

High voltage ignition coil driver NPN power Darlington transistors

Features

- Very rugged bipolar technology
- Built in clamping Zener
- High operating junction temperature
- Fully insulated package (U.L. compliant) for easy mounting

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.

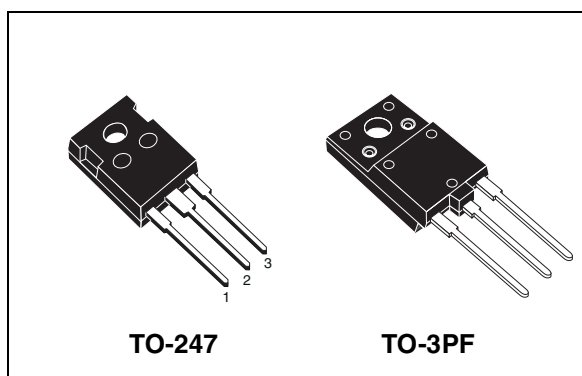


Figure 1. Internal schematic diagram

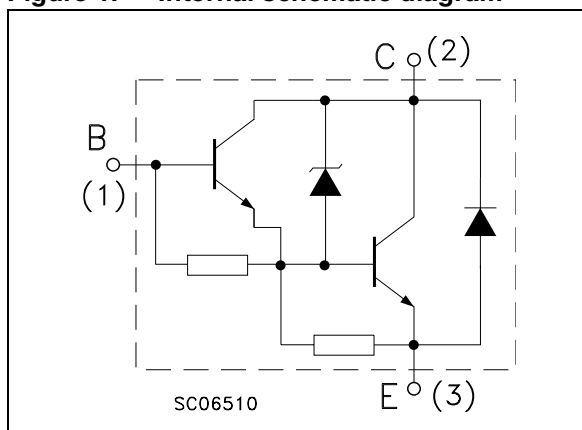


Table 1. Device summary

Order code	Marking	Packages	Packaging
BU941ZP	BU941ZP	TO-247	Tube
BU941ZPFI	BU941ZPFI	TO-3PF	Tube

1 Absolute maximum ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value		Unit
		BU941ZP	BU941ZPFI	
V_{CEO}	Collector-emitter voltage ($I_B = 0$)	350		V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	5		V
I_C	Collector current	15		A
I_{CM}	Collector peak current ($t_p < 5\text{ms}$)	30		A
I_B	Base current	1		A
I_{BM}	Base peak current ($t_p < 5\text{ms}$)	5		A
P_{tot}	Total dissipation at $T_c \leq 25\text{ °C}$	155	65	W
V_{isol}	Insulation withstand voltage (RMS) from all three leads to external heatsink		2500	V
T_{stg}	Storage temperature	-65 to 175	-65 to 175	°C
T_J	Max. operating junction temperature	175	175	°C

Table 3. Thermal data

Symbol	Parameter	TO-247	TO-3PF	Unit
$R_{thj-case}$	Thermal resistance junction-case	max 0.97	2.3	°C/W

2 Electrical characteristics

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

Table 4. Electrical characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{CEO}	Collector cut-off current ($I_{\text{B}} = 0$)	$V_{\text{CE}} = 300 \text{ V}$ $V_{\text{CE}} = 300 \text{ V} \quad T_{\text{J}} = 125^{\circ}\text{C}$			100 0.5	μA mA
I_{EBO}	Emitter cut-off current ($I_{\text{C}} = 0$)	$V_{\text{EB}} = 5 \text{ V}$			20	mA
$V_{\text{Clamp}}^{(1)}$	Clamping voltage	$I_{\text{C}} = 100 \text{ mA}$	350		500	V
$V_{\text{CE(sat)}}^{(1)}$	Collector-emitter saturation voltage	$I_{\text{C}} = 8 \text{ A} \quad I_{\text{B}} = 100 \text{ mA}$ $I_{\text{C}} = 10 \text{ A} \quad I_{\text{B}} = 250 \text{ mA}$ $I_{\text{C}} = 12 \text{ A} \quad I_{\text{B}} = 300 \text{ mA}$			1.8 1.8 2	V V V
$V_{\text{BE(sat)}}^{(1)}$	Collector-emitter base voltage	$I_{\text{C}} = 8 \text{ A} \quad I_{\text{B}} = 100 \text{ mA}$ $I_{\text{C}} = 10 \text{ A} \quad I_{\text{B}} = 250 \text{ mA}$ $I_{\text{C}} = 12 \text{ A} \quad I_{\text{B}} = 300 \text{ mA}$			2.2 2.5 2.7	V V V
$h_{\text{FE}}^{(1)}$	DC current gain	$I_{\text{C}} = 5 \text{ A} \quad V_{\text{CE}} = 10 \text{ V}$	300			
	Functional test	$V_{\text{CC}} = 24 \text{ V} \quad L = 7 \text{ mH}$ <i>Figure 13.</i>	10			A
t_{s} t_{f}	Inductive load Storage time Fall time	$V_{\text{CC}} = 12 \text{ V} \quad L = 7 \text{ mH}$ $V_{\text{BE(off)}} = 0 \text{ V} \quad R_{\text{BE}} = 47 \Omega$ $V_{\text{Clamp}} = 300 \text{ V} \quad I_{\text{C}} = 7 \text{ A}$ $I_{\text{B1}} = 70 \text{ mA}$		15 0.5		μs μs
V_{F}	Diode forward voltage	$I_{\text{F}} = 10 \text{ A}$			2.5	V

