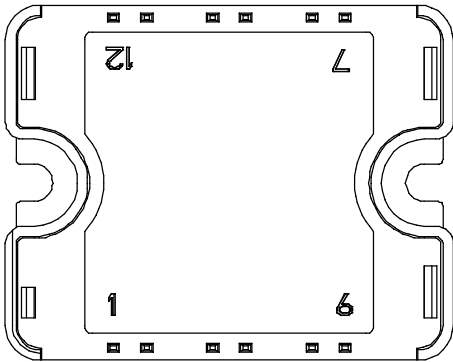
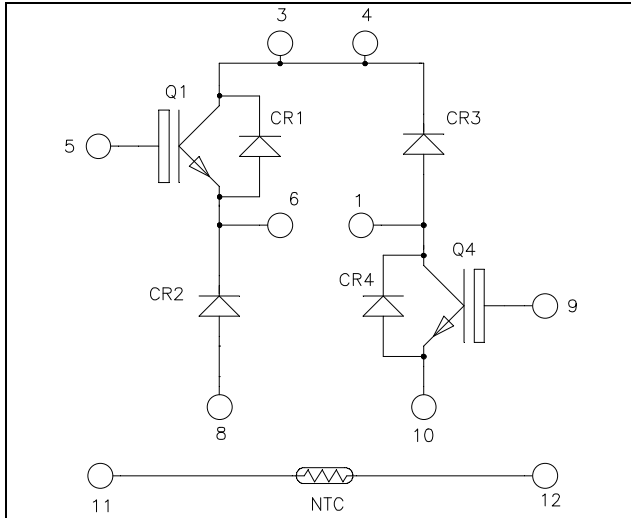


**Asymmetrical - Bridge
Trench + Field Stop IGBT
Power Module**

**$V_{CES} = 600V$
 $I_C = 50A^* @ T_c = 80^\circ C$**



Pins 3/4 must be shorted together

Application

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

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
 - RBSOA and SCSOA rated
- Very low stray inductance
 - Symmetrical design
- Internal thermistor for temperature monitoring
- High level of integration

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
- RoHS Compliant

Absolute maximum ratings

| Symbol | Parameter | Max ratings | Unit |
|-----------|---------------------------------------|---------------------|-------------|
| V_{CES} | Collector - Emitter Breakdown Voltage | 600 | V |
| I_C | Continuous Collector Current | $T_C = 25^\circ C$ | 80* |
| | | $T_C = 80^\circ C$ | 50* |
| I_{CM} | Pulsed Collector Current | $T_C = 25^\circ C$ | 100 |
| V_{GE} | Gate - Emitter Voltage | ± 20 | V |
| P_D | Maximum Power Dissipation | $T_C = 25^\circ C$ | 176 |
| RBSOA | Reverse Bias Safe Operating Area | $T_J = 150^\circ C$ | 100A @ 550V |

* Specification of IGBT device but output current must be limited to 40A to not exceed a delta of temperature greater than 35°C for the connectors.

CAUTION: These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed. See application note APT0502 on 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 | μA |
| $V_{CE(sat)}$ | Collector Emitter Saturation Voltage | $V_{GE} = 15V$ $I_C = 50A$ | | 1.5 1.7 | 1.9 | V |
| $V_{GE(th)}$ | Gate Threshold Voltage | $V_{GE} = V_{CE}, I_C = 600\mu\text{A}$ | 5.0 | 5.8 | 6.5 | V |
| I_{GES} | Gate – Emitter Leakage Current | $V_{GE} = 20V, V_{CE} = 0V$ | | | 600 | nA |

