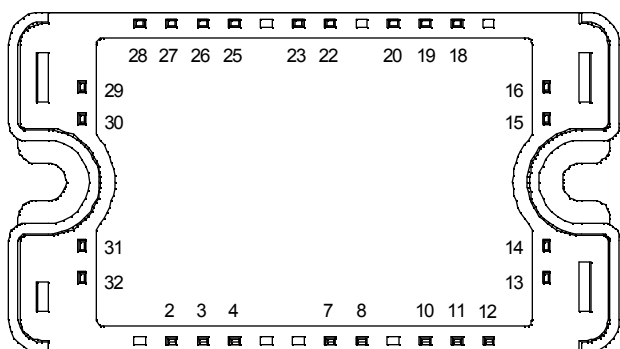
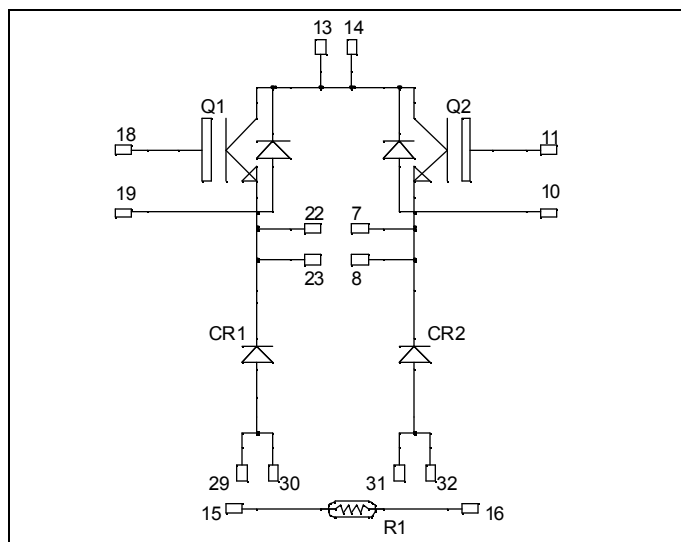


## Dual Buck chopper Trench + Field Stop IGBT® Power Module

**$V_{CES} = 600V$**   
 **$I_C = 30A @ T_c = 80^\circ C$**



All multiple inputs and outputs must be shorted together  
Example: 13/14 ; 29/30 ; 22/23 ...

### Application

- AC and DC motor control
- Switched Mode Power Supplies

### 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
- 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  $V_{CESat}$
- Low profile
- Each leg can be easily paralleled to achieve a single buck of twice the current capability.
- RoHS Compliant

### Absolute maximum ratings

| Symbol    | Parameter                             | Max ratings                                          | Unit |
|-----------|---------------------------------------|------------------------------------------------------|------|
| $V_{CES}$ | Collector - Emitter Breakdown Voltage | 600                                                  | V    |
| $I_C$     | Continuous Collector Current          | $T_C = 25^\circ C$<br>50<br>$T_C = 80^\circ C$<br>30 | A    |
| $I_{CM}$  | Pulsed Collector Current              | $T_C = 25^\circ C$<br>60                             | A    |
| $V_{GE}$  | Gate - Emitter Voltage                | $\pm 20$                                             | V    |
| $P_D$     | Maximum Power Dissipation             | $T_C = 25^\circ C$<br>90                             | W    |
| RBSOA     | Reverse Bias Safe Operating Area      | $T_J = 150^\circ C$<br>60A @ 550V                    |      |



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  | $V_{GE} = 0V, V_{CE} = 600V$            |                                                       |            | 250 | $\mu\text{A}$ |
| $V_{CE(sat)}$ | Collector Emitter Saturation Voltage | $V_{GE} = 15V$<br>$I_C = 30A$           | $T_j = 25^\circ\text{C}$<br>$T_j = 150^\circ\text{C}$ | 1.5<br>1.7 | 1.9 | V             |
| $V_{GE(th)}$  | Gate Threshold Voltage               | $V_{GE} = V_{CE}, I_C = 400\mu\text{A}$ | 5.0                                                   | 5.8        | 6.5 | V             |
| $I_{GES}$     | Gate – Emitter Leakage Current       | $V_{GE} = 20V, V_{CE} = 0V$             |                                                       |            | 300 | nA            |

