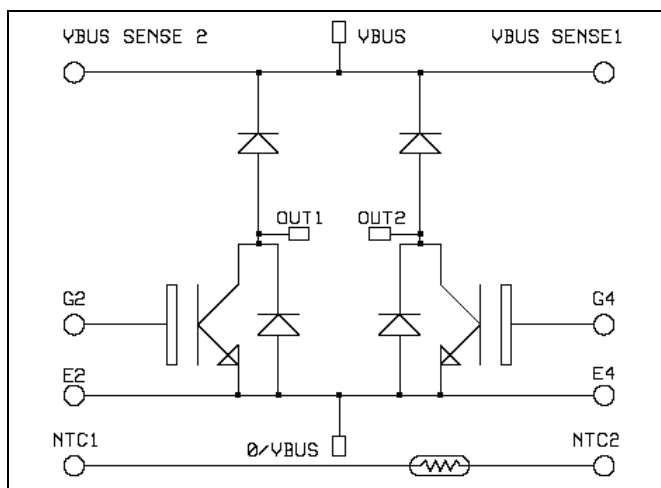


## Dual Boost Chopper NPT IGBT Power Module

**$V_{CES} = 1200V$**   
 **$I_C = 75A @ T_c = 80^\circ C$**



### Application

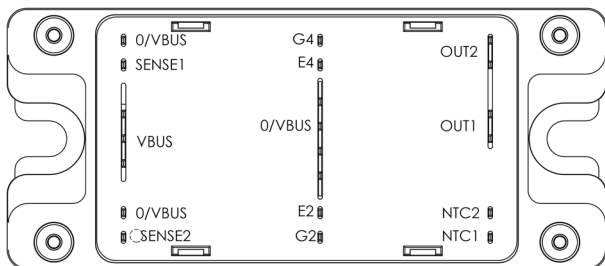
- AC and DC motor control
- Switched Mode Power Supplies
- Power factor correction

### 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
  - RBSOA and SCSOA rated
- Kelvin emitter for easy drive
- Very low stray inductance
  - Symmetrical design
  - Lead frames for power connections
- Internal thermistor for temperature monitoring
- 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
- Solderable terminals both for power and signal for easy PCB mounting
- 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          | $T_c = 25^\circ C$<br>100<br>$T_c = 80^\circ C$<br>75 | A    |
| $I_{CM}$  | Pulsed Collector Current              | $T_c = 25^\circ C$<br>150                             |      |
| $V_{GE}$  | Gate - Emitter Voltage                | $\pm 20$  | V    |
| $P_D$     | Maximum Power Dissipation             | $T_c = 25^\circ C$<br>500                             | W    |
| RBSOA     | Reverse Bias Safe Operating Area      | $T_j = 150^\circ C$<br>150A @ 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  | $V_{GE} = 0V$<br>$V_{CE} = 1200V$      | $T_j = 25^\circ\text{C}$<br>$T_j = 125^\circ\text{C}$ |     |            | 250<br>500 | $\mu\text{A}$ |
| $V_{CE(sat)}$ | Collector Emitter saturation Voltage | $V_{GE} = 15V$<br>$I_C = 75A$          | $T_j = 25^\circ\text{C}$<br>$T_j = 125^\circ\text{C}$ |     | 3.2<br>3.9 | 3.7        | V             |
| $V_{GE(th)}$  | Gate Threshold Voltage               | $V_{GE} = V_{CE}, I_C = 2.5\text{ mA}$ |   | 4.5 |            | 6.5        | V             |
| $I_{GES}$     | Gate – Emitter Leakage Current       | $V_{GE} = \pm 20V, V_{CE} = 0V$        |   |     |            | $\pm 500$  | nA            |

