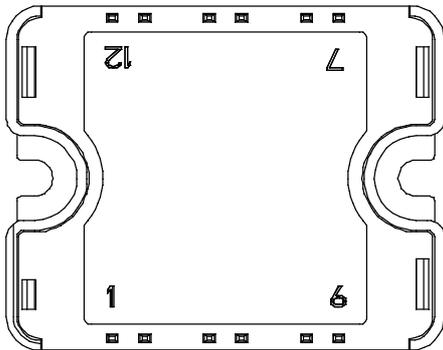
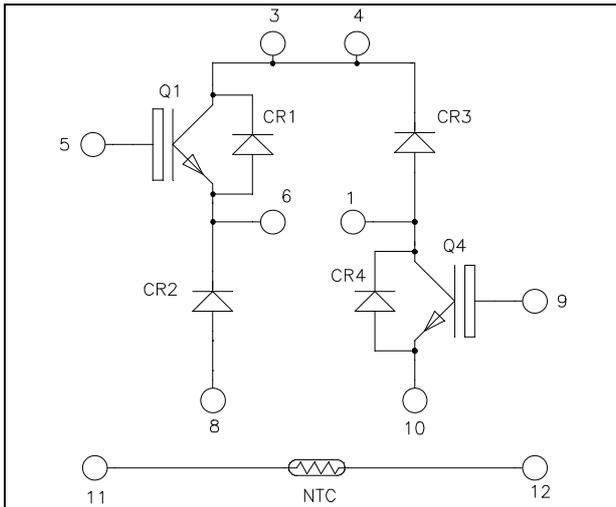


## Asymmetrical - Bridge NPT IGBT Power Module

$V_{CES} = 600V$   
 $I_C = 50A^* @ T_c = 80^\circ C$



Pins 3/4 must be shorted together

### 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 100 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	$T_C = 25^\circ C$	65*
		$T_C = 80^\circ C$	50*
$I_{CM}$	Pulsed Collector Current	$T_C = 25^\circ C$	230
$V_{GE}$	Gate - Emitter Voltage	$\pm 20$	V
$P_D$	Maximum Power Dissipation	$T_C = 25^\circ C$	250
RBSOA	Reverse Bias Safe Operating Area	$T_j = 125^\circ C$	100A @ 500V

\* Specification of IGBT device but output current must be limited to 40A to not exceed a delta of temperature greater than 35°C for the connectors.

**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	$V_{GE} = 0V$ $V_{CE} = 600V$	$T_j = 25^\circ\text{C}$		250	$\mu\text{A}$	
			$T_j = 125^\circ\text{C}$		500		
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	$V_{GE} = 15V$ $I_C = 50A$	$T_j = 25^\circ\text{C}$	1.7	2.0	2.45	V
			$T_j = 125^\circ\text{C}$		2.2		
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE} = V_{CE}, I_C = 1mA$		4		6	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	$V_{GE} = 0V$		2200		pF
$C_{oes}$	Output Capacitance	$V_{CE} = 25V$		323		
$C_{res}$	Reverse Transfer Capacitance	$f = 1MHz$		200		
$Q_g$	Total gate Charge	$V_{GE} = 15V$		166		nC
$Q_{ge}$	Gate – Emitter Charge	$V_{Bus} = 300V$		20		
$Q_{gc}$	Gate – Collector Charge	$I_C = 50A$		100		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching ( $25^\circ\text{C}$ )		40		ns
$T_r$	Rise Time	$V_{GE} = 15V$		9		
$T_{d(off)}$	Turn-off Delay Time	$V_{Bus} = 400V$		120		
$T_f$	Fall Time	$I_C = 50A$ $R_G = 2.7\Omega$		12		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching ( $125^\circ\text{C}$ )		42		ns
$T_r$	Rise Time	$V_{GE} = 15V$		10		
$T_{d(off)}$	Turn-off Delay Time	$V_{Bus} = 400V$		130		
$T_f$	Fall Time	$I_C = 50A$ $R_G = 2.7\Omega$		21		
$E_{on}$	Turn-on Switching Energy	$V_{GE} = 15V$ $V_{Bus} = 400V$	$T_j = 125^\circ\text{C}$	0.5		mJ
$E_{off}$	Turn-off Switching Energy	$I_C = 50A$ $R_G = 2.7\Omega$	$T_j = 125^\circ\text{C}$	1		
$I_{sc}$	Short Circuit data	$V_{GE} \leq 15V ; V_{Bus} = 360V$ $t_p \leq 10\mu\text{s} ; T_j = 125^\circ\text{C}$		225		A

