

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



SUPER MAGN-A-PAK

### FEATURES

- High current capability
- High surge capability
- High voltage ratings up to 2000 V
- 3000 V<sub>RMS</sub> isolating voltage with non-toxic substrate
- Industrial standard package
- UL approved file E78996
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS  
COMPLIANT**

### TYPICAL APPLICATIONS

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

### PRODUCT SUMMARY

$I_{T(AV)}$	430 A
Type	Modules - Thyristor
Package	SMAP
Circuit	Two SCRs doubler circuit

### MAJOR RATINGS AND CHARACTERISTICS

SYMBOL	CHARACTERISTICS	VALUES	UNITS
$I_{T(AV)}$		430	A
	$T_C$	82	°C
$I_{T(RMS)}$		675	A
	$T_C$	82	°C
$I_{TSM}$	50 Hz	15.7	kA
	60 Hz	16.4	
$I^2t$	50 Hz	1232	kA <sup>2</sup> s
	60 Hz	1125	
$I^2\sqrt{t}$		12 320	kA <sup>2</sup> √s
$V_{RRM}$	Range	1600 to 2000	V
$T_J$	Range	- 40 to 150	°C
$T_{Stg}$	Range	- 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 t = 8.3 ms	No voltage reapplied	15.7	kA
				t = 10 ms t = 8.3 ms	
		Sinusoidal half wave, initial $T_J = T_J$ maximum	13.2		
			13.8		
Maximum $I^2t$ for fusing	$I^2t$	t = 10 ms t = 8.3 ms	No voltage reapplied	1232	kA <sup>2</sup> s
				t = 10 ms t = 8.3 ms	
		871			
		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 <sup>2</sup> √s
Low level value of threshold voltage	$V_{F(TO)1}$	$(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)})$ , $T_J = T_J$ maximum		0.96	V
High level value of threshold voltage	$V_{F(TO)2}$	$(I > \pi \times I_{T(AV)})$ , $T_J = T_J$ maximum		1.06	
Low level value of on-state slope resistance	$r_{f1}$	$(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)})$ , $T_J = T_J$ maximum		0.51	mΩ
High level value of on-state slope resistance	$r_{f2}$	$(I > \pi \times I_{T(AV)})$ , $T_J = T_J$ 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, $I_{TM} = 400\text{ A}$ , $V_{DRM}$ applied		1000	A/μs
Typical delay time	$t_d$	Gate current 1 A, $di_g/dt = 1\text{ A}/\mu\text{s}$ $V_d = 0.67\% V_{DRM}$ , $T_J = 25\text{ °C}$		2.0	μs
Typical turn-off time	$t_q$	$I_{TM} = 750\text{ A}$ , $T_J = T_J$ maximum, $di/dt = -60\text{ A}/\mu\text{s}$ $V_R = 50$ , $dV/dt = 20\text{ V}/\mu\text{s}$ , 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 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	

