# BT153B-1200T-A

## Automotive Grade SCR

Rev.01 - 25 July 2019

Product data sheet

## 1. General description

Planar passivated Silicon Controlled Rectifier (SCR) in a TO-263 surface mountable plastic package intended for use in applications requiring very high inrush current capability and high bidirectional blocking voltage capability. This product is qualified to AEC-Q101 standard for use in automotive applications.

RoHS Halogen-Free

AEC - Q101 Qualified

## 2. Features and benefits

- High junction operating temperature capability ($T_{j(max)}$ = 150 °C)
- AEC-Q101 compliant
- Planar passivated for voltage ruggedness and reliability
- High voltage capacity
- Very high current surge capability
- Surface mountable package

## 3. Applications

- Automotive battery charger, On Board Charger & Off Board Charger
- DC motor control
- Power converter
- Solid State Relay (SSR)
- Uninterruptible Power Supply (UPS)

## 4. Quick reference data

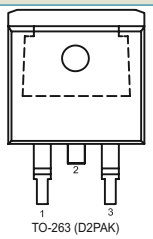
**Table 1. Quick reference data**

| Symbol | Parameter | Conditions | Values | Unit |
|---|---|---|---|---|
| **Absolute maximum rating** | | | | |
| $V_{RRM}$ | repetitive peak reverse voltage | | 1200 | V |
| $I_{T(RMS)}$ | RMS on-state current | half sine wave; $T_{mb} \leq 119$ °C; Fig. 1; Fig. 2; Fig. 3 | 47 | 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 | 350 | A |
| | | half sine wave; $T_{j(init)}$ = 25 °C; $t_p$ = 8.3 ms | 385 | A |
| $T_j$ | junction temperature | | 150 | °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; Fig. 8 | | - | - | 50 | mA |
| $I_H$ | holding current | $V_D$ = 12 V; $T_j$ = 25 °C; Fig. 10 | | - | - | 80 | mA |
| $V_T$ | on-state voltage | $I_T$ = 30 A; $T_j$ = 25 °C; Fig. 11 | | - | - | 1.3 | V |
| **Dynamic characteristics** | | | | | | | |
| $dV_D/dt$ | rate of rise of off-state voltage | $V_{DM}$ = 804 V; $T_j$ = 150 °C; ($V_{DM}$ = 67% of $V_{DRM}$); gate open; exponential waveform; | | 1000 | - | - | V/µs |

## 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 |
|---|---|---|---|---|---|---|
| BT153B-1200T-A | TO263 | BT153B-1200T-AJ | Reel | 800 | TO263N | 26-Sep-2016 |

## 7. Marking

**Table 4. Marking codes**

| Type number | Marking codes |
|---|---|
| BT153B-1200T-A | BT153B-1200T-A |

# 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 | | 1200 | V |
| $V_{RRM}$ | repetitive peak reverse voltage | | 1200 | V |
| $I_{T(AV)}$ | average on-state current | half sine wave; $T_{mb} \leq 119$ °C; | 30 | A |
| $I_{T(RMS)}$ | RMS on-state current | half sine wave; $T_{mb} \leq 119$ °C; Fig. 1; Fig. 2; Fig. 3 | 47 | 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 | 350 | A |
| | | half sine wave; $T_{j(init)} = 25$ °C; $t_p = 8.3$ ms | 385 | A |
| $I^2t$ | $I^2t$ for fusing | $t_p = 10$ms; sine wave | 612.5 | $A^2s$ |
| $dI_T/dt$ | rate of rise of on-state current | $I_G = 100$mA | 150 | A/µs |
| $I_{GM}$ | peak gate current | | 5 | A |
| $V_{GM}$ | peak gate voltage | | 5 | V |
| $P_{GM}$ | peak gate power | | 20 | W |
| $P_{G(AV)}$ | average gate power | over any 20 ms period | 0.5 | W |
| $T_{stg}$ | storage temperature | | -40 to 150 | °C |
| $T_j$ | junction temperature | | 150 | °C |

