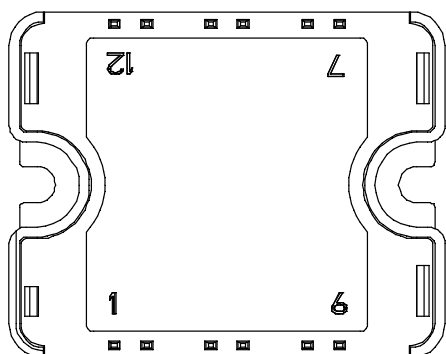
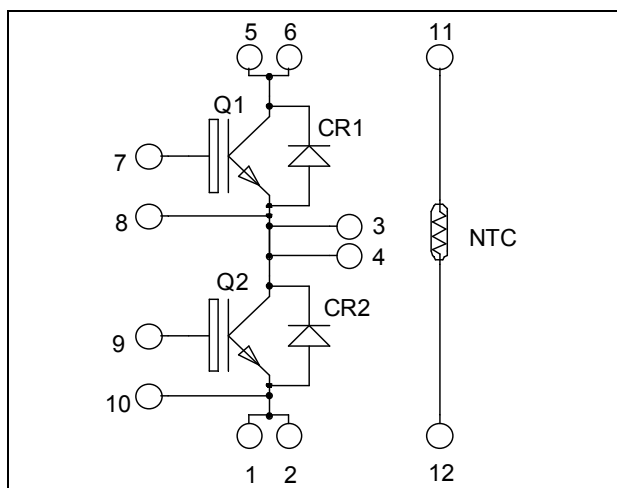


**Phase leg**  
**Fast Trench + Field Stop IGBT3**  
**Power Module**

$$V_{CES} = 1200V$$

$$I_C = 35A @ T_c = 80^{\circ}C$$



Pins 1/2 ; 3/4 ; 5/6 must be shorted together

## Application

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

## Features

- Fast Trench + Field Stop IGBT3 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	1200	V
$I_C$	Continuous Collector Current	$T_C = 25^{\circ}C$	55
		$T_C = 80^{\circ}C$	35
$I_{CM}$	Pulsed Collector Current	$T_C = 25^{\circ}C$	70
$V_{GE}$	Gate - Emitter Voltage	$\pm 20$	V
$P_D$	Maximum Power Dissipation	$T_C = 25^{\circ}C$	208
RBSOA	Reverse Bias Safe Operating Area	$T_j = 125^{\circ}C$	70A@1150V



**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	$V_{GE} = 0V$ $V_{CE} = 1200V$	$T_j = 25^\circ\text{C}$		250	$\mu\text{A}$
			$T_j = 125^\circ\text{C}$		500	
$V_{CE(sat)}$	Collector Emitter saturation Voltage	$V_{GE} = 15V$ $I_C = 35A$	$T_j = 25^\circ\text{C}$	1.7	2.1	V
			$T_j = 125^\circ\text{C}$	2.0		
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE} = V_{CE}, I_C = 1.5mA$	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	$V_{GE} = 0V, V_{CE} = 25V$		2.5		nF
$C_{res}$	Reverse Transfer Capacitance	$f = 1MHz$		0.15		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching ( $25^\circ\text{C}$ )		90		ns
$T_r$	Rise Time	$V_{GE} = \pm 15V$		30		
$T_{d(off)}$	Turn-off Delay Time	$V_{Bus} = 600V$		420		
$T_f$	Fall Time	$I_C = 35A$ $R_G = 27\Omega$		70		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching ( $125^\circ\text{C}$ )		90		ns
$T_r$	Rise Time	$V_{GE} = \pm 15V$		50		
$T_{d(off)}$	Turn-off Delay Time	$V_{Bus} = 600V$		520		
$T_f$	Fall Time	$I_C = 35A$ $R_G = 27\Omega$		90		
$E_{on}$	Turn-on Switching Energy	$V_{GE} = \pm 15V$ $V_{Bus} = 600V$	$T_j = 125^\circ\text{C}$	3.5		mJ
$E_{off}$	Turn-off Switching Energy	$I_C = 35A$ $R_G = 27\Omega$	$T_j = 125^\circ\text{C}$	4.1		

