

## High voltage fast-switching PNP power transistor

Datasheet — production data

### Features

- High voltage capability
- Fast switching speed

### Applications

- Lighting
- Switch mode power supply

### Description

This device is a high voltage fast-switching PNP power transistor. It is manufactured using high voltage multi epitaxial planar technology for high switching speeds and medium voltage capability. It uses a cellular emitter structure with planar edge termination to enhance switching speeds while maintaining a wide RBSOA. The device is designed for use in lighting applications and low cost switch-mode power supplies.

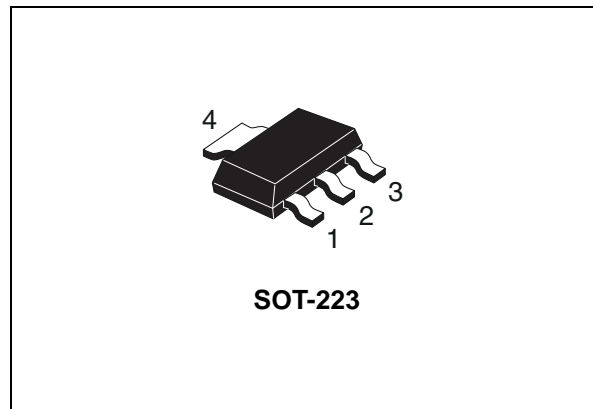


Figure 1. Internal schematic diagram

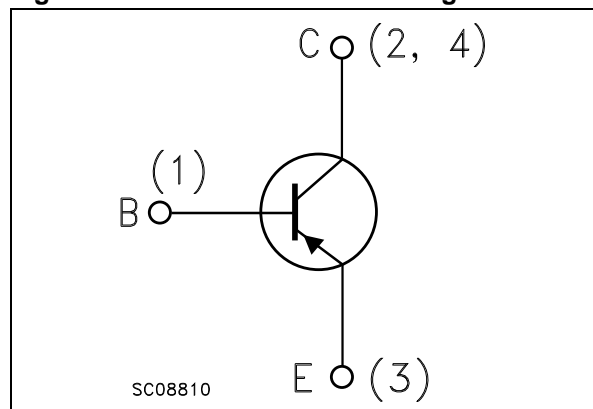


Table 1. Device summary

| Part number | Marking | Package | Packaging     |
|-------------|---------|---------|---------------|
| STN9360     | N9360   | SOT-223 | Tape and reel |

# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

| Symbol    | Parameter                                  | Value      | Unit |
|-----------|--|------------|------|
| $V_{CES}$ | Collector-emitter voltage ( $V_{BE} = 0$ ) | -600       | V    |
| $V_{CEO}$ | Collector-emitter voltage ( $I_B = 0$ )    | -600       | V    |
| $V_{EBO}$ | Emitter-base voltage ( $I_C = 0$ )         | -7         | V    |
| $I_C$     | Collector current                          | -0.5       | A    |
| $I_{CM}$  | Collector peak current ( $t_P < 5$ ms)     | -1         | A    |
| $I_B$     | Base current                               | -0.25      | A    |
| $I_{BM}$  | Base peak current ( $t_P < 5$ ms)          | -0.5       | 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 <sup>(1)</sup> max | 78    | °C/W |

