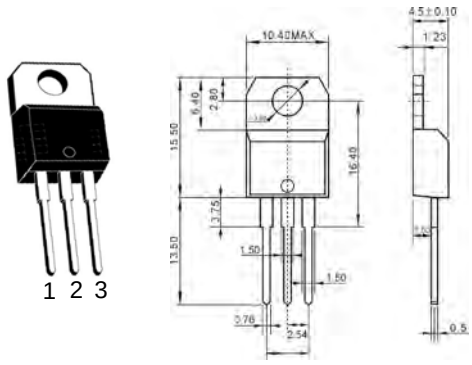
# Bi-Directional Triode Thyristor

Designed for high performance full-wave ac control applications where high noise immunity and high commutating di/dt are required.

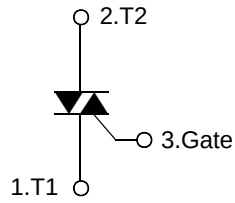
TO-220AB




## Features

- Blocking Voltage to 800 V
- On-State Current Rating of 16A RMS at 80℃
- Uniform Gate Trigger Currents in Three Quadrants
- High Immunity to dV/dt-1500V/us minimum at 125℃
- Minimizes Snubber Networks for Protection
- Industry Standard TO-220AB Package
- High Commutating dI/dt- 4.0A/ms minimum at 125℃
- Internally Isolated (2500VRMS)
- These are Pb-Free Devices

**Symbol**




### Absolute Maximum Ratings

| Symbol | Parameter | | | Value | Unit |
|---|---|---|---|---|---|
| $I_{T(RMS)}$ | RMS on-state current(full since wave) | TO-220AB | TC=100℃ | 16 | A |
| | | TO-220AB Ins. | TC=85℃ | | |
| $I_{TSM}$ | Non repetitive surge peak on-state current(full cycle, Tj initial=25℃) | F=50Hz | t=20ms | 160 | A |
| | | F=60Hz | t=16.7ms | 168 | |
| $I^2t$ | $I^2t$ Value for fusing | tp=10ms | | 144 | $A^2s$ |
| DI/DT | Critical rate of rise of on-state current IG=2X$I_{GT,tr\leq100ns}$ | F=120Hz | Tj=125℃ | 50 | A/us |
| VDSM/VRSM | Non repetitive surge peak off-state voltage | tp=10ms | Tj=25℃ | Vdrm / vrrm + 100V | V |
| IGM | Peak gate current | tp=20us | Tj=125℃ | 4 | A |
| $P_{G(AV)}$ | Average gate power dissipation | | Tj=125℃ | 1 | W |
| $T_{stg}$ | Storage junction temperature range | | | -40 to +150 | ℃ |
| $T_j$ | Operating junction temperature range | | | -40 to +125 | |

## Electrical Characteristics(Tj=25℃,unlessotherwisespecified)

### Snubberless™ and Logic Level (3 quadrants)

| Symbol | Test conditions | Quadrant | BTA16 | | Unit |
|---|---|---|---|---|---|
| $I_{GT}$(1) | $V_D$=12V $R_L$=33Ω | Ⅰ-Ⅱ-Ⅲ | MAX | 50 | mA |
| $V_{GT}$ | | Ⅰ-Ⅱ-Ⅲ | MAX | 1.3 | V |
| $V_{GD}$ | $V_D$=$V_{DRM}$ $R_L$=3.3KΩTj=125℃ | Ⅰ-Ⅱ-Ⅲ | MIN | 0.2 | V |
| IH(2) | IT=500mA | | MAX | 50 | mA |
| IL | $I_G$=1.2$I_{GT}$ | Ⅰ-Ⅲ | MAX | 70 | mA |
| | | Ⅱ | | 80 | |
| Dv / Dt(2) | $V_D$=67%$V_{DRM}$ Gate open Tj=125℃ | | MIN | 1000 | V/us |
| (Dl/dt)c(2) | (Dv/dt)c=0.1V/us Tj=125℃ | | MIN | - | A/ms |
| | (Dv/dt)c=10V/us Tj=125℃ | | | - | |
| | Without snubber Tj=125℃ | | | 14 | |

