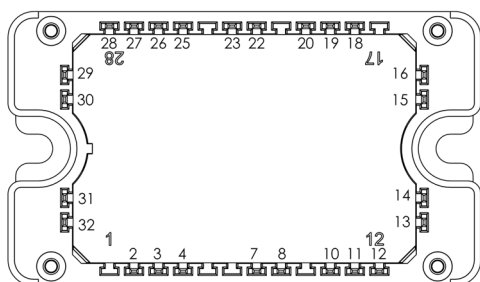
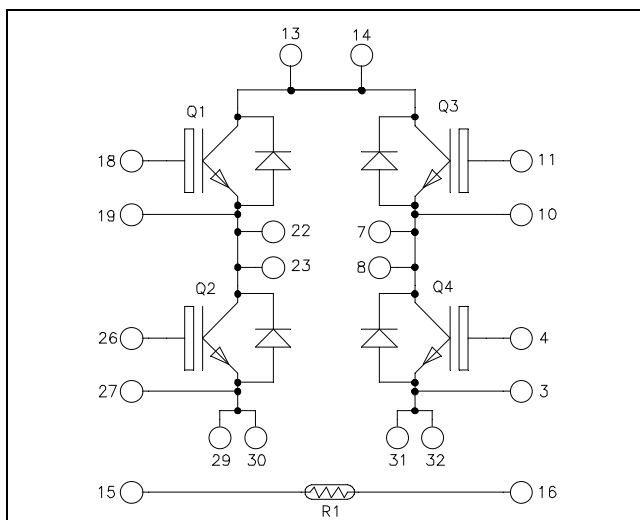


**Full bridge
High speed Trench + Field Stop
IGBT4 Power Module**

$$V_{CES} = 650V$$

$$I_C = 100A @ T_c = 60^\circ C$$



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

Application

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

Features

- **High speed Trench + Field Stop IGBT 4**
 - Low voltage drop
 - Low leakage current
 - Low switching losses
- Very low stray inductance
- 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
- Easy paralleling due to positive TC of VCEsat
- Each leg can be easily paralleled to achieve a phase leg of twice the current capability
- 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 | 650 | V |
| I_C | Continuous Collector Current | $T_C = 25^\circ C$ | 135 |
| | | $T_C = 60^\circ C$ | 100 |
| I_{CM} | Pulsed Collector Current | $T_C = 25^\circ C$ | 270 |
| V_{GE} | Gate - Emitter Voltage | ± 20 | V |
| P_D | Power Dissipation | 350 | 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 | $V_{GE} = 0V, V_{CE} = 650V$ | | | 50 | μA |
| $V_{CE(sat)}$ | Collector Emitter Saturation Voltage | $V_{GE} = 15V$ $I_C = 100A$ | $T_j = 25^\circ C$ $T_j = 150^\circ C$ | 1.4 2.2 | 2.3 | V |
| $V_{GE(th)}$ | Gate Threshold Voltage | $V_{GE} = V_{CE}, I_C = 1.6 mA$ | 4.2 | 5.1 | 5.6 | 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 | $V_{GE} = 0V$ | | 6100 | | pF |
| C_{oes} | Output Capacitance | $V_{CE} = 25V$ | | 232 | | |
| C_{res} | Reverse Transfer Capacitance | $f = 1MHz$ | | 180 | | |
| Q_G | Gate charge | $V_{GE} = 15V, I_C = 100A$ $V_{CE} = 480V$ | | 630 | | nC |
| $T_{d(on)}$ | Turn-on Delay Time | Inductive Switching (25°C) $V_{GE} = \pm 15V$ $V_{Bus} = 400V$ $I_C = 100A$ $R_G = 3.6\Omega$ | | 19 | | ns |
| T_r | Rise Time | | | 33 | | |
| $T_{d(off)}$ | Turn-off Delay Time | | | 197 | | |
| T_f | Fall Time | | | 21 | | |
| $T_{d(on)}$ | Turn-on Delay Time | Inductive Switching (150°C) $V_{GE} = \pm 15V$ $V_{Bus} = 400V$ $I_C = 100A$ $R_G = 3.6\Omega$ | | 19 | | ns |
| T_r | Rise Time | | | 29 | | |
| $T_{d(off)}$ | Turn-off Delay Time | | | 227 | | |
| T_f | Fall Time | | | 22 | | |
| E_{on} | Turn on Energy | $V_{GE} = \pm 15V$ $V_{Bus} = 400V$ $I_C = 100A$ $R_G = 3.6\Omega$ | $T_j = 150^\circ C$ | 2.4 | | mJ |
| E_{off} | Turn off Energy | | $T_j = 150^\circ C$ | 2 | | |
| R_G | Integrated gate resistor | | | 2 | | Ω |
| I_{sc} | Short Circuit data | $V_{GE} \leq 15V; V_{Bus} = 400V$ $t_p \leq 5\mu s; T_j = 150^\circ C$ | | 700 | | A |
| R_{thJC} | Junction to Case Thermal Resistance | | | | 0.44 | $^\circ C/W$ |

