

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 approved file E78996
- Compliant to RoHS directive 2002/95/EC
- Designed and qualified for multiple level



RoHS
COMPLIANT

PRODUCT SUMMARY

| | |
|-------------|-------|
| $I_{T(AV)}$ | 150 A |
|-------------|-------|

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^2s |
| | 60 Hz | 73 | |
| $I^2\sqrt{t}$ | | 800 | $kA^2\sqrt{s}$ |
| 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 |
|---------------|---|---|--------------------------------------|
| 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 ² 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 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} | $I_{pk} = \pi \times I_{T(AV)}$, $T_J = 25^\circ\text{C}$ | | 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 | |

| SWITCHING | | | | | |
|-----------------------|----------|---|--|-----------|-------|
| 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 | |

| BLOCKING | | | | | |
|--|--------------------------|--|--|--------|-------|
| 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 |



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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/ μs |

| 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 | | | | |
| Approximate weight | | | | 200 | g |
| | | | | 7.1 | oz. |
| Case style | | | | New 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

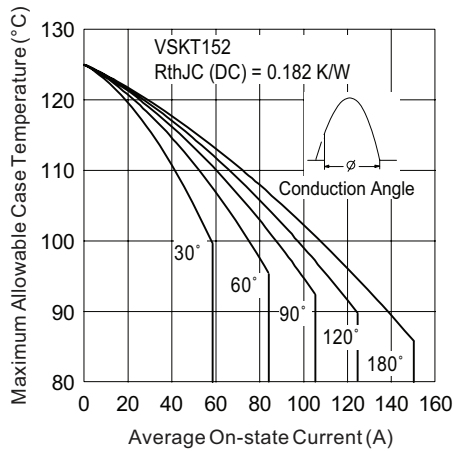


Fig. 1 - Current Ratings Characteristics

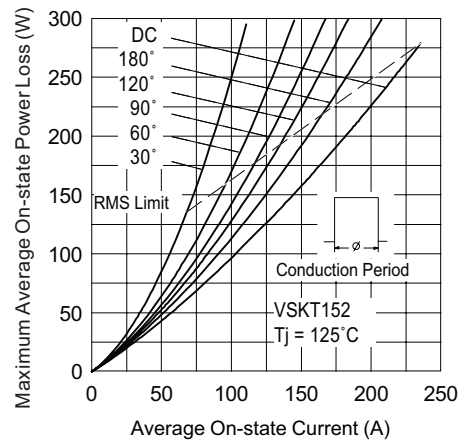


Fig. 4 - Forward Power Loss Characteristics

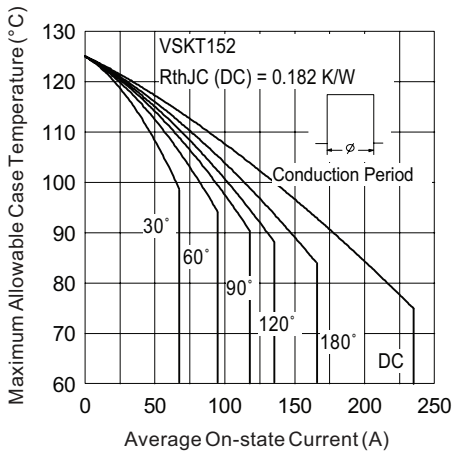


Fig. 2 - Current Ratings Characteristics

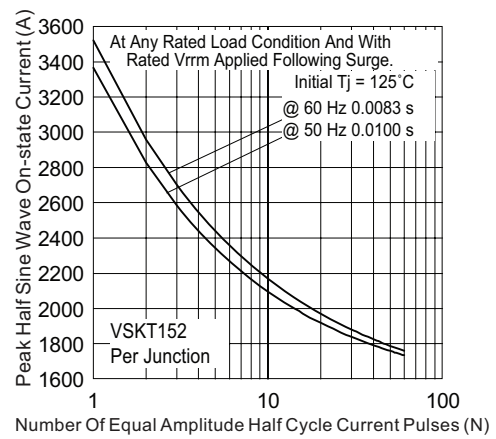


Fig. 5 - Maximum Non-Repetitive Surge Current

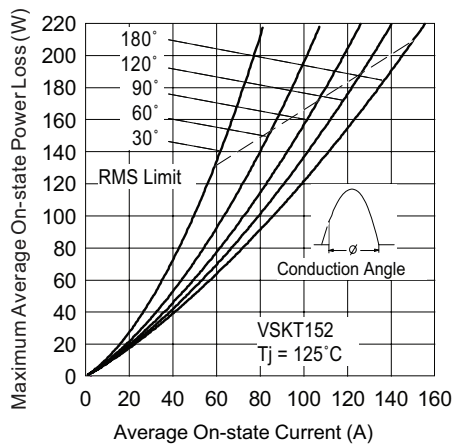


Fig. 3 - Forward Power Loss Characteristics

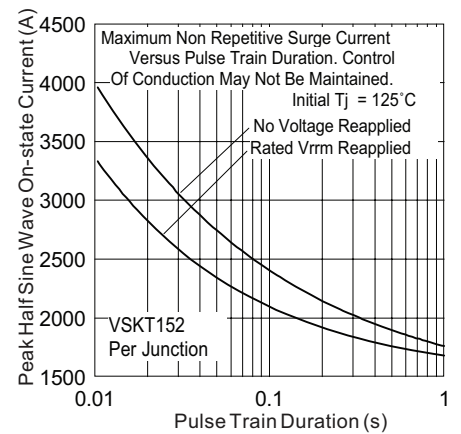


Fig. 6 - Maximum Non-Repetitive Surge Current

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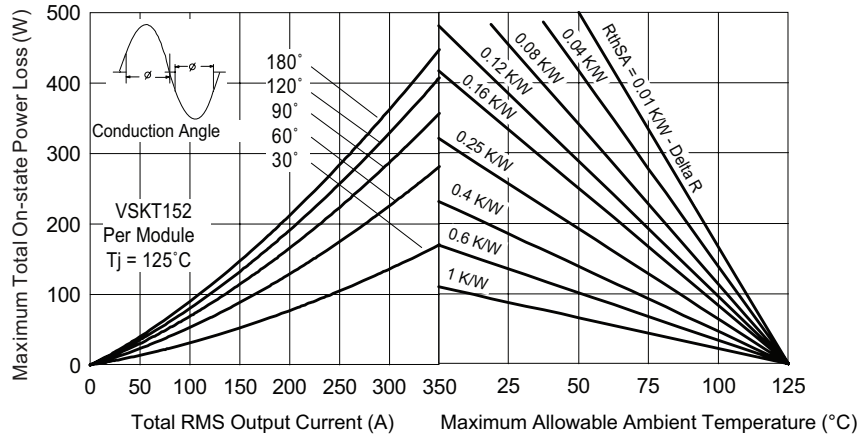


