

### 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 topologies)

### Description

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

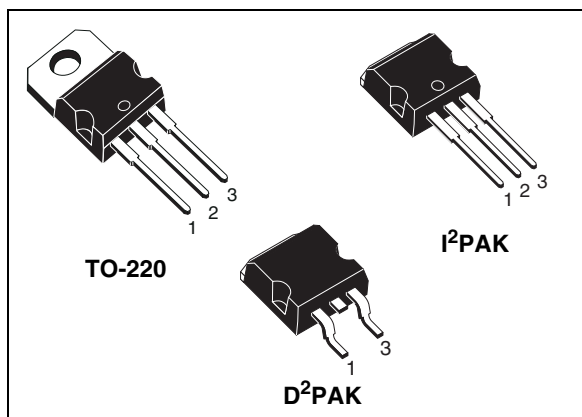


Figure 1. Internal schematic diagram

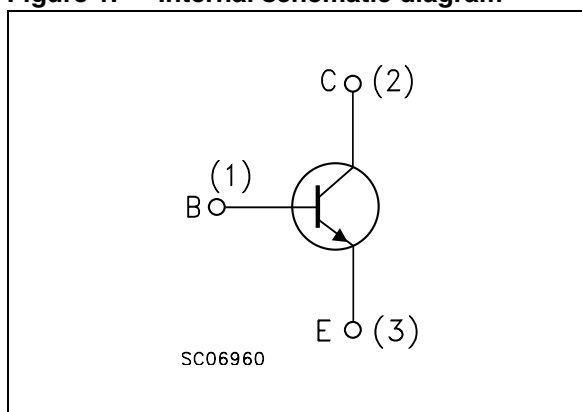


Table 1. Device summary

Order code	Marking	Package	Packaging
BUL7216	BUL7216	TO-220	Tube
BULB7216-1	BULB7216	I <sup>2</sup> PAK	Tube
BULB7216T4	BULB7216	D <sup>2</sup> PAK	Tape and reel

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# 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 ( $t_P < 5\text{ms}$ )	6	A
$I_B$	Base current	1	A
$I_{BM}$	Base peak current ( $t_P < 5\text{ms}$ )	2	A
$P_{tot}$	Total dissipation at $T_C = 25^\circ\text{C}$	80	W
$T_{stg}$	Storage temperature	-65 to 150	$^\circ\text{C}$
$T_J$	Max. operating junction temperature	150	$^\circ\text{C}$

