# BTA440Z-800BT

## 3Q Hi-Com Triac

Rev.01 - 11 April 2019 Product data sheet

## 1. General description

Planar passivated high commutation three quadrant triac in a SOT1292 (IITO3P) package intended for use in circuits where high static and dynamic dV/dt and high dI/dt can occur. This "series BT" triac will commutate the full RMS current at the maximum rated junction temperature ($T_{j(max)}$ = 150 °C) without the aid of a snubber. It is used in applications where "high junction operating temperature capability" is required.

## 2. Features and benefits

- High current TRIAC
- 3Q technology for improved noise immunity
- High commutation capability with maximum false trigger immunity
- High immunity to false turn-on by dV/dt
- High junction operating temperature capability ($T_{j(max)}$ = 150 °C)
- High voltage capability
- Least sensitive gate for highest noise immunity
- Low thermal resistance
- Planar passivated for voltage ruggedness and reliability
- Triggering in three quadrants only
- Insulated tab rated at 2500Vrms

## 3. Applications

- Applications subject to high temperature ($T_{j(max)}$ = 150 °C)
- High current / high surge applications
- High power / industrial controls - e.g. heating, motors, lighting

## 4. Quick reference data

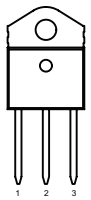
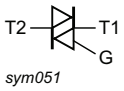
**Table 1. Quick reference data**

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_{DRM}$ | repetitive peak off-state voltage | | | - | - | 800 | V |
| $I_{T(RMS)}$ | RMS on-state current | full sine wave; $T_{mb} \leq 110$ °C; Fig. 1; Fig. 2; Fig. 3 | | - | - | 40 | 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 | | - | - | 400 | A |
| | | full sine wave; $T_{j(init)}$ = 25 °C; $t_p$ = 16.7 ms | | - | - | 440 | A |
| $T_j$ | junction temperature | | | - | - | 150 | °C |
| **Static characteristics** | | | | | | | |

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $I_{GT}$ | gate trigger current | $V_D$ = 12 V; $I_T$ = 0.1 A; T2+ G+; $T_j$ = 25 °C; Fig. 7 | | - | - | 50 | mA |
| | | $V_D$ = 12 V; $I_T$ = 0.1 A; T2+ G-; $T_j$ = 25 °C; Fig. 7 | | - | - | 50 | mA |
| | | $V_D$ = 12 V; $I_T$ = 0.1 A; T2- G-; $T_j$ = 25 °C; Fig. 7 | | - | - | 50 | mA |
| $I_H$ | holding current | $V_D$ = 12 V; $T_j$ = 25 °C; Fig. 9 | | - | - | 80 | mA |
| $V_T$ | on-state voltage | $I_T$ = 56.6 A; $T_j$ = 25 °C; Fig. 10 | | - | - | 1.5 | V |
| **Dynamic characteristics** | | | | | | | |
| $dV_D/dt$ | rate of rise of off-state voltage | $V_{DM}$ = 536 V; $T_j$ = 150 °C; ($V_{DM}$ = 67% of $V_{DRM}$); exponential waveform; gate open circuit | | 1000 | - | - | V/µs |
| $dI_{COM}/dt$ | rate of change of commutating current | $V_D$ = 400 V; $T_j$ = 150 °C; $I_{T(RMS)}$ = 20 A; $dV_{com}/dt$ = 20 V/µs; (snubberless condition); gate open circuit | | 15 | - | - | A/ms |

## 5. Pinning information

**Table 2. Pinning information**

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|---|---|---|---|---|
| 1 | T1 | main terminal 1 |  IITO3P (SOT1292) |  sym051 |
| 2 | T2 | main terminal 2 | | |
| 3 | G | gate | | |
| mb | n.c. | mounting base; isolated | | |

## 6. Ordering information

**Table 3. Ordering information**

| Type number | Package Name | Orderable part number | Packing method | Small packing quantity | Package version | Package issue date |
|---|---|---|---|---|---|---|
| BTA440Z-800BT | IITO3P | BTA440Z-800BTQ | Tube | 30 | SOT1292 | 21-July-2017 |

