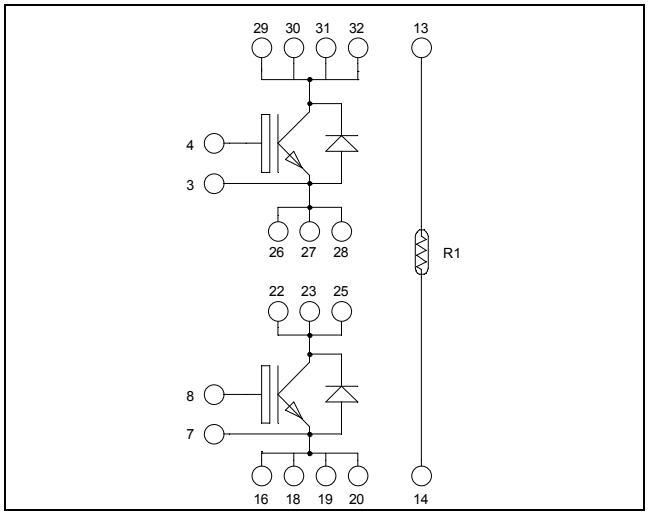
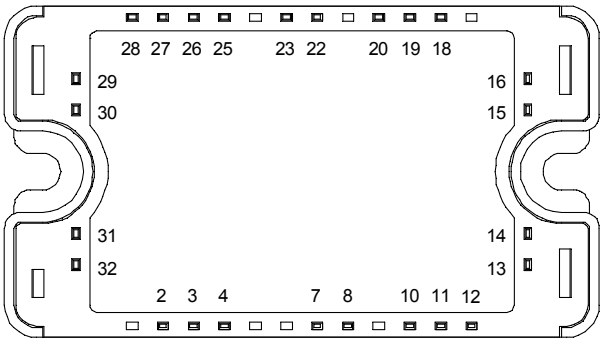
APTGLQ100A120T3AG

Phase leg
High speed Trench + Field Stop IGBT4
Power Module

V_{CES} = 1200V
I_C = 100A @ 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

- ***High speed Trench + Field Stop IGBT 4 Technology***
  - Low voltage drop
  - Low leakage current
  - Low switching losses
  - RBSOA and SCSOA rated
- Kelvin emitter for easy drive
- Very low stray inductance
- High level of integration
- Internal thermistor for temperature monitoring
- AlN substrate for improved thermal performance

Benefits

- Outstanding performance at high frequency operation
- 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 TC of VCEsat
- Each leg can be easily paralleled to achieve a phase leg of twice the current capability
- 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		1200	V
I_C	Continuous Collector Current	T_C = 25°C	185	A
		T_C = 100°C	100	
I_{CM}	Pulsed Collector Current	T_C = 25°C	375	
V_{GE}	Gate – Emitter Voltage		±20	V
P_D	Maximum Power Dissipation		650	W
RBSOA	Reverse Bias Safe Operating Area	T_j = 150°C	200A @ 1100V	

CAUTION: These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed.
See application note APT0502 on www.microsemi.com

Electrical Characteristics (per IGBT)

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
I_{CES}	Zero Gate Voltage Collector Current	V_{GE} = 0V, V_{CE} = 1200V				50	µA
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	V_{GE} =15V I_C = 100A	T_j = 25°C	1.7	2.05	2.4	V
			T_j = 150°C		2.6		
$V_{GE(th)}$	Gate Threshold Voltage	V_{GE} = V_{CE} , I_C = 3.8 mA		5.0	5.8	6.5	V
I_{GES}	Gate – Emitter Leakage Current	V_{GE} = 20V, V_{CE} = 0V				150	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			6150		pF
C_{oes}	Output Capacitance				350		
C_{res}	Reverse Transfer Capacitance				300		
Q_G	Gate charge	V_{GE} = 15V, I_C = 100A V_{CE} = 960V			450		nC
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C) V_{GE} = ±15V V_{Bus} = 600V I_C = 100A R_G = 5Ω			30		ns
T_r	Rise Time				57		
$T_{d(off)}$	Turn-off Delay Time				290		
T_f	Fall Time				16		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (150°C) V_{GE} = ±15V V_{Bus} = 600V I_C = 100A R_G = 5Ω			30		ns
T_r	Rise Time				49		
$T_{d(off)}$	Turn-off Delay Time				366		
T_f	Fall Time				48		
E_{on}	Turn on Energy	V_{GE} = ±15V V_{Bus} = 600V I_C = 100A R_G = 5Ω	T_j = 25°C		7.7		mJ
			T_j = 150°C		9		
E_{off}	Turn off Energy		T_j = 25°C		2.9		
			T_j = 150°C		5.4		
I_{sc}	Short Circuit data	V_{GE} ≤15V ; V_{Bus} = 900V t_p ≤10µs ; T_j = 150°C			350		A
R_{thJC}	Junction to Case Thermal Resistance					0.23	°C/W

