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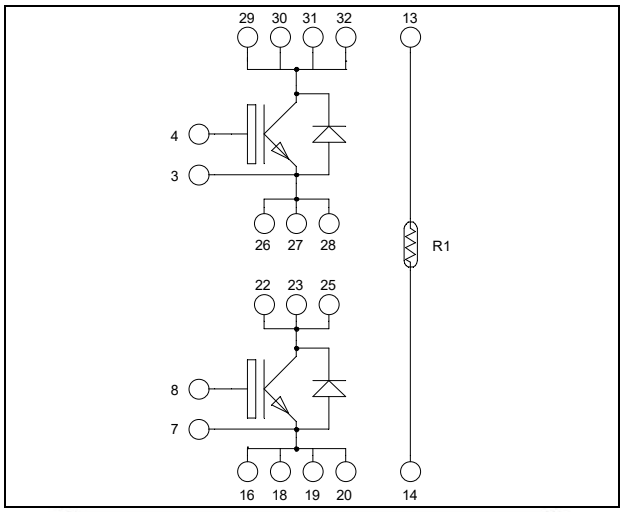
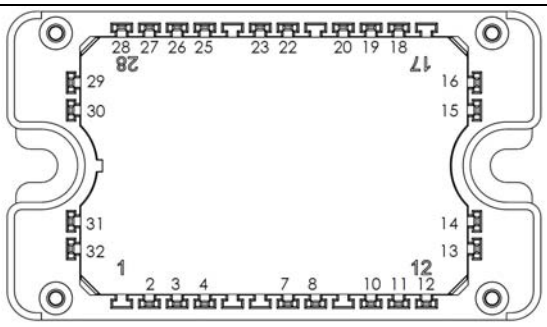
APTGT150A60T3AG

Phase leg
Trench + Field Stop IGBT3
Power Module

V_{CES} = 600V
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**
  - Low voltage drop
  - Low tail current
  - Switching frequency up to 20 kHz
  - Low leakage current
  - RBSOA and SCSOA rated
- Very low stray inductance
- Kelvin emitter for easy drive
- Internal thermistor for temperature monitoring
- 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
- Easy paralleling due to positive T_C of V_{CEsat}
- RoHS Compliant

All ratings @ T_j = 25°C unless otherwise specified

Absolute maximum ratings (Per IGBT)

Symbol	*Parameter*		*Max ratings*	*Unit*
V_{CES}	Collector - Emitter Voltage		600	V
I_C	Continuous Collector Current	T_C = 25°C	225	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	Power Dissipation	T_C = 25°C	600	W
RBSOA	Reverse Bias Safe Operating Area	T_j = 150°C	300A @ 550V	

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

Electrical Characteristics (Per IGBT)

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 = 150A	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				400	nA

Dynamic Characteristics (Per IGBT)

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
C_{ies}	Input Capacitance	V_{GE} = 0V V_{CE} = 25V f = 1MHz			9200		pF
C_{oes}	Output Capacitance				580		
C_{res}	Reverse Transfer Capacitance				270		
Q_G	Gate charge	V_{GE}= ±15V ; V_{CE}=300V I_C=150A			1.6		µC
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C) V_{GE} = ±15V V_{Bus} = 300V I_C = 150A R_G = 3.3Ω			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 = 150A R_G = 3.3Ω			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 = 150A R_G = 3.3Ω	T_j = 25°C		0.85		mJ
			T_j = 150°C		1.5		
E_{off}	Turn off Energy		T_j = 25°C		4.1		mJ
			T_j = 150°C		5.3		
I_{sc}	Short Circuit data	V_{GE} ≤15V ; V_{Bus} = 360V t_p ≤ 6µs ; T_j = 150°C			750		A
R_{thJC}	Junction to Case Thermal Resistance					0.25	°C/W

Reverse diode ratings and characteristics (Per diode)