1. Pulsed duration = 300 μs , duty cycle $\leq 1.5\%$.

2.1 Electrical characteristic (curves)

Figure 2. Safe operating area

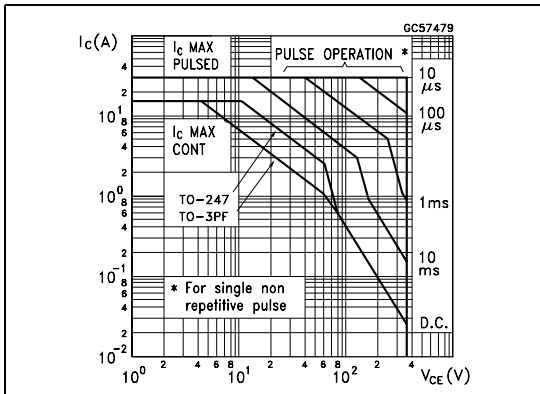


Figure 3. Derating curve

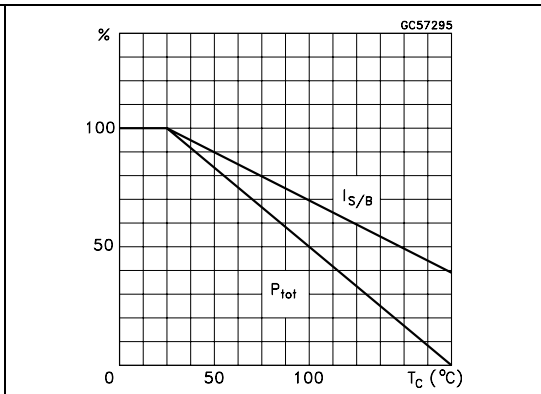


Figure 4. DC current gain

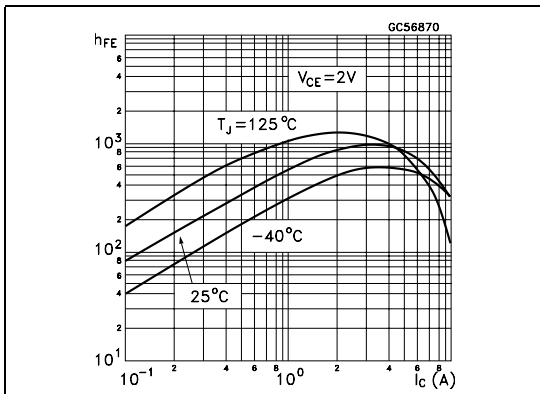


Figure 5. DC current gain

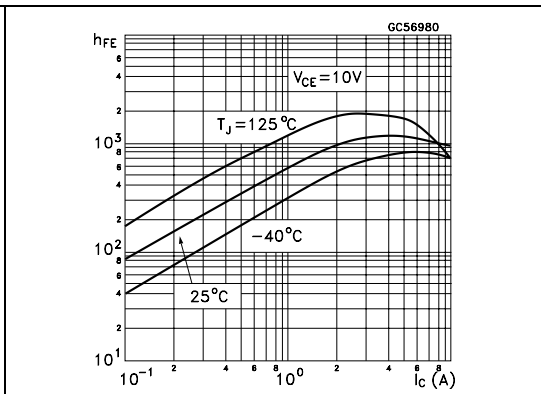


