

Thyristor/Diode and Thyristor/Thyristor (ADD-A-PAK Generation 5 Power Modules), 105 A



ADD-A-PAK

PRODUCT SUMMARY

$I_{T(AV)}$ or $I_{F(AV)}$	105 A
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MECHANICAL DESCRIPTION

The Generation 5 of ADD-A-PAK modules combine the excellent thermal performance obtained by the usage of Direct Bonded Copper substrate with superior mechanical ruggedness, thanks to the insertion of a solid copper baseplate at the bottom side of the device. The Cu baseplate allows an easier mounting on the majority of heatsink with increased tolerance of surface roughness and improved thermal spread.

The Generation 5 of AAP modules is manufactured without hard mold, eliminating in this way any possible direct stress on the leads.

The electrical terminals are secured against axial pull-out: they are fixed to the module housing via a click-stop feature already tested and proved as reliable on other Vishay HPP modules.

FEATURES

- High voltage
- Industrial standard package
- Thick copper baseplate
- UL E78996 approved
- 3500 V_{RMS} isolating voltage
- Totally lead (Pb)-free
- Designed and qualified for industrial level



RoHS
COMPLIANT

BENEFITS

- Up to 1600 V
- Fully compatible TO-240AA
- High surge capability
- Easy mounting on heatsink
- Al₂O₃ DBC insulator
- Heatsink grounded

ELECTRICAL DESCRIPTION

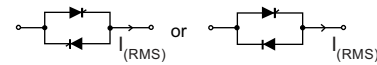
These modules are intended for general purpose high voltage applications such as high voltage regulated power supplies, lighting circuits, temperature and motor speed control circuits, UPS and battery charger.

MAJOR RATINGS AND CHARACTERISTICS

SYMBOL	CHARACTERISTICS	VALUES	UNITS
$I_{T(AV)}$ or $I_{F(AV)}$	85 °C	105	A
$I_{O(RMS)}$	As AC switch	235	
I_{TSM} , I_{FSM}	50 Hz 60 Hz	1785 1870	
I^2t	50 Hz	15.91	kA ² s
	60 Hz	14.52	
$I^2\sqrt{t}$		159.1	kA ² √s
V_{RRM}	Range	400 to 1600	V
T_{Stg}		- 40 to 150	°C
T_J		- 40 to 130	

ELECTRICAL SPECIFICATIONS

VOLTAGE RATINGS					
TYPE NUMBER	VOLTAGE CODE	V _{RRM} , MAXIMUM REPETITIVE REVERSE VOLTAGE V	V _{RSM} , MAXIMUM NON-REPETITIVE PEAK REVERSE VOLTAGE V	V _{DRM} , MAXIMUM REPETITIVE PEAK OFF-STATE VOLTAGE, GATE OPEN CIRCUIT V	I _{RRM} , I _{DRM} AT 130 °C mA
VSK.105	04	400	500	400	20
	06	600	700	600	
	08	800	900	800	
	10	1000	1100	1000	
	12	1200	1300	1200	
	14	1400	1500	1400	
	16	1600	1700	1600	

