

## 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<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)


**RoHS**  
COMPLIANT

### 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 |

### 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 <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<br>REPETITIVE PEAK<br>REVERSE VOLTAGE<br>V | V <sub>RSM</sub> , MAXIMUM<br>NON-REPETITIVE PEAK<br>REVERSE VOLTAGE<br>V | I <sub>RRM</sub> MAXIMUM<br>AT T <sub>J</sub> = MAXIMUM<br>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             |                                                    | 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       |         | Nm    |
| Mounting torque ± 10 % <div>to heatsink</div> <div>to terminal</div> |                                   | 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 to 6     |         |       |
|                                                                      |                                   |                                                                                                                                          | 3 to 4     |         |       |
| Approximate weight                                                   |                                   | Lubricated threads.                                                                                                                      | 176        |         | g     |

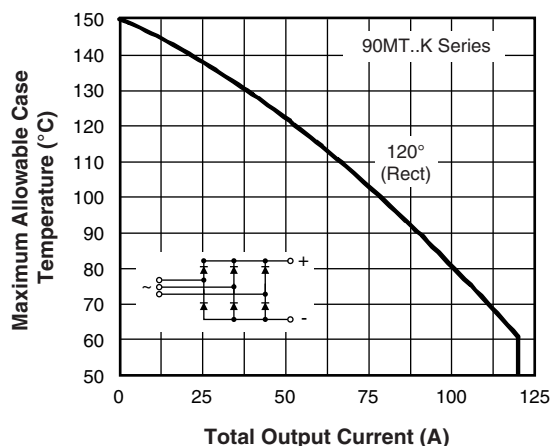


Fig. 1 - Current Ratings Characteristics

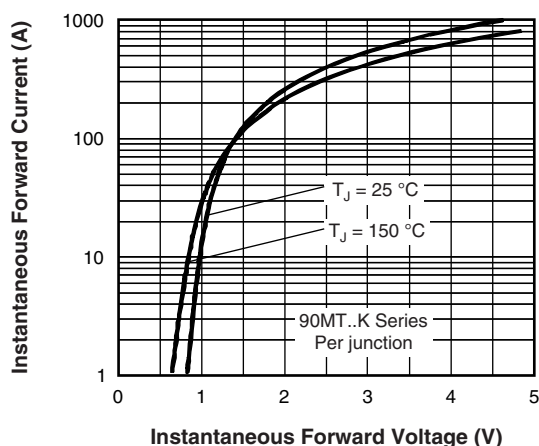


Fig. 2 - Forward Voltage Drop Characteristics

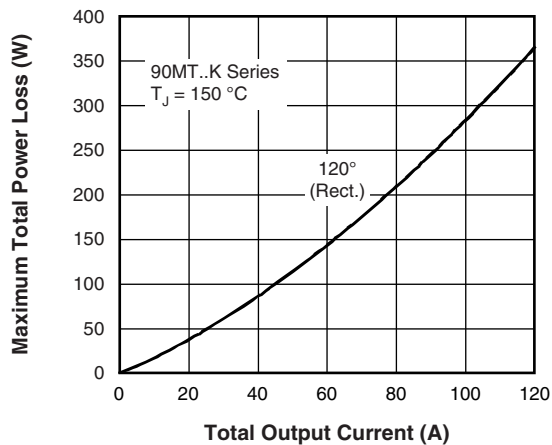


Fig. 3 - Total Power Loss Characteristics

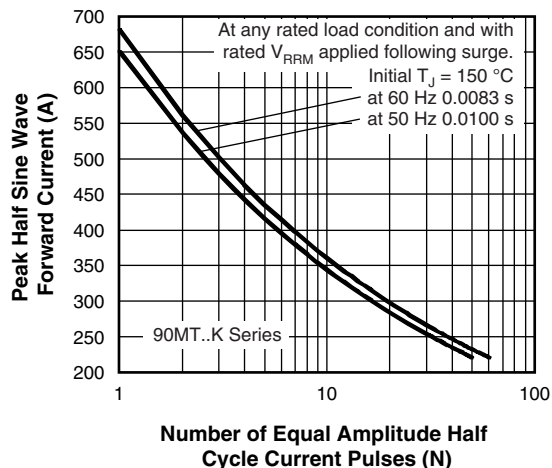
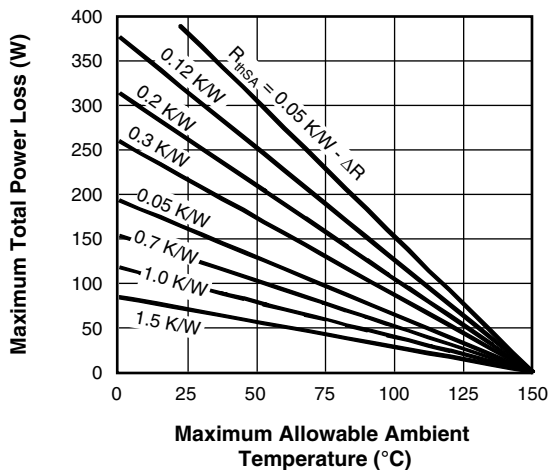


