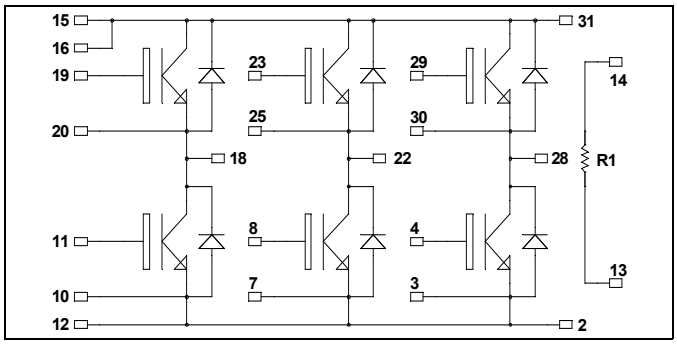
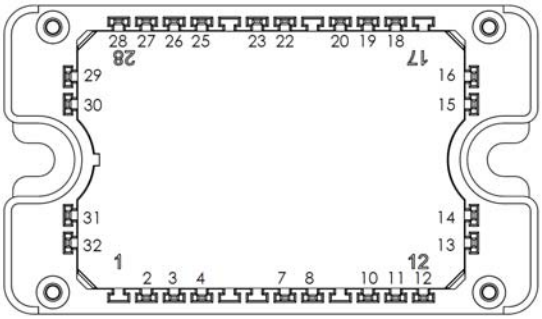
APTGT25X120T3G

3 Phase bridge
Trench + Field Stop IGBT3
Power Module

V_{CES} = 1200V
I_C = 25A @ Tc = 80°C



It is recommended to connect a decoupling capacitor between pins 31 & 2 to reduce switching overvoltages, if DC Power is connected between pins 15, 16 & 12.
Pins 15 & 16 must be shorted together.



Application

- 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
- Kelvin emitter for easy drive
- Very low stray inductance
- Internal thermistor for temperature monitoring

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
- 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	40	A
		T_C = 80°C	25	
I_{CM}	Pulsed Collector Current	T_C = 25°C	50	
V_{GE}	Gate – Emitter Voltage		±20	V
P_D	Power Dissipation	T_C = 25°C	156	W
RBSOA	Reverse Bias Safe Operation Area	T_j = 125°C	50A @ 1150V	

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} = 1200V				250	µA
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	V_{GE} = 15V I_C = 25A	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 = 1mA		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			1800		pF
C_{res}	Reverse Transfer Capacitance				82		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C) V_{GE} = ±15V V_{Bus} = 600V I_C = 25A R_G = 27Ω			90		ns
T_r	Rise Time				30		
$T_{d(off)}$	Turn-off Delay Time				420		
T_f	Fall Time				70		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (125°C) V_{GE} = ±15V V_{Bus} = 600V I_C = 25A R_G = 27Ω			90		ns
T_r	Rise Time				50		
$T_{d(off)}$	Turn-off Delay Time				520		
T_f	Fall Time				90		
E_{on}	Turn-on Switching Energy	V_{GE} = ±15V V_{Bus} = 600V I_C = 25A R_G = 27Ω	T_j = 125°C		2.5		mJ
E_{off}	Turn-off Switching Energy		T_j = 125°C		2.9		
R_{thJC}	Junction to Case Thermal Resistance					0.8	°C/W

Reverse 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				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		
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
$\Delta B/B$		T_C=100°C		4		%

