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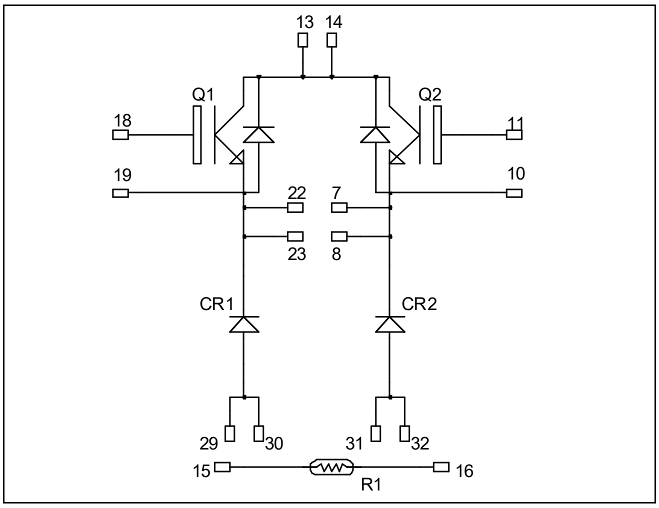
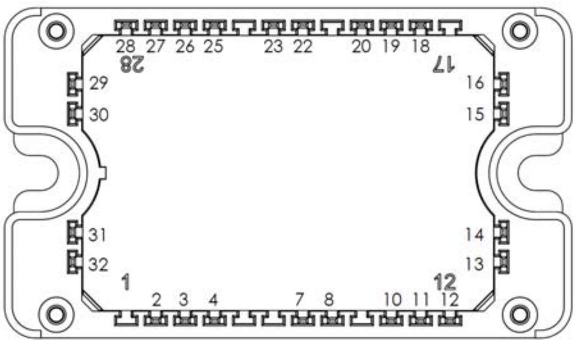
Microsemi
Power Matters.™

APTGL90DSK120T3G

Dual Buck chopper
Trench + Field Stop IGBT4
Power module

V_{CES} = 1200V
I_C = 90A @ Tc = 80°C





All multiple inputs and outputs must be shorted together
Example: 13/14 ; 29/30 ; 22/23 …

Application
- AC and DC motor control
- Switched Mode Power Supplies

Features
- **Trench + Field Stop IGBT 4**
  - Low voltage drop
  - Low leakage current
  - Low switching losses
  - 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
- Easy paralleling due to positive TC of VCEsat
- Each leg can be easily paralleled to achieve a single buck 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	110	A
		T_c = 80°C	90	
I_{CM}	Pulsed Collector Current	T_c = 25°C	150	
V_{GE}	Gate – Emitter Voltage		±20	V
P_D	Power Dissipation	T_c = 25°C	385	W
RBSOA	Reverse Bias Safe Operating Area	T_j = 150°C	150A @ 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 = 75A	T_j = 25°C		1.85	2.25	V
			T_j = 150°C		2.25		
$V_{GE(th)}$	Gate Threshold Voltage	V_{GE} = V_{CE}, I_C = 3 mA		5	5.8	6.5	V
I_{GES}	Gate – Emitter Leakage Current	V_{GE} = 20 V, V_{CE} = 0V				600	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			4.4		nF
C_{oes}	Output Capacitance				0.29		
C_{res}	Reverse Transfer Capacitance				0.24		
Q_G	Gate charge	V_{GE}= ±15V ; V_{CE}=600V I_C=75A			0.57		µC
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C) V_{GE} = ±15V V_{Bus} = 600V I_C = 75A R_G = 2.2Ω			130		ns
T_r	Rise Time				20		
$T_{d(off)}$	Turn-off Delay Time				300		
T_f	Fall Time				45		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (150°C) V_{GE} = ±15V V_{Bus} = 600V I_C = 75A R_G = 2.2Ω			150		ns
T_r	Rise Time				35		
$T_{d(off)}$	Turn-off Delay Time				350		
T_f	Fall Time				80		
E_{on}	Turn-on Switching Energy	V_{GE} = ±15V V_{Bus} = 600V I_C = 75A R_G = 2.2Ω	T_J = 25°C		3.3		mJ
			T_J = 150°C		8.5		
E_{off}	Turn-off Switching Energy		T_J = 25°C		4.2		mJ
			T_J = 150°C		7.2		
I_{sc}	Short Circuit data	V_{GE} ≤15V ; V_{Bus} = 900V t_p ≤10µs ; T_j = 150°C			300		A
R_{thJC}	Junction to Case Thermal Resistance					0.39	°C/W

