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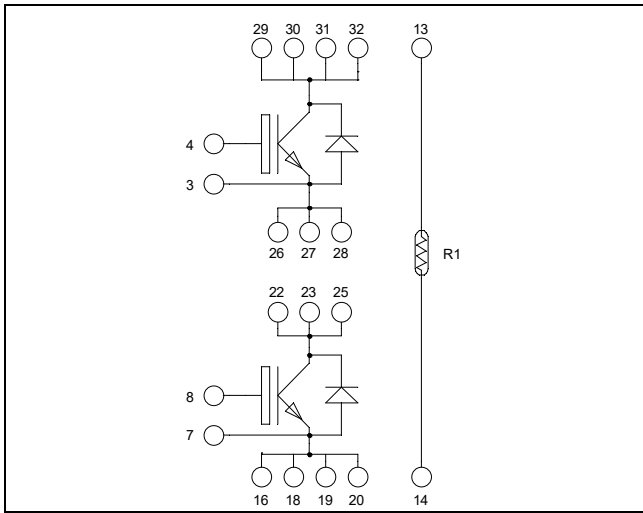
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Phase leg
High speed Trench + Field Stop IGBT4
Power Module

$V_{CES} = 1200V$
 $I_C = 100A @ T_c = 100^\circ C$

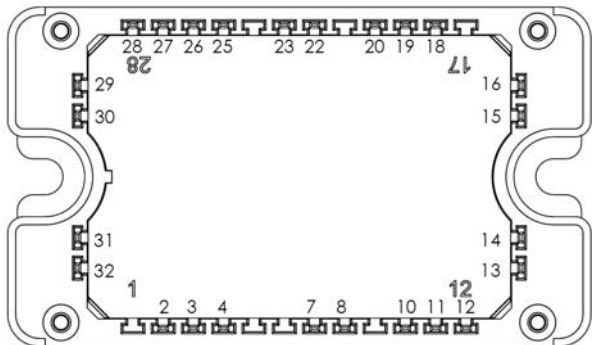


Application

- 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
- Kelvin emitter for easy drive
- Very low stray inductance
- Internal thermistor for temperature monitoring
- AlN substrate for improved thermal performance



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

Pins 29/30/31/32 must be shorted together
 Pins 26/27/28/22/23/25 must be shorted together
 to achieve a phase leg
 Pins 16/18/19/20 must be shorted together

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 | 1200 | V |
| I_C | Continuous Collector Current | $T_c = 25^\circ C$ | 185 |
| | | $T_c = 100^\circ C$ | 100 |
| I_{CM} | Pulsed Collector Current | $T_c = 25^\circ C$ | 375 |
| V_{GE} | Gate - Emitter Voltage | ± 20 | V |
| P_D | Power Dissipation | 650 | 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} = 1200V | | | 50 | μA |
| V _{CE(sat)} | Collector Emitter Saturation Voltage | V _{GE} = 15V I _C = 100A | 1.7 | T _j = 25°C 2.05 | 2.4 | V |
| | | T _j = 150°C 2.6 | | | | |
| V _{GE(th)} | Gate Threshold Voltage | V _{GE} = V _{CE} , I _C = 3.8 mA | 5.0 | 5.8 | 6.5 | 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 V _{CE} = 25V f = 1MHz | | 6150 | | pF |
| C _{oes} | Output Capacitance | | | 350 | | |
| C _{res} | Reverse Transfer Capacitance | | | 300 | | |
| Q _G | Gate charge | V _{GE} = 15V, I _C = 100A V _{CE} = 960V | | 450 | | nC |
| T _{d(on)} | Turn-on Delay Time | Inductive Switching (25°C) V _{GE} = ±15V V _{Bus} = 600V I _C = 100A R _G = 5Ω | | 30 | | ns |
| T _r | Rise Time | | | 57 | | |
| T _{d(off)} | Turn-off Delay Time | | | 290 | | |
| T _f | Fall Time | | | 16 | | |
| T _{d(on)} | Turn-on Delay Time | Inductive Switching (150°C) V _{GE} = ±15V V _{Bus} = 600V I _C = 100A R _G = 5Ω | | 30 | | ns |
| T _r | Rise Time | | | 49 | | |
| T _{d(off)} | Turn-off Delay Time | | | 366 | | |
| T _f | Fall Time | | | 48 | | |
| E _{on} | Turn on Energy | V _{GE} = ±15V V _{Bus} = 600V I _C = 100A R _G = 5Ω | T _j = 25°C | 7.7 | | mJ |
| | | | T _j = 150°C | 9 | | |
| E _{off} | Turn off Energy | | T _j = 25°C | 2.9 | | |
| | | | T _j = 150°C | 5.4 | | |
| I _{sc} | Short Circuit data | V _{GE} ≤ 15V ; V _{Bus} = 900V t _p ≤ 10μs ; T _j = 150°C | | 350 | | A |
| R _{thJC} | Junction to Case Thermal Resistance | | | | 0.23 | °C/W |

