

## NPN高频低噪声晶体管

### 描述

2SC4228 是超高频低噪声晶体管,采用平面 NPN 硅外延双极型工艺,具有高功率增益、低噪声特性。由于采用了超小型的 SOT-323 封装,特别适用于高密度表面贴片安装,主要用于 VHF, UHF 低噪声放大器。

### 主要特性

高增益:  $|S_{21e}|^2$  典型值为 5.5 dB  
 低噪声: NF 典型值为 2.0dB  
 增益带宽乘积:  $f_T$  典型值为 8GHz

@  $V_{CE}=3V, I_C=5mA, f=2GHz$   
 @  $V_{CE}=3V, I_C=5mA, f=2GHz$   
 @  $V_{CE}=3V, I_C=5mA, f=2GHz$

### 极限工作条件范围 ( $T_A=25^\circ C$ )

参数	符号	极值	单位
集电极基极击穿电压	$V_{CBO}$	20	V
集电极发射极击穿电压	$V_{CEO}$	10	V
发射极基极击穿电压	$V_{EBO}$	1.5	V
集电极电流	$I_C$	35	mA
功耗	$P_C$	150	mW
结温度	$T_j$	150	$^\circ C$
存储温度	$T_{stg}$	-65 ~ +150	$^\circ C$

### hFE 规格

分档	A	B	C	D	E
标号	R43	R44	R45		
hFE	60-100	90-140	130-180	170-250	250-300

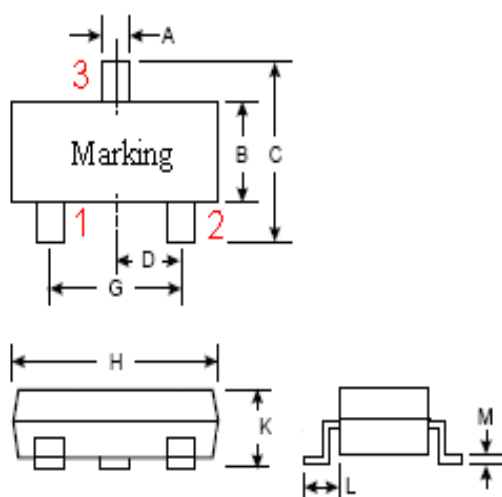
## 电学特性 (TA=25°C)

参数	符号	最小	典型	最大	单位	测试条件
集电极基极击穿电压	V <sub>CB0</sub>	20			V	I <sub>C</sub> =1.0μA
集电极基极漏电流	I <sub>CB0</sub>			0.1	μA	V <sub>CB</sub> =10V
发射极基极漏电流	I <sub>EB0</sub>			0.1	μA	V <sub>EB</sub> =1V
直流增益	h <sub>FE</sub>	60	150	300		V <sub>CE</sub> =3V, I <sub>C</sub> =5mA
特征频率	f <sub>T</sub>		8	8.5	GHz	V <sub>CE</sub> =3V, I <sub>C</sub> =5mA, f=2GHz
输出反馈电容	C <sub>re</sub>		0.65	1.0	pF	V <sub>CB</sub> =10V, I <sub>E</sub> =0mA, f=1MHz
功率增益	S <sub>21e</sub>   <sup>2</sup>		5.5		dB	V <sub>CE</sub> =3V, I <sub>C</sub> =5mA, f=2GHz
噪声因子	NF		2.0		dB	V <sub>CE</sub> =3V, I <sub>C</sub> =5mA, f=2GHz

