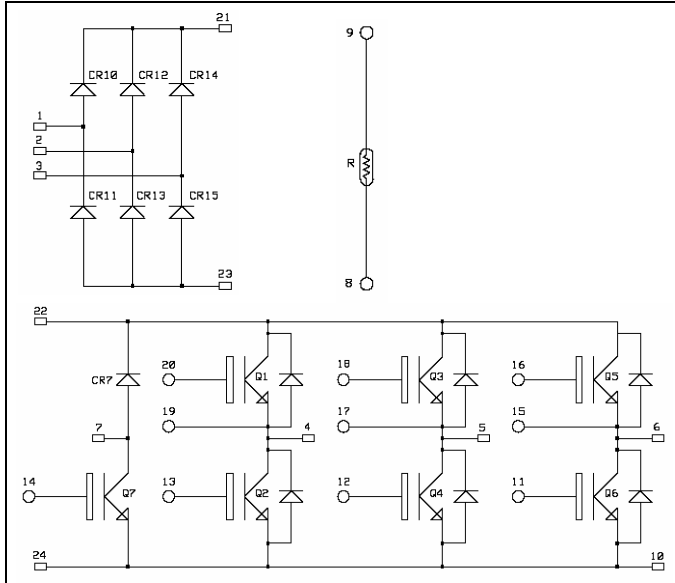
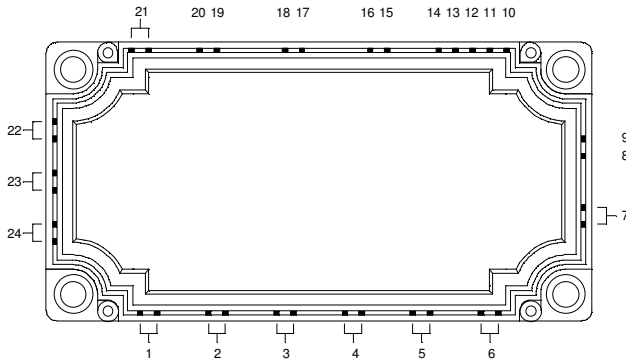


## Input rectifier bridge + Brake + 3 Phase Bridge Trench IGBT<sup>®</sup> Power Module

$V_{CES} = 1200V$   
 $I_C = 50A @ T_c = 80^\circ C$



APTGT50X120RTP3: Without Brake (Pin 7 & 14 not connected)



### Application

- AC Motor control

### Features

- Trench + Field Stop IGBT<sup>®</sup> Technology
  - Low voltage drop
  - Low tail current
  - Switching frequency up to 20 kHz
  - Soft recovery parallel diodes
  - Low diode VF
  - Low leakage current
  - Avalanche energy rated
  - RBSOA and SCSOA rated
- Kelvin emitter for easy drive
- 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	$T_c = 80^\circ C$ 80	A	
$I_{FSM}$	Surge Forward Current	$t_p = 10ms$ $T_j = 25^\circ C$		500
		$T_j = 150^\circ C$		400

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

**IGBT & Diode Brake** (only for APTGT50X120BTP3) Absolute maximum ratings

<i>Symbol</i>	<i>Parameter</i>		<i>Max ratings</i>	<i>Unit</i>
V <sub>CES</sub>	Collector - Emitter Breakdown Voltage		1200	V
I <sub>C</sub>	Continuous Collector Current	T <sub>C</sub> = 25°C	55	A
		T <sub>C</sub> = 80°C	35	
I <sub>CM</sub>	Pulsed Collector Current	T <sub>C</sub> = 25°C	80	
V <sub>GE</sub>	Gate – Emitter Voltage		±20	V
P <sub>D</sub>	Maximum Power Dissipation	T <sub>C</sub> = 25°C	200	W
I <sub>F</sub>	DC Forward Current	T <sub>C</sub> = 80°C	15	A

**IGBT & Diode Inverter** Absolute maximum ratings

<i>Symbol</i>	<i>Parameter</i>		<i>Max ratings</i>	<i>Unit</i>
V <sub>CES</sub>	Collector - Emitter Breakdown Voltage		1200	V
I <sub>C</sub>	Continuous Collector Current	T <sub>C</sub> = 25°C	75	A
		T <sub>C</sub> = 80°C	50	
I <sub>CM</sub>	Pulsed Collector Current	T <sub>C</sub> = 25°C	100	
V <sub>GE</sub>	Gate – Emitter Voltage		±20	V
P <sub>D</sub>	Maximum Power Dissipation	T <sub>C</sub> = 25°C	270	W
RBSOA	Reverse Bias Safe Operating Area	T <sub>j</sub> = 125°C	100A @ 1100V	
I <sub>F</sub>	DC Forward Current	T <sub>C</sub> = 80°C	50	A
I <sub>FRM</sub>	Repetitive Peak Forward Current	t <sub>p</sub> = 1ms	100	

