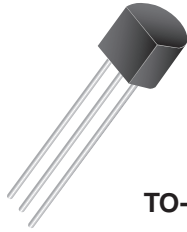
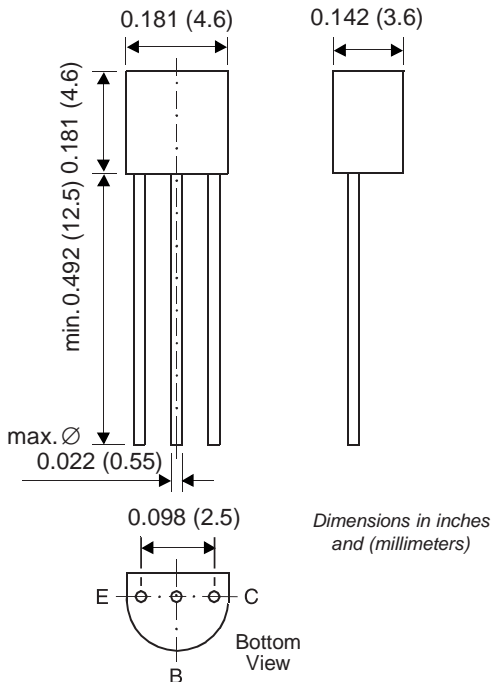


## Small Signal Transistor (PNP)


**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	$P_{tot}$	625 5.0	mW mW/°C
Power Dissipation	$P_{tot}$	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

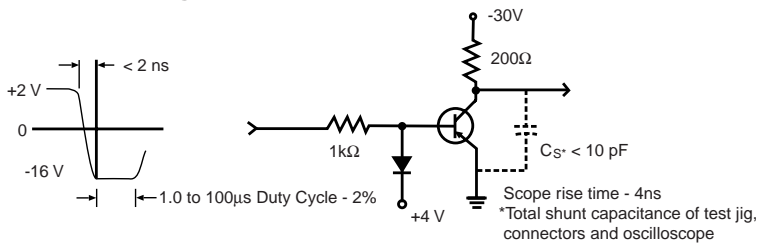
**Electrical Characteristics** ( $T_J = 25^\circ\text{C}$  unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
DC Current Gain	$h_{FE}$	$-V_{CE} = 1\text{ V}, -I_C = 0.1\text{ mA}$	30	—	—	—
		$-V_{CE} = 1\text{ V}, -I_C = 1\text{ mA}$	60	—	—	
		$-V_{CE} = 1\text{ V}, -I_C = 10\text{ mA}$	100	—	—	
		$-V_{CE} = 2\text{ V}, -I_C = 150\text{ mA}$	100	—	300	
		$-V_{CE} = 2\text{ V}, -I_C = 500\text{ mA}$	20	—	—	
Collector Cutoff Current	$-I_{CEV}$	$-V_{EB} = 0.4\text{ V}, -V_{CE} = 35\text{ V}$	—	—	100	nA
Base Cutoff Current	$-I_{BEV}$	$-V_{EB} = 0.4\text{ V}, -V_{CE} = 35\text{ V}$	—	—	100	nA
Collector-Emitter Saturation Voltage <sup>(1)</sup>	$-V_{CEsat}$	$-I_C = 150\text{ mA}, -I_B = 15\text{ mA}$ $-I_C = 500\text{ mA}, -I_B = 50\text{ mA}$	— —	— —	0.40 0.75	V
Base-Emitter Saturation Voltage <sup>(1)</sup>	$-V_{BEsat}$	$-I_C = 150\text{ mA}, -I_B = 15\text{ mA}$ $-I_C = 500\text{ mA}, -I_B = 50\text{ mA}$	0.75 —	— —	0.95 1.30	V
Collector-Emitter Breakdown Voltage	$-V_{(BR)CEO}$	$-I_C = 1\text{ mA}, I_B = 0$	40	—	—	V
Collector-Base Breakdown Voltage	$-V_{(BR)CBO}$	$-I_C = 0.1\text{ mA}, I_E = 0$	40	—	—	V
Emitter-Base Breakdown Voltage	$-V_{(BR)EBO}$	$-I_E = 0.1\text{ mA}, I_C = 0$	5.0	—	—	V
Input Impedance	$h_{ie}$	$-V_{CE} = 10\text{ V}, -I_C = 1\text{ mA},$ $f = 1\text{ kHz}$	1.5	—	15	k $\Omega$
Voltage Feedback Ratio	$h_{re}$	$-V_{CE} = 10\text{ V}, -I_C = 1\text{ mA},$ $f = 1\text{ kHz}$	$0.1 \cdot 10^{-4}$	—	$8 \cdot 10^{-4}$	—
Current Gain-Bandwidth Product	$f_T$	$-V_{CE} = 10\text{ V}, -I_C = 20\text{ mA}$ $f = 100\text{ MHz}$	200	—	—	MHz
Collector-Base Capacitance	$C_{CB}$	$-V_{CB} = 10\text{ V}, I_E = 0,$ $f = 1.0\text{ MHz}$	—	—	8.5	pF
Emitter-Base Capacitance	$C_{EB}$	$-V_{EB} = 0.5\text{ V}, I_C = 0$ $f = 1.0\text{ MHz}$	—	—	30	pF
Small Signal Current Gain	$h_{fe}$	$-V_{CE} = 10\text{ V}, -I_C = 1\text{ mA}$ $f = 1\text{ kHz}$	60	—	500	—
Output Admittance	$h_{oe}$	$-V_{CE} = 10\text{ V}, -I_C = 1\text{ mA}$ $f = 1\text{ kHz}$	1.0	—	100	$\mu\text{S}$

**Notes:**(1) Pulse test: Pulse width  $\leq 300\mu\text{s}$  - Duty cycle  $\leq 2\%$

**Electrical Characteristics** ( $T_J = 25^\circ\text{C}$  unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Delay Time (see fig. 1)	$t_d$	$-I_{B1} = 15\text{ mA}$ , $-I_C = 150\text{ mA}$ , $-V_{CC} = 30\text{ V}$ , $-V_{EB} = 2\text{ V}$	—	—	15	ns
Rise Time (see fig. 1)	$t_r$	$-I_{B1} = 15\text{ mA}$ , $-I_C = 150\text{ mA}$ , $-V_{CC} = 30\text{ V}$ , $-V_{EB} = 2\text{ V}$	—	—	20	ns
Storage Time (see fig. 2)	$t_s$	$-I_{B1} = -I_{B2} = 15\text{ mA}$ , $-I_C = 150\text{ mA}$ , $-V_{CC} = 30\text{ V}$	—	—	225	ns
Fall Time (see fig. 2)	$t_f$	$-I_{B1} = -I_{B2} = 15\text{ mA}$ , $-I_C = 150\text{ mA}$ , $-V_{CC} = 30\text{ V}$	—	—	30	ns

**Switching Time Equivalent Test Circuit**
**Figure 1 - Turn-On Time**

**Figure 2 - Turn-Off Time**
