

Low voltage fast-switching NPN power transistor

Features

- Very low collector to emitter saturation voltage
- High current gain characteristic
- Fast-switching speed
- Surface-mounting DPAK (TO-252) power package in tape & reel (suffix "T4")

Description

The device is manufactured in Planar technology with "Base Island" layout. The resulting transistor shows exceptional high gain performance coupled with very low saturation voltage.

Applications

- CCFL drivers
- Voltage regulators
- Relay drivers
- High efficiency, low voltage, switching applications

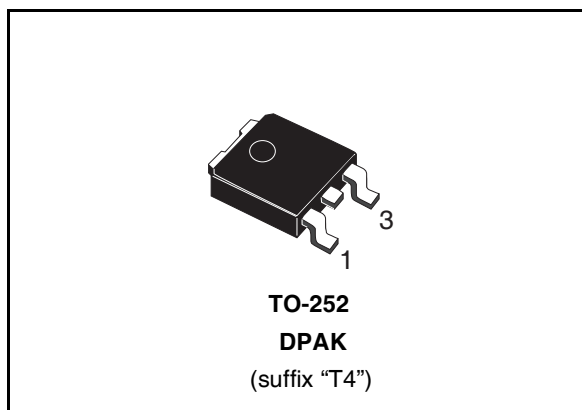


Figure 1. Internal schematic diagram

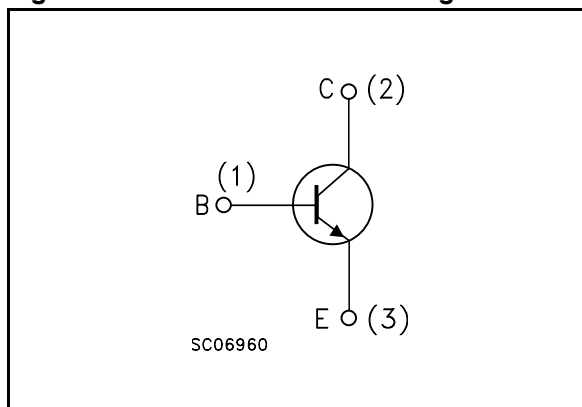


Table 1. Device summary

| Order code | Marking | Package | Packaging |
|------------|---------|---------|-------------|
| STD1802T4 | D1802 | DPAK | Tape & reel |

1 Electrical ratings

Table 2. Absolute maximum rating

| Symbol | Parameter | Value | Unit |
|-----------|--|------------|------------------|
| V_{CBO} | Collector-base voltage ($I_E = 0$) | 80 | V |
| V_{CEO} | Collector-emitter voltage ($I_B = 0$) | 60 | V |
| V_{EBO} | Emitter-base voltage ($I_C = 0$) | 6 | 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 |
| P_{tot} | Total dissipation at $T_C \leq 25^\circ\text{C}$ | 15 | 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 |
|----------------|--------------------------------------|-------|--------------------|
| $R_{thj-case}$ | Thermal resistance junction-case max | 8.33 | $^\circ\text{C/W}$ |

