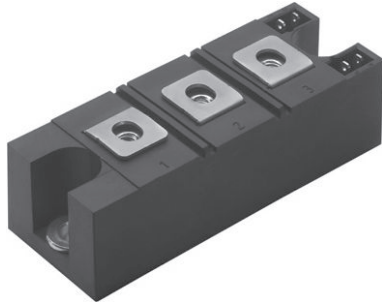





# Thyristor/Thyristor, 150 A (INT-A-PAK Power Module)



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](http://www.vishay.com/doc?99912)



RoHS  
COMPLIANT

### PRIMARY CHARACTERISTICS

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

### APPLICATIONS

- Battery charges
- Welders
- Power converters

### MAJOR RATINGS AND CHARACTERISTICS

SYMBOL	CHARACTERISTICS	VALUES	UNITS
$I_{T(AV)}$	85 °C	150	A
$I_{T(RMS)}$		330	A
$I_{TSM}$	50 Hz	4000	
	60 Hz	4200	
$I^2t$	50 Hz	80	kA <sup>2</sup> s
	60 Hz	73	
$I^2\sqrt{t}$		800	kA <sup>2</sup> √s
$V_{DRM}/V_{RRM}$		400	V
$T_{Stg}$	Range	-40 to +150	°C
$T_J$	Range	-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 °C mA
VS-VSKT152/04PbF	400	500	50



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

<b>SWITCHING</b>					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Typical delay time	$t_{gd}$	$T_J = 25^\circ\text{C}$	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	

<b>BLOCKING</b>					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum peak reverse and off-state leakage current	$I_{RRM}$ , $I_{DRM}$	$T_J = 125^\circ\text{C}$		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



TRIGGERING					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum peak gate power	$P_{GM}$	$t_p \leq 5$ 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	$I_{GM}$	$t_p \leq 5$ 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; $R_a = 1$ $\Omega$	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/ $\mu$ s

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 $\pm 10$ %	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	

