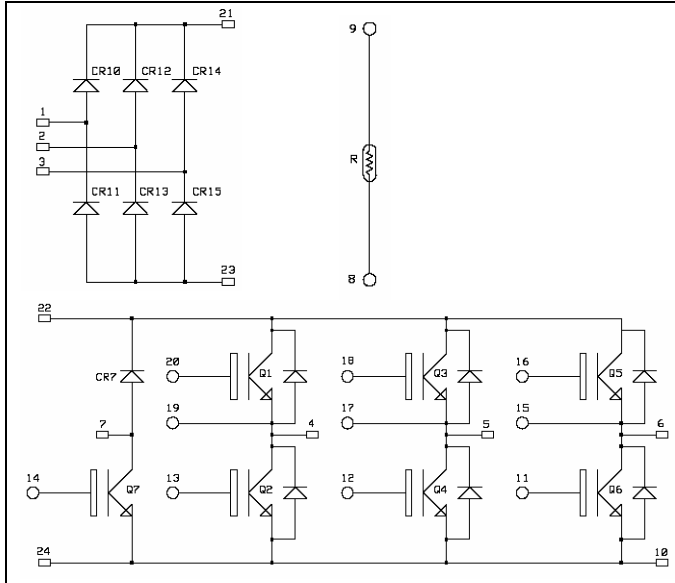
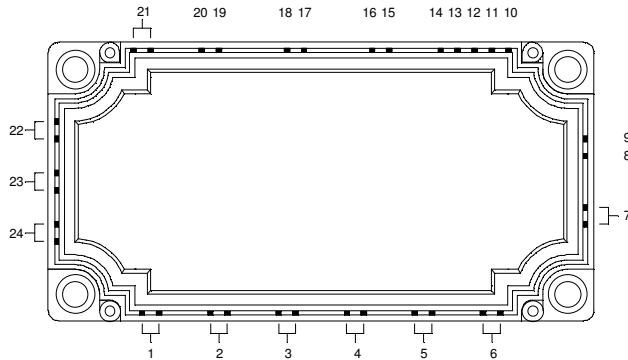


## Input rectifier bridge + Brake + 3 Phase Bridge Trench IGBT® Power Module

$V_{CES} = 1200V$   
 $I_C = 35A @ T_c = 80^\circ C$



APTGT35X120RTP3: Without Brake (Pin 7 & 14 not connected)



### Application

- AC Motor control

### Features

- Trench + Field Stop IGBT® 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	$t_p = 10ms$ $T_j = 25^\circ C$		320
		$T_j = 150^\circ C$		260

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

**IGBT & Diode Brake** (only for APTGT35X120BTP3) Absolute maximum ratings

Symbol	Parameter	Max ratings	Unit
V <sub>CES</sub>	Collector - Emitter Breakdown Voltage	1200	V
I <sub>C</sub>	Continuous Collector Current	T <sub>C</sub> = 25°C	40
		T <sub>C</sub> = 80°C	25
I <sub>CM</sub>	Pulsed Collector Current	T <sub>C</sub> = 25°C	65
V <sub>GE</sub>	Gate - Emitter Voltage	±20	V
P <sub>D</sub>	Maximum Power Dissipation	T <sub>C</sub> = 25°C	160
I <sub>F</sub>	DC Forward Current	T <sub>C</sub> = 80°C	15

**IGBT & Diode Inverter** Absolute maximum ratings

Symbol	Parameter	Max ratings	Unit
V <sub>CES</sub>	Collector - Emitter Breakdown Voltage	1200	V
I <sub>C</sub>	Continuous Collector Current	T <sub>C</sub> = 25°C	55
		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
RBSOA	Reverse Bias Safe Operating Area	T <sub>j</sub> = 125°C	80A @ 1100V
I <sub>F</sub>	DC Forward Current	T <sub>C</sub> = 80°C	35
I <sub>FRM</sub>	Repetitive Peak Forward Current	t <sub>p</sub> = 1ms	50

## 2. Electrical Characteristics

**Diodes Rectifier** Electrical Characteristics

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
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 APTGT35X120BTP3) Electrical Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
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	T <sub>j</sub> = 25°C	1.4	1.7	2.1
		I <sub>C</sub> = 25A	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> = 1mA	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			600	nA
C <sub>ies</sub>	Input Capacitance	V <sub>GE</sub> = 0V, V <sub>CE</sub> = 25V f = 1MHz		1808		pF
C <sub>oes</sub>	Output Capacitance			95		
C <sub>res</sub>	Reverse Transfer Capacitance			82		
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		IGBT		0.6	°C/W
			Diode		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			4	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	1.8	2.2	V
				T <sub>j</sub> = 125°C	2.1		
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			600	nA	
C <sub>ies</sub>	Input Capacitance	V <sub>GE</sub> = 0V V <sub>CE</sub> = 25V f = 1MHz		2530		pF	
C <sub>oss</sub>	Output Capacitance			132			
C <sub>rss</sub>	Reverse Transfer Capacitance			115			
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> = 40A R <sub>G</sub> = 27Ω		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> = 40A R <sub>G</sub> = 27Ω		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			4.2			mJ
V <sub>F</sub>	Forward Voltage	V <sub>GE</sub> = 0V I <sub>F</sub> = 40A	T <sub>j</sub> = 25°C	2.1		V	
			T <sub>j</sub> = 125°C	2.0			
Q <sub>rr</sub>	Reverse Recovery Charge	I <sub>F</sub> = 25A V <sub>R</sub> = 600V di/dt=990A/μs	T <sub>j</sub> = 25°C	2		μC	
			T <sub>j</sub> = 125°C	5			
R <sub>thJC</sub>	Junction to Case		IGBT		0.6	°C/W	
			Diode		0.95		

