

Thyristor/Diode and Thyristor/Thyristor (SUPER MAGN-A-PAK Power Modules), 430 A



SUPER MAGN-A-PAK

FEATURES

- High current capability
- High surge capability
- High voltage ratings up to 2000 V
- 3000 V_{RMS} isolating voltage with non-toxic substrate
- Industrial standard package
- UL approved file E78996 
- Compliant to RoHS directive 2002/95/EC



RoHS
COMPLIANT

TYPICAL APPLICATIONS

- Motor starters
- DC motor controls - AC motor controls
- Uninterruptable power supplies
- Wind mill

PRODUCT SUMMARY

$I_{T(AV)}$	430 A
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MAJOR RATINGS AND CHARACTERISTICS

SYMBOL	CHARACTERISTICS	VALUES	UNITS
$I_{T(AV)}$	82 °C	430	A
$I_{T(RMS)}$		675	A
	T_C	82	°C
I_{TSM}	50 Hz	15.7	kA
	60 Hz	16.4	
I^2t	50 Hz	1232	kA ² s
	60 Hz	1125	
$I^2\sqrt{t}$		12 320	kA ² √s
V_{RRM}	Range	1600 to 2000	V
T_J	Range	- 40 to 150	°C
T_{Stg}		- 40 to 130	

ELECTRICAL SPECIFICATIONS

VOLTAGE RATINGS

TYPE NUMBER	VOLTAGE CODE	V_{RRM}/V_{DRM} , MAXIMUM REPETITIVE PEAK REVERSE VOLTAGE V	V_{RSM} , MAXIMUM NON-REPETITIVE PEAK REVERSE VOLTAGE V	I_{RRM}/I_{DRM} MAXIMUM AT $T_J = T_J$ MAXIMUM mA
VSK.430..	16	1600	1700	100
	18	1800	1900	
	20	2000	2100	

ON-STATE CONDUCTION							
PARAMETER	SYMBOL	TEST CONDITIONS			VALUES	UNITS	
Maximum average on-state current at case temperature	$I_{T(AV)}$, $I_{F(AV)}$	180° conduction, half sine wave			430	A	
					82	°C	
Maximum RMS on-state current	$I_{T(RMS)}$	180° conduction, half sine wave at $T_C = 82\text{ °C}$			675	A	
Maximum peak, one-cycle, non-repetitive surge current	I_{TSM} , I_{FSM}	t = 10 ms	No voltage reapplied	Sinusoidal half wave, initial $T_J = T_J$ maximum	15.7	kA	
		t = 8.3 ms			16.4		
		t = 10 ms	100 % V_{RRM} reapplied		13.2		kA ² s
		t = 8.3 ms			13.8		
Maximum I^2t for fusing	I^2t	t = 10 ms	No voltage reapplied		1232	kA ² s	
		t = 8.3 ms			1125		
		t = 10 ms	100 % V_{RRM} reapplied		871		kA ² √s
		t = 8.3 ms			795		
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	t = 0.1 ms to 10 ms, no voltage reapplied			12 320	kA ² √s	
Low level value of threshold voltage	$V_{F(TO)1}$	(16.7 % × π × $I_{T(AV)}$ < I < π × $I_{T(AV)}$), $T_J = T_J$ maximum			0.96	V	
High level value of threshold voltage	$V_{F(TO)2}$	(I > π × $I_{T(AV)}$), $T_J = T_J$ maximum			1.06		
Low level value of on-state slope resistance	r_{f1}	(16.7 % × π × $I_{T(AV)}$ < I < π × $I_{T(AV)}$), $T_J = T_J$ maximum			0.51	mΩ	
High level value of on-state slope resistance	r_{f2}	(I > π × $I_{T(AV)}$), $T_J = T_J$ maximum			0.45		
Maximum on-state voltage drop	V_{TM}	$I_{pk} = 1500\text{ A}$, $T_J = 25\text{ °C}$, $t_p = 10\text{ ms}$ sine pulse			1.65	V	
Maximum forward voltage drop	V_{FM}	$I_{pk} = 1500\text{ A}$, $T_J = 25\text{ °C}$, $t_p = 10\text{ ms}$ sine pulse			1.65	V	
Maximum holding current	I_H	$T_J = 25\text{ °C}$, anode supply 12 V resistive load			500	mA	
Typical latching current	I_L				1000		

