

# DATA SHEET

# NEC

## NPN SILICON RF TRANSISTOR 2SC5337

### NPN SILICON RF TRANSISTOR FOR HIGH-FREQUENCY LOW DISTORTION AMPLIFIER 4-PIN POWER MINIMOLD

#### FEATURES

- Low distortion:  $IM_2 = 59.0$  dB TYP.,  $IM_3 = 82.0$  dB TYP. @  $V_{CE} = 10$  V,  $I_c = 50$  mA
- Low noise  
 $NF = 1.5$  dB TYP. @  $V_{CE} = 10$  V,  $I_c = 50$  mA,  $f = 500$  MHz  
 $NF = 2.0$  dB TYP. @  $V_{CE} = 10$  V,  $I_c = 50$  mA,  $f = 1$  GHz
- 4-pin power minimold package with improved gain from the 2SC4536

#### ★ ORDERING INFORMATION

Part Number	Quantity	Supplying Form
2SC5337	25 pcs (Non reel)	• Magazine case
2SC5337-T1	1 kpcs/reel	• 12 mm wide embossed taping • Collector face the perforation side of the tape

**Remark** To order evaluation samples, consult your NEC sales representative.  
Unit sample quantity is 25 pcs.

#### ABSOLUTE MAXIMUM RATINGS ( $T_A = +25^\circ\text{C}$ )

Parameter	Symbol	Ratings	Unit
Collector to Base Voltage	$V_{CBO}$	30	V
Collector to Emitter Voltage	$V_{CEO}$	15	V
Emitter to Base Voltage	$V_{EBO}$	3.0	V
Collector Current	$I_c$	250	mA
Total Power Dissipation	$P_{tot}$ <sup>Note</sup>	2.0	W
Junction Temperature	$T_j$	150	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-65 to +150	$^\circ\text{C}$

**Note** Mounted on  $16\text{ cm}^2 \times 0.7$  mm (t) ceramic substrate (Copper plating)

**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 representative for availability and additional information.

**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = +25°C)**

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
DC Characteristics						
Collector Cut-off Current	I <sub>CBO</sub>	V <sub>CB</sub> = 20 V, I <sub>E</sub> = 0 mA	–	0.01	5.0	μA
Emitter Cut-off Current	I <sub>EBO</sub>	V <sub>BE</sub> = 2 V, I <sub>C</sub> = 0 mA	–	0.03	5.0	μA
DC Current Gain	h <sub>FE</sub> <sup>Note 1</sup>	V <sub>CE</sub> = 10 V, I <sub>C</sub> = 50 mA	40	120	200	–
RF Characteristics						
Insertion Power Gain	S <sub>21e</sub>   <sup>2</sup>	V <sub>CE</sub> = 10 V, I <sub>C</sub> = 50 mA, f = 1 GHz	7.0	8.3	–	dB
Noise Figure (1)	N <sub>F</sub> <sup>Note 2</sup>	V <sub>CE</sub> = 10 V, I <sub>C</sub> = 50 mA, f = 500 MHz	–	1.5	3.5	dB
Noise Figure (2)	N <sub>F</sub> <sup>Note 2</sup>	V <sub>CE</sub> = 10 V, I <sub>C</sub> = 50 mA, f = 1 GHz	–	2.0	3.5	dB
2nd Order Intermodulation Distortion	IM <sub>2</sub>	V <sub>CE</sub> = 10 V, I <sub>C</sub> = 50 mA, R <sub>S</sub> = R <sub>L</sub> = 75 Ω, V <sub>in</sub> = 105 dBμV/75 Ω, f <sub>1</sub> = 190 MHz, f <sub>2</sub> = 90 MHz, f = f <sub>1</sub> – f <sub>2</sub>	–	59.0	–	dB
3rd Order Intermodulation Distortion	IM <sub>3</sub>	V <sub>CE</sub> = 10 V, I <sub>C</sub> = 50 mA, R <sub>S</sub> = R <sub>L</sub> = 75 Ω, V <sub>in</sub> = 105 dBμV/75 Ω, f <sub>1</sub> = 190 MHz, f <sub>2</sub> = 200 MHz, f = 2 × f <sub>1</sub> – f <sub>2</sub>	–	82.0	–	dB

