

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.

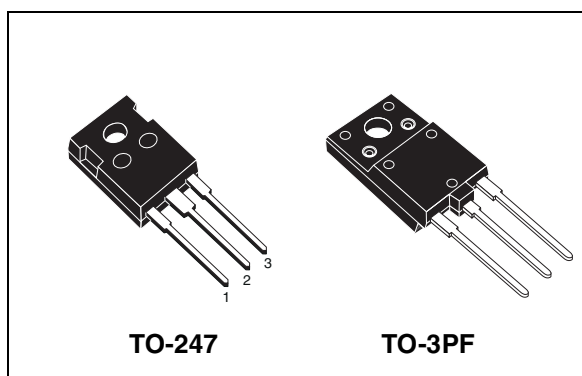


Figure 1. Internal schematic diagram

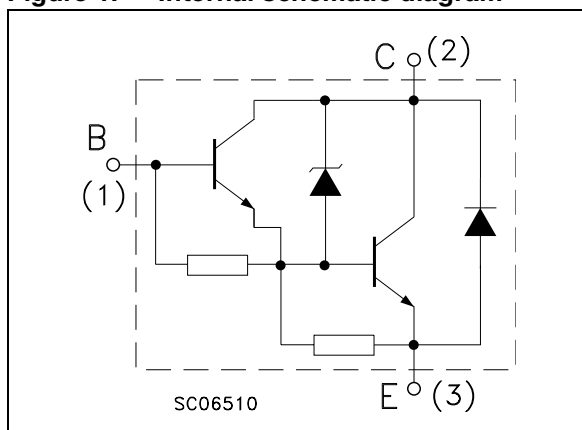


Table 1. Device summary

| 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 ($I_{\text{B}} = 0$) | $V_{\text{CE}} = 300 \text{ V}$ $V_{\text{CE}} = 300 \text{ V}$ $T_{\text{J}} = 125^{\circ}\text{C}$ | | | 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 | $I_{\text{C}} = 8 \text{ A}$ $I_{\text{B}} = 100 \text{ mA}$ $I_{\text{C}} = 10 \text{ A}$ $I_{\text{B}} = 250 \text{ mA}$ $I_{\text{C}} = 12 \text{ A}$ $I_{\text{B}} = 300 \text{ mA}$ | | | 1.8 1.8 2 | V V V |
| $V_{\text{BE(sat)}}^{(1)}$ | Collector-emitter base voltage | $I_{\text{C}} = 8 \text{ A}$ $I_{\text{B}} = 100 \text{ mA}$ $I_{\text{C}} = 10 \text{ A}$ $I_{\text{B}} = 250 \text{ mA}$ $I_{\text{C}} = 12 \text{ A}$ $I_{\text{B}} = 300 \text{ mA}$ | | | 2.2 2.5 2.7 | V V V |
| $h_{\text{FE}}^{(1)}$ | DC current gain | $I_{\text{C}} = 5 \text{ A}$ $V_{\text{CE}} = 10 \text{ V}$ | 300 | | | |
| | Functional test | $V_{\text{CC}} = 24 \text{ V}$ $L = 7 \text{ mH}$ <i>Figure 13.</i> | 10 | | | A |
| t_{s} t_{f} | Inductive load Storage time Fall time | $V_{\text{CC}} = 12 \text{ V}$ $L = 7 \text{ mH}$ $V_{\text{BE(off)}} = 0 \text{ V}$ $R_{\text{BE}} = 47 \Omega$ $V_{\text{Clamp}} = 300 \text{ V}$ $I_{\text{C}} = 7 \text{ A}$ $I_{\text{B1}} = 70 \text{ mA}$ | | 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

