



# THE DATASHEET OF BUL742CFP



### 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
- Switch mode power supplies

### Description

The devices are manufactured using high voltage multi-epitaxial planar technology for high switching speeds and high voltage capability. Thanks to an increased intermediate layer, it has an intrinsic ruggedness which enables the transistor to withstand an high collector current level during breakdown condition, without using the transil protection usually necessary in typical converters for lamp ballast.

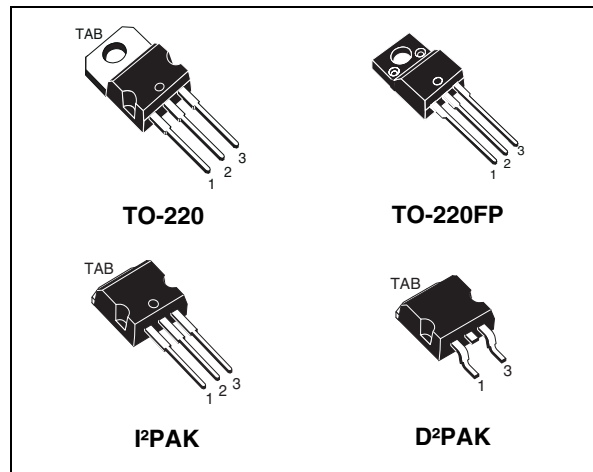


Figure 1. Internal schematic diagram

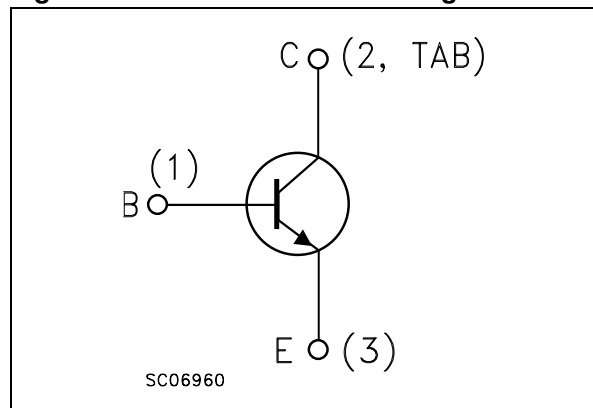


Table 1. Device summary

| Order codes | Markings  | Packages           | Packaging     |
|-------------|-----------|--------------------|---------------|
| BUL742C     | BUL742C   | TO-220             | Tube          |
| BUL742CFP   | BUL742CFP | TO-220FP           |               |
| BULB742C-1  | BULB742C  | I <sup>2</sup> PAK |               |
| BULB742CT4  | BULB742C  | D <sup>2</sup> PAK | Tape and reel |

# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

| Symbol           | Parameter   | TO-220 /<br>D <sup>2</sup> PAK / I <sup>2</sup> PAK | TO-220FP | Unit |
|------------------|---|---|----------|------|
| V <sub>CES</sub> | Collector-emitter voltage (V <sub>BE</sub> = 0)   | 1050  |          | V    |
| V <sub>CEO</sub> | Collector-emitter voltage (I <sub>B</sub> = 0)  | 400   |          | V    |
| V <sub>EBO</sub> | Emitter-base voltage (I <sub>C</sub> = 0, I <sub>B</sub> = 2 A, t <sub>p</sub> < 10 ms) | V <sub>(BR)EBO</sub>                                |          | V    |
| I <sub>C</sub>   | Collector current   | 4   |          | A    |
| I <sub>CM</sub>  | Collector peak current (t <sub>p</sub> < 5 ms)  | 8   |          | A    |
| I <sub>B</sub>   | Base current  | 2   |          | A    |
| I <sub>BM</sub>  | Base peak current (t <sub>p</sub> < 5 ms)   | 4   |          | A    |
| P <sub>TOT</sub> | Total dissipation at T <sub>c</sub> = 25 °C   | 70  | 30       | W    |
| T <sub>STG</sub> | Storage temperature   | -65 to 150  |          | °C   |
| V <sub>ISO</sub> | Isolation withstand voltage (RMS) from all three leads to external heatsink             | 1500  |          | V    |
| T <sub>J</sub>   | Max. operating junction temperature   | 150   |          | °C   |

**Table 3. Thermal data**

| Symbol            | Parameter                             | TO-220/D <sup>2</sup> PAK/I <sup>2</sup> PAK | TO-220FP | Unit |
|-------------------|---------------------------------------|--|----------|------|
| R <sub>thJC</sub> | Thermal resistance junction - case    | 1.79   | 4.17     | °C/W |
| R <sub>thJA</sub> | Thermal resistance junction - ambient | 62.5   | 62.5     | °C/W |

## 2 Electrical characteristics

$T_{\text{case}} = 25^{\circ}\text{C}$  unless otherwise specified.

