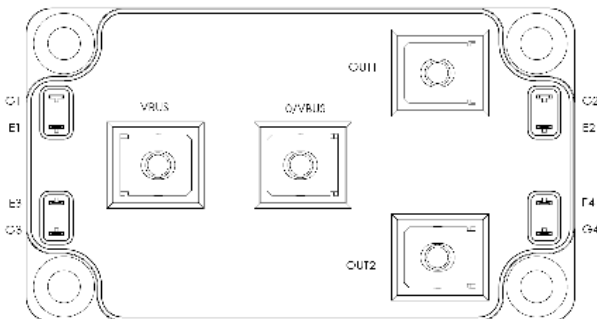
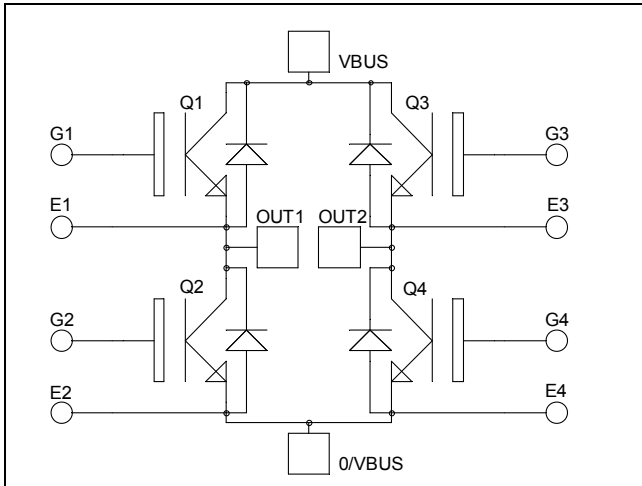


**Full - Bridge  
Trench + Field Stop IGBT3  
Power Module**

**$V_{CES} = 600V$   
 $I_C = 300A @ T_C = 80^\circ C$**



### 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
- 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  $T_C$  of  $V_{CEsat}$
- Low profile
- RoHS Compliant

### Absolute maximum ratings

| Symbol    | Parameter                             | Max ratings         | Unit        |
|-----------|---------------------------------------|---------------------|-------------|
| $V_{CES}$ | Collector - Emitter Breakdown Voltage | 600                 | V           |
| $I_C$     | Continuous Collector Current          | $T_C = 25^\circ C$  | 430         |
|           |                                       | $T_C = 80^\circ C$  | 300         |
| $I_{CM}$  | Pulsed Collector Current              | $T_C = 25^\circ C$  | 500         |
| $V_{GE}$  | Gate - Emitter Voltage                | $\pm 20$            | V           |
| $P_D$     | Maximum Power Dissipation             | $T_C = 25^\circ C$  | 1150        |
| RBSOA     | Reverse Bias Safe Operating Area      | $T_j = 150^\circ C$ | 600A @ 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  | $V_{GE} = 0\text{V}$ , $V_{CE} = 600\text{V}$ |     |            | 350 | $\mu\text{A}$ |
| $V_{CE(sat)}$ | Collector Emitter Saturation Voltage | $V_{GE} = 15\text{V}$<br>$I_C = 300\text{A}$  |     | 1.4<br>1.5 | 1.8 | V             |
| $V_{GE(th)}$  | Gate Threshold Voltage               | $V_{GE} = V_{CE}$ , $I_C = 1.5\text{ mA}$     | 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            | $V_{GE} = 0\text{V}$                                 |   | 24           |     | nF   |
| $C_{oes}$    | Output Capacitance           | $V_{CE} = 25\text{V}$                                |   | 1.5          |     |      |
| $C_{res}$    | Reverse Transfer Capacitance | $f = 1\text{MHz}$                                    |   | 0.75         |     |      |
| $T_{d(on)}$  | Turn-on Delay Time           | Inductive Switching ( $25^\circ\text{C}$ )           |   | 115          |     | ns   |
| $T_r$        | Rise Time                    | $V_{GE} = \pm 15\text{V}$                            |   | 45           |     |      |
| $T_{d(off)}$ | Turn-off Delay Time          | $V_{Bus} = 300\text{V}$<br>$I_C = 300\text{A}$       |   | 200          |     |      |
| $T_f$        | Fall Time                    | $R_G = 1.8\Omega$                                    |   | 55           |     |      |
| $T_{d(on)}$  | Turn-on Delay Time           | Inductive Switching ( $150^\circ\text{C}$ )          |   | 120          |     | ns   |
| $T_r$        | Rise Time                    | $V_{GE} = \pm 15\text{V}$                            |   | 50           |     |      |
| $T_{d(off)}$ | Turn-off Delay Time          | $V_{Bus} = 300\text{V}$<br>$I_C = 300\text{A}$       |   | 250          |     |      |
| $T_f$        | Fall Time                    | $R_G = 1.8\Omega$                                    |   | 70           |     |      |
| $E_{on}$     | Turn on Energy               | $V_{GE} = \pm 15\text{V}$<br>$V_{Bus} = 300\text{V}$ | $T_j = 25^\circ\text{C}$<br>$T_j = 150^\circ\text{C}$ | 1.5<br>2.7   |     | mJ   |
| $E_{off}$    | Turn off Energy              | $I_C = 300\text{A}$<br>$R_G = 1.8\Omega$             | $T_j = 25^\circ\text{C}$<br>$T_j = 150^\circ\text{C}$ | 8.55<br>10.5 |     | mJ   |