Figure 6. Collector-emitter saturation voltage

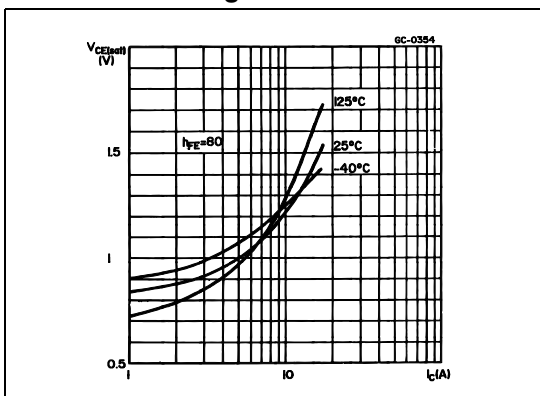


Figure 7. Base-emitter saturation voltage

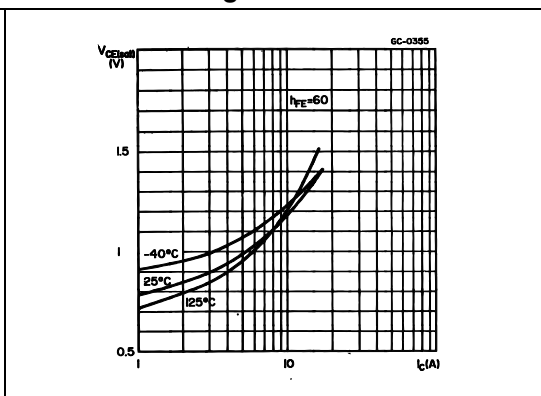


Figure 8. Base-emitter saturation voltage

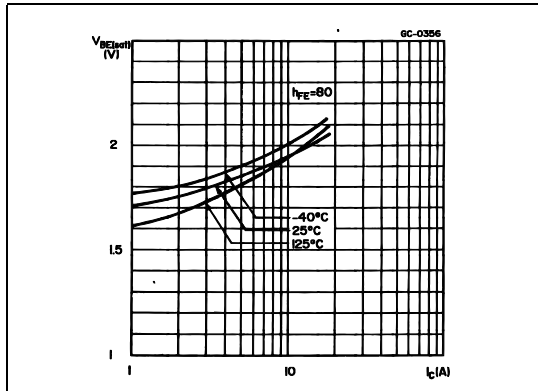


Figure 9. Base-emitter saturation voltage

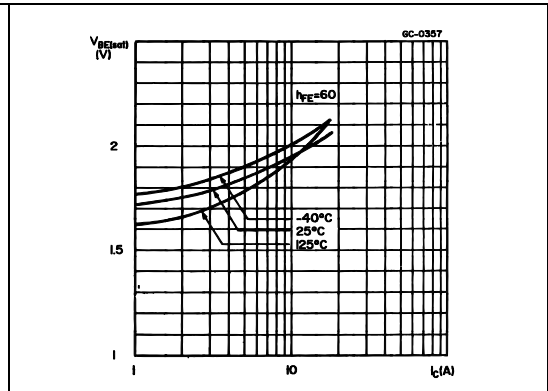
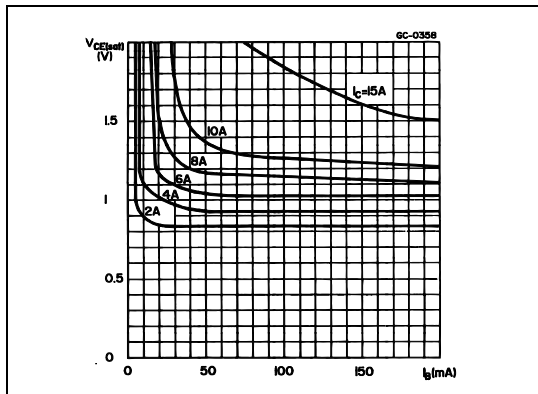