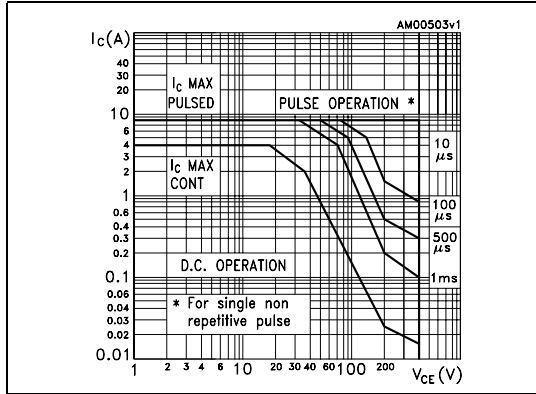
**Table 4. Electrical characteristics**

| Symbol                           | Parameter   | Test conditions  | Min.     | Typ.        | Max.       | Unit                |
|----------------------------------|---|--|----------|-------------|------------|---------------------|
| $I_{\text{CES}}$                 | Collector cut-off current ( $V_{\text{BE}} = 0$ )           | $V_{\text{CE}} = 1050 \text{ V}$   |          | 0.2         | 10         | $\mu\text{A}$       |
| $I_{\text{CEO}}$                 | Collector cut-off current ( $I_{\text{B}} = 0$ )            | $V_{\text{CE}} = 400 \text{ V}$  |          | 10          | 250        | $\mu\text{A}$       |
| $V_{(\text{BR})\text{EBO}}$      | Emitter base breakdown voltage ( $I_{\text{C}} = 0$ )       | $I_{\text{E}} = 1 \text{ mA}$  | 15       | 19          | 24         | V                   |
| $V_{\text{CEO(sus)}}^{(1)}$      | Collector-emitter sustaining voltage ( $I_{\text{B}} = 0$ ) | $I_{\text{C}} = 10 \text{ mA}$   | 400      | 450         |            | V                   |
| $V_{\text{CE(sat)}}^{(1)}$       | Collector-emitter saturation voltage                        | $I_{\text{C}} = 1 \text{ A}$ $I_{\text{B}} = 0.2 \text{ A}$<br>$I_{\text{C}} = 3.5 \text{ A}$ $I_{\text{B}} = 1 \text{ A}$   |          | 0.15<br>0.6 | 0.5<br>1.5 | V<br>V              |
| $V_{\text{BE(sat)}}^{(1)}$       | Base-emitter saturation voltage                             | $I_{\text{C}} = 3.5 \text{ A}$ $I_{\text{B}} = 1 \text{ A}$  |          | 1.1         | 1.5        | V                   |
| $h_{\text{FE}}^{(1)}$            | DC current gain   | $I_{\text{C}} = 0.1 \text{ A}$ $V_{\text{CE}} = 5 \text{ V}$<br>$I_{\text{C}} = 0.8 \text{ A}$ $V_{\text{CE}} = 3 \text{ V}$   | 48<br>25 | 75<br>35    | 100<br>50  |                     |
| $t_{\text{s}}$<br>$t_{\text{f}}$ | Resistive load<br>Storage time<br>Fall time                 | $I_{\text{C}} = 2 \text{ A}$ $V_{\text{CC}} = 125 \text{ V}$<br>$I_{\text{B1}} = - I_{\text{B2}} = 400 \text{ mA}$<br>$t_{\text{p}} = 300 \mu\text{s}$ $V_{\text{BE(off)}} = -5 \text{ V}$ |          | 2.4<br>350  | 3.5<br>500 | $\mu\text{s}$<br>ns |
| $E_{\text{ar}}$                  | Repetitive avalanche energy                                 | $L = 2 \text{ mH}$ $C = 1.8 \text{ nF}$<br>$V_{\text{BE(off)}} = -5 \text{ V}$   | 6        |             |            | mJ                  |

