



### HAOPIN MICROELECTRONICS CO.,LTD.

#### Description

Glass passivated triacs in a plastic envelope, intended for use in applications requiring high bidirectional transient and blocking voltage capability and high thermal cycling performance. Typical applications include motor control, industrial and domestic lighting, heating and static switching.

| <p>Symbol</p>  |                      | <p>Simplified outline</p>  <p>TO-220</p> |  |
|---|----------------------|---|--|
| Pin   | Description          |   |  |
| 1   | Main terminal 1 (T1) |   |  |
| 2   | Main terminal 2 (T2) |   |  |
| 3   | gate (G)             |   |  |
| TAB   | Main terminal        |   |  |

#### Applications:

- ◆ Motor control
- ◆ Industrial and domestic lighting
- ◆ Heating
- ◆ Static switching

#### Features

- ◆ Blocking voltage to 600 V
- ◆ On-state RMS current to 8 A

| SYMBOL      | PARAMETER   | Value | Unit |
|-------------|---|-------|------|
| $V_{DRM}$   | Repetitive peak off-state voltages                                    | 600   | V    |
| $I_T (RMS)$ | RMS on-state current (full sine wave)                                 | 8     | A    |
| $I_{TSM}$   | Non-repetitive peak on-state current (full cycle, $T_j$ initial=25°C) | 84    | A    |

| SYMBOL        | PARAMETER            | CONDITIONS | MIN | TYP | MAX | UNIT |
|---------------|----------------------|------------|-----|-----|-----|------|
| $R_{th(j-c)}$ | Junction to case(AC) |            | -   | 2.5 | -   | °C/W |
| $R_{th(j-a)}$ | Junction to ambient  |            | -   | 60  | -   | °C/W |

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Limiting values in accordance with the Maximum system(IEC 134)

| SYMBOL       | PARAMETER                                  | CONDITIONS                                  | MIN     | Value              | UNIT             |             |            |
|--------------|--|---|---------|--------------------|------------------|-------------|------------|
| $V_{DRM}$    | Repetitive peak off-state Voltages         |   | -       | 600                | V                |             |            |
| $I_{T(RMS)}$ | RMS on-state current                       | $T_c=100^{\circ}C$                          | -       | 8                  | A                |             |            |
| $I_{TSM}$    | Non repetitive surge peak on-state current | Full cycle<br>$T_j$ initial =25 $^{\circ}C$ | F=50Hz  | t=20ms             | -                | 80          | A          |
|              |  |   | F=60Hz  | t=16.7ms           | -                | 84          | A          |
| $I^2t$       | $I^2t$ value for fusing                    | $T_p=10ms$                                  | -       | 36                 | A <sup>2</sup> S |             |            |
| dI/dt        | Critical rate of rise of on-state current  | $I_G=2 \times I_{GT}$ , $tr \leq 100ns$     | F=120Hz | $T_j=125^{\circ}C$ | -                | 50          | A/ $\mu$ s |
| $I_{GM}$     | Peak gate current                          | $tp=20\mu s$                                |         | $T_j=125^{\circ}C$ | -                | 4           | A          |
| $I_{DRM}$    | $V_{DRM}=V_{RRM}$                          |   |         | $T_j=25^{\circ}C$  | -                | 5           | $\mu$ A    |
| $I_{RRM}$    | $V_{DRM}=V_{RRM}$                          |   |         | $T_j=125^{\circ}C$ | -                | 1           | mA         |
| $P_{G(AV)}$  | Average gate power                         |   |         | $T_j=125^{\circ}C$ | -                | 1           | W          |
| $T_{stg}$    | Storage temperature range                  |   | -40     | 150                |                  | $^{\circ}C$ |            |
| $T_j$        | Operating junction Temperature range       |   | -40     | 125                |                  | $^{\circ}C$ |            |

