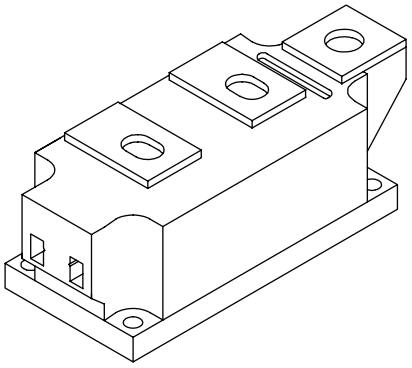
Fast Diodes, 460 A
(SUPER MAGN-A-PAK™ Power Modules)



SUPER MAGN-A-PAK™

FEATURES

- High power FAST recovery diode series
- High current capability
- 3000 V_{RMS} isolating voltage with non-toxic substrate
- High surge capability
- High voltage ratings up to 2500 V
- Industrial standard package
- UL E78996 approved
- Lead (Pb)-free
- Designed and qualified for industrial level

Pb-free
RoHS COMPLIANT

PRODUCT SUMMARY	
$I_{F(AV)}$	460 A

TYPICAL APPLICATIONS

- Snubber for large GTO
- Snubber for large IGBT

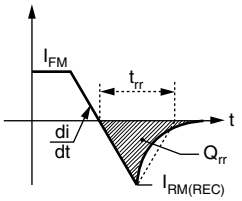
MAJOR RATINGS AND CHARACTERISTICS			
SYMBOL	CHARACTERISTICS	VALUES	UNITS
$I_{F(AV)}$		460	A
	T_C	82	°C
$I_{F(RMS)}$		720	A
	T_C	82	°C
I_{FSM}	50 Hz	13 000	A
	60 Hz	13 800	
I^2t	50 Hz	845	kA^2s
	60 Hz	790	
$I^2\sqrt{t}$		8450	$kA^2\sqrt{s}$
V_{RRM}	Range	1600 to 2500	V
t_{rr}		4.0	µs
T_{Stg}, T_J	Range	- 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 T_J MAXIMUM mA
VSKDL450..S20	16	1600	1700	50
	20	2000	2100	
	25	2500	2600	

FORWARD CONDUCTION						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**			**VALUES**	**UNITS**
Maximum average forward current at case temperature	$I_{F(AV)}$	180° conduction, half sine wave			460	A
					82	°C
Maximum RMS forward current	$I_{F(RMS)}$	180° conduction, half sine wave at T_C = 82 °C			720	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	13.0	kA
		t = 8.3 ms			13.8	
		t = 10 ms	100 % V_{RRM} reapplied		11.1	
		t = 8.3 ms			11.8	
Maximum I^2t for fusing	I^2t	t = 10 ms	No voltage reapplied		845	kA^2s
		t = 8.3 ms			790	
		t = 10 ms	100 % V_{RRM} reapplied		616	
		t = 8.3 ms			578	
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	t = 0.1 to 10 ms, no voltage reapplied			8450	$kA^2\sqrt{s}$
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			1.16	V
High level value of threshold voltage	$V_{F(TO)2}$	(I > π x $I_{F(AV)}$), $T_J = T_J$ maximum			1.62	
Low level value of forward slope resistance	r_{f1}	(16.7 % x π x $I_{F(AV)}$ < I < π x $I_{F(AV)}$), $T_J = T_J$ maximum			0.68	mΩ
High level value of forward slope resistance	r_{f2}	(I > π x $I_{F(AV)}$), $T_J = T_J$ maximum			0.41	
Maximum forward voltage drop	V_{FM}	I_{pk} = 1800 A, T_J = 25 °C, t_p = 10 ms sine pulse			2.20	V

RECOVERY CHARACTERISTICS								
CODE	**MAXIMUM VALUE AT T_J = 25 °C**	**TEST CONDITIONS**			**TYPICAL VALUES AT T_J = 150 °C**			
	t_{rr} AT 25 % I_{RRM} (µs)	**I_{pk} SQUARE PULSE (A)**	**dI/dt (A/µs)**	**V_r (V)**	**t_{rr} AT 25 % I_{RRM} (µs)**	**Q_{rr} (µC)**	**I_r (A)**	
S20	2.0	1000	100	- 50	4	400	180	



BLOCKING				
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**VALUES**	**UNITS**
RMS insulation voltage	V_{INS}	t = 1 s	3000	V
Maximum peak reverse and off-state leakage current	I_{RRM}	$T_J = T_J$ maximum, rated V_{RRM} applied	50	mA

