# BULB7216
# BUL7216

## High voltage fast-switching NPN power transistor

## Features

- Low spread of dynamic parameters
- High voltage capability
- Minimum lot-to-lot spread for reliable operation
- Very high switching speed

## Applications

- Electronic ballast for fluorescent lighting (277 V push-pull and 347 V half bridge topoligies)

## Description

The devices are manufactured using diffused collector technology to enhance switching speeds and tight $h_{FE}$ while maintaining the wide RBSOA.

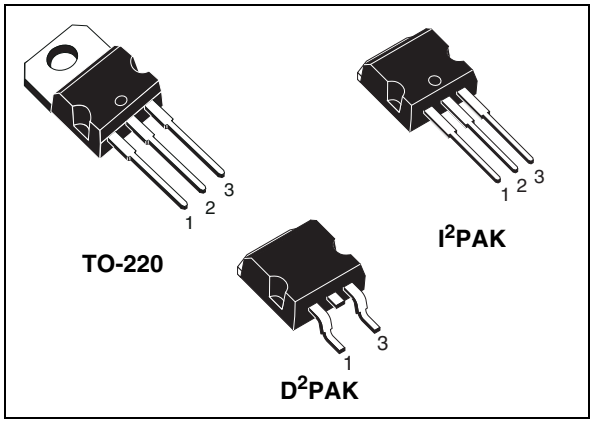



**Figure 1. Internal schematic diagram**

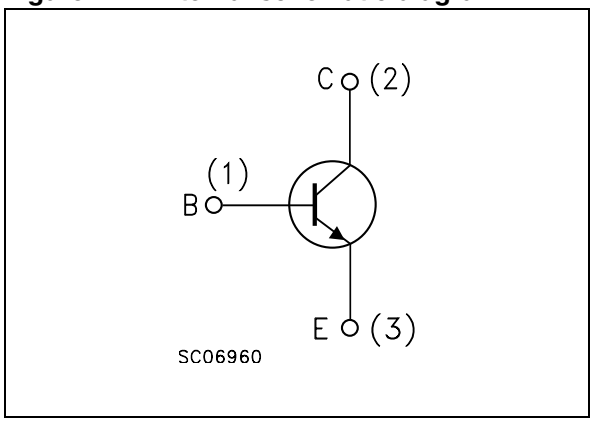



**Table 1. Device summary**

| Order code | Marking | Package | Packaging |
|---|---|---|---|
| BUL7216 | BUL7216 | TO-220 | Tube |
| BULB7216-1 | BULB7216 | $I^2PAK$ | Tube |
| BULB7216T4 | BULB7216 | $D^2PAK$ | Tape and reel |

# Contents

# 1 Electrical ratings

**Table 2. Absolute maximum rating**

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $V_{CES}$ | Collector-emitter voltage ($V_{BE}$ = 0) | 1600 | V |
| $V_{CEO}$ | Collector-emitter voltage ($I_B$ = 0) | 700 | V |
| $V_{EBO}$ | Emitter-base voltage ($I_C$ = 0) | 12 | V |
| $I_C$ | Collector current | 3 | A |
| $I_{CM}$ | Collector peak current ($t_P$ < 5ms) | 6 | A |
| $I_B$ | Base current | 1 | A |
| $I_{BM}$ | Base peak current ($t_P$ < 5ms) | 2 | A |
| $P_{tot}$ | Total dissipation at $T_c$ = 25°C | 80 | W |
| $T_{stg}$ | Storage temperature | -65 to 150 | °C |
| $T_J$ | Max. operating junction temperature | 150 | °C |

**Table 3. Thermal data**

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $R_{thj\text{-}case}$ | Thermal resistance junction - case | 1.56 | °C/W |

# 2 Electrical characteristics

($T_{case}$ = 25°C unless otherwise specified)

