

## ADD-A-PAK Generation VII Power Modules Standard Diodes, 60 A




ADD-A-PAK

| PRODUCT SUMMARY |                               |
|-----------------|-------------------------------|
| $I_{F(AV)}$     | 60 A                          |
| Type            | Modules - Diode, High Voltage |

### MECHANICAL DESCRIPTION

The ADD-A-PAK generation VII, 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.

### FEATURES

- High voltage
- Industrial standard package
- Low thermal resistance
- UL approved file E78996 
- Compliant to RoHS Directive 2002/95/EC
- Designed and qualified for industrial level



**RoHS**  
COMPLIANT

### BENEFITS

- Excellent thermal performances obtained by the usage of exposed direct bonded copper substrate
- Up to 1600 V
- High surge capability
- Easy mounting on heatsink

### ELECTRICAL DESCRIPTION

These modules are intended for general purpose high voltage applications such as high voltage regulated power supplies, lighting circuits, temperature and motor speed control circuits, UPS and battery charger.

| MAJOR RATINGS AND CHARACTERISTICS |                 |             |                    |
|-----------------------------------|-----------------|-------------|--------------------|
| SYMBOL                            | CHARACTERISTICS | VALUES      | UNITS              |
| $I_{F(AV)}$                       | 114 °C          | 60          | A                  |
| $I_{F(RMS)}$                      |                 | 94          |                    |
| $I_{FSM}$                         | 50 Hz           | 1300        |                    |
|                                   | 60 Hz           | 1360        |                    |
| $I^2t$                            | 50 Hz           | 8.44        | kA <sup>2</sup> s  |
|                                   | 60 Hz           | 7.68        |                    |
| $I^2\sqrt{t}$                     |                 | 84.5        | kA <sup>2</sup> √s |
| $V_{RRM}$                         | Range           | 400 to 1600 | V                  |
| $T_J$                             |                 | - 40 to 150 | °C                 |
| $T_{Stg}$                         |                 |             |                    |

# VSKD56.., VSKE56.., VSKJ56.., VSKC56.. Series



Vishay Semiconductors

ADD-A-PAK Generation VII  
Power Modules Standard Diodes, 60 A

## ELECTRICAL SPECIFICATIONS

| VOLTAGE RATINGS |              |   |   |   |
|-----------------|--------------|---|---|---|
| TYPE NUMBER     | VOLTAGE CODE | V <sub>RRM</sub> , MAXIMUM REPETITIVE PEAK REVERSE VOLTAGE<br>V | V <sub>RSM</sub> , MAXIMUM NON-REPETITIVE PEAK REVERSE VOLTAGE<br>V | I <sub>RRM</sub> MAXIMUM AT T <sub>J</sub> = 150 °C<br>mA |
| VSK.56          | 04           | 400   | 500   | 10  |
|                 | 06           | 600   | 700   |   |
|                 | 08           | 800   | 900   |   |
|                 | 10           | 1000  | 1100  |   |
|                 | 12           | 1200  | 1300  |   |
|                 | 14           | 1400  | 1500  |   |
|                 | 16           | 1600  | 1700  |   |