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_{CBO} | Collector cut-off current ($I_{\text{E}} = 0$) | $V_{\text{CB}} = 40\text{V}$ | | | 0.1 | μA |
| I_{EBO} | Emitter cut-off current ($I_{\text{C}} = 0$) | $V_{\text{EB}} = 4\text{V}$ | | | 0.1 | μA |
| $V_{(\text{BR})\text{CBO}}$ | Collector-base breakdown voltage ($I_{\text{E}} = 0$) | $I_{\text{C}} = 100\mu\text{A}$ | 80 | | | V |
| $V_{(\text{BR})\text{CEO}}$ | Collector-emitter breakdown voltage ($I_{\text{B}} = 0$) | $I_{\text{C}} = 1\text{mA}$ | 60 | | | V |
| $V_{(\text{BR})\text{EBO}}$ | Emitter-base breakdown voltage ($I_{\text{C}} = 0$) | $I_{\text{E}} = 100\mu\text{A}$ | 6 | | | V |
| $V_{\text{CE}(\text{sat})}^{(1)}$ | Collector-emitter saturation voltage | $I_{\text{C}} = 2\text{A}$ $I_{\text{B}} = 100\text{mA}$ $I_{\text{C}} = 3\text{A}$ $I_{\text{B}} = 150\text{mA}$ | | 150 200 | 300 400 | mV mV |
| $V_{\text{BE}(\text{sat})}^{(1)}$ | Base-emitter saturation voltage | $I_{\text{C}} = 2\text{A}$ $I_{\text{B}} = 100\text{mA}$ | | 0.9 | 1.2 | V |
| $h_{\text{FE}}^{(1)}$ | DC current gain | $I_{\text{C}} = 100\text{mA}$ $V_{\text{CE}} = 2\text{V}$ $I_{\text{C}} = 3\text{A}$ $V_{\text{CE}} = 2\text{V}$ | 200 100 | | 400 | |
| f_{T} | Transition frequency | $V_{\text{CE}} = 10\text{V}$ $I_{\text{C}} = 50\text{mA}$ | | 150 | | MHz |
| C_{CBO} | Collector-base capacitance | $V_{\text{CB}} = 10\text{V}$ $f = 1\text{MHz}$ | | 50 | | pF |
| t_{ON} t_{s} t_{f} | Resistive load Turn-on time Storage time Fall time | $I_{\text{C}} = 1\text{A}$ $V_{\text{CC}} = 30\text{V}$ $I_{\text{B1}} = -I_{\text{B2}} = 0.1\text{A}$ | | 50 1.35 120 | | ns μs ns |

