

Standard Recovery Diodes, 165 A to 230 A (New INT-A-PAK Power Modules)



New INT-A-PAK

FEATURES

- High voltage
- Electrically isolated by DBC ceramic (Al_2O_3)
- 3500 V_{RMS} isolating voltage
- Industrial standard package
- High surge capability
- Glass passivated chips
- Modules uses high voltage power diodes in four basic configurations
- Simple mounting
- UL E78996 approved
- Totally lead (Pb)-free
- Designed and qualified for multiple level



RoHS
COMPLIANT

PRODUCT SUMMARY

$I_{F(AV)}$	165 A to 230 A
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APPLICATIONS

- DC motor control and drives
- Battery chargers
- Welders
- Power converters

MAJOR RATINGS AND CHARACTERISTICS

SYMBOL	CHARACTERISTICS	VSK.166..	VSK.196..	VSK.236..	UNITS
$I_{F(AV)}$		165	195	230	A
	T_C	100	100	100	$^{\circ}C$
$I_{F(RMS)}$		260	305	360	A
I_{FSM}	50 Hz	4000	4750	5500	
	60 Hz	4200	4980	5765	
I^2t	50 Hz	80	113	151	kA^2s
	60 Hz	73	103	138	
$I^2\sqrt{t}$		798	1130	1516	$kA^2\sqrt{s}$
V_{RRM}		400 to 1600			V
T_J	Range	- 40 to 150			$^{\circ}C$

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} AT 150 $^{\circ}C$ mA
VSK.166 VSK.196 VSK.236	04	400	500	20
	08	800	900	
	12	1200	1300	
	14	1400	1500	
	16	1600	1700	

FORWARD CONDUCTION							
PARAMETER	SYMBOL	TEST CONDITIONS		VSK.166	VSK.196	VSK.236	UNITS
Maximum average on-state current at case temperature	$I_{F(AV)}$	180° conduction, half sine wave		165	195	230	A
				100	100	100	°C
Maximum RMS on-state current	$I_{F(RMS)}$			260	305	360	A
Maximum peak, one-cycle on-state, non-repetitive surge current	I_{FSM}	t = 10 ms	No voltage reapplied	4000	4750	5500	
		t = 8.3 ms		4200	4980	5765	
		t = 10 ms	100 % V_{RRM} reapplied	3350	4000	4630	
		t = 8.3 ms		3500	4200	4850	
Maximum I^2t for fusing	I^2t	t = 10 ms	No voltage reapplied	80	113	151	
		t = 8.3 ms		73	103	138	
		t = 10 ms	100 % V_{RRM} reapplied	56	80	107	
		t = 8.3 ms		52	73	98	
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	t = 0.1 to 10 ms, no voltage reapplied		798	1130	1516	$kA^2\sqrt{s}$
Low level value of threshold voltage	$V_{F(TO)1}$	$(16.7\% \times \pi \times I_{F(AV)} < I < \pi \times I_{F(AV)})$, T_J maximum		0.73	0.69	0.7	V
High level value of threshold voltage	$V_{F(TO)2}$	$(I > \pi \times I_{F(AV)})$, T_J maximum		0.88	0.78	0.83	
Low level value on-state slope resistance	$r_{\theta 1}$	$(16.7\% \times \pi \times I_{F(AV)} < I < \pi \times I_{F(AV)})$, T_J maximum		1.5	1.3	1.2	$m\Omega$
High level value on-state	$r_{\theta 2}$	$(I > \pi \times I_{F(AV)})$, T_J maximum		1.26	1.2	1.07	
Maximum forward voltage drop	V_{FM}	$I_{FM} = \pi \times I_{F(AV)}$, $T_J = 25\text{ °C}$, 180° conduction Average power = $V_{F(TO)} \times I_{F(AV)} + r_f \times (I_{F(RMS)})^2$		1.43	1.38	1.46	V

BLOCKING							
PARAMETER	SYMBOL	TEST CONDITIONS		VSK.166	VSK.196	VSK.236	UNITS
Maximum peak reverse and off-state leakage current	I_{RRM}	$T_J = 150\text{ °C}$		20			mA
RMS insulation voltage	V_{INS}	50 Hz, circuit to base, all terminals shorted, t = 1 s		3500			V

THERMAL AND MECHANICAL SPECIFICATIONS							
PARAMETER	SYMBOL	TEST CONDITIONS		VSK.166	VSK.196	VSK.236	UNITS
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		0.2	0.16	0.14	K/W
Maximum thermal resistance, case to heatsink per module	R_{thCS}	Mounting surface smooth, flat and greased		0.05			
Mounting torque $\pm 100\%$	IAP to heatsink busbar to IAP	A mounting compound is recommended and the torque should be rechecked after a period of 3 hours to allow for the spread of the compound. Lubricated threads.		4 to 6			Nm
Approximate weight				200			g
				7.1			oz.
Case style				New INT-A-PAK			



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ΔR CONDUCTION PER JUNCTION											
DEVICES	SINUSOIDAL CONDUCTION AT T _J MAXIMUM					RECTANGULAR CONDUCTION AT T _J MAXIMUM					UNITS
	180°	120°	90°	60°	30°	180°	120°	90°	60°	30°	
VSK.166	0.025	0.03	0.038	0.055	0.089	0.018	0.031	0.041	0.057	0.089	K/W
VSK.196	0.016	0.019	0.024	0.034	0.053	0.012	0.02	0.026	0.035	0.054	
VSK.236	0.009	0.010	0.014	0.018	0.025	0.008	0.012	0.015	0.019	0.025	

