
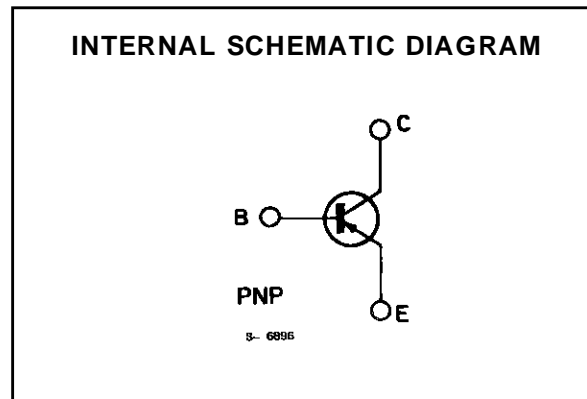
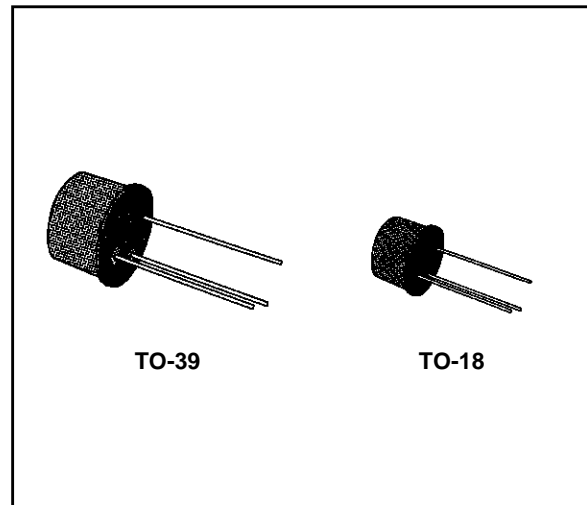


GENERAL PURPOSE AMPLIFIERS AND SWITCHES

DESCRIPTION

The 2N2904A, 2N2905A, 2N2906A and 2N2907A are silicon planar epitaxial PNP transistors in Jedec TO-39 (for 2N2904A and 2N2905A) and in Jedec TO-18 (for 2N2906A and 2N2907A) metal cases. They are designed for high-speed saturated switching and general purpose applications.

 2N2904A/2N2905A approved to CECC 50002-100, 2N2906A/2N2907A approved to CECC 50002-103 available on request.



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CBO}	Collector-base Voltage ($I_E = 0$)	- 60	V
V_{CEO}	Collector-emitter Voltage ($I_B = 0$)	- 60	V
V_{EBO}	Emitter-base Voltage ($I_C = 0$)	- 5	V
I_C	Collector Current	- 600	mA
P_{tot}	Total Power Dissipation at $T_{amb} \leq 25\text{ }^\circ\text{C}$ for 2N2904A and 2N2905A for 2N2906A and 2N2907A at $T_{case} \leq 25\text{ }^\circ\text{C}$ for 2N2904A and 2N2905A for 2N2906A and 2N2907A	0.6	W
		0.4	W
		3	W
		1.8	W
T_{stg}, T_j	Storage and Junction Temperature	- 65 to 200	$^\circ\text{C}$

2N2904A-2N2905A-2N2906A-2N2907A

THERMAL DATA

			2N2904A 2N2905A	2N2906A 2N2907A
$R_{th\ j-case}$	Thermal Resistance Junction-case	Max	58.3 °C/W	97.3 °C/W
$R_{th\ j-amb}$	Thermal Resistance Junction-ambient	Max	292 °C/W	437.5 °C/W

