

To our customers,

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## Old Company Name in Catalogs and Other Documents

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On April 1<sup>st</sup>, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

Renesas Electronics website: <http://www.renesas.com>

April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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**HIGH-FREQUENCY LOW NOISE AMPLIFIER  
NPN SILICON EPITAXIAL TRANSISTOR  
(WITH BUILT-IN 6-PIN 2 × 2SC4226) SMALL MINI MOLD**

The μPA810T has built-in 2 low-voltage transistors which are designed to amplify low noise in the VHF band to the UHF band.

**FEATURES**

- Low Noise  
NF = 1.2 dB TYP. @ f = 1 GHz, V<sub>CE</sub> = 3 V, I<sub>c</sub> = 7 mA
- High Gain  
|S<sub>21e</sub>|<sup>2</sup> = 9.0 dB TYP. @ f = 1 GHz, V<sub>CE</sub> = 3 V, I<sub>c</sub> = 7 mA
- A Small Mini Mold Package Adopted
- Built-in 2 Transistors (2 × 2SC4226)

**ORDERING INFORMATION**

PART NUMBER	QUANTITY	PACKING STYLE
μPA810T	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.
μPA810T-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.)

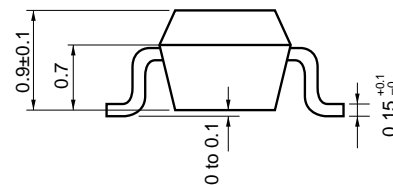
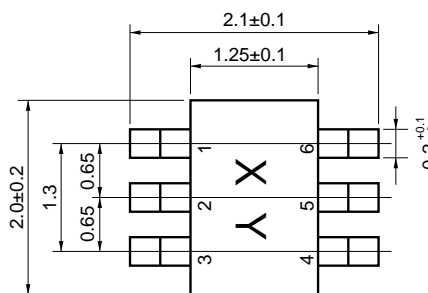
**ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 25 °C)**

PARAMETER	SYMBOL	RATING	UNIT
Collector to Base Voltage	V <sub>CB0</sub>	20	V
Collector to Emitter Voltage	V <sub>CE0</sub>	12	V
Emitter to Base Voltage	V <sub>EB0</sub>	3	V
Collector Current	I <sub>c</sub>	100	mA
Total Power Dissipation	P <sub>T</sub>	150 in 1 element 200 in 2 elements <sup>Note</sup>	mW
Junction Temperature	T <sub>j</sub>	150	°C
Storage Temperature	T <sub>stg</sub>	-65 to +150	°C

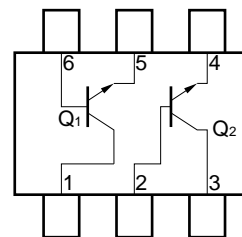
**Note** 110 mW must not be exceeded in 1 element.

**PACKAGE DRAWINGS**

(Unit: mm)