Chopper 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		100		A
V_F	Diode Forward Voltage	I_F = 100A			2.4	3	V
		I_F = 150A			2.7		
		I_F = 100A	T_j = 125°C		1.8		
t_{rr}	Reverse Recovery Time	I_F = 100A V_R = 800V di/dt =200A/µs	T_j = 25°C		385		ns
			T_j = 125°C		480		
Q_{rr}	Reverse Recovery Charge		T_j = 25°C		1055		nC
			T_j = 125°C		5240		
R_{thJC}	Junction to Case Thermal Resistance					0.55	°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

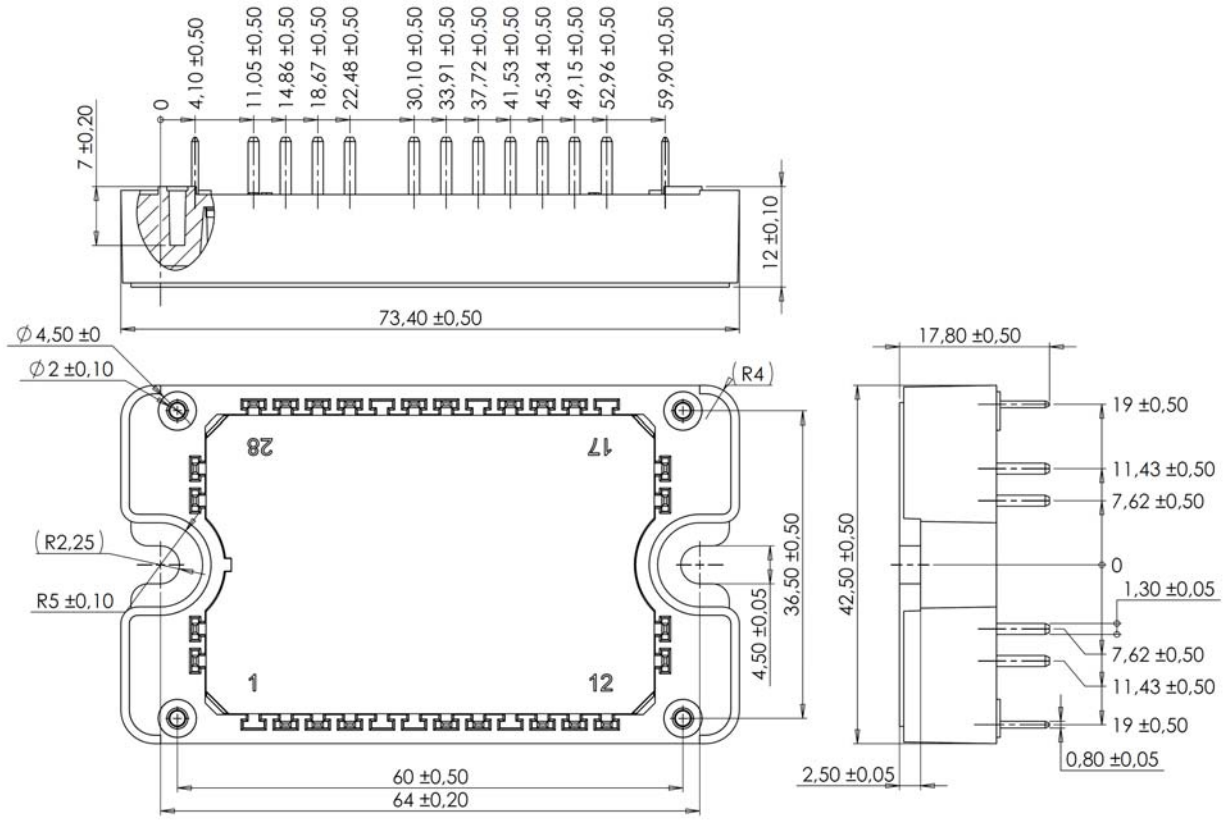
Temperature sensor NTC (see application note APT0406 on www.microsemi.com for more information).

