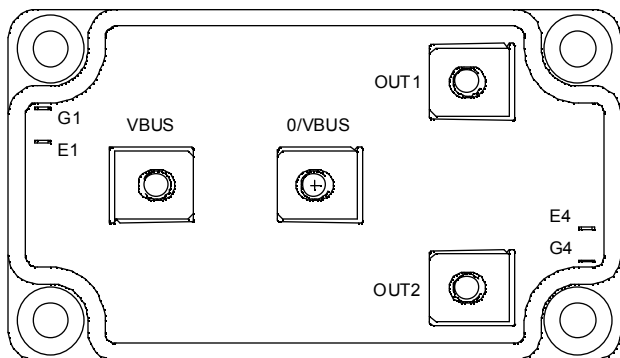
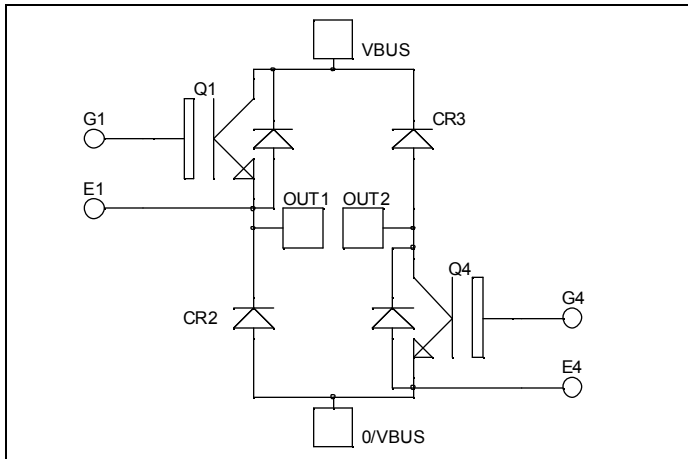


## Asymmetrical - Bridge NPT IGBT Power Module

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



### Application

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

### Features

- Non Punch Through (NPT) Fast IGBT
  - Low voltage drop
  - Low tail current
  - Switching frequency up to 50 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

- Outstanding performance at high frequency operation
- 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 | 1200                | V            |
| $I_C$     | Continuous Collector Current          | $T_c = 25^\circ C$  | 200          |
|           |                                       | $T_c = 80^\circ C$  | 150          |
| $I_{CM}$  | Pulsed Collector Current              | $T_c = 25^\circ C$  | 300          |
| $V_{GE}$  | Gate - Emitter Voltage                | $\pm 20$            | V            |
| $P_D$     | Maximum Power Dissipation             | $T_c = 25^\circ C$  | 961          |
| RBSOA     | Reverse Bias Safe Operating Area      | $T_j = 150^\circ C$ | 300A @ 1200V |

**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  | $V_{GE} = 0\text{V}$<br>$V_{CE} = 1200\text{V}$ | $T_j = 25^\circ\text{C}$  |     |     | 350       | $\mu\text{A}$ |
|               |                                      |                                                 | $T_j = 125^\circ\text{C}$ |     |     | 600       |               |
| $V_{CE(sat)}$ | Collector Emitter saturation Voltage | $V_{GE} = 15\text{V}$<br>$I_C = 150\text{A}$    | $T_j = 25^\circ\text{C}$  |     | 3.2 | 3.7       | V             |
|               |                                      |                                                 | $T_j = 125^\circ\text{C}$ |     | 3.9 |           |               |
| $V_{GE(th)}$  | Gate Threshold Voltage               | $V_{GE} = V_{CE}, I_C = 5\text{mA}$             |                           | 4.5 |     | 6.5       | V             |
| $I_{GES}$     | Gate – Emitter Leakage Current       | $V_{GE} = \pm 20\text{V}, V_{CE} = 0\text{V}$   |                           |     |     | $\pm 500$ | nA            |

