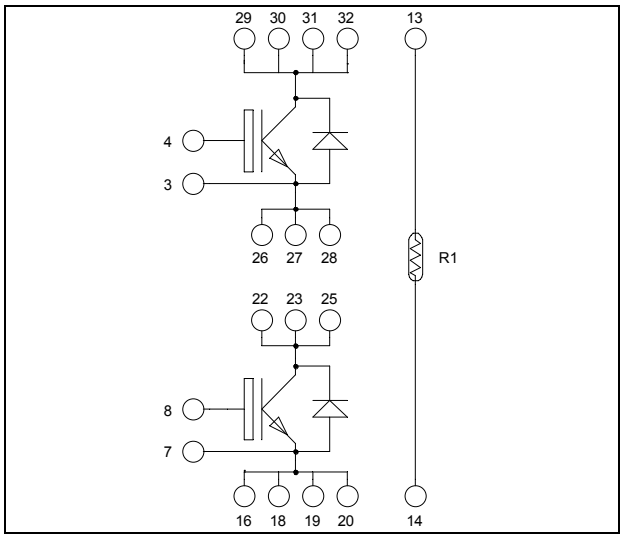
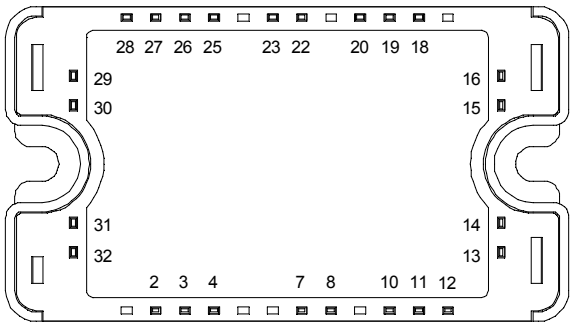
APTGT150A120T3AG

Phase leg
Trench + Field Stop IGBT3
Power Module

V_{CES} = 1200V
I_C = 150A @ Tc = 100°C





Pins 29/30/31/32 must be shorted together
Pins 26/27/28/22/23/25 must be shorted together to achieve a phase leg
Pins 16/18/19/20 must be shorted together

Application

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

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
- Very low stray inductance
- Kelvin emitter for easy drive
- Internal thermistor for temperature monitoring
- High level of integration
- AlN substrate for improved thermal performance

Benefits

- 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

Absolute maximum ratings

Symbol	*Parameter*		*Max ratings*	*Unit*
V_{CES}	Collector - Emitter Breakdown Voltage		1200	V
I_C	Continuous Collector Current	T_C = 25°C	220	A
		T_C = 100°C	150	
I_{CM}	Pulsed Collector Current	T_C = 25°C	300	
V_{GE}	Gate – Emitter Voltage		±20	V
P_D	Maximum Power Dissipation	T_C = 25°C	833	W
RBSOA	Reverse Bias Safe Operating Area	T_j = 125°C	300A @ 1150V	

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} = 1200V				250	µA
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	V_{GE} = 15V I_C = 150A	T_j = 25°C		1.7	2.1	V
			T_j = 125°C		2.0		
$V_{GE(th)}$	Gate Threshold Voltage	V_{GE} = V_{CE} , I_C = 3 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			10.7		nF
C_{oes}	Output Capacitance				0.56		
C_{res}	Reverse Transfer Capacitance				0.48		
Q_G	Gate charge	V_{GE}= ±15V ; V_{CE}=600V I_C=150A			1.4		µC
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C) V_{GE} = ±15V V_{Bus} = 600V I_C = 150A R_G = 2.2Ω			280		ns
T_r	Rise Time				40		
$T_{d(off)}$	Turn-off Delay Time				420		
T_f	Fall Time				75		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (125°C) V_{GE} = ±15V V_{Bus} = 600V I_C = 150A R_G = 2.2Ω			290		ns
T_r	Rise Time				45		
$T_{d(off)}$	Turn-off Delay Time				520		
T_f	Fall Time				90		
E_{on}	Turn-on Switching Energy	V_{GE} = ±15V V_{Bus} = 600V I_C = 150A R_G = 2.2Ω	T_j = 125°C		14		mJ
E_{off}	Turn-off Switching Energy		T_j = 125°C		16		
I_{sc}	Short Circuit data	V_{GE} ≤15V ; V_{Bus} = 900V t_p ≤ 10µs ; T_j = 125°C			600		A