$T_j=25^{\circ}C$  unless otherwise stated

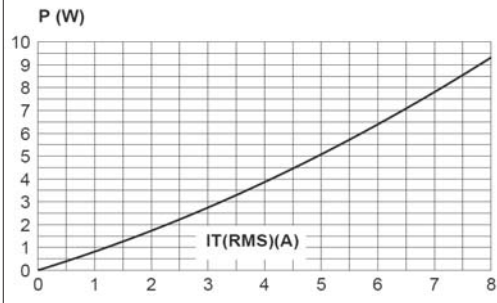
| SYMBOL                 | PARAMETER        | CONDITIONS                                      | MIN      | TYP | MAX | UNIT       |    |
|------------------------|------------------|---|----------|-----|-----|------------|----|
| Static characteristics |                  |   |          |     |     |            |    |
| $I_{GT}$               |                  | $V_D=12V; R_L=30\Omega$                         | I-II-III | -   | -   | 25         | mA |
|                        |                  |   |          | IV  |     |            | 50 |
| $I_L$                  |                  | $I_G=1.2 I_{GT}$                                | I-III-IV | -   | -   | 40         | mA |
|                        |                  |   |          | II  | -   | -          | 80 |
| $I_H$                  |                  | $I_T=500mA$                                     | -        | -   | 25  | mA         |    |
| $V_{GT}$               |                  | $V_D=12V; R_L=30\Omega$                         | -        | -   | 1.3 | V          |    |
| $V_{GD}$               |                  | $V_D=V_{DRM} R_L=3.3K\Omega T_j=125^{\circ}C$   | 0.2      | -   | -   | V          |    |
| dV/dt                  |                  | $V_D=67\%V_{DRM}$ gate open; $T_j=125^{\circ}C$ | 200      | -   | -   | V/ $\mu$ s |    |
| (dV/dt)c               | (dI/dt)c=3.5A/ms | $T_j=125^{\circ}C$                              | 5        | -   | -   | V/ $\mu$ s |    |

### Dynamic Characteristics

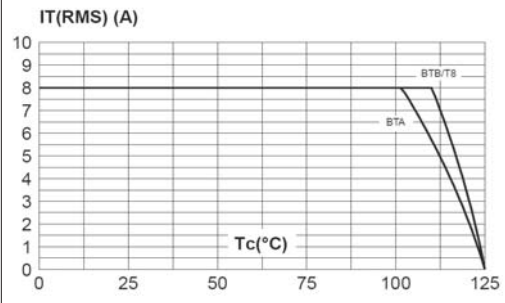
|          |                            |                    |   |   |      |            |
|----------|----------------------------|--------------------|---|---|------|------------|
| $V_{TM}$ | $I_{TM}=11A$ $tp=380\mu s$ | $T_j=25^{\circ}C$  | - | - | 1.55 | V          |
| $V_{TO}$ | Threshold voltage          | $T_j=125^{\circ}C$ | - | - | 0.85 | V          |
| $R_d$    | Dynamic resistance         | $T_j=125^{\circ}C$ | - | - | 50   | m $\Omega$ |

### Description

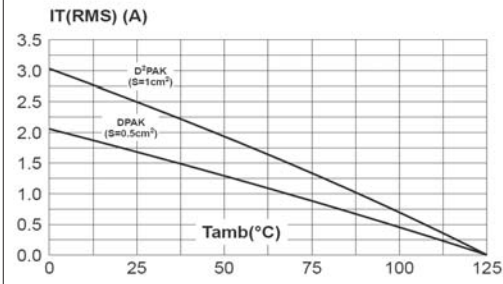
**Fig. 1:** Maximum power dissipation versus RMS on-state current (full cycle).



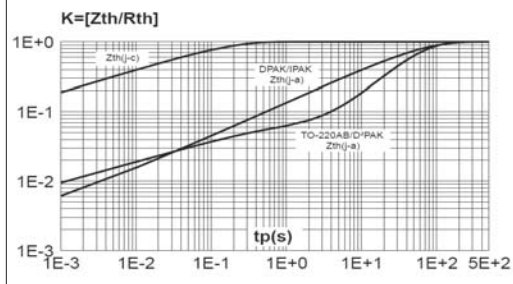
**Fig. 2-1:** RMS on-state current versus case temperature (full cycle).



