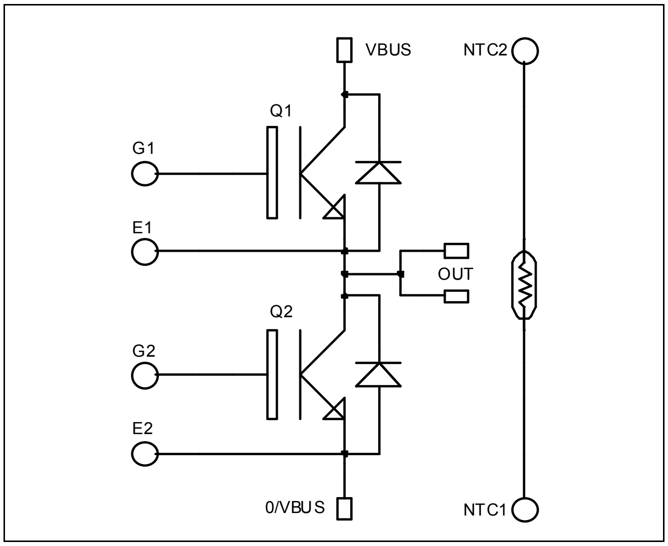
APTGT300A60TG

Phase leg
Trench + Field Stop IGBT
Power Module

V_{CES} = 600V
I_C = 300A @ Tc = 80°C

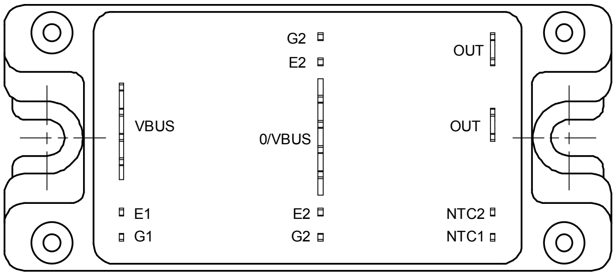


Application

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

Features

- Trench + Field Stop IGBT 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 T_C of V_{CEsat}
- 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	430	A
		T_C = 80°C	300	
I_{CM}	Pulsed Collector Current	T_C = 25°C	450	
V_{GE}	Gate – Emitter Voltage		±20	V
P_D	Maximum Power Dissipation	T_C = 25°C	935	W
RBSOA	Reverse Bias Safe Operating Area	T_j = 150°C	600A @ 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				350	µA
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	V_{GE} =15V I_C = 300A	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 = 1.5 mA		5.0	5.8	6.5	V
I_{GES}	Gate – Emitter Leakage Current	V_{GE} = 20V, V_{CE} = 0V				500	nA

Dynamic Characteristics

Symbol	*Characteristic*	*Test Conditions*		*Min*	*Typ*	*Max*	*Unit*
C_{ies}	Input Capacitance	V_{GE} = 0V V_{CE} = 25V f = 1MHz			18.4		nF
C_{oes}	Output Capacitance				1.16		
C_{res}	Reverse Transfer Capacitance				0.54		
Q_G	Gate charge	V_{GE}=±15V, I_C=300A V_{CE}=300V			3.2		µC
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C) V_{GE} = ±15V V_{Bus} = 300V I_C = 300A R_G = 2.2Ω			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 = 300A R_G = 2.2Ω			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 = 300A R_G = 2.2Ω	T_j = 25°C		1.7		mJ
			T_j = 150°C		3		
E_{off}	Turn off Energy		T_j = 25°C		8.2		mJ
			T_j = 150°C		10.6		
I_{sc}	Short Circuit data	V_{GE} ≤15V ; V_{Bus} = 360V t_p ≤ 6µs ; T_j = 150°C			1500		A

