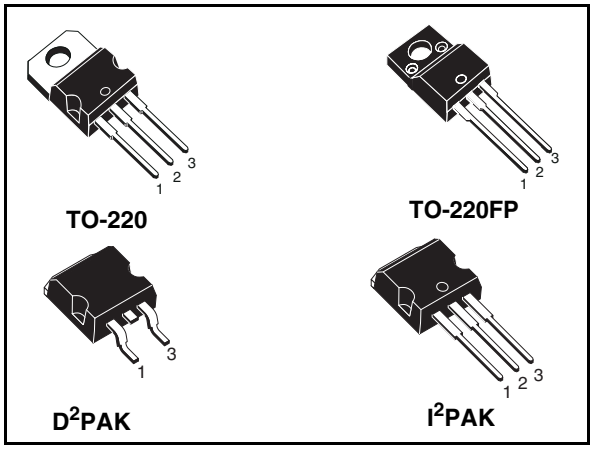
BUL49D
BULB49D

High voltage fast-switching NPN power transistors

Features

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



Applications

- Electronic transformers for halogen lamps
- Flyback and forward single transistor low power converters

Description

The devices are manufactured using high voltage multi-epitaxial planar technology for high switching speeds and high voltage capability. The devices are designed for use in electronic transformer for halogen lamps.

Figure 1. Internal schematic diagram

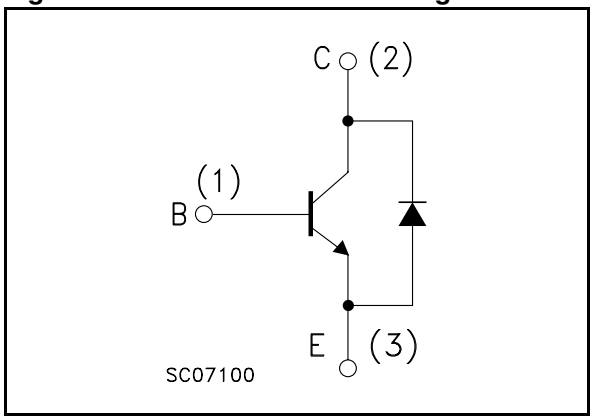


Table 1. Device summary

Order code	Marking	Package	Packaging
BUL49D	BUL49D	TO-220	Tube
BUL49DFP	BUL49DFP	TO-220FP	Tube
BULB49D-1	BULB49D	I^2PAK	Tube
BULB49DT4	BULB49D	D^2PAK	Tape and reel

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2 Electrical characteristics 4

2.1 Electrical characteristics (curves) 5

2.2 Test circuits 7

3 Package mechanical data 8

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1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value		Unit
		D^2PAK I^2PAK TO-220	TO-220FP	
V_{CES}	Collector-emitter voltage (V_{BE} =0)	850		V
V_{CEO}	Collector-emitter voltage (I_B =0)	450		V
V_{EBO}	Emitter-base voltage (I_C =0, I_B <2 A, t_P < 10 ms)	$V_{(BR)EBO}$		V
I_C	Collector current	5		A
I_{CM}	Collector peak current (t_P < 5ms)	10		A
I_B	Base current	2		A
I_{BM}	Base peak current (t_P < 5 ms)	4		A
P_{tot}	Total dissipation at T_c ≤25°C	80	34	W
T_{stg}	Storage temperature	-65 to 150		°C
T_J	Max. operating junction temperature	150		°C

