

RQA0002DNS

Silicon N-Channel MOS FET

REJ03G0583-0200

Rev.2.00

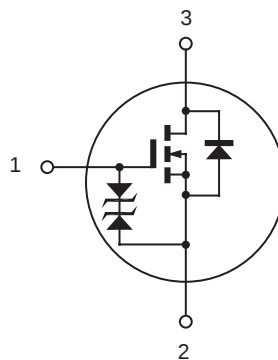
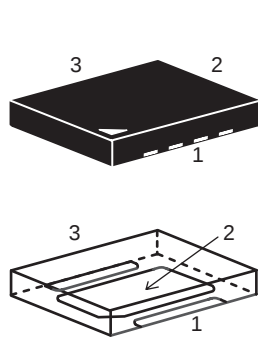
Aug 03, 2006

Features

- High output power, High gain, High efficiency
Pout = +39.6 dBm, Linear gain = 20 dB, PAE = 68% (f = 520 MHz)
- Small outline package (WSN0504-2: 5.0 × 4.0 × 0.8 mm)

Outline

RENESAS Package code: PWSN0002ZA-B
(Package name: HWSN-2 <WSN0504-2>)



1. Gate
2. Source
3. Drain

Note: Marking is "RQA0002".

Absolute Maximum Ratings

(Ta = 25°C)

Item	Symbol	Ratings	Unit
Drain to source voltage	V _{DSS}	16	V
Gate to source voltage	V _{GSS}	±5	V
Drain current	I _D	3.8	A
Channel dissipation	P _{ch}	15	W
Channel temperature	T _{ch}	150	°C
Storage temperature	T _{stg}	-55 to +150	°C

Note: Value at Tc = 25°C

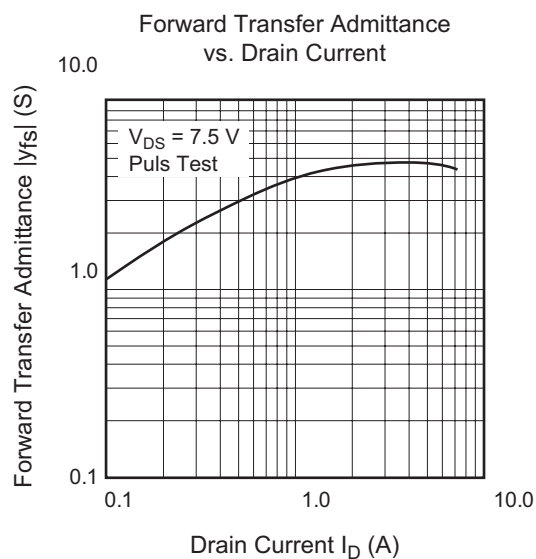
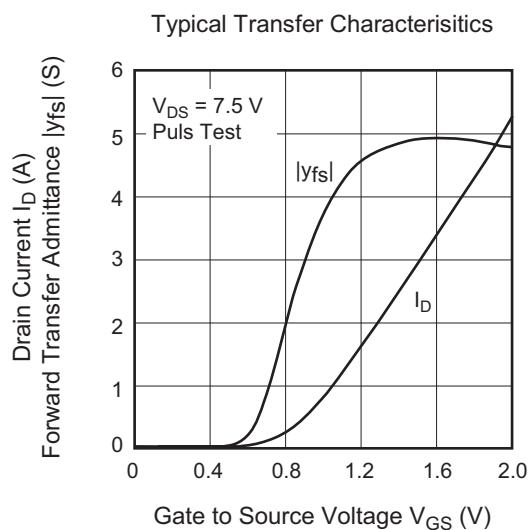
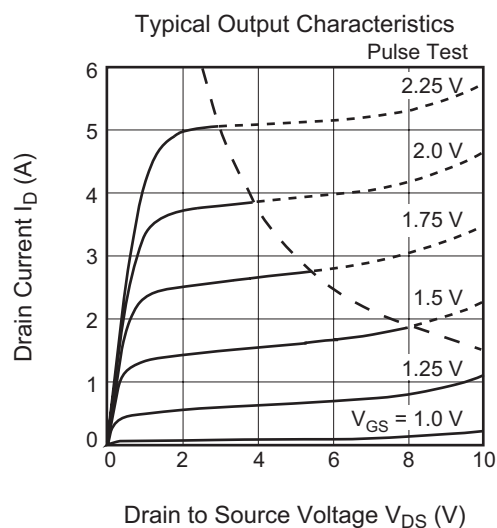
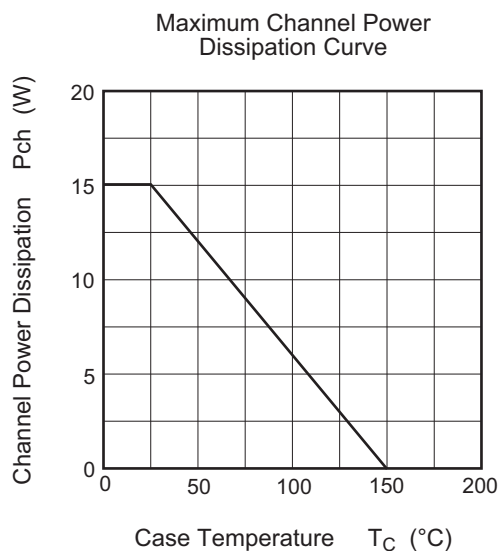
This device is sensitive to electro static discharge. An adequate handling procedure is requested.

