

## 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<sub>RMS</sub> 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](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT

### TYPICAL APPLICATIONS

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

### PRIMARY CHARACTERISTICS

|             |                               |
|-------------|-------------------------------|
| $I_{T(AV)}$ | 570 A                         |
| Type        | Modules - thyristor, standard |
| Package     | Super MAGN-A-PAK              |

### 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 <sup>2</sup> s          |
|                   | 60 Hz                            | 1473        |                            |
| $I^2\sqrt{t}$     |                                  | 16 200      | kA <sup>2</sup> $\sqrt{s}$ |
| $V_{DRM}/V_{RRM}$ |                                  | 1600        | V                          |
| $T_{Stg}$         | Range                            | -40 to +125 | $^\circ\text{C}$           |
| $T_J$             | Range                            | -40 to +135 |                            |

### ELECTRICAL SPECIFICATIONS

#### VOLTAGE RATINGS

| TYPE NUMBER      | VOLTAGE CODE | $V_{RRM}/V_{DRM}$ , MAXIMUM REPETITIVE PEAK REVERSE VOLTAGE<br>V | $V_{RSM}$ , MAXIMUM NON-REPETITIVE PEAK REVERSE VOLTAGE<br>V | $I_{RRM}/I_{DRM}$ MAXIMUM AT $T_J = T_J$ MAXIMUM<br>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 | 18.0   | kA                 |
|  |                    | t = 8.3 ms  |                           |   | 18.8   |                    |
|  |                    | t = 10 ms   | 100 % $V_{RRM}$ reapplied |   | 15.1   |                    |
|  |                    | t = 8.3 ms  |                           |   | 15.8   |                    |
| Maximum $I^2t$ for fusing                                      | $I^2t$             | t = 10 ms   | No voltage reapplied      |   | 1620   | kA <sup>2</sup> s  |
|  |                    | t = 8.3 ms  |                           |   | 1473   |                    |
|  |                    | t = 10 ms   | 100 % $V_{RRM}$ reapplied |   | 1146   |                    |
|  |                    | t = 8.3 ms  |                           |   | 1042   |                    |
| Maximum $I^2\sqrt{t}$ for fusing                               | $I^2\sqrt{t}$      | t = 0.1 ms to 10 ms, no voltage reapplied   |                           |   | 16 200 | kA <sup>2</sup> √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, $di_g/dt = 1\text{ A}/\mu\text{s}$<br>$V_d = 0.67\% V_{DRM}$ , $T_J = 25\text{ °C}$   |  |  | 2.0       | μs    |
| Typical turn-off time                     | $t_q$   | $I_{TM} = 750\text{ A}$ ; $T_J = T_J$ maximum, $di/dt = -60\text{ A}/\mu\text{s}$ ,<br>$V_R = 50\text{ V}$ , $dV/dt = 20\text{ V}/\mu\text{s}$ , 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<br>$\pm 10$ %                             | Super MAGN-A-PAK to heatsink<br>busbar to super MAGN-A-PAK | 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    |
|   |  |   | 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**

