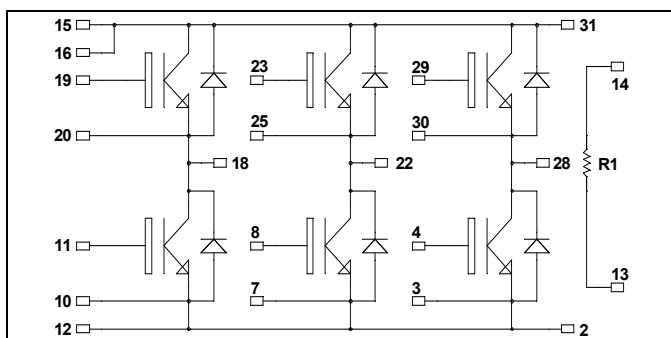


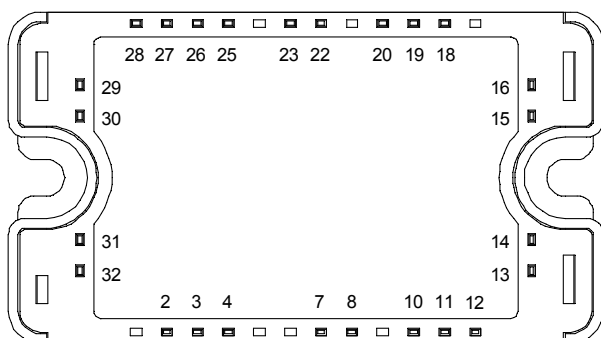
## 3 Phase bridge Trench + Field Stop IGBT® Power Module

$$V_{CES} = 1200V$$

$$I_C = 25A @ T_c = 80^{\circ}C$$



It is recommended to connect a decoupling capacitor between pins 31 & 2 to reduce switching overvoltages, if DC Power is connected between pins 15, 16 & 12. Pins 15 & 16 must be shorted together.



### Application

- 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
  - RBSOA and SCSOA rated
- Kelvin emitter for easy drive
- Very low stray inductance
- High level of integration
- Internal thermistor for temperature monitoring

### Benefits

- Outstanding performance at high frequency operation
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Solderable terminals both for power and signal for easy PCB mounting
- 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          | $T_C = 25^{\circ}C$  | 40          | A    |
|           |                                       | $T_C = 80^{\circ}C$  | 25          |      |
| $I_{CM}$  | Pulsed Collector Current              | $T_C = 25^{\circ}C$  | 50          |      |
| $V_{GE}$  | Gate - Emitter Voltage                |                      | $\pm 20$    | V    |
| $P_D$     | Maximum Power Dissipation             | $T_C = 25^{\circ}C$  | 156         | W    |
| RBSOA     | Reverse Bias Safe Operation Area      | $T_j = 125^{\circ}C$ | 50A @ 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  | $V_{GE} = 0V, V_{CE} = 1200V$ |                                                       |            | 250 | $\mu A$ |
| $V_{CE(sat)}$ | Collector Emitter Saturation Voltage | $V_{GE} = 15V$<br>$I_C = 25A$ | $T_j = 25^\circ\text{C}$<br>$T_j = 125^\circ\text{C}$ | 1.7<br>2.0 | 2.1 | V       |
| $V_{GE(th)}$  | Gate Threshold Voltage               | $V_{GE} = V_{CE}, I_C = 1mA$  | 5.0                                                   | 5.8        | 6.5 | V       |
| $I_{GES}$     | Gate – Emitter Leakage Current       | $V_{GE} = 20V, V_{CE} = 0V$   |                                                       |            | 400 | nA      |

