

GERMANIUM MILLIWATT TRANSISTORS

This line of low-frequency, low-power transistors consists of a wide selection of highly reliable germanium PNP devices designed for general purpose switching, amplifier, and control applications.

The line is generally characterized by devices having a power rating to 225 mW, a maximum operating temperature range from -65°C to $+100^{\circ}\text{C}$, and a typical cutoff frequency ($f_{\alpha b}$) to 8 MHz.

QUICK SELECTION GUIDE — FOR AMPLIFIER / OSCILLATOR AND SWITCHING APPLICATIONS TO 20 KILOCYCLES

The following transistors merit first consideration within the specified gain-voltage groups. All of the specified devices have collector power dissipation ratings (P_D) of 150-225 mW, and a maximum operating junction temperature of 100°C .

MINIMUM DC CURRENT GAIN (h_{FE})	TRANSISTOR VOLTAGE RATING; V_{CER} (R = 10 k)			
	12-24	25-39	40-49	50-60
20	—	2N524	MA910 ③	2N2042
30	2N322	2N525 2N1191 ①	2N1924 2N1186	—
40	2N323 2N1008 ① ②	2N526 2N1192 ①	2N1008A ① ② 2N1925	2N1008B ① ② 2N2043
60	2N324 2N1705	2N527 2N1175	2N1926	—
90	2N467 2N508 MA1706	2N1193 ① 2N2171 2N3427	2N1188	—
130	MA1707	2N3428	—	—
180	MA1708	2N1194 ① MA1702	—	—

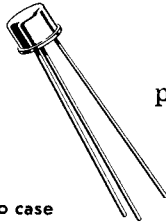
① Small Signal Current Gain h_{fe} ② V_{CEO} ③ V_{CES}

COMPLETE NUMERICAL-ALPHABETICAL LISTING

Type	MAXIMUM RATINGS					ELECTRICAL CHARACTERISTICS					MILITARY and Hi-Rel Type
	P _D mW	T _J °C	V _{CSO} volts	V _{CEB} (R = 10 k) volts	I _C mA	h _{FE} @ V _{CE} & I _C				f _{αB} typ MHz	
						min	max	volts	mA		
2N319	225	100	—	20	500	25	42	1	20	1.0 ⑤	
2N320	225	100	—	20	500	34	65	1	20	1.5 ⑤	
2N321	225	100	—	20	500	53	121	1	20	2.0 ⑤	
2N322	225	100	—	18	500	34	65	1	20	1.0 ⑤	
2N323	225	100	—	18	500	53	121	1	20	1.5 ⑤	
2N324	225	100	—	18	500	72	198	1	20	2.0 ⑤	
2N331	200	100	30	V _{EB} = 12	200	30	70	6	1	1.5	JAN 2N331
2N381	225	100	50	25	400	35	65	1	20	3	
2N382	225	100	50	25	400	60	95	1	20	4	
2N383	225	100	50	25	400	75	120	1	20	5	
2N398	50	85	105	V _{pt} = 105	100	20	—	0.35	5	1.0	USN 2N398
2N398A	150	100	105	V _{pt} = 105	200	20	—	0.35	5	1.0	
2N460	225	100	45	35 ⑦	400	31	200	6	1 ②	4	
2N461	225	100	45	35 ⑦	400	0.94 h _b	0.972	6	1 ②	1.2	USAF 2N461
2N464	200	100	45	40	100	14	—	6	1	1.0	
2N465	200	100	45	30	100	27	—	6	1	1.5	USA 2N465
2N466	200	100	35	20	100	56	—	6	1	2.0	JAN 2N466
2N467	200	100	35	15	100	112	—	6	1	2.5	USA 2N467
2N508	225	100	—	18	500	99	198	1	20	2.5 ⑤	
2N524	225	100	—	30	500	25	42	1	20	0.8 ⑤	2N524A ①
2N525	225	100	—	30	500	34	65	1	20	1.0 ⑤	2N525A ①
2N526	225	100	—	30	500	53	90	1	20	1.3 ⑤	JAN 2N526
2N527	225	100	—	30	500	72	121	1	20	1.5 ⑤	2N526A ①
2N650	200	100	45	30	500	30	70	6	1	1.5	2N527A ①
											2N650A ①
2N651	200	100	45	30	500	50	120	6	1	2.0	USN 2N650A
											2N651A ①
2N652	200	100	45	30	500	100	225	6	1	2.5	USN 2N651A
											2N652A ①
											USN 2N652A
2N653	200	100	30	25	250	30	70	6	1	1.5	
2N654	200	100	30	25	250	50	125	6	1	2.0	
2N655	200	100	30	25	250	100	250	6	1	2.5	
2N1008	200	100	20	20 ⑥	300	40 h _{FE}	150	5	10	—	
2N1008A	200	100	40	40 ⑥	300	40 h _{FE}	150	5	10	—	
2N1008B	200	100	60	60 ⑥	300	40 h _{FE}	150	5	10	—	
2N1175	225	100	—	25	500	70	140	1	20	1.5 ⑤	
2N1185	200	100	45	30	500	190	400	6	1	3.0	
2N1186	200	100	60	45	500	30	70	6	1	1.5	
2N1187	200	100	60	45	500	50	120	6	1	2.0	
2N1188	200	100	60	45	500	100	225	6	1	2.5	
2N1189	200	100	45	30	500	60	—	1	10 ②	3.5	
2N1190	200	100	45	30	500	100	—	1	10 ②	4.5	
2N1191	200	100	40	25	200	30	70	6	1	1.5	
2N1192	200	100	40	25	200	50	125	6	1	2.0	

2N322 thru **2N324**
2N508

$V_{CB} = 18 \text{ V}$
 h_{FE} - to 99-198 (min-max)
 $f_{\alpha b}$ - to 2.5 MHz



CASE 31
(TO-5)

Base connected to case

PNP germanium transistors for audio driver and low power output service in entertainment equipment.

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Base Voltage	V_{CB}	18	Vdc
Collector-Emitter Voltage	V_{CEO}	18	Vdc
Emitter-Base Voltage	V_{EB}	5	Vdc
Collector Current	I_C	500	mAdc
Junction and Storage Temperature	T_j & T_{stg}	-65 to + 100	°C
Power Dissipation at 25°C Free Air	P_D	225	mW

ELECTRICAL CHARACTERISTICS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

Characteristics	Symbol	Min	Max	Unit
Collector Cutoff Current $V_{CB} = -16 \text{ Vdc}, I_E = 0$	I_{CBO}	—	16	μAdc
Emitter Cutoff Current $V_{EB} = -3 \text{ Vdc}, I_C = 0$	I_{EBO}	—	16	μAdc
Collector-Emitter Voltage $I_C = 0.6 \text{ mAdc}, R_{BE} = 5 \text{ K}$	BV_{CER}	18	—	Vdc
DC Current Gain $V_{CE} = -1 \text{ Vdc}, I_C = 20 \text{ mAdc}$	h_{FE}			—
		34	65	
		53	121	
		72	198	
		99	198	
Base Input Voltage $V_{CE} = -1 \text{ Vdc}, I_C = 20 \text{ mAdc}$	V_{BE}	180	320	mVdc
Output Capacitance; Input AC Open Circuit $V_{CB} = -5 \text{ Vdc}, I_E = 1 \text{ mAdc}, f = 1 \text{ MHz}$	C_{ob}	—	35	pF
Frequency Cutoff $V_{CB} = -5 \text{ Vdc}, I_E = 1 \text{ mAdc}$	$f_{\alpha b}$			MHz
		1.0	—	
		1.5	—	
		2.0	—	
		2.5	—	