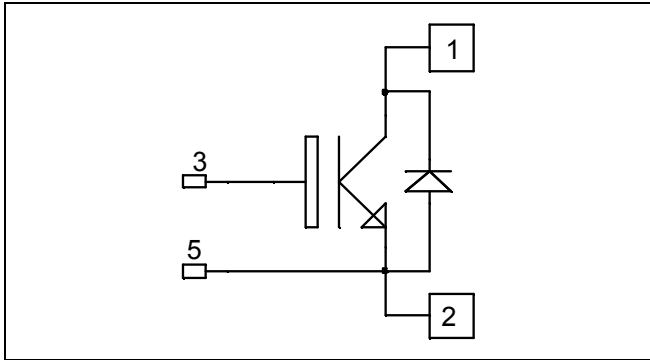


**Single switch  
NPT IGBT Power Module**

**$V_{CES} = 600V$   
 $I_C = 500A @ T_c = 80^\circ C$**



**Application**

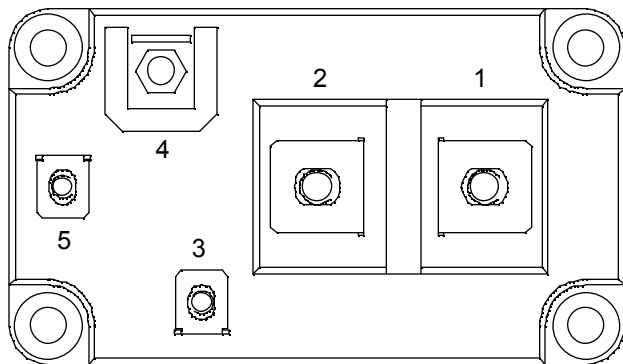
- Welding converters
- Switched Mode Power Supplies
- Uninterruptible Power Supplies
- Motor control

**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
- Kelvin emitter for easy drive
- Low stray inductance
  - M6 connectors for power
  - M4 connectors for signal
- High level of integration

**Benefits**

- Outstanding performance at high frequency operation
- Stable temperature behavior
- Very rugged
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Easy paralleling due to positive TC of VCEsat



**Absolute maximum ratings**

| Symbol    | Parameter                             | Max ratings         | Unit      |
|-----------|---------------------------------------|---------------------|-----------|
| $V_{CES}$ | Collector - Emitter Breakdown Voltage | 600                 | V         |
| $I_C$     | Continuous Collector Current          | $T_C = 25^\circ C$  | 625       |
|           |                                       | $T_C = 80^\circ C$  | 500       |
| $I_{CM}$  | Pulsed Collector Current              | $T_C = 25^\circ C$  | 900       |
| $V_{GE}$  | Gate - Emitter Voltage                | $\pm 20$            | V         |
| $P_D$     | Maximum Power Dissipation             | $T_C = 25^\circ C$  | 2000      |
| RBSOA     | Reverse Bias Safe Operation Area      | $T_j = 125^\circ C$ | 900A@520V |

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

All ratings @  $T_j = 25^\circ\text{C}$  unless otherwise specified

## Electrical Characteristics

| Symbol       | Characteristic                      | Test Conditions                                | Min                       | Typ  | Max  | Unit          |
|--------------|-------------------------------------|------------------------------------------------|---------------------------|------|------|---------------|
| $I_{CES}$    | Zero Gate Voltage Collector Current | $V_{GE} = 0\text{V}$<br>$V_{CE} = 600\text{V}$ | $T_j = 25^\circ\text{C}$  | 1    | 500  | $\mu\text{A}$ |
|              |                                     |                                                | $T_j = 125^\circ\text{C}$ | 1    |      | $\text{mA}$   |
| $V_{CE(on)}$ | Collector Emitter on Voltage        | $V_{GE} = 15\text{V}$<br>$I_C = 500\text{A}$   | $T_j = 25^\circ\text{C}$  | 1.95 | 2.45 | V             |
|              |                                     |                                                | $T_j = 125^\circ\text{C}$ | 2.2  |      |               |
| $V_{GE(th)}$ | Gate Threshold Voltage              | $V_{GE} = V_{CE}, I_C = 6\text{mA}$            | 4.5                       | 5.5  | 6.5  | V             |
| $I_{GES}$    | Gate – Emitter Leakage Current      | $V_{GE} = 20\text{V}, V_{CE} = 0\text{V}$      |                           |      | 400  | $\text{nA}$   |