| FORWARD CONDUCTION  |                     |  |   |                                   |                    |
|---|---------------------|--|---|-----------------------------------|--------------------|
| PARAMETER   | SYMBOL              | TEST CONDITIONS  |   | VALUES                            | UNITS              |
| Maximum average forward current at case temperature           | I <sub>F(AV)</sub>  | 180° conduction, half sine wave  |   | 60                                | A                  |
|   |                     |  |   | 114                               | °C                 |
| Maximum RMS forward current                                   | I <sub>F(RMS)</sub> | DC at 90 °C case temperature   |   | 94                                |                    |
| Maximum peak, one-cycle forward, non-repetitive surge current | I <sub>FSM</sub>    | t = 10 ms  | No voltage reappplied   | 1300                              | A                  |
|   |                     | t = 8.3 ms   |   | 100 % V <sub>RRM</sub> reappplied |                    |
|   |                     | t = 10 ms  | Sinusoidal half wave, initial T <sub>J</sub> = T <sub>J</sub> maximum |                                   |                    |
|   |                     | t = 8.3 ms   |   | 1140                              |                    |
| Maximum I <sup>2</sup> t for fusing                           | I <sup>2</sup> t    | t = 10 ms  | No voltage reappplied   | 8.44                              | kA <sup>2</sup> s  |
|   |                     | t = 8.3 ms   |   | 100 % V <sub>RRM</sub> reappplied |                    |
|   |                     | t = 10 ms  | 5.97  |                                   |                    |
|   |                     | t = 8.3 ms   | 5.43  |                                   |                    |
| Maximum I <sup>2</sup> √t for fusing                          | I <sup>2</sup> √t   | t = 0.1 ms to 10 ms, no voltage reappplied   |   | 84.5                              | kA <sup>2</sup> √s |
| Low level value of threshold voltage                          | V <sub>F(TO)1</sub> | (16.7 % × π × I <sub>F(AV)</sub> < I < π × I <sub>F(AV)</sub> ), T <sub>J</sub> = T <sub>J</sub> maximum |   | 0.74                              | V                  |
| High level value of threshold voltage                         | V <sub>F(TO)2</sub> | (I > π × I <sub>F(AV)</sub> ), T <sub>J</sub> = T <sub>J</sub> maximum                                   |   | 0.86                              |                    |
| Low level value of forward slope resistance                   | r <sub>f1</sub>     | (16.7 % × π × I <sub>F(AV)</sub> < I < π × I <sub>F(AV)</sub> ), T <sub>J</sub> = T <sub>J</sub> maximum |   | 3.94                              | mΩ                 |
| High level value of forward slope resistance                  | r <sub>f2</sub>     | (I > π × I <sub>F(AV)</sub> ), T <sub>J</sub> = T <sub>J</sub> maximum                                   |   | 3.43                              |                    |
| Maximum forward voltage drop                                  | V <sub>FM</sub>     | I <sub>FM</sub> = π × I <sub>F(AV)</sub> , T <sub>J</sub> = 25 °C, t <sub>p</sub> = 400 μs square wave   |   | 1.6                               | V                  |

| BLOCKING                             |                  |                         |  |                            |       |
|--------------------------------------|------------------|-------------------------|--|----------------------------|-------|
| PARAMETER                            | SYMBOL           | TEST CONDITIONS         |  | VALUES                     | UNITS |
| Maximum peak reverse leakage current | I <sub>RRM</sub> | T <sub>J</sub> = 150 °C |  | 10                         | mA    |
| Maximum RMS insulation voltage       | V <sub>INS</sub> | 50 Hz                   |  | 3000 (1 min)<br>3600 (1 s) | V     |



# VSKD56.., VSKE56.., VSKJ56.., VSKC56.. Series

ADD-A-PAK Generation VII  
Power Modules Standard Diodes, 60 A

Vishay Semiconductors

| THERMAL AND MECHANICAL SPECIFICATIONS                         |                |  |                               |       |
|---|----------------|--|-------------------------------|-------|
| PARAMETER   | SYMBOL         | TEST CONDITIONS  | VALUES                        | UNITS |
| Junction and storage temperature range                        | $T_J, T_{Stg}$ |  | - 40 to 150                   | °C    |
| Maximum internal thermal resistance, junction to case per leg | $R_{thJC}$     | DC operation   | 0.33                          | °C/W  |
| Typical thermal resistance, case to heatsink per module       | $R_{thCS}$     | Mounting surface flat, smooth and greased  | 0.1                           |       |
| Mounting torque $\pm 10\%$<br>to heatsink<br>busbar           |                | 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. | 4                             | Nm    |
|   |                |  | 3                             |       |
| Approximate weight  |                |  | 75                            | g     |
|   |                |  | 2.7                           | oz.   |
| Case style  |                | JEDEC  | ADD-A-PAK Gen. VII (TO-240AA) |       |

| $\Delta R$ CONDUCTION PER JUNCTION |                           |       |       |       |       |                             |       |       |       |       |       |
|------------------------------------|---------------------------|-------|-------|-------|-------|-----------------------------|-------|-------|-------|-------|-------|
| DEVICES                            | SINE HALF WAVE CONDUCTION |       |       |       |       | RECTANGULAR WAVE CONDUCTION |       |       |       |       | UNITS |
|                                    | 180°                      | 120°  | 90°   | 60°   | 30°   | 180°                        | 120°  | 90°   | 60°   | 30°   |       |
| VSK.56                             | 0.115                     | 0.136 | 0.173 | 0.236 | 0.346 | 0.09                        | 0.145 | 0.185 | 0.243 | 0.349 | °C/W  |

