

### Features

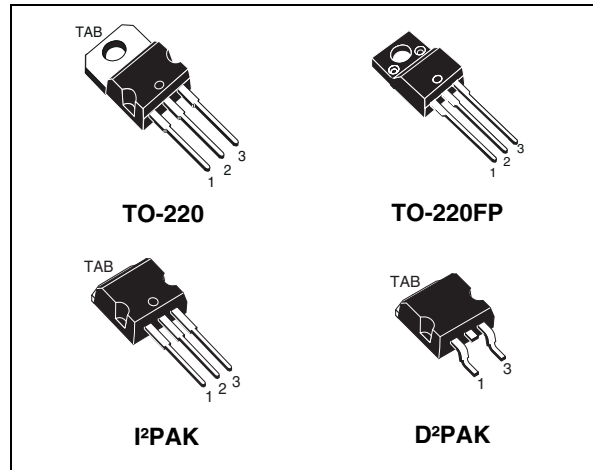
- Low spread of dynamic parameters
- High voltage capability
- Minimum lot-to-lot spread for reliable operation
- Very high switching speed

### Applications

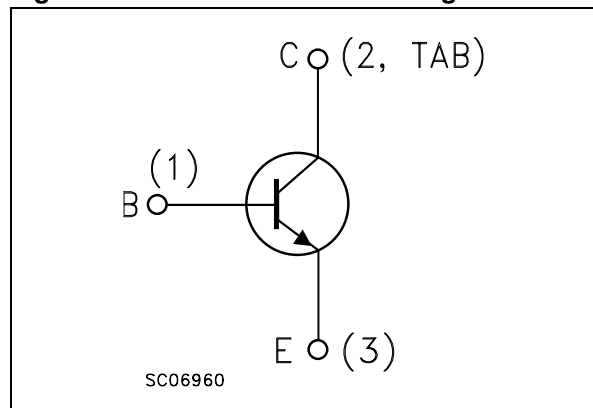
- Electronic ballast for fluorescent lighting
- Switch mode power supplies

### 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 / 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	$I_{\text{C}} = 1 \text{ A}$ $I_{\text{B}} = 0.2 \text{ A}$ $I_{\text{C}} = 3.5 \text{ A}$ $I_{\text{B}} = 1 \text{ A}$		0.15 0.6	0.5 1.5	V 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	$I_{\text{C}} = 0.1 \text{ A}$ $V_{\text{CE}} = 5 \text{ V}$ $I_{\text{C}} = 0.8 \text{ A}$ $V_{\text{CE}} = 3 \text{ V}$	48 25	75 35	100 50	
$t_{\text{s}}$ $t_{\text{f}}$	Resistive load Storage time Fall time	$I_{\text{C}} = 2 \text{ A}$ $V_{\text{CC}} = 125 \text{ V}$ $I_{\text{B1}} = - I_{\text{B2}} = 400 \text{ mA}$ $t_{\text{p}} = 300 \mu\text{s}$ $V_{\text{BE(off)}} = -5 \text{ V}$		2.4 350	3.5 500	$\mu\text{s}$ ns
$E_{\text{ar}}$	Repetitive avalanche energy	$L = 2 \text{ mH}$ $C = 1.8 \text{ nF}$ $V_{\text{BE(off)}} = -5 \text{ V}$	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

