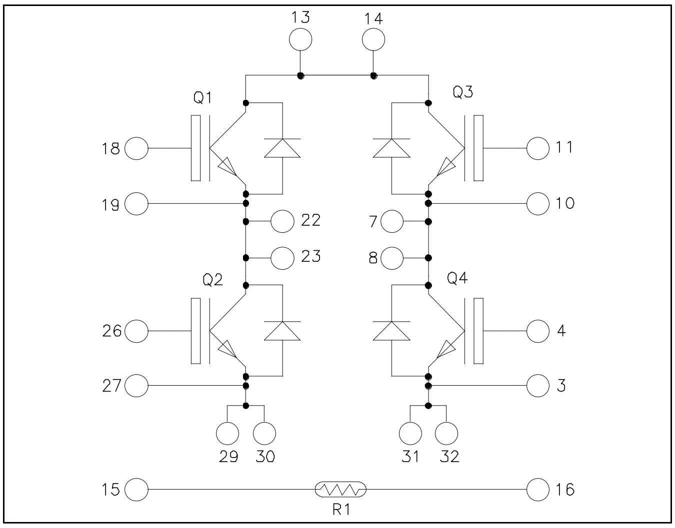
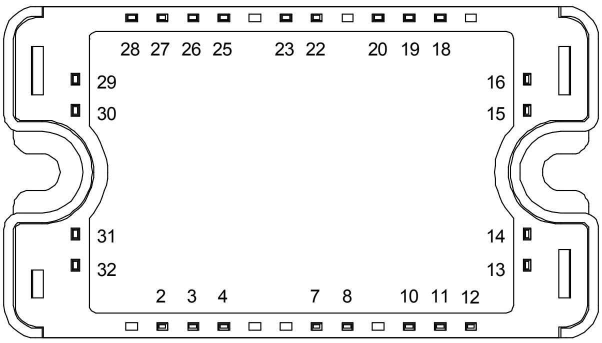
APTGF25H120T3G

Microsemi
POWER PRODUCTS GROUP

Full - Bridge
NPT IGBT Power Module

V_{CES} = 1200V
I_C = 25A @ Tc = 80°C





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

Application
- Welding converters
- Switched Mode Power Supplies
- Uninterruptible Power Supplies
- Motor control

Features
- Non Punch Through (NPT) Fast IGBT
  - Low voltage drop
  - Low tail current
  - Switching frequency up to 50 kHz
  - Soft recovery parallel diodes
  - Low diode VF
  - Low leakage current
  - RBSOA and SCSOA rated
  - Symmetrical design
- Kelvin emitter for easy drive
- Very low stray inductance
- High level of integration
- 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 T_C of V_{CEsat}
- Each leg can be easily paralleled to achieve a phase leg of twice the current capability
- RoHS compliant

Absolute maximum ratings

Symbol	*Parameter*		*Max ratings*	*Unit*
V_{CES}	Collector - Emitter Breakdown 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	100	
V_{GE}	Gate – Emitter Voltage		±20	V
P_D	Maximum Power Dissipation	T_C = 25°C	208	W
RBSOA	Reverse Bias Safe Operating Area	T_j = 125°C	50A@1150V	

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

All ratings @ T_j = 25°C unless otherwise specified

Electrical Characteristics

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
I_{CES}	Zero Gate Voltage Collector Current	V_{GE} = 0V, V_{CE} = 1200V	T_j = 25°C			250	µA
			T_j = 125°C			500	
$V_{CE(sat)}$	Collector Emitter saturation Voltage	V_{GE} =15V, I_C = 25A	T_j = 25°C	2.5	3.2	3.7	V
			T_j = 125°C		4.0		
$V_{GE(th)}$	Gate Threshold Voltage	V_{GE} = V_{CE} , I_C = 1mA		4		6	V
I_{GES}	Gate – Emitter Leakage Current	V_{GE} = 20V, V_{CE} = 0V				400	nA

