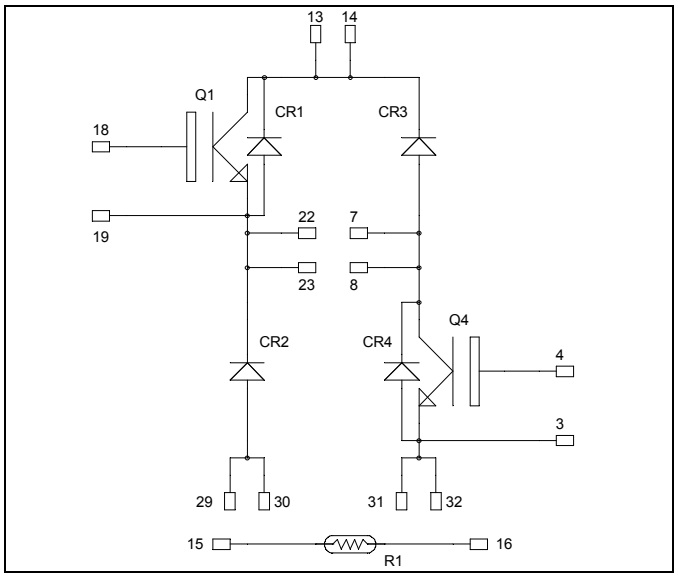
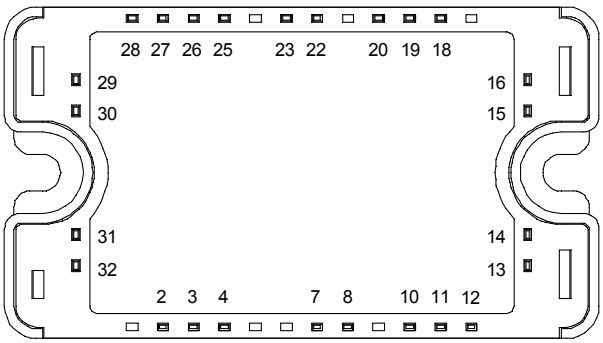
Asymmetrical - Bridge NPT IGBT Power Module

V_{CES} = 600V
I_C = 90A @ 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
- Switched Reluctance Motor Drives

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
  - 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 TC of VCEsat
- 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°C	110	A
		T_c = 80°C	90	
I_{CM}	Pulsed Collector Current	T_c = 25°C	200	
V_{GE}	Gate – Emitter Voltage		±20	V
P_D	Maximum Power Dissipation	T_c = 25°C	416	W
RBSOA	Reverse Bias Safe Operating Area	T_j = 150°C	200A @ 600V	

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°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				250	µA
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	V_{GE} =15V I_C = 100A	T_j = 25°C		2	2.5	V
			T_j = 125°C		2.2		
$V_{GE(th)}$	Gate Threshold Voltage	V_{GE} = V_{CE} , I_C = 1.5mA		4.5	5.5	6.5	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			4.3		nF
C_{res}	Reverse Transfer Capacitance				0.4		
Q_G	Gate charge	V_{GE}= 15V ; V_{CE}=300V I_C=100A			240		nC
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C) V_{GE} = ±15V V_{Bus} = 300V I_C = 100A R_G = 2.2Ω			25		ns
T_r	Rise Time				10		
$T_{d(off)}$	Turn-off Delay Time				130		
T_f	Fall Time				20		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (125°C) V_{GE} = ±15V V_{Bus} = 300V I_C = 100A R_G = 2.2Ω			25		ns
T_r	Rise Time				11		
$T_{d(off)}$	Turn-off Delay Time				150		
T_f	Fall Time				30		
E_{on}	Turn-on Switching Energy	V_{GE} = ±15V V_{Bus} = 300V I_C = 100A R_G = 2.2Ω	T_j = 125°C		1		mJ
E_{off}	Turn-off Switching Energy		T_j = 125°C		3		
I_{sc}	Short Circuit data	V_{GE} ≤15V ; V_{Bus} = 360V t_p ≤ 10µs ; T_j = 125°C			450		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°C			100	µA
			T_j = 125°C			500	
I_F	DC Forward Current		Tc = 80°C		100		A
V_F	Diode Forward Voltage	I_F = 100A			1.6	2	V
		I_F = 200A			2		
		I_F = 100A	T_j = 125°C		1.3		
t_{rr}	Reverse Recovery Time	I_F = 100A V_R = 400V di/dt =200A/µs	T_j = 25°C		160		ns
			T_j = 125°C		220		
Q_{rr}	Reverse Recovery Charge		T_j = 25°C		290		nC
			T_j = 125°C		1530		

