# BT131-600D

4Q Triac

Rev.03 - 19 October 2021 Product data sheet

## 1. General description

Planar passivated very sensitive gate four quadrant triac in a TO92 plastic package.This very sensitive gate "series D" triac is intended for interfacing with low power drivers including microcontrollers.

## 2. Features and benefits

- Direct interfacing to logic level ICs
- Direct interfacing with low power gate drivers and microcontrollers
- High blocking voltage capability
- Planar passivated for voltage ruggedness and reliability
- Very sensitive gate
- Triggering in all four quadrants

## 3. Applications

- Air conditioner indoor fan control
- General purpose low power motor control
- General purpose switching and phase control

## 4. Quick reference data

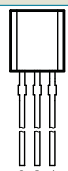
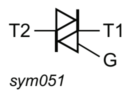
**Table 1. Quick reference data**

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| **Absolute maximum rating** | | | | | | | |
| $V_{DRM}$ | repetitive peak off-state voltage | | | - | - | 600 | V |
| $I_{T(RMS)}$ | RMS on-state current | full sine wave; $T_{lead} \leq 51.2$ °C; Fig. 1; Fig. 2; Fig. 3 | | - | - | 1 | A |
| $I_{TSM}$ | non-repetitive peak on-state current | full sine wave; $T_{j(init)} = 25$ °C; $t_p = 20$ ms; Fig. 4; Fig. 5 | | - | - | 12.5 | A |
| | | full sine wave; $T_{j(init)} = 25$ °C; $t_p = 16.7$ ms | | - | - | 13.7 | 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; T2+ G+; $T_j = 25$ °C; Fig. 7 | | - | - | 5 | mA |
| | | $V_D = 12$ V; $I_T = 0.1$ A; T2+ G-; $T_j = 25$ °C; Fig. 7 | | - | - | 5 | mA |
| | | $V_D = 12$ V; $I_T = 0.1$ A; T2- G-; $T_j = 25$ °C; Fig. 7 | | - | - | 5 | mA |
| | | $V_D = 12$ V; $I_T = 0.1$ A; T2- G+; $T_j = 25$ °C; Fig. 7 | | - | - | 7 | mA |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $I_H$ | holding current | $V_D$ = 12 V; $T_j$ = 25 °C; Fig. 9 | | - | 1.3 | 10 | mA |
| $V_T$ | on-state voltage | $I_T$ = 1.4 A; $T_j$ = 25 °C; Fig. 10 | | - | 1.2 | 1.5 | V |
| **Symbol** | **Parameter** | **Conditions** | | **Min** | **Typ** | **Max** | **Unit** |
| **Dynamic characteristics** | | | | | | | |
| $dV_D/dt$ | rate of rise of off-state voltage | $V_{DM}$ = 402 V; $T_j$ = 125 °C; ($V_{DM}$ = 67% of $V_{DRM}$); exponential waveform; $R_{GT1(ext)}$ = 1 kΩ | | 20 | - | - | V/µs |
| $dV_{com}/dt$ | rate of change of commutating voltage | $V_D$ = 400 V; $T_j$ = 125 °C; $dI_{com}/dt$ = 0.5 A/ms; $I_T$ = 1 A; gate open circuit | | 3 | - | - | V/µs |

## 5. Pinning information

**Table 2. Pinning information**

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|---|---|---|---|---|
| 1 | T2 | main terminal 2 |  3 2 1 TO-92 (SOT54) |   |
| 2 | G | gate | | |
| 3 | T1 | main terminal 1 | | |

## 6. Ordering information

**Table 3. Ordering information**

| Type number | Package Name | Orderable part number | Packing method | Small packing quantity | Package version | Package issue date |
|---|---|---|---|---|---|---|
| BT131-600D | TO92 | BT131-600D,412 | Bulk | 1000 | SOT54 | 14-Nov-2013 |
| BT131-600D | TO92 | BT131-600DQP | Reel | 2000 | SOT54 | 14-Nov-2013 |
| BT131-600D/L01 | TO92 | BT131-600D/L01EP | Bulk | 500 | SOT54/L01 | 14-Nov-2013 |

