

TOSHIBA BI-DIRECTIONAL TRIODE THYRISTOR SILICON PLANAR TYPE

## SM12GZ47, SM12JZ47, SM12GZ47A, SM12JZ47A

### AC POWER CONTROL APPLICATIONS

- Repetitive Peak off-State Voltage :  $V_{DRM} = 400V, 600V$
- R.M.S On-State Current :  $I_T (RMS) = 12A$
- High Commutating ( $dv / dt$ )
- Isolation Voltage :  $V_{Isol} = 1500V AC$

### ABSOLUTE MAXIMUM RATINGS

| CHARACTERISTIC  | SYMBOL      | RATING     | UNIT        |
|---|-------------|------------|-------------|
| Repetitive Peak Off-State Voltage and Repetitive Peak Reverse Voltage | $V_{DRM}$   | 400        | V           |
|   |             | 600        |             |
| R. M. S. On-state Current (Full Sine Waveform $T_C = 72^\circ C$ )    | $I_T (RMS)$ | 12         | A           |
| Peak One Cycle Surge On-State Current (Non-Repetitive)                | $I_{TSM}$   | 120 (50Hz) | A           |
|   |             | 132 (60Hz) |             |
| $I^2t$ Limit Value  | $I^2t$      | 72         | $A^2s$      |
| Critical Rate of Rise of On-State Current (Note 1)                    | $di / dt$   | 50         | A / $\mu s$ |
| Peak Gate Power Dissipation   | $P_{GM}$    | 5          | W           |
| Average Gate Power Dissipation  | $P_{G(AV)}$ | 0.5        | W           |
| Peak Gate Voltage   | $V_{FGM}$   | 10         | V           |
| Peak Gate Current   | $I_{GM}$    | 2          | A           |
| Junction Temperature  | $T_j$       | -40~125    | $^\circ C$  |
| Storage Temperature Range   | $T_{stg}$   | -40~125    | $^\circ C$  |
| Isolation Voltage (AC, $t = 1min.$ )                                  | $V_{Isol}$  | 1500       | V           |

Note 1:  $di / dt$  test condition

$$V_{DRM} = 0.5 \times \text{Rated}$$

$$I_{TM} \leq 17A$$

$$t_{gw} \geq 10\mu s$$

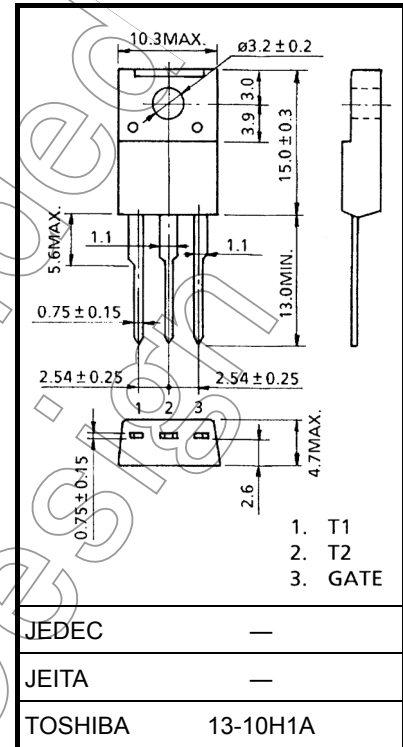
$$t_{gr} \leq 250ns$$

$$i_{gp} = I_{GT} \times 2.0$$

Note 2: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/Derating Concept and Methods) and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Unit: mm

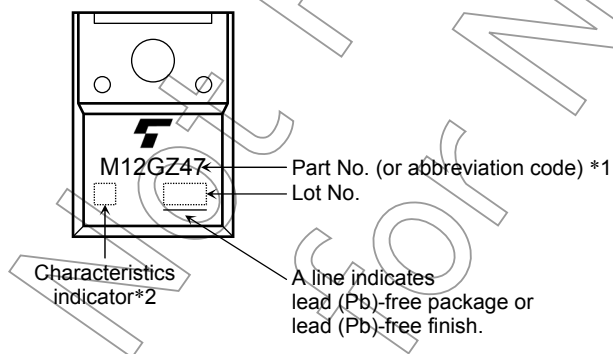


Weight: 1.7 g (typ.)

