# BTA204S-600F

## 3Q Hi-Com Triac

Rev.02 - 19 March 2025 Product data sheet

## 1. General description

Planar passivated high commutation three quadrant triac in a SOT428 (DPAK) surface-mountable plastic package. This "series F" triac balances the requirements of commutation performance and gate sensitivity and is intended for interfacing with low power drivers and logic ICs including microcontrollers in higher noise environments.

## 2. Features and benefits

- 3Q technology for improved noise immunity
- Direct triggering from low power drivers and logic ICs
- High blocking voltage capability
- High commutation capability
- Intermediate sensitivity for maximum noise immunity and logic level triggering
- Planar passivated for voltage ruggedness and reliability
- Surface-mountable package
- Triggering in three quadrants only

## 3. Applications

- AC solenoids
- General purpose motor control circuits
- Home appliances

## 4. Quick reference data

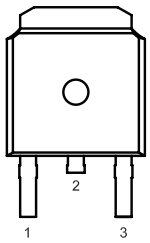
**Table 1. Quick reference data**

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_{DRM}$ | repetitive peak off-state voltage | | | - | - | 600 | V |
| $I_{T(RMS)}$ | RMS on-state current | full sine wave; $T_{mb} \leq 107$ °C; Fig. 1; Fig. 2; Fig. 3 | | - | - | 4 | 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 | | - | - | 25 | A |
| | | full sine wave; $T_{j(init)} = 25$ °C; $t_p = 16.7$ ms | | - | - | 27 | A |
| $T_j$ | junction temperature | | | - | - | 125 | °C |
| **Static characteristics** | | | | | | | |
| $I_{GT}$ | gate trigger current | $V_D = 12$ V; $I_T = 0.1$ A; T2+ G+; $T_j = 25$ °C; Fig. 7 | | - | - | 25 | mA |

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| | | $V_D$ = 12 V; $I_T$ = 0.1 A; T2+ G-; $T_j$ = 25 °C; Fig. 7 | | - | - | 25 | mA |
| | | $V_D$ = 12 V; $I_T$ = 0.1 A; T2- G-; $T_j$ = 25 °C; Fig. 7 | | - | - | 25 | mA |
| $I_H$ | holding current | $V_D$ = 12 V; $T_j$ = 25 °C; Fig. 9 | | - | - | 20 | mA |
| $V_T$ | on-state voltage | $I_T$ = 5 A; $T_j$ = 25 °C; Fig. 10 | | - | 1.4 | 1.7 | V |
| **Dynamic characteristics** | | | | | | | |
| $dV_D/dt$ | rate of rise of off-state voltage | $V_{DM}$ = 402 V; $T_j$ = 125 °C; ($V_{DM}$ = 67% of $V_{DRM}$); exponential waveform; gate open circuit | | 50 | - | - | V/µs |
| $dI_{com}/dt$ | rate of change of commutating current | $V_D$ = 400 V; $T_j$ = 125 °C; $I_{T(RMS)}$ = 4 A; $dV_{com}/dt$ = 10 V/µs; gate open circuit | | 3 | - | - | A/ms |
| | | $V_D$ = 400 V; $T_j$ = 125 °C; $I_{T(RMS)}$ = 4 A; $dV_{com}/dt$ = 0.1 V/µs; gate open circuit | | 15 | - | - | A/ms |

## 5. Pinning information

**Table 2. Pinning information**

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|---|---|---|---|---|
| 1 | K | cathode |   | |
| 2 | A | anode | | |
| 3 | G | gate | | |
| mb | A | 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 |
|---|---|---|---|---|---|---|
| BTA204S-600F | TO252 | BTA204S-600F,118 | Reel | 2500 | TO252N | 07-Mar-2025 |
| | | | | | TO252Q | 05-Mar-2025 |

