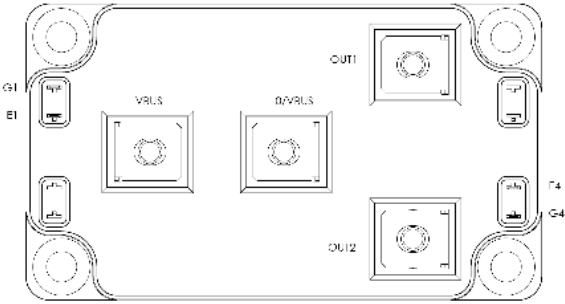
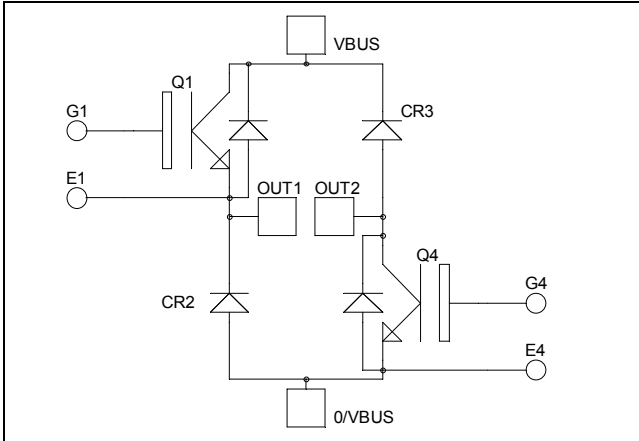


## Asymmetrical - bridge NPT IGBT Power Module

**$V_{CES} = 600V$**   
 **$I_C = 180A @ T_c = 80^\circ C$**



### Application

- Welding converters
- Switched Mode Power Supplies
- Switched Reluctance Motor Drives

### Features

- Non Punch Through (NPT) Fast IGBT®
  - Low voltage drop
  - Low tail current
  - Switching frequency up to 100 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
  - M5 power connectors
- 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
- Easy paralleling due to positive  $T_c$  of  $V_{CEsat}$
- 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	$T_c = 25^\circ C$	220
		$T_c = 80^\circ C$	180
$I_{CM}$	Pulsed Collector Current	$T_c = 25^\circ C$	630
$V_{GE}$	Gate - Emitter Voltage	$\pm 20$	V
$P_D$	Maximum Power Dissipation	$T_c = 25^\circ C$	833
RBSOA	Reverse Bias Safe Operating Area	$T_j = 150^\circ C$	400A @ 600V

**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	$V_{GE} = 0\text{V}$ $V_{CE} = 600\text{V}$	$T_j = 25^\circ\text{C}$		300	$\mu\text{A}$
			$T_j = 125^\circ\text{C}$		1000	
$V_{CE(sat)}$	Collector Emitter saturation Voltage	$V_{GE} = 15\text{V}$ $I_C = 180\text{A}$	$T_j = 25^\circ\text{C}$	2.0	2.5	V
			$T_j = 125^\circ\text{C}$	2.2		
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE} = V_{CE}, I_C = 2\text{mA}$	3		5	V
$I_{GES}$	Gate – Emitter Leakage Current	$V_{GE} = 20\text{V}, V_{CE} = 0\text{V}$			$\pm 200$	nA

**Dynamic Characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$C_{ies}$	Input Capacitance	$V_{GE} = 0\text{V}$ $V_{CE} = 25\text{V}$ $f = 1\text{MHz}$		8.6		nF
$C_{oes}$	Output Capacitance			0.94		
$C_{res}$	Reverse Transfer Capacitance			0.8		
$Q_g$	Total gate Charge	$V_{GS} = 15\text{V}$ $V_{Bus} = 300\text{V}$ $I_C = 180\text{A}$		660		nC
$Q_{ge}$	Gate – Emitter Charge			580		
$Q_{gc}$	Gate – Collector Charge			400		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching ( $25^\circ\text{C}$ ) $V_{GE} = 15\text{V}$ $V_{Bus} = 400\text{V}$ $I_C = 180\text{A}$ $R_G = 2.5\ \Omega$		26		ns
$T_r$	Rise Time			25		
$T_{d(off)}$	Turn-off Delay Time			150		
$T_f$	Fall Time			30		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching ( $125^\circ\text{C}$ ) $V_{GE} = 15\text{V}$ $V_{Bus} = 400\text{V}$ $I_C = 180\text{A}$ $R_G = 2.5\ \Omega$		26		ns
$T_r$	Rise Time			25		
$T_{d(off)}$	Turn-off Delay Time			170		
$T_f$	Fall Time			40		
$E_{on}$	Turn-on Switching Energy	$V_{GE} = 15\text{V}$ $V_{Bus} = 400\text{V}$ $I_C = 180\text{A}$ $R_G = 2.5\ \Omega$	$T_j = 125^\circ\text{C}$	8.6		mJ
$E_{off}$	Turn-off Switching Energy		$T_j = 125^\circ\text{C}$	7		

