

## Low voltage fast-switching NPN power transistor

Datasheet - production data

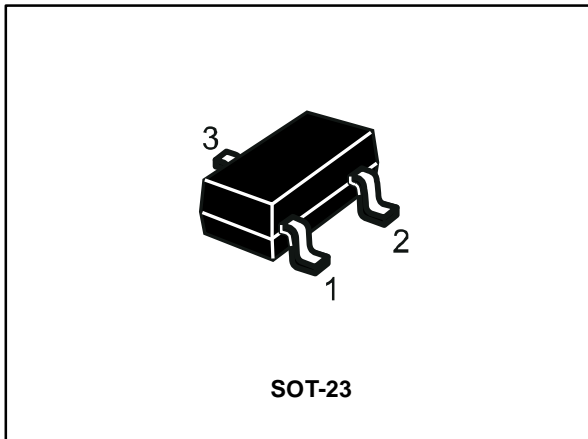
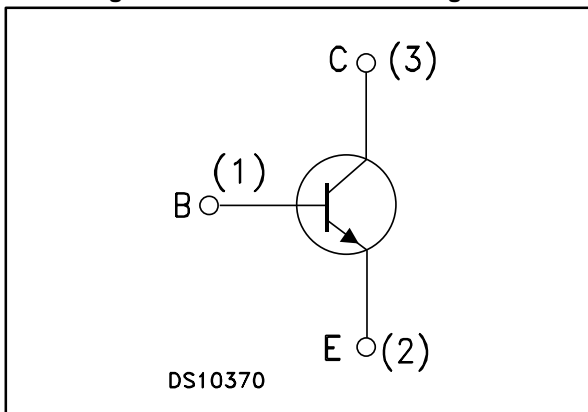


Figure 1: Internal schematic diagram



### Features

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

### Description

The device is an NPN 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 PNP is the 2STR2160.

### Applications

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

Table 1: Device summary

| Order code | Marking | Package | Packing       |
|------------|---------|---------|---------------|
| 2STR1160   | 1160    | SOT-23  | Tape and reel |

# 1 Electrical ratings

**Table 2: Absolute maximum rating**

| Symbol           | Parameter                                      | Value      | Unit |
|------------------|------------------------------------------------|------------|------|
| V <sub>CB0</sub> | Collector-base voltage (I <sub>E</sub> = 0)    | 60         | V    |
| V <sub>CE0</sub> | Collector-emitter voltage (I <sub>B</sub> = 0) | 60         | V    |
| V <sub>EB0</sub> | Emitter-base voltage (I <sub>C</sub> = 0)      | 5          | V    |
| I <sub>C</sub>   | Collector current                              | 1          | A    |
| I <sub>CM</sub>  | Collector peak current (t <sub>P</sub> < 5ms)  | 2          | A    |
| P <sub>tot</sub> | Total dissipation at T <sub>amb</sub> = 25°C   | 0.5        | W    |
| T <sub>stg</sub> | Storage temperature                            | -65 to 150 | °C   |
| T <sub>J</sub>   | Max. operating junction temperature            | 150        | °C   |

**Table 3: Thermal data**

| Symbol                              | Parameter                           | Value | Unit     |
|-------------------------------------|-------------------------------------|-------|----------|
| R <sub>thj-amb</sub> <sup>(1)</sup> | Thermal resistance junction-amb max | 250   | °C/<br>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)

