

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



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 E78996 approved 
- Lead (Pb)-free
- Designed and qualified for industrial level



RoHS
COMPLIANT

PRODUCT SUMMARY

$I_{F(AV)}$	250 to 320 A
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DESCRIPTION

This new 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.).

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 ² s
	60 Hz	225	363	466	
$I^2\sqrt{t}$		2460	3980	5110	kA ² √s
V_{RRM}		400 to 3000			V
T_J		- 40 to 150			°C

VSK.250, VSK.270, VSK.320 Series



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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
VSK.250- VSK.270- VSK.320-	04	400	500	50
	08	800	900	
	12	1200	1300	
	16	1600	1700	
	20	2000	2100	
VSK.270-	30	3000	3100	

FORWARD CONDUCTION								
PARAMETER	SYMBOL	TEST CONDITIONS			VSK.250	VSK.270	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 ² t for fusing	I ² t	t = 10 ms	No voltage reapplied		246	398	511	kA ² s
		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 √t for fusing	I ² √t	t = 0.1 to 10 ms, no voltage reapplied			2460	3980	5110	kA ² √s
Low level value of threshold voltage	V _{F(TO)1}	(16.7 % × π × I _{F(AV)} < I < π × 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 × I _{F(AV)}), T _J = T _J maximum			0.92	0.87	0.86	
Low level forward slope resistance	r _{f1}	(16.7 % × π × I _{F(AV)} < I < π × I _{F(AV)}), T _J = T _J maximum			0.63	0.94	0.59	mΩ
High level forward slope resistance	r _{f2}	(I > π × I _{F(AV)}), T _J = T _J maximum			0.49	0.81	0.44	
Maximum forward voltage drop	V _{FM}	I _{FM} = π × I _{F(AV)} , T _J = T _J maximum, 180° conduction Average power = V _{F(TO)} × I _{F(AV)} + r _f × (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



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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		K/W
Maximum resistance, case to heatsink per module	R _{thCS}	Mounting surface flat, smooth and greased	0.035			
MAP 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
Mounting torque ± 10 % busbar to MAP			8 to 10			
Approximate weight			800			g
			30			oz.

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

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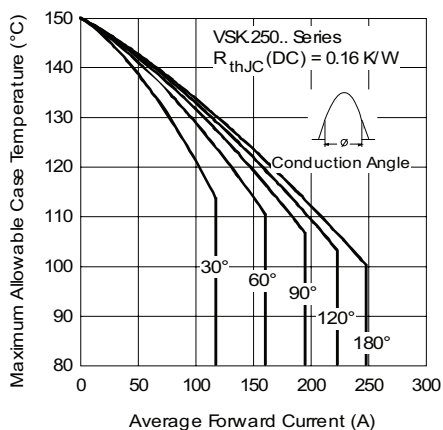