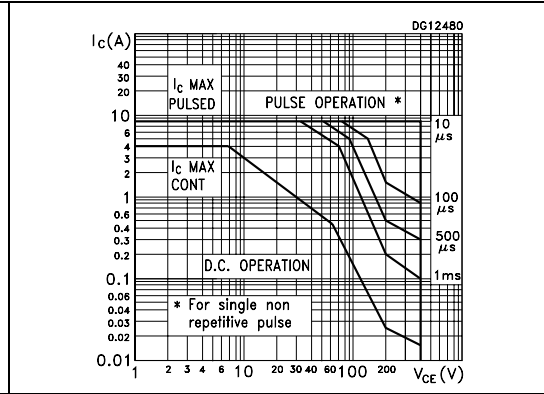
1. Pulse test: pulse duration  $\leq 300 \mu\text{s}$ , duty cycle  $\leq 2\%$ .

## 2.1 Electrical characteristics (curves)

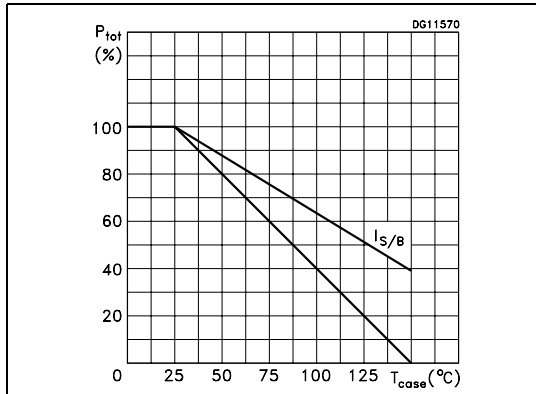
**Figure 2. Safe operating area for TO-220/I<sup>2</sup>PAK/D<sup>2</sup>PAK**



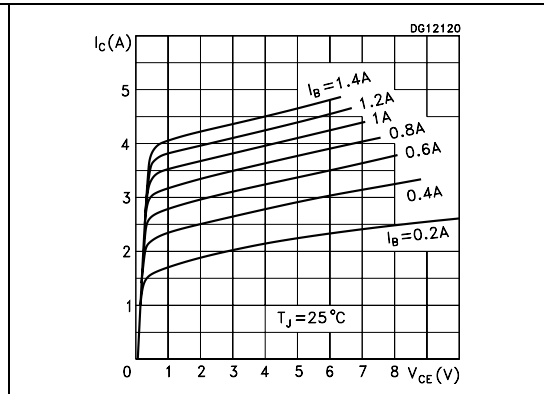
**Figure 3. Safe operating area for TO-220FP**



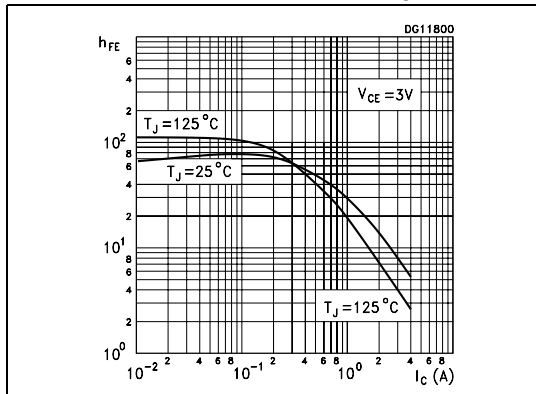
**Figure 4. Derating curve**



**Figure 5. Output characteristics**



**Figure 6. DC current gain ( $V_{CE} = 3\text{ V}$ )**



**Figure 7. DC current gain ( $V_{CE} = 5\text{ V}$ )**

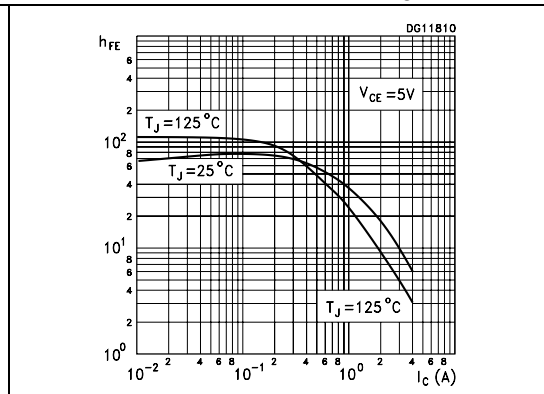


Figure 8. Collector - emitter saturation voltage Figure 9. Base-emitter saturation voltage

