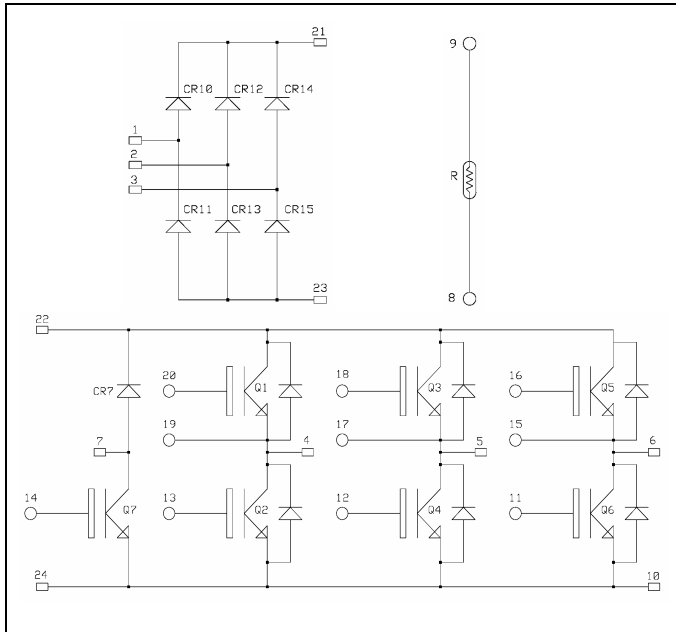


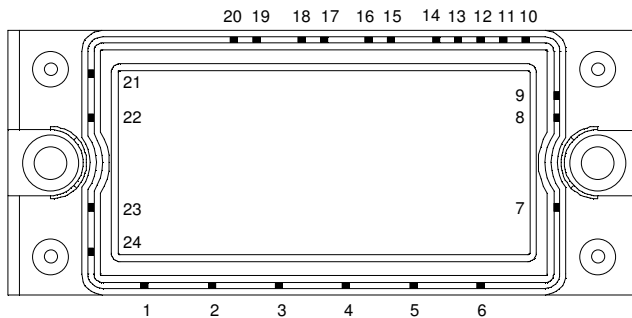
Input rectifier bridge + Brake + 3 Phase Bridge NPT IGBT Power Module

$$V_{CES} = 600V$$

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



APTGF20X60RTP2: Without Brake (Pin 7 & 14 not connected)



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 @ $T_j = 25^{\circ}C$ 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 | $T_j = 25^{\circ}C$ 300 | |
| | | $T_j = 150^{\circ}C$ 230 | |

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

IGBT & Diode Brake (only for APTGF20X60BTP2) Absolute maximum ratings

| Symbol | Parameter | Max ratings | Unit |
|------------------|---------------------------------------|-----------------------|------|
| V _{CES} | Collector - Emitter Breakdown Voltage | 600 | V |
| I _C | Continuous Collector Current | T _C = 25°C | 20 |
| | | T _C = 80°C | 10 |
| I _{CM} | Pulsed Collector Current | T _C = 25°C | 25 |
| V _{GE} | Gate - Emitter Voltage | ±20 | V |
| P _D | Maximum Power Dissipation | T _C = 25°C | 80 |
| I _F | DC Forward Current | T _C = 80°C | 10 |

IGBT & Diode Inverter Absolute maximum ratings

| Symbol | Parameter | Max ratings | Unit |
|------------------|---------------------------------------|---|------------|
| V _{CES} | Collector - Emitter Breakdown Voltage | 600 | V |
| I _C | Continuous Collector Current | T _C = 25°C | 35 |
| | | T _C = 80°C | 20 |
| I _{CM} | Pulsed Collector Current | T _C = 25°C | 70 |
| V _{GE} | Gate - Emitter Voltage | ±20 | V |
| P _D | Maximum Power Dissipation | T _C = 25°C | 125 |
| SCSOA | Short circuit Safe Operating Area | T _j = 125°C | 80A @ 360V |
| I _F | DC Forward Current | T _C = 80°C | 20 |
| I _{FSM} | Surge Forward Current | t _p = 1ms T _C = 80°C | 40 |

2. Electrical Characteristics

Diodes Rectifier Electrical Characteristics

| Symbol | Characteristic | Test Conditions | Min | Typ | Max | Unit |
|-------------------|------------------|--|-----|-----|------|------|
| I _R | Reverse Current | V _R = 1600V T _j = 150°C | | 2 | | mA |
| V _F | Forward Voltage | I _F = 30A T _j = 25°C | | 1.3 | 1.5 | V |
| | | I _F = 20A T _j = 150°C | | 1 | 1.05 | |
| R _{thJC} | Junction to Case | | | | 1 | °C/W |

