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## Low voltage fast-switching PNP power transistors

### Features

- Very low collector-emitter saturation voltage
- High current gain characteristic
- Fast switching speed

### Applications

- LED
- Motherboard & hard disk drive
- Mobile equipment
- DC-DC converter

### Description

The devices are PNP transistors manufactured using new "PB-HDC" (power bipolar high density current) technology. The resulting transistor shows exceptional high gain performances coupled with very low saturation voltage.

The 2STF2340 complementary PNP is the 2STF1340.

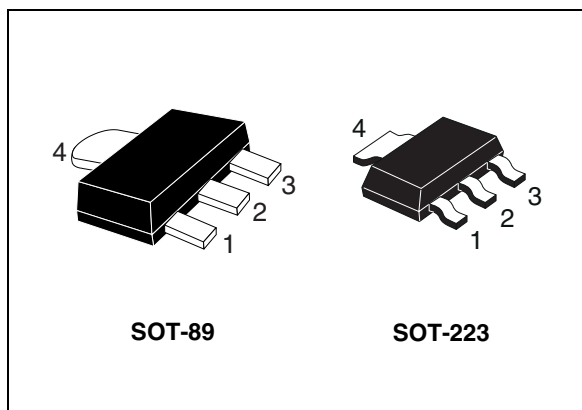


Figure 1. Internal schematic diagram

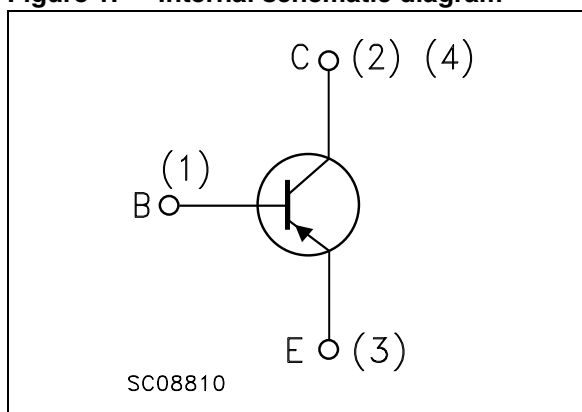


Table 1. Device summary

| Order codes | Marking | Packages | Packaging     |
|-------------|---------|----------|---------------|
| 2STF2340    | 2340    | SOT-89   | Tape and reel |
| 2STN2340    | N2340   | SOT-223  | Tape and reel |

# 1 Electrical ratings

**Table 2. Absolute maximum rating**

| Symbol    | Parameter                                  | Value      |          | Unit |
|-----------|--|------------|----------|------|
|           |  | 2STF2340   | 2STN2340 |      |
|           |  | SOT-89     | SOT-223  |      |
| $V_{CES}$ | Collector-emitter voltage ( $V_{BE} = 0$ ) | -40        |          | V    |
| $V_{CEO}$ | Collector-emitter voltage ( $I_B = 0$ )    | -40        |          | 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     | 1.4        | 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                               | SOT-89 | SOT-223 | Unit |
|------------------|---|--------|---------|------|
| $R_{thJA}^{(1)}$ | Thermal resistance junction-ambient max | 89     | 78      | °C/W |

