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

APPLICATIONS

- Battery chargers
- Welders
- Power converters
- Alternators

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

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^2s
	60 Hz	894	
$I^2\sqrt{t}$		9800	$kA^2\sqrt{s}$
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

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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^2t for fusing	I^2t	t = 10 ms	No voltage reapplied		1385	kA^2s
		t = 8.3 ms			1265	
		t = 10 ms	100 % V_{RRM} reapplied		894	
		t = 8.3 ms			894	
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	t = 0.1 ms to 10 ms, no voltage reapplied			1385	$kA^2\sqrt{s}$
Low level value of threshold voltage	$V_{T(TO)1}$	(16.7 % x π x $I_{T(AV)}$ < I < π x $I_{T(AV)}$), T_J maximum			0.6839	V
High level value of threshold voltage	$V_{T(TO)2}$	(I > π x $I_{T(AV)}$), T_J maximum			0.7598	
Low level value on-state slope resistance	r_{t1}	(16.7 % x π x $I_{T(AV)}$ < I < π x $I_{T(AV)}$), T_J maximum			0.393	mΩ
High level value on-state slope resistance	r_{t2}	(I > π x $I_{T(AV)}$), 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 A/µs, V_d = 0.67 % V_{DRM}, T_J = 25 °C, I_t = 400 A	1.3	µs
Typical turn-off time	t_q	I_{TM} = 750 A, $T_J = T_J$ maximum, dI/dt = 60 A/µs, V_R = 50 V, dV/dt = 20 V/µs, Gate 0 V 100 Ω, t_p = 500 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

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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 = 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, $t_r \leq 1$ µs $T_J = T_J$ maximum, anode voltage ≤ 80 % V_{DRM}, I_t = 400 A	1000	A/µs

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		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
Mounting torque ± 10 % busbar to MAGN-A-PAK block			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

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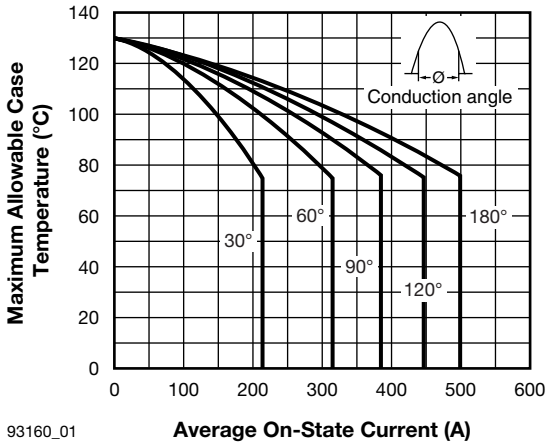