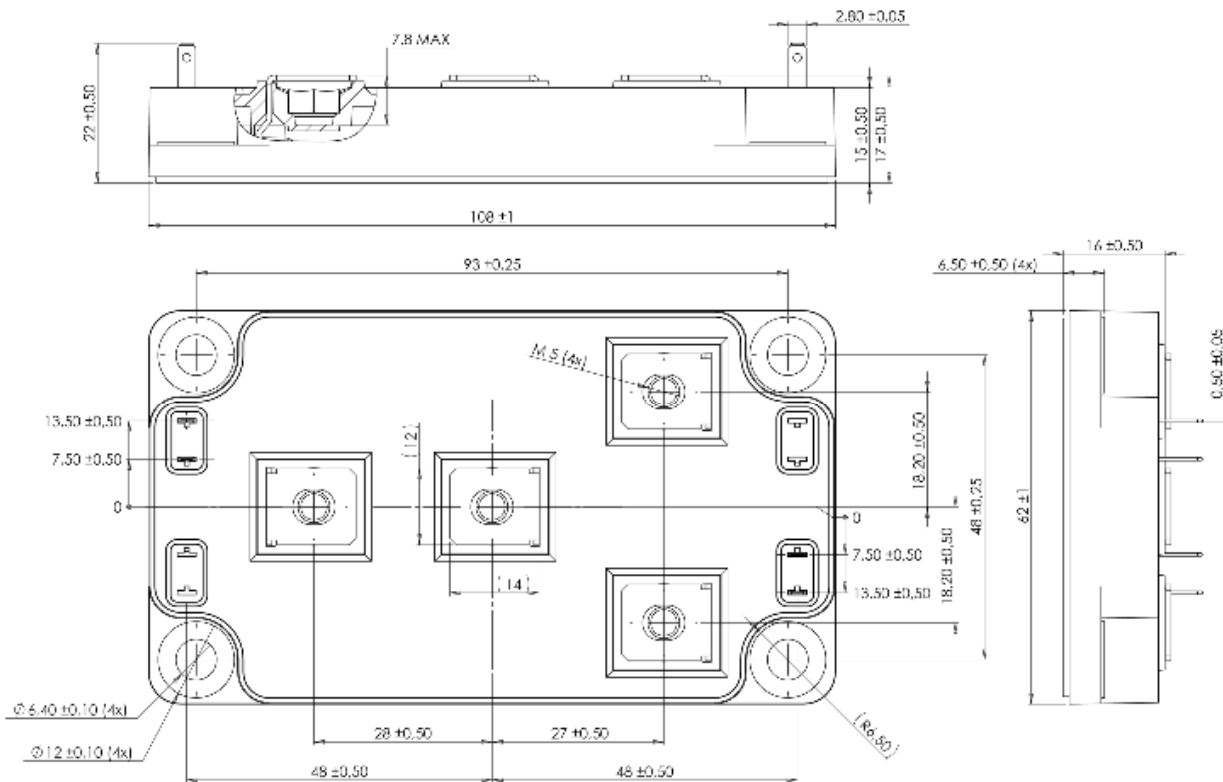
**Diode ratings and characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$V_{RRM}$	Maximum Peak Repetitive Reverse Voltage		600			V
$I_{RM}$	Maximum Reverse Leakage Current	$V_R = 600\text{V}$	$T_j = 25^\circ\text{C}$		350	$\mu\text{A}$
			$T_j = 125^\circ\text{C}$		750	
$I_F$	DC Forward Current	$T_c = 80^\circ\text{C}$		200		A
$V_F$	Diode Forward Voltage	$I_F = 200\text{A}$		1.6	1.8	V
		$I_F = 400\text{A}$		1.9		
		$I_F = 200\text{A}$	$T_j = 125^\circ\text{C}$		1.4	
$t_{rr}$	Reverse Recovery Time	$I_F = 200\text{A}$ $V_R = 400\text{V}$	$T_j = 25^\circ\text{C}$	180		ns
			$T_j = 125^\circ\text{C}$	220		
$Q_{rr}$	Reverse Recovery Charge	$di/dt = 400\text{A}/\mu\text{s}$	$T_j = 25^\circ\text{C}$	780		nC
			$T_j = 125^\circ\text{C}$	2900		

