

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.

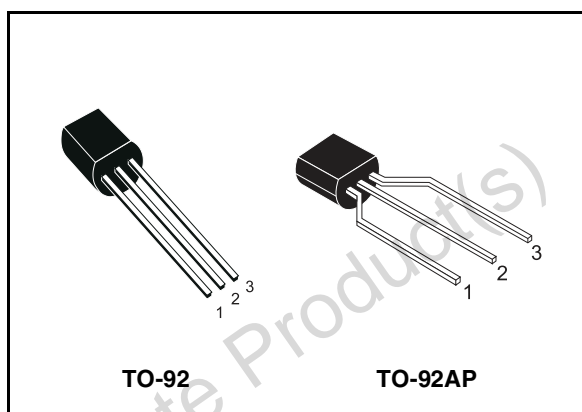


Figure 1. Internal schematic diagram

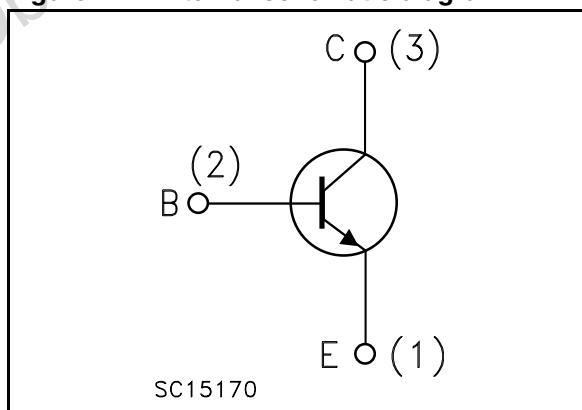


Table 1. Device summary

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

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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 |
|---------------|-------------------------------------|---------|------|
| $R_{thj-amb}$ | Thermal resistance junction-ambient | max 114 | °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_{CBO} | Collector cut-off current ($I_{\text{E}} = 0$) | $V_{\text{CB}} = 120\text{ V}$ $V_{\text{CB}} = 120\text{ V}$ $T_{\text{C}} = 100\text{ °C}$ | | | 50 1 | nA μA |
| I_{EBO} | Emitter cut-off current ($I_{\text{C}} = 0$) | $V_{\text{EB}} = 7\text{ V}$ | | | 10 | nA |
| $V_{(\text{BR})\text{CBO}}^{(1)}$ | Collector-base breakdown Voltage ($I_{\text{E}} = 0$) | $I_{\text{C}} = 100\text{ }\mu\text{A}$ | 150 | | | V |
| $V_{(\text{BR})\text{CEO}}^{(1)}$ | Collector-emitter breakdown Voltage ($I_{\text{B}} = 0$) | $I_{\text{C}} = 10\text{ mA}$ | 60 | | | V |
| $V_{(\text{BR})\text{EBO}}^{(1)}$ | Emitter-base breakdown Voltage ($I_{\text{C}} = 0$) | $I_{\text{E}} = 100\text{ }\mu\text{A}$ | 7 | | | V |
| $V_{\text{CE}(\text{sat})}^{(1)}$ | Collector-emitter saturation voltage | $I_{\text{C}} = 100\text{ mA}$ $I_{\text{B}} = 5\text{ mA}$ $I_{\text{C}} = 1\text{ A}$ $I_{\text{B}} = 50\text{ mA}$ $I_{\text{C}} = 2\text{ A}$ $I_{\text{B}} = 50\text{ mA}$ $I_{\text{C}} = 5\text{ A}$ $I_{\text{B}} = 200\text{ mA}$ | | 10 70 140 320 | 50 120 200 450 | mV mV mV mV |
| $V_{\text{BE}(\text{sat})}^{(1)}$ | Base-emitter saturation voltage | $I_{\text{C}} = 4\text{ A}$ $I_{\text{B}} = 200\text{ mA}$ | | 1 | 1.15 | V |
| h_{FE} | DC current gain | $I_{\text{C}} = 10\text{ mA}$ $V_{\text{CE}} = 1\text{ V}$ $I_{\text{C}} = 2\text{ A}$ $V_{\text{CE}} = 1\text{ V}$ $I_{\text{C}} = 5\text{ A}$ $V_{\text{CE}} = 1\text{ V}$ $I_{\text{C}} = 10\text{ A}$ $V_{\text{CE}} = 1\text{ V}$ | 150 150 90 30 | 300 270 140 50 | 350 | |
| f_{T} | Transition frequency | $V_{\text{CE}} = 10\text{ V}$ $I_{\text{C}} = 100\text{ mA}$ | | 130 | | MHz |
| C_{CBO} | Collector-base capacitance | $V_{\text{CB}} = 10\text{ V}$ $f = 1\text{ MHz}$ | | 45 | | pF |
| t_{on} t_{s} t_{f} | Resistive load Turn-on time Storage time Fall time | $I_{\text{C}} = 1\text{ A}$ $V_{\text{CC}} = 10\text{ V}$ $I_{\text{B1}} = -I_{\text{B2}} = 0.1\text{ A}$ | | 55 1.35 120 | | ns μs ns |

