



STN83003

High voltage fast-switching
NPN power transistor

Features

- High voltage capability
- Very high switching speed

Application

- Electronics ballasts for fluorescent lighting

Description

The device is manufactured using high voltage multi-epitaxial planar technology for high switching speeds and high voltage capability. It uses a cellular emitter structure with planar edge termination to enhance switching speeds while maintaining the wide RBSOA. The STN83003 is expressly designed for a new solution to be used in compact fluorescent lamps, where it is coupled with the STN93003, its complementary PNP transistor.

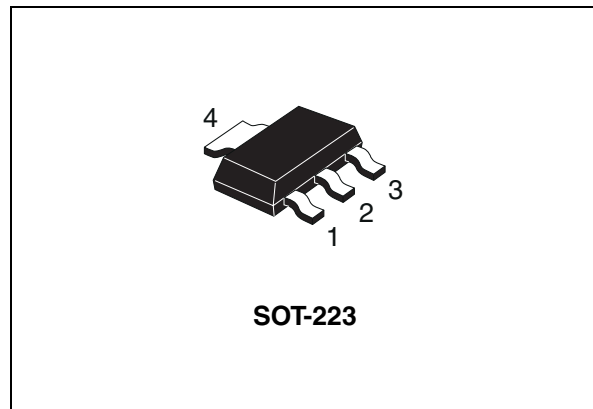


Figure 1. Internal schematic diagram

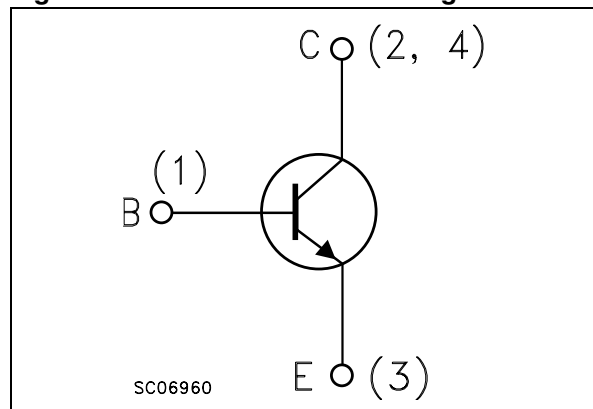


Table 1. Device summary

| Part number | Marking | Package | Packaging |
|-------------|---------|---------|---------------|
| STN83003 | N83003 | SOT-223 | Tape and reel |

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1 Electrical ratings

Table 2. Absolute maximum ratings

| Symbol | Parameter | Value | Unit |
|-----------|---|---------------|------|
| V_{CES} | Collector-emitter voltage ($V_{BE} = 0$) | 700 | V |
| V_{CEO} | Collector-emitter voltage ($I_B = 0$) | 400 | V |
| V_{EBO} | Emitter-base voltage ($I_C = 0$, $I_B = 0.75$ A, $t_P < 10$ μ s) | $V_{(BR)EBO}$ | V |
| I_C | Collector current | 1.5 | A |
| I_{CM} | Collector peak current ($t_P < 5$ ms) | 3 | A |
| I_B | Base current | 0.75 | A |
| I_{BM} | Base peak current ($t_P < 5$ ms) | 1.5 | A |
| P_{TOT} | Total dissipation at $T_a = 25$ °C | 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 | Value | Unit |
|------------|--|-------|------|
| R_{thJA} | Thermal resistance junction-ambient ⁽¹⁾ max | 78 | °C/W |

