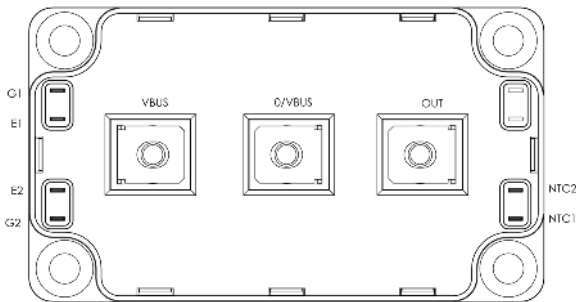
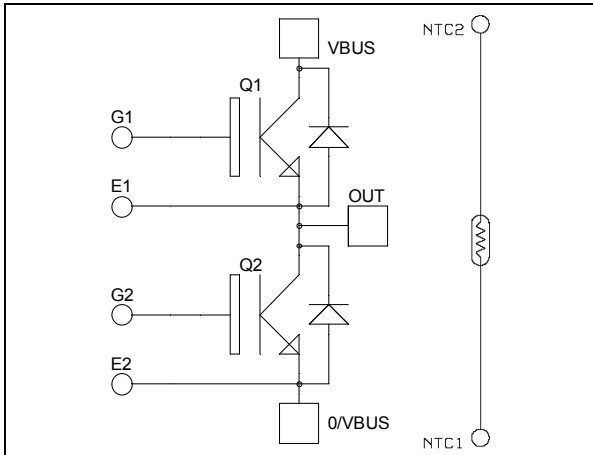


Phase leg
High speed Trench + Field Stop IGBT4
Power module

$V_{CES} = 650V$
 $I_C = 600A^* @ T_c = 60^\circ C$



Application

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

Features

- High speed 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 source for easy drive
- Very low stray inductance
- M5 power connectors
- High level of integration
- Internal thermistor for temperature monitoring

Benefits

- Stable temperature behavior
- Very rugged
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Easy paralleling due to positive TC of VCEsat
- Low profile
- 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 | $T_C = 25^\circ C$ | 770* |
| | | $T_C = 60^\circ C$ | 600* |
| I_{CM} | Pulsed Collector Current | $T_C = 25^\circ C$ | 1500 |
| V_{GE} | Gate - Emitter Voltage | ± 20 | V |
| P_D | Maximum Power Dissipation | $T_C = 25^\circ C$ | 2000 |
| RBSOA | Reverse Bias Safe Operating Area | $T_j = 125^\circ C$ | 1200A @ 600V |

* Specification of device but current must be limited due to size of power connectors.

CAUTION: These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed. See application note APT0502 on www.microsemi.com

Electrical Characteristics (per IGBT)

| Symbol | Characteristic | Test Conditions | Min | Typ | Max | Unit |
|---------------|--------------------------------------|---------------------------------|-----|-------------|-----|---------|
| I_{CES} | Zero Gate Voltage Collector Current | $V_{GE} = 0V, V_{CE} = 650V$ | | | 600 | μA |
| $V_{CE(sat)}$ | Collector Emitter saturation Voltage | $V_{GE} = 15V$ $I_C = 600A$ | | 1.85 2.2 | 2.3 | V |
| $V_{GE(th)}$ | Gate Threshold Voltage | $V_{GE} = V_{CE}, I_C = 3.2 mA$ | 4.2 | 5.1 | 5.6 | V |
| I_{GES} | Gate – Emitter Leakage Current | $V_{GE} = 20V, V_{CE} = 0V$ | | | 1 | μA |

Dynamic Characteristics (per IGBT)

