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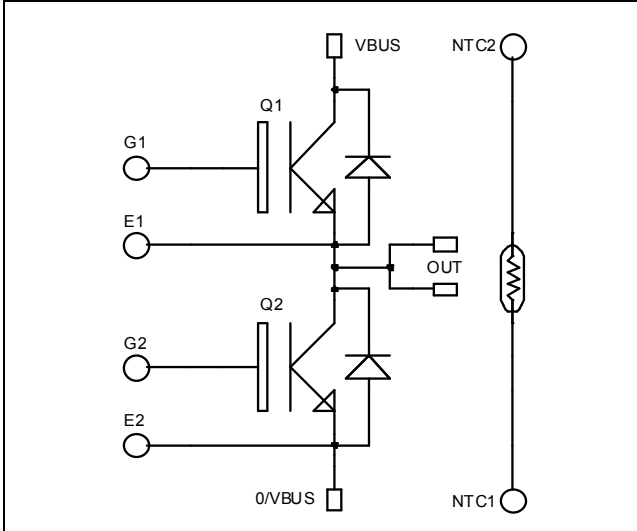
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**Phase leg  
High speed Trench + Field Stop IGBT4  
Power Module**

**$V_{CES} = 1200V$   
 $I_C = 100A @ T_c = 80^\circ C$**


**Application**

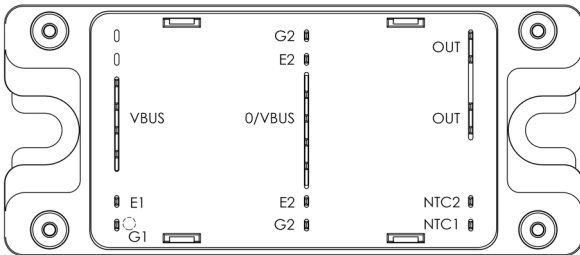
- Welding converters
- Switched Mode Power Supplies
- Uninterruptible Power Supplies
- Motor control

**Features**

- **High speed Trench + Field Stop IGBT 4 Technology**
  - Low voltage drop
  - Low leakage current
  - Low switching losses
- Kelvin emitter for easy drive
- Very low stray inductance
- Lead frames for power connections
- 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  $T_C$  of  $V_{CESat}$
- Low profile
- RoHS Compliant



**All ratings @  $T_j = 25^\circ C$  unless otherwise specified**

**Absolute maximum ratings (Per IGBT)**

| Symbol    | Parameter                    | Max ratings        | Unit |
|-----------|------------------------------|--------------------|------|
| $V_{CES}$ | Collector - Emitter Voltage  | 1200               | V    |
| $I_C$     | Continuous Collector Current | $T_C = 25^\circ C$ | 170  |
|           |                              | $T_C = 80^\circ C$ | 100  |
| $I_{CM}$  | Pulsed Collector Current     | $T_C = 25^\circ C$ | 340  |
| $V_{GE}$  | Gate - Emitter Voltage       | $\pm 20$           | V    |
| $P_D$     | Power Dissipation            | 520                | W    |

 **CAUTION:** These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed.

**Electrical Characteristics (Per IGBT)**

| Symbol        | Characteristic                       | Test Conditions                           | Min  | Typ  | Max  | Unit    |
|---------------|--------------------------------------|---|------|------|------|---------|
| $I_{CES}$     | Zero Gate Voltage Collector Current  | $V_{GE} = 0V, V_{CE} = 1200V$             |      |      | 50   | $\mu A$ |
| $V_{CE(sat)}$ | Collector Emitter Saturation Voltage | $V_{GE} = 15V$<br>$I_C = 100A$            | 1.78 | 2.05 | 2.42 | V       |
|               |                                      | $T_j = 25^\circ C$<br>$T_j = 150^\circ C$ |      | 2.6  |      |         |
| $V_{GE(th)}$  | Gate Threshold Voltage               | $V_{GE} = V_{CE}, I_C = 3.8 mA$           | 5.1  | 5.8  | 6.4  | V       |
| $I_{GES}$     | Gate – Emitter Leakage Current       | $V_{GE} = 20V, V_{CE} = 0V$               |      |      | 150  | nA      |

