

### Applications

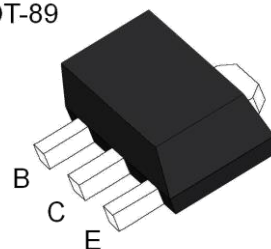
- Emergency lighting circuits
- Motor driving (including DC fans)
- Solenoid, relay and actuator drivers
- Backlight inverters

### Features

- Very low saturation voltages
- Extremely low equivalent on-resistance;
- 4.5A continuous current
- Up to 15 amps peak current

**Marking** : N2010

SOT-89



### Absolute Maximum Ratings (Ta=25°C)

| Parameter                                                                        | Symbol     | Value       | Unit       |
|----------------------------------------------------------------------------------|------------|-------------|------------|
| Collector-base voltage                                                           | $BV_{CBO}$ | 150         | V          |
| Collector-emitter voltage                                                        | $BV_{CEO}$ | 60          | V          |
| Emitter-base voltage                                                             | $BV_{EBO}$ | 7           | V          |
| Collector current (DC) <sup>*a</sup>                                             | $I_C$      | 4.5         | A          |
| Collector current (Pulse)                                                        | $I_{CP}$   | 15          | A          |
| Base current (DC)                                                                | $I_B$      | 0.5         | A          |
| Practical power dissipation <sup>*a</sup><br>Lineardratingfactor                 | $P_D$      | 1<br>8      | W<br>mW/°C |
| Power dissipation at $T_A=25^\circ\text{C}$ <sup>*b</sup><br>Lineardratingfactor | $P_D$      | 0.71<br>5.7 | W<br>mW/°C |
| Junction temperature                                                             | $T_j$      | 150         | °C         |
| Storage temperature                                                              | $T_{stg}$  | -55~150     | °C         |

### Thermal Characteristics

| Parameter                                            | Symbol          | Conditions | Value | Unit   |
|------------------------------------------------------|-----------------|------------|-------|--------|
| Thermal resistance junction to ambient <sup>*a</sup> | $R_{\theta JA}$ |            | 125   | °C / W |
| Thermal resistance junction to ambient <sup>*b</sup> | $R_{\theta JA}$ |            | 175   | °C / W |

\* (a) For a device through hole mounted on 25mm x 25mm x 1.6mm FR4 PCB with high coverage of single sided 1oz copper, in still air conditions. Collector lead length to solder point 4mm.

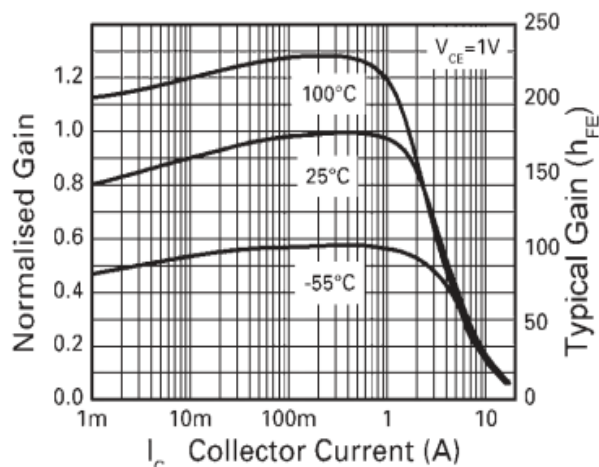
(b) For a device mounted in a socket in still air conditions. Collector lead length 10mm.

