Standard Recovery Diodes (MAGN-A-PAK Power Modules), 250 A to 320 A

MAGN-A-PAK

FEATURES

- High voltage
- Electrically isolated base plate
- 3000 V_{RMS} isolating voltage
- Industrial standard package
- Simplified mechanical designs, rapid assembly
- High surge capability
- Large creepage distances
- UL approved file E78996
- Designed and qualified for industrial level
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT

DESCRIPTION / APPLICATIONS

This VS-VSK series of MAGN-A-PAKs uses high voltage power diodes in two basic configurations. The semiconductors are electrically isolated from the metal base, allowing common heatsinks and compact assemblies to be built. They can be interconnected to form single phase or three phase bridges and the single diode module can be used in conjunction with the thyristor modules as a freewheel diode.

These modules are intended for general purpose applications such as battery chargers, welders and plating equipment and where high voltage and high current are required (motor drives, etc.)

PRIMARY CHARACTERISTICS	
$I_{F(AV)}$	250 A to 320 A
Type	Modules - diode, high voltage
Package	MAGN-A-PAK
Circuit configuration	Two diodes doubler circuit, two diodes common cathode, single diode

MAJOR RATINGS AND CHARACTERISTICS					
SYMBOL	CHARACTERISTICS	VSK.250..	VSK.270..	VSK.320..	UNITS
$I_{F(AV)}$		250	270	320	A
	T_C	100	100	100	°C
$I_{F(RMS)}$		393	424	502	A
I_{FSM}	50 Hz	7015	8920	10 110	
	60 Hz	7345	9430	10 580	
I^2t	50 Hz	246	398	511	kA^2s
	60 Hz	225	363	466	
$I^2\sqrt{t}$		2460	3980	5110	$kA^2\sqrt{s}$
V_{RRM}		400 to 2000	400 to 3000	400 to 2000	V
T_J		-40 to +150			°C

ELECTRICAL SPECIFICATIONS

VOLTAGE RATINGS

TYPE NUMBER	VOLTAGE CODE	V_{RRM}, MAXIMUM REPETITIVE PEAK REVERSE VOLTAGE V	V_{RSM}, MAXIMUM NON-REPETITIVE PEAK REVERSE VOLTAGE V	I_{RRM} MAXIMUM AT 150 °C mA
VS-VSK.270 VS-VSK.320	04	400	500	50
VS-VSK.250 VS-VSK.270 VS-VSK.320	08	800	900	
	12	1200	1300	
	16	1600	1700	
	20	2000	2100	
VS-VSK.270	30	3000	3100	

FORWARD CONDUCTION

PARAMETER	SYMBOL	TEST CONDITIONS			VALUES VSK.250	VALUES VSK.270	VALUES VSK.320	UNITS
Maximum average forward current at case temperature	$I_{F(AV)}$	180° conduction, half sine wave			250	270	320	A
					100	100	100	°C
Maximum RMS forward current	$I_{F(RMS)}$	As AC switch			393	424	502	A
Maximum peak, one-cycle forward, non-repetitive surge current	I_{FSM}	t = 10 ms	No voltage reapplied	Sinusoidal half wave, initial $T_J = T_J$ maximum	7015	8920	10 110	
		t = 8.3 ms			7345	9340	10 580	
		t = 10 ms	100 % V_{RRM} reapplied		5900	7500	8500	
		t = 8.3 ms			6180	7850	8900	
Maximum I^2t for fusing	I^2t	t = 10 ms	No voltage reapplied		246	398	511	kA^2s
		t = 8.3 ms			225	363	466	
		t = 10 ms	100 % V_{RRM} reapplied		174	281	361	
		t = 8.3 ms			159	257	330	
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	t = 0.1 ms to 10 ms, no voltage reapplied			2460	3980	5110	$kA^2\sqrt{s}$
Low level value of threshold voltage	$V_{F(TO)1}$	(16.7 % x π x $I_{F(AV)}$ < I < π x $I_{F(AV)}$), $T_J = T_J$ maximum			0.79	0.74	0.69	V
High level value of threshold voltage	$V_{F(TO)2}$	(I > π x $I_{F(AV)}$), $T_J = T_J$ maximum			0.92	0.87	0.86	
Low level forward slope resistance	r_{f1}	(16.7 % x π x $I_{F(AV)}$ < I < π x $I_{F(AV)}$), $T_J = T_J$ maximum			0.63	0.94	0.59	mΩ
High level forward slope resistance	r_{f2}	(I > π x $I_{F(AV)}$), $T_J = T_J$ maximum			0.49	0.81	0.44	
Maximum forward voltage drop	V_{FM}	I_{FM} = π x $I_{F(AV)}$, $T_J = T_J$ maximum, 180° conduction Average power = $V_{F(TO)}$ x $I_{F(AV)}$ + r_f x $(I_{F(RMS)})^2$			1.29	1.48	1.28	V

