

# RQG1004UPAQL

## NPN Silicon Germanium Transistor High Frequency Low Noise Amplifier

REJ03G1552-0100

Rev.1.00

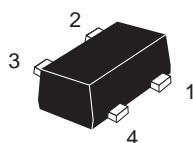
Jul 20, 2007

### Features

- Ideal for LNA applications. e.g. Tuner, Wireless LAN, Cordless phone and etc.
- High gain and low noise.
  - MSG = 25 dB typ. , NF = 0.65 dB typ. at  $V_{CE} = 2\text{ V}$ ,  $I_C = 5\text{ mA}$ ,  $f = 0.9\text{ GHz}$
  - MSG = 22 dB typ. , NF = 0.75 dB typ. at  $V_{CE} = 2\text{ V}$ ,  $I_C = 5\text{ mA}$ ,  $f = 1.8\text{ GHz}$
  - MSG = 21 dB typ. , NF = 0.85 dB typ. at  $V_{CE} = 2\text{ V}$ ,  $I_C = 5\text{ mA}$ ,  $f = 2.4\text{ GHz}$
  - MSG = 15 dB typ. , NF = 1.3 dB typ. at  $V_{CE} = 2\text{ V}$ ,  $I_C = 10\text{ mA}$ ,  $f = 5.8\text{ GHz}$
- High transition frequency
  - $f_T = 41\text{ GHz}$  typ.
- Small and low height package
  - MFPAK-4 (1.4 x 0.8 x 0.55(max) mm)

### Outline

RENESAS package code: PUSF0004ZA-A  
(Package name: MFPAK-4)



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

Note: Marking is "UP-".

### Absolute Maximum Ratings

( $T_a = 25^\circ\text{C}$ )

Item	Symbol	Ratings	Unit
Collector to base voltage	$V_{CBO}$	8	V
Collector to emitter voltage	$V_{CEO}$	3.5	V
Emitter to base voltage	$V_{EBO}$	1.2	V
Collector current	$I_C$	35	mA
Collector power dissipation	$P_c$	80	mW
	$P_c$	200 <sup>note1</sup>	mW
Junction temperature	$T_j$	150	$^\circ\text{C}$
Storage temperature	$T_{stg}$	-55 to +150	$^\circ\text{C}$

Notes: 1. Value on PCB (FR-4 : 40 x 40 x 1.6mm double side)

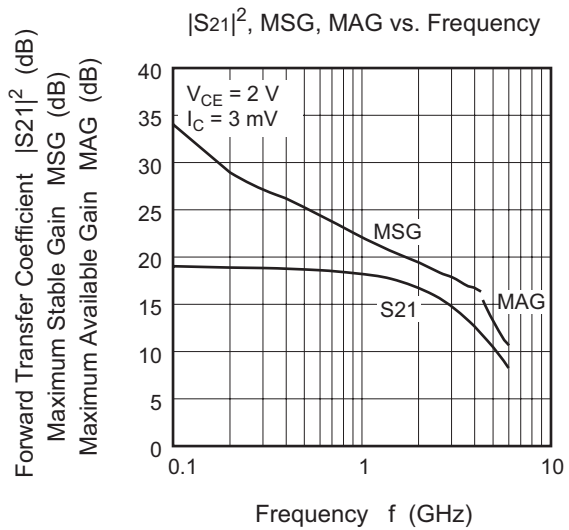
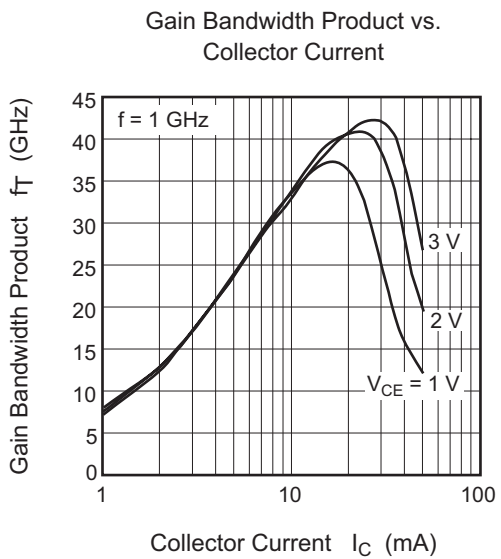
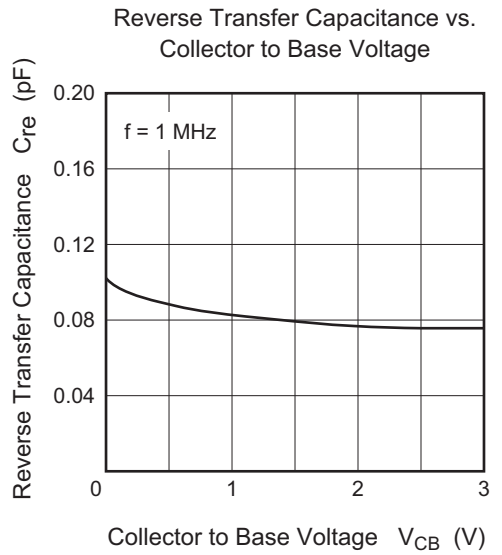
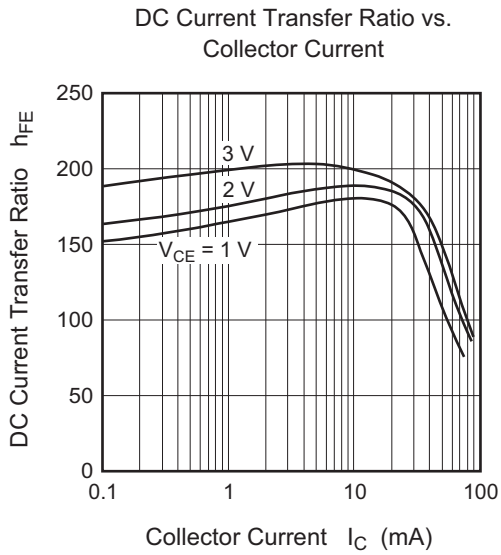
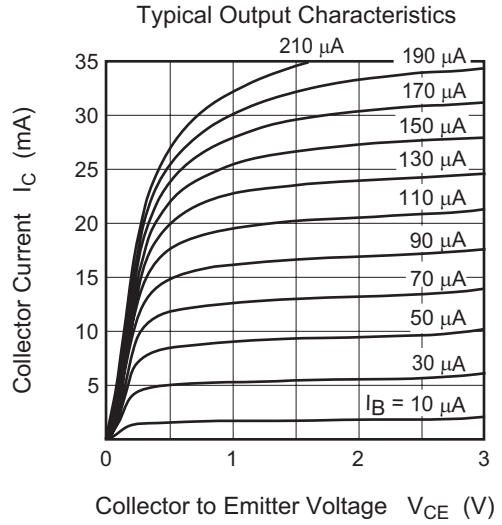
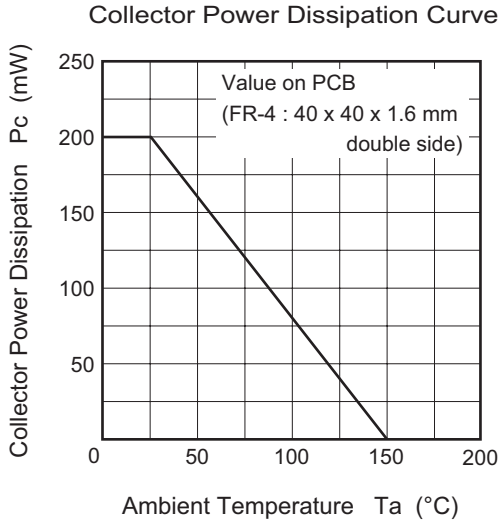
## Electrical Characteristics