Dynamic Characteristics

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
C_{ies}	Input Capacitance	V_{GE} = 0V, V_{CE} = 25V, f = 1MHz			1650		pF
C_{oes}	Output Capacitance				250		
C_{res}	Reverse Transfer Capacitance				110		
Q_g	Total gate Charge	V_{GE} = 15V, V_{Bus} = 600V, I_C =25A			160		nC
Q_{ge}	Gate – Emitter Charge				10		
Q_{gc}	Gate – Collector Charge				70		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C), V_{GE} = 15V, V_{Bus} = 600V, I_C = 25A, R_G = 22Ω			60		ns
T_r	Rise Time				50		
$T_{d(off)}$	Turn-off Delay Time				305		
T_f	Fall Time				30		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (125°C), V_{GE} = 15V, V_{Bus} = 600V, I_C = 25A, R_G = 22Ω			60		ns
T_r	Rise Time				50		
$T_{d(off)}$	Turn-off Delay Time				346		
T_f	Fall Time				40		
E_{on}	Turn-on Switching Energy	V_{GE} = 15V, V_{Bus} = 600V, I_C = 25A, R_G = 22Ω	T_j = 125°C		3.5		mJ
E_{off}	Turn-off Switching Energy		T_j = 125°C		1.5		

Reverse diode ratings and characteristics

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
V_{RRM}	Maximum Peak Repetitive Reverse Voltage			1200			V
I_{RM}	Maximum Reverse Leakage Current	V_R=1200V	T_j = 25°C			100	µA
			T_j = 125°C			250	
I_F	Forward Current		Tc = 80°C		25		A
V_F	Diode Forward Voltage	I_F = 25A, V_{GE} = 0V	T_j = 25°C		2.1		V
			T_j = 125°C		1.9		
t_{rr}	Reverse Recovery Time	I_F = 25A, V_R = 600V, di/dt =1000A/µs	T_j = 25°C		95		ns
			T_j = 125°C		190		
Q_{rr}	Reverse Recovery Charge		T_j = 25°C		2.1		µC
			T_j = 125°C		4.5		
E_r	Reverse Recovery Energy		T_j = 25°C		0.75		mJ
			T_j = 125°C		1.5		

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
$B_{25/85}$	T_{25} = 298.15 K		3952		K

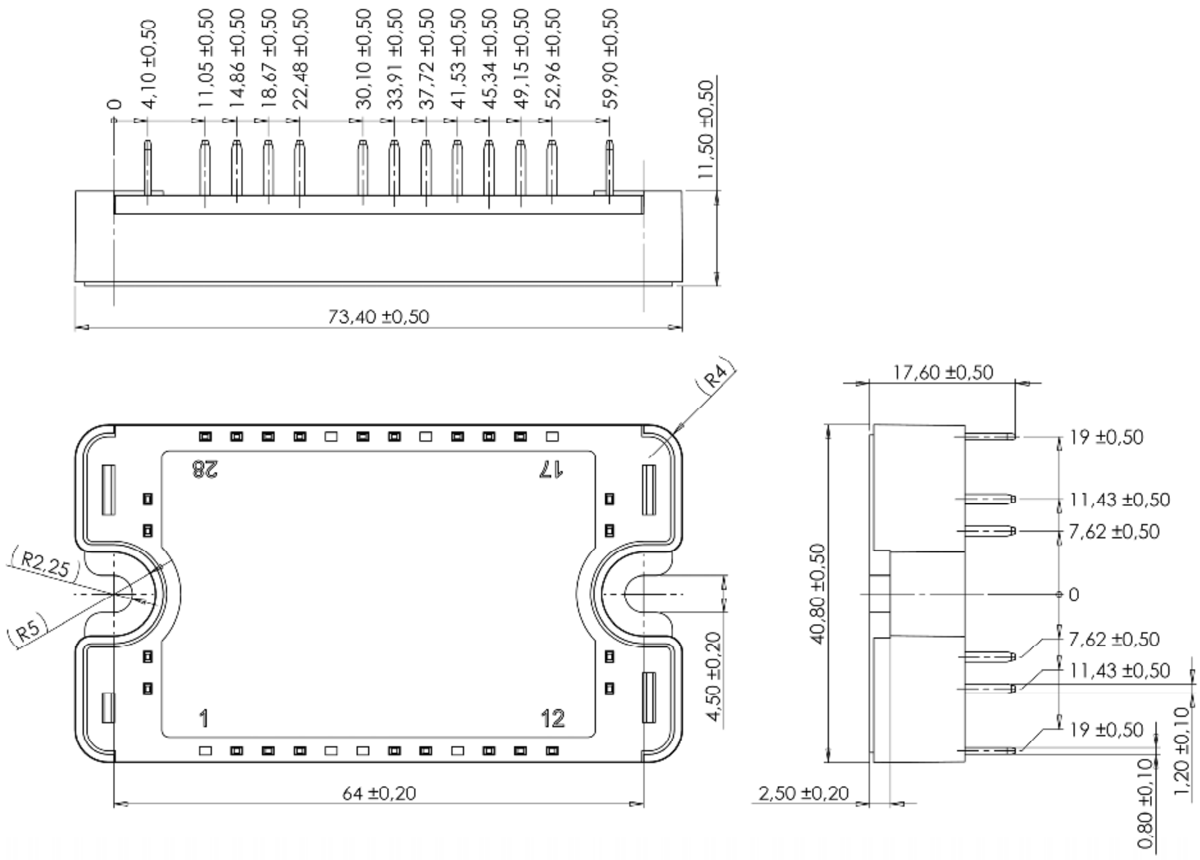
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

