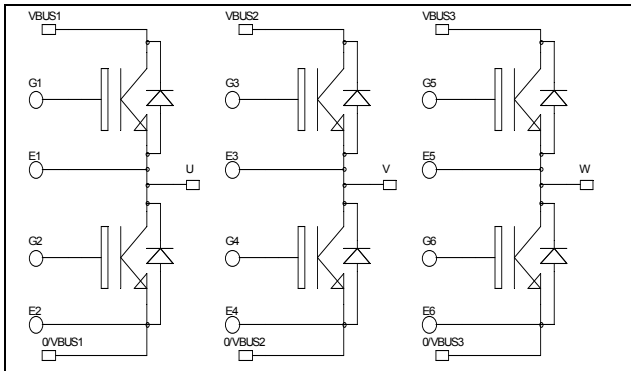


**Triple phase leg  
Trench + Field Stop IGBT3  
Power Module**

**$V_{CES} = 600V$   
 $I_C = 50A @ T_c = 80^\circ C$**



### Application

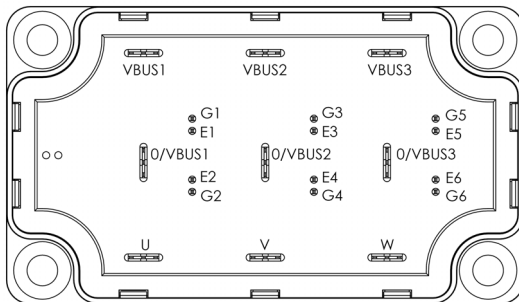
- Welding converters
- Switched Mode Power Supplies
- Uninterruptible Power Supplies
- Motor control

### 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
- 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
- Very low (12mm) profile
- Each leg can be easily paralleled to achieve a phase leg of three times the current capability
- Module can be configured as a three phase bridge
- Module can be configured as a boost followed by a full bridge
- RoHS Compliant



### Absolute maximum ratings

Symbol	Parameter	Max ratings	Unit
$V_{CES}$	Collector - Emitter Breakdown Voltage	600	V
$I_C$	Continuous Collector Current	$T_c = 25^\circ C$	80
		$T_c = 80^\circ C$	50
$I_{CM}$	Pulsed Collector Current	$T_c = 25^\circ C$	100
$V_{GE}$	Gate - Emitter Voltage	$\pm 20$	V
$P_D$	Maximum Power Dissipation	$T_c = 25^\circ C$	176
RBSOA	Reverse Bias Safe Operating Area	$T_J = 150^\circ C$	100A @ 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**

<i>Symbol</i>	<i>Characteristic</i>	<i>Test Conditions</i>	<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>
$I_{CES}$	Zero Gate Voltage Collector Current	$V_{GE} = 0V, V_{CE} = 600V$			250	$\mu\text{A}$
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	$V_{GE} = 15V$ $I_C = 50A$	$T_j = 25^\circ\text{C}$	1.5	1.9	V
			$T_j = 150^\circ\text{C}$	1.7		
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE} = V_{CE}, I_C = 600\mu\text{A}$		5.0	5.8	V
$I_{GES}$	Gate – Emitter Leakage Current	$V_{GE} = 20V, V_{CE} = 0V$			600	nA

**Dynamic Characteristics**

<i>Symbol</i>	<i>Characteristic</i>	<i>Test Conditions</i>	<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>
$C_{ies}$	Input Capacitance	$V_{GE} = 0V$		3150		pF
$C_{oes}$	Output Capacitance	$V_{CE} = 25V$		200		
$C_{res}$	Reverse Transfer Capacitance	$f = 1\text{MHz}$		95		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching ( $25^\circ\text{C}$ )		110		ns
$T_r$	Rise Time	$V_{GE} = \pm 15V$ $V_{Bus} = 300V$		45		
$T_{d(off)}$	Turn-off Delay Time	$I_C = 50A$		200		
$T_f$	Fall Time	$R_G = 8.2\Omega$		40		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching ( $150^\circ\text{C}$ )		120		ns
$T_r$	Rise Time	$V_{GE} = \pm 15V$ $V_{Bus} = 300V$		50		
$T_{d(off)}$	Turn-off Delay Time	$I_C = 50A$		250		
$T_f$	Fall Time	$R_G = 8.2\Omega$		60		
$E_{on}$	Turn-on Switching Energy	$V_{GE} = \pm 15V$ $V_{Bus} = 300V$ $I_C = 50A$	$T_j = 25^\circ\text{C}$	0.3		mJ
			$T_j = 150^\circ\text{C}$	0.43		
$E_{off}$	Turn-off Switching Energy	$R_G = 8.2\Omega$	$T_j = 25^\circ\text{C}$	1.35		mJ
			$T_j = 150^\circ\text{C}$	1.75		

