

**MM118-XX  
 SERIES**

**600 / 1200 Volts  
 150 Amps**

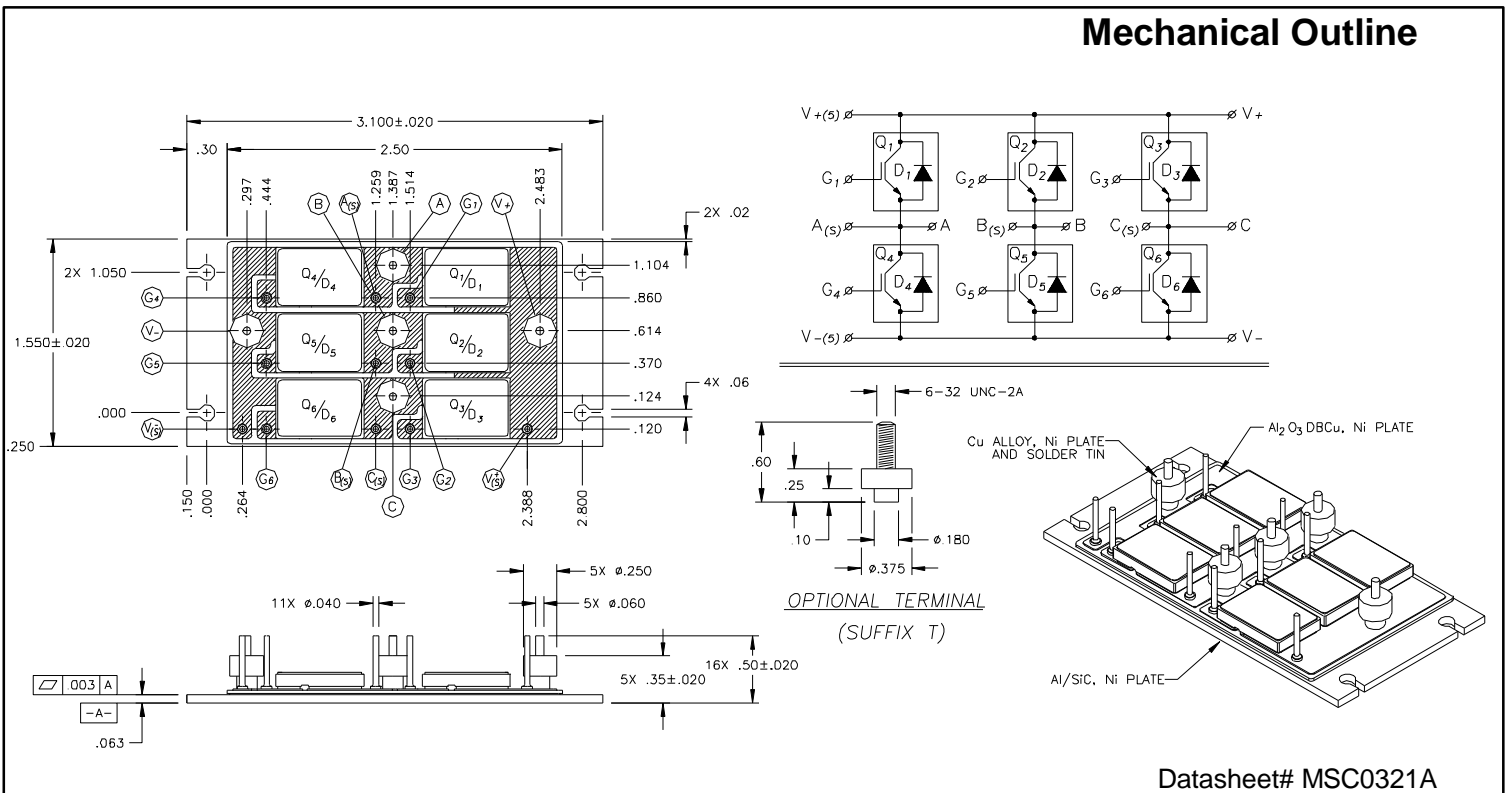
**3 PHASE N-CANNEL  
 INSULATED GATE  
 BIPOLAR  
 TRANSISTOR (IGBT)  
 BRIDGE**

