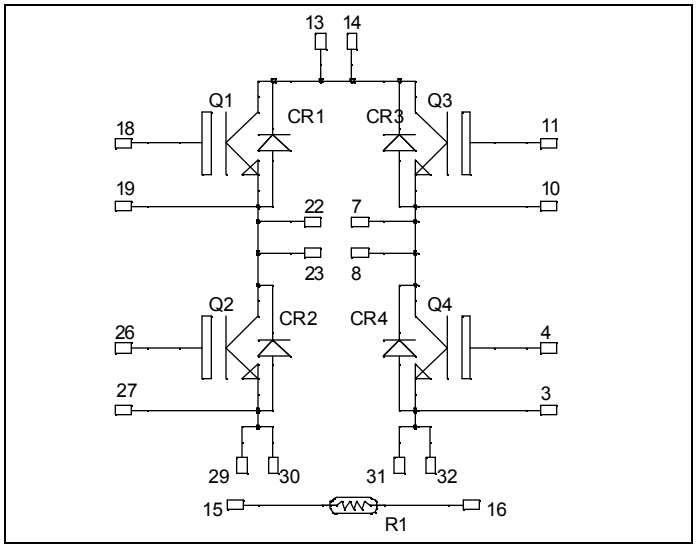
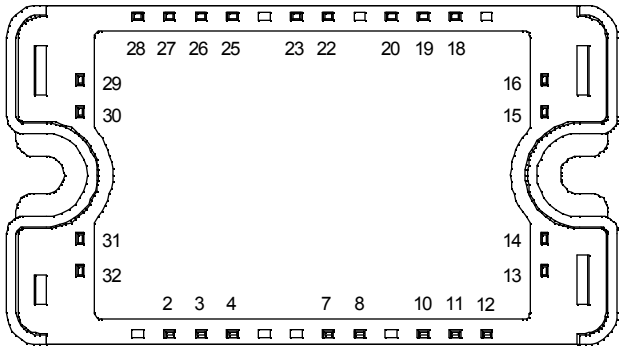
Full - Bridge
NPT IGBT Power Module

V_{CES} = 1200V
I_C = 15A @ Tc = 80°C





All multiple inputs and outputs must be shorted together
Example: 13/14 ; 29/30 ; 22/23 …

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 50 kHz
  - Soft recovery parallel diodes
  - Low diode VF
  - Low leakage current
  - Avalanche energy rated
  - RBSOA and SCSOA rated
  - Symmetrical design
- 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
- Easy paralleling due to positive T_C of V_{CEsat}
- Each leg can be easily paralleled to achieve a phase leg of twice the current capability
- RoHS compliant

Absolute maximum ratings

Symbol	*Parameter*		*Max ratings*	*Unit*
V_{CES}	Collector - Emitter Breakdown Voltage		1200	V
I_C	Continuous Collector Current	T_C = 25°C	25	A
		T_C = 80°C	15	
I_{CM}	Pulsed Collector Current	T_C = 25°C	60	
V_{GE}	Gate – Emitter Voltage		±20	V
P_D	Maximum Power Dissipation	T_C = 25°C	140	W
RBSOA	Reverse Bias Safe Operating Area	T_j = 125°C	30A@1150V	

CAUTION: These Devices are sensitive to Electrostatic Discharge. Proper Handing Procedures Should Be Followed. See application note APT0502 on www.microsemi.com

