DATA SHEET

CEL

NPN SILICON RF TRANSISTOR

NE856M02 / 2SC5336

JEITA Part No.

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

FEATURES

- High gain: $|S_{21e}|^2$ = 12 dB TYP. @ V_{CE} = 10 V, I_C = 20 mA, f = 1 GHz
- 4-pin power minimold package with improved gain from the NE85634 / 2SC3357

★ ORDERING INFORMATION

Part Number	Quantity	Supplying Form
NE856M02-AZ 2SC5336-AZ	25 pcs (Non reel)	• Magazine case
NE856M02-AZ 2SC5336-T1-AZ	1 kpcs/reel	• 12 mm wide embossed taping • Collector face the perforation side of the tape

Remark To order evaluation samples, please contact your nearby sales office.
Unit sample quantity is 25 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}	3.0	V
Collector Current	I_C	100	mA
Total Power Dissipation	P_{tot} Note	1.2	W
Junction Temperature	T_j	150	°C
Storage Temperature	T_{stg}	−65 to +150	°C

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

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

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Document No. P10938EJ2V0DS00 (2nd edition)
Date Published August 2001 NS CP(K)

The mark ★ shows major revised points.

ELECTRICAL CHARACTERISTICS (T_A = +25°C)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
DC Characteristics						
Collector Cut-off Current	I_{CBO}	V_{CB} = 10 V, I_E = 0 mA	–	–	1.0	μA
Emitter Cut-off Current	I_{EBO}	V_{BE} = 1 V, I_C = 0 mA	–	–	1.0	μA
DC Current Gain	h_{FE} Note 1	V_{CE} = 10 V, I_C = 20 mA	50	120	250	–
RF Characteristics						
Gain Bandwidth Product	f_T	V_{CE} = 10 V, I_C = 20 mA	–	6.5	–	GHz
Insertion Power Gain	$\lvert S_{21e} \rvert^2$	V_{CE} = 10 V, I_C = 20 mA, f = 1 GHz	–	12	–	dB
Noise Figure (1)	NF	V_{CE} = 10 V, I_C = 7 mA, f = 1 GHz	–	1.1	–	dB
Noise Figure (2)	NF	V_{CE} = 10 V, I_C = 40 mA, f = 1 GHz	–	1.8	3.0	dB
Reverse Transfer Capacitance	C_{re} Note 2	V_{CB} = 10 V, I_E = 0 mA, f = 1 MHz	–	0.5	0.8	pF

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

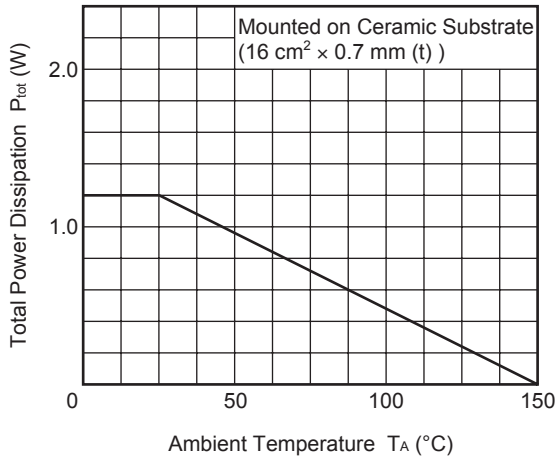
2. Collector to base capacitance when the emitter grounded

h_{FE} CLASSIFICATION

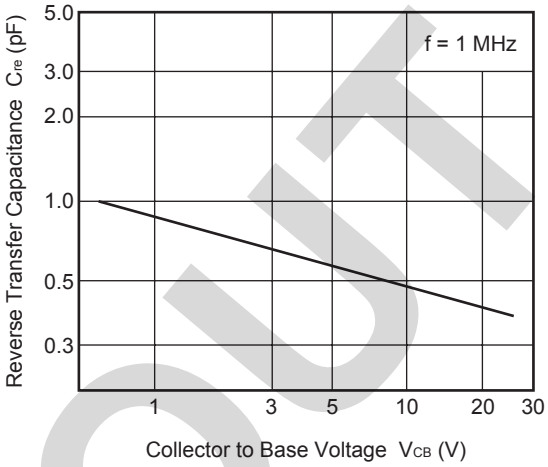
Rank	RH	RF	RE
Marking	RH	RF	RE
h_{FE} Value	50 to 100	80 to 160	125 to 250

