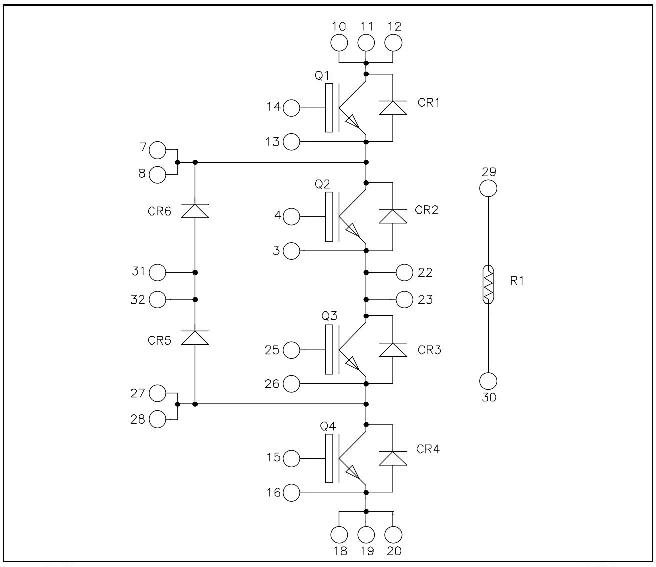
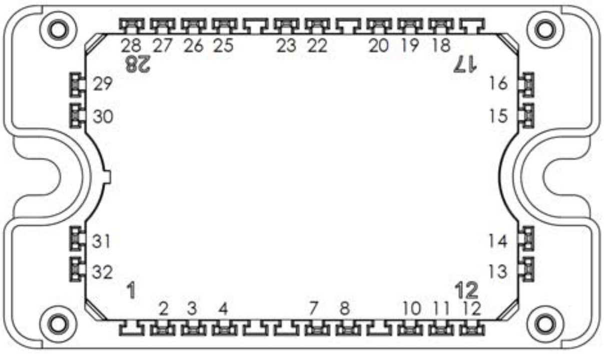
APTGL60TL120T3G

Three level inverter
Trench + Field Stop IGBT4

V_{CES} = 1200V
I_C = 60A @ Tc = 80°C





All multiple inputs and outputs must be shorted together
Example: 10/11/12 ; 7/8 …

Application
- Solar converter
- Uninterruptible Power Supplies

Features
- Trench + Field Stop IGBT 4
  - Low voltage drop
  - Low leakage current
  - Low switching losses
- Kelvin emitter for easy drive
- Very low stray inductance
- High level of integration
- Internal thermistor for temperature monitoring

Benefits
- Stable temperature behavior
- Very rugged
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Low profile
- RoHS Compliant

All ratings @ T_j = 25°C unless otherwise specified

Q1 to Q4 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	80	A
		T_C = 80°C	60	
I_{CM}	Pulsed Collector Current	T_C = 25°C	100	
V_{GE}	Gate – Emitter Voltage		±20	V
P_D	Power Dissipation	T_C = 25°C	280	W

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

Q1 to Q4 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				1	mA
$V_{CE(sat)}$	Collector Emitter saturation Voltage	V_{GE} = 15V I_C = 50A	T_j = 25°C		1.8	2.2	V
			T_j = 150°C		2.2		
$V_{GE(th)}$	Gate Threshold Voltage	V_{GE} = V_{CE} , I_C = 1.6mA		5.0	5.8	6.5	V
I_{GES}	Gate – Emitter Leakage Current	V_{GE} = 20V, V_{CE} = 0V				400	nA

Q1 to Q4 Dynamic Characteristics (per IGBT)

Symbol	*Characteristic*	*Test Conditions*		*Min*	*Typ*	*Max*	*Unit*
C_{ies}	Input Capacitance	V_{GE} = 0V V_{CE} = 25V f = 1MHz			2770		pF
C_{oes}	Output Capacitance				205		
C_{res}	Reverse Transfer Capacitance				160		
Q_G	Gate charge	V_{GE}= ±15V ; V_{CE}=600V I_C=50A			0.38		µC
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C) V_{GE} = ±15V V_{CE} = 600V I_C = 50A R_G = 8.2Ω			50		ns
T_r	Rise Time				27		
$T_{d(off)}$	Turn-off Delay Time				270		
T_f	Fall Time				70		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (150°C) V_{GE} = ±15V V_{CE} = 600V I_C = 50A R_G = 8.2Ω			50		ns
T_r	Rise Time				30		
$T_{d(off)}$	Turn-off Delay Time				290		
T_f	Fall Time				80		
E_{on}	Turn-on Switching Energy	V_{GE} = ±15V V_{CE} = 600V I_C = 50A R_G = 8.2Ω	T_J = 25°C		3.8		mJ
			T_J = 150°C		5.5		
E_{off}	Turn-off Switching Energy		T_J = 25°C		2.5		mJ
			T_J = 150°C		4.5		
I_{sc}	Short Circuit data	V_{GE} ≤15V ; V_{Bus} = 900V t_p ≤10µs ; T_j = 150°C			200		A
R_{thJC}	Junction to Case Thermal Resistance					0.53	°C/W

