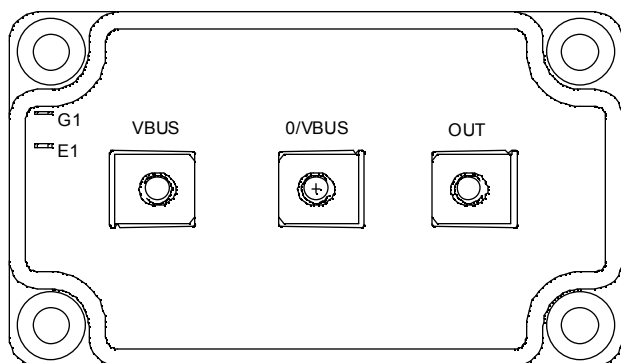
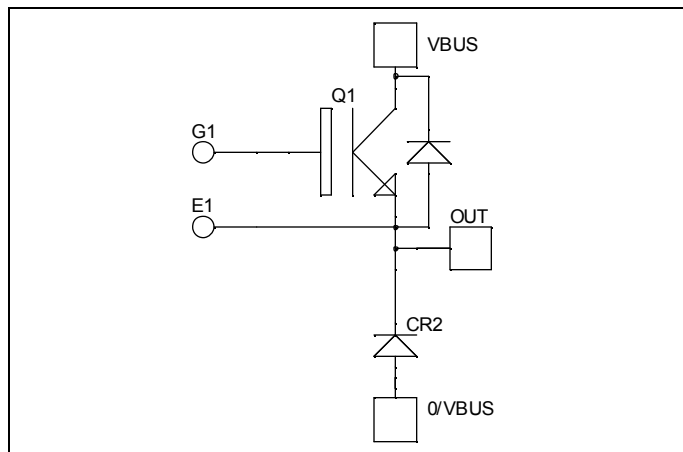


**Buck chopper  
Trench + Field Stop IGBT®  
Power Module**

$$V_{CES} = 1700V$$

$$I_C = 300A @ T_c = 80^{\circ}C$$



## 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 | 1700                                                     | V    |
| $I_C$     | Continuous Collector Current          | $T_C = 25^{\circ}C$<br>400<br>$T_C = 80^{\circ}C$<br>300 | A    |
| $I_{CM}$  | Pulsed Collector Current              | $T_C = 25^{\circ}C$<br>600                               |      |
| $V_{GE}$  | Gate - Emitter Voltage                | $\pm 20$                                                 | V    |
| $P_D$     | Maximum Power Dissipation             | $T_C = 25^{\circ}C$<br>1660                              | W    |
| RBSOA     | Reverse Bias Safe Operating Area      | $T_j = 125^{\circ}C$<br>600A @ 1600V                     |      |

**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  | $V_{GE} = 0\text{V}$ , $V_{CE} = 1700\text{V}$ |                                                       |            | 750 | $\mu\text{A}$ |
| $V_{CE(sat)}$ | Collector Emitter Saturation Voltage | $V_{GE} = 15\text{V}$<br>$I_C = 300\text{A}$   | $T_j = 25^\circ\text{C}$<br>$T_j = 125^\circ\text{C}$ | 2.0<br>2.4 | 2.4 | V             |
| $V_{GE(th)}$  | Gate Threshold Voltage               | $V_{GE} = V_{CE}$ , $I_C = 5\text{mA}$         | 5.0                                                   | 5.8        | 6.5 | V             |
| $I_{GES}$     | Gate – Emitter Leakage Current       | $V_{GE} = 20\text{V}$ , $V_{CE} = 0\text{V}$   |                                                       |            | 600 | nA            |

