

Low voltage high performance NPN power transistor

Features

- Very low collector-emitter saturation voltage
- High current gain characteristic
- Fast switching speed
- Miniature SOT-23 plastic package
ECOPACK[®]2 grade for surface mounting circuits

Applications

- Strobe and LED drives
- Motor and relay drives
- DC-DC converters

Description

This device is an NPN transistor manufactured using low voltage planar technology with a double-metal process.

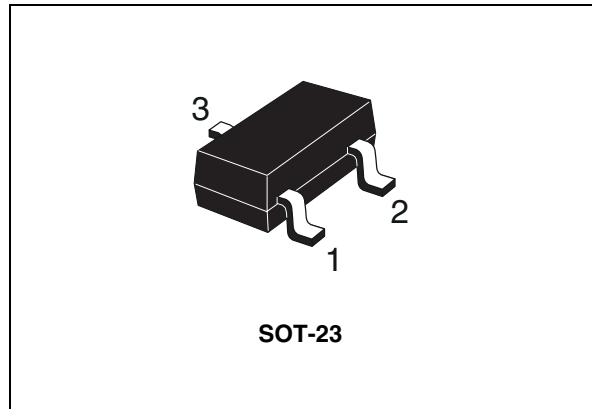


Figure 1. Internal schematic diagram

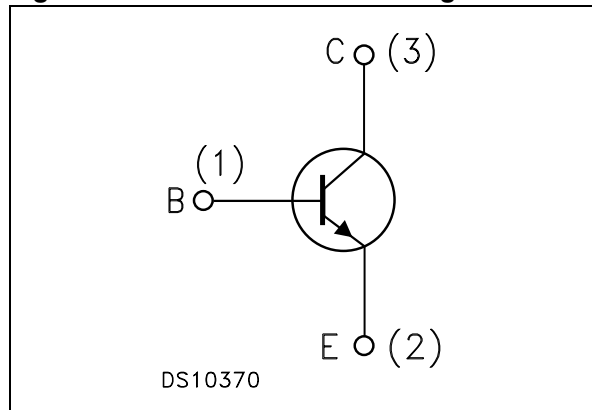


Table 1. Device summary

| Order code | Marking | Package | Packing |
|------------|---------|---------|---------------|
| 3STR1630 | 1630 | SOT-23 | Tape and reel |

1 Electrical ratings

Table 2. Absolute maximum ratings

| Symbol | Parameter | Value | Unit |
|-----------|--|------------|------|
| V_{CES} | Collector-emitter voltage ($V_{BE} = 0$) | 30 | 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 | 6 | A |
| I_{CM} | Collector peak current ($t_p < 5$ ms) | 12 | A |
| P_{TOT} | Total dissipation at $T_{amb} = 25$ °C | 0.5 | 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 |
|------------------|---|-------|------|
| $R_{thJA}^{(1)}$ | Thermal resistance junction-ambient max | 250 | °C/W |

1. Device mounted on PCB area of 1 cm².

2 Electrical characteristics

$T_{\text{case}} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified.