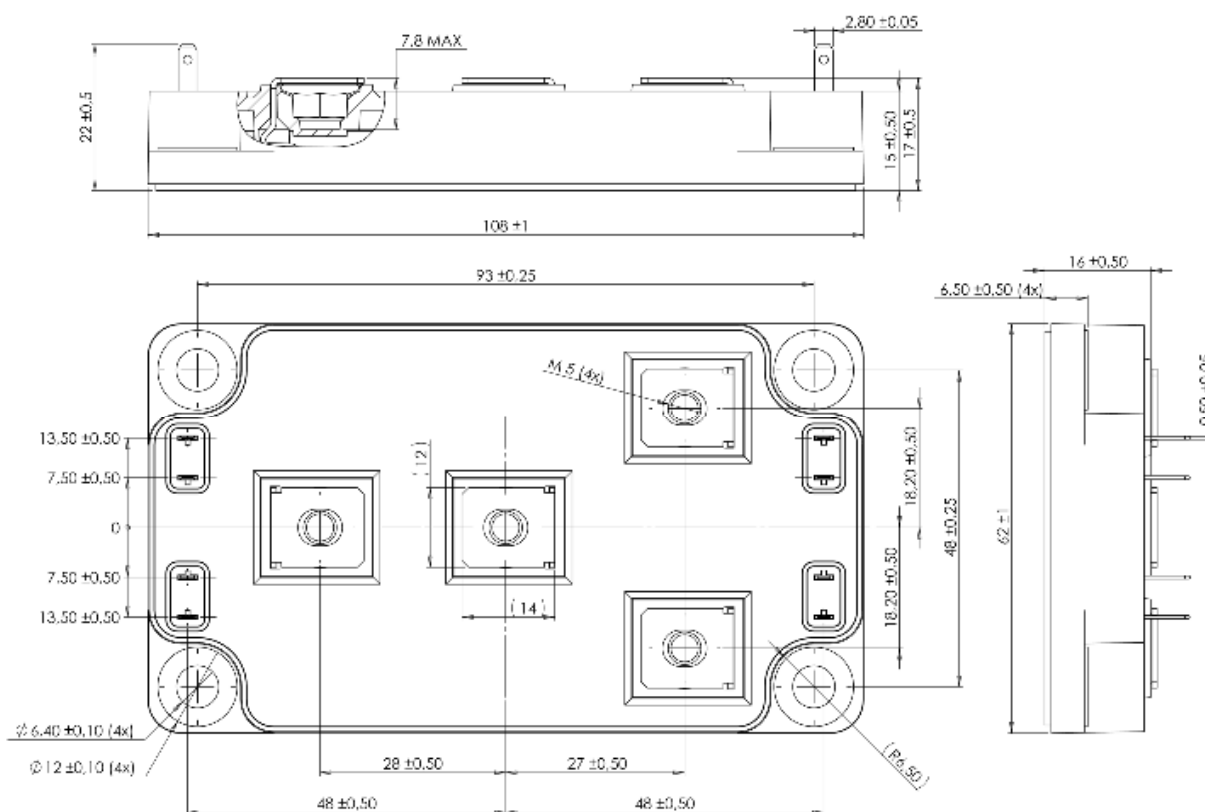
**Reverse diode ratings and characteristics**

