

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

Datasheet - production data



Figure 1: Internal schematic diagram

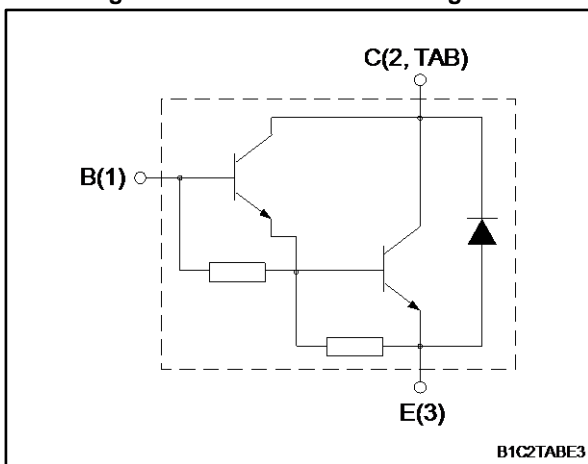


Table 1: Device summary

Order code	Marking	Package	Packing
BU931P	BU931P	TO-247	Tube

### 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.

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# 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	15	A
$I_{CM}$	Collector peak current	30	A
$I_B$	Base current	1	A
$I_{BM}$	Base peak current	5	A
$P_{TOT}$	Total dissipation at $T_C = 25\text{ °C}$	135	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	1.1	°C/W
$R_{thJA}$	Thermal resistance junction-ambient	50	°C/W

## 2 Electrical characteristics

( $T_C = 25\text{ °C}$  unless otherwise specified)

**Table 4: Electrical characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I <sub>CES</sub>	Collector cut-off current	V <sub>BE</sub> = 0 V, V <sub>CE</sub> = 500 V		-	100	μA
		V <sub>BE</sub> = 0 V, V <sub>CE</sub> = 500 V, T <sub>C</sub> = 125 °C <sup>(1)</sup>		-	0.5	mA
I <sub>CEO</sub>	Collector cut-off current	I <sub>B</sub> = 0 A, V <sub>CE</sub> = 450 V		-	100	μA
		I <sub>B</sub> = 0 A, V <sub>CE</sub> = 450 V, T <sub>C</sub> = 125 °C <sup>(1)</sup>		-	0.5	mA
I <sub>EBO</sub>	Emitter cut-off current	I <sub>C</sub> = 0 A, V <sub>EB</sub> = 5 V		-	20	mA
V <sub>CEO(sus)</sub> <sup>(2)</sup>	Collector-emitter sustaining voltage	I <sub>B</sub> = 0 A, I <sub>C</sub> = 100 mA	400	-		V
V <sub>CE(sat)</sub> <sup>(2)</sup>	Collector-emitter saturation voltage	I <sub>C</sub> = 7 A, I <sub>B</sub> = 70 mA		-	1.6	V
		I <sub>C</sub> = 8 A, I <sub>B</sub> = 100 mA		-	1.8	V
		I <sub>C</sub> = 10 A, I <sub>B</sub> = 250 mA		-	1.8	V
V <sub>BE(sat)</sub> <sup>(2)</sup>	Base-emitter saturation voltage	I <sub>C</sub> = 7 A, I <sub>B</sub> = 70 mA		-	2.2	V
		I <sub>C</sub> = 8 A, I <sub>B</sub> = 100 mA		-	2.4	V
		I <sub>C</sub> = 10 A, I <sub>B</sub> = 250 mA		-	2.5	V
h <sub>FE</sub> <sup>(2)</sup>	DC current gain	I <sub>C</sub> = 5 A, V <sub>CE</sub> = 10 V	300	-		
V <sub>F</sub>	Diode forward voltage	I <sub>F</sub> = 10 A		-	2.5	V
	Functional test	V <sub>CC</sub> = 24 V, L = 7 mH, V <sub>clamp</sub> = 400 V (see <a href="#">Figure 10: "Functional test circuit"</a> )	8	-		A

**Notes:**

<sup>(1)</sup>Defined by design, not subject to production test.

