

# T2N4401

## Low Power Bipolar Transistors

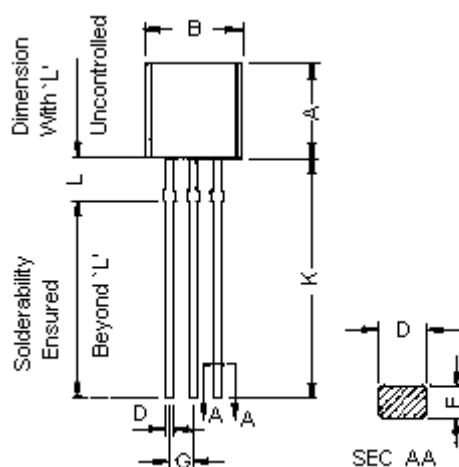


### Features:

- NPN Silicon Planar Epitaxial Transistors.
- General purpose Switching Applications.

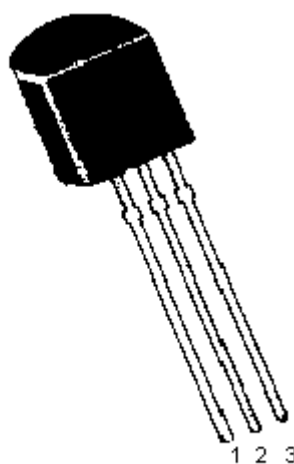
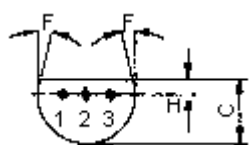


### TO-92 Plastic Package



| Dimensions | Minimum | Maximum |
|------------|---------|---------|
| A          | 4.32    | 5.33    |
| B          | 4.45    | 5.20    |
| C          | 3.18    | 4.19    |
| D          | 0.41    | 0.55    |
| E          | 0.35    | 0.50    |
| F          | 5°      |         |
| G          | 1.14    | 1.40    |
| H          |         | 1.53    |
| K          | 12.70   | -       |
| L          | 1.982   | 2.082   |

Dimensions : Millimetres



### Pin Configuration

1 = Emitter

2 = Base

3 = Collector



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### Absolute Maximum Ratings

| Rating                                                                           | Symbol         | T2N4401     | Unit                       |
|----------------------------------------------------------------------------------|----------------|-------------|----------------------------|
| Collector-Emitter Voltage                                                        | $V_{CEO}$      | 40          | V                          |
| Collector-Base Voltage                                                           | $V_{CBO}$      | 60          |                            |
| Emitter-Base Voltage                                                             | $V_{EBO}$      | 6           |                            |
| Collector Current Continuous                                                     | $I_C$          | 600         | mA                         |
| Power Dissipation at $T_a = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$          | 625<br>5.0  | mW<br>mW/ $^\circ\text{C}$ |
| Power Dissipation at $T_C = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ |                | 1.5<br>12   | W<br>W/ $^\circ\text{C}$   |
| Operating and Storage Junction<br>Temperature Range                              | $T_j, T_{stg}$ | -55 to +150 | $^\circ\text{C}$           |
| <b>Thermal Resistance</b>                                                        |                |             |                            |
| Junction to Case                                                                 | $R_{th(j-c)}$  | 83.3        | $^\circ\text{C/W}$         |
| Junction to Ambient                                                              | $R_{th(j-a)}$  | 200         |                            |

### Electrical Characteristics ( $T_a = 25^\circ\text{C}$ unless otherwise specified)

| Characteristic                                                                                                             | Symbol          | T2N4401             | Unit          |
|----------------------------------------------------------------------------------------------------------------------------|-----------------|---------------------|---------------|
| Collector Emitter Voltage<br>$I_C = 1\text{mA}, I_B = 0$                                                                   | $BV_{CEO}^*$    | >40                 | V             |
| Collector Base Voltage<br>$I_C = 100\mu\text{A}, I_E = 0$                                                                  | $BV_{CBO}$      | >60                 |               |
| Emitter Base Voltage<br>$I_E = 100\mu\text{A}, I_C = 0$                                                                    | $BV_{EBO}$      | >6                  |               |
| Base Cut off Current<br>$V_{CE} = 35\text{V}, V_{EB} = 0.4\text{V}$                                                        | $I_{BEV}$       | <0.1                | $\mu\text{A}$ |
| Collector Cut off Current<br>$V_{CE} = 35\text{V}, V_{EB} = 0.4\text{V}$                                                   | $I_{CEX}$       |                     |               |
| Collector Emitter Saturation Voltage<br>$I_C = 150\text{mA}, I_B = 15\text{mA}$<br>$I_C = 500\text{mA}, I_B = 50\text{mA}$ | $V_{CE(Sat)}^*$ | <0.4<br><0.75       | V             |
| Base Emitter Saturation Voltage<br>$I_C = 150\text{mA}, I_B = 15\text{mA}$<br>$I_C = 500\text{mA}, I_B = 50\text{mA}$      | $V_{BE(Sat)}^*$ | 0.75 - 0.95<br><1.2 |               |