Fig. 1 - Current Ratings Characteristics

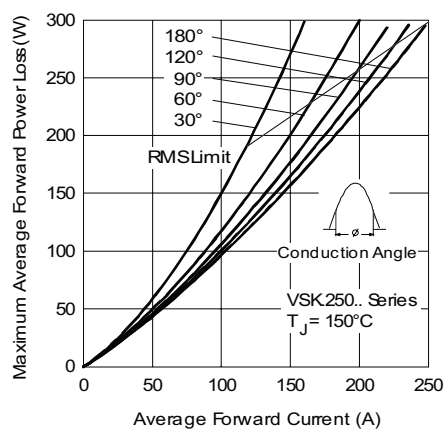


Fig. 3 - Forward Power Loss Characteristics

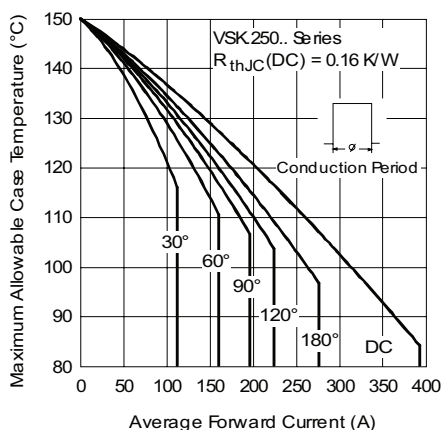


Fig. 2 - Current Ratings Characteristics

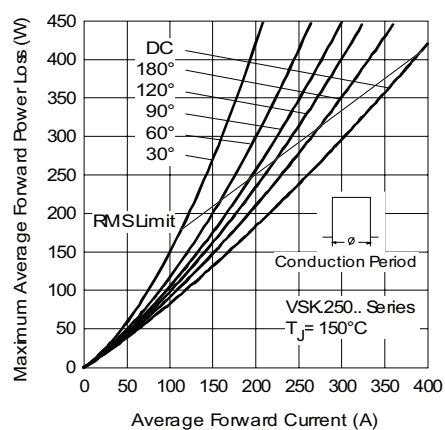


Fig. 4 - Forward Power Loss Characteristics

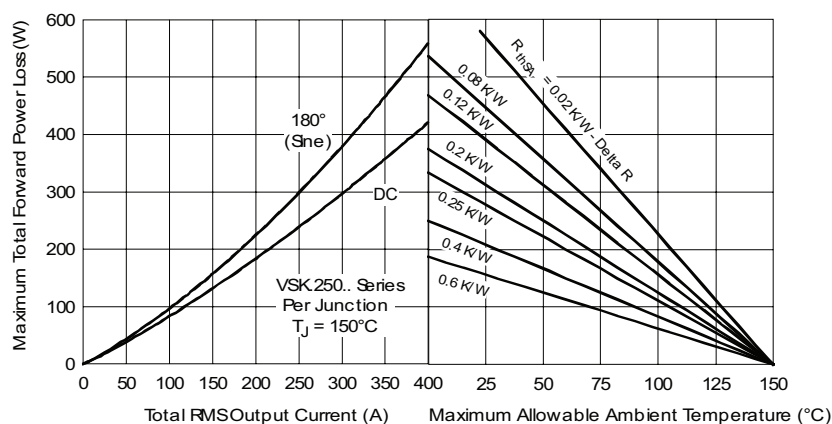


Fig. 5 - Forward Power Loss Characteristics



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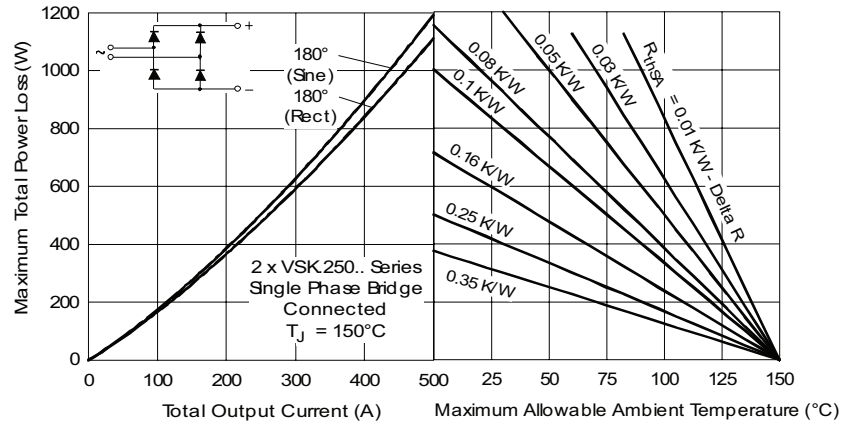