1. Device mounted on PCB area of 1 cm<sup>2</sup>.

## 2 Electrical characteristics

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

**Table 4. Electrical characteristics**

| Symbol                     | Parameter   | Test conditions   | Min.           | Typ. | Max. | Unit          |
|----------------------------|---|---|----------------|------|------|---------------|
| $I_{\text{CES}}$           | Collector cut-off current<br>( $V_{\text{BE}} = 0$ )              | $V_{\text{CE}} = -600\text{ V}$   |                |      | -10  | $\mu\text{A}$ |
| $I_{\text{EBO}}$           | Emitter cut-off current<br>( $I_{\text{C}} = 0$ )                 | $V_{\text{EB}} = -7\text{ V}$   |                |      | -1   | $\mu\text{A}$ |
| $V_{\text{CE(sus)}}^{(1)}$ | Collector-emitter<br>sustaining voltage<br>( $I_{\text{B}} = 0$ ) | $I_{\text{C}} = -10\text{ mA}$  | -600           |      |      | V             |
| $V_{\text{CE(sat)}}^{(1)}$ | Collector-emitter<br>saturation voltage                           | $I_{\text{C}} = -100\text{ mA}$ $I_{\text{B}} = -10\text{ mA}$  |                |      | -0.5 | V             |
| $V_{\text{BE(sat)}}^{(1)}$ | Base-emitter saturation<br>voltage                                | $I_{\text{C}} = -100\text{ mA}$ $I_{\text{B}} = -10\text{ mA}$  |                |      | -1   | V             |
| $h_{\text{FE}}$            | DC current gain   | $I_{\text{C}} = -1\text{ mA}$ $V_{\text{CE}} = -5\text{ V}$<br>$I_{\text{C}} = -10\text{ mA}$ $V_{\text{CE}} = -5\text{ V}$<br>$I_{\text{C}} = -20\text{ mA}$ $V_{\text{CE}} = -5\text{ V}$ | 170<br><br>120 | 200  |      |               |
| $t_{\text{r}}$             | Resistive load<br>Rise time                                       | $V_{\text{CC}} = -200\text{ V}$ , $I_{\text{C}} = -0.1\text{ A}$  |                | 45   |      | ns            |
| $t_{\text{s}}$             | Storage time  | $I_{\text{B1}} = -10\text{ mA}$ , $I_{\text{B2}} = 20\text{ mA}$  |                | 3.15 |      | $\mu\text{s}$ |
| $t_{\text{f}}$             | Fall time   | $T_{\text{p}} = 30\text{ }\mu\text{s}$  |                | 160  |      | 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

