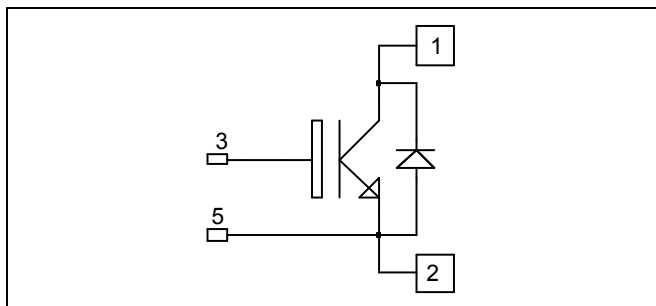


**Single switch  
Trench + Field Stop IGBT3  
Power Module**

**$V_{CES} = 1200V$   
 $I_C = 600A @ T_c = 80^\circ C$**

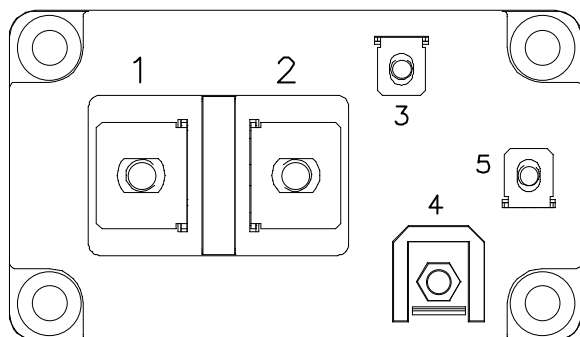


## Application

- Welding converters
- Switched Mode Power Supplies
- Uninterruptible Power Supplies
- Motor control

## Features

- Trench + Field Stop IGBT3 Technology
  - Low voltage drop
  - Low tail current
  - Switching frequency up to 20 kHz
  - Soft recovery parallel diodes
  - Low diode VF
  - Low leakage current
  - RBSOA and SCSOA rated
- Kelvin emitter for easy drive
- M6 connectors for power
- M4 connectors for signal
- High level of integration



## Benefits

- Stable temperature behavior
- Very rugged
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Easy paralleling due to positive  $T_C$  of  $V_{CEsat}$
- RoHS Compliant

## Absolute maximum ratings

| Symbol    | Parameter                             | Max ratings         | Unit        |
|-----------|---------------------------------------|---------------------|-------------|
| $V_{CES}$ | Collector - Emitter Breakdown Voltage | 1200                | V           |
| $I_C$     | Continuous Collector Current          | $T_C = 25^\circ C$  | A           |
|           |                                       | $T_C = 80^\circ C$  |             |
| $I_{CM}$  | Pulsed Collector Current              | $T_C = 25^\circ C$  | 1200        |
| $V_{GE}$  | Gate - Emitter Voltage                | $\pm 20$            | V           |
| $P_D$     | Maximum Power Dissipation             | $T_C = 25^\circ C$  | 2500        |
| RBSOA     | Reverse Bias Safe Operating Area      | $T_j = 125^\circ C$ | 1200A@1050V |

**CAUTION:** These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed.  
See application note APT0502 on [www.microsemi.com](http://www.microsemi.com)

**All ratings @  $T_j = 25^\circ\text{C}$  unless otherwise specified**

**Electrical Characteristics**

| Symbol        | Characteristic                       | Test Conditions                                       | Min | Typ        | Max | Unit |
|---------------|--------------------------------------|-------------------------------------------------------|-----|------------|-----|------|
| $I_{CES}$     | Zero Gate Voltage Collector Current  | $V_{GE} = 0V, V_{CE} = 1200V$                         |     |            | 5   | mA   |
| $V_{CE(sat)}$ | Collector Emitter saturation Voltage | $V_{GE} = 15V$<br>$I_C = 600A$                        |     | 1.7<br>2.0 | 2.1 | V    |
|               |                                      | $T_j = 25^\circ\text{C}$<br>$T_j = 125^\circ\text{C}$ |     |            |     |      |
| $V_{GE(th)}$  | Gate Threshold Voltage               | $V_{GE} = V_{CE}, I_C = 24mA$                         | 5.0 | 5.8        | 6.5 | V    |
| $I_{GES}$     | Gate – Emitter Leakage Current       | $V_{GE} = 20V, V_{CE} = 0V$                           |     |            | 400 | nA   |

