

### Maximum Ratings ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

| Rating  | Symbol                               | Value                                   | Unit               |
|---|--------------------------------------|---|--------------------|
| Peak Repetitive Off-State Voltage (Note 1)<br>(Gate Open, Sine Wave 50 to 60 Hz, $T_J = -40^\circ$ to $125^\circ\text{C}$ )<br>BTA16-600SW3G<br>BTA16-800SW3G | $V_{\text{DRM}}$<br>$V_{\text{RRM}}$ | 600<br>800                              | V                  |
| On-State RMS Current (Full Cycle Sine Wave, 60 Hz, $T_C = 25^\circ\text{C}$ )   | $I_{\text{T (RMS)}}$                 | 16                                      | A                  |
| Peak Non-Repetitive Surge Current<br>(One Full Cycle Sine Wave, 60 Hz, $T_C = 25^\circ\text{C}$ )   | $I_{\text{TSM}}$                     | 170                                     | A                  |
| Circuit Fusing Consideration ( $t = 8.3$ ms)  | $I^2t$                               | 120                                     | A <sup>2</sup> sec |
| Non-Repetitive Surge Peak Off-State Voltage ( $T_J = 25^\circ\text{C}$ , $t = 8.3$ ms)  | $V_{\text{DSM}}/V_{\text{RSM}}$      | $V_{\text{DSM}}/V_{\text{RSM}}$<br>+100 | V                  |
| Peak Gate Current ( $T_J = 110^\circ\text{C}$ , $t \leq 20$ $\mu\text{s}$ )   | $I_{\text{GM}}$                      | 4.0                                     | A                  |
| Peak Gate Power (Pulse Width $\leq 20$ $\mu\text{s}$ , $T_C = 80^\circ\text{C}$ )   | $P_{\text{GM}}$                      | 20                                      | W                  |
| Average Gate Power ( $T_J = 125^\circ\text{C}$ )  | $P_{\text{G(AV)}}$                   | 1.0                                     | W                  |
| Operating Junction Temperature Range  | $T_J$                                | -40 to +125                             | $^\circ\text{C}$   |
| Storage Temperature Range   | $T_{\text{stg}}$                     | -40 to +125                             | $^\circ\text{C}$   |
| RMS Isolation Voltage ( $t = 300$ ms, R.H. $\leq 30\%$ , $T_A = 25^\circ\text{C}$ )   | $V_{\text{iso}}$                     | 2500                                    | V                  |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

- $V_{\text{DRM}}$  and  $V_{\text{RRM}}$  for all types can be applied on a continuous basis. Ratings apply for zero or negative gate voltage; however, positive gate voltage shall not be applied concurrent with negative potential on the anode. Blocking voltages shall not be tested with a constant current source such that the voltage ratings of the devices are exceeded.

### Thermal Characteristics

| Rating   | Symbol                               | Value      | Unit               |
|--|--------------------------------------|------------|--------------------|
| Thermal Resistance,<br>Junction-to-Case (AC)<br>Junction-to-Ambient            | $R_{\text{θJC}}$<br>$R_{\text{θJA}}$ | 2.13<br>60 | $^\circ\text{C/W}$ |
| Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds | $T_L$                                | 260        | $^\circ\text{C}$   |

### Electrical Characteristics - OFF ( $T_J = 25^\circ\text{C}$ unless otherwise noted ; Electricals apply in both directions)

| Characteristic   |                           | Symbol    | Min | Typ | Max   | Unit |
|--|---------------------------|-----------|-----|-----|-------|------|
| Peak Repetitive Blocking Current<br>( $V_D = V_{DRM} = V_{RRM}$ ; Gate Open) | $T_J = 25^\circ\text{C}$  | $I_{DRM}$ | -   | -   | 0.005 | mA   |
|  | $T_J = 110^\circ\text{C}$ | $I_{RRM}$ | -   | -   | 2.0   |      |