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{CBO}	Collector Cutoff Current ($I_E = 0$)	$V_{CB} = -50\text{ V}$			- 10	nA
		$V_{CB} = -50\text{ V}$ $T_{amb} = 150\text{ °C}$			- 10	μA
I_{CEX}	Collector Cutoff Current ($V_{BE} = 0.5\text{ V}$)	$V_{CE} = -30\text{ V}$			- 50	nA
I_{BEX}	Base Cutoff Current ($V_{BE} = 0.5\text{ V}$)	$V_{CE} = -30\text{ V}$			- 50	nA
$V_{(BR)\ CBO}$	Collector-base Breakdown Voltage ($I_E = 0$)	$I_C = -10\ \mu\text{A}$	- 60			V
$V_{(BR)\ CEO}^*$	Collector-emitter Breakdown Voltage ($I_B = 0$)	$I_C = -10\text{ mA}$	- 60			V
$V_{(BR)\ EBO}$	Emitter-base Breakdown Voltage ($I_C = 0$)	$I_E = -10\ \mu\text{A}$	- 5			V
$V_{CE(sat)}^*$	Collector-emitter Saturation Voltage	$I_C = -150\text{ mA}$ $I_B = -15\text{ mA}$			- 0.4	V
		$I_C = -500\text{ mA}$ $I_B = -50\text{ mA}$			- 1.6	V
$V_{BE(sat)}^*$	Base-emitter Saturation Voltage	$I_C = -150\text{ mA}$ $I_B = -16\text{ mA}$			- 1.3	V
		$I_C = -500\text{ mA}$ $I_B = -50\text{ mA}$			- 2.6	V
h_{FE}^*	DC Current Gain	for 2N2904A and 2N2906A				
		$I_C = -0.1\text{ mA}$ $V_{CE} = -10\text{ V}$	40			
		$I_C = -1\text{ mA}$ $V_{CE} = -10\text{ V}$	40			
		$I_C = -10\text{ mA}$ $V_{CE} = -10\text{ V}$	40			
		$I_C = -150\text{ mA}$ $V_{CE} = -10\text{ V}$	40			120
h_{FE}^*	DC Current Gain	for 2N2905A and 2N2907A				
		$I_C = -0.1\text{ mA}$ $V_{CE} = -10\text{ V}$	75			
		$I_C = -1\text{ mA}$ $V_{CE} = -10\text{ V}$	100			
		$I_C = -10\text{ mA}$ $V_{CE} = -10\text{ V}$	100			
		$I_C = -150\text{ mA}$ $V_{CE} = -10\text{ V}$	100			300
f_T	Transition Frequency	$I_C = -50\text{ mA}$ $V_{CE} = -20\text{ V}$	200			MHz
		$f = 100\text{ MHz}$				
C_{EBO}	Emitter-base Capacitance	$I_C = 0$ $V_{EB} = -2\text{ V}$			30	pF
C_{CBO}	Collector-base Capacitance	$f = 1\text{ MHz}$				
		$I_E = 0$ $V_{CB} = -10\text{ V}$			8	pF
t_d^{**}	Delay Time	$I_C = -150\text{ mA}$ $V_{CC} = -30\text{ V}$			10	ns
t_r^{**}	Rise Time	$I_{B1} = -15\text{ mA}$				
		$V_{CC} = -30\text{ V}$			40	ns
t_s^{**}	Storage Time	$I_C = -150\text{ mA}$ $V_{CC} = -6\text{ V}$			80	ns
		$I_{B1} = -I_{B2} = -15\text{ mA}$				

* Pulsed : pulse duration = 300 μs , duty cycle = 1.5 %.

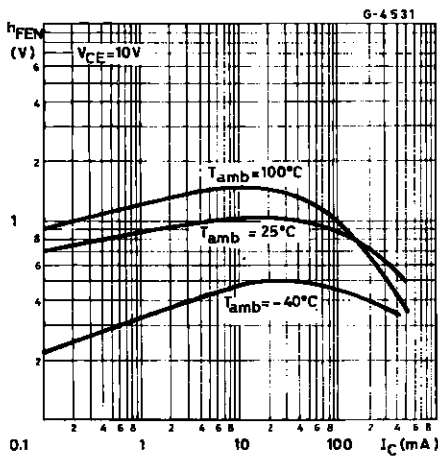
** See test circuit.

ELECTRICAL CHARACTERISTICS (continued)

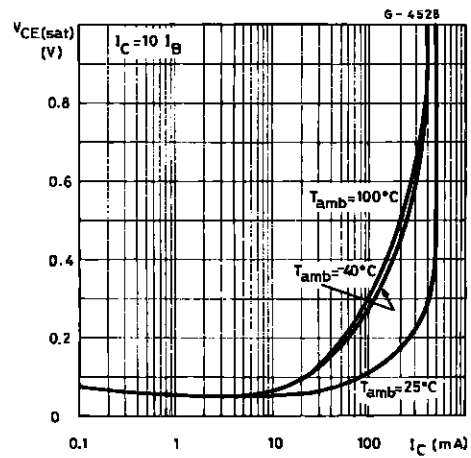
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_f^{**}	Fall Time	$I_C = -150 \text{ mA}$ $V_{CC} = -6 \text{ V}$ $I_{B1} = -I_{B2} = -15 \text{ mA}$			30	ns
t_{on}^{**}	Turn-on Time	$I_C = -150 \text{ mA}$ $V_{CC} = -30 \text{ V}$ $I_{B1} = -15 \text{ mA}$			45	ns
t_{off}^{**}	Turn-off Time	$I_C = -150 \text{ mA}$ $V_{CC} = -6 \text{ V}$ $I_{B1} = -I_{B2} = -15 \text{ mA}$			100	ns

* Pulsed : pulse duration = 300 μs , duty cycle = 1.5 %.
 ** see test circuit.

