

Low voltage fast-switching PNP power transistor

Features

- Very low collector-emitter saturation voltage
- High current gain characteristic
- Fast switching speed
- Miniature SOT-23 plastic package for surface mounting circuits

Applications

- LED
- Battery charger
- Motor and relay driver
- Voltage regulation

Description

The 2STR2215 is a PNP transistor manufactured using new "PB-HCD" (Power Bipolar High Current Density) technology. The resulting transistor shows exceptional high gain performances coupled with very low saturation voltage. The complementary NPN is the 2STR1215.

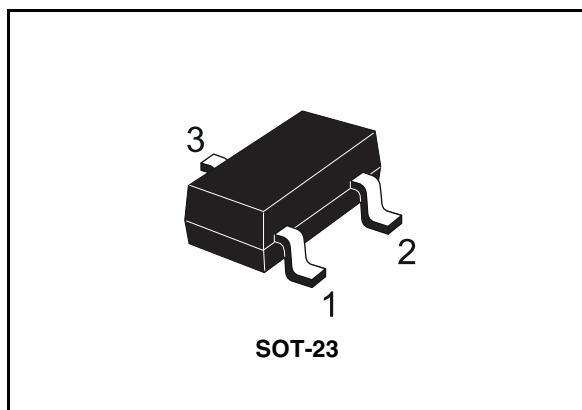


Figure 1. Internal schematic diagram

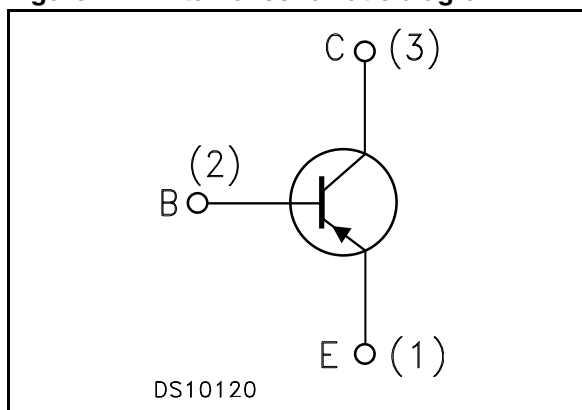


Table 1. Device summary

| Order code | Marking | Package | Packaging |
|------------|---------|---------|---------------|
| 2STR2215 | 215 | SOT-23 | Tape and reel |

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1 Electrical ratings

Table 2. Absolute maximum rating

| Symbol | Parameter | Value | Unit |
|-----------|---|------------|------|
| V_{CBO} | Collector-base voltage ($I_E = 0$) | -15 | V |
| V_{CEO} | Collector-emitter voltage ($I_B = 0$) | -15 | V |
| V_{EBO} | Emitter-base voltage ($I_C = 0$) | -5 | V |
| I_C | Collector current | -1.5 | A |
| I_{CM} | Collector peak current ($t_P < 5$ ms) | -3 | 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 |
|---------------------|-------------------------------------|-------|------|
| $R_{thj-amb}^{(1)}$ | Thermal resistance junction-amb max | 250 | °C/W |

(1) Device mounted on PCB area of 1cm²

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 ($I_{\text{E}} = 0$) | $V_{\text{CB}} = -15\text{ V}$ | | | -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 ($I_{\text{E}} = 0$) | $I_{\text{C}} = -100\text{ }\mu\text{A}$ | -15 | | | V |
| $V_{(\text{BR})\text{CEO}}^{(1)}$ | Collector-emitter breakdown voltage ($I_{\text{B}} = 0$) | $I_{\text{C}} = -10\text{ mA}$ | -15 | | | 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 | $I_{\text{C}} = -100\text{ mA}$ $I_{\text{B}} = -1\text{ mA}$ | | | -0.15 | V |
| | | $I_{\text{C}} = -1\text{ A}$ $I_{\text{B}} = -100\text{ mA}$ | | -0.25 | -0.50 | V |
| | | $I_{\text{C}} = -2\text{ A}$ $I_{\text{B}} = -200\text{ mA}$ | | -0.40 | -0.85 | V |
| $V_{\text{BE}(\text{sat})}^{(1)}$ | Base-emitter saturation voltage | $I_{\text{C}} = -1\text{ A}$ $I_{\text{B}} = -100\text{ mA}$ | | -0.90 | -1.25 | V |
| $h_{\text{FE}}^{(1)}$ | DC current gain | $I_{\text{C}} = -50\text{ mA}$ $V_{\text{CE}} = -2\text{ V}$ | 200 | 280 | 560 | |
| | | $I_{\text{C}} = -500\text{ mA}$ $V_{\text{CE}} = -2\text{ V}$ | 200 | | | |
| | | $I_{\text{C}} = -1\text{ A}$ $V_{\text{CE}} = -2\text{ V}$ | 130 | | | |
| | | $I_{\text{C}} = -2\text{ A}$ $V_{\text{CE}} = -2\text{ V}$ | 80 | | | |
| C_{CBO} | Collector-base capacitance ($I_{\text{E}} = 0$) | $V_{\text{CB}} = -10\text{ V}$ $f = 1\text{ MHz}$ | | 20 | | pF |
| t_{on} t_{off} | Resistive load Turn-on time | $I_{\text{C}} = -1.5\text{ A}$ $V_{\text{CC}} = -10\text{ V}$ $I_{\text{B1}} = -I_{\text{B2}} = -150\text{ mA}$ | | 60 | | ns |
| | Turn-off time | | | 220 | | ns |

