# STSA851

## Low voltage fast-switching NPN power transistor

### Features

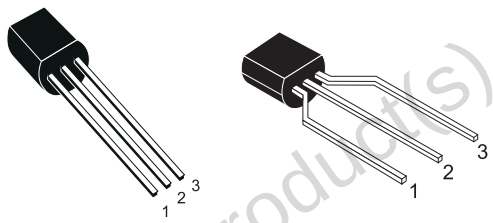
- Very low collector to emitter saturation voltage
- High current gain characteristic
- Fast-switching speed

### Applications

- Emergency lighting
- Voltage regulators
- Relay drivers
- High efficiency low voltage switching applications

### Description

The device is manufactured in NPN planar technology by using a "base island" layout. the resulting transistor shows exceptional high gain performance coupled with very low saturation voltage.




TO-92 TO-92AP

**Figure 1. Internal schematic diagram**

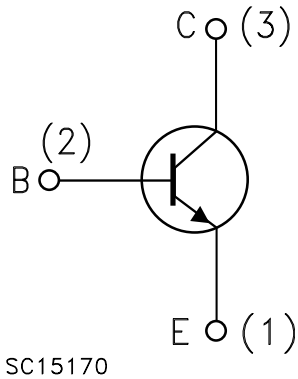





**Table 1. Device summary**

| Order code | Marking | Package | Packaging |
|---|---|---|---|
| STSA851 | SA851 | TO-92 | Bulk |
| STSA851-AP | SA851 | TO-92AP | Ammopack |

# Contents

# 1 Electrical ratings

**Table 2. Absolute maximum rating**

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $V_{CBO}$ | Collector-base voltage ($I_E$ = 0) | 150 | V |
| $V_{CEO}$ | Collector-emitter voltage ($I_B$ = 0) | 60 | V |
| $V_{EBO}$ | Emitter-base voltage ($I_C$ = 0) | 7 | V |
| $I_C$ | Collector current | 5 | A |
| $I_{CM}$ | Collector peak current ($t_P$ < 5 ms) | 20 | A |
| $I_B$ | Base current | 1 | A |
| $P_{tot}$ | Total dissipation at $T_{amb}$ = 25 °C | 1.1 | W |
| $T_{stg}$ | Storage temperature | -65 to 150 | °C |
| $T_J$ | Max. operating junction temperature | 150 | °C |

**Table 3. Thermal data**

| Symbol | Parameter | | Value | Unit |
|---|---|---|---|---|
| $R_{thj\text{-}amb}$ | Thermal resistance junction-ambient | max | 114 | °C/W |

# 2 Electrical characteristics

($T_{case}$ = 25 °C unless otherwise specified)

**Table 4. Electrical characteristics**

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $I_{CBO}$ | Collector cut-off current ($I_E$ = 0) | $V_{CB}$ = 120 V<br>$V_{CB}$ = 120 V $T_C$ = 100 °C | | | 50<br>1 | nA<br>µA |
| $I_{EBO}$ | Emitter cut-off current ($I_C$ = 0) | $V_{EB}$ = 7 V | | | 10 | nA |
| $V_{(BR)CBO}$ (1) | Collector-base breakdown Voltage ($I_E$ = 0) | $I_C$ = 100 µA | 150 | | | V |
| $V_{(BR)CEO}$ (1) | Collector-emitter breakdown Voltage ($I_B$ = 0) | $I_C$ = 10 mA | 60 | | | V |
| $V_{(BR)EBO}$ (1) | Emitter-base breakdown Voltage ($I_C$ = 0) | $I_E$ = 100 µA | 7 | | | V |
| $V_{CE(sat)}$ (1) | Collector-emitter saturation voltage | $I_C$ = 100 mA $I_B$ = 5 mA<br>$I_C$ = 1 A $I_B$ = 50 mA<br>$I_C$ = 2 A $I_B$ = 50 mA<br>$I_C$ = 5 A $I_B$ = 200 mA | | 10<br>70<br>140<br>320 | 50<br>120<br>200<br>450 | mV<br>mV<br>mV<br>mV |
| $V_{BE(sat)}$ (1) | Base-emitter saturation voltage | $I_C$ = 4 A $I_B$ = 200 mA | | 1 | 1.15 | V |
| $h_{FE}$ | DC current gain | $I_C$ = 10 mA $V_{CE}$ = 1 V<br>$I_C$ = 2 A $V_{CE}$ = 1 V<br>$I_C$ = 5 A $V_{CE}$ = 1 V<br>$I_C$ = 10 A $V_{CE}$ = 1 V | 150<br>150<br>90<br>30 | 300<br>270<br>140<br>50 | 350 | |
| $f_T$ | Transition frequency | $V_{CE}$ = 10 V $I_C$ = 100 mA | | 130 | | MHz |
| $C_{CBO}$ | Collector-base capacitance | $V_{CB}$ = 10 V f = 1 MHz | | 45 | | pF |
| $t_{on}$<br>$t_s$<br>$t_f$ | Resistive load<br>Turn-on time<br>Storage time<br>Fall time | $I_C$ = 1 A $V_{CC}$ = 10 V<br>$I_{B1}$ = -$I_{B2}$ = 0.1 A | | 55<br>1.35<br>120 | | ns<br>µs<br>ns |

