BU931
BU931P, BU931T

High voltage ignition coil driver
NPN power Darlington transistors

Features

- Very rugged Bipolar technology
- High operating junction temperature
- Wide range of packages

Application

- High ruggedness electronic ignitions

Description

The devices are bipolar Darlington transistors manufactured using multi-epitaxial planar technology. They have been properly designed to be used in automotive environment as electronic ignition power actuators.

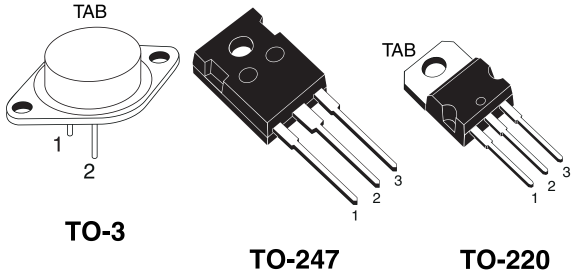


Figure 1. Internal schematic diagrams

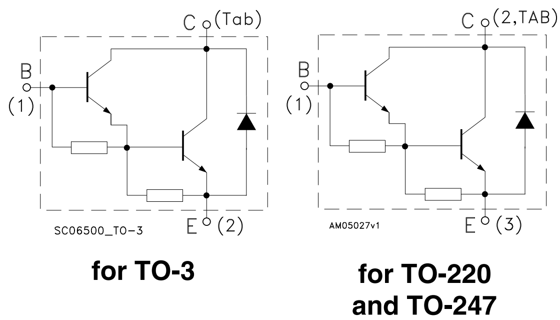


Table 1. Device summary

Order codes	Marking	Packages	Packaging
BU931	BU931	TO-3	Tray
BU931P	BU931P	TO-247	Tube
BU931T	BU931T	TO-220	Tube

Content

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_{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} = 500 V V_{CE} = 500 V T_C = 125 °C			100 0.5	µA mA
I_{CEO}	Collector cut-off current (I_B = 0)	V_{CE} = 450 V V_{CE} = 450 V T_C = 125 °C			100 0.5	µA mA
I_{EBO}	Emitter cut-off current (I_C = 0)	V_{EB} = 5 V			20	mA
$V_{CEO(sus)}$ (1)	Collector-emitter sustaining voltage (I_B = 0)	I_C = 100 mA L = 10 mH V_{clamp} = 400 V see *Figure 14*	400			V
$V_{CE(sat)}$ (1)	Collector-emitter saturation voltage	I_C = 7 A I_B = 70 mA I_C = 8 A I_B = 100 mA I_C = 10 A I_B = 250 mA			1.6 1.8 1.8	V V V
$V_{BE(sat)}$ (1)	Base-emitter saturation voltage	I_C = 7 A I_B = 70 mA I_C = 8 A I_B = 100 mA I_C = 10 A I_B = 250 mA			2.2 2.4 2.5	V V V
h_{FE} (1)	DC current gain	I_C = 5 A V_{CE} = 10 V	300			
V_F	Diode forward voltage	I_F = 10 A			2.5	V
	Functional test	V_{CC} = 24 V L = 7 mH V_{clamp} = 400 V see *Figure 11*	8			A
 t_s t_f	Inductive Load Storage time Fall time	I_C = 7 A V_{clamp} = 300 V I_B = 70 mA L = 7 mH V_{BE} = 0 R_{BE} = 47 Ω V_{CC} = 12 V see *Figure 13*		 15 0.5		 µs µs

