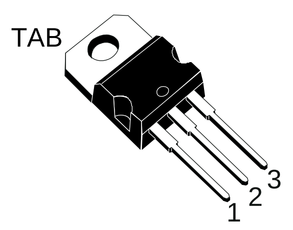
BU931T

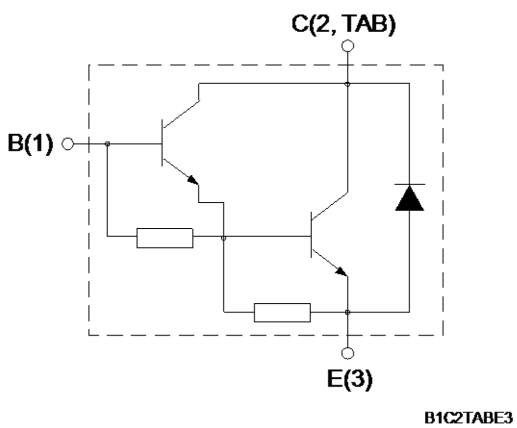
Automotive-grade high voltage ignition coil driver NPN power Darlington transistor

Datasheet - production data



TO-220

Figure 1: Internal schematic diagram



Features

- AEC-Q101 qualified
- Very rugged Bipolar technology
- High operating junction temperature

Applications

- High ruggedness electronic ignitions

Description

This is a high voltage power Darlington transistor developed using multi-epitaxial planar technology. It has been properly designed for automotive environment as electronic ignition power actuators.

Table 1: Device summary

Order code	Marking	Package	Packing
BU931T	BU931T	TO-220	Tube

Contents

1 Electrical ratings

Table 2: Absolute maximum ratings

Symbol	Parameter	Value	Unit
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	10	A
I_{CM}	Collector peak current	20	A
I_B	Base current	1	A
I_{BM}	Base peak current	5	A
P_{TOT}	Total dissipation at Tc = 25 °C	125	W
T_{stg}	Storage temperature range	-65 to 175	°C
T_j	Operating junction temperature range		°C

Table 3: Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance junction-case	1.2	°C/W
R_{thJA}	Thermal resistance junction-ambient	62.5	°C/W

2 Electrical characteristics

(T_C = 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, V_{CE} = 500 V		-	100	µA
		V_{BE} = 0 V, V_{CE} = 500 V, T_C = 125 °C [(1)]		-	0.5	mA
I_{CEO}	Collector cut-off current	I_B = 0 A, V_{CE} = 450 V		-	100	µA
		I_B = 0 A, V_{CE} = 450 V, T_C = 125 °C [(1)]		-	0.5	mA
I_{EBO}	Emitter cut-off current	I_C= 0 A, V_{EB} = 5 V		-	20	mA
$V_{CEO(sus)}$[(2)]	Collector-emitter sustaining voltage	I_B= 0 A, I_C = 100 mA	400	-		V
$V_{CE(sat)}$[(2)]	Collector-emitter saturation voltage	I_C = 7 A, I_B = 70 mA		-	1.6	V
		I_C = 8 A, I_B = 100 mA		-	1.8	V
		I_C = 10 A, I_B = 250 mA		-	1.8	V
$V_{BE(sat)}$[(2)]	Base-emitter saturation voltage	I_C = 7 A, I_B = 70 mA		-	2.2	V
		I_C = 8 A, I_B = 100 mA		-	2.4	V
		I_C = 10 A, I_B = 250 mA		-	2.5	V
h_{FE}[(2)]	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 10: "Functional test circuit")	8	-		A

Notes:

(1)Defined by design, not subject to production test.

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

Table 5: Inductive load switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
t_s	Storage time	V_{CC} = 12 V, V_{clamp} = 300 V, L = 7 mH, R_{BE} = 47 Ω, I_C = 7 A, I_B = 70 mA	-	15	-	µs
t_f	Fall time		-	0.5	-	µs