1. Pulsed duration = 300 µs, duty cycle ≥ 1.5%.

## 2.1 Electrical characteristics (curves)

**Figure 2. Output characteristics**

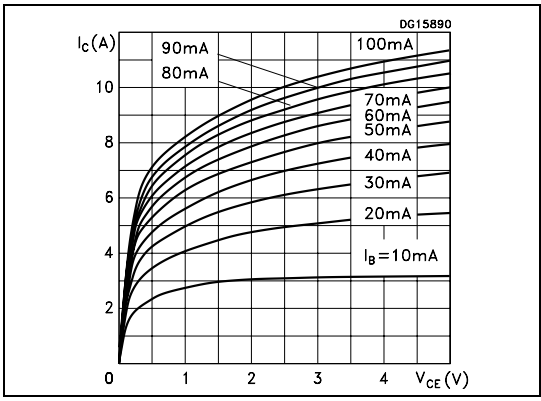



**Figure 3. DC current gain**

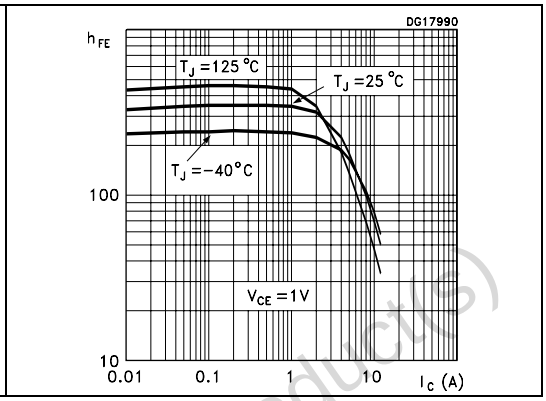



**Figure 4. Collector-emitter saturation voltage**

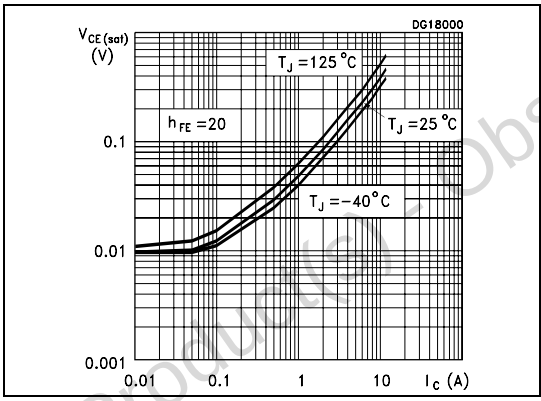



**Figure 5. Collector-emitter saturation voltage**

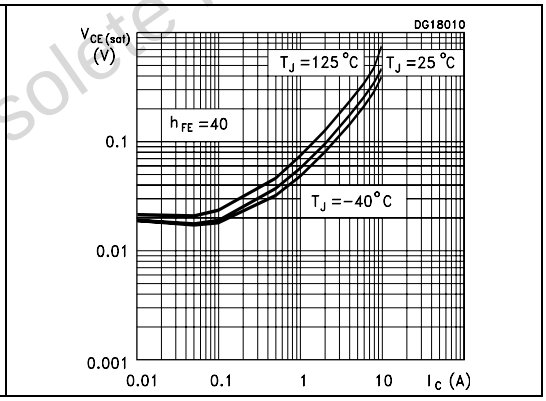