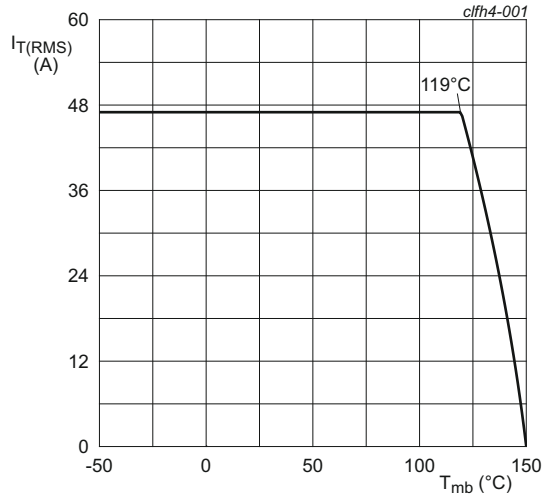
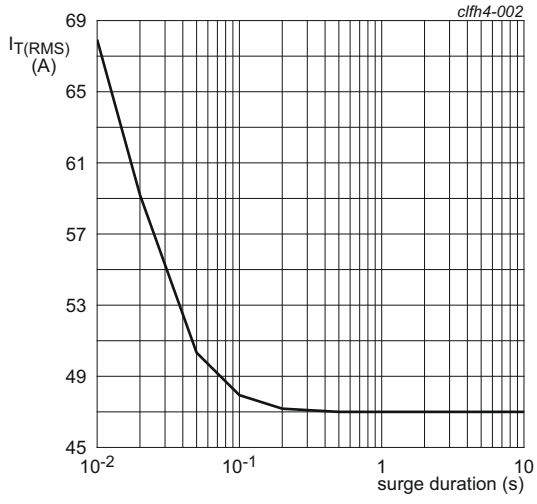
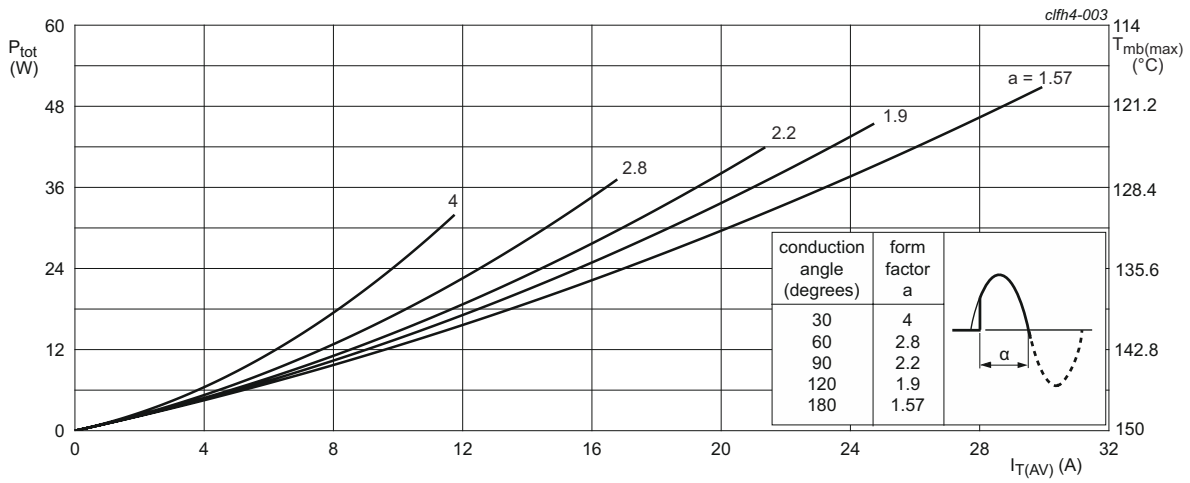



