# BT169G

## SCR

**5 September 2018**

## 1. General description

Planar passivated Silicon Controlled Rectifier with sensitive gate in a SOT54 (TO-92) plastic package. This SCR is designed to be interfaced directly to microcontrollers, logic ICs and other low power gate trigger circuits.

## 2. Features and benefits

- High voltage capability
- Planar passivated for voltage ruggedness and reliability
- Sensitive gate

## 3. Applications

- Ignition circuits
- Lighting ballasts
- Protection circuits
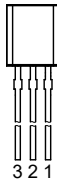- Switched Mode Power Supplies

## 4. Quick reference data

**Table 1. Quick reference data**

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_{RRM}$ | repetitive peak reverse voltage | | | - | - | 600 | V |
| $I_{T(AV)}$ | average on-state current | half sine wave; $T_{lead} \leq$ 83 °C; Fig. 1 | | - | - | 0.5 | A |
| $I_{T(RMS)}$ | RMS on-state current | half sine wave; $T_{lead} \leq$ 83 °C; Fig. 2; Fig. 3 | | - | - | 0.8 | A |
| $I_{TSM}$ | non-repetitive peak on-state current | half sine wave; $T_{j(init)}$ = 25 °C; $t_p$ = 10 ms; Fig. 4; Fig. 5 | | - | - | 8 | A |
| | | half sine wave; $T_{j(init)}$ = 25 °C; $t_p$ = 8.3 ms | | - | - | 9 | A |
| $T_j$ | junction temperature | | | - | - | 125 | °C |
| **Static characteristics** | | | | | | | |
| $I_{GT}$ | gate trigger current | $V_D$ = 12 V; $I_T$ = 10 mA; $T_j$ = 25 °C; Fig. 7 | | - | 50 | 200 | µA |
| **Dynamic characteristics** | | | | | | | |
| $dV_D/dt$ | rate of rise of off-state voltage | $V_{DM}$ = 402 V; $T_j$ = 125 °C; $R_{GK}$ = 1 kΩ; ($V_{DM}$ = 67% of $V_{DRM}$); exponential waveform; Fig. 12 | | 500 | 800 | - | V/µs |

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| | | $V_{DM}$ = 402 V; $T_j$ = 125 °C; ($V_{DM}$ = 67% of $V_{DRM}$); exponential waveform; gate open circuit; Fig. 12 | | - | 25 | - | V/µs |

# 5. Pinning information

**Table 2. Pinning information**

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|---|---|---|---|---|
| 1 | A | anode | | A —▷|— K |
| 2 | G | gate | | G |
| 3 | K | cathode | | sym037 |
| | | | **TO-92 (SOT54)** | |

# 6. Ordering information

**Table 3. Ordering information**

| Type number | Package | | |
|---|---|---|---|
| | **Name** | **Description** | **Version** |
| BT169G | TO-92 | plastic single-ended leaded (through hole) package; 3 leads | SOT54 |

## 7. Limiting values

*In accordance with the Absolute Maximum Rating System (IEC 60134).*

| Symbol | Parameter | Conditions | | Min | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{DRM}$ | repetitive peak off-state voltage | | | - | 600 | V |
| $V_{RRM}$ | repetitive peak reverse voltage | | | - | 600 | V |
| $I_{T(AV)}$ | average on-state current | half sine wave; $T_{lead} \leq$ 83 °C; Fig. 1 | | - | 0.5 | A |
| $I_{T(RMS)}$ | RMS on-state current | half sine wave; $T_{lead} \leq$ 83 °C; Fig. 2; Fig. 3 | | - | 0.8 | A |
| $I_{TSM}$ | non-repetitive peak on-state current | half sine wave; $T_{j(init)}$ = 25 °C; $t_p$ = 10 ms; Fig. 4; Fig. 5 | | - | 8 | A |
| | | half sine wave; $T_{j(init)}$ = 25 °C; $t_p$ = 8.3 ms | | - | 9 | A |
| $I^2t$ | $I^2t$ for fusing | $t_p$ = 10 ms; SIN | | - | 0.32 | A²s |
| $dI_T/dt$ | rate of rise of on-state current | $I_T$ = 2 A; $I_G$ = 10 mA; $dI_G/dt$ = 100 mA/µs | | - | 50 | A/µs |
| $I_{GM}$ | peak gate current | | | - | 1 | A |
| $V_{RGM}$ | peak reverse gate voltage | | | - | 5 | V |
| $P_{GM}$ | peak gate power | | | - | 2 | W |
| $P_{G(AV)}$ | average gate power | over any 20 ms period | | - | 0.1 | W |
| $T_{stg}$ | storage temperature | | | -40 | 150 | °C |
| $T_j$ | junction temperature | | | - | 125 | °C |



