

ATTENTION
OBSERVE PRECAUTIONS
FOR HANDLING
ELECTROSTATIC
SENSITIVE
DEVICES

Revision date: 4th/Mar.'02

MITSUBISHI RF POWER MOS FET

RD70HVF1

Silicon MOSFET Power Transistor, 175MHz 70W 520MHz 50W

DESCRIPTION

RD70HVF1 is a MOS FET type transistor specifically designed for VHF/UHF High power amplifiers applications.

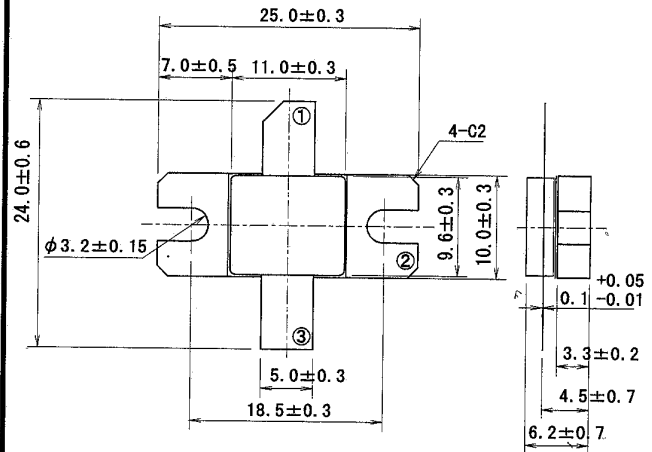
FEATURES

- High power and High Gain:
Pout > 70W, Gp > 10.6dB @ Vdd = 12.5V, f = 175MHz
Pout > 50W, Gp > 7.0dB @ Vdd = 12.5V, f = 520MHz
- High Efficiency: 60% typ. on VHF Band
- High Efficiency: 55% typ. on UHF Band

APPLICATION

For output stage of high power amplifiers in VHF/UHF band mobile radio sets.

OUTLINE DRAWING



PIN ① DRAIN ② SOURCE ③ GATE

ABSOLUTE MAXIMUM RATINGS

(Tc = 25 deg.C UNLESS OTHERWISE NOTED)

SYMBOL	PARAMETER	CONDITIONS	RATINGS	UNIT
VDSS	Drain to source voltage		30	V
VGSS	Gate to source voltage		+/-20	V
Pch	Channel dissipation	Tc = 25 deg.C	150	W
Tj	Junction Temperature		175	deg.C
Tstg	Storage temperature		-40 to +125	deg.C

Note 1: Above parameters are guaranteed independently.

ELECTRICAL CHARACTERISTICS (Tc = 25 deg.C, UNLESS OTHERWISE NOTED)

SYMBOL	PARAMETER	CONDITIONS	LIMITS			UNIT
			MIN	TYP	MAX.	
IdSS	Zero gate voltage drain current	VDS = 17V, VGS = 0V	-	-	300	μA
IGSS	Gate to source leak current	VGS = 10V, VDS = 0V	-	-	1	μA
VTH	Gate threshold Voltage	VDS = 12V, IDS = 1mA	1.3	1.8	2.3	V
Pout	Output power	VDS = 12.5V, Pin = 6W,	70	75		W
η d	Drain efficiency	f = 175MHz	55	60		%
Pout	Output power	VDS = 12.5V, Pin = 10W,	50	55		W
η d	Drain efficiency	f = 520MHz	50	55		%

Note: Above parameters, ratings, limits and conditions are subject to change.

Keep safety first in your circuit designs!

Mitsubishi Electric Corporation puts the maximum effort into making semiconductor products better and more reliable, but there is always the possibility that trouble may occur with them. Trouble with semiconductors may lead to personal injury, fire or property damage. Remember to give due consideration to safety when making your circuit designs, with appropriate measures such as (i) placement of substitutive, auxiliary circuits, (ii) use of non-flammable material or (iii) prevention against any malfunction or mishap.