Note

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

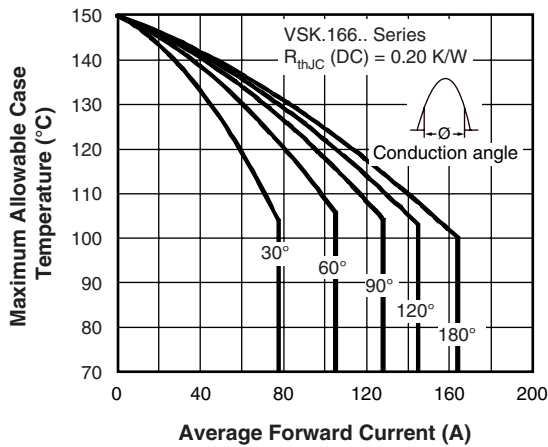


Fig. 1 - Current Ratings Characteristics

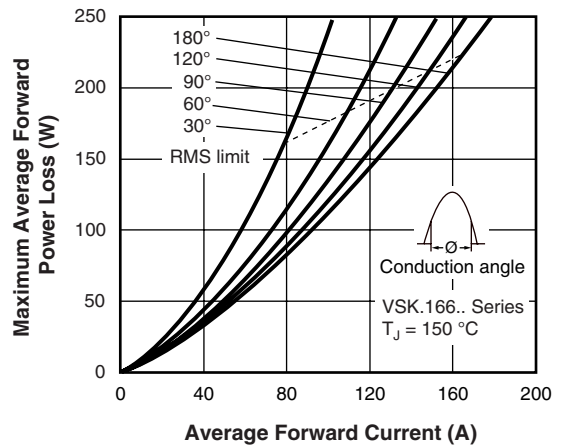


Fig. 3 - On-State Power Loss Characteristics

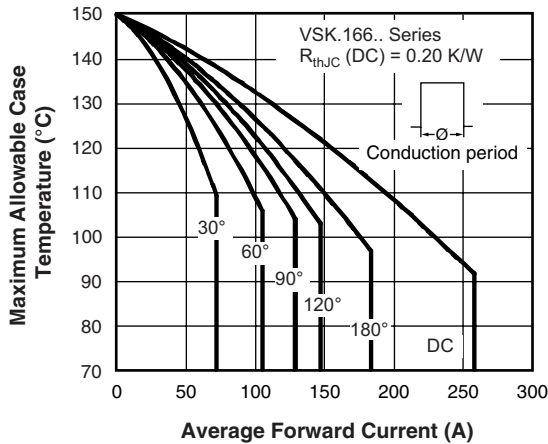


Fig. 2 - Current Ratings Characteristics

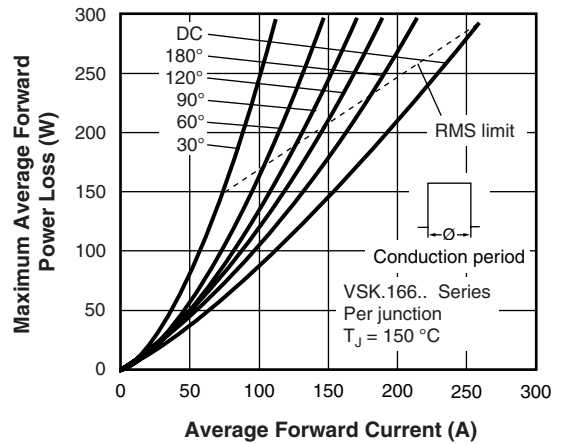


Fig. 4 - On-State Power Loss Characteristics

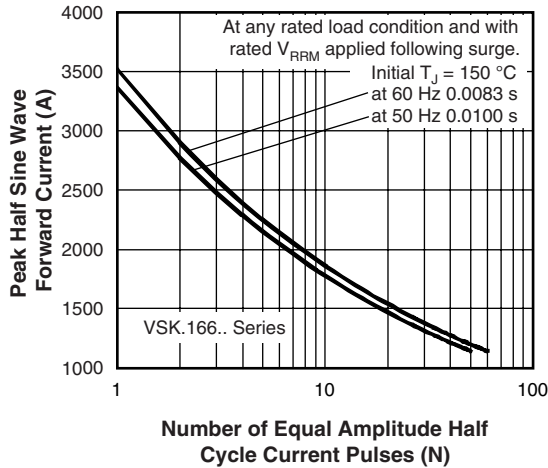


Fig. 5 - Maximum Non-Repetitive Surge Current

