


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 
- Material categorization: For definitions of compliance please see 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, Standard
Package	SMAP
Circuit	Two SCRs doubler circuit

MAJOR RATINGS AND CHARACTERISTICS

SYMBOL	CHARACTERISTICS	VALUES	UNITS
$I_{T(AV)}$	$T_C = 82\text{ }^{\circ}\text{C}$	430	A
$I_{T(RMS)}$	$T_C = 82\text{ }^{\circ}\text{C}$	675	
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 \sqrt{s}
V_{RRM}	Range	1600 to 2000	V
T_J	Range	- 40 to 150	$^{\circ}\text{C}$
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	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		
		t = 8.3 ms			1125		
		t = 10 ms	100 % V_{RRM} reapplied		871		
		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 % x π x $I_{T(AV)}) < I < \pi$ x $I_{T(AV)}$, $T_J = T_J$ maximum			0.96	V	
High level value of threshold voltage	$V_{F(TO)2}$	(I > π x $I_{T(AV)}$), $T_J = T_J$ maximum			1.06		
Low level value of on-state slope resistance	r_{f1}	(16.7 % x π x $I_{T(AV)}) < I < \pi$ x $I_{T(AV)}$, $T_J = T_J$ maximum			0.51	mΩ	
High level value of on-state slope resistance	r_{f2}	(I > π x $I_{T(AV)}$), $T_J = T_J$ 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, $di_g/dt = 1\text{ A/μs}$ $V_d = 0.67\% V_{DRM}$, $T_J = 25\text{ °C}$	2.0	μs
Typical turn-off time	t_q	$I_{TM} = 750\text{ A}$, $T_J = T_J$ maximum, $di/dt = -60\text{ A/μs}$ $V_R = 50$, $dV/dt = 20\text{ V/μs}$, 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

