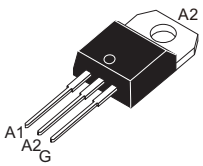
# TRIACs, 12A

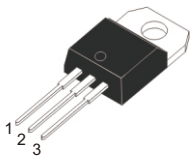
## Snubberless, Logic Level and Standard

### FEATURES

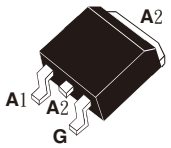
- Medium current triac
- Low thermal resistance with clip bonding
- Low thermal resistance insulation ceramic for insulated TO-220AB package
- High commutation (4Q) or very high commutation (3Q) capability
- 12T series are **UL** certified (File ref: E320098)
- Packages are RoHS compliant




TO-220AB (**non-Insulated**)
(12TxxA)

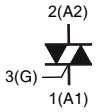



TO-220AB **(Insulated)**
(12TxxAI)




TO-263 (**D²PAK)**
(12TxxH)

TO-220F**(ITO-220AB)**
(12TxxAF)




### APPLICATIONS

ON/OFF or phase angle function in applications such as static relays, light dimmers and appliance motors speed controllers.

The snubberless versions (with suffix W) are especially recommended for use on inductive loads, because of their high commutation performances. The 12T series provides an insulated tab (rated at 2500$V_{RMS}$).

### MAIN FEATURES

| SYMBOL | VALUE | UNIT |
|---|---|---|
| $I_{T(RMS)}$ | 12 | A |
| $V_{DRM}/V_{RRM}$ | 600 to 1000 | V |
| $I_{GT(Q1)}$ | 5 to 50 | mA |

### ABSOLUTE MAXIMUM RATINGS

| PARAMETER | SYMBOL | TEST CONDITIONS | | VALUE | UNIT |
|---|---|---|---|---|---|
| RMS on-state current (full sine wave) | $I_{T(RMS)}$ | TO-263/TO-220AB | $T_c$ = 105ºC | 12 | A |
| | | TO-220AB insulated/TO-220F (ITO-220AB) | $T_c$ = 90ºC | | |
| Non repetitive surge peak on-state current (full cycle, $T_j$ initial = 25°C) | $I_{TSM}$ | F =50 Hz | t = 20 ms | 120 | A |
| | | F =60 Hz | t = 16.7 ms | 126 | |
| $I^2t$ Value for fusing | $I^2t$ | $t_p$ = 10 ms | | 72 | $A^2s$ |
| Critical rate of rise of on-state current $I_G = 2xI_{GT}$, $t_r$≤100ns | dI/dt | F =100 Hz | $T_j$ =125ºC | 50 | A/µs |
| Peak gate current | $I_{GM}$ | $T_p$ =20 µs | $T_j$ =125ºC | 4 | A |
| Average gate power dissipation | $P_{G(AV)}$ | $T_j$ =125ºC | | 1 | W |
| Storage temperature range | $T_{stg}$ | | | - 40 to + 150 | ºC |
| Operating junction temperature range | $T_j$ | | | - 40 to + 125 | |

## ◎ ELECTRICAL CHARACTERISTICS ($T_J$= 25 ºC unless otherwise specified)

| SNUBBERLESS and Logic level (3 quadrants) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| SYMBOL | TEST CONDITIONS | QUADRANT | | 12Txxxx | | | | Unit |
| | | | | TW | SW | CW | BW | |
| $I_{GT}$(1) | $V_D$ = 12 V, $R_L$ = 30Ω | I - II - III | MAX. | 05 | 10 | 35 | 50 | mA |
| $V_{GT}$ | | I - II - III | MAX. | 1.3 | | | | V |
| $V_{GD}$ | $V_D$ = $V_{DRM}$, $R_L$ = 3.3KΩ<br>$T_j$ = 125°C | I - II - III | MIN. | 0.2 | | | | V |
| $I_H$(2) | $I_T$ = 100 mA | | MAX. | 10 | 15 | 40 | 60 | mA |
| $I_L$ | $I_G$ = 1.2 $I_{GT}$ | I - III | MAX. | 10 | 20 | 50 | 70 | mA |
| | | II | | 15 | 35 | 60 | 80 | |
| dV/dt(2) | $V_D$ = 67% $V_{DRM}$, gate open ,$T_j$ = 125°C | | MIN. | 20 | 40 | 500 | 1000 | V/µs |
| (dI/dt)c(2) | (dV/dt)c = 0.1 V/µs | $T_j$ = 125°C | MIN. | 3.5 | 6.5 | - | - | A/ms |
| | (dV/dt)c = 10 V/µs | $T_j$ = 125°C | | 1 | 2.9 | - | - | |
| | Without snubber | $T_j$ = 125°C | | - | - | 6.5 | 12 | |

