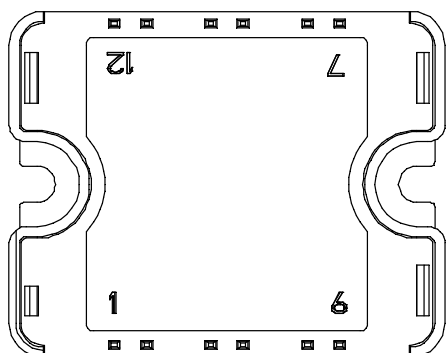
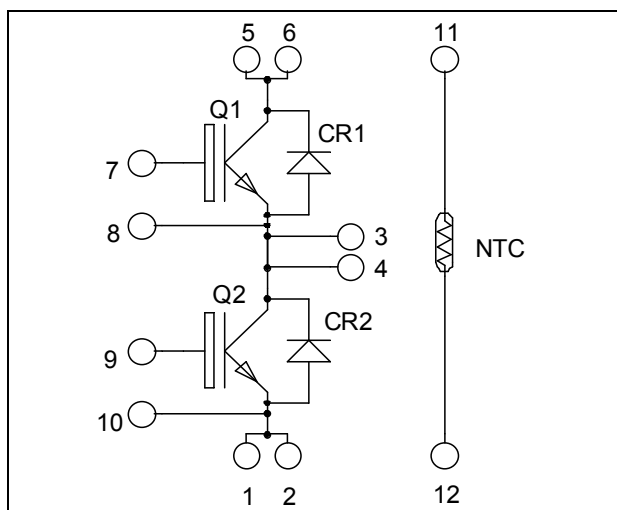


Phase leg NPT IGBT Power Module

$V_{CES} = 600V$
 $I_C = 30A @ T_c = 80^\circ C$



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

Application

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

Features

- 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	$T_C = 25^\circ C$	A
		$T_C = 80^\circ C$	
I_{CM}	Pulsed Collector Current	$T_C = 25^\circ C$	100
V_{GE}	Gate - Emitter Voltage	± 20	V
P_D	Maximum Power Dissipation	$T_C = 25^\circ C$	140
RBSOA	Reverse Bias Safe Operating Area	$T_j = 125^\circ C$	60A@500V

CAUTION: These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed. See application note APT0502 on 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	μA
			$T_j = 125^\circ\text{C}$		500	
$V_{CE(on)}$	Collector Emitter on Voltage	$V_{GE} = 15V$ $I_C = 30A$	$T_j = 25^\circ\text{C}$	1.7	2.0	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	$V_{GE} = 0V$		1350		pF
C_{oes}	Output Capacitance	$V_{CE} = 25V$		193		
C_{res}	Reverse Transfer Capacitance	$f = 1MHz$		120		
Q_g	Total gate Charge	$V_{GE} = 15V$		99		nC
Q_{ge}	Gate – Emitter Charge	$V_{Bus} = 300V$		10		
Q_{gc}	Gate – Collector Charge	$I_C = 30A$		60		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C)		30		ns
T_r	Rise Time	$V_{GE} = 15V$		12		
$T_{d(off)}$	Turn-off Delay Time	$V_{Bus} = 400V$		80		
T_f	Fall Time	$I_C = 30A$ $R_G = 6.8\Omega$		15		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (125°C)		32		ns
T_r	Rise Time	$V_{GE} = 15V$		12		
$T_{d(off)}$	Turn-off Delay Time	$V_{Bus} = 400V$		90		
T_f	Fall Time	$I_C = 30A$ $R_G = 6.8\Omega$		21		
E_{on}	Turn-on Switching Energy	$V_{GE} = 15V$ $V_{Bus} = 400V$	$T_j = 125^\circ\text{C}$	0.3		mJ
E_{off}	Turn-off Switching Energy	$I_C = 30A$ $R_G = 6.8\Omega$	$T_j = 125^\circ\text{C}$	0.8		