Table 3. Thermal data

Symbol	Parameter		D^2PAK I^2PAK TO-220	TO-220FP	Unit
$R_{thj\text{-}case}$	Thermal resistance junction-case	max	1.56	3.67	°C/W
$R_{thj\text{-}amb}$	Thermal resistance junction-ambient	max	62.5	62.5	°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} = 850 V V_{CE} = 850 V T_c = 125 °C			100 500	µA µA
I_{EBO}	Emitter cut-off current (I_C =0)	V_{EB} = 9 V			100	µA
$V_{(BR)EBO}$	Emitter-base brakdown voltage (I_C = 0)	I_E =10 mA	10		18	V
$V_{CEO(sus)}$ (1)	Collector-emitter sustaining voltage (I_B = 0)	I_C =10 mA	450			V
$V_{CE(sat)}$ (1)	Collector-emitter saturation voltage	I_C =1 A I_B =0.2 A I_C =2 A I_B =0.4 A I_C =4 A I_B =0.8 A		0.1	0.3 0.6 1.2	V V V
$V_{BE(sat)}$ (1)	Base-emitter saturation voltage	I_C =1 A I_B =0.2 A I_C =4 A I_B =0.8 A			1 1.3	V V
h_{FE} (1)	DC current gain	I_C =10 mA V_{CE} =5 V I_C =500 mA V_{CE} =5 V I_C =7 A V_{CE} =10 V	10 4		 60 10	
V_{CEW} (1)	Maximum collector-emitter voltage without snubber	I_C =8 A V_{BB}= -2.5 V L =50 µH R_{BB} =0 t_p =10 µs	450			V
t_s t_f	Resistive load Storage time Fall time	V_{CC} =250 V I_C =2 A I_{B1}=-I_{B2} =400 mA (see *Figure 12*)	2		3 0.8	µs µs
t_s t_f	Inductive load Storage time Fall time	V_{CL} =300 V I_C =4 A $I_{B(on)}$ =800 mA $R_{BB(off)}$ =0 $V_{BE(off)}$ =-5 V L =1 mH (see *Figure 13*)		0.6 50	1.3 100	µs ns
V_F	Diode forward voltage	I_C = 3 A			1.5	V

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

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area (for TO-220 - D²PAK - I²PAK)

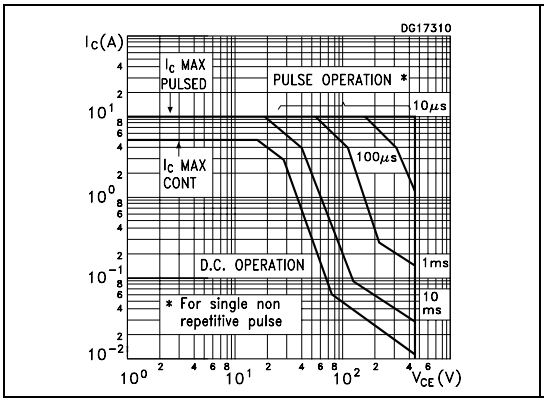


Figure 3. Safe operating area (for TO-220FP)

