



Thyristor / Diode and Thyristor / Thyristor (Super MAGN-A-PAK Power Modules), 500 A



Super MAGN-A-PAK

FEATURES

- High current capability
- High surge capability
- Industrial standard package
- 3000 V_{RMS} isolating voltage with non-toxic substrate
- UL approved file E78996 
- Designed and qualified for industrial level
- 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

PRODUCT SUMMARY

$I_{T(AV)}$, $I_{F(AV)}$	500 A
Type	Modules - thyristor, standard
Package	Super MAGN-A-PAK
Circuit configuration	Two SCRs doubler circuit, SCR / diode doubler circuit, positive control, SCR / diode doubler circuit, negative control

MAJOR RATINGS AND CHARACTERISTICS

SYMBOL	CHARACTERISTICS	VALUES	UNITS
$I_{T(AV)}$, $I_{F(AV)}$	$T_C = 82\text{ }^{\circ}\text{C}$	500	A
$I_{T(RMS)}$	$T_C = 82\text{ }^{\circ}\text{C}$	785	A
I_{TSM}	50 Hz	17.8	kA
	60 Hz	18.7	
I^2t	50 Hz	1591	kA ² s
	60 Hz	1452	
$I^2\sqrt{t}$		15 910	kA ² √s
V_{RRM}	Range	800 to 1600	V
T_{Stg}	Range	-40 to +150	$^{\circ}\text{C}$
T_J	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
VS-VSK.500	08	800	900	100
	12	1200	1300	
	14	1400	1500	
	16	1600	1700	

**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			500	A	
					82	°C	
Maximum RMS on-state current	I _{T(RMS)}	180° conduction, half sine wave at T _C = 82 °C			785	A	
Maximum peak, one-cycle, non-repetitive on-state surge current	I _{TSM} , I _{FSM}	t = 10 ms	No voltage reapplied	Sinusoidal half wave, initial T _J = T _J maximum	17.8	kA	
		t = 8.3 ms			18.7		
		t = 10 ms	100 % V _{RRM} reapplied		15.0		kA ² s
		t = 8.3 ms			15.7		
Maximum I ² t for fusing	I ² t	t = 10 ms	No voltage reapplied		1591		
		t = 8.3 ms			1452		
		t = 10 ms	100 % V _{RRM} reapplied		1125		
		t = 8.3 ms			1027		
Maximum I ² √t for fusing	I ² √t	t = 0.1 ms to 10 ms, no voltage reapplied			15 910	kA ² √s	
Low level value or threshold voltage	V _{T(TO)1}	(16.7 % × π × I _{T(AV)}) < I < π × I _{T(AV)} , T _J = T _J maximum			0.85	V	
High level value of threshold voltage	V _{T(TO)2}	(I > π × I _{T(AV)}), T _J = T _J maximum			0.93		
Low level value on-state slope resistance	r _{t1}	(16.7 % × π × I _{T(AV)}) < I < π × I _{T(AV)} , T _J = T _J maximum			0.36	mΩ	
High level value on-state slope resistance	r _{t2}	(I > π × I _{T(AV)}), T _J = T _J maximum			0.32		
Maximum on-state voltage drop	V _{TM}	I _{pk} = 1500 A, T _J = 25 °C, t _p = 10 ms sine pulse			1.50	V	
Maximum forward voltage drop	V _{FM}	I _{pk} = 1500 A, T _J = 25 °C, t _p = 10 ms sine pulse			1.50	V	
Maximum holding current	I _H	T _J = 25 °C, anode supply 12 V resistive load			500	mA	
Maximum 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, $di/dt = -60\text{ A/μs}$, $V_R = 50\text{ V}$, $dV/dt = 20\text{ V/μs}$, 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

