

Thyristor/Thyristor, 150 A (INT-A-PAK Power Module)


INT-A-PAK

FEATURES

- Electrically isolated by DBC ceramic (Al_2O_3)
- 3500 V_{RMS} isolating voltage
- Industrial standard package
- High surge capability
- Glass passivated chips
- Simple mounting
- UL approved file E78996 
- Designed and qualified for multiple level
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912


RoHS
COMPLIANT

PRIMARY CHARACTERISTICS

$I_{\text{T(AV)}}$	150 A
Type	Modules - thyristor, standard
Package	INT-A-PAK

APPLICATIONS

- Battery charges
- Welders
- Power converters

MAJOR RATINGS AND CHARACTERISTICS

SYMBOL	CHARACTERISTICS	VALUES	UNITS
$I_{\text{T(AV)}}$	85 °C	150	A
$I_{\text{T(RMS)}}$		330	A
I_{TSM}	50 Hz	4000	
	60 Hz	4200	
I^2t	50 Hz	80	kA^2s
	60 Hz	73	
$I^2\sqrt{t}$		800	$\text{kA}^2\sqrt{\text{s}}$
$V_{\text{DRM}}/V_{\text{RRM}}$		400	V
T_{Stg}	Range	-40 to +150	°C
T_{J}	Range	-40 to +125	

ELECTRICAL SPECIFICATIONS

VOLTAGE RATINGS

TYPE NUMBER	$V_{\text{RRM}}/V_{\text{DRM}}$, MAXIMUM REPETITIVE PEAK REVERSE VOLTAGE V	$V_{\text{RSM}}/V_{\text{DSM}}$, MAXIMUM NON-REPETITIVE PEAK REVERSE VOLTAGE V	$I_{\text{RRM}}/I_{\text{DRM}}$ AT 125 °C mA
VS-VSKT152/04PbF	400	500	50



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			150	A
					85	°C
Maximum RMS on-state current	I _{T(RMS)}	As AC switch			330	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	4000	
		t = 8.3 ms			4200	
		t = 10 ms	100 % V _{RRM} reapplied		3350	
		t = 8.3 ms			3500	
Maximum I ² t for fusing	I ² t	t = 10 ms	No voltage reapplied		80	
		t = 8.3 ms			73	
		t = 10 ms	100 % V _{RRM} reapplied	56		
		t = 8.3 ms		51		
Maximum I ² √t for fusing	I ² √t	t = 0.1 ms to 10 ms, no voltage reapplied			800	kA ² √s
Value of threshold voltage	V _{T(TO)}	T _J maximum			0.82	V
On-state slope resistance	r _t				1.44	mΩ
Maximum on-state voltage drop	V _{TM}	I _{pk} = π × I _{T(AV)} , T _J = 25 °C			1.48	V
Maximum holding current	I _H	T _J = 25 °C, anode supply = 6 V, resistive load, gate open circuit			200	mA
Maximum latching current	I _L	T _J = 25 °C, anode supply = 6 V, resistive load			400	

SWITCHING					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Typical delay time	t_{gd}	$T_J = 25\text{ }^{\circ}\text{C}$	Gate current = 1 A, $di_g/dt = 1\text{ A}/\mu\text{s}$ $V_d = 0.67\text{ \% }V_{\text{DRM}}$	1	μs
Typical rise time	t_{gr}			2	
Typical turn-off time	t_q	$I_{\text{TM}} = 300\text{ A}$, - $di/dt = 15\text{ A}/\mu\text{s}$; $T_J = T_J$ maximum $V_R = 50\text{ V}$; $dV/dt = 20\text{ V}/\mu\text{s}$; gate 0 V, 100 Ω		50 to 200	

BLOCKING				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum peak reverse and off-state leakage current	I_{RRM} , I_{DRM}	$T_J = 125\text{ }^{\circ}\text{C}$	50	mA
RMS insulation voltage	V_{INS}	50 Hz, circuit to base, all terminals shorted, $t = 1\text{ s}$	3500	V
Critical rate of rise of off-state voltage	dV/dt	$T_J = T_J$ maximum, exponential to 67 % rated V_{DRM}	1000	V/ μ s