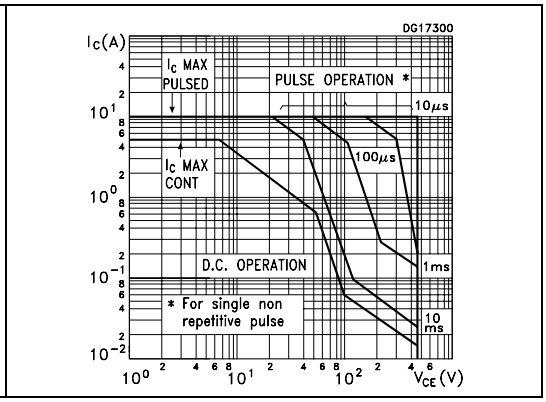


Figure 4. Derating curves

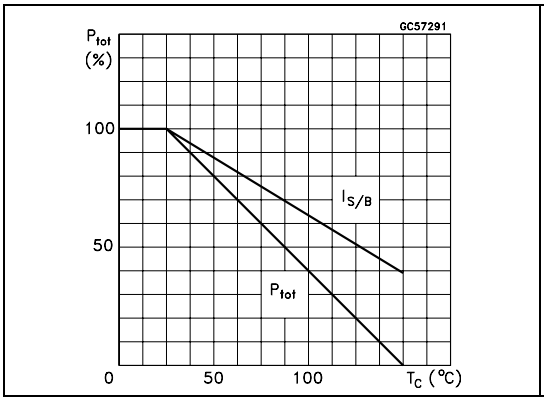


Figure 5. Output characteristics

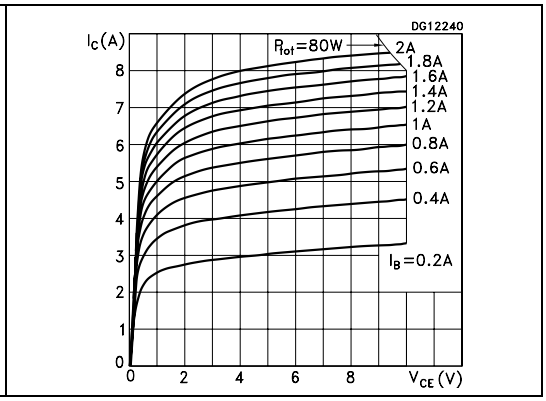


Figure 6. Collector-emitter saturation voltage

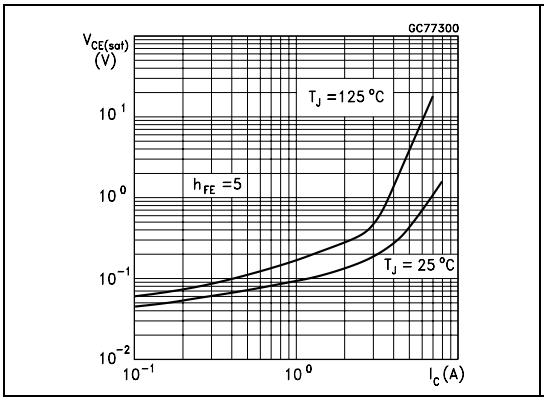


Figure 7. Base-emitter saturation voltage

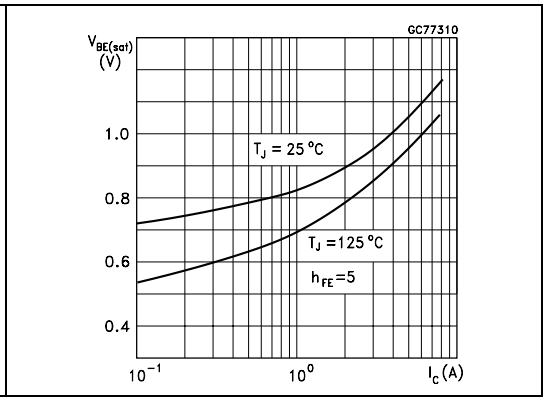


