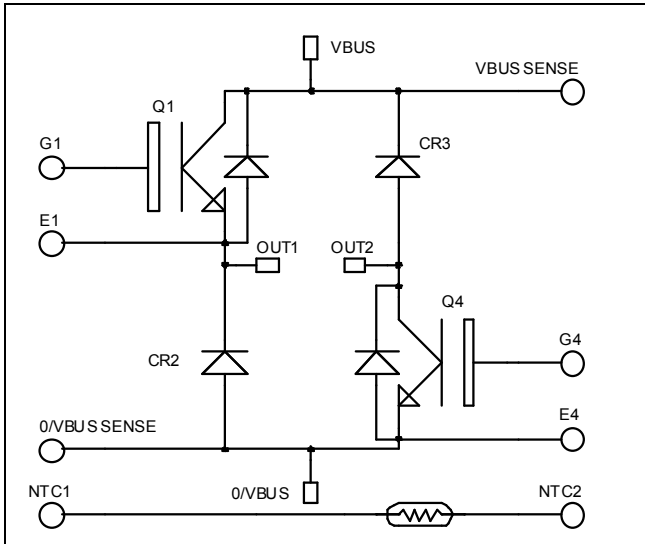


**Asymmetrical - Bridge  
Trench + Field Stop IGBT3  
Power Module**

**$V_{CES} = 600V$   
 $I_C = 150A @ T_c = 80^\circ C$**

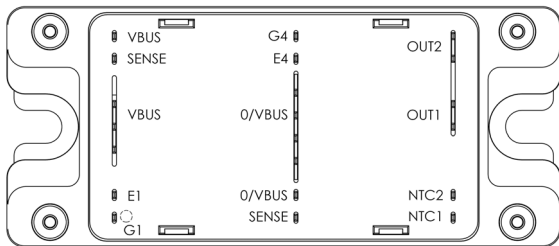


### Application

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

### Features

- 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
  - Lead frames for power connections
- Internal thermistor for temperature monitoring
- High level of integration



### Benefits

- Stable temperature behavior
- Very rugged
- Solderable terminals for easy PCB mounting
- 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	600	V
$I_C$	Continuous Collector Current	$T_c = 25^\circ C$	225
		$T_c = 80^\circ C$	150
$I_{CM}$	Pulsed Collector Current	$T_c = 25^\circ C$	350
$V_{GE}$	Gate - Emitter Voltage	$\pm 20$	V
$P_D$	Maximum Power Dissipation	$T_c = 25^\circ C$	480
RBSOA	Reverse Bias Safe Operating Area	$T_j = 150^\circ C$	300A @ 550V

**CAUTION:** These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed. See application note APT0502 on [www.microsemi.com](http://www.microsemi.com)

All ratings @  $T_j = 25^\circ\text{C}$  unless otherwise specified

**Electrical Characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$I_{CES}$	Zero Gate Voltage Collector Current	$V_{GE} = 0\text{V}$ , $V_{CE} = 600\text{V}$			250	$\mu\text{A}$
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	$V_{GE} = 15\text{V}$ $I_C = 150\text{A}$		1.5 1.7	1.9	V
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE} = V_{CE}$ , $I_C = 1.5\text{ mA}$	5.0	5.8	6.5	V
$I_{GES}$	Gate – Emitter Leakage Current	$V_{GE} = 20\text{V}$ , $V_{CE} = 0\text{V}$			400	nA

**Dynamic Characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$C_{ies}$	Input Capacitance	$V_{GE} = 0\text{V}$		9200		pF
$C_{oes}$	Output Capacitance	$V_{CE} = 25\text{V}$		580		
$C_{res}$	Reverse Transfer Capacitance	$f = 1\text{MHz}$		270		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching ( $25^\circ\text{C}$ )		115		ns
$T_r$	Rise Time	$V_{GE} = \pm 15\text{V}$		45		
$T_{d(off)}$	Turn-off Delay Time	$V_{Bus} = 300\text{V}$ $I_C = 150\text{A}$		225		
$T_f$	Fall Time	$R_G = 3.3\Omega$		55		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching ( $150^\circ\text{C}$ )		130		ns
$T_r$	Rise Time	$V_{GE} = \pm 15\text{V}$		50		
$T_{d(off)}$	Turn-off Delay Time	$V_{Bus} = 300\text{V}$ $I_C = 150\text{A}$		300		
$T_f$	Fall Time	$R_G = 3.3\Omega$		70		
$E_{on}$	Turn on Energy	$V_{GE} = \pm 15\text{V}$ $V_{Bus} = 300\text{V}$ $I_C = 150\text{A}$	$T_j = 25^\circ\text{C}$	0.85		mJ
			$T_j = 150^\circ\text{C}$	1.5		
$E_{off}$	Turn off Energy	$R_G = 3.3\Omega$	$T_j = 25^\circ\text{C}$	4.1		mJ
			$T_j = 150^\circ\text{C}$	5.3		

