



Single Thyristor (MAGN-A-PAK Block Power Module), 500 A



MAGN-A-PAK Block

FEATURES

- Electrically isolated base plate
- 3000 V_{RMS} isolating voltage
- Industrial standard package
- Simplified mechanical designs, rapid assembly
- High surge capability
- Large creepage distances
- UL approved file E78996 
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

RoHS
COMPLIANT

PRIMARY CHARACTERISTICS

$I_{T(AV)}$	500 A
Type	Modules - thyristor, standard
Package	MAGN-A-PAK block

APPLICATIONS

- Battery chargers
- Welders
- Power converters
- Alternators

MAJOR RATINGS AND CHARACTERISTICS

SYMBOL	CHARACTERISTICS	VALUES	UNITS
V_{DRM}/V_{RRM}		800	V
$I_{T(AV)}$	76 °C	500	A
$I_{T(RMS)}$		785	
I_{TSM}	50 Hz	14 000	
	60 Hz	14 658	
I^2t	50 Hz	980	kA ² s
	60 Hz	894	
$I^2\sqrt{t}$		9800	kA ² √s
T_J	Range	-40 to +130	°C

ELECTRICAL SPECIFICATIONS

VOLTAGE RATINGS

TYPE NUMBER	V_{RRM}/V_{DRM} , MAXIMUM REPETITIVE PEAK REVERSE VOLTAGE V	V_{RSM}/V_{DSM} , MAXIMUM NON-REPETITIVE PEAK REVERSE VOLTAGE V	I_{RRM}/I_{DRM} AT 130 °C mA
VS-VSKS500/08PbF	800	900	80

**ON-STATE CONDUCTION**

PARAMETER	SYMBOL	TEST CONDITIONS			VALUES	UNITS	
Maximum average on-state current at case temperature	I _{T(AV)}	180° conduction half sine wave			500	A	
					76	°C	
Maximum RMS on-state current	I _{T(RMS)}	As AC switch			785	A	
Maximum peak, one-cycle on-state, non-repetitive surge current	I _{TSM}	t = 10 ms	No voltage reapplied	Sine half wave, initial T _J = T _J maximum	16 646		
		t = 8.3 ms			17 430		
		t = 10 ms	100 % V _{RRM} reapplied		14 000		
		t = 8.3 ms			14 658		
Maximum I ² t for fusing	I ² t	t = 10 ms	No voltage reapplied		1385	kA ² s	
		t = 8.3 ms			1265		
		t = 10 ms	100 % V _{RRM} reapplied		894		
		t = 8.3 ms			894		
Maximum I ² √t for fusing	I ² √t	t = 0.1 ms to 10 ms, no voltage reapplied			1385	kA ² /s	
Low level value of threshold voltage	V _{T(TO)1}	(16.7 % × π × I _{T(AV)} < I < π × I _{T(AV)}), T _J maximum			0.6839	V	
High level value of threshold voltage	V _{T(TO)2}	(I > π × I _{T(AV)}), T _J maximum			0.7598		
Low level value on-state slope resistance	r _{t1}	(16.7 % × π × I _{T(AV)} < I < π × I _{T(AV)}), T _J maximum			0.393	mΩ	
High level value on-state slope resistance	r _{t2}	(I > π × I _{T(AV)}), T _J maximum			0.389		
Maximum on-state voltage drop	V _{TM}	T _J = 25 °C, I _{pk} = 500 A			1.1	V	

SWITCHING

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Typical delay time	t_d	Gate current 1 A, $di_g/dt = 1\text{ A}/\mu\text{s}$, $V_d = 0.67 \% V_{DRM}$, $T_J = 25\text{ °C}$, $I_t = 400\text{ A}$	1.3	μs
Typical turn-off time	t_q	$I_{TM} = 750\text{ A}$, $T_J = T_J$ maximum, $di/dt = 60\text{ A}/\mu\text{s}$, $V_R = 50\text{ V}$, $dV/dt = 20\text{ V}/\mu\text{s}$, Gate 0 V 100 Ω, $t_p = 500\text{ μs}$	200	

BLOCKING

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum critical rate of rise of off-state voltage	dV/dt	$T_J = T_J$ maximum linear to 67 % rated V_{DRM}	500	V/μs
Maximum peak reverse and off-state leakage current	I_{DRM} , I_{RRM}	$T_J = T_J$ maximum, rated V_{DRM}/V_{RRM} applied	80	mA
RMS insulation voltage	V_{INS}	50 Hz, circuit to base, all terminal shorted, t = 1 s	3000	V