**Table 3. Thermal data**

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

## 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 ( $V_{\text{BE}} = 0$ )	$V_{\text{CE}} = 1600 \text{ V}$			0.1	mA
		$V_{\text{CE}} = 1600 \text{ V}$ $T_{\text{C}} = 125^{\circ}\text{C}$			0.5	mA
$I_{\text{CEO}}$	Collector cut-off current ( $I_{\text{B}} = 0$ )	$V_{\text{CE}} = 680 \text{ V}$			0.1	mA
$I_{\text{CBO}}$	Collector cut-off current ( $I_{\text{E}} = 0$ )	$V_{\text{CB}} = 1600 \text{ V}$			0.1	mA
		$V_{\text{CB}} = 1600 \text{ V}$ $T_{\text{C}} = 125^{\circ}\text{C}$			0.5	mA
$I_{\text{EBO}}$	Emitter cut-off current ( $I_{\text{C}} = 0$ )	$V_{\text{EB}} = 12 \text{ V}$			1	mA
$V_{(\text{BR})\text{CEO}}^{(1)}$	Collector-emitter breakdown voltage ( $I_{\text{B}} = 0$ )	$I_{\text{C}} = 1 \text{ mA}$	700			V
$V_{(\text{BR})\text{EBO}}^{(1)}$	Emitter-base breakdown voltage ( $I_{\text{C}} = 0$ )	$I_{\text{E}} = 1 \text{ mA}$	12			V
$V_{(\text{BR})\text{CES}}^{(1)}$	Collector-emitter breakdown voltage ( $V_{\text{BE}} = 0$ )	$I_{\text{C}} = 0.1 \text{ mA}$	1600			V
$V_{\text{CE}(\text{sat})}^{(1)}$	Collector-emitter saturation voltage	$I_{\text{C}} = 0.25 \text{ A}$ $I_{\text{B}} = 25 \text{ mA}$			1	V
		$I_{\text{C}} = 0.5 \text{ A}$ $I_{\text{B}} = 50 \text{ mA}$			1.5	V
		$I_{\text{C}} = 0.8 \text{ A}$ $I_{\text{B}} = 80 \text{ mA}$			3	V
$V_{\text{BE}(\text{sat})}^{(1)}$	Base-emitter saturation voltage	$I_{\text{C}} = 0.5 \text{ A}$ $I_{\text{B}} = 100 \text{ mA}$			1	V
		$I_{\text{C}} = 1 \text{ A}$ $I_{\text{B}} = 100 \text{ mA}$			1.1	V
		$I_{\text{C}} = 2 \text{ A}$ $I_{\text{B}} = 400 \text{ mA}$			1.2	V
$h_{\text{FE}}^{(1)}$	DC current gain	$I_{\text{C}} = 0.5 \text{ A}$ $V_{\text{CE}} = 1 \text{ V}$	7		18	
		$I_{\text{C}} = 0.5 \text{ A}$ $V_{\text{CE}} = 3 \text{ V}$	16		35	
		$I_{\text{C}} = 2 \text{ A}$ $V_{\text{CE}} = 5 \text{ V}$	4		11	
		$I_{\text{C}} = 1 \text{ A}$ $V_{\text{CE}} = 10 \text{ V}$	19			
$t_{\text{d}}$ $t_{\text{r}}$ $t_{\text{s}}$ $t_{\text{f}}$	Resistive load Delay time Rise time Storage time Fall time	$I_{\text{C}} = 0.5 \text{ A}$ $V_{\text{CC}} = 125 \text{ V}$			0.3	$\mu\text{s}$
		$I_{\text{B1}} = 50 \text{ mA}$ $I_{\text{B2}} = -0.5 \text{ A}$			1.1	$\mu\text{s}$
		P.W. = 300 $\mu\text{s}$ D.C. = 2%			0.9	$\mu\text{s}$
					0.35	$\mu\text{s}$
$E_{\text{ar}}$	Repetitive avalanche energy	$L = 2 \text{ mH}$ $C = 1.8 \text{ nF}$ $V_{\text{BE}(\text{off})} = -5 \text{ V}$	8			mJ