**Figure 6. Base-emitter saturation voltage**

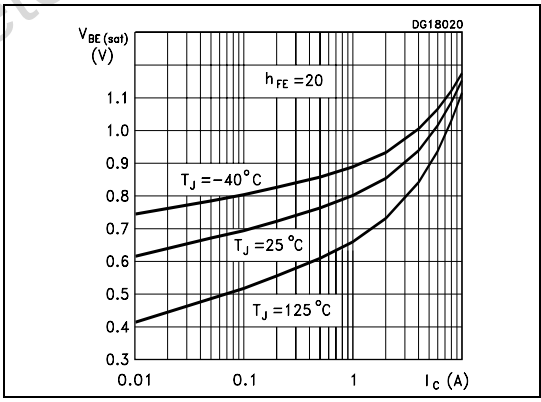



**Figure 7. Base-emitter on voltage**

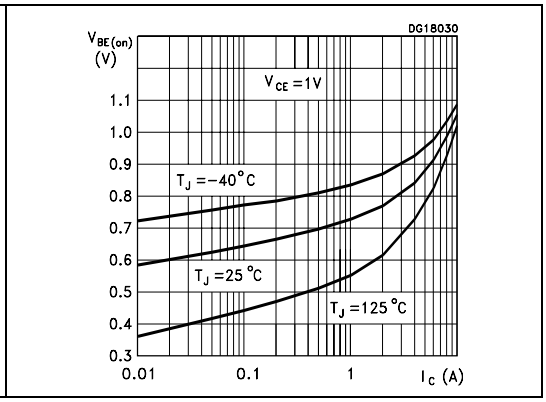


**Figure 8. Switching times resistive load**

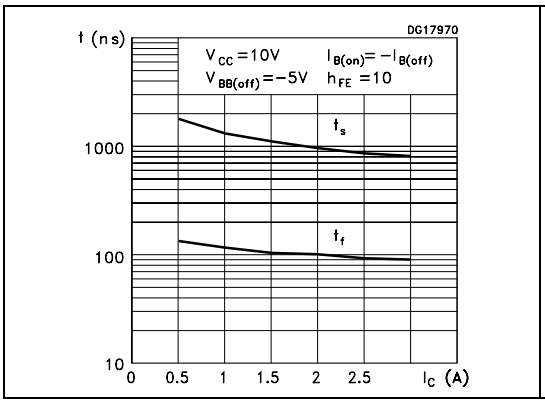



**Figure 9. Switching times resistive load**

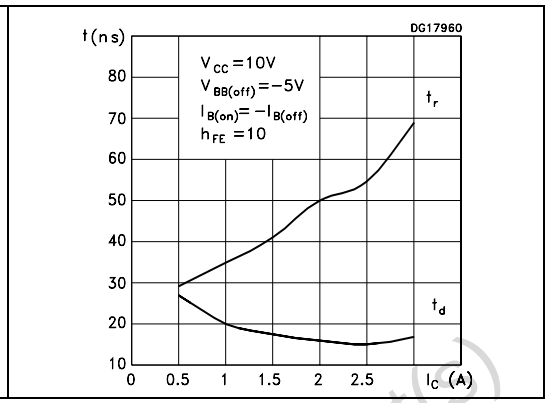
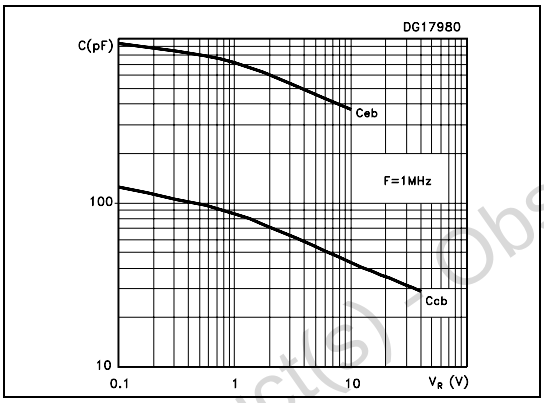
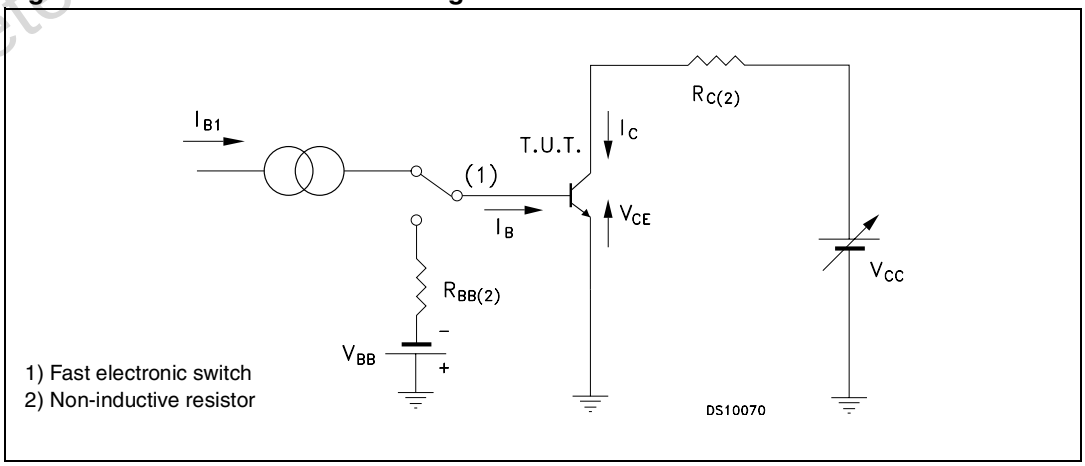



