

MICROWAVE LOW NOISE AMPLIFIER

NPN SILICON EPITAXIAL TRANSISTOR

(WITH BUILT-IN 2 $\times$ 2SC5193) SMALL MINI MOLD

FEATURES

- Low Voltage Operation, Low Phase Distortion
- Low Noise
 $NF = 1.5 \text{ dB TYP. @ } V_{CE} = 3 \text{ V, } I_c = 7 \text{ mA, } f = 2 \text{ GHz}$
 $NF = 1.7 \text{ dB TYP. @ } V_{CE} = 1 \text{ V, } I_c = 3 \text{ mA, } f = 2 \text{ GHz}$
- Large Absolute Maximum Collector Current
 $I_c = 100 \text{ mA}$
- A Small Mini Mold Package Adopted
- Built-in 2 Transistors (2 $\times$ 2SC5193)

ORDERING INFORMATION

PART NUMBER	QUANTITY	PACKING STYLE
μ PA814T	Loose products (50 PCS)	Embossed tape 8 mm wide. Pin 6 (Q1 Base), Pin 5 (Q1 Emitter), Pin 4 (Q2 Emitter) face to perforation side of the tape.
μ PA814T-T1	Taping products (3 KPCS/Reel)	

Remark If you require an evaluation sample, please contact an NEC Sales Representative. (Unit sample quantity is 50 pcs.)

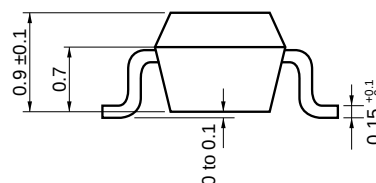
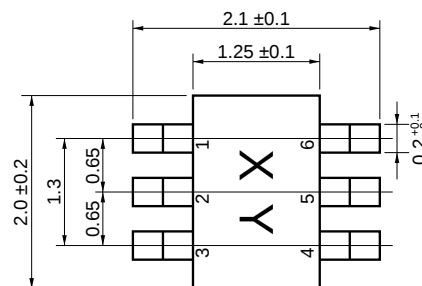
ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$)

PARAMETER	SYMBOL	RATING	UNIT
Collector to Base Voltage	V_{CBO}	9	V
Collector to Emitter Voltage	V_{CEO}	6	V
Emitter to Base Voltage	V_{EBO}	2	V
Collector Current	I_c	100	mA
Total Power Dissipation	P_T	150 in 1 element 200 in 2 elements ^{Note}	mW
Junction Temperature	T_j	150	$^\circ\text{C}$
Storage Temperature	T_{stg}	-65 to +150	$^\circ\text{C}$

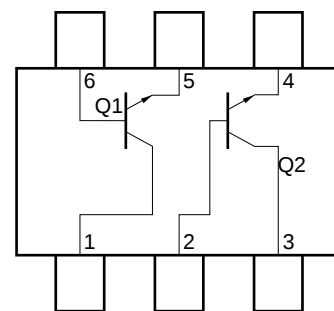
Note 110 mW must not be exceeded in 1 element.

PACKAGE DRAWINGS

(Unit: mm)



PIN CONFIGURATION (Top View)



PIN CONNECTIONS

- | | |
|-------------------|-----------------|
| 1. Collector (Q1) | 4. Emitter (Q2) |
| 2. Base (Q2) | 5. Emitter (Q1) |
| 3. Collector (Q2) | 6. Base (Q1) |

This device uses radio frequency technology. Take due precautions to protect it from excessive input levels such as static electricity.

The information in this document is subject to change without notice.

ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Collector Cutoff Current	I _{CBO}	V _{CB} = 5 V, I _E = 0			0.1	μ A
Emitter Cutoff Current	I _{EBO}	V _{EB} = 1 V, I _C = 0			0.1	μ A
DC Current Gain	h _{FE}	V _{CE} = 1 V, I _C = 3 mA ^{Note 1}	80		160	
Gain Bandwidth Product (1)	f _T (1)	V _{CE} = 1 V, I _C = 3 mA, f = 2 GHz	4.0	4.5		GHz
Gain Bandwidth Product (2)	f _T (2)	V _{CE} = 3 V, I _C = 20 mA, f = 2 GHz		9.0		GHz
Feed-back Capacitance	C _{re}	V _{CB} = 1 V, I _E = 0, f = 1 MHz ^{Note 2}		0.75	0.85	pF
Insertion Power Gain (1)	S _{21e} ² (1)	V _{CE} = 1 V, I _C = 3 mA, f = 2 GHz	2.5	3.5		dB
Insertion Power Gain (2)	S _{21e} ² (2)	V _{CE} = 3 V, I _C = 20 mA, f = 2 GHz		6.5		dB
Noise Figure (1)	NF (1)	V _{CE} = 1 V, I _C = 3 mA, f = 2 GHz		1.7	2.5	dB
Noise Figure (2)	NF (2)	V _{CE} = 3 V, I _C = 7 mA, f = 2 GHz		1.5		dB
h _{FE} Ratio	h _{FE1} /h _{FE2}	V _{CE} = 1 V, I _C = 3 mA A smaller value among h _{FE} of h _{FE1} = Q1, Q2 A larger value among h _{FE} of h _{FE2} = Q1, Q2	0.85			

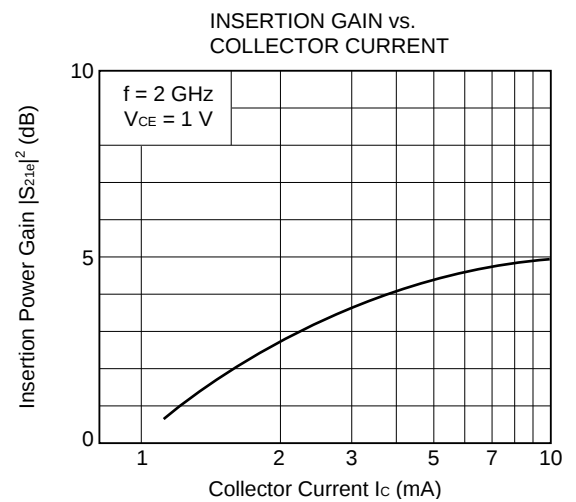
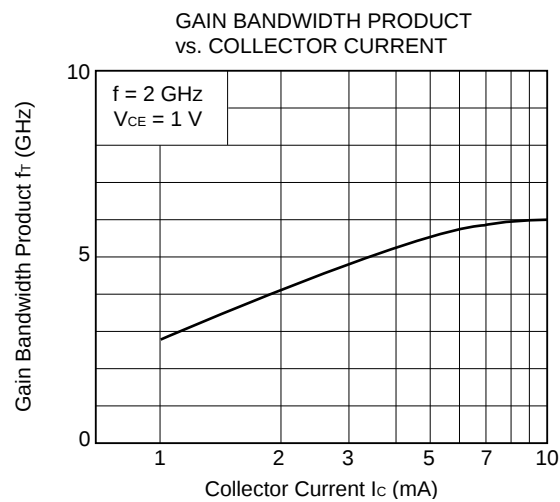
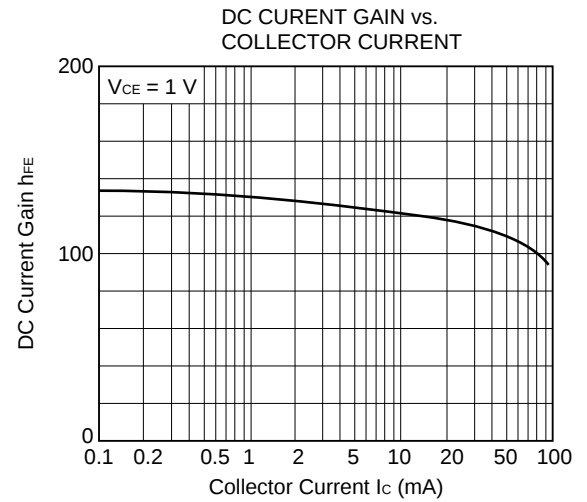
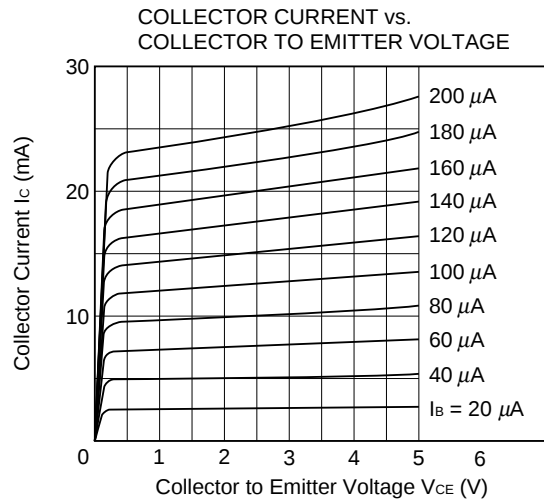
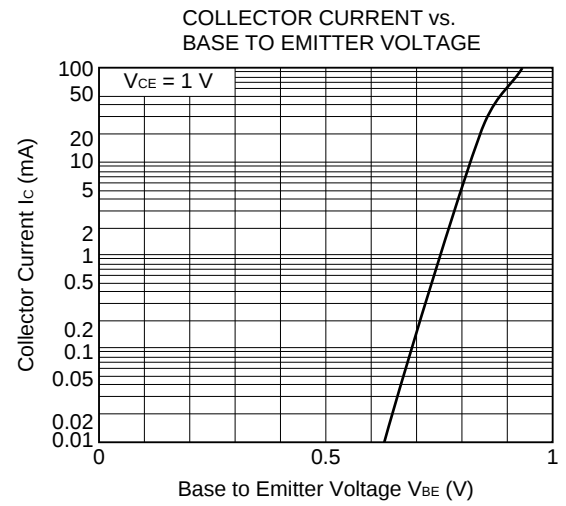
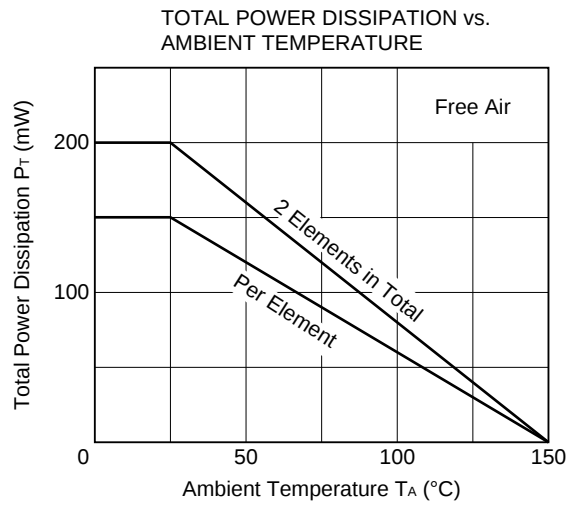
Notes 1. Pulse Measurement: P_w ≤ 350 μ s, Duty cycle ≤ 2 %