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

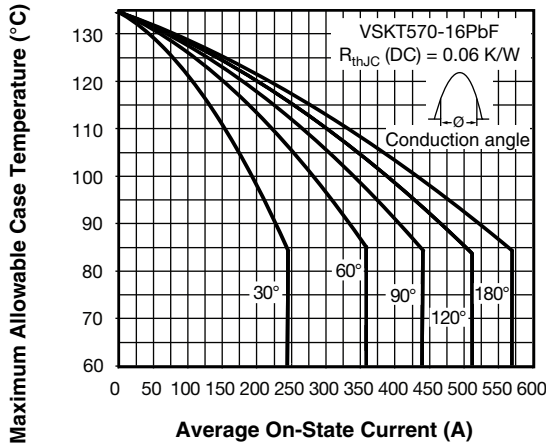


Fig. 1 - Current Ratings Characteristics

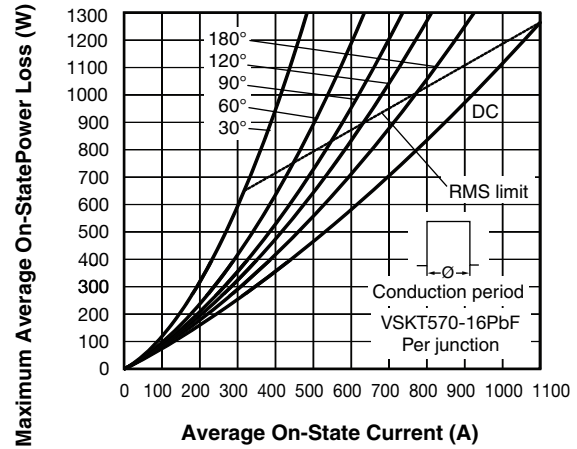


Fig. 4 - On-State Power Loss Characteristics

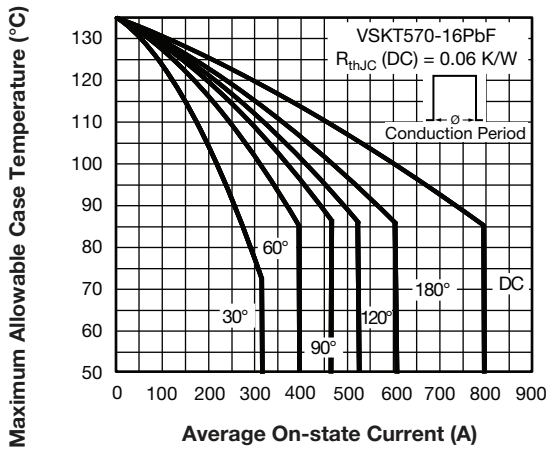


Fig. 2 - Current Ratings Characteristics

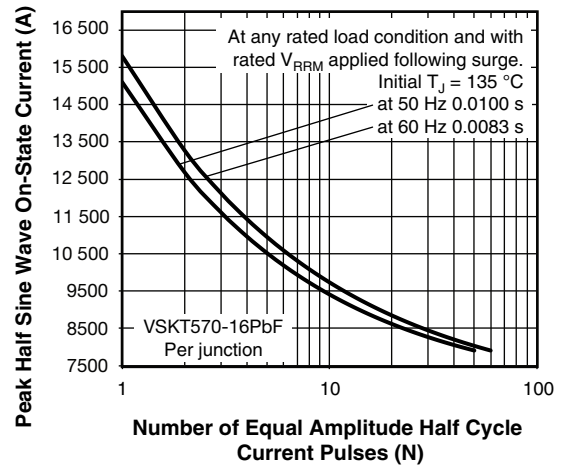


Fig. 5 - Maximum Non-Repetitive Surge Current

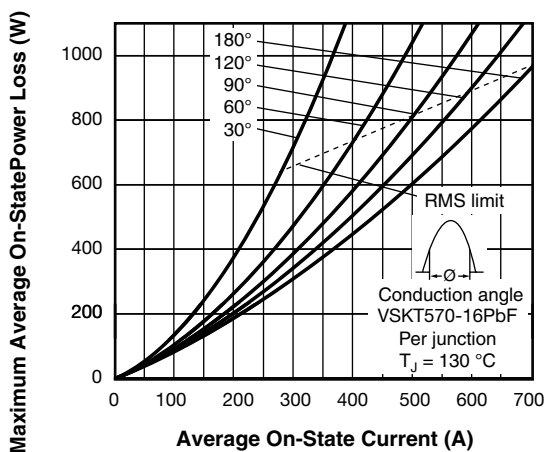


Fig. 3 - On-State Power Loss Characteristics

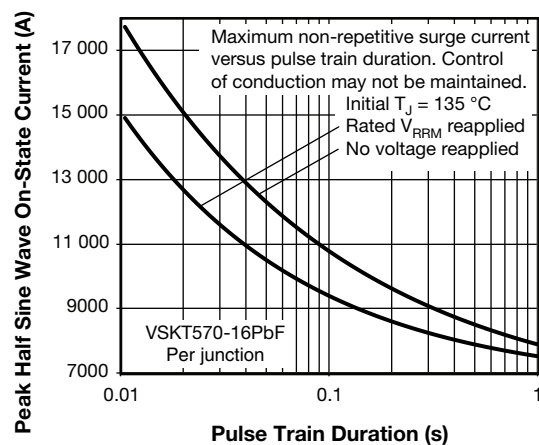


Fig. 6 - Maximum Non-Repetitive Surge Current

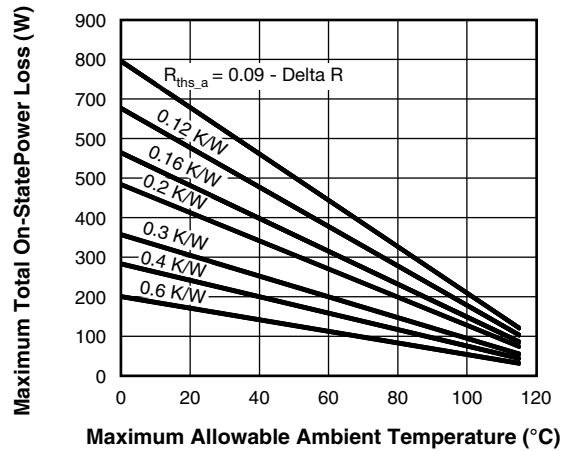
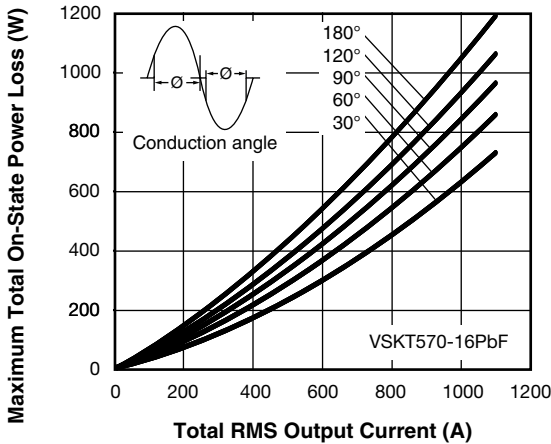