Reverse 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			150	µA
			T_j = 150°C			400	
I_F	DC Forward Current		Tc = 80°C		300		A
V_F	Diode Forward Voltage	I_F = 300A V_{GE} = 0V	T_j = 25°C		1.6	2	V
			T_j = 150°C		1.5		
t_{rr}	Reverse Recovery Time	I_F = 300A V_R = 300V di/dt =4000A/µs	T_j = 25°C		130		ns
			T_j = 150°C		225		
Q_{rr}	Reverse Recovery Charge		T_j = 25°C		13.7		µC
			T_j = 150°C		29		
E_r	Reverse Recovery Energy		T_j = 25°C		3.2		mJ
			T_j = 150°C		7		

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
$\Delta R_{25}/R_{25}$				5		%
$B_{25/85}$	T_{25} = 298.15 K			3952		K
$\Delta B/B$		T_C=100°C		4		%

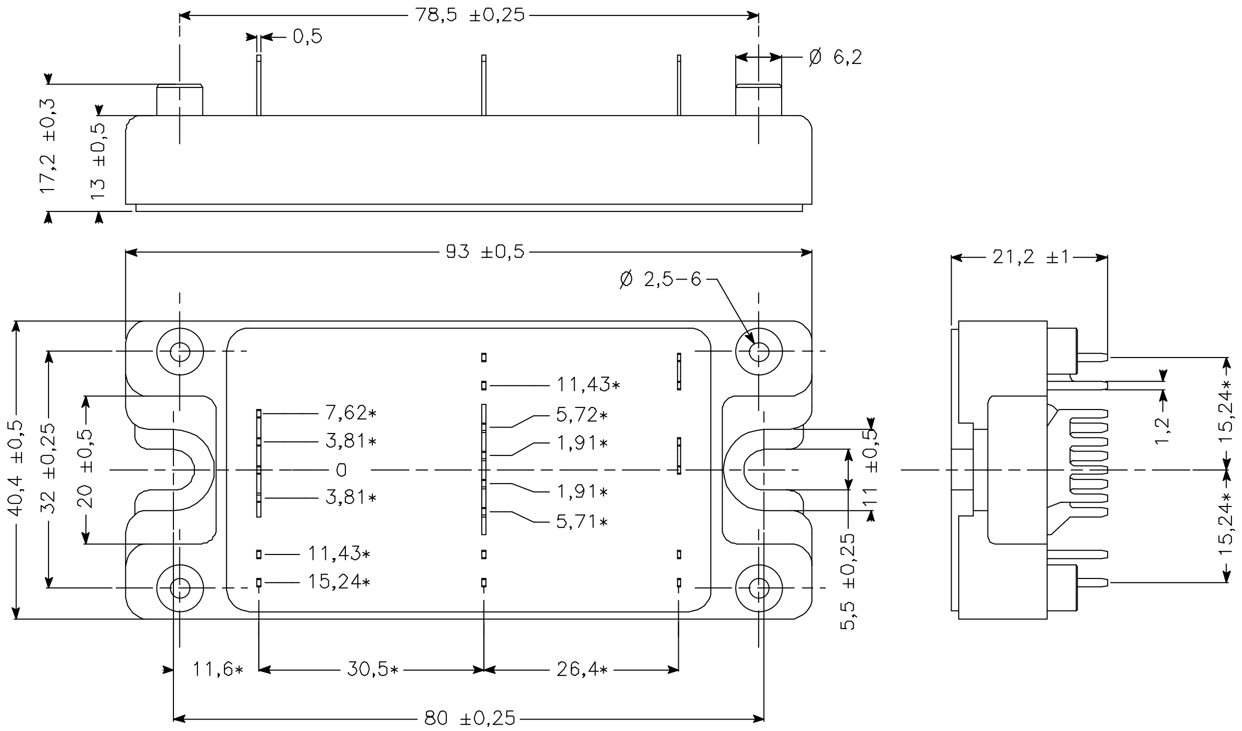
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