**TRIGGERING**

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum peak gate power	P_{GM}	$T_J = T_J$ maximum, $t_p \leq 5$ ms	10	W
Maximum peak average gate power	$P_{G(AV)}$	$T_J = T_J$ maximum, $f = 50$ Hz, $d\% = 50$	2.0	
Maximum peak positive gate current	$+I_{GM}$	$T_J = T_J$ maximum, $t_p \leq 5$ ms	3.0	A
Maximum peak positive gate voltage	$+V_{GM}$		20	
Maximum peak negative gate voltage	$-V_{GM}$		5.0	
Maximum DC gate current required to trigger	I_{GT}	$T_J = 25$ °C, V_{ak} 12 V	200	mA
DC gate voltage required to trigger	V_{GT}		3.0	
DC gate current not to trigger	I_{GD}	$T_J = T_J$ maximum	10	mA
DC gate voltage not to trigger	V_{GD}		0.25	V

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 per module	R_{thC-hs}	Mounting surface smooth, flat and greased	0.02	
Mounting torque ± 10 %	Super MAGN-A-PAK 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 Super MAGN-A-PAK		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

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

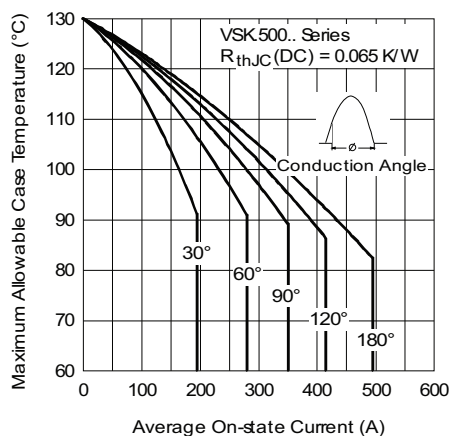


Fig. 1 - Current Ratings Characteristics

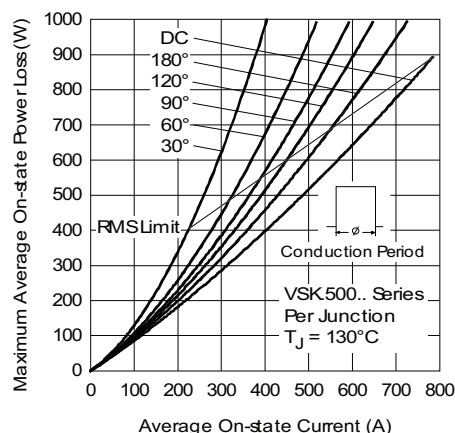


Fig. 4 - On-State Power Loss Characteristics

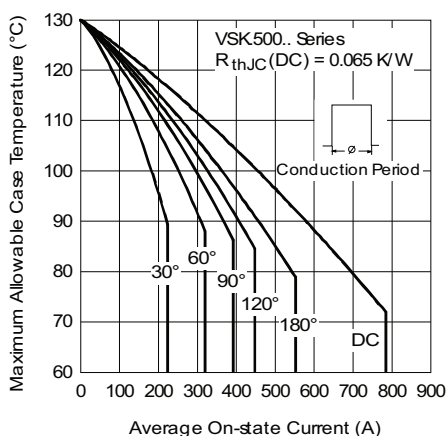


Fig. 2 - Current Ratings Characteristics

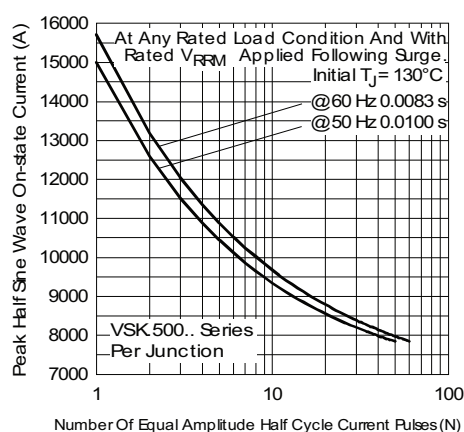


Fig. 5 - Maximum Non-Repetitive Surge Current

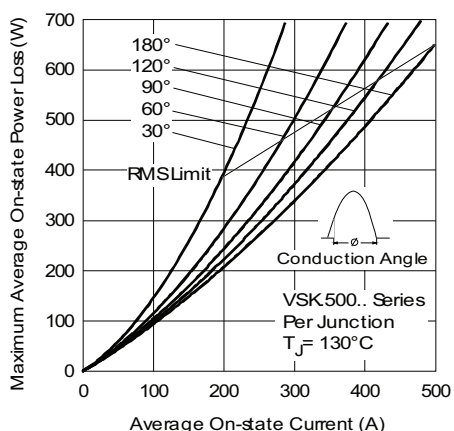


Fig. 3 - On-State Power Loss Characteristics

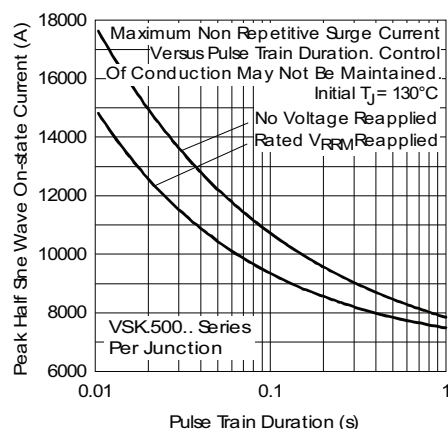


Fig. 6 - Maximum Non-Repetitive Surge Current

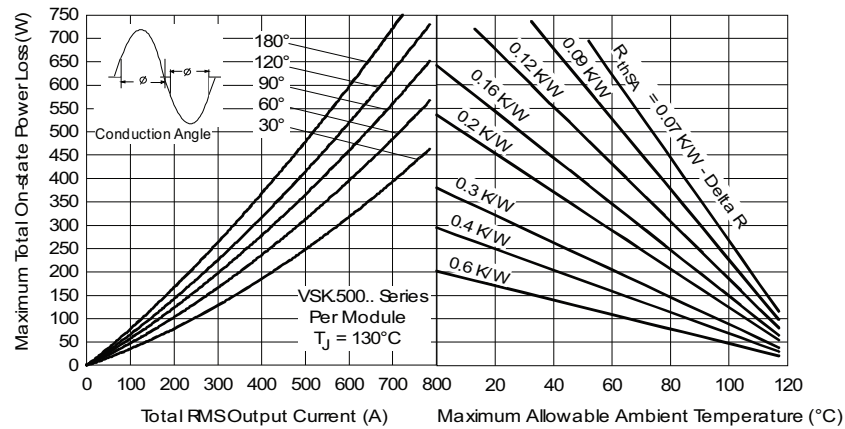