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

2.1 Electrical characteristics (curves)

Figure 2. Output characteristics

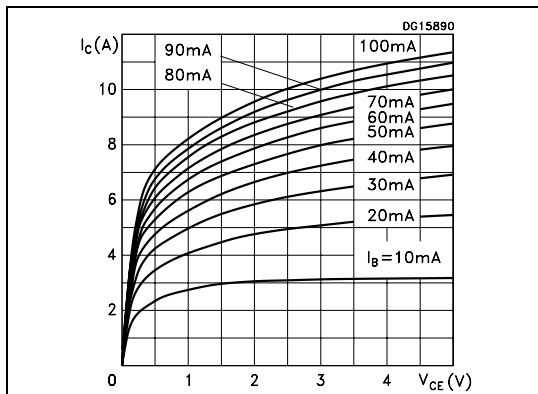


Figure 3. DC current gain

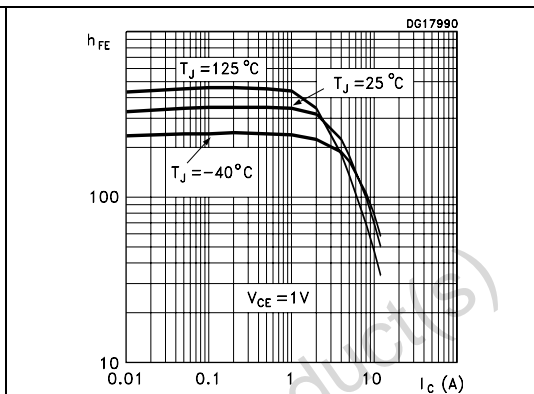


Figure 4. Collector-emitter saturation voltage

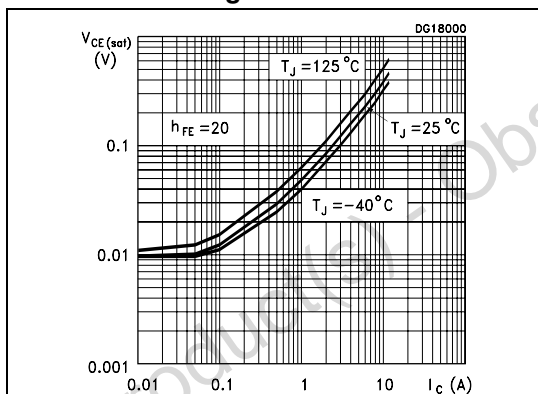


Figure 5. Collector-emitter saturation voltage

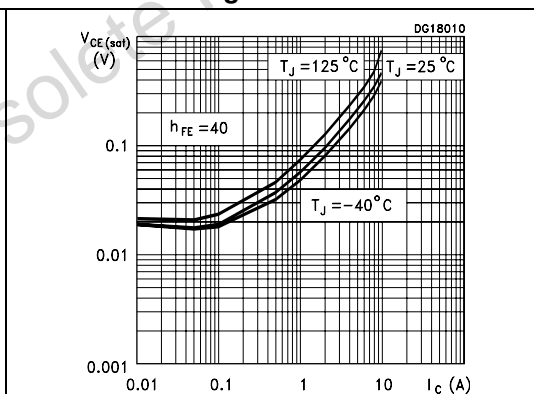


