



SANYO Semiconductors

## DATA SHEET

# CPH6001A — High-Frequency Low-Noise Amplifier Applications

NPN Epitaxial Planar Silicon Transistor

## Features

- High gain :  $|S_{21e}|^2=11\text{dB typ}$  ( $f=1\text{GHz}$ ).
- High cutoff frequency :  $f_T=6.7\text{GHz typ}$ .
- Small and slim 6-pin package.
- Large allowable collector dissipation (800mW max).

## Specifications

Absolute Maximum Ratings at  $T_a=25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Collector-to-Base Voltage	$V_{CB0}$		20	V
Collector-to-Emitter Voltage	$V_{CE0}$		12	V
Emitter-to-Base Voltage	$V_{EB0}$		2	V
Collector Current	$I_C$		100	mA
Collector Dissipation	$P_C$	When mounted on ceramic substrate (250mm <sup>2</sup> X0.8mm)	800	mW
Junction Temperature	$T_j$		150	$^\circ\text{C}$
Storage Temperature	$T_{stg}$		-55 to +150	$^\circ\text{C}$

Electrical Characteristics at  $T_a=25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Collector Cutoff Current	$I_{CBO}$	$V_{CB}=10\text{V}, I_E=0\text{A}$			1.0	$\mu\text{A}$
Emitter Cutoff Current	$I_{EBO}$	$V_{EB}=1\text{V}, I_C=0\text{A}$			10	$\mu\text{A}$
DC Current Gain	$h_{FE1}$	$V_{CE}=5\text{V}, I_C=30\text{mA}$	90		180	
	$h_{FE2}$	$V_{CE}=5\text{V}, I_C=70\text{mA}$	70			
Gain-Bandwidth Product	$f_T$	$V_{CE}=5\text{V}, I_C=30\text{mA}$	5	6.7		GHz

Marking : GA

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# CPH6001A

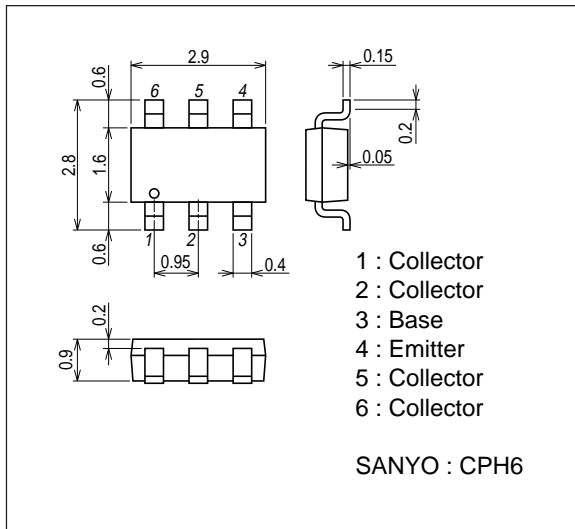
Continued from preceding page.

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Output Capacitance	Cob	V <sub>CB</sub> =5V, f=1MHz		0.95	1.5	pF
Reverse Transfer Capacitance	Cre	V <sub>CB</sub> =5V, f=1MHz		0.6		pF
Forward Transfer Gain	S <sub>21e</sub>   <sup>2</sup>	V <sub>CE</sub> =5V, I <sub>C</sub> =30mA, f=1GHz	9	11		dB
Noise Figure	NF	V <sub>CE</sub> =5V, I <sub>C</sub> =7mA, f=1GHz		1.1	2.0	dB

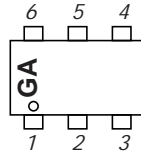
## Package Dimensions

unit : mm (typ)

