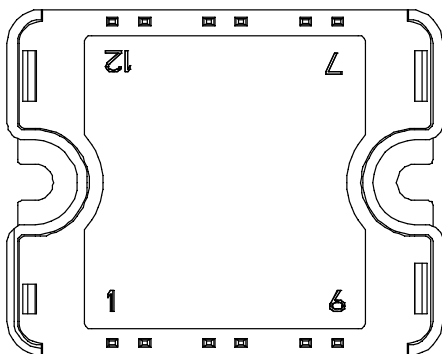
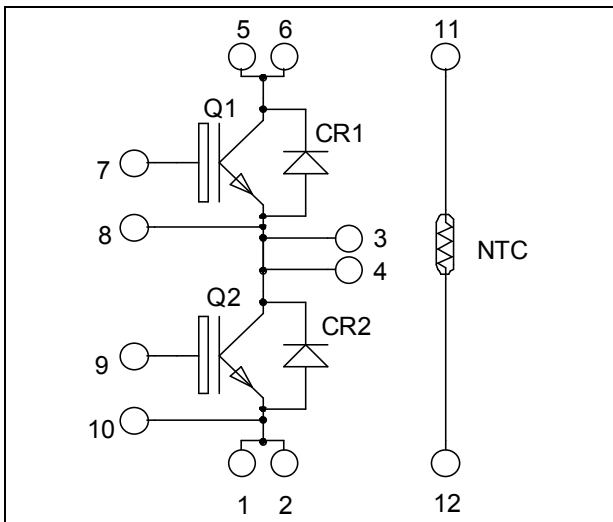


**Phase leg  
Trench + Field Stop IGBT®  
Power Module**

**$V_{CES} = 600V$   
 $I_C = 20A @ T_c = 80^\circ C$**



Pins 1/2 ; 3/4 ; 5/6 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	$T_C = 25^\circ C$	32
		$T_C = 80^\circ C$	20
$I_{CM}$	Pulsed Collector Current	$T_C = 25^\circ C$	40
$V_{GE}$	Gate - Emitter Voltage	$\pm 20$	V
$P_D$	Maximum Power Dissipation	$T_C = 25^\circ C$	62
RBSOA	Reverse Bias Safe Operating Area	$T_J = 150^\circ C$	40A @ 550V

**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	$V_{GE} = 0V, V_{CE} = 600V$			250	$\mu\text{A}$
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	$V_{GE} = 15V$ $I_C = 20A$	$T_j = 25^\circ\text{C}$	1.5	1.9	V
			$T_j = 150^\circ\text{C}$		1.7	
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE} = V_{CE}, I_C = 300\mu\text{A}$	5.0	5.8	6.5	V
$I_{GES}$	Gate – Emitter Leakage Current	$V_{GE} = 20V, V_{CE} = 0V$			300	nA

**Dynamic Characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$C_{ies}$	Input Capacitance	$V_{GE} = 0V$ $V_{CE} = 25V$ $f = 1\text{MHz}$		1100		pF
$C_{oes}$	Output Capacitance			70		
$C_{res}$	Reverse Transfer Capacitance			35		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching ( $25^\circ\text{C}$ ) $V_{GE} = \pm 15V$ $V_{Bus} = 300V$ $I_C = 20A$ $R_G = 12\Omega$		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 ( $150^\circ\text{C}$ ) $V_{GE} = \pm 15V$ $V_{Bus} = 300V$ $I_C = 20A$ $R_G = 12\Omega$		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	$V_{GE} = \pm 15V$ $V_{Bus} = 300V$ $I_C = 20A$ $R_G = 12\Omega$	$T_j = 25^\circ\text{C}$	0.11		mJ
			$T_j = 150^\circ\text{C}$	0.2		
$E_{off}$	Turn-off Switching Energy		$T_j = 25^\circ\text{C}$	0.5		mJ
			$T_j = 150^\circ\text{C}$	0.7		

