TOSHIBA AC SWITCH OPTICALLY ISOLATED AC SWITCH WITH ZERO VOLTAGE TURN-ON FUNCTION

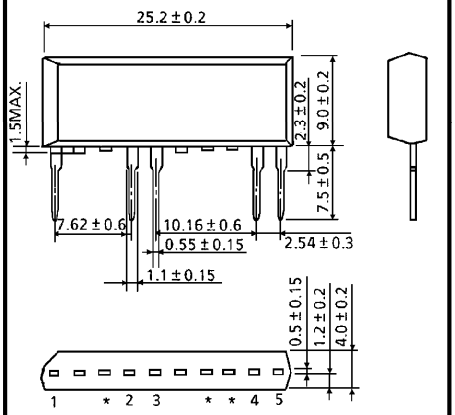
# TSA3000G, TSA3000J

- R.M.S. ON-STATE CURRENT : $I_{T\,(RMS)}$ = 0.1~3A
- Repetitive Peak Off-State Voltage : $V_{DRM}$ = 400, 600V
- Isolation Voltage between input to output : 3000VAC (t = 1min.)
- Thickness of inner insulation material: 0.8mm (min.)
- Creepage distances, Clearances for insulation between input and output side : 6mm (min.)
- TTL drive is available

MAXIMUM RATINGS (Ta = 25°C)

| | CHARACTERISTIC | | SYMBOL | RATING | UNIT |
|---|---|---|---|---|---|
| INPUT | Control Input Current | | $I_{F\,(IN)}$ | 50 | mA |
| | Forward Current Derating (Ta ≧ 53°C) | | $\Delta I_F$ / °C | −0.7 | mA / °C |
| | Peak Forward Current (100μs pulse, 100pps) | | $I_{FP}$ | 1 | A |
| | Reverse Voltage | | $V_R$ | 5 | V |
| OUTPUT | Repetitive Peak Off-State Voltage | TSA3000G | $V_{DRM}$ | 400 | V |
| | | TSA3000J | | 600 | |
| | Nominal AC Line Voltage (Note 1) | TSA3000G | $V_{AC}$ | 80~125 | V |
| | | TSA3000J | | 80~250 | |
| | R.M.S On-State Current (Sine Waveform, R.M.S.) | | $I_{T(RMS)}$ | 0.1~3 | A |
| | Peak One Cycle Surge On-State Current (Non-Repetitive) | | $I_{TSM}$ | 30 (50Hz) | A |
| | | | | 33 (60Hz) | |
| | $I^2t$ Limit Value | | $I^2t$ | 4.5 | $A^2s$ |
| Operating Frequency Range | | | f | 45~65 | Hz |
| Operating Temperature Range | | | $T_{opr}$ | −40~100 | °C |
| Storage Temperature Range | | | $T_{stg}$ | −40~100 | °C |
| Isolation Voltage (Input to Output) Note 2 | | | $BV_S$ | 3000 | V |

Unit in mm

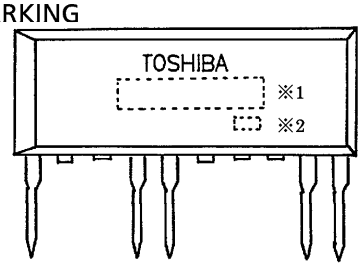



1 : AC OUTPUT (MT2) 4 : DC INPUT (+)
2 : AC OUTPUT (MT1) 5 : DC INPUT (−)
3 : GATE * : RESIN FLASH

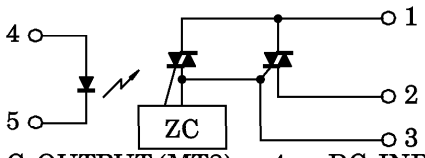
| | |
|---|---|
| JEDEC | — |
| EIAJ | — |
| TOSHIBA | 10-25A1A |

