

## FEATURES

- High current (max. 1 A)
- Low voltage (max. 80 V)
- Integrated diode and resistor.

## APPLICATIONS

- Industrial switching applications such as:
  - Print hammer
  - Solenoid
  - Relay and lamp drivers.

## DESCRIPTION

PNP Darlington transistor in a SOT223 plastic package.

## PINNING

| PIN | DESCRIPTION |
|-----|-------------|
| 1   | base        |
| 2,4 | collector   |
| 3   | emitter     |

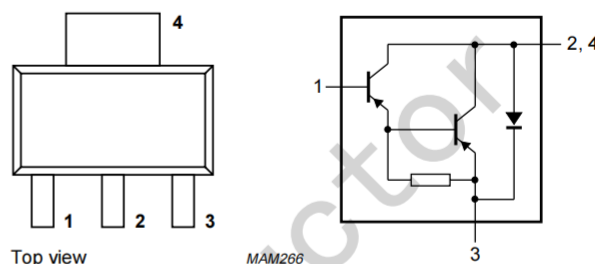


Fig.1 Simplified outline (SOT223) and symbol.

## LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

| SYMBOL    | PARAMETER                     | CONDITIONS                                         | MIN. | MAX. | UNIT               |
|-----------|-------------------------------|----------------------------------------------------|------|------|--------------------|
| $V_{CBO}$ | collector-base voltage        | open emitter                                       | –    | –90  | V                  |
| $V_{CES}$ | collector-emitter voltage     | $V_{BE} = 0$                                       | –    | –80  | V                  |
| $V_{EBO}$ | emitter-base voltage          | open collector                                     | –    | –5   | V                  |
| $I_C$     | collector current (DC)        |                                                    | –    | –1   | A                  |
| $I_{CM}$  | peak collector current        |                                                    | –    | –1.5 | A                  |
| $I_B$     | base current (DC)             |                                                    | –    | –100 | mA                 |
| $P_{tot}$ | total power dissipation       | $T_{amb} \leq 25\text{ }^{\circ}\text{C}$ ; note 1 | –    | 1.25 | W                  |
| $T_{stg}$ | storage temperature           |                                                    | –65  | +150 | $^{\circ}\text{C}$ |
| $T_j$     | junction temperature          |                                                    | –    | 150  | $^{\circ}\text{C}$ |
| $T_{amb}$ | operating ambient temperature |                                                    | –65  | +150 | $^{\circ}\text{C}$ |

## Note

1. Device mounted on a printed-circuit board, single sided copper, tinplated, mounting pad for collector 1 cm<sup>2</sup>. For other mounting conditions, see “Thermal considerations for the SOT223 in the General Part of associated Handbook”.

**THERMAL CHARACTERISTICS**

| SYMBOL        | PARAMETER                                        | CONDITIONS | VALUE | UNIT |
|---------------|--------------------------------------------------|------------|-------|------|
| $R_{th\ j-a}$ | thermal resistance from junction to ambient      | note 1     | 98    | K/W  |
| $R_{th\ j-s}$ | thermal resistance from junction to solder point |            | 17    | K/W  |