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
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

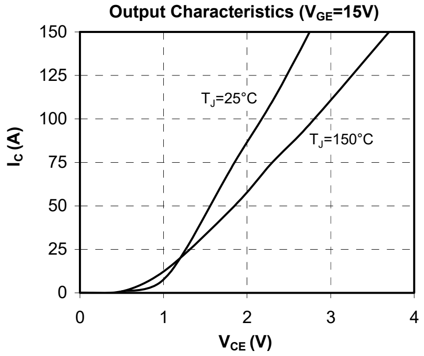
Package outline (dimensions in mm)



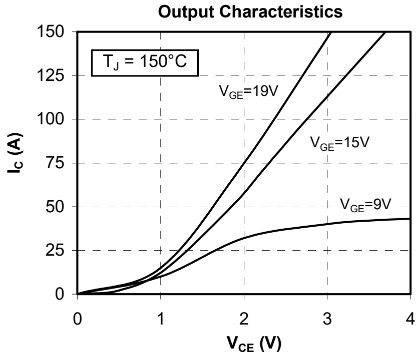
See application note 1906 - Mounting Instructions for SP3F Power Modules on www.microsemi.com

Typical Performance Curve

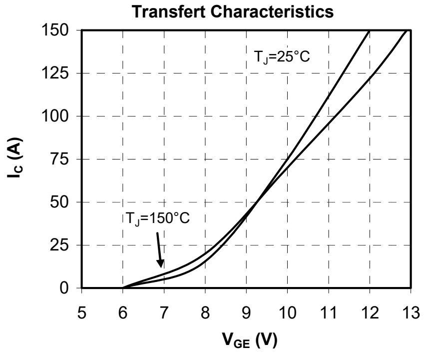
Output Characteristics (V_{GE}=15V)



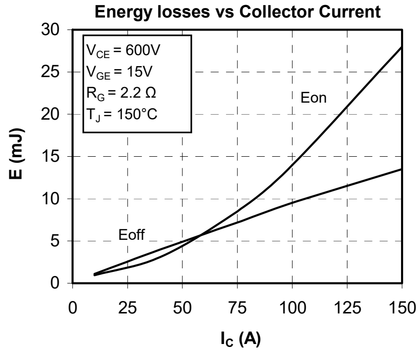
Output Characteristics



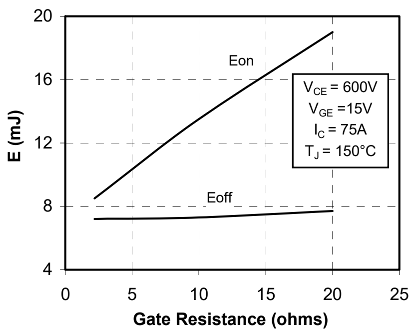
Transfert Characteristics



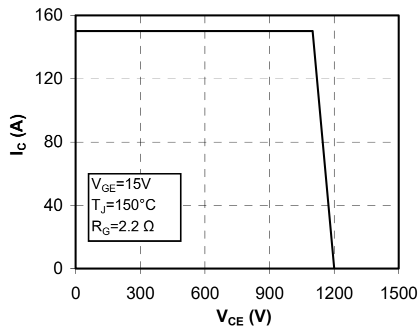
Energy losses vs Collector Current



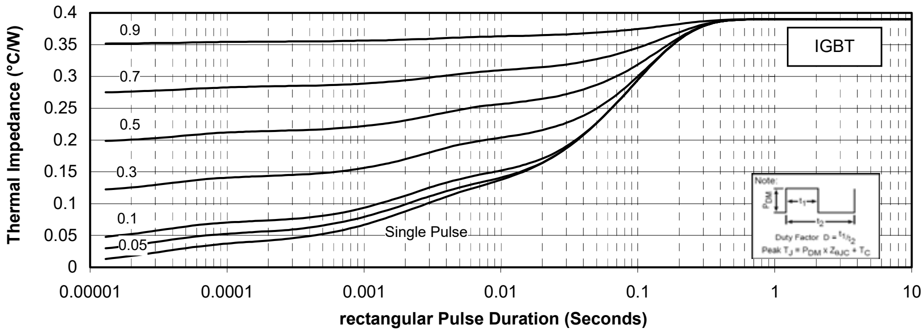
Switching Energy Losses vs Gate Resistance

