

## Complementary power Darlingtons

Datasheet — production data

### Features

- Monolithic Darlingtons configuration
- Integrated antiparallel collector-emitter diode

### Applications

- Linear and switching industrial equipment

### Description

The devices are manufactured in planar technology with “base island” layout and monolithic Darlingtons configuration. The resulting transistors show exceptional high gain performance coupled with very low saturation voltage.

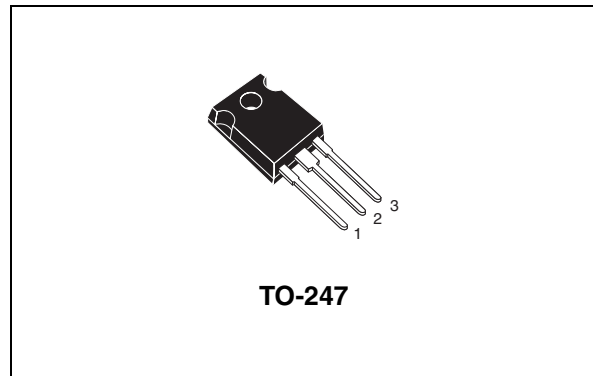


Figure 1. Internal schematic diagrams

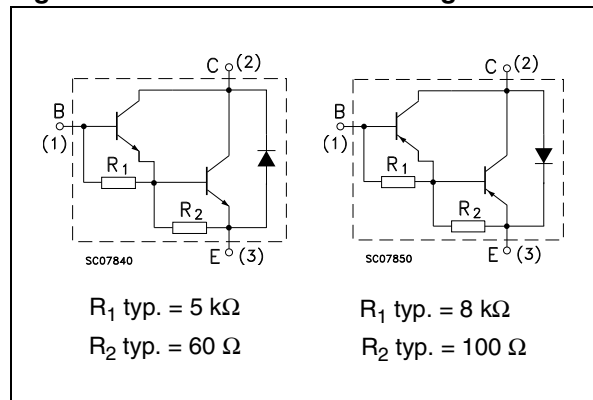


Table 1. Device summary

| Part number | Marking | Polarity | Package | Packaging |
|-------------|---------|----------|---------|-----------|
| TIP142      | TIP142  | NPN      | TO-247  | Tube      |
| TIP147      | TIP147  | PNP      |         |           |

# 1 Absolute maximum ratings

**Table 2. Absolute maximum ratings**

| Symbol    | Parameter                                      | Value      | Unit |
|-----------|--|------------|------|
| $V_{CBO}$ | Collector-base voltage ( $I_E = 0$ )           | 100        | V    |
| $V_{CEO}$ | Collector-emitter voltage ( $I_B = 0$ )        | 100        | 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                                   | 0.5        | A    |
| $P_{TOT}$ | Total dissipation at $T_{case} = 25\text{ °C}$ | 125        | W    |
| $T_{STG}$ | Storage temperature                            | -65 to 150 | °C   |
| $T_J$     | Max. operating junction temperature            | 150        | °C   |

*Note:* For PNP type voltage and current are negative.

**Table 3. Thermal data**

| Symbol     | Parameter                        | Value | Unit |
|------------|----------------------------------|-------|------|
| $R_{thJC}$ | Thermal resistance junction-case | max 1 | °C/W |

## 2 Electrical characteristics

$T_{\text{case}} = 25\text{ °C}$ ; unless otherwise specified.