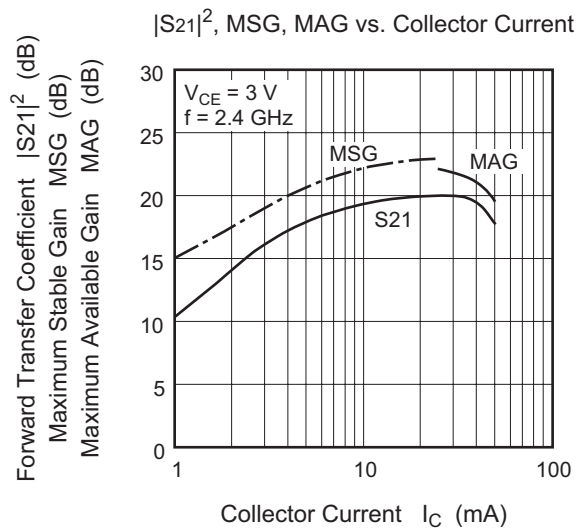
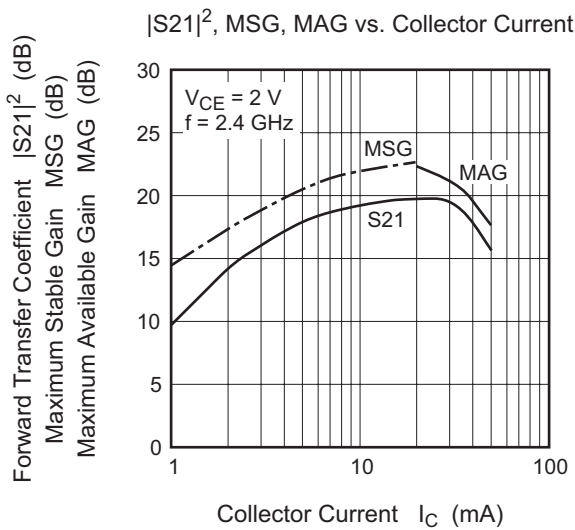
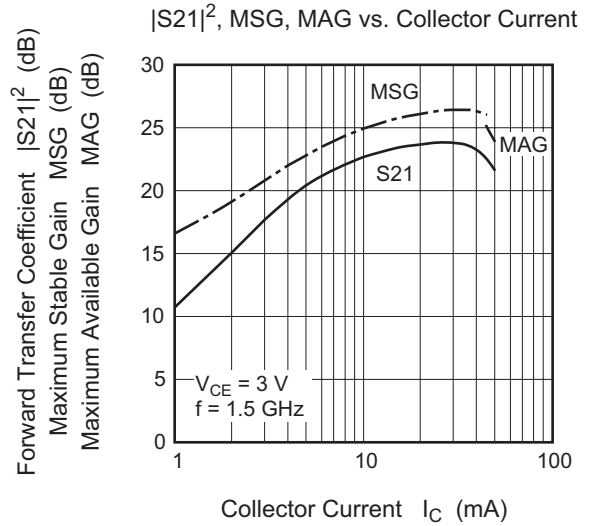
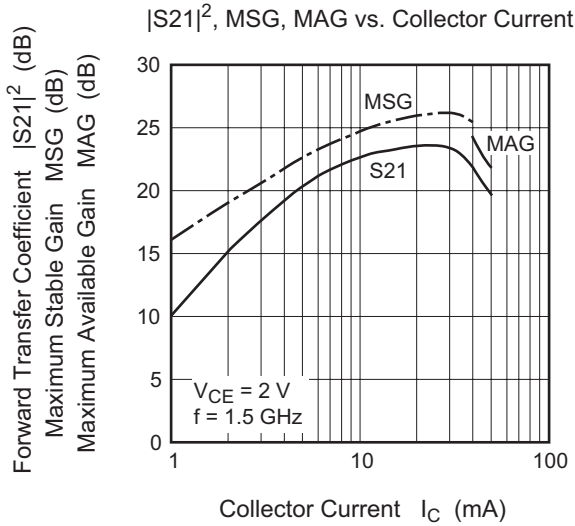
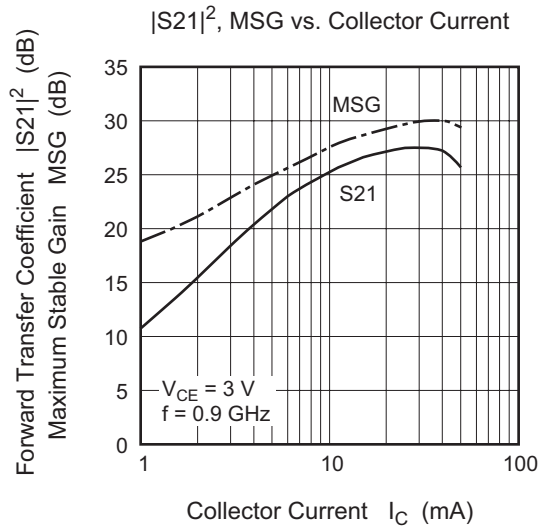
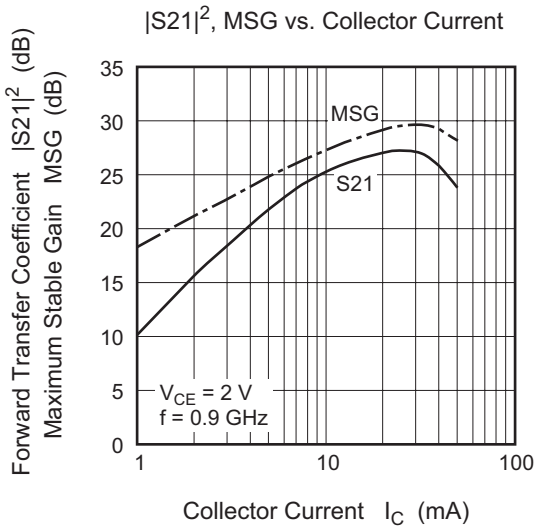
(Ta = 25°C)

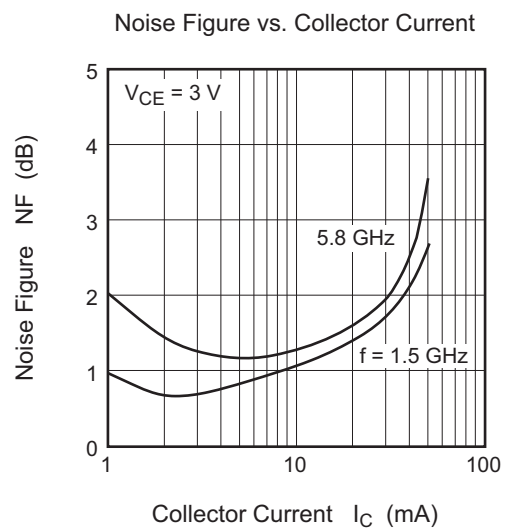
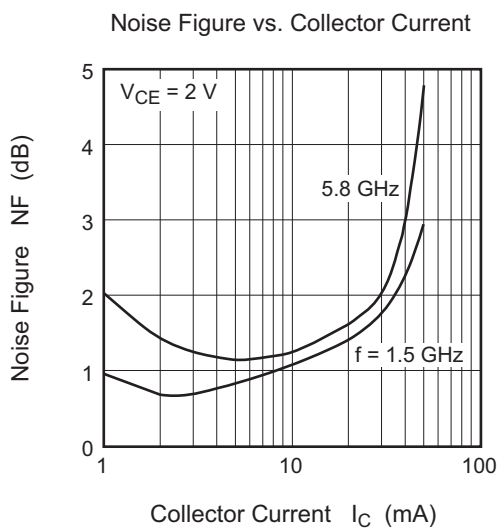
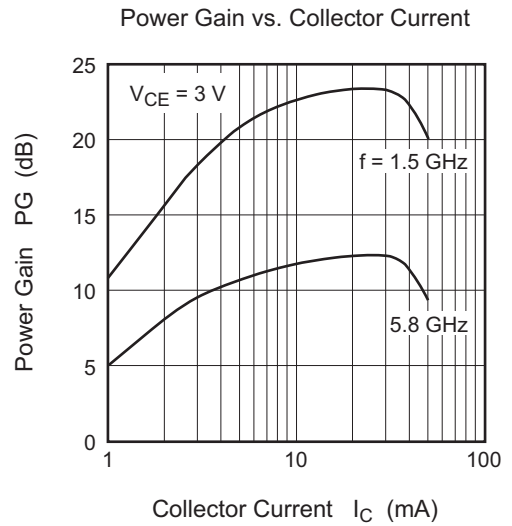
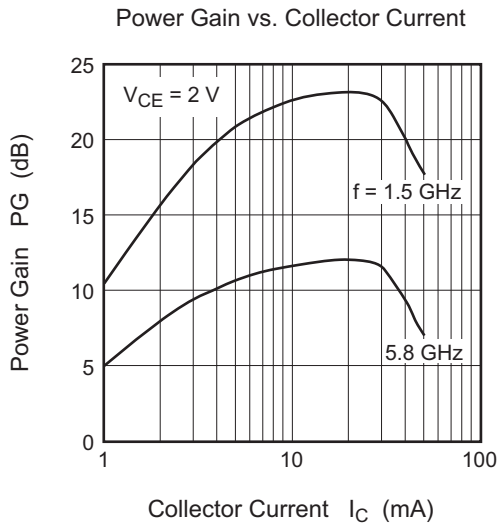
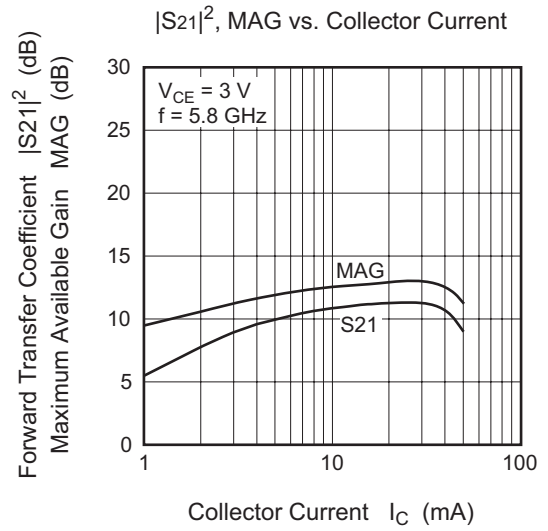
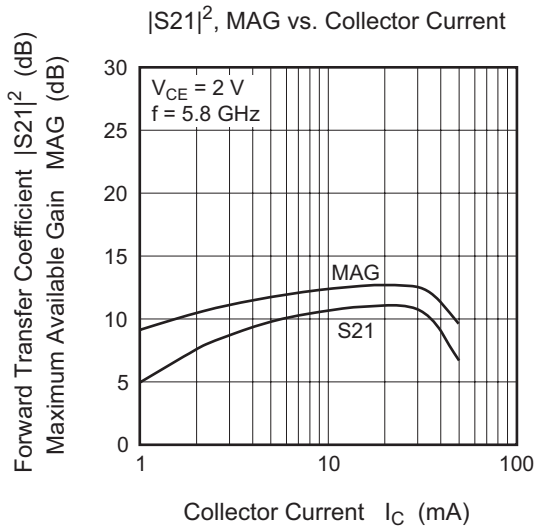
Item	Symbol	Min.	Typ	Max.	Unit	Test Conditions	
DC current transfer ratio	$h_{FE}$	150	180	230	—	$V_{CE} = 2\text{ V}, I_C = 3\text{ mA}$	
Reverse Transfer Capacitance	$C_{re}$	—	0.07	—	pF	$V_{CB} = 2\text{ V}, I_E = 0, f = 1\text{ MHz}$	
Transition Frequency	$f_T$	—	41	—	GHz	$V_{CE} = 2\text{ V}, I_C = f_T\text{ peak}, f = 1\text{ GHz}$	
Forward Transfer Coefficient	0.9 GHz	$ S_{21} ^2$	—	18.5	—	dB	$V_{CE} = 2\text{ V}, I_C = 3\text{ mA}$
	1.5 GHz		—	17.5	—		
	2.4 GHz		—	16.5	—		$V_{CE} = 2\text{ V}, I_C = 10\text{ mA}$
	5.8 GHz		—	10.5	—		
Maximum Stable Gain Note1	0.9 GHz	MSG	—	23	—	dB	$V_{CE} = 2\text{ V}, I_C = 3\text{ mA}$
	1.5 GHz		—	21	—		
	2.4 GHz		—	19	—		$V_{CE} = 2\text{ V}, I_C = 10\text{ mA}$
	5.8 GHz		—	16	—		
Maximum Available Gain Note2	5.8 GHz	MAG	—	12.5	—	dB	$V_{CE} = 2\text{ V}, I_C = 10\text{ mA}$
Power Gain	1.5 GHz	PG	—	18	—	dB	$V_{CE} = 2\text{ V}, I_C = 3\text{ mA}$
	5.8 GHz		—	11.5	—		$V_{CE} = 2\text{ V}, I_C = 10\text{ mA}$
Noise figure	1.5 GHz	NF	—	0.7	—	dB	$V_{CE} = 2\text{ V}, I_C = 3\text{ mA}$
	5.8 GHz		—	1.3	—		$V_{CE} = 2\text{ V}, I_C = 10\text{ mA}$

