

## 2SK2596

### Silicon N-Channel MOS FET UHF Power Amplifier

REJ03G0207-0400

Rev.4.00

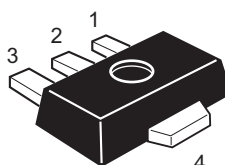
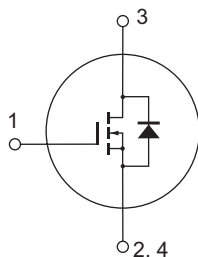
Nov 08, 2007

#### Features

- High power output, High gain, High efficiency  
PG = 12.2 dB, Pout = 1.05 W,  $\eta_D = 45\%$  min. (f = 836.5 MHz)
- Compact package capable of surface mounting

#### Outline

RENESAS package code: PLZZ0004CA-A  
(Package name: UPAK<sup>®</sup>)



1. Gate
2. Source
3. Drain
4. Source

Note: Marking is "BX".

\*UPAK is a trademark of Renesas Technology Corp.

#### Absolute Maximum Ratings

(Ta = 25°C)

Item	Symbol	Ratings	Unit
Drain to source voltage	$V_{DSS}$	17	V
Gate to source voltage	$V_{GSS}$	±10	V
Drain current	$I_D$	0.4	A
Drain peak current	$I_{D(pulse)}$ <sup>Note1</sup>	1	A
Channel dissipation	$P_{ch}$ <sup>Note2</sup>	3	W
Channel temperature	$T_{ch}$	150	°C
Storage temperature	$T_{stg}$	-45 to +150	°C

Notes: 1.  $PW \leq 10 \mu s$ , duty cycle  $\leq 1\%$

2. Value at  $T_c = 25^\circ C$

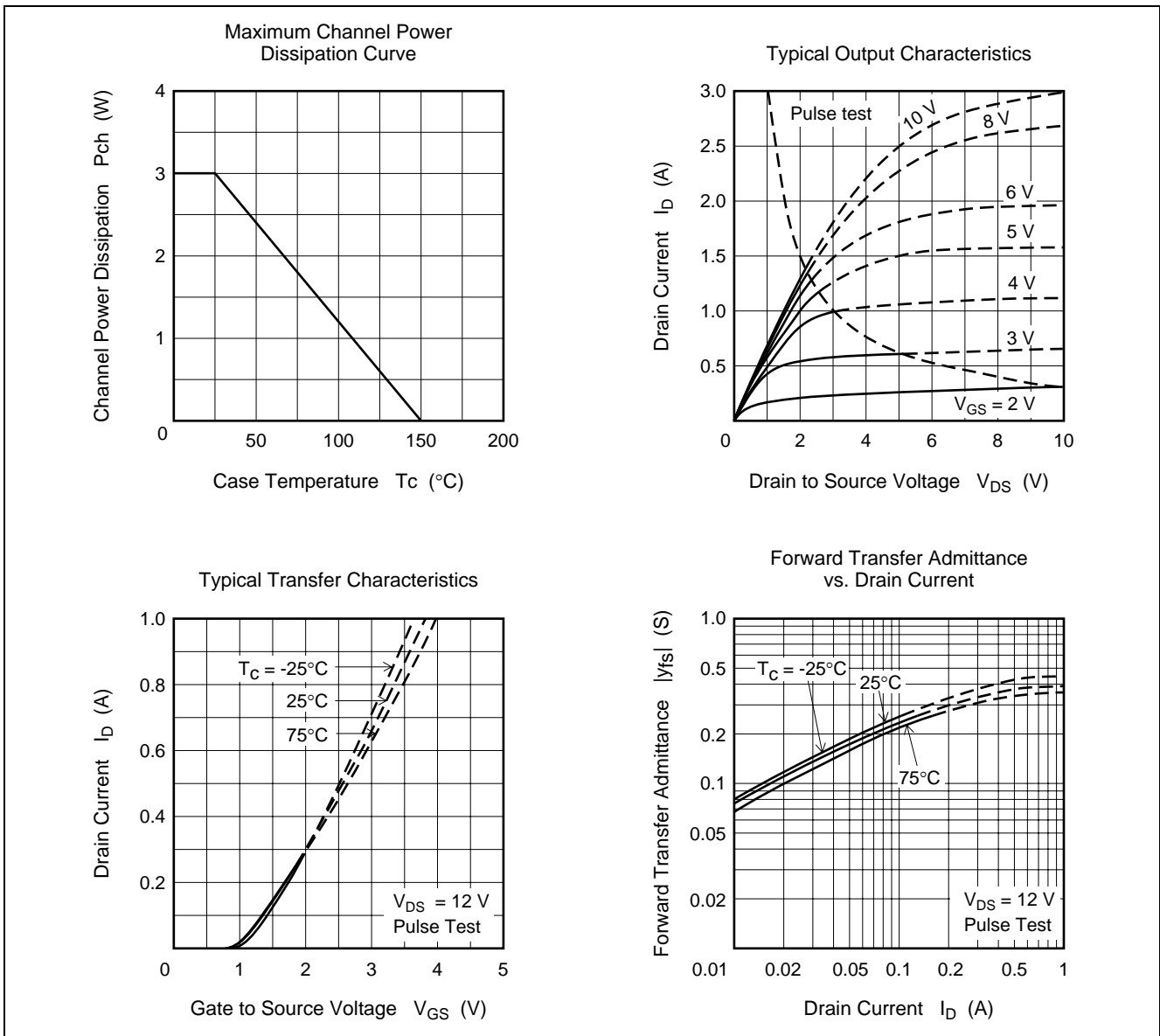
This device is sensitive to electro static discharge. An adequate careful handling procedure is requested.