Diode ratings and characteristics (per diode)

| Symbol | Characteristic | Test Conditions | Min | Typ | Max | Unit |
|-------------------|-------------------------------------|---|------------------------|------|------|------|
| V _{RRM} | Peak Repetitive Reverse Voltage | | | | 1200 | V |
| I _{RM} | Reverse Leakage Current | V _R = 1200V | | | 150 | μA |
| I _F | DC Forward Current | T _c = 80°C | | 120 | | A |
| V _F | Diode Forward Voltage | I _F = 120A | | 2.6 | 3 | V |
| | | I _F = 240A | | 3 | | |
| | | I _F = 120A T _j = 125°C | | 1.8 | | |
| t _{rr} | Reverse Recovery Time | I _F = 120A V _R = 800V di/dt = 400A/μs | T _j = 25°C | 265 | | ns |
| | | | T _j = 125°C | 350 | | |
| Q _{rr} | Reverse Recovery Charge | I _F = 120A V _R = 800V di/dt = 400A/μs | T _j = 25°C | 1120 | | nC |
| | | | T _j = 125°C | 5780 | | |
| R _{thJC} | Junction to Case Thermal Resistance | | | | 0.37 | °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 | | % |

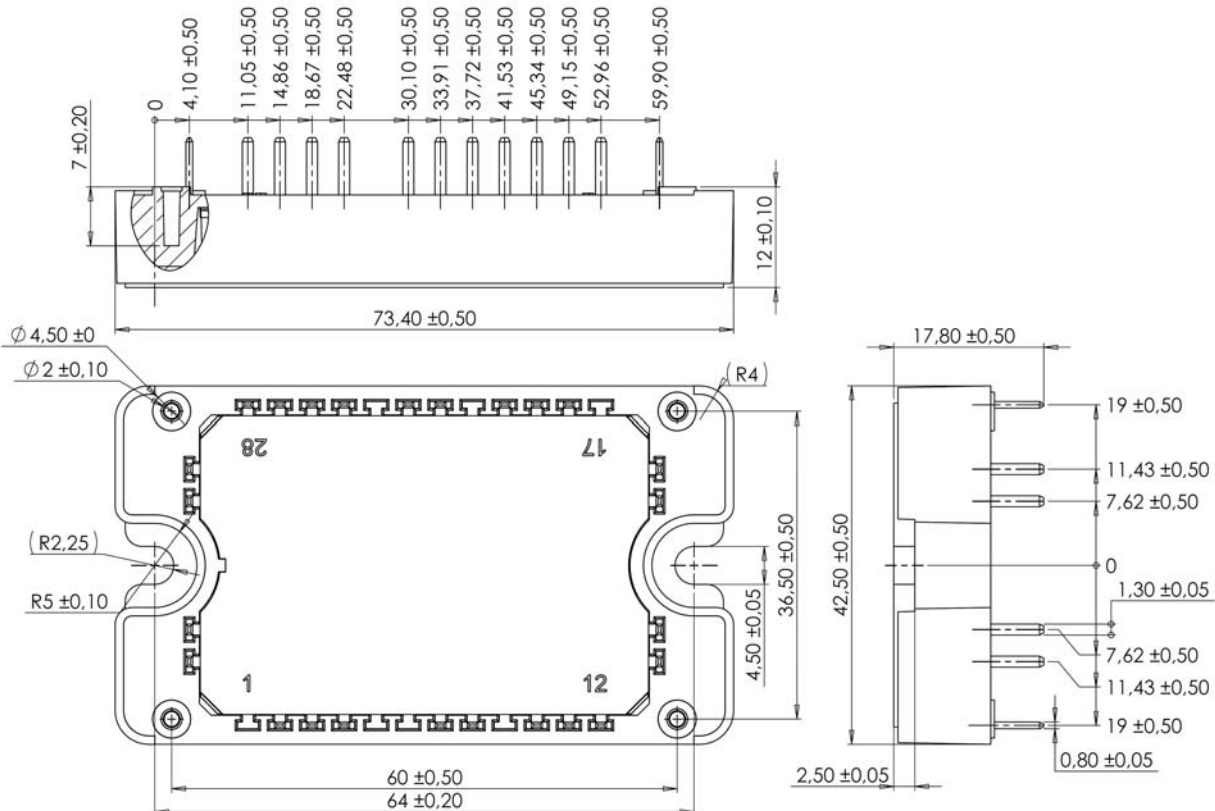
$$R_T = \frac{R_{25}}{\exp \left[B_{25/85} \left(\frac{1}{T_{25}} - \frac{1}{T} \right) \right]}$$

