# NCR100Q-6M

## SCR

Rev.01 - 28 June 2019

Product data sheet

## 1. General description

Planar passivated Silicon Controlled Rectifier (SCR) with sensitive gate in a SOT89 surface mountable plastic package. This SCR is designed to be interfaced directly to microcontrollers, logic integrated circuits and other low power gate trigger circuits.

## 2. Features and benefits

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

## 3. Applications

- Ground Fault Circuit Interrupters (GFCI)
- General purpose switching and phase control
- Ignition circuits, CDI for 2- and 3-wheelers
- Motor control-e.g. small kitchen appliances

## 4. Quick reference data

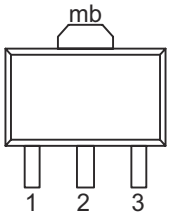
**Table 1. Quick reference data**

| Symbol | Parameter | Conditions | Values | Unit |
|---|---|---|---|---|
| **Absolute maximum rating** | | | | |
| $V_{RRM}$ | repetitive peak reverse voltage | | 600 | V |
| $I_{T(RMS)}$ | RMS on-state current | half sine wave; $T_{sp} \leq 109$ °C; Fig. 1; 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 |

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| **Static characteristics** | | | | | | | |
| $I_{GT}$ | gate trigger current | $V_D$ = 12 V; $I_T$ = 0.1 A; $T_j$ = 25 °C; Fig. 7 | | 15 | - | 100 | µA |
| $I_H$ | holding current | $V_D$ = 12 V; $T_j$ = 25 °C; $R_{GK(ext)}$ = 1 kΩ; Fig. 9 | | - | - | 5 | mA |
| $V_T$ | on-state voltage | $I_T$ = 1.6 A; $T_j$ = 25 °C; Fig. 10 | | - | 1.4 | 1.7 | V |
| **Dynamic characteristics** | | | | | | | |
| $dV_D/dt$ | rate of rise of off-state voltage | $V_{DM}$ = 600 V; $T_j$ = 125 °C; $R_{GK}$= 1 kΩ; exponential waveform | | 100 | - | - | V/µs |

## 5. Pinning information

**Table 2. Pinning information**

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|---|---|---|---|---|
| 1 | G | gate |  |  |
| 2 | A | anode | | |
| 3 | K | cathode | | |
| mb | mb | mounting base; connected to anode | | |

## 6. Ordering information

**Table 3. Ordering information**

| Type number | Package Name | Orderable part number | Packing method | Small packing quantity | Package version | Package issue date |
|---|---|---|---|---|---|---|
| NCR100Q-6M | SOT89 | NCR100Q-6MJ | Reel | 1000 | SOT89L | 8-Mar-2019 |

## 7. Marking

**Table 4. Marking codes**

| Type number | Marking codes |
|---|---|
| NCR100Q-6M | NCR1006M |

# 8. Limiting values

**Table 5. Limiting values**

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

| Symbol | Parameter | Conditions | Values | 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; $T_{sp} \leq 109$ °C | 0.51 | A |
| $I_{T(RMS)}$ | RMS on-state current | half sine wave; $T_{sp} \leq 109$ °C; Fig. 1; 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; sine wave | 0.32 | $A^2s$ |
| $dI_T/dt$ | rate of rise of on-state current | $I_G = 0.2$ mA | 50 | A/µs |
| $I_{GM}$ | peak gate current | | 1 | A |
| $V_{GM}$ | peak 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 to 150 | °C |
| $T_j$ | junction temperature | | 125 | °C |