\*Pulse Test : Pulse Width:  $\leq 300\mu\text{s}$ , Duty  $\leq 2.0\%$

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### Electrical Characteristics ( $T_a = 25^\circ\text{C}$ unless otherwise specified)

| Characteristic                                                                                                                                                                                                                                                 | Symbol          | T2N4401                               | Unit              |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------------------------------------|-------------------|
| DC Current Gain<br>I <sub>C</sub> = 0.1mA, V <sub>CE</sub> = 1V<br>I <sub>C</sub> = 1mA, V <sub>CE</sub> = 1V<br>I <sub>C</sub> = 10mA, V <sub>CE</sub> = 1V<br>I <sub>C</sub> = 150mA, V <sub>CE</sub> = 1V*<br>I <sub>C</sub> = 500mA, V <sub>CE</sub> = 2V* | h <sub>FE</sub> | >20<br>>40<br>>80<br>100 - 300<br>>40 | -                 |
| Dynamic Characteristics                                                                                                                                                                                                                                        |                 |                                       |                   |
| Small Signal Current Gain<br>I <sub>C</sub> = 1mA, V <sub>CE</sub> = 10V, f = 1KHz                                                                                                                                                                             | h <sub>fe</sub> | 40 - 500                              | -                 |
| Input Impedance<br>I <sub>C</sub> = 1mA, V <sub>CE</sub> = 10V, f = 1KHz                                                                                                                                                                                       | h <sub>ie</sub> | 1.0 - 15                              | kΩ                |
| Characteristic                                                                                                                                                                                                                                                 | Symbol          | 2N4401                                | Unit              |
| Voltage Feedback Ratio<br>I <sub>C</sub> = 1mA, V <sub>CE</sub> = 10V, f = 1KHz                                                                                                                                                                                | h <sub>re</sub> | 0.1 - 8.0                             | x10 <sup>-4</sup> |
| Output Impedance<br>I <sub>C</sub> = 1mA, V <sub>CE</sub> = 10V, f = 1KHz                                                                                                                                                                                      | h <sub>oe</sub> | 1.0 - 30                              | μΩ                |
| Collector-Base Capacitance<br>V <sub>CB</sub> = 5V, I <sub>E</sub> = 0, f = 100KHz<br>V <sub>CB</sub> = 10V, I <sub>E</sub> = 0, f = 140KHz                                                                                                                    | C <sub>cb</sub> | <6.5<br>-                             | pF                |
| Emitter-Base Capacitance<br>V <sub>EB</sub> = 0.5V, I <sub>C</sub> = 0, f = 100kHz                                                                                                                                                                             | C <sub>eb</sub> | <30                                   |                   |
| Transition Frequency<br>I <sub>C</sub> = 20mA, V <sub>CE</sub> = 10V, f = 100MHz                                                                                                                                                                               | f <sub>T</sub>  | >250                                  | MHz               |
| Switching Characteristics                                                                                                                                                                                                                                      |                 |                                       |                   |
| V <sub>CC</sub> = 30V, V <sub>EB</sub> = 2V<br>I <sub>C</sub> = 150mA, I <sub>B1</sub> = 15mA                                                                                                                                                                  |                 |                                       |                   |
| Delay Time                                                                                                                                                                                                                                                     | t <sub>d</sub>  | <15                                   | ns                |
| Rise Time                                                                                                                                                                                                                                                      | t <sub>r</sub>  | <20                                   |                   |
| V <sub>CC</sub> = 30V, I <sub>C</sub> = 150mA<br>I <sub>B1</sub> = I <sub>B2</sub> = 15mA                                                                                                                                                                      |                 |                                       |                   |
| Storage time                                                                                                                                                                                                                                                   | t <sub>s</sub>  | <225                                  | ns                |
| Fall Time                                                                                                                                                                                                                                                      | t <sub>f</sub>  | <30                                   |                   |