**Dynamic Characteristics**

| Symbol       | Characteristic               | Test Conditions   |                           | Min | Typ | Max | Unit |
|--------------|------------------------------|---|---------------------------|-----|-----|-----|------|
| $C_{ies}$    | Input Capacitance            | $V_{GE} = 0V$   |                           |     | 5.1 |     | nF   |
| $C_{oes}$    | Output Capacitance           | $V_{CE} = 25V$  |                           |     | 0.7 |     |      |
| $C_{res}$    | Reverse Transfer Capacitance | $f = 1\text{MHz}$   |                           |     | 0.4 |     |      |
| $T_{d(on)}$  | Turn-on Delay Time           | Inductive Switching ( $25^\circ\text{C}$ )<br>$V_{GE} = 15V$<br>$V_{Bus} = 600V$<br>$I_C = 75A$<br>$R_G = 7.5\Omega$  |                           |     | 120 |     | ns   |
| $T_r$        | Rise Time                    |   |                           |     | 50  |     |      |
| $T_{d(off)}$ | Turn-off Delay Time          |   |                           |     | 310 |     |      |
| $T_f$        | Fall Time                    |   |                           |     | 20  |     |      |
| $T_{d(on)}$  | Turn-on Delay Time           | Inductive Switching ( $125^\circ\text{C}$ )<br>$V_{GE} = 15V$<br>$V_{Bus} = 600V$<br>$I_C = 75A$<br>$R_G = 7.5\Omega$ |                           |     | 130 |     | ns   |
| $T_r$        | Rise Time                    |   |                           |     | 60  |     |      |
| $T_{d(off)}$ | Turn-off Delay Time          |   |                           |     | 360 |     |      |
| $T_f$        | Fall Time                    |   |                           |     | 30  |     |      |
| $E_{on}$     | Turn-on Switching Energy     | $V_{GE} = 15V$<br>$V_{Bus} = 600V$  | $T_j = 125^\circ\text{C}$ |     | 9   |     | mJ   |
| $E_{off}$    | Turn-off Switching Energy    | $I_C = 75A$<br>$R_G = 7.5\Omega$  | $T_j = 125^\circ\text{C}$ |     | 4   |     |      |

**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         | $V_R = 1200V$  | $T_j = 25^\circ\text{C}$<br>$T_j = 125^\circ\text{C}$ |      |     | 250<br>500 | $\mu\text{A}$ |
| $I_F$     | DC Forward Current                      |  | $T_c = 70^\circ\text{C}$                              |      | 100 |            | A             |
| $V_F$     | Diode Forward Voltage                   | $I_F = 100A$   |   |      | 2.0 | 2.5        | V             |
|           |   | $I_F = 200A$   |   |      | 2.3 |            |               |
|           |   | $I_F = 100A$   | $T_j = 125^\circ\text{C}$                             |      | 1.8 |            |               |
| $t_{rr}$  | Reverse Recovery Time                   | $I_F = 100A$<br>$V_R = 800V$<br>$di/dt = 200A/\mu s$ | $T_j = 25^\circ\text{C}$                              |      | 420 |            | ns            |
|           |   |  | $T_j = 125^\circ\text{C}$                             |      | 580 |            |               |
| $Q_{rr}$  | Reverse Recovery Charge                 |  | $T_j = 25^\circ\text{C}$                              |      | 1.2 |            | $\mu\text{C}$ |
|           |   |  | $T_j = 125^\circ\text{C}$                             |      | 5.3 |            |               |

**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    |

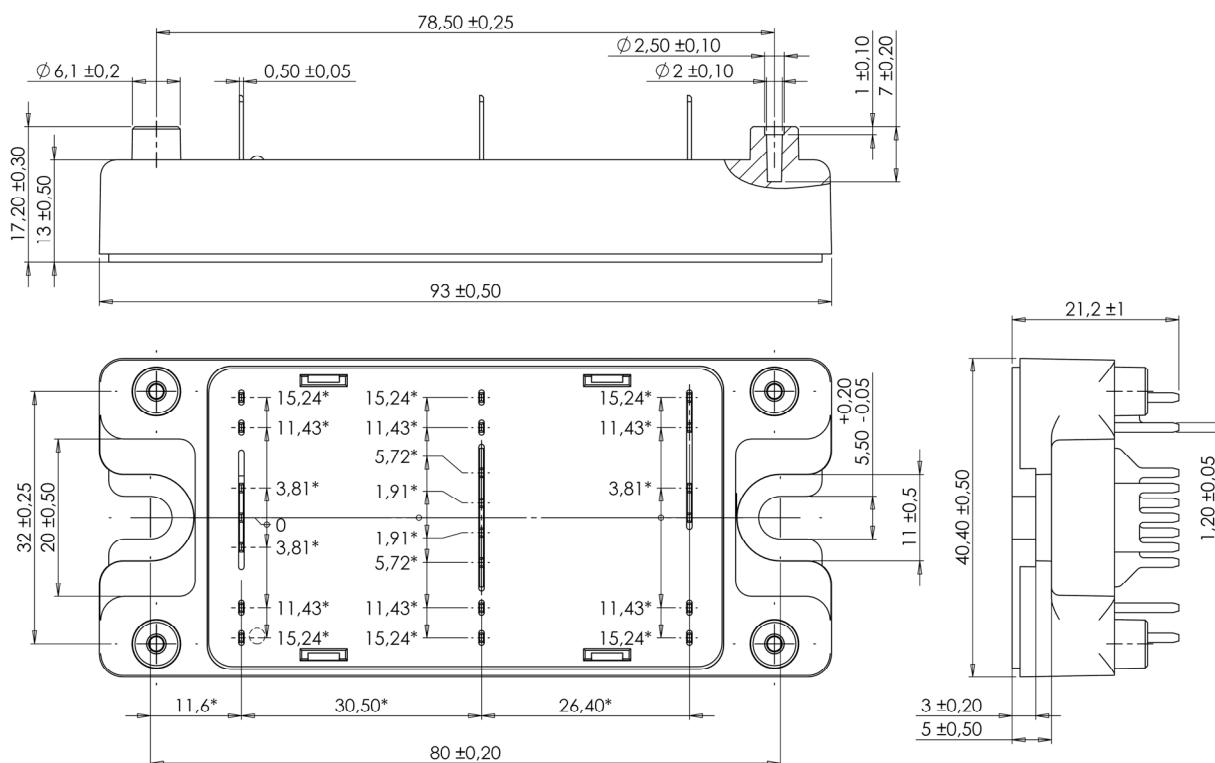
$$R_T = \frac{R_{25}}{\exp \left[ B_{25/85} \left( \frac{1}{T_{25}} - \frac{1}{T} \right) \right]}$$