Fig. 7 - On-State Power Loss Characteristics

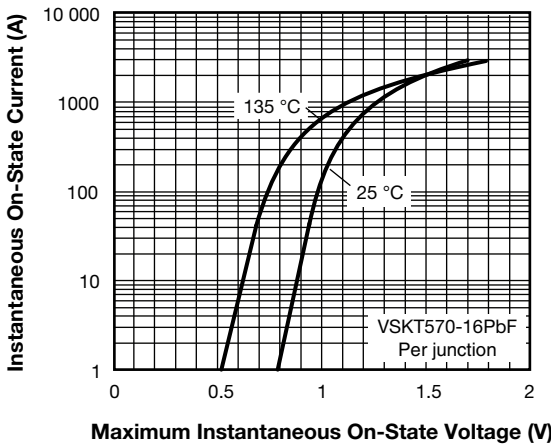


Fig. 8 - On-State Voltage Drop Characteristics

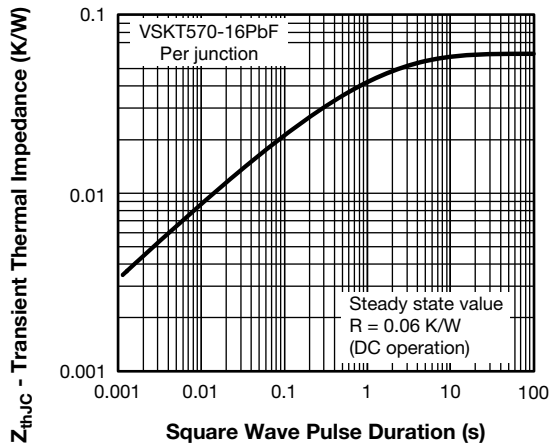


Fig. 9 - Thermal Impedance  $Z_{thJC}$  Characteristics

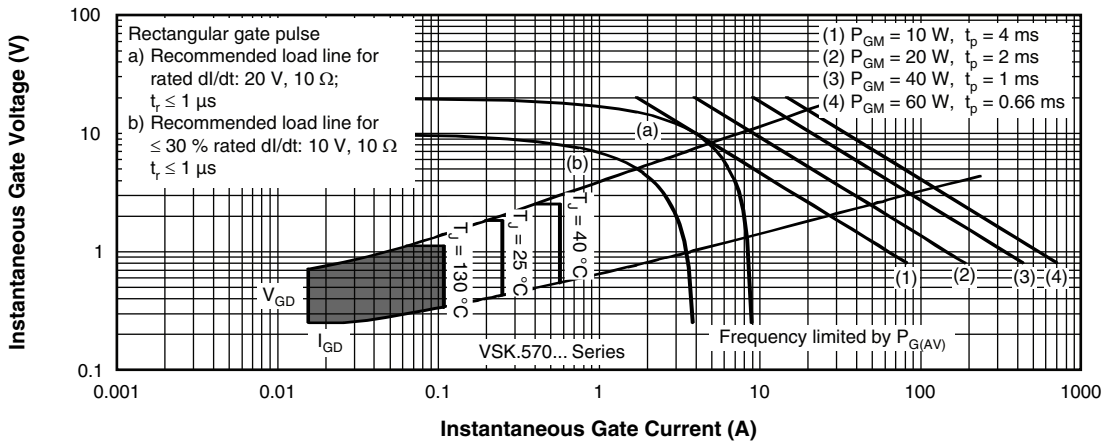


Fig. 10 - Gate Characteristics

**ORDERING INFORMATION TABLE**

|             |              |           |            |          |           |            |
|-------------|--------------|-----------|------------|----------|-----------|------------|
| Device code | <b>VS-VS</b> | <b>KT</b> | <b>570</b> | <b>-</b> | <b>16</b> | <b>PbF</b> |
|             | ①            | ②         | ③          |          | ④         | ⑤          |