**Dynamic Characteristics**

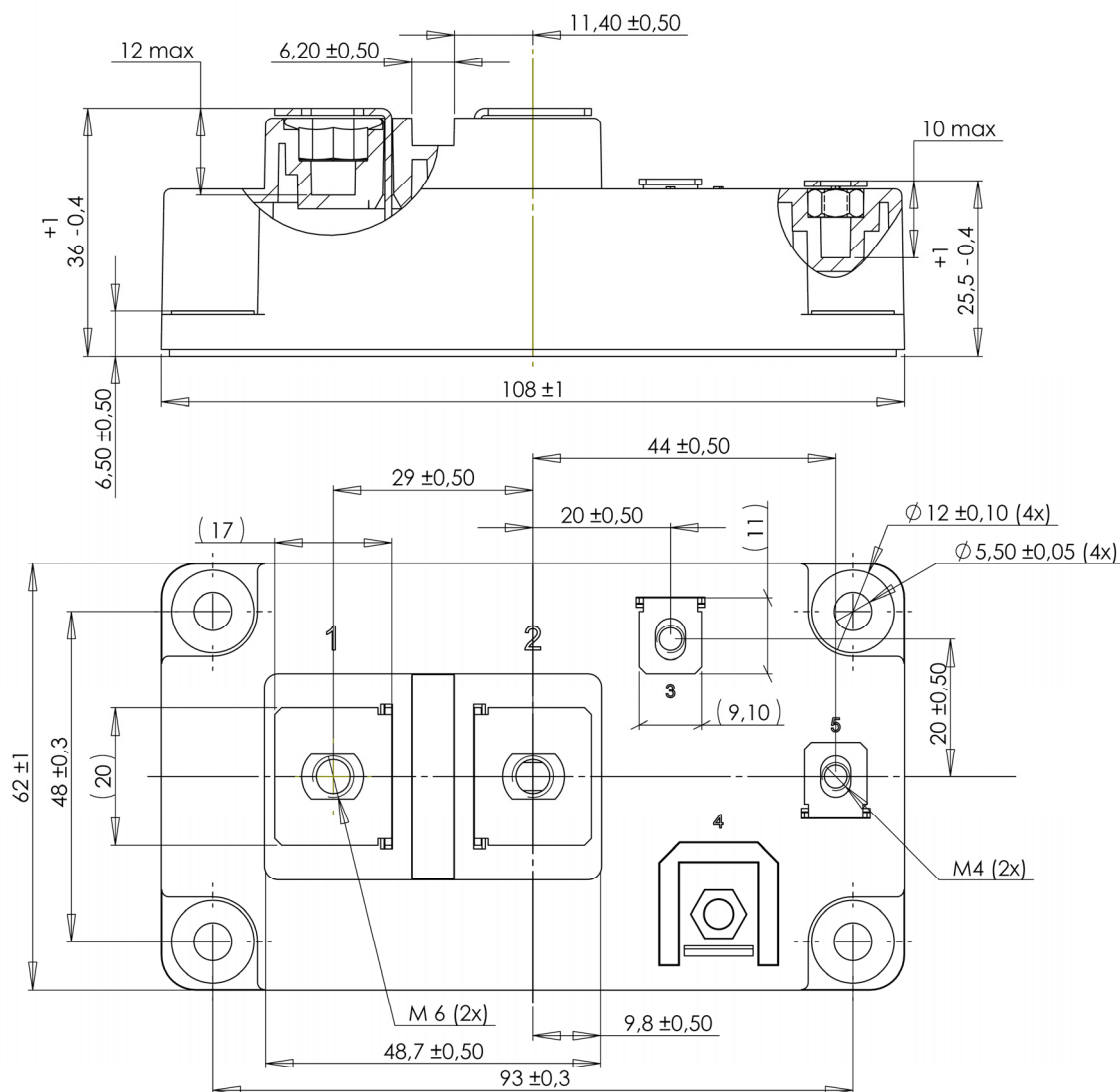
| Symbol       | Characteristic               | Test Conditions                                                                                                            | Min                       | Typ  | Max | Unit    |
|--------------|------------------------------|----------------------------------------------------------------------------------------------------------------------------|---------------------------|------|-----|---------|
| $C_{ies}$    | Input Capacitance            | $V_{GE} = 0V$                                                                                                              |                           | 43   |     | nF      |
| $C_{oes}$    | Output Capacitance           | $V_{CE} = 25V$                                                                                                             |                           | 2.25 |     |         |
| $C_{res}$    | Reverse Transfer Capacitance | $f = 1MHz$                                                                                                                 |                           | 2    |     |         |
| $Q_G$        | Gate charge                  | $V_{GE} = \pm 15V, I_C = 600A$<br>$V_{CE} = 600V$                                                                          |                           | 5.6  |     | $\mu C$ |
| $T_{d(on)}$  | Turn-on Delay Time           | Inductive Switching ( $25^\circ\text{C}$ )<br>$V_{GE} = \pm 15V$<br>$V_{Bus} = 600V$<br>$I_C = 600A$<br>$R_G = 1.2\Omega$  |                           | 280  |     | ns      |
| $T_r$        | Rise Time                    |                                                                                                                            |                           | 90   |     |         |