Reverse 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	$V_R = 600V$	$T_j = 25^\circ\text{C}$		25	μA
			$T_j = 125^\circ\text{C}$		500	
I_F	DC Forward Current		$T_c = 80^\circ\text{C}$	25		A
V_F	Diode Forward Voltage	$I_F = 25A$		1.8	2.2	V
		$I_F = 50A$		2.2		
		$I_F = 25A$ $T_j = 125^\circ\text{C}$		1.6		
t_{rr}	Reverse Recovery Time	$I_F = 25A$ $V_R = 400V$	$T_j = 25^\circ\text{C}$	30		ns
			$T_j = 125^\circ\text{C}$	175		
Q_{rr}	Reverse Recovery Charge	$di/dt = 200A/\mu s$	$T_j = 25^\circ\text{C}$	55		nC
			$T_j = 125^\circ\text{C}$	485		

Thermal and package characteristics

Symbol	Characteristic		Min	Typ	Max	Unit
R _{thJC}	Junction to Case Thermal Resistance	IGBT			0.9	°C/W
		Diode			1.4	
V _{ISOL}	RMS Isolation Voltage, any terminal to case t=1 min, I _{isol} <1mA, 50/60Hz		2500			V
T _J	Operating junction temperature range		-40		150	°C
T _{STG}	Storage Temperature Range		-40		125	
T _C	Operating Case Temperature		-40		100	
Torque	Mounting torque	To heatsink	M4	2.5	4.7	N.m
Wt	Package Weight				80	g

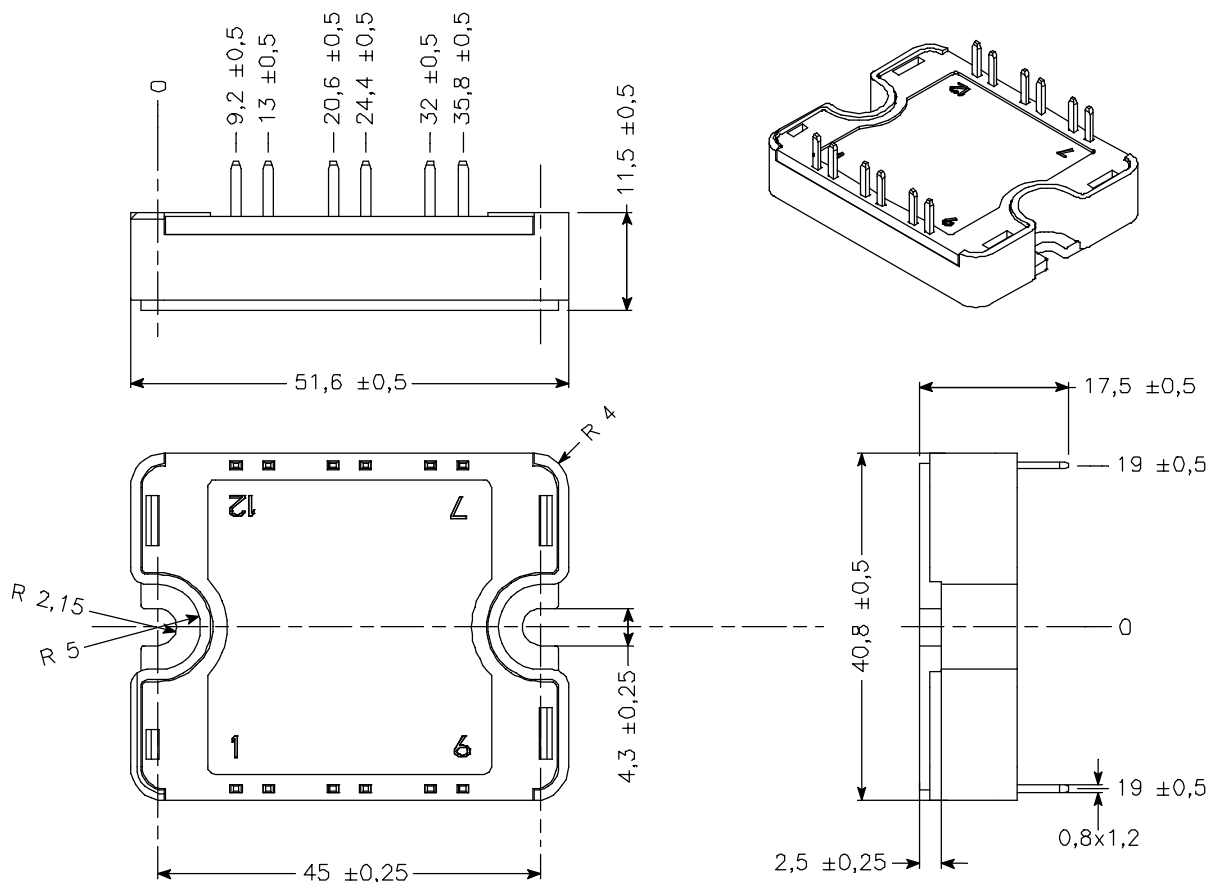
Temperature sensor NTC (see application note APT0406 on www.microsemi.com for more information).

