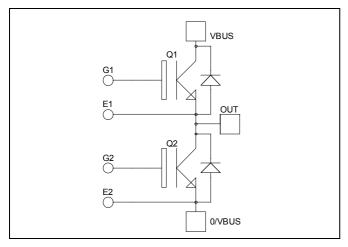


# Phase leg Fast Trench + Field Stop IGBT3 Power Module

$$V_{CES} = 1200V$$
  
 $I_{C} = 400A$  @  $Tc = 80$ °C



#### Application

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

#### **Features**

- Fast Trench + Field Stop IGBT3 Technology
  - Low voltage drop
  - Low tail current
  - Switching frequency up to 20 kHz
  - Soft recovery parallel diodes
  - Low diode VF
  - Low leakage current
  - RBSOA and SCSOA rated
- Kelvin emitter for easy drive
  - Very low stray inductance
    - Symmetrical design
    - M5 power connectors
- High level of integration



- Stable temperature behavior
- Very rugged
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Easy paralleling due to positive TC of VCEsat
- Low profile
- RoHS Compliant

#### Absolute maximum ratings

Symbol	Parameter		Max ratings	Unit
$V_{CES}$	Collector - Emitter Breakdown Voltage		1200	V
T	Continuous Collector Current	$T_C = 25$ °C	560 *	
$I_{C}$	Continuous Conector Current	$T_C = 80$ °C	400	A
$I_{CM}$	Pulsed Collector Current	$T_C = 25$ °C	800	
$ m V_{GE}$	Gate – Emitter Voltage		±20	V
$P_{D}$	Maximum Power Dissipation	$T_C = 25$ °C	1785	W
RBSOA	Reverse Bias Safe Operating Area	$T_j = 125^{\circ}C$	800A @ 1100V	

<sup>\*</sup> Specification of IGBT device but output current must be limited to 500A to not exceed a delta of temperature greater than 100°C for the connectors.

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	$V_{GE} = 0V, V_{CE} = 1200V$				750	μA
V	Collector Emitter Saturation Voltage		$T_j = 25^{\circ}C$	1.4	1.7	2.1	V
$V_{CE(sat)}$			$T_j = 125$ °C		2.0		v
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE} = V_{CE}$ , $I_C = 4 \text{ mA}$		5.0	5.8	6.5	V
$I_{GES}$	Gate – Emitter Leakage Current	$V_{GE} = 20V, V_{CE} = 0V$				600	nA

**Dynamic Characteristics** 

·	Characteristic	Test Conditions	Min	Тур	Max	Unit
Cies	Input Capacitance	$V_{GE} = 0V$		28		
$C_{oes}$	Output Capacitance	$V_{CE} = 25V$		1.6		nF
$C_{res}$	Reverse Transfer Capacitance	f = 1MHz		1.2		
T <sub>d(on)</sub>	Turn-on Delay Time	Inductive Switching (25°C)		260		ns
$T_{r}$	Rise Time	$V_{GE} = \pm 15V$		30		
$T_{d(off)}$	Turn-off Delay Time	$V_{Bus} = 600V$ $I_{C} = 400A$		420		
$T_{\mathrm{f}}$	Fall Time	$R_G = 1.2\Omega$		80		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (125°C)		290		ns
$T_{r}$	Rise Time	$V_{GE} = \pm 15V$		50		
$T_{d(off)}$	Turn-off Delay Time	$V_{Bus} = 600V$ - $I_C = 400A$		520		
$T_{\mathrm{f}}$	Fall Time	$R_G = 1.2\Omega$		100		
Eon	Turn on Energy	$V_{GE} = \pm 15V \ V_{Bus} = 600V$ $T_j = 125^{\circ}C$		40		m I
$E_{\text{off}}$	Turn off Energy	$I_C = 400A$ $R_G = 1.2\Omega$ $T_j = 125^{\circ}C$		40		mJ

