


Thyristor/Thyristor (SUPER MAGN-A-PAK Power Modules), 570 A



SUPER MAGN-A-PAK

FEATURES

- High current capability
- High surge capability
- Industrial standard package
- 3000 V_{RMS} isolating voltage with non-toxic substrate
- Designed and qualified for industrial level
- UL approved file E78996 
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT

TYPICAL APPLICATIONS

- Motor starters
- DC motor controls - AC motor controls
- Uninterruptible power supplies

PRODUCT SUMMARY

| | |
|-------------|-------------------------------|
| $I_{T(AV)}$ | 570 A |
| Type | Modules - Thyristor, Standard |
| Package | SMAP |
| Circuit | Two SCRs Doubler Circuit |

MAJOR RATINGS AND CHARACTERISTICS

| SYMBOL | CHARACTERISTICS | VALUES | UNITS |
|-------------------|----------------------------------|-------------|--------------------|
| $I_{T(AV)}$ | $T_C = 85\text{ }^\circ\text{C}$ | 570 | A |
| $I_{T(RMS)}$ | $T_C = 85\text{ }^\circ\text{C}$ | 894 | |
| I_{TSM} | 50 Hz | 18 000 | |
| | 60 Hz | 18 800 | |
| I^2t | 50 Hz | 1620 | kA ² s |
| | 60 Hz | 1473 | |
| $I^2\sqrt{t}$ | | 16 200 | kA ² √s |
| V_{DRM}/V_{RRM} | | 1600 | V |
| T_{Stg} | Range | -40 to +125 | °C |
| T_J | Range | -40 to +135 | |

ELECTRICAL SPECIFICATIONS

VOLTAGE RATINGS

| TYPE NUMBER | VOLTAGE CODE | V_{RRM}/V_{DRM} , MAXIMUM REPETITIVE PEAK REVERSE VOLTAGE V | V_{RSM} , MAXIMUM NON-REPETITIVE PEAK REVERSE VOLTAGE V | I_{RRM}/I_{DRM} MAXIMUM AT $T_J = T_J$ MAXIMUM mA |
|------------------|--------------|--|--|--|
| VS-VSKT570-16PbF | 16 | 1600 | 1700 | 110 |



| 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 | | 570 | A |
| | | | | 85 | °C |
| Maximum RMS on-state current | $I_{T(RMS)}$ | 180° conduction, half sine wave at $T_C = 85\text{ °C}$ | | 894 | A |
| Maximum peak, one-cycle, non-repetitive on-state surge current | I_{TSM}, I_{FSM} | t = 10 ms | No voltage reapplied | Sinusoidal half wave, initial $T_J = T_J$ maximum | kA |
| | | t = 8.3 ms | | | |
| | | t = 10 ms | 100 % V_{RRM} reapplied | | |
| | | t = 8.3 ms | | | |
| Maximum I^2t for fusing | I^2t | t = 10 ms | No voltage reapplied | kA ² s | |
| | | t = 8.3 ms | | | |
| | | t = 10 ms | 100 % V_{RRM} reapplied | | |
| | | t = 8.3 ms | | | |
| Maximum $I^2\sqrt{t}$ for fusing | $I^2\sqrt{t}$ | t = 0.1 ms to 10 ms, no voltage reapplied | | 16 200 | kA ² √s |
| Low level value or threshold voltage | $V_{T(TO)1}$ | $(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)})$, $T_J = T_J$ maximum | | 0.59 | V |
| High level value of threshold voltage | $V_{T(TO)2}$ | $(I > \pi \times I_{T(AV)})$, $T_J = T_J$ maximum | | 0.63 | |
| Low level value on-state slope resistance | r_{t1} | $(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)})$, $T_J = T_J$ maximum | | 0.41 | mΩ |
| High level value on-state slope resistance | r_{t2} | $(I > \pi \times I_{T(AV)})$, $T_J = T_J$ maximum | | 0.38 | |
| Maximum on-state voltage drop | V_{TM} | $I_{pk} = 1500\text{ A}$, $T_J = 25\text{ °C}$, $t_p = 10\text{ ms}$ sine pulse | | 1.36 | V |
| Maximum holding current | I_H | $T_J = 25\text{ °C}$, anode supply 12 V resistive load | | 500 | mA |
| Maximum latching current | I_L | | | 1000 | |

