

Medium current, high performance, low voltage PNP transistor

Features

- Very low collector to emitter saturation voltage
- DC current gain, $h_{FE} > 100$
- 3 A continuous collector current
- 40 V breakdown voltage $V_{(BR)CER}$
- SOT-223 plastic package for surface mounting circuits in tape and reel packing

Applications

- Power management in portable equipment
- Voltage regulation in bias supply circuits
- Switching regulator in battery charger applications
- Heavy load driver

Description

The device is manufactured in low voltage PNP planar technology by using a "Base Island" layout. The resulting transistor shows exceptional high gain performance coupled with very low saturation voltage.

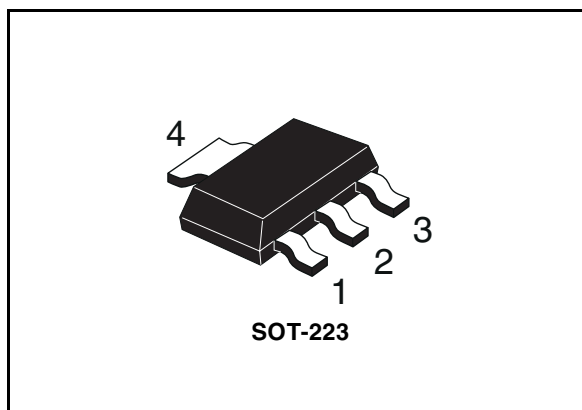


Figure 1. Internal schematic diagram

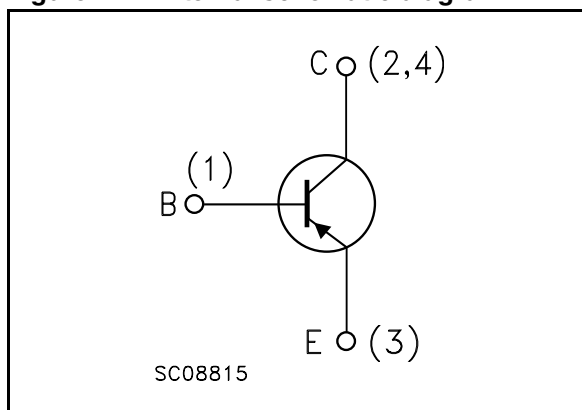


Table 1. Device summary

| Order code | Marking | Package | Packaging |
|------------|---------|---------|---------------|
| STN790A | N790A | SOT-223 | Tape and reel |

1 Electrical ratings

Table 2. Absolute maximum rating

| Symbol | Parameter | Value | Unit |
|-----------|--|------------|------|
| V_{CBO} | Collector-base voltage ($I_E = 0$) | -40 | V |
| V_{CER} | Collector-emitter voltage ($R_{BE} = 47 \Omega$) | -40 | V |
| V_{CEO} | Collector-emitter voltage ($I_B = 0$) | -30 | V |
| V_{EBO} | Emitter-base voltage ($I_C = 0$) | -5 | V |
| I_C | Collector current | -3 | A |
| I_{CM} | Collector peak current ($t_p < 5$ ms) | -6 | A |
| P_{tot} | Total dissipation at $T_{amb} = 25$ °C | 1.6 | 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 ⁽¹⁾ max | 78 | °C/W |