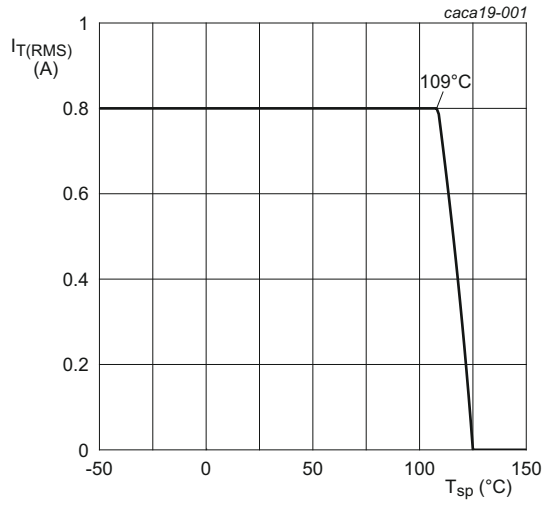
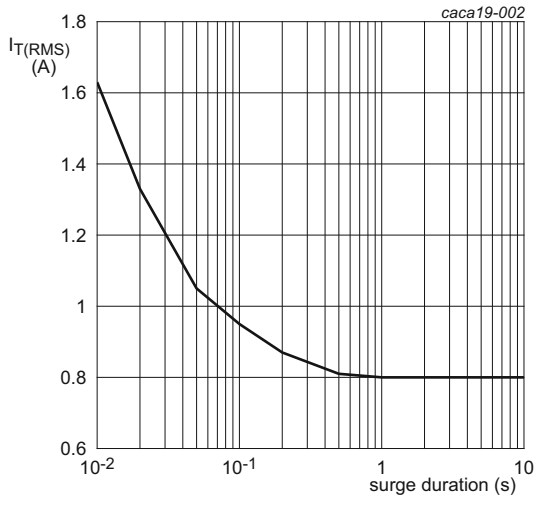
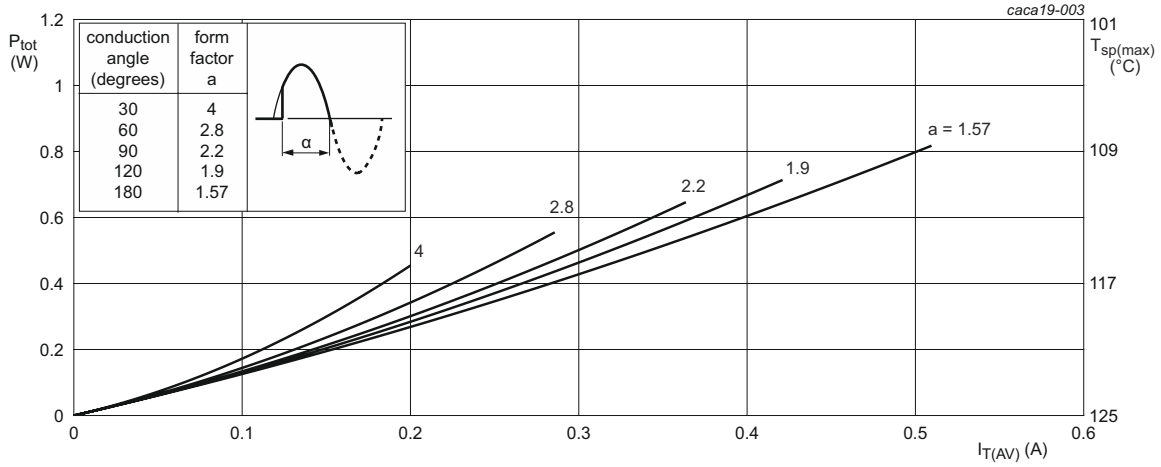



**Fig. 1. RMS on-state current as a function of solder point temperature; maximum values**




f = 50Hz; $T_{sp}$ = 109 °C

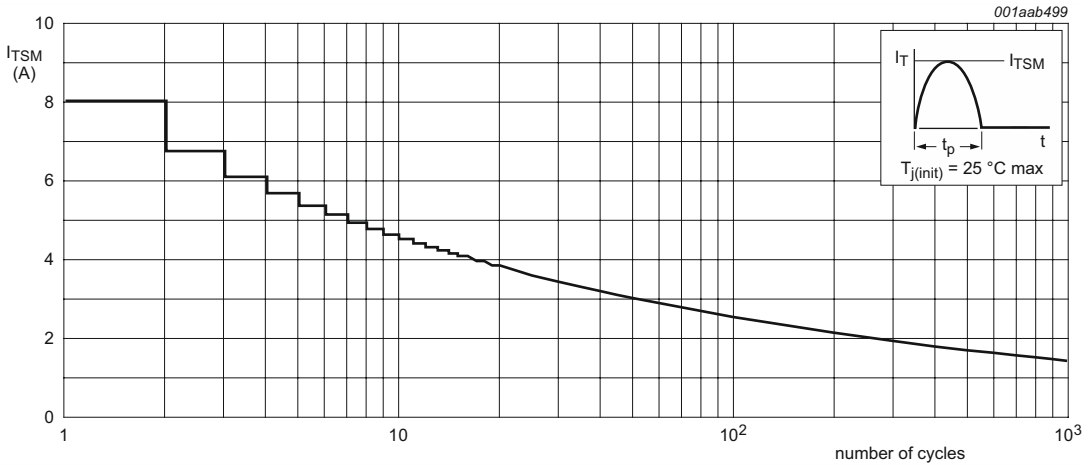
**Fig. 2. RMS on-state current as a function of surge duration; maximum values**