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

## 2 Electrical characteristics

$T_{\text{case}} = 25\text{ °C}$  unless otherwise specified

**Table 4. Electrical characteristics**

| Symbol                              | Parameter  | Test conditions  | Min.       | Typ.      | Max.         | Unit          |
|-------------------------------------|--|--|------------|-----------|--------------|---------------|
| $I_{\text{CBO}}$                    | Collector cut-off current<br>( $I_{\text{E}} = 0$ )              | $V_{\text{CB}} = -40\text{ V}$   |            |           | -0.1         | $\mu\text{A}$ |
| $I_{\text{EBO}}$                    | Emitter cut-off current<br>( $I_{\text{C}} = 0$ )                | $V_{\text{EB}} = -5\text{ V}$  |            |           | -0.1         | $\mu\text{A}$ |
| $V_{(\text{BR})\text{CBO}}^{(1)}$   | Collector-base<br>breakdown voltage<br>( $I_{\text{E}} = 0$ )    | $I_{\text{C}} = -100\ \mu\text{A}$   | -40        |           |              | V             |
| $V_{(\text{BR})\text{CEO}}^{(1)}$   | Collector-emitter<br>breakdown voltage<br>( $I_{\text{B}} = 0$ ) | $I_{\text{C}} = -10\text{ mA}$   | -40        |           |              | V             |
| $V_{(\text{BR})\text{EBO}}$         | Emitter-base breakdown<br>voltage ( $I_{\text{C}} = 0$ )         | $I_{\text{E}} = -100\ \mu\text{A}$   | -5         |           |              | V             |
| $V_{\text{CE}(\text{sat})}^{(1)}$   | Collector-emitter<br>saturation voltage                          | $I_{\text{C}} = -2\text{ A}$ $I_{\text{B}} = -100\text{ mA}$<br>$I_{\text{C}} = -3\text{ A}$ $I_{\text{B}} = -150\text{ mA}$   |            |           | -250<br>-350 | mV<br>mV      |
| $V_{\text{BE}(\text{sat})}^{(1)}$   | Base-emitter saturation<br>voltage                               | $I_{\text{C}} = -2\text{ A}$ $I_{\text{B}} = -100\text{ mA}$   |            |           | -1.2         | V             |
| $h_{\text{FE}}^{(1)}$               | DC current gain  | $I_{\text{C}} = -0.1\text{ A}$ $V_{\text{CE}} = -2\text{ V}$<br>$I_{\text{C}} = -1\text{ A}$ $V_{\text{CE}} = -2\text{ V}$<br>$I_{\text{C}} = -3\text{ A}$ $V_{\text{CE}} = -2\text{ V}$ | 100<br>180 | 220       | 450          |               |
| $f_{\text{t}}$                      | 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 ( $I_{\text{E}} = 0$ )             | $V_{\text{CB}} = -10\text{ V}$ $f = 1\text{ MHz}$  |            | 50        |              | pF            |
| $t_{\text{on}}$<br>$t_{\text{off}}$ | Resistive load<br>Turn-on time<br>Turn-off time                  | $I_{\text{C}} = -1.5\text{ A}$ $V_{\text{CC}} = -10\text{ V}$<br>$I_{\text{B}(\text{on})} = -I_{\text{B}(\text{off})} = -150\text{ mA}$<br>$V_{\text{BB}(\text{off})} = 5\text{ V}$      |            | 80<br>450 |              | ns<br>ns      |

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

## 2.1 Electrical characteristics (curves)

Figure 2. Output characteristics

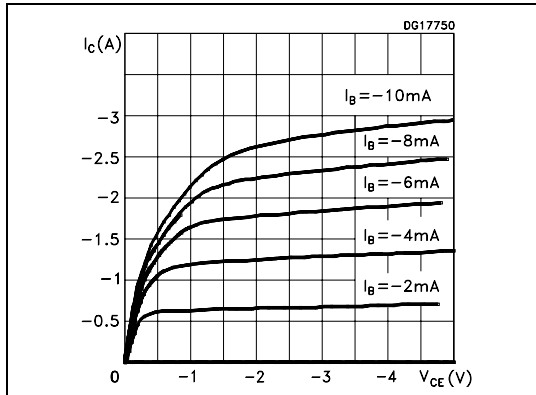


Figure 3. Derating curve

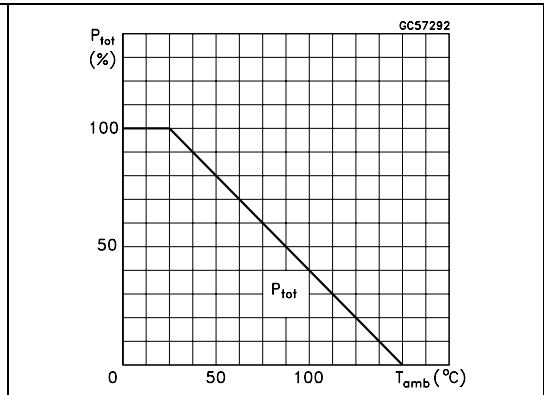


Figure 4. DC current gain ( $V_{CE} = -2$  V)

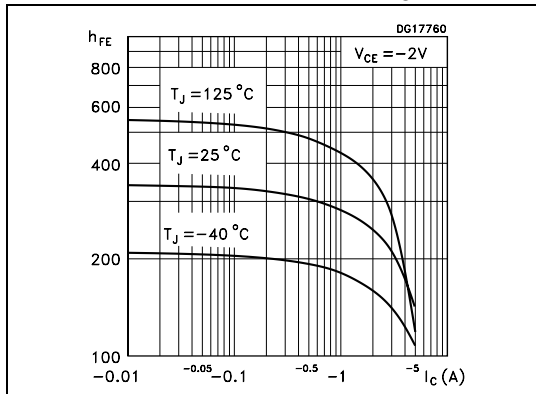


Figure 5. DC current gain ( $V_{CE} = -5$  V)