Electrical Characteristics

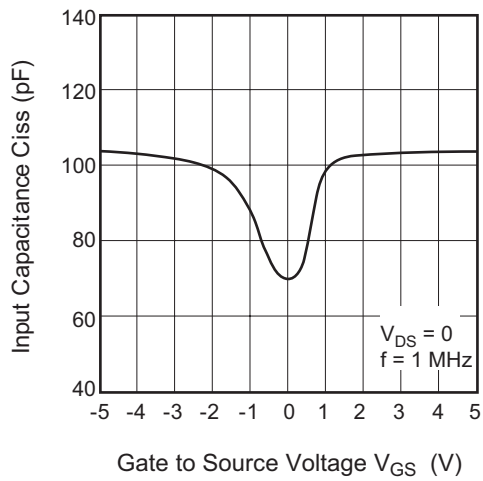
(Ta = 25°C)

Item	Symbol	Min.	Typ	Max.	Unit	Test Conditions
Zero gate voltage drain current	I_{DSS}	—	—	20	μA	$V_{DS} = 16 V, V_{GS} = 0$
Gate to source leak current	I_{GSS}	—	—	± 3	μA	$V_{GS} = \pm 5 V, V_{DS} = 0$
Gate to source cutoff voltage	$V_{GS(off)}$	0.25	0.4	0.75	V	$I_D = 1 mA, V_{DS} = 7.5 V$
Forward transfer admittance	$ y_{fs} $	4.0	4.8	5.8	S	$V_{DS} = 7.5 V, I_D = 2 A$
Input capacitance	C_{iss}	—	102	—	pF	$V_{GS} = 5 V, V_{DS} = 0, f = 1 MHz$
Output capacitance	C_{oss}	—	50	—	pF	$V_{DS} = 7.5 V, V_{GS} = 0, f = 1 MHz$
Reverse transfer capacitance	C_{rss}	—	4.5	—	pF	$V_{DS} = 7.5 V, V_{GS} = 0, f = 1 MHz$
Output power	P_{out}	38.7	39.6	—	dBm	$V_{DS} = 7.5 V, I_{DQ} = 200 mA$ $f = 520 MHz, P_{in} = +25 dBm$
		7.41	9.12	—	W	
Power added efficiency	PAE	60	68	—	%	
Output power	P_{out}	—	35.8	—	dBm	$V_{DS} = 3.6 V, I_{DQ} = 200 mA$ $f = 520 MHz, P_{in} = +25 dBm$
		—	3.8	—	W	
Power added efficiency	PAE	—	60	—	%	

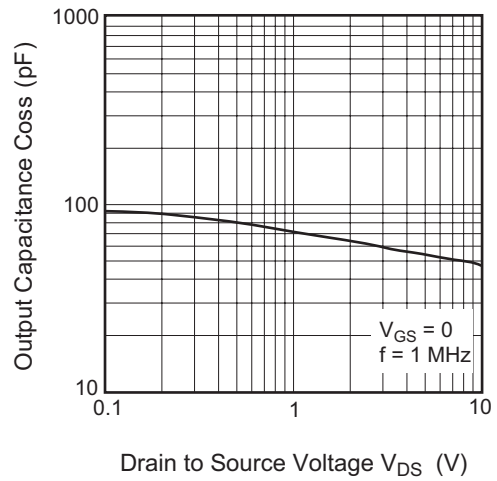
Main Characteristics



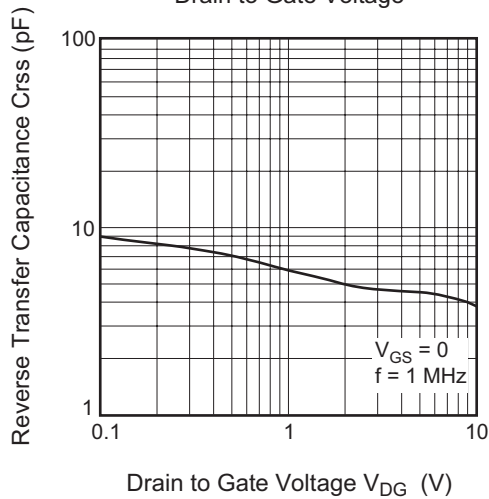
Input Capacitance vs.
Gate to Source Voltage



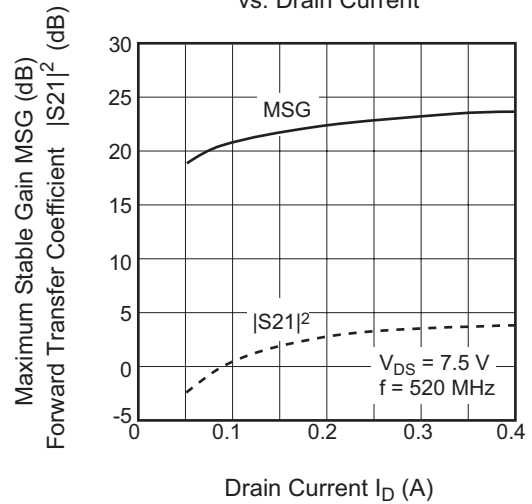
Output Capacitance vs.
Drain to Source Voltage