Figure 8. DC current gain

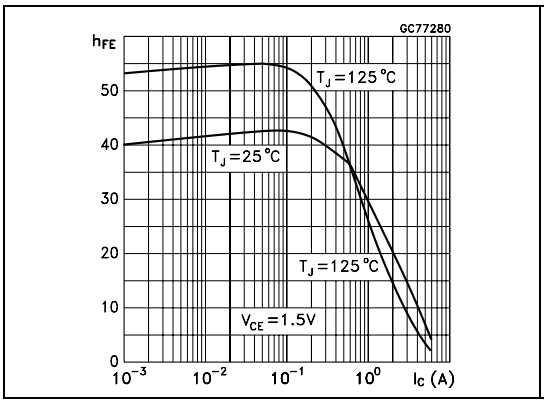


Figure 9. DC current gain

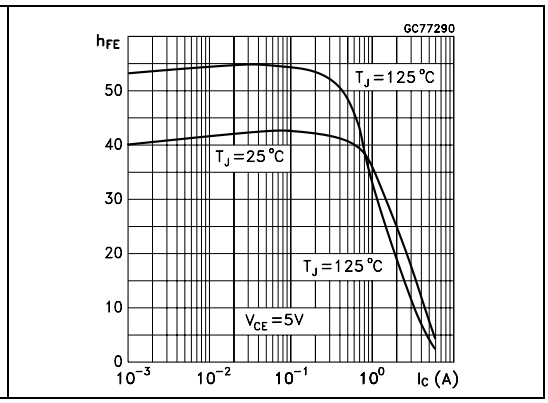


Figure 10. Inductive load storage time

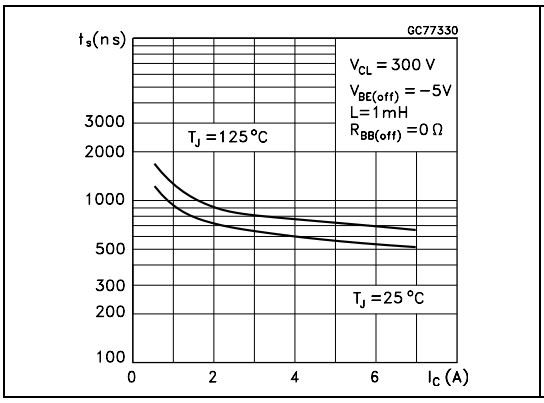


Figure 11. Inductive load fall time

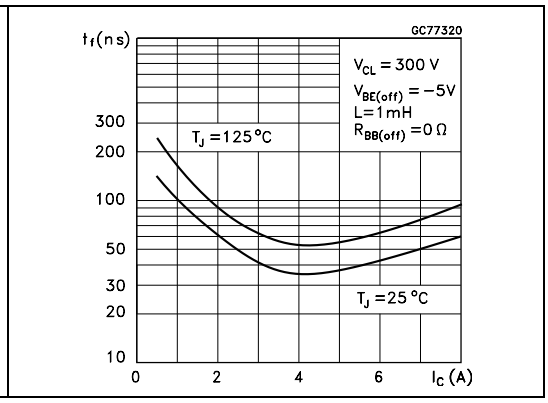
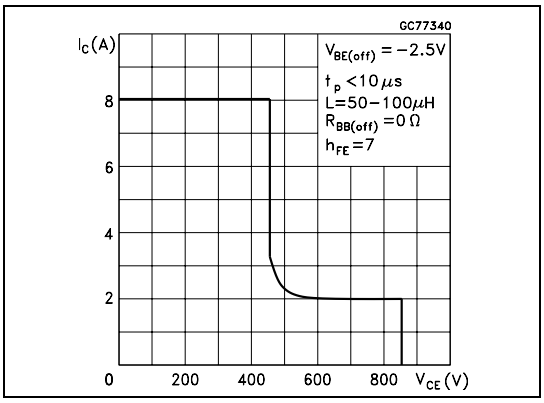