CR1 to CR6 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=600V				100	µA
I_F	DC Forward Current		Tc = 80°C		30		A
V_F	Diode Forward Voltage	I_F = 30A			2.6	3.1	V
		I_F = 60A			3.2		
		I_F = 30A	T_j = 125°C		1.8		
t_{rr}	Reverse Recovery Time	I_F = 30A V_R = 800V di/dt =200A/µs	T_j = 25°C		300		ns
			T_j = 125°C		380		
Q_{rr}	Reverse Recovery Charge		T_j = 25°C		360		nC
			T_j = 125°C		1700		
E_{rr}	Reverse Recovery Energy	I_F = 30A V_R = 800V di/dt =1000A/µs	T_j = 125°C		1.6		mJ
R_{thJC}	Junction to Case Thermal Resistance					1.2	°C/W

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
ΔB/B		T_C=100°C		4		%

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

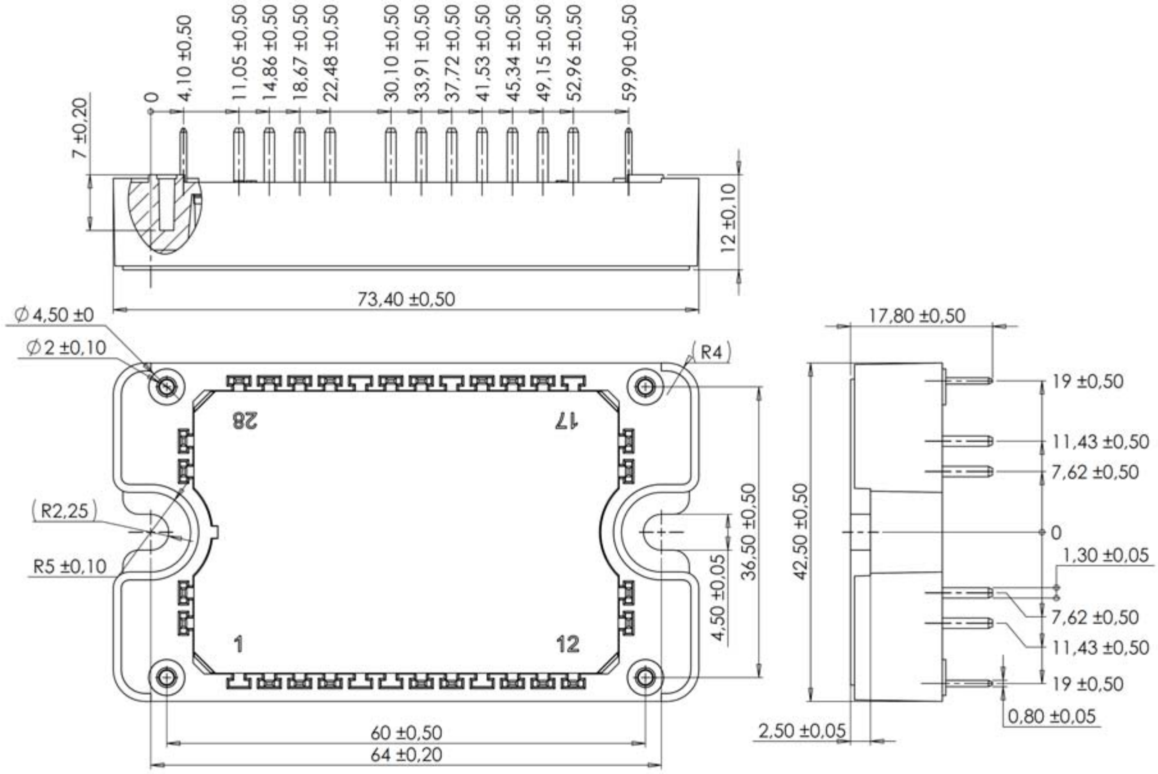
T: Thermistor temperature

R_T: Thermistor value at T

Thermal and package characteristics

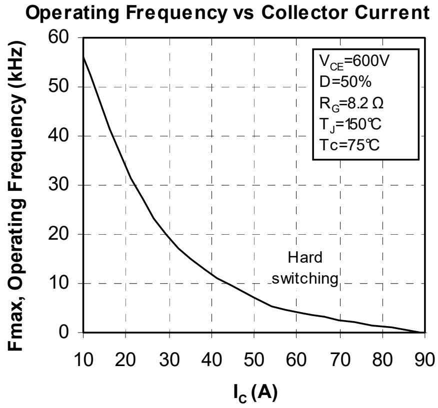
Symbol	*Characteristic*			*Min*	*Max*	*Unit*
V_{ISOL}	RMS Isolation Voltage, any terminal to case t =1 min, 50/60Hz			4000		V
