

# 2SC5759

Silicon NPN Epitaxial  
UHF / VHF wide band amplifier

# HITACHI

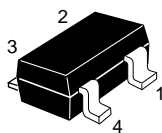
ADE-208-1389 (Z)  
Preliminary 1st. Edition  
Mar. 2001

## Features

- High gain bandwidth product  
 $f_T = 10.6$  GHz typ.
- High power gain and low noise figure ;  
PG = 11.5B typ. , NF = 1.1 dB typ. at  $f = 900$  MHz
- Very low distortion  
Output IP3 (800 MHz) = 36 dBm typ.

## Outline

CMPAK-4



1. Collector
2. Collector
3. Base
4. Emitter

Note: Marking is "WN-".

This data sheet contains tentative specification for new product development. It may partially be subject to change without notice.

**Absolute Maximum Ratings** (Ta = 25°C)

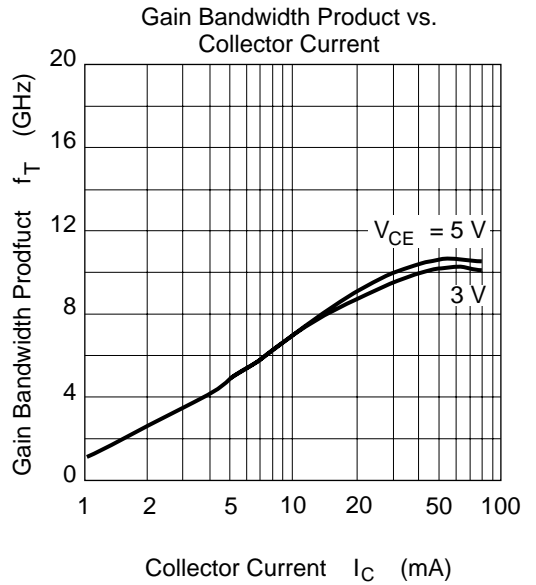
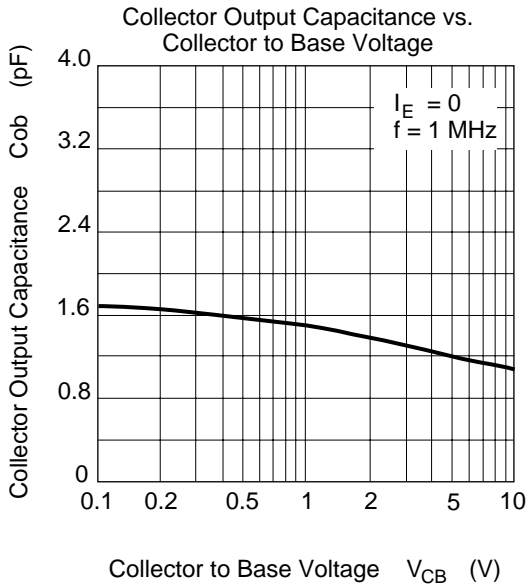
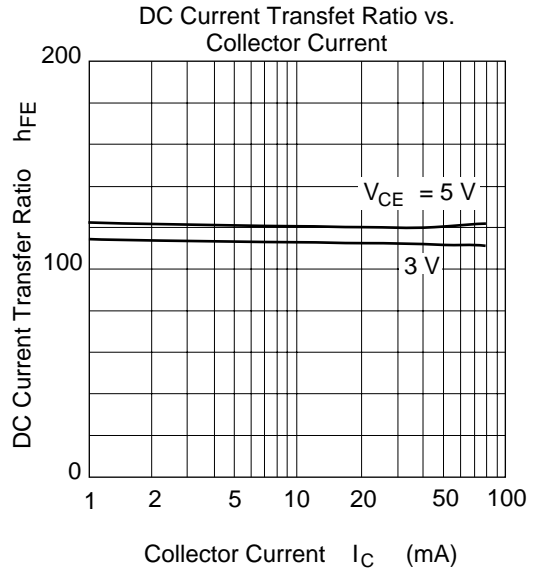
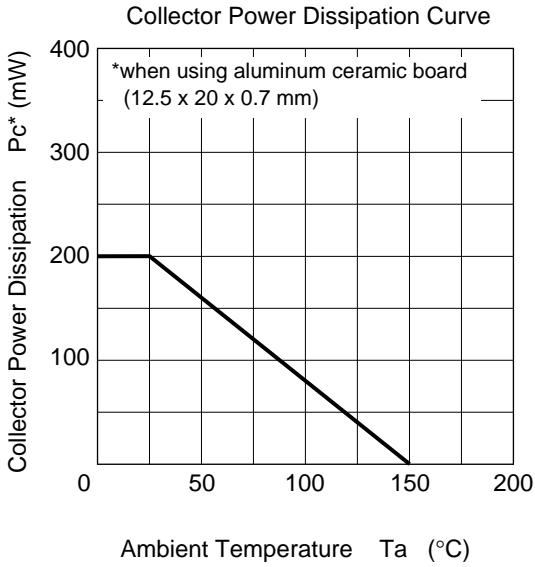
Item	Symbol	Ratings	Unit
Collector to base voltage	V <sub>CBO</sub>	15	V
Collector to emitter voltage	V <sub>CEO</sub>	6	V
Emitter to base voltage	V <sub>EBO</sub>	1.5	V
Collector current	I <sub>C</sub>	80	mA
Collector power dissipation	Pc	200*	mW
Junction temperature	Tj	150	°C
Storage temperature	Tstg	-55 to +150	°C