### Electrical Characteristics - ON ( $T_J = 25^\circ\text{C}$ unless otherwise noted; Electricals apply in both directions)

| Characteristic   |              | Symbol   | Min | Typ | Max  | Unit |
|--|--------------|----------|-----|-----|------|------|
| Forward On-State Voltage (Note 2) ( $I_{TM} = \pm 22.5$ A Peak)                  |              | $V_{TM}$ | -   | -   | 1.55 | V    |
| Gate Trigger Current (Continuous dc) ( $V_D = 12$ V, $R_L = 30$ $\Omega$ )       | MT2(+), G(+) | $I_{GT}$ | 2.0 | -   | 10   | mA   |
|  | MT2(+), G(-) |          | 2.0 | -   | 10   |      |
|  | MT2(-), G(-) |          | 2.0 | -   | 10   |      |
| Holding Current<br>( $V_D = 12$ V, Gate Open, Initiating Current = $\pm 500$ mA) |              | $I_H$    | -   | -   | 20   | mA   |
| Latching Current ( $V_D = 12$ V, $I_G = 12$ mA)                                  | MT2(+), G(+) | $I_L$    | -   | -   | 25   | mA   |
|  | MT2(+), G(-) |          | -   | -   | 30   |      |
|  | MT2(-), G(-) |          | -   | -   | 25   |      |
| Gate Trigger Voltage ( $V_D = 12$ V, $R_L = 30$ $\Omega$ )                       | MT2(+), G(+) | $V_{GT}$ | 0.5 | -   | 1.3  | V    |
|  | MT2(+), G(-) |          | 0.5 | -   | 1.3  |      |
|  | MT2(-), G(-) |          | 0.5 | -   | 1.3  |      |
| Gate Non-Trigger Voltage ( $T_J = 110^\circ\text{C}$ )                           | MT2(+), G(+) | $V_{GD}$ | 0.2 | -   | -    | V    |
|  | MT2(+), G(-) |          | 0.2 | -   | -    |      |
|  | MT2(-), G(-) |          | 0.2 | -   | -    |      |

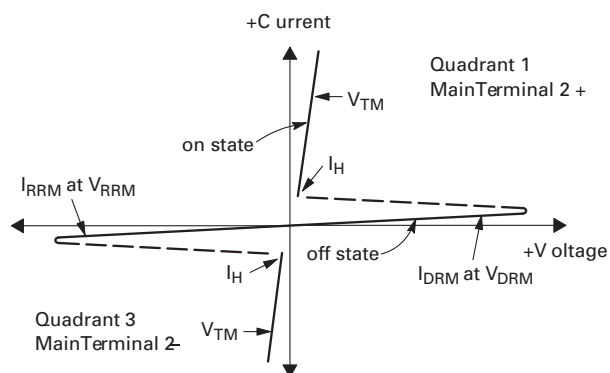
2. Indicates Pulse Test: Pulse Width  $\leq 2.0$  ms, Duty Cycle  $\leq 2\%$ .

### Dynamic Characteristics

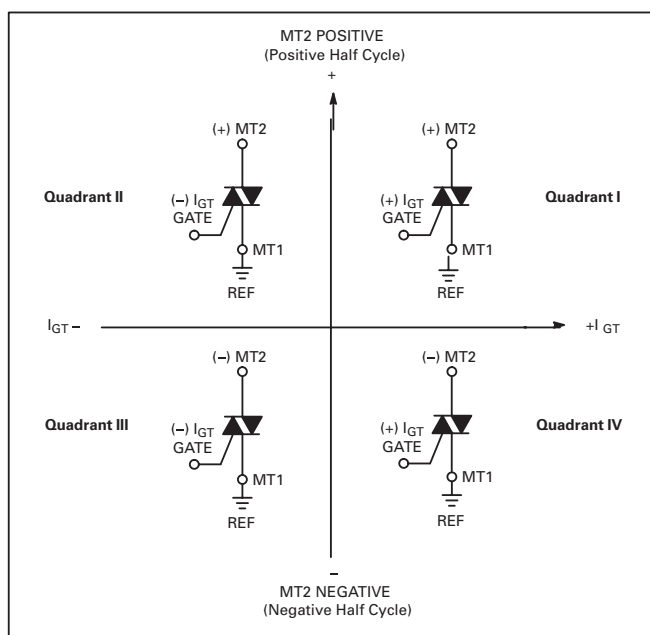
| Characteristic   | Symbol      | Min | Typ | Max | Unit             |
|--|-------------|-----|-----|-----|------------------|
| Rate of Change of Commutating Current, See Figure 10.<br>(Gate Open, $T_j = 110^\circ\text{C}$ , No Snubber)                                       | $(di/dt)_c$ | 2.0 | –   | –   | A/ms             |
| Critical Rate of Rise of On-State Current<br>( $T_j = 110^\circ\text{C}$ , $f = 120\text{ Hz}$ , $I_g = 20\text{ mA}$ , $t_r \leq 100\text{ ns}$ ) | $di/dt$     | –   | –   | 50  | A/ $\mu\text{s}$ |
| Critical Rate of Rise of Off-State Voltage<br>( $V_D = 0.66 \times V_{DRM}$ , Exponential Waveform, Gate Open, $T_j = 110^\circ\text{C}$ )         | $dV/dt$     | 250 | –   | –   | V/ $\mu\text{s}$ |

