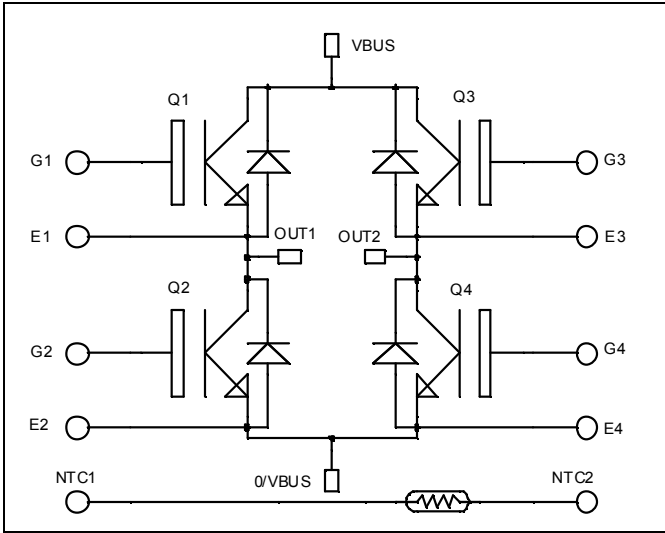


**Full - Bridge  
Trench + Field Stop IGBT®  
Power Module**

**$V_{CES} = 600V$   
 $I_C = 150A @ T_c = 80^\circ C$**

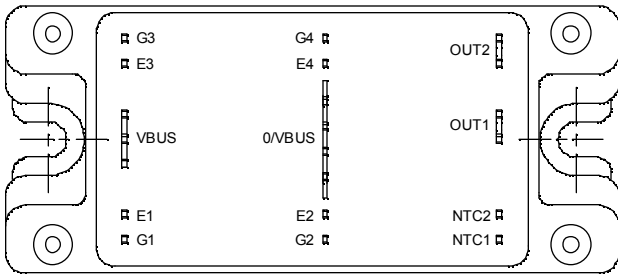


**Application**

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

**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
  - 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 | 600                 | V           |
| $I_C$     | Continuous Collector Current          | $T_c = 25^\circ C$  | 225         |
|           |                                       | $T_c = 80^\circ C$  | 150         |
| $I_{CM}$  | Pulsed Collector Current              | $T_c = 25^\circ C$  | 350         |
| $V_{GE}$  | Gate - Emitter Voltage                | $\pm 20$            | V           |
| $P_D$     | Maximum Power Dissipation             | $T_c = 25^\circ C$  | 480         |
| RBSOA     | Reverse Bias Safe Operating Area      | $T_j = 150^\circ C$ | 300A @ 550V |

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

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  | $V_{GE} = 0\text{V}, V_{CE} = 600\text{V}$   |   |            | 250 | $\mu\text{A}$ |
| $V_{CE(sat)}$ | Collector Emitter Saturation Voltage | $V_{GE} = 15\text{V}$<br>$I_C = 150\text{A}$ | $T_j = 25^\circ\text{C}$<br>$T_j = 150^\circ\text{C}$ | 1.5<br>1.7 | 1.9 | V             |
| $V_{GE(th)}$  | Gate Threshold Voltage               | $V_{GE} = V_{CE}, I_C = 1.5\text{ mA}$       | 5.0   | 5.8        | 6.5 | V             |
| $I_{GES}$     | Gate – Emitter Leakage Current       | $V_{GE} = 20\text{V}, V_{CE} = 0\text{V}$    |   |            | 400 | nA            |