Fig. 7 - On-State Power Loss Characteristics

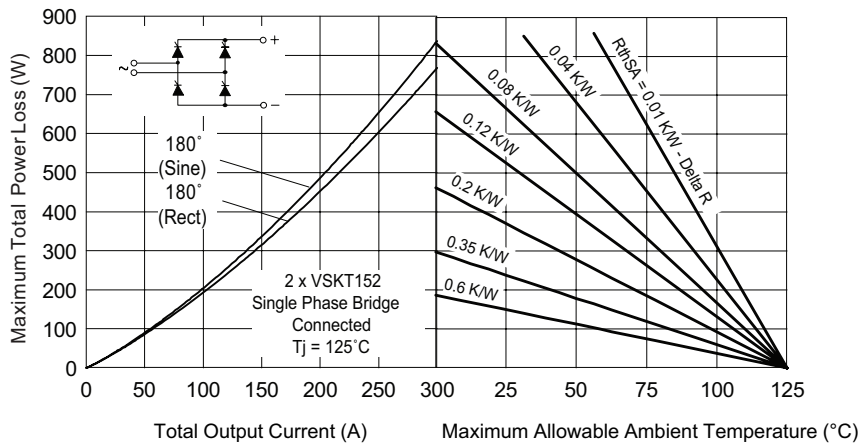


Fig. 8 - On-State Power Loss Characteristics

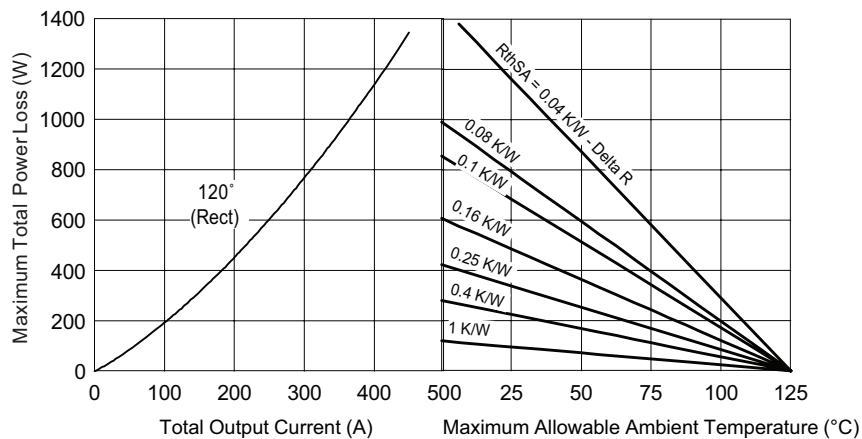


Fig. 9 - On-State Power Loss Characteristics

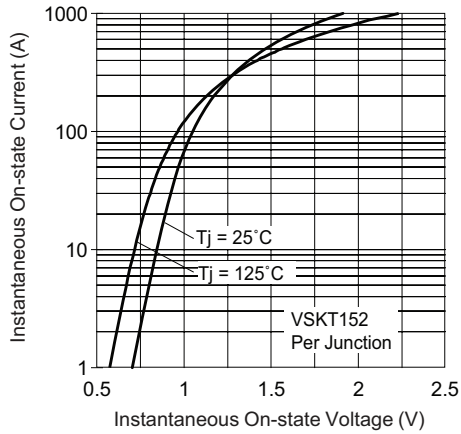


Fig. 10 - On-State Voltage Drop Characteristics

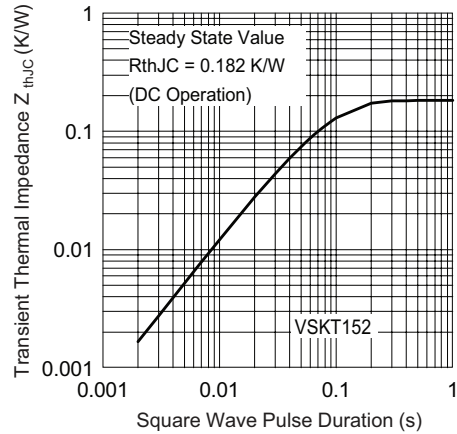


Fig. 11 - Thermal Impedance Z_{thJC} Characteristics

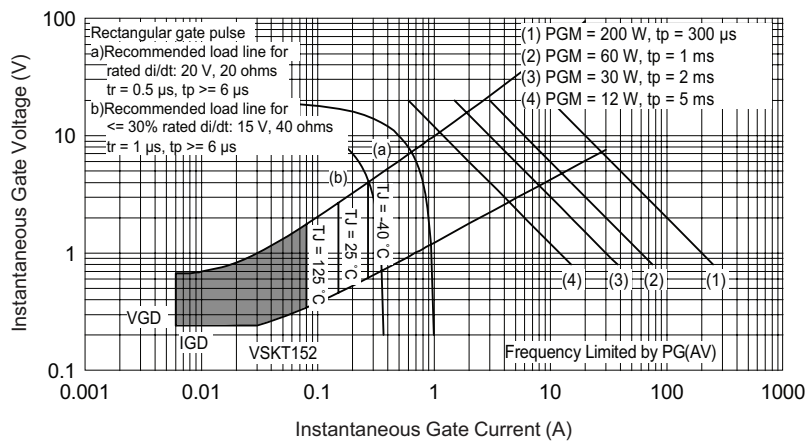


Fig. 12 - Gate Characteristics

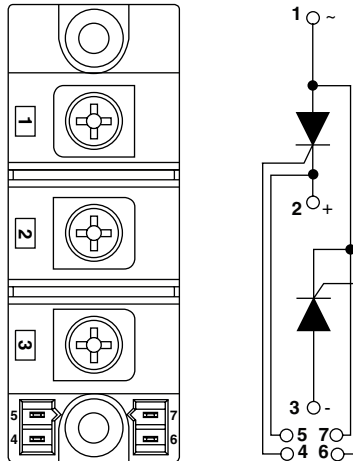
ORDERING INFORMATION TABLE