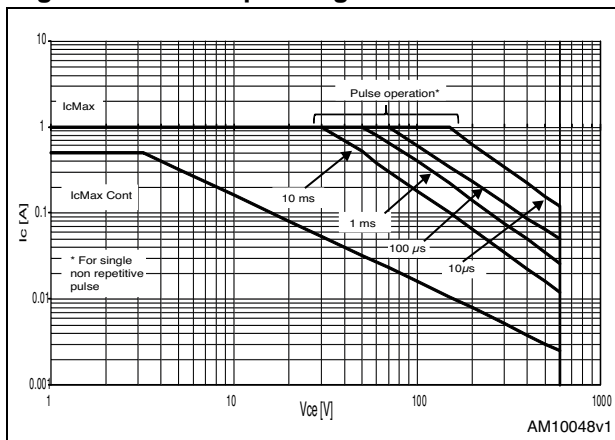


Figure 3. Derating curve

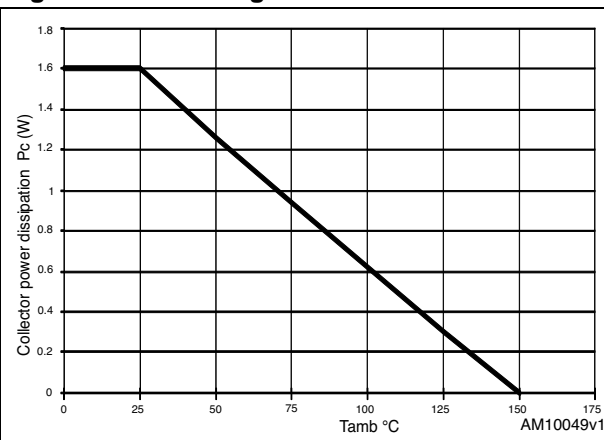


Figure 4. Output curves up to  $V_{CE} = 0.5\text{ V}$

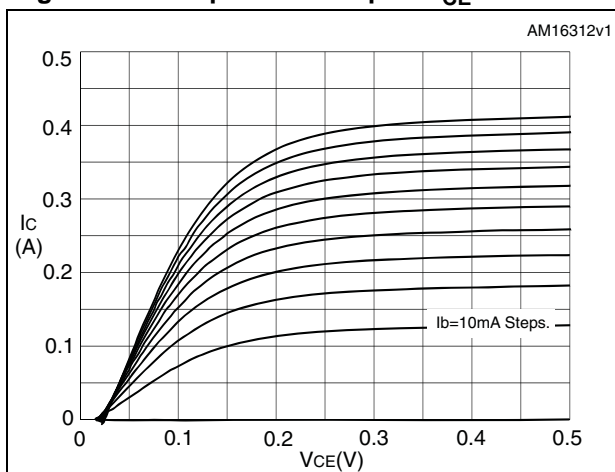


Figure 5. Output curves up to  $V_{CE} = 5\text{ V}$

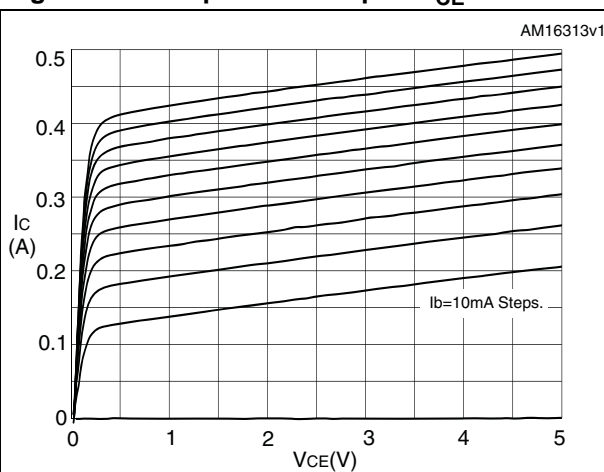


Figure 6. DC current gain ( $V_{CE} = 1\text{ V}$ )

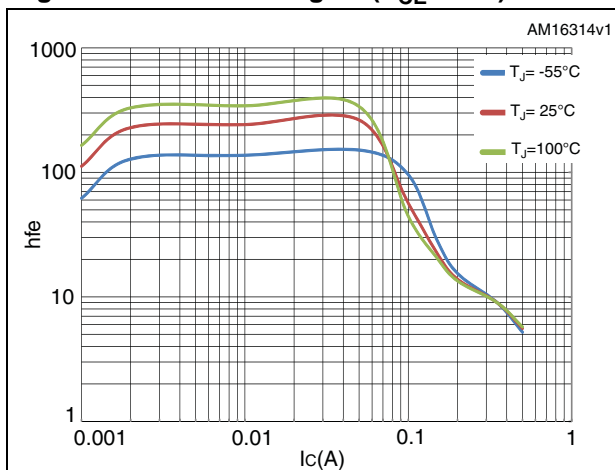


Figure 7. DC current gain ( $V_{CE} = 5\text{ V}$ )

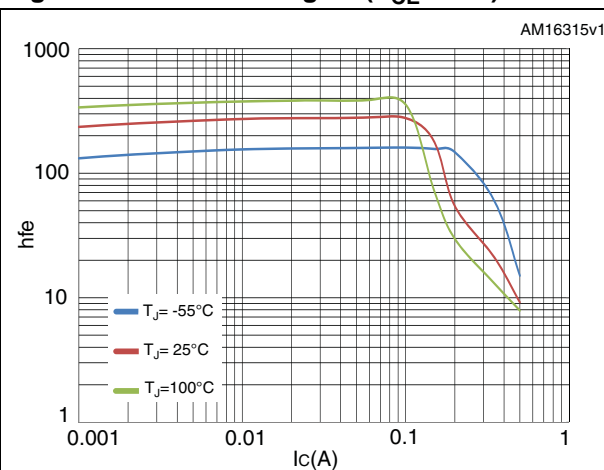


Figure 8. Collector-emitter saturation voltage Figure 9. Base-emitter saturation voltage