#### Note

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

# VSKD56.., VSKE56.., VSKJ56.., VSKC56.. Series



Vishay Semiconductors

ADD-A-PAK Generation VII  
Power Modules Standard Diodes, 60 A

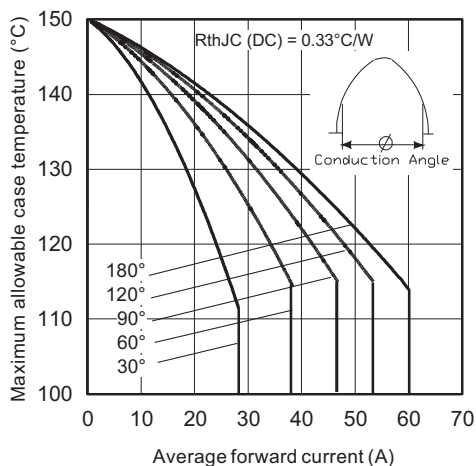


Fig. 1 - Current Ratings Characteristics

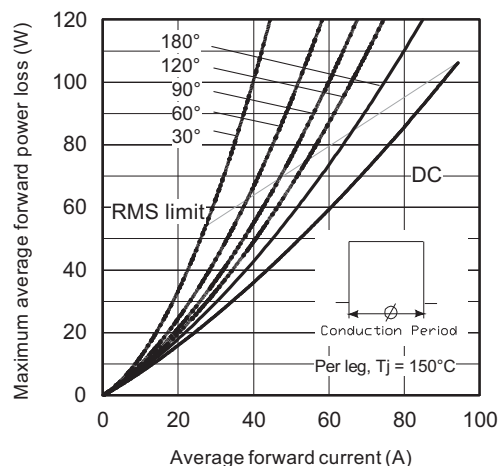


Fig. 4 - Forward Power Loss Characteristics

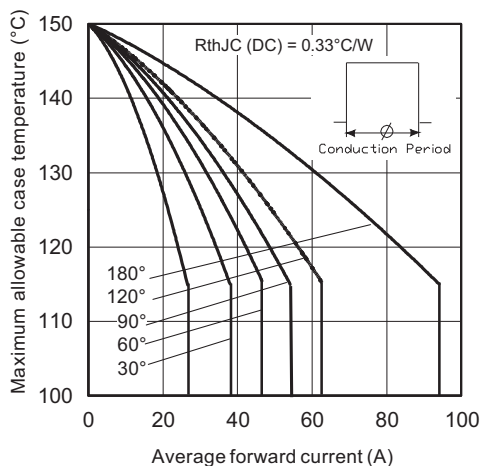


Fig. 2 - Current Ratings Characteristics

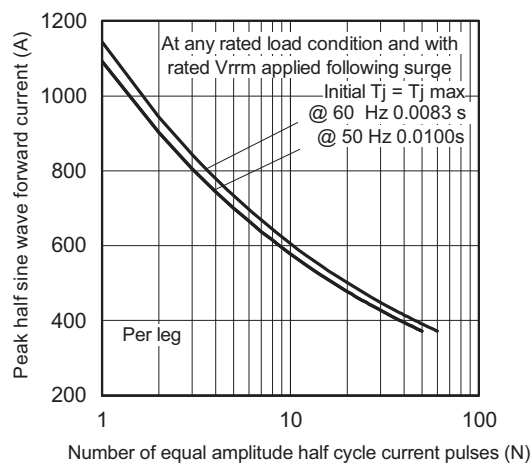


Fig. 5 - Maximum Non-Repetitive Surge Current

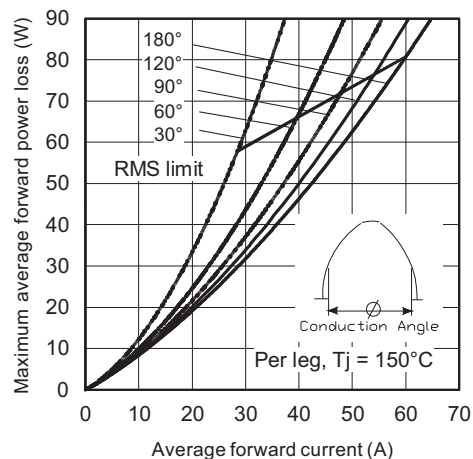


Fig. 3 - Forward Power Loss Characteristics

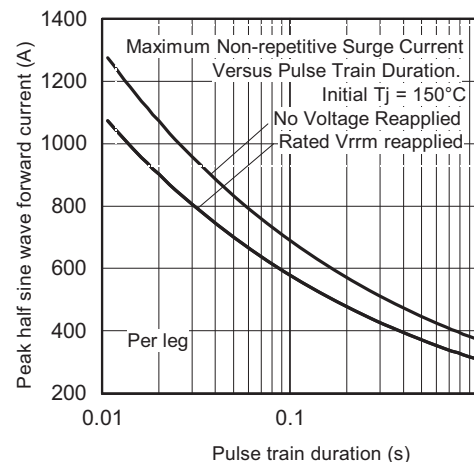


Fig. 6 - Maximum Non-Repetitive Surge Current



# VSKD56.., VSKE56.., VSKJ56.., VSKC56.. Series

ADD-A-PAK Generation VII  
Power Modules Standard Diodes, 60 A

Vishay Semiconductors

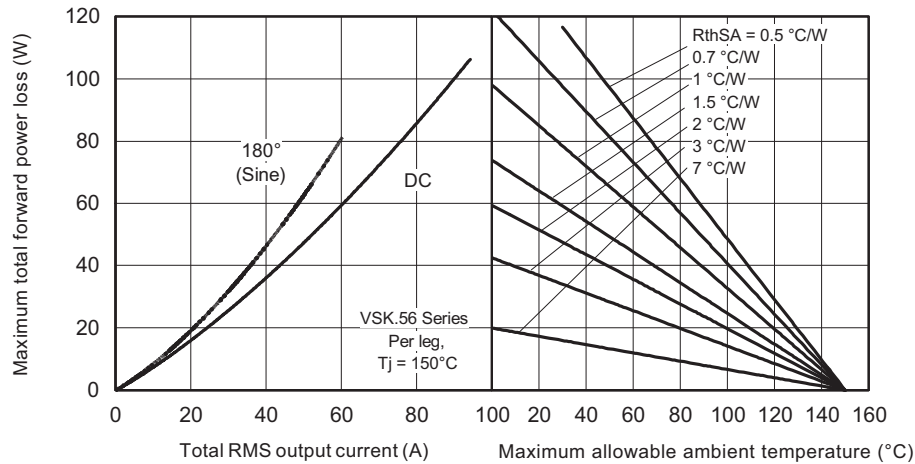


Fig. 7 - Forward Power Loss Characteristics

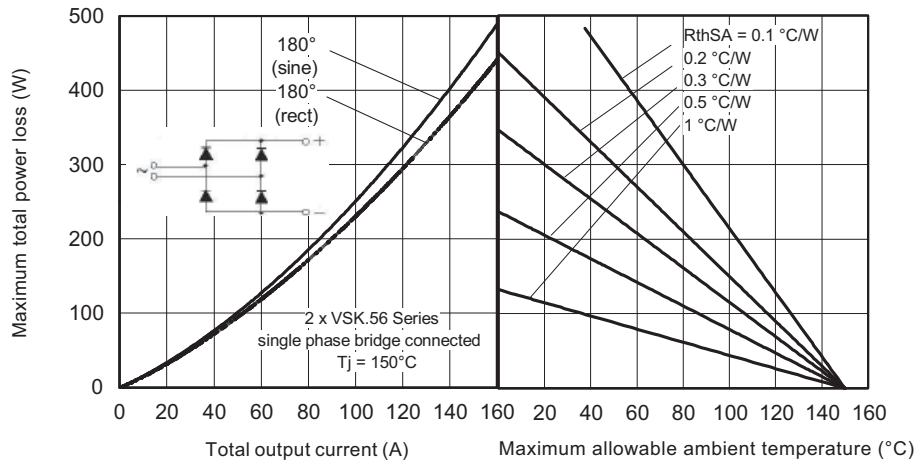


Fig. 8 - Forward Power Loss Characteristics

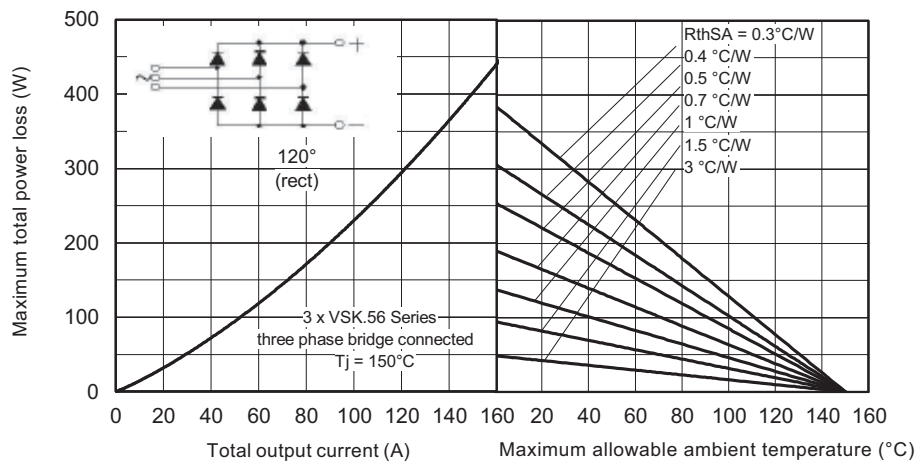