## 7. Marking

**Table 4. Marking codes**

| Type number | Marking code |
|---|---|
| BTA440Z-800BT | BTA440Z-800BT |

# 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 | | | - | 800 | V |
| $I_{T(RMS)}$ | RMS on-state current | full sine wave; $T_{mb} \leq 110$ °C; Fig. 1; Fig. 2; Fig. 3 | | - | 40 | 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 | | - | 400 | A |
| | | full sine wave; $T_{j(init)} = 25$ °C; $t_p = 16.7$ ms | | - | 440 | A |
| $I^2t$ | $I^2t$ for fusing | $t_p = 10$ ms; sine-wave pulse | | - | 800 | $A^2s$ |
| $dI_T/dt$ | rate of rise of on-state current | $I_G = 100$ mA | | - | 150 | A/µs |
| $I_{GM}$ | peak gate current | $t_p = 20$ µs | | - | 8 | A |
| $P_{GM}$ | peak gate power | $t_p = 20$ µs | | - | 40 | W |
| $P_{G(AV)}$ | average gate power | | | - | 1 | W |
| $T_{stg}$ | storage temperature | | | -40 | 150 | °C |
| $T_j$ | junction temperature | | | - | 150 | °C |

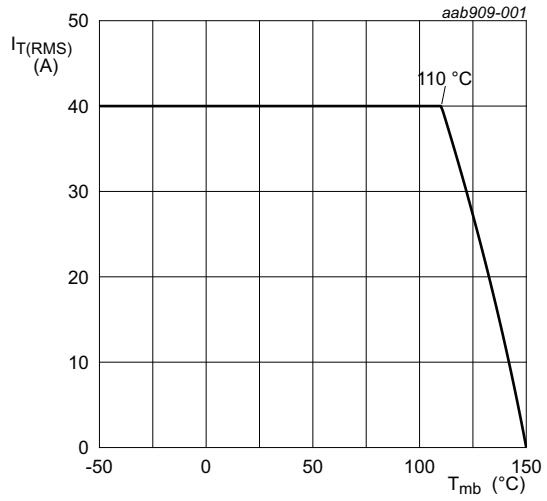
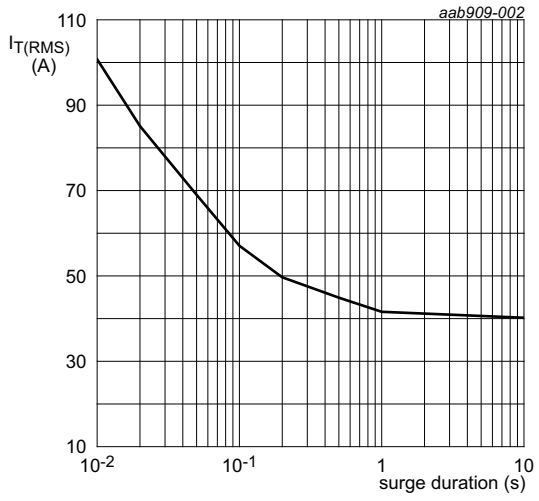
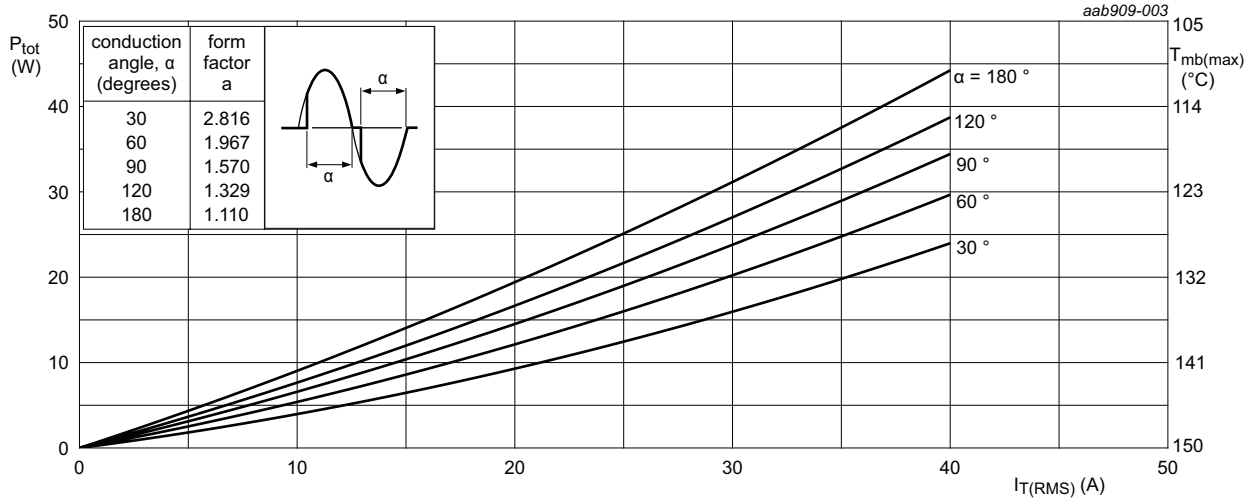