**Table 4. Electrical characteristics**

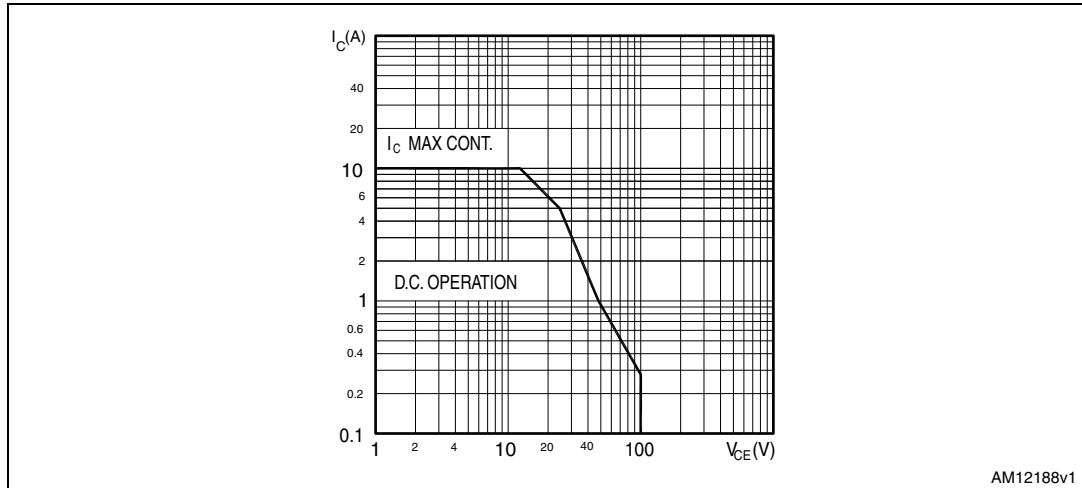
| Symbol                              | Parameter   | Test conditions   | Min.        | Typ.     | Max.   | Unit                           |
|-------------------------------------|---|---|-------------|----------|--------|--------------------------------|
| $I_{\text{CBO}}$                    | Collector cut-off current<br>( $I_{\text{E}} = 0$ )               | $V_{\text{CB}} = 100\text{ V}$  |             |          | 1      | mA                             |
| $I_{\text{CEO}}$                    | Collector cut-off current<br>( $I_{\text{B}} = 0$ )               | $V_{\text{CE}} = 50\text{ V}$   |             |          | 2      | mA                             |
| $I_{\text{EBO}}$                    | Emitter cut-off current<br>( $I_{\text{C}} = 0$ )                 | $V_{\text{EB}} = 5\text{ V}$  |             |          | 2      | mA                             |
| $V_{\text{CEO(sus)}}^{(1)}$         | Collector-emitter<br>sustaining voltage<br>( $I_{\text{B}} = 0$ ) | $I_{\text{C}} = 30\text{ mA}$   | 100         |          |        | V                              |
| $V_{\text{CE(sat)}}^{(1)}$          | Collector-emitter<br>saturation voltage                           | $I_{\text{C}} = 5\text{ A}$ $I_{\text{B}} = 10\text{ mA}$<br>$I_{\text{C}} = 10\text{ A}$ $I_{\text{B}} = 40\text{ mA}$ |             |          | 2<br>3 | V<br>V                         |
| $V_{\text{BE(on)}}^{(1)}$           | Base-emitter on voltage   | $I_{\text{C}} = 10\text{ A}$ $V_{\text{CE}} = 4\text{ V}$   |             |          | 3      | V                              |
| $h_{\text{FE}}^{(1)}$               | DC current gain   | $I_{\text{C}} = 5\text{ A}$ $V_{\text{CE}} = 4\text{ V}$<br>$I_{\text{C}} = 10\text{ A}$ $V_{\text{CE}} = 4\text{ V}$   | 1000<br>500 |          |        |                                |
| $t_{\text{on}}$<br>$t_{\text{off}}$ | Resistive load<br>Turn-on time<br>Turn-off time                   | $I_{\text{C}} = 10\text{ A}$ $R_{\text{L}} = 3\text{ }\Omega$<br>$I_{\text{B1}} = -I_{\text{B2}} = 40\text{ mA}$        |             | 0.9<br>4 |        | $\mu\text{s}$<br>$\mu\text{s}$ |

1. Pulse test: pulse duration  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .

For PNP type voltage and current are negative.

