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1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value			Unit
		BU931	BU931P	BU931T	
V _{CES}	Collector-emitter voltage (V _{BE} = 0)	500			V
V _{CEO}	Collector-emitter voltage (I _B = 0)	400			V
V _{EBO}	Emitter-base voltage (I _C = 0)	5			V
I _C	Collector current	15		10	A
I _{CM}	Collector peak current	30		20	A
I _B	Base current	1			A
I _{BM}	Base peak current	5			A
P _{TOT}	Total dissipation at T _C = 25 °C	175	135	125	W
T _{STG}	Storage temperature	-65 to 200	-65 to 175		°C
T _J	Max. operating junction temperature	200	175		

Table 3. Thermal data

Symbol	Parameter	Value			Unit
		BU931	BU931P	BU931T	
R_{thJC}	Thermal resistance junction-case max.	1	1.1	1.2	°C/W

2 Electrical characteristics

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

Table 4. Electrical characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{CES}	Collector cut-off current ($V_{\text{BE}} = 0$)	$V_{\text{CE}} = 500\text{ V}$ $V_{\text{CE}} = 500\text{ V}$ $T_{\text{C}} = 125\text{ }^{\circ}\text{C}$			100 0.5	μA mA
I_{CEO}	Collector cut-off current ($I_{\text{B}} = 0$)	$V_{\text{CE}} = 450\text{ V}$ $V_{\text{CE}} = 450\text{ V}$ $T_{\text{C}} = 125\text{ }^{\circ}\text{C}$			100 0.5	μA mA
I_{EBO}	Emitter cut-off current ($I_{\text{C}} = 0$)	$V_{\text{EB}} = 5\text{ V}$			20	mA
$V_{\text{CEO(sus)}}^{(1)}$	Collector-emitter sustaining voltage ($I_{\text{B}} = 0$)	$I_{\text{C}} = 100\text{ mA}$ $L = 10\text{ mH}$ $V_{\text{clamp}} = 400\text{ V}$ see Figure 14	400			V
$V_{\text{CE(sat)}}^{(1)}$	Collector-emitter saturation voltage	$I_{\text{C}} = 7\text{ A}$ $I_{\text{B}} = 70\text{ mA}$ $I_{\text{C}} = 8\text{ A}$ $I_{\text{B}} = 100\text{ mA}$ $I_{\text{C}} = 10\text{ A}$ $I_{\text{B}} = 250\text{ mA}$			1.6 1.8 1.8	V V V
$V_{\text{BE(sat)}}^{(1)}$	Base-emitter saturation voltage	$I_{\text{C}} = 7\text{ A}$ $I_{\text{B}} = 70\text{ mA}$ $I_{\text{C}} = 8\text{ A}$ $I_{\text{B}} = 100\text{ mA}$ $I_{\text{C}} = 10\text{ A}$ $I_{\text{B}} = 250\text{ mA}$			2.2 2.4 2.5	V V V
$h_{\text{FE}}^{(1)}$	DC current gain	$I_{\text{C}} = 5\text{ A}$ $V_{\text{CE}} = 10\text{ V}$	300			
V_{F}	Diode forward voltage	$I_{\text{F}} = 10\text{ A}$			2.5	V
	Functional test	$V_{\text{CC}} = 24\text{ V}$ $L = 7\text{ mH}$ $V_{\text{clamp}} = 400\text{ V}$ see Figure 11	8			A
t_{s} t_{f}	Inductive Load Storage time Fall time	$I_{\text{C}} = 7\text{ A}$ $V_{\text{clamp}} = 300\text{ V}$ $I_{\text{B}} = 70\text{ mA}$ $L = 7\text{ mH}$ $V_{\text{BE}} = 0$ $R_{\text{BE}} = 47\text{ }\Omega$ $V_{\text{CC}} = 12\text{ V}$ see Figure 13		15 0.5		μs μs

