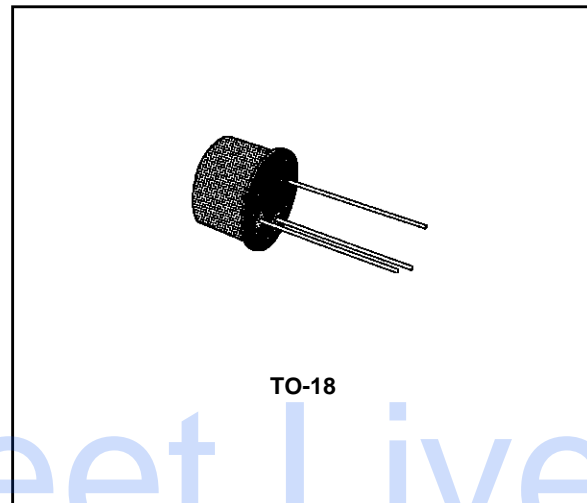


GENERAL PURPOSE AMPLIFIERS AND SWITCHES

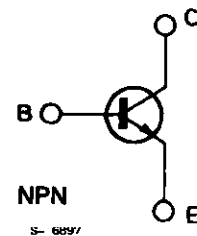
DESCRIPTION

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.



Datasheet.Live

INTERNAL SCHEMATIC DIAGRAM



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 $T_{amb} \leq 25\text{ }^\circ\text{C}$ at $T_{case} \leq 25\text{ }^\circ\text{C}$	0.36	W
		1.8	W
T_{stg}, T_j	Storage and Junction Temperature	- 65 to 200	$^\circ\text{C}$

2N3301-2N3302

THERMAL DATA

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

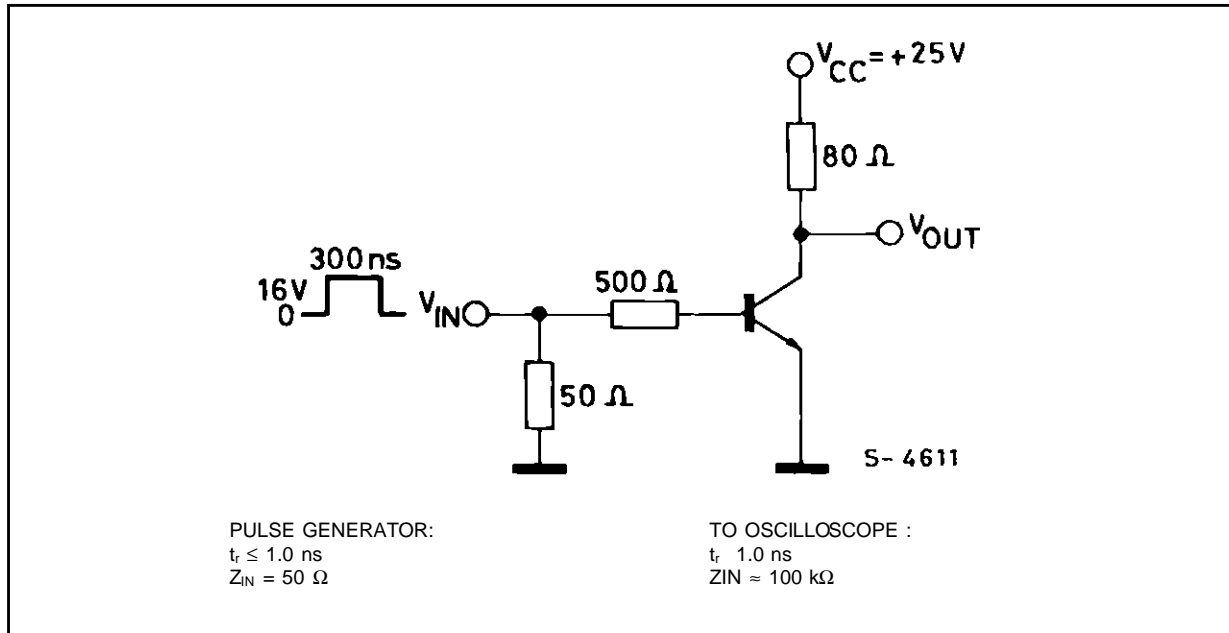
ELECTRICAL CHARACTERISTICS ($T_{amb} = 25\text{ °C}$ unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit	
I_{CES}	Collector Cutoff Current ($V_{BE} = 0$)	$V_{CB} = 50\text{ V}$			10	nA	
		$V_{CB} = 50\text{ V}$ $T_{amb} = 150\text{ °C}$			10	μA	
I_{EBO}	Emitter-cutoff Current ($I_C = 0$)	$V_{EB} = 3\text{ V}$			10	nA	
$V_{(BR)CBO}$	Collector-base Breakdown Voltage ($I_E = 0$)	$I_C = 10\text{ μA}$	60			V	
$V_{(BR)CEO}^*$	Collector-emitter Breakdown Voltage ($I_B = 0$)	$I_C = 10\text{ mA}$	30			V	
$V_{(BR)EBO}$	Emitter-base Breakdown Voltage ($I_C = 0$)	$I_E = 10\text{ μA}$	5			V	
$V_{CE(sat)}^*$	Collector-emitter Saturation Voltage	$I_C = 150\text{ mA}$ $I_B = 15\text{ mA}$			0.22	V	
		$I_C = 500\text{ mA}$ $I_B = 50\text{ mA}$			0.6	V	
$V_{BE(sat)}^*$	Base-emitter Saturation Voltage	$I_C = 150\text{ mA}$ $I_B = 15\text{ mA}$			1.1	V	
		$I_C = 500\text{ mA}$ $I_B = 50\text{ mA}$			1.5	V	
h_{FE}^*	DC Current Gain	for 2N3301					
		$I_C = 0.1\text{ mA}$ $V_{CE} = 10\text{ V}$	20	40			
		$I_C = 1\text{ mA}$ $V_{CE} = 10\text{ V}$	25	60			
		$I_C = 10\text{ mA}$ $V_{CE} = 10\text{ V}$	35	70			
		$I_C = 150\text{ mA}$ $V_{CE} = 10\text{ V}$	40		120		
		$I_C = 500\text{ mA}$ $V_{CE} = 10\text{ V}$	20	60			
		$I_C = 150\text{ mA}$ $V_{CE} = 1\text{ V}$	20	50			
		for 2N3302					
		$I_C = 0.1\text{ mA}$ $V_{CE} = 10\text{ V}$	35	80			
		$I_C = 1\text{ mA}$ $V_{CE} = 10\text{ V}$	50	140			
		$I_C = 10\text{ mA}$ $V_{CE} = 10\text{ V}$	75	200			
		$I_C = 150\text{ mA}$ $V_{CE} = 10\text{ V}$	100		300		
$I_C = 500\text{ mA}$ $V_{CE} = 10\text{ V}$	50	125					
$I_C = 150\text{ mA}$ $V_{CE} = 1\text{ V}$	50	75					
h_{fe}	High Frequency Current Gain	$I_C = 50\text{ mA}$ $V_{CE} = 10\text{ V}$ $f = 100\text{ MHz}$	2.5				
C_{EBO}	Emitter-base Capacitance	$V_{EB} = 2\text{ V}$ $f = 1\text{ MHz}$			20	pF	
C_{CBO}	Collector-base Capacitance	$V_{CB} = 10\text{ V}$ $f = 1\text{ MHz}$			8	pF	
t_{on}^{**}	Turn-on Time	$I_C = 300\text{ mA}$ $V_{CC} = 25\text{ V}$ $I_{B1} = 30\text{ mA}$			60	ns	
t_{off}^{**}	Turn-off Time	$I_C = 300\text{ mA}$ $V_{CC} = 25\text{ V}$ $I_{B1} = -I_{B2} = 30\text{ mA}$			150	ns	