Fig. 4 - Maximum Non-Repetitive Surge Current

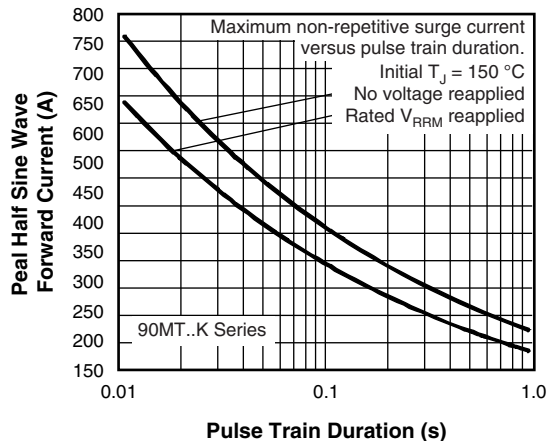


Fig. 5 - Maximum Non-Repetitive Surge Current



Fig. 6 - Current Ratings Characteristics

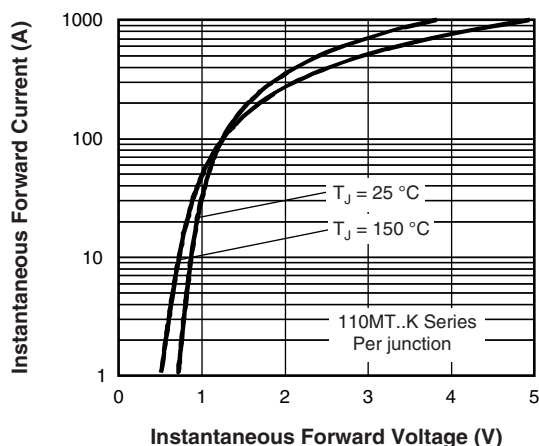


Fig. 7 - Forward Voltage Drop Characteristics

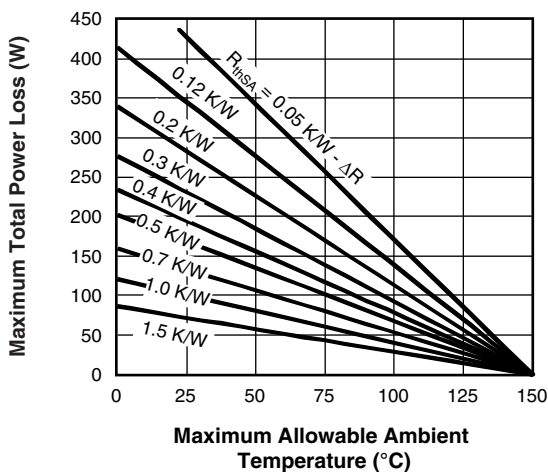


Fig. 8 - Total Power Loss Characteristics



Fig. 9 - Maximum Non-Repetitive Surge Current

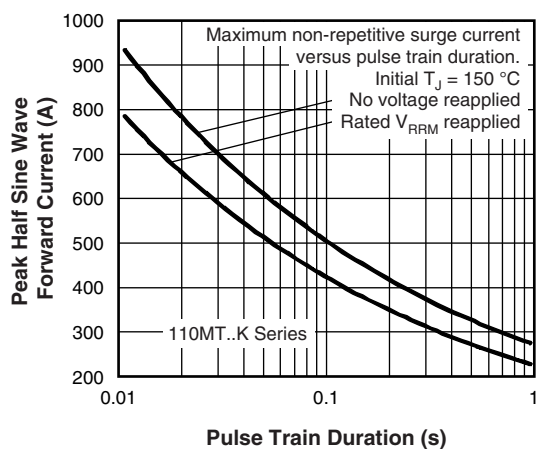
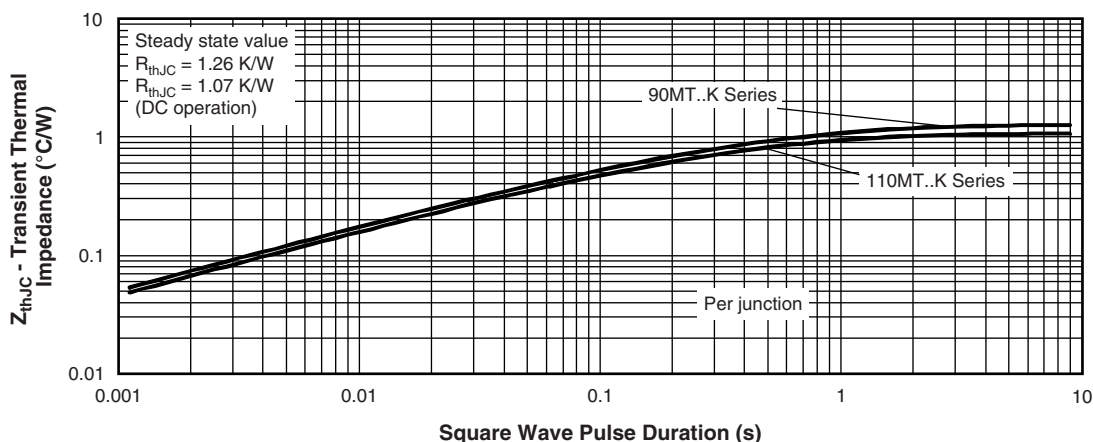


Fig. 10 - Maximum Non-Repetitive Surge Current


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

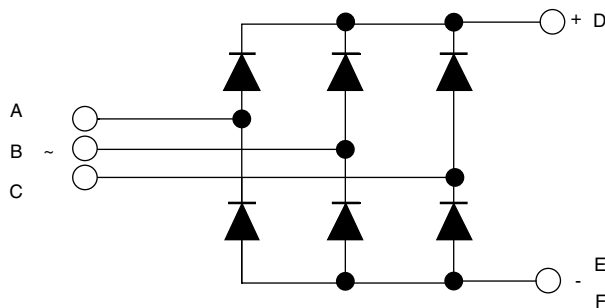
## ORDERING INFORMATION TABLE

| 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)