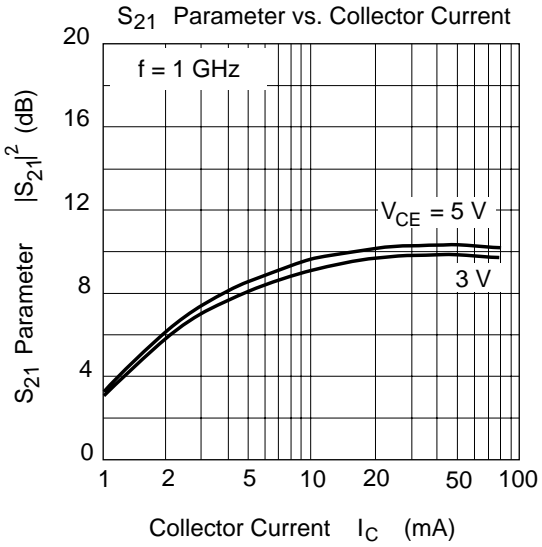
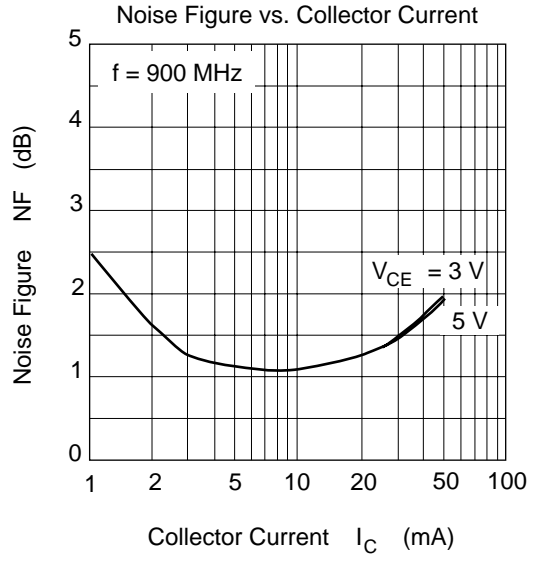
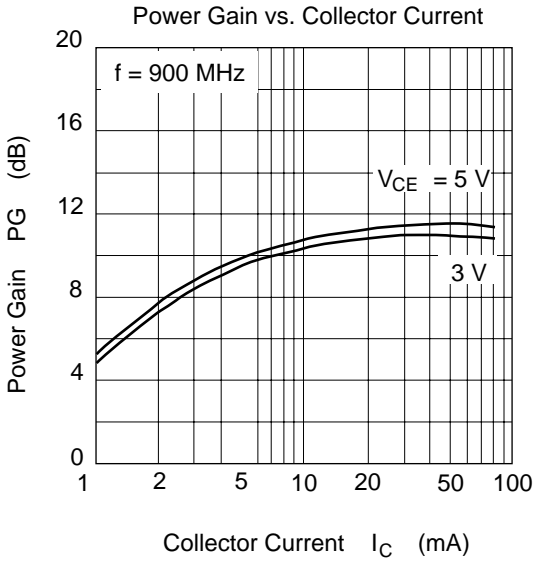
\* When using aluminium ceramic board (12.5 x 20 x 0.7 mm)