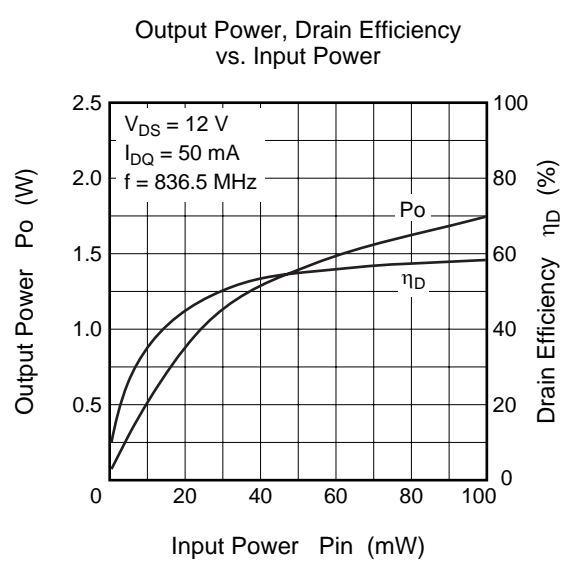
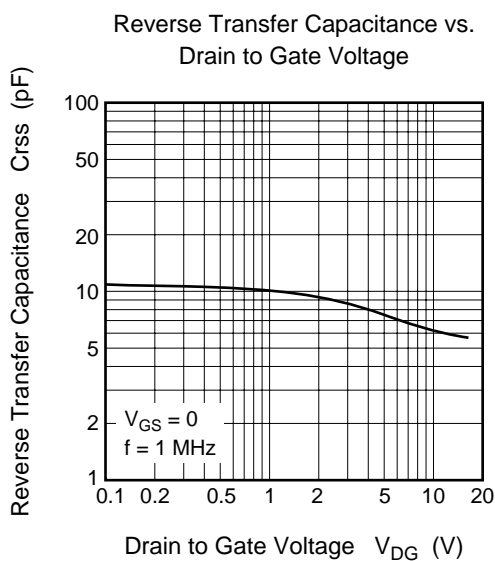
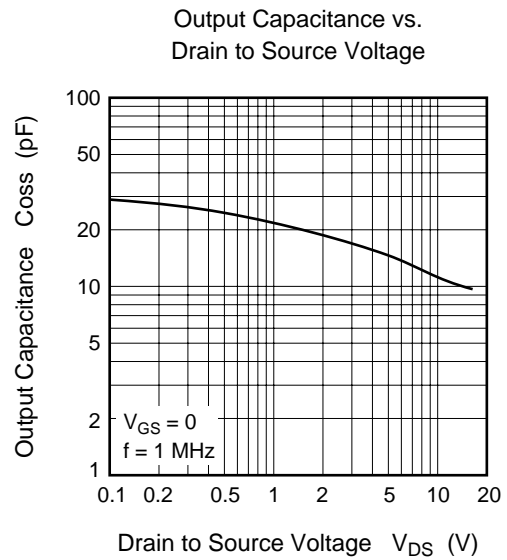
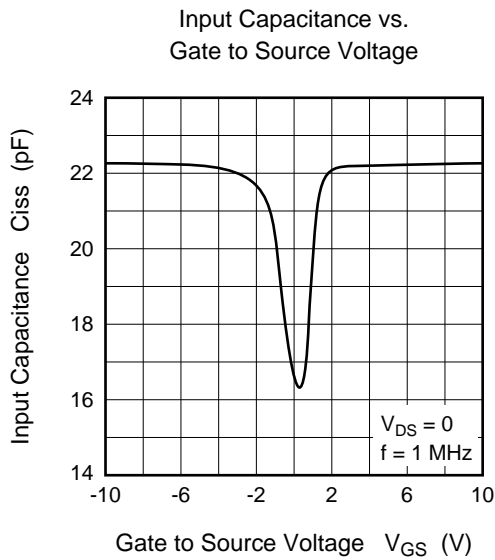
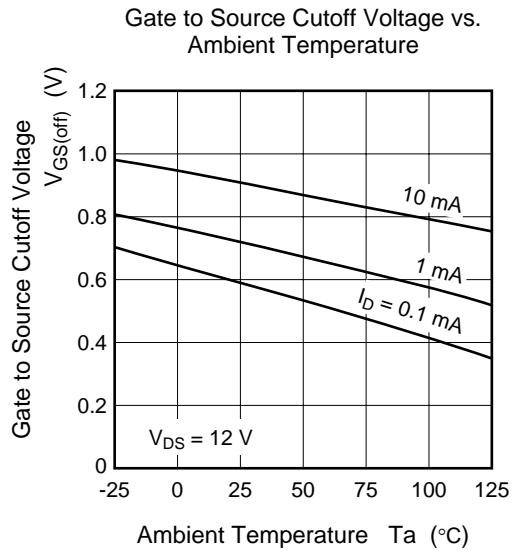
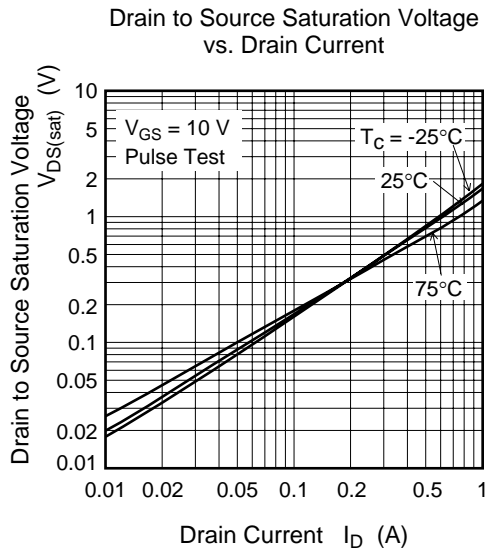
### Electrical Characteristics