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

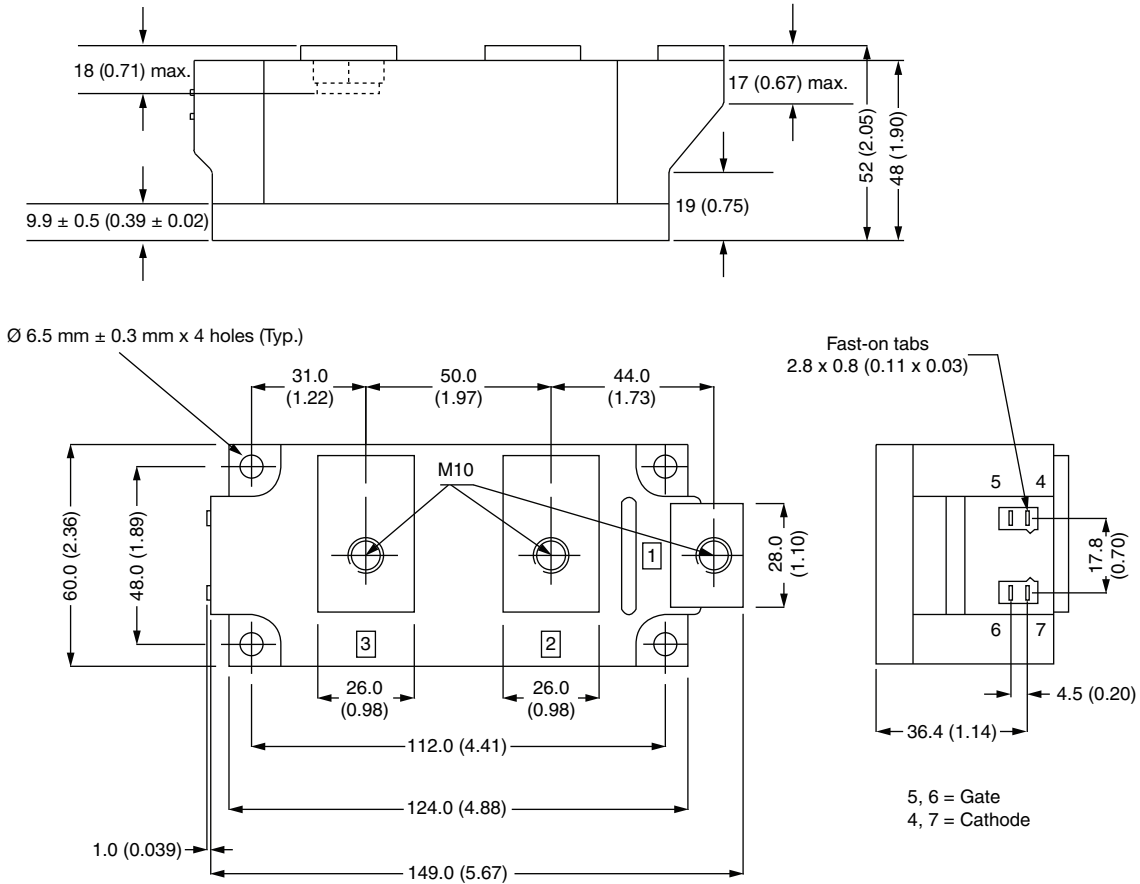
| CIRCUIT CONFIGURATION    |                            |                 |
|--------------------------|----------------------------|-----------------|
| CIRCUIT DESCRIPTION      | CIRCUIT CONFIGURATION CODE | CIRCUIT DRAWING |
| Two SCRs doubler circuit | KT                         |               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

| LINKS TO RELATED DOCUMENTS |  |
|----------------------------|--|
| Dimensions                 | <a href="http://www.vishay.com/doc?95283">www.vishay.com/doc?95283</a> |



## Super MAGN-A-PAK Thyristor/Diode

**DIMENSIONS** in millimeters (inches)





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