

1. General description

Planar passivated Silicon Controlled Rectifier (SCR) in a TO-263 surface mountable plastic package intended for use in applications requiring good bidirectional blocking voltage and high inrush current capability, high thermal cycling performance and high junction temperature capability ($T_{j(max)} = 150$ °C).

2. Features and benefits

- Good bidirectional blocking voltage capability
- High current surge capability
- High thermal cycling performance
- Surface mountable package
- Planar passivated for voltage ruggedness and reliability
- High junction operating temperature capability ($T_{j(max)} = 150$ °C)

3. Applications

- Capacitive Discharge Ignition (CDI)
- Crowbar protection
- Inrush protection
- Motor control
- Voltage regulation
- High junction operating temperature capability ($T_{j(max)} = 150$ °C)

4. Quick reference data

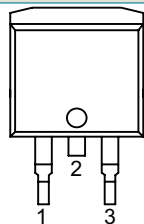

Table 1. Quick reference data

| Symbol | Parameter | Conditions | Values | Unit |
|--------------------------------|--------------------------------------|---|--------|------|
| Absolute maximum rating | | | | |
| V_{RRM} | repetitive peak reverse voltage | | 650 | V |
| $I_{T(RMS)}$ | RMS on-state current | half sine wave; $T_{mb} \leq 136$ °C; Fig. 1 ; Fig. 2 ; Fig. 3 | 12 | 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 | 120 | A |
| | | half sine wave; $T_{j(init)} = 25$ °C; $t_p = 8.3$ ms | 132 | A |
| T_j | junction temperature | | 150 | °C |

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------|-----------------------------------|--|-----|------|-----|------------|
| Static characteristics | | | | | | |
| I_{GT} | gate trigger current | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; $T_j = 25\text{ °C}$; Fig. 7 | - | - | 5 | mA |
| I_H | holding current | $V_D = 12\text{ V}$; $T_j = 25\text{ °C}$; Fig. 9 | - | - | 20 | mA |
| V_T | on-state voltage | $I_T = 12\text{ A}$; $T_j = 25\text{ °C}$; Fig. 10 | - | 1.14 | 1.4 | V |
| Dynamic characteristics | | | | | | |
| dV_D/dt | rate of rise of off-state voltage | $V_{DM} = 402\text{ V}$; $T_j = 150\text{ °C}$; $R_{GK} = 100\ \Omega$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform; | 200 | 1000 | - | V/ μ s |

5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|--------|---------------------------------|---|---|
| 1 | K | cathode |  |  sym037 |
| 2 | A | anode | | |
| 3 | G | gate | | |
| mb | A | mounting base; connect 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 |
|--------------|--------------|-----------------------|----------------|------------------------|-----------------|--------------------|
| TYN12B-600LT | TO-263 | TYN12B-600J | Reel | 800 | TO-263E | 26-May-2017 |

7. Marking

Table 4. Marking codes

| Type number | Marking codes |
|--------------|---------------|
| TYN12B-600LT | TYN12B-600LT |

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 | | 650 | V |
| V_{RRM} | repetitive peak reverse voltage | | 650 | V |
| $I_{T(AV)}$ | average on-state current | half sine wave; $T_{mb} \leq 136\text{ °C}$; | 7.5 | A |
| $I_{T(RMS)}$ | RMS on-state current | half sine wave; $T_{mb} \leq 136\text{ °C}$; Fig. 1 ; Fig. 2 ; Fig. 3 | 12 | A |
| I_{TSM} | non-repetitive peak on-state current | half sine wave; $T_{j(\text{init})} = 25\text{ °C}$; $t_p = 10\text{ ms}$; Fig. 4 ; Fig. 5 | 120 | A |
| | | half sine wave; $T_{j(\text{init})} = 25\text{ °C}$; $t_p = 8.3\text{ ms}$ | 132 | A |
| I^2t | I^2t for fusing | $t_p = 10\text{ ms}$; sine wave | 72 | A ² s |
| di_T/dt | rate of rise of on-state current | $I_G = 10\text{ mA}$ | 50 | A/ μ s |
| I_{GM} | peak gate current | | 2 | A |
| V_{GM} | peak gate voltage | | 5 | V |
| 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 to 150 | °C |
| T_j | junction temperature | | 150 | °C |