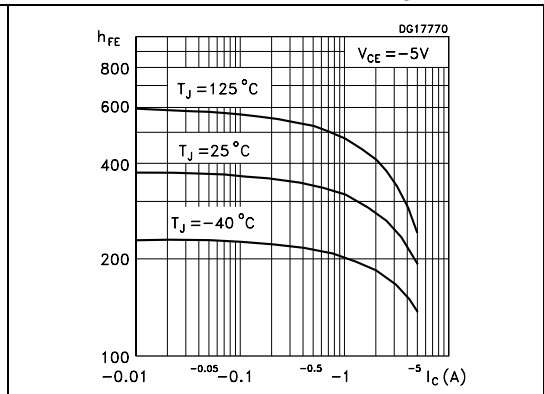


Figure 6. Collector-emitter saturation voltage

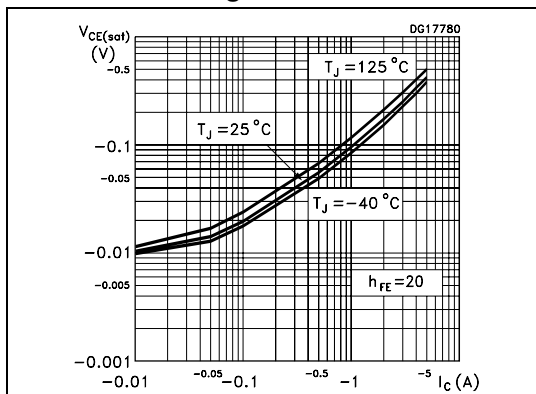


Figure 7. Base-emitter saturation voltage

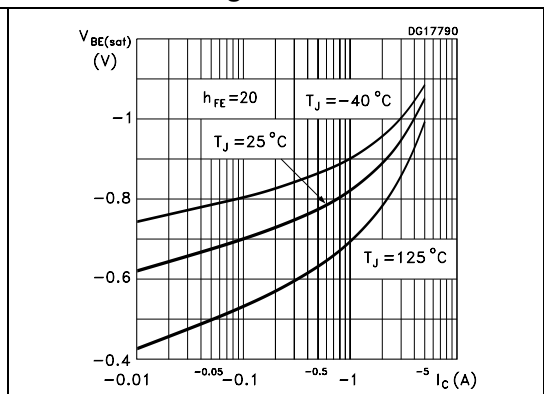


Figure 8. Resistive load switching on

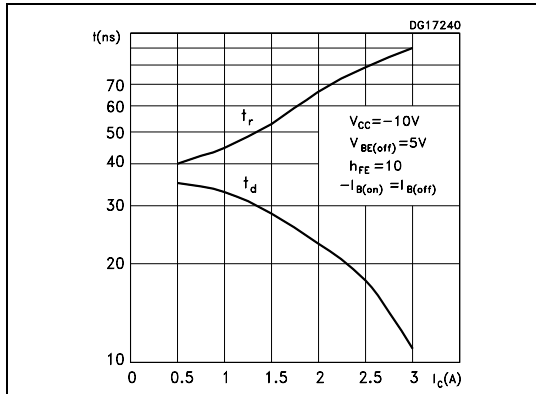


Figure 9. Resistive load switching off

