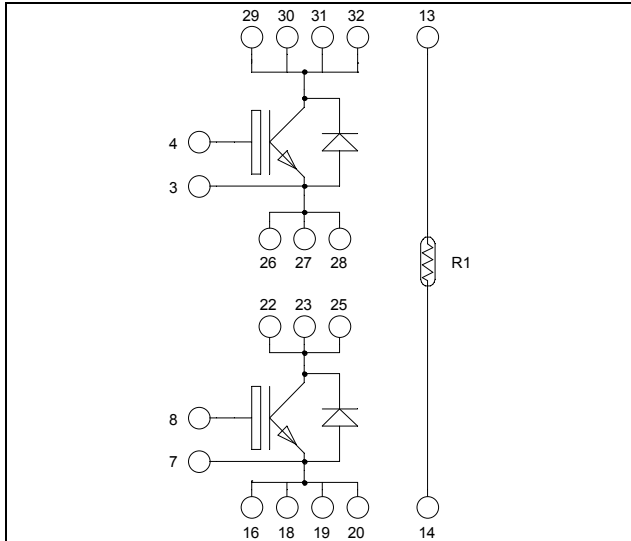


Phase leg

## Phase leg Trench + Field Stop IGBT Power Module

**$V_{CES} = 600V$**   
 **$I_C = 200A @ T_c = 100^\circ C$**

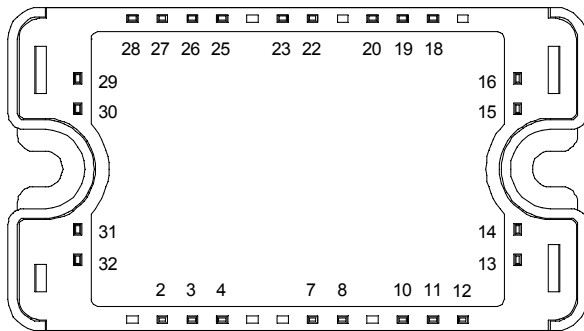


### Application

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

### Features

- Trench + Field Stop IGBT 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
- Very low stray inductance
- Kelvin emitter for easy drive
- Internal thermistor for temperature monitoring
- High level of integration
- AlN substrate for improved thermal performance



### Benefits

- 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

Pins 29/30/31/32 must be shorted together

Pins 26/27/28/22/23/25 must be shorted together  
to achieve a phase leg

Pins 16/18/19/20 must be shorted together

### Absolute maximum ratings

Symbol	Parameter	Max ratings	Unit
$V_{CES}$	Collector - Emitter Breakdown Voltage	600	V
$I_C$	Continuous Collector Current	$T_C = 25^\circ C$	290
		$T_C = 100^\circ C$	200
$I_{CM}$	Pulsed Collector Current	$T_C = 25^\circ C$	400
$V_{GE}$	Gate - Emitter Voltage	$\pm 20$	V
$P_D$	Maximum Power Dissipation	$T_C = 25^\circ C$	750
RBSOA	Reverse Bias Safe Operating Area	$T_j = 150^\circ C$	400A @ 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	$V_{GE} = 0V, V_{CE} = 600V$			250	$\mu\text{A}$
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	$V_{GE} = 15V$ $I_C = 200A$	$T_j = 25^\circ\text{C}$	1.5	1.9	V
			$T_j = 150^\circ\text{C}$	1.7		
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE} = V_{CE}, I_C = 2\text{ mA}$	5.0	5.8	6.5	V
$I_{GES}$	Gate – Emitter Leakage Current	$V_{GE} = 20V, V_{CE} = 0V$			400	nA

**Dynamic Characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$C_{ies}$	Input Capacitance	$V_{GE} = 0V$		12.3		nF
$C_{oes}$	Output Capacitance	$V_{CE} = 25V$		0.8		
$C_{res}$	Reverse Transfer Capacitance	$f = 1\text{MHz}$		0.4		
$Q_G$	Gate charge	$V_{GE} = \pm 15V ; V_{CE} = 300V$ $I_C = 200A$		2.2		$\mu\text{C}$
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching ( $25^\circ\text{C}$ ) $V_{GE} = \pm 15V$ $V_{Bus} = 300V$ $I_C = 200A$ $R_G = 2\Omega$		115		ns
$T_r$	Rise Time			45		
$T_{d(off)}$	Turn-off Delay Time			225		
$T_f$	Fall Time			55		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching ( $150^\circ\text{C}$ ) $V_{GE} = \pm 15V$ $V_{Bus} = 300V$ $I_C = 200A$ $R_G = 2\Omega$		130		ns
$T_r$	Rise Time			50		
$T_{d(off)}$	Turn-off Delay Time			300		
$T_f$	Fall Time			70		
$E_{on}$	Turn on Energy	$V_{GE} = \pm 15V$ $V_{Bus} = 300V$ $I_C = 200A$	$T_j = 25^\circ\text{C}$	1		mJ
			$T_j = 150^\circ\text{C}$	1.8		
$E_{off}$	Turn off Energy	$R_G = 2\Omega$	$T_j = 25^\circ\text{C}$	5.7		mJ
			$T_j = 150^\circ\text{C}$	7		
$I_{sc}$	Short Circuit data	$V_{GE} \leq 15V ; V_{Bus} = 360V$ $t_p \leq 6\mu\text{s} ; T_j = 150^\circ\text{C}$		1000		A

