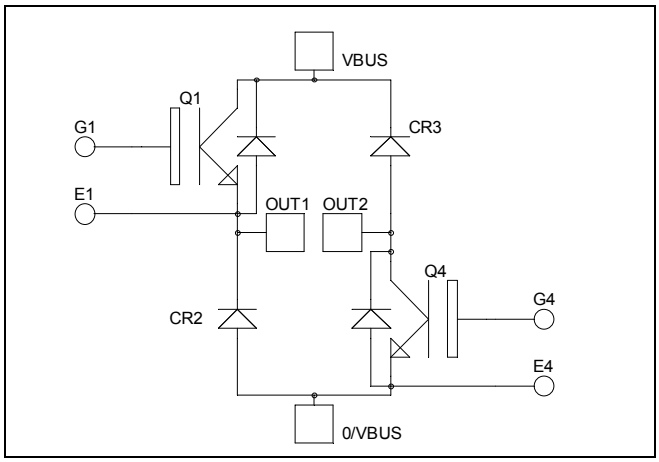
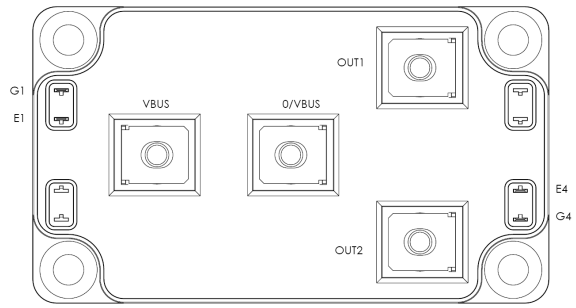
APTGT200DH60G

Asymmetrical - Bridge Trench + Field Stop IGBT3 Power Module

V_{CES} = 600V
I_C = 200A @ Tc = 80°C





Application

- Welding converters
- Switched Mode Power Supplies
- Switched Reluctance Motor Drives

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
  - M5 power connectors
- High level of integration

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

Absolute maximum ratings

Symbol	*Parameter*		*Max ratings*	*Unit*
V_{CES}	Collector - Emitter Breakdown Voltage		600	V
I_C	Continuous Collector Current	T_C = 25°C	290	A
		T_C = 80°C	200	
I_{CM}	Pulsed Collector Current	T_C = 25°C	400	
V_{GE}	Gate – Emitter Voltage		±20	V
P_D	Maximum Power Dissipation	T_C = 25°C	625	W
RBSOA	Reverse Bias Safe Operating Area	T_j = 150°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

All ratings @ T_j = 25°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	µA
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	V_{GE} =15V I_C = 200A	T_j = 25°C		1.5	1.9	V
			T_j = 150°C		1.7		
$V_{GE(th)}$	Gate Threshold Voltage	V_{GE} = V_{CE} , I_C = 2 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 V_{CE} = 25V f = 1MHz			12.3		nF
C_{oes}	Output Capacitance				0.8		
C_{res}	Reverse Transfer Capacitance				0.4		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C) V_{GE} = ±15V V_{Bus} = 300V I_C = 200A R_G = 2Ω			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°C) V_{GE} = ±15V V_{Bus} = 300V I_C = 200A R_G = 2Ω			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} = ±15V V_{Bus} = 300V I_C = 200A R_G = 2Ω	T_j = 25°C		1		mJ
			T_j = 150°C		1.8		
E_{off}	Turn off Energy		T_j = 25°C		5.7		mJ
			T_j = 150°C		7		