THERMAL AND MECHANICAL SPECIFICATIONS				
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**VALUES**	**UNITS**
Maximum operating junction and storage temperature range	T_J, T_{Stg}		- 40 to 150	°C
Maximum thermal resistance, junction to case per junction	R_{thJC}	DC operation	0.065	K/W
Maximum thermal resistance, case to heatsink	R_{thC-hs}		0.02	
Mounting torque ± 10 % — SMAP to heatsink		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.	6 to 8	Nm
Mounting torque ± 10 % — busbar to SMAP			12 to 15	
Approximate weight			1500	g
Case style		See dimensions - link at the end of datasheet	SUPER MAGN-A-PAK	

ΔR_{thJC} CONDUCTION				
CONDUCTION ANGLE	**SINUSOIDAL CONDUCTION**	**RECTANGULAR CONDUCTION**	**TEST CONDITIONS**	**UNITS**
180°	0.009	0.006	$T_J = T_J$ maximum	K/W
120°	0.011	0.011		
90°	0.014	0.015		
60°	0.021	0.022		
30°	0.037	0.038		

Note

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

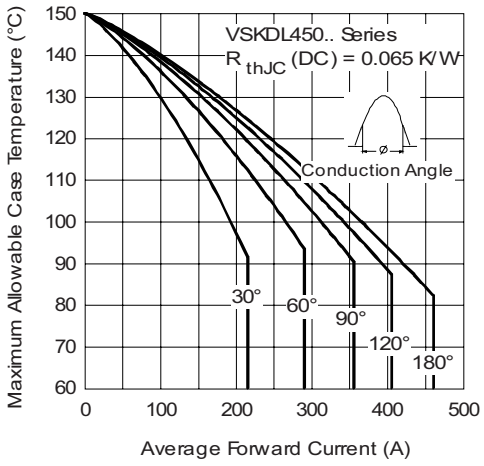


Fig. 1 - Current Ratings Characteristics

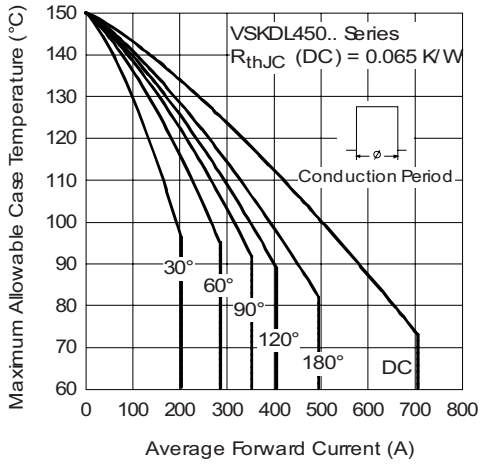


Fig. 2 - Current Ratings Characteristics

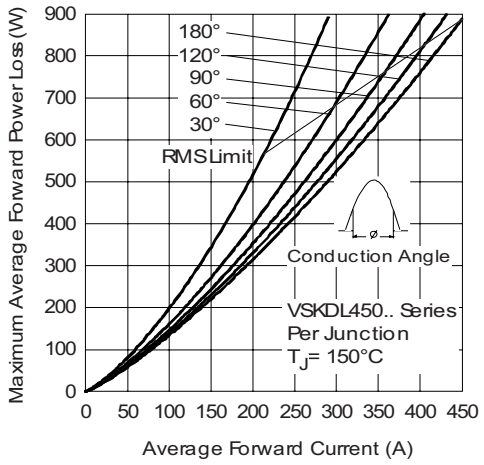


Fig. 3 - Forward Power Loss Characteristics

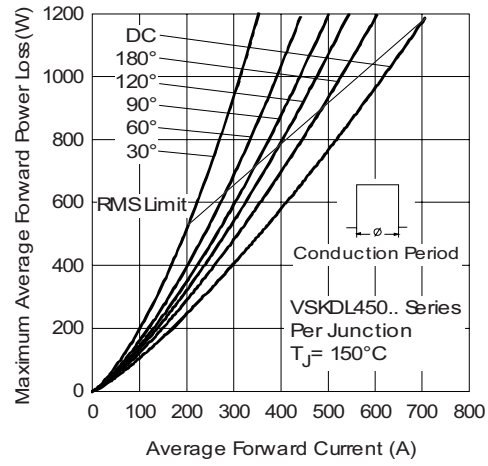


Fig. 4 - Forward Power Loss Characteristics

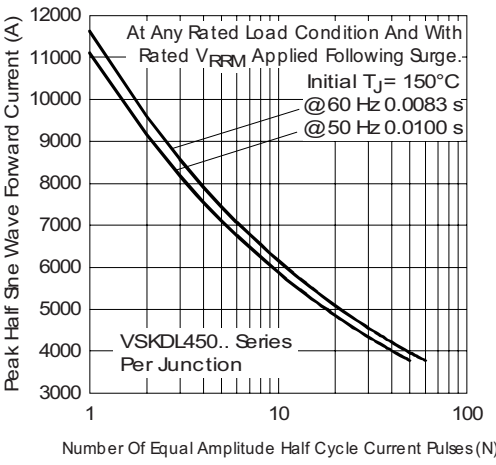


Fig. 5 - Maximum Non-Repetitive Surge Current

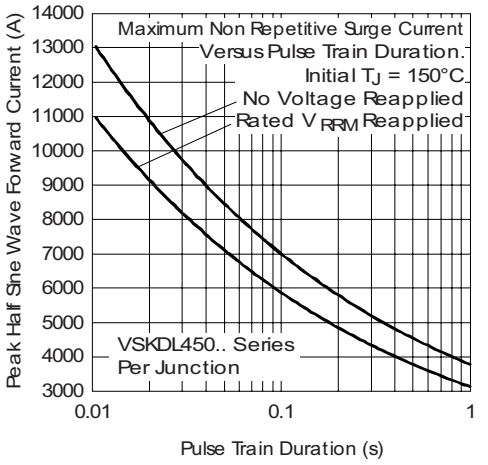


Fig. 6 - Maximum Non-Repetitive Surge Current

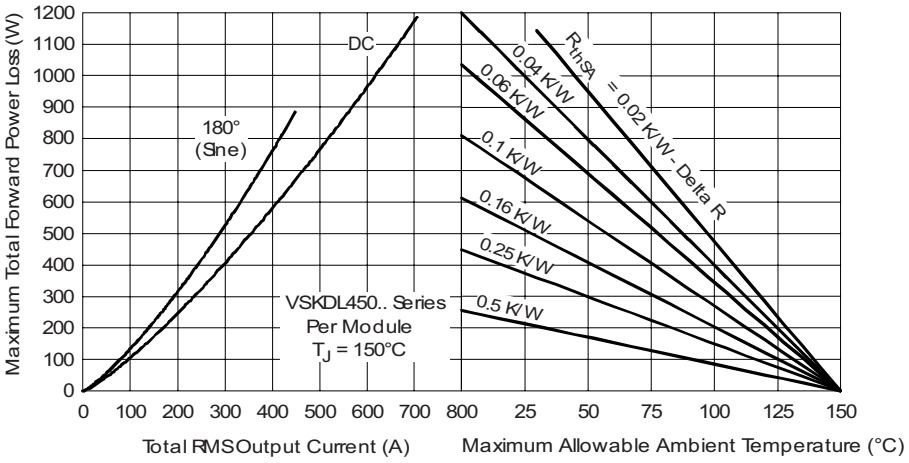


Fig. 7 - Forward Power Loss Characteristics

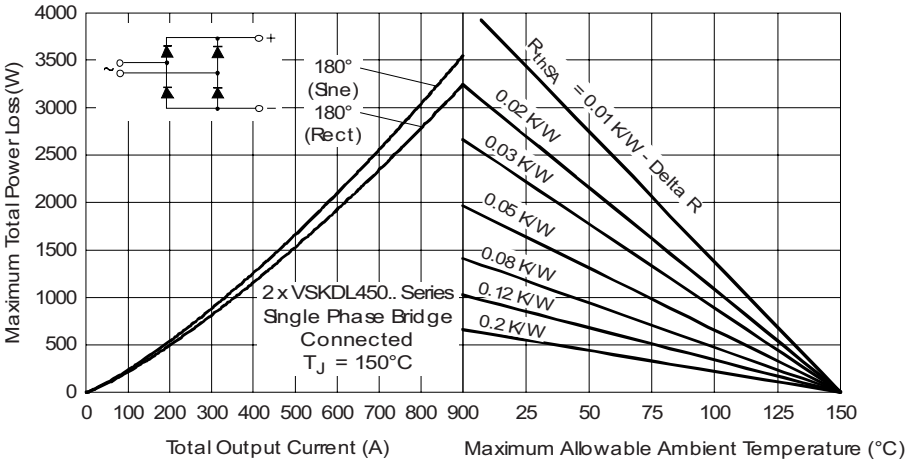


Fig. 8 - Forward Power Loss Characteristics

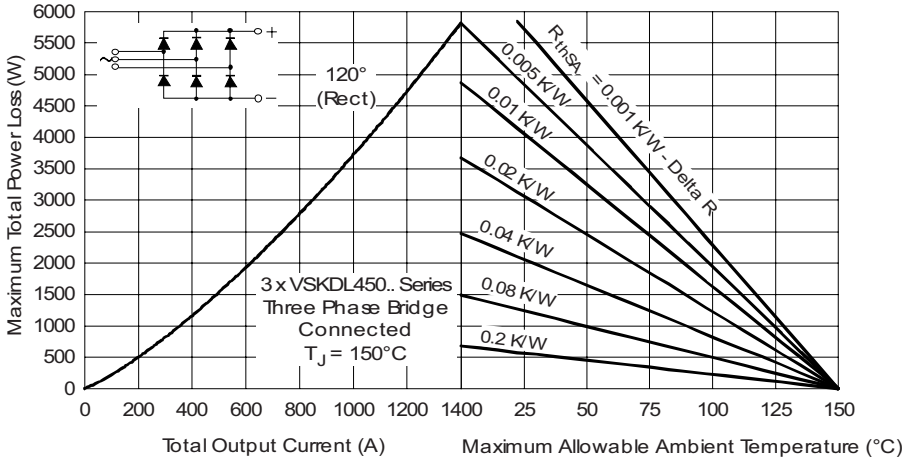


Fig. 9 - Forward Power Loss Characteristics