Table 4. Electrical characteristics

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|-------------------------------------|--|--|-------------------|------------------|------------------|----------------|
| I_{CBO} | Collector cut-off current ($I_{\text{E}} = 0$) | $V_{\text{CB}} = 30\text{ V}$ | | | 0.1 | μA |
| I_{EBO} | Emitter cut-off current ($I_{\text{C}} = 0$) | $V_{\text{EB}} = 4\text{ V}$ | | | 0.1 | μA |
| $V_{(\text{BR})\text{CBO}}$ | Collector-base breakdown voltage ($I_{\text{E}} = 0$) | $I_{\text{C}} = 100\text{ }\mu\text{A}$ | 30 | | | V |
| $V_{(\text{BR})\text{CEO}}^{(1)}$ | Collector-emitter breakdown voltage ($I_{\text{B}} = 0$) | $I_{\text{C}} = 10\text{ mA}$ | 30 | | | V |
| $V_{(\text{BR})\text{EBO}}$ | Emitter-base breakdown voltage ($I_{\text{C}} = 0$) | $I_{\text{E}} = 100\text{ }\mu\text{A}$ | 5 | | | V |
| $V_{\text{CE}(\text{sat})}^{(1)}$ | Collector-emitter saturation voltage | $I_{\text{C}} = 1\text{ A}$ $I_{\text{B}} = 100\text{ mA}$ $I_{\text{C}} = 2\text{ A}$ $I_{\text{B}} = 40\text{ mA}$ $I_{\text{C}} = 5\text{ A}$ $I_{\text{B}} = 500\text{ mA}$ | | 60 140 240 | 90 190 300 | mV mV mV |
| $V_{\text{BE}(\text{sat})}^{(1)}$ | Base-emitter saturation voltage | $I_{\text{C}} = 2\text{ A}$ $I_{\text{B}} = 40\text{ mA}$ $I_{\text{C}} = 5\text{ A}$ $I_{\text{B}} = 500\text{ mA}$ | | 830 1000 | 1100 | mV mV |
| $h_{\text{FE}}^{(1)}$ | DC current gain | $I_{\text{C}} = 50\text{ mA}$ $V_{\text{CE}} = 2\text{ V}$ $I_{\text{C}} = 0.5\text{ A}$ $V_{\text{CE}} = 2\text{ V}$ $I_{\text{C}} = 2\text{ A}$ $V_{\text{CE}} = 2\text{ V}$ $I_{\text{C}} = 5\text{ A}$ $V_{\text{CE}} = 2\text{ V}$ | 210 180 170 | 260 90 | 560 | |
| f_{t} | Transition frequency | $I_{\text{C}} = 0.1\text{ A}$ $V_{\text{CE}} = 10\text{ V}$ | | 100 | | MHz |
| C_{CBO} | Collector-base capacitance ($I_{\text{E}} = 0$) | $V_{\text{CB}} = 40\text{ V}$, $f = 1\text{ MHz}$ | | 15 | | pF |
| t_{on} t_{off} | Resistive load Turn-on time Turn-off time | $I_{\text{C}} = 2.5\text{ A}$ $V_{\text{CC}} = 12\text{ V}$ $I_{\text{B}1} = - I_{\text{B}2} = 125\text{ mA}$ $V_{\text{BE}(\text{off})} = -5\text{ V}$ | | 90 450 | | ns ns |

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

2.1 Electrical characteristics (curves)

Figure 2. DC current gain ($V_{CE}=1\text{ V}$)

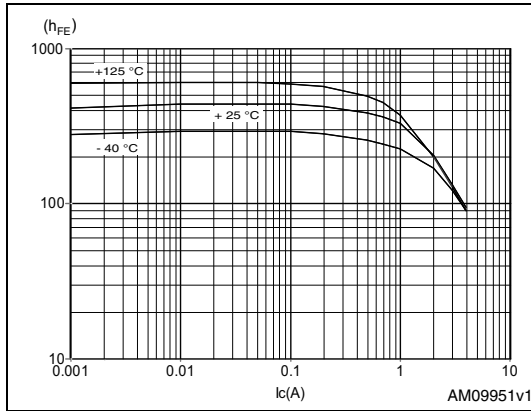


Figure 3. DC current gain ($V_{CE}=2\text{ V}$)

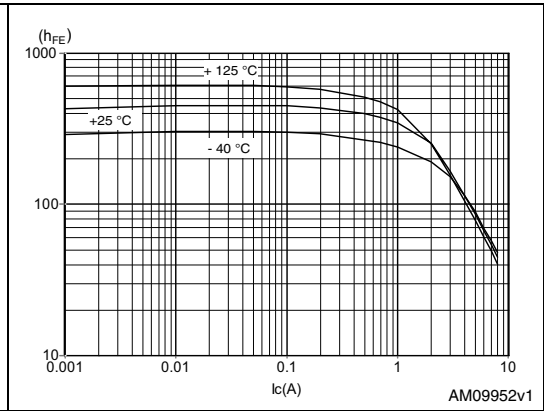


Figure 4. Collector-emitter saturation voltage (V_{CEsat} @ $h_{FE}=10$)

