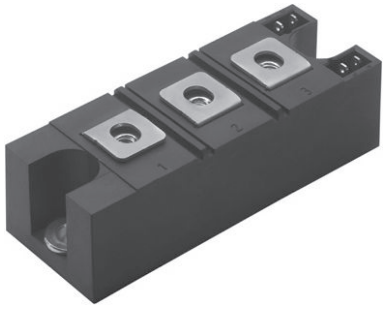
Thyristor/Thyristor, 150 A (INT-A-PAK Power Module)



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

APPLICATIONS

- Battery charges
- Welders
- Power converters

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

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^2s
	60 Hz	73	
$I^2\sqrt{t}$		800	$kA^2\sqrt{s}$
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

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^2t for fusing	I^2t	t = 10 ms	No voltage reapplied		80	kA^2s
		t = 8.3 ms			73	
		t = 10 ms	100 % V_{RRM} reapplied		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 reapplied			800	$kA^2\sqrt{s}$
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 °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 °C	Gate current = 1 A, dI_g/dt = 1 A/µs V_d = 0.67 % V_{DRM}	1	µs
Typical rise time	t_{gr}			2	
Typical turn-off time	t_q	I_{TM} = 300 A, - dI/dt = 15 A/µs; T_J = T_J maximum V_R = 50 V; dV/dt = 20 V/µs; 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 °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 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		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				
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