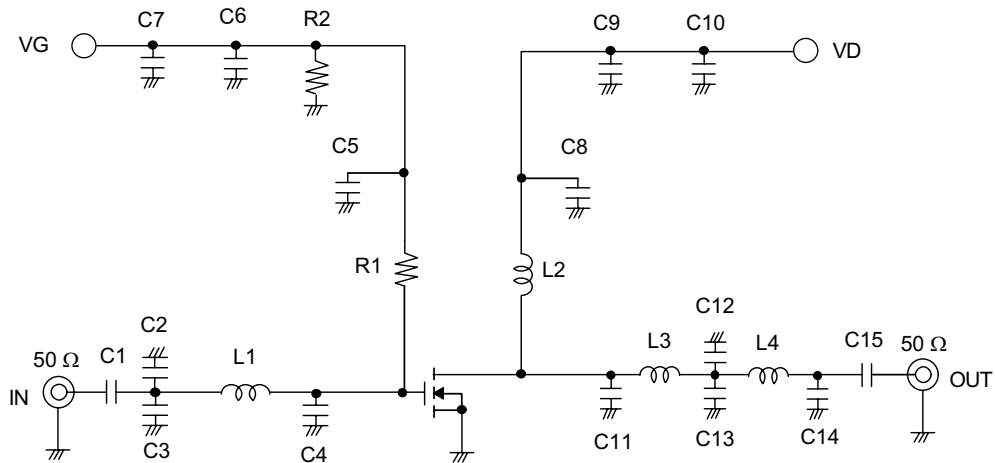


Reverse Transfer Capacitance vs.
Drain to Gate Voltage

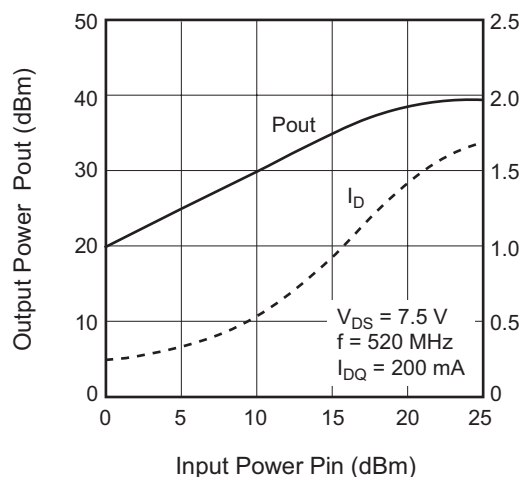
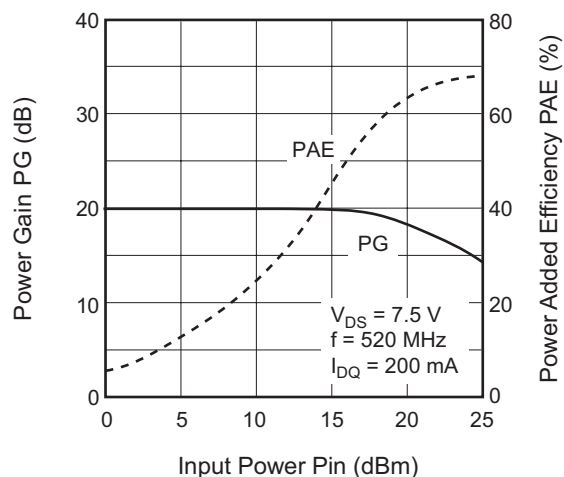
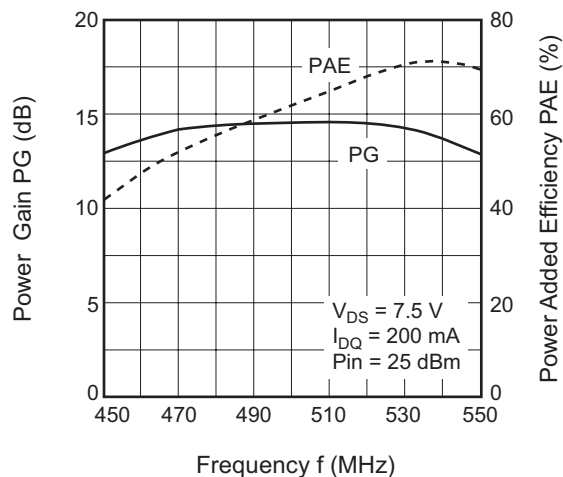


Maximum Stable Gain, $|S_{21}|^2$
vs. Drain Current

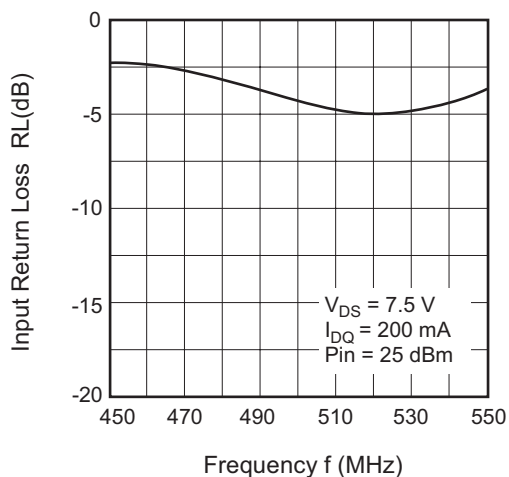
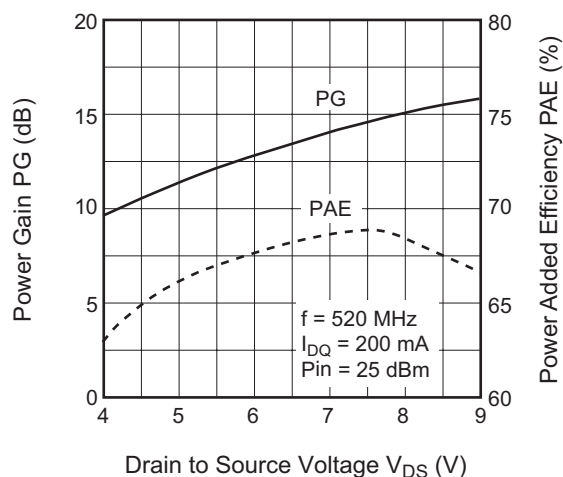
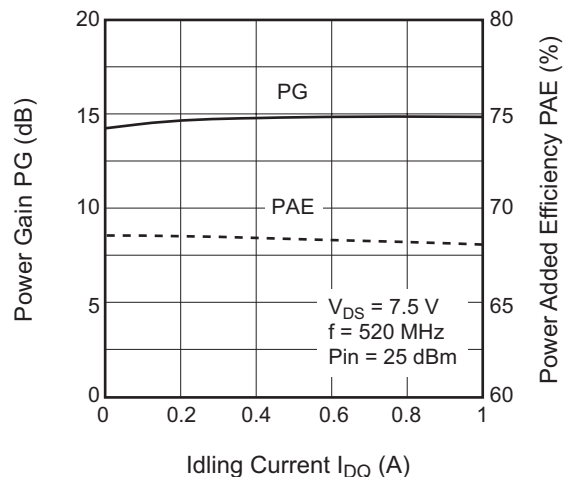