Fig. 6 - Forward Power Loss Characteristics

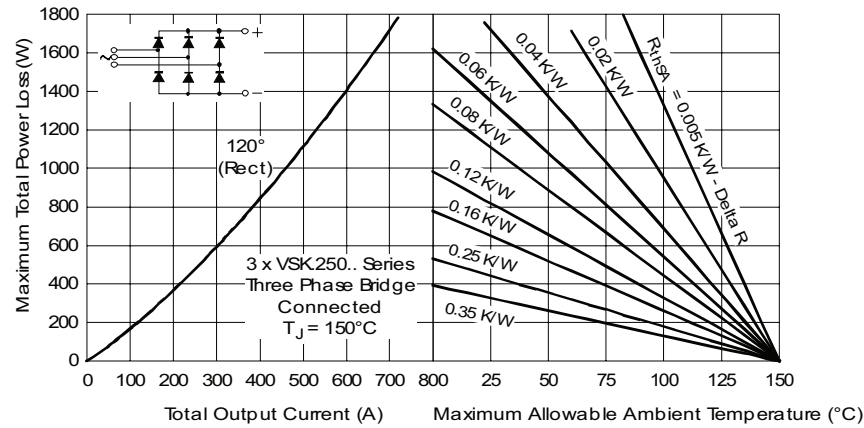


Fig. 7 - Forward Power Loss Characteristics

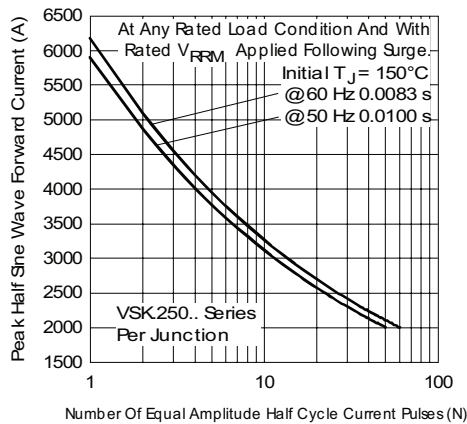


Fig. 8 - Maximum Non-Repetitive Surge Current

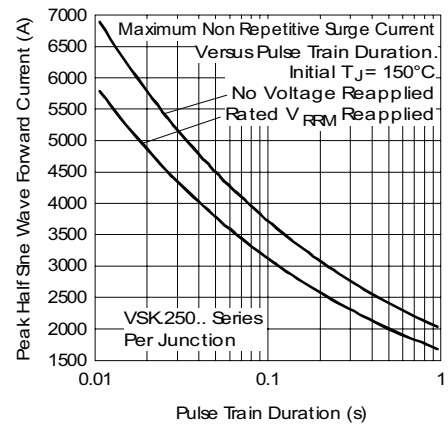


Fig. 9 - Maximum Non-Repetitive Surge Current

VSK.250, VSK.270, VSK.320 Series

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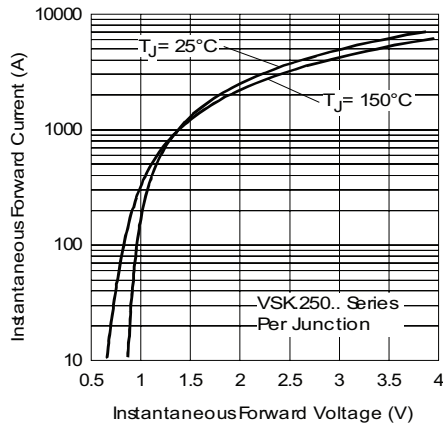


