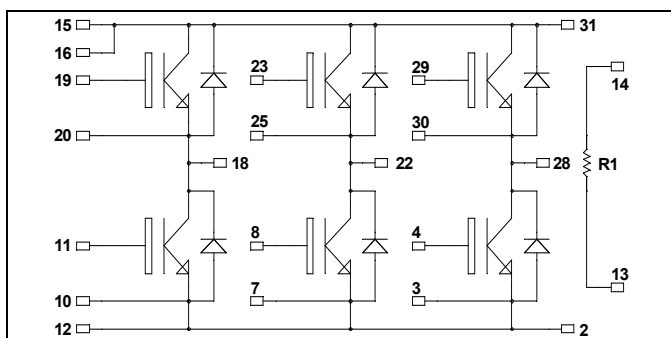
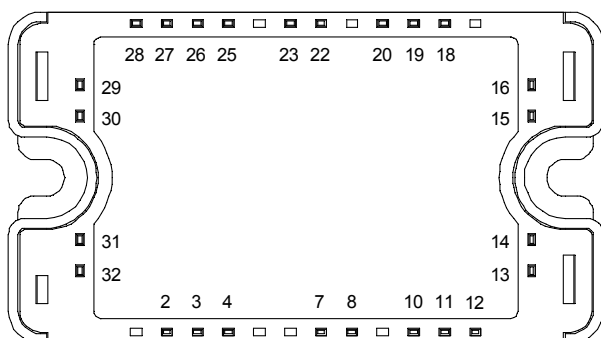


## 3 Phase bridge NPT IGBT Power Module

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



It is recommended to connect a decoupling capacitor between pins 31 & 2 to reduce switching overvoltages, if DC Power is connected between pins 15, 16 & 12. Pins 15 & 16 must be shorted together.



### Application

- 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
- Kelvin emitter for easy drive
- Very low stray inductance
- High level of integration
- 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

### Absolute maximum ratings

Symbol	Parameter	Max ratings	Unit
$V_{CES}$	Collector - Emitter Breakdown Voltage	600	V
$I_C$	Continuous Collector Current	$T_c = 25^\circ C$ 42 $T_c = 80^\circ C$ 30	A
$I_{CM}$	Pulsed Collector Current	$T_c = 25^\circ C$ 100	
$V_{GE}$	Gate - Emitter Voltage	$\pm 20$	V
$P_D$	Maximum Power Dissipation	$T_c = 25^\circ C$ 140	W
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](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	$V_{GE} = 15V$ $I_C = 30A$	$T_j = 25^\circ\text{C}$	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 ( $25^\circ\text{C}$ )		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 ( $125^\circ\text{C}$ )		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	$\mu\text{A}$
			$T_j = 125^\circ\text{C}$		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
		$di/dt = 200A/\mu s$	$T_j = 125^\circ\text{C}$	160		
$Q_{rr}$	Reverse Recovery Charge	$di/dt = 200A/\mu s$	$T_j = 25^\circ\text{C}$	35		nC
			$T_j = 125^\circ\text{C}$	480		