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
V_{RRM}	Peak Repetitive Reverse Voltage					600	V
I_{RM}	Reverse Leakage Current	V_R = 600V				150	µA
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	V
			T_j = 150°C		1.5		
t_{rr}	Reverse Recovery Time	I_F = 150A V_R = 300V di/dt =2800A/µs	T_j = 25°C		100		ns
			T_j = 150°C		150		
Q_{rr}	Reverse Recovery Charge		T_j = 25°C		7.2		µC
			T_j = 150°C		15.2		
E_r	Reverse Recovery Energy		T_j = 25°C		1.7		mJ
			T_j = 150°C		3.6		
R_{thJC}	Junction to Case Thermal Resistance					0.42	°C/W

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				110	g

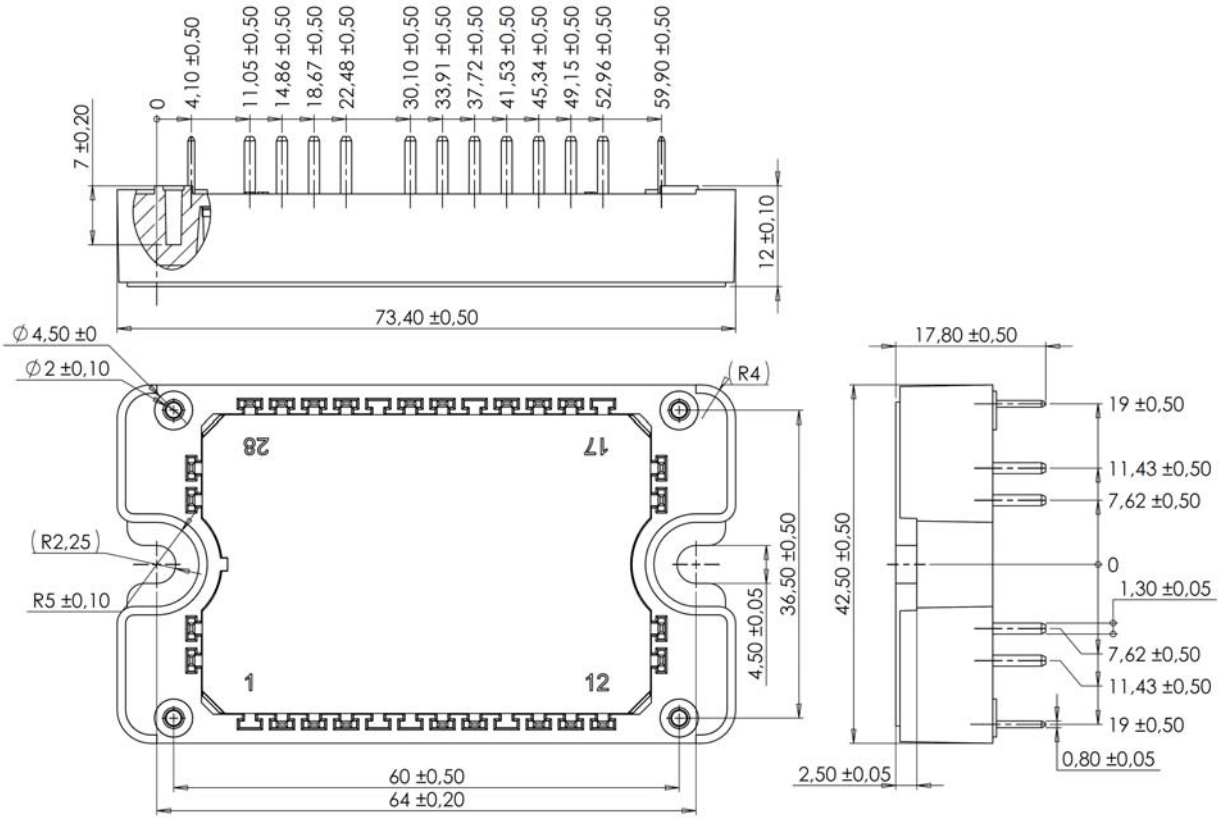
Temperature sensor NTC (see application note APT0406 on www.microsemi.com for more information).