**Dynamic Characteristics**

| Symbol       | Characteristic               | Test Conditions                                                    |                           | Min                       | Typ  | Max | Unit |
|--------------|------------------------------|--------------------------------------------------------------------|---------------------------|---------------------------|------|-----|------|
| $C_{ies}$    | Input Capacitance            | $V_{GE} = 0\text{V}$<br>$V_{CE} = 25\text{V}$<br>$f = 1\text{MHz}$ |                           |                           | 10.2 |     | nF   |
| $C_{oes}$    | Output Capacitance           |                                                                    |                           |                           | 1.4  |     |      |
| $C_{res}$    | Reverse Transfer Capacitance |                                                                    |                           |                           | 0.75 |     |      |
| $T_{d(on)}$  | Turn-on Delay Time           | Inductive Switching ( $25^\circ\text{C}$ )                         |                           |                           | 120  |     | ns   |
| $T_r$        | Rise Time                    | $V_{GE} = 15\text{V}$<br>$V_{Bus} = 600\text{V}$                   |                           |                           | 50   |     |      |
| $T_{d(off)}$ | Turn-off Delay Time          | $I_C = 150\text{A}$                                                |                           |                           | 310  |     |      |
| $T_f$        | Fall Time                    | $R_G = 5.6\Omega$                                                  |                           |                           | 20   |     |      |
| $T_{d(on)}$  | Turn-on Delay Time           | Inductive Switching ( $125^\circ\text{C}$ )                        |                           |                           | 130  |     | ns   |
| $T_r$        | Rise Time                    | $V_{GE} = 15\text{V}$<br>$V_{Bus} = 600\text{V}$                   |                           |                           | 60   |     |      |
| $T_{d(off)}$ | Turn-off Delay Time          | $I_C = 150\text{A}$                                                |                           |                           | 360  |     |      |
| $T_f$        | Fall Time                    | $R_G = 5.6\Omega$                                                  |                           |                           | 30   |     |      |
| $E_{on}$     | Turn-on Switching Energy     | $V_{GE} = 15\text{V}$<br>$V_{Bus} = 600\text{V}$                   | $T_j = 125^\circ\text{C}$ |                           | 18   |     | mJ   |
| $E_{off}$    | Turn-off Switching Energy    | $I_C = 150\text{A}$<br>$R_G = 5.6\Omega$                           |                           | $T_j = 125^\circ\text{C}$ |      | 8   |      |