### Standard (4 Quadrants)

| Symbol | Test conditions | Quadrant | BTA16 | | Unit |
|---|---|---|---|---|---|
| IGT(1) | $V_D$=12V $R_L$=33Ω | Ⅰ-Ⅱ-Ⅲ | MAX | 50 | mA |
| | | Ⅳ | | 100 | |
| VGT | | ALL | MAX | 1.3 | V |
| VGD | $V_D$=$V_{DRM}$ $R_L$=3.3KΩTj=125℃ | ALL | MIN | 0.2 | V |
| IH(2) | IT=500mA | | MAX | 50 | mA |
| IL | $I_G$=1.2$I_{GT}$ | Ⅰ-Ⅲ-Ⅳ | MAX | 60 | mA |
| | | Ⅱ | | 120 | |
| (Dl/dt)(2) | $V_D$=67%$V_{DRM}$ Gate open Tj=125℃ | | MIN | 400 | V/us |
| (Dl/dt)c(2) | (Dv/dt)c=7A/ms Tj=125℃ | | MIN | 10 | V/us |

### Static Characteristics

| Symbol | Test conditions | | | Value | Unit |
|---|---|---|---|---|---|
| VTM(2) | ITM=22A tp=380us | TJ=25℃ | MAX | 1.55 | V |
| Vto(2) | Threshold voltage | TJ=125℃ | MAX | 0.85 | V |
| Rd(2) | Dynamic resistance | TJ=125℃ | MAX | 25 | mΩ |
| $I_{DRM}$ | $V_{DRM}$=$V_{RRM}$ | TJ=25℃ | MAX | 5 | uA |
| $I_{RRM}$ | | TJ=125℃ | | 2 | mA |
| $V_{DRM}$/$V_{RRM}$ | Voltage | TJ=25℃ | MIN | 800 | V |

**Note 1**: minimum IGT is guaranted at 5% of IGT max

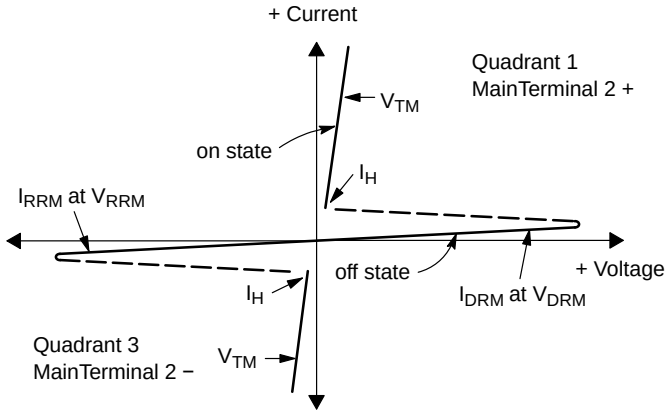
**Note 2**: for both polarities of A2 referenced to A1

