Ordering number:ENN5036B

NPN Epitaxial Planar Silicon Transistor

2SC5231

VHF to UHF Wide-Band Low-Noise Amplifier Applications

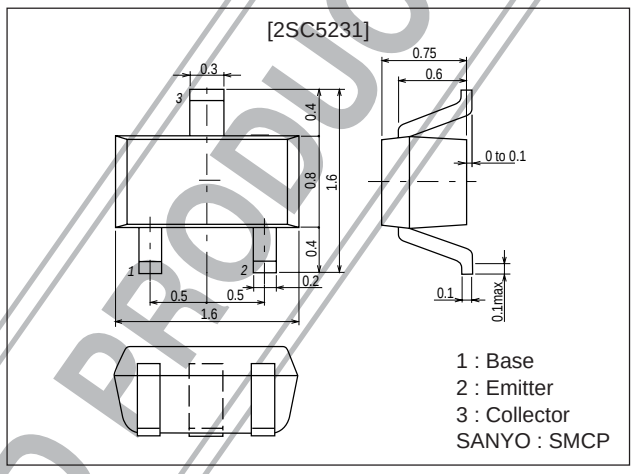
Features

- Low noise : NF=1.0dB typ (f=1GHz).
- High gain : $|S21e|^2$=12dB typ (f=1GHz).
- High cutoff frequency : f_T=7GHz typ.
- Ultrasmall package permiting applied sets to be small and slim.

Package Dimensions

unit:mm

2106A



Specifications

Absolute Maximum Ratings at Ta = 25˚C

Parameter	Symbol	Conditions	Ratings	Unit
Collector-to-Base Voltage	V_{CBO}		20	V
Collector-to-Emitter Voltage	V_{CEO}		10	V
Emitter-to-Base Voltage	V_{EBO}		2	V
Collector Current	I_C		70	mA
Collector Dissipation	P_C		100	mW
Junction Temperature	Tj		150	˚C
Storage Temperature	Tstg		–55 to +150	˚C

Electrical Characteristics at Ta = 25˚C

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Collector Cutoff Current	I_{CBO}	V_{CB}=10V, I_E=0			1.0	μA
Emitter Cutoff Current	I_{EBO}	V_{EB}=1V, I_C=0			10	μA
DC Current Gain	h_{FE}	V_{CE}=5V, I_C=20mA	60*		270*	
Gain-Bandwidth Product	f_T	V_{CE}=5V, I_C=20mA	5	7		GHz
Output Capacitance	Cob	V_{CB}=10V, f=1MHz		0.7	1.2	pF
Reverse Transfer Capacitance	Cre	V_{CB}=10V, f=1MHz		0.45		pF

≠ : Pulse Test Pulse Width≤2ms

Continued on next page.

* : The 2SC5231 is classified by 20mA h_{FE} as follows :

Marking	C7	C8	C9
h_{FE}	60 to 120	90 to 180	135 to 270

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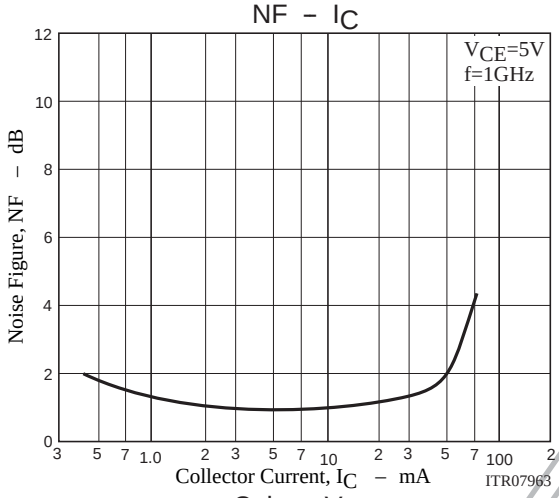
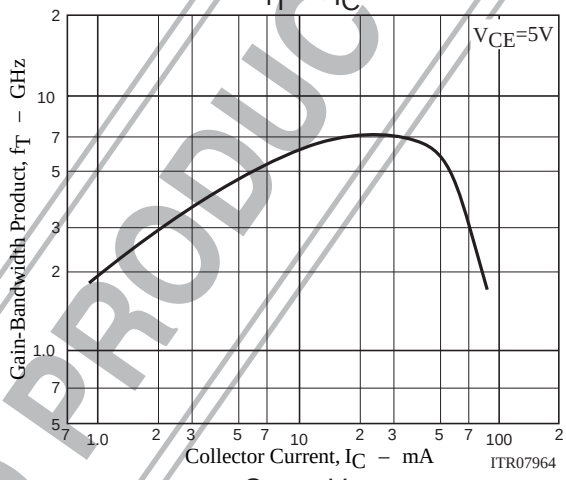
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Forward Transfer Gain	| S21e |^2 1	V_{CE}=5V, I_C=20mA, f=1GHz	9	12		dB
	| S21e |^2 2	V_{CE}=2V, I_C=3mA, f=1GHz		8.5		dB
Noise Figure	NF	V_{CE}=5V, I_C=7mA, f=1GHz		1.0	1.8	dB