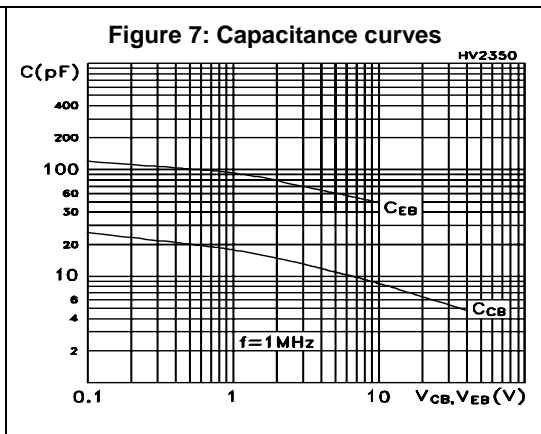
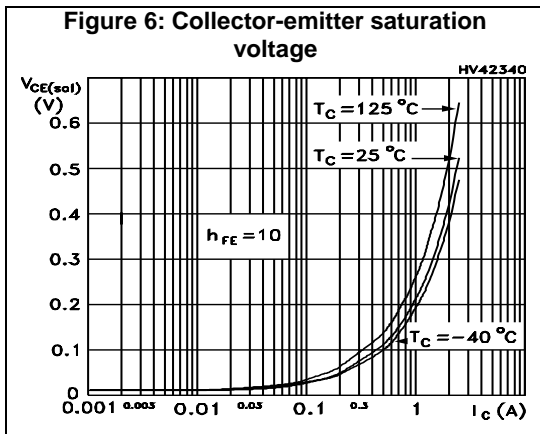
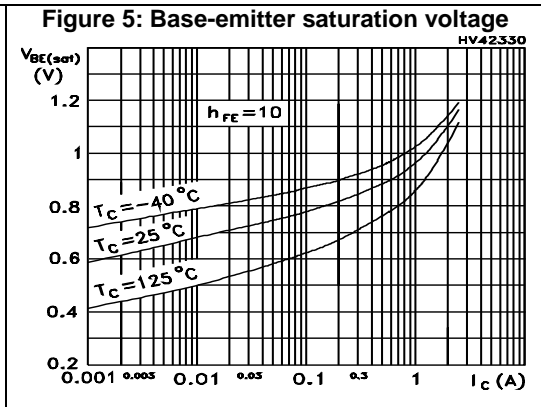
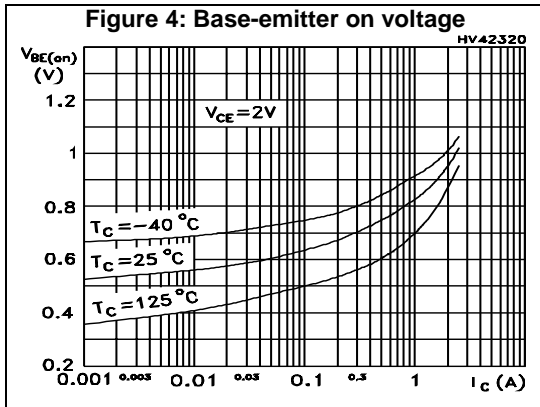
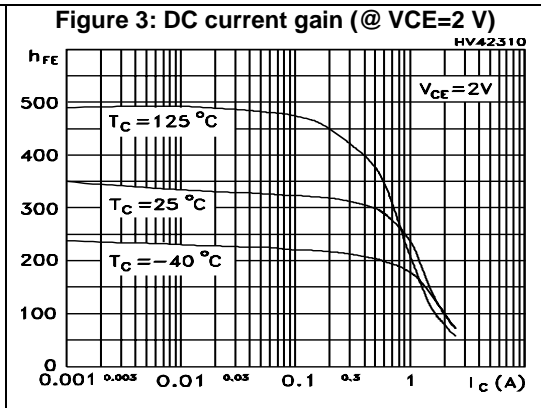
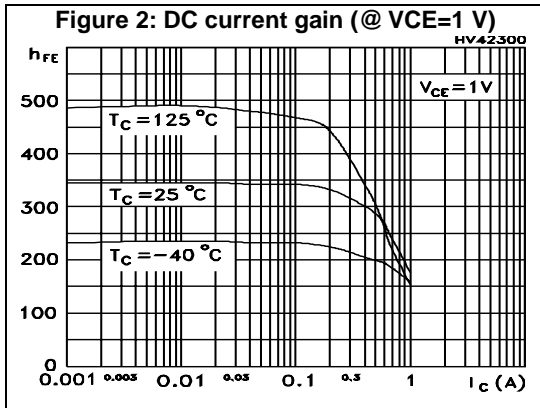
**Table 4: Electrical characteristics**

