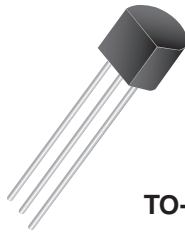
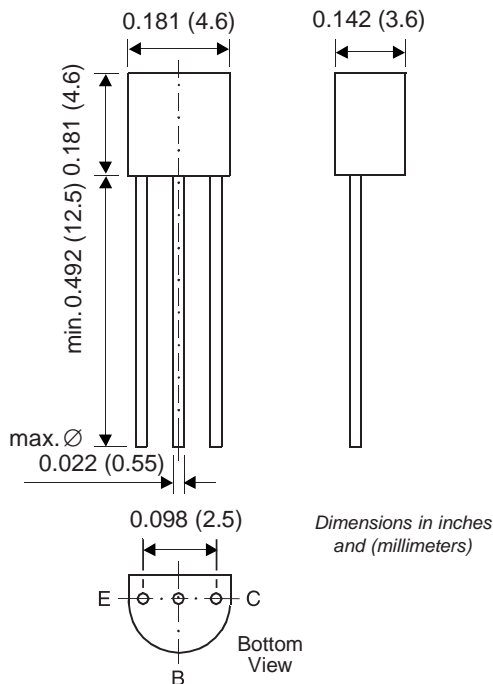


## Small Signal Transistor (PNP)



TO-226AA (TO-92)



### Features

- PNP Silicon Epitaxial Planar Transistor for switching and amplifier applications.
- As complementary type, the NPN transistor 2N4401 is recommended.
- On special request, this transistor is also manufactured in the pin configuration TO-18.
- This transistor is also available in the SOT-23 case with the type designation MMBT4403.

### Mechanical Data

**Case:** TO-92 Plastic Package

**Weight:** approx. 0.18g

**Packaging Codes/Options:**

E6/Bulk – 5K per container, 20K/box

E7/4K per Ammo mag., 20K/box

### Maximum Ratings & Thermal Characteristics Ratings at 25°C ambient temperature unless otherwise specified.

Parameter	Symbol	Value	Unit
Collector-Emitter Voltage	$-V_{CEO}$	40	V
Collector-Base Voltage	$-V_{CBO}$	40	V
Emitter-Base Voltage	$-V_{EBO}$	5.0	V
Collector Current	$-I_C$	600	mA
Power Dissipation $T_A = 25^\circ\text{C}$ Derate above 25°C	$P_{tot}$	625 5.0	mW mW/°C
Power Dissipation $T_C = 25^\circ\text{C}$ Derate above 25°C	$P_{tot}$	1.5 12	W mW/°C
Thermal Resistance Junction to Ambient Air	$R_{\theta JA}$	200	°C/W
Thermal Resistance Junction to Case	$R_{\theta JC}$	83.3	°C/W
Junction Temperature	$T_j$	150	°C
Storage Temperature Range	$T_s$	-55 to +150	°C