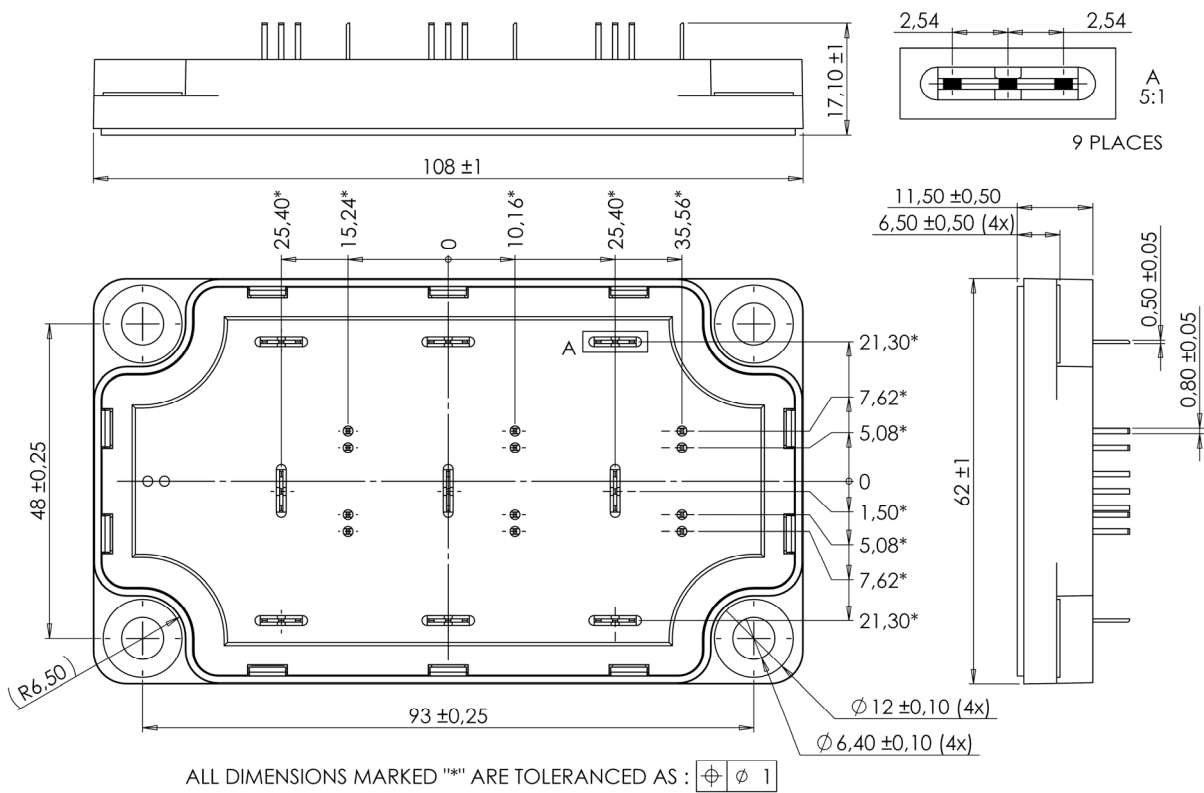
**Reverse diode ratings and characteristics**