## 7. Marking

**Table 4. Marking codes**

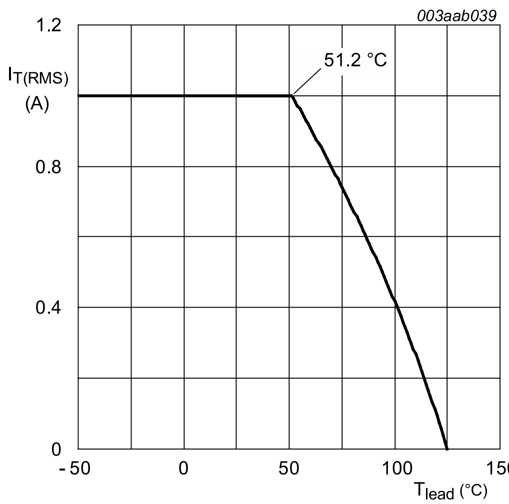
| Type number | Marking codes |
|---|---|
| BT131-600D | 131-6D |

# 8. Limiting values

**Table 5. Limiting values**

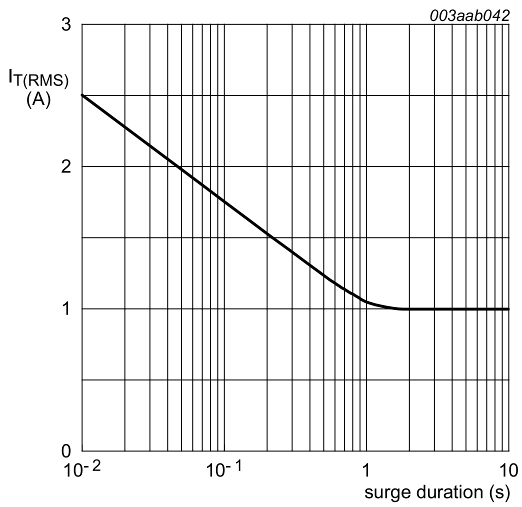
*In accordance with the Absolute Maximum Rating System (IEC 60134).*

| Symbol | Parameter | Conditions | | Min | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{DRM}$ | repetitive peak off-state voltage | | | - | 600 | V |
| $I_{T(RMS)}$ | RMS on-state current | full sine wave; $T_{lead} \leq 51.2$ °C; Fig 1; Fig 2; Fig 3 | | - | 1 | A |
| $I_{TSM}$ | non-repetitive peak on-state current | full sine wave; $T_{j(init)} = 25$ °C; $t_p = 20$ ms; Fig 4; Fig 5 | | - | 12.5 | A |
| | | full sine wave; $T_{j(init)} = 25$ °C; $t_p = 16.7$ ms | | - | 13.7 | A |
| $I^2t$ | $I^2t$ for fusing | $t_P = 10$ ms; SIN | | - | 0.78 | $A^2s$ |
| $dI_T/dt$ | rate of rise of on-state current | $I_G = 10$ mA | | - | 50 | A/µs |
| | | $I_G = 10$ mA | | - | 50 | A/µs |
| | | $I_G = 14$ mA | | - | 10 | A/µs |
| | | $I_G = 10$ mA | | - | 50 | A/µs |
| $I_{GM}$ | peak gate current | | | - | 2 | A |
| $P_{GM}$ | peak gate power | | | - | 5 | 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 |