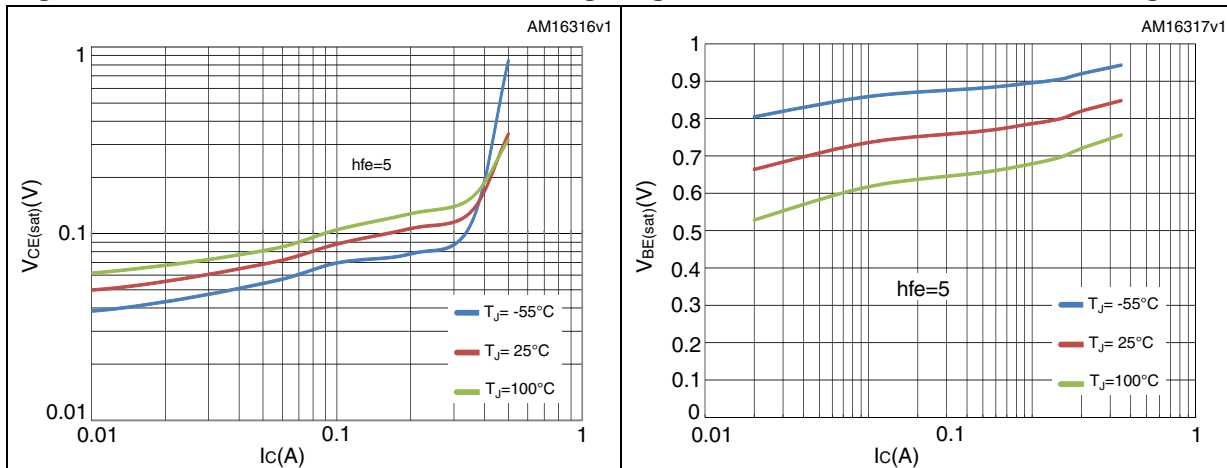


Figure 10. Base-emitter on voltage Figure 11. Capacitance variation

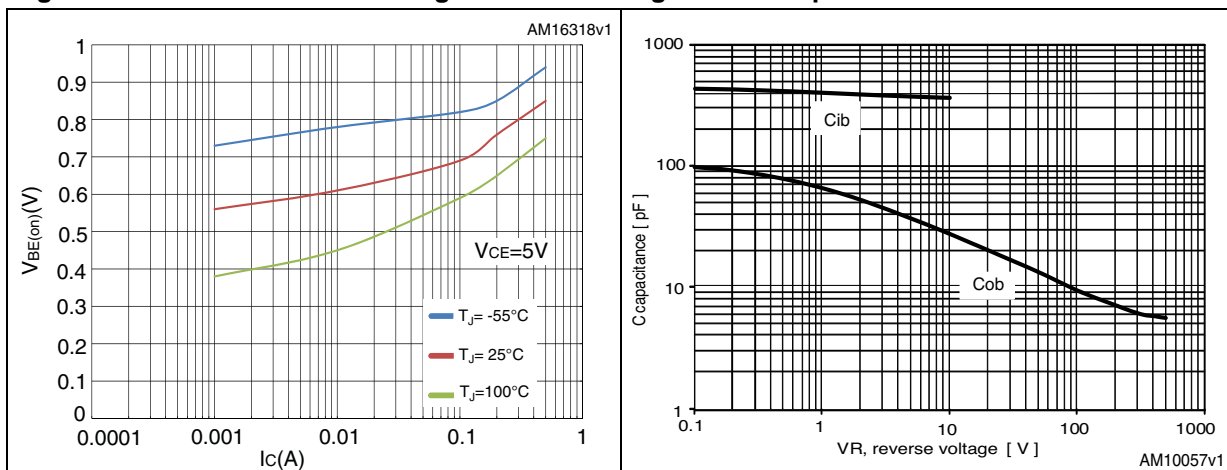
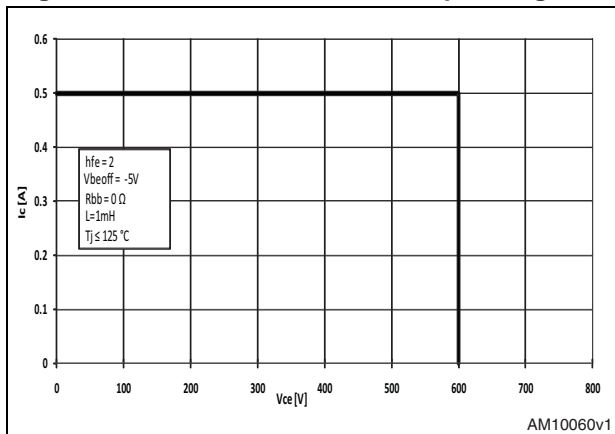
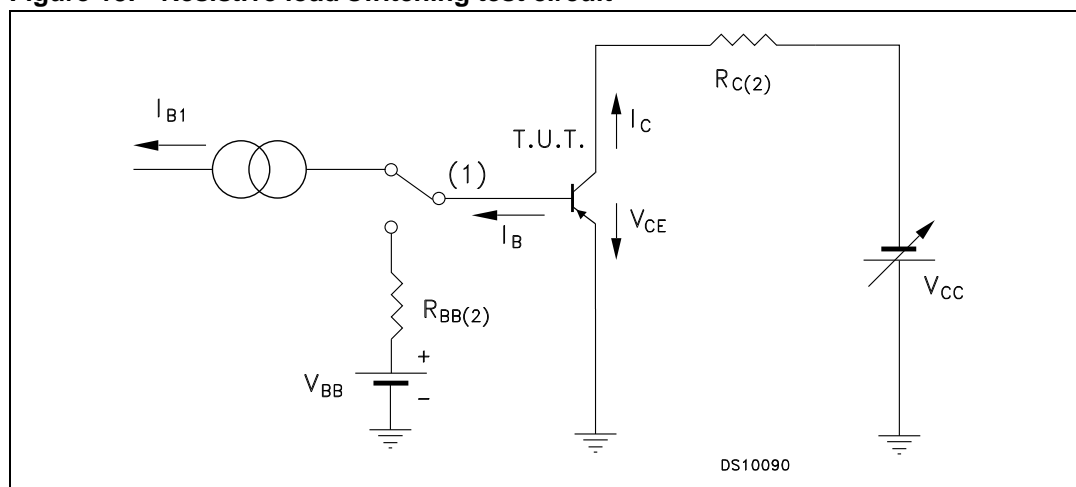


