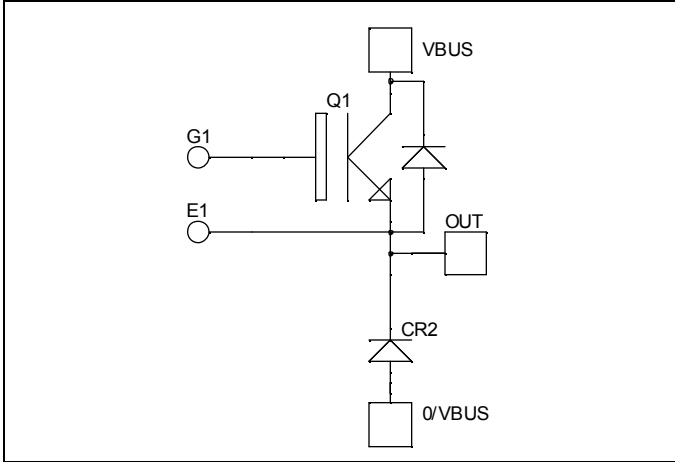


*Buck chopper  
Trench + Field Stop IGBT®  
Power Module*

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



### Application

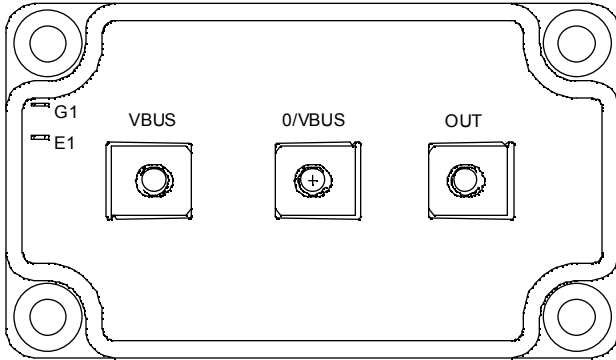
- AC and DC motor control
- Switched Mode Power Supplies

### 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
  - 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 | 600                 | V            |
| $I_C$     | Continuous Collector Current          | $T_c = 25^\circ C$  | 700 *        |
|           |                                       | $T_c = 80^\circ C$  | 600 *        |
| $I_{CM}$  | Pulsed Collector Current              | $T_c = 25^\circ C$  | 800          |
| $V_{GE}$  | Gate - Emitter Voltage                | $\pm 20$            | V            |
| $P_D$     | Maximum Power Dissipation             | $T_c = 25^\circ C$  | 2300         |
| RBSOA     | Reverse Bias Safe Operating Area      | $T_j = 150^\circ C$ | 1200A @ 550V |

\* Specification of IGBT device but output current must be limited to 500A to not exceed a delta of temperature greater than 100°C for the connectors.



**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  | $V_{GE} = 0\text{V}, V_{CE} = 600\text{V}$   |                           |     | 750 | $\mu\text{A}$ |
| $V_{CE(sat)}$ | Collector Emitter Saturation Voltage | $V_{GE} = 15\text{V}$<br>$I_C = 600\text{A}$ | $T_j = 25^\circ\text{C}$  | 1.4 | 1.8 | V             |
|               |                                      |  | $T_j = 150^\circ\text{C}$ | 1.5 |     |               |
| $V_{GE(th)}$  | Gate Threshold Voltage               | $V_{GE} = V_{CE}, I_C = 2\text{mA}$          | 5.0                       | 5.8 | 6.5 | V             |
| $I_{GES}$     | Gate – Emitter Leakage Current       | $V_{GE} = 20\text{V}, V_{CE} = 0\text{V}$    |                           |     | 800 | nA            |