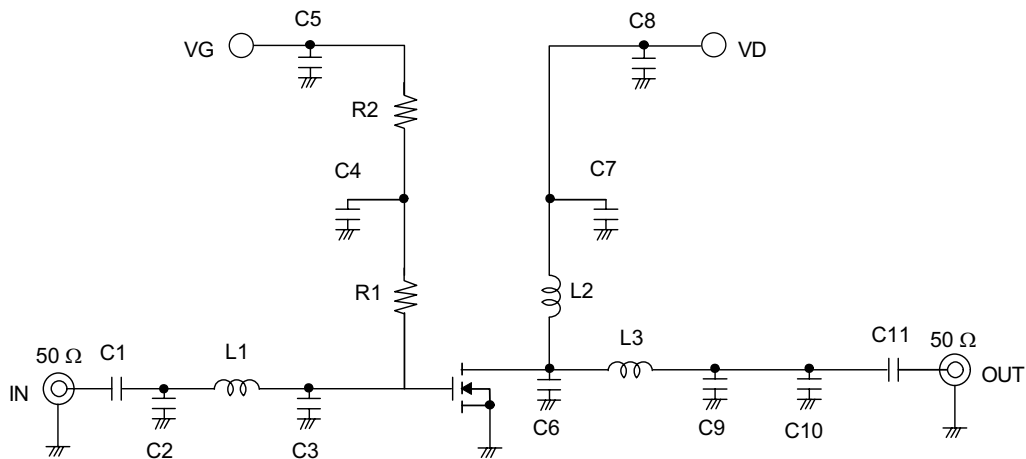
Evaluation Circuit (@ $V_{DD} = 7.5V$ Turning, $f = 520$ MHz)


- C1, C6, C9, C15: 1000 pF Chip Capacitor
 C2: 4 pF Chip Capacitor
 C3: 15 pF Chip Capacitor
 C4, C11: 5 pF Chip Capacitor
 C5, C8: 100pF Chip Capacitor
 C7, C10: 1 μ F Chip Capacitor
 C12, C14: 10 pF Chip Capacitor
 C13: 7 pF Chip Capacitor
 L1: 1.8 nH Chip Inductor
 L2: 8 Turns D : 0.5 mm, ϕ 2.4 mm Enamel Wire
 L3: 1.0 nH Chip Inductor
 L4: 1.5 nH Chip Inductor
 R1: 6.8 k Ω Chip Resistor
 R2: 40 k Ω Chip Resistor