T: Thermistor temperature
 R_T: Thermistor value at T

Thermal and package characteristics

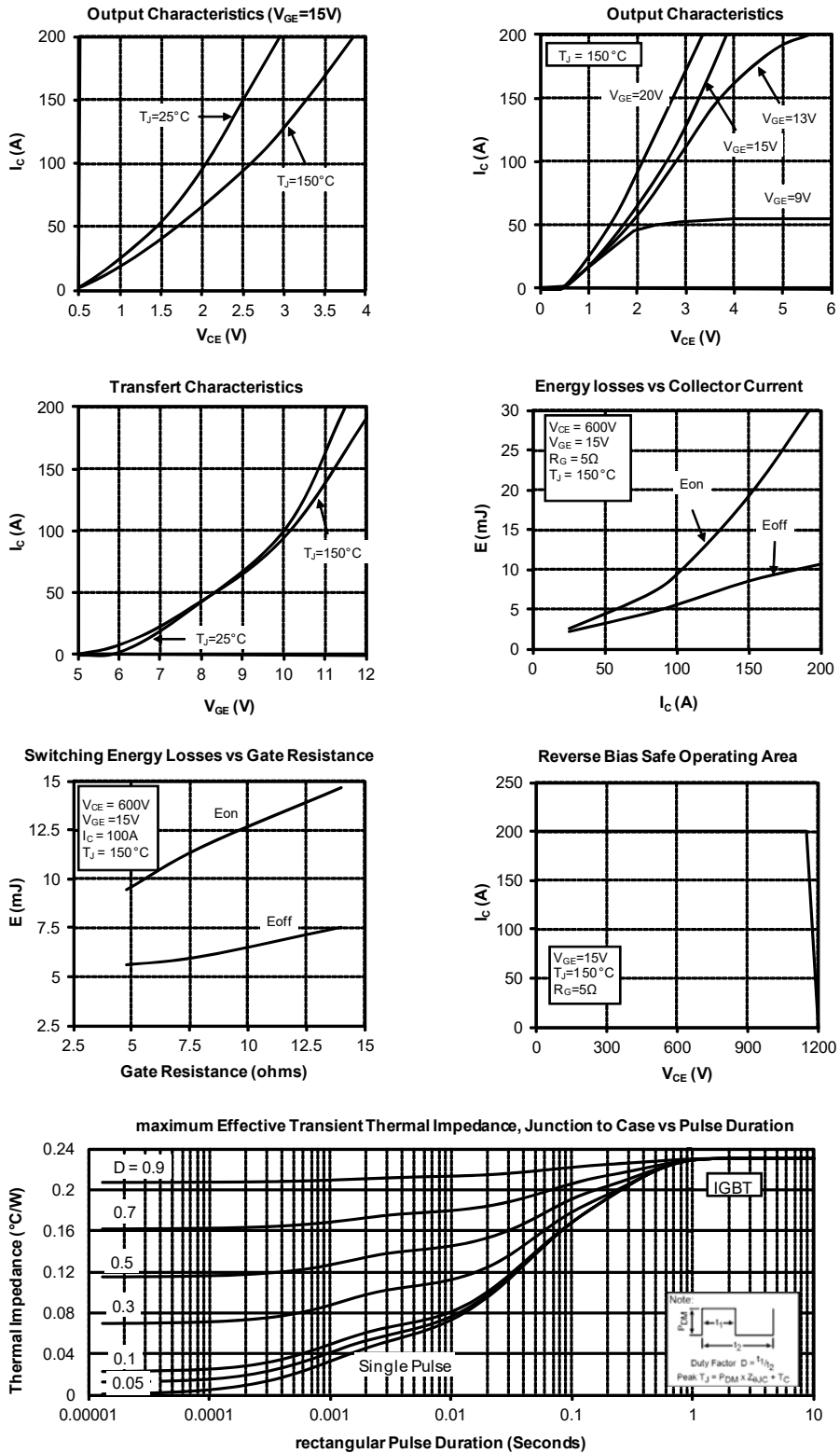
| Symbol | Characteristic | Min | Max | Unit | | |
|-------------------|--|-------------|-----------------------|------|-----|-----|
| V _{ISOL} | RMS Isolation Voltage, any terminal to case t=1 min, 50/60Hz | 4000 | | V | | |
| T _J | Operating junction temperature range | -40 | 175 | °C | | |
| T _{JOP} | 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 | 2 | 3 | N.m |
| Wt | Package Weight | | | | 110 | g |