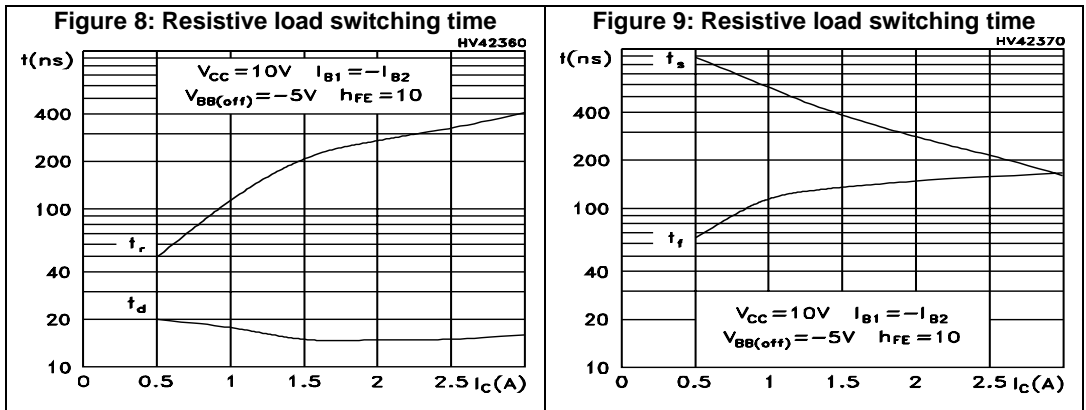
| Symbol                            | Parameter                                                  | Test conditions                                                                          | Min. | Typ. | Max. | Unit          |
|-----------------------------------|------------------------------------------------------------|------------------------------------------------------------------------------------------|------|------|------|---------------|
| $I_{\text{CBO}}$                  | Collector cut-off current ( $I_{\text{E}} = 0$ )           | $V_{\text{CB}} = 60 \text{ V}$                                                           |      |      | 0.1  | $\mu\text{A}$ |
| $I_{\text{EBO}}$                  | Emitter cut-off current ( $I_{\text{C}} = 0$ )             | $V_{\text{EB}} = 5 \text{ V}$                                                            |      |      | 0.1  | $\mu\text{A}$ |
| $V_{(\text{BR})\text{CBO}}$       | Collector-base breakdown voltage ( $I_{\text{E}} = 0$ )    | $I_{\text{C}} = 100 \mu\text{A}$                                                         | 60   |      |      | V             |
| $V_{(\text{BR})\text{CEO}}^{(1)}$ | Collector-emitter breakdown voltage ( $I_{\text{B}} = 0$ ) | $I_{\text{C}} = 10 \text{ mA}$                                                           | 60   |      |      | V             |
| $V_{(\text{BR})\text{EBO}}$       | Emitter-base breakdown voltage ( $I_{\text{C}} = 0$ )      | $I_{\text{E}} = 100 \mu\text{A}$                                                         | 5    |      |      | V             |
| $V_{\text{CE(sat)}}$              | Collector-emitter saturation voltage                       | $I_{\text{C}} = 0.5 \text{ A } I_{\text{B}} = 50 \text{ mA}$                             |      | 130  | 210  | mV            |
|                                   |                                                            | $I_{\text{C}} = 1 \text{ A } I_{\text{B}} = 100 \text{ mA}$                              |      | 210  | 430  | mV            |
| $V_{\text{BE(sat)}}$              | Base-emitter saturation voltage                            | $I_{\text{C}} = 1 \text{ A } I_{\text{B}} = 100 \text{ mA}$                              |      | 0.9  | 1.25 | V             |
| $h_{\text{FE}}$                   | DC current gain                                            | $I_{\text{C}} = 0.5 \text{ A } V_{\text{CE}} = 2\text{V}$                                | 180  | 250  | 560  |               |
|                                   |                                                            | $I_{\text{C}} = 1 \text{ A } V_{\text{CE}} = 2\text{V}$                                  | 85   | 130  |      |               |
|                                   |                                                            | $I_{\text{C}} = 2 \text{ A } V_{\text{CE}} = 2\text{V}$                                  |      | 30   |      |               |
|                                   | Resistive load                                             |                                                                                          |      |      |      |               |
| $t_{\text{on}}$                   | Turn-on time                                               | $I_{\text{C}} = 1.5 \text{ A } V_{\text{CC}} = 10 \text{ V}$                             |      | 220  |      | ns            |
| $t_{\text{off}}$                  | Turn-off time                                              | $I_{\text{B1}} = -I_{\text{B2}} = 150 \text{ mA}$<br>$V_{\text{BB(off)}} = -5 \text{ V}$ |      | 500  |      | ns            |

**Notes:**

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

## 2.1 Typical characteristic (curves)





### 3 Package mechanical data

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#### 3.1 SOT-23 mechanical data

