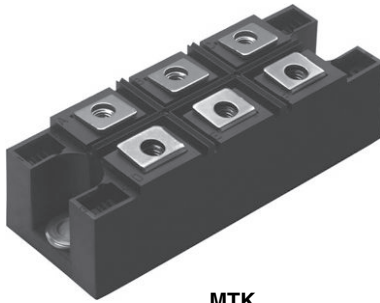


## Three Phase Bridge (Power Modules), 90 A/110 A



MTK

### 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  $V_{RMS}$  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)


**RoHS**  
COMPLIANT

### PRIMARY CHARACTERISTICS

|                       |                    |
|-----------------------|--------------------|
| $I_O$                 | 90 A to 110 A      |
| $V_{RRM}$             | 800 V to 1600 V    |
| Package               | MTK                |
| Circuit configuration | Three phase bridge |

### 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.

### MAJOR RATINGS AND CHARACTERISTICS

| SYMBOL            | CHARACTERISTICS | VALUES<br>90MT.K | VALUES<br>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>    |                 | -40 to 150       |                   |                   |

### ELECTRICAL SPECIFICATIONS

#### VOLTAGE RATINGS

| TYPE NUMBER               | VOLTAGE CODE | $V_{RRM}$ , MAXIMUM<br>REPETITIVE PEAK<br>REVERSE VOLTAGE<br>V | $V_{RSM}$ , MAXIMUM<br>NON-REPETITIVE PEAK<br>REVERSE VOLTAGE<br>V | $I_{RRM}$ MAXIMUM<br>AT $T_J$ = MAXIMUM<br>mA |
|---------------------------|--------------|----------------------------------------------------------------|--------------------------------------------------------------------|-----------------------------------------------|
| VS-90MT..K<br>VS-110MT..K | 80           | 800                                                            | 900                                                                | 10                                            |
|                           | 100          | 1000                                                           | 1100                                                               |                                               |
|                           | 120          | 1200                                                           | 1300                                                               |                                               |
|                           | 140          | 1400                                                           | 1500                                                               |                                               |
|                           | 160          | 1600                                                           | 1700                                                               |                                               |

**FORWARD CONDUCTION**

| PARAMETER                                                     | SYMBOL              | TEST CONDITIONS                                                                            |                                  |                                                    | VALUES<br>90MT.K | VALUES<br>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             |                                                    | 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                                                                                                                                          | VALUES<br>90MT.K | VALUES<br>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 %                                   |                                   | 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. Lubricated threads. | 4 to 6           |                   | Nm    |
| to heatsink<br>to terminal                               |                                   |                                                                                                                                                          | 3 to 4           |                   |       |
| Approximate weight                                       |                                   |                                                                                                                                                          | 176              |                   | g     |