Diode ratings and characteristics (per diode)

| Symbol | Characteristic | Test Conditions | Min | Typ | Max | Unit |
|------------|-------------------------------------|---|---|------------|------|--------------|
| V_{RRM} | Peak Repetitive Reverse Voltage | | | | 650 | V |
| I_{RM} | Reverse Leakage Current | $V_R = 650V$ | | | 50 | μA |
| I_F | DC Forward Current | $T_c = 25^\circ C$ | | 100 | | A |
| V_F | Diode Forward Voltage | $I_F = 100A$ $V_{GE} = 0V$ | $T_j = 25^\circ C$ $T_j = 150^\circ C$ | 1.6 1.5 | 2 | V |
| t_{rr} | Reverse Recovery Time | $I_F = 100A$ $V_R = 300V$ $di/dt = 2000A/\mu s$ | $T_j = 25^\circ C$ $T_j = 150^\circ C$ | 125 220 | | ns |
| Q_{rr} | Reverse Recovery Charge | | $T_j = 25^\circ C$ $T_j = 150^\circ C$ | 4.7 9.9 | | μC |
| E_{rr} | Reverse Recovery Energy | | $T_j = 25^\circ C$ $T_j = 150^\circ C$ | 1.1 2.4 | | mJ |
| R_{thJC} | Junction to Case Thermal Resistance | | | | 0.77 | $^\circ C/W$ |

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

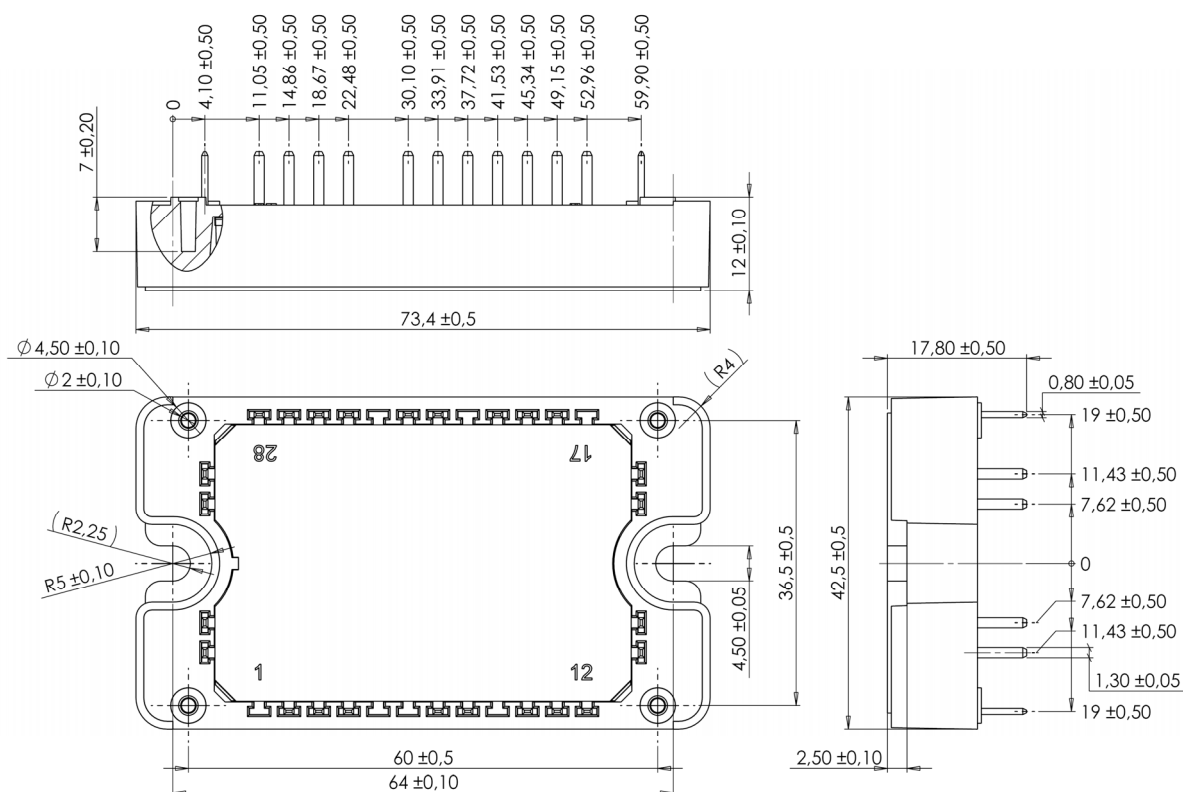
| Symbol | Characteristic | Min | Typ | Max | Unit |
|-----------------------------------|----------------------------|-----|------|-----|------|
| R ₂₅ | Resistance @ 25°C | | 50 | | kΩ |
| ΔR ₂₅ /R ₂₅ | | | 5 | | % |
| B _{25/85} | T ₂₅ = 298.15 K | | 3952 | | K |
| ΔB/B | T _C = 100°C | | 4 | | %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