| SWITCHING | | | | | |
|---|---------|---|--|-----------|-------|
| PARAMETER | SYMBOL | TEST CONDITIONS | | VALUES | UNITS |
| Maximum rate of rise of turned-on current | di/dt | $T_J = T_J$ maximum, $I_{TM} = 400\text{ A}$, V_{DRM} applied | | 1000 | A/μs |
| Typical delay time | t_d | Gate current 1 A, $di_g/dt = 1\text{ A}/\mu\text{s}$ $V_d = 0.67\% V_{DRM}$, $T_J = 25\text{ °C}$ | | 2.0 | μs |
| Typical turn-off time | t_q | $I_{TM} = 750\text{ A}$; $T_J = T_J$ maximum, $di/dt = -60\text{ A}/\mu\text{s}$, $V_R = 50\text{ V}$, $dV/dt = 20\text{ V}/\mu\text{s}$, gate 0 V 100 Ω | | 65 to 240 | |

| BLOCKING | | | | | |
|--|--------------------|--|--|--------|-------|
| PARAMETER | SYMBOL | TEST CONDITIONS | | VALUES | UNITS |
| Maximum critical rate of rise of off-state voltage | dV/dt | $T_J = T_J$ maximum, linear to $V_D = 80\% V_{DRM}$ | | 1000 | V/μs |
| RMS insulation voltage | V_{INS} | t = 1 s | | 3000 | V |
| Maximum peak reverse and off-state leakage current | I_{RRM}, I_{DRM} | $T_J = T_J$ maximum, rated V_{DRM}/V_{RRM} applied | | 110 | mA |



| TRIGGERING | | | | |
|---|-------------|--|--------|-------|
| PARAMETER | SYMBOL | TEST CONDITIONS | VALUES | UNITS |
| Maximum peak gate power | P_{GM} | $T_J = T_J$ maximum, $t_p \leq 5$ ms | 10 | W |
| Maximum peak average gate power | $P_{G(AV)}$ | $T_J = T_J$ maximum, $f = 50$ Hz, $d\% = 50$ | 2.0 | |
| Maximum peak positive gate current | $+I_{GM}$ | $T_J = T_J$ maximum, $t_p \leq 5$ ms | 3.0 | A |
| Maximum peak positive gate voltage | $+V_{GM}$ | | 20 | |
| Maximum peak negative gate voltage | $-V_{GM}$ | | 5.0 | |
| Maximum DC gate current required to trigger | I_{GT} | $T_J = 25$ °C, V_{ak} 12 V | 200 | mA |
| DC gate voltage required to trigger | V_{GT} | | 3.0 | V |
| DC gate current not to trigger | I_{GD} | $T_J = T_J$ maximum | 10 | mA |
| DC gate voltage not to trigger | V_{GD} | | 0.25 | V |

| THERMAL AND MECHANICAL SPECIFICATIONS | | | | |
|---|------------------|--|------------------|-------|
| PARAMETER | SYMBOL | TEST CONDITIONS | VALUES | UNITS |
| Maximum junction operating temperature range | T_J | | -40 to +135 | °C |
| Maximum storage temperature range | T_{Stg} | | -40 to +125 | |
| Maximum thermal resistance, junction to case per junction | R_{thJC} | DC operation | 0.06 | K/W |
| Maximum thermal resistance, case to heatsink per module | R_{thC-hs} | Mounting surface smooth, flat and greased | 0.02 | |
| Mounting torque ± 10 % | SMAP 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. | 6-8 | Nm |
| | busbar to SMAP | | 12-15 | |
| Approximate weight | | | 1500 | g |
| Case style | | See dimensions (link at the end of datasheet) | SUPER MAGN-A-PAK | |