**Features**

- Available in Low Conduction Loss Class as MM118-xxL or Fast Switching Class as MM118-xxF
- Compact and rugged construction offering weight and space savings
- Available with PC board solderable pins (see mechanical outline below) or threaded terminals (add "T" suffix to part number, see option below)
- HPM (Hermetic Power Module)
- Isolation voltage capability (in reference to the base) in excess of 3kV
- Very low thermal resistance
- Thermally matched construction provides excellent temperature and power cycling capability
- Additional voltage ratings or terminations available upon request

**Maximum Ratings per switch @ 25°C (unless otherwise specified)**

| PART NUMBER  | SYMBOL                                  | MM118-06                | MM118-12                                 |
|--|---|-------------------------|--|
| Collector-to-Emitter Breakdown Voltage (Gate shorted to Emitter), @ $T_j \geq 25^\circ\text{C}$  | $BV_{CES}$                              | 600 V                   | 1200 V                                   |
| Collector-to-Gate Breakdown Voltage @ $T_j \geq 25^\circ\text{C}$ , $R_{GS} = 1 \text{ M}\Omega$ | $BV_{CGR}$                              | 600 V                   | 1200 V                                   |
| Gate-to-Emitter Voltage  | continuous<br>transient                 | $V_{GES}$<br>$V_{GEM}$  | $\pm 20 \text{ V}$<br>$\pm 30 \text{ V}$ |
| Continuous Collector Current<br>25°C   | $T_j =$<br><br>$T_j = 90^\circ\text{C}$ | $I_{C25}$<br>$I_{C90}$  | 60 A<br>32 A                             |
| Peak Collector Current, pulswidth limited by $T_{j \text{ max}}$                                 | $I_{CM}$                                | 120 A                   | 104 A                                    |
| Power Dissipation  | $P_D$                                   | 165 W                   | 165 W                                    |
| Thermal resistance, junction to base   | per switch                              | $R_{\theta_{jc}}$ , max | 0.75°C/W                                 |



## Maximum Ratings @ 25°C (unless otherwise specified) - continued

| DESCRIPTION   | SYMBOL         | MM118-06    | MM118-12    |
|---|----------------|-------------|-------------|
| Short Circuit Reverse Current (RBSOA) @ $T_j = 125^\circ\text{C}$ , $V_{CE} = 0.8 \times V_{CES}$ | $I_{max}$      | 64 A        | 66 A        |
| Junction and Storage Temperature Range (°C)   | $T_j, T_{stg}$ | -55 to +150 | -55 to +150 |
| Continuous Source Current (parallel Diode)  | $I_S$          | 60 A        | 50 A        |
| Pulse Source Current (parallel Diode)   | $I_{SM}$       | 100 A       | 100 A       |