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

**Table 5: Inductive load switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
t <sub>s</sub>	Storage time	V <sub>BE</sub> =0, V <sub>CC</sub> = 12 V, V <sub>clamp</sub> = 300 V, L = 7 mH, R <sub>BE</sub> = 47 Ω, I <sub>C</sub> = 7 A, I <sub>B</sub> = 70 mA (see <a href="#">Figure 12: "Switching time test circuit"</a> )	-	15	-	μs
t <sub>f</sub>	Fall time		-	0.5	-	μs

## 2.1 Electrical characteristics (curves)

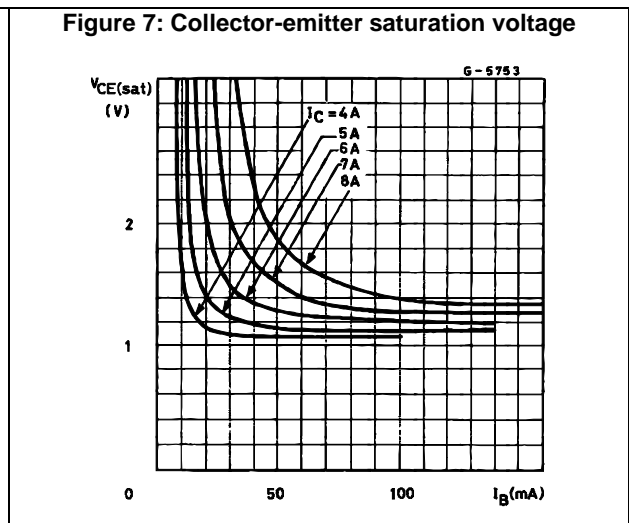
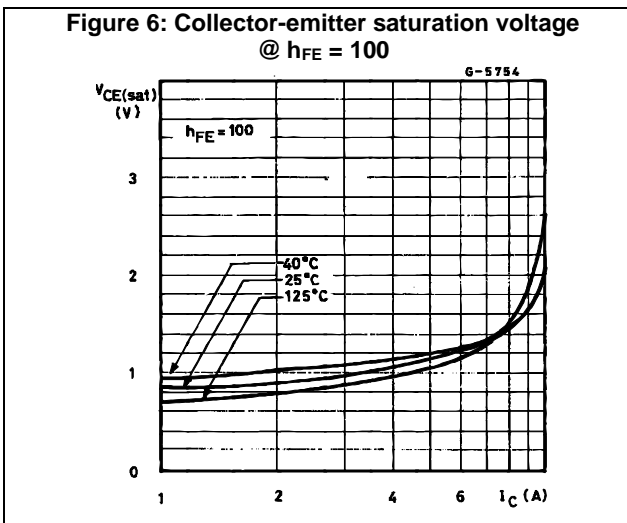
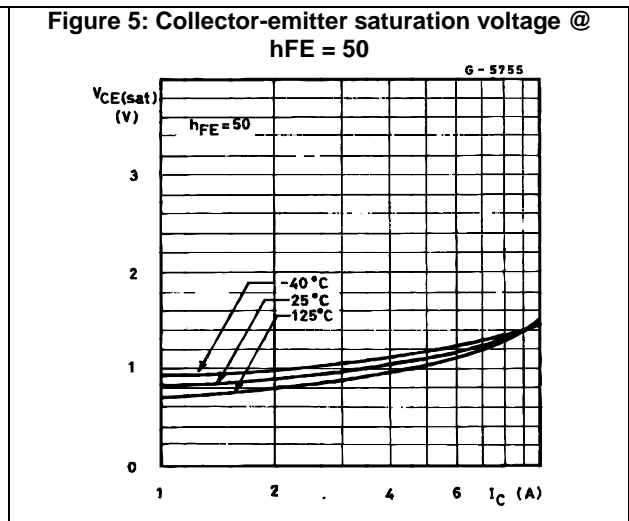
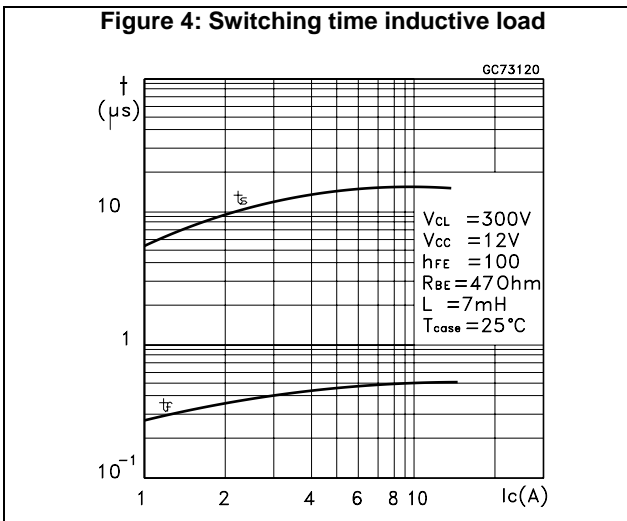
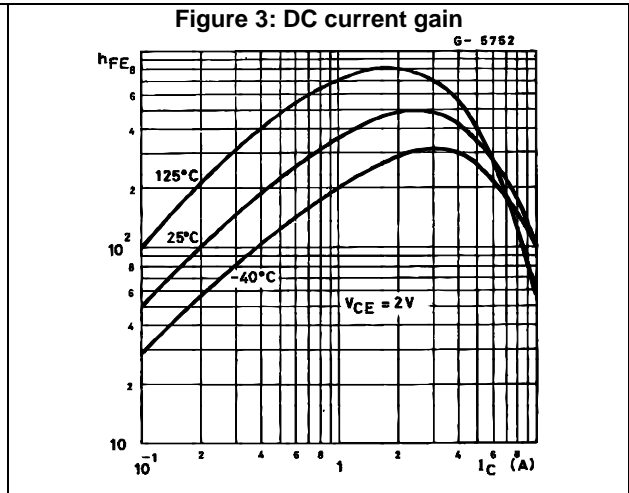
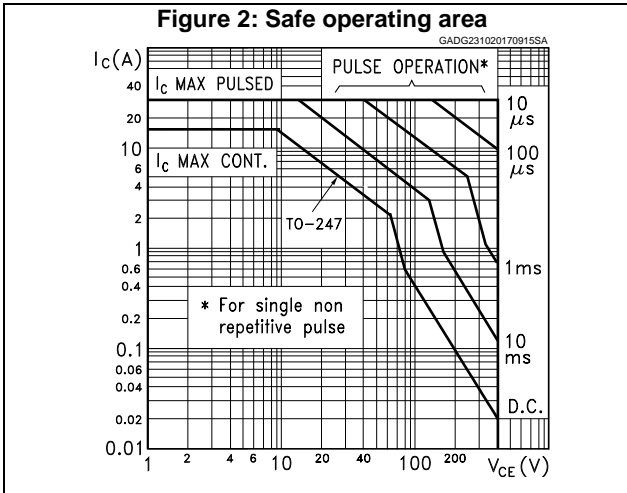