| ΔR_{thJC} CONDUCTION | | | | |
|------------------------------|-----------------------|------------------------|---------------------|-------|
| CONDUCTION ANGLE | SINUSOIDAL CONDUCTION | RECTANGULAR CONDUCTION | TEST CONDITIONS | UNITS |
| 180° | 0.009 | 0.006 | $T_J = T_J$ maximum | K/W |
| 120° | 0.011 | 0.011 | | |
| 90° | 0.014 | 0.015 | | |
| 60° | 0.021 | 0.022 | | |
| 30° | 0.037 | 0.038 | | |

Note

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

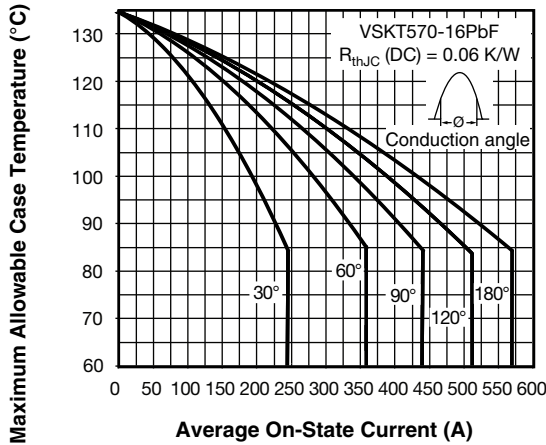


Fig. 1 - Current Ratings Characteristics