(Ta = 25°C)

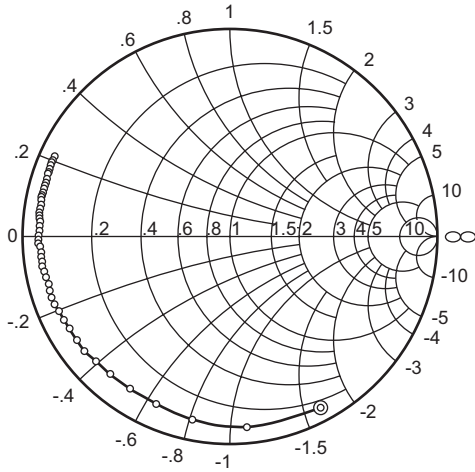
Item	Symbol	Min.	Typ	Max.	Unit	Test Conditions
Zero gate voltage drain current	$I_{DSS}$	—	—	10	$\mu A$	$V_{DS} = 12 V, V_{GS} = 0$
Gate to source leak current	$I_{GSS}$	—	—	$\pm 5.0$	$\mu A$	$V_{GS} = \pm 10 V, V_{DS} = 0$
Gate to source cutoff voltage	$V_{GS(off)}$	0.4	—	1.1	V	$V_{DS} = 12 V, I_D = 2 mA$
Input capacitance	$C_{iss}$	—	22	—	pF	$V_{GS} = 5 V, V_{DS} = 0, f = 1 MHz$
Output capacitance	$C_{oss}$	—	10.5	—	pF	$V_{DS} = 12 V, V_{GS} = 0, f = 1 MHz$
Output Power	$P_{out}$	30.2	31.5	—	dBm	$V_{DS} = 12 V, I_{DQ} = 50 mA$
		1.05	1.4	—	W	$f = 836.5 MHz, P_{in} = 63 mW$
Drain Efficiency	$\eta_D$	45	55	—	%	

### Main Characteristics



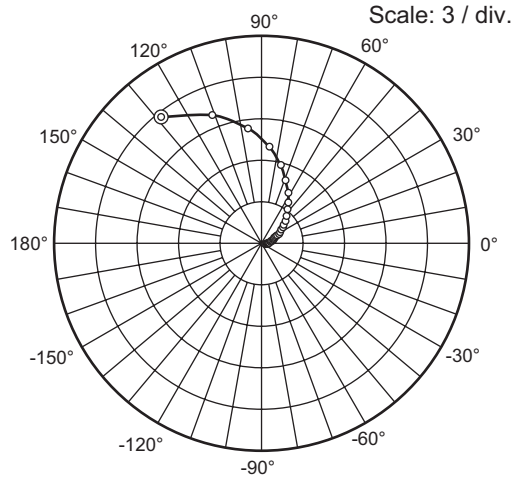


S<sub>11</sub> Parameter vs. Frequency



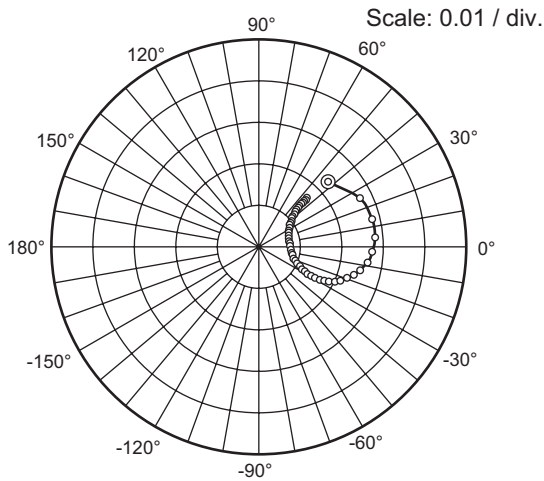
Test condition:  $V_{DS} = 12\text{ V}$ ,  $I_{DQ} = 50\text{ mA}$ ,  $Z_O = 50\ \Omega$   
100 to 2500 MHz (50 MHz step)