Note (1) Pulsed duration = 300 μs , duty cycle $\leq 1.5\%$

2.1 Electrical characteristics (curves)

Figure 2. Derating curve

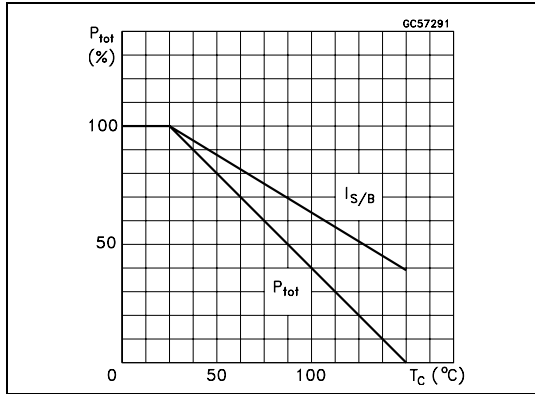


Figure 3. DC current gain

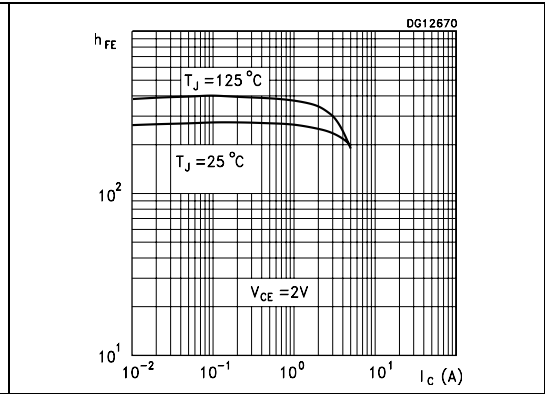


Figure 4. Collector-emitter saturation voltage

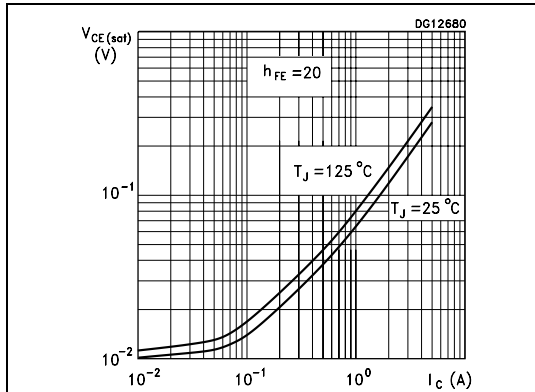


Figure 5. Collector-emitter saturation voltage

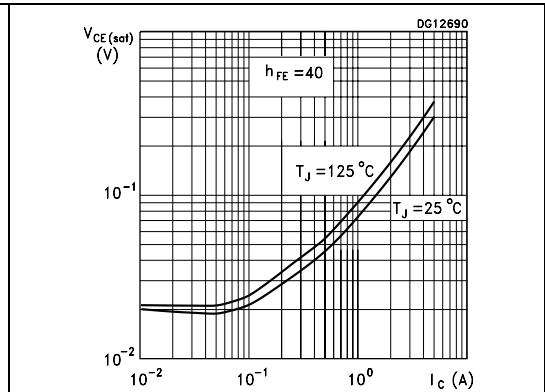


Figure 6. Base-emitter saturation voltage

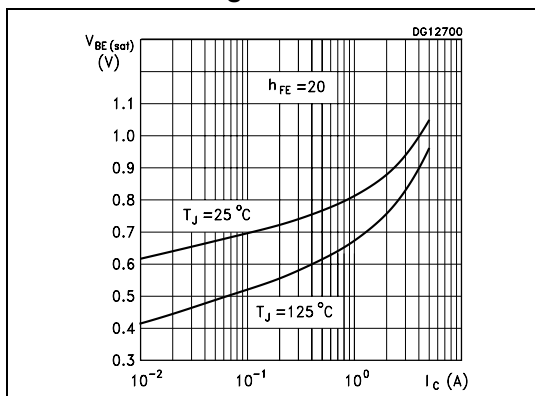