$\Delta R_{thJC}$ 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

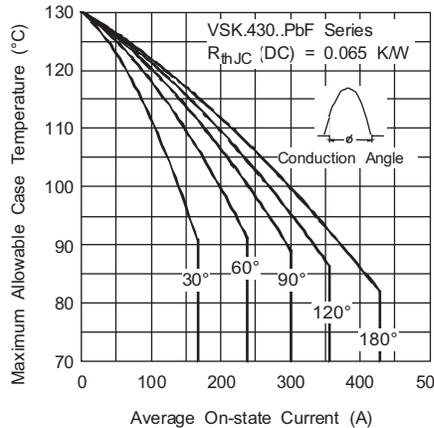


Fig. 1 - Current Ratings Characteristics

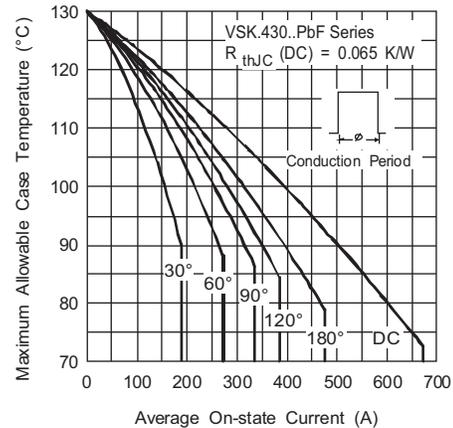


Fig. 2 - Current Ratings Characteristics

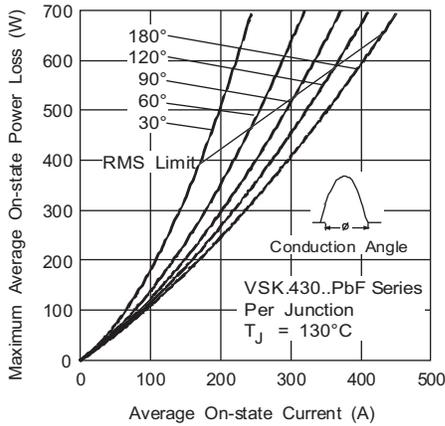


Fig. 3 - On-State Power Loss Characteristics

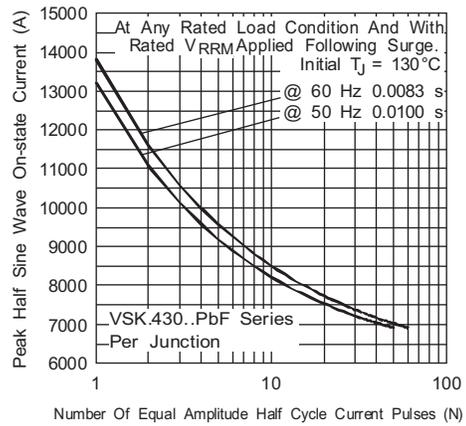


Fig. 5 - Maximum Non-Repetitive Surge Current

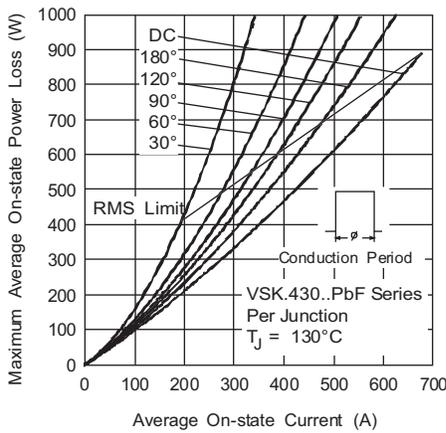


Fig. 4 - On-State Power Loss Characteristics

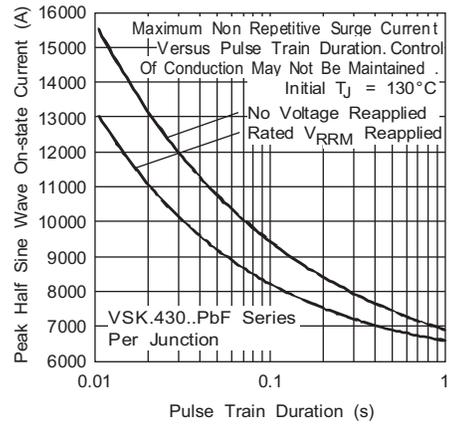


