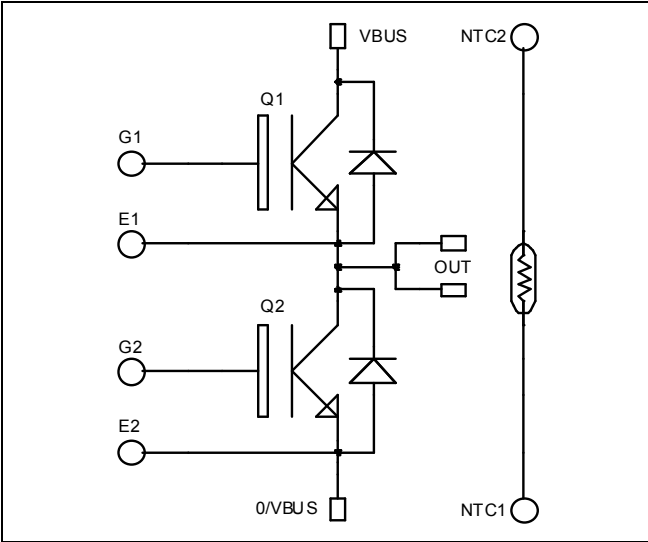


## Phase leg NPT IGBT Power Module

**$V_{CES} = 1200V$**   
 **$I_C = 100A @ T_c = 80^\circ C$**



### Application

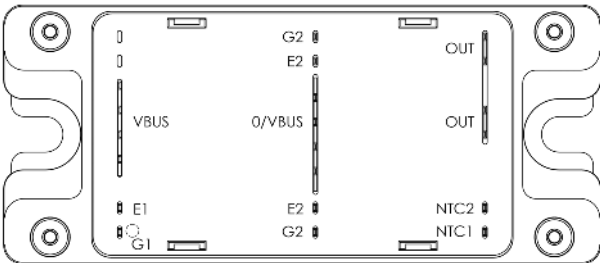
- Welding converters
- Switched Mode Power Supplies
- Uninterruptible Power Supplies
- Motor control

### Features

- Non Punch Through (NPT) Fast IGBT
  - Low voltage drop
  - Low tail current
  - Switching frequency up to 50 kHz
  - Soft recovery parallel diodes
  - Low diode VF
  - Low leakage current
  - RBSOA and SCSOA rated
- Kelvin emitter for easy drive
- Very low stray inductance
  - Symmetrical design
  - Lead frames for power connections
- Internal thermistor for temperature monitoring
- High level of integration

### Benefits

- Outstanding performance at high frequency operation
- Stable temperature behavior
- Very rugged
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Solderable terminals both for power and signal for easy PCB mounting
- Easy paralleling due to positive TC of VCEsat
- 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	$T_c = 25^\circ C$	135
		$T_c = 80^\circ C$	100
$I_{CM}$	Pulsed Collector Current	$T_c = 25^\circ C$	300
$V_{GE}$	Gate - Emitter Voltage	$\pm 20$	V
$P_D$	Maximum Power Dissipation	$T_c = 25^\circ C$	568
RBSOA	Reverse Bias Safe Operating Area	$T_j = 150^\circ C$	200A @ 1200V

**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	$V_{GE} = 0\text{V}$ $V_{CE} = 1200\text{V}$	$T_j = 25^\circ\text{C}$		350	$\mu\text{A}$
			$T_j = 125^\circ\text{C}$		600	
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	$V_{GE} = 15\text{V}$ $I_C = 100\text{A}$	$T_j = 25^\circ\text{C}$	3.2	3.7	V
			$T_j = 125^\circ\text{C}$	4.0		
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE} = V_{CE}, I_C = 2\text{mA}$	4.5		6.5	V
$I_{GES}$	Gate – Emitter Leakage Current	$V_{GE} = 20\text{V}, V_{CE} = 0\text{V}$			150	nA