**Dynamic Characteristics**

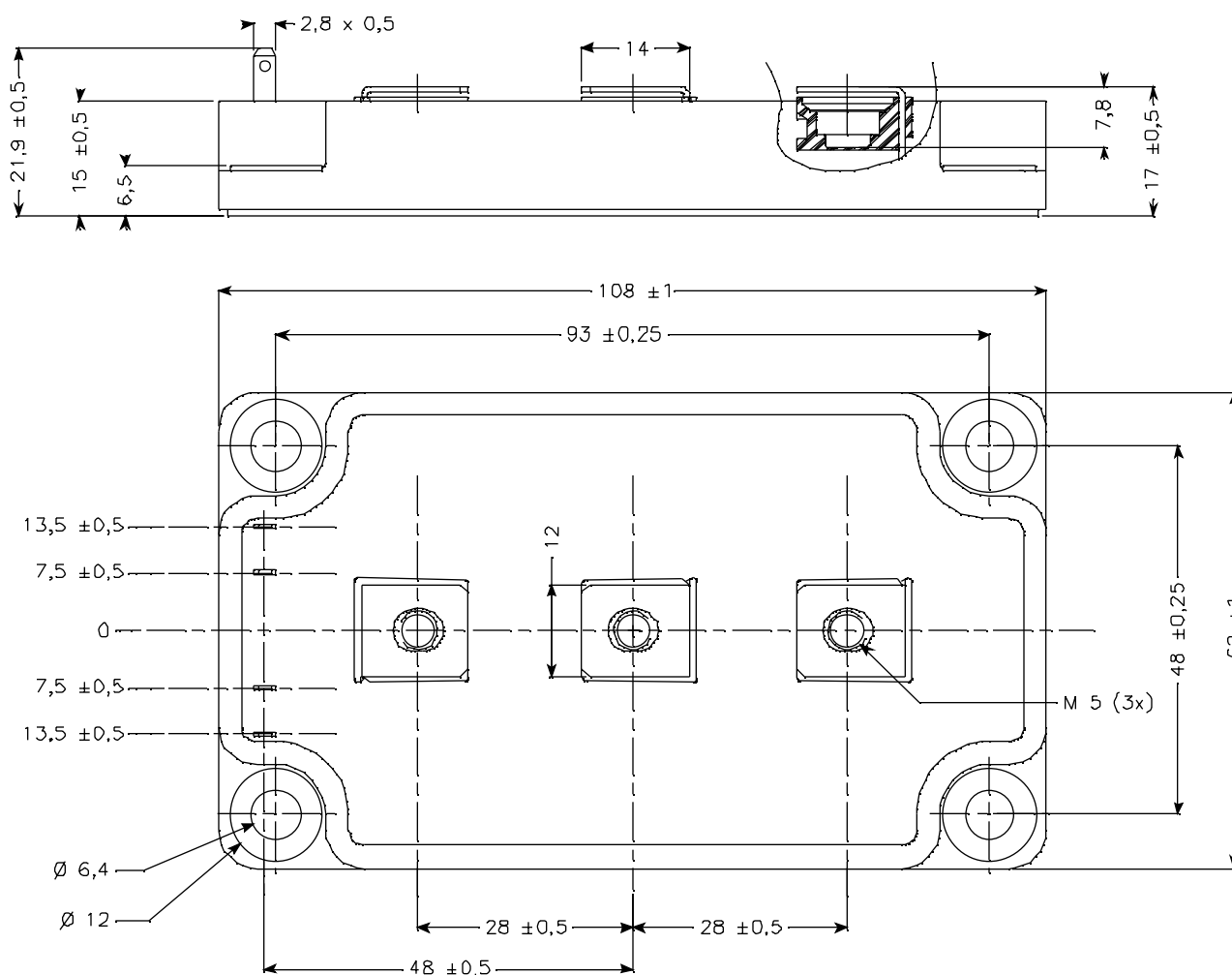
| Symbol       | Characteristic               | Test Conditions                                                                                                                             | Min                       | Typ  | Max | Unit |
|--------------|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|------|-----|------|
| $C_{ies}$    | Input Capacitance            | $V_{GE} = 0\text{V}$                                                                                                                        |                           | 26.5 |     | nF   |
| $C_{oes}$    | Output Capacitance           | $V_{CE} = 25\text{V}$                                                                                                                       |                           | 1.1  |     |      |
| $C_{res}$    | Reverse Transfer Capacitance | $f = 1\text{MHz}$                                                                                                                           |                           | 0.88 |     |      |
| $T_{d(on)}$  | Turn-on Delay Time           | Inductive Switching ( $25^\circ\text{C}$ )<br>$V_{GE} = 15\text{V}$<br>$V_{Bus} = 900\text{V}$<br>$I_C = 300\text{A}$<br>$R_G = 2.2\Omega$  |                           | 370  |     | ns   |
| $T_r$        | Rise Time                    |                                                                                                                                             |                           | 40   |     |      |
| $T_{d(off)}$ | Turn-off Delay Time          |                                                                                                                                             |                           | 650  |     |      |
| $T_f$        | Fall Time                    |                                                                                                                                             |                           | 180  |     |      |
| $T_{d(on)}$  | Turn-on Delay Time           | Inductive Switching ( $125^\circ\text{C}$ )<br>$V_{GE} = 15\text{V}$<br>$V_{Bus} = 900\text{V}$<br>$I_C = 300\text{A}$<br>$R_G = 2.2\Omega$ |                           | 400  |     | ns   |
| $T_r$        | Rise Time                    |                                                                                                                                             |                           | 50   |     |      |
| $T_{d(off)}$ | Turn-off Delay Time          |                                                                                                                                             |                           | 800  |     |      |
| $T_f$        | Fall Time                    |                                                                                                                                             |                           | 300  |     |      |
| $E_{on}$     | Turn-on Switching Energy     | $V_{GE} = 15\text{V}$<br>$V_{Bus} = 900\text{V}$<br>$I_C = 300\text{A}$<br>$R_G = 2.2\Omega$                                                | $T_j = 125^\circ\text{C}$ | 96   |     | mJ   |
| $E_{off}$    | Turn-off Switching Energy    |                                                                                                                                             | $T_j = 125^\circ\text{C}$ | 94   |     |      |