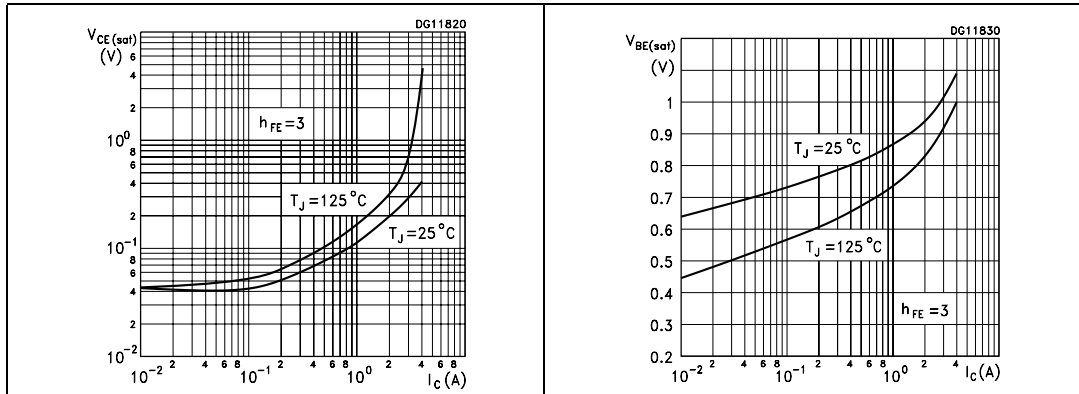


Figure 10. Resistive load switching on times ( $h_{FE} = 5$ ) Figure 11. Resistive load switching off times ( $h_{FE} = 5$ )

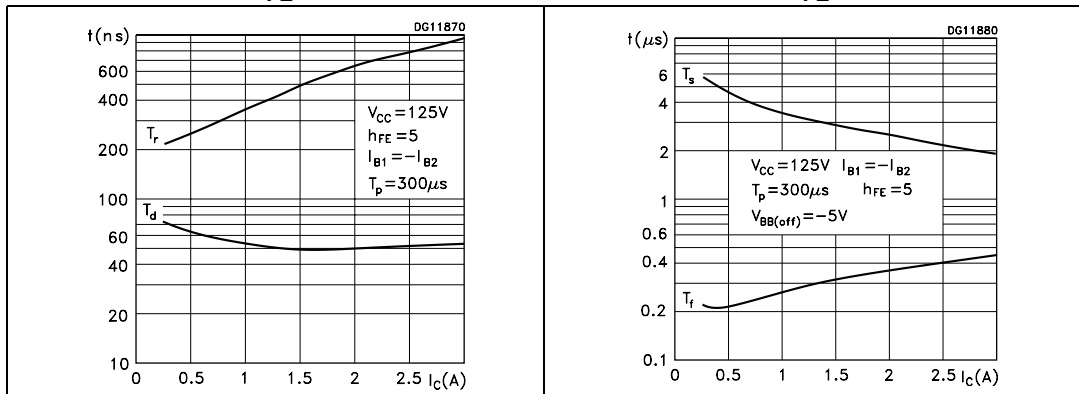


Figure 12. Resistive load switching on times ( $h_{FE} = 10$ ) Figure 13. Resistive load switching off times ( $h_{FE} = 10$ )