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

2.1 Electrical characteristics (curves)

Figure 2. DC current gain

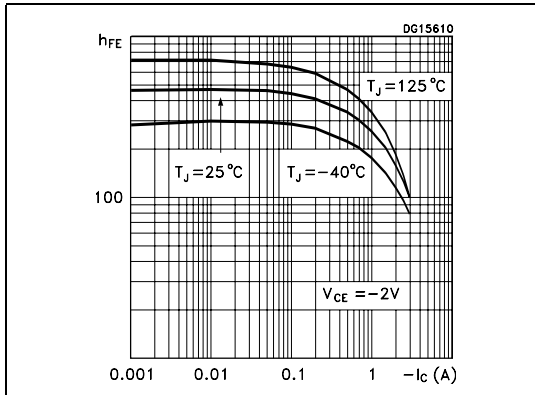


Figure 3. Collector-emitter saturation voltage

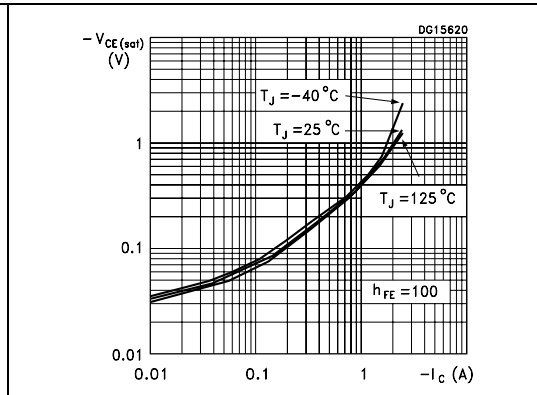


Figure 4. Base-emitter saturation voltage

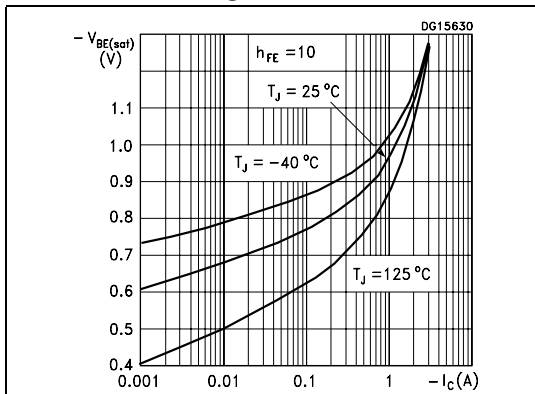


Figure 5. Resistive load switching time

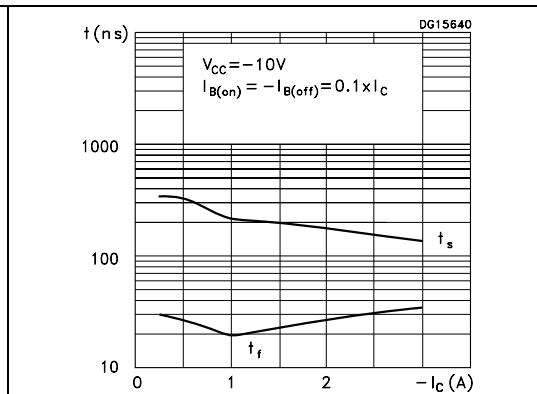


Figure 6. Resistive load switching time

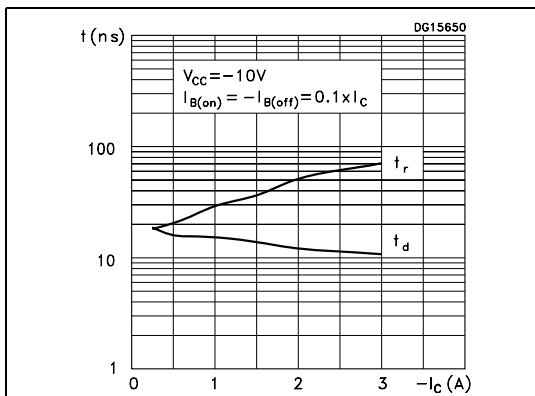
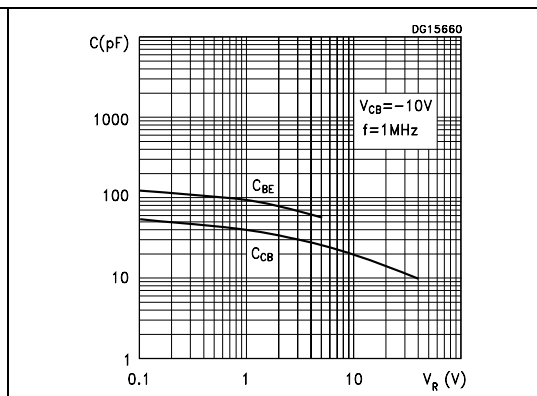
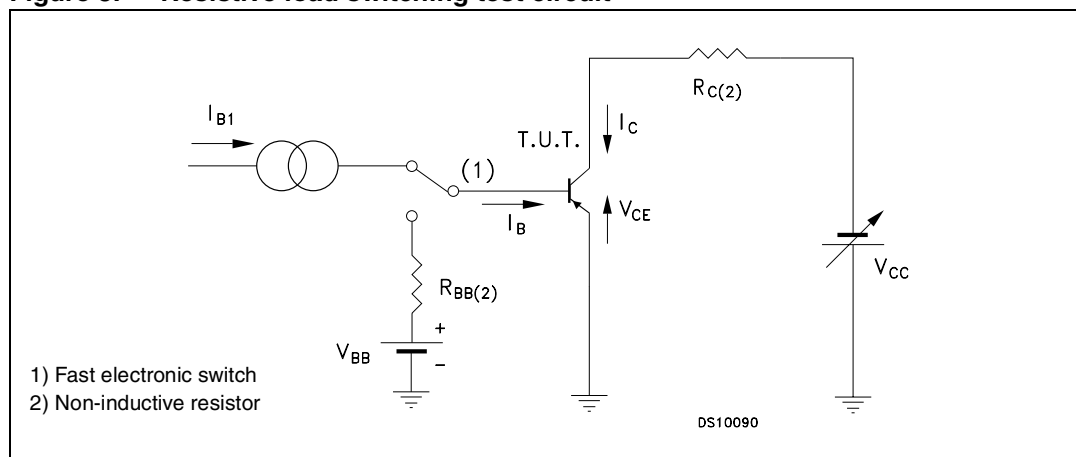


Figure 7. Capacitance