Dynamic Characteristics

| Symbol | Characteristic | Test Conditions | Min | Typ | Max | Unit |
|--------------|------------------------------|---|---------------------------|------|-----|---------------|
| C_{ies} | Input Capacitance | $V_{GE} = 0V$ | | 3150 | | pF |
| C_{oes} | Output Capacitance | $V_{CE} = 25V$ | | 200 | | |
| C_{res} | Reverse Transfer Capacitance | $f = 1\text{MHz}$ | | 95 | | |
| Q_G | Gate charge | $V_{GE} = \pm 15V, I_C = 50A$ $V_{CE} = 300V$ | | 0.5 | | μC |
| $T_{d(on)}$ | Turn-on Delay Time | Inductive Switching (25°C) $V_{GE} = \pm 15V$ $V_{Bus} = 300V$ $I_C = 50A$ $R_G = 8.2\Omega$ | | 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°C) $V_{GE} = \pm 15V$ $V_{Bus} = 300V$ $I_C = 50A$ $R_G = 8.2\Omega$ | | 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 | $V_{GE} = \pm 15V$ $V_{Bus} = 300V$ | $T_j = 25^\circ\text{C}$ | 0.3 | | mJ |
| | | | $T_j = 150^\circ\text{C}$ | 0.43 | | |
| E_{off} | Turn-off Switching Energy | $I_C = 50A$ $R_G = 8.2\Omega$ | $T_j = 25^\circ\text{C}$ | 1.35 | | mJ |
| | | | $T_j = 150^\circ\text{C}$ | 1.75 | | |
| I_{sc} | Short Circuit data | $V_{GE} \leq 15V; V_{Bus} = 360V$ $t_p \leq 6\mu\text{s}; T_j = 150^\circ\text{C}$ | | 250 | | A |

Diode ratings and characteristics (CR2 & CR3)

| Symbol | Characteristic | Test Conditions | Min | Typ | Max | Unit |
|-----------|---|--|---------------------------|------------|------------|---------------|
| V_{RRM} | Maximum Peak Repetitive Reverse Voltage | | 600 | | | V |
| I_{RM} | Maximum Reverse Leakage Current | $V_R = 600V$ | | | 250 500 | μA |
| | | | | | | |
| I_F | DC Forward Current | | | 50 | | A |
| | | | | | | |
| V_F | Diode Forward Voltage | $I_F = 50A$ $V_{GE} = 0V$ | | 1.6 1.5 | 2 | V |
| | | | | | | |
| t_{rr} | Reverse Recovery Time | $I_F = 50A$ $V_R = 300V$ $di/dt = 1800A/\mu\text{s}$ | $T_j = 25^\circ\text{C}$ | 100 | | ns |
| | | | $T_j = 150^\circ\text{C}$ | 150 | | |
| Q_{rr} | Reverse Recovery Charge | | $T_j = 25^\circ\text{C}$ | 2.6 | | μC |
| | | | $T_j = 150^\circ\text{C}$ | 5.4 | | |
| E_r | Reverse Recovery Energy | | $T_j = 25^\circ\text{C}$ | 0.6 | | mJ |
| | | | $T_j = 150^\circ\text{C}$ | 1.2 | | |

CR1 & CR4 are IGBT protection diodes only

Thermal and package characteristics

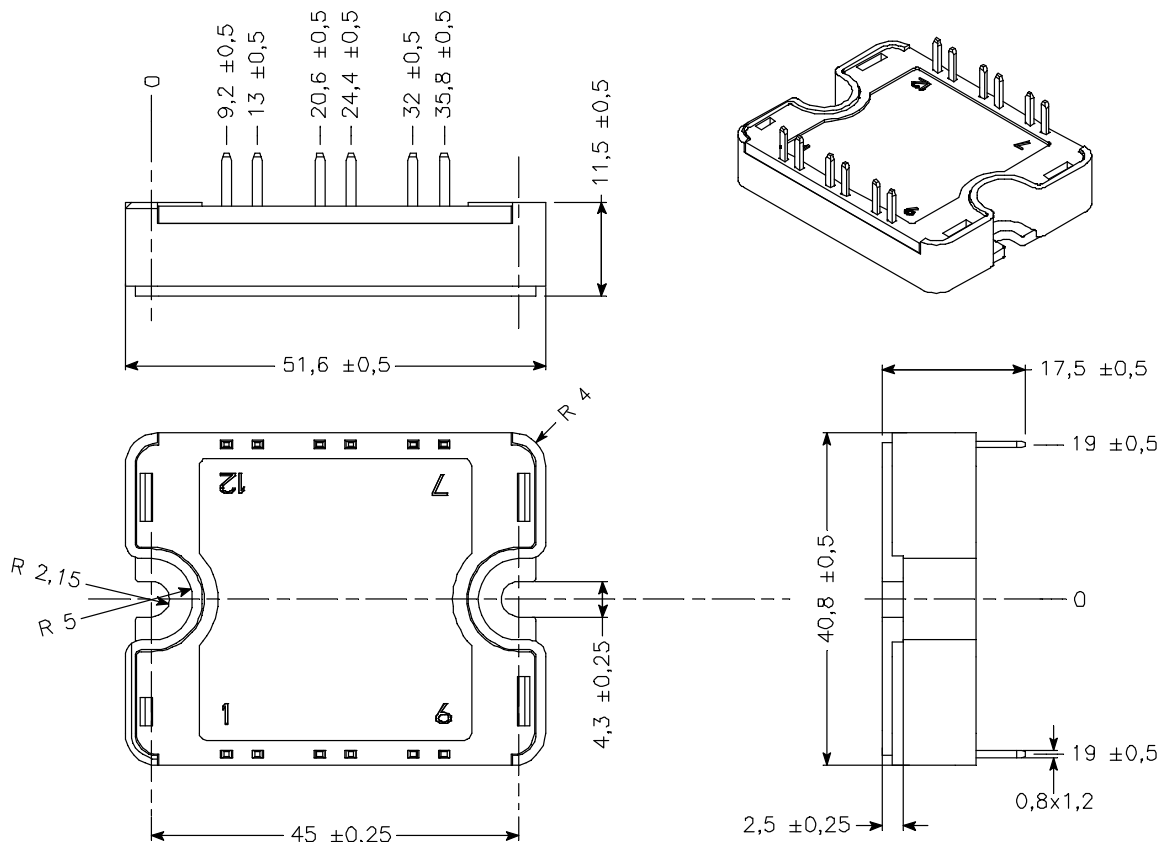
| Symbol | Characteristic | Min | Typ | Max | Unit | |
|-------------------|---|-------------|-----|------|------|-----|
| R _{thJC} | Junction to Case Thermal Resistance | IGBT | | 0.85 | °C/W | |
| | | Diode | | 1.42 | | |
| V _{ISOL} | RMS Isolation Voltage, any terminal to case t = 1 min, I _{isol} < 1mA, 50/60Hz | 2500 | | | 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 | 2.5 | 4.7 | N.m |
| Wt | Package Weight | | | 80 | | g |

