

DATA SHEET

NEC

NPN SILICON RF TRANSISTOR 2SC5431

NPN EPITAXIAL SILICON TRANSISTOR FOR UHF TUNER OSC/MIX FLAT-LEAD 3-PIN THIN-TYPE ULTRA SUPER MINIMOLD

FEATURES

- Contains same chip as 2SC5004
- Flat-lead 3-pin thin-type ultra super minimold package

★ ORDERING INFORMATION

Part Number	Quantity	Supplying Form
2SC5431	50 pcs (Non reel)	• 8 mm wide embossed taping • Pin 3 (collector) face the perforation side of the tape
2SC5431-T1	3 kpcs/reel	

Remark To order evaluation samples, contact your nearby sales office.
The unit sample quantity is 50 pcs.

ABSOLUTE MAXIMUM RATINGS (T_A = +25°C)

Parameter	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}	3	V
Collector Current	I _C	60	mA
Total Power Dissipation	P _{tot} ^{Note}	100	mW
Junction Temperature	T _j	125	°C
Storage Temperature	T _{stg}	−65 to +125	°C

Note Free air

Because this product uses high-frequency technology, avoid excessive static electricity, etc.

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Not all devices/types available in every country. Please check with local NEC Compound Semiconductor Devices representative for availability and additional information.

ELECTRICAL CHARACTERISTICS ($T_A = +25^\circ\text{C}$)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Collector Cut-off Current	I_{CBO}	$V_{CB} = 15\text{ V}, I_E = 0\text{ mA}$	—	—	100	nA
Emitter Cut-off Current	I_{EBO}	$V_{EB} = 1\text{ V}, I_C = 0\text{ mA}$	—	—	100	nA
Collector to Emitter Saturation Voltage	$V_{CE(sat)}$	$h_{FE} = 10, I_C = 5\text{ mA}$	—	—	0.5	V
DC Current Gain	$h_{FE}^{\text{Note 1}}$	$V_{CE} = 5\text{ V}, I_C = 5\text{ mA}$	60	—	120	—
Gain Bandwidth Product	f_T	$V_{CE} = 5\text{ V}, I_C = 5\text{ mA}, f = 1\text{ GHz}$	3.0	4.3	—	GHz
Insertion Power Gain	$ S_{21e} ^2$	$V_{CE} = 5\text{ V}, I_C = 5\text{ mA}, f = 1\text{ GHz}$	5.0	—	—	dB
Reverse Transfer Capacitance	$C_{re}^{\text{Note 2}}$	$V_{CB} = 5\text{ V}, I_E = 0\text{ mA}, f = 1\text{ MHz}$	—	0.6	1.2	pF

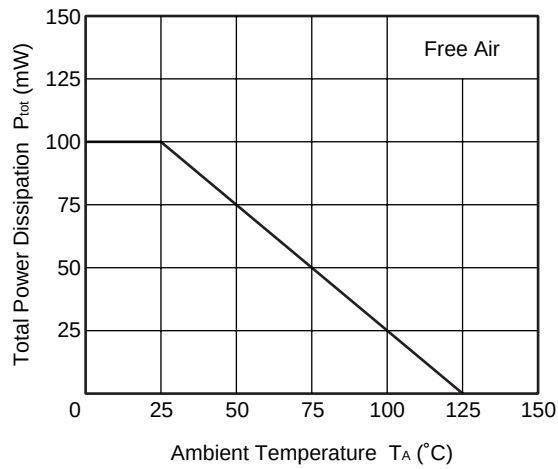
- Notes** 1. Pulse measurement: $PW \leq 350\text{ }\mu\text{s}$, Duty Cycle $\leq 2\%$
2. Collector to base capacitance when the emitter grounded

h_{FE} CLASSIFICATION

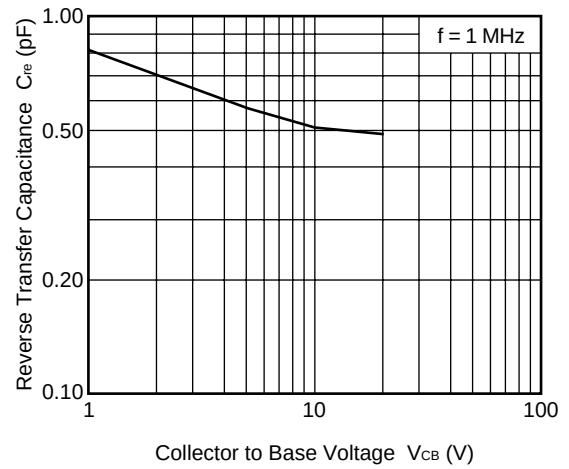
Rank	EB	FB
Marking	TA	TB
h_{FE} Value	60 to 90	80 to 120

