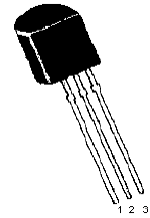


# Low Power Bipolar Transistor



#### Pin Configuration:

1. Emitter
2. Base
3. Collector

#### Features:

- NPN Silicon Planar Epitaxial Transistors
- General Purpose Switching Applications

#### Absolute Maximum Ratings

Description	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	mW
Derate above $25^\circ\text{C}$		5	mW/ $^\circ\text{C}$
Power Dissipation at $T_c = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$		1.5	W
Derate above $25^\circ\text{C}$		12	W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	$T_j, T_{stg}$	-55 to +150	$^\circ\text{C}$

#### Thermal Resistance

Junction to Case	$R_{th(j-c)}$	83.3	$^\circ\text{C/W}$
Junction to Ambient	$R_{th(j-a)}$	200	

# Low Power Bipolar Transistor

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

Description	Symbol	Test Condition	2N4401	Unit
Collector Emitter Voltage	$BV_{CEO}^*$	$I_C = 1\text{mA}, I_B = 0$	>40	V
Collector Base Voltage	$BV_{CBO}$	$I_C = 100\mu\text{A}, I_E = 0$	>60	
Emitter Base Voltage	$BV_{EBO}$	$I_E = 100\mu\text{A}, I_C = 0$	>6	
Base Cut off Current	$I_{BEV}$	$V_{CE} = 35\text{V}, V_{EB} = 0.4\text{V}$	<0.1	$\mu\text{A}$
Collector Cut off Current	$I_{CEX}$	$V_{CE} = 35\text{V}, V_{EB} = 0.4\text{V}$		
Collector Emitter Saturation Voltage	$V_{CE(Sat)}^*$	$I_C = 150\text{mA}, I_B = 15\text{mA}$ $I_C = 500\text{mA}, I_B = 50\text{mA}$	<0.4 <0.75	V
Base Emitter Saturation Voltage	$V_{BE(Sat)}^*$	$I_C = 150\text{mA}, I_B = 15\text{mA}$ $I_C = 500\text{mA}, I_B = 50\text{mA}$	0.75 - 0.95 <1.2	
DC Current Gain	$h_{FE}$	$I_C = 0.1\text{mA}, V_{CE} = 1\text{V}$ $I_C = 1\text{mA}, V_{CE} = 1\text{V}$ $I_C = 10\text{mA}, V_{CE} = 1\text{V}$ $I_C = 150\text{mA}, V_{CE} = 1\text{V}^*$ $I_C = 500\text{mA}, V_{CE} = 2\text{V}^*$	>20 >40 >80 100 - 300 >40	-

## Dynamic Characteristics

Small Signal Current Gain	$h_{fe}$	$I_C = 1\text{mA}, V_{CE} = 10\text{V},$ $f = 1\text{kHz}$	40 - 500	-
Input Impedance	$h_{ie}$	$I_C = 1\text{mA}, V_{CE} = 10\text{V},$ $f = 1\text{kHz}$	1 - 15	$\text{k}\Omega$
Voltage Feedback Ratio	$h_{re}$	$I_C = 1\text{mA}, V_{CE} = 10\text{V},$ $f = 1\text{kHz}$	0.1 - 8	$\times 10^{-4}$
Output Impedance	$h_{oe}$	$I_C = 1\text{mA}, V_{CE} = 10\text{V},$ $f = 1\text{kHz}$	1 - 30	$\mu\Omega$
Collector-Base Capacitance	$C_{cb}$	$V_{CB} = 5\text{V}, I_E = 0,$ $f = 100\text{kHz}$ $V_{CB} = 10\text{V}, I_E = 0,$ $f = 140\text{kHz}$	<6.5 -	$\text{pF}$
Emitter-Base Capacitance	$C_{eb}$	$V_{EB} = 0.5\text{V}, I_C = 0,$ $f = 100\text{kHz}$	<30	
Transition Frequency	$f_T$	$I_C = 20\text{mA}, V_{CE} = 10\text{V},$ $f = 100\text{MHz}$	>250	$\text{MHz}$

