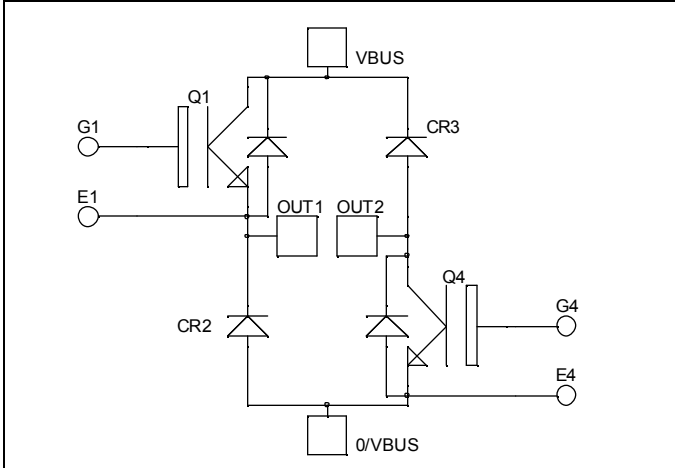


**Asymmetrical - Bridge  
Fast Trench + Field Stop IGBT®  
Power Module**

**$V_{CES} = 1200V$   
 $I_C = 200A @ T_c = 80^\circ C$**

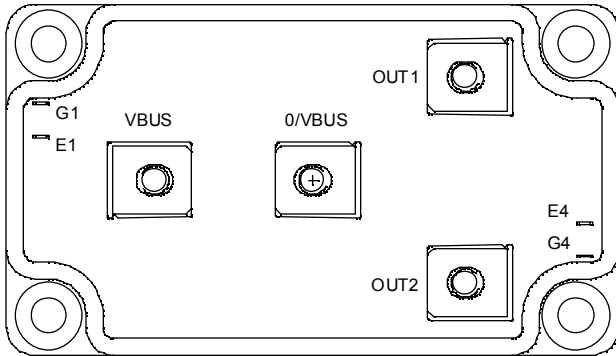


### Application

- Welding converters
- Switched Mode Power Supplies
- Switched Reluctance Motor Drives

### Features

- Fast 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
  - Avalanche energy rated
  - RBSOA and SCSOA rated
- Kelvin emitter for easy drive
- Very low stray inductance
  - Symmetrical design
  - M5 power connectors
- 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 TC of VCEsat
- Low profile
- RoHS Compliant

### Absolute maximum ratings

| Symbol    | Parameter                             | Max ratings         | Unit         |
|-----------|---------------------------------------|---------------------|--------------|
| $V_{CES}$ | Collector - Emitter Breakdown Voltage | 1200                | V            |
| $I_C$     | Continuous Collector Current          | $T_c = 25^\circ C$  | 280          |
|           |                                       | $T_c = 80^\circ C$  | 200          |
| $I_{CM}$  | Pulsed Collector Current              | $T_c = 25^\circ C$  | 400          |
| $V_{GE}$  | Gate - Emitter Voltage                | $\pm 20$            | V            |
| $P_D$     | Maximum Power Dissipation             | $T_c = 25^\circ C$  | 890          |
| RBSOA     | Reverse Bias Safe Operating Area      | $T_j = 125^\circ C$ | 400A @ 1100V |

**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  | $V_{GE} = 0\text{V}, V_{CE} = 1200\text{V}$  |                                 |                                 | 350                             | $\mu\text{A}$ |
| $V_{CE(sat)}$ | Collector Emitter Saturation Voltage | $V_{GE} = 15\text{V}$<br>$I_C = 200\text{A}$ | $T_j = 25^\circ\text{C}$<br>1.4 | $T_j = 25^\circ\text{C}$<br>1.7 | $T_j = 25^\circ\text{C}$<br>2.1 | V             |
|               |                                      |  | $T_j = 125^\circ\text{C}$       | 2.0                             |                                 |               |
| $V_{GE(th)}$  | Gate Threshold Voltage               | $V_{GE} = V_{CE}, I_C = 3\text{mA}$          | 5.0                             | 5.8                             | 6.5                             | V             |
| $I_{GES}$     | Gate – Emitter Leakage Current       | $V_{GE} = 20\text{V}, V_{CE} = 0\text{V}$    |                                 |                                 | 500                             | nA            |

