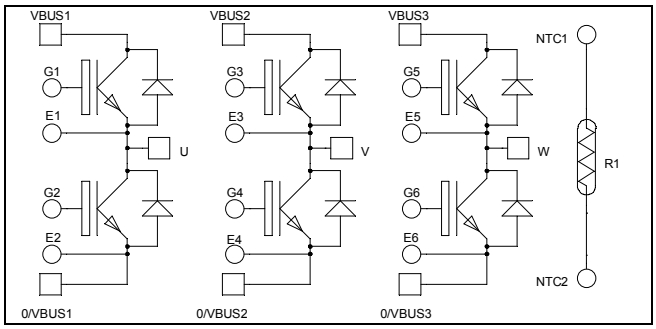
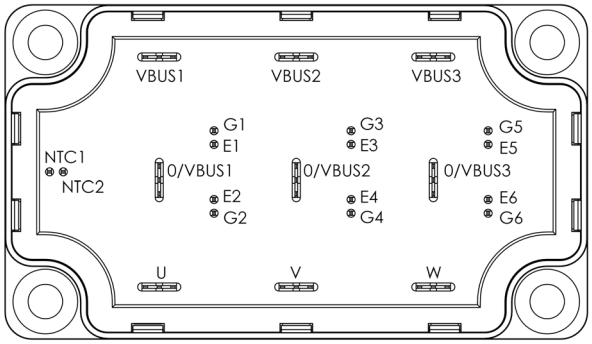
Triple phase leg Trench + Field Stop IGBT4 Power module

V_{CES} = 1200V
I_C = 120A @ Tc = 80°C





Application

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

Features

- Trench + Field Stop IGBT 4 Technology
  - Low voltage drop
  - Low leakage current
  - Low switching losses
  - 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
  - Symmetrical design
  - Lead frames for power connections
- 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		1200	V
I_C	Continuous Collector Current	T_c = 25°C	140	A
		T_c = 80°C	120	
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	517	W
RBSOA	Reverse Bias Safe Operating Area	T_j = 150°C	200A @ 1150V	

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} = 1200V				250	µA
$V_{CE(sat)}$	Collector Emitter saturation Voltage	V_{GE} = 15V I_C = 100A	T_j = 25°C		1.8	2.15	V
			T_j = 150°C		2.15		
$V_{GE(th)}$	Gate Threshold Voltage	V_{GE} = V_{CE} , I_C = 3.4mA		5.2	5.8	6.5	V
I_{GES}	Gate – Emitter Leakage Current	V_{GE} = 20V, V_{CE} = 0V				600	nA

Dynamic Characteristics

Symbol	*Characteristic*	*Test Conditions*		*Min*	*Typ*	*Max*	*Unit*
C_{ies}	Input Capacitance	V_{GE} = 0V V_{CE} = 25V f = 1MHz			6.2		nF
C_{oes}	Output Capacitance				0.4		
C_{res}	Reverse Transfer Capacitance				0.35		
Q_G	Gate charge	V_{GE}= ±15V ; V_{CE}=600V I_C=100A			0.85		µC
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C) V_{GE} = ±15V V_{Bus} = 600V I_C = 100A R_G = 7.5Ω			130		ns
T_r	Rise Time				20		
$T_{d(off)}$	Turn-off Delay Time				300		
T_f	Fall Time				45		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (150°C) V_{GE} = ±15V V_{Bus} = 600V I_C = 100A R_G = 7.5Ω			150		ns
T_r	Rise Time				35		
$T_{d(off)}$	Turn-off Delay Time				350		
T_f	Fall Time				80		
E_{on}	Turn-on Switching Energy	V_{GE} = ±15V V_{Bus} = 600V I_C = 100A R_G = 7.5Ω	T_J = 25°C		5		mJ
			T_J = 150°C		10.5		
E_{off}	Turn-off Switching Energy		T_J = 25°C		5.5		mJ
			T_J = 150°C		9.5		
I_{sc}	Short Circuit data	V_{GE} ≤15V ; V_{Bus} = 900V t_p≤10µs ; T_j = 150°C			400		A

