

## NPN MEDIUM POWER TRANSISTORS

### Features

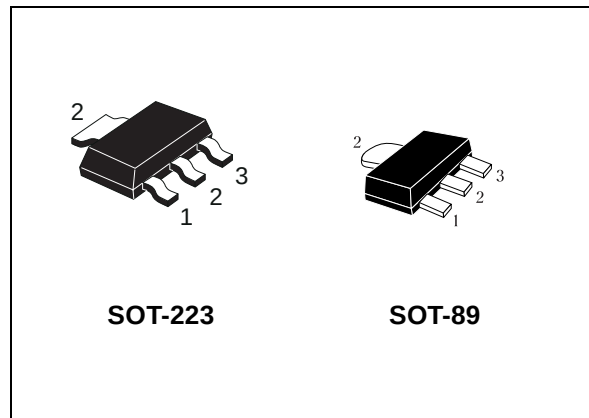
- SURFACE MOUNTING DEVICES IN MEDIUM POWER SOT-223 AND SOT-89 PACKAGE
- AVAILABLE IN TAPE & REEL PACKING
- IN COMPLIANCE WITH THE 2002/93/EC EUROPEAN DIRECTIVE

### Applications

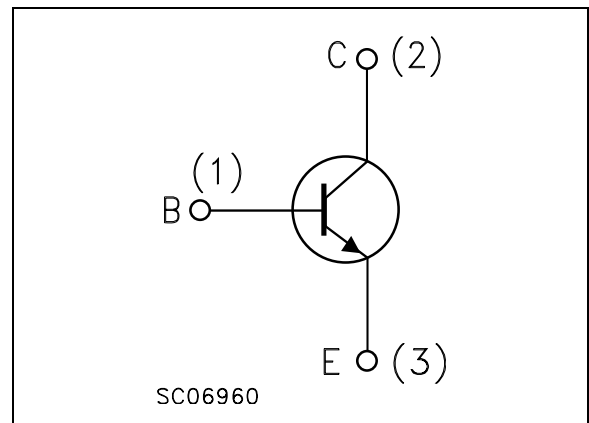
- VOLTAGE REGULATION
- RELAY DRIVER
- GENERIC SWITCH

### Description

The STF724 and STN724 are PNP transistors manufactured using planar Technology resulting in rugged high performance devices.



### Internal Schematic Diagram



### Order codes

| Part Number | Marking | Package | Packing     |
|-------------|---------|---------|-------------|
| STF724      | 724     | SOT-89  | Tape & reel |
| STN724      | N724    | SOT-223 | Tape & reel |

# 1 Absolute Maximum Ratings

**Table 1. Absolute Maximum Rating**

| Symbol           | Parameter                                      | Value      |        | Unit |
|------------------|------------------------------------------------|------------|--------|------|
|                  |                                                | STF724     | STN724 |      |
| V <sub>CBO</sub> | Collector-Base Voltage (I <sub>E</sub> = 0)    | 60         |        | V    |
| V <sub>CEO</sub> | Collector-Emitter Voltage (I <sub>B</sub> = 0) | 30         |        | V    |
| V <sub>EBO</sub> | Collector-Base Voltage (I <sub>C</sub> = 0)    | 5          |        | V    |
| I <sub>C</sub>   | Collector Current                              | 3          |        | A    |
| I <sub>CM</sub>  | Collector Peak Current (t <sub>p</sub> < 5ms)  | 6          |        | A    |
| I <sub>B</sub>   | Base Current                                   | 1          |        | A    |
| I <sub>BM</sub>  | Base Peak Current (t <sub>p</sub> < 5ms)       | 2          |        | A    |
| P <sub>TOT</sub> | Total dissipation at T <sub>c</sub> = 25°C     | 1.4        | 1.6    | W    |
| T <sub>STG</sub> | Storage Temperature                            | -65 to 150 |        | °C   |
| T <sub>J</sub>   | Max. Operating Junction Temperature            | 150        |        |      |

**Table 2. Thermal Data**

| Symbol                          | Parameter                           | Value  |         | Unit               |
|---------------------------------|-------------------------------------|--------|---------|--------------------|
|                                 |                                     | SOT-89 | SOT-223 |                    |
| $R_{thj-amb}$<br><i>Note: 1</i> | Thermal Resistance Junction-Amb Max | 89     | 78      | $^\circ\text{C/W}$ |

