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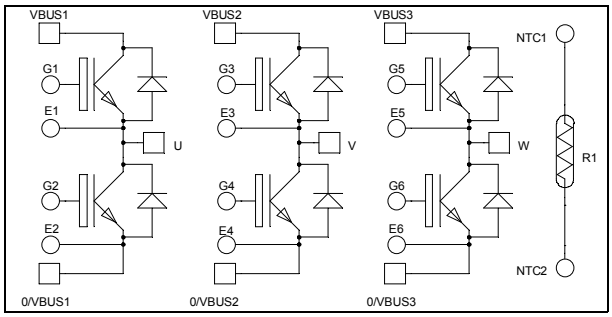
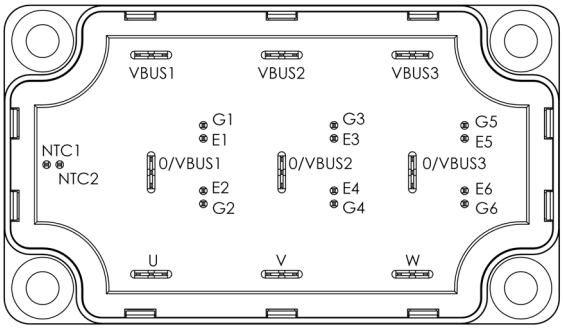
APTGTQ150TA65TPG

Triple phase leg
High speed IGBT 5 Power Module

V_{CES} = 650V
I_C = 150A @ Tc = 25°C





Application

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

Features

- High speed IGBT 5
  - Low voltage drop
  - Low tail current
  - Switching frequency up to 100 kHz
  - Low leakage current
- Kelvin emitter for easy drive
- Very low stray inductance
- Lead frames for power connections
- 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

All ratings @ T_j = 25°C unless otherwise specified

Absolute maximum ratings (Per IGBT)

Symbol	*Parameter*		*Max ratings*	*Unit*
V_{CES}	Collector - Emitter Voltage		650	V
I_C	Continuous Collector Current	T_C = 25°C	150	A
		T_C = 80°C	90	
I_{CM}	Pulsed Collector Current	T_C = 25°C	300	
V_{GE}	Gate – Emitter Voltage		±20	V
P_D	Power Dissipation		365	W

CAUTION: These Devices are sensitive to Electrostatic Discharge. Proper Handing 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} = 650V				150	µA
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	V_{GE} =15V I_C = 150A	T_j = 25°C		1.65	2.2	V
			T_j = 150°C		1.9		
$V_{GE(th)}$	Gate Threshold Voltage	V_{GE} = V_{CE} , I_C = 1.5mA		3.3	4.0	4.7	V
I_{GES}	Gate – Emitter Leakage Current	V_{GE} = 20V, V_{CE} = 0V				360	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			9000		pF
C_{oes}	Output Capacitance				150		
C_{res}	Reverse Transfer Capacitance				33		
Q_G	Gate charge	V_{GE} = 15V, I_C = 150A V_{CE} = 520V			360		nC
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C) V_{GE} = 15V V_{Bus} = 400V I_C = 75A R_G = 1Ω			21		ns
T_r	Rise Time				15		
$T_{d(off)}$	Turn-off Delay Time				180		
T_f	Fall Time				18		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (150°C) V_{GE} = 15V V_{Bus} = 400V I_C = 75A R_G = 1Ω			20		ns
T_r	Rise Time				15		
$T_{d(off)}$	Turn-off Delay Time				205		
T_f	Fall Time				26		
E_{on}	Turn on Energy	V_{GE} = 15V V_{Bus} = 400V I_C = 75A R_G = 1Ω	T_j = 150°C		2.25		mJ
E_{off}	Turn off Energy		T_j = 150°C		0.9		
R_{Gint}	Integrated gate resistor				1.7		Ω
R_{thJC}	Junction to Case Thermal Resistance					0.41	°C/W

Diode ratings and characteristics (per diode)

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
V_{RRM}	Peak Repetitive Reverse Voltage					650	V
I_{RM}	Reverse Leakage Current	V_R=650V				150	µA
I_F	DC Forward Current		Tc = 25°C		150		A
V_F	Diode Forward Voltage	I_F = 150A V_{GE} = 0V	T_j = 25°C		1.6	2.2	V
			T_j = 150°C		1.65		
t_{rr}	Reverse Recovery Time	I_F = 75A V_R = 400V di/dt =4500A/µs	T_j = 25°C		46		ns
			T_j = 150°C		62		
Q_{rr}	Reverse Recovery Charge		T_j = 25°C		1.5		µC
			T_j = 150°C		3		
R_{thJC}	Junction to Case Thermal Resistance					0.47	°C/W

