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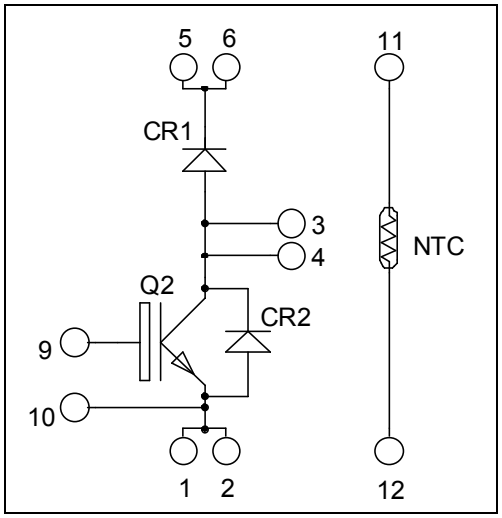
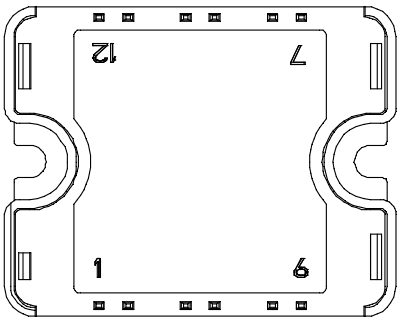
Boost chopper
High speed IGBT 5 Power Module

V_{CES} = 650V
I_C = 100A @ Tc = 25°C





Pins 1/2 ; 3/4 ; 5/6 must be shorted together

Application

- AC and DC motor control
- Switched Mode Power Supplies
- Power Factor Correction

Features

- High speed IGBT 5
  - Low voltage drop
  - Low tail current
  - Switching frequency up to 100 kHz
  - Low leakage current
- Very low stray inductance
- Internal thermistor for temperature monitoring

Benefits

- Outstanding performance at high frequency operation
- 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

All ratings @ T_j = 25°C unless otherwise specified

Absolute maximum ratings

Symbol	*Parameter*		*Max ratings*	*Unit*
V_{CES}	Collector - Emitter Voltage		650	V
I_C	Continuous Collector Current	T_C = 25°C	100	A
		T_C = 80°C	60	
I_{CM}	Pulsed Collector Current	T_C = 25°C	200	
V_{GE}	Gate – Emitter Voltage		±20	V
P_D	Power Dissipation		250	W

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

Electrical Characteristics

Symbol	*Characteristic*	*Test Conditions*		*Min*	*Typ*	*Max*	*Unit*
I_{CES}	Zero Gate Voltage Collector Current	V_{GE} = 0V, V_{CE} = 650V				100	µA
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	V_{GE} =15V I_C = 100A	T_j = 25°C		1.65	2.2	V
			T_j = 150°C		1.9		
$V_{GE(th)}$	Gate Threshold Voltage	V_{GE} = V_{CE} , I_C = 1mA		3.3	4.0	4.7	V
I_{GES}	Gate – Emitter Leakage Current	V_{GE} = 20V, V_{CE} = 0V				240	nA

Dynamic Characteristics

Symbol	*Characteristic*	*Test Conditions*		*Min*	*Typ*	*Max*	*Unit*
C_{ies}	Input Capacitance	V_{GE} = 0V V_{CE} = 25V f = 1MHz			6000		pF
C_{oes}	Output Capacitance				100		
C_{res}	Reverse Transfer Capacitance				22		
Q_G	Gate charge	V_{GE} = 15V, I_C = 100A V_{CE} = 520V			240		nC
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C) V_{GE} = 15V V_{Bus} = 400V I_C = 50A R_G = 2Ω			21		ns
T_r	Rise Time				15		
$T_{d(off)}$	Turn-off Delay Time				180		
T_f	Fall Time				18		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (150°C) V_{GE} = 15V V_{Bus} = 400V I_C = 50A R_G = 2Ω			20		ns
T_r	Rise Time				15		
$T_{d(off)}$	Turn-off Delay Time				205		
T_f	Fall Time				26		
E_{on}	Turn on Energy	V_{GE} = 15V V_{Bus} = 400V I_C = 50A R_G = 2Ω	T_j = 150°C		1.5		mJ
E_{off}	Turn off Energy		T_j = 150°C		0.6		
R_{Gint}	Integrated gate resistor				2.5		Ω
R_{thJC}	Junction to Case Thermal Resistance					0.6	°C/W

diode ratings and characteristics (per diode)