**Fig. 1. RMS on-state current as a function of mounting base temperature; maximum values**




f = 50 Hz; $T_{mb} = 110$ °C

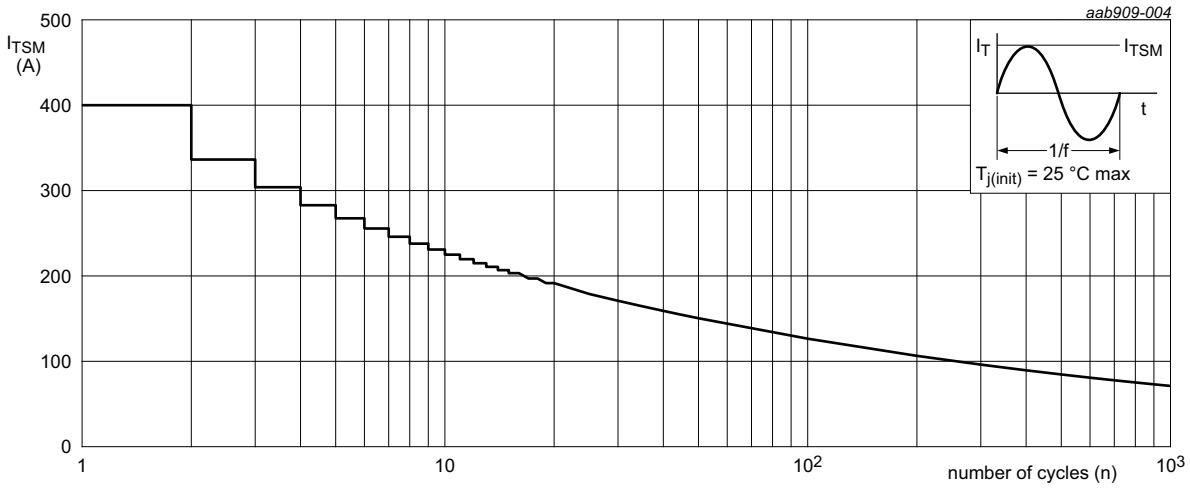
**Fig. 2. RMS on-state current as a function of surge duration; maximum values**




α = conduction angle

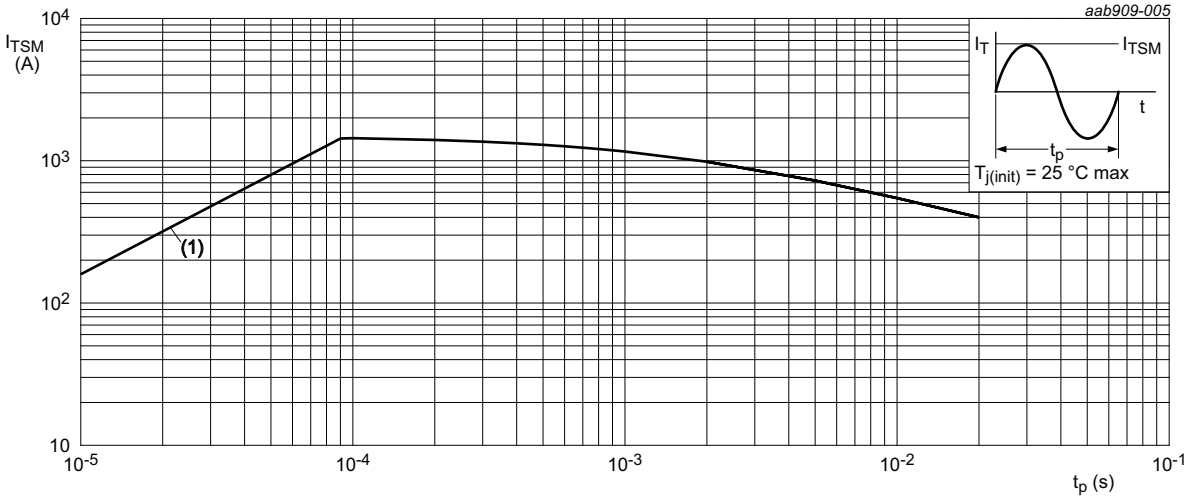
a = form factor = $I_{T(RMS)}$ / $I_{T(AV)}$

