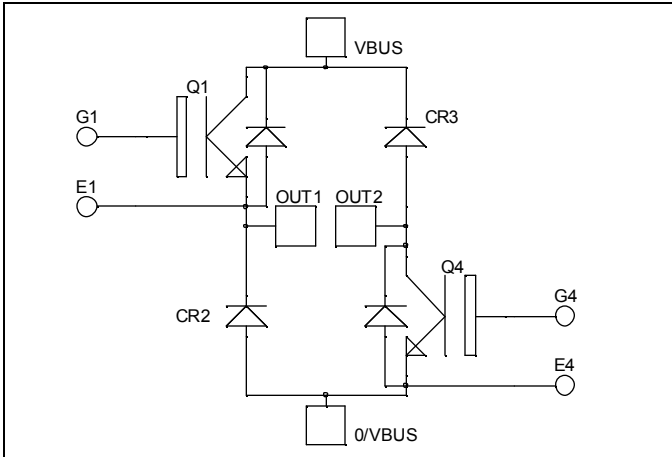


**Asymmetrical - Bridge  
Fast Trench + Field Stop IGBT®  
Power Module**

**$V_{CES} = 1200V$   
 $I_C = 150A @ T_c = 80^\circ C$**

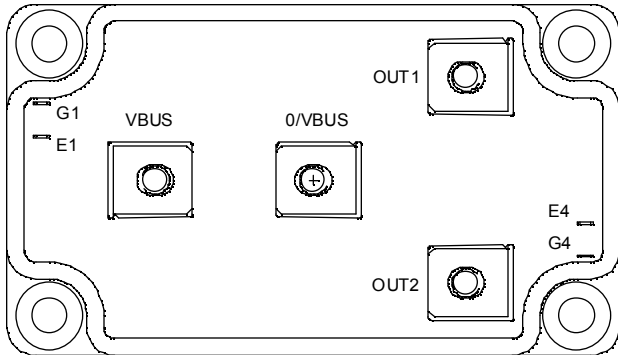


### Application

- 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          | $T_C = 25^\circ C$  | 220          |
|           |                                       | $T_C = 80^\circ C$  | 150          |
| $I_{CM}$  | Pulsed Collector Current              | $T_C = 25^\circ C$  | 350          |
| $V_{GE}$  | Gate - Emitter Voltage                | $\pm 20$            | V            |
| $P_D$     | Maximum Power Dissipation             | $T_C = 25^\circ C$  | 690          |
| RBSOA     | Reverse Bias Safe Operating Area      | $T_j = 125^\circ C$ | 300A @ 1150V |

**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>$I_C = 150\text{A}$ | $T_j = 25^\circ\text{C}$  | 1.7 | 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       | $V_{GE} = 20\text{V}, V_{CE} = 0\text{V}$    |                           |     | 400 | nA            |

**Dynamic Characteristics**

| Symbol       | Characteristic               | Test Conditions                                      | Min                       | Typ  | Max | Unit |
|--------------|------------------------------|--|---------------------------|------|-----|------|
| $C_{ies}$    | Input Capacitance            | $V_{GE} = 0\text{V}$                                 |                           | 10.7 |     | nF   |
| $C_{oes}$    | Output Capacitance           | $V_{CE} = 25\text{V}$                                |                           | 0.56 |     |      |
| $C_{res}$    | Reverse Transfer Capacitance | $f = 1\text{MHz}$                                    |                           | 0.48 |     |      |
| $T_{d(on)}$  | Turn-on Delay Time           | Inductive Switching ( $25^\circ\text{C}$ )           |                           | 280  |     | ns   |
| $T_r$        | Rise Time                    | $V_{GE} = \pm 15\text{V}$                            |                           | 40   |     |      |
| $T_{d(off)}$ | Turn-off Delay Time          | $V_{Bus} = 600\text{V}$                              |                           | 420  |     |      |
| $T_f$        | Fall Time                    | $I_C = 150\text{A}$<br>$R_G = 2.2\Omega$             |                           | 75   |     |      |
| $T_{d(on)}$  | Turn-on Delay Time           | Inductive Switching ( $125^\circ\text{C}$ )          |                           | 290  |     | ns   |
| $T_r$        | Rise Time                    | $V_{GE} = \pm 15\text{V}$                            |                           | 45   |     |      |
| $T_{d(off)}$ | Turn-off Delay Time          | $V_{Bus} = 600\text{V}$                              |                           | 520  |     |      |
| $T_f$        | Fall Time                    | $I_C = 150\text{A}$<br>$R_G = 2.2\Omega$             |                           | 90   |     |      |
| $E_{on}$     | Turn-on Switching Energy     | $V_{GE} = \pm 15\text{V}$<br>$V_{Bus} = 600\text{V}$ | $T_j = 125^\circ\text{C}$ | 14   |     | mJ   |
| $E_{off}$    | Turn-off Switching Energy    | $I_C = 150\text{A}$<br>$R_G = 2.2\Omega$             | $T_j = 125^\circ\text{C}$ | 16   |     |      |