SWITCHING				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum rate of rise of turned-on current	di/dt	T _J = T _J maximum, I _{TM} = 400 A, V _{DRM} applied	1000	A/μs
Typical delay time	t _d	Gate current 1 A, di _g /dt = 1 A/μs V _d = 0.67 % V _{DRM} , T _J = 25 °C	2.0	μs
Typical turn-off time	t _q	I _{TM} = 750 A, T _J = T _J maximum, di/dt = - 60 A/μs V _R = 50, dV/dt = 20 V/μs, Gate 0 V 100 Ω	200	

BLOCKING					
PARAMETER	SYMBOL	TEST CONDITIONS			VALUES UNITS
Maximum critical rate of rise of off-state voltage	dV/dt	$T_J = 130\text{ °C}$, linear to $V_D = 80\% V_{DRM}$			1000 V/μs
RMS insulation voltage	V_{INS}	$t = 1\text{ s}$			3000 V
Maximum peak reverse and off-state leakage current	I_{RRM} , I_{DRM}	$T_J = T_J$ maximum, rated V_{DRM}/V_{RRM} applied			100 mA



THERMAL AND MECHANICAL SPECIFICATIONS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum junction operating temperature range	T_J		- 40 to 130	°C
Maximum storage temperature range	T_{Stg}		- 40 to 150	
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 $\pm 10\%$	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
	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