**Reverse diode ratings and characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$V_{RRM}$	Maximum Peak Repetitive Reverse Voltage		600			V
$I_{RM}$	Maximum Reverse Leakage Current	$V_R = 600V$	$T_j = 25^\circ\text{C}$		100	$\mu\text{A}$
			$T_j = 150^\circ\text{C}$		350	
$I_F$	DC Forward Current			20		A
$V_F$	Diode Forward Voltage	$I_F = 20A$ $V_{GE} = 0V$	$T_j = 25^\circ\text{C}$	1.6	2	V
			$T_j = 150^\circ\text{C}$		1.5	
$t_{rr}$	Reverse Recovery Time	$I_F = 20A$ $V_R = 300V$ $di/dt = 1600A/\mu\text{s}$	$T_j = 25^\circ\text{C}$	100		ns
			$T_j = 150^\circ\text{C}$		150	
$Q_{rr}$	Reverse Recovery Charge		$T_j = 25^\circ\text{C}$	1.1		$\mu\text{C}$
			$T_j = 150^\circ\text{C}$		2.3	
$E_r$	Reverse Recovery Energy		$T_j = 25^\circ\text{C}$	0.23		mJ
		$T_j = 150^\circ\text{C}$		0.50		

## Thermal and package characteristics

Symbol	Characteristic	Min	Typ	Max	Unit	
R <sub>thJC</sub>	Junction to Case Thermal Resistance	IGBT		2.4	°C/W	
		Diode		3.25		
V <sub>ISOL</sub>	RMS Isolation Voltage, any terminal to case t=1 min, I isol<1mA, 50/60Hz	2500			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	2.5	4.7	N.m
Wt	Package Weight			80		g

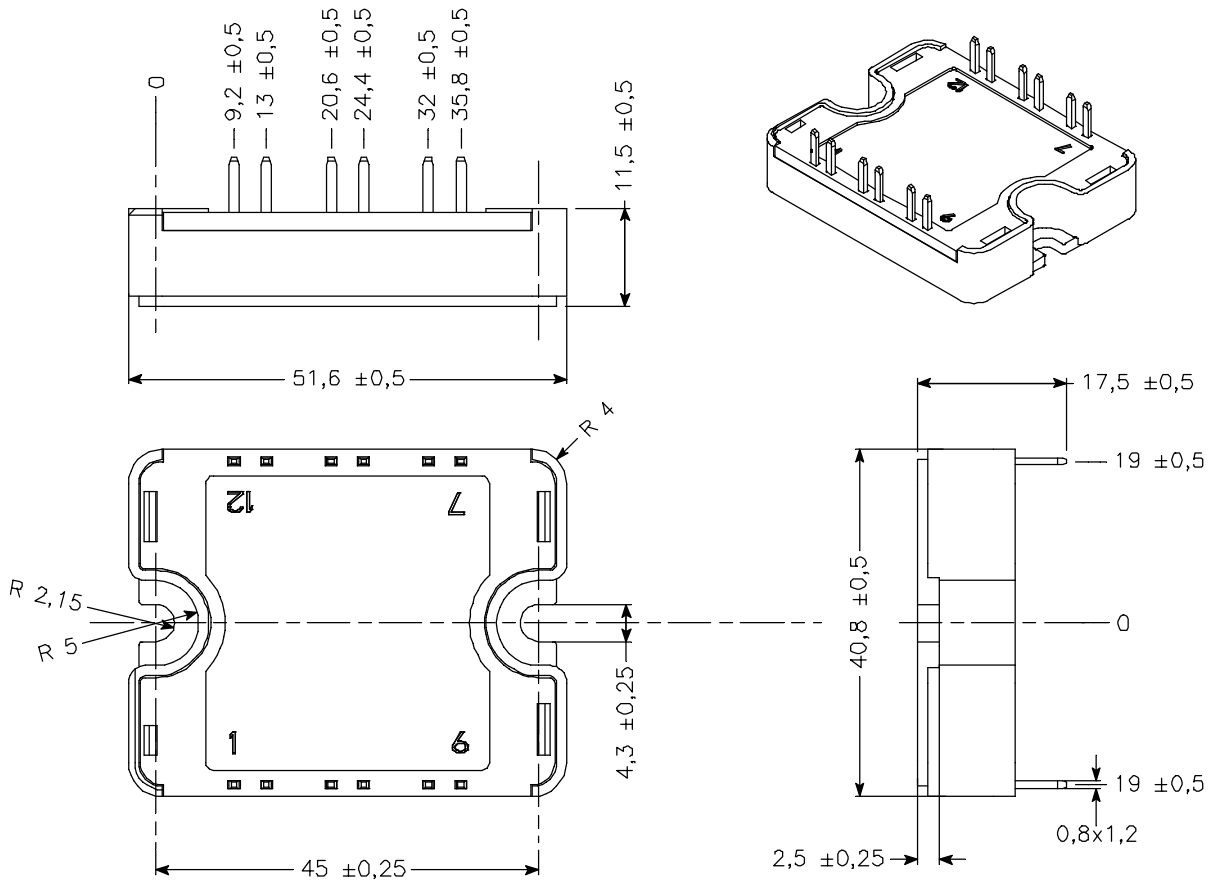
## Temperature sensor NTC (see application note APT0406 on www.microsemi.com for more information).

