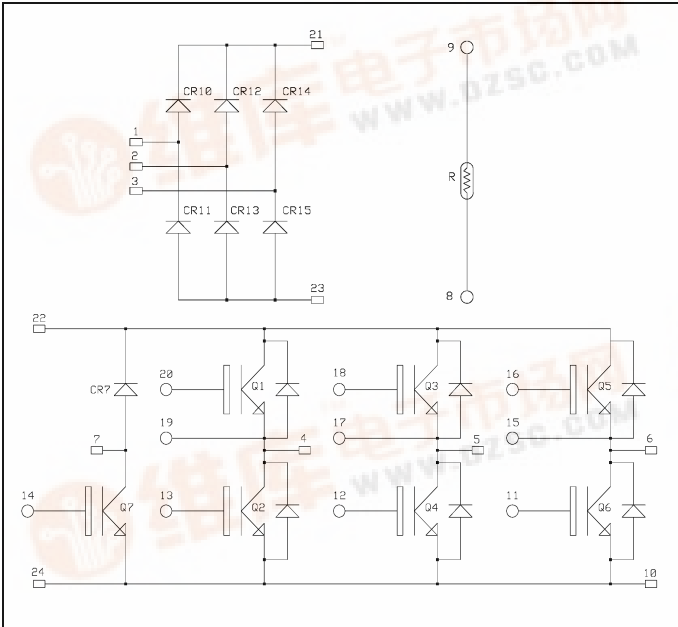




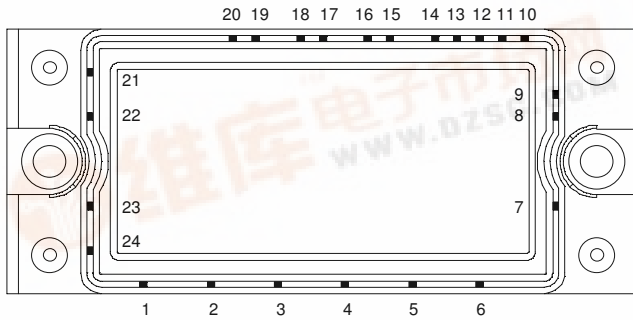
APTGF10X60RTP2 APTGF10X60BTP2

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

**$V_{CES} = 600V$
 $I_C = 10A @ T_c = 80^\circ C$**



APTGF10X60RTP2: 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 @ $T_j = 25^\circ C$ 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	$T_c = 80^\circ C$ 10	A	
I_{FSM}	Surge Forward Current	$T_j = 25^\circ C$ $t_p = 10ms$		300
		$T_j = 150^\circ C$		230

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



IGBT & Diode Brake (only for APTGF10X60BTP2) 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
		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
I _F	DC Forward Current	T _C = 80°C	10

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	20
		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
SCSOA	Short circuit Safe Operating Area	T _j = 125°C	45A @ 360V
I _F	DC Forward Current	T _C = 80°C	10
I _{FSM}	Surge Forward Current	t _p = 1ms T _C = 80°C	20

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 = 10A T _j = 150°C		0.9	0.95	
R _{thJC}	Junction to Case				1	°C/W

IGBT Brake & Diode (only for APTGF10X60BTP2) 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 = 0.35mA	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		600		pF
V _F	Forward Voltage	V _{GE} = 0V I _F = 10A	T _j = 25°C	1.25	1.7	V
			T _j = 125°C	1.2		
R _{thJC}	Junction to Case		IGBT		1.5	°C/W
			Diode		2.3	

IGBT & Diode Inverter Electrical Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
BV_{CES}	Collector - Emitter Breakdown Voltage	$V_{GE} = 0V, I_C = 500\mu A$	600			V
I_{CES}	Zero Gate Voltage Collector Current	$V_{GE} = 0V$ $V_{CE} = 600V$	$T_j = 25^\circ C$ $T_j = 125^\circ C$	0.5 0.8	500	μA mA
$V_{CE(on)}$	Collector Emitter on Voltage	$V_{GE} = 15V$ $I_C = 10A$	$T_j = 25^\circ C$ $T_j = 125^\circ C$	1.95 2.2	2.35	V
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE} = V_{CE}, I_C = 0.6 mA$	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	$V_{GE} = 0V, V_{CE} = 25V$ $f = 1MHz$		600		pF
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C) $V_{GE} = \pm 15V$ $V_{Bus} = 300V$ $I_C = 10A$ $R_G = 82\Omega$		35		ns
T_r	Rise Time			30		
$T_{d(off)}$	Turn-off Delay Time			220		
T_f	Fall Time			18		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (125°C) $V_{GE} = \pm 15V$ $V_{Bus} = 300V$ $I_C = 10A$ $R_G = 82\Omega$		35		ns
T_r	Rise Time			35		
$T_{d(off)}$	Turn-off Delay Time			230		
T_f	Fall Time			30		
E_{off}	Turn off Energy			0.3		
V_F	Forward Voltage	$V_{GE} = 0V$ $I_F = 10A$	$T_j = 25^\circ C$ $T_j = 125^\circ C$	1.25 1.2	1.7	V
Q_{rr}	Reverse Recovery Charge	$I_F = 10A$ $V_R = 300V$ $di/dt = 400A/\mu s$	$T_j = 25^\circ C$ $T_j = 125^\circ C$	0.85 1.35		μC
R_{thJC}	Junction to Case		IGBT Diode		1.5 2.3	$^\circ C/W$