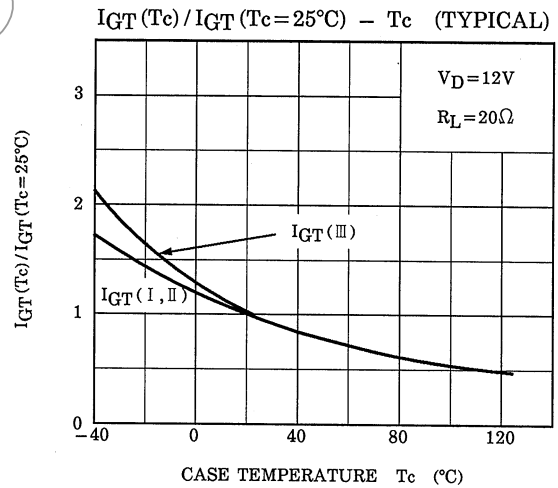
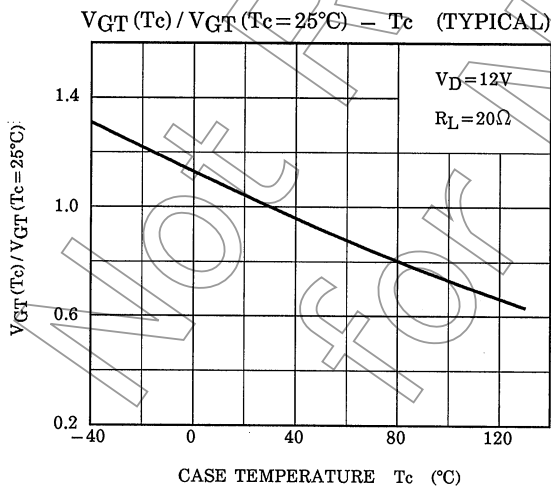
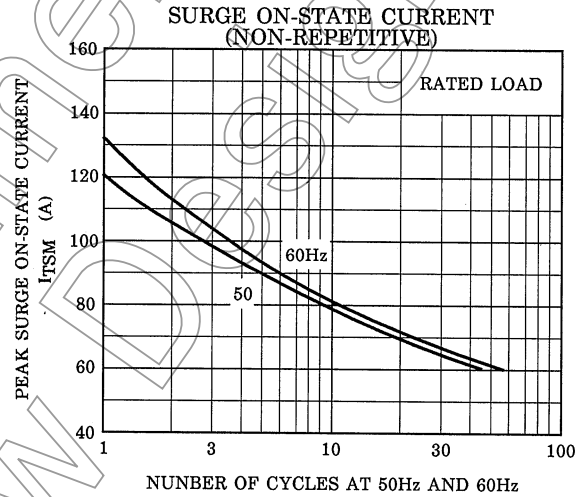
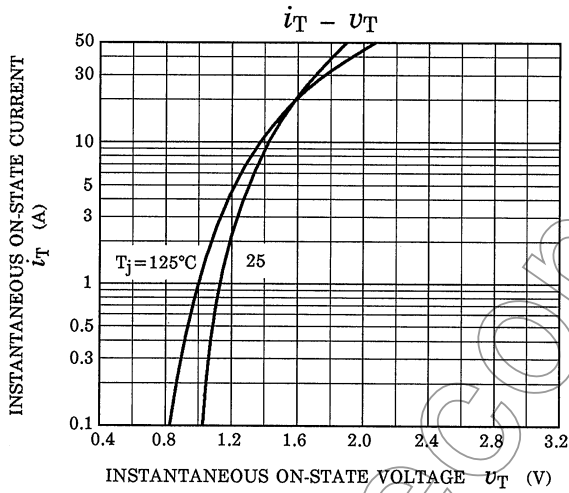