## Dynamic Characteristics

| Symbol       | Characteristic               | Test Conditions   | Min                       | Typ | Max | Unit |
|--------------|------------------------------|---|---------------------------|-----|-----|------|
| $C_{ies}$    | Input Capacitance            | $V_{GE} = 0\text{V}$  |                           | 14  |     | nF   |
| $C_{oes}$    | Output Capacitance           | $V_{CE} = 25\text{V}$   |                           | 0.8 |     |      |
| $C_{res}$    | Reverse Transfer Capacitance | $f = 1\text{MHz}$   |                           | 0.6 |     |      |
| $T_{d(on)}$  | Turn-on Delay Time           | Inductive Switching ( $25^\circ\text{C}$ )<br>$V_{GE} = \pm 15\text{V}$<br>$V_{Bus} = 600\text{V}$<br>$I_C = 200\text{A}$<br>$R_G = 2.7\Omega$  |                           | 260 |     | ns   |
| $T_r$        | Rise Time                    |   |                           | 30  |     |      |
| $T_{d(off)}$ | Turn-off Delay Time          |   |                           | 420 |     |      |
| $T_f$        | Fall Time                    |   |                           | 70  |     |      |
| $T_{d(on)}$  | Turn-on Delay Time           | Inductive Switching ( $125^\circ\text{C}$ )<br>$V_{GE} = \pm 15\text{V}$<br>$V_{Bus} = 600\text{V}$<br>$I_C = 200\text{A}$<br>$R_G = 2.7\Omega$ |                           | 290 |     | ns   |
| $T_r$        | Rise Time                    |   |                           | 50  |     |      |
| $T_{d(off)}$ | Turn-off Delay Time          |   |                           | 520 |     |      |
| $T_f$        | Fall Time                    |   |                           | 90  |     |      |
| $E_{on}$     | Turn on Energy               | $V_{GE} = \pm 15\text{V}$<br>$V_{Bus} = 600\text{V}$  | $T_j = 125^\circ\text{C}$ | 20  |     | mJ   |
| $E_{off}$    | Turn off Energy              | $I_C = 200\text{A}$<br>$R_G = 2.7\Omega$  | $T_j = 125^\circ\text{C}$ | 20  |     |      |