TRIGGERING						
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS	
Maximum peak gate power	P _{GM}	t _p ≤ 5 ms, T _J = T _J maximum		12	W	
Maximum average gate power	P _{G(AV)}	f = 50 Hz, T _J = T _J maximum		3		
Maximum peak gate current	I _{GM}	t _p ≤ 5 ms, T _J = T _J maximum		3	A	
Maximum peak negative gate voltage	- V _{GT}			10	V	
Maximum required DC gate voltage to trigger	V _{GT}	T _J = - 40 °C	Anode supply = 6 V, resistive load; R _a = 1 Ω	4		
		T _J = 25 °C		2.5		
		T _J = T _J maximum		1.7		
Maximum required DC gate current to trigger	I _{GT}	T _J = - 40 °C		270	mA	
		T _J = 25 °C		150		
		T _J = T _J maximum		80		
Maximum gate voltage that will not trigger	V _{GD}	T _J = T _J maximum, rated V _{DRM} applied		0.3	V	
Maximum gate current that will not trigger	I _{GD}			10	mA	
Maximum rate of rise of turned-on current	di/dt	T _J = T _J maximum, I _{TM} = 400 A rated V _{DRM} applied		300	A/μs	

THERMAL AND MECHANICAL SPECIFICATIONS					
PARAMETER		SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum junction operating temperature range		T _J		-40 to +125	°C
Maximum storage temperature range		T _{Stg}		-40 to +150	
Maximum thermal resistance, junction to case per junction		R _{thJC}	DC operation	0.18	K/W
Maximum thermal resistance, case to heatsink per module		R _{thCS}	Mounting surface smooth, flat and greased	0.05	
Mounting torque ± 10 %	IAP to heatsink busbar to IAP		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. Lubricated threads.	4 to 6	Nm
Approximate weight				200	g
				7.1	oz.
Case style				INT-A-PAK	

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°	
VSKT152/04PbF	0.007	0.010	0.013	0.016	0.017	0.009	0.012	0.014	0.016	0.017	K/W