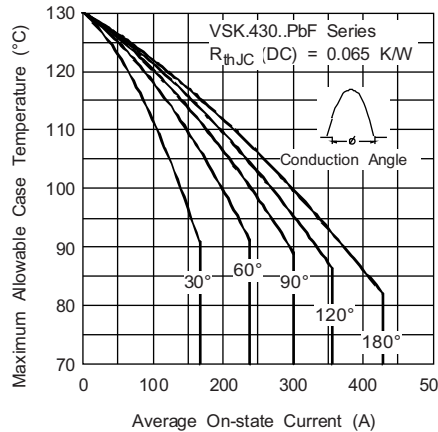


Fig. 1 - Current Ratings Characteristics

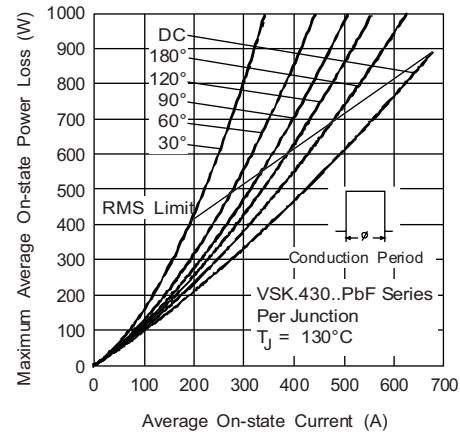


Fig. 4 - On-State Power Loss Characteristics

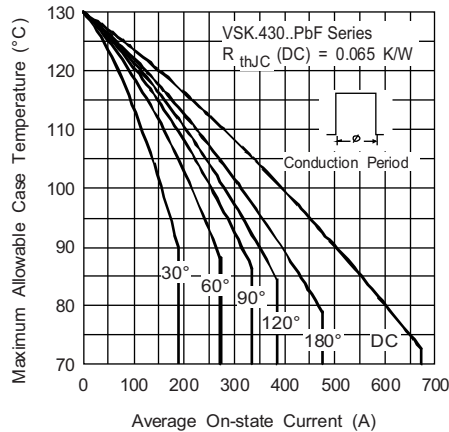


Fig. 2 - Current Ratings Characteristics

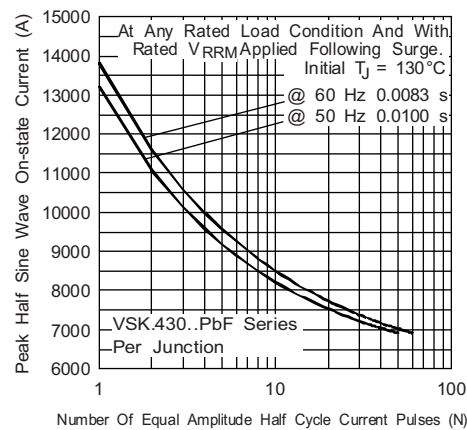


Fig. 5 - Maximum Non-Repetitive Surge Current

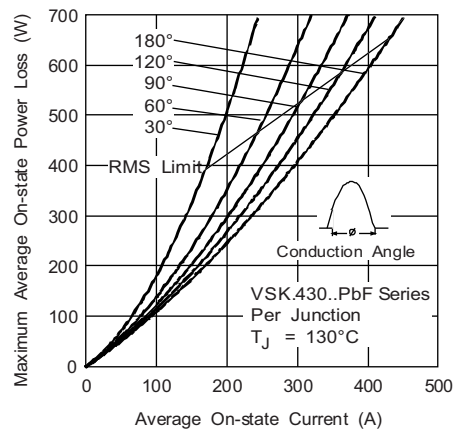


Fig. 3 - On-State Power Loss Characteristics

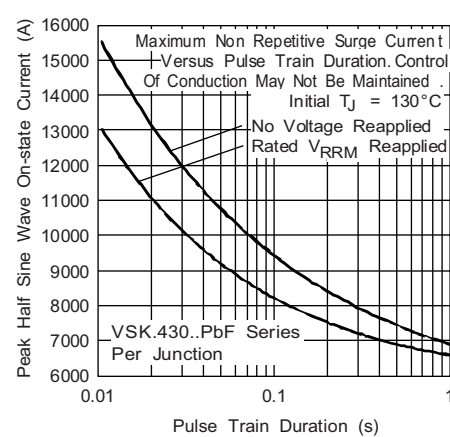


Fig. 6 - Maximum Non-Repetitive Surge Current

Thyristor/Diode and Thyristor/Thyristor Vishay Semiconductors
(SUPER MAGN-A-PAK Power Modules), 430 A