**Note**

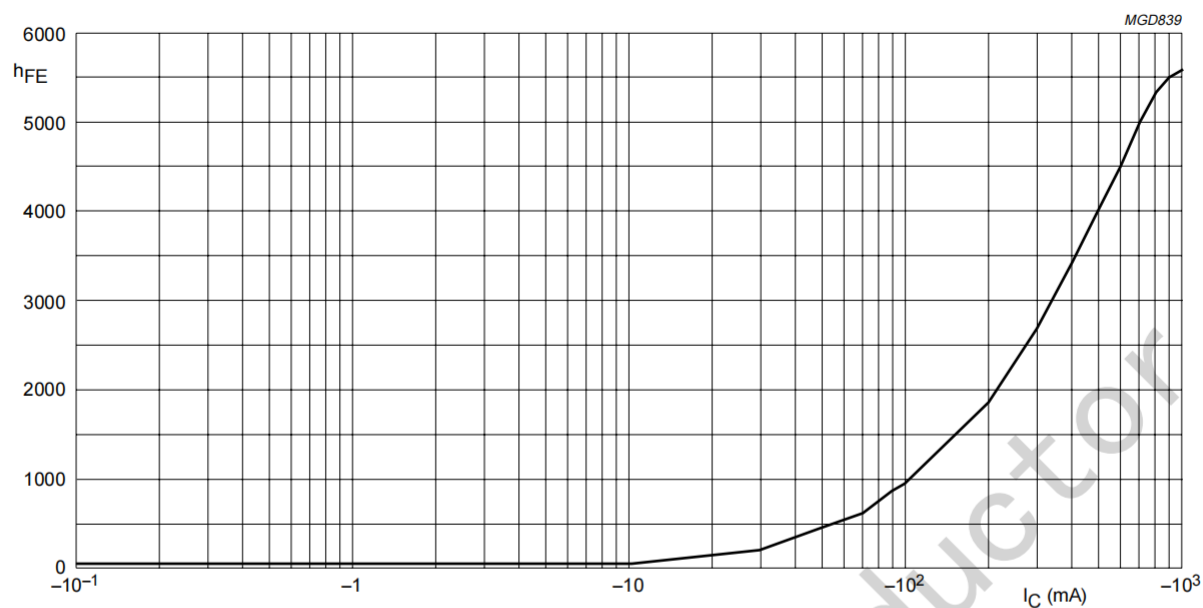
- Device mounted on a printed-circuit board, single sided copper, tinplated, mounting pad for collector 1 cm<sup>2</sup>.  
For other mounting conditions, see "Thermal considerations for the SOT223 in the General Part of associated Handbook".

**CHARACTERISTICS**
 $T_j = 25\ ^\circ\text{C}$  unless otherwise specified.

| SYMBOL                                                         | PARAMETER                            | CONDITIONS                                                                                      | MIN.         | TYP.   | MAX.   | UNIT |
|----------------------------------------------------------------|--------------------------------------|-------------------------------------------------------------------------------------------------|--------------|--------|--------|------|
| $I_{CES}$                                                      | collector cut-off current            | $V_{BE} = 0; V_{CE} = -80\text{ V}$                                                             | –            | –      | –50    | nA   |
| $I_{EBO}$                                                      | emitter cut-off current              | $I_C = 0; V_{EB} = -4\text{ V}$                                                                 | –            | –      | –50    | nA   |
| $h_{FE}$                                                       | DC current gain                      | $V_{CE} = -10\text{ V}$ ; note 1; see Fig.2<br>$I_C = -150\text{ mA}$<br>$I_C = -500\text{ mA}$ | 1000<br>2000 | –<br>– | –<br>– |      |
| $V_{CEsat}$                                                    | collector-emitter saturation voltage | $I_C = -500\text{ mA}; I_B = -0.5\text{ mA}$                                                    | –            | –      | –1.3   | V    |
|                                                                |                                      | $I_C = -500\text{ mA}; I_B = -0.5\text{ mA};$<br>$T_j = 150\ ^\circ\text{C}$                    | –            | –      | –1.3   | V    |
| $V_{BEsat}$                                                    | base-emitter saturation voltage      | $I_C = -500\text{ mA}; I_B = -0.5\text{ mA}$                                                    | –            | –      | –1.9   | V    |
| $f_T$                                                          | transition frequency                 | $I_C = -500\text{ mA}; V_{CE} = -5\text{ V};$<br>$f = 100\text{ MHz}$                           | –            | 200    | –      | MHz  |
| <b>Switching times (between 10% and 90% levels); see Fig.3</b> |                                      |                                                                                                 |              |        |        |      |
| $t_{on}$                                                       | turn-on time                         | $I_{Con} = -500\text{ mA}; I_{Bon} = -0.5\text{ mA};$                                           | –            | 400    | –      | ns   |
| $t_{off}$                                                      | turn-off time                        | $I_{Boff} = 0.5\text{ mA}$                                                                      | –            | 1500   | –      | ns   |

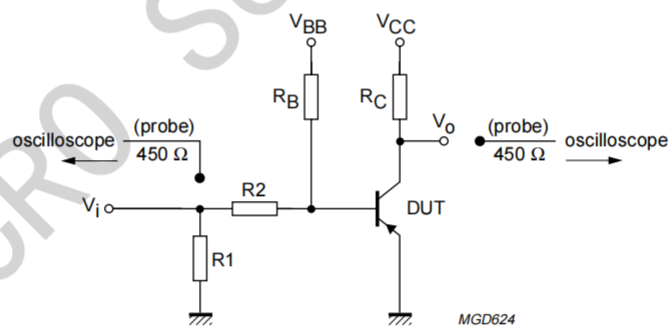
**Note**

- Pulse test:  $t_p \leq 300\ \mu\text{s}$ ;  $\delta \leq 0.02$ .