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

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

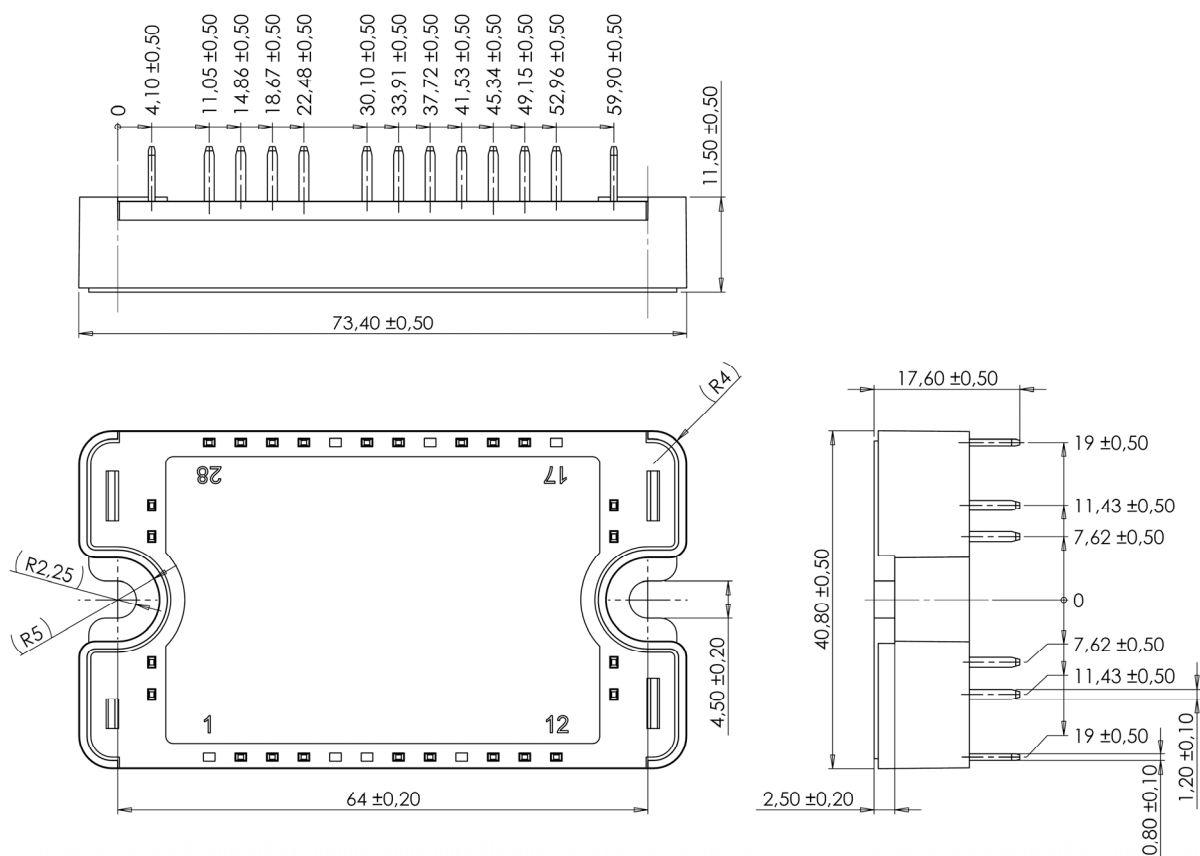
$$R_T = \frac{R_{25}}{\exp \left[ B_{25/85} \left( \frac{1}{T_{25}} - \frac{1}{T} \right) \right]}$$

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

## Thermal and package characteristics

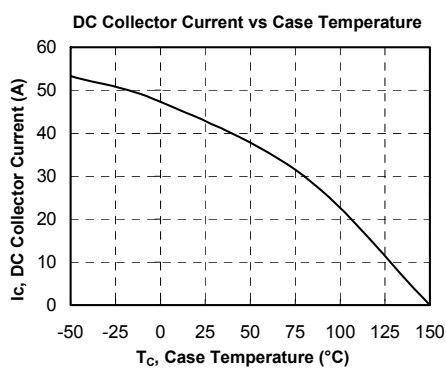
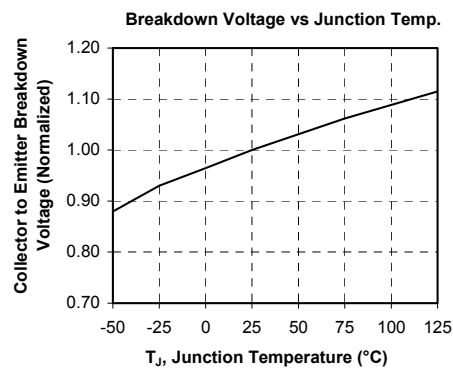
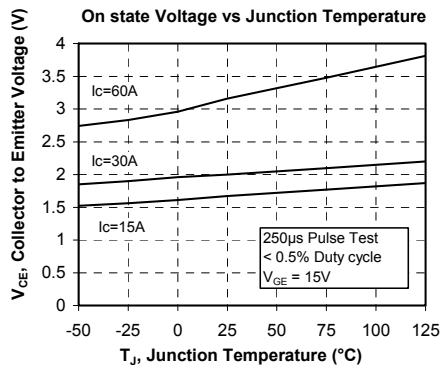
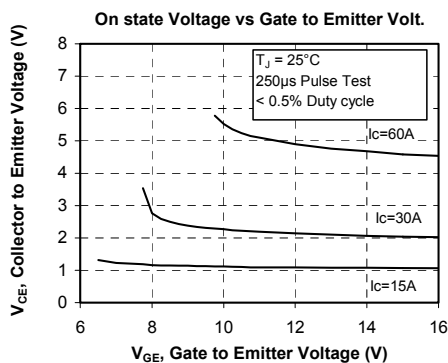
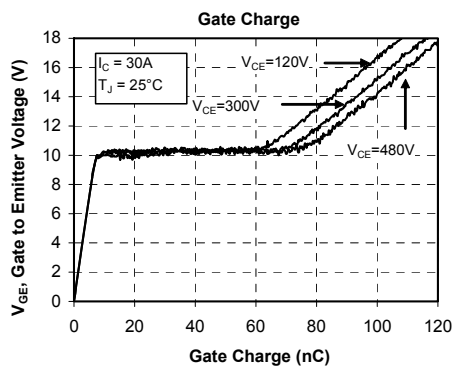
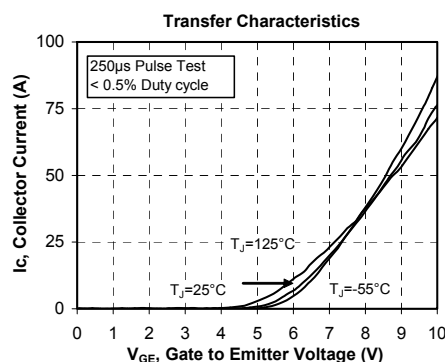
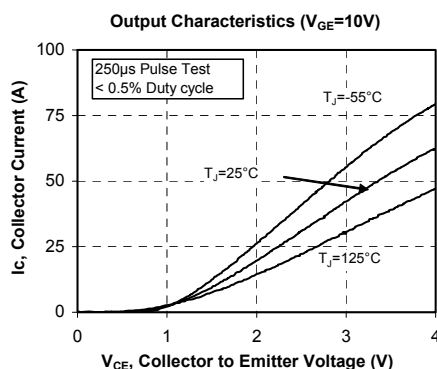
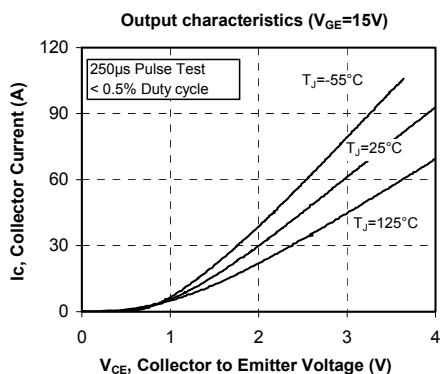
Symbol	Characteristic			Min	Typ	Max	Unit
R <sub>thJC</sub>	Junction to Case Thermal Resistance			IGBT		0.9	°C/W
				Diode		1.2	
V <sub>ISOL</sub>	RMS Isolation Voltage, any terminal to case t =1 min, 50/60Hz			4000			V
T <sub>J</sub>	Operating junction temperature range			-40		150	°C
T <sub>STG</sub>	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					110	g