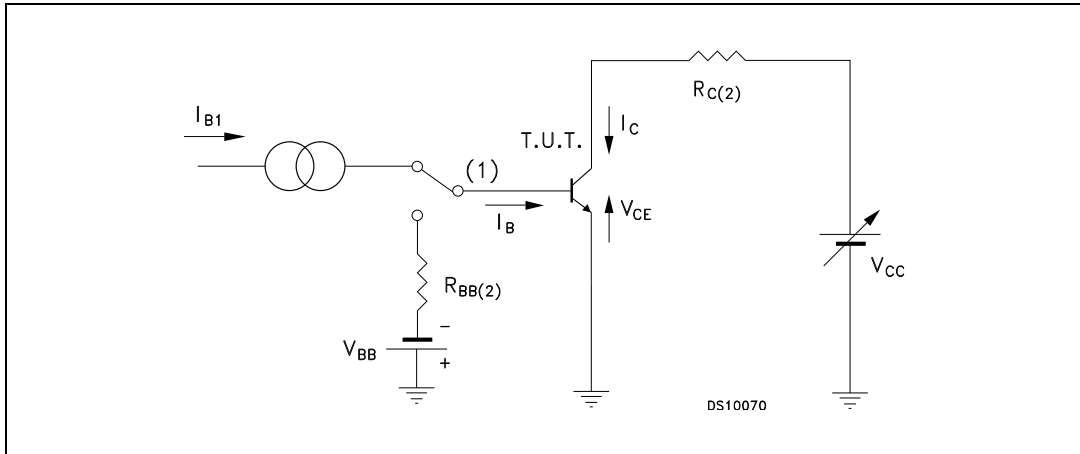
### 3 Electrical characteristics (curve)