## Reverse diode ratings and characteristics

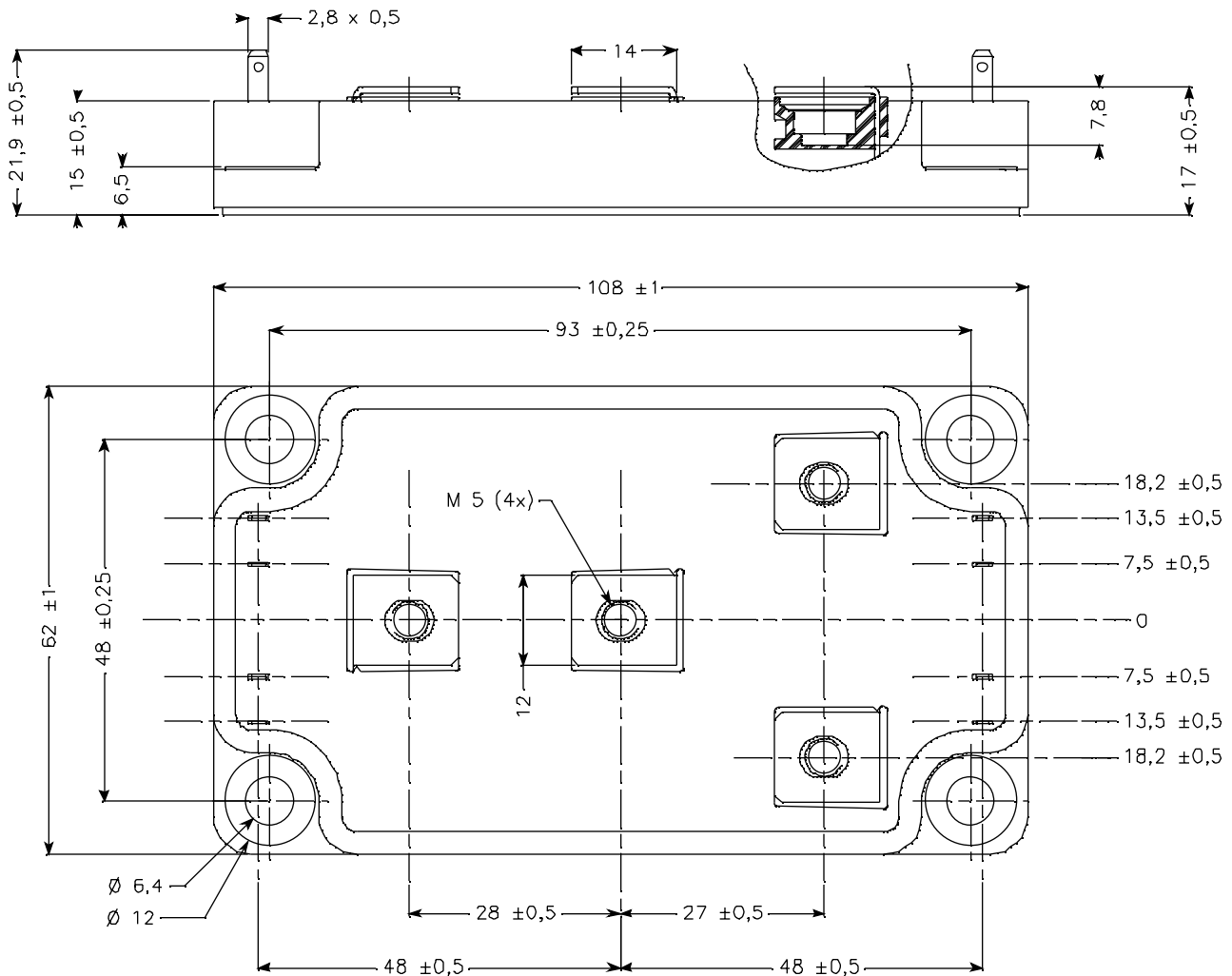
| Symbol    | Characteristic                          | Test Conditions  | Min  | Typ   | Max   | Unit          |               |
|-----------|---|--|------|---|---|---------------|---------------|
| $V_{RRM}$ | Maximum Peak Repetitive Reverse Voltage |  | 1200 |   |   | V             |               |
| $I_{RM}$  | Maximum Reverse Leakage Current         | $V_R = 1200\text{V}$   |      |   | $T_j = 25^\circ\text{C}$<br>350<br>$T_j = 125^\circ\text{C}$<br>600 | $\mu\text{A}$ |               |
| $I_F$     | DC Forward Current                      |  |      | 200   |   | A             |               |
| $V_F$     | Diode Forward Voltage                   | $I_F = 200\text{A}$<br>$V_{GE} = 0\text{V}$                                      |      | $T_j = 25^\circ\text{C}$<br>1.6<br>$T_j = 125^\circ\text{C}$<br>1.6 | 2.1   | V             |               |
| $t_{rr}$  | Reverse Recovery Time                   | $I_F = 200\text{A}$<br>$V_R = 600\text{V}$<br>$di/dt = 2500\text{A}/\mu\text{s}$ |      | $T_j = 25^\circ\text{C}$<br>170<br>$T_j = 125^\circ\text{C}$<br>280 |   | ns            |               |
| $Q_{rr}$  | Reverse Recovery Charge                 |  |      | $T_j = 25^\circ\text{C}$<br>18<br>$T_j = 125^\circ\text{C}$<br>36   |   |               | $\mu\text{C}$ |
| $E_r$     | Reverse Recovery Energy                 |  |      | $T_j = 25^\circ\text{C}$<br>10<br>$T_j = 125^\circ\text{C}$<br>18   |   | mJ            |               |
|           |   |  |      |   |   |               |               |
|           |   |  |      |   |   |               |               |