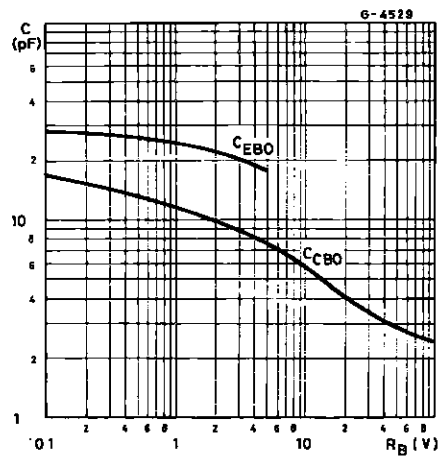
Normalized DC Current Gain.



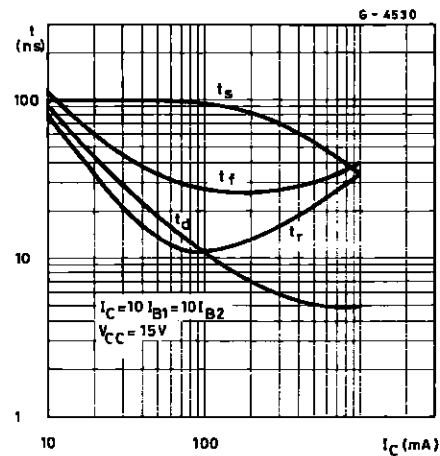
Collector-emitter Saturation Voltage.



Collector-base and Emitter-base capacitances.

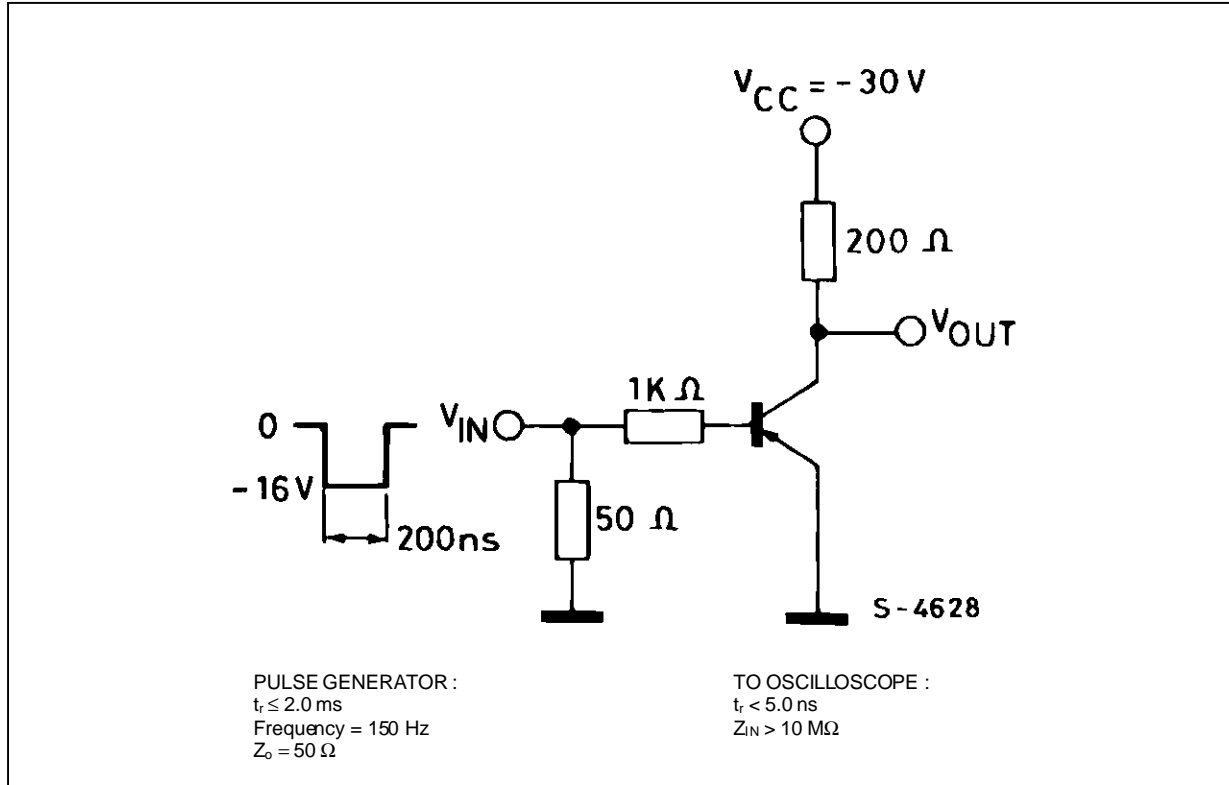


Switching Characteristics.

