

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



New 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 E78996 approved
- Totally lead (Pb)-free
- Designed and qualified for multiple level


**RoHS  
COMPLIANT**

### PRODUCT SUMMARY

$I_{T(AV)}$	150 A
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### APPLICATIONS

- Battery charges
- Welders
- Power converters

### MAJOR RATINGS AND CHARACTERISTICS

SYMBOL	CHARACTERISTICS	VALUES	UNITS
$I_{T(AV)}$		150	A
	$T_C$	85	$^{\circ}C$
$I_{T(RMS)}$		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	$kA^2\sqrt{s}$
$V_{RRM}$		400	V
$T_{Stg}$	Range	- 40 to 150	$^{\circ}C$
$T_J$		- 40 to 125	

### 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 125 $^{\circ}C$ mA
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	4000	
		t = 8.3 ms	No voltage reapplied	4200	
		t = 10 ms	100 % $V_{RRM}$ reapplied	3350	
		t = 8.3 ms	100 % $V_{RRM}$ reapplied	3500	
Maximum $I^2t$ for fusing	$I^2t$	t = 10 ms	No voltage reapplied	80	kA <sup>2</sup> s
		t = 8.3 ms	No voltage reapplied	73	
		t = 10 ms	100 % $V_{RRM}$ reapplied	56	
		t = 8.3 ms	100 % $V_{RRM}$ reapplied	51	
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	t = 0.1 to 10 ms, no voltage reapplied		800	kA <sup>2</sup> √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	$V_{TM}$	$I_{pk} = \pi \times I_{T(AV)}$ , $T_J = 25\text{ °C}$		1.48	V
Maximum holding current	$I_H$	$T_J = 25\text{ °C}$ , anode supply = 6 V, resistive load, gate open circuit		200	mA
Maximum latching current	$I_L$	$T_J = 25\text{ °C}$ , anode supply = 6 V, resistive load		400	

SWITCHING					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Typical delay time	$t_{gd}$	$T_J = 25\text{ °C}$	Gate current = 1 A, $di_g/dt = 1\text{ A}/\mu\text{s}$ $V_d = 0.67\% V_{DRM}$	1	μs
Typical rise time	$t_{gr}$			2	
Typical turn-off time	$t_q$	$I_{TM} = 300\text{ A}$ , $-di/dt = 15\text{ A}/\mu\text{s}$ ; $T_J = T_J$ 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	$I_{RRM}$ , $I_{DRM}$	$T_J = 125\text{ °C}$		50	mA
RMS insulation voltage	$V_{INS}$	50 Hz, circuit to base, all terminals shorted, t = 1 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/μs



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TRIGGERING					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum peak gate power	$P_{GM}$	$t_p \leq 5 \text{ ms}$ , $T_J = T_J \text{ maximum}$		12	W
Maximum average gate power	$P_{G(AV)}$	$f = 50 \text{ Hz}$ , $T_J = T_J \text{ maximum}$		3	
Maximum peak gate current	$I_{GM}$	$t_p \leq 5 \text{ ms}$ , $T_J = T_J \text{ maximum}$		3	A
Maximum peak negative gate voltage	$-V_{GT}$			10	V
Maximum required DC gate voltage to trigger	$V_{GT}$	$T_J = -40 \text{ }^\circ\text{C}$	Anode supply = 6 V, resistive load; $R_a = 1 \text{ } \Omega$	4	
		$T_J = 25 \text{ }^\circ\text{C}$		2.5	
		$T_J = T_J \text{ maximum}$		1.7	
Maximum required DC gate current to trigger	$I_{GT}$	$T_J = -40 \text{ }^\circ\text{C}$		270	mA
		$T_J = 25 \text{ }^\circ\text{C}$		150	
		$T_J = T_J \text{ maximum}$		80	
Maximum gate voltage that will not trigger	$V_{GD}$	$T_J = T_J \text{ maximum}$ , 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	$di/dt$	$T_J = T_J \text{ maximum}$ , $I_{TM} = 400 \text{ A}$ rated $V_{DRM}$ applied		300	A/ $\mu\text{s}$