### Thermal Resistances

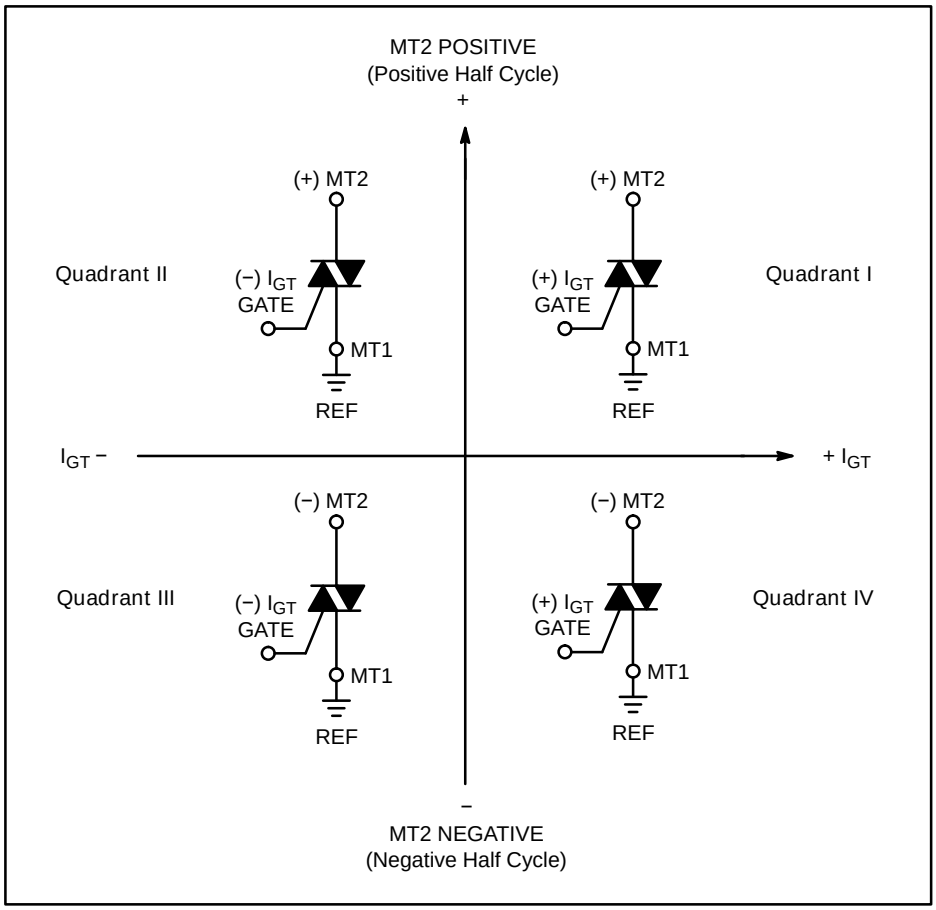
| Symbol | Parameter | | Value | Unit |
|---|---|---|---|---|
| $R_{th(j-c)}$ | Junction to case(AC) | TO-220AB | 1.2 | ℃/W |
| | | TO-220AB(Insulated) | 2.1 | |
| Rth(j-a) | Junction to ambient | TO-220AB/ TO-220AB(Insulated) | 60 | ℃/W |

# Voltage Current Characteristic of Triacs (Bidirectional Device)

| Symbol | Parameter |
|---|---|
| $V_{DRM}$ | Peak Repetitive Forward Off State Voltage |
| $I_{DRM}$ | Peak Forward Blocking Current |
| $V_{RRM}$ | Peak Repetitive Reverse Off State Voltage |
| $I_{RRM}$ | Peak Reverse Blocking Current |
| $V_{TM}$ | Maximum On State Voltage |
| $I_H$ | Holding Current |




**Quadrant Definitions for a Triac**




All polarities are referenced to MT1.
With in−phase signals (using standard AC lines) quadrants I and III are used.