Figure 12. Reverse biased safe operating area



2.2 Test circuits

Figure 13. Resistive load switching test circuit

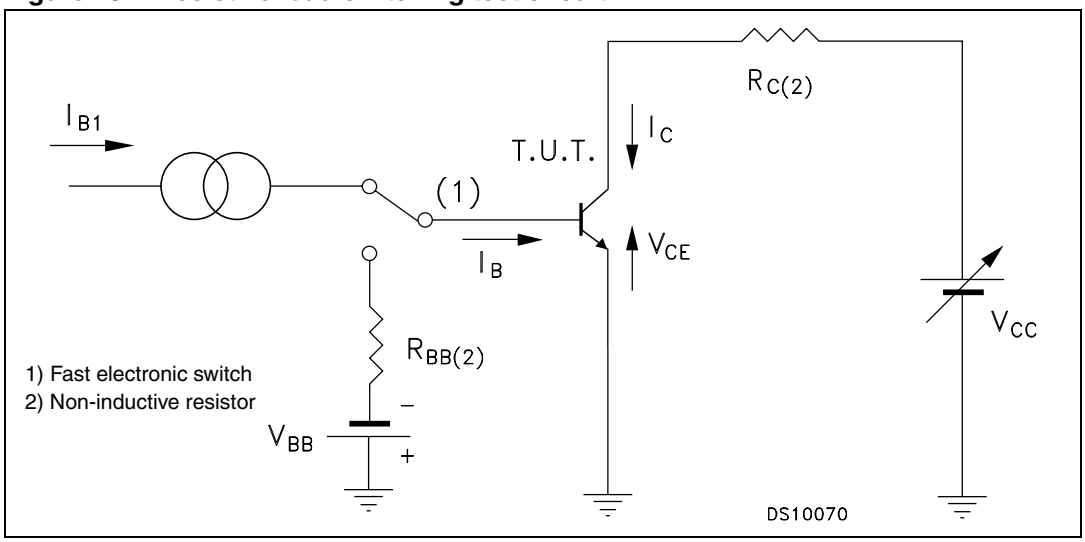
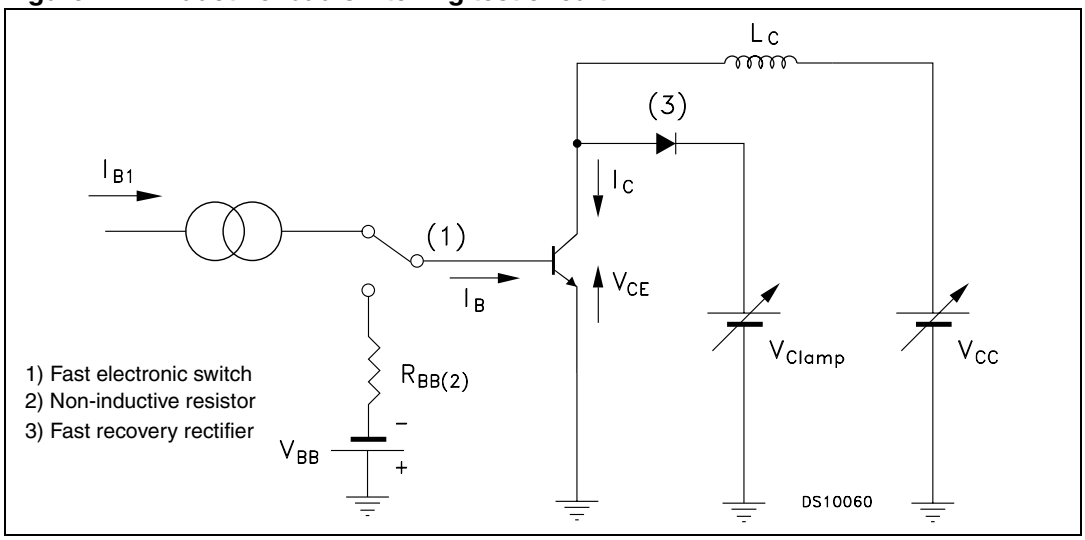


