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# Thyristor/Diode and Thyristor/Thyristor (SUPER MAGN-A-PAK Power Modules), 430 A

SUPER MAGN-A-PAK

## FEATURES

- High current capability
- High surge capability
- High voltage ratings up to 2000 V
- 3000 $V_{RMS}$ isolating voltage with non-toxic substrate
- Industrial standard package
- UL approved file E78996
- Compliant to RoHS directive 2002/95/EC

Pb-free
RoHS COMPLIANT

## TYPICAL APPLICATIONS

- Motor starters
- DC motor controls - AC motor controls
- Uninterruptable power supplies
- Wind mill

| PRODUCT SUMMARY | |
|---|---|
| $I_{T(AV)}$ | 430 A |

| MAJOR RATINGS AND CHARACTERISTICS | | | |
|---|---|---|---|
| SYMBOL | CHARACTERISTICS | VALUES | UNITS |
| $I_{T(AV)}$ | 82 °C | 430 | A |
| $I_{T(RMS)}$ | | 675 | A |
| | $T_C$ | 82 | °C |
| $I_{TSM}$ | 50 Hz | 15.7 | kA |
| | 60 Hz | 16.4 | |
| $I^2t$ | 50 Hz | 1232 | $kA^2s$ |
| | 60 Hz | 1125 | |
| $I^2\sqrt{t}$ | | 12 320 | $kA^2\sqrt{s}$ |
| $V_{RRM}$ | Range | 1600 to 2000 | V |
| $T_J$ | Range | - 40 to 150 | °C |
| $T_{Stg}$ | | - 40 to 130 | |

## 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 |
| VSK.430.. | 16 | 1600 | 1700 | 100 |
| | 18 | 1800 | 1900 | |
| | 20 | 2000 | 2100 | |

| ON-STATE CONDUCTION | | | | | | |
|---|---|---|---|---|---|---|
| **PARAMETER** | **SYMBOL** | **TEST CONDITIONS** | | | **VALUES** | **UNITS** |
| Maximum average on-state current at case temperature | $I_{T(AV)}$, $I_{F(AV)}$ | 180° conduction, half sine wave | | | 430 | A |
| | | | | | 82 | °C |
| Maximum RMS on-state current | $I_{T(RMS)}$ | 180° conduction, half sine wave at $T_C$ = 82 °C | | | 675 | A |
| Maximum peak, one-cycle, non-repetitive surge current | $I_{TSM}$, $I_{FSM}$ | t = 10 ms | No voltage reapplied | Sinusoidal half wave, initial $T_J$ = $T_J$ maximum | 15.7 | kA |
| | | t = 8.3 ms | | | 16.4 | |
| | | t = 10 ms | 100 % $V_{RRM}$ reapplied | | 13.2 | |
| | | t = 8.3 ms | | | 13.8 | |
| Maximum $I^2t$ for fusing | $I^2t$ | t = 10 ms | No voltage reapplied | | 1232 | $kA^2s$ |
| | | t = 8.3 ms | | | 1125 | |
| | | t = 10 ms | 100 % $V_{RRM}$ reapplied | | 871 | |
| | | t = 8.3 ms | | | 795 | |
| Maximum $I^2\sqrt{t}$ for fusing | $I^2\sqrt{t}$ | t = 0.1 ms to 10 ms, no voltage reapplied | | | 12 320 | $kA^2\sqrt{s}$ |
| Low level value of threshold voltage | $V_{F(TO)1}$ | (16.7 % x π x $I_{T(AV)}$ < I < π x $I_{T(AV)}$), $T_J$ = $T_J$ maximum | | | 0.96 | V |
| High level value of threshold voltage | $V_{F(TO)2}$ | (I > π x $I_{T(AV)}$), $T_J$ = $T_J$ maximum | | | 1.06 | |
| Low level value of on-state slope resistance | $r_{f1}$ | (16.7 % x π x $I_{T(AV)}$ < I < π x $I_{T(AV)}$), $T_J$ = $T_J$ maximum | | | 0.51 | mΩ |
| High level value of on-state slope resistance | $r_{f2}$ | (I > π x $I_{T(AV)}$), $T_J$ = $T_J$ maximum | | | 0.45 | |
| Maximum on-state voltage drop | $V_{TM}$ | $I_{pk}$ = 1500 A, $T_J$ = 25 °C, $t_p$ = 10 ms sine pulse | | | 1.65 | V |
| Maximum forward voltage drop | $V_{FM}$ | $I_{pk}$ = 1500 A, $T_J$ = 25 °C, $t_p$ = 10 ms sine pulse | | | 1.65 | V |
| Maximum holding current | $I_H$ | $T_J$ = 25 °C, anode supply 12 V resistive load | | | 500 | mA |
| Typical 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 A, $V_{DRM}$ applied | 1000 | A/µs |
| Typical delay time | $t_d$ | Gate current 1 A, $dI_g/dt$ = 1 A/µs<br>$V_d$ = 0.67 % $V_{DRM}$, $T_J$ = 25 °C | 2.0 | µs |
| Typical turn-off time | $t_q$ | $I_{TM}$ = 750 A, $T_J$ = $T_J$ maximum, dI/dt = - 60 A/µs<br>$V_R$ = 50, dV/dt = 20 V/µs, Gate 0 V 100 Ω | 200 | |

