# BTA302-600ET

## 3Q Hi-Com Triac

Rev.01 - 13 January 2025 Product data sheet

## 1. General description

Planar passivated high commutation three quadrant triac in a SOT54 (TO-92) plastic package. This "series ET" triac balances the requirements of commutation performance and gate sensitivity and is intended for interfacing with low power drivers and logic ICs including microcontrollers.

## 2. Features and benefits

- 3Q technology for improved noise immunity
- Direct triggering from low power drivers and logic ICs
- High commutation capability with sensitive gate
- High immunity to false turn-on by dV/dt
- High voltage capability
- Planar passivated for voltage ruggedness and reliability
- Sensitive gate for easy logic level triggering
- Triggering in three quadrants only

## 3. Applications

- General purpose motor control
- Small loads in washing machines
- Solenoid drivers

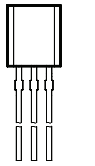
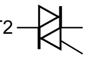
## 4. Quick reference data

**Table 1. Quick reference data**

| Symbol | Parameter | Conditions | Notes | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| **Absolute maximum rating** | | | | | | | |
| $V_{DRM}$ | repetitive peak off-state voltage | | | | 600 | | V |
| $I_{T(RMS)}$ | RMS on-state current | square-wave pulse; $T_{lead}$ ≤ 57 °C; Fig. 1; Fig. 2; Fig. 3 | | | 2 | | A |
| $I_{TSM}$ | non-repetitive peak forward current | full sine wave; $t_p$ = 20 ms; $T_{j(init)}$ = 25 °C; Fig. 4; Fig. 5 | | | 17 | | A |
| | | full sine wave; $t_p$ = 16.7 ms; $T_{j(init)}$ = 25 °C | | | 18.7 | | A |
| $T_j$ | operating junction temperature | | | | -40 to 150 | | °C |
| **Static characteristics** | | | | | | | |
| **Symbol** | **Parameter** | **Conditions** | **Notes** | **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 | | 1 | - | 10 | mA |
| | | $V_D$ = 12 V; $I_T$ = 0.1 A; T2+ G- $T_j$ = 25 °C; Fig. 7 | | 1 | - | 10 | mA |
| | | $V_D$ = 12 V; $I_T$ = 0.1 A; T2- G- $T_j$ = 25 °C; Fig. 7 | | 1 | - | 10 | mA |
| $I_H$ | holding current | $V_D$ = 12 V; $T_j$ = 25 °C; Fig. 9 | | - | - | 12 | mA |
| $V_T$ | on-state voltage | $I_T$ = 2.0 A; $T_j$ = 25 °C; Fig. 10 | | - | 1.35 | 1.55 | V |

## 5. Pinning information

**Table 2. Pinning information**

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|---|---|---|---|---|
| 1 | T2 | main terminal 2 |   |   |
| 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 |
|---|---|---|---|---|---|---|
| BTA302-600ET | TO92 | BTA302-600ET,412 | Bulk | 1000 | TO92L | 10-May-2021 |

## 7. Marking

**Table 4. Marking codes**

| Type number | Marking codes |
|---|---|
| BTA302-600ET | 302-6E |

# 8. Limiting values

**Table 5. Limiting values**

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

| Symbol | Parameter | Conditions | Notes | Values | Unit |
|---|---|---|---|---|---|
| $V_{DRM}$ | repetitive peak off-state voltage | | | 600 | V |
| $V_{RRM}$ | repetitive peak reverse voltage | | | 600 | V |
| $I_{T(RMS)}$ | RMS on-state current | full sine wave; $T_{lead} \leq 57°C$; Fig. 1; Fig. 2; Fig. 3 | | 2 | A |
| $I_{TSM}$ | non-repetitive peak on-state current | full sine wave; $t_p$ = 20 ms; $T_{j(init)}$ = 25 °C; Fig. 4; Fig. 5 | | 17 | A |
| | | full sine wave; $t_p$ = 16.7 ms; $T_{j(init)}$ = 25 °C | | 18.7 | A |
| $I^2t$ | $I^2t$ for fusing | $t_p$ = 10ms; sine wave | | 1.4 | $A^2/s$ |
| $dI_T/dt$ | rate of rise of on-state current | $I_G$ = 10mA | | 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 | | 0.1 | W |
| $T_{stg}$ | storage temperature | | | -40 to 150 | °C |
| $T_j$ | operating junction temperature | | | -40 to 150 | °C |

