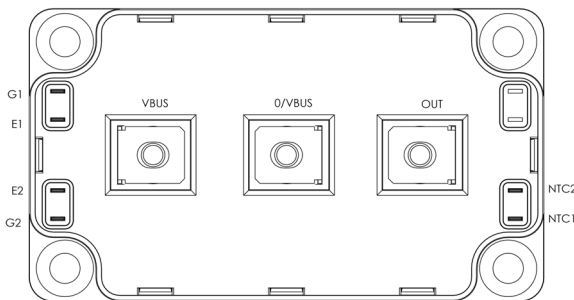
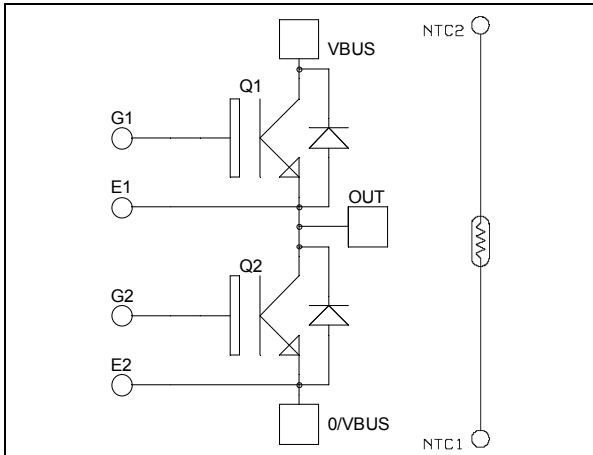


Phase leg
High speed Trench + Field Stop IGBT4
Power module

$V_{CES} = 1200V$
 $I_C = 400A @ T_c = 80^\circ C$



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	1200	V
I_C	Continuous Collector Current	$T_C = 25^\circ C$ 625	A
		$T_C = 80^\circ C$ 400	
I_{CM}	Pulsed Collector Current	$T_C = 25^\circ C$ 1250	
V_{GE}	Gate - Emitter Voltage	± 20	V
P_D	Maximum Power Dissipation	$T_C = 25^\circ C$ 1900	W
RBSOA	Reverse Bias Safe Operating Area	$T_j = 125^\circ C$ 800A @ 1100V	

CAUTION: These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed.

Electrical Characteristics (per IGBT)

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
I_{CES}	Zero Gate Voltage Collector Current	$V_{GE} = 0V, V_{CE} = 1200V$			200	μA
$V_{CE(sat)}$	Collector Emitter saturation Voltage	$V_{GE} = 15V$ $I_C = 400A$		2.05 2.6	2.4	V
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE} = V_{CE}, I_C = 14 mA$	5.2	5.8	6.4	V
I_{GES}	Gate – Emitter Leakage Current	$V_{GE} = 20V, V_{CE} = 0V$			680	nA

Dynamic Characteristics (per IGBT)

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C_{ies}	Input Capacitance	$V_{GE} = 0V$		24.6		nF
C_{oes}	Output Capacitance	$V_{CE} = 25V$		1.4		
C_{res}	Reverse Transfer Capacitance	$f = 1MHz$		1.2		
Q_G	Gate charge	$V_{GE} = 15V ; V_{CE} = 960V$ $I_C = 400A$		1800		nC
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C) $V_{GE} = \pm 15V$ $V_{CE} = 600V$ $I_C = 400A$ $R_G = 1.25\Omega$		30		ns
T_r	Rise Time			57		
$T_{d(off)}$	Turn-off Delay Time			290		
T_f	Fall Time			16		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (150°C) $V_{GE} = \pm 15V$ $V_{CE} = 600V$ $I_C = 400A$ $R_G = 1.25\Omega$		30		ns
T_r	Rise Time			49		
$T_{d(off)}$	Turn-off Delay Time			366		
T_f	Fall Time			48		
E_{on}	Turn-on Switching Energy	$V_{GE} = \pm 15V$ $V_{CE} = 600V$ $I_C = 400A$ $R_G = 1.25\Omega$		36		mJ
E_{off}	Turn-off Switching Energy	$T_J = 150^\circ C$		22		mJ
I_{sc}	Short Circuit data	$V_{GE} \leq 15V ; V_{Bus} = 600V$ $t_p \leq 10\mu s ; T_J = 150^\circ C$		1400		A
R_{thJC}	Junction to Case Thermal Resistance				0.08	°C/W