**Electrical Characteristics** (Ta = 25°C)

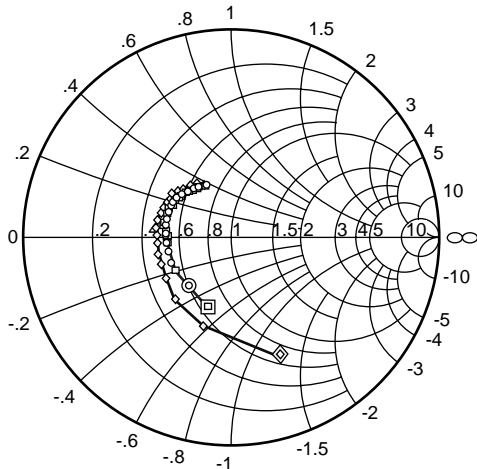
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Collector to base breakdown voltage	V <sub>(BR)CBO</sub>	15	—	—	V	I <sub>C</sub> = 10 μA, I <sub>E</sub> = 0
Collector cutoff current	I <sub>CBO</sub>	—	—	1	μA	V <sub>CB</sub> = 12 V, I <sub>E</sub> = 0
Collector cutoff current	I <sub>CEO</sub>	—	—	1	mA	V <sub>CE</sub> = 6 V, R <sub>BE</sub> = ∞
Emitter cutoff current	I <sub>EBO</sub>	—	—	10	μA	V <sub>EB</sub> = 1.5 V, I <sub>C</sub> = 0
DC current transfer ratio	h <sub>FE</sub>	80	120	160	V	V <sub>CE</sub> = 5 V, I <sub>C</sub> = 50 mA
Collector output capacitance	Cob	—	1.2	2.2	pF	V <sub>CB</sub> = 5 V, I <sub>E</sub> = 0 f = 1 MHz
Gain bandwidth product	f <sub>T</sub>	8	10.6	—	GHz	V <sub>CE</sub> = 5 V, I <sub>C</sub> = 50 mA f = 1 GHz
Power gain	PG	7	11.5	—	dB	V <sub>CE</sub> = 5 V, I <sub>C</sub> = 50 mA f = 900 MHz
Noise figure	NF	—	1.1	1.9	dB	V <sub>CE</sub> = 5 V, I <sub>C</sub> = 5 mA f = 900 MHz
S <sub>21</sub> parameter	S <sub>21</sub>   <sup>2</sup>	—	10.3	—	dB	V <sub>CE</sub> = 5 V, I <sub>C</sub> = 50 mA f = 1 GHz
Output IP3	OIP3	—	36	—	dBm	V <sub>CE</sub> = 5 V, I <sub>C</sub> = 50 mA f = 800 MHz

