TOSHIBA Thyristor Silicon Planar Type

# SF5G49,SF5J49,USF5G49,USF5J49

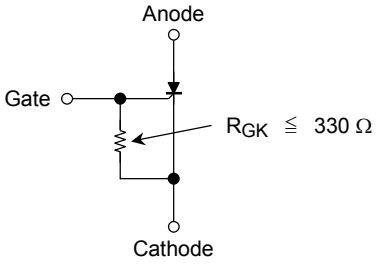
Medium Power Control Applications

- Repetitive peak off-state voltage: $V_{DRM}$ = 400, 600 V
  Repetitive peak reverse voltage: $V_{RRM}$ = 400, 600 V
- Average on-state current: $I_{T\ (AV)}$ = 5 A
- Gate trigger current: $I_{GT}$ = 70 μA max

## Maximum Ratings

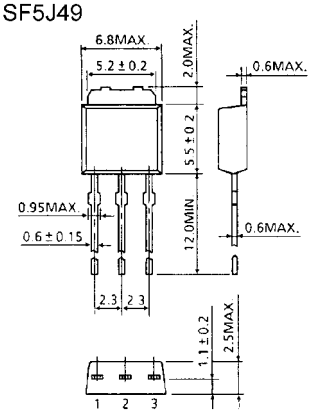
| Characteristics | | Symbol | Rating | Unit |
|---|---|---|---|---|
| Repetitive peak off-state voltage and Repetitive peak reverse voltage ($R_{GK}$ = 330 Ω) | SF5G49 USF5G49 | $V_{DRM}$ $V_{RRM}$ | 400 | V |
| | SF5J49 USF5J49 | | 600 | |
| Non-repetitive peak reverse voltage (non-repetitive < 5 ms, $T_j$ = 0~125°C, $R_{GK}$ = 330 Ω) | SF5G49 USF5G49 | $V_{RSM}$ | 500 | V |
| | SF5J49 USF5J49 | | 720 | |
| Average on-state current | | $I_{T\ (AV)}$ | 5 | A |
| R.M.S on-state current | | $I_{T\ (RMS)}$ | 7.8 | A |
| Peak one cycle surge on-state current (non-repetitive) | | $I_{TSM}$ | 65 (50 Hz) | A |
| $I^2t$ limit value | | $I^2t$ | 20 | $A^2s$ |
| Peak gate power dissipation | | $P_{GM}$ | 0.5 | W |
| Average gate power dissipation | | $P_{G\ (AV)}$ | 0.05 | W |
| Peak forward gate voltage | | $V_{FGM}$ | 5 | V |
| Peak reverse gate voltage | | $V_{RGM}$ | −5 | V |
| Peak forward gate current | | $I_{GM}$ | 200 | mA |
| Junction temperature | | $T_j$ | −40~125 | °C |
| Storage temperature range | | $T_{stg}$ | −40~125 | °C |

Note: Should be used with gate resistance as follows:




Unit: mm

SF5G49
SF5J49

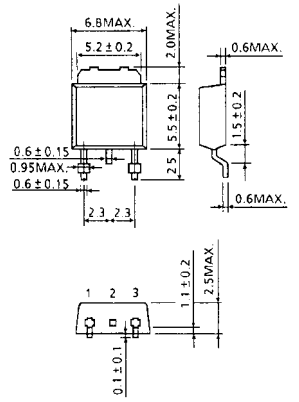



1. CATHODE
2. ANODE (HEAT SINK)
3. GATE

| | |
|---|---|
| JEDEC | — |
| JEITA | — |
| TOSHIBA | 13-7F1A |

Weight: 0.36 g (typ.)

USF5G49
USF5J49




1. CATHODE
2. ANODE (BACK SIDE)
3. GATE

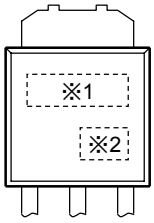
| | |
|---|---|
| JEDEC | — |
| JEITA | — |
| TOSHIBA | 13-F2A |

Weight: 0.28 g (typ.)