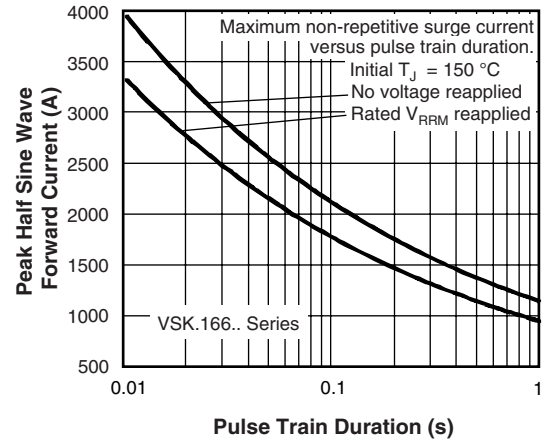


Fig. 6 - Maximum Non-Repetitive Surge Current

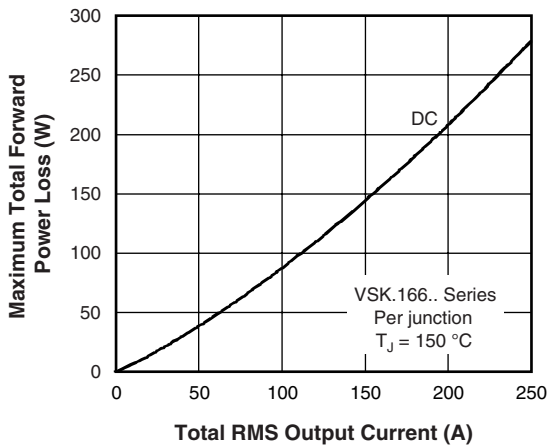


Fig. 7 - On-State Power Loss Characteristics

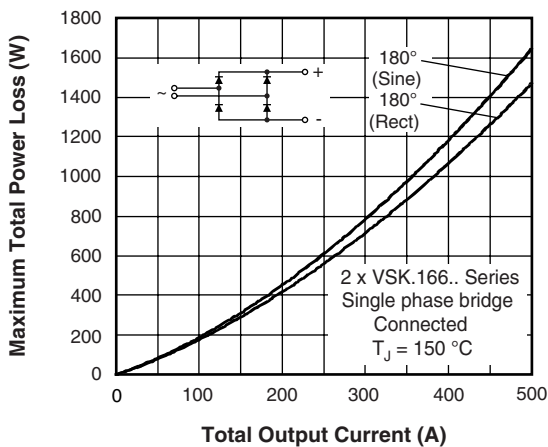
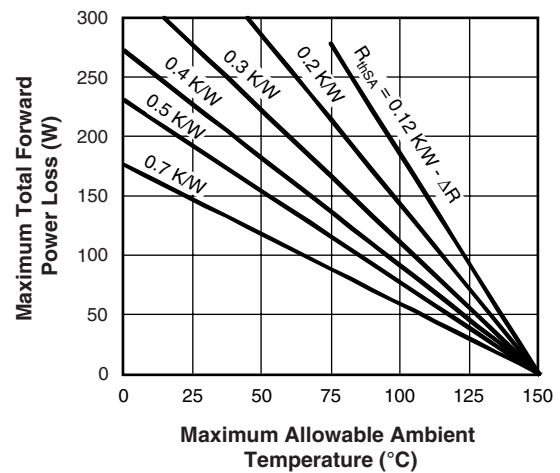
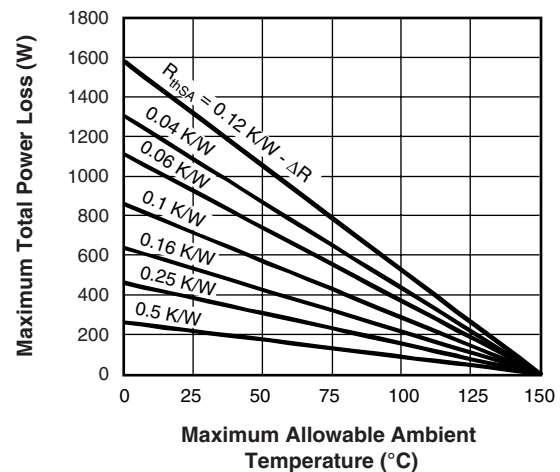


Fig. 8 - On-State Power Loss Characteristics





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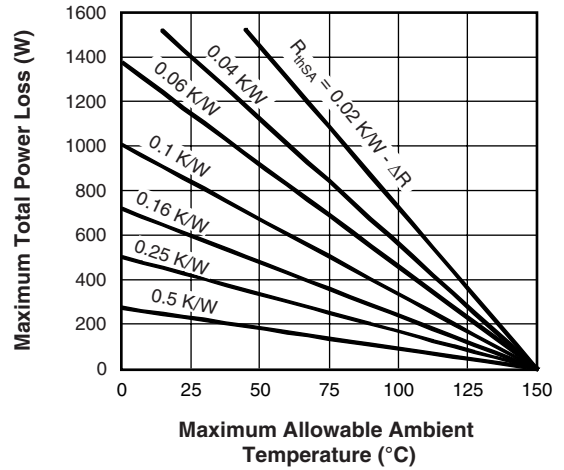
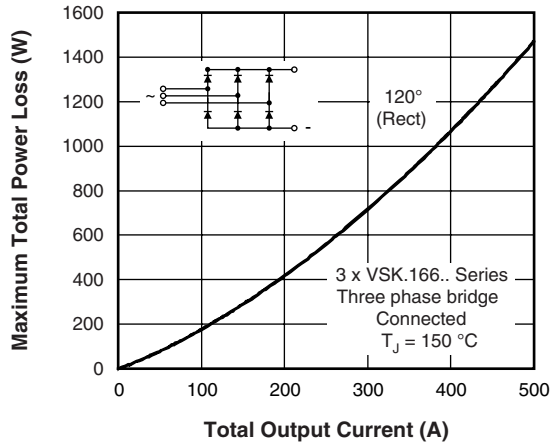


