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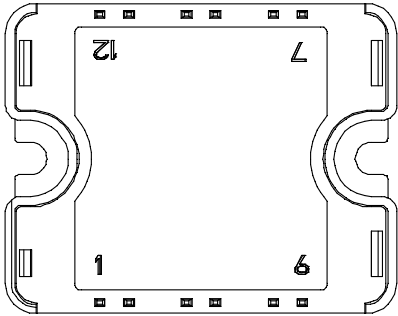
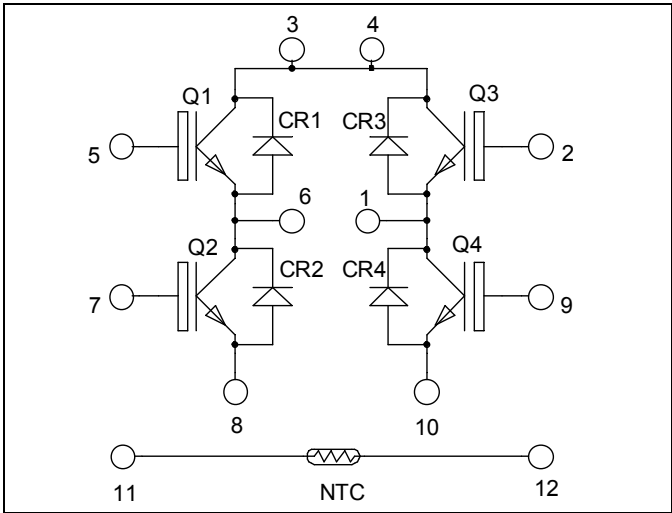
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**Full bridge  
Trench + Field Stop IGBT4  
Power Module**

**$V_{CES} = 1200V$   
 $I_C = 40A @ T_c = 80^\circ C$**



Pins 3/4 must be shorted together

**Application**

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

**Features**

- Trench + Field Stop IGBT 4 Technology
  - Low voltage drop
  - Low leakage current
  - Low switching losses
  - Low tail current
  - Soft recovery parallel diodes
  - Low diode VF
  - RBSOA and SCSOA rated
- Kelvin emitter for easy drive
- Very low stray inductance
- High level of integration
- 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
- RoHS compliant

**Absolute maximum ratings**

Symbol	Parameter	Max ratings	Unit
$V_{CES}$	Collector - Emitter Breakdown Voltage	1200	V
$I_C$	Continuous Collector Current	$T_c = 25^\circ C$	65
		$T_c = 80^\circ C$	40
$I_{CM}$	Pulsed Collector Current	$T_c = 25^\circ C$	70
$V_{GE}$	Gate - Emitter Voltage	$\pm 20$	V
$P_D$	Maximum Power Dissipation	$T_c = 25^\circ C$	220
RBSOA	Reverse Bias Safe Operating Area	$T_j = 150^\circ C$	70A @ 1100V

**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)

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	$V_{GE} = 0V, V_{CE} = 1200V$			250	$\mu\text{A}$
$V_{CE(sat)}$	Collector Emitter saturation Voltage	$V_{GE} = 15V$ $I_C = 35A$		1.85 2.25	2.25	V
		$T_j = 25^\circ\text{C}$ $T_j = 150^\circ\text{C}$				
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE} = V_{CE}, I_C = 1.2mA$	5.0	5.8	6.5	V
$I_{GES}$	Gate – Emitter Leakage Current	$V_{GE} = 20V, V_{CE} = 0V$			400	nA

