Silicon NPN Planar RF Transistor

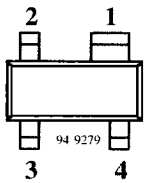
Electrostatic sensitive device.
Observe precautions for handling.

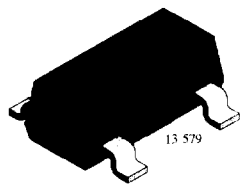
Applications

For low-noise and high-gain broadband amplifiers at collector currents from 0.2 mA to 5 mA.

Features

- Low supply voltage
- Low current consumption
- 50 Ω input impedance at 945 MHz
- Low noise figure
- High power gain





Marking: 822
Plastic case (SOT 143)
1 = Collector; 2 = Emitter; 3 = Base; 4 = Emitter

Absolute Maximum Ratings

Parameters	Symbol	Value	Unit
Collector-base voltage	V_{CBO}	12	V
Collector-emitter voltage	V_{CEO}	6	V
Emitter-base voltage	V_{EBO}	2	V
Collector current	I_C	8	mA
Total power dissipation $T_{amb} \leq 125°C$	P_{tot}	30	mW
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	–65 to +150	°C

Maximum Thermal Resistance

Parameters	Symbol	Maximum	Unit
Junction ambient on glass fibre printed board (25 x 20 x 1.5 mm)^3 plated with 35 µm Cu	R_{thJA}	450	K/W

Electrical DC Characteristics

T_{amb} = 25°C

Parameters / Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Collector-emitter cut-off current V_{CE} = 12 V, V_{BE} = 0	I_{CES}			100	µA
Collector-base cut-off current V_{CB} = 8 V, I_E = 0	I_{CBO}			100	nA
Emitter-base cut-off current V_{EB} = 1 V, I_C = 0	I_{EBO}			1	µA
Collector-emitter breakdown voltage I_C = 1 mA, I_B = 0	$V_{(BR)CEO}$	6			V
Collector-emitter saturation voltage I_C = 5 mA, I_B = 0.5 mA	V_{CEsat}		0.1	0.4	V
DC forward current transfer ratio V_{CE} = 3 V, I_C = 1 mA	h_{FE}	40	90	150	

Electrical AC Characteristics

T_{amb} = 25°C

Parameters / Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Transition frequency					
V_{CE} = 3 V, I_C = 1 mA, f = 500 MHz	f_T		4.7		GHz
V_{CE} = 2 V, I_C = 1.5 mA, f = 500 MHz	f_T		5.2		GHz
Collector-base capacitance V_{CB} = 1 V, f = 1 MHz	C_{cb}		0.2		pF
Noise figure $Z_S = Z_{Sopt}$, f = 945 MHz, V_{CE} = 3 V, I_C = 1 mA V_{CE} = 2 V, I_C = 1.5 mA $Z_S = Z_{Sopt}$, f = 450 MHz, V_{CE} = 2 V, I_C = 0.5 mA	 F_{opt} F_{opt} F_{opt}		 1.8 2.0 1.1		 dB dB dB
Power gain					
V_{CE} = 3 V, I_C = 1 mA, f = 945 MHz	G_{pe} at F_{opt}		12.5		dB
V_{CE} = 2 V, I_C = 1.5 mA, f = 945 MHz	G_{pe} at F_{opt}		14.0		dB
V_{CE} = 2 V, I_C = 0.5 mA, f = 450 MHz	G_{pe} at F_{opt}		13.5		dB
Collector current for f_T max V_{CE} = 2 V, f = 500 MHz	I_C		3		mA
Real part of input impedance					
V_{CE} = 3 V, I_C = 1 mA, f = 945 MHz	$Re(h_{11e})$		50		Ω
V_{CE} = 2 V, I_C = 1.5 mA, f = 945 MHz	$Re(h_{11e})$		50		Ω