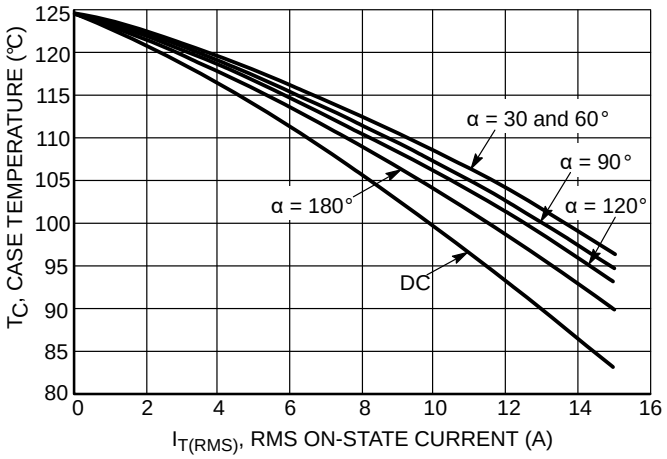



**Figure 1. RMS Current Derating**

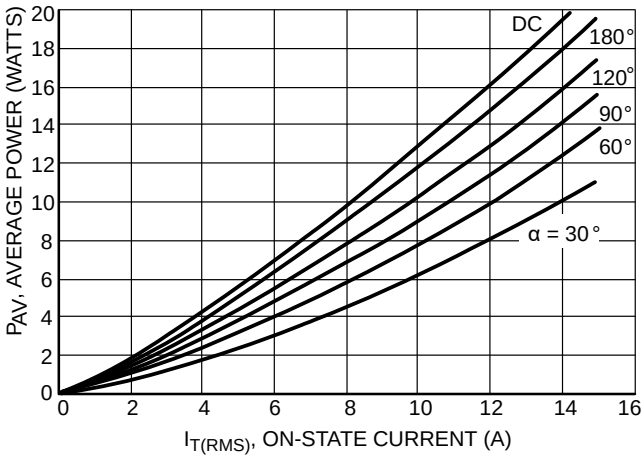



**Figure 2. On-State Power Dissipation**

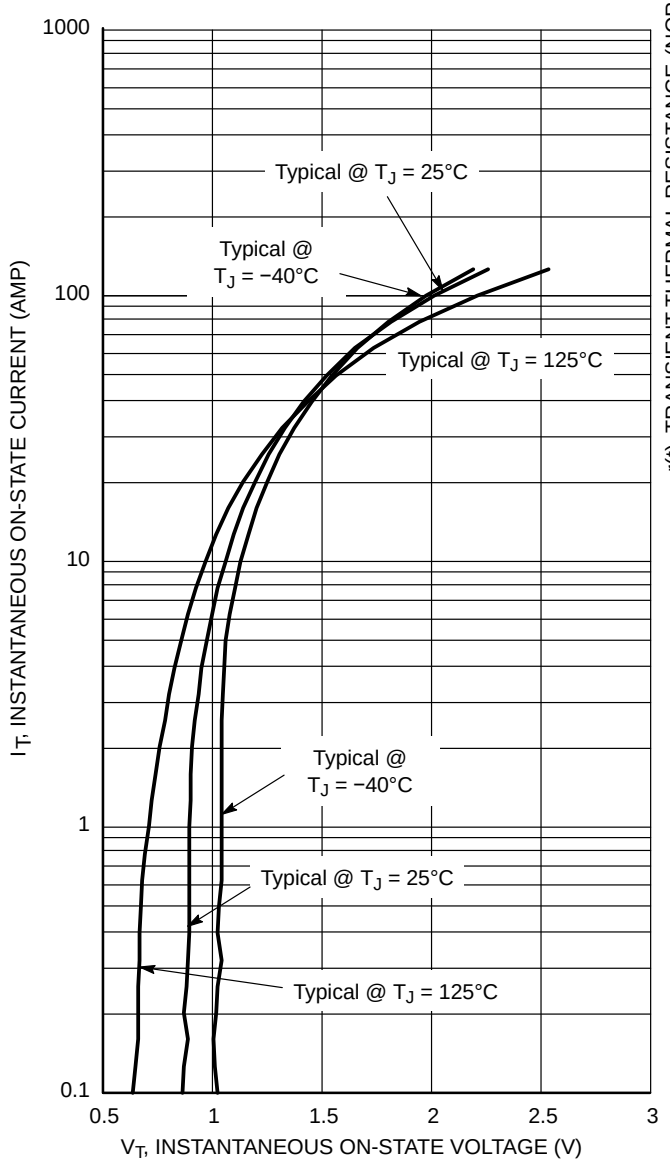



**Figure 3. On-State Characteristics**

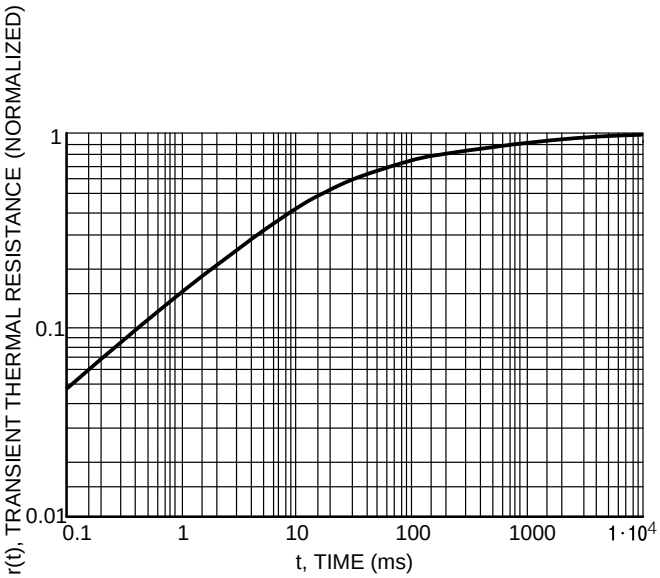