1. Pulse test: pulse duration ≤ 300 µs, duty cycle ≤ 2 %

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area for BU931 and BU931P

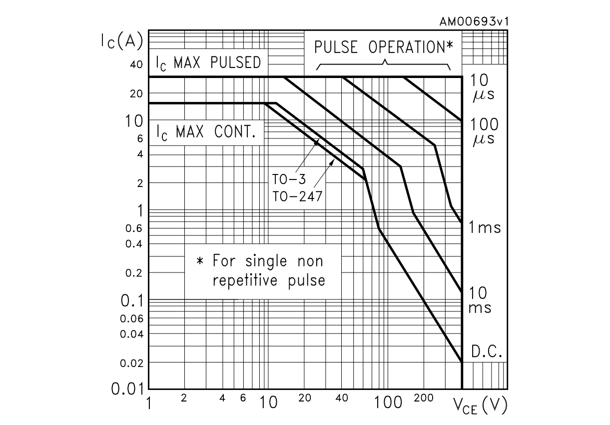


Figure 3. Safe operating area for BU931T

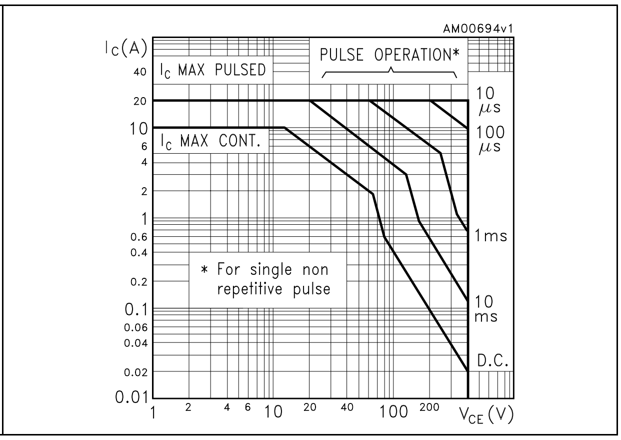


Figure 4. DC current gain

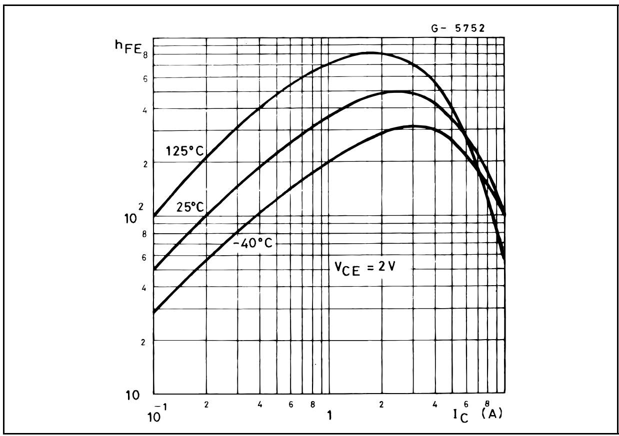


Figure 5. Switching time inductive load

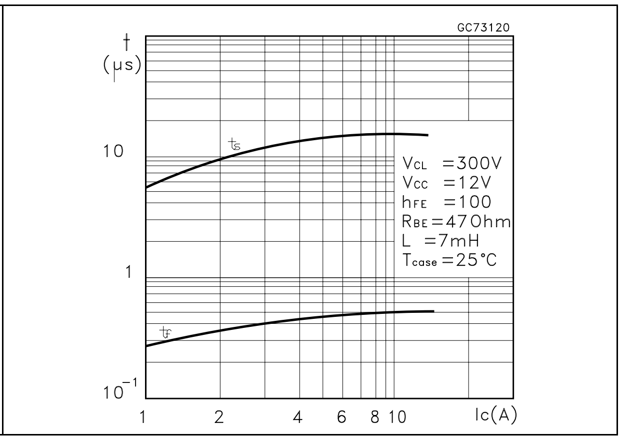