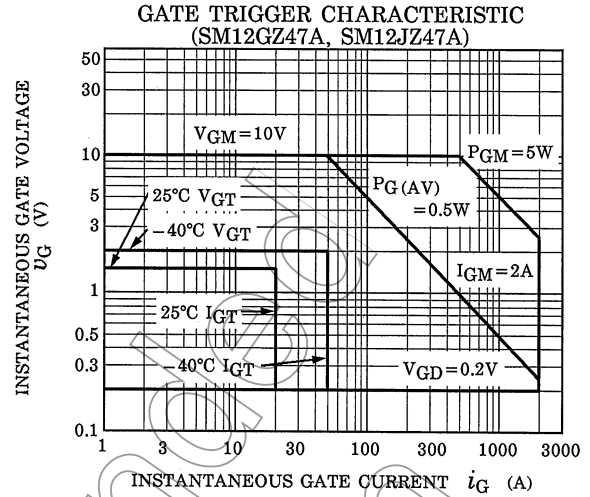
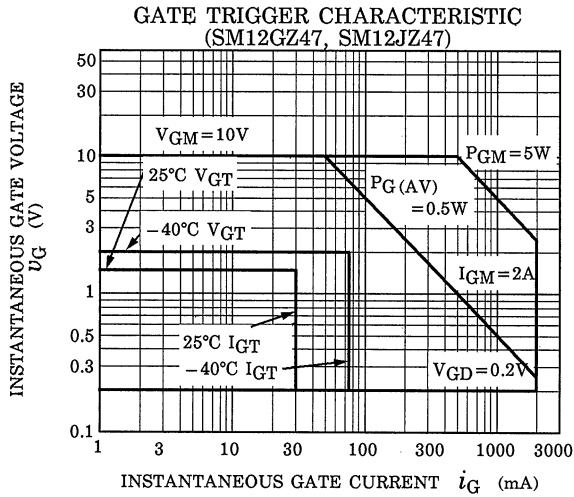
### ELECTRICAL CHARACTERISTICS (Ta = 25°C)

