

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


ADD-A-PAK

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

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.

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	1785	
	60 Hz	1870	
I ² t	50 Hz	15.91	kA ² s
	60 Hz	14.52	
I ² √t		159.1	kA ² √s
V _{RRM}	Range	400 to 1600	V
T _{Stg}		- 40 to 150	°C
T _J		- 40 to 130	

VSK.105..PbF Series

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ELECTRICAL SPECIFICATIONS

VOLTAGE RATINGS					
TYPE NUMBER	VOLTAGE CODE	V _{RRM} , MAXIMUM REPETITIVE PEAK 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, T _C = 85 °C			105	A
Maximum average forward current (diodes)	I _{F(AV)}					
Maximum continuous RMS on-state current, as AC switch	I _{O(RMS)}	or			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		T _J = 25 °C, no voltage reapplied	1570	
		t = 10 ms			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		T _J = 25 °C, no voltage reapplied	10.27	
		t = 10 ms			20.00	
		t = 8.3 ms			18.30	
Maximum I ² \sqrt{t} for fusing	I ² \sqrt{t} (1)	t = 0.1 to 10 ms, no voltage reapplied T _J = T _J maximum			159.1	kA ² \sqrt{s}
Maximum value or threshold voltage	V _{T(TO)} (2)	Low level (3)	T _J = T _J maximum	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	T _J = T _J maximum	2.37	mΩ
		High level (4)			2.25	
Maximum peak on-state or forward voltage	V _{TM}	I _{TM} = $\pi \times I_{T(AV)}$	T _J = 25 °C	T _J = 25 °C	1.64	V
	V _{FM}	I _{FM} = $\pi \times I_{F(AV)}$				
Maximum non-repetitive rate of rise of turned on current	dl/dt	T _J = 25 °C, from 0.67 V _{DRM} , I _{TM} = $\pi \times I_{T(AV)}$, 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 $\sqrt{t} \times \sqrt{t_x}$

(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 °C	Anode supply = 6 V resistive load		4.0			
		T _J = 25 °C			2.5			
		T _J = 125 °C			1.7			
Maximum gate current required to trigger	I _{GT}	T _J = -40 °C	Anode supply = 6 V resistive load		270	mA		
		T _J = 25 °C			150			
		T _J = 125 °C			80			
Maximum gate voltage that will not trigger	V _{GD}	T _J = 125 °C, rated V _{DRM} applied			0.25	V		
Maximum gate current that will not trigger	I _{GD}	T _J = 125 °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 °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 °C, linear to 0.67 V _{DRM} , gate open circuit			500	V/μs

Note

⁽¹⁾ Available with dV/dt = 1000 V/μs, 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	°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 ± 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°		
VSK.105	0.04	0.05	0.05	0.08	0.12	0.03	0.05	0.06	0.08	0.12	°C/W