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

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		%

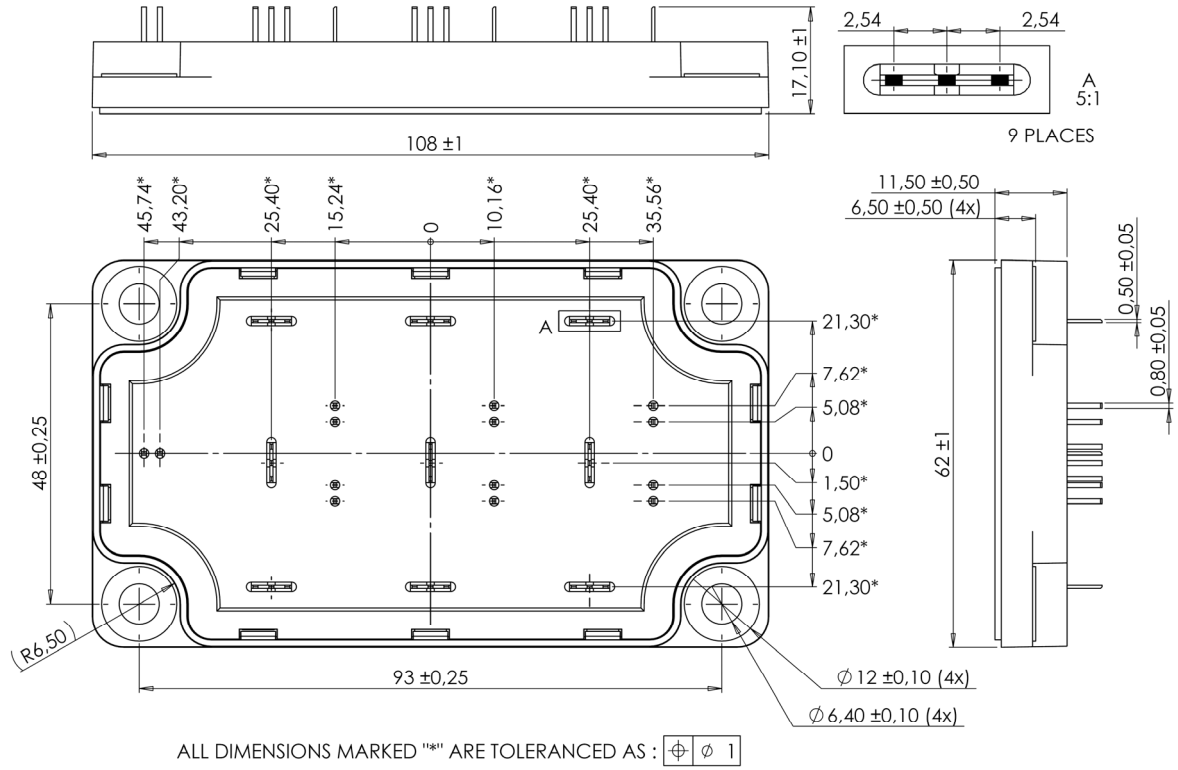
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

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	M6	3	5	N.m
Wt	Package Weight				250	g

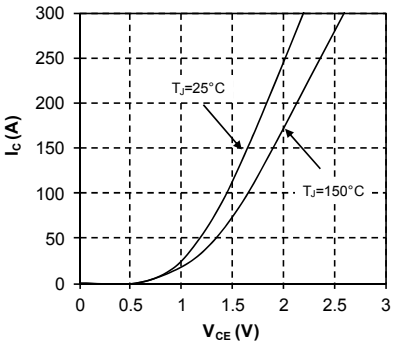
Package outline (dimensions in mm)



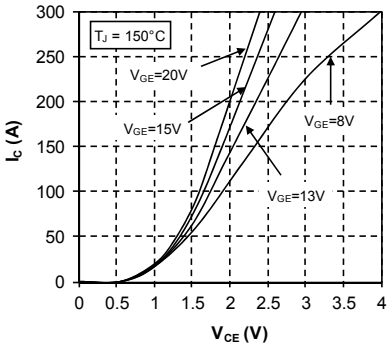
See application note 1902 - Mounting Instructions for SP6-P (12mm) Power Modules on www.microsemi.com

Typical Performance Curve

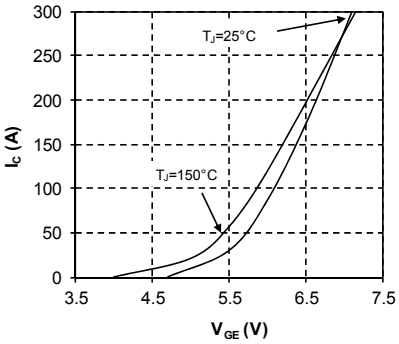
Output Characteristics (V_{GE}=15V)



