

High voltage fast-switching NPN power transistor

Features

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

Applications

- Compact fluorescent lamps (CFLs)
- SMPS for battery charger

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 STBV42G and STBV42G-AP are supplied using halogen-free molding compound.

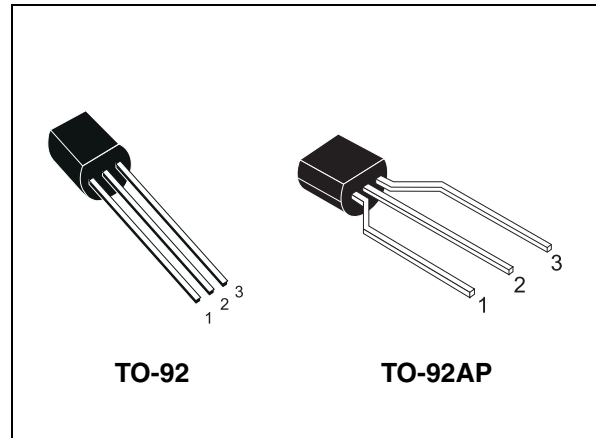


Figure 1. Internal schematic diagram

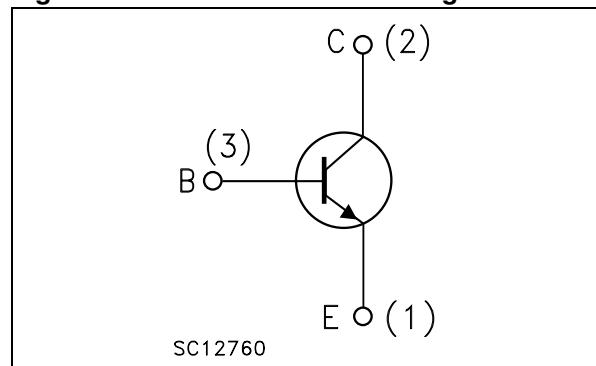


Table 1. Device summary

| Order codes | Marking | Package | Packaging |
|-------------|---------|---------|-----------|
| STBV42 | BV42 | TO-92 | Bulk |
| STBV42-AP | BV42 | TO-92AP | Ammopack |
| STBV42G | BV42G | TO-92 | Bulk |
| STBV42G-AP | BV42G | TO-92AP | Ammopack |

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 ($I_C = 0$) | 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 | 1 | W |
| T_{stg} | Storage temperature | -65 to 150 | °C |
| T_J | Max. operating junction temperature | 150 | |

Table 3. Thermal data

| Symbol | Parameter | Value | Unit |
|------------|--------------------------------------|-------|------|
| R_{thJC} | Thermal resistance junction-case max | 125 | °C/W |

2 Electrical characteristics

($T_C = 25\text{ }^\circ\text{C}$; unless otherwise specified)

Table 4. Electrical characteristics

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|----------------------|--|--|------|------|------|---------------|
| I_{CES} | Collector cut-off current ($V_{BE} = 0$) | $V_{CE} = 700\text{ V}$ | | | 1 | mA |
| | | $V_{CE} = 700\text{ V}$ $T_C = 125\text{ }^\circ\text{C}$ | | | 5 | mA |
| I_{EBO} | Emitter cut-off current ($I_C = 0$) | $V_{EB} = 9\text{ V}$ | | | 1 | mA |
| $V_{CEO(sus)}^{(1)}$ | Collector-emitter sustaining voltage ($I_B = 0$) | $I_C = 1\text{ mA}$ | 400 | | | V |
| $V_{CE(sat)}^{(1)}$ | Collector-emitter saturation voltage | $I_C = 0.25\text{ A}$ $I_B = 50\text{ mA}$ | | 0.2 | 0.5 | V |
| | | $I_C = 0.5\text{ A}$ $I_B = 125\text{ mA}$ | | 0.3 | 1 | V |
| | | $I_C = 0.75\text{ A}$ $I_B = 250\text{ mA}$ | | 0.4 | 1.5 | V |
| $V_{BE(sat)}^{(1)}$ | Base-emitter saturation voltage | $I_C = 0.25\text{ A}$ $I_B = 50\text{ mA}$ | | | 1 | V |
| | | $I_C = 0.5\text{ A}$ $I_B = 125\text{ mA}$ | | | 1.2 | V |
| $h_{FE}^{(1)}$ | DC current gain | $I_C = 0.5\text{ mA}$ $V_{CE} = 2\text{ V}$ | 12 | | | |
| | | $I_C = 0.4\text{ A}$ $V_{CE} = 5\text{ V}$ | 10 | | 30 | |
| | | $I_C = 0.8\text{ A}$ $V_{CE} = 5\text{ V}$ | 5 | | 20 | |
| t_f | Inductive Load Fall time | $I_C = 0.25\text{ A}$ $V_{clamp} = 300\text{ V}$ $I_{B1} = -I_{B2} = 50\text{ mA}$ $L = 3\text{ mH}$ <i>Figure 9</i> | | 0.3 | | μs |

