# Q6012RH5G

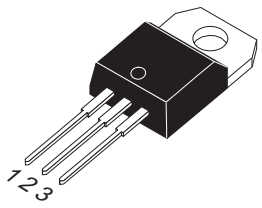
*Three Quadrant Triacs*

## Description

Passivated high commutation triacs in a plastic envelope intended for use in circuits where high static and dynamic dV/dt and high dI/dt can occur. These devices will commutate the full rated ms current at the maximum rated junction temperature without the aid of a snubber.

**Simplified outline**

**TO-220AB**




## Features

- Blocking voltage to 600 V
- On-state RMS current to 12 A

**Symbol**


## Applications

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

| Pin | Description |
|---|---|
| 1 | Main terminal 1 (T1) |
| 2 | Main terminal 2 (T2) |
| 3 | gate (G) |
| TAB | Main terminal 2 (T2) |

| SYMBOL | PARAMETER | Value | Unit |
|---|---|---|---|
| $V_{DRM}$ | Repetitive peak off-state voltages | 600 | V |
| $I_{T(RMS)}$ | RMS on-state current | 12 | A |
| $I_{TSM}$ | Non-repetitive peak on-state current | 95 | A |

| SYMBOL | PARAMETER | CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| $R_{thj-mb}$ | Thermal resistance<br>Junction to mounting base | full cycle<br>half cycle | -<br>- | -<br>- | 1.5<br>2.0 | K/W<br>K/W |
| $R_{th\,j-a}$ | Thermal resistance<br>Junction to ambient | in free air | - | 60 | - | K/W |

## 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 | Full sine wave; $T_{mb} \leqslant 99℃$ | - | 12 | A |
| $I_{TSM}$ | Non repetitive surge peak on-state current | full sine wave; t=20ms<br>Tj = 25℃ prior to surge t=16.7ms | -<br>- | 95<br>105 | A<br>A |
| $I^2t$ | $I^2t$ for fusing | t=10ms | - | 45 | $A^2S$ |
| $dI_T/dt$ | Repetitive rate of rise of on-state current after triggering | $I_{TM}$=20A; $I_G$=0.2$A_T$, $dI_G/dt$=0.2A/μs | - | 100 | A/μs |
| $I_{GM}$ | Peak gate current | | - | 2 | A |
| $P_{GM}$ | Peak gate power | | - | 5 | W |
| $P_{G(AV)}$ | Average gate power | over any 20 ms period | - | 0.5 | W |
| $T_{stg}$ | Storage temperature | | -40 | 150 | ℃ |
| $T_j$ | Operating junction temperature | | - | 125 | ℃ |

## $T_J$ =25 °C unless otherwise stated

| SYMBOL | PARAMETER | CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| $I_{GT}$ | Gate trigger current | $V_D$=12V; $I_T$=0.1A T2+G+<br>T2+G-<br>T2-G- | -<br>-<br>- | -<br>-<br>- | 25<br>25<br>25 | mA<br>mA<br>mA |
| $V_{GT}$ | Gate trigger voltage | $V_D$=12V; $I_T$=0.1A<br>$V_D$=400V; $I_T$=0.1A; $T_j$=125℃ | -<br>0.25 | -<br>- | 1.5<br>- | V<br>V |
| $I_L$ | Latching current | $V_D$=12V; $I_{GT}$=0.1A T2+G+<br>T2+G-<br>T2-G- | -<br>-<br>- | -<br>-<br>- | 25<br>40<br>40 | mA<br>mA<br>mA |
| $I_D$ | Off-state leakage current | $V_D$=$V_{DRM(max)}$ ; $T_j$=125℃ | - | - | 0.5 | mA |
| $I_H$ | Holding current | $V_D$=12V; $I_{GT}$=0.1A | - | - | 30 | mA |
| $V_T$ | On-state voltage | $I_T$=17A | - | - | 1.6 | V |
| $dV_D/dt$ | Critical rate of rise of off-state voltage | $V_{DM}$=67%$V_{DRM(max)}$ ; $T_j$=110℃; exponential waveform; gate open circuit | 70 | - | - | V/μs |