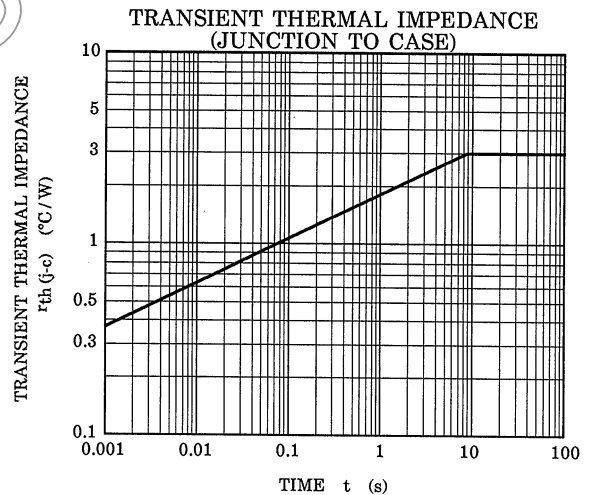
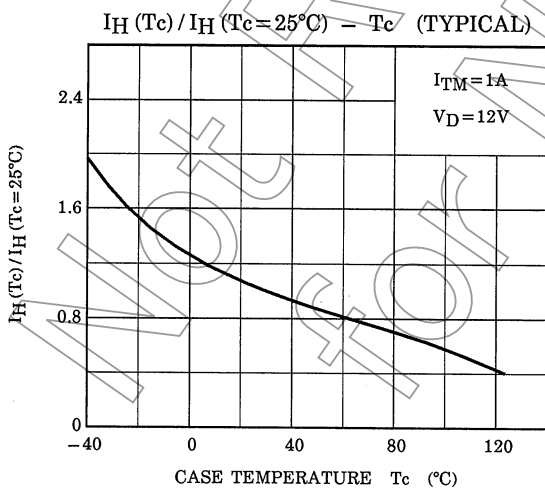
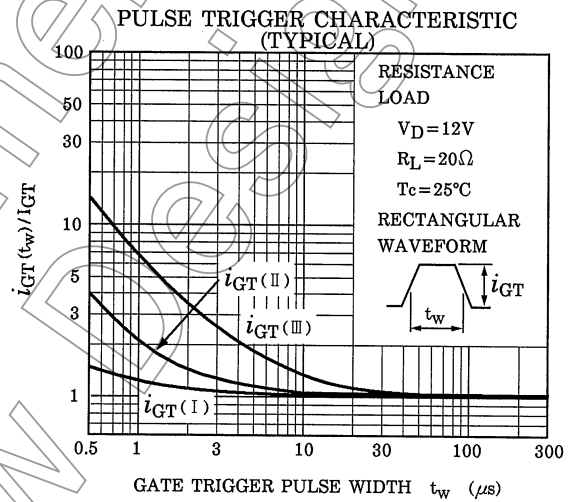
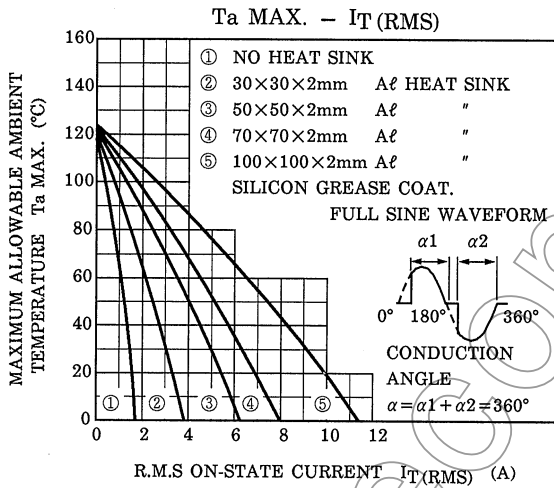
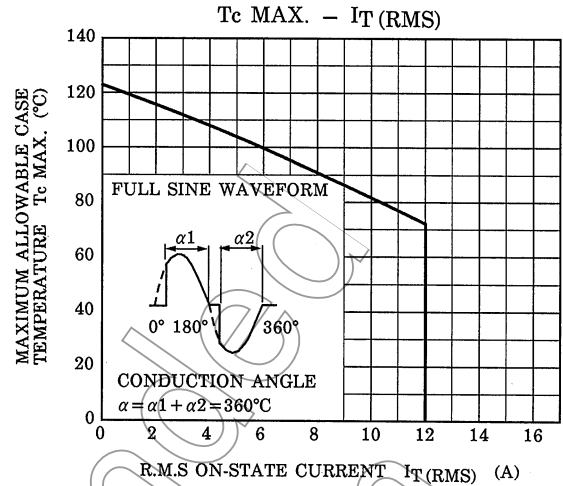
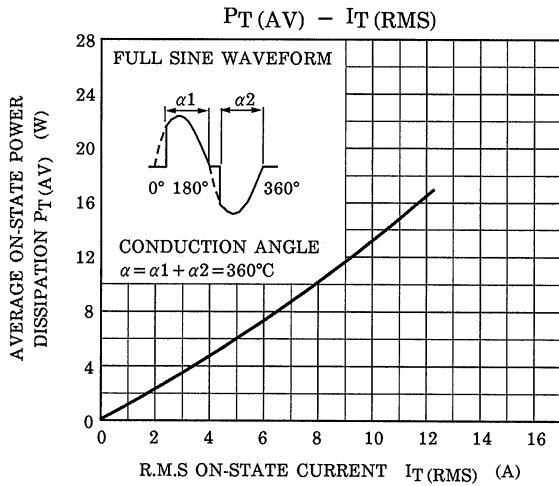
| CHARACTERISTIC  |                        | SYMBOL        | TEST CONDITION  | MIN              | TYP. | MAX | UNIT                        |    |
|---|------------------------|---------------|---|------------------|------|-----|-----------------------------|----|
| Repetitive Peak Off-State Current                         |                        | $I_{DRM}$     | $V_{DRM} = \text{Rated}$  | —                | —    | 20  | $\mu\text{A}$               |    |
| Gate Trigger Voltage                                      | I                      | $V_{GT}$      | $V_D = 12\text{V}$ ,<br>$R_L = 20\Omega$  | T2 (+), Gate (+) | —    | —   | 1.5                         | V  |
|   | II                     |               |   | T2 (+), Gate (-) | —    | —   | 1.5                         |    |
|   | III                    |               |   | T2 (-), Gate (-) | —    | —   | 1.5                         |    |
|   | IV                     |               |   | T2 (-), Gate (+) | —    | —   | —                           |    |
| Gate Trigger Current                                      | SM12GZ47<br>SM12JZ47   | $I_{GT}$      | $V_D = 12\text{V}$ ,<br>$R_L = 20\Omega$  | T2 (+), Gate (+) | —    | —   | 30                          | mA |
|   |                        |               |   | T2 (+), Gate (-) | —    | —   | 30                          |    |
|   |                        |               |   | T2 (-), Gate (-) | —    | —   | 30                          |    |
|   |                        |               |   | T2 (-), Gate (+) | —    | —   | —                           |    |
|   | SM12GZ47A<br>SM12JZ47A |               |   | T2 (+), Gate (+) | —    | —   | 20                          |    |
|   |                        |               |   | T2 (+), Gate (-) | —    | —   | 20                          |    |
|   |                        |               |   | T2 (-), Gate (-) | —    | —   | 20                          |    |