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

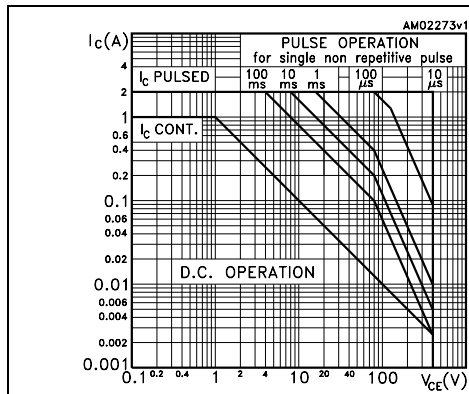


Figure 3. Derating curve

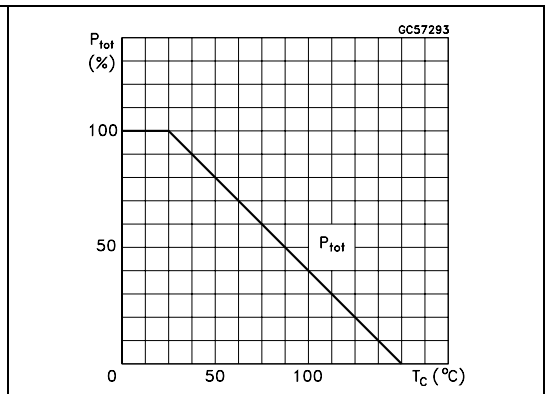


Figure 4. DC current gain ($V_{CE} = 3\text{ V}$)

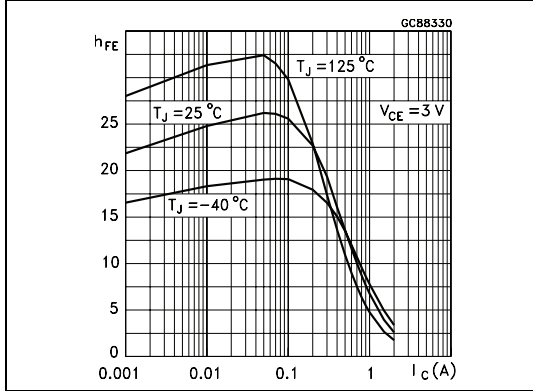


Figure 5. DC current gain ($V_{CE} = 5\text{ V}$)

