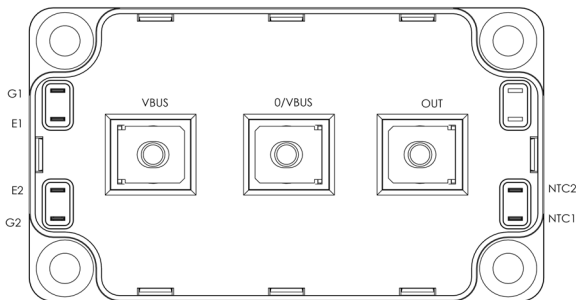
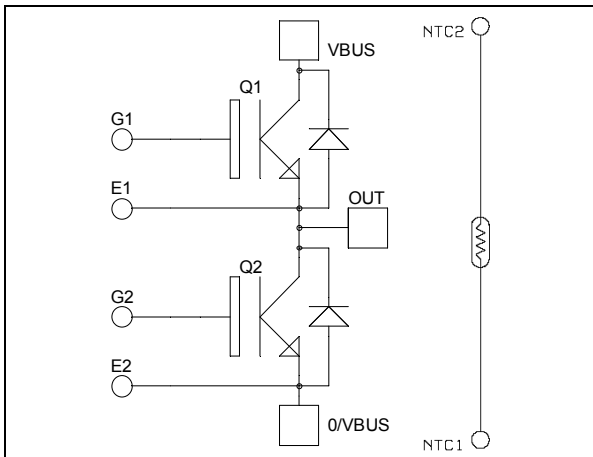


Phase leg
High speed Trench + Field Stop IGBT4
Power module

$V_{CES} = 650V$
 $I_C = 600A^* @ T_c = 60^\circ C$



Application

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

Features

- High speed Trench + Field Stop IGBT 4 Technology
 - Low voltage drop
 - Low leakage current
 - Low switching losses
 - Soft recovery parallel diodes
 - Low diode VF
 - RBSOA and SCSOA rated
- Kelvin source for easy drive
- Very low stray inductance
- M5 power connectors
- High level of integration
- Internal thermistor for temperature monitoring

Benefits

- 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

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

Absolute maximum ratings (per IGBT)

Symbol	Parameter	Max ratings	Unit
V_{CES}	Collector - Emitter Voltage	650	V
I_C	Continuous Collector Current	$T_C = 25^\circ C$	770*
		$T_C = 60^\circ C$	600*
I_{CM}	Pulsed Collector Current	$T_C = 25^\circ C$	1500
V_{GE}	Gate - Emitter Voltage	± 20	V
P_D	Maximum Power Dissipation	$T_C = 25^\circ C$	2000
RBSOA	Reverse Bias Safe Operating Area	$T_j = 125^\circ C$	1200A @ 600V

* Specification of device but current must be limited due to size of power connectors.

CAUTION: These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed. See application note APT0502 on www.microsemi.com

Electrical Characteristics (per IGBT)

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
I_{CES}	Zero Gate Voltage Collector Current	$V_{GE} = 0V, V_{CE} = 650V$			600	μA
$V_{CE(sat)}$	Collector Emitter saturation Voltage	$V_{GE} = 15V$ $I_C = 600A$		1.85 2.2	2.3	V
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE} = V_{CE}, I_C = 3.2 mA$	4.2	5.1	5.6	V
I_{GES}	Gate – Emitter Leakage Current	$V_{GE} = 20V, V_{CE} = 0V$			1	μA

Dynamic Characteristics (per IGBT)