Main Characteristics



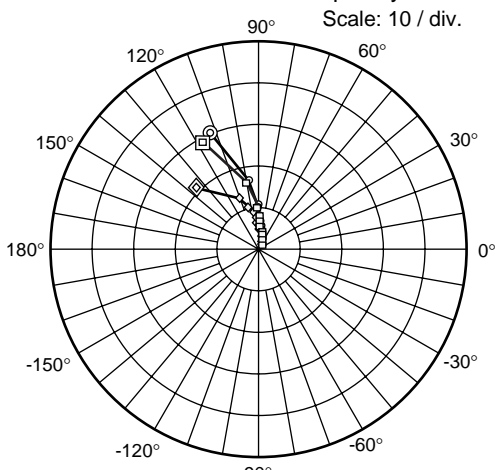


S11 Parameter vs. Frequency



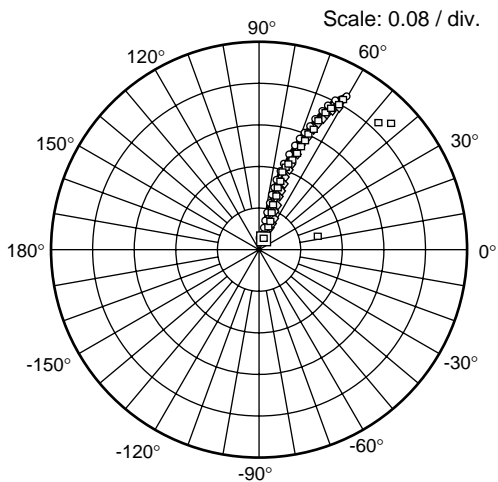
Condition :  $V_{CE} = 3\text{ V}$ ,  $Z_o = 50\ \Omega$   
 100 to 2000 MHz (100 MHz Step)  
 ○ — ○ : IC = 50 mA  
 □ — □ : IC = 30 mA  
 ◇ — ◇ : IC = 10 mA

S21 Parameter vs. Frequency



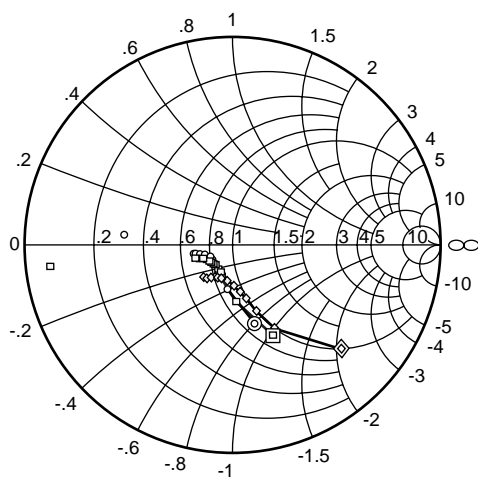
Condition :  $V_{CE} = 3\text{ V}$ ,  $Z_o = 50\ \Omega$   
 100 to 2000 MHz (100 MHz Step)  
 ○ — ○ : IC = 50 mA  
 □ — □ : IC = 30 mA  
 ◇ — ◇ : IC = 10 mA

S12 Parameter vs. Frequency



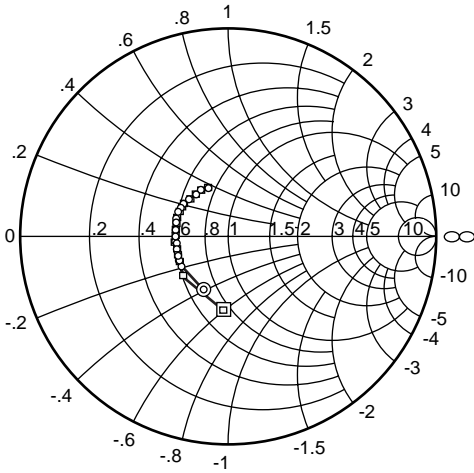
Condition :  $V_{CE} = 3\text{ V}$ ,  $Z_o = 50\ \Omega$   
 100 to 2000 MHz (100 MHz Step)  
 ○ — ○ : IC = 50 mA  
 □ — □ : IC = 30 mA  
 ◇ — ◇ : IC = 10 mA

S22 Parameter vs. Frequency



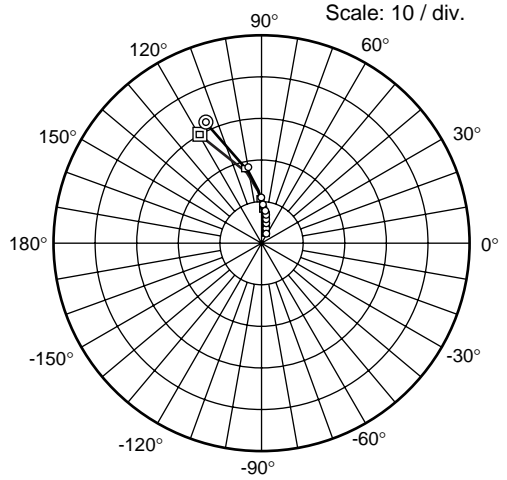
Condition :  $V_{CE} = 3\text{ V}$ ,  $Z_o = 50\ \Omega$   
 100 to 2000 MHz (100 MHz Step)  
 ○ — ○ : IC = 50 mA  
 □ — □ : IC = 30 mA  
 ◇ — ◇ : IC = 10 mA