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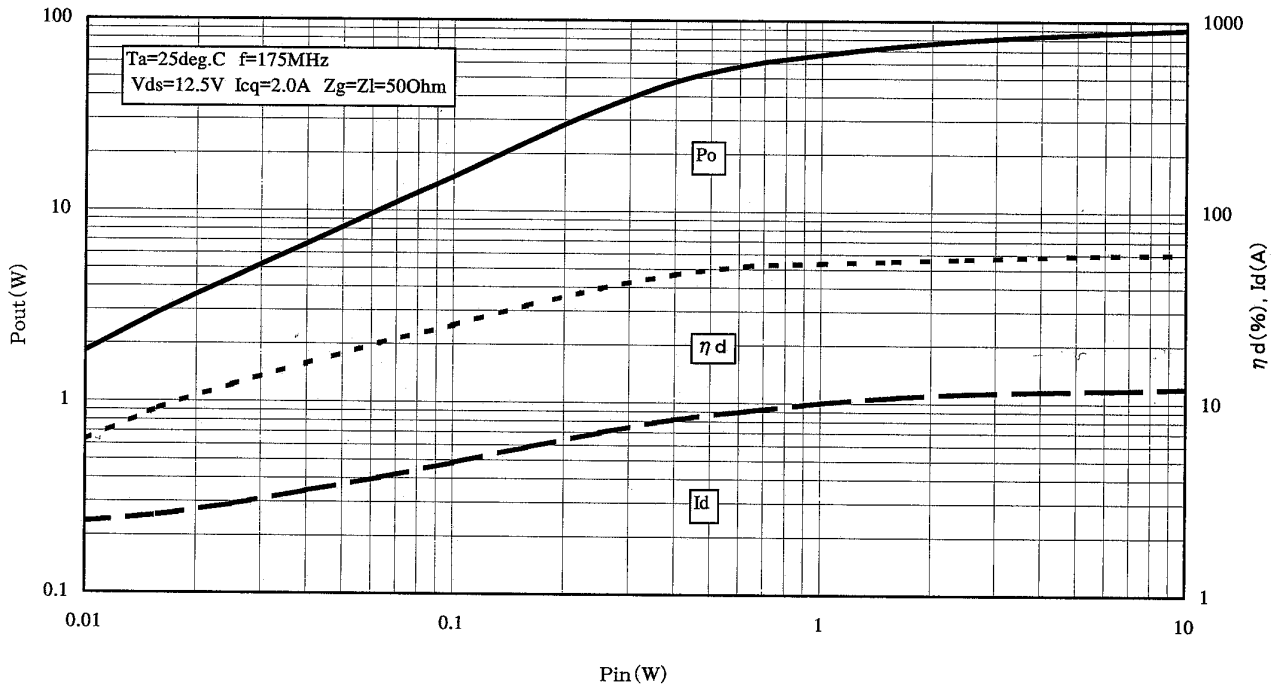
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RD70HVF1

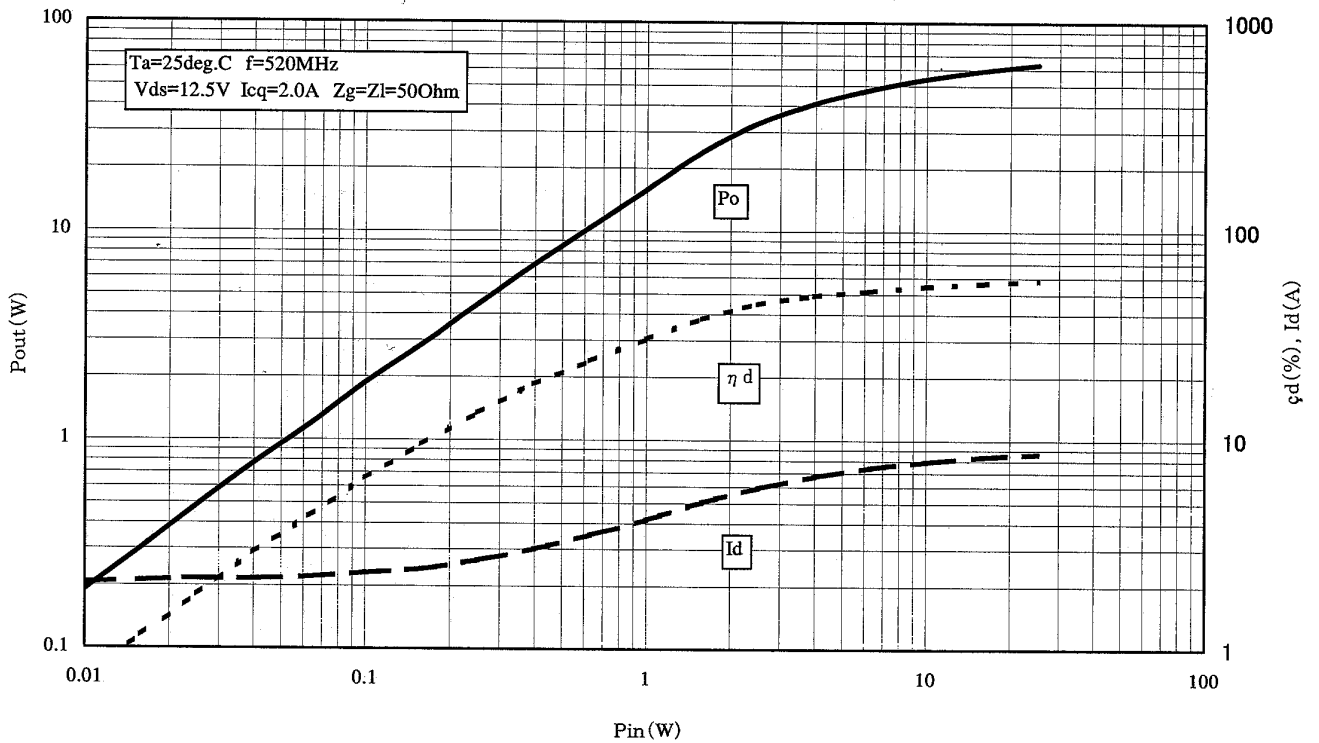
Silicon MOSFET Power Transistor, 175MHz 70W 520MHz 50W

● TYPICAL CHARACTERISTICS (f=175/520MHz)

RD70HVF1 Pout vs. Pin characteristics



RD70HVF1 Pout vs. Pin characteristics



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