

## Three Phase Bridge (Power Modules), 90 A/110 A



MT-K


**RoHS  
COMPLIANT**
**FEATURES**

- Package fully compatible with the industry standard INT-A-PAK power modules series
- High thermal conductivity package, electrically insulated case
- Excellent power volume ratio, outline for easy connections to power transistor and IGBT modules
- 4000 V<sub>RMS</sub> isolating voltage
- UL E78996 approved
- 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)

**DESCRIPTION**

A range of extremely compact, encapsulated three phase bridge rectifiers offering efficient and reliable operation. They are intended for use in general purpose and heavy duty applications.

| PRODUCT SUMMARY  |                    |
|------------------|--------------------|
| I <sub>O</sub>   | 90 A to 110 A      |
| V <sub>RRM</sub> | 800 V to 1600 V    |
| Package          | MT-K               |
| Circuit          | Three phase bridge |

| MAJOR RATINGS AND CHARACTERISTICS |                 |             |           |                   |
|-----------------------------------|-----------------|-------------|-----------|-------------------|
| SYMBOL                            | CHARACTERISTICS | 90MT.K      | 110MT.K   | UNITS             |
| I <sub>O</sub>                    |                 | 90 (120)    | 110 (150) | A                 |
|                                   | T <sub>C</sub>  | 90 (61)     | 90 (57)   | °C                |
| I <sub>FSM</sub>                  | 50 Hz           | 770         | 950       | A                 |
|                                   | 60 Hz           | 810         | 1000      |                   |
| I <sup>2</sup> t                  | 50 Hz           | 3000        | 4500      | A <sup>2</sup> s  |
|                                   | 60 Hz           | 2700        | 4100      |                   |
| I <sup>2</sup> √t                 |                 | 30 000      | 45 000    | A <sup>2</sup> √s |
| V <sub>RRM</sub>                  | Range           | 800 to 1600 |           | V                 |
| T <sub>Stg</sub>                  | Range           | -40 to 150  |           | °C                |
| T <sub>J</sub>                    |                 |             |           |                   |

**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> = MAXIMUM mA |
| VS-90-110MT..K  | 80           | 800   | 900   | 10  |
|                 | 100          | 1000  | 1100  |   |
|                 | 120          | 1200  | 1300  |   |
|                 | 140          | 1400  | 1500  |   |
|                 | 160          | 1600  | 1700  |   |



| FORWARD CONDUCTION  |                     |  |                                  |  |           |                   |                  |
|---|---------------------|--|----------------------------------|--|-----------|-------------------|------------------|
| PARAMETER   | SYMBOL              | TEST CONDITIONS  |                                  | 90MT.K   | 110MT.K   | UNITS             |                  |
| Maximum DC output current at case temperature                 | I <sub>O</sub>      | 120° rect. conduction angle  |                                  | 90 (120)   | 110 (150) | A                 |                  |
|   |                     |  |                                  | 90 (61)  | 90 (57)   | °C                |                  |
| Maximum peak, one-cycle forward, non-repetitive surge current | I <sub>FSM</sub>    | t = 10 ms  | No voltage reapplied             | Initial<br>T <sub>J</sub> = T <sub>J</sub> maximum | 770       | 950               | A                |
|   |                     | t = 8.3 ms   |                                  |  | 810       | 1000              |                  |
|   |                     | t = 10 ms  | 100 % V <sub>RRM</sub> reapplied |  | 650       | 800               |                  |
|   |                     | t = 8.3 ms   |                                  |  | 680       | 840               |                  |
| Maximum I <sup>2</sup> t for fusing                           | I <sup>2</sup> t    | t = 10 ms  | No voltage reapplied             | Initial<br>T <sub>J</sub> = T <sub>J</sub> maximum | 3000      | 4500              | A <sup>2</sup> s |
|   |                     | t = 8.3 ms   |                                  |  | 2700      | 4100              |                  |
|   |                     | t = 10 ms  | 100 % V <sub>RRM</sub> reapplied |  | 2100      | 3200              |                  |
|   |                     | t = 8.3 ms   |                                  |  | 1900      | 2900              |                  |
| Maximum I <sup>2</sup> √t for fusing                          | I <sup>2</sup> √t   | t = 0.1 ms to 10 ms, no voltage reapplied  |                                  | 30 000   | 45 000    | A <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> maximum    |                                  | 0.89   | 0.81      | V                 |                  |
| High level value of threshold voltage                         | V <sub>F(TO)2</sub> | (I > π × I <sub>F(AV)</sub> ), T <sub>J</sub> maximum                                      |                                  | 1.05   | 0.99      |                   |                  |
| 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> maximum    |                                  | 5.11   | 4.37      | mΩ                |                  |
| High level value of forward slope resistance                  | r <sub>f2</sub>     | (I > π × I <sub>F(AV)</sub> ), T <sub>J</sub> maximum                                      |                                  | 4.64   |           |                   |                  |
| Maximum forward voltage drop                                  | V <sub>FM</sub>     | I <sub>pk</sub> = 150 A, T <sub>J</sub> = 25 °C<br>t <sub>p</sub> = 400 μs single junction |                                  | 1.6  | 1.4       | V                 |                  |
| RMS isolation voltage   | V <sub>ISOL</sub>   | T <sub>J</sub> = 25 °C, all terminal shorted<br>f = 50 Hz, t = 1 s                         |                                  | 4000   |           |                   |                  |

