



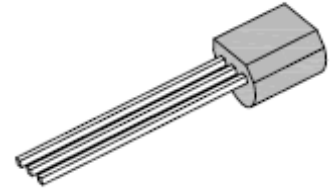
# Small Signal General Purpose Transistors (NPN)

## 2N4400/2N4401

### Small Signal General Purpose Transistors (NPN)

#### Features

- NPN Silicon Epitaxial Transistor for Switching and Amplifier Applications
- RoHS Compliance



TO-92

#### Mechanical Data

<b>Case:</b>	TO-92, Plastic Package
<b>Terminals:</b>	Solderable per MIL-STD-202G, Method 208
<b>Weight:</b>	0.18 gram

#### Maximum Ratings ( $T_{Ambient}=25^{\circ}C$ unless noted otherwise)

Symbol	Description	2N4400	2N4401	Unit
	Marking Code	2N4400	2N4401	
<b>V<sub>CEO</sub></b>	Collector-Emitter Voltage	40		V
<b>V<sub>CBO</sub></b>	Collector-Base Voltage	60		V
<b>V<sub>EBO</sub></b>	Emitter-Base Voltage	6.0		V
<b>I<sub>C</sub></b>	Collector Current Continuous	600		mA
<b>P<sub>D</sub></b>	Power Dissipation at $T_A=25^{\circ}C$	625		mW
	Derate above $25^{\circ}C$	5.0		mW/ $^{\circ}C$
<b>P<sub>D</sub></b>	Power Dissipation at $T_C=25^{\circ}C$	1.5		W
	Derate above $25^{\circ}C$	12		mW/ $^{\circ}C$
<b>R<sub>θJA</sub></b>	Thermal Resistance Junction to Ambient Air	200		$^{\circ}C/W$
<b>R<sub>θJC</sub></b>	Thermal Resistance Junction to Case	83.3		$^{\circ}C/W$
<b>T<sub>J</sub>, T<sub>STG</sub></b>	Operation and Storage Junction Temperature Range	-55 to +150		$^{\circ}C$



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## 2N4400/2N4401

### Electrical Characteristics ( $T_{Ambient}=25^{\circ}C$ unless noted otherwise)

Symbol	Description	2N4400		2N4401		Unit	Conditions
		Min.	Max.	Min.	Max.		
<b>V<sub>(BR)CBO</sub></b>	Collector-Base Breakdown Voltage	60	-	60	-	V	I <sub>C</sub> =100μA, I <sub>E</sub> =0
<b>V<sub>(BR)CEO</sub>*</b>	Collector-Emitter Breakdown Voltage	40	-	40	-	V	I <sub>C</sub> =1mA, I <sub>B</sub> =0
<b>V<sub>(BR)EBO</sub></b>	Emitter-Base Breakdown Voltage	6.0	-	6.0	-	V	I <sub>E</sub> =100μA, I <sub>C</sub> =0
<b>V<sub>CE(sat)</sub>*</b>	Collector Emitter Saturation Voltage	-	0.40	-	0.40	V	I <sub>C</sub> =150mA, I <sub>B</sub> =15mA
		-	0.75	-	0.75		I <sub>C</sub> =500mA, I <sub>B</sub> =50mA
<b>V<sub>BE(sat)</sub>*</b>	Base Emitter Saturation Voltage	0.75	0.95	0.75	0.95	V	I <sub>C</sub> =150mA, I <sub>B</sub> =15mA
		-	1.20	-	1.20		I <sub>C</sub> =500mA, I <sub>B</sub> =50mA
<b>I<sub>CEV</sub></b>	Collector Cut-Off Current	-	100	-	100	nA	V <sub>EB</sub> =0.4V, V <sub>CE</sub> =35V
<b>I<sub>BEV</sub></b>	Base Cut-Off Current	-	100	-	100	nA	V <sub>EB</sub> =0.4V, V <sub>CE</sub> =35V
<b>h<sub>FE</sub>*</b>	D.C. Current Gain	-	-	20	-		V <sub>CE</sub> =1V, I <sub>C</sub> =0.1mA
		20	-	40	-		V <sub>CE</sub> =1V, I <sub>C</sub> =1mA
		40	-	80	-		V <sub>CE</sub> =1V, I <sub>C</sub> =10mA
		50	150	100	300		V <sub>CE</sub> =1V, I <sub>C</sub> =150mA
		20	-	40	-		V <sub>CE</sub> =2V, I <sub>C</sub> =500mA
<b>h<sub>ie</sub></b>	Input Impedance	0.5	7.5	1.0	15	kΩ	V <sub>CE</sub> =10V, I <sub>C</sub> =1mA f=1KHz,
<b>h<sub>re</sub></b>	Voltage Feedback Ratio	0.1	8.0	0.1	8.0	x10 <sup>-4</sup>	V <sub>CE</sub> =10V, I <sub>C</sub> =1mA f=1KHz,
<b>f<sub>T</sub></b>	Current Gain-Bandwidth Product	200	-	250	-	MHz	V <sub>CE</sub> =10V, I <sub>C</sub> =20mA, f=100MHz
<b>C<sub>CBO</sub></b>	Collector-Base Capacitance	-	6.5	-	6.5	pF	V <sub>CB</sub> =5V, I <sub>E</sub> =0 f=100KHz,
<b>C<sub>EBO</sub></b>	Emitter-Base Capacitance	-	30	-	30	pF	V <sub>EB</sub> =0.5V, I <sub>C</sub> =0 f=100KHz,
<b>h<sub>fe</sub></b>	Small Signal Current Gain	20	250	40	500		V <sub>CE</sub> =10V, I <sub>C</sub> =1mA f=1KHz,
<b>h<sub>oe</sub></b>	Output Admittance	1.0	30	1.0	30	μS	V <sub>CE</sub> =10V, I <sub>C</sub> =1mA f=1KHz,
<b>t<sub>d</sub></b>	Delay Time	-	15	-	15	nS	V <sub>CC</sub> =30V, V <sub>EB</sub> =2V I <sub>C</sub> =150mA, I <sub>B1</sub> =15mA
<b>t<sub>r</sub></b>	Rise Time	-	20	-	20	nS	
<b>t<sub>s</sub></b>	Storage Time	-	225	-	225	nS	V <sub>CC</sub> =30V, I <sub>C</sub> =150mA I <sub>B1</sub> =I <sub>B2</sub> =15mA
<b>t<sub>f</sub></b>	Fall Time	-	30	-	30	nS	