**Dynamic Characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$C_{ies}$	Input Capacitance	$V_{GE} = 0\text{V}$ $V_{CE} = 25\text{V}$ $f = 1\text{MHz}$		6900		pF
$C_{oes}$	Output Capacitance			660		
$C_{res}$	Reverse Transfer Capacitance			440		
$Q_g$	Total gate Charge	$V_{GS} = 15\text{V}$ $V_{Bus} = 600\text{V}$ $I_C = 100\text{A}$		660		nC
$Q_{ge}$	Gate – Emitter Charge			70		
$Q_{gc}$	Gate – Collector Charge			400		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching ( $25^\circ\text{C}$ ) $V_{GE} = 15\text{V}$ $V_{Bus} = 600\text{V}$ $I_C = 100\text{A}$ $R_G = 2.5\ \Omega$		35		ns
$T_r$	Rise Time			65		
$T_{d(off)}$	Turn-off Delay Time			320		
$T_f$	Fall Time			30		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching ( $125^\circ\text{C}$ ) $V_{GE} = 15\text{V}$ $V_{Bus} = 600\text{V}$ $I_C = 100\text{A}$ $R_G = 2.5\ \Omega$		35		ns
$T_r$	Rise Time			65		
$T_{d(off)}$	Turn-off Delay Time			360		
$T_f$	Fall Time			40		
$E_{on}$	Turn-on Switching Energy	$V_{GE} = 15\text{V}$ $V_{Bus} = 600\text{V}$ $I_C = 100\text{A}$	$T_j = 125^\circ\text{C}$	13.9		mJ
$E_{off}$	Turn-off Switching Energy	$R_G = 2.5\ \Omega$	$T_j = 125^\circ\text{C}$	6.1		

**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	$V_R = 1200\text{V}$	$T_j = 25^\circ\text{C}$		350	$\mu\text{A}$
			$T_j = 125^\circ\text{C}$		600	
$I_F$	DC Forward Current			120		A
$V_F$	Diode Forward Voltage	$I_F = 120\text{A}$		2.0	2.5	V
		$I_F = 240\text{A}$		2.3		
		$I_F = 120\text{A}$	$T_j = 125^\circ\text{C}$	1.8		
$t_{rr}$	Reverse Recovery Time	$I_F = 120\text{A}$ $V_R = 800\text{V}$ $di/dt = 800\text{A}/\mu\text{s}$	$T_j = 25^\circ\text{C}$	370		ns
			$T_j = 125^\circ\text{C}$	500		
$Q_{rr}$	Reverse Recovery Charge		$T_j = 25^\circ\text{C}$	2.64		$\mu\text{C}$
			$T_j = 125^\circ\text{C}$	13.8		

## Thermal and package characteristics

Symbol	Characteristic	Min	Typ	Max	Unit	
R <sub>thJC</sub>	Junction to Case Thermal Resistance	IGBT		0.22	°C/W	
		Diode		0.32		
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	M5	2.5	4.7	N.m
Wt	Package Weight				160	g

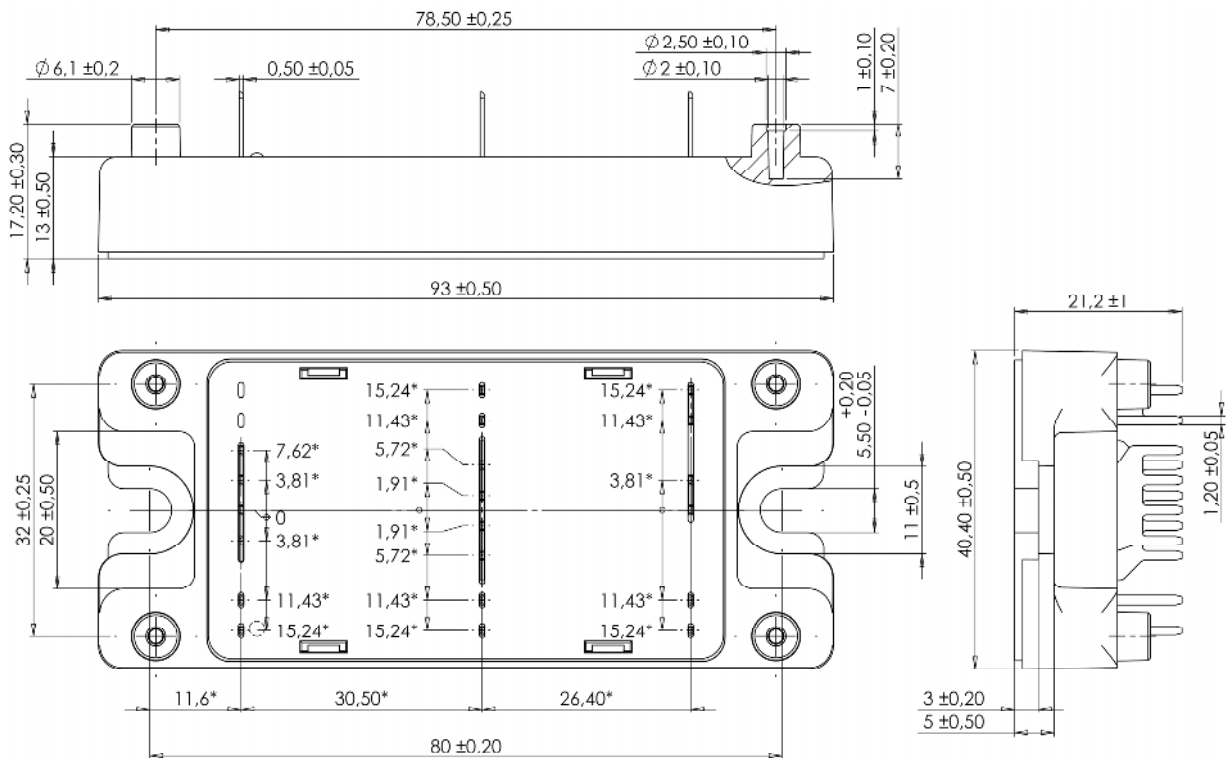
## Temperature sensor NTC (see application note APT0406 on www.microsemi.com for more information).