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

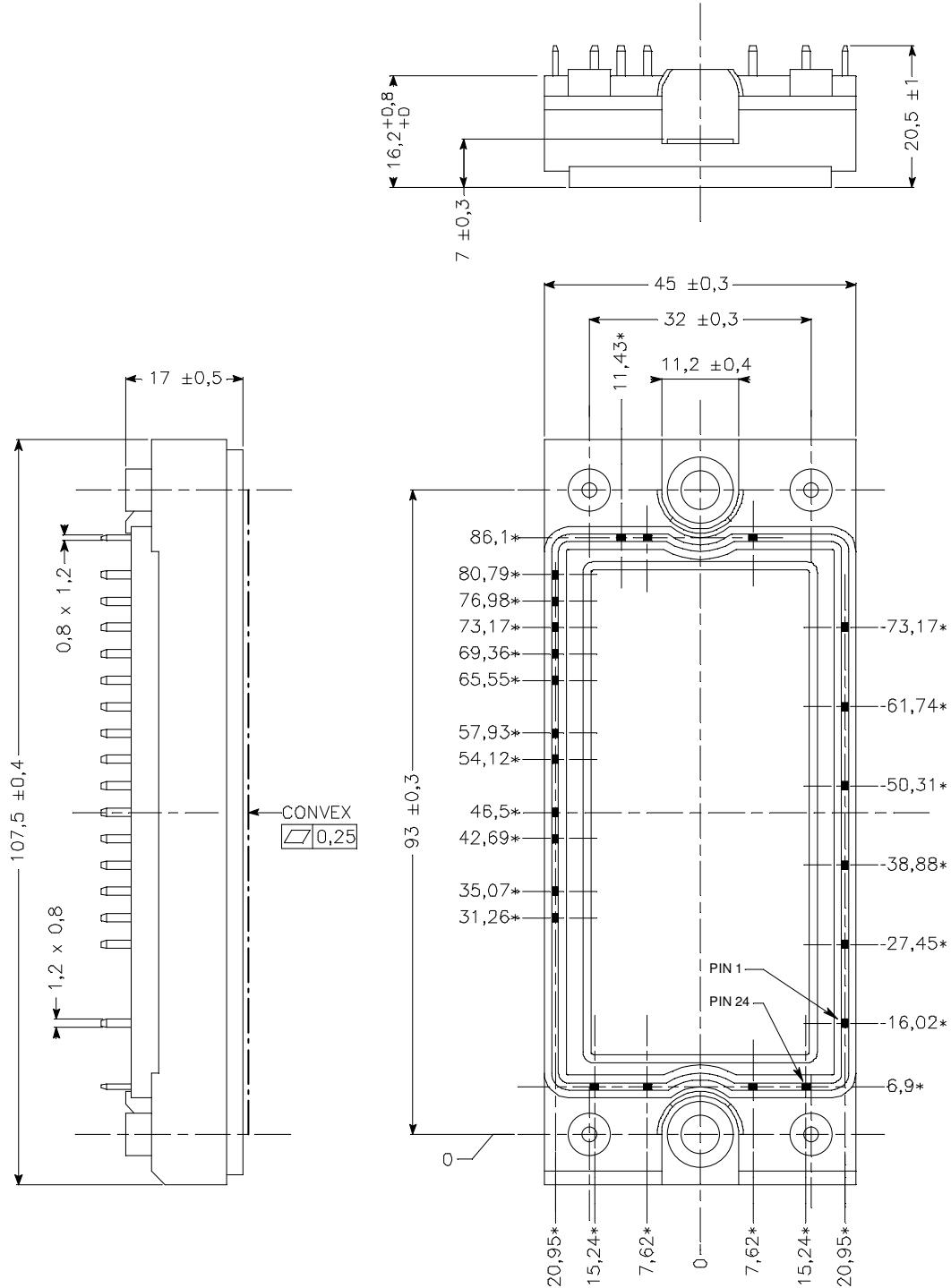
$$R_T = \frac{R_{25}}{\exp\left[B_{25/50}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

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 : ± 0.4

APT reserves the right to change, without notice, the specifications and information contained herein

APT's products are covered by one or more of U.S patents 4,895,810 5,045,903 5,089,434 5,182,234 5,019,522 5,262,336 6,503,786 5,256,583 4,748,103 5,283,202 5,231,474 5,434,095 5,528,058 and foreign patents. U.S and Foreign patents pending. All Rights Reserved.