*Note: 1 Device mounted on a PCB area of  $1\text{ cm}^2$ .*

## 2 Electrical Characteristics

**Table 3. Electrical Characteristics** ( $T_{CASE} = 25^{\circ}C$ ; unless otherwise specified)

| Symbol                         | Parameter                                            | Test Conditions                                                   | Min.                                                                    | Typ.            | Max.              | Unit        |
|--------------------------------|------------------------------------------------------|-------------------------------------------------------------------|-------------------------------------------------------------------------|-----------------|-------------------|-------------|
| $I_{CES}$                      | Collector Cut-off Current<br>( $V_{BE} = 0$ )        | $V_{CE} = 60V$                                                    |                                                                         |                 | 10                | $\mu A$     |
| $I_{CEO}$                      | Collector Cut-off Current<br>( $I_B = 0$ )           | $V_{CE} = 30V$                                                    |                                                                         |                 | 100               | $\mu A$     |
| $I_{EBO}$                      | Emitter Cut-off Current<br>( $I_C = 0$ )             | $V_{EB} = 5V$                                                     |                                                                         |                 | 10                | $\mu A$     |
| $V_{(BR)CBO}$                  | Collector-Base<br>Breakdown Voltage ( $I_E = 0$ )    | $I_C = 100\mu A$                                                  | 60                                                                      |                 |                   | V           |
| $V_{(BR)CEO}$<br><i>Note 2</i> | Collector-Emitter Breakdown<br>Voltage ( $I_B = 0$ ) | $I_C = 10\text{ mA}$                                              | 30                                                                      |                 |                   | V           |
| $V_{(BR)EBO}$                  | Collector-Emitter Breakdown<br>Voltage ( $I_C = 0$ ) | $I_E = 100\mu A$                                                  | 5                                                                       |                 |                   | V           |
| $V_{CE(sat)}$<br><i>Note 2</i> | Collector-Emitter Saturation<br>Voltage              | $I_C = 1\text{ A}$<br>$I_C = 2\text{ A}$<br>$I_C = 3\text{ A}$    | $I_B = 50\text{ mA}$<br>$I_B = 100\text{ mA}$<br>$I_B = 150\text{ mA}$  |                 | 0.4<br>0.7<br>1.1 | V<br>V<br>V |
| $V_{BE(sat)}$<br><i>Note 2</i> | Base-Emitter Saturation Voltage                      | $I_C = 2\text{ A}$                                                | $I_B = 100\text{ mA}$                                                   |                 | 1.2               | V           |
| $h_{FE}$                       | DC Current Gain                                      | $I_C = 100\text{ mA}$<br>$I_C = 1\text{ A}$<br>$I_C = 3\text{ A}$ | $V_{CE} = 2\text{ V}$<br>$V_{CE} = 2\text{ V}$<br>$V_{CE} = 2\text{ V}$ | 100<br>80<br>30 | 300               |             |
| $f_T$                          | Transistor Frequency                                 | $V_{CE} = 10\text{ V}$                                            | $I_C = 0.1\text{ A}$                                                    | 100             |                   | MHz         |