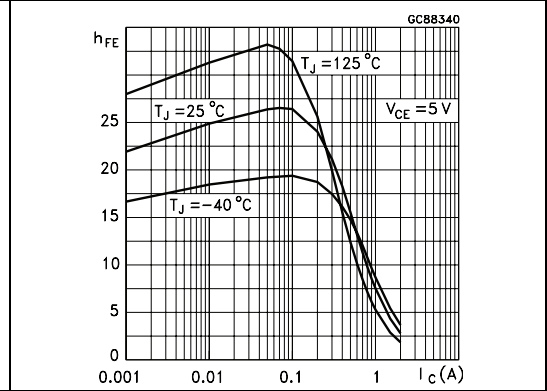


Figure 6. Collector-emitter saturation voltage

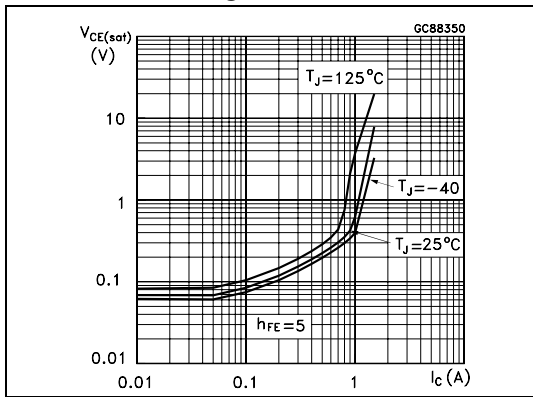


Figure 7. Base-emitter saturation voltage

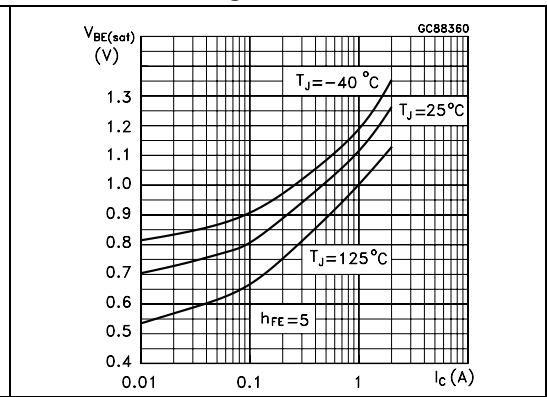
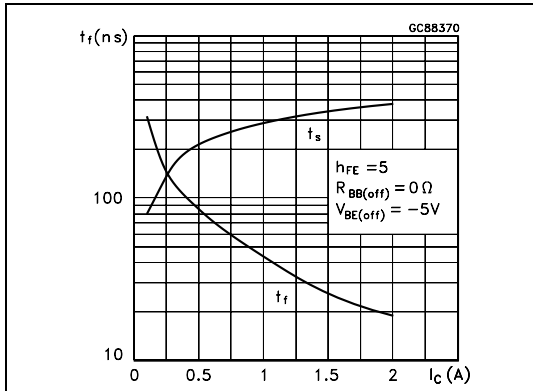
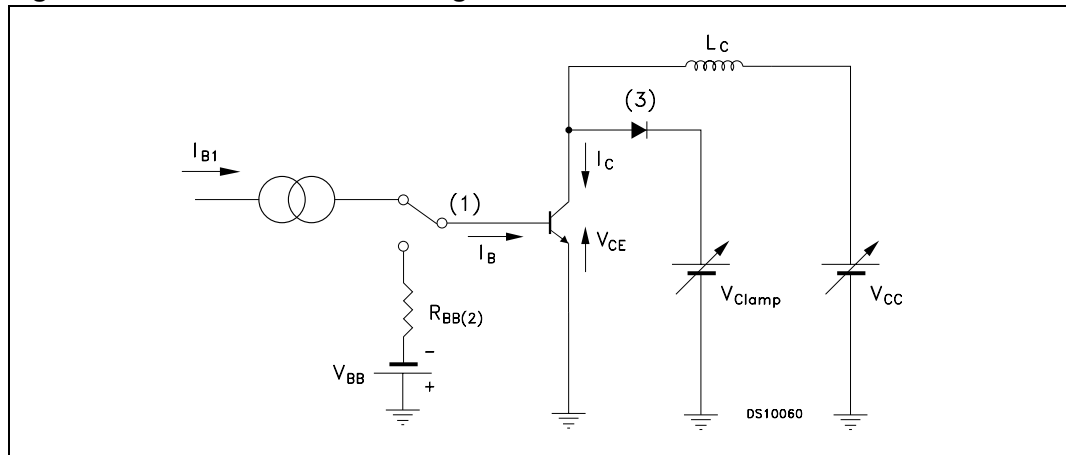


