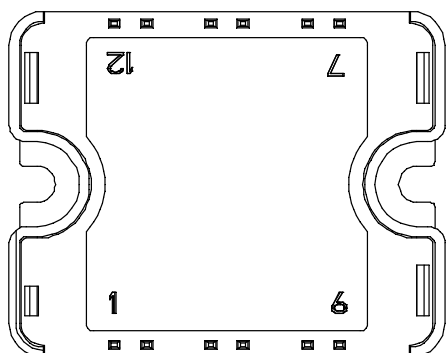
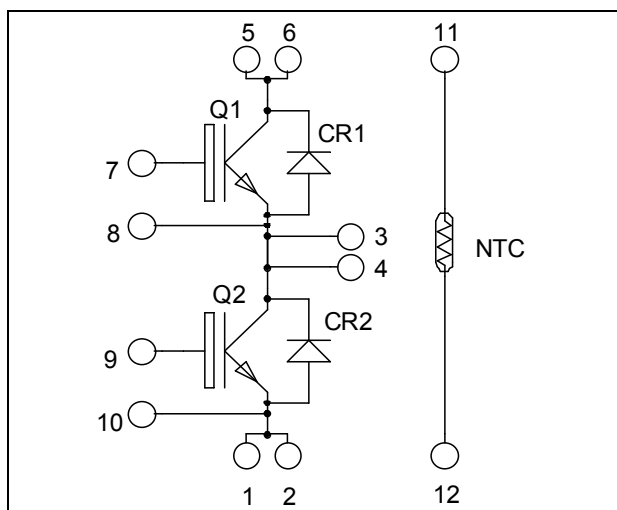


Phase leg NPT IGBT Power Module

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



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	$V_{GE} = 0\text{V}$ $V_{CE} = 600\text{V}$	$T_j = 25^\circ\text{C}$		250	μA
			$T_j = 125^\circ\text{C}$		500	
$V_{CE(on)}$	Collector Emitter on Voltage	$V_{GE} = 15\text{V}$ $I_C = 30\text{A}$	$T_j = 25^\circ\text{C}$	1.7	2.0	V
			$T_j = 125^\circ\text{C}$	2.2		
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE} = V_{CE}, I_C = 1\text{mA}$	4		6	V
I_{GES}	Gate – Emitter Leakage Current	$V_{GE} = 20\text{V}, V_{CE} = 0\text{V}$			400	nA

Dynamic Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C_{ies}	Input Capacitance	$V_{GE} = 0\text{V}$		1350		pF
C_{oes}	Output Capacitance	$V_{CE} = 25\text{V}$		193		
C_{res}	Reverse Transfer Capacitance	$f = 1\text{MHz}$		120		
Q_g	Total gate Charge	$V_{GE} = 15\text{V}$		99		nC
Q_{ge}	Gate – Emitter Charge	$V_{Bus} = 300\text{V}$		10		
Q_{gc}	Gate – Collector Charge	$I_C = 30\text{A}$		60		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C)		30		ns
T_r	Rise Time	$V_{GE} = 15\text{V}$		12		
$T_{d(off)}$	Turn-off Delay Time	$V_{Bus} = 400\text{V}$		80		
T_f	Fall Time	$I_C = 30\text{A}$ $R_G = 6.8\Omega$		15		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (125°C)		32		ns
T_r	Rise Time	$V_{GE} = 15\text{V}$		12		
$T_{d(off)}$	Turn-off Delay Time	$V_{Bus} = 400\text{V}$		90		
T_f	Fall Time	$I_C = 30\text{A}$ $R_G = 6.8\Omega$		21		
E_{on}	Turn-on Switching Energy	$V_{GE} = 15\text{V}$ $V_{Bus} = 400\text{V}$	$T_j = 125^\circ\text{C}$	0.3		mJ
E_{off}	Turn-off Switching Energy	$I_C = 30\text{A}$ $R_G = 6.8\Omega$	$T_j = 125^\circ\text{C}$	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	$V_R = 600\text{V}$	$T_j = 25^\circ\text{C}$		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	$I_F = 25\text{A}$		1.8	2.2	V
		$I_F = 50\text{A}$		2.2		
		$I_F = 25\text{A}$ $T_j = 125^\circ\text{C}$		1.6		
t_{rr}	Reverse Recovery Time	$I_F = 25\text{A}$ $V_R = 400\text{V}$	$T_j = 25^\circ\text{C}$	30		ns
			$T_j = 125^\circ\text{C}$	175		
Q_{rr}	Reverse Recovery Charge	$di/dt = 200\text{A}/\mu\text{s}$	$T_j = 25^\circ\text{C}$	55		nC
			$T_j = 125^\circ\text{C}$	485		