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  |     | 0.25 | °C/W |
|                   |   |             |    | Diode |     | 0.6  |      |
| V <sub>ISOL</sub> | RMS Isolation Voltage, any terminal to case t =1 min, 50/60Hz |             |    | 4000  |     |      | 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 | M5 | 2.5   |     | 4.7  | N.m  |
| Wt                | Package Weight  |             |    |       |     | 160  | g    |

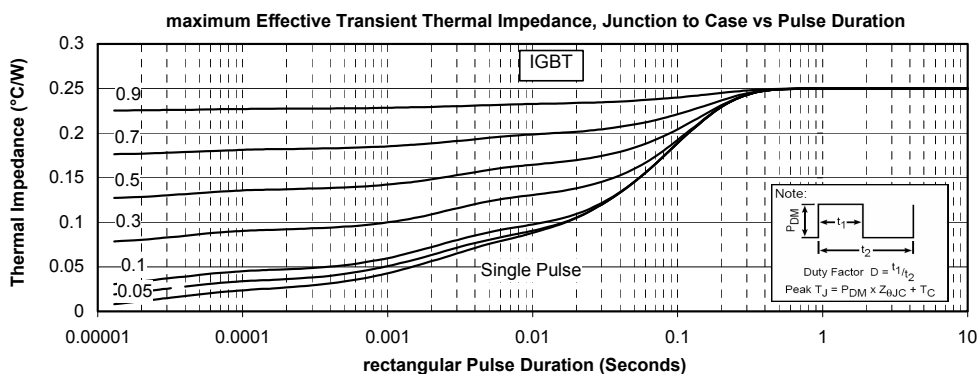
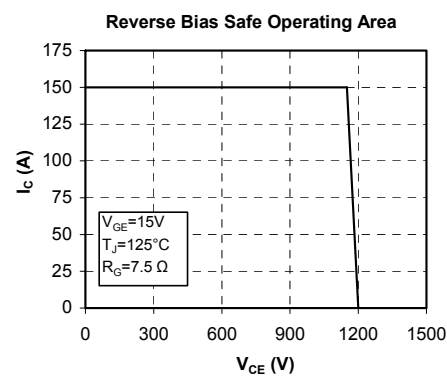
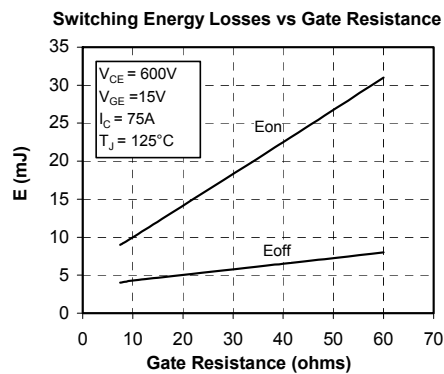
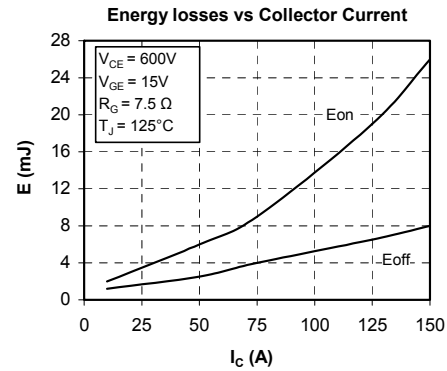
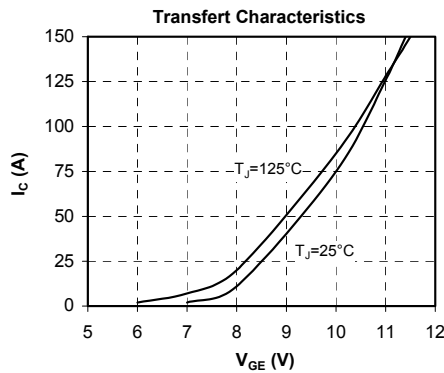
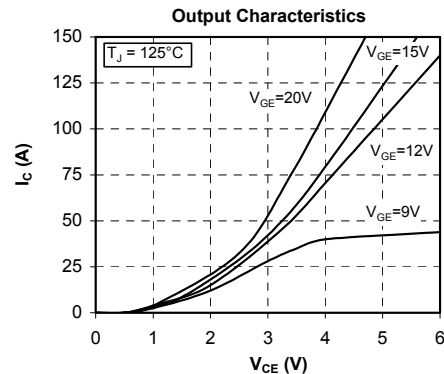
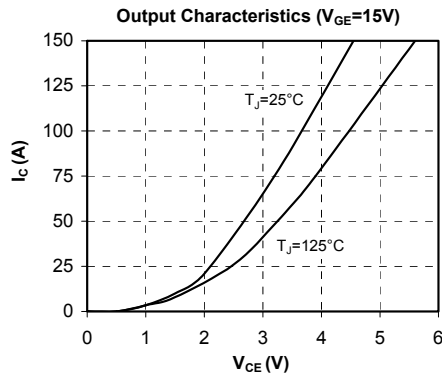
## SP4 Package outline (dimensions in mm)