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

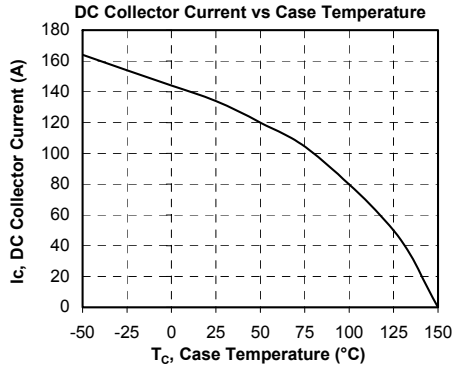
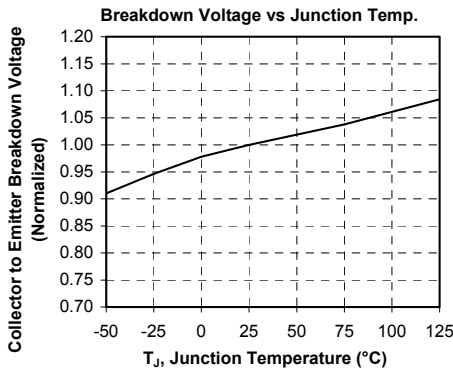
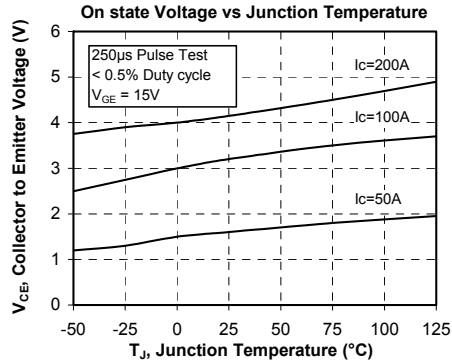
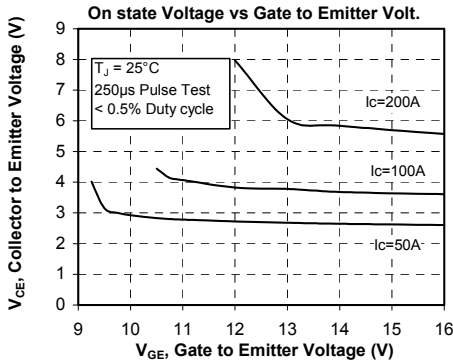
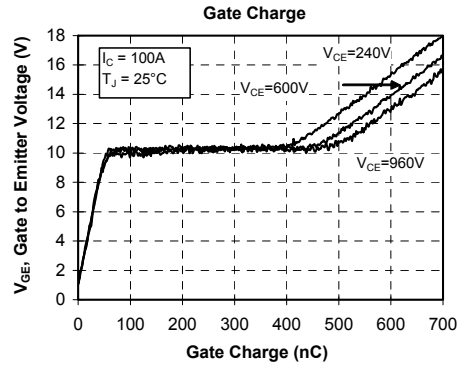
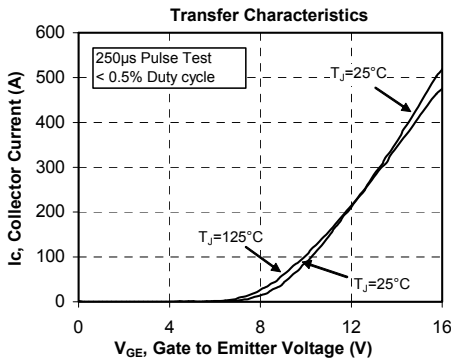
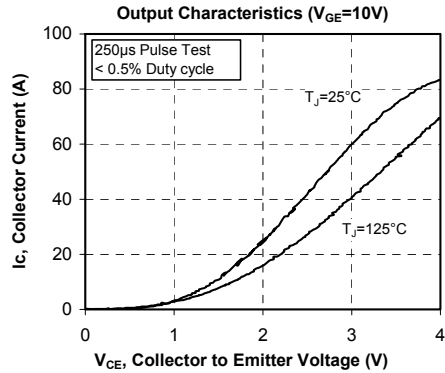
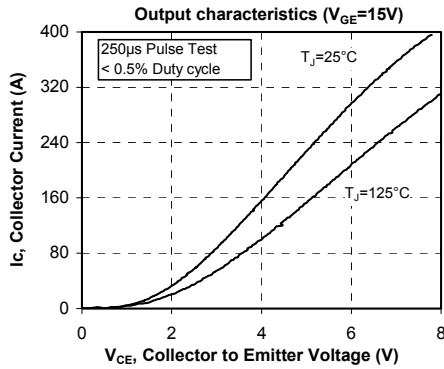
## SP4 Package outline (dimensions in mm)

