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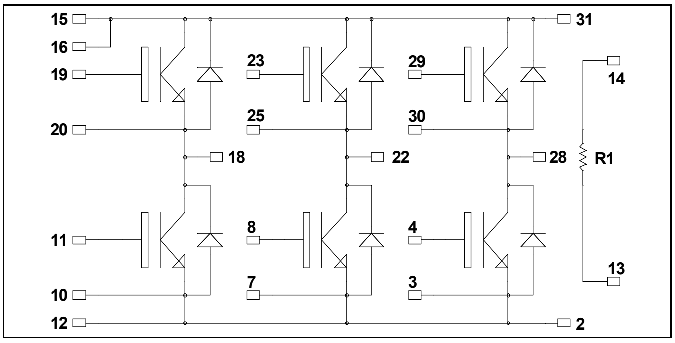
APTGT30X60T3G

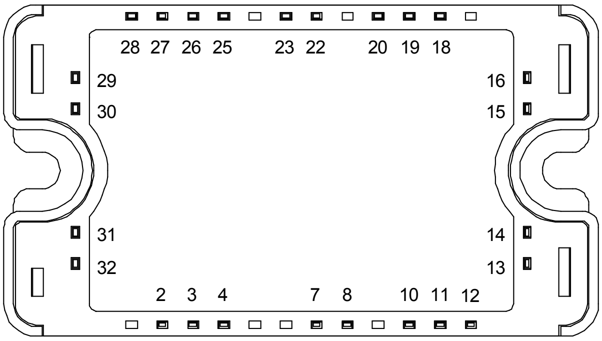
Microsemi
POWER PRODUCTS GROUP

3 Phase bridge
Trench + Field Stop IGBT3
Power Module

V_{CES} = 600V
I_C = 30A @ 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 Technology
  - Low voltage drop
  - Low tail current
  - Switching frequency up to 20 kHz
  - Soft recovery parallel diodes
  - Low diode VF
  - Low leakage current
  - RBSOA and SCSOA rated
- 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
- RoHS compliant

Absolute maximum ratings

Symbol	*Parameter*		*Max ratings*	*Unit*
V_{CES}	Collector - Emitter Breakdown Voltage		600	V
I_C	Continuous Collector Current	$T_C = 25°C$	50	A
		$T_C = 80°C$	30	
I_{CM}	Pulsed Collector Current	$T_C = 25°C$	60	
V_{GE}	Gate – Emitter Voltage		±20	V
P_D	Maximum Power Dissipation	$T_C = 25°C$	90	W
RBSOA	Reverse Bias Safe Operating Area	$T_J = 150°C$	60A @ 550V	

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} = 600V				250	µA
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	V_{GE} =15V, I_C = 30A	T_j = 25°C		1.5	1.9	V
			T_j = 150°C		1.7		
$V_{GE(th)}$	Gate Threshold Voltage	V_{GE} = V_{CE} , I_C = 400µA		5.0	5.8	6.5	V
I_{GES}	Gate – Emitter Leakage Current	V_{GE} = 20V, V_{CE} = 0V				300	nA

Dynamic Characteristics

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
C_{ies}	Input Capacitance	V_{GE} = 0V, V_{CE} = 25V, f = 1MHz			1600		pF
C_{oes}	Output Capacitance				110		
C_{res}	Reverse Transfer Capacitance				50		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C), V_{GE} = ±15V, V_{Bus} = 300V, I_C = 30A, R_G = 10Ω			110		ns
T_r	Rise Time				45		
$T_{d(off)}$	Turn-off Delay Time				200		
T_f	Fall Time				40		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (150°C), V_{GE} = ±15V, V_{Bus} = 300V, I_C = 30A, R_G = 10Ω			120		ns
T_r	Rise Time				50		
$T_{d(off)}$	Turn-off Delay Time				250		
T_f	Fall Time				60		
E_{on}	Turn-on Switching Energy	V_{GE} = ±15V, V_{Bus} = 300V, I_C = 30A, R_G = 10Ω	T_j = 25°C		0.16		mJ
			T_j = 150°C		0.3		
E_{off}	Turn-off Switching Energy		T_j = 25°C		0.7		mJ
			T_j = 150°C		1.05		