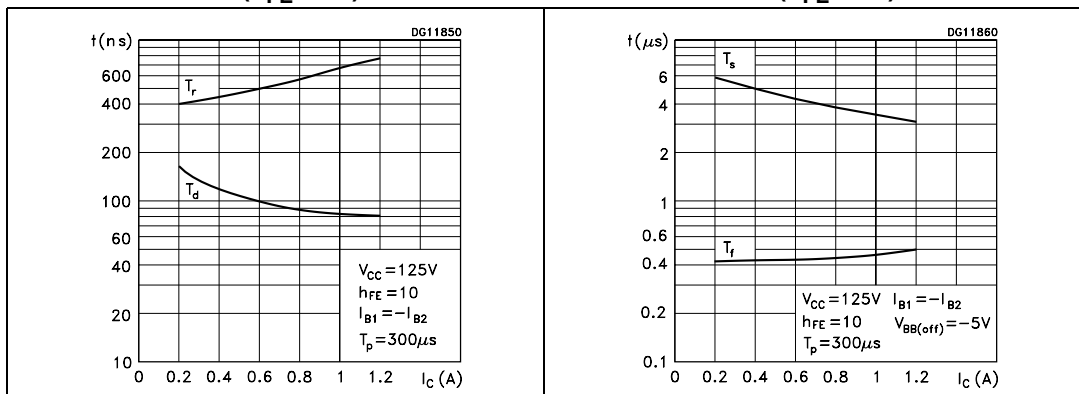
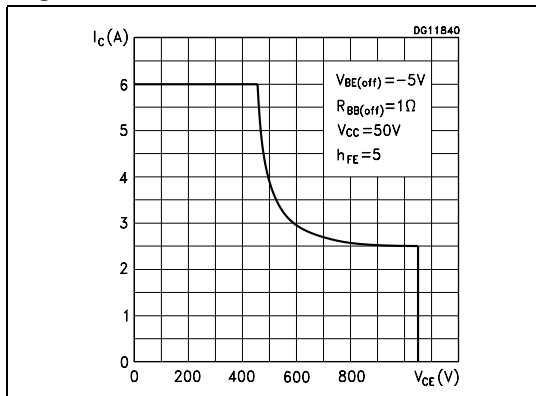


Figure 14. Reverse biased SOA



### 3 Test circuit

Figure 15. Energy rating test circuit

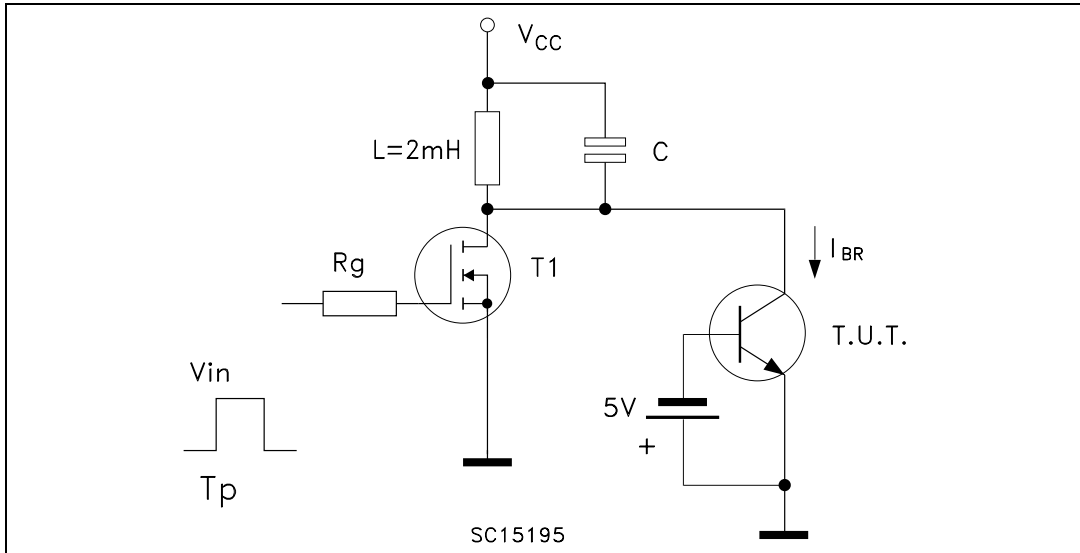
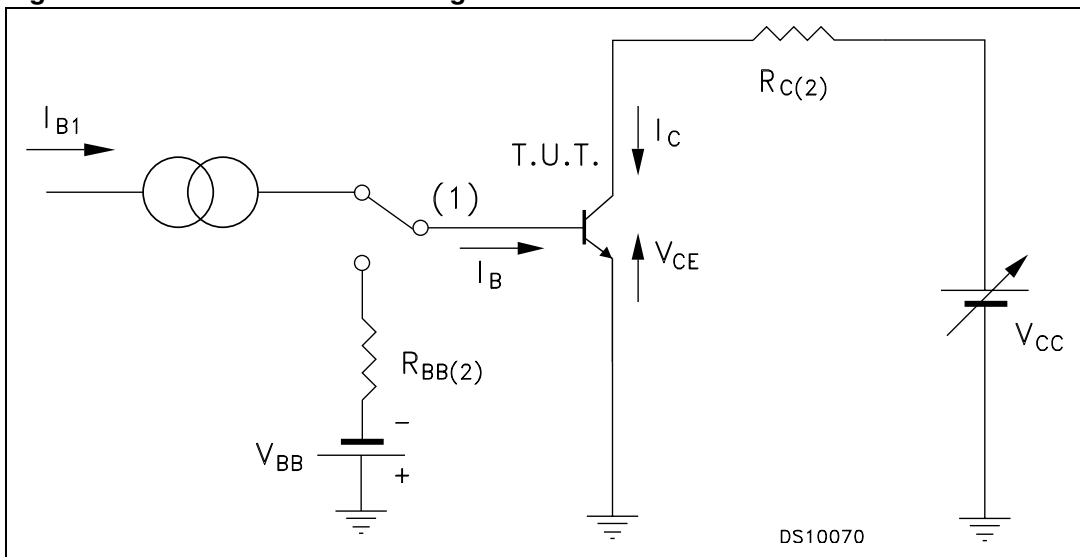