Figure 7. Base-emitter on voltage

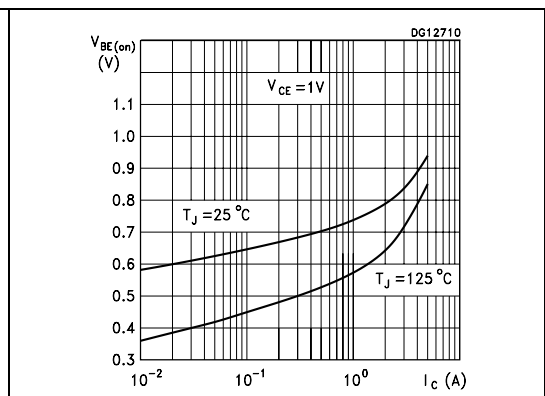


Figure 8. Switching times resistive load

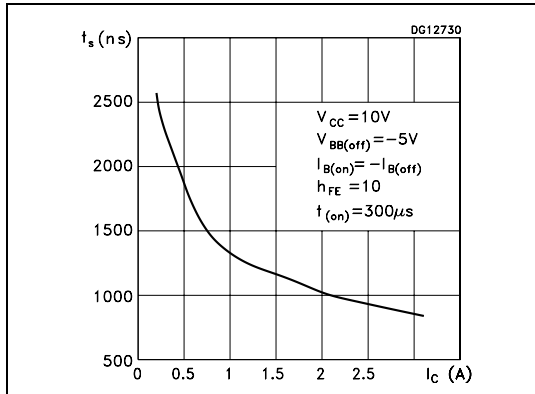


Figure 9. Switching times resistive load

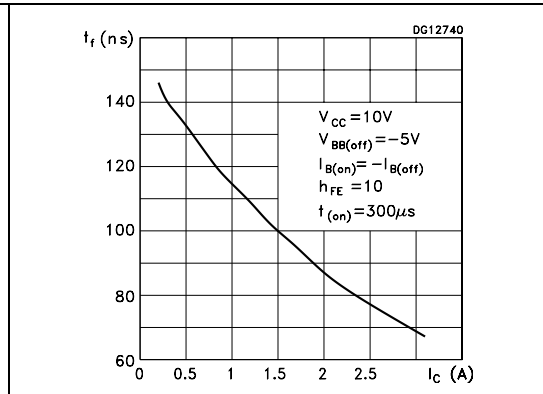


Figure 10. Switching times resistive load

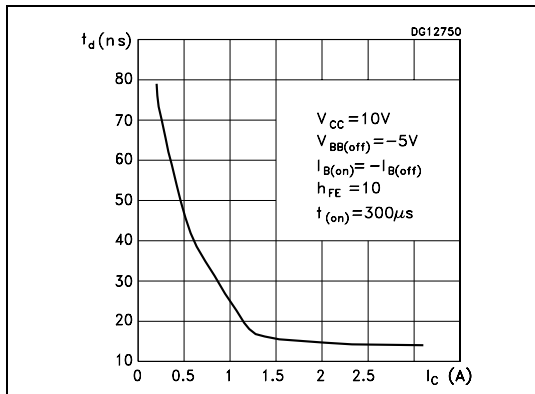


Figure 11. Switching times inductive load

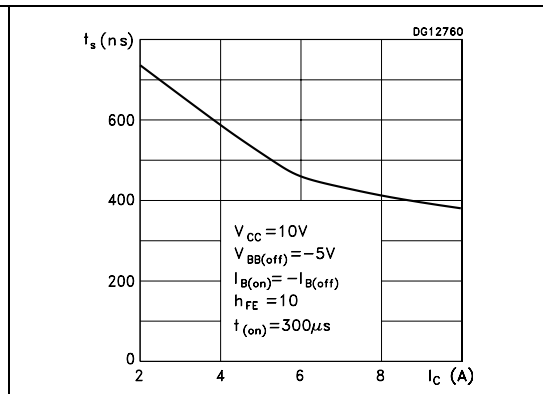
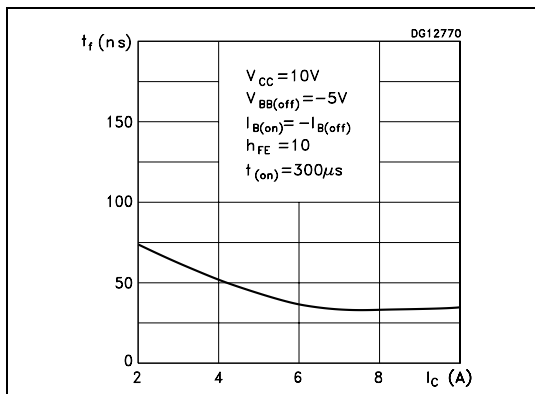
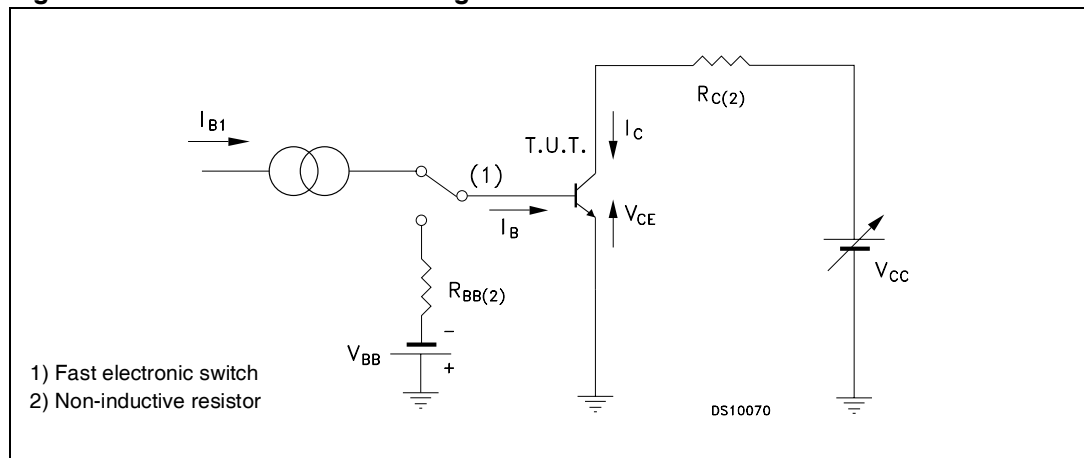