**Chopper diode ratings and characteristics**

| Symbol    | Characteristic                          | Test Conditions                                                                  | Min                                                   | Typ        | Max         | Unit          |
|-----------|-----------------------------------------|----------------------------------------------------------------------------------|-------------------------------------------------------|------------|-------------|---------------|
| $V_{RRM}$ | Maximum Peak Repetitive Reverse Voltage |                                                                                  | 1700                                                  |            |             | V             |
| $I_{RM}$  | Maximum Reverse Leakage Current         | $V_R = 1700\text{V}$                                                             | $T_j = 25^\circ\text{C}$<br>$T_j = 125^\circ\text{C}$ |            | 750<br>1000 | $\mu\text{A}$ |
| $I_F$     | DC Forward Current                      |                                                                                  | $T_c = 80^\circ\text{C}$                              | 300        |             | A             |
| $V_F$     | Diode Forward Voltage                   | $I_F = 300\text{A}$                                                              | $T_j = 25^\circ\text{C}$<br>$T_j = 125^\circ\text{C}$ | 1.8<br>1.9 | 2.2         | V             |
| $t_{rr}$  | Reverse Recovery Time                   | $I_F = 300\text{A}$<br>$V_R = 900\text{V}$<br>$di/dt = 3200\text{A}/\mu\text{s}$ | $T_j = 25^\circ\text{C}$<br>$T_j = 125^\circ\text{C}$ | 385<br>490 |             | ns            |
| $Q_{rr}$  | Reverse Recovery Charge                 |                                                                                  | $T_j = 25^\circ\text{C}$<br>$T_j = 125^\circ\text{C}$ | 76<br>124  |             | $\mu\text{C}$ |
| $E_r$     | Reverse Recovery Energy                 |                                                                                  | $T_j = 25^\circ\text{C}$<br>$T_j = 125^\circ\text{C}$ | 35<br>70   |             | mJ            |