$V_{CE} = -10 \text{ V}$ .

Fig.2 DC current gain; typical values.

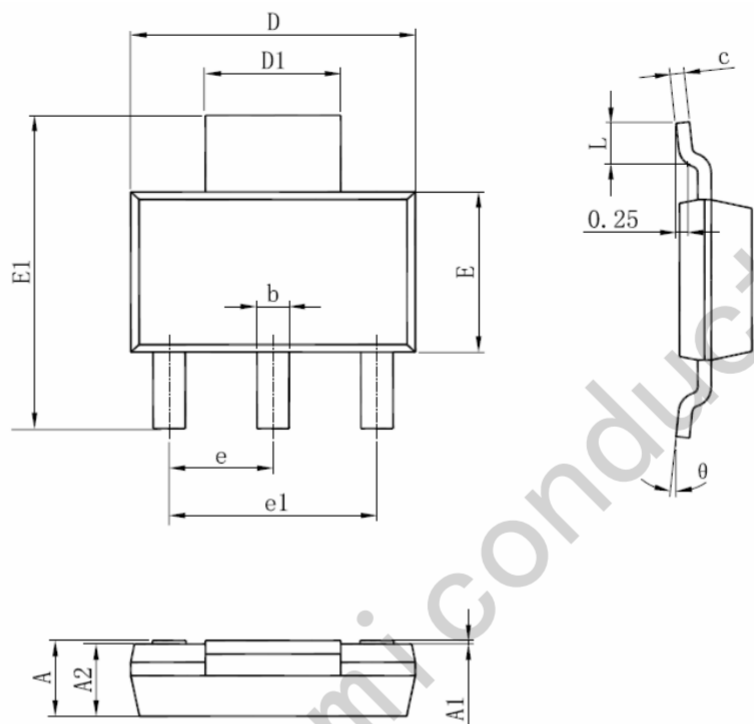


$V_i = -10 \text{ V}$ ;  $T = 200 \mu\text{s}$ ;  $t_p = 6 \mu\text{s}$ ;  $t_r = t_f \leq 3 \text{ ns}$ .  
 $R_1 = 56 \Omega$ ;  $R_2 = 10 \text{ k}\Omega$ ;  $R_B = 10 \text{ k}\Omega$ ;  $R_C = 18 \Omega$ .  
 $V_{BB} = 1.8 \text{ V}$ ;  $V_{CC} = -10.7 \text{ V}$ .  
Oscilloscope: input impedance  $Z_i = 50 \Omega$ .

Fig.3 Test circuit for switching times.

## Package Information

SOT-223



| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min                       | Max   | Min                  | Max   |
| A      | 1.520                     | 1.800 | 0.060                | 0.071 |
| A1     | 0.000                     | 0.100 | 0.000                | 0.004 |
| A2     | 1.500                     | 1.700 | 0.059                | 0.067 |
| b      | 0.660                     | 0.820 | 0.026                | 0.032 |
| c      | 0.250                     | 0.350 | 0.010                | 0.014 |
| D      | 6.200                     | 6.400 | 0.244                | 0.252 |
| D1     | 2.900                     | 3.100 | 0.114                | 0.122 |
| E      | 3.300                     | 3.700 | 0.130                | 0.146 |
| E1     | 6.830                     | 7.070 | 0.269                | 0.278 |
| e      | 2.300(BSC)                |       | 0.091(BSC)           |       |
| e1     | 4.500                     | 4.700 | 0.177                | 0.185 |
| L      | 0.900                     | 1.150 | 0.035                | 0.045 |
| θ      | 0°                        | 10°   | 0°                   | 10°   |