Figure 2. Safe operating area



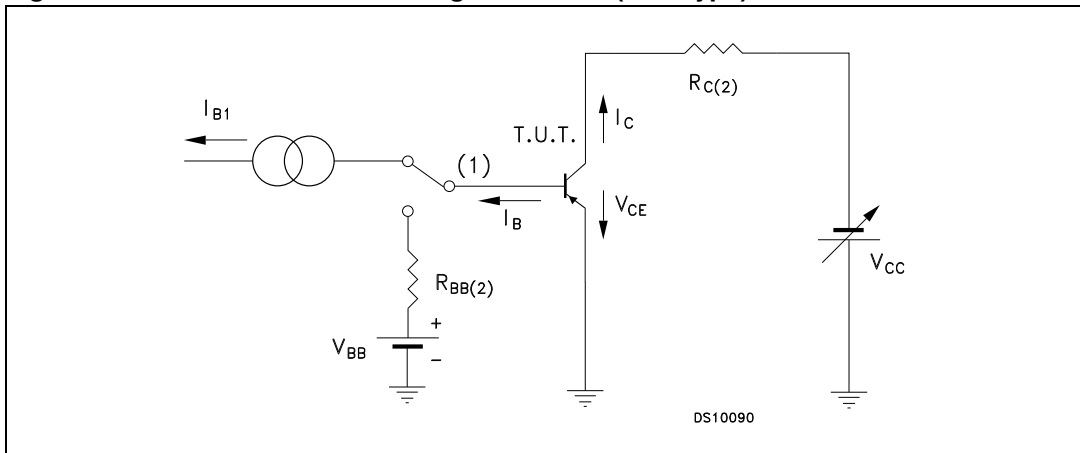
## 4 Test circuits

**Figure 3. Resistive load switching test circuit (NPN type)**



1. Fast electronic switch
2. Non-inductive resistor

**Figure 4. Resistive load switching test circuit (PNP type)**



1. Fast electronic switch
2. Non-inductive resistor

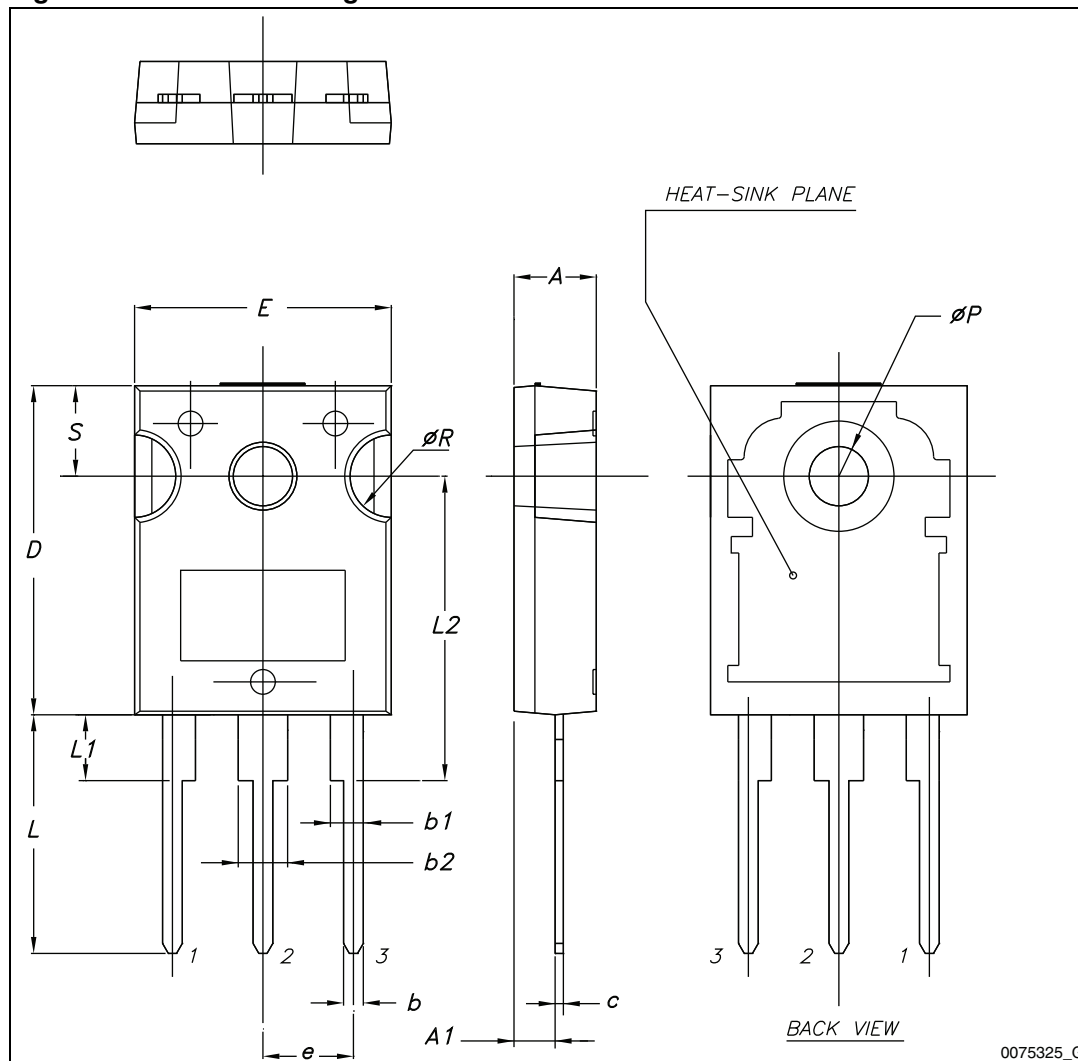
## 5 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK<sup>®</sup> is an ST trademark.

Table 5. 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    | 5.30  | 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  |

Figure 5. TO-247 drawing



0075325\_G



## 6 Revision history

**Table 6. Document revision history**

| Date        | Revision | Changes  |
|-------------|----------|--|
| 15-Oct-2007 | 6        | Package change from SOT-93 to TO-247.  |
| 12-May-2010 | 7        | Technology change from epitaxial base to planar base island.                     |
| 19-Apr-2012 | 8        | Added: <a href="#">Figure 2: Safe operating area</a><br>Updated: mechanical data |

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