IGBT Brake & Diode (only for APTGF20X60BTP2) Electrical Characteristics

| Symbol | Characteristic | Test Conditions | Min | Typ | Max | Unit |
|---------------------|-------------------------------------|---|-----|------|------|------|
| I _{CES} | Zero Gate Voltage Collector Current | V _{GE} = 0V V _{CE} = 600V T _j = 25°C | | 0.5 | 500 | μA |
| | | T _j = 125°C | | 0.8 | | mA |
| V _{CE(on)} | Collector Emitter on Voltage | V _{GE} = 15V I _C = 10A T _j = 25°C | | 1.95 | 2.35 | V |
| | | T _j = 125°C | | 2.2 | | |
| V _{GE(th)} | Gate Threshold Voltage | V _{GE} = V _{CE} , I _C = 0.35 mA | 4.5 | 5.5 | 6.5 | V |
| I _{GES} | Gate - Emitter Leakage Current | V _{GE} = 20V, V _{CE} = 0V | | | 300 | nA |
| C _{ies} | Input Capacitance | V _{GE} = 0V, V _{CE} = 25V f = 1MHz | | 800 | | pF |
| V _F | Forward Voltage | V _{GE} = 0V I _F = 20A T _j = 25°C | | 1.25 | 1.75 | V |
| | | T _j = 125°C | | 1.2 | | |
| R _{thJC} | 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 _{CES} | Collector - Emitter Breakdown Voltage | V _{GE} = 0V, I _C = 500μA | 600 | | | V |
| I _{CES} | Zero Gate Voltage Collector Current | V _{GE} = 0V V _{CE} = 600V | T _j = 25°C | 0.7 | 500 | μA |
| | | | T _j = 125°C | 1.0 | | mA |
| V _{CE(on)} | Collector Emitter on Voltage | V _{GE} = 15V I _C = 20A | T _j = 25°C | 1.95 | 2.45 | V |
| | | | T _j = 125°C | 2.2 | | |
| V _{GE(th)} | Gate Threshold Voltage | V _{GE} = V _{CE} , I _C = 0.5 mA | 4.5 | 5.5 | 6.5 | V |
| I _{GES} | Gate - Emitter Leakage Current | V _{GE} = 20V, V _{CE} = 0V | | | 300 | nA |
| C _{ies} | Input Capacitance | V _{GE} = 0V, V _{CE} = 25V f = 1MHz | | 1100 | | pF |
| T _{d(on)} | Turn-on Delay Time | Inductive Switching (25°C) V _{GE} = ±15V V _{Bus} = 300V I _C = 20A R _G = 47Ω | | 50 | | ns |
| T _r | Rise Time | | | 50 | | |
| T _{d(off)} | Turn-off Delay Time | | | 250 | | |
| T _f | Fall Time | | | 30 | | |
| T _{d(on)} | Turn-on Delay Time | Inductive Switching (125°C) V _{GE} = ±15V V _{Bus} = 300V I _C = 20A R _G = 47Ω | | 50 | | ns |
| T _r | Rise Time | | | 50 | | |
| T _{d(off)} | Turn-off Delay Time | | | 270 | | |
| T _f | Fall Time | | | 40 | | |
| E _{off} | Turn off Energy | | | 0.7 | | mJ |
| V _F | Forward Voltage | V _{GE} = 0V I _F = 20A | T _j = 25°C | 1.25 | 1.7 | V |
| | | | T _j = 125°C | 1.2 | | |
| Q _{rr} | Reverse Recovery Charge | I _F = 20A V _R = 300V di/dt=700A/μs | T _j = 25°C | 1.7 | | μC |
| | | | T _j = 125°C | 2.7 | | |
| R _{thJC} | Junction to Case | | IGBT | | 1 | °C/W |
| | | | Diode | | 1.5 | |

Temperature sensor NTC

| Symbol | Characteristic | Min | Typ | Max | Unit |
|--------------------|----------------------------|-----|------|-----|------|
| R ₂₅ | Resistance @ 25°C | | 5 | | kΩ |
| B _{25/50} | T ₂₅ = 298.16 K | | 3375 | | K |

