

## BU941 BU941P

# High voltage ignition coil driver NPN power Darlington transistors

#### **Features**

- Very rugged Bipolar technology
- High operating junction temperature
- Integrated antiparallel collector-emitter diode

#### **Applications**

■ 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.

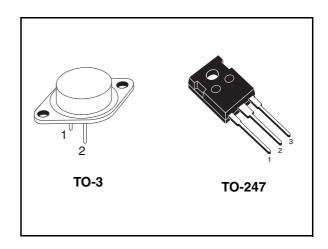


Figure 1. Internal schematic diagrams

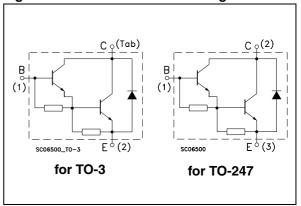


Table 1. Device summary

Order codes	Marking	Package	Packaging
BU941	BU941	TO-3	Tray
BU941P	BU941P	TO-247	Tube

Content BU941, BU941P

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BU941, BU941P Electrical ratings

# 1 Electrical ratings

Table 2. Absolute maximum ratings

Complete	Davamatav	Value		11	
Symbol	Parameter	BU941	BU941P	Unit	
$V_{CES}$	Collector-emitter voltage (V <sub>BE</sub> = 0)	500		V	
V <sub>CEO</sub>	Collector-emitter voltage (I <sub>B</sub> = 0)	40	00	٧	
V <sub>EBO</sub>	Emitter-base voltage (I <sub>C</sub> = 0)	5		V	
I <sub>C</sub>	Collector current 15		Α		
I <sub>CM</sub>	Collector peak current 30		Α		
Ι <sub>Β</sub>	Base current	1		Α	
I <sub>BM</sub>	Base peak current	5		Α	
P <sub>TOT</sub>	Total dissipation at T <sub>c</sub> = 25 °C 180 155		W		
T <sub>stg</sub>	Storage temperature	-65 to 200	-65 to 175	°C	
T <sub>J</sub>	Max. operating junction temperature	200	175		

Table 3. Thermal data

s	Symbol	Parameter	Value	Unit
F	R <sub>thj-case</sub>	Thermal resistance junction-case max.	0.97	°C/W

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Electrical characteristics BU941, BU941P

## 2 Electrical characteristics

( $T_{case} = 25 \, ^{\circ}C$ ; unless otherwise specified)

Table 4. Electrical characteristics

Symbol	Parameter Test conditions		Min.	Тур.	Max.	Unit
I <sub>CES</sub>	Collector cut-off current (V <sub>BE</sub> = 0)	V <sub>CE</sub> = 500 V V <sub>CE</sub> = 500 V T <sub>C</sub> = 125 °C			100 0.5	μA mA
I <sub>CEO</sub>	Collector cut-off current (I <sub>B</sub> = 0)	V <sub>CE</sub> = 450 V V <sub>CE</sub> = 450 V T <sub>C</sub> = 125 °C			100 0.5	μA mA
I <sub>EBO</sub>	Emitter cut-off current (I <sub>C</sub> = 0)	V <sub>EB</sub> = 5 V			20	mA
V <sub>CEO(sus)</sub> <sup>(1)</sup>	Collector-emitter sustaining voltage (I <sub>B</sub> = 0)	$I_C = 10 \text{ mA}$ $L = 10 \text{ mH}$ $V_{clamp} = 400 \text{ V}$ see <i>Figure 12</i>	400			V
V <sub>CE(sat)</sub> (1)	Collector-emitter saturation voltage	$\begin{split} I_{C} = 8 \text{ A} & I_{B} = 100 \text{ mA} \\ I_{C} = 10 \text{ A} & I_{B} = 250 \text{ mA} \\ I_{C} = 12 \text{ A} & I_{B} = 300 \text{ mA} \end{split}$			1.6 1.8 2	V V V
V <sub>BE(sat)</sub> (1)	Base-emitter saturation voltage	$\begin{split} I_{C} = 8 \text{ A} & I_{B} = 100 \text{ mA} \\ I_{C} = 10 \text{ A} & I_{B} = 250 \text{ mA} \\ I_{C} = 12 \text{ A} & I_{B} = 300 \text{ mA} \end{split}$			2.2 2.5 2.7	V V V
h <sub>FE</sub> <sup>(1)</sup>	DC current gain	$I_C = 5 \text{ A}$ $V_{CE} = 10 \text{ V}$	300			
V <sub>F</sub>	Diode forward voltage	I <sub>F</sub> = 10 A			2.5	V
	Functional test	$V_{CC} = 24 \text{ V}$ $L = 7 \text{ mH}$ $V_{clamp} = 400 \text{ V}$ see <i>Figure 9</i>	10			Α
t <sub>s</sub>	Inductive Load Storage time Fall time	$\begin{split} I_{C} &= 7 \text{ A} & V_{clamp} = 300 \text{ V} \\ I_{B} &= 70 \text{ mA} & L = 7 \text{ mH} \\ V_{BE} &= 0 & R_{BE} = 47 \Omega \\ V_{CC} &= 12 \text{ V} & \text{see } \textit{Figure 11} \end{split}$		15 0.5		μs μs