T: Thermistor temperature
R_T: Thermistor value at T

Thermal and package characteristics

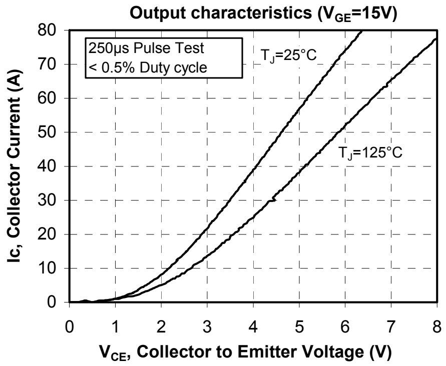
Symbol	Characteristic			Min	Typ	Max	Unit
R_{thJC}	Junction to Case Thermal Resistance		IGBT			0.6	°C/W
			Diode			1.2	
V_{ISOL}	RMS Isolation Voltage, any terminal to case t =1 min, 50/60Hz			4000			V
T_J	Operating junction temperature range			-40		150	°C
T_{STG}	Storage Temperature Range			-40		125	
T_C	Operating Case Temperature			-40		100	
Torque	Mounting torque	To heatsink	M4	2		3	N.m
Wt	Package Weight					110	g

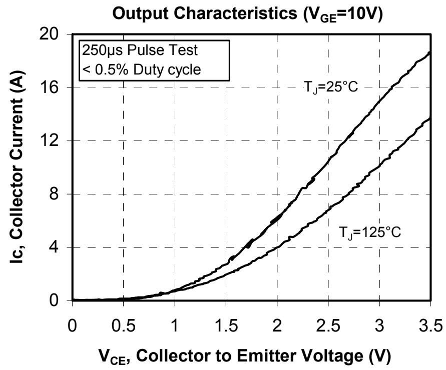
SP3 Package outline (dimensions in mm)

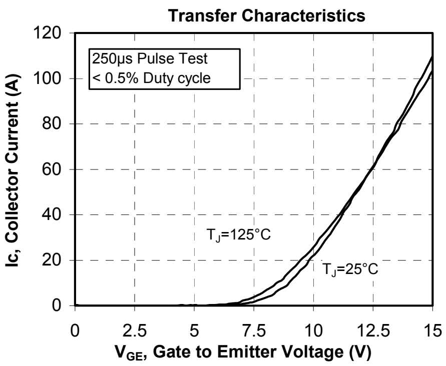


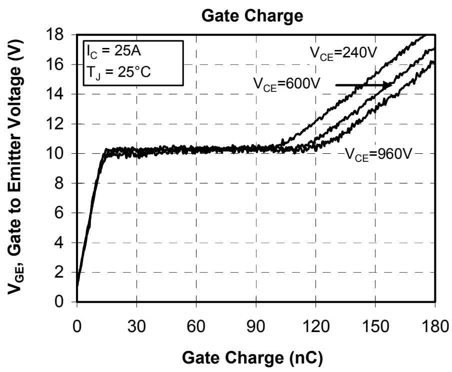
See application note 1901 - Mounting Instructions for SP3 Power Modules on www.microsemi.com