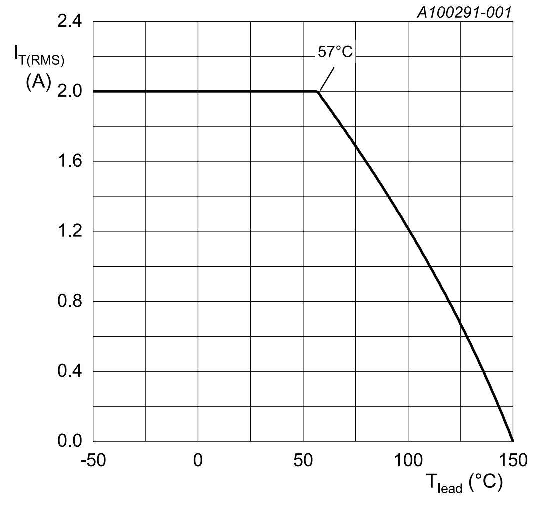
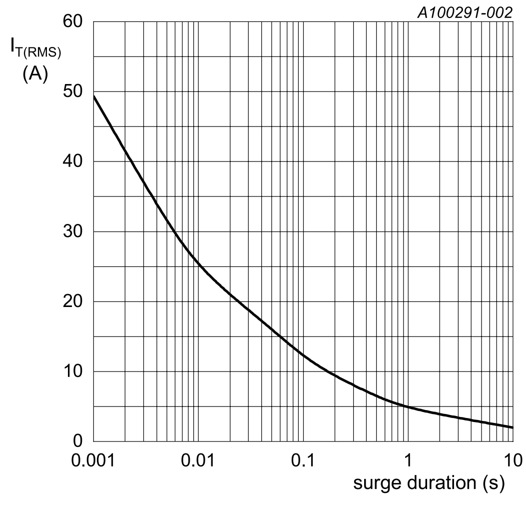
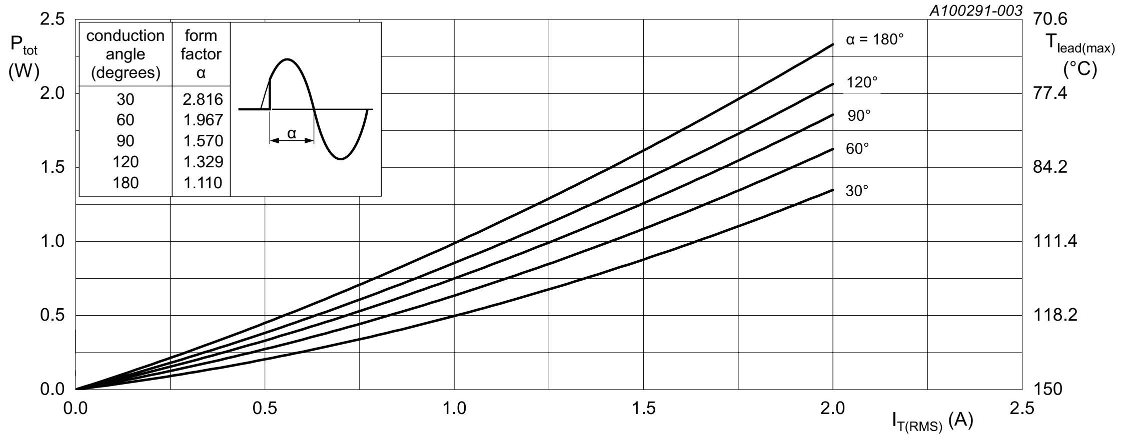



**Fig. 1. RMS on-state current as a function of lead temperature; maximum values**




f = 50 Hz; $T_{lead}$ = 57 °C

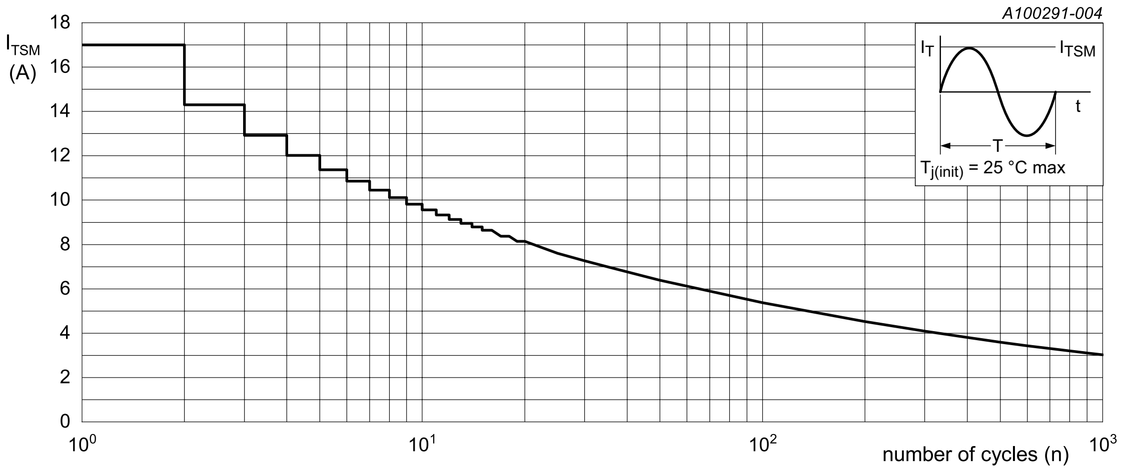
**Fig. 2. RMS on-state current as a function of surge duration; maximum values**