| Symbol | Characteristic | Test Conditions | Min | Typ | Max | Unit |
|--------------|-------------------------------------|---|---|------------|-------|--------------|
| C_{ies} | Input Capacitance | $V_{GE} = 0V$ | | 36.6 | | nF |
| C_{oes} | Output Capacitance | $V_{CE} = 25V$ | | 1.3 | | |
| C_{res} | Reverse Transfer Capacitance | $f = 1MHz$ | | 1.08 | | |
| Q_G | Gate charge | $V_{GE} = 15V ; V_{CE} = 480V$ $I_C = 600A$ | | 3500 | | nC |
| $T_{d(on)}$ | Turn-on Delay Time | Inductive Switching (25°C) $V_{GE} = \pm 15V$ $V_{CE} = 400V$ $I_C = 600A$ $R_G = 0.6\Omega$ | | 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) $V_{GE} = \pm 15V$ $V_{CE} = 400V$ $I_C = 600A$ $R_G = 0.6\Omega$ | | 19 | | ns |
| T_r | Rise Time | | | 29 | | |
| $T_{d(off)}$ | Turn-off Delay Time | | | 227 | | |
| T_f | Fall Time | | | 22 | | |
| E_{on} | Turn-on Switching Energy | $V_{GE} = \pm 15V$ $V_{CE} = 400V$ $I_C = 600A$ | $T_j = 25^\circ C$ $T_j = 150^\circ C$ | 12 14.7 | | mJ |
| E_{off} | Turn-off Switching Energy | $R_G = 0.6\Omega$ | $T_j = 25^\circ C$ $T_j = 150^\circ C$ | 11.2 12 | | mJ |
| I_{sc} | Short Circuit data | $V_{GE} \leq 15V ; V_{Bus} = 600V$ $t_p \leq 10\mu s ; T_j = 150^\circ C$ | | 3900 | | A |
| R_{thJC} | Junction to Case Thermal Resistance | | | | 0.075 | $^\circ C/W$ |

Diode ratings and characteristics (per diode)

| Symbol | Characteristic | Test Conditions | Min | Typ | Max | Unit |
|------------|-------------------------------------|---|---------------------|------|------|--------------|
| V_{RRM} | Repetitive Reverse Voltage | | | | 650 | V |
| I_{RM} | Reverse Leakage Current | $V_R = 650V$ | | | 300 | μA |
| I_F | DC Forward Current | | | 600 | | A |
| V_F | Diode Forward Voltage | $I_F = 600A$ $V_{GE} = 0V$ | $T_j = 25^\circ C$ | 1.6 | 2 | V |
| | | | $T_j = 150^\circ C$ | 1.5 | | |
| t_{rr} | Reverse Recovery Time | $I_F = 600A$ $V_R = 400V$ $di/dt = 7000A/\mu s$ | $T_j = 25^\circ C$ | 125 | | ns |
| | | | $T_j = 150^\circ C$ | 220 | | |
| Q_{rr} | Reverse Recovery Charge | $I_F = 600A$ $V_R = 400V$ $di/dt = 7000A/\mu s$ | $T_j = 25^\circ C$ | 28.1 | | μC |
| | | | $T_j = 150^\circ C$ | 59.3 | | |
| E_r | Reverse Recovery Energy | $I_F = 600A$ $V_R = 400V$ $di/dt = 7000A/\mu s$ | $T_j = 25^\circ C$ | 6.6 | | mJ |
| | | | $T_j = 150^\circ C$ | 14.4 | | |
| R_{thJC} | Junction to Case Thermal Resistance | | | | 0.13 | $^\circ C/W$ |

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 | | % |

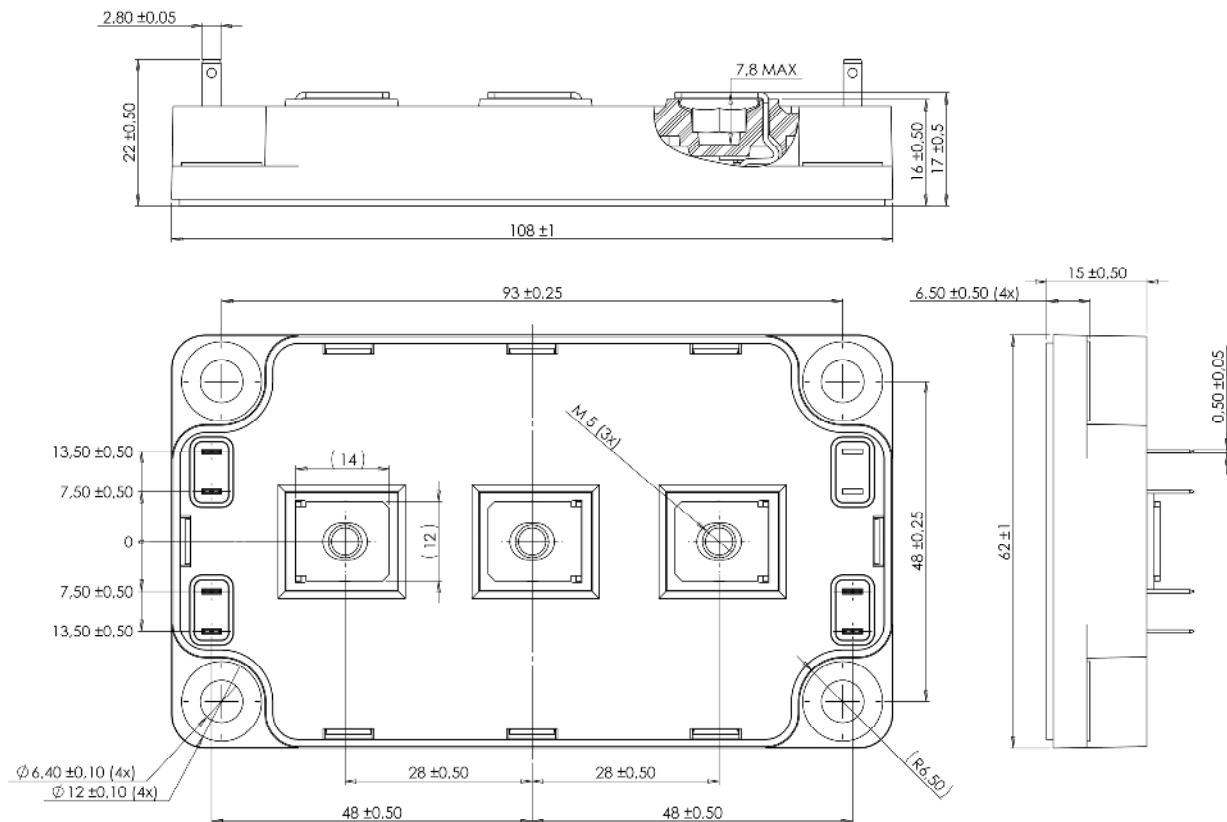
$$R_T = \frac{R_{25}}{\exp \left[B_{25/85} \left(\frac{1}{T_{25}} - \frac{1}{T} \right) \right]}$$

