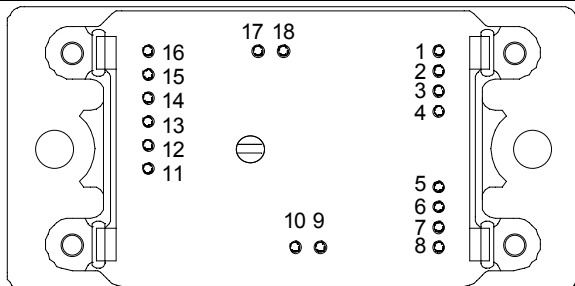
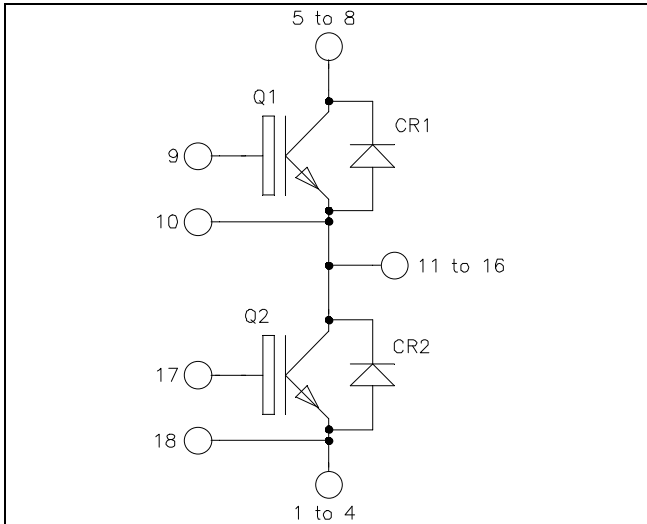


**Phase leg  
Trench + Field Stop IGBT4  
Power Module**

**$V_{CES} = 1200V$   
 $I_C = 180A @ T_c = 80^\circ C$**



Pins 1/2/3/4 ; 5/6/7/8 ; 11/12/13/14/15/16 must be shorted together

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

### Absolute maximum ratings

| Symbol    | Parameter                             | Max ratings         | Unit         |
|-----------|---------------------------------------|---------------------|--------------|
| $V_{CES}$ | Collector - Emitter Breakdown Voltage | 1200                | V            |
| $I_C$     | Continuous Collector Current          | $T_c = 25^\circ C$  | 220          |
|           |                                       | $T_c = 80^\circ C$  | 180          |
| $I_{CM}$  | Pulsed Collector Current              | $T_c = 25^\circ C$  | 300          |
| $V_{GE}$  | Gate - Emitter Voltage                | $\pm 20$            | V            |
| $P_D$     | Maximum Power Dissipation             | $T_c = 25^\circ C$  | 750          |
| RBSOA     | Reverse Bias Safe Operating Area      | $T_j = 125^\circ C$ | 300A @ 1100V |

### Application

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

### Features

- Trench + Field Stop IGBT 4 Technology
  - Low voltage drop
  - Low leakage current
  - Low switching losses
  - Soft recovery parallel diodes
  - Low diode VF
  - RBSOA and SCSOA rated
- Kelvin emitter for easy drive
- Very low stray inductance
- 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
- Easy paralleling due to positive  $T_c$  of  $V_{CESat}$
- RoHS Compliant

**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)

**Electrical Characteristics**

| <i>Symbol</i>        | <i>Characteristic</i>                | <i>Test Conditions</i>                                      | <i>Min</i> | <i>Typ</i> | <i>Max</i> | <i>Unit</i> |
|----------------------|--------------------------------------|---|------------|------------|------------|-------------|
| I <sub>CEs</sub>     | Zero Gate Voltage Collector Current  | V <sub>GE</sub> = 0V, V <sub>CE</sub> = 1200V               |            |            | 300        | μA          |
| V <sub>CE(sat)</sub> | Collector Emitter saturation Voltage | V <sub>GE</sub> = 15V<br>I <sub>C</sub> = 150A              |            | 1.8<br>2.2 | 2.2        | V           |
| V <sub>GE(th)</sub>  | Gate Threshold Voltage               | V <sub>GE</sub> = V <sub>CE</sub> , I <sub>C</sub> = 5.5 mA | 5.0        | 5.8        | 6.5        | V           |
| I <sub>GES</sub>     | Gate – Emitter Leakage Current       | V <sub>GE</sub> = 20V, V <sub>CE</sub> = 0V                 |            |            | 200        | nA          |

