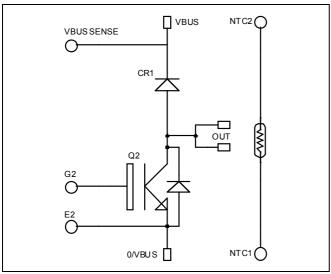


# Boost chopper NPT IGBT Power Module

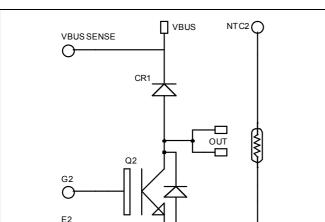


G2 f E2 ft

E2 🛭

G2 4

O/VBUS



 $V_{CES} = 1200V$  $I_C = 150A$  @ Tc = 80°C

#### **Application**

- AC and DC motor control
- Switched Mode Power Supplies
- **Power Factor Correction**

#### **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
  - RBSOA and SCSOA rated
- Kelvin emitter for easy drive
- Very low stray inductance
  - Symmetrical design
  - Lead frames for power connections
- Internal thermistor for temperature monitoring
- High level of integration

#### **Benefits**

- Outstanding performance at high frequency operation
- Stable temperature behavior
- Very rugged
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Solderable terminals both for power and signal for easy PCB mounting
- Easy paralleling due to positive  $T_C$  of  $V_{CEsat}$
- Low profile
- RoHS compliant

### Absolute maximum ratings

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Symbol	Parameter		Max ratings	Unit
$V_{CES}$	Collector - Emitter Breakdown Voltage		1200	V
Ţ	Continuous Collector Current	$T_c = 25^{\circ}C$	200	
$I_{C}$	Continuous Conector Current	$T_c = 80^{\circ}C$	150	A
$I_{CM}$	Pulsed Collector Current	$T_c = 25^{\circ}C$	300	
$V_{GE}$	Gate – Emitter Voltage		±20	V
$P_{D}$	Maximum Power Dissipation	$T_c = 25^{\circ}C$	961	W
RBSOA	Reverse Bias Safe Operating Area	$T_j = 150^{\circ}C$	300A @ 1200V	

OUT

NTC2 #

NTC1 (

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
T	Zero Gate Voltage Collector Current	$V_{GE} = 0V$	$T_j = 25$ °C			350	^
$I_{CES}$	Zero Gate Voltage Collector Current	$V_{CE} = 1200V$	$T_j = 125$ °C			600	μΑ
17	Collector Emitter saturation Voltage	$V_{GE} = 15V$	$T_j = 25$ °C		3.2	3.7	V
V <sub>CE(sat)</sub>	Conector Emitter saturation voltage	$I_{\rm C} = 150 A$	$T_j = 125$ °C		3.9		·
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE} = V_{CE}$ , $I_C = 5 \text{ mA}$		4.5		6.5	V
$I_{GES}$	Gate – Emitter Leakage Current	$V_{GE} = \pm 20V, V_{CE} = 0V$				±500	nA

**Dynamic Characteristics** 

Symbol	Characteristic	Test Condition	Min	Тур	Max	Unit	
Cies	Input Capacitance	$V_{GE} = 0V$ $V_{CE} = 25V$			10.2		
$C_{oes}$	Output Capacitance				1.4		nF
$C_{res}$	Reverse Transfer Capacitance	f = 1MHz		0.75			
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C)			120		
$T_{r}$	Rise Time	$V_{GE} = 15V$			50		ns
$T_{d(off)}$	Turn-off Delay Time	$V_{Bus} = 600V$ $I_{C} = 150A$			310		
$T_{\mathrm{f}}$	Fall Time	$R_G = 5.6\Omega$		20			
$T_{d(on)}$	Turn-on Delay Time	Inductive Swit	ching (125°C)		130		
$T_{r}$	Rise Time	$V_{GE} = 15V$			60		
$T_{d(off)}$	Turn-off Delay Time	$V_{\text{Bus}} = 600V$ $I_{\text{C}} = 150A$			360		ns
$T_{\mathrm{f}}$	Fall Time	$R_G = 5.6\Omega$			30		
Eon	Turn-on Switching Energy	$V_{GE} = 15V$ $V_{Bus} = 600V$	$T_j = 125$ °C		18		T
$E_{\text{off}}$	Turn-off Switching Energy	$I_C = 150A$ $R_G = 5.6\Omega$	$T_j = 125$ °C		8		mJ

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 <sub>R</sub> =1200V	$T_j = 25$ °C			350	^
1 <sub>RM</sub>		V <sub>R</sub> -1200 V	$T_j = 125$ °C			600	μΑ
$I_{\mathrm{F}}$	DC Forward Current		$Tc = 70^{\circ}C$		200		Α
		$I_F = 200A$			2	2.5	
$V_{\rm F}$	Diode Forward Voltage	$I_F = 400A$			2.3		V
		$I_F = 200A$	$T_{j} = 125^{\circ}C$		1.8		
+	$t_{rr}$ Reverse Recovery Time $I_F = 200A$ $V_D = 800V$	$T_j = 25$ °C		420		ng	
ι <sub>rr</sub>		$I_F = 200A$ $V_R = 800V$	$T_j = 125$ °C		520		ns
Qrr	Reverse Recovery Charge	$di/dt = 400A/\mu s$ $T_j$	$T_j = 25$ °C		2.5		μС
			$T_{j} = 125^{\circ}C$		10.7		μС



