


SCR/SCR and SCR/Diode (MAGN-A-PAK Power Modules), 230 A



MAGN-A-PAK

FEATURES

- High voltage
- Electrically isolated base plate
- 3500 V_{RMS} isolating voltage
- Industrial standard package
- Simplified mechanical designs, rapid assembly
- High surge capability
- Large creepage distances
- UL approved file E78996 
- Designed and qualified for industrial level
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912


RoHS
COMPLIANT

| PRIMARY CHARACTERISTICS | |
|-------------------------|-------------------------------|
| I _{T(AV)} | 230 A |
| Type | Modules - thyristor, standard |
| Package | MAGN-A-PAK |

DESCRIPTION

This VSK series of MAGN-A-PAK modules uses high voltage power thyristor/thyristor and thyristor/diode in seven basic configurations. The semiconductors are electrically isolated from the metal base, allowing common heatsinks and compact assemblies to be built. They can be interconnected to form single phase or three phase bridges or as AC-switches when modules are connected in anti-parallel mode. These modules are intended for general purpose applications such as battery chargers, welders, motor drives, UPS, etc.

| MAJOR RATINGS AND CHARACTERISTICS | | | |
|------------------------------------|-----------------|-------------|--------------------|
| SYMBOL | CHARACTERISTICS | VALUES | UNITS |
| I _{T(AV)} | 85 °C | 230 | A |
| I _{T(RMS)} | | 510 | |
| I _{TSM} | 50 Hz | 7500 | |
| | 60 Hz | 7850 | |
| I ² t | 50 Hz | 280 | kA ² s |
| | 60 Hz | 260 | |
| I ² √t | | 280 | kA ² √s |
| V _{DRM} /V _{RRM} | | 800 to 2000 | V |
| T _J | Range | -40 to +130 | °C |

ELECTRICAL SPECIFICATIONS

| VOLTAGE RATINGS | | | | |
|-----------------|--------------|--|---|---|
| TYPE NUMBER | VOLTAGE CODE | V _{RRM} /V _{DRM} , MAXIMUM REPETITIVE PEAK REVERSE AND OFF-STATE BLOCKING VOLTAGE V | V _{RSM} , MAXIMUM NON-REPETITIVE PEAK REVERSE VOLTAGE V | I _{RRM} /I _{DRM} AT 130 °C MAXIMUM mA |
| VS-VSK.230- | 08 | 800 | 900 | 50 |
| | 12 | 1200 | 1300 | |
| | 16 | 1600 | 1700 | |
| | 18 | 1800 | 1900 | |
| | 20 | 2000 | 2100 | |



| ON-STATE CONDUCTION | | | | | |
|--|---------------|--|---------------------------|--------|--------------------|
| PARAMETER | SYMBOL | TEST CONDITIONS | | VALUES | UNITS |
| Maximum average on-state current at case temperature | $I_{T(AV)}$ | 180° conduction, half sine wave | | 230 | A |
| | | | | 85 | °C |
| Maximum RMS on-state current | $I_{T(RMS)}$ | As AC switch | | 510 | |
| Maximum peak, one-cycle on-state non-repetitive, surge current | I_{TSM} | t = 10 ms | No voltage reapplied | 7500 | A |
| | | t = 8.3 ms | | 7850 | |
| | | t = 10 ms | 100 % V_{RRM} reapplied | 6300 | |
| | | t = 8.3 ms | | 6600 | |
| Maximum I^2t for fusing | I^2t | t = 10 ms | No voltage reapplied | 280 | kA ² s |
| | | t = 8.3 ms | | 256 | |
| | | t = 10 ms | 100 % V_{RRM} reapplied | 198 | |
| | | t = 8.3 ms | | 181 | |
| Maximum $I^2\sqrt{t}$ for fusing | $I^2\sqrt{t}$ | t = 0.1 ms to 10 ms, no voltage reapplied | | 2800 | 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 | | 1.03 | V |
| High level value of threshold voltage | $V_{T(TO)2}$ | $(I > \pi \times I_{T(AV)})$, $T_J = T_J$ maximum | | 1.07 | |
| 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 | | 0.77 | mΩ |
| High level value on-state slope resistance | r_{t2} | $(I > \pi \times I_{T(AV)})$, $T_J = T_J$ maximum | | 0.73 | |
| Maximum on-state voltage drop | V_{TM} | $I_{TM} = \pi \times I_{T(AV)}$, $T_J = T_J$ maximum, 180° conduction, average power = $V_{T(TO)} \times I_{T(AV)} + r_f \times (I_{T(RMS)})^2$ | | 1.59 | V |
| Maximum holding current | I_H | Anode supply = 12 V, initial $I_T = 30$ A, $T_J = 25$ °C | | 500 | |
| Maximum latching current | I_L | Anode supply = 12 V, resistive load = 1 Ω, gate pulse: 10 V, 100 μs, $T_J = 25$ °C | | 1000 | mA |

| SWITCHING | | | | | |
|-----------------------|--------|--|--|-----------|-------|
| PARAMETER | SYMBOL | TEST CONDITIONS | | VALUES | UNITS |
| Typical delay time | t_d | $T_J = 25$ °C, gate current = 1 A $dI_g/dt = 1$ A/μs, $V_d = 0.67\% V_{DRM}$ | | 1.0 | μs |
| Typical rise time | t_r | | | 2.0 | |
| 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 150 | |