| THERMAL AND MECHANICAL SPECIFICATIONS                    |                                   |  |  |            |         |       |
|--|-----------------------------------|--|--|------------|---------|-------|
| PARAMETER  | SYMBOL                            | TEST CONDITIONS  |  | 90MT.K     | 110MT.K | UNITS |
| Maximum junction operating and storage temperature range | T <sub>J</sub> , T <sub>Stg</sub> |  |  | -40 to 150 |         | °C    |
| Maximum thermal resistance, junction to case             | R <sub>thJC</sub>                 | DC operation per module  |  | 0.21       | 0.18    | °C/W  |
|  |                                   | DC operation per junction  |  | 1.26       | 1.07    |       |
|  |                                   | 120° rect. conduction angle per module   |  | 0.25       | 0.21    |       |
|  |                                   | 120° rect. conduction angle per junction   |  | 1.47       | 1.25    |       |
| Maximum thermal resistance, case to heatsink per module  | R <sub>thCS</sub>                 | Mounting surface smooth, flat and greased  |  | 0.03       |         |       |
| Mounting torque ± 10 %                                   | to heatsink<br>to terminal        | 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. Lubricated threads. |  | 4 to 6     |         | Nm    |
|  |                                   |  |  | 3 to 4     |         |       |
| Approximate weight                                       |                                   |  |  | 176        |         | g     |