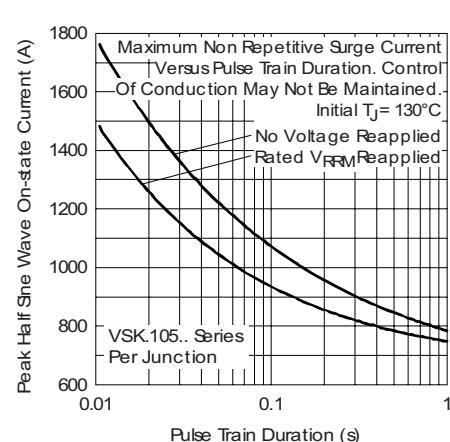
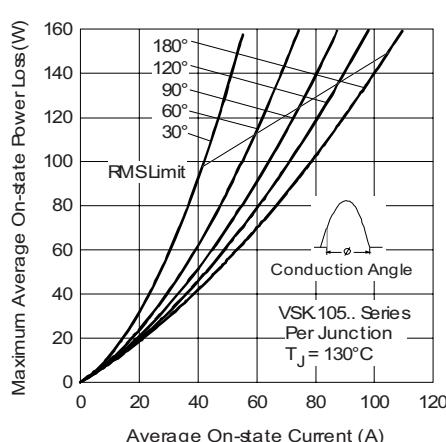
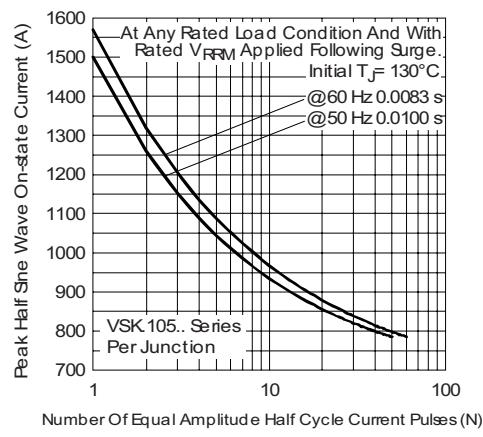
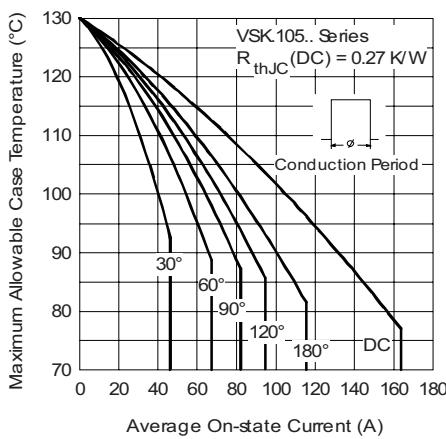
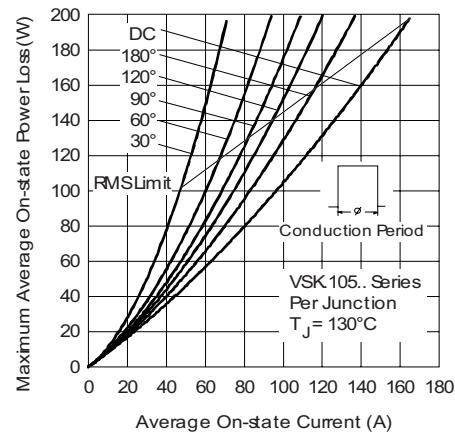
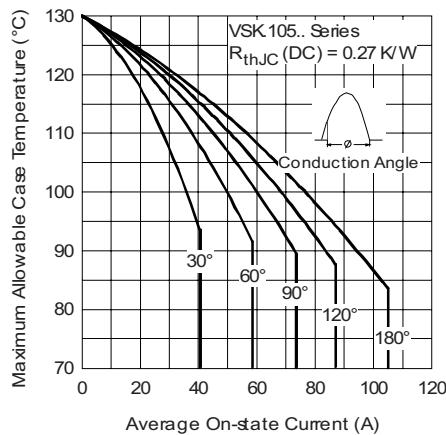
Note

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

VSK.105..PbF Series

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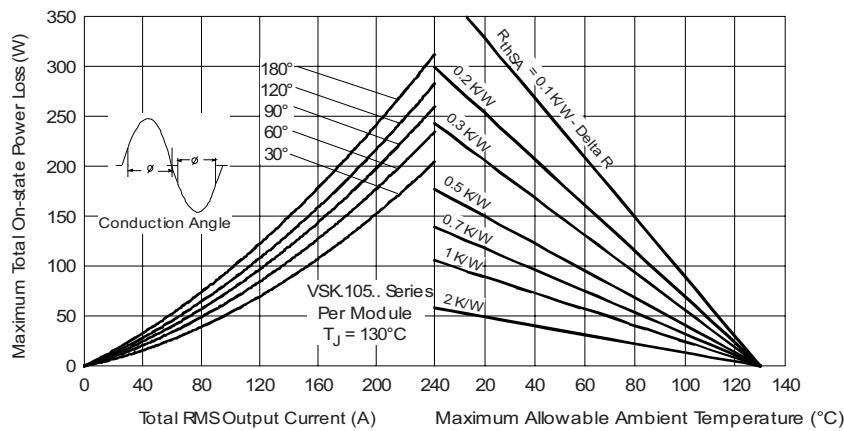