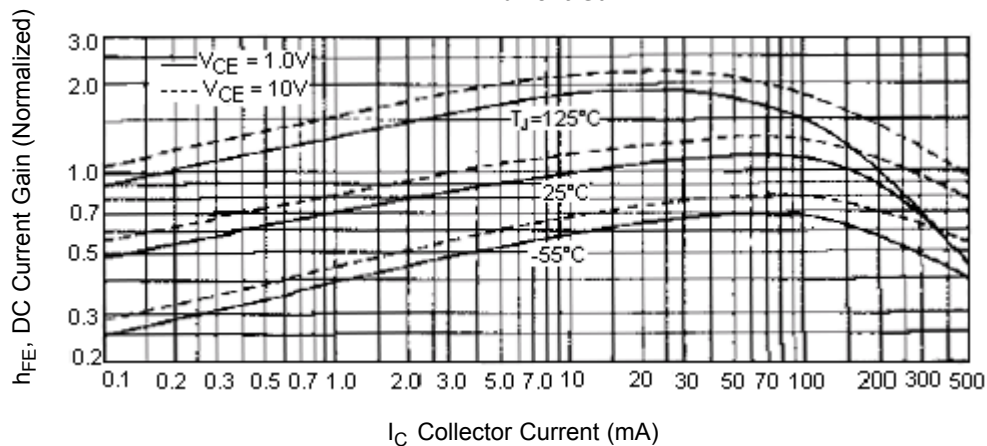
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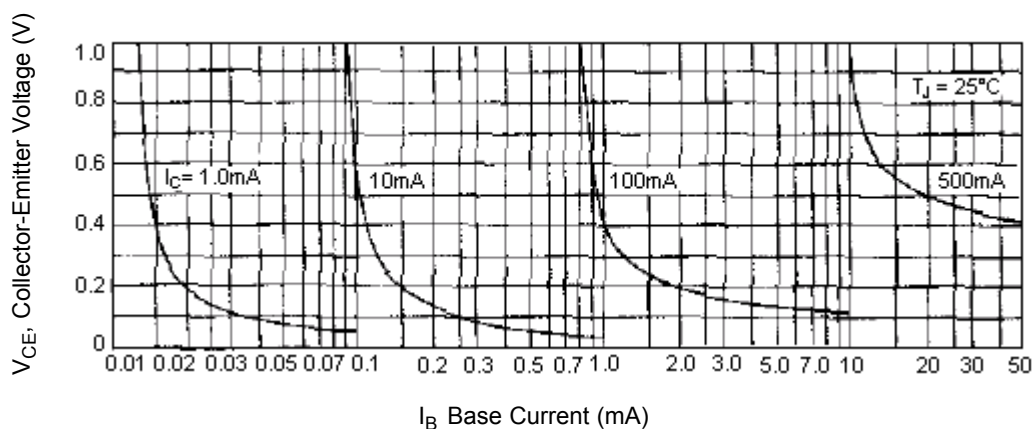
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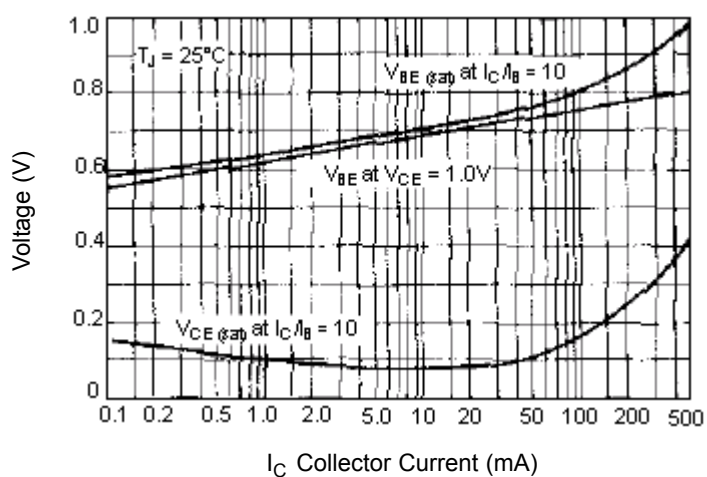
DC Current Gain