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

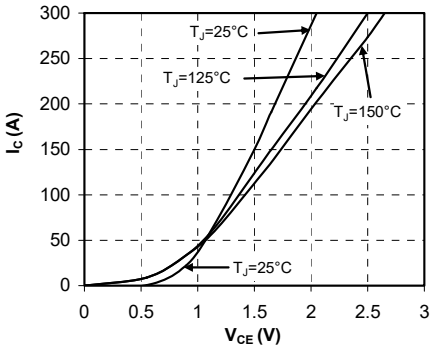
Package outline (dimensions in mm)



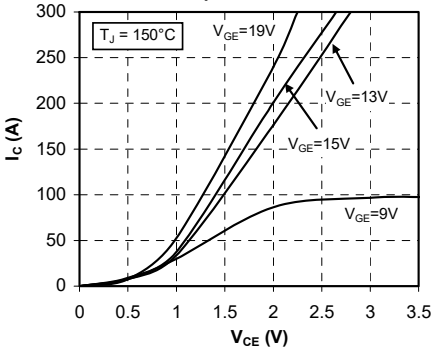
See application note 1901 - Mounting Instructions for SP3 Power Modules on www.microsemi.com

Typical Performance Curve

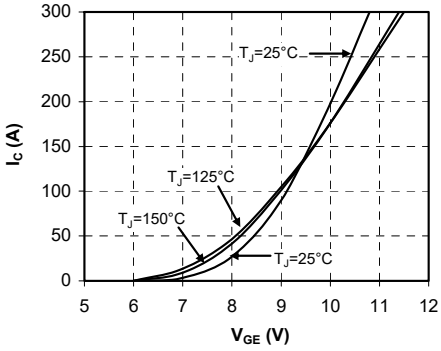
Output Characteristics (V_{GE}=15V)



