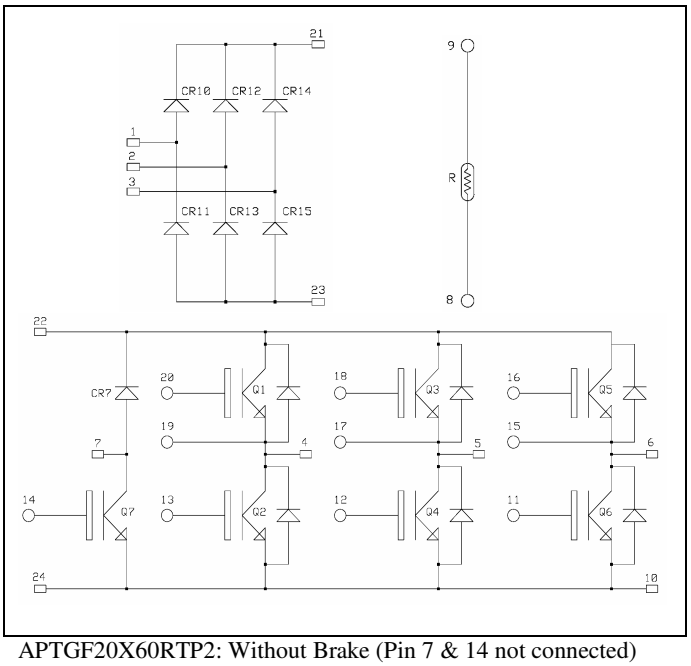
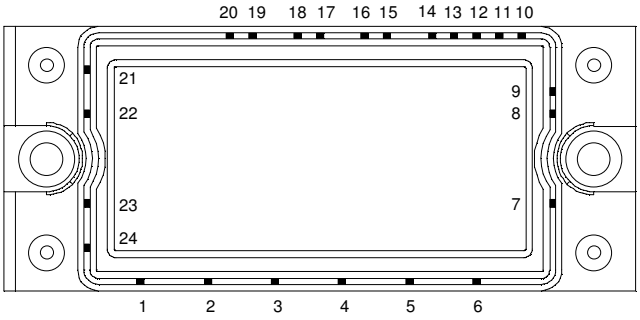
APTGF20X60RTP2
APTGF20X60BTP2

Input rectifier bridge + Brake + 3 Phase Bridge NPT IGBT Power Module

V_{CES} = 600V
I_C = 20A @ Tc = 80°C



APTGF20X60RTP2: Without Brake (Pin 7 & 14 not connected)



Application

- AC 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
  - Avalanche energy rated
  - RBSOA and SCSOA rated
- Very low stray inductance
- High level of integration
- Internal thermistor for temperature monitoring

Benefits

- Low conduction losses
- Stable temperature behavior
- Very rugged
- Solderable terminals for easy PCB mounting
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Easy paralleling due to positive TC of VCEsat
- Low profile

All ratings @ T_j = 25°C unless otherwise specified

1. Absolute maximum ratings

Diode rectifier Absolute maximum ratings

Symbol	*Parameter*			*Max ratings*	*Unit*
V_{RRM}	Repetitive Peak Reverse Voltage			1600	V
I_D	DC Forward Current		T_C = 80°C	20	A
I_{FSM}	Surge Forward Current	t_p = 10ms	T_j = 25°C	300	
			T_j = 150°C	230	

CAUTION: These Devices are sensitive to Electrostatic Discharge. Proper Handing Procedures Should Be Followed.

IGBT & Diode Brake (only for APTGF20X60BTP2) 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	20	A
		T_C = 80°C	10	
I_{CM}	Pulsed Collector Current	T_C = 25°C	25	
V_{GE}	Gate – Emitter Voltage		±20	V
P_D	Maximum Power Dissipation	T_C = 25°C	80	W
I_F	DC Forward Current	T_C = 80°C	10	A

IGBT & Diode Inverter 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	35	A
		T_C = 80°C	20	
I_{CM}	Pulsed Collector Current	T_C = 25°C	70	
V_{GE}	Gate – Emitter Voltage		±20	V
P_D	Maximum Power Dissipation	T_C = 25°C	125	W
SCSOA	Short circuit Safe Operating Area	T_j = 125°C	80A @ 360V	
I_F	DC Forward Current	T_C = 80°C	20	A
I_{FSM}	Surge Forward Current t_p = 1ms	T_C = 80°C	40	