**Dynamic Characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$C_{ies}$	Input Capacitance	$V_{GE} = 0V$		1950		pF
$C_{oes}$	Output Capacitance	$V_{CE} = 25V$		155		
$C_{res}$	Reverse Transfer Capacitance	$f = 1MHz$		115		
$Q_G$	Gate charge	$V_{GE} = \pm 15V; V_{CE} = 600V$ $I_C = 35A$		0.27		$\mu\text{C}$
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching ( $25^\circ\text{C}$ ) $V_{GE} = \pm 15V$ $V_{CE} = 600V$ $I_C = 35A$ $R_G = 12\Omega$		130		ns
$T_r$	Rise Time			20		
$T_{d(off)}$	Turn-off Delay Time			300		
$T_f$	Fall Time			45		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching ( $150^\circ\text{C}$ ) $V_{GE} = \pm 15V$ $V_{CE} = 600V$ $I_C = 35A$ $R_G = 12\Omega$		150		ns
$T_r$	Rise Time			35		
$T_{d(off)}$	Turn-off Delay Time			350		
$T_f$	Fall Time			80		
$E_{on}$	Turn-on Switching Energy	$V_{GE} = \pm 15V$ $V_{CE} = 600V$ $I_C = 35A$ $R_G = 12\Omega$	$T_j = 25^\circ\text{C}$	2.6		mJ
			$T_j = 150^\circ\text{C}$	4		
$E_{off}$	Turn-off Switching Energy	$I_C = 35A$ $R_G = 12\Omega$	$T_j = 25^\circ\text{C}$	2		mJ
			$T_j = 150^\circ\text{C}$	3		
$I_{sc}$	Short Circuit data	$V_{GE} \leq 15V; V_{Bus} = 900V$ $t_p \leq 10\mu\text{s}; T_j = 150^\circ\text{C}$		140		A

**Reverse diode ratings and characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$V_{RRM}$	Maximum Peak Repetitive Reverse Voltage		1200			V
$I_{RM}$	Maximum Reverse Leakage Current	$V_R = 1200V$			100 500	$\mu\text{A}$
		$T_j = 25^\circ\text{C}$ $T_j = 150^\circ\text{C}$				
$I_F$	DC Forward Current	$T_c = 80^\circ\text{C}$		30		A
$V_F$	Diode Forward Voltage	$I_F = 30A$		2.6	3.1	V
		$I_F = 60A$		3.2		
		$I_F = 30A$	$T_j = 125^\circ\text{C}$		1.8	
$t_{rr}$	Reverse Recovery Time	$I_F = 30A$ $V_R = 800V$ $di/dt = 200A/\mu\text{s}$	$T_j = 25^\circ\text{C}$	300		ns
			$T_j = 125^\circ\text{C}$		380	
$Q_{rr}$	Reverse Recovery Charge	$I_F = 30A$ $V_R = 800V$ $di/dt = 200A/\mu\text{s}$	$T_j = 25^\circ\text{C}$	360		nC
			$T_j = 125^\circ\text{C}$		1700	

**Temperature sensor NTC** (see application note APT0406 on [www.microsemi.com](http://www.microsemi.com) for more information).

Symbol	Characteristic	Min	Typ	Max	Unit
R <sub>25</sub>	Resistance @ 25°C		50		kΩ
ΔR <sub>25</sub> /R <sub>25</sub>			5		%
B <sub>25/85</sub>	T <sub>25</sub> = 298.15 K		3952		K
ΔB/B	T <sub>C</sub> = 100°C		4		%

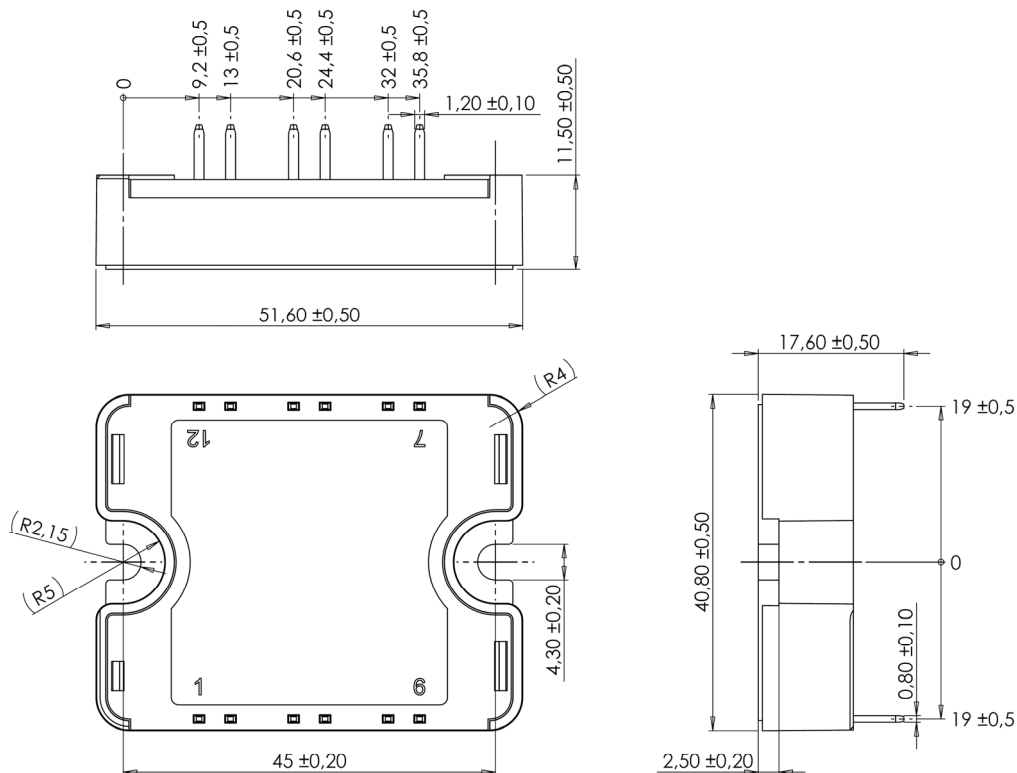
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