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



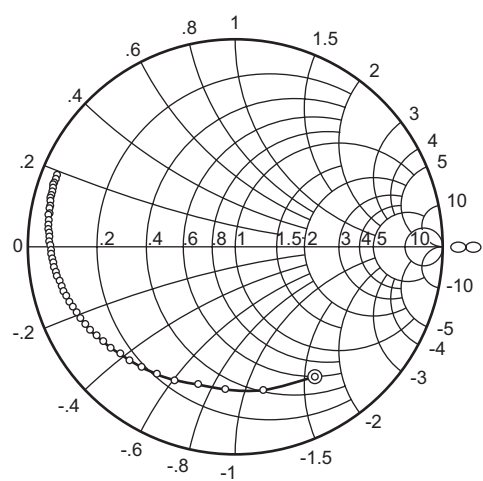
Test condition:  $V_{DS} = 12\text{ V}$ ,  $I_{DQ} = 50\text{ mA}$ ,  $Z_O = 50\ \Omega$   
100 to 2500 MHz (50 MHz step)

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



Test condition:  $V_{DS} = 12\text{ V}$ ,  $I_{DQ} = 50\text{ mA}$ ,  $Z_O = 50\ \Omega$   
100 to 2500 MHz (50 MHz step)

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



Test condition:  $V_{DS} = 12\text{ V}$ ,  $I_{DQ} = 50\text{ mA}$ ,  $Z_O = 50\ \Omega$   
100 to 2500 MHz (50 MHz step)

## S Parameter

 $(V_{DS} = 3.8 \text{ V}, I_{DQ} = 50 \text{ mA}, Z_O = 50 \Omega)$ 

f (MHz)	S11		S21		S12		S22	
	MAG	ANG(deg.)	MAG	ANG(deg.)	MAG	ANG(deg.)	MAG	ANG(deg.)
100	0.875	-71.1	7.24	121.4	0.0440	28.8	0.646	-97.9
150	0.825	-95.7	6.41	100.9	0.0474	12.2	0.662	-118.6
200	0.807	-110.8	5.28	86.8	0.0471	1.8	0.677	-130.6
250	0.806	-121.1	4.27	76.7	0.0454	-6.9	0.711	-139.0
300	0.811	-129.1	3.46	68.9	0.0440	-12.7	0.731	-145.0
350	0.824	-135.7	2.85	62.4	0.0416	-17.6	0.746	-149.9
400	0.840	-141.1	2.39	56.8	0.0393	-21.4	0.764	-153.5
450	0.853	-145.4	2.03	52.1	0.0374	-24.9	0.774	-156.9
500	0.860	-149.1	1.75	48.1	0.0352	-27.0	0.788	-159.6
550	0.868	-152.6	1.52	44.6	0.0334	-29.7	0.800	-162.1
600	0.874	-155.8	1.34	41.4	0.0316	-31.1	0.808	-164.1
650	0.883	-158.6	1.19	38.5	0.0301	-32.5	0.817	-166.0
700	0.890	-160.9	1.06	35.9	0.0289	-33.7	0.818	-167.9
750	0.895	-163.1	0.96	33.4	0.0273	-34.7	0.827	-169.6
800	0.895	-165.1	0.87	31.0	0.0259	-35.2	0.834	-171.3
850	0.897	-167.1	0.79	28.9	0.0247	-36.1	0.835	-172.7
900	0.900	-169.1	0.72	26.9	0.0233	-36.8	0.839	-174.1
950	0.904	-170.8	0.67	25.1	0.0224	-36.7	0.843	-175.5
1000	0.908	-172.3	0.62	23.2	0.0214	-37.0	0.849	-176.8
1050	0.908	-173.8	0.57	21.3	0.0204	-36.6	0.853	-178.0
1100	0.909	-175.3	0.53	19.4	0.0197	-37.0	0.858	-179.3
1150	0.910	-176.8	0.50	17.6	0.0187	-36.6	0.858	179.5
1200	0.911	-178.1	0.47	16.1	0.0179	-35.9	0.864	178.3
1250	0.915	-179.3	0.44	14.6	0.0172	-34.9	0.866	177.2
1300	0.918	179.6	0.41	13.0	0.0165	-34.9	0.870	176.2
1350	0.918	178.4	0.39	11.4	0.0157	-33.1	0.873	175.1
1400	0.915	177.1	0.37	9.8	0.0150	-32.4	0.871	174.0
1450	0.916	175.9	0.35	8.4	0.0144	-30.6	0.874	173.1
1500	0.918	174.7	0.33	6.9	0.0139	-29.2	0.876	172.0
1550	0.919	173.6	0.32	5.6	0.0131	-27.5	0.878	170.7
1600	0.921	172.8	0.30	4.2	0.0128	-25.5	0.883	169.8
1650	0.923	171.8	0.29	3.0	0.0122	-23.1	0.882	169.0
1700	0.923	170.8	0.27	1.6	0.0120	-22.0	0.885	167.9
1750	0.923	169.6	0.26	0.1	0.0119	-18.9	0.887	166.9
1800	0.925	168.5	0.25	-1.2	0.0116	-16.6	0.892	165.8
1850	0.926	167.6	0.24	-2.6	0.0114	-13.7	0.893	164.7
1900	0.925	166.9	0.23	-3.8	0.0111	-10.7	0.893	163.5
1950	0.923	165.9	0.22	-5.3	0.0111	-7.1	0.896	163.3
2000	0.923	164.9	0.21	-6.4	0.0109	-6.1	0.898	161.9
2050	0.923	163.9	0.20	-7.5	0.0110	-3.0	0.898	161.0
2100	0.923	162.9	0.20	-8.6	0.0111	0.8	0.899	160.1
2150	0.924	161.9	0.19	-9.9	0.0111	3.0	0.903	159.1
2200	0.927	160.8	0.18	-11.0	0.0115	5.6	0.901	158.6
2250	0.927	159.9	0.18	-12.2	0.0114	7.9	0.905	157.5
2300	0.927	158.9	0.17	-13.1	0.0116	9.9	0.905	156.5
2350	0.929	157.9	0.16	-14.4	0.0120	12.4	0.908	155.6
2400	0.930	157.0	0.16	-15.4	0.0123	13.2	0.909	155.1
2450	0.931	156.2	0.15	-16.4	0.0124	15.0	0.905	154.1
2500	0.930	155.2	0.15	-17.4	0.0130	16.2	0.903	153.2