Notes: 1.  $MSG = |S_{21}| / |S_{12}|$ 2.  $MAG = |S_{21}| / |S_{12}|(K - (K^2 - 1)^{1/2})$

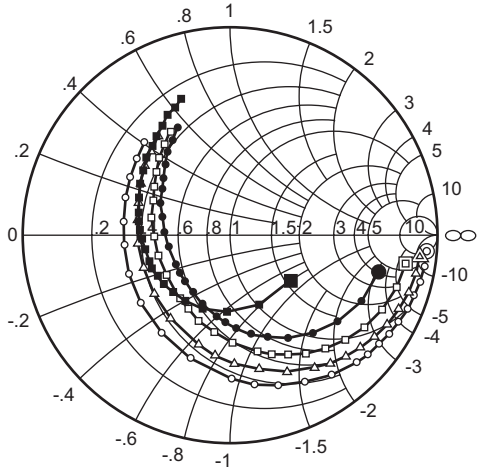
Main Characteristics







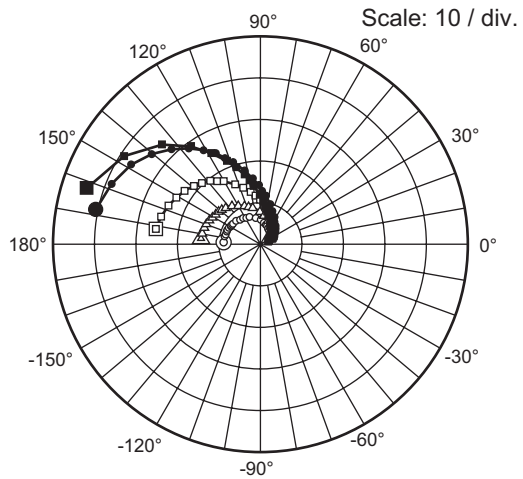
S<sub>11</sub> Parameter vs. Frequency



Condition:  $V_{CE} = 2\text{ V}$ ,  $Z_o = 50\ \Omega$   
 100 to 1000 MHz (100 MHz Step)  
 1000 to 2000 MHz (200 MHz Step)  
 2000 to 6000 MHz (400 MHz Step)

$\odot$ — $\circ$   $I_C = 3\text{ mA}$        $\bullet$ — $\bullet$   $I_C = 20\text{ mA}$   
 $\triangle$ — $\triangle$   $I_C = 5\text{ mA}$        $\blacksquare$ — $\blacksquare$   $I_C = 50\text{ mA}$   
 $\square$ — $\square$   $I_C = 10\text{ mA}$

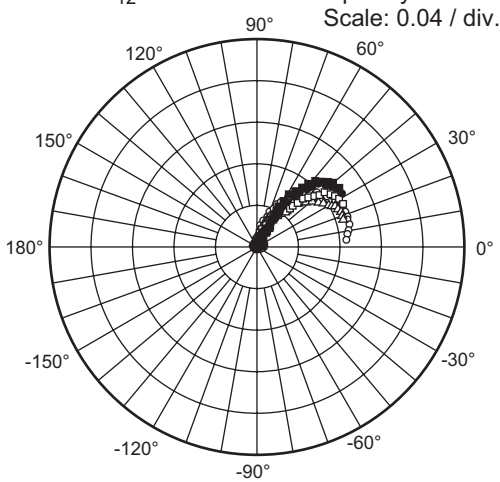
S<sub>21</sub> Parameter vs. Frequency



Condition:  $V_{CE} = 2\text{ V}$ ,  $Z_o = 50\ \Omega$   
 100 to 1000 MHz (100 MHz Step)  
 1000 to 2000 MHz (200 MHz Step)  
 2000 to 6000 MHz (400 MHz Step)

$\odot$ — $\circ$   $I_C = 3\text{ mA}$        $\bullet$ — $\bullet$   $I_C = 20\text{ mA}$   
 $\triangle$ — $\triangle$   $I_C = 5\text{ mA}$        $\blacksquare$ — $\blacksquare$   $I_C = 50\text{ mA}$   
 $\square$ — $\square$   $I_C = 10\text{ mA}$

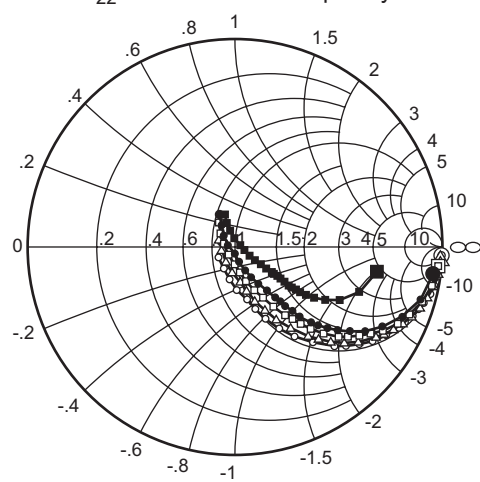
S<sub>12</sub> Parameter vs. Frequency



Condition:  $V_{CE} = 2\text{ V}$ ,  $Z_o = 50\ \Omega$   
 100 to 1000 MHz (100 MHz Step)  
 1000 to 2000 MHz (200 MHz Step)  
 2000 to 6000 MHz (400 MHz Step)

$\odot$ — $\circ$   $I_C = 3\text{ mA}$        $\bullet$ — $\bullet$   $I_C = 20\text{ mA}$   
 $\triangle$ — $\triangle$   $I_C = 5\text{ mA}$        $\blacksquare$ — $\blacksquare$   $I_C = 50\text{ mA}$   
 $\square$ — $\square$   $I_C = 10\text{ mA}$

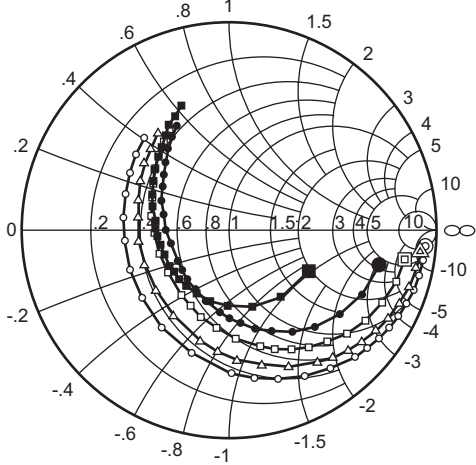
S<sub>22</sub> Parameter vs. Frequency



Condition:  $V_{CE} = 2\text{ V}$ ,  $Z_o = 50\ \Omega$   
 100 to 1000 MHz (100 MHz Step)  
 1000 to 2000 MHz (200 MHz Step)  
 2000 to 6000 MHz (400 MHz Step)

$\odot$ — $\circ$   $I_C = 3\text{ mA}$        $\bullet$ — $\bullet$   $I_C = 20\text{ mA}$   
 $\triangle$ — $\triangle$   $I_C = 5\text{ mA}$        $\blacksquare$ — $\blacksquare$   $I_C = 50\text{ mA}$   
 $\square$ — $\square$   $I_C = 10\text{ mA}$