Diode ratings and characteristics (per diode)

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
V_{RRM}	Repetitive Reverse Voltage				1200	V
I_{RM}	Reverse Leakage Current	$V_R = 1200V$			250	μA
I_F	DC Forward Current	$T_C = 50^\circ C$		400		A
V_F	Diode Forward Voltage	$I_F = 400A$ $V_{GE} = 0V$		1.9 1.85	2.2	V
t_{rr}	Reverse Recovery Time	$I_F = 400A$ $V_R = 600V$ $di/dt = 7000A/\mu s$	$T_J = 25^\circ C$	155		ns
			$T_J = 150^\circ C$	300		
Q_{rr}	Reverse Recovery Charge		$T_J = 25^\circ C$	37.2		μC
			$T_J = 150^\circ C$	78		
E_r	Reverse Recovery Energy		$T_J = 25^\circ C$	16		mJ
			$T_J = 150^\circ C$	32		
R_{thJC}	Junction to Case Thermal Resistance				0.14	°C/W

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

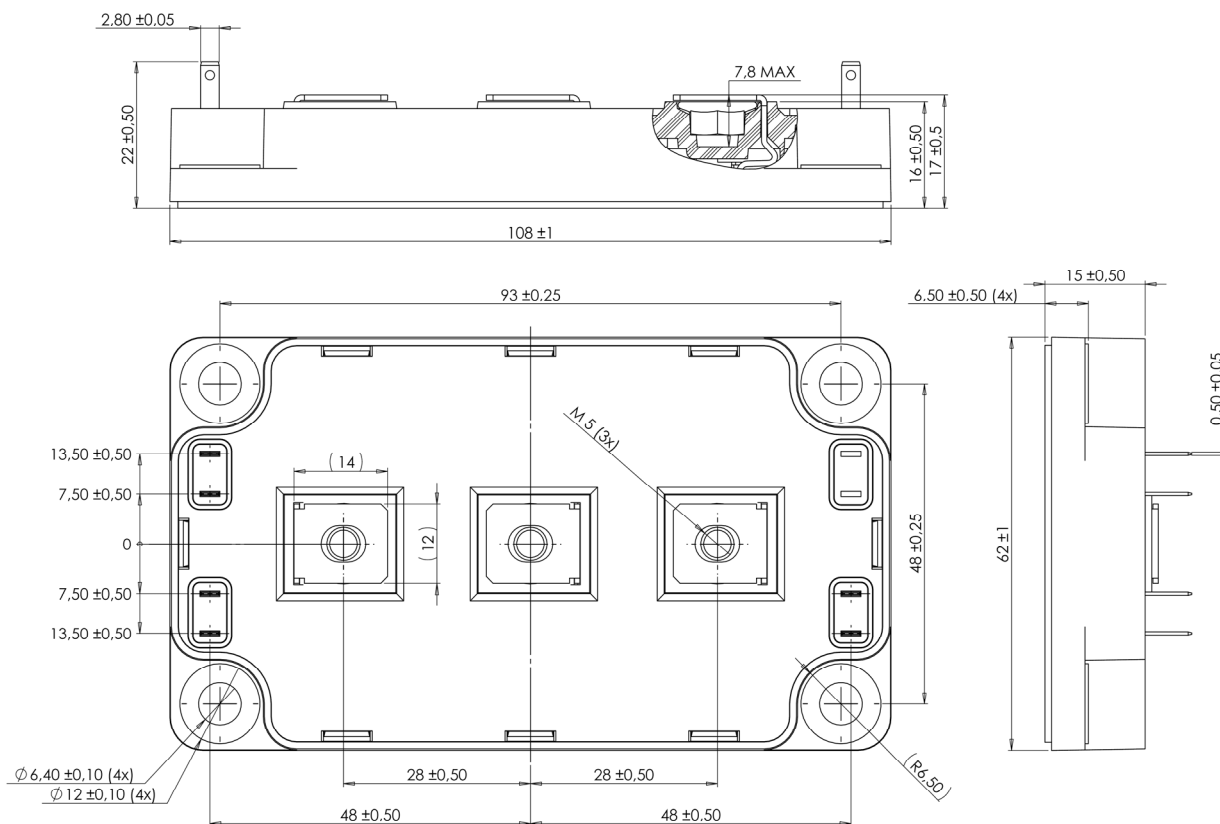
Symbol	Characteristic	Min	Typ	Max	Unit
R ₂₅	Resistance @ 25°C		50		kΩ
ΔR ₂₅ /R ₂₅			5		%
B _{25/85}	T ₂₅ = 298.15 K		3952		K
ΔB/B	T _C = 100°C		4		%

