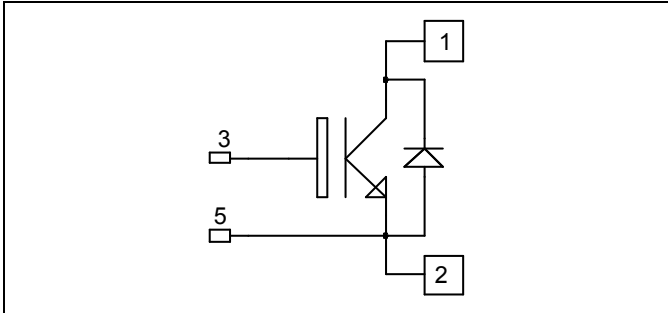


**Single switch  
Trench + Field Stop IGBT  
Power Module**

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



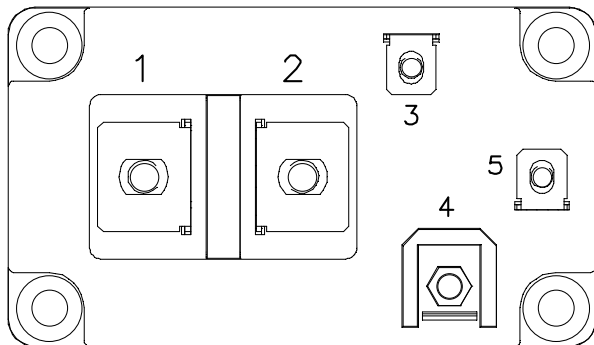
### Application

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

### Features

- Trench + Field Stop IGBT 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 | 600                 | V          |
| $I_C$     | Continuous Collector Current          | $T_c = 25^\circ C$  | 760        |
|           |                                       | $T_c = 80^\circ C$  | 580        |
| $I_{CM}$  | Pulsed Collector Current              | $T_c = 25^\circ C$  | 800        |
| $V_{GE}$  | Gate - Emitter Voltage                | $\pm 20$            | V          |
| $P_D$     | Maximum Power Dissipation             | $T_c = 25^\circ C$  | 1600       |
| RBSOA     | Reverse Bias Safe Operating Area      | $T_j = 125^\circ C$ | 1200A@550V |

**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  | $V_{GE} = 0\text{V}, V_{CE} = 600\text{V}$   |                           |     | 1    | mA   |
| $V_{CE(sat)}$ | Collector Emitter saturation Voltage | $V_{GE} = 15\text{V}$<br>$I_C = 600\text{A}$ | $T_j = 25^\circ\text{C}$  | 1.5 | 1.9  | V    |
|               |                                      |  | $T_j = 125^\circ\text{C}$ | 1.7 |      |      |
| $V_{GE(th)}$  | Gate Threshold Voltage               | $V_{GE} = V_{CE}, I_C = 10\text{mA}$         | 5.0                       | 5.8 | 6.5  | V    |
| $I_{GES}$     | Gate – Emitter Leakage Current       | $V_{GE} = 20\text{V}, V_{CE} = 0\text{V}$    |                           |     | 2400 | nA   |

**Dynamic Characteristics**

| Symbol       | Characteristic               | Test Conditions   | Min                       | Typ  | Max | Unit          |
|--------------|------------------------------|---|---------------------------|------|-----|---------------|
| $C_{ies}$    | Input Capacitance            | $V_{GE} = 0\text{V}$  |                           | 37   |     | nF            |
| $C_{oes}$    | Output Capacitance           | $V_{CE} = 25\text{V}$   |                           | 2.3  |     |               |
| $C_{res}$    | Reverse Transfer Capacitance | $f = 1\text{MHz}$   |                           | 1.1  |     |               |
| $Q_G$        | Gate charge                  | $V_{GE} = -8/+15\text{V}, I_C = 600\text{A}$<br>$V_{CE} = 300\text{V}$  |                           | 4.4  |     | $\mu\text{C}$ |
| $T_{d(on)}$  | Turn-on Delay Time           | Inductive Switching ( $25^\circ\text{C}$ )<br>$V_{GE} = \pm 15\text{V}$<br>$V_{Bus} = 300\text{V}$<br>$I_C = 600\text{A}$<br>$R_G = 1.5\Omega$  |                           | 250  |     | ns            |
| $T_r$        | Rise Time                    |   |                           | 70   |     |               |
| $T_{d(off)}$ | Turn-off Delay Time          |   |                           | 550  |     |               |
| $T_f$        | Fall Time                    |   |                           | 70   |     |               |
| $T_{d(on)}$  | Turn-on Delay Time           | Inductive Switching ( $150^\circ\text{C}$ )<br>$V_{GE} = \pm 15\text{V}$<br>$V_{Bus} = 300\text{V}$<br>$I_C = 600\text{A}$<br>$R_G = 1.5\Omega$ |                           | 270  |     | ns            |
| $T_r$        | Rise Time                    |   |                           | 80   |     |               |
| $T_{d(off)}$ | Turn-off Delay Time          |   |                           | 650  |     |               |
| $T_f$        | Fall Time                    |   |                           | 80   |     |               |
| $E_{on}$     | Turn on Energy               | $V_{GE} = \pm 15\text{V}$<br>$V_{Bus} = 300\text{V}$  | $T_j = 150^\circ\text{C}$ | 7.5  |     | mJ            |
| $E_{off}$    | Turn off Energy              | $I_C = 600\text{A}$<br>$R_G = 1.5\Omega$  | $T_j = 150^\circ\text{C}$ | 30   |     |               |
| $I_{sc}$     | Short Circuit data           | $V_{GE} \leq 15\text{V}; V_{Bus} = 360\text{V}$<br>$t_p = 6\mu\text{s}; T_j = 150^\circ\text{C}$  |                           | 3000 |     | A             |