Fig. 7 - On-State Power Loss Characteristics

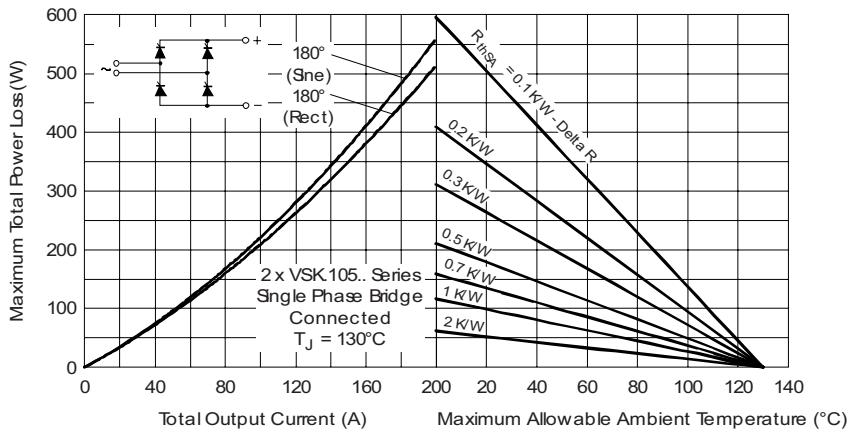


Fig. 8 - On-State Power Loss Characteristics

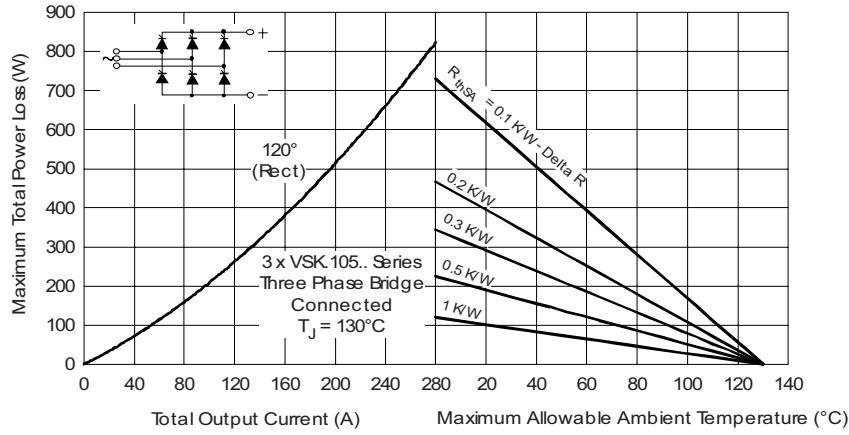


Fig. 9 - On-State Power Loss Characteristics

VSK.105..PbF Series

Vishay High Power Products

Thyristor/Diode and Thyristor/Thyristor
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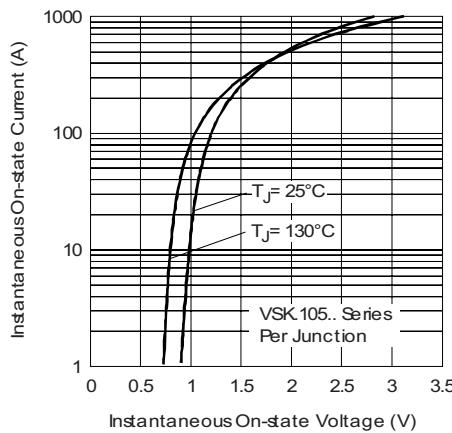


