# AAP Gen 7 (TO-240AA)
# Power Modules Schottky Rectifier, 400 A

AAP Gen 7 (TO-240AA)

## FEATURES

- 175 °C $T_J$ operation
- Low forward voltage drop
- High frequency operation
- Low thermal resistance
- 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

## BENEFITS

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

| PRIMARY CHARACTERISTICS | |
|---|---|
| $I_{F(AV)}$ | 400 A |
| $V_R$ | 150 V |
| Package | AAP Gen 7 (TO-240AA) |
| Circuit configuration | Two diodes common cathode |

## 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.

## ELECTRICAL DESCRIPTION / APPLICATIONS

The VS-VSKCS409/150 Schottky rectifier common cathode 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.

| MAJOR RATINGS AND CHARACTERISTICS | | | |
|---|---|---|---|
| SYMBOL | CHARACTERISTICS | VALUES | UNITS |
| $I_{F(AV)}$ | Rectangular waveform | 400 | A |
| $V_{RRM}$ | | 150 | V |
| $I_{FSM}$ | $t_p$ = 5 µs sine | 20 000 | A |
| $V_F$ | 200 $A_{pk}$, $T_J$ = 125 °C | 0.85 | V |
| $T_J$ | Range | -55 to +175 | °C |

| VOLTAGE RATINGS | | | |
|---|---|---|---|
| PARAMETER | SYMBOL | VS-VSKCS409/150 | UNITS |
| Maximum DC reverse voltage | $V_R$ | 150 | V |
| Maximum working peak reverse voltage | $V_{RWM}$ | | |

## ABSOLUTE MAXIMUM RATINGS

| PARAMETER | | SYMBOL | TEST CONDITIONS | | VALUES | UNITS |
|---|---|---|---|---|---|---|
| Maximum average forward current | per module | $I_{F(AV)}$ | 50 % duty cycle at $T_C$ = 105 °C, rectangular waveform | | 400 | A |
| | per leg | | | | 200 | |
| Maximum peak one cycle non-repetitive surge current | | $I_{FSM}$ | 5 µs sine or 3 µs 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 °C, $I_{AS}$ = 1.8 A, L = 10 mH | | 15 | mJ |
| Repetitive avalanche current | | $I_{AR}$ | Current decaying linearly to zero in 1 µs<br>Frequency limited by $T_J$ maximum $V_A$ = 1.5 x $V_R$ typical | | 1 | A |

## ELECTRICAL SPECIFICATIONS

| PARAMETER | SYMBOL | TEST CONDITIONS | | VALUES | UNITS |
|---|---|---|---|---|---|
| Maximum forward voltage drop | $V_{FM}$ | 200 A | $T_J$ = 25 °C | 1.03 | V |
| | | 400 A | | 1.33 | |
| | | 200 A | $T_J$ = 125 °C | 0.85 | |
| | | 400 A | | 1.13 | |
| Maximum reverse leakage current | $I_{RM}$ | $T_J$ = 25 °C | $V_R$ = Rated $V_R$ | 6 | mA |
| | | $T_J$ = 125 °C | | 85 | |
| Maximum junction capacitance | $C_T$ | $V_R$ = 5 $V_{DC}$ (test signal range 100 kHz to 1 MHz), 25 °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/µs |
| Maximum RMS insulation voltage | $V_{INS}$ | 50 Hz | | 3000 (1 min)<br>3600 (1 s) | V |

## THERMAL - MECHANICAL SPECIFICATIONS

| PARAMETER | | SYMBOL | TEST CONDITIONS | VALUES | UNITS |
|---|---|---|---|---|---|
| Maximum junction and storage temperature range | | $T_J$, $T_{Stg}$ | | -55 to +175 | °C |
| Maximum thermal resistance, junction to case per leg | | $R_{thJC}$ | DC operation | 0.32 | °C/W |
| Typical thermal resistance, case to heatsink per module | | $R_{thCS}$ | | 0.1 | |
| Approximate weight | | | | 75 | g |
| | | | | 2.7 | oz. |
| Mounting torque ± 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® | TO-240AA compatible | |

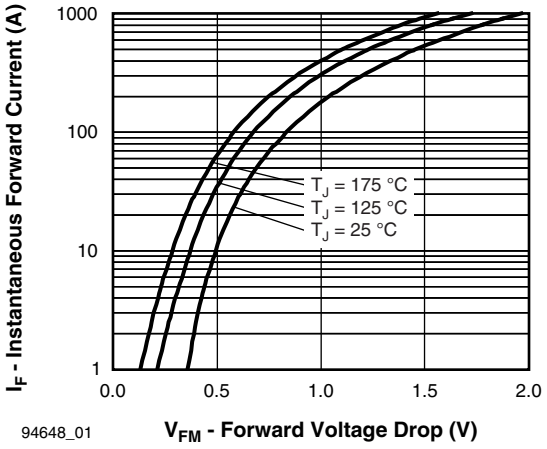



Fig. 1 - Maximum Forward Voltage Drop Characteristics (Per Leg)