**Fig. 1. RMS on-state current as a function of mounting base temperature; maximum values**




f = 50 Hz; $T_{mb} = 119$ °C

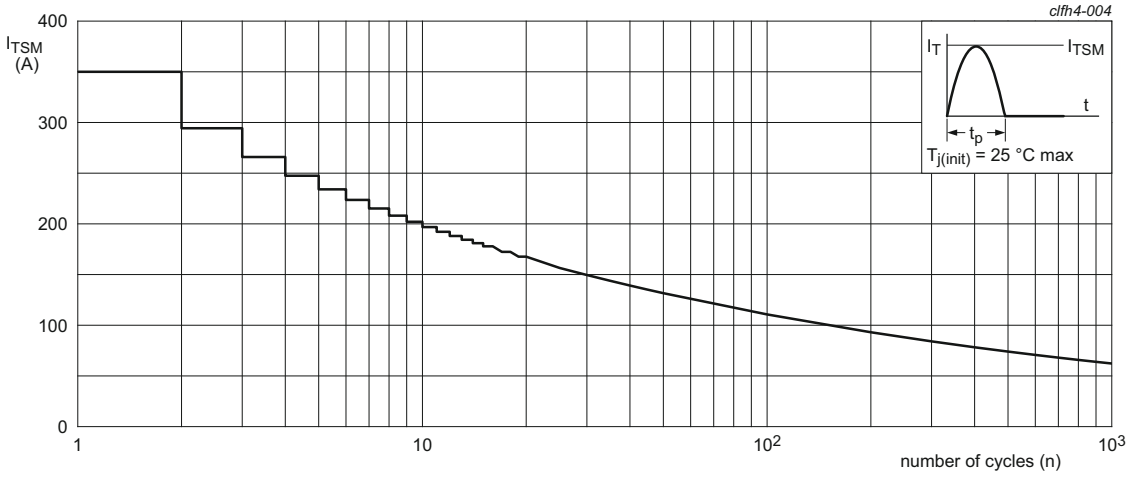
**Fig. 2. RMS on-state current as a function of surge duration; maximum values**




α = conduction angle

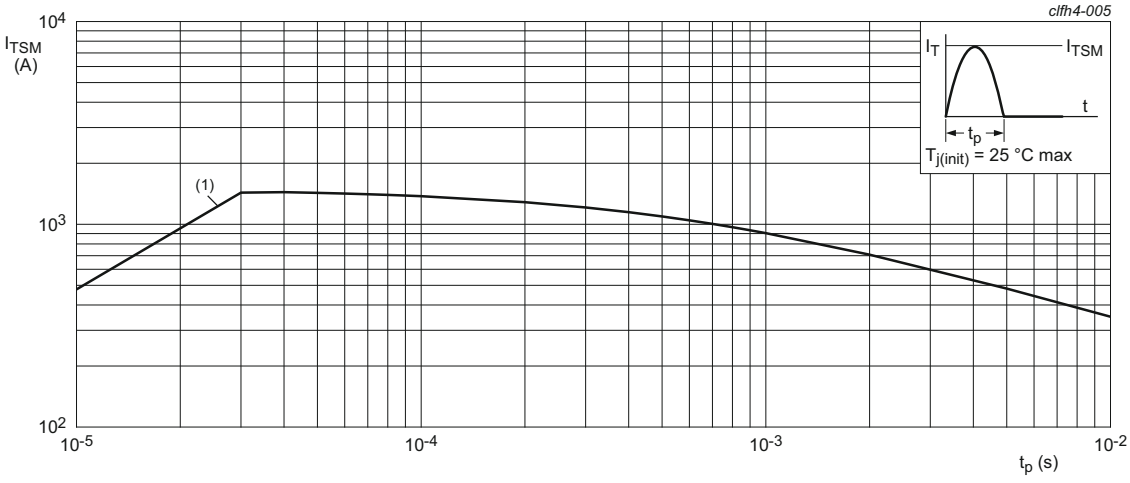
a = form factor = $I_{T(RMS)}$ / $I_{T(AV)}$