Symbol	Characteristic	Min	Typ	Max	Unit
R ₂₅	Resistance @ 25°C		50		kΩ
B _{25/85}	T ₂₅ = 298.15 K		3952		K

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

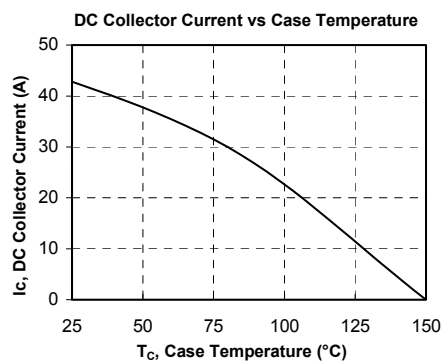
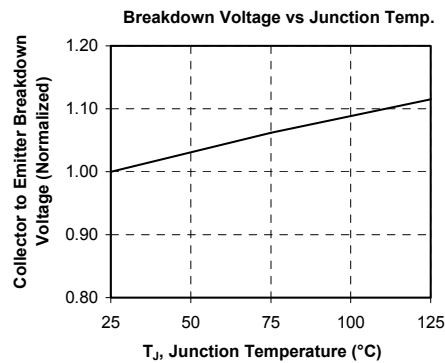
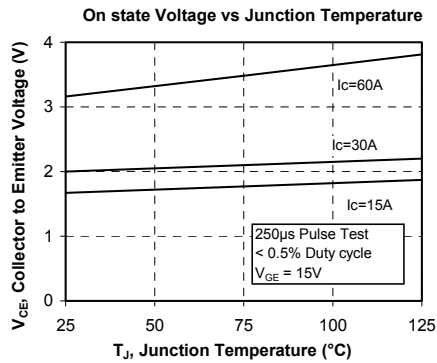
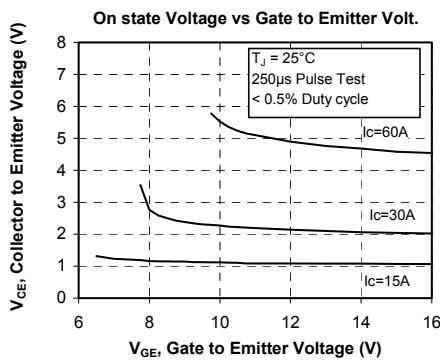
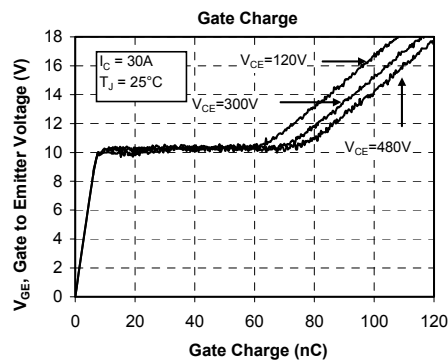
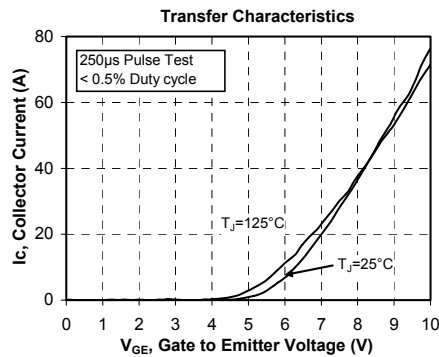
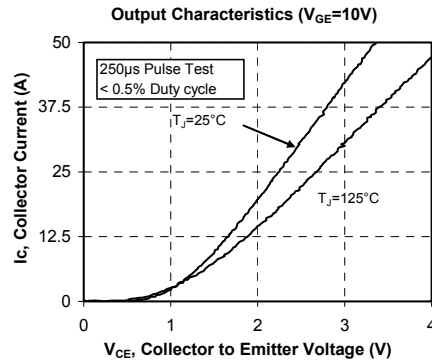
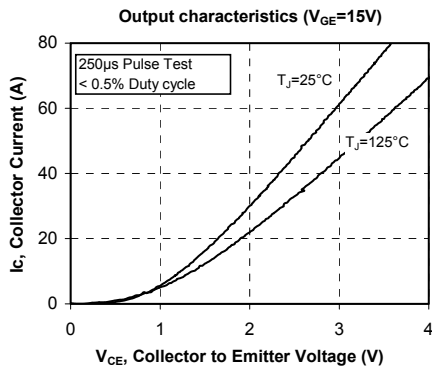
T: Thermistor temperature
R_T: Thermistor value at T