THERMAL AND MECHANICAL SPECIFICATIONS					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum junction operating temperature range	$T_J$			- 40 to 125	$^\circ\text{C}$
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 $\pm 10 \%$	IAP 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. Lubricated threads.		4 to 6	Nm
	busbar to IAP			200	
Approximate weight				7.1	oz.
Case style				New INT-A-PAK	

$\Delta R$ 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

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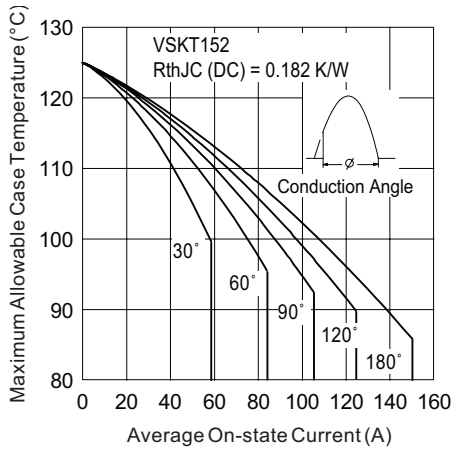


Fig. 1 - Current Ratings Characteristics

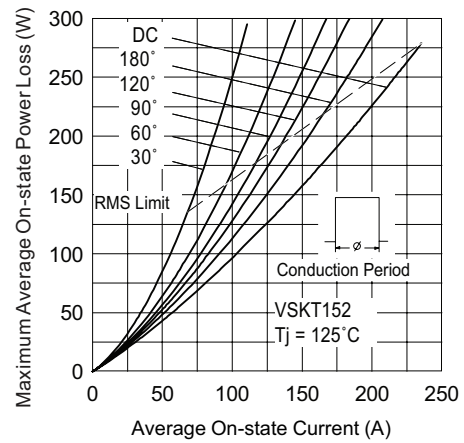


Fig. 4 - Forward Power Loss Characteristics

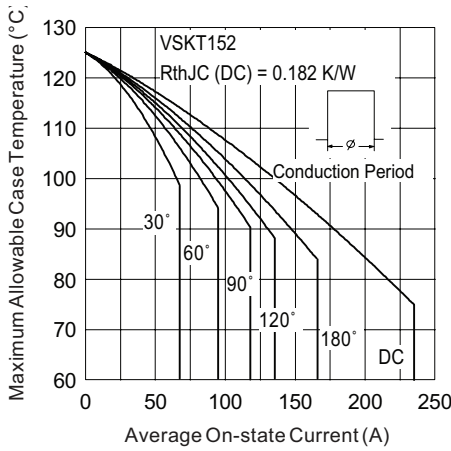


Fig. 2 - Current Ratings Characteristics

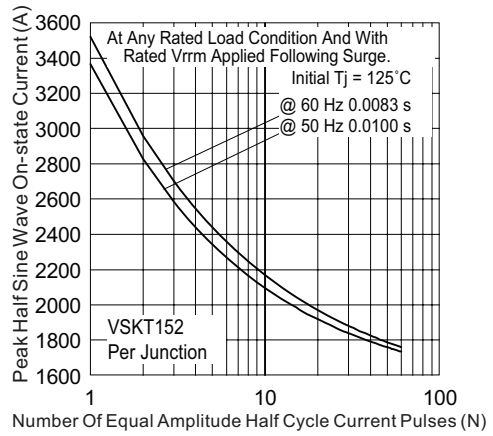


Fig. 5 - Maximum Non-Repetitive Surge Current

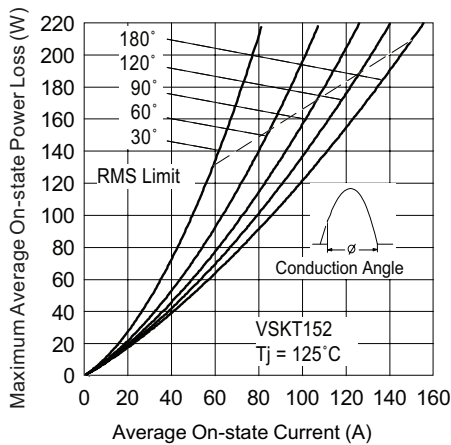


Fig. 3 - Forward Power Loss Characteristics

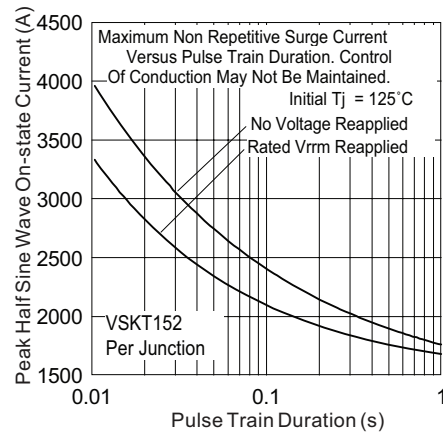


Fig. 6 - Maximum Non-Repetitive Surge Current



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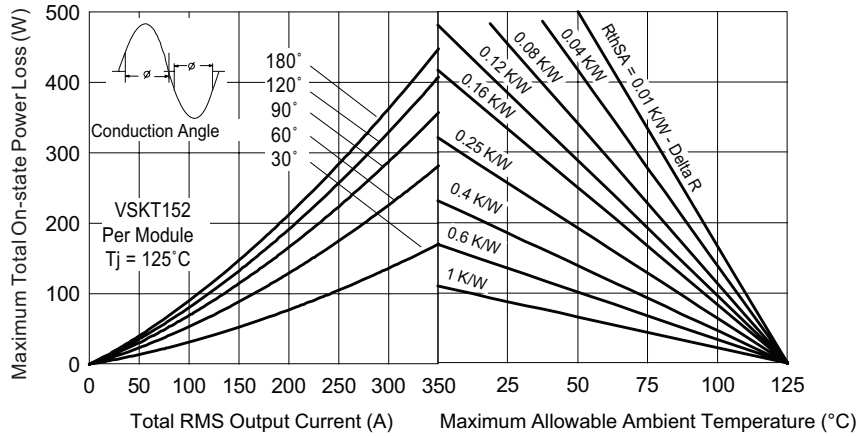


