

## 2SC4904

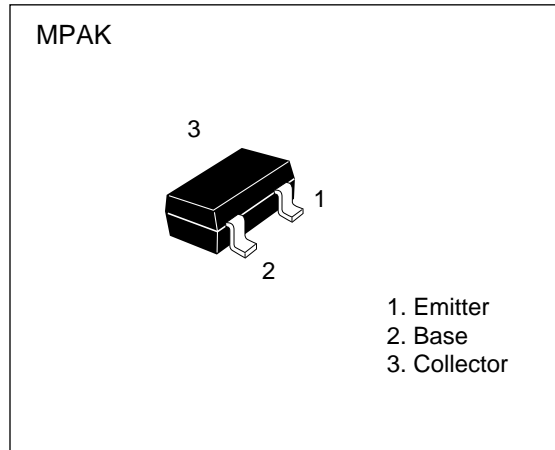
### Silicon NPN Bipolar Transistor

#### Application

VHF & UHF wide band amplifire

#### Features

- High gain bandwidth product  
 $f_T = 5.8 \text{ GHz typ}$
- High gain, low noise figure  
PG = 12.0 dB typ,  
NF = 1.6 dB typ at  $f = 900 \text{ MHz}$



**Table 1 Absolute Maximum Ratings** ( $T_a = 25^\circ\text{C}$ )

Item	Symbol	Ratings	Unit
Collector to base voltage	$V_{CBO}$	20	V
Collector to emitter voltage	$V_{CEO}$	12	V
Emitter to base voltage	$V_{EBO}$	2	V
Collector current	$I_C$	50	mA
Collector power dissipation	$P_C$	150	mW
Junction temperature	$T_j$	150	$^\circ\text{C}$
Storage temperature	$T_{stg}$	-55 to +150	$^\circ\text{C}$

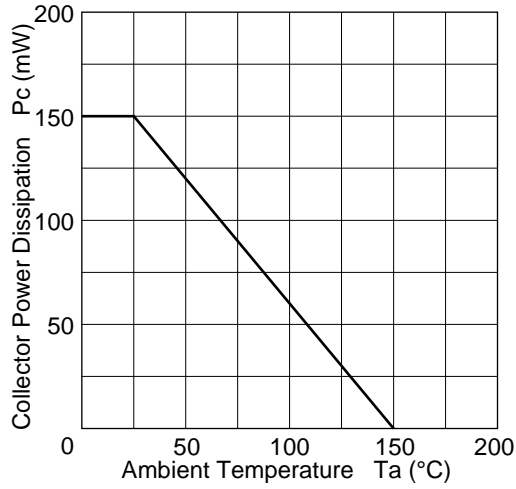
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**Table 2 Electrical Characteristics (Ta = 25°C)**

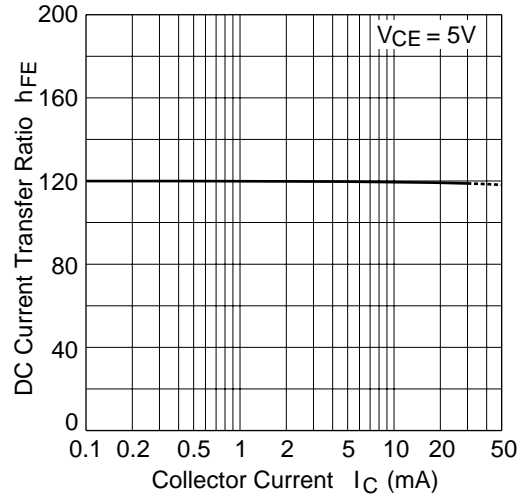
Item	Symbol	Min	Typ	Max	Unit	Test conditions
Collector to base breakdown voltage	$V_{(BR)CBO}$	20	—	—	V	$I_C = 10 \mu A, I_E = 0$
Collector cutoff current	$I_{CBO}$	—	—	10	$\mu A$	$V_{CB} = 15 V, I_E = 0$
	$I_{CEO}$	—	—	1	mA	$V_{CE} = 12 V, R_{BE} = \infty$
Emitter cutoff current	$I_{EBO}$	—	—	10	$\mu A$	$V_{EB} = 2 V, I_C = 0$
DC current transfer ratio	$h_{FE}$	50	120	250		$V_{CE} = 5 V, I_C = 20 mA$
Output capacitance	$C_{ob}$	—	0.8	1.2	pF	$V_{CB} = 5 V, I_E = 0, f = 1 MHz$
Gain bandwidth product	$f_T$	4.0	5.8	—	GHz	$V_{CE} = 5 V, I_C = 20 mA$
Power gain	PG	9.5	12.0	—	dB	$V_{CE} = 5 V, I_C = 20 mA, f = 900 MHz$
Noise figure	NF	—	1.6	3.0	dB	$V_{CE} = 5 V, I_C = 5 mA, f = 900 MHz$