1. Device mounted on PCB area of 1 cm².

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_{CES} | Collector cut-off current ($V_{\text{BE}} = 0$) | $V_{\text{CE}} = 700\text{ V}$ | | | 1 | mA |
| | | $V_{\text{CE}} = 700\text{ V}$ $T_{\text{C}} = 125\text{ °C}$ | | | 5 | mA |
| $V_{(\text{BR})\text{EBO}}$ | Emitter-base breakdown voltage ($I_{\text{C}} = 0$) | $I_{\text{E}} = 10\text{ mA}$ | 12 | | 18 | V |
| $V_{\text{CE(sus)}}^{(1)}$ | Collector-emitter sustaining voltage ($I_{\text{B}} = 0$) | $I_{\text{C}} = 10\text{ mA}$ | 400 | | | V |
| $V_{\text{CE(sat)}}^{(1)}$ | Collector-emitter saturation voltage | $I_{\text{C}} = 0.35\text{ A}$ $I_{\text{B}} = 50\text{ mA}$ | | | 1 | V |
| | | $I_{\text{C}} = 0.5\text{ A}$ $I_{\text{B}} = 0.1\text{ A}$ | | | 0.5 | V |
| $V_{\text{BE(sat)}}^{(1)}$ | Base-emitter saturation voltage | $I_{\text{C}} = 0.5\text{ A}$ $I_{\text{B}} = 0.1\text{ A}$ | | | 1 | V |
| h_{FE} | DC current gain | $I_{\text{C}} = 10\text{ mA}$ $V_{\text{CE}} = 5\text{ V}$ | 10 | | | |
| | | $I_{\text{C}} = 0.35\text{ A}$ $V_{\text{CE}} = 5\text{ V}$ | 16 | 25 | 32 | |
| | | $I_{\text{C}} = 1\text{ A}$ $V_{\text{CE}} = 5\text{ V}$ | 4 | | | |
| t_{r} t_{s} t_{f} | Resistive load Rise time Storage time Fall time | $I_{\text{C}} = 0.35\text{ A}$ $V_{\text{CC}} = 125\text{ V}$ $I_{\text{B1}} = - I_{\text{B2}} = 70\text{ mA}$ $t_{\text{p}} \geq 25\text{ }\mu\text{s}$ | | 100 | | ns |
| | | | 1.5 | 2.2 | 2.9 | μs |
| | | | | 0.2 | | μs |
| t_{s} t_{f} | Inductive load Storage time Fall time | $I_{\text{C}} = 0.5\text{ A}$ $I_{\text{B1}} = 0.1\text{ A}$ $V_{\text{BE(off)}} = -5\text{ V}$ $L = 10\text{ mH}$ $V_{\text{Clamp}} = 300\text{ V}$ | | 450 | | ns |
| | | | | 90 | | ns |

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

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

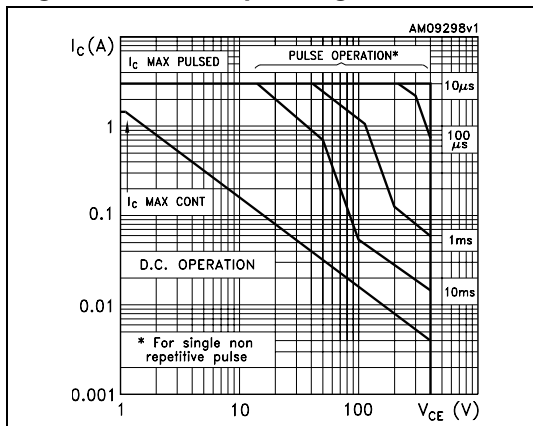


Figure 3. Derating curve

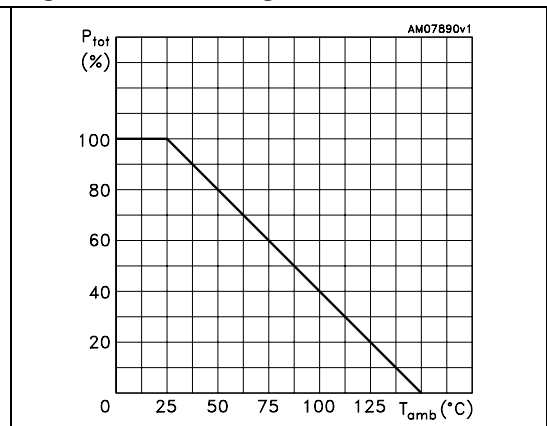


Figure 4. DC current gain ($V_{CE} = 5 V$)

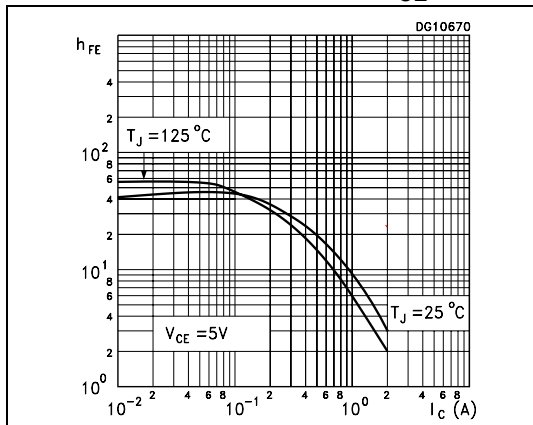


Figure 5. DC current gain ($V_{CE} = 1 V$)