Figure 6. Collector-emitter saturation voltage @ h_{FE} = 50

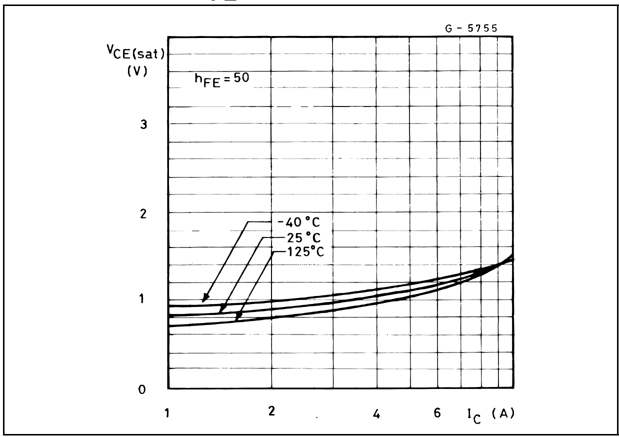


Figure 7. Collector-emitter saturation voltage @ h_{FE} = 100

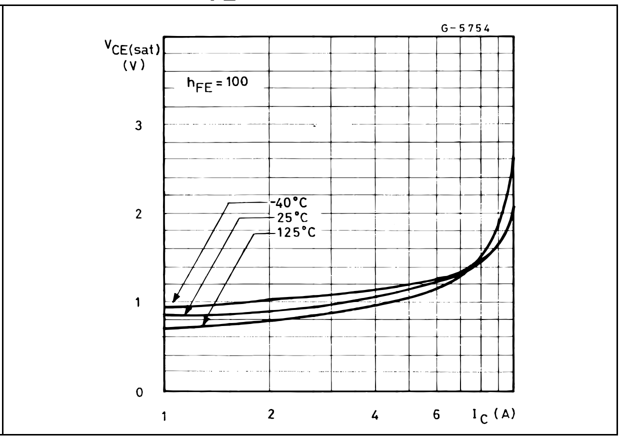


Figure 8. Collector-emitter saturation voltage

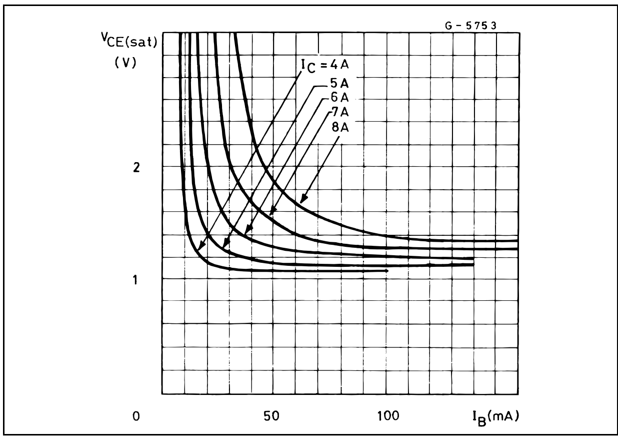


Figure 9. Base-emitter saturation voltage @ h_{FE} = 50

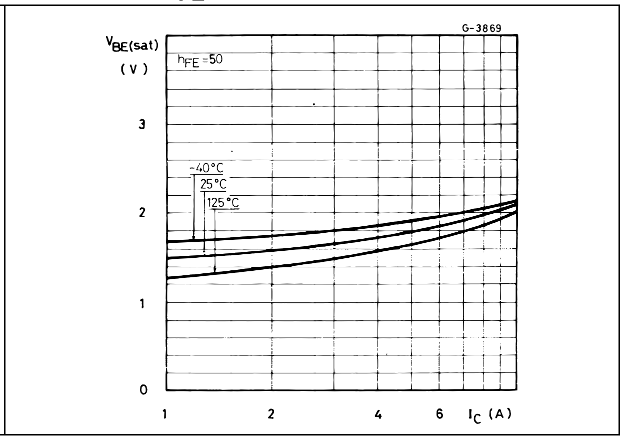
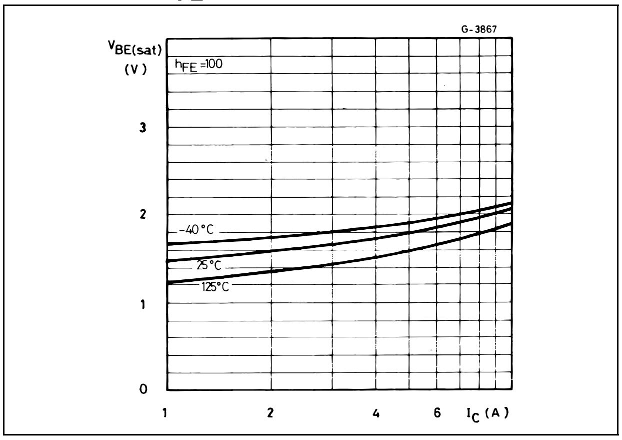


