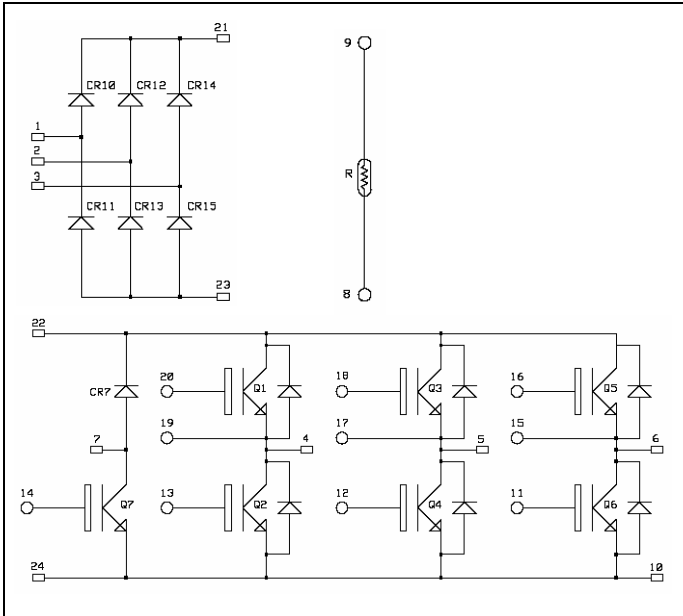
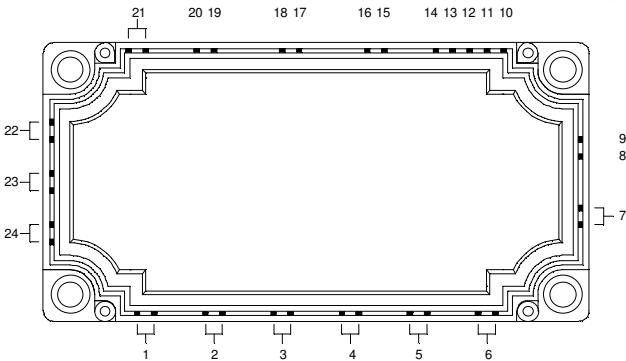


Input rectifier bridge +  
Brake + 3 Phase Bridge  
NPT IGBT Power Module

V<sub>CES</sub> = 600V  
I<sub>C</sub> = 50A @ T<sub>c</sub> = 80°C



APTGF50X60RTP3: 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<sub>j</sub> = 25°C unless otherwise specified

## 1. Absolute maximum ratings

### Diode rectifier Absolute maximum ratings

Symbol	Parameter	Max ratings	Unit
V <sub>RRM</sub>	Repetitive Peak Reverse Voltage	1600	V
I <sub>D</sub>	DC Forward Current	T <sub>c</sub> = 80°C 80	A
I <sub>FSM</sub>	Surge Forward Current	T <sub>j</sub> = 25°C 500	
		T <sub>j</sub> = 150°C 400	

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

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

Symbol	Parameter	Max ratings	Unit
V <sub>CES</sub>	Collector - Emitter Breakdown Voltage	600	V
I <sub>C</sub>	Continuous Collector Current	T <sub>C</sub> = 25°C	35
		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
I <sub>F</sub>	DC Forward Current	T <sub>C</sub> = 80°C	10

**IGBT & Diode Inverter** Absolute maximum ratings

Symbol	Parameter	Max ratings	Unit
V <sub>CES</sub>	Collector - Emitter Breakdown Voltage	600	V
I <sub>C</sub>	Continuous Collector Current	T <sub>C</sub> = 25°C	70
		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
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
I <sub>FRM</sub>	Repetitive Peak Forward Current	t <sub>p</sub> = 1ms	80

## 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 APTGF50X60BTP3) 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> = 600V		1	500	μA
V <sub>CE(on)</sub>	Collector Emitter on Voltage	V <sub>GE</sub> = 15V I <sub>C</sub> = 20A	T <sub>J</sub> = 25°C	2.0	2.5	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> = 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		1.95 2.2	2.45	V
		T <sub>j</sub> = 25°C T <sub>j</sub> = 125°C				
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		2200		pF
C <sub>res</sub>	Reverse Transfer Capacitance	f = 1MHz		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		1.25 1.2	1.6	V
		T <sub>j</sub> = 25°C T <sub>j</sub> = 125°C				
Q <sub>rr</sub>	Reverse Recovery Charge	I <sub>F</sub> = 50A V <sub>R</sub> = 300V di/dt=800A/μs		3.4 5.6		μC
		T <sub>j</sub> = 25°C T <sub>j</sub> = 125°C				
R <sub>thJC</sub>	Junction to Case				0.5 0.8	°C/W
		IGBT Diode				

### 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