| Type number | Marking codes | |
|---|---|---|
| | Assembly factory: N | Assembly factory: Q |
| BTA204S-600F | 204S6F<br>PJNxxxx xx | 204S6F<br>PJQxxxx xx |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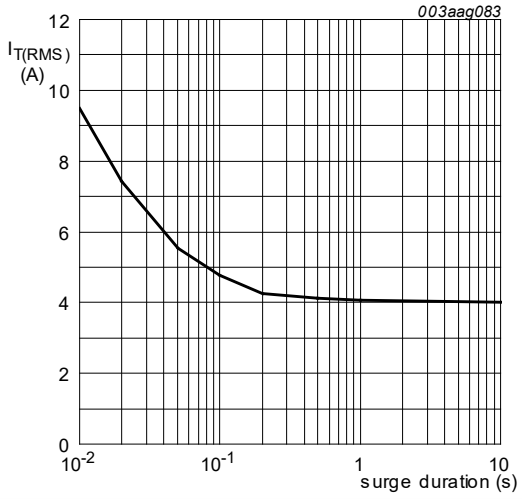
# 7. Limiting values

**Table 4. 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; $T_{mb} \leq$ 107 °C; Fig. 1; Fig. 2; Fig. 3 | | - | 4 | 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 | | - | 25 | A |
| | | full sine wave; $T_{j(init)}$ = 25 °C; $t_p$ = 16.7 ms | | - | 27 | A |
| $I^2t$ | $I^2t$ for fusing | $t_p$ = 10 ms; SIN | | - | 3.1 | A²s |
| $dI_T/dt$ | rate of rise of on-state current | $I_G$ = 50 mA | | - | 100 | 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 | | - | 0.5 | W |
| $T_{stg}$ | storage temperature | | | -40 | 150 | °C |
| $T_j$ | junction temperature | | | - | 125 | °C |