Thermal and package characteristics

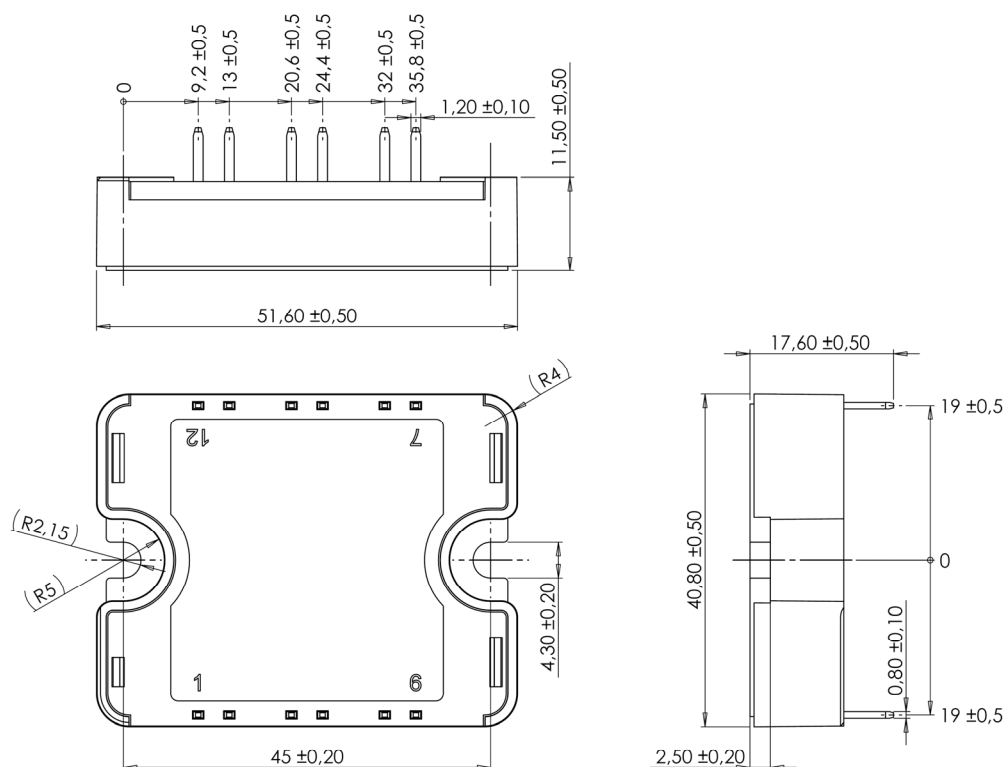
Symbol	Characteristic		Min	Typ	Max	Unit
R _{thJC}	Junction to Case Thermal Resistance	IGBT			0.9	°C/W
		Diode			1.4	
V _{ISOL}	RMS Isolation Voltage, any terminal to case t = 1 min, 50/60Hz		4000			V
T _J	Operating junction temperature range		-40		150	°C
T _{STG}	Storage Temperature Range		-40		125	
T _C	Operating Case Temperature		-40		100	
Torque	Mounting torque	To heatsink	M4	2	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 ₂₅	Resistance @ 25°C		50		kΩ
B _{25/85}	T ₂₅ = 298.15 K		3952		K