T: Thermistor temperature  
 R<sub>T</sub>: Thermistor value at T

### Thermal and package characteristics

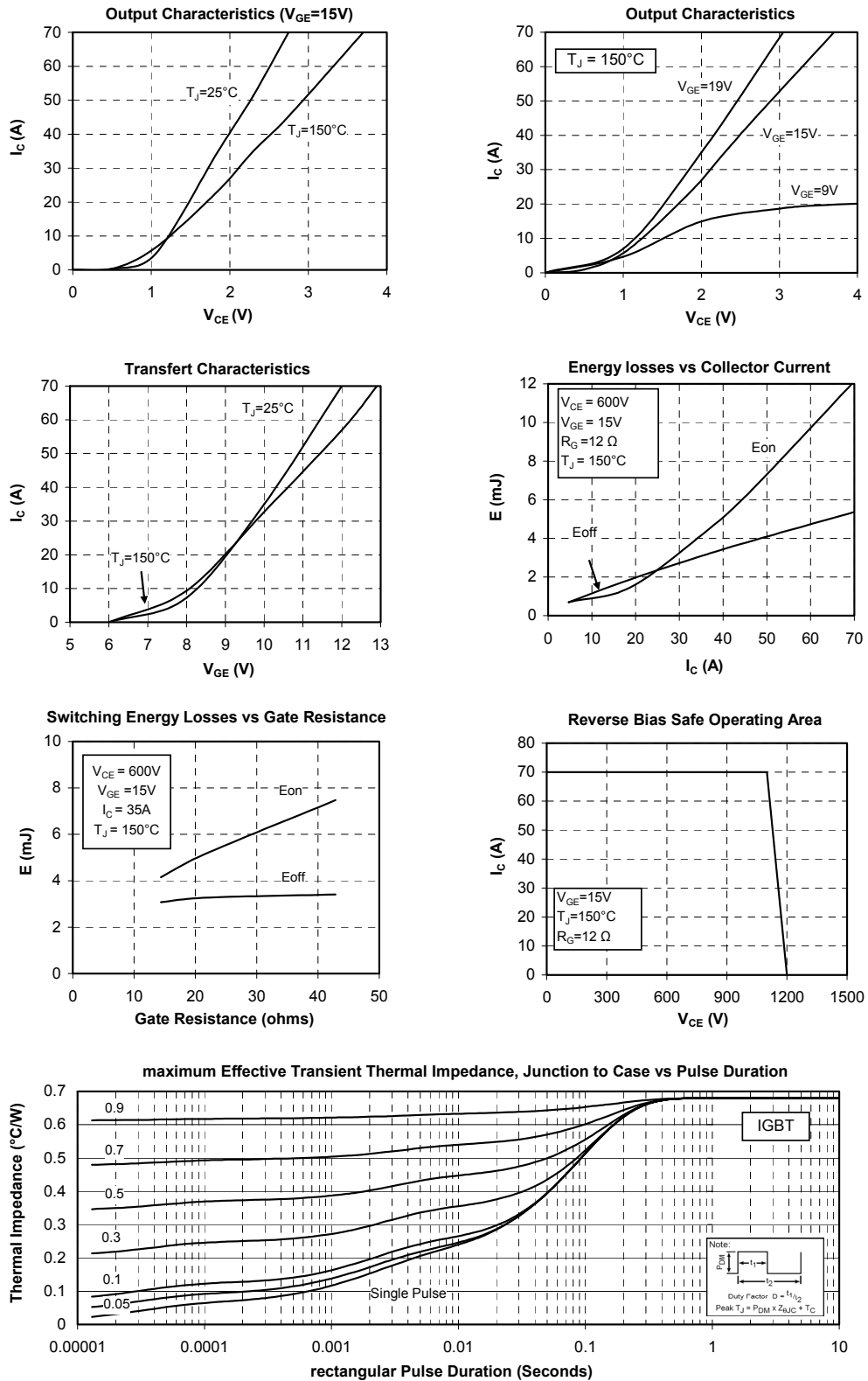
Symbol	Characteristic	Min	Typ	Max	Unit		
R <sub>thJC</sub>	Junction to Case Thermal Resistance	IGBT		0.68	°C/W		
		Diode		1.2			
V <sub>ISOL</sub>	RMS Isolation Voltage, any terminal to case t = 1 min, 50/60Hz	4000			V		
T <sub>J</sub>	Operating junction temperature range	-40		175	°C		
T <sub>STG</sub>	Storage Temperature Range	-40		125			
T <sub>C</sub>	Operating Case Temperature	-40		100			
Torque	Mounting torque		To heatsink	M4	2	3	N.m
Wt	Package Weight					80	g