### Voltage Current Characteristic of SCR

| 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                           |

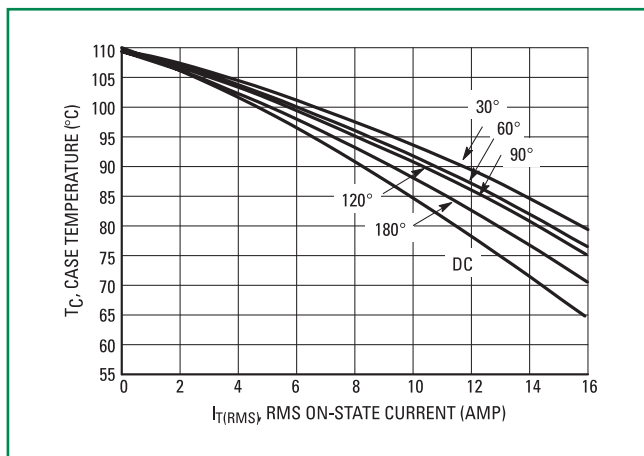


### Quadrant Definitions for a Triac

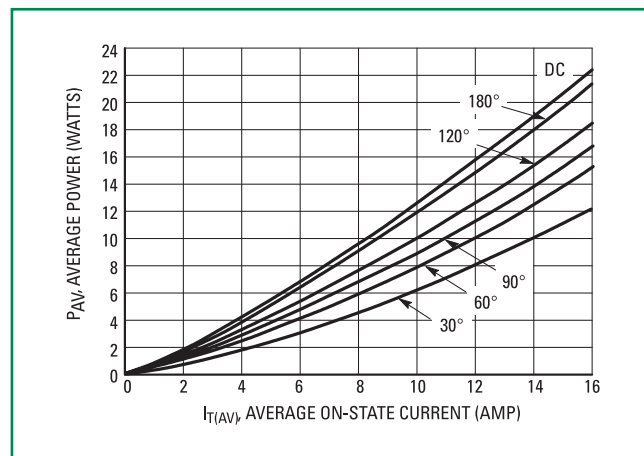


All polarities are referenced to MT1.  
With in-phase signals (using standard AC lines) quadrants I and III are used.