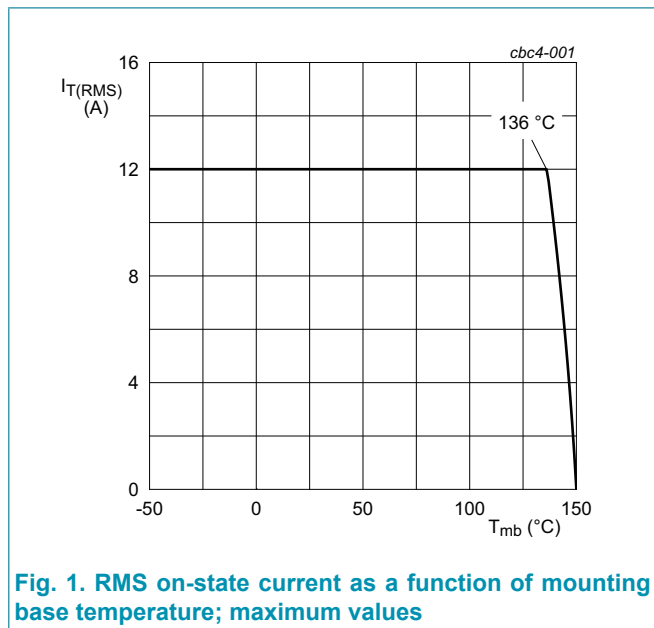


Fig. 1. RMS on-state current as a function of mounting base temperature; maximum values