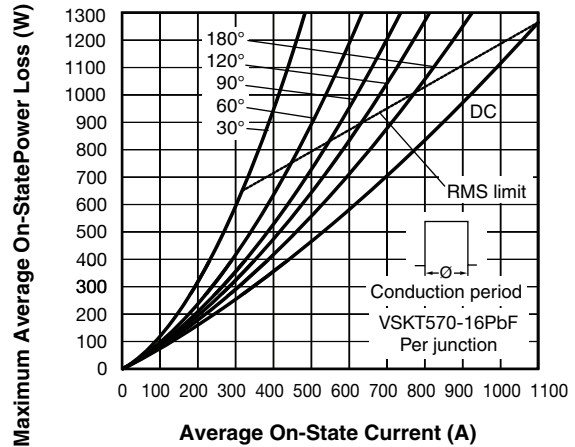


Fig. 4 - On-State Power Loss Characteristics

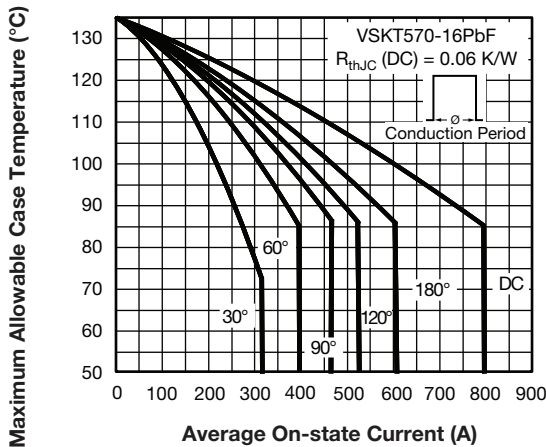


Fig. 2 - Current Ratings Characteristics

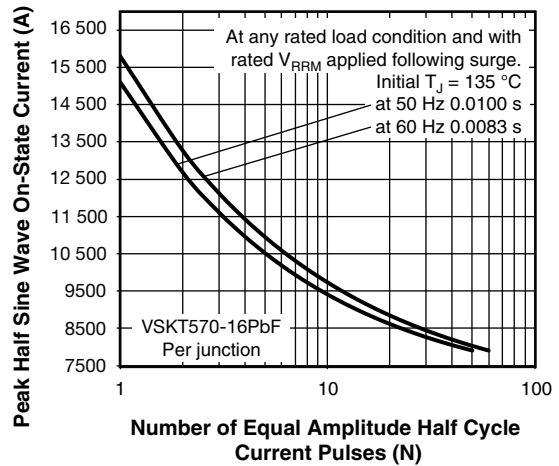


Fig. 5 - Maximum Non-Repetitive Surge Current

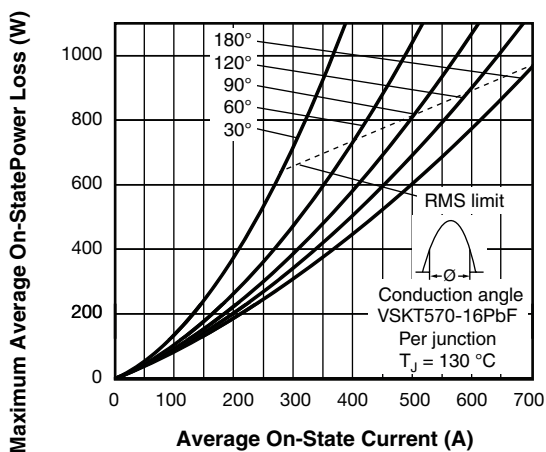


Fig. 3 - On-State Power Loss Characteristics

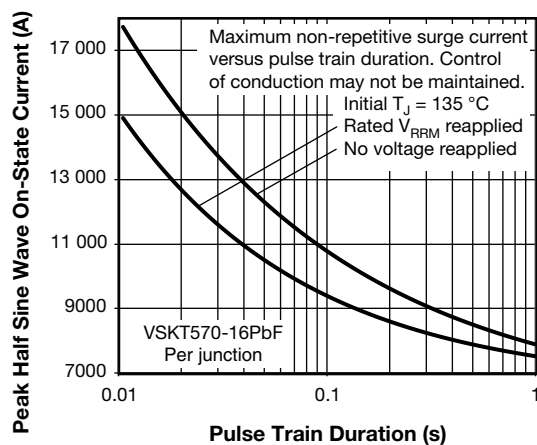


Fig. 6 - Maximum Non-Repetitive Surge Current

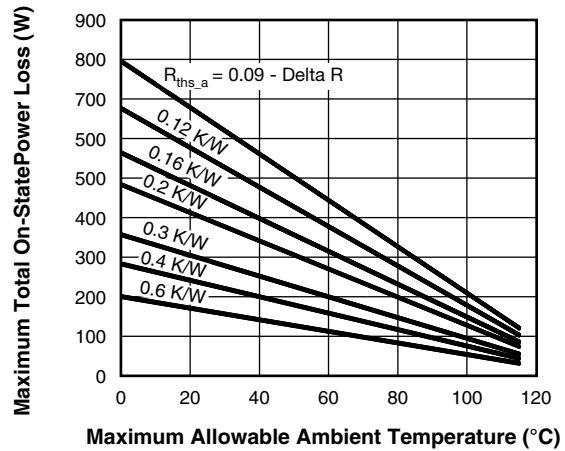
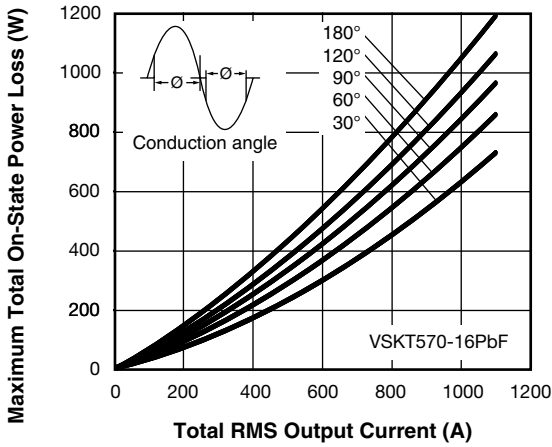