## Electrical Parameters, per switch @ 25°C (unless otherwise specified)

| DESCRIPTION  | SYMBOL                                      | CONDITIONS  | PART   | MIN   | TYP.   | MAX  | UNIT          |
|--|---|---|--|---|--|--|---------------|
| Collector-to-Emitter Breakdown Voltage (Gate Shorted to Emitter)           | $BV_{CES}$                                  | $V_{GS} = 0\text{ V}$ , $I_C = 250\ \mu\text{A}$  | MM118-06<br>MM118-12   | 600<br>1200                                   |  |  | V             |
| Gate Threshold Voltage   | $V_{GE(th)}$                                | $V_{CE} = V_{GE}$ , $I_C = 250\ \mu\text{A}$<br>$V_{CE} = V_{GE}$ , $I_C = 2.5\ \text{mA}$<br>$V_{CE} = V_{GE}$ , $I_C = 350\ \mu\text{A}$  | MM118-06F<br>MM118-06L<br>MM118-12   | 2.5<br>4<br>4.5                               | 4<br>5.5   | 5.0<br>7<br>6.5  | V             |
| Gate-to-Emitter Leakage Current  | $I_{GES}$                                   | $V_{GE} = \pm 20V_{DC}$ , $V_{CE} = 0$<br>$T_J = 25^\circ\text{C}$<br>$T_J = 125^\circ\text{C}$   | (ALL)  |   |  | $\pm 100$<br>$\pm 200$                                       | nA            |
| Collector-to-Emitter Leakage Current (Zero Gate Voltage Collector Current) | $I_{CES}$                                   | $V_{CE} = 0.8 \cdot BV_{CES}$<br>$V_{GE} = 0\text{ V}$<br>$T_J = 25^\circ\text{C}$<br>$T_J = 125^\circ\text{C}$   | (ALL)  |   |  | 200<br>1000  | $\mu\text{A}$ |
| Collector-to-Emitter Saturation Voltage (1)                                | $V_{CE(sat)}$                               | $V_{GE} = 15\text{ V}$ , $I_C = 30\text{ A}$<br>$I_C = 60\text{ A}$<br>$I_C = 30\text{ A}$<br>$I_C = 30\text{ A}$<br>$V_{GE} = 15\text{ V}$ , $I_C = 25\text{ A}$<br>$I_C = 50\text{ A}$<br>$I_C = 25\text{ A}$<br>$T_J = 25^\circ\text{C}$<br>$T_J = 25^\circ\text{C}$<br>$T_J = 125^\circ\text{C}$<br>$T_J = 25^\circ\text{C}$<br>$T_J = 25^\circ\text{C}$<br>$T_J = 125^\circ\text{C}$ | MM118-06F<br>MM118-06F<br>MM118-06F<br>MM018-06L<br>MM118-12<br>MM118-12<br>MM118-12                           | 2.2<br>3.5<br>2.2<br>2.2<br>2.7<br>3.4<br>3.3 | 2.2<br>3.5<br>2.2<br>2.5<br>3.2<br>3.4<br>3.9                | 2.9<br>tbd<br>tbd<br>2.5<br>3.2<br>tbd<br>3.9                | V             |
| Forward Transconductance (1)   | $g_{fs}$                                    | $V_{CE} \geq 10\text{ V}$ ; $I_C = 30\text{ A}$<br>$V_{CE} \geq 10\text{ V}$ ; $I_C = 30\text{ A}$  | MM118-06F<br>MM118-06L<br>MM118-12   | 15<br>7<br>8.5                                | 20<br>13<br>20   |  | S             |
| Input Capacitance<br>Output Capacitance<br>Reverse Transfer Capacitance    | $C_{ies}$<br><br>$C_{oes}$<br><br>$C_{res}$ | $V_{GE} = 0\text{ V}$ , $V_{CE} = 25\text{ V}$ , $f = 1\text{ MHz}$   | MM118-06F<br>MM118-06L<br>MM118-12<br>MM118-06F<br>MM118-06L<br>MM118-12<br>MM118-06F<br>MM118-06L<br>MM118-12 |   | 2500<br>2760<br>1650<br>230<br>240<br>250<br>70<br>51<br>110 | tbd<br>tbd<br>2200<br>tbd<br>tbd<br>380<br>tbd<br>tbd<br>160 | pF            |
| <b>INDUCTIVE LOAD, <math>T_j = 25^\circ\text{C}</math> (2,3)</b>           |   |   |  |   |  |  |               |
| Turn-on Delay Time   | $t_{d(on)}$                                 | $V_{GE} = 15\text{ V}$ , $L = 100\ \mu\text{H}$ note 2, 3<br>for MM118-06: $V_{CE} = 480\text{ V}$ ,<br>$I_C = 30\text{ A}$ , $R_G = 4.7\ \Omega$<br>for MM118-12: $V_{CE} = 600\text{ V}$ ,<br>$I_C = 25\text{ A}$ , $R_G = 47\ \Omega$  | MM118-06F<br>MM118-06L<br>MM118-12   | 25<br>60<br>75                                | tbd<br>tbd<br>110  | ns<br>ns<br>ns   |               |
| Rise Time  | $t_{ri}$                                    |   | MM118-06F<br>MM118-06L<br>MM118-12   | 30<br>130<br>65                               | tbd<br>tbd<br>100  | ns<br>ns<br>ns   |               |
| On Energy  | $E_{on}$                                    |   | MM118-12   | 3.6   | -  | mJ   |               |
| Turn-off Delay Time  | $t_{d(off)}$                                |   | MM118-06F<br>MM118-06L<br>MM118-12   | 175<br>400<br>420                             | tbd<br>tbd<br>560  | ns<br>ns<br>ns   |               |
| Fall Time  | $t_{fi}$                                    |   | MM118-06F<br>MM118-06L<br>MM118-12   | 125<br>400<br>45                              | 175<br>tbd<br>60   | ns<br>ns<br>ns   |               |
| Off Energy   | $E_{off}$                                   |   | MM118-06F<br>MM118-06L<br>MM118-12   | 1.3<br>5<br>2.4                               | -<br>-<br>-  | mJ<br>mJ<br>mJ   |               |