## Electrical Characteristics (T<sub>J</sub> = 25°C unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
DC Current Gain	h <sub>FE</sub>	-V <sub>CE</sub> = 1 V, -I <sub>C</sub> = 0.1 mA	30	—	—	—
		-V <sub>CE</sub> = 1 V, -I <sub>C</sub> = 1 mA	60	—	—	
		-V <sub>CE</sub> = 1 V, -I <sub>C</sub> = 10 mA	100	—	—	
		-V <sub>CE</sub> = 2 V, -I <sub>C</sub> = 150 mA	100	—	300	
		-V <sub>CE</sub> = 2 V, -I <sub>C</sub> = 500 mA	20	—	—	
Collector Cutoff Current	-I <sub>CEV</sub>	-V <sub>EB</sub> = 0.4 V, -V <sub>CE</sub> = 35 V	—	—	100	nA
Base Cutoff Current	-I <sub>BEV</sub>	-V <sub>EB</sub> = 0.4 V, -V <sub>CE</sub> = 35 V	—	—	100	nA
Collector-Emitter Saturation Voltage <sup>(1)</sup>	-V <sub>CEsat</sub>	-I <sub>C</sub> = 150 mA, -I <sub>B</sub> = 15 mA	—	—	0.40	V
		-I <sub>C</sub> = 500 mA, -I <sub>B</sub> = 50 mA	—	—	0.75	
Base-Emitter Saturation Voltage <sup>(1)</sup>	-V <sub>BEsat</sub>	-I <sub>C</sub> = 150 mA, -I <sub>B</sub> = 15 mA	0.75	—	0.95	V
		-I <sub>C</sub> = 500 mA, -I <sub>B</sub> = 50 mA	—	—	1.30	
Collector-Emitter Breakdown Voltage	-V <sub>(BR)CEO</sub>	-I <sub>C</sub> = 1 mA, I <sub>B</sub> = 0	40	—	—	V
Collector-Base Breakdown Voltage	-V <sub>(BR)CBO</sub>	-I <sub>C</sub> = 0.1 mA, I <sub>E</sub> = 0	40	—	—	V
Emitter-Base Breakdown Voltage	-V <sub>(BR)EBO</sub>	-I <sub>E</sub> = 0.1 mA, I <sub>C</sub> = 0	5.0	—	—	V
Input Impedance	h <sub>ie</sub>	-V <sub>CE</sub> = 10 V, -I <sub>C</sub> = 1 mA, f = 1 kHz	1.5	—	15	kΩ
Voltage Feedback Ratio	h <sub>re</sub>	-V <sub>CE</sub> = 10 V, -I <sub>C</sub> = 1 mA, f = 1 kHz	0.1 • 10 <sup>-4</sup>	—	8 • 10 <sup>-4</sup>	—
Current Gain-Bandwidth Product	f <sub>T</sub>	-V <sub>CE</sub> = 10 V, -I <sub>C</sub> = 20 mA f = 100 MHz	200	—	—	MHz
Collector-Base Capacitance	C <sub>CB</sub>	-V <sub>CB</sub> = 10 V, I <sub>E</sub> = 0, f = 1.0 MHz	—	—	8.5	pF
Emitter-Base Capacitance	C <sub>EB</sub>	-V <sub>EB</sub> = 0.5 V, I <sub>C</sub> = 0 f = 1.0 MHz	—	—	30	pF
Small Signal Current Gain	h <sub>fe</sub>	-V <sub>CE</sub> = 10 V, -I <sub>C</sub> = 1 mA f = 1 kHz	60	—	500	—
Output Admittance	h <sub>oe</sub>	-V <sub>CE</sub> = 10 V, -I <sub>C</sub> = 1 mA f = 1 kHz	1.0	—	100	μS

**Notes:**

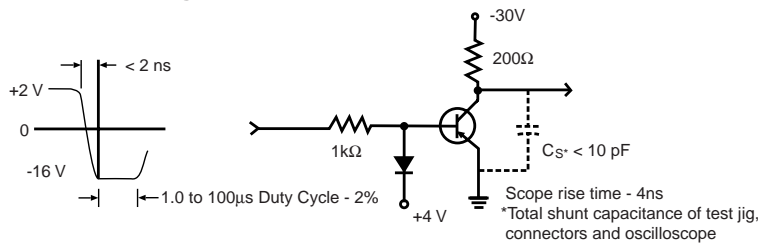
(1) Pulse test: Pulse width ≤ 300 μs - Duty cycle ≤ 2%

## Electrical Characteristics (T<sub>J</sub> = 25°C unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Delay Time (see fig. 1)	t <sub>d</sub>	-I <sub>B1</sub> = 15 mA, -I <sub>C</sub> = 150 mA, -V <sub>CC</sub> = 30 V, -V <sub>EB</sub> = 2 V	—	—	15	ns
Rise Time (see fig. 1)	t <sub>r</sub>	-I <sub>B1</sub> = 15 mA, -I <sub>C</sub> = 150 mA, -V <sub>CC</sub> = 30 V, -V <sub>EB</sub> = 2 V	—	—	20	ns
Storage Time (see fig. 2)	t <sub>s</sub>	-I <sub>B1</sub> = -I <sub>B2</sub> = 15 mA, -I <sub>C</sub> = 150 mA, -V <sub>CC</sub> = 30 V	—	—	225	ns
Fall Time (see fig. 2)	t <sub>f</sub>	-I <sub>B1</sub> = -I <sub>B2</sub> = 15 mA, -I <sub>C</sub> = 150 mA, -V <sub>CC</sub> = 30 V	—	—	30	ns

## Switching Time Equivalent Test Circuit

**Figure 1 - Turn-On Time**



**Figure 2 - Turn-Off Time**