All ratings @ T_j = 25°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} = 1200V	T_j = 25°C			250	µA
			T_j = 125°C			500	
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	V_{GE} =15V I_C = 15A	T_j = 25°C	2.5	3.2	3.7	V
			T_j = 125°C		4.0		
$V_{GE(th)}$	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 V_{CE} = 25V f = 1MHz		1000		pF
C_{oes}	Output Capacitance			150		
C_{res}	Reverse Transfer Capacitance			70		
Q_g	Total gate Charge	V_{GE} = 15V V_{Bus} = 300V I_C =15A		99		nC
Q_{ge}	Gate – Emitter Charge			10		
Q_{gc}	Gate – Collector Charge			70		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C) V_{GE} = 15V V_{Bus} = 400V I_C = 15A R_G = 33Ω		60		ns
T_r	Rise Time			50		
$T_{d(off)}$	Turn-off Delay Time			315		
T_f	Fall Time			30		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (125°C) V_{GE} = 15V V_{Bus} = 400V I_C = 15A R_G = 33Ω		60		ns
T_r	Rise Time			50		
$T_{d(off)}$	Turn-off Delay Time			356		
T_f	Fall Time			40		
E_{on}	Turn-on Switching Energy	V_{GE} = 15V V_{Bus} = 400V I_C = 15A R_G = 33Ω	T_j = 125°C	2		mJ
E_{off}	Turn-off Switching Energy		T_j = 125°C	1		

Reverse diode ratings and characteristics

Symbol	*Characteristic*	*Test Conditions*		*Min*	*Typ*	*Max*	*Unit*
V_{RRM}	Maximum Peak Repetitive Reverse Voltage			1200			V
I_{RM}	Maximum Reverse Leakage Current	V_R=1200V	T_j = 25°C			250	µA
			T_j = 125°C			500	
I_F	DC Forward Current		Tc = 80°C		15		A
V_F	Diode Forward Voltage	I_F = 15A V_{GE} = 0V	T_j = 25°C		2.1		V
			T_j = 125°C		1.9		
t_{rr}	Reverse Recovery Time	I_F = 15A V_R = 600V di/dt =1000A/µs	T_j = 25°C		95		ns
			T_j = 125°C		190		
Q_{rr}	Reverse Recovery Charge		T_j = 25°C		1.5		µC
			T_j = 125°C		3.1		
E_r	Reverse Recovery Energy		T_j = 25°C		0.5		mJ
			T_j = 125°C		1.2		

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

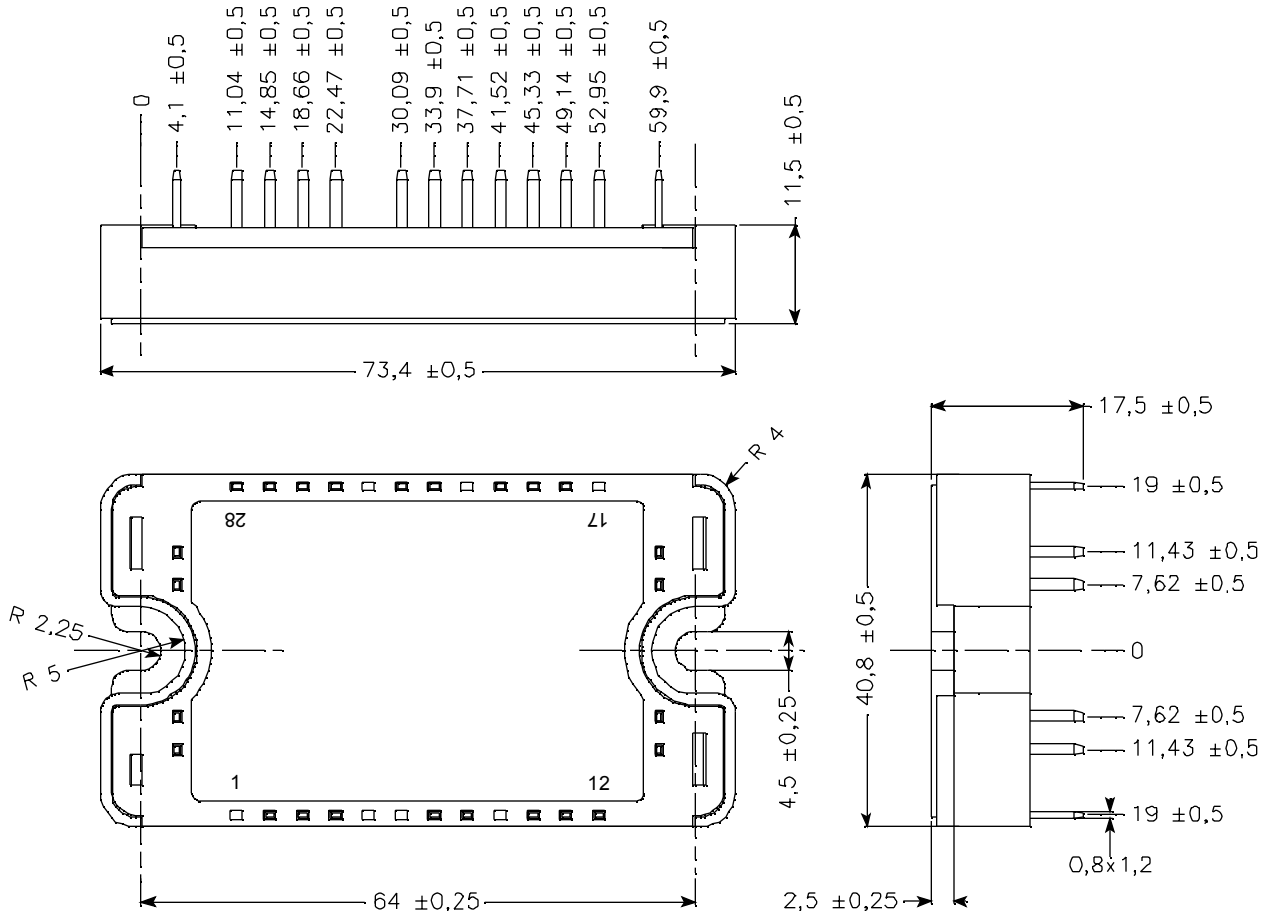
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

