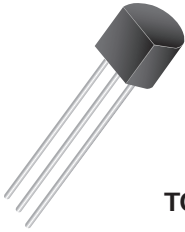
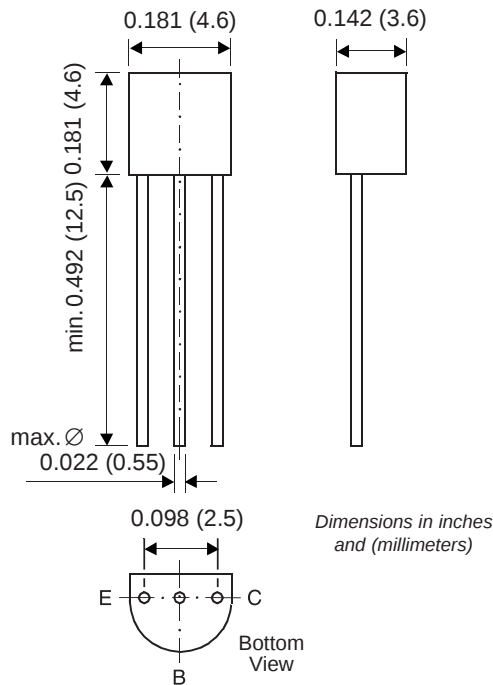


Small Signal Transistor (NPN)


TO-226AA (TO-92)


Features

- NPN Silicon Epitaxial Planar Transistor for switching and amplifier applications.
- As complementary type, the PNP transistor 2N3906 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 MMBT3904.

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}	60	V
Emitter-Base Voltage	V_{EBO}	6.0	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°C unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Collector-Base Breakdown Voltage	V _{(BR)CBO}	I _C = 10 μA, I _E = 0	60	—	—	V
Collector-Emitter Breakdown Voltage ⁽¹⁾	V _{(BR)CEO}	I _C = 1 mA, I _B = 0	40	—	—	V
Emitter-Base Breakdown Voltage	V _{(BR)EBO}	I _E = 10 μA, I _C = 0	6	—	—	V
Collector Saturation Voltage	V _{CEsat}	I _C = 10 mA, I _B = 1 mA I _C = 50 mA, I _B = 5 mA	— —	— —	0.2 0.3	V
Base Saturation Voltage	V _{BEsat}	I _C = 10 mA, I _B = 1 mA I _C = 50 mA, I _B = 5 mA	— —	— —	0.85 0.95	V
Collector-Emitter Cutoff Current	I _{CEV}	V _{EB} = 3 V, V _{CE} = 30 V	—	—	50	nA
Emitter-Base Cutoff Current	I _{EBV}	V _{EB} = 3 V, V _{CE} = 30 V	—	—	50	nA
DC Current Gain	h _{FE}	V _{CE} = 1 V, I _C = 0.1 mA V _{CE} = 1 V, I _C = 1 mA V _{CE} = 1 V, I _C = 10 mA V _{CE} = 1 V, I _C = 50 mA V _{CE} = 1 V, I _C = 100 mA	40 70 100 60 30	— — 300 — —	— — — — —	—
Input Impedance	h _{ie}	V _{CE} = 10 V, I _C = 1 mA f = 1 kHz	1	—	10	kΩ
Voltage Feedback Ratio	h _{re}	V _{CE} = 10 V, I _C = 1 mA f = 1 kHz	0.5 • 10 ⁻⁴	—	8 • 10 ⁻⁴	—
Gain-Bandwidth Product	f _T	V _{CE} = 20 V, I _C = 10 mA f = 100 MHz	300	—	—	MHz
Collector-Base Capacitance	C _{CBO}	V _{CB} = 5 V, f = 100 kHz	—	—	4	pF
Emitter-Base Capacitance	C _{EBO}	V _{CB} = 0.5 V, f = 100 kHz	—	—	8	pF
Small Signal Current Gain	h _{fe}	V _{CE} = 10 V, I _C = 1 mA, f = 1 kHz	100	—	400	—
Output Admittance	h _{oe}	V _{CE} = 1 V, I _C = 1 mA, f = 1 kHz	1	—	40	μS
Noise Figure	NF	V _{CE} = 5 V, I _C = 100 μA, R _G = 1 kΩ, f = 10...15000 kHz	—	—	5	dB
Delay Time (see fig. 1)	t _d	I _{B1} = 1 mA, I _C = 10 mA	—	—	35	ns
Rise Time (see fig. 1)	t _r	I _{B1} = 1 mA, I _C = 10 mA	—	—	35	ns
Storage Time (see fig. 2)	t _s	-I _{B1} = I _{B2} = 1 mA I _C = 10 mA	—	—	200	ns
Fall Time (see fig. 2)	t _f	-I _{B1} = I _{B2} = 1 mA I _C = 10 mA	—	—	50	ns

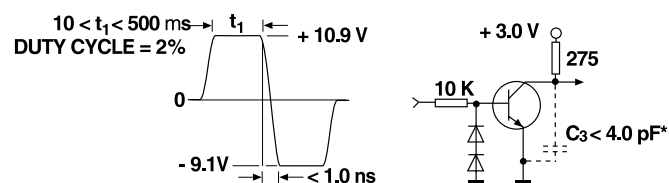


Fig. 1: Test circuit for delay and rise time
* total shunt capacitance of test jig and connectors

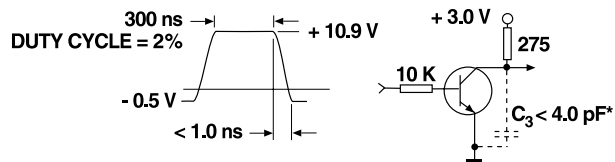


Fig. 2: Test circuit for storage and fall time
* total shunt capacitance of test jig and connectors