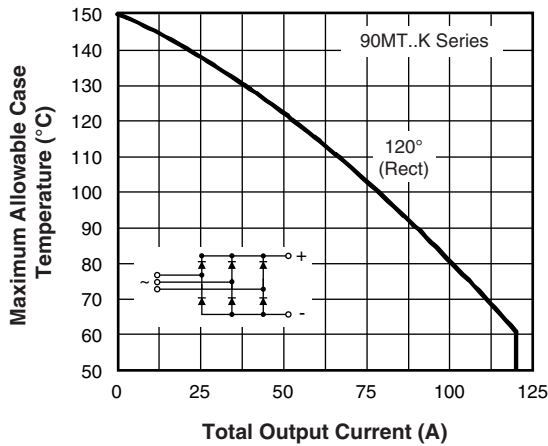


Fig. 1 - Current Ratings Characteristics

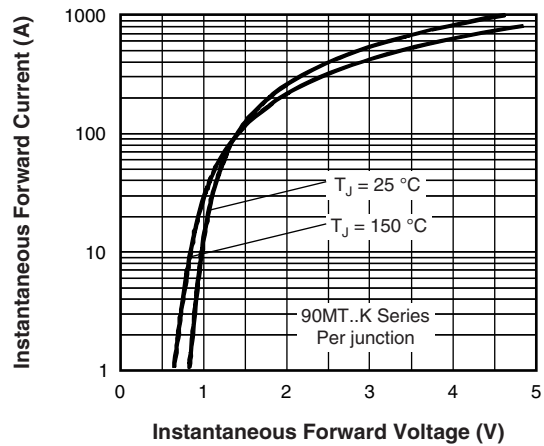


Fig. 2 - Forward Voltage Drop Characteristics

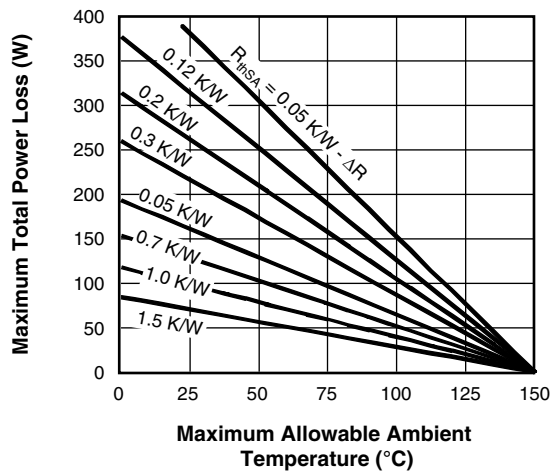
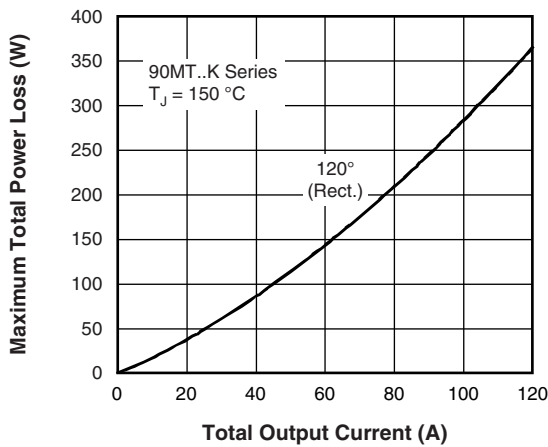