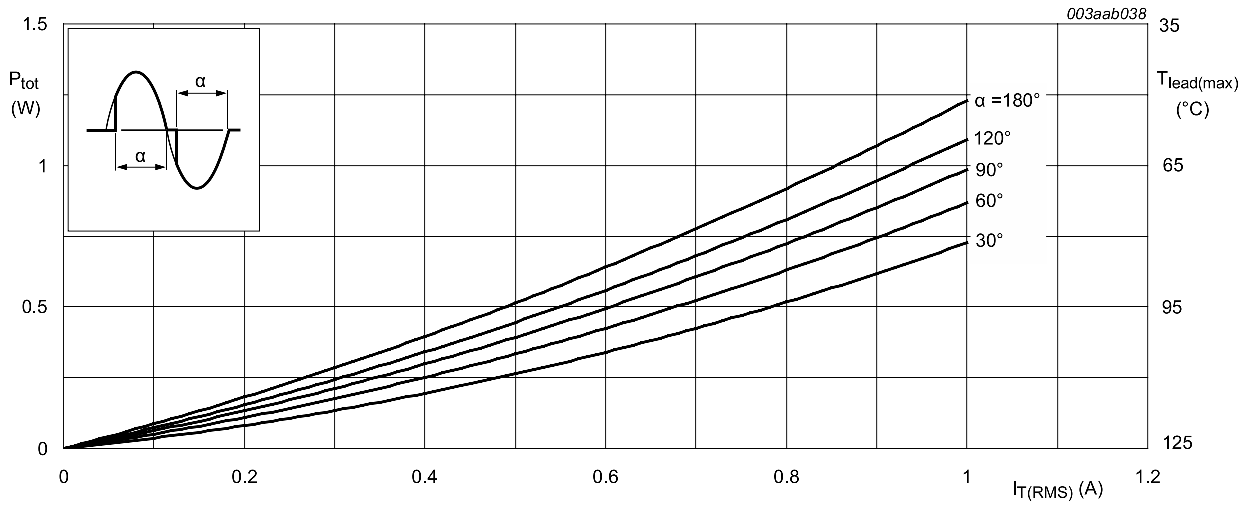

$T_{lead} = 51.2$ °C

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



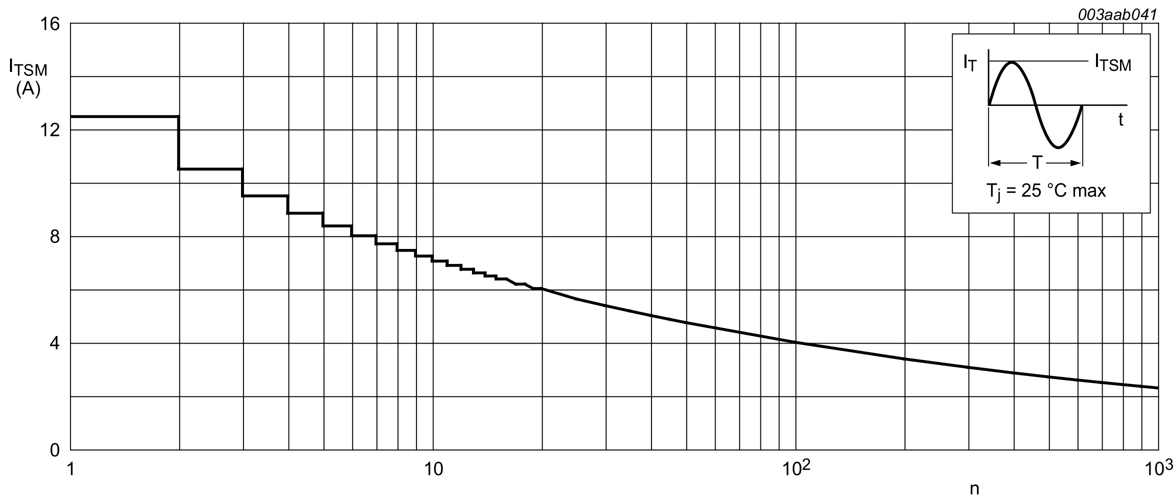

$f = 50$ Hz; $T_{lead} = 51.2$ °C

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



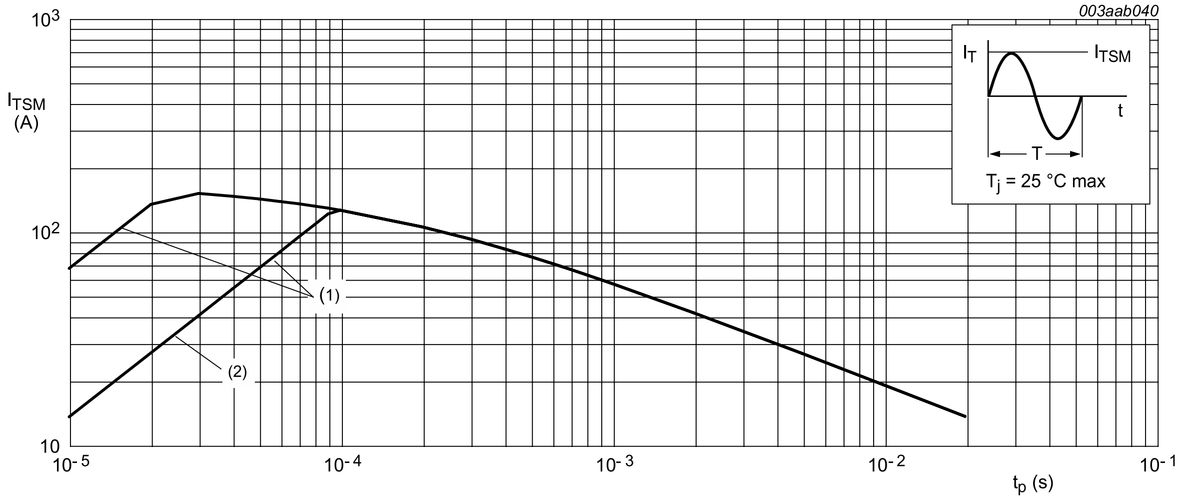

α = conduction angle

**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**



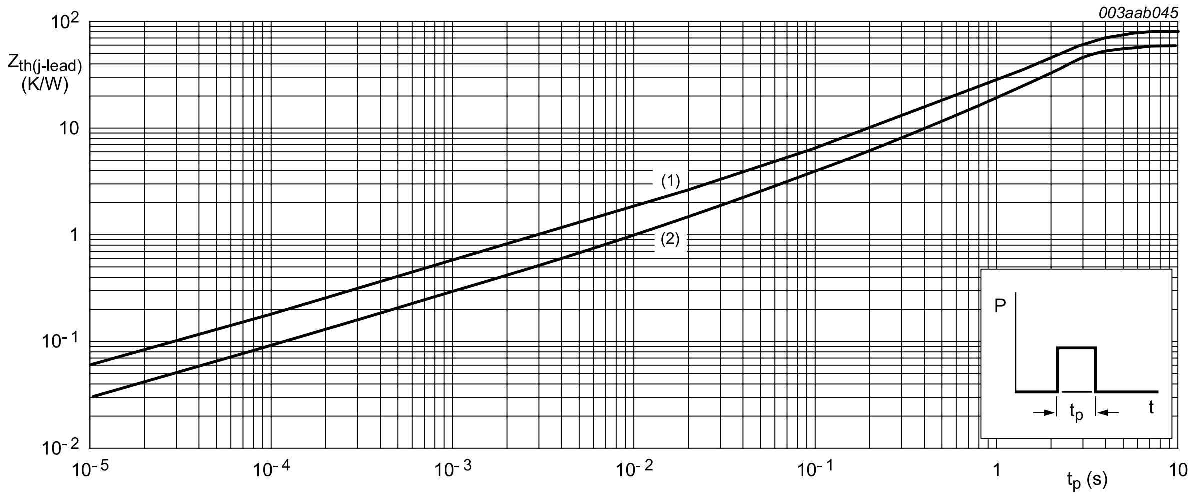

$t_p$ ≤ 20 ms
(1) $dI_T/dt$ limit
(2) T2- G+ quadrant

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

# 9. Thermal characteristics

**Table 6. Thermal characteristics**

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $R_{th(j-lead)}$ | thermal resistance from junction to lead | full cycle; Fig 6 | | - | - | 60 | K/W |
| | | half cycle; Fig 6 | | - | - | 80 | 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 |



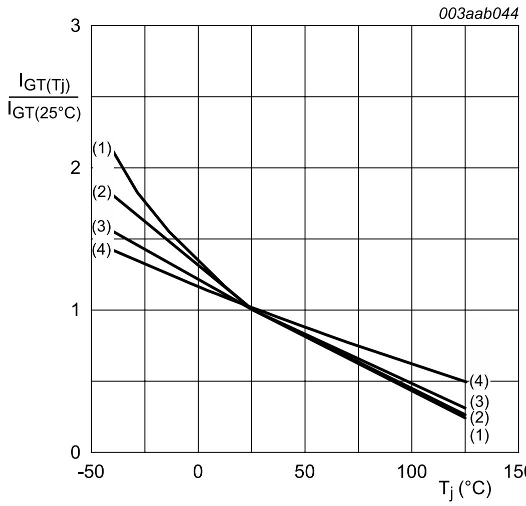

(1) Unidirectional (half cycle)
(2) Bidirectional (full cycle)