CR1 & CR4 are IGBT protection diodes only

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
$\Delta R_{25}/R_{25}$				5		%
$B_{25/85}$	T_{25} = 298.15 K			3952		K
ΔB/B		T_C=100°C		4		%

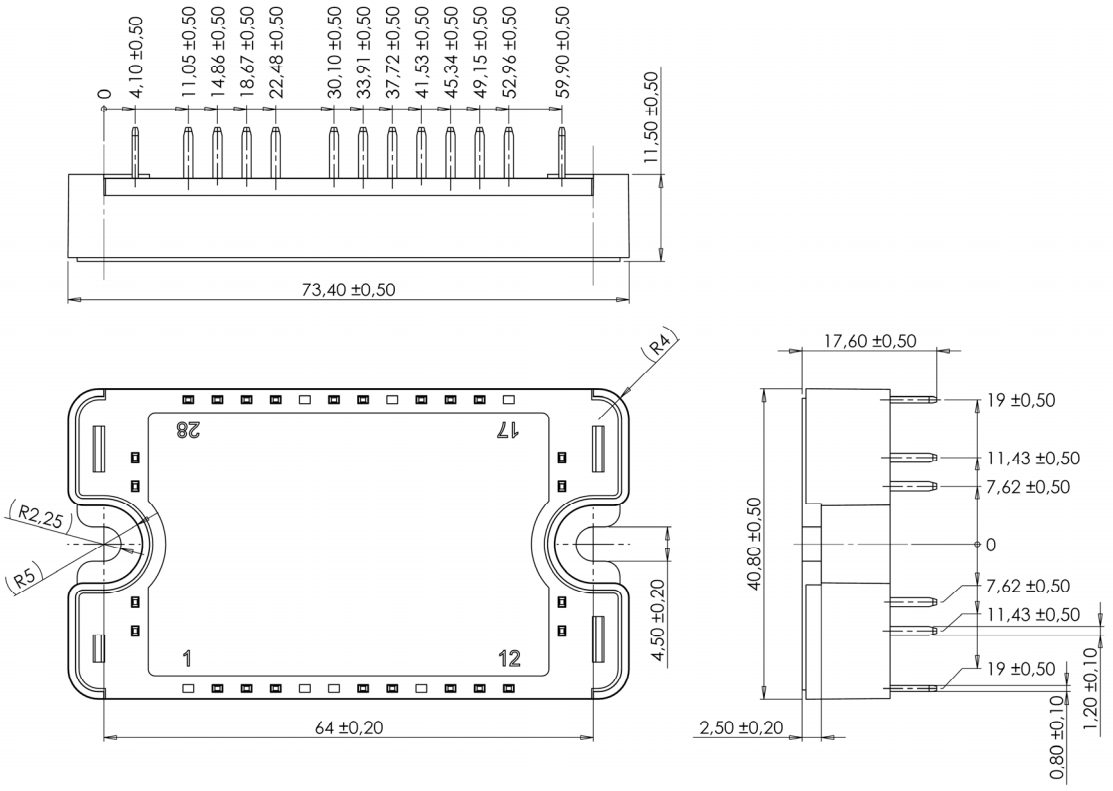
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