Reverse diode ratings and characteristics

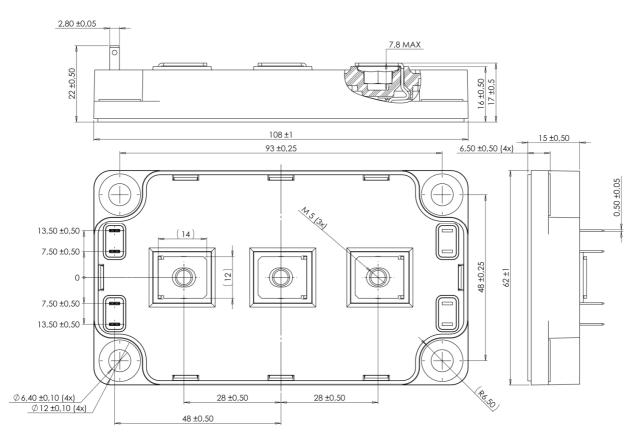
Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
$V_{RRM}$	Maximum Peak Repetitive Reverse Voltage			1200			V
$I_{RM}$	Maximum Reverse Leakage Current	V <sub>R</sub> =1200V	$T_i = 25$ °C $T_i = 125$ °C			700 900	μА
$I_{\mathrm{F}}$	DC Forward Current		$T_c = 80^{\circ}C$		400	700	A
$V_{\rm F}$	Diode Forward Voltage	$I_F = 400A$ $V_{GE} = 0V$	$T_i = 25^{\circ}C$		1.6	2.1	V
<b>v</b> <sub>F</sub>			$T_{i} = 125^{\circ}C$		1.6		V
t <sub>rr</sub>	Reverse Recovery Time		$T_j = 25^{\circ}C$		170		ns
·rr	reverse recovery Time	1 400 4	$T_j = 125$ °C		280		115
0	Q <sub>rr</sub> Reverse Recovery Charge	$\begin{aligned} & I_F = 400A \\ & V_R = 600V \\ & di/dt = 4000A/\mu s \end{aligned}$	$T_j = 25$ °C		36		μС
<b>Q</b> rr			$T_j = 125$ °C		72		μС
Е	Reverse Recovery Energy	J	$T_j = 25^{\circ}C$		20		m I
$E_{r}$			$T_i = 125^{\circ}C$		36		mJ



### Thermal and package characteristics

Symbol	Characteristic			Min	Typ	Max	Unit
$R_{\text{thJC}}$	Linction to Case Thermal Resistance		IGBT			0.07	°C/W
			Diode			0.13	
$V_{ISOL}$	RMS Isolation Voltage, any terminal to case t =1 min, 50/60Hz			4000			V
$T_{\rm J}$	Operating junction temperature range Storage Temperature Range			-40		150	
$T_{STG}$				-40		125	°C
$T_{\rm C}$	Operating Case Temperature			-40		100	
Torque	Mounting torque	To heatsink	M6	3		5	N.m
		For terminals	M5	2		3.5	11.111
Wt	Package Weight					300	g

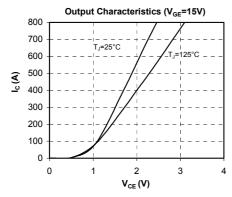
## SP6 Package outline (dimensions in mm)

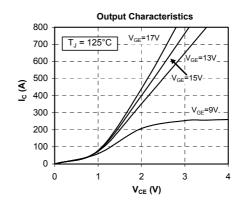


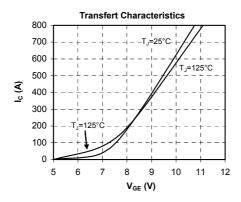
See application note APT0601 - Mounting Instructions for SP6 Power Modules on www.microsemi.com

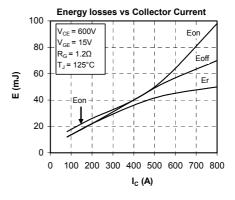


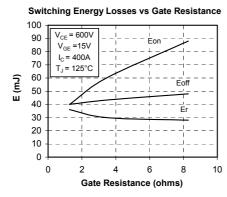
#### **Typical Performance Curve**

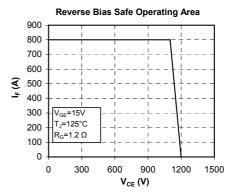


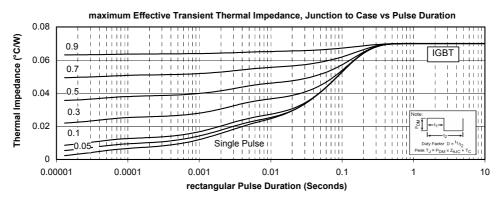




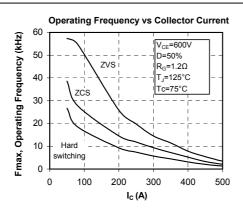


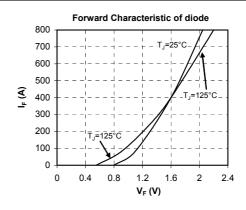


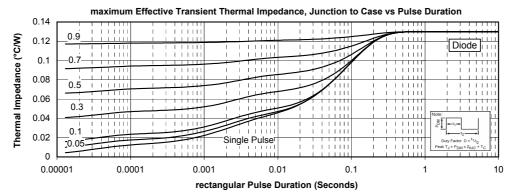














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