2 Pulsed duration = 300  $\mu s$ , duty cycle  $\leq 1.5\%$ .

2.1 Electrical characteristics (curve)

Figure 1. DC Current Gain

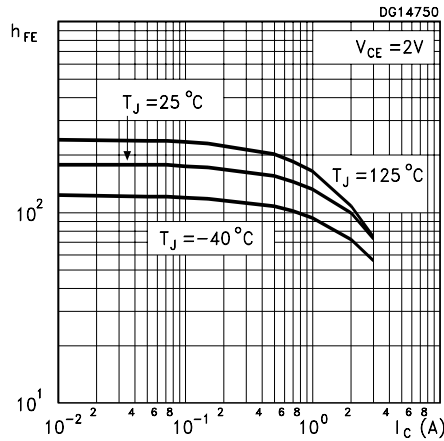


Figure 2. DC Current Gain

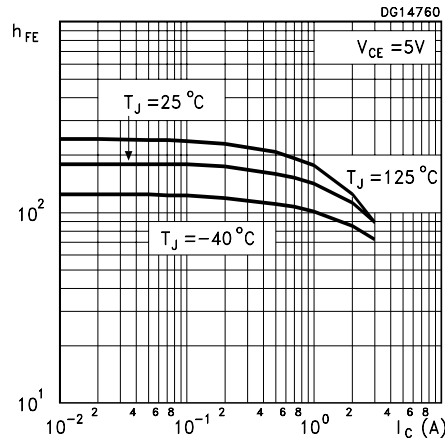


Figure 3. Collector-emitter saturation voltage

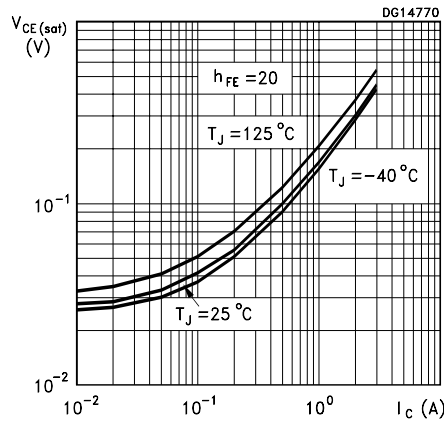


Figure 4. Base-emitter saturation voltage

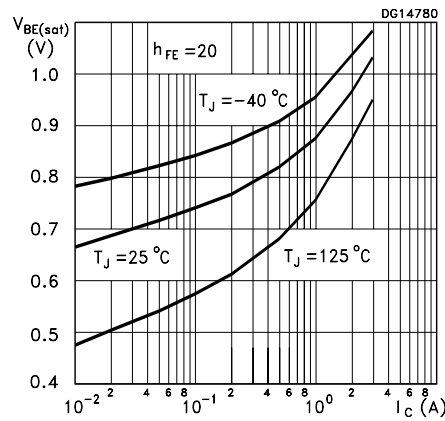


Figure 5. Switching times on resistive load

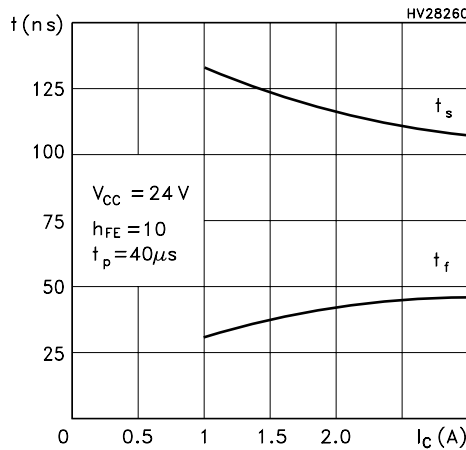


Figure 6. Switching times resistive on load

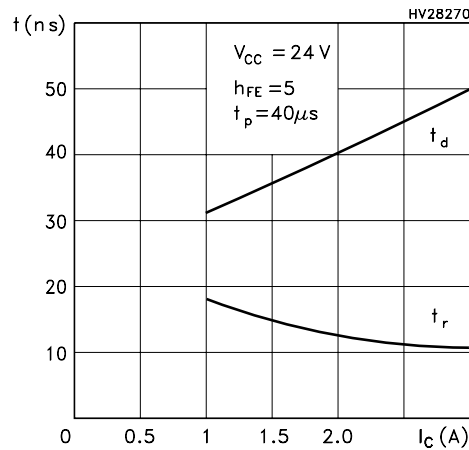
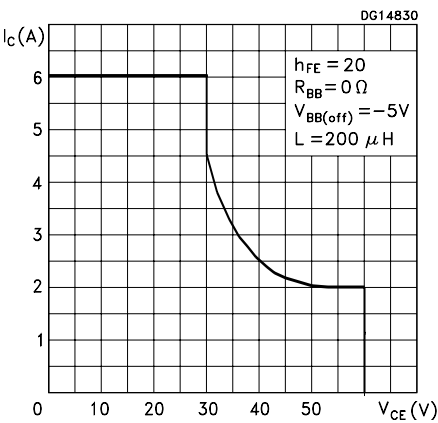