Figure 16. Resistive load switching test circuit

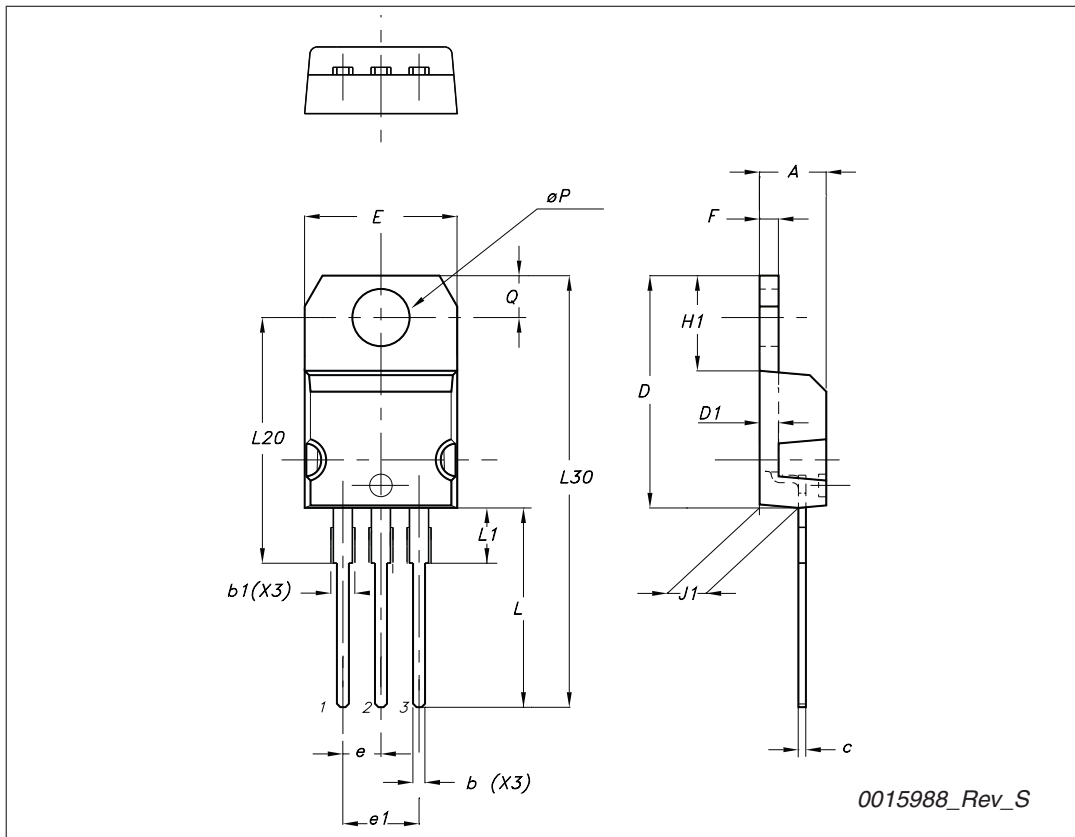


## 4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK<sup>®</sup> is an ST trademark.

**TO-220 type A mechanical data**

| Dim | mm    |       |       |
|-----|-------|-------|-------|
|     | Min   | Typ   | Max   |
| A   | 4.40  |       | 4.60  |
| b   | 0.61  |       | 0.88  |
| b1  | 1.14  |       | 1.70  |
| c   | 0.48  |       | 0.70  |
| D   | 15.25 |       | 15.75 |
| D1  |       | 1.27  |       |
| E   | 10    |       | 10.40 |
| e   | 2.40  |       | 2.70  |
| e1  | 4.95  |       | 5.15  |
| F   | 1.23  |       | 1.32  |
| H1  | 6.20  |       | 6.60  |
| J1  | 2.40  |       | 2.72  |
| L   | 13    |       | 14    |
| L1  | 3.50  |       | 3.93  |
| L20 |       | 16.40 |       |
| L30 |       | 28.90 |       |
| ∅P  | 3.75  |       | 3.85  |
| Q   | 2.65  |       | 2.95  |