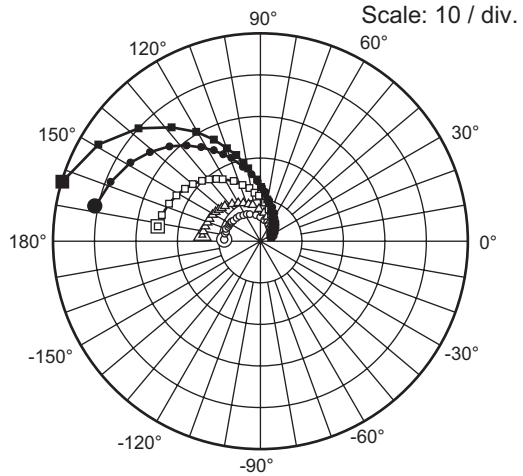
S<sub>11</sub> Parameter vs. Frequency



Condition:  $V_{CE} = 3\text{ V}$ ,  $Z_o = 50\ \Omega$   
 100 to 1000 MHz (100 MHz Step)  
 1000 to 2000 MHz (200 MHz Step)  
 2000 to 6000 MHz (400 MHz Step)

$\odot$ — $\circ$   $I_C = 3\text{ mA}$        $\bullet$ — $\bullet$   $I_C = 20\text{ mA}$   
 $\triangle$ — $\triangle$   $I_C = 5\text{ mA}$        $\blacksquare$ — $\blacksquare$   $I_C = 50\text{ mA}$   
 $\square$ — $\square$   $I_C = 10\text{ mA}$

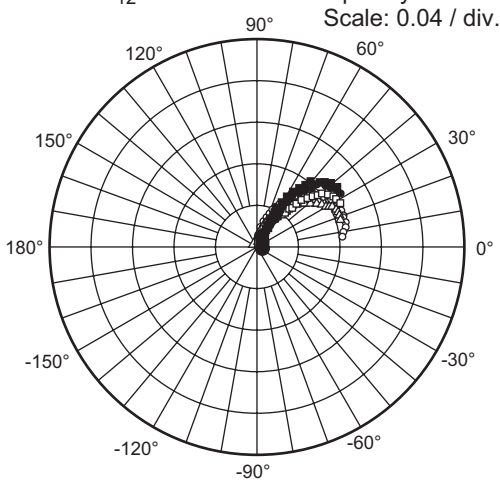
S<sub>21</sub> Parameter vs. Frequency



Condition:  $V_{CE} = 3\text{ V}$ ,  $Z_o = 50\ \Omega$   
 100 to 1000 MHz (100 MHz Step)  
 1000 to 2000 MHz (200 MHz Step)  
 2000 to 6000 MHz (400 MHz Step)

$\odot$ — $\circ$   $I_C = 3\text{ mA}$        $\bullet$ — $\bullet$   $I_C = 20\text{ mA}$   
 $\triangle$ — $\triangle$   $I_C = 5\text{ mA}$        $\blacksquare$ — $\blacksquare$   $I_C = 50\text{ mA}$   
 $\square$ — $\square$   $I_C = 10\text{ mA}$

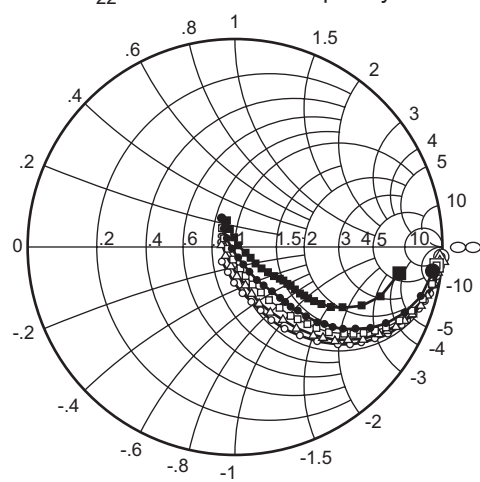
S<sub>12</sub> Parameter vs. Frequency



Condition:  $V_{CE} = 3\text{ V}$ ,  $Z_o = 50\ \Omega$   
 100 to 1000 MHz (100 MHz Step)  
 1000 to 2000 MHz (200 MHz Step)  
 2000 to 6000 MHz (400 MHz Step)

$\odot$ — $\circ$   $I_C = 3\text{ mA}$        $\bullet$ — $\bullet$   $I_C = 20\text{ mA}$   
 $\triangle$ — $\triangle$   $I_C = 5\text{ mA}$        $\blacksquare$ — $\blacksquare$   $I_C = 50\text{ mA}$   
 $\square$ — $\square$   $I_C = 10\text{ mA}$

S<sub>22</sub> Parameter vs. Frequency



Condition:  $V_{CE} = 3\text{ V}$ ,  $Z_o = 50\ \Omega$   
 100 to 1000 MHz (100 MHz Step)  
 1000 to 2000 MHz (200 MHz Step)  
 2000 to 6000 MHz (400 MHz Step)

$\odot$ — $\circ$   $I_C = 3\text{ mA}$        $\bullet$ — $\bullet$   $I_C = 20\text{ mA}$   
 $\triangle$ — $\triangle$   $I_C = 5\text{ mA}$        $\blacksquare$ — $\blacksquare$   $I_C = 50\text{ mA}$   
 $\square$ — $\square$   $I_C = 10\text{ mA}$

## S Parameter

 $(V_{CE} = 2 \text{ V}, I_C = 3 \text{ mA}, Z_O = 50 \Omega)$ 

f (MHz)	S11		S21		S12		S22	
	MAG	ANG(deg.)	MAG	ANG(deg.)	MAG	ANG(deg.)	MAG	ANG(deg.)
100	0.948	-4.9	8.83	176.3	0.004	34.6	0.994	-2.5
200	0.949	-8.9	8.79	172.0	0.011	82.1	0.992	-5.5
300	0.942	-13.6	8.74	167.7	0.016	78.5	0.987	-8.4
400	0.935	-18.1	8.71	163.9	0.021	81.8	0.976	-11.0
500	0.926	-22.6	8.67	160.2	0.027	76.9	0.966	-13.7
600	0.914	-27.1	8.52	156.4	0.031	71.8	0.951	-16.4
700	0.901	-31.7	8.43	152.8	0.036	70.1	0.936	-18.9
800	0.887	-36.1	8.31	149.4	0.040	66.6	0.919	-21.3
900	0.873	-40.8	8.30	146.1	0.045	65.1	0.900	-23.7
1000	0.860	-45.1	8.18	142.8	0.049	61.8	0.882	-26.1
1100	0.844	-49.5	8.10	139.4	0.053	60.3	0.864	-28.2
1200	0.828	-54.0	7.96	136.1	0.057	58.0	0.843	-30.4
1300	0.810	-58.3	7.81	132.9	0.060	55.6	0.824	-32.5
1400	0.791	-62.9	7.70	129.6	0.063	53.1	0.803	-34.3
1500	0.774	-67.7	7.58	126.5	0.066	51.6	0.782	-36.3
1600	0.756	-72.2	7.47	123.3	0.068	49.3	0.759	-38.1
1700	0.740	-76.6	7.33	120.3	0.071	46.9	0.739	-40.1
1800	0.724	-80.8	7.18	117.3	0.073	45.8	0.717	-41.6
1900	0.705	-85.2	7.04	114.5	0.076	43.5	0.697	-43.3
2000	0.690	-89.5	6.89	111.5	0.078	42.3	0.675	-44.9
2200	0.651	-98.5	6.61	105.7	0.081	39.1	0.634	-47.9
2400	0.621	-107.8	6.33	100.1	0.083	35.8	0.594	-50.8
2600	0.597	-116.6	6.04	95.0	0.087	33.5	0.554	-53.6
2800	0.576	-125.1	5.76	90.0	0.088	31.1	0.516	-56.3
3000	0.553	-134.0	5.47	85.0	0.090	28.0	0.481	-58.8
3200	0.536	-142.8	5.21	80.2	0.091	26.2	0.447	-61.4
3400	0.528	-151.2	4.97	75.6	0.092	24.1	0.412	-64.2
3600	0.522	-159.1	4.73	71.3	0.092	21.8	0.380	-66.8
3800	0.514	-167.1	4.49	67.0	0.092	20.3	0.348	-69.1
4000	0.511	-174.8	4.26	63.0	0.092	18.7	0.317	-71.8
4200	0.512	178.4	4.05	59.0	0.091	17.5	0.288	-74.3
4400	0.517	172.7	3.85	55.5	0.092	17.1	0.263	-77.2
4600	0.525	166.8	3.69	51.8	0.092	15.4	0.239	-81.6
4800	0.535	160.4	3.51	47.8	0.092	13.6	0.211	-86.7
5000	0.548	154.8	3.33	44.3	0.092	12.1	0.184	-92.2
5200	0.560	150.0	3.18	40.7	0.090	10.6	0.159	-98.8
5400	0.572	145.4	3.02	37.3	0.089	9.8	0.137	-106.7
5600	0.581	140.8	2.87	33.9	0.088	8.5	0.118	-116.3
5800	0.593	136.5	2.72	30.8	0.087	7.3	0.102	-129.5
6000	0.610	132.5	2.59	27.3	0.086	4.6	0.094	-146.8