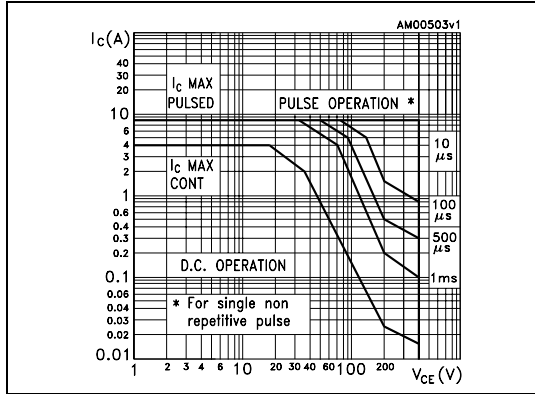


Figure 3. Safe operating area for TO-220FP

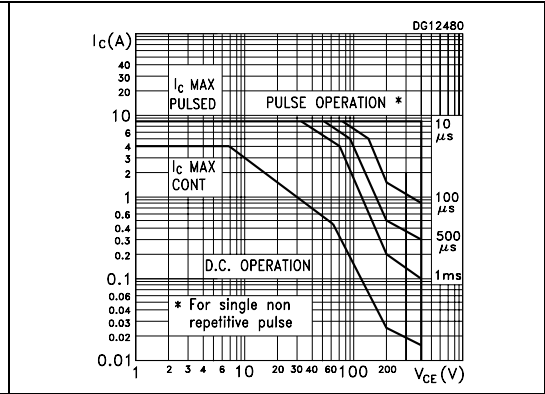


Figure 4. Derating curve

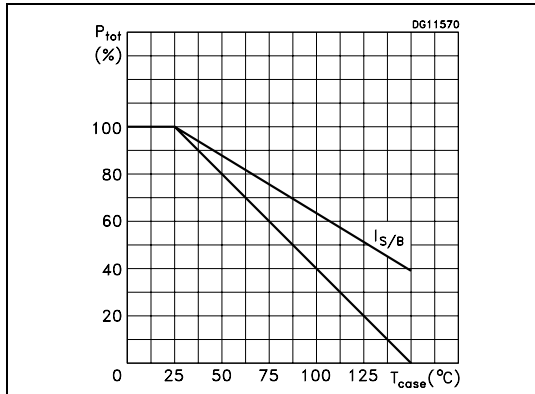


Figure 5. Output characteristics

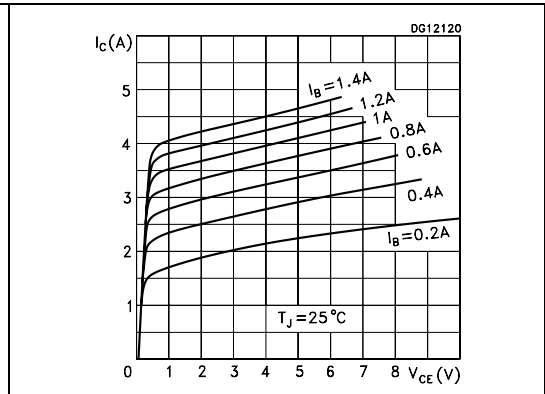


Figure 6. DC current gain ( $V_{CE} = 3$  V)

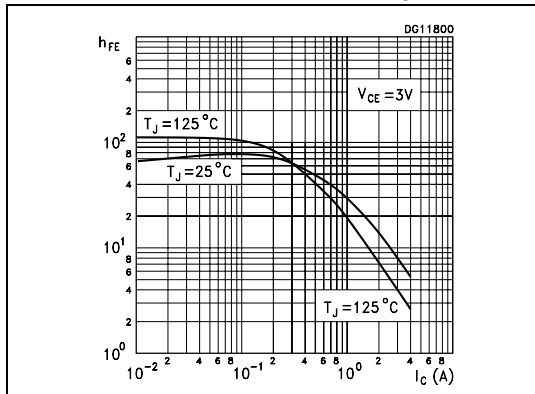


Figure 7. DC current gain ( $V_{CE} = 5$  V)