T: Thermistor temperature
R_T: Thermistor value at T

Thermal and package characteristics

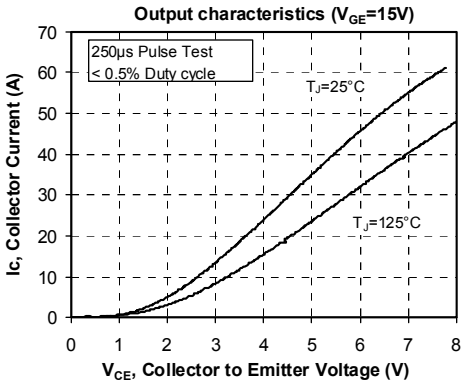
Symbol	Characteristic			Min	Typ	Max	Unit
R_{thJC}	Junction to Case Thermal Resistance		IGBT			0.9	°C/W
			Diode			2.0	
V_{ISOL}	RMS Isolation Voltage, any terminal to case t =1 min, I isol < 1mA, 50/60Hz			2500			V
T_J	Operating junction temperature range			-40		150	°C
T_{STG}	Storage Temperature Range			-40		125	
T_C	Operating Case Temperature			-40		100	
Torque	Mounting torque	To heatsink	M4	2.5		4.7	N.m
Wt	Package Weight					110	g

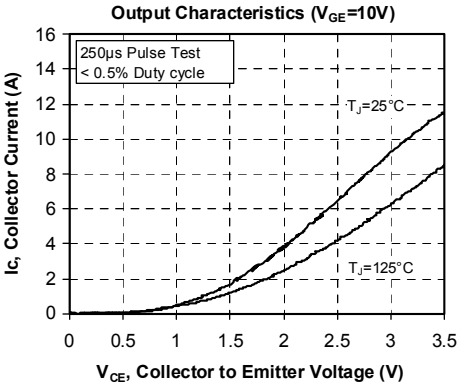
SP3 Package outline (dimensions in mm)