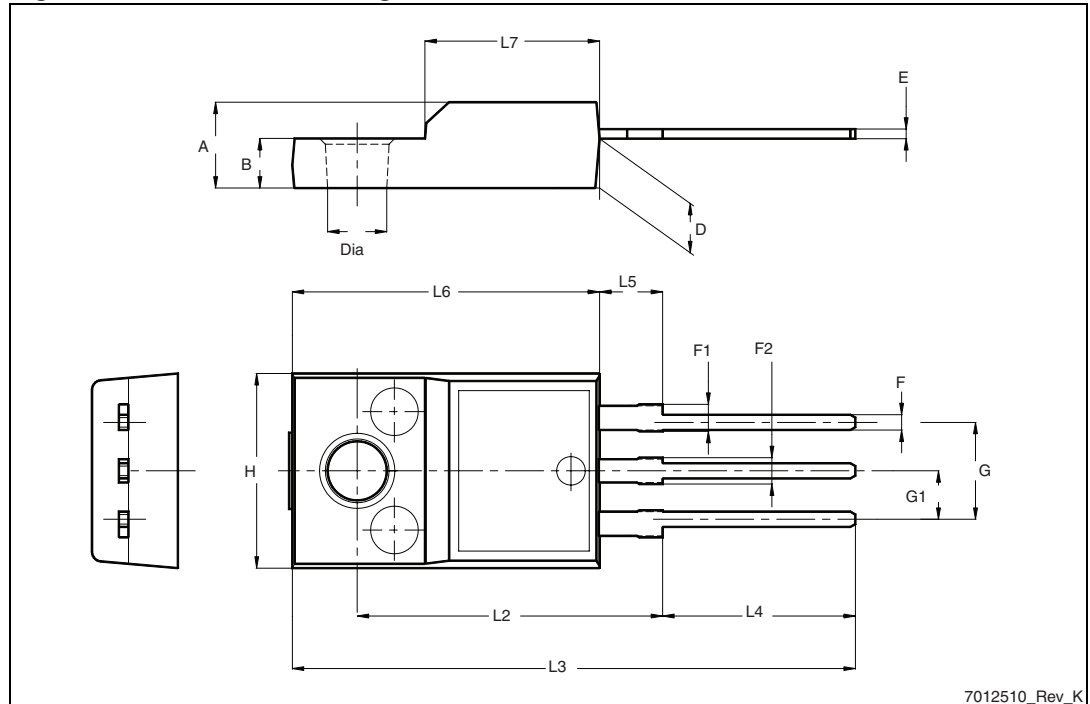
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Table 5. TO-220FP mechanical data

