

Complementary power Darlingtons

**Features**

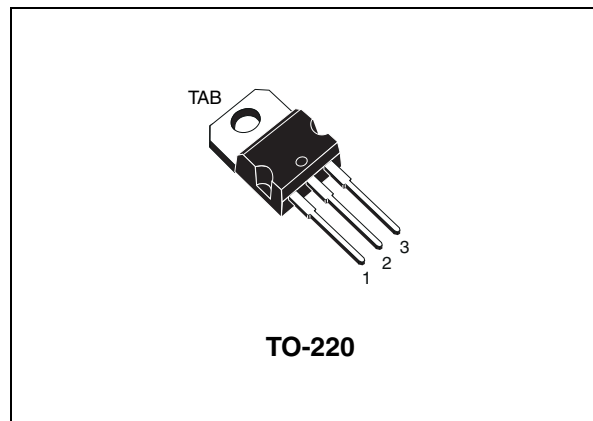
- Monolithic Darlingtons configuration
- Integrated antiparallel collector-emitter diode

**Application**

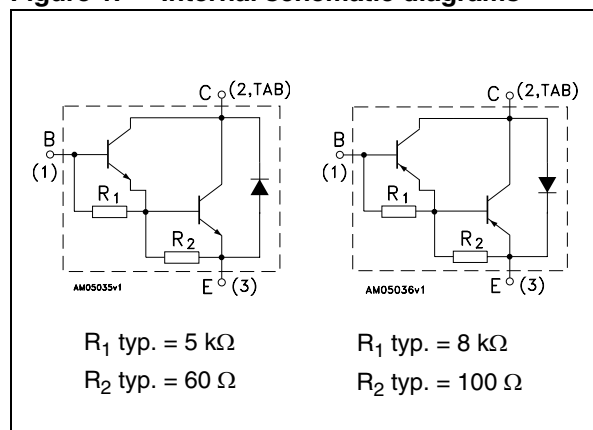
- Linear and switching industrial equipment

**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 |
|-------------|---------|----------|---------|-----------|
| TIP142T     | TIP142T | NPN      | TO-220  | Tube      |
| TIP147T     | TIP147T | 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 $T_{case} = 25\text{ °C}$ | 90         | 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 1.4 | °C/W |

## 2 Electrical characteristics

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

**Table 4. Electrical characteristics**

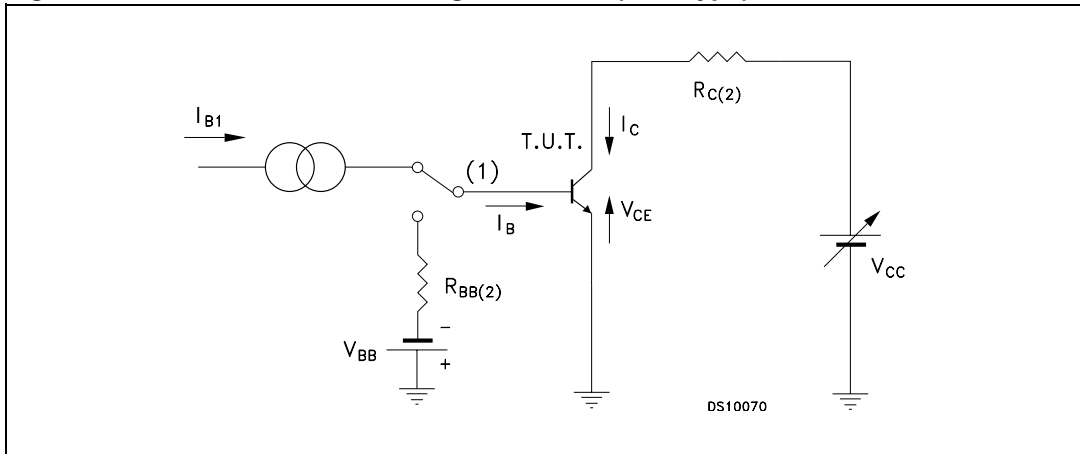
| Symbol                              | Parameter   | Test conditions   | Min.        | Typ.     | Max.   | Unit                           |
|-------------------------------------|---|---|-------------|----------|--------|--------------------------------|
| $I_{\text{CBO}}$                    | Collector 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  $\leq 2\%$ .