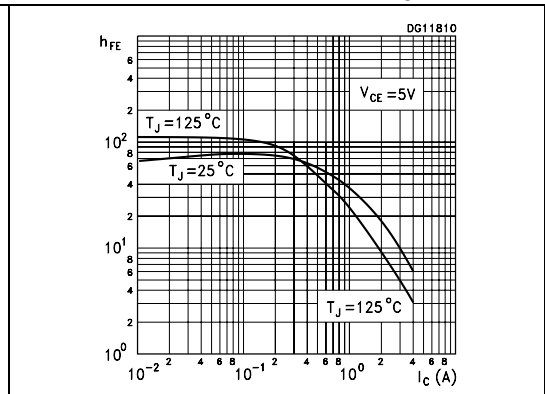


Figure 8. Collector - emitter saturation voltage

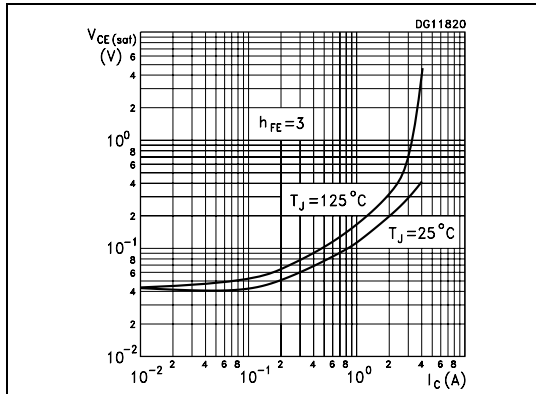


Figure 9. Base-emitter saturation voltage

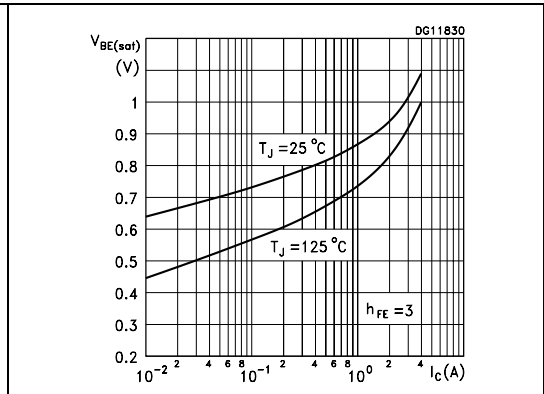


Figure 10. Resistive load switching on times ( $h_{FE} = 5$ )

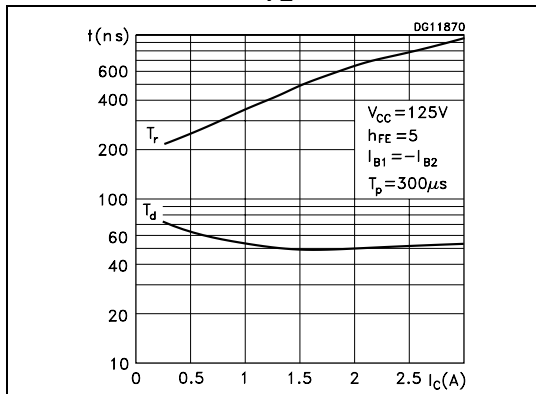


Figure 11. Resistive load switching off times ( $h_{FE} = 5$ )

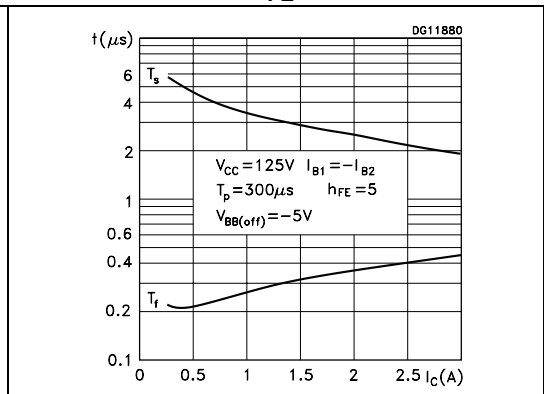


Figure 12. Resistive load switching on times ( $h_{FE} = 10$ )

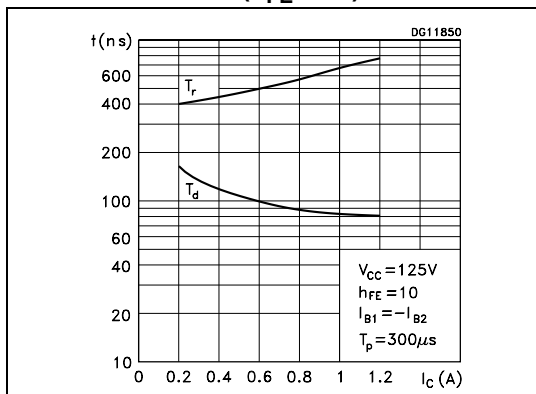


Figure 13. Resistive load switching off times ( $h_{FE} = 10$ )