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

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

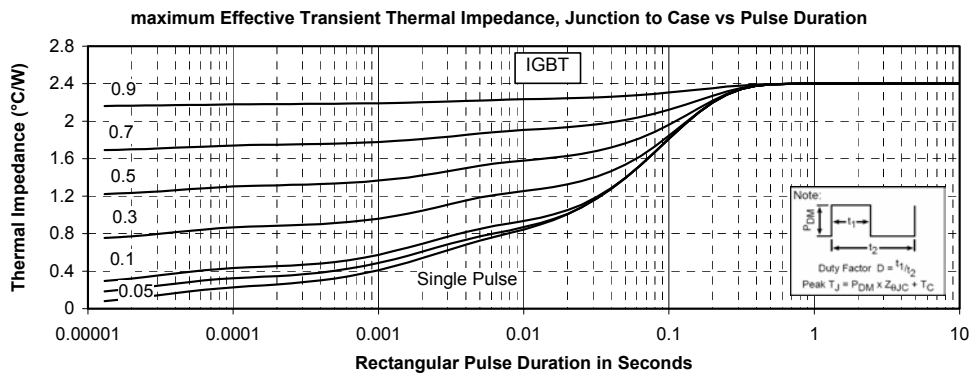
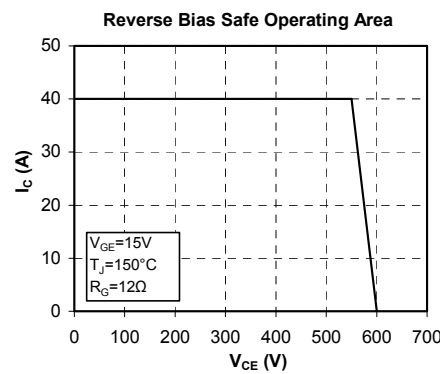
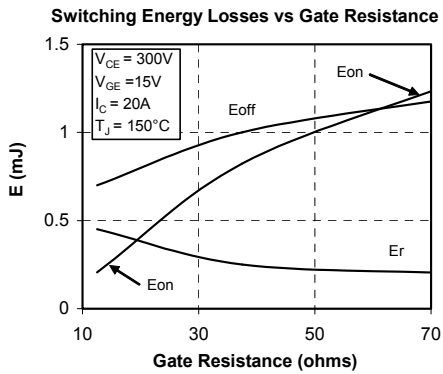
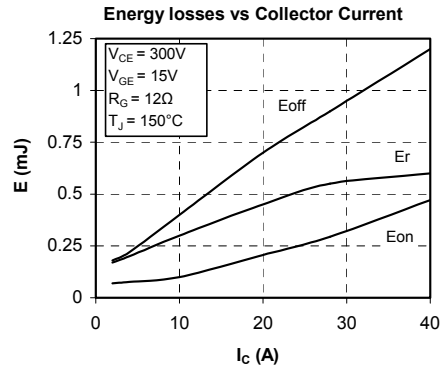
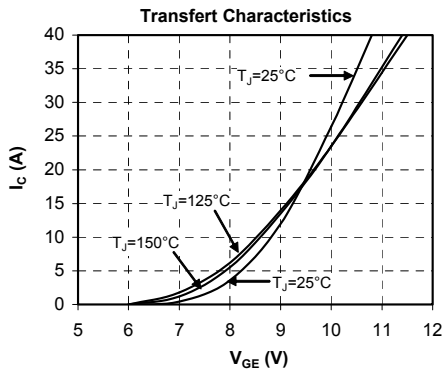
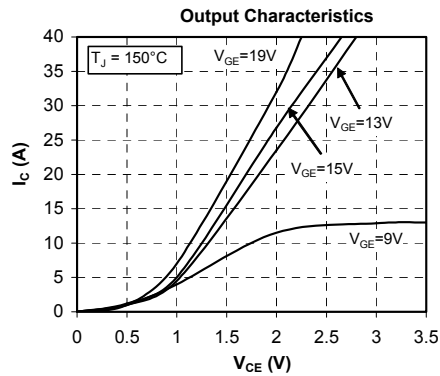
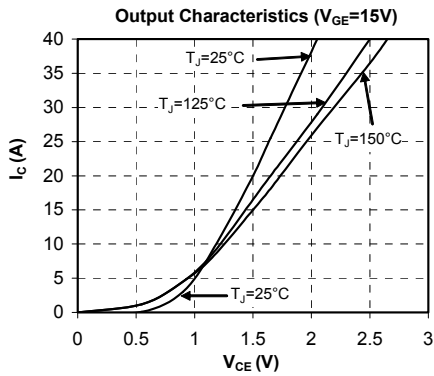
T: Thermistor temperature  
 R<sub>T</sub>: Thermistor value at T