α = conduction angle

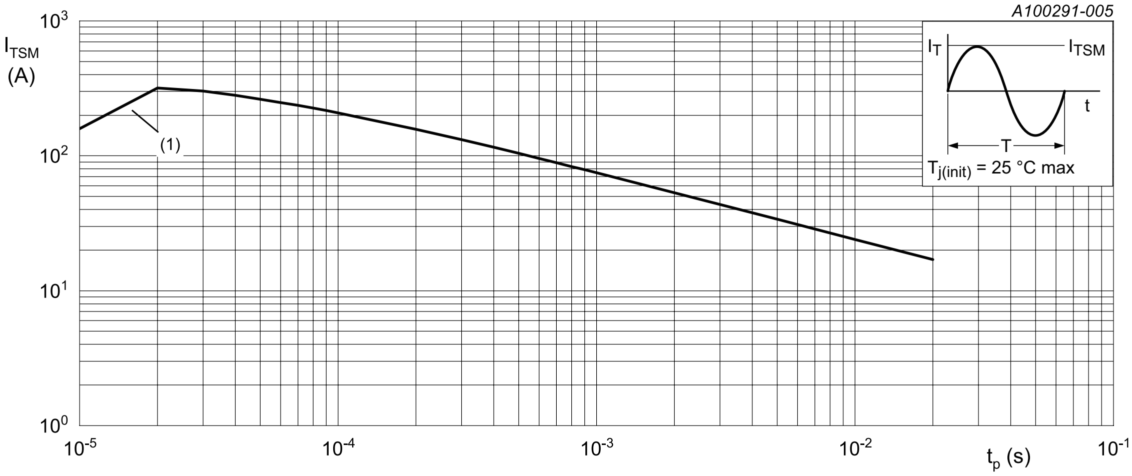
a = form factor = $I_{T(RMS)}$ / $I_{T(AV)}$

**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**




$t_p$ ≤ 20 ms ;

(1) $dI_T/dt$ limit

**Fig. 5. Total power dissipation as a function of RMS on-state current; 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 | | - | 40 | - | K/W |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient free air | in free air | | - | 150 | - | K/W |

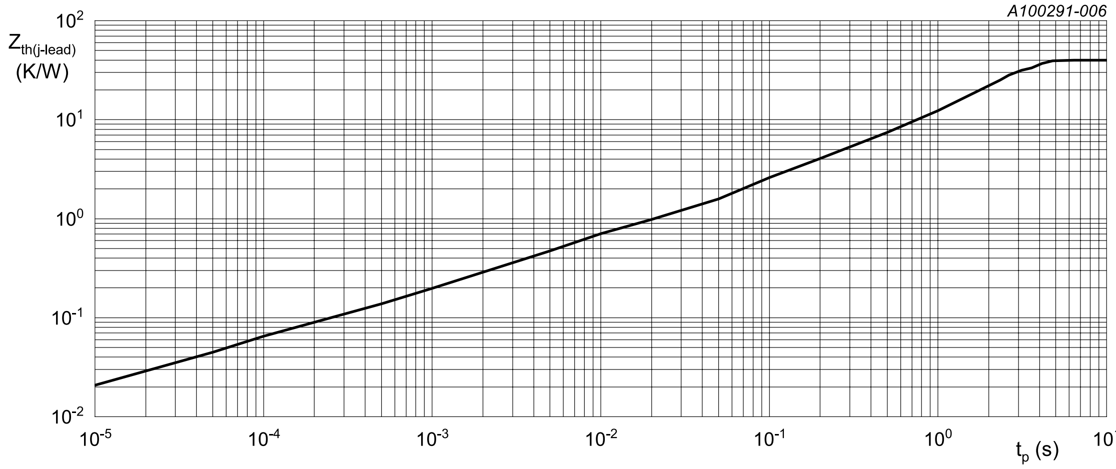
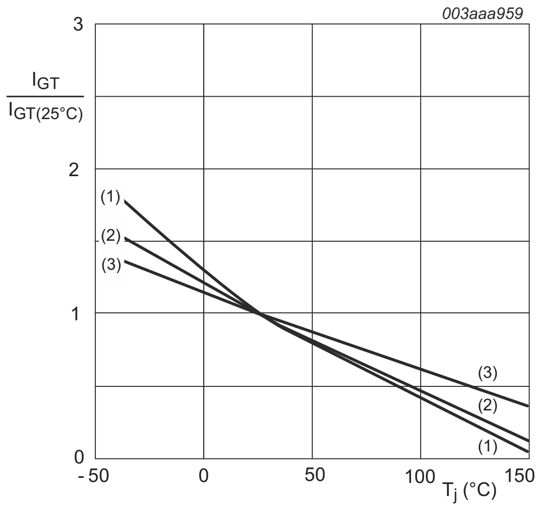



