

## Low voltage fast-switching PNP power transistor

Datasheet - production data

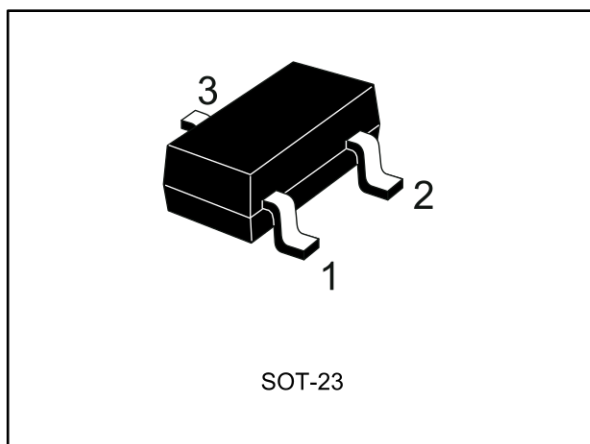
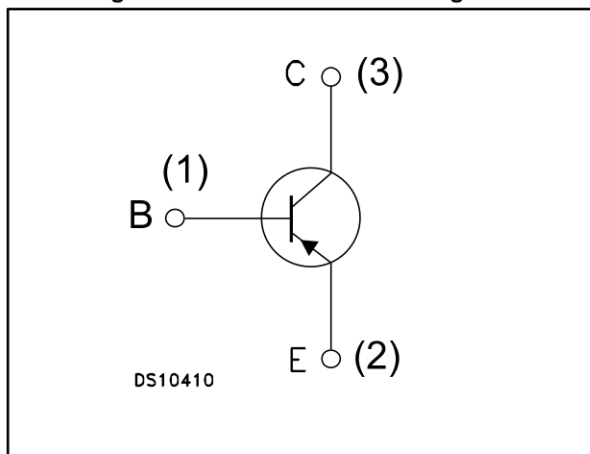


Figure 1: Internal schematic diagram



### 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
- Motherboard & hard disk drive
- Mobile equipment
- Battery charger
- Voltage regulation

### Description

The device 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.

Table 1: Device summary

| Order code | Marking | Package | Packing       |
|------------|---------|---------|---------------|
| 2STR2230   | 2230    | SOT-23  | Tape and reel |

---

## Contents

|          |                                              |          |
|----------|----------------------------------------------|----------|
| <b>1</b> | <b>Electrical ratings .....</b>              | <b>3</b> |
| <b>2</b> | <b>Electrical characteristics .....</b>      | <b>4</b> |
|          | 2.1 Electrical characteristics (curves)..... | 5        |
| <b>3</b> | <b>Package information .....</b>             | <b>6</b> |
|          | 3.1 SOT-23 package information .....         | 6        |
| <b>4</b> | <b>Revision history .....</b>                | <b>9</b> |

# 1 Electrical ratings

Table 2: Absolute maximum rating

| Symbol    | Parameter                                   | Value      | Unit       |
|-----------|---------------------------------------------|------------|------------|
| $V_{CES}$ | Collector-emitter voltage ( $V_{CE} = 0$ )  | -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                           | -1.5       | A          |
| $I_{CM}$  | Collector peak current ( $t_P < 5ms$ )      | -3         | A          |
| $P_{tot}$ | Total dissipation at $T_{amb} = 25^\circ C$ | 0.5        | W          |
| $T_{stg}$ | Storage temperature range                   | -65 to 150 | $^\circ C$ |
| $T_J$     | Operating junction temperature range        |            |            |

Table 3: Thermal data

| Symbol              | Parameter                           | Value | Unit         |
|---------------------|-------------------------------------|-------|--------------|
| $R_{thj-amb}^{(1)}$ | Thermal resistance junction-amb max | 250   | $^\circ C/W$ |