## S Parameter

 $(V_{DS} = 6.0 \text{ V}, I_{DQ} = 50 \text{ mA}, Z_O = 50 \Omega)$ 

f (MHz)	S11		S21		S12		S22	
	MAG	ANG(deg.)	MAG	ANG(deg.)	MAG	ANG(deg.)	MAG	ANG(deg.)
100	0.883	-68.6	9.10	123.1	0.0371	33.6	0.675	-83.2
150	0.851	-92.2	7.85	104.4	0.0411	15.6	0.668	-105.0
200	0.836	-108.2	6.46	89.9	0.0410	4.6	0.672	-118.6
250	0.828	-119.0	5.26	79.3	0.0405	-3.2	0.699	-128.4
300	0.829	-127.4	4.28	71.1	0.0388	-10.1	0.715	-135.6
350	0.839	-134.4	3.54	64.2	0.0369	-15.2	0.732	-141.2
400	0.852	-139.9	2.97	58.4	0.0352	-19.6	0.751	-145.8
450	0.863	-144.3	2.53	53.4	0.0332	-22.8	0.763	-149.4
500	0.869	-148.1	2.18	49.3	0.0315	-25.2	0.778	-152.7
550	0.875	-151.8	1.90	45.5	0.0299	-27.6	0.787	-155.6
600	0.880	-155.0	1.68	42.2	0.0283	-29.4	0.796	-158.2
650	0.887	-157.8	1.48	39.1	0.0269	-31.1	0.805	-160.5
700	0.894	-160.2	1.33	36.3	0.0255	-32.4	0.811	-162.6
750	0.897	-162.4	1.19	33.6	0.0245	-33.3	0.822	-164.4
800	0.898	-164.4	1.08	31.1	0.0230	-34.5	0.827	-166.4
850	0.900	-166.6	0.99	28.8	0.0218	-34.7	0.828	-167.9
900	0.902	-168.5	0.90	26.8	0.0208	-35.2	0.834	-169.8
950	0.906	-170.3	0.83	24.8	0.0195	-35.6	0.839	-171.3
1000	0.910	-171.8	0.77	22.7	0.0188	-35.8	0.846	-172.9
1050	0.910	-173.3	0.71	20.7	0.0178	-35.5	0.849	-174.3
1100	0.912	-174.8	0.66	18.8	0.0169	-34.7	0.854	-175.8
1150	0.911	-176.3	0.62	16.9	0.0160	-34.6	0.855	-176.9
1200	0.914	-177.6	0.58	15.2	0.0153	-33.8	0.861	-178.2
1250	0.918	-178.8	0.54	13.7	0.0144	-32.6	0.864	-179.4
1300	0.920	-179.9	0.51	12.1	0.0139	-31.3	0.868	179.3
1350	0.920	178.9	0.48	10.4	0.0133	-28.6	0.871	178.3
1400	0.917	177.5	0.45	8.8	0.0125	-28.2	0.873	177.0
1450	0.918	176.2	0.43	7.2	0.0121	-26.1	0.877	176.0
1500	0.919	175.0	0.41	5.6	0.0116	-23.4	0.877	174.7
1550	0.921	174.0	0.39	4.4	0.0110	-21.4	0.879	173.5
1600	0.923	173.1	0.37	2.9	0.0106	-17.6	0.883	172.5
1650	0.925	172.2	0.35	1.5	0.0103	-15.3	0.886	171.5
1700	0.925	171.1	0.33	0.1	0.0103	-12.9	0.889	170.5
1750	0.925	169.9	0.32	-1.5	0.0098	-8.7	0.894	169.5
1800	0.927	168.9	0.31	-2.8	0.0100	-5.4	0.897	168.4
1850	0.928	167.9	0.29	-4.2	0.0100	-1.3	0.901	167.1
1900	0.926	167.3	0.28	-5.5	0.0099	0.5	0.896	165.9
1950	0.925	166.2	0.26	-7.0	0.0100	5.7	0.897	165.5
2000	0.924	165.2	0.25	-8.2	0.0101	8.1	0.903	164.1
2050	0.925	164.2	0.24	-9.3	0.0102	10.3	0.900	163.1
2100	0.925	163.2	0.24	-10.5	0.0103	12.8	0.904	162.0
2150	0.926	162.1	0.23	-11.8	0.0106	15.5	0.906	161.2
2200	0.929	161.1	0.22	-13.0	0.0110	17.7	0.908	160.4
2250	0.929	160.2	0.21	-14.1	0.0114	20.0	0.904	159.5
2300	0.929	159.2	0.20	-15.2	0.0118	22.1	0.909	158.2
2350	0.931	158.2	0.20	-16.4	0.0123	24.2	0.915	157.6
2400	0.934	157.3	0.19	-17.5	0.0126	25.3	0.910	156.8
2450	0.933	156.5	0.18	-18.6	0.0128	26.1	0.909	155.8
2500	0.932	155.5	0.18	-19.7	0.0134	26.9	0.910	154.8

