

## NPN medium power transistors

### Features

- Surface mounting devices in medium power SOT-223 and SOT-89 packages
- Available in tape and reel packaging

### Applications

- Voltage regulation
- Relay driver
- Generic switch

### Description

The STF724 and STN724 are NPN transistors manufactured using Planar technology resulting in rugged high performance devices.

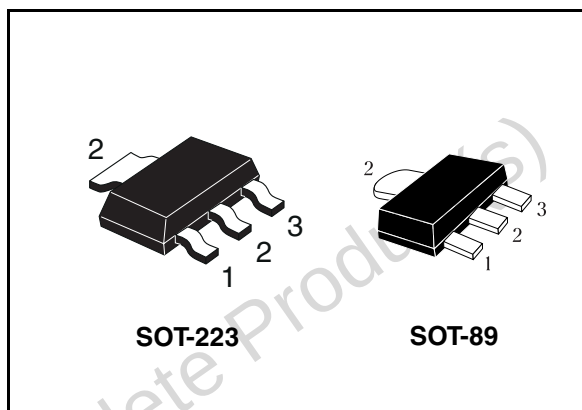


Figure 1. Internal schematic diagram

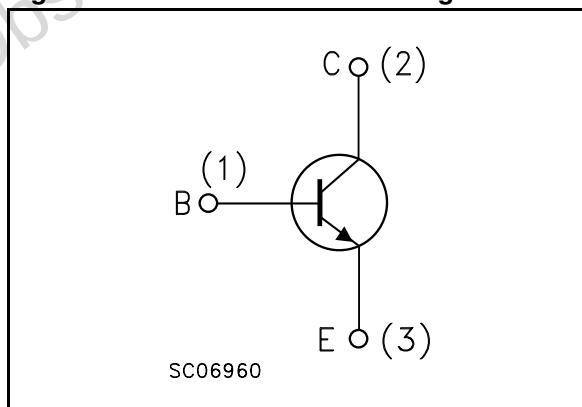


Table 1. Device summary

| Order code | Marking | Package | Packaging   |
|------------|---------|---------|-------------|
| STF724     | 724     | SOT-89  | Tape & reel |
| STN724     | N724    | SOT-223 |             |

## Contents

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# 1 Electrical ratings

**Table 2. Absolute maximum rating**

| Symbol    | Parameter                                         | Value      |        | Unit             |
|-----------|---------------------------------------------------|------------|--------|------------------|
|           |                                                   | STF724     | STN724 |                  |
| $V_{CBO}$ | Collector-base voltage ( $I_E = 0$ )              | 60         |        | 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                                 | 3          |        | A                |
| $I_{CM}$  | Collector peak current ( $t_P < 5\text{ms}$ )     | 6          |        | A                |
| $I_B$     | Base current                                      | 1          |        | A                |
| $I_{BM}$  | Base peak current ( $t_P < 5\text{ms}$ )          | 2          |        | A                |
| $P_{tot}$ | Total dissipation at $T_{amb} = 25^\circ\text{C}$ | 1.4        | 1.6    | W                |
| $T_{stg}$ | Storage temperature                               | -65 to 150 |        | $^\circ\text{C}$ |
| $T_J$     | Max. operating junction temperature               | 150        |        | $^\circ\text{C}$ |

**Table 3. Thermal data**

| Symbol        | Parameter                                              | Value  |         | Unit               |
|---------------|--------------------------------------------------------|--------|---------|--------------------|
|               |                                                        | SOT-89 | SOT-223 |                    |
| $R_{thj-amb}$ | Thermal resistance junction-ambient <sup>(1)</sup> max | 89     | 78      | $^\circ\text{C/W}$ |