**Fig. 6. Transient thermal impedance from junction to lead as a function of pulse duration**

# 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; T2+ G+; $T_j$ = 25 °C; Fig. 7 | | 1 | - | 10 | mA |
| | | $V_D$ = 12 V; $I_T$ = 0.1 A; T2+ G-; $T_j$ = 25 °C; Fig. 7 | | 1 | - | 10 | mA |
| | | $V_D$ = 12 V; $I_T$ = 0.1 A; T2- G-; $T_j$ = 25 °C; Fig. 7 | | 1 | - | 10 | mA |
| $I_L$ | latching current | $V_D$ = 12 V; $I_T$ = 0.1 A; T2+ G+; $T_j$ = 25 °C; Fig. 8 | | - | - | 12 | mA |
| | | $V_D$ = 12 V; $I_T$ = 0.1 A; T2+ G-; $T_j$ = 25 °C; Fig. 8 | | - | - | 20 | mA |
| | | $V_D$ = 12 V; $I_T$ = 0.1 A; T2- G-; $T_j$ = 25 °C; Fig. 8 | | - | - | 12 | mA |
| $I_H$ | holding current | $V_D$ = 12 V; $T_j$ = 25 °C; Fig. 9 | | - | - | 12 | mA |
| $V_T$ | on-state voltage | $I_T$ = 2.0 A; $T_j$ = 25 °C; Fig. 10 | | - | 1.35 | 1.55 | 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; $T_j$ = 150 °C | | - | - | 2 | mA |
| $I_R$ | reverse current | $V_R$ = 600 V; $T_j$ = 150 °C | | - | - | 2 | 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; | | 600 | - | - | V/µs |
| $dI_{com}/dt$ | rate of change of commutating current | $V_D$ = 400 V; $T_j$ = 125 °C; $I_{T(RMS)}$ = 1 A; $dV_{com}/dt$ = 20 V/µs; (snubberless condition); gate open circuit | | 2.5 | - | - | A/ms |
| | | $V_D$ = 400 V; $T_j$ = 125 °C; $I_{T(RMS)}$ = 1 A; $dV_{com}/dt$ = 10 V/µs; gate open circuit | | 3.5 | - | - | A/ms |