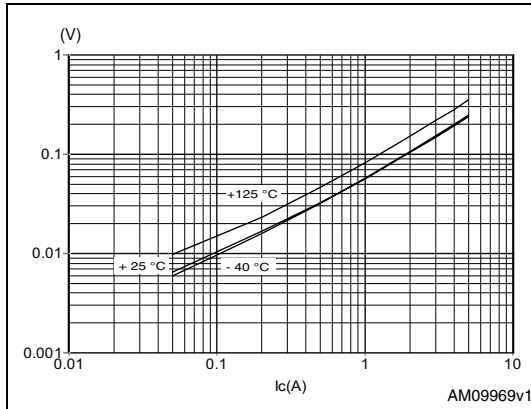


Figure 5. Collector-emitter saturation voltage (V_{CEsat} @ $h_{FE}=50$)

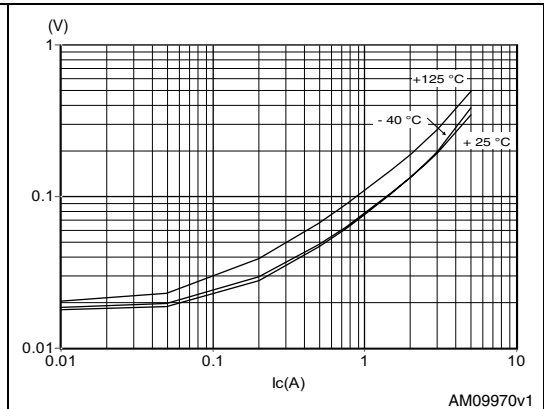


Figure 6. Base-emitter saturation voltage (V_{BEsat} @ $h_{FE}=10$)

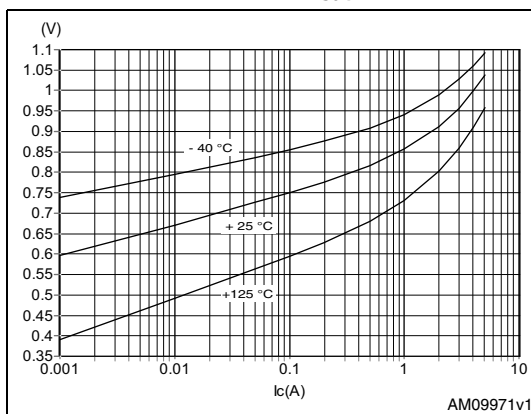


Figure 7. Base-emitter saturation voltage (V_{BEsat} @ $h_{FE}=50$)

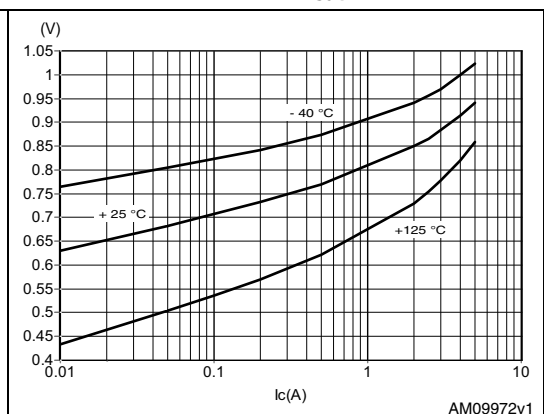


Figure 8. Resistive load switching time (ON) **Figure 9. Resistive load switching time (OFF)**