T: Thermistor temperature
R_T: Thermistor value at T

Thermal and package characteristics

Symbol	*Characteristic*			*Min*	*Typ*	*Max*	*Unit*
R_{thJC}	Junction to Case Thermal Resistance		IGBT			0.16	°C/W
			Diode			0.29	
V_{ISOL}	RMS Isolation Voltage, any terminal to case t =1 min, I isol<1mA, 50/60Hz			2500			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	M5	2.5		4.7	N.m
Wt	Package Weight					160	g

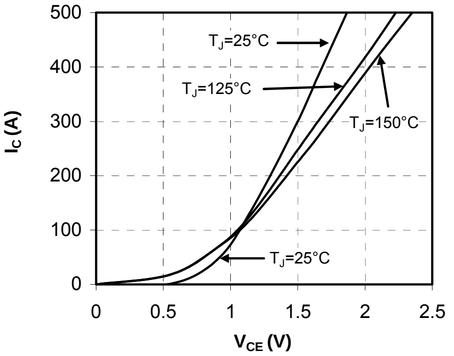
SP4 Package outline (dimensions in mm)

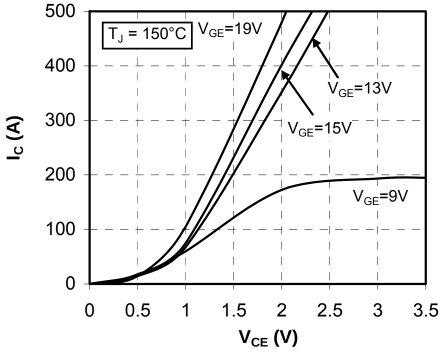


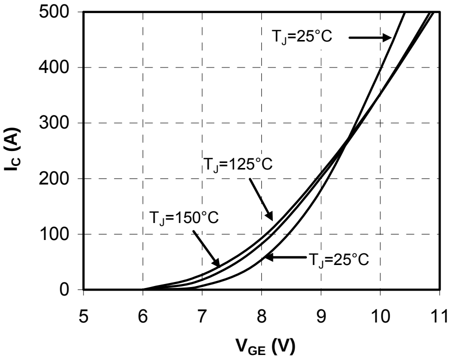
ALL DIMENSIONS MARKED " * " ARE TOLERENCED AS : ⌖ Ø1

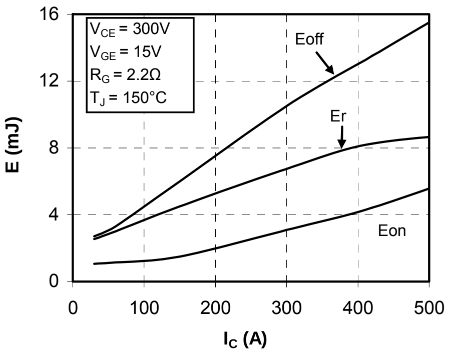
See application note APT0501 - Mounting Instructions for SP4 Power Modules on www.microsemi.com

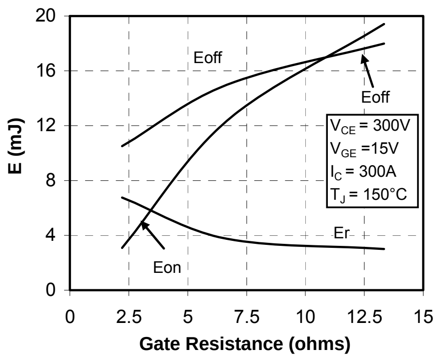
Typical Performance Curve

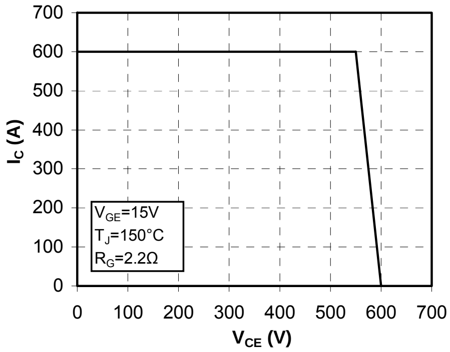

Output Characteristics (V_{GE}=15V)