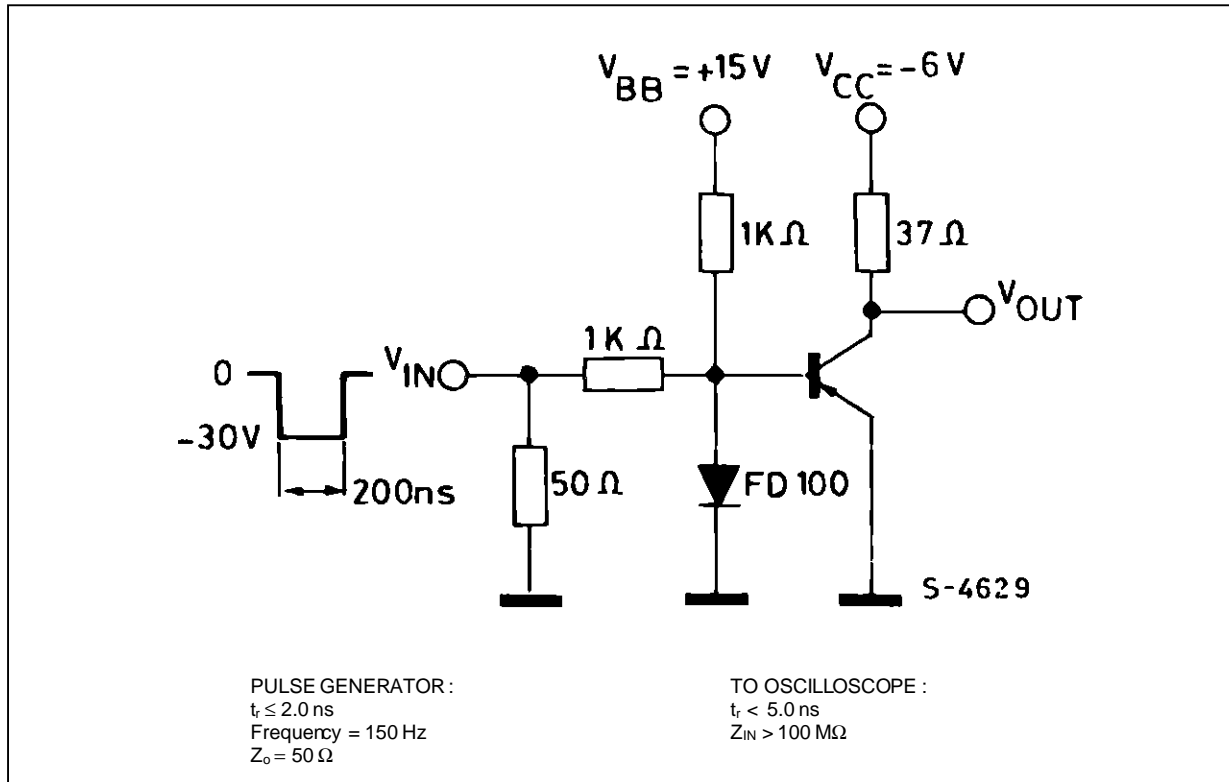


2N2904A-2N2905A-2N2906A-2N2907A

Test Circuit for t_{on} , t_r , t_d .