**Table 4. Electrical characteristics**

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $I_{CES}$ | Collector cut-off current ($V_{BE}$ = 0) | $V_{CE}$ =1600 V<br>$V_{CE}$ =1600 V $T_C$ = 125 °C | | | 0.1<br>0.5 | mA<br>mA |
| $I_{CEO}$ | Collector cut-off current ($I_B$ = 0) | $V_{CE}$ =680 V | | | 0.1 | mA |
| $I_{CBO}$ | Collector cut-off current ($I_E$ = 0) | $V_{CB}$ =1600 V<br>$V_{CB}$ =1600 V $T_C$ = 125 °C | | | 0.1<br>0.5 | mA<br>mA |
| $I_{EBO}$ | Emitter cut-off current ($I_C$ = 0) | $V_{EB}$ =12 V | | | 1 | mA |
| $V_{(BR)CEO}$ (1) | Collector-emitter breakdown voltage ($I_B$ = 0) | $I_C$ = 1 mA | 700 | | | V |
| $V_{(BR)EBO}$ (1) | Emitter-base breakdown voltage ($I_C$ = 0) | $I_E$ = 1 mA | 12 | | | V |
| $V_{(BR)CES}$ (1) | Collector-emitter breakdown voltage ($V_{BE}$ = 0) | $I_C$ = 0.1 mA | 1600 | | | V |
| $V_{CE(sat)}$ (1) | Collector-emitter saturation voltage | $I_C$ = 0.25 A $I_B$ = 25 mA<br>$I_C$ = 0.5 A $I_B$ = 50 mA<br>$I_C$ = 0.8 A $I_B$ = 80 mA | | | 1<br>1.5<br>3 | V<br>V<br>V |
| $V_{BE(sat)}$ (1) | Base-emitter saturation voltage | $I_C$ = 0.5 A $I_B$ = 100 mA<br>$I_C$ = 1 A $I_B$ = 100 mA<br>$I_C$ = 2 A $I_B$ = 400 mA | | | 1<br>1.1<br>1.2 | V<br>V<br>V |
| $h_{FE}$ (1) | DC current gain | $I_C$ = 0.5 A $V_{CE}$ = 1 V<br>$I_C$ = 0.5 A $V_{CE}$ = 3 V<br>$I_C$ = 2 A $V_{CE}$ = 5 V<br>$I_C$ = 1 A $V_{CE}$ = 10 V | 7<br>16<br>4<br>19 | | 18<br>35<br>11 | |
| $t_d$<br>$t_r$<br>$t_s$<br>$t_f$ | Resistive load<br>Delay time<br>Rise time<br>Storage time<br>Fall time | $I_C$ = 0.5 A $V_{CC}$ = 125 V<br>$I_{B1}$ = 50 mA $I_{B2}$ = -0.5 A<br>P.W.= 300 µs D.C.= 2% | | | 0.3<br>1.1<br>0.9<br>0.35 | µs<br>µs<br>µs<br>µs |
| $E_{ar}$ | Repetitive avalanche energy | L = 2 mH C = 1.8 nF<br>$V_{BE(off)}$ = -5 V | 8 | | | mJ |