**Reverse diode ratings and characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$V_{RRM}$	Maximum Peak Repetitive Reverse Voltage		600			V
$I_{RM}$	Maximum Reverse Leakage Current	$V_R = 600\text{V}$			250 500	$\mu\text{A}$
$I_F$	DC Forward Current			150		A
$V_F$	Diode Forward Voltage	$I_F = 150\text{A}$ $V_{GE} = 0\text{V}$	$T_j = 25^\circ\text{C}$ $T_j = 150^\circ\text{C}$	1.6 1.5	2	V
$t_{rr}$	Reverse Recovery Time		$T_j = 25^\circ\text{C}$ $T_j = 150^\circ\text{C}$	130 225		ns
$Q_{rr}$	Reverse Recovery Charge	$I_F = 150\text{A}$ $V_R = 300\text{V}$ $di/dt = 3000\text{A}/\mu\text{s}$	$T_j = 25^\circ\text{C}$ $T_j = 150^\circ\text{C}$	6.9 14.5		$\mu\text{C}$
$E_r$	Reverse Recovery Energy		$T_j = 25^\circ\text{C}$ $T_j = 150^\circ\text{C}$	1.6 3.5		mJ

**Temperature sensor NTC** (see application note APT0406 on [www.microsemi.com](http://www.microsemi.com) for more information).

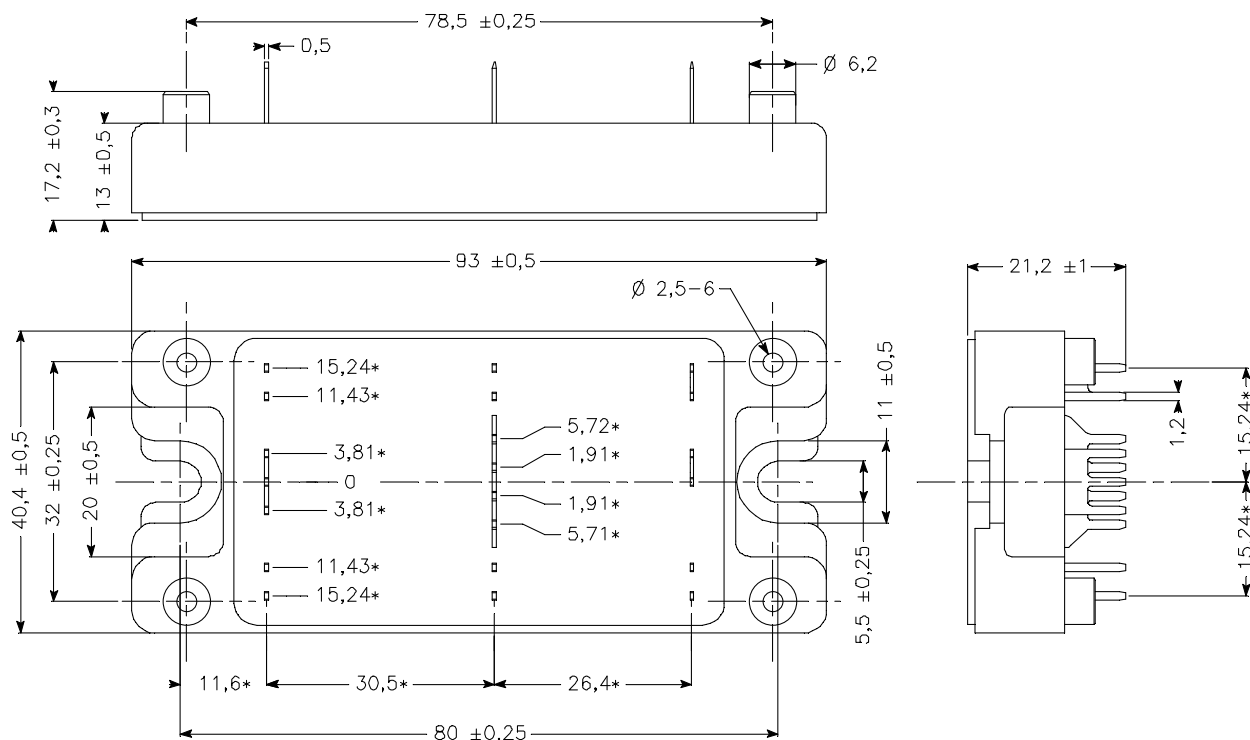
Symbol	Characteristic	Min	Typ	Max	Unit
R <sub>25</sub>	Resistance @ 25°C		50		kΩ
B <sub>25/85</sub>	T <sub>25</sub> = 298.15 K		3952		K