2.1 Electrical characteristics (curves)

Figure 2: Safe operating area

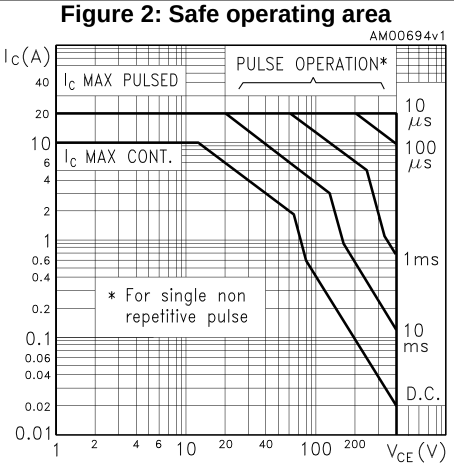


Figure 3: DC current gain

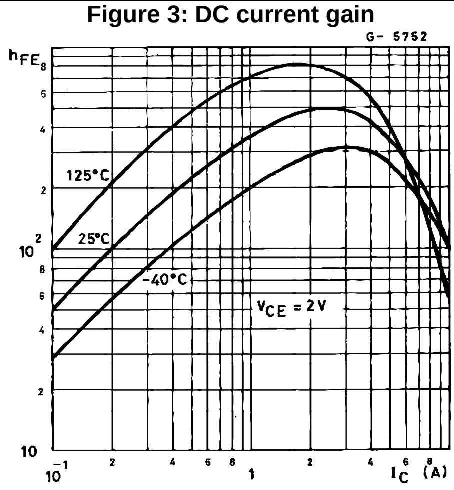


Figure 4: Switching time inductive load

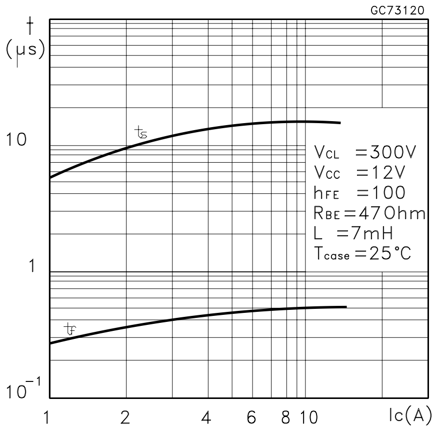


Figure 5: Collector-emitter saturation voltage @ h_{FE} = 50

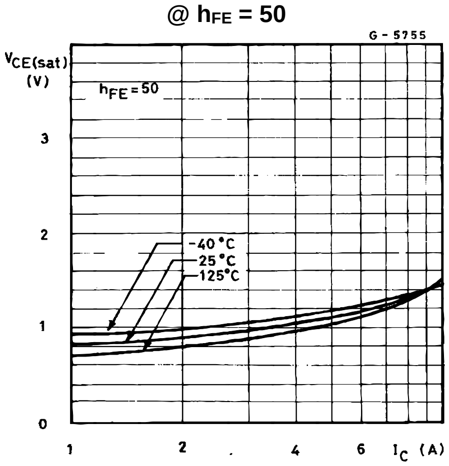


Figure 6: Collector-emitter saturation voltage @ h_{FE} = 100

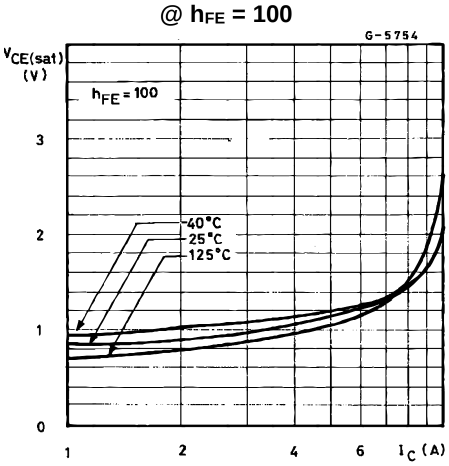


Figure 7: Collector-emitter saturation voltage

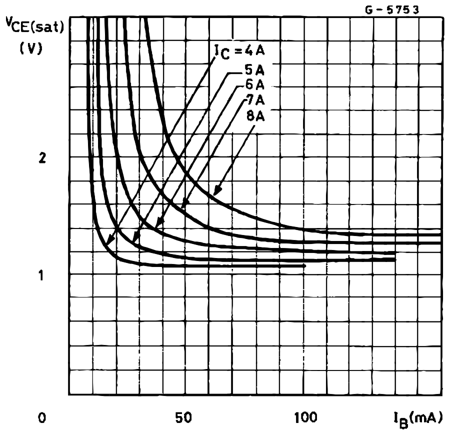