TYPICAL CHARACTERISTICS (Unless otherwise specified, $T_A = +25^\circ\text{C}$)

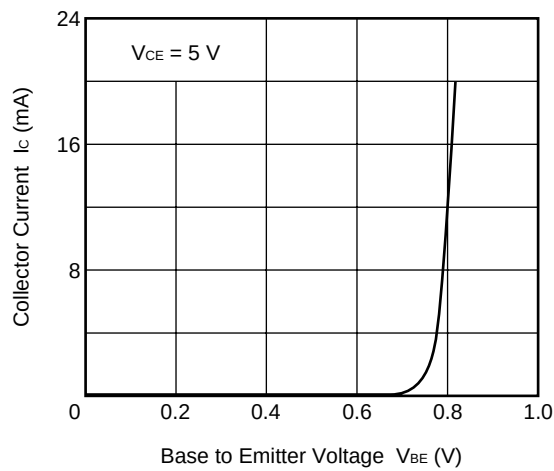
**TOTAL POWER DISSIPATION
vs. AMBIENT TEMPERATURE**



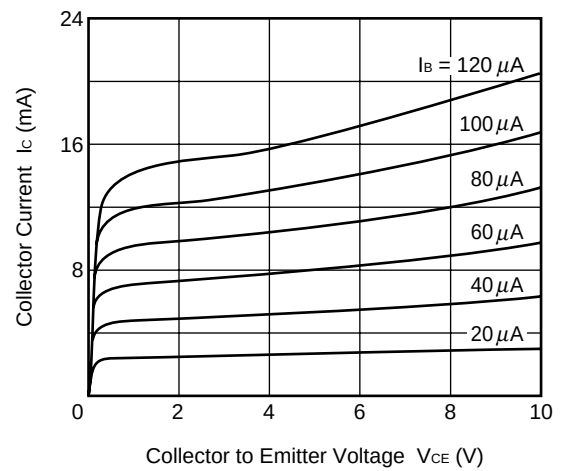
**REVERSE TRANSFER CAPACITANCE
vs. COLLECTOR TO BASE VOLTAGE**



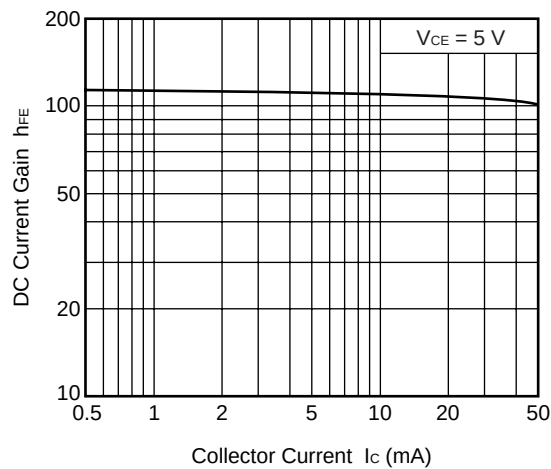
**COLLECTOR CURRENT vs.
BASE TO EMITTER VOLTAGE**