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

T: Thermistor temperature  
R<sub>T</sub>: Thermistor value at T

**Thermal and package characteristics**

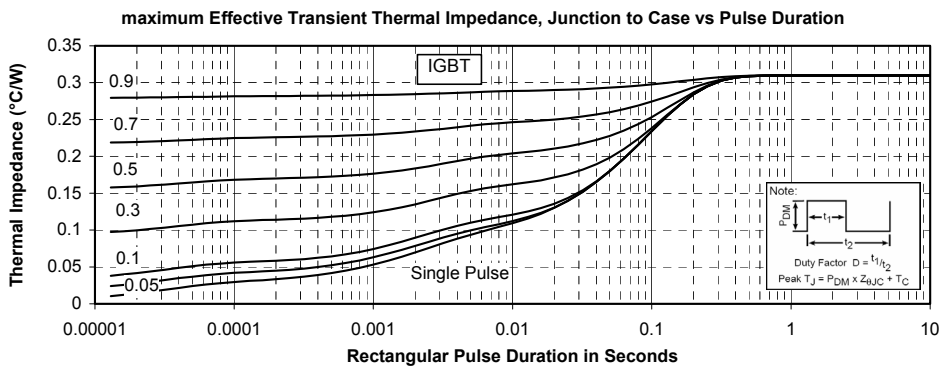
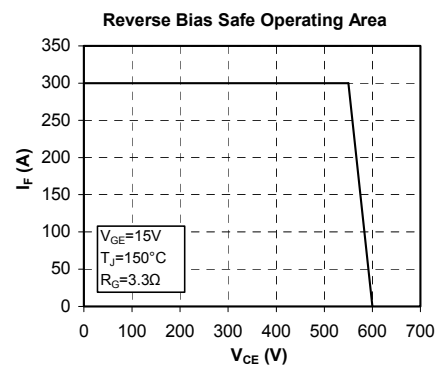
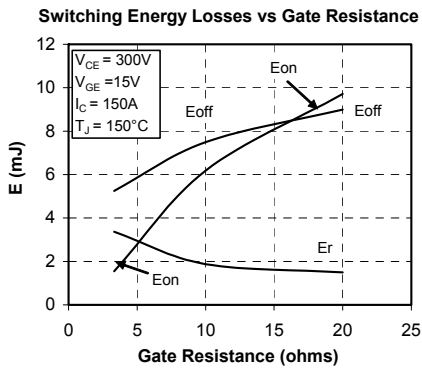
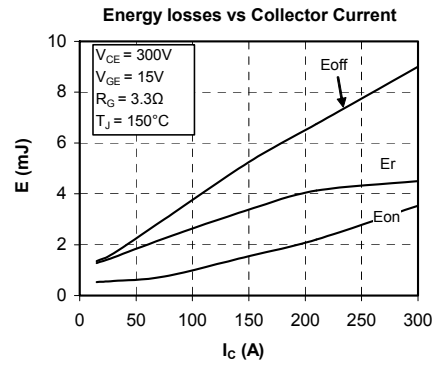
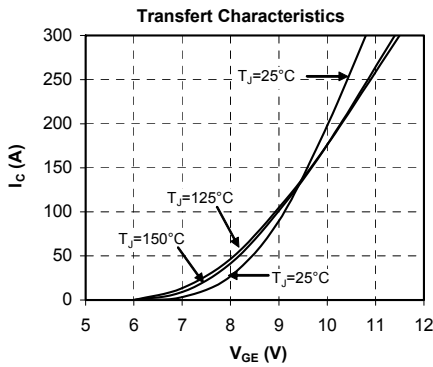
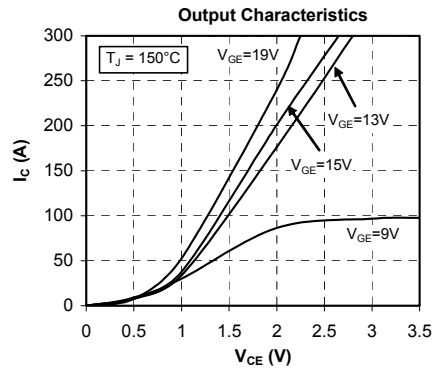
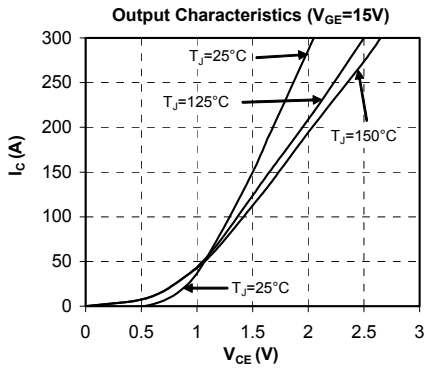
Symbol	Characteristic	Min	Typ	Max	Unit		
R <sub>thJC</sub>	Junction to Case Thermal Resistance	IGBT		0.31	°C/W		
		Diode		0.52			
V <sub>ISOL</sub>	RMS Isolation Voltage, any terminal to case t = 1 min, 50/60Hz	4000			V		
T <sub>J</sub>	Operating junction temperature range	-40		175	°C		
T <sub>STG</sub>	Storage Temperature Range	-40		125			
T <sub>C</sub>	Operating Case Temperature	-40		100			
Torque	Mounting torque		To Heatsink	M5	2.5	4.7	N.m
Wt	Package Weight					160	g