Fig. 7 - On-State Power Loss Characteristics

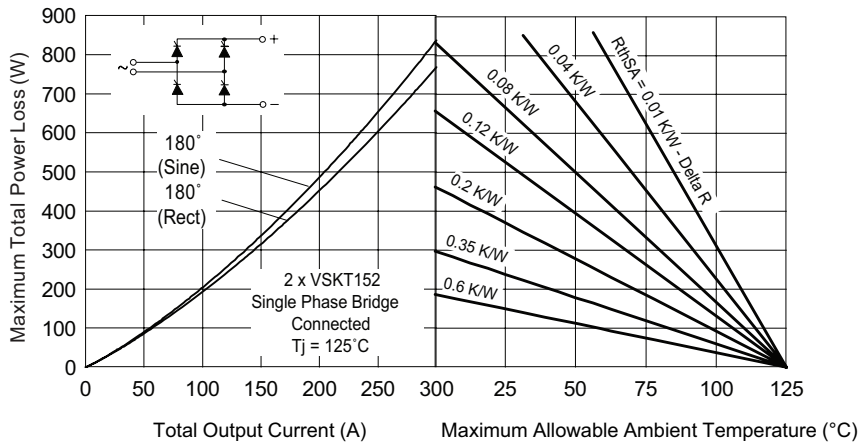


Fig. 8 - On-State Power Loss Characteristics

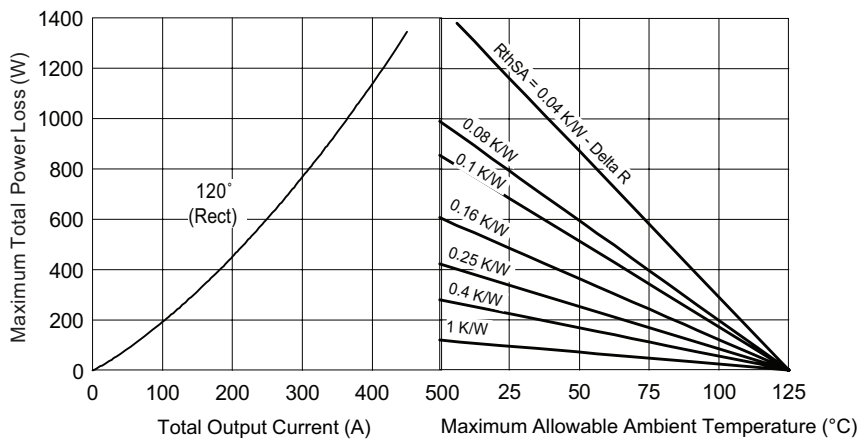


Fig. 9 - On-State Power Loss Characteristics

# VSKT152/04PbF



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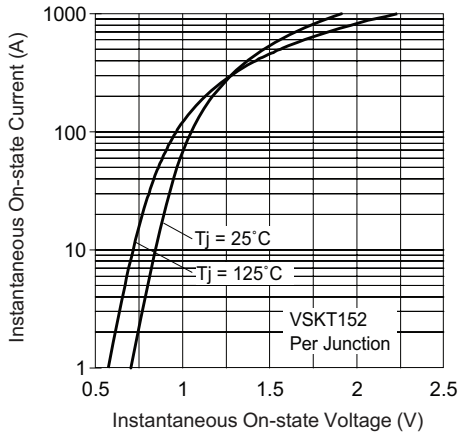


Fig. 10 - On-State Voltage Drop Characteristics

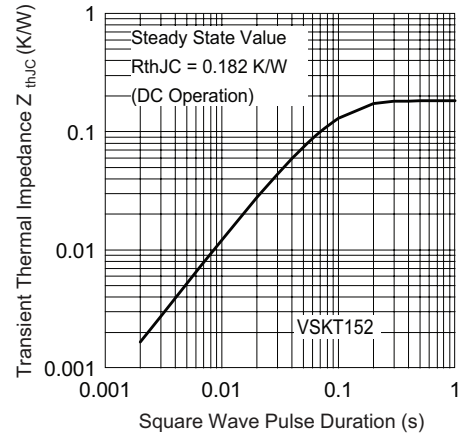


Fig. 11 - Thermal Impedance  $Z_{thJC}$  Characteristics

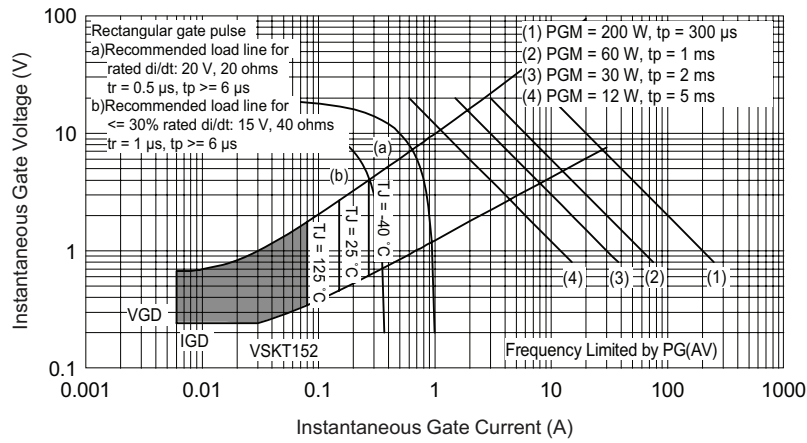


Fig. 12 - Gate Characteristics



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### ORDERING INFORMATION TABLE

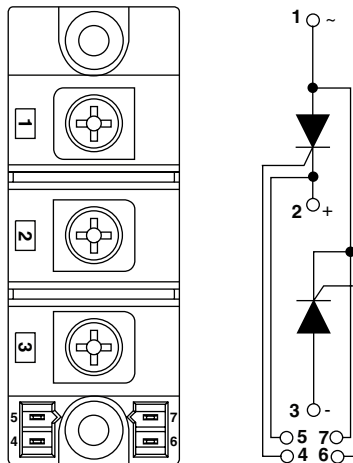
Device code	<b>VSK</b>	<b>T</b>	<b>152</b>	<b>/</b>	<b>04</b>	<b>PbF</b>
	①	②	③		④	⑤

- 1** - Module type
- 2** - Circuit configuration:  
T = Two SCR doubler 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](http://www.vishay.com/doc?95172)

### CIRCUIT CONFIGURATION



#### LINKS TO RELATED DOCUMENTS

Dimensions	<a href="http://www.vishay.com/doc?95067">http://www.vishay.com/doc?95067</a>
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