Figure 14. Inductive load switching test circuit

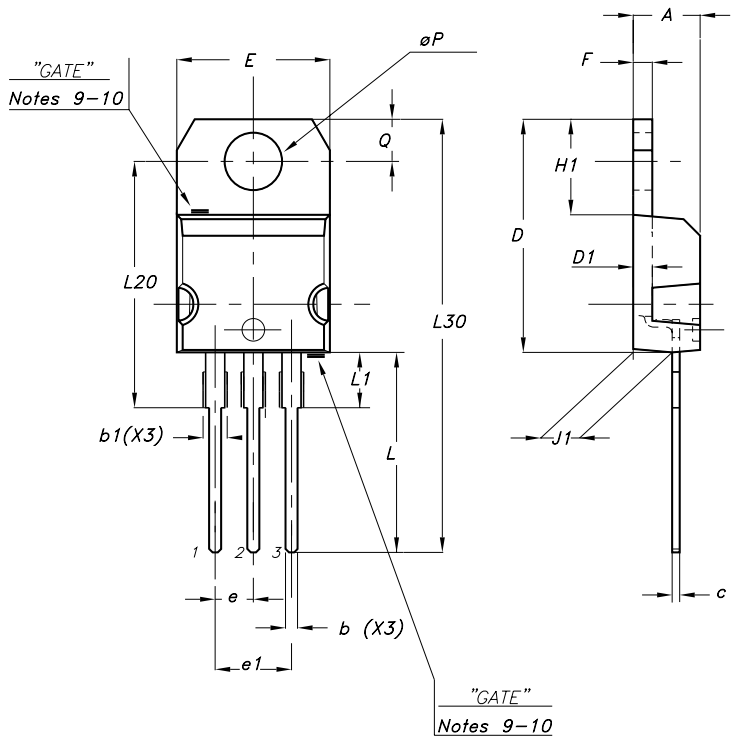


3 Package mechanical data

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

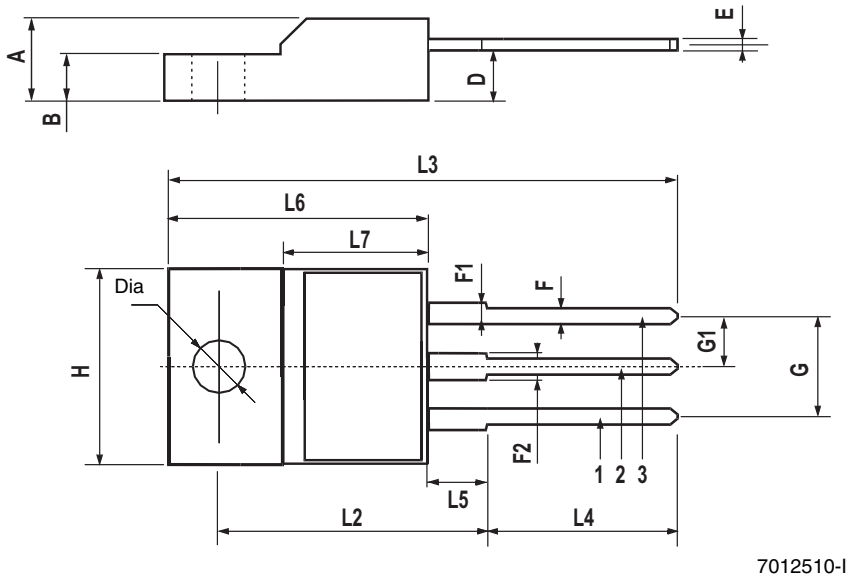
TO-220 mechanical data

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	0.48		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



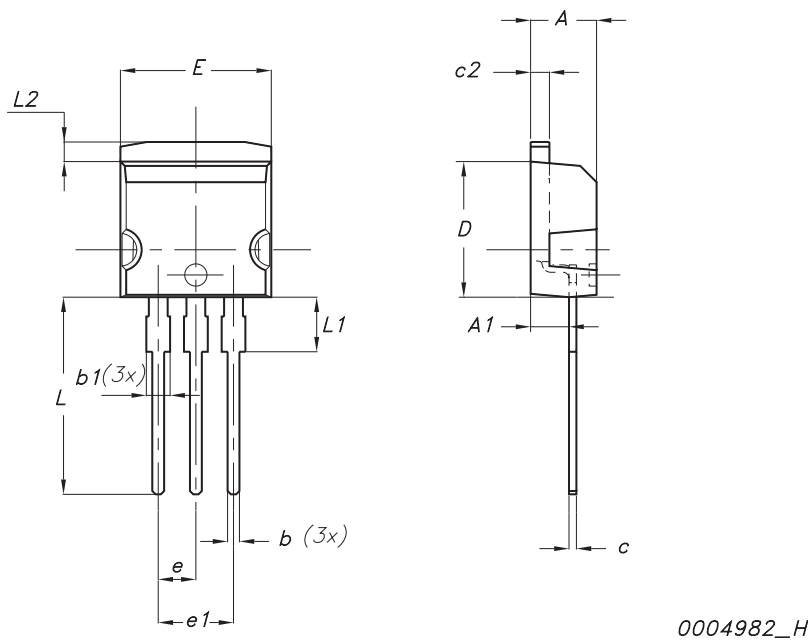
TO-220FP mechanical data

Dim.	mm.			inch		
	Min.	Typ	Max.	Min.	Typ.	Max.
A	4.40		4.60	0.173		0.181
B	2.5		2.7	0.098		0.106
D	2.5		2.75	0.098		0.108
E	0.45		0.70	0.017		0.027
F	0.75		1.00	0.030		0.039
F1	1.15		1.50	0.045		0.067
F2	1.15		1.50	0.045		0.067
G	4.95		5.20	0.195		0.204
G1	2.40		2.70	0.094		0.106
H	10		10.40	0.393		0.409
L2		16			0.630	
L3	28.6		30.6	1.126		1.204
L4	9.80		10.60	0.385		0.417
L5	2.9		3.6	0.114		0.141
L6	15.90		16.40	0.626		0.645
L7	9		9.30	0.354		0.366
Dia	3		3.2	0.118		0.126