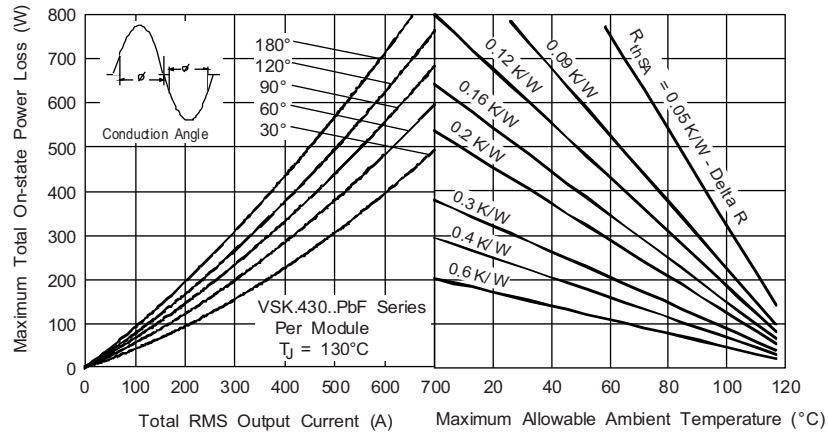


Fig. 7 - On-State Power Loss Characteristics

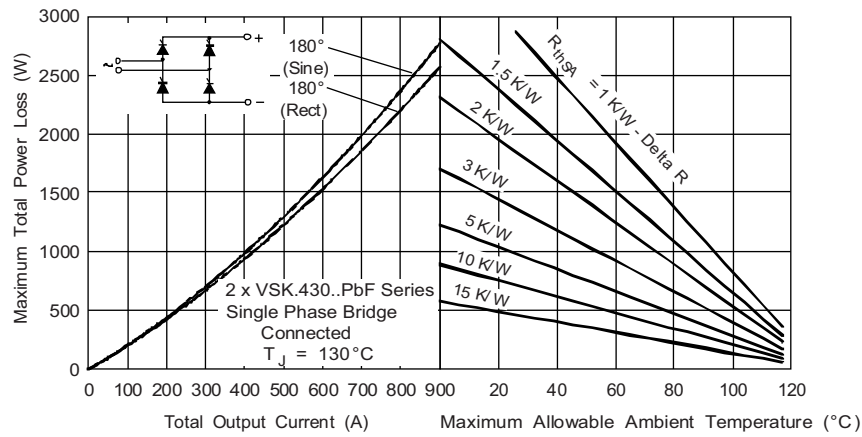


Fig. 8 - On-State Power Loss Characteristics

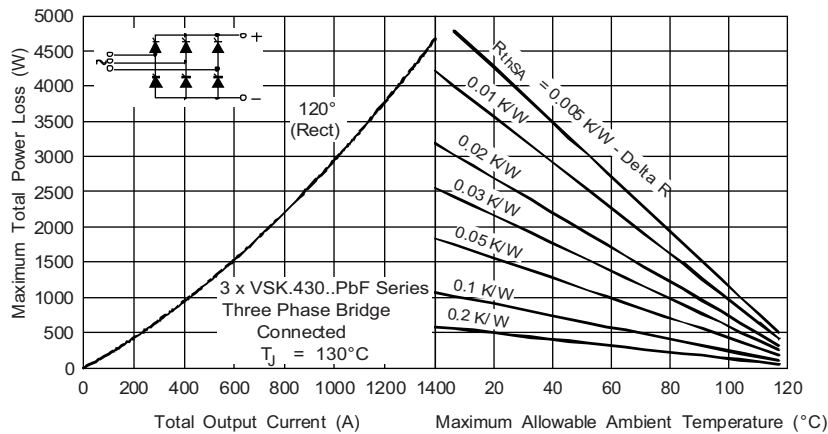


Fig. 9 - On-State Power Loss Characteristics

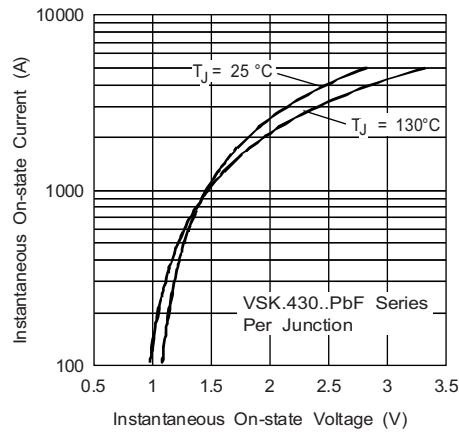


Fig. 10 - On-State Voltage Drop Characteristics

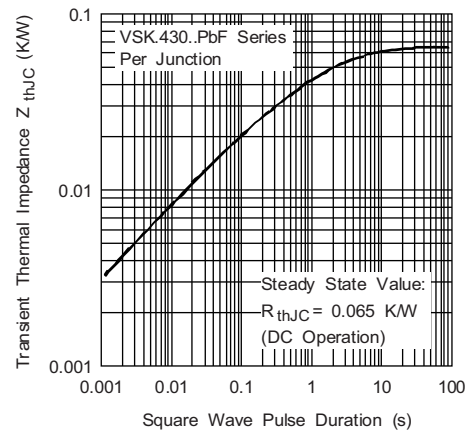


Fig. 11 - Thermal Impedance Z_{thJC} Characteristics

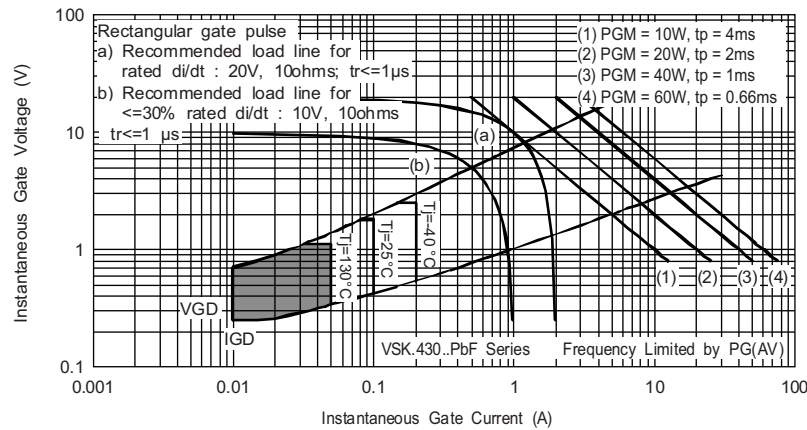


Fig. 12 - Gate Characteristics

ORDERING INFORMATION TABLE

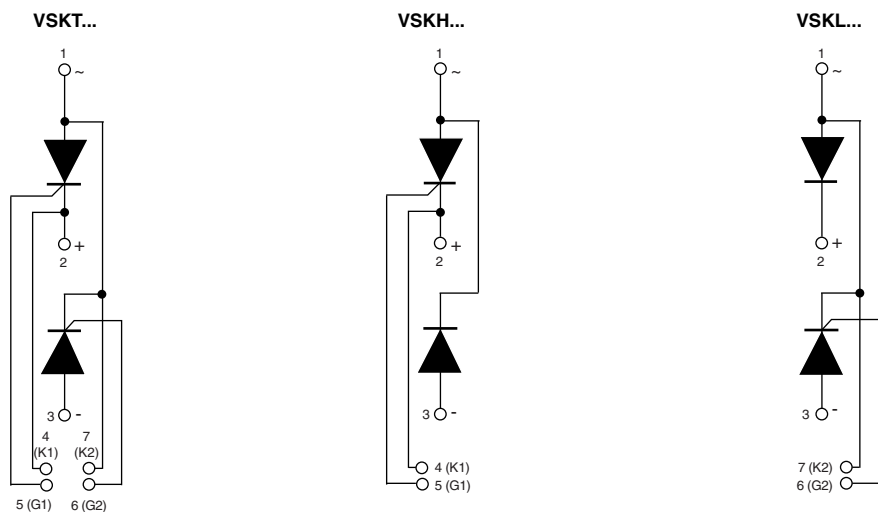