**PIN CONFIGURATION (Top View)**



**PIN CONNECTIONS**

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

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

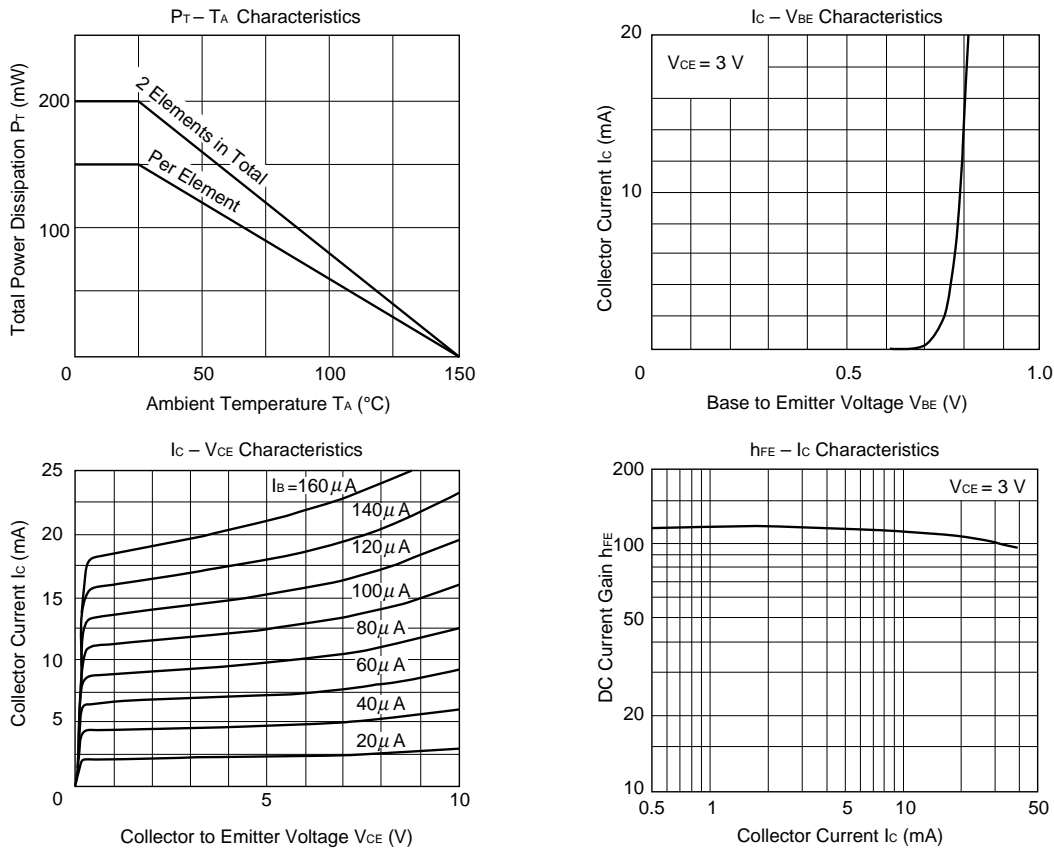
PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Collector Cutoff Current	I <sub>CBO</sub>	V <sub>CB</sub> = 10 V, I <sub>E</sub> = 0			1	μA
Emitter Cutoff Current	I <sub>EBO</sub>	V <sub>EB</sub> = 1 V, I <sub>C</sub> = 0			1	μA
DC Current Gain	h <sub>FE</sub>	V <sub>CE</sub> = 3 V, I <sub>C</sub> = 7 mA <sup>Note 1</sup>	70		250	
Gain Bandwidth Product	f <sub>T</sub>	V <sub>CE</sub> = 3 V, I <sub>C</sub> = 7 mA	3.0	4.5		GHz
Feed-back Capacitance	C <sub>re</sub>	V <sub>CB</sub> = 3 V, I <sub>E</sub> = 0, f = 1 MHz <sup>Note 2</sup>		0.7	1.5	pF
Insertion Power Gain	S <sub>21e</sub>   <sup>2</sup>	V <sub>CE</sub> = 3 V, I <sub>C</sub> = 7 mA, f = 1 GHz	7	9		dB
Noise Figure	NF	V <sub>CE</sub> = 3 V, I <sub>C</sub> = 7 mA, f = 1 GHz		1.2	2.5	dB
h <sub>FE</sub> Ratio	h <sub>FE1</sub> /h <sub>FE2</sub>	V <sub>CE</sub> = 3 V, I <sub>C</sub> = 7 mA A smaller value among h <sub>FE</sub> of h <sub>FE1</sub> = Q1, Q2 A larger value among h <sub>FE</sub> of h <sub>FE2</sub> = Q1, Q2	0.85			