**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 ;

(1) $dI_T/dt$ limit

**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 |
|---|---|---|---|---|---|---|---|
| $R_{th(j-mb)}$ | thermal resistance from junction to mounting base | Fig. 6 | | - | - | 0.6 | K/W |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient free air | in free air | | - | 55 | - | K/W |

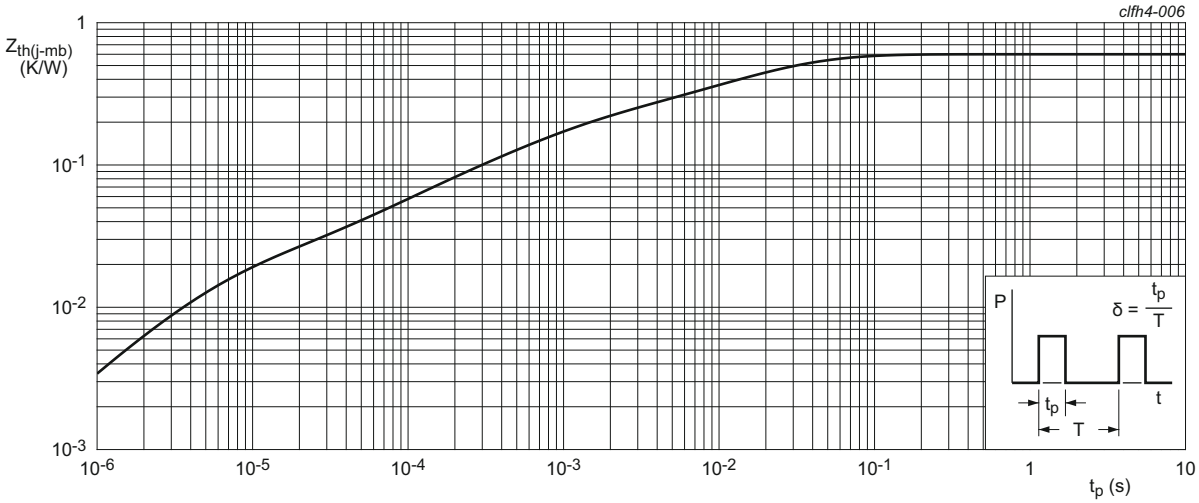



**Fig. 6. Transient thermal impedance from junction to mounting base as a function of pulse duration**

# 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; Fig. 8 | | - | - | 50 | mA |
| $I_L$ | latching current | $V_D$ = 12 V; $I_T$ = 0.1 A; $T_j$ = 25 °C; Fig. 9 | | - | - | 100 | mA |
| $I_H$ | holding current | $V_D$ = 12 V; $T_j$ = 25 °C; Fig. 10 | | - | - | 80 | mA |
| $V_T$ | on-state voltage | $I_T$ = 30 A; $T_j$ = 25 °C; Fig. 11 | | - | - | 1.3 | V |
| $V_{GT}$ | gate trigger voltage | $V_D$ = 12 V; $I_T$ = 0.1 A; $T_j$ = 25 °C; Fig. 12 | | - | 0.75 | 1 | V |
| | | $V_D$ = 1200 V; $I_T$ = 0.1 A; $T_j$ = 150 °C | | 0.2 | 0.45 | - | V |
| $I_D$ | off-state current | $V_D$ = 1200 V; $T_j$ = 125 °C | | - | - | 2 | mA |
| $I_R$ | reverse current | $V_D$ = 1200 V; $T_j$ = 125 °C | | - | - | 2 | mA |
| **Dynamic characteristics** | | | | | | | |
| $dV_D/dt$ | rate of rise of off-state voltage | $V_{DM}$ = 804 V; $T_j$ = 150 °C; ($V_{DM}$ = 67% of $V_{DRM}$); gate open; exponential waveform | | 1000 | - | - | V/µs |
| $t_{gt}$ | gate-controlled turn-on time | $I_{TM}$ = 30 A; $V_D$ = 800 V; $I_G$ = 100 mA; $(dI_G/dt)_M$ = 5 A/µs; $T_j$ = 25 °C | | | 2 | - | µs |
| $t_q$ | commutated turn-off time | $V_{DM}$ = 804 V; $T_j$ = 125 °C; $I_{TM}$ = 30 A; $V_R$ = 25 V; $dV_D/dt$ = 50 V/µs; $(dI_T/dt)_M$ = 30 A/µs; ($V_{DM}$ = 67% of $V_{DRM}$) | | | 70 | - | µs |