BLOCKING

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum peak reverse leakage current	I_{RRM}	T_J = 150 °C	50	mA
RMS insulation voltage	V_{INS}	50 Hz, circuit to base, all terminals shorted, t = 1 s	3000	V

THERMAL AND MECHANICAL SPECIFICATIONS

PARAMETER		SYMBOL	TEST CONDITIONS	VALUES			UNITS
				VSK.250	VSK.270	VSK.320	
Maximum junction operating and storage temperature range		T_J, T_{Stg}		-40 to +150			°C
Maximum thermal resistance, junction to case per junction		R_{thJC}	DC operation	0.16	0.125	0.125	K/W
Maximum resistance, case to heat sink per module		R_{thCS}	Mounting surface flat, smooth and greased	0.035			K/W
Mounting torque ± 10 %	MAGN-A-PAK to heatsink		A mounting compound is recommended and the torque should be rechecked after a period of about 3 hours to allow for the spread of the compound.	4 to 6			Nm
	Busbar to MAGN-A-PAK						
Approximate weight				800			g
				30			oz.
Case style				MAGN-A-PAK			

ΔR CONDUCTION PER JUNCTION

DEVICE	SINUSOIDAL CONDUCTION AT T_J MAXIMUM					RECTANGULAR CONDUCTION AT T_J MAXIMUM					UNITS
	180°	120°	90°	60°	30°	180°	120°	90°	60°	30°	
VSK.250	0.009	0.010	0.014	0.020	0.032	0.007	0.011	0.015	0.021	0.033	K/W
VSK.270	0.008	0.012	0.014	0.020	0.032	0.007	0.011	0.015	0.020	0.033	
VSK.320	0.008	0.010	0.013	0.020	0.032	0.007	0.011	0.015	0.020	0.033	

Note

- The table above shows the increment of thermal resistance R_{thJC} when devices operate at different conduction angles than DC