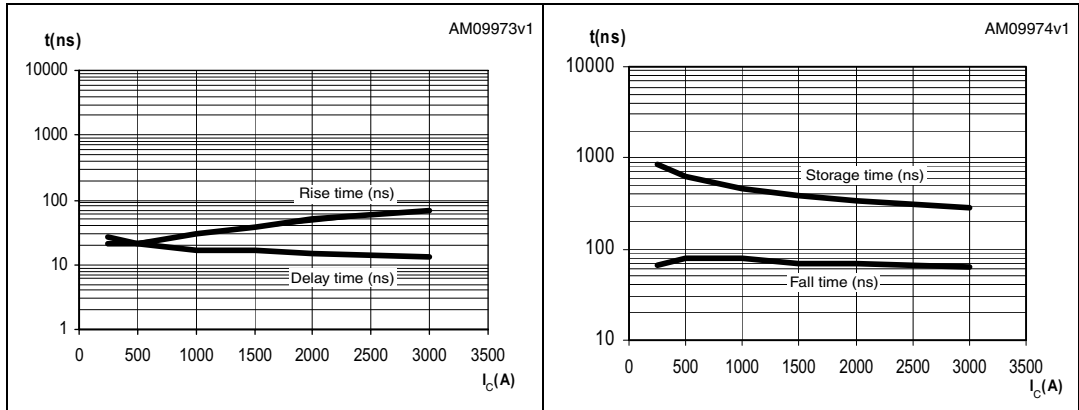
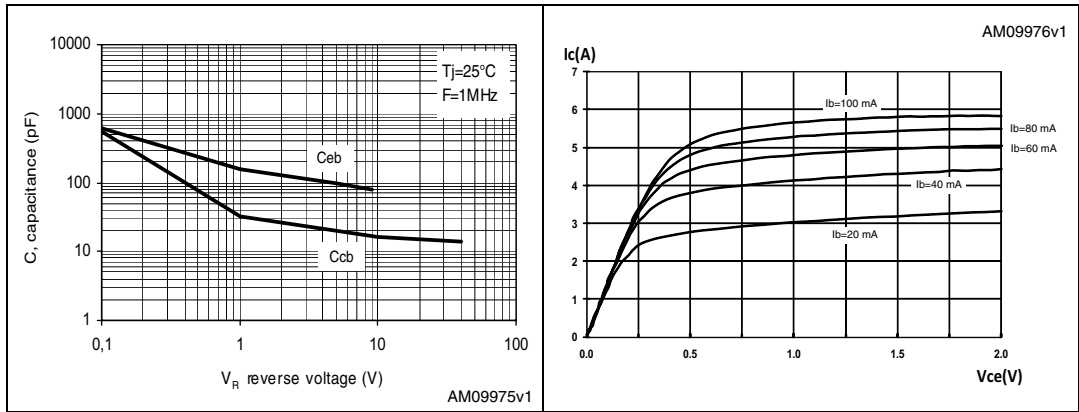
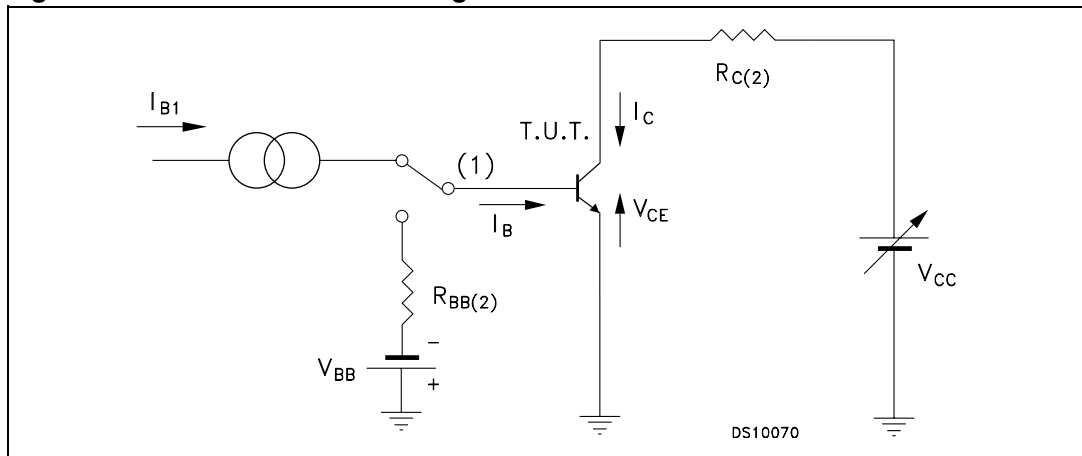