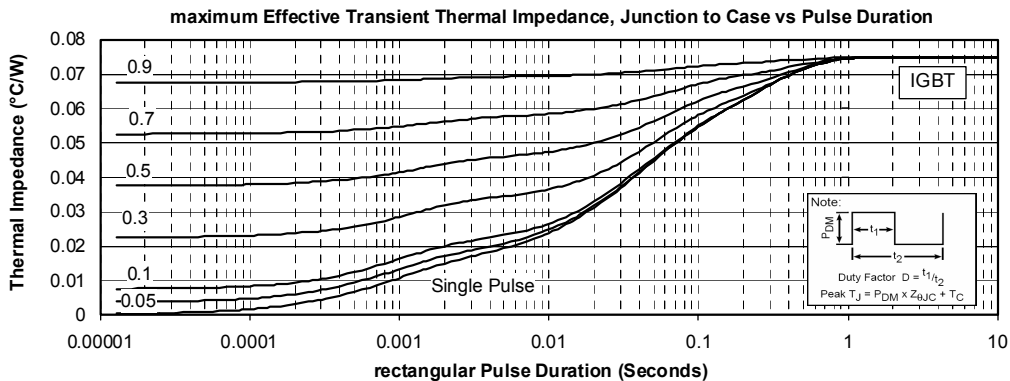
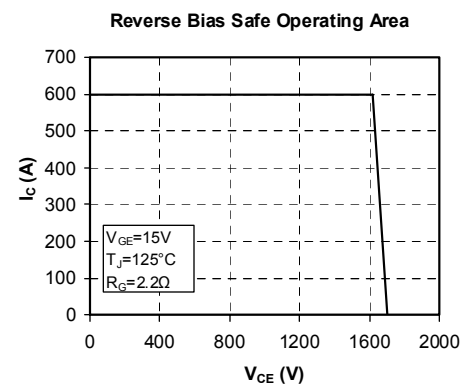
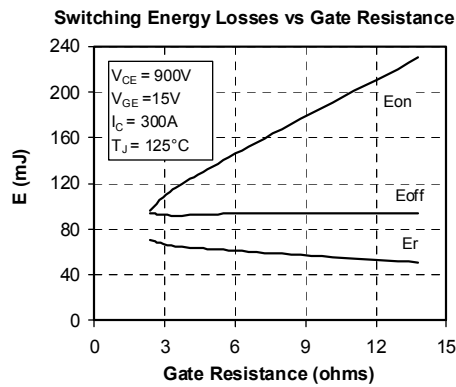
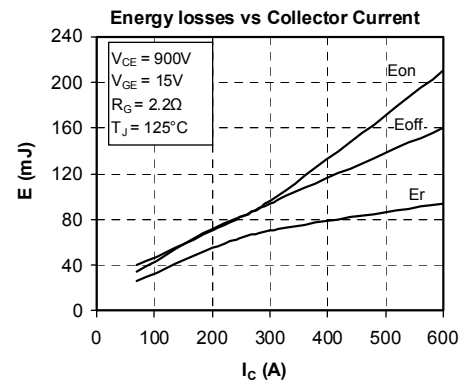
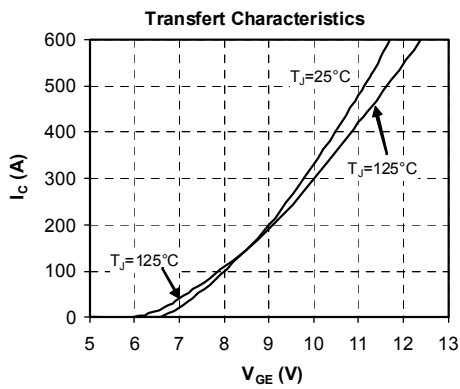
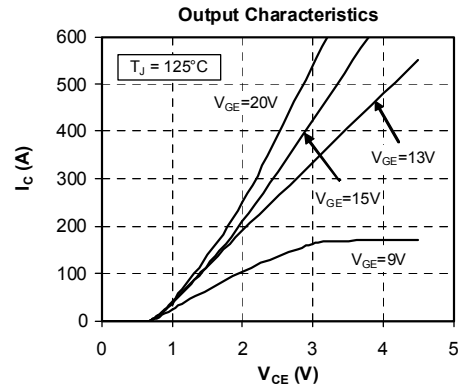
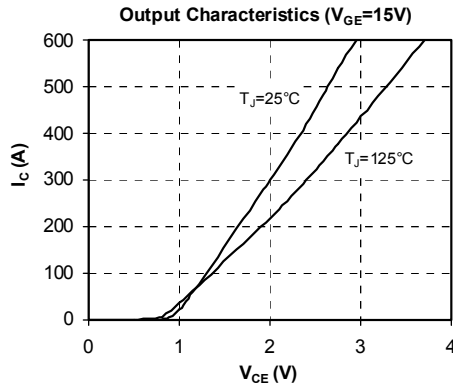
**Thermal and package characteristics**