**Figure 10. Capacitance**




## 2.2 Test circuit

**Figure 11. Resistive load switching test circuit**

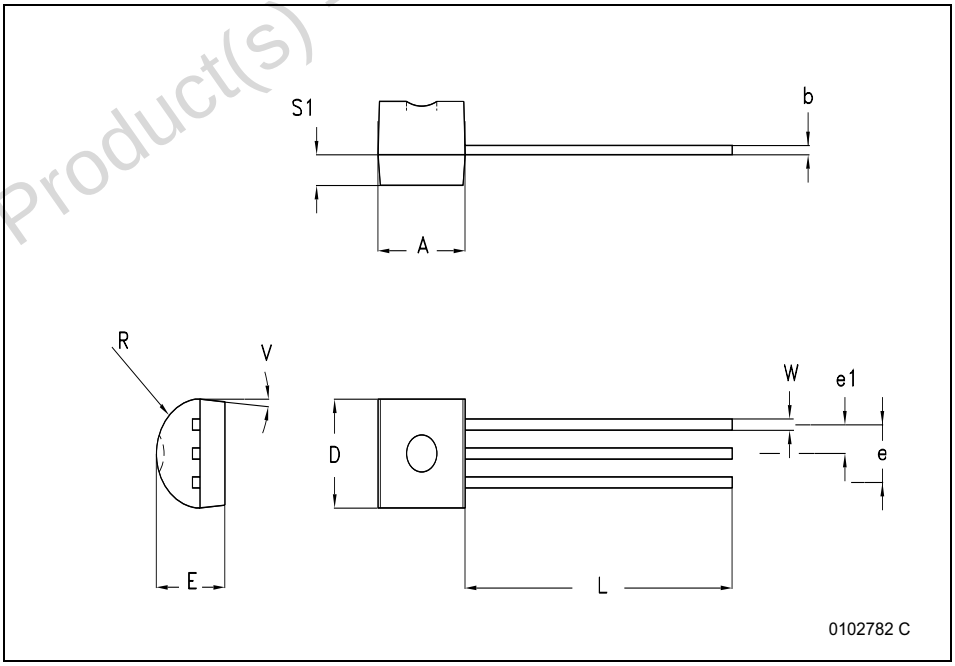


# 3 Package mechanical data

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

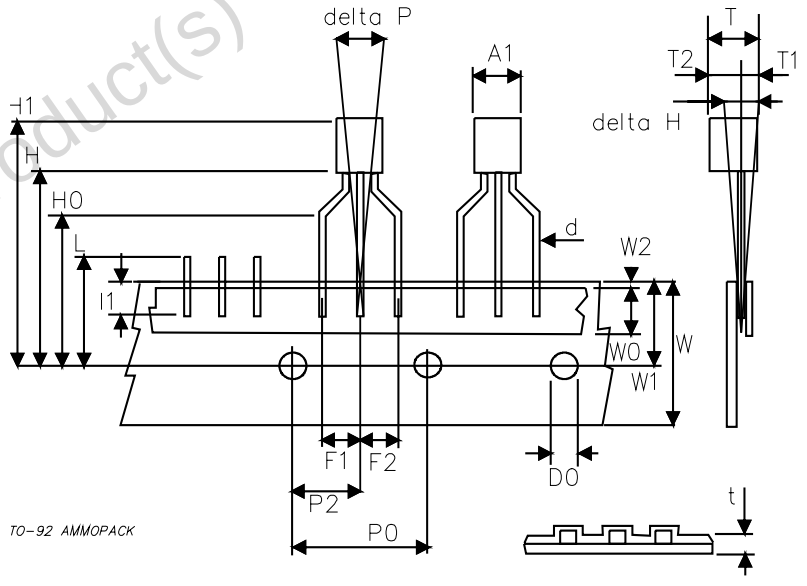
## TO-92 BULK SHIPMENT MECHANICAL DATA

| DIM. | mm. | | |
|---|---|---|---|
| | MIN. | TYP | MAX. |
| A | 4.32 | | 4.95 |
| b | 0.36 | | 0.51 |
| D | 4.45 | | 4.95 |
| E | 3.30 | | 3.94 |
| e | 2.41 | | 2.67 |
| e1 | 1.14 | | 1.40 |
| L | 12.70 | | 15.49 |
| R | 2.16 | | 2.41 |
| S1 | 0.92 | | 1.52 |
| W | 0.41 | | 0.56 |
| V | | 5 O | |



## TO-92 AMMOPACK SHIPMENT (Suffix"-AP") MECHANICAL DATA

| DIM. | mm. | | |
|---|---|---|---|
| | MIN. | TYP | MAX. |
| A1 | | | 4.80 |
| T | | | 3.80 |
| T1 | | | 1.60 |
| T2 | | | 2.30 |
| d | | | 0.48 |
| P0 | 12.50 | 12.70 | 12.90 |
| P2 | 5.65 | 6.35 | 7.05 |
| F1,F2 | 2.44 | 2.54 | 2.94 |
| delta H | -2.00 | | 2.00 |
| W | 17.50 | 18.00 | 19.00 |
| W0 | 5.70 | 6.00 | 6.30 |
| W1 | 8.50 | 9.00 | 9.25 |
| W2 | | | 0.50 |
| H | 18.50 | | 20.50 |
| H0 | 15.50 | 16.00 | 16.50 |
| H1 | | | 25.00 |
| D0 | 3.80 | 4.00 | 4.20 |
| t | | | 0.90 |
| L | | | 11.00 |
| I1 | 3.00 | | |
| delta P | -1.00 | | 1.00 |



# 4 Revision history

Table 5. Document revision history

| Date | Revision | Changes |
|---|---|---|
| 05-Sep-2003 | 2 | |
| 25-Mar-2008 | 3 | New graphics. |

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