## Dynamic Characteristics

| Symbol       | Characteristic               | Test Conditions                                                                                                          | Min                                                   | Typ         | Max | Unit |
|--------------|------------------------------|--------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|-------------|-----|------|
| $C_{ies}$    | Input Capacitance            | $V_{GE} = 0V$                                                                                                            |                                                       | 1600        |     | pF   |
| $C_{oes}$    | Output Capacitance           | $V_{CE} = 25V$                                                                                                           |                                                       | 110         |     |      |
| $C_{res}$    | Reverse Transfer Capacitance | $f = 1\text{MHz}$                                                                                                        |                                                       | 50          |     |      |
| $T_{d(on)}$  | Turn-on Delay Time           | Inductive Switching ( $25^\circ\text{C}$ )<br>$V_{GE} = \pm 15V$<br>$V_{Bus} = 300V$<br>$I_C = 30A$<br>$R_G = 10\Omega$  |                                                       | 110         |     | ns   |
| $T_r$        | Rise Time                    |                                                                                                                          |                                                       | 45          |     |      |
| $T_{d(off)}$ | Turn-off Delay Time          |                                                                                                                          |                                                       | 200         |     |      |
| $T_f$        | Fall Time                    |                                                                                                                          |                                                       | 40          |     |      |
| $T_{d(on)}$  | Turn-on Delay Time           | Inductive Switching ( $150^\circ\text{C}$ )<br>$V_{GE} = \pm 15V$<br>$V_{Bus} = 300V$<br>$I_C = 30A$<br>$R_G = 10\Omega$ |                                                       | 120         |     | ns   |
| $T_r$        | Rise Time                    |                                                                                                                          |                                                       | 50          |     |      |
| $T_{d(off)}$ | Turn-off Delay Time          |                                                                                                                          |                                                       | 250         |     |      |
| $T_f$        | Fall Time                    |                                                                                                                          |                                                       | 60          |     |      |
| $E_{on}$     | Turn-on Switching Energy     | $V_{GE} = \pm 15V$<br>$V_{Bus} = 300V$<br>$I_C = 30A$<br>$R_G = 10\Omega$                                                | $T_j = 25^\circ\text{C}$<br>$T_j = 150^\circ\text{C}$ | 0.16<br>0.3 |     | mJ   |
| $E_{off}$    | Turn-off Switching Energy    |                                                                                                                          | $T_j = 25^\circ\text{C}$<br>$T_j = 150^\circ\text{C}$ | 0.7<br>1.05 |     | mJ   |

## Chopper 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         | $V_R = 600V$                                               | $T_j = 25^\circ\text{C}$<br>$T_j = 150^\circ\text{C}$ |              | 250<br>500 | $\mu\text{A}$ |
| $I_F$     | DC Forward Current                      |                                                            | $T_c = 80^\circ\text{C}$                              | 30           |            | A             |
| $V_F$     | Diode Forward Voltage                   | $I_F = 30A$<br>$V_{GE} = 0V$                               | $T_j = 25^\circ\text{C}$<br>$T_j = 150^\circ\text{C}$ | 1.6<br>1.5   | 2          | V             |
| $t_{rr}$  | Reverse Recovery Time                   | $I_F = 30A$<br>$V_R = 300V$<br>$di/dt = 1800A/\mu\text{s}$ | $T_j = 25^\circ\text{C}$<br>$T_j = 150^\circ\text{C}$ | 100<br>150   |            | ns            |
| $Q_{rr}$  | Reverse Recovery Charge                 |                                                            | $T_j = 25^\circ\text{C}$<br>$T_j = 150^\circ\text{C}$ | 1.5<br>3.1   |            | $\mu\text{C}$ |
| $E_r$     | Reverse Recovery Energy                 |                                                            | $T_j = 25^\circ\text{C}$<br>$T_j = 150^\circ\text{C}$ | 0.34<br>0.75 |            | 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    |