**Electrical Characteristics** ( $T_A=25^{\circ}\text{C}$ , unless otherwise specified)

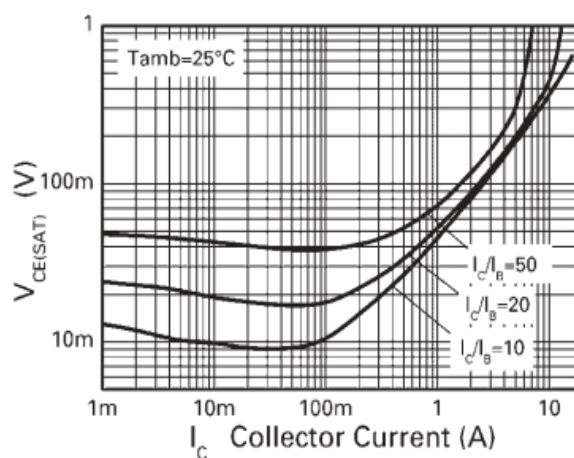
| Parameter                             | Symbol        | Conditions                                                                    | Min | Typ | Max  | Unit |
|---------------------------------------|---------------|-------------------------------------------------------------------------------|-----|-----|------|------|
| Collector-base breakdown voltage      | $BV_{CBO}$    | $I_C = 100\mu\text{A}$ , $I_E = 0$                                            | 150 |     |      | V    |
| Collector-emitter breakdown voltage   | $BV_{CEO}$    | $I_C = 10\text{mA}$ , $I_B = 0$                                               | 60  |     |      | V    |
| Emitter-base breakdown voltage        | $BV_{EBO}$    | $I_E = 100\mu\text{A}$ , $I_C = 0$                                            | 7   |     |      | V    |
| Collector cut-off current             | $I_{CBO}$     | $V_{CB} = 120\text{V}$ , $I_E = 0$                                            |     |     | 50   | nA   |
| Emitter cut-off current               | $I_{EBO}$     | $V_{EB} = 6\text{V}$ , $I_C = 0$                                              |     |     | 10   | nA   |
| DC current gain*                      | $h_{FE}$      | $V_{CE} = 1\text{V}$ , $I_B = 10\text{mA}$                                    | 100 |     |      |      |
|                                       |               | $V_{CE} = 1\text{V}$ , $I_B = 2\text{A}$                                      | 100 |     | 300  |      |
|                                       |               | $V_{CE} = 1\text{V}$ , $I_B = 5\text{A}$                                      | 55  |     |      |      |
|                                       |               | $V_{CE} = 1\text{V}$ , $I_B = 10\text{A}$                                     | 20  |     |      |      |
|                                       |               | $V_{CE} = -2\text{V}$ , $I_B = -3\text{A}$                                    | 100 |     |      |      |
| Collector-emitter saturation voltage* | $V_{CE(sat)}$ | $I_C = 100\text{mA}$ , $I_B = 5\text{mA}$                                     |     |     | 30   | mV   |
|                                       |               | $I_C = 1\text{A}$ , $I_B = 100\text{mA}$                                      |     |     | 55   |      |
|                                       |               | $I_C = 1\text{A}$ , $I_B = 50\text{mA}$                                       |     |     | 65   |      |
|                                       |               | $I_C = 2\text{A}$ , $I_B = 50\text{mA}$                                       |     |     | 130  |      |
|                                       |               | $I_C = 5\text{A}$ , $I_B = 200\text{mA}$                                      |     |     | 210  |      |
| Equivalent on-resistance              | $R_{CE(sat)}$ | $I_C = 2\text{A}$ , $I_B = 200\text{mA}$                                      |     |     | 130  | mΩ   |
| Base-emitter saturation voltage*      | $V_{BE(sat)}$ | $I_C = 4\text{A}$ , $I_B = 200\text{mA}$                                      |     |     | 1.05 | V    |
| Base-emitter turn on voltage          | $V_{BE(on)}$  | $V_{CE} = 1\text{V}$ , $I_C = 4\text{A}$                                      |     |     | 0.95 | V    |
| Transition frequency                  | $f_T$         | $V_{CE} = 10\text{V}$ , $I_E = 100\text{mA}$<br>$f = 50\text{MHz}$            |     | 130 |      | MHz  |
| Collector output Capacitance          | $C_{ob}$      | $V_{CB} = 10\text{V}$ , $I_E = 0$ , $f = 1\text{MHz}$                         |     | 31  |      | pF   |
| Switching time                        | $t_{ON}$      | $V_{CC} = 10\text{V}$ , $I_C = 1\text{A}$<br>$I_{B1} = I_{B2} = 100\text{mA}$ |     | 42  |      | ns   |
|                                       | $t_{OFF}$     |                                                                               |     | 760 |      | ns   |

\* Measured under pulsed conditions. Pulse width  $\leq 300\mu\text{s}$ ; duty cycle  $\leq 2\%$ .