| $T_{d(off)}$ | Turn-off Delay Time          |                                                                                                                            |                           | 550  |     |         |
| $T_f$        | Fall Time                    |                                                                                                                            |                           | 130  |     |         |
| $T_{d(on)}$  | Turn-on Delay Time           | Inductive Switching ( $125^\circ\text{C}$ )<br>$V_{GE} = \pm 15V$<br>$V_{Bus} = 600V$<br>$I_C = 600A$<br>$R_G = 1.2\Omega$ |                           | 300  |     | ns      |
| $T_r$        | Rise Time                    |                                                                                                                            |                           | 100  |     |         |
| $T_{d(off)}$ | Turn-off Delay Time          |                                                                                                                            |                           | 650  |     |         |
| $T_f$        | Fall Time                    |                                                                                                                            |                           | 180  |     |         |
| $E_{on}$     | Turn on Energy               | $V_{GE} = \pm 15V$<br>$V_{Bus} = 600V$<br>$I_C = 600A$<br>$R_G = 1.2\Omega$                                                | $T_j = 125^\circ\text{C}$ | 50   |     | mJ      |
| $E_{off}$    | Turn off Energy              |                                                                                                                            | $T_j = 125^\circ\text{C}$ | 88   |     |         |
| $I_{sc}$     | Short Circuit data           | $V_{GE} \leq 15V; V_{Bus} = 900V$<br>$t_b \leq 10\mu s; T_j = 125^\circ\text{C}$                                           |                           | 2400 |     | A       |