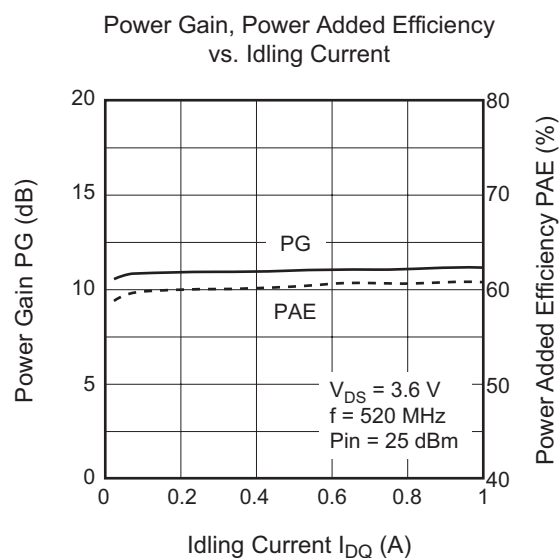
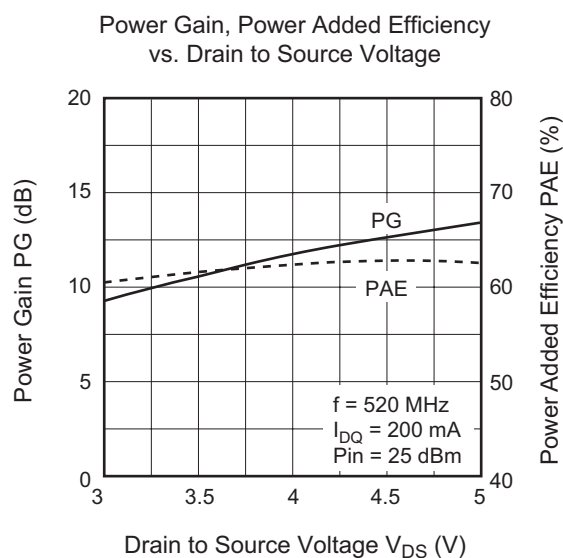
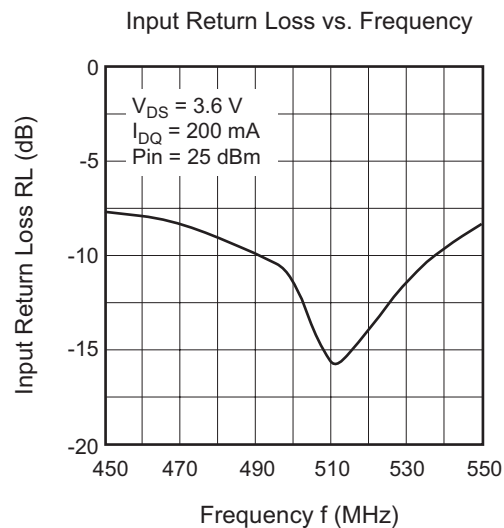
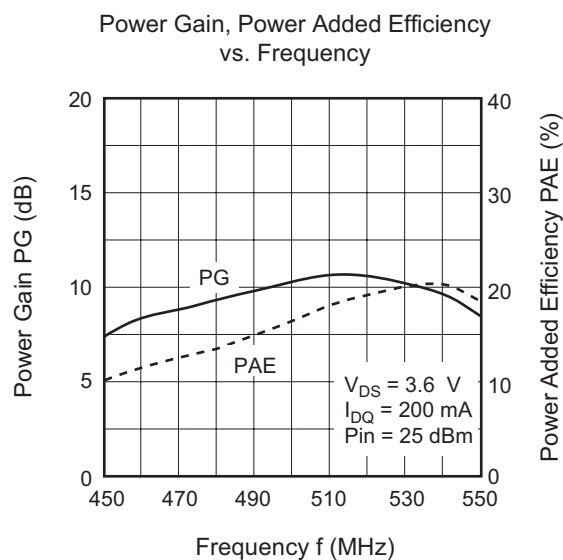
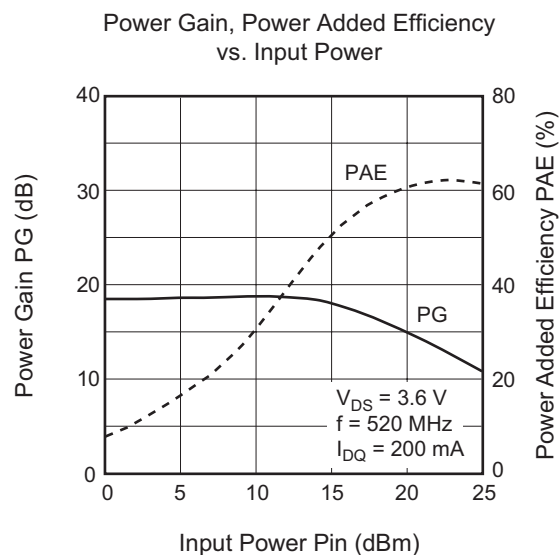
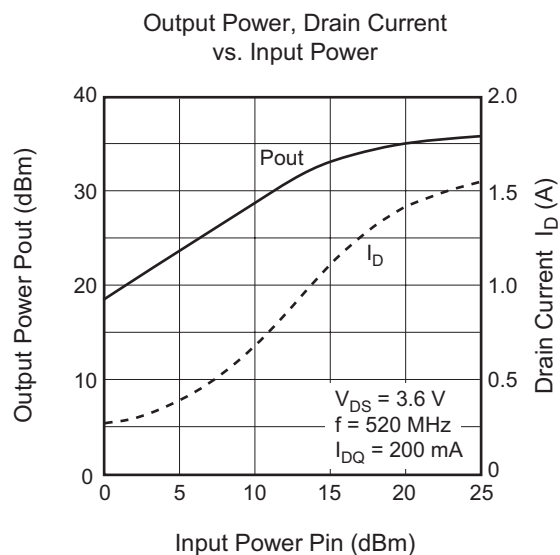
Output Power, Drain Current
vs. Input PowerPower Gain, Power Added Efficiency
vs. Input PowerPower Gain, Power Added Efficiency
vs. Frequency

Input Return Loss vs. Frequency

Power Gain, Power Added Efficiency,
vs. Drain to Source VoltagePower Gain, Power Added Efficiency
vs. Idling Current

Evaluation Circuit 2 (@ $V_{DD} = 3.6V$ Turning, $f = 520\text{ MHz}$)


- C1, C11: 1000 pF Chip Capacitor
 C2: 20 pF Chip Capacitor
 C3, C10: 10 pF Chip Capacitor
 C4, C7: 100 pF Chip Capacitor
 C5, C8: 10 μ F Chip Capacitor
 C6: 5 pF Chip Capacitor
 C9: 27 pF Chip Capacitor
 L1: 1.5 nH Chip Inductor
 L2: 8 Turns D : 0.5 mm , ϕ 2.4 mm Enamel Wire
 L3: 1.2 nH Chip Inductor
 R1: 200 Ω Chip Resistor
 R2: 3 k Ω Chip Resistor