★ **TYPICAL CHARACTERISTICS (Unless otherwise specified, T_A = +25°C)**

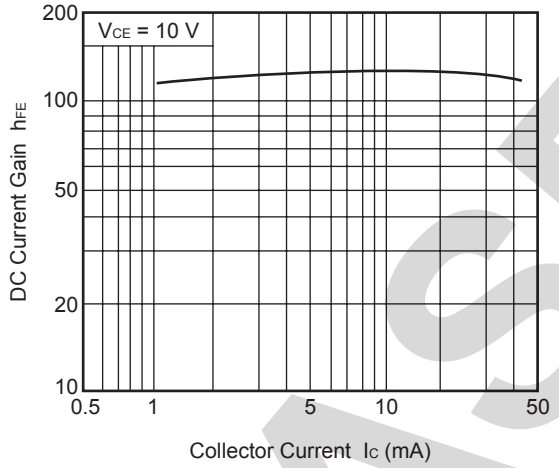
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



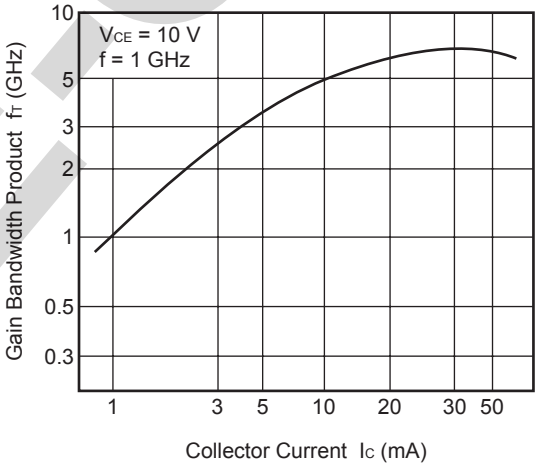
REVERSE TRANSFER CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



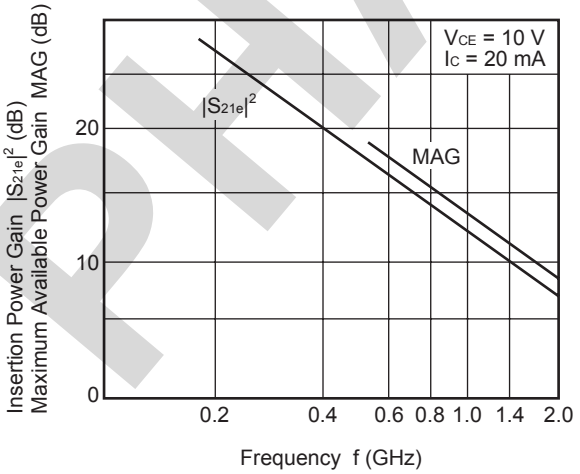
DC CURRENT GAIN vs. COLLECTOR CURRENT



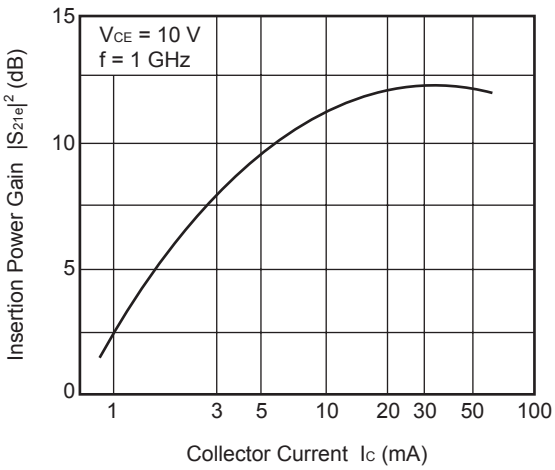
GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