Figure 12. Reverse biased safe operating area



## 2.2 Test circuits

Figure 13. Resistive load switching test circuit



1. Fast electronic switching
2. Non-inductive resistor

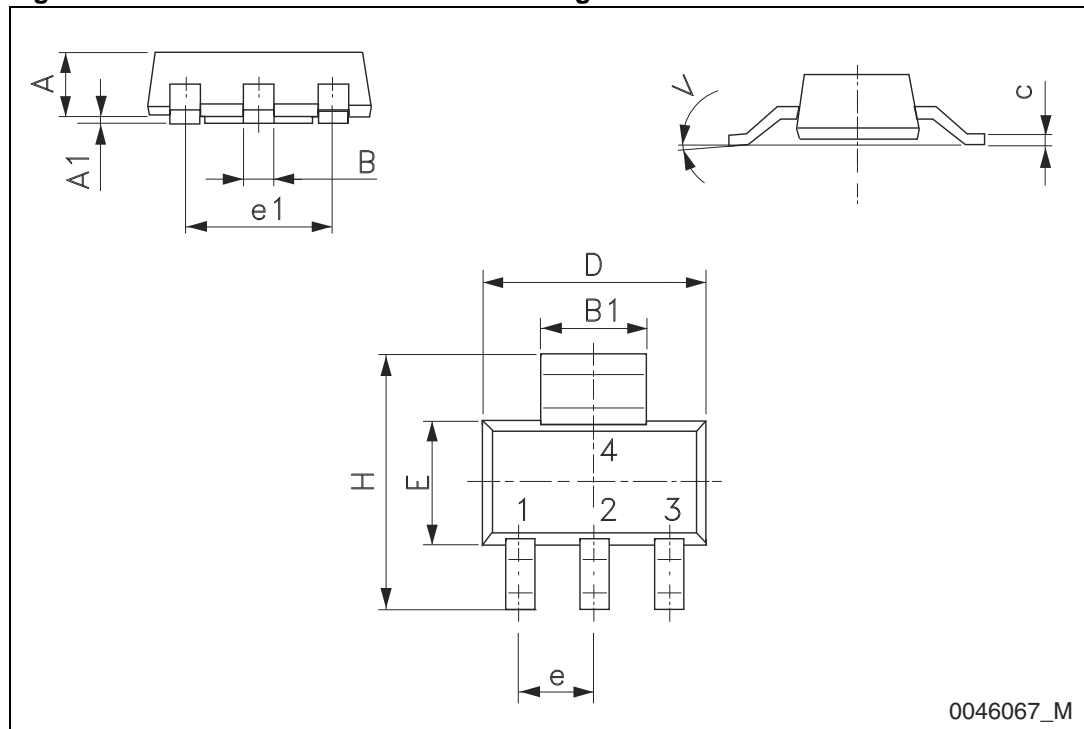
### 3 Package mechanical data

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

Table 5. 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°  |

Figure 14. SOT-223 mechanical data drawing





## 4 Revision history

**Table 6. Document revision history**

| Date        | Revision | Changes  |
|-------------|----------|--|
| 21-May-2012 | 1        | Initial release.   |
| 06-Dec-2012 | 2        | Document status promoted from preliminary data to datasheet. |

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