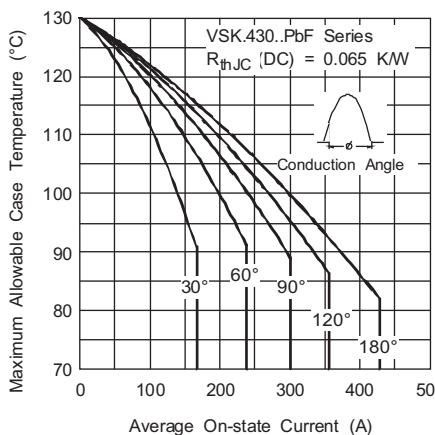


Fig. 1 - Current Ratings Characteristics

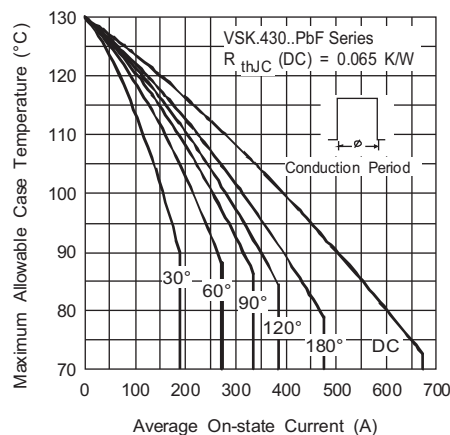


Fig. 2 - Current Ratings Characteristics

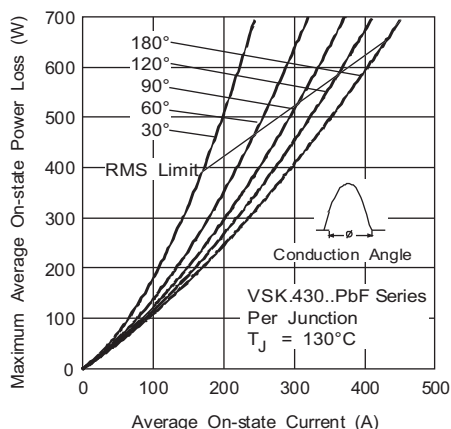


Fig. 3 - On-State Power Loss Characteristics

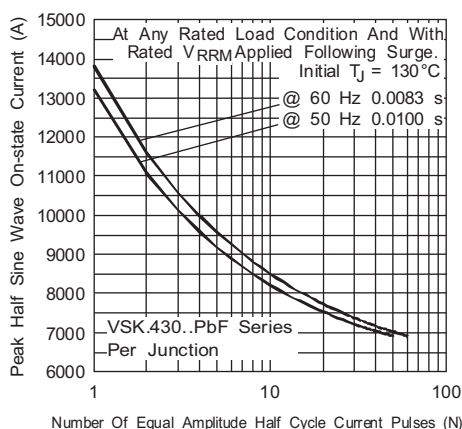


Fig. 5 - Maximum Non-Repetitive Surge Current

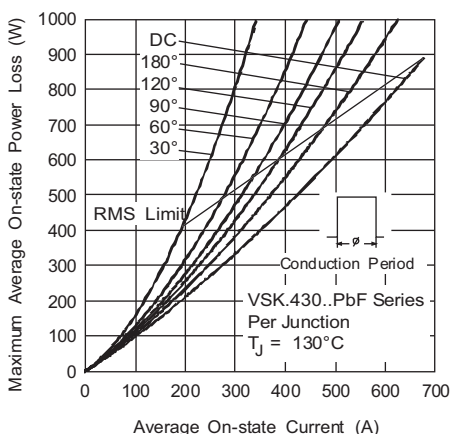


Fig. 4 - On-State Power Loss Characteristics