## Dynamic Characteristics

| Symbol       | Characteristic               | Test Conditions   | Min   | Typ        | Max | Unit |
|--------------|------------------------------|---|---|------------|-----|------|
| $C_{ies}$    | Input Capacitance            | $V_{GE} = 0\text{V}$  |   | 9200       |     | pF   |
| $C_{oes}$    | Output Capacitance           | $V_{CE} = 25\text{V}$   |   | 580        |     |      |
| $C_{res}$    | Reverse Transfer Capacitance | $f = 1\text{MHz}$   |   | 270        |     |      |
| $T_{d(on)}$  | Turn-on Delay Time           | Inductive Switching ( $25^\circ\text{C}$ )                                  |   | 115        |     | ns   |
| $T_r$        | Rise Time                    | $V_{GE} = \pm 15\text{V}$<br>$V_{Bus} = 300\text{V}$                        |   | 45         |     |      |
| $T_{d(off)}$ | Turn-off Delay Time          | $I_C = 150\text{A}$   |   | 225        |     |      |
| $T_f$        | Fall Time                    | $R_G = 6.8\Omega$   |   | 55         |     |      |
| $T_{d(on)}$  | Turn-on Delay Time           | Inductive Switching ( $150^\circ\text{C}$ )                                 |   | 130        |     | ns   |
| $T_r$        | Rise Time                    | $V_{GE} = \pm 15\text{V}$<br>$V_{Bus} = 300\text{V}$                        |   | 50         |     |      |
| $T_{d(off)}$ | Turn-off Delay Time          | $I_C = 150\text{A}$   |   | 300        |     |      |
| $T_f$        | Fall Time                    | $R_G = 6.8\Omega$   |   | 70         |     |      |
| $E_{on}$     | Turn on Energy               | $V_{GE} = \pm 15\text{V}$<br>$V_{Bus} = 300\text{V}$<br>$I_C = 150\text{A}$ | $T_j = 25^\circ\text{C}$<br>$T_j = 150^\circ\text{C}$ | 2.1<br>2.6 |     | mJ   |
| $E_{off}$    | Turn off Energy              | $R_G = 6.8\Omega$   | $T_j = 25^\circ\text{C}$<br>$T_j = 150^\circ\text{C}$ | 3.5<br>5.3 |     |      |

## Reverse 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         | $V_R = 600\text{V}$  | $T_j = 25^\circ\text{C}$<br>$T_j = 150^\circ\text{C}$ |            | 150<br>400 | $\mu\text{A}$ |
| $I_F$     | DC Forward Current                      |  |   | 150        |            | A             |
| $V_F$     | Diode Forward Voltage                   | $I_F = 150\text{A}$<br>$V_{GE} = 0\text{V}$                                      | $T_j = 25^\circ\text{C}$<br>$T_j = 150^\circ\text{C}$ | 1.6<br>1.5 | 2          | V             |
| $t_{rr}$  | Reverse Recovery Time                   |  | $T_j = 25^\circ\text{C}$<br>$T_j = 150^\circ\text{C}$ | 125<br>220 |            | ns            |
| $Q_{rr}$  | Reverse Recovery Charge                 | $I_F = 150\text{A}$<br>$V_R = 300\text{V}$<br>$di/dt = 2800\text{A}/\mu\text{s}$ | $T_j = 25^\circ\text{C}$<br>$T_j = 150^\circ\text{C}$ | 7<br>15    |            | $\mu\text{C}$ |
| $E_r$     | Reverse Recovery Energy                 |  | $T_j = 25^\circ\text{C}$<br>$T_j = 150^\circ\text{C}$ | 1.7<br>3.6 |            | mJ            |

**Temperature sensor NTC** (see application note APT0406 on [www.advancedpower.com](http://www.advancedpower.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    |

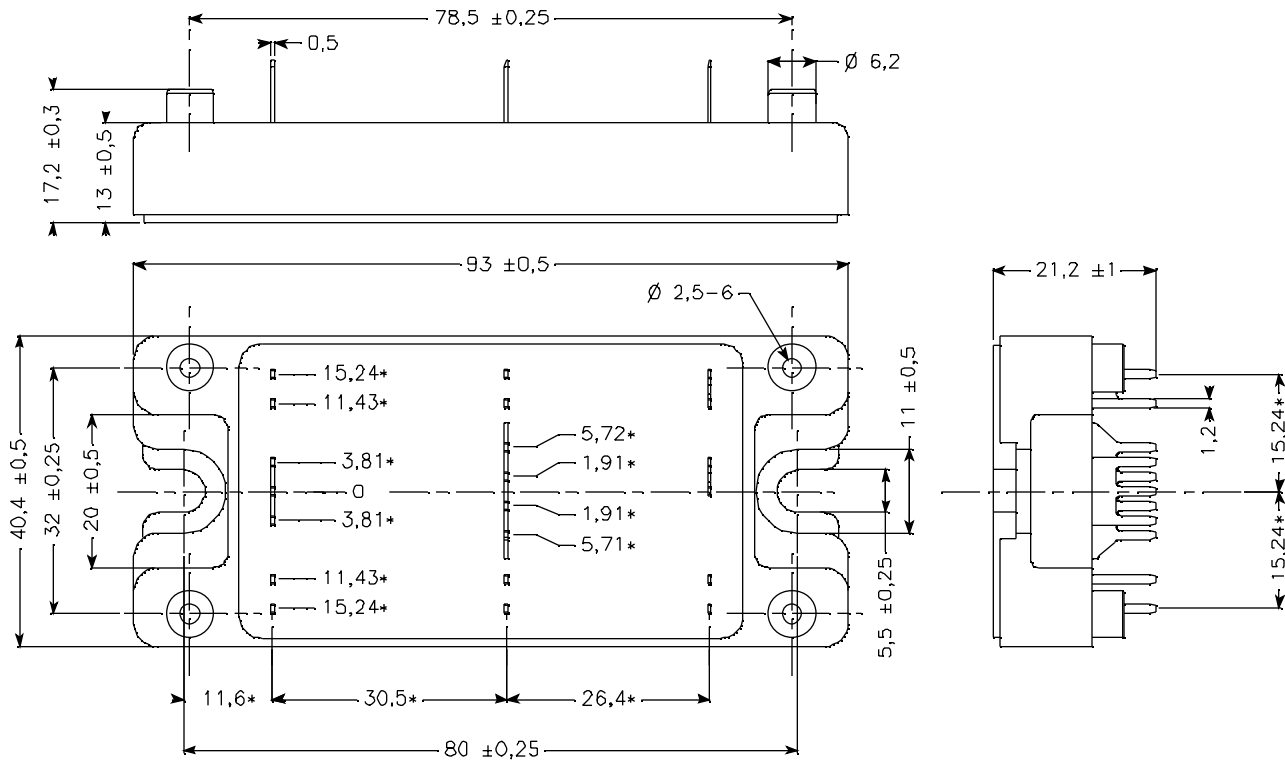
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T} - \frac{1}{T_{25}}\right)\right]}$$