1. Pulsed duration = 300  $\mu\text{s}$ , duty cycle  $\leq 1.5\%$

## 2.1 Electrical characteristics (curves)

Figure 2. Derating curve

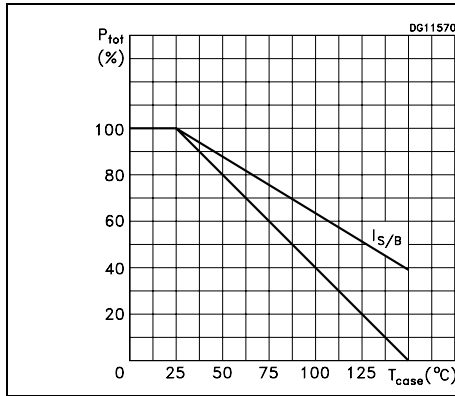


Figure 3. Reverse biased safe operating area

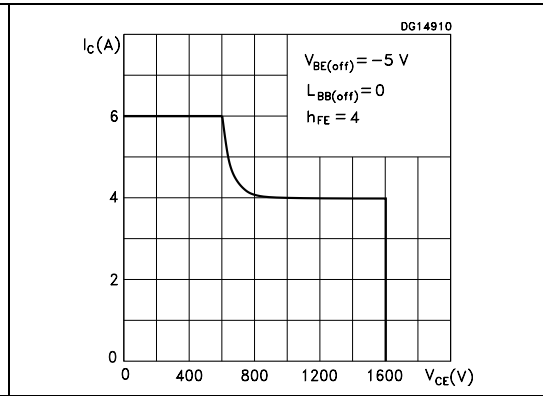


Figure 4. DC current gain

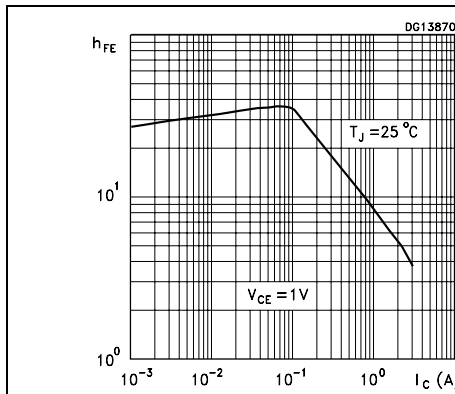


Figure 5. DC current gain

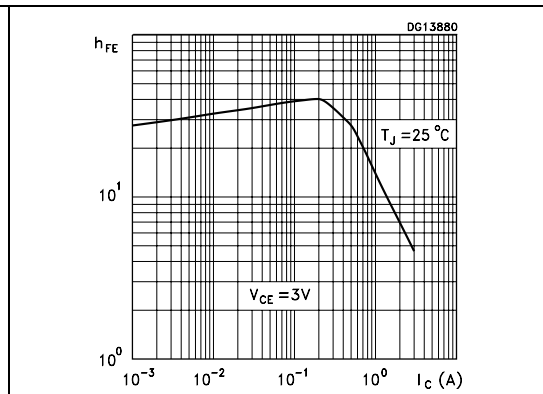


Figure 6. Collector - emitter saturation

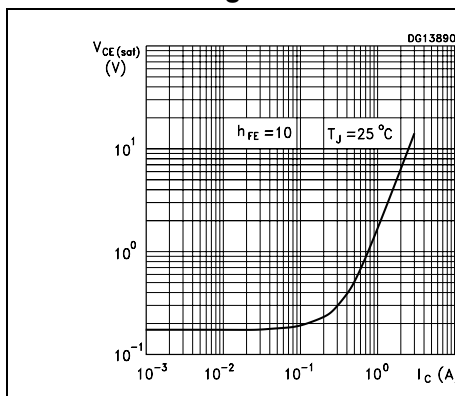


Figure 7. Base - emitter saturation voltage

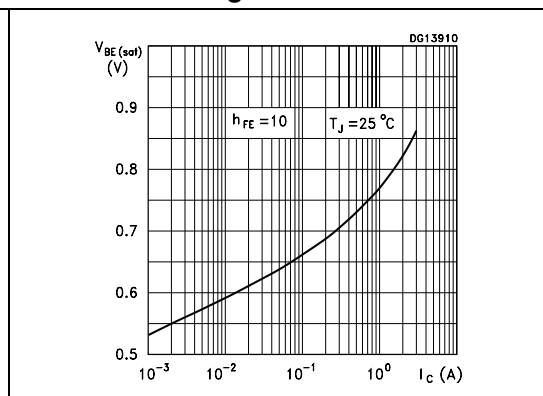
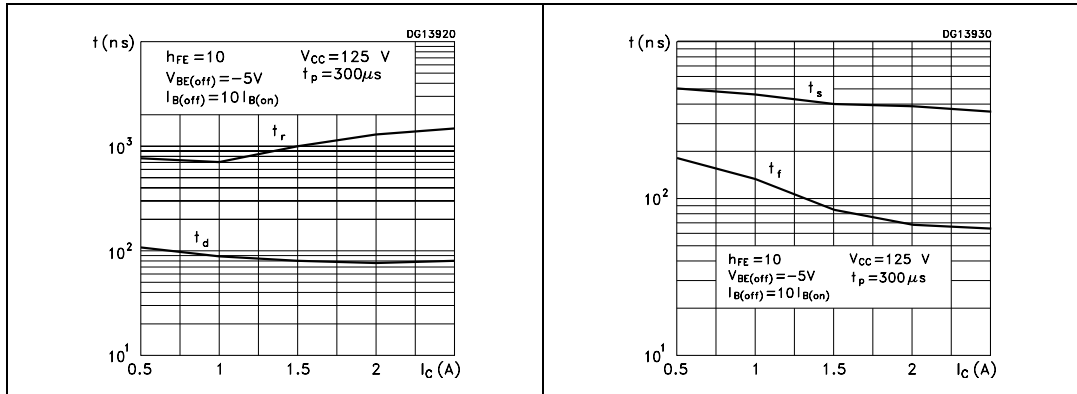


