

SCR/SCR and SCR/Diode (MAGN-A-PAK Power Modules), 230 A



MAGN-A-PAK

PRIMARY CHARACTERISTICS					
I _{T(AV)}	230 A				
Туре	Modules - thyristor, standard				
Package	MAGN-A-PAK				

FEATURES

- · High voltage
- · Electrically isolated base plate
- 3500 V_{RMS} isolating voltage
- · Industrial standard package
- · Simplified mechanical designs, rapid assembly
- High surge capability
- Large creepage distances
- UL approved file E78996
- Designed and qualified for industrial level
- Material categorization: for definitions of compliance please see <u>www.vishav.com/doc?99912</u>

DESCRIPTION

This VSK series of MAGN-A-PAK modules uses high voltage power thyristor/thyristor and thyristor/diode in seven basic configurations. The semiconductors are electrically isolated from the metal base, allowing common heatsinks and compact assemblies to be built. They can be interconnected to form single phase or three phase bridges or as AC-switches when modules are connected in anti-parallel mode. These modules are intended for general purpose applications such as battery chargers, welders, motor drives, UPS, etc.

MAJOR RATINGS AND CHARACTERISTICS							
SYMBOL	CHARACTERISTICS VALUES		UNITS				
I _{T(AV)}	85 °C	230					
I _{T(RMS)}		510	A				
1	50 Hz	7500	A				
I _{TSM}	60 Hz	7850					
l ² t	50 Hz	280	kA ² s				
I - 1	60 Hz	260	KA2S				
l ² √t		280	kA²√s				
V _{DRM} /V _{RRM}		800 to 2000	V				
T _J	Range	-40 to +130	°C				

ELECTRICAL SPECIFICATIONS

VOLTAGE RATINGS								
TYPE NUMBER	VOLTAGE CODE	V _{RRM} /V _{DRM} , MAXIMUM REPETITIVE PEAK REVERSE AND OFF-STATE BLOCKING VOLTAGE V	V _{RSM} , MAXIMUM NON-REPETITIVE PEAK REVERSE VOLTAGE V	I _{RRM} /I _{DRM} AT 130 °C MAXIMUM mA				
	08	800	900					
	12	1200	1300					
VS-VSK.230-	16	1600	1700	50				
	18	1800	1900					
	20	2000	2100					



ON-STATE CONDUCTION						
PARAMETER	SYMBOL		TEST CONDITIONS			UNITS
Maximum average on-state current	I _{T(AV)}	180° conductio	on, half sine wave		230	Α
at case temperature	, ,	100 Conductio	on, nan sine wave	•	85	°C
Maximum RMS on-state current	I _{T(RMS)}	As AC switch			510	
		t = 10 ms	No voltage		7500	
Maximum peak, one-cycle on-state		t = 8.3 ms	reapplied		7850	Α
non-repetitive, surge current	I _{TSM}	t = 10 ms	100 % V _{RRM}	Sinusoidal	6300	
		t = 8.3 ms	reapplied	half wave,	6600	
Maximum I ² t for fusing		t = 10 ms	No voltage	initial	280	- kA ² s
	l ² t	t = 8.3 ms	reapplied	$T_J = T_J$ maximum	256	
		t = 10 ms	100 % V _{RRM}		198	
		t = 8.3 ms	reapplied		181	
Maximum I ² √t for fusing	I ² √t	t = 0.1 ms to 1	t = 0.1 ms to 10 ms, no voltage reapplied			kA²√s
Low level value or threshold voltage	V _{T(TO)1}	(16.7 % x π x l-	(16.7 % x π x $I_{T(AV)} < I < \pi$ x $I_{T(AV)}$), $T_J = T_J$ maximum			V
High level value of threshold voltage	V _{T(TO)2}	$(I > \pi \times I_{T(AV)}), T$	J = TJ maximum		1.07	v
Low level value on-state slope resistance	r _{t1}	(16.7 % x π x l-	(16.7 % x π x $I_{T(AV)} < I < \pi$ x $I_{T(AV)}$), $T_J = T_J$ maximum			mΩ
High level value on-state slope resistance	r _{t2}	$(I > \pi \times I_{T(AV)}), T$	$(I > \pi \times I_{T(AV)}), T_J = T_J \text{ maximum}$			1115.2
Maximum on-state voltage drop	V _{TM}	$I_{TM} = \pi \times I_{T(AV)}$, $T_J = T_J$ maximum, 180° conduction, average power = $V_{T(TO)} \times I_{T(AV)} + r_f \times (I_{T(RMS)})^2$			1.59	V
Maximum holding current	I _H	Anode supply	= 12 V, initial I_T =	30 A, T _J = 25 °C	500	
Maximum latching current	ΙL		v = 12 V, resi V, 100 μs, T _J = 2	stive load = 1 Ω , 5 °C	1000	mA