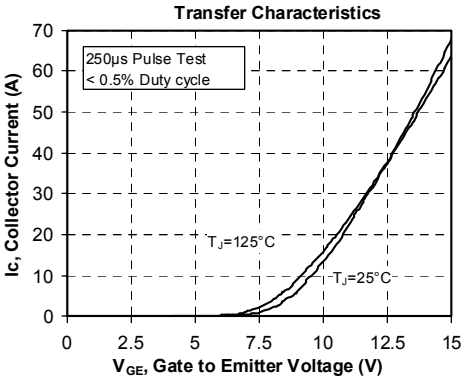


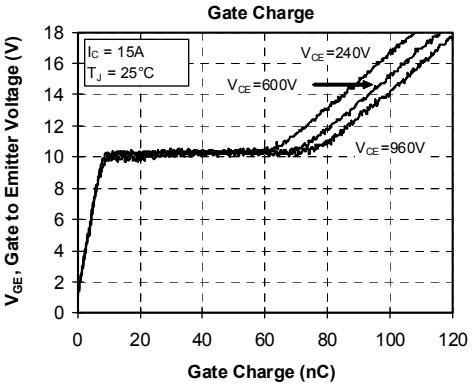
See application note 1901 - Mounting Instructions for SP3 Power Modules on www.microsemi.com