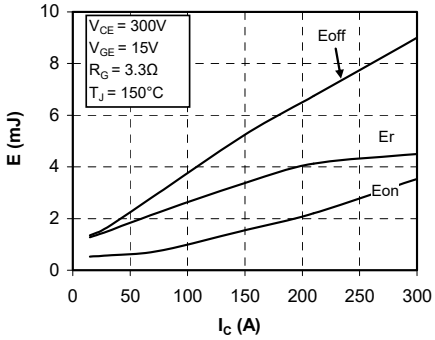
Output Characteristics



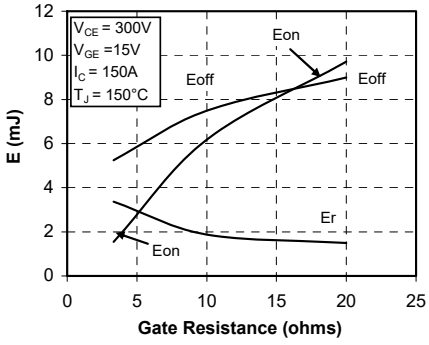
Transfert Characteristics



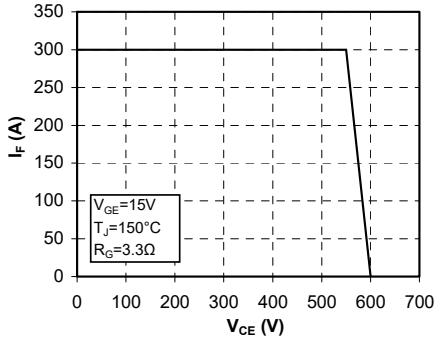
Energy losses vs Collector Current



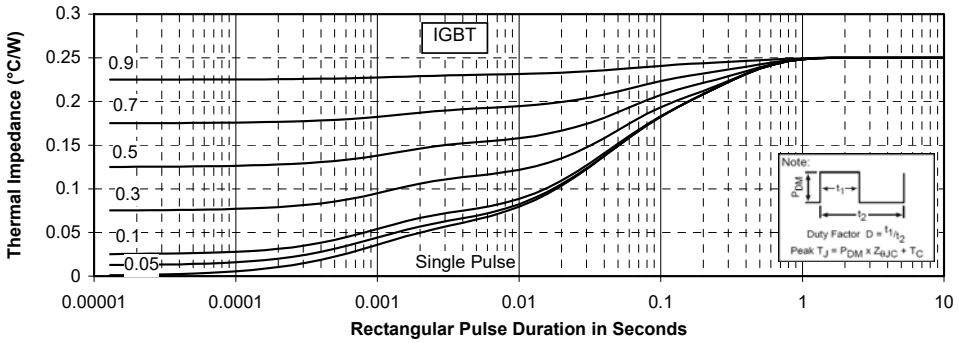
Switching Energy Losses vs Gate Resistance

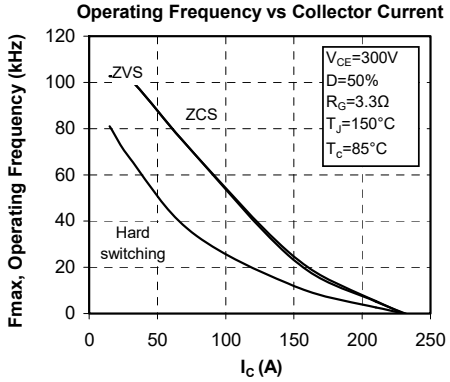


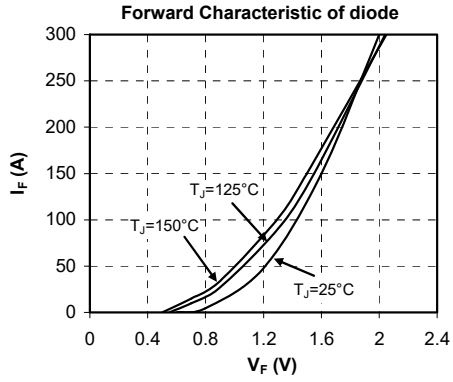
Reverse Bias Safe Operating Area

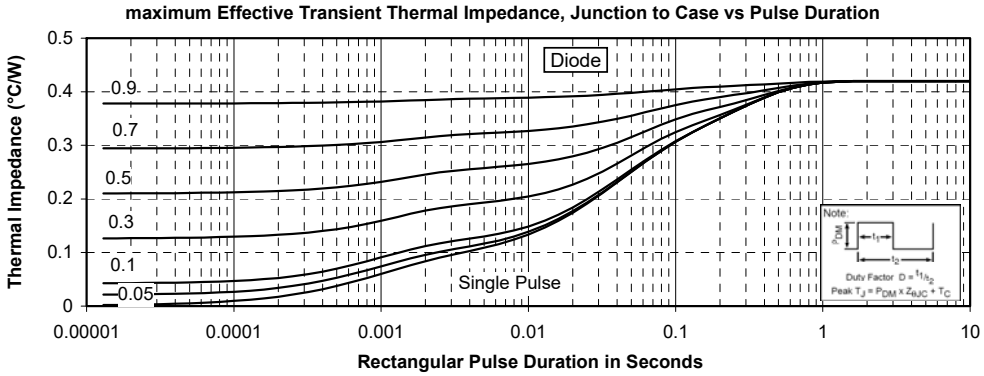


maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration




Operating Frequency vs Collector Current
Fmax, Operating Frequency (kHz)
I_C (A)
ZVS
ZCS
Hard switching
V_{CE}=300V
D=50%
R_G=3.3Ω
T_J=150°C
T_c=85°C


Forward Characteristic of diode
I_F (A)
V_F (V)
T_J=125°C
T_J=150°C
T_J=25°C


maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration
Thermal Impedance (°C/W)
Rectangular Pulse Duration in Seconds
Diode
Single Pulse
0.9
0.7
0.5
0.3
0.1
0.05
Note:

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