## ◎ ELECTRICAL CHARACTERISTICS ($T_J$= 25 ºC unless otherwise specified)

| Standard (4 quadrants) | | | | | | | |
|---|---|---|---|---|---|---|---|
| SYMBOL | TEST CONDITIONS | QUADRANT | | 12Txxxx | | | UNIT |
| | | | | A | C | B | |
| $I_{GT}$(1) | $V_D$ = 12 V, $R_L$ = 30Ω | I - II - III | MAX. | 10 | 25 | 50 | mA |
| | | IV | | 25 | 50 | 100 | |
| $V_{GT}$ | | ALL | | 1.3 | | | V |
| $V_{GD}$ | $V_D$ = $V_{DRM}$, $R_L$ = 3.3KΩ, $T_j$ = 125°C | ALL | | 0.2 | | | V |
| $I_H$(2) | $I_T$ = 500 mA | | MAX. | 25 | 25 | 50 | mA |
| $I_L$ | $I_G$ = 1.2 $I_{GT}$ | I - III - IV | MAX. | 30 | 40 | 50 | mA |
| | | II | | 40 | 80 | 80 | |
| $dV/d_t$(2) | $V_D$ = 67% $V_{DRM}$, gate open, $T_j$ = 125°C | | MIN. | 100 | 200 | 400 | V/µs |
| (dV/dt)c(2) | (dI/dt)c = 5.3 A/ms, $T_j$ = 125°C | | MIN. | 3 | 5 | 10 | V/µs |

| STATIC CHARACTERISTICS | | | | | |
|---|---|---|---|---|---|
| SYMBOL | TEST CONDITIONS | | | VALUE | UNIT |
| $V_{TM}$(2) | $I_{TM}$ = 17 A, $t_P$ = 380 µs | $T_j$ = 25°C | MAX. | 1.55 | V |
| $V_{t0}$(2) | Threshold voltage | $T_j$ = 125°C | MAX. | 0.85 | V |
| $R_d$(2) | Dynamic resistance | $T_j$ = 125°C | MAX. | 35 | mΩ |
| $I_{DRM}$<br>$I_{RRM}$ | $V_D$ = $V_{DRM}$<br>$V_R$ = $V_{RRM}$ | $T_j$ = 25°C | MAX. | 5 | µA |
| | | $T_j$ = 125°C | | 1 | mA |

**Note** 1: Minimum $I_{GT}$ is guaranted at 5% of $I_{GT}$ max.
**Note** 2: For both polarities of A2 referenced to A1.

## THERMAL RESISTANCE

| SYMBOL | | | | VALUE | UNIT |
|---|---|---|---|---|---|
| $R_{th(j-c)}$ | Junction to case (AC) | | TO-220AB, TO-263 | 1.4 | °C/W |
| | | | TO-220AB Insulated/TO-220F | 2.3 | |
| $R_{th(j-a)}$ | Junction to ambient | S = 1 $cm^2$ | TO-263 | 45 | °C/W |
| | | | TO-220AB Insulated, TO-220AB, TO-220F | 60 | |

S = Copper surface under tab.