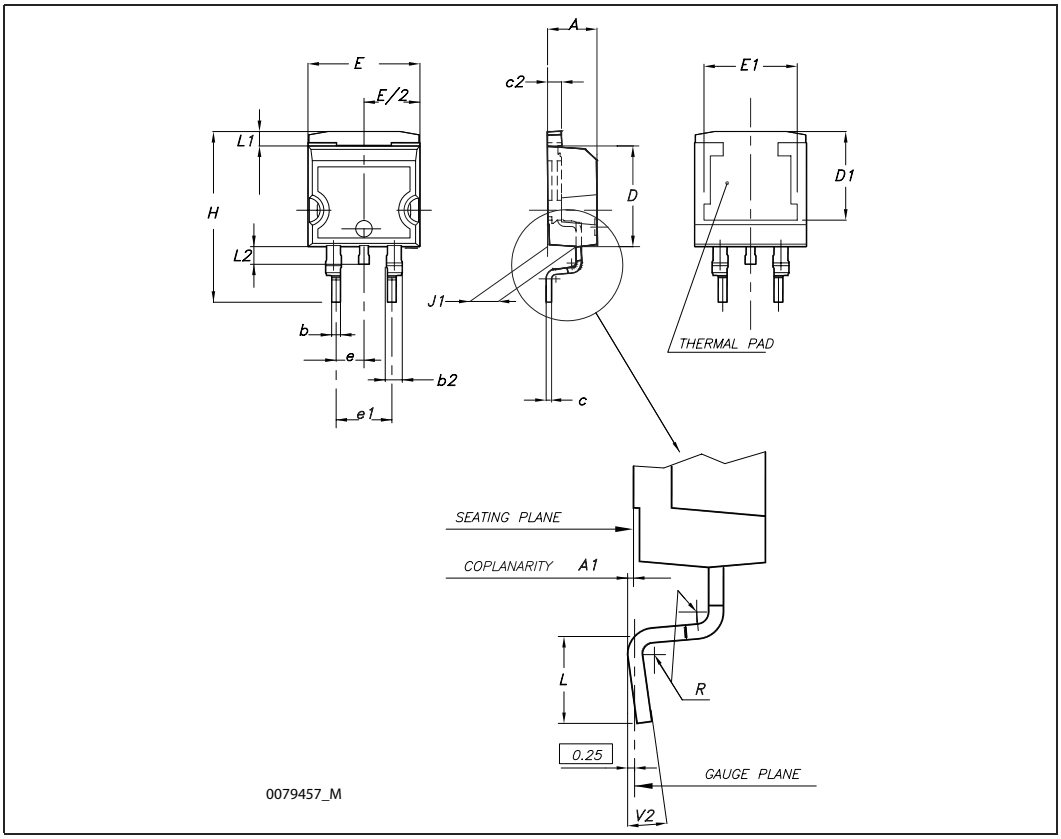
I²PAK (TO-262) mechanical data

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



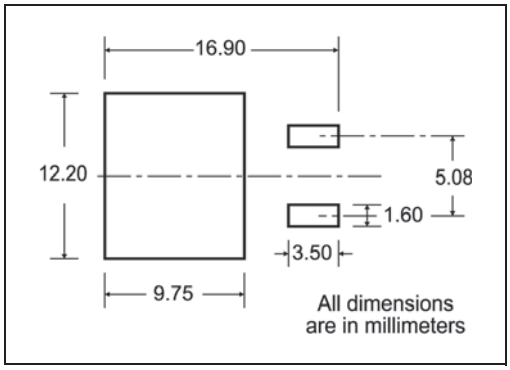
D²PAK (TO-263) mechanical data

Dim	mm			inch		
	Min	Typ	Max	Min	Typ	Max
A	4.40		4.60	0.173		0.181
A1	0.03		0.23	0.001		0.009
b	0.70		0.93	0.027		0.037
b2	1.14		1.70	0.045		0.067
c	0.45		0.60	0.017		0.024
c2	1.23		1.36	0.048		0.053
D	8.95		9.35	0.352		0.368
D1	7.50			0.295		
E	10		10.40	0.394		0.409
E1	8.50			0.334		
e		2.54			0.1	
e1	4.88		5.28	0.192		0.208
H	15		15.85	0.590		0.624
J1	2.49		2.69	0.099		0.106
L	2.29		2.79	0.090		0.110
L1	1.27		1.40	0.05		0.055
L2	1.30		1.75	0.051		0.069
R		0.4			0.016	
V2	0°		8°	0°		8°

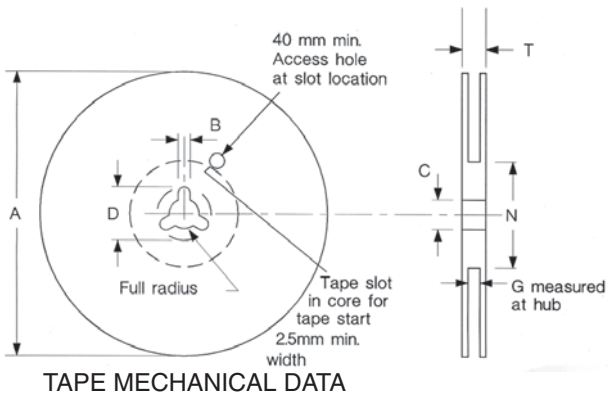


4 Packaging information

D²PAK FOOTPRINT



TAPE AND REEL SHIPMENT



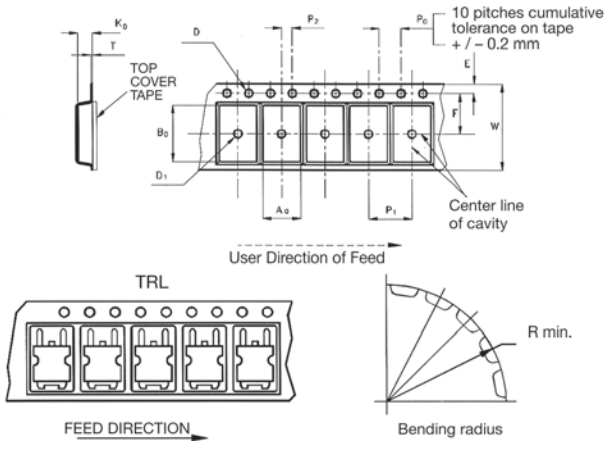
REEL MECHANICAL DATA

DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A		330		12.992
B	1.5		0.059	
C	12.8	13.2	0.504	0.520
D	20.2		0795	
G	24.4	26.4	0.960	1.039
N	100		3.937	
T		30.4		1.197

BASE QTY	BULK QTY
1000	1000

TAPE MECHANICAL DATA

DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A0	10.5	10.7	0.413	0.421
B0	15.7	15.9	0.618	0.626
D	1.5	1.6	0.059	0.063
D1	1.59	1.61	0.062	0.063
E	1.65	1.85	0.065	0.073
F	11.4	11.6	0.449	0.456
K0	4.8	5.0	0.189	0.197
P0	3.9	4.1	0.153	0.161
P1	11.9	12.1	0.468	0.476
P2	1.9	2.1	0.075	0.082
R	50		1.574	
T	0.25	0.35	0.0098	0.0137
W	23.7	24.3	0.933	0.956



5 Revision history

Table 5. Document revision history

Date	Revision	Changes
10-Sep-2003	1	First release.
04-May-2007	2	The document has been reformatted.
09-Jun-2008	3	Inserted devices in: D^2PAK and I^2PAK.

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