## Dynamic Characteristics

| | | | | | | |
|---|---|---|---|---|---|---|
| $dI_{com}/dt$ | Critical rate of change of commutating current | $V_{DM}$=400V; $T_j$=125℃; $I_{T(RMS)}$=12A; $dV_{com}/dt$=20V/μs; gate open circuit | 5 | - | - | A/ms |
| $dI_{com}/dt$ | Critical rate of change of commutating current | $V_{DM}$=400V; $T_j$=125°C; $I_{T(RMS)}$=12A; $dV_{com}/dt$=0.1V/μs; gate open circuit | 19 | - | - | A/ms |

Note 1 : Although not recommended, off-state voltages up to 800V may be applied without damage , but the triac may swith to the on-state .the rate of current should not exceed 15A/us.

Note 2 : Device does not trigger in the T2-, G+ quadrant.

## Description

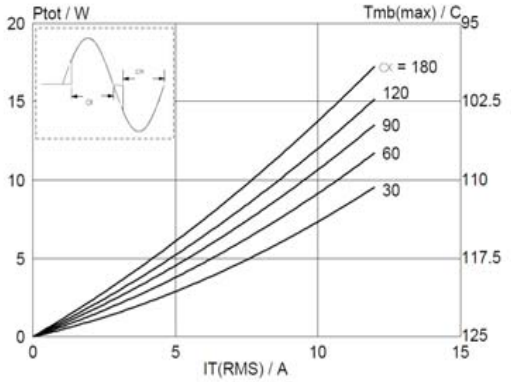



*Fig.1. Maximum on-state dissipation, $P_{tot}$, versus rms on-state current, $I_{T(RMS)}$, where α = conduction angle.*

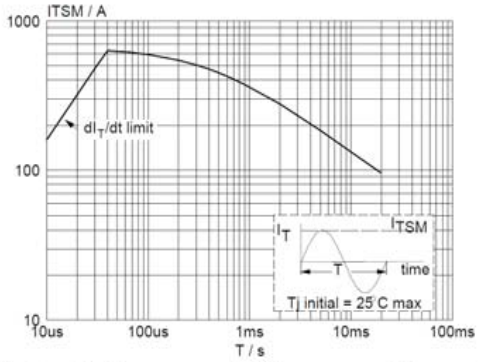



*Fig.2. Maximum permissible non-repetitive peak on-state current $I_{TSM}$, versus pulse width $t_p$, for sinusoidal currents, $t_p \leq 20ms$.*

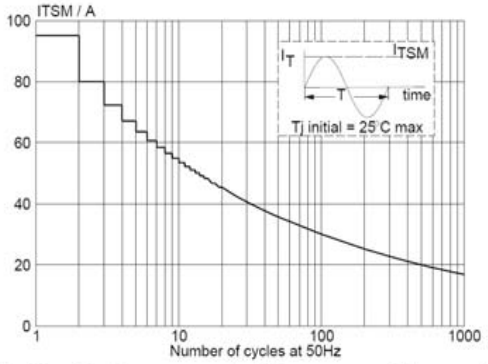



*Fig.3. Maximum permissible non-repetitive peak on-state current $I_{TSM}$, versus number of cycles, for sinusoidal currents, f = 50 Hz.*

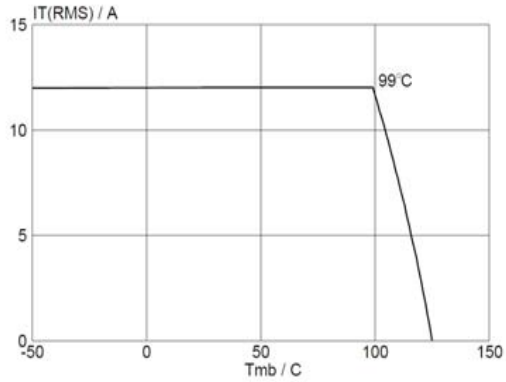



*Fig.4. Maximum permissible rms current $I_{T(RMS)}$, versus mounting base temperature $T_{mb}$.*