$\Delta R$ 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

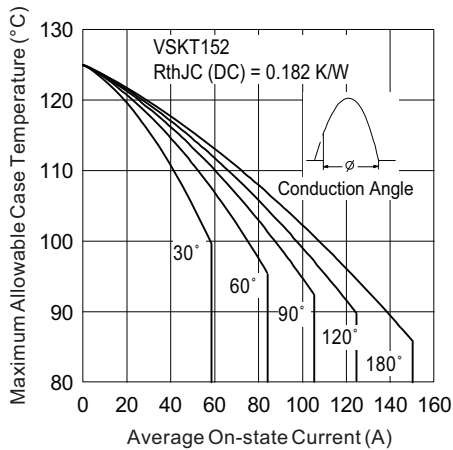


Fig. 1 - Current Ratings Characteristics

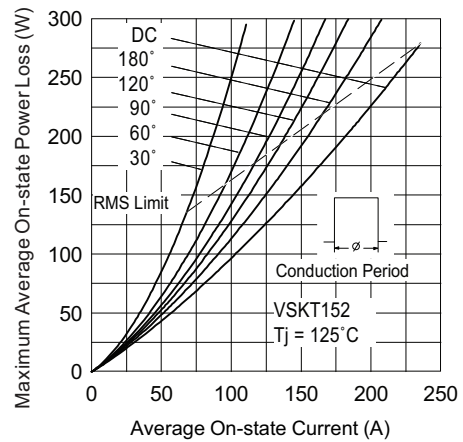


Fig. 4 - Forward Power Loss Characteristics

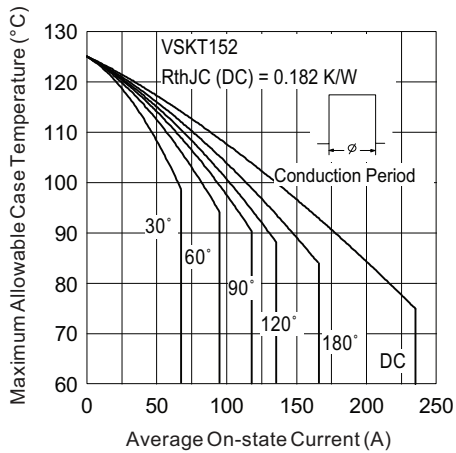


Fig. 2 - Current Ratings Characteristics

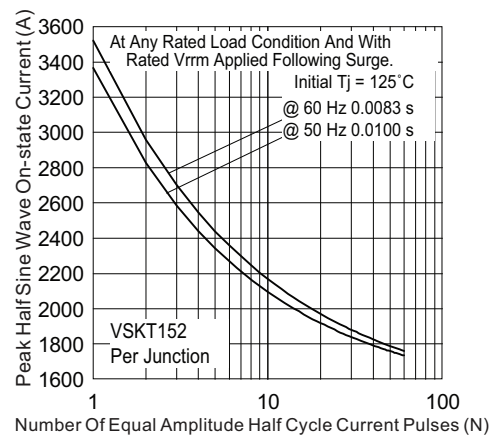


Fig. 5 - Maximum Non-Repetitive Surge Current

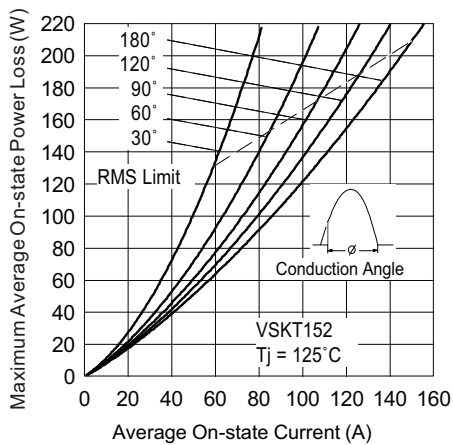


Fig. 3 - Forward Power Loss Characteristics

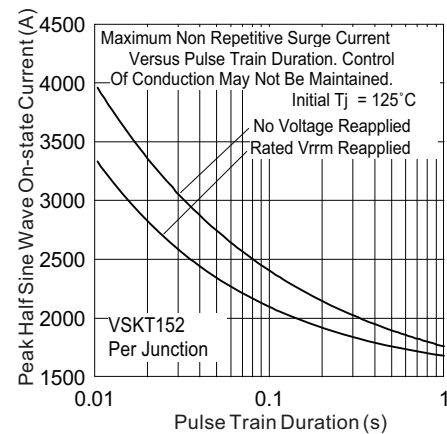


Fig. 6 - Maximum Non-Repetitive Surge Current

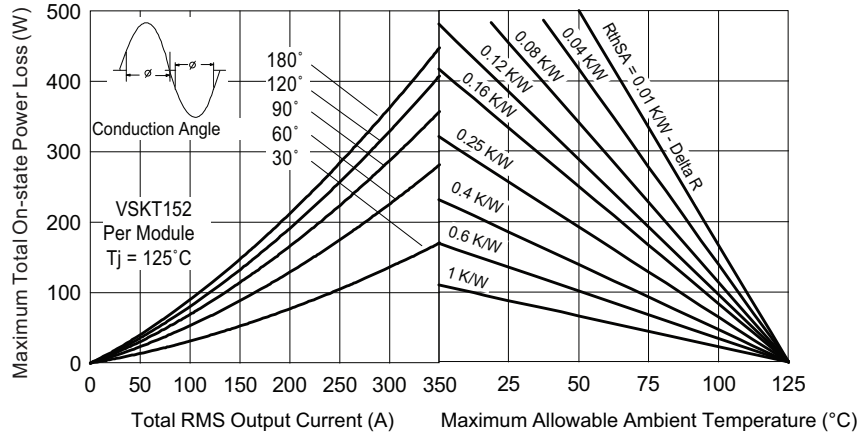


Fig. 7 - On-State Power Loss Characteristics

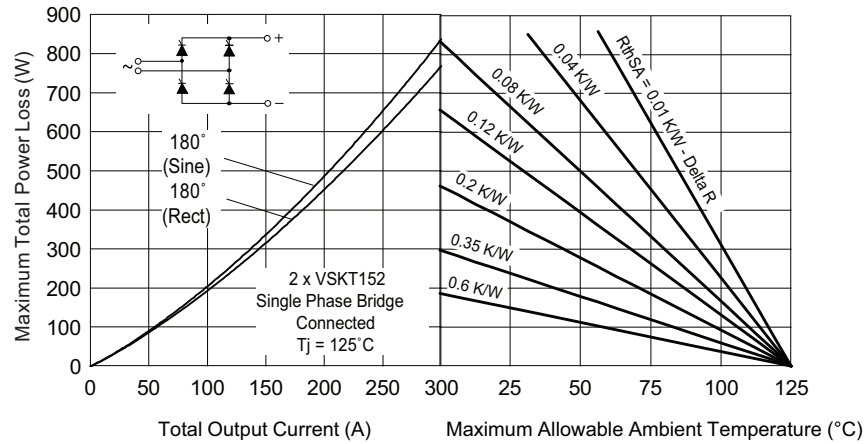


Fig. 8 - On-State Power Loss Characteristics

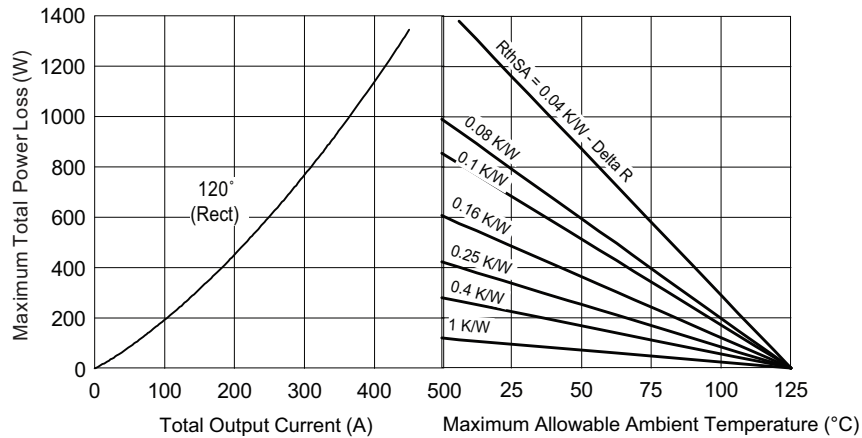


Fig. 9 - On-State Power Loss Characteristics