Fig. 10 - Forward Voltage Drop Characteristics

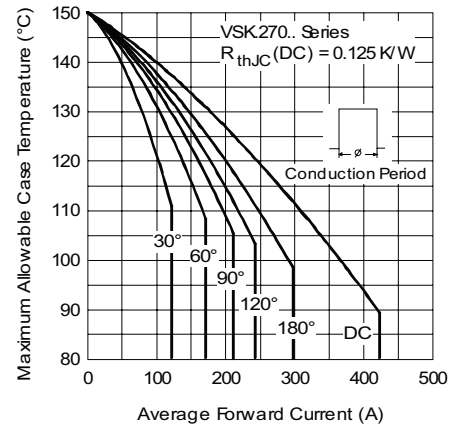


Fig. 13 - Current Ratings Characteristics

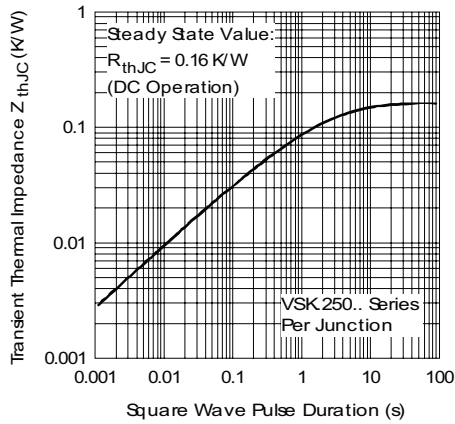


Fig. 11 - Thermal Impedance Z_{thJC} Characteristics

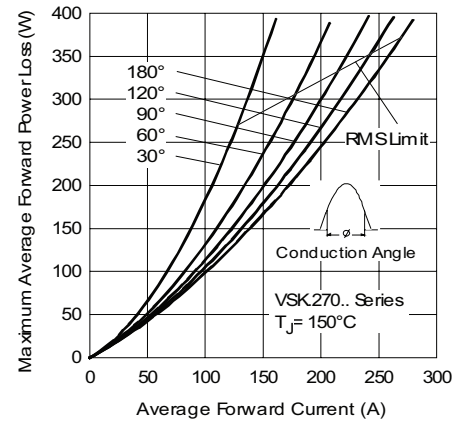


Fig. 14 - Forward Power Loss Characteristics

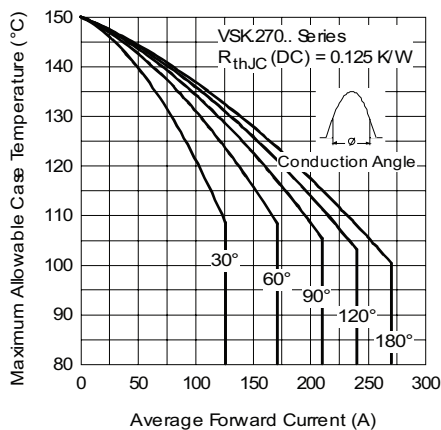


Fig. 12 - Current Ratings Characteristics

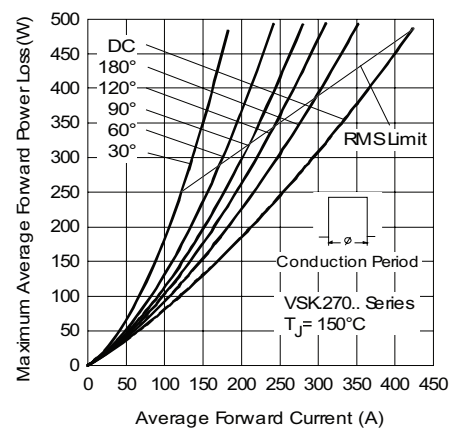


Fig. 15 - Forward Power Loss Characteristics



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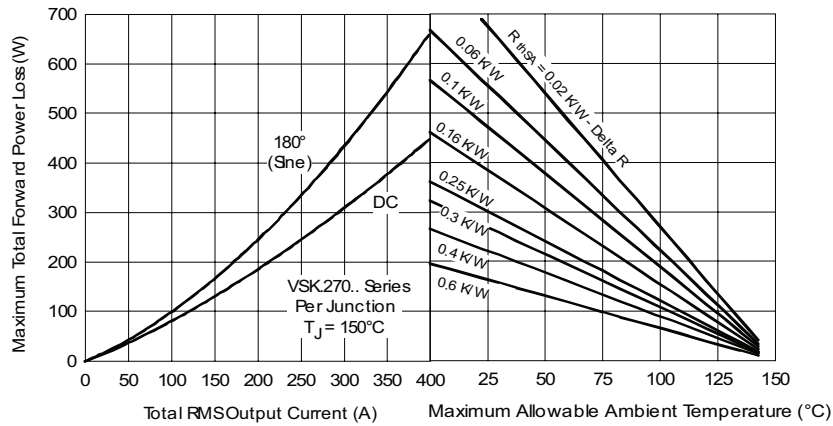