## PRODUCT SELECTOR

| PART NUMBER | VOLTAGE (xx) | | | SENSITIVITY | TYPE | PACKAGE |
|---|---|---|---|---|---|---|
| | 600 V | 800 V | 1000 V | | | |
| 12TxxA-B/12TxxAI-B | V | V | V | 50 mA | Standard | TO-220AB |
| 12TxxA-BW/12TxxAI-BW | V | V | V | 50 mA | Snubberless | |
| 12TxxA-C/12TxxAI-C | V | V | V | 25 mA | Standard | |
| 12TxxA-CW/12TxxAI-CW | V | V | V | 35 mA | Snubberless | |
| 12TxxA-SW/12TxxAI-SW | V | V | V | 10 mA | Logic level | |
| 12TxxA-TW/12TxxAI-TW | V | V | V | 5 mA | Logic level | |
| 12TxxH-B | V | V | V | 50 mA | Standard | $D^2PAK$ |
| 12TxxH-C | V | V | V | 25 mA | Standard | |
| 12TxxH-SW | V | V | V | 10 mA | Logic level | |
| 12TxxH-CW | V | V | V | 35 mA | Snubberless | |
| 12TxxH-BW | V | V | V | 50 mA | Snubberless | |
| 12TxxH-TW | V | V | V | 5 mA | Logic level | |
| 12TxxAF-B | V | V | V | 50 mA | Standard | TO-220F (ITO-220AB) |
| 12TxxAF-C | V | V | V | 25 mA | Standard | |
| 12TxxAF-BW | V | V | V | 50 mA | Snubberless | |
| 12TxxAF-CW | V | V | V | 35 mA | Snubberless | |
| 12TxxAF-SW | V | V | V | 10 mA | Logic level | |
| 12TxxAF-TW | V | V | V | 10 mA | Logic level | |

**AI:** Insulated TO-220AB package

## ORDERING INFORMATION

| ORDERING TYPE | MARKING | PACKAGE | WEIGHT | BASE Q'TY | DELIVERY MODE |
|---|---|---|---|---|---|
| 12TxxA-yy | 12TxxA-yy | TO-220AB | 2.0g | 50 | Tube |
| 12TxxAI-yy | 12TxxAI-yy | TO-220AB (insulated) | 2.3g | 50 | Tube |
| 12TxxAF-yy | 12TxxAF-yy | TO-220F(ITO-220AB) | 2.5g | 50 | Tube |
| 12TxxH-yy | 12TxxH-yy | TO-236($D^2PAK$) | 2.0g | 50 | Tube |

**Note**: xx = voltage, yy = sensitivity

## ORDERING INFORMATION SCHEME

**12 T 06 A - BW**

**Current**

12 = 12A

**Triac series**

**Voltage**

06 = 600V
08 = 800V
10 = 1000V

**Package type**

A = TO-220AB (non-insulated)
AI = TO-220AB ( insulated)
AF = TO-220F ( ITO-220AB, insulated)
H = TO-263 ($D^2PAK$)

**$I_{GT}$ Sensitivity**

| | |
|---|---|
| B = 50mA Standard | BW = 50mA Snubberless |
| C = 25mA Standard | CW = 35mA Snubberless |
| SW = 10mA Logic Level | TW = 5mA Logic Level |

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

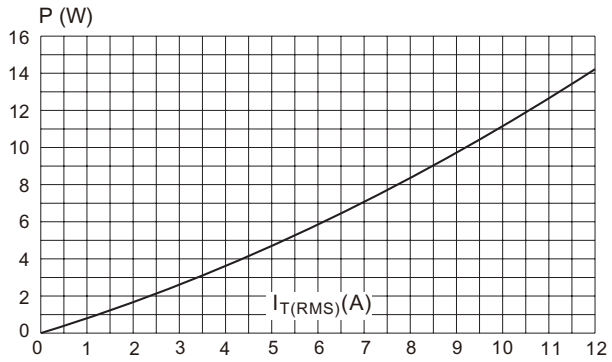



**Fig.2 RMS on-state current versus case temperature (full cycle)**

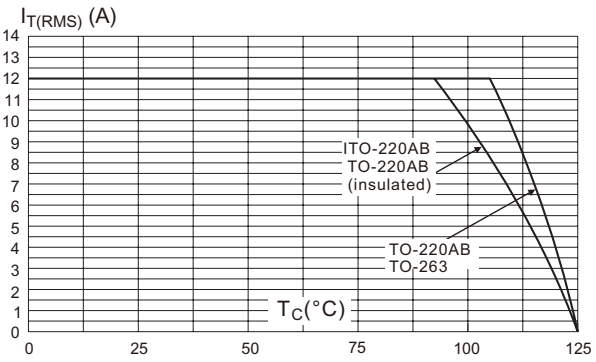



**Fig.3 RMS on-state current versus ambient temperature (printed circuit board FR4, copper thickness: 35µm)(full cycle)**