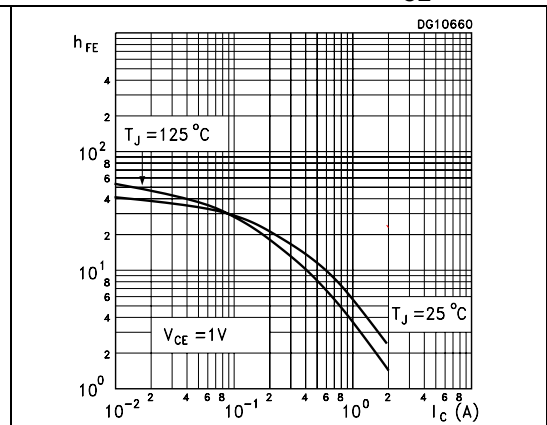


Figure 6. Collector-emitter saturation voltage

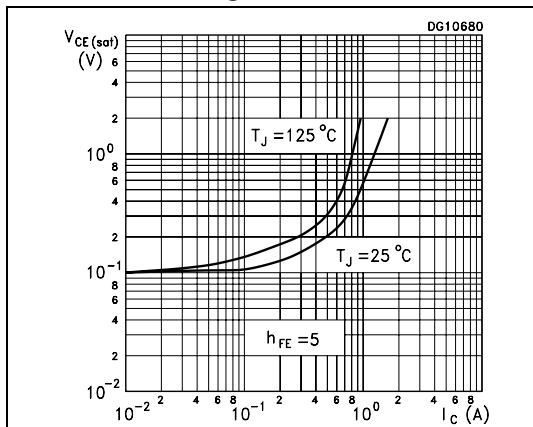


Figure 7. Base-emitter saturation voltage

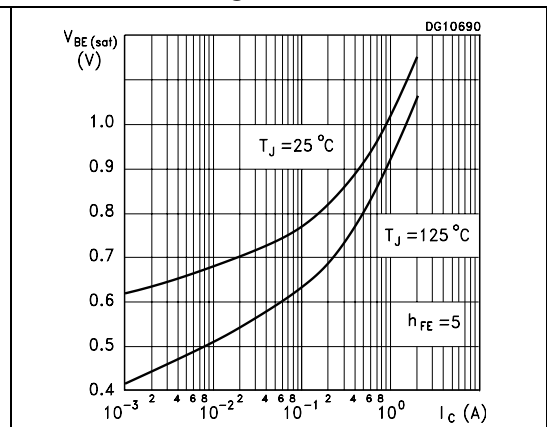


Figure 8. Resistive load fall time

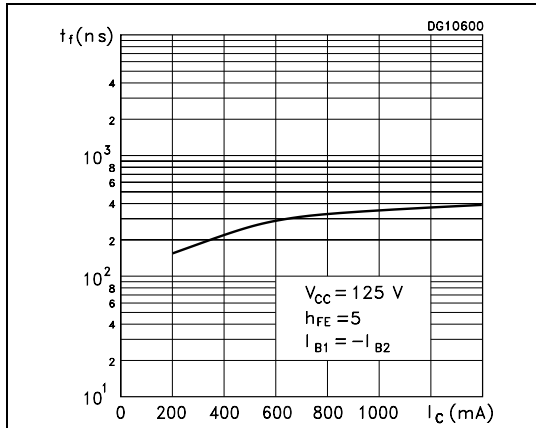