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

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area for BU931 and BU931P

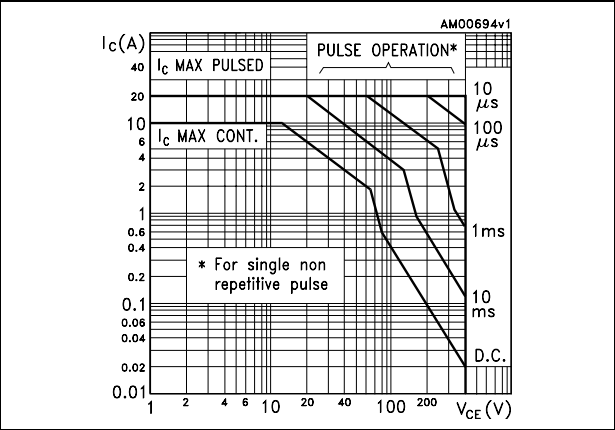
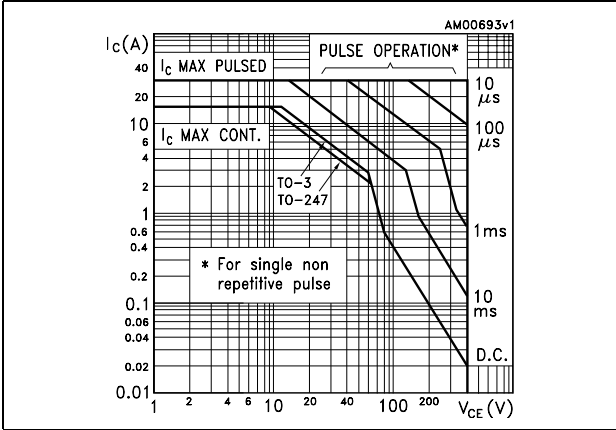