**Dynamic Characteristics**

| Symbol       | Characteristic               | Test Conditions                                                                                                          | Min                                                   | Typ        | Max | Unit |
|--------------|------------------------------|--------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|------------|-----|------|
| $C_{ies}$    | Input Capacitance            | $V_{GE} = 0V, V_{CE} = 25V$                                                                                              |                                                       | 1800       |     | pF   |
| $C_{res}$    | Reverse Transfer Capacitance | $f = 1MHz$                                                                                                               |                                                       | 82         |     |      |
| $T_{d(on)}$  | Turn-on Delay Time           | Inductive Switching ( $25^\circ\text{C}$ )<br>$V_{GE} = \pm 15V$<br>$V_{Bus} = 600V$<br>$I_C = 25A$<br>$R_G = 27\Omega$  |                                                       | 90         |     | ns   |
| $T_r$        | Rise Time                    |                                                                                                                          |                                                       | 30         |     |      |
| $T_{d(off)}$ | Turn-off Delay Time          |                                                                                                                          |                                                       | 420        |     |      |
| $T_f$        | Fall Time                    |                                                                                                                          |                                                       | 70         |     |      |
| $T_{d(on)}$  | Turn-on Delay Time           | Inductive Switching ( $125^\circ\text{C}$ )<br>$V_{GE} = \pm 15V$<br>$V_{Bus} = 600V$<br>$I_C = 25A$<br>$R_G = 27\Omega$ |                                                       | 90         |     | ns   |
| $T_r$        | Rise Time                    |                                                                                                                          |                                                       | 50         |     |      |
| $T_{d(off)}$ | Turn-off Delay Time          |                                                                                                                          |                                                       | 520        |     |      |
| $T_f$        | Fall Time                    |                                                                                                                          |                                                       | 90         |     |      |
| $E_{on}$     | Turn-on Switching Energy     | $V_{GE} = \pm 15V$<br>$V_{Bus} = 600V$<br>$I_C = 25A$<br>$R_G = 27\Omega$                                                | $T_j = 25^\circ\text{C}$<br>$T_j = 125^\circ\text{C}$ | 1.9<br>2.5 |     | mJ   |
| $E_{off}$    | Turn-off Switching Energy    |                                                                                                                          | $T_j = 25^\circ\text{C}$<br>$T_j = 125^\circ\text{C}$ | 1.9<br>2.9 |     |      |

**Reverse 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>$T_j = 150^\circ\text{C}$ |                   | 100<br>500 | $\mu A$ |
| $I_F$     | DC Forward Current                      | $T_c = 80^\circ\text{C}$                                           |                                                       | 30                |            | A       |
| $V_F$     | Diode Forward Voltage                   | $I_F = 30A$<br>$I_F = 60A$<br>$I_F = 30A, T_j = 125^\circ\text{C}$ |                                                       | 2.6<br>3.2<br>1.8 | 3.1        | V       |
| $t_{rr}$  | Reverse Recovery Time                   | $I_F = 30A$<br>$V_R = 800V$<br>$di/dt = 200A/\mu s$                | $T_j = 25^\circ\text{C}$<br>$T_j = 125^\circ\text{C}$ | 300<br>380        |            | ns      |
| $Q_{rr}$  | Reverse Recovery Charge                 |                                                                    | $T_j = 25^\circ\text{C}$<br>$T_j = 125^\circ\text{C}$ | 360<br>1700       |            | nC      |

**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    |

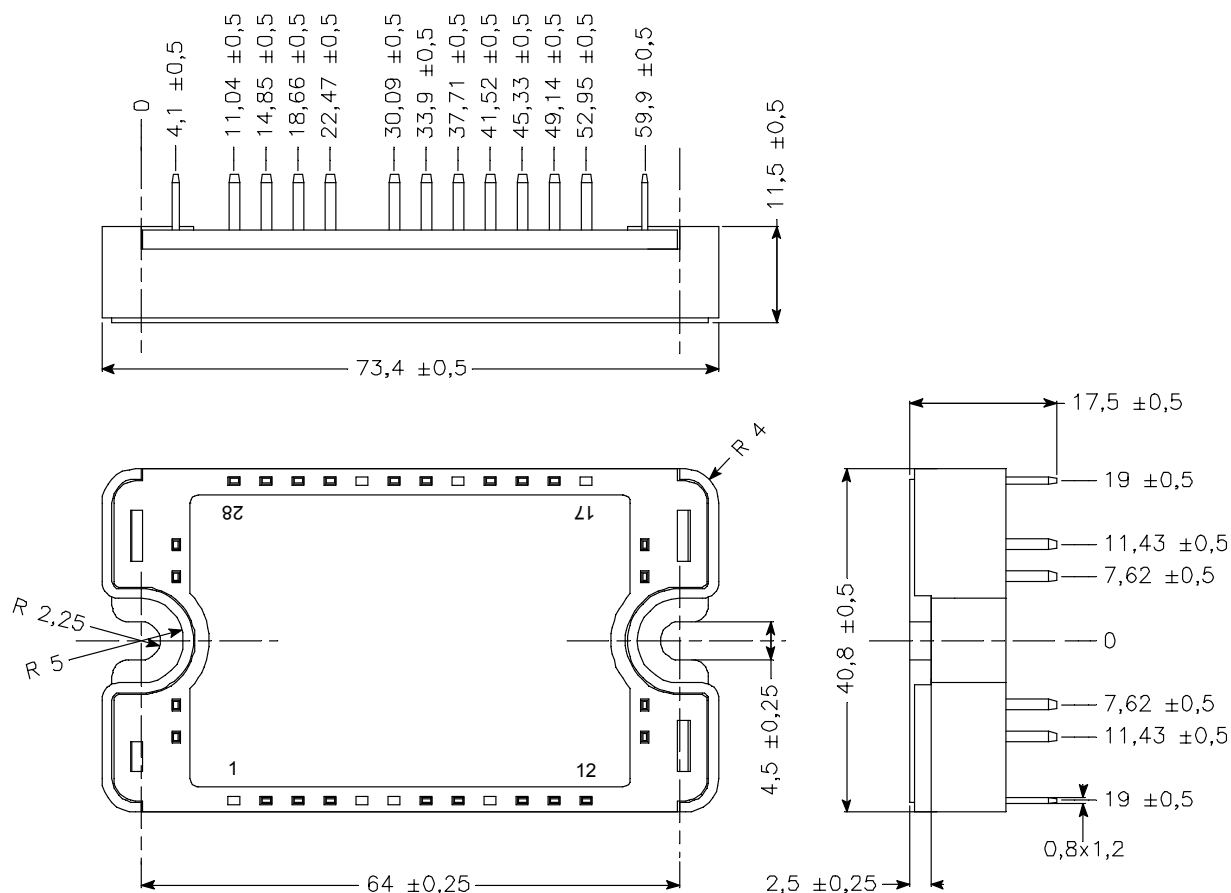
$$R_T = \frac{R_{25}}{\exp \left[ B_{25/85} \left( \frac{1}{T_{25}} - \frac{1}{T} \right) \right]}$$