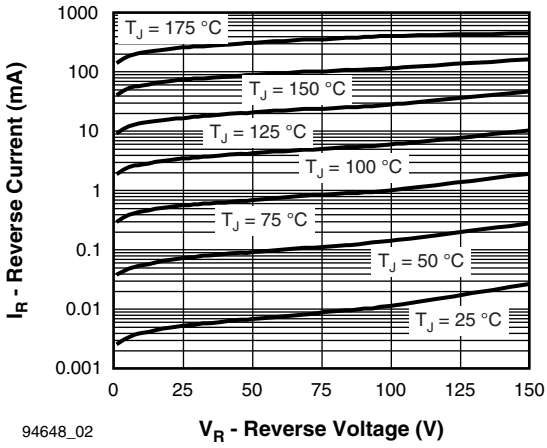



Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

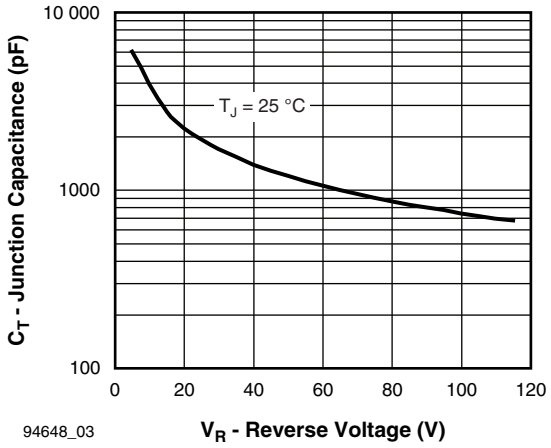



Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

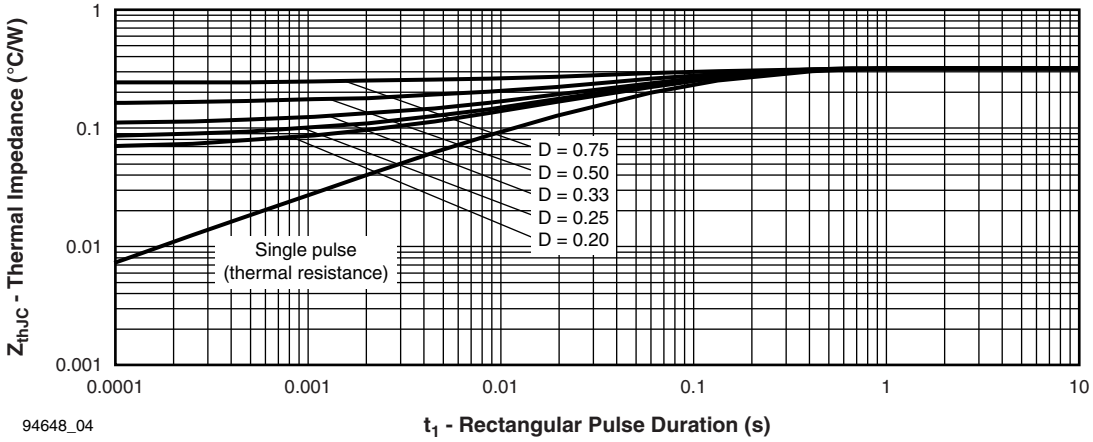



Fig. 4 - Maximum Thermal Impedance $Z_{thJC}$ Characteristics (Per Diode)

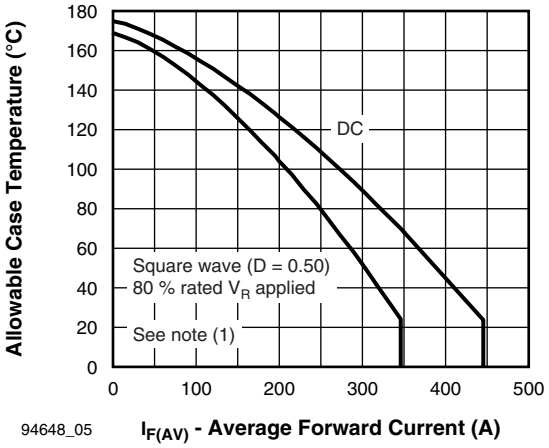



Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current (Per Leg)

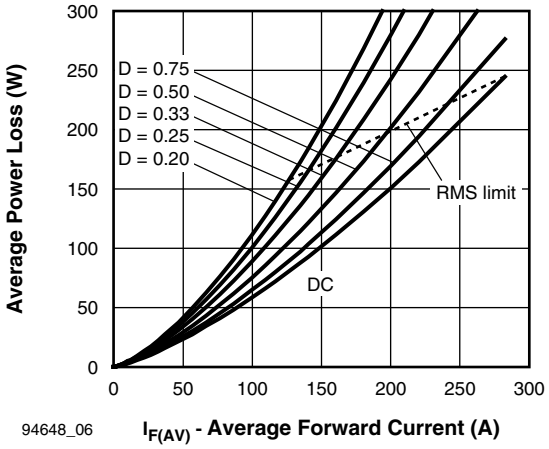



Fig. 6 - Forward Power Loss Characteristics (Per Leg)

