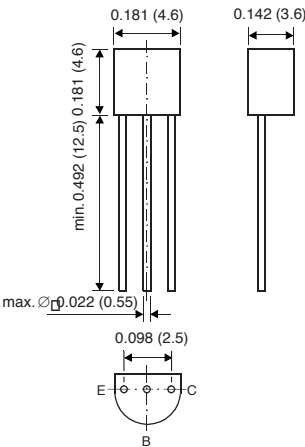


2N4401

SMALL SIGNAL TRANSISTORS (NPN)

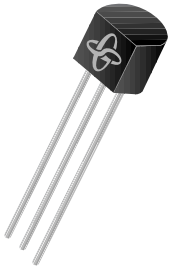
TO-92



Dimensions in inches and (millimeters)

FEATURES

- ◆ NPN Silicon Epitaxial Planar 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

MAXIMUM RATINGS AND THERMAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified

	SYMBOL	VALUE	UNIT
Collector-Base Voltage	V _{CBO}	60	Volts
Collector-Emitter Voltage	V _{CEO}	40	Volts
Emitter-Base Voltage	V _{EBO}	6.0	Volts
Collector Current-Continuous	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	W mW/°C
Thermal Resistance, Junction to Ambient Air	R _{θJA}	200	°C/W
Thermal Resistance Junction to Case	R _{θJC}	83.3	°C/W
Junction Temperature	T _j	150	°C
Storage Temperature Range	T _S	-55 to +150	°C

2N4401

ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified

	SYMBOL	MIN.	MAX.	UNIT
Collector-Base Breakdown Voltage at $I_C = 0.1 \text{ mA}$, $I_E = 0$	$V_{(BR)CBO}$	60	—	Volts
Collector-Emitter Breakdown Voltage ⁽¹⁾ at $I_C = 1 \text{ mA}$, $I_B = 0$	$V_{(BR)CEO}$	40	—	Volts
Emitter-Base Breakdown Voltage at $I_E = 0.1 \text{ mA}$, $I_C = 0$	$V_{(BR)EBO}$	6.0	—	Volts
Collector-Emitter Saturation Voltage ⁽¹⁾ at $I_C = 150 \text{ mA}$, $I_B = 15 \text{ mA}$ at $I_C = 500 \text{ mA}$, $I_B = 50 \text{ mA}$	V_{CEsat} V_{CEsat}	— —	0.40 0.75	Volts Volts
Base-Emitter Saturation Voltage ⁽¹⁾ at $I_C = 150 \text{ mA}$, $I_B = 15 \text{ mA}$ at $I_C = 500 \text{ mA}$, $I_B = 50 \text{ mA}$	V_{BEsat} V_{BEsat}	0.75 —	0.95 1.20	Volts Volts
Collector Cutoff Current at $V_{EB} = 0.4 \text{ V}$, $V_{CE} = 35 \text{ V}$	I_{CEX}	—	100	nA
Base Cutoff Current at $V_{EB} = 0.4 \text{ V}$, $V_{CE} = 35 \text{ V}$	I_{BEV}	—	100	nA
DC Current Gain at $V_{CE} = 1 \text{ V}$, $I_C = 0.1 \text{ mA}$ at $V_{CE} = 1 \text{ V}$, $I_C = 1 \text{ mA}$ at $V_{CE} = 1 \text{ V}$, $I_C = 10 \text{ mA}$ at $V_{CE} = 1 \text{ V}$, $I_C = 150 \text{ mA}$ ⁽¹⁾ at $V_{CE} = 2 \text{ V}$, $I_C = 500 \text{ mA}$ ⁽¹⁾	h_{FE} h_{FE} h_{FE} h_{FE} h_{FE}	20 40 80 100 40	— — — 300 —	— — — — —
Input Impedance at $V_{CE} = 10 \text{ V}$, $I_C = 1 \text{ mA}$, $f = 1 \text{ kHz}$	h_{ie}	1.0	15	k Ω
Voltage Feedback Ratio at $V_{CE} = 10 \text{ V}$, $I_C = 1 \text{ mA}$, $f = 1 \text{ kHz}$	h_{re}	$0.1 \cdot 10^{-4}$	$8 \cdot 10^{-4}$	—
Current Gain-Bandwidth Product at $V_{CE} = 10 \text{ V}$, $I_C = 20 \text{ mA}$, $f = 100 \text{ MHz}$	f_T	250	—	MHz
Collector-Base Capacitance at $V_{CB} = 5 \text{ V}$, $I_E = 0$, $f = 1.0 \text{ MHz}$	C_{CBO}	—	6.5	pF
Emitter-Base Capacitance at $V_{EB} = 0.5 \text{ V}$, $I_C = 0$, $f = 1.0 \text{ MHz}$	C_{EBO}	—	30	pF

NOTES

(1) Pulse test: Pulse width $\leq 300\mu\text{s}$ - Duty cycle $\leq 2\%$

2N4401

ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified

	SYMBOL	MIN.	MAX.	UNIT
Small Signal Current Gain at $V_{CE} = 10\text{ V}$, $I_C = 1\text{ mA}$, $f = 1\text{ kHz}$	h_{fe}	40	500	—
Output Admittance at $V_{CE} = 10\text{ V}$, $I_C = 1\text{ mA}$, $f = 1\text{ kHz}$	h_{oe}	1.0	30	μS
Delay Time (see fig. 1) at $I_C = 150\text{ mA}$, $I_{B1} = 15\text{ mA}$, $V_{CC}=30\text{V}$, $V_{BE}=2.0\text{V}$	t_d	—	15	ns
Rise Time (see fig. 1) at $I_C = 150\text{ mA}$, $I_{B1} = 15\text{ mA}$, $V_{CC}=30\text{V}$, $V_{BE}=2.0\text{V}$	t_r	—	20	ns
Storage Time (see fig. 2) at $I_{B1} = I_{B2} = 15\text{ mA}$, $V_{CC}=30\text{V}$, $I_C=150\text{mA}$	t_s	—	225	ns
Fall Time (see fig. 2) at $I_{B1} = I_{B2} = 15\text{ mA}$, $V_{CC}=30\text{V}$, $I_C=150\text{mA}$	t_f	—	30	ns

SWITCHING TIME EQUIVALENT TEST CIRCUIT

FIGURE 1 - TURN-ON TIME

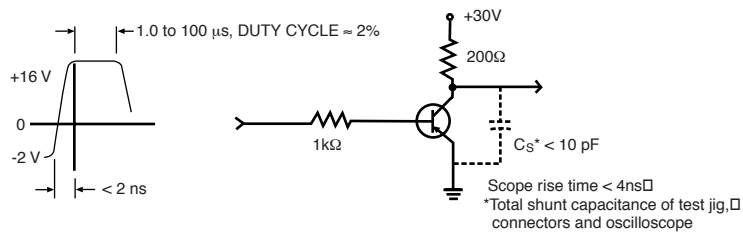


FIGURE 2 - TURN-OFF TIME