Fig. 7 - On-State Power Loss Characteristics

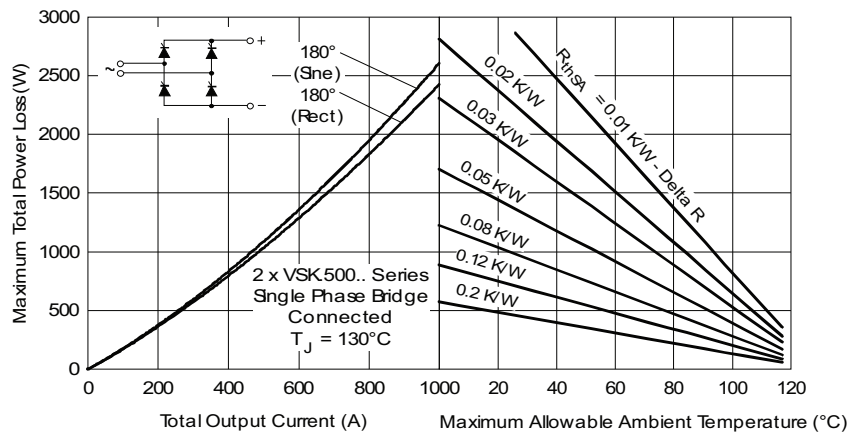


Fig. 8 - On-State Power Loss Characteristics

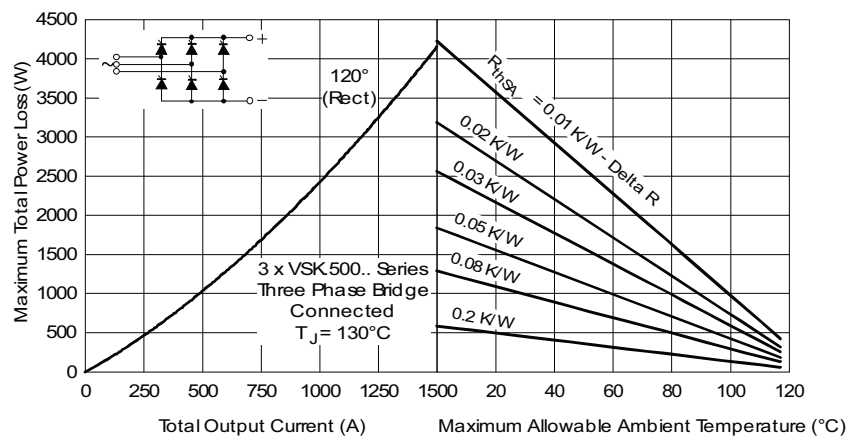


Fig. 9 - On-State Power Loss Characteristics

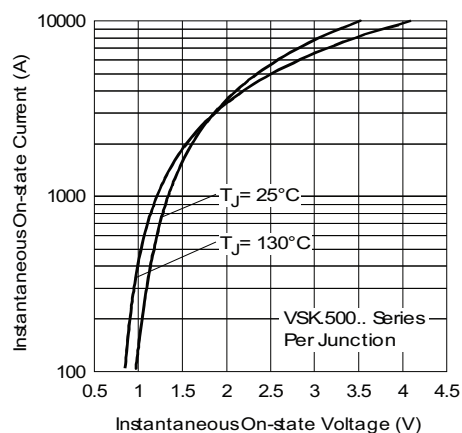


Fig. 10 - On-State Voltage Drop Characteristics

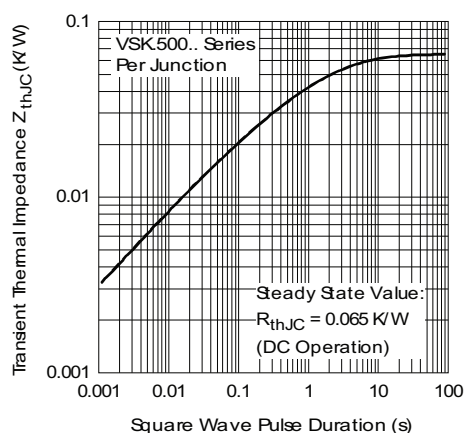


Fig. 11 - Thermal Impedance Z_{thJC} Characteristics

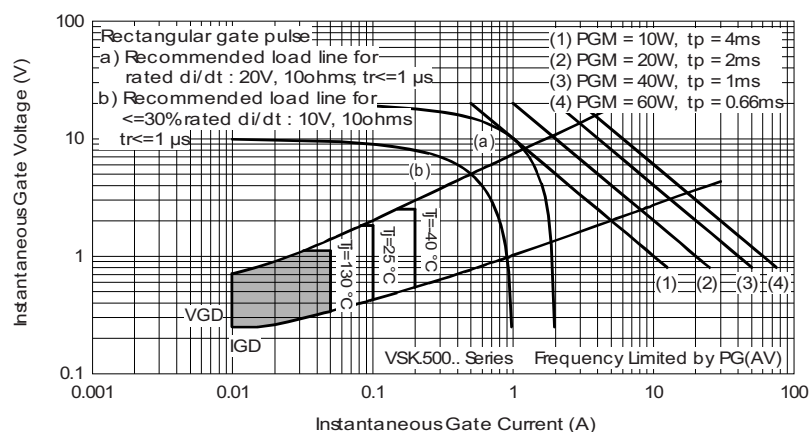


Fig. 12 - Gate Characteristics

ORDERING INFORMATION TABLE

Device code	VS-VS	KT	500	-	16	PbF
	①	②	③		④	⑤

- 1** - Vishay Semiconductors product
- 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	KT	
SCR / diode doubler circuit, positive control	KH	
SCR / diode doubler circuit, negative control	KL	