## Thermal and package characteristics

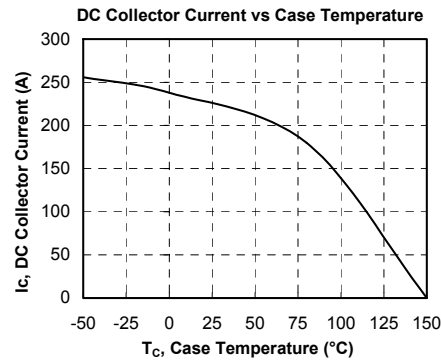
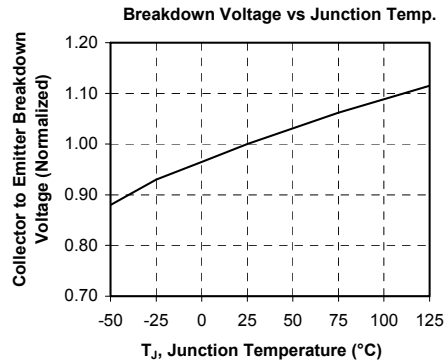
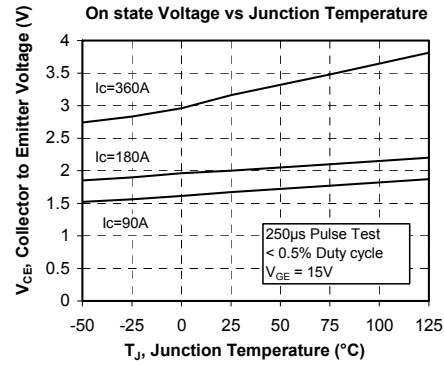
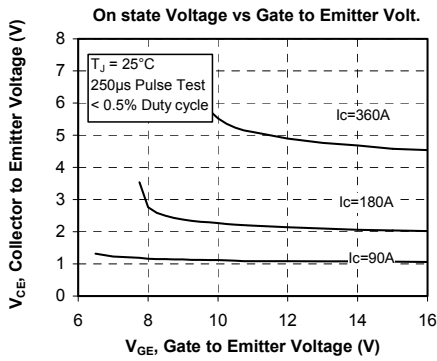
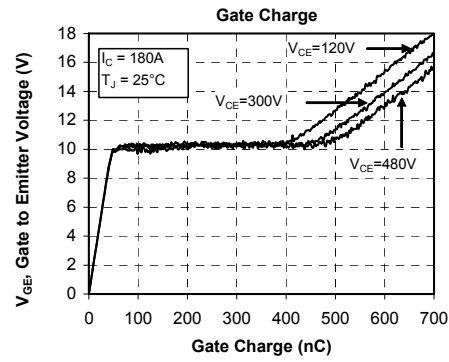
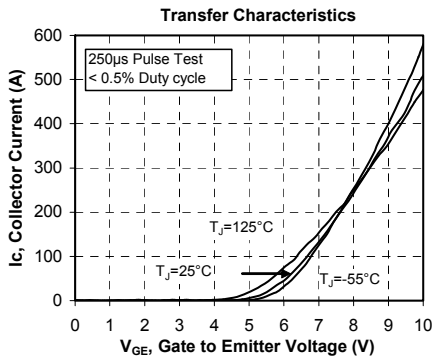
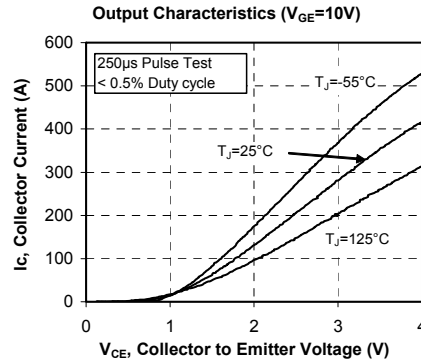
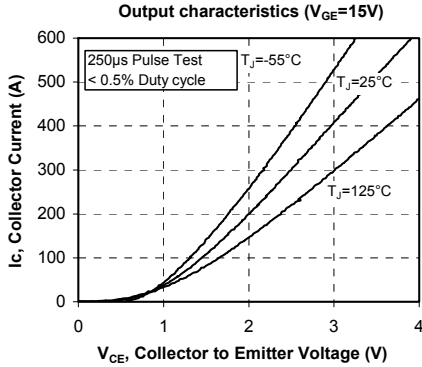
<i>Symbol</i>	<i>Characteristic</i>		<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>
R <sub>thJC</sub>	Junction to Case Thermal Resistance	IGBT			0.15	°C/W
		Diode			0.32	
V <sub>ISOL</sub>	RMS Isolation Voltage, any terminal to case t=1 min, 50/60Hz		4000			V
T <sub>J</sub>	Operating junction temperature 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	M6	3	5	N.m
		For terminals	M5	2	3.5	
Wt	Package Weight				300	g