| BLOCKING | | | | |
|---|---|---|---|---|
| **PARAMETER** | **SYMBOL** | **TEST CONDITIONS** | **VALUES** | **UNITS** |
| Maximum critical rate of rise of off-state voltage | dV/dt | $T_J$ = 130 °C, 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 | 100 | mA |



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Revision: 02-Jul-10

| THERMAL AND MECHANICAL SPECIFICATIONS | | | | |
|---|---|---|---|---|
| **PARAMETER** | **SYMBOL** | **TEST CONDITIONS** | **VALUES** | **UNITS** |
| Maximum junction operating temperature range | $T_J$ | | - 40 to 130 | °C |
| Maximum storage temperature range | $T_{Stg}$ | | - 40 to 150 | |
| Maximum thermal resistance, junction to case per junction | $R_{thJC}$ | DC operation | 0.065 | K/W |
| Maximum thermal resistance, case to heatsink | $R_{thC-hs}$ | | 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 to 8 | Nm |
| Mounting torque ± 10 % — busbar to SMAP | | | 12 to 15 | |
| Approximate weight | | | 1500 | g |
| Case style | | See dimensions - link at the end of datasheet | SUPER MAGN-A-PAK | |

| $\Delta R_{thJC}$ 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**

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

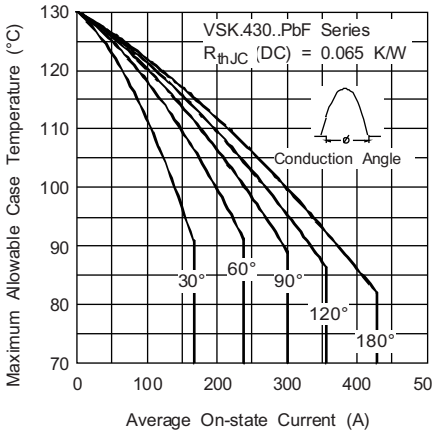


Fig. 1 - Current Ratings Characteristics

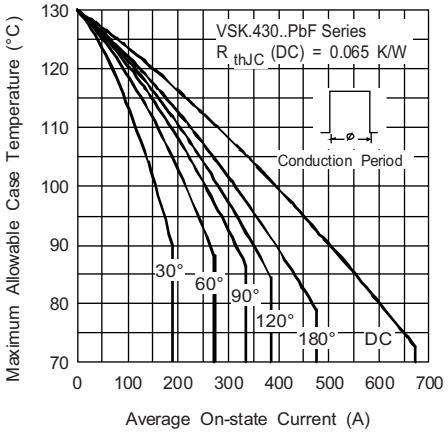


Fig. 2 - Current Ratings Characteristics

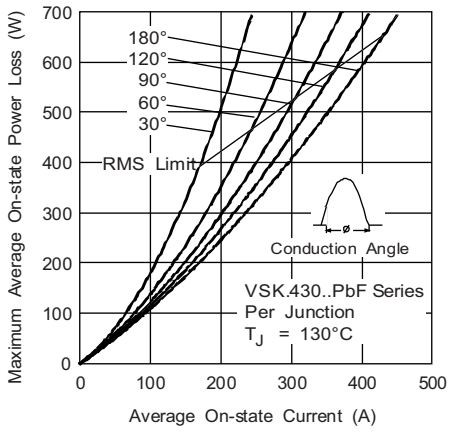


Fig. 3 - On-State Power Loss Characteristics

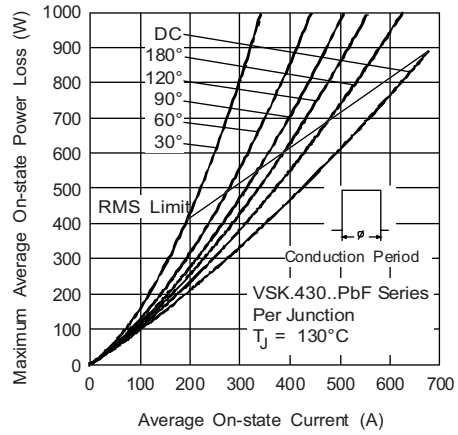


Fig. 4 - On-State Power Loss Characteristics

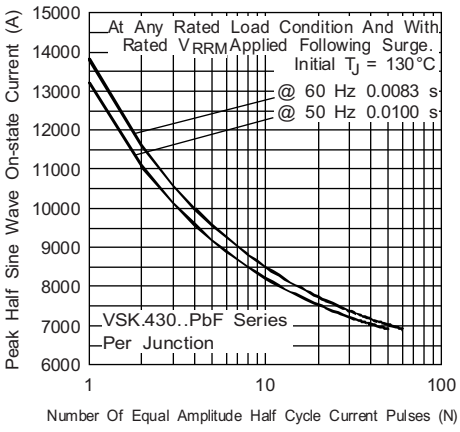


Fig. 5 - Maximum Non-Repetitive Surge Current

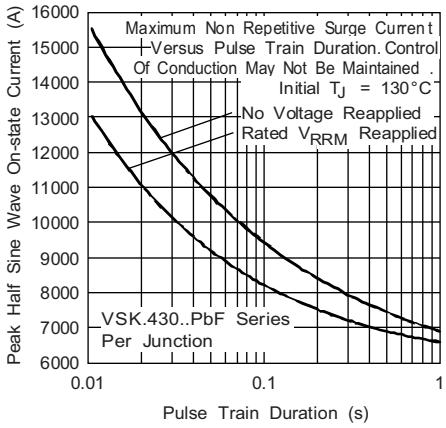


Fig. 6 - Maximum Non-Repetitive Surge Current



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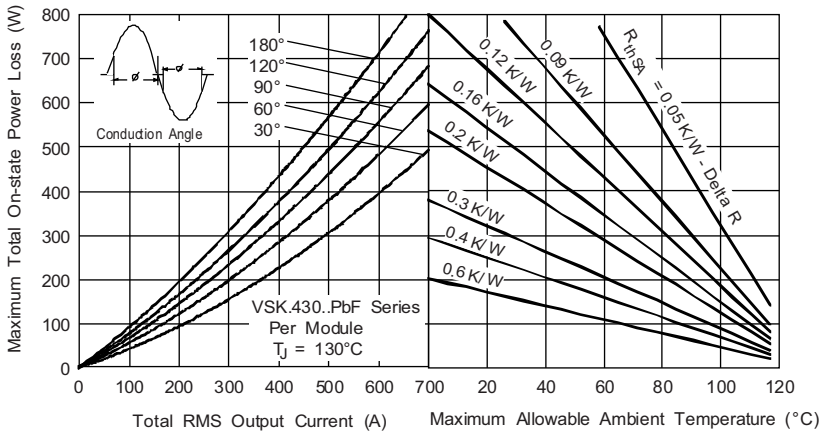


