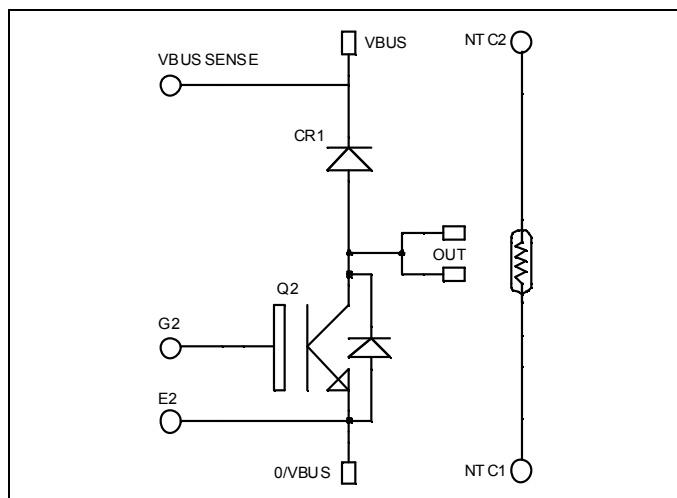


**Boost chopper  
Fast Trench + Field Stop IGBT®  
Power Module**

$$V_{CES} = 1200V$$

$$I_C = 150A @ T_c = 80^{\circ}C$$

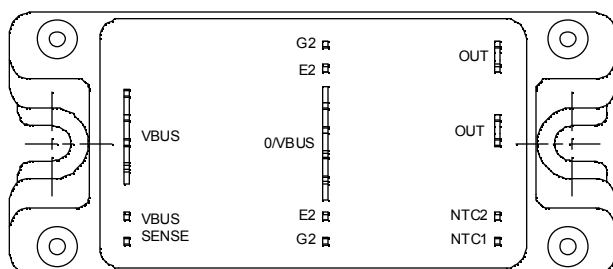


## Application

- AC and DC motor control
- Switched Mode Power Supplies
- Power Factor Correction

## 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
  - Lead frames for power connections
- High level of integration
- Internal thermistor for temperature monitoring



## Benefits

- Stable temperature behavior
- Very rugged
- Solderable terminals for easy PCB mounting
- 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          | $T_c = 25^{\circ}C$<br>220<br>$T_c = 80^{\circ}C$<br>150 | A    |
| $I_{CM}$  | Pulsed Collector Current              | $T_c = 25^{\circ}C$<br>350                               |      |
| $V_{GE}$  | Gate - Emitter Voltage                | $\pm 20$                                                 | V    |
| $P_D$     | Maximum Power Dissipation             | $T_c = 25^{\circ}C$<br>690                               | W    |
| RBSOA     | Reverse Bias Safe Operating Area      | $T_j = 125^{\circ}C$<br>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>$I_C = 150\text{A}$   | $T_j = 25^\circ\text{C}$<br>$T_j = 125^\circ\text{C}$ | 1.7<br>2.0 | 2.1 | V             |
| $V_{GE(th)}$  | 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   |     |      |

## Chopper 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         | $V_R = 1200\text{V}$                                                             | $T_j = 25^\circ\text{C}$<br>$T_j = 125^\circ\text{C}$ |            | 250<br>500 | $\mu\text{A}$ |
| $I_F$     | DC Forward Current                      |                                                                                  | $T_c = 80^\circ\text{C}$                              | 150        |            | A             |
| $V_F$     | Diode Forward Voltage                   | $I_F = 150\text{A}$                                                              | $T_j = 25^\circ\text{C}$<br>$T_j = 125^\circ\text{C}$ | 1.6<br>1.6 | 2.1        | V             |
| $t_{rr}$  | Reverse Recovery Time                   | $I_F = 150\text{A}$<br>$V_R = 600\text{V}$<br>$di/dt = 3000\text{A}/\mu\text{s}$ | $T_j = 25^\circ\text{C}$                              | 170        |            | ns            |
|           |                                         |                                                                                  | $T_j = 125^\circ\text{C}$                             | 280        |            |               |
| $Q_{rr}$  | Reverse Recovery Charge                 |                                                                                  | $T_j = 25^\circ\text{C}$                              | 15         |            | $\mu\text{C}$ |
|           |                                         |                                                                                  | $T_j = 125^\circ\text{C}$                             | 29         |            |               |
| $E_r$     | Reverse Recovery Energy                 |                                                                                  | $T_j = 25^\circ\text{C}$<br>$T_j = 125^\circ\text{C}$ | 7<br>12    |            | mJ            |