S11 Parameter vs. Frequency



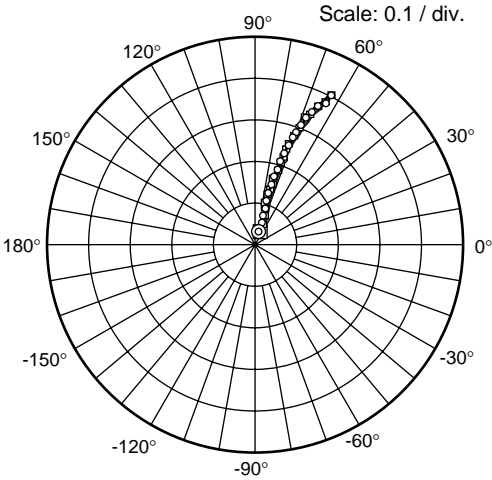
Condition :  $V_{CE} = 5\text{ V}$ ,  $Z_o = 50\ \Omega$   
 100 to 2000 MHz (100 MHz Step)  
 ○ — ○ : IC = 50 mA  
 □ — □ : IC = 30 mA

S21 Parameter vs. Frequency



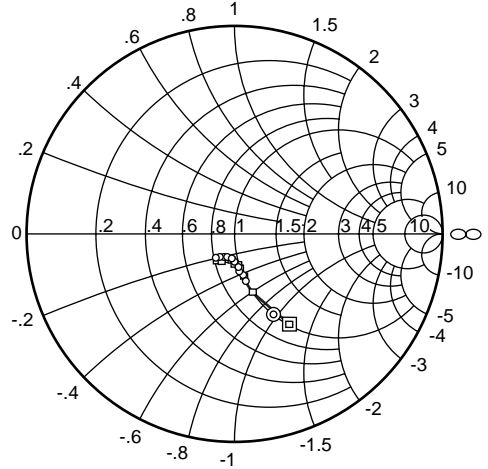
Condition :  $V_{CE} = 5\text{ V}$ ,  $Z_o = 50\ \Omega$   
 100 to 2000 MHz (100 MHz Step)  
 ○ — ○ : IC = 50 mA  
 □ — □ : IC = 30 mA

S12 Parameter vs. Frequency



Condition :  $V_{CE} = 5\text{ V}$ ,  $Z_o = 50\ \Omega$   
 100 to 2000 MHz (100 MHz Step)  
 ○ — ○ : IC = 50 mA  
 □ — □ : IC = 30 mA

S22 Parameter vs. Frequency



Condition :  $V_{CE} = 5\text{ V}$ ,  $Z_o = 50\ \Omega$   
 100 to 2000 MHz (100 MHz Step)  
 ○ — ○ : IC = 50 mA  
 □ — □ : IC = 30 mA

Sparameter (  $V_{CE} = 3V$ ,  $I_C = 10\text{ mA}$ ,  $Z_o = 50\ \Omega$  )

