

High voltage fast-switching NPN power transistor

Preliminary data

Features

- High voltage capability
- Low spread of dynamic parameters
- Minimum lot-to-lot spread for reliable operation
- Very high switching speed
- Integrated antiparallel collector-emitter diode

Applications

- Electronic ballast for fluorescent lighting
- Electronic transformer for halogen lamps

Description

This device is an NPN power transistor manufactured using high voltage multi epitaxial planar technology for high switching speeds. It uses a cellular emitter structure with planar edge termination to enhance switching speeds while maintaining a satisfactory RBSOA.

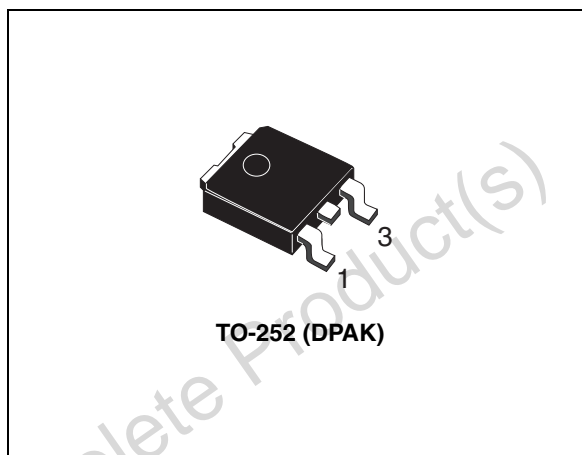


Figure 1. Internal schematic diagram

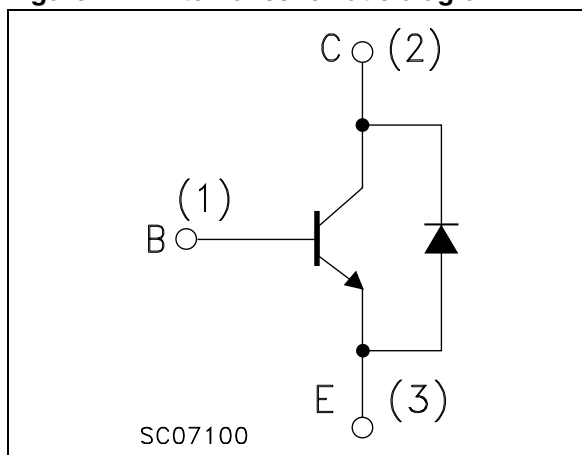


Table 1. Device summary

| Part number | Marking | Package | Packaging |
|-------------|---------|---------|---------------|
| TRD236DT4 | TRD236D | TO-252 | Tape and reel |

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1 Electrical ratings

Table 2. Absolute maximum rating

| 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 ($I_C = 0, I_B = 2 \text{ A}, t_p < 10 \mu\text{s}$) | $V_{(BR)EBO}$ | V |
| I_C | Collector current ($I_C = 0$) | 4 | A |
| I_{CM} | Collector peak current ($t_p < 5 \text{ ms}$) | 8 | A |
| I_B | Base current | 2 | A |
| I_{BM} | Base peak current ($t_p < 5 \text{ ms}$) | 4 | A |
| P_{tot} | Total dissipation at $T_c \leq 25 \text{ }^\circ\text{C}$ | 35 | W |
| T_{stg} | Storage temperature | -65 to 150 | $^\circ\text{C}$ |
| T_J | Max. operating junction temperature | 150 | $^\circ\text{C}$ |