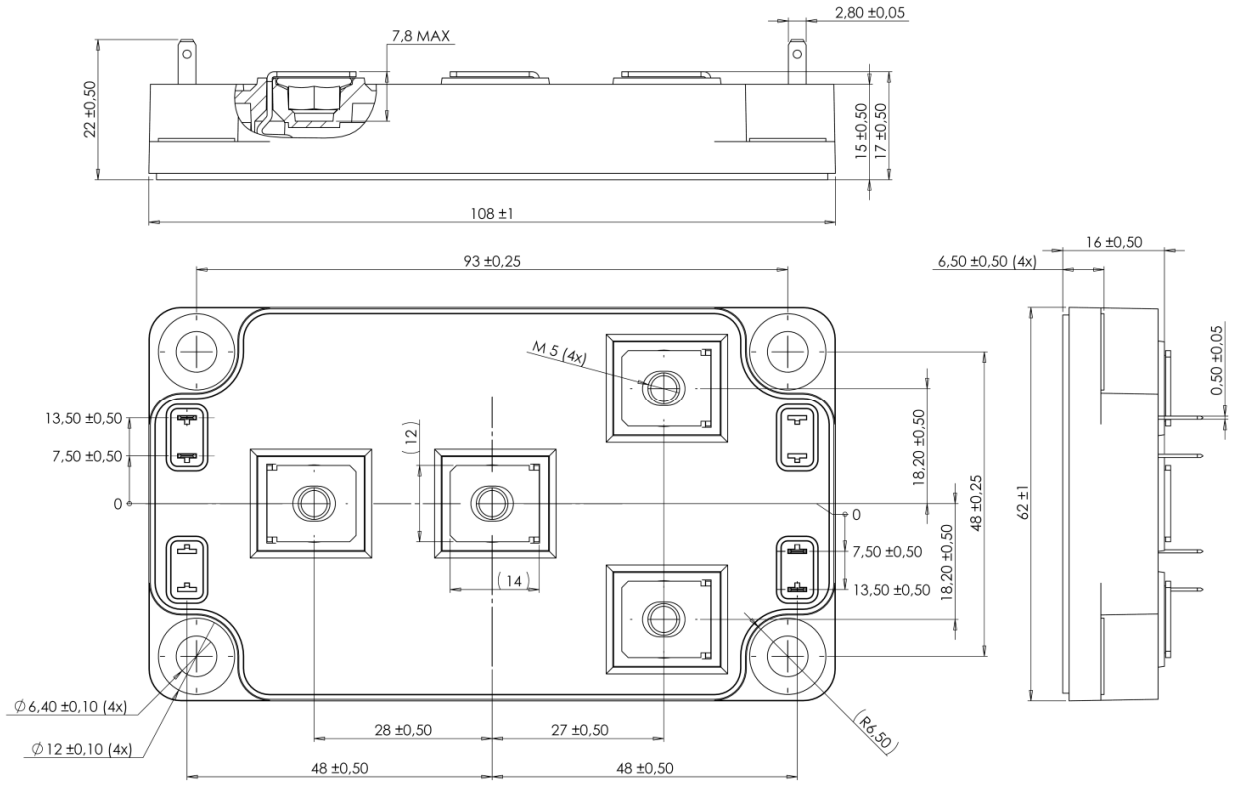
Diode ratings and characteristics

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°C			250	µA
			T_j = 150°C			500	
I_F	DC Forward Current		Tc = 80°C		200		A
V_F	Diode Forward Voltage	I_F = 200A V_{GE} = 0V	T_j = 25°C		1.6	2	V
			T_j = 150°C		1.5		
t_{rr}	Reverse Recovery Time	I_F = 200A V_R = 300V di/dt =2200A/µs	T_j = 25°C		130		ns
			T_j = 150°C		225		
Q_{rr}	Reverse Recovery Charge		T_j = 25°C		9		µC
			T_j = 150°C		19		
Er	Reverse Recovery Energy		T_j = 25°C		2.3		mJ
			T_j = 150°C		4.7		

Thermal and package characteristics

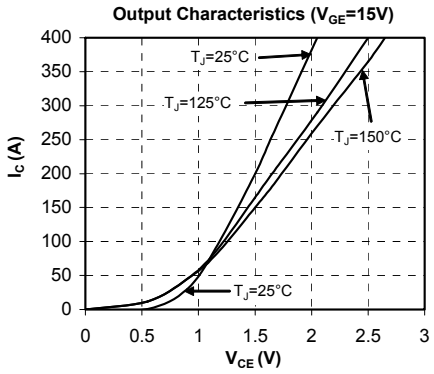
Symbol	*Characteristic*			*Min*	*Typ*	*Max*	*Unit*
R_{thJC}	Junction to Case Thermal Resistance		IGBT			0.24	°C/W
			Diode			0.4	
V_{ISOL}	RMS Isolation Voltage, any terminal to case t =1 min, 50/60Hz			4000			V
T_J	Operating junction temperature range			-40		175	°C
T_{STG}	Storage Temperature Range			-40		125	
T_C	Operating Case Temperature			-40		100	
Torque	Mounting torque	To heatsink	M6	3		5	N.m
		For terminals	M5	2		3.5	
Wt	Package Weight					300	g