Figure 10. Collector-emitter saturation voltage



2.2 Test circuit

Figure 11. Functional test circuit

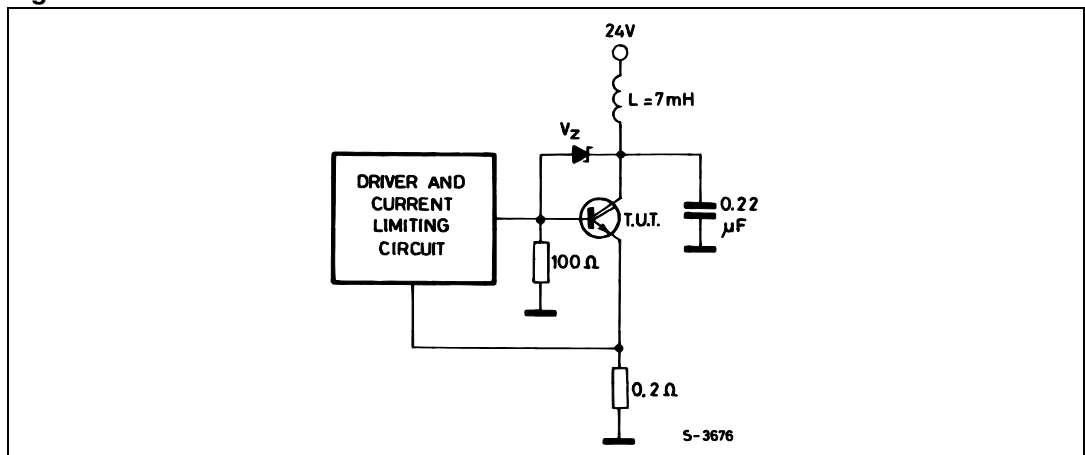


Figure 12. Functional test waveforms

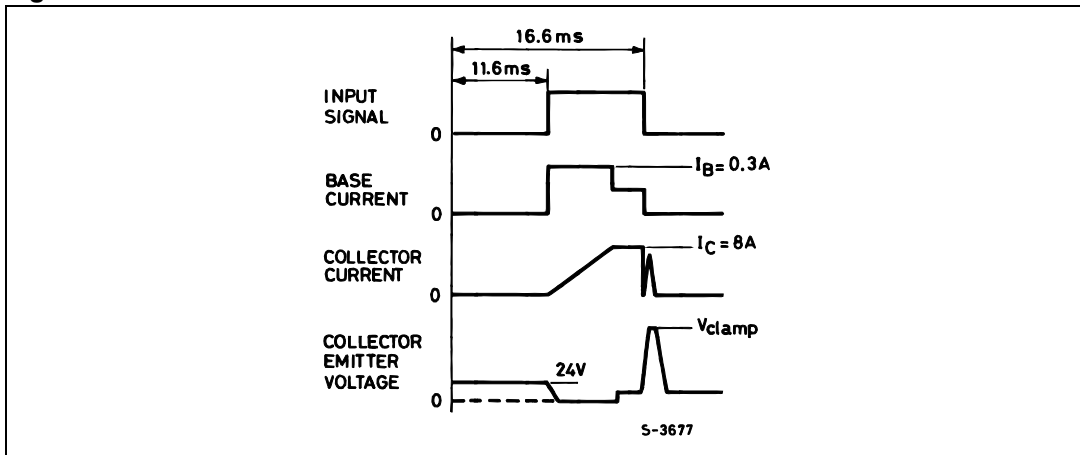
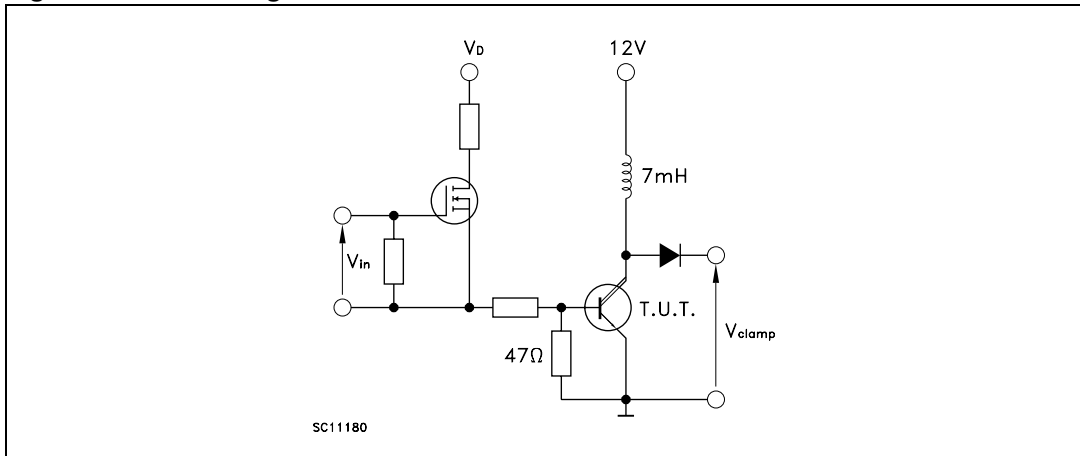