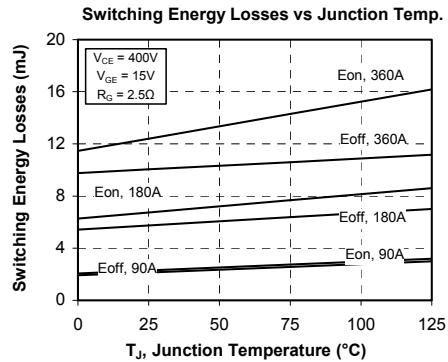
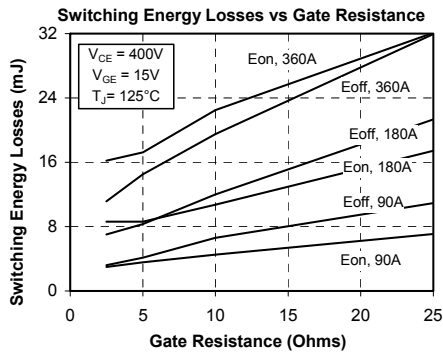
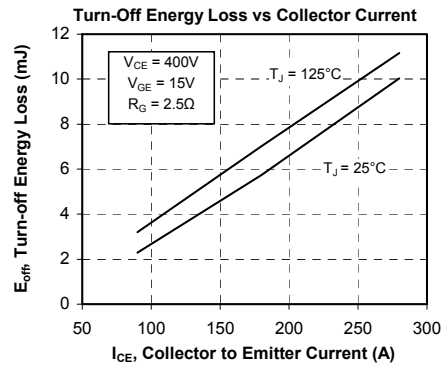
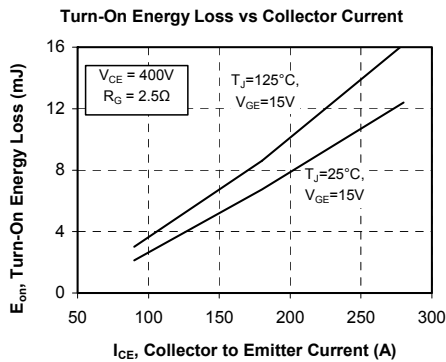
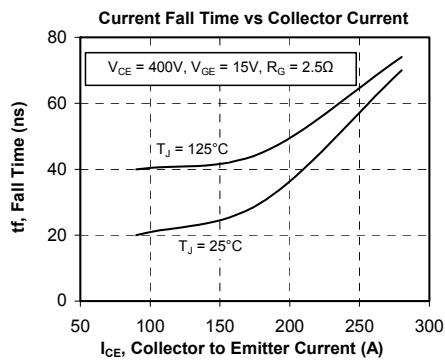
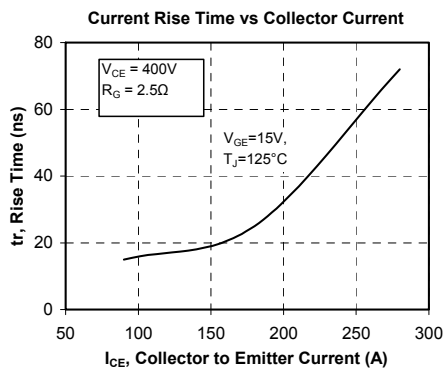
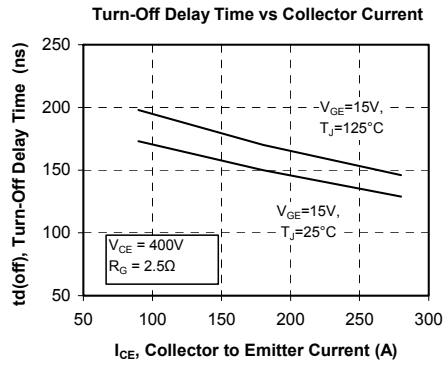
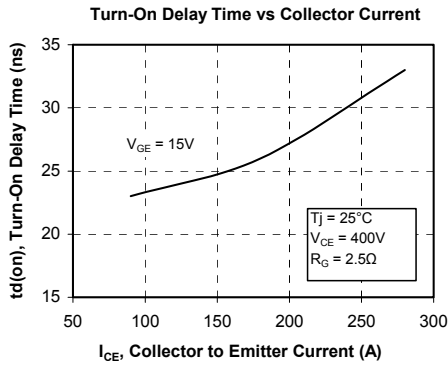
## SP6 Package outline (dimensions in mm)