## SP3 Package outline (dimensions in mm)

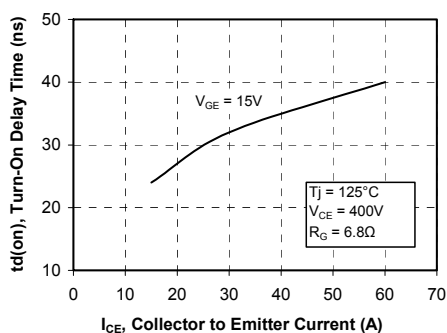


See application note 1901 - Mounting Instructions for SP3 Power Modules on [www.microsemi.com](http://www.microsemi.com)

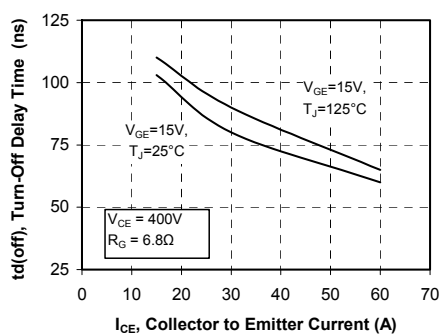
## Typical Performance Curve



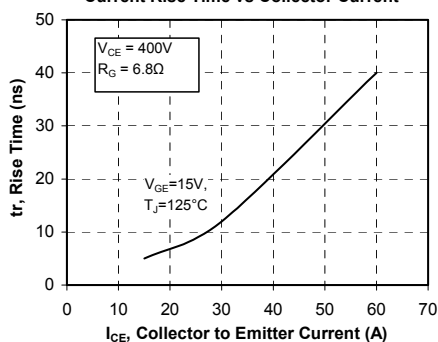
Turn-On Delay Time vs Collector Current



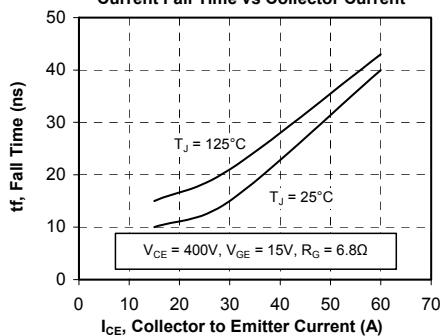
Turn-Off Delay Time vs Collector Current