**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**




$t_p \leq 20$ ms
(1) $dI_T/dt$ limit

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

# 9. Thermal characteristics

**Table 6. Thermal characteristics**

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $R_{th(j-mb)}$ | thermal resistance from junction to mounting base | Fig 6 | | - | - | 0.9 | K/W |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient free air | in free air | | - | 50 | - | K/W |

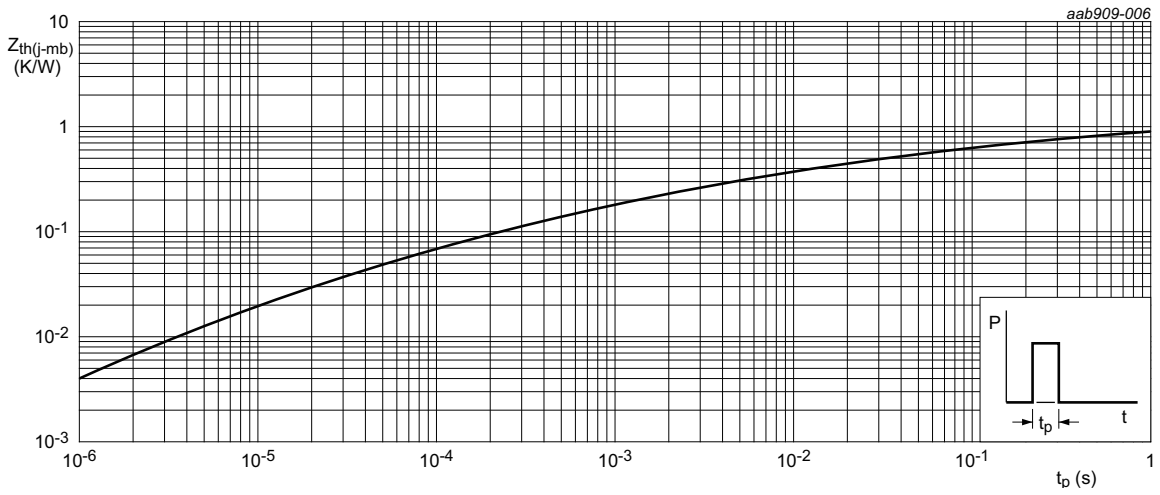



**Fig. 6. Transient thermal impedance from junction to mounting base as a function of pulse duration**

# 10. Isolation Characteristics

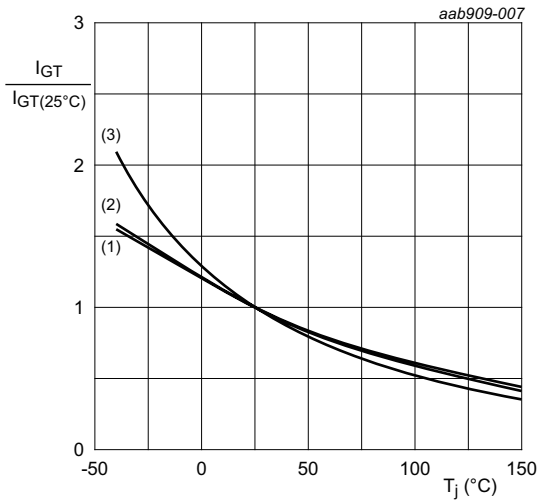
**Table 7. Isolation Characteristics**

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_{isol(RMS)}$ | RMS isolation voltage | from all terminals to external heatsink; sinusoidal waveform; clean and dust free; 50 Hz ≤ f ≤ 60 Hz; RH ≤ 65 %; $T_{mb}$ = 25 °C | | - | - | 2500 | V |