## S Parameter

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

f (MHz)	S11		S21		S12		S22	
	MAG	ANG(deg.)	MAG	ANG(deg.)	MAG	ANG(deg.)	MAG	ANG(deg.)
100	0.924	-6.5	14.34	174.7	0.006	80.7	0.993	-3.7
200	0.915	-11.9	14.21	169.4	0.011	89.9	0.987	-7.5
300	0.902	-17.8	14.02	164.0	0.015	78.2	0.975	-11.2
400	0.888	-23.7	13.81	159.3	0.020	76.8	0.958	-14.7
500	0.869	-29.4	13.60	154.7	0.026	72.6	0.937	-18.1
600	0.849	-35.0	13.26	150.1	0.030	68.2	0.912	-21.4
700	0.827	-40.7	12.98	145.8	0.033	66.9	0.887	-24.4
800	0.805	-46.1	12.69	141.6	0.037	63.3	0.860	-27.3
900	0.782	-51.8	12.46	137.7	0.041	61.1	0.831	-30.0
1000	0.758	-57.1	12.12	133.9	0.045	58.4	0.804	-32.6
1100	0.734	-62.3	11.81	130.1	0.047	56.5	0.776	-34.9
1200	0.710	-67.4	11.47	126.4	0.050	54.5	0.749	-37.2
1300	0.686	-72.3	11.12	122.9	0.052	52.9	0.721	-39.3
1400	0.661	-77.5	10.79	119.4	0.055	50.1	0.696	-41.1
1500	0.639	-82.7	10.47	116.1	0.057	49.1	0.670	-43.0
1600	0.618	-87.8	10.17	112.9	0.058	47.2	0.644	-44.6
1700	0.599	-92.5	9.85	109.9	0.060	45.9	0.620	-46.4
1800	0.581	-97.1	9.51	107.1	0.061	45.0	0.596	-47.7
1900	0.563	-101.6	9.21	104.3	0.063	43.3	0.574	-49.2
2000	0.546	-106.3	8.93	101.5	0.064	42.7	0.551	-50.6
2200	0.512	-115.7	8.37	96.2	0.068	40.6	0.509	-53.0
2400	0.489	-125.3	7.86	91.1	0.069	39.1	0.471	-55.4
2600	0.475	-134.1	7.39	86.5	0.072	37.6	0.434	-57.9
2800	0.461	-142.5	6.96	82.1	0.074	35.9	0.398	-60.3
3000	0.448	-151.2	6.54	77.7	0.076	34.3	0.366	-62.5
3200	0.441	-159.9	6.17	73.6	0.077	33.5	0.335	-65.0
3400	0.443	-167.7	5.83	69.5	0.079	31.8	0.304	-67.6
3600	0.446	-174.9	5.52	65.8	0.080	30.3	0.274	-70.1
3800	0.447	177.8	5.21	61.9	0.081	29.8	0.245	-72.7
4000	0.451	170.7	4.92	58.5	0.082	28.5	0.217	-75.7
4200	0.459	164.9	4.66	55.0	0.083	28.1	0.191	-78.3
4400	0.468	160.1	4.42	52.0	0.085	27.9	0.169	-82.3
4600	0.481	155.2	4.23	48.6	0.086	26.8	0.147	-88.7
4800	0.497	149.8	4.01	45.0	0.087	24.9	0.122	-97.3
5000	0.513	144.9	3.80	41.8	0.088	23.6	0.099	-107.5
5200	0.529	140.9	3.62	38.6	0.088	22.6	0.080	-122.7
5400	0.544	137.1	3.43	35.5	0.088	21.4	0.069	-142.9
5600	0.556	133.0	3.26	32.5	0.088	20.3	0.066	-165.8
5800	0.571	129.2	3.09	29.6	0.087	19.3	0.072	172.2
6000	0.589	125.8	2.94	26.5	0.088	17.4	0.089	155.3

## S Parameter

(V<sub>CE</sub> = 2 V, I<sub>C</sub> = 10 mA, Z<sub>O</sub> = 50 Ω)

f (MHz)	S11		S21		S12		S22	
	MAG	ANG(deg.)	MAG	ANG(deg.)	MAG	ANG(deg.)	MAG	ANG(deg.)
100	0.857	-9.4	25.35	171.8	0.005	58.6	0.986	-5.4
200	0.839	-17.6	24.79	164.5	0.011	75.6	0.969	-11.0
300	0.813	-26.2	24.03	157.3	0.014	76.0	0.939	-16.3
400	0.782	-34.3	23.22	150.9	0.018	74.8	0.903	-21.1
500	0.749	-42.3	22.33	144.9	0.023	67.4	0.865	-25.4
600	0.711	-49.8	21.30	139.0	0.025	64.5	0.819	-29.4
700	0.675	-57.1	20.30	133.8	0.029	63.2	0.776	-32.7
800	0.639	-63.9	19.32	129.0	0.031	59.2	0.736	-35.6
900	0.606	-70.7	18.38	124.5	0.034	57.9	0.697	-38.3
1000	0.574	-76.8	17.43	120.4	0.037	55.8	0.661	-40.6
1100	0.546	-82.7	16.55	116.5	0.039	54.2	0.626	-42.6
1200	0.518	-88.4	15.70	112.9	0.040	53.2	0.595	-44.4
1300	0.493	-93.8	14.91	109.6	0.042	52.5	0.565	-45.9
1400	0.470	-99.4	14.17	106.4	0.044	51.3	0.539	-47.3
1500	0.451	-104.8	13.51	103.4	0.046	51.7	0.513	-48.6
1600	0.435	-110.1	12.88	100.6	0.046	50.2	0.488	-49.7
1700	0.422	-115.0	12.29	98.0	0.048	49.5	0.466	-50.9
1800	0.409	-119.6	11.74	95.6	0.049	49.0	0.445	-51.7
1900	0.397	-124.3	11.23	93.2	0.051	48.3	0.425	-52.8
2000	0.386	-128.9	10.78	90.8	0.052	48.7	0.407	-53.7
2200	0.368	-138.6	9.92	86.4	0.055	47.6	0.372	-55.4
2400	0.362	-148.1	9.18	82.2	0.058	47.0	0.341	-57.0
2600	0.360	-156.3	8.54	78.4	0.061	46.4	0.310	-59.0
2800	0.359	-164.0	7.97	74.6	0.064	45.7	0.280	-61.0
3000	0.359	-172.0	7.44	71.0	0.066	44.7	0.254	-62.9
3200	0.366	-179.6	6.97	67.5	0.069	44.0	0.228	-65.4
3400	0.378	173.8	6.56	64.0	0.072	43.3	0.202	-68.3
3600	0.389	167.8	6.18	60.7	0.074	41.4	0.176	-71.2
3800	0.396	161.7	5.83	57.4	0.076	40.6	0.150	-74.1
4000	0.407	155.8	5.49	54.4	0.078	39.6	0.126	-77.5
4200	0.421	151.2	5.19	51.4	0.080	39.3	0.103	-82.0
4400	0.434	147.7	4.91	48.8	0.084	38.9	0.083	-89.1
4600	0.450	143.8	4.70	45.8	0.086	37.0	0.066	-103.9
4800	0.469	139.4	4.45	42.5	0.087	35.4	0.049	-129.5
5000	0.489	135.5	4.22	39.7	0.089	34.1	0.045	-164.0
5200	0.506	132.3	4.01	36.7	0.090	32.9	0.055	166.7
5400	0.523	129.2	3.80	34.0	0.091	31.7	0.073	148.1
5600	0.537	125.8	3.61	31.2	0.092	30.2	0.093	137.2
5800	0.555	122.6	3.42	28.5	0.093	29.2	0.114	129.3
6000	0.575	119.7	3.25	25.7	0.093	26.4	0.140	124.3

## S Parameter

(V<sub>CE</sub> = 2 V, I<sub>C</sub> = 20 mA, Z<sub>O</sub> = 50 Ω)

f (MHz)	S11		S21		S12		S22	
	MAG	ANG(deg.)	MAG	ANG(deg.)	MAG	ANG(deg.)	MAG	ANG(deg.)
100	0.741	-13.8	40.41	168.2	0.001	107.1	0.967	-7.8
200	0.710	-26.6	38.69	158.1	0.010	80.0	0.930	-15.6
300	0.665	-38.7	36.40	148.5	0.012	77.4	0.871	-22.4
400	0.618	-49.9	33.92	140.3	0.015	70.1	0.808	-28.2
500	0.569	-60.3	31.33	133.0	0.019	65.1	0.748	-32.6
600	0.521	-69.4	28.77	126.6	0.021	60.6	0.688	-36.1
700	0.484	-78.0	26.46	121.2	0.023	61.6	0.637	-38.9
800	0.448	-85.6	24.37	116.4	0.025	58.8	0.592	-41.1
900	0.420	-92.9	22.52	112.4	0.027	60.0	0.551	-42.9
1000	0.395	-99.2	20.86	108.6	0.030	58.1	0.516	-44.6
1100	0.374	-105.5	19.41	105.3	0.032	57.7	0.485	-45.6
1200	0.355	-111.5	18.11	102.2	0.033	56.7	0.458	-46.6
1300	0.339	-117.3	16.96	99.4	0.034	57.9	0.434	-47.3
1400	0.326	-123.1	15.92	96.8	0.036	56.4	0.413	-47.9
1500	0.318	-128.6	15.02	94.3	0.038	57.4	0.392	-48.5
1600	0.311	-133.7	14.20	92.0	0.039	56.9	0.373	-49.2
1700	0.307	-138.6	13.46	89.8	0.041	56.7	0.356	-49.9
1800	0.301	-143.0	12.77	87.8	0.042	56.7	0.340	-50.1
1900	0.297	-147.3	12.16	85.8	0.045	56.2	0.325	-50.8
2000	0.294	-151.8	11.61	83.8	0.046	56.7	0.310	-51.2
2200	0.291	-161.1	10.60	80.1	0.050	55.9	0.284	-52.2
2400	0.299	-169.2	9.76	76.6	0.053	55.4	0.259	-53.3
2600	0.308	-176.0	9.03	73.2	0.057	54.7	0.235	-54.9
2800	0.315	177.7	8.40	70.0	0.060	54.1	0.210	-56.6
3000	0.323	171.1	7.83	66.8	0.064	52.7	0.188	-58.2
3200	0.337	165.1	7.33	63.7	0.067	51.3	0.166	-60.6
3400	0.354	159.9	6.88	60.7	0.070	50.3	0.142	-63.6
3600	0.368	155.3	6.48	57.6	0.073	48.9	0.119	-66.1
3800	0.378	150.1	6.09	54.6	0.076	48.2	0.097	-69.2
4000	0.394	145.4	5.73	51.9	0.078	47.3	0.074	-73.4
4200	0.410	141.8	5.42	49.2	0.081	45.9	0.053	-79.3
4400	0.424	139.2	5.14	46.8	0.085	45.5	0.034	-93.6
4600	0.440	136.1	4.90	44.0	0.087	43.5	0.024	-137.8
4800	0.461	132.4	4.65	40.9	0.089	41.6	0.034	165.2
5000	0.482	129.2	4.41	38.3	0.091	40.2	0.055	143.4
5200	0.501	126.7	4.18	35.5	0.093	38.7	0.079	132.7
5400	0.518	124.1	3.97	32.9	0.095	37.5	0.103	126.2
5600	0.534	121.1	3.77	30.3	0.096	35.8	0.126	121.5
5800	0.552	118.4	3.57	27.8	0.097	34.4	0.148	117.6
6000	0.573	115.9	3.39	25.1	0.097	32.1	0.174	115.2