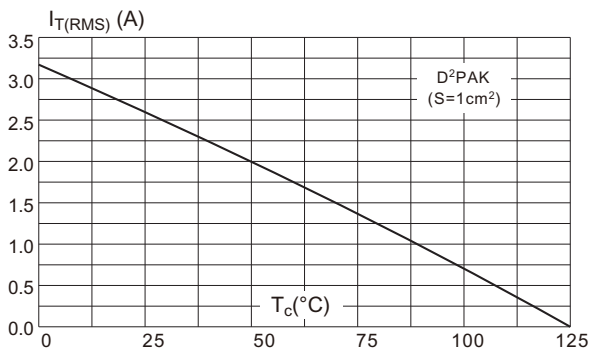



**Fig.4 Relative variation of thermal impedance versus pulse duration.**

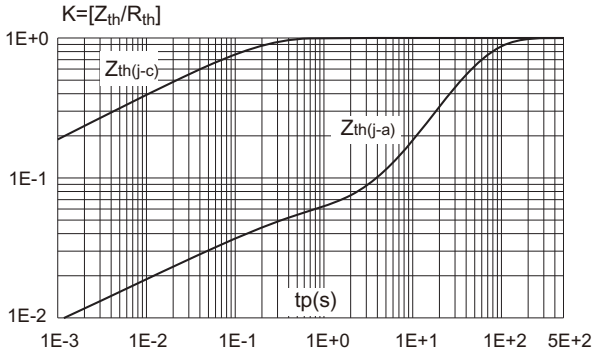


**Fig.5 On-state characteristics (maximum values).**

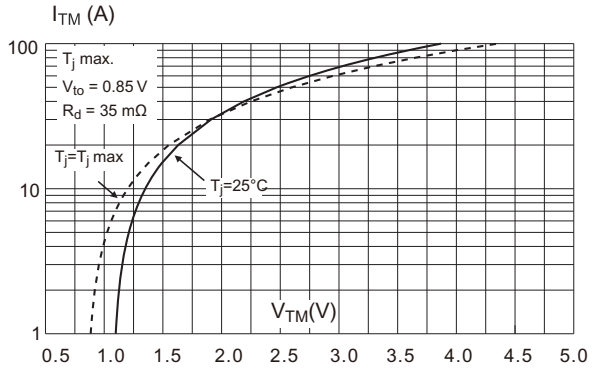



**Fig.6 Surge peak on-state current versus number of cycles.**

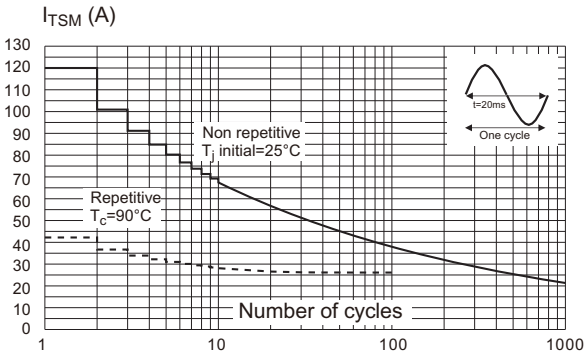



**Fig.7 Non-repetitive surge peak on-state current for a sinusoidal pulse with width tp < 10ms. and corresponding value of $I^2t$.**

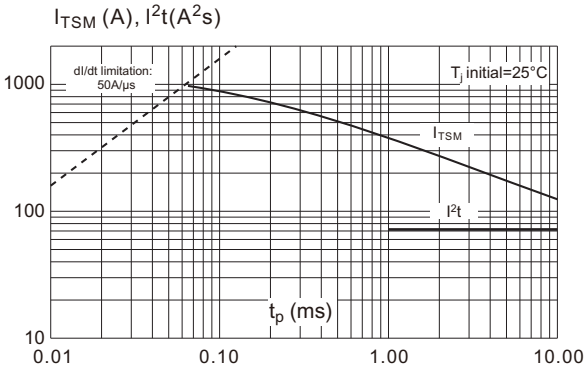



**Fig.8 Relative variation of gate trigger current,holding current and latching current versus junction temperature (typical values).**