Note

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

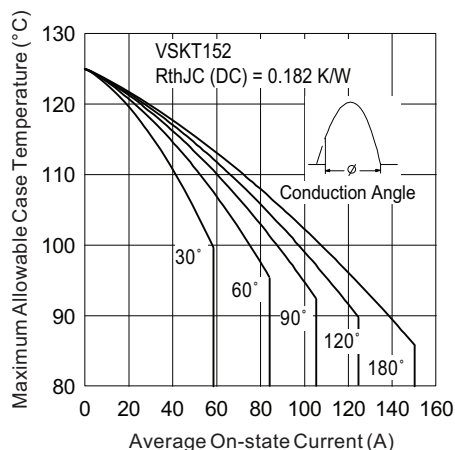


Fig. 1 - Current Ratings Characteristics

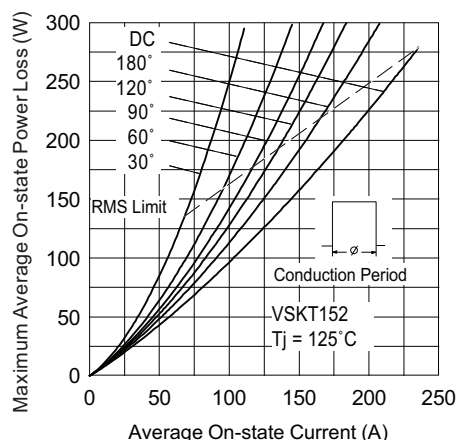


Fig. 4 - Forward Power Loss Characteristics

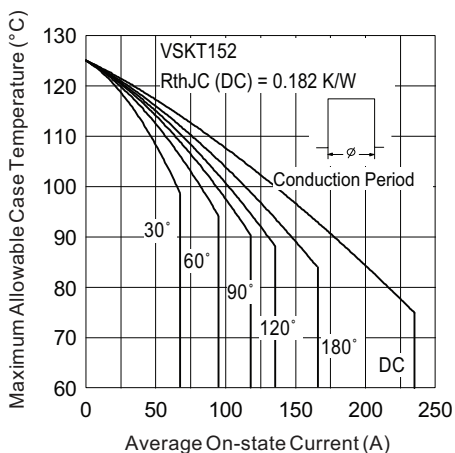


Fig. 2 - Current Ratings Characteristics

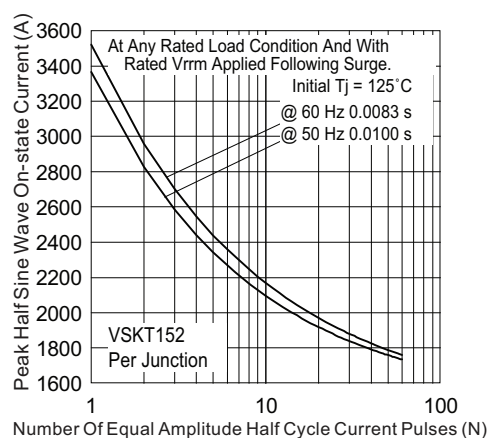


Fig. 5 - Maximum Non-Repetitive Surge Current

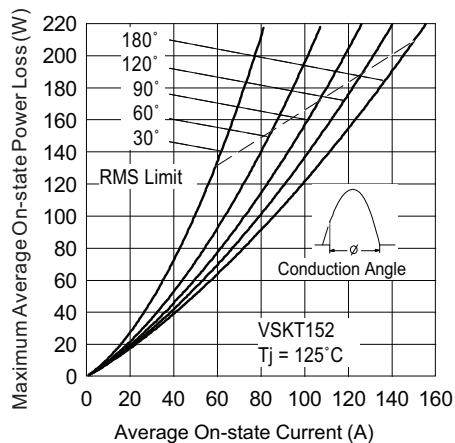


Fig. 3 - Forward Power Loss Characteristics

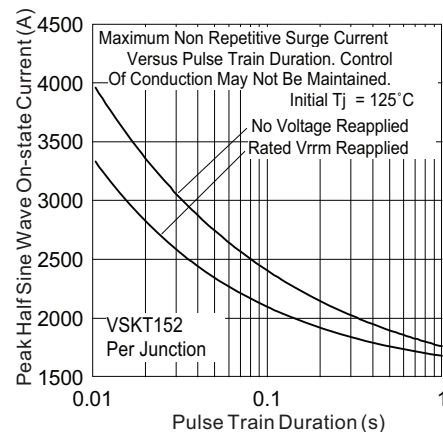


Fig. 6 - Maximum Non-Repetitive Surge Current

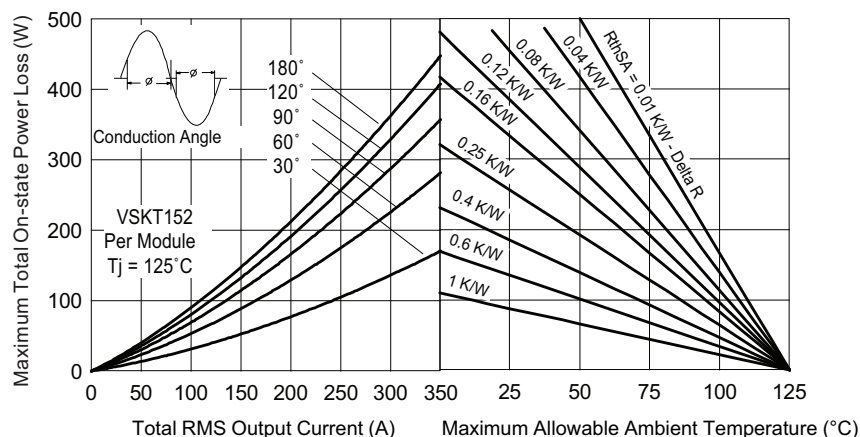


Fig. 7 - On-State Power Loss Characteristics

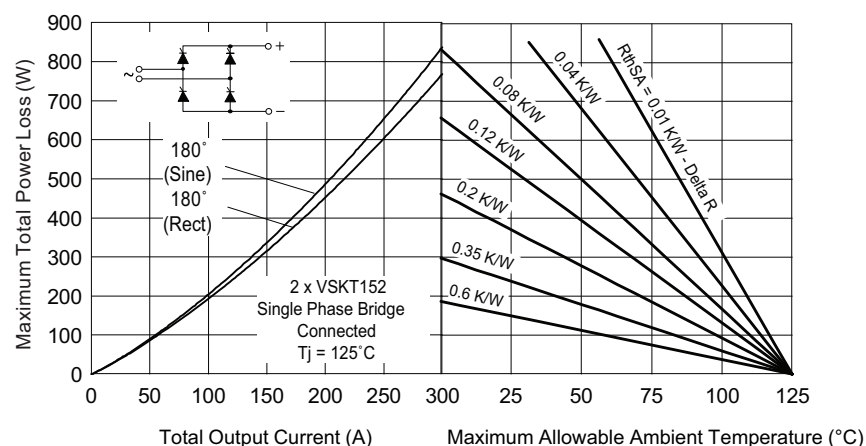


Fig. 8 - On-State Power Loss Characteristics