Figure 10. Capacitance curves **Figure 11. Output curve**



2.2 Test circuits

Figure 12. Resistive load switching test circuit



1. Fast electronic switch
2. Non-inductive resistor

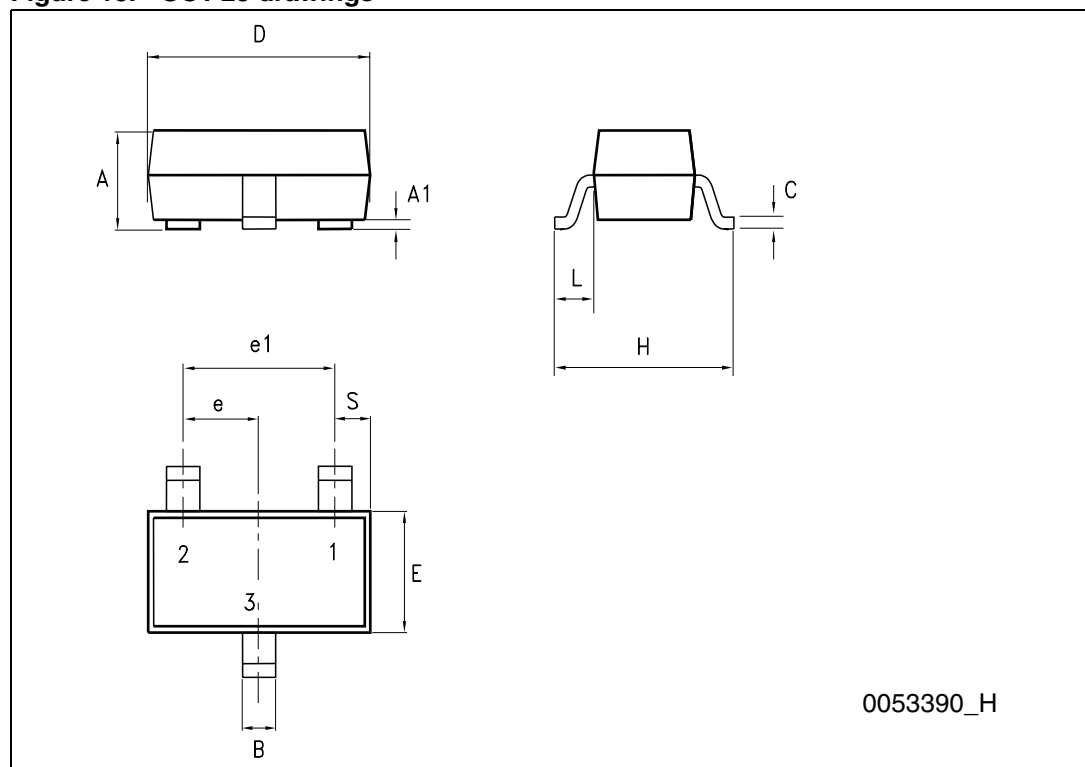
3 Package mechanical data

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

Table 5. SOT-23 mechanical data

| Dim. | mm. | | |
|------|-------|------|------|
| | Min. | Typ. | Max. |
| A | 0.89 | | 1.4 |
| A1 | 0 | | 0.1 |
| B | 0.3 | | 0.51 |
| C | 0.085 | | 0.18 |
| D | 2.75 | | 3.04 |
| e | 0.85 | | 1.05 |
| e1 | 1.7 | | 2.1 |
| E | 1.2 | | 1.6 |
| H | 2.1 | | 2.75 |
| L | | 0.6 | |
| S | 0.35 | | 0.65 |

Figure 13. SOT-23 drawings



0053390_H

4 Revision history

Table 6. Document revision history

| Date | Revision | Changes |
|-------------|----------|--|
| 02-Nov-2009 | 1 | Initial release |
| 17-Jan-2011 | 2 | Removed "Preliminary data" text from coverpage header. |
| 15-Jun-2011 | 3 | Curves inserted Modified: Table 4 |

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