## 封装形式

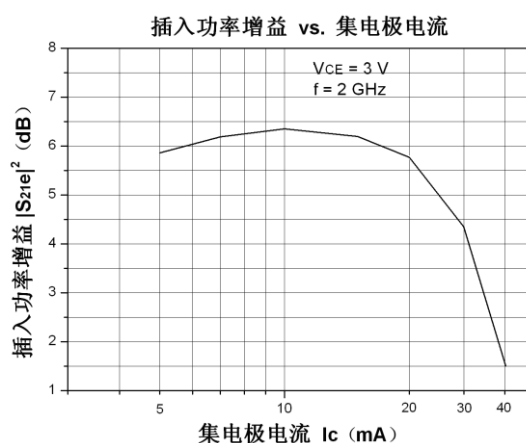
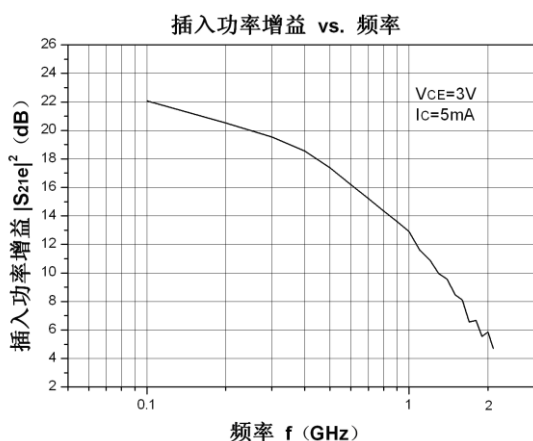
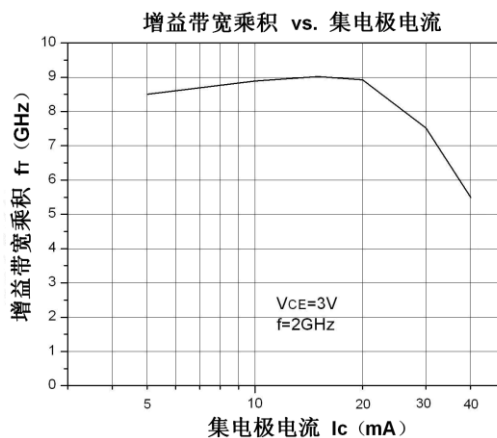
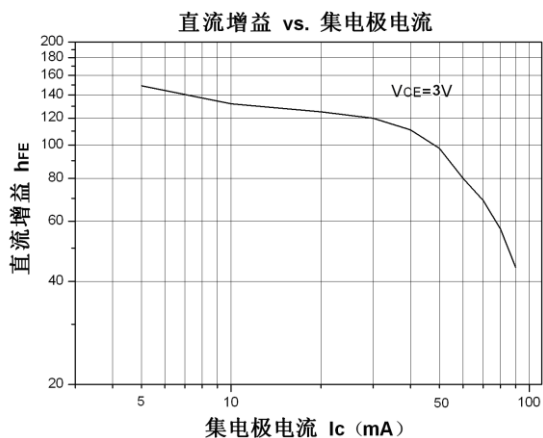
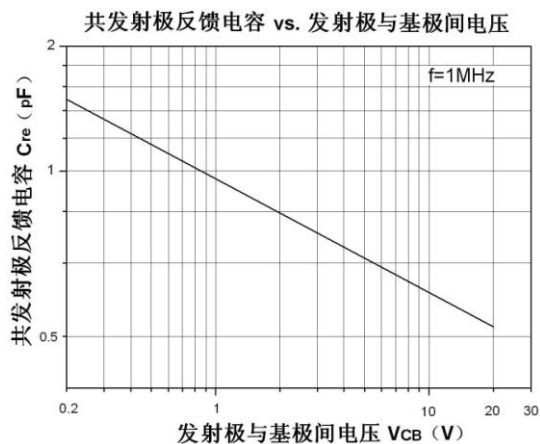
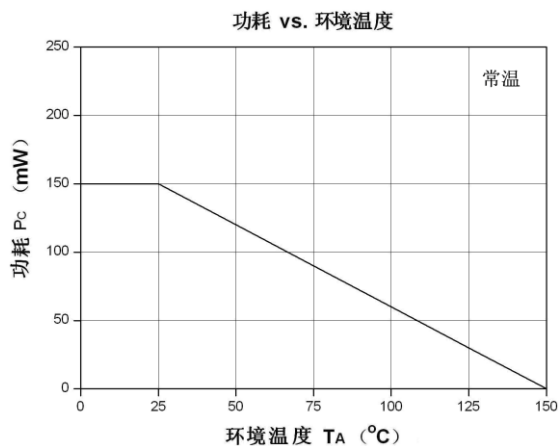
SOT-323