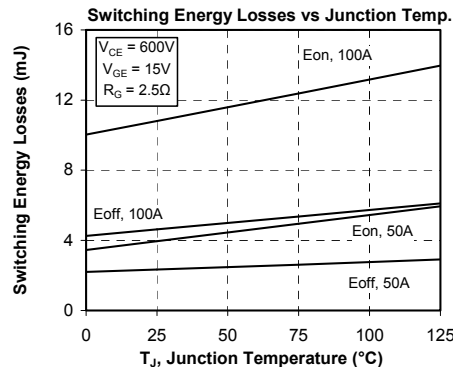
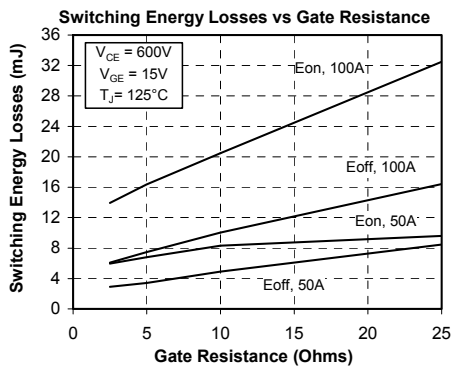
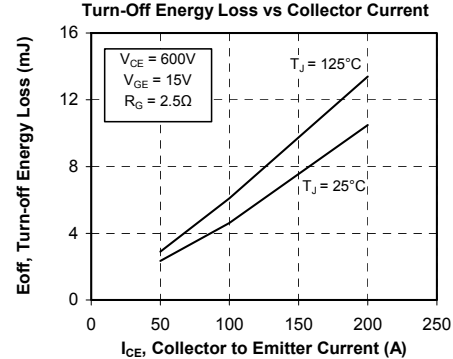
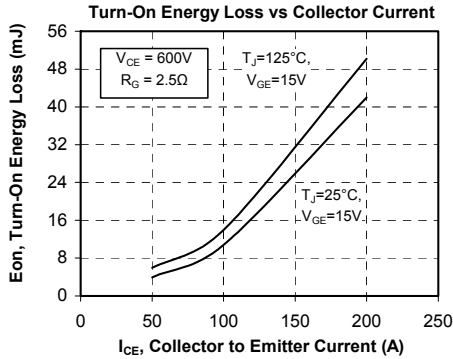
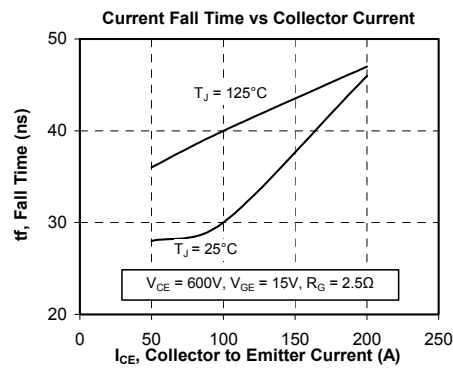
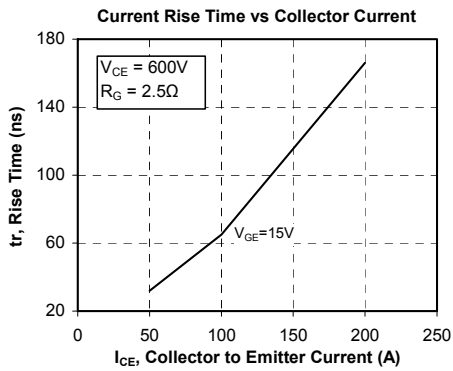
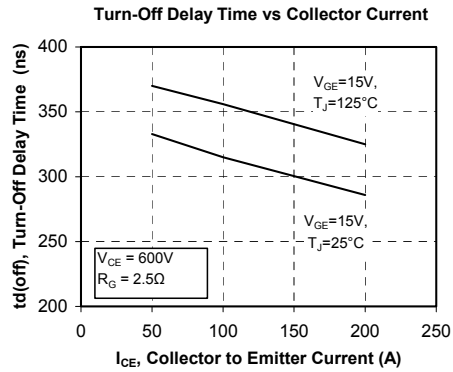
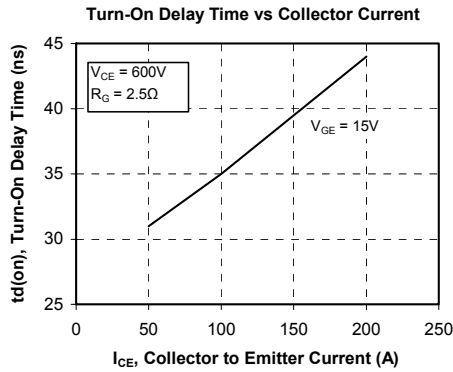