Figure 8: Base-emitter saturation voltage  
@  $h_{FE} = 50$

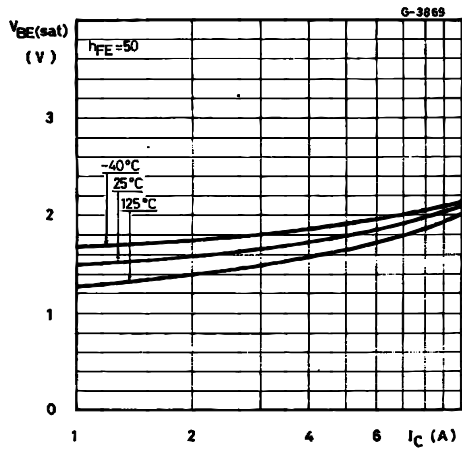
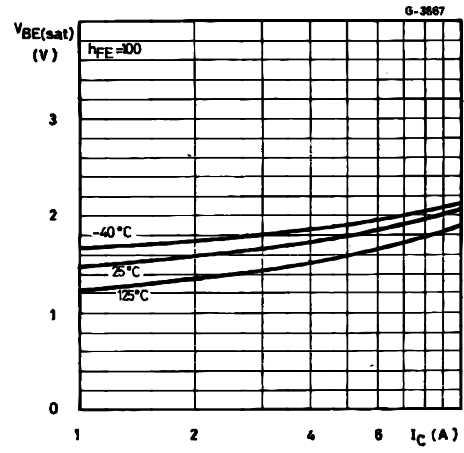