f = 50 Hz; $T_{mb}$ = 107 °C

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

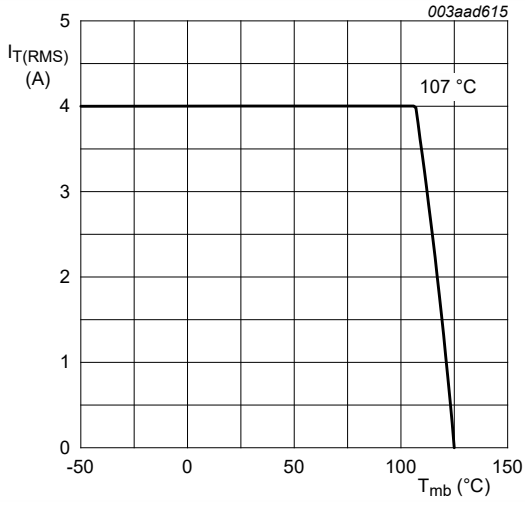



**Fig. 2. RMS on-state current as a function of mounting base temperature; maximum values**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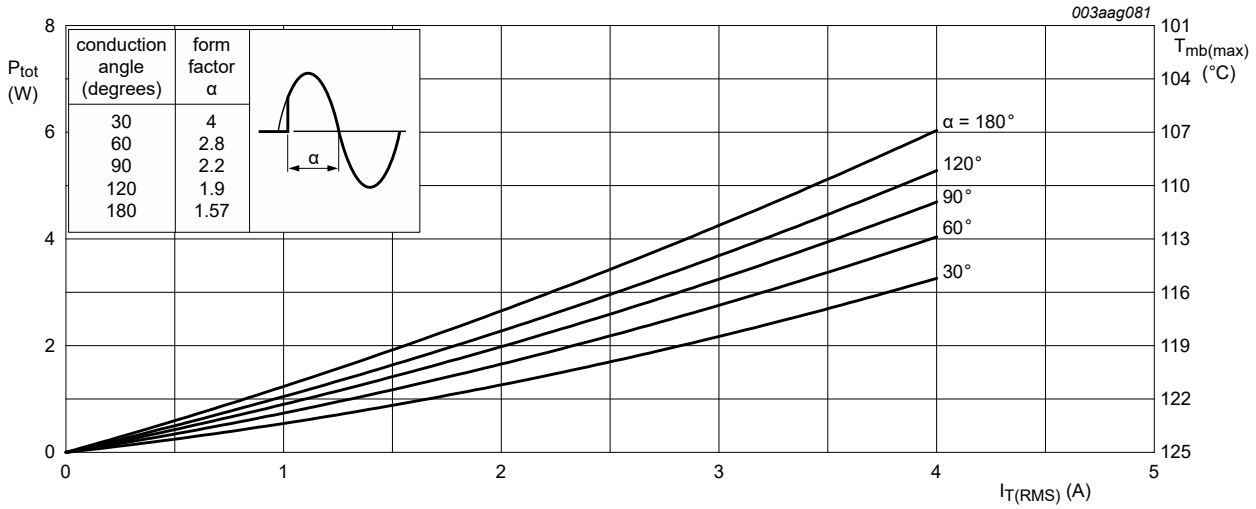
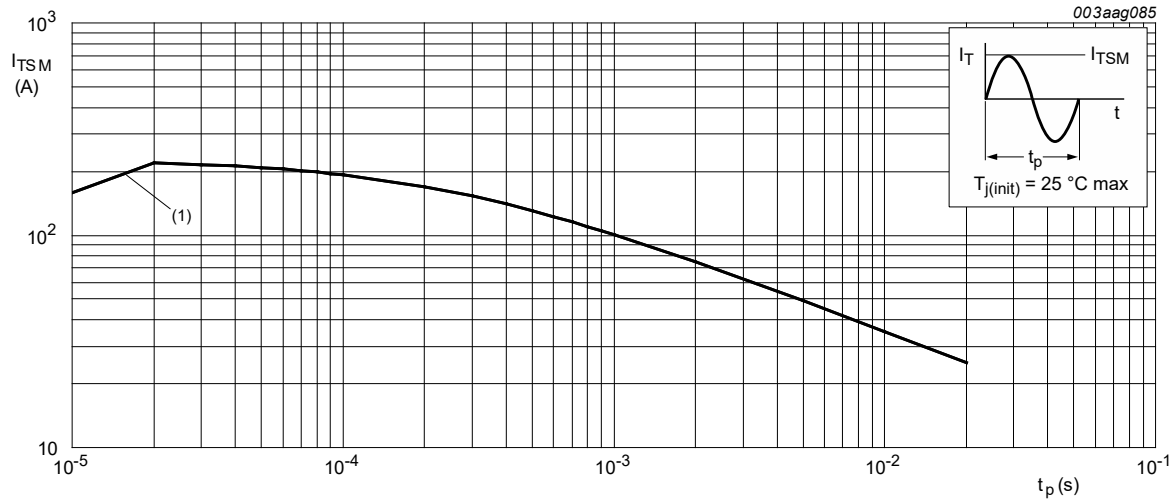