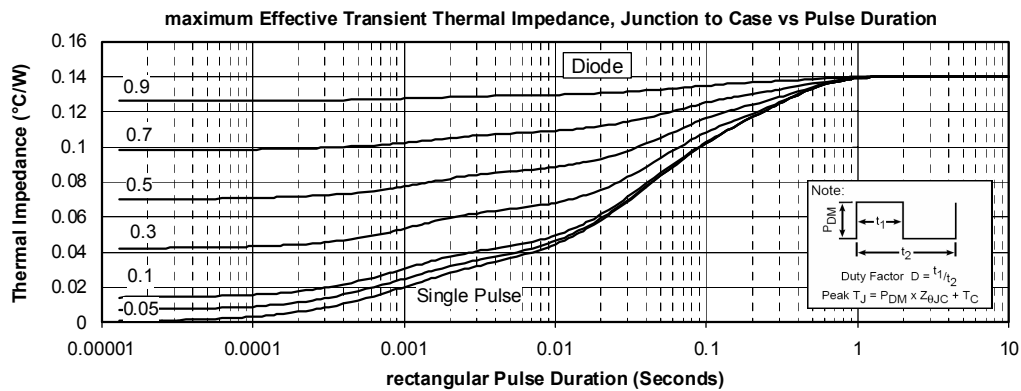
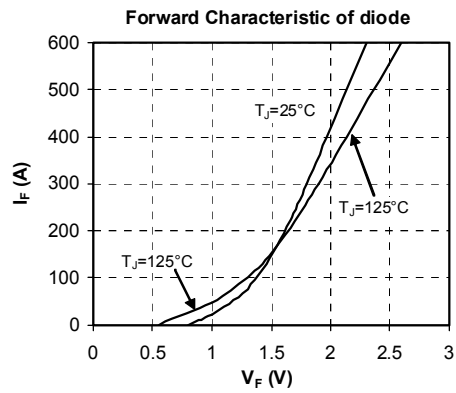
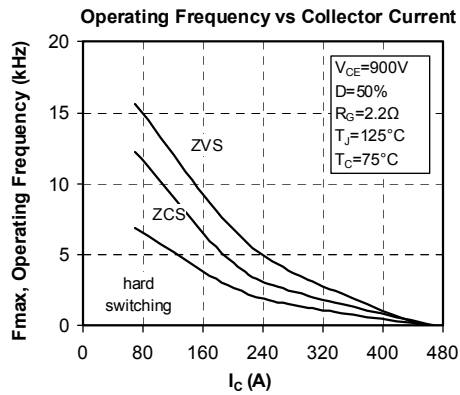
| Symbol            | Characteristic                                                                          | Min           | Typ | Max   | Unit |
|-------------------|-----------------------------------------------------------------------------------------|---------------|-----|-------|------|
| R <sub>thJC</sub> | Junction to Case Thermal Resistance                                                     | IGBT          |     | 0.075 | °C/W |
|                   |                                                                                         | Diode         |     | 0.14  |      |
| V <sub>ISOL</sub> | RMS Isolation Voltage, any terminal to case t = 1 min, I <sub>isol</sub> < 1mA, 50/60Hz | 3500          |     |       | 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     | N.m  |
|                   |                                                                                         | For terminals | M5  | 2     |      |
| 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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