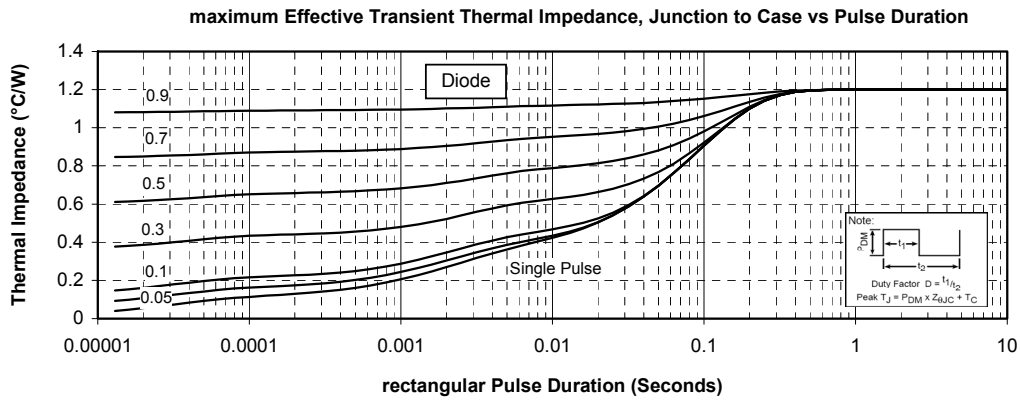
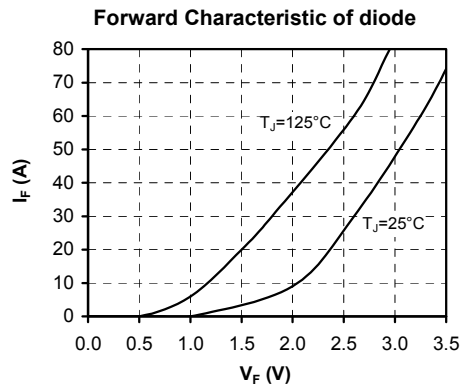
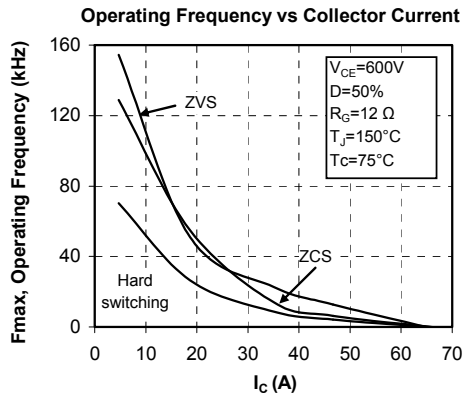
### SP1 Package outline (dimensions in mm)



See application note 1904 - Mounting Instructions for SP1 Power Modules on [www.microsemi.com](http://www.microsemi.com)

## Typical Performance Curve





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