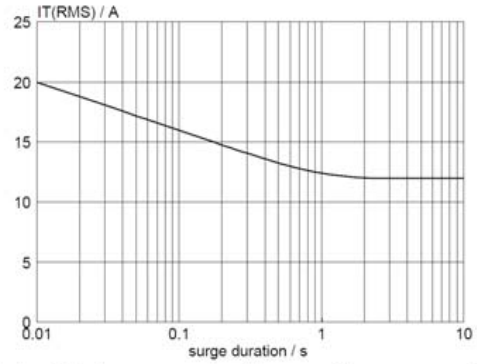



*Fig.5. Maximum permissible repetitive rms on-state current $I_{T(RMS)}$, versus surge duration, for sinusoidal currents, f = 50 Hz; $T_{mb} \leq 99°C$.*

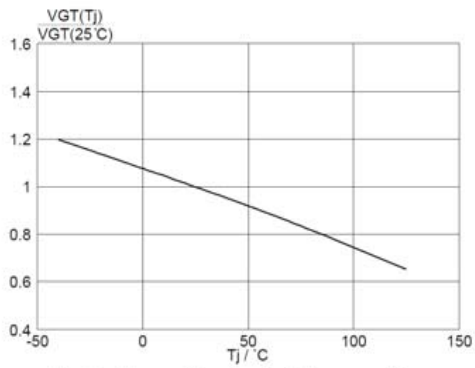



*Fig.6. Normalised gate trigger voltage $V_{GT}(T_j)/ V_{GT}(25°C)$, versus junction temperature $T_j$.*

## Description

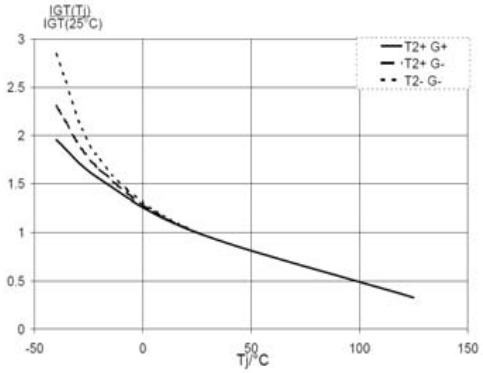



*Fig.7. Normalised gate trigger current $I_{GT}(T_j)/ I_{GT}(25^{\circ}C)$, versus junction temperature $T_j$.*

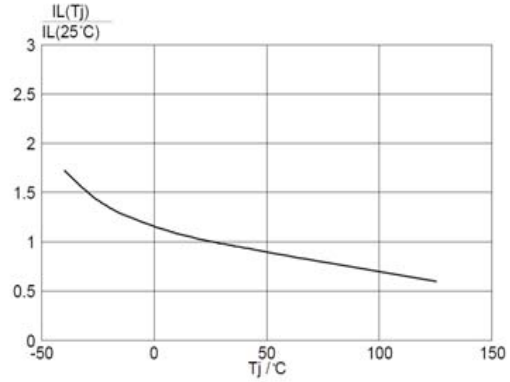



*Fig.8. Normalised latching current $I_L(T_j)/ I_L(25^{\circ}C)$, versus junction temperature $T_j$.*

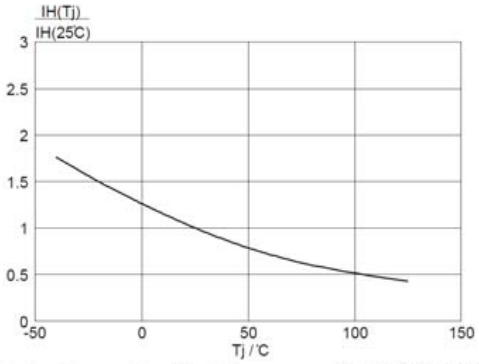



*Fig.9. Normalised holding current $I_H(T_j)/ I_H(25^{\circ}C)$, versus junction temperature $T_j$.*