Figure 9. Resistive load storage time

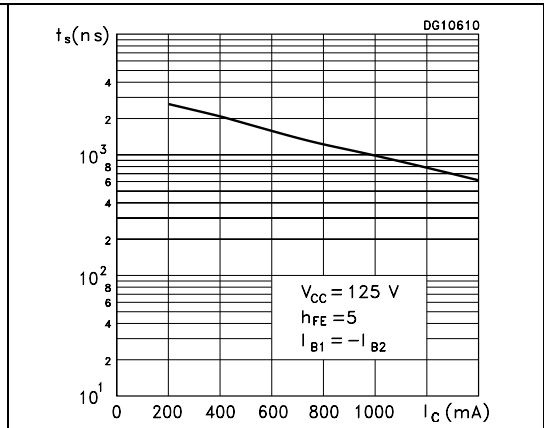


Figure 10. Inductive load fall time

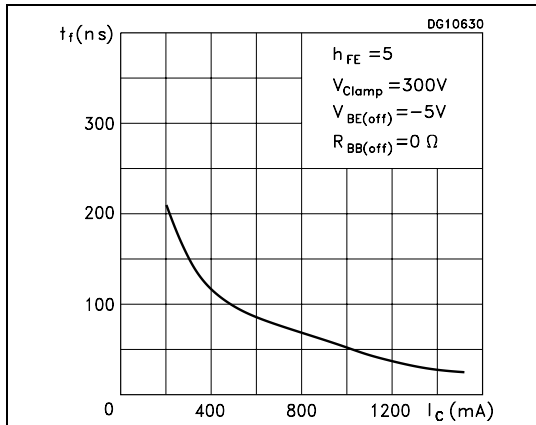


Figure 11. Inductive load storage time

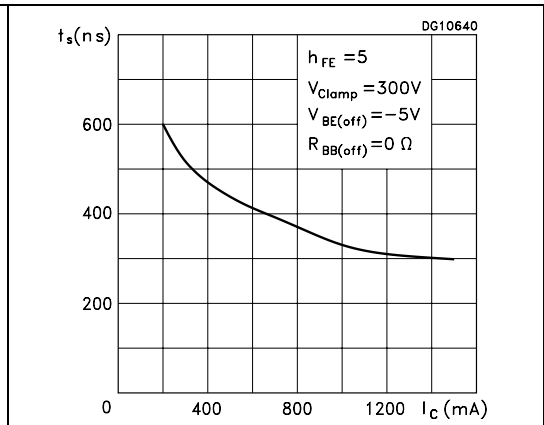
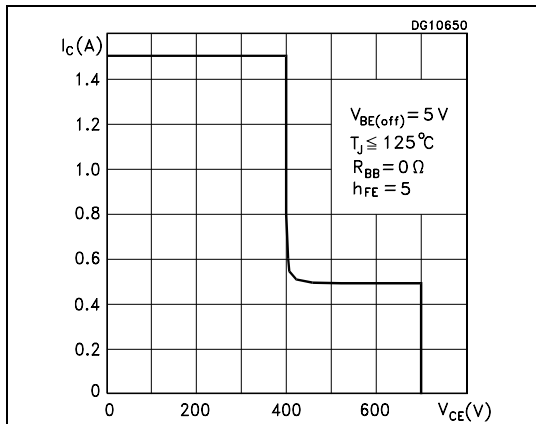
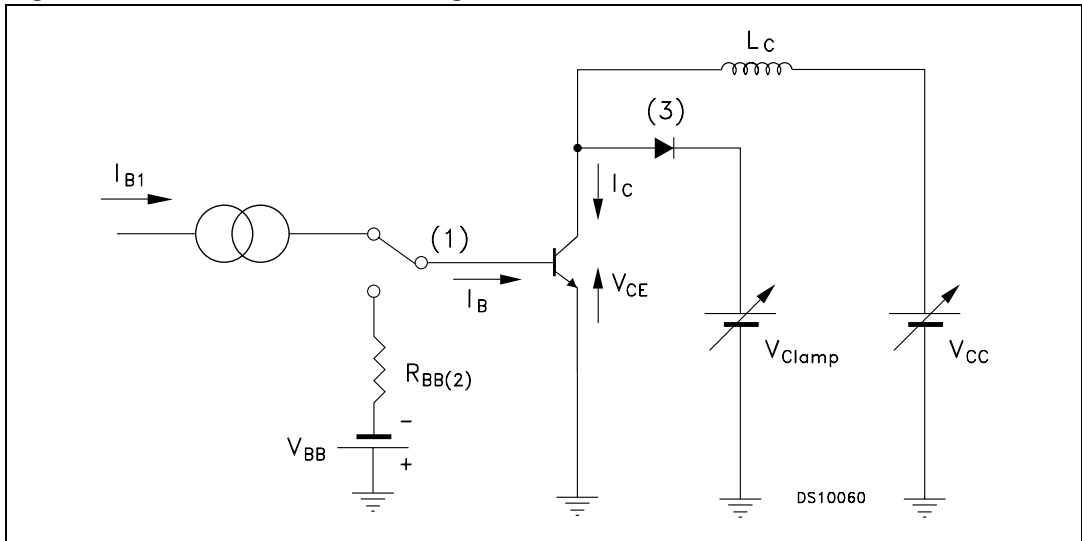