Reverse diode ratings and characteristics

Symbol	*Characteristic*	*Test Conditions*		*Min*	*Typ*	*Max*	*Unit*
V_{RRM}	Maximum Peak Repetitive Reverse Voltage			1200			V
I_{RM}	Maximum Reverse Leakage Current	V_R=1200V	T_j = 25°C			350	µA
			T_j = 125°C			600	
I_F	DC Forward Current		Tc = 100°C		150		A
V_F	Diode Forward Voltage	I_F = 150A V_{GE} = 0V	T_j = 25°C		1.6	2.1	V
			T_j = 125°C		1.6		
t_{rr}	Reverse Recovery Time	I_F = 150A V_R = 600V di/dt =2500A/µs	T_j = 25°C		170		ns
			T_j = 125°C		280		
Q_{rr}	Reverse Recovery Charge		T_j = 25°C		14		µC
			T_j = 125°C		28		
E_r	Reverse Recovery Energy		T_j = 25°C		6		mJ
			T_j = 125°C		11		

Thermal and package characteristics

Symbol	Characteristic			Min	Typ	Max	Unit
R_{thJC}	Junction to Case Thermal Resistance		IGBT			0.15	°C/W
			Diode			0.25	
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	M4	2		3	N.m
Wt	Package Weight					110	g

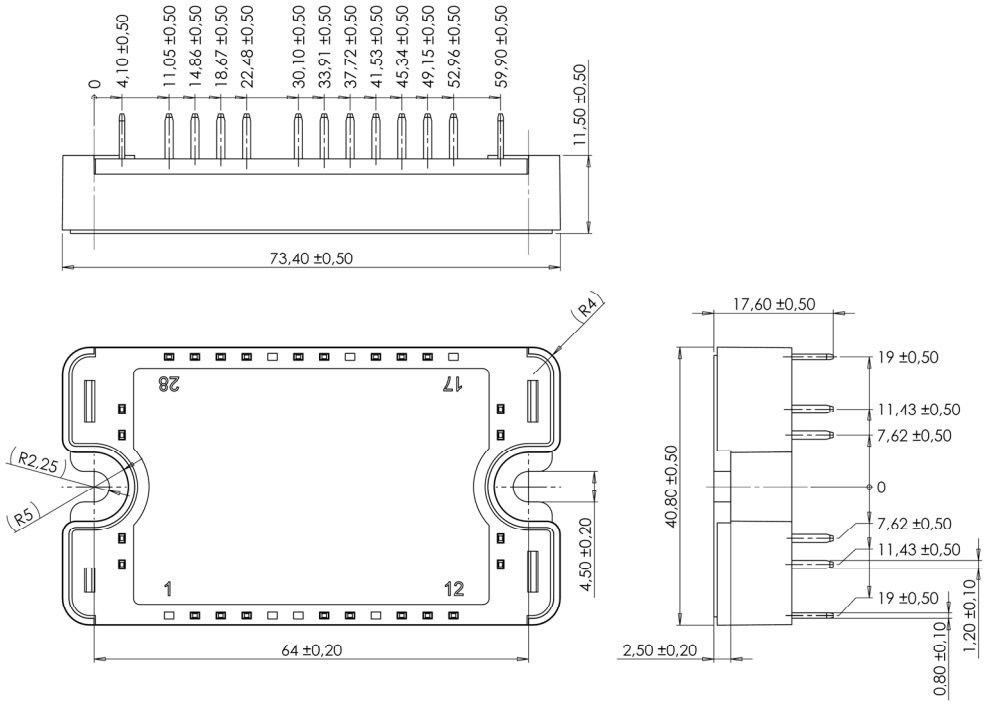
Temperature sensor NTC (see application note APT0406 on www.microsemi.com for more information).