**Dynamic Characteristics (Per IGBT)**

| Symbol       | Characteristic                      | Test Conditions  | Min | Typ  | Max  | Unit         |
|--------------|-------------------------------------|--|-----|------|------|--------------|
| $C_{ies}$    | Input Capacitance                   | $V_{GE} = 0V$<br>$V_{CE} = 25V$<br>$f = 1MHz$  |     | 6150 |      | pF           |
| $C_{oes}$    | Output Capacitance                  |  |     | 460  |      |              |
| $C_{res}$    | Reverse Transfer Capacitance        |  |     | 345  |      |              |
| $Q_G$        | Gate charge                         | $V_{GE} = 15V, I_C = 100A$<br>$V_{CE} = 960V$  |     | 460  |      | nC           |
| $T_{d(on)}$  | Turn-on Delay Time                  | Inductive Switching (25°C)<br>$V_{GE} = \pm 15V$<br>$V_{Bus} = 600V$<br>$I_C = 100A$<br>$R_G = 5\Omega$  |     | 30   |      | ns           |
| $T_r$        | Rise Time                           |  |     | 57   |      |              |
| $T_{d(off)}$ | Turn-off Delay Time                 |  |     | 290  |      |              |
| $T_f$        | Fall Time                           |  |     | 16   |      |              |
| $T_{d(on)}$  | Turn-on Delay Time                  | Inductive Switching (150°C)<br>$V_{GE} = \pm 15V$<br>$V_{Bus} = 600V$<br>$I_C = 100A$<br>$R_G = 5\Omega$ |     | 30   |      | ns           |
| $T_r$        | Rise Time                           |  |     | 49   |      |              |
| $T_{d(off)}$ | Turn-off Delay Time                 |  |     | 366  |      |              |
| $T_f$        | Fall Time                           |  |     | 48   |      |              |
| $E_{on}$     | Turn on Energy                      | $V_{GE} = \pm 15V$<br>$V_{Bus} = 600V$<br>$I_C = 100A$   |     | 9.5  |      | mJ           |
| $E_{off}$    | Turn off Energy                     | $R_G = 5\Omega$  |     | 5.6  |      |              |
| $R_G$        | Integrated gate resistor            |  |     | 7.5  |      | $\Omega$     |
| $I_{sc}$     | Short Circuit data                  | $V_{GE} \leq 15V; V_{Bus} = 600V$<br>$t_p \leq 10\mu s; T_j = 150^\circ C$                               |     | 350  |      | A            |
| $R_{thJC}$   | Junction to Case Thermal Resistance |  |     |      | 0.29 | $^\circ C/W$ |

**Diode ratings and characteristics (per diode)**

| Symbol     | Characteristic                      | Test Conditions                                      | Min                 | Typ | Max  | Unit         |
|------------|-------------------------------------|--|---------------------|-----|------|--------------|
| $V_{RRM}$  | Peak Repetitive Reverse Voltage     |  |                     |     | 1200 | V            |
| $I_{RM}$   | Reverse Leakage Current             | $V_R = 1200V$  |                     |     | 100  | $\mu A$      |
| $I_F$      | DC Forward Current                  | $T_c = 60^\circ C$                                   |                     | 100 |      | A            |
| $V_F$      | Diode Forward Voltage               | $I_F = 100A$   |                     | 2.4 | 3.5  | V            |
|            |                                     | $I_F = 150A$   |                     | 2.7 |      |              |
|            |                                     | $I_F = 100A$   | $T_j = 125^\circ C$ |     | 1.8  |              |
| $t_{rr}$   | Reverse Recovery Time               | $I_F = 100A$<br>$V_R = 800V$<br>$di/dt = 200A/\mu s$ | $T_j = 25^\circ C$  |     | 385  | ns           |
|            |                                     |  | $T_j = 125^\circ C$ |     | 480  |              |
| $Q_{rr}$   | Reverse Recovery Charge             | $I_F = 100A$<br>$V_R = 800V$<br>$di/dt = 200A/\mu s$ | $T_j = 25^\circ C$  |     | 1.05 | $\mu C$      |
|            |                                     |  | $T_j = 125^\circ C$ |     | 5.24 |              |
| $R_{thJC}$ | Junction to Case Thermal Resistance |  |                     |     | 0.35 | $^\circ C/W$ |



**Temperature sensor NTC** (see application note APT0406 on www.microsemi.com).

| Symbol                            | Characteristic             | Min | Typ  | Max | Unit |
|-----------------------------------|----------------------------|-----|------|-----|------|
| R <sub>25</sub>                   | Resistance @ 25°C          |     | 50   |     | kΩ   |
| ΔR <sub>25</sub> /R <sub>25</sub> |                            |     | 5    |     | %    |
| B <sub>25/85</sub>                | T <sub>25</sub> = 298.15 K |     | 3952 |     | K    |
| ΔB/B                              | T <sub>C</sub> = 100°C     |     | 4    |     | %    |