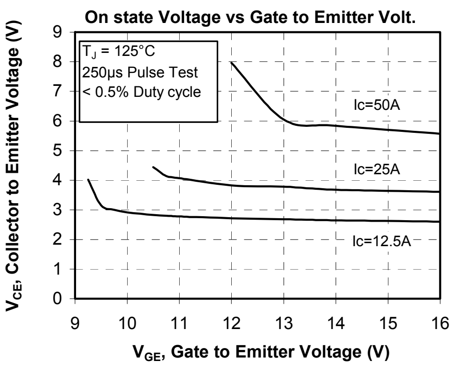
Typical Performance Curve

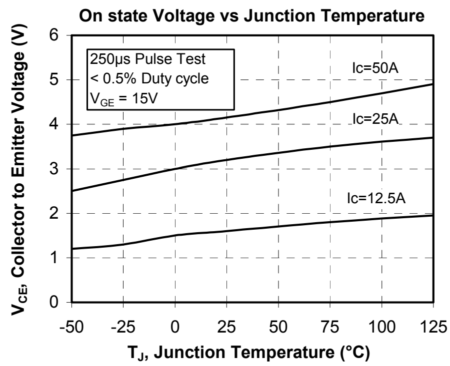


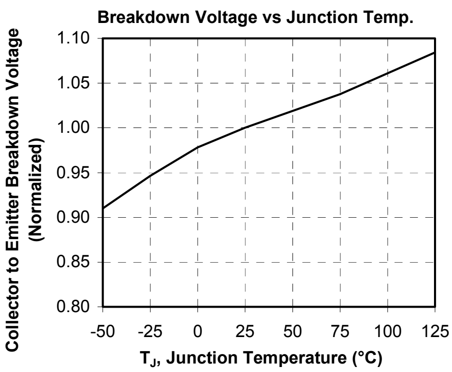


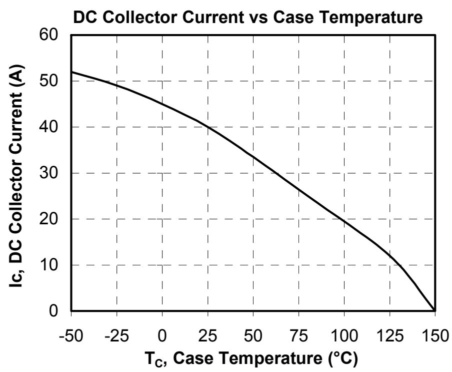




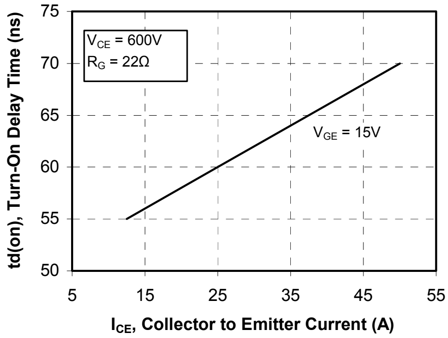








Turn-On Delay Time vs Collector Current



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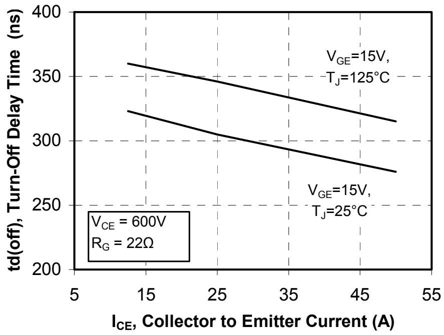
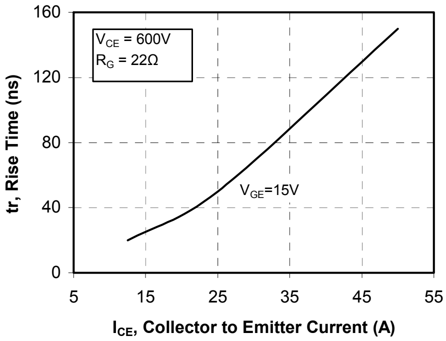
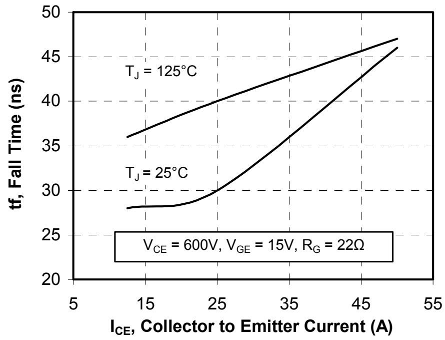