DC Current Gain



On Voltages

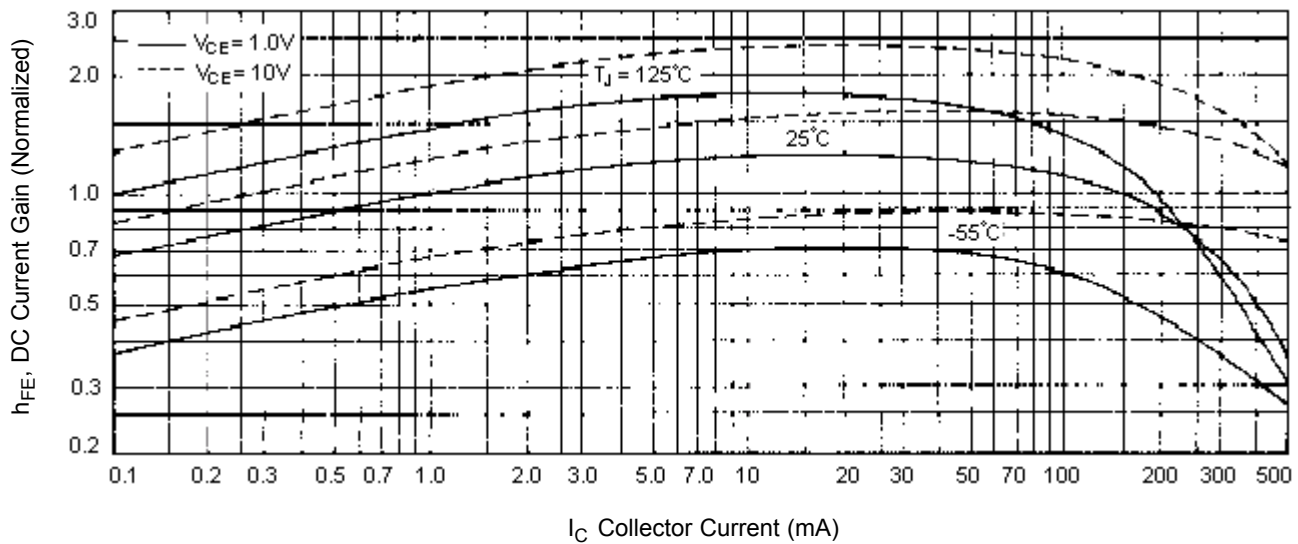


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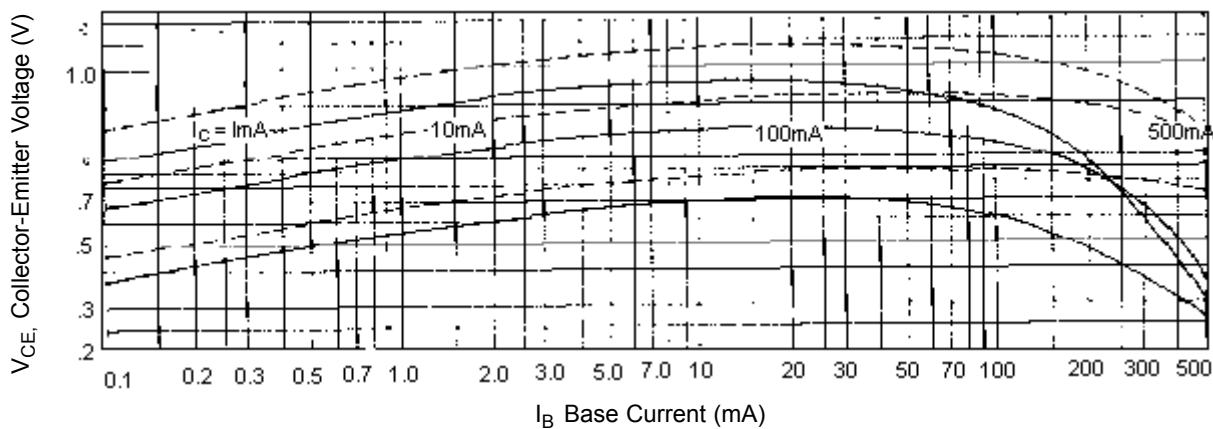
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DC Current Gain



Collector Saturation Region

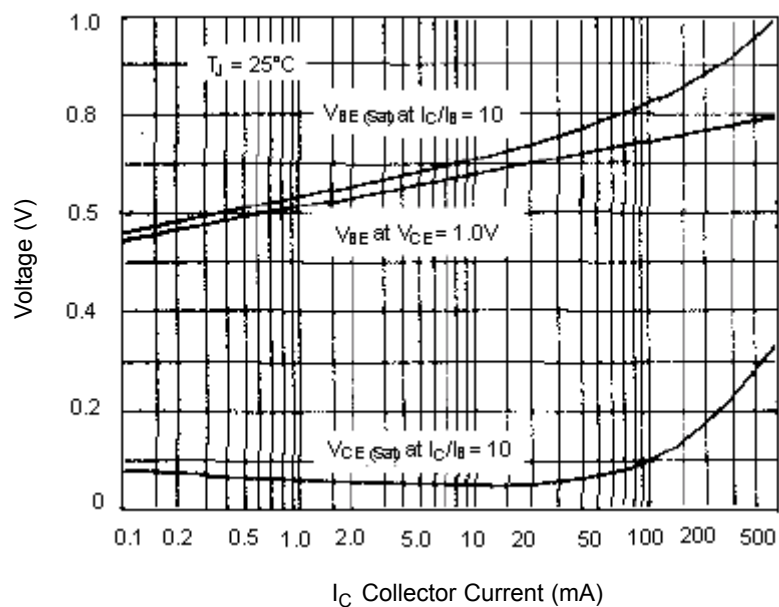


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## Low Power Bipolar Transistors



On Voltages



### Part Number Table

| Package | Part Number |
|---------|-------------|
| TO-92   | 2N4401      |

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## Low Power Bipolar Transistors



### Notes:

### International Sales Offices:



#### AUSTRALIA – Farnell InOne

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