f (MHz)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100	0.598953	-67.2683	20.92746	134.7901	0.039212	63.46611	0.719763	-43.3095
200	0.449769	-108.857	13.05294	112.4581	0.058681	58.49998	0.458795	-63.3063
300	0.388073	-132.646	8.987253	101.2855	0.075599	60.50255	0.330162	-72.4292
400	0.356355	-149.324	6.828566	94.61819	0.092309	63.10033	0.265712	-77.6853
500	0.348875	-161.568	5.498522	89.24696	0.109448	65.2607	0.228792	-81.4373
600	0.340977	-170.581	4.604677	85.10618	0.127493	66.40792	0.205705	-84.9379
700	0.342148	-177.833	3.974175	81.58567	0.145746	67.21887	0.191576	-88.067
800	0.33248	175.9498	3.500114	78.02541	0.164155	67.89103	0.182352	-91.1939
900	0.334331	169.7497	3.11258	74.99636	0.183985	67.58355	0.177252	-94.4435
1000	0.330628	165.1672	2.820245	72.26931	0.201166	67.91171	0.173922	-96.8831
1100	0.327731	159.5991	2.584965	69.77995	0.221741	67.41957	0.174419	-99.1591
1200	0.32824	156.1327	2.394378	66.9368	0.237924	67.01805	0.175074	-102.059
1300	0.323009	151.3053	2.235558	64.80204	0.260564	66.88975	0.17803	-104.603
1400	0.327822	145.9897	2.088352	62.49431	0.277632	65.52528	0.180789	-107.237
1500	0.322151	143.2707	1.9734	60.14742	0.29472	65.81161	0.183993	-109.557
1600	0.319738	137.253	1.864493	58.29125	0.316599	63.86349	0.189455	-111.969
1700	0.323893	135.0458	1.768547	56.31213	0.329909	63.77271	0.192733	-114.077
1800	0.313012	130.7687	1.692055	54.13005	0.35645	63.28138	0.198951	-116.009
1900	0.314083	127.2073	1.619106	52.49423	0.367684	61.18535	0.202498	-118.969
2000	0.30788	123.7846	1.559941	50.96312	0.393103	61.76477	0.209282	-120.291

**Sparameter** (  $V_{CE} = 3V$ ,  $I_C = 30\text{ mA}$ ,  $Z_o = 50\ \Omega$  )

f (MHz)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100	0.359231	-108.561	28.86756	117.4007	0.027653	66.54531	0.478909	-65.4568
200	0.315388	-146.251	15.25267	100.9862	0.047239	71.05222	0.267151	-85.3741
300	0.304156	-162.6	10.08288	93.68728	0.068526	74.04803	0.191803	-95.895
400	0.300526	-174.017	7.542839	89.14133	0.08998	74.6652	0.15921	-103.256
500	0.302516	177.5775	6.023624	85.33413	0.111099	75.05667	0.142393	-109.009
600	0.301428	171.7108	5.030207	81.99574	0.132665	74.89602	0.133925	-114.062
700	0.302757	166.6837	4.312375	79.01769	0.154095	73.90613	0.129926	-118.281
800	0.298831	161.2968	3.791308	76.41924	0.17525	73.59343	0.128127	-121.621
900	0.30327	156.2363	3.3637	73.82754	0.197386	72.11131	0.128473	-124.857
1000	0.296877	152.546	3.048492	71.39383	0.216536	71.49931	0.128796	-126.942
1100	0.294338	147.6174	2.792653	69.14086	0.239869	70.35476	0.131288	-128.797
1200	0.297847	144.8029	2.58095	66.92132	0.257675	69.11534	0.135362	-130.761
1300	0.290491	141.4854	2.415847	65.03156	0.282017	68.2458	0.13954	-132.324
1400	0.285987	136.5209	2.251857	62.99602	0.298985	66.4113	0.143959	-134.445
1500	0.285668	133.2577	2.121921	61.01823	0.317593	66.06546	0.147511	-135.948
1600	0.28952	129.3946	2.00549	59.10592	0.339989	63.80411	0.15306	-137.276
1700	0.289058	126.8596	1.901102	57.2283	0.353944	63.45042	0.156247	-138.751
1800	0.276366	122.635	1.820812	55.43738	0.380628	62.56796	0.161772	-139.638
1900	0.279275	119.5554	1.738412	53.98105	0.390934	60.15776	0.165972	-141.606
2000	0.27422	116.508	1.673569	52.18349	0.416956	60.34276	0.171575	-141.755