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

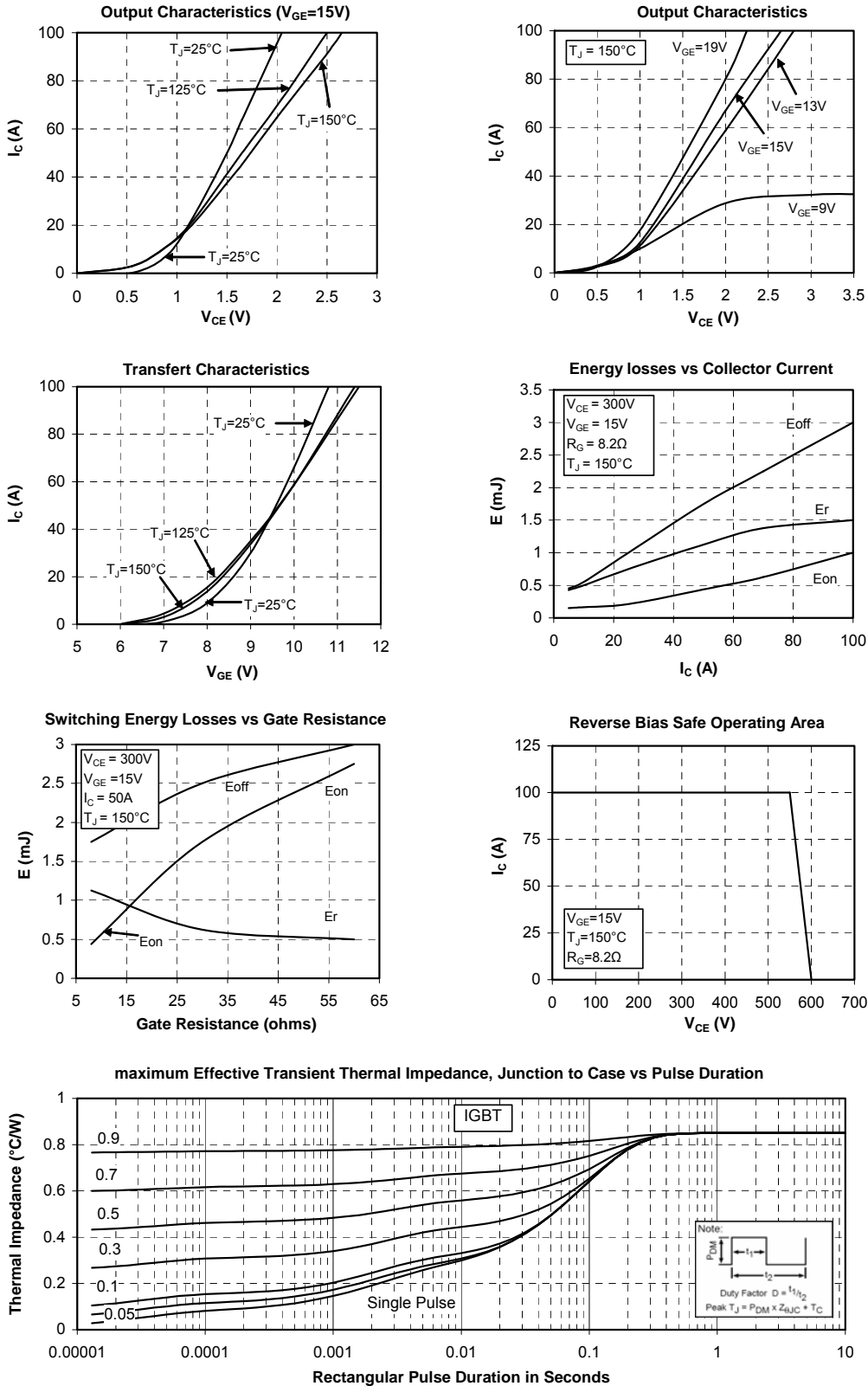
| Symbol | Characteristic | Min | Typ | Max | Unit |
|-----------------------------------|----------------------------|------------------------|------|-----|------|
| R ₂₅ | Resistance @ 25°C | | 50 | | kΩ |
| ΔR ₂₅ /R ₂₅ | | | 5 | | % |
| B _{25/85} | T ₂₅ = 298.15 K | | 3952 | | K |
| ΔB/B | | T _C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