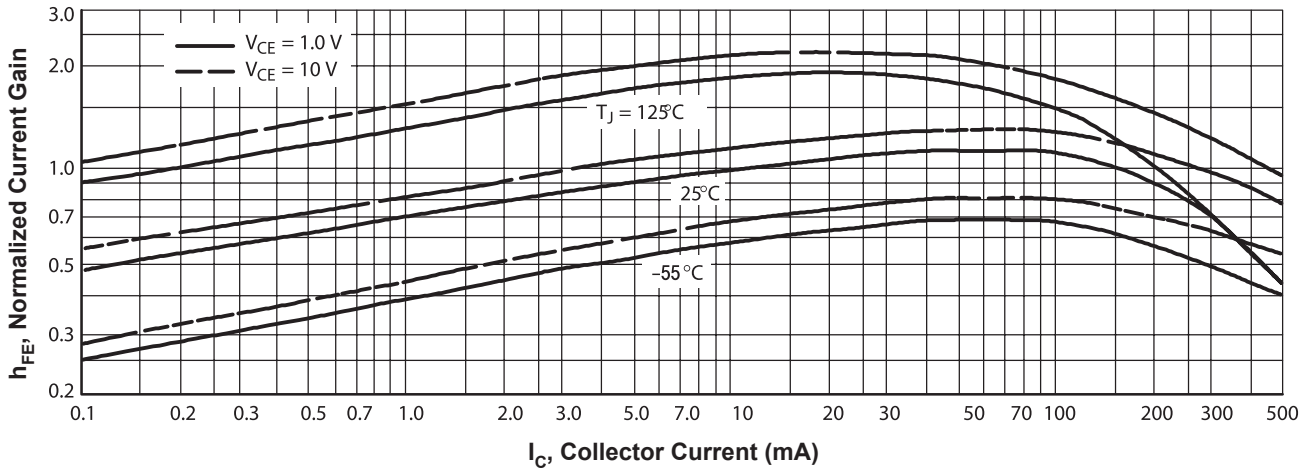
## Switching Characteristics

Delay Time	$t_d$	$V_{CC} = 30\text{V}, V_{EB} = 2\text{V}$	<15	ns
Rise Time	$t_r$	$I_C = 150\text{mA}, I_{B1} = 15\text{mA}$	<20	
Storage time	$t_s$	$V_{CC} = 30\text{V}, I_C = 150\text{mA}$	<225	
Fall Time	$t_f$	$I_{B1} = I_{B2} = 15\text{mA}$	<30	

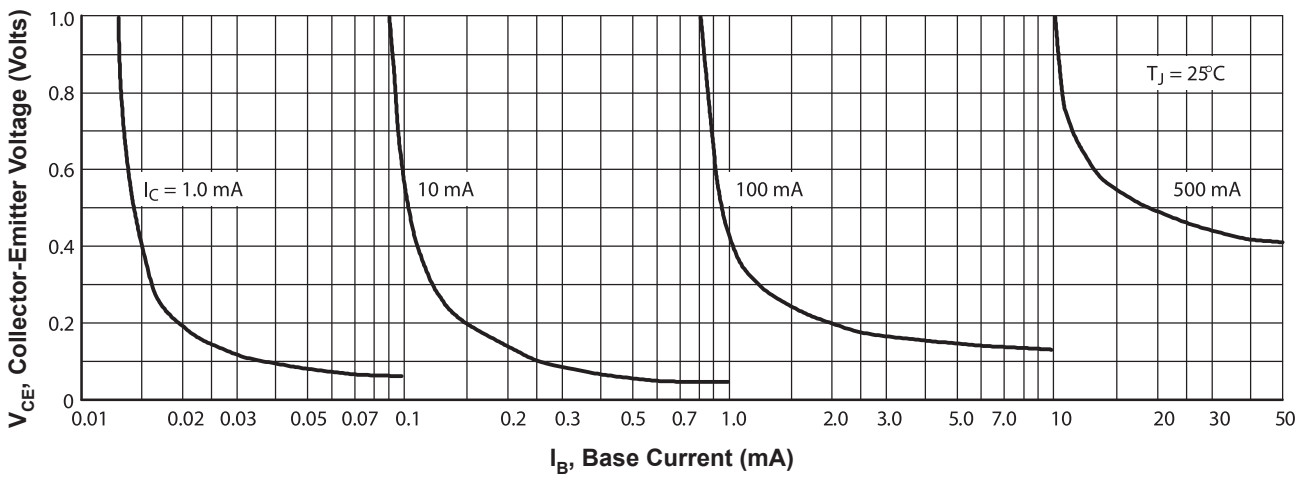
\*Pulse Test: Pulse Width:  $\leq 300\mu\text{s}$ , Duty  $\leq 2\%$