T: Thermistor temperature
 R_T: Thermistor value at T

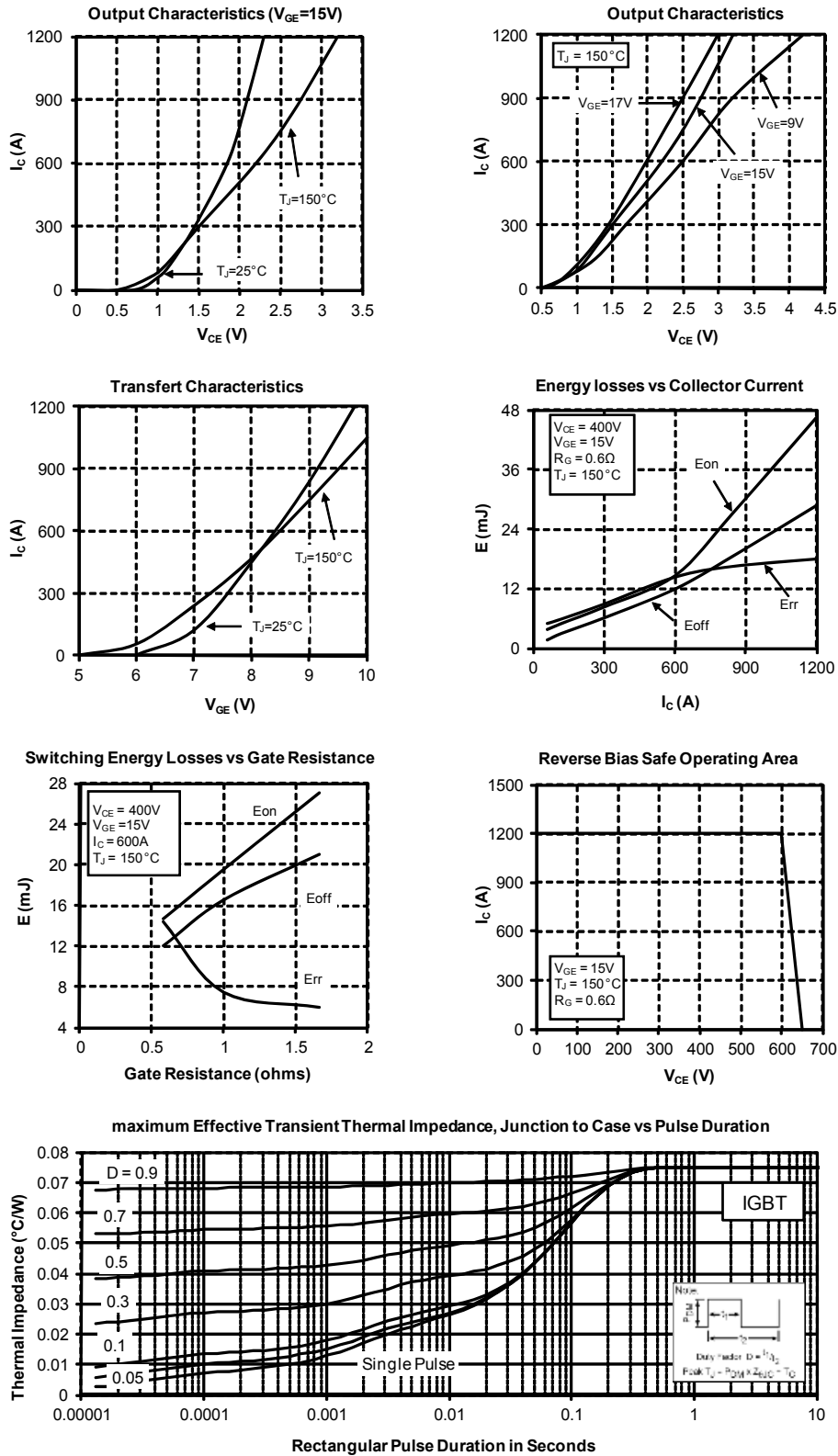
Thermal and package characteristics

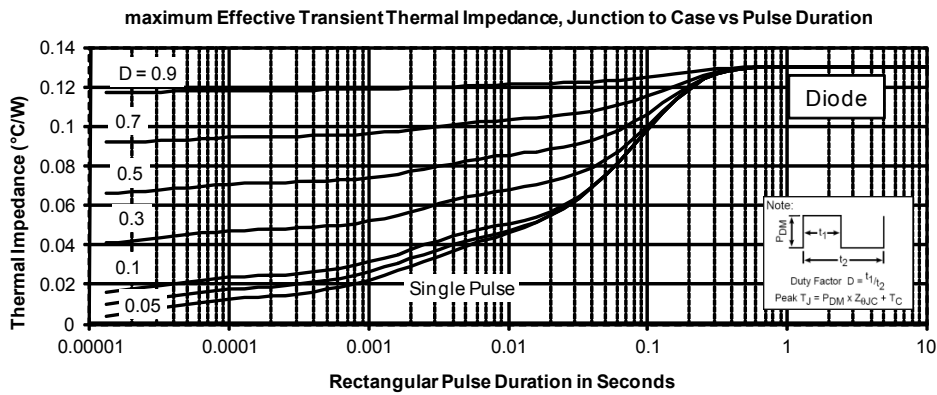
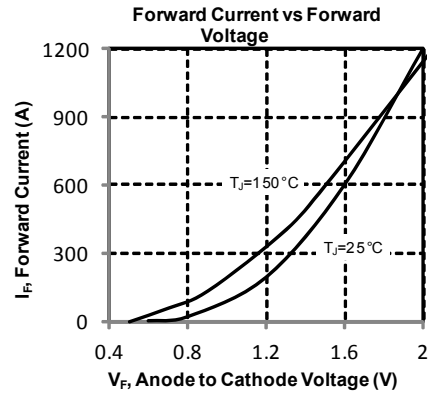
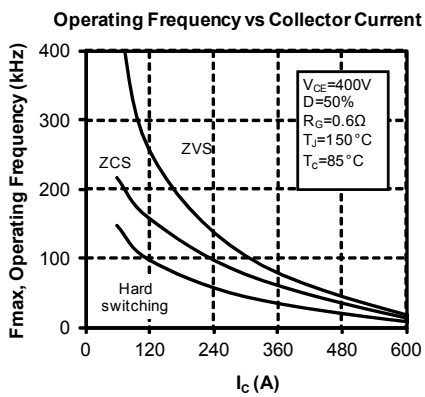
| Symbol | Characteristic | Min | Max | Unit | |
|-------------------|--|---------------|-----------------------|------|-----|
| V _{ISOL} | RMS Isolation Voltage, any terminal to case t = 1 min, 50/60Hz | 4000 | | V | |
| T _J | Operating junction temperature range | -40 | 175 | °C | |
| T _{JOP} | Recommended junction temperature under switching conditions | -40 | T _{Jmax} -25 | | |
| T _{STG} | Storage Temperature Range | -40 | 125 | | |
| T _C | Operating Case Temperature | -40 | 100 | | |
| Torque | Mounting torque | To Heatsink | M6 | 3 | N.m |
| | | For terminals | M5 | 2 | |
| Wt | Package Weight | | 300 | g | |

SP6 Package outline (dimensions in mm)



See application note APT0601 - Mounting Instructions for SP6 Power Modules on www.microsemi.com

Typical Performance Curve




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