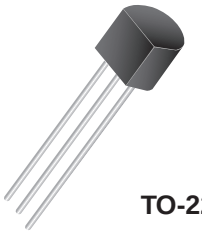
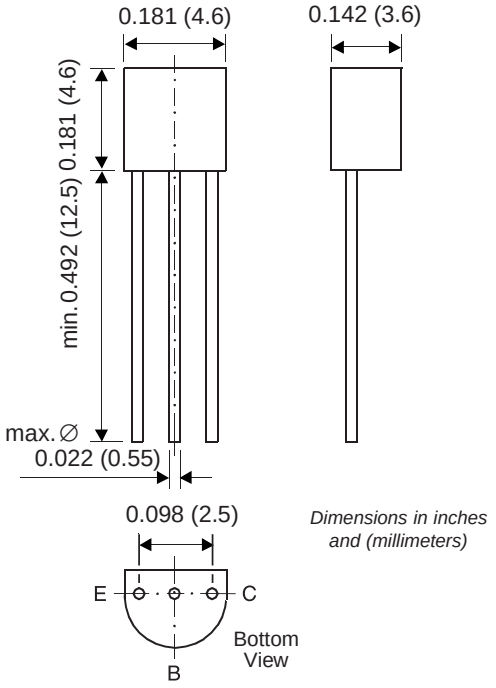
New Product

Vishay Semiconductors
formerly General Semiconductor

Small Signal Transistor (PNP)



TO-226AA (TO-92)



Dimensions in inches and (millimeters)

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°C Derate above 25°C	P_{tot}	625 5.0	mW mW/°C
Power Dissipation	T_C = 25°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_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 $-V_{CE}$ = 1 V, $-I_C$ = 1 mA $-V_{CE}$ = 1 V, $-I_C$ = 10 mA $-V_{CE}$ = 2 V, $-I_C$ = 150 mA $-V_{CE}$ = 2 V, $-I_C$ = 500 mA	30 60 100 100 20	— — — — —	— — — 300 —	—
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	$0.1 \cdot 10^{-4}$	—	$8 \cdot 10^{-4}$	—
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°C unless otherwise noted)

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

Switching Time Equivalent Test Circuit

Figure 1 - Turn-On Time

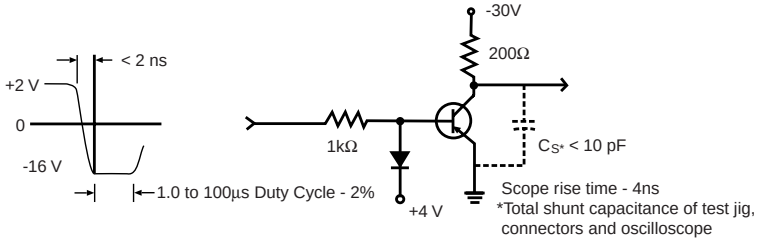


Figure 2 - Turn-Off Time