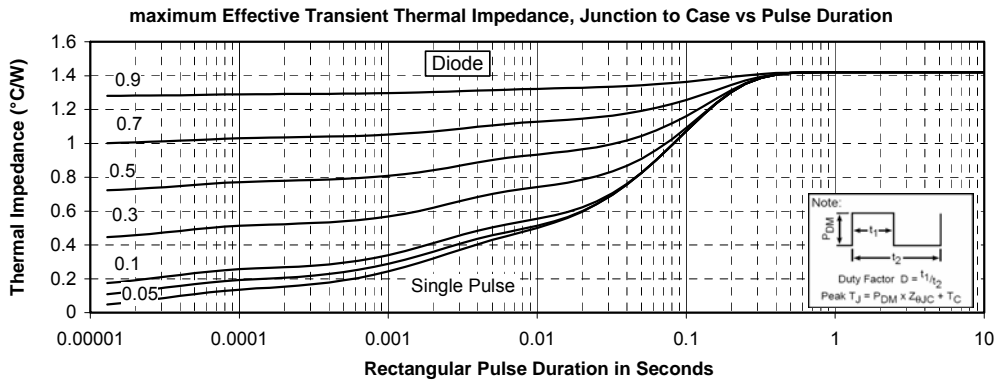
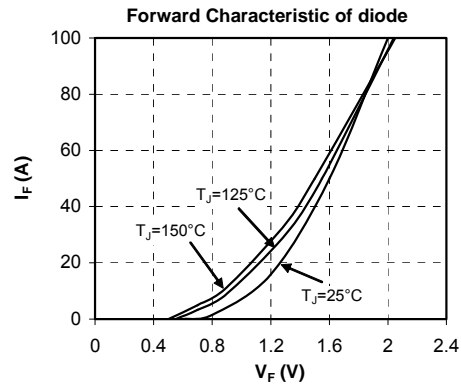
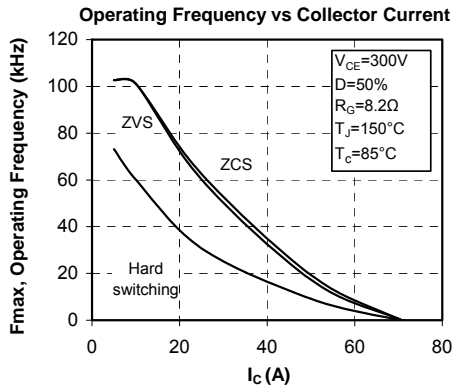
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

T: Thermistor temperature
 R_T: Thermistor value at T

SP1 Package outline (dimensions in mm)

 See application note 1904 - Mounting Instructions for SP1 Power Modules on www.microsemi.com

Typical Performance Curve





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