| | | | | | | |
|-------------|------------|----------|-----------------------------------|----------|-----------|------------|
| Device code | VSK | T | 152 | / | 04 | PbF |
| | 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

CIRCUIT CONFIGURATION

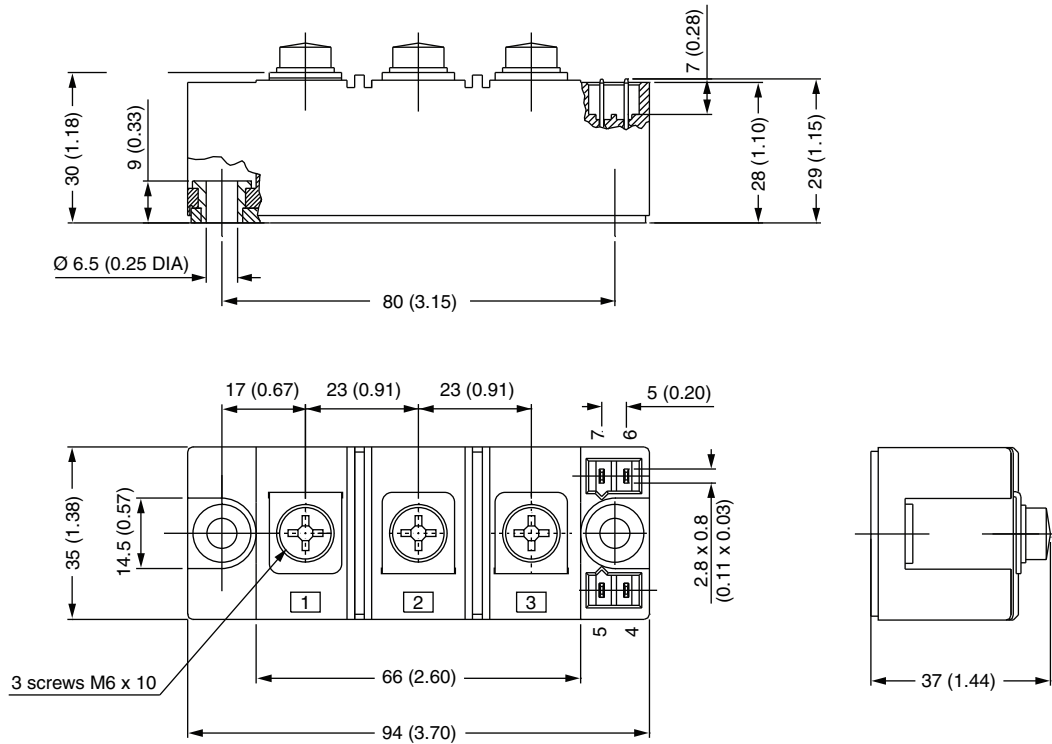


LINKS TO RELATED DOCUMENTS

| | |
|------------|--|
| Dimensions | www.vishay.com/doc?9506Z |
|------------|--|

INT-A-PAK IGBT/Thyristor

DIMENSIONS in millimeters (inches)





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