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

**Thermal and package characteristics**

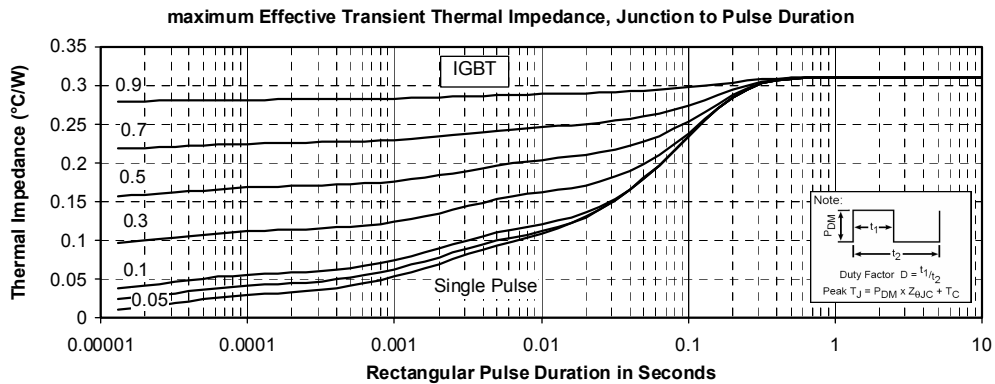
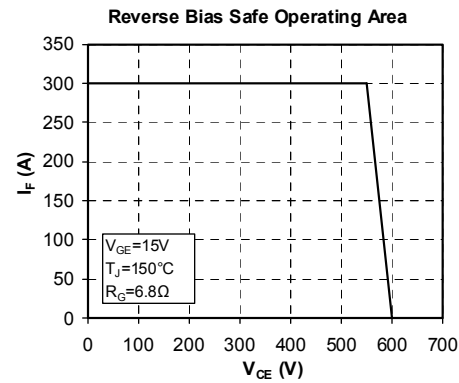
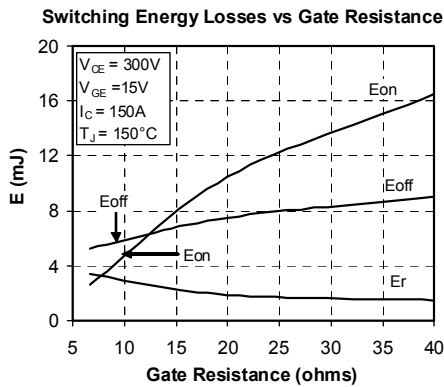
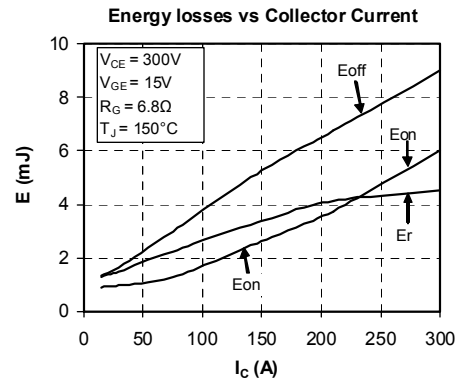
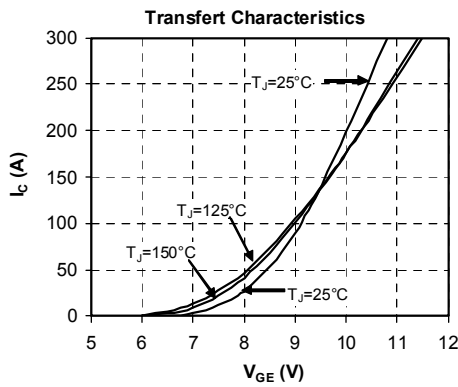
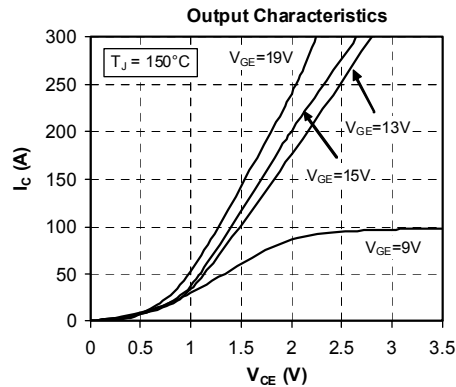
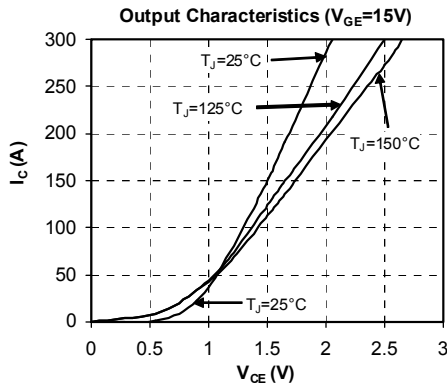
| Symbol            | Characteristic   | Min         | Typ | Max  | Unit |     |
|-------------------|--|-------------|-----|------|------|-----|
| R <sub>thJC</sub> | Junction to Case Thermal Resistance  | IGBT        |     | 0.31 | °C/W |     |
|                   |  | Diode       |     | 0.52 |      |     |
| 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 | M5  | 1.5  | 4.7  | N.m |
| Wt                | Package Weight   |             |     | 160  |      | g   |