Symbol	*Characteristic*	*Test Conditions*		*Min*	*Typ*	*Max*	*Unit*
V_{RRM}	Peak Repetitive Reverse Voltage					650	V
I_{RM}	Reverse Leakage Current	V_R=650V				100	µA
I_F	DC Forward Current		Tc = 25°C		100		A
V_F	Diode Forward Voltage	I_F = 100A V_{GE} = 0V	T_j = 25°C		1.6	2.2	V
			T_j = 150°C		1.65		
t_{rr}	Reverse Recovery Time	I_F = 50A V_R = 400V di/dt =3000A/µs	T_j = 25°C		46		ns
			T_j = 150°C		62		
Q_{rr}	Reverse Recovery Charge		T_j = 25°C		1		µC
			T_j = 150°C		2		
R_{thJC}	Junction to Case Thermal Resistance					0.7	°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
$\Delta R_{25}/R_{25}$				5		%
$B_{25/85}$	T_{25} = 298.15 K			3952		K
$\Delta B/B$		T_C=100°C		4		%

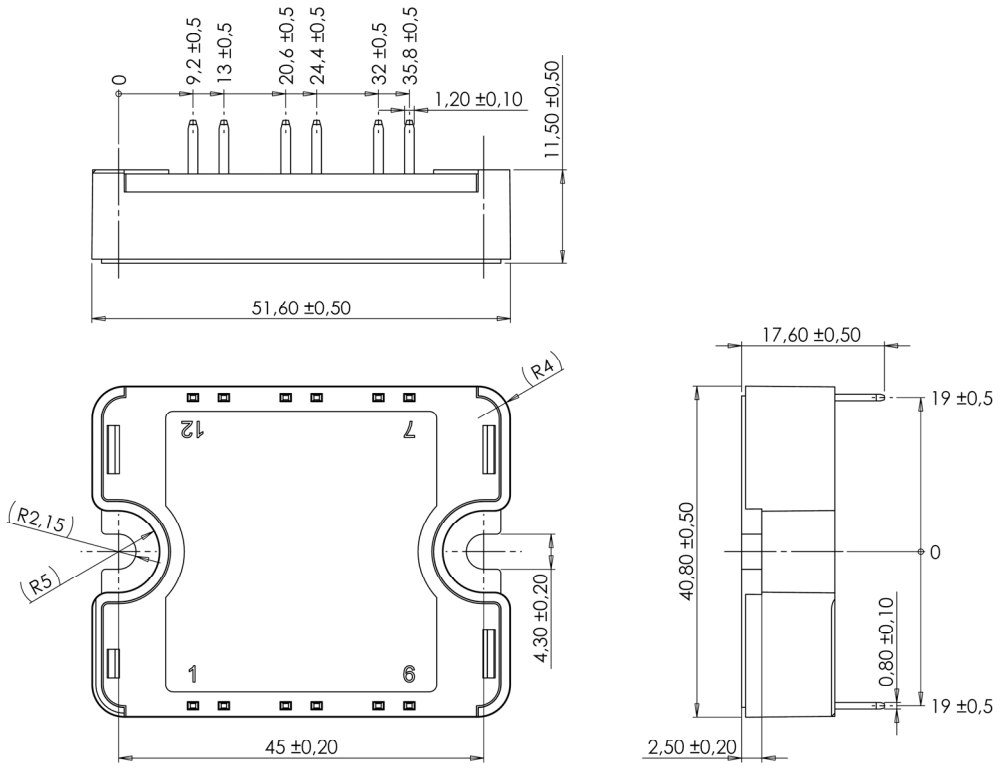
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

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	$T_J$max -25	
T_{STG}	Storage Temperature Range			-40	125	
T_C	Operating Case Temperature			-40	125	
Torque	Mounting torque	To heatsink	M4	2	3	N.m
Wt	Package Weight				80	g

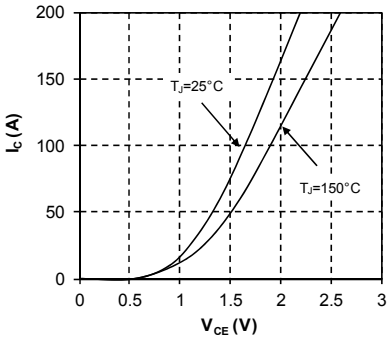
Package outline (dimensions in mm)



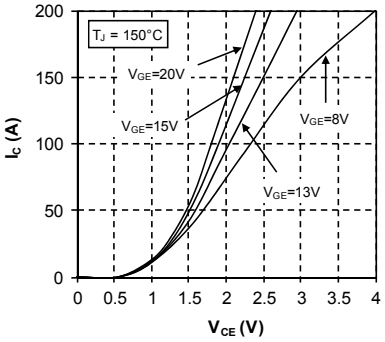
See application note 1904 - Mounting Instructions for SP1 Power Modules on www.microsemi.com

Typical performance curve

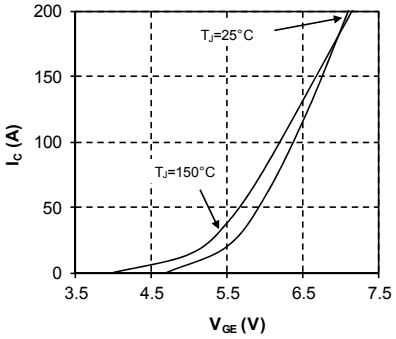
Output Characteristics (V_{GE}=15V)