Weight : 2g

MARKING




EQUIVALENT CIRCUIT




1 : AC OUTPUT (MT2) 4 : DC INPUT (+)
2 : AC OUTPUT (MT1) 5 : DC INPUT (−)
3 : GATE ZC : ZEROCROSS CIRCUIT

| NUMBER | SYMBOL | | MARK | |
|---|---|---|---|---|
| ※1 | TYPE | TSA3000G | TYPE | TSA3000G |
| | | TSA3000J | | TSA3000J |
| ※2 | Lot Number □□ Month (Staring from Alphabet A) Year (Last Number of the Christian era) | | Example 3A : January 1993 3B : February 1993 3L : December 1993 | |

(The cutted pins near by Pin No.1 & No.3 is connecting in electrically with output terminal)

Note 1 : When the voltage larger than applied AC voltage is applied to the device such as 2 phase motor and others, please derating for this maximum rating value.
Note 2 : TEST CONDITION··· AC, t = 60s, RH ≦ 60%
Note 3 : Soldering of printed wiring board should be used under 260°C and 10 seconds.

ELECTRICAL CHARACTERISTICS (Ta = 25°C)

| | CHARACTERISTIC | | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|---|---|
| INPUT | Forward Voltage | | $V_F$ | $I_F$ = 10mA | 1.0 | 1.15 | 1.3 | V |
| | Reverse Current | | $I_R$ | $V_R$ = 5V | — | — | 10 | μA |
| | Capacitance | | $C_T$ | $V_T$ = 0V, f = 1MHz | — | 20 | — | pF |
| OUTPUT | Peak Off-State Current | | $I_{DRM}$ | $V_{DRM}$ = Rated | — | — | 10 | μA |
| | Peak On-State Voltage | | $V_{TM}$ | $I_{TM}$ = 4.5A | — | — | 1.5 | V |
| | Holding Current | | $I_H$ | $V_D$ = 6V, Beginning Current = 1A | — | — | 25 | mA |
| | Critical Rate of Rise of Off-State Voltage | | dv / dt | $V_{DRM}$ = Rated | — | 2000 | — | V / μs |
| | Critical Rate of Rise of Commutating Voltage | | (dv / dt) c | $V_D$ = 400V<br>−di / dt = 30A / ms | — | 30 | — | V / μs |
| | Thermal Resistance | Junction to Lead | $R_{th\ (j\text{-}\ell)}$ | AC | — | — | 20 | °C / W |
| | | Junction to Ambient | $R_{th\ (j\text{-}a)}$ | AC | — | — | 85 | °C / W |

COUPLED ELECTRICAL CHARACTERISTICS (Ta = 25°C)

| CHARACTERISTIC | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Trigger LED Current | $I_{FT}$ | $V_D$ = 6V, $R_L$ = 20Ω | — | — | 10 | mA |
| Inhibit Voltage | $V_{IH}$ | $I_F$ = 10mA, $R_L$ = 20Ω | — | 38 | 50 | V |
| Capacitance (Input to output) | $C_S$ | $V_S$ = 0V, f = 1MHz | — | 0.5 | — | pF |
| Isolation Resistance | $R_S$ | V = 500V, RH ≦ 60% | $10^9$ | — | — | Ω |
| Turn-off Time | $t_{off}$ | OUTPUT : Sine Waveform | — | — | 3 / 4 | cycle |