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

# 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; T2+ G+; $T_j$ = 25 °C; Fig. 7 | | - | - | 5 | mA |
| | | $V_D$ = 12 V; $I_T$ = 0.1 A; T2+ G-; $T_j$ = 25 °C; Fig. 7 | | - | - | 5 | mA |
| | | $V_D$ = 12 V; $I_T$ = 0.1 A; T2- G-; $T_j$ = 25 °C; Fig. 7 | | - | - | 5 | mA |
| | | $V_D$ = 12 V; $I_T$ = 0.1 A; T2- G+; $T_j$ = 25 °C; Fig. 7 | | - | - | 7 | mA |
| $I_L$ | latching current | $V_D$ = 12 V; $I_G$ = 0.1 A; T2+ G+; $T_j$ = 25 °C; Fig. 8 | | - | - | 10 | mA |
| | | $V_D$ = 12 V; $I_G$ = 0.1 A; T2+ G-; $T_j$ = 25 °C; Fig. 8 | | - | - | 20 | mA |
| | | $V_D$ = 12 V; $I_G$ = 0.1 A; T2- G-; $T_j$ = 25 °C; Fig. 8 | | - | - | 10 | mA |
| | | $V_D$ = 12 V; $I_G$ = 0.1 A; T2- G+; $T_j$ = 25 °C; Fig. 8 | | - | - | 10 | mA |
| $I_H$ | holding current | $V_D$ = 12 V; $T_j$ = 25 °C; Fig. 9 | | - | 1.3 | 10 | mA |
| $V_T$ | on-state voltage | $I_T$ = 1.4 A; $T_j$ = 25 °C; Fig. 10 | | - | 1.2 | 1.5 | 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 |
| | | $V_D$ = 400 V; $I_T$ = 0.1 A; $T_j$ = 125 °C | | 0.2 | 0.3 | - | V |
| $I_D$ | off-state current | $V_D$ = 600 V; $T_j$ = 125 °C | | - | 0.1 | 0.5 | mA |
| **Dynamic characteristics** | | | | | | | |
| $dV_D/dt$ | rate of rise of off-state voltage | $V_{DM}$ = 402 V; $T_j$ = 125 °C; ($V_{DM}$ = 67% of $V_{DRM}$); exponential waveform; $R_{GT1(ext)}$ = 1 kΩ | | 20 | - | - | V/μs |
| $dV_{com}/dt$ | rate of change of commutating voltage | $V_D$ = 400 V; $T_j$ = 125 °C; $dI_{com}/dt$ = 0.5 A/ms; $I_T$ = 1 A; gate open circuit | | 3 | - | - | V/μs |
| $t_{gt}$ | gate-controlled turn-on time | $I_{TM}$ = 1.5 A; $V_D$ = 600 V; $I_G$ = 0.1 A; $dI_G$/dt = 5 A/μs | | - | 2 | - | μs |