**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	$V_R = 1200V$	$T_j = 25^\circ\text{C}$		250	$\mu\text{A}$
			$T_j = 125^\circ\text{C}$		500	
$I_F$	DC Forward Current		$T_c = 80^\circ\text{C}$	35		A
$V_F$	Diode Forward Voltage	$I_F = 35A$	$T_j = 25^\circ\text{C}$	1.6	2.1	V
			$T_j = 125^\circ\text{C}$	1.6		
$t_{rr}$	Reverse Recovery Time		$T_j = 25^\circ\text{C}$	170		ns
			$T_j = 125^\circ\text{C}$	280		
$Q_{rr}$	Reverse Recovery Charge	$I_F = 35A$ $V_R = 600V$ $di/dt = 1500A/\mu s$	$T_j = 25^\circ\text{C}$	3.5		$\mu\text{C}$
			$T_j = 125^\circ\text{C}$	7		
$E_r$	Reverse Recovery Energy		$T_j = 25^\circ\text{C}$	1.4		mJ
			$T_j = 125^\circ\text{C}$	2.7		

## Thermal and package characteristics

Symbol	Characteristic	Min	Typ	Max	Unit
R <sub>thJC</sub>	Junction to Case Thermal Resistance	IGBT		0.60	°C/W
		Diode		0.95	
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		150	°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	N.m
Wt	Package Weight			80	g

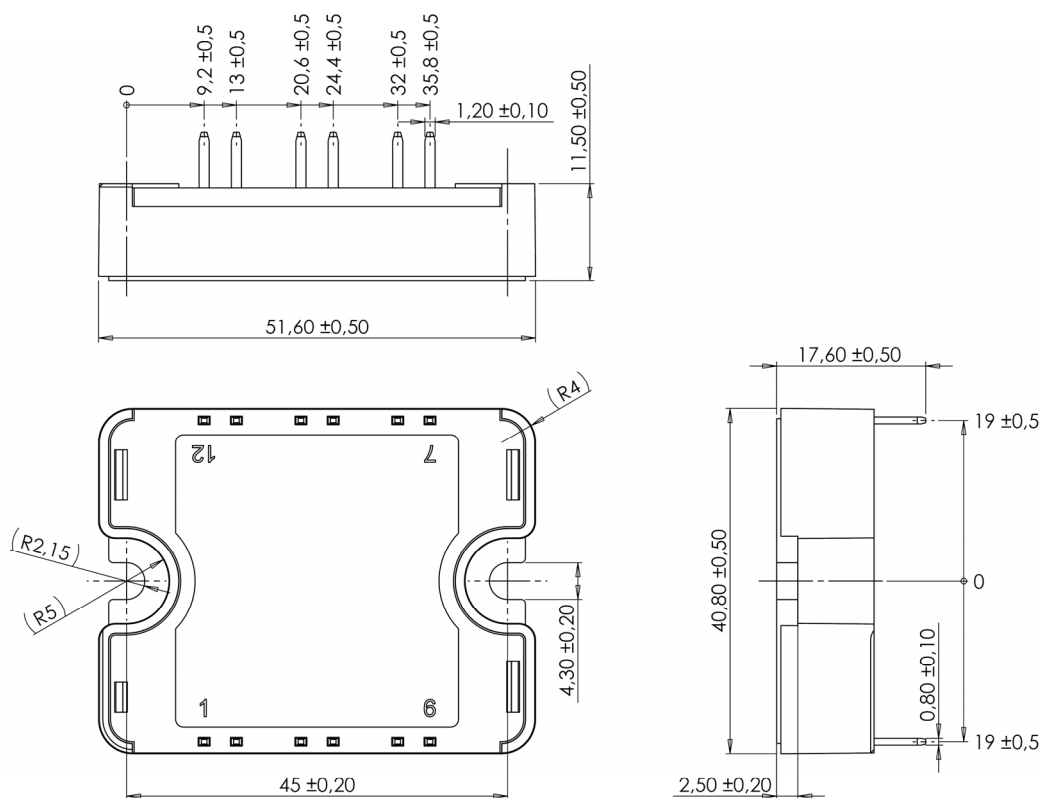
## Temperature sensor NTC (see application note APT0406 on www.microsemi.com for more information).

