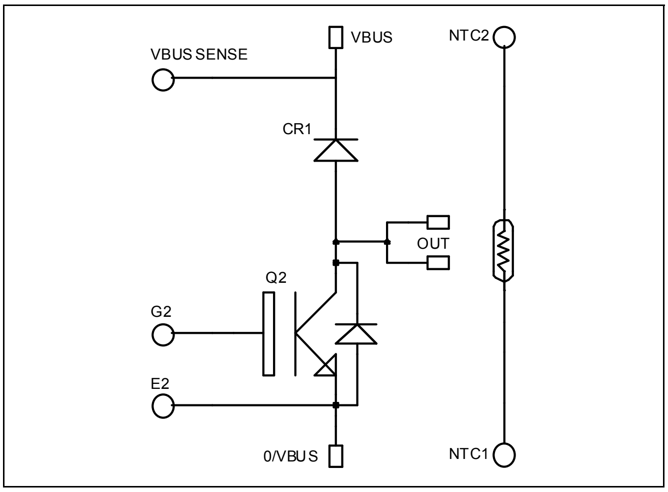
APTGT100DA170TG

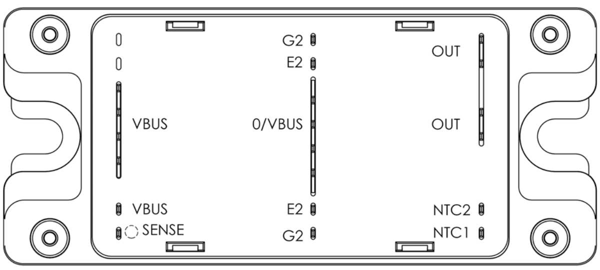
Boost chopper
Trench + Field Stop IGBT3
Power Module

V_{CES} = 1700V
I_C = 100A @ Tc = 80°C



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

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
  - Lead frames for power connections
- High level of integration
- Internal thermistor for temperature monitoring



Benefits
- Stable temperature behavior
- Very rugged
- Solderable terminals for easy PCB mounting
- 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		1700	V
I_C	Continuous Collector Current	T_C = 25°C	150	A
		T_C = 80°C	100	
I_{CM}	Pulsed Collector Current	T_C = 25°C	200	
V_{GE}	Gate – Emitter Voltage		±20	V
P_D	Maximum Power Dissipation	T_C = 25°C	560	W
RBSOA	Reverse Bias Safe Operating Area	T_j = 125°C	200A @ 1600V	

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} = 1700V				250	µA
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	V_{GE} = 15V, I_C = 100A	T_j = 25°C		2.0	2.4	V
			T_j = 125°C		2.4		
$V_{GE(th)}$	Gate Threshold Voltage	V_{GE} = V_{CE} , I_C = 2mA		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			9		nF
C_{oes}	Output Capacitance				0.36		
C_{res}	Reverse Transfer Capacitance				0.3		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C), V_{GE} = 15V, V_{Bus} = 900V, I_C = 100A, R_G = 4.7 Ω			370		ns
T_r	Rise Time				40		
$T_{d(off)}$	Turn-off Delay Time				650		
T_f	Fall Time				180		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (125°C), V_{GE} = 15V, V_{Bus} = 900V, I_C = 100A, R_G = 4.7 Ω			400		ns
T_r	Rise Time				50		
$T_{d(off)}$	Turn-off Delay Time				800		
T_f	Fall Time				300		
E_{on}	Turn-on Switching Energy	V_{GE} = 15V, V_{Bus} = 900V, I_C = 100A, R_G = 4.7 Ω	T_j = 125°C		32		mJ
E_{off}	Turn-off Switching Energy		T_j = 125°C		31		