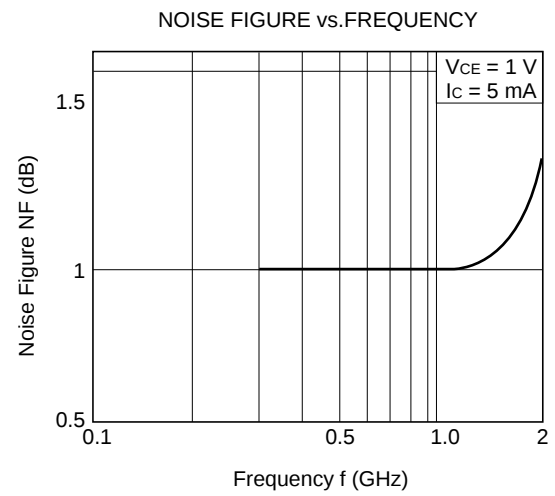
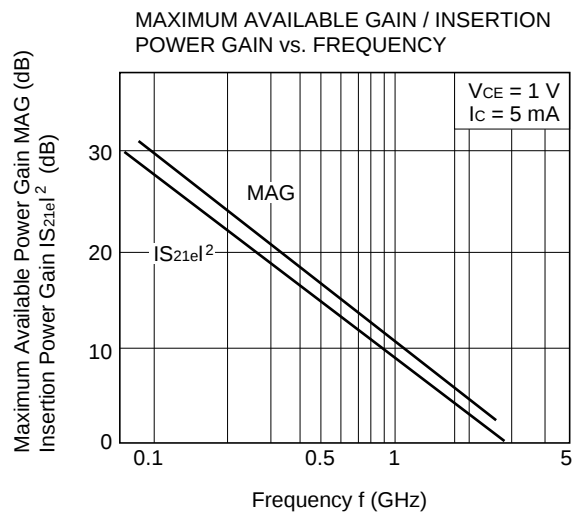
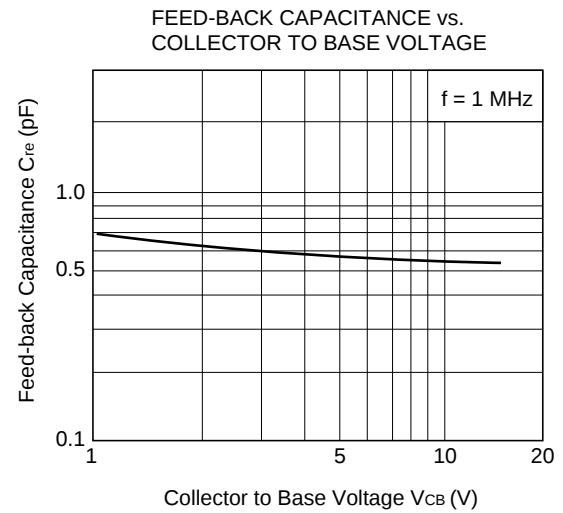
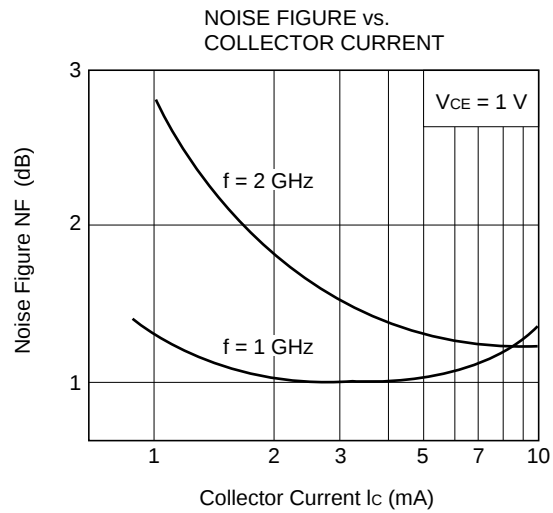
2. Measured with 3-pin bridge, emitter and case should be connected to guard pin of bridge.