α = conduction angle

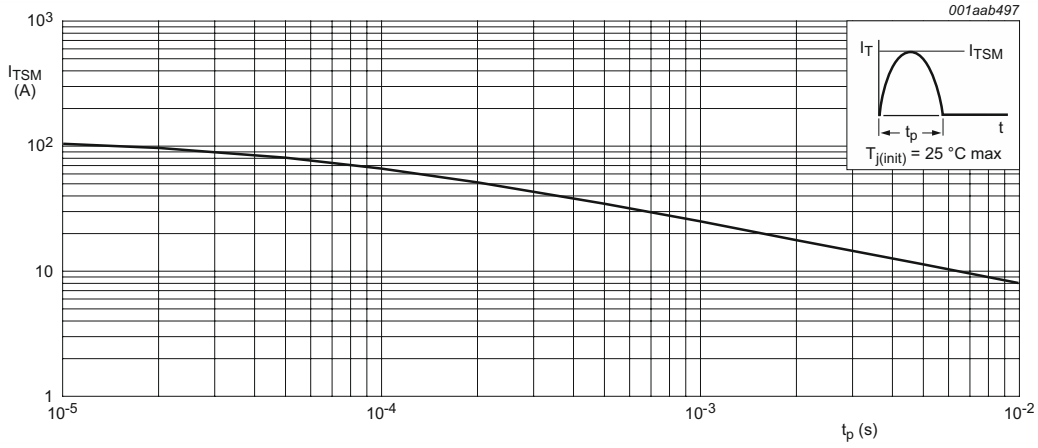
a = form factor = $I_{T(RMS)}$ / $I_{T(AV)}$

**Fig. 3. Total power dissipation as a function of RMS on-state current; 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**




$t_p \leq 10$ ms

**Fig. 5. Non-repetitive peak on-state current as a function of pulse duration; maximum values**

# 9. Thermal characteristics

**Table 6. Thermal characteristics**

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point | Fig. 6 | | - | - | 20 | K/W |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient free air | in free air | | - | 90 | - | K/W |