Chopper 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
I_F	DC Forward Current		Tc = 80°C		120		A
V_F	Diode Forward Voltage	I_F = 100A V_{GE} = 0V	T_j = 25°C		1.9	2.4	V
			T_j = 150°C		1.85		
t_{rr}	Reverse Recovery Time	I_F = 100A V_R = 600V di/dt =2400A/µs	T_j = 25°C		155		ns
			T_j = 150°C		300		
Q_{rr}	Reverse Recovery Charge		T_j = 25°C		9.3		µC
			T_j = 150°C		20		
E_{rr}	Reverse Recovery Energy		T_j = 25°C		3.4		mJ
			T_j = 150°C		8		

Thermal and package characteristics

Symbol	Characteristic			Min	Typ	Max	Unit
R_{thJC}	Junction to Case Thermal Resistance		IGBT			0.29	°C/W
			Diode			0.5	
V_{ISOL}	RMS Isolation Voltage, any terminal to case t =1 min, 50/60Hz			4000			V
T_J	Operating junction temperature range			-40		175	°C
T_{STG}	Storage Temperature Range			-40		125	
T_C	Operating Case Temperature			-40		100	
Torque	Mounting torque	To heatsink	M6	3		5	N.m
Wt	Package Weight					250	g

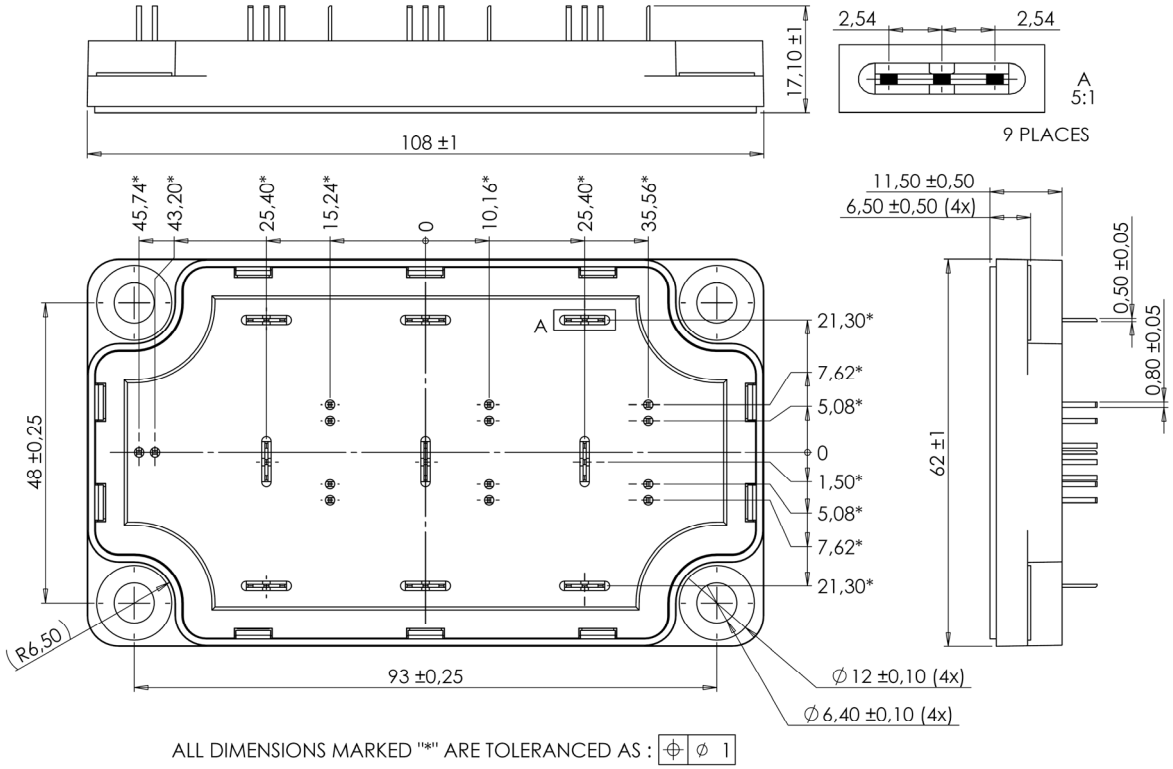
Temperature sensor NTC (see application note APT0406 on www.microsemi.com for more information).

