

## AAP Gen 7 (TO-240AA) Power Modules Schottky Rectifier, 200 A



AAP Gen 7 (TO-240AA)

**FEATURES**

- 175 °C  $T_J$  operation
- Low forward voltage drop
- High frequency operation
- UL approved file E78996
- Low thermal resistance
- Designed and qualified for industrial level
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT

**BENEFITS**

- Excellent thermal performances obtained by the usage of exposed direct bonded copper substrate
- High surge capability
- Easy mounting on heatsink

**ELECTRICAL DESCRIPTION / APPLICATIONS**

The VS-VSKDS409/150 Schottky rectifier doubler module has been optimized for low reverse leakage at high temperature. The proprietary barrier technology allows for reliable operation up to 175 °C junction temperature. Typical applications are in high current switching power supplies, plating power supplies, UPS systems, converters, freewheeling diodes, welding, and reverse battery protection.

| PRIMARY CHARACTERISTICS |                            |
|-------------------------|----------------------------|
| $I_{F(AV)}$             | 200 A                      |
| $V_R$                   | 150 V                      |
| Package                 | AAP Gen 7 (TO-240AA)       |
| Circuit configuration   | Two diodes doubler circuit |

**MECHANICAL DESCRIPTION**

The AAP Gen 7, new generation of ADD-A-PAK module, combines the excellent thermal performances obtained by the usage of exposed direct bonded copper substrate, with advanced compact simple package solution and simplified internal structure with minimized number of interfaces.

| MAJOR RATINGS AND CHARACTERISTICS |  |             |       |
|-----------------------------------|--|-------------|-------|
| SYMBOL                            | CHARACTERISTICS  | VALUES      | UNITS |
| $I_{F(AV)}$                       | Rectangular waveform                                     | 200         | A     |
| $V_{RRM}$                         |  | 150         | V     |
| $I_{FSM}$                         | $t_p = 5 \mu s$ sine                                     | 20 000      | A     |
| $V_F$                             | 200 A <sub>pk</sub> , $T_J = 125 \text{ }^\circ\text{C}$ | 0.85        | V     |
| $T_J$                             | Range  | -55 to +175 | °C    |

| VOLTAGE RATINGS                     |           |                 |       |
|-------------------------------------|-----------|-----------------|-------|
| PARAMETER                           | SYMBOL    | VS-VSKDS409/150 | UNITS |
| Maximum DC reverse voltage          | $V_R$     | 150             | V     |
| Maximum static peak reverse voltage | $V_{RRM}$ |                 |       |



| ABSOLUTE MAXIMUM RATINGS                            |             |   |   |        |       |
|---|-------------|---|---|--------|-------|
| PARAMETER   | SYMBOL      | TEST CONDITIONS   |   | VALUES | UNITS |
| Maximum average forward current                     | $I_{F(AV)}$ | 50 % duty cycle at $T_C = 105\text{ }^\circ\text{C}$ , rectangular waveform   |   | 200    | A     |
| Maximum peak one cycle non-repetitive surge current | $I_{FSM}$   | 5 $\mu\text{s}$ sine or 3 $\mu\text{s}$ rect. pulse   | Following any rated load condition and with rated $V_{RRM}$ applied | 20 000 |       |
|   |             | 10 ms sine or 6 ms rect. pulse  |   | 2300   |       |
| Non-repetitive avalanche energy                     | $E_{AS}$    | $T_J = 25\text{ }^\circ\text{C}$ , $I_{AS} = 1.8\text{ A}$ , $L = 10\text{ mH}$   |   | 15     | mJ    |
| Repetitive avalanche current                        | $I_{AR}$    | Current decaying linearly to zero in 1 $\mu\text{s}$<br>Frequency limited by $T_J$ maximum $V_A = 1.5 \times V_R$ typical |   | 1      | A     |
| Maximum dynamic peak reverse voltage                | $V_{AV}$    | $T_J = 25\text{ }^\circ\text{C}$ , $I_{AS} = 1.8\text{ A}$ , $L = 10\text{ mH}$   |   | 170    | V     |