Fig. 1 - Current Rating Characteristics

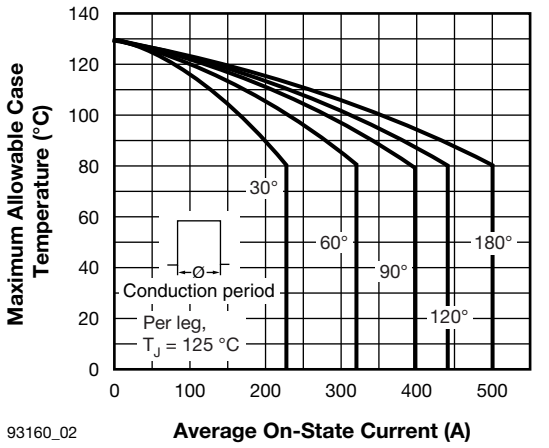


Fig. 2 - Current Rating Characteristics

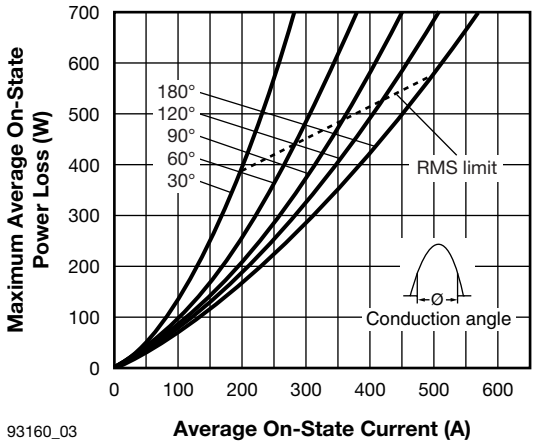


Fig. 3 - On-State Power Loss Characteristics

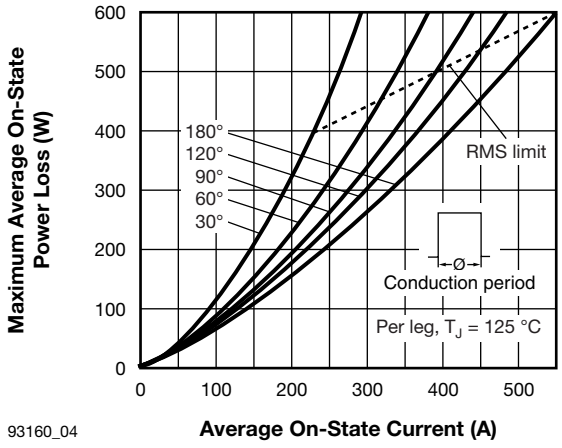


Fig. 4 - On-State Power Loss Characteristics

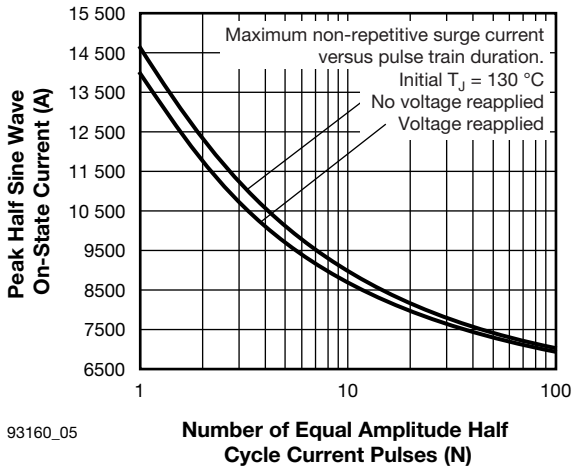


Fig. 5 - Maximum Non-Repetitive Surge Current

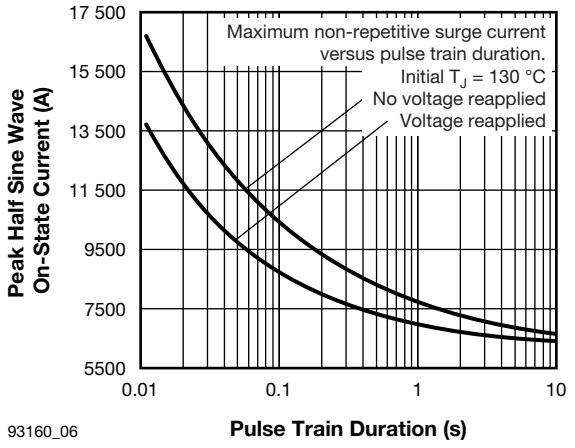


Fig. 6 - Maximum Non-Repetitive Surge Current

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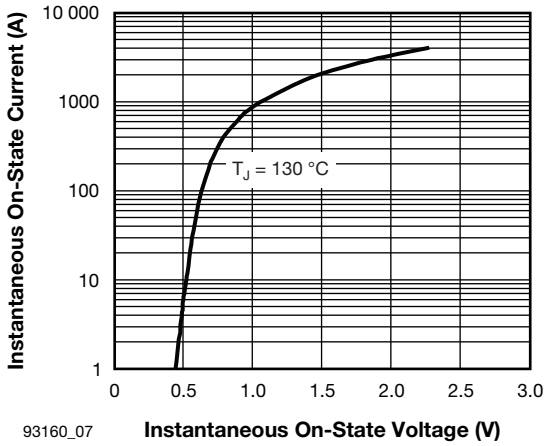