7018A-002

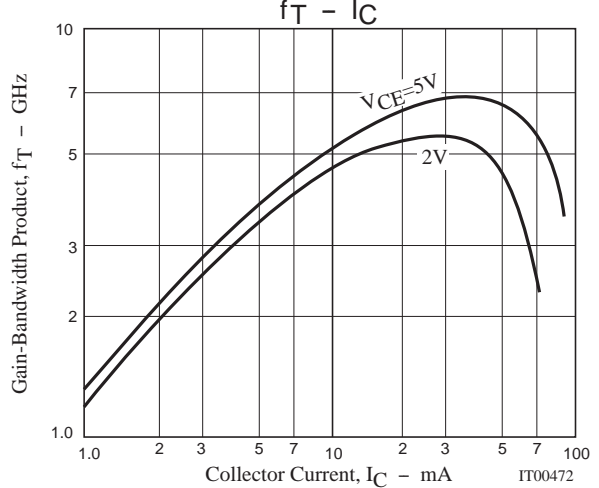
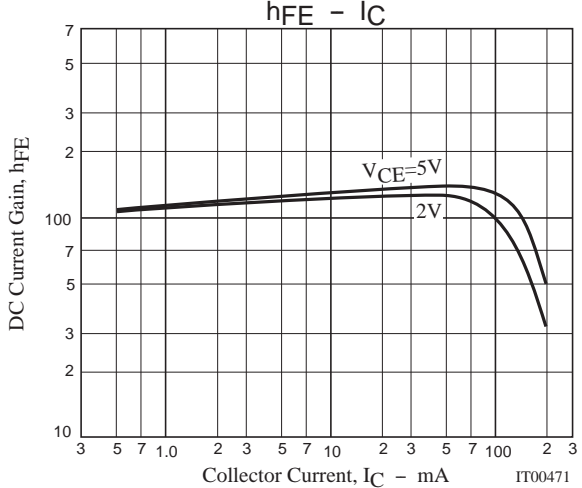
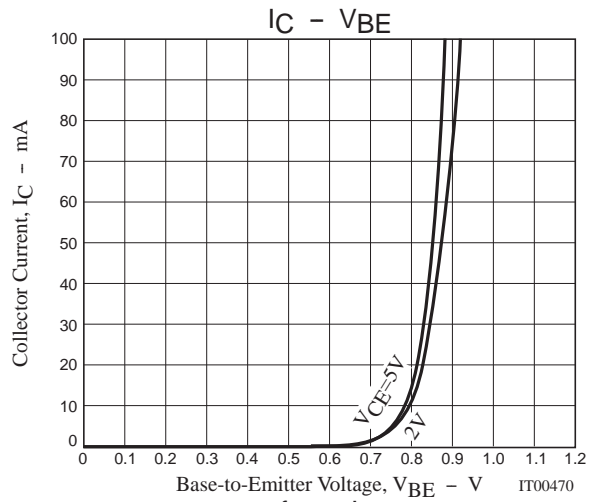
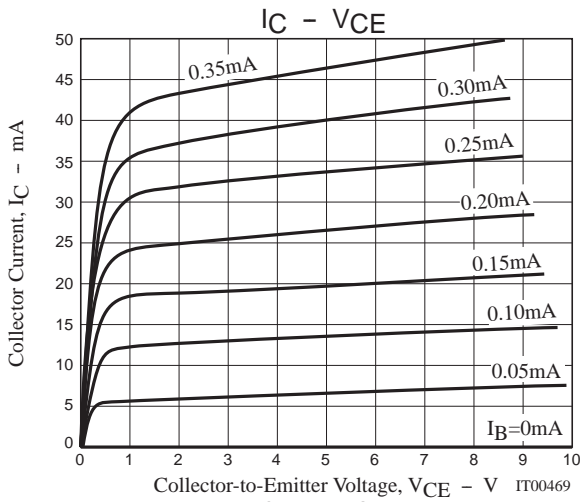