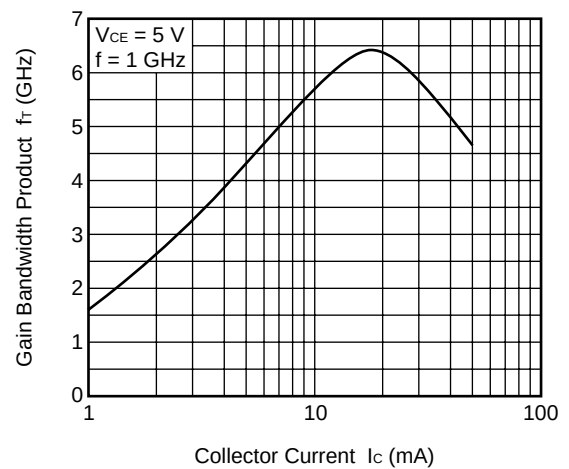
**COLLECTOR CURRENT vs.
COLLECTOR TO EMITTER VOLTAGE**

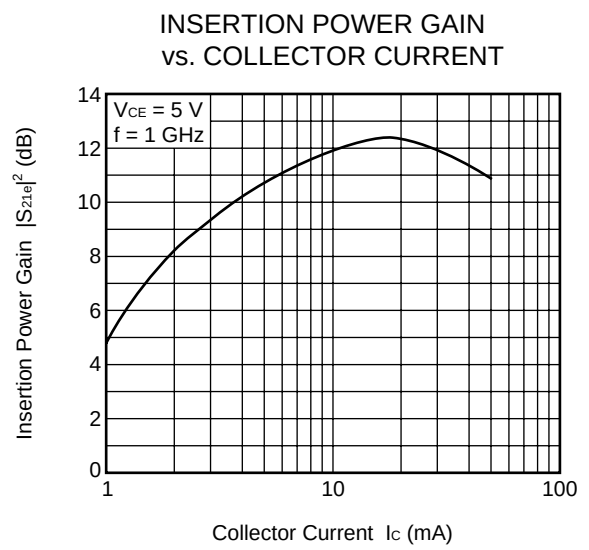
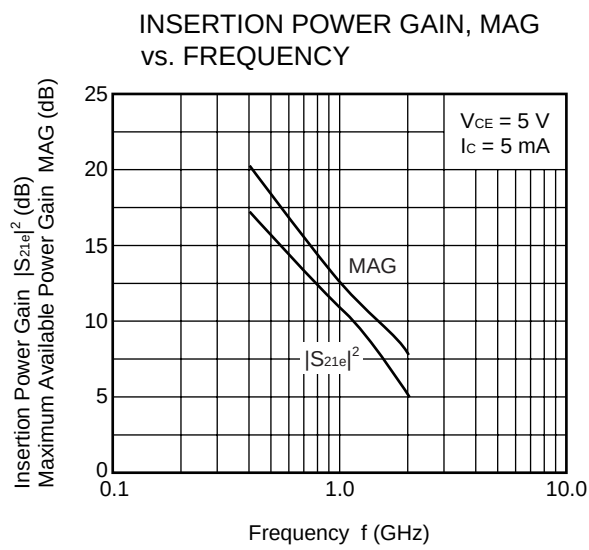


**DC CURRENT GAIN vs.
COLLECTOR CURRENT**



**GAIN BANDWIDTH PRODUCT
vs. COLLECTOR CURRENT**





Remark The graphs indicate nominal characteristics.

S-PARAMETERS

$V_{CE} = 3\text{ V}$, $I_C = 1\text{ mA}$, $Z_O = 50\ \Omega$

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.2	0.878	-34.4	3.225	149.4	0.076	65.6	0.939	-14.8
0.4	0.699	-64.9	2.556	125.7	0.123	48.1	0.796	-25.3
0.6	0.607	-90.1	2.080	107.1	0.148	37.3	0.691	-34.0
0.8	0.531	-107.9	1.791	94.8	0.154	30.0	0.647	-40.4
1.0	0.477	-123.5	1.524	85.4	0.161	25.2	0.626	-43.9
1.2	0.450	-137.4	1.316	76.4	0.164	23.3	0.596	-46.6
1.4	0.442	-148.0	1.184	68.0	0.163	24.6	0.567	-50.9
1.6	0.427	-157.3	1.081	62.1	0.159	26.6	0.543	-56.5
1.8	0.415	-167.7	0.976	56.8	0.152	28.8	0.534	-62.8
2.0	0.426	-177.6	0.883	51.5	0.148	29.8	0.526	-69.2
2.2	0.450	-175.6	0.821	45.2	0.150	33.0	0.509	-76.5
2.4	0.467	170.7	0.786	40.7	0.153	37.3	0.508	-86.2
2.6	0.477	166.1	0.741	37.9	0.161	42.2	0.527	-94.4
2.8	0.492	161.5	0.676	34.8	0.167	46.5	0.541	-100.8
3.0	0.511	158.0	0.638	29.9	0.174	50.0	0.536	-107.8