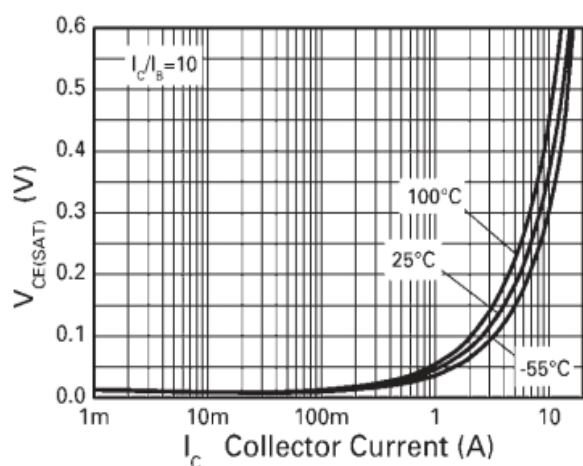
## Typical Characteristics



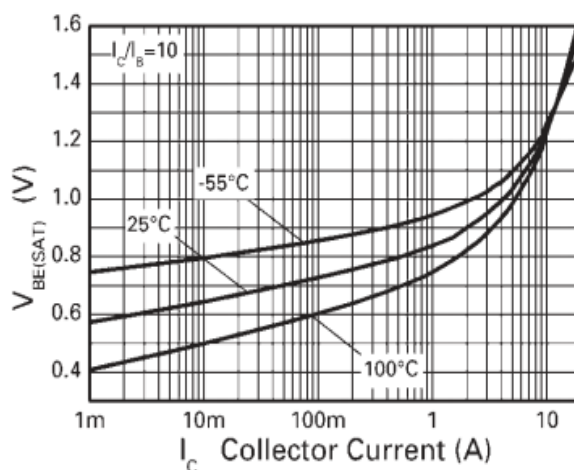
**Figure 1. DC current Gain**



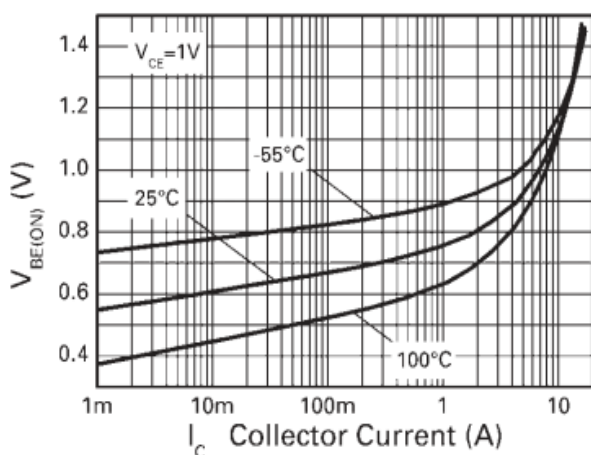
**Figure 2. Collector-Emitter Saturation Voltage**



**Figure 3. Collector-Emitter Saturation Voltage**



**Figure 4. Base-Emitter Saturation Voltage**



**Figure 5. Base-Emitter on Voltage**

**Package Dimensions**

| Dim | Millimeter |      | Inches |       |
|-----|------------|------|--------|-------|
|     | Min.       | Max. | Min.   | Max.  |
| A   | 1.40       | 1.60 | 0.055  | 0.063 |
| b   | 0.32       | 0.52 | 0.013  | 0.020 |
| b1  | 0.38       | 0.58 | 0.015  | 0.023 |
| c   | 0.35       | 0.45 | 0.014  | 0.018 |
| D   | 4.40       | 4.60 | 0.173  | 0.181 |
| D1  | 1.45       | 1.65 | 0.057  | 0.065 |
| D2  | 1.70       | 1.80 | 0.067  | 0.071 |
| E   | 2.30       | 2.60 | 0.091  | 0.102 |
| E1  | 3.95       | 4.25 | 0.156  | 0.167 |
| E2  | 1.80       | 2.00 | 0.071  | 0.079 |
| e   | 1.40       | 1.60 | 0.055  | 0.063 |
| e1  | 2.80       | 3.20 | 0.110  | 0.126 |
| L   | 0.90       | 1.20 | 0.035  | 0.047 |

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