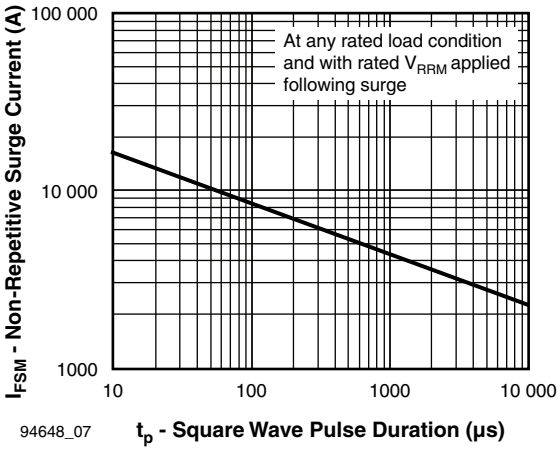



Fig. 7 - Maximum Non-Repetitive Surge Current

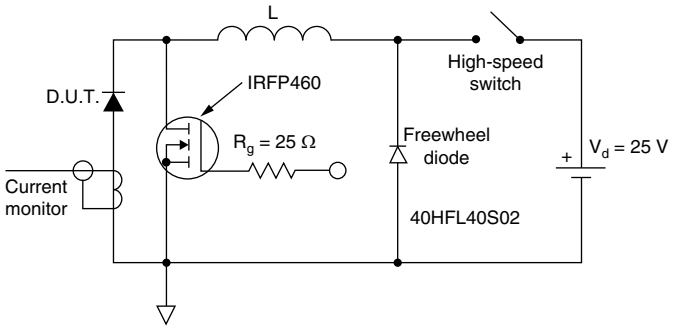



Fig. 8 - Unclamped Inductive Test Circuit

**Note**

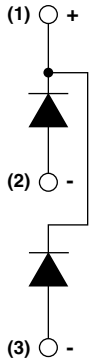
(1) Formula used: $T_C = T_J - (Pd + Pd_{REV}) \times R_{thJC}$;
Pd = forward power loss = $I_{F(AV)} \times V_{FM}$ at ($I_{F(AV)}$/D) (see fig. 6);
$Pd_{REV}$ = inverse power loss = $V_{R1} \times I_R (1 - D)$; $I_R$ at $V_{R1}$ = 80 % rated $V_R$

## ORDERING INFORMATION TABLE

| Device code | VS-VS | KC | S | 40 | 9 | / | 150 |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | | 6 |

- 1 - VS-VS = Vishay Semiconductors product
- 2 - Circuit configuration:
  KC = ADD-A-PAK - 2 diodes common cathode
- 3 - S = Schottky diode
- 4 - Average current rating (40 = 400 A)
- 5 - Product silicon identification
- 6 - Voltage rating (150 = 150 V)

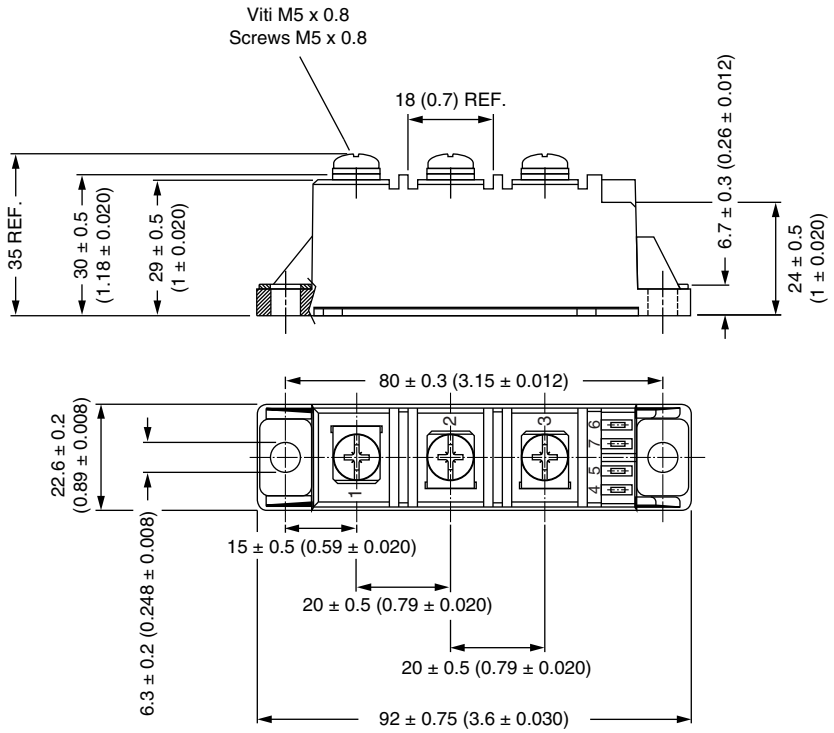
## CIRCUIT CONFIGURATION




| LINKS TO RELATED DOCUMENTS | |
|---|---|
| Dimensions | www.vishay.com/doc?95369 |

# ADD-A-PAK Generation VII - Diode

**DIMENSIONS** in millimeters (inches)



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