SWITCHING							
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS			
Typical delay time	t _d	$T_J = 25$ °C, gate current = 1 A $dI_a/dt = 1$ A/ μ s,	1.0				
Typical rise time	t _r	$V_{d} = 0.67 \% V_{DRM}$	2.0	us			
Typical turn-off time	t _q	I_{TM} = 300 A; dl/dt = 15 A/ μ s; T $_{J}$ = T $_{J}$ maximum; V $_{R}$ = 50 V; dV/dt = 20 V/ μ s; gate 0 V, 100 Ω	50 to 150	μο			

BLOCKING							
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS			
Maximum peak reverse and off-state leakage current	I _{RRM,} I _{DRM}	$T_J = T_J$ maximum	50	mA			
RMS insulation voltage	V _{INS}	50 Hz, circuit to base, all terminals shorted, 25 °C, 1 s	3000	V			
Critical rate of rise of off-state voltage	dV/dt	$T_J = T_J$ maximum, exponential to 67 % rated V_{DRM}	1000	V/µs			

TRIGGERING						
PARAMETER	SYMBOL	TEST	TEST CONDITIONS			
Maximum peak gate power	P _{GM}	$t_p \le 5 \text{ ms}, T_J = T_J \text{ max}$	kimum	10.0	W	
Maximum average gate power	P _{G(AV)}	$f = 50 \text{ Hz}, T_J = T_J \text{ max}$	kimum	2.0	VV	
Maximum peak gate current	+ I _{GM}	$t_p \le 5 \text{ ms}, T_J = T_J \text{ max}$	kimum	3.0	Α	
Maximum peak negative gate voltage	- V _{GT}	$t_p \le 5 \text{ ms}, T_J = T_J \text{ maximum}$		5.0		
	V _{GT}	T _J = -40 °C	Assistant dov	4.0	V	
Maximum required DC gate voltage to trigger		T _J = 25 °C	Anode supply = 12 V, resistive load; Ra = 1 Ω	3.0		
		$T_J = T_J$ maximum		2.0		
		T _J = - 40 °C		350		
Maximum required DC gate current to trigger	I _{GT}	T _J = 25 °C	Anode supply = 12 V, resistive load; Ra = 1 Ω	200	mA	
		$T_J = T_J$ maximum	10000110000, 110 = 1 32	100		
Maximum gate voltage that will not trigger	V_{GD}	$T_J = T_J$ maximum, rated V_{DRM} applied		0.25	V	
Maximum gate current that will not trigger	I_{GD}	$T_J = T_J$ maximum, rated V_{DRM} applied		10.0	mA	
Maximum rate of rise of turned-on current	dl/dt	$T_J = T_J$ maximum, I_{TM}	= 400 A, rated V _{DRM} applied	500	A/µs	