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

## 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          |
|-----------------------------------|---------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|-------------------|---------------|
| $I_{\text{CES}}$                  | Collector cut-off current<br>( $V_{\text{BE}} = 0$ )          | $V_{\text{CE}} = 60 \text{ V}$                                                                                                                                                                          |                 |      | 10                | $\mu\text{A}$ |
| $I_{\text{CEO}}$                  | Collector cut-off current<br>( $I_{\text{B}} = 0$ )           | $V_{\text{CE}} = 30 \text{ V}$                                                                                                                                                                          |                 |      | 100               | $\mu\text{A}$ |
| $I_{\text{EBO}}$                  | Emitter cut-off current<br>( $I_{\text{C}} = 0$ )             | $V_{\text{EB}} = 5 \text{ V}$                                                                                                                                                                           |                 |      | 10                | $\mu\text{A}$ |
| $V_{(\text{BR})\text{CBO}}$       | Collector-base breakdown<br>voltage ( $I_{\text{E}} = 0$ )    | $I_{\text{C}} = 100 \mu\text{A}$                                                                                                                                                                        | 60              |      |                   | V             |
| $V_{(\text{BR})\text{CEO}}^{(1)}$ | Collector-emitter<br>breakdown voltage ( $I_{\text{B}} = 0$ ) | $I_{\text{C}} = 10 \text{ mA}$                                                                                                                                                                          | 30              |      |                   | V             |
| $V_{(\text{BR})\text{EBO}}$       | Emitter-base breakdown<br>voltage ( $I_{\text{C}} = 0$ )      | $I_{\text{E}} = 100 \mu\text{A}$                                                                                                                                                                        | 5               |      |                   | V             |
| $V_{\text{CE(sat)}}^{(1)}$        | Collector-emitter saturation<br>voltage                       | $I_{\text{C}} = 1 \text{ A} \quad I_{\text{B}} = 50 \text{ mA}$<br>$I_{\text{C}} = 2 \text{ A} \quad I_{\text{B}} = 100 \text{ mA}$<br>$I_{\text{C}} = 3 \text{ A} \quad I_{\text{B}} = 150 \text{ mA}$ |                 |      | 0.4<br>0.7<br>1.1 | V<br>V<br>V   |
| $V_{\text{BE(sat)}}^{(1)}$        | Base-emitter saturation<br>voltage                            | $I_{\text{C}} = 2 \text{ A} \quad I_{\text{B}} = 100 \text{ mA}$                                                                                                                                        |                 |      | 1.2               | V             |
| $h_{\text{FE}}$                   | DC current gain                                               | $I_{\text{C}} = 100 \text{ mA} \quad V_{\text{CE}} = 2 \text{ V}$<br>$I_{\text{C}} = 1 \text{ A} \quad V_{\text{CE}} = 2 \text{ V}$<br>$I_{\text{C}} = 3 \text{ A} \quad V_{\text{CE}} = 2 \text{ V}$   | 100<br>80<br>30 |      | 300               |               |
| $f_{\text{T}}$                    | Transition frequency                                          | $V_{\text{CE}} = 10 \text{ V} \quad I_{\text{C}} = 0.1 \text{ A}$                                                                                                                                       |                 | 100  |                   | MHz           |