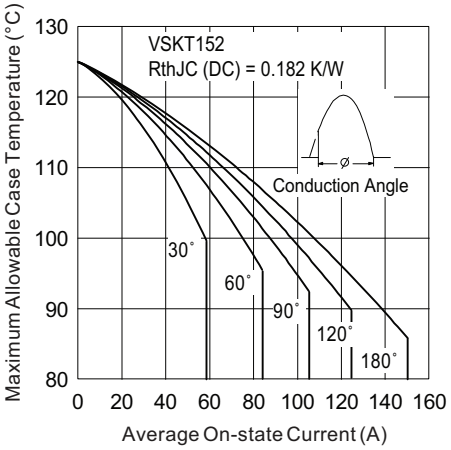


Fig. 1 - Current Ratings Characteristics

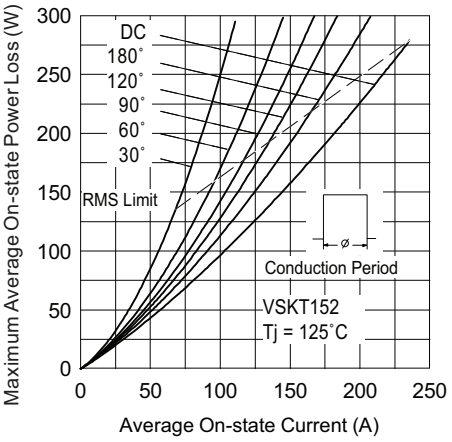


Fig. 4 - Forward Power Loss Characteristics

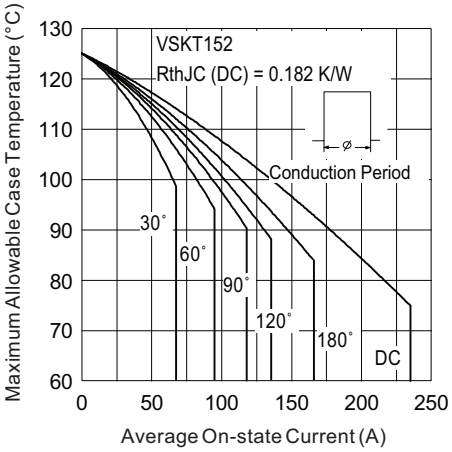


Fig. 2 - Current Ratings Characteristics

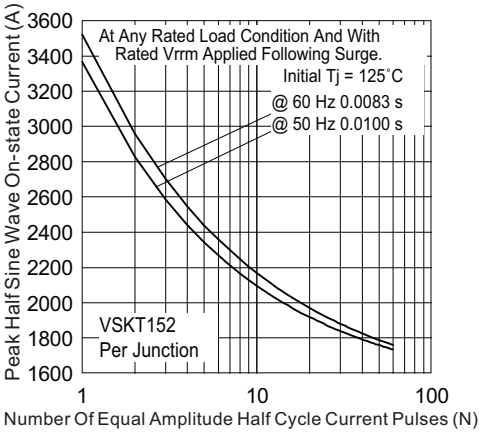


Fig. 5 - Maximum Non-Repetitive Surge Current

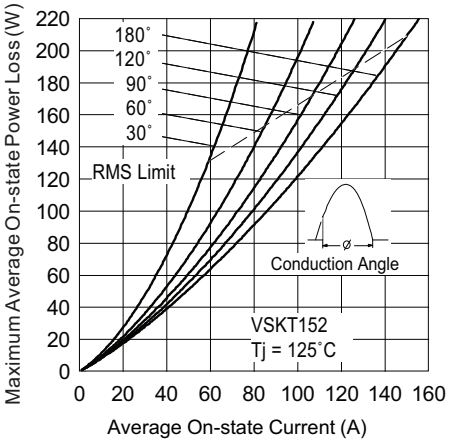


Fig. 3 - Forward Power Loss Characteristics

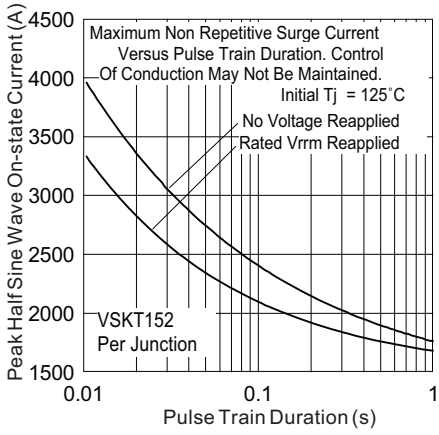


Fig. 6 - Maximum Non-Repetitive Surge Current

