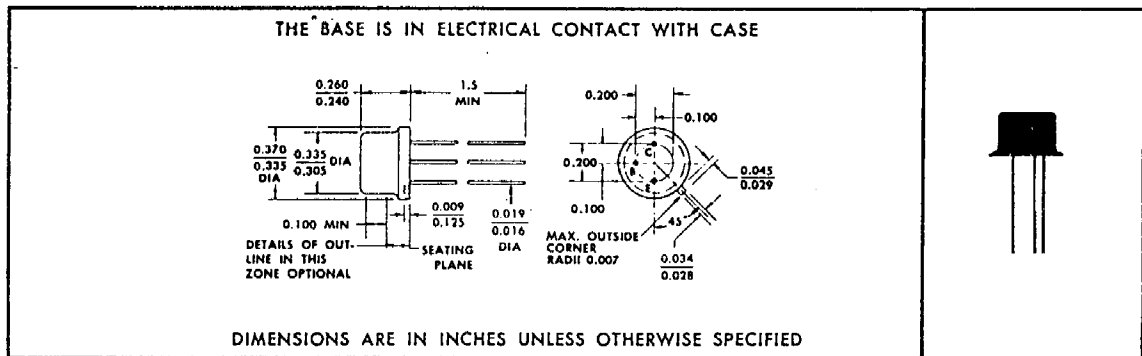


2N1302 – 2N1309 Germanium Transistor

***mechanical data**

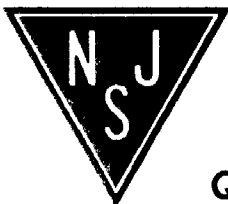
The transistors are in a JEDEC TO-5 hermetically sealed welded package with glass to metal seal between case and leads. Approximate weight is one gram.



***absolute maximum ratings at 25°C free-air temperature (unless otherwise noted)**

	2N1302, 2N1304 2N1306, 2N1308	2N1303, 2N1305, 2N1307, 2N1309
Collector-Base Voltage	← 25 v →	← 30 v →
Emitter-Base Voltage	← 25 v →	
Collector Current	← 300 ma →	
Total Device Dissipation at (or below) 25°C Free-Air Temperature (See Note 1) .	← 150 mw →	
Operating Collector Junction Temperature	← 85°C →	
Storage Temperature Range	← -65°C to 100°C →	

NOTE: 1. Derate linearly to 85°C free-air temperature at the rate of 2.5 mw/°C.
 *Indicates JEDEC registered data.



Quality Semi-Conductors

NJ Semi-Conductors reserves the right to change test conditions, parameter limits and package dimensions without notice. Information furnished by NJ Semi-Conductors is believed to be both accurate and reliable at the time of going to press. However, NJ Semi-Conductors assumes no responsibility for any errors or omissions discovered in its use. NJ Semi-Conductors encourages customers to verify that datasheets are current before placing orders.