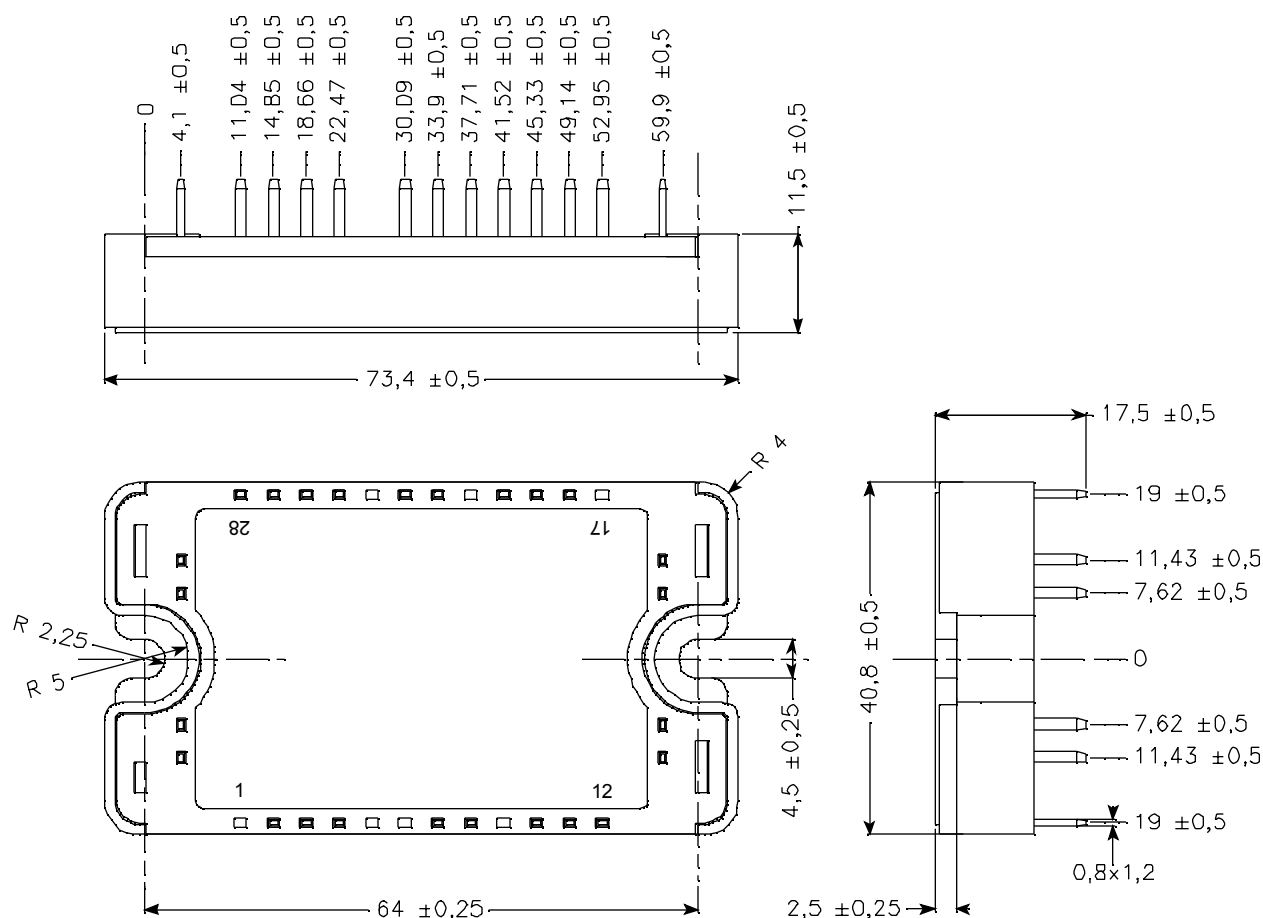
$$R_T = \frac{R_{25}}{\exp \left[ B_{25/85} \left( \frac{1}{T_{25}} - \frac{1}{T} \right) \right]}$$