Fig. 16 - Forward Power Loss Characteristics

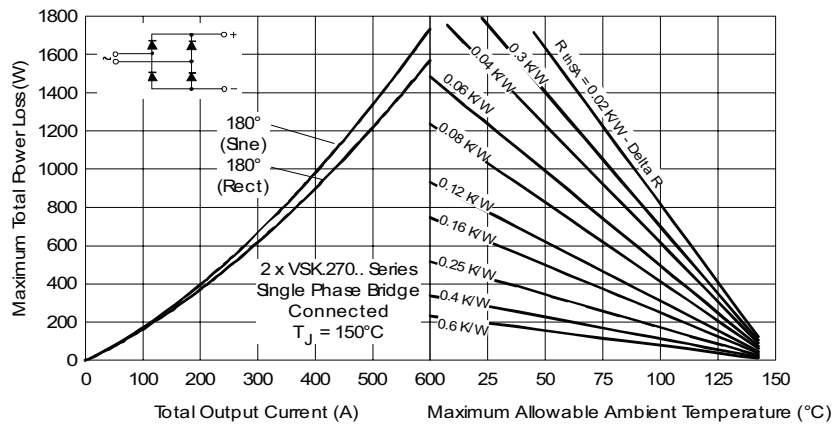


Fig. 17 - Forward Power Loss Characteristics

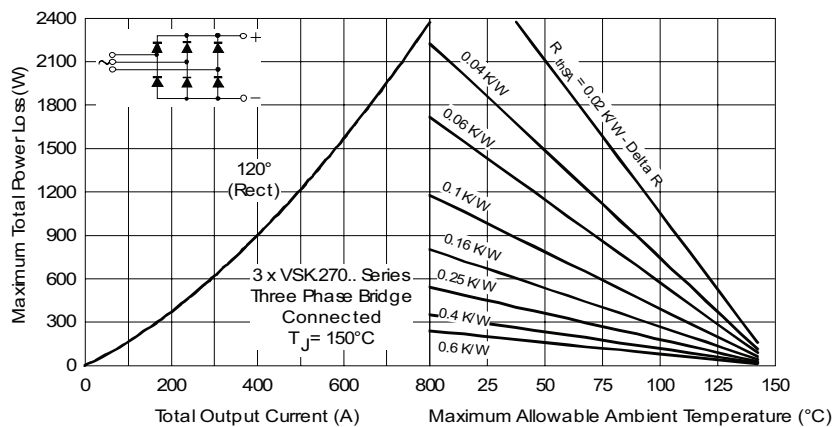


Fig. 18 - Forward Power Loss Characteristics

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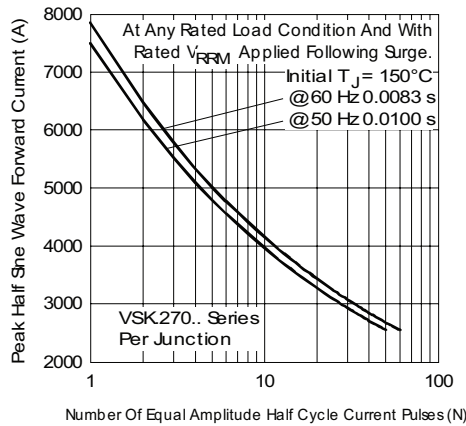