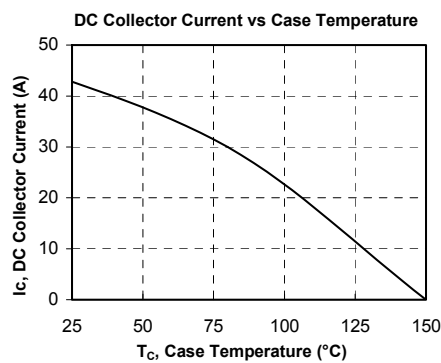
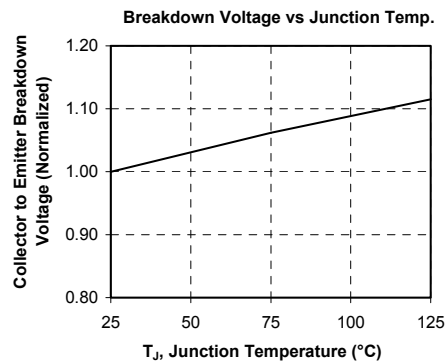
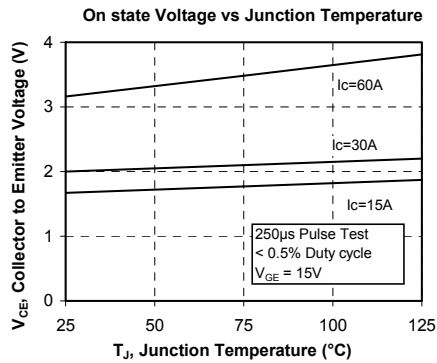
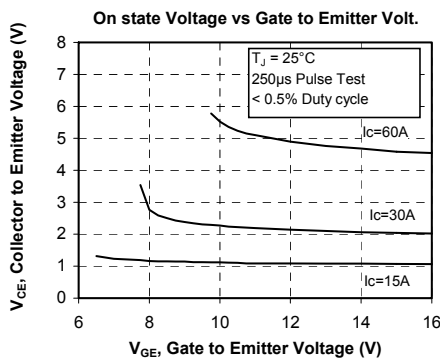
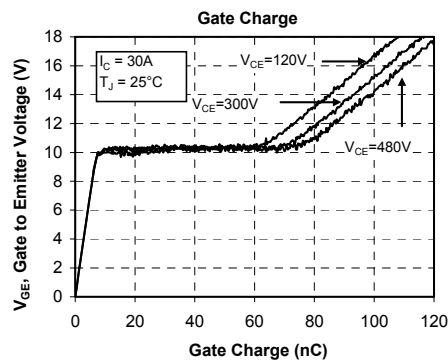
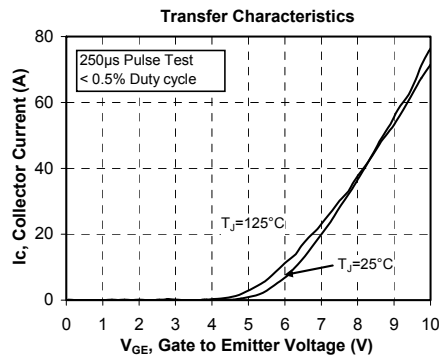
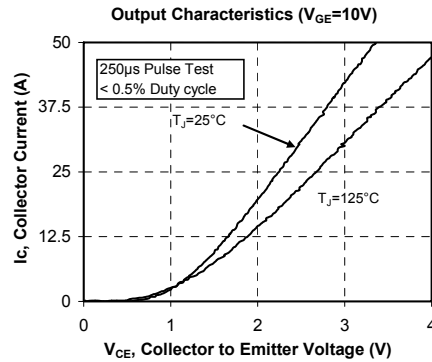
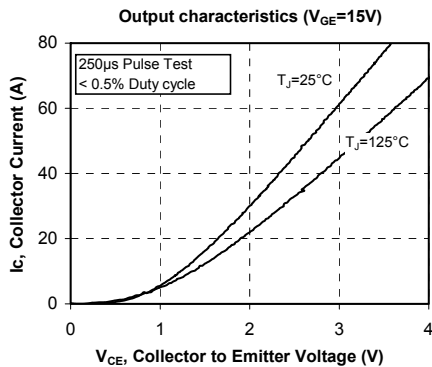
$$R_T = \frac{R_{25}}{\exp \left[B_{25/85} \left(\frac{1}{T_{25}} - \frac{1}{T} \right) \right]}$$