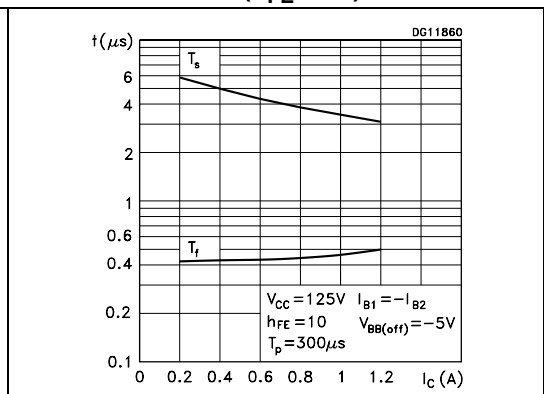
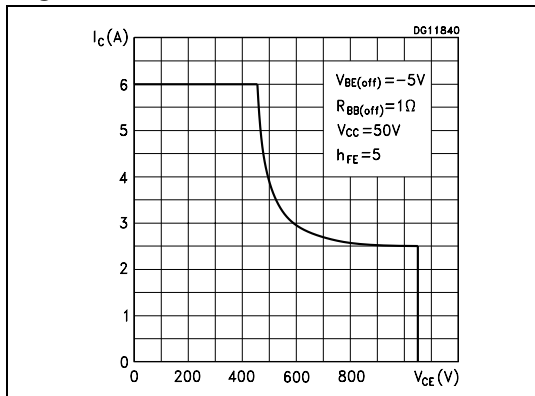


Figure 14. Reverse biased SOA



### 3 Test circuit

Figure 15. Energy rating test circuit

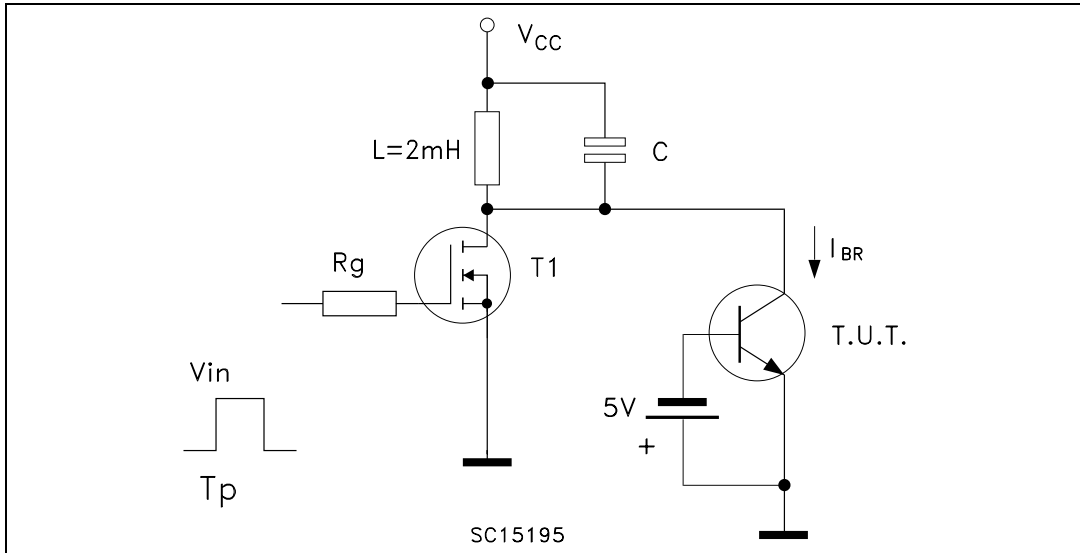
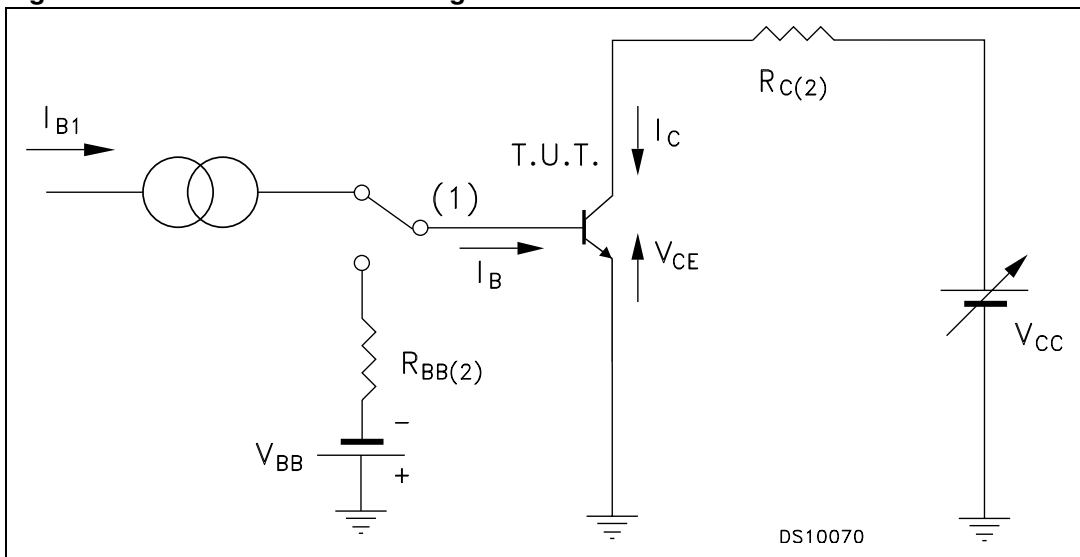