Fig. 10 - On-State Voltage Drop Characteristics

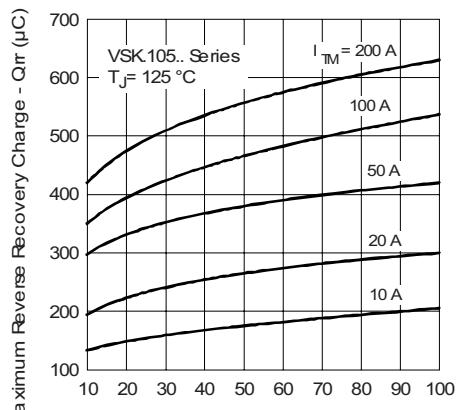


Fig. 11 - Recovery Charge Characteristics

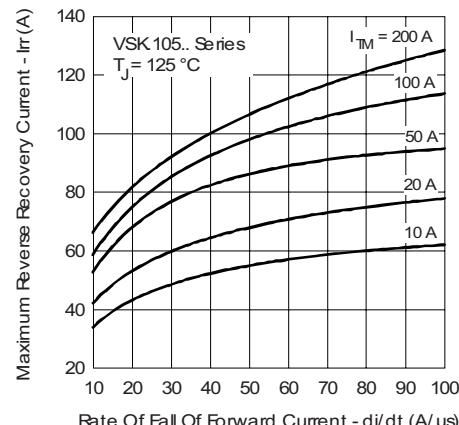


Fig. 12 - Recovery Current Characteristics

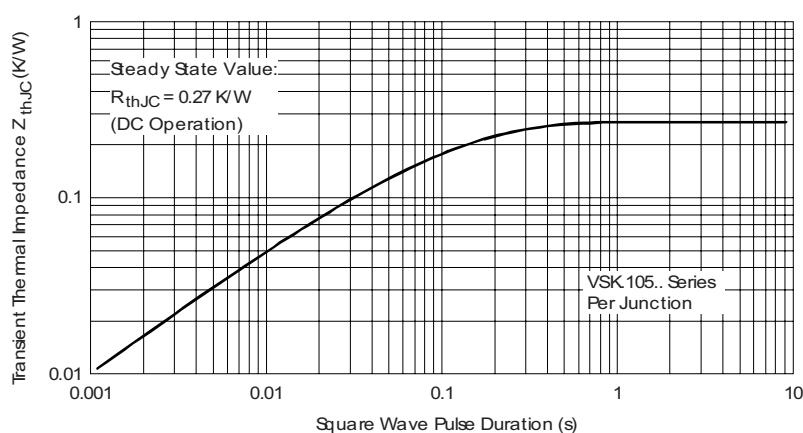


Fig. 13 - Thermal Impedance Z_{thJC} Characteristics

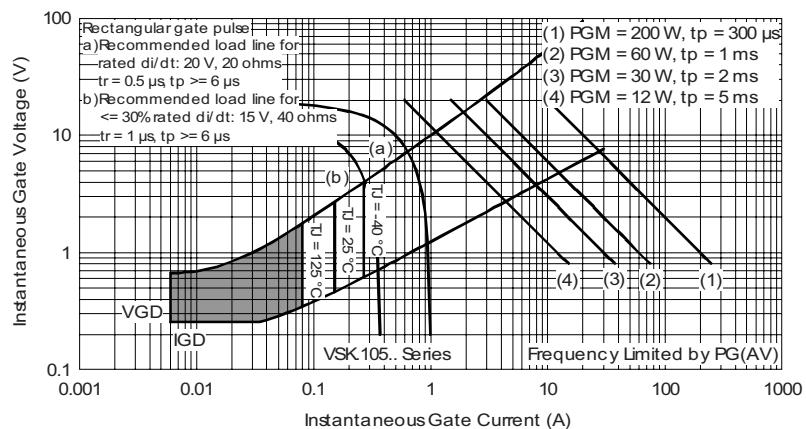


Fig. 14 - Gate Characteristics

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/μs
 No letter = dV/dt 500 V/μs
[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

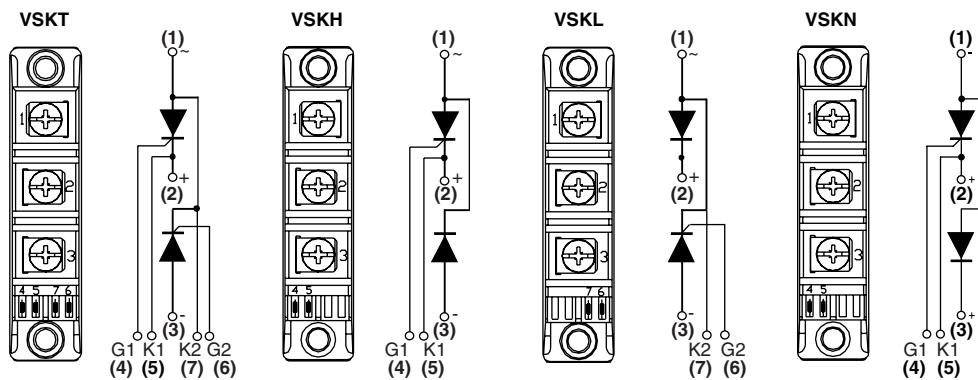
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Vishay High Power Products