## 2. Electrical Characteristics

**Diodes Rectifier** Electrical Characteristics

<i>Symbol</i>	<i>Characteristic</i>	<i>Test Conditions</i>		<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>
I <sub>R</sub>	Reverse Current	V <sub>R</sub> = 1600V	T <sub>j</sub> = 150°C		3		mA
V <sub>F</sub>	Forward Voltage	I <sub>F</sub> = 50A	T <sub>j</sub> = 150°C		1.0		V
R <sub>thJC</sub>	Junction to Case					0.65	°C/W

**IGBT Brake & Diode** (only for APTGT50X120BTP3) Electrical Characteristics

<i>Symbol</i>	<i>Characteristic</i>	<i>Test Conditions</i>		<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>
I <sub>CES</sub>	Zero Gate Voltage Collector Current	V <sub>GE</sub> = 0V, V <sub>CE</sub> = 1200V			4		mA
V <sub>CE(on)</sub>	Collector Emitter on Voltage	V <sub>GE</sub> = 15V I <sub>C</sub> = 35A	T <sub>j</sub> = 25°C		1.8	2.2	V
			T <sub>j</sub> = 125°C			2.2	
V <sub>GE(th)</sub>	Gate Threshold Voltage	V <sub>GE</sub> = V <sub>CE</sub> , I <sub>C</sub> = 1.5mA		5.0	5.8	6.5	V
I <sub>GES</sub>	Gate – Emitter Leakage Current	V <sub>GE</sub> = 20V, V <sub>CE</sub> = 0V				500	nA
C <sub>ies</sub>	Input Capacitance	V <sub>GE</sub> = 0V, V <sub>CE</sub> = 25V f = 1MHz			2530		pF
C <sub>oes</sub>	Output Capacitance				132		
C <sub>res</sub>	Reverse Transfer Capacitance				115		
V <sub>F</sub>	Forward Voltage	V <sub>GE</sub> = 0V I <sub>F</sub> = 35A	T <sub>j</sub> = 25°C		2.3	2.7	V
			T <sub>j</sub> = 125°C			2.5	
R <sub>thJC</sub>	Junction to Case					0.6	°C/W
						1.5	

## IGBT & Diode Inverter Electrical Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit		
BV <sub>CES</sub>	Collector - Emitter Breakdown Voltage	V <sub>GE</sub> = 0V, I <sub>C</sub> = 3mA	1200			V		
I <sub>CES</sub>	Zero Gate Voltage Collector Current	V <sub>GE</sub> = 0V, V <sub>CE</sub> = 1200V			5	mA		
V <sub>CE(on)</sub>	Collector Emitter on Voltage	V <sub>GE</sub> = 15V I <sub>C</sub> = 50A		T <sub>j</sub> = 25°C	1.4	1.7	2.1	V
				T <sub>j</sub> = 125°C		2.0		
V <sub>GE(th)</sub>	Gate Threshold Voltage	V <sub>GE</sub> = V <sub>CE</sub> , I <sub>C</sub> = 2 mA	5.0	5.8	6.5	V		
I <sub>GES</sub>	Gate – Emitter Leakage Current	V <sub>GE</sub> = 20V, V <sub>CE</sub> = 0V			500	nA		
C <sub>ies</sub>	Input Capacitance	V <sub>GE</sub> = 0V V <sub>CE</sub> = 25V f = 1MHz		3600		pF		
C <sub>oss</sub>	Output Capacitance			188				
C <sub>rss</sub>	Reverse Transfer Capacitance			163				
T <sub>d(on)</sub>	Turn-on Delay Time	Inductive Switching (25°C) V <sub>GE</sub> = ±15V V <sub>Bus</sub> = 600V I <sub>C</sub> = 50A R <sub>G</sub> = 18Ω		85		ns		
T <sub>r</sub>	Rise Time			30				
T <sub>d(off)</sub>	Turn-off Delay Time			420				
T <sub>f</sub>	Fall Time			65				
T <sub>d(on)</sub>	Turn-on Delay Time	Inductive Switching (125°C) V <sub>GE</sub> = ±15V V <sub>Bus</sub> = 600V I <sub>C</sub> = 50A R <sub>G</sub> = 18Ω		90		ns		
T <sub>r</sub>	Rise Time			45				
T <sub>d(off)</sub>	Turn-off Delay Time			520				
T <sub>f</sub>	Fall Time			90				
E <sub>off</sub>	Turn off Energy			5.8			mJ	
V <sub>F</sub>	Forward Voltage	V <sub>GE</sub> = 0V I <sub>F</sub> = 50A	T <sub>j</sub> = 25°C		1.6	2.2	V	
			T <sub>j</sub> = 125°C		1.6			
Q <sub>rr</sub>	Reverse Recovery Charge	I <sub>F</sub> = 50A V <sub>R</sub> = 600V di/dt=990A/μs	T <sub>j</sub> = 25°C		5.2		μC	
			T <sub>j</sub> = 125°C		9.4			
R <sub>thJC</sub>	Junction to Case		IGBT		0.45	°C/W		
			Diode		0.75			

## Temperature sensor NTC

Symbol	Characteristic	Min	Typ	Max	Unit
R <sub>25</sub>	Resistance @ 25°C		5		kΩ
B <sub>25/50</sub>	T <sub>25</sub> = 298.16 K		3375		K