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C_{ies}	Input Capacitance	$V_{GE} = 0V$		36.6		nF
C_{oes}	Output Capacitance	$V_{CE} = 25V$		1.3		
C_{res}	Reverse Transfer Capacitance	$f = 1MHz$		1.08		
Q_G	Gate charge	$V_{GE} = 15V ; V_{CE} = 480V$ $I_C = 600A$		3500		nC
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C) $V_{GE} = \pm 15V$ $V_{CE} = 400V$ $I_C = 600A$ $R_G = 0.6\Omega$		19		ns
T_r	Rise Time			33		
$T_{d(off)}$	Turn-off Delay Time			197		
T_f	Fall Time			21		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (150°C) $V_{GE} = \pm 15V$ $V_{CE} = 400V$ $I_C = 600A$ $R_G = 0.6\Omega$		19		ns
T_r	Rise Time			29		
$T_{d(off)}$	Turn-off Delay Time			227		
T_f	Fall Time			22		
E_{on}	Turn-on Switching Energy	$V_{GE} = \pm 15V$ $V_{CE} = 400V$ $I_C = 600A$	$T_j = 25^\circ C$ $T_j = 150^\circ C$	12 14.7		mJ
E_{off}	Turn-off Switching Energy	$R_G = 0.6\Omega$	$T_j = 25^\circ C$ $T_j = 150^\circ C$	11.2 12		mJ
I_{sc}	Short Circuit data	$V_{GE} \leq 15V ; V_{Bus} = 600V$ $t_p \leq 10\mu s ; T_j = 150^\circ C$		3900		A
R_{thJC}	Junction to Case Thermal Resistance				0.075	$^\circ C/W$

Diode ratings and characteristics (per diode)

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
V_{RRM}	Repetitive Reverse Voltage				650	V
I_{RM}	Reverse Leakage Current	$V_R = 650V$			300	μA
I_F	DC Forward Current			600		A
V_F	Diode Forward Voltage	$I_F = 600A$ $V_{GE} = 0V$	$T_j = 25^\circ C$	1.6	2	V
			$T_j = 150^\circ C$	1.5		
t_{rr}	Reverse Recovery Time	$I_F = 600A$ $V_R = 400V$ $di/dt = 7000A/\mu s$	$T_j = 25^\circ C$	125		ns
			$T_j = 150^\circ C$	220		
Q_{rr}	Reverse Recovery Charge	$I_F = 600A$ $V_R = 400V$ $di/dt = 7000A/\mu s$	$T_j = 25^\circ C$	28.1		μC
			$T_j = 150^\circ C$	59.3		
E_r	Reverse Recovery Energy	$I_F = 600A$ $V_R = 400V$ $di/dt = 7000A/\mu s$	$T_j = 25^\circ C$	6.6		mJ
			$T_j = 150^\circ C$	14.4		
R_{thJC}	Junction to Case Thermal Resistance				0.13	$^\circ C/W$

Temperature sensor NTC (see application note APT0406 on www.microsemi.com).

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

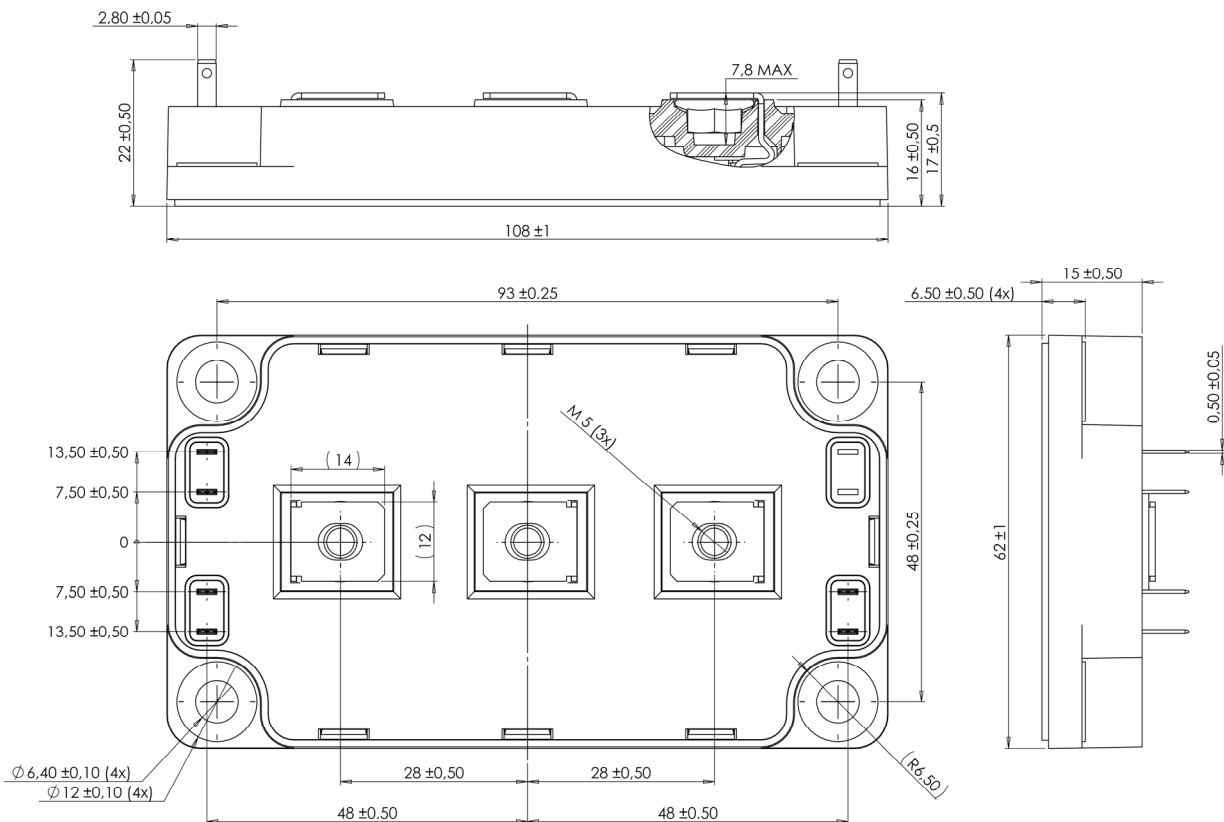
$$R_T = \frac{R_{25}}{\exp \left[B_{25/85} \left(\frac{1}{T_{25}} - \frac{1}{T} \right) \right]}$$