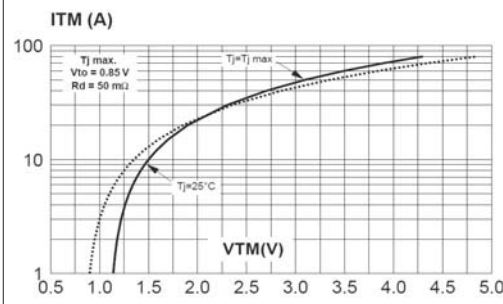
**Fig. 2-2:** RMS on-state current versus ambient temperature (printed circuit board FR4, copper thickness: 35µm), full cycle.



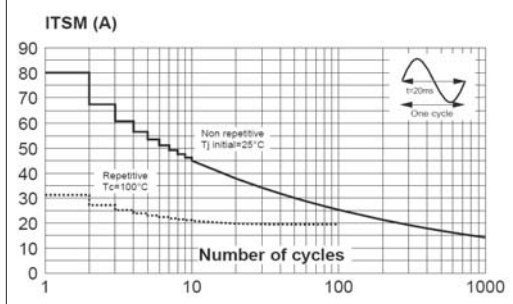
**Fig. 3:** Relative variation of thermal impedance versus pulse duration.



**Fig. 4:** On-state characteristics (maximum values).

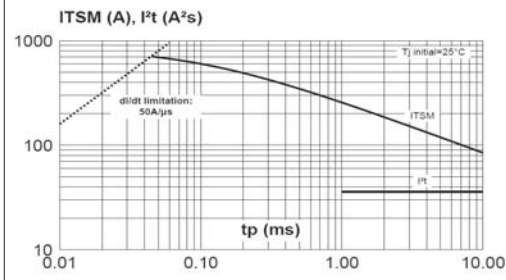


**Fig. 5:** Surge peak on-state current versus number of cycles.

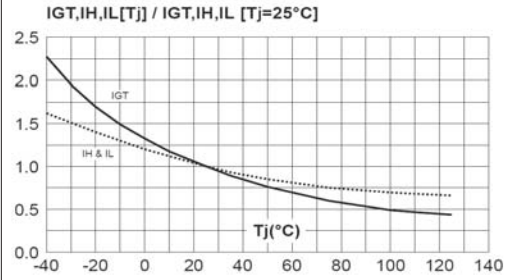


#### Description

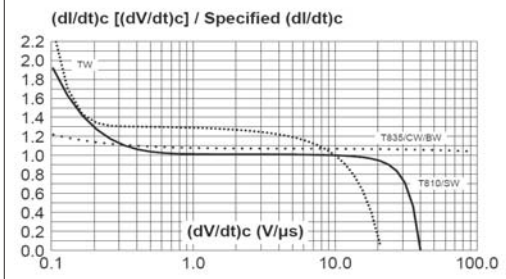
**Fig. 6:** Non-repetitive surge peak on-state current for a sinusoidal pulse with width  $t_p < 10\text{ms}$ , and corresponding value of  $I^2t$ .



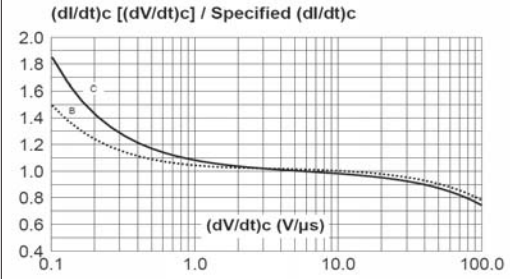
**Fig. 7:** Relative variation of gate trigger current, holding current and latching current versus junction temperature (typical values).