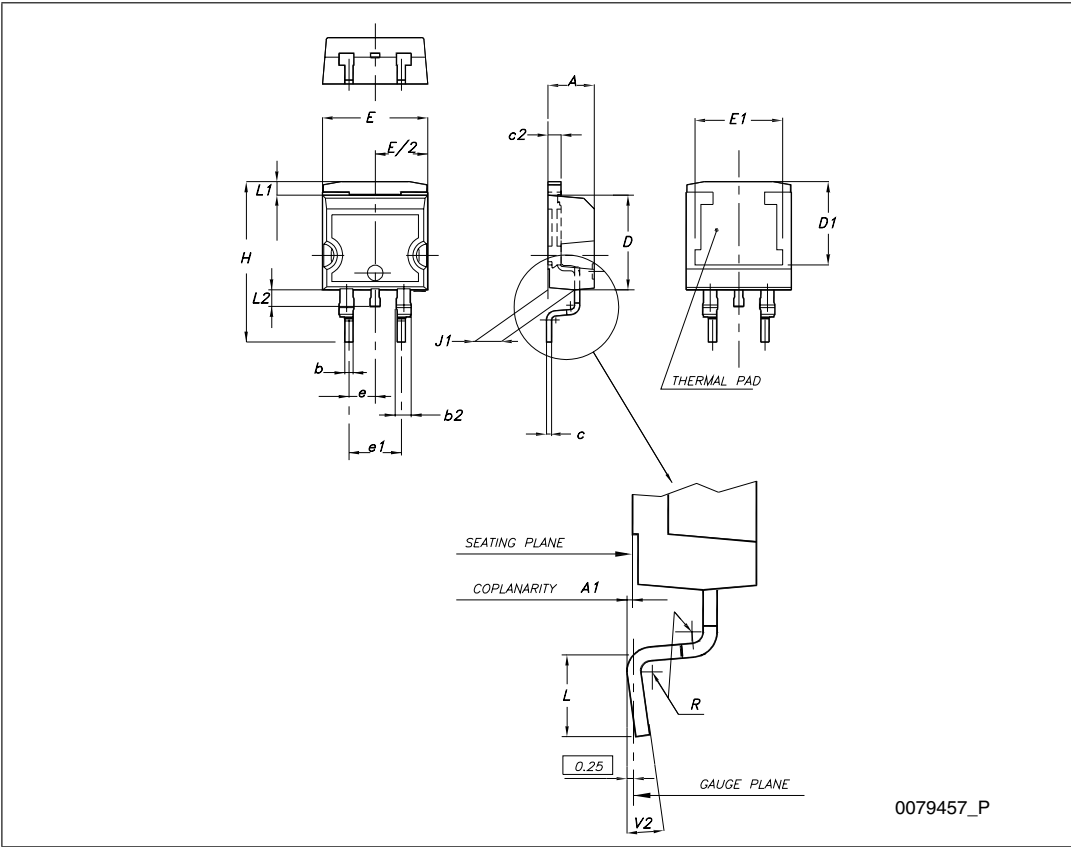
| Dim. | mm.  |      |      |
|------|------|------|------|
|      | Min. | Typ. | Max. |
| A    | 4.4  |      | 4.6  |
| B    | 2.5  |      | 2.7  |
| D    | 2.5  |      | 2.75 |
| E    | 0.45 |      | 0.7  |
| F    | 0.75 |      | 1    |
| F1   | 1.15 |      | 1.70 |
| F2   | 1.15 |      | 1.70 |
| G    | 4.95 |      | 5.2  |
| G1   | 2.4  |      | 2.7  |
| H    | 10   |      | 10.4 |
| L2   |      | 16   |      |
| L3   | 28.6 |      | 30.6 |
| L4   | 9.8  |      | 10.6 |
| L5   | 2.9  |      | 3.6  |
| L6   | 15.9 |      | 16.4 |
| L7   | 9    |      | 9.3  |
| Dia  | 3    |      | 3.2  |

Figure 17. TO-220FP drawing



**D<sup>2</sup>PAK (TO-263) mechanical data**

| Dim. | mm.  |      |       |
|------|------|------|-------|
|      | Min. | Typ. | Max.  |
| A    | 4.40 |      | 4.60  |
| A1   | 0.03 |      | 0.23  |
| b    | 0.70 |      | 0.93  |
| b2   | 1.14 |      | 1.70  |
| c    | 0.45 |      | 0.60  |
| c2   | 1.23 |      | 1.36  |
| D    | 8.95 |      | 9.35  |
| D1   | 7.50 |      |       |
| E    | 10   |      | 10.40 |
| E1   | 8.50 |      |       |
| e    |      | 2.54 |       |
| e1   | 4.88 |      | 5.28  |
| H    | 15   |      | 15.85 |
| J1   | 2.49 |      | 2.69  |
| L    | 2.29 |      | 2.79  |
| L1   | 1.27 |      | 1.40  |
| L2   | 1.30 |      | 1.75  |
| R    |      | 0.4  |       |
| V2   | 0°   |      | 8°    |



## 5 Revision history

**Table 6. Document revision history**

| <b>Date</b> | <b>Revision</b> | <b>Changes</b>                                 |
|-------------|-----------------|--|
| 21-Jun-2004 | 1               | First release                                  |
| 10-Aug-2007 | 2               | No content changes, document reformatted       |
| 27-May-2008 | 3               | Added I <sup>2</sup> PAK package               |
| 30-Nov-2010 | 4               | Added TO-220FP and D <sup>2</sup> PAK packages |

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