T: Thermistor temperature
R_T: Thermistor value at T

Thermal and package characteristics

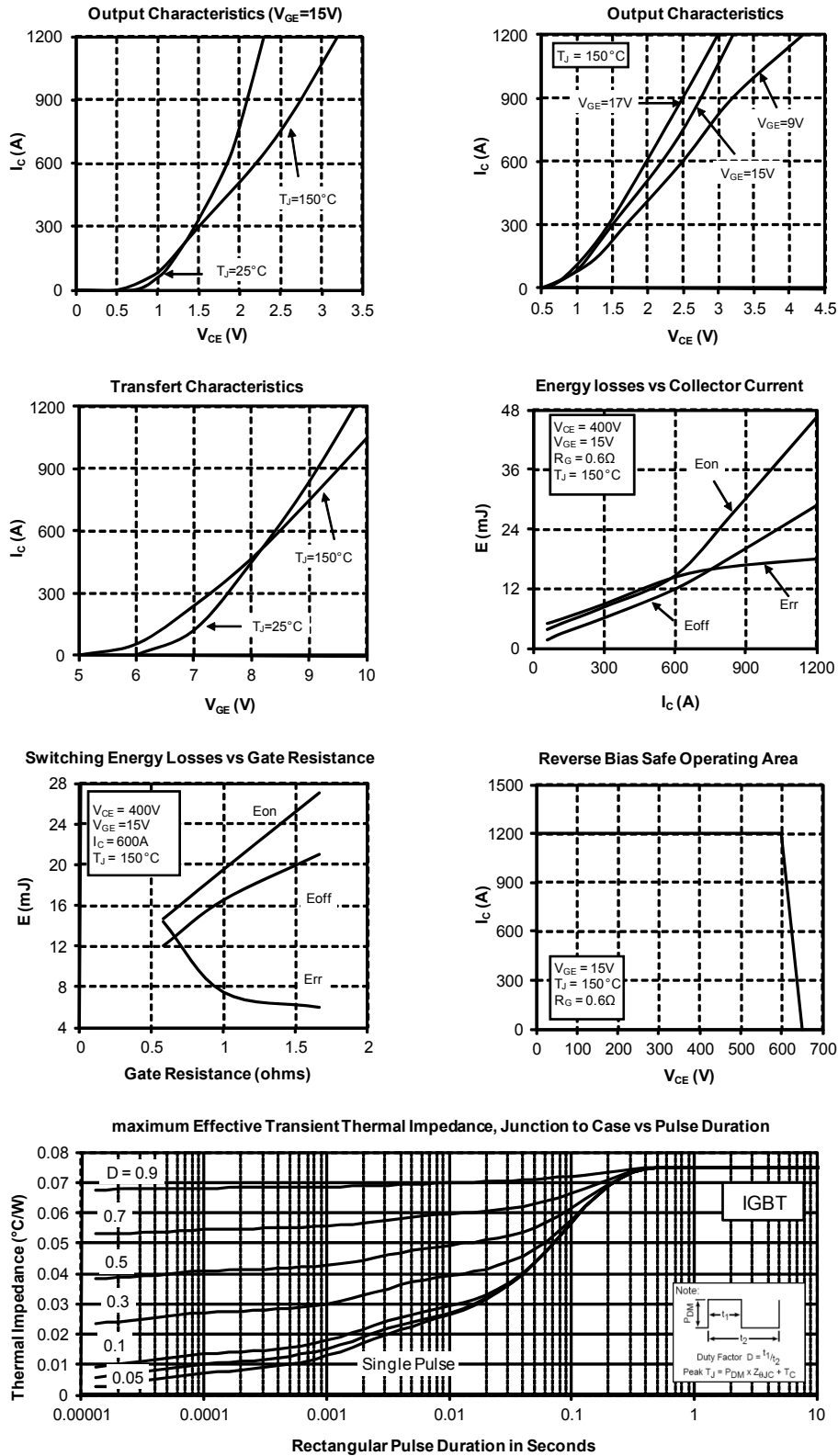
Symbol	Characteristic	Min	Max	Unit	
V _{ISOL}	RMS Isolation Voltage, any terminal to case t = 1 min, 50/60Hz	4000		V	
T _J	Operating junction temperature range	-40	175	°C	
T _{JOP}	Recommended junction temperature under switching conditions	-40	T _{Jmax} -25		
T _{STG}	Storage Temperature Range	-40	125		
T _C	Operating Case Temperature	-40	100		
Torque	Mounting torque	To Heatsink	M6	3	N.m
		For terminals	M5	2	
Wt	Package Weight		300	g	