|   |                        |               |   | T2 (-), Gate (+) | —    | —   | —                           |    |
| Peak On-State Voltage                                     |                        | $V_{TM}$      | $I_{TM} = 17\text{A}$   | —                | —    | 1.5 | V                           |    |
| Gate Non-Trigger Voltage                                  |                        | $V_{GD}$      | $V_D = \text{Rated}$ , $T_c = 125^\circ\text{C}$  | 0.2              | —    | —   | V                           |    |
| Holding Current   |                        | $I_H$         | $V_D = 12\text{V}$ , $I_{TM} = 1\text{A}$   | —                | —    | 50  | mA                          |    |
| Thermal Resistance  |                        | $R_{th(j-c)}$ | Junction to Case, AC  | —                | —    | 3.0 | $^\circ\text{C} / \text{W}$ |    |
| Critical Rate of Rise of Off-State Voltage                | SM12GZ47<br>SM12JZ47   | $dv / dt$     | $V_{DRM} = \text{Rated}$ , $T_j = 125^\circ\text{C}$<br>Exponential Rise                        | —                | 300  | —   | V / $\mu\text{s}$           |    |
|   | SM12GZ47A<br>SM12JZ47A |               |   | —                | 200  | —   |                             |    |
| Critical Rate of Rise of Off-State Voltage at Commutation | SM12GZ47<br>SM12JZ47   | $(dv / dt)_c$ | $V_{DRM} = 400\text{V}$ , $T_j = 125^\circ\text{C}$<br>$(di / dt)_c = -6.5\text{A} / \text{ms}$ | 10               | —    | —   | V / $\mu\text{s}$           |    |
|   | SM12GZ47A<br>SM12JZ47A |               |   | 4                | —    | —   |                             |    |

### MARKING



|    | Part No.<br>(or abbreviation code) | Part No.             |
|----|------------------------------------|----------------------|
| *1 | M12GZ47                            | SM12GZ47, SM12GZ47A  |
|    | M12JZ47                            | SM12JZ47, SM12JZ47A  |
| *2 | Nothing                            | SM12GZ47, SM12JZ47   |
|    | A                                  | SM12GZ47A, SM12JZ47A |





**RESTRICTIONS ON PRODUCT USE**

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