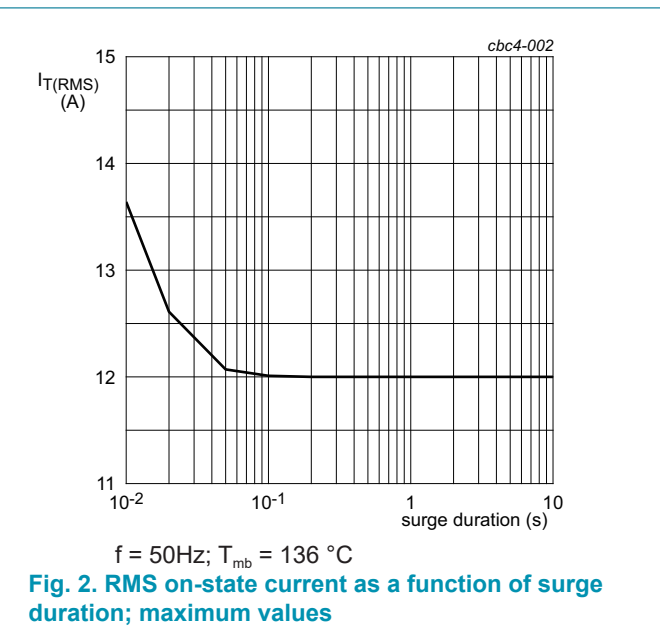


Fig. 2. RMS on-state current as a function of surge duration; maximum values

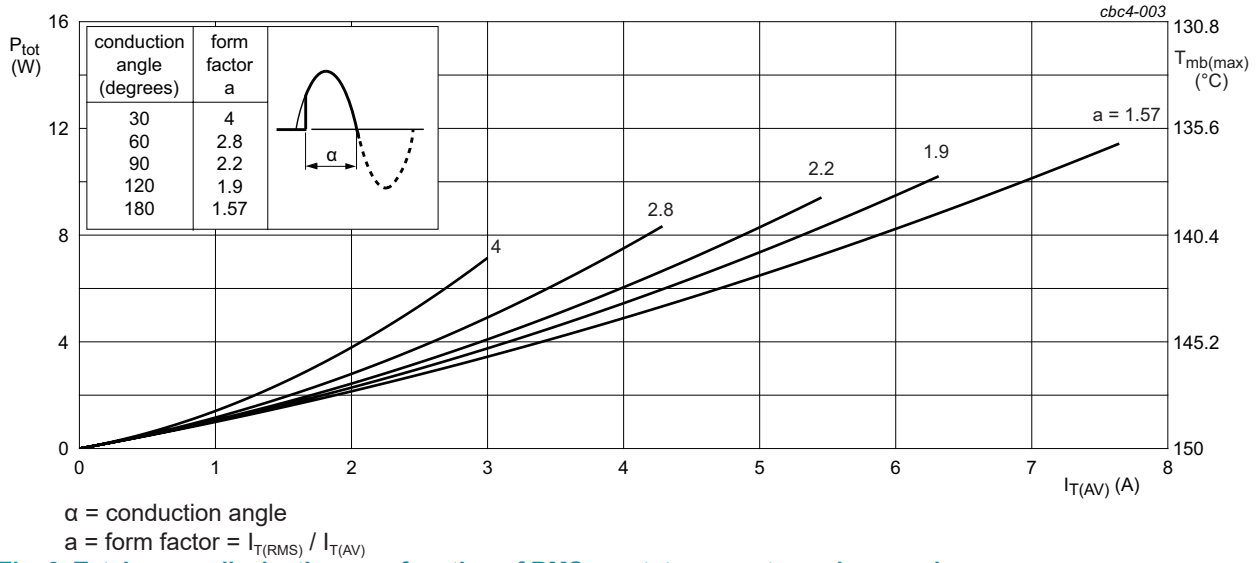


Fig. 3. Total power dissipation as a function of RMS on-state current; maximum values

