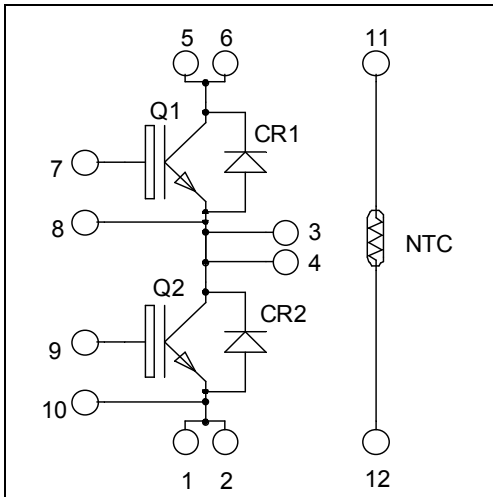


**Phase leg**  
**High speed IGBT 5 Power Module**

**$V_{CES} = 650V$**   
 **$I_C = 100A @ T_c = 25^\circ C$**


**Application**

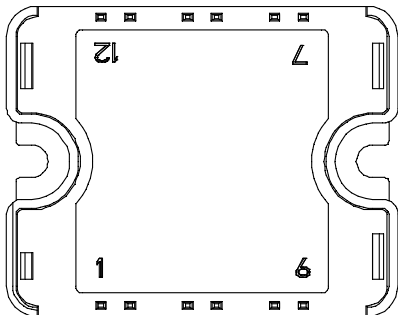
- Welding converters
- Switched Mode Power Supplies
- Uninterruptible Power Supplies
- Motor control

**Features**

- High speed IGBT 5
  - Low voltage drop
  - Low tail current
  - Switching frequency up to 100 kHz
  - Low leakage current
- Very low stray inductance
- 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



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

**All ratings @  $T_j = 25^\circ C$  unless otherwise specified**

**Absolute maximum ratings (Per IGBT)**

Symbol	Parameter	Max ratings	Unit
$V_{CES}$	Collector - Emitter Voltage	650	V
$I_C$	Continuous Collector Current	$T_C = 25^\circ C$	100
		$T_C = 80^\circ C$	60
$I_{CM}$	Pulsed Collector Current	$T_C = 25^\circ C$	200
$V_{GE}$	Gate - Emitter Voltage	$\pm 20$	V
$P_D$	Power Dissipation	250	W

**CAUTION:** These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed.

**Electrical Characteristics (per IGBT)**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$I_{CES}$	Zero Gate Voltage Collector Current	$V_{GE} = 0V, V_{CE} = 650V$			100	$\mu A$
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	$V_{GE} = 15V$ $I_C = 100A$		1.65 1.9	2.2	V
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE} = V_{CE}, I_C = 1mA$	3.3	4.0	4.7	V
$I_{GES}$	Gate – Emitter Leakage Current	$V_{GE} = 20V, V_{CE} = 0V$			240	nA

**Dynamic Characteristics (per IGBT)**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$C_{ies}$	Input Capacitance	$V_{GE} = 0V$		6000		pF
$C_{oes}$	Output Capacitance	$V_{CE} = 25V$		100		
$C_{res}$	Reverse Transfer Capacitance	$f = 1MHz$		22		
$Q_G$	Gate charge	$V_{GE} = 15V, I_C = 100A$ $V_{CE} = 520V$		240		nC
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C) $V_{GE} = 15V$ $V_{Bus} = 400V$ $I_C = 50A$ $R_G = 2\Omega$		21		ns
$T_r$	Rise Time			15		
$T_{d(off)}$	Turn-off Delay Time			180		
$T_f$	Fall Time			18		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (150°C) $V_{GE} = 15V$ $V_{Bus} = 400V$ $I_C = 50A$ $R_G = 2\Omega$		20		ns
$T_r$	Rise Time			15		
$T_{d(off)}$	Turn-off Delay Time			205		
$T_f$	Fall Time			26		
$E_{on}$	Turn on Energy	$V_{GE} = 15V$ $V_{Bus} = 400V$		1.5		mJ
$E_{off}$	Turn off Energy	$I_C = 50A$ $R_G = 2\Omega$		0.6		
$R_{Gint}$	Integrated gate resistor			2.5		$\Omega$
$R_{thJC}$	Junction to Case Thermal Resistance				0.6	$^{\circ}C/W$

**Diode ratings and characteristics (per diode)**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$V_{RRM}$	Peak Repetitive Reverse Voltage				650	V
$I_{RM}$	Reverse Leakage Current	$V_R = 650V$			100	$\mu A$
$I_F$	DC Forward Current			100		A
$V_F$	Diode Forward Voltage	$I_F = 100A$ $V_{GE} = 0V$		1.6 1.65	2.2	V
$t_{rr}$	Reverse Recovery Time	$I_F = 50A$ $V_R = 400V$ $di/dt = 3000A/\mu s$		46 62		ns
$Q_{rr}$	Reverse Recovery Charge			1 2		$\mu C$
$R_{thJC}$	Junction to Case Thermal Resistance				0.7	$^{\circ}C/W$