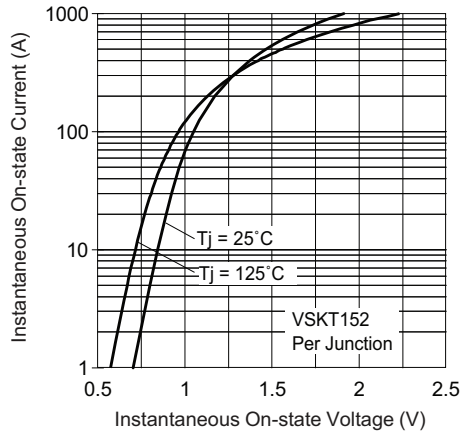


Fig. 10 - On-State Voltage Drop Characteristics

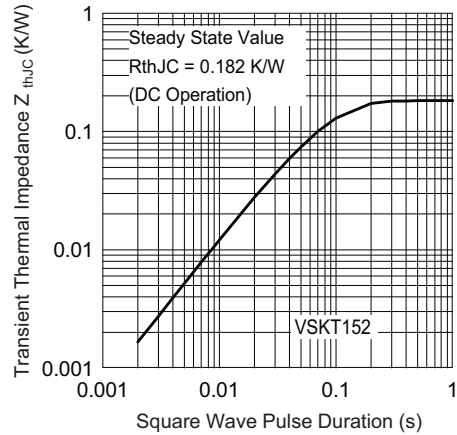


Fig. 11 - Thermal Impedance  $Z_{thJC}$  Characteristics

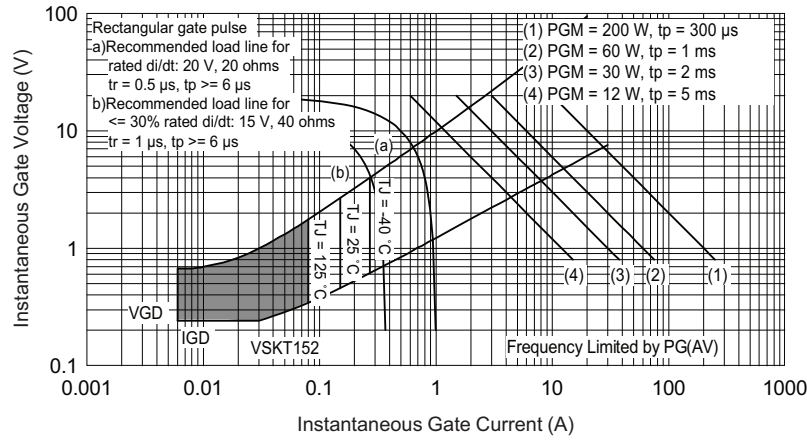


Fig. 12 - Gate Characteristics

**ORDERING INFORMATION TABLE**

Device code	<b>VS-VS</b>	<b>KT</b>	<b>152</b>	<b>04</b>	<b>PbF</b>
	①	②	③	④	⑤
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
	-	-	-	-	-
	Vishay Semiconductors product	Circuit configuration	Current rating	Voltage rating (04 = 400 V)	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		
CIRCUIT DESCRIPTION	CIRCUIT CONFIGURATION CODE	CIRCUIT DRAWING
Two SCRs doubler circuit	T	

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

## INT-A-PAK IGBT/Thyristor

**DIMENSIONS** in millimeters (inches)







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