P-N-P ALLOY-JUNCTION GERMANIUM TRANSISTORS

electrical characteristics at 25°C free-air temperature

PARAMETER	TEST CONDITIONS	2N1303			2N1305			2N1307			2N1309			UNIT
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
V_{CBO} Collector-Base Breakdown Voltage	$I_C = -100 \mu a, I_E = 0$	-30	—	—	-30	—	—	-30	—	—	-30	—	—	v
V_{EBO} Emitter-Base Breakdown Voltage	$I_E = -100 \mu a, I_C = 0$	-25	—	—	-25	—	—	-25	—	—	-25	—	—	v
V_{PT} Punch Through Voltage†	$V_{EBI} = -1 v$	-25	—	—	-20	—	—	-15	—	—	-15	—	—	v
I_{CBO} Collector Cutoff Current	$V_{CB} = -25 v, I_E = 0$	—	-2	-6	—	-2	-6	—	-2	-6	—	-2	-6	μa
I_{EBO} Emitter Cutoff Current	$V_{EB} = -25 v, I_C = 0$	—	-1.5	-6	—	-1.5	-6	—	-1.5	-6	—	-1.5	-6	μa
h_{FE} Static Forward Current Transfer Ratio	$V_{CE} = -1 v, I_C = -10 ma$	20	100	—	40	115	200	60	130	300	80	160	—	—
	$V_{CE} = -0.35 v, I_C = -200 ma$	10	45	—	15	55	—	20	65	—	20	75	—	—
V_{BE} Base-Emitter Voltage	$I_B = -0.5 ma, I_C = -10 ma$	-0.15	-0.25	-0.40	-0.15	-0.25	-0.35	-0.15	-0.25	-0.35	-0.15	-0.25	-0.35	v
$V_{CE(sat)}$ Collector-Emitter Saturation Voltage	$I_B = -0.5 ma, I_C = -10 ma$	—	-0.08	-0.20	—	—	—	—	—	—	—	—	—	v
	$I_B = -0.25 ma, I_C = -10 ma$	—	—	—	—	-0.08	-0.20	—	—	—	—	—	—	v
	$I_B = -0.17 ma, I_C = -10 ma$	—	—	—	—	—	—	—	-0.08	-0.20	—	—	—	v
	$I_B = -0.13 ma, I_C = -10 ma$	—	—	—	—	—	—	—	—	—	—	-0.08	-0.20	v
h_{ib} Small-Signal Common-Base Input Impedance	$V_{CB} = -5 v, I_E = 1 ma, f = 1 kc$	—	29	—	—	29	—	—	29	—	—	29	—	ohm
h_{rb} Small-Signal Common-Base Reverse Voltage Transfer Ratio	$V_{CB} = -5 v, I_E = 1 ma, f = 1 kc$	—	7×10^{-4}	—	—	7×10^{-4}	—	—	7×10^{-4}	—	—	7×10^{-4}	—	—
h_{ob} Small-Signal Common-Base Output Admittance	$V_{CB} = -5 v, I_E = 1 ma, f = 1 kc$	—	0.40	—	—	0.40	—	—	0.40	—	—	0.40	—	μmho
h_{fe} Small-Signal Common-Emitter Forward Current Transfer Ratio	$V_{CE} = -5 v, I_C = -1 ma, f = 1 kc$	—	115	—	—	130	—	—	150	—	—	190	—	—
α_{fcb} Common-Base Alpha-Cutoff Frequency	$V_{CB} = -5 v, I_E = 1 ma$	3	12	—	5	14	—	10	16	—	15	20	—	mc
C_{ob} Common-Base Open-Circuit Output Capacitance	$V_{CB} = -5 v, I_E = 0, f = 1 mc$	—	10	20	—	10	20	—	10	20	—	10	20	pf
C_{ib} Common-Base Open-Circuit Input Capacitance	$V_{EB} = -5 v, I_C = 0, f = 1 mc$	—	9	—	—	9	—	—	9	—	—	9	—	pf

† V_{PT} is determined by measuring the emitter-base floating potential V_{EBI} . The collector-base voltage, V_{CB} , is increased until $V_{EBI} = -1$ volt; this value μa $V_{CB} = (V_{PT} - 1 v)$.

switching characteristics at 25°C free-air temperature

PARAMETER	TEST CONDITIONS††	2N1303			2N1305			2N1307			2N1309			UNIT
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
t_d Delay Time	$I_C = -10 ma, I_{B(1)} = -1.3 ma, I_{B(2)} = 0.7 ma, V_{BE(off)} = 0.8 v, R_L = 1 k \Omega$ (See Fig. 1)	—	0.06	—	—	0.06	—	—	0.06	—	—	0.05	—	μsec
t_r Rise Time		—	0.18	—	—	0.18	—	—	0.14	—	—	0.14	—	μsec
t_s Storage Time		—	0.80	—	—	0.80	—	—	0.78	—	—	0.76	—	μsec
t_f Fall Time		—	0.38	—	—	0.38	—	—	0.36	—	—	0.30	—	μsec
Q_{sb} Stored Base Charge	$I_{B(1)} = -1 ma, I_C = -10 ma$ (See Fig. 2)	—	960	—	—	920	—	—	880	—	—	800	—	pcb

††Voltage and current values shown are nominal, exact values vary slightly with device parameters.

operating characteristics at 25°C free-air temperature

PARAMETER	TEST CONDITIONS	2N1303			2N1305			2N1307			2N1309			UNIT
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
NF Spot Noise Figure	$V_{CB} = -5 v, I_E = 1 ma, f = 1 kc, R_G = 1 k \Omega$	—	4	—	—	4	—	—	3	—	—	3	—	db

*Indicates JEDEC registered data (typical values excluded).