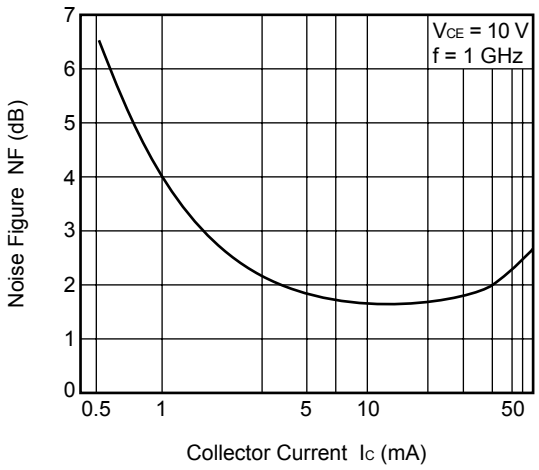
INSERTION POWER GAIN, MAG vs. FREQUENCY



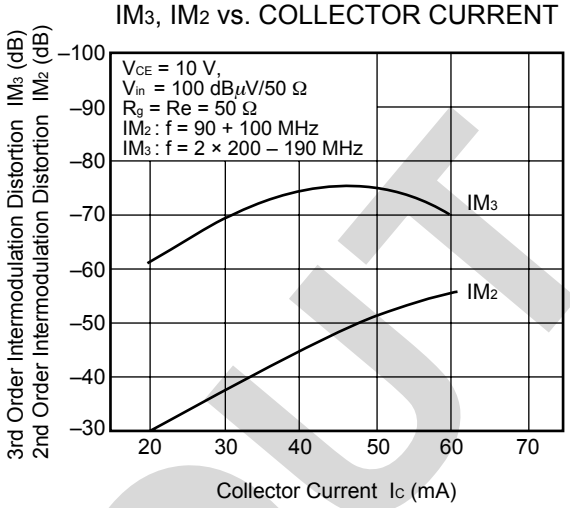
INSERTION POWER GAIN vs. COLLECTOR CURRENT



NOISE FIGURE vs.
COLLECTOR CURRENT



IM3, IM2 vs. COLLECTOR CURRENT



Remark The graphs indicate nominal characteristics.