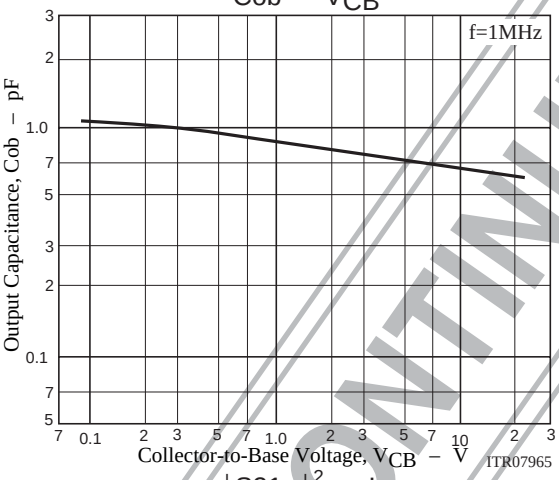
NF – I_C



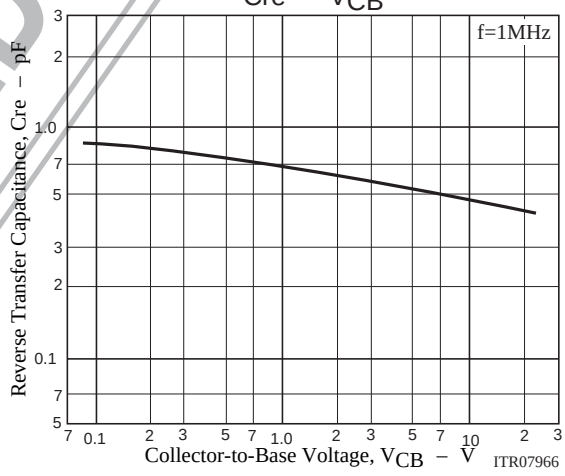
f_T – I_C



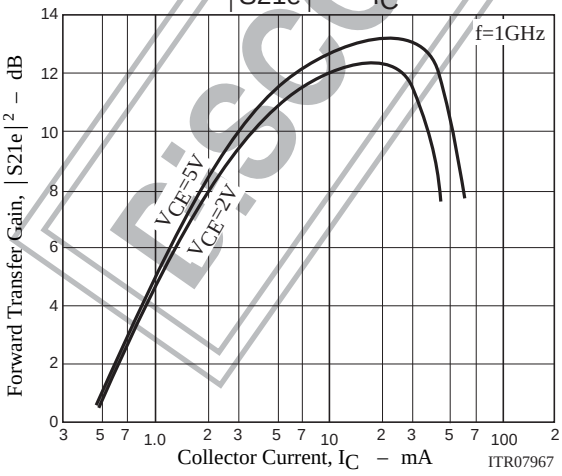
Cob – V_{CB}



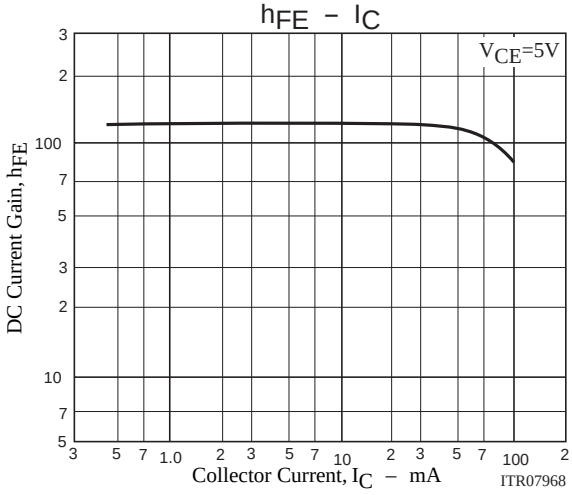
Cre – V_{CB}

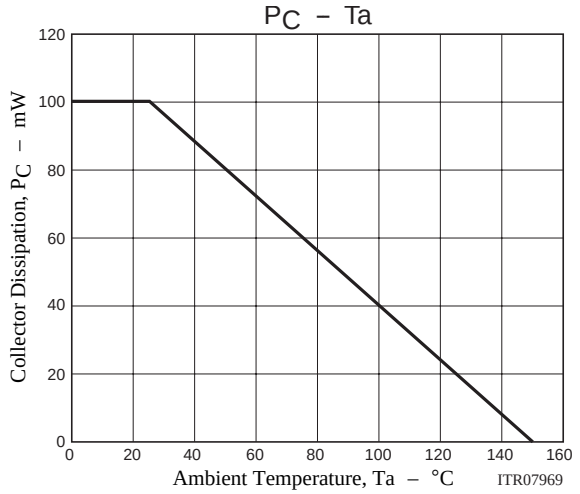


$|S21e|^2$ – I_C