ON-STATE CONDUCTION							
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS		
Maximum average on-state current (thyristors)	I _{T(AV)}	180° conduction, half sine wave,		105			
Maximum average forward current (diodes)	I _{F(AV)}	T _C = 85 °C					
Maximum continuous RMS on-state current, as AC switch	I _{O(RMS)}			235			
Maximum peak, one-cycle non-repetitive on-state or forward current	I _{TSM} or I _{FSM}	t = 10 ms	No voltage reapplied	Sinusoidal half wave, initial T _J = T _J maximum	1785	A	
		t = 8.3 ms			1870		
		t = 10 ms	100 % V _{RRM} reapplied		1500		
		t = 8.3 ms			1570		
		t = 10 ms	T _J = 25 °C, no voltage reapplied		2000		
		t = 8.3 ms			2100		
Maximum I ² t for fusing	I ² t	t = 10 ms	No voltage reapplied	Initial T _J = T _J maximum	15.91	kA ² s	
		t = 8.3 ms			14.52		
		t = 10 ms	100 % V _{RRM} reapplied		11.25		
		t = 8.3 ms			10.27		
		t = 10 ms	T _J = 25 °C, no voltage reapplied		20.00		
		t = 8.3 ms			18.30		
Maximum I ² √t for fusing	I ² √t (1)	t = 0.1 to 10 ms, no voltage reapplied T _J = T _J maximum		159.1	kA ² √s		
Maximum value or threshold voltage	V _{T(TO)} (2)	Low level (3)	T _J = T _J maximum	0.80	V		
		High level (4)		0.85			
Maximum value of on-state slope resistance	r _t (2)	Low level (3)	T _J = T _J maximum	2.37	mΩ		
		High level (4)		2.25			
Maximum peak on-state or forward voltage	V _{TM}	I _{TM} = π × I _{T(AV)}	T _J = 25 °C	1.64	V		
	V _{FM}	I _{FM} = π × I _{F(AV)}					
Maximum non-repetitive rate of rise of turned on current	di/dt	T _J = 25 °C, from 0.67 V _{DRM} , I _{TM} = π × I _{T(AV)} , I _g = 500 mA, t _r < 0.5 μs, t _p > 6 μs		150	A/μs		
Maximum holding current	I _H	T _J = 25 °C, anode supply = 6 V, resistive load, gate open circuit		250	mA		
Maximum latching current	I _L	T _J = 25 °C, anode supply = 6 V, resistive load		400			

Notes

(1) I²t for time t_x = I²√t × √t_x

(2) Average power = V_{T(TO)} × I_{T(AV)} + r_t × (I_{T(RMS)})²

(3) 16.7 % × π × I_{AV} < I < π × I_{AV}

(4) I > π × I_{AV}



TRIGGERING					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum peak gate power	P_{GM}			12	W
Maximum average gate power	$P_{G(AV)}$			3	
Maximum peak gate current	I_{GM}			3	A
Maximum peak negative gate voltage	$-V_{GM}$			10	V
Maximum gate voltage required to trigger	V_{GT}	$T_J = -40\text{ }^\circ\text{C}$	Anode supply = 6 V resistive load	4.0	
		$T_J = 25\text{ }^\circ\text{C}$		2.5	
		$T_J = 125\text{ }^\circ\text{C}$		1.7	
Maximum gate current required to trigger	I_{GT}	$T_J = -40\text{ }^\circ\text{C}$	Anode supply = 6 V resistive load	270	mA
		$T_J = 25\text{ }^\circ\text{C}$		150	
		$T_J = 125\text{ }^\circ\text{C}$		80	
Maximum gate voltage that will not trigger	V_{GD}	$T_J = 125\text{ }^\circ\text{C}$, rated V_{DRM} applied		0.25	V
Maximum gate current that will not trigger	I_{GD}	$T_J = 125\text{ }^\circ\text{C}$, rated V_{DRM} applied		6	mA

BLOCKING					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum peak reverse and off-state leakage current at V_{RRM} , V_{DRM}	I_{RRM} , I_{DRM}	$T_J = 130\text{ }^\circ\text{C}$, gate open circuit		20	mA
RMS insulation voltage	V_{INS}	50 Hz, circuit to base, all terminals shorted		2500 (1 min) 3500 (1 s)	V
Maximum critical rate of rise of off-state voltage	dV/dt ⁽¹⁾	$T_J = 130\text{ }^\circ\text{C}$, linear to $0.67 V_{DRM}$, gate open circuit		500	V/ μ s

Note

⁽¹⁾ Available with $dV/dt = 1000\text{ V}/\mu\text{s}$, to complete code add S90 i.e. VSKT105/16S90P