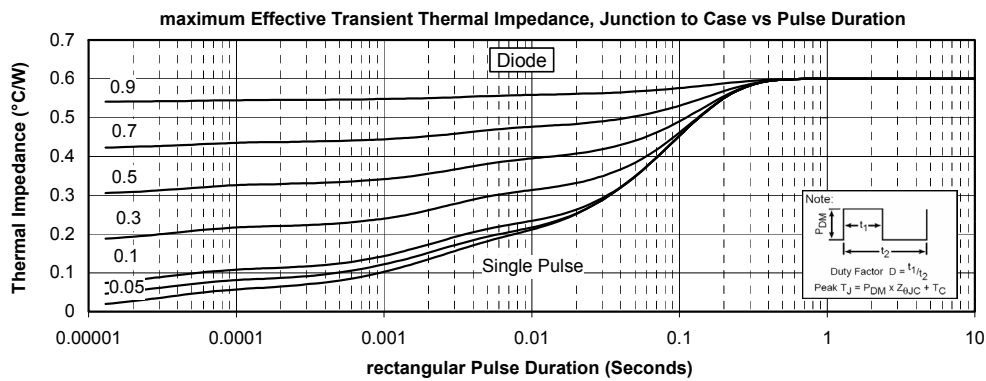
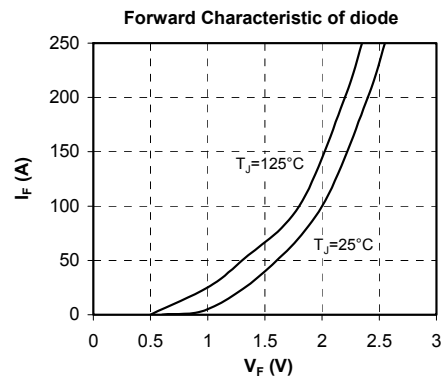
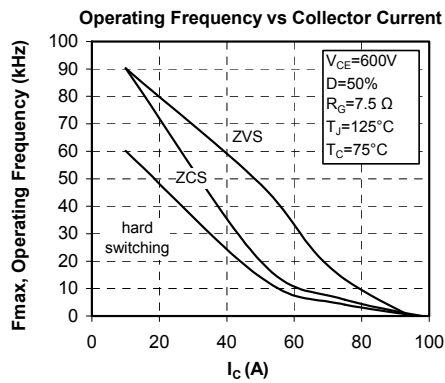


ALL DIMENSIONS MARKED \* ARE TOLERANCED AS:  $\pm 0.1$

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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