Figure 9: Base-emitter saturation voltage  
@  $h_{FE} = 100$



### 3 Test circuits

Figure 10: Functional test circuit

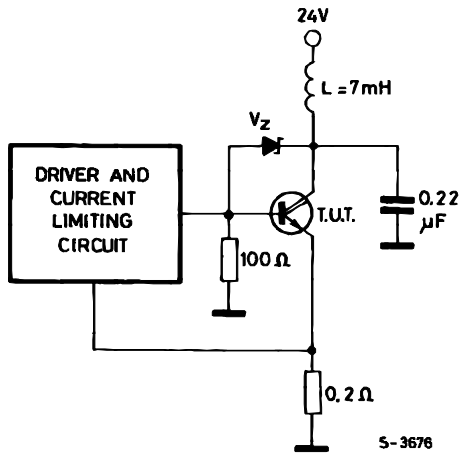


Figure 11: Functional test waveforms

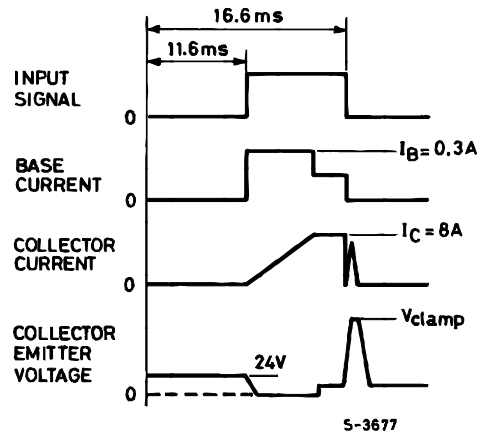


Figure 12: Switching time test circuit

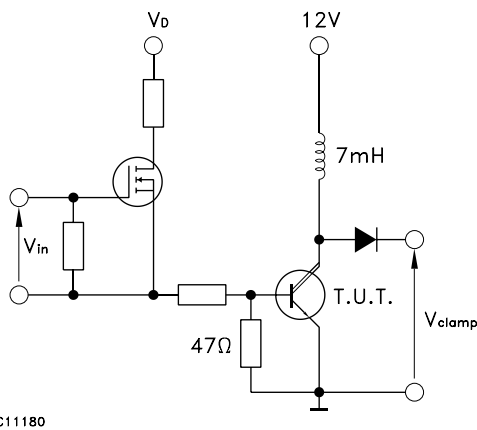
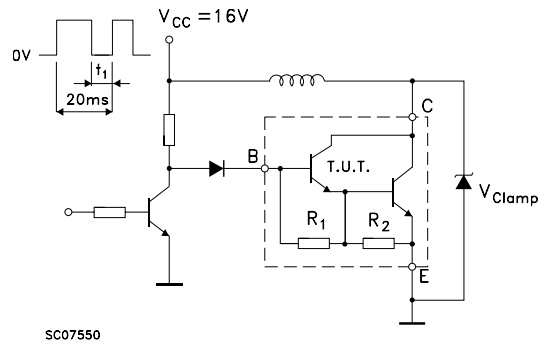


