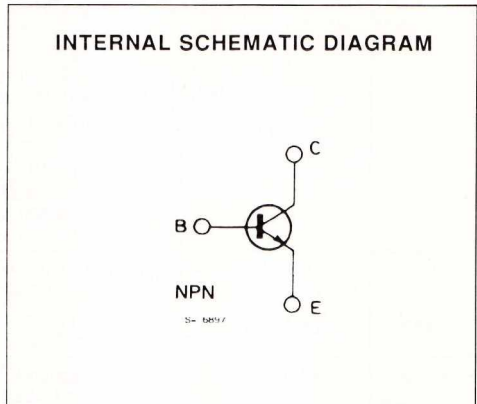
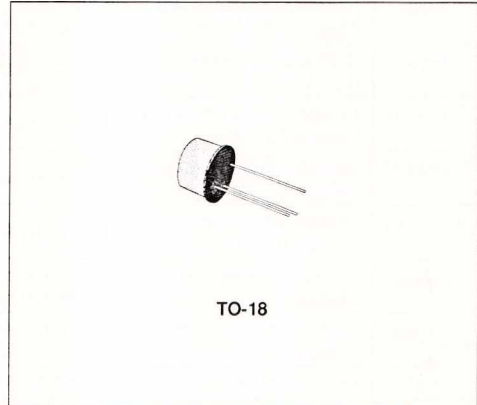




GENERAL PURPOSE AMPLIFIERS AND SWITCHES

DESCRIPTION

The 2N3301 and 2N3302 are silicon planar epitaxial NPN transistors in Jedec TO-18 metal case. They are designed to cover a wide range of amplifier and switching applications.



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CBO}	Collector-base Voltage ($I_E = 0$)	60	V
V_{CEO}	Collector-emitter Voltage ($I_B = 0$)	30	V
V_{EBO}	Emitter-base Voltage ($I_C = 0$)	5	V
I_C	Collector Current	0.5	A
P_{tot}	Total Power Dissipation at $T_{amb} \leq 25^\circ\text{C}$ at $T_{case} \leq 25^\circ\text{C}$	0.36 1.8	W W
T_{stg}, T_J	Storage and Junction Temperature	- 65 to 200	$^\circ\text{C}$

THERMAL DATA

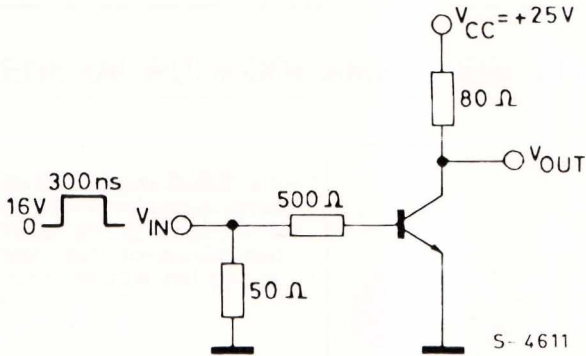
$R_{th\ j-case}$	Thermal Resistance Junction-case	Max	97.2	$^{\circ}C/W$
$R_{th\ j-amb}$	Thermal Resistance Junction-ambient	Max	486	$^{\circ}C/W$