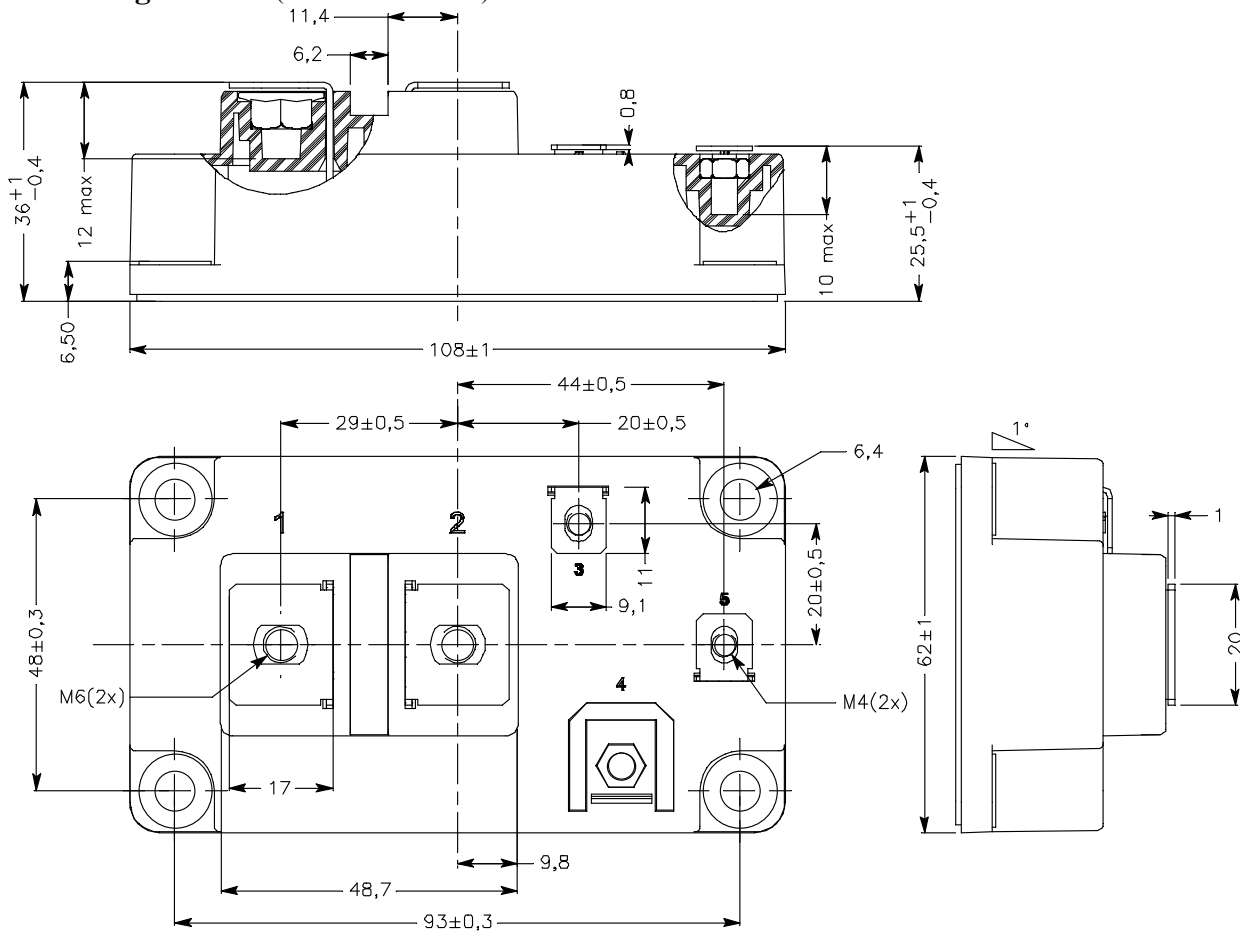
**Reverse diode ratings and characteristics**