|  |                     |   |  |                                  |                                |    |
|--|---------------------|---|--|----------------------------------|--------------------------------|----|
| <b>INDUCTIVE LOAD, T<sub>j</sub> = 125°C (2,3)</b><br>Turn-on Delay Time<br>Rise Time<br>On Energy<br>Turn-off Delay Time<br>Fall Time<br>Off Energy | t <sub>d(on)</sub>  | V <sub>GE</sub> = 15 V, L = 100 μH note 2, 3<br>for MM118-06: V <sub>CE</sub> = 480 V,<br>I <sub>C</sub> = 30 A, R <sub>G</sub> = 4.7 Ω<br>for MM118-12: V <sub>CE</sub> = 600 V,<br>I <sub>C</sub> = 25 A, R <sub>G</sub> = 47 Ω   | MM118-06F  | 25                               | tbd                            | ns |
|  |                     |   | MM118-06L  | 60                               | tbd                            | ns |
|  |                     |   | MM118-12   | 95                               | tbd                            | ns |
|  | t <sub>ri</sub>     |   | MM118-06F  | 35                               | tbd                            | ns |
|  |                     |   | MM118-06L  | 130                              | tbd                            | ns |
|  |                     |   | MM118-12   | 90                               | tbd                            | ns |
|  | E <sub>on</sub>     |   | MM118-06F  | 1                                | -                              | mJ |
|  |                     |   | MM118-06L  | 4.2                              | -                              | mJ |
|  |                     |   | MM118-12   | 10                               | -                              | mJ |
|  | t <sub>d(off)</sub> |   | MM118-06F  | 250                              | tbd                            | ns |
|  | MM118-06L           | 540   | 1000   | ns                               |                                |    |
|  | MM118-12            | 420   | tbd  | ns                               |                                |    |
| t <sub>fi</sub>  | MM118-06F           | 260   | tbd  | ns                               |                                |    |
|  | MM118-06L           | 600   | 1500   | ns                               |                                |    |
|  | MM118-12            | 45  | tbd  | ns                               |                                |    |
| E <sub>off</sub>   | MM118-06F           | 4   | -  | mJ                               |                                |    |
|  | MM118-06L           | 12  | -  | mJ                               |                                |    |
|  | MM118-12            | 4.2   | -  | mJ                               |                                |    |
| Total Gate Charge  | Q <sub>g</sub>      | V <sub>GE</sub> = 15 V,<br>for MM118-06: V <sub>CE</sub> = 300V, I <sub>C</sub> = 30 A<br>for MM118-12: V <sub>CE</sub> = 600 V, I <sub>C</sub> = 25 A  | MM118-06F  | 125                              | 150                            | nC |
| Gate-to-Emitter Charge   | Q <sub>ge</sub>     |   | MM118-06L  | 110                              | 150                            |    |
|  |                     |   | MM118-12   | 160                              | tbd                            |    |