SP1 Package outline (dimensions in mm)

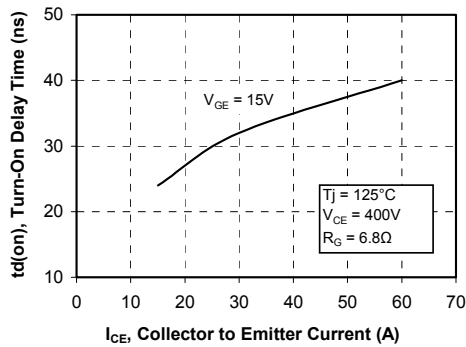


See application note 1904 - Mounting Instructions for SP1 Power Modules on www.microsemi.com

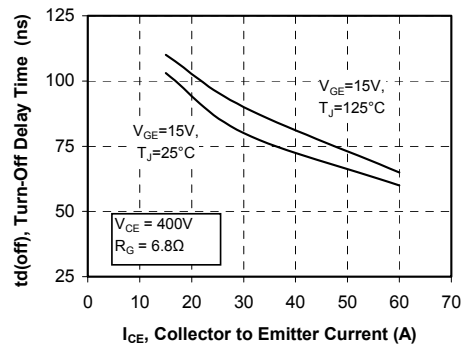
Typical Performance Curve



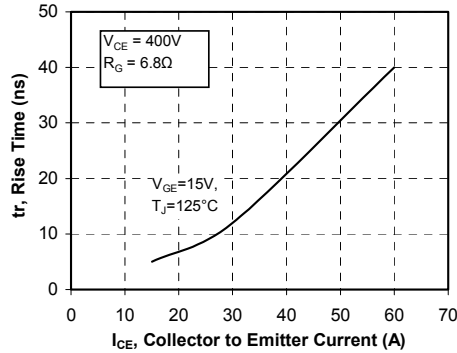
Turn-On Delay Time vs Collector Current



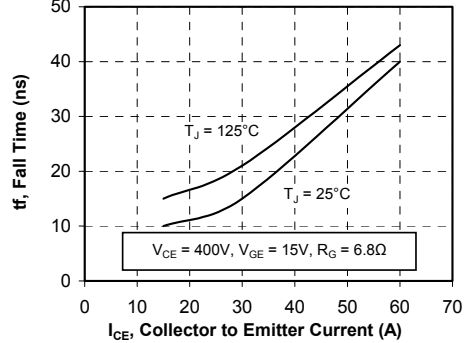
Turn-Off Delay Time vs Collector Current