Fig. 7 - On-State Power Loss Characteristics

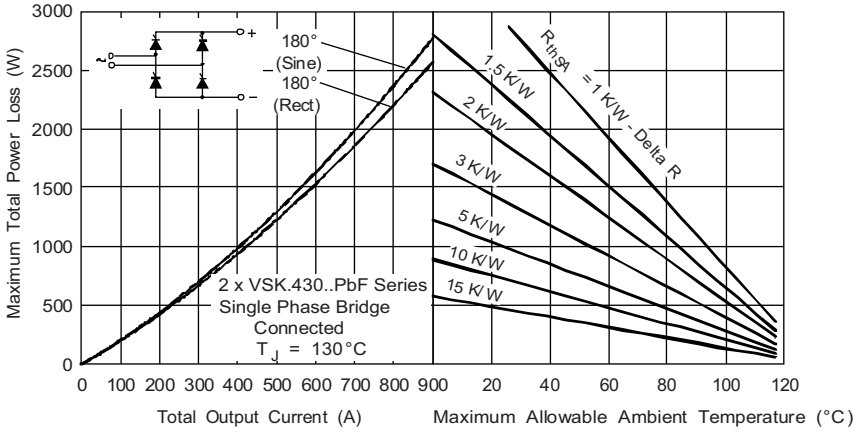


Fig. 8 - On-State Power Loss Characteristics

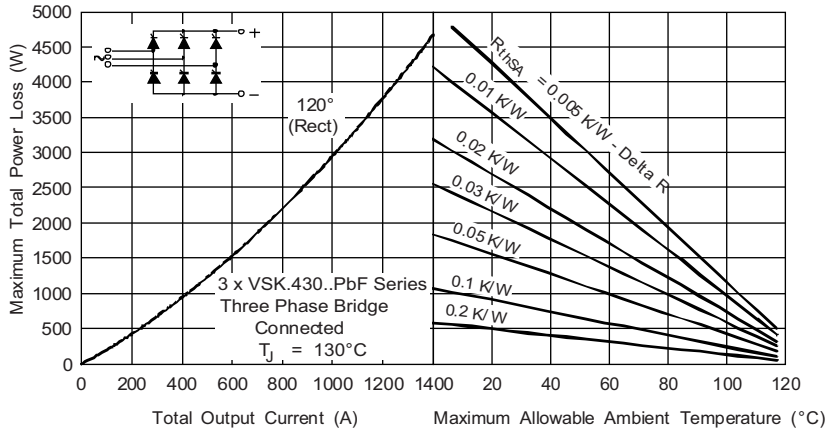


Fig. 9 - On-State Power Loss Characteristics

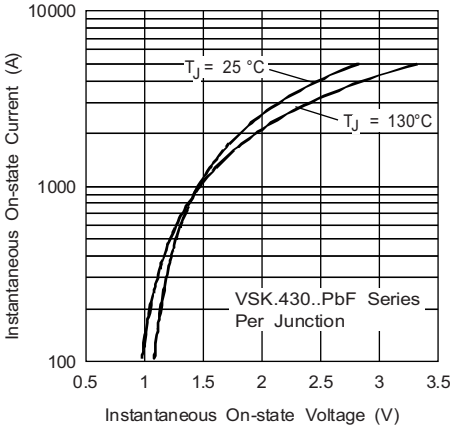


Fig. 10 - On-State Voltage Drop Characteristics

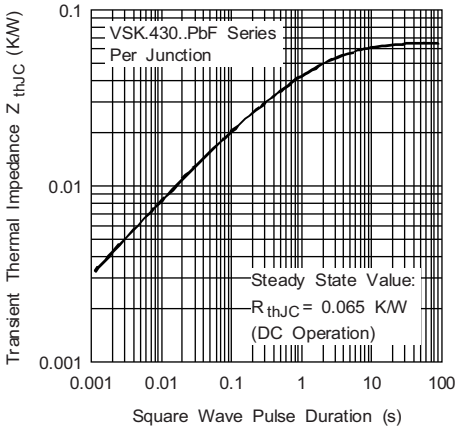


Fig. 11 - Thermal Impedance $Z_{thJC}$ Characteristics

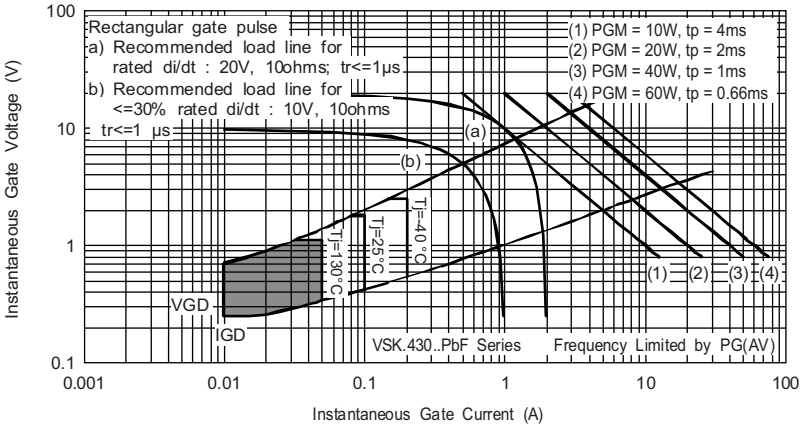


Fig. 12 - Gate Characteristics

## ORDERING INFORMATION TABLE

**Device code**

| VSK | T | 430 | - | 20 | PbF |
|---|---|---|---|---|---|
| 1 | 2 | 3 | | 4 | 5 |

- 1 - Module type
- 2 - Circuit configuration (see end of datasheet)
- 3 - Current rating
- 4 - Voltage code x 100 = $V_{RRM}$ (see Voltage Ratings table)
- 5 - Lead (Pb)-free