## S Parameter

 $(V_{DS} = 7.2 \text{ V}, I_{DQ} = 50 \text{ mA}, Z_O = 50 \Omega)$ 

f (MHz)	S11		S21		S12		S22	
	MAG	ANG(deg.)	MAG	ANG(deg.)	MAG	ANG(deg.)	MAG	ANG(deg.)
100	0.895	-67.4	9.82	124.2	0.0332	37.0	0.689	-76.7
150	0.866	-90.5	8.41	106.1	0.0382	18.0	0.676	-98.7
200	0.850	-106.8	6.97	91.5	0.0385	6.6	0.673	-112.6
250	0.842	-117.9	5.71	80.7	0.0382	-1.9	0.697	-123.1
300	0.840	-126.6	4.66	72.3	0.0362	-8.4	0.715	-130.8
350	0.847	-133.6	3.87	65.3	0.0348	-13.8	0.728	-136.8
400	0.858	-139.3	3.25	59.2	0.0328	-17.8	0.746	-141.6
450	0.869	-143.8	2.77	54.2	0.0313	-21.7	0.760	-145.7
500	0.874	-147.7	2.40	49.8	0.0298	-24.2	0.772	-149.4
550	0.879	-151.3	2.09	46.0	0.0282	-26.4	0.782	-152.4
600	0.884	-154.6	1.84	42.6	0.0267	-28.9	0.793	-155.1
650	0.891	-157.5	1.63	39.4	0.0253	-30.6	0.802	-157.7
700	0.896	-159.9	1.46	36.5	0.0241	-31.3	0.810	-159.6
750	0.899	-162.1	1.31	33.7	0.0225	-32.9	0.816	-162.1
800	0.900	-164.1	1.19	31.1	0.0215	-33.2	0.822	-163.9
850	0.901	-166.3	1.08	28.8	0.0205	-34.3	0.827	-165.5
900	0.904	-168.3	0.99	26.6	0.0191	-34.5	0.834	-167.5
950	0.908	-170.0	0.91	24.5	0.0183	-34.5	0.839	-169.1
1000	0.912	-171.6	0.84	22.5	0.0173	-34.5	0.844	-170.6
1050	0.912	-173.0	0.78	20.4	0.0165	-34.1	0.851	-172.3
1100	0.913	-174.6	0.72	18.3	0.0155	-33.9	0.854	-173.8
1150	0.913	-176.0	0.68	16.5	0.0146	-33.2	0.857	-175.2
1200	0.915	-177.4	0.63	14.7	0.0139	-32.0	0.862	-176.4
1250	0.919	-178.6	0.59	13.1	0.0132	-30.1	0.866	-177.8
1300	0.921	-179.7	0.56	11.5	0.0126	-28.9	0.869	-178.9
1350	0.921	179.1	0.53	9.7	0.0119	-25.8	0.873	179.8
1400	0.918	177.7	0.49	8.1	0.0113	-23.4	0.876	178.5
1450	0.919	176.4	0.47	6.4	0.0108	-22.4	0.880	177.5
1500	0.920	175.3	0.44	4.9	0.0102	-19.1	0.878	176.3
1550	0.922	174.1	0.42	3.5	0.0101	-15.1	0.881	175.0
1600	0.923	173.3	0.40	2.0	0.0097	-12.4	0.885	173.8
1650	0.926	172.3	0.38	0.7	0.0093	-8.8	0.886	172.9
1700	0.927	171.3	0.36	-0.8	0.0093	-5.0	0.890	171.7
1750	0.926	170.1	0.35	-2.3	0.0094	-1.7	0.894	170.7
1800	0.928	169.1	0.33	-3.8	0.0091	1.6	0.897	169.3
1850	0.929	168.1	0.32	-5.2	0.0093	6.0	0.898	168.3
1900	0.928	167.4	0.30	-6.5	0.0095	8.8	0.900	166.9
1950	0.925	166.3	0.29	-8.1	0.0099	14.4	0.899	166.6
2000	0.926	165.3	0.27	-9.2	0.0100	15.8	0.904	165.1
2050	0.926	164.3	0.26	-10.4	0.0102	18.8	0.904	164.2
2100	0.926	163.3	0.25	-11.6	0.0104	20.4	0.907	162.9
2150	0.928	162.2	0.24	-12.9	0.0108	23.0	0.908	162.1
2200	0.929	161.2	0.24	-14.1	0.0114	25.2	0.912	161.6
2250	0.930	160.3	0.23	-15.3	0.0114	26.2	0.909	160.4
2300	0.930	159.3	0.22	-16.4	0.0121	27.4	0.913	159.2
2350	0.933	158.2	0.21	-17.6	0.0124	28.9	0.917	158.4
2400	0.935	157.4	0.20	-18.8	0.0131	29.6	0.911	157.6
2450	0.934	156.6	0.20	-19.7	0.0133	31.0	0.912	156.9
2500	0.934	155.6	0.19	-20.9	0.0134	31.5	0.912	155.8