α = conduction angle
a = form factor = $I_{T(RMS)}$ / $I_{T(AV)}$

**Fig. 1. Total power dissipation as a function of average on-state current; maximum values**

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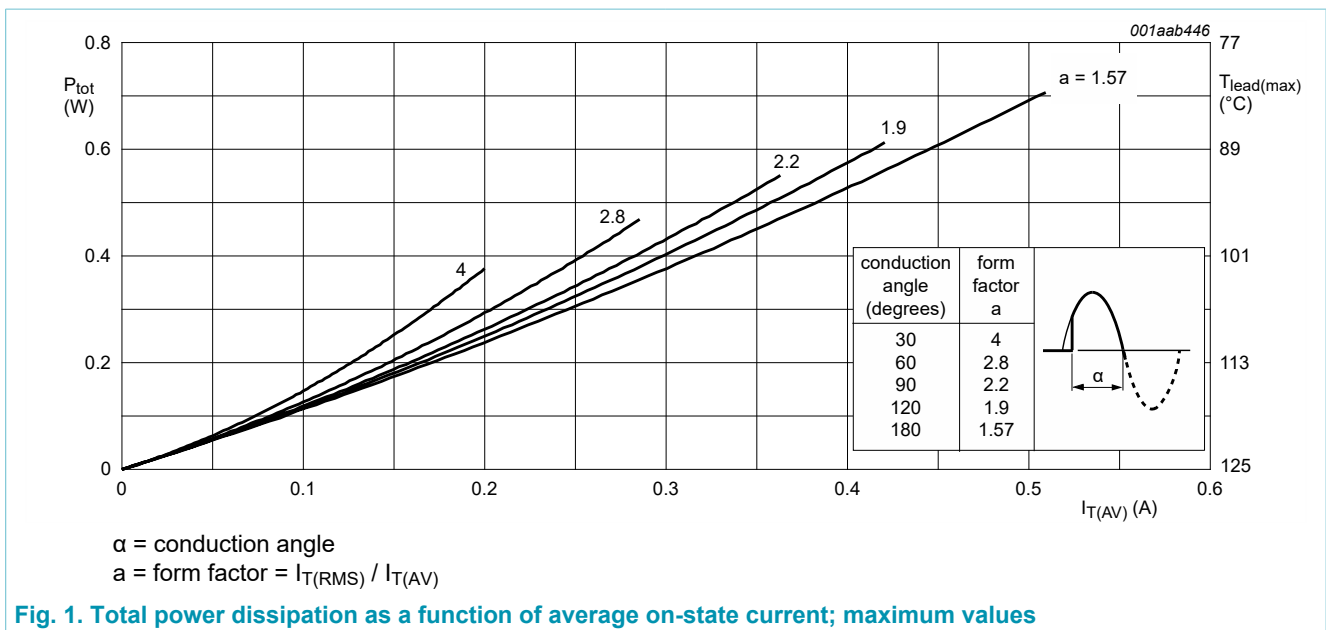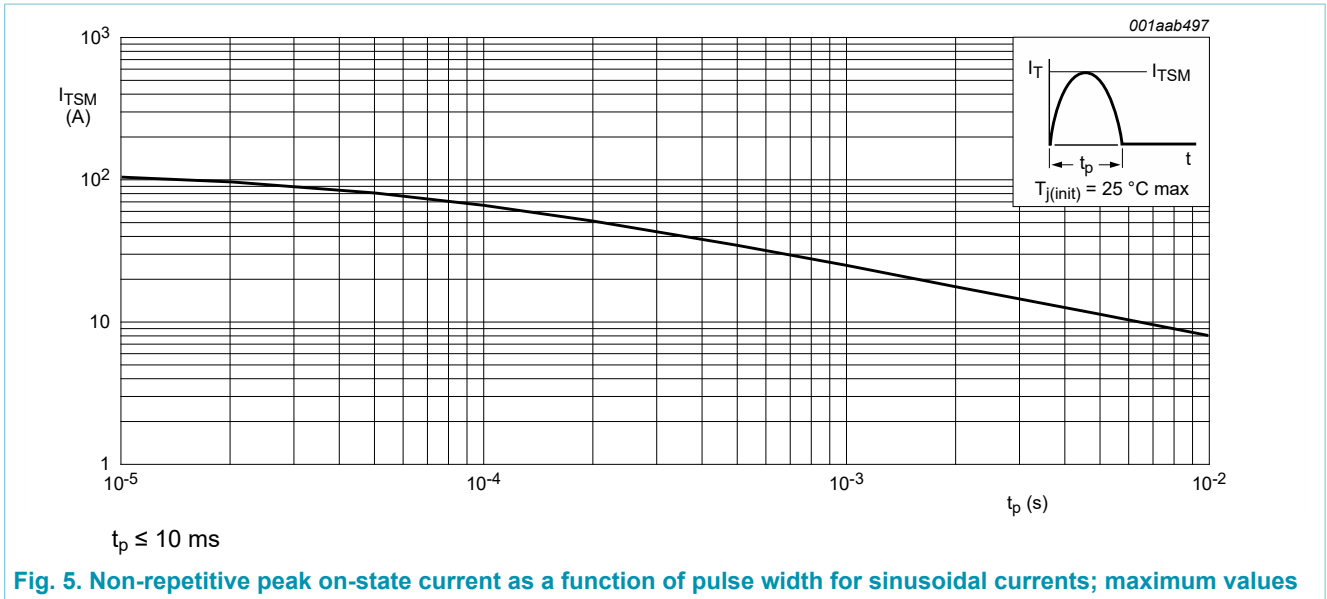f = 50 Hz; $T_{lead}$ = 83 °C

