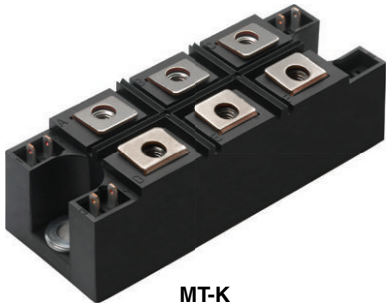
# Three Phase Bridge (Power Modules), 90 A/110 A



MT-K

## 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

Pb-free

RoHS COMPLIANT

| PRODUCT SUMMARY | |
|---|---|
| $I_O$ | 90 A to 110 A |
| $V_{RRM}$ | 800 V to 1600 V |
| Package | MT-K |
| Circuit | 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 | 90MT.K | 110MT.K | UNITS |
| $I_O$ | | 90 (120) | 110 (150) | A |
| | $T_C$ | 90 (61) | 90 (57) | °C |
| $I_{FSM}$ | 50 Hz | 770 | 950 | A |
| | 60 Hz | 810 | 1000 | |
| $I^2t$ | 50 Hz | 3000 | 4500 | $A^2s$ |
| | 60 Hz | 2700 | 4100 | |
| $I^2\sqrt{t}$ | | 30 000 | 45 000 | $A^2\sqrt{s}$ |
| $V_{RRM}$ | Range | 800 to 1600 | | V |
| $T_{Stg}$ | Range | -40 to 150 | | °C |
| $T_J$ | | | | |

## ELECTRICAL SPECIFICATIONS

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



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## FORWARD CONDUCTION

| PARAMETER | SYMBOL | TEST CONDITIONS | | | 90MT.K | 110MT.K | UNITS |
|---|---|---|---|---|---|---|---|
| Maximum DC output current at case temperature | $I_O$ | 120° rect. conduction angle | | | 90 (120) | 110 (150) | A |
| | | | | | 90 (61) | 90 (57) | °C |
| Maximum peak, one-cycle forward, non-repetitive surge current | $I_{FSM}$ | t = 10 ms | No voltage reapplied | Initial $T_J = T_J$ maximum | 770 | 950 | A |
| | | t = 8.3 ms | | | 810 | 1000 | |
| | | t = 10 ms | 100 % $V_{RRM}$ reapplied | | 650 | 800 | |
| | | t = 8.3 ms | | | 680 | 840 | |
| Maximum $I^2t$ for fusing | $I^2t$ | t = 10 ms | No voltage reapplied | | 3000 | 4500 | $A^2s$ |
| | | t = 8.3 ms | | | 2700 | 4100 | |
| | | t = 10 ms | 100 % $V_{RRM}$ reapplied | | 2100 | 3200 | |
| | | t = 8.3 ms | | | 1900 | 2900 | |
| Maximum $I^2\sqrt{t}$ for fusing | $I^2\sqrt{t}$ | t = 0.1 ms to 10 ms, no voltage reapplied | | | 30 000 | 45 000 | $A^2\sqrt{s}$ |
| Low level value of threshold voltage | $V_{F(TO)1}$ | (16.7 % x π x $I_{F(AV)}$ < I < π x $I_{F(AV)}$), $T_J$ maximum | | | 0.89 | 0.81 | V |
| High level value of threshold voltage | $V_{F(TO)2}$ | (I > π x $I_{F(AV)}$), $T_J$ maximum | | | 1.05 | 0.99 | |
| Low level value of forward slope resistance | $r_{f1}$ | (16.7 % x π x $I_{F(AV)}$ < I < π x $I_{F(AV)}$), $T_J$ maximum | | | 5.11 | 4.37 | mΩ |
| High level value of forward slope resistance | $r_{f2}$ | (I > π x $I_{F(AV)}$), $T_J$ maximum | | | 4.64 | | |
| Maximum forward voltage drop | $V_{FM}$ | $I_{pk}$ = 150 A, $T_J$ = 25 °C<br>$t_p$ = 400 µs single junction | | | 1.6 | 1.4 | V |
| RMS isolation voltage | $V_{ISOL}$ | $T_J$ = 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 | | $T_J$, $T_{Stg}$ | | -40 to 150 | | °C |
| Maximum thermal resistance, junction to case | | $R_{thJC}$ | 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 | | $R_{thCS}$ | Mounting surface smooth, flat and greased | 0.03 | | |
| Mounting torque ± 10 % | to heatsink | | 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 |
| | to terminal | | | 3 to 4 | | |
| Approximate weight | | | | 176 | | g |