α = conduction angle

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

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




$t_p$ ≤ 20 ms; (1) $dI_T/dt$ limit

**Fig. 4. Non-repetitive peak on-state current as a function of pulse width; maximum values**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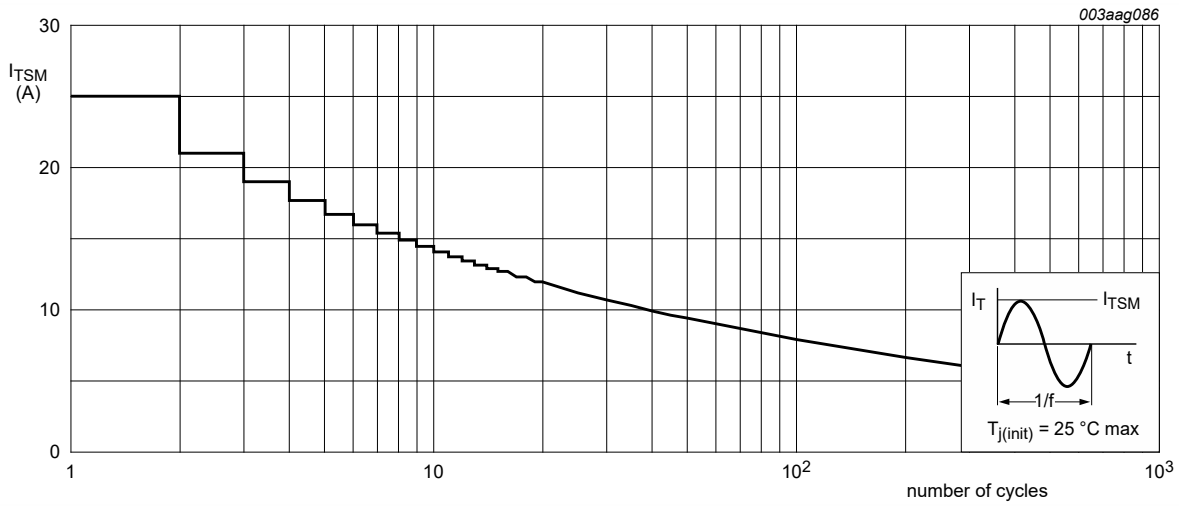


f = 50 Hz

**Fig. 5. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values**


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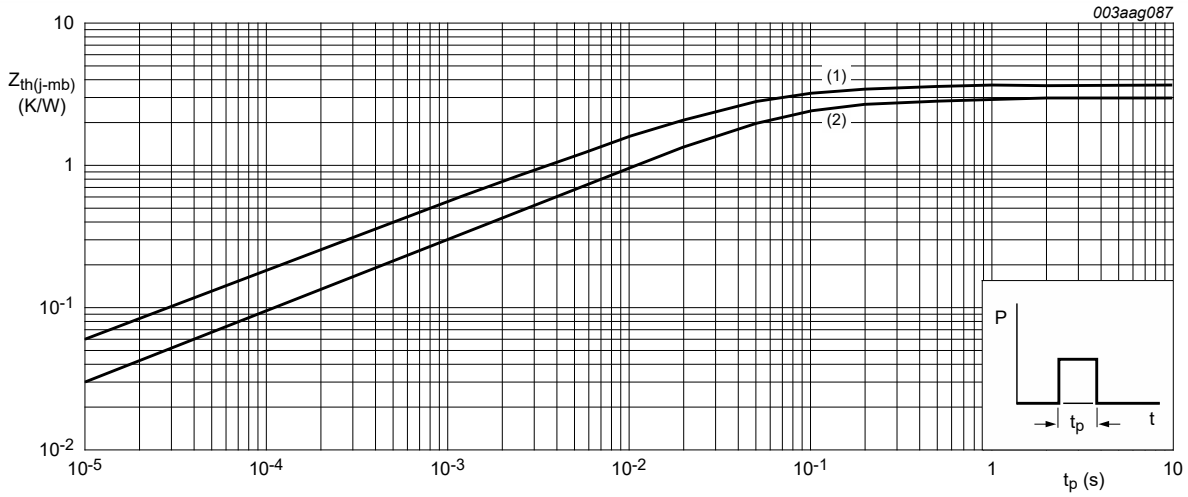
# 8. Thermal characteristics

**Table 5. Thermal characteristics**

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $R_{th(j-mb)}$ | thermal resistance from junction to mounting base | full cycle; Fig. 6 | | - | - | 3 | K/W |
| | | half cycle; Fig. 6 | | - | - | 3.7 | K/W |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient free air | printed circuit board (FR4) mounted | | - | 75 | - | K/W |




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

**Fig. 6. Transient thermal impedance from junction to mounting base as a function of pulse width**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# 9. Characteristics