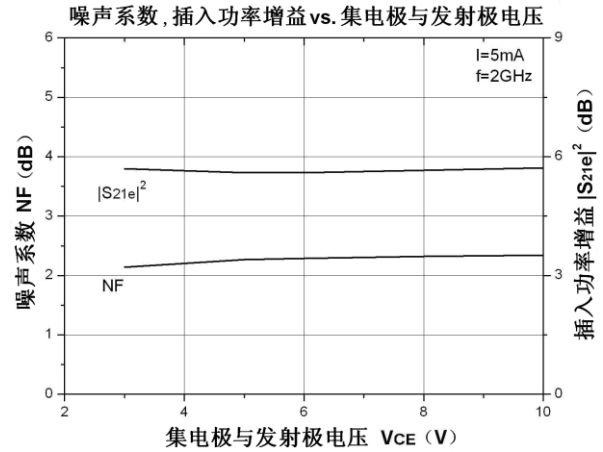
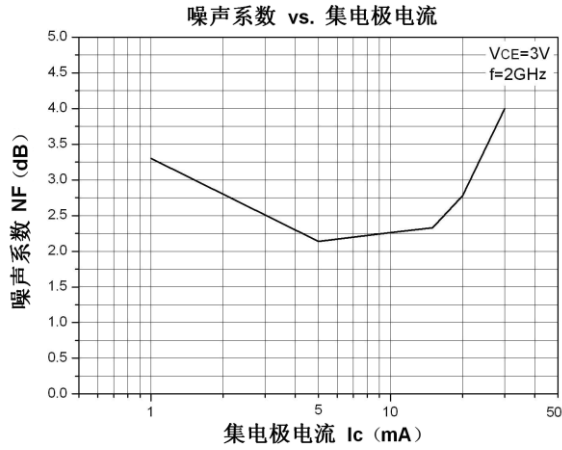
管脚定义：1：基极（Base） 2：发射极（Emitter） 3：集电极（Collector）



符号	最小值 (mm)	最大值 (mm)
A	0.200	0.400
B	1.150	1.350
C	2.150	2.450
D	0.650	
G	1.200	1.400
H	2.000	2.200
K	0.900	1.100
L	0.525	
M	0.080	0.150