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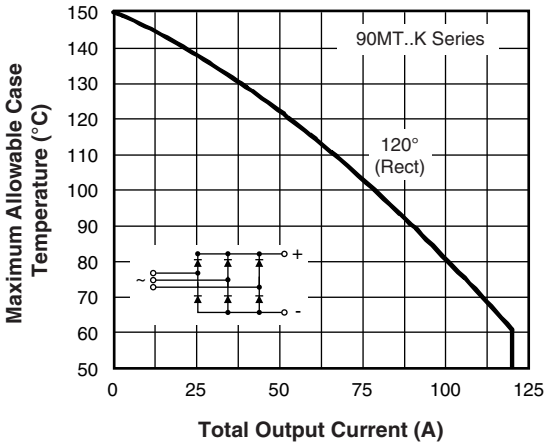



Fig. 1 - Current Ratings Characteristics

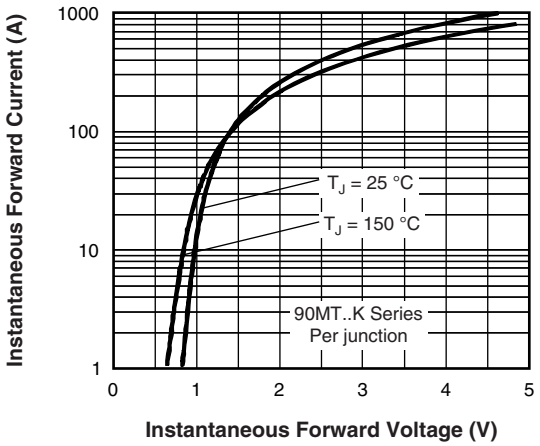
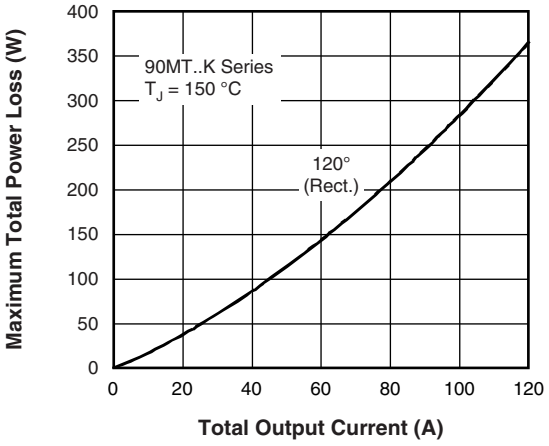