Device code	VSK	T	430	-	20	PbF
	1	2	3		4	5
	1	2	3		4	5
	1	2	3		4	5
	1	2	3		4	5
	1	2	3		4	5

1 - Module type
2 - Circuit configuration (see end of datasheet)
3 - Current rating
4 - Voltage code x 100 = V_{RRM} (see Voltage Ratings table)
5 - Lead (Pb)-free

Note

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

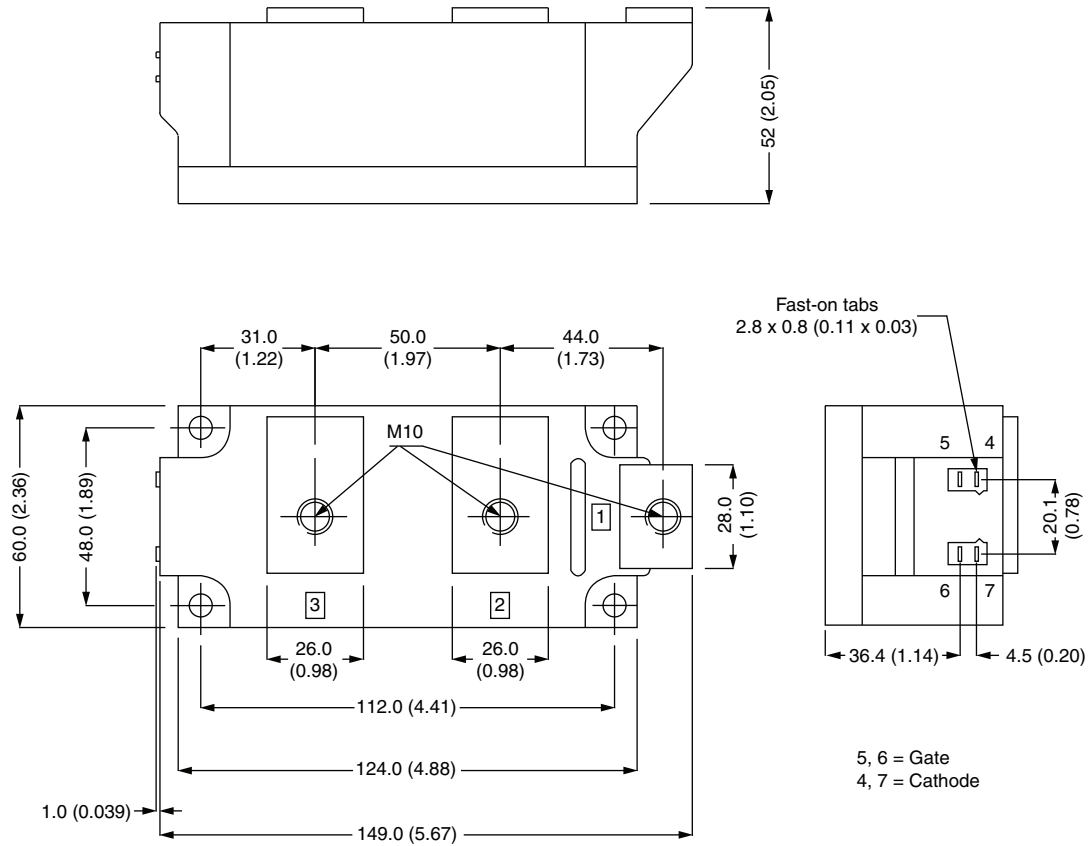
CIRCUIT CONFIGURATION



LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95283

Super MAGN-A-PAK Thyristor/Diode

DIMENSIONS in millimeters (inches)





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