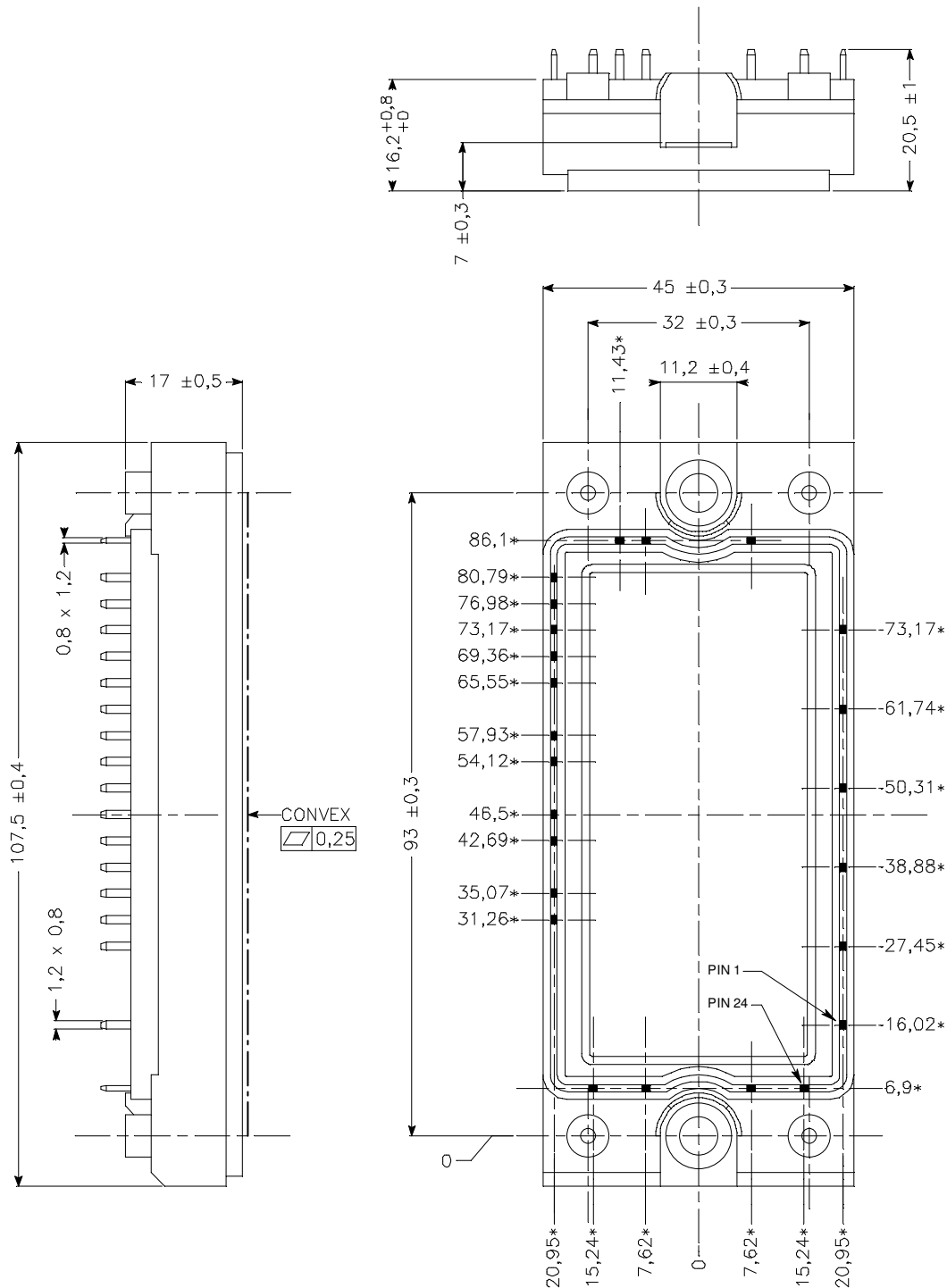
$$R_T = \frac{R_{25}}{\exp \left[B_{25/50} \left(\frac{1}{T_{25}} - \frac{1}{T} \right) \right]}$$

T: Thermistor temperature
R_T: Thermistor value at T

3. Thermal and package characteristics

| Symbol | Characteristic | Min | Typ | Max | Unit |
|-------------------|--|-------------|-----|-----|------|
| V _{ISOL} | RMS Isolation Voltage, any terminal to case t = 1 min, I _{isol} < 1mA, 50/60Hz | 2500 | | | V |
| T _J | Operating junction temperature range | -40 | | 150 | °C |
| T _{STG} | Storage Temperature Range | -40 | | 125 | |
| T _C | Operating Case Temperature | -40 | | 125 | |
| Torque | Mounting torque | To Heatsink | M5 | 3.3 | N.m |
| Wt | Package Weight | | | 185 | g |

4. Package outline



ALL DIMENSIONS MARKED " * " ARE TOLERENCED AS : $\varnothing 0.4$

APT reserves the right to change, without notice, the specifications and information contained herein

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