Figure 8. Resistive load switching time Figure 9. Resistive load switching time



### 3 Test circuit

Figure 10. Energy rating test circuit

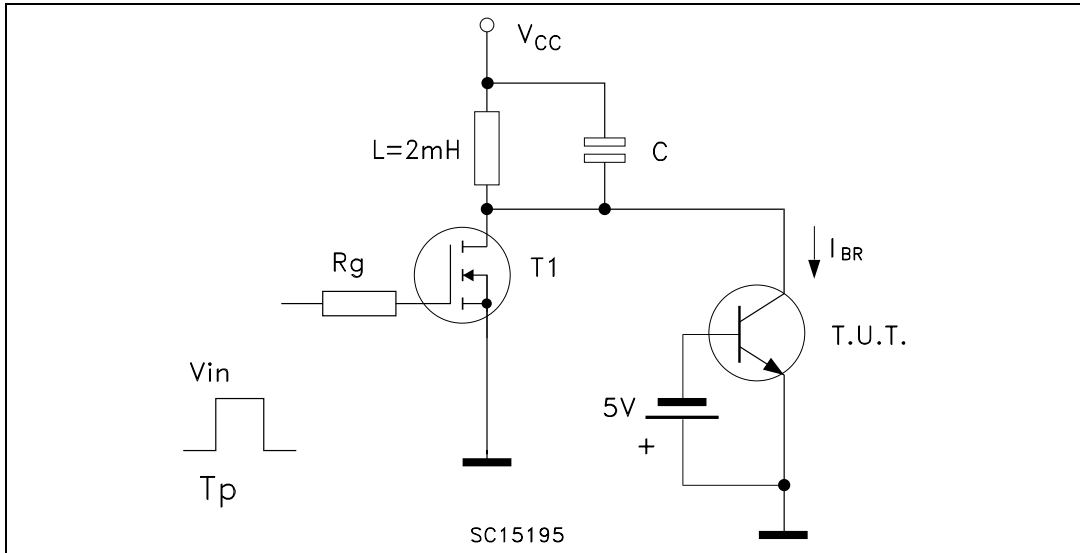
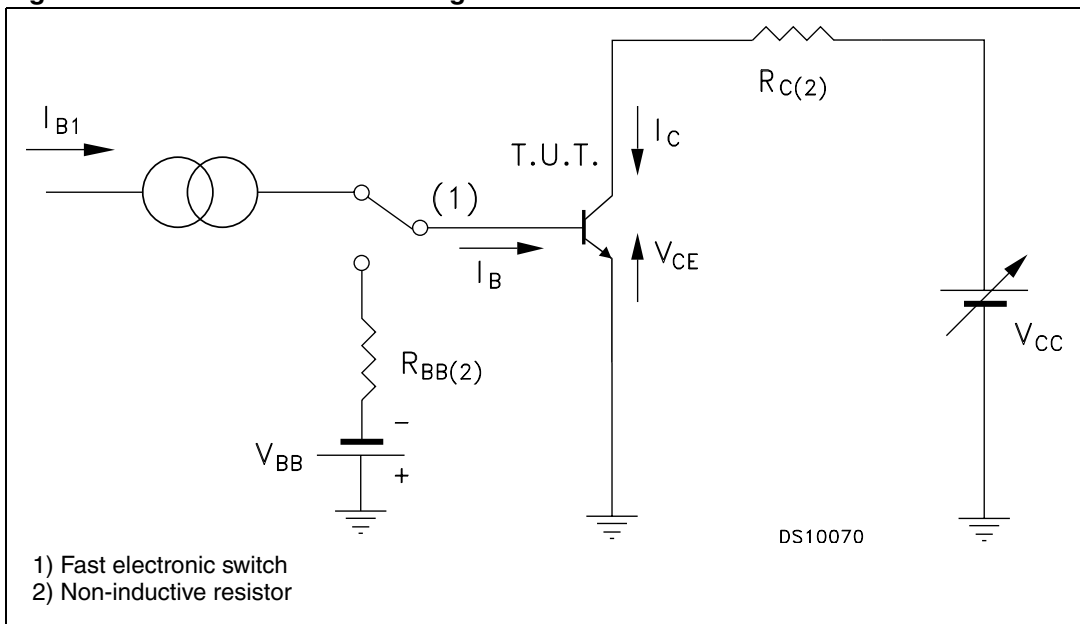