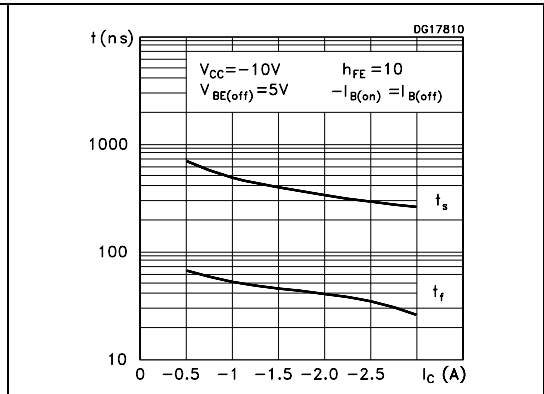
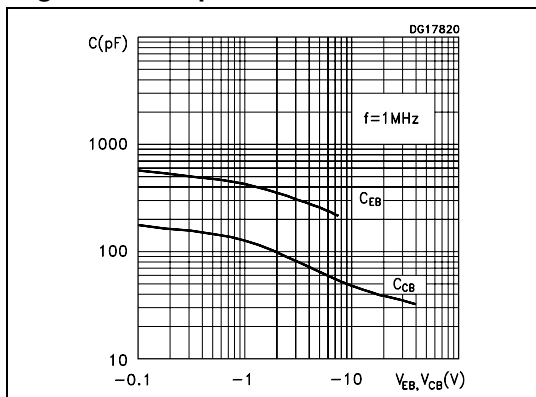
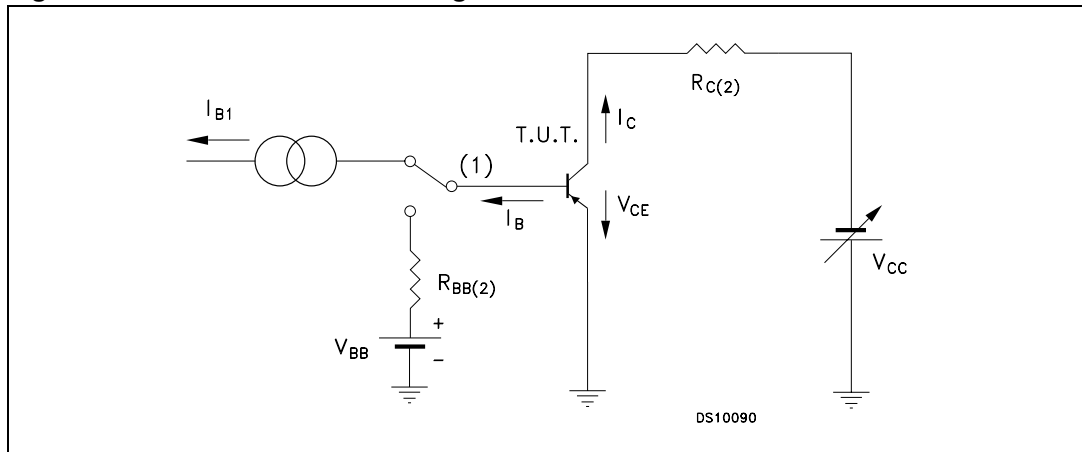


Figure 10. Capacitance curves



## 2.2 Test circuits

Figure 11. Resistive load switching test circuit



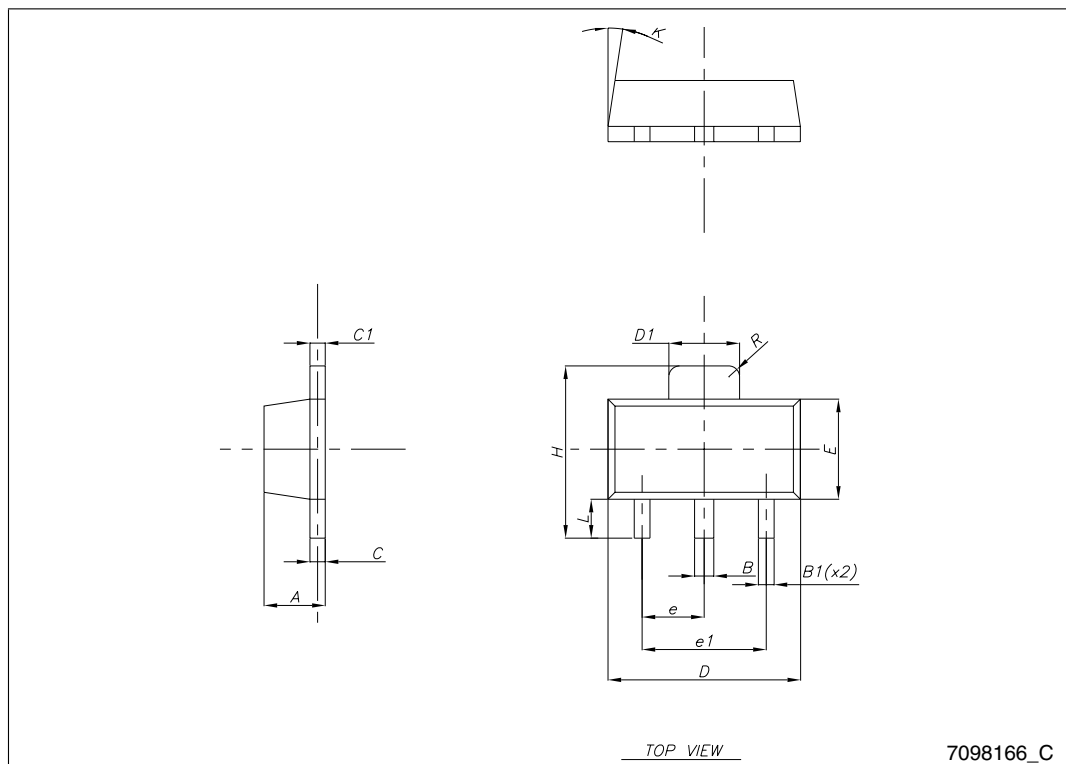
1. Fast electronic switch
2. Non-inductive resistor