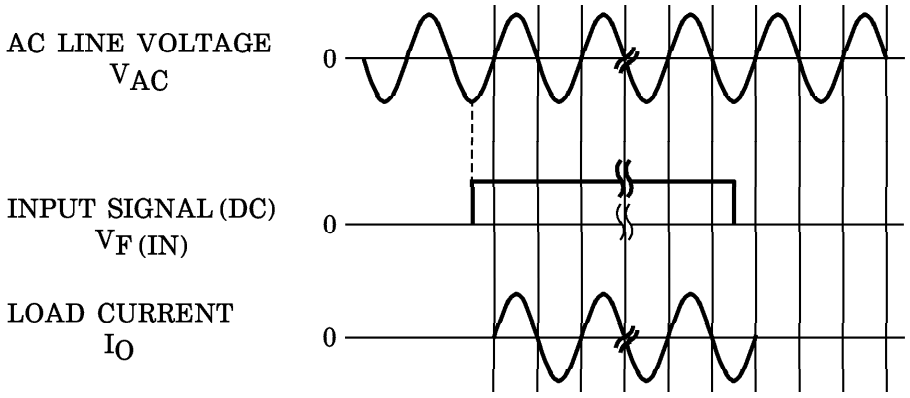
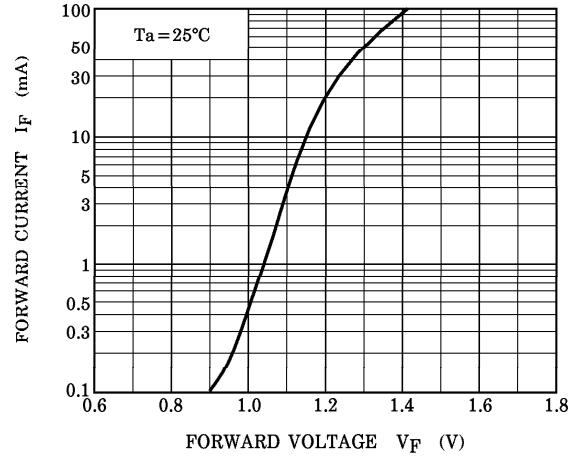
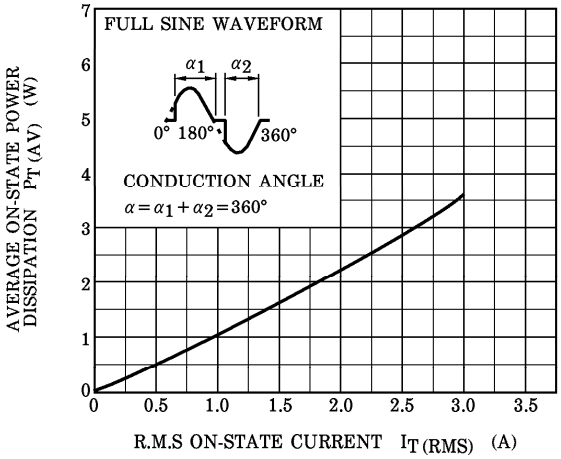