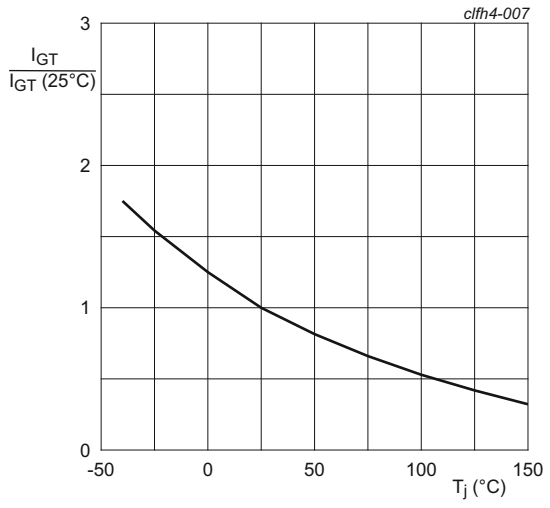



**Fig. 7. Normalized gate trigger current as a function of junction temperature**

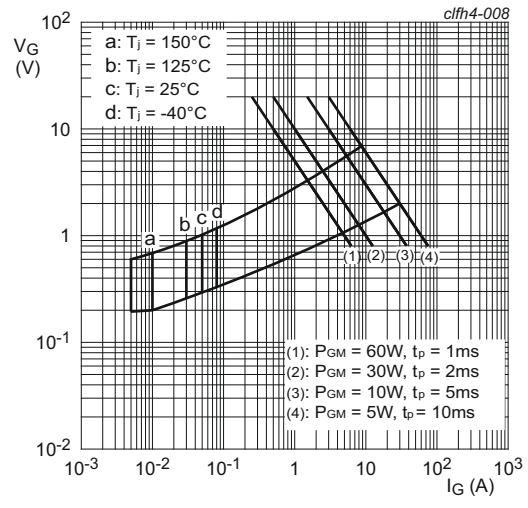



**Fig. 8. Gate voltage as a function of gate current**

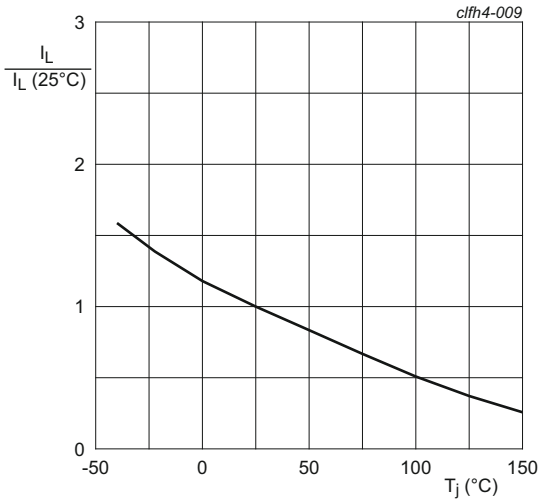



**Fig. 9. Normalized latching current as a function of junction temperature**

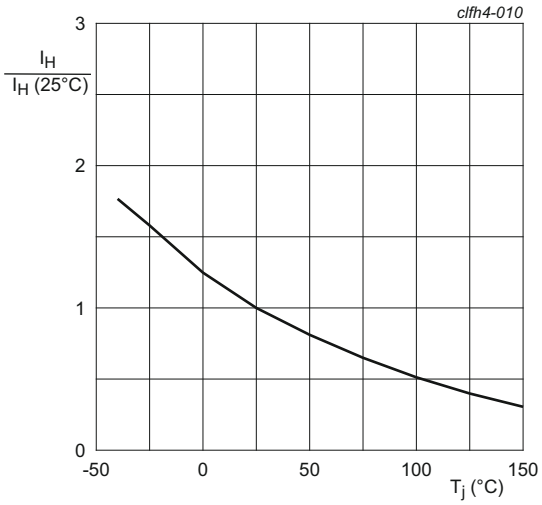
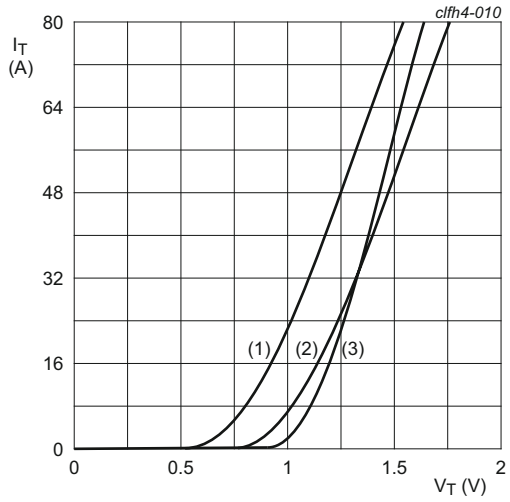



**Fig. 10. Normalized holding current as a function of junction temperature**




$V_o$ = 1.039 V; $R_s$ = 0.0089 Ω
(1) $T_j$ = 150 °C; typical values
(2) $T_j$ = 150 °C; maximum values
(3) $T_j$ = 25 °C; maximum values