**Diode ratings and characteristics**

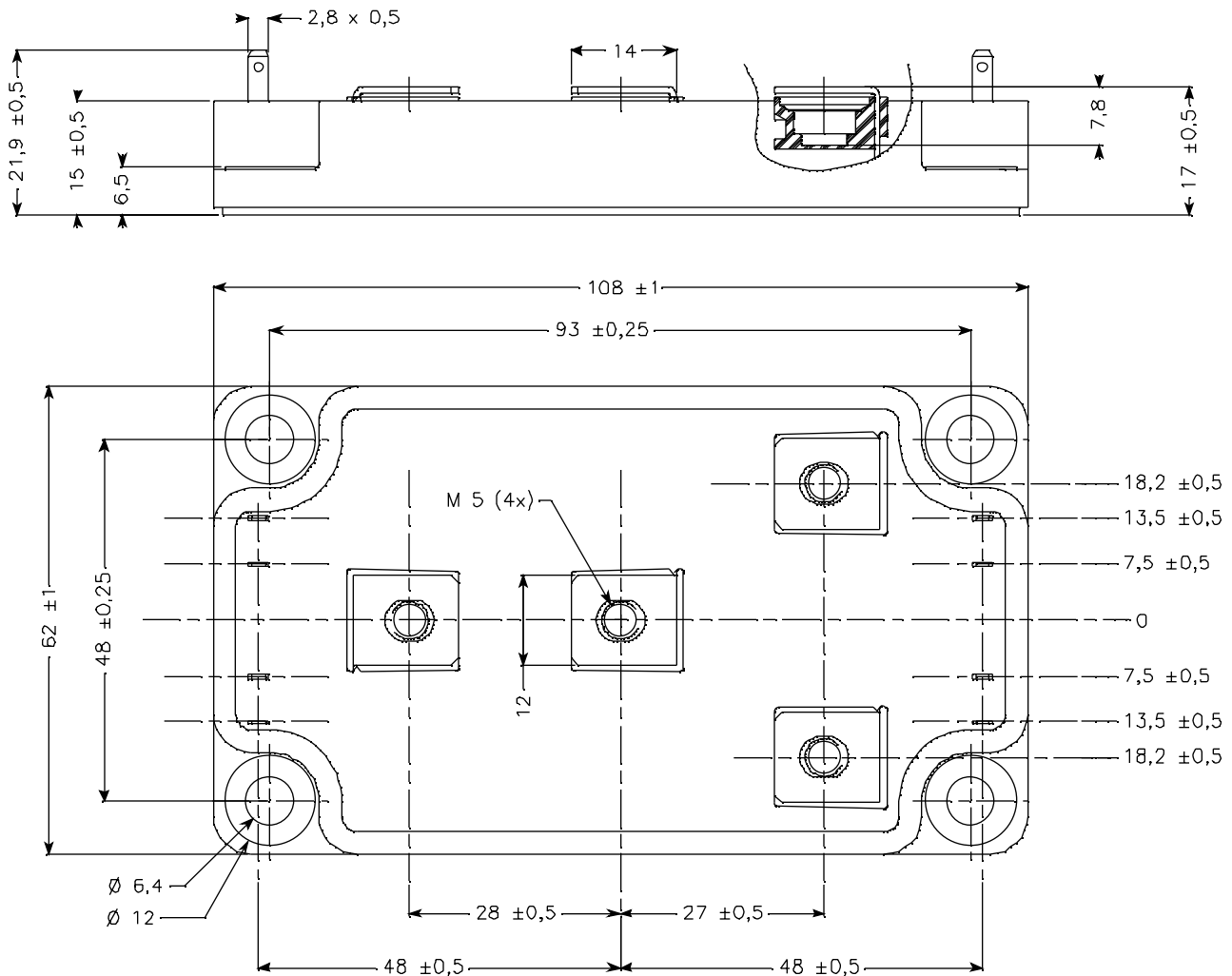
| Symbol    | Characteristic                          | Test Conditions  | Min                       | Typ | Max | Unit          |
|-----------|---|--|---------------------------|-----|-----|---------------|
| $V_{RRM}$ | Maximum Peak Repetitive Reverse Voltage |  | 1200                      |     |     | V             |
| $I_{RM}$  | Maximum Reverse Leakage Current         | $V_R = 1200\text{V}$   | $T_j = 25^\circ\text{C}$  |     | 250 | $\mu\text{A}$ |
|           |   |  | $T_j = 125^\circ\text{C}$ |     | 600 |               |
| $I_F$     | DC Forward Current                      |  | $T_c = 80^\circ\text{C}$  | 150 |     | A             |
| $V_F$     | Diode Forward Voltage                   | $I_F = 150\text{A}$  | $T_j = 25^\circ\text{C}$  | 1.6 | 2.1 | V             |
|           |   |  | $T_j = 125^\circ\text{C}$ | 1.6 |     |               |
| $t_{rr}$  | Reverse Recovery Time                   | $I_F = 150\text{A}$<br>$V_R = 600\text{V}$<br>$di/dt = 2500\text{A}/\mu\text{s}$ | $T_j = 25^\circ\text{C}$  | 170 |     | ns            |
|           |   |  | $T_j = 125^\circ\text{C}$ | 280 |     |               |
| $Q_{rr}$  | Reverse Recovery Charge                 |  | $T_j = 25^\circ\text{C}$  | 14  |     | $\mu\text{C}$ |
|           |   |  | $T_j = 125^\circ\text{C}$ | 28  |     |               |
| $E_r$     | Reverse Recovery Energy                 |  | $T_j = 25^\circ\text{C}$  | 6   |     | mJ            |
|           |   |  | $T_j = 125^\circ\text{C}$ | 11  |     |               |

