

# 2N4401



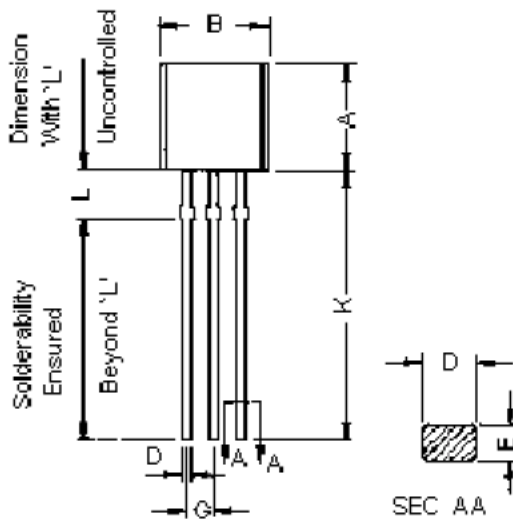
## Low Power Bipolar Transistors



### Features:

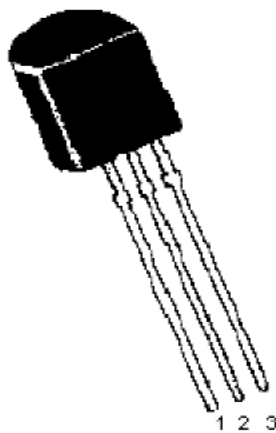
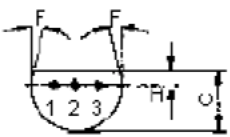
- NPN Silicon Planar Epitaxial Transistors.
- General Purpose Switching Applications.

### 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	2N4401	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 $T_a = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	625 5.0	mW mW/ $^\circ\text{C}$
Power Dissipation at $T_c = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$		1.5 12	W W/ $^\circ\text{C}$
Operating and Storage Junction 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	2N4401	Unit
Collector Emitter Voltage $I_C = 1\text{mA}, I_B = 0$	$BV_{CEO}^*$	>40	V
Collector Base Voltage $I_C = 100\mu\text{A}, I_E = 0$	$BV_{CBO}$	>60	
Emitter Base Voltage $I_E = 100\mu\text{A}, I_C = 0$	$BV_{EBO}$	>6	
Base Cut off Current $V_{CE} = 35\text{V}, V_{EB} = 0.4\text{V}$	$I_{BEV}$	<0.1	$\mu\text{A}$
Collector Cut off Current $V_{CE} = 35\text{V}, V_{EB} = 0.4\text{V}$	$I_{CEX}$		
Collector Emitter Saturation Voltage $I_C = 150\text{mA}, I_B = 15\text{mA}$ $I_C = 500\text{mA}, I_B = 50\text{mA}$	$V_{CE(sat)}^*$	<0.4 <0.75	V
Base Emitter Saturation Voltage $I_C = 150\text{mA}, I_B = 15\text{mA}$ $I_C = 500\text{mA}, I_B = 50\text{mA}$	$V_{BE(sat)}^*$	0.75 - 0.95 <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	2N4401	Unit
DC Current Gain $I_C = 0.1\text{mA}, V_{CE} = 1\text{V}$ $I_C = 1\text{mA}, V_{CE} = 1\text{V}$ $I_C = 10\text{mA}, V_{CE} = 1\text{V}$ $I_C = 150\text{mA}, V_{CE} = 1\text{V}^*$ $I_C = 500\text{mA}, V_{CE} = 2\text{V}^*$	$h_{FE}$	>20 >40 >80 100 - 300 >40	-
<b>Dynamic Characteristics</b>			
Small Signal Current Gain $I_C = 1\text{mA}, V_{CE} = 10\text{V}, f = 1\text{KHz}$	$h_{fe}$	40 - 500	-
Input Impedance $I_C = 1\text{mA}, V_{CE} = 10\text{V}, f = 1\text{KHz}$	$h_{ie}$	1.0 - 15	k $\Omega$
Voltage Feedback Ratio $I_C = 1\text{mA}, V_{CE} = 10\text{V}, f = 1\text{KHz}$	$h_{re}$	0.1 - 8.0	$\times 10^{-4}$
Output Impedance $I_C = 1\text{mA}, V_{CE} = 10\text{V}, f = 1\text{KHz}$	$h_{oe}$	1.0 - 30	$\mu\Omega$
Collector-Base Capacitance $V_{CB} = 5\text{V}, I_E = 0, f = 100\text{KHz}$ $V_{CB} = 10\text{V}, I_E = 0, f = 140\text{KHz}$	$C_{cb}$	<6.5 -	pF
Emitter-Base Capacitance $V_{EB} = 0.5\text{V}, I_C = 0, f = 100\text{KHz}$	$C_{eb}$	<30	
Transition Frequency $I_C = 20\text{mA}, V_{CE} = 10\text{V}, f = 100\text{MHz}$	$f_T$	>250	MHz
<b>Switching Characteristics</b>			
$V_{CC} = 30\text{V}, V_{EB} = 2\text{V}$ $I_C = 150\text{mA}, I_{B1} = 15\text{mA}$			
Delay Time	$t_d$	<15	ns
Rise Time	$t_r$	<20	
$V_{CC} = 30\text{V}, I_C = 150\text{mA}$ $I_{B1} = I_{B2} = 15\text{mA}$			
Storage time	$t_s$	<225	ns
Fall Time	$t_f$	<30	