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

## Thermal and package characteristics

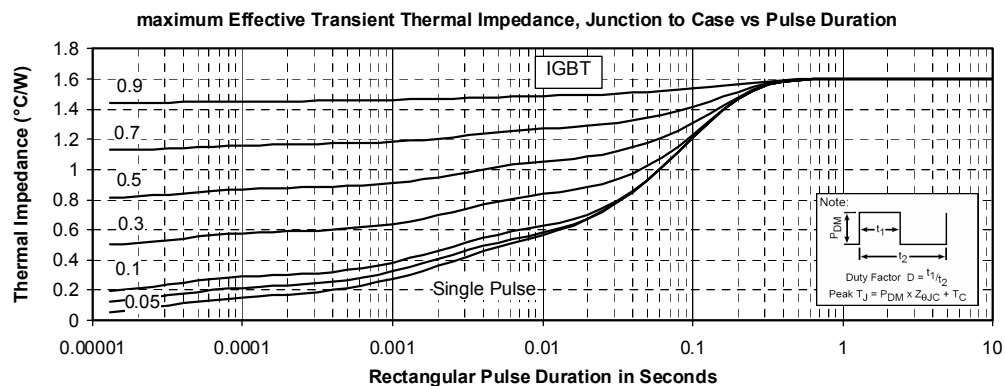
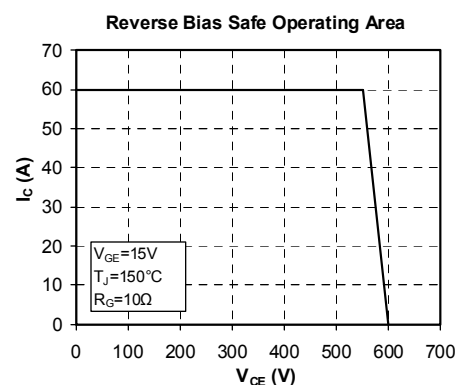
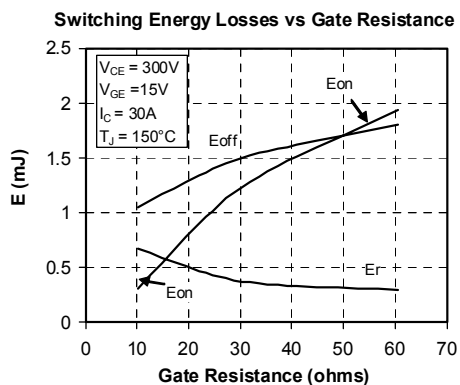
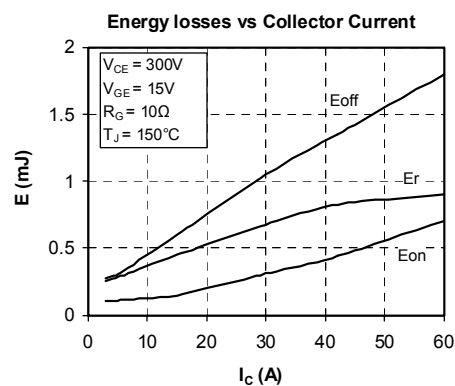
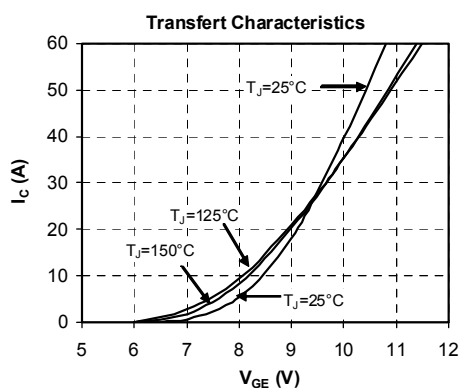
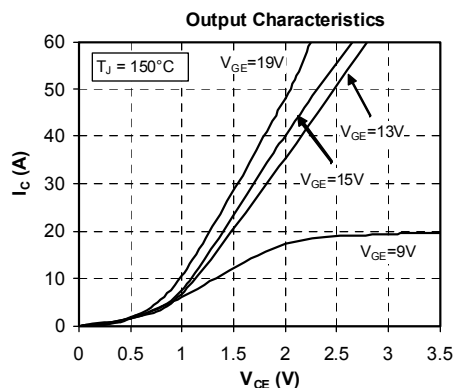
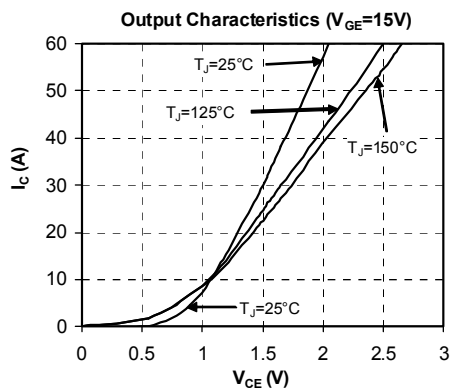
| Symbol            | Characteristic                                                            |             |    | Min   | Typ | Max  | Unit |
|-------------------|---------------------------------------------------------------------------|-------------|----|-------|-----|------|------|
| R <sub>thJC</sub> | Junction to Case Thermal Resistance                                       |             |    | IGBT  |     | 1.6  | °C/W |
|                   |                                                                           |             |    | Diode |     | 2.45 |      |
| 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   |     | 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 | M4 | 2.5   |     | 4.7  | N.m  |
| Wt                | Package Weight                                                            |             |    |       |     | 110  | g    |