| Symbol    | Characteristic                          | Test Conditions  | Min | Typ          | Max        | Unit          |
|-----------|---|--|-----|--------------|------------|---------------|
| $V_{RRM}$ | Maximum Peak Repetitive Reverse Voltage |  | 600 |              |            | V             |
| $I_{RM}$  | Maximum Reverse Leakage Current         | $V_R = 600\text{V}$  |     |              | 150<br>400 | $\mu\text{A}$ |
| $I_F$     | DC Forward Current                      |  |     | 300          |            | A             |
| $V_F$     | Diode Forward Voltage                   | $I_F = 300\text{A}$<br>$V_{GE} = 0\text{V}$                                      |     | 1.5<br>1.4   | 1.9        | V             |
| $t_{rr}$  | Reverse Recovery Time                   |  |     | 130<br>225   |            | ns            |
| $Q_{rr}$  | Reverse Recovery Charge                 | $I_F = 300\text{A}$<br>$V_R = 300\text{V}$<br>$di/dt = 3100\text{A}/\mu\text{s}$ |     | 13.5<br>28.5 |            | $\mu\text{C}$ |
| $E_r$     | Reverse Recovery Energy                 |  |     | 3.5<br>7.1   |            | mJ            |

### Thermal and package characteristics

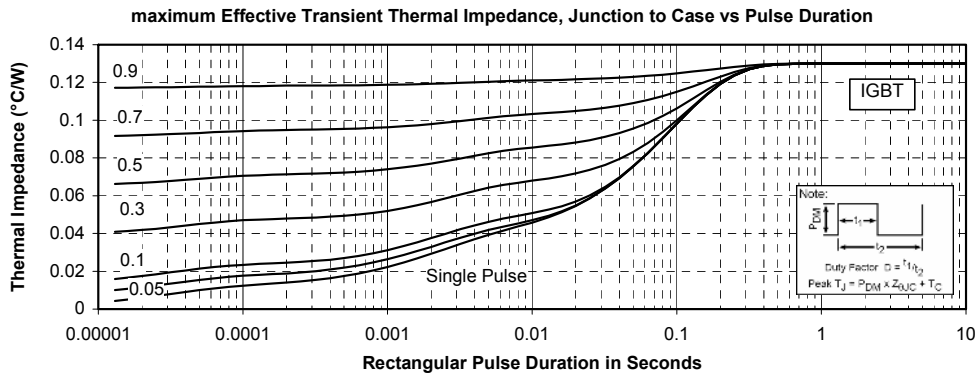
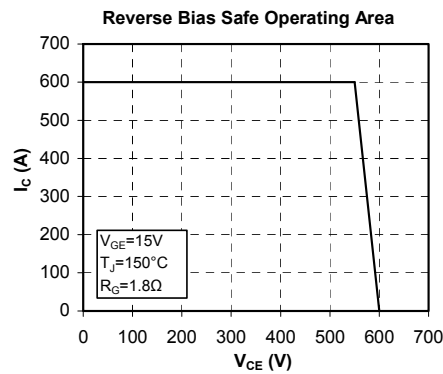
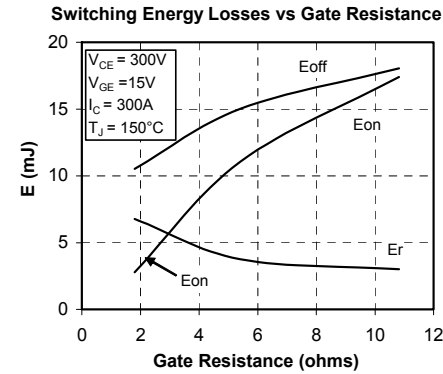
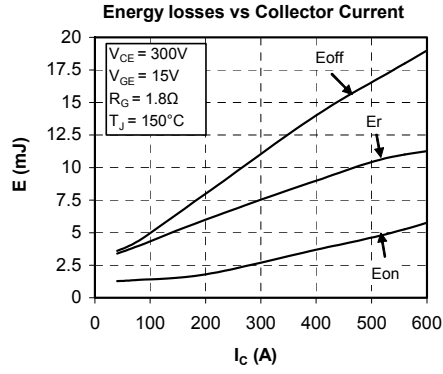
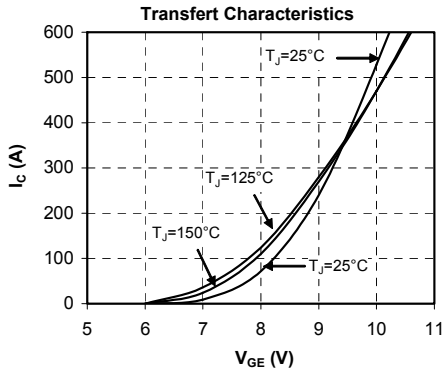
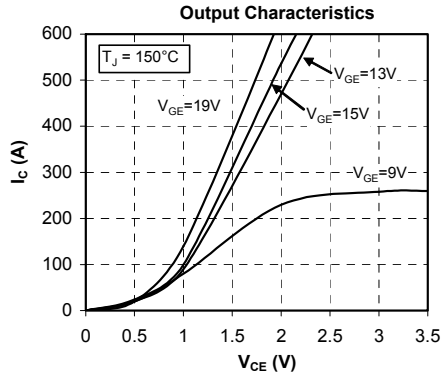
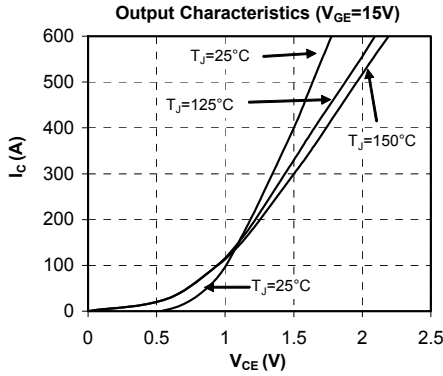
| <i>Symbol</i> | <i>Characteristic</i>  | <i>Min</i>    | <i>Typ</i> | <i>Max</i> | <i>Unit</i> |     |
|---------------|--|---------------|------------|------------|-------------|-----|
| $R_{thJC}$    | Junction to Case Thermal Resistance                            | IGBT          |            | 0.13       | °C/W        |     |
|               |  | Diode         |            | 0.21       |             |     |
| $V_{ISOL}$    | RMS Isolation Voltage, any terminal to case $t=1$ min, 50/60Hz | 4000          |            |            | V           |     |
| $T_J$         | Operating junction temperature range                           | -40           |            | 175        | °C          |     |
| $T_{STG}$     | Storage Temperature Range                                      | -40           |            | 125        |             |     |
| $T_C$         | Operating Case Temperature                                     | -40           |            | 100        |             |     |
| Torque        | Mounting torque  | To heatsink   | M6         | 3          | 5           | N.m |
|               |  | For terminals | M5         | 2          | 3.5         |     |
| Wt            | Package Weight   |               |            | 300        | g           |     |