Reverse diode ratings and characteristics

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
V_{RRM}	Maximum Peak Repetitive Reverse Voltage			600			V
I_{RM}	Maximum Reverse Leakage Current	V_R=600V	T_j = 25°C			250	µA
			T_j = 150°C			500	
I_F	DC Forward Current		Tc = 80°C		30		A
V_F	Diode Forward Voltage	I_F = 30A, V_{GE} = 0V	T_j = 25°C		1.6	2	V
			T_j = 150°C		1.5		
t_{rr}	Reverse Recovery Time	I_F = 30A, V_R = 300V, di/dt =1800A/µs	T_j = 25°C		100		ns
			T_j = 150°C		150		
Q_{rr}	Reverse Recovery Charge		T_j = 25°C		1.5		µC
			T_j = 150°C		3.1		
E_r	Reverse Recovery Energy		T_j = 25°C		0.34		mJ
			T_j = 150°C		0.75		

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

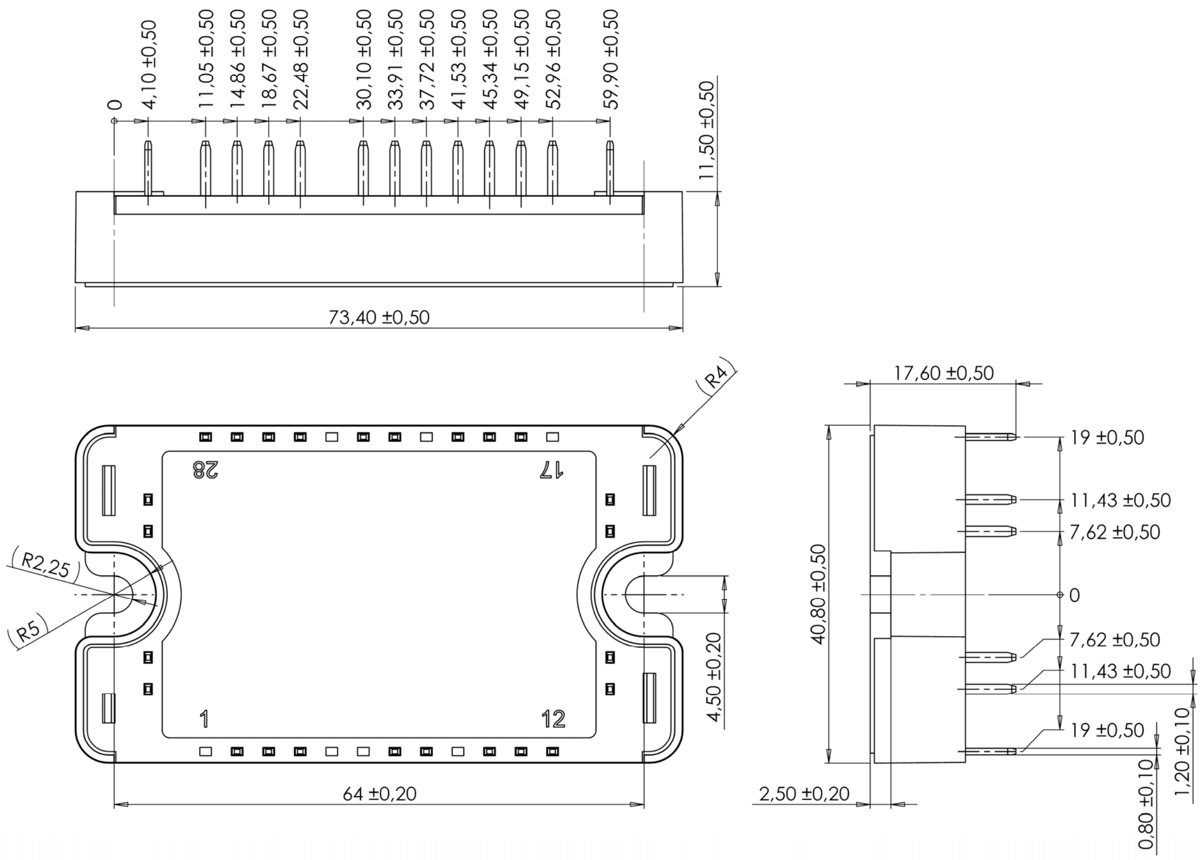
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