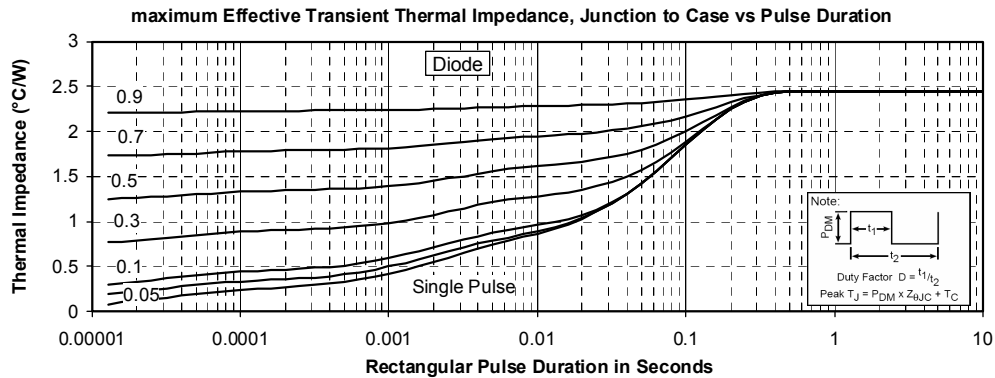
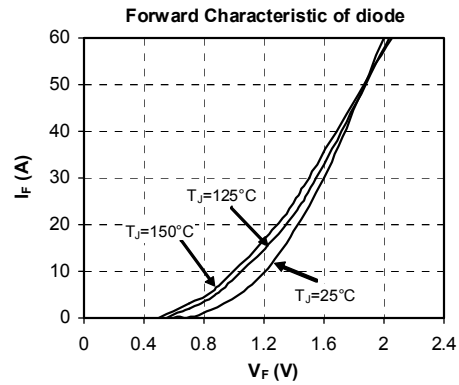
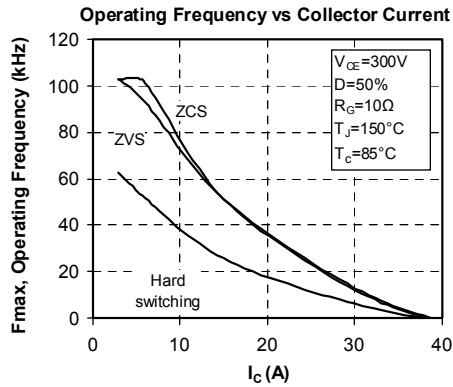
## SP3 Package outline (dimensions in mm)



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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