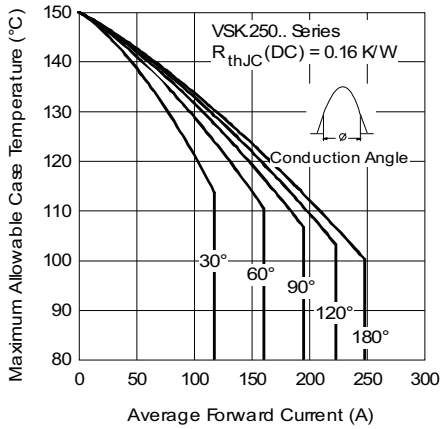


Fig. 1 - Current Ratings Characteristics

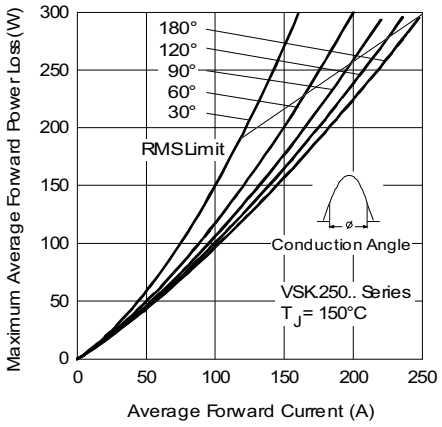


Fig. 3 - Forward Power Loss Characteristics

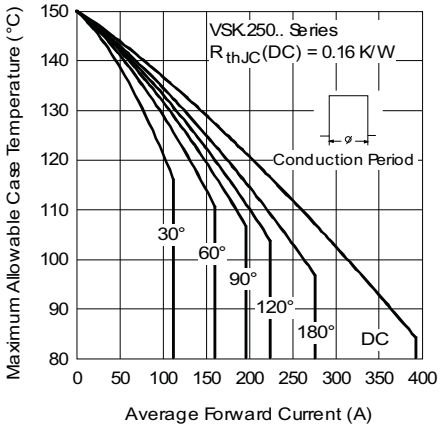


Fig. 2 - Current Ratings Characteristics

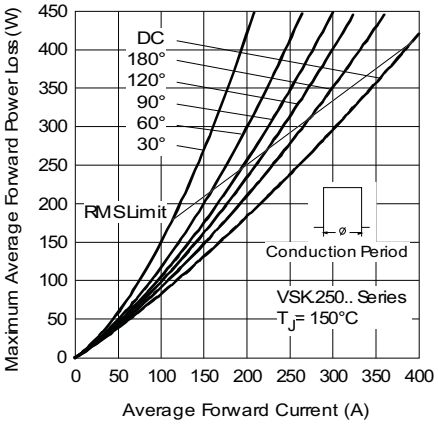


Fig. 4 - Forward Power Loss Characteristics

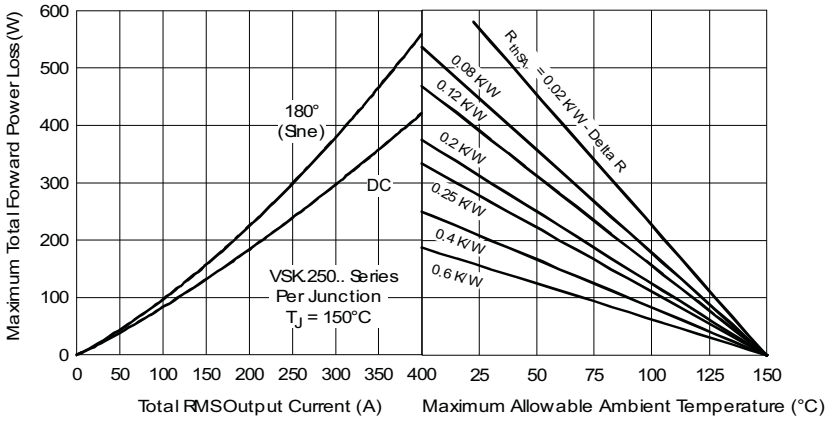


Fig. 5 - Forward Power Loss Characteristics

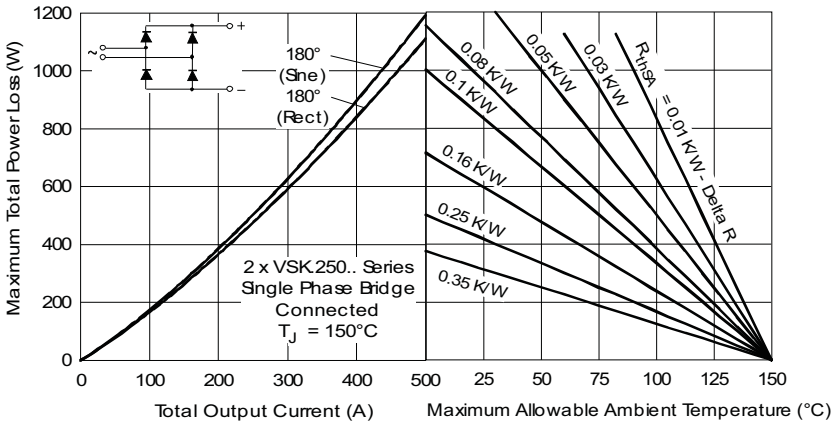


Fig. 6 - Forward Power Loss Characteristics

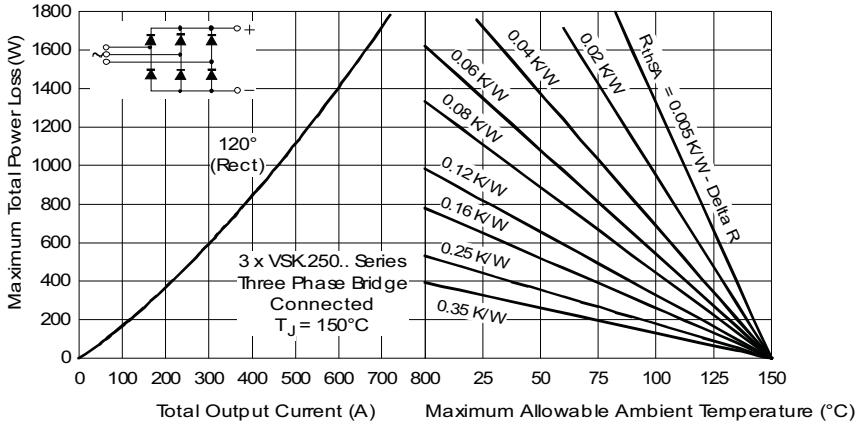


Fig. 7 - Forward Power Loss Characteristics

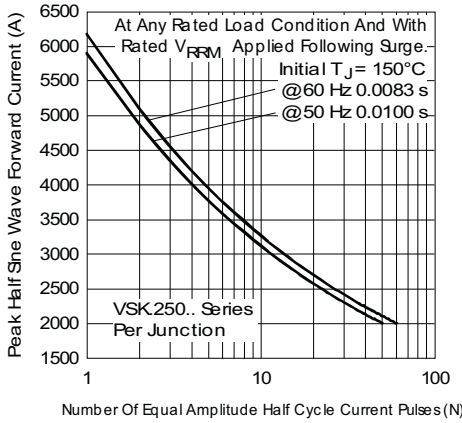


