

Low voltage fast-switching NPN power transistors

Features

- Very low collector-emitter saturation voltage
- High current gain characteristic
- Fast-switching speed

Applications

- Emergency lighting
- LED
- Voltage regulation
- Relay drive

Description

The devices are NPN transistors manufactured using new "PB-HCD" (power bipolar high current density) technology. The resulting transistor shows exceptional high gain performances coupled with very low saturation voltage.

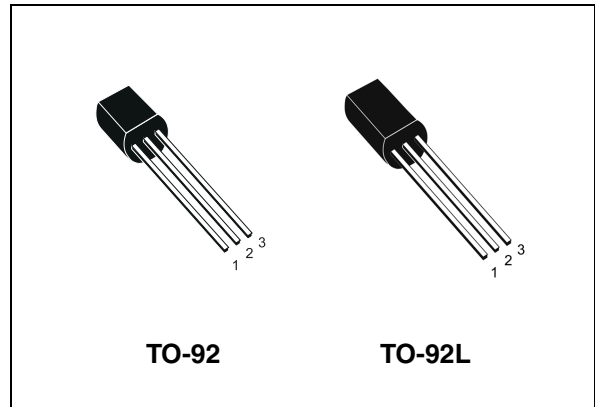


Figure 1. Internal schematic diagram

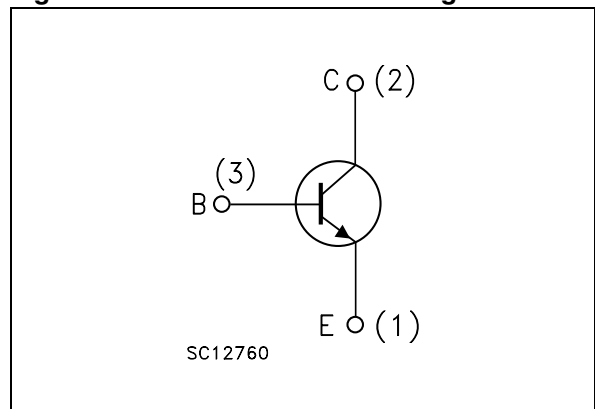


Table 1. Device summary

| Order codes | Marking | Packages | Packaging |
|-------------|---------|----------|-----------|
| 2STL1360 | L1360 | TO-92L | Bag |
| 2STX1360 | X1360 | TO-92 | Bag |

1 Electrical ratings

Table 2. Absolute maximum ratings

| Symbol | Parameter | Value | | Unit |
|-----------|---|------------|----------|------|
| | | 2STX1360 | 2STL1360 | |
| 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 ($t_P < 5$ ms) | 5 | | A |
| I_B | Base current | 0.2 | | A |
| I_{BM} | Base peak current ($t_P < 5$ ms) | 0.4 | | A |
| P_{TOT} | Total dissipation at $T_{amb} = 25$ °C | 1 | 1.2 | 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 |
|------------|---|-------|--------|------|
| | | TO-92 | TO-92L | |
| R_{thJA} | Thermal resistance junction-ambient max | 125 | 104 | °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_{CBO} | Collector cut-off current ($I_{\text{E}} = 0$) | $V_{\text{CB}} = 80\text{ V}$ | | | 100 | nA |
| I_{EBO} | Emitter cut-off current ($I_{\text{C}} = 0$) | $V_{\text{EB}} = 6\text{ V}$ | | | 100 | nA |
| $V_{\text{BE(on)}}$ | Base-emitter on voltage | $V_{\text{CE}} = 2\text{ V}$ $I_{\text{C}} = 100\text{ mA}$ | 630 | 650 | 730 | mV |
| $V_{\text{CE(sat)}}^{(1)}$ | Collector-emitter saturation voltage | $I_{\text{C}} = 2\text{ A}$ $I_{\text{B}} = 100\text{ mA}$ | | 130 | 300 | mV |
| | | $I_{\text{C}} = 3\text{ A}$ $I_{\text{B}} = 150\text{ mA}$ | | 180 | 500 | mV |
| $V_{\text{BE(sat)}}^{(1)}$ | 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 | $I_{\text{C}} = 0.1\text{ A}$ $V_{\text{CE}} = 2\text{ V}$ | 80 | | | |
| | | $I_{\text{C}} = 1\text{ A}$ $V_{\text{CE}} = 2\text{ V}$ | 160 | | 400 | |
| t_{d} t_{r} t_{s} t_{f} | RESISTIVE LOAD | | | | | |
| | Delay time | $V_{\text{CC}} = 10\text{ V}$ $I_{\text{C}} = 3\text{ A}$ | | 17 | 20 | ns |
| | Rise time | $I_{\text{B(on)}} = - I_{\text{B(off)}} = 300\text{ mA}$ | | 81 | 100 | ns |
| | Storage time | $V_{\text{BE(off)}} = -5\text{ V}$ | | 620 | 720 | ns |
| t_{f} | Fall time | | | 54 | 65 | ns |
| | | | | | | |
| f_{T} | Transition frequency | $I_{\text{C}} = 0.1\text{ A}$ $V_{\text{CE}} = 10\text{ V}$ | | 130 | | MHz |