**Fig. 2. RMS on-state current as a function of surge duration for sinusoidal currents**



**Fig. 3. RMS on-state current as a function of lead temperature; maximum values**



f = 50 Hz

**Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values**

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Fig. 5. Non-repetitive peak on-state current as a function of pulse width for sinusoidal currents; maximum values

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## 8. Thermal characteristics

**Table 5. Thermal characteristics**

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $R_{th(j-lead)}$ | thermal resistance from junction to lead | Fig. 6 | | - | - | 60 | K/W |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient free air | printed circuit board mounted: lead length = 4 mm | | - | 150 | - | K/W |



**Fig. 6. Transient thermal impedance from junction to lead as a function of pulse width**

## 9. Characteristics

Table 6. Characteristics

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| **Static characteristics** | | | | | | | |
| $I_{GT}$ | gate trigger current | $V_D$ = 12 V; $I_T$ = 10 mA; $T_j$ = 25 °C; Fig. 7 | | - | 50 | 200 | µA |
| $I_L$ | latching current | $V_D$ = 12 V; $I_G$ = 0.5 mA; $T_j$ = 25 °C; Fig. 8 | | - | 2 | 6 | mA |
| $I_H$ | holding current | $V_D$ = 12 V; $T_j$ = 25 °C; Fig. 9 | | - | 2 | 5 | mA |
| $V_T$ | on-state voltage | $I_T$ = 1.2 A; $T_j$ = 25 °C; Fig. 10 | | - | 1.25 | 1.7 | V |