**Dynamic Characteristics**

| Symbol       | Characteristic               | Test Conditions                                      | Min                       | Typ | Max | Unit |
|--------------|------------------------------|--|---------------------------|-----|-----|------|
| $C_{ies}$    | Input Capacitance            | $V_{GE} = 0\text{V}$                                 |                           | 49  |     | nF   |
| $C_{oes}$    | Output Capacitance           | $V_{CE} = 25\text{V}$                                |                           | 3.1 |     |      |
| $C_{res}$    | Reverse Transfer Capacitance | $f = 1\text{MHz}$                                    |                           | 1.5 |     |      |
| $T_{d(on)}$  | Turn-on Delay Time           | Inductive Switching ( $25^\circ\text{C}$ )           |                           | 130 |     | ns   |
| $T_r$        | Rise Time                    | $V_{GE} = \pm 15\text{V}$                            |                           | 55  |     |      |
| $T_{d(off)}$ | Turn-off Delay Time          | $V_{Bus} = 300\text{V}$                              |                           | 250 |     |      |
| $T_f$        | Fall Time                    | $I_C = 600\text{A}$<br>$R_G = 2\Omega$               |                           | 60  |     |      |
| $T_{d(on)}$  | Turn-on Delay Time           | Inductive Switching ( $150^\circ\text{C}$ )          |                           | 145 |     | ns   |
| $T_r$        | Rise Time                    | $V_{GE} = \pm 15\text{V}$                            |                           | 60  |     |      |
| $T_{d(off)}$ | Turn-off Delay Time          | $V_{Bus} = 300\text{V}$                              |                           | 320 |     |      |
| $T_f$        | Fall Time                    | $I_C = 600\text{A}$<br>$R_G = 2\Omega$               |                           | 80  |     |      |
| $E_{on}$     | Turn on Energy               | $V_{GE} = \pm 15\text{V}$<br>$V_{Bus} = 300\text{V}$ | $T_j = 25^\circ\text{C}$  | 3   |     | mJ   |
|              |                              |  | $T_j = 150^\circ\text{C}$ | 5.5 |     |      |
| $E_{off}$    | Turn off Energy              | $I_C = 600\text{A}$<br>$R_G = 2\Omega$               | $T_j = 25^\circ\text{C}$  | 17  |     | mJ   |
|              |                              |  | $T_j = 150^\circ\text{C}$ | 21  |     |      |