**Dynamic Characteristics**

| <i>Symbol</i>       | <i>Characteristic</i>               | <i>Test Conditions</i>  | <i>Min</i> | <i>Typ</i> | <i>Max</i> | <i>Unit</i> |
|---------------------|-------------------------------------|---|------------|------------|------------|-------------|
| C <sub>ies</sub>    | Input Capacitance                   | V <sub>GE</sub> = 0V  |            | 9.3        |            | nF          |
| C <sub>oes</sub>    | Output Capacitance                  | V <sub>CE</sub> = 25V   |            | 0.58       |            |             |
| C <sub>res</sub>    | Reverse Transfer Capacitance        | f = 1MHz  |            | 0.5        |            |             |
| Q <sub>G</sub>      | Gate charge                         | V <sub>GE</sub> = -8V / 15V ; V <sub>CE</sub> = 600V<br>I <sub>C</sub> = 150A   |            | 0.85       |            | μC          |
| T <sub>d(on)</sub>  | Turn-on Delay Time                  | Inductive Switching (25°C)<br>V <sub>GE</sub> = ±15V<br>V <sub>CE</sub> = 600V<br>I <sub>C</sub> = 150A<br>R <sub>G</sub> = 3Ω  |            | 130        |            | ns          |
| T <sub>r</sub>      | Rise Time                           |   |            | 20         |            |             |
| T <sub>d(off)</sub> | Turn-off Delay Time                 |   |            | 300        |            |             |
| T <sub>f</sub>      | Fall Time                           |   |            | 45         |            |             |
| T <sub>d(on)</sub>  | Turn-on Delay Time                  | Inductive Switching (150°C)<br>V <sub>GE</sub> = ±15V<br>V <sub>CE</sub> = 600V<br>I <sub>C</sub> = 150A<br>R <sub>G</sub> = 3Ω |            | 150        |            | ns          |
| T <sub>r</sub>      | Rise Time                           |   |            | 35         |            |             |
| T <sub>d(off)</sub> | Turn-off Delay Time                 |   |            | 350        |            |             |
| T <sub>f</sub>      | Fall Time                           |   |            | 80         |            |             |
| E <sub>on</sub>     | Turn-on Switching Energy            | V <sub>GE</sub> = ±15V<br>V <sub>CE</sub> = 600V<br>I <sub>C</sub> = 150A   |            | 13.5       |            | mJ          |
| E <sub>off</sub>    | Turn-off Switching Energy           | R <sub>G</sub> = 3Ω   |            | 14.5       |            | mJ          |
| I <sub>sc</sub>     | Short Circuit data                  | V <sub>GE</sub> ≤ 15V ; V <sub>Bus</sub> = 900V<br>t <sub>p</sub> ≤ 10μs ; T <sub>j</sub> = 150°C                               |            | 600        |            | A           |
| R <sub>thJC</sub>   | Junction to Case Thermal Resistance |   |            |            | 0.20       | °C/W        |

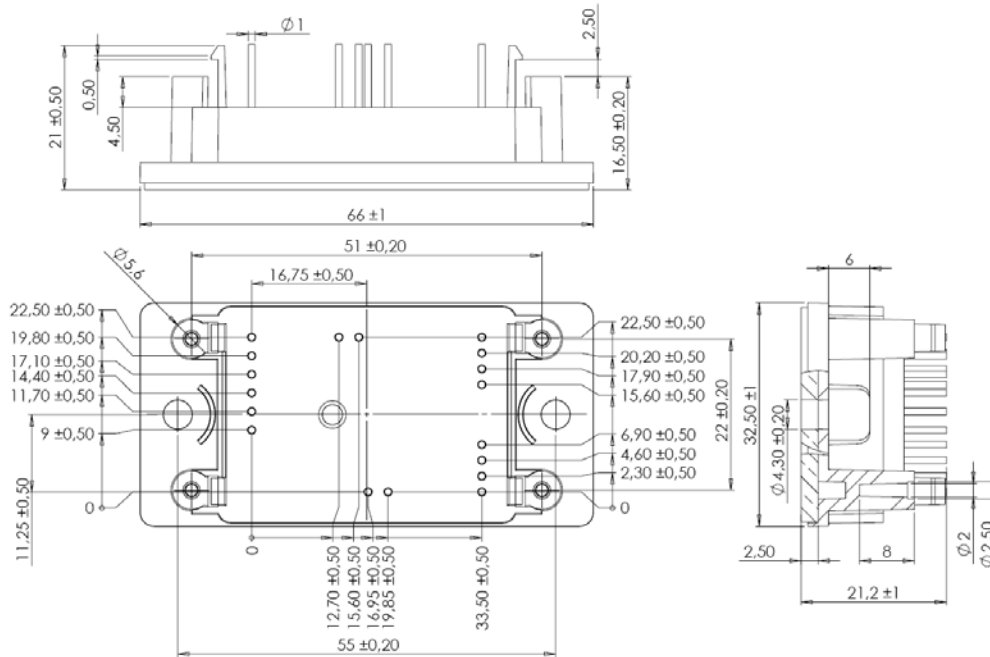
**Reverse diode ratings and characteristics**