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

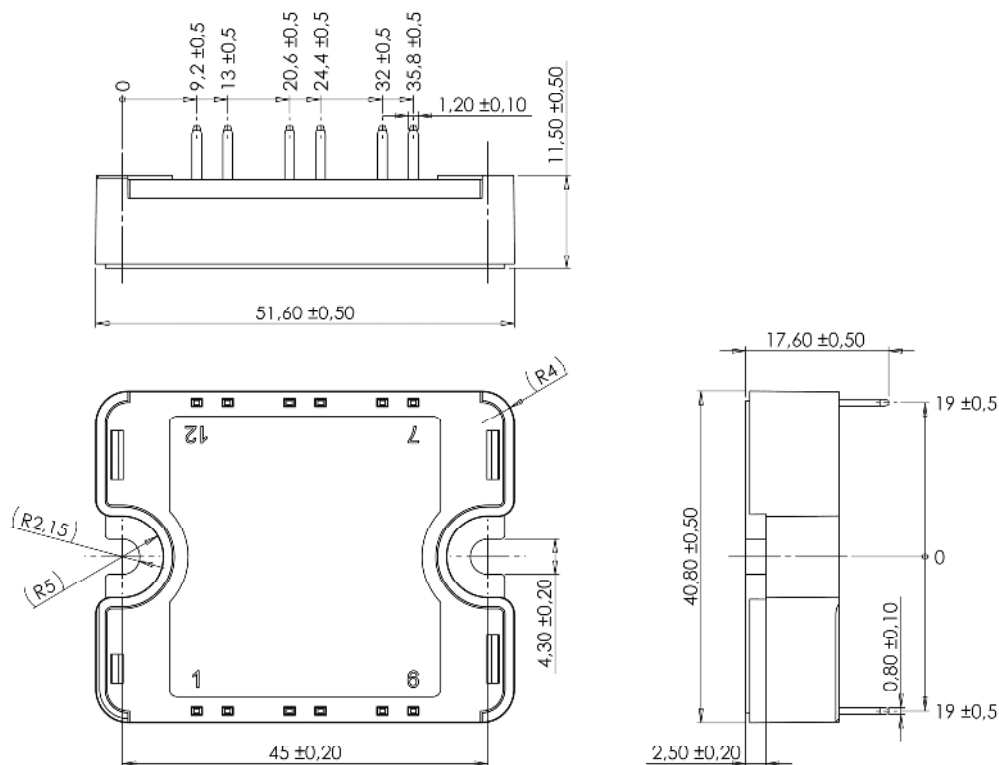
Symbol	Characteristic	Min	Typ	Max	Unit
R <sub>25</sub>	Resistance @ 25°C		50		kΩ
ΔR <sub>25</sub> /R <sub>25</sub>			5		%
B <sub>25/85</sub>	T <sub>25</sub> = 298.15 K		3952		K
ΔB/B	T <sub>C</sub> = 100°C		4		%

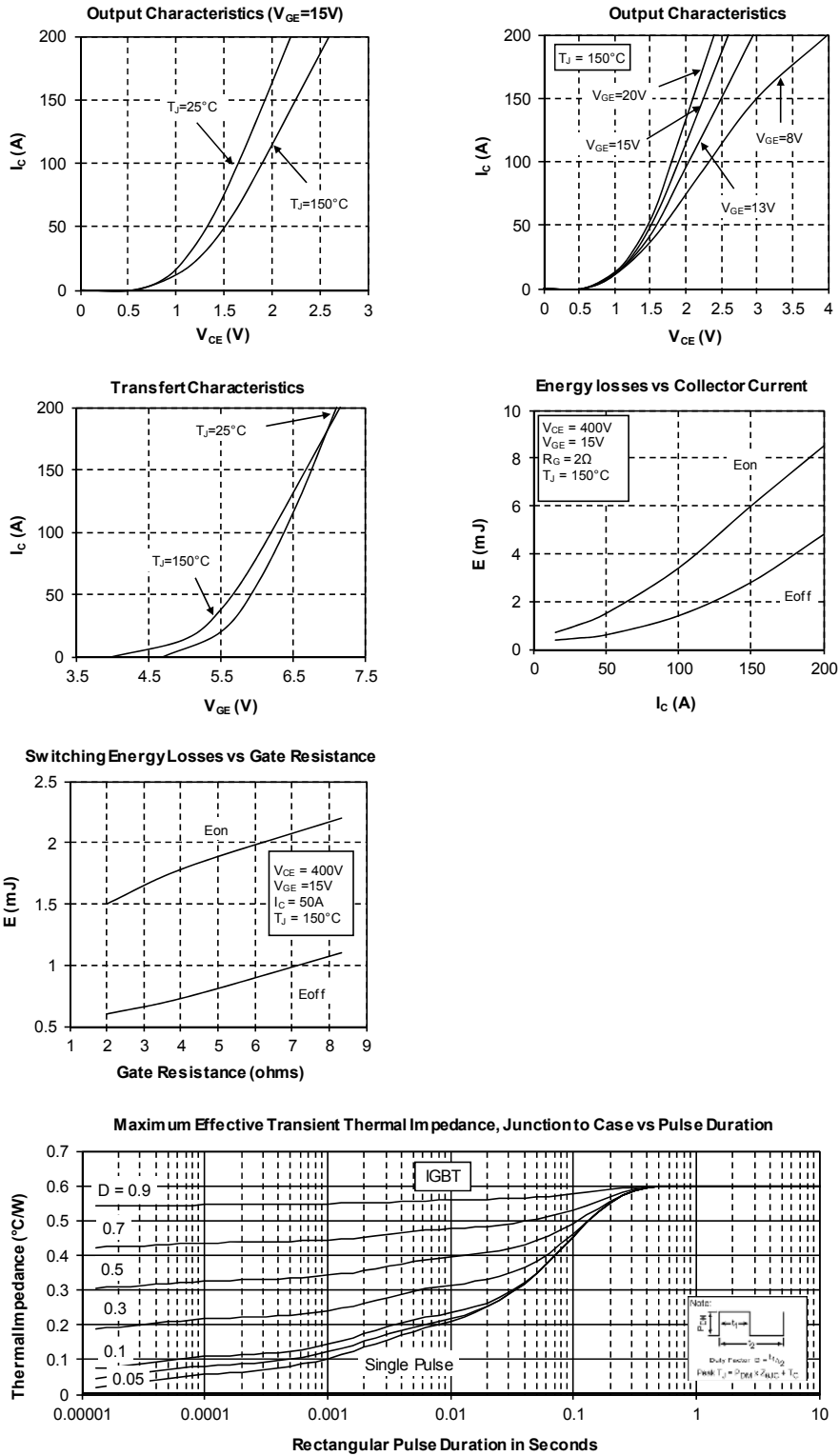
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