Figure 4. DC current gain

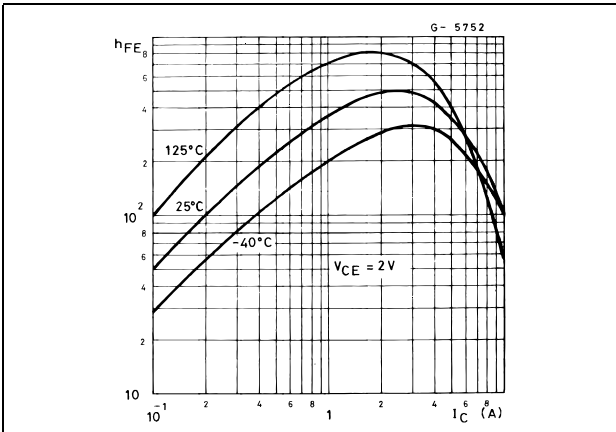


Figure 5. Switching time inductive load

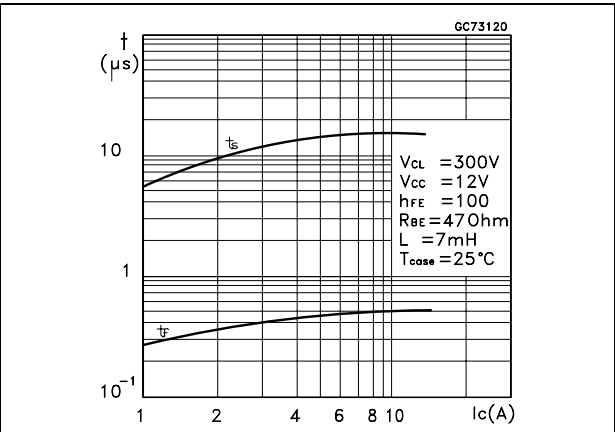


Figure 6. Collector-emitter saturation voltage @ hFE = 50

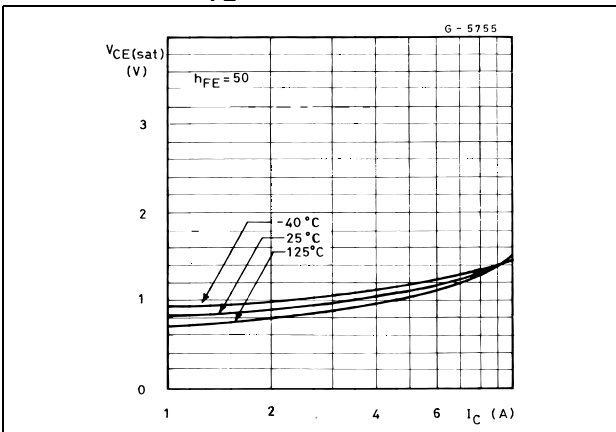


Figure 7. Collector-emitter saturation voltage @ hFE = 100

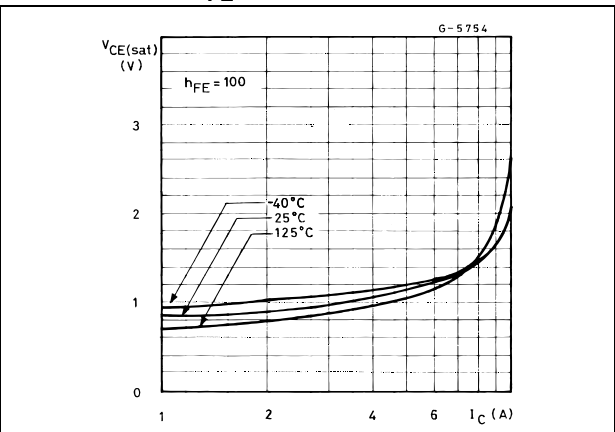


Figure 8. Collector-emitter saturation voltage Figure 9. Base-emitter saturation voltage @ $h_{FE} = 50$

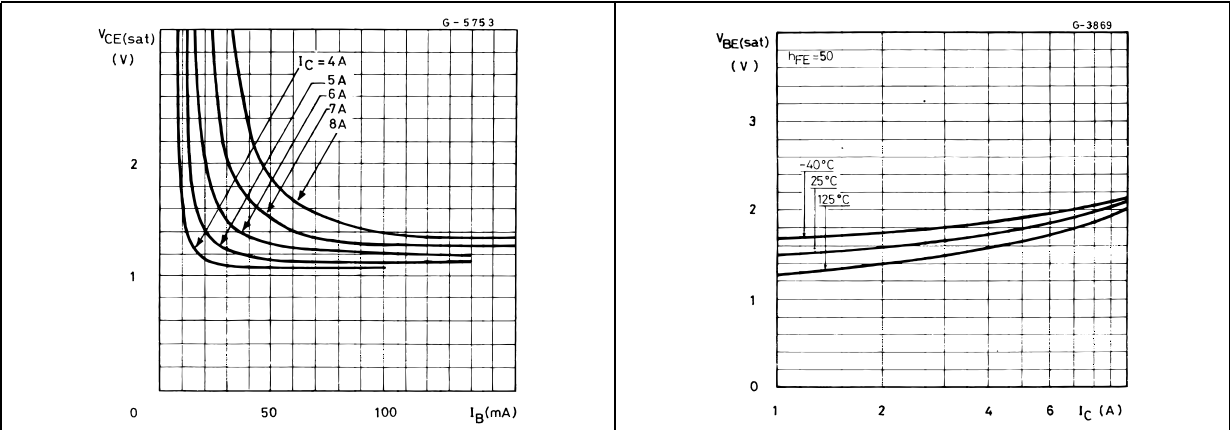
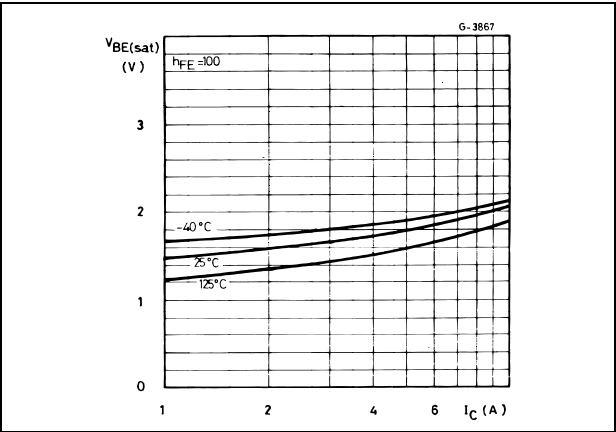