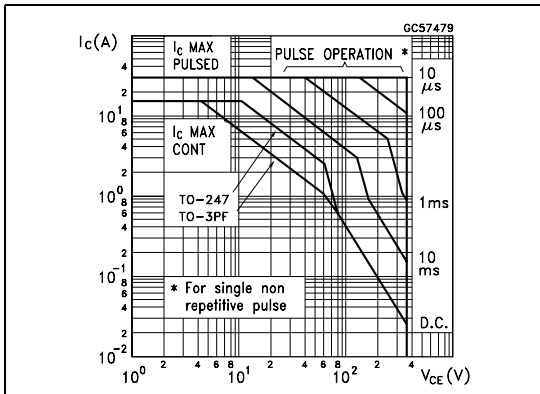


Figure 3. Derating curve

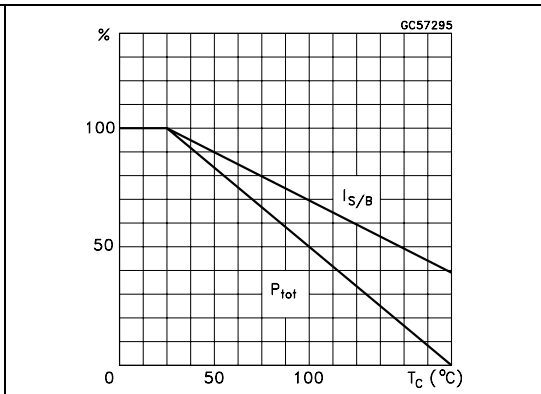


Figure 4. DC current gain

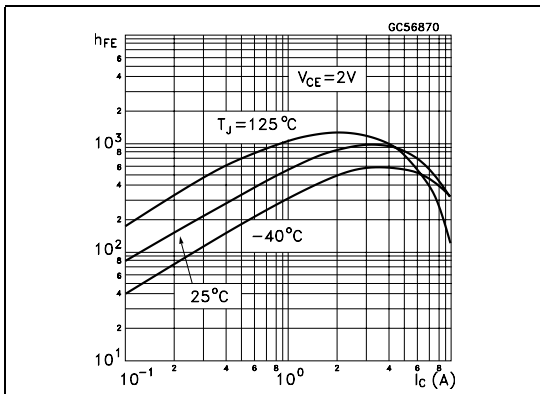


Figure 5. DC current gain

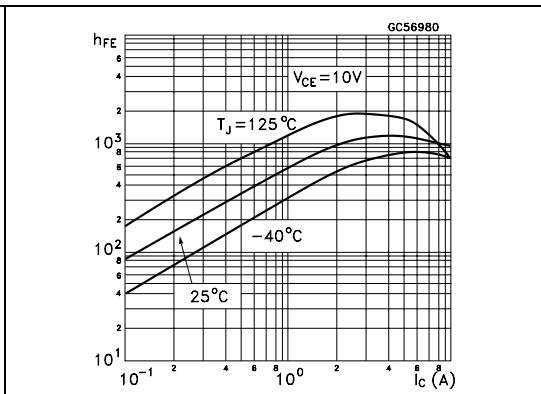


Figure 6. Collector-emitter saturation voltage