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

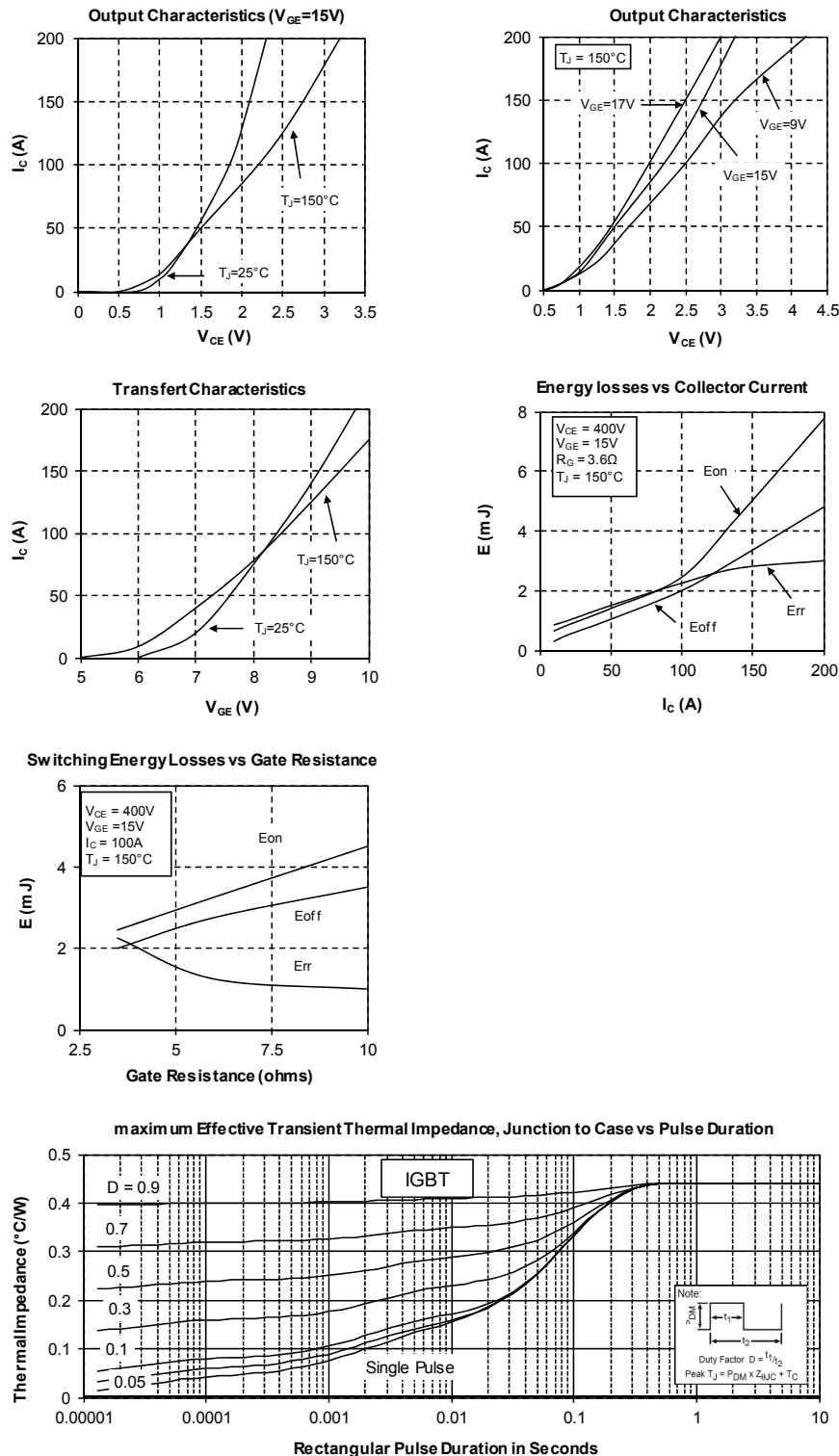
T: Thermistor temperature
R_T: Thermistor value at T