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

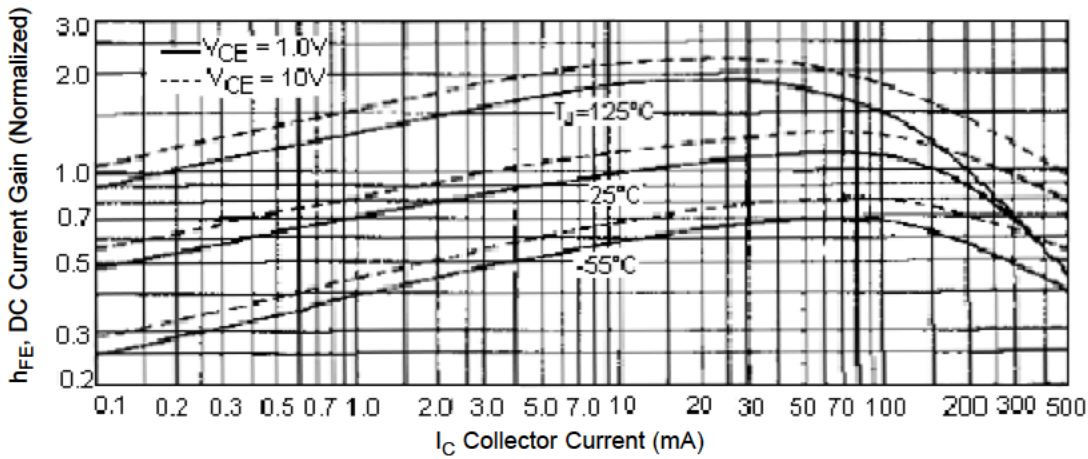


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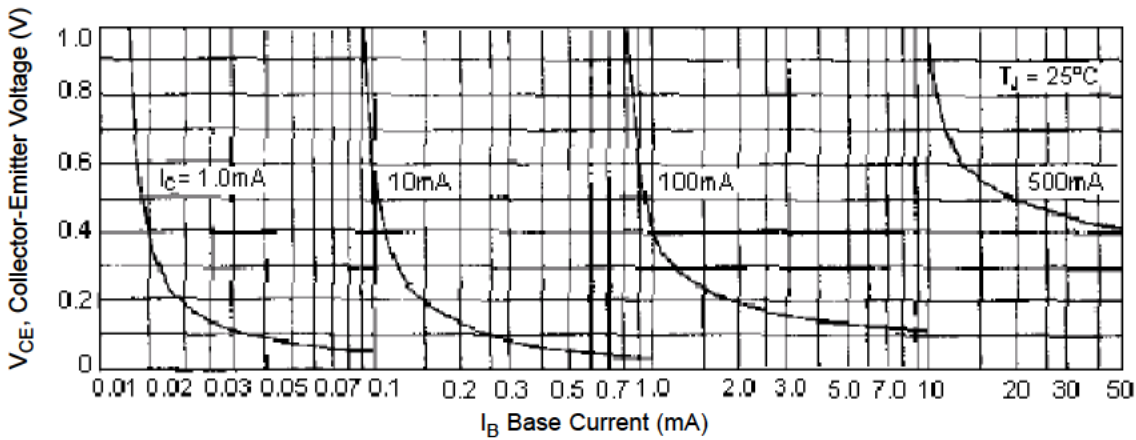
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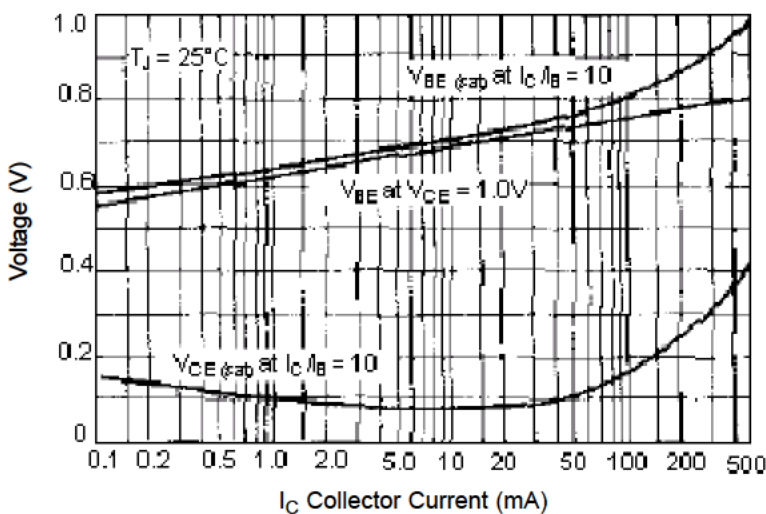
DC Current Gain