Figure 12. Switching times resistive load



2.2 Test circuits

Figure 13. Resistive load switching test circuit

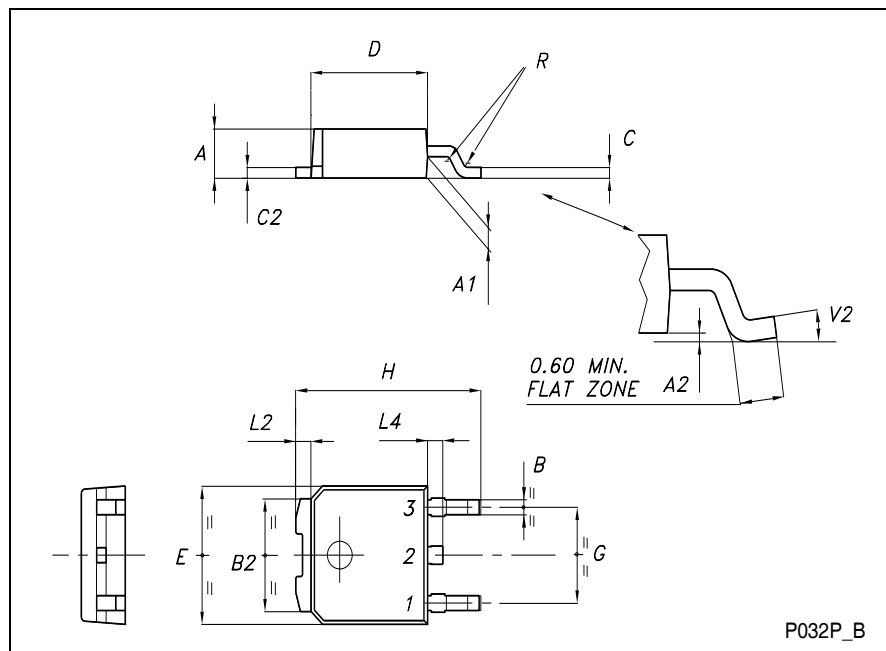


3 Package mechanical data

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

TO-252 (DPAK) MECHANICAL DATA

| DIM. | mm | | | inch | | |
|------|------|------|-------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 2.20 | | 2.40 | 0.087 | | 0.094 |
| A1 | 0.90 | | 1.10 | 0.035 | | 0.043 |
| A2 | 0.03 | | 0.23 | 0.001 | | 0.009 |
| B | 0.64 | | 0.90 | 0.025 | | 0.035 |
| B2 | 5.20 | | 5.40 | 0.204 | | 0.213 |
| C | 0.45 | | 0.60 | 0.018 | | 0.024 |
| C2 | 0.48 | | 0.60 | 0.019 | | 0.024 |
| D | 6.00 | | 6.20 | 0.236 | | 0.244 |
| E | 6.40 | | 6.60 | 0.252 | | 0.260 |
| G | 4.40 | | 4.60 | 0.173 | | 0.181 |
| H | 9.35 | | 10.10 | 0.368 | | 0.398 |
| L2 | | 0.8 | | | 0.031 | |
| L4 | 0.60 | | 1.00 | 0.024 | | 0.039 |
| V2 | 0° | | 8° | 0° | | 0° |



4 Revision history

Table 5. Revision history

| Date | Revision | Changes |
|-------------|-----------------|--------------------------------|
| 11-Mar-2003 | 1 | Initial release. |
| 05-Sep-2003 | 2 | Minor text change |
| 12-Jun-2004 | 3 | New disclaimer |
| 12-Jul-2007 | 4 | Package name added on table 1. |

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