T: Thermistor temperature
R_T: Thermistor value at T

Thermal and package characteristics

Symbol	*Characteristic*			*Min*	*Typ*	*Max*	*Unit*
R_{thJC}	Junction to Case Thermal Resistance		IGBT			0.3	°C/W
			Diode			0.55	
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					110	g

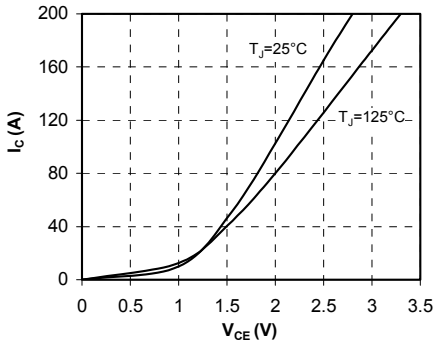
SP3 Package outline (dimensions in mm)



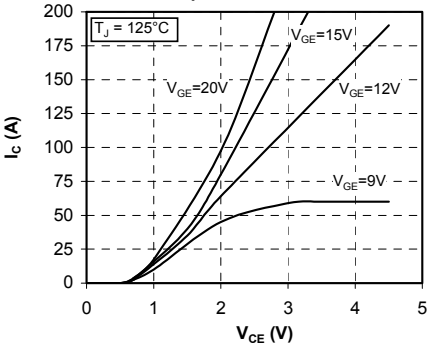
See application note 1901 - Mounting Instructions for SP3 Power Modules on www.microsemi.com

Typical Performance Curve

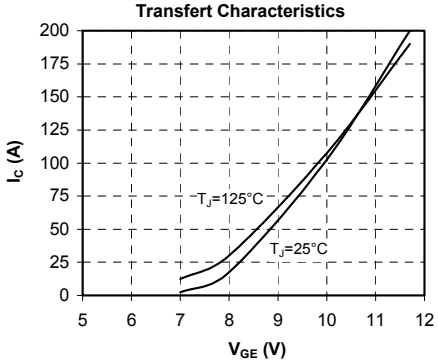
Output Characteristics (V_{GE}=15V)