# 11. Characteristics

**Table 8. 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 | | - | - | 50 | mA |
| | | $V_D$ = 12 V; $I_T$ = 0.1 A; T2+ G-; $T_j$ = 25 °C; Fig. 7 | | - | - | 50 | mA |
| | | $V_D$ = 12 V; $I_T$ = 0.1 A; T2- G-; $T_j$ = 25 °C; Fig. 7 | | - | - | 50 | mA |
| $I_L$ | latching current | $V_D$ = 12 V; $I_G$ = 0.1 A; T2+ G+; $T_j$ = 25 °C; Fig. 8 | | - | - | 70 | mA |
| | | $V_D$ = 12 V; $I_G$ = 0.1 A; T2+ G-; $T_j$ = 25 °C; Fig. 8 | | - | - | 160 | mA |
| | | $V_D$ = 12 V; $I_G$ = 0.1 A; T2- G-; $T_j$ = 25 °C; Fig. 8 | | - | - | 70 | mA |
| $I_H$ | holding current | $V_D$ = 12 V; $T_j$ = 25 °C; Fig. 9 | | - | - | 80 | mA |
| $V_T$ | on-state voltage | $I_T$ = 56.6 A; $T_j$ = 25 °C; Fig. 10 | | - | - | 1.5 | V |
| $V_{GT}$ | gate trigger voltage | $V_D$ = 12 V; $T_j$ = 25 °C; Fig. 11 | | - | 0.8 | 1.3 | V |
| | | $V_D$ = 400 V; $T_j$ = 150 °C | | 0.2 | 0.45 | - | V |
| $I_D$ | off-state current | $V_D$ = 800 V; $T_j$ = 25 °C | | - | - | 10 | µA |
| | | $V_D$ = 800 V; $T_j$ = 150 °C | | - | - | 2 | mA |
| **Dynamic characteristics** | | | | | | | |
| $dV_D/dt$ | rate of rise of off-state voltage | $V_{DM}$ = 536 V; $T_j$ = 150 °C; ($V_{DM}$ = 67% of $V_{DRM}$); exponential waveform; gate open circuit | | 1000 | - | - | V/µs |
| $dI_{com}/dt$ | rate of change of commutating current | $V_D$ = 400 V; $T_j$ = 150 °C; $I_{T(RMS)}$ = 20 A; $dV_{com}/dt$ = 20 V/µs; (snubberless condition); gate open circuit | | 15 | - | - | A/ms |




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

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

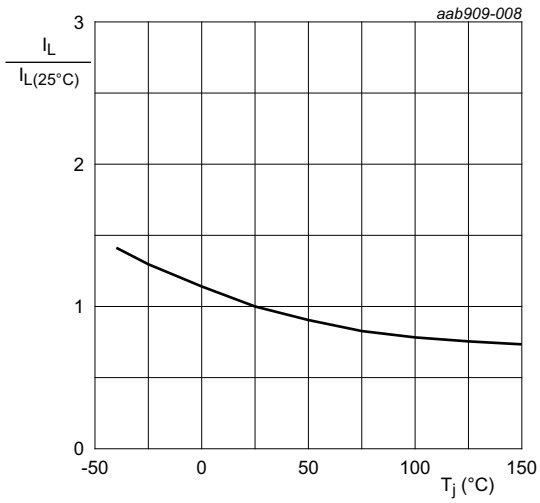



**Fig. 8. Normalized latching current as a function of junction temperature**

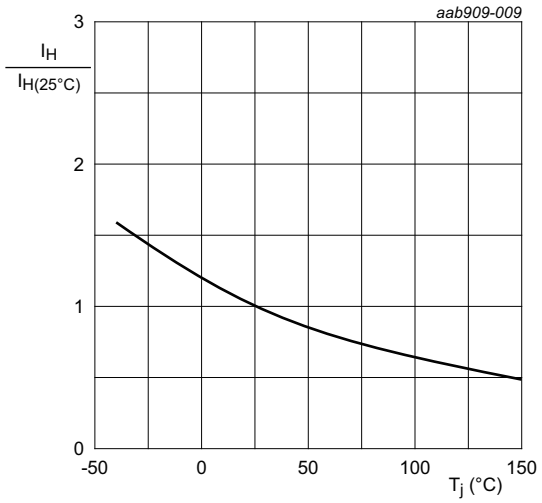
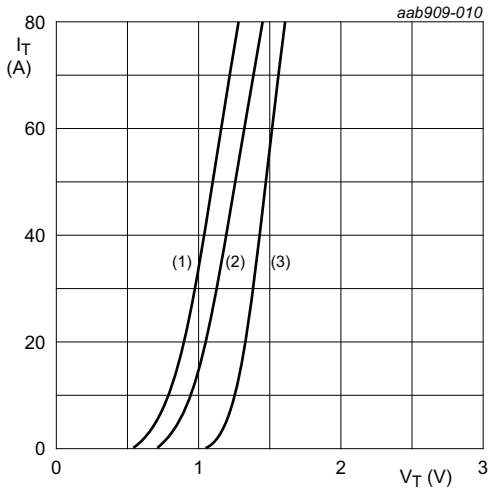



