

High voltage fast-switching NPN power transistor

Features

- High voltage capability
- Low spread of dynamic parameters
- Very high switching speed

Application

- Compact fluorescent lamps (CFLs)

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.

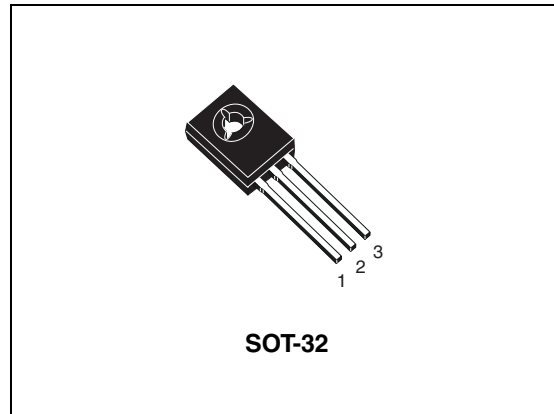


Figure 1. Internal schematic diagram

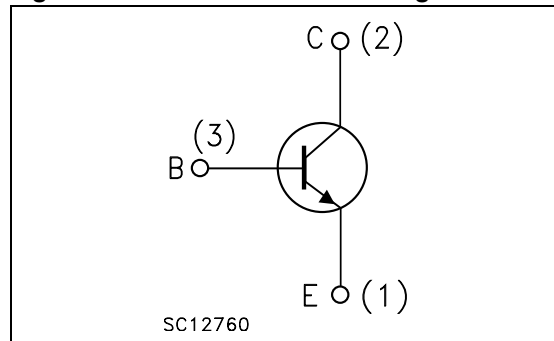


Table 1. Device summary

| Order code | Marking | Package | Packaging |
|------------|---------|---------|-----------|
| ST13003N | 13003N | SOT-32 | BAG |

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} | Collector-base voltage ($I_C = 0$) | 9 | V |
| I_C | Collector current | 1 | A |
| I_{CM} | Collector peak current ($t_P < 5$ ms) | 2 | A |
| I_B | Base current | 0.5 | A |
| I_{BM} | Base peak current ($t_P < 5$ ms) | 1 | A |
| P_{TOT} | Total dissipation at $T_c = 25$ °C | 20 | W |
| T_{STG} | Storage temperature | -55 to 150 | °C |
| T_J | Max. operating junction temperature | 150 | |

Table 3. Thermal data

| Symbol | Parameter | Value | Unit |
|------------|----------------------------------|-------|------|
| R_{thJC} | Thermal resistance junction-case | 6.25 | °C/W |

2 Electrical characteristics

$T_{\text{case}} = 25\text{ }^{\circ}\text{C}$; 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 |
| | | $V_{\text{CE}} = 700\text{ V}$ $T_{\text{C}} = 125\text{ }^{\circ}\text{C}$ | | | 5 | mA |
| I_{EBO} | Emitter cut-off current ($I_{\text{C}} = 0$) | $V_{\text{EB}} = 9\text{ V}$ | | | 1 | mA |
| $V_{\text{CEQ(sus)}}^{(1)}$ | 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 | $I_{\text{C}} = 0.5\text{ A}$ $I_{\text{B}} = 125\text{ mA}$ | | | 0.7 | V |
| | | $I_{\text{C}} = 1\text{ A}$ $I_{\text{B}} = 330\text{ mA}$ | | | 1.2 | V |
| $V_{\text{BE(sat)}}^{(1)}$ | Base-emitter saturation voltage | $I_{\text{C}} = 0.5\text{ A}$ $I_{\text{B}} = 125\text{ mA}$ | | | 1.2 | V |
| | | $I_{\text{C}} = 1\text{ A}$ $I_{\text{B}} = 330\text{ mA}$ | | | 1.3 | V |
| h_{FE} | DC current gain | $I_{\text{C}} = 0.5\text{ A}$, $V_{\text{CE}} = 2\text{ V}$ | 6 | | 18 | |
| | | $I_{\text{C}} = 1\text{ A}$ $V_{\text{CE}} = 10\text{ V}$ | 5 | | 15 | |
| t_{s} t_{f} | Inductive Load Storage time Fall time | $I_{\text{C}} = 0.4\text{ A}$ $V_{\text{clamp}} = 300\text{ V}$ $I_{\text{B(on)}} = -I_{\text{B(off)}} = 80\text{ mA}$ $V_{\text{BB(off)}} = -5\text{ V}$ <i>Figure 8</i> | | 2.5 | | μs |
| | | | | 180 | | ns |