**Notes 1.** Pulse measurement: PW ≤ 350 μs, Duty Cycle ≤ 2%

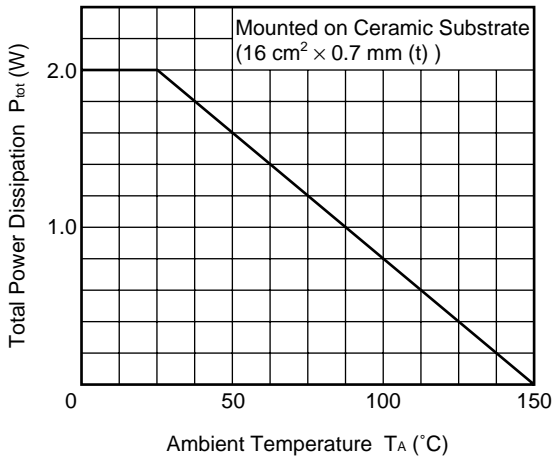
**2.** R<sub>S</sub> = R<sub>L</sub> = 50 Ω, tuned

**h<sub>FE</sub> CLASSIFICATION**

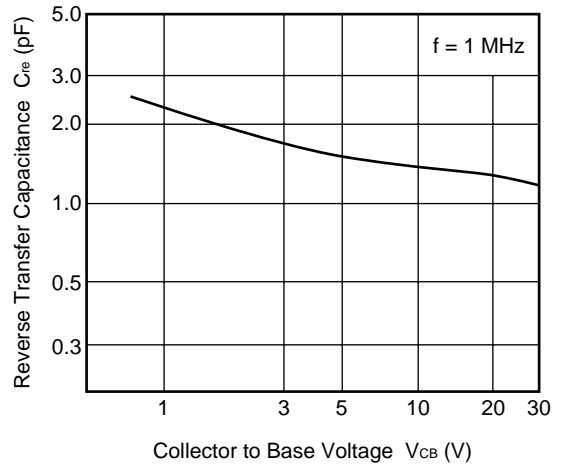
Rank	QQ	QR	QS
Marking	QQ	QR	QS
h <sub>FE</sub> Value	40 to 80	60 to 120	100 to 200

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

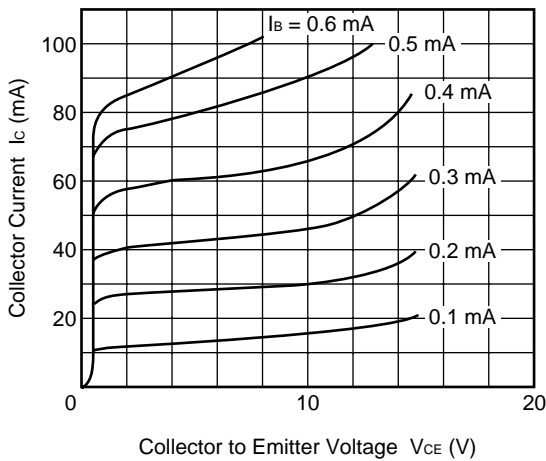
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



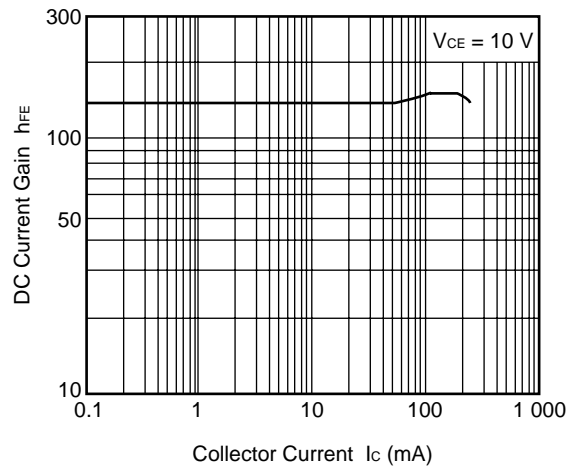
REVERSE TRANSFER CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



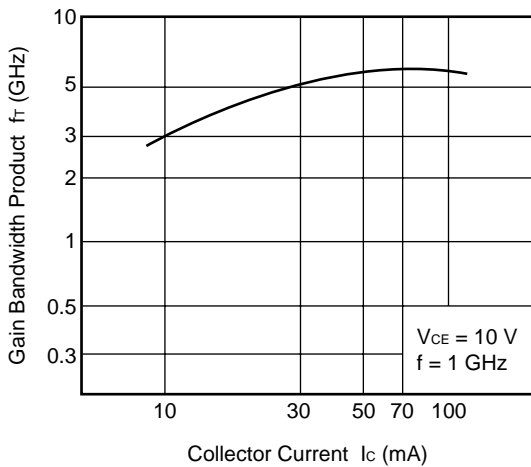
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