**Chopper diode ratings and characteristics**

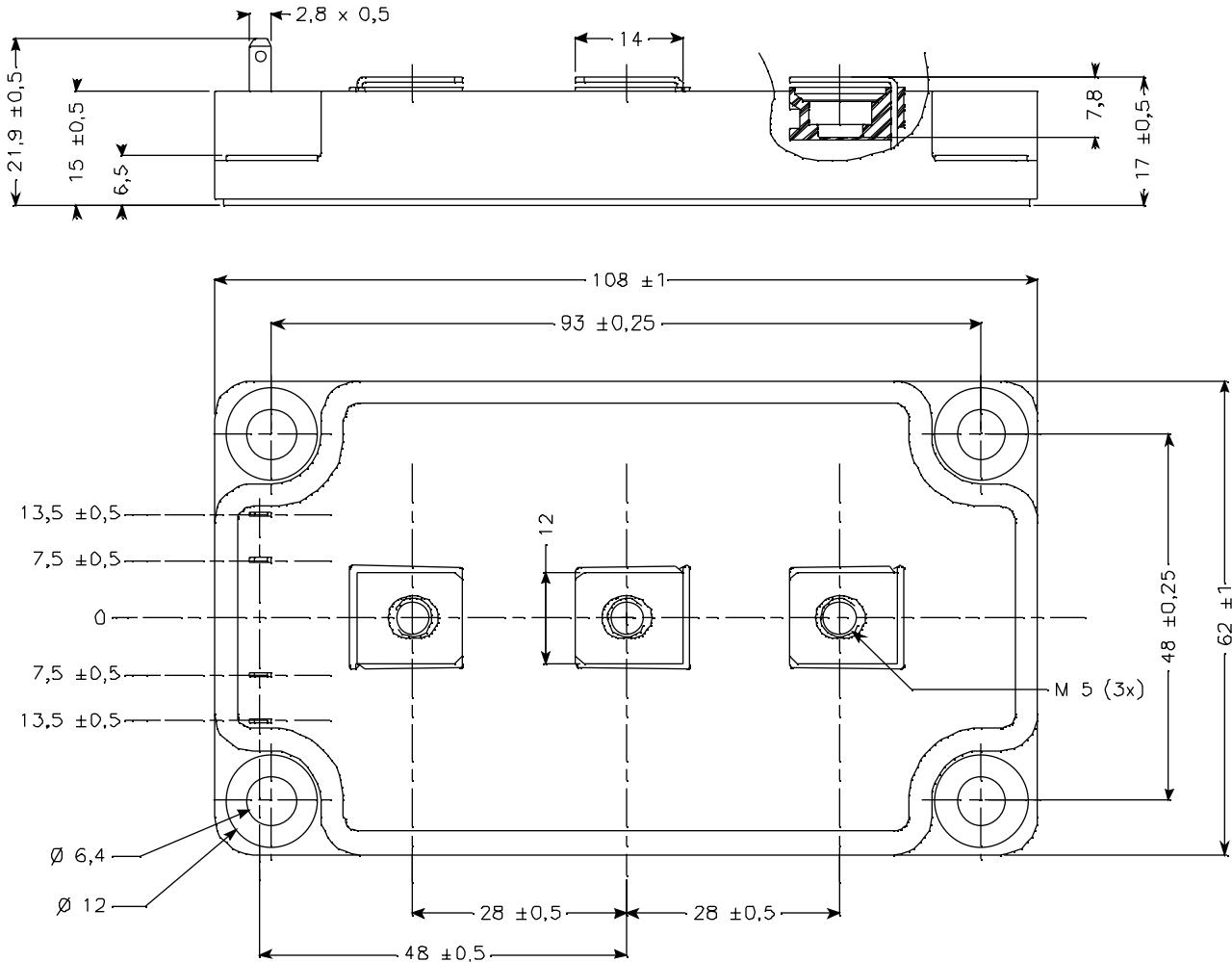
| Symbol    | Characteristic                          | Test Conditions  | Min                       | Typ  | Max | Unit          |
|-----------|---|--|---------------------------|------|-----|---------------|
| $V_{RRM}$ | Maximum Peak Repetitive Reverse Voltage |  | 600                       |      |     | V             |
| $I_{RM}$  | Maximum Reverse Leakage Current         | $V_R = 600\text{V}$  | $T_j = 25^\circ\text{C}$  |      | 350 | $\mu\text{A}$ |
|           |   |  | $T_j = 150^\circ\text{C}$ |      | 550 |               |
| $I_F$     | DC Forward Current                      |  |                           | 600  |     | A             |
| $V_F$     | Diode Forward Voltage                   | $I_F = 600\text{A}$<br>$V_{GE} = 0\text{V}$                                      | $T_j = 25^\circ\text{C}$  | 1.5  | 1.9 | V             |
|           |   |  | $T_j = 150^\circ\text{C}$ | 1.4  |     |               |
| $t_{rr}$  | Reverse Recovery Time                   |  | $T_j = 25^\circ\text{C}$  | 120  |     | ns            |
|           |   |  | $T_j = 150^\circ\text{C}$ | 210  |     |               |
| $Q_{rr}$  | Reverse Recovery Charge                 | $I_F = 600\text{A}$<br>$V_R = 300\text{V}$<br>$di/dt = 5000\text{A}/\mu\text{s}$ | $T_j = 25^\circ\text{C}$  | 27   |     | $\mu\text{C}$ |
|           |   |  | $T_j = 150^\circ\text{C}$ | 57   |     |               |
| $E_r$     | Reverse Recovery Energy                 |  | $T_j = 25^\circ\text{C}$  | 6.9  |     | mJ            |
|           |   |  | $T_j = 150^\circ\text{C}$ | 14.1 |     |               |