1. Pulsed duration = 300 µs, duty cycle ≤1.5%

## 2.1 Electrical characteristics (curves)

**Figure 2. Derating curve**

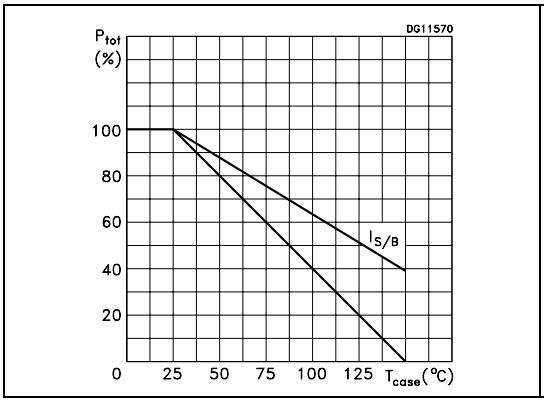



**Figure 3. Reverse biased safe operating area**

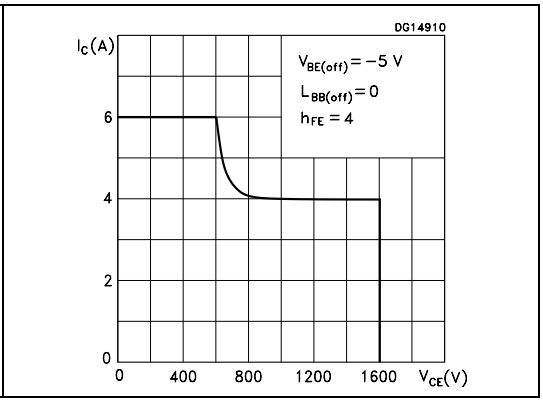



**Figure 4. DC current gain**

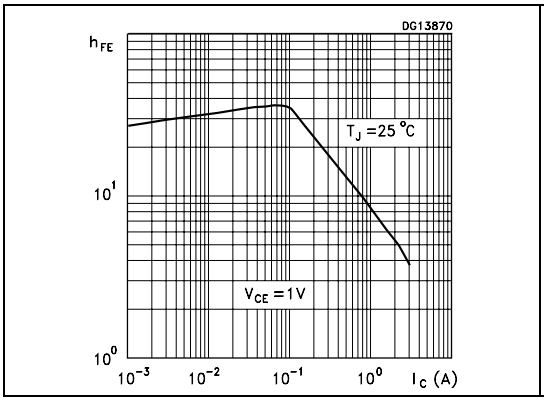