Figure 10. Base-emitter saturation voltage @ $h_{FE} = 100$



3 Test circuits

Figure 11. Functional test circuit

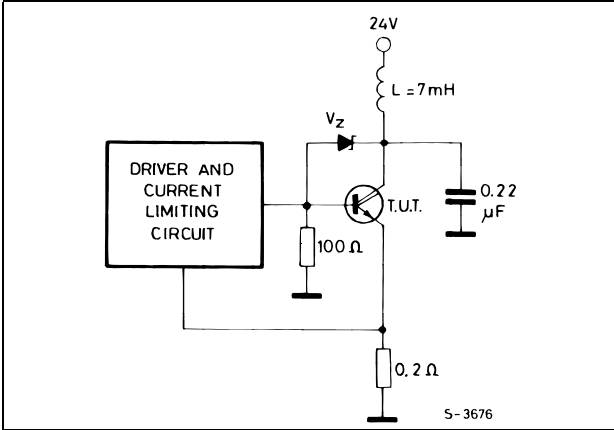


Figure 12. Functional test waveforms

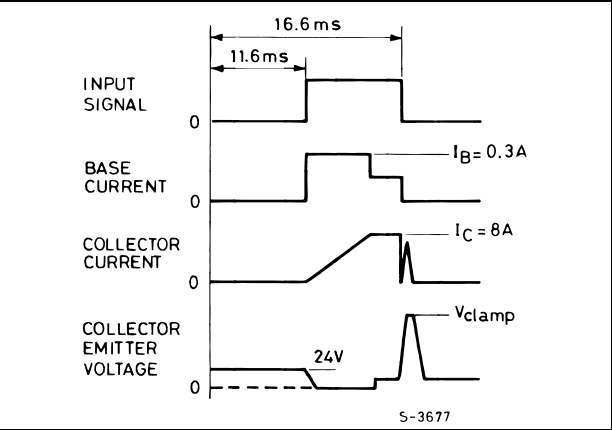


Figure 13. Switching time test circuit

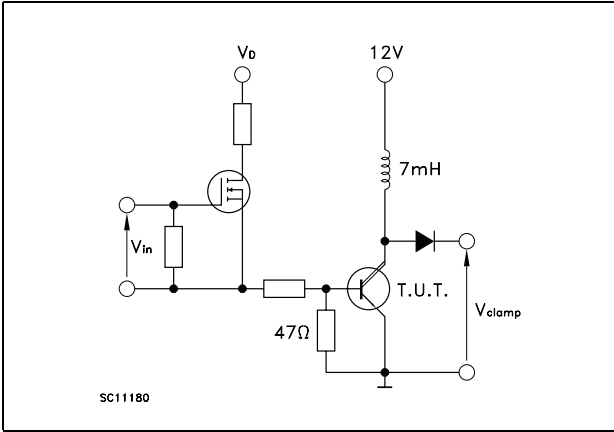
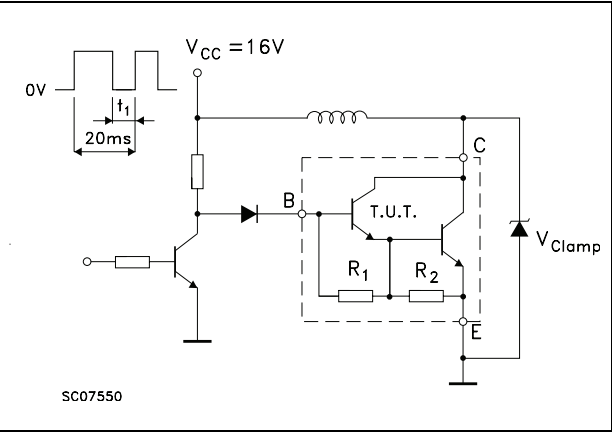