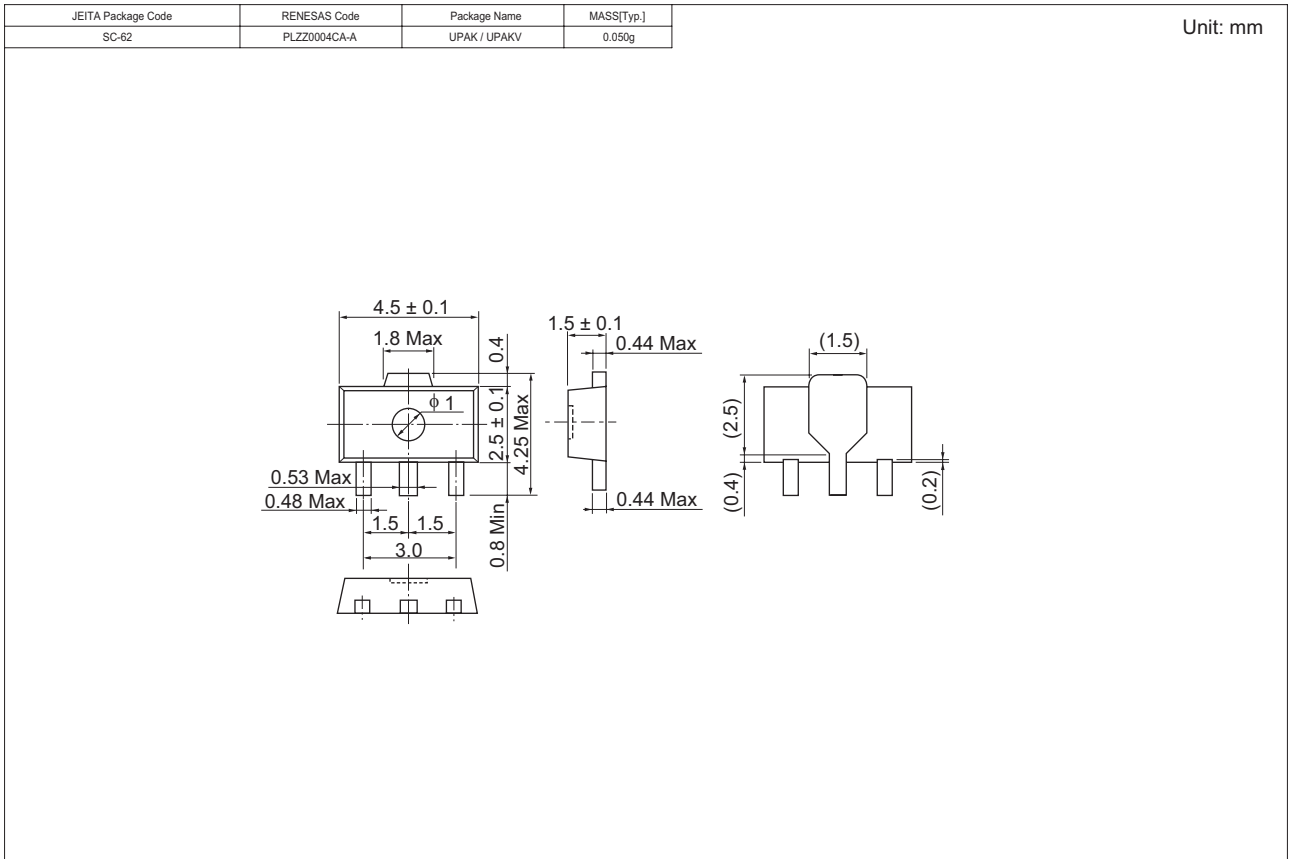
## S Parameter

 $(V_{DS} = 12\text{ V}, I_{DQ} = 50\text{ mA}, Z_O = 50\ \Omega)$ 

f (MHz)	S11		S21		S12		S22	
	MAG	ANG(deg.)	MAG	ANG(deg.)	MAG	ANG(deg.)	MAG	ANG(deg.)
100	0.932	-62.1	11.71	128.4	0.0228	42.3	0.735	-59.0
150	0.921	-85.1	9.96	111.2	0.0270	25.0	0.709	-79.5
200	0.898	-101.9	8.40	96.8	0.0281	13.2	0.691	-94.0
250	0.882	-114.0	7.04	85.0	0.0282	4.1	0.694	-105.3
300	0.877	-123.5	5.80	76.1	0.0275	-3.0	0.714	-114.4
350	0.879	-131.1	4.86	68.7	0.0265	-8.9	0.723	-121.6
400	0.884	-137.2	4.11	62.1	0.0252	-13.4	0.738	-127.7
450	0.892	-141.9	3.53	56.6	0.0239	-17.1	0.753	-132.7
500	0.893	-146.0	3.06	52.0	0.0228	-20.2	0.765	-137.0
550	0.893	-150.2	2.68	47.7	0.0215	-23.0	0.776	-140.9
600	0.895	-153.4	2.37	43.7	0.0203	-25.1	0.788	-144.3
650	0.900	-156.4	2.10	40.3	0.0191	-27.0	0.799	-147.3
700	0.907	-158.8	1.88	37.0	0.0179	-27.9	0.808	-150.1
750	0.909	-161.1	1.70	33.9	0.0168	-29.4	0.816	-152.7
800	0.909	-163.2	1.53	30.9	0.0157	-30.1	0.825	-155.1
850	0.906	-165.4	1.40	28.3	0.0147	-30.2	0.831	-157.3
900	0.909	-167.5	1.28	25.8	0.0136	-30.2	0.837	-159.5
950	0.912	-169.4	1.18	23.3	0.0127	-29.4	0.845	-161.5
1000	0.917	-170.9	1.08	21.1	0.0119	-28.5	0.851	-163.5
1050	0.915	-172.3	1.00	18.9	0.0111	-26.8	0.857	-165.3
1100	0.916	-173.9	0.93	16.5	0.0103	-25.1	0.862	-167.1
1150	0.916	-175.3	0.87	14.3	0.0096	-22.8	0.866	-168.8
1200	0.917	-177.0	0.81	12.4	0.0090	-19.8	0.871	-170.4
1250	0.923	-178.0	0.75	10.8	0.0085	-15.8	0.876	-171.9