THERMAL AND MECHANICAL SPECIFICATIONS					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Junction operating temperature range	T_J			- 40 to 130	$^\circ\text{C}$
Storage temperature range	T_{Stg}			- 40 to 150	
Maximum internal thermal resistance, junction to case per module	R_{thJC}	DC operation		0.135	K/W
Typical thermal resistance, case to heatsink	R_{thCS}	Mounting surface flat, smooth and greased		0.1	
Mounting torque $\pm 10\%$	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.		5	Nm
	busbar			3	
Approximate weight				110	g
				4	oz.
Case style		JEDEC		TO-240AA	

ΔR CONDUCTION PER JUNCTION											
DEVICES	SINE HALF WAVE CONDUCTION					RECTANGULAR WAVE CONDUCTION					UNITS
	180°	120°	90°	60°	30°	180°	120°	90°	60°	30°	
VSK.105	0.04	0.05	0.05	0.08	0.12	0.03	0.05	0.06	0.08	0.12	$^\circ\text{C}/\text{W}$

Note

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

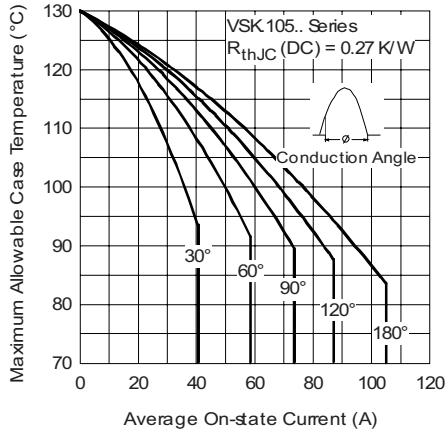


Fig. 1 - Current Ratings Characteristics

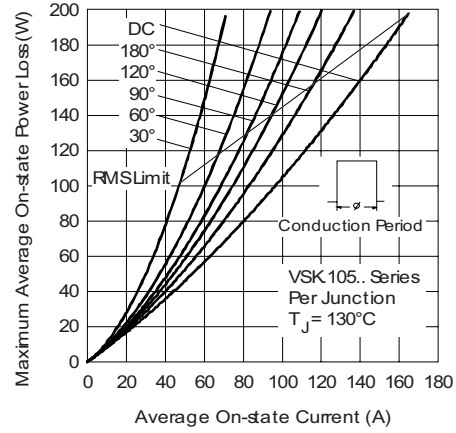


Fig. 4 - On-State Power Loss Characteristics

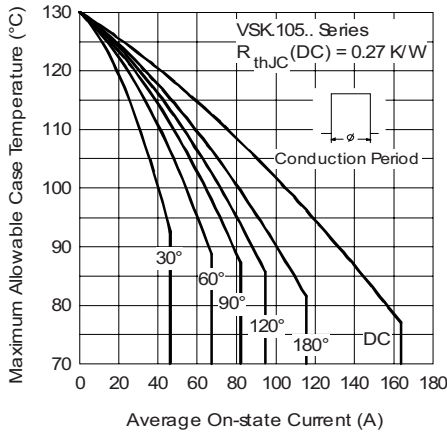


Fig. 2 - Current Ratings Characteristics

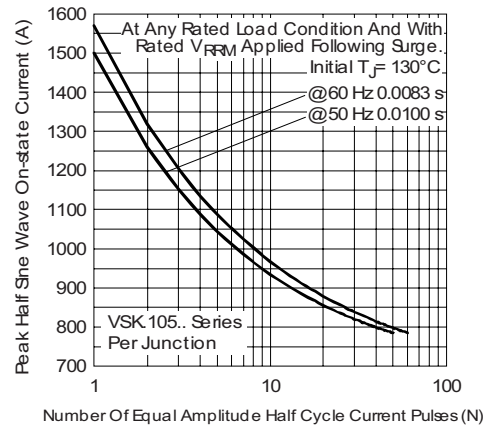


Fig. 5 - Maximum Non-Repetitive Surge Current

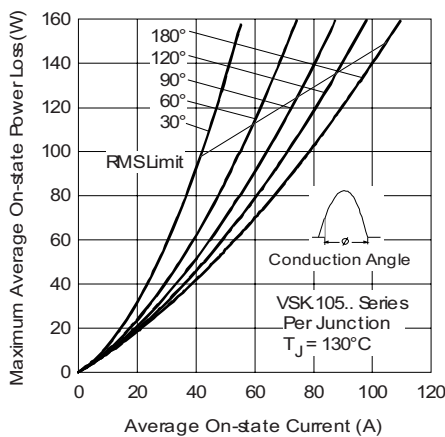


Fig. 3 - On-State Power Loss Characteristics

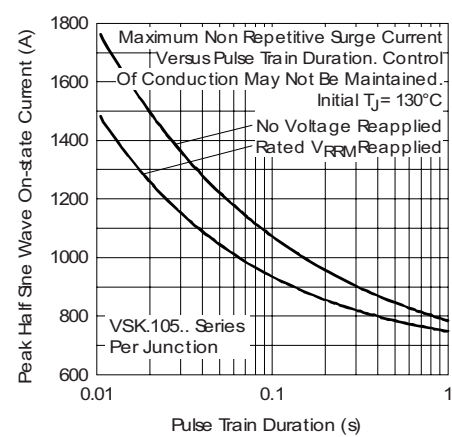


Fig. 6 - Maximum Non-Repetitive Surge Current

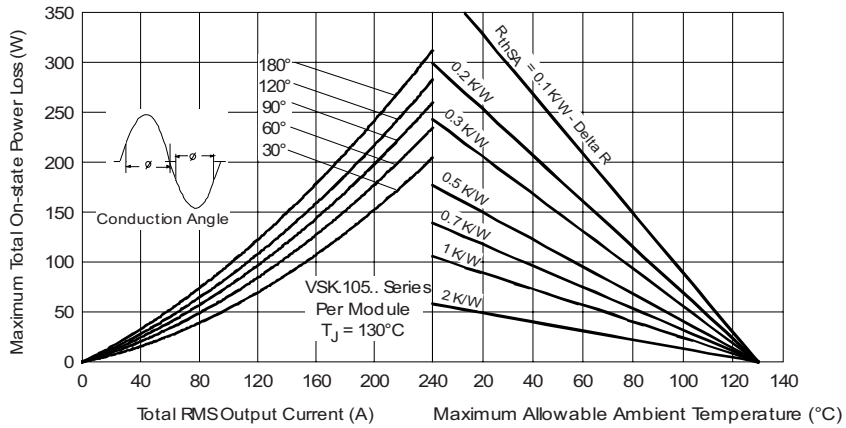


Fig. 7 - On-State Power Loss Characteristics