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

2.1 Electrical characteristics (curves)

Figure 2. DC current gain ($V_{\text{CE}} = 5\text{ V}$)

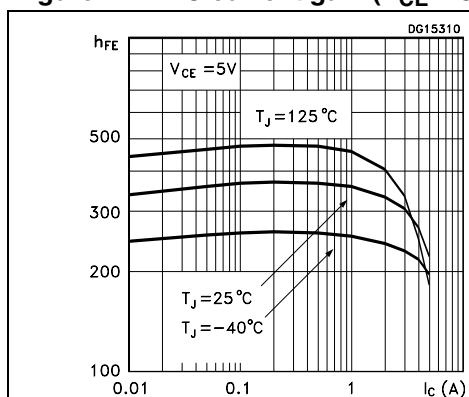


Figure 3. DC current gain ($V_{\text{CE}} = 2\text{ V}$)

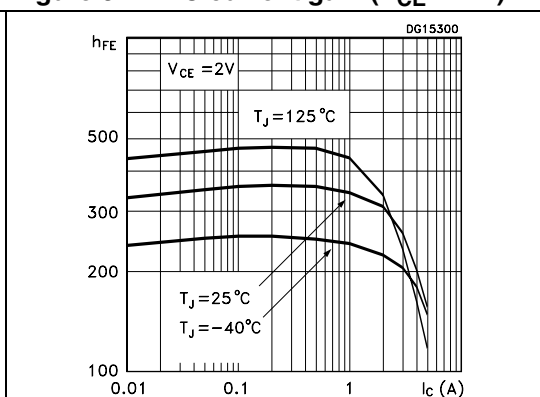


Figure 4. Collector-emitter saturation voltage