Figure 14. Sustaining voltage test circuit

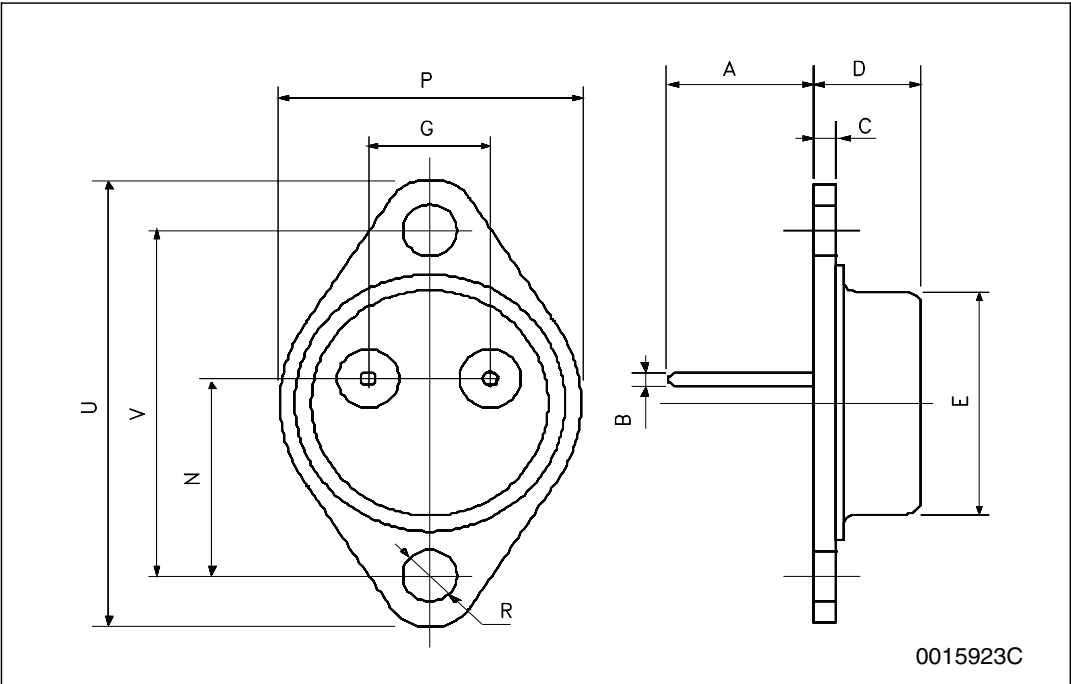


4 Package mechanical data

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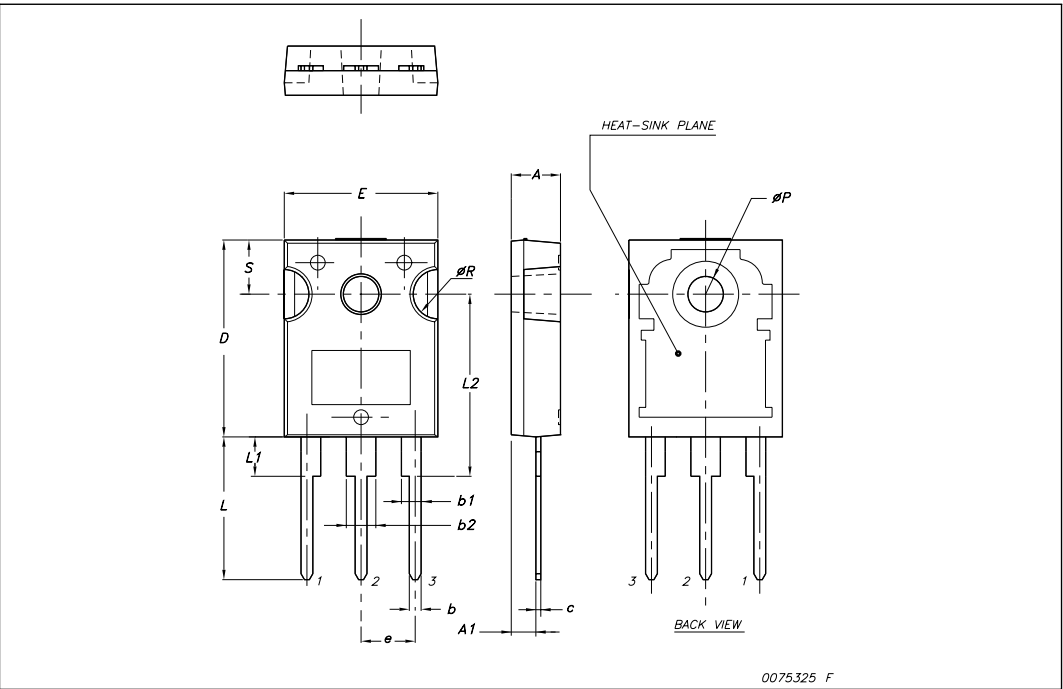
TO-3 mechanical data

