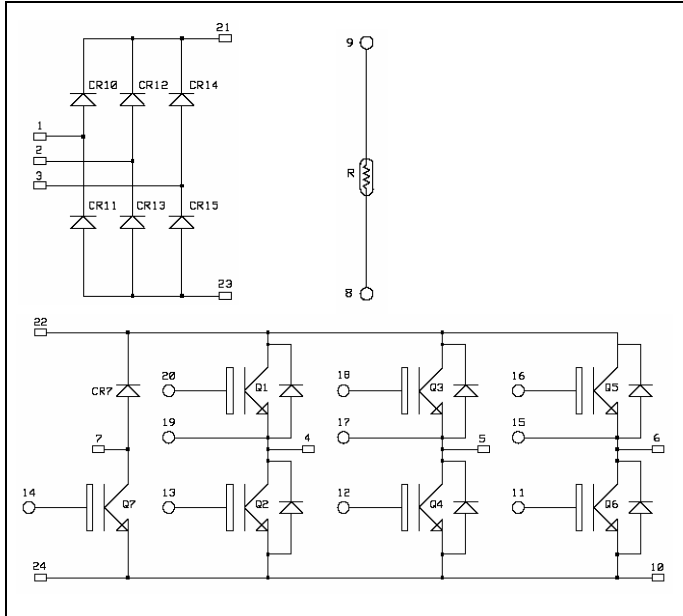
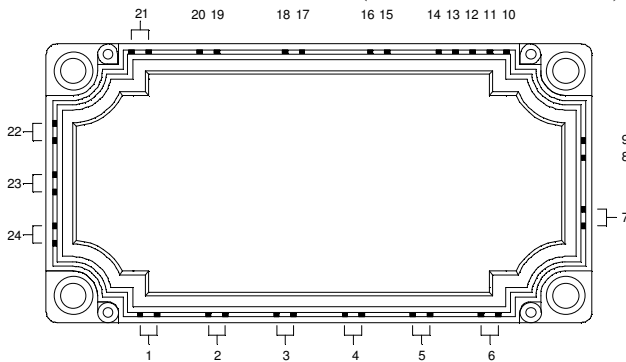


## Input rectifier bridge + Brake + 3 Phase Bridge NPT IGBT Power Module

$V_{CES} = 600V$   
 $I_C = 50A @ T_c = 80^\circ C$



APTGF50X60RTP3: Without Brake (Pin 7 & 14 not connected)




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	$T_j = 25^\circ C$ 500	
		$T_j = 150^\circ C$ 400	

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

#### 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

**IGBT & Diode Brake** (only for APTGF50X60BTP3) Absolute maximum ratings

<i>Symbol</i>	<i>Parameter</i>		<i>Max ratings</i>	<i>Unit</i>
V <sub>CES</sub>	Collector - Emitter Breakdown Voltage		600	V
I <sub>C</sub>	Continuous Collector Current	T <sub>C</sub> = 25°C	35	A
		T <sub>C</sub> = 80°C	25	
I <sub>CM</sub>	Pulsed Collector Current	T <sub>C</sub> = 25°C	70	
V <sub>GE</sub>	Gate – Emitter Voltage		±20	V
P <sub>D</sub>	Maximum Power Dissipation	T <sub>C</sub> = 25°C	155	W
I <sub>F</sub>	DC Forward Current	T <sub>C</sub> = 80°C	10	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		600	V
I <sub>C</sub>	Continuous Collector Current	T <sub>C</sub> = 25°C	70	A
		T <sub>C</sub> = 80°C	50	
I <sub>CM</sub>	Pulsed Collector Current	T <sub>C</sub> = 25°C	125	
V <sub>GE</sub>	Gate – Emitter Voltage		±20	V
P <sub>D</sub>	Maximum Power Dissipation	T <sub>C</sub> = 25°C	250	W
RBSOA	Reverse Bias Safe Operating Area	T <sub>j</sub> = 125°C	225A @ 360V	
I <sub>F</sub>	DC Forward Current	T <sub>C</sub> = 80°C	30	A
I <sub>FRM</sub>	Repetitive Peak Forward Current	t <sub>p</sub> = 1ms	80	

## 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 APTGF50X60BTP3) 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> = 600V		1	500	µA	
V <sub>CE(on)</sub>	Collector Emitter on Voltage	V <sub>GE</sub> = 15V	T <sub>j</sub> = 25°C		2.0	2.5	V
		I <sub>C</sub> = 20A	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> = 0.5mA		4.5	5.5	6.5	V
I <sub>GES</sub>	Gate – Emitter Leakage Current	V <sub>GE</sub> = 20V, V <sub>CE</sub> = 0V				400	nA
C <sub>ies</sub>	Input Capacitance	V <sub>GE</sub> = 0V, V <sub>CE</sub> = 25V f = 1MHz			1100		pF
C <sub>res</sub>	Reverse Transfer Capacitance				70		
V <sub>F</sub>	Forward Voltage	V <sub>GE</sub> = 0V I <sub>F</sub> = 10A	T <sub>j</sub> = 25°C		1.25	1.7	V
			T <sub>j</sub> = 125°C		1.2		
R <sub>thJC</sub>	Junction to Case		IGBT			0.8	°C/W
			Diode			2.3	

## 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> = 500μA	600			V	
I <sub>CES</sub>	Zero Gate Voltage Collector Current	V <sub>GE</sub> = 0V, V <sub>CE</sub> = 600V		1	500	μA	
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	1.95	2.45	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 mA	4.5	5.5	6.5	V	
I <sub>GES</sub>	Gate - Emitter Leakage Current	V <sub>GE</sub> = 20V, V <sub>CE</sub> = 0V			400	nA	
C <sub>ies</sub>	Input Capacitance	V <sub>GE</sub> = 0V, V <sub>CE</sub> = 25V f = 1MHz		2200		pF	
C <sub>res</sub>	Reverse Transfer Capacitance			200			
T <sub>d(on)</sub>	Turn-on Delay Time	Inductive Switching (25°C) V <sub>GE</sub> = ±15V V <sub>Bus</sub> = 300V I <sub>C</sub> = 50A R <sub>G</sub> = 2.7Ω		40		ns	
T <sub>r</sub>	Rise Time			9			
T <sub>d(off)</sub>	Turn-off Delay Time			120			
T <sub>f</sub>	Fall Time			12			
T <sub>d(on)</sub>	Turn-on Delay Time	Inductive Switching (125°C) V <sub>GE</sub> = ±15V V <sub>Bus</sub> = 300V I <sub>C</sub> = 50A R <sub>G</sub> = 2.7Ω		42		ns	
T <sub>r</sub>	Rise Time			10			
T <sub>d(off)</sub>	Turn-off Delay Time			132			
T <sub>f</sub>	Fall Time			21			
E <sub>off</sub>	Turn off Energy			1.0			mJ
V <sub>F</sub>	Forward Voltage	V <sub>GE</sub> = 0V I <sub>F</sub> = 50A	T <sub>j</sub> = 25°C	1.25	1.6	V	
			T <sub>j</sub> = 125°C	1.2			
Q <sub>rr</sub>	Reverse Recovery Charge	I <sub>F</sub> = 50A V <sub>R</sub> = 300V di/dt=800A/μs	T <sub>j</sub> = 25°C	3.4		μC	
			T <sub>j</sub> = 125°C	5.6			
R <sub>thJC</sub>	Junction to Case		IGBT		0.5	°C/W	
			Diode		0.8		

## 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