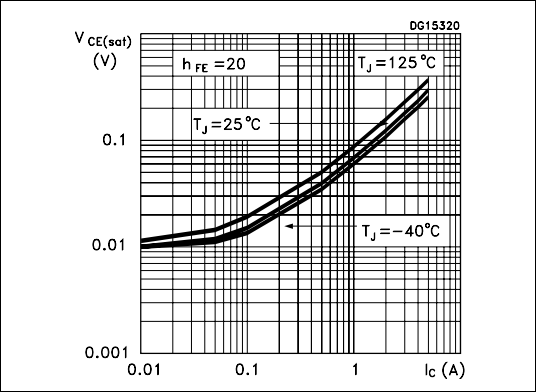


Figure 5. Base-emitter saturation voltage

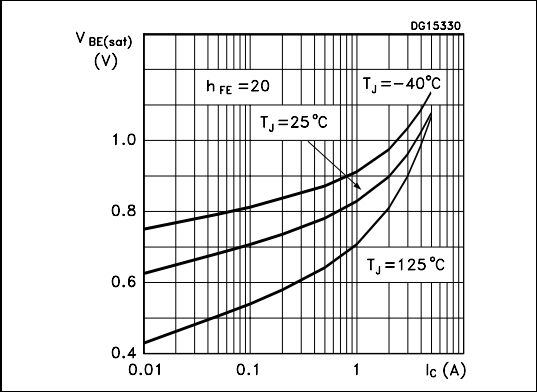


Figure 6. Resistive load switching time

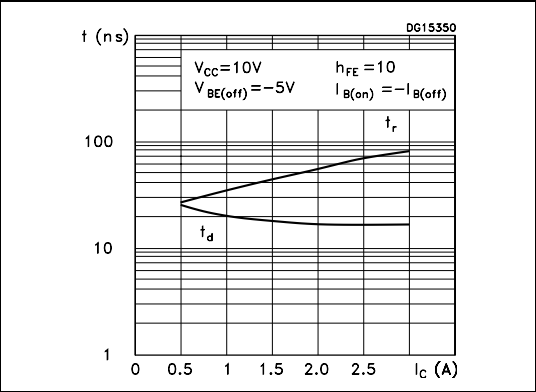


Figure 7. Resistive load switching time

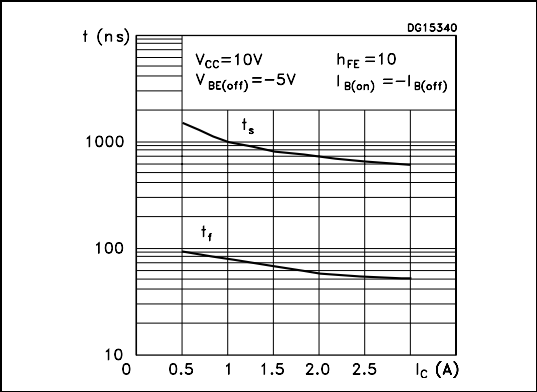
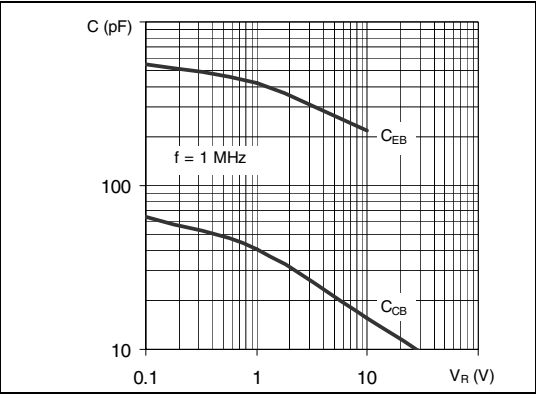
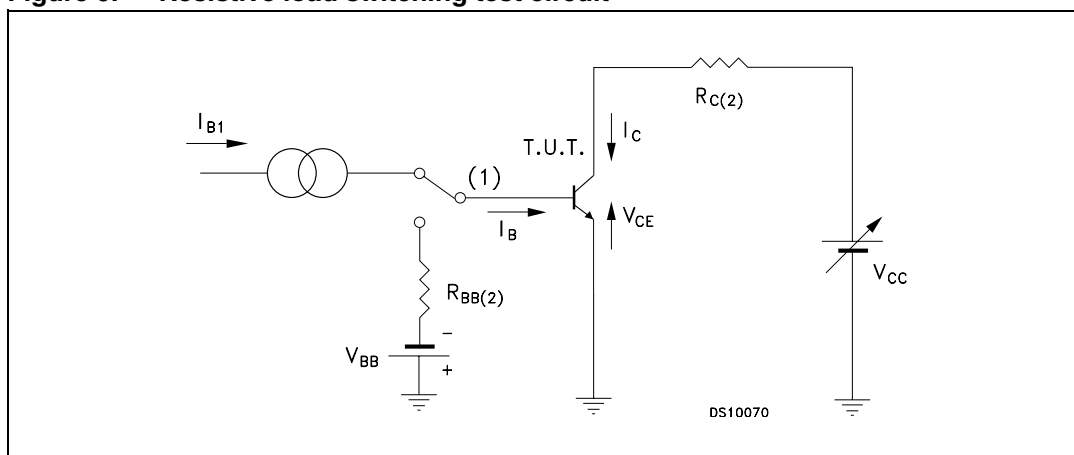