Fig. 9 - On-State Power Loss Characteristics

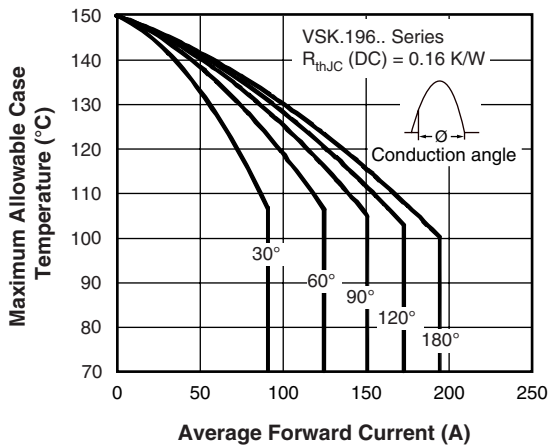


Fig. 10 - Current Ratings Characteristics

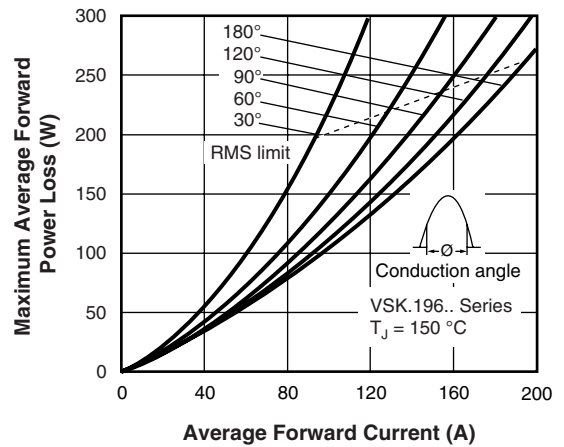


Fig. 12 - On-State Power Loss Characteristics

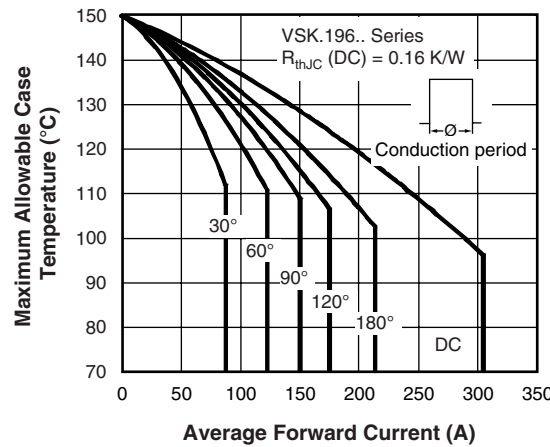


Fig. 11 - Current Ratings Characteristics

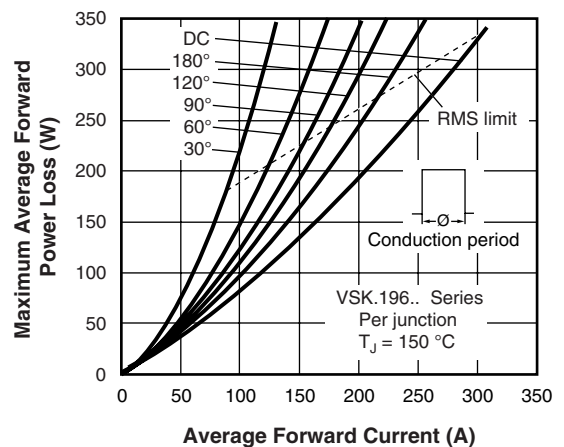


Fig. 13 - On-State Power Loss Characteristics

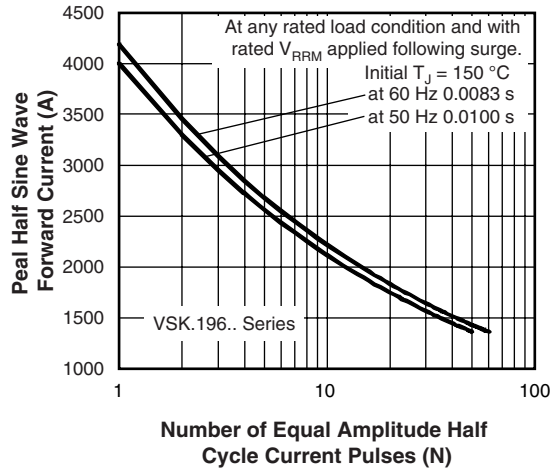


Fig. 14 - Maximum Non-Repetitive Surge Current