DC Current Gain



On Voltages

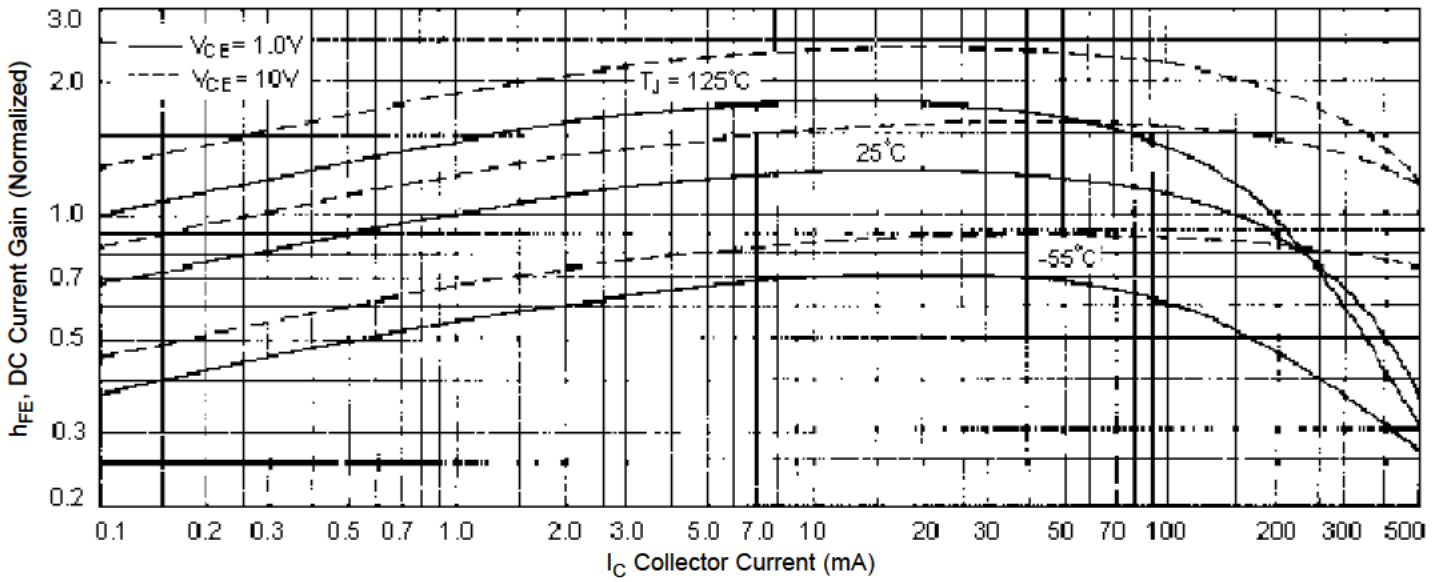


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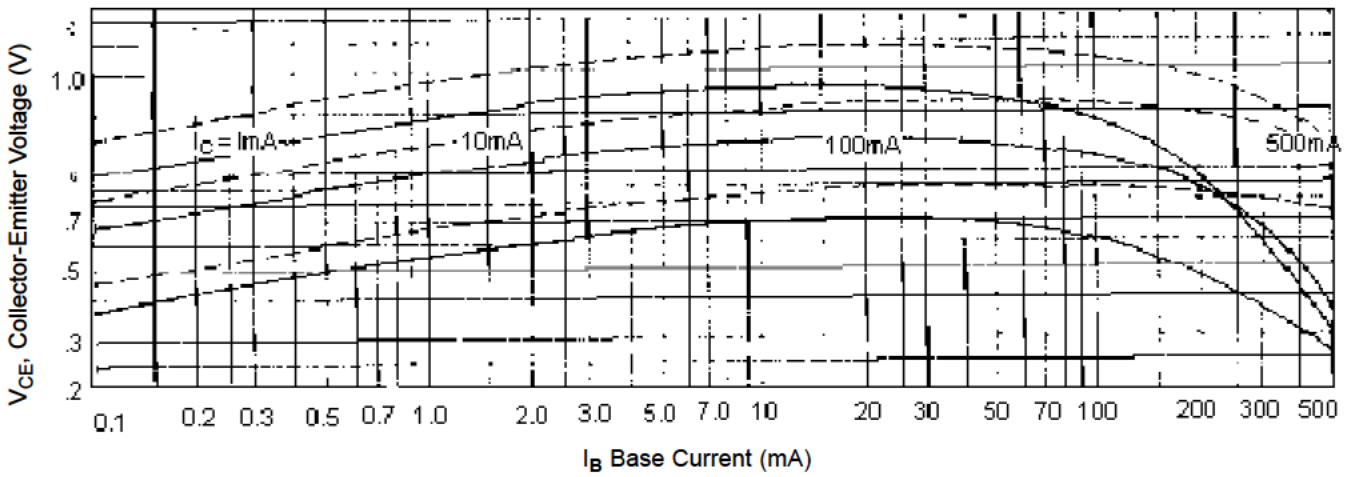
## Low Power Bipolar Transistors



DC Current Gain



Collector Saturation Region

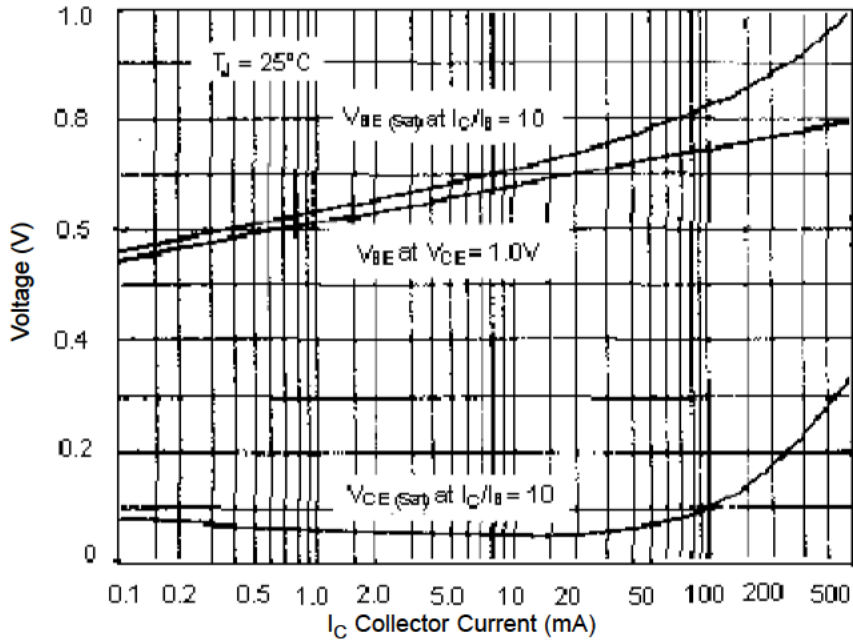


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## Low Power Bipolar Transistors



On Voltages



### Part Number Table

Package	Part Number
TO-92	2N4401



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## Low Power Bipolar Transistors



### Notes:

### International Sales Offices:

 <b>AUSTRALIA</b> – Farnell Tel No: ++61 1300 361 005 Fax No: ++61 1300 361 225	 <b>FINLAND</b> – Farnell Tel No: ++ 358 9 560 7780 Fax No: ++ 358 9 345 5411	 <b>ITALY</b> – Farnell Tel No: ++ 39 02 93 995 200 Fax No: ++ 39 02 93 995 300	 <b>SPAIN</b> – Farnell Tel No: 901 20 20 80 Fax No: 901 20 20 90
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