f_S = disturbance signal, f_N = useful signal

Common Emitter S-Parameters
V_{CE} = 2 V, I_C = 0.5 mA

f/MHz	S_{11}		S_{21}		S_{12}		S_{22}	
	LIN MAG	ANG	LIN MAG	ANG	LIN MAG	ANG	LIN MAG	ANG
		deg		deg		deg		deg
100	0.974	–4.0	1.86	175.2	0.012	86.4	0.997	–2.3
200	0.967	–7.9	1.84	169.7	0.024	82.4	0.993	–4.8
300	0.956	–11.8	1.82	164.2	0.035	78.6	0.87	–6.9
400	0.941	–15.6	1.79	158.9	0.046	75.1	0.979	–9.3
500	0.926	–19.0	1.75	153.9	0.056	71.7	0.968	–11.4
600	0.907	–22.5	1.72	149.2	0.066	69.0	0.959	–13.1
700	0.890	–25.8	1.68	145.0	0.075	66.4	0.951	–15.2
800	0.870	–29.3	1.66	141.0	0.084	63.9	0.940	–16.9
900	0.851	–32.3	1.63	136.1	0.092	61.1	0.930	–18.8
1000	0.833	–35.6	1.60	132.6	0.099	59.0	0.924	–20.4
1100	0.814	–39.0	1.58	128.6	0.108	56.9	0.913	–22.2
1200	0.794	–42.4	1.57	124.9	0.115	54.8	0.904	–24.0
1300	0.773	–45.6	1.55	121.2	0.121	52.7	0.895	–25.7

Common Emitter S-Parameters
V_{CE} = 2 V, I_C = 1.5 mA

f/MHz	S_{11}		S_{21}		S_{12}		S_{22}	
	LIN MAG	ANG	LIN MAG	ANG	LIN MAG	ANG	LIN MAG	ANG
		deg		deg		deg		deg
100	0.919	–6.9	4.86	171.8	0.012	84.3	0.992	–3.6
200	0.897	–13.7	4.78	163.4	0.023	78.4	0.979	–7.1
300	0.864	–19.8	4.62	155.7	0.034	73.0	0.957	–10.2
400	0.824	–25.7	4.41	148.3	0.043	68.4	0.933	–13.0
500	0.781	–31.0	4.21	141.3	0.051	64.0	0.909	–15.6
600	0.735	–36.1	4.00	135.3	0.058	60.6	0.881	–17.3
700	0.693	–40.5	3.82	129.4	0.064	58.2	0.858	–19.2
800	0.647	–44.6	3.62	124.3	0.071	54.7	0.836	–20.7
900	0.605	–48.5	3.46	118.9	0.076	52.0	0.814	–22.3
1000	0.567	–52.4	3.30	114.3	0.081	49.8	0.796	–23.6
1100	0.526	–56.4	3.16	110.0	0.085	48.1	0.778	–24.9
1200	0.491	–60.1	3.04	105.7	0.090	46.1	0.763	–26.3
1300	0.458	–64.4	2.92	102.0	0.094	44.9	0.747	–27.5

Typical Characteristics (T_j = 25°C unless otherwise specified)