THERMAL A	THERMAL AND MECHANICAL SPECIFICATIONS							
PARAMETER	PARAMETER		TEST CONDITIONS	VALUES	UNITS			
Junction operatir	Junction operating temperature range			-40 to +130	°C			
Storage tempera	ture range	T _{Stg}		-40 to +150)			
Maximum thermal resistance, junction to case per junction		R _{thJC}	DC operation 0.		K/W			
	Typical thermal resistance, case to heatsink per module		Mounting surface flat, smooth, and greased	0.02	r∨ vv			
Mounting _	MAGN-A-PAK to heatsink		A mounting compound is recommended and the torque should be rechecked after a period	4.1 0	N			
torque ± 10 % busbar to MAGN-A-PAK			of about 3 h to allow for the spread of the compound.	4 to 6	Nm			
Approximate weight				500	g			
Approximate weight				17.8	oz.			
Case style				MAGN-A	-PAK			

AR CONDUCTION PER JUNCTION											
DEVICES	SINUS	SINUSOIDAL CONDUCTION AT T _J MAXIMUM					RECTANGULAR CONDUCTION AT T _J MAXIMUM				UNITS
DEVICES	180°	120°	90°	60°	30°	180°	120°	90°	60°	30°	UNITS
VSK.230-	0.009	0.010	0.010	0.020	0.032	0.007	0.011	0.015	0.020	0.033	K/W