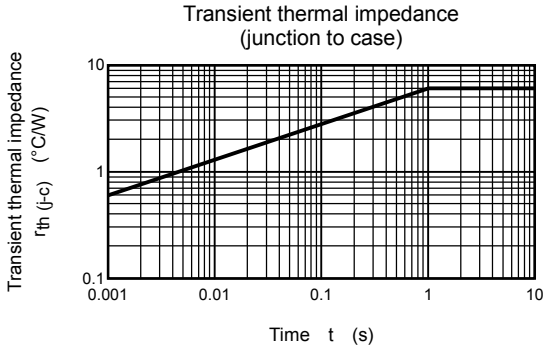
## Electrical Characteristics (Ta = 25°C)

| Characteristics | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Repetitive peak off-state current and Repetitive peak reverse current | $I_{DRM}$ $I_{RRM}$ | $V_{DRM} = V_{RRM}$ = Rated $R_{GK}$ = 330 Ω | — | — | 20 | μA |
| Peak on-state voltage | $V_{TM}$ | $I_{TM}$ = 12 A | — | — | 1.6 | V |
| Gate trigger voltage | $V_{GT}$ | $V_D$ = 6 V, $R_L$ = 100 Ω $R_{GK}$ = 330 Ω | — | — | 0.8 | V |
| Gate trigger current | $I_{GT}$ | | 3 | — | 70 | μA |
| Gate non-trigger voltage | $V_{GD}$ | $V_D$ = Rated × 2/3, Tc = 125°C | 0.2 | — | — | V |
| Critical rate of rise of off-state voltage | dv/dt | $V_{DRM}$ = Rated × 2/3, Tc = 75°C $R_{GK}$ = 330 Ω, Exponential rise | — | 50 | — | V/μs |
| Holding current | $I_H$ | $R_L$ = 100 Ω, $R_{GK}$ = 330 Ω | — | 2.5 | — | mA |
| Thermal resistance (junction to case) | $R_{th\ (j\text{-}c)}$ | DC | — | — | 6.0 | °C/W |

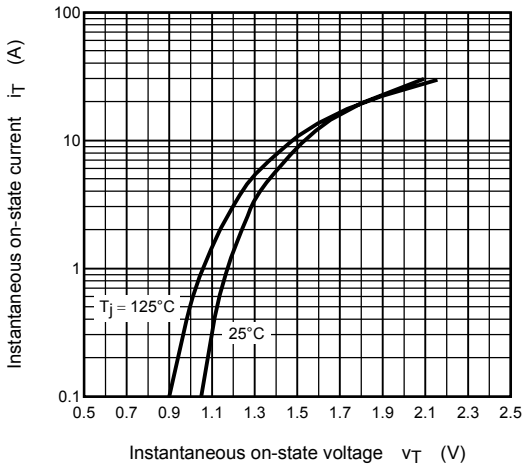
## Marking



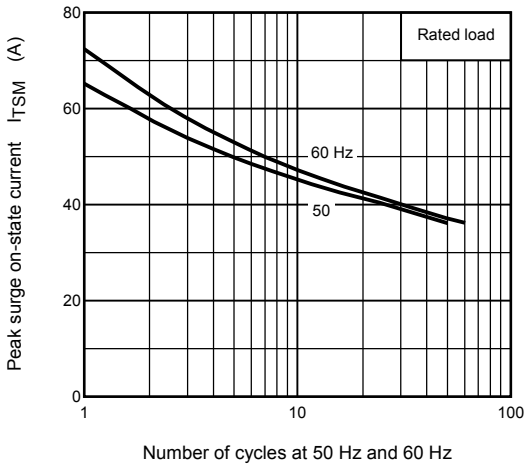

| | | | | |
|---|---|---|---|---|
| ※1 | Mark | F5G49 | Type Name | SF5G49, USF5G49 |
| | | F5J49 | | SF5J49, USF5J49 |
| ※2 | Lot Number<br>□□<br>Month (starting from alphabet A)<br>Year (last decimal digit of the current year) | | | |