**Notes:**

<sup>(1)</sup>Device mounted on PCB area of 1 cm<sup>2</sup>

## 2 Electrical characteristics

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

**Table 4: Electrical characteristics**

| Symbol                            | Parameter                                                        | Test conditions                                                                                                      | Min. | Typ.  | Max.  | Unit          |
|-----------------------------------|------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|------|-------|-------|---------------|
| $I_{\text{CBO}}$                  | Collector cut-off current<br>( $I_{\text{E}} = 0$ )              | $V_{\text{CB}} = -30 \text{ V}$                                                                                      |      |       | -0.1  | $\mu\text{A}$ |
| $I_{\text{EBO}}$                  | Emitter cut-off current<br>( $I_{\text{C}} = 0$ )                | $V_{\text{EB}} = -4 \text{ V}$                                                                                       |      |       | -0.1  | $\mu\text{A}$ |
| $V_{(\text{BR})\text{CBO}}$       | Collector-base<br>breakdown voltage<br>( $I_{\text{E}} = 0$ )    | $I_{\text{C}} = -100 \mu\text{A}$                                                                                    | -30  |       |       | V             |
| $V_{(\text{BR})\text{CEO}}^{(1)}$ | Collector-emitter<br>breakdown voltage<br>( $I_{\text{B}} = 0$ ) | $I_{\text{C}} = -10 \text{ mA}$                                                                                      | -30  |       |       | V             |
| $V_{(\text{BR})\text{EBO}}$       | Emitter-base<br>breakdown voltage ( $I_{\text{C}} = 0$ )         | $I_{\text{E}} = -100 \mu\text{A}$                                                                                    | -5   |       |       | V             |
| $V_{\text{CE(sat)}}^{(1)}$        | Collector-emitter<br>saturation voltage                          | $I_{\text{C}} = -0.1 \text{ A}, I_{\text{B}} = -1 \text{ mA}$                                                        |      |       | -0.17 | V             |
|                                   |                                                                  | $I_{\text{C}} = -1 \text{ A}, I_{\text{B}} = -100 \text{ mA}$                                                        |      | -0.25 | -0.45 | V             |
|                                   |                                                                  | $I_{\text{C}} = -2 \text{ A}, I_{\text{B}} = -200 \text{ mA}$                                                        |      | -0.42 | -0.8  | V             |
| $V_{\text{BE(sat)}}^{(1)}$        | Base-emitter saturation<br>voltage                               | $I_{\text{C}} = -1 \text{ A}, I_{\text{B}} = -100 \text{ mA}$                                                        |      | -0.9  | -1.25 | V             |
| $h_{\text{FE}}^{(1)}$             | DC current gain                                                  | $I_{\text{C}} = -50 \text{ mA}, V_{\text{CE}} = -2 \text{ V}$                                                        | 210  |       |       |               |
|                                   |                                                                  | $I_{\text{C}} = -0.5 \text{ A}, V_{\text{CE}} = -2 \text{ V}$                                                        | 170  | 280   | 560   |               |
|                                   |                                                                  | $I_{\text{C}} = -1 \text{ A}, V_{\text{CE}} = -2 \text{ V}$                                                          | 100  |       |       |               |
|                                   |                                                                  | $I_{\text{C}} = -1.5 \text{ A}, V_{\text{CE}} = -2 \text{ V}$                                                        | 70   |       |       |               |
| $f_{\text{t}}$                    | Transition frequency                                             | $I_{\text{C}} = -0.1 \text{ A}, V_{\text{CE}} = -5 \text{ V}$<br>$f = 100 \text{ MHz}$                               | 100  |       |       | MHz           |
| $C_{\text{CBO}}$                  | Collector-base<br>capacitance                                    | $I_{\text{E}} = 0, V_{\text{CB}} = -10 \text{ V}$<br>$f = 1 \text{ MHz}$                                             |      | 10    |       | pF            |
| $t_{\text{on}}$                   | Turn-on time                                                     | Resistive load                                                                                                       |      | 74    |       | ns            |
| $t_{\text{off}}$                  | Turn-off time                                                    | $I_{\text{C}} = -1.5 \text{ A}, V_{\text{CC}} = -10 \text{ V}$<br>$I_{\text{B1}} = -I_{\text{B2}} = -150 \text{ mA}$ |      | 200   |       | ns            |