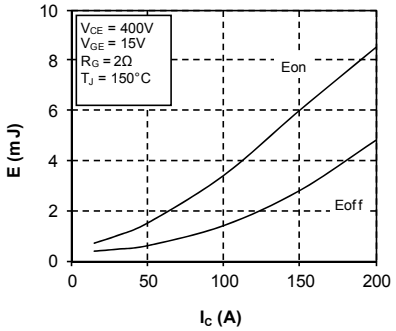
Output Characteristics



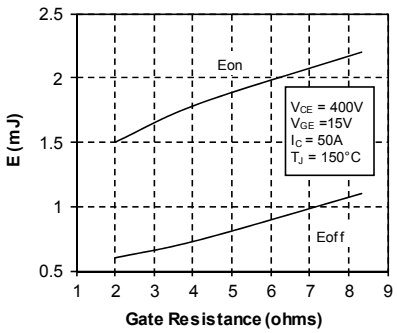
Transfert Characteristics



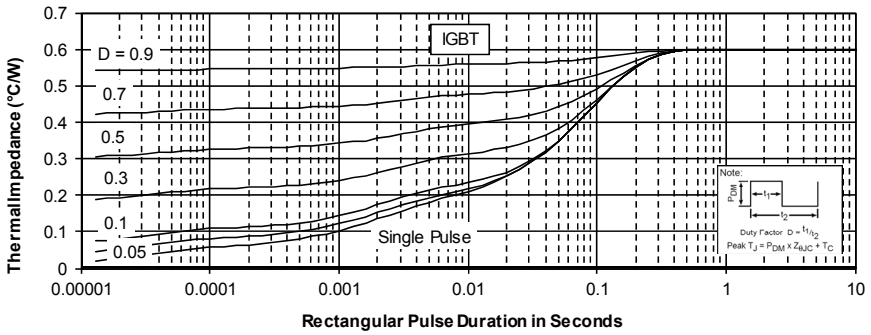
Energy losses vs Collector Current



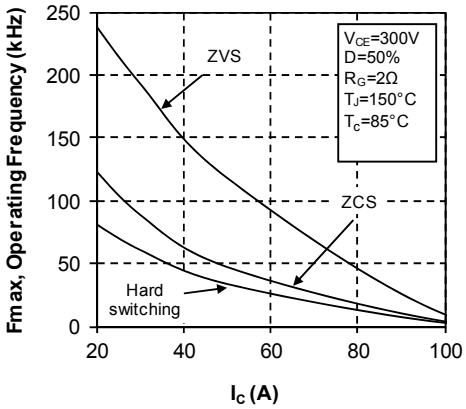
Switching Energy Losses vs Gate Resistance



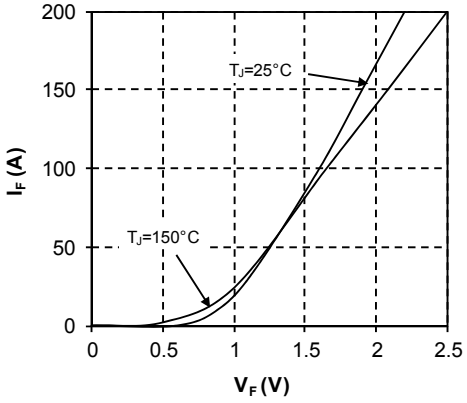
Maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration



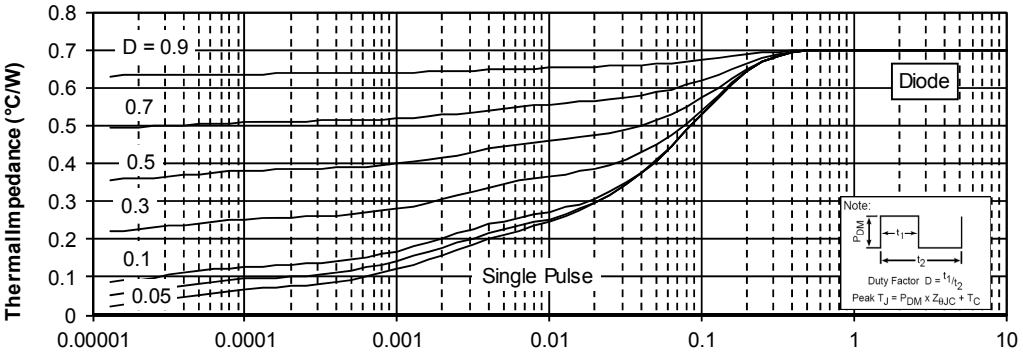
Operating Frequency vs Collector Current



Diode forward characteristic



Maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration



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