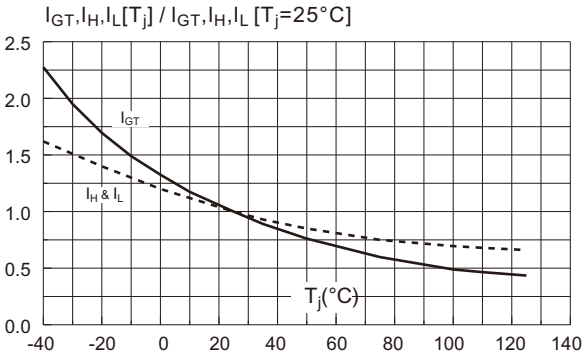



**Fig.9 Relative variation of critical rate of decrease of main current versus (dV/dt)c (typical values).**

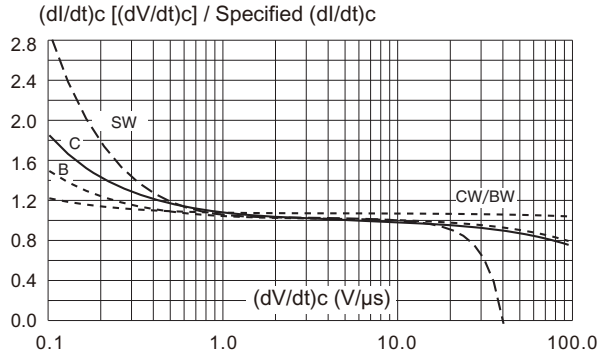



**Fig.10 Relative variation of critical rate of decrease of main current versus (dV/dt)c (typical values).**

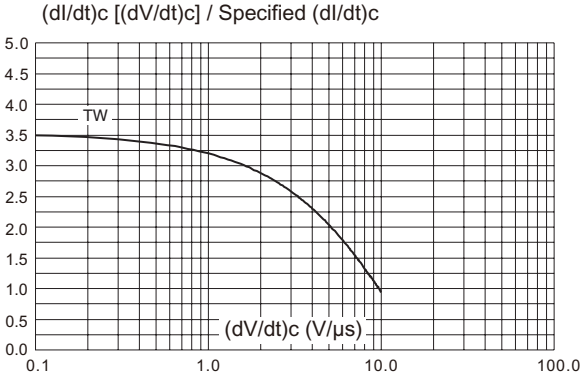


**Fig.11 Relative variation of critical rate of decrease of main current versus junction temperature**

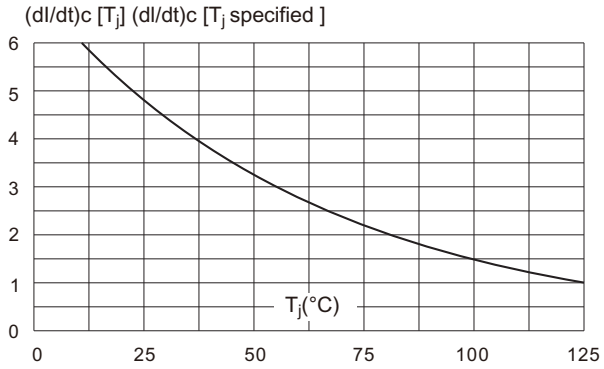
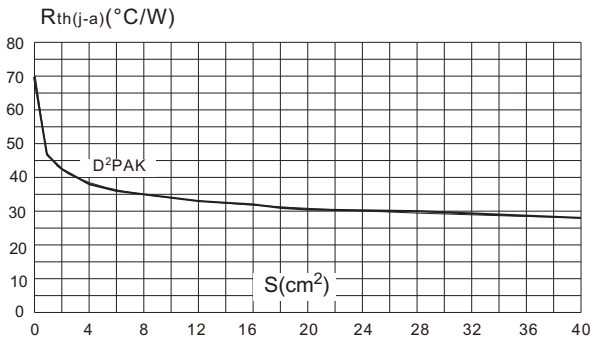
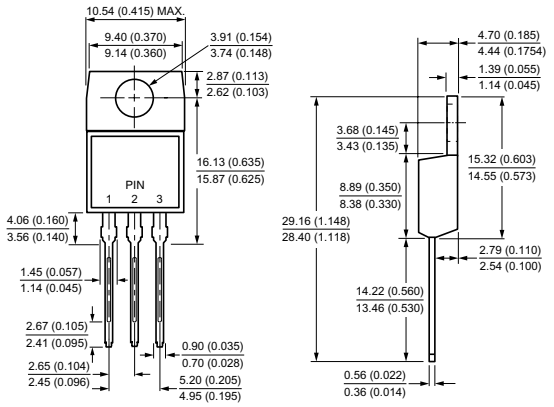