Fig.1 ZERO VOLTAGE SWITCHING WAVEFORM

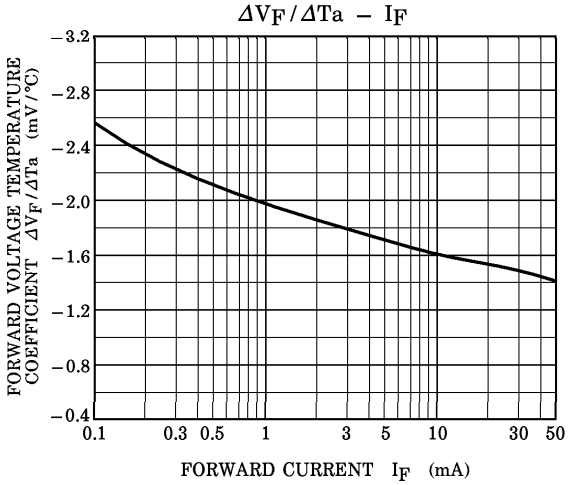
$I_F - V_F$



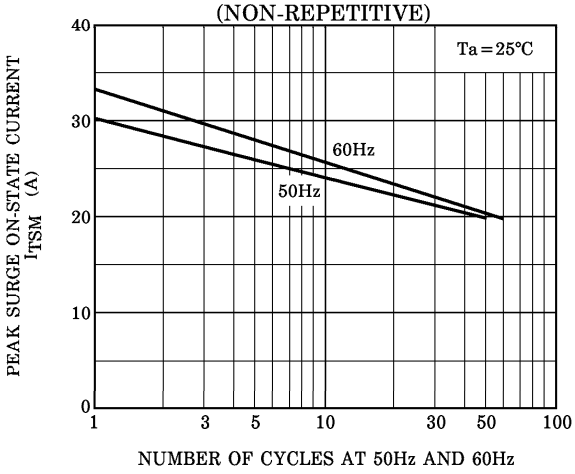

$P_{T(AV)} - I_{T(RMS)}$



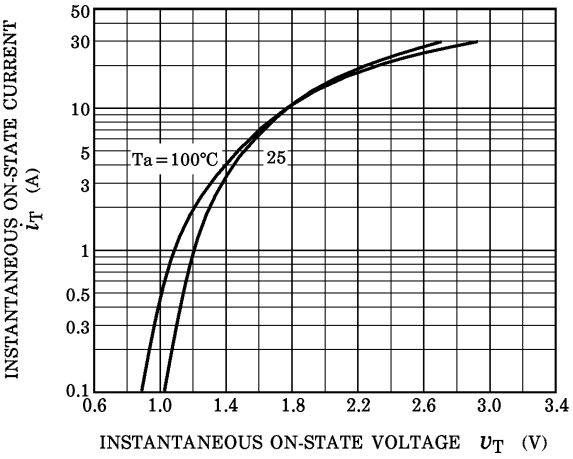

$\Delta V_F / \Delta Ta - I_F$



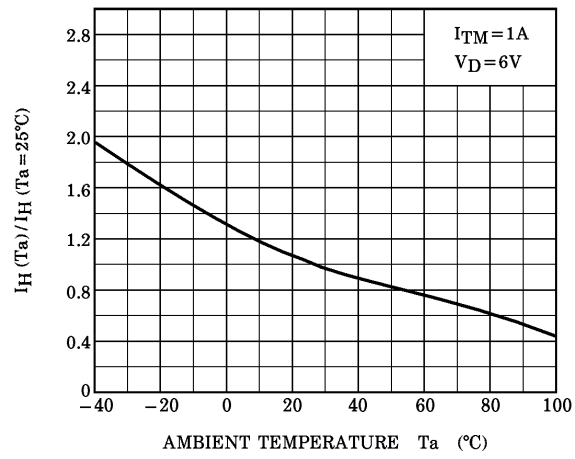

SURGE ON-STATE CURRENT (NON-REPETITIVE)