TRIGGERING				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum peak gate power	P_{GM}	$T_J = T_J$ maximum, $t_p \leq 5$ ms	10.0	W
Maximum 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 required DC gate voltage to trigger	V_{GT}	$T_J = T_J$ maximum, $T_J = 25$ °C Anode supply: 12 V resistive load	3	V
Maximum required DC gate current to trigger	I_{GT}		200	mA
Maximum holding current	I_H		600	
Maximum peak positive gate voltage	$+V_{GM}$	$T_J = T_J$ maximum, $t_p \leq 5$ ms	20	V
Maximum peak negative gate voltage	$-V_{GM}$		5.0	
DC gate voltage not to trigger	V_{GD}	$T_J = T_J$ maximum Maximum gate current/voltage not to trigger is the maximum value which will not trigger any unit with rated V_{DRM} anode to cathode applied	0.30	V
DC gate current not to trigger	I_{GD}		10	mA
Maximum non-repetitive rate of rise of turned-on current	di/dt	Gate drive 20 V, 20 Ω , $t_r \leq 1$ μ s $T_J = T_J$ maximum, anode voltage ≤ 80 % V_{DRM} , $I_t = 400$ A	1000	A/ μ s

THERMAL AND MECHANICAL SPECIFICATIONS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum junction operating and storage temperature range	T_J, T_{Stg}		-40 to +130	°C
Maximum thermal resistance, junction to case per junction	R_{thJC}	DC operation	0.08	K/W
Maximum thermal resistance, case to heatsink per module	R_{thCS}	Mounting surface smooth, flat and greased	0.035	
Mounting torque ± 10 %	MAGN-A-PAK block to heatsink busbar to MAGN-A-PAK block	A mounting compound is recommended and the torque should be rechecked after a period of 3 h to allow for the spread of the compound. Lubricated threads.	6 to 8	Nm
			12 to 15	
Approximate weight			430	g
			15.3	oz.
Case style			MAGN-A-PAK block	

ΔR CONDUCTION PER JUNCTION											
DEVICES	SINUSOIDAL CONDUCTION AT T _J MAXIMUM					RECTANGULAR CONDUCTION AT T _J MAXIMUM					UNITS
	180°	120°	90°	60°	30°	180°	120°	90°	60°	30°	
VS-VSKS500	0.013	0.0148	0.018	0.026	0.044	0.082	0.0142	0.019	0.027	0.044	K/W