 $Temperature\ sensor\ NTC\ (\text{see application note APT0406 on www.microsemi.com for more information}).$ 

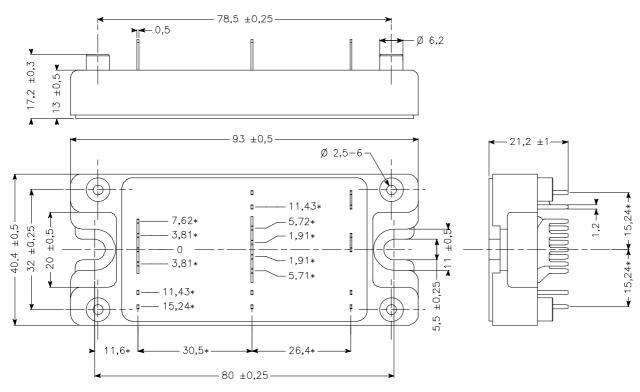
Symbol	Characteristic	Min	Тур	Max	Unit
R <sub>25</sub>	Resistance @ 25°C		50		kΩ
B 25/85	$T_{25} = 298.15 \text{ K}$		3952		K

$$R_{T} = \frac{R_{25}}{\exp \left[ B_{25/85} \left( \frac{1}{T_{75}} - \frac{1}{T} \right) \right]} \quad \text{T: Thermistor temperature}$$
 
$$R_{T}: \text{ Thermistor value at T}$$

Thermal and package characteristics

Symbol	Characteristic			Min	Typ	Max	Unit
$R_{thJC}$	Junction to Case Thermal Resistance		IGBT			0.13	°C/W
KthJC			Diode			0.32	C/ VV
$V_{ISOL}$	RMS Isolation Voltage, any terminal to case t =1 min, 50/60Hz		4000			V	
$T_{J}$	Operating junction temperature range		-40		150		
$T_{STG}$	Storage Temperature Range		-40		125	°C	
$T_{\rm C}$	Operating Case Temperature			-40		100	
Torque	Mounting torque	To heatsink	M5	2.5		4.7	N.m
Wt	Package Weight		•			160	g

### SP4 Package outline (dimensions in mm)

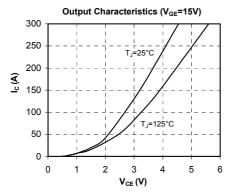


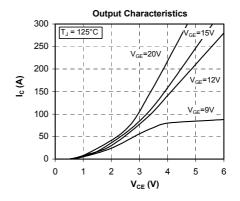
ALL DIMENSIONS MARKED " \* " ARE TOLERENCED AS : + 01

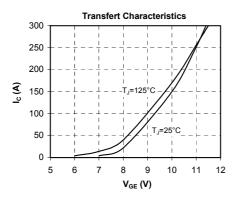
See application note APT0501 - Mounting Instructions for SP4 Power Modules on www.microsemi.com

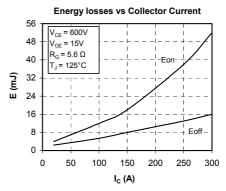


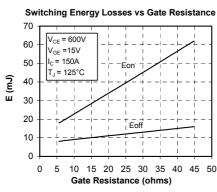
### **Typical Performance Curve**

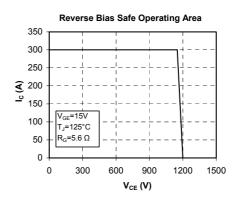


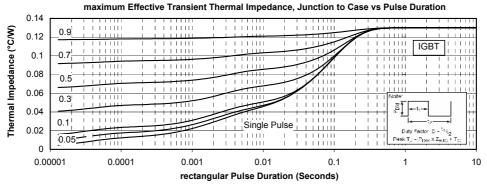




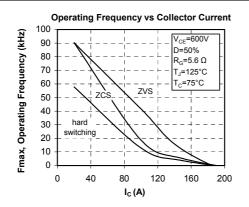


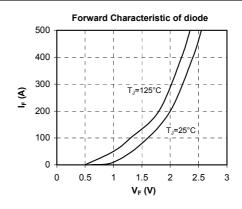


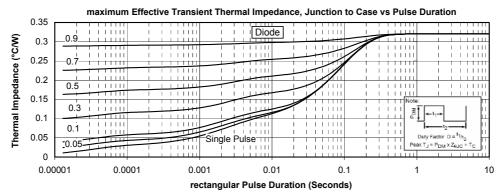














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