<i>Symbol</i>	<i>Characteristic</i>	<i>Test Conditions</i>	<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>
$V_{RRM}$	Maximum Peak Repetitive Reverse Voltage		600			V
$I_{RM}$	Maximum Reverse Leakage Current	$V_R = 600V$			250	$\mu\text{A}$
			$T_j = 25^\circ\text{C}$		500	
$I_F$	DC Forward Current			50		A
$V_F$	Diode Forward Voltage	$I_F = 50A$ $V_{GE} = 0V$	$T_j = 25^\circ\text{C}$	1.6	2	V
			$T_j = 150^\circ\text{C}$	1.5		
$t_{rr}$	Reverse Recovery Time		$T_j = 25^\circ\text{C}$	100		ns
			$T_j = 150^\circ\text{C}$	150		
$Q_{rr}$	Reverse Recovery Charge	$I_F = 50A$ $V_R = 300V$ $di/dt = 1800A/\mu\text{s}$	$T_j = 25^\circ\text{C}$	2.6		$\mu\text{C}$
			$T_j = 150^\circ\text{C}$	5.4		
$E_r$	Reverse Recovery Energy		$T_j = 25^\circ\text{C}$	0.6		mJ
			$T_j = 150^\circ\text{C}$	1.2		

## Thermal and package characteristics

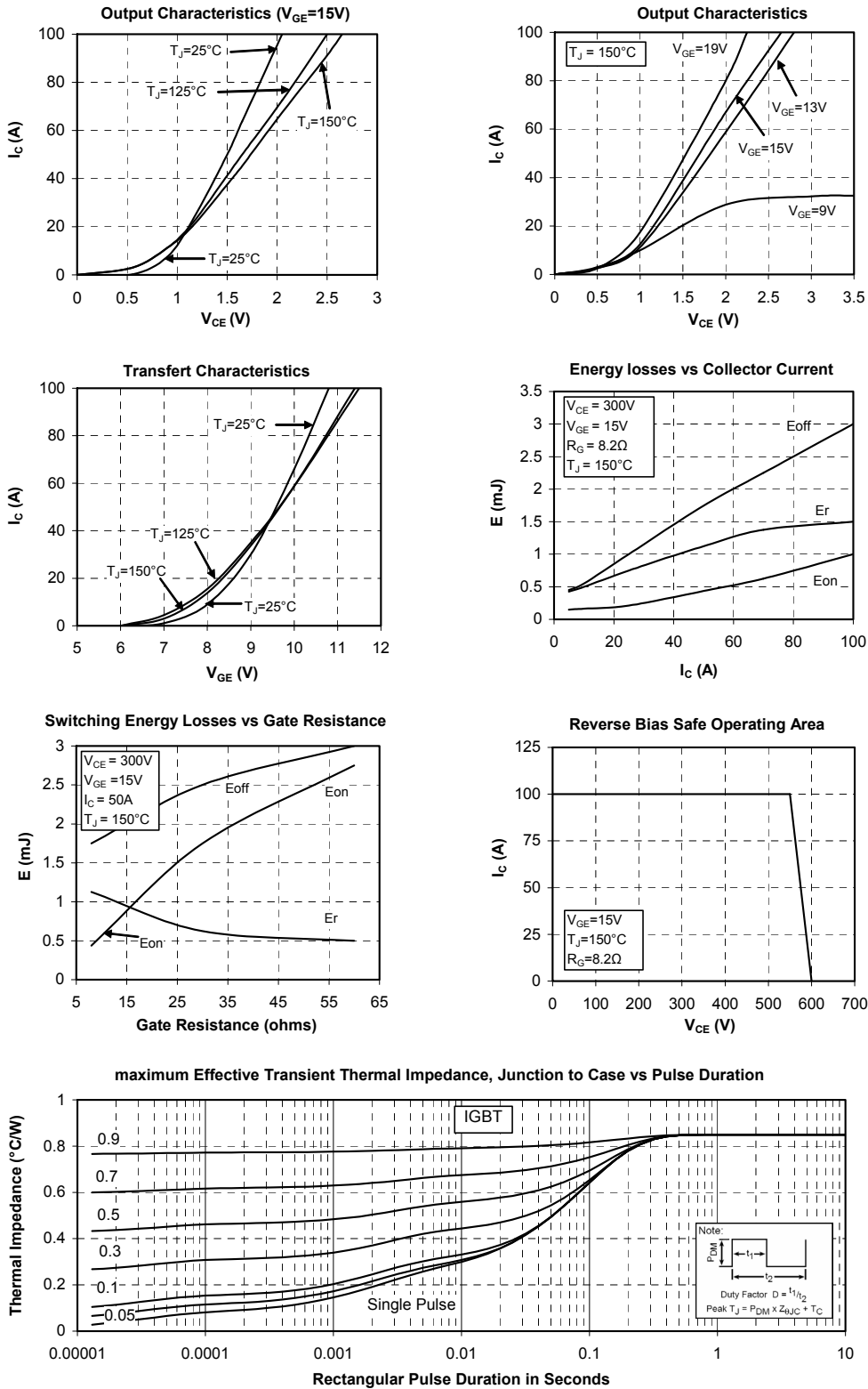
Symbol	Characteristic	Min	Typ	Max	Unit	
R <sub>thJC</sub>	Junction to Case Thermal Resistance	IGBT		0.85	°C/W	
		Diode		1.42		
V <sub>ISOL</sub>	RMS Isolation Voltage, any terminal to case t=1 min, 50/60Hz	4000			V	
T <sub>J</sub>	Operating junction temperature range	-40		175	°C	
T <sub>STG</sub>	Storage Temperature Range	-40		125		
T <sub>C</sub>	Operating Case Temperature	-40		100		
Torque	Mounting torque	To heatsink	M6	3	5	N.m
Wt	Package Weight				250	g