**Figure 4. Thermal Response**

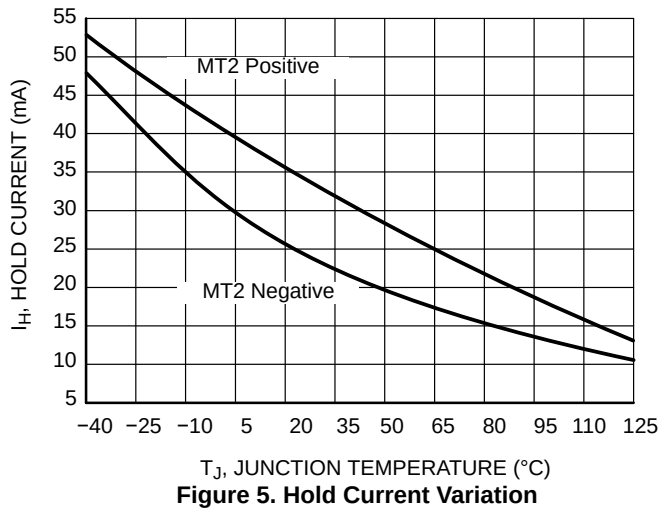



**Figure 5. Hold Current Variation**

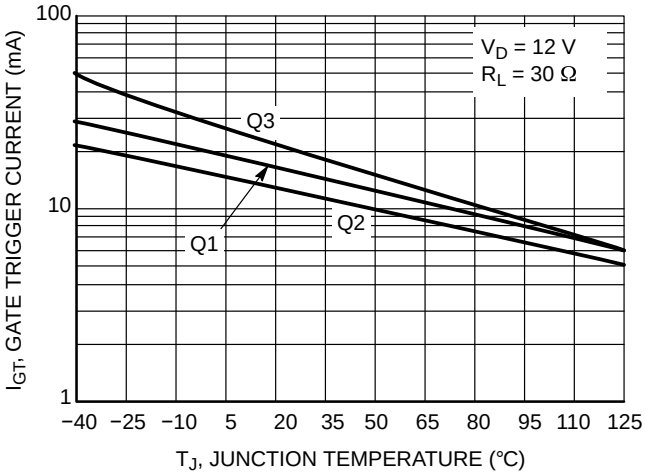



**Figure 6. Gate Trigger Current Variation**

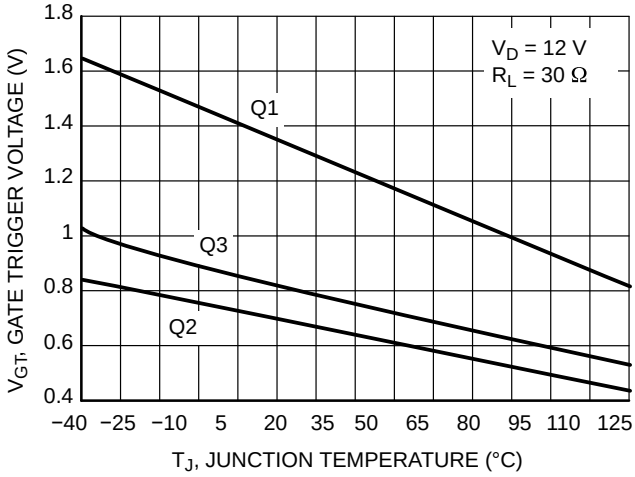



**Figure 7. Gate Trigger Voltage Variation**

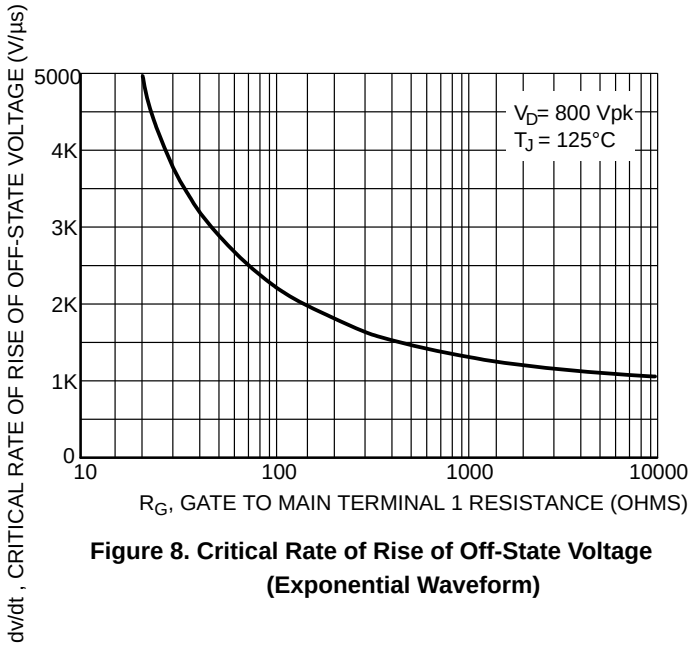