Symbol	Characteristic		Min	Typ	Max	Unit
R_{25}	Resistance @ 25°C			50		kΩ
$\Delta R_{25}/R_{25}$				5		%
$B_{25/85}$	T_{25} = 298.15 K			3952		K
$\Delta B/B$		T_C=100°C		4		%

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

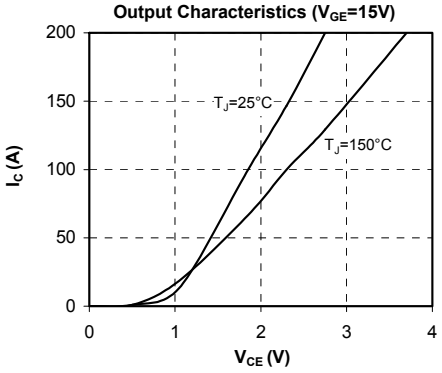
T: Thermistor temperature
R_T: Thermistor value at T

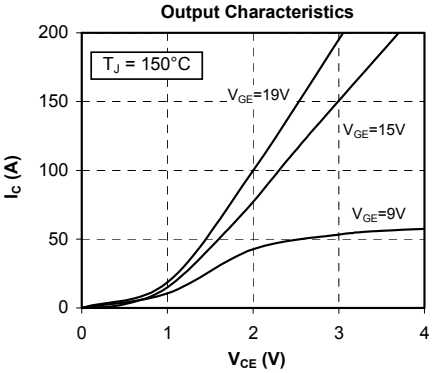
SP6-P Package outline (dimensions in mm)

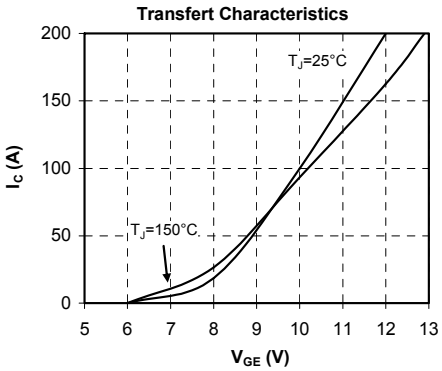


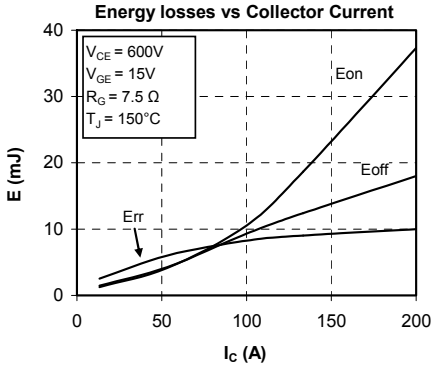
See application note 1902 - Mounting Instructions for SP6-P (12mm) Power Modules on www.microsemi.com