**Fig.12 D²PAK thermal resistance junction to ambient versus copper surface under tab (printed circuit board FR4, copper thickness: 35µm)**

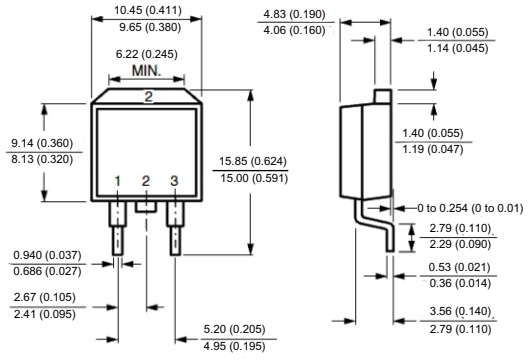


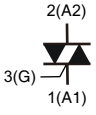

## Case Style

**TO-220AB**




**TO-263(D²PAK)**

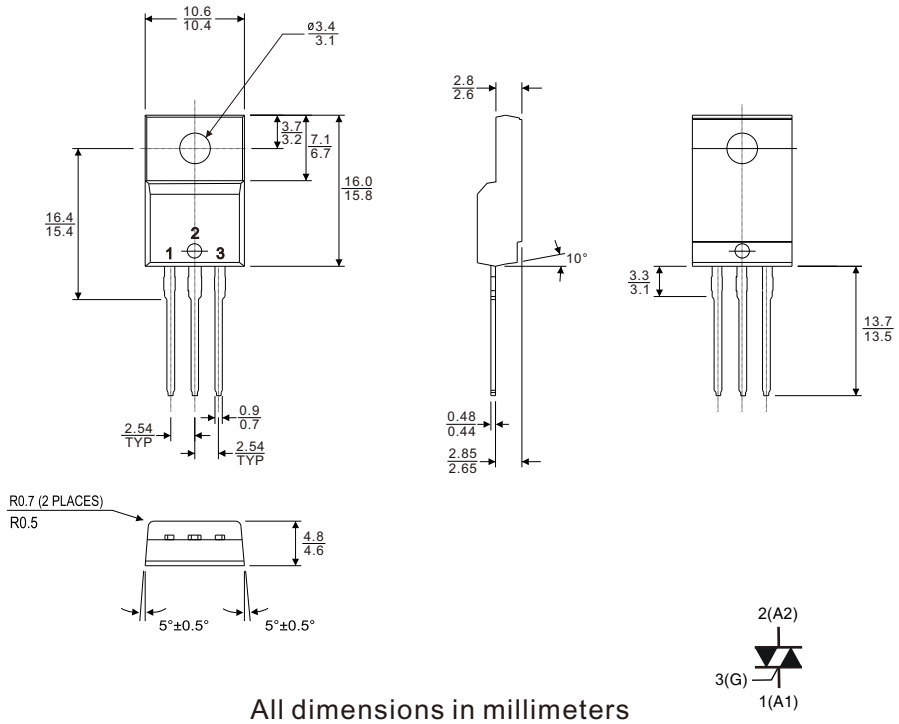



All dimensions in millimeters(inches)

## Case Style

**ITO-220AB**




All dimensions in millimeters