(1) T2- G+
(2) T2- G-
(3) T2+ G-
(4) T2+ G+

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

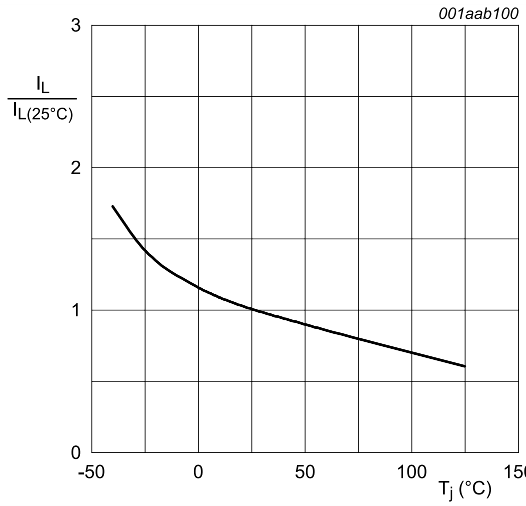



**Fig. 8. Normalized latching current as a function of junction temperature**

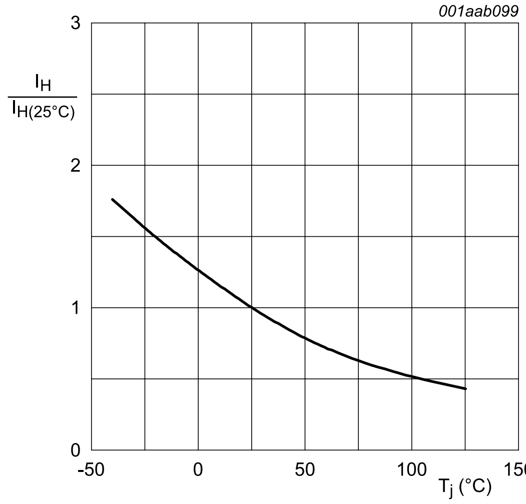
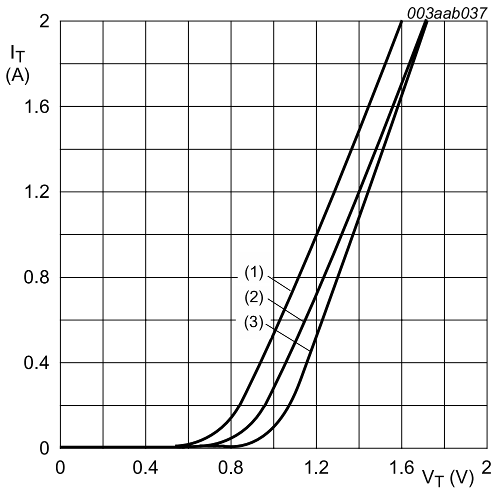



**Fig. 9. Normalized holding current as a function of junction temperature**




$V_o$ = 0.92 V; $R_s$ = 0.4 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**

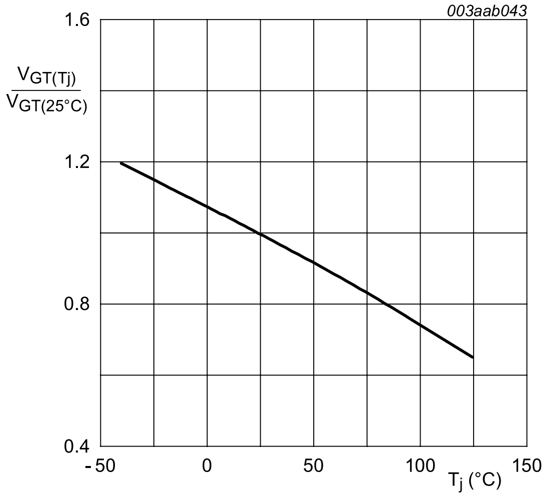
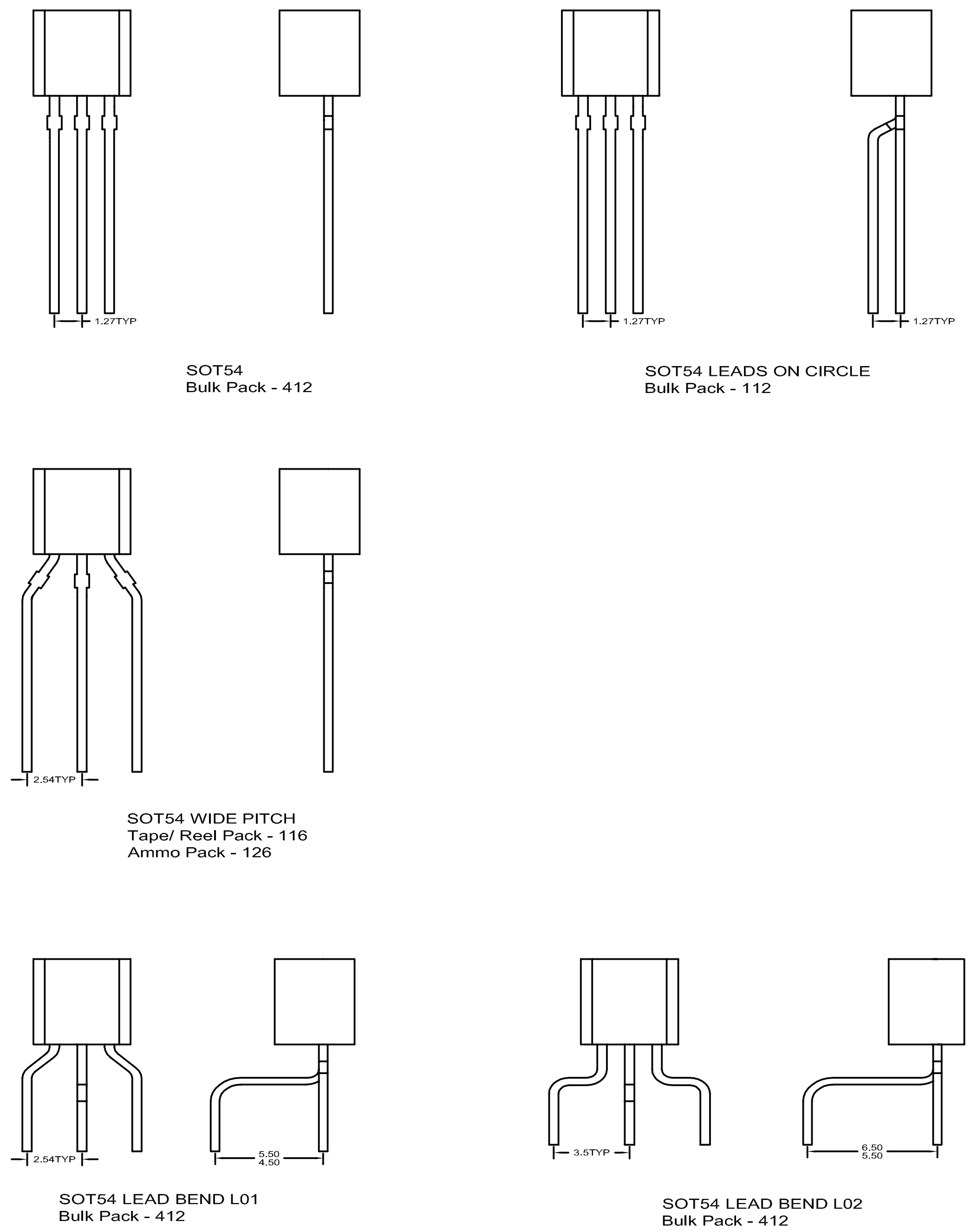