T: Thermistor temperature
 R_T: Thermistor value at T

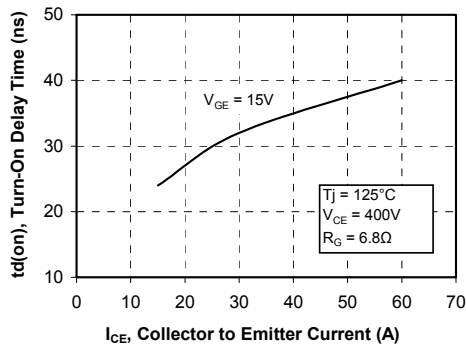
SP1 Package outline (dimensions in mm)


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

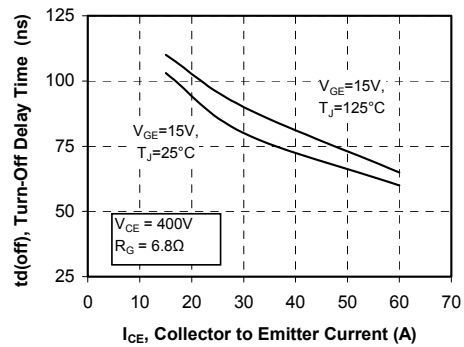
Typical Performance Curve



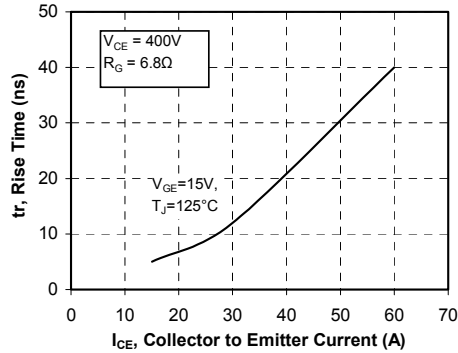
Turn-On Delay Time vs Collector Current



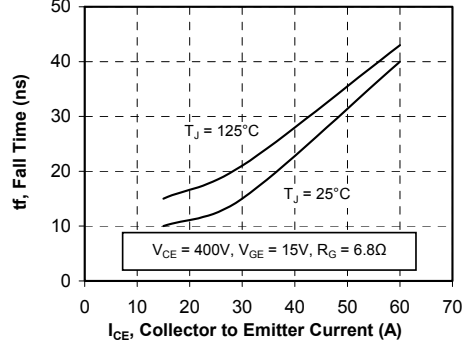
Turn-Off Delay Time vs Collector Current