Fig. 19 - Maximum Non-Repetitive Surge Current

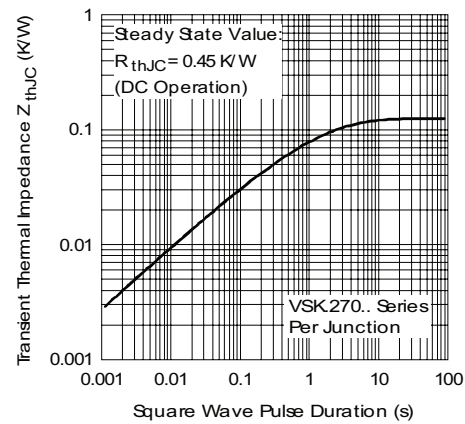


Fig. 22 - Thermal Impedance Z_{thJC} Characteristics

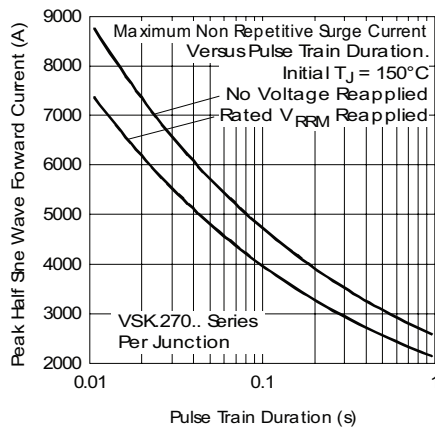


Fig. 20 - Maximum Non-Repetitive Surge Current

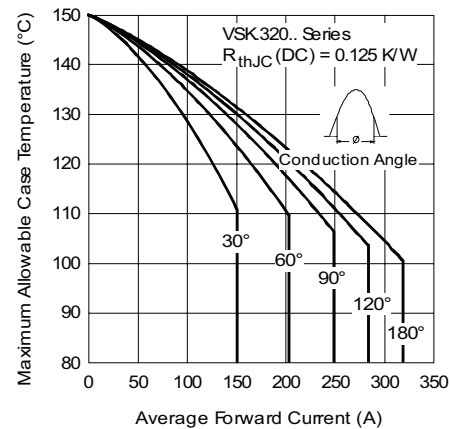


Fig. 23 - Current Ratings Characteristics

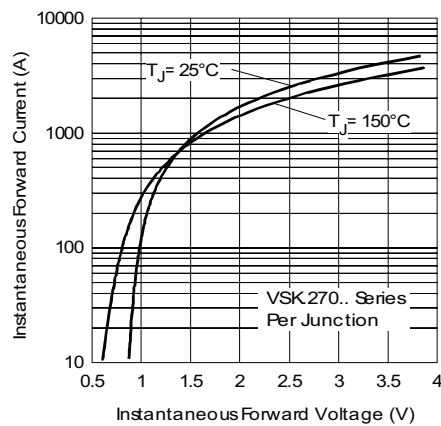


Fig. 21 - Forward Voltage Drop Characteristics

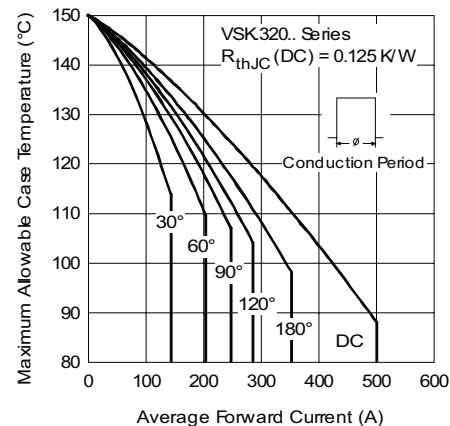


Fig. 24 - Current Ratings Characteristics



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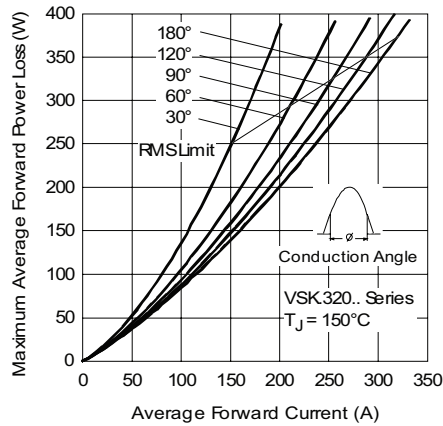