## Dynamic Characteristics

| Symbol       | Characteristic               | Test Conditions                                                                                                                                 | Min | Typ | Max | Unit        |
|--------------|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-----|-------------|
| $C_{ies}$    | Input Capacitance            | $V_{GE} = 0\text{V}, V_{CE} = 25\text{V}$                                                                                                       |     | 26  |     | $\text{nF}$ |
| $C_{res}$    | Reverse Transfer Capacitance | $f = 1\text{MHz}$                                                                                                                               |     | 2.4 |     |             |
| $T_{d(on)}$  | Turn-on Delay Time           | Inductive Switching ( $25^\circ\text{C}$ )<br>$V_{GE} = \pm 15\text{V}$<br>$V_{Bus} = 300\text{V}$<br>$I_C = 600\text{A}$<br>$R_G = 4.7\Omega$  |     | 174 |     | $\text{ns}$ |
| $T_r$        | Rise Time                    |                                                                                                                                                 |     | 80  |     |             |
| $T_{d(off)}$ | Turn-off Delay Time          |                                                                                                                                                 |     | 400 |     |             |
| $T_f$        | Fall Time                    |                                                                                                                                                 |     | 70  |     |             |
| $T_{d(on)}$  | Turn-on Delay Time           | Inductive Switching ( $125^\circ\text{C}$ )<br>$V_{GE} = \pm 15\text{V}$<br>$V_{Bus} = 300\text{V}$<br>$I_C = 600\text{A}$<br>$R_G = 4.7\Omega$ |     | 200 |     | $\text{ns}$ |
| $T_r$        | Rise Time                    |                                                                                                                                                 |     | 85  |     |             |
| $T_{d(off)}$ | Turn-off Delay Time          |                                                                                                                                                 |     | 420 |     |             |
| $T_f$        | Fall Time                    |                                                                                                                                                 |     | 80  |     |             |
| $E_{on}$     | Turn on Energy               |                                                                                                                                                 |     | 11  |     | $\text{mJ}$ |
| $E_{off}$    | Turn off Energy              |                                                                                                                                                 |     | 22  |     |             |

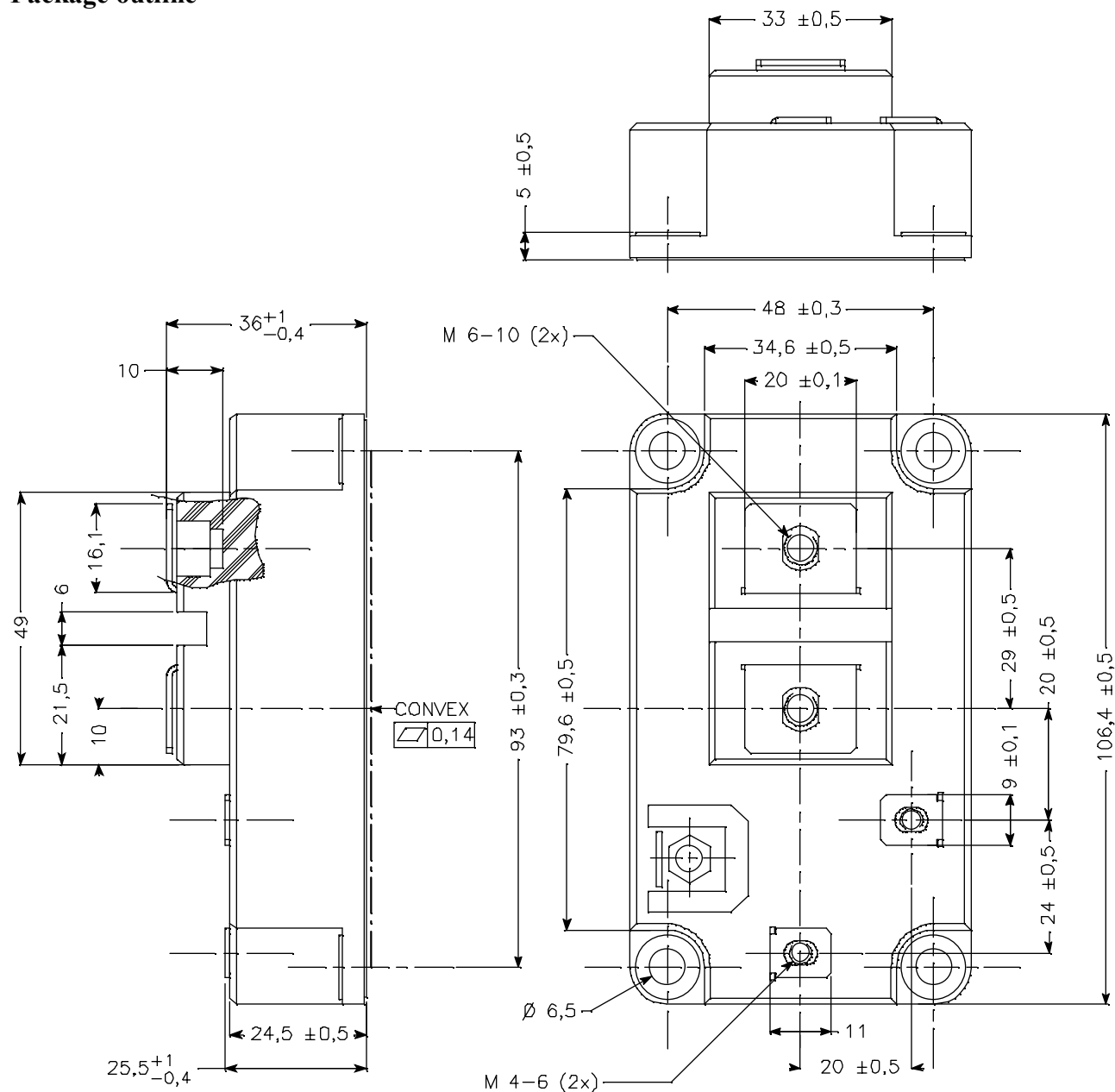
## Reverse diode ratings and characteristics