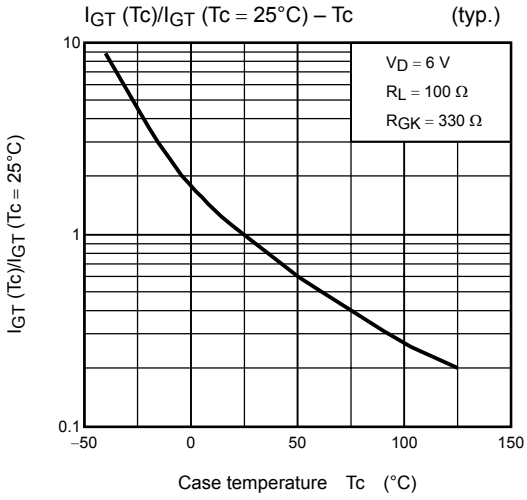
$i_T - v_T$



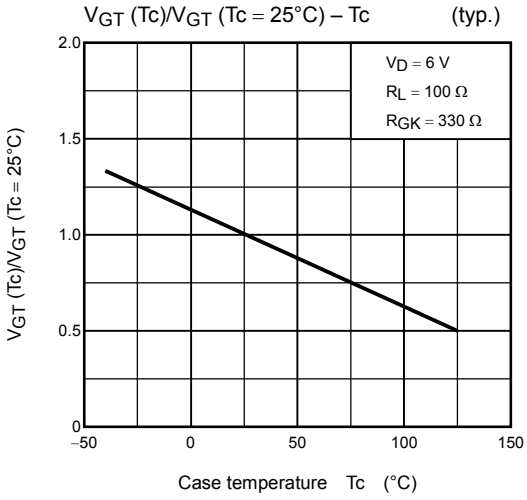

Surge on-state current (non-repetitive)



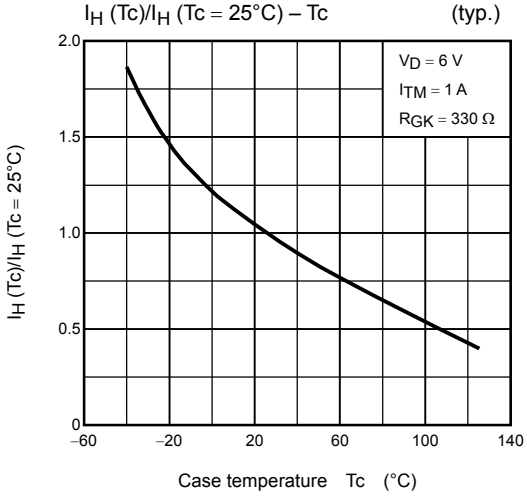

$I_{GT}$ (Tc)/$I_{GT}$ (Tc = 25°C) – Tc (typ.)



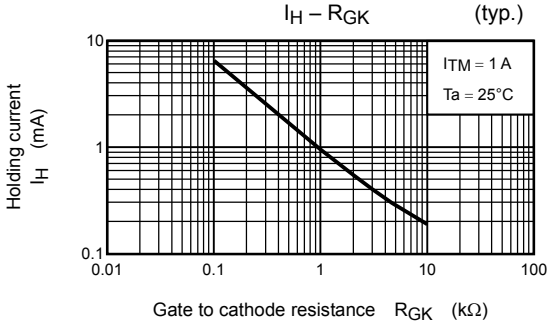

$V_{GT}$ (Tc)/$V_{GT}$ (Tc = 25°C) – Tc (typ.)



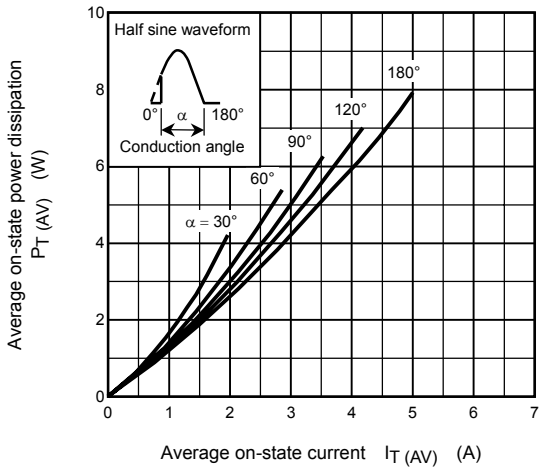

$I_H$ (Tc)/$I_H$ (Tc = 25°C) – Tc (typ.)



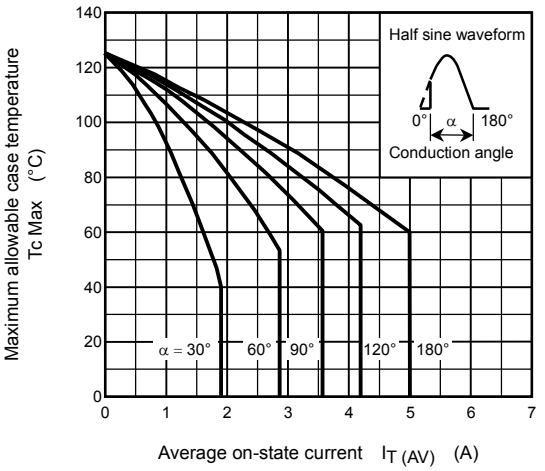

$I_H - R_{GK}$ (typ.)