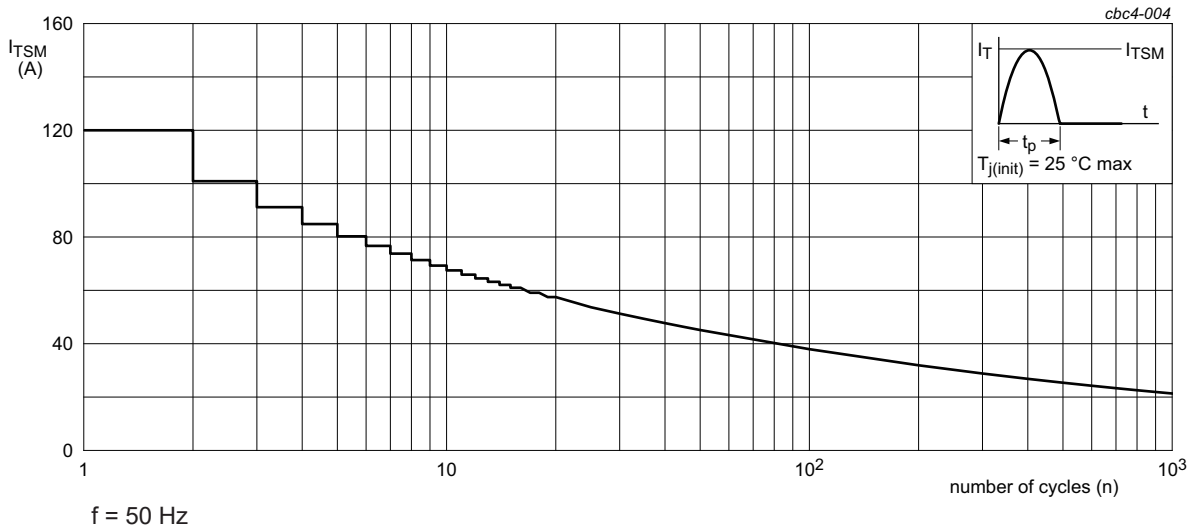


Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values

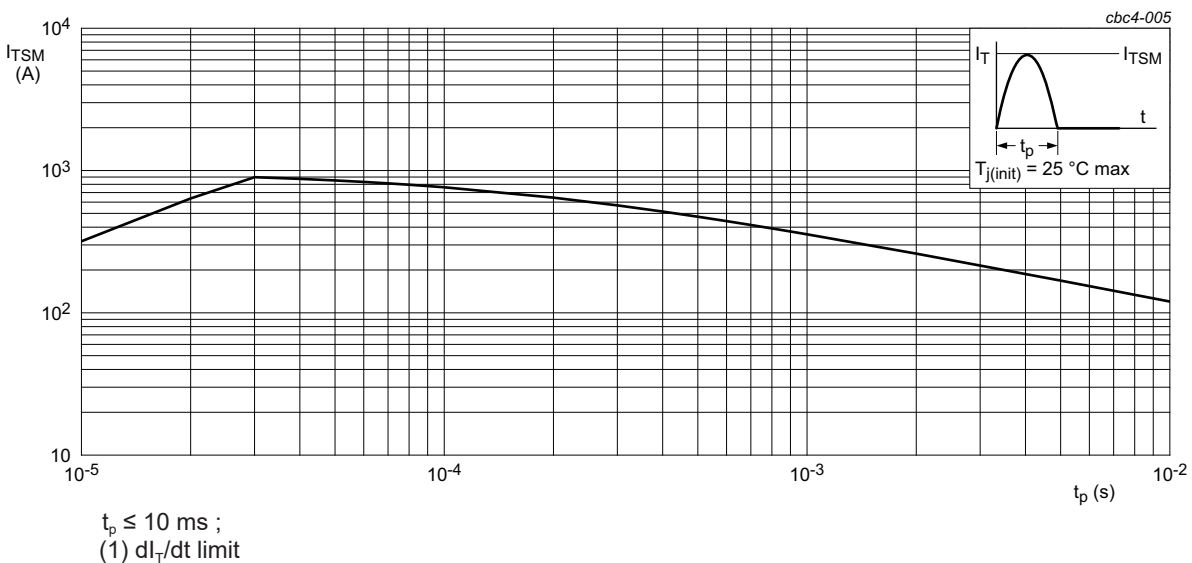


Fig. 5. Total power dissipation as a function of RMS on-state current; maximum values

9. Thermal characteristics

Table 6. Thermal characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|----------------|--|------------------------------|-----|-----|-----|------|
| $R_{th(j-mb)}$ | thermal resistance from junction to mounting base | Fig. 6 | - | - | 1.2 | K/W |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient free air | minimum footprint, FR4 board | - | 55 | - | K/W |

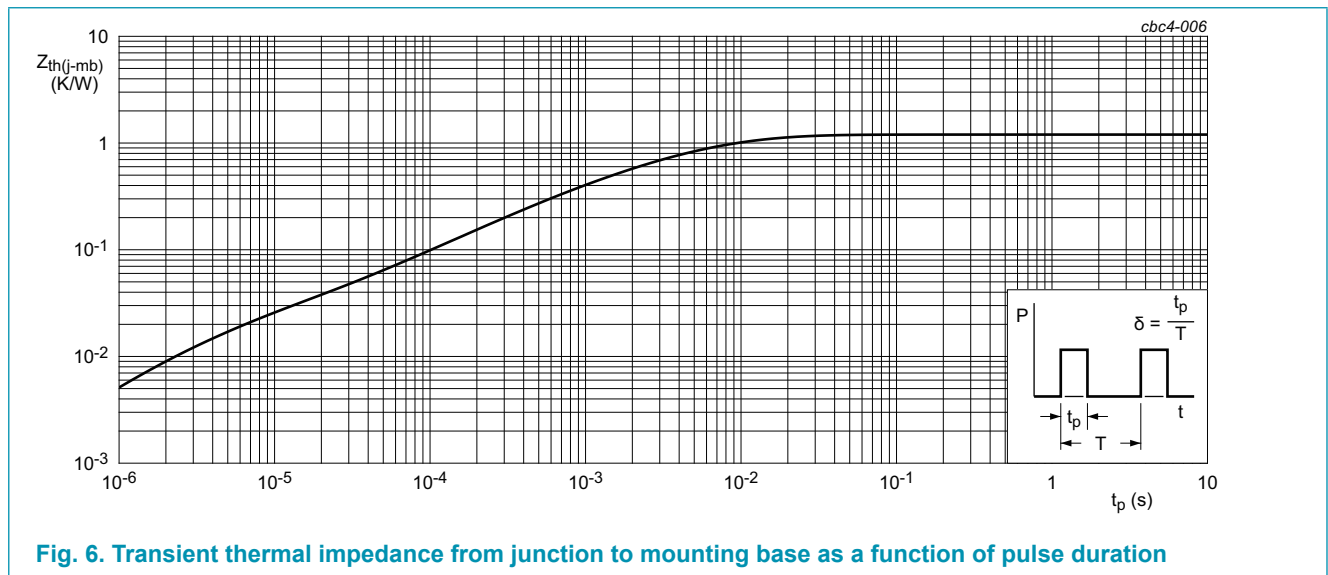


Fig. 6. Transient thermal impedance from junction to mounting base as a function of pulse duration