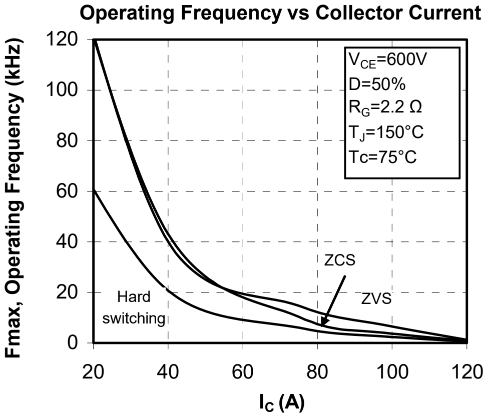


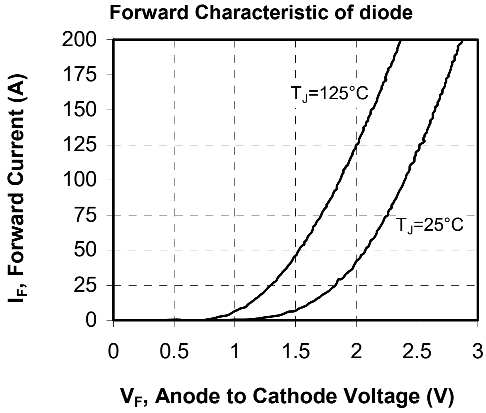
Reverse Bias Safe Operating Area

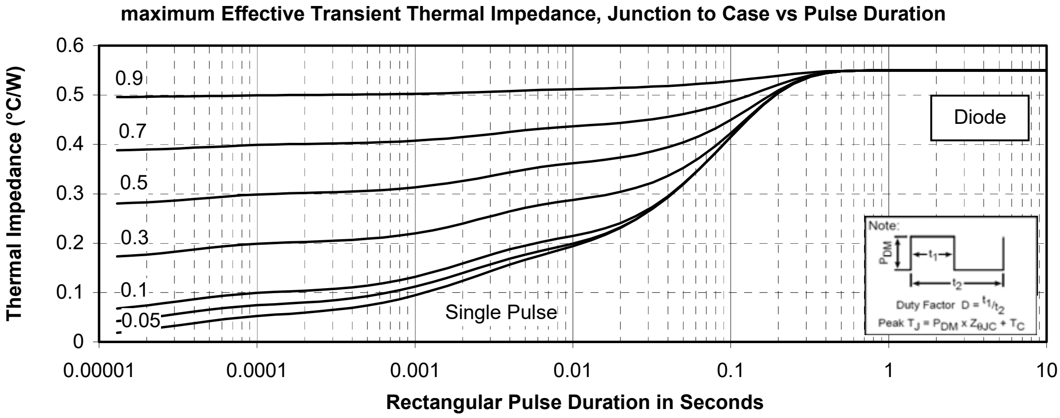


maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration




Operating Frequency vs Collector Current
Fmax, Operating Frequency (kHz)
120
100
80
60
40
20
0
20
40
60
80
100
120
IC (A)
VCE=600V
D=50%
RG=2.2 Ω
TJ=150°C
Tc=75°C
ZCS
ZVS
Hard switching


Forward Characteristic of diode
IF, Forward Current (A)
200
175
150
125
100
75
50
25
0
0
0.5
1
1.5
2
2.5
3
VF, Anode to Cathode Voltage (V)
TJ=125°C
TJ=25°C


maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration
Thermal Impedance (°C/W)
0.6
0.5
0.4
0.3
0.2
0.1
0
0.9
0.7
0.5
0.3
0.1
0.05
Single Pulse
Diode
0.00001
0.0001
0.001
0.01
0.1
1
10
Rectangular Pulse Duration in Seconds

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