**Fig. 11. On-state current as a function of on-state voltage**

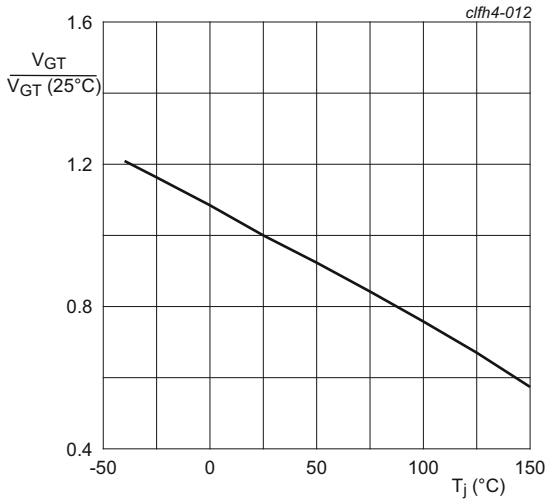
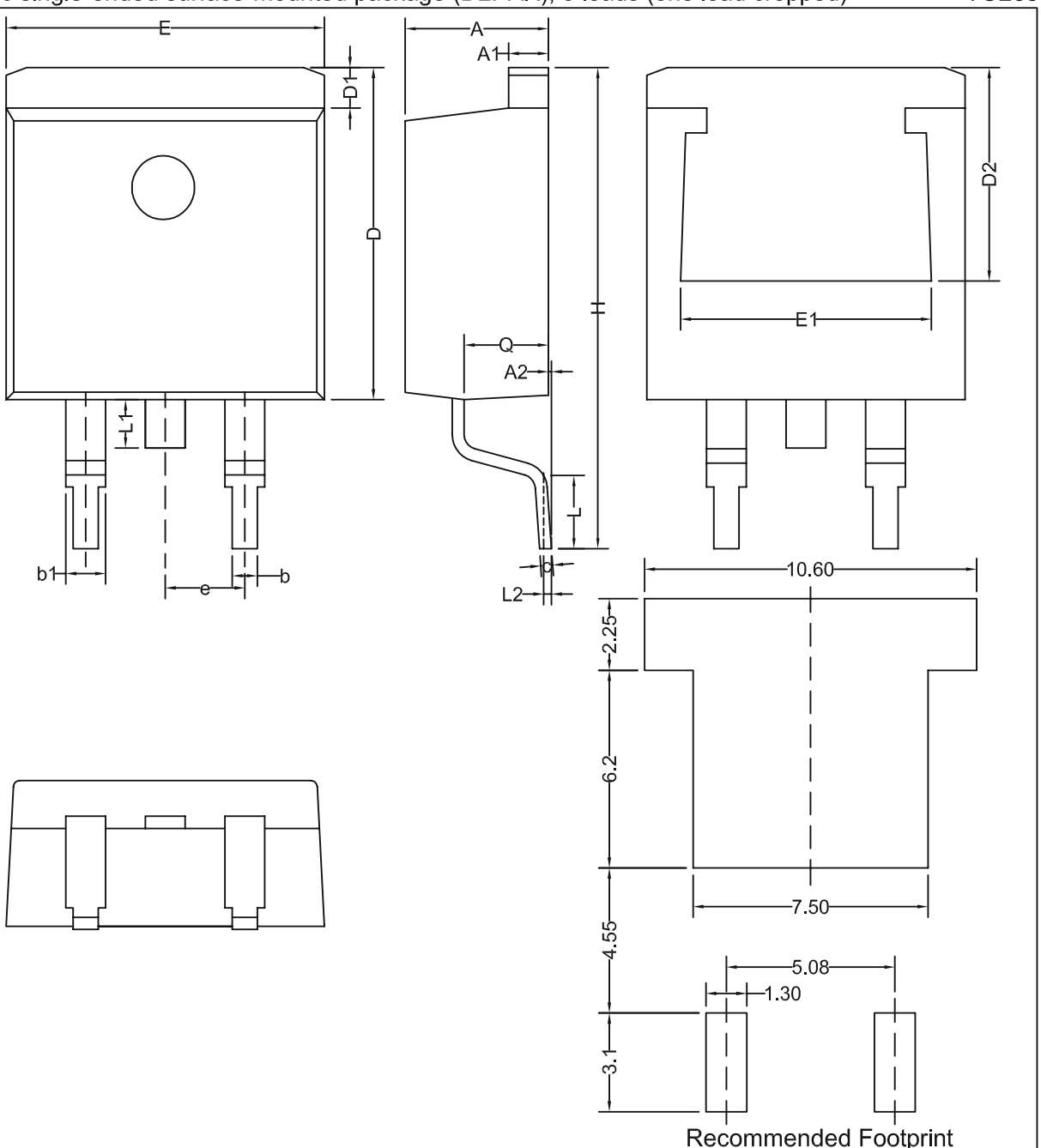



**Fig. 12. Normalized gate trigger voltage as a function of junction temperature**

## 11. Package outline

Plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped) TO263




| Unit | A | A1 | A2 | b | b1 | c | D | D1 | D2 | e | E | E1 | H | L | L1 | L2 | Q |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| min | 4.10 | 1.22 | 0.00 | 0.60 | 1.05 | 0.34 | --- | 1.20 | 6.60 | 2.54 (BSC) | 9.70 | 7.80 | 14.80 | 2.10 | --- | 0.25 (BSC.) | 2.20 |
| max | 4.70 | 1.40 | 0.25 | 0.90 | 1.45 | 0.64 | 11.00 | 1.60 | --- | | 10.30 | --- | 15.80 | 2.90 | 1.75 | | 2.79 |

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