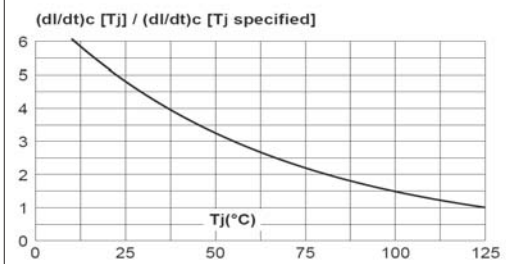
**Fig. 8-1:** Relative variation of critical rate of decrease of main current versus  $(dV/dt)_c$  (typical values). Snubberless & Logic Level Types



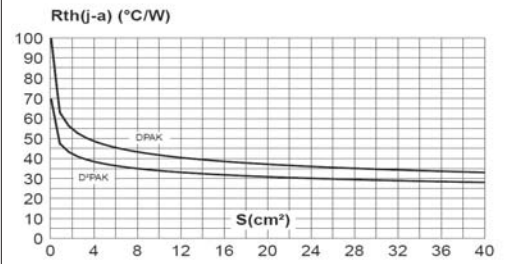
**Fig. 8-2:** Relative variation of critical rate of decrease of main current versus  $(dV/dt)_c$  (typical values). Standard Types



**Fig. 9:** Relative variation of critical rate of decrease of main current versus junction temperature.



**Fig. 10:** DPAK and D<sup>2</sup>PAK Thermal resistance junction to ambient versus copper surface under tab (printed circuit board FR4, copper thickness: 35 µm).

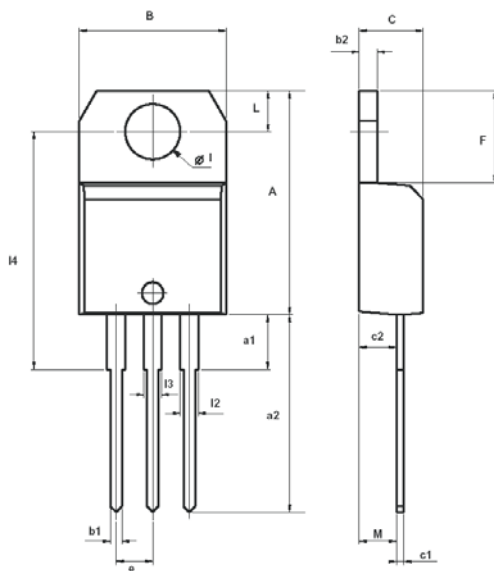


### MECHANICAL DATA

Dimensions in mm

Net Mass: 2g

TO-220AB



| REF. | DIMENSIONS  |       |       |        |       |       |
|------|-------------|-------|-------|--------|-------|-------|
|      | Millimeters |       |       | Inches |       |       |
|      | Min.        | Typ.  | Max.  | Min.   | Typ.  | Max.  |
| A    | 15.20       |       | 15.90 | 0.598  |       | 0.625 |
| a1   |             | 3.75  |       |        | 0.147 |       |
| a2   | 13.00       |       | 14.00 | 0.511  |       | 0.551 |
| B    | 10.00       |       | 10.40 | 0.393  |       | 0.409 |
| b1   | 0.61        |       | 0.88  | 0.024  |       | 0.034 |
| b2   | 1.23        |       | 1.32  | 0.048  |       | 0.051 |
| C    | 4.40        |       | 4.60  | 0.173  |       | 0.181 |
| c1   | 0.49        |       | 0.70  | 0.019  |       | 0.027 |
| c2   | 2.40        |       | 2.72  | 0.094  |       | 0.107 |
| e    | 2.40        |       | 2.70  | 0.094  |       | 0.106 |
| F    | 6.20        |       | 6.60  | 0.244  |       | 0.259 |
| I    | 3.75        |       | 3.85  | 0.147  |       | 0.151 |
| I4   | 15.80       | 16.40 | 16.80 | 0.622  | 0.646 | 0.661 |
| L    | 2.65        |       | 2.95  | 0.104  |       | 0.116 |
| I2   | 1.14        |       | 1.70  | 0.044  |       | 0.066 |
| I3   | 1.14        |       | 1.70  | 0.044  |       | 0.066 |
| M    |             | 2.60  |       |        | 0.102 |       |