2 Electrical characteristics

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

Table 3. Electrical characteristics

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|----------------------------------|---|---|------|------|------|---------------|
| I_{CES} | Collector cut-off current ($V_{\text{BE}} = 0$) | $V_{\text{CE}} = 700\text{ V}$ | | | 0.1 | mA |
| | | $V_{\text{CE}} = 700\text{ V}$ $T_{\text{C}} = 125\text{ °C}$ | | | 0.5 | mA |
| I_{CEO} | Collector cut-off current ($I_{\text{B}} = 0$) | $V_{\text{CE}} = 400\text{ V}$ | | | 0.25 | mA |
| $V_{(\text{BR})\text{EBO}}$ | Emitter-base breakdown voltage ($I_{\text{C}} = 0$) | $I_{\text{E}} = 10\text{ mA}$ | 9 | | 18 | V |
| $V_{\text{CEO(sus)}}^{(1)}$ | 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 | $I_{\text{C}} = 0.8\text{ A}$ $I_{\text{B}} = 0.1\text{ A}$ | | | 1.1 | V |
| | | $I_{\text{C}} = 2.5\text{ A}$ $I_{\text{B}} = 0.6\text{ A}$ | | | 1.3 | V |
| $V_{\text{BE(sat)}}^{(1)}$ | Base-emitter saturation voltage | $I_{\text{C}} = 1\text{ A}$ $I_{\text{B}} = 0.2\text{ A}$ | | | 1.2 | V |
| | | $I_{\text{C}} = 2.5\text{ A}$ $I_{\text{B}} = 0.5\text{ A}$ | | | 1.3 | V |
| h_{FE} | DC current gain | $I_{\text{C}} = 10\text{ mA}$ $V_{\text{CE}} = 5\text{ V}$ | 10 | | | |
| | | $I_{\text{C}} = 2.5\text{ A}$ $V_{\text{CE}} = 5\text{ V}$ | 8 | | 28 | |
| t_{s} t_{f} | Inductive load Storage time Fall time | $V_{\text{CC}} = 200\text{ V}$ $I_{\text{C}} = 2\text{ A}$ $I_{\text{B1}} = 0.4\text{ A}$ $V_{\text{BE(off)}} = -5\text{ V}$ $R_{\text{BB}} = 0\text{ }\Omega$ $L = 200\text{ }\mu\text{H}$ (see Figure 13) | | 0.6 | | μs |
| | | | | 0.1 | | μs |
| V_{F} | Diode forward voltage | $I_{\text{F}} = 2\text{ A}$ | | | 2.5 | V |

1. Pulsed duration = 300 ms, duty cycle $\leq 1.5\%$

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

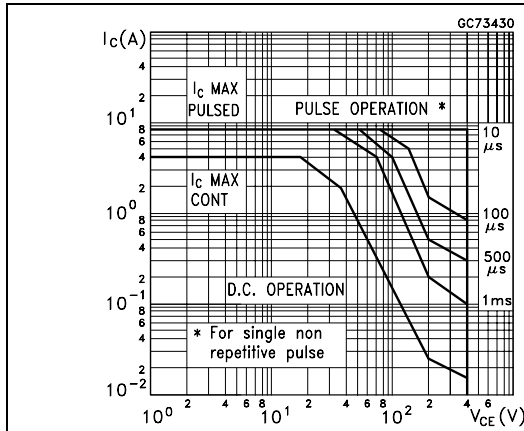


Figure 3. Derating curve

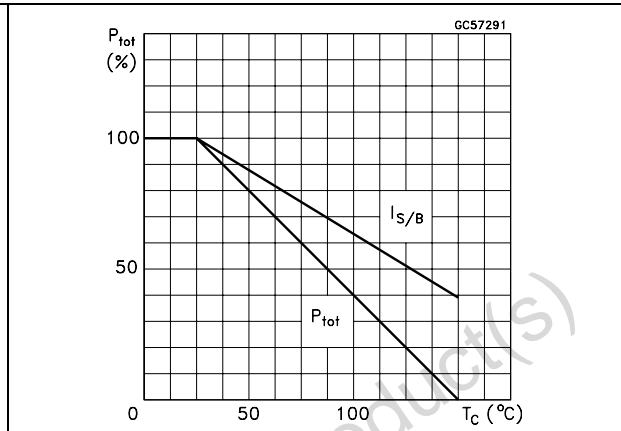


Figure 4. DC current gain ($V_{CE} = 1.5$ V)

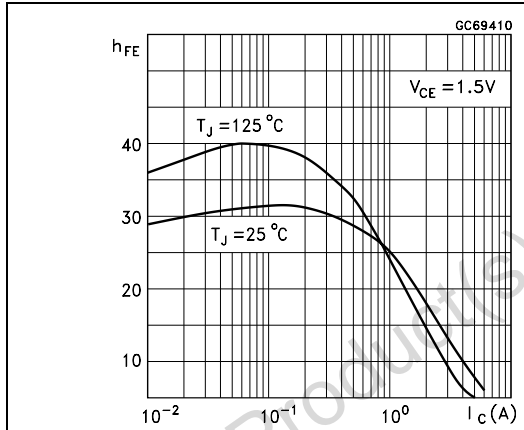


Figure 5. DC current gain ($V_{CE} = 5$ V)