| <i>Symbol</i>     | <i>Characteristic</i>                   | <i>Test Conditions</i>   | <i>Min</i> | <i>Typ</i>             | <i>Max</i> | <i>Unit</i> |    |
|-------------------|---|--|------------|------------------------|------------|-------------|----|
| V <sub>RRM</sub>  | Maximum Peak Repetitive Reverse Voltage |  | 1200       |                        |            | V           |    |
| I <sub>RM</sub>   | Maximum Reverse Leakage Current         | V <sub>R</sub> = 1200V   |            |                        | 100        | μA          |    |
| I <sub>F</sub>    | DC Forward Current                      |  |            | 150                    |            | A           |    |
| V <sub>F</sub>    | Diode Forward Voltage                   | I <sub>F</sub> = 150A<br>V <sub>GE</sub> = 0V                      |            | T <sub>j</sub> = 25°C  | 1.7        | 2.2         | V  |
|                   |   |  |            | T <sub>j</sub> = 150°C | 1.65       |             |    |
| t <sub>rr</sub>   | Reverse Recovery Time                   | I <sub>F</sub> = 150A<br>V <sub>R</sub> = 600V<br>di/dt = 3400A/μs |            | T <sub>j</sub> = 25°C  | 155        |             | ns |
|                   |   |  |            | T <sub>j</sub> = 150°C | 300        |             |    |
| Q <sub>rr</sub>   | Reverse Recovery Charge                 |  |            | T <sub>j</sub> = 25°C  | 13.3       |             | μC |
|                   |   |  |            | T <sub>j</sub> = 150°C | 27.6       |             |    |
| E <sub>rr</sub>   | Reverse Recovery Energy                 |  |            | T <sub>j</sub> = 25°C  | 5.9        |             | mJ |
|                   |   |  |            | T <sub>j</sub> = 150°C | 11.5       |             |    |
| R <sub>thJC</sub> | Junction to Case Thermal Resistance     |  |            |                        | 0.38       | °C/W        |    |