h_{FE} CLASSIFICATION

Rank	KB
Marking	88T
h _{FE} Value	80 to 160

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





S-PARAMETERS $V_{CE} = 1\text{ V}$, $I_C = 1\text{ mA}$

FREQUENCY		S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG	
100.00	0.959	-19.0	3.692	165.1	0.053	78.5	0.985	-10.2	
200.00	0.931	-35.2	3.385	152.3	0.097	68.8	0.945	-18.7	
300.00	0.849	-51.4	3.161	138.3	0.137	57.2	0.871	-28.2	
400.00	0.825	-64.7	2.868	129.8	0.166	50.6	0.817	-33.9	
500.00	0.782	-76.8	2.677	119.2	0.186	42.6	0.731	-39.2	
600.00	0.761	-91.4	2.506	112.5	0.205	38.3	0.693	-43.9	
700.00	0.725	-103.2	2.351	101.6	0.213	32.3	0.638	-47.0	
800.00	0.677	-114.4	2.224	95.2	0.225	27.6	0.609	-51.7	
900.00	0.647	-124.0	2.015	86.8	0.223	25.5	0.574	-55.3	
1000.00	0.633	-133.0	1.886	80.4	0.224	21.2	0.533	-60.7	
1100.00	0.619	-141.6	1.749	75.3	0.228	20.7	0.502	-64.6	
1200.00	0.601	-150.7	1.670	69.2	0.231	18.1	0.463	-68.5	
1300.00	0.591	-156.9	1.595	65.1	0.235	15.7	0.434	-71.7	
1400.00	0.580	-162.3	1.482	59.4	0.224	13.9	0.408	-75.0	
1500.00	0.598	-168.9	1.423	54.7	0.221	11.3	0.394	-78.4	
1600.00	0.610	-175.2	1.354	51.5	0.211	14.1	0.376	-82.7	
1700.00	0.606	176.5	1.293	47.5	0.209	13.7	0.363	-87.5	
1800.00	0.599	171.7	1.285	43.9	0.213	16.0	0.345	-93.2	
1900.00	0.585	167.3	1.238	39.1	0.213	16.0	0.333	-98.5	
2000.00	0.603	164.1	1.216	33.1	0.217	15.4	0.320	-103.8	