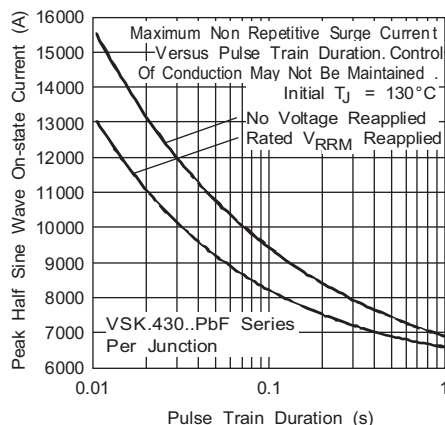


Fig. 6 - Maximum Non-Repetitive Surge Current

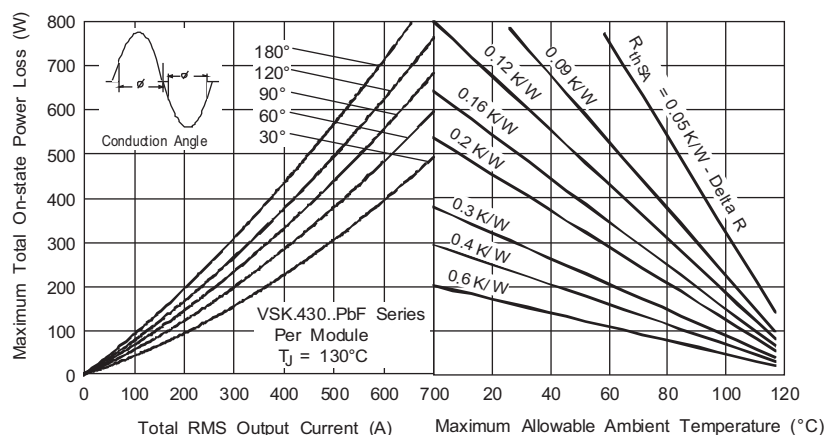


Fig. 7 - On-State Power Loss Characteristics

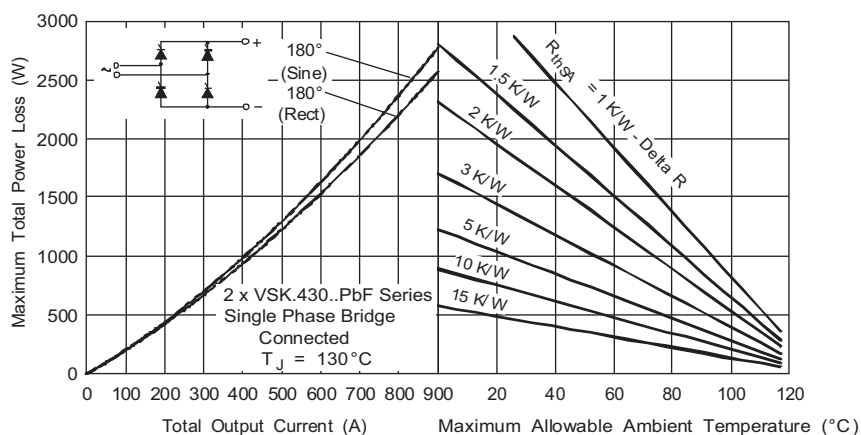


Fig. 8 - On-State Power Loss Characteristics

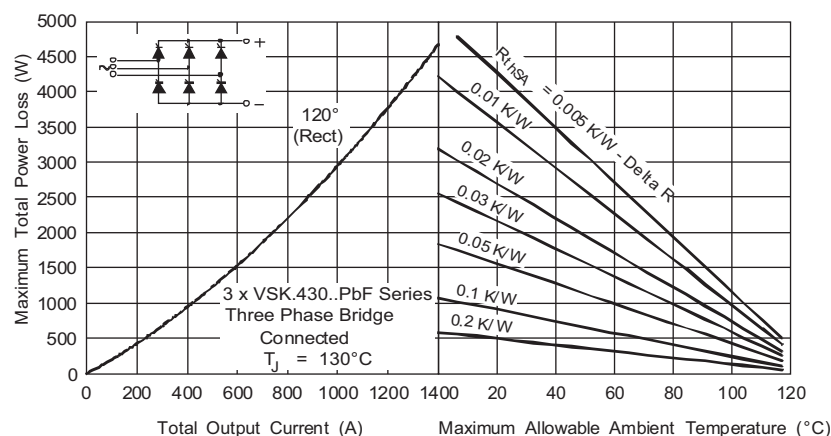


Fig. 9 - On-State Power Loss Characteristics

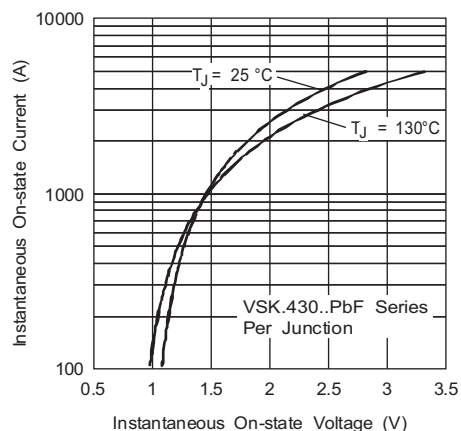
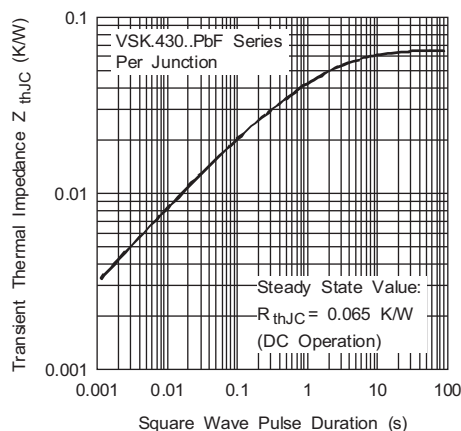