1. Pulsed duration = 300  $\mu\text{s}$ , duty cycle  $\leq 1.5 \%$

## 2.1 Electrical characteristics (curves)

Figure 2. DC Current Gain

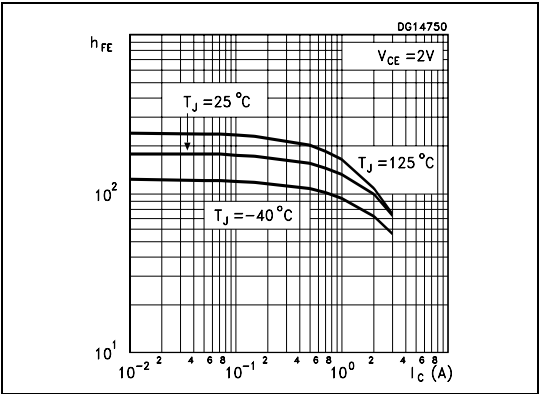


Figure 3. DC Current Gain

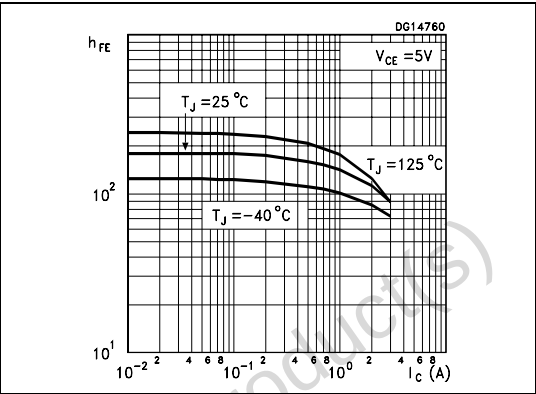


Figure 4. Collector-emitter saturation voltage

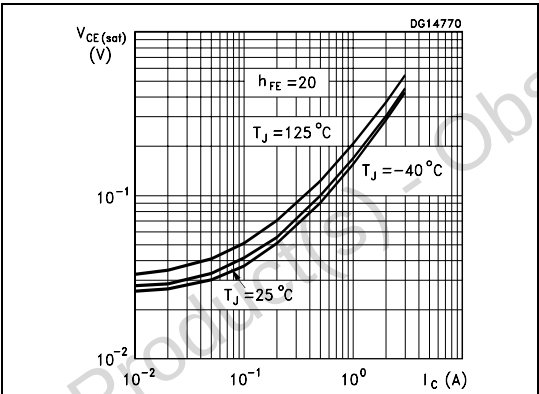


Figure 5. Base-emitter saturation voltage

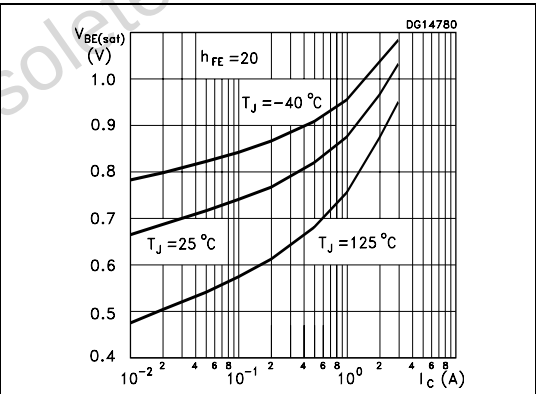


Figure 6. Switching times on resistive load

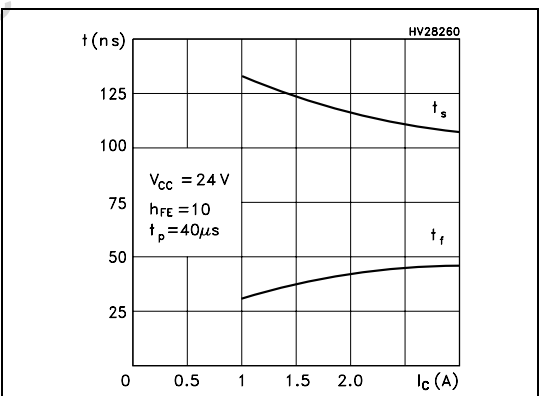
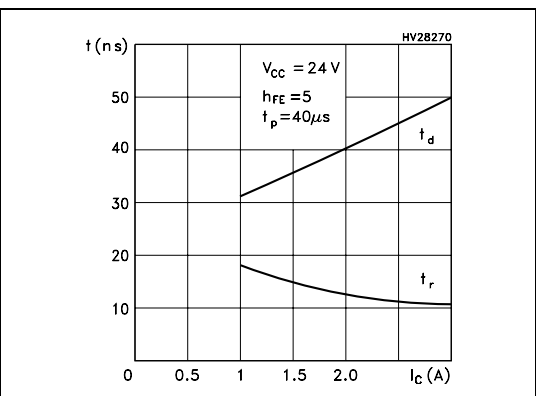
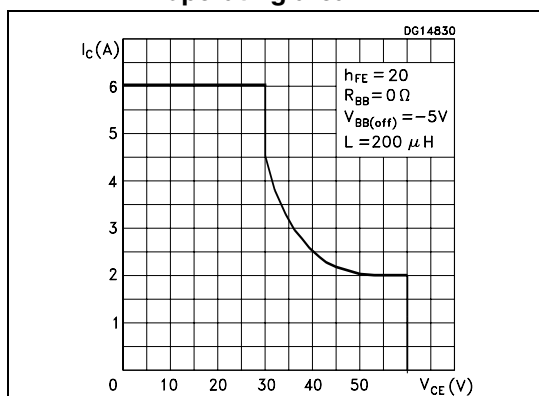