## Thermal and package characteristics

*Symbol Characteristic*

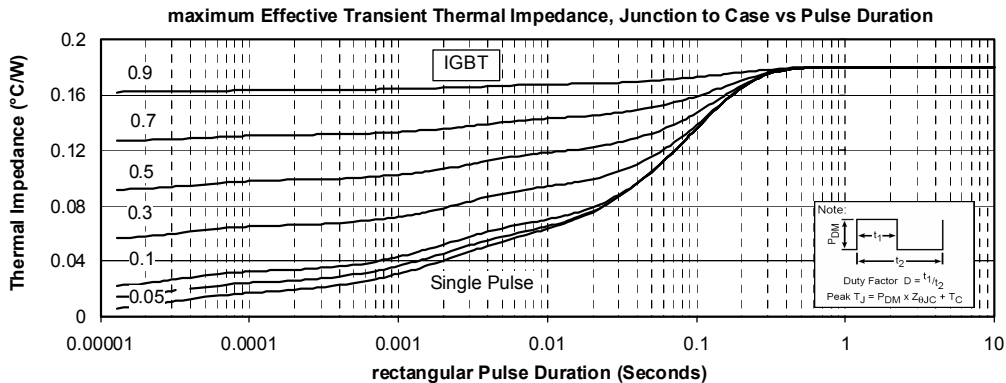
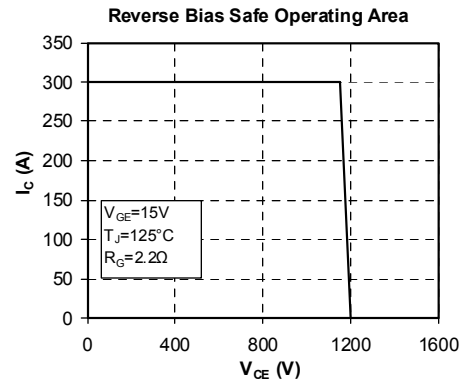
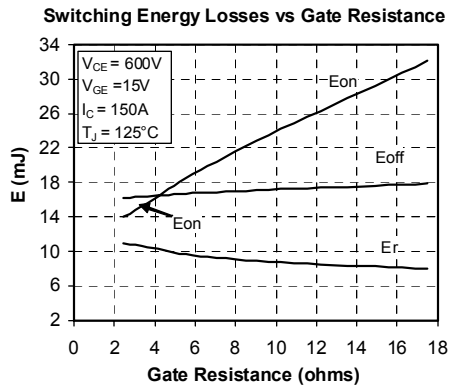
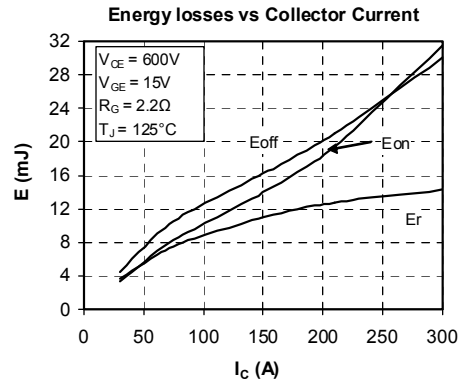
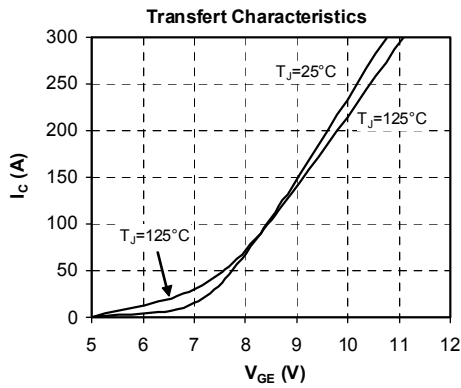
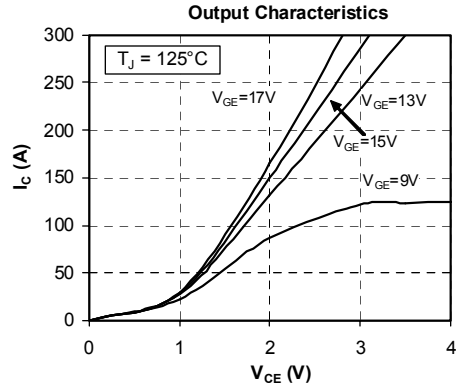
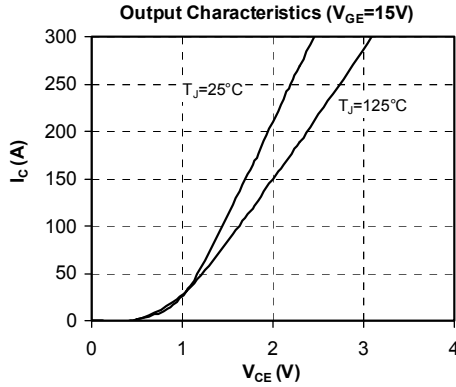
|                   |   |               | <i>Min</i> | <i>Typ</i> | <i>Max</i> | <i>Unit</i> |
|-------------------|---|---------------|------------|------------|------------|-------------|
| R <sub>thJC</sub> | Junction to Case Thermal Resistance   | IGBT          |            |            | 0.18       | °C/W        |
|                   |   | Diode         |            |            | 0.30       |             |
| 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           |