## S Parameter

(V<sub>CE</sub> = 2 V, I<sub>C</sub> = 50 mA, Z<sub>O</sub> = 50 Ω)

f (MHz)	S11		S21		S12		S22	
	MAG	ANG(deg.)	MAG	ANG(deg.)	MAG	ANG(deg.)	MAG	ANG(deg.)
100	0.366	-36.3	43.83	162.2	0.004	54.1	0.693	-10.0
200	0.363	-67.4	39.08	147.2	0.011	66.0	0.637	-20.1
300	0.369	-92.0	33.67	134.8	0.012	57.4	0.567	-26.6
400	0.377	-110.4	28.86	125.4	0.012	59.3	0.503	-30.6
500	0.384	-124.2	24.89	118.1	0.016	55.9	0.455	-33.0
600	0.390	-135.1	21.74	112.1	0.018	57.7	0.413	-34.2
700	0.398	-143.7	19.23	107.3	0.020	59.9	0.381	-34.9
800	0.403	-150.6	17.19	103.2	0.021	57.2	0.357	-35.3
900	0.409	-156.3	15.52	99.8	0.024	58.2	0.334	-35.4
1000	0.412	-161.5	14.12	96.6	0.026	59.9	0.316	-35.5
1100	0.415	-166.0	12.96	93.8	0.028	59.7	0.301	-35.2
1200	0.418	-170.2	11.94	91.1	0.029	61.3	0.288	-35.3
1300	0.422	-174.1	11.08	88.7	0.031	61.3	0.277	-35.0
1400	0.426	-177.6	10.32	86.5	0.032	60.5	0.267	-34.8
1500	0.432	179.4	9.66	84.3	0.035	61.4	0.258	-34.8
1600	0.437	176.7	9.08	82.3	0.036	60.8	0.248	-34.8
1700	0.442	174.0	8.57	80.3	0.038	61.5	0.239	-34.8
1800	0.445	171.6	8.10	78.5	0.040	61.5	0.231	-34.4
1900	0.448	169.0	7.68	76.7	0.042	60.4	0.222	-34.7
2000	0.452	166.5	7.30	74.8	0.044	61.3	0.214	-34.6
2200	0.462	161.6	6.62	71.4	0.048	60.1	0.199	-34.4
2400	0.477	157.7	6.07	68.1	0.051	59.3	0.183	-34.4
2600	0.488	154.1	5.60	64.9	0.056	58.8	0.167	-34.8
2800	0.498	150.5	5.18	61.8	0.059	58.4	0.150	-34.9
3000	0.508	146.7	4.81	58.8	0.062	56.3	0.133	-34.4
3200	0.522	143.2	4.49	55.8	0.065	55.6	0.117	-34.7
3400	0.537	140.3	4.21	52.9	0.069	54.5	0.100	-33.7
3600	0.548	137.4	3.95	49.9	0.072	52.6	0.082	-31.8
3800	0.558	134.0	3.71	47.0	0.074	51.7	0.066	-27.4
4000	0.570	131.1	3.49	44.4	0.078	50.9	0.049	-18.9
4200	0.583	128.8	3.30	41.8	0.081	49.9	0.037	-4.5
4400	0.594	126.9	3.12	39.3	0.085	48.9	0.026	21.7
4600	0.606	124.4	2.98	36.5	0.087	46.8	0.026	66.1
4800	0.621	121.7	2.82	33.6	0.089	45.1	0.043	93.8
5000	0.637	119.5	2.67	31.0	0.091	43.9	0.062	102.4
5200	0.650	117.7	2.54	28.4	0.093	42.3	0.083	105.8
5400	0.661	115.7	2.41	25.8	0.095	41.2	0.104	107.6
5600	0.671	113.4	2.29	23.3	0.096	40.0	0.123	108.0
5800	0.684	111.4	2.17	20.9	0.097	38.6	0.143	107.8
6000	0.699	109.5	2.07	18.3	0.098	36.0	0.165	108.0

## S Parameter

(V<sub>CE</sub> = 3 V, I<sub>C</sub> = 3 mA, Z<sub>O</sub> = 50 Ω)

f (MHz)	S11		S21		S12		S22	
	MAG	ANG(deg.)	MAG	ANG(deg.)	MAG	ANG(deg.)	MAG	ANG(deg.)
100	0.949	-4.9	8.92	176.3	0.005	44.4	0.996	-2.7
200	0.949	-8.8	8.86	172.0	0.012	84.1	0.992	-5.4
300	0.944	-13.5	8.80	167.8	0.015	79.3	0.985	-8.1
400	0.937	-18.0	8.76	164.1	0.020	81.5	0.976	-10.7
500	0.927	-22.5	8.74	160.4	0.025	75.9	0.965	-13.2
600	0.916	-26.9	8.61	156.6	0.029	71.9	0.951	-15.9
700	0.904	-31.4	8.55	153.0	0.034	70.4	0.936	-18.3
800	0.890	-35.8	8.42	149.5	0.038	67.2	0.920	-20.6
900	0.876	-40.5	8.39	146.3	0.043	64.8	0.902	-23.0
1000	0.861	-44.9	8.27	143.0	0.047	62.6	0.884	-25.2
1100	0.845	-49.3	8.18	139.7	0.051	59.8	0.867	-27.3
1200	0.829	-53.7	8.06	136.3	0.054	57.7	0.847	-29.5
1300	0.812	-57.9	7.93	133.1	0.057	55.5	0.827	-31.5
1400	0.792	-62.6	7.82	129.7	0.060	53.2	0.807	-33.3
1500	0.775	-67.2	7.70	126.6	0.063	51.8	0.786	-35.2
1600	0.757	-71.8	7.58	123.5	0.065	49.1	0.764	-37.0
1700	0.740	-76.2	7.44	120.5	0.068	47.6	0.743	-38.7
1800	0.723	-80.4	7.30	117.5	0.070	45.9	0.723	-40.2
1900	0.705	-84.8	7.15	114.7	0.073	44.0	0.702	-41.8
2000	0.688	-89.1	7.00	111.7	0.074	42.8	0.681	-43.4
2200	0.650	-98.0	6.72	105.9	0.078	39.5	0.641	-46.2
2400	0.619	-107.3	6.44	100.4	0.080	36.6	0.602	-48.9
2600	0.594	-116.1	6.14	95.3	0.083	34.3	0.564	-51.5
2800	0.572	-124.6	5.85	90.3	0.084	32.0	0.527	-54.0
3000	0.549	-133.3	5.57	85.3	0.085	28.9	0.492	-56.3
3200	0.532	-142.2	5.30	80.6	0.087	27.2	0.458	-58.9
3400	0.523	-150.6	5.05	76.0	0.088	25.2	0.425	-61.3
3600	0.517	-158.4	4.81	71.7	0.088	23.0	0.393	-63.7
3800	0.509	-166.4	4.57	67.4	0.088	21.3	0.362	-65.9
4000	0.504	-174.3	4.33	63.4	0.088	20.0	0.332	-68.2
4200	0.506	178.9	4.12	59.5	0.088	18.8	0.303	-70.3
4400	0.511	173.2	3.93	56.0	0.088	18.5	0.278	-73.1
4600	0.519	167.3	3.77	52.2	0.089	17.1	0.253	-76.8
4800	0.529	160.9	3.58	48.3	0.089	15.3	0.225	-81.3
5000	0.541	155.2	3.40	44.7	0.088	13.8	0.198	-85.9
5200	0.554	150.3	3.24	41.1	0.087	12.6	0.172	-91.3
5400	0.567	145.8	3.08	37.8	0.087	11.4	0.148	-98.0
5600	0.576	141.1	2.93	34.4	0.085	10.1	0.127	-105.9
5800	0.588	136.7	2.78	31.2	0.084	9.0	0.108	-116.4
6000	0.605	132.8	2.65	27.8	0.083	6.7	0.094	-132.4