**Fig. 9. Normalized holding current as a function of junction temperature**




$V_o$ = 0.928 V; $R_s$ = 0.0068 Ω
(1) $T_j$ = 150 °C; typical values
(2) $T_j$ = 150 °C; maximum values
(3) $T_j$ = 25 °C; maximum values

**Fig. 10. On-state current as a function of on-state voltage**

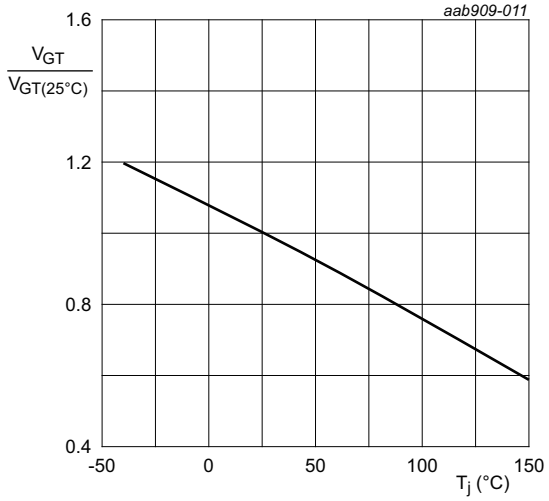
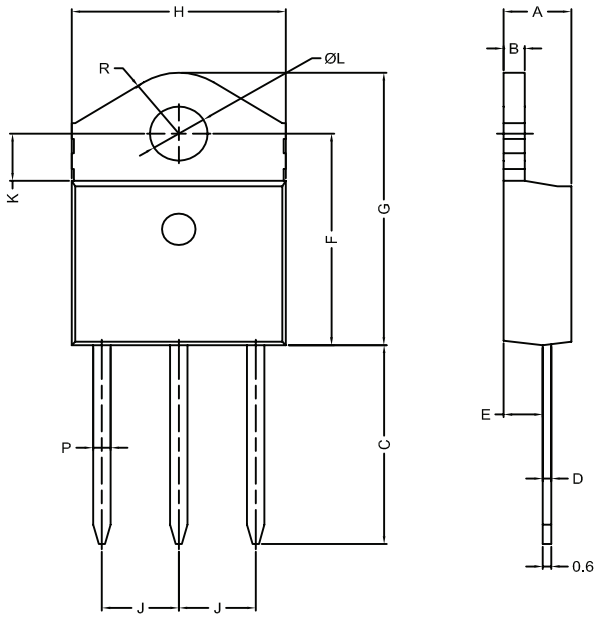



**Fig. 11. Normalized gate trigger voltage as a function of junction temperature**

## 12. Package outline

Plastic single-ended through-hole package; isolated heatsink mounted; 1 mounting hole; 3 -lead TO3P SOT1292




| Unit | | A | B | C | D | E | F | G | H | J | K | L | P | R |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | min | 4.75 | 1.45 | 14.35 | 0.50 | 2.70 | 15.80 | 20.40 | 15.10 | 5.40 | 3.40 | 4.08 | 1.20 | 4.6 (typ.) |
| | max | 4.95 | 1.55 | 15.60 | 0.70 | 2.90 | 16.50 | 21.10 | 15.50 | 5.65 | 3.65 | 4.17 | 1.40 | |

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | EIAJ | | | |
| SOT1292 | | - | | | | |

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## Data sheet status

| Document status [1][2] | Product status [3] | Definition |
|---|---|---|
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| Product [short] data sheet | Production | This document contains the product specification. |

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