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

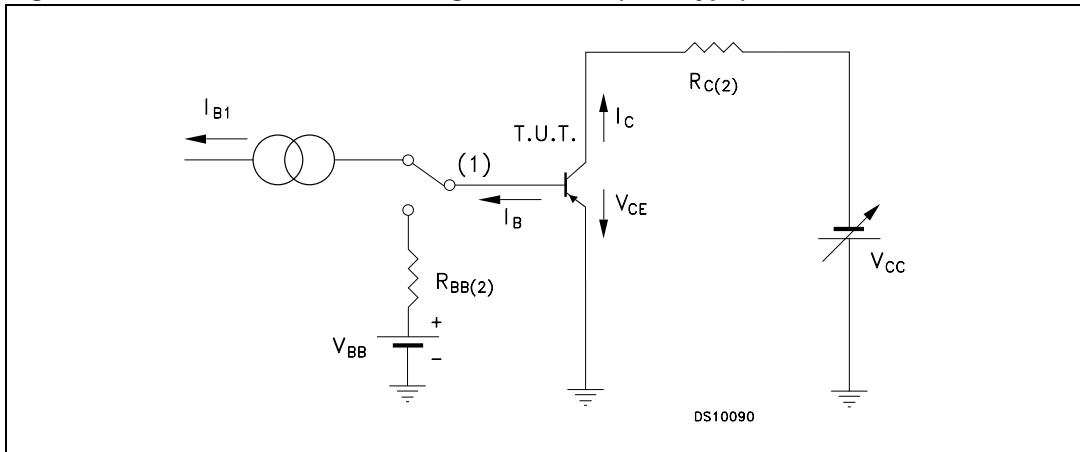
## 2.1 Test circuits

**Figure 2. Resistive load switching test circuit (NPN type)**



1. Fast electronic switch
2. Non-inductive resistor

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



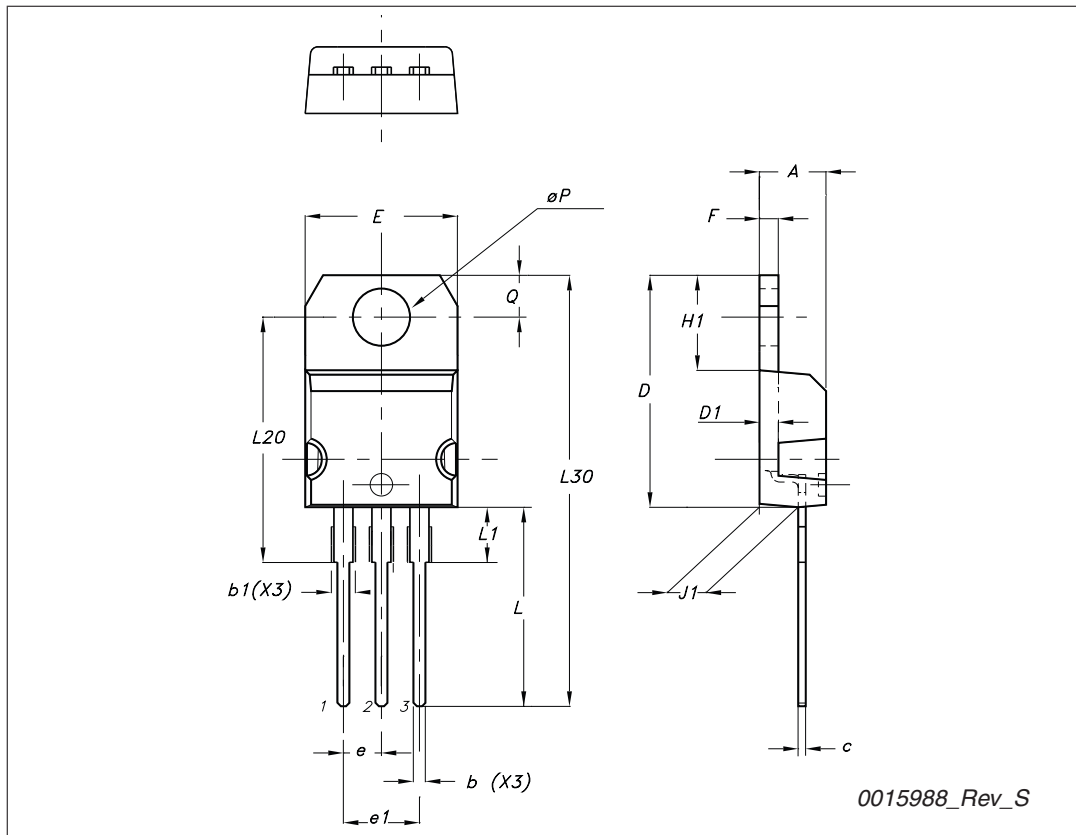
1. Fast electronic switch
2. Non-inductive resistor

### 3 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.

**TO-220 type A mechanical data**

| Dim | mm    |       |       |
|-----|-------|-------|-------|
|     | Min   | Typ   | Max   |
| A   | 4.40  |       | 4.60  |
| b   | 0.61  |       | 0.88  |
| b1  | 1.14  |       | 1.70  |
| c   | 0.48  |       | 0.70  |
| D   | 15.25 |       | 15.75 |
| D1  |       | 1.27  |       |
| E   | 10    |       | 10.40 |
| e   | 2.40  |       | 2.70  |
| e1  | 4.95  |       | 5.15  |
| F   | 1.23  |       | 1.32  |
| H1  | 6.20  |       | 6.60  |
| J1  | 2.40  |       | 2.72  |
| L   | 13    |       | 14    |
| L1  | 3.50  |       | 3.93  |
| L20 |       | 16.40 |       |
| L30 |       | 28.90 |       |
| ∅P  | 3.75  |       | 3.85  |
| Q   | 2.65  |       | 2.95  |



## 4 Revision history

**Table 5. Document revision history**

| <b>Date</b> | <b>Revision</b> | <b>Changes</b>   |
|-------------|-----------------|--|
| 21-Jun-2004 | 4               |  |
| 20-May-2010 | 5               | Technology change from epitaxial base to planar base island. |

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