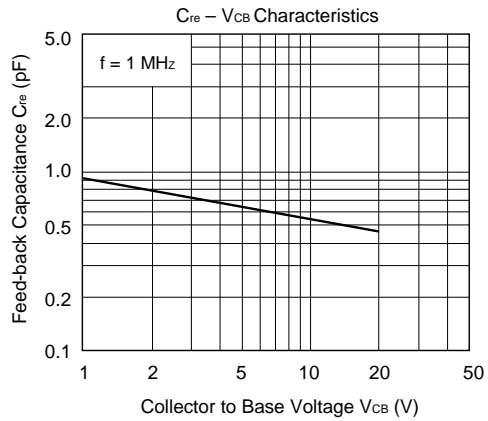
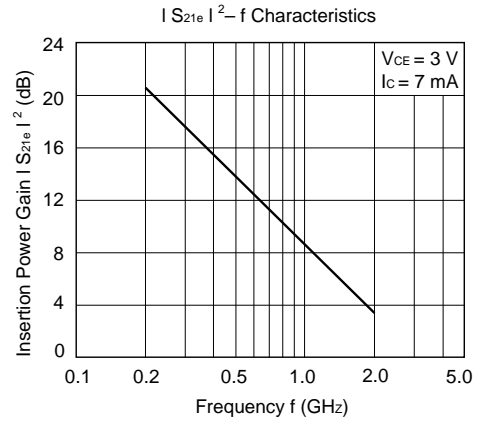
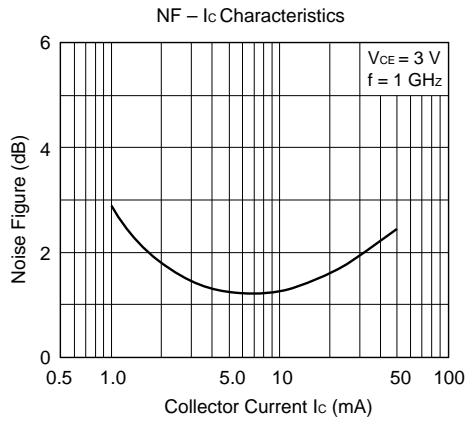
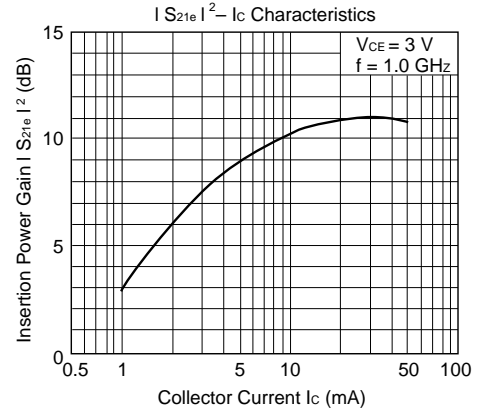
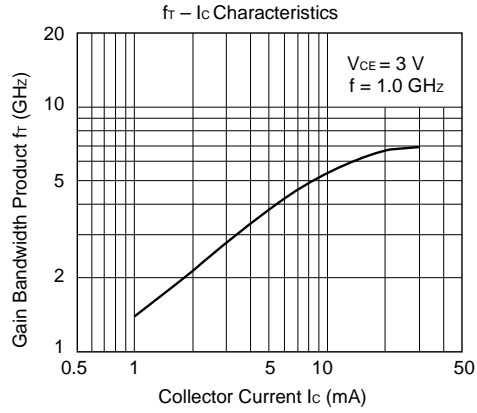
- Notes**
1. Pulse Measurement: P<sub>w</sub> ≤ 350 μs, Duty cycle ≤ 2 %
  2. Measured with 3-pin bridge, emitter and case should be connected to guard pin of bridge.