Figure 16. Resistive load switching test circuit



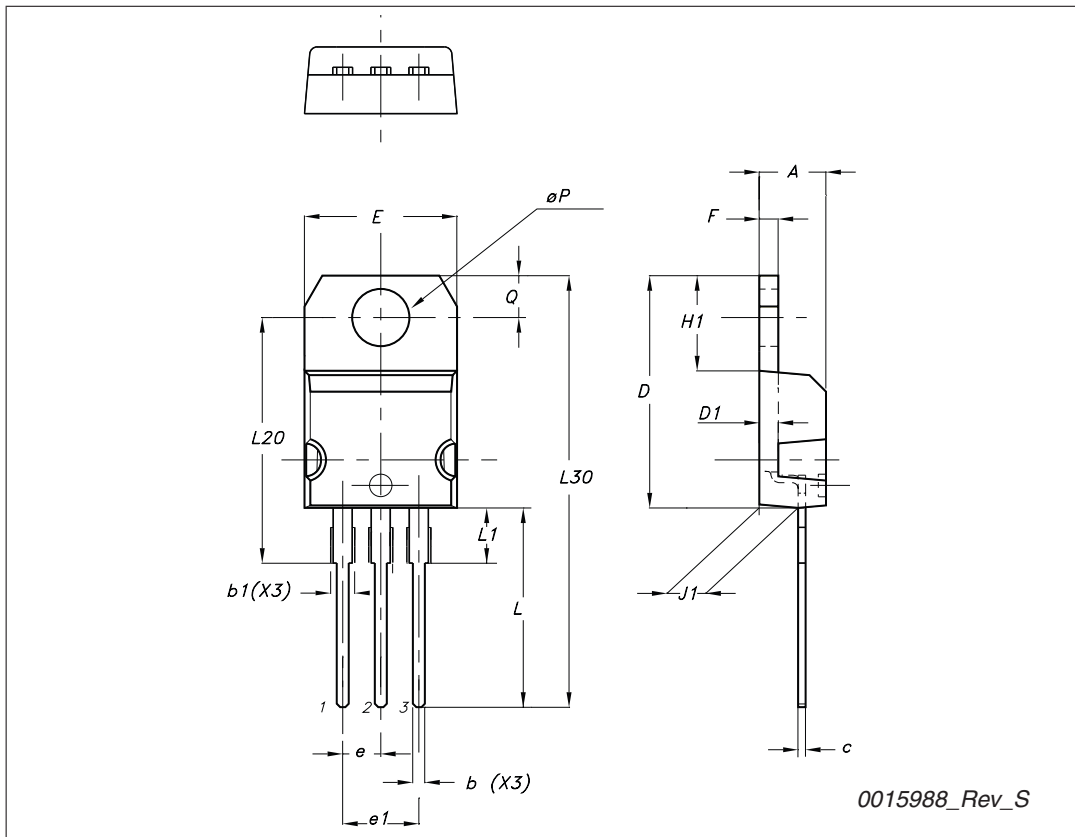
## 4 Package mechanical data

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



