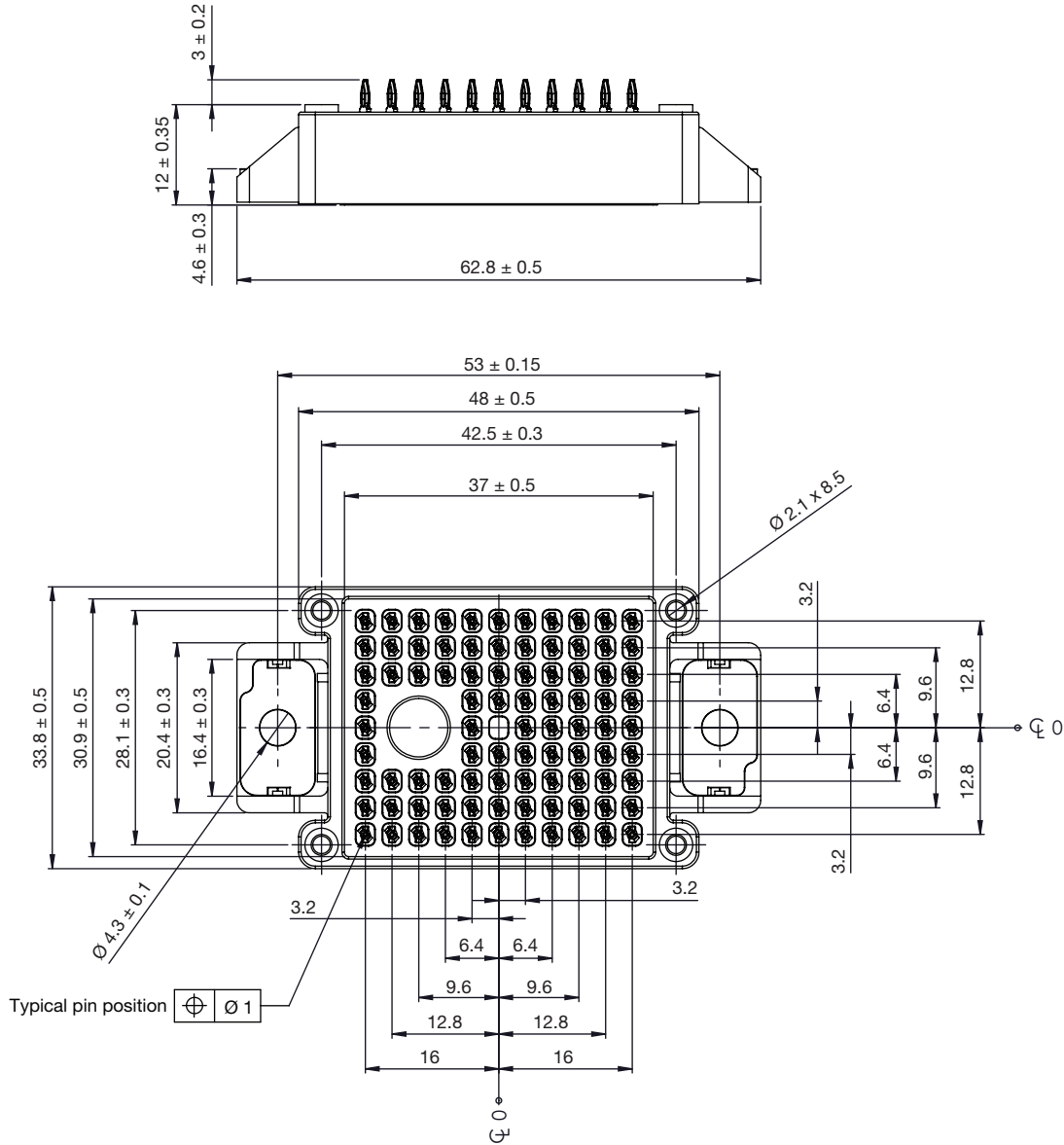
LINKS TO RELATED DOCUMENTS

Dimensions	<a href="http://www.vishay.com/doc?95558">www.vishay.com/doc?95558</a>
Application Note	<a href="http://www.vishay.com/doc?95580">www.vishay.com/doc?95580</a>



## EMIPAK-1B PressFit

**DIMENSIONS** in millimeters





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