**Temperature sensor NTC** (see application note APT0406 on [www.microsemi.com](http://www.microsemi.com) for more information).

| Symbol             | Characteristic             | Min | Typ  | Max | Unit |
|--------------------|----------------------------|-----|------|-----|------|
| R <sub>25</sub>    | Resistance @ 25°C          |     | 50   |     | kΩ   |
| B <sub>25/85</sub> | T <sub>25</sub> = 298.15 K |     | 3952 |     | K    |

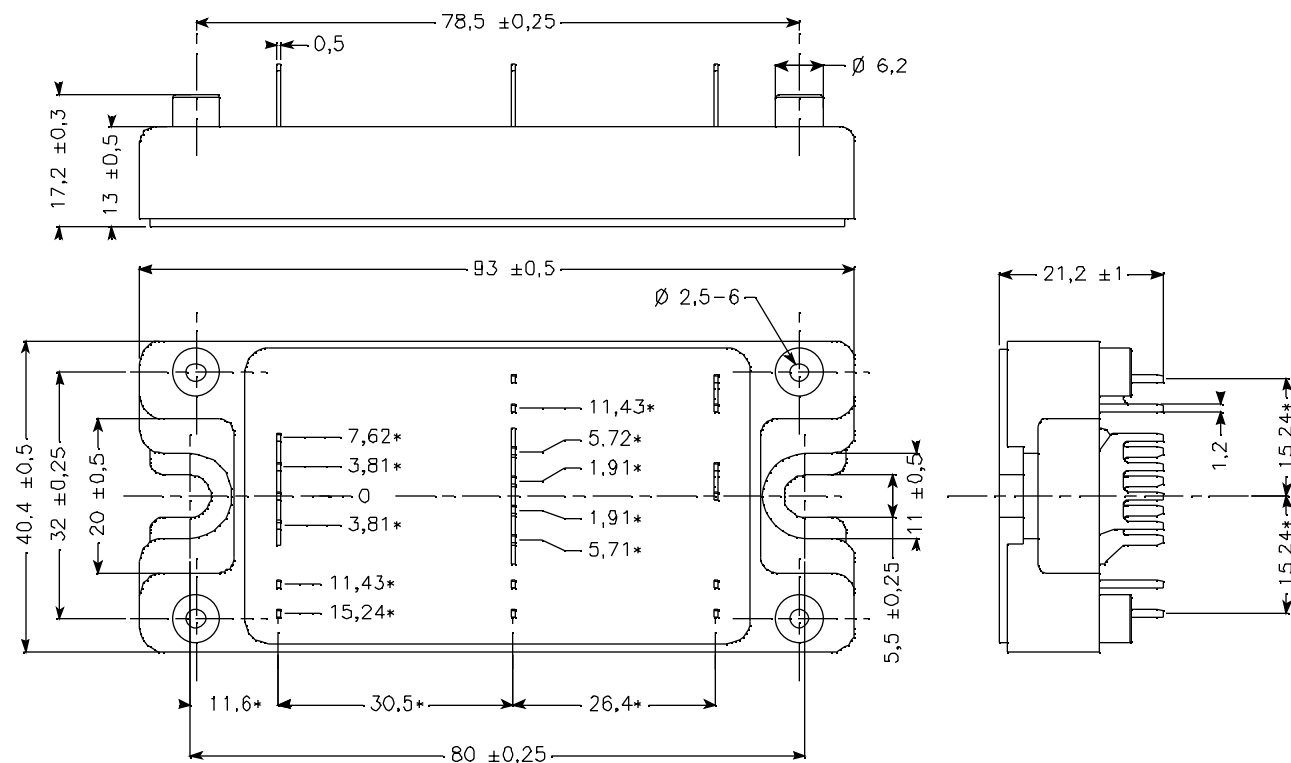
$$R_T = \frac{R_{25}}{\exp \left[ B_{25/85} \left( \frac{1}{T_{25}} - \frac{1}{T} \right) \right]}$$