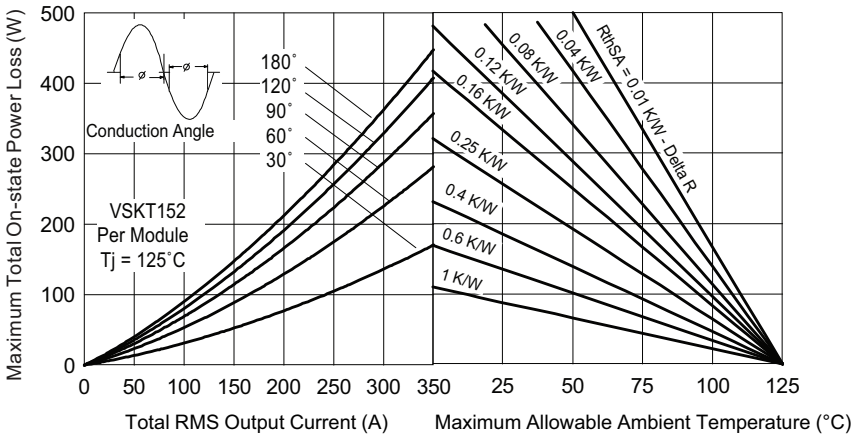


Fig. 7 - On-State Power Loss Characteristics

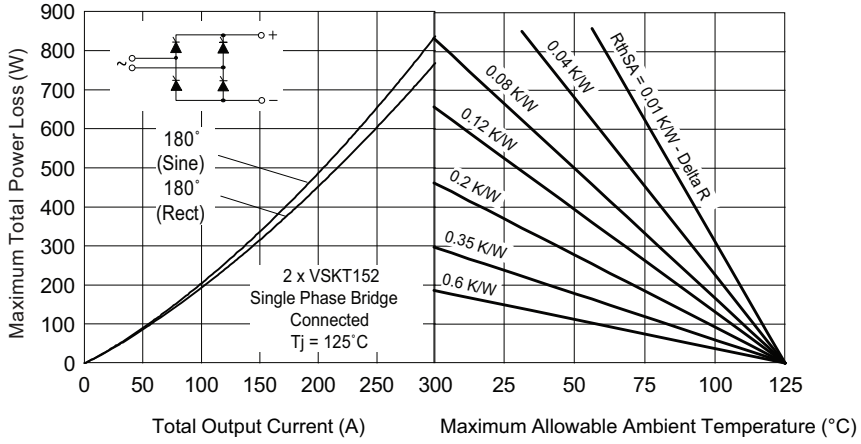


Fig. 8 - On-State Power Loss Characteristics

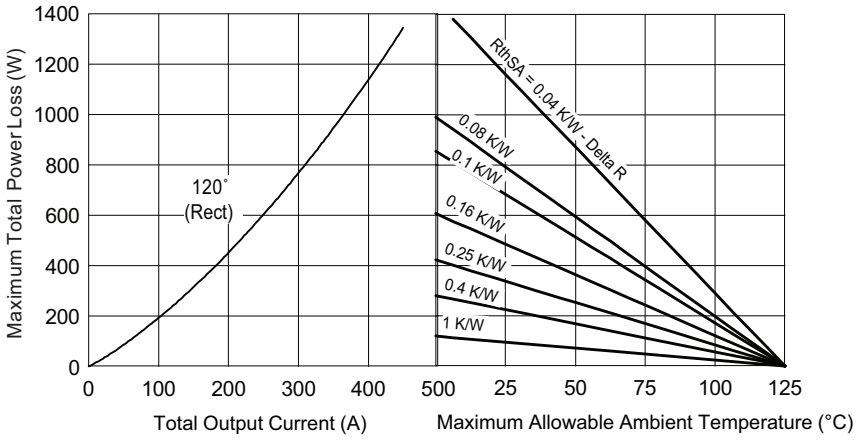


Fig. 9 - On-State Power Loss Characteristics

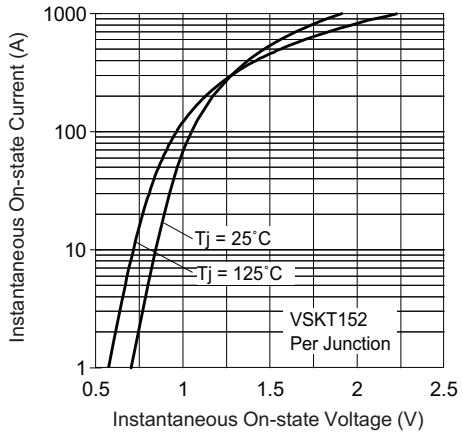


Fig. 10 - On-State Voltage Drop Characteristics

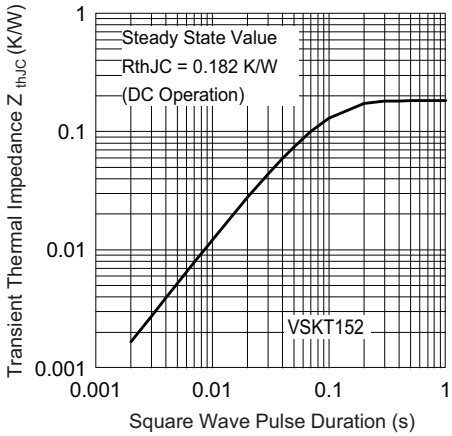


Fig. 11 - Thermal Impedance Z_{thJC} Characteristics

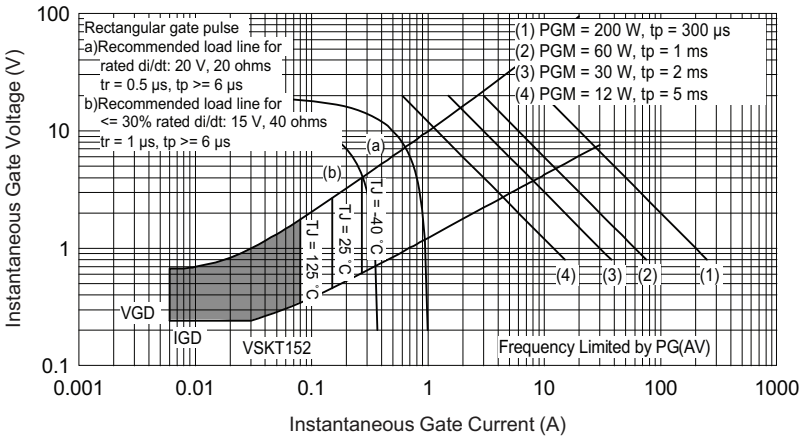


Fig. 12 - Gate Characteristics