| ELECTRICAL SPECIFICATIONS       |           |  |                                   |              |                  |
|---------------------------------|-----------|--|-----------------------------------|--------------|------------------|
| PARAMETER                       | SYMBOL    | TEST CONDITIONS  |                                   | VALUES       | UNITS            |
| Maximum forward voltage drop    | $V_{FM}$  | 200 A  | $T_J = 25\text{ }^\circ\text{C}$  | 1.03         | V                |
|                                 |           | 400 A  |                                   | 1.33         |                  |
|                                 |           | 200 A  | $T_J = 125\text{ }^\circ\text{C}$ | 0.85         |                  |
|                                 |           | 400 A  |                                   | 1.13         |                  |
| Maximum reverse leakage current | $I_{RM}$  | $T_J = 25\text{ }^\circ\text{C}$   | $V_R = \text{Rated } V_R$         | 6            | mA               |
|                                 |           | $T_J = 125\text{ }^\circ\text{C}$  |                                   | 85           |                  |
| Maximum junction capacitance    | $C_T$     | $V_R = 5\text{ V}_{DC}$ (test signal range 100 kHz to 1 MHz), $25\text{ }^\circ\text{C}$ |                                   | 6000         | pF               |
| Typical series inductance       | $L_S$     | Measured lead to lead 5 mm from package body   |                                   | 5.0          | nH               |
| Maximum voltage rate of change  | $dV/dt$   | Rated $V_R$  |                                   | 10 000       | V/ $\mu\text{s}$ |
| Maximum RMS insulation voltage  | $V_{INS}$ | 50 Hz  |                                   | 3000 (1 min) | V                |
|                                 |           |  |                                   | 3600 (1 s)   |                  |

| THERMAL - MECHANICAL SPECIFICATIONS                     |                |  |  |                     |                           |
|---|----------------|--|--|---------------------|---------------------------|
| PARAMETER   | SYMBOL         | TEST CONDITIONS  |  | VALUES              | UNITS                     |
| Maximum junction and storage temperature range          | $T_J, T_{Stg}$ |  |  | -55 to +175         | $^\circ\text{C}$          |
| Maximum thermal resistance, junction to case per leg    | $R_{thJC}$     | DC operation   |  | 0.32                | $^\circ\text{C}/\text{W}$ |
| Typical thermal resistance, case to heatsink per module | $R_{thCS}$     |  |  | 0.1                 |                           |
| Approximate weight                                      |                |  |  | 75                  | g                         |
|   |                |  |  | 2.7                 | oz.                       |
| Mounting torque $\pm 10\%$                              | to heatsink    | A mounting compound is recommended and the torque should be rechecked after a period of 3 h to allow for the spread of the compound. |  | 4                   | Nm                        |
|   | busbar         |  |  | 3                   |                           |
| Case style  |                | JEDEC <sup>®</sup>   |  | TO-240AA compatible |                           |

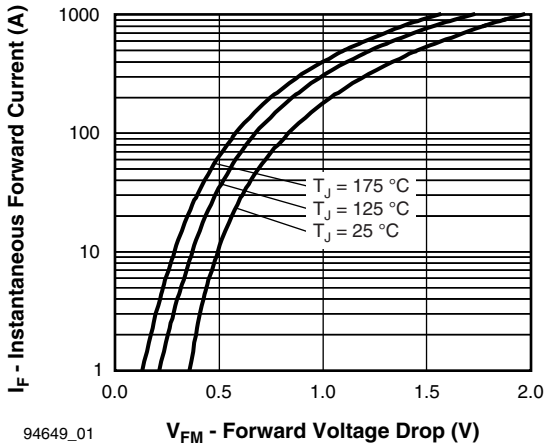


Fig. 1 - Maximum Forward Voltage Drop Characteristics (Per Leg)