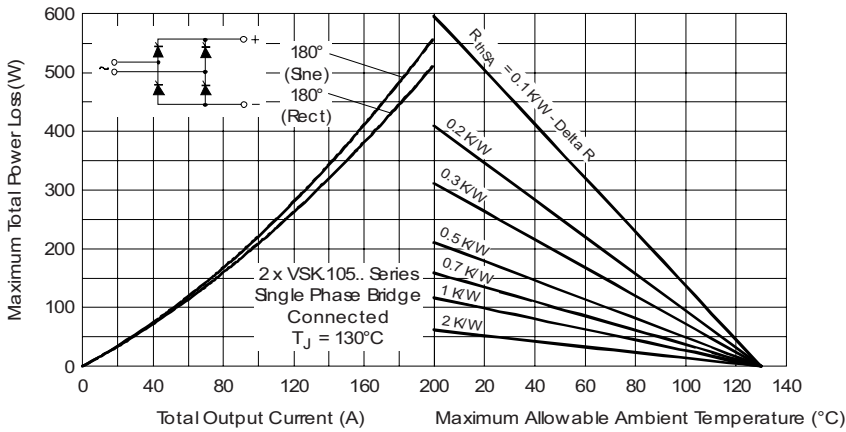


Fig. 8 - On-State Power Loss Characteristics

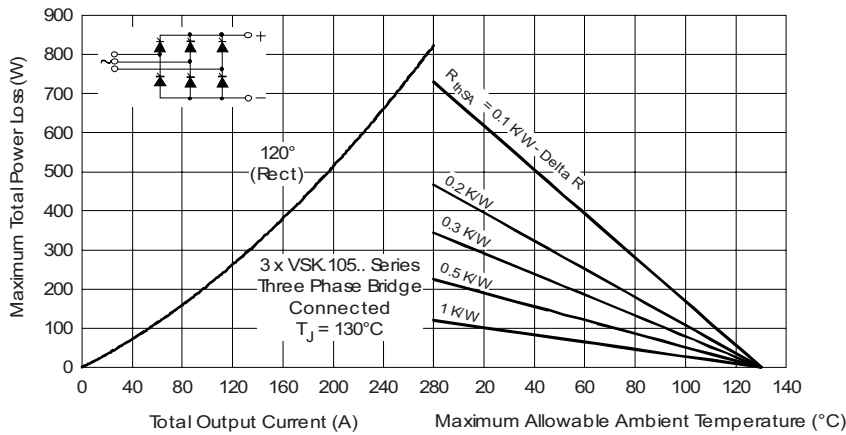


Fig. 9 - On-State Power Loss Characteristics

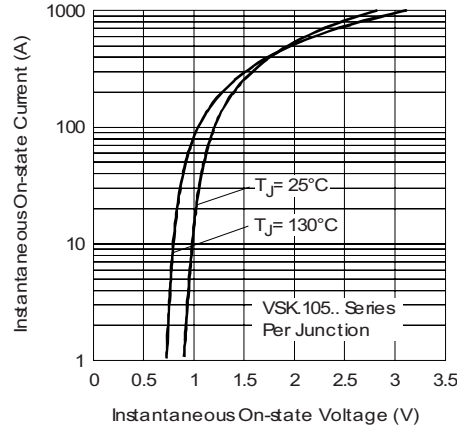


Fig. 10 - On-State Voltage Drop Characteristics

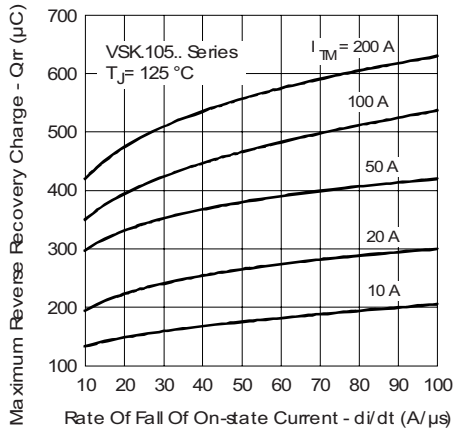


Fig. 11 - Recovery Charge Characteristics

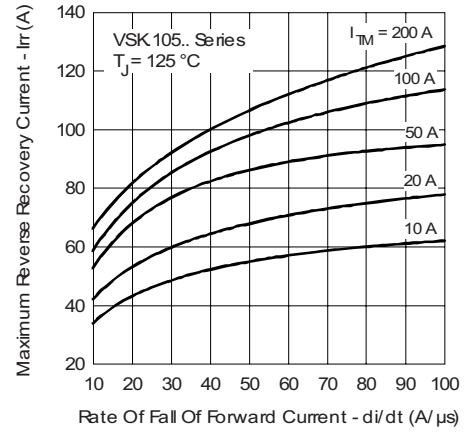


Fig. 12 - Recovery Current Characteristics

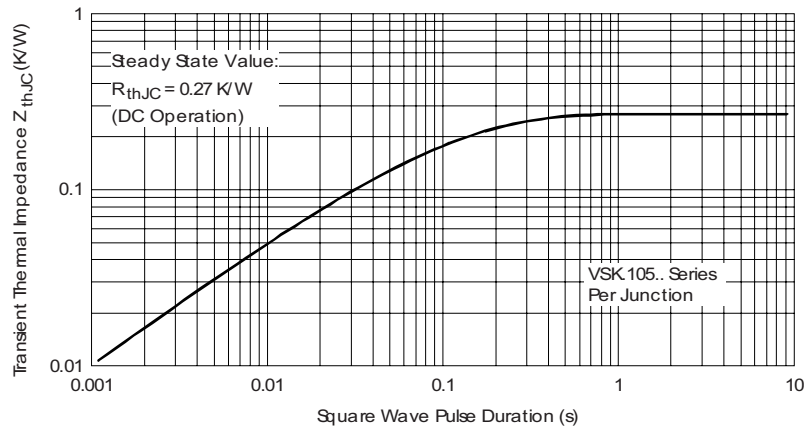


Fig. 13 - Thermal Impedance Z_{thJC} Characteristics

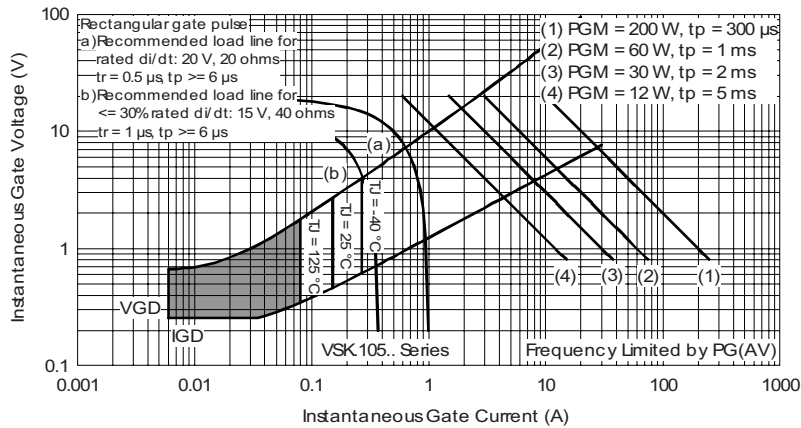


Fig. 14 - Gate Characteristics

ORDERING INFORMATION TABLE

Device code	VSK	T	105	/	16	S90	P
	①	②	③		④	⑤	⑥

- 1** - Module type
- 2** - Circuit configuration (see end of datasheet)