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

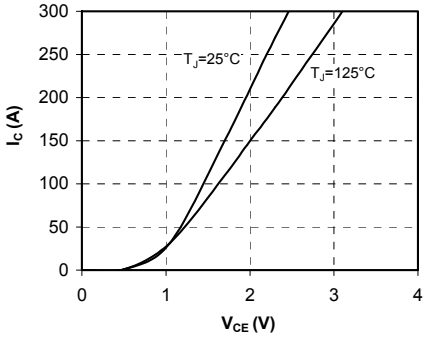
SP3 Package outline (dimensions in mm)



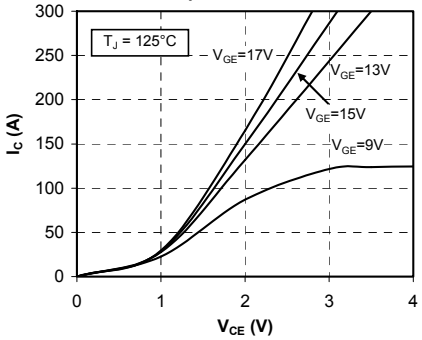
See application note 1901 - Mounting Instructions for SP3 Power Modules on www.microsemi.com

Typical Performance Curve

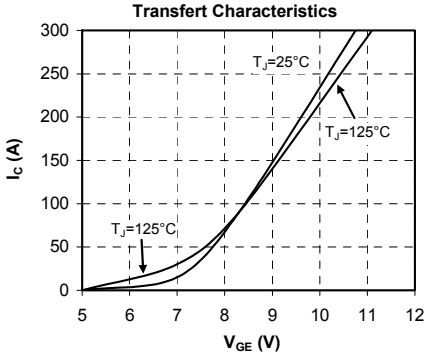
Output Characteristics (V_{GE}=15V)