## S Parameter

 $(V_{CE} = 3\text{ V}, I_C = 5\text{ mA}, Z_O = 50\ \Omega)$ 

f (MHz)	S11		S21		S12		S22	
	MAG	ANG(deg.)	MAG	ANG(deg.)	MAG	ANG(deg.)	MAG	ANG(deg.)
100	0.926	-6.4	14.14	174.7	0.004	94.8	0.988	-3.6
200	0.918	-11.5	14.00	169.6	0.011	81.6	0.985	-7.1
300	0.906	-17.4	13.81	164.3	0.015	80.2	0.974	-10.6
400	0.892	-23.1	13.66	159.7	0.019	77.2	0.956	-14.0
500	0.875	-28.8	13.48	155.1	0.024	72.9	0.938	-17.2
600	0.855	-34.3	13.17	150.6	0.028	68.7	0.913	-20.4
700	0.833	-39.9	12.91	146.3	0.032	66.5	0.890	-23.3
800	0.811	-45.2	12.62	142.2	0.036	63.5	0.864	-26.0
900	0.788	-50.9	12.40	138.4	0.039	61.3	0.836	-28.6
1000	0.764	-56.0	12.08	134.5	0.043	58.9	0.810	-31.1
1100	0.740	-61.3	11.78	130.8	0.046	56.3	0.784	-33.3
1200	0.715	-66.3	11.45	127.1	0.048	54.6	0.758	-35.6
1300	0.692	-71.1	11.11	123.6	0.050	53.3	0.732	-37.5
1400	0.667	-76.2	10.79	120.1	0.052	50.3	0.706	-39.2
1500	0.644	-81.4	10.50	116.8	0.054	49.9	0.681	-41.0
1600	0.623	-86.4	10.20	113.6	0.056	47.6	0.655	-42.6
1700	0.604	-91.2	9.87	110.6	0.058	46.7	0.632	-44.2
1800	0.585	-95.6	9.55	107.8	0.060	45.3	0.609	-45.5
1900	0.568	-100.1	9.26	105.0	0.061	43.8	0.587	-46.9
2000	0.550	-104.7	8.98	102.2	0.062	43.1	0.566	-48.2
2200	0.514	-114.1	8.42	96.8	0.066	41.1	0.525	-50.5
2400	0.490	-123.7	7.92	91.8	0.067	39.3	0.488	-52.7
2600	0.474	-132.6	7.45	87.2	0.070	38.1	0.451	-54.9
2800	0.460	-140.9	7.02	82.7	0.071	36.6	0.417	-57.1
3000	0.446	-149.6	6.61	78.4	0.073	34.8	0.384	-59.1
3200	0.439	-158.2	6.23	74.2	0.075	33.8	0.354	-61.3
3400	0.440	-166.3	5.90	70.2	0.076	32.7	0.324	-63.6
3600	0.442	-173.6	5.58	66.4	0.077	31.1	0.294	-65.9
3800	0.442	179.0	5.27	62.6	0.078	30.4	0.266	-68.0
4000	0.446	171.8	4.98	59.1	0.080	29.6	0.238	-70.3
4200	0.454	165.9	4.72	55.6	0.080	29.0	0.212	-72.4
4400	0.463	161.2	4.48	52.5	0.082	28.6	0.189	-75.4
4600	0.476	156.1	4.29	49.2	0.084	27.6	0.166	-80.5
4800	0.491	150.6	4.07	45.6	0.084	25.7	0.139	-86.7
5000	0.508	145.6	3.86	42.4	0.086	25.0	0.114	-94.2
5200	0.523	141.6	3.67	39.1	0.085	23.6	0.091	-104.1
5400	0.538	137.7	3.49	36.1	0.086	22.5	0.072	-119.6
5600	0.550	133.6	3.31	32.9	0.085	21.4	0.059	-140.4
5800	0.565	129.8	3.14	30.1	0.086	20.6	0.056	-167.1
6000	0.584	126.4	2.99	26.9	0.085	18.4	0.067	168.0

## S Parameter

(V<sub>CE</sub> = 3 V, I<sub>C</sub> = 10 mA, Z<sub>O</sub> = 50 Ω)

f (MHz)	S11		S21		S12		S22	
	MAG	ANG(deg.)	MAG	ANG(deg.)	MAG	ANG(deg.)	MAG	ANG(deg.)
100	0.858	-9.2	25.03	171.8	0.006	53.4	0.975	-5.2
200	0.842	-17.1	24.50	164.9	0.010	78.2	0.967	-10.4
300	0.818	-25.4	23.79	157.8	0.013	71.9	0.938	-15.4
400	0.789	-33.3	23.02	151.5	0.018	72.2	0.904	-19.9
500	0.755	-41.1	22.18	145.6	0.022	67.5	0.867	-24.1
600	0.717	-48.4	21.18	139.8	0.025	63.7	0.825	-27.8
700	0.682	-55.6	20.23	134.6	0.028	62.9	0.785	-30.9
800	0.647	-62.3	19.28	129.8	0.030	59.2	0.746	-33.8
900	0.613	-69.0	18.37	125.4	0.032	58.0	0.708	-36.2
1000	0.580	-75.0	17.44	121.3	0.035	56.1	0.672	-38.5
1100	0.553	-80.7	16.57	117.4	0.038	54.5	0.640	-40.4
1200	0.524	-86.4	15.74	113.8	0.039	53.4	0.609	-42.2
1300	0.499	-91.7	14.96	110.5	0.041	52.9	0.581	-43.6
1400	0.474	-97.2	14.23	107.3	0.042	51.3	0.555	-44.8
1500	0.455	-102.7	13.58	104.2	0.044	51.7	0.530	-46.0
1600	0.438	-107.8	12.96	101.4	0.045	50.7	0.506	-47.1
1700	0.424	-112.8	12.38	98.8	0.046	50.0	0.485	-48.2
1800	0.410	-117.3	11.82	96.4	0.048	49.9	0.463	-49.0
1900	0.398	-121.9	11.32	94.0	0.050	48.9	0.444	-49.9
2000	0.387	-126.6	10.87	91.5	0.051	48.4	0.426	-50.7
2200	0.367	-136.3	10.01	87.1	0.054	48.0	0.391	-52.3
2400	0.359	-145.8	9.28	82.9	0.056	47.5	0.360	-53.7
2600	0.357	-154.2	8.63	79.1	0.060	46.6	0.330	-55.4
2800	0.355	-162.0	8.06	75.3	0.062	46.6	0.302	-57.1
3000	0.354	-170.1	7.53	71.7	0.064	45.0	0.275	-58.8
3200	0.360	-177.9	7.06	68.2	0.067	44.1	0.250	-60.8
3400	0.371	175.4	6.65	64.7	0.070	43.1	0.224	-63.1
3600	0.381	169.1	6.27	61.4	0.072	42.3	0.198	-65.2
3800	0.389	162.9	5.91	58.1	0.074	41.6	0.173	-67.3
4000	0.400	156.9	5.56	55.1	0.076	40.6	0.147	-69.7
4200	0.413	152.1	5.26	52.1	0.078	39.9	0.125	-72.2
4400	0.426	148.6	4.99	49.4	0.081	39.7	0.104	-76.7
4600	0.442	144.6	4.77	46.4	0.084	37.9	0.083	-85.4
4800	0.461	140.0	4.52	43.1	0.085	36.5	0.059	-100.8
5000	0.481	136.1	4.29	40.3	0.087	34.9	0.041	-125.2
5200	0.498	132.9	4.08	37.3	0.088	33.8	0.036	-167.0
5400	0.516	129.8	3.87	34.5	0.090	32.3	0.048	159.6
5600	0.531	126.3	3.67	31.7	0.089	31.2	0.066	141.8
5800	0.547	123.1	3.48	29.1	0.091	29.8	0.088	131.2
6000	0.568	120.2	3.31	26.2	0.091	27.8	0.113	125.5

## S Parameter

(V<sub>CE</sub> = 3 V, I<sub>C</sub> = 20 mA, Z<sub>O</sub> = 50 Ω)

f (MHz)	S11		S21		S12		S22	
	MAG	ANG(deg.)	MAG	ANG(deg.)	MAG	ANG(deg.)	MAG	ANG(deg.)
100	0.743	-12.9	40.70	168.3	0.005	-4.2	0.961	-7.1
200	0.714	-25.5	38.93	158.5	0.010	79.3	0.929	-14.7
300	0.671	-37.2	36.62	149.1	0.013	71.4	0.878	-21.1
400	0.624	-48.1	34.15	141.1	0.014	69.1	0.816	-26.6
500	0.576	-58.0	31.56	133.9	0.019	63.5	0.759	-30.9
600	0.529	-66.8	29.04	127.5	0.021	61.0	0.701	-34.3
700	0.490	-75.2	26.73	122.1	0.022	62.1	0.651	-37.0
800	0.453	-82.6	24.65	117.4	0.025	58.8	0.608	-39.1
900	0.425	-89.8	22.80	113.3	0.027	59.4	0.568	-40.8
1000	0.399	-96.1	21.14	109.6	0.029	58.8	0.534	-42.3
1100	0.377	-102.2	19.70	106.2	0.032	57.6	0.503	-43.4
1200	0.356	-108.1	18.38	103.1	0.032	56.8	0.476	-44.3
1300	0.339	-113.9	17.23	100.2	0.033	57.4	0.452	-45.0
1400	0.326	-119.5	16.18	97.6	0.035	56.5	0.431	-45.6
1500	0.316	-125.1	15.27	95.1	0.038	58.3	0.412	-46.1
1600	0.309	-130.2	14.44	92.8	0.038	57.1	0.393	-46.7
1700	0.303	-135.1	13.70	90.6	0.041	57.2	0.376	-47.3
1800	0.296	-139.6	13.00	88.6	0.042	57.0	0.360	-47.5
1900	0.292	-144.1	12.38	86.5	0.043	56.5	0.345	-48.1
2000	0.287	-148.6	11.82	84.5	0.045	57.5	0.331	-48.5
2200	0.283	-158.1	10.80	80.8	0.049	56.7	0.304	-49.4
2400	0.289	-166.6	9.95	77.3	0.052	56.1	0.280	-50.3
2600	0.298	-173.5	9.22	74.0	0.056	55.1	0.256	-51.6
2800	0.304	179.9	8.58	70.7	0.059	54.6	0.231	-53.1
3000	0.312	172.9	7.99	67.5	0.062	53.0	0.210	-54.3
3200	0.325	166.6	7.48	64.4	0.065	52.0	0.187	-56.2
3400	0.342	161.3	7.04	61.3	0.069	51.3	0.164	-58.4
3600	0.356	156.5	6.62	58.4	0.071	49.8	0.141	-60.3
3800	0.367	151.2	6.23	55.3	0.074	49.0	0.118	-61.9
4000	0.382	146.3	5.87	52.6	0.077	47.5	0.094	-63.9
4200	0.398	142.6	5.55	49.9	0.079	46.8	0.073	-65.9
4400	0.412	140.0	5.26	47.4	0.083	46.1	0.053	-71.6
4600	0.428	137.0	5.02	44.7	0.086	44.2	0.033	-90.6
4800	0.449	133.1	4.76	41.6	0.088	42.4	0.019	-150.0
5000	0.471	129.8	4.52	38.9	0.090	40.8	0.032	151.9
5200	0.490	127.2	4.29	36.2	0.091	39.2	0.055	133.9
5400	0.508	124.6	4.07	33.5	0.093	37.9	0.079	125.9
5600	0.523	121.6	3.86	30.9	0.094	36.6	0.102	120.9
5800	0.542	118.8	3.66	28.4	0.095	34.9	0.126	116.8
6000	0.563	116.3	3.48	25.7	0.096	32.8	0.153	114.8