Figure 11. Resistive load switching test circuit



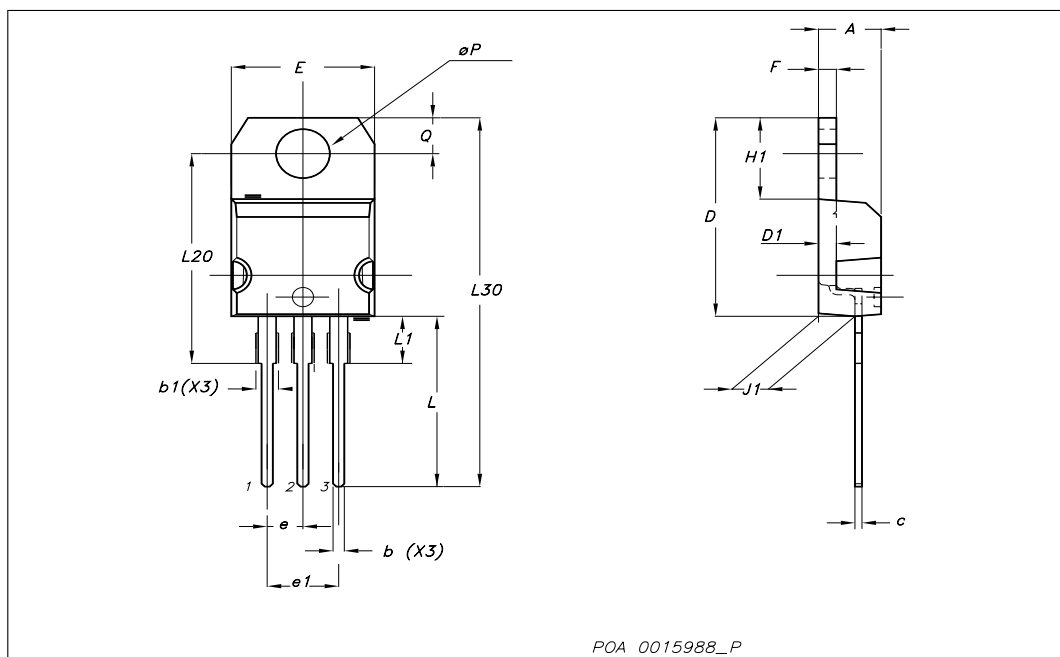
## 4 Package mechanical data

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](http://www.st.com)