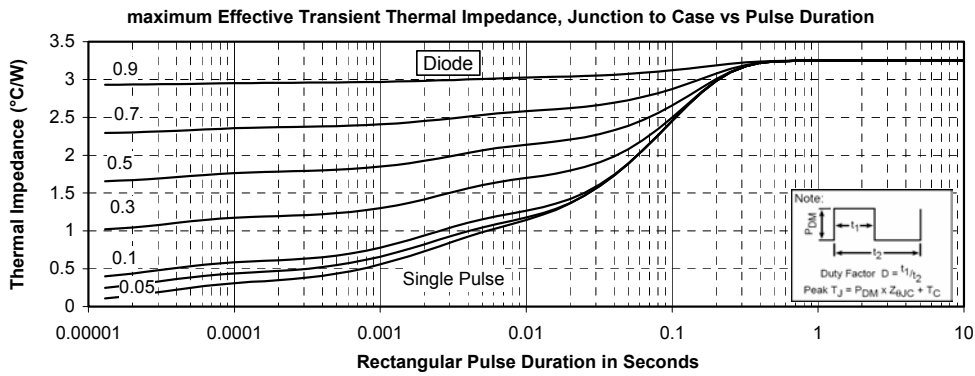
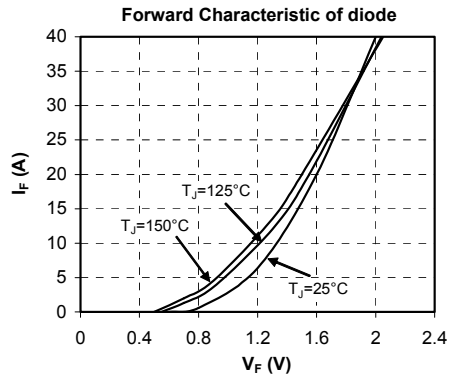
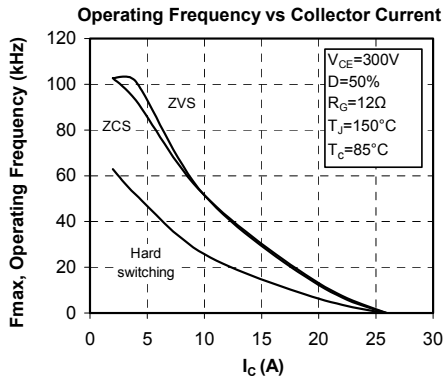
## SP1 Package outline (dimensions in mm)



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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