### 3 Package mechanical data

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

## SOT-89 mechanical data

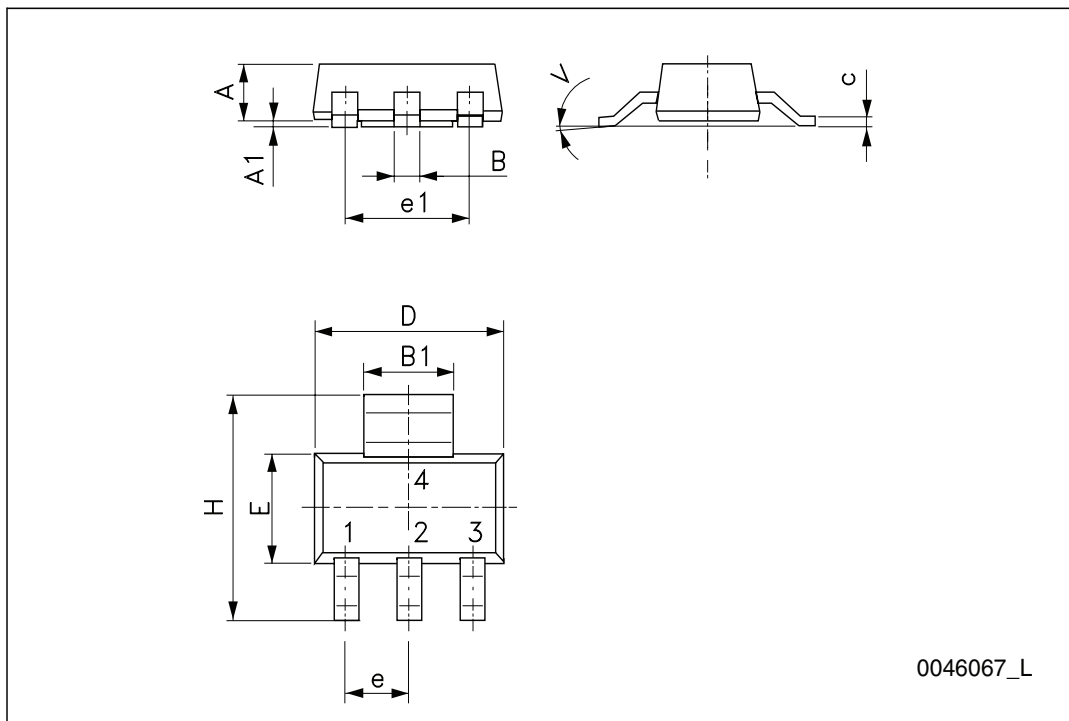
| Dim. | mm   |      |      |
|------|------|------|------|
|      | Min. | Typ. | Max. |
| A    | 1.40 |      | 1.60 |
| B    | 0.44 |      | 0.56 |
| B1   | 0.36 |      | 0.48 |
| C    | 0.35 |      | 0.44 |
| C1   | 0.35 |      | 0.44 |
| D    | 4.40 |      | 4.60 |
| D1   | 1.62 |      | 1.83 |
| E    | 2.29 |      | 2.60 |
| e    | 1.42 |      | 1.57 |
| e1   | 2.92 |      | 3.07 |
| H    | 3.94 |      | 4.25 |
| K    | 1°   |      | 8°   |
| L    | 0.89 |      | 1.20 |
| R    |      | 0.25 |      |





**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                               |
|-------------|----------|---------------------------------------|
| 04-Dec-2007 | 1        | Initial release.                      |
| 19-Oct-2009 | 2        | Inserted 2STN2340 in SOT-223 package. |

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