Sparameter (  $V_{CE} = 3V$ ,  $I_C = 50 \text{ mA}$ ,  $Z_o = 50 \Omega$  )

f (MHz)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100	0.30578	-130.338	30.47948	112.1628	0.024997	70.70717	0.396577	-73.9423
200	0.301596	-158.898	15.55864	98.07695	0.045769	75.63829	0.219336	-94.8247
300	0.29477	-170.772	10.21329	91.92603	0.068518	77.18159	0.162953	-106.377
400	0.295209	179.0227	7.620648	87.65349	0.090742	77.64937	0.139738	-115.16
500	0.30235	172.1684	6.085737	84.25556	0.112614	77.15289	0.128805	-121.16
600	0.299513	167.2651	5.076454	81.17507	0.13495	76.63391	0.124214	-125.862
700	0.305759	162.7894	4.356069	78.41549	0.156917	75.28605	0.12291	-129.903
800	0.301849	158.8704	3.822645	76.12218	0.178985	74.56688	0.123402	-133.043
900	0.302874	153.4117	3.400883	73.57437	0.201763	72.81619	0.125205	-135.757
1000	0.300956	150.0058	3.074232	71.05568	0.221428	72.36415	0.126461	-137.863
1100	0.296478	145.5456	2.812228	68.96803	0.244918	71.06102	0.129763	-138.837
1200	0.293811	142.9462	2.605872	66.89516	0.263254	69.8099	0.133781	-140.585
1300	0.295225	138.196	2.433414	64.91973	0.287446	68.57248	0.138231	-141.673
1400	0.291037	134.094	2.268564	62.9896	0.305017	66.55263	0.142585	-143.281
1500	0.283634	131.4221	2.141007	60.82483	0.324297	66.30193	0.146111	-144.381
1600	0.290887	126.4386	2.020216	59.00477	0.346817	63.88139	0.151454	-145.383
1700	0.288334	125.0576	1.922426	57.51582	0.360229	63.34487	0.154564	-146.733
1800	0.276435	121.8631	1.834797	55.47205	0.387345	62.37906	0.160068	-147.097
1900	0.281741	117.7072	1.761456	54.04735	0.397927	59.95753	0.163455	-148.56
2000	0.27394	114.1901	1.688011	52.38011	0.423763	60.11156	0.168173	-149.024

**Sparameter** (  $V_{CE} = 5V$ ,  $I_C = 30 \text{ mA}$ ,  $Z_o = 50 \Omega$  )

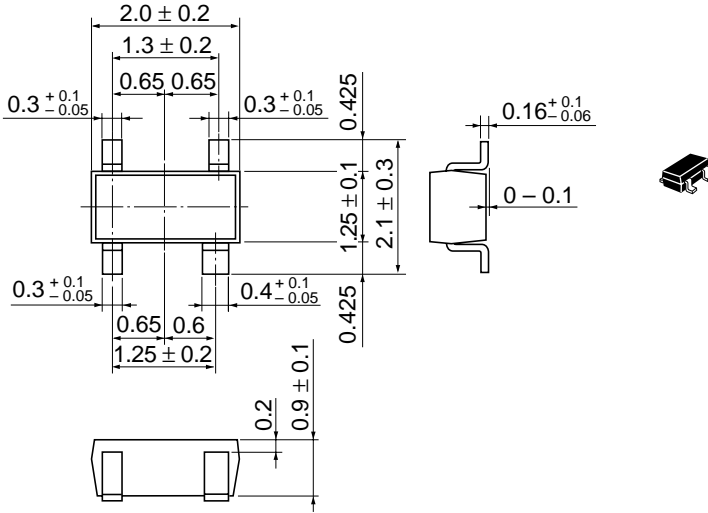
f (MHz)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100	0.35261	-97.797	30.1558	119.4705	0.026211	67.56679	0.50466	-57.1508
200	0.284026	-137.005	16.15995	102.3153	0.044514	71.48276	0.28511	-71.5641
300	0.264329	-156.652	10.70127	94.81076	0.06455	74.27343	0.203018	-77.1744
400	0.260622	-169.949	8.026367	89.98606	0.084597	75.2212	0.165988	-80.6117
500	0.260912	-178.593	6.418046	86.21579	0.104522	75.69292	0.146109	-83.56
600	0.259799	174.4016	5.362778	82.9316	0.125266	75.53591	0.135196	-86.8135
700	0.262359	168.86	4.603929	80.06665	0.145513	74.85186	0.128938	-89.7288
800	0.260092	162.9529	4.034037	77.60057	0.165743	74.54804	0.125989	-92.6482
900	0.259462	159.6904	3.593629	74.82135	0.187002	73.30099	0.125922	-95.8456
1000	0.257411	154.0554	3.241017	72.43858	0.205252	72.93235	0.125284	-98.718
1100	0.257056	149.2637	2.964427	70.27048	0.227226	71.57358	0.128706	-100.689
1200	0.25457	145.5193	2.747441	68.27233	0.243996	70.62059	0.130872	-103.708
1300	0.253065	141.7591	2.556911	66.36358	0.267317	69.82521	0.135485	-106.051
1400	0.248145	136.0751	2.386639	64.22393	0.284728	67.97394	0.139611	-108.876
1500	0.252811	134.4743	2.256663	62.06816	0.302113	68.06532	0.143449	-111.062
1600	0.250609	129.9291	2.124319	60.37457	0.324516	65.6789	0.14922	-113.245
1700	0.24973	127.2855	2.009943	58.56598	0.337768	65.34525	0.153483	-115.438
1800	0.244338	121.6419	1.922925	56.97171	0.364939	64.61247	0.159803	-116.963
1900	0.246673	119.0956	1.835373	55.08806	0.374859	62.29382	0.163968	-119.448
2000	0.23931	115.5349	1.764527	53.69533	0.399835	62.61938	0.170396	-120.448