S-PARAMETERS

V_{CE} = 10 V, I_C = 20 mA

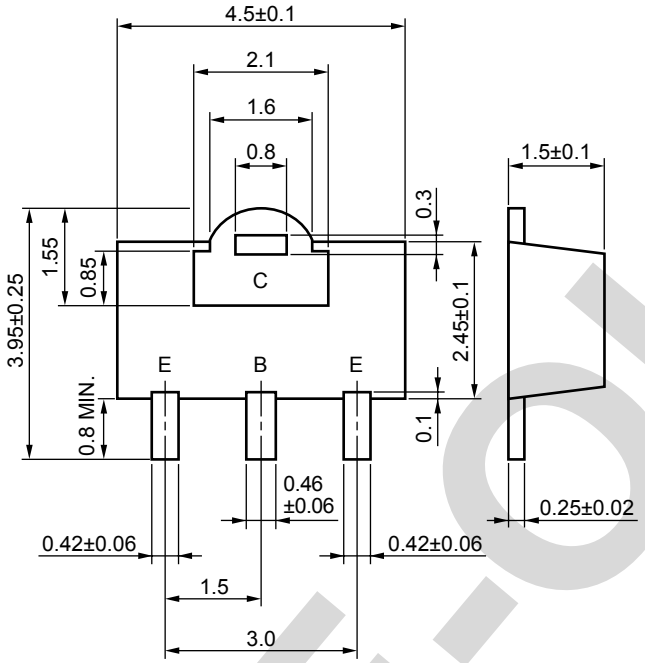
Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.519	–74.5	30.931	131.9	0.017	60.6	0.752	–30.2
0.2	0.413	–112.9	18.965	111.5	0.031	61.9	0.570	–39.7
0.3	0.413	–133.4	13.324	101.9	0.038	65.1	0.465	–39.8
0.4	0.345	–145.7	10.164	95.9	0.045	69.8	0.428	–40.1
0.5	0.331	–153.8	8.177	91.8	0.055	71.8	0.436	–41.1
0.6	0.320	–159.6	6.834	89.1	0.064	70.9	0.438	–43.5
0.7	0.302	–166.8	5.832	86.7	0.074	73.9	0.434	–47.5
0.8	0.296	–169.2	5.107	84.3	0.077	74.4	0.429	–47.8
0.9	0.283	–173.2	4.600	83.1	0.088	71.2	0.436	–46.5
1.0	0.285	–179.8	4.200	82.3	0.097	74.5	0.455	–47.8
1.1	0.265	175.2	3.930	80.8	0.100	76.3	0.467	–46.8
1.2	0.260	174.1	3.979	78.5	0.109	75.9	0.529	–47.4
1.3	0.263	166.0	3.741	68.6	0.114	76.8	0.551	–55.8
1.4	0.242	163.0	3.115	66.6	0.119	78.3	0.509	–55.8
1.5	0.252	160.1	2.844	65.7	0.133	82.0	0.510	–58.5
1.6	0.253	154.0	2.595	64.1	0.140	81.0	0.496	–55.2
1.7	0.253	149.9	2.420	63.7	0.158	80.9	0.515	–54.8
1.8	0.257	147.2	2.305	63.0	0.165	82.2	0.518	–56.5
1.9	0.262	143.0	2.171	62.6	0.172	80.5	0.536	–58.6
2.0	0.273	141.5	2.049	61.2	0.177	78.3	0.524	–61.5

V_{CE} = 10 V, I_C = 40 mA

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.378	–97.1	32.908	123.3	0.017	71.1	0.665	–34.7
0.2	0.317	–131.8	18.819	106.0	0.027	71.2	0.487	–38.7
0.3	0.308	–150.1	12.955	97.5	0.035	71.8	0.398	–38.5
0.4	0.299	–158.7	9.775	93.1	0.042	78.1	0.393	–36.9
0.5	0.297	–165.5	7.899	89.8	0.052	78.5	0.399	–37.6
0.6	0.288	–169.2	6.586	87.6	0.061	79.1	0.407	–39.9
0.7	0.274	–173.7	5.607	85.2	0.071	77.4	0.400	–44.6
0.8	0.261	–177.3	4.879	83.5	0.081	76.4	0.415	–47.4
0.9	0.255	178.9	4.435	82.2	0.092	76.5	0.399	–46.2
1.0	0.260	173.0	4.024	81.4	0.095	77.6	0.440	–44.3
1.1	0.243	169.4	3.801	80.6	0.098	77.1	0.441	–45.2
1.2	0.239	169.3	3.827	78.2	0.109	78.3	0.494	–46.2
1.3	0.245	160.3	3.587	68.4	0.117	78.0	0.517	–55.4
1.4	0.216	157.8	2.980	66.0	0.125	80.3	0.486	–54.5
1.5	0.235	155.3	2.726	66.1	0.137	86.5	0.500	–59.0
1.6	0.243	148.8	2.537	64.0	0.143	80.6	0.474	–53.7
1.7	0.233	146.0	2.348	64.2	0.159	81.2	0.496	–56.8
1.8	0.242	144.6	2.200	63.5	0.163	80.4	0.491	–53.6
1.9	0.249	141.9	2.073	63.3	0.171	81.7	0.534	–58.0
2.0	0.260	140.4	1.986	61.7	0.184	77.5	0.535	–61.3

★ PACKAGE DIMENSIONS

4-PIN POWER MINIMOLD (UNIT: mm)



PIN CONNECTIONS

E : Emitter
C : Collector
B : Base

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