# Low Power Bipolar Transistor

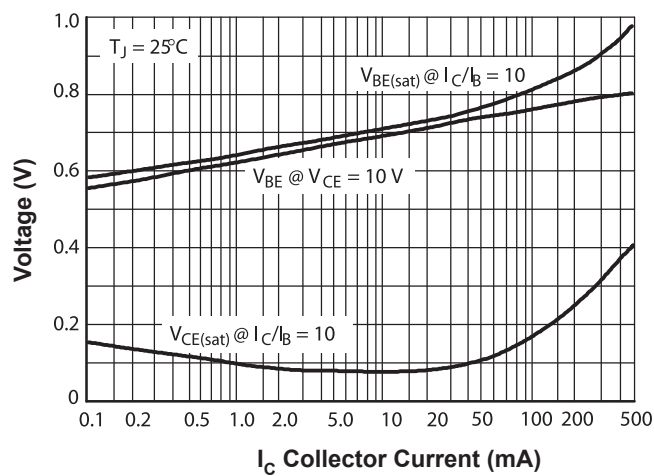
DC Current Gain



DC Current Gain

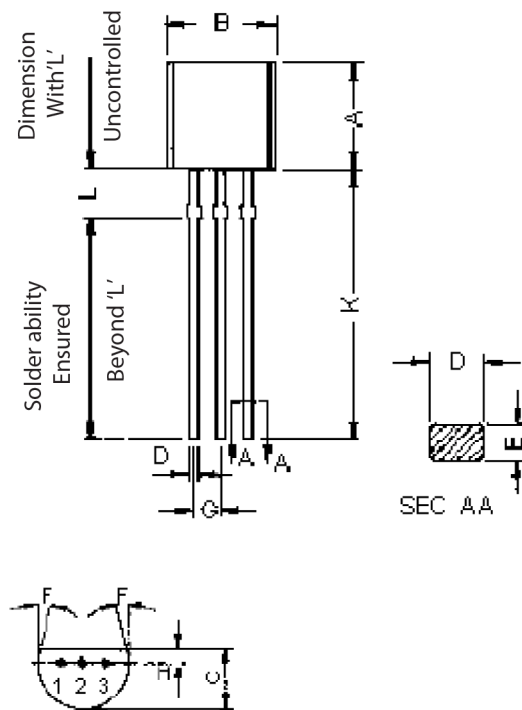


On Voltages



# Low Power Bipolar Transistor

## TO-92 Plastic Package



Dimensions	Min.	Max.
A	4.32	5.33
B	4.45	5.2
C	3.18	4.19
D	0.41	0.55
E	0.35	0.5
F	5°	
G	1.14	1.4
H		1.53
K	12.7	-
L	1.982	2.082

Dimensions : Millimetres

## Part Number Table

Description	Part Number
Transistor, NPN, TO-92	2N4401

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