Marking for 2SC4904 is "YM-".

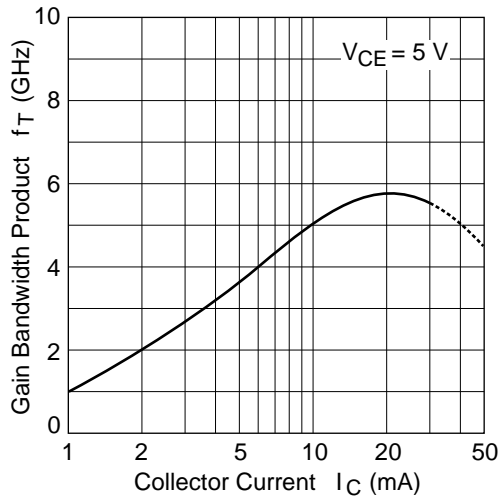
Maximum collector power dissipation curve



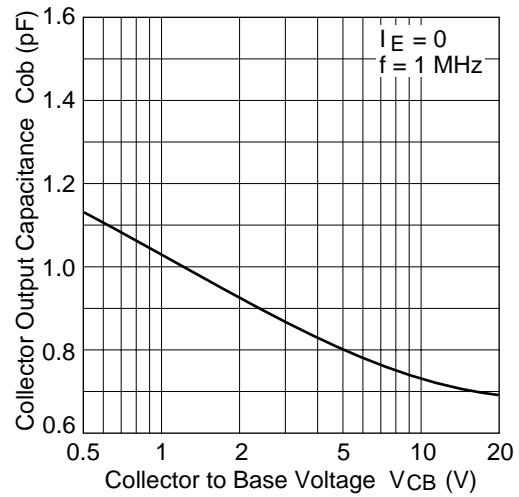
DC current transfer ratio vs. collector current