T: Thermistor temperature  
R<sub>T</sub>: Thermistor value at T

## Thermal and package characteristics

| Symbol            | Characteristic                                                            |             |    | Min   | Typ | Max  | Unit |
|-------------------|---------------------------------------------------------------------------|-------------|----|-------|-----|------|------|
| R <sub>thJC</sub> | Junction to Case Thermal Resistance                                       |             |    | IGBT  |     | 0.18 | °C/W |
|                   |                                                                           |             |    | Diode |     | 0.34 |      |
| V <sub>ISOL</sub> | RMS Isolation Voltage, any terminal to case t =1 min, I isol<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   |     | 125  |      |
| Torque            | Mounting torque                                                           | To Heatsink | M5 | 2.5   |     | 4.7  | N.m  |
| Wt                | Package Weight                                                            |             |    |       |     | 160  | g    |

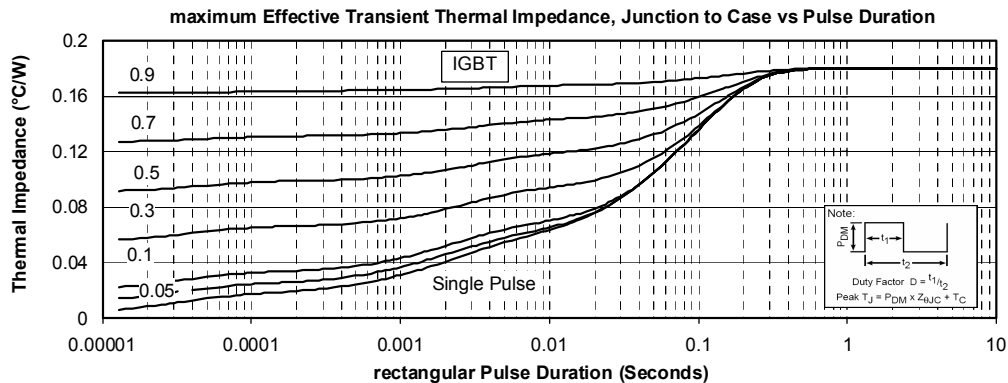
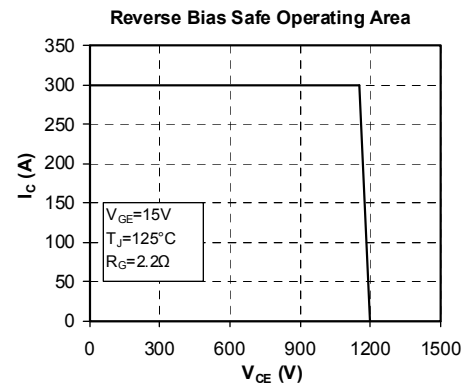
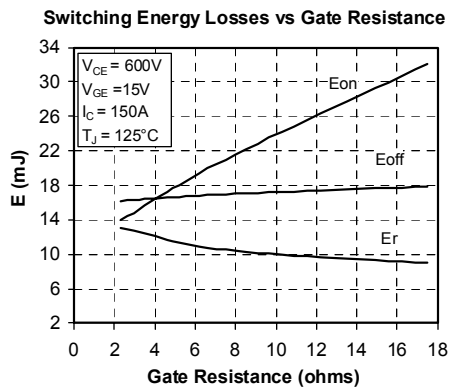
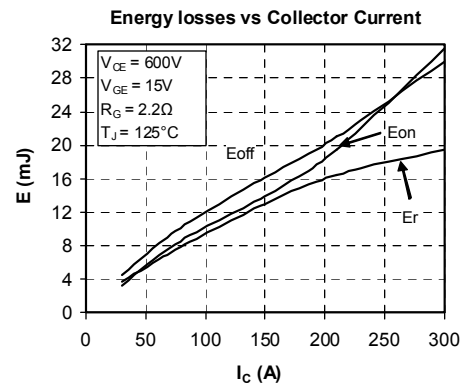
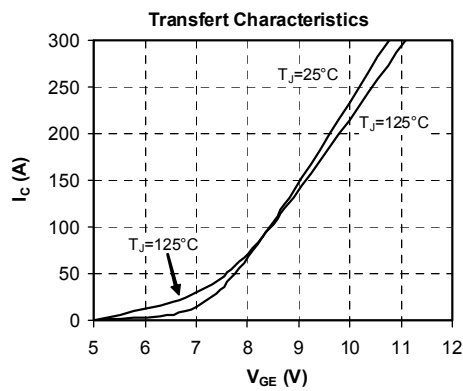
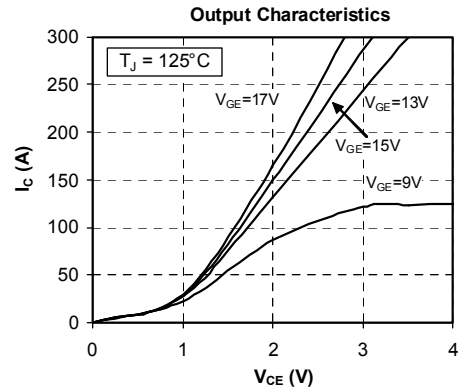
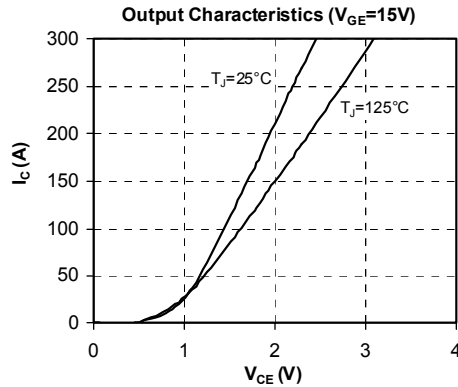
## SP4 Package outline (dimensions in mm)