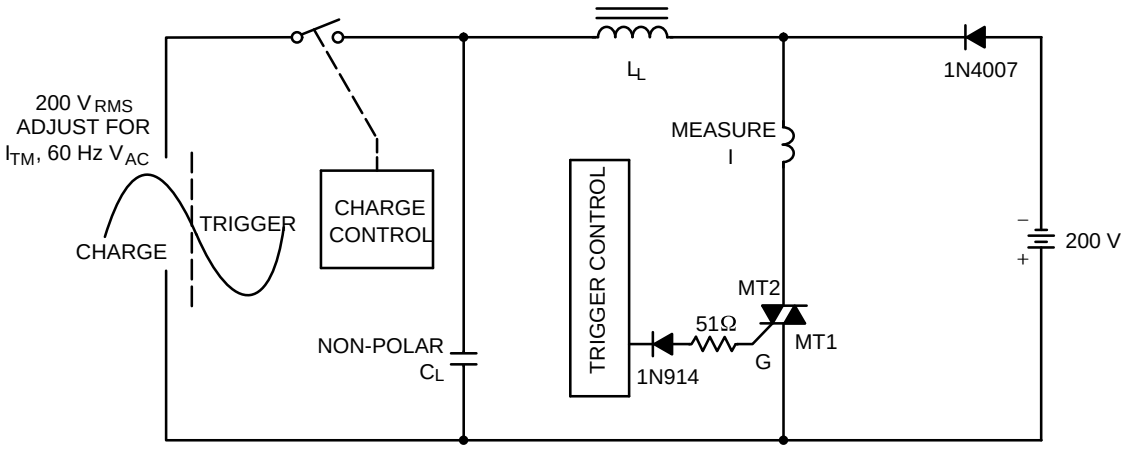



**Figure 8. Critical Rate of Rise of Off-State Voltage (Exponential Waveform)**




Note: Component values are for verification of rated (di/dt)c. See AN1048 for additional information.

**Figure 9. Simplified Test Circuit to Measure the Critical Rate of Rise of Commutating Current $(di/dt)_c$**