## Thermal and package characteristics

*Symbol Characteristic*

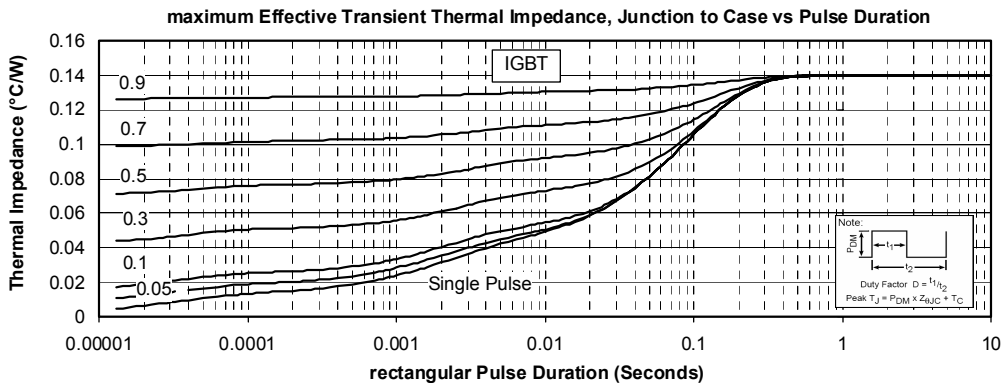
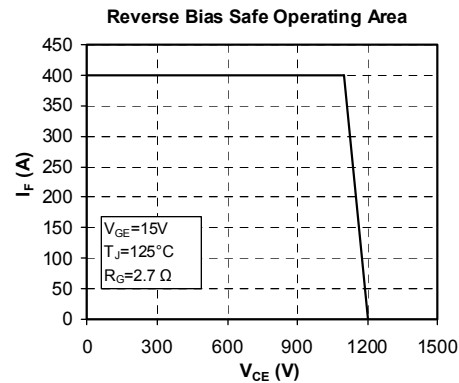
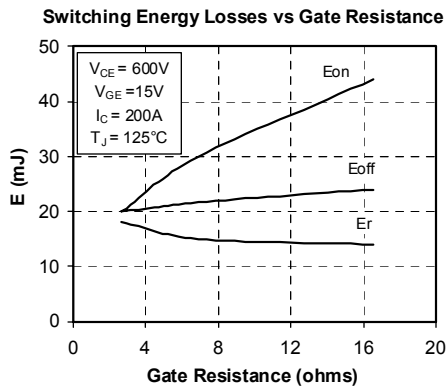
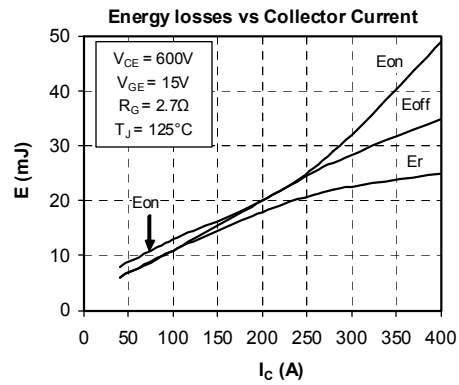
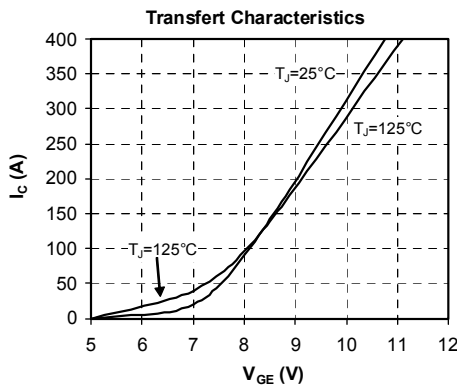
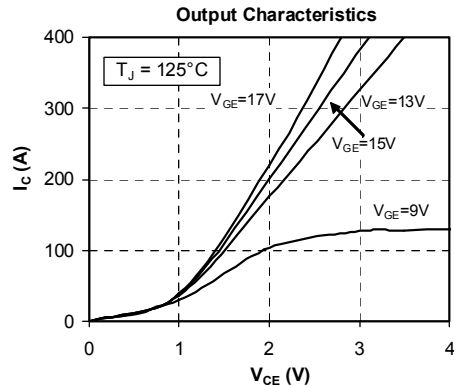
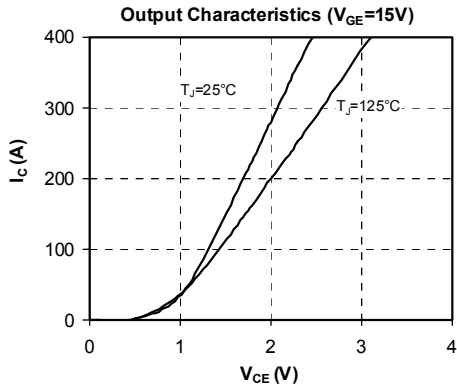
|                   |   | <i>Min</i>    | <i>Typ</i> | <i>Max</i> | <i>Unit</i> |     |
|-------------------|---|---------------|------------|------------|-------------|-----|
| R <sub>thJC</sub> | Junction to Case Thermal Resistance   | IGBT          |            | 0.14       | °C/W        |     |
|                   |   | Diode         |            | 0.25       |             |     |
| V <sub>ISOL</sub> | RMS Isolation Voltage, any terminal to case t = 1 min, I <sub>isol</sub> < 1mA, 50/60Hz | 2500          |            |            | 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           |            | 100        |             |     |
| Torque            | Mounting torque   | To heatsink   | M6         | 3          | 5           | N.m |
|                   |   | For terminals | M5         | 2          | 3.5         |     |
| Wt                | Package Weight  |               |            | 280        | g           |     |