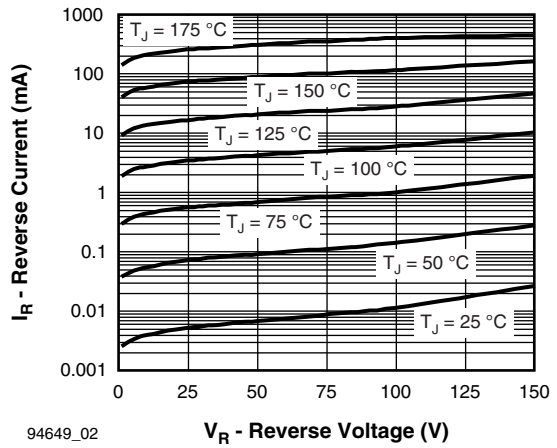


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

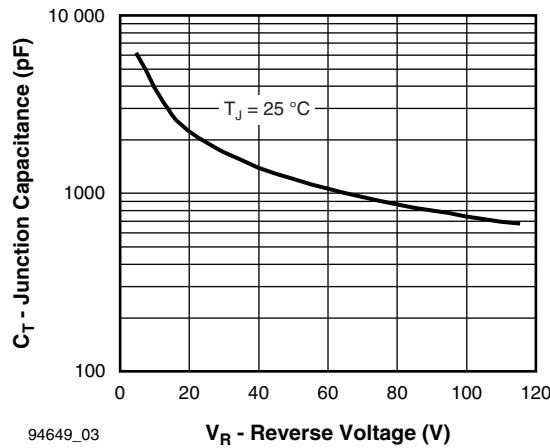


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

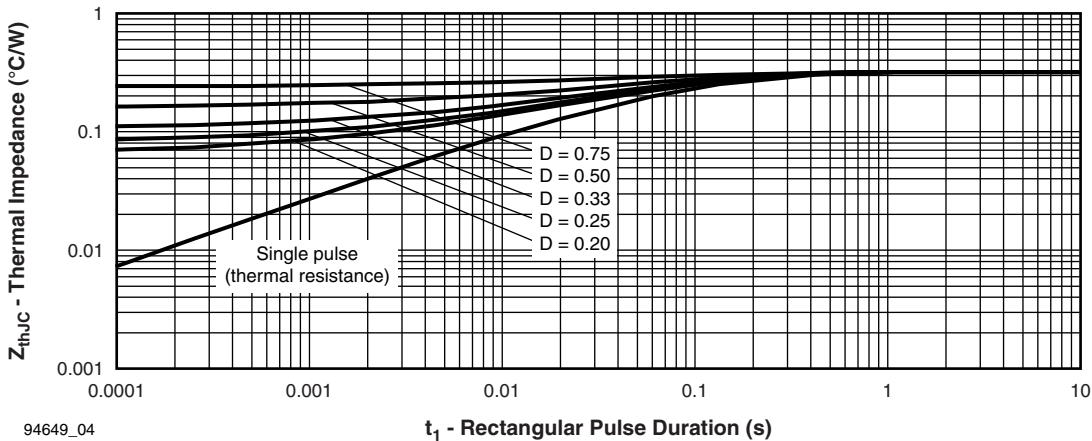
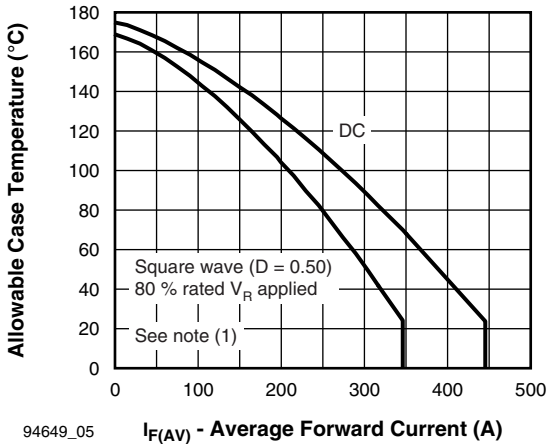


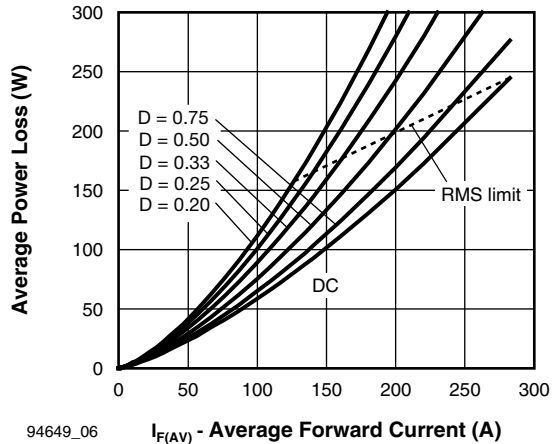
Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics (Per Diode)