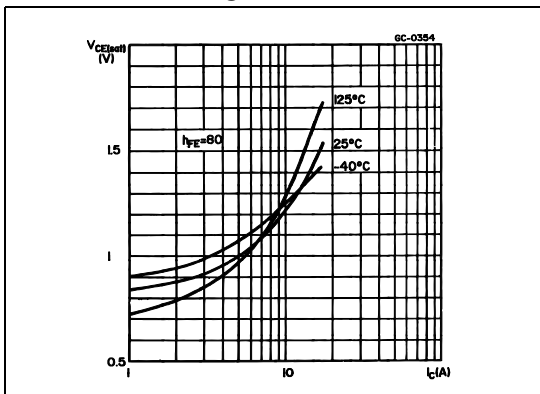


Figure 7. Base-emitter saturation voltage

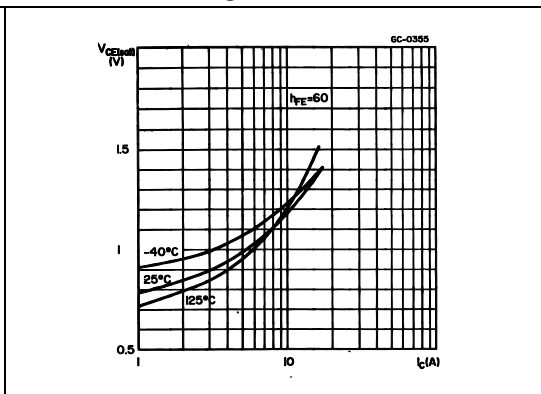


Figure 8. Base-emitter saturation voltage

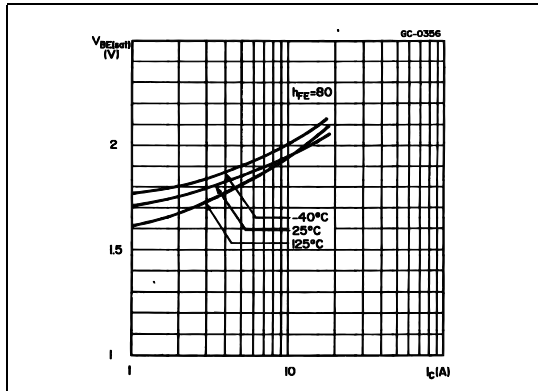


Figure 9. Base-emitter saturation voltage

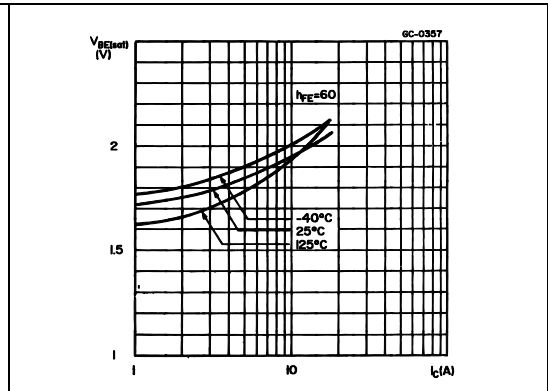
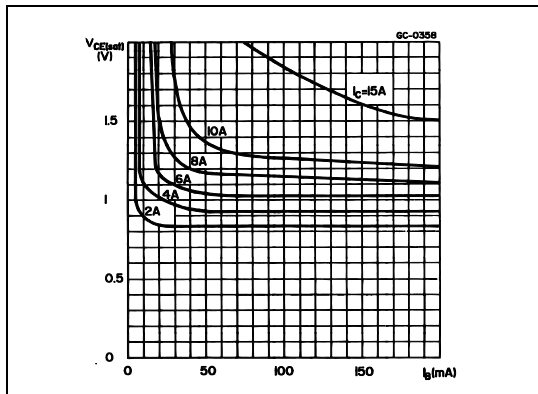