Chopper diode ratings and characteristics

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
V_{RRM}	Maximum Peak Repetitive Reverse Voltage			1700			V
I_{RM}	Maximum Reverse Leakage Current	V_R=1700V	T_j = 25°C			250	µA
			T_j = 125°C			500	
I_F	DC Forward Current		Tc = 80°C		100		A
V_F	Diode Forward Voltage	I_F = 100A	T_j = 25°C		1.8	2.2	V
			T_j = 125°C		1.9		
t_{rr}	Reverse Recovery Time	I_F = 100A, V_R = 900V, di/dt =1000A/µs	T_j = 25°C		385		ns
			T_j = 125°C		490		
Q_{rr}	Reverse Recovery Charge		T_j = 25°C		25		µC
			T_j = 125°C		42		
E_r	Reverse Recovery Energy		T_j = 25°C		11		mJ
			T_j = 125°C		21		

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

Symbol	Characteristic	Min	Typ	Max	Unit
R_{25}	Resistance @ 25°C		50		kΩ
$B_{25/85}$	T_{25} = 298.15 K		3952		K

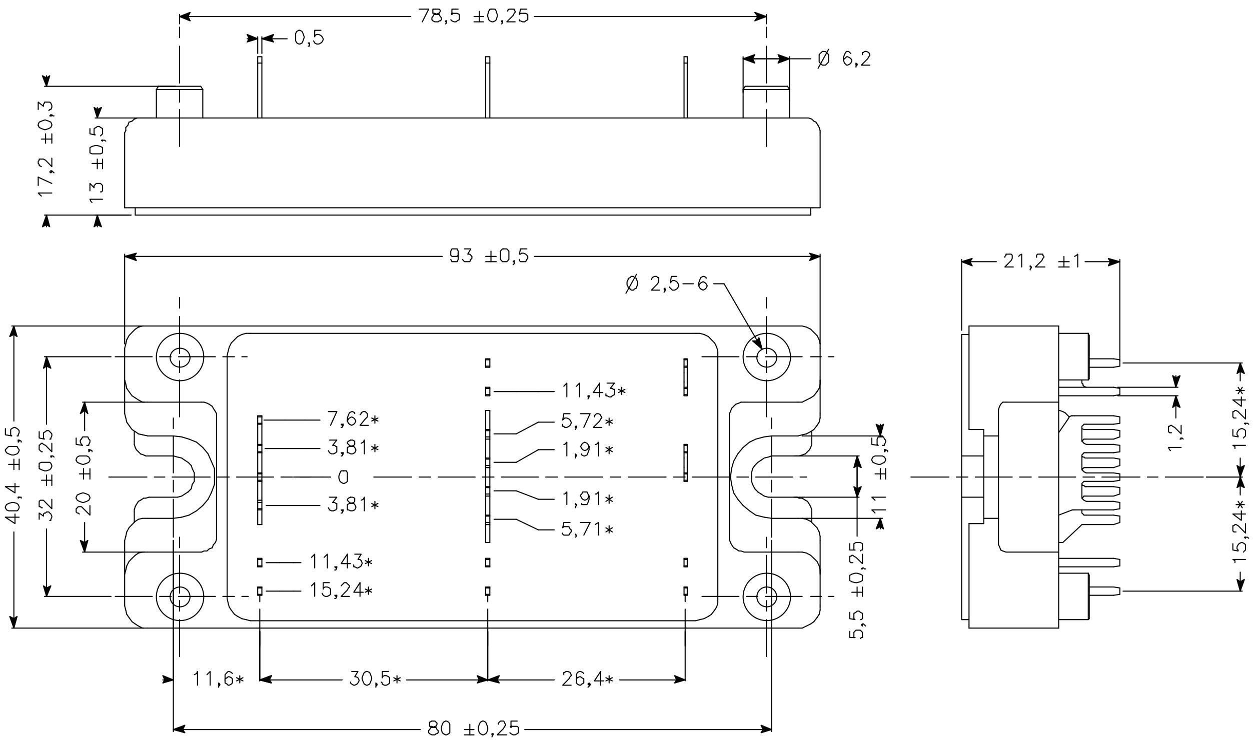
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

T: Thermistor temperature
R_T: Thermistor value at T

Thermal and package characteristics

Symbol	Characteristic			Min	Typ	Max	Unit
R_{thJC}	Junction to Case Thermal Resistance		IGBT			0.22	°C/W
			Diode			0.39	
V_{ISOL}	RMS Isolation Voltage, any terminal to case t =1 min, 50/60Hz			4000			V
T_J	Operating junction temperature range			-40		150	°C
T_{STG}	Storage Temperature Range			-40		125	
T_C	Operating Case Temperature			-40		100	
Torque	Mounting torque	To Heatsink	M5	2.5		4.7	N.m
Wt	Package Weight					160	g