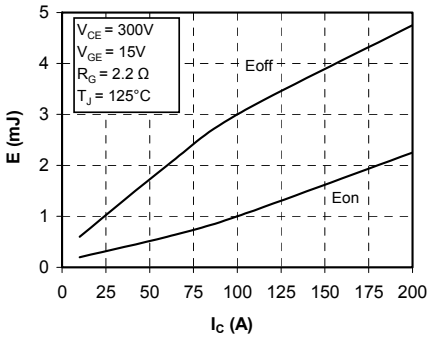
Output Characteristics



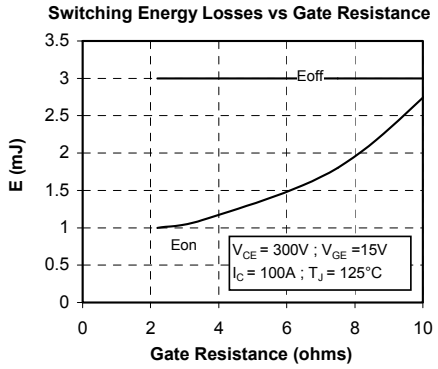
Transfert Characteristics



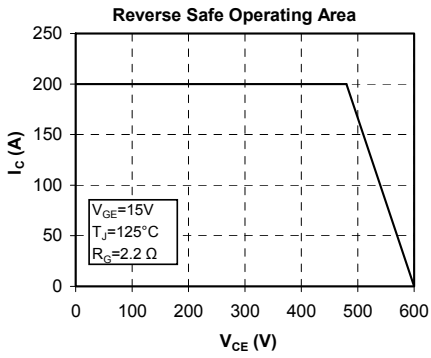
Energy losses vs Collector Current



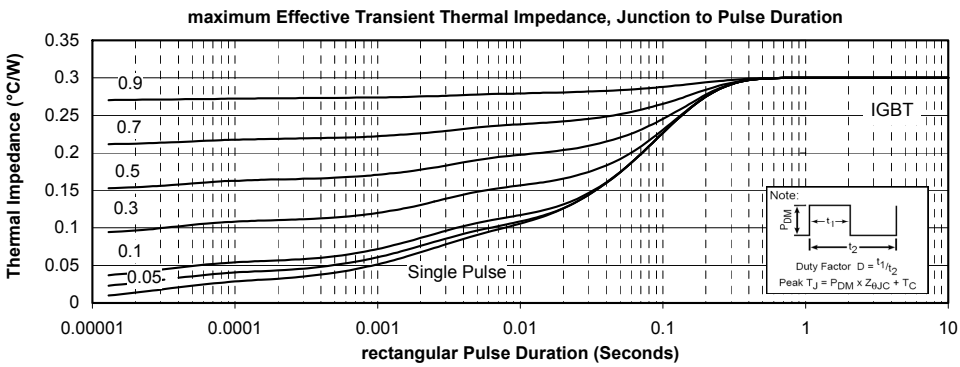
Switching Energy Losses vs Gate Resistance



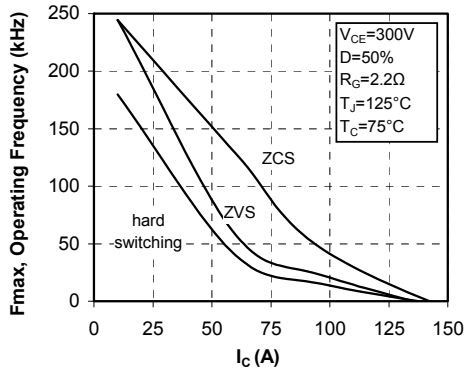
Reverse Safe Operating Area



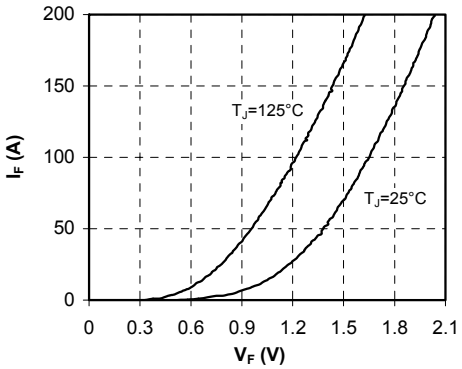
maximum Effective Transient Thermal Impedance, Junction to Pulse Duration



Operating Frequency vs Collector Current



Forward Characteristic of diode



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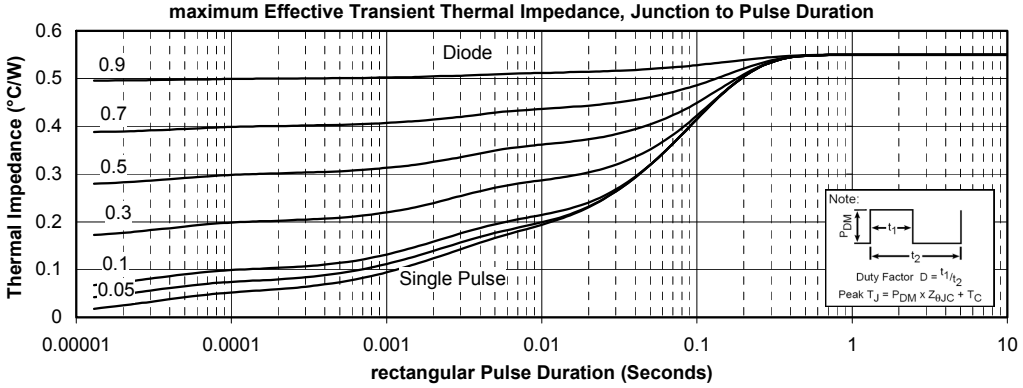

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