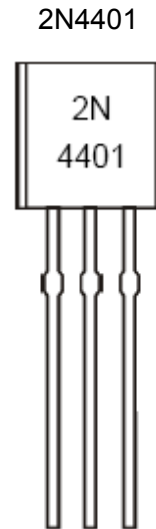
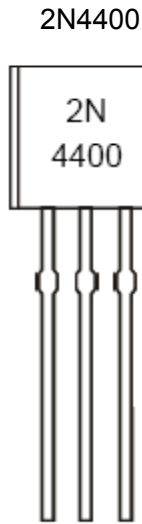
\*Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%



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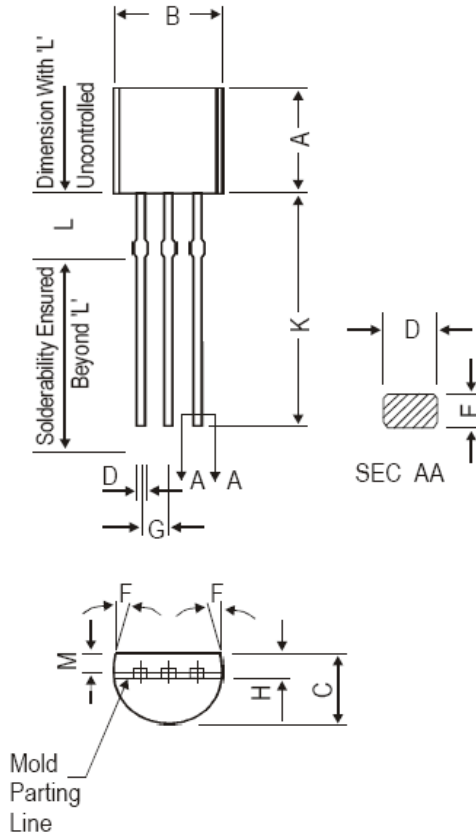
## 2N4400/2N4401

### Marking Information:



### Dimensions in mm

TO-92



DIM	MIN.	MAX.
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 DEG	
G	1.14	1.40
H	1.20	1.40
K	12.70	—
L	1.982	2.082
M	1.03	1.20



# Small Signal General Purpose Transistors (NPN)

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### PIN CONFIGURATION

1. EMITTER
2. BASE
3. COLLECTOR