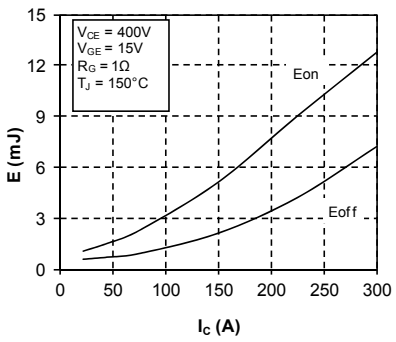
Output Characteristics



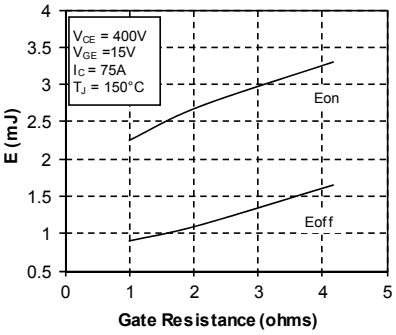
Transfert Characteristics



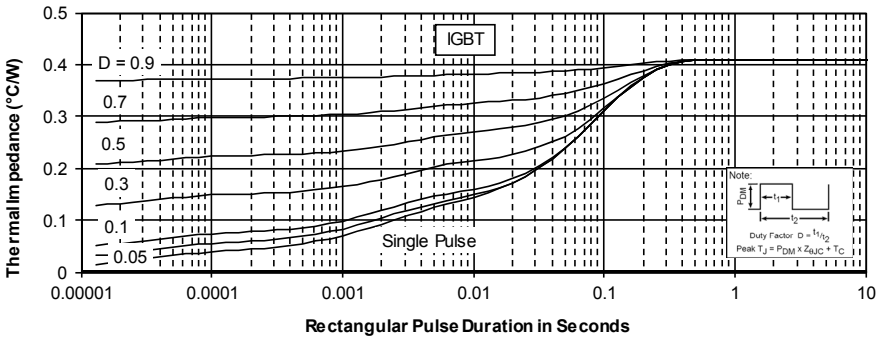
Energy losses vs Collector Current

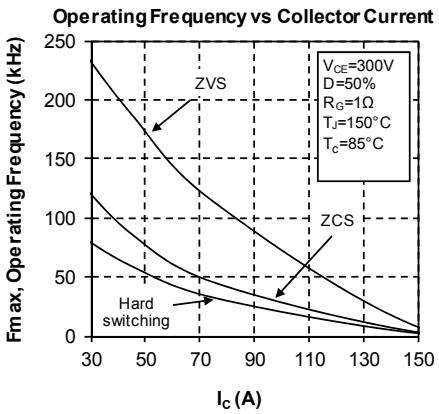


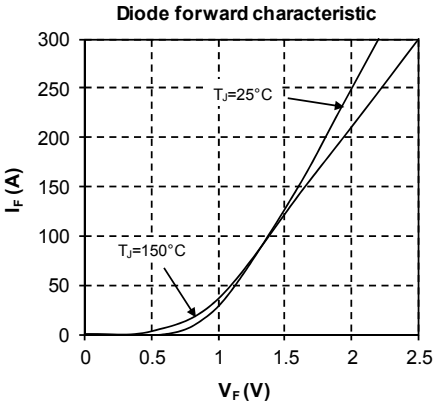
Switching Energy Losses vs Gate Resistance

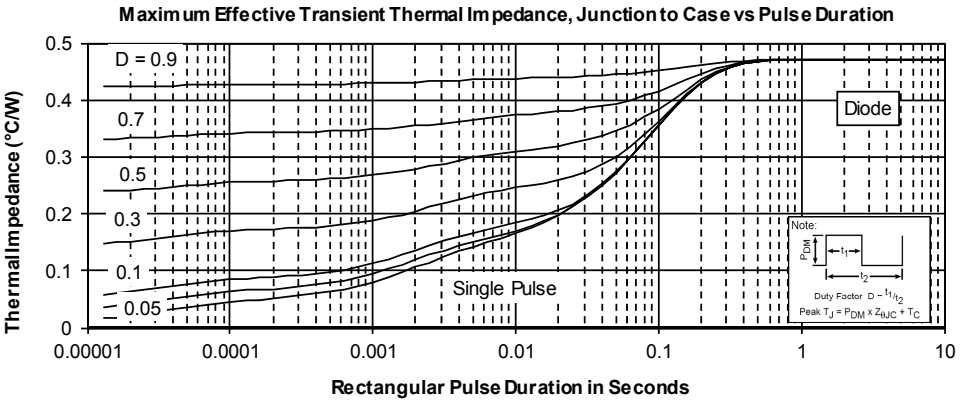


Maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration




Operating Frequency vs Collector Current
Fmax, Operating Frequency (kHz)
250
200
150
100
50
0
30
50
70
90
110
130
150
I_C (A)
ZVS
ZCS
Hard switching
V_{CE}=300V
D=50%
R_G=1Ω
T_J=150°C
T_c=85°C


Diode forward characteristic
I_F (A)
300
250
200
150
100
50
0
0
0.5
1
1.5
2
2.5
V_F (V)
T_J=25°C
T_J=150°C


Maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration
ThermalImpedance (°C/W)
0.5
0.4
0.3
0.2
0.1
0
0.00001
0.0001
0.001
0.01
0.1
1
10
Rectangular Pulse Duration in Seconds
D = 0.9
0.7
0.5
0.3
0.1
0.05
Single Pulse
Diode
Note:
P_{DM}
t_1
t_2
Duty Factor D = t_1/t_2
Peak T_J = P_{DM} x $Z_{\theta JC}$ + T_C

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