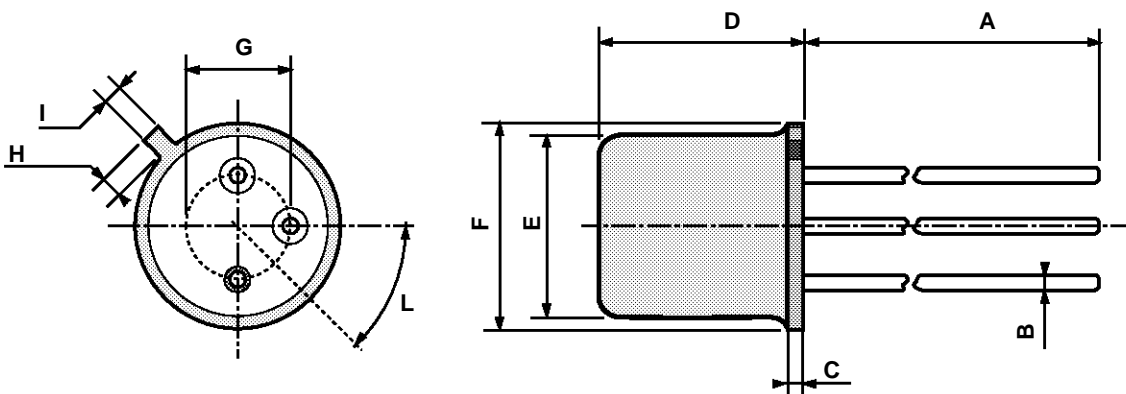


Test Circuit for t_{off} , t_o , t_f .



TO-18 MECHANICAL DATA

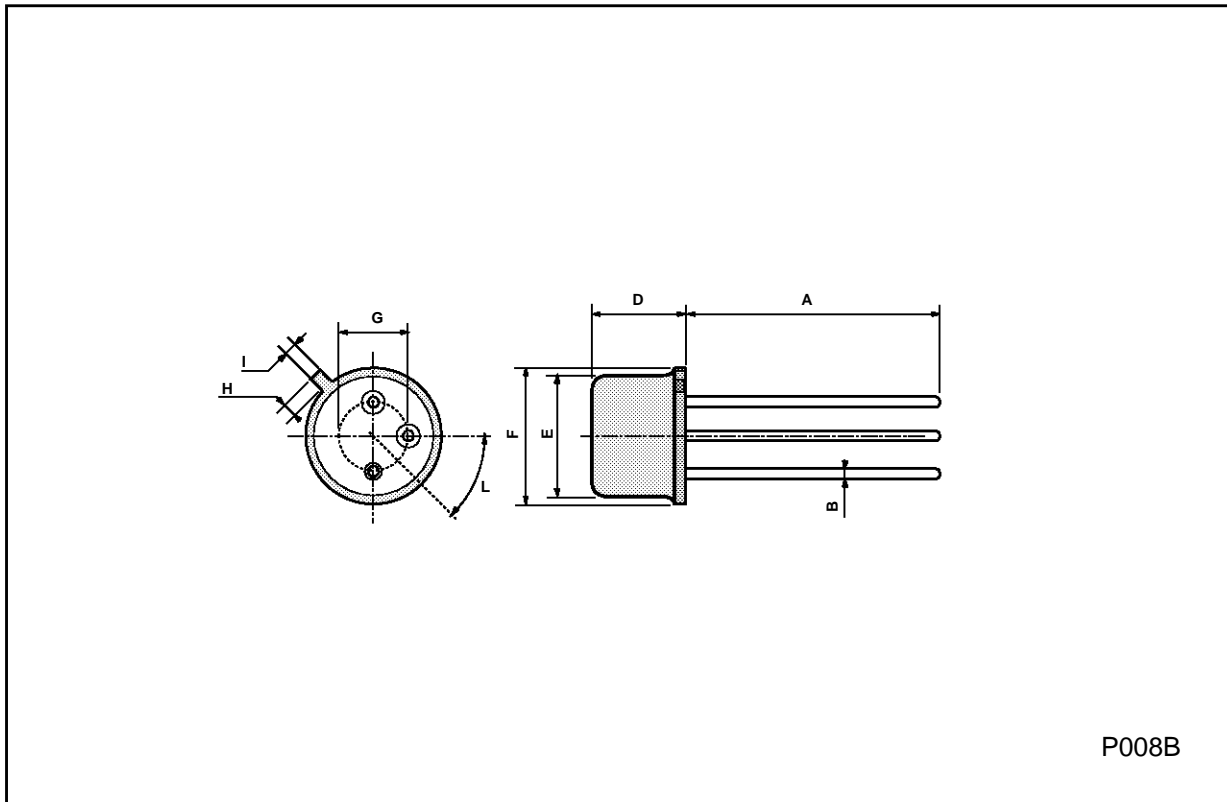
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A		12.7			0.500	
B			0.49			0.019
D			5.3			0.208
E			4.9			0.193
F			5.8			0.228
G	2.54			0.100		
H			1.2			0.047
I			1.16			0.045
L	45°			45°		



0016043

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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