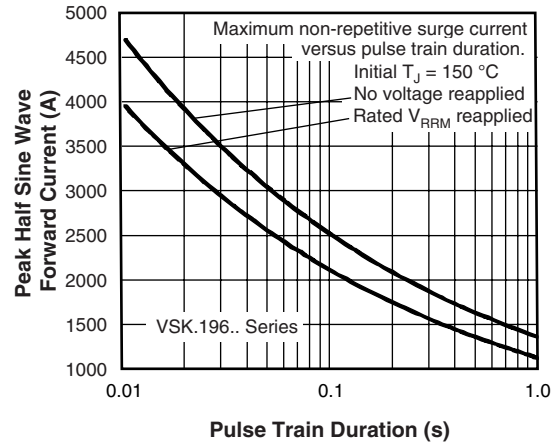


Fig. 15 - Maximum Non-Repetitive Surge Current

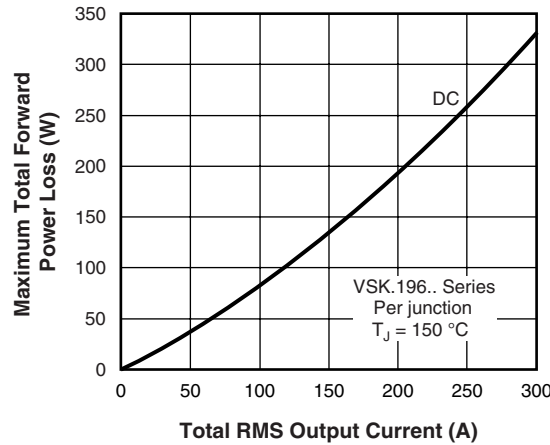


Fig. 16 - On-State Power Loss Characteristics

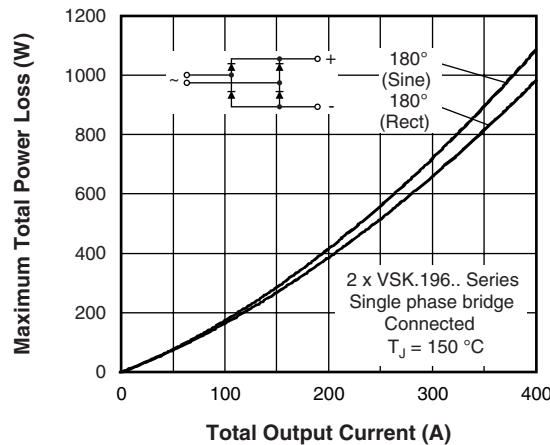
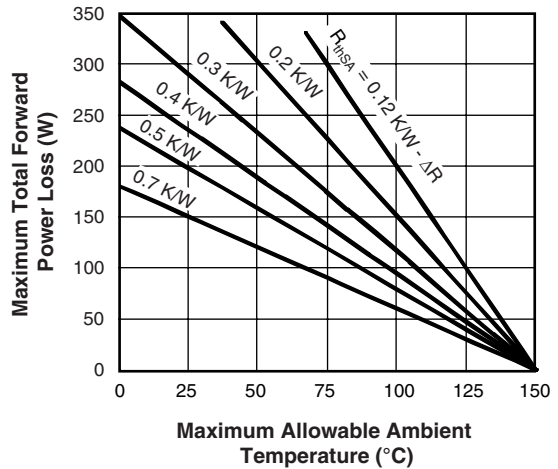
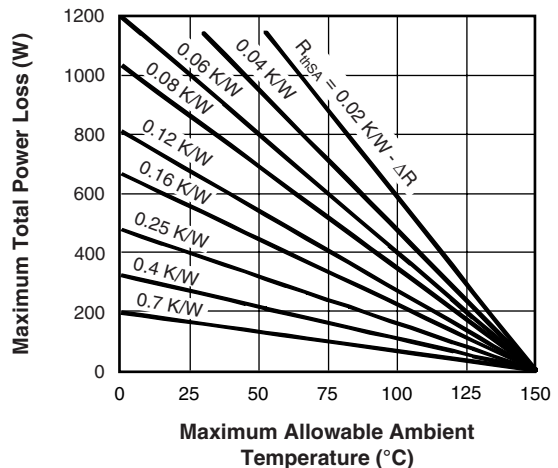


Fig. 17 - On-State Power Loss Characteristics





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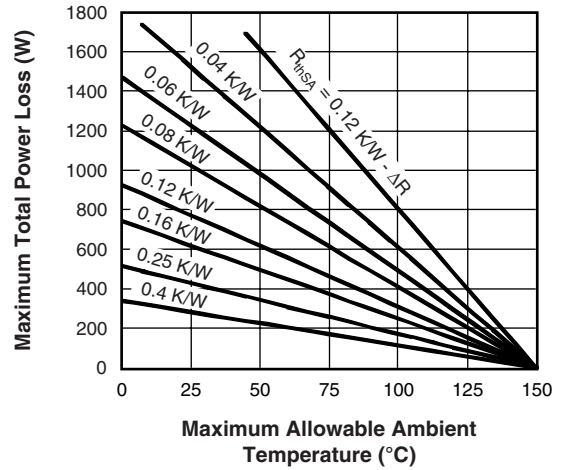
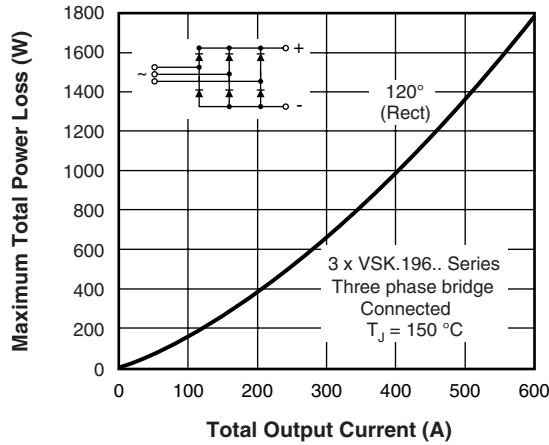