Figure 10. Collector-emitter saturation voltage



2.2 Test circuit

Figure 11. Functional test circuit

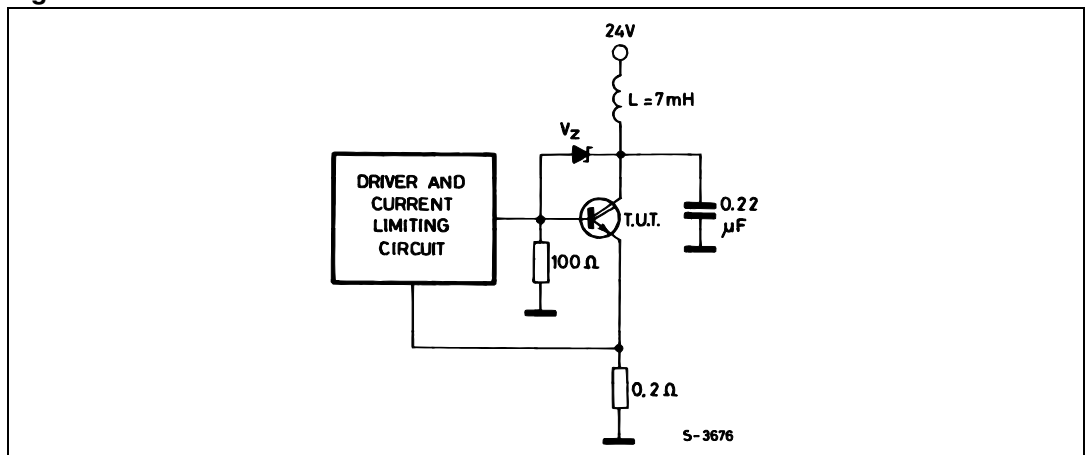


Figure 12. Functional test waveforms

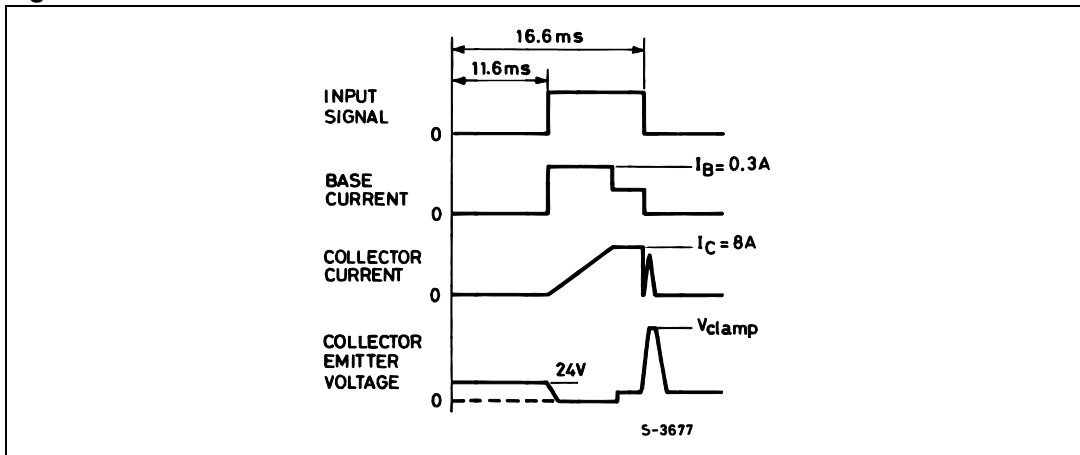
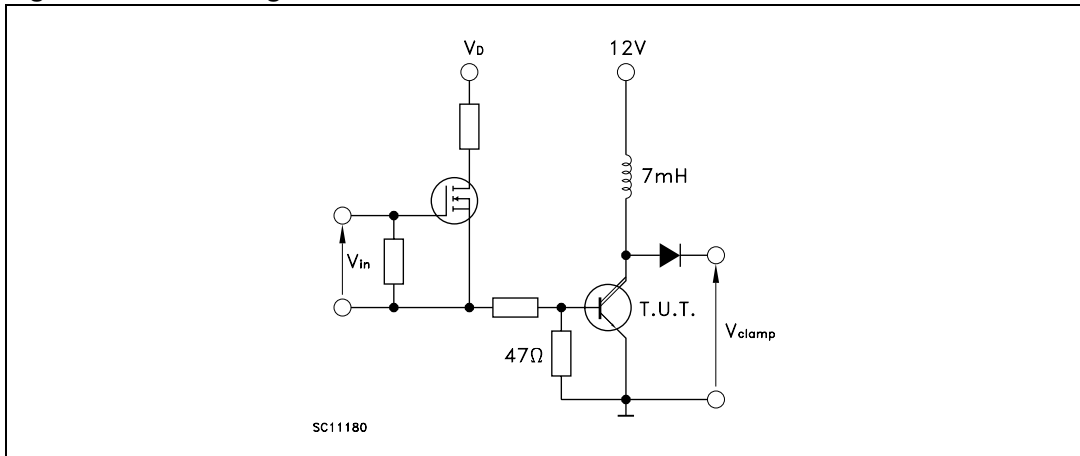