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

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

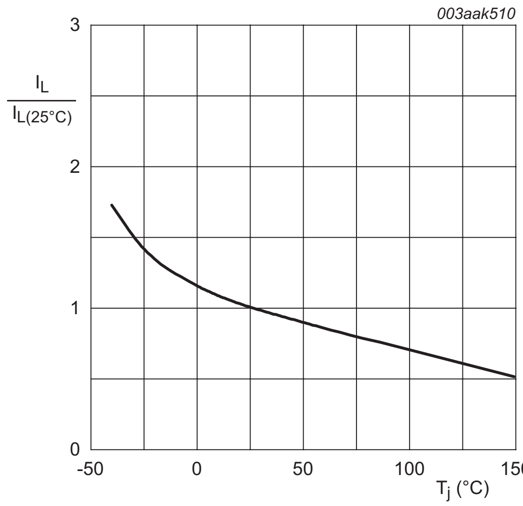



**Fig. 8. Normalized latching current as a function of junction temperature**

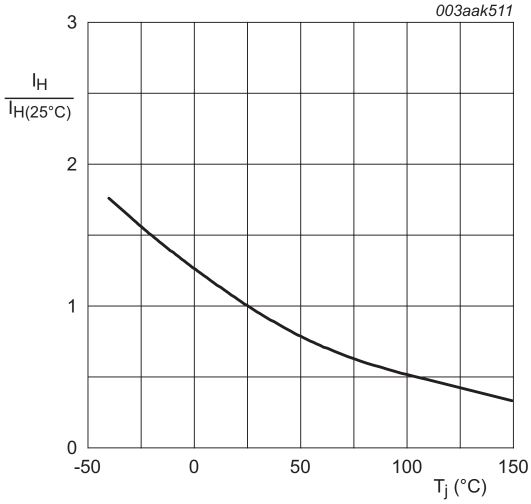
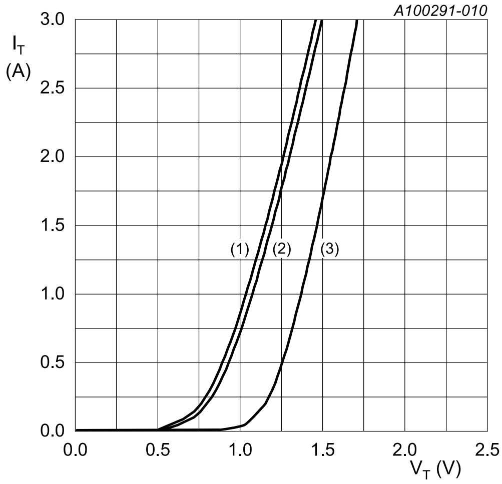



**Fig. 9. Normalized holding current as a function of junction temperature**




$V_o$ = 0.90 V; $R_s$ = 0.177 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**

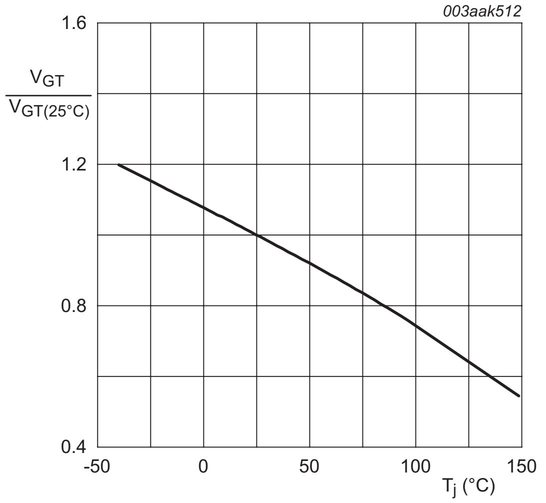
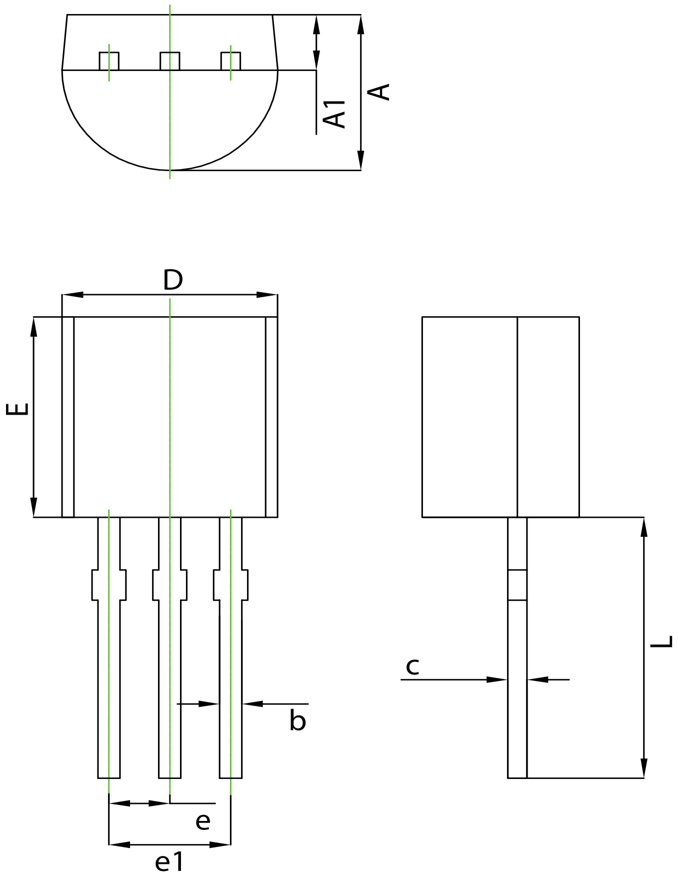



**Fig. 11. Normalized gate trigger voltage as a function of junction temperature**

## 11. Package outline

TO92L 412




| 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 |

· PACKAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS.

# 12. Legal information

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|---|---|---|
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**Date of release: 13 January 2025**