Figure 10. Base-emitter saturation voltage @ h_{FE} = 100



3 Test circuits

Figure 11. Functional test circuit

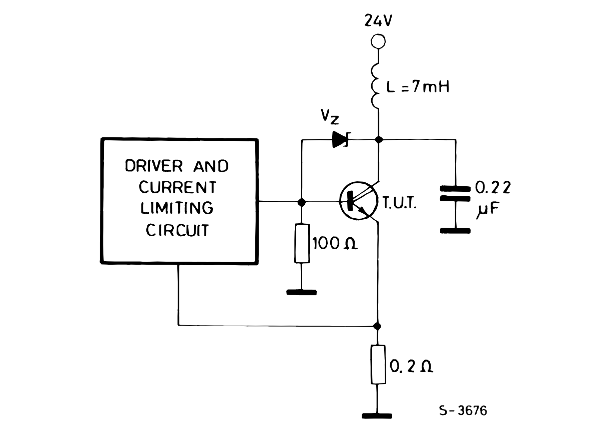


Figure 12. Functional test waveforms

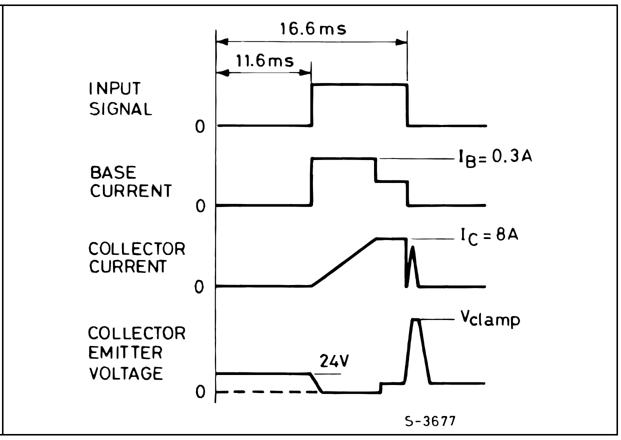


Figure 13. Switching time test circuit

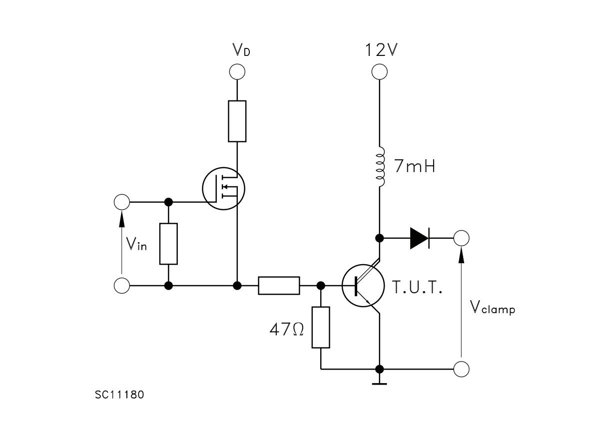
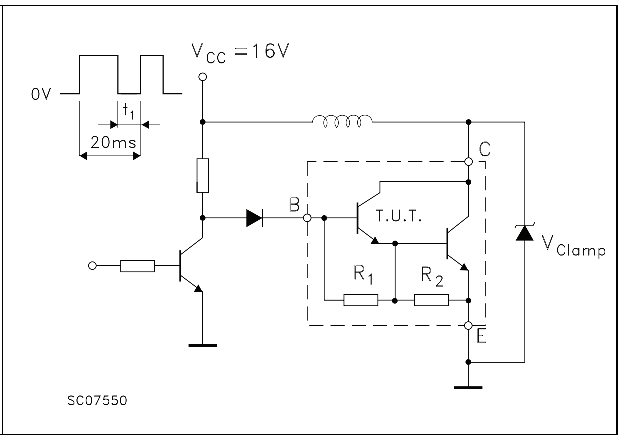