Fig. 2 - Forward Voltage Drop Characteristics



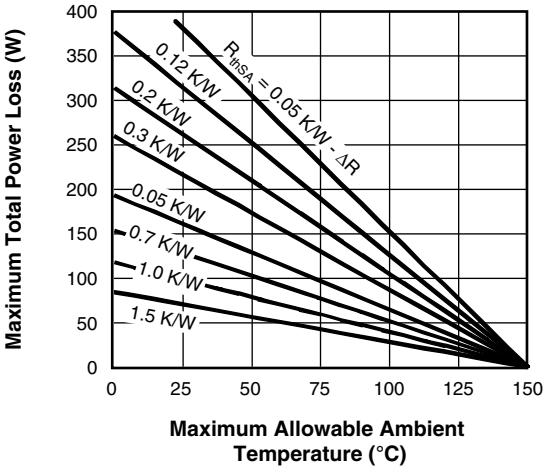




Fig. 3 - Total Power Loss Characteristics

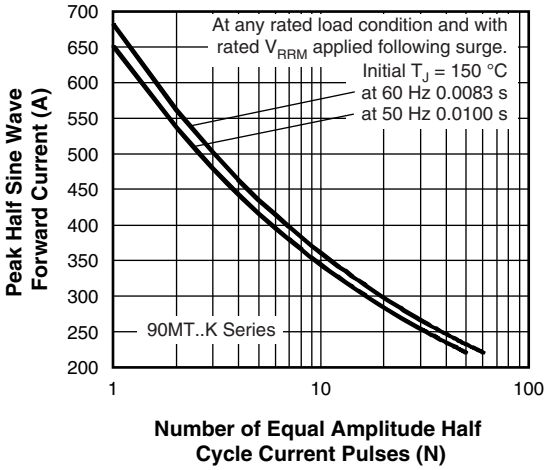



Fig. 4 - Maximum Non-Repetitive Surge Current

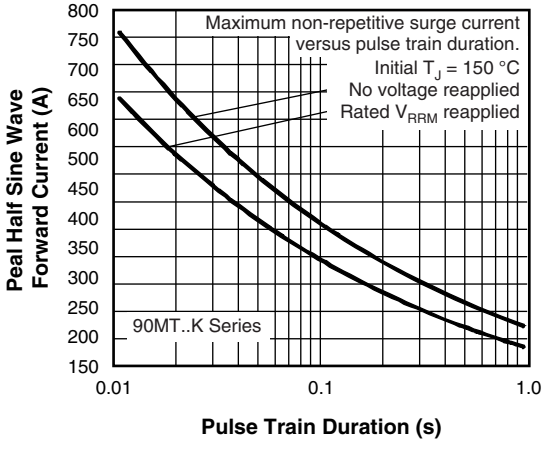



Fig. 5 - Maximum Non-Repetitive Surge Current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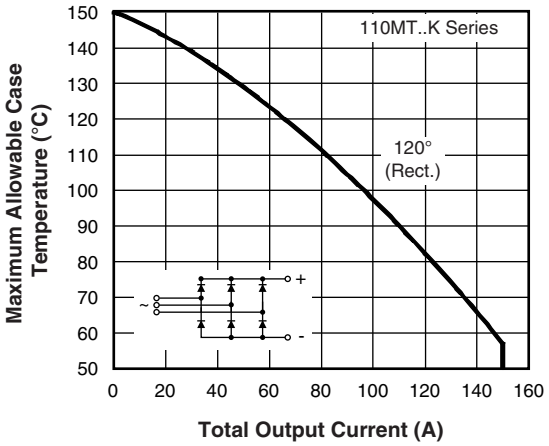



Fig. 6 - Current Ratings Characteristics

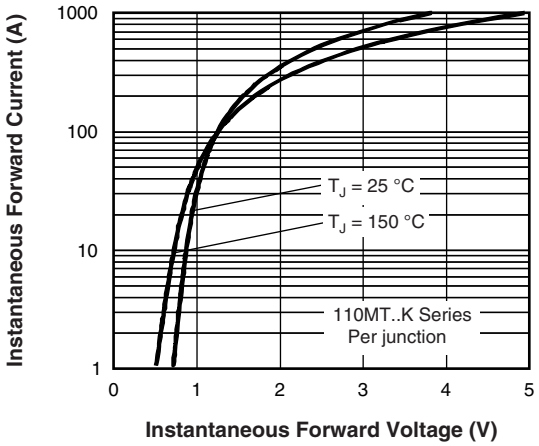
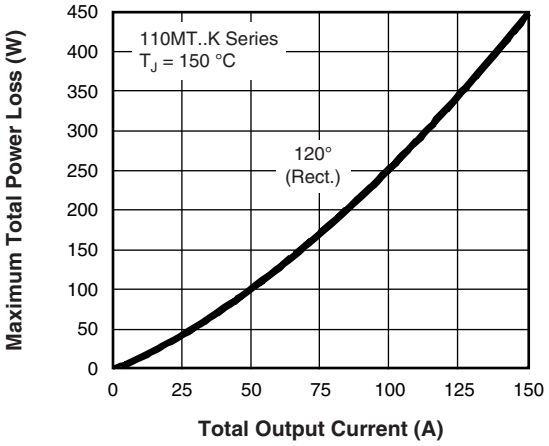