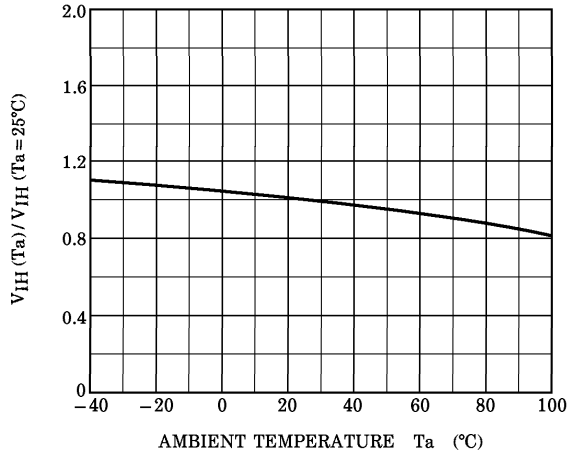

$i_T - v_T$



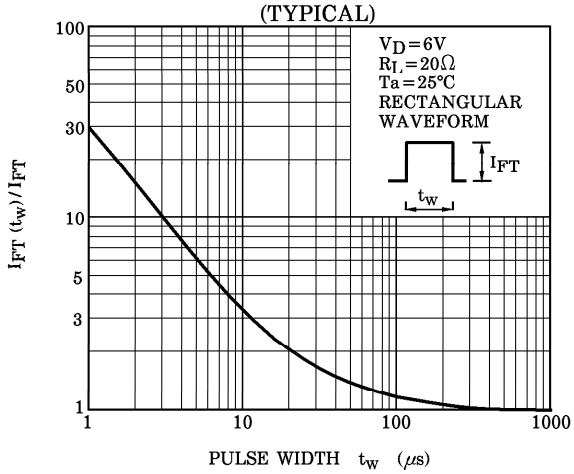

$I_H (Ta) / I_H (Ta = 25°C) - Ta$ (TYPICAL)



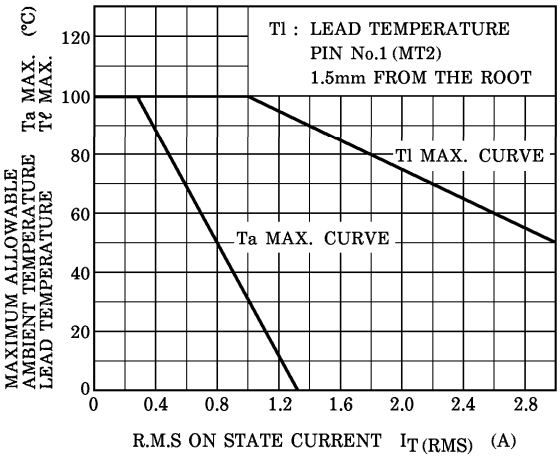
$V_{IH}$ (Ta) / $V_{IH}$ (Ta = 25°C) – Ta (TYPICAL)



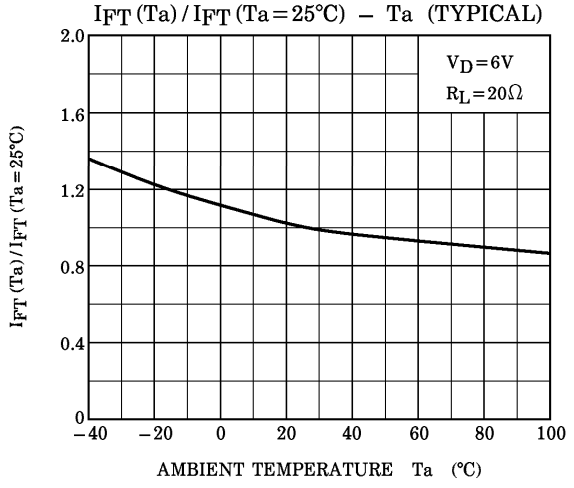

PULSE TRIGGER CHARACTERISTIC (TYPICAL)



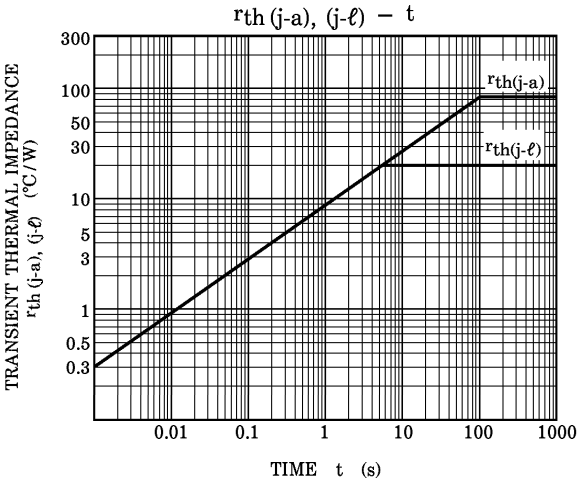

Ta MAX. T$\ell$ MAX. – $I_{T\,(RMS)}$




$I_{FT}$ (Ta) / $I_{FT}$ (Ta = 25°C) – Ta (TYPICAL)




$r_{th}$ (j-a), (j-$\ell$) – t



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