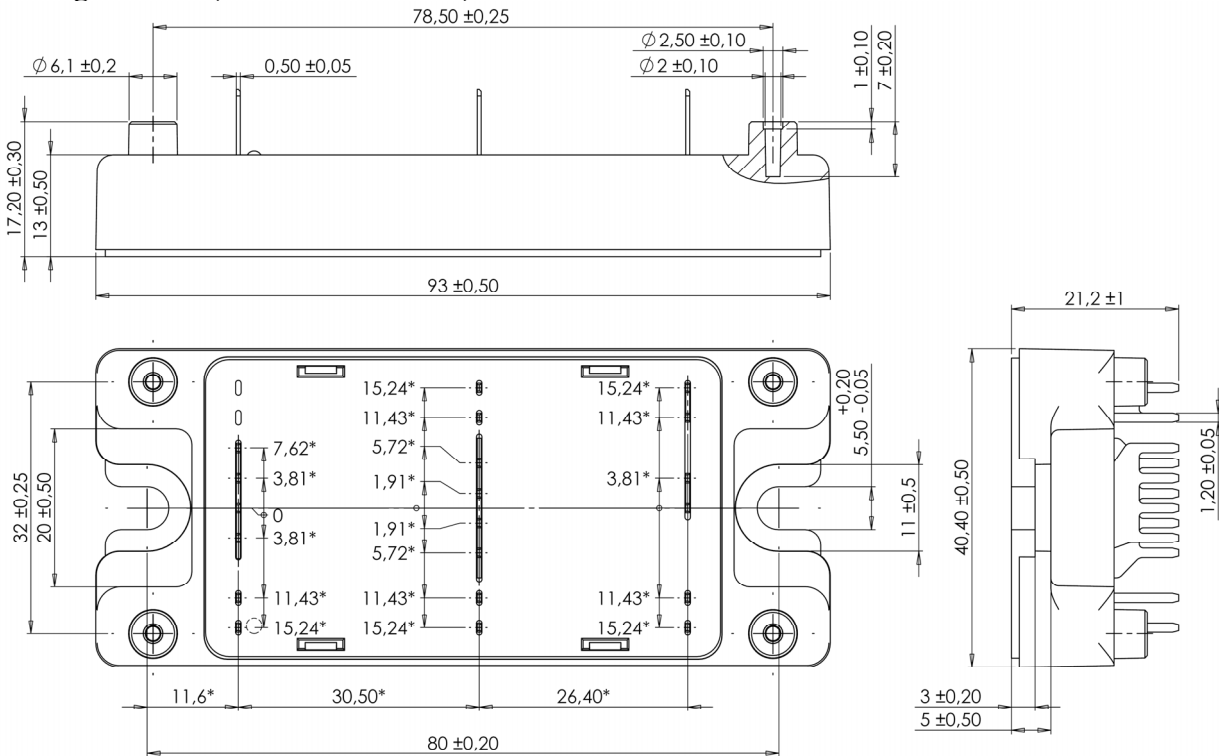
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