ELECTRICAL CHARACTERISTICS ($T_{amb} = 25\ ^{\circ}C$ unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{CES}	Collector Cutoff Current ($V_{BE} = 0$)	$V_{CB} = 50\ V$ $V_{CB} = 50\ V$ $T_{amb} = 150\ ^{\circ}C$			10 10	nA μA
I_{EBO}	Emitter-cutoff Current ($I_C = 0$)	$V_{EB} = 3\ V$			10	nA
$V_{(BR)CBO}$	Collector-base Breakdown Voltage ($I_E = 0$)	$I_C = 10\ \mu A$	60			V
$V_{(BR)CEO}^*$	Collector-emitter Breakdown Voltage ($I_B = 0$)	$I_C = 10\ mA$	30			V
$V_{(BR)EBO}$	Emitter-base Breakdown Voltage ($I_C = 0$)	$I_E = 10\ \mu A$	5			V
$V_{CE(sat)}^*$	Collector-emitter Saturation Voltage	$I_C = 150\ mA$ $I_B = 15\ mA$ $I_C = 500\ mA$ $I_B = 50\ mA$			0.22 0.6	V V
$V_{BE(sat)}^*$	Base-emitter Saturation Voltage	$I_C = 150\ mA$ $I_B = 15\ mA$ $I_C = 500\ mA$ $I_B = 50\ mA$			1.1 1.5	V V
h_{FE}^*	DC Current Gain	for 2N3301 $I_C = 0.1\ mA$ $V_{CE} = 10\ V$ $I_C = 1\ mA$ $V_{CE} = 10\ V$ $I_C = 10\ mA$ $V_{CE} = 10\ V$ $I_C = 150\ mA$ $V_{CE} = 10\ V$ $I_C = 500\ mA$ $V_{CE} = 10\ V$ $I_C = 150\ mA$ $V_{CE} = 1\ V$ for 2N3302 $I_C = 0.1\ mA$ $V_{CE} = 10\ V$ $I_C = 1\ mA$ $V_{CE} = 10\ V$ $I_C = 10\ mA$ $V_{CE} = 10\ V$ $I_C = 150\ mA$ $V_{CE} = 10\ V$ $I_C = 500\ mA$ $V_{CE} = 10\ V$ $I_C = 150\ mA$ $V_{CE} = 1\ V$	20 25 35 40 20 20	40 60 70 70 60 50	120 300	
h_{fe}	High Frequency Current Gain	$I_C = 50\ mA$ $f = 100\ MHz$ $V_{CE} = 10\ V$	2.5			
C_{EBO}	Emitter-base Capacitance	$V_{EB} = 2\ V$ $f = 1\ MHz$			20	pF
C_{CBO}	Collector-base Capacitance	$V_{CB} = 10\ V$ $f = 1\ MHz$			8	pF
t_{on}^{**}	Turn-on Time	$I_C = 300\ mA$ $V_{CC} = 25\ V$ $I_{B1} = 30\ mA$			60	ns
t_{off}^{**}	Turn-off Time	$I_C = 300\ mA$ $V_{CC} = 25\ V$ $I_{B1} = -I_{B2} = 30\ mA$			150	ns

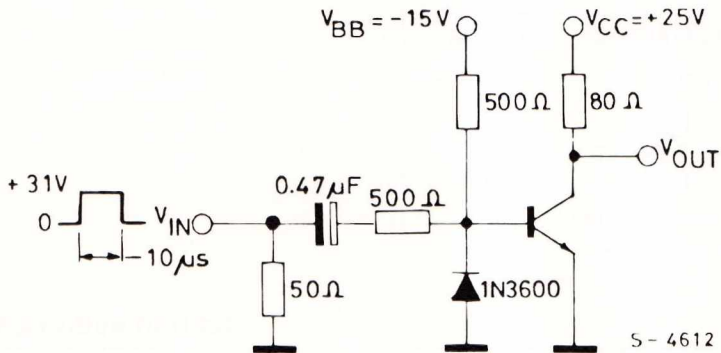
* Pulsed : pulse duration = 300 μs , duty cycle = 1 %.

** See test circuits.

Test Circuit for t_{on} .

PULSE GENERATOR:
 $t \leq 1.0$ ns
 $Z_N = 50 \Omega$

TO OSCILLOSCOPE :
 $t \leq 1.0$ ns
 $Z_{IN} = 100$ k Ω

Test Circuit for t_{off} .

PULSE GENERATOR:
 $t \leq 20$ ns
 $Z_N = 50 \Omega$

TO OSCILLOSCOPE :
 $t \leq 1.0$ ns
 $Z_{IN} = 100$ k Ω