**Table 6. Characteristics**

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| **Static characteristics** | | | | | | | |
| $I_{GT}$ | gate trigger current | $V_D$ = 12 V; $I_T$ = 0.1 A; T2+ G+; $T_j$ = 25 °C; Fig. 7 | | - | - | 25 | mA |
| | | $V_D$ = 12 V; $I_T$ = 0.1 A; T2+ G-; $T_j$ = 25 °C; Fig. 7 | | - | - | 25 | mA |
| | | $V_D$ = 12 V; $I_T$ = 0.1 A; T2- G-; $T_j$ = 25 °C; Fig. 7 | | - | - | 25 | mA |
| $I_L$ | latching current | $V_D$ = 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 | | - | - | 30 | mA |
| | | $V_D$ = 12 V; $I_G$ = 0.1 A; T2- G-; $T_j$ = 25 °C; Fig. 8 | | - | - | 20 | mA |
| $I_H$ | holding current | $V_D$ = 12 V; $T_j$ = 25 °C; Fig. 9 | | - | - | 20 | mA |
| $V_T$ | on-state voltage | $I_T$ = 5 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 |
| | | $V_D$ = 400 V; $I_T$ = 0.1 A; $T_j$ = 125 °C; Fig. 11 | | 0.25 | 0.4 | - | 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; gate open circuit | | 50 | - | - | V/µs |
| $dI_{com}/dt$ | rate of change of commutating current | $V_D$ = 400 V; $T_j$ = 125 °C; $I_{T(RMS)}$ = 4 A; $dV_{com}/dt$ = 10 V/µs; gate open circuit | | 3 | - | - | A/ms |
| | | $V_D$ = 400 V; $T_j$ = 125 °C; $I_{T(RMS)}$ = 4 A; $dV_{com}/dt$ = 0.1 V/µs; gate open circuit | | 15 | - | - | A/ms |


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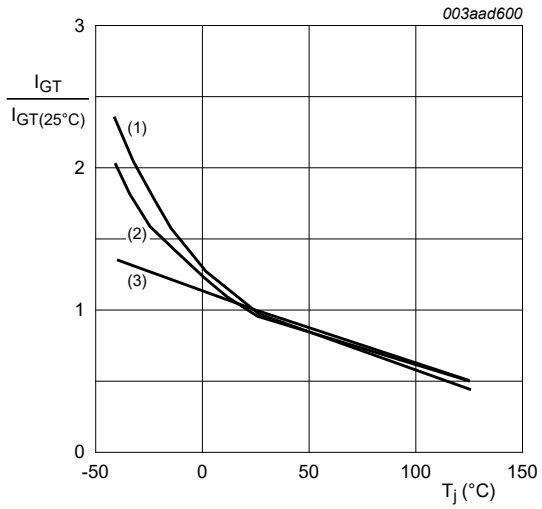