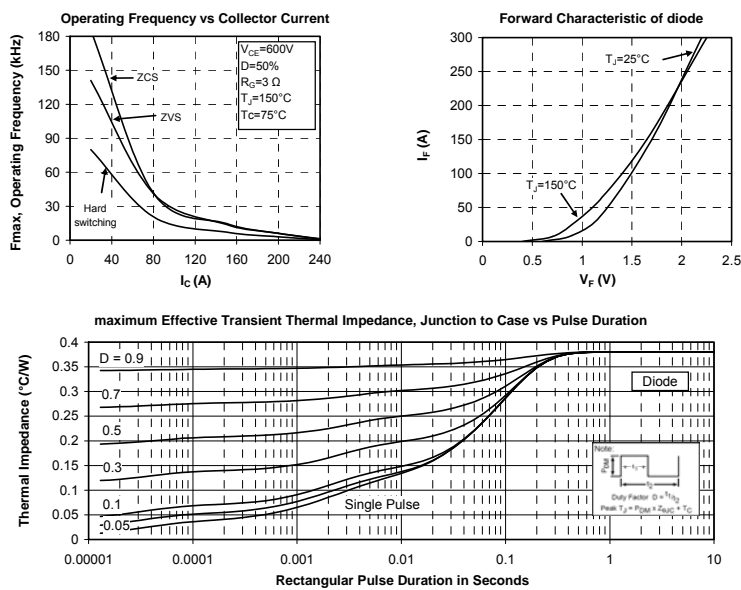
## Thermal and package characteristics

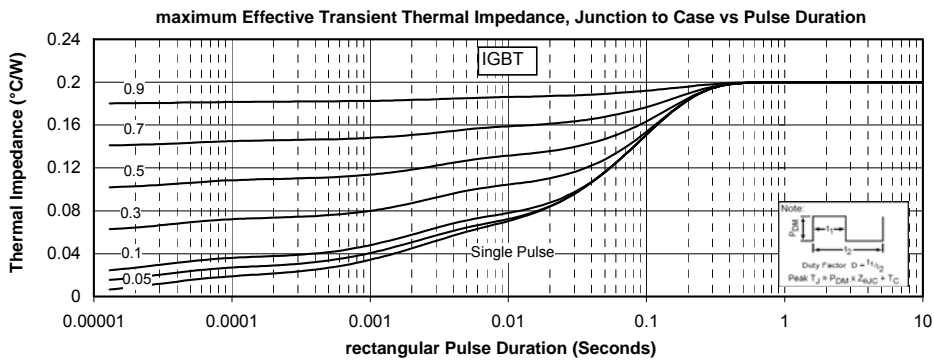
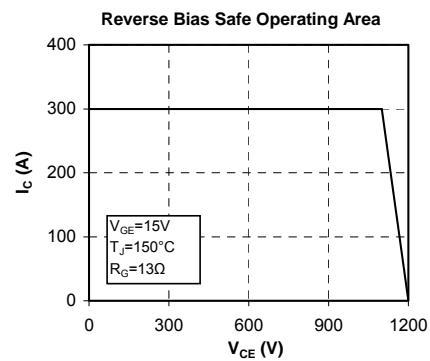
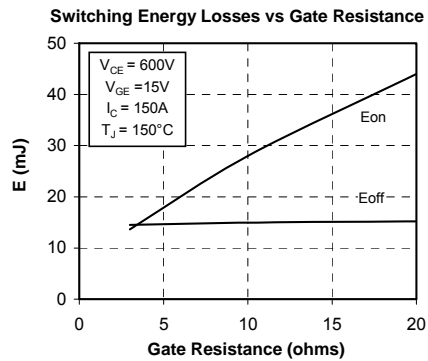
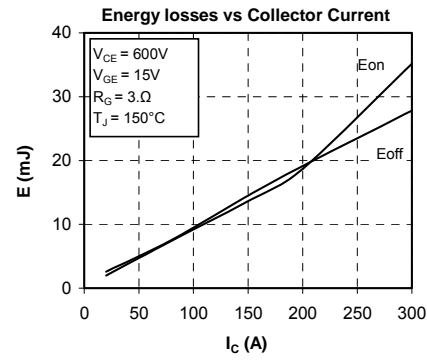
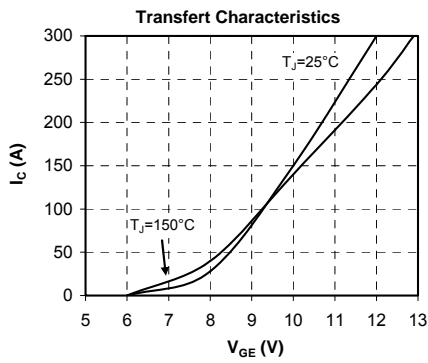
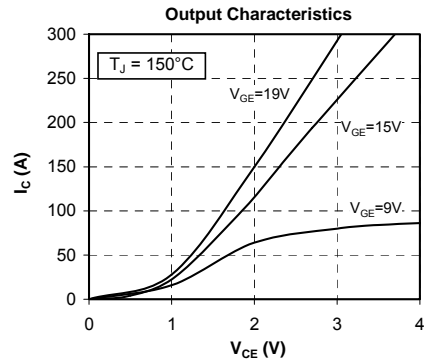
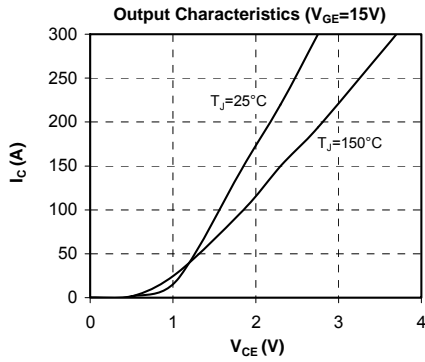
| Symbol     | Characteristic  | Min         | Typ | Max | Unit |     |
|------------|---|-------------|-----|-----|------|-----|
| $V_{ISOL}$ | RMS Isolation Voltage, any terminal to case $t=1$ min, $I_{isol} < 1$ mA, 50/60Hz | 4000        |     |     | V    |     |
| $T_J$      | Operating junction temperature range  | -40         |     | 175 | °C   |     |
| $T_{STG}$  | Storage Temperature Range   | -40         |     | 125 |      |     |
| $T_C$      | Operating Case Temperature  | -40         |     | 100 |      |     |
| Torque     | Mounting torque   | To heatsink | M4  | 2   | 3    | N.m |
| Wt         | Package Weight  |             |     |     | 75   | g   |

## SP2 Package outline (dimensions in mm)



## Typical Performance Curve





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