Figure 7. Switching times on resistive load



**Figure 8. Reverse biased safe operating area**



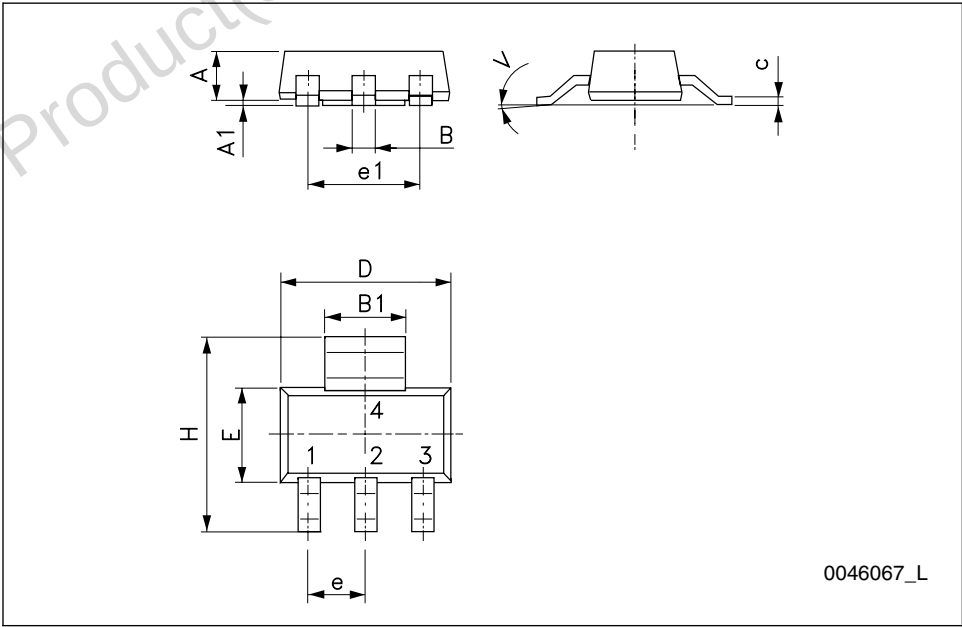
### 3 Package mechanical data

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)

Obsolete Product(s) - Obsolete Product(s)

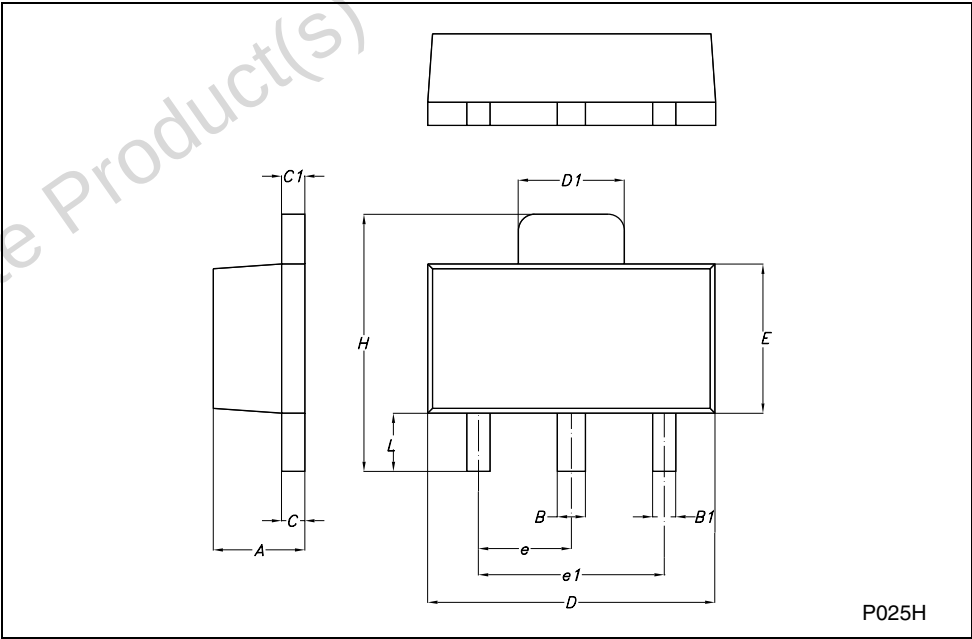
SOT-223 mechanical data

| 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 ° |



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  |



## 4 Revision history

**Table 5. Document revision history**

| Date        | Revision | Changes                          |
|-------------|----------|----------------------------------|
| 29-Mar-2005 | 1        | Initial release.                 |
| 12-Oct-2005 | 2        | Added new graphics               |
| 17-Jul-2006 | 3        | New template                     |
| 04-Apr-2008 | 4        | SOT-223 mechanical data updated. |

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