1. Device mounted on PCB area of 1 cm².

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 ($I_{\text{E}} = 0$) | $V_{\text{CB}} = -30\text{ V}$ $V_{\text{CB}} = -30\text{ V}; T_{\text{C}} = 100\text{ °C}$ | | | -10 -100 | μA μA |
| I_{EBO} | Emitter cut-off current ($I_{\text{C}} = 0$) | $V_{\text{EB}} = -4\text{ V}$ | | | -10 | μA |
| $V_{(\text{BR})\text{CEO}}^{(1)}$ | Collector-emitter breakdown voltage ($I_{\text{B}} = 0$) | $I_{\text{C}} = -10\text{ mA}$ | -30 | | | V |
| $V_{(\text{BR})\text{CER}}^{(1)}$ | Collector-emitter breakdown voltage ($R_{\text{BE}} = 47\ \Omega$) | $I_{\text{C}} = -10\text{ mA}$ | -40 | | | V |
| $V_{(\text{BR})\text{CBO}}$ | Collector-base breakdown voltage ($I_{\text{E}} = 0$) | $I_{\text{C}} = -100\ \mu\text{A}$ | -40 | | | V |
| $V_{(\text{BR})\text{EBO}}$ | Emitter-base breakdown voltage ($I_{\text{C}} = 0$) | $I_{\text{E}} = -100\ \mu\text{A}$ | -5 | | | V |
| $V_{\text{CE}(\text{sat})}^{(1)}$ | Collector-emitter saturation voltage | $I_{\text{C}} = -0.5\text{ A}$ $I_{\text{B}} = -5\text{ mA}$ $I_{\text{C}} = -1.2\text{ A}$ $I_{\text{B}} = -20\text{ mA}$ $I_{\text{C}} = -2\text{ A}$ $I_{\text{B}} = -20\text{ mA}$ $I_{\text{C}} = -3\text{ A}$ $I_{\text{B}} = -100\text{ mA}$ $I_{\text{C}} = -3\text{ A}$ $I_{\text{B}} = -100\text{ mA}$ $T_{\text{J}} = 100\text{ °C}$ | | | -0.15 -0.25 -0.5 -0.7 -0.9 | V V V V V |
| $V_{\text{BE}(\text{sat})}^{(1)}$ | Base-emitter saturation voltage | $I_{\text{C}} = -1\text{ A}$ $I_{\text{B}} = -10\text{ mA}$ | | -0.8 | -1 | V |
| $V_{\text{BE}(\text{on})}^{(1)}$ | Base-emitter on voltage | $I_{\text{C}} = -1\text{ A}$ $V_{\text{CE}} = -2\text{ V}$ | | -0.8 | -1 | V |
| $h_{\text{FE}}^{(1)}$ | DC current gain | $I_{\text{C}} = -10\text{ mA}$ $V_{\text{CE}} = -2\text{ V}$ $I_{\text{C}} = -500\text{ mA}$ $V_{\text{CE}} = -2\text{ V}$ $I_{\text{C}} = -1\text{ A}$ $V_{\text{CE}} = -2\text{ V}$ $I_{\text{C}} = -2\text{ A}$ $V_{\text{CE}} = -1\text{ V}$ $I_{\text{C}} = -3\text{ A}$ $V_{\text{CE}} = -1\text{ V}$ | 100 100 100 100 90 | 200 200 160 130 | 400 400 | |

Table 4. Electrical characteristics (continued)

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|--------|------------------------------|--|------|------|------|------|
| f_t | Transition frequency | $I_C = -50 \text{ mA}$ $V_{CE} = -5 \text{ V}$ $f = 50 \text{ MHz}$ | | 100 | | MHz |
| t_d | Resistive load Delay time | $I_C = -3 \text{ A}$ $V_{CC} = -20 \text{ V}$ | | 180 | 220 | ns |
| t_r | Rise time | $I_{B1} = -I_{B2} = -60 \text{ mA}$ | | 160 | 210 | ns |
| t_s | Storage time | see Figure 8 | | 250 | 300 | ns |
| t_f | Fall time | | | 80 | 100 | ns |