**Diode ratings and characteristics**

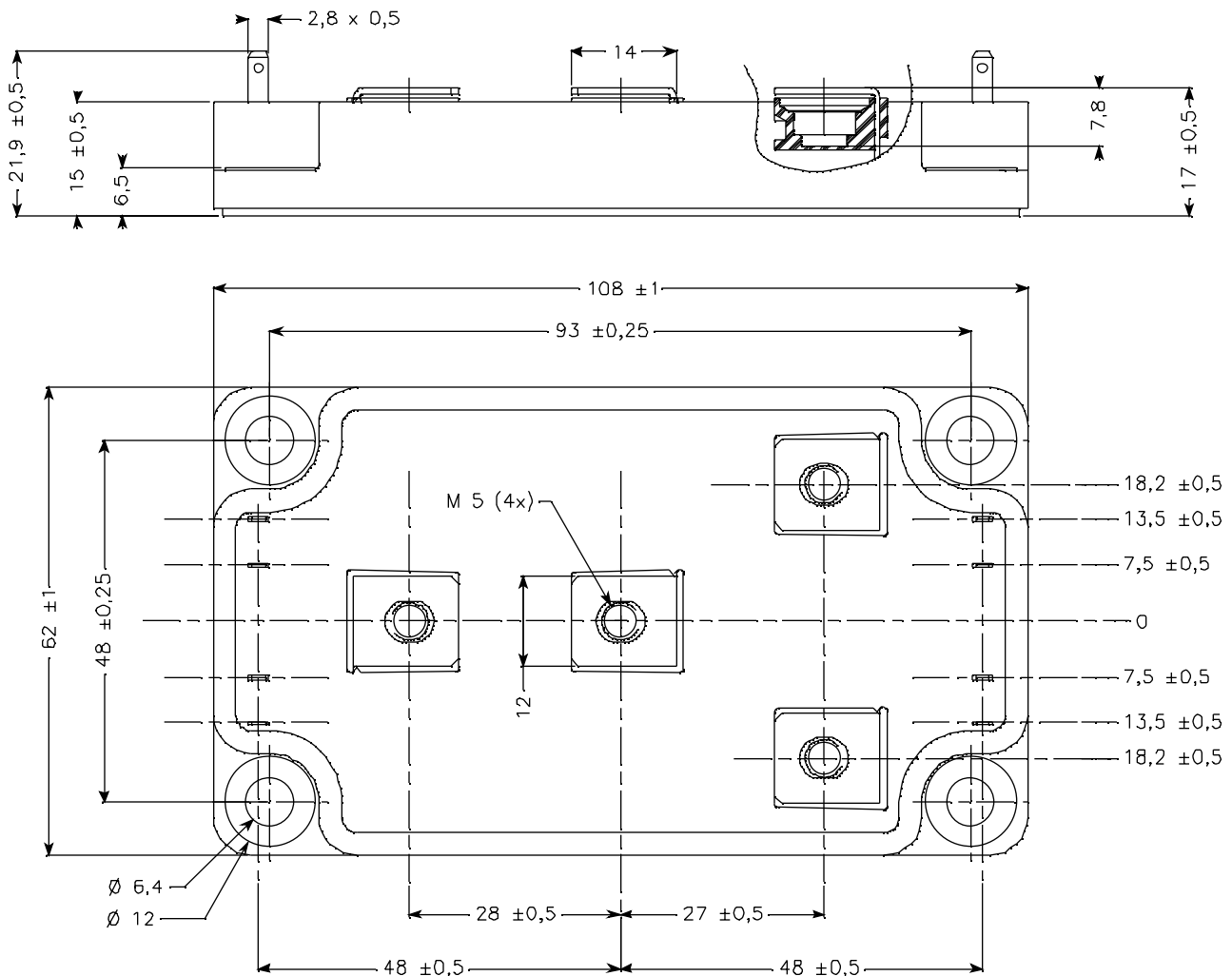
| Symbol    | Characteristic                          | Test Conditions                                                                 |                           | Min  | Typ  | Max | Unit          |
|-----------|-----------------------------------------|---------------------------------------------------------------------------------|---------------------------|------|------|-----|---------------|
| $V_{RRM}$ | Maximum Peak Repetitive Reverse Voltage |                                                                                 |                           | 1200 |      |     | V             |
| $I_{RM}$  | Maximum Reverse Leakage Current         | $V_R = 1200\text{V}$                                                            | $T_j = 25^\circ\text{C}$  |      |      | 350 | $\mu\text{A}$ |
|           |                                         |                                                                                 | $T_j = 125^\circ\text{C}$ |      |      | 600 |               |
| $I_F$     | DC Forward Current                      | $T_c = 70^\circ\text{C}$                                                        |                           |      | 200  |     | A             |
| $V_F$     | Diode Forward Voltage                   | $I_F = 200\text{A}$                                                             |                           |      | 2    | 2.5 | V             |
|           |                                         | $I_F = 400\text{A}$                                                             |                           |      | 2.3  |     |               |
|           |                                         | $I_F = 200\text{A}$                                                             | $T_j = 125^\circ\text{C}$ |      | 1.8  |     |               |
| $t_{rr}$  | Reverse Recovery Time                   | $I_F = 200\text{A}$<br>$V_R = 800\text{V}$<br>$di/dt = 400\text{A}/\mu\text{s}$ | $T_j = 25^\circ\text{C}$  |      | 420  |     | ns            |
|           |                                         |                                                                                 | $T_j = 125^\circ\text{C}$ |      | 520  |     |               |
| $Q_{rr}$  | Reverse Recovery Charge                 |                                                                                 | $T_j = 25^\circ\text{C}$  |      | 2.5  |     | $\mu\text{C}$ |
|           |                                         |                                                                                 | $T_j = 125^\circ\text{C}$ |      | 10.7 |     |               |