Fig. 7 - On-State Voltage Drop Characteristics

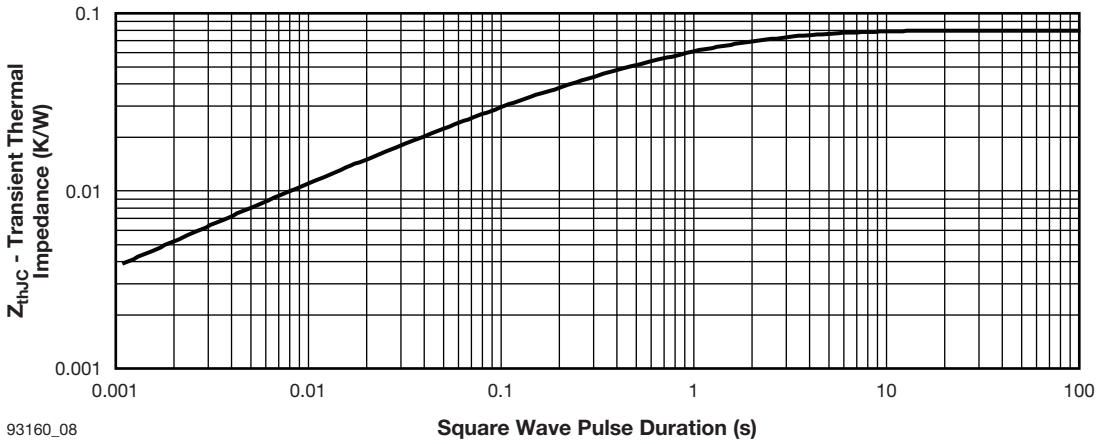


Fig. 8 - Thermal Impedance Z_{thJC} Characteristics

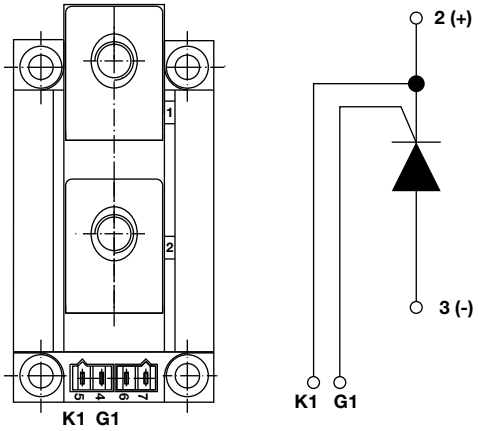
ORDERING INFORMATION TABLE

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

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CIRCUIT CONFIGURATION	
CIRCUIT DESCRIPTION	**CIRCUIT DRAWING**
Single SCR	

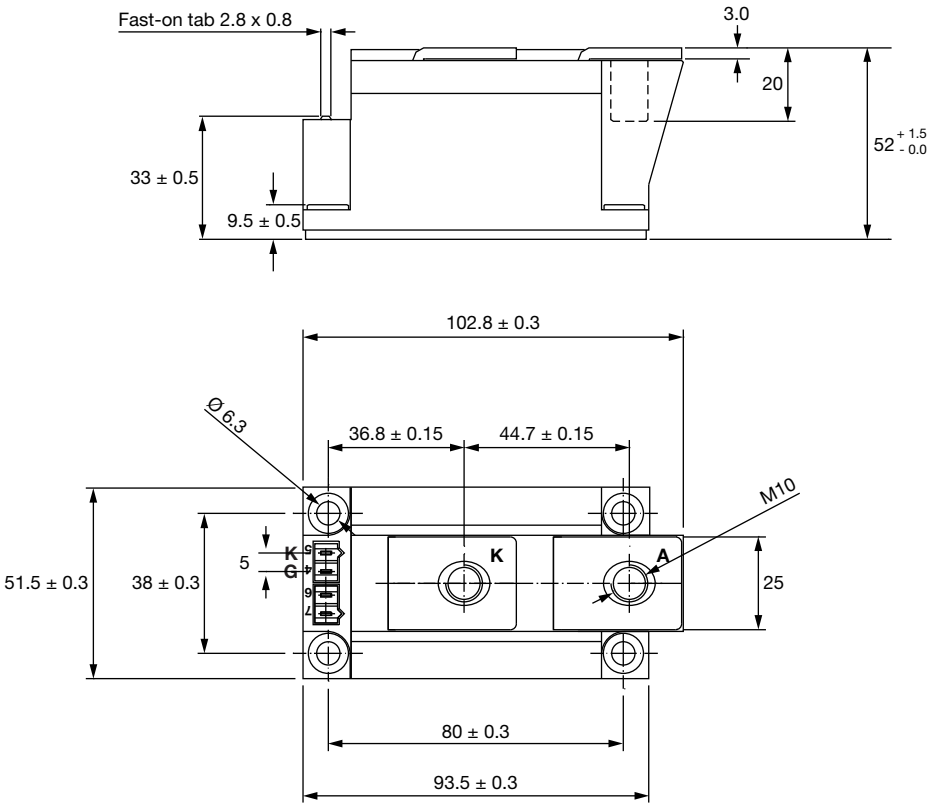
LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95379

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Thyristor MAP Block

DIMENSIONS in millimeters



Notes

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

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