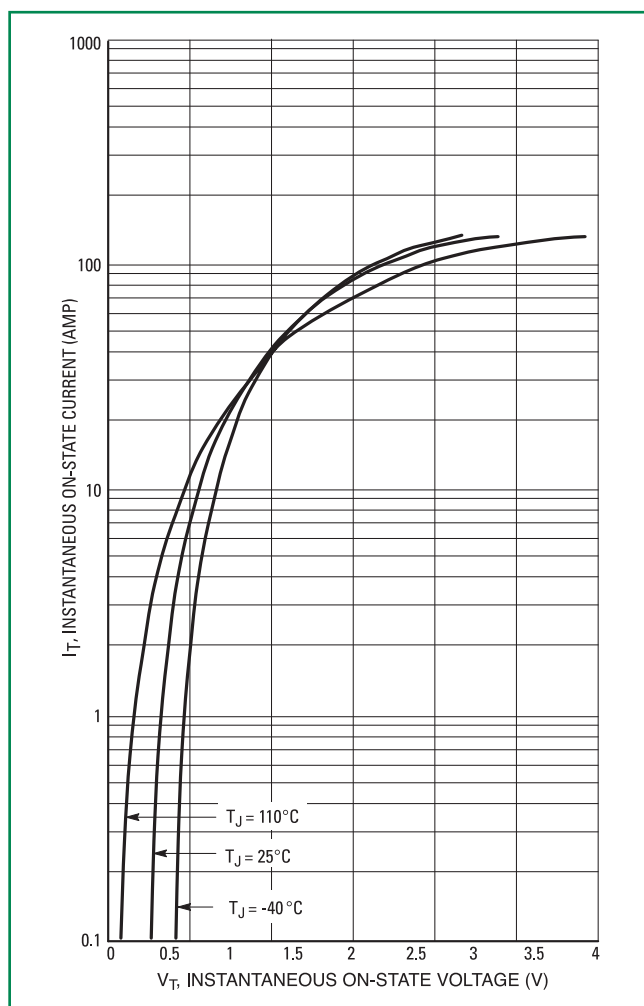
**Figure 1. Typical RMS Current Derating**



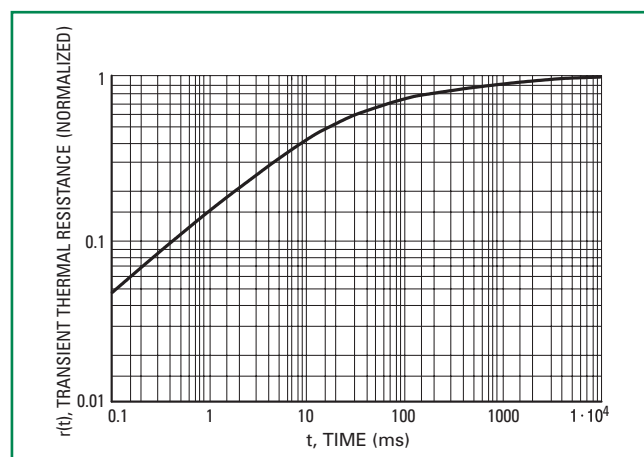
**Figure 2. On-State Power Dissipation**



