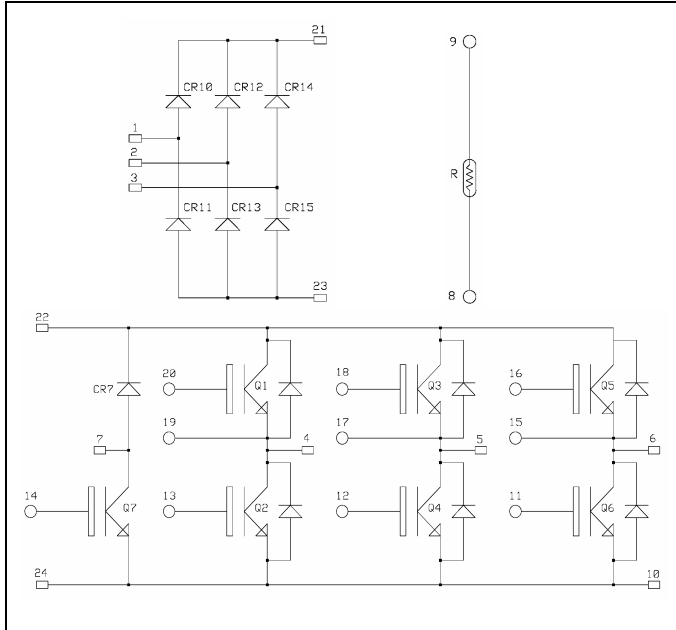


## Input rectifier bridge + Brake + 3 Phase Bridge NPT IGBT Power Module

$$V_{CES} = 600V$$

$$I_C = 20A @ T_c = 80^{\circ}C$$



APTGF20X60RTP2: 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	$T_c = 80^{\circ}C$ 20	A
$I_{FSM}$	Surge Forward Current	$t_p = 10ms$ $T_j = 25^{\circ}C$ 300	
		$T_j = 150^{\circ}C$ 230	

 **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 APTGF20X60BTP2) 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	20
		T <sub>C</sub> = 80°C	10
I <sub>CM</sub>	Pulsed Collector Current	T <sub>C</sub> = 25°C	25
V <sub>GE</sub>	Gate - Emitter Voltage	±20	V
P <sub>D</sub>	Maximum Power Dissipation	T <sub>C</sub> = 25°C	80
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	35
		T <sub>C</sub> = 80°C	20
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	125
SCSOA	Short circuit Safe Operating Area	T <sub>j</sub> = 125°C	80A @ 360V
I <sub>F</sub>	DC Forward Current	T <sub>C</sub> = 80°C	20
I <sub>FSM</sub>	Surge Forward Current	t <sub>p</sub> = 1ms T <sub>C</sub> = 80°C	40

## 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		2		mA
V <sub>F</sub>	Forward Voltage	I <sub>F</sub> = 30A T <sub>j</sub> = 25°C		1.3	1.5	V
		I <sub>F</sub> = 20A T <sub>j</sub> = 150°C		1	1.05	
R <sub>thJC</sub>	Junction to Case				1	°C/W

**IGBT Brake & Diode** (only for APTGF20X60BTP2) 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	T <sub>j</sub> = 25°C	0.5	500	μA
			T <sub>j</sub> = 125°C	0.8		mA
V <sub>CE(on)</sub>	Collector Emitter on Voltage	V <sub>GE</sub> = 15V I <sub>C</sub> = 10A	T <sub>j</sub> = 25°C	1.95	2.35	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> = 0.35 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			300	nA
C <sub>ies</sub>	Input Capacitance	V <sub>GE</sub> = 0V, V <sub>CE</sub> = 25V f = 1MHz		800		pF
V <sub>F</sub>	Forward Voltage	V <sub>GE</sub> = 0V I <sub>F</sub> = 20A	T <sub>j</sub> = 25°C	1.25	1.75	V
			T <sub>j</sub> = 125°C	1.2		
R <sub>thJC</sub>	Junction to Case		IGBT		1.5	°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> = 500μA	600			V
I <sub>CES</sub>	Zero Gate Voltage Collector Current	V <sub>GE</sub> = 0V V <sub>CE</sub> = 600V	T <sub>j</sub> = 25°C	0.7	500	μA
			T <sub>j</sub> = 125°C	1.0		mA
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	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> = 0.5 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			300	nA
C <sub>ies</sub>	Input Capacitance	V <sub>GE</sub> = 0V, V <sub>CE</sub> = 25V f = 1MHz		1100		pF
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> = 20A R <sub>G</sub> = 47Ω		50		ns
T <sub>r</sub>	Rise Time			50		
T <sub>d(off)</sub>	Turn-off Delay Time			250		
T <sub>f</sub>	Fall Time			30		
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> = 20A R <sub>G</sub> = 47Ω		50		ns
T <sub>r</sub>	Rise Time			50		
T <sub>d(off)</sub>	Turn-off Delay Time			270		
T <sub>f</sub>	Fall Time			40		
E <sub>off</sub>	Turn off Energy			0.7		mJ
V <sub>F</sub>	Forward Voltage	V <sub>GE</sub> = 0V I <sub>F</sub> = 20A	T <sub>j</sub> = 25°C	1.25	1.7	V
			T <sub>j</sub> = 125°C	1.2		
Q <sub>rr</sub>	Reverse Recovery Charge	I <sub>F</sub> = 20A V <sub>R</sub> = 300V di/dt=700A/μs	T <sub>j</sub> = 25°C	1.7		μC
			T <sub>j</sub> = 125°C	2.7		
R <sub>thJC</sub>	Junction to Case		IGBT		1	°C/W
			Diode		1.5	

## 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			185	g