T_J	Operating junction temperature range			-40	175	°C
T_{JOP}	Recommended junction temperature under switching conditions			-40	$T_J$max -25	
T_{STG}	Storage Temperature Range			-40	125	
T_C	Operating Case Temperature			-40	125	
Torque	Mounting torque	To heatsink	M4	2	3	N.m
Wt	Package Weight				110	g

Package outline (dimensions in mm)

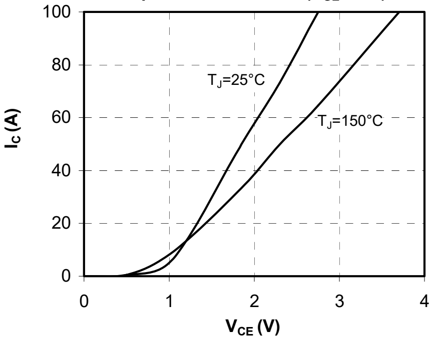


See application note 1906 - Mounting Instructions for SP3F Power Modules on www.microsemi.com

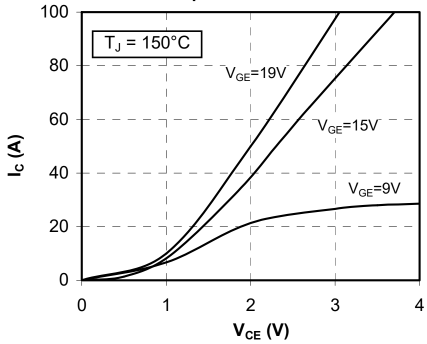
Q1 to Q4 Typical performance curve



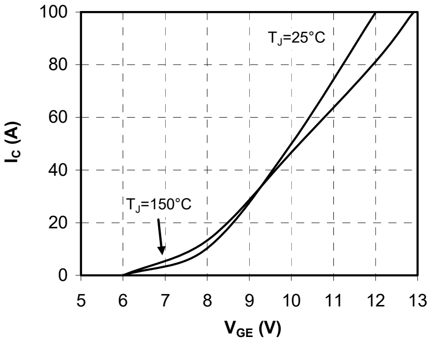
Output Characteristics (V_{GE}=15V)



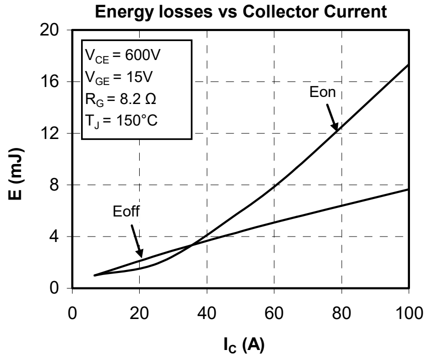
Output Characteristics



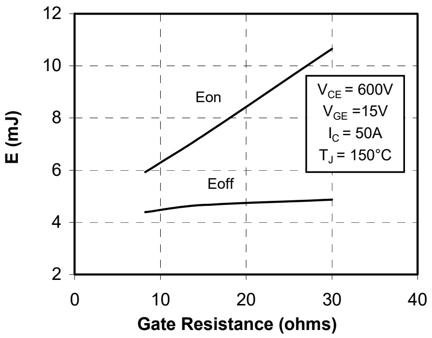
Transfert Characteristics



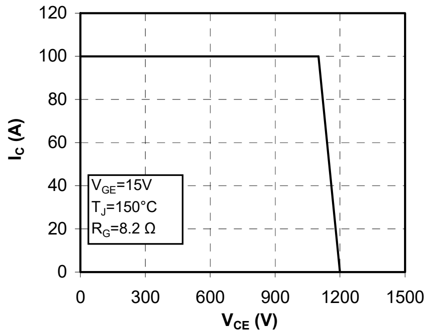
Energy losses vs Collector Current



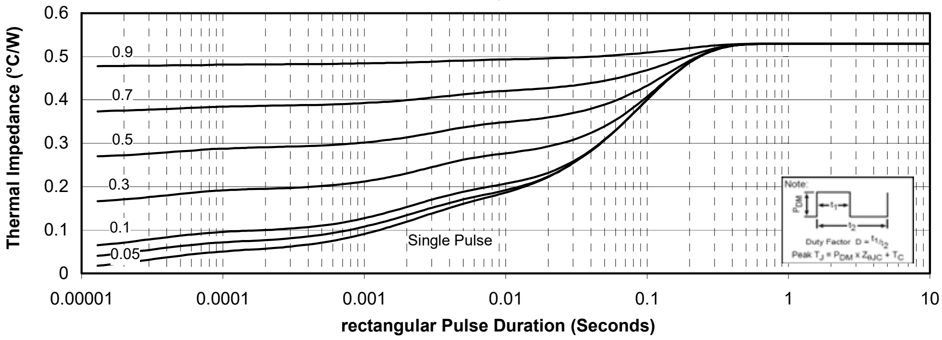
Switching Energy Losses vs Gate Resistance