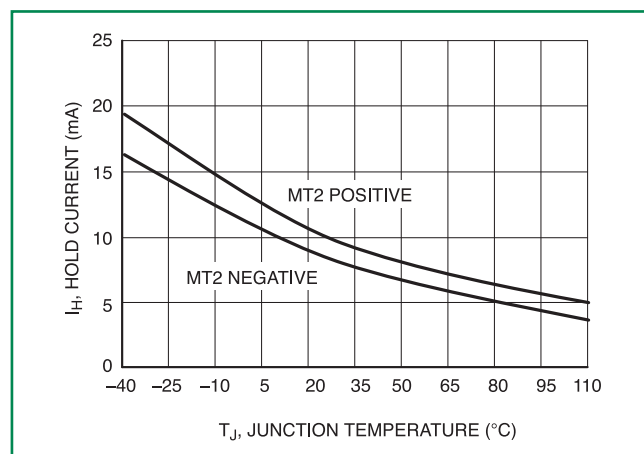
**Figure 3. On-State Characteristics**



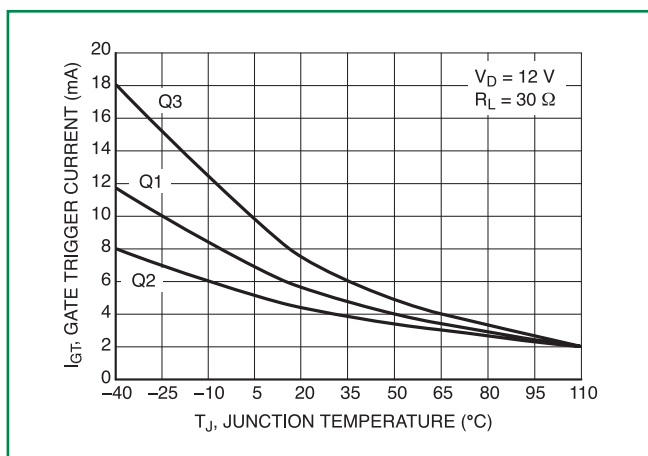
**Figure 4. Thermal Response**



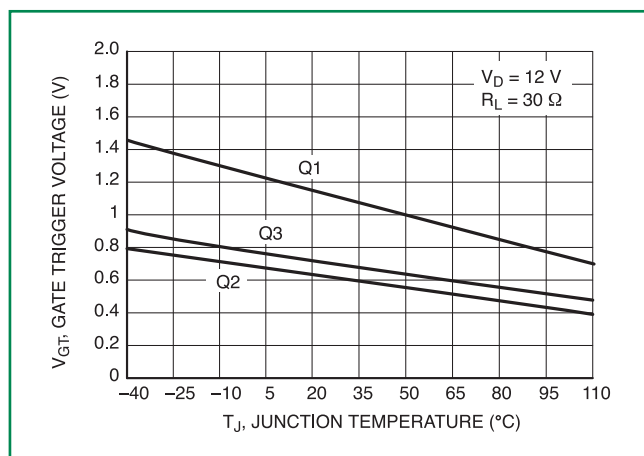
**Figure 5. Hold Current Variation**



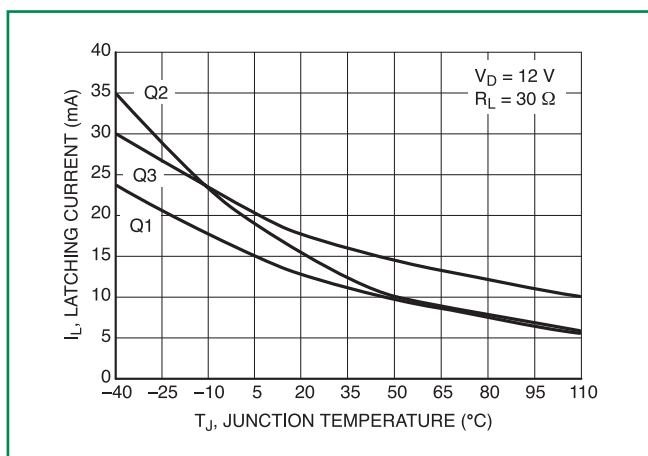
**Figure 6. Gate Trigger Current Variation**



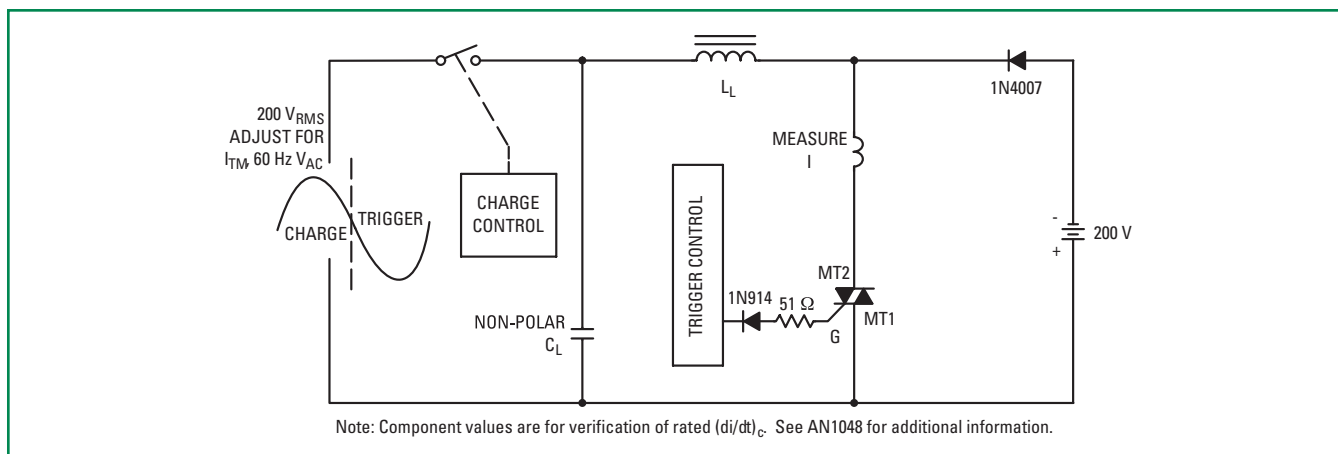
**Figure 7. Gate Trigger Voltage Variation**