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

FREQUENCY		S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG	
100.00	0.888	-31.2	9.366	156.5	0.050	73.2	0.942	-20.2	
200.00	0.801	-56.4	8.003	138.0	0.084	61.5	0.821	-35.4	
300.00	0.682	-78.0	6.696	122.5	0.111	50.1	0.680	-48.7	
400.00	0.619	-93.8	5.670	113.3	0.126	45.6	0.572	-56.4	
500.00	0.569	-107.5	4.859	104.3	0.135	41.2	0.473	-62.6	
600.00	0.546	-121.1	4.337	99.1	0.146	40.2	0.413	-67.2	
700.00	0.518	-132.6	3.837	90.2	0.151	37.8	0.358	-70.9	
800.00	0.498	-142.3	3.529	85.6	0.162	36.5	0.322	-75.3	
900.00	0.488	-150.3	3.233	79.1	0.165	37.3	0.287	-79.6	
1000.00	0.488	-158.0	2.970	74.1	0.172	35.6	0.256	-85.3	
1100.00	0.485	-165.7	2.704	70.4	0.180	37.1	0.227	-90.3	
1200.00	0.477	-173.7	2.528	65.5	0.189	35.8	0.201	-95.8	
1300.00	0.472	-178.3	2.393	62.0	0.200	35.3	0.182	-101.3	
1400.00	0.467	178.0	2.190	57.9	0.201	34.6	0.164	-107.8	
1500.00	0.491	173.2	2.072	53.6	0.208	33.1	0.153	-114.7	
1600.00	0.508	168.8	1.954	51.4	0.213	35.8	0.143	-123.8	
1700.00	0.512	161.9	1.858	48.3	0.223	34.5	0.136	-133.6	
1800.00	0.512	157.8	1.825	45.2	0.235	35.9	0.132	-145.7	
1900.00	0.505	154.2	1.746	40.8	0.248	33.9	0.130	-155.8	
2000.00	0.520	152.1	1.704	35.5	0.260	31.8	0.131	-165.3	

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

FREQUENCY		S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG	
100.00	0.820	-41.1	13.583	150.1	0.045	71.6	0.898	-27.9	
200.00	0.699	-70.8	10.743	128.9	0.074	57.8	0.719	-46.7	
300.00	0.578	-94.2	8.453	113.9	0.094	48.9	0.555	-60.8	
400.00	0.515	-110.4	6.860	105.2	0.105	47.0	0.443	-69.1	
500.00	0.479	-123.8	5.735	97.6	0.115	44.7	0.355	-75.9	
600.00	0.463	-136.2	5.013	93.3	0.125	45.9	0.300	-81.3	
700.00	0.445	-146.8	4.384	85.6	0.134	44.7	0.254	-86.0	
800.00	0.437	-154.9	3.996	81.6	0.146	44.6	0.222	-92.0	
900.00	0.433	-161.7	3.464	75.6	0.154	45.5	0.194	-98.3	
1000.00	0.442	-168.5	3.334	71.4	0.164	43.9	0.170	-106.0	
1100.00	0.444	-175.3	3.026	68.2	0.174	45.3	0.149	-113.9	
1200.00	0.442	177.4	2.809	63.7	0.187	43.8	0.135	-123.4	
1300.00	0.438	173.4	2.650	60.6	0.200	43.1	0.122	-132.7	
1400.00	0.435	170.3	2.422	56.8	0.205	42.1	0.115	-143.3	
1500.00	0.461	166.8	2.285	52.9	0.216	40.3	0.117	-152.6	
1600.00	0.479	163.0	2.150	51.1	0.222	42.1	0.118	-164.4	
1700.00	0.486	156.7	2.041	48.2	0.235	40.3	0.126	-175.2	
1800.00	0.487	152.8	2.002	45.3	0.249	40.8	0.134	174.3	
1900.00	0.484	149.6	1.905	41.2	0.264	38.1	0.145	165.3	
2000.00	0.498	147.8	1.857	36.0	0.279	35.8	0.152	158.7	