Diode ratings and characteristics (per diode)

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
V_{RRM}	Peak Repetitive Reverse Voltage					1200	V
I_{RM}	Reverse Leakage Current	V_R=1200V				150	µA
I_F	DC Forward Current		Tc = 80°C		120		A
V_F	Diode Forward Voltage	I_F = 120A			2.6	3	V
		I_F = 240A			3		
		I_F = 120A	T_j = 125°C		1.8		
t_{rr}	Reverse Recovery Time	I_F = 120A V_R = 800V di/dt = 400A/µs	T_j = 25°C		265		ns
			T_j = 125°C		350		
Q_{rr}	Reverse Recovery Charge		T_j = 25°C		1120		nC
			T_j = 125°C		5780		
R_{thJC}	Junction to Case Thermal Resistance					0.37	°C/W

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

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		%

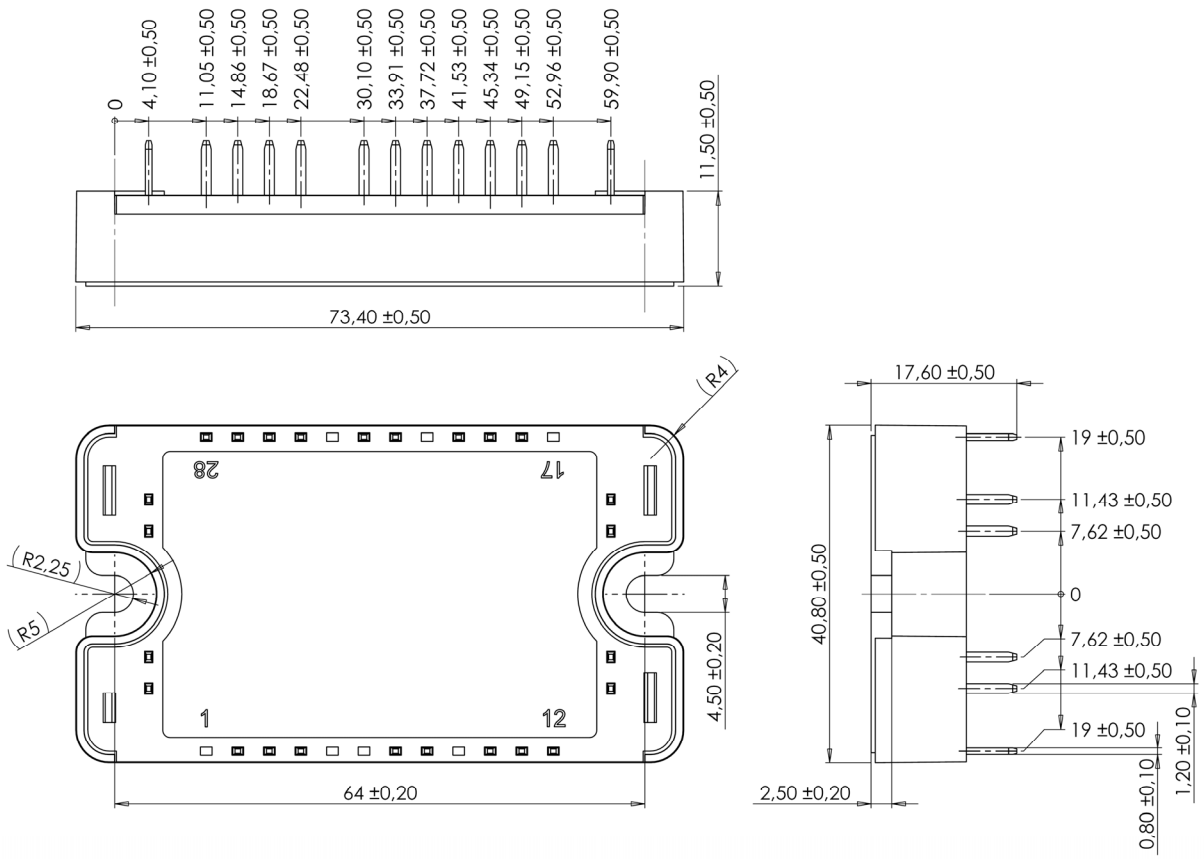
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