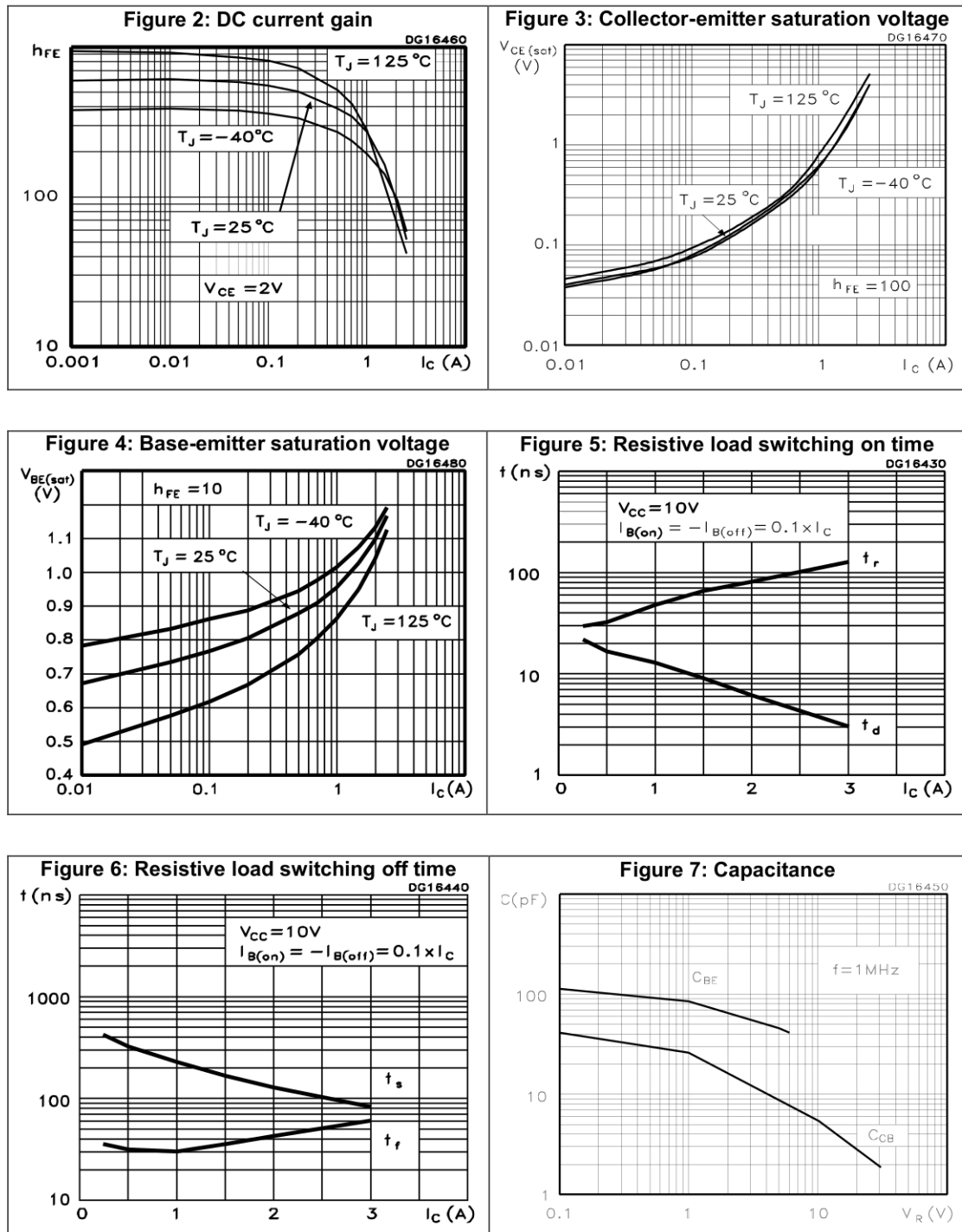
**Notes:**

<sup>(1)</sup>Pulse test: pulse duration = 300  $\mu\text{s}$ , duty cycle  $\leq 1.5 \%$

## 2.1 Electrical characteristics (curves)



For the PNP transistors, current and voltage polarities are reversed.