Fig. 8 - Maximum Non-Repetitive Surge Current

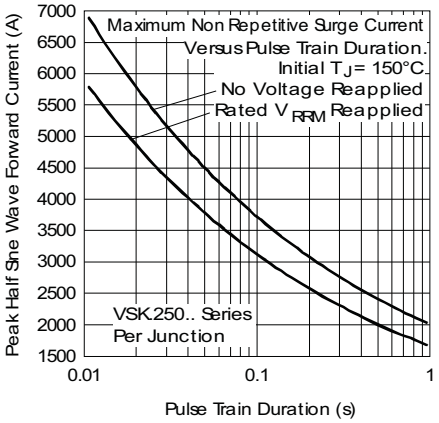


Fig. 9 - Maximum Non-Repetitive Surge Current

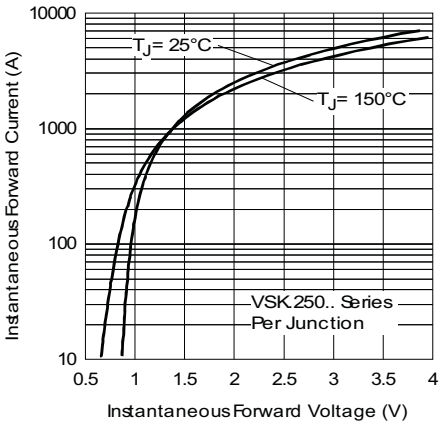


Fig. 10 - Forward Voltage Drop Characteristics

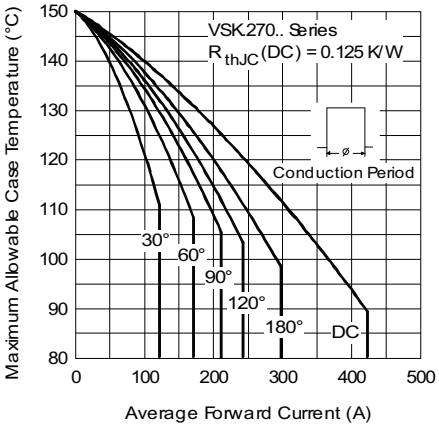


Fig. 13 - Current Ratings Characteristics

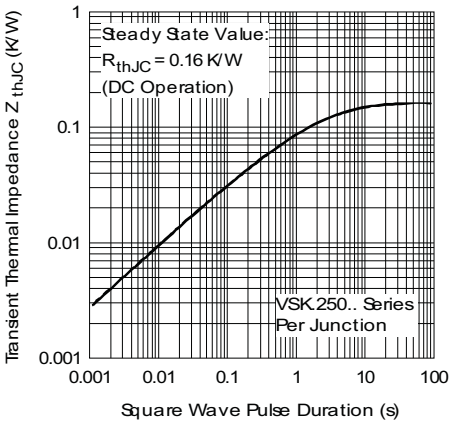


Fig. 11 - Thermal Impedance Z_{thJC} Characteristics

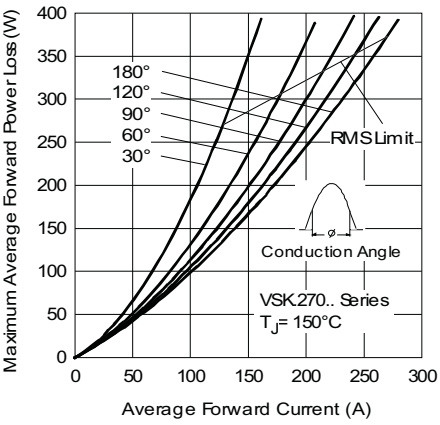


Fig. 14 - Forward Power Loss Characteristics

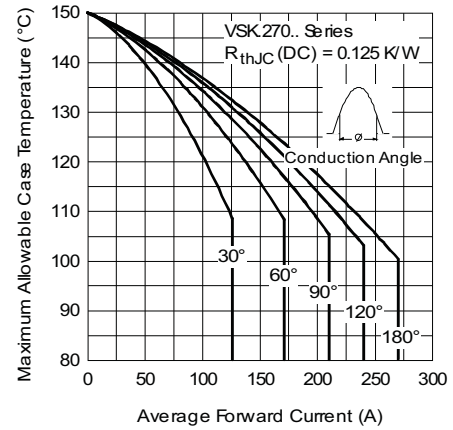


Fig. 12 - Current Ratings Characteristics

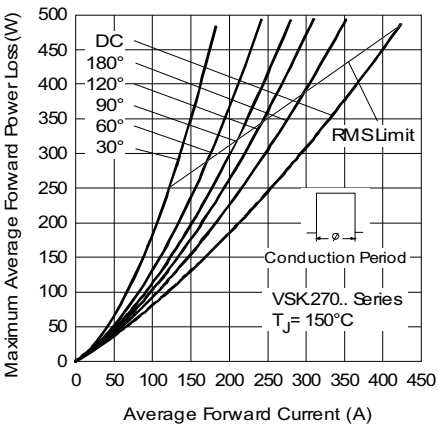


Fig. 15 - Forward Power Loss Characteristics