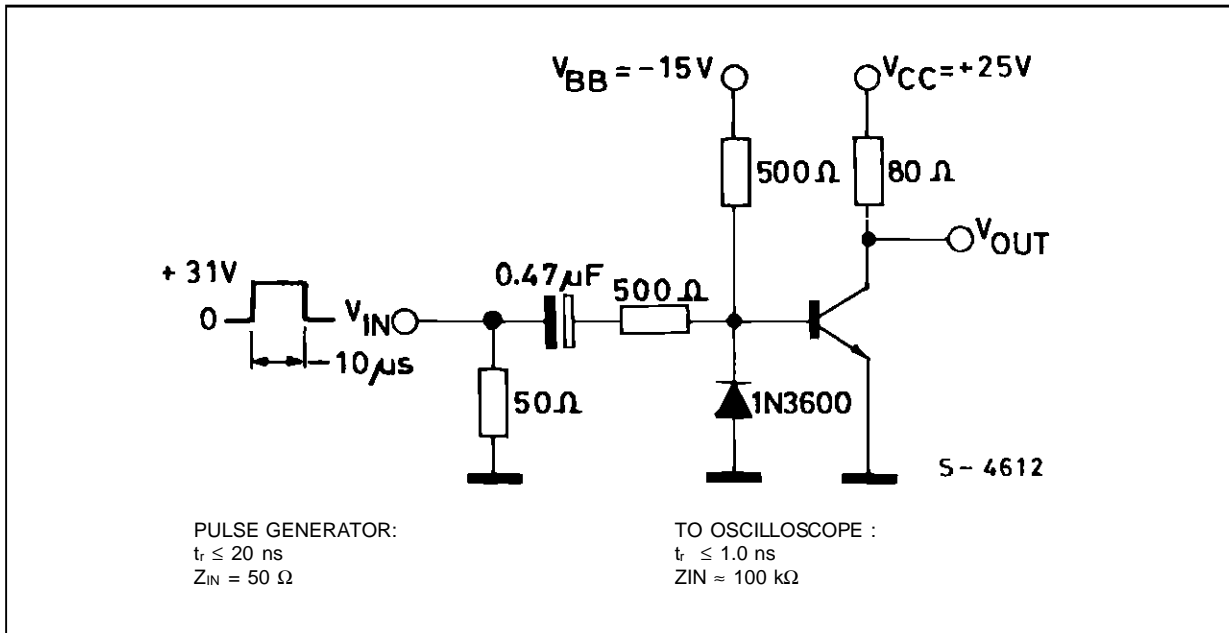
* Pulsed : pulse duration = 300 μs, duty cycle = 1 %.

** See test circuits.

Test Circuit for t_{on} .

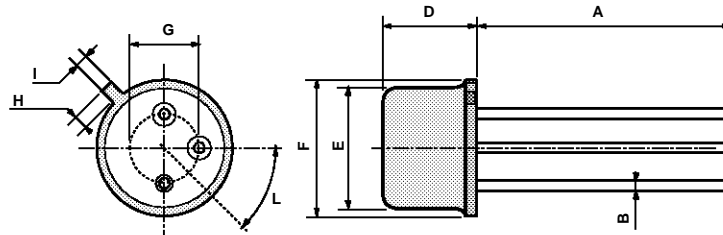


Test Circuit for t_{off} .



TO39 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	12.7			0.500		
B			0.49			0.019
D			6.6			0.260
E			8.5			0.334
F			9.4			0.370
G	5.08			0.200		
H			1.2			0.047
I			0.9			0.035
L	45° (typ.)					



P008B

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