**Reverse diode ratings and characteristics**

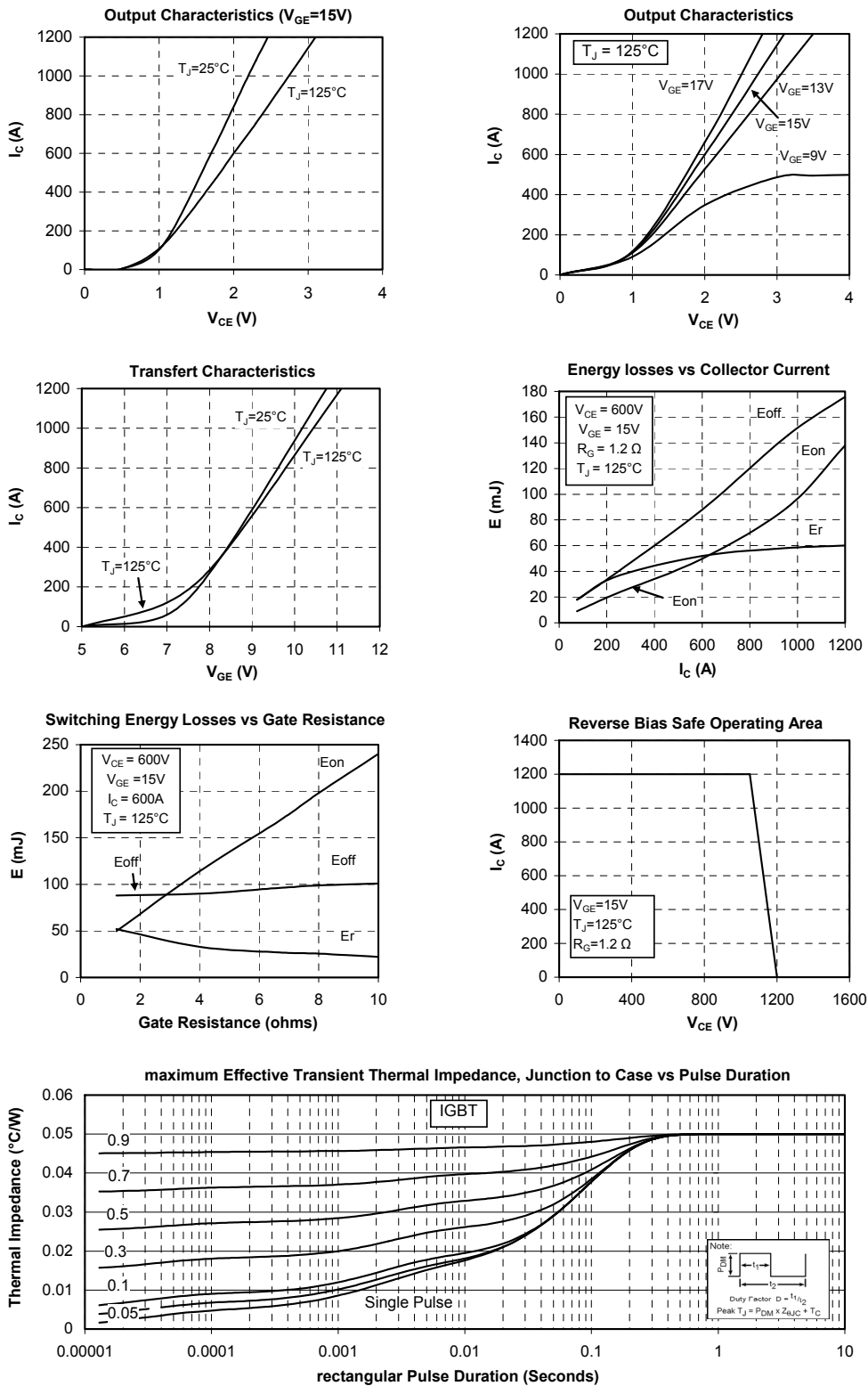
| Symbol    | Characteristic                          | Test Conditions                                       | Min                                                   | Typ        | Max         | Unit    |
|-----------|-----------------------------------------|-------------------------------------------------------|-------------------------------------------------------|------------|-------------|---------|
| $V_{RRM}$ | Maximum Peak Repetitive Reverse Voltage |                                                       | 1200                                                  |            |             | V       |
| $I_{RRM}$ | Maximum Reverse Leakage Current         | $V_R = 1200V$                                         |                                                       |            | 750<br>1000 | $\mu A$ |
|           |                                         | $T_j = 25^\circ\text{C}$<br>$T_j = 125^\circ\text{C}$ |                                                       |            |             |         |
| $I_F$     | DC Forward Current                      | $T_c = 80^\circ\text{C}$                              |                                                       | 600        |             | A       |
| $V_F$     | Diode Forward Voltage                   | $I_F = 600A$<br>$V_{GE} = 0V$                         | $T_j = 25^\circ\text{C}$<br>$T_j = 125^\circ\text{C}$ | 1.6<br>1.6 | 2.1         | V       |
| $t_{rr}$  | Reverse Recovery Time                   | $I_F = 600A$<br>$V_R = 600V$<br>$di/dt = 7000A/\mu s$ | $T_j = 25^\circ\text{C}$<br>$T_j = 125^\circ\text{C}$ | 250<br>350 |             | ns      |
| $Q_{rr}$  | Reverse Recovery Charge                 |                                                       | $T_j = 25^\circ\text{C}$<br>$T_j = 125^\circ\text{C}$ | 60<br>115  |             | $\mu C$ |
| $E_{rr}$  | Reverse Recovery Energy                 |                                                       | $T_j = 25^\circ\text{C}$<br>$T_j = 125^\circ\text{C}$ | 28<br>52   |             | mJ      |