**Figure 5. DC current gain**

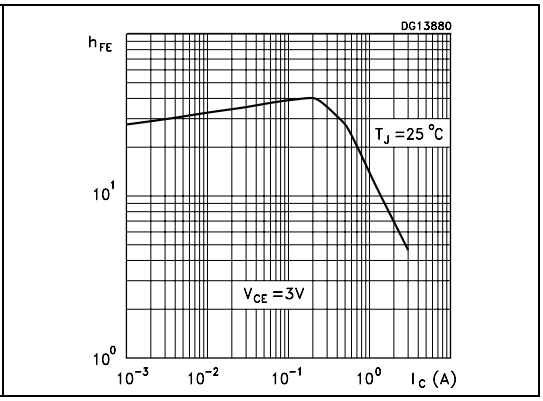



**Figure 6. Collector - emitter saturation voltage**

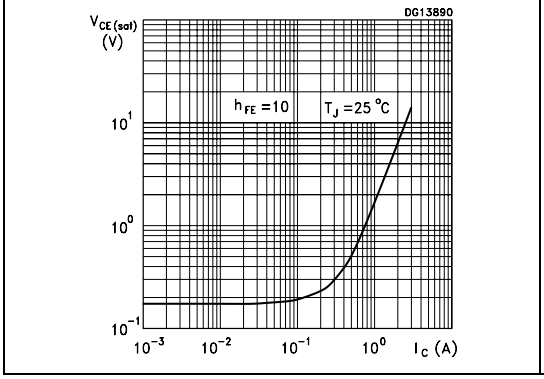



**Figure 7. Base - emitter saturation voltage**

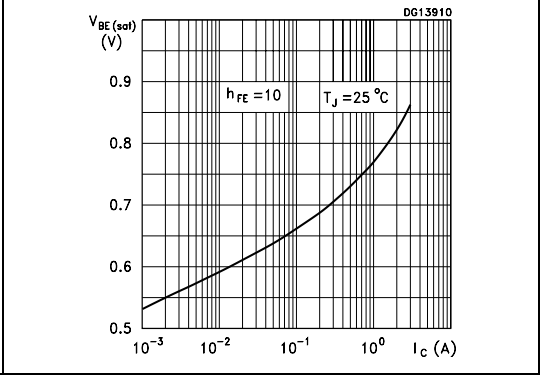