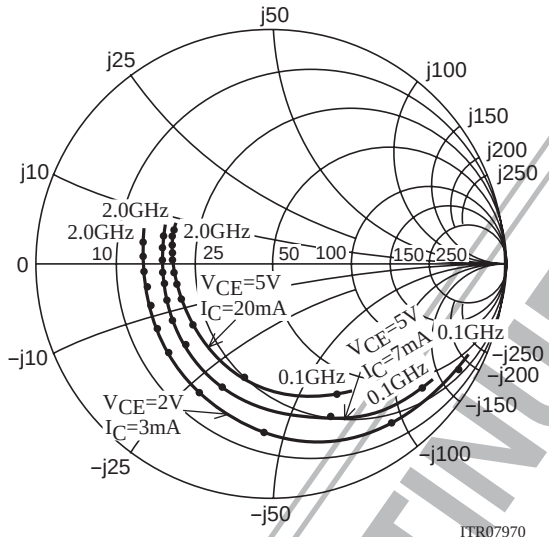
h_{FE} – I_C



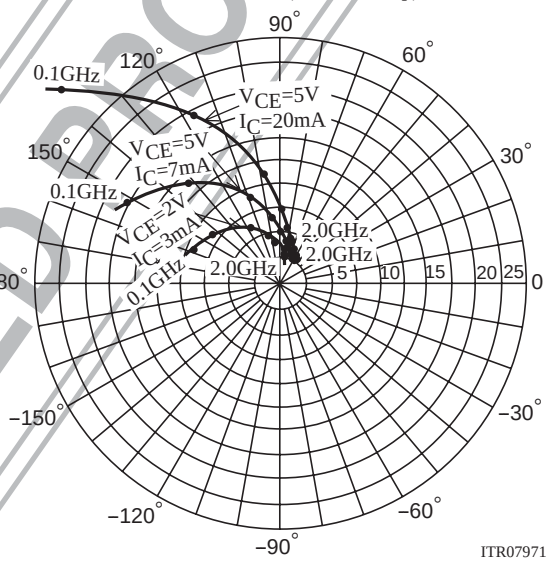


S Parameters

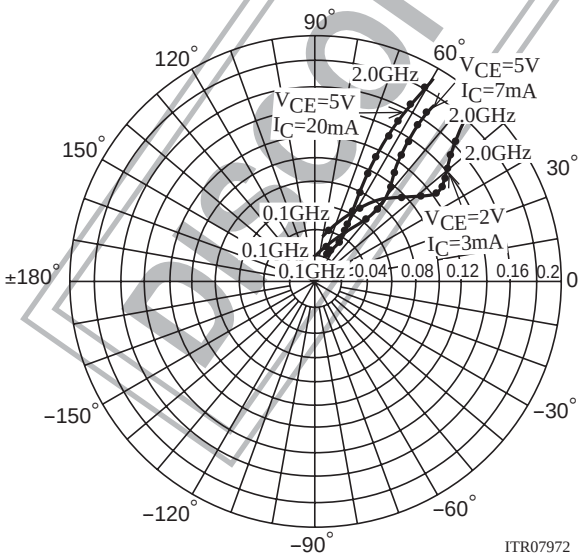
S11e
f=100MHz, 200MHz to 2000MHz(200MHz Step)



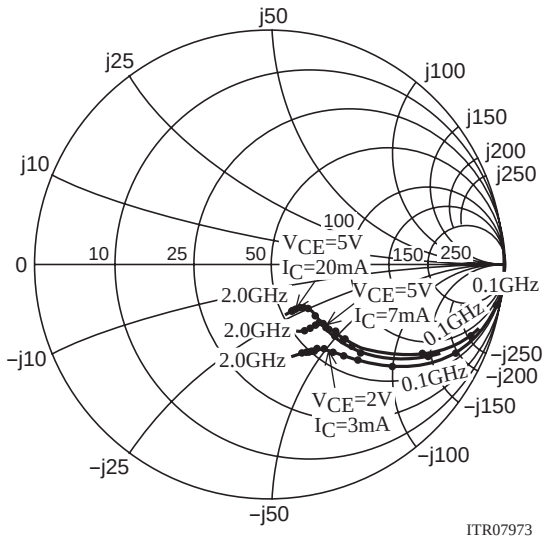
S21e
f=100MHz, 200MHz to 2000MHz(200MHz Step)