| Gate-to-Collector (Miller) Charge  | Q <sub>gc</sub>     |   | MM118-06F  | 23                               | 35                             |    |
|  |                     |   | MM118-06L  | 34                               | 45                             |    |
|  |                     | MM118-12  | 20   | tbd                              |                                |    |
|  |                     | MM118-06F   | 50   | 75                               |                                |    |
|  |                     | MM118-06L   | 47   | 63                               |                                |    |
|  |                     | MM118-12  | 75   | tbd                              |                                |    |
| Antiparallel diode forward voltage (1)   | V <sub>F</sub>      | I <sub>E</sub> = 15 A T <sub>J</sub> = 25 °C<br>I <sub>E</sub> = 30 A T <sub>J</sub> = 25 °C<br>I <sub>E</sub> = 50 A T <sub>J</sub> = 25 °C<br>I <sub>E</sub> = 15 A T <sub>J</sub> = 150 °C<br>I <sub>E</sub> = 10 A T <sub>J</sub> = 25 °C<br>I <sub>E</sub> = 10 A T <sub>J</sub> = 100 °C                                | MM118-06<br>MM118-06<br>MM118-06<br>MM118-06<br>MM118-12<br>MM118-12 | -<br>1.7<br>1.9<br>-<br>2.4<br>2 | 1.5<br>-<br>-<br>1.3<br>3<br>- | V  |
| Antiparallel diode reverse recovery time   | t <sub>rr</sub>     | I <sub>E</sub> = 10 A, dI <sub>E</sub> /dt = 100 A/us, T <sub>J</sub> = 25°C<br>I <sub>E</sub> = 30 A, dI <sub>E</sub> /dt = 100 A/us, T <sub>J</sub> = 25°C<br>I <sub>E</sub> = 10 A, dI <sub>E</sub> /dt = 100 A/us, T <sub>J</sub> = 25°C<br>I <sub>E</sub> = 10 A, dI <sub>E</sub> /dt = 100 A/us, T <sub>J</sub> = 125°C | MM118-06<br>MM118-06<br>MM118-12<br>MM118-12                         | -<br>140<br>-<br>60              | 100<br>-<br>tbd<br>-           | ns |
| Antiparallel diode reverse recovery charge   | Q <sub>rr</sub>     | I <sub>E</sub> = 10 A, dI <sub>E</sub> /dt = 100 A/us, T <sub>J</sub> = 25°C<br>I <sub>E</sub> = 30 A, dI <sub>E</sub> /dt = 100 A/us, T <sub>J</sub> = 25°C<br>I <sub>E</sub> = 10 A, dI <sub>E</sub> /dt = 100 A/us, T <sub>J</sub> = 25°C<br>I <sub>E</sub> = 10 A, dI <sub>E</sub> /dt = 100 A/us, T <sub>J</sub> = 125°C | MM118-06<br>MM118-06<br>MM118-12<br>MM118-12                         | 160<br>320<br>tbd<br>800         |                                | nC |
| Antiparallel diode peak recovery current   | I <sub>RM</sub>     | I <sub>E</sub> = 10 A, dI <sub>E</sub> /dt = 100 A/us, T <sub>J</sub> = 25°C<br>I <sub>E</sub> = 30 A, dI <sub>E</sub> /dt = 100 A/us, T <sub>J</sub> = 25°C<br>I <sub>E</sub> = 10 A, dI <sub>E</sub> /dt = 100 A/us, T <sub>J</sub> = 25°C<br>I <sub>E</sub> = 10 A, dI <sub>E</sub> /dt = 100 A/us, T <sub>J</sub> = 125°C | MM118-06<br>MM118-06<br>MM118-12<br>MM118-12                         | 3<br>4.2<br>tbd<br>22            |                                | A  |

### Notes

- (1) Pulse test, t ≤ 300 ns, duty cycle ≤ 2%
- (2) switching times and losses may increase for larger V<sub>CE</sub> and/or R<sub>G</sub> values or higher junction temperatures.
- (3) switching losses include "tail" losses
- (4) Microsemi does not manufacture the igbt die; contact Microsemi for details.