Note

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

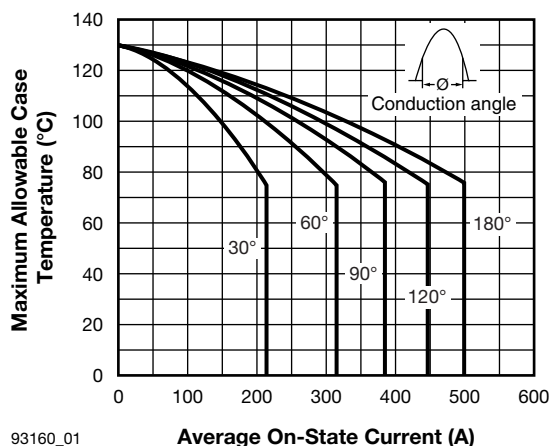


Fig. 1 - Current Rating Characteristics

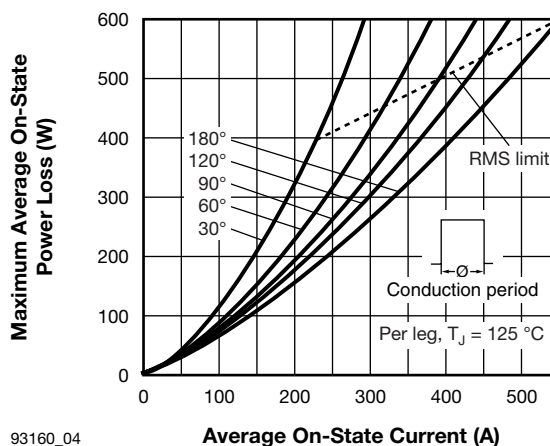


Fig. 4 - On-State Power Loss Characteristics

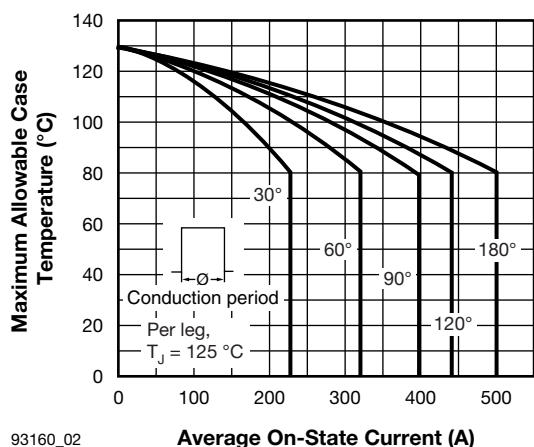


Fig. 2 - Current Rating Characteristics

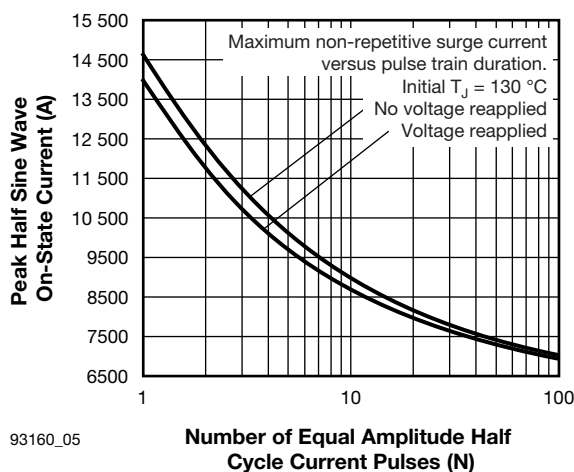


Fig. 5 - Maximum Non-Repetitive Surge Current

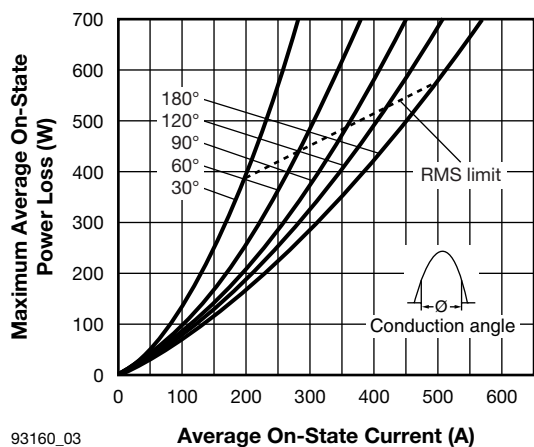


Fig. 3 - On-State Power Loss Characteristics

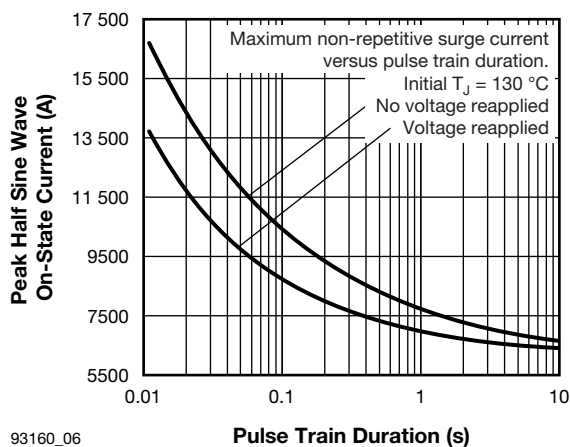


Fig. 6 - Maximum Non-Repetitive Surge Current

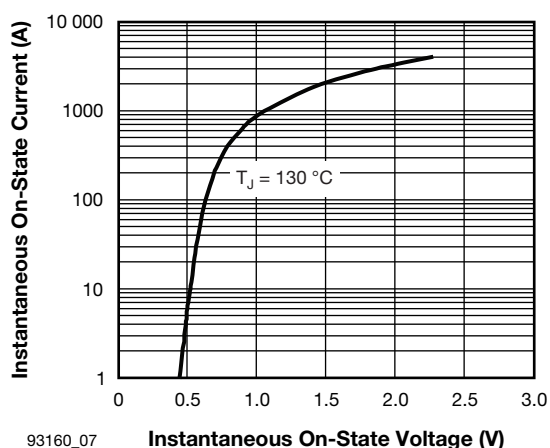
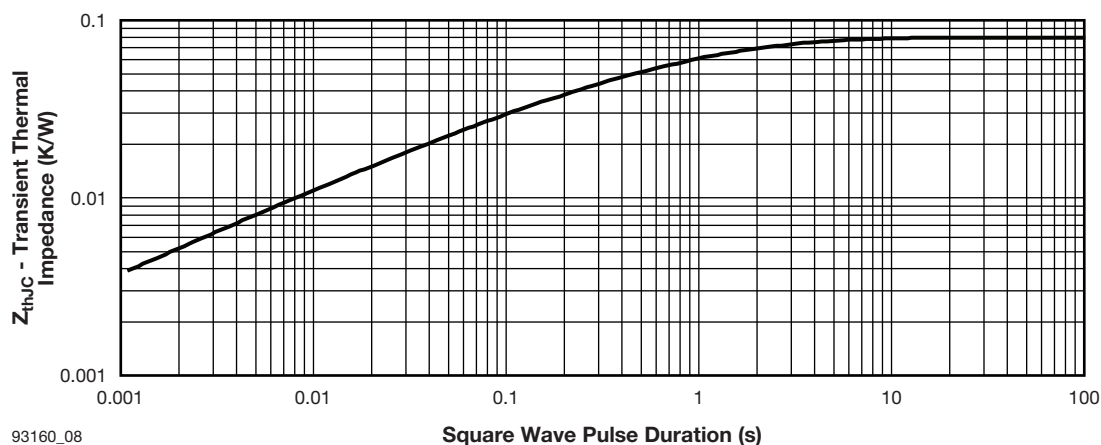