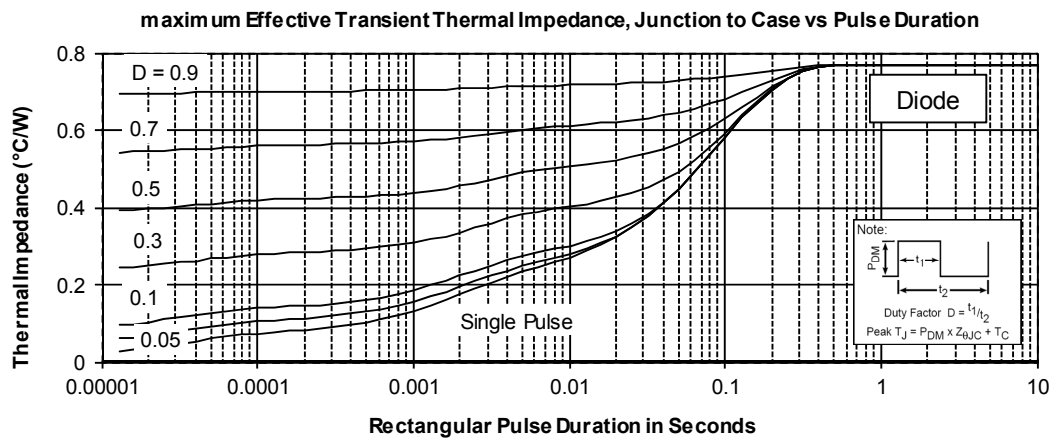
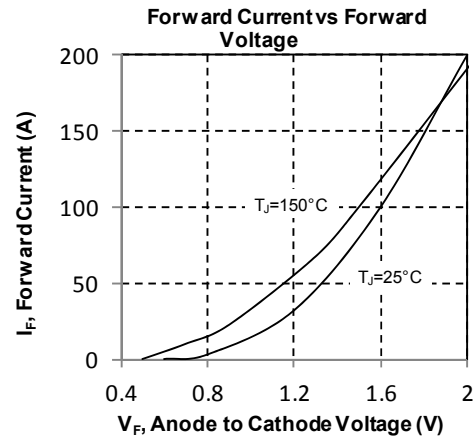
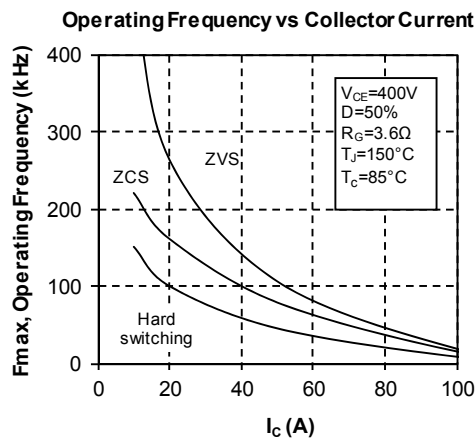
Thermal and package characteristics

| Symbol | Characteristic | Min | Max | Unit |
|-------------------|--|-------------|-----------------------|------|
| V _{ISOL} | RMS Isolation Voltage, any terminal to case t = 1 min, 50/60Hz | 4000 | | V |
| T _J | Operating junction temperature range | -40 | 175 | °C |
| T _{JOP} | Recommended junction temperature under switching conditions | -40 | T _{Jmax} -25 | |
| T _{STG} | Storage Temperature Range | -40 | 125 | |
| T _C | Operating Case Temperature | -40 | 125 | |
| Torque | Mounting torque | To heatsink | M4 | N.m |
| Wt | Package Weight | | 110 | g |

Package outline (dimensions in mm)

 See application note 1906 - Mounting Instructions for SP3F Power Modules on www.microsemi.com

Typical performance curve





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