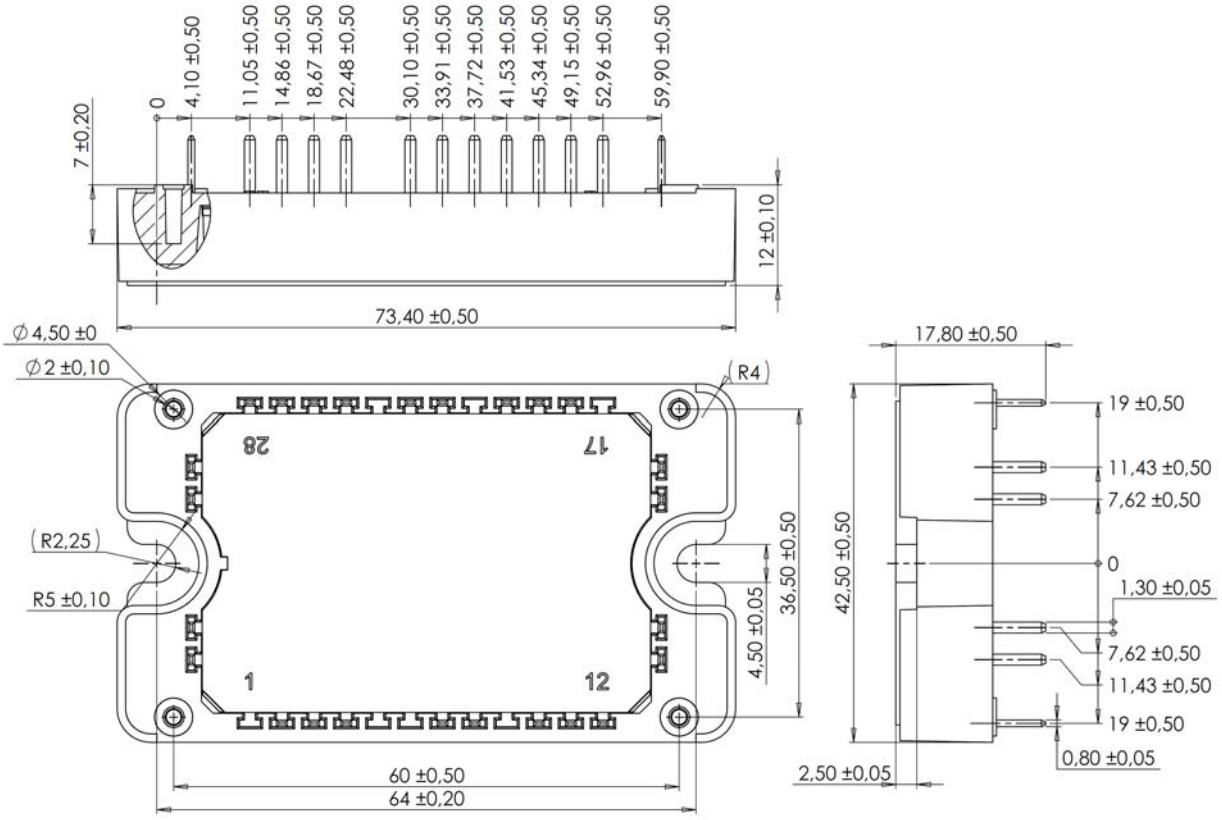
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

T: Thermistor temperature
R_T: Thermistor value at T

Thermal and package characteristics

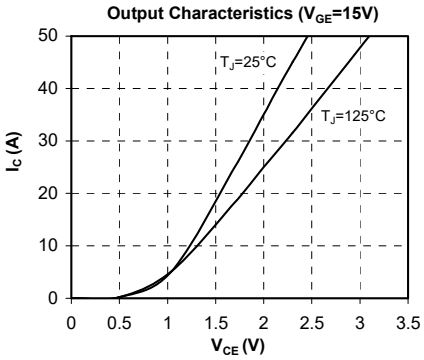
Symbol	Characteristic			Min	Max	Unit
V_{ISOL}	RMS Isolation Voltage, any terminal to case t =1 min, 50/60Hz			4000		V
T_J	Operating junction temperature range			-40	150	°C
T_{JOP}	Recommended junction temperature under switching conditions			-40	$T_J$max -25	
T_{STG}	Storage Temperature Range			-40	125	
T_C	Operating Case Temperature			-40	125	
Torque	Mounting torque	To heatsink	M4	2	3	N.m
Wt	Package Weight				110	g

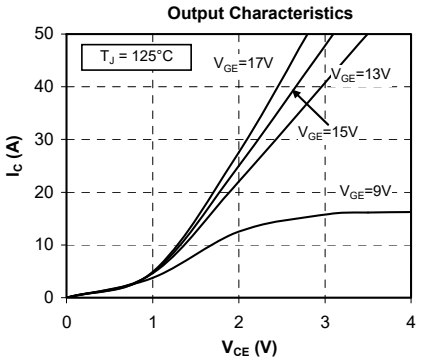
Package outline (dimensions in mm)

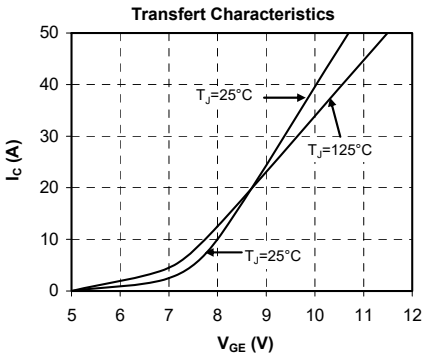


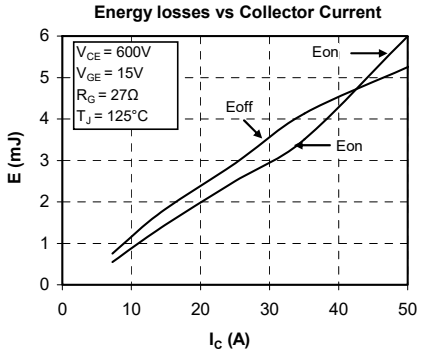
See application note 1906 - Mounting Instructions for SP3F Power Modules on www.microsemi.com