| $V_{GT}$ | gate trigger voltage | $V_D$ = 12 V; $I_T$ = 10 mA; $T_j$ = 25 °C; Fig. 11 | | - | 0.5 | 0.8 | V |
| | | $V_D$ = 600 V; $I_T$ = 10 mA; $T_j$ = 125 °C; Fig. 11 | | 0.2 | 0.3 | - | V |
| $I_D$ | off-state current | $V_D$ = 600 V; $R_{GK(ext)}$ = 1 kΩ; $T_j$ = 125 °C | | - | 0.05 | 0.1 | mA |
| $I_R$ | reverse current | $V_R$ = 600 V; $T_j$ = 125 °C; $R_{GK(ext)}$ = 1 kΩ | | - | 0.05 | 0.1 | mA |
| **Dynamic characteristics** | | | | | | | |
| $dV_D/dt$ | rate of rise of off-state voltage | $V_{DM}$ = 402 V; $T_j$ = 125 °C; $R_{GK}$ = 1 kΩ; ($V_{DM}$ = 67% of $V_{DRM}$); exponential waveform; Fig. 12 | | 500 | 800 | - | V/µs |
| | | $V_{DM}$ = 402 V; $T_j$ = 125 °C; ($V_{DM}$ = 67% of $V_{DRM}$); exponential waveform; gate open circuit; Fig. 12 | | - | 25 | - | V/µs |
| $t_{gt}$ | gate-controlled turn-on time | $I_{TM}$ = 2 A; $V_D$ = 600 V; $I_G$ = 10 mA; $dI_G/dt$ = 0.1 A/µs; $T_j$ = 25 °C | | - | 2 | - | µs |
| $t_q$ | commutated turn-off time | $V_{DM}$ = 402 V; $T_j$ = 125 °C; $I_{TM}$ = 1.6 A; $V_R$ = 35 V; $(dI_T/dt)_M$ = 30 A/µs; $dV_D/dt$ = 2 V/µs; $R_{GK(ext)}$ = 1 kΩ; ($V_{DM}$ = 67% of $V_{DRM}$) | | - | 100 | - | µs |
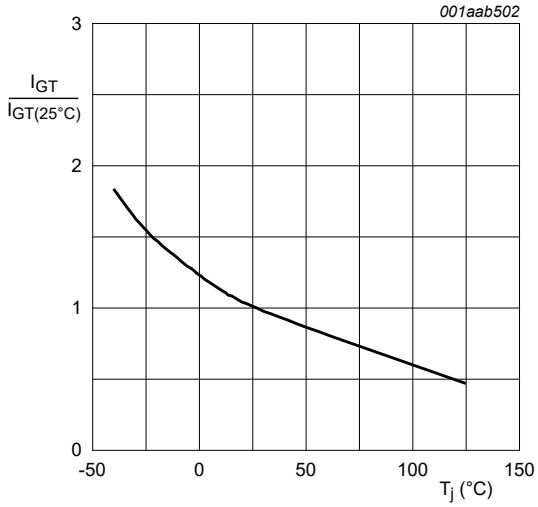
**Fig. 7. Normalized gate trigger current as a function of junction temperature**



$R_{GK}$ = 1 kΩ

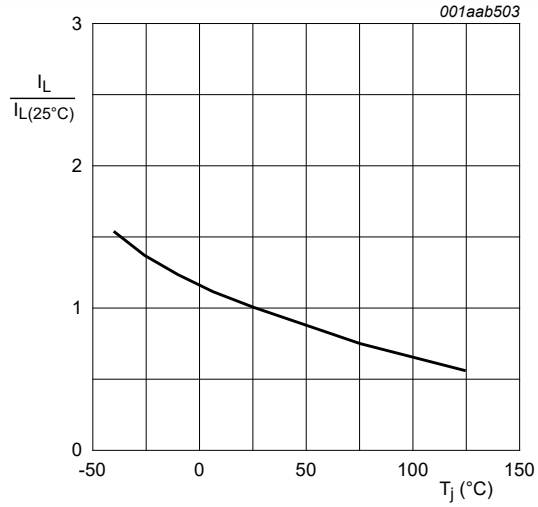**Fig. 8. Normalized latching current as a function of junction temperature**