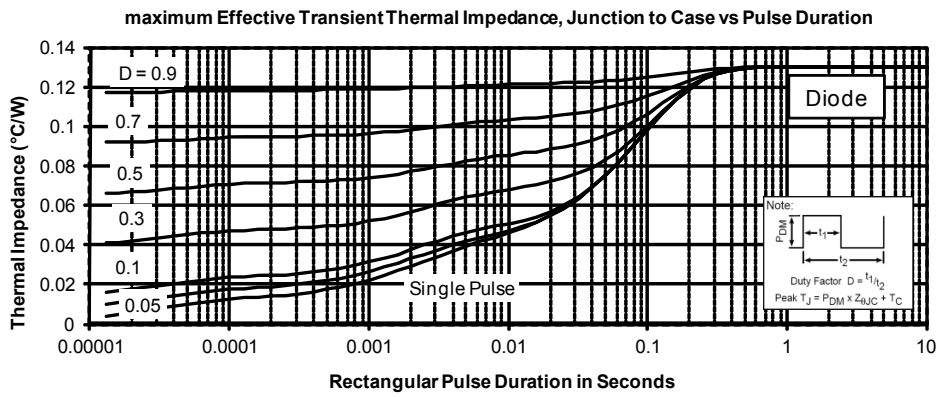
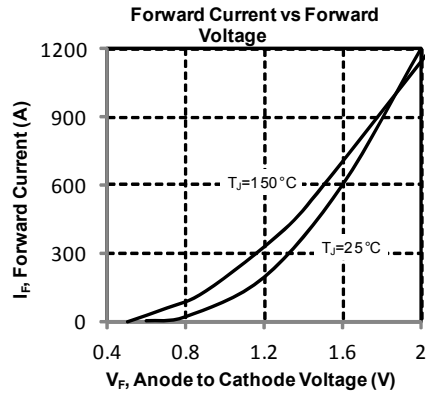
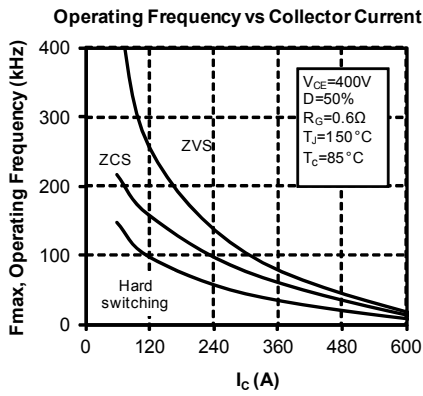
SP6 Package outline (dimensions in mm)



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

Typical Performance Curve





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