10. Characteristics

Table 7. Characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------|-----------------------------------|---|------|------|-----|------------------|
| Static characteristics | | | | | | |
| I_{GT} | gate trigger current | $V_D = 12\text{ V}; I_T = 0.1\text{ A}; T_j = 25\text{ }^\circ\text{C}$; Fig. 7 | - | - | 5 | mA |
| I_L | latching current | $V_D = 12\text{ V}; I_T = 0.1\text{ A}; T_j = 25\text{ }^\circ\text{C}$; Fig. 8 | - | - | 40 | mA |
| I_H | holding current | $V_D = 12\text{ V}; T_j = 25\text{ }^\circ\text{C}$; Fig. 9 | - | - | 20 | mA |
| V_T | on-state voltage | $I_T = 12\text{ A}; T_j = 25\text{ }^\circ\text{C}$; Fig. 10 | - | 1.14 | 1.4 | V |
| V_{GT} | gate trigger voltage | $V_D = 12\text{ V}; I_T = 0.1\text{ A}; T_j = 25\text{ }^\circ\text{C}$; Fig. 11 | - | 0.7 | 1 | V |
| | | $V_D = 400\text{ V}; I_T = 0.1\text{ A}; T_j = 150\text{ }^\circ\text{C}$; Fig. 11 | 0.25 | 0.4 | - | V |
| I_D | off-state current | $V_D = 650\text{ V}; T_j = 150\text{ }^\circ\text{C}$ | - | - | 1 | mA |
| I_R | reverse current | $V_D = 650\text{ V}; T_j = 150\text{ }^\circ\text{C}$ | - | - | 1 | mA |
| Dynamic characteristics | | | | | | |
| dV_D/dt | rate of rise of off-state voltage | $V_{DM} = 402\text{ V}; T_j = 150\text{ }^\circ\text{C}; R_{GK} = 100\text{ }\Omega$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform; | 200 | 1000 | - | V/ μs |
| | | $V_{DM} = 402\text{ V}; T_j = 150\text{ }^\circ\text{C}; (V_{DM} = 67\%$ of V_{DRM}); exponential waveform; gate open circuit | 50 | - | - | V/ μs |
| t_{gt} | gate-controlled turn-on time | $I_{TM} = 12\text{ A}; V_D = 600\text{ V}; I_G = 10\text{ mA}; (dI_G/dt)_M = 5\text{ A}/\mu\text{s}; T_j = 25\text{ }^\circ\text{C}$ | - | 2 | - | μs |
| t_q | commutated turn-off time | $V_{DM} = 402\text{ V}; T_j = 150\text{ }^\circ\text{C}; I_{TM} = 12\text{ A}; V_R = 25\text{ V}; dV_D/dt = 30\text{ V}/\mu\text{s}; (dI_T/dt)_M = 30\text{ A}/\mu\text{s}; R_{GK(ext)} = 100\text{ }\Omega$; ($V_{DM} = 67\%$ of V_{DRM}) | - | 70 | - | μs |