Fig. 18 - On-State Power Loss Characteristics

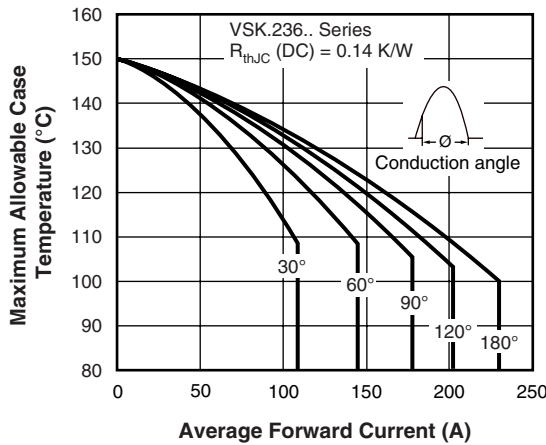


Fig. 19 - Current Ratings Characteristics

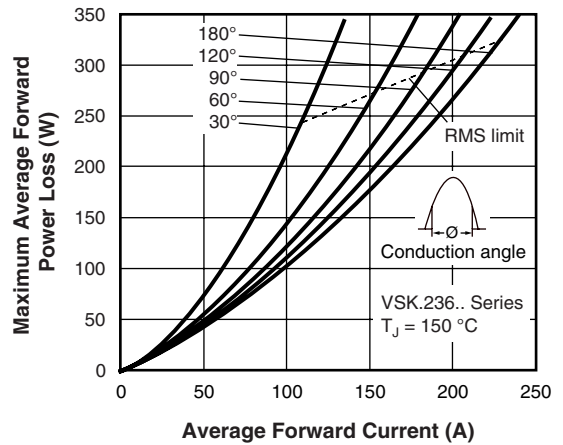


Fig. 21 - On-State Power Loss Characteristics

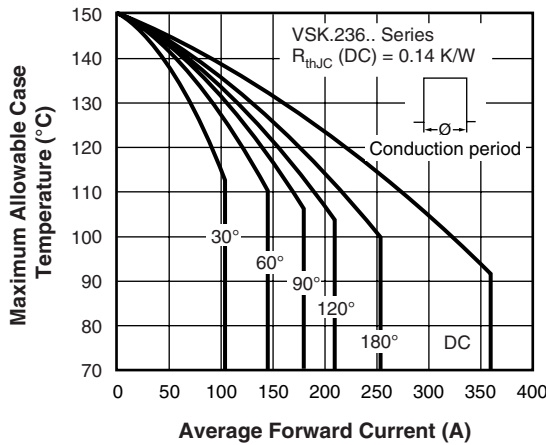


Fig. 20 - Current Ratings Characteristics

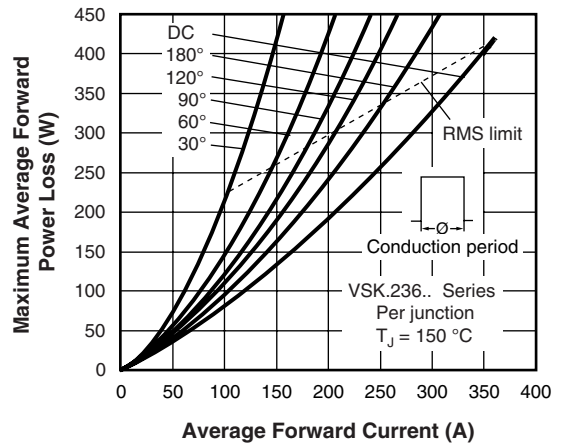


Fig. 22 - On-State Power Loss Characteristics

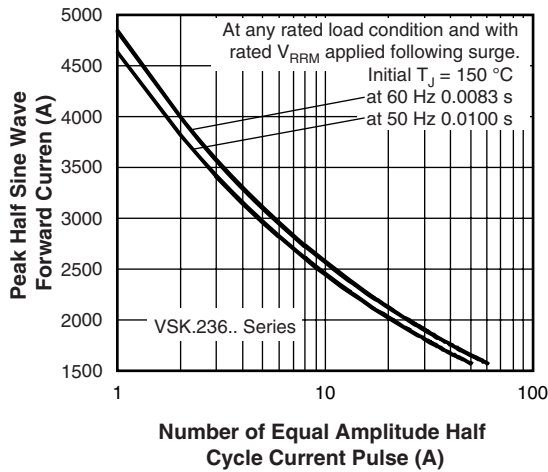


Fig. 23 - Maximum Non-Repetitive Surge Current