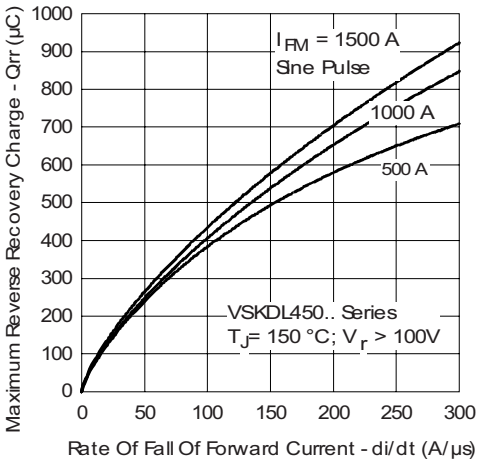


Fig. 10 - Recovery Charge Characteristics

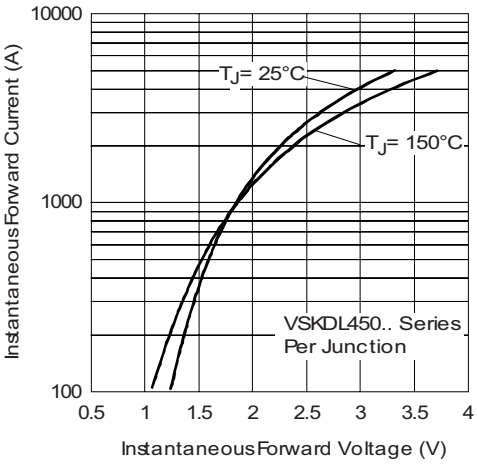


Fig. 12 - Forward Voltage Drop Characteristics

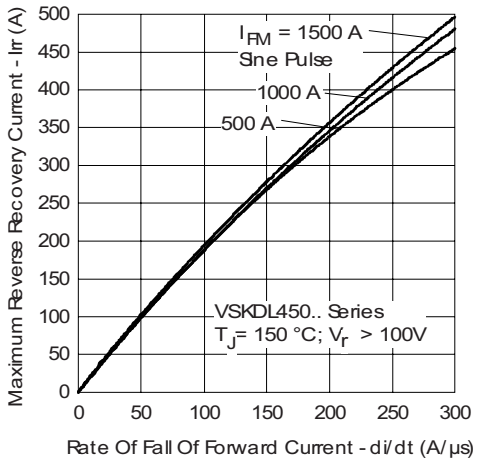


Fig. 11 - Recovery Current Characteristics

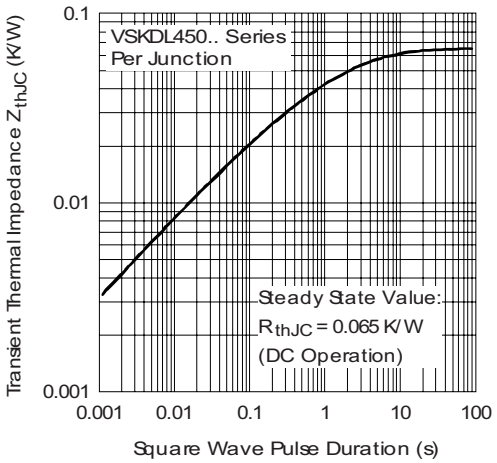


Fig. 13 - Thermal Impedance Z_{thJC} Characteristics

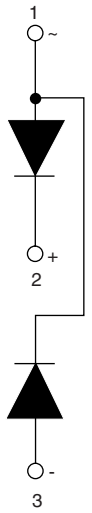
ORDERING INFORMATION TABLE

Device code

VSK	D	L	450	-	25	S20
1	2	3	4		5	6

1 - Module type
2 - Circuit configuration D = 2 diodes in series
3 - Fast recovery
4 - Current rating
5 - Voltage code x 100 = V_{RRM} (see Voltage Ratings table)
6 - t_{rr} code (see Recovery Characteristics table)

CIRCUIT CONFIGURATION



LINKS TO RELATED DOCUMENTS	
Dimensions	http://www.vishay.com/doc?95088

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