2. Electrical Characteristics

Diodes Rectifier Electrical Characteristics

Symbol	*Characteristic*	*Test Conditions*		*Min*	*Typ*	*Max*	*Unit*
I_R	Reverse Current	V_R = 1600V	T_j = 150°C		2		mA
V_F	Forward Voltage	I_F = 30A	T_j = 25°C		1.3	1.5	V
		I_F = 20A	T_j = 150°C		1	1.05	
R_{thJC}	Junction to Case					1	°C/W

IGBT Brake & Diode (only for APTGF20X60BTP2) Electrical Characteristics

Symbol	*Characteristic*	*Test Conditions*		*Min*	*Typ*	*Max*	*Unit*
I_{CES}	Zero Gate Voltage Collector Current	V_{GE} = 0V, V_{CE} = 600V	T_j = 25°C		0.5	500	µA
			T_j = 125°C		0.8		mA
$V_{CE(on)}$	Collector Emitter on Voltage	V_{GE} = 15V, I_C = 10A	T_j = 25°C		1.95	2.35	V
			T_j = 125°C		2.2		
$V_{GE(th)}$	Gate Threshold Voltage	V_{GE} = V_{CE}, I_C = 0.35 mA		4.5	5.5	6.5	V
I_{GES}	Gate – Emitter Leakage Current	V_{GE} = 20V, V_{CE} = 0V				300	nA
C_{ies}	Input Capacitance	V_{GE} = 0V, V_{CE} = 25V f = 1MHz			800		pF
V_F	Forward Voltage	V_{GE} = 0V, I_F = 20A	T_j = 25°C		1.25	1.75	V
			T_j = 125°C		1.2		
R_{thJC}	Junction to Case		IGBT			1.5	°C/W
			Diode			1.5	

IGBT & Diode Inverter Electrical Characteristics

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
BV_{CES}	Collector - Emitter Breakdown Voltage	V_{GE} = 0V, I_C = 500µA		600			V
I_{CES}	Zero Gate Voltage Collector Current	V_{GE} = 0V V_{CE} = 600V	T_j = 25°C		0.7	500	µA
			T_j = 125°C		1.0		mA
$V_{CE(on)}$	Collector Emitter on Voltage	V_{GE} =15V I_C = 20A	T_j = 25°C		1.95	2.45	V
			T_j = 125°C		2.2		
$V_{GE(th)}$	Gate Threshold Voltage	V_{GE} = V_{CE} , I_C = 0.5 mA		4.5	5.5	6.5	V
I_{GES}	Gate – Emitter Leakage Current	V_{GE} = 20V, V_{CE} = 0V				300	nA
C_{ies}	Input Capacitance	V_{GE} = 0V, V_{CE} = 25V f = 1MHz			1100		pF
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C) V_{GE} = ±15V V_{Bus} = 300V I_C = 20A R_G = 47Ω			50		ns
T_r	Rise Time				50		
$T_{d(off)}$	Turn-off Delay Time				250		
T_f	Fall Time				30		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (125°C) V_{GE} = ±15V V_{Bus} = 300V I_C = 20A R_G = 47Ω			50		ns
T_r	Rise Time				50		
$T_{d(off)}$	Turn-off Delay Time				270		
T_f	Fall Time				40		
E_{off}	Turn off Energy				0.7		mJ
V_F	Forward Voltage	V_{GE} = 0V I_F = 20A	T_j = 25°C		1.25	1.7	V
			T_j = 125°C		1.2		
Q_{rr}	Reverse Recovery Charge	I_F = 20A V_R = 300V di/dt=700A/µs	T_j = 25°C		1.7		µC
			T_j = 125°C		2.7		
R_{thJC}	Junction to Case		IGBT			1	°C/W
			Diode			1.5	

Temperature sensor NTC

Symbol	Characteristic	Min	Typ	Max	Unit
R_{25}	Resistance @ 25°C		5		kΩ
$B_{25/50}$	T_{25} = 298.16 K		3375		K