| BLOCKING | | | | | |
|--|-----------------------|---|--|--------|-------|
| PARAMETER | SYMBOL | TEST CONDITIONS | | VALUES | UNITS |
| Maximum peak reverse and off-state leakage current | I_{RRM} , I_{DRM} | $T_J = T_J$ maximum | | 50 | mA |
| RMS insulation voltage | V_{INS} | 50 Hz, circuit to base, all terminals shorted, 25 °C, 1 s | | 3000 | 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 | | 10.0 | W |
| Maximum average gate power | $P_{G(AV)}$ | f = 50 Hz, $T_J = T_J$ maximum | | 2.0 | |
| Maximum peak gate current | + I_{GM} | $t_p \leq 5$ ms, $T_J = T_J$ maximum | | 3.0 | A |
| Maximum peak negative gate voltage | - V_{GT} | $t_p \leq 5$ ms, $T_J = T_J$ maximum | | 5.0 | V |
| Maximum required DC gate voltage to trigger | V_{GT} | $T_J = -40$ °C | Anode supply = 12 V, resistive load; $R_a = 1$ Ω | 4.0 | |
| | | $T_J = 25$ °C | | 3.0 | |
| | | $T_J = T_J$ maximum | | 2.0 | |
| Maximum required DC gate current to trigger | I_{GT} | $T_J = -40$ °C | Anode supply = 12 V, resistive load; $R_a = 1$ Ω | 350 | |
| | | $T_J = 25$ °C | | 200 | |
| | | $T_J = T_J$ maximum | | 100 | |
| Maximum gate voltage that will not trigger | V_{GD} | $T_J = T_J$ maximum, rated V_{DRM} applied | | 0.25 | V |
| Maximum gate current that will not trigger | I_{GD} | $T_J = T_J$ maximum, rated V_{DRM} applied | | 10.0 | mA |
| Maximum rate of rise of turned-on current | dI/dt | $T_J = T_J$ maximum, $I_{TM} = 400$ A, rated V_{DRM} applied | | 500 | A/μs |



| THERMAL AND MECHANICAL SPECIFICATIONS | | | | |
|---|--|--|-------------|-------|
| PARAMETER | SYMBOL | TEST CONDITIONS | VALUES | UNITS |
| Junction operating temperature range | T_J | | -40 to +130 | °C |
| Storage temperature range | T_{Stg} | | -40 to +150 | |
| Maximum thermal resistance, junction to case per junction | R_{thJC} | DC operation | 0.125 | K/W |
| Typical thermal resistance, case to heatsink per module | R_{thCS} | Mounting surface flat, smooth, and greased | 0.02 | |
| Mounting torque $\pm 10\%$ | MAGN-A-PAK to heatsink busbar to MAGN-A-PAK | A mounting compound is recommended and the torque should be rechecked after a period of about 3 h to allow for the spread of the compound. | 4 to 6 | Nm |
| Approximate weight | | | | |
| | | | 17.8 | oz. |
| Case style | | | MAGN-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° | |
| VSK.230- | 0.009 | 0.010 | 0.010 | 0.020 | 0.032 | 0.007 | 0.011 | 0.015 | 0.020 | 0.033 | 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. 2 - Current Ratings Characteristics



Fig. 3 - On-State Power Loss Characteristics



Fig. 5 - Maximum Non-Repetitive Surge Current



Fig. 4 - On-State Power Loss Characteristics

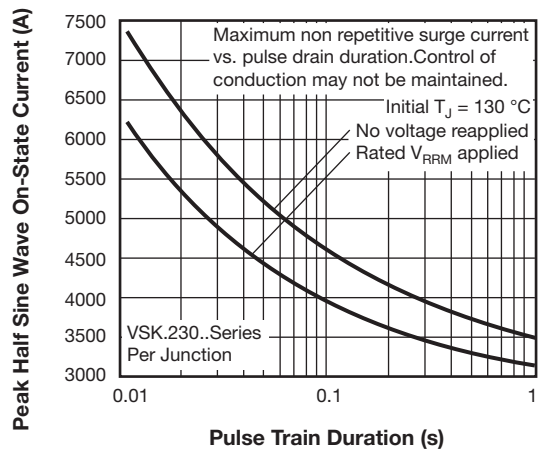


Fig. 6 - Maximum Non-Repetitive Surge Current



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 - Reverse Recovery Charge Characteristics



Fig. 12 - Gate Characteristics



Fig. 13 - Thermal Impedance Z_{thJC} Characteristics

ORDERING INFORMATION TABLE

| | | | | | | |
|-------------|--------------|-----------|------------|----------|-----------|------------|
| Device code | VS-VS | KT | 230 | - | 20 | PbF |
| | ① | ② | ③ | ④ | ⑤ | |

- 1** - Vishay Semiconductors product
- 2** - Circuit configuration (see dimensions - link at the end of datasheet)
- 3** - Current rating
- 4** - Voltage code x 100 = V_{RRM} (see Voltage Ratings table)
- 5** -
 - None = standard production
 - 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 | KT | <p>VSKT...</p> <p>Available 800 V: contact factory for different requirements</p> |
| SCR/diode doubler circuit, positive control | KH | <p>VSKH...</p> <p>Available 800 V: contact factory for different requirements</p> |
| SCR/diode doubler circuit, negative control | KL | <p>VSKL...</p> <p>Available 800 V: contact factory for different requirements</p> |
| Two SCRs common cathodes | KK | <p>VSKK...</p> <p>Available 800 V: contact factory for different requirements</p> |

| LINKS TO RELATED DOCUMENTS | |
|-----------------------------------|--|
| Dimensions | www.vishay.com/doc?95086 |

MAGN-A-PAK

DIMENSIONS in millimeters (inches)



Notes

- Dimensions are nominal
- Full engineering drawings are available on request
- UL identification number for gate and cathode wire: UL 1385
- UL identification number for package: UL 94 V-0



Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.



Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



Как с нами связаться

Телефон: 8 (812) 309 58 32 (многоканальный)

Факс: 8 (812) 320-02-42

Электронная почта: org@eplast1.ru

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.