0015988\_Rev\_S

I<sup>2</sup>PAK (TO-262) 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

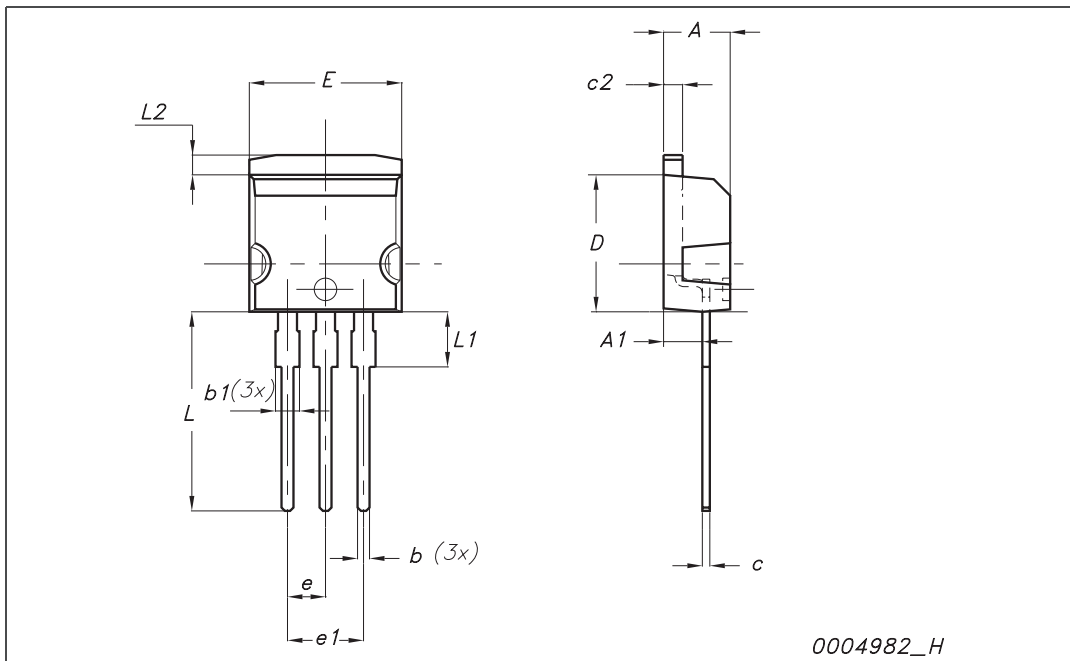
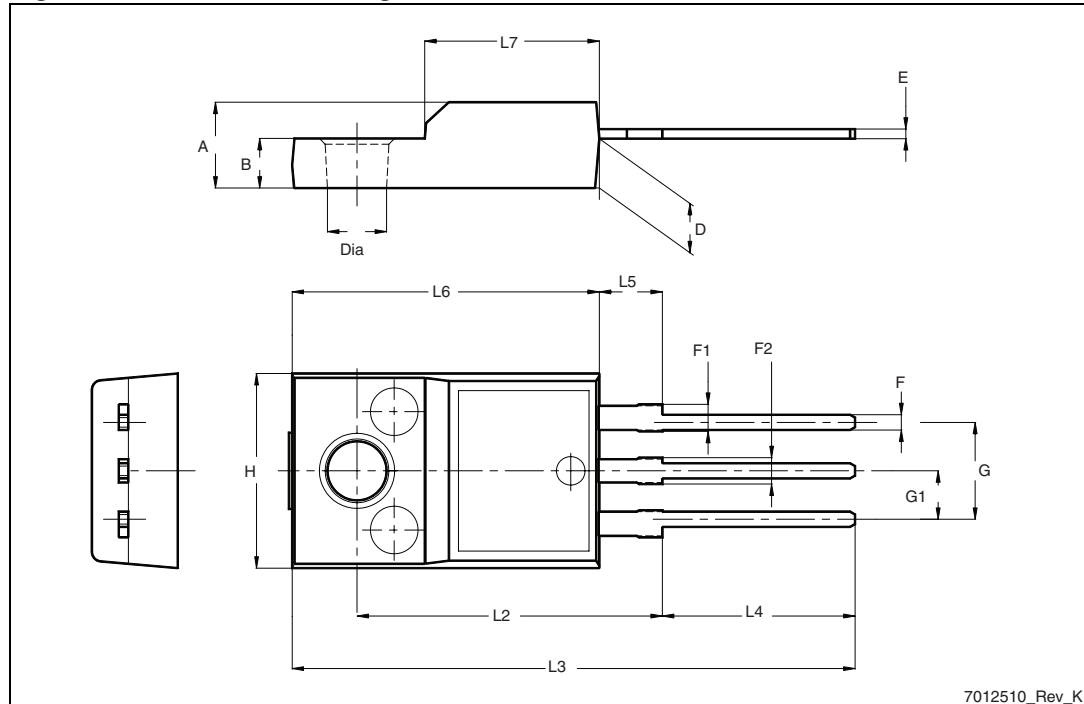