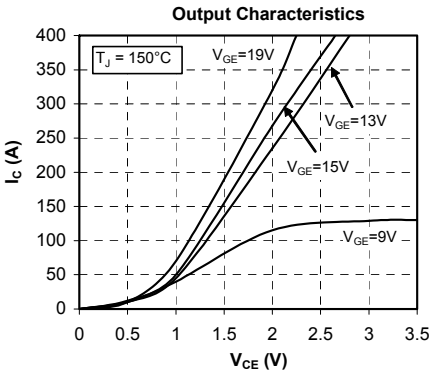
SP6 Package outline (dimensions in mm)

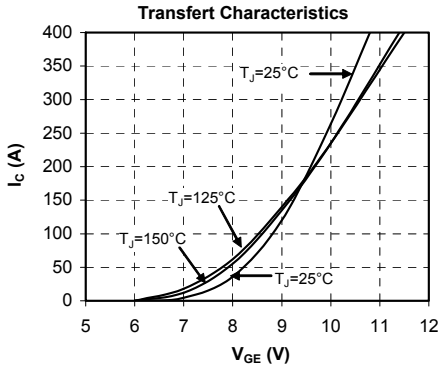


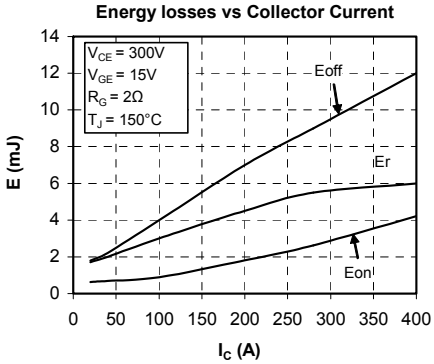
See application note APT0601 - Mounting Instructions for SP6 Power Modules on www.microsemi.com