| Symbol    | Characteristic                          | Test Conditions  | Min                       | Typ | Max  | Unit          |
|-----------|---|--|---------------------------|-----|------|---------------|
| $V_{RRM}$ | Maximum Peak Repetitive Reverse Voltage |  | 600                       |     |      | V             |
| $I_{RRM}$ | Maximum Reverse Leakage Current         | $V_R = 600\text{V}$  | $T_j = 25^\circ\text{C}$  |     | 750  | $\mu\text{A}$ |
|           |   |  | $T_j = 150^\circ\text{C}$ |     | 1000 |               |
| $I_F$     | DC Forward Current                      |  | $T_c = 80^\circ\text{C}$  | 600 |      | A             |
| $V_F$     | Diode Forward Voltage                   | $I_F = 600\text{A}$<br>$V_{GE} = 0\text{V}$                                      | $T_j = 25^\circ\text{C}$  | 1.6 | 2.1  | V             |
|           |   |  | $T_j = 150^\circ\text{C}$ | 1.5 |      |               |
| $t_{rr}$  | Reverse Recovery Time                   | $I_F = 600\text{A}$<br>$V_R = 300\text{V}$<br>$di/dt = 8600\text{A}/\mu\text{s}$ | $T_j = 25^\circ\text{C}$  | 150 |      | ns            |
|           |   |  | $T_j = 150^\circ\text{C}$ | 250 |      |               |
| $Q_{rr}$  | Reverse Recovery Charge                 |  | $T_j = 25^\circ\text{C}$  | 27  |      | $\mu\text{C}$ |
|           |   |  | $T_j = 150^\circ\text{C}$ | 60  |      |               |
| $E_{rr}$  | Reverse Recovery Energy                 | $T_j = 25^\circ\text{C}$   | 6.4                       |     | mJ   |               |
|           |   | $T_j = 150^\circ\text{C}$  | 14                        |     |      |               |