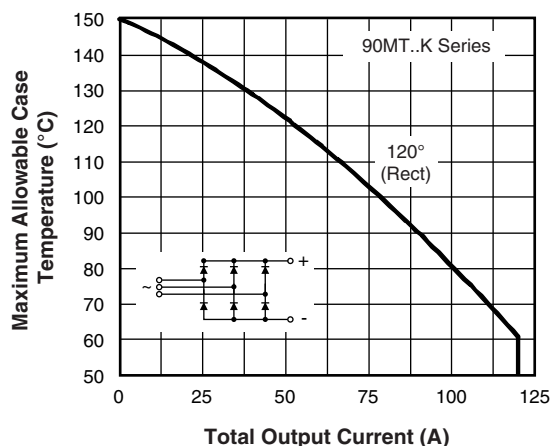


Fig. 1 - Current Ratings Characteristics

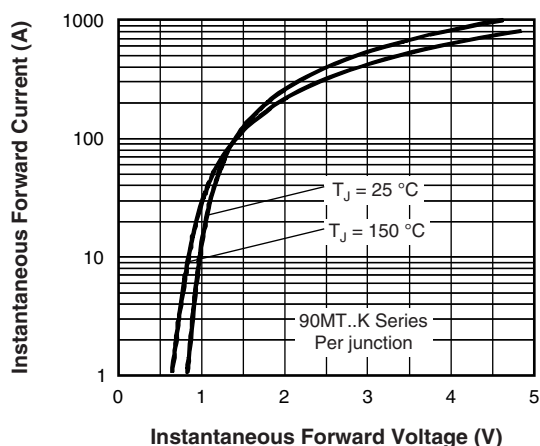


Fig. 2 - Forward Voltage Drop Characteristics

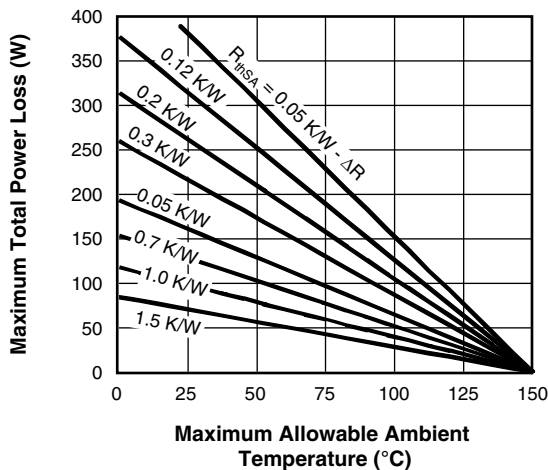
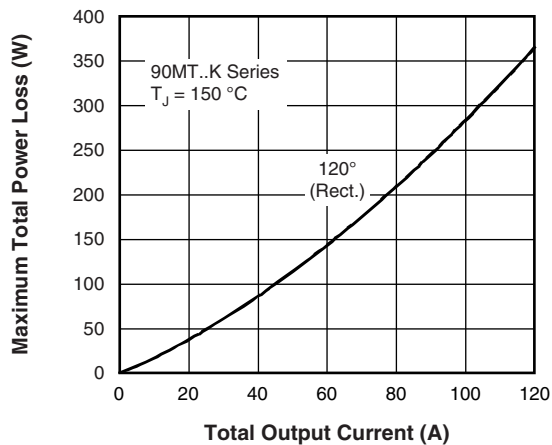