S parameter

(V_{DS} = 7.2 V, I_D = 200 mA, Z_o = 50 Ω)

f (MHz)	S11		S21		S12		S22	
	MAG	ANG (deg.)	MAG	ANG (deg.)	MAG	ANG (deg.)	MAG	ANG (deg.)
100	0.875	-161.0	10.17	88.0	0.014	-5.9	0.770	-170.7
120	0.889	-164.0	8.09	84.2	0.013	-6.2	0.786	-170.2
140	0.867	-165.0	7.20	81.5	0.014	-3.3	0.781	-171.1
160	0.877	-166.0	6.21	78.7	0.012	-9.1	0.788	-170.7
180	0.879	-167.0	5.49	75.9	0.013	-10.9	0.794	-170.7
200	0.874	-168.0	4.87	74.4	0.012	-10.6	0.805	-170.7
220	0.881	-168.0	4.38	71.8	0.012	-14.7	0.805	-170.3
240	0.883	-168.0	3.97	69.4	0.012	-14.9	0.810	-170.0
260	0.885	-169.0	3.60	67.3	0.012	-17.4	0.816	-169.8
280	0.889	-169.0	3.29	65.8	0.012	-16.3	0.823	-169.7
300	0.897	-169.0	3.03	64.0	0.011	-18.9	0.829	-169.4
320	0.898	-170.0	2.79	62.0	0.011	-22.0	0.834	-169.2
340	0.897	-170.0	2.57	60.5	0.011	-22.1	0.839	-169.1
360	0.902	-170.0	2.40	59.1	0.011	-22.2	0.847	-169.0
380	0.907	-170.0	2.24	57.5	0.010	-24.3	0.851	-168.8
400	0.905	-170.0	2.08	56.0	0.010	-24.2	0.858	-168.7
420	0.906	-170.0	1.94	54.8	0.010	-26.0	0.862	-168.5
440	0.915	-170.0	1.83	53.6	0.009	-26.3	0.867	-168.5
460	0.917	-170.0	1.71	52.1	0.009	-27.1	0.873	-168.3
480	0.915	-170.0	1.61	50.9	0.009	-27.8	0.877	-168.2
500	0.920	-170.0	1.52	50.1	0.008	-26.9	0.881	-168.1
520	0.924	-170.0	1.44	48.9	0.008	-27.7	0.887	-168.1
540	0.921	-170.0	1.35	47.7	0.008	-28.7	0.889	-168.0
560	0.925	-170.0	1.28	46.8	0.008	-28.6	0.894	-168.0
580	0.932	-170.0	1.21	45.8	0.007	-28.2	0.898	-167.8
600	0.931	-170.0	1.15	44.8	0.007	-29.4	0.901	-167.8
620	0.928	-170.0	1.09	44.1	0.007	-29.7	0.904	-167.8
640	0.934	-170.0	1.04	43.3	0.006	-27.2	0.907	-167.8
660	0.936	-170.0	0.99	42.3	0.006	-28.6	0.911	-167.8
680	0.934	-170.0	0.94	41.5	0.006	-27.7	0.914	-167.6
700	0.937	-169.0	0.90	41.0	0.006	-29.1	0.917	-167.6
720	0.941	-170.0	0.86	40.3	0.006	-29.1	0.919	-167.6
740	0.940	-170.0	0.82	39.5	0.005	-27.9	0.922	-167.6
760	0.940	-170.0	0.79	39.0	0.005	-29.4	0.925	-167.5
780	0.943	-169.0	0.76	38.4	0.005	-27.4	0.925	-167.5
800	0.945	-169.0	0.72	37.6	0.005	-25.5	0.928	-167.4
820	0.944	-169.0	0.69	37.0	0.005	-27.1	0.930	-167.4
840	0.947	-169.0	0.66	36.7	0.005	-24.5	0.933	-167.4
860	0.950	-169.0	0.64	35.8	0.004	-25.4	0.934	-167.2
880	0.948	-169.0	0.61	35.5	0.004	-21.6	0.936	-167.2
900	0.947	-169.0	0.59	35.2	0.004	-21.1	0.937	-167.1
920	0.953	-169.0	0.57	34.6	0.004	-19.6	0.940	-167.1
940	0.952	-169.0	0.55	34.0	0.004	-17.8	0.941	-167.1
960	0.950	-169.0	0.53	33.7	0.003	-16.2	0.942	-167.0
980	0.953	-169.0	0.51	33.5	0.003	-14.1	0.945	-167.0
1000	0.956	-169.0	0.49	32.9	0.003	-12.2	0.945	-166.9

S parameter

(V_{DS} = 7.5 V, I_D = 50 mA, Z_o = 50 Ω)