SP4 Package outline (dimensions in mm)

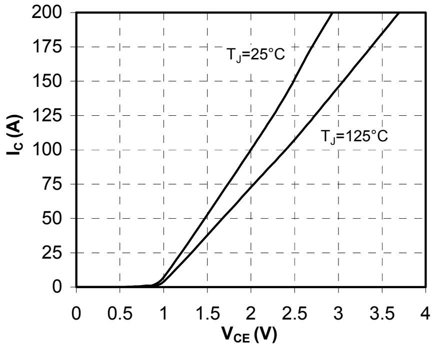


ALL DIMENSIONS MARKED " * " ARE TOLERENCED AS : ⌖|Ø1

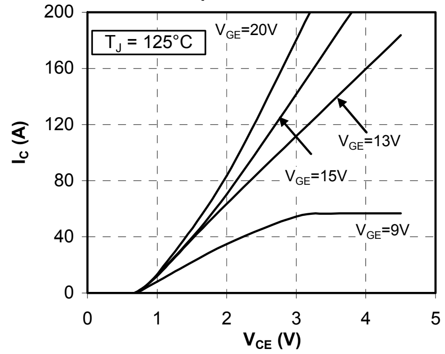
See application note APT0501 - Mounting Instructions for SP4 Power Modules on www.microsemi.com

Typical Performance Curve

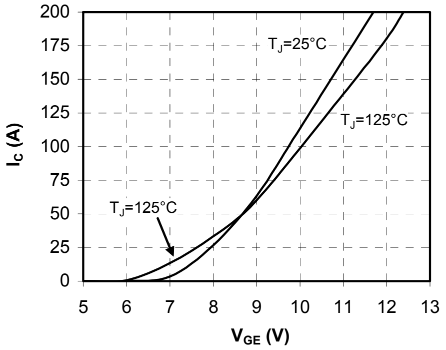
Output Characteristics (V_{GE}=15V)