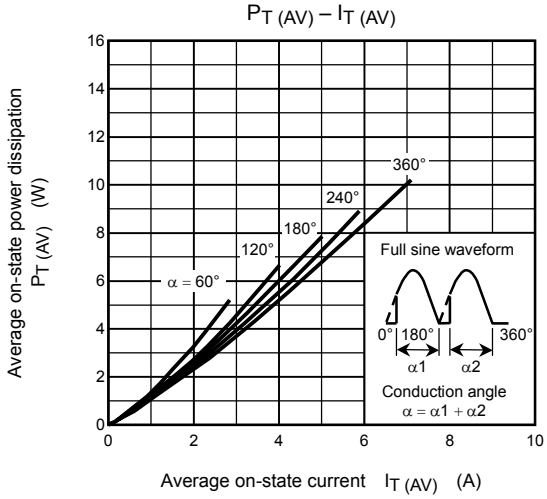
$P_{T\,(AV)} - I_{T\,(AV)}$



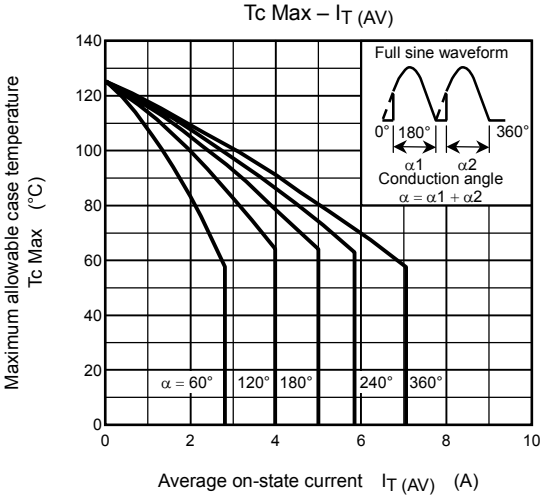

$Tc\ Max - I_{T\,(AV)}$



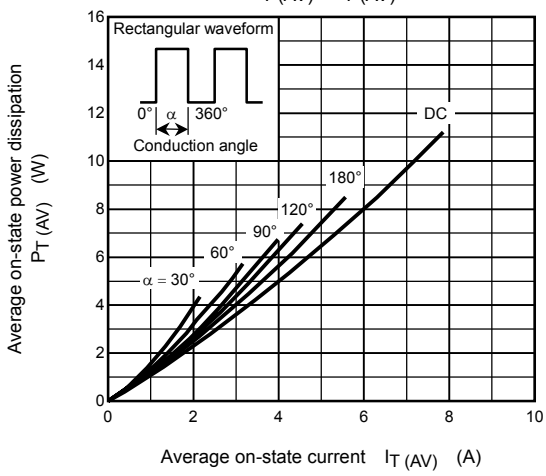

$P_{T\,(AV)} - I_{T\,(AV)}$



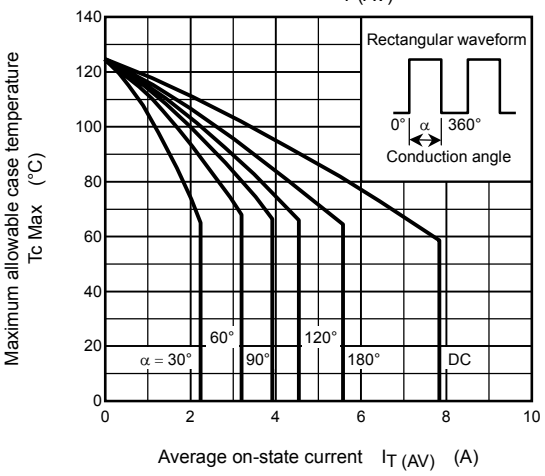

$Tc\ Max - I_{T\,(AV)}$

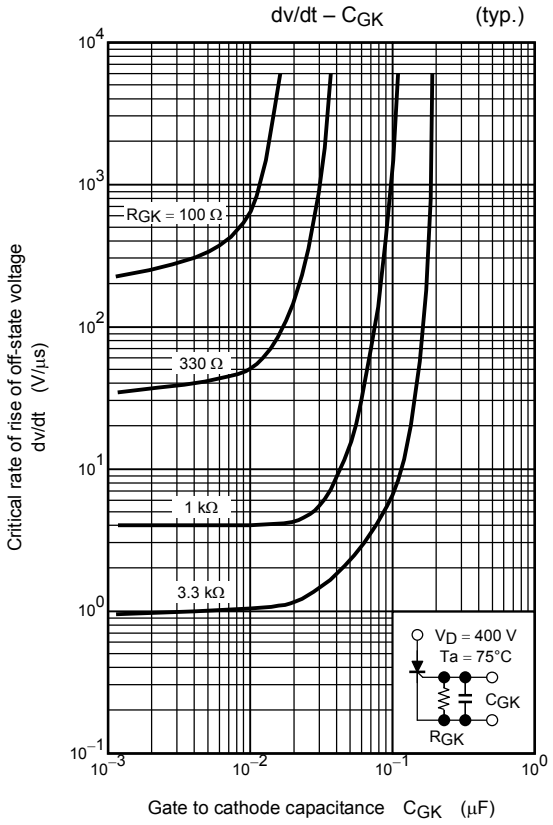


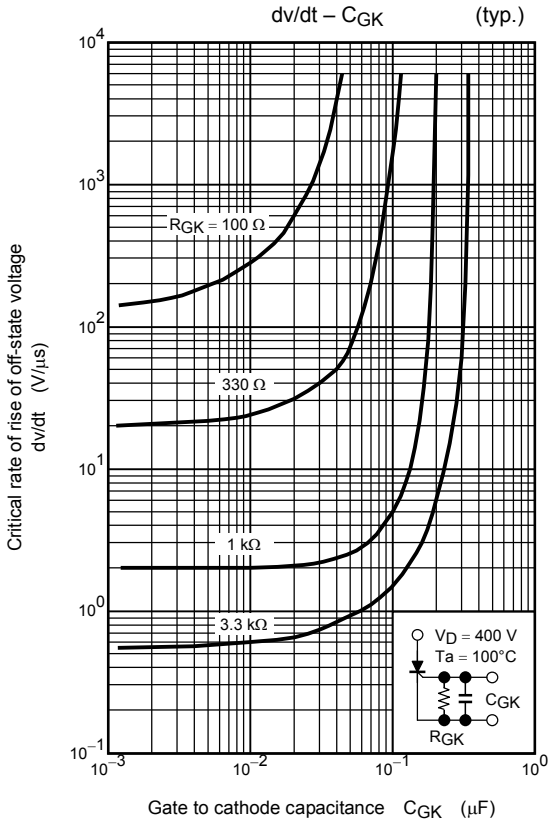

$P_{T\,(AV)} - I_{T\,(AV)}$

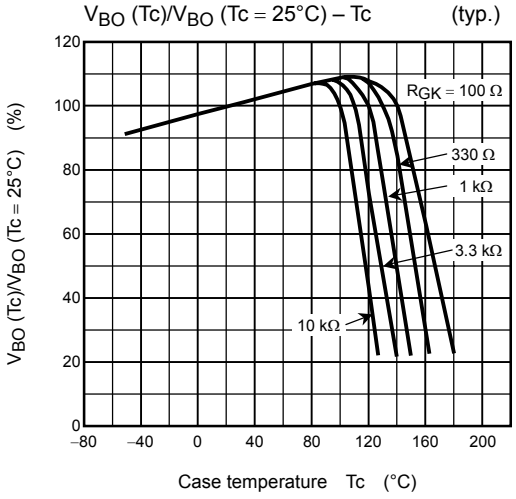



$Tc\ Max - I_{T\,(AV)}$




dv/dt – $C_{GK}$ (typ.)
Critical rate of rise of off-state voltage dv/dt (V/μs)
$10^4$
$10^3$
$10^2$
$10^1$
$10^0$
$10^{-1}$
$R_{GK}$ = 100 Ω
330 Ω
1 kΩ
3.3 kΩ
$V_D$ = 400 V
Ta = 75°C
$C_{GK}$
$R_{GK}$
$10^{-3}$
$10^{-2}$
$10^{-1}$
$10^0$
Gate to cathode capacitance $C_{GK}$ (μF)


dv/dt – $C_{GK}$ (typ.)
Critical rate of rise of off-state voltage dv/dt (V/μs)
$10^4$
$10^3$
$10^2$
$10^1$
$10^0$
$10^{-1}$
$R_{GK}$ = 100 Ω
330 Ω
1 kΩ
3.3 kΩ
$V_D$ = 400 V
Ta = 100°C
$C_{GK}$
$R_{GK}$
$10^{-3}$
$10^{-2}$
$10^{-1}$
$10^0$
Gate to cathode capacitance $C_{GK}$ (μF)


$V_{BO}$ (Tc)/$V_{BO}$ (Tc = 25°C) – Tc (typ.)
$V_{BO}$ (Tc)/$V_{BO}$ (Tc = 25°C) (%)
120
100
80
60
40
20
0
$R_{GK}$ = 100 Ω
330 Ω
1 kΩ
3.3 kΩ
10 kΩ
−80
−40
0
40
80
120
160
200
Case temperature Tc (°C)

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