<sup>1.</sup> Pulsed duration = 300 µs, duty cycle ≤1.5%

## 2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

Figure 3. DC current gain

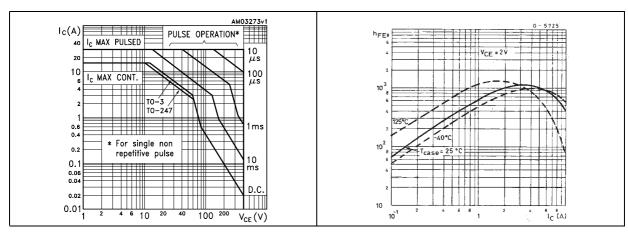


Figure 4. DC current gain

Figure 5. Collector-emitter saturation voltage

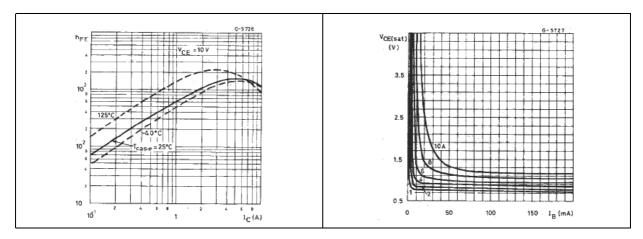
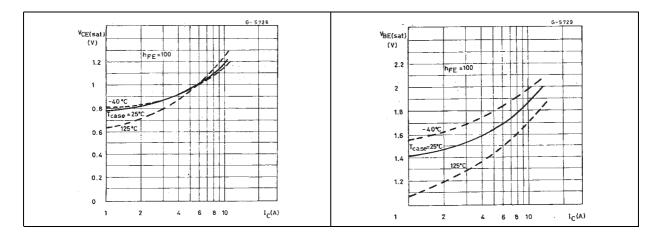


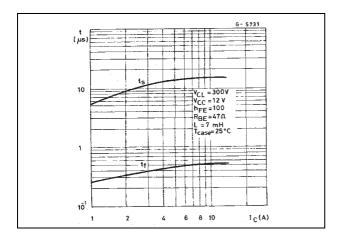
Figure 6. Collector-emitter saturation voltage Figure 7. Base-emitter saturation voltage



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Electrical characteristics BU941, BU941P

Figure 8. Switching time inductive load



BU941, BU941P Test circuits

### 3 Test circuits

Figure 9. Functional test circuit

Figure 10. Functional test wafeforms

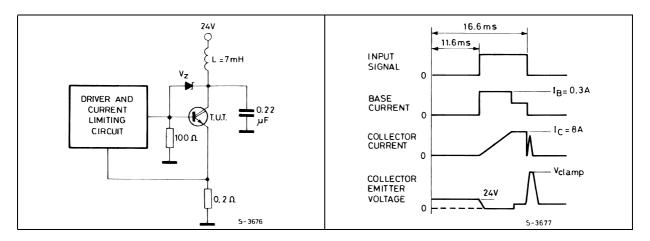
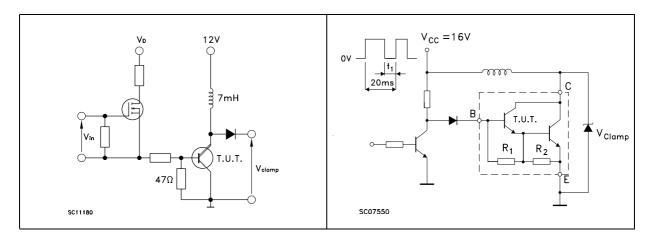


Figure 11. Switching time test circuit

Figure 12. Sustaining voltage test circuit



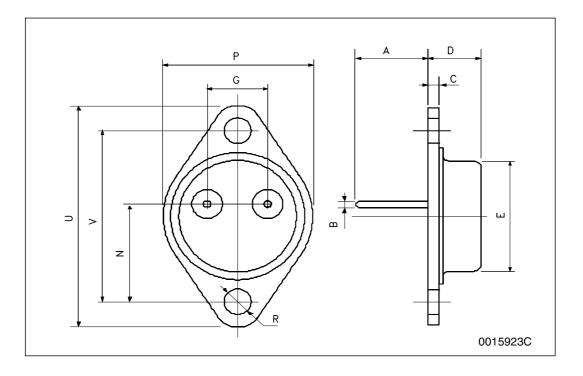
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## 4 Package mechanical data

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-3 mechanical data

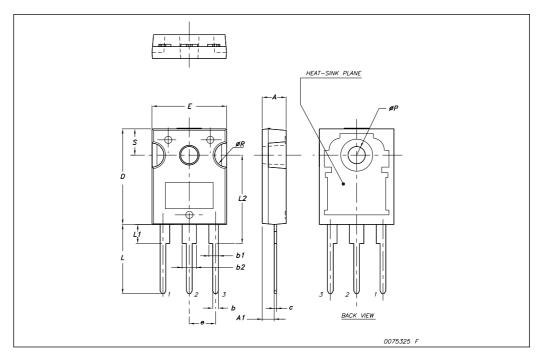
DIM.	mm.				
Diw.	min.	typ	max.		
А	11.00		13.10		
В	0.97		1.15		
С	1.50		1.65		
D	8.32		8.92		
Е	19.00		20.00		
G	10.70		11.10		
N	16.50		17.20		
Р	25.00		26.00		
R	4.00		4.09		
U	38.50		39.30		
V	30.00		30.30		



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#### **TO-247 Mechanical data**

Dim.	mm.			
J	Min.	Тур	Max.	
Α	4.85		5.15	
A1	2.20		2.60	
b	1.0		1.40	
b1	2.0		2.40	
b2	3.0		3.40	
С	0.40		0.80	
D	19.85		20.15	
E	15.45		15.75	
е		5.45		
L	14.20		14.80	
L1	3.70		4.30	
L2	_	18.50		
øΡ	3.55		3.65	
øR	4.50		5.50	
S		5.50		



BU941, BU941P Revision history

# 5 Revision history

Table 5. Document revision history

Date	Revision	Changes
21-Jun-2004	2	
18-Nov-2008	3	Package changed from TO-218 to TO-247 for BU941P.

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