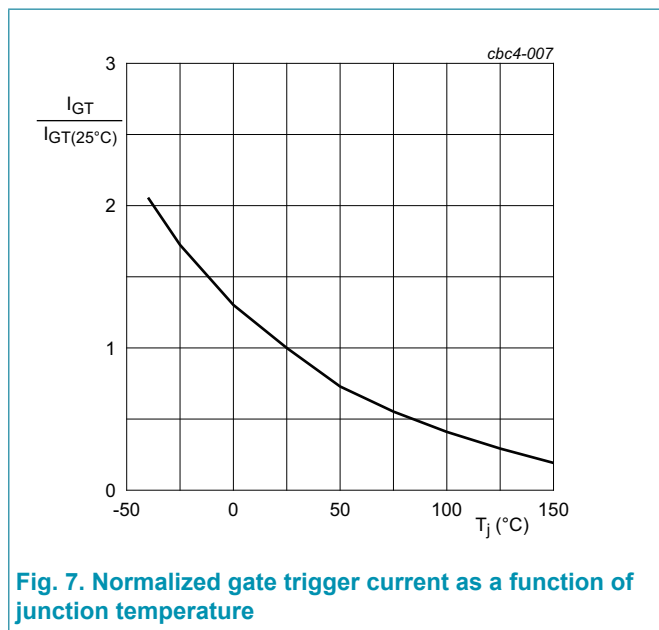


Fig. 7. Normalized gate trigger current as a function of junction temperature

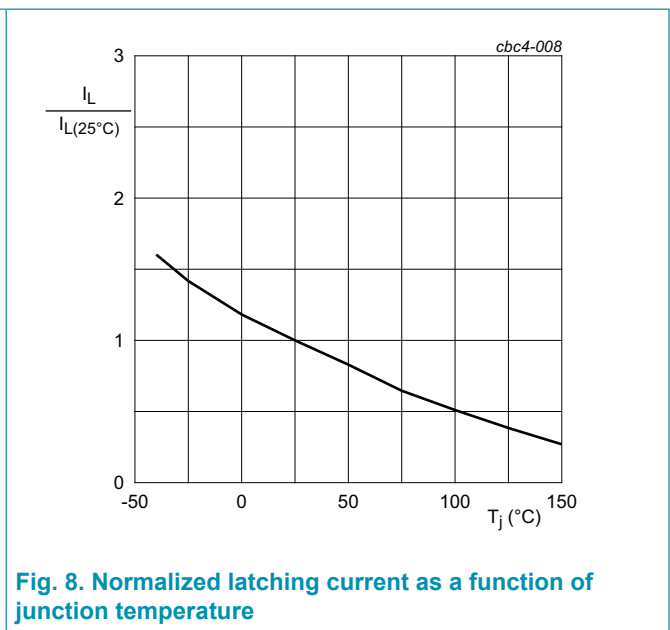


Fig. 8. Normalized latching current as a function of junction temperature

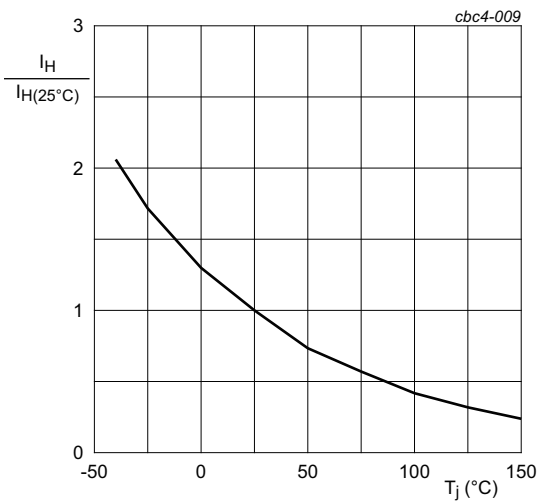
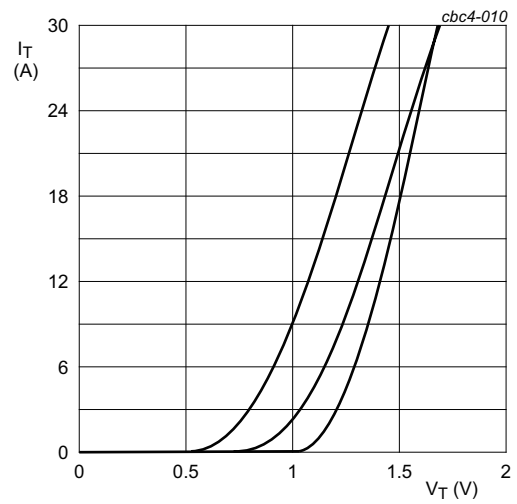


Fig. 9. Normalized holding current as a function of junction temperature



$V_o = 0.922 \text{ V}; R_s = 0.0304 \Omega$
 (1) $T_j = 150^\circ\text{C}$; typical values
 (2) $T_j = 150^\circ\text{C}$; maximum values
 (3) $T_j = 25^\circ\text{C}$; maximum values