Fig. 3 - Total Power Loss Characteristics

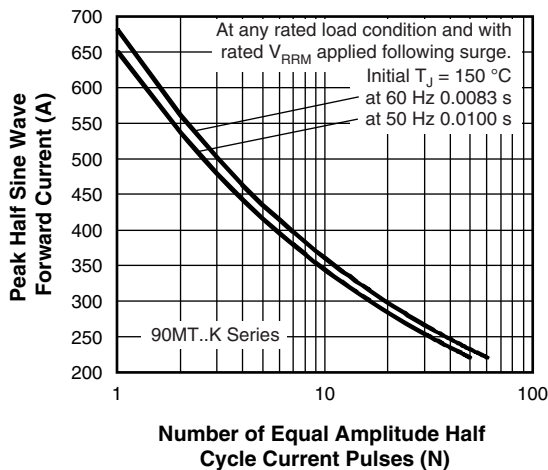


Fig. 4 - Maximum Non-Repetitive Surge Current

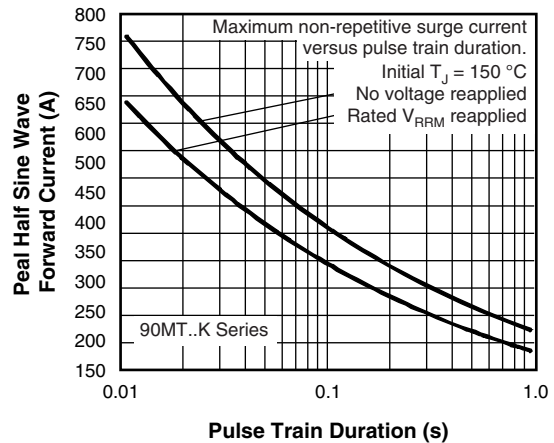


Fig. 5 - Maximum Non-Repetitive Surge Current

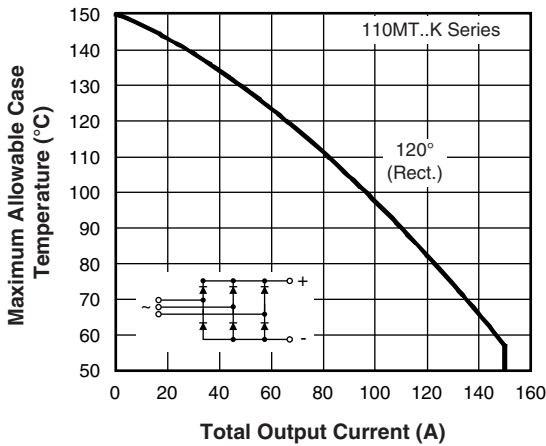


Fig. 6 - Current Ratings Characteristics

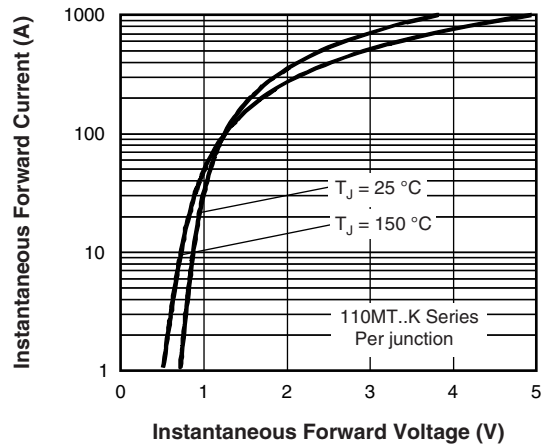


Fig. 7 - Forward Voltage Drop Characteristics

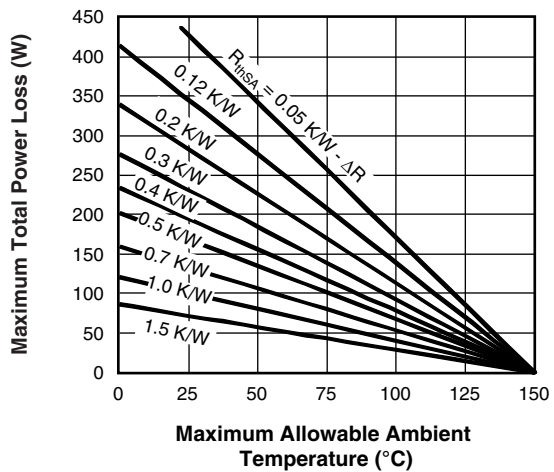
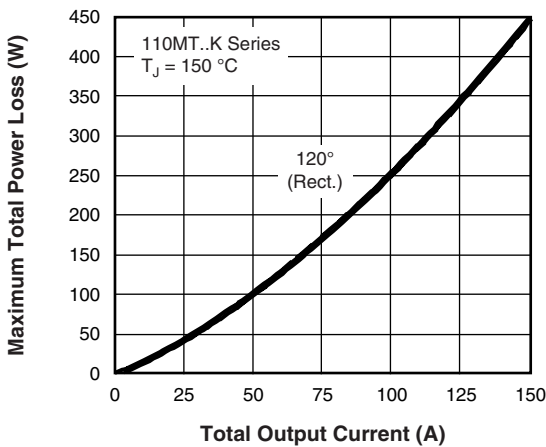