Figure 6. Base-emitter saturation voltage

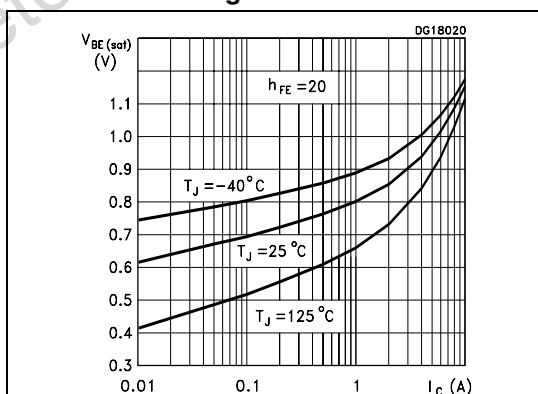


Figure 7. Base-emitter on voltage

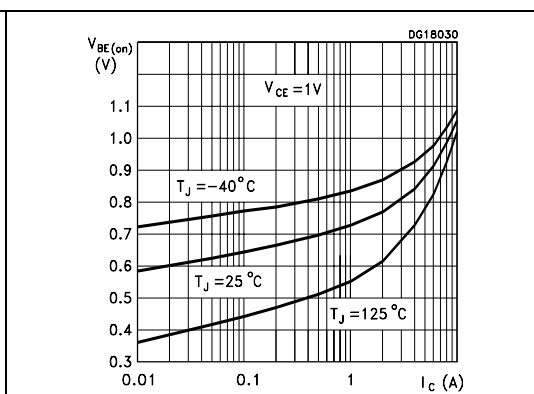


Figure 8. Switching times resistive load

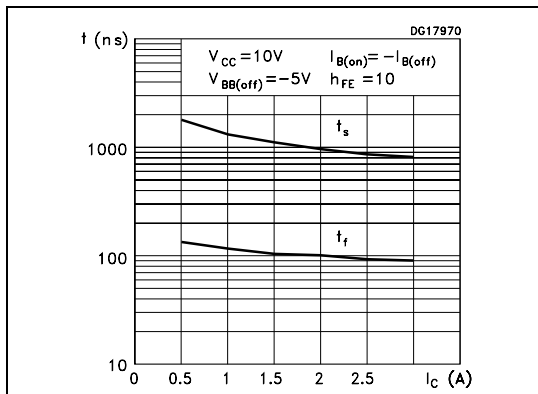


Figure 9. Switching times resistive load

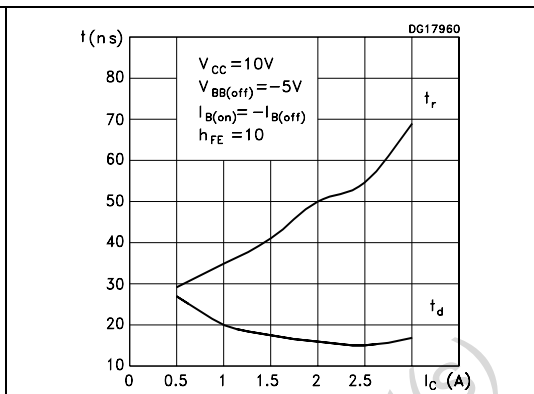
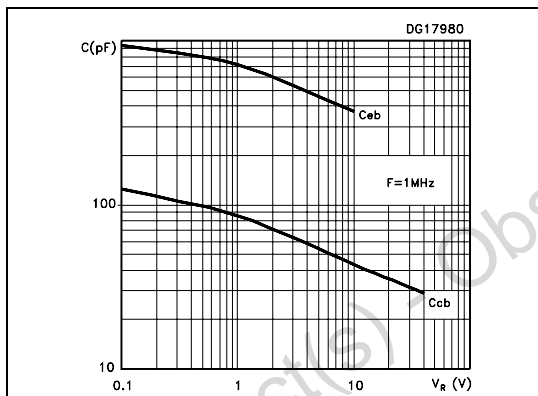
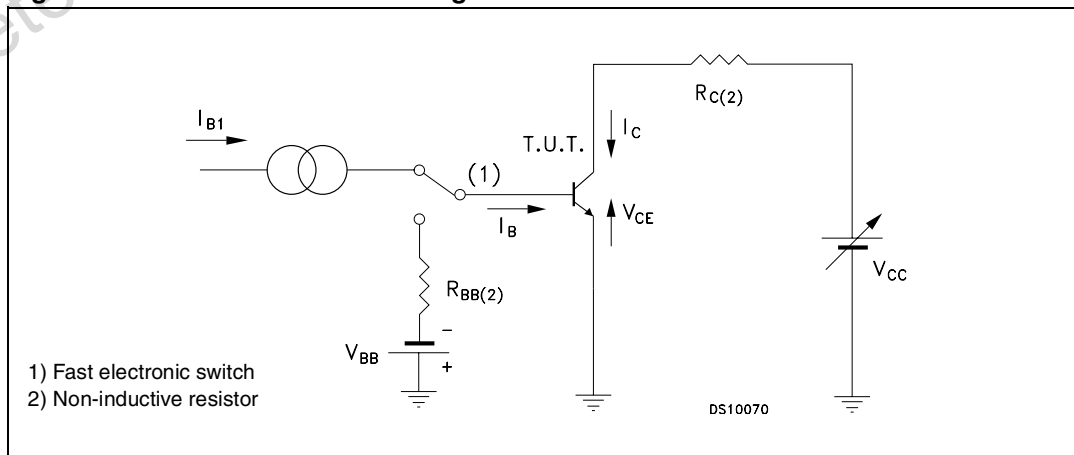