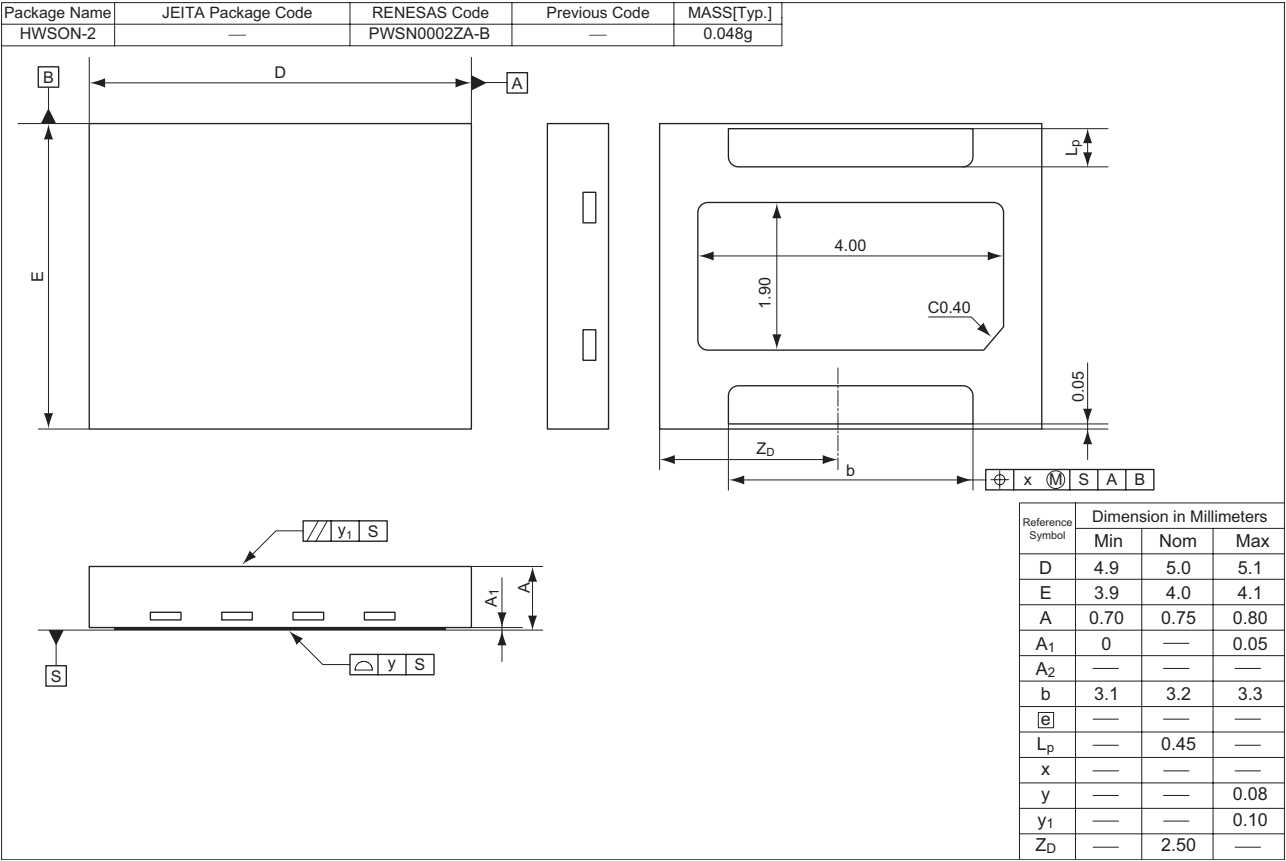
f (MHz)	S11		S21		S12		S22	
	MAG	ANG (deg.)	MAG	ANG (deg.)	MAG	ANG (deg.)	MAG	ANG (deg.)
100	0.830	-152.0	8.18	81.9	0.027	-10.2	0.662	-153.0
120	0.856	-155.0	6.46	78.4	0.025	-13.5	0.694	-155.0
140	0.842	-157.0	5.63	72.3	0.025	-17.6	0.707	-155.0
160	0.853	-159.0	4.73	68.3	0.024	-23.5	0.731	-156.0
180	0.862	-160.0	4.09	64.9	0.023	-26.3	0.751	-157.0
200	0.867	-161.0	3.60	62.0	0.022	-28.1	0.771	-157.0
220	0.877	-162.0	3.15	58.5	0.021	-32.2	0.787	-158.0
240	0.882	-162.0	2.78	55.4	0.020	-33.6	0.804	-158.0
260	0.889	-163.0	2.48	53.1	0.020	-36.6	0.819	-159.0
280	0.897	-163.0	2.23	50.7	0.019	-38.0	0.833	-159.0
300	0.904	-164.0	2.01	48.5	0.018	-40.1	0.846	-160.0
320	0.910	-164.0	1.81	46.4	0.018	-42.1	0.857	-160.0
340	0.915	-165.0	1.65	44.5	0.016	-44.1	0.866	-161.0
360	0.921	-165.0	1.50	42.6	0.016	-45.0	0.877	-161.0
380	0.924	-166.0	1.37	40.9	0.015	-46.5	0.884	-162.0
400	0.927	-166.0	1.26	39.3	0.014	-47.9	0.892	-162.0
420	0.932	-166.0	1.16	37.8	0.014	-49.1	0.898	-162.0
440	0.936	-166.0	1.07	36.7	0.013	-49.2	0.905	-163.0
460	0.940	-167.0	0.99	35.4	0.012	-50.5	0.911	-163.0
480	0.943	-167.0	0.92	34.2	0.012	-51.1	0.916	-163.0
500	0.944	-167.0	0.86	33.0	0.011	-50.9	0.920	-164.0
520	0.948	-167.0	0.80	32.2	0.011	-52.3	0.926	-164.0
540	0.949	-167.0	0.74	31.3	0.010	-52.6	0.927	-164.0
560	0.952	-167.0	0.70	30.3	0.010	-52.4	0.932	-164.0
580	0.955	-167.0	0.65	29.4	0.009	-52.5	0.935	-164.0
600	0.955	-168.0	0.61	29.0	0.009	-53.9	0.939	-165.0
620	0.957	-168.0	0.58	28.1	0.009	-53.7	0.941	-165.0
640	0.958	-168.0	0.55	27.3	0.008	-52.5	0.944	-165.0
660	0.959	-168.0	0.51	26.6	0.008	-53.8	0.947	-165.0
680	0.960	-168.0	0.49	26.0	0.007	-53.0	0.949	-165.0
700	0.962	-168.0	0.46	25.5	0.007	-54.0	0.951	-165.0
720	0.963	-168.0	0.44	25.1	0.007	-54.7	0.953	-165.0
740	0.964	-168.0	0.41	24.6	0.006	-54.7	0.955	-166.0
760	0.966	-168.0	0.39	24.1	0.006	-54.6	0.957	-166.0
780	0.966	-168.0	0.37	23.7	0.006	-53.9	0.958	-166.0
800	0.968	-168.0	0.36	23.4	0.006	-52.2	0.959	-166.0
820	0.968	-168.0	0.34	22.9	0.005	-54.4	0.959	-166.0
840	0.971	-168.0	0.33	22.5	0.005	-53.2	0.962	-166.0
860	0.971	-168.0	0.31	22.3	0.005	-53.7	0.962	-166.0
880	0.971	-168.0	0.30	21.9	0.004	-50.4	0.964	-166.0
900	0.973	-168.0	0.29	21.6	0.004	-51.7	0.964	-166.0
920	0.972	-168.0	0.27	21.3	0.004	-49.6	0.966	-166.0
940	0.972	-168.0	0.26	21.2	0.004	-49.7	0.967	-166.0
960	0.974	-168.0	0.25	20.9	0.003	-48.8	0.967	-166.0
980	0.971	-168.0	0.24	20.7	0.003	-46.8	0.968	-166.0
1000	0.973	-168.0	0.23	20.5	0.003	-46.3	0.969	-166.0