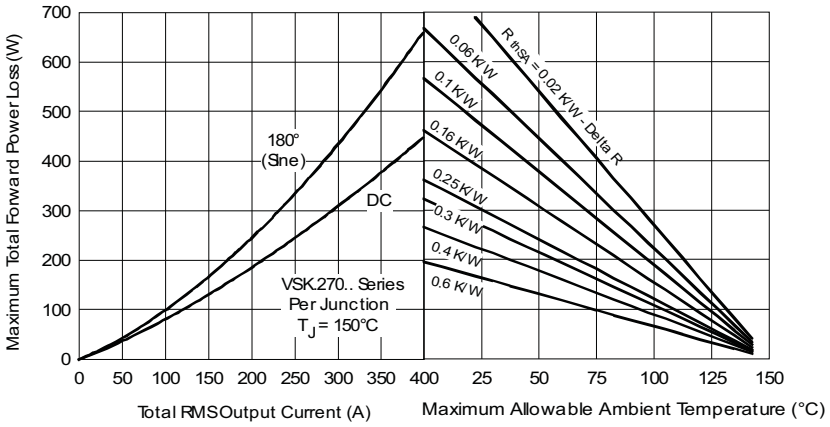


Fig. 16 - Forward Power Loss Characteristics

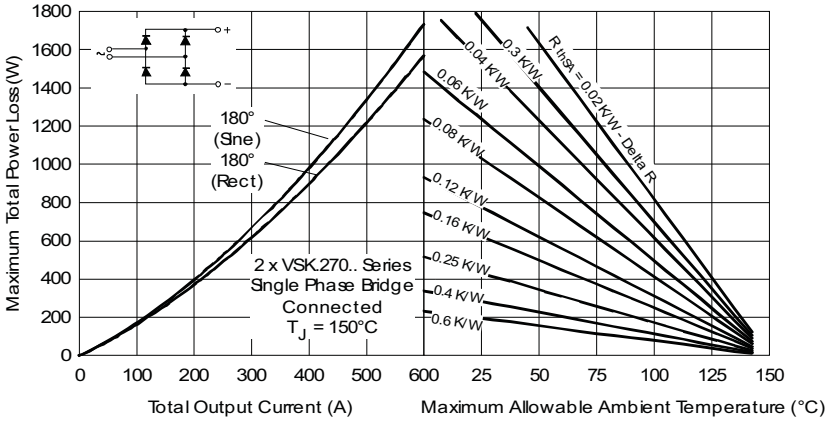


Fig. 17 - Forward Power Loss Characteristics

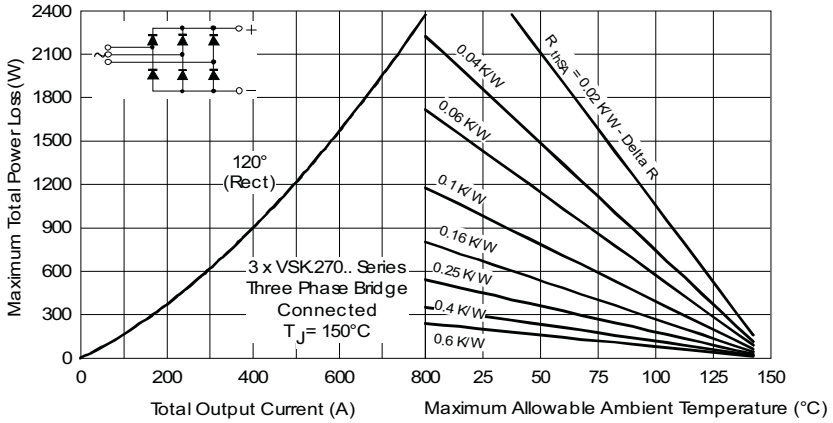


Fig. 18 - Forward Power Loss Characteristics

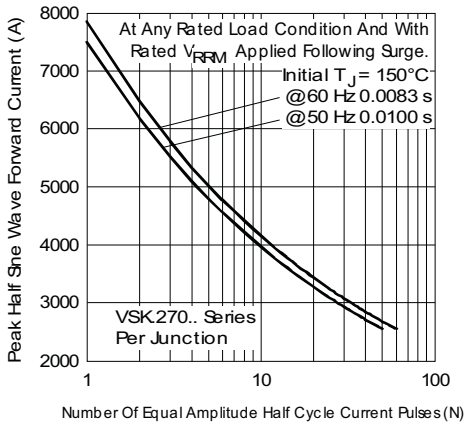


Fig. 19 - Maximum Non-Repetitive Surge Current

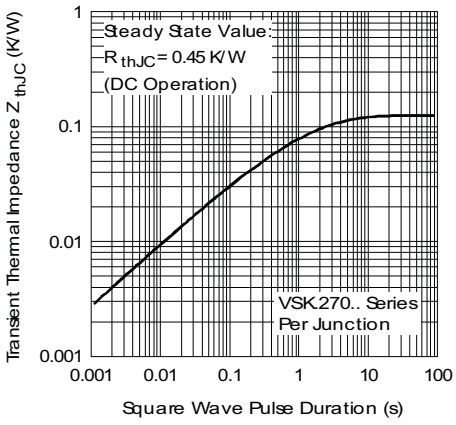


Fig. 22 - Thermal Impedance Z_{thJC} Characteristics

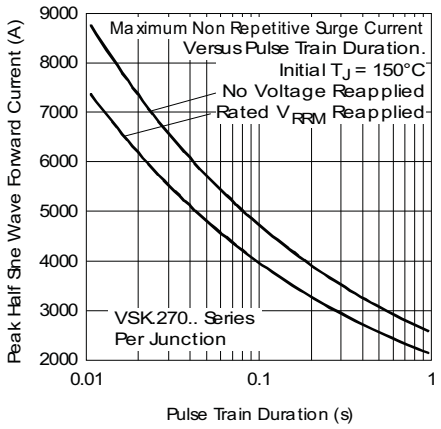


Fig. 20 - Maximum Non-Repetitive Surge Current

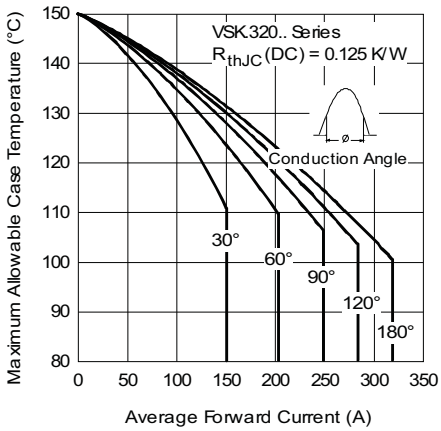


Fig. 23 - Current Ratings Characteristics

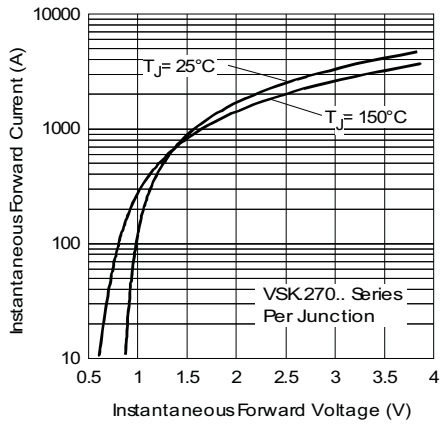