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

Rank	FB	GB
Marking	24R	25R
h <sub>FE</sub> Value	70 to 140	125 to 250

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





S-PARAMETERS

V<sub>CE</sub> = 3 V, I<sub>c</sub> = 1 mA

FREQUENCY MHz	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	0.959	-26.1	3.680	162.0	0.045	77.2	0.983	-9.0
200.00	0.920	-48.3	3.305	146.4	0.080	63.8	0.937	-15.8
300.00	0.838	-69.2	2.972	131.3	0.111	50.1	0.863	-23.0
400.00	0.810	-85.6	2.612	121.4	0.128	43.5	0.815	-26.3
500.00	0.775	-100.0	2.367	110.9	0.137	34.7	0.745	-29.1
600.00	0.767	-115.0	2.149	104.1	0.147	30.8	0.724	-31.7
700.00	0.745	-127.0	1.986	93.8	0.147	25.1	0.693	-33.2
800.00	0.722	-137.7	1.854	87.9	0.150	21.5	0.682	-36.5
900.00	0.711	-146.4	1.655	80.0	0.143	20.5	0.668	-39.2
1000.00	0.715	-155.0	1.541	74.0	0.140	17.1	0.644	-43.7
1100.00	0.708	-163.2	1.414	69.2	0.136	19.0	0.623	-46.8
1200.00	0.697	-171.9	1.340	63.3	0.134	18.0	0.594	-50.1
1300.00	0.688	-177.1	1.271	59.5	0.132	18.5	0.577	-52.7
1400.00	0.675	178.8	1.174	54.4	0.122	20.1	0.559	-55.3
1500.00	0.706	173.6	1.119	49.8	0.118	21.9	0.559	-58.3
1600.00	0.725	168.7	1.058	47.5	0.111	29.5	0.549	-61.9
1700.00	0.723	161.1	1.007	43.9	0.114	33.2	0.547	-66.8
1800.00	0.718	156.4	0.998	40.8	0.119	40.8	0.537	-71.6
1900.00	0.702	152.5	0.957	36.2	0.126	44.1	0.526	-76.8
2000.00	0.716	149.8	0.943	31.1	0.137	47.1	0.514	-81.8

V<sub>CE</sub> = 3 V, I<sub>c</sub> = 3 mA

FREQUENCY MHz	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	0.878	-39.3	9.289	153.2	0.041	71.5	0.941	-17.3
200.00	0.788	-69.5	7.675	133.1	0.068	55.9	0.807	-28.4
300.00	0.685	-93.9	6.222	117.5	0.087	44.8	0.674	-36.5
400.00	0.634	-111.2	5.151	108.1	0.094	41.7	0.588	-39.0
500.00	0.603	-125.2	4.360	99.6	0.100	37.3	0.511	-40.5
600.00	0.591	-137.9	3.838	94.6	0.105	37.7	0.475	-41.3
700.00	0.573	-148.5	3.378	86.0	0.107	36.4	0.443	-41.5
800.00	0.566	-156.8	3.215	82.1	0.113	36.7	0.425	-43.2
900.00	0.563	-163.4	2.821	75.6	0.114	38.8	0.408	-45.0
1000.00	0.573	-170.3	2.594	70.7	0.118	38.3	0.385	-48.2
1100.00	0.577	-177.2	2.359	67.2	0.122	41.5	0.365	-50.7
1200.00	0.572	175.4	2.200	62.2	0.128	41.7	0.343	-53.3
1300.00	0.563	171.4	2.084	58.8	0.136	42.9	0.326	-55.1
1400.00	0.555	168.5	1.904	54.8	0.138	43.8	0.309	-57.1
1500.00	0.584	164.9	1.803	50.5	0.146	44.3	0.301	-59.6
1600.00	0.603	161.2	1.700	48.7	0.150	48.4	0.290	-62.8
1700.00	0.608	154.7	1.616	45.4	0.161	47.8	0.281	-67.3
1800.00	0.607	150.8	1.591	42.4	0.173	50.0	0.268	-72.3
1900.00	0.598	147.7	1.523	38.1	0.183	48.8	0.255	-77.4
2000.00	0.612	145.8	1.488	32.8	0.197	47.7	0.244	-82.6