2.2 Test circuit

Figure 8. Resistive load switching test circuit

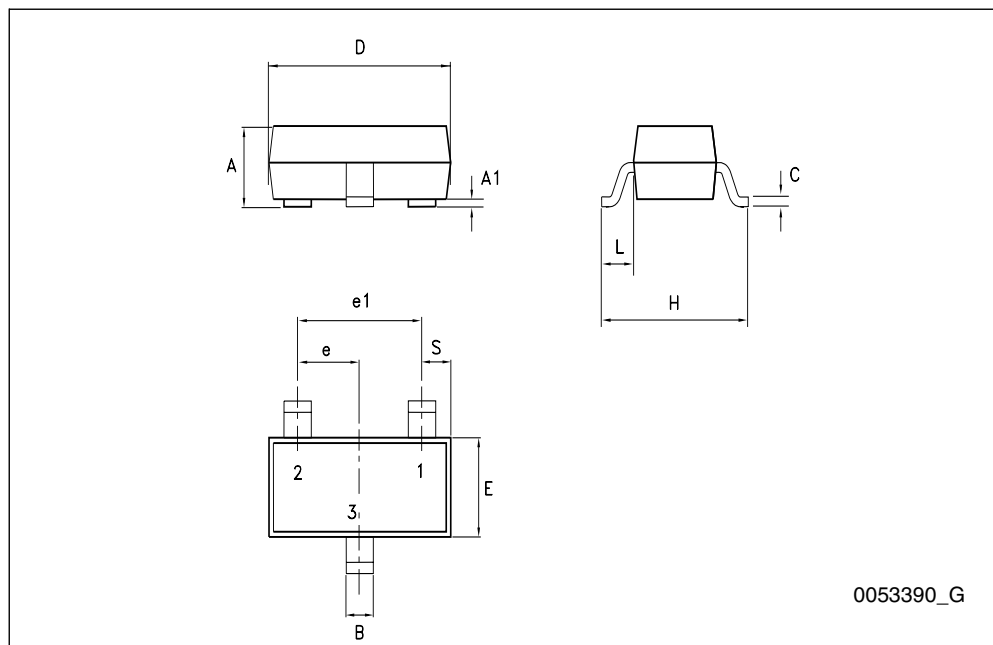


3 Package mechanical data

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-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 |



4 Revision history

Table 5. Document revision history

| Date | Revision | Changes |
|-------------|-----------------|-------------------------------------|
| 09-Feb-2006 | 1 | Initial release. |
| 20-Jul-2006 | 2 | New template. |
| 08-Sep-2008 | 3 | Updated the SOT-23 mechanical data. |

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