Fig. 7 - Forward Voltage Drop Characteristics



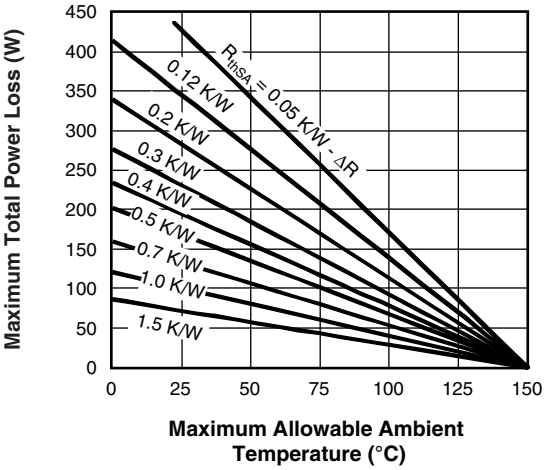




Fig. 8 - Total Power Loss Characteristics

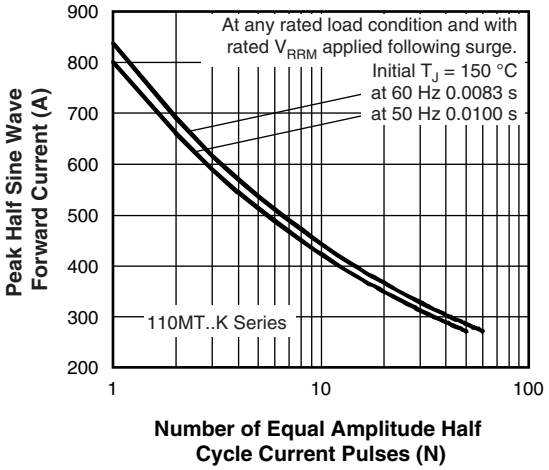



Fig. 9 - Maximum Non-Repetitive Surge Current

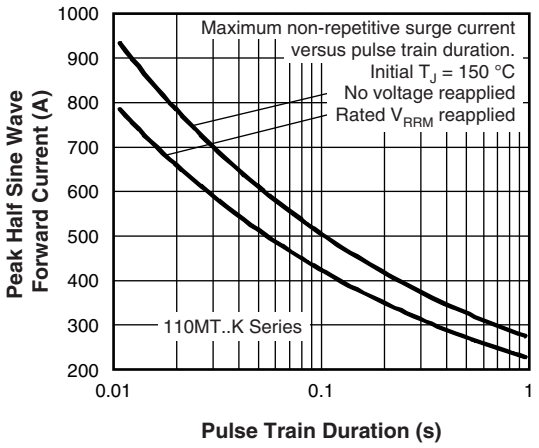



Fig. 10 - Maximum Non-Repetitive Surge Current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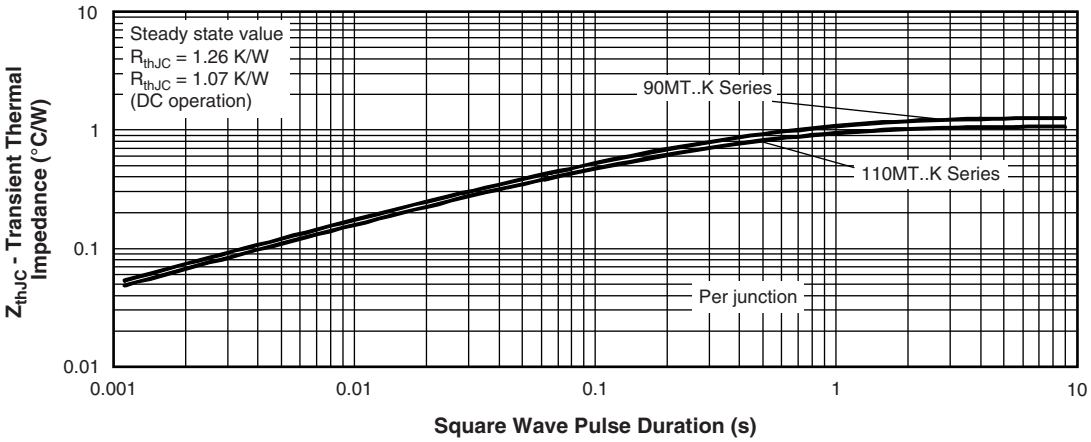



Fig. 11 - Thermal Impedance $Z_{thJC}$ Characteristic

## ORDERING INFORMATION TABLE

**Device code**

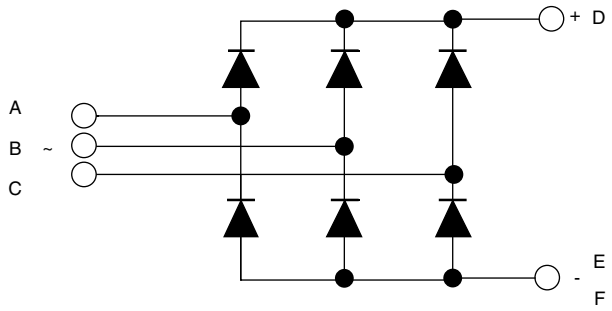
| VS- | 11 | 0 | MT | 160 | K | PbF |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | | 6 |