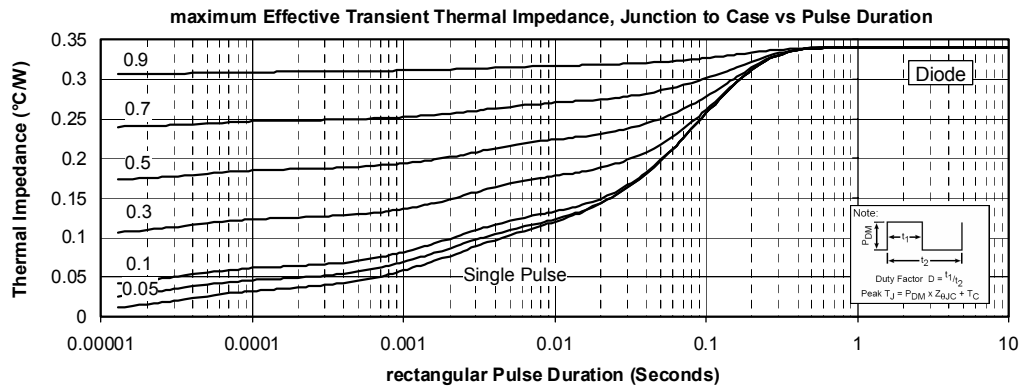
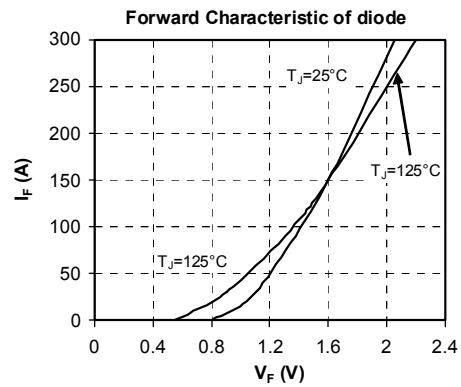
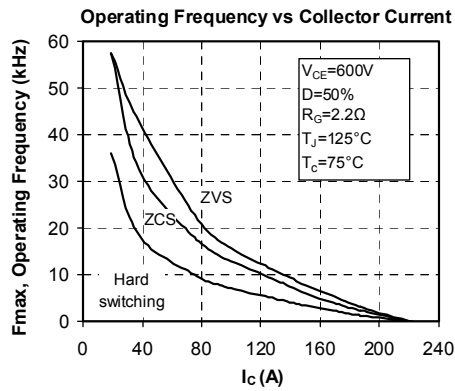


ALL DIMENSIONS MARKED "\*" ARE TOLERENCED AS:  $\pm 0.1$

See application note APT0501 - Mounting Instructions for SP4 Power Modules on [www.microsemi.com](http://www.microsemi.com)

## Typical Performance Curve





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