Fig. 6 - Maximum Non-Repetitive Surge Current

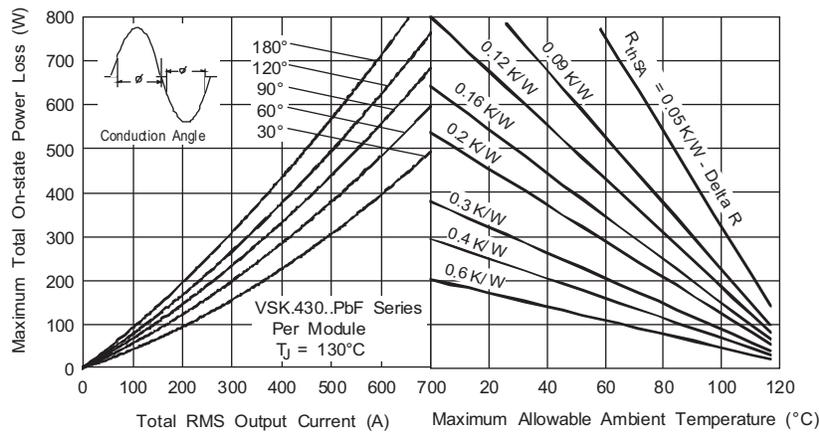


Fig. 7 - On-State Power Loss Characteristics

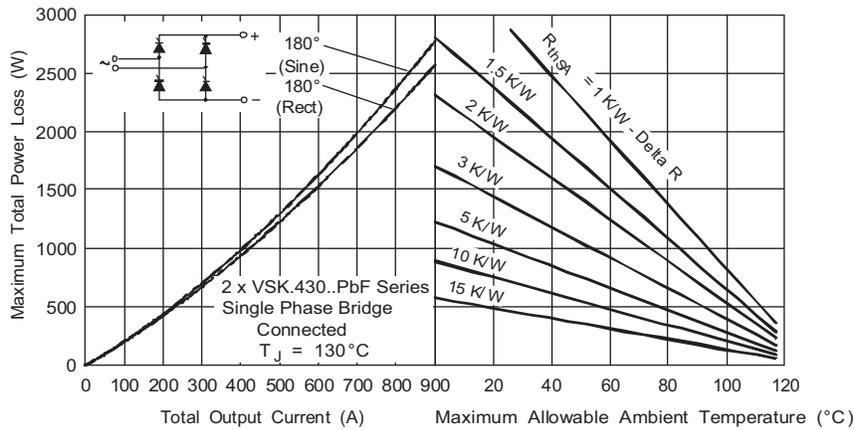


Fig. 8 - On-State Power Loss Characteristics

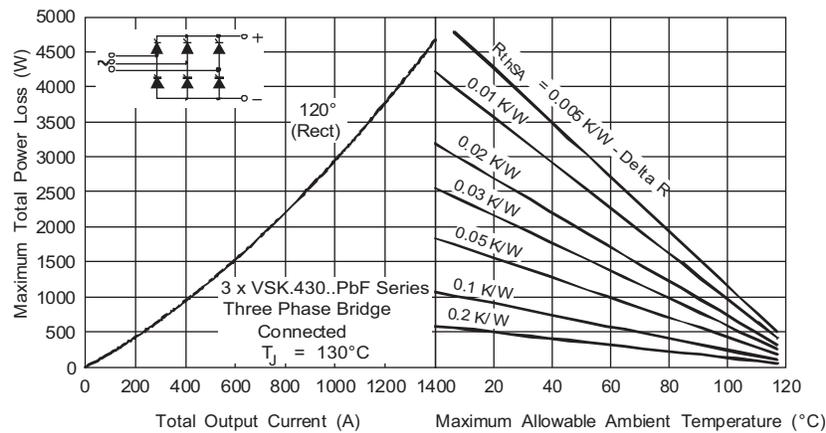


Fig. 9 - On-State Power Loss Characteristics

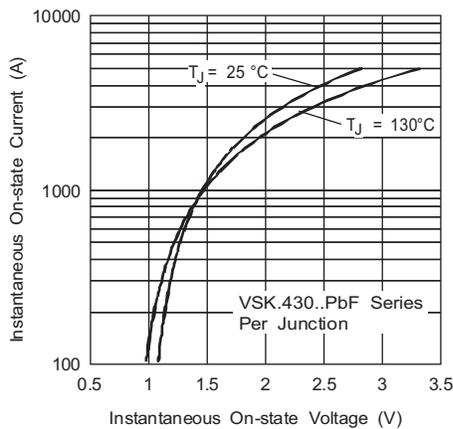


Fig. 10 - On-State Voltage Drop Characteristics

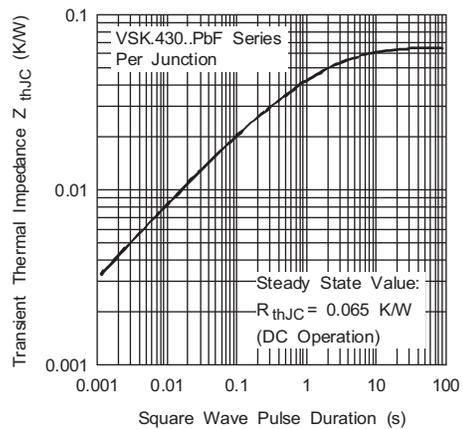


Fig. 11 - Thermal Impedance  $Z_{thJC}$  Characteristics

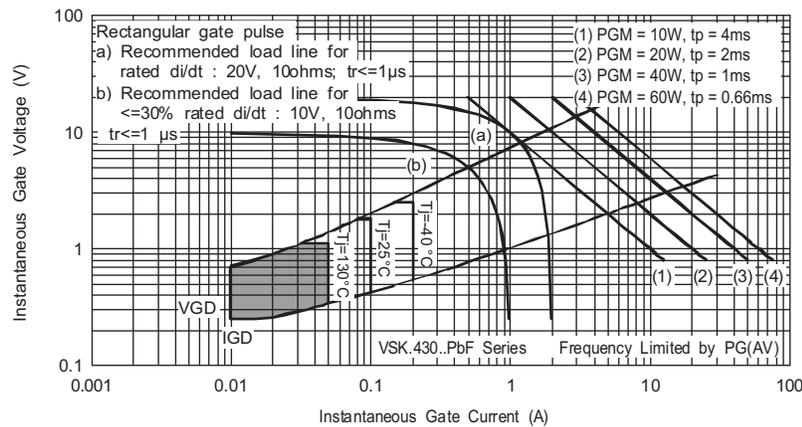


Fig. 12 - Gate Characteristics