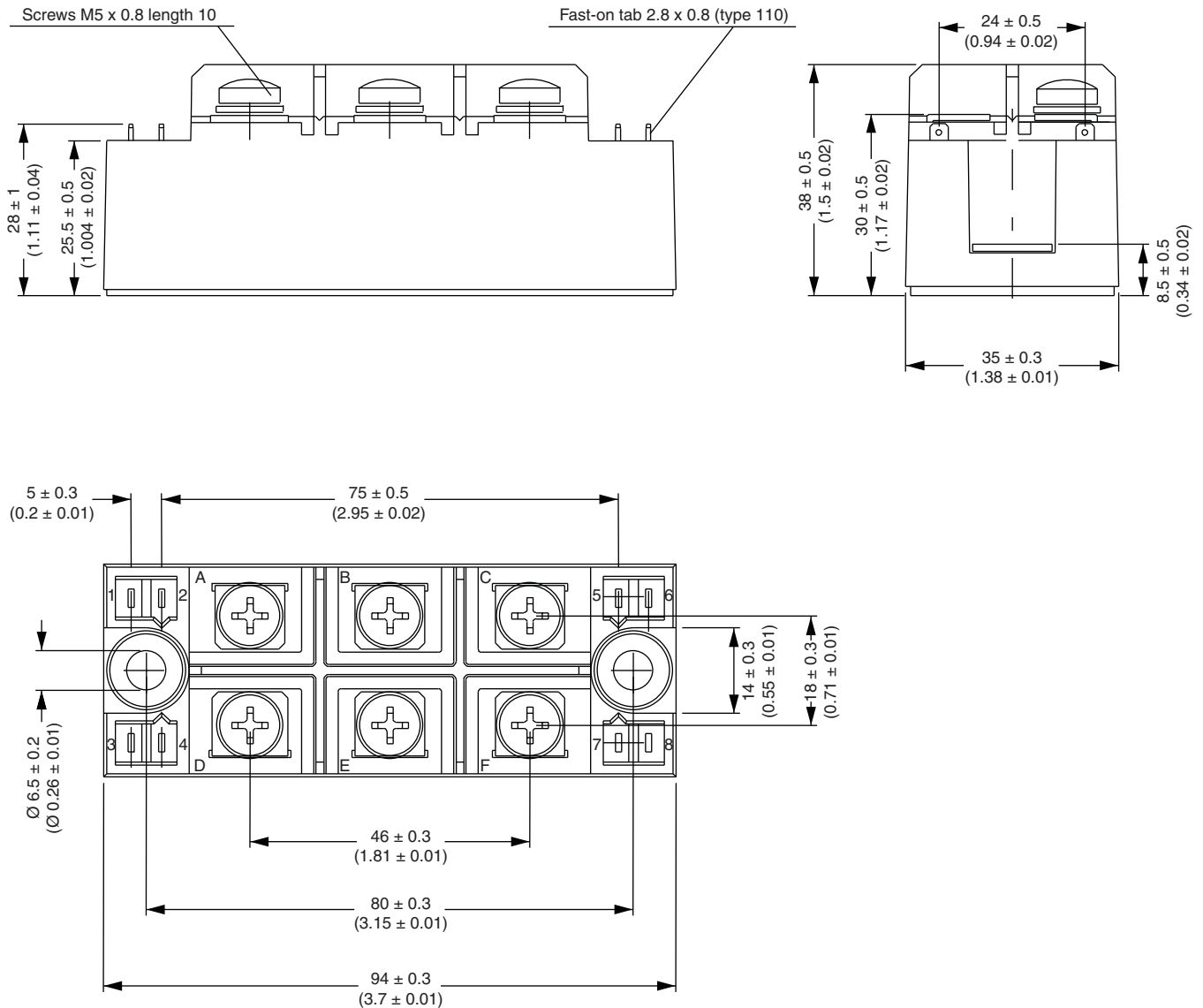
## CIRCUIT CONFIGURATION



| 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)





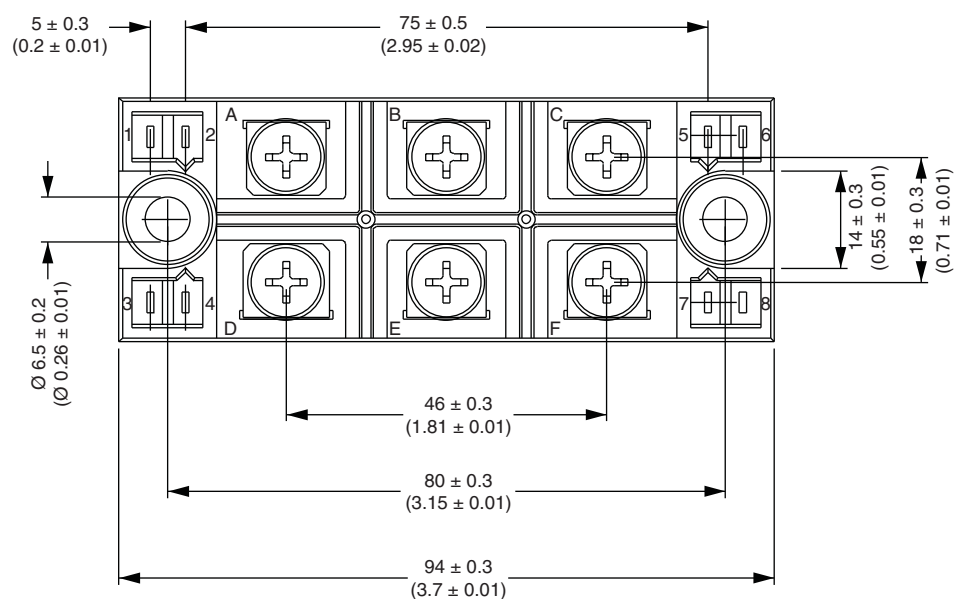
Technical drawing of the 1000mAh 3.7V Li-ion battery, showing front and side views with dimensions in millimeters (mm) and inches (in).

**Front View Dimensions:**

- Overall Height:  $28 \pm 1$  mm ( $1.11 \pm 0.04$  in)
- Height to Top of Fast-on Tab:  $25.5 \pm 0.5$  mm ( $1.004 \pm 0.02$  in)
- Fast-on Tab Dimensions:  $2.8 \times 0.8$  (type 110)
- Screws: M5 x 0.8 length 10

**Side View Dimensions:**

- Overall Width:  $35 \pm 0.3$  mm ( $1.38 \pm 0.01$  in)
- Overall Depth:  $30 \pm 0.5$  mm ( $1.17 \pm 0.02$  in)
- Depth to Top of Fast-on Tab:  $8.5 \pm 0.5$  mm ( $0.34 \pm 0.02$  in)
- Distance between Fast-on Tabs:  $24 \pm 0.5$  mm ( $0.94 \pm 0.02$  in)





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