Note

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

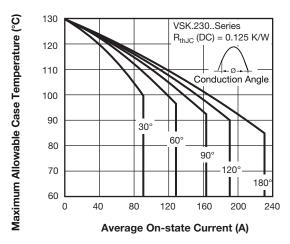


Fig. 1 - Current Ratings Characteristics

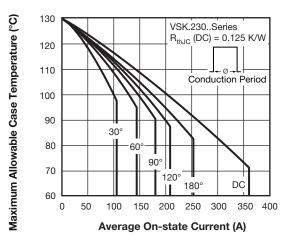


Fig. 2 - Current Ratings Characteristics

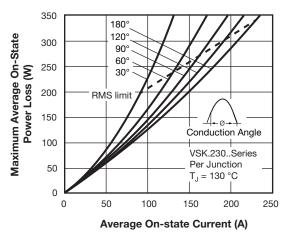


Fig. 3 - On-State Power Loss Characteristics

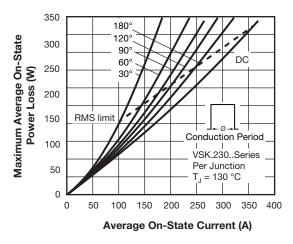


Fig. 4 - On-State Power Loss Characteristics

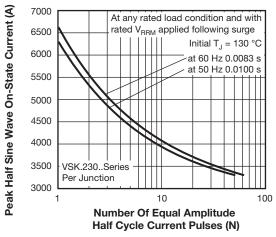


Fig. 5 - Maximum Non-Repetitive Surge Current

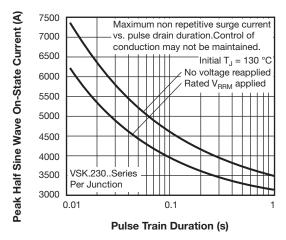


Fig. 6 - Maximum Non-Repetitive Surge Current

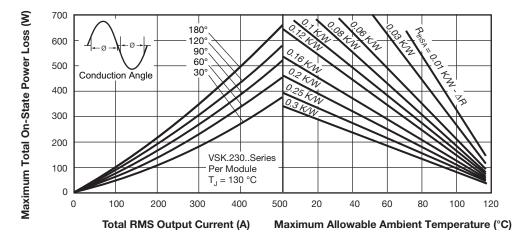


Fig. 7 - On-State Power Loss Characteristics



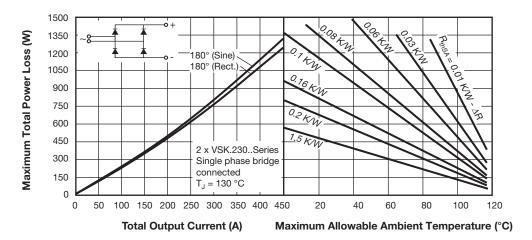


Fig. 8 - On-State Power Loss Characteristics

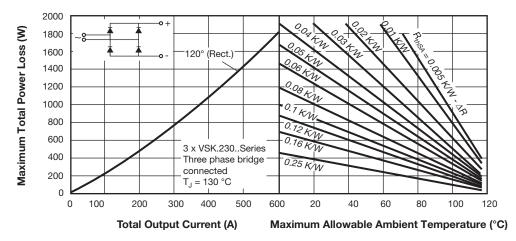


Fig. 9 - On-State Power Loss Characteristics

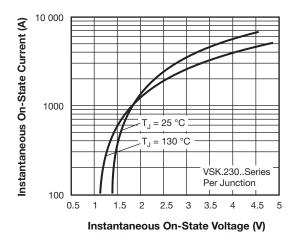


Fig. 10 - On-State Voltage Drop Characteristics

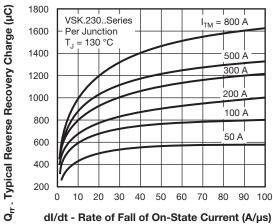


Fig. 11 - Reverse Recovery Charge Characteristics

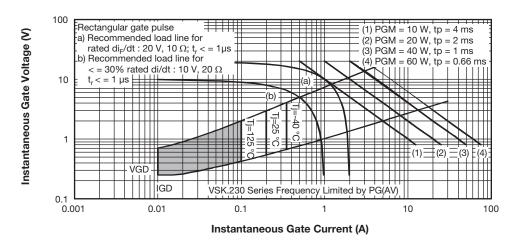


Fig. 12 - Gate Characteristics

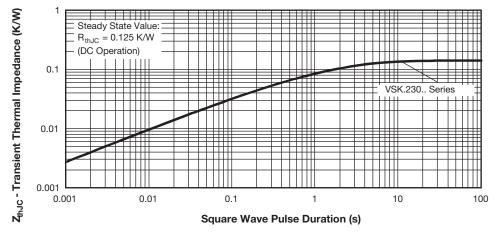
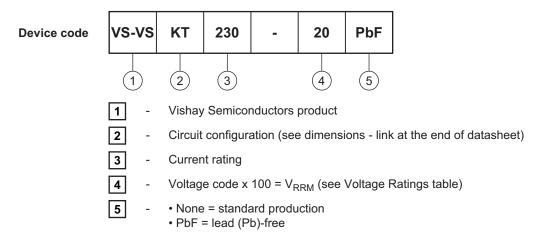


Fig. 13 - Thermal Impedance Z_{thJC} Characteristics

ORDERING INFORMATION TABLE



Note

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



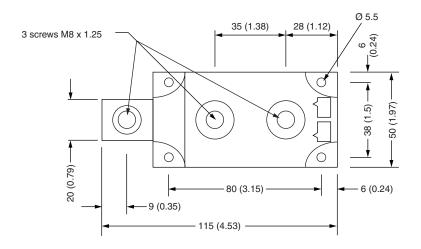
CIRCUIT CONFIGURATION		
CIRCUIT DESCRIPTION	CIRCUIT CONFIGURATION CODE	CIRCUIT DRAWING
Two SCRs doubler circuit	КТ	VSKT VSKT VSKT Available 800 V: contact factory for different requirements
SCR/diode doubler circuit, positive control	КН	VSKH VSKH Available 800 V: contact factory for different requirements
SCR/diode doubler circuit, negative control	KL	VSKL VSKL VSKL Available 800 V: contact factory for different requirements
Two SCRs common cathodes	КК	VSKK VSKK VSKK Available 800 V: contact factory for different requirements

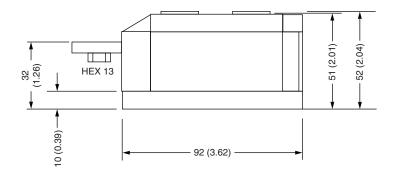
LINKS TO RELATED DOCUMENTS				
Dimensions	www.vishay.com/doc?95086			



MAGN-A-PAK

DIMENSIONS in millimeters (inches)





Notes

- Dimensions are nominal
- Full engineering drawings are available on request
- UL identification number for gate and cathode wire: UL 1385
- UL identification number for package: UL 94 V-0



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