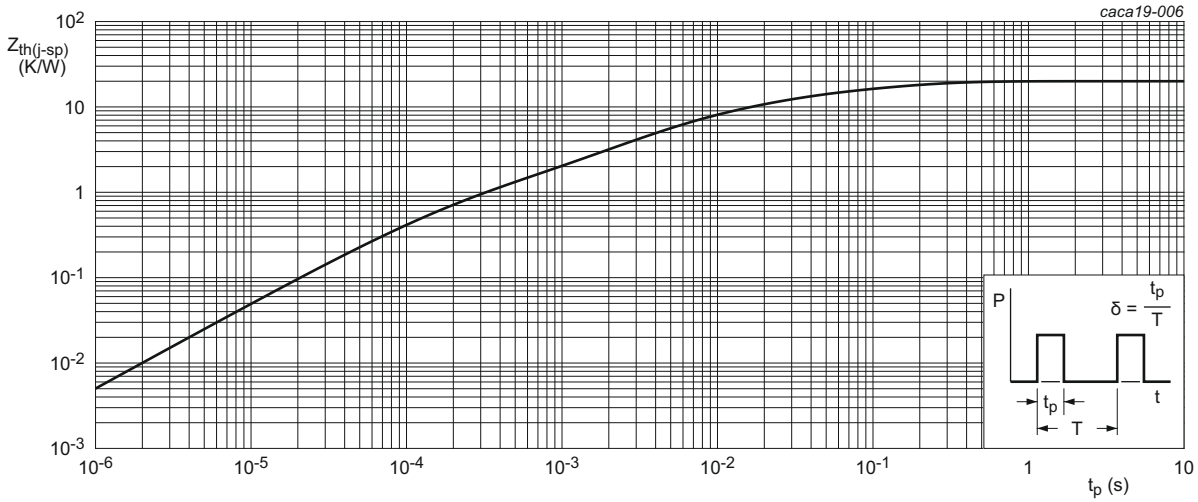



**Fig. 6. Transient thermal impedance from junction to solder point as a function of pulse duration**

# 10. Characteristics

**Table 7. Characteristics**

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| **Static characteristics** | | | | | | | |
| $I_{GT}$ | gate trigger current | $V_D$ = 12 V; $I_T$ = 0.1 A; $T_j$ = 25 °C; Fig. 7 | | 15 | - | 100 | µA |
| $I_L$ | latching current | $V_D$ = 12 V; $I_T$ = 0.1 A; $T_j$ = 25 °C; $R_{GK(ext)}$ = 1 kΩ; Fig. 8 | | - | - | 6 | mA |
| $I_H$ | holding current | $V_D$ = 12 V; $T_j$ = 25 °C; $R_{GK(ext)}$ = 1 kΩ; Fig. 9 | | - | - | 5 | mA |
| $V_T$ | on-state voltage | $I_T$ = 1.6 A; $T_j$ = 25 °C; Fig. 10 | | - | 1.4 | 1.7 | V |
| $V_{GT}$ | gate trigger voltage | $V_D$ = 12 V; $I_T$ = 0.1 A; $T_j$ = 25 °C; Fig. 11 | | - | 0.7 | 1 | V |
| | | $V_D$ = 600 V; $I_T$ = 0.1 A; $T_j$ = 125 °C | | 0.2 | 0.5 | - | V |
| $I_D$ | off-state current | $V_D$ = 600 V; $T_j$ = 125 °C | | - | - | 0.1 | mA |
| $I_R$ | reverse current | $V_D$ = 600 V; $T_j$ = 125 °C | | - | - | 0.1 | mA |
| **Dynamic characteristics** | | | | | | | |
| $dV_D/dt$ | rate of rise of off-state voltage | $V_{DM}$ = 600 V; $T_j$ = 125 °C; $R_{GK}$ = 1 kΩ; exponential waveform | | 100 | - | - | V/µs |
| $t_{gt}$ | gate-controlled turn-on time | $I_{TM}$ = 2 A; $V_D$ = 600 V; $I_G$ = 1 mA; $(dI_G/dt)_M$ = 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; $dV_D/dt$ = 2 V/µs; $(dI_T/dt)_M$ = 30 A/µs; $R_{GK(ext)}$ = 1 kΩ ; ($V_{DM}$ = 67% of $V_{DRM}$) | | - | 100 | - | µs |