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

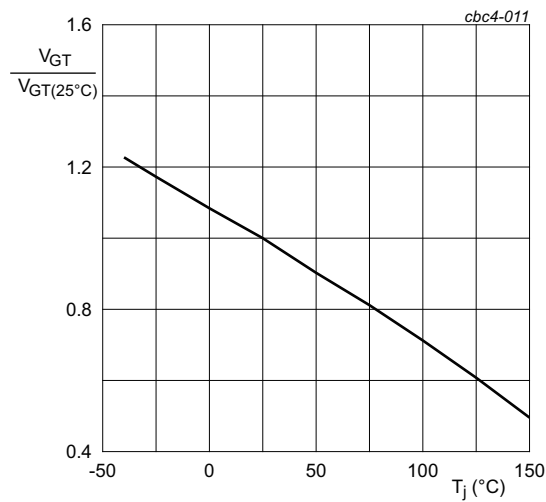
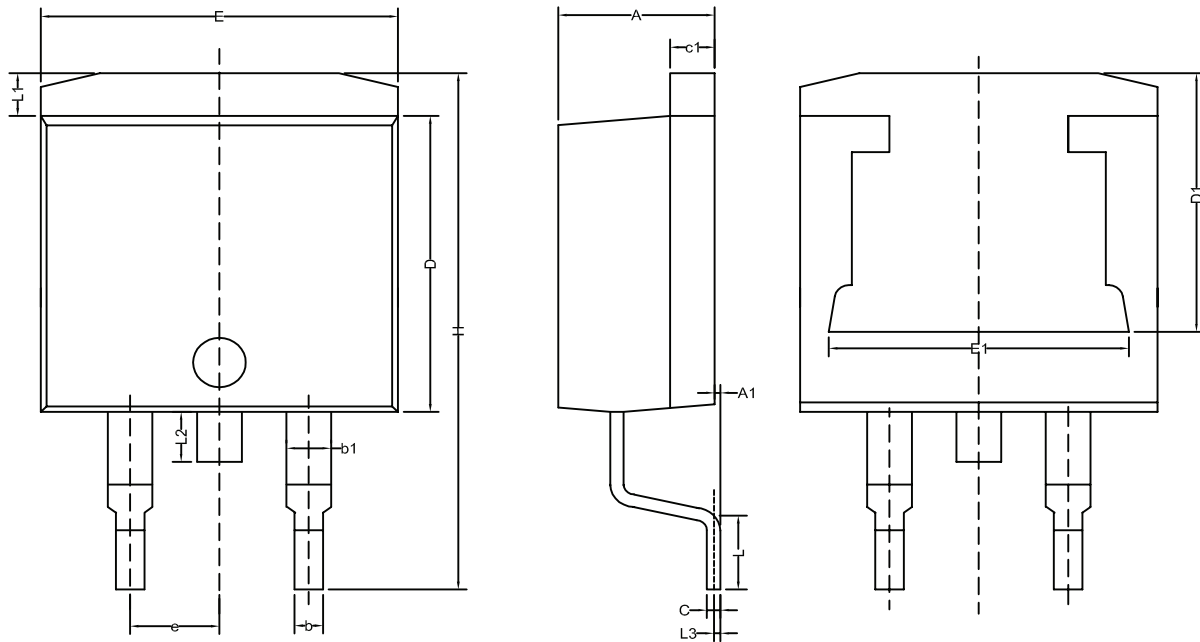


Fig. 11. Normalized gate trigger voltage as a function of junction temperature

11. Package outline

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

TO263



| Unit | A | A1 | b | b1 | c | c1 | D | D1 | E | E1 | e | H | L | L1 | L2 | L3 |
|------|-----|------|------|------|------|------|------|------|------|-------|------|-------|------|------|------|--------|
| MM | min | 4.35 | 0.00 | 0.69 | 1.14 | 0.38 | 1.14 | 8.50 | 7.50 | 10.00 | 8.25 | 14.60 | 2.50 | 1.00 | 1.27 | |
| | max | 4.75 | 0.15 | 0.99 | 1.73 | 0.61 | 1.40 | 9.02 | 8.00 | 10.40 | 8.80 | 15.60 | 2.79 | 1.65 | 1.78 | 0.25 |
| | | | | | | | | | | | 2.54 | | | | | (BSC.) |

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|--------------------------------|--------------------|---|
| 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. |

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- [2] The term 'short data sheet' is explained in section "Definitions".
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13. 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. Marking..... | 3 |
| 8. Limiting values | 3 |
| 9. Thermal characteristics | 5 |
| 10. Characteristics..... | 6 |
| 11. Package outline | 8 |
| 12. Legal information | 9 |
| 13. Contents | 11 |

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