Figure 12. Reverse biased SOA



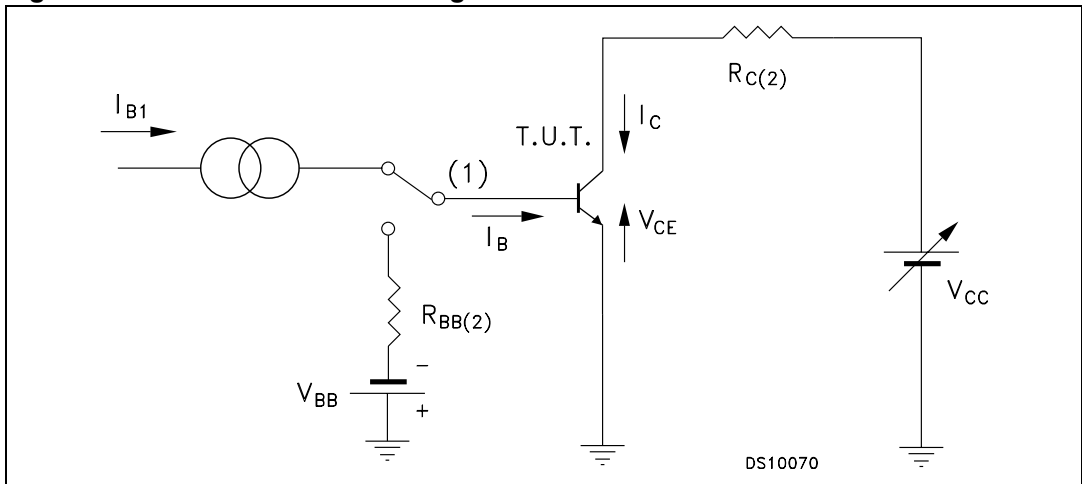
2.2 Test circuits

Figure 13. Inductive load switching test circuit



1. Fast electronic switching
2. Non-inductive resistor
3. Fast recovery rectifier

Figure 14. Resistive load switching test circuit



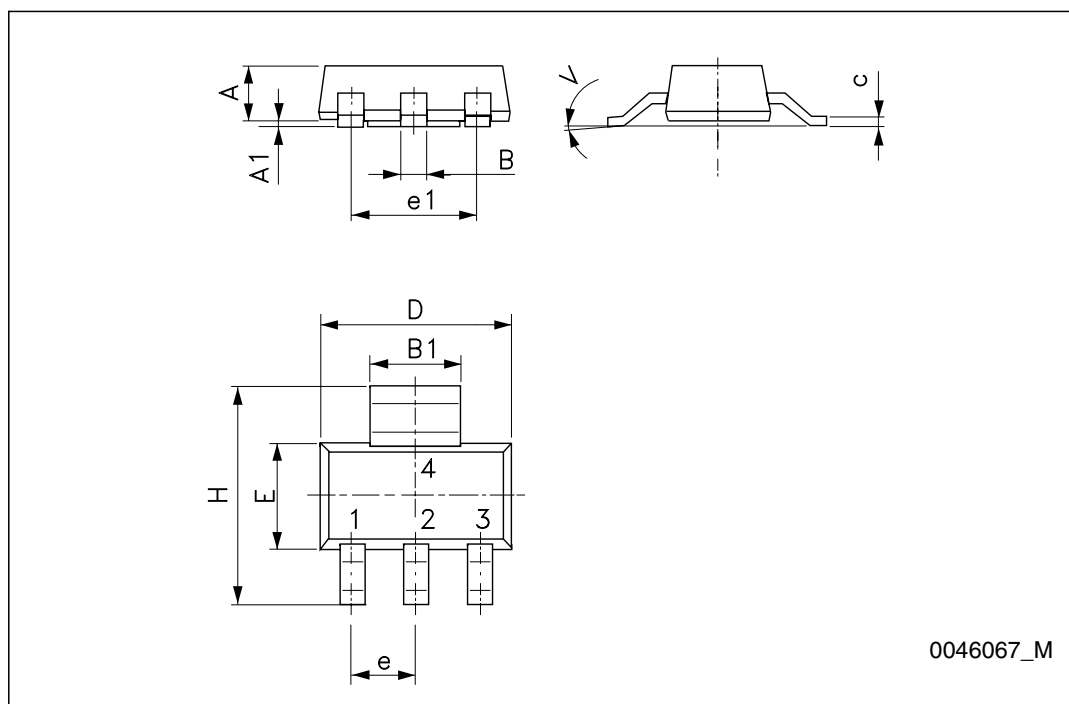
1. Fast electronic switching
2. Non-inductive resistor

3 Package mechanical data

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

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 |
|-------------|----------|--|
| 09-May-2006 | 1 | Initial release. |
| 17-Jan-2007 | 2 | The device's safe operating area curve has been added on page 5. |
| 13-Dec-2010 | 3 | Updated package mechanical data on page 9 . |

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