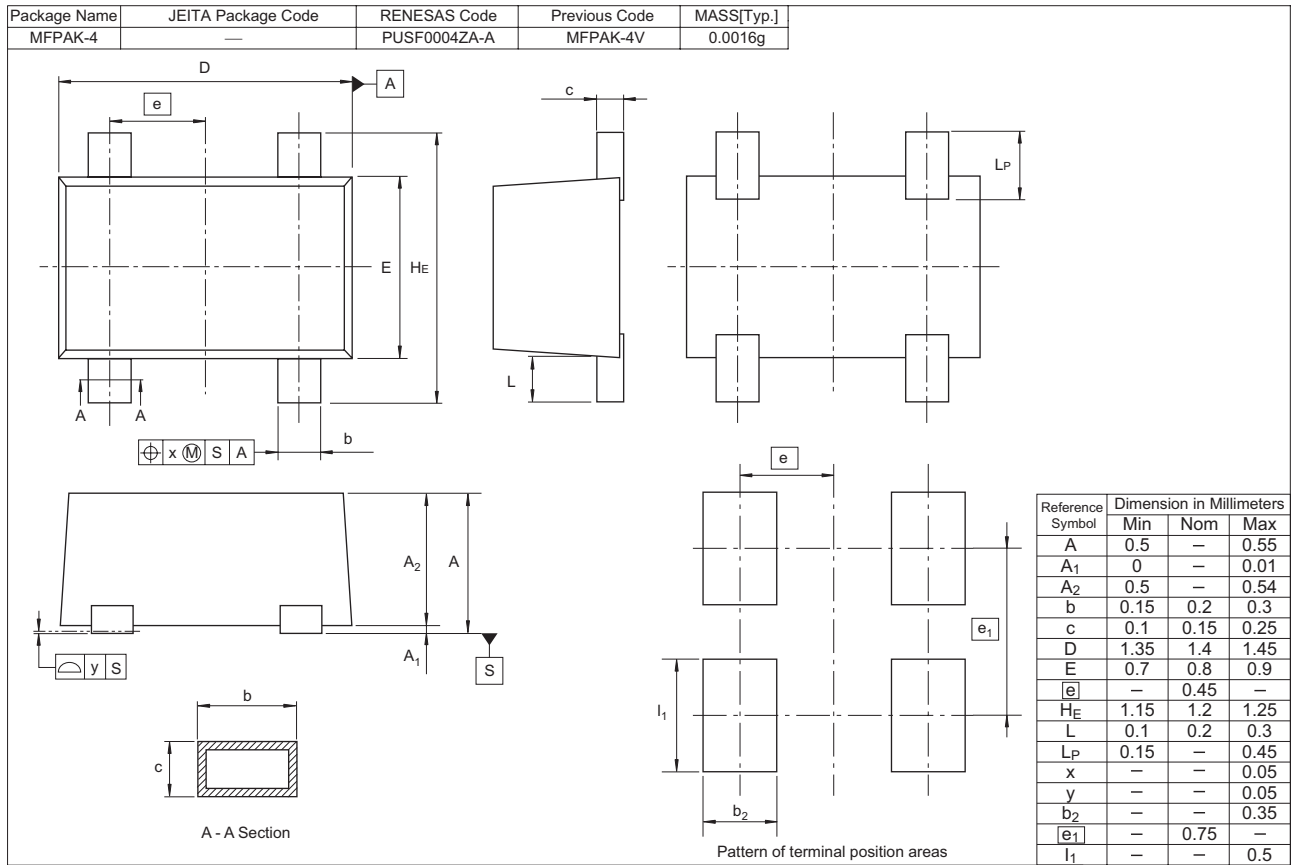


## S Parameter

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

f (MHz)	S11		S21		S12		S22	
	MAG	ANG(deg.)	MAG	ANG(deg.)	MAG	ANG(deg.)	MAG	ANG(deg.)
100	0.433	-27.2	49.96	163.4	0.007	39.6	0.800	-8.9
200	0.409	-52.0	45.46	149.3	0.009	65.3	0.743	-18.7
300	0.384	-73.1	40.04	137.3	0.010	57.5	0.670	-25.1
400	0.365	-91.1	34.94	128.0	0.011	61.8	0.599	-29.4
500	0.351	-105.4	30.50	120.6	0.015	62.3	0.544	-31.9
600	0.341	-117.7	26.85	114.6	0.017	60.5	0.496	-33.3
700	0.338	-127.5	23.87	109.8	0.019	62.7	0.460	-34.2
800	0.333	-135.8	21.42	105.7	0.021	59.8	0.430	-34.7
900	0.334	-142.8	19.38	102.2	0.022	62.1	0.405	-35.0
1000	0.332	-148.9	17.67	99.0	0.025	61.5	0.384	-35.2
1100	0.334	-154.5	16.25	96.2	0.026	61.1	0.365	-35.1
1200	0.333	-159.6	14.99	93.6	0.028	62.0	0.351	-35.2
1300	0.335	-164.2	13.93	91.2	0.029	63.8	0.338	-35.0
1400	0.338	-168.4	12.99	89.0	0.031	62.3	0.327	-34.9
1500	0.342	-172.2	12.18	86.8	0.033	63.6	0.316	-34.9
1600	0.346	-175.4	11.45	84.8	0.035	63.2	0.305	-34.9
1700	0.351	-178.4	10.82	83.0	0.036	62.4	0.296	-35.2
1800	0.353	178.7	10.23	81.2	0.038	63.2	0.286	-34.9
1900	0.356	175.8	9.71	79.4	0.040	61.6	0.277	-35.2
2000	0.360	172.9	9.24	77.6	0.042	62.8	0.268	-35.2
2200	0.370	167.1	8.40	74.3	0.046	62.0	0.251	-35.5
2400	0.385	162.7	7.71	71.0	0.049	61.5	0.235	-35.9
2600	0.398	158.8	7.12	68.0	0.053	60.4	0.218	-36.4
2800	0.408	154.9	6.61	64.9	0.056	59.6	0.199	-37.0
3000	0.420	150.6	6.14	62.0	0.060	58.2	0.183	-37.4
3200	0.435	146.8	5.74	59.1	0.063	57.1	0.165	-38.2
3400	0.452	143.7	5.39	56.2	0.067	56.0	0.146	-38.7
3600	0.465	140.5	5.07	53.3	0.070	54.5	0.127	-38.4
3800	0.476	136.9	4.76	50.4	0.072	53.6	0.109	-37.3
4000	0.490	133.6	4.48	47.9	0.076	52.5	0.090	-35.4
4200	0.505	131.3	4.24	45.3	0.078	51.2	0.072	-32.3
4400	0.517	129.3	4.02	42.8	0.082	50.9	0.054	-28.8
4600	0.532	126.9	3.84	40.1	0.085	48.8	0.034	-21.0
4800	0.549	124.1	3.64	37.2	0.087	46.4	0.018	23.0
5000	0.567	121.8	3.45	34.6	0.090	45.2	0.027	81.2
5200	0.582	119.7	3.28	31.9	0.091	43.8	0.047	98.5
5400	0.597	117.7	3.11	29.4	0.093	42.3	0.068	104.1
5600	0.609	115.3	2.96	26.8	0.094	41.0	0.090	106.0
5800	0.625	113.1	2.81	24.4	0.096	39.5	0.111	106.4
6000	0.642	111.1	2.68	21.8	0.096	37.2	0.136	107.2

### Package Dimensions



### Ordering Information

Part No.	Quantity	Shipping Container
RQG1004UP-TL-E	10000 pcs	φ178 mm reel, 8 mm emboss taping

Note: For some grades, production may be terminated. Please contact the Renesas sales office to check the state of production before ordering the product.

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