S12e
f=100MHz, 200MHz to 2000MHz(200MHz Step)



S22e
f=100MHz, 200MHz to 2000MHz(200MHz Step)



S parameters (Common emitter)

V_{CE}=5V, I_C=7mA, Z_O=50Ω

Freq (MHz)	$\lvert S_{11} \rvert$	$\angle S_{11}$	$\lvert S_{21} \rvert$	$\angle S_{21}$	$\lvert S_{12} \rvert$	$\angle S_{12}$	$\lvert S_{22} \rvert$	$\angle S_{22}$
100	0.786	–40.7	17.507	151.3	0.028	70.1	0.898	–20.4
200	0.677	–72.4	13.998	131.4	0.046	58.0	0.739	–33.4
400	0.546	–112.7	9.061	108.6	0.064	49.6	0.525	–43.7
600	0.492	–135.2	6.442	96.1	0.076	49.3	0.432	–46.7
800	0.473	–150.0	5.005	87.3	0.087	50.8	0.374	–44.4
1000	0.465	–160.0	4.073	80.4	0.099	52.6	0.346	–49.7
1200	0.457	–169.5	3.449	74.0	0.111	54.0	0.332	–51.6
1400	0.451	–176.2	2.989	68.6	0124	55.2	0.321	–54.1
1600	0.449	177.8	2.658	63.8	0.138	56.6	0.319	–56.2
1800	0.454	172.5	2.378	58.4	0.151	56.7	0.313	–60.0
2000	0.460	167.1	2.154	54.0	0.166	56.7	0.311	–63.2

V_{CE}=5V, I_C=20mA, Z_O=50Ω

Freq (MHz)	$\lvert S_{11} \rvert$	$\angle S_{11}$	$\lvert S_{21} \rvert$	$\angle S_{21}$	$\lvert S_{12} \rvert$	$\angle S_{12}$	$\lvert S_{22} \rvert$	$\angle S_{22}$
100	0.601	–65.8	28.967	137.1	0.023	64.1	0.757	–32.9
200	0.497	–103.7	19.309	116.6	0.035	57.0	0.534	–50.3
400	0.435	–139.6	10.891	98.6	0.050	58.7	0.345	–50.3
600	0.419	–156.6	7.461	89.3	0.065	61.3	0.280	–50.7
800	0.414	–166.6	5.695	82.5	0.081	63.1	0.251	–51.3
1000	0.413	–174.0	4.613	77.0	0.098	63.8	0.235	–52.9
1200	0.413	178.6	3.870	71.8	0.114	63.9	0.226	–55.1
1400	0.411	173.8	3.345	66.9	0.131	63.6	0.221	–57.7
1600	0.413	169.6	2.960	62.7	0.148	63.2	0.220	–60.2
1800	0.416	165.1	2.655	58.0	0.165	61.8	0.219	–64.8
2000	0.422	160.3	2.406	54.0	0.182	60.6	0.218	–68.3

V_{CE}=2V, I_C=3mA, Z_O=50Ω

Freq (MHz)	$\lvert S_{11} \rvert$	$\angle S_{11}$	$\lvert S_{21} \rvert$	$\angle S_{21}$	$\lvert S_{12} \rvert$	$\angle S_{12}$	$\lvert S_{22} \rvert$	$\angle S_{22}$
100	0.888	–30.2	9.280	158.6	0.038	73.6	0.949	–15.1
200	0.815	–56.4	8.218	141.3	0.067	60.5	0.849	–26.9
400	0.690	–96.0	6.074	116.7	0.098	45.1	0.657	–41.1
600	0.616	–120.7	4.517	101.4	0.112	38.4	0.539	–47.6
800	0.584	–138.0	3.610	90.4	0.120	35.8	0.475	–51.2
1000	0.566	–150.7	2.995	81.9	0.125	35.7	0.434	–54.5
1200	0.555	–161.2	2.540	74.2	0.131	36.5	0.410	–57.5
1400	0.546	–169.3	2.213	67.5	0.137	38.4	0.393	–60.7
1600	0.541	–176.4	1.982	62.0	0.143	40.7	0.391	–64.0
1800	0.545	177.1	1.774	55.9	0.152	42.5	0.382	–67.8
2000	0.547	170.9	1.614	50.9	0.163	44.7	0.381	–72.1