Fig. 21 - Forward Voltage Drop Characteristics

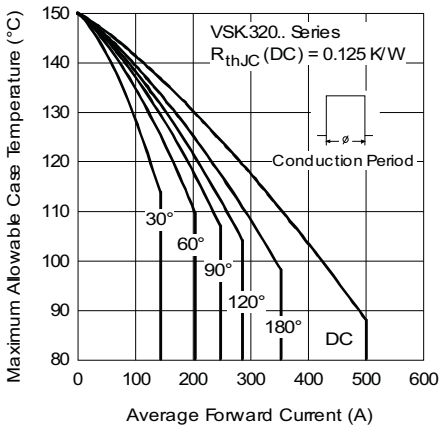


Fig. 24 - Current Ratings Characteristics

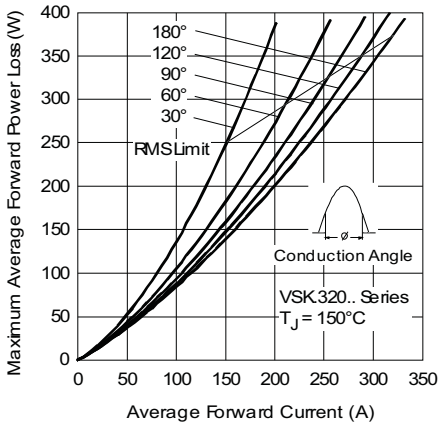


Fig. 25 - Forward Power Loss Characteristics

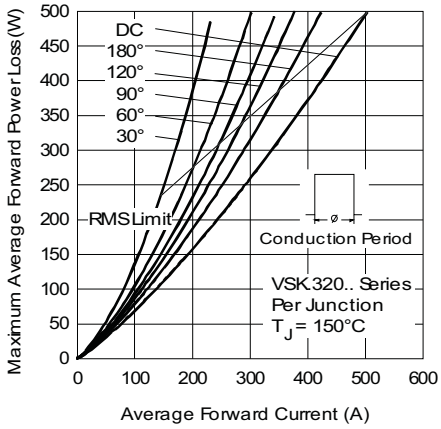


Fig. 26 - Forward Power Loss Characteristics

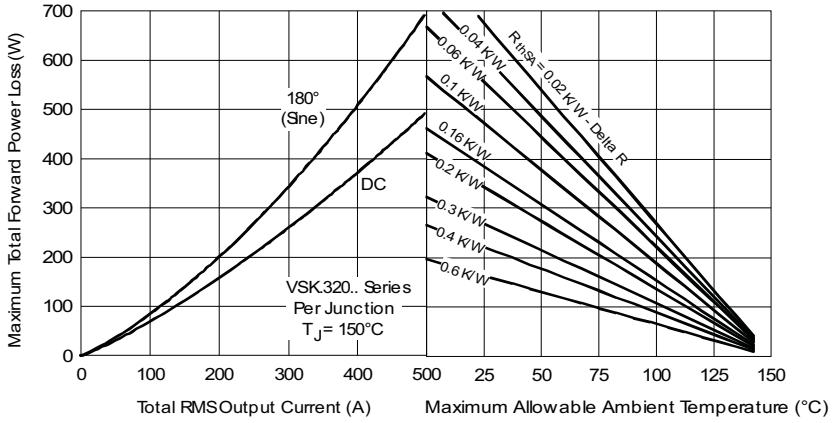


Fig. 27 - Forward Power Loss Characteristics

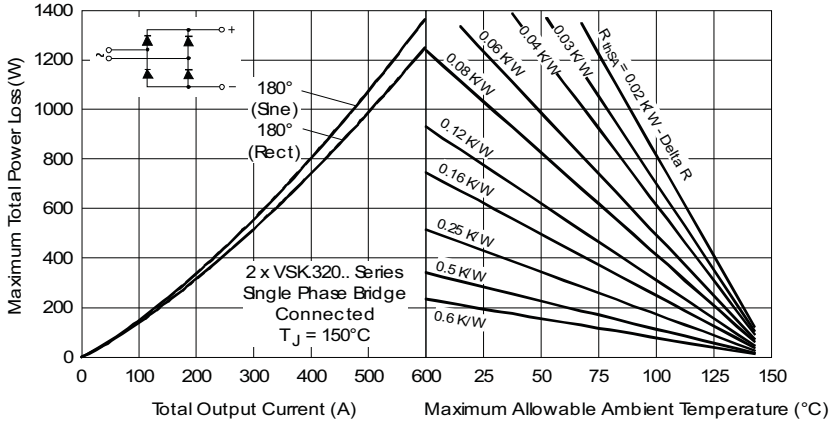


Fig. 28 - Forward Power Loss Characteristics

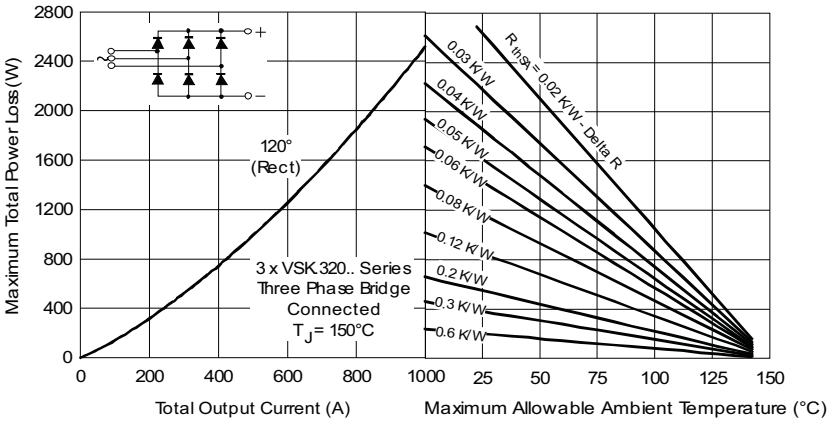


Fig. 29 - Forward Power Loss Characteristics

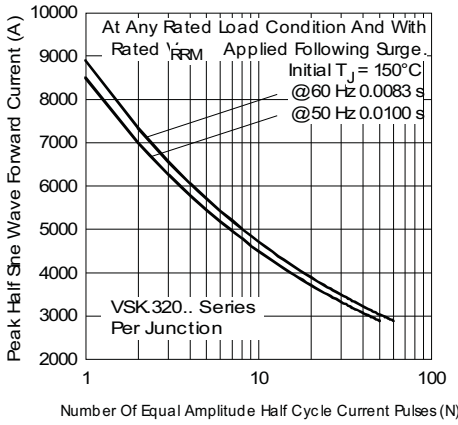


Fig. 30 - Maximum Non-Repetitive Surge Current