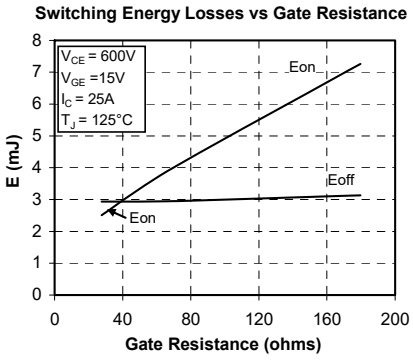
Typical Performance Curve

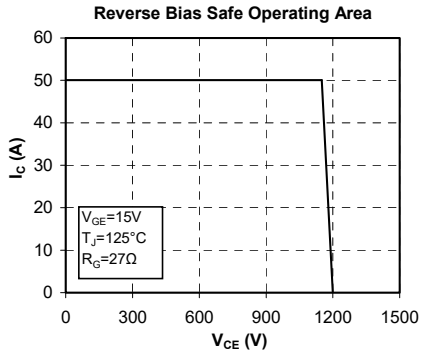


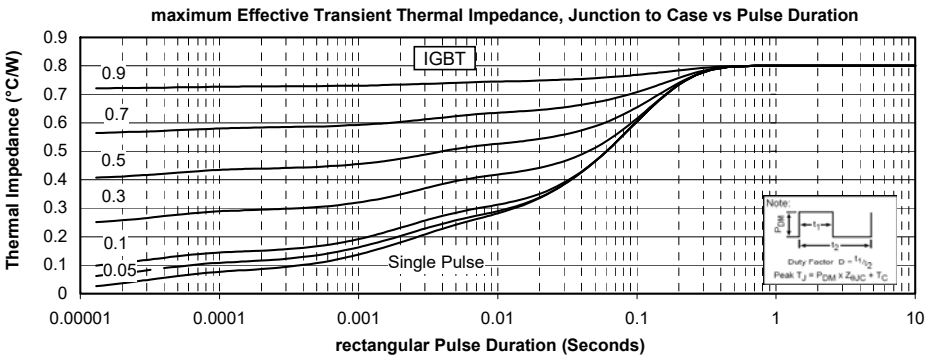


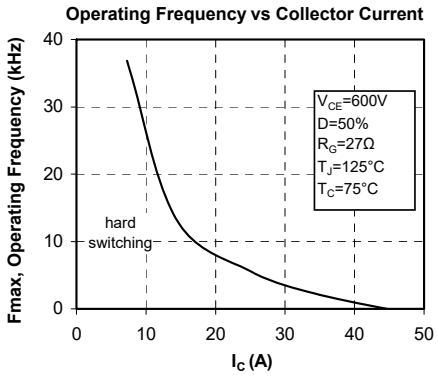


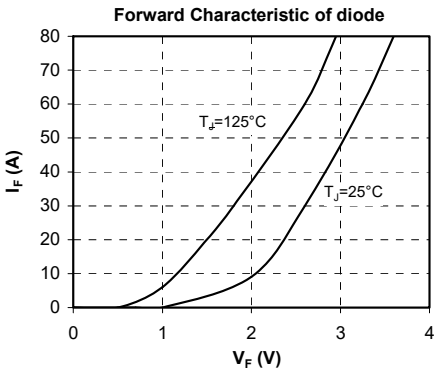


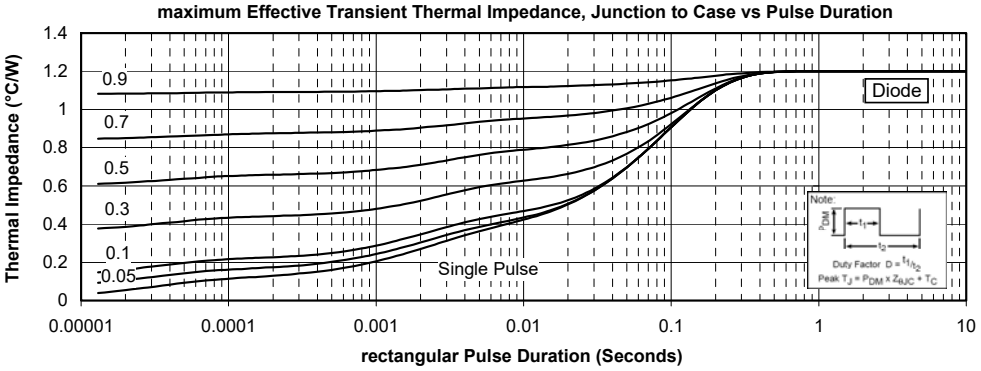







Operating Frequency vs Collector Current
Fmax, Operating Frequency (kHz)
40
30
20
10
0
0
10
20
30
40
50
I_C (A)
V_{CE}=600V
D=50%
R_G=27Ω
T_J=125°C
T_C=75°C
hard
switching


Forward Characteristic of diode
I_F (A)
80
70
60
50
40
30
20
10
0
0
1
2
3
4
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)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0.00001
0.0001
0.001
0.01
0.1
1
10
rectangular Pulse Duration (Seconds)
0.9
0.7
0.5
0.3
0.1
0.05
Single Pulse
Diode
Note:
Duty Factor D = t_1/t_2
Peak T_J = P_{DM} x $Z_{\theta JC}$ + T_C

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