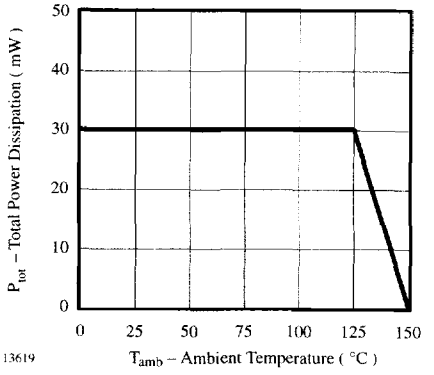


Figure 1. Total Power Dissipation vs. Ambient Temperature

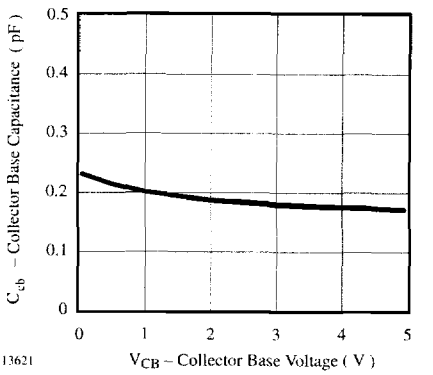


Figure 3. Collector Base Capacitance vs. Collector Base Voltage

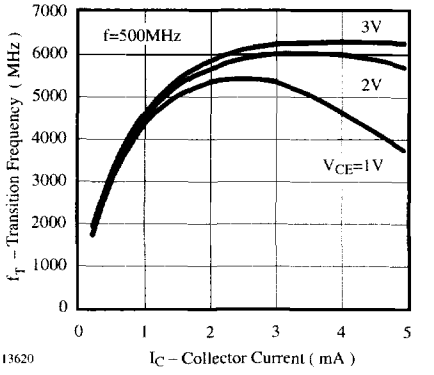


Figure 2. Transition Frequency vs. Collector Current

V_{CE} = 2 V; I_C = 1.5 mA; Z_0 = 50 Ω

S_{11}

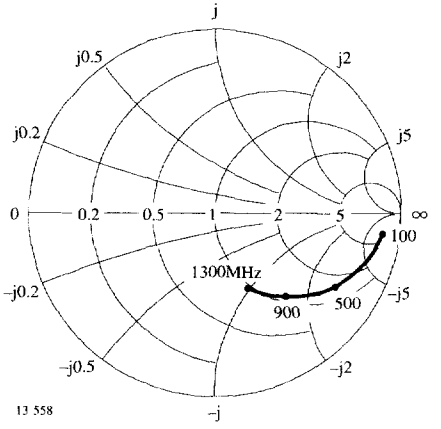


Figure 4. Input reflection coefficient

S_{12}

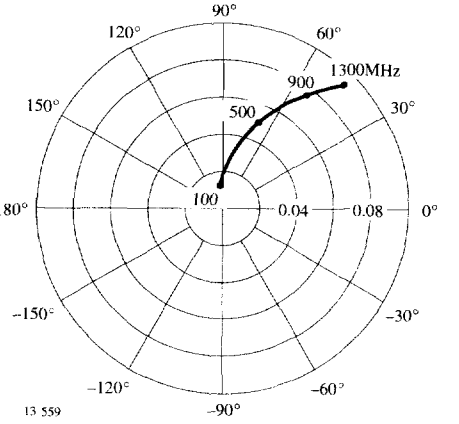


Figure 6. Reverse transmission coefficient

S_{21}

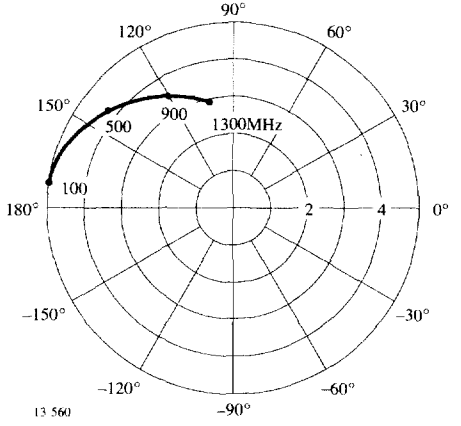


Figure 5. Forward transmission coefficient

S_{22}

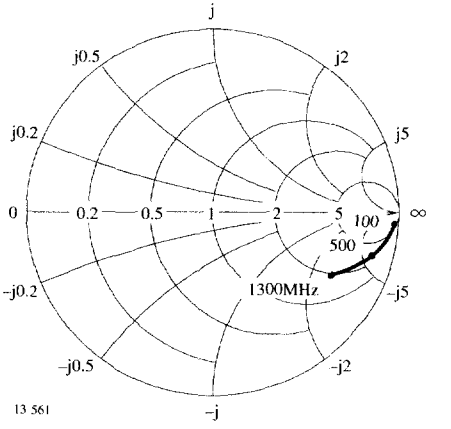


Figure 7. Output reflection coefficient

Dimensions in mm