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

## Thermal and package characteristics

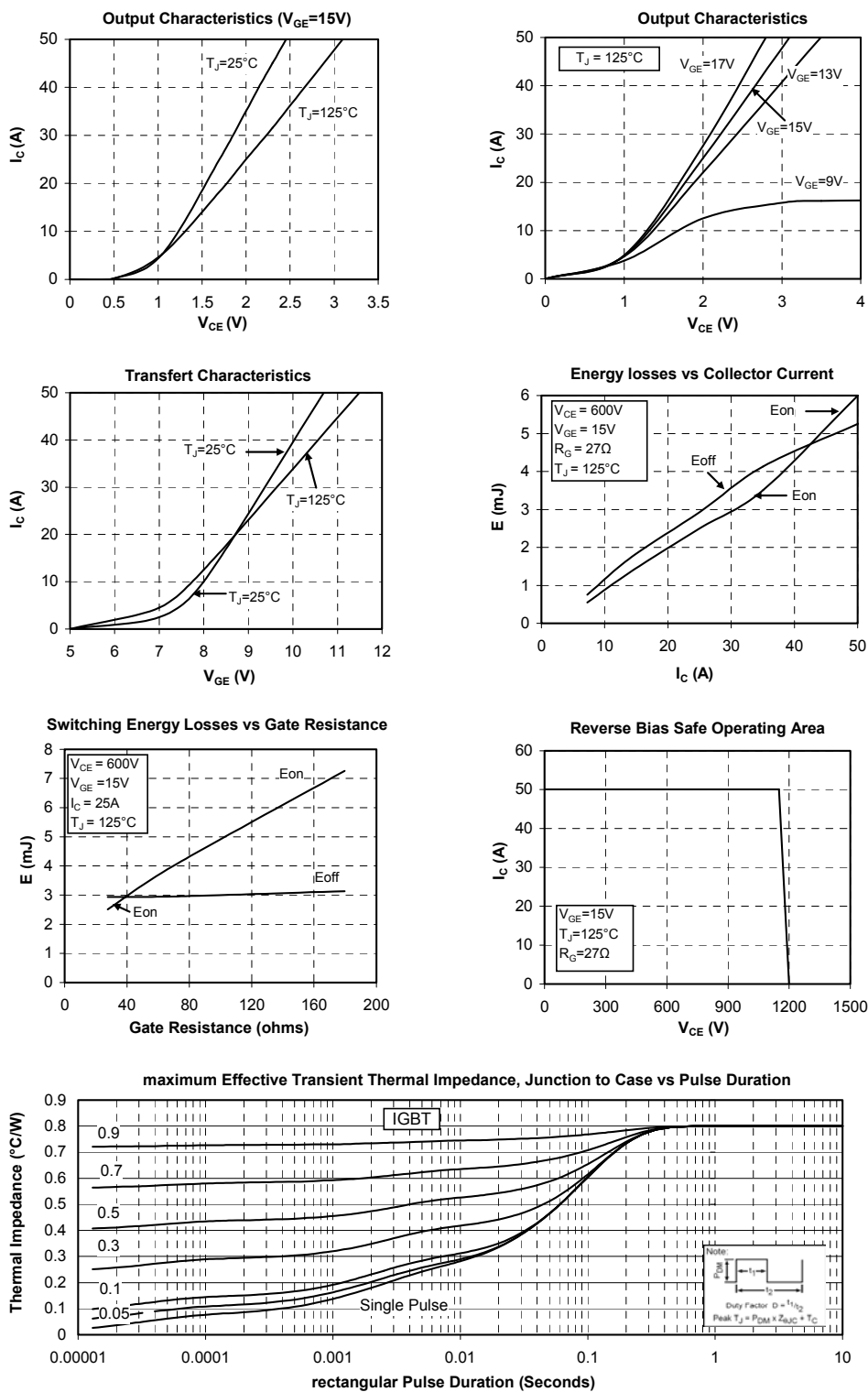
| Symbol            | Characteristic                                                            |             |    | Min   | Typ | Max | Unit |
|-------------------|---------------------------------------------------------------------------|-------------|----|-------|-----|-----|------|
| R <sub>thJC</sub> | Junction to Case Thermal Resistance                                       |             |    | IGBT  |     | 0.8 | °C/W |
|                   |                                                                           |             |    | Diode |     | 1.2 |      |
| 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   |     | 100 |      |
| Torque            | Mounting torque                                                           | To heatsink | M4 | 2.5   |     | 4.7 | N.m  |
| Wt                | Package Weight                                                            |             |    |       |     | 110 | g    |