Figure 14. Sustaining voltage test circuit

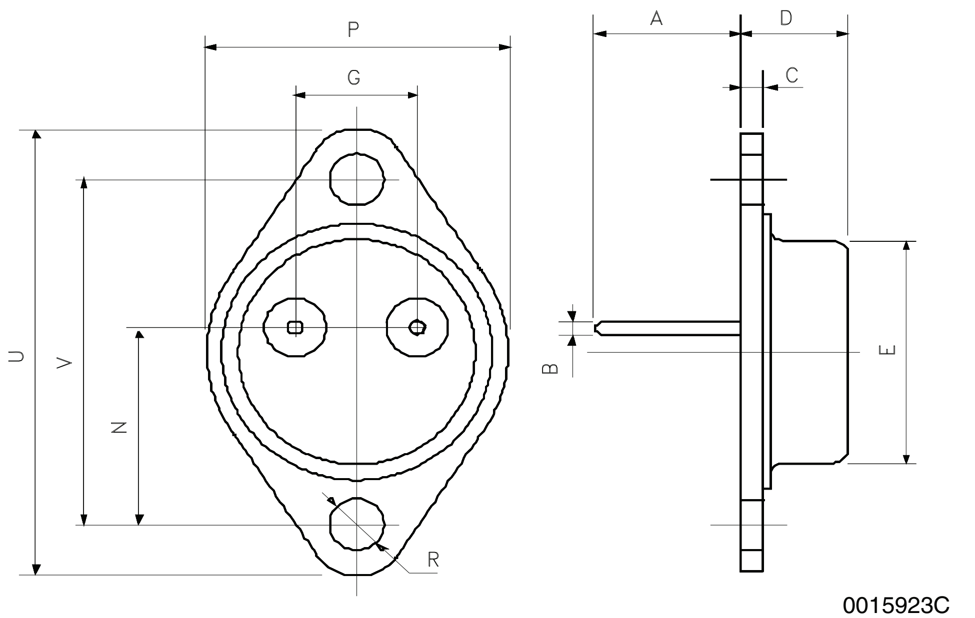


4 Package mechanical data

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

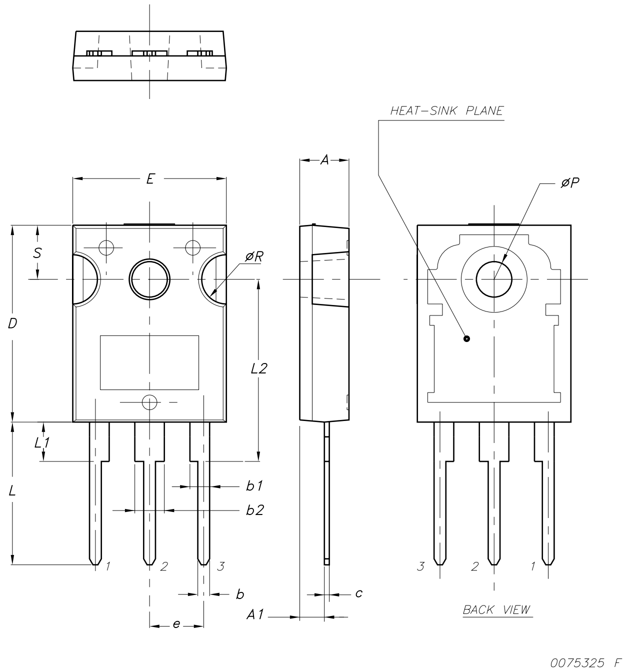
TO-3 mechanical data

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



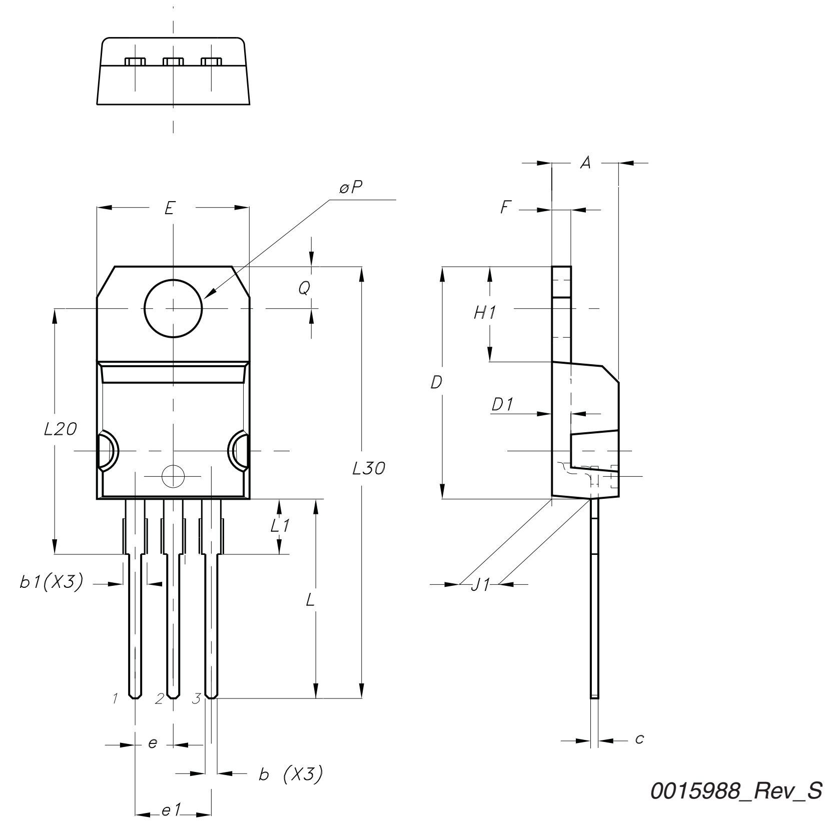
TO-247 Mechanical data

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	
∅P	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.