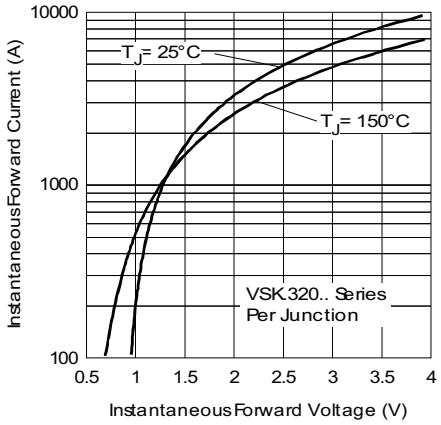


Fig. 32 - Forward Voltage Drop Characteristics

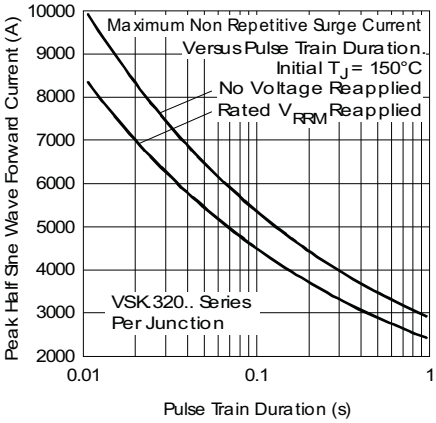


Fig. 31 - Maximum Non-Repetitive Surge Current

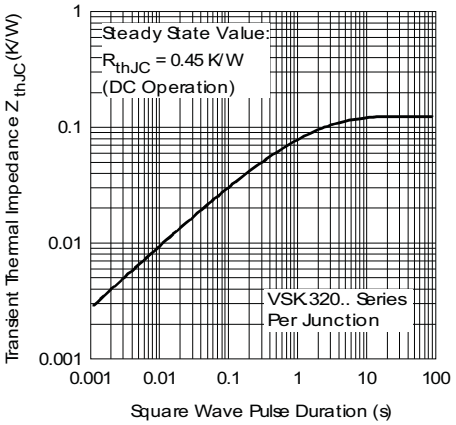


Fig. 33 - Thermal Impedance Z_{thJC} Characteristics

ORDERING INFORMATION TABLE

Device code

VS-VS	KD	320	-	24	PbF
1	2	3		4	5

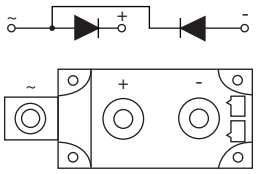
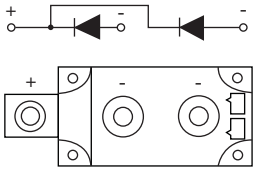
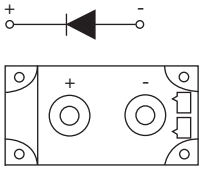
1 - Vishay Semiconductors product

2 - Circuit configuration (see Circuit Configuration table)

3 - Current rating: $I_{F(AV)}$ rounded

4 - Voltage code x 100 = V_{RRM} (see Voltage Ratings table)