Fig. 7 - On-State Power Loss Characteristics

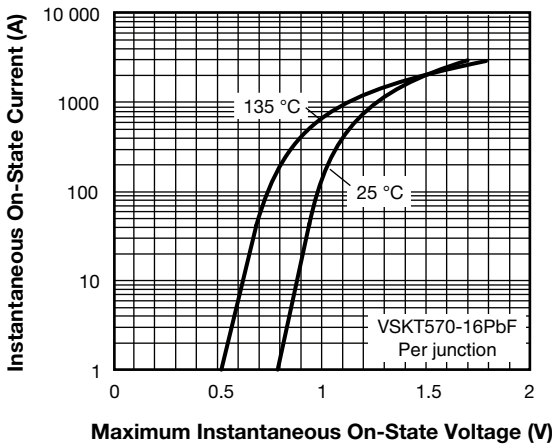


Fig. 8 - On-State Voltage Drop Characteristics

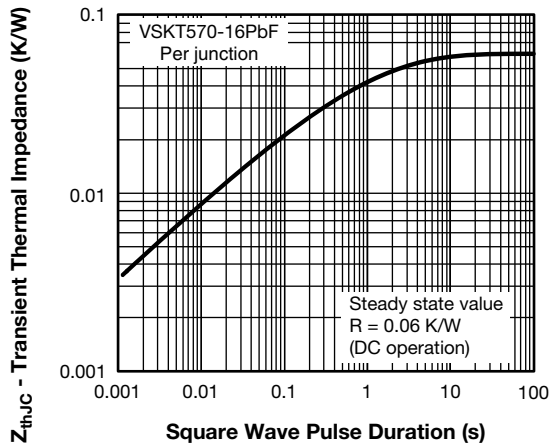


Fig. 9 - Thermal Impedance Z_{thJC} Characteristics

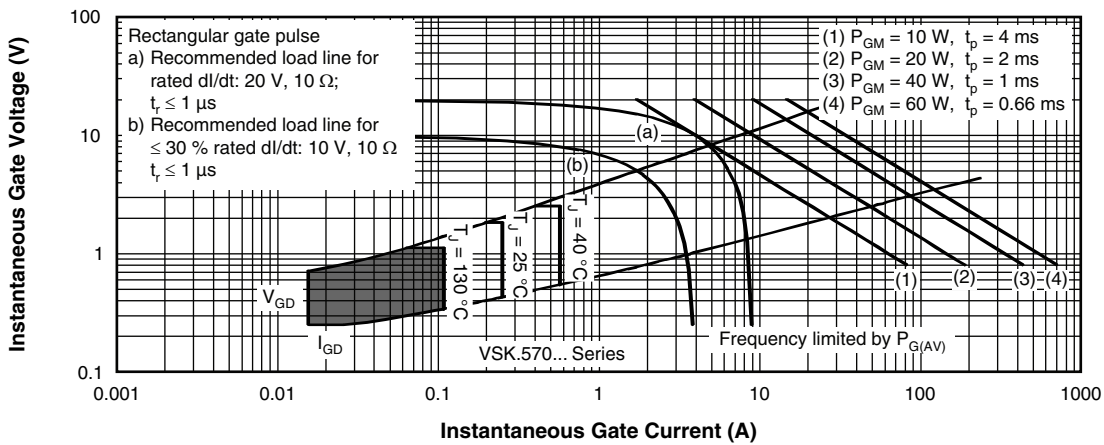


Fig. 10 - Gate Characteristics

ORDERING INFORMATION TABLE

| | | | | | | | |
|-------------|------------|------------|----------|------------|----------|-----------|------------|
| Device code | VS- | VSK | T | 570 | - | 16 | PbF |
| | ① | ② | ③ | ④ | | ⑤ | ⑥ |

- 1** - Vishay Semiconductors product
- 2** - Module type
- 3** - Circuit configuration (see below)
- 4** - Current rating
- 5** - Voltage code x 100 = V_{RRM}
- 6** - Lead (Pb)-free