Fig. 3 - Total Power Loss Characteristics

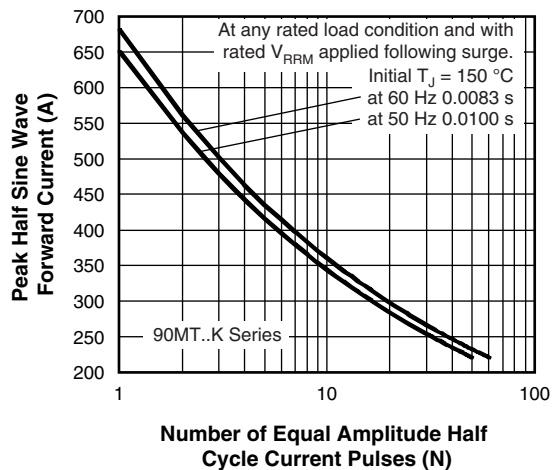


Fig. 4 - Maximum Non-Repetitive Surge Current

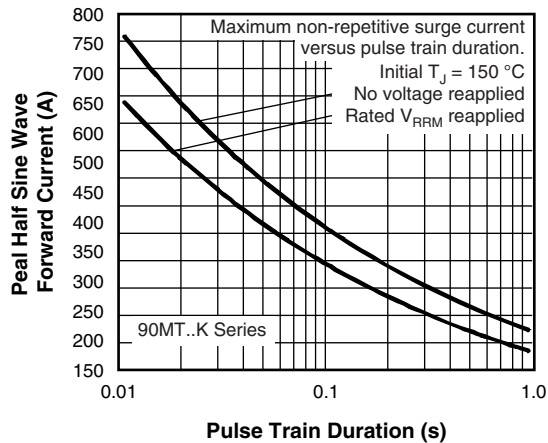


Fig. 5 - Maximum Non-Repetitive Surge Current



Fig. 6 - Current Ratings Characteristics

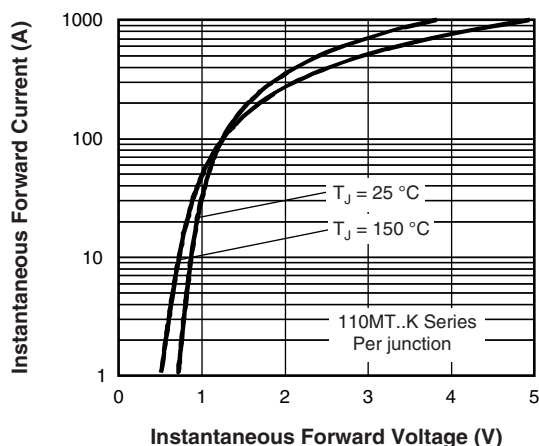


Fig. 7 - Forward Voltage Drop Characteristics

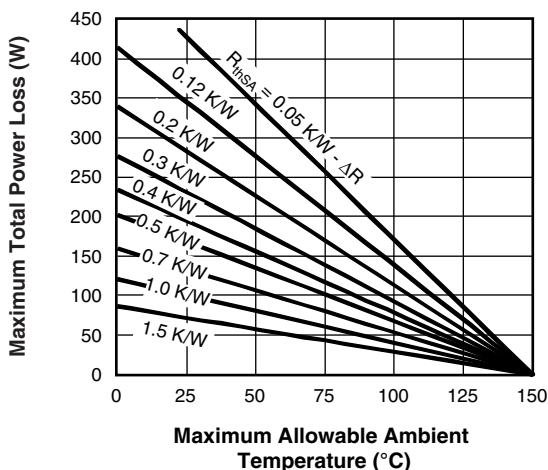


Fig. 8 - Total Power Loss Characteristics



Fig. 9 - Maximum Non-Repetitive Surge Current

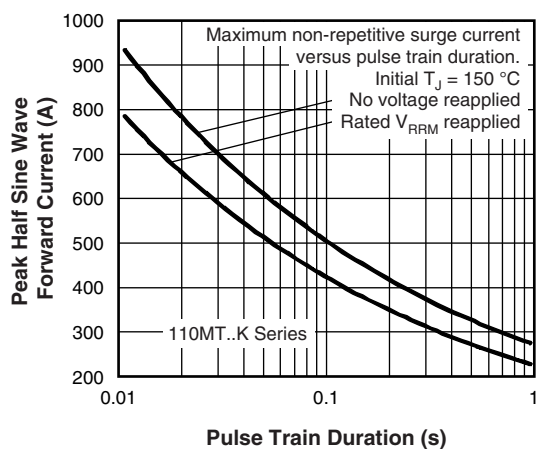
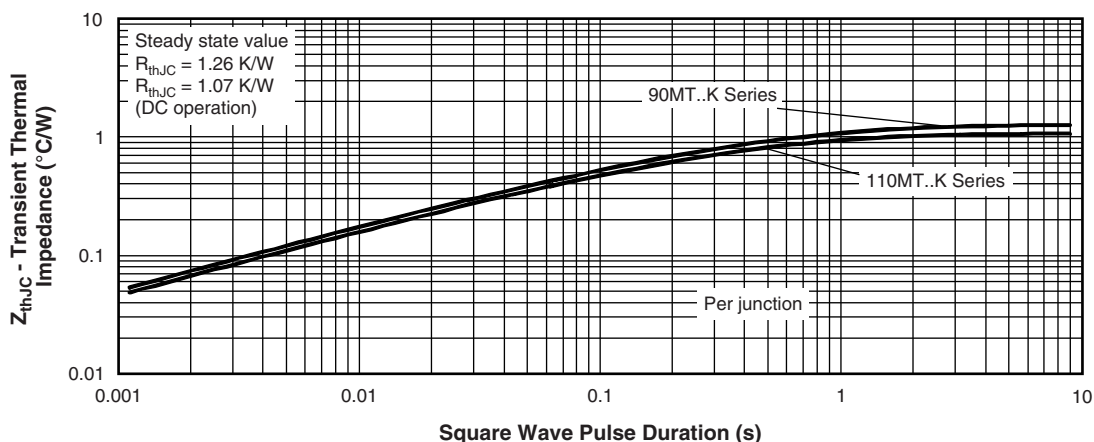


Fig. 10 - Maximum Non-Repetitive Surge Current


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

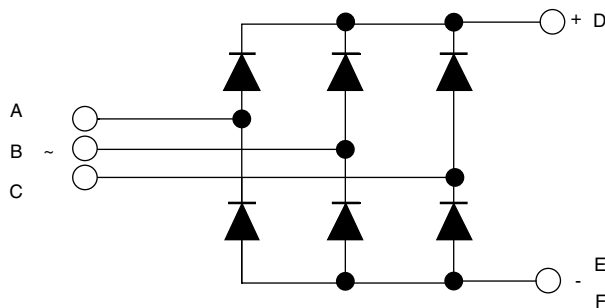
## ORDERING INFORMATION TABLE

| Device code | VS- | 11                                                              | 0 | MT | 160 | K | PbF |
|-------------|-----|-----------------------------------------------------------------|---|----|-----|---|-----|
|             | ①   | ②                                                               | ③ | ④  | ⑤   | ⑥ |     |
| ①           | -   | Vishay Semiconductors product                                   |   |    |     |   |     |
| ②           | -   | Current rating code: 9 = 90 A (average)<br>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)