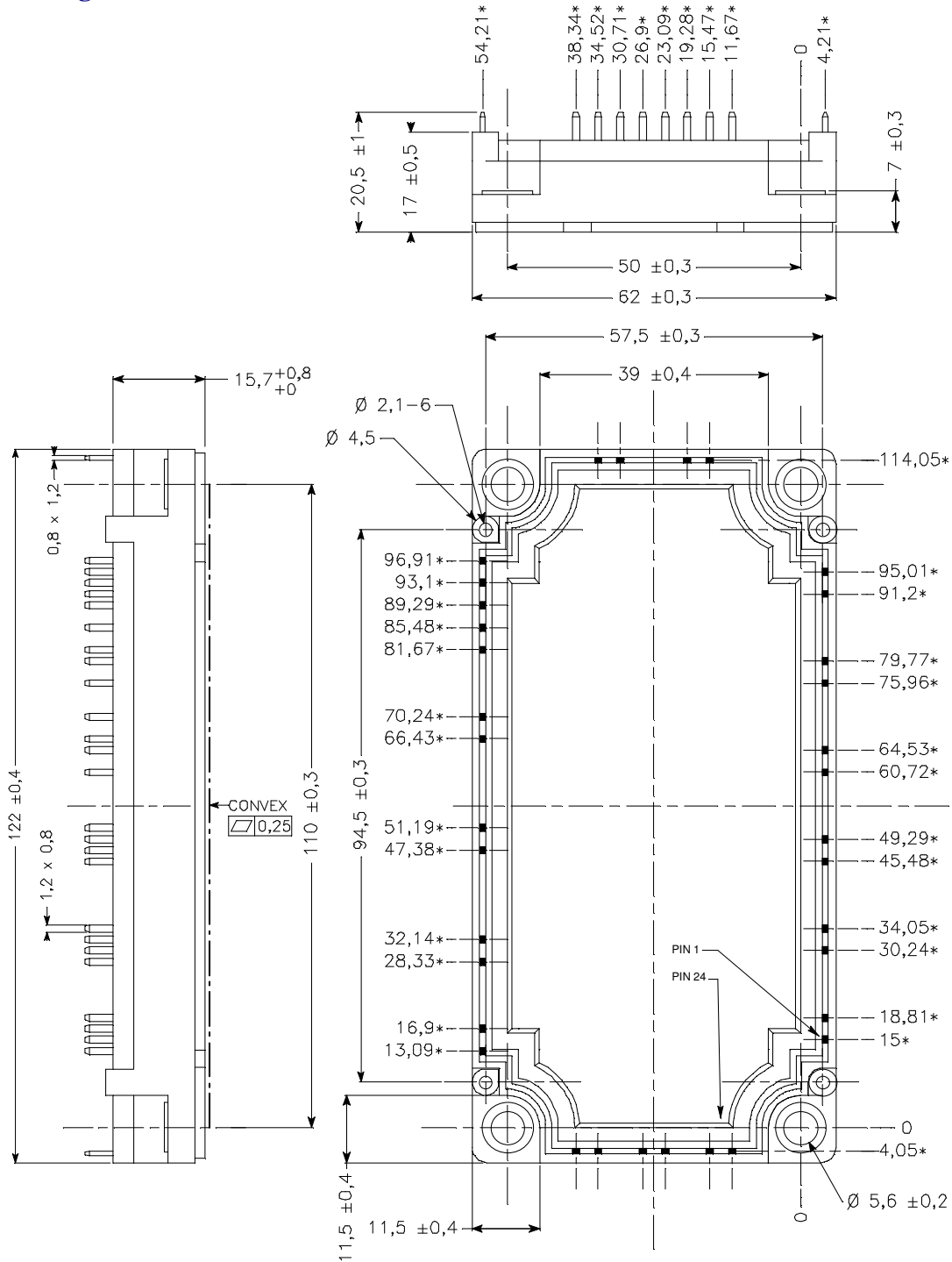
$$R_T = \frac{R_{25}}{\exp \left[ B_{25/50} \left( \frac{1}{T_{25}} - \frac{1}{T} \right) \right]}$$

T: Thermistor temperature  
R<sub>T</sub>: Thermistor value at T

## 3. Thermal and package characteristics

Symbol	Characteristic	Min	Typ	Max	Unit	
V <sub>ISOL</sub>	RMS Isolation Voltage, any terminal to case t = 1 min, I <sub>isol</sub> < 1mA, 50/60Hz	2500			V	
T <sub>J</sub>	Operating junction temperature range	-40		150	°C	
T <sub>STG</sub>	Storage Temperature Range	-40		125		
T <sub>C</sub>	Operating Case Temperature	-40		125		
Torque	Mounting torque	To Heatsink	M5		3.3	N.m
Wt	Package Weight				300	g

**4. Package outline**



ALL DIMENSIONS MARKED "\*" ARE TOLERENCED AS :  $\varnothing \pm 0,4$

**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.