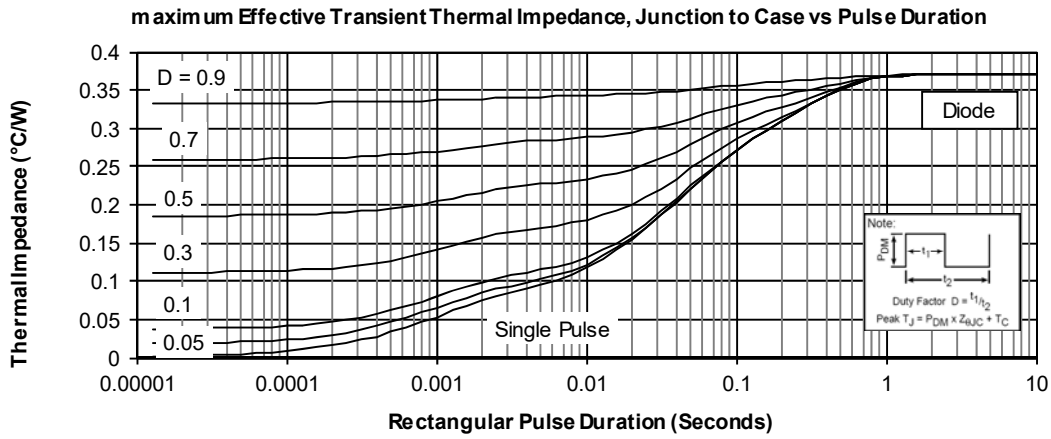
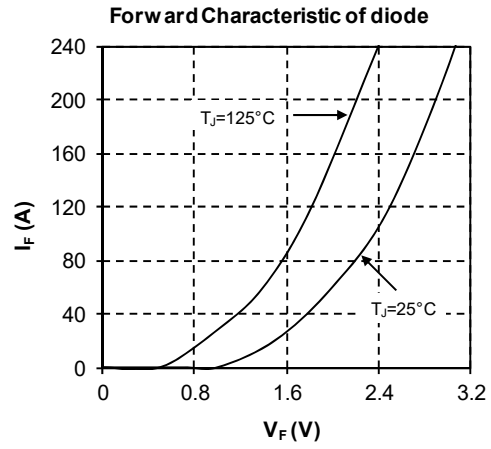
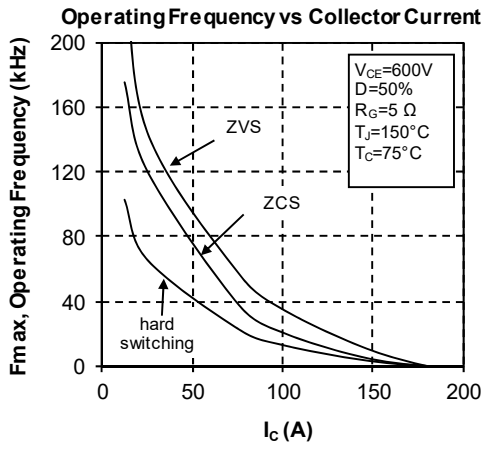
Package outline (dimensions in mm)



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

Typical performance curve





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