Figure 13. Switching time test circuit

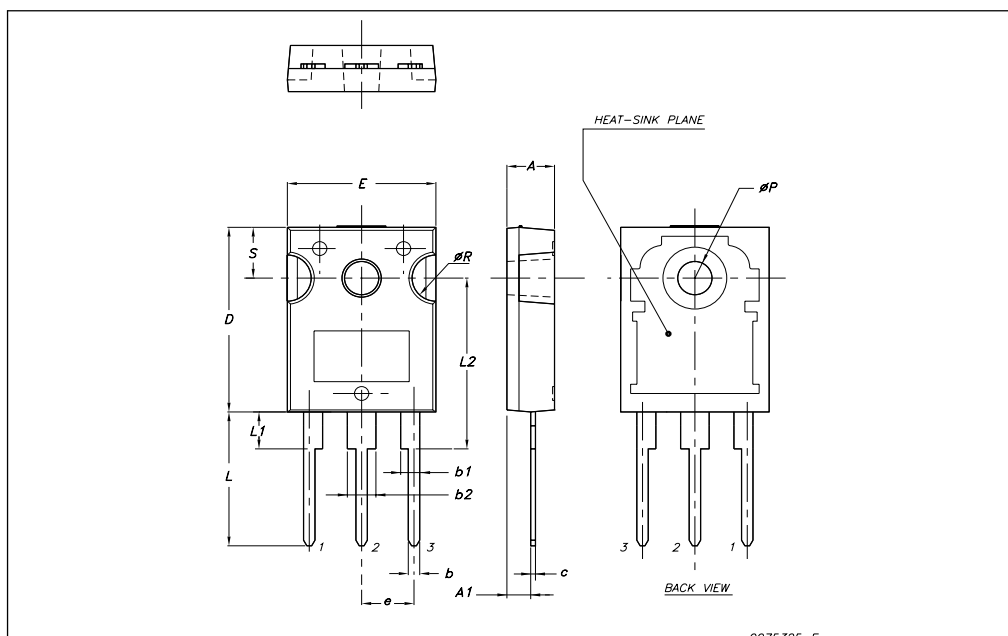


3 Package mechanical data

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

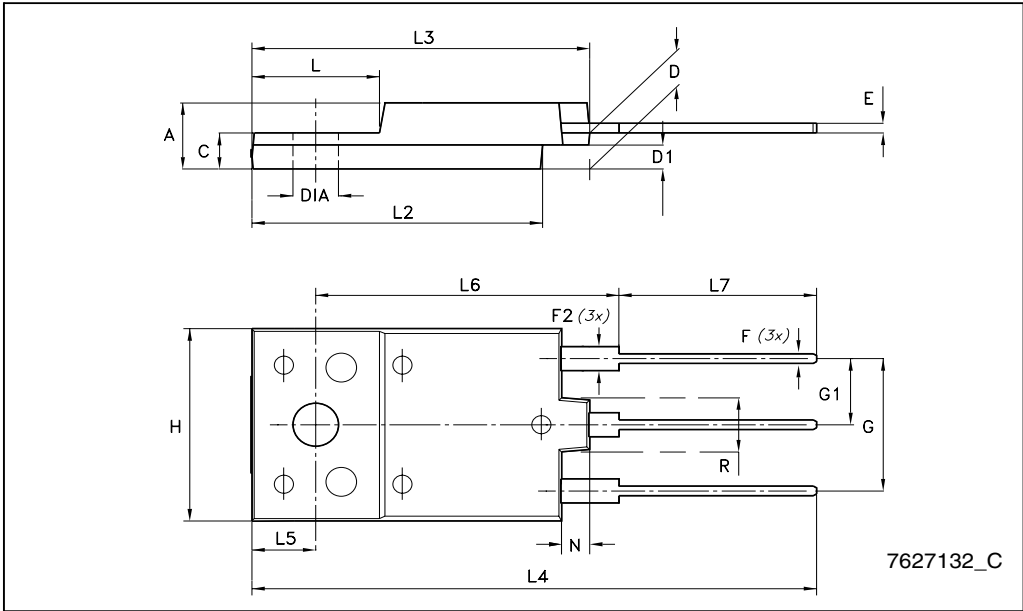
TO-247 Mechanical data

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-3PF mechanical data

DIM.	mm.		
	min.	typ	max.
A	5.30		5.70
C	2.80		3.20
D	3.10		3.50
D1	1.80		2.20
E	0.80		1.10
F	0.65		0.95
F2	1.80		2.20
G	10.30		11.50
G1		5.45	
H	15.30		15.70
L	9.80	10	10.20
L2	22.80		23.20
L3	26.30		26.70
L4	43.20		44.40
L5	4.30		4.70
L6	24.30		24.70
L7	14.60		15
N	1.80		2.20
R	3.80		4.20
Dia	3.40		3.80



4 Revision history

Table 5. Document revision history

Date	Revision	Changes
03-Feb-2005	6	
22-Jan-2008	7	Package change from TO-218 to TO-247 and from ISOWATT218 to TO-3PF.

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