**Note**

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



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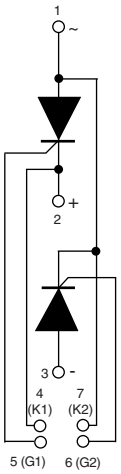
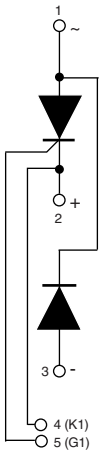
## CIRCUIT CONFIGURATION

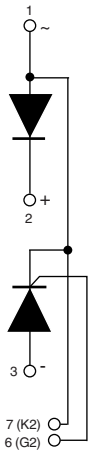
VSKT...




VSKH...



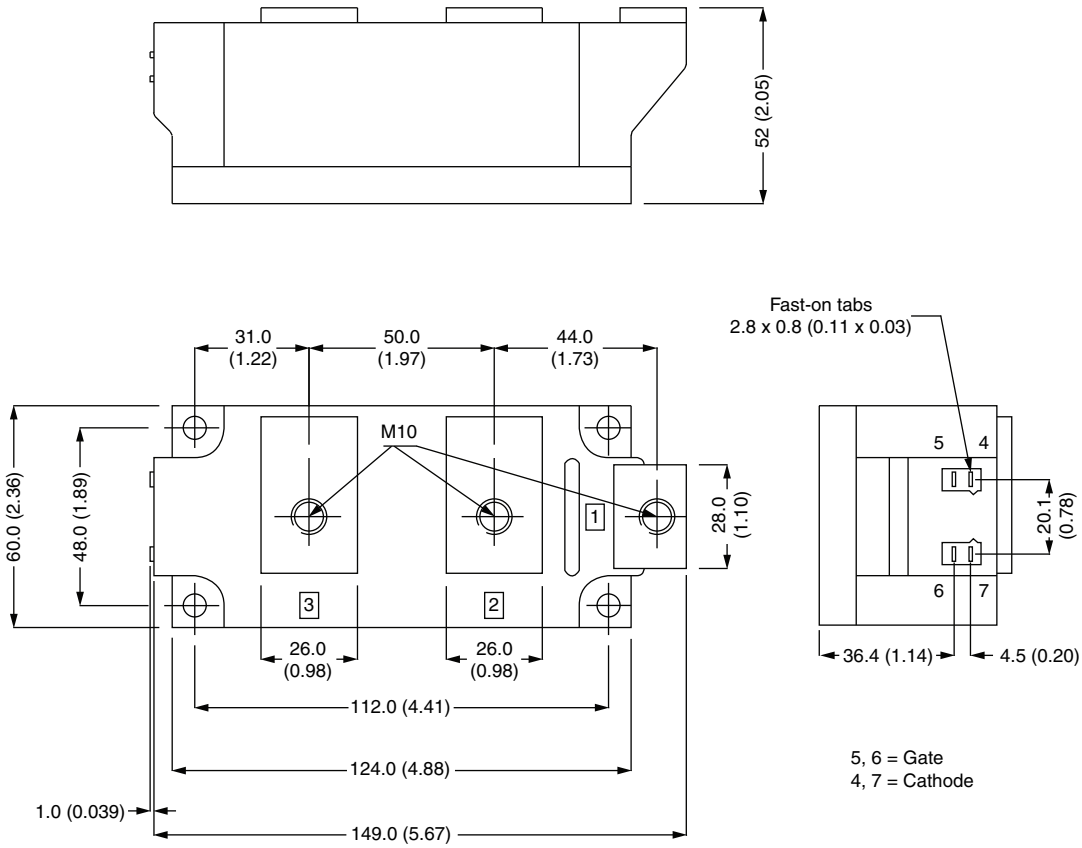

VSKL...




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

# Super MAGN-A-PAK Thyristor/Diode

**DIMENSIONS** in millimeters (inches)



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