## Marking

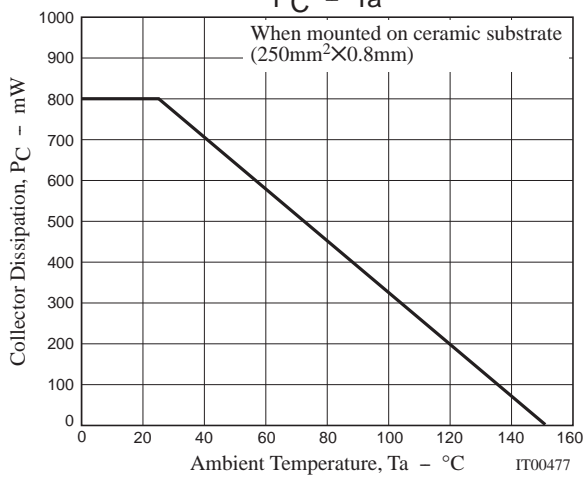
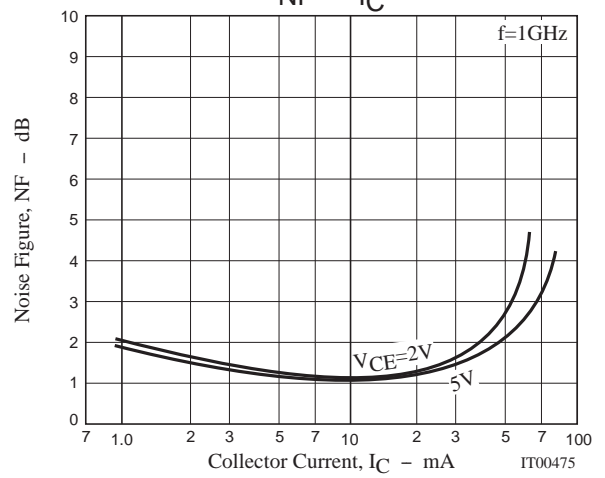
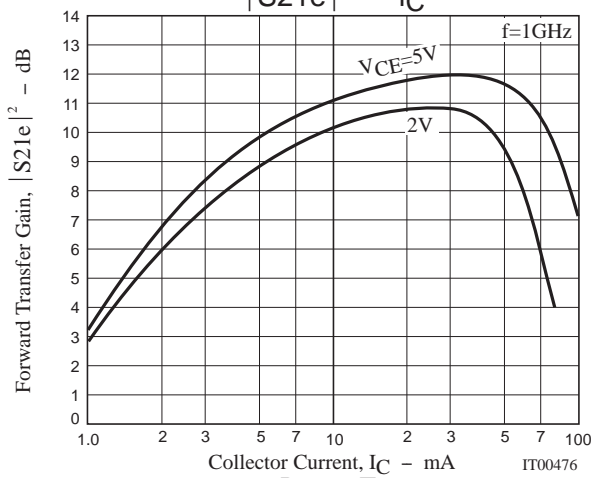
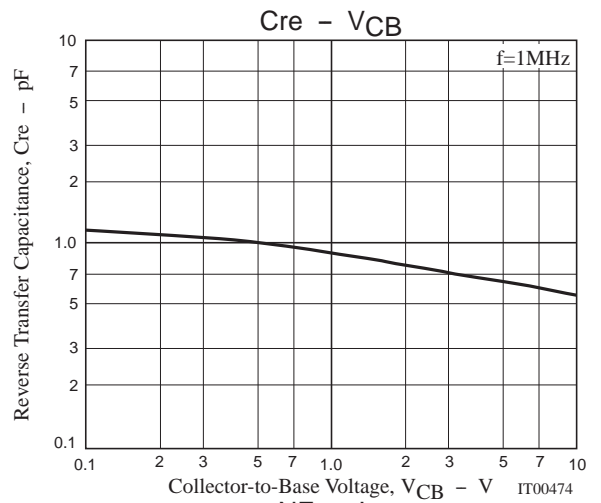
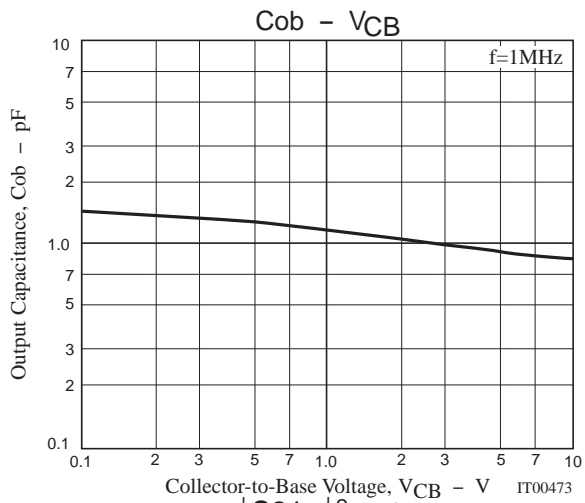


- 1 : Collector
- 2 : Collector
- 3 : Base
- 4 : Emitter
- 5 : Collector
- 6 : Collector

Top view



# CPH6001A



# CPH6001A

## S Parameters (Common emitter)

$V_{CE}=2V, I_C=5mA, Z_O=50\Omega$

Freq(MHz)	S <sub>11</sub>	∠S <sub>11</sub>	S <sub>21</sub>	∠S <sub>21</sub>	S <sub>12</sub>	∠S <sub>12</sub>	S <sub>22</sub>	∠S <sub>22</sub>
100	0.799	-48.2	12.990	147.1	0.044	65.4	0.871	-26.6
200	0.678	-83.5	9.939	125.1	0.069	51.4	0.687	-42.9
400	0.557	-124.8	6.138	101.0	0.090	42.3	0.476	-57.0
600	0.514	-147.5	4.326	87.6	0.103	41.5	0.390	-63.7
800	0.497	-161.9	3.345	77.6	0.115	43.4	0.353	-69.1
1000	0.488	-173.8	2.740	68.9	0.129	45.3	0.337	-74.6
1200	0.484	177.2	2.324	61.3	0.144	46.7	0.335	-79.9
1400	0.484	169.3	2.030	54.5	0.150	47.8	0.340	-85.1
1600	0.483	161.1	1.804	48.3	0.177	48.3	0.346	-90.6
1800	0.482	153.5	1.638	42.3	0.196	48.1	0.355	-96.6
2000	0.487	146.4	1.493	36.6	0.215	47.4	0.367	-102.1