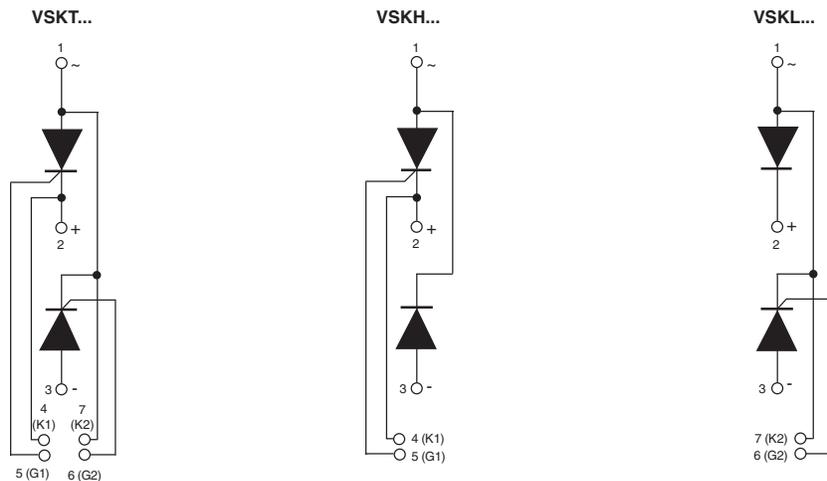
**ORDERING INFORMATION TABLE**

Device code	<b>VSK</b>	<b>T</b>	<b>430</b>	<b>-</b>	<b>20</b>	<b>PbF</b>
	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](http://www.vishay.com/doc?95172)

**CIRCUIT CONFIGURATION**

**LINKS TO RELATED DOCUMENTS**

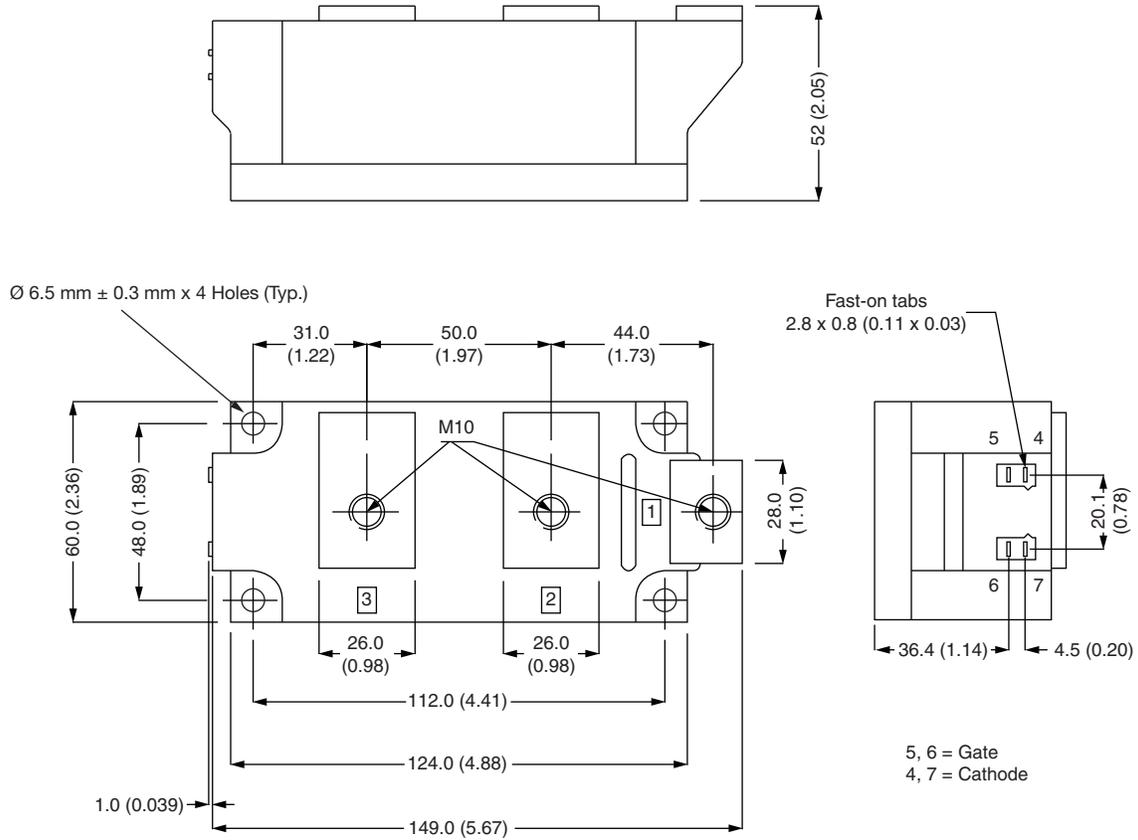
Dimensions

[www.vishay.com/doc?95283](http://www.vishay.com/doc?95283)



## Super MAGN-A-PAK Thyristor/Diode

**DIMENSIONS** in millimeters (inches)





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