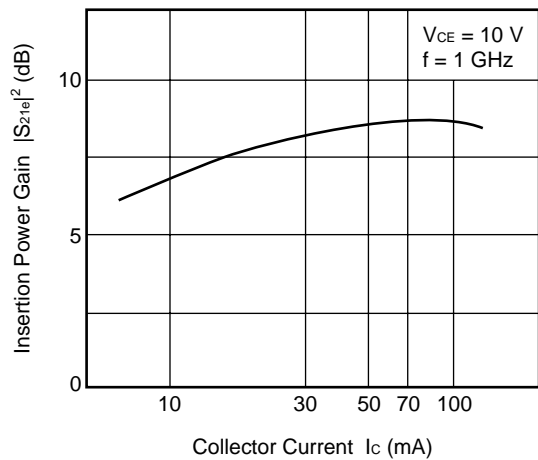
DC CURRENT GAIN vs. COLLECTOR CURRENT



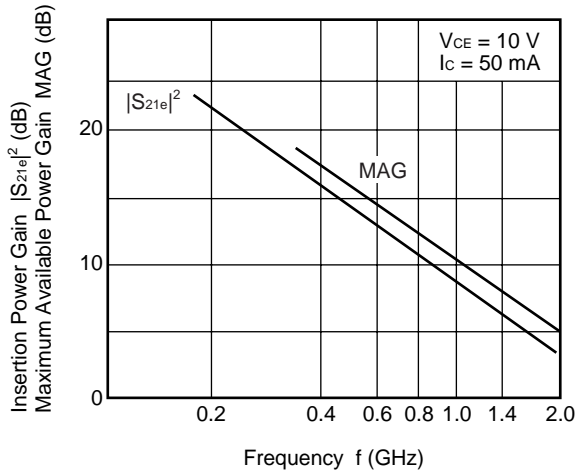
GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



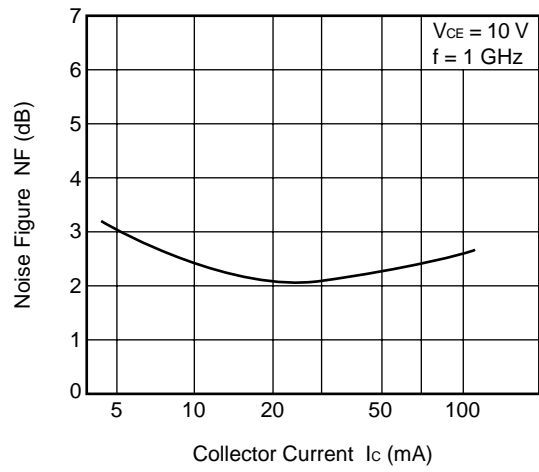
INSERTION POWER GAIN vs. COLLECTOR CURRENT