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

2.1 Electrical characteristics (curves)

Figure 2. Derating curve

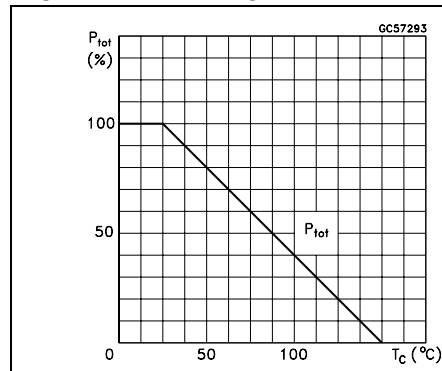


Figure 3. DC current gain ($V_{\text{CE}} = 3\text{ V}$)

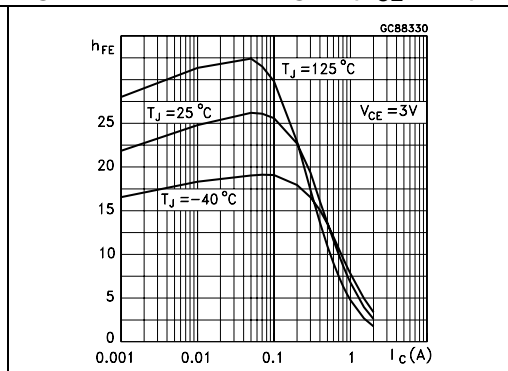


Figure 4. DC current gain ($V_{CE} = 5\text{ V}$)

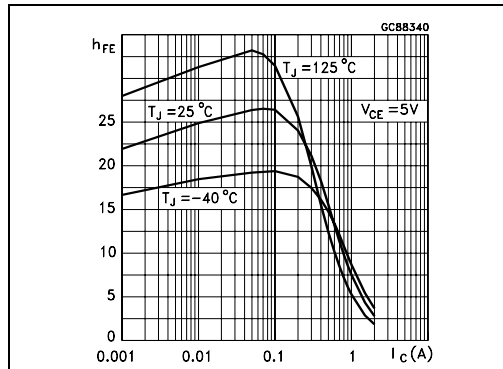


Figure 5. Collector-emitter saturation voltage

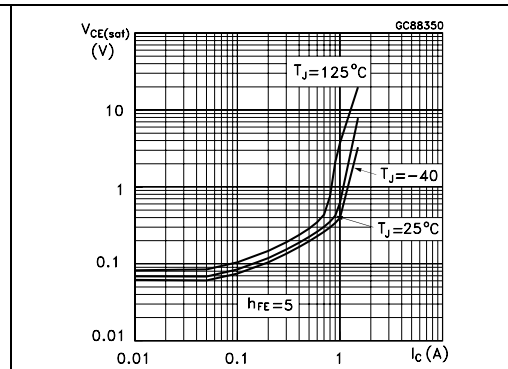


Figure 6. Base-emitter saturation voltage

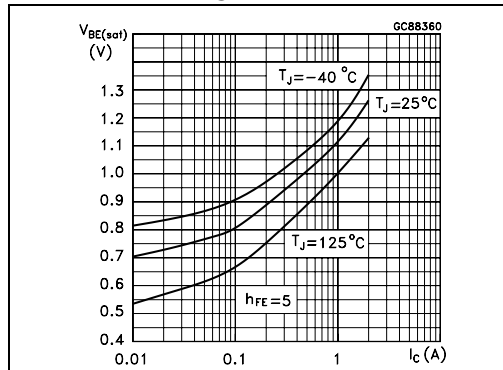
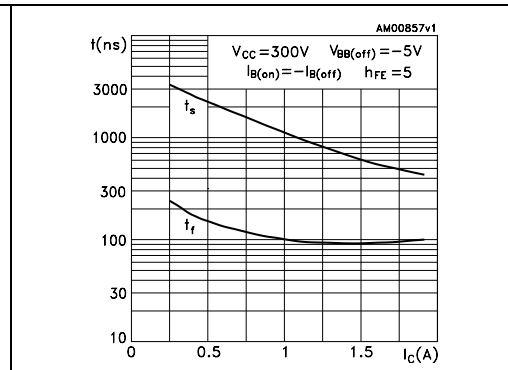
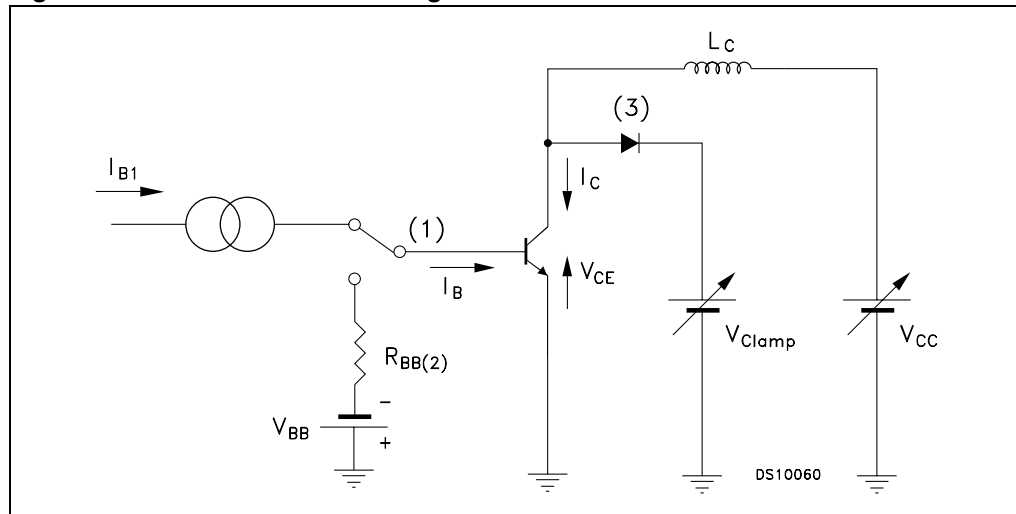