## 典型特性曲线 (TA = 25 °C)



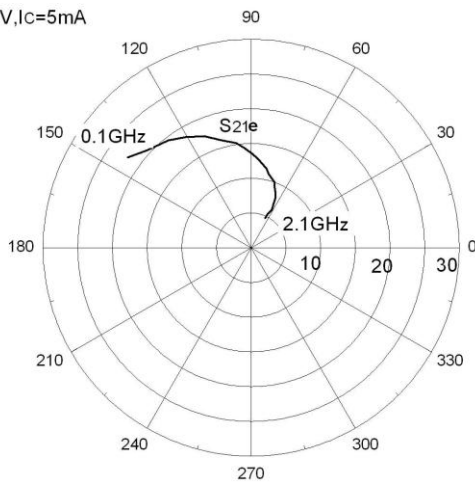


**SMITH 图**

测试条件: VCE=3V, IC=5mA

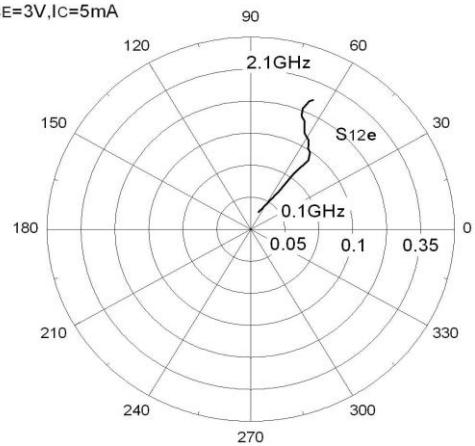
**S21e -FREQUENCY**

条件: VCE=3V, IC=5mA



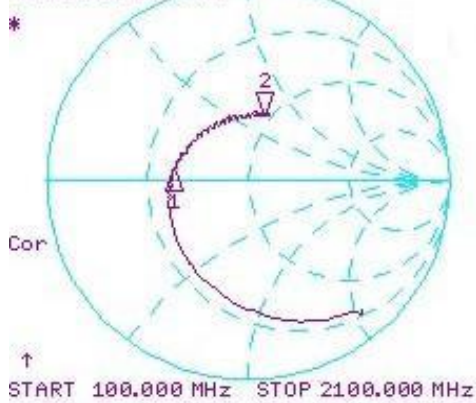
**S12e -FREQUENCY**

条件: VCE=3V, IC=5mA



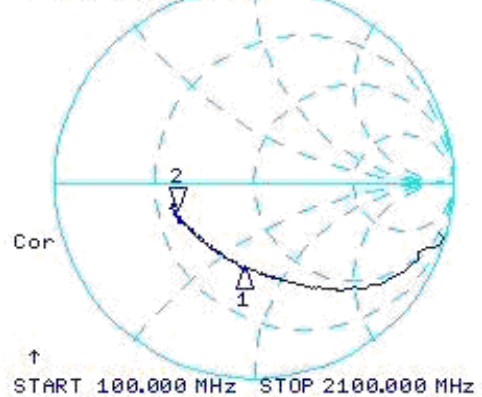
**S11e -FREQUENCY**

Z: 45.533  $\Omega$  34.387  $\Omega$  2.7364 nH  
2 000.000 000 MHz



**S22e -FREQUENCY**

Z: 20.903  $\Omega$  -7.1650  $\Omega$  11.106 pF  
2 000.000 000 MHz



**散射参数 (S-PARAMETER)**

测试条件:  $V_{CE}=3V$ ,  $I_C=5mA$ ,  $Z_0=50\Omega$ 

测试频率	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
0.1	0.855	-48.801	12.710	143.87	0.025	67.576	0.966	-14.735
0.2	0.763	-66.883	10.616	136.77	0.041	62.939	0.854	-33.989
0.3	0.655	-88.554	9.497	127.74	0.060	62.861	0.726	-48.126
0.4	0.567	-106.56	8.465	120.78	0.071	60.028	0.638	-57.838
0.5	0.514	-122.96	7.400	112.79	0.077	56.08	0.574	-65.518
0.6	0.470	-137.89	6.452	106.21	0.086	51.689	0.525	-72.426
0.7	0.432	-152.05	5.762	98.138	0.095	53.654	0.490	-79.297
0.8	0.411	-164.33	5.220	93.86	0.097	53.803	0.462	-85.2
0.9	0.384	-176.4	4.788	86.638	0.102	56.147	0.445	-91.2
1	0.380	170.73	4.416	85.732	0.105	54.511	0.436	-98.459
1.1	0.352	160.05	3.802	79.059	0.115	58.39	0.418	-103.85
1.2	0.348	149.81	3.511	76.588	0.116	58.262	0.406	-109.92
1.3	0.331	140.8	3.147	70.039	0.125	62.108	0.399	-115.82
1.4	0.335	130.41	3.011	69.561	0.134	63.053	0.394	-122.38
1.5	0.320	123.19	2.654	65.367	0.140	67.835	0.393	-125.76
1.6	0.330	112.5	2.543	67.393	0.152	64.829	0.395	-134.48
1.7	0.323	105.92	2.130	62.177	0.163	69.09	0.397	-137.99
1.8	0.337	95.571	2.155	61.964	0.187	67.97	0.393	-146.38
1.9	0.318	89.396	1.893	61.427	0.187	72.16	0.406	-149.87
2	0.344	77.432	1.962	63.618	0.218	67.927	0.424	-160.91
2.1	0.346	71.601	1.719	64.762	0.229	67.533	0.438	-162.29

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