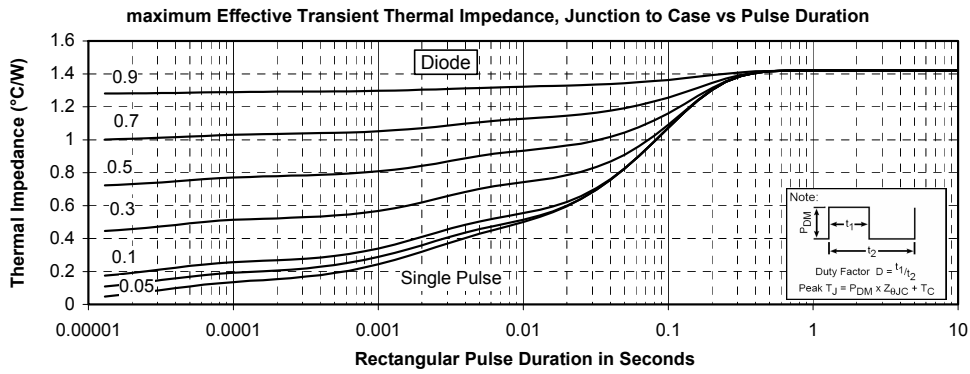
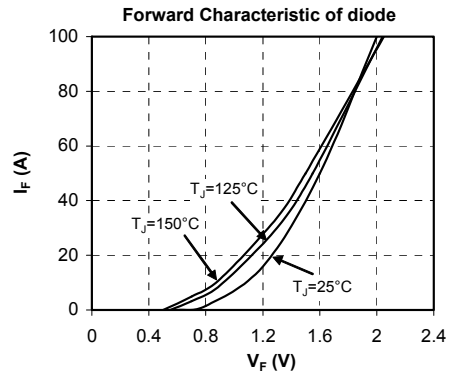
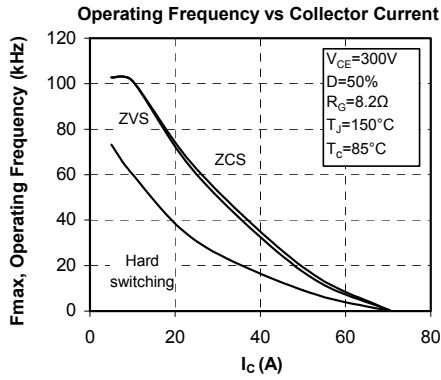
## SP6-P Package outline (dimensions in mm)



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

## Typical Performance Curve





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