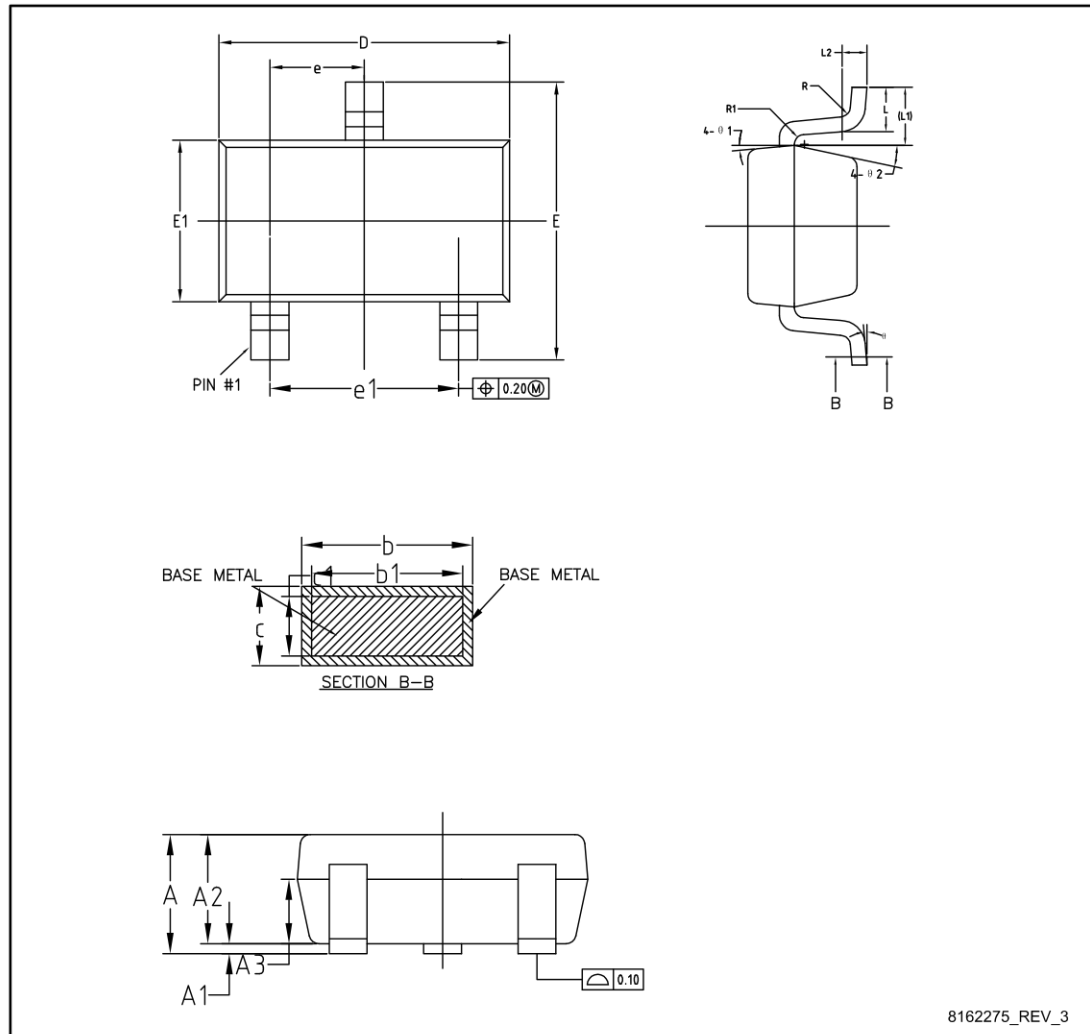


### 3 Package information

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](http://www.st.com). ECOPACK® is an ST trademark.