T: Thermistor temperature
R_T: Thermistor value at T

Thermal and package characteristics

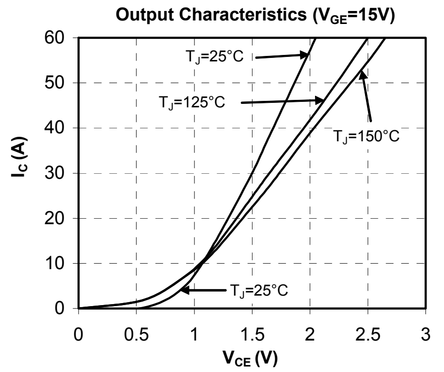
Symbol	*Characteristic*			*Min*	*Typ*	*Max*	*Unit*
R_{thJC}	Junction to Case Thermal Resistance		IGBT			1.6	°C/W
			Diode			2.45	
V_{ISOL}	RMS Isolation Voltage, any terminal to case t =1 min, 50/60Hz			4000			V
T_J	Operating junction temperature range			-40		175	°C
T_{STG}	Storage Temperature Range			-40		125	
T_C	Operating Case Temperature			-40		100	
Torque	Mounting torque	To heatsink	M4	2		3	N.m
Wt	Package Weight					110	g

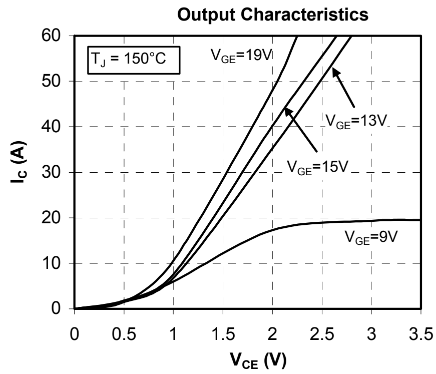
SP3 Package outline (dimensions in mm)

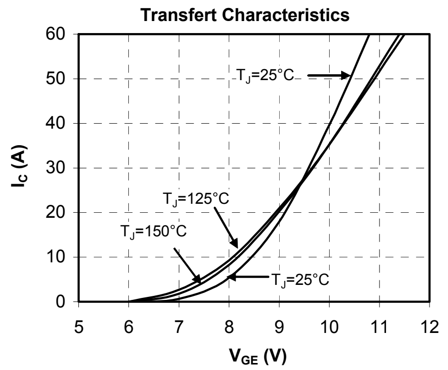


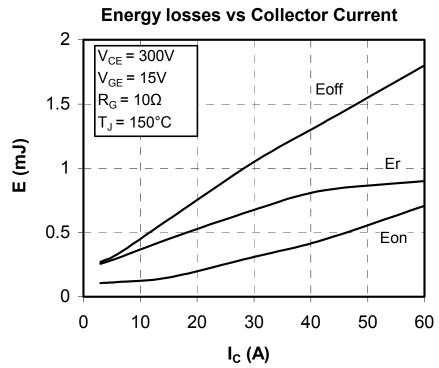
See application note 1901 - Mounting Instructions for SP3 Power Modules on www.microsemi.com