94649\_05

$I_{F(AV)}$  - Average Forward Current (A)

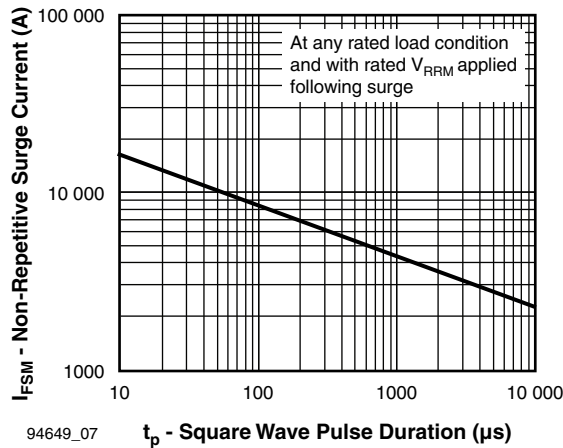
Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current (Per Leg)



94649\_06

$I_{F(AV)}$  - Average Forward Current (A)

Fig. 6 - Forward Power Loss Characteristics (Per Leg)



94649\_07

$t_p$  - Square Wave Pulse Duration ( $\mu$ s)

Fig. 7 - Maximum Non-Repetitive Surge Current

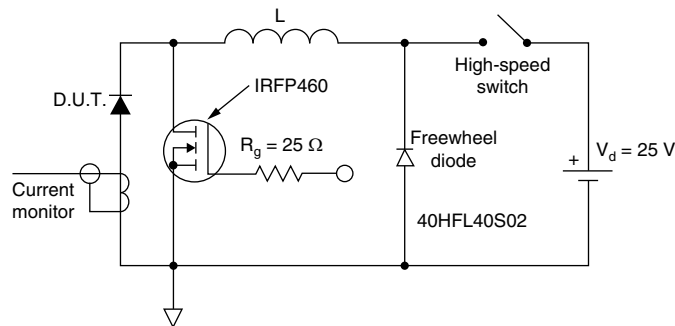


Fig. 8 - Unclamped Inductive Test Circuit

**Note**

- (1) Formula used:  $T_C = T_J - (P_d + P_{dREV}) \times R_{thJC}$ ;  
 $P_d$  = forward power loss =  $I_{F(AV)} \times V_{FM}$  at  $(I_{F(AV)}/D)$  (see fig. 6);  
 $P_{dREV}$  = inverse power loss =  $V_{R1} \times I_R (1 - D)$ ;  $I_R$  at  $V_{R1} = 80\%$  rated  $V_R$

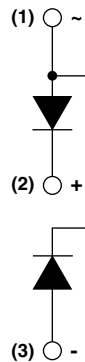
**ORDERING INFORMATION TABLE**

|             |              |           |          |           |          |          |            |
|-------------|--------------|-----------|----------|-----------|----------|----------|------------|
| Device code | <b>VS-VS</b> | <b>KD</b> | <b>S</b> | <b>40</b> | <b>9</b> | <b>/</b> | <b>150</b> |
|             | ①            | ②         | ③        | ④         | ⑤        |          | ⑥          |

- 1** - Vishay Semiconductors product
- 2** - Circuit configuration:  
KD = ADD-A-PAK - 2 diodes doubler circuit
- 3** - S = Schottky diode
- 4** - Average current rating (40 = 400 A) <sup>(1)</sup>
- 5** - Product silicon identification
- 6** - Voltage rating (150 = 150 V)

**Note**

<sup>(1)</sup> For KD configuration average current rating per module is 200 A

**CIRCUIT CONFIGURATION**

**LINKS TO RELATED DOCUMENTS**

|            |  |
|------------|--|
| Dimensions | <a href="http://www.vishay.com/doc?95369">www.vishay.com/doc?95369</a> |
|------------|--|

## ADD-A-PAK Generation VII - Diode

**DIMENSIONS** in millimeters (inches)





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