**Fig. 11. Normalized gate trigger voltage as a function of junction temperature**

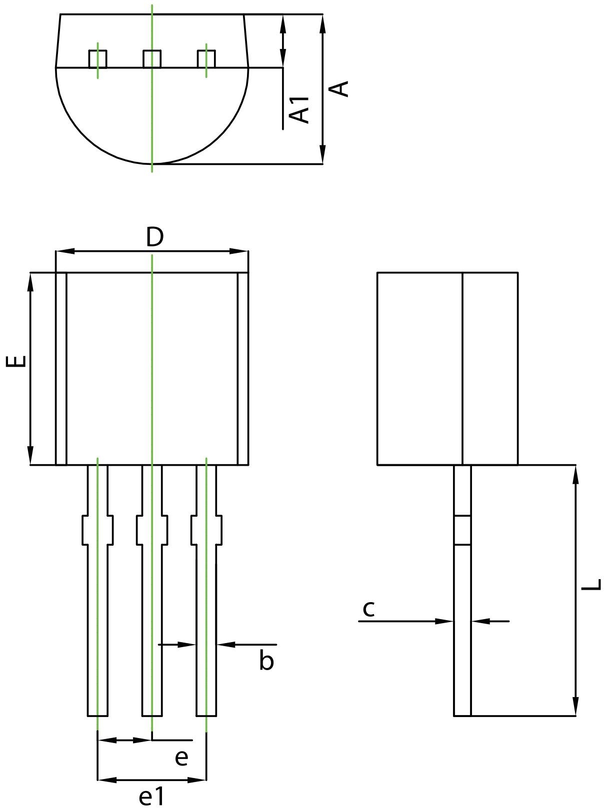
## 11. Package outline

SOT54 PACKAGE OUTLINE




Remark: Detailed dimensions refer to POD drawing.

Plastic single-ended leaded(through hole) package; 3 leads TO92




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | 3.300 | 3.700 | 0.130 | 0.146 |
| A1 | 1.100 | 1.400 | 0.043 | 0.055 |
| b | 0.380 | 0.550 | 0.015 | 0.022 |
| c | 0.360 | 0.510 | 0.014 | 0.020 |
| D | 4.300 | 4.700 | 0.169 | 0.185 |
| E | 4.300 | 4.700 | 0.169 | 0.185 |
| e | 1.270 TYP. | | 0.050 TYP. | |
| e1 | 2.440 | 2.640 | 0.096 | 0.104 |
| L | 14.100 | 14.500 | 0.555 | 0.571 |

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