(1) T2- G-
(2) T2+ G-
(3) T2+ G+

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

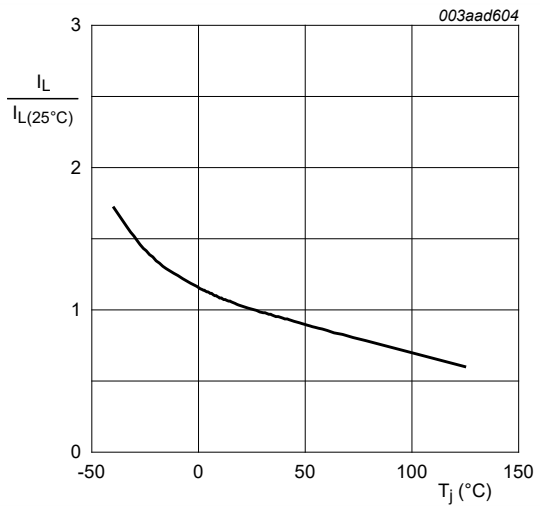



**Fig. 8. Normalized latching current as a function of junction temperature**

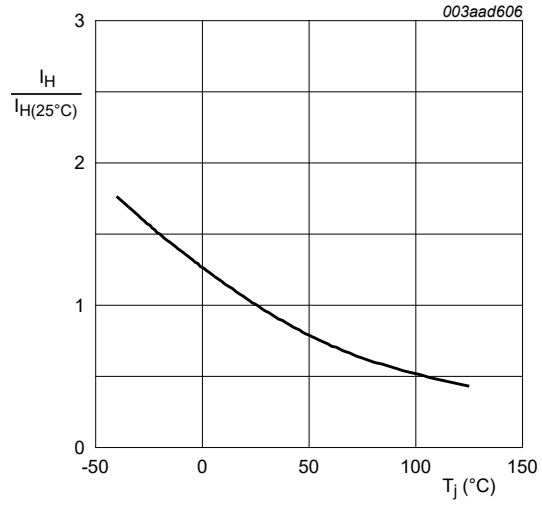
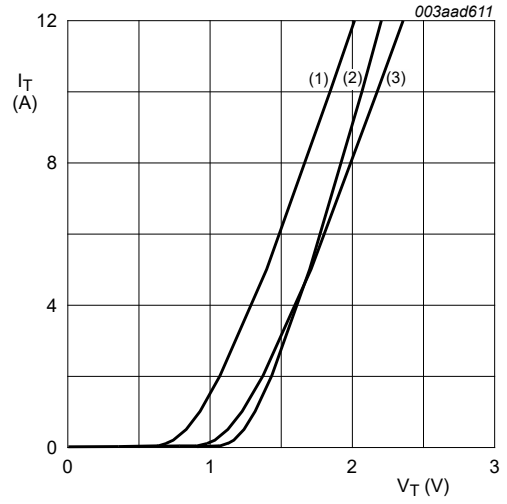



**Fig. 9. Normalized holding current as a function of junction temperature**




$V_o$ = 1.27 V; $R_s$ = 0.091 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**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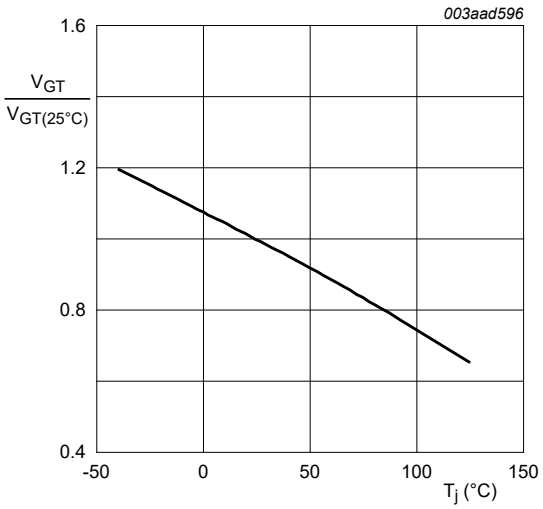