Gain bandwidth product vs. collector current

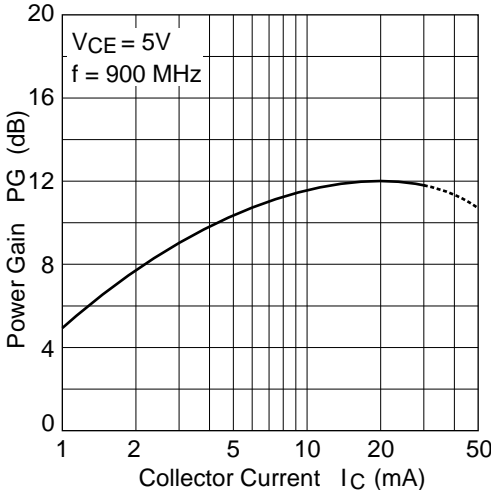


Collector output capacitance vs. collector to base voltage

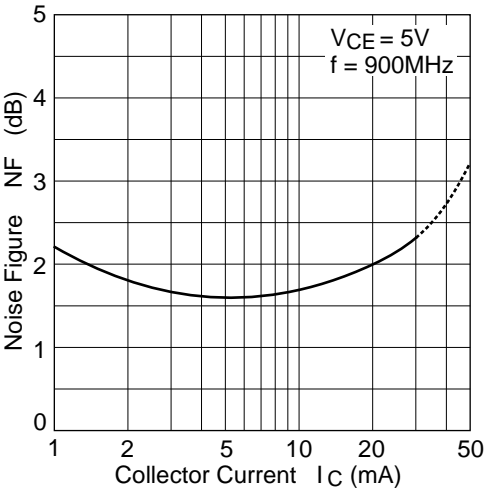


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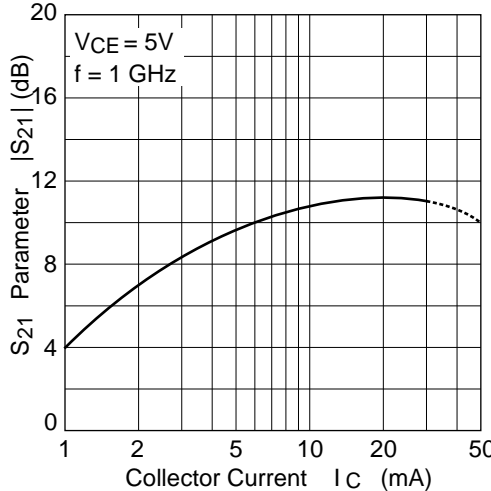
Power gain vs. collector current



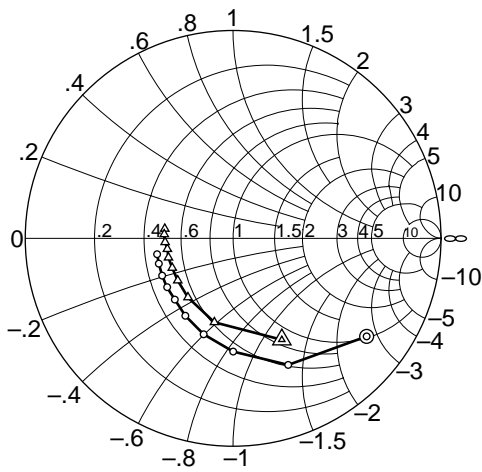
Noise figure vs. collector current



S21 parameter vs. collector current

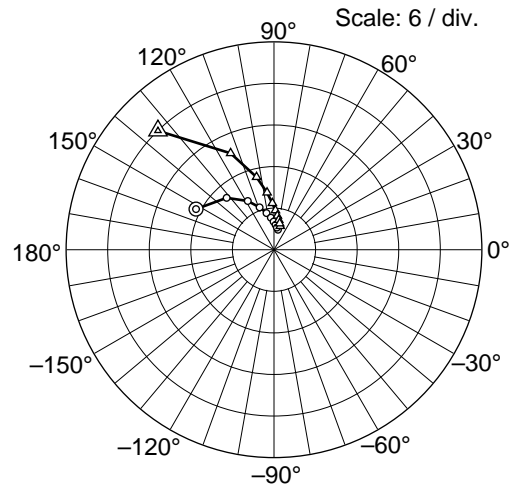


S11 parameter vs. frequency



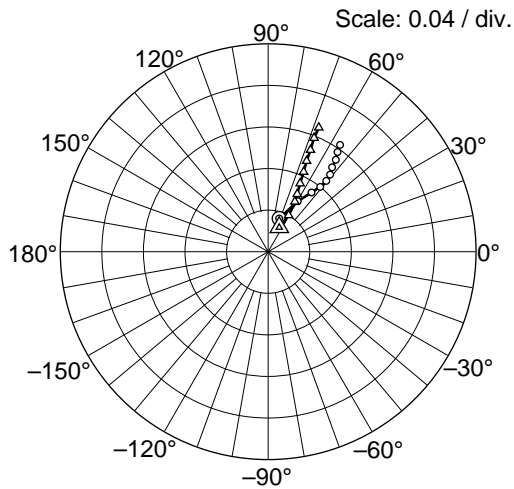
Condition:  $V_{CE} = 5\text{ V}$ ,  $Z_o = 50\ \Omega$   
 100 MHz to 1000 MHz (100 MHz step)  
 ○ — ○ ( $I_C = 5\text{ mA}$ )  
 △ — △ ( $I_C = 20\text{ mA}$ )