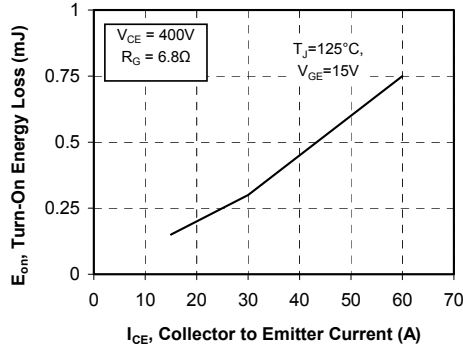
Current Rise Time vs Collector Current



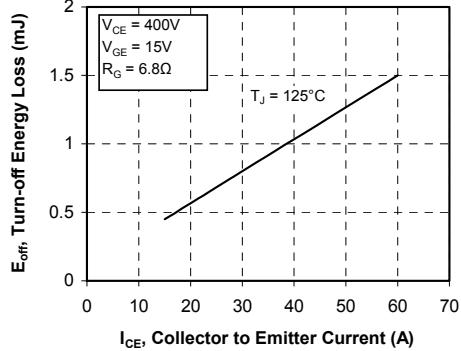
Current Fall Time vs Collector Current



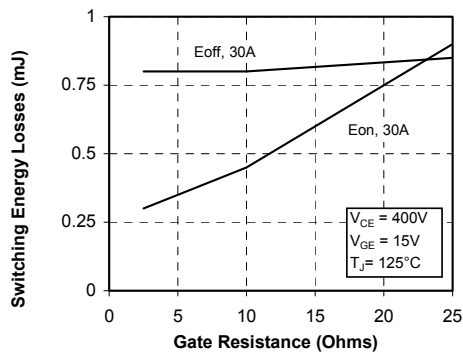
Turn-On Energy Loss vs Collector Current



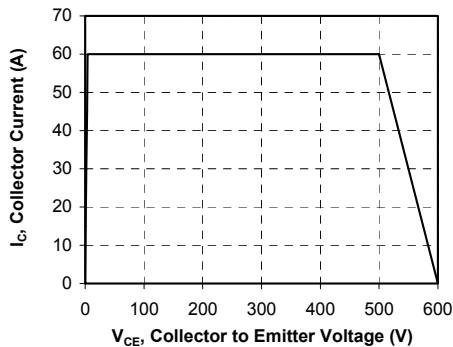
Turn-Off Energy Loss vs Collector Current

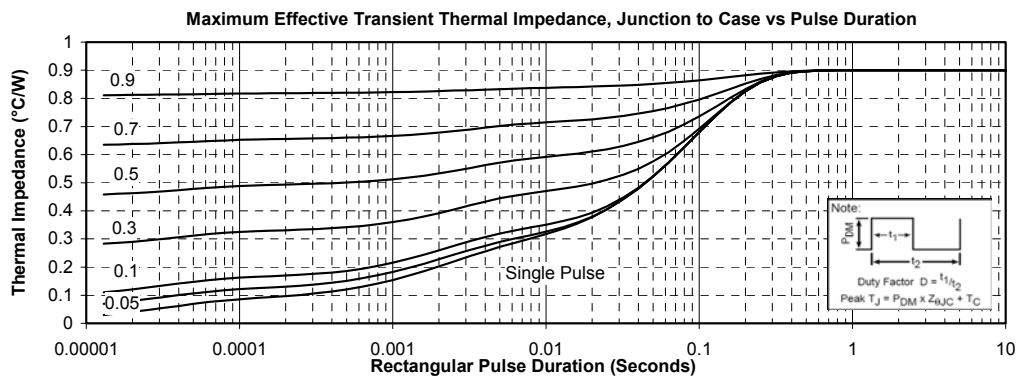
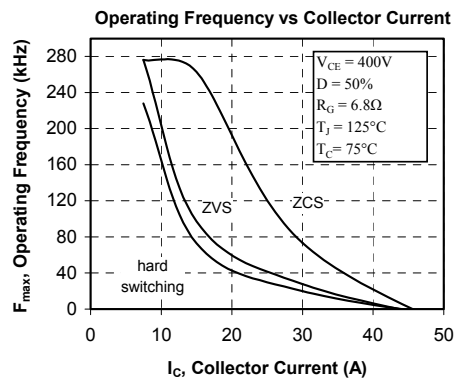
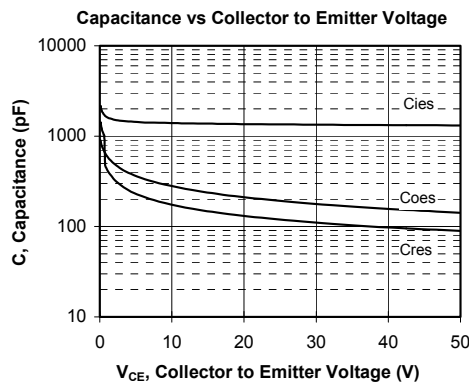


Switching Energy Losses vs Gate Resistance



Reverse Bias Safe Operating Area





Microsemi reserves the right to change, without notice, the specifications and information contained herein

Microsemi's products are covered by one or more of U.S. patents 4,895,810 5,045,903 5,089,434 5,182,234 5,019,522 5,262,336 6,503,786 5,256,583 4,748,103 5,283,202 5,231,474 5,434,095 5,528,058 and foreign patents. U.S. and Foreign patents pending. All Rights Reserved.