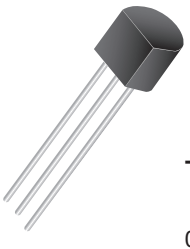
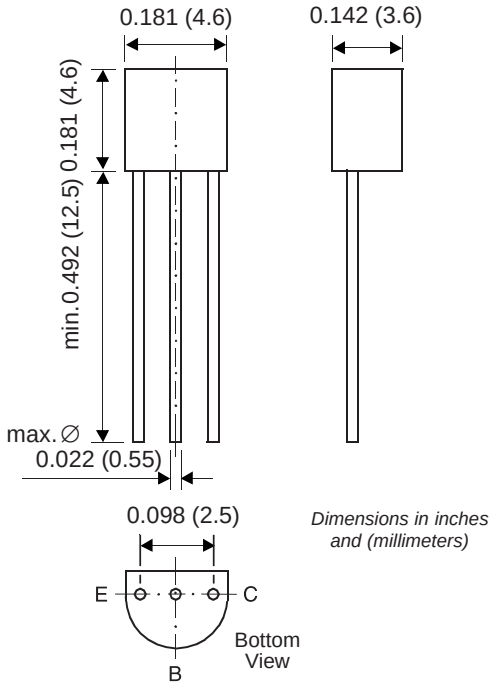
New Product

Vishay Semiconductors
formerly General Semiconductor

Small Signal Transistor (NPN)



TO-226AA (TO-92)



Features

- NPN Silicon Epitaxial Transistor for switching and amplifier applications.
- As complementary type, the PNP transistor 2N4403 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 MMBT4401,

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	600	mA
Power Dissipation at T_A = 25°C Derate above 25°C	P_{tot}	625 5.0	mW mW/°C
Power Dissipation at T_C = 25°C Derate above 25°C	P_{tot}	1.5 12	mW 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
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	I_C = 0.1 mA, 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 = 0.1 mA, I_C = 0	6.0	—	—	V
Collector-Emitter Saturation Voltage	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	V_{BEsat}	I_C = 150 mA, I_B = 15 mA I_C = 500 mA, I_B = 50 mA	0.75 —	— —	0.95 1.20	V
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
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 = 150 mA V_{CE} = 2 V, I_C = 500 mA	20 40 80 100 40	— — — — —	— — — 300 —	—
Input Impedance	h_{ie}	V_{CE} = 10 V, I_C = 1 mA f = 1 kHz	1.0	—	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} = 5 V, I_C = 20 mA f = 100 MHz	250	—	—	MHz
Collector-Base Capacitance	C_{CBO}	V_{CB} = 5 V, I_E = 0, f = 1.0 MHz	—	—	6.5	pF
Emitter-Base Capacitance	C_{EBO}	V_{CB} = 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	40	—	500	—
Output Admittance	h_{oe}	V_{CE} = 10 V, I_C = 1 mA, f = 1 kHz	1.0	—	30	µS

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_C = 150 mA, I_{B1} = 15 mA V_{CC} = 30 V, V_{BE} = 2.0 mA	—	—	15	ns
Rise Time (see fig. 1)	t_r	I_C = 150 mA, I_{B1} = 15 mA V_{CC} = 30 V, V_{BE} = 2.0 mA	—	—	20	ns
Storage Time (see fig. 2)	t_s	I_{B1} = I_{B2} = 15 mA V_{CC} = 30 V, I_C = 150 mA	—	—	225	ns
Fall Time (see fig. 2)	t_f	I_{B1} = I_{B2} = 15 mA V_{CC} = 30 V, I_C = 150 mA	—	—	30	ns

Switching Time Equivalent Test Circuit

Figure 1 - Turn-ON Time

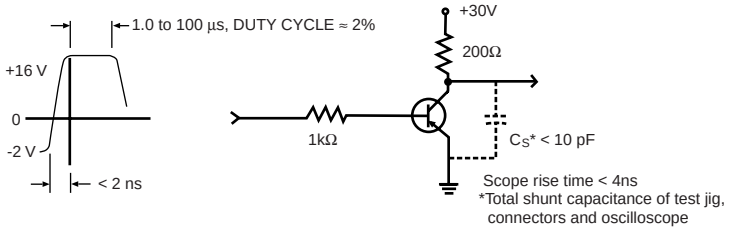


Figure 2 - Turn-OFF Time