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CIRCUIT CONFIGURATION



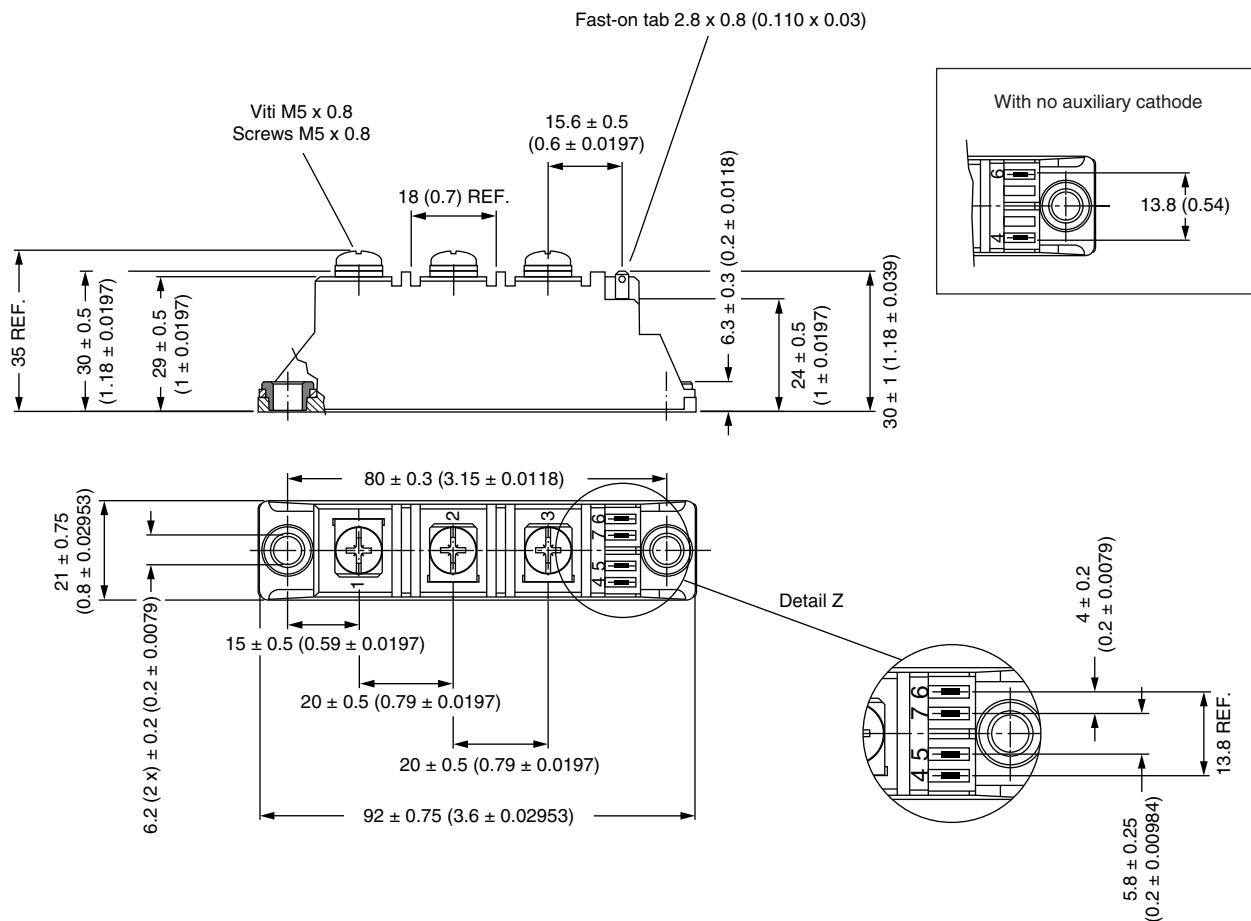
LINKS TO RELATED DOCUMENTS

Dimensions

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

ADD-A-PAK SCR

DIMENSIONS in millimeters (inches)



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