- 3** - Current code ⁽¹⁾
- 4** - Voltage code (see Voltage Ratings table)
- 5** - dV/dt code: S90 = dV/dt 1000 V/ μ s
No letter = dV/dt 500 V/ μ s
- 6** - P = Lead (Pb)-free

⁽¹⁾ Available with no auxiliary cathode
(for details see dimensions - link at the end of datasheet)
To specify change: 105 to 106
e.g.: VSKT106/16P etc.

Note

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

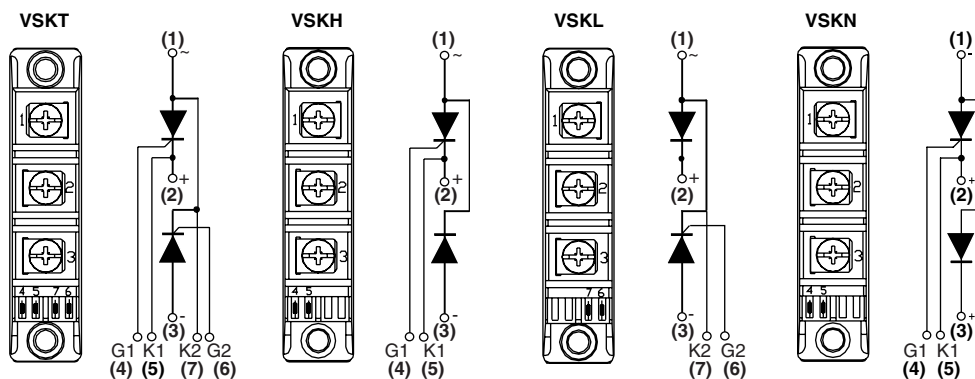
VSK.105..PbF Series



Vishay High Power Products

Thyristor/Diode and Thyristor/Thyristor
(ADD-A-PAK Generation 5 Power Modules), 105 A

CIRCUIT CONFIGURATION



LINKS TO RELATED DOCUMENTS

Dimensions

<http://www.vishay.com/doc?95085>



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