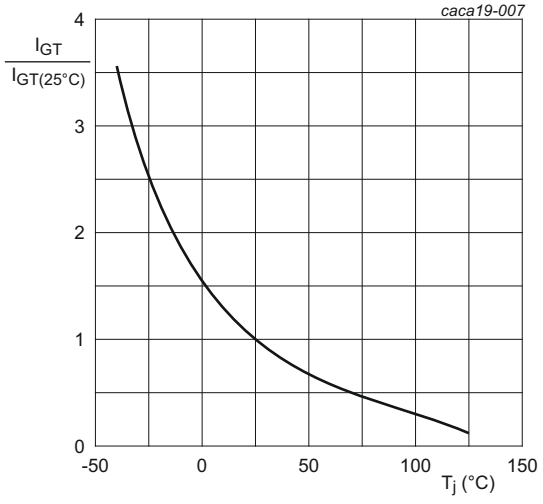



**Fig. 7. Normalized gate trigger current as a function of junction temperature**

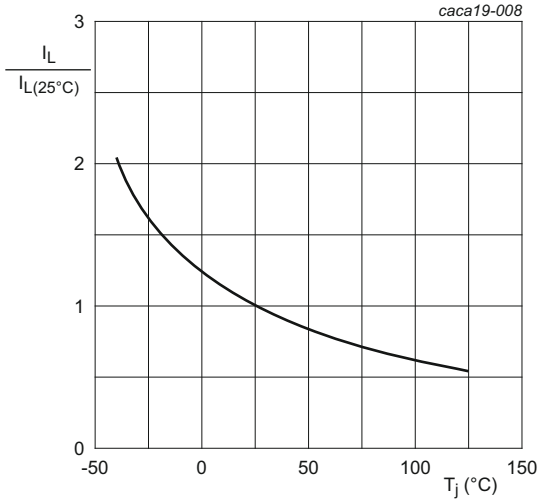



**Fig. 8. Normalized latching current as a function of junction temperature**

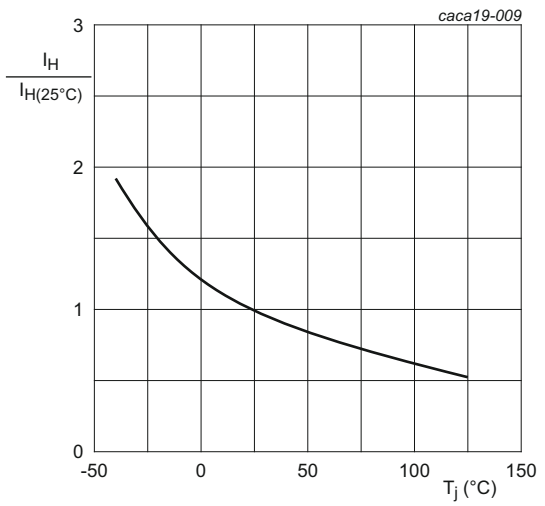
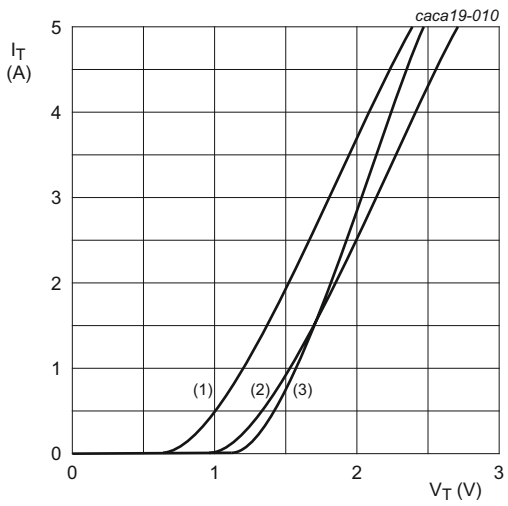



**Fig. 9. Normalized holding current as a function of junction temperature**




$V_o$ = 1.173 V; $R_s$ = 0.3437 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**