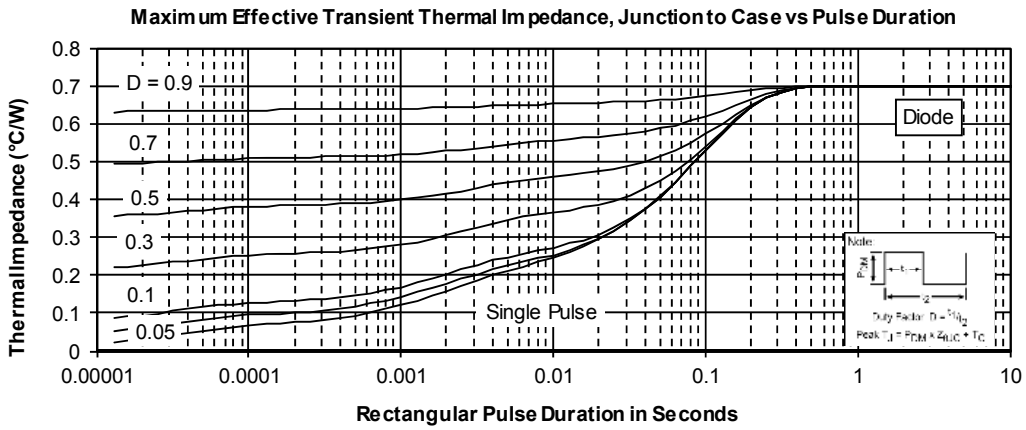
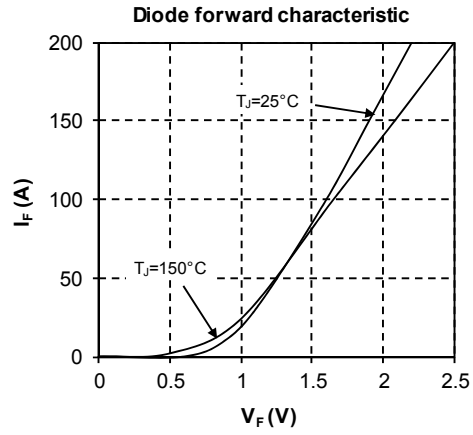
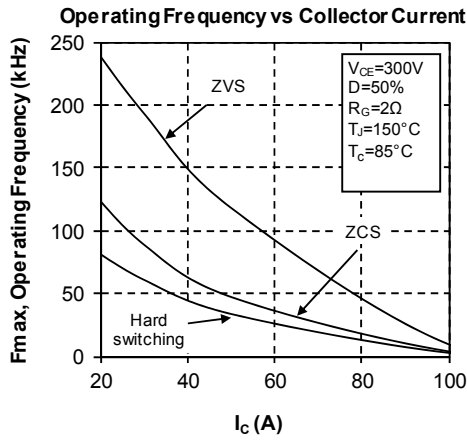
T: Thermistor temperature  
 R<sub>T</sub>: Thermistor value at T

**Thermal and package characteristics**

Symbol	Characteristic	Min	Max	Unit		
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>JOP</sub>	Recommended junction temperature under switching conditions	-40	T <sub>Jmax</sub> -25			
T <sub>STG</sub>	Storage Temperature Range	-40	125			
T <sub>C</sub>	Operating Case Temperature	-40	125			
Torque	Mounting torque	To heatsink	M4	2	3	N.m
Wt	Package Weight				80	g

**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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