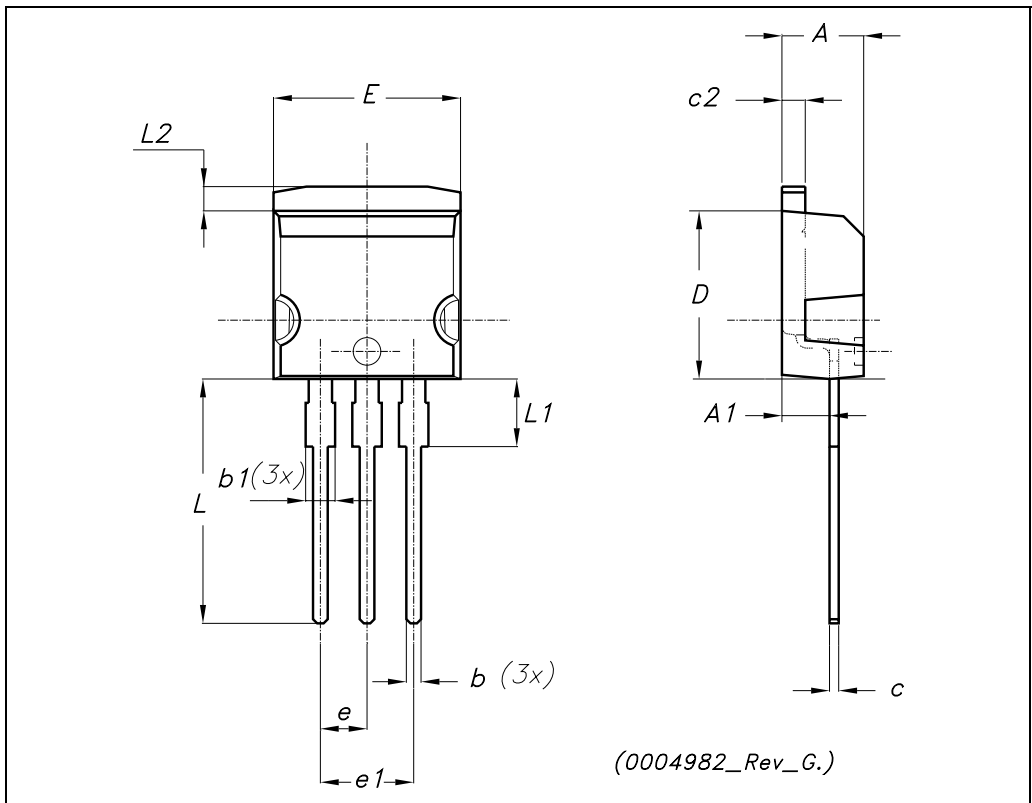
TO-220 mechanical data

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



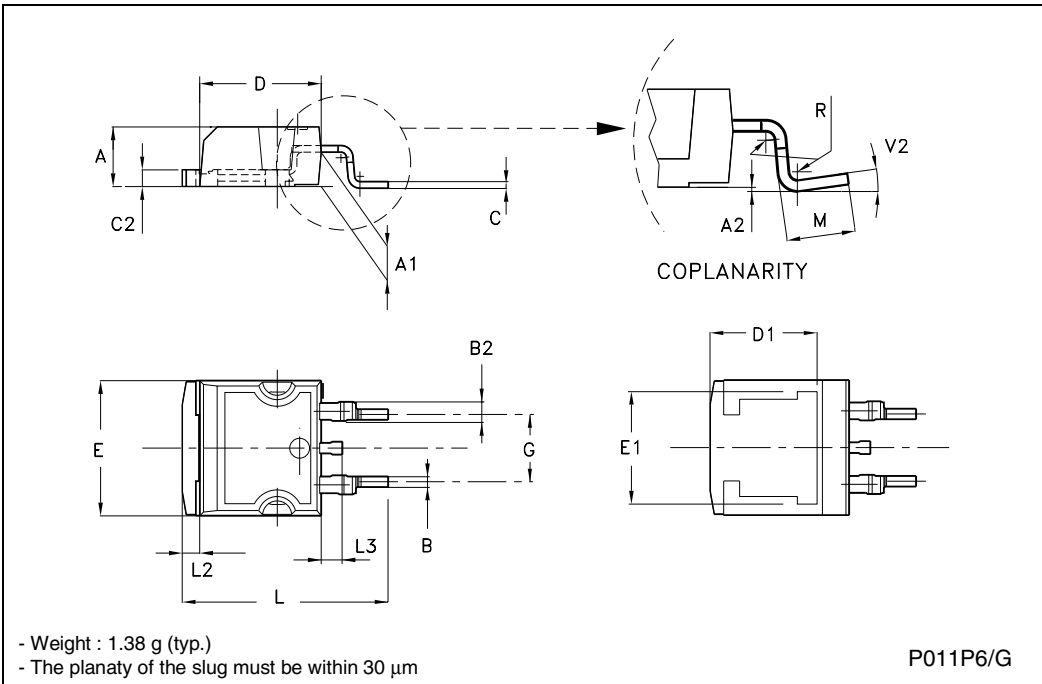
**TO-262 (I<sup>2</sup>PAK) MECHANICAL DATA**

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<sup>2</sup>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°



## 5 Revision history

**Table 5. Document revision history**

Date	Revision	Changes
17-Jan-2006	1	First release.
28-Nov-2007	2	Added packages D <sup>2</sup> PAK and I <sup>2</sup> PAK