- 1 - Vishay Semiconductors product
- 2 - Current rating code: 9 = 90 A (average)
  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

## CIRCUIT CONFIGURATION




| LINKS TO RELATED DOCUMENTS | |
|---|---|
| Dimensions | www.vishay.com/doc?95004 |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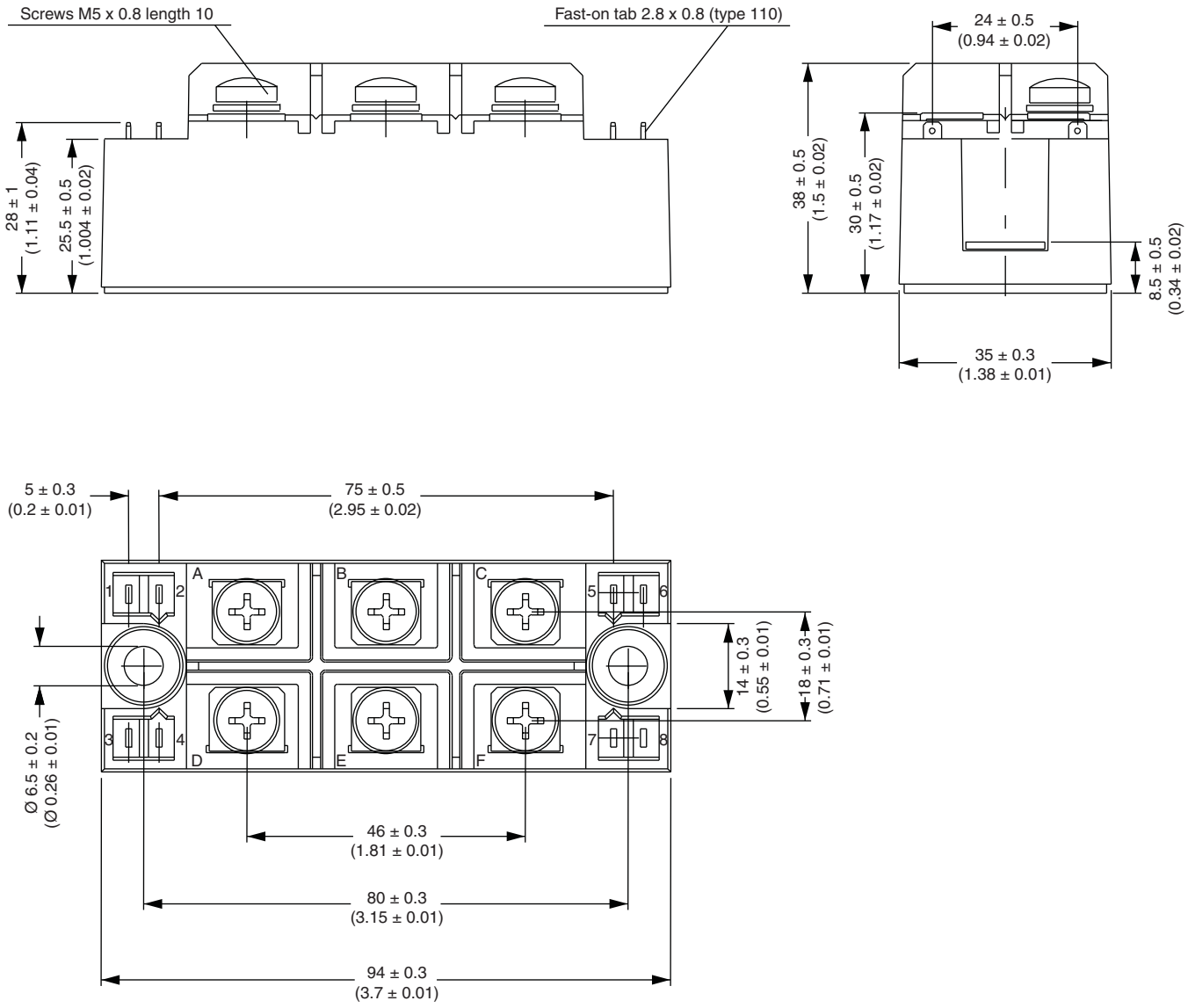