S-PARAMETERS

V<sub>CE</sub> = 3 V, I<sub>c</sub> = 5 mA

FREQUENCY MHz	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	0.803	-48.9	13.450	147.0	0.040	65.9	0.892	-23.3
200.00	0.693	-83.5	10.285	124.9	0.059	54.1	0.705	-36.2
300.00	0.594	-108.3	7.895	110.2	0.073	45.6	0.557	-43.4
400.00	0.548	-125.1	6.305	101.7	0.080	44.7	0.468	-45.0
500.00	0.528	-138.0	5.237	94.4	0.086	42.6	0.398	-45.4
600.00	0.520	-149.3	4.554	90.4	0.092	45.2	0.363	-45.2
700.00	0.508	-158.7	3.961	82.8	0.097	45.4	0.334	-44.8
800.00	0.505	-165.6	3.624	79.1	0.106	46.4	0.317	-46.0
900.00	0.505	-171.1	3.283	73.6	0.112	48.6	0.301	-47.1
1000.00	0.519	-176.9	3.009	69.1	0.120	48.0	0.279	-49.9
1100.00	0.527	177.0	2.729	66.0	0.127	50.1	0.262	-52.2
1200.00	0.525	170.1	2.536	61.5	0.135	49.4	0.243	-54.7
1300.00	0.518	166.6	2.399	58.3	0.147	49.9	0.227	-56.2
1400.00	0.513	164.1	2.188	54.6	0.151	50.2	0.211	-57.7
1500.00	0.539	161.2	2.067	50.6	0.162	49.5	0.202	-60.2
1600.00	0.558	158.0	1.945	48.9	0.169	52.1	0.190	-63.7
1700.00	0.565	152.1	1.847	46.0	0.181	50.8	0.179	-68.3
1800.00	0.567	148.5	1.814	43.0	0.194	51.9	0.166	-74.4
1900.00	0.561	145.6	1.737	38.9	0.205	49.8	0.152	-80.5
2000.00	0.574	144.1	1.693	33.8	0.219	47.9	0.142	-86.6

V<sub>CE</sub> = 3 V, I<sub>c</sub> = 7 mA

FREQUENCY MHz	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	0.729	-58.5	17.087	141.0	0.037	66.1	0.838	-29.0
200.00	0.612	-95.4	12.153	118.7	0.052	52.6	0.618	-42.2
300.00	0.529	-119.9	9.023	105.1	0.064	47.7	0.467	-48.4
400.00	0.492	-135.6	7.052	97.4	0.072	48.8	0.382	-49.2
500.00	0.481	-147.4	5.805	91.0	0.078	49.2	0.321	-48.7
600.00	0.476	-157.4	4.986	87.6	0.087	51.9	0.291	-47.9
700.00	0.469	-166.0	4.341	80.7	0.094	52.3	0.265	-47.0
800.00	0.469	-171.8	3.951	77.3	0.106	53.1	0.248	-47.6
900.00	0.471	-176.4	3.408	71.8	0.112	54.6	0.233	-48.7
1000.00	0.487	178.6	3.268	68.1	0.123	53.4	0.213	-51.0
1100.00	0.497	172.9	2.959	65.2	0.132	55.1	0.197	-53.1
1200.00	0.496	166.5	2.748	60.9	0.142	53.9	0.179	-55.6
1300.00	0.490	163.3	2.598	57.8	0.155	54.0	0.164	-57.0
1400.00	0.485	161.2	2.365	54.4	0.161	53.4	0.149	-59.0
1500.00	0.513	158.7	2.230	50.5	0.172	52.0	0.140	-61.3
1600.00	0.531	155.9	2.100	49.0	0.180	54.1	0.127	-65.2
1700.00	0.539	150.3	1.990	46.2	0.194	52.2	0.115	-70.6
1800.00	0.543	146.9	1.955	43.4	0.207	52.8	0.102	-78.3
1900.00	0.539	144.2	1.867	39.4	0.218	50.2	0.088	-87.0
2000.00	0.552	142.6	1.820	34.3	0.233	47.9	0.080	-95.5

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