## Thermal and package characteristics

Symbol Characteristic

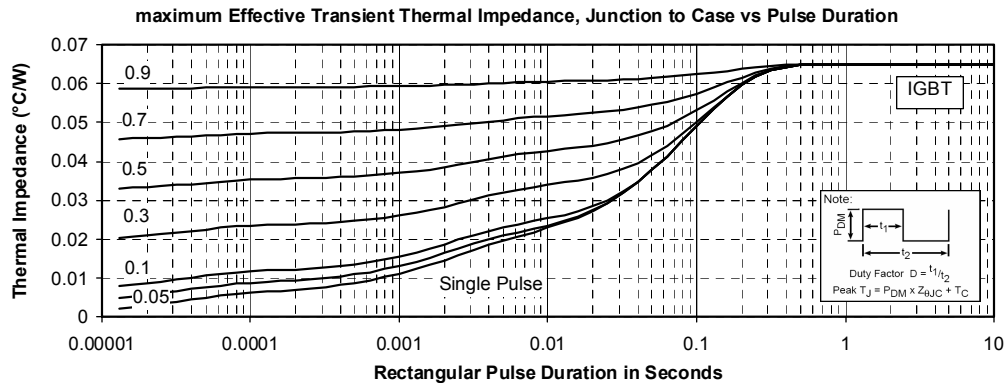
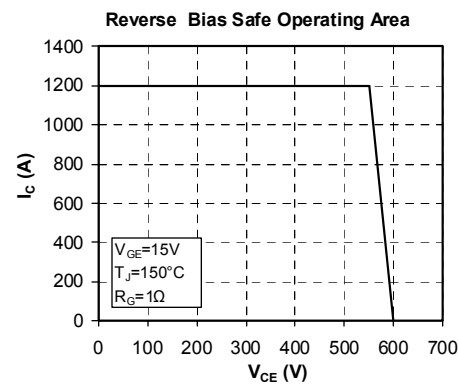
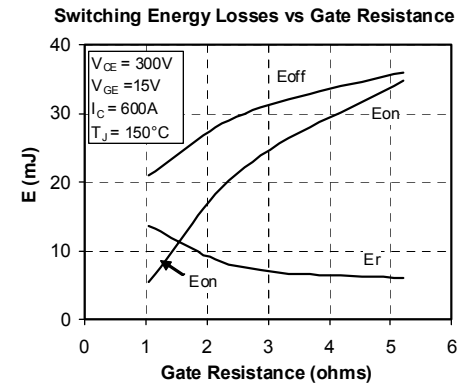
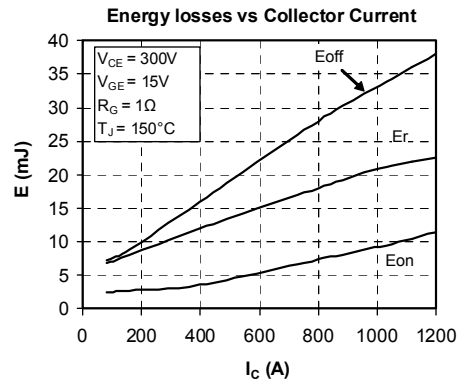
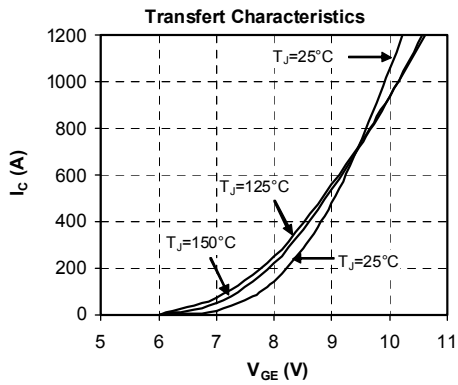
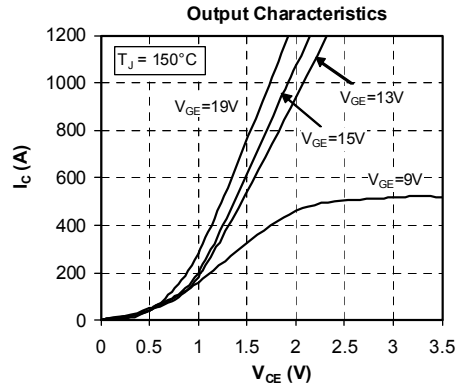
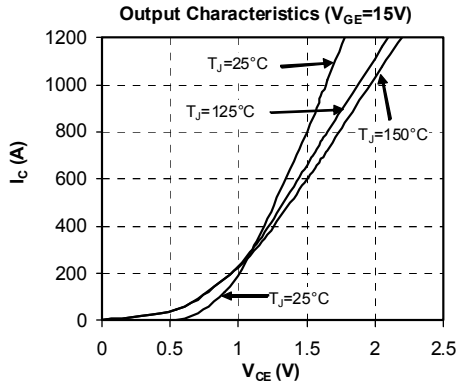
|                   |  |               | Min  | Typ | Max   | Unit |
|-------------------|--|---------------|------|-----|-------|------|
| R <sub>thJC</sub> | Junction to Case Thermal Resistance  | IGBT          |      |     | 0.065 | °C/W |
|                   |  | Diode         |      |     | 0.11  |      |
| 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  |     | 175   | °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    |