Figure 8. Switching time inductive load



2.2 Test circuit

Figure 9. Inductive load switching test circuit



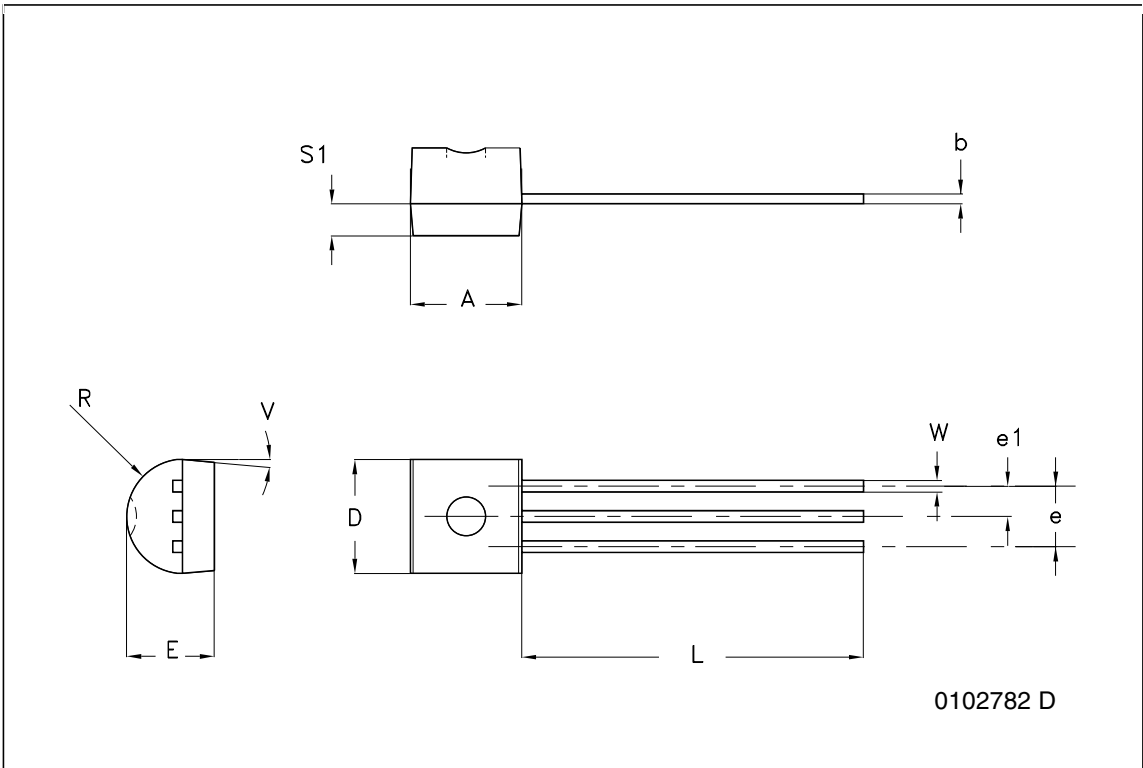
1. Fast electronic switch
2. Non-inductive resistor
3. Fast recovery rectifier