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

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

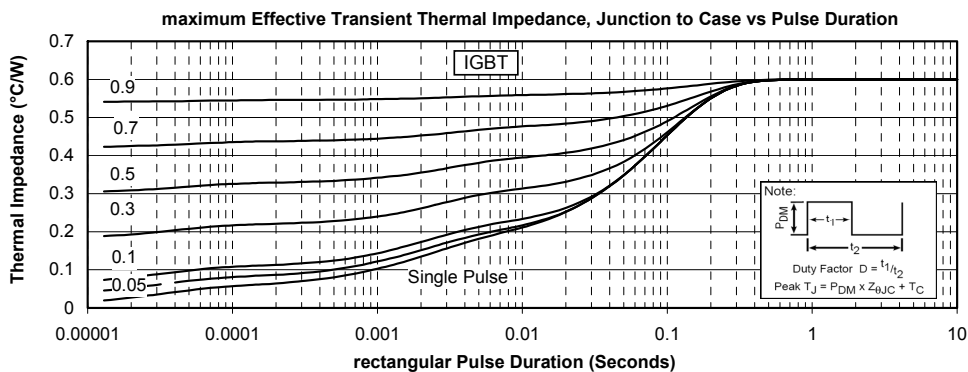
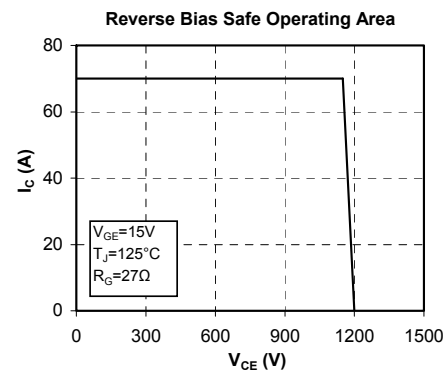
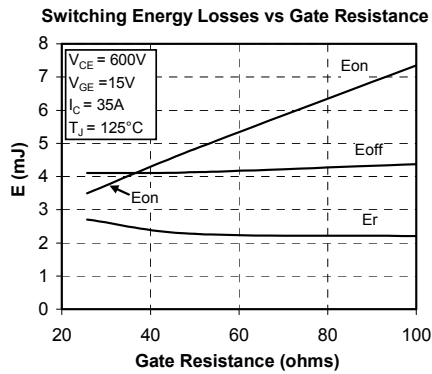
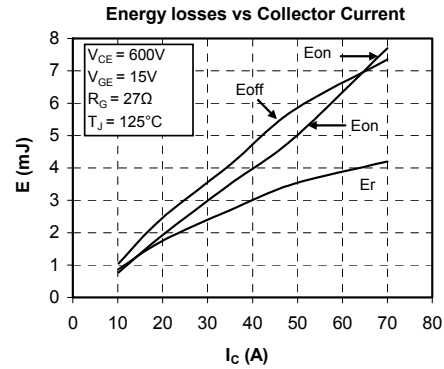
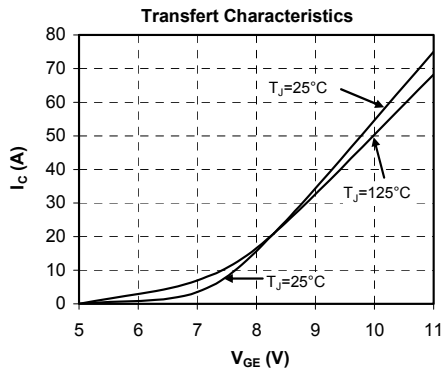
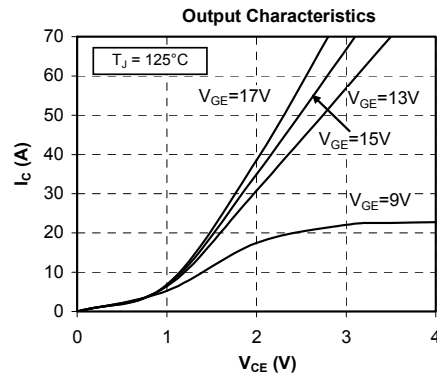
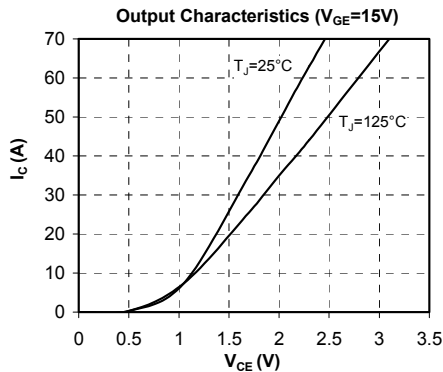
T: Thermistor temperature  
 R<sub>T</sub>: Thermistor value at T