Figure 10: SOT-23 mechanical drawing

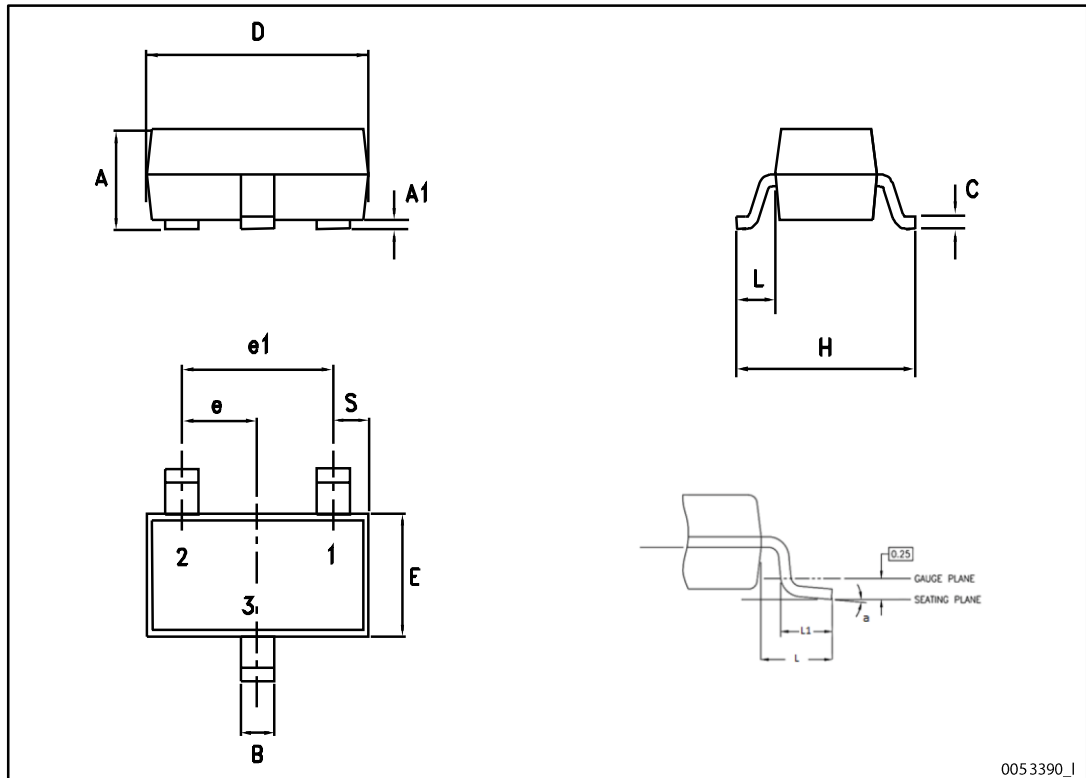
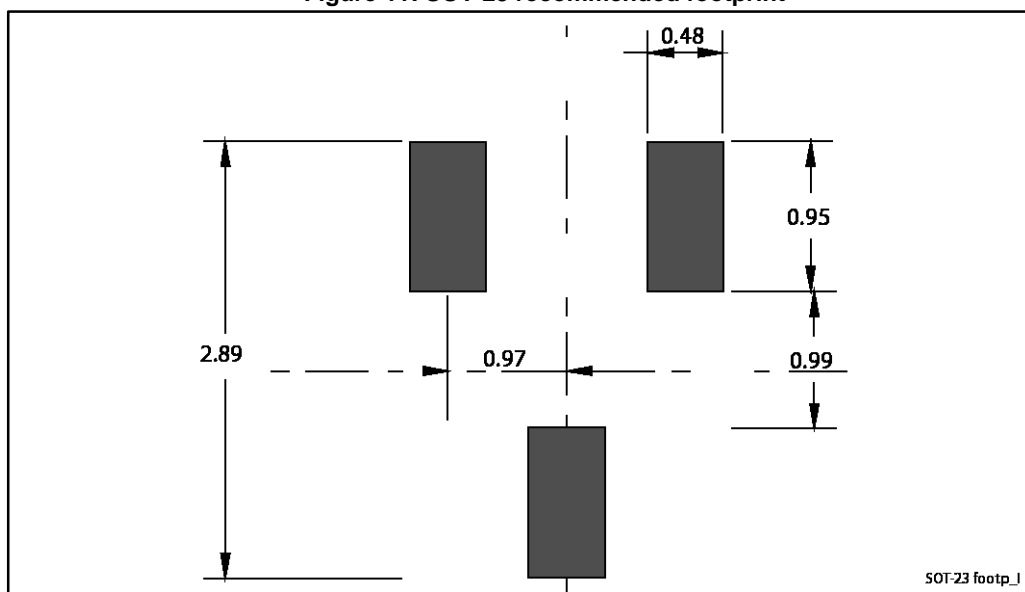


Table 5: SOT-23 mechanical data

| Dim. | mm    |      |      |
|------|-------|------|------|
|      | Min.  | Typ. | Max. |
| A    | 0.89  |      | 1.40 |
| A1   | 0     |      | 0.10 |
| B    | 0.30  |      | 0.51 |
| C    | 0.085 |      | 0.18 |
| D    | 2.75  |      | 3.04 |
| e    | 0.85  |      | 1.05 |
| e1   | 1.70  |      | 2.10 |
| E    | 1.20  |      | 1.75 |
| H    | 2.10  |      | 3.00 |
| L    |       | 0.60 |      |
| S    | 0.35  |      | 0.65 |
| L1   | 0.25  |      | 0.55 |
| a    | 0°    |      | 8°   |

Figure 11: SOT-23 recommended footprint



Dimensions are in mm.

## 4 Revision history

Table 6: Document revision history

| Date        | Revision | Changes                                                        |
|-------------|----------|----------------------------------------------------------------|
| 12-Feb-2008 | 1        | Initial release                                                |
| 08-May-2014 | 2        | Updated <a href="#">Section 3: "Package mechanical data"</a> . |
| 01-Apr-2015 | 3        | Updated marking in <a href="#">Table 1: "Device summary"</a>   |



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