T: Thermistor temperature
R_T: Thermistor value at T

Thermal and package characteristics

Symbol	*Characteristic*			*Min*	*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	100	
Torque	Mounting torque	To heatsink	M4	2	3	N.m
Wt	Package Weight				110	g

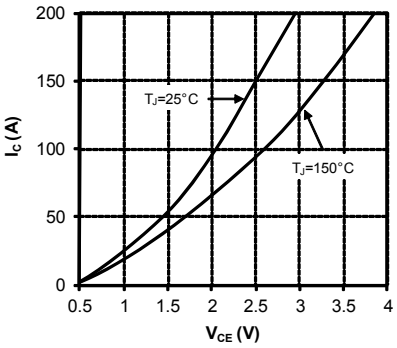
Package outline (dimensions in mm)



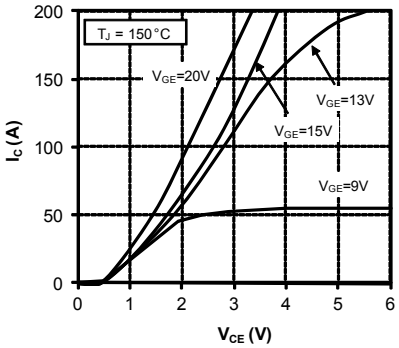
See application note 1901 - Mounting Instructions for SP3 Power Modules on www.microsemi.com

Typical performance curve

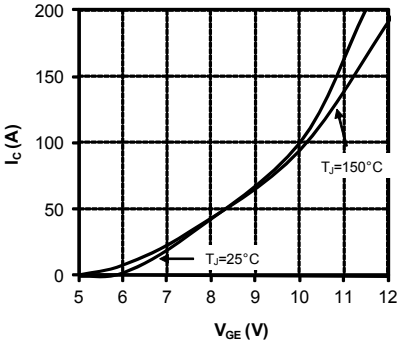
Output Characteristics (V_{GE}=15V)