S21 parameter vs. frequency



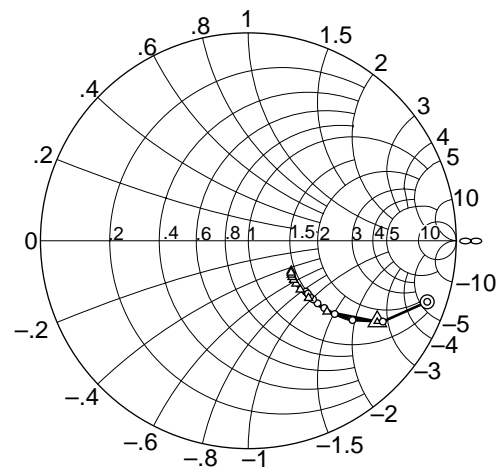
Condition:  $V_{CE} = 5\text{ V}$ ,  $Z_o = 50\ \Omega$   
 100 MHz to 1000 MHz (100 MHz step)  
 ○ — ○ ( $I_C = 5\text{ mA}$ )  
 △ — △ ( $I_C = 20\text{ mA}$ )

S12 parameter vs. frequency



Condition:  $V_{CE} = 5\text{ V}$ ,  $Z_o = 50\ \Omega$   
 100 MHz to 1000 MHz (100 MHz step)  
 ○ — ○ ( $I_C = 5\text{ mA}$ )  
 △ — △ ( $I_C = 20\text{ mA}$ )

S22 parameter vs. frequency



Condition:  $V_{CE} = 5\text{ V}$ ,  $Z_o = 50\ \Omega$   
 100 MHz to 1000 MHz (100 MHz step)  
 ○ — ○ ( $I_C = 5\text{ mA}$ )  
 △ — △ ( $I_C = 20\text{ mA}$ )

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**Table 3 S Parameter** ( $V_{CE} = 5\text{ V}$ ,  $I_C = 5\text{ mA}$ ,  $Z_O = 50\ \Omega$ , Emitter common)

f (MHz)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100	0.797	-36.3	12.71	152.4	0.0337	71.8	0.909	-18.8
200	0.664	-66.5	10.16	132.3	0.0565	59.7	0.755	-31.0
300	0.545	-90.0	8.01	118.2	0.0708	53.9	0.630	-37.3
400	0.483	-107.1	6.49	108.7	0.0801	51.3	0.545	-40.3
500	0.438	-121.7	5.43	101.5	0.0883	50.7	0.488	-41.5
600	0.407	-133.6	4.67	95.6	0.0953	51.3	0.449	-42.1
700	0.395	-143.5	4.09	90.8	0.102	52.9	0.420	-42.1
800	0.386	-152.3	3.63	86.4	0.110	53.7	0.401	-42.2
900	0.378	-161.2	3.26	82.6	0.117	55.2	0.383	-41.6
1000	0.374	-168.2	2.97	78.9	0.124	56.1	0.370	-41.4

**Table 4 S Parameter** ( $V_{CE} = 5\text{ V}$ ,  $I_C = 20\text{ mA}$ ,  $Z_O = 50\ \Omega$ , Emitter common)

f (MHz)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100	0.541	-64.4	24.01	134.3	0.0257	65.7	0.732	-32.1
200	0.414	-102.6	15.27	114.2	0.0402	60.6	0.510	-42.0
300	0.358	-127.4	10.78	103.5	0.0513	61.9	0.400	-43.6
400	0.335	-142.7	8.31	96.9	0.0621	63.2	0.343	-43.3
500	0.326	-154.1	6.73	92.0	0.0727	64.9	0.309	-42.0
600	0.325	-163.4	5.69	87.9	0.0840	66.0	0.288	-40.9
700	0.321	-170.7	4.93	84.3	0.0948	67.0	0.274	-39.7
800	0.328	-176.7	4.35	80.9	0.106	67.4	0.264	-38.3
900	0.332	176.7	3.88	77.8	0.118	68.0	0.257	-36.8
1000	0.332	172.1	3.53	75.2	0.129	67.8	0.252	-35.0