**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	$V_R = 600V$	$T_j = 25^\circ\text{C}$		250	$\mu\text{A}$
			$T_j = 150^\circ\text{C}$		500	
$I_F$	DC Forward Current			200		A
$V_F$	Diode Forward Voltage	$I_F = 200A$ $V_{GE} = 0V$	$T_j = 25^\circ\text{C}$	1.6	2	V
			$T_j = 150^\circ\text{C}$	1.5		
$t_{rr}$	Reverse Recovery Time	$I_F = 200A$ $V_R = 300V$ $di/dt = 2800A/\mu\text{s}$	$T_j = 25^\circ\text{C}$	125		ns
			$T_j = 150^\circ\text{C}$	220		
$Q_{rr}$	Reverse Recovery Charge		$T_j = 25^\circ\text{C}$	9		$\mu\text{C}$
			$T_j = 150^\circ\text{C}$	20		
$E_r$	Reverse Recovery Energy		$T_j = 25^\circ\text{C}$	2.2		mJ
			$T_j = 150^\circ\text{C}$	4.8		

## Thermal and package characteristics

Symbol	Characteristic	Min	Typ	Max	Unit	
R <sub>thJC</sub>	Junction to Case Thermal Resistance	IGBT		0.20	°C/W	
		Diode		0.31		
V <sub>ISOL</sub>	RMS Isolation Voltage, any terminal to case t=1 min, I <sub>isol</sub> <1mA, 50/60Hz	2500			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	M4	2.5	4.7	N.m
Wt	Package Weight				110	g

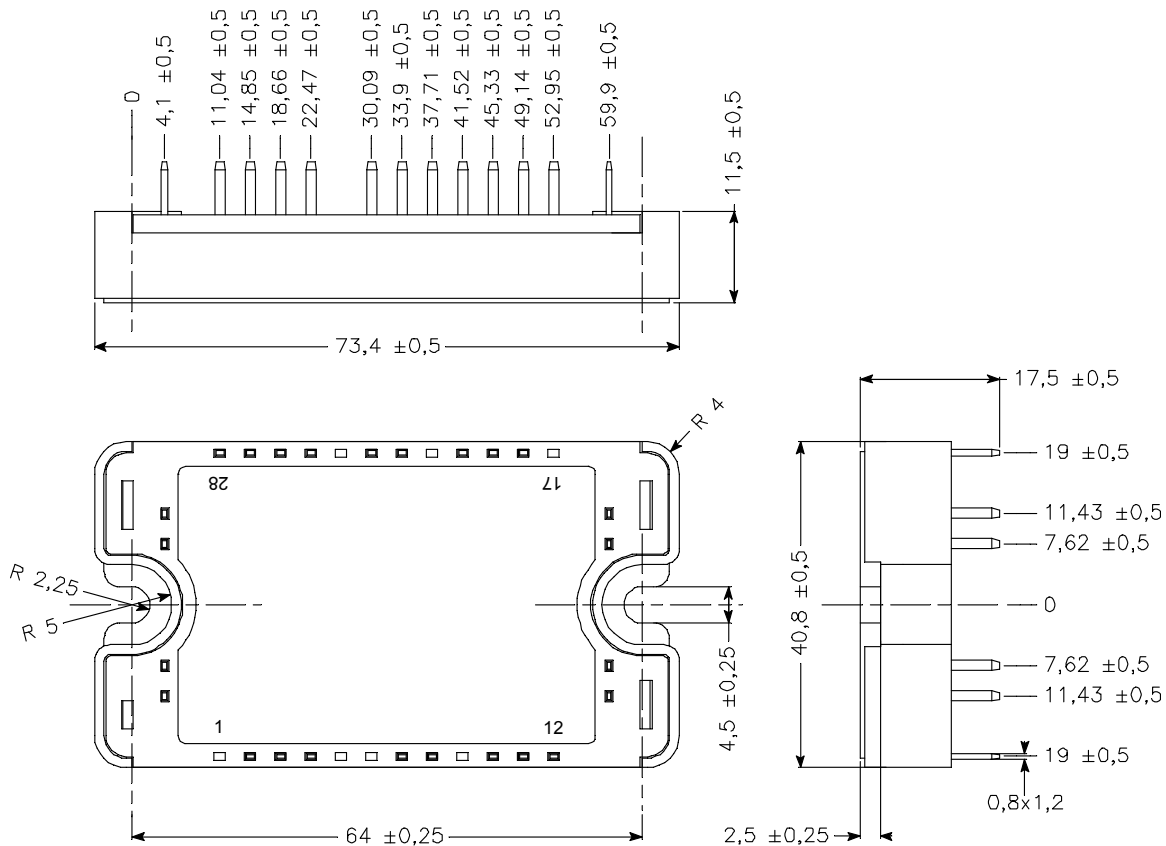
## Temperature sensor NTC (see application note APT0406 on www.microsemi.com for more information).