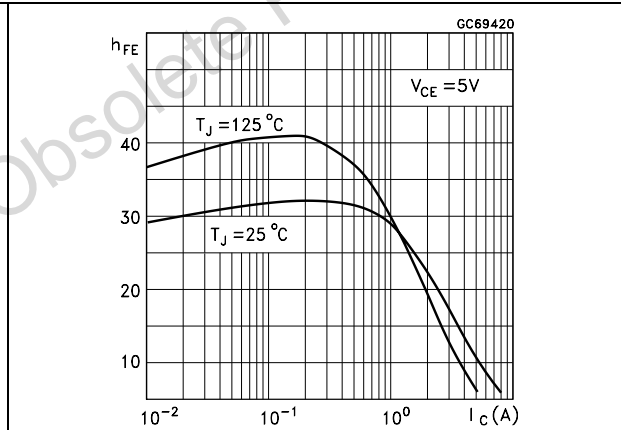


Figure 6. Collector-emitter saturation voltage Figure 7. Base-emitter saturation voltage

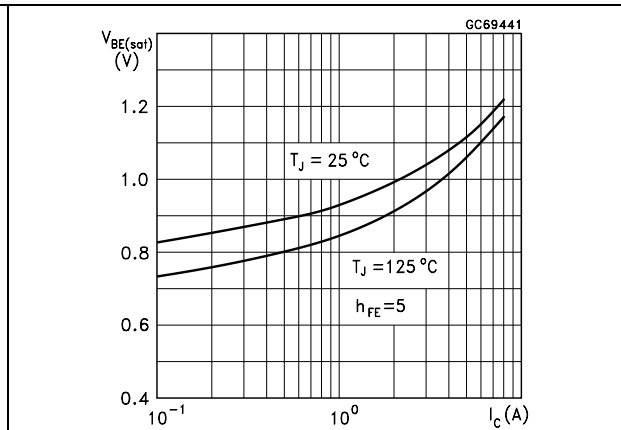
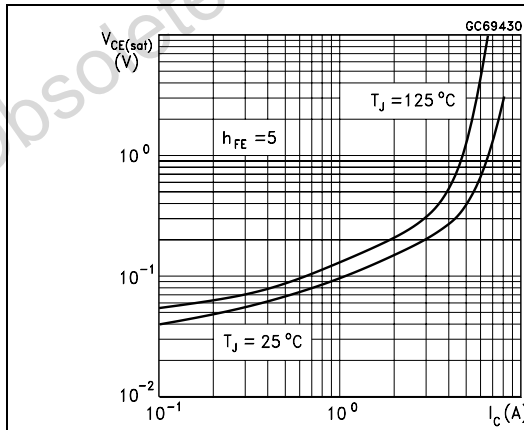