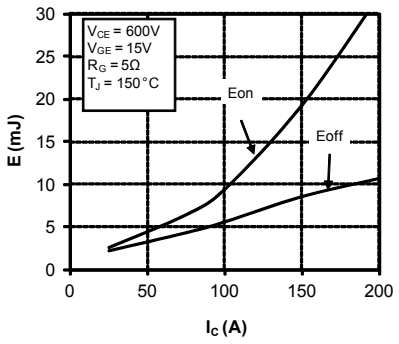
Output Characteristics



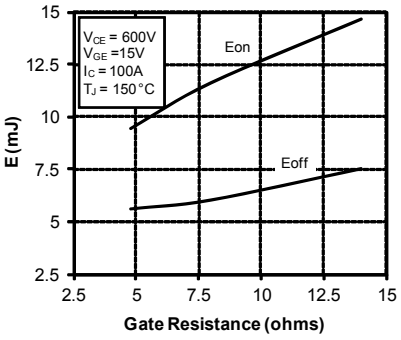
Transfert Characteristics



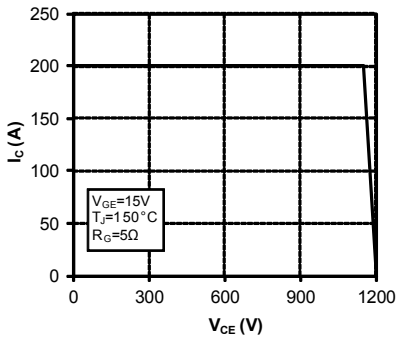
Energy losses vs Collector Current



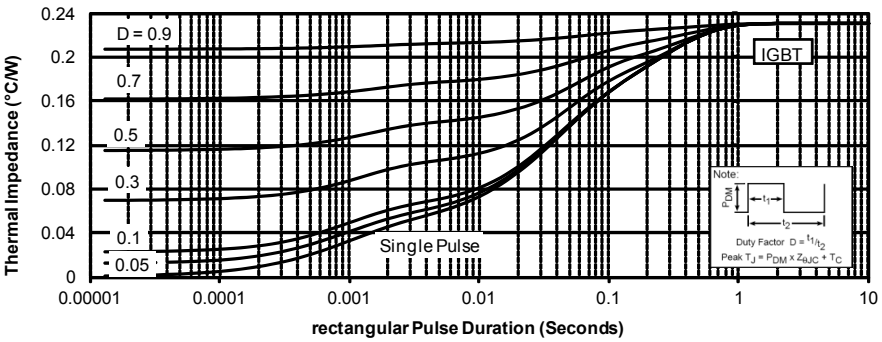
Switching Energy Losses vs Gate Resistance

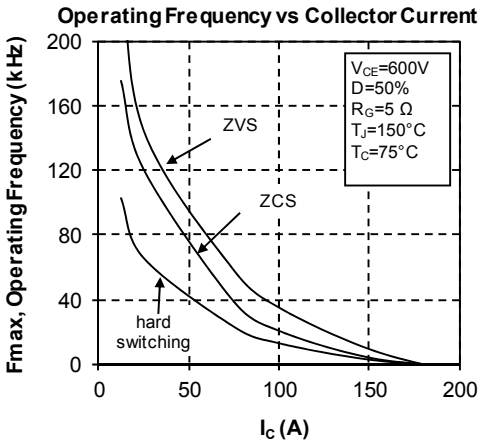


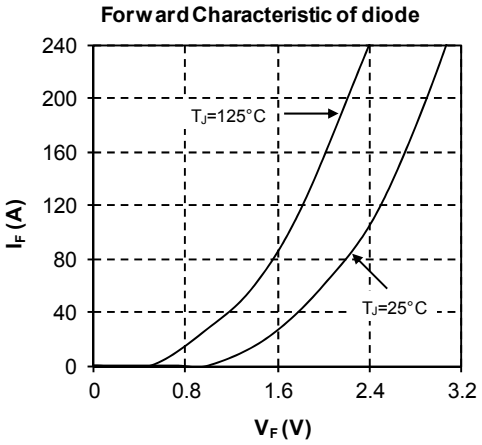
Reverse Bias Safe Operating Area

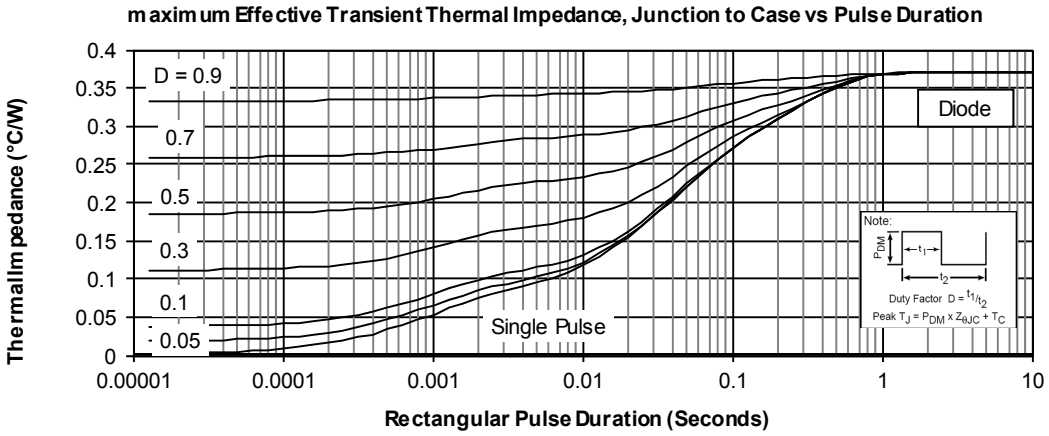


maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration




Operating Frequency vs Collector Current
Fmax, Operating Frequency (kHz)
200
160
120
80
40
0
0
50
100
150
200
I_C (A)
V_{CE}=600V
D=50%
R_G=5 Ω
T_J=150°C
T_C=75°C
ZVS
ZCS
hard
switching


Forward Characteristic of diode
I_F (A)
240
200
160
120
80
40
0
0
0.8
1.6
2.4
3.2
V_F (V)
T_J=125°C
T_J=25°C


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

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