$V_{CE}=2V, I_C=10mA, Z_O=50\Omega$

Freq(MHz)	S <sub>11</sub>	∠S <sub>11</sub>	S <sub>21</sub>	∠S <sub>21</sub>	S <sub>12</sub>	∠S <sub>12</sub>	S <sub>22</sub>	∠S <sub>22</sub>
100	0.683	-65.5	19.214	137.7	0.038	60.9	0.767	-38.0
200	0.550	-109.9	13.370	114.8	0.055	51.2	0.536	-55.8
400	0.440	-143.5	7.287	93.9	0.074	50.3	0.342	-69.5
600	0.443	-162.0	5.046	83.6	0.094	52.5	0.280	-75.8
800	0.457	-174.9	3.900	75.6	0.114	54.1	0.255	-81.6
1000	0.445	172.3	3.214	67.3	0.135	55.0	0.243	-87.7
1200	0.427	166.4	2.681	60.6	0.156	54.5	0.245	-92.6
1400	0.418	162.9	2.309	54.1	0.177	53.7	0.251	-97.6
1600	0.439	160.3	1.987	49.2	0.199	52.5	0.258	-102.6
1800	0.486	149.1	1.850	46.2	0.221	50.6	0.269	-107.7
2000	0.468	137.2	1.745	40.2	0.241	48.2	0.280	-112.9

$V_{CE}=2V, I_C=20mA, Z_O=50\Omega$

Freq(MHz)	S <sub>11</sub>	∠S <sub>11</sub>	S <sub>21</sub>	∠S <sub>21</sub>	S <sub>12</sub>	∠S <sub>12</sub>	S <sub>22</sub>	∠S <sub>22</sub>
100	0.540	-87.3	24.533	127.8	0.032	58.3	0.646	-49.3
200	0.469	-125.4	14.920	107.9	0.045	55.2	0.411	-67.4
400	0.437	-157.2	8.009	91.0	0.067	59.1	0.256	-81.3
600	0.430	-171.6	5.453	81.5	0.091	61.2	0.210	-89.3
800	0.428	178.4	4.148	74.0	0.116	61.3	0.197	-95.4
1000	0.427	170.3	3.373	67.4	0.140	60.3	0.196	-100.5
1200	0.424	163.2	2.840	61.0	0.164	58.5	0.201	-105.2
1400	0.424	156.9	2.484	55.3	0.189	56.7	0.208	-109.8
1600	0.423	150.0	2.201	50.1	0.212	54.6	0.218	-114.2
1800	0.420	144.2	1.999	44.8	0.236	52.0	0.228	-119.0
2000	0.422	136.2	1.825	39.5	0.257	49.0	0.238	-123.8

$V_{CE}=2V, I_C=30mA, Z_O=50\Omega$

Freq(MHz)	S <sub>11</sub>	∠S <sub>11</sub>	S <sub>21</sub>	∠S <sub>21</sub>	S <sub>12</sub>	∠S <sub>12</sub>	S <sub>22</sub>	∠S <sub>22</sub>
100	0.487	-101.2	26.240	123.1	0.029	58.4	0.579	-54.7
200	0.446	-136.8	15.309	104.6	0.041	58.0	0.356	-72.3
400	0.435	-163.5	8.071	89.3	0.065	62.9	0.223	-86.1
600	0.437	-176.4	5.488	80.4	0.090	64.2	0.186	-94.2
800	0.433	174.9	4.181	73.3	0.117	63.7	0.178	-100.3
1000	0.435	166.8	3.388	66.7	0.142	62.3	0.180	-105.7
1200	0.433	160.8	2.855	60.5	0.168	60.1	0.187	-110.1
1400	0.427	154.6	2.491	54.8	0.192	57.9	0.195	-114.4
1600	0.432	147.9	2.211	49.7	0.217	55.4	0.205	-118.8
1800	0.428	141.8	2.002	44.3	0.241	52.7	0.217	-123.3
2000	0.430	134.8	1.831	39.4	0.261	49.4	0.227	-127.9