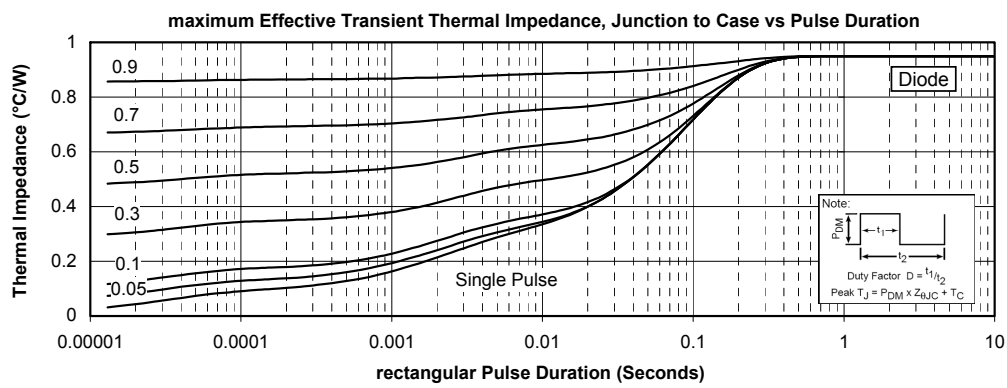
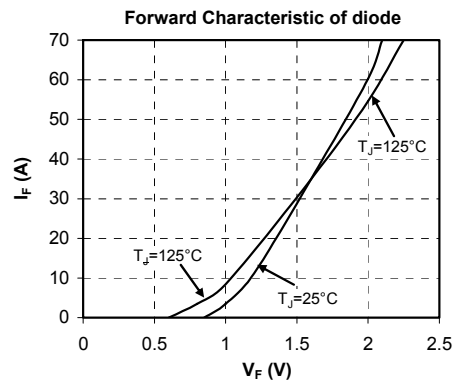
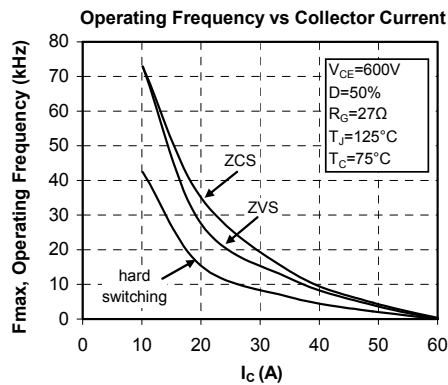
## SP1 Package outline (dimensions in mm)



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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