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

Thermal and package characteristics

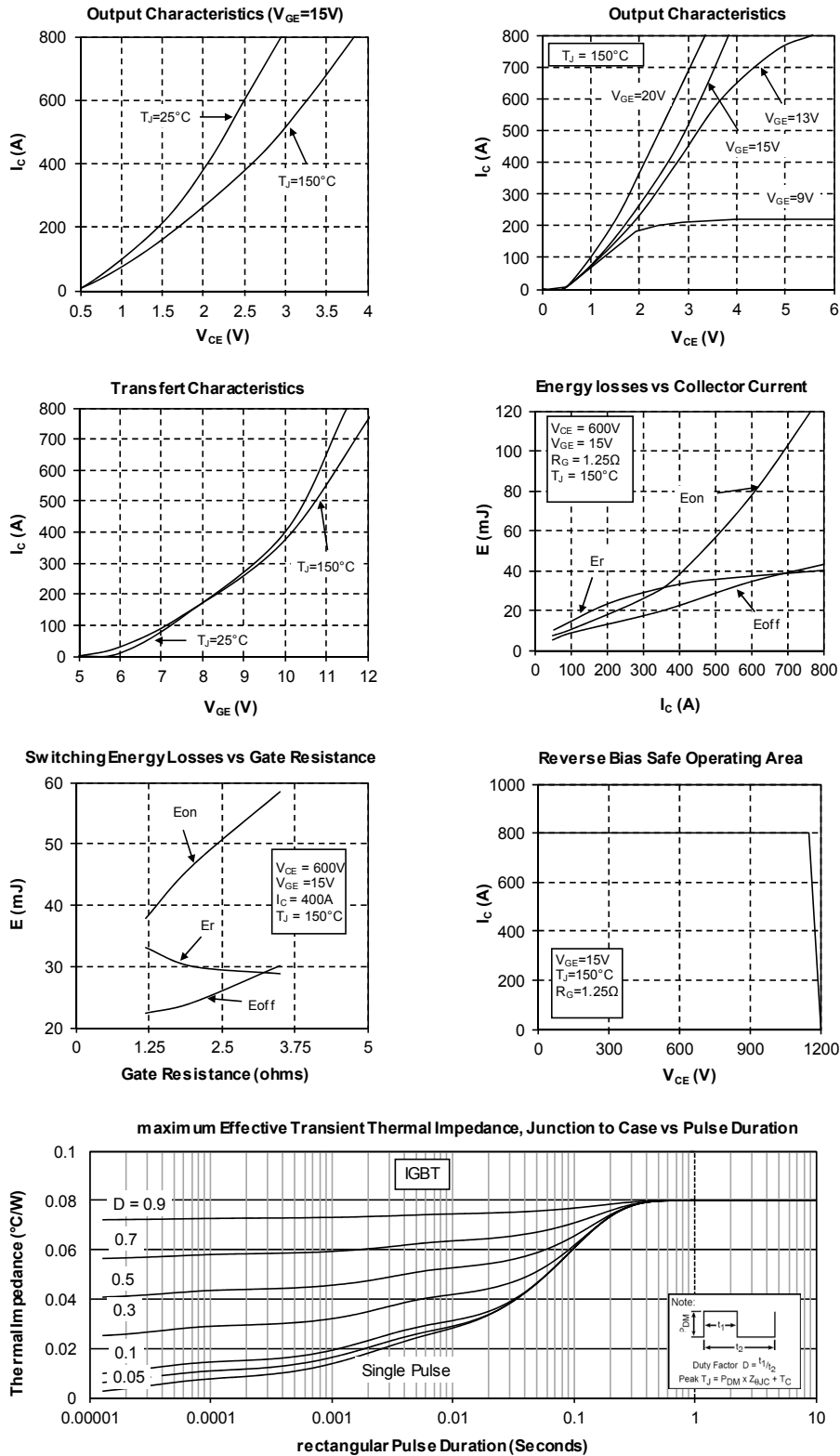
Symbol	Characteristic			Min	Max	Unit
V _{ISOL}	RMS Isolation Voltage, any terminal to case t =1 min, 50/60Hz			4000		V
T _J	Operating junction temperature range			-40	175	°C
T _{JOP}	Recommended junction temperature under switching conditions			-40	T _J max -25	
T _{STG}	Storage Temperature Range			-40	125	
T _C	Operating Case Temperature			-40	100	
Torque	Mounting torque	To Heatsink	M6	3	5	N.m
		For teminals	M5	2	3.5	
Wt	Package Weight				300	g