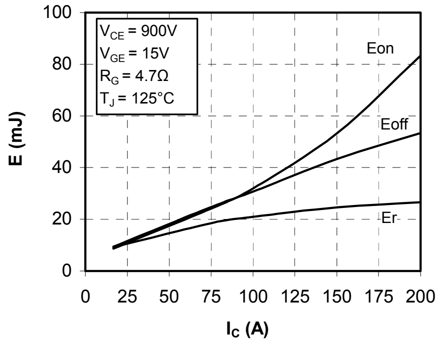
Output Characteristics



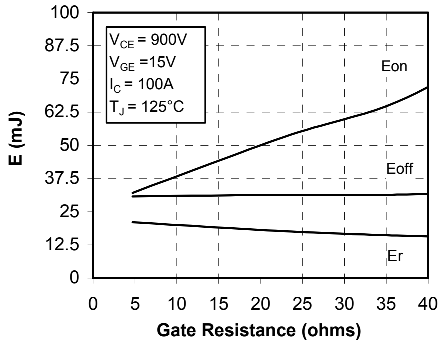
Transfert Characteristics



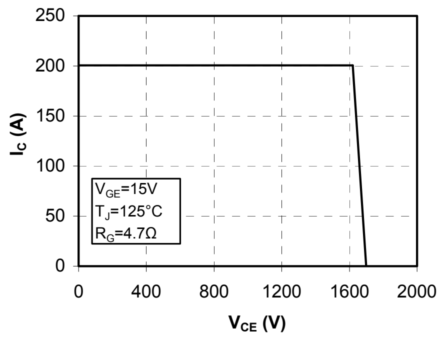
Energy losses vs Collector Current



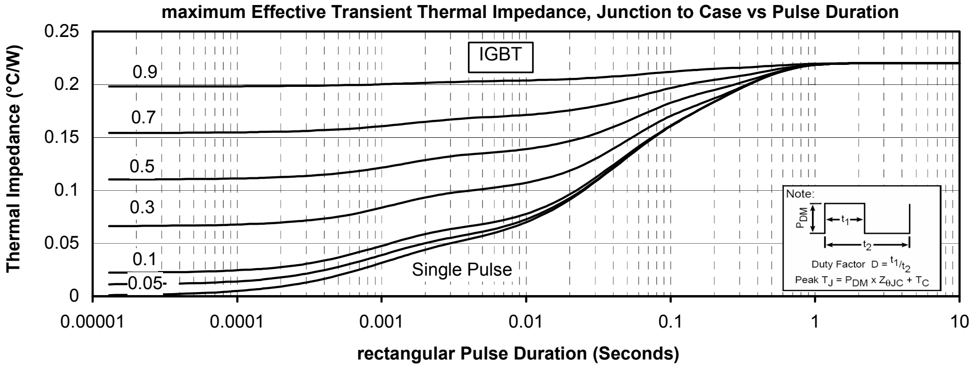
Switching Energy Losses vs Gate Resistance

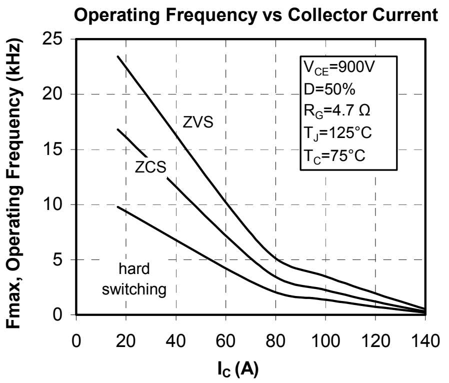


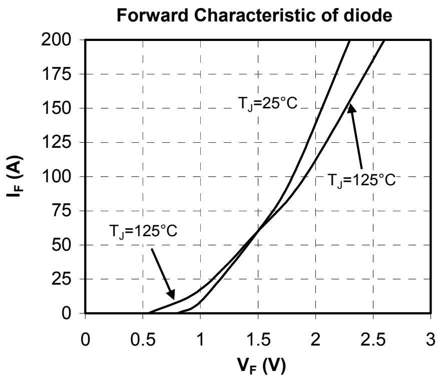
Reverse Bias Safe Operating Area

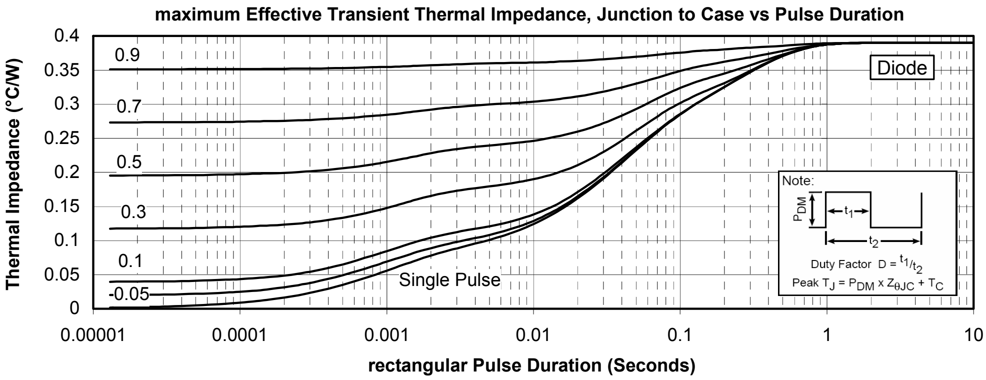


maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration




Operating Frequency vs Collector Current
Fmax, Operating Frequency (kHz)
I_C (A)
V_{CE}=900V
D=50%
R_G=4.7 Ω
T_J=125°C
T_C=75°C
ZVS
ZCS
hard switching
0
5
10
15
20
25
0
20
40
60
80
100
120
140


Forward Characteristic of diode
I_F (A)
V_F (V)
T_J=25°C
T_J=125°C
T_J=125°C
0
25
50
75
100
125
150
175
200
0
0.5
1
1.5
2
2.5
3


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

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