LINKS TO RELATED DOCUMENTS

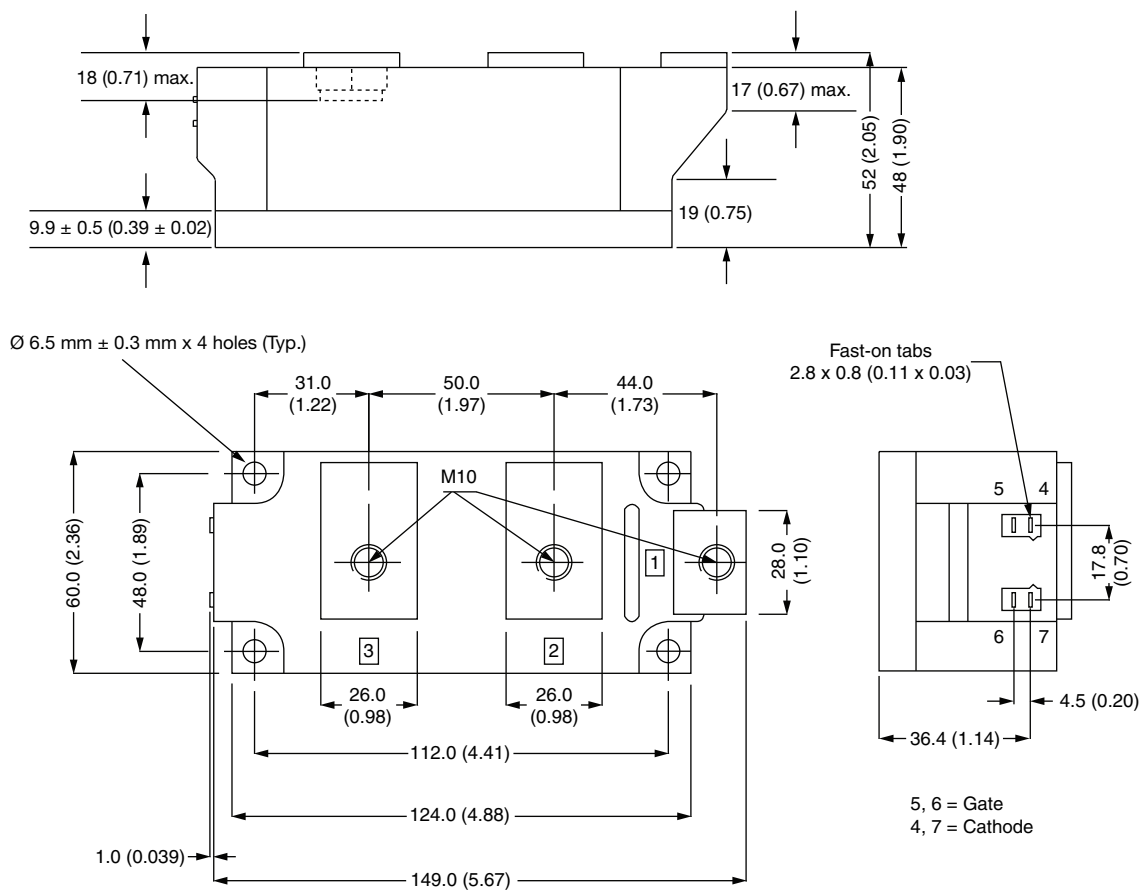
Dimensions

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.