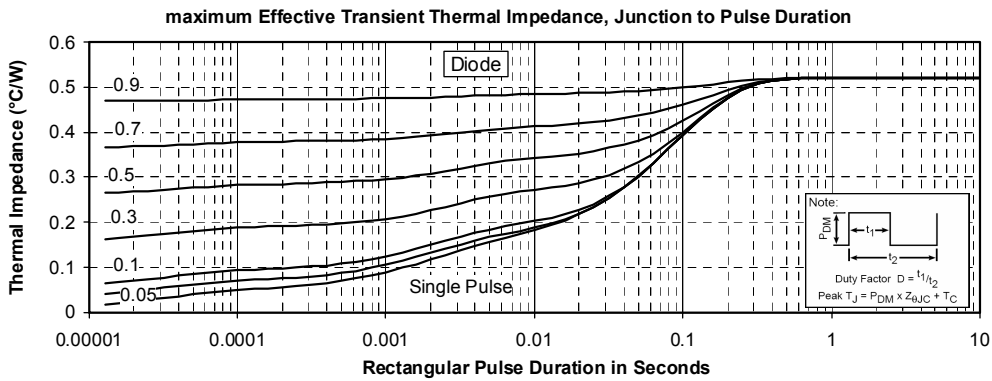
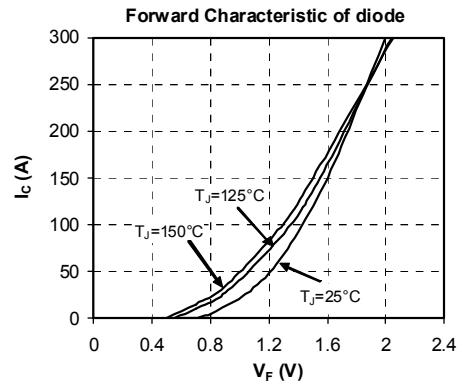
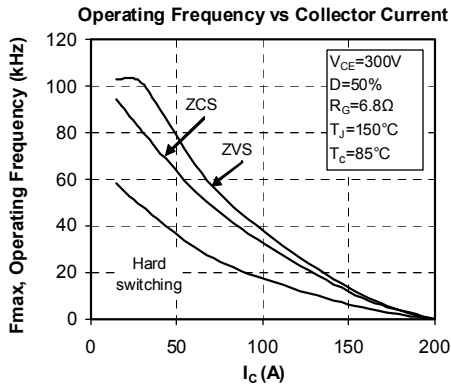
**SP4 Package outline** (dimensions in mm)



ALL DIMENSIONS MARKED "\*" ARE TOLERENCED AS:  $\pm \varnothing 1$

## Typical Performance Curve





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