**Diode ratings and characteristics (CR2 & CR3)**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$V_{RRM}$	Maximum Peak Repetitive Reverse Voltage		600			V
$I_{RM}$	Maximum Reverse Leakage Current	$V_R = 600V$	$T_j = 25^\circ\text{C}$		25	$\mu\text{A}$
			$T_j = 125^\circ\text{C}$		500	
$I_F$	DC Forward Current		$T_c = 80^\circ\text{C}$	30		A
$V_F$	Diode Forward Voltage	$I_F = 30A$		1.8	2.2	V
		$I_F = 60A$		2.2		
		$I_F = 30A$	$T_j = 125^\circ\text{C}$	1.5		
$t_{rr}$	Reverse Recovery Time	$I_F = 30A$ $V_R = 400V$	$T_j = 25^\circ\text{C}$	25		ns
			$T_j = 125^\circ\text{C}$	160		
$Q_{rr}$	Reverse Recovery Charge	$di/dt = 200A/\mu\text{s}$	$T_j = 25^\circ\text{C}$	35		nC
			$T_j = 125^\circ\text{C}$	480		

CR1 &amp; CR4 are IGBT protection diodes only

## Thermal and package characteristics

Symbol	Characteristic	Min	Typ	Max	Unit	
R <sub>thJC</sub>	Junction to Case Thermal Resistance	IGBT		0.5	°C/W	
		Diode		1.2		
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	3	N.m
Wt	Package Weight				80	g

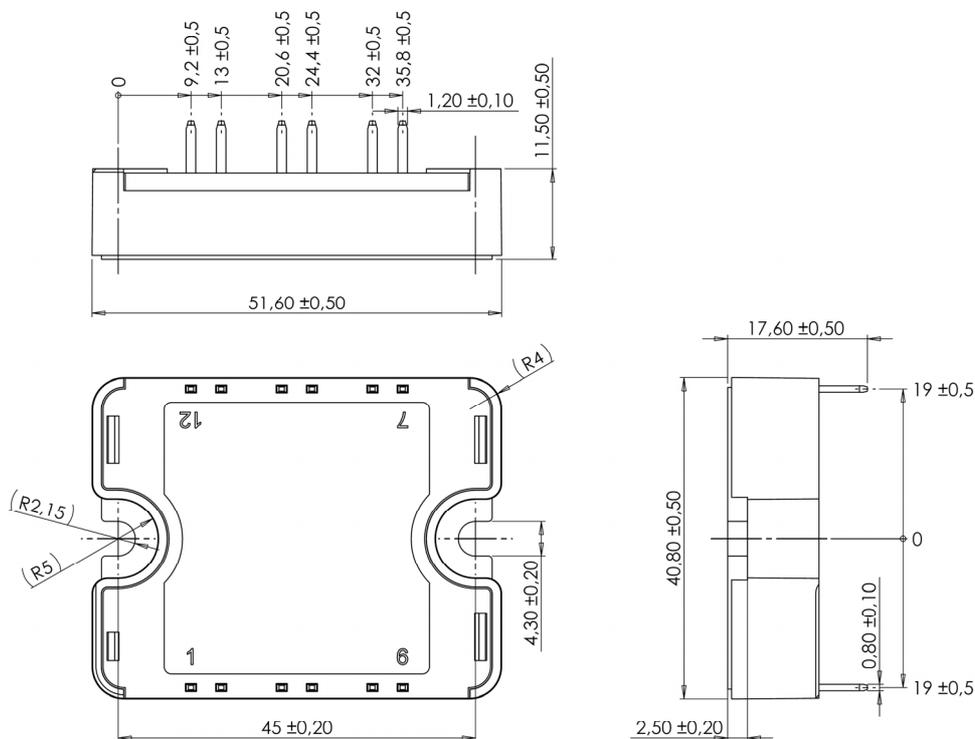
## Temperature sensor NTC (see application note APT0406 on www.microsemi.com for more information).