**Fig. 11. Normalized gate trigger voltage as a function of junction temperature**


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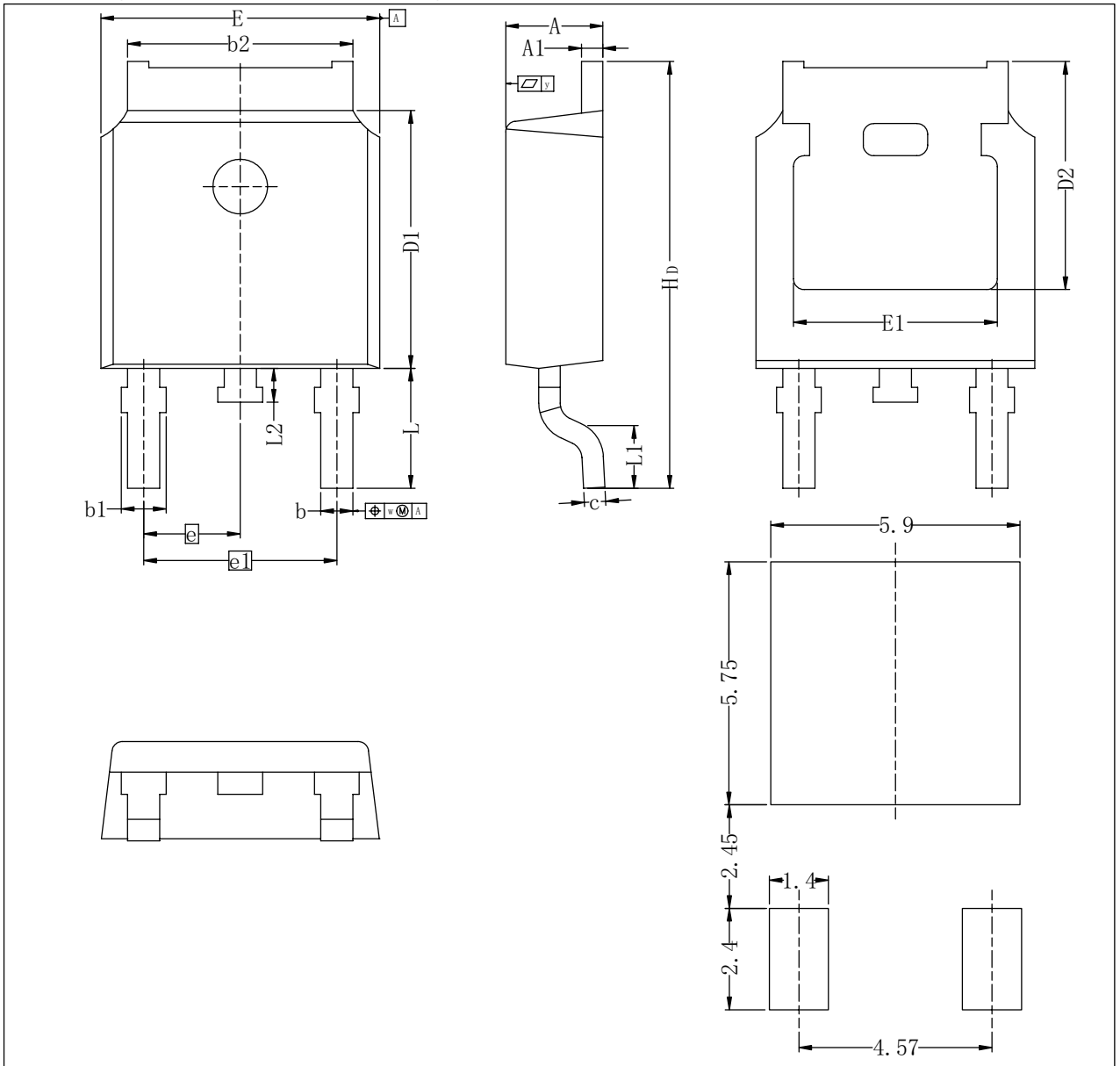
## 10. Package outline

*Assembly factory: N*

Plastic single-ended surface-mounted package (DPAK); 3 leads (one lead cropped)