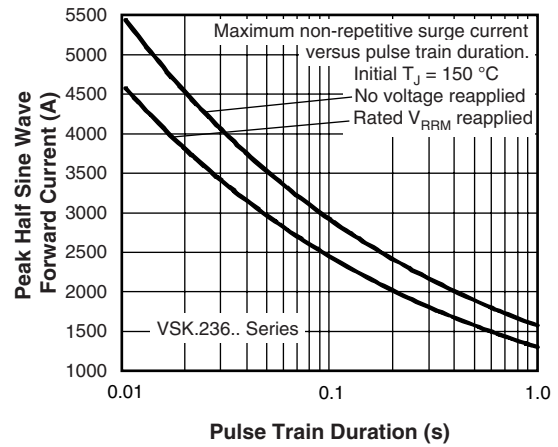


Fig. 24 - Maximum Non-Repetitive Surge Current

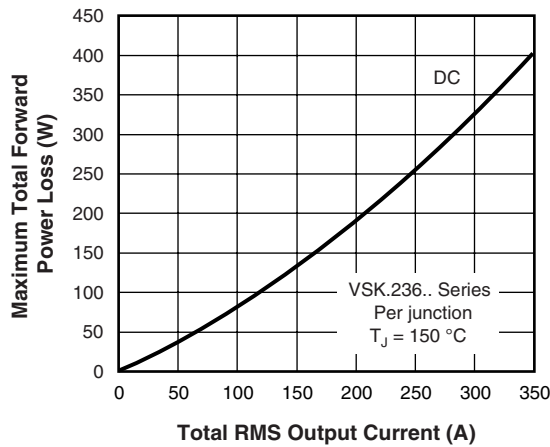


Fig. 25 - On-State Power Loss Characteristics

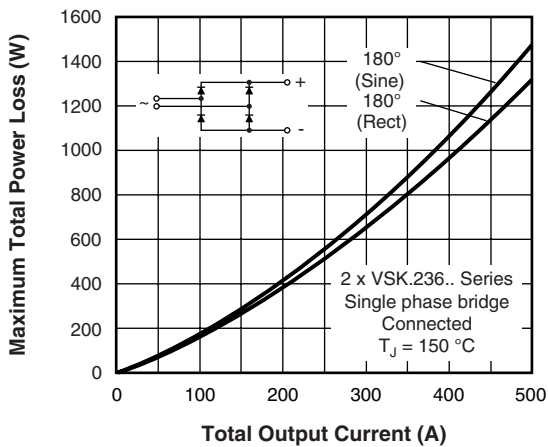
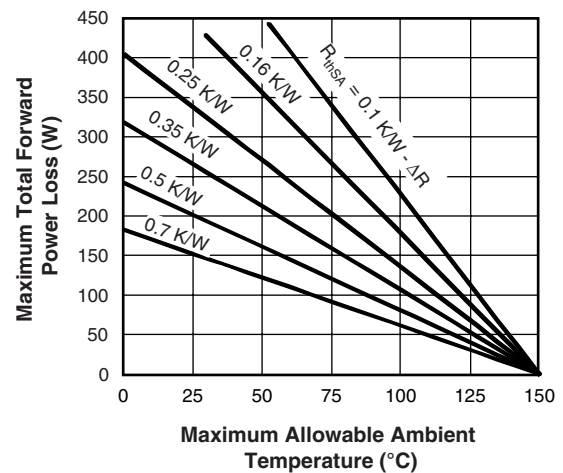
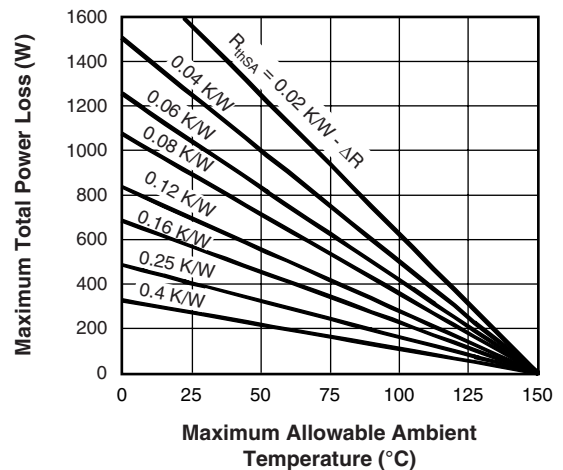


Fig. 26 - On-State Power Loss Characteristics





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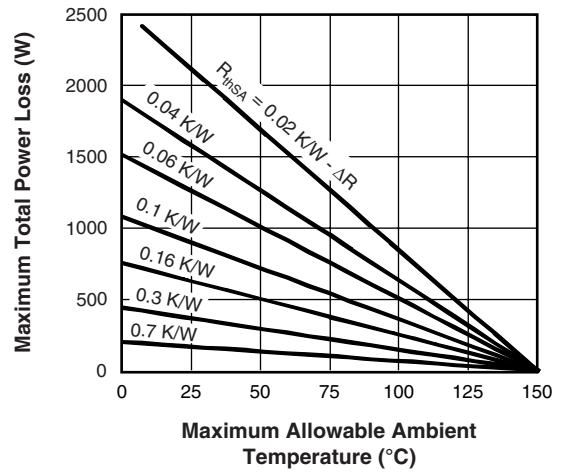
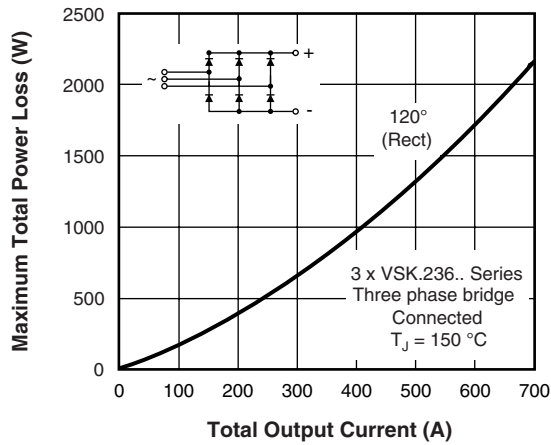