Fig. 9 - Forward Power Loss Characteristics

# VSKD56.., VSKE56.., VSKJ56.., VSKC56.. Series



Vishay Semiconductors

ADD-A-PAK Generation VII  
Power Modules Standard Diodes, 60 A

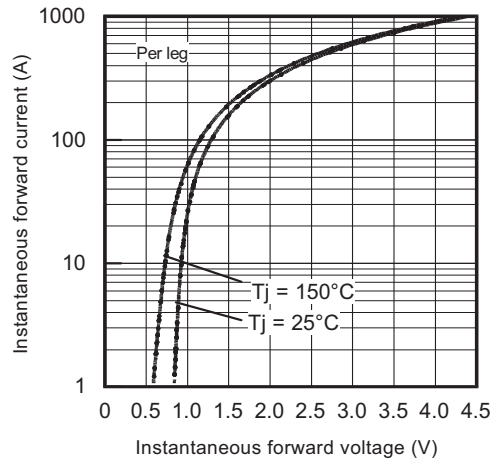


Fig. 10 - Forward Voltage Characteristics

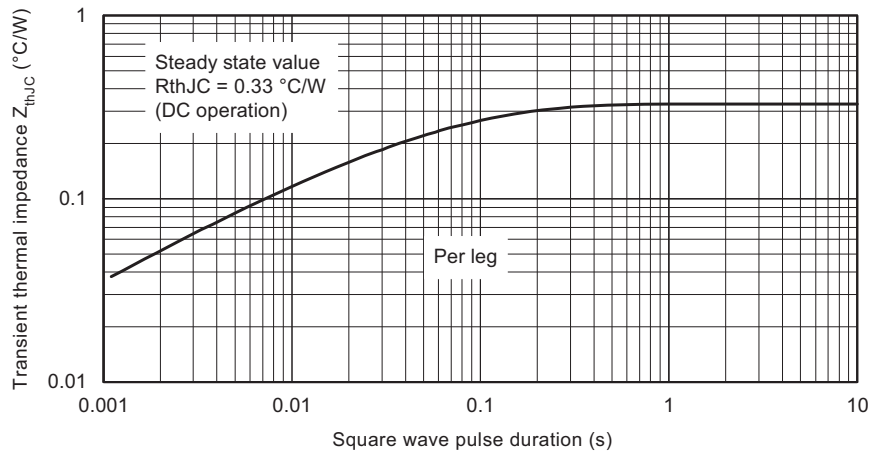


Fig. 11 - Thermal Impedance  $Z_{thJC}$  Characteristics

## ORDERING INFORMATION TABLE

|             |            |          |           |          |           |
|-------------|------------|----------|-----------|----------|-----------|
| Device code | <b>VSK</b> | <b>D</b> | <b>56</b> | <b>/</b> | <b>16</b> |
|             | ①          | ②        | ③         |          | ④         |

- 1** - Module type
- 2** - Circuit configuration (see Circuit Configuration table)
- 3** - Current code (60 A)
- 4** - Voltage code (see Voltage Ratings table)

### Note

- To order the optional hardware go to [www.vishay.com/doc?95172](http://www.vishay.com/doc?95172)



# VSKD56.., VSKE56.., VSKJ56.., VSKC56.. Series

ADD-A-PAK Generation VII  
Power Modules Standard Diodes, 60 A

Vishay Semiconductors

| CIRCUIT CONFIGURATION      |                            |                       |
|----------------------------|----------------------------|-----------------------|
| CIRCUIT DESCRIPTION        | CIRCUIT CONFIGURATION CODE | CIRCUIT DRAWING       |
| Two diodes doubler circuit | D                          | <p><b>VSKD...</b></p> |
| Two diodes common cathodes | C                          | <p><b>VSKC...</b></p> |
| Two diodes common anodes   | J                          | <p><b>VSKJ...</b></p> |
| Single diode               | E                          | <p><b>VSKE...</b></p> |

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



## 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 and agree to fully indemnify and hold Vishay and its distributors harmless from and against any and all claims, liabilities, expenses and damages arising or resulting in connection with such use or sale, including attorneys fees, even if such claim alleges that Vishay or its distributor was negligent regarding the design or manufacture of the part. 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.