S parameter

(V_{DS} = 7.5 V, I_D = 200 mA, Z₀ = 50 Ω)

f (MHz)	S11		S21		S12		S22	
	MAG	ANG (deg.)	MAG	ANG (deg.)	MAG	ANG (deg.)	MAG	ANG (deg.)
100	0.880	-161.0	10.20	87.9	0.013	-2.3	0.768	-170.0
120	0.897	-163.0	8.14	84.6	0.012	-5.6	0.784	-170.0
140	0.880	-165.0	7.28	81.5	0.014	-3.8	0.779	-171.0
160	0.884	-166.0	6.24	78.5	0.013	-9.9	0.786	-171.0
180	0.886	-167.0	5.51	76.2	0.013	-11.0	0.792	-170.0
200	0.887	-168.0	4.92	74.6	0.013	-11.0	0.803	-170.0
220	0.890	-168.0	4.41	71.6	0.012	-15.1	0.803	-170.0
240	0.893	-168.0	3.97	69.4	0.013	-14.3	0.809	-170.0
260	0.896	-169.0	3.61	67.6	0.012	-17.6	0.814	-170.0
280	0.899	-169.0	3.31	65.7	0.012	-17.2	0.821	-169.0
300	0.902	-169.0	3.04	63.9	0.012	-19.6	0.828	-169.0
320	0.905	-169.0	2.80	62.2	0.011	-21.9	0.833	-169.0
340	0.908	-169.0	2.59	60.6	0.011	-22.0	0.838	-169.0
360	0.910	-169.0	2.40	58.9	0.011	-21.8	0.846	-169.0
380	0.913	-170.0	2.24	57.5	0.010	-23.5	0.850	-169.0
400	0.916	-170.0	2.09	56.1	0.010	-25.2	0.856	-168.0
420	0.918	-170.0	1.95	54.7	0.010	-27.2	0.861	-168.0
440	0.920	-170.0	1.83	53.4	0.009	-26.6	0.866	-168.0
460	0.923	-170.0	1.72	52.2	0.009	-27.6	0.872	-168.0
480	0.925	-170.0	1.61	51.0	0.009	-28.1	0.876	-168.0
500	0.928	-170.0	1.52	49.9	0.009	-26.9	0.881	-168.0
520	0.930	-170.0	1.44	48.8	0.008	-28.1	0.885	-168.0
540	0.932	-170.0	1.36	47.7	0.008	-28.3	0.888	-168.0
560	0.934	-170.0	1.28	46.7	0.008	-28.6	0.894	-168.0
580	0.936	-170.0	1.21	45.8	0.007	-28.2	0.896	-168.0
600	0.938	-170.0	1.15	44.8	0.007	-30.5	0.901	-168.0
620	0.939	-170.0	1.10	43.9	0.007	-29.4	0.903	-168.0
640	0.941	-170.0	1.04	43.1	0.006	-27.6	0.907	-168.0
660	0.942	-170.0	0.99	42.3	0.006	-28.2	0.910	-168.0
680	0.944	-170.0	0.95	41.6	0.006	-27.6	0.914	-168.0
700	0.945	-170.0	0.90	40.8	0.006	-29.8	0.916	-168.0
720	0.946	-170.0	0.86	40.1	0.006	-28.6	0.919	-167.0
740	0.948	-170.0	0.82	39.4	0.005	-29.3	0.922	-167.0
760	0.949	-169.0	0.79	38.8	0.005	-29.0	0.924	-167.0
780	0.951	-169.0	0.75	38.2	0.005	-28.4	0.926	-167.0
800	0.953	-169.0	0.72	37.6	0.005	-25.7	0.928	-167.0
820	0.953	-169.0	0.69	37.0	0.005	-27.5	0.929	-167.0
840	0.954	-169.0	0.67	36.5	0.004	-25.3	0.932	-167.0
860	0.955	-169.0	0.64	36.0	0.004	-25.9	0.934	-167.0
880	0.956	-169.0	0.62	35.5	0.004	-21.8	0.936	-167.0
900	0.957	-169.0	0.59	35.0	0.004	-21.7	0.937	-167.0
920	0.958	-169.0	0.57	34.6	0.004	-19.7	0.940	-167.0
940	0.959	-169.0	0.55	34.1	0.004	-18.5	0.941	-167.0
960	0.960	-169.0	0.53	33.7	0.003	-18.3	0.942	-167.0
980	0.960	-169.0	0.51	33.3	0.003	-14.8	0.944	-167.0
1000	0.962	-169.0	0.49	33.0	0.003	-12.7	0.945	-167.0

Package Dimensions



Ordering Information

Part Name	Quantity	Shipping Container
RQA0002DNSTB-E	2000 pcs.	φ178 mm Reel, 12 mm Emboss Taping

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