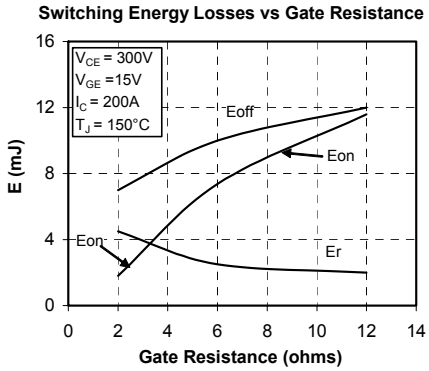
Typical Performance Curve

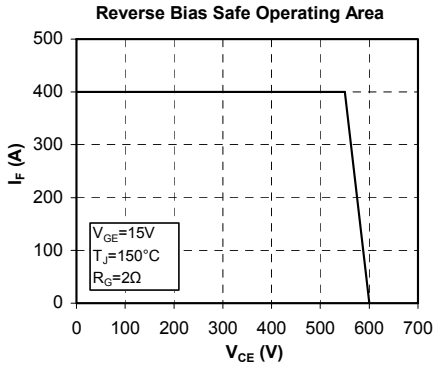


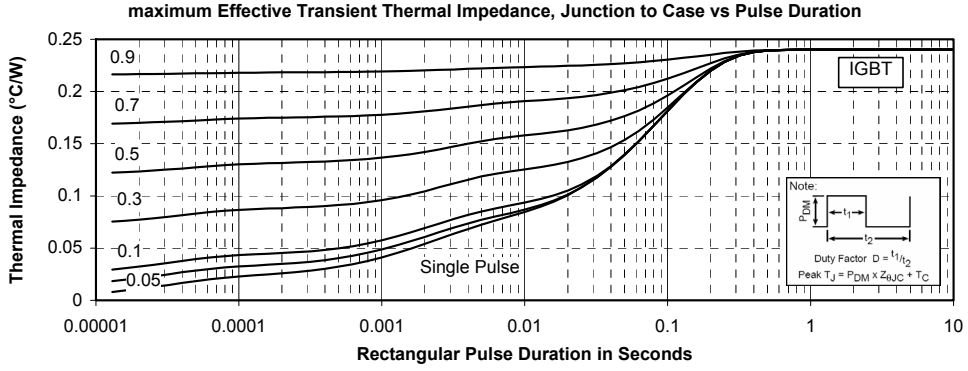


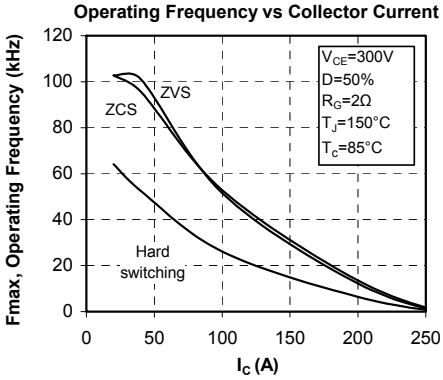


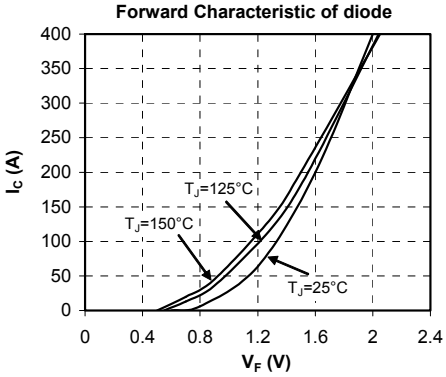


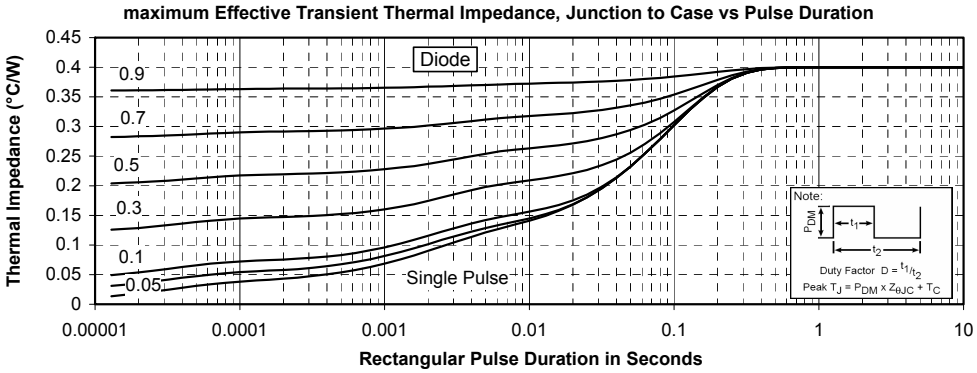







Operating Frequency vs Collector Current
Fmax, Operating Frequency (kHz)
I_C (A)
V_{CE}=300V
D=50%
R_G=2Ω
T_J=150°C
T_c=85°C
ZVS
ZCS
Hard switching
0
20
40
60
80
100
120
0
50
100
150
200
250


Forward Characteristic of diode
I_C (A)
V_F (V)
T_J=125°C
T_J=150°C
T_J=25°C
0
50
100
150
200
250
300
350
400
0
0.4
0.8
1.2
1.6
2
2.4


maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration
Thermal Impedance (°C/W)
Rectangular Pulse Duration in Seconds
Diode
0.9
0.7
0.5
0.3
0.1
0.05
Single Pulse
Note:
Duty Factor D = t_1/t_2
Peak T_J = P_{DM} x $Z_{\theta JC}$ + T_C
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
0.00001
0.0001
0.001
0.01
0.1
1
10

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