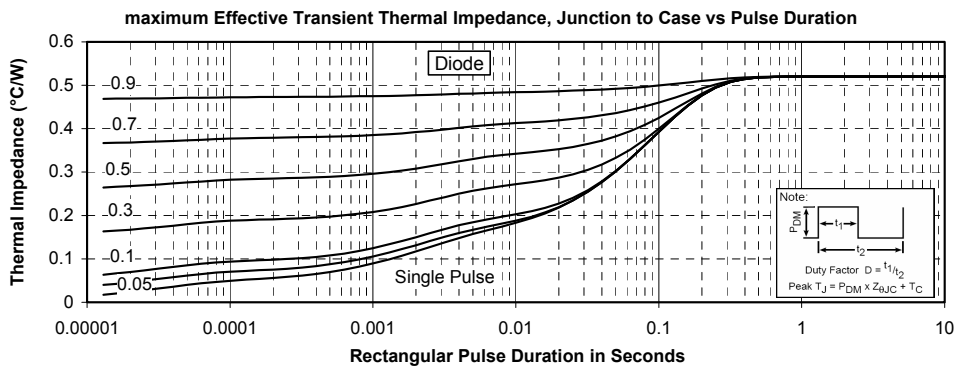
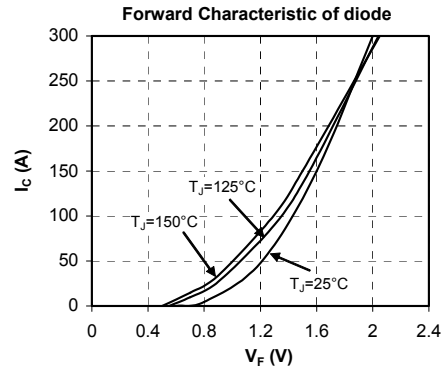
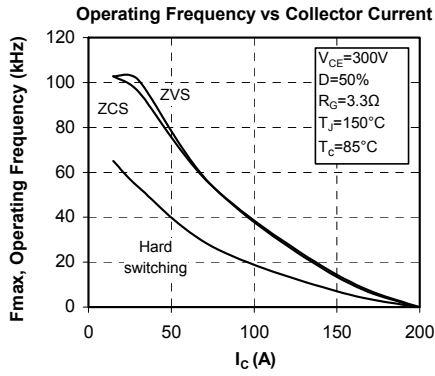
**SP4 Package outline (dimensions in mm)**


ALL DIMENSIONS MARKED "\*" ARE TOLERANCED AS :  $\text{⌀} \pm 0.1$

See application note APT0501 - Mounting Instructions for SP4 Power Modules on [www.microsemi.com](http://www.microsemi.com)

## Typical Performance Curve





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