**Figure 8. Resistive load switching time**

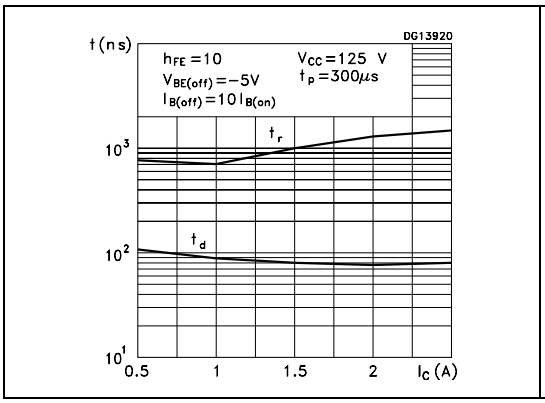
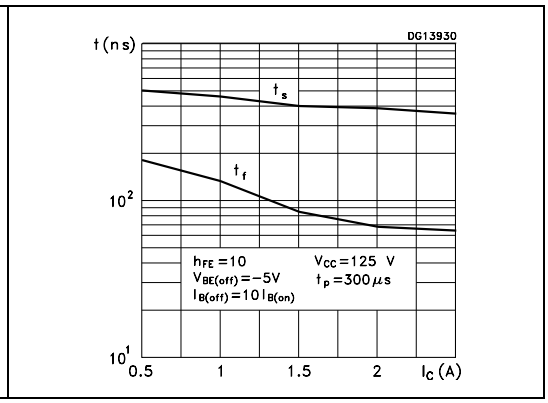



**Figure 9. Resistive load switching time**



# 3 Test circuit

**Figure 10. Energy rating test circuit**

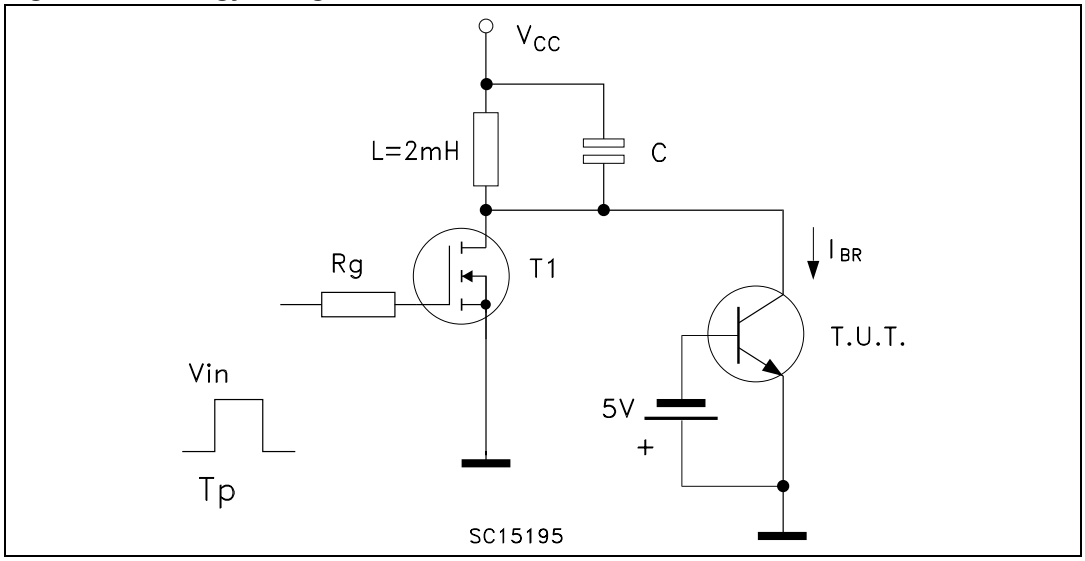
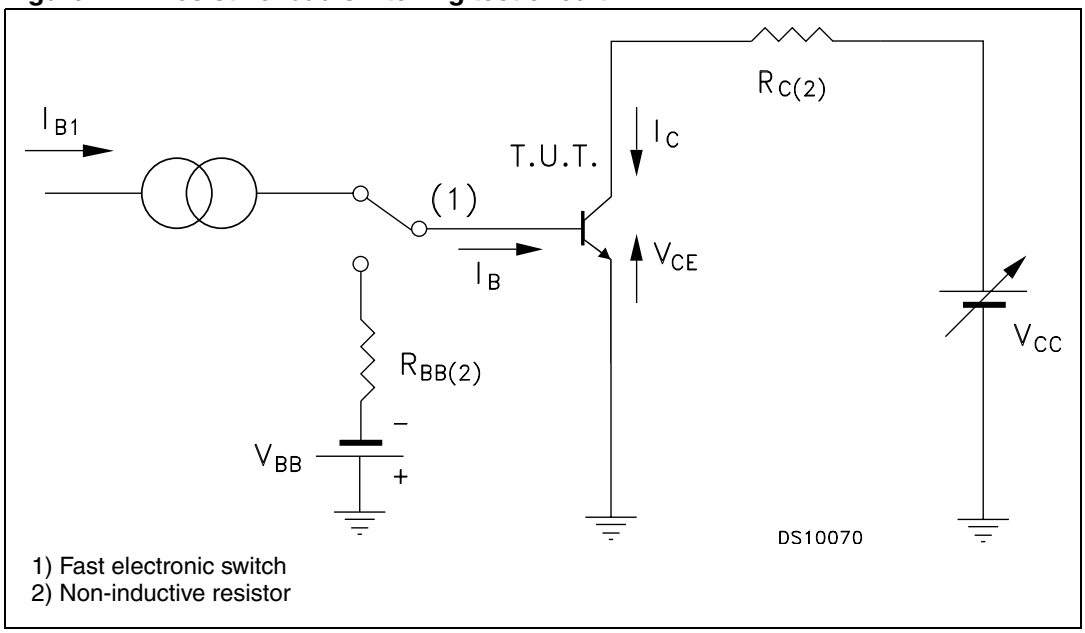