Table 5. TO-220FP mechanical data

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

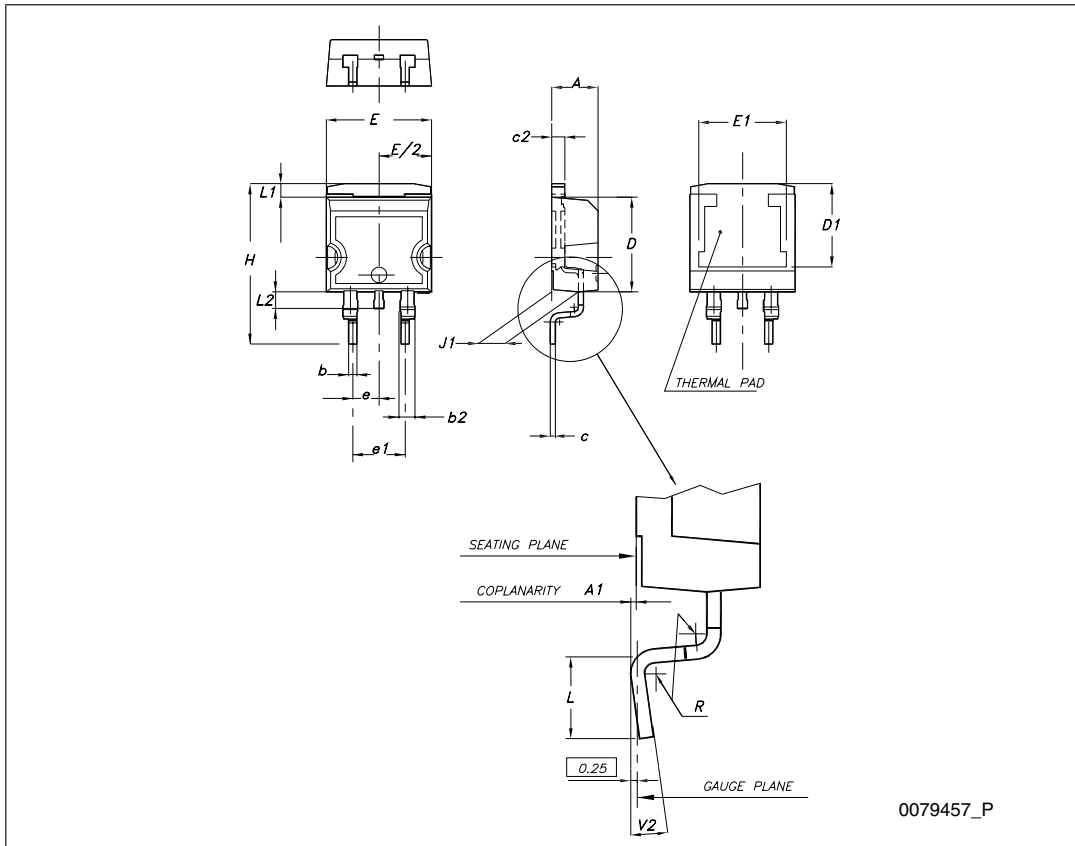
Figure 17. TO-220FP drawing



7012510\_Rev\_K

**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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