$V_{CE} = 3\text{ V}$, $I_C = 3\text{ mA}$, $Z_O = 50\ \Omega$

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.2	0.707	-53.0	7.303	137.7	0.064	58.0	0.814	-27.8
0.4	0.514	-91.3	5.041	113.3	0.091	43.6	0.575	-40.8
0.6	0.439	-116.2	3.754	97.8	0.102	38.9	0.457	-48.1
0.8	0.391	-133.8	3.018	88.9	0.107	37.8	0.404	-52.1
1.0	0.369	-148.6	2.525	82.3	0.116	38.2	0.372	-53.8
1.2	0.370	-159.9	2.132	75.2	0.125	40.2	0.343	-55.5
1.4	0.374	-167.5	1.885	68.7	0.135	43.3	0.318	-59.4
1.6	0.367	-175.1	1.693	64.2	0.141	46.6	0.299	-64.8
1.8	0.370	176.3	1.506	59.8	0.148	49.4	0.289	-70.7
2.0	0.390	168.9	1.355	55.2	0.155	50.2	0.280	-77.1
2.2	0.413	164.3	1.251	49.5	0.167	50.7	0.268	-85.6
2.4	0.430	160.7	1.189	45.0	0.180	51.9	0.272	-95.6
2.6	0.444	157.1	1.126	42.7	0.196	53.3	0.286	-104.0
2.8	0.462	153.8	1.028	39.5	0.206	54.8	0.297	-110.4
3.0	0.480	151.4	0.964	34.6	0.214	55.2	0.303	-117.3

$V_{CE} = 3\text{ V}$, $I_C = 5\text{ mA}$, $Z_O = 50\ \Omega$

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.2	0.597	-65.7	9.659	130.5	0.056	53.8	0.719	-35.9
0.4	0.431	-106.4	6.136	107.4	0.075	44.3	0.463	-49.2
0.6	0.375	-130.0	4.420	93.7	0.086	43.7	0.354	-55.6
0.8	0.347	-146.7	3.497	86.2	0.093	44.8	0.305	-58.8
1.0	0.340	-160.1	2.911	80.3	0.105	47.0	0.272	-59.9
1.2	0.348	-169.5	2.441	74.2	0.116	49.1	0.246	-61.7
1.4	0.355	-175.6	2.153	68.4	0.130	51.6	0.225	-66.0
1.6	0.352	177.6	1.925	64.4	0.142	54.4	0.210	-71.9
1.8	0.359	170.0	1.706	60.4	0.152	56.4	0.200	-78.5
2.0	0.381	163.8	1.533	56.1	0.161	56.4	0.192	-86.1
2.2	0.404	160.0	1.411	50.7	0.175	55.8	0.185	-96.3
2.4	0.421	157.0	1.343	46.6	0.191	55.7	0.191	-107.2
2.6	0.435	153.7	1.270	44.3	0.209	56.3	0.206	-115.6
2.8	0.454	150.8	1.162	41.6	0.220	57.4	0.218	-122.2
3.0	0.472	149.0	1.088	36.6	0.227	57.0	0.228	-129.3

$V_{CE} = 5\text{ V}$, $I_C = 1\text{ mA}$, $Z_O = 50\ \Omega$

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.2	0.886	-32.7	3.235	150.8	0.066	66.7	0.948	-12.9
0.4	0.711	-62.0	2.597	127.7	0.109	49.9	0.821	-22.2
0.6	0.616	-86.9	2.130	109.4	0.131	39.3	0.722	-30.2
0.8	0.538	-104.5	1.844	97.1	0.139	32.5	0.682	-36.4
1.0	0.481	-120.1	1.577	87.9	0.145	27.7	0.666	-39.6
1.2	0.448	-134.2	1.362	79.1	0.148	26.0	0.639	-41.9
1.4	0.437	-145.2	1.222	70.8	0.148	27.7	0.611	-45.7
1.6	0.421	-154.8	1.116	64.9	0.144	29.8	0.584	-50.7
1.8	0.407	-165.5	1.008	59.5	0.138	32.6	0.574	-56.6
2.0	0.417	-175.6	0.915	54.3	0.135	34.1	0.566	-62.5
2.2	0.439	177.1	0.849	47.8	0.138	37.8	0.550	-69.0
2.4	0.455	172.0	0.812	43.3	0.143	42.2	0.542	-77.8
2.6	0.466	167.2	0.768	40.5	0.152	47.0	0.558	-86.0
2.8	0.480	162.4	0.701	37.4	0.159	51.8	0.573	-92.3
3.0	0.499	158.8	0.661	32.5	0.167	55.6	0.566	-98.7