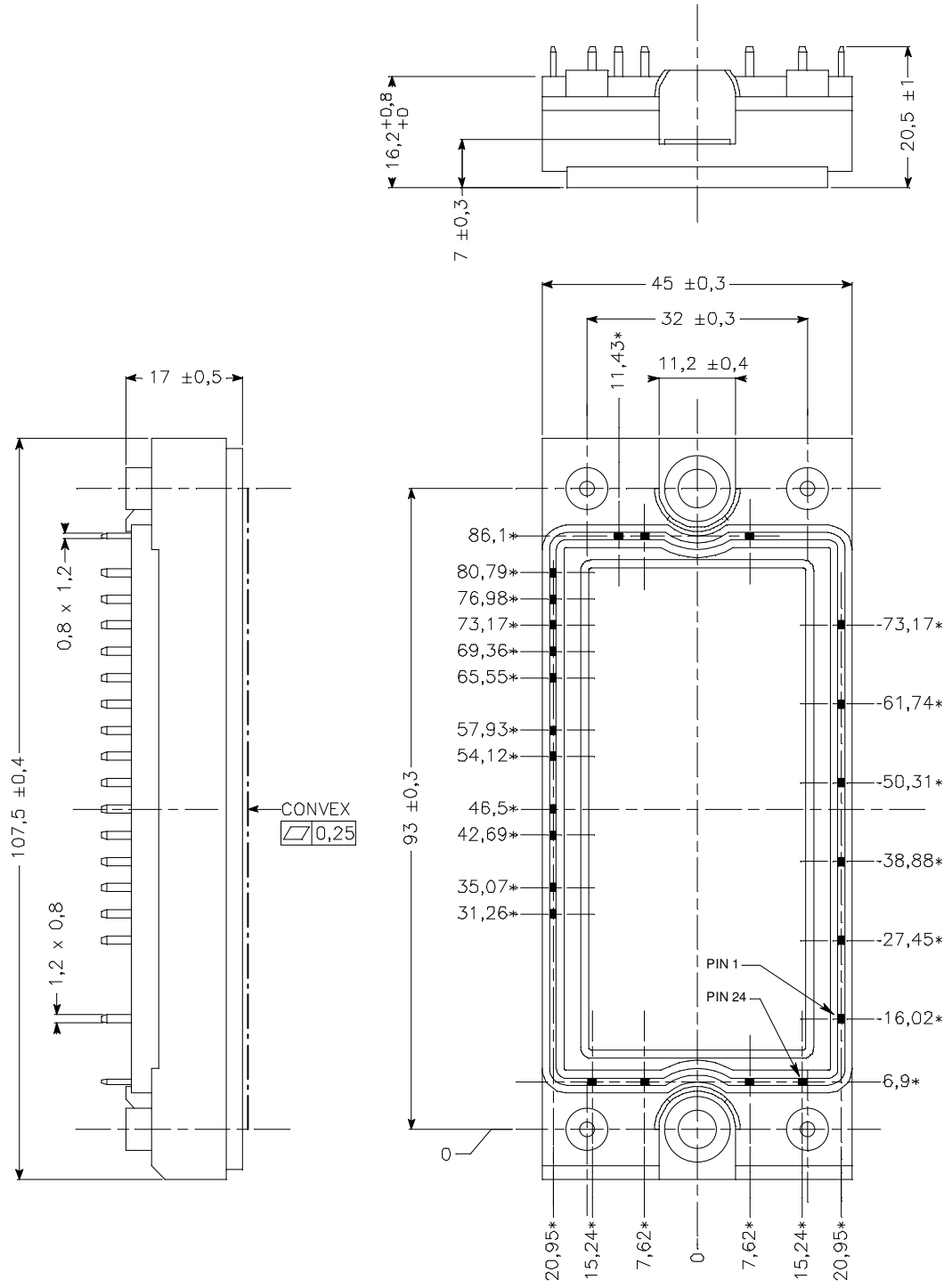
$$R_T = \frac{R_{25}}{\exp\left[B_{25/50}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

T: Thermistor temperature
R_T: Thermistor value at T

3. Thermal and package characteristics

Symbol	Characteristic			Min	Typ	Max	Unit
V_{ISOL}	RMS Isolation Voltage, any terminal to case t =1 min, I isol<1mA, 50/60Hz			2500			V
T_J	Operating junction temperature range			-40		150	°C
T_{STG}	Storage Temperature Range			-40		125	
T_C	Operating Case Temperature			-40		125	
Torque	Mounting torque	To Heatsink	M5			3.3	N.m
Wt	Package Weight					185	g

4. Package outline



ALL DIMENSIONS MARKED " * " ARE TOLERENCED AS : ⌖ Ø0,4