Symbol	Characteristic	Min	Typ	Max	Unit
R <sub>25</sub>	Resistance @ 25°C		50		kΩ
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		%

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

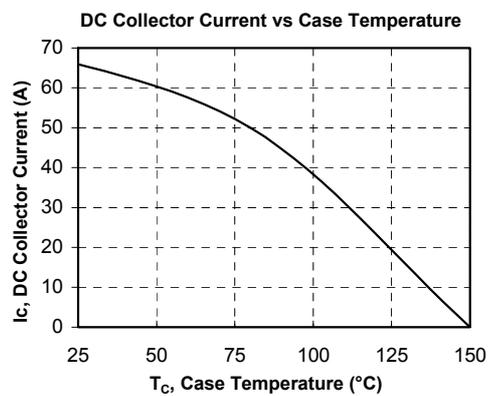
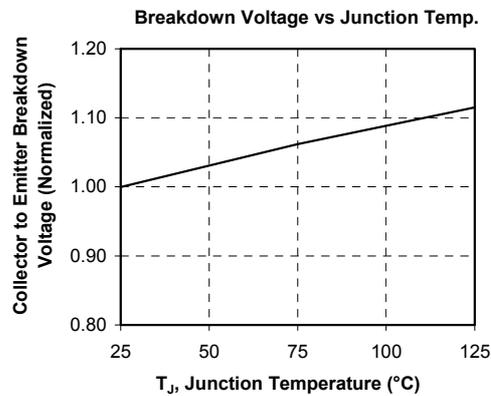
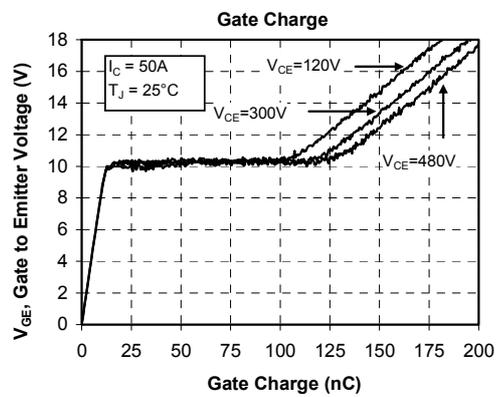
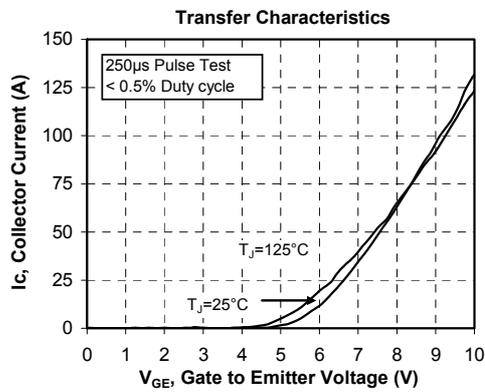
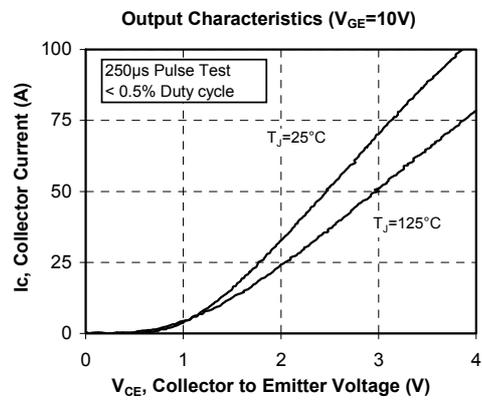
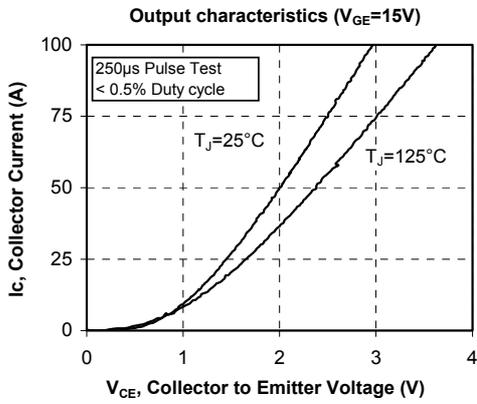
T: Thermistor temperature  
R<sub>T</sub>: Thermistor value at T