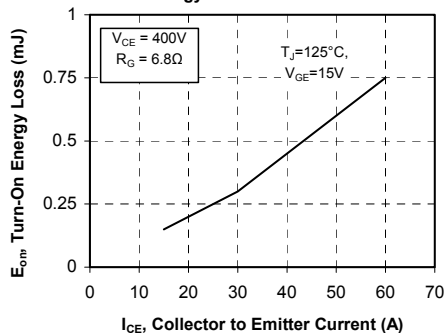
Current Rise Time vs Collector Current



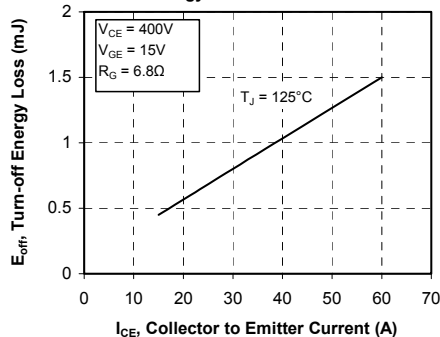
Current Fall Time vs Collector Current



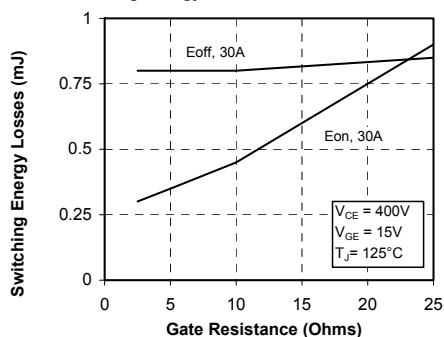
Turn-On Energy Loss vs Collector Current



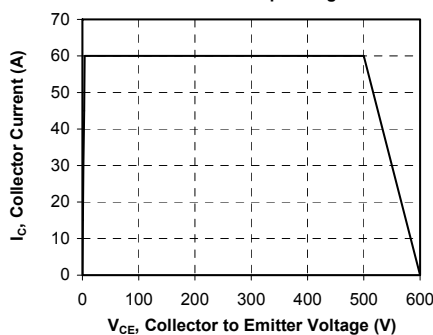
Turn-Off Energy Loss vs Collector Current

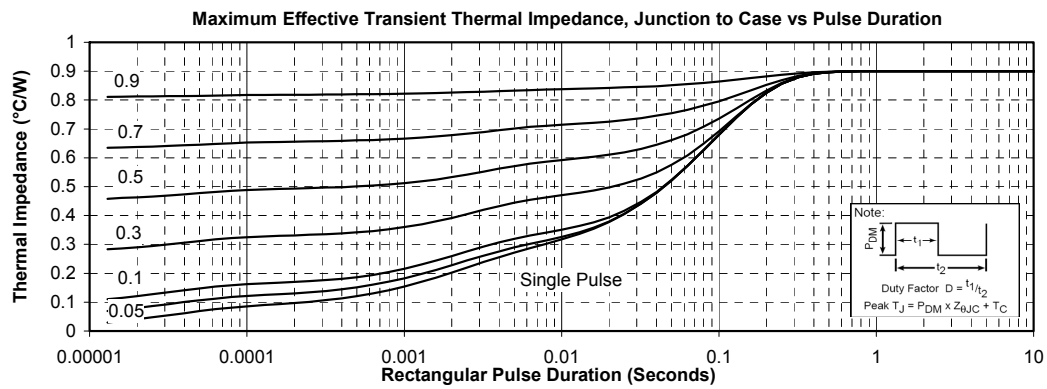
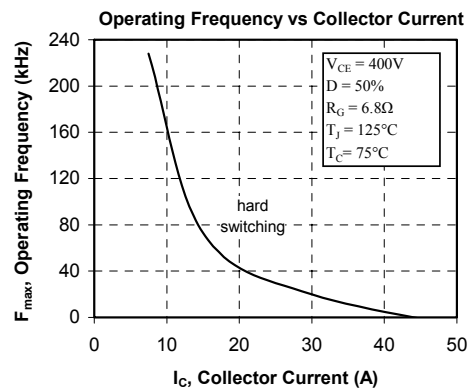
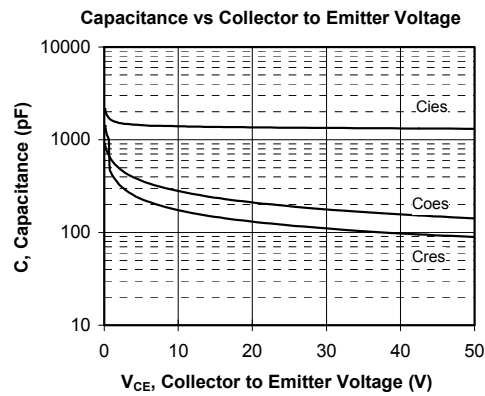


Switching Energy Losses vs Gate Resistance



Reverse Bias Safe Operating Area





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