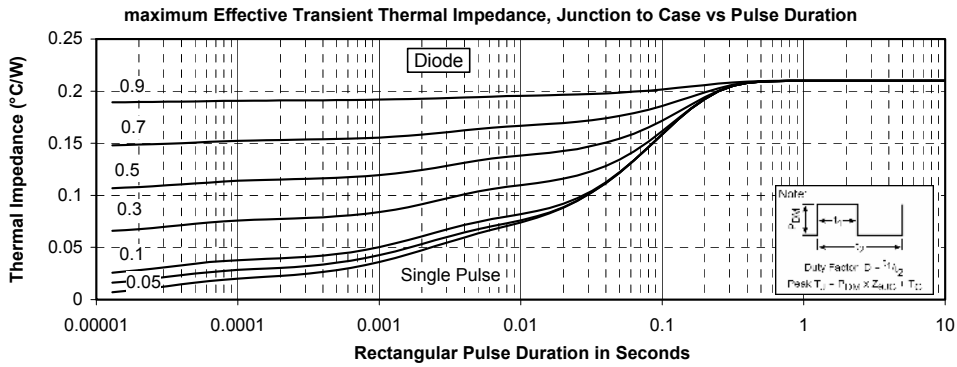
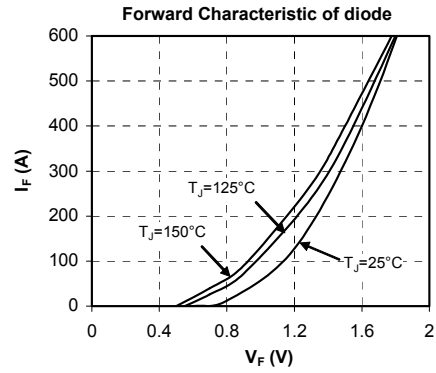
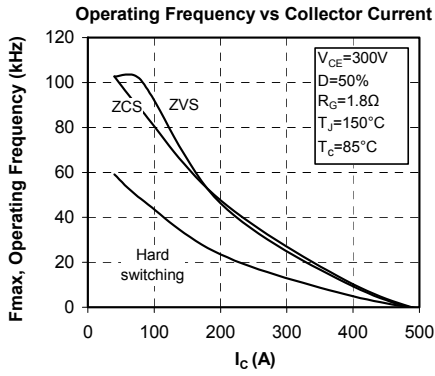
### SP6 Package outline (dimensions in mm)



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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