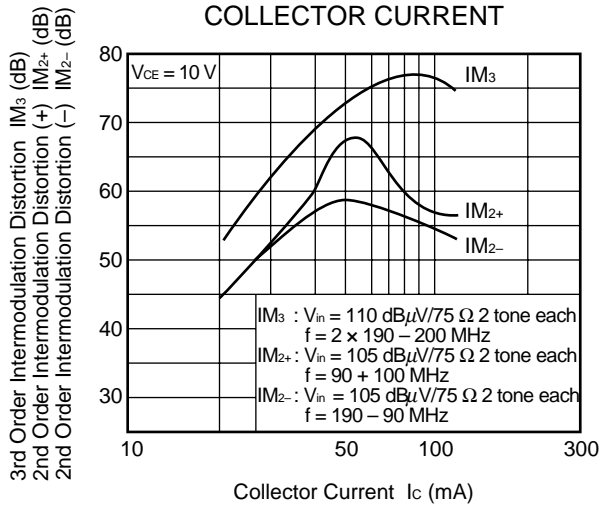
INSERTION POWER GAIN, MAG vs. FREQUENCY



NOISE FIGURE vs. COLLECTOR CURRENT



IM3, IM2+, IM2- vs. COLLECTOR CURRENT



**Remark** The graphs indicate nominal characteristics.

**S-PARAMETERS**

V<sub>CE</sub> = 10 V, I<sub>c</sub> = 50 mA

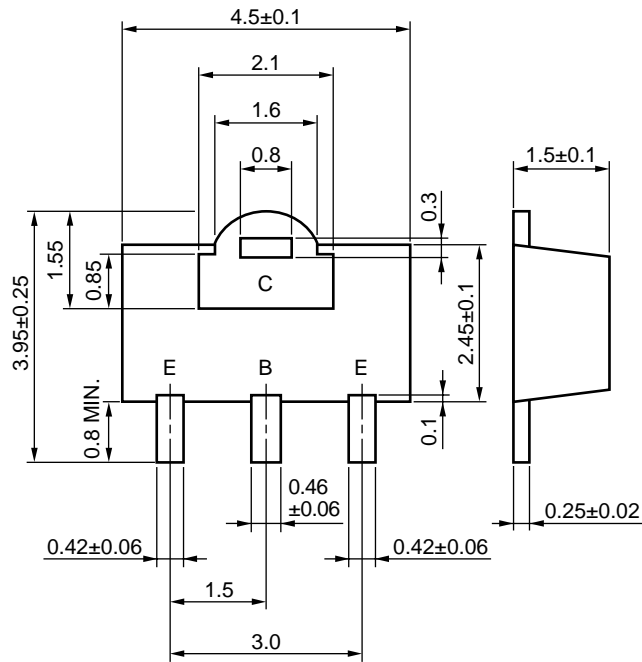
Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.592	-136.6	24.447	108.4	0.030	50.5	0.465	-95.2
0.2	0.577	-160.0	12.746	96.5	0.042	57.4	0.335	-123.0
0.3	0.566	-168.5	8.591	91.2	0.055	67.3	0.276	-130.1
0.4	0.558	-174.0	6.438	87.2	0.066	70.8	0.269	-132.7
0.5	0.554	-177.5	5.160	84.1	0.083	68.6	0.262	-134.5
0.6	0.542	-179.4	4.312	82.3	0.095	70.6	0.262	-139.1
0.7	0.527	177.9	3.729	80.9	0.112	71.2	0.251	-133.4
0.8	0.519	175.8	3.292	78.7	0.123	74.6	0.252	-132.9
0.9	0.509	174.4	2.983	77.7	0.136	75.0	0.252	-124.6
1.0	0.514	171.0	2.759	76.6	0.151	75.3	0.257	-125.3
1.1	0.498	166.8	2.648	75.4	0.166	75.8	0.278	-118.4
1.2	0.494	167.3	2.665	71.3	0.180	74.7	0.306	-120.2
1.3	0.487	161.7	2.478	63.0	0.194	75.9	0.314	-124.2
1.4	0.467	160.4	2.177	60.1	0.216	74.7	0.273	-124.0
1.5	0.477	157.4	1.973	57.9	0.230	74.9	0.281	-123.2
1.6	0.471	154.5	1.815	57.2	0.240	73.2	0.291	-120.2
1.7	0.467	152.5	1.754	55.3	0.260	72.9	0.316	-118.7
1.8	0.469	151.3	1.639	54.4	0.273	70.5	0.312	-123.1
1.9	0.465	149.1	1.568	53.4	0.285	69.9	0.316	-125.5
2.0	0.468	147.0	1.475	52.6	0.289	69.3	0.323	-126.3

V<sub>CE</sub> = 10 V, I<sub>c</sub> = 100 mA

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.564	-146.0	24.857	105.3	0.019	50.2	0.284	-116.1
0.2	0.586	-165.8	12.845	94.5	0.026	59.6	0.204	-129.9
0.3	0.576	-171.9	8.681	89.7	0.041	73.2	0.199	-138.7
0.4	0.561	-176.3	6.541	86.3	0.048	77.8	0.200	-140.1
0.5	0.550	179.9	5.209	83.5	0.060	81.4	0.196	-137.0
0.6	0.540	178.2	4.358	82.2	0.069	82.0	0.182	-137.6
0.7	0.538	175.7	3.772	80.6	0.086	84.2	0.216	-131.0
0.8	0.521	174.6	3.332	78.4	0.099	85.1	0.210	-130.5
0.9	0.510	173.2	3.037	77.0	0.113	85.4	0.222	-122.2
1.0	0.524	168.5	2.780	76.9	0.119	83.5	0.198	-120.1
1.1	0.502	165.2	2.680	75.3	0.136	86.8	0.213	-114.9
1.2	0.489	165.9	2.718	72.3	0.156	83.5	0.246	-114.9
1.3	0.488	161.1	2.578	63.0	0.177	85.5	0.251	-122.8
1.4	0.472	157.9	2.213	58.7	0.184	81.8	0.209	-127.2
1.5	0.480	155.3	2.012	57.8	0.194	85.3	0.252	-114.1
1.6	0.470	153.4	1.846	57.2	0.219	82.2	0.242	-117.6
1.7	0.465	151.1	1.745	56.5	0.235	82.4	0.240	-112.9
1.8	0.464	149.5	1.677	54.9	0.248	79.0	0.263	-121.9
1.9	0.460	147.9	1.571	53.3	0.249	78.6	0.281	-120.0
2.0	0.466	146.0	1.514	52.3	0.264	77.4	0.276	-124.0

★ PACKAGE DIMENSIONS

4-PIN POWER MINIMOLD (UNIT: mm)



PIN CONNECTIONS

- E : Emitter
- C : Collector
- B : Base

[MEMO]

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