Symbol	Characteristic	Min	Typ	Max	Unit
R <sub>25</sub>	Resistance @ 25°C		50		kΩ
ΔR <sub>25</sub> /R <sub>25</sub>			5		%
B <sub>25/85</sub>	T <sub>25</sub> = 298.15 K		3952		K
ΔB/B		T <sub>C</sub> =100°C	4		%

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

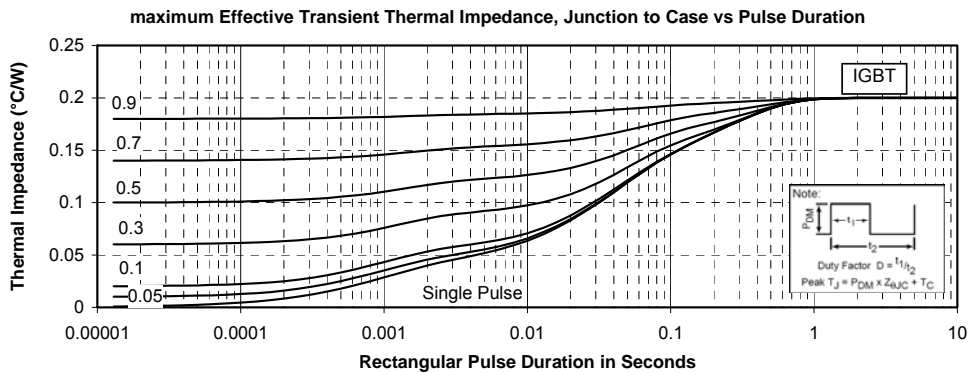
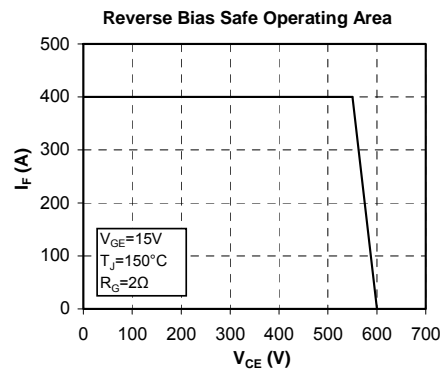
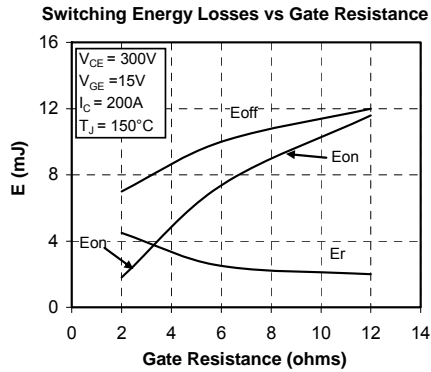
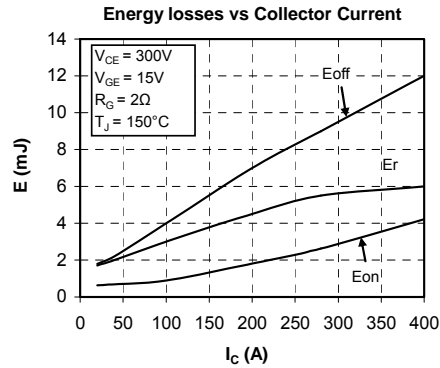
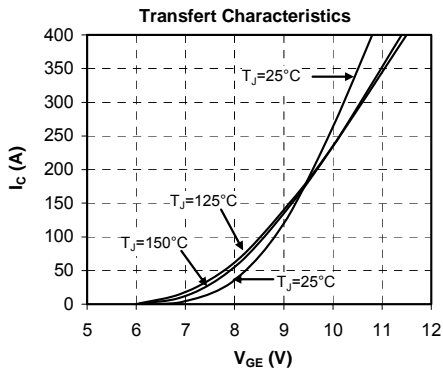
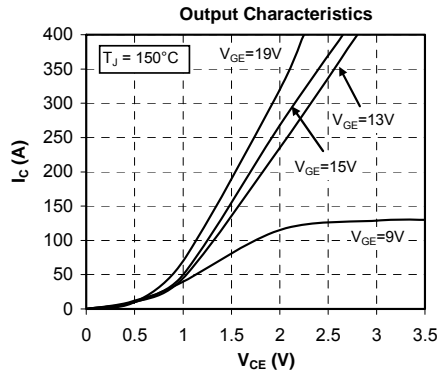
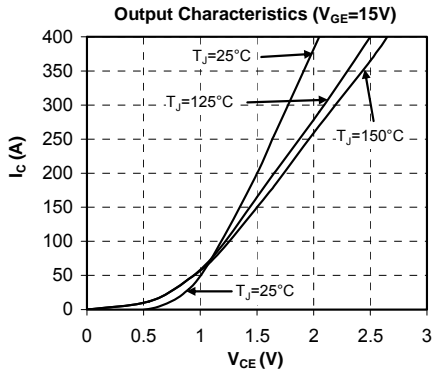
T: Thermistor temperature  
 R<sub>T</sub>: Thermistor value at T