3 Package mechanical data

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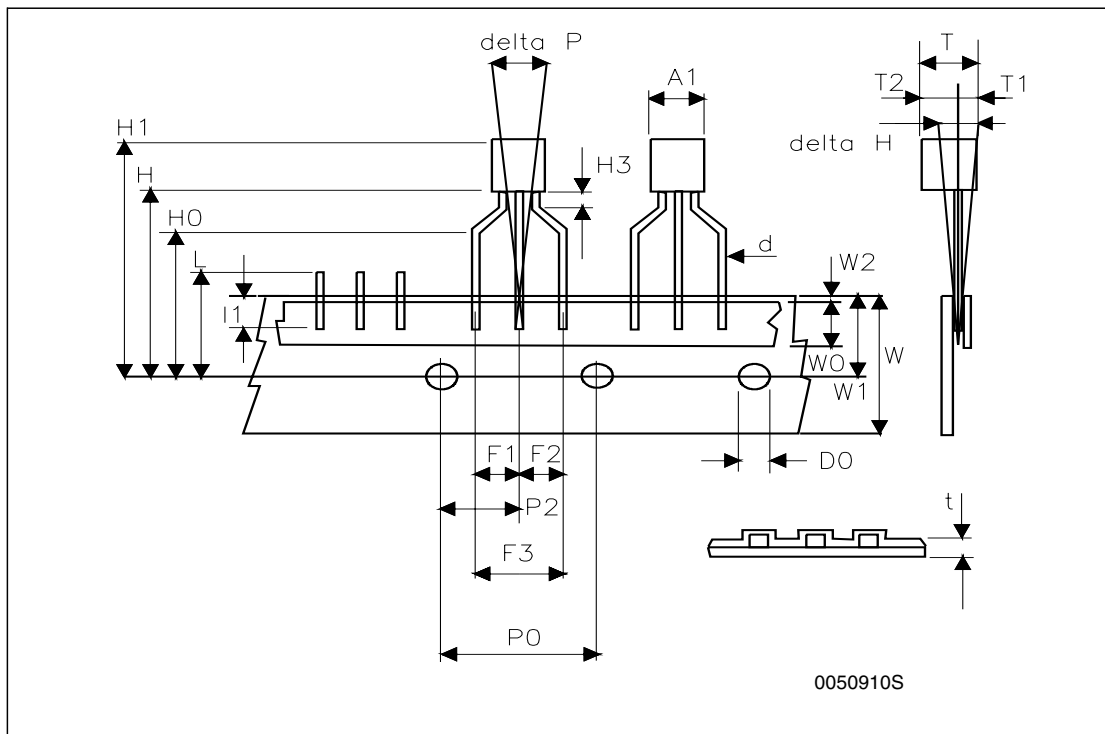
TO-92 bulk shipment mechanical data

| DIM. | mm. | | |
|------|-------|-----|-------|
| | MIN. | TYP | MAX. |
| A | 4.32 | | 4.95 |
| b | 0.36 | | 0.51 |
| D | 4.45 | | 4.95 |
| E | 3.30 | | 3.94 |
| e | 2.41 | | 2.67 |
| e1 | 1.14 | | 1.40 |
| L | 12.70 | | 15.49 |
| R | 2.16 | | 2.41 |
| S1 | 0.92 | | 1.52 |
| W | 0.41 | | 0.56 |
| V | | 5° | |



TO-92 ammopack shipment (suffix"-AP") mechanical data

| Dim. | mm | | |
|---------|-------|-------|-------|
| | Min | Typ | Max |
| A1 | | | 4.80 |
| T | | | 3.80 |
| T1 | | | 1.60 |
| T2 | | | 2.30 |
| d | | | 0.48 |
| P0 | 12.50 | 12.70 | 12.90 |
| P2 | 5.65 | 6.35 | 7.05 |
| F1,F2 | 2.44 | 2.54 | 2.94 |
| F3 | 4.98 | 5.08 | 5.48 |
| delta H | -2.00 | | 2.00 |
| W | 17.50 | 18.00 | 19.00 |
| W0 | 5.70 | 6.00 | 6.30 |
| W1 | 8.50 | 9.00 | 9.25 |
| W2 | | | 0.50 |
| H | 18.50 | | 20.50 |
| H3 | 0.5 | 1 | 1.5 |
| H0 | 15.50 | 16.00 | 16.50 |
| H1 | | | 25.00 |
| D0 | 3.80 | 4.00 | 4.20 |
| t | | | 0.90 |
| L | | | 11.00 |
| I1 | 3.00 | | |
| delta P | -1.00 | | 1.00 |



4 Revision history

Table 5. Document revision history

| Date | Revision | Changes |
|-------------|----------|---|
| 06-Sep-2001 | 3 | Document migration, no content change. |
| 03-Jul-2008 | 4 | Added halogen-free molding compound package. |
| 21-Oct-2008 | 5 | Updated Table 2 on page 2 and Table 4 on page 3 . |
| 29-Jul-2009 | 6 | Updated safe operating area Figure 2 on page 3 . |

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