Fig. 10 - On-State Voltage Drop Characteristics


Fig. 11 - Thermal Impedance Z_{thJC} Characteristics

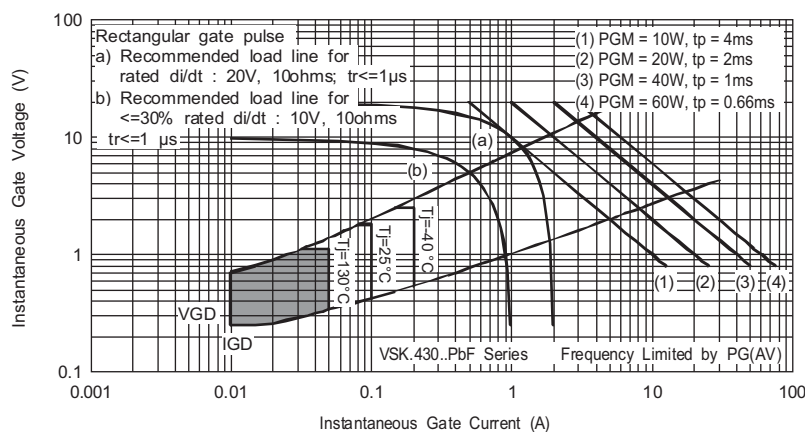


Fig. 12 - Gate Characteristics

ORDERING INFORMATION TABLE

Device code

VSK	T	430	-	20	PbF
------------	----------	------------	----------	-----------	------------

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

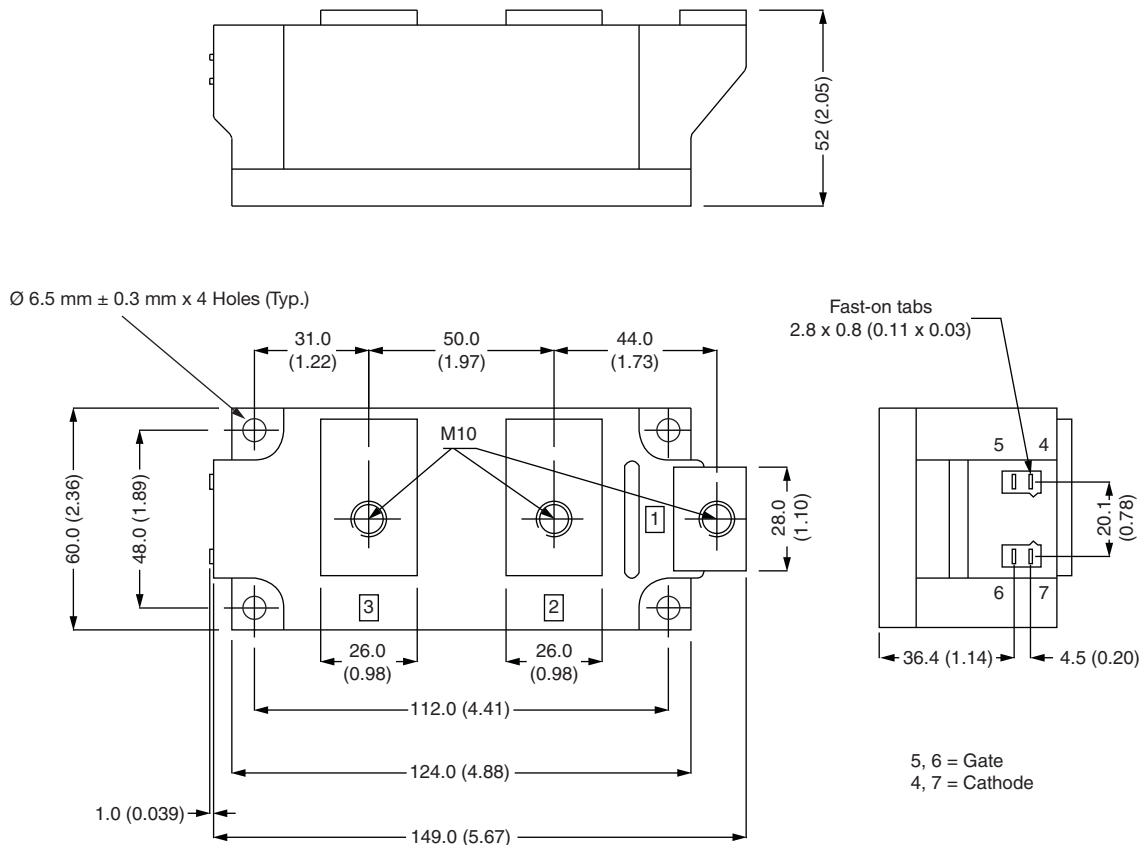
- To order the optional hardware go to www.vishay.com/doc?95172

Circuit Configuration		
Circuit Description	Circuit Configuration Code	Circuit Drawing
Two SCRs doubler circuit	T	<div> <p>VSKT...</p> <p>5 (G1) 6 (G2)</p> </div> <div> <p>VSKH...</p> <p>4 (K1) 5 (G1)</p> </div> <div> <p>VSKL...</p> <p>7 (K2) 6 (G2)</p> </div>

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

Super MAGN-A-PAK Thyristor/Diode

DIMENSIONS in millimeters (inches)





Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and/or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.

Material Category Policy

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.

Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as Halogen-Free follow Halogen-Free requirements as per JEDEC JS709A standards. Please note that some Vishay documentation may still make reference to the IEC 61249-2-21 definition. We confirm that all the products identified as being compliant to IEC 61249-2-21 conform to JEDEC JS709A standards.