Figure 8. Inductive load fall time

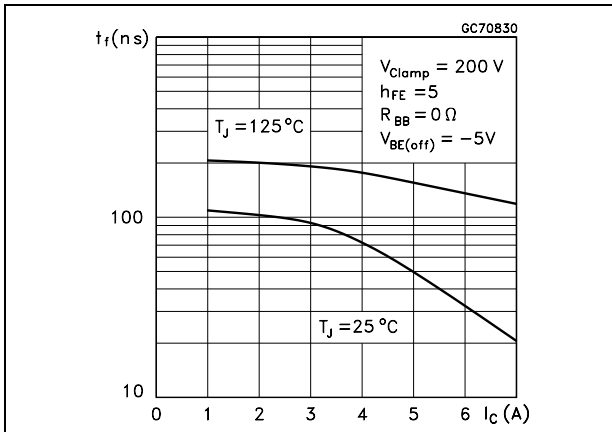


Figure 9. Inductive load storage time

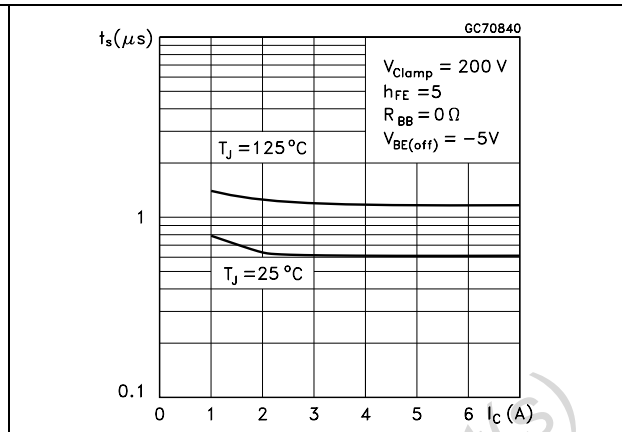


Figure 10. Resistive load fall time

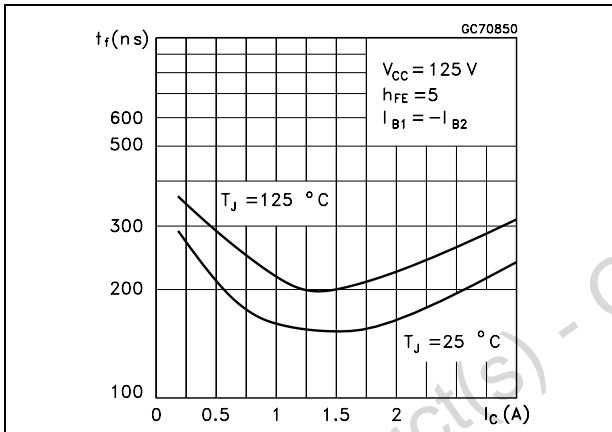


Figure 11. Resistive load storage time

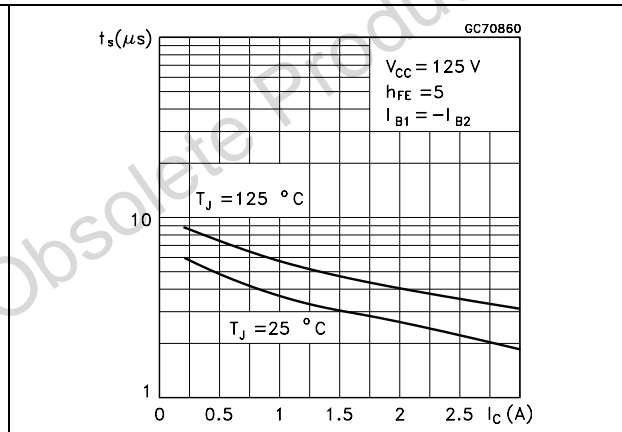
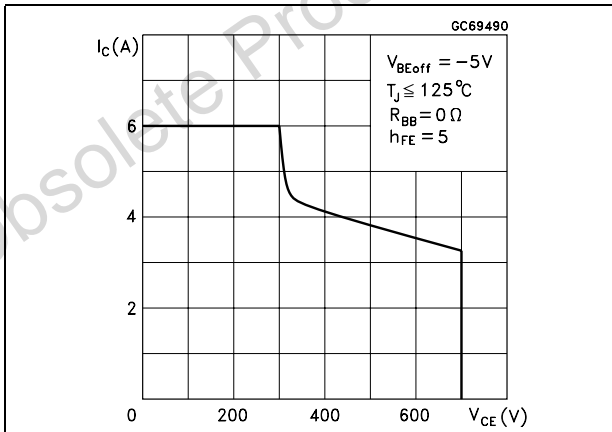
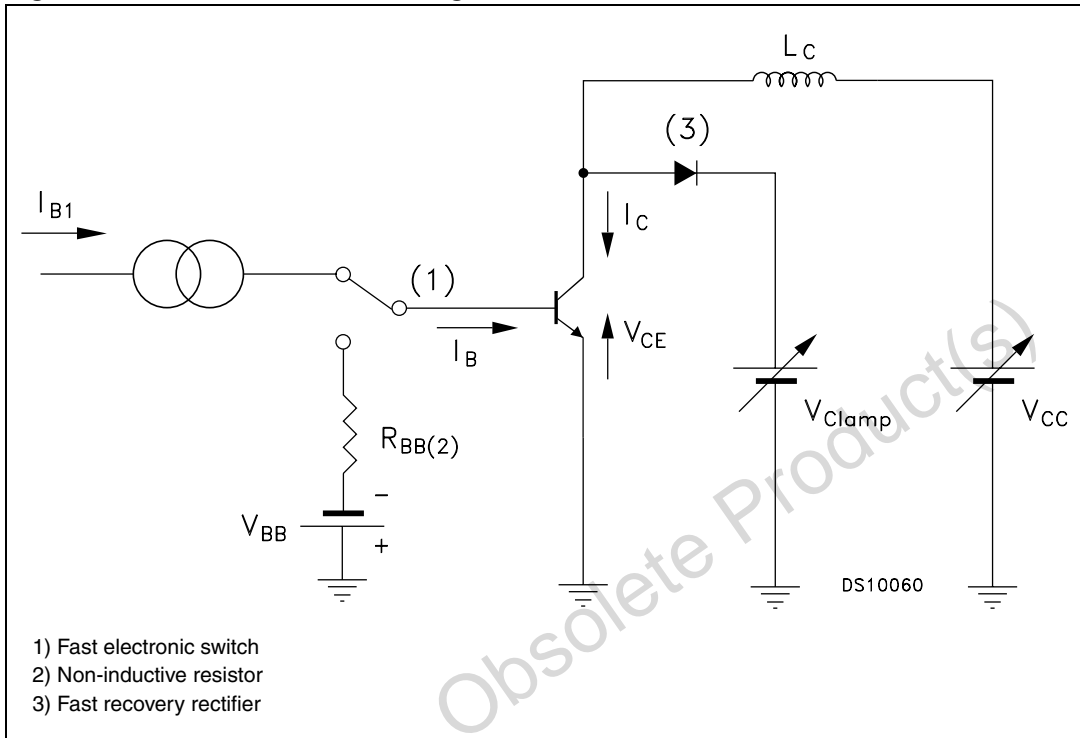