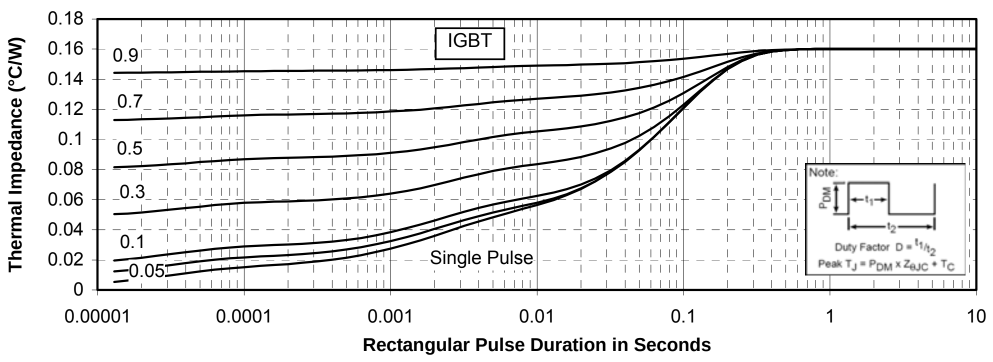

Output Characteristics

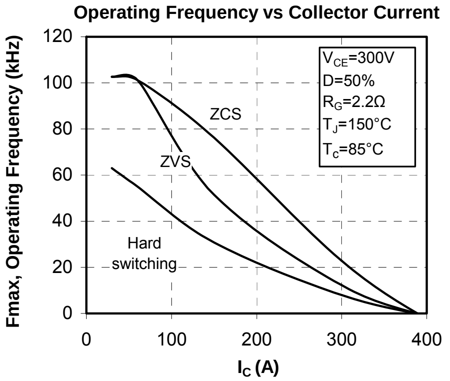

Transfert Characteristics

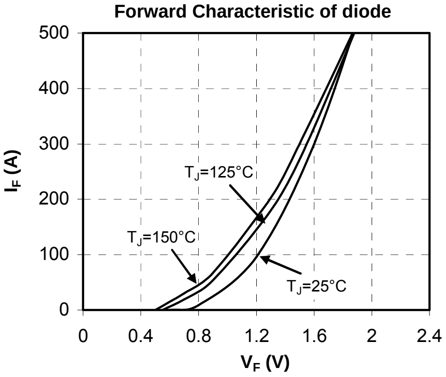

Energy losses vs Collector Current

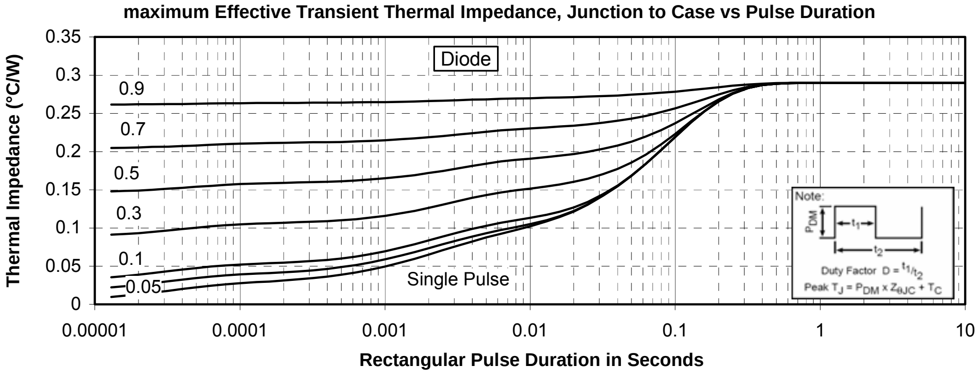

Switching Energy Losses vs Gate Resistance


Reverse Bias Safe Operating Area


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







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