# CPH6001A

## S Parameters (Common emitter)

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

Freq(MHz)	S11	$\angle S_{11}$	S21	$\angle S_{21}$	S12	$\angle S_{12}$	S22	$\angle S_{22}$
100	0.822	-42.5	13.211	150.0	0.035	68.2	0.901	-20.9
200	0.684	-77.8	10.639	128.5	0.056	54.8	0.743	-34.0
400	0.516	-116.3	6.681	103.3	0.076	45.3	0.548	-44.9
600	0.481	-140.7	4.776	89.6	0.087	44.9	0.467	-49.9
800	0.477	-157.6	3.714	80.0	0.098	46.3	0.433	-54.2
1000	0.454	-172.9	3.055	71.0	0.110	48.5	0.419	-58.8
1200	0.435	179.1	2.572	63.0	0.124	50.1	0.416	-64.0
1400	0.431	173.9	2.213	56.2	0.138	51.7	0.419	-68.9
1600	0.449	169.6	1.922	50.7	0.154	52.8	0.424	-74.4
1800	0.495	157.8	1.789	46.3	0.171	52.8	0.431	-80.3
2000	0.482	145.3	1.669	39.6	0.188	52.4	0.440	-85.7

$V_{CE}=5V, I_C=10mA, Z_O=50\Omega$

Freq(MHz)	S11	$\angle S_{11}$	S21	$\angle S_{21}$	S12	$\angle S_{12}$	S22	$\angle S_{22}$
100	0.690	-57.0	20.017	141.0	0.031	64.0	0.813	-29.6
200	0.552	-93.8	14.091	118.9	0.046	54.8	0.599	-43.3
400	0.447	-133.6	8.190	97.6	0.064	52.8	0.419	-51.2
600	0.413	-154.2	5.664	86.0	0.080	55.0	0.355	-54.8
800	0.402	-167.0	4.314	77.6	0.098	56.9	0.329	-58.9
1000	0.399	-177.7	3.519	70.1	0.116	57.8	0.320	-63.5
1200	0.395	173.3	2.985	63.3	0.135	57.5	0.322	-68.5
1400	0.390	165.6	2.590	57.2	0.154	57.1	0.325	-73.5
1600	0.396	158.1	2.293	51.4	0.173	56.1	0.332	-78.8
1800	0.398	150.8	2.069	45.7	0.193	54.6	0.341	-84.4
2000	0.396	143.4	1.881	40.4	0.211	52.8	0.350	-90.0

$V_{CE}=5V, I_C=20mA, Z_O=50\Omega$

Freq(MHz)	S11	$\angle S_{11}$	S21	$\angle S_{21}$	S12	$\angle S_{12}$	S22	$\angle S_{22}$
100	0.481	-85.7	28.955	127.1	0.024	61.8	0.649	-41.0
200	0.403	-123.6	17.443	107.7	0.035	60.6	0.427	-51.3
400	0.370	-155.2	9.326	91.5	0.056	64.6	0.292	-54.9
600	0.363	-170.7	6.348	82.3	0.078	66.1	0.256	-57.9
800	0.359	179.9	4.826	75.3	0.100	65.9	0.245	-62.2
1000	0.360	171.2	3.907	68.5	0.123	64.8	0.244	-67.4
1200	0.360	164.4	3.288	62.7	0.145	63.1	0.249	-72.7
1400	0.356	157.3	2.871	57.0	0.167	61.2	0.256	-78.0
1600	0.362	151.2	2.541	51.8	0.188	59.0	0.265	-83.6
1800	0.361	143.6	2.290	46.5	0.210	56.5	0.274	-89.4
2000	0.363	137.2	2.076	41.4	0.229	53.6	0.284	-95.1

$V_{CE}=5V, I_C=30mA, Z_O=50\Omega$

Freq(MHz)	S11	$\angle S_{11}$	S21	$\angle S_{21}$	S12	$\angle S_{12}$	S22	$\angle S_{22}$
100	0.426	-101.6	29.939	122.4	0.021	62.6	0.587	-42.4
200	0.389	-137.3	17.324	104.3	0.032	63.2	0.385	-49.1
400	0.379	-163.4	9.137	89.5	0.053	67.9	0.277	-50.5
600	0.378	-176.3	6.195	80.8	0.076	68.9	0.252	-53.4
800	0.375	175.0	4.700	74.0	0.098	68.3	0.245	-58.2
1000	0.380	167.8	3.799	67.9	0.121	66.8	0.248	-64.0
1200	0.379	161.2	3.196	61.8	0.143	64.9	0.255	-69.8
1400	0.378	154.9	2.787	56.1	0.165	62.8	0.262	-75.4
1600	0.382	148.6	2.469	50.9	0.187	60.5	0.271	-81.4
1800	0.382	142.5	2.227	45.8	0.209	57.8	0.281	-87.6
2000	0.385	135.6	2.027	40.7	0.228	55.0	0.291	-93.3

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