Figure 12. Reverse biased operating area



2.2 Test circuits

Figure 13. Inductive load switching test circuit



3 Package mechanical data

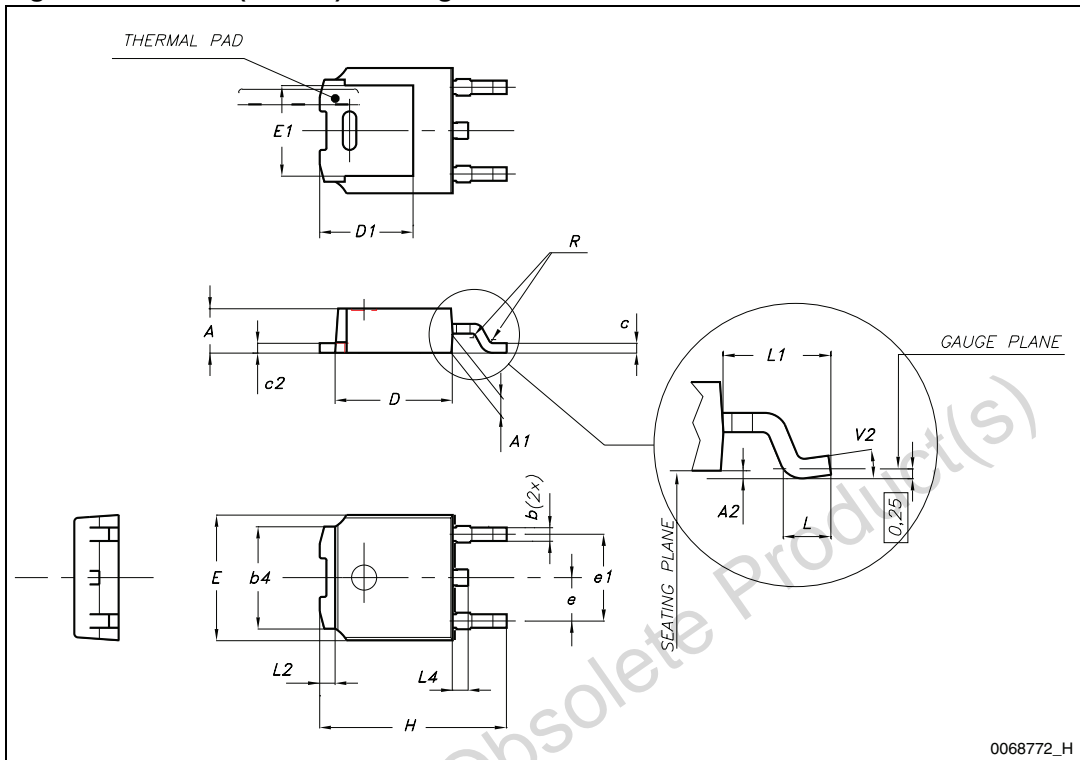
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Table 4. DPAK (TO-252) mechanical data

| Dim. | mm | | |
|------|------|------|-------|
| | Min. | Typ. | Max. |
| A | 2.20 | | 2.40 |
| A1 | 0.90 | | 1.10 |
| A2 | 0.03 | | 0.23 |
| b | 0.64 | | 0.90 |
| b4 | 5.20 | | 5.40 |
| c | 0.45 | | 0.60 |
| c2 | 0.48 | | 0.60 |
| D | 6.00 | | 6.20 |
| D1 | | 5.10 | |
| E | 6.40 | | 6.60 |
| E1 | | 4.70 | |
| e | | 2.28 | |
| e1 | 4.40 | | 4.60 |
| H | 9.35 | | 10.10 |
| L | 1 | | 1.50 |
| L1 | | 2.80 | |
| L2 | | 0.80 | |
| L4 | 0.60 | | 1 |
| R | | 0.20 | |
| V2 | 0° | | 8° |

Figure 14. DPAK (TO-252) drawing



4 Revision history

Table 5. Document revision history

| Date | Revision | Changes |
|-------------|----------|---------------|
| 28-Jun-2011 | 1 | First release |

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