Fig. 25 - Forward Power Loss Characteristics

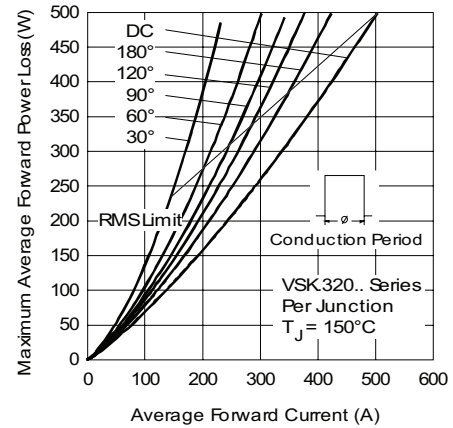


Fig. 26 - Forward Power Loss Characteristics

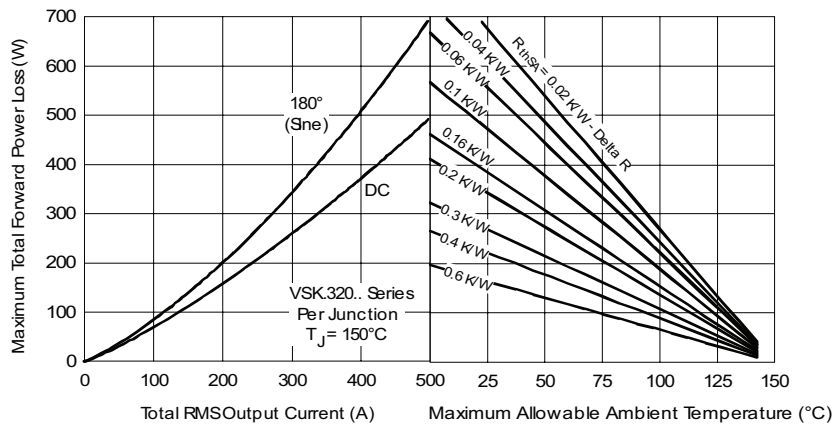


Fig. 27 - Forward Power Loss Characteristics

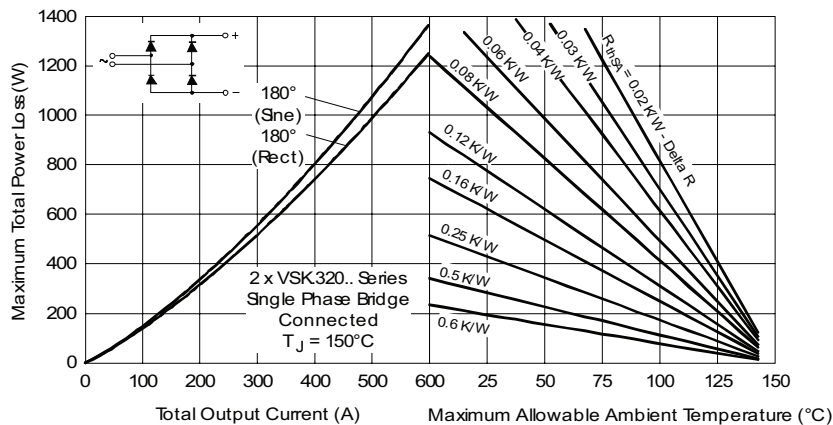


Fig. 28 - Forward Power Loss Characteristics

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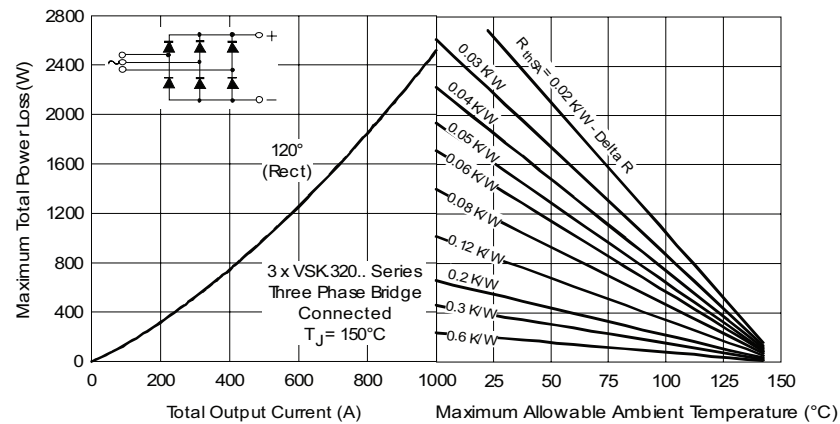