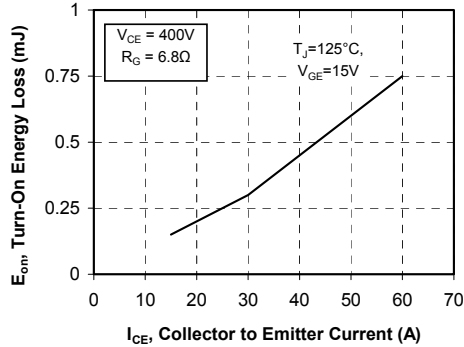
Current Rise Time vs Collector Current



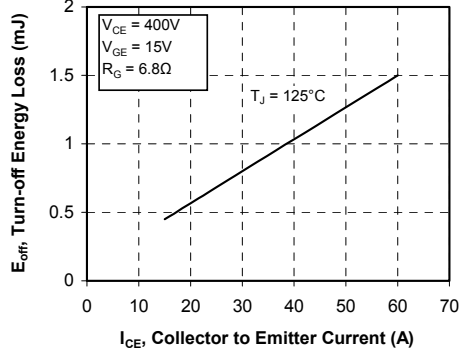
Current Fall Time vs Collector Current



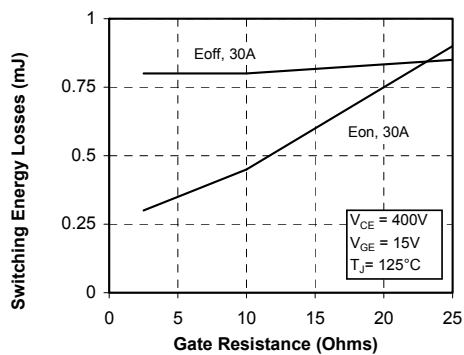
Turn-On Energy Loss vs Collector Current



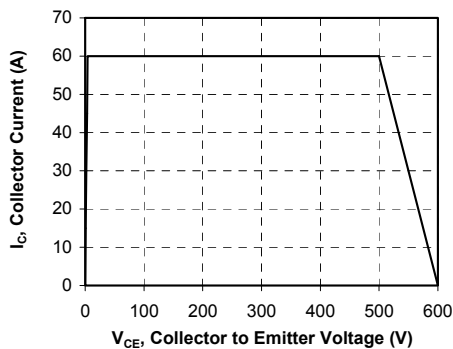
Turn-Off Energy Loss vs Collector Current

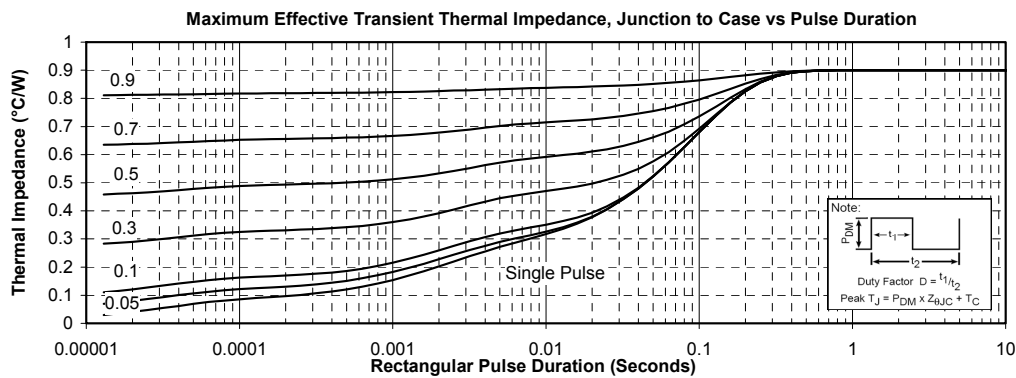
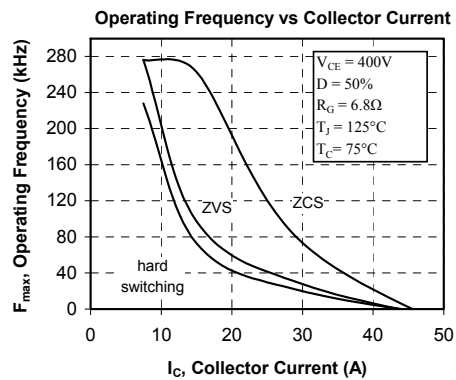
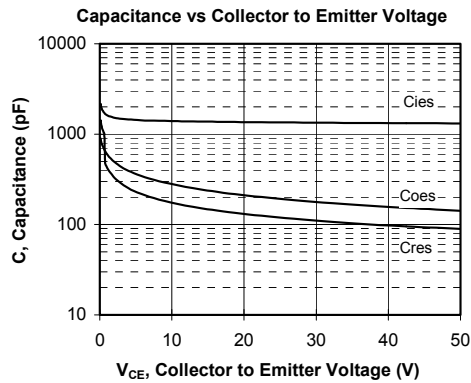


Switching Energy Losses vs Gate Resistance



Reverse Bias Safe Operating Area





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