**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

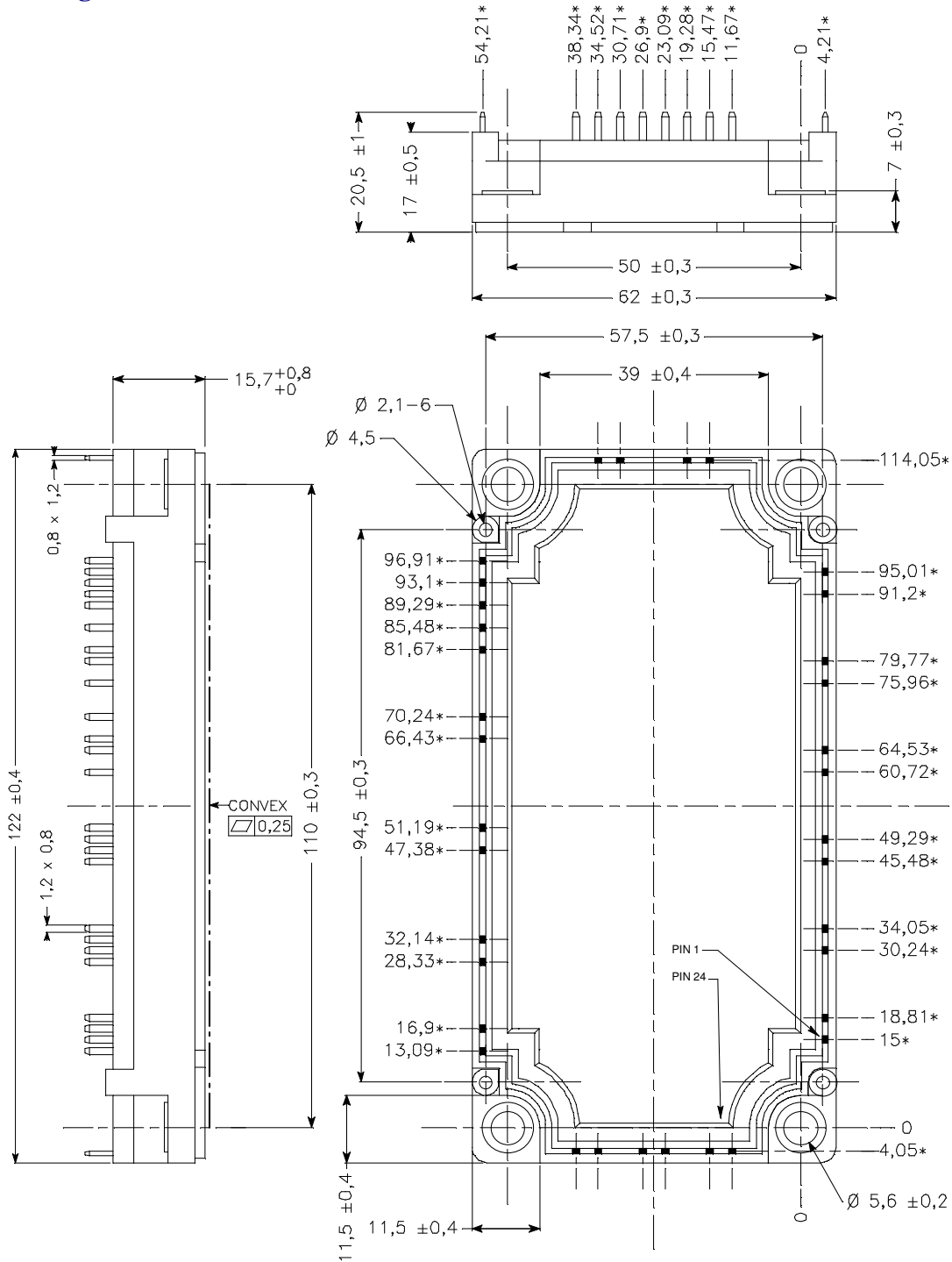
$$R_T = \frac{R_{25}}{\exp\left[B_{25/50}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

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 TOLERANCED AS :  $\varnothing \pm 0.4$

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