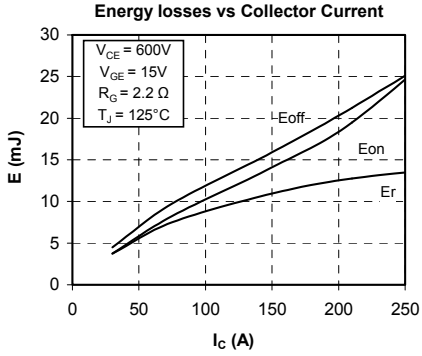
Output Characteristics



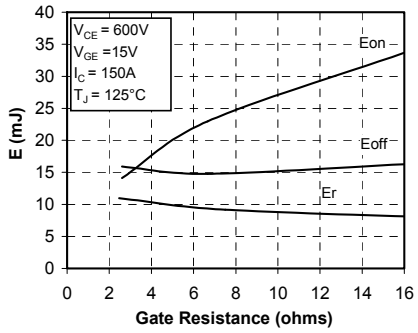
Transfert Characteristics



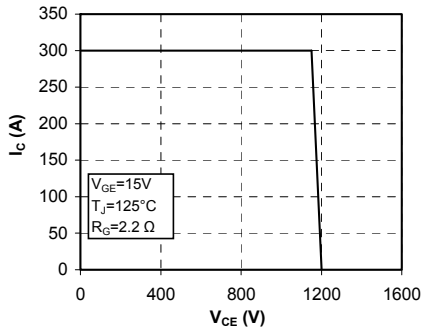
Energy losses vs Collector Current



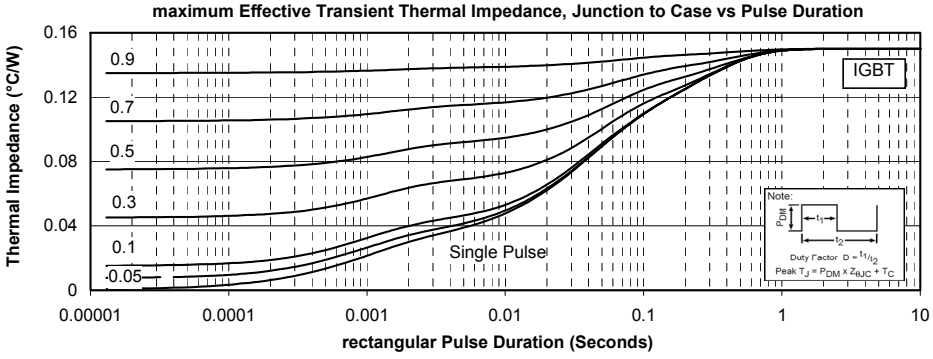
Switching Energy Losses vs Gate Resistance



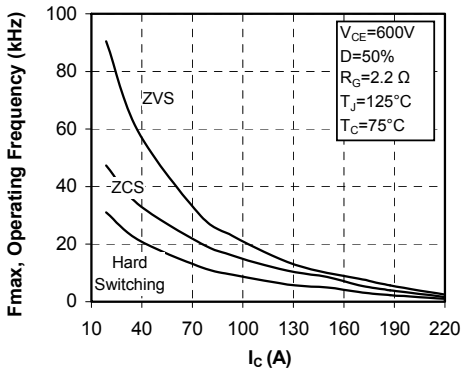
Reverse Bias Safe Operating Area



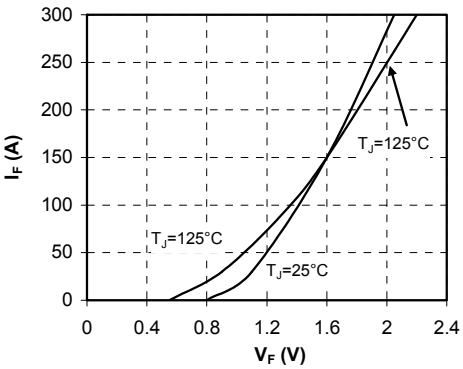
maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration



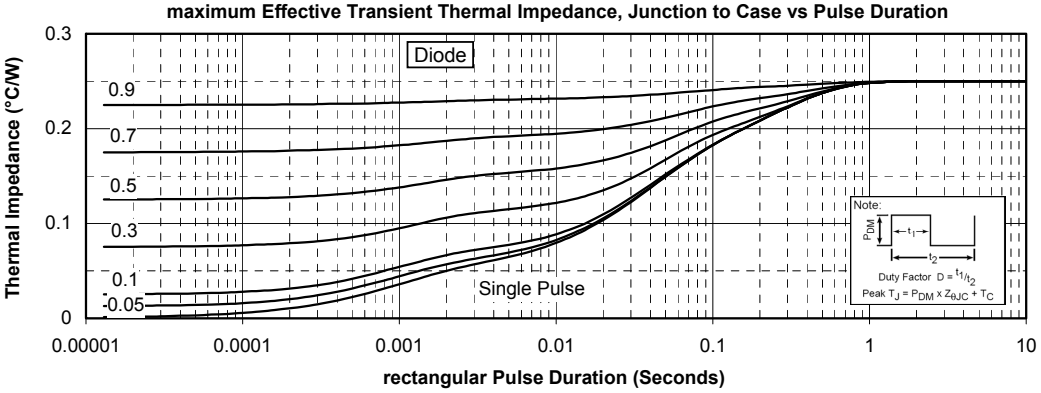
Operating Frequency vs Collector Current



Forward Characteristic of diode



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



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