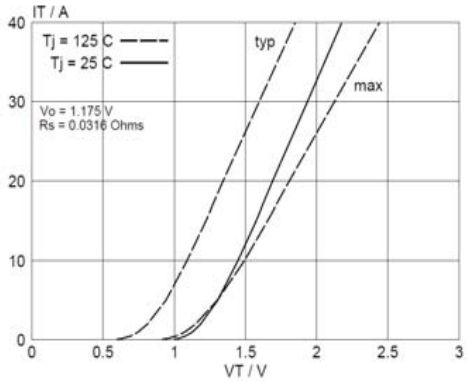



*Fig.10. Typical and maximum on-state characteristic*

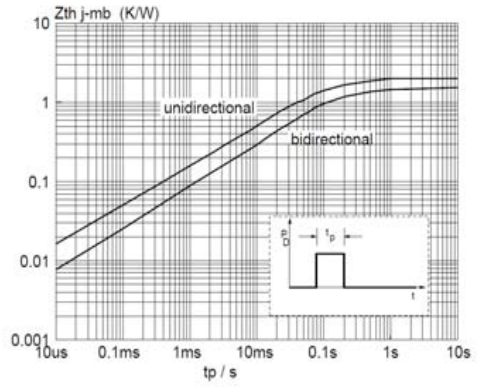



*Fig.11. Transient thermal impedance $Z_{th\ j\text{-}mb}$, versus pulse width $t_p$.*

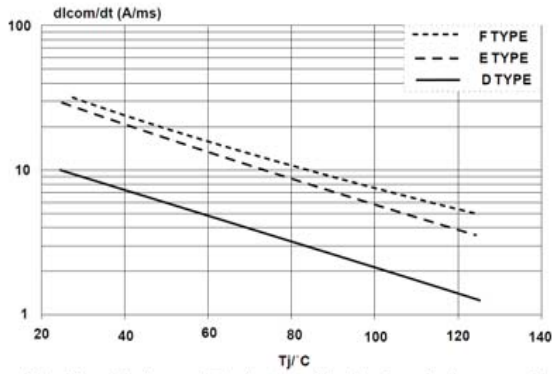
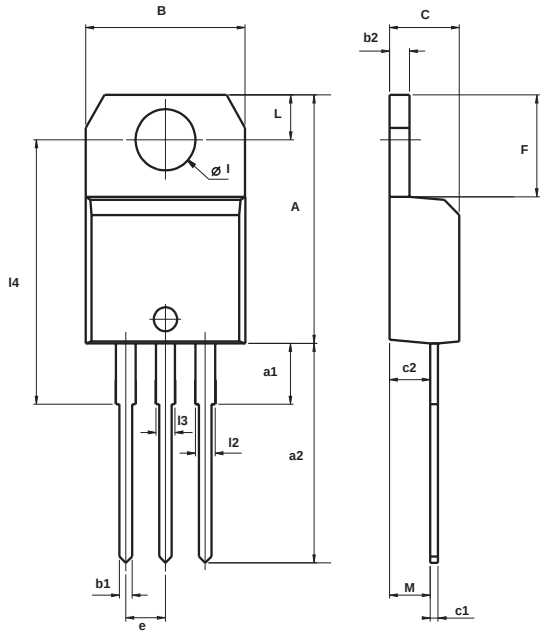



*Fig.12. Minimum Typical, critical rate of change of commutating current $dI_{com}/dt$ versus junction temperature, $dV_{com}/dt$ =20V/μs.*

## Package Mechanical Data

TO-220AB (Plastic)




| 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 | |