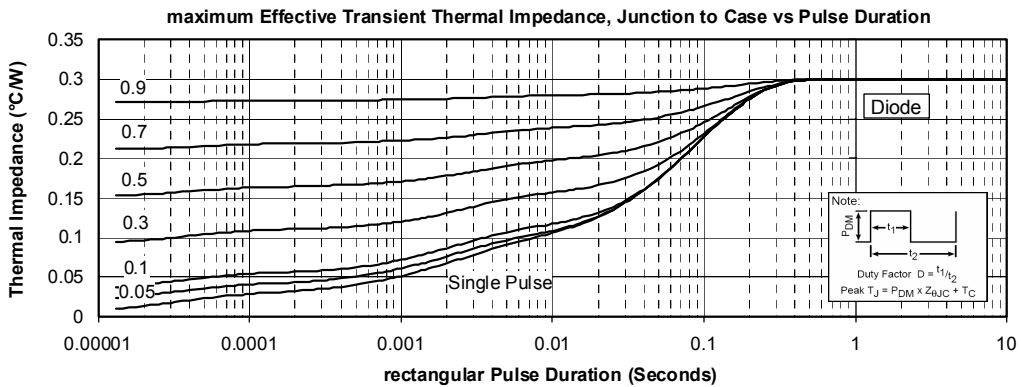
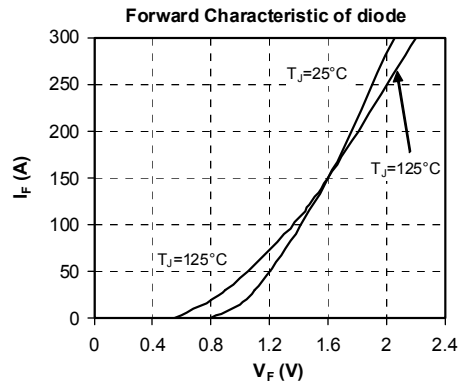
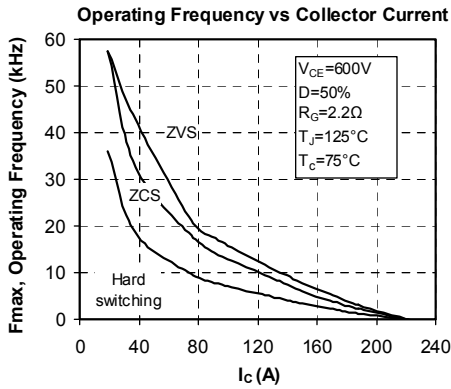
## SP6 Package outline (dimensions in mm)



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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