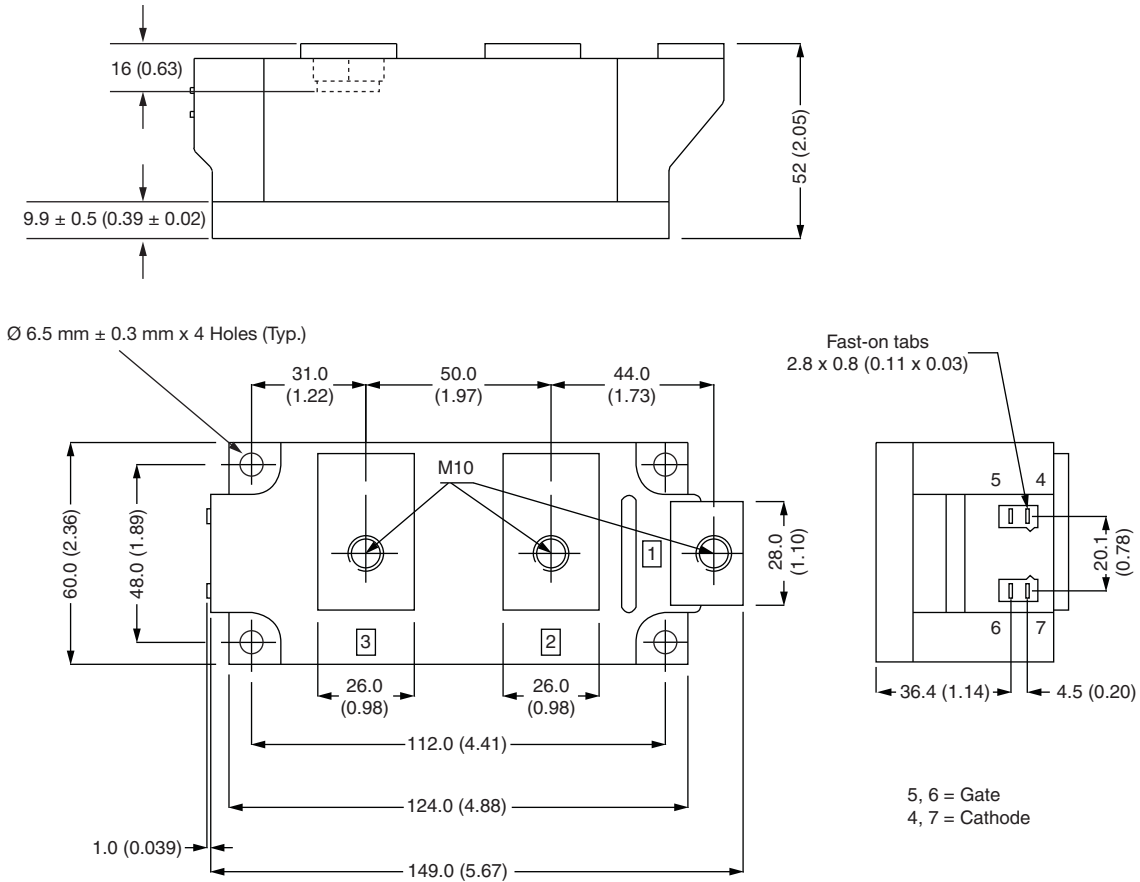
| CIRCUIT CONFIGURATION | | |
|--------------------------|----------------------------|-----------------|
| CIRCUIT DESCRIPTION | CIRCUIT CONFIGURATION CODE | CIRCUIT DRAWING |
| Two SCRs doubler circuit | T | |

| LINKS TO RELATED DOCUMENTS | |
|----------------------------|--|
| Dimensions | www.vishay.com/doc?95283 |



Super MAGN-A-PAK Thyristor/Diode

DIMENSIONS in millimeters (inches)





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