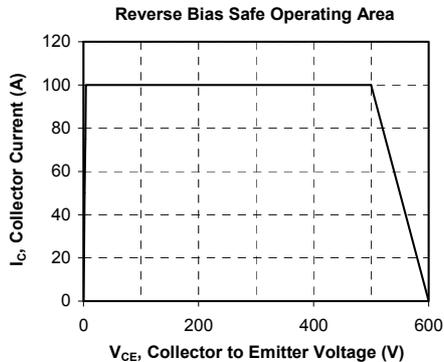
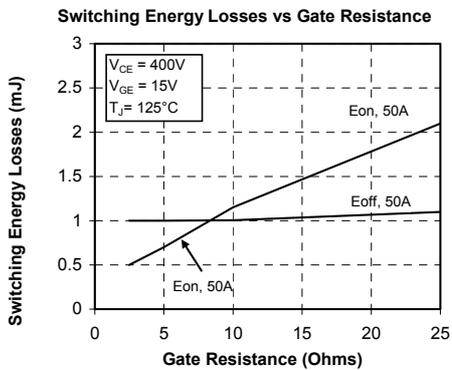
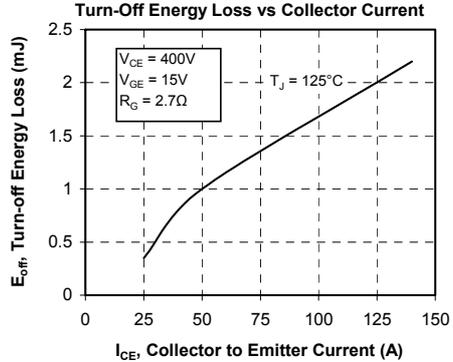
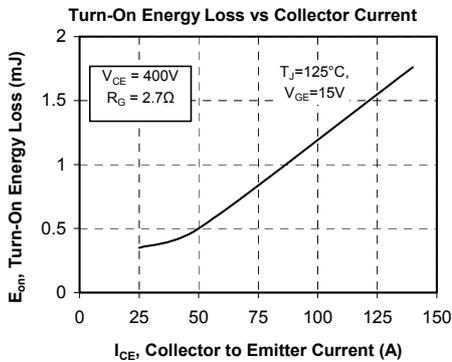
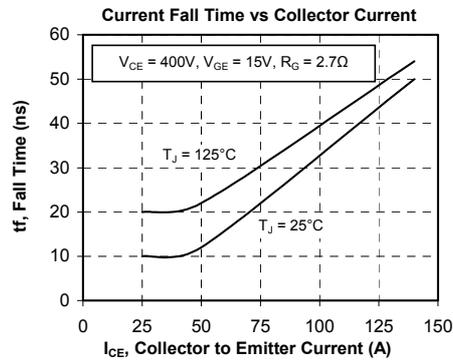
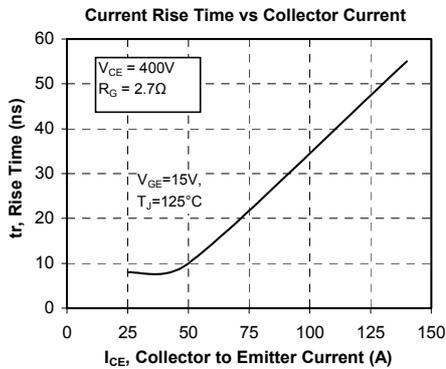
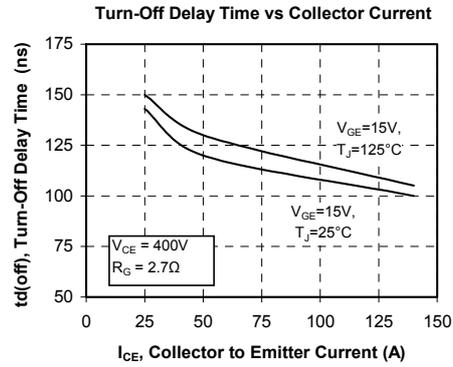
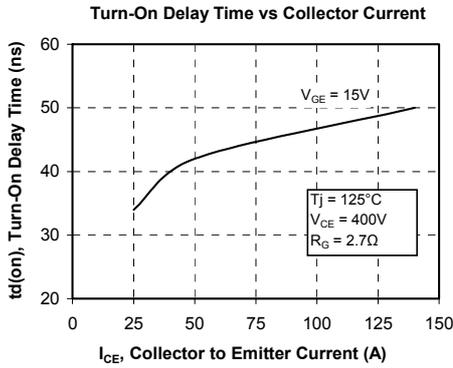
## SP1 Package outline (dimensions in mm)