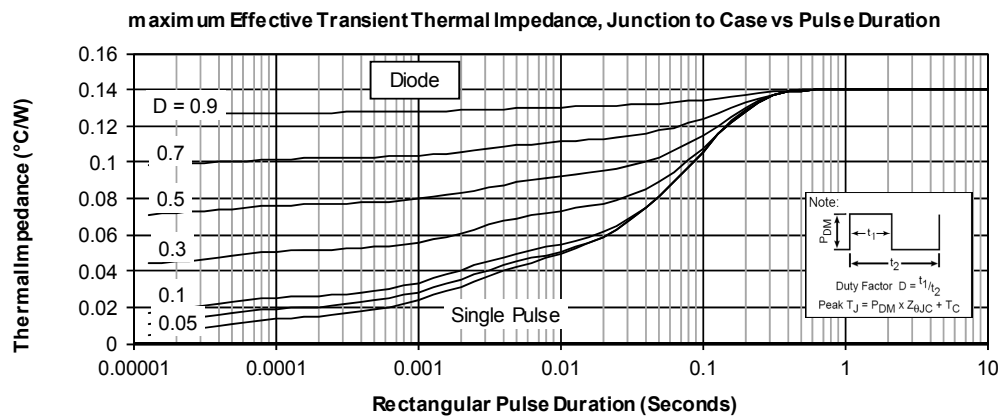
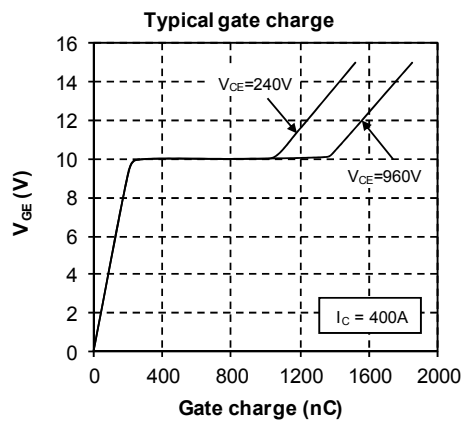
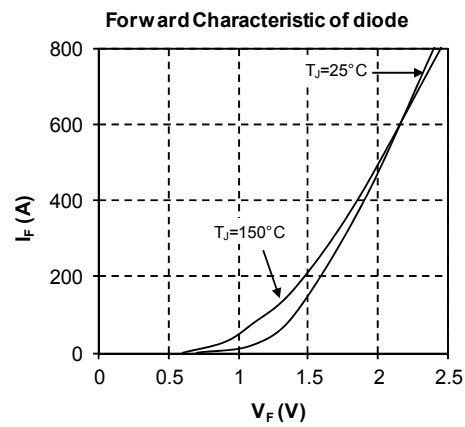
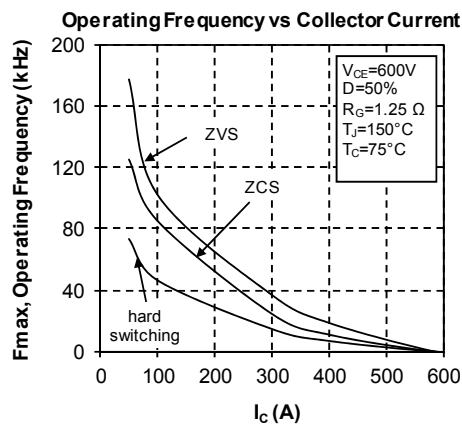
Package outline (dimensions in mm)



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

Typical Performance Curve





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