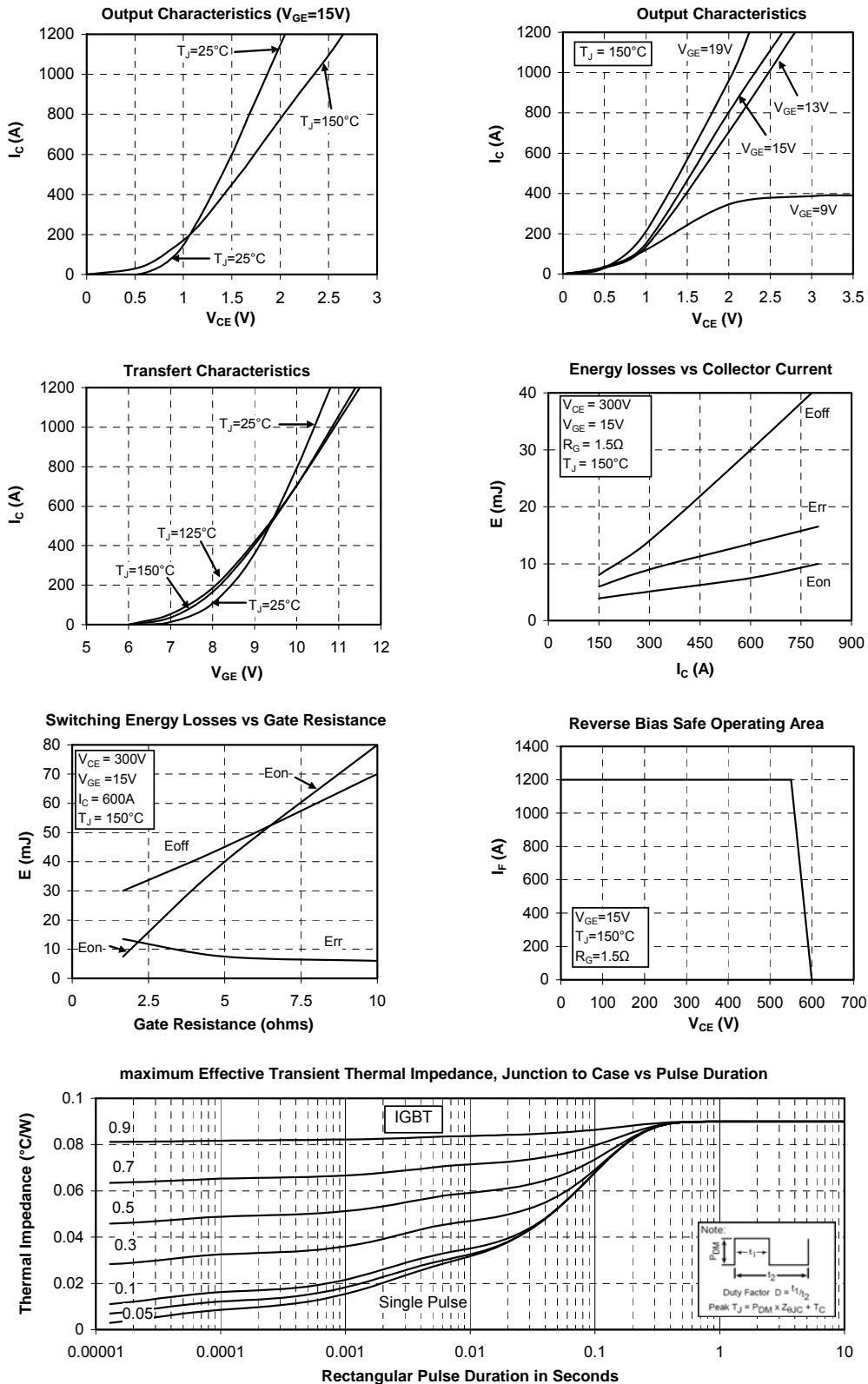
## Thermal and package characteristics

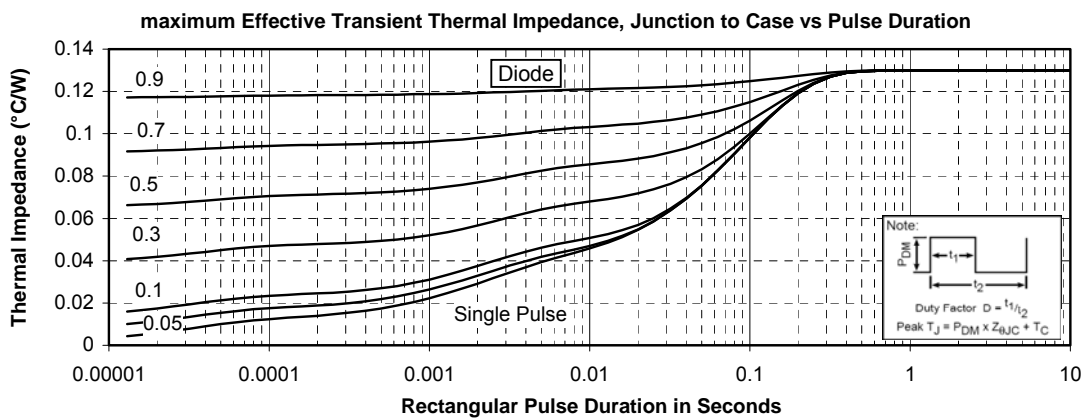
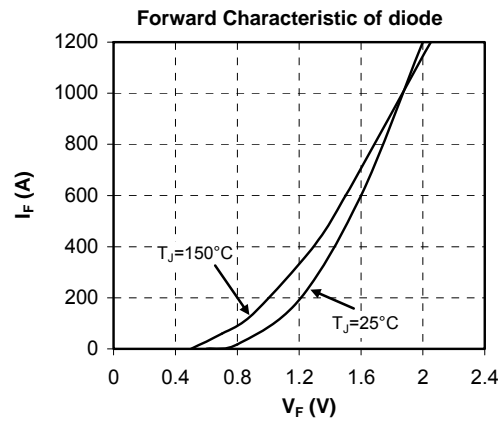
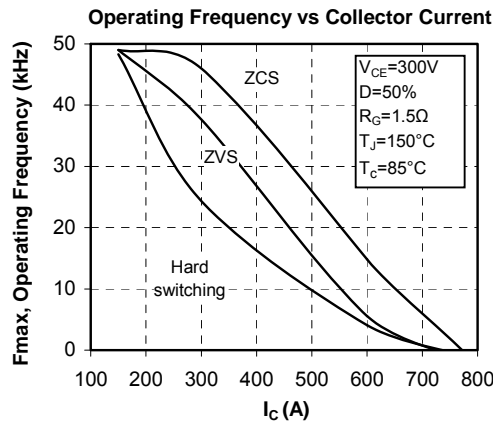
| Symbol     | Characteristic  | Min   | Typ | Max  | Unit |
|------------|---|-------|-----|------|------|
| $R_{thJC}$ | Junction to Case Thermal Resistance   | IGBT  |     | 0.09 | °C/W |
|            |   | Diode |     | 0.13 |      |
| $V_{ISOL}$ | RMS Isolation Voltage, any terminal to case $t=1$ min, $I_{isol}<1$ mA, 50/60Hz | 2500  |     |      | V    |
| $T_J$      | Operating junction temperature range  | -40   |     | 175  | °C   |
| $T_{STG}$  | Storage Temperature Range   | -40   |     | 125  |      |
| $T_C$      | 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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