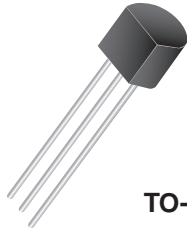
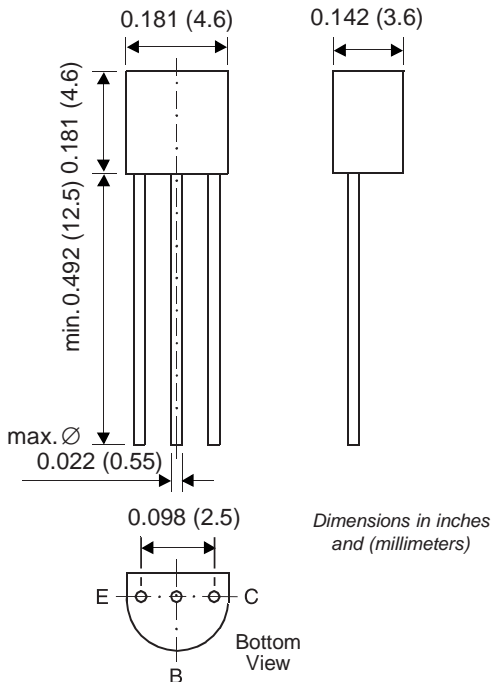


Small Signal Transistor (PNP)


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}	$T_A = 25^\circ\text{C}$	625
		Derate above 25°C	5.0
Power Dissipation	P_{tot}	$T_C = 25^\circ\text{C}$	1.5
		Derate above 25°C	12
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°C unless otherwise noted)

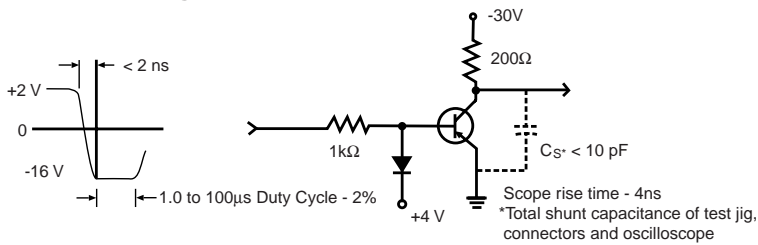
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
DC Current Gain	h _{FE}	-V _{CE} = 1 V, -I _C = 0.1 mA	30	—	—	—
		-V _{CE} = 1 V, -I _C = 1 mA	60	—	—	
		-V _{CE} = 1 V, -I _C = 10 mA	100	—	—	
		-V _{CE} = 2 V, -I _C = 150 mA	100	—	300	
		-V _{CE} = 2 V, -I _C = 500 mA	20	—	—	
Collector Cutoff Current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

Notes:

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