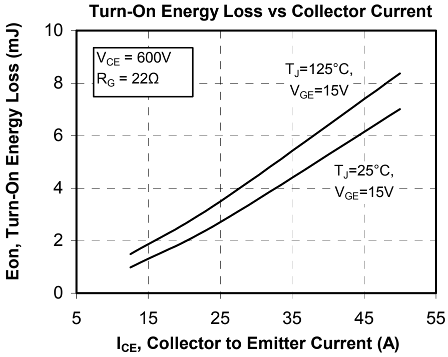
Current Rise Time vs Collector Current



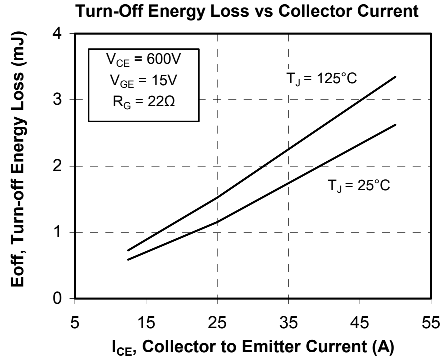
Current Fall Time vs Collector Current



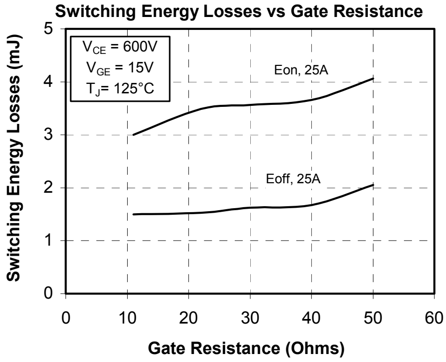
Turn-On Energy Loss vs Collector Current



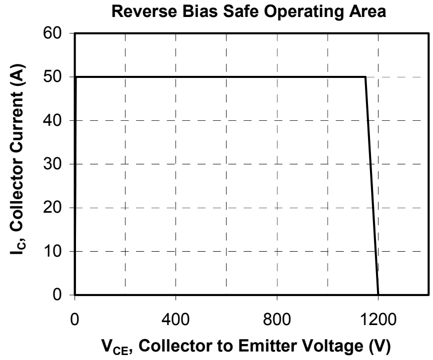
Turn-Off Energy Loss vs Collector Current



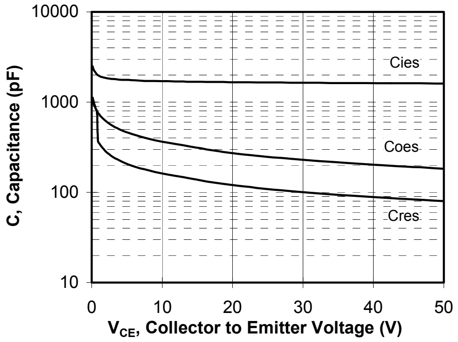
Switching Energy Losses vs Gate Resistance



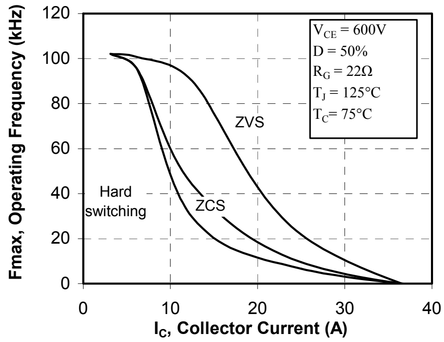
Reverse Bias Safe Operating Area



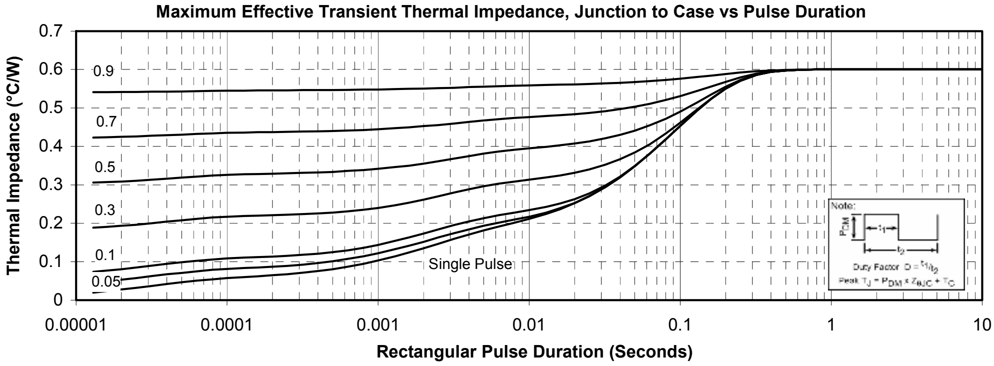
Capacitance vs Collector to Emitter Voltage



Operating Frequency vs Collector Current



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



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