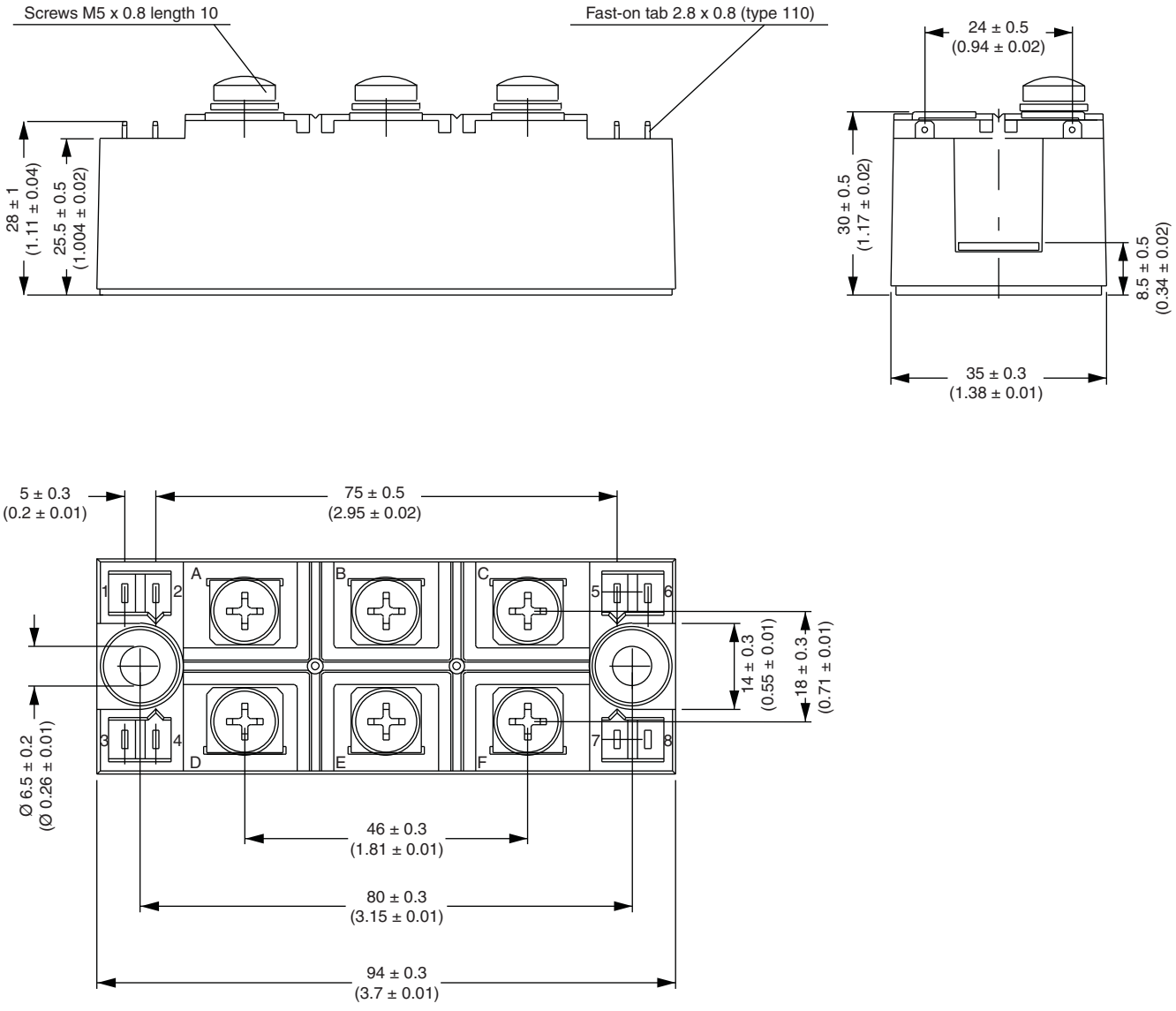
# MTK (with and without optional barrier)

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



**DIMENSIONS WITHOUT OPTIONAL BARRIERS** in millimeters (inches)



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