**Figure 11. Resistive load switching test circuit**



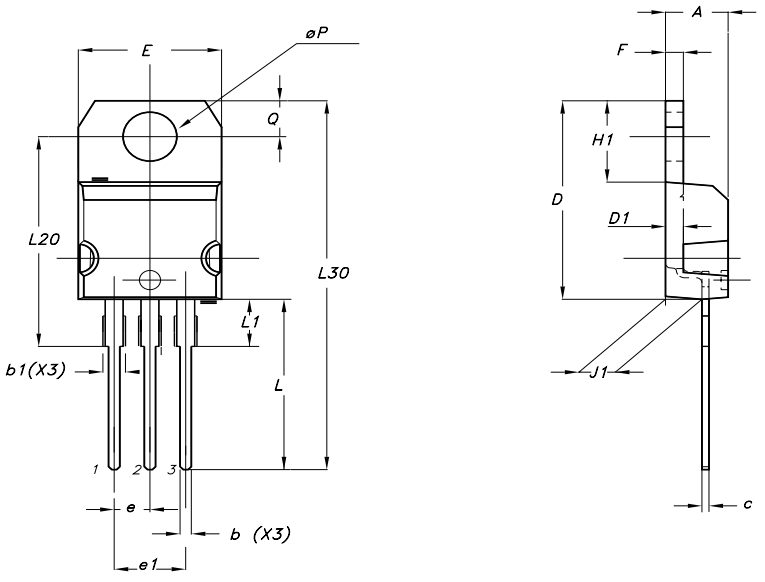

1) Fast electronic switch
2) Non-inductive resistor

# 4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com

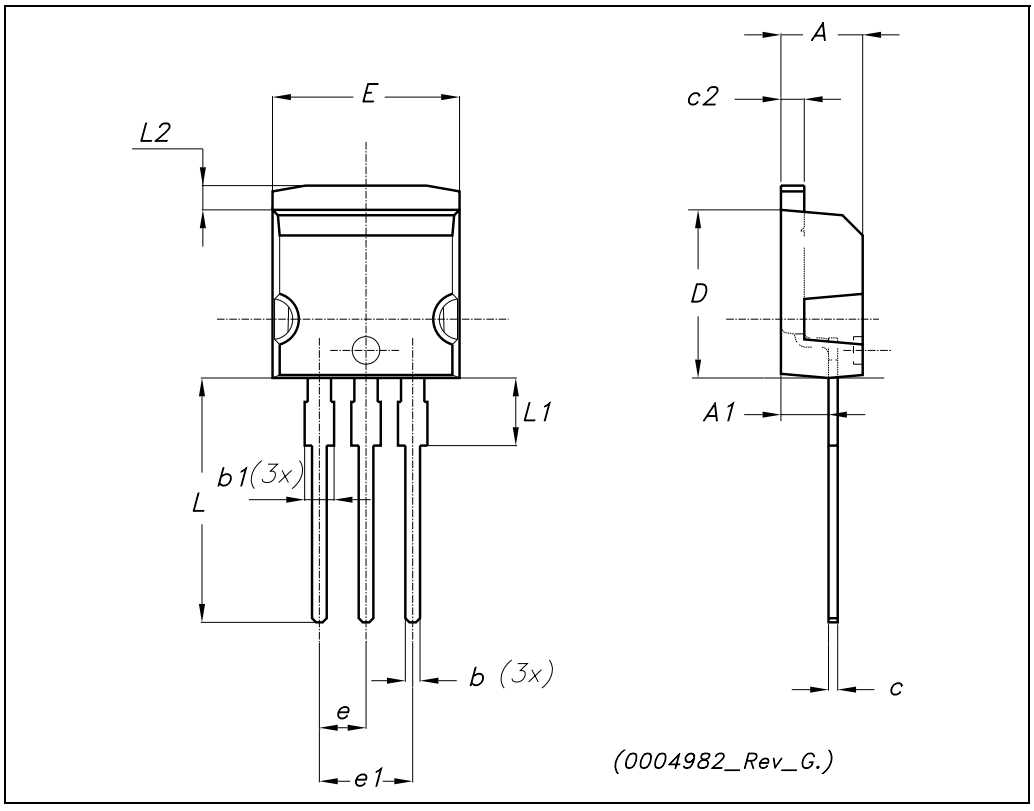
## TO-220 mechanical data

| Dim | mm | | | inch | | |
|---|---|---|---|---|---|---|
| | Min | Typ | Max | Min | Typ | Max |
| A | 4.40 | | 4.60 | 0.173 | | 0.181 |
| b | 0.61 | | 0.88 | 0.024 | | 0.034 |
| b1 | 1.14 | | 1.70 | 0.044 | | 0.066 |
| c | 0.49 | | 0.70 | 0.019 | | 0.027 |
| D | 15.25 | | 15.75 | 0.6 | | 0.62 |
| D1 | | 1.27 | | | 0.050 | |
| E | 10 | | 10.40 | 0.393 | | 0.409 |
| e | 2.40 | | 2.70 | 0.094 | | 0.106 |
| e1 | 4.95 | | 5.15 | 0.194 | | 0.202 |
| F | 1.23 | | 1.32 | 0.048 | | 0.051 |
| H1 | 6.20 | | 6.60 | 0.244 | | 0.256 |
| J1 | 2.40 | | 2.72 | 0.094 | | 0.107 |
| L | 13 | | 14 | 0.511 | | 0.551 |
| L1 | 3.50 | | 3.93 | 0.137 | | 0.154 |
| L20 | | 16.40 | | | 0.645 | |
| L30 | | 28.90 | | | 1.137 | |
| ∅P | 3.75 | | 3.85 | 0.147 | | 0.151 |
| Q | 2.65 | | 2.95 | 0.104 | | 0.116 |