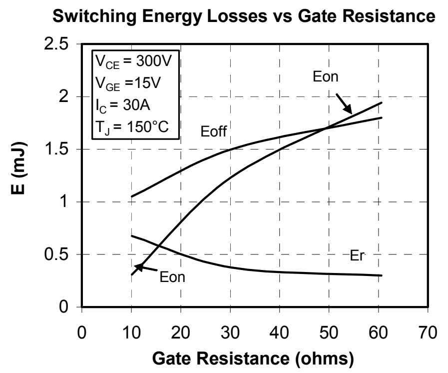
Typical Performance Curve

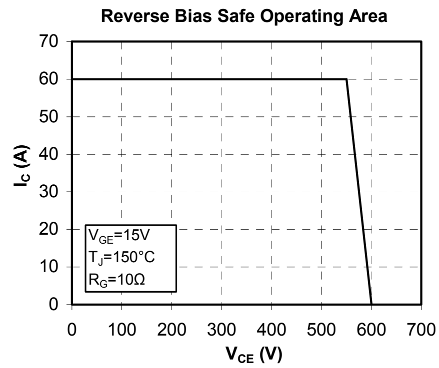


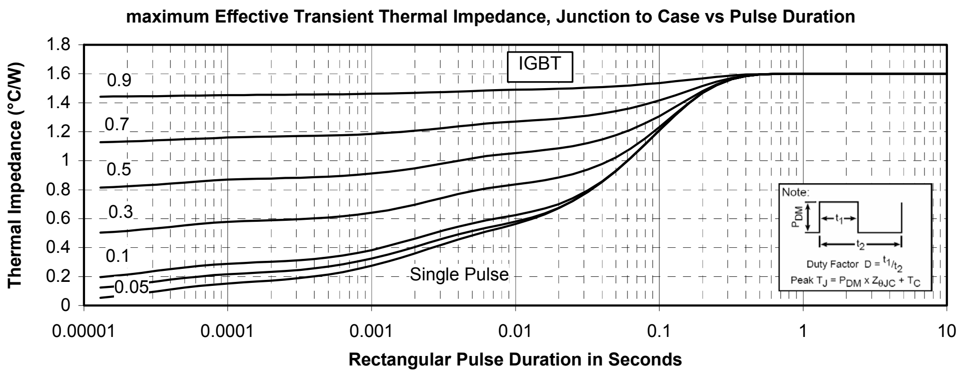


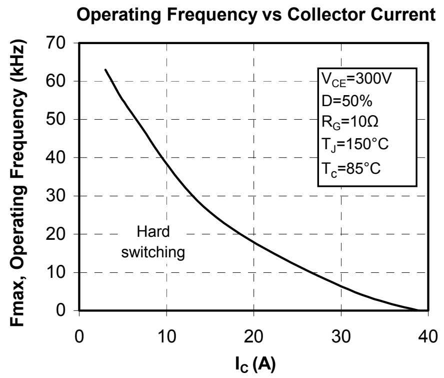


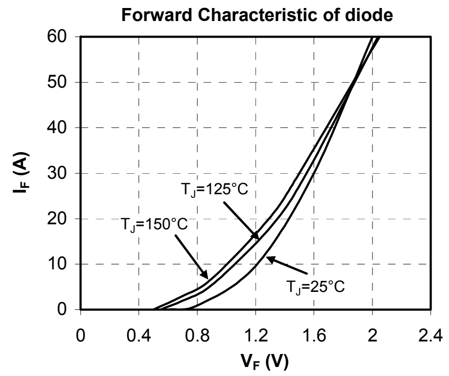


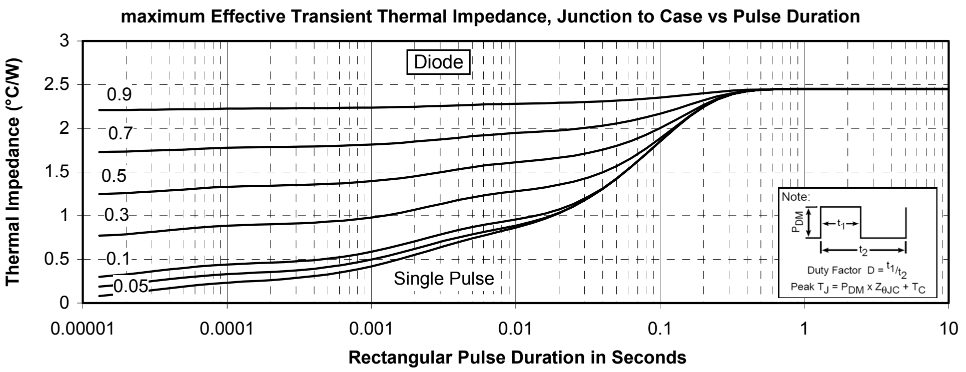







Operating Frequency vs Collector Current
Fmax, Operating Frequency (kHz)
I_C (A)
V_{CE}=300V
D=50%
R_G=10Ω
T_J=150°C
T_c=85°C
Hard switching


Forward Characteristic of diode
I_F (A)
V_F (V)
T_J=125°C
T_J=150°C
T_J=25°C


maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration
Thermal Impedance (°C/W)
Rectangular Pulse Duration in Seconds
Diode
0.9
0.7
0.5
0.3
0.1
0.05
Single Pulse
Note:
P_{DM}
t_1
t_2
Duty Factor D = t_1/t_2
Peak T_J = P_{DM} x $Z_{θJC}$ + T_C

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