Figure 8: Base-emitter saturation voltage @ h_{FE} = 50

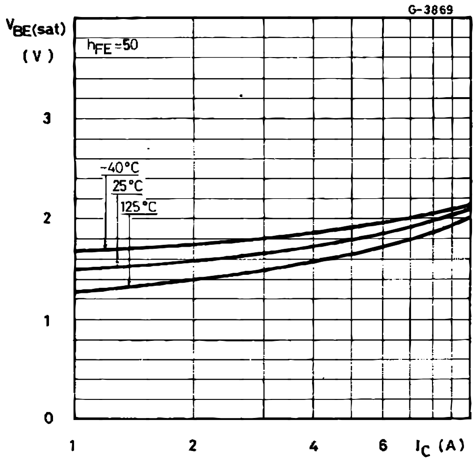
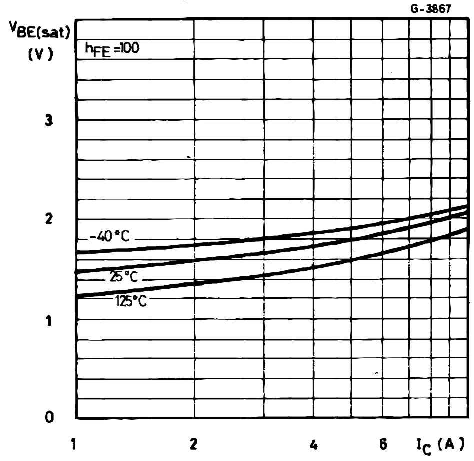


Figure 9: Base-emitter saturation voltage @ h_{FE} = 100



3 Test circuits

Figure 10: Functional test circuit

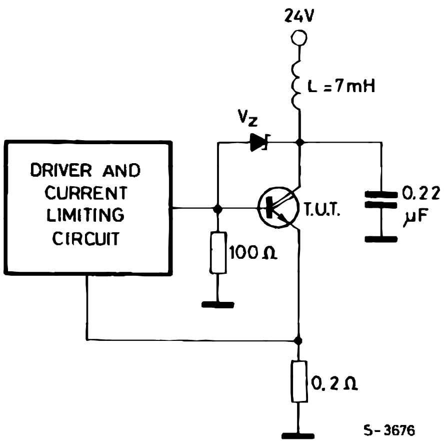


Figure 11: Functional test waveforms

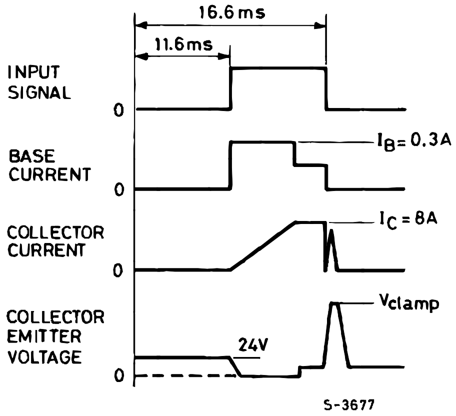


Figure 12: Switching time test circuit

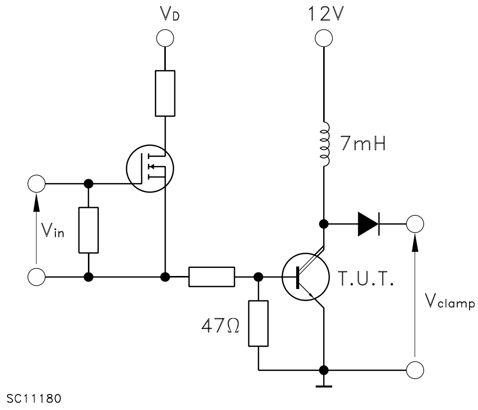
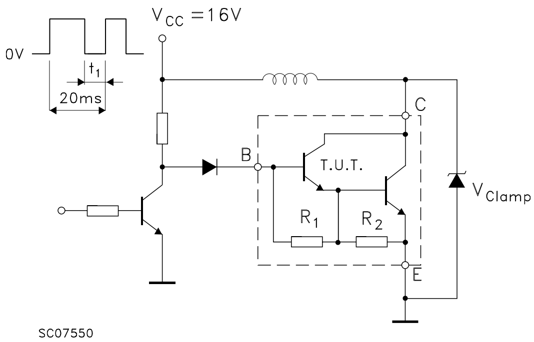


Figure 13: Sustaining voltage test circuit



4 Package information

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.