$V_{CE} = 5\text{ V}$, $I_C = 3\text{ mA}$, $Z_O = 50\ \Omega$

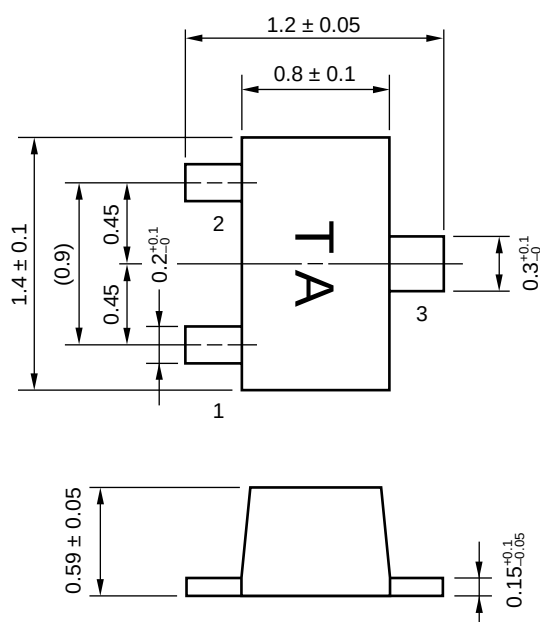
Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.2	0.723	-49.7	7.443	139.6	0.057	60.0	0.839	-24.0
0.4	0.525	-86.6	5.234	115.4	0.082	45.9	0.617	-35.2
0.6	0.444	-111.6	3.929	99.6	0.094	41.3	0.501	-41.5
0.8	0.390	-129.2	3.168	90.6	0.098	39.8	0.452	-45.1
1.0	0.362	-144.4	2.663	84.0	0.106	40.3	0.424	-46.4
1.2	0.359	-156.6	2.247	77.1	0.115	42.2	0.397	-47.3
1.4	0.362	-164.8	1.987	70.4	0.124	45.5	0.372	-50.3
1.6	0.354	-172.8	1.784	66.0	0.131	49.1	0.349	-54.8
1.8	0.356	178.2	1.589	61.6	0.138	52.4	0.338	-60.2
2.0	0.374	170.5	1.426	57.1	0.144	53.2	0.328	-65.8
2.2	0.397	165.6	1.316	51.3	0.155	54.2	0.315	-72.5
2.4	0.414	162.0	1.253	46.8	0.169	55.1	0.310	-81.4
2.6	0.429	158.2	1.186	44.2	0.185	56.6	0.320	-89.7
2.8	0.446	154.8	1.083	41.4	0.196	58.6	0.329	-96.2
3.0	0.465	152.3	1.018	36.2	0.204	59.2	0.331	-102.7

$V_{CE} = 5\text{ V}$, $I_C = 5\text{ mA}$, $Z_O = 50\ \Omega$

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.2	0.675	-66.0	10.641	135.2	0.052	57.8	0.786	-29.4
0.4	0.550	-108.8	7.098	111.6	0.074	46.8	0.546	-41.0
0.6	0.513	-133.2	5.218	96.6	0.088	45.0	0.428	-47.0
0.8	0.489	-149.5	4.145	88.0	0.097	45.5	0.377	-50.1
1.0	0.487	-162.2	3.458	81.6	0.108	47.9	0.345	-50.9
1.2	0.501	-170.9	2.973	75.0	0.119	50.1	0.316	-51.8
1.4	0.508	-176.5	2.566	69.0	0.133	52.1	0.290	-54.8
1.6	0.498	177.3	2.279	64.7	0.143	55.0	0.269	-59.4
1.8	0.502	169.8	2.018	60.4	0.153	56.4	0.257	-65.0
2.0	0.524	164.0	1.800	56.0	0.162	56.5	0.246	-71.1
2.2	0.545	160.2	1.645	50.1	0.176	55.6	0.233	-78.4
2.4	0.560	156.9	1.559	45.5	0.191	55.4	0.229	-88.3
2.6	0.571	153.6	1.475	43.0	0.210	56.1	0.236	-97.3
2.8	0.585	150.5	1.337	39.9	0.222	57.1	0.239	-104.3
3.0	0.602	148.5	1.246	35.4	0.226	57.1	0.240	-110.6

★ PACKAGE DIMENSIONS

FLAT-LEAD 3-PIN THIN-TYPE ULTRA SUPER MINIMOLD (UNIT: mm)



PIN CONNECTIONS

1. Emitter
2. Base
3. Collector

- **The information in this document is current as of February, 2002. The information is subject to change without notice. For actual design-in, refer to the latest publications of NEC's data sheets or data books, etc., for the most up-to-date specifications of NEC semiconductor products. Not all products and/or types are available in every country. Please check with an NEC sales representative for availability and additional information.**
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M8E 00.4-0110

► **Business issue**

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► **Technical issue**

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