1. Pulse duration = 300 μs , duty cycle $\leq 1.5\%$

2.1 Electrical characteristics (curves)

Figure 2. DC current gain

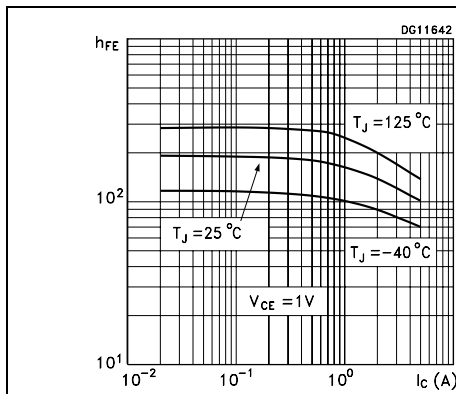


Figure 3. DC current gain

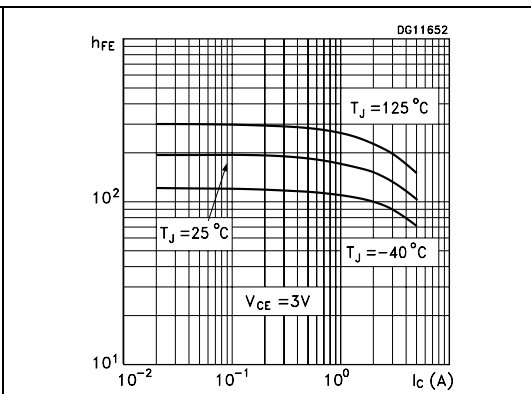


Figure 4. Collector-emitter saturation voltage

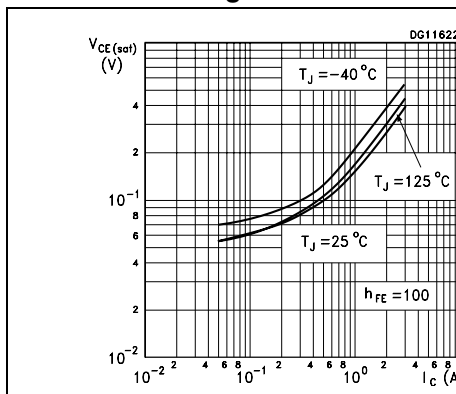


Figure 5. Base-emitter saturation voltage

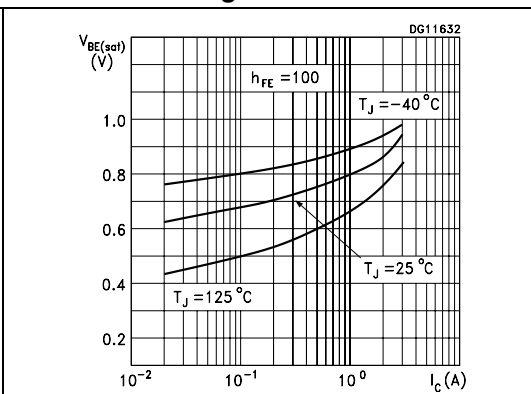
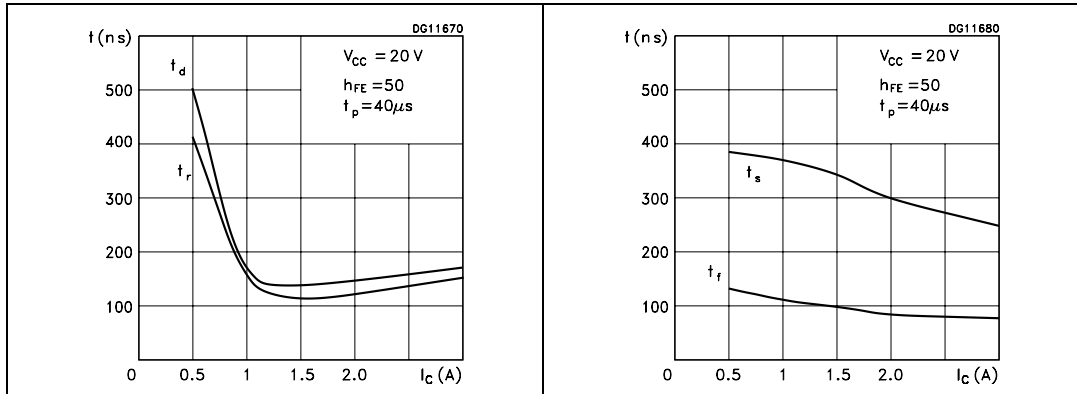
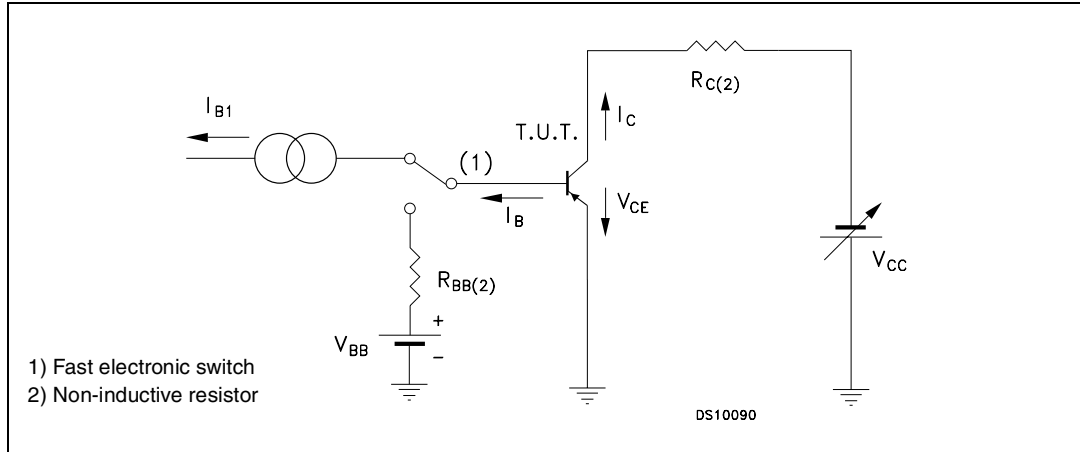