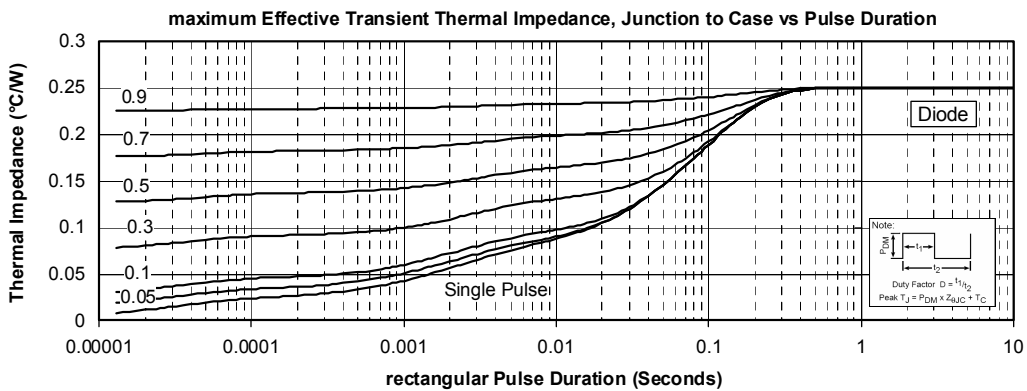
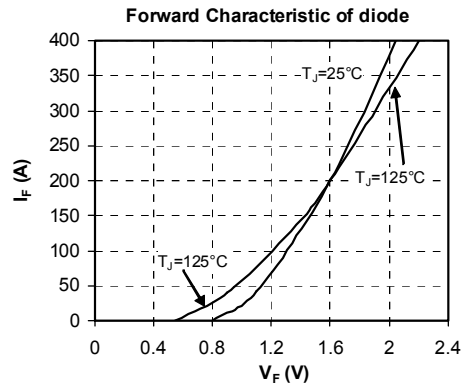
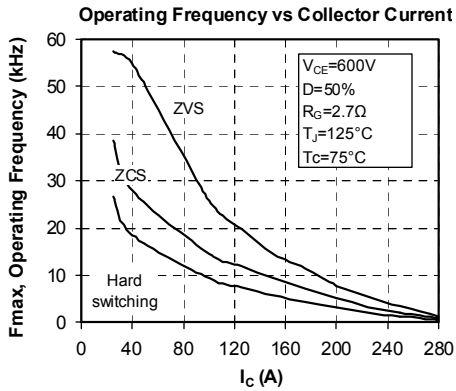
## SP6 Package outline (dimensions in mm)



See application note APT0601 - Mounting Instructions for SP6 Power Modules on [www.microsemi.com](http://www.microsemi.com)

## Typical Performance Curve





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