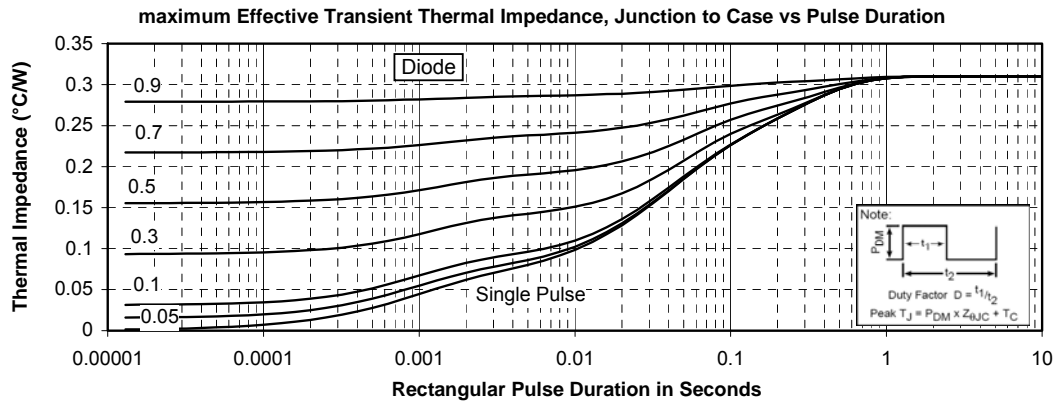
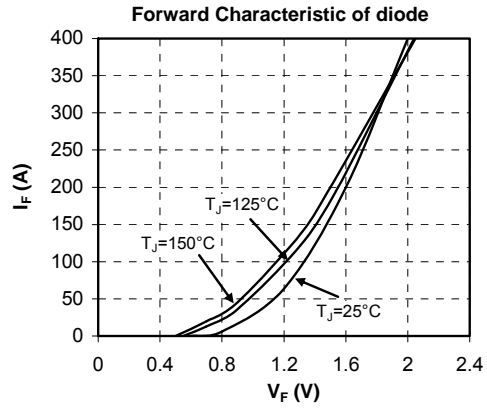
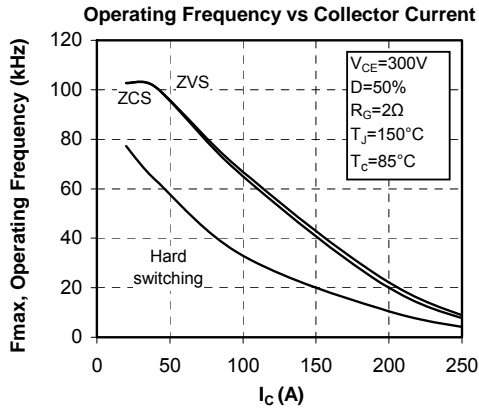
## SP3 Package outline (dimensions in mm)



See application note 1901 - Mounting Instructions for SP3 Power Modules on [www.microsemi.com](http://www.microsemi.com)

## Typical Performance Curve





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### Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: [info@moschip.ru](mailto:info@moschip.ru)

Skype отдела продаж:

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