Figure 13: Sustaining voltage test circuit



## 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](http://www.st.com). ECOPACK® is an ST trademark.

### 4.1 TO-247 package information

Figure 14: TO-247 package outline

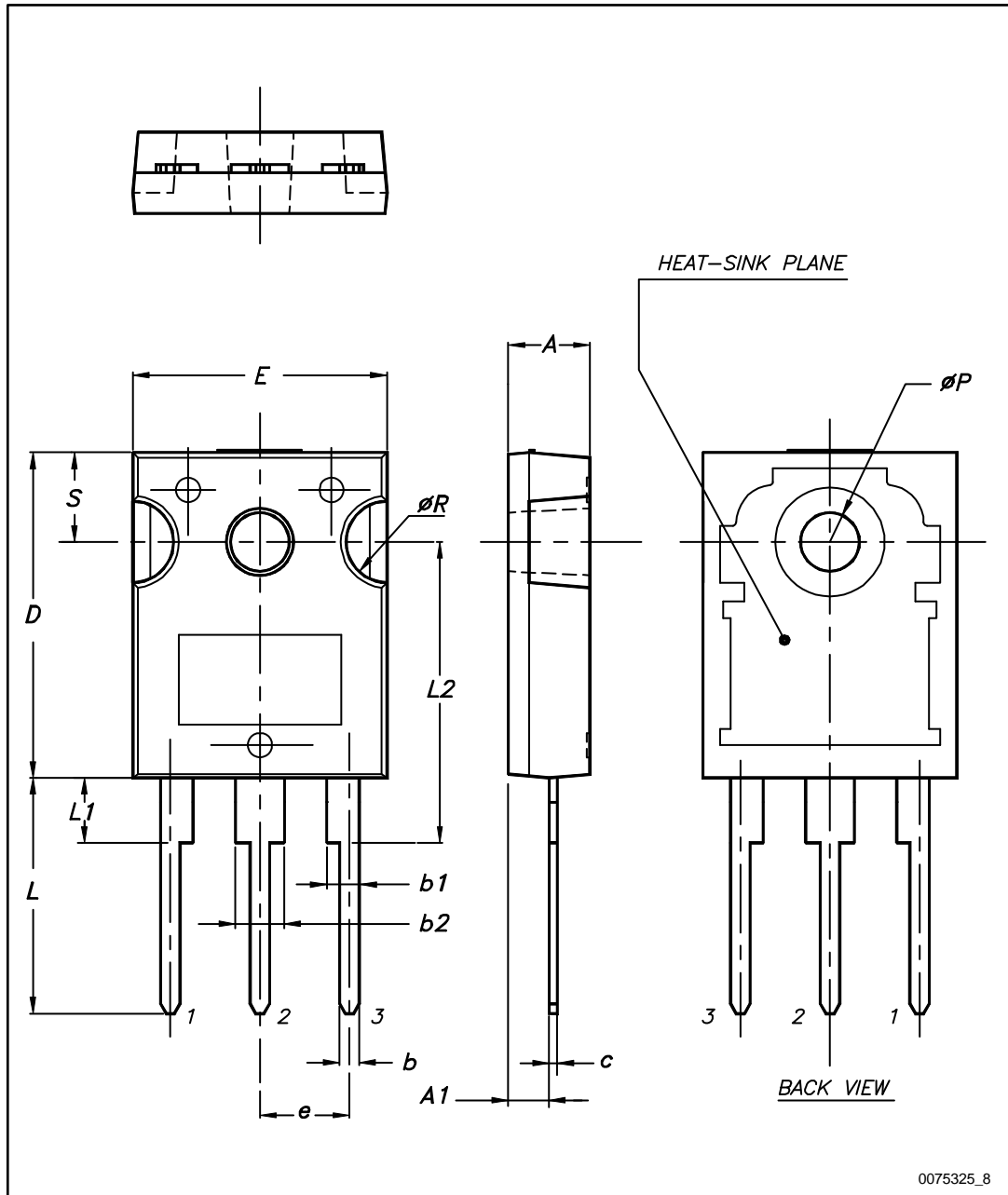




Table 6: TO-247 package mechanical data

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	5.30	5.45	5.60
L	14.20		14.80
L1	3.70		4.30
L2		18.50	
ØP	3.55		3.65
ØR	4.50		5.50
S	5.30	5.50	5.70

## 5 Revision history

Table 7: Document revision history

Date	Revision	Changes
23-Oct-2017	1	Initial release. Part number previously included in datasheet DocID1004.

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