#### 3.1 SOT-23 package information

Figure 8: SOT-23 package outline

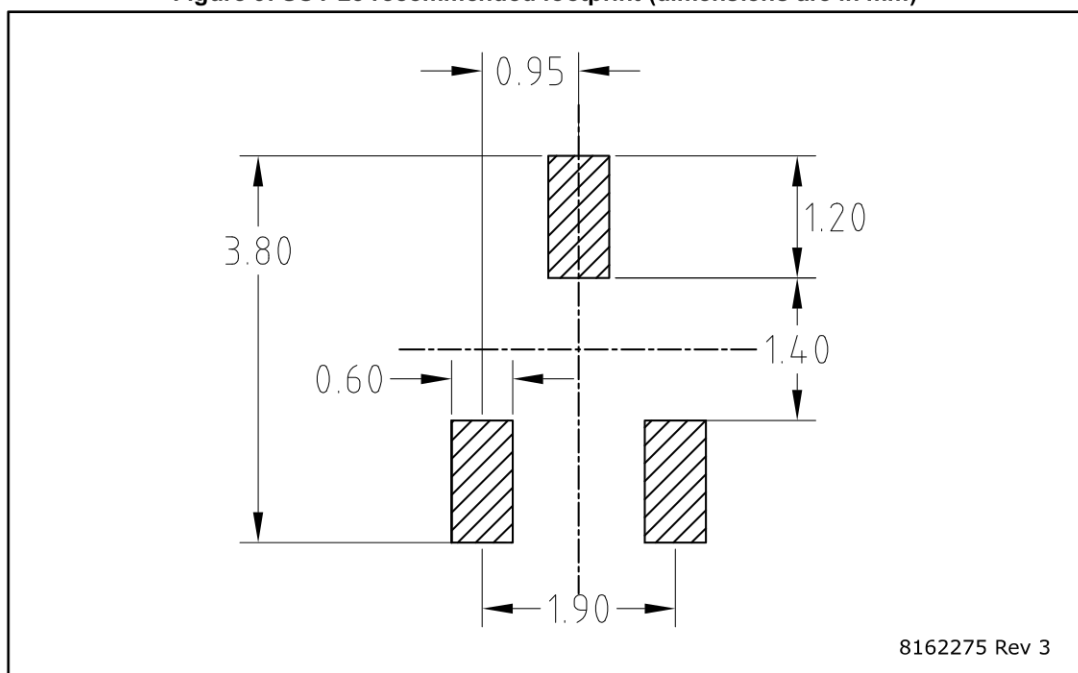


8162275\_REV\_3

Table 5: SOT-23 package mechanical data

| Dim. | mm    |          |       |
|------|-------|----------|-------|
|      | Min.  | Typ.     | Max.  |
| A    |       |          | 1.25  |
| A1   | 0     |          | 0.15  |
| A2   | 1     | 1.10     | 1.20  |
| A3   | 0.60  | 0.65     | 0.70  |
| b    | 0.36  |          | 0.50  |
| b1   | 0.36  | 0.38     | 0.45  |
| c    | 0.14  |          | 0.20  |
| c1   | 0.14  | 0.15     | 0.16  |
| D    | 2.826 | 2.926    | 3.026 |
| E    | 2.60  | 2.80     | 3.00  |
| E1   | 1.526 | 1.626    | 1.726 |
| e    | 0.90  | 0.95     | 1.00  |
| e1   | 1.80  | 1.90     | 2.00  |
| L    | 0.35  | 0.45     | 0.60  |
| L1   |       | 0.59 REF |       |
| L2   |       | 0.25 BSC |       |
| R    | 0.05  |          |       |
| R1   | 0.05  |          |       |
| θ    | 0°    |          | 8°    |
| θ1   | 3°    | 5°       | 7°    |
| θ2   | 6°    |          | 14°   |

Figure 9: SOT-23 recommended footprint (dimensions are in mm)





## 4 Revision history

**Table 6: Document revision history**

| Date        | Revision | Changes                                                                                                                                                                          |
|-------------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 18-Jul-2006 | 1        | Initial release                                                                                                                                                                  |
| 31-Oct-2006 | 2        | New graphics                                                                                                                                                                     |
| 07-Nov-2006 | 3        | Maturity changed from preliminary to full.                                                                                                                                       |
| 09-Jun-2016 | 4        | Updated features and description in cover page.<br>Updated <i>Table 1: "Device summary"</i> .<br>Updated <i>Section 3.1: "SOT-23 package information"</i><br>Minor text changes. |
| 04-Jul-2016 | 5        | Updated silhouette in cover page.<br>Minor text changes.                                                                                                                         |

**IMPORTANT NOTICE – PLEASE READ CAREFULLY**

STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST's terms and conditions of sale in place at the time of order acknowledgement.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of Purchasers' products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

© 2016 STMicroelectronics – All rights reserved