Figure 6. Switching time resistive load Figure 7. Switching time resistive load



2.2 Test circuit

Figure 8. Resistive load switching test circuit

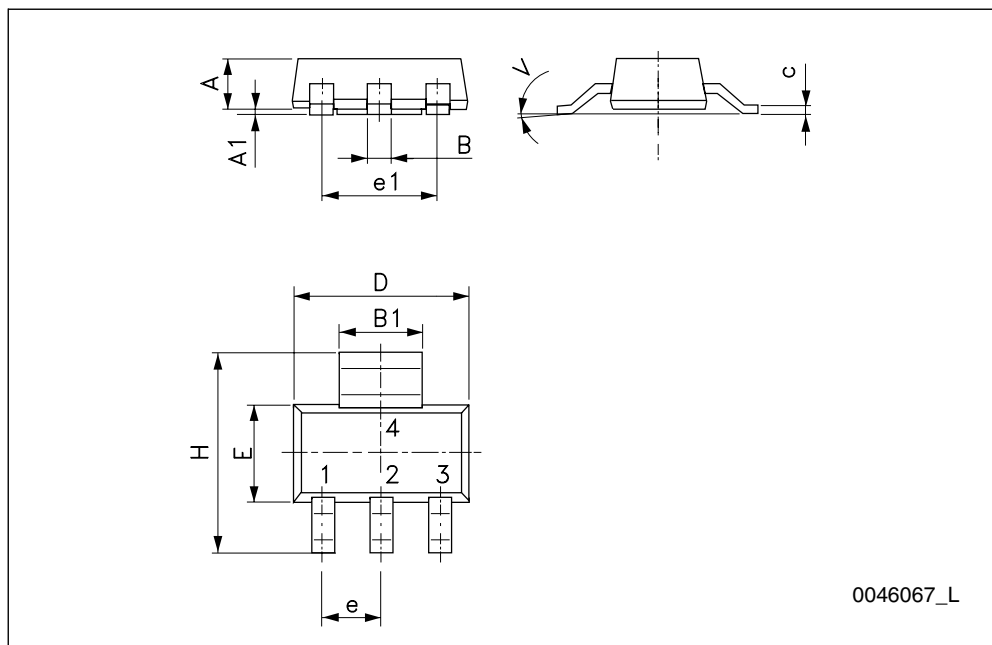


3 Package mechanical data

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

SOT-223 mechanical data

| DIM. | mm. | | |
|------|------|------|------|
| | min. | typ | max. |
| A | | | 1.80 |
| A1 | 0.02 | | 0.1 |
| B | 0.60 | 0.70 | 0.85 |
| B1 | 2.90 | 3.00 | 3.15 |
| c | 0.24 | 0.26 | 0.35 |
| D | 6.30 | 6.50 | 6.70 |
| e | | 2.30 | |
| e1 | | 4.60 | |
| E | 3.30 | 3.50 | 3.70 |
| H | 6.70 | 7.00 | 7.30 |
| V | | | 10 ° |



4 Revision history

Table 5. Document revision history

| Date | Revision | Changes |
|-------------|----------|----------------------------------|
| 24-Mar-2006 | 3 | Updated to new template |
| 26-Jun-2008 | 4 | Updated SOT-223 mechanical data. |

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