Figure 13. Switching time test circuit

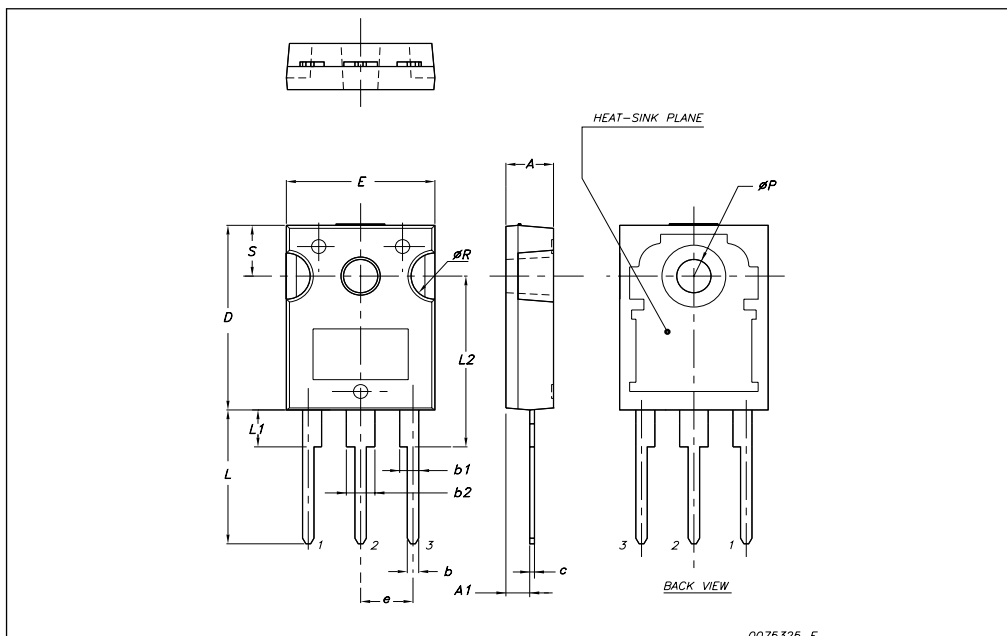


3 Package mechanical data

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

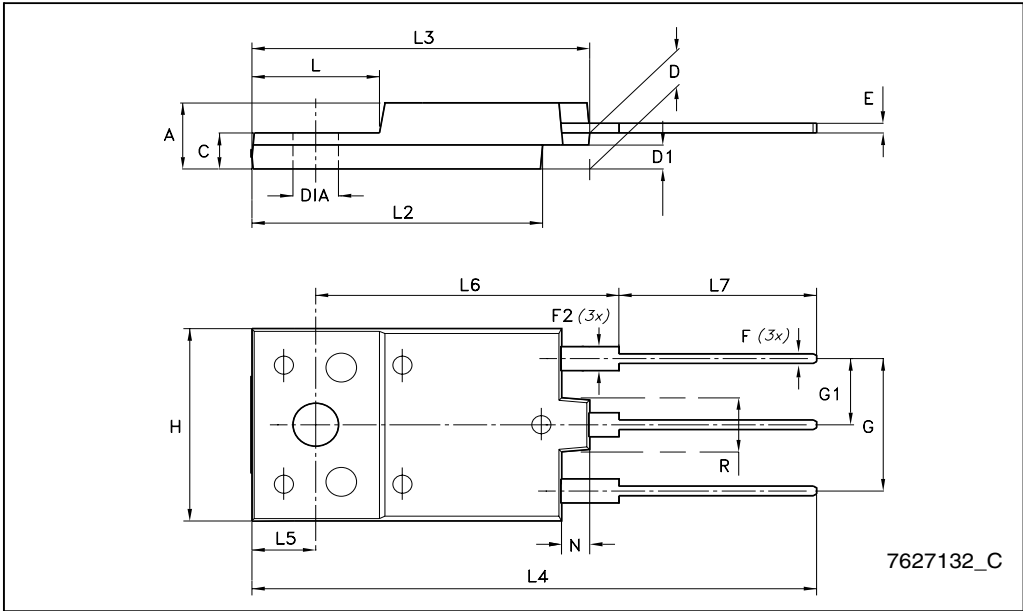
TO-247 Mechanical data

| 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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