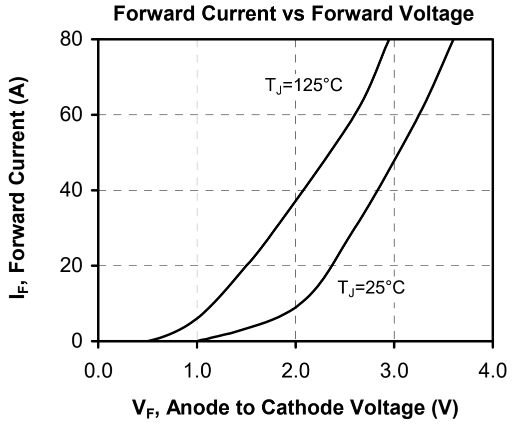
Reverse Bias Safe Operating Area

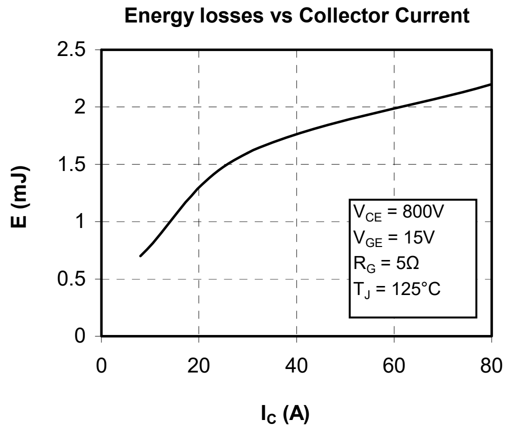


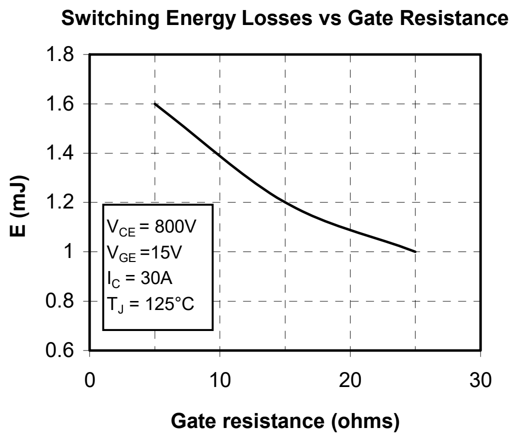
maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration

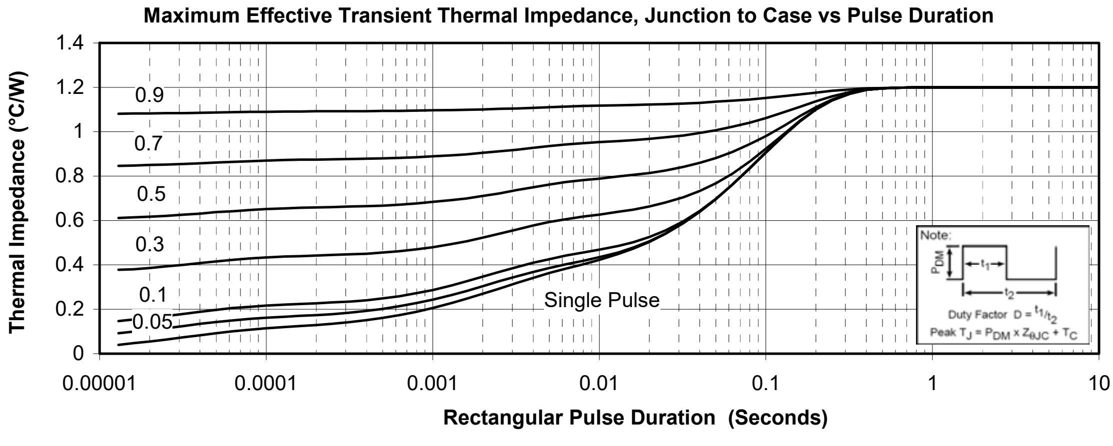


CR1 to CR6 Typical performance curve









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