| Unit | A | A1 | b | b1 | b2 | c | D1 | D2 | E | E1 | e | e1 | $H_D$ | L | L1 | L2 | w | y |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| min | 2.22 | 0.46 | 0.71 | 0.72 | 5.00 | 0.20 | 5.98 | 4.00 | 6.47 | 4.45 | 2.285 | 4.57 | 9.60 | 2.90 (Ref.) | 0.50 | 0.50 | 0.20 | |
| mm nom | | | | | | | | | | | | | | | | | | |
| max | 2.38 | 0.93 | 0.89 | 1.10 | 5.46 | 0.56 | 6.22 | --- | 6.73 | --- | | | 10.40 | | --- | 0.90 | | 0.20 |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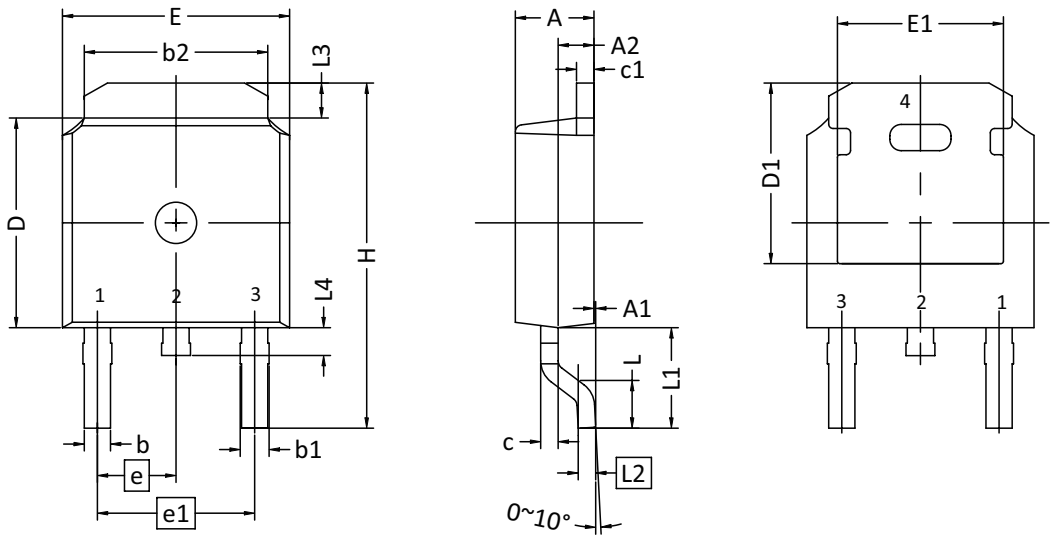
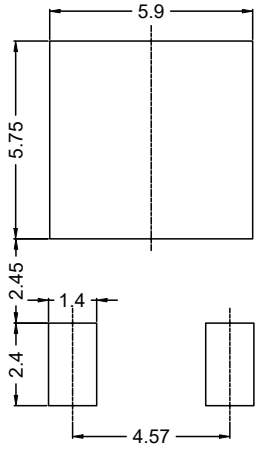
*Assembly factory: Q*

Plastic single-ended surface-mounted package (DPAK); 3 leads (one lead cropped) TO252




Recommended Footprint

| SYMBOLS | DIMENSION IN MM | | |
|---|---|---|---|
| | MIN | NOM | MAX |
| A | 2.184 | 2.286 | 2.400 |
| A1 | 0.000 | --- | 0.200 |
| A2 | 0.889 | 1.041 | 1.170 |
| b | 0.635 | 0.762 | 0.889 |
| b1 | 0.680 | 0.840 | 1.143 |
| b2 | 4.953 | 5.340 | 5.500 |
| c | 0.450 | 0.508 | 0.610 |
| c1 | 0.450 | 0.508 | 0.630 |
| D | 5.969 | 6.096 | 6.223 |
| D1 | 5.210 | 5.249 | 5.380 |
| E | 6.350 | 6.604 | 6.800 |
| E1 | 4.318 | 4.826 | 4.920 |
| e | 2.286BSC | | |
| e1 | 4.572BSC | | |
| H | 9.398 | 10.033 | 10.500 |
| L | 1.270 | 1.520 | 2.032 |
| L1 | 2.921REF | | |
| L2 | 0.408 | 0.508 | 0.608 |
| L3 | 0.889 | 1.016 | 1.270 |
| L4 | 0.600 | --- | 1.016 |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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. |
| Preliminary [short] data sheet | Qualification | This document contains data from the preliminary specification. |
| Product [short] data sheet | Production | This document contains the product specification. |

[1] Please consult the most recently issued document before initiating or completing a design.
[2] The term 'short data sheet' is explained in section "Definitions".
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## 12. Contents

1. General description....1
2. Features and benefits....1
3. Applications....1
4. Quick reference data....1
5. Pinning information....2
6. Ordering information....2
7. Limiting values....3
8. Thermal characteristics....6
9. Characteristics....7
10. Package outline....10
11. Legal information....11

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