## Thermal and package characteristics

*Symbol Characteristic*

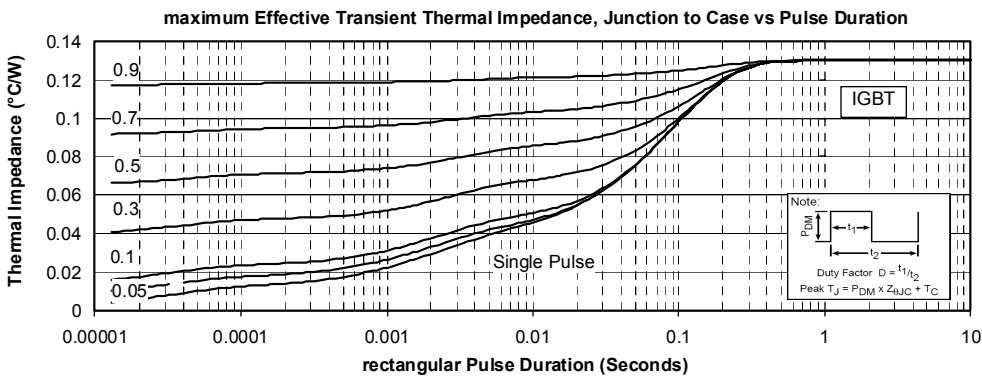
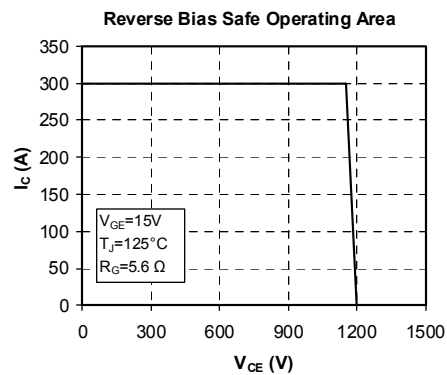
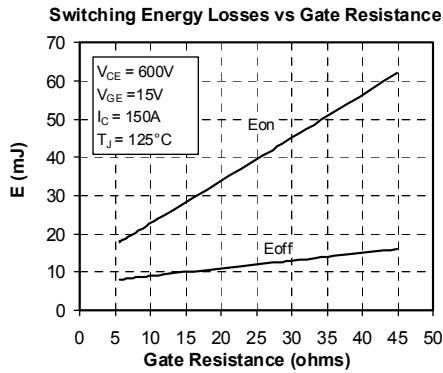
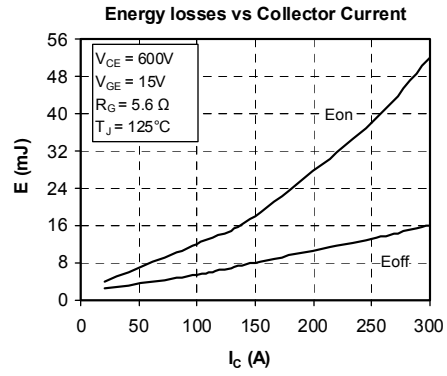
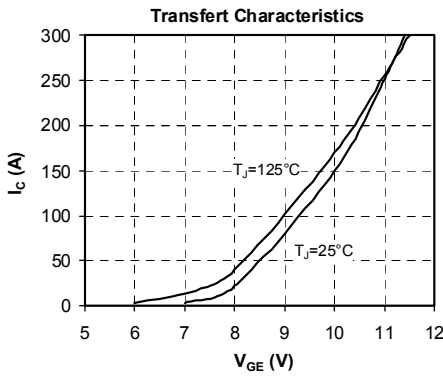
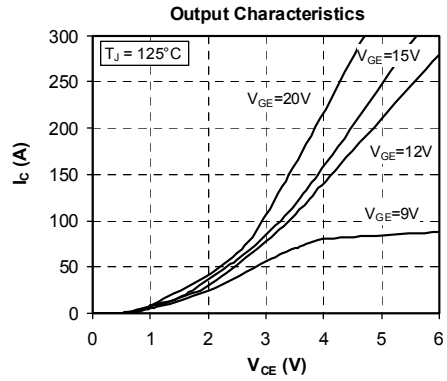
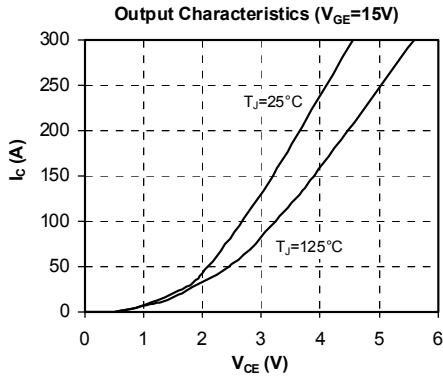
|            |                                                                                 | <i>Min</i>    | <i>Typ</i> | <i>Max</i> | <i>Unit</i> |     |
|------------|---------------------------------------------------------------------------------|---------------|------------|------------|-------------|-----|
| $R_{thJC}$ | Junction to Case Thermal Resistance                                             | IGBT          |            | 0.13       | °C/W        |     |
|            |                                                                                 | Diode         |            | 0.32       |             |     |
| $V_{ISOL}$ | 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           |            | 150        | °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                                                                  |               |            | 280        | g           |     |