Figure 7. Switching time inductive load



2.2 Test circuit

Figure 8. Inductive load switching test circuit



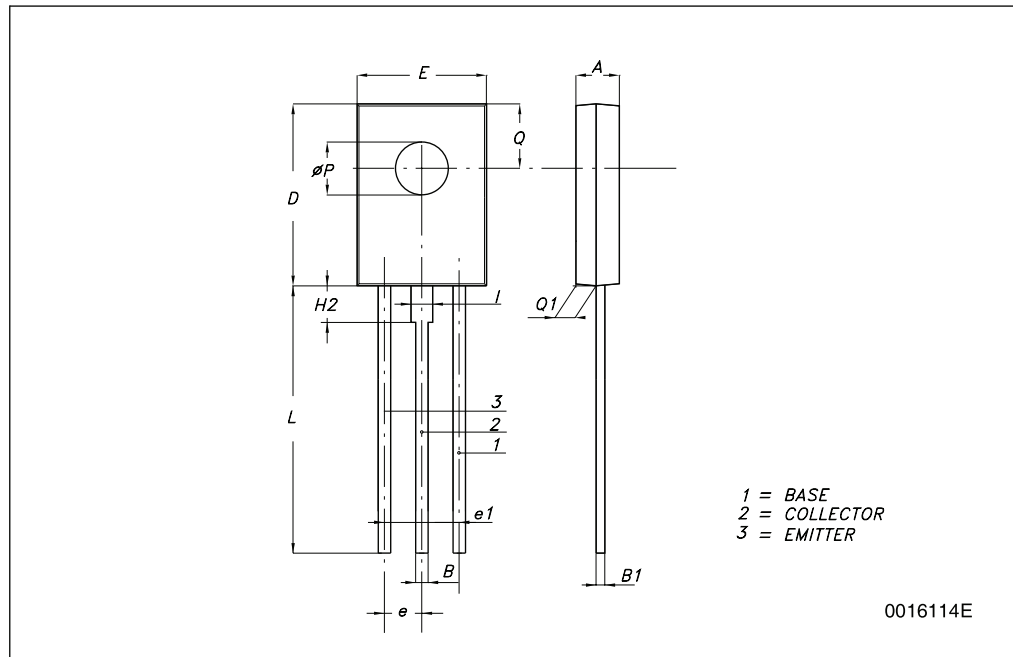
1. Fast electronic switch
2. Non-inductive resistor
3. Fast recovery rectifier

3 Package mechanical data

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SOT-32 (TO-126) MECHANICAL DATA

| DIM. | mm. | | |
|------|------|------|-------|
| | MIN. | TYP | MAX. |
| A | 2.4 | | 2.9 |
| B | 0.64 | | 0.88 |
| B1 | 0.39 | | 0.63 |
| D | 10.5 | | 11.05 |
| E | 7.4 | | 7.8 |
| e | 2.04 | 2.29 | 2.54 |
| e1 | 4.07 | 4.58 | 5.08 |
| L | 15.3 | | 16 |
| P | 2.9 | | 3.2 |
| Q | | 3.8 | |
| Q1 | 1 | | 1.52 |
| H2 | | 2.15 | |
| I | | 1.27 | |



4 Revision history

Table 5. Document revision history

| Date | Revision | Changes |
|-------------|----------|--|
| 26-May-2009 | 1 | First release. |
| 25-Feb-2010 | 2 | Updated Figure 1 on page 1 . |

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