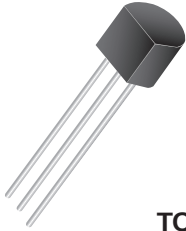
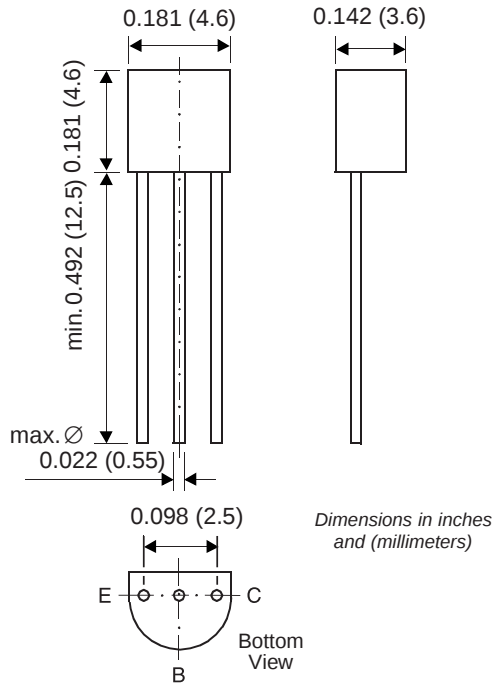


Small Signal Transistor (PNP)



TO-226AA (TO-92)



Features

- PNP Silicon Epitaxial Planar Transistor for switching and amplifier applications.
- As complementary type, the NPN transistor 2N3904 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 MMBT3906.

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	$-I_C$	200	mA
Power Dissipation $T_A = 25^\circ\text{C}$ $T_C = 25^\circ\text{C}$	P_{tot}	625 1.5	mW W
Thermal Resistance Junction to Ambient Air	$R_{\theta JA}$	250 ⁽¹⁾	$^\circ\text{C/W}$
Junction Temperature	T_j	150	$^\circ\text{C}$
Storage Temperature Range	T_S	-65 to +150	$^\circ\text{C}$

Note: (1) Valid provided that leads are kept at ambient temperature.

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
DC Current Gain	h_{FE}	$-V_{CE} = 1\text{ V}, -I_C = 0.1\text{ mA}$	60	—	—	—
		$-V_{CE} = 1\text{ V}, -I_C = 1\text{ mA}$	80	—	—	
		$-V_{CE} = 1\text{ V}, -I_C = 10\text{ mA}$	100	—	300	
		$-V_{CE} = 1\text{ V}, -I_C = 50\text{ mA}$	60	—	—	
		$-V_{CE} = 1\text{ V}, -I_C = 100\text{ mA}$	30	—	—	
Collector-Emitter Cutoff Current	$-I_{CEV}$	$-V_{EB} = 3\text{ V}, -V_{CE} = 30\text{ V}$	—	—	50	nA
Emitter-Base Cutoff Current	$-I_{EBV}$	$-V_{EB} = 3\text{ V}, -V_{CE} = 30\text{ V}$	—	—	50	nA
Collector Saturation Voltage	$-V_{CEsat}$	$-I_C = 10\text{ mA}, -I_B = 1\text{ mA}$	—	—	0.25	V
		$-I_C = 50\text{ mA}, -I_B = 5\text{ mA}$	—	—	0.4	
Base Saturation Voltage	$-V_{BEsat}$	$-I_C = 10\text{ mA}, -I_B = 1\text{ mA}$	—	—	0.85	V
		$-I_C = 50\text{ mA}, -I_B = 5\text{ mA}$	—	—	0.95	
Collector-Emitter Breakdown Voltage	$-V_{(BR)CEO}$	$-I_C = 1\text{ mA}, I_B = 0$	40	—	—	V
Collector-Base Breakdown Voltage	$-V_{(BR)CBO}$	$-I_C = 10\text{ }\mu\text{A}, I_E = 0$	40	—	—	V
Emitter-Base Breakdown Voltage	$-V_{(BR)EBO}$	$-I_E = 10\text{ }\mu\text{A}, I_C = 0$	5	—	—	V
Input Impedance	h_{ie}	$-V_{CE} = 10\text{ V}, -I_C = 1\text{ mA}, f = 1\text{ kHz}$	1	—	10	k Ω
Voltage Feedback Ratio	h_{re}	$-V_{CE} = 10\text{ V}, -I_C = 1\text{ mA}, f = 1\text{ kHz}$	$0.5 \cdot 10^{-4}$	—	$8 \cdot 10^{-4}$	—
Current Gain-Bandwidth Product	f_T	$-V_{CE} = 20\text{ V}, -I_C = 10\text{ mA}, f = 100\text{ MHz}$	250	—	—	MHz
Collector-Base Capacitance	C_{CBO}	$-V_{CB} = 5\text{ V}, f = 100\text{ kHz}$	—	—	4.5	pF
Emitter-Base Capacitance	C_{EBO}	$-V_{EB} = 0.5\text{ V}, f = 100\text{ kHz}$	—	—	10	pF
Small Signal Current Gain	h_{fe}	$-V_{CE} = 10\text{ V}, -I_C = 1\text{ mA}, f = 1\text{ kHz}$	100	—	400	—
Output Admittance	h_{oe}	$-V_{CE} = 1\text{ V}, -I_C = 1\text{ mA}, f = 1\text{ kHz}$	1	—	40	μS

Electrical Characteristics (T_J = 25°C unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Noise Figure	F	$-V_{CE} = 5\text{ V}$, $-I_C = 100\text{ }\mu\text{A}$, $R_G = 1\text{ k}\Omega$, $f = 10\text{..}15000\text{ Hz}$	—	—	4	dB
Delay Time (see fig. 1)	t_d	$-I_{B1} = 1\text{ mA}$, $-I_C = 10\text{ mA}$	—	—	35	ns
Rise Time (see fig. 1)	t_r	$-I_{B1} = 1\text{ mA}$, $-I_C = 10\text{ mA}$,	—	—	35	ns
Storage Time (see fig. 2)	t_s	$I_{B1} = -I_{B2} = 1\text{ mA}$, $-I_C = 10\text{ mA}$	—	—	225	ns
Fall Time (see fig. 2)	t_f	$I_{B1} = -I_{B2} = 1\text{ mA}$, $-I_C = 10\text{ mA}$	—	—	75	ns

Fig. 1: Test circuit for delay and rise time

* total shunt capacitance of test jig and connectors

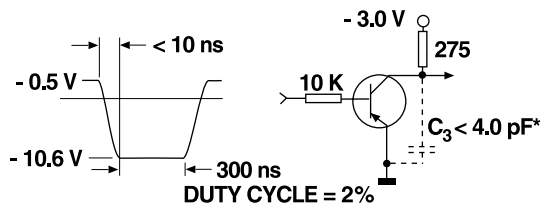


Fig. 2: Test circuit for storage and fall time

* total shunt capacitance of test jig and connectors