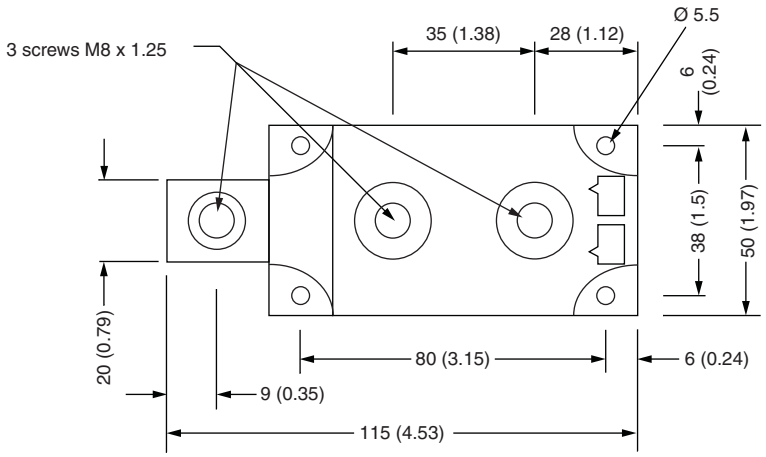
5 - Lead (Pb)-free

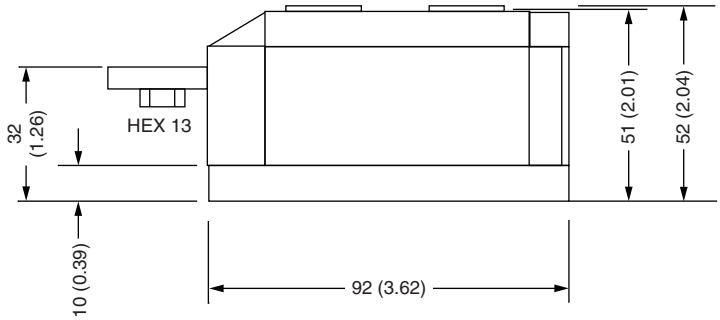
CIRCUIT CONFIGURATION		
CIRCUIT DESCRIPTION	CIRCUIT CONFIGURATION CODE	CIRCUIT DRAWING
Two diodes doubler circuit	KD	VSKD... 
Two diodes common cathode	KC	VSKC... 
Single diode	KE	VSKE... 

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95086

MAGN-A-PAK

DIMENSIONS in millimeters (inches)





Notes

- Dimensions are nominal
- Full engineering drawings are available on request
- UL identification number for gate and cathode wire: UL 1385
- UL identification number for package: UL 94 V-0

Disclaimer

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