Figure 10. Capacitance



2.2 Test circuit

Figure 11. Resistive load switching test circuit



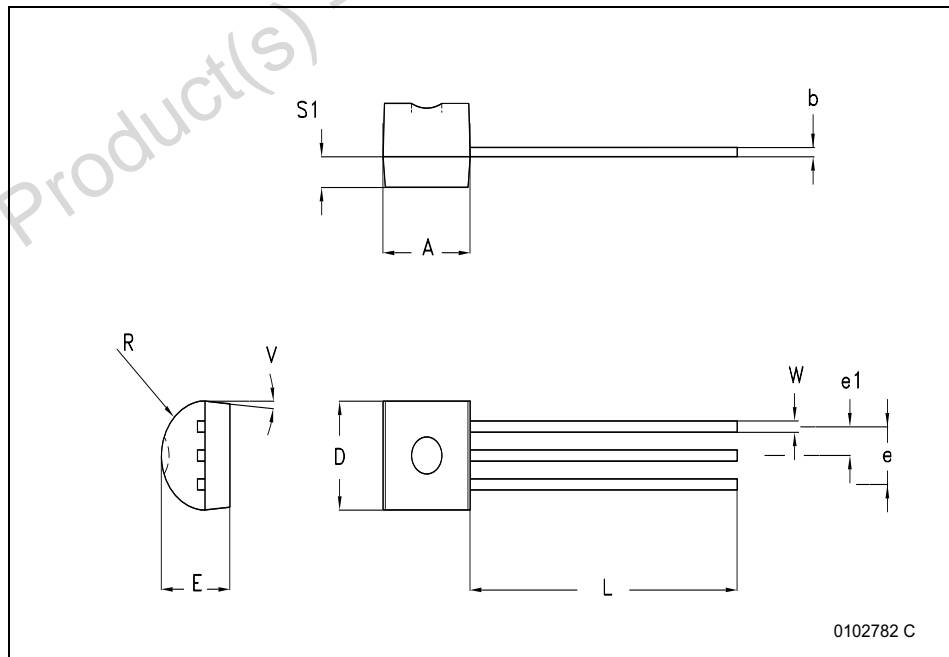
3 Package mechanical data

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

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TO-92 BULK SHIPMENT MECHANICAL DATA

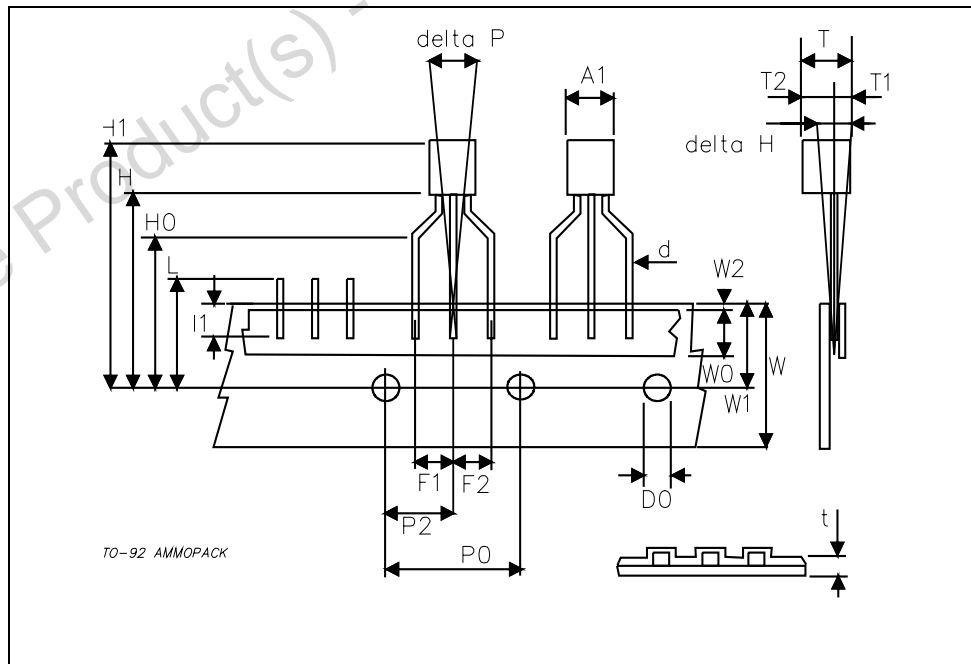
| DIM. | mm. | | |
|------|-------|-----|-------|
| | MIN. | TYP | MAX. |
| A | 4.32 | | 4.95 |
| b | 0.36 | | 0.51 |
| D | 4.45 | | 4.95 |
| E | 3.30 | | 3.94 |
| e | 2.41 | | 2.67 |
| e1 | 1.14 | | 1.40 |
| L | 12.70 | | 15.49 |
| R | 2.16 | | 2.41 |
| S1 | 0.92 | | 1.52 |
| W | 0.41 | | 0.56 |
| V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



0102782 C

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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