4.1 TO-220 type A package information

Figure 14: TO-220 type A package outline

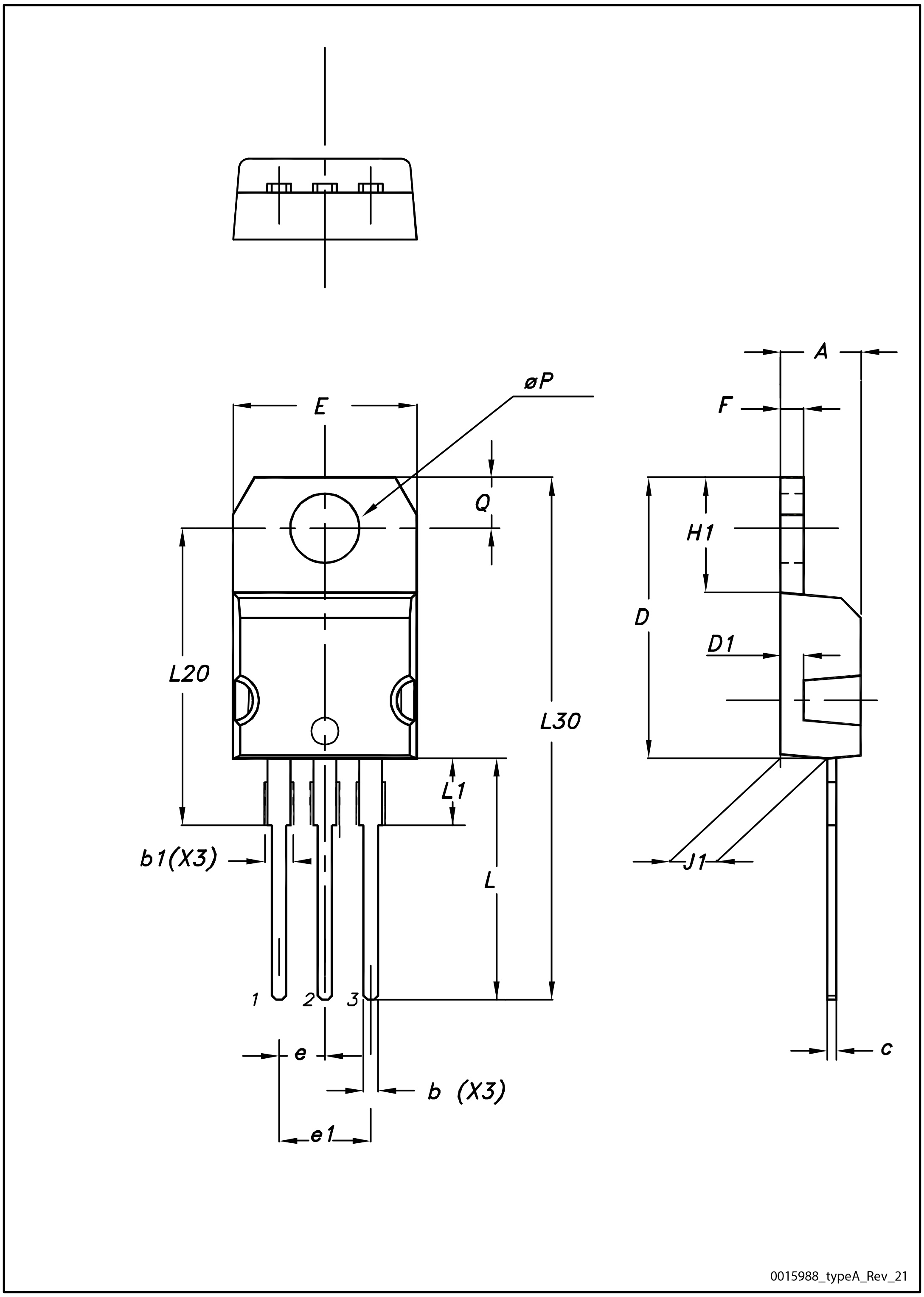


Table 6: TO-220 type A package mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
b	0.61		0.88
b1	1.14		1.55
c	0.48		0.70
D	15.25		15.75
D1		1.27	
E	10.00		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	13.00		14.00
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 7: 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.
12-Oct-2017	5	The part numbers BU931 and BU931P have been moved to two separate datasheets. Modified *Table 2: "Absolute maximum ratings"*, *Table 3: "Thermal data"* and *Table 4: "Electrical characteristics"*. Updated *Section 4: "Package information"*. Minor text changes.