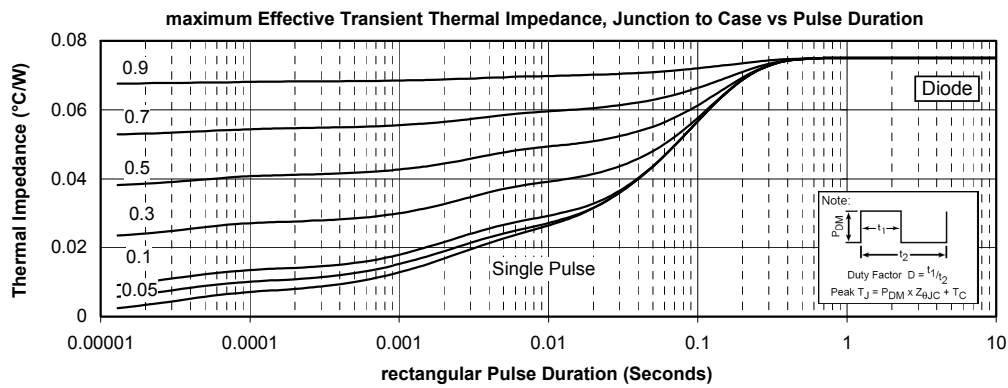
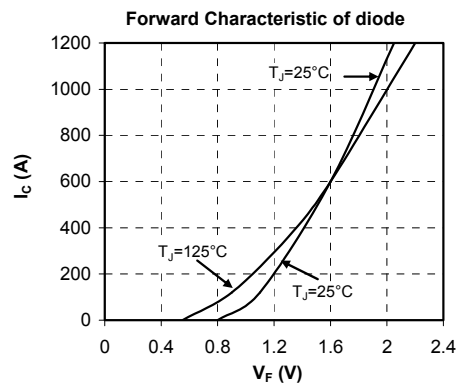
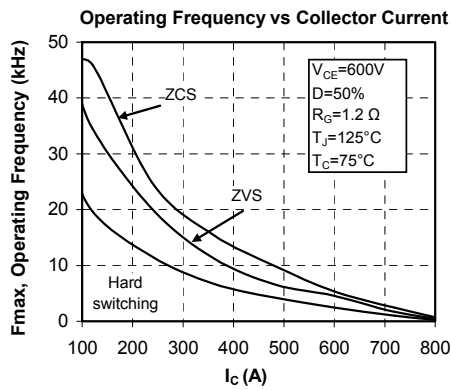
**Thermal and package characteristics**

| Symbol            | Characteristic                                               |       | Min  | Typ | Max   | Unit |
|-------------------|--------------------------------------------------------------|-------|------|-----|-------|------|
| R <sub>thJC</sub> | Junction to Case Thermal Resistance                          | IGBT  |      |     | 0.05  | °C/W |
|                   |                                                              | Diode |      |     | 0.075 |      |
| V <sub>ISOL</sub> | RMS Isolation Voltage, any terminal to case t=1 min, 50/60Hz |       | 4000 |     |       | V    |
| T <sub>J</sub>    | Operating junction temperature range                         |       | -40  |     | 150   | °C   |
| T <sub>STG</sub>  | Storage Temperature Range                                    |       | -40  |     | 125   |      |
| T <sub>C</sub>    | Operating Case Temperature                                   |       | -40  |     | 125   |      |
| Torque            | Mounting torque                                              | M6    | 3    |     | 5     | N.m  |
|                   |                                                              | M4    | 1    |     | 2     |      |
| Wt                | Package Weight                                               |       |      |     | 350   | g    |

**D4 Package outline (dimensions in mm)**


## Typical Performance Curve





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