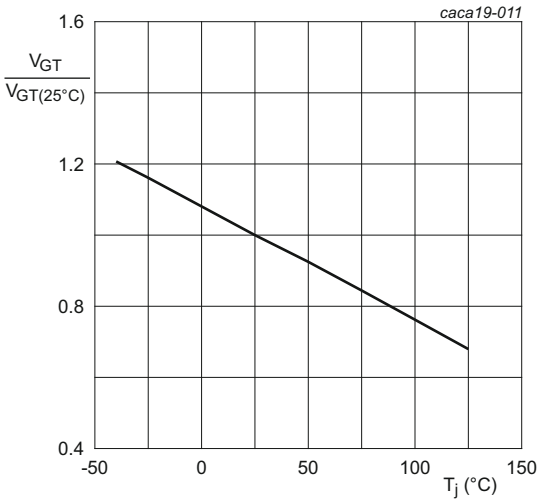
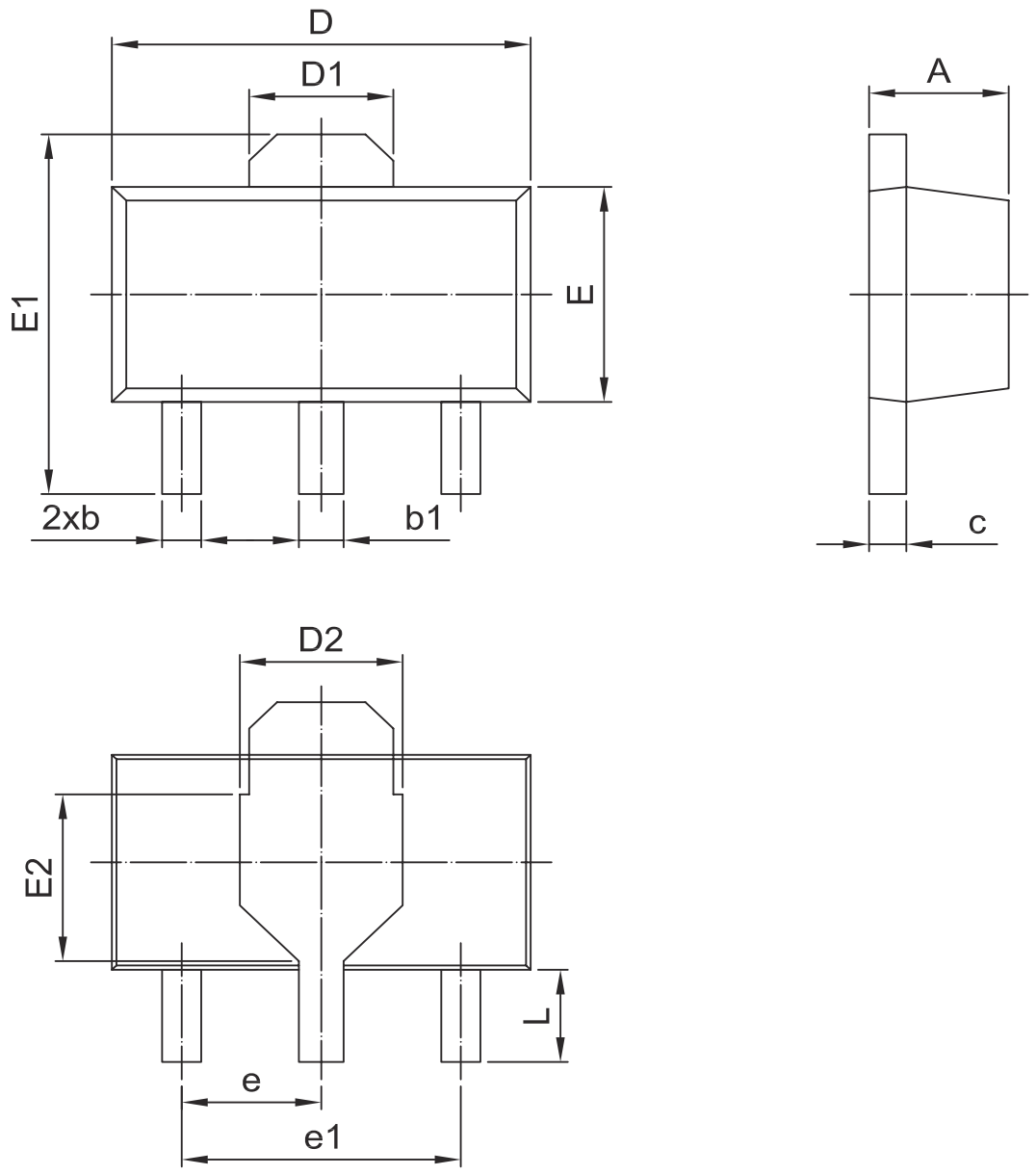



**Fig. 11. Normalized gate trigger voltage as a function of junction temperature**

## 11. Package outline

Plastic small outline package; 4 leads SOT89




| UNIT | | A | b | b1 | c | D | D1 | D2 | E | E1 | E2 | e | e1 | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | Min | 1.35 | 0.32 | 0.40 | 0.30 | 4.35 | (1.55) | (1.75) | 2.30 | 3.85 | (1.90) | 1.50 TYP | 3.00 TYP | 0.85 |
| | Max | 1.65 | 0.52 | 0.60 | 0.50 | 4.65 | | | 2.60 | 4.35 | | | | 1.25 |

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|---|---|---|
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