| Symbol   | Characteristic          | Test Conditions                                                                  | Min                       | Typ  | Max | Unit          |
|----------|-------------------------|----------------------------------------------------------------------------------|---------------------------|------|-----|---------------|
| $V_F$    | Diode Forward Voltage   | $I_F = 600\text{A}$<br>$V_{GE} = 0\text{V}$                                      | $T_j = 25^\circ\text{C}$  | 1.25 | 1.6 | V             |
|          |                         |                                                                                  | $T_j = 125^\circ\text{C}$ | 1.2  |     |               |
| $Q_{rr}$ | Reverse Recovery Charge | $I_F = 600\text{A}$<br>$V_R = 300\text{V}$<br>$di/dt = 5600\text{A}/\mu\text{s}$ | $T_j = 25^\circ\text{C}$  | 40   |     | $\mu\text{C}$ |
|          |                         |                                                                                  | $T_j = 125^\circ\text{C}$ | 66   |     |               |

## Thermal and package characteristics

| Symbol     | Characteristic                                                                                     | Min   | Typ | Max  | Unit                      |
|------------|----------------------------------------------------------------------------------------------------|-------|-----|------|---------------------------|
| $R_{thJC}$ | Junction to Case                                                                                   | IGBT  |     | 0.06 | $^\circ\text{C}/\text{W}$ |
|            |                                                                                                    | Diode |     | 0.12 |                           |
| $V_{ISOL}$ | RMS Isolation Voltage, any terminal to case $t = 1\text{ min}$ , $I_{isol} < 1\text{mA}$ , 50/60Hz | 2500  |     |      | V                         |
| $T_j$      | Operating junction temperature range                                                               | -40   |     | 150  | $^\circ\text{C}$          |
| $T_{STG}$  | Storage Temperature Range                                                                          | -40   |     | 125  |                           |
| $T_C$      | Operating Case Temperature                                                                         | -40   |     | 125  |                           |
| Torque     | Mounting torque                                                                                    | M6    | 3   | 5    | $\text{N.m}$              |
|            |                                                                                                    | M4    | 1   | 2    |                           |
| Wt         | Package Weight                                                                                     |       |     | 420  | g                         |

## Package outline



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

APT's products are covered by one or more of U.S. patents 4,895,810 5,045,903 5,089,434 5,182,234 5,019,522 5,262,336 6,503,786 5,256,583 4,748,103 5,283,202 5,231,474 5,434,095 5,528,058 and foreign patents. U.S. and Foreign patents pending. All Rights Reserved.