DIM.	mm.		
	min.	typ	max.
A	11.00		13.10
B	0.97		1.15
C	1.50		1.65
D	8.32		8.92
E	19.00		20.00
G	10.70		11.10
N	16.50		17.20
P	25.00		26.00
R	4.00		4.09
U	38.50		39.30
V	30.00		30.30



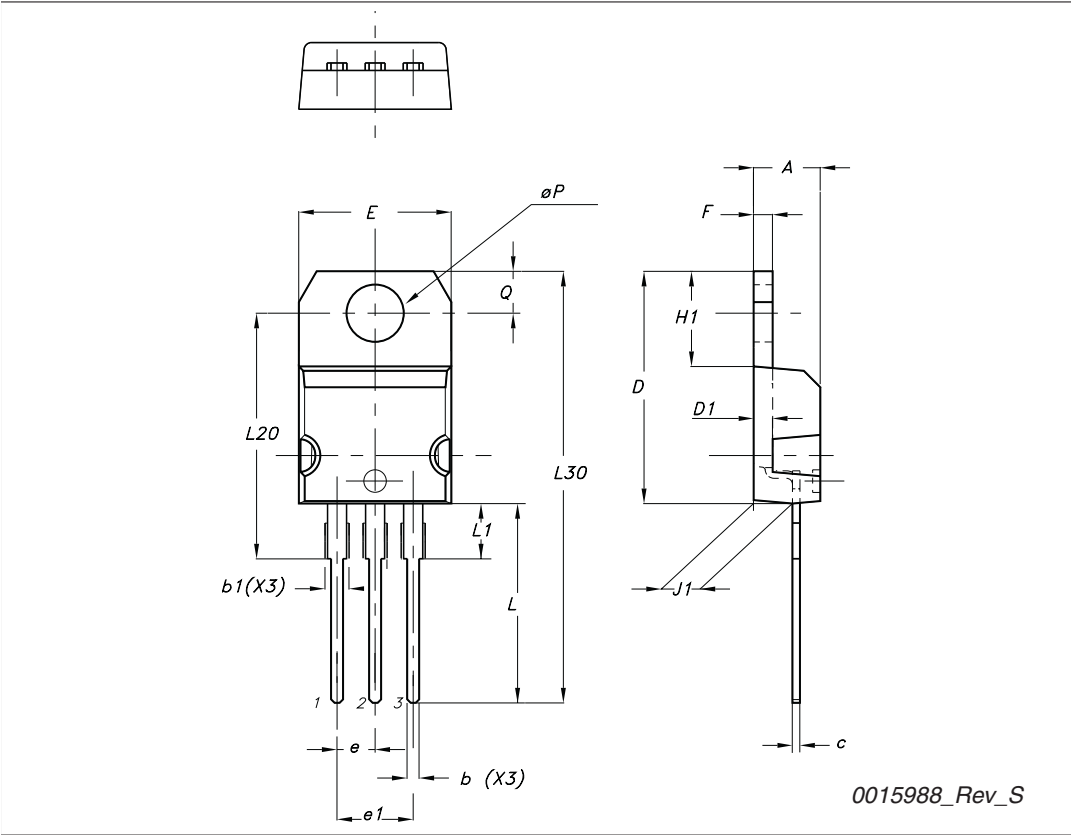
TO-247 Mechanical data

Dim.	mm.		
	Min.	Typ	Max.
A	4.85		5.15
A1	2.20		2.60
b	1.0		1.40
b1	2.0		2.40
b2	3.0		3.40
c	0.40		0.80
D	19.85		20.15
E	15.45		15.75
e		5.45	
L	14.20		14.80
L1	3.70		4.30
L2		18.50	
øP	3.55		3.65
øR	4.50		5.50
S		5.50	



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	
ØP	3.75		3.85
Q	2.65		2.95



5 Revision history

Table 5. Document revision history

Date	Revision	Changes
18-Nov-2008	3	Package changed from TO-218 to TO-247 for BU931P. Inserted type in TO-220 (BU931T).
02-Dec-2009	4	Modified I_C test condition value of $V_{CEO(sus)}$ parameter Table 4 on page 4 , updated TO-220 package mechanical data.

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