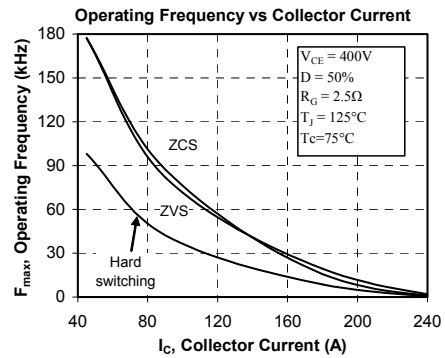
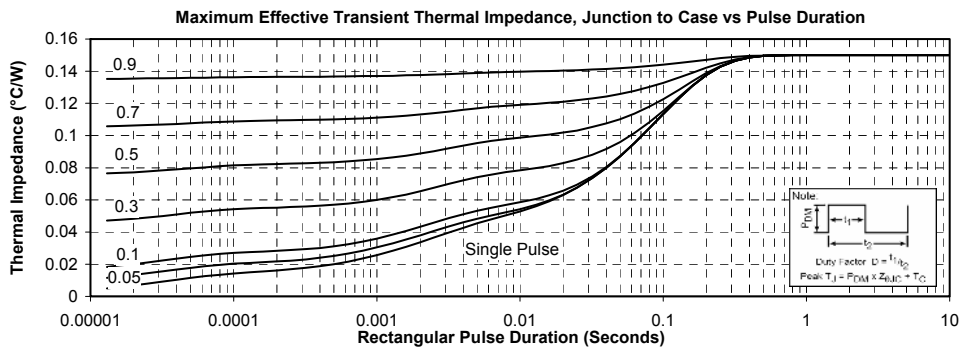
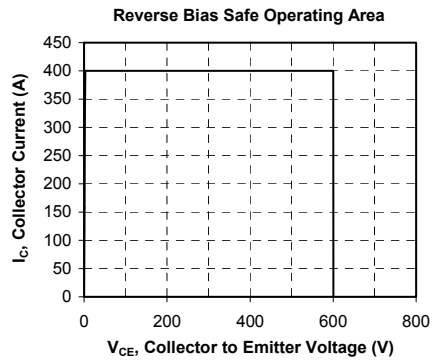
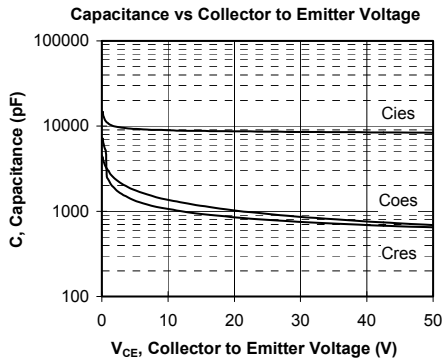


See application note APT0601 - Mounting Instructions for SP6 Power Modules on [www.microsemi.com](http://www.microsemi.com)

## Typical Performance Curve







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