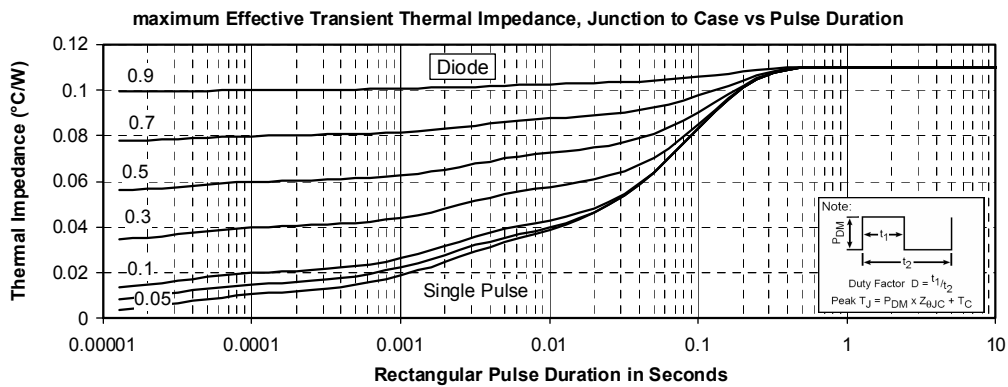
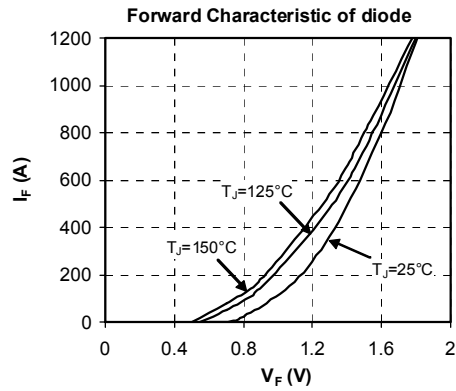
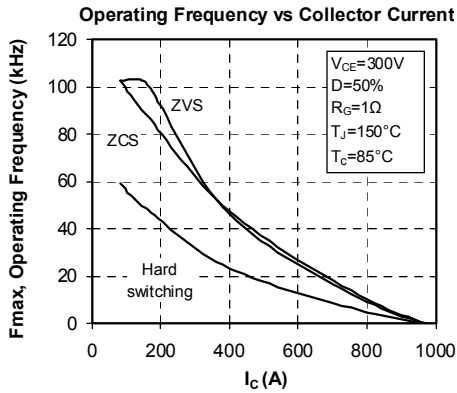
## SP6 Package outline (dimensions in mm)



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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