Fig. 27 - On-State Power Loss Characteristics

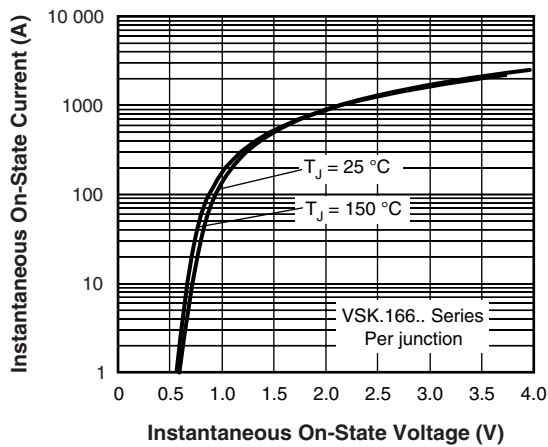


Fig. 28 - On-State Voltage Drop Characteristics

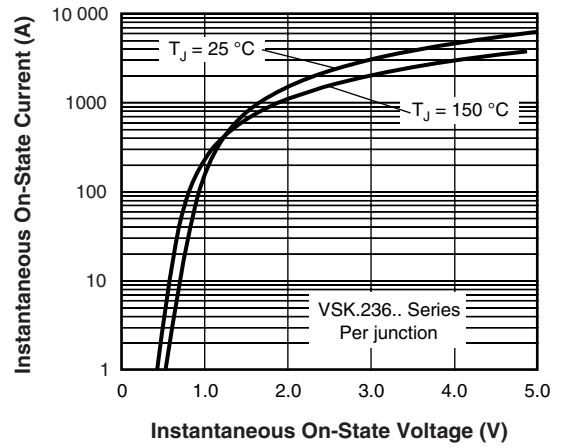


Fig. 30 - On-State Voltage Drop Characteristics

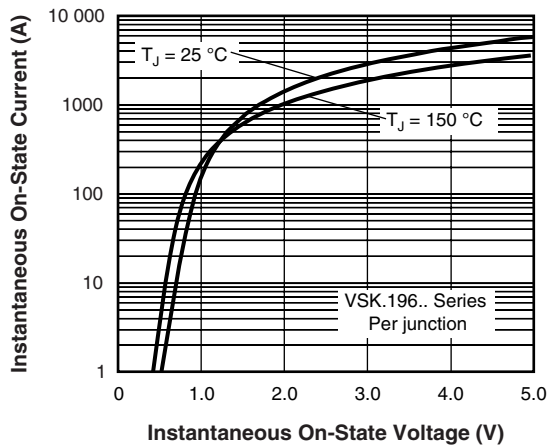


Fig. 29 - On-State Voltage Drop Characteristics

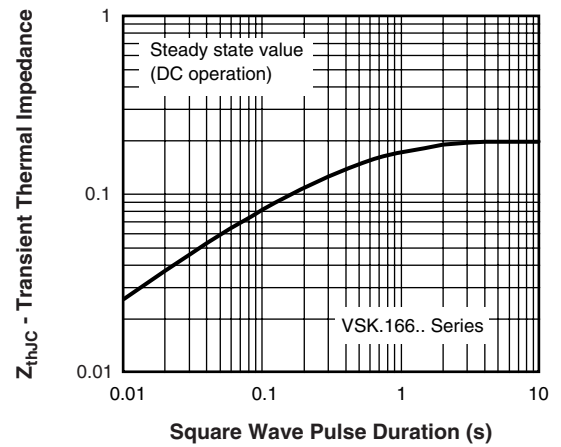


Fig. 31 - Thermal Impedance Z_{thJC} Characteristics

VSK.166, .196, .236..PbF Series



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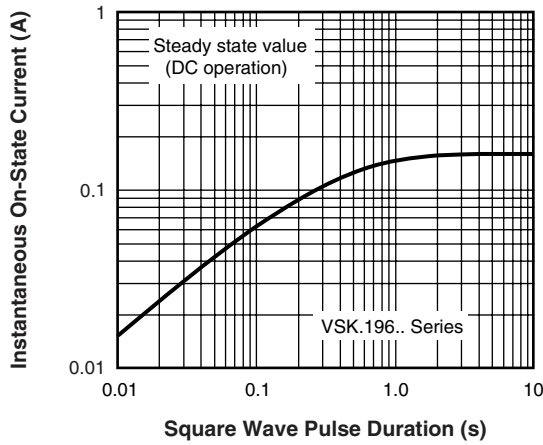


Fig. 32 - Thermal Impedance Z_{thJC} Characteristics

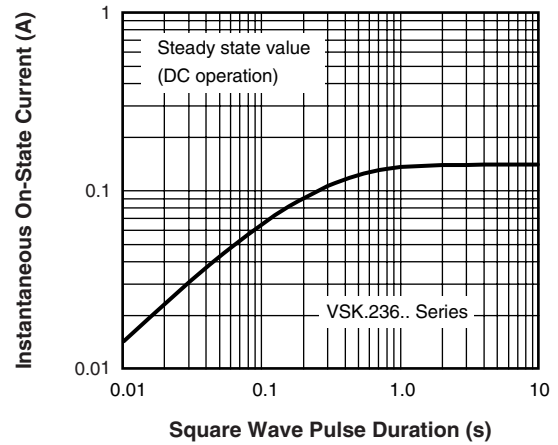


Fig. 33 - Thermal Impedance Z_{thJC} Characteristics

ORDERING INFORMATION TABLE

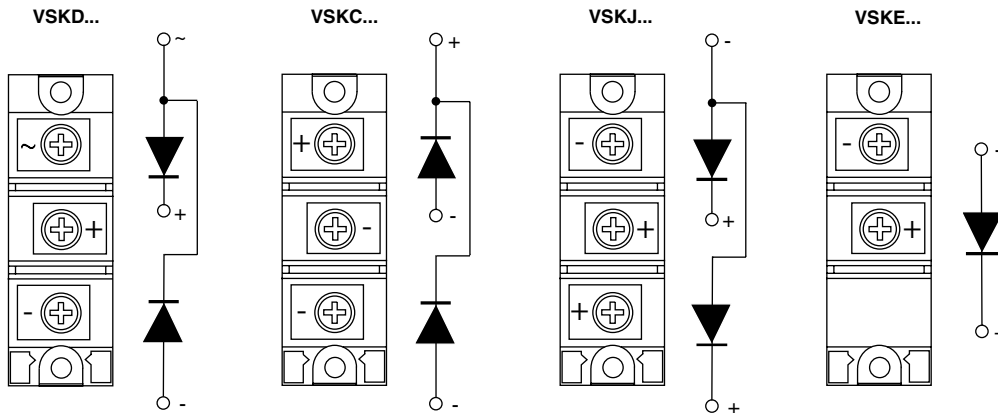
Device code	VSK	D	236	/	16	PbF
	①	②	③	④	⑤	

- ① - Module type
- ② - Circuit configuration
- ③ - Current rating: $I_{F(AV)}$
- ④ - Voltage code $\times 100 = V_{RRM}$
- ⑤ - PbF = Lead (Pb)-free

Note

- To order the optional hardware go to www.vishay.com/doc?95172

CIRCUIT CONFIGURATION



LINKS TO RELATED DOCUMENTS

Dimensions

<http://www.vishay.com/doc?95254>



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