1300	0.925	-179.3	0.71	8.8	0.0080	-11.9	0.880	-173.4
1350	0.923	179.7	0.67	7.0	0.0078	-7.0	0.883	-174.8
1400	0.921	178.2	0.62	5.2	0.0074	-1.8	0.886	-176.2
1450	0.920	176.8	0.59	3.4	0.0074	3.6	0.889	-177.6
1500	0.920	175.5	0.56	1.9	0.0074	8.5	0.890	-178.9
1550	0.923	174.5	0.52	0.2	0.0075	13.5	0.893	179.7
1600	0.927	173.7	0.50	-1.4	0.0076	18.0	0.897	178.4
1650	0.928	172.7	0.47	-2.8	0.0079	23.3	0.899	177.2
1700	0.926	171.5	0.45	-4.5	0.0082	26.4	0.902	175.9
1750	0.926	170.3	0.43	-5.9	0.0086	29.8	0.905	174.7
1800	0.927	169.1	0.41	-7.5	0.0090	33.1	0.910	173.5
1850	0.929	168.2	0.39	-9.0	0.0095	35.5	0.912	172.2
1900	0.927	167.5	0.38	-10.4	0.0100	37.1	0.913	170.8
1950	0.927	166.6	0.36	-12.0	0.0105	40.0	0.911	170.2
2000	0.928	165.4	0.34	-13.4	0.0109	41.0	0.917	168.6
2050	0.927	164.5	0.33	-14.6	0.0115	41.8	0.916	167.6
2100	0.924	163.5	0.32	-15.9	0.0121	42.8	0.918	166.4
2150	0.925	162.4	0.30	-17.2	0.0126	43.1	0.921	165.3
2200	0.930	161.1	0.29	-18.3	0.0132	44.0	0.922	164.6
2250	0.928	160.4	0.28	-19.8	0.0137	44.4	0.921	163.4
2300	0.929	159.3	0.26	-20.9	0.0142	44.7	0.924	162.3
2350	0.931	158.3	0.26	-22.1	0.0148	44.5	0.927	161.4
2400	0.932	157.3	0.25	-23.4	0.0153	44.4	0.926	160.6
2450	0.931	156.6	0.24	-24.5	0.0158	44.6	0.924	159.4
2500	0.930	155.6	0.23	-25.7	0.0163	44.4	0.925	158.4



## Package Dimensions



## Ordering Information

Part Name	Quantity	Shipping Container
2SK2596BXTL-E	1000 pcs.	$\phi 178$ mm Reel, 12 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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