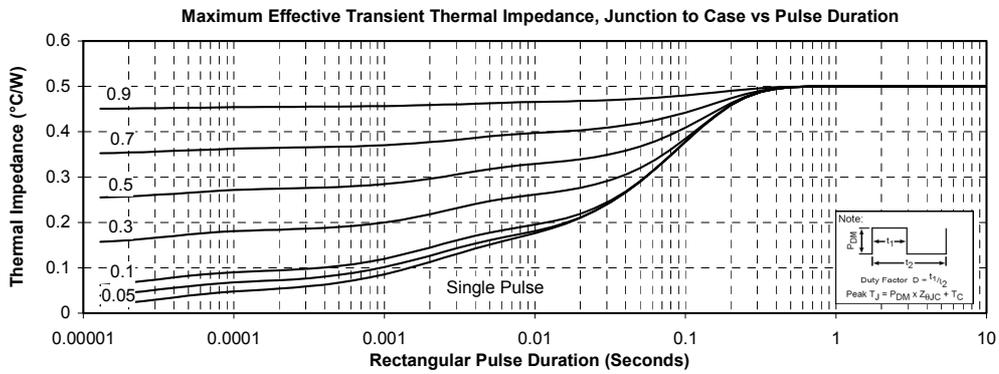
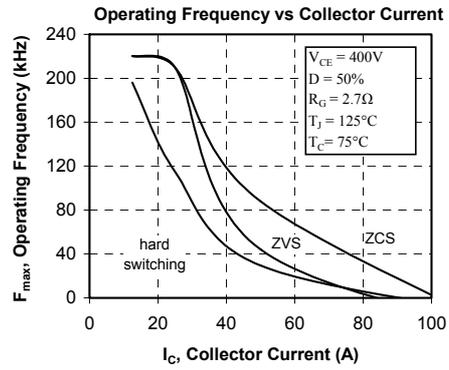
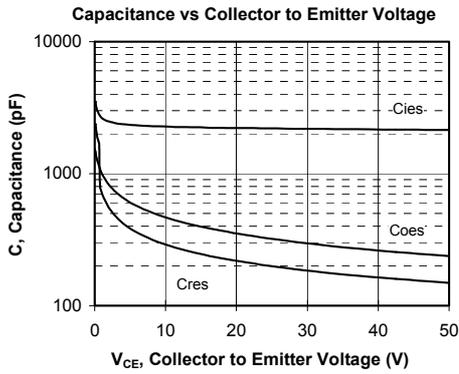


See application note 1904 - Mounting Instructions for SP1 Power Modules on [www.microsemi.com](http://www.microsemi.com)