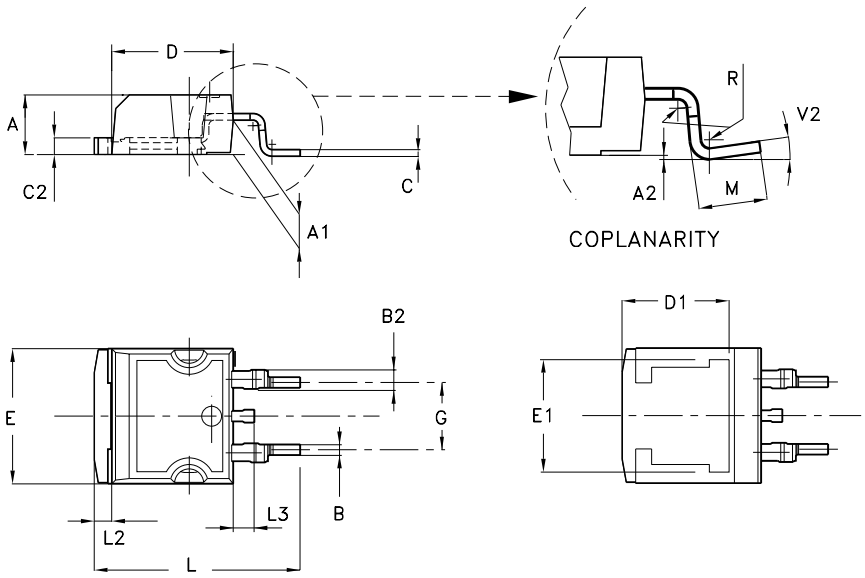
## TO-262 ($I^2$PAK) MECHANICAL DATA

| DIM. | mm. | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A | 4.40 | | 4.60 | 0.173 | | 0.181 |
| A1 | 2.40 | | 2.72 | 0.094 | | 0.107 |
| b | 0.61 | | 0.88 | 0.024 | | 0.034 |
| b1 | 1.14 | | 1.70 | 0.044 | | 0.066 |
| c | 0.49 | | 0.70 | 0.019 | | 0.027 |
| c2 | 1.23 | | 1.32 | 0.048 | | 0.052 |
| D | 8.95 | | 9.35 | 0.352 | | 0.368 |
| e | 2.40 | | 2.70 | 0.094 | | 0.106 |
| e1 | 4.95 | | 5.15 | 0.194 | | 0.202 |
| E | 10 | | 10.40 | 0.393 | | 0.410 |
| L | 13 | | 14 | 0.511 | | 0.551 |
| L1 | 3.50 | | 3.93 | 0.137 | | 0.154 |
| L2 | 1.27 | | 1.40 | 0.050 | | 0.055 |



## TO-263 ($D^2$PAK) MECHANICAL DATA

| DIM. | mm | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 4.40 | | 4.60 | 0.173 | | 0.181 |
| A1 | 2.49 | | 2.69 | 0.098 | | 0.106 |
| A2 | 0.03 | | 0.23 | 0.001 | | 0.009 |
| B | 0.70 | | 0.93 | 0.027 | | 0.036 |
| B2 | 1.14 | | 1.70 | 0.044 | | 0.067 |
| C | 0.45 | | 0.60 | 0.017 | | 0.023 |
| C2 | 1.23 | | 1.36 | 0.048 | | 0.053 |
| D | 8.95 | | 9.35 | 0.352 | | 0.368 |
| D1 | | 8.00 | | | 0.315 | |
| E | 10.00 | | 10.40 | 0.393 | | 0.409 |
| E1 | | 8.50 | | | 0.334 | |
| G | 4.88 | | 5.28 | 0.192 | | 0.208 |
| L | 15.00 | | 15.85 | 0.590 | | 0.624 |
| L2 | 1.27 | | 1.4 | 0.050 | | 0.055 |
| L3 | 1.40 | | 1.75 | 0.055 | | 0.068 |
| M | 2.40 | | 3.2 | 0.094 | | 0.126 |
| R | | 0.40 | | | 0.016 | |
| V2 | 0° | | 8° | 0° | | 8° |




- Weight : 1.38 g (typ.)
- The planaty of the slug must be within 30 µm

P011P6/G

# 5 Revision history

Table 5. Document revision history

| Date | Revision | Changes |
|---|---|---|
| 17-Jan-2006 | 1 | First release. |
| 28-Nov-2007 | 2 | Added packages $D^2PAK$ and $I^2PAK$ |

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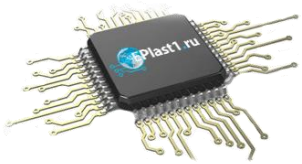
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.

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