$R_{GK}$ = 1 kΩ

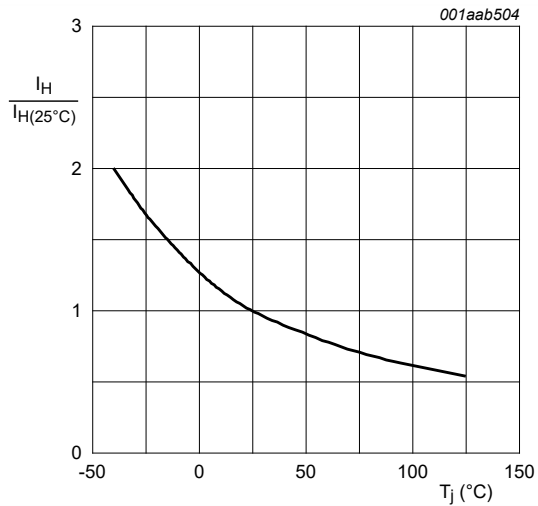**Fig. 9. Normalized holding current as a function of junction temperature**



$V_o$ = 1.067 V; $R_s$ = 0.187 Ω
(1) $T_j$ = 125 °C; typical values
(2) $T_j$ = 125 °C; maximum values
(3) $T_j$ = 25 °C; maximum values
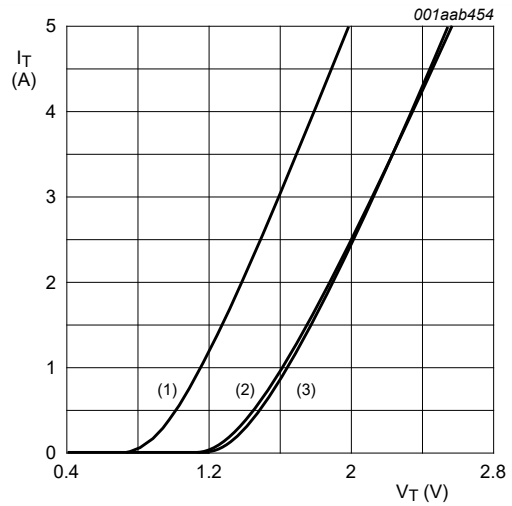
**Fig. 10. On-state current as a function of on-state voltage**

Fig. 11. **Normalized gate trigger voltage as a function of junction temperature**



(1) $R_{GK}$ = 1 kΩ
(2) gate open circuit

Fig. 12. **Critical rate of rise of off-state voltage as a function of junction temperature; typical values**

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# 10. Package outline

SOT54 PACKAGE OUTLINE

SOT54
Bulk Pack - 412

1.27TYP

SOT54 LEADS ON CIRCLE
Bulk Pack - 112

1.27TYP

1.27TYP

SOT54 WIDE PITCH
Tape/ Reel Pack - 116
Ammo Pack - 126

2.54TYP

SOT54 LEAD BEND L01
Bulk Pack - 412

2.54TYP

5.50
4.50

SOT54 LEAD BEND L02
Bulk Pack - 412

3.5TYP

6.50
5.50

Remark: Detailed dimensions refer to POD drawing.

**Fig. 13. Package outline TO-92 (SOT54)**

# 11. Legal information

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| Document status [1][2] | Product status [3] | Definition |
|---|---|---|
| Objective [short] data sheet | Development | This document contains data from the objective specification for product development. |
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