Figure 7. Reverse biased area

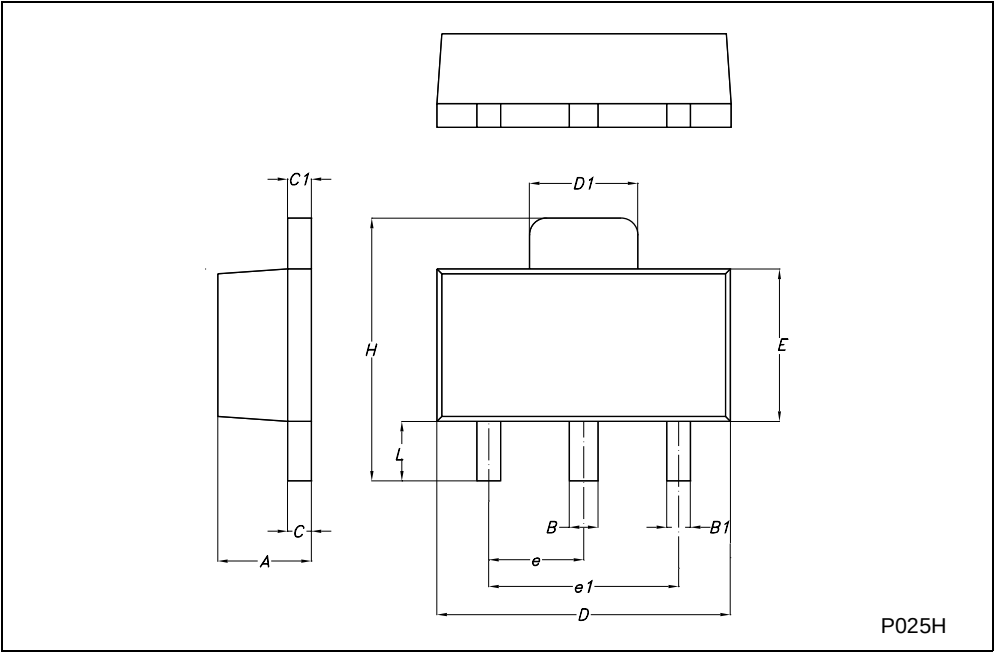


### 3 Package Mechanical Data

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](http://www.st.com)

SOT-89 MECHANICAL DATA

| DIM. | mm   |      |      | mils  |      |       |
|------|------|------|------|-------|------|-------|
|      | MIN. | TYP. | MAX. | MIN.  | TYP. | MAX.  |
| A    | 1.4  |      | 1.6  | 55.1  |      | 63.0  |
| B    | 0.44 |      | 0.56 | 17.3  |      | 22.0  |
| B1   | 0.36 |      | 0.48 | 14.2  |      | 18.9  |
| C    | 0.35 |      | 0.44 | 13.8  |      | 17.3  |
| C1   | 0.35 |      | 0.44 | 13.8  |      | 17.3  |
| D    | 4.4  |      | 4.6  | 173.2 |      | 181.1 |
| D1   | 1.62 |      | 1.83 | 63.8  |      | 72.0  |
| E    | 2.29 |      | 2.6  | 90.2  |      | 102.4 |
| e    | 1.42 |      | 1.57 | 55.9  |      | 61.8  |
| e1   | 2.92 |      | 3.07 | 115.0 |      | 120.9 |
| H    | 3.94 |      | 4.25 | 155.1 |      | 167.3 |
| L    | 0.89 |      | 1.2  | 35.0  |      | 47.2  |



| SOT-223 MECHANICAL DATA |      |      |      |       |       |       |
|-------------------------|------|------|------|-------|-------|-------|
| DIM.                    | mm   |      |      | inch  |       |       |
|                         | MIN. | TYP. | MAX. | MIN.  | TYP.  | MAX.  |
| A                       |      |      | 1.80 |       |       | 0.071 |
| B                       | 0.60 | 0.70 | 0.80 | 0.024 | 0.027 | 0.031 |
| B1                      | 2.90 | 3.00 | 3.10 | 0.114 | 0.118 | 0.122 |
| c                       | 0.24 | 0.26 | 0.32 | 0.009 | 0.010 | 0.013 |
| D                       | 6.30 | 6.50 | 6.70 | 0.248 | 0.256 | 0.264 |
| e                       |      | 2.30 |      |       | 0.090 |       |
| e1                      |      | 4.60 |      |       | 0.181 |       |
| E                       | 3.30 | 3.50 | 3.70 | 0.130 | 0.138 | 0.146 |
| H                       | 6.70 | 7.00 | 7.30 | 0.264 | 0.276 | 0.287 |
| V                       |      |      | 10°  |       |       | 10°   |
| A1                      |      | 0.02 |      |       |       |       |

The mechanical drawing illustrates the SOT-223 package in three views: top, side, and bottom. The top view shows dimensions A (lead length), B (lead width), B1 (body width), c (lead thickness), D (body length), e (pitch), e1 (body length), and E (body height). The side view shows the lead profile with dimension H (total height) and V (lead angle). The bottom view shows the mounting pads with dimensions D, B1, and e. The package is labeled P008B.



## 4 Revision History

| Date        | Revision | Changes          |
|-------------|----------|------------------|
| 12-Oct-2005 | 1        | Initial release. |

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