Fig. 8 - Total Power Loss Characteristics

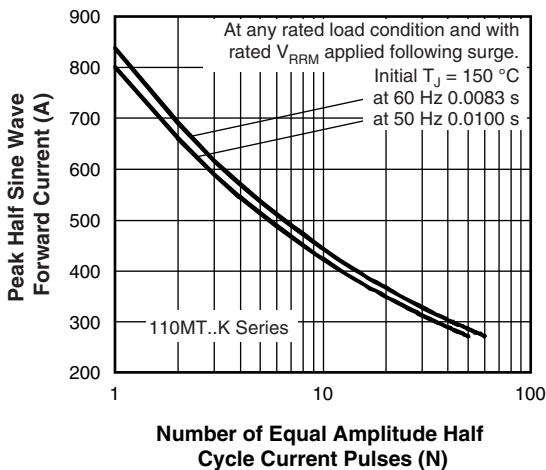


Fig. 9 - Maximum Non-Repetitive Surge Current

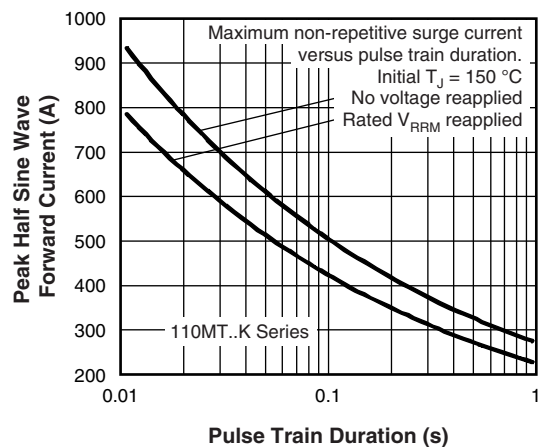


Fig. 10 - Maximum Non-Repetitive Surge Current


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

**ORDERING INFORMATION TABLE**

|             |            |           |          |           |            |          |            |
|-------------|------------|-----------|----------|-----------|------------|----------|------------|
| Device code | <b>VS-</b> | <b>11</b> | <b>0</b> | <b>MT</b> | <b>160</b> | <b>K</b> | <b>PbF</b> |
|             | ①          | ②         | ③        | ④         | ⑤          | ⑥        |            |

- 1** - Vishay Semiconductors product
- 2** - Current rating code: 9 = 90 A (average)  
11 = 110 A (average)
- 3** - Three phase diodes bridge
- 4** - Essential part number
- 5** - Voltage code x 10 =  $V_{RRM}$  (see Voltage Ratings table)
- 6** - PbF = Lead (Pb)-free

**Note**

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

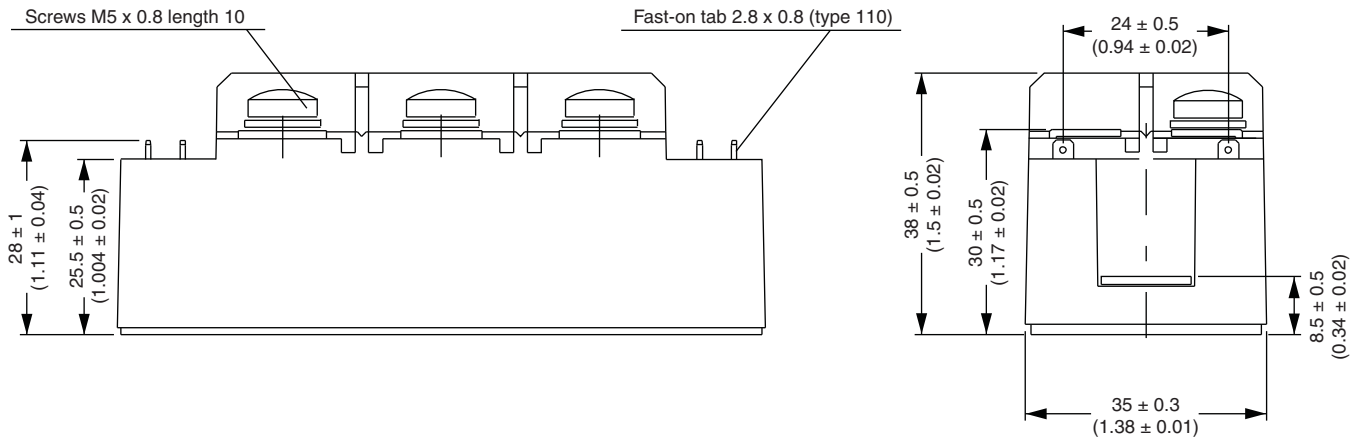
**CIRCUIT CONFIGURATION**

**LINKS TO RELATED DOCUMENTS**

|            |  |
|------------|--|
| Dimensions | <a href="http://www.vishay.com/doc?95004">www.vishay.com/doc?95004</a> |
|------------|--|

## MTK (with and without optional barrier)

### DIMENSIONS WITH OPTIONAL BARRIERS in millimeters (inches)



# Outline Dimensions

Vishay Semiconductors MTK (with and without optional barrier)



## DIMENSIONS WITHOUT OPTIONAL BARRIERS in millimeters (inches)





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### Наши контакты:

**Телефон:** +7 812 627 14 35

**Электронная почта:** [sales@st-electron.ru](mailto:sales@st-electron.ru)

**Адрес:** 198099, Санкт-Петербург,  
Промышленная ул, дом № 19, литера Н,  
помещение 100-Н Офис 331