**Figure 8. Typical Latching Current Variation**

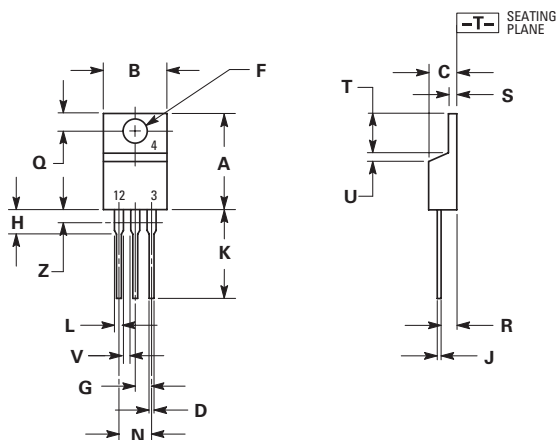


**Figure 9. Simplified Test Circuit to Measure the Critical Rate of Rise of Commutating Current ( $di/dt$ )**



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

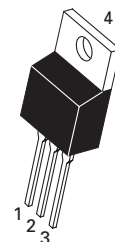
### Dimensions



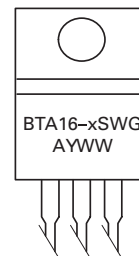
| Dim | Inches |       | Millimeters |       |
|-----|--------|-------|-------------|-------|
|     | Min    | Max   | Min         | Max   |
| A   | 0.570  | 0.620 | 14.48       | 15.75 |
| B   | 0.380  | 0.405 | 9.66        | 10.28 |
| C   | 0.160  | 0.190 | 4.07        | 4.82  |
| D   | 0.025  | 0.035 | 0.64        | 0.88  |
| F   | 0.142  | 0.147 | 3.61        | 3.73  |
| G   | 0.095  | 0.105 | 2.42        | 2.66  |
| H   | 0.110  | 0.155 | 2.80        | 3.93  |
| J   | 0.014  | 0.022 | 0.36        | 0.55  |
| K   | 0.500  | 0.562 | 12.70       | 14.27 |
| L   | 0.045  | 0.060 | 1.15        | 1.52  |
| N   | 0.190  | 0.210 | 4.83        | 5.33  |
| Q   | 0.100  | 0.120 | 2.54        | 3.04  |
| R   | 0.080  | 0.110 | 2.04        | 2.79  |
| S   | 0.045  | 0.055 | 1.15        | 1.39  |
| T   | 0.235  | 0.255 | 5.97        | 6.47  |
| U   | 0.000  | 0.050 | 0.00        | 1.27  |
| V   | 0.045  | ---   | 1.15        | ---   |
| Z   | ---    | 0.080 | ---         | 2.04  |

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

### Part Marking System



TO-220AB  
CASE 221A  
STYLE 12



x= 6 or 8  
A= Assembly Location (Optional)\*  
Y= Year  
WW = Work Week  
G= Pb-Free Package

\* The Assembly Location code (A) is optional. In cases where the Assembly Location is stamped on the package the assembly code may be blank.

### Pin Assignment

|   |                 |
|---|-----------------|
| 1 | Main Terminal 1 |
| 2 | Main Terminal 2 |
| 3 | Gate            |
| 4 | No Connection   |

### Ordering Information

| Device        | Package            | Shipping        |
|---------------|--------------------|-----------------|
| BTA16-600SW3G | TO-220AB (Pb-Free) | 50 Units / Rail |
| BTA16-800SW3G | TO-220AB (Pb-Free) | 50 Units / Rail |

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