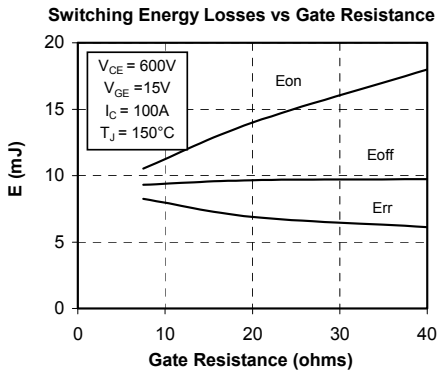
Typical Performance Curve

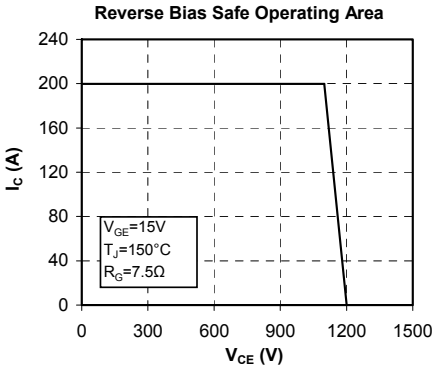


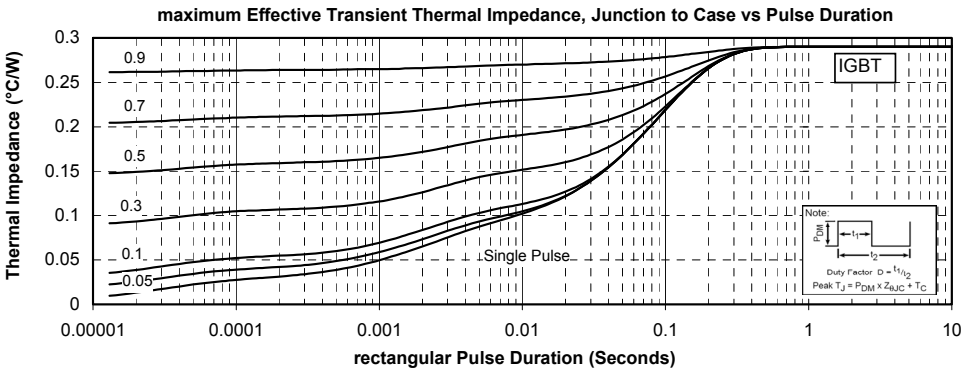




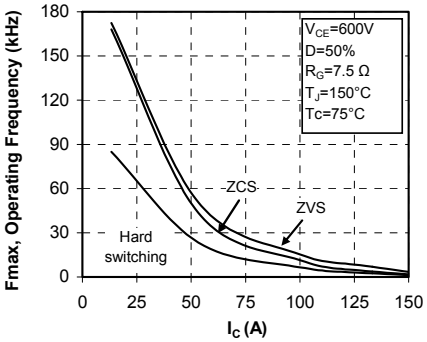




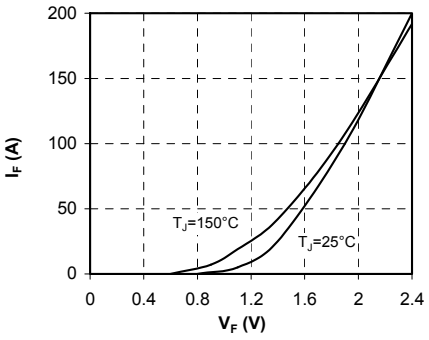




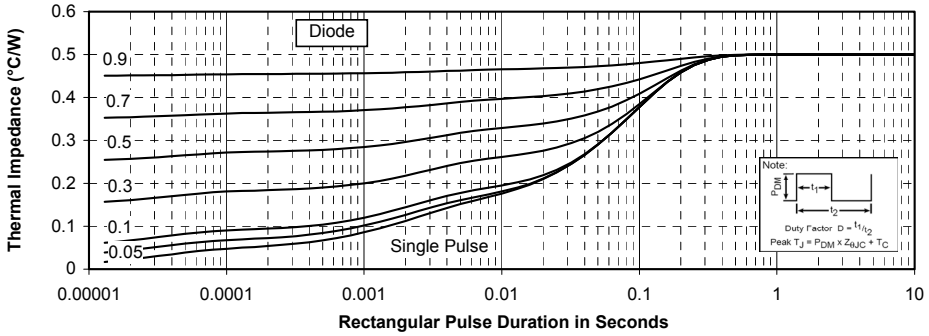
Operating Frequency vs Collector Current



Forward Characteristic of diode



maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration



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