ORDERING INFORMATION TABLE

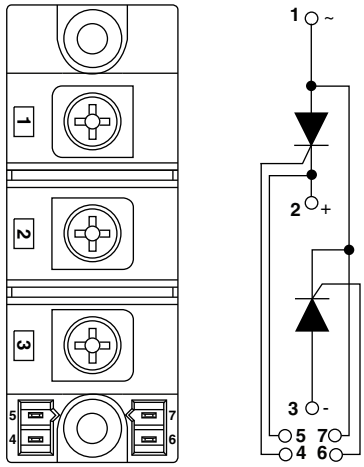
Device code

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

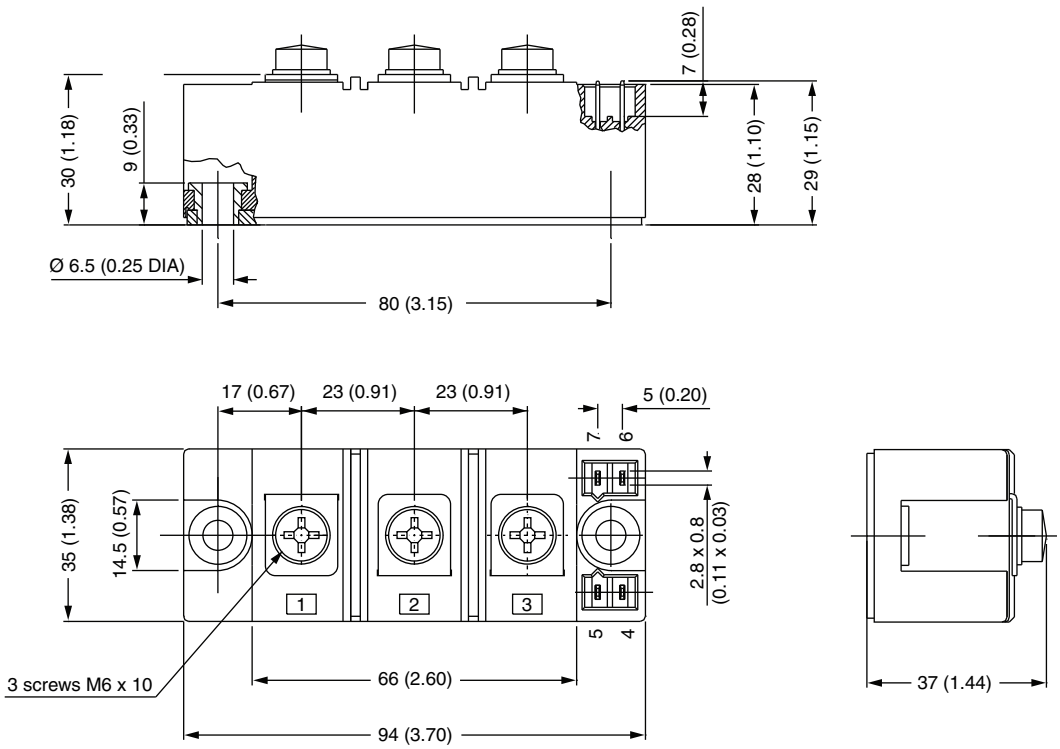
- To order the optional hardware go to www.vishay.com/doc?95172

CIRCUIT CONFIGURATION		
CIRCUIT DESCRIPTION	**CIRCUIT CONFIGURATION CODE**	**CIRCUIT DRAWING**
Two SCRs doubler circuit	T	

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

INT-A-PAK IGBT/Thyristor

DIMENSIONS in millimeters (inches)



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