Fig. 29 - Forward Power Loss Characteristics

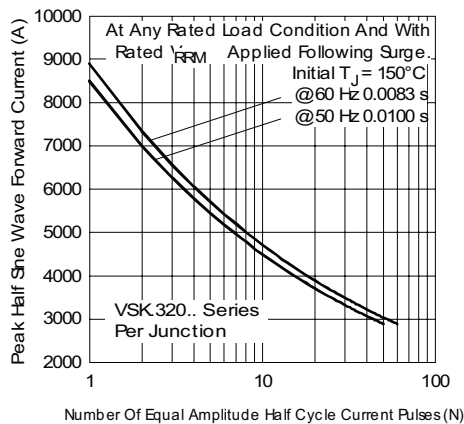


Fig. 30 - Maximum Non-Repetitive Surge Current

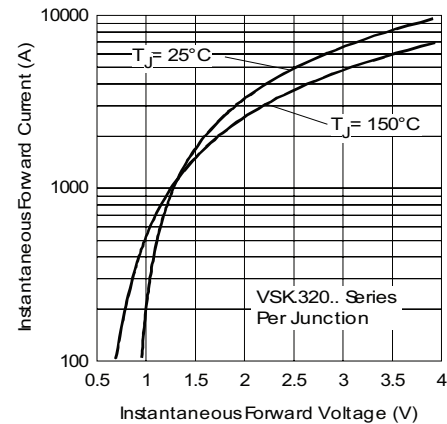


Fig. 32 - Forward Voltage Drop Characteristics

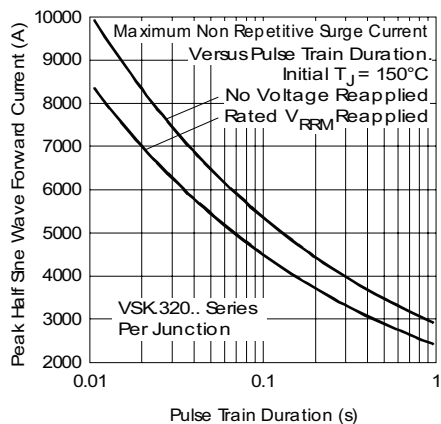


Fig. 31 - Maximum Non-Repetitive Surge Current

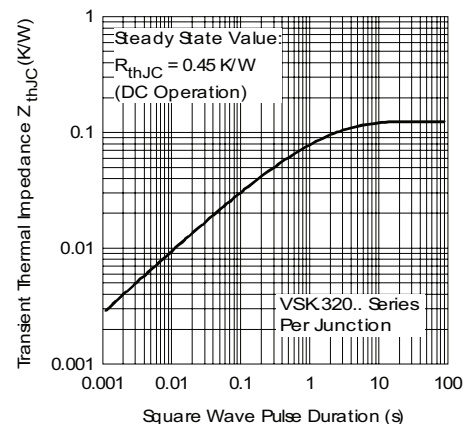


Fig. 33 - Thermal Impedance Z_{thJC} Characteristics



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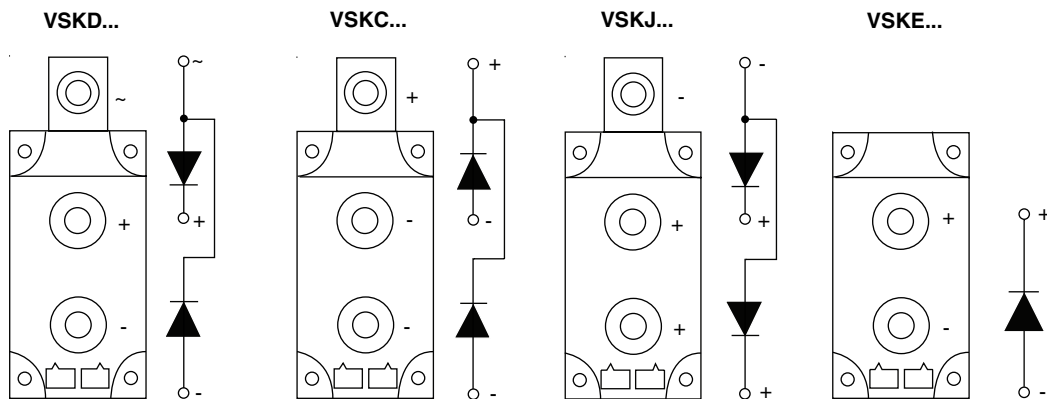
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ORDERING INFORMATION TABLE

Device code	VSK	D	320	-	24
	1	2	3		4

- 1** - Module type
- 2** - Circuit configuration
- 3** - Current rating: $I_{F(AV)}$ rounded
- 4** - Voltage code $\times 100 = V_{RRM}$ (see Voltage Ratings table)

CIRCUIT CONFIGURATION



LINKS TO RELATED DOCUMENTS

Dimensions

<http://www.vishay.com/doc?95086>



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