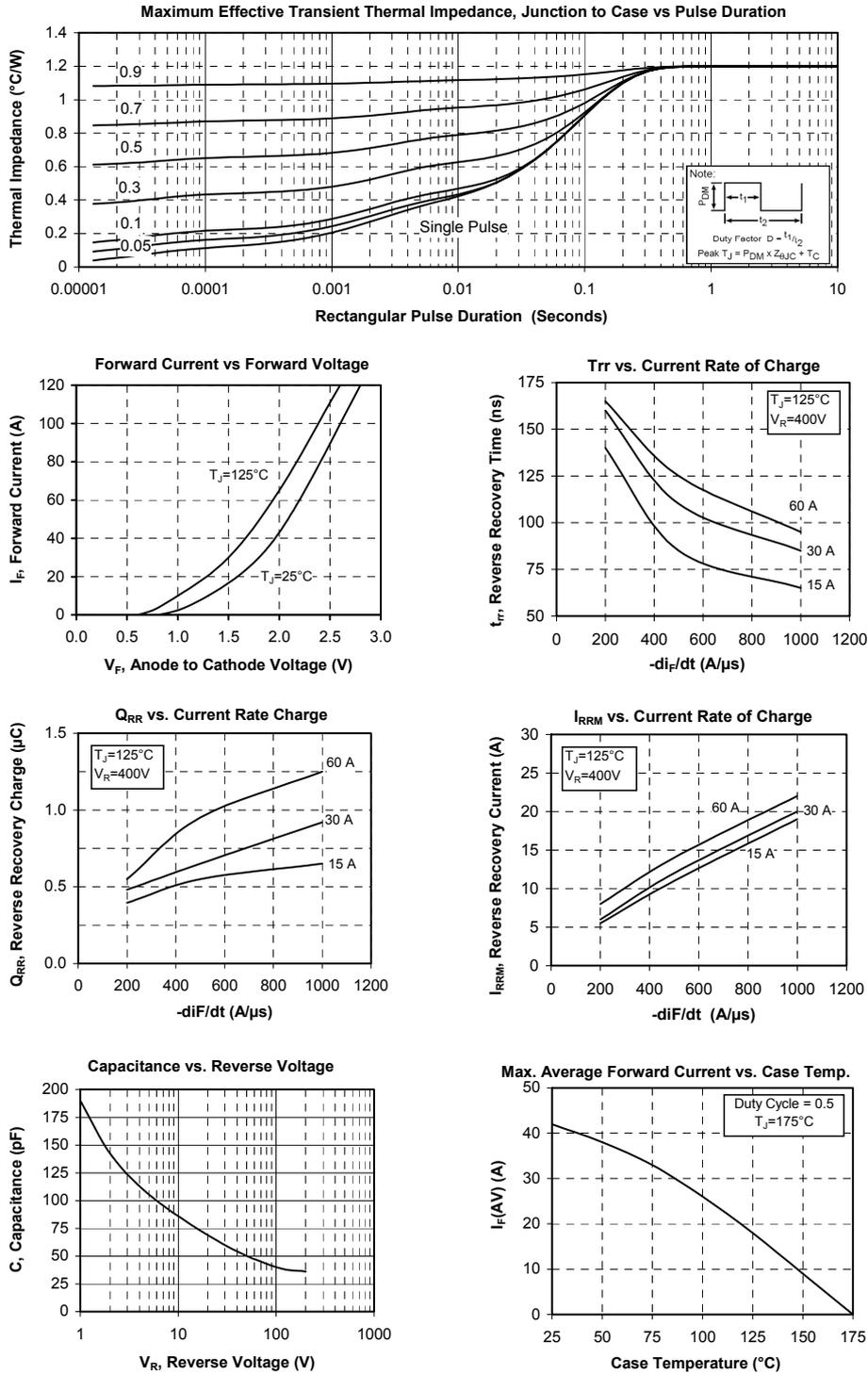
## Typical IGBT Performance Curve







## Typical diode Performance Curve



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