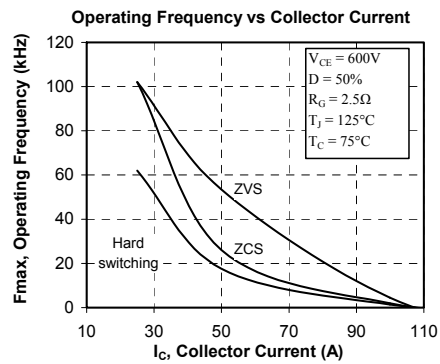
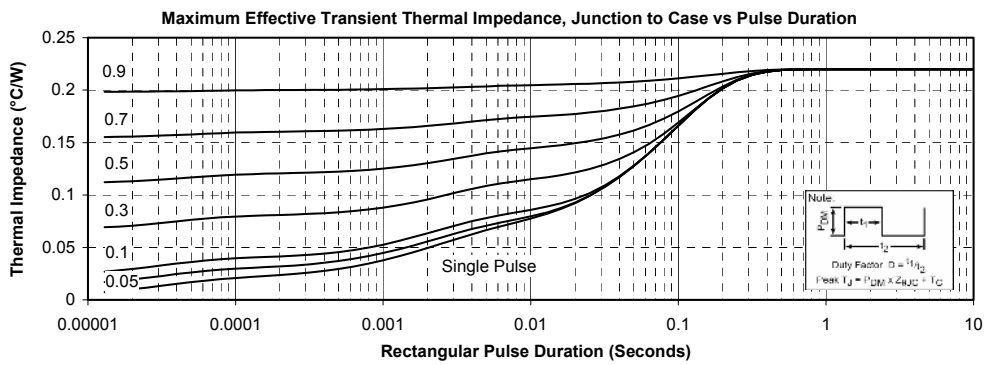
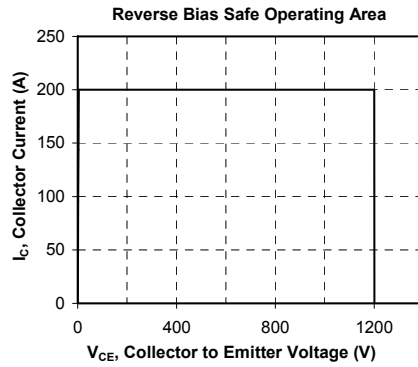
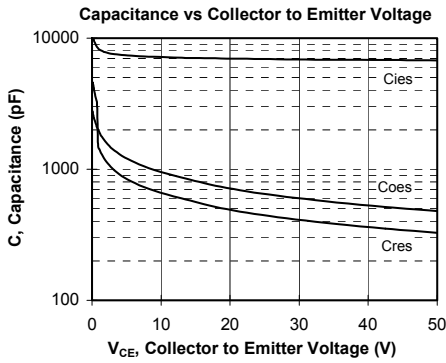
ALL DIMENSIONS MARKED "\*" ARE TOLERANCED AS:  $\pm \phi 1$

See application note APT0501 - Mounting Instructions for SP4 Power Modules on www.microsemi.com

## Typical Performance Curve







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