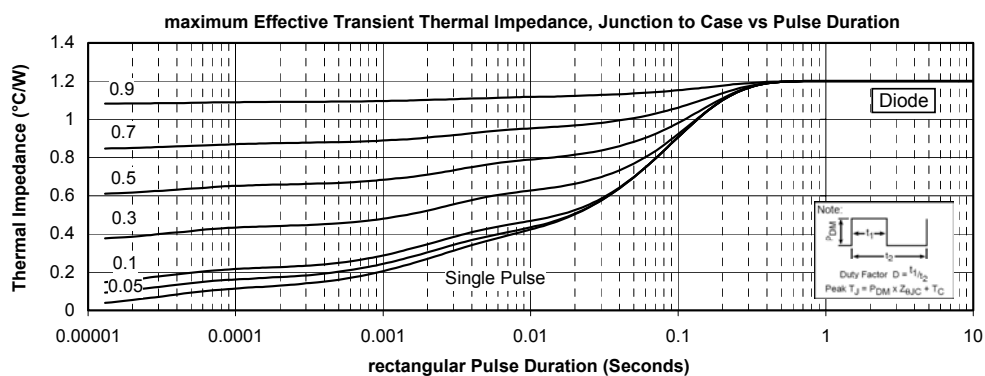
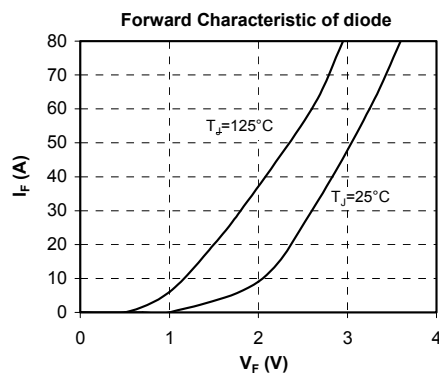
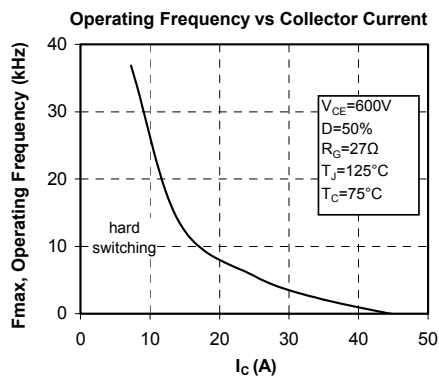
## SP3 Package outline (dimensions in mm)



See application note 1901 - Mounting Instructions for SP3 Power Modules on [www.microsemi.com](http://www.microsemi.com)

## Typical Performance Curve





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