Fig. 7 - On-State Voltage Drop Characteristics

Fig. 8 - Thermal Impedance Z_{thJC} Characteristics**ORDERING INFORMATION TABLE**

Device code	VS-	VSK	S	500	/	08	PbF
	1	2	3	4		5	6

- 1** - Vishay Semiconductors product
- 2** - Module type
- 3** - Circuit configuration (S = single SCR)
- 4** - Current rating (500 = 500 A)
- 5** - Voltage rating (08 = 800 V)
- 6** - PbF = lead (Pb)-free

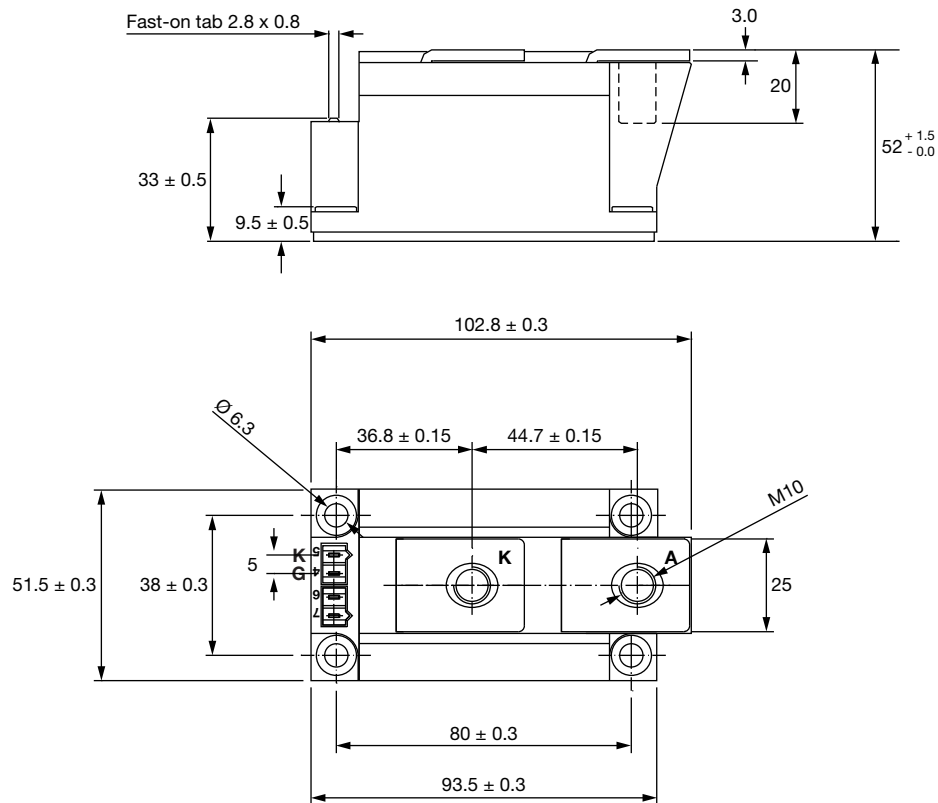


CIRCUIT CONFIGURATION	
CIRCUIT DESCRIPTION	CIRCUIT DRAWING
Single SCR	

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95379

Thyristor MAP Block

DIMENSIONS in millimeters



Notes

- Dimensions are nominal
- Full engineering drawings are available on request



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