Figure 8. Capacitance



2.2 Test circuit

Figure 9. Resistive load switching test circuit



1. Fast electronic switch
2. Non-inductive resistor

3 Package mechanical data

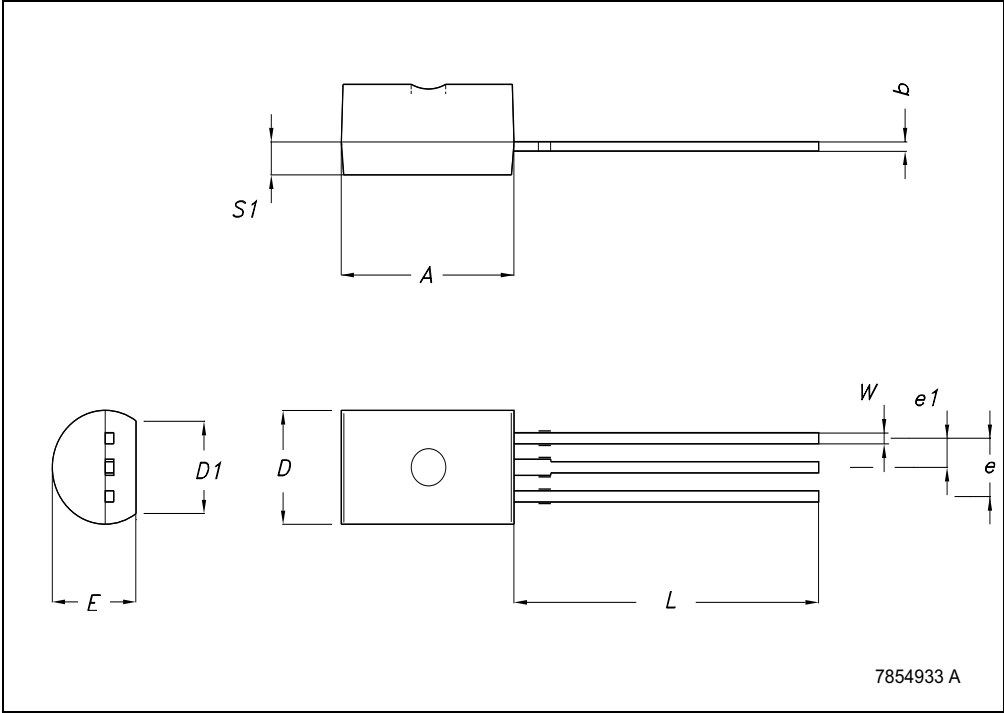
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| TO-92 bulk shipment mechanical data | | | |
|-------------------------------------|-------|-----|-------|
| DIM. | mm. | | |
| | MIN. | TYP | MAX. |
| A | 4.32 | | 4.95 |
| b | 0.36 | | 0.51 |
| D | 4.45 | | 4.95 |
| E | 3.30 | | 3.94 |
| e | 2.41 | | 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° | |

The diagram illustrates the mechanical specifications of a TO-92 package through three views: a top view, a side view, and a front view. The top view shows the width (A) and the distance from the base to the top of the package (S1). The side view shows the height (D) and the distance from the base to the top of the package (E). The front view shows the length (L), the distance from the base to the top of the package (R), the distance from the base to the top of the package (V), the distance from the base to the top of the package (W), the distance from the base to the top of the package (e1), and the distance from the base to the top of the package (e). The package is labeled with the part number 0102782 D.

TO-92L MECHANICAL DATA

| DIM. | mm. | | |
|------|-------|------|-------|
| | MIN. | TYP | MAX. |
| A | 7.80 | | 8.20 |
| b | 0.35 | | 0.45 |
| D | 4.70 | | 5.10 |
| D1 | | 4 | |
| E | 3.70 | | 4.10 |
| e | 2.44 | | 2.64 |
| e1 | | 1.27 | |
| L | 13.30 | | 14.30 |
| S1 | 1.28 | | 1.58 |
| W | 0.35 | | 0.55 |



4 Revision history

Table 5. Document revision history

| Date | Revision | Changes |
|-------------|----------|--|
| 20-Oct-2006 | 1 | Initial release |
| 16-Jul-2007 | 2 | Added figures 2, 3, 4, 5, 6, 7 and 8 |
| 29-Oct-2009 | 3 | Updated Figure 8 on page 4 and TO-92 package mechanical data |

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