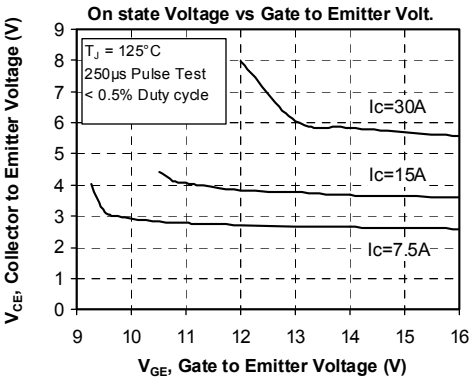
Typical Performance Curve

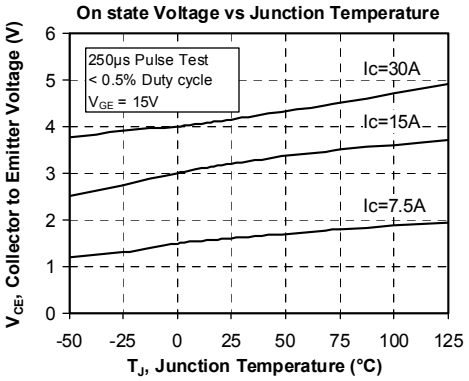


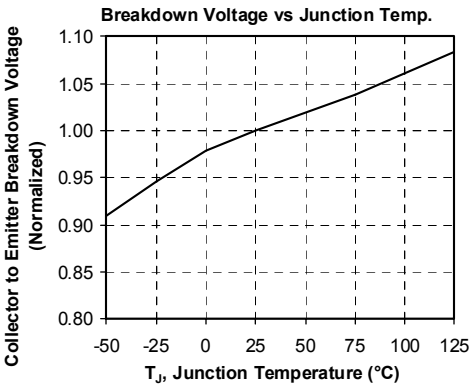


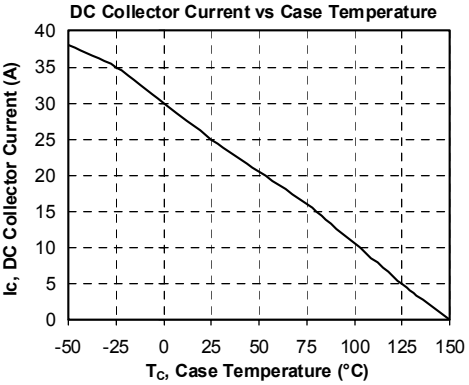




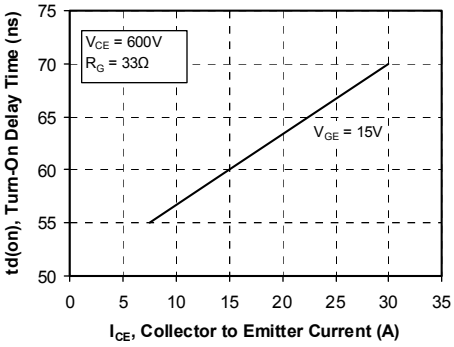




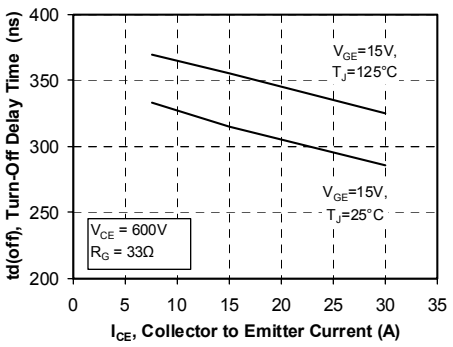




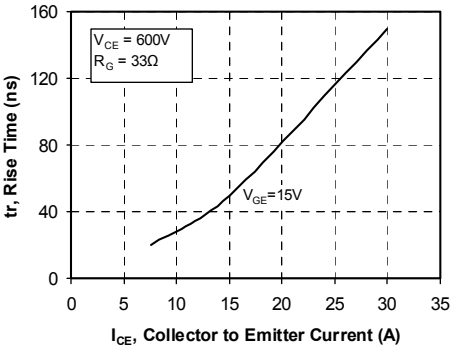
Turn-On Delay Time vs Collector Current



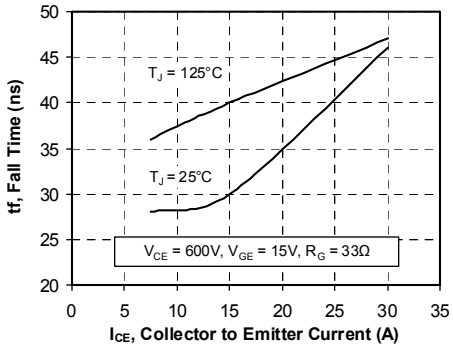
Turn-Off Delay Time vs Collector Current



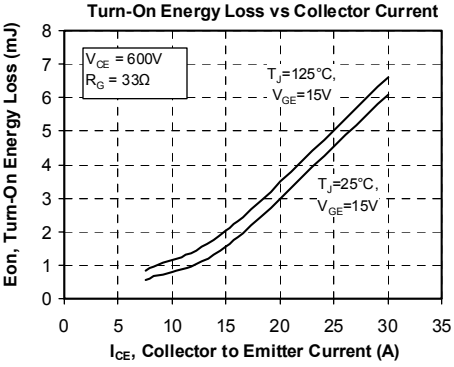
Current Rise Time vs Collector Current



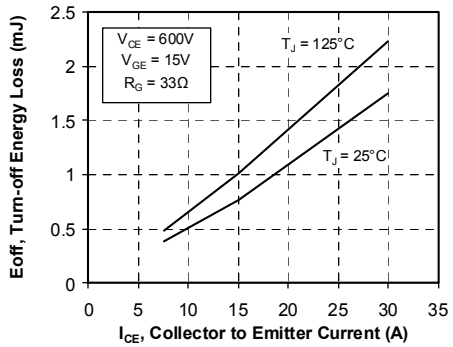
Current Fall Time vs Collector Current



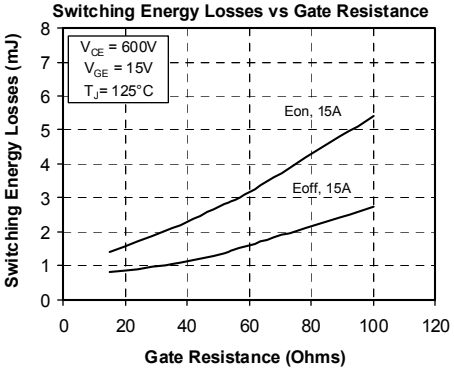
Turn-On Energy Loss vs Collector Current



Turn-Off Energy Loss vs Collector Current



Switching Energy Losses vs Gate Resistance



Reverse Bias Safe Operating Area