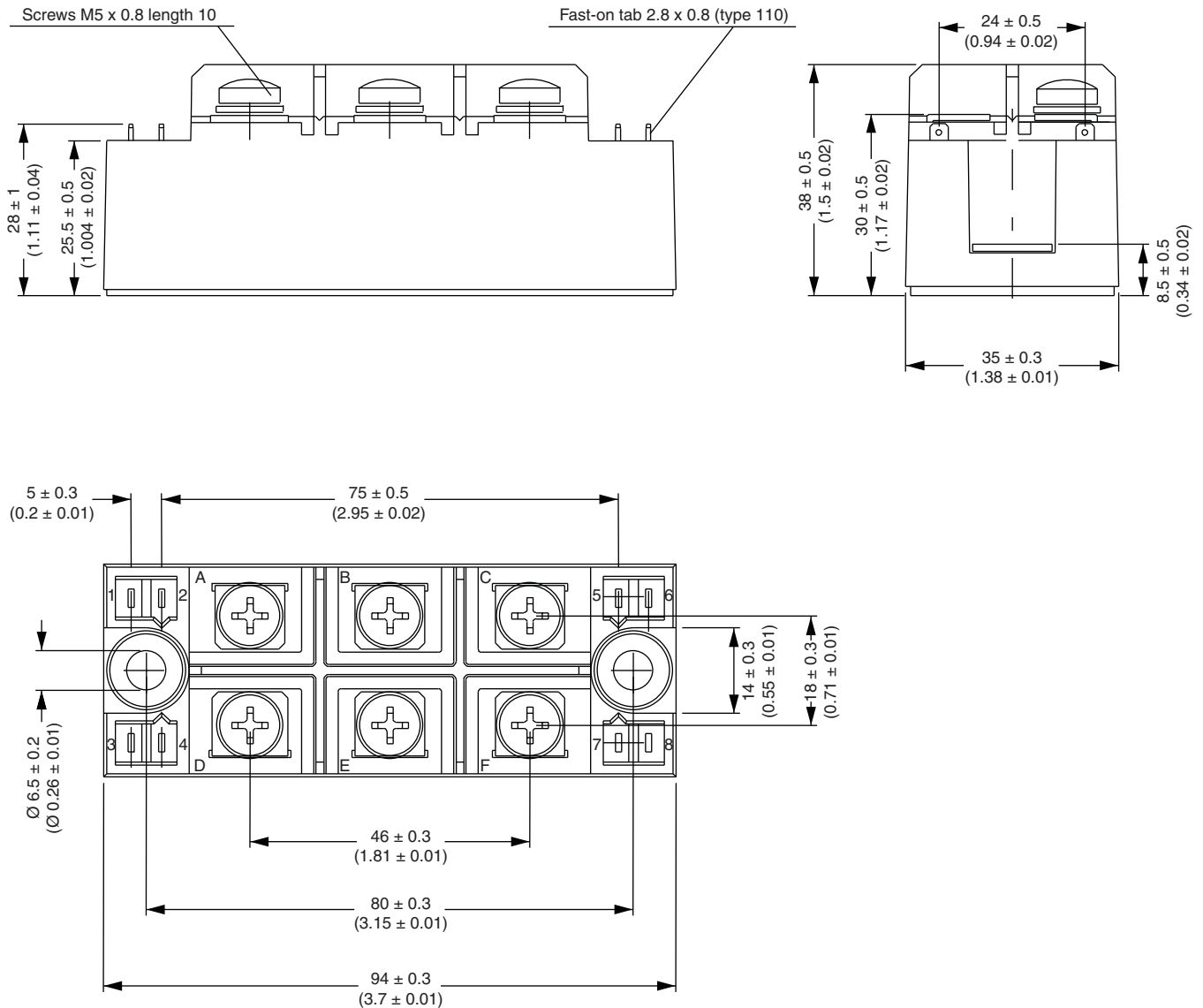
## CIRCUIT CONFIGURATION



| 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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