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

### Thermal and package characteristics

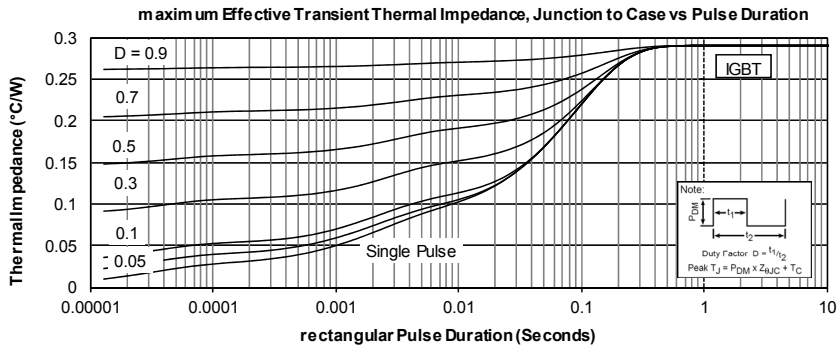
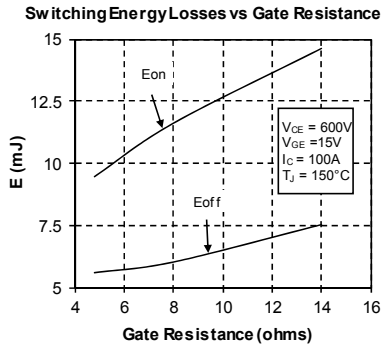
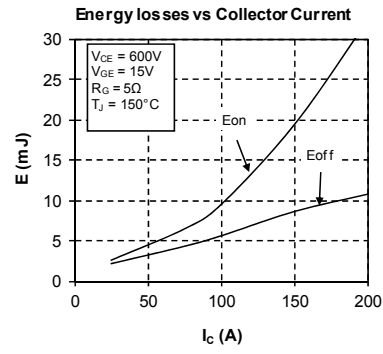
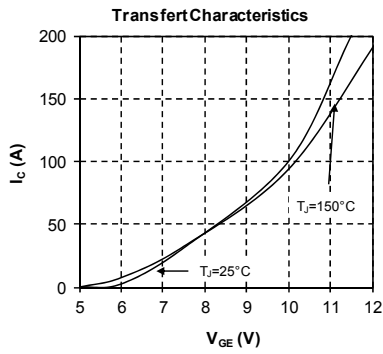
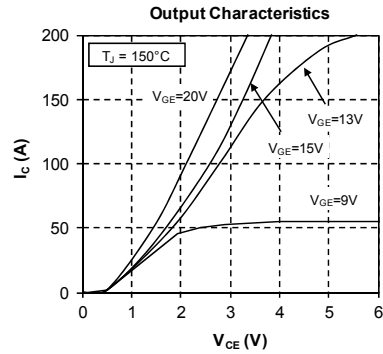
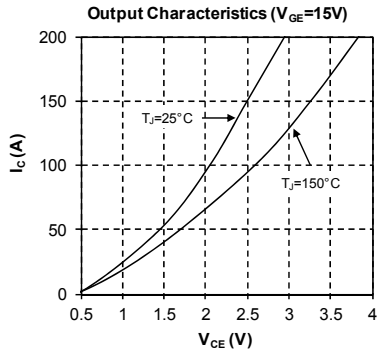
| Symbol            | Characteristic   | Min         | Max                    | Unit |
|-------------------|--|-------------|------------------------|------|
| V <sub>ISOL</sub> | RMS Isolation Voltage, any terminal to case t = 1 min, 50/60Hz | 4000        |                        | V    |
| T <sub>J</sub>    | Operating junction temperature range                           | -40         | 175                    | °C   |
| T <sub>JOP</sub>  | Recommended junction temperature under switching conditions    | -40         | T <sub>Jmax</sub> - 25 |      |
| T <sub>STG</sub>  | Storage Temperature Range                                      | -40         | 125                    |      |
| T <sub>C</sub>    | Operating Case Temperature                                     | -40         | 125                    |      |
| Torque            | Mounting torque  | To heatsink | M5                     |      |
| Wt                | Package Weight   |             | 160                    | g    |

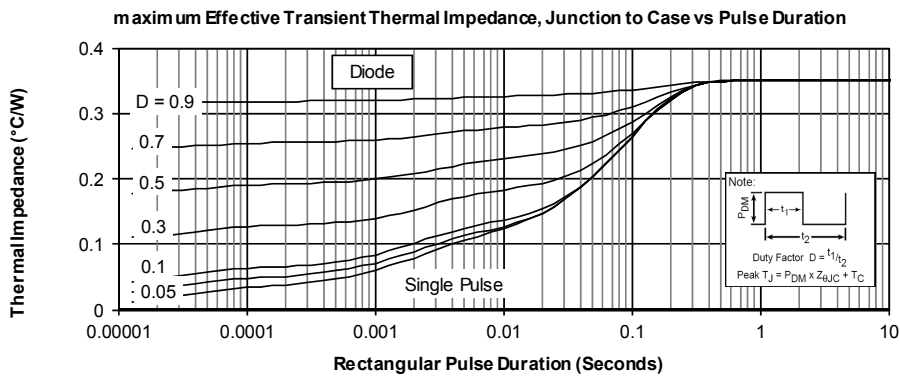
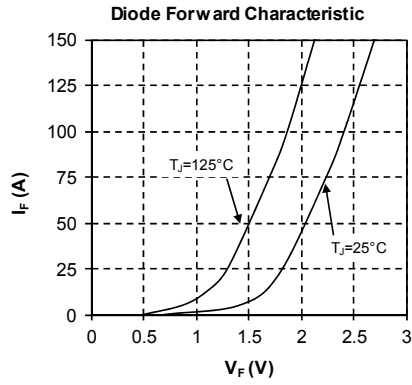
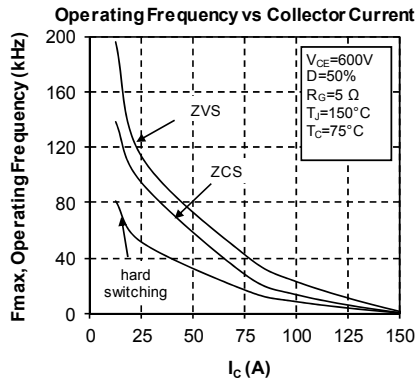
### Package outline (dimensions in mm)



ALL DIMENSIONS MARKED "\*" ARE TOLERANCED AS :  $\pm \phi 1$

See application note APT0501 - Mounting Instructions for SP4 Power Modules on www.microsemi.com

**Typical performance curve**




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