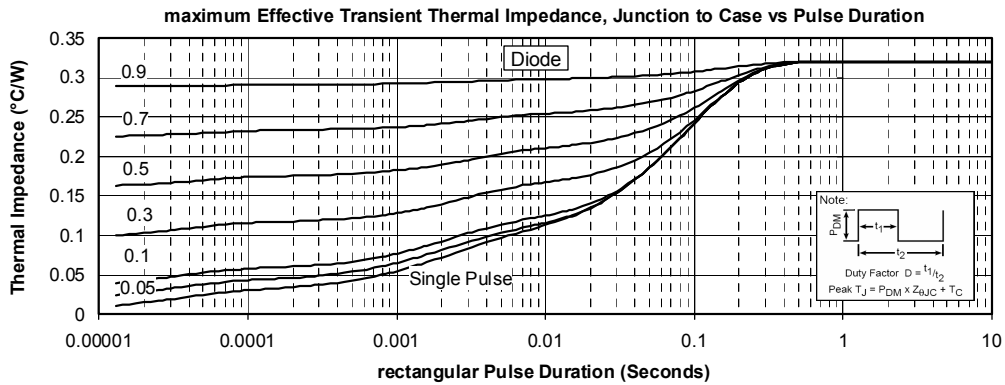
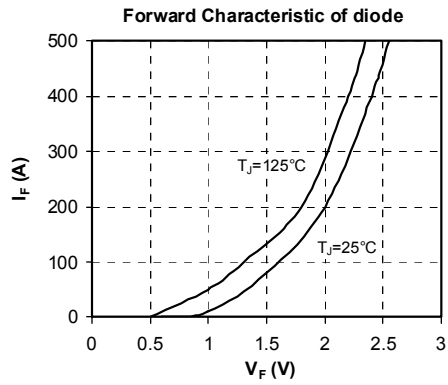
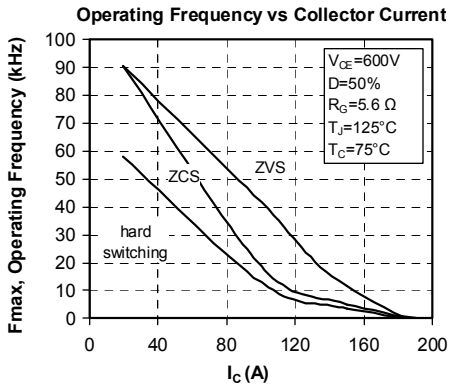
## SP6 Package outline (dimensions in mm)



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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