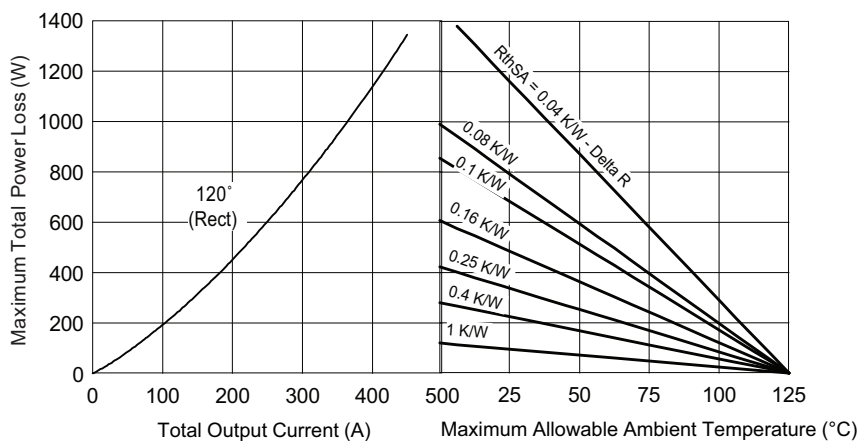


Fig. 9 - On-State Power Loss Characteristics

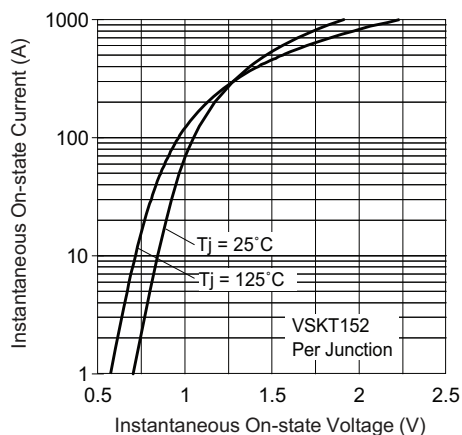


Fig. 10 - On-State Voltage Drop Characteristics

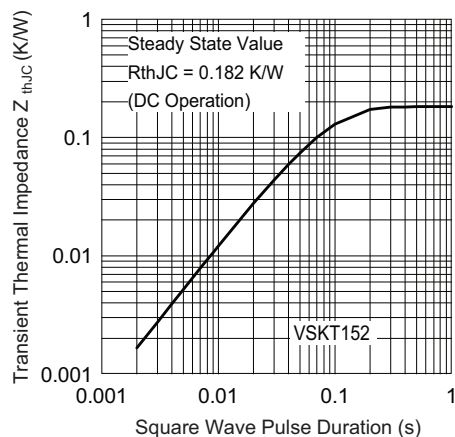
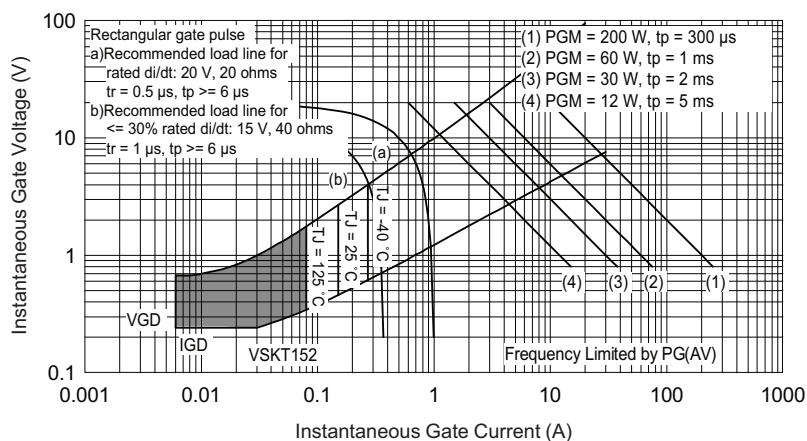

Fig. 11 - Thermal Impedance Z_{thJC} Characteristics


Fig. 12 - Gate Characteristics



ORDERING INFORMATION TABLE

Device code	VS-VS	KT	152	04	PbF
	1	2	3	4	5
1	- Vishay Semiconductors product				
2	- Circuit configuration				
3	- Current rating				
4	- Voltage rating (04 = 400 V)				
5	- PbF = Lead (Pb)-free				

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	T	

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95067

DIMENSIONS in millimeters (inches)





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