Sparameter (  $V_{CE} = 5V$ ,  $I_C = 50 \text{ mA}$ ,  $Z_o = 50 \Omega$  )

f (MHz)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100	0.291758	-115.597	31.98084	114.5201	0.024191	70.60357	0.425493	-63.3881
200	0.262506	-150.118	16.53687	99.44897	0.04295	74.98991	0.232621	-76.9533
300	0.25264	-166.485	10.89096	92.90653	0.064176	77.17974	0.167481	-82.864
400	0.249821	-176.107	8.132018	88.5446	0.085356	77.60479	0.138502	-86.8928
500	0.254165	175.0164	6.495179	85.12476	0.10605	77.60152	0.123129	-90.3532
600	0.256297	169.3437	5.413083	82.03326	0.127348	77.04694	0.115926	-93.817
700	0.255695	164.005	4.640691	79.45089	0.147866	76.10572	0.112281	-97.5277
800	0.251251	159.448	4.077449	76.77794	0.168499	75.58247	0.111355	-100.599
900	0.251896	154.6364	3.62249	74.32644	0.190533	73.82486	0.112178	-104.146
1000	0.253678	150.7514	3.270479	72.24742	0.209036	73.43816	0.112983	-106.791
1100	0.253604	146.3047	2.986835	70.10613	0.231346	72.07415	0.116835	-108.399
1200	0.255931	143.0495	2.770664	67.9089	0.248816	70.87114	0.12054	-111.202
1300	0.249083	138.7155	2.582541	65.95254	0.272736	70.05552	0.125567	-113.093
1400	0.251106	133.7603	2.405897	64.19683	0.289699	68.14367	0.130005	-115.769
1500	0.244701	131.4558	2.264443	62.01345	0.307831	67.81096	0.13398	-117.527
1600	0.252523	126.757	2.139887	60.27316	0.329813	65.50997	0.140568	-120.082
1700	0.251786	124.3368	2.029969	58.68525	0.343309	65.15033	0.144548	-121.79
1800	0.241853	119.8372	1.940752	56.83018	0.370002	64.14401	0.150337	-123.128
1900	0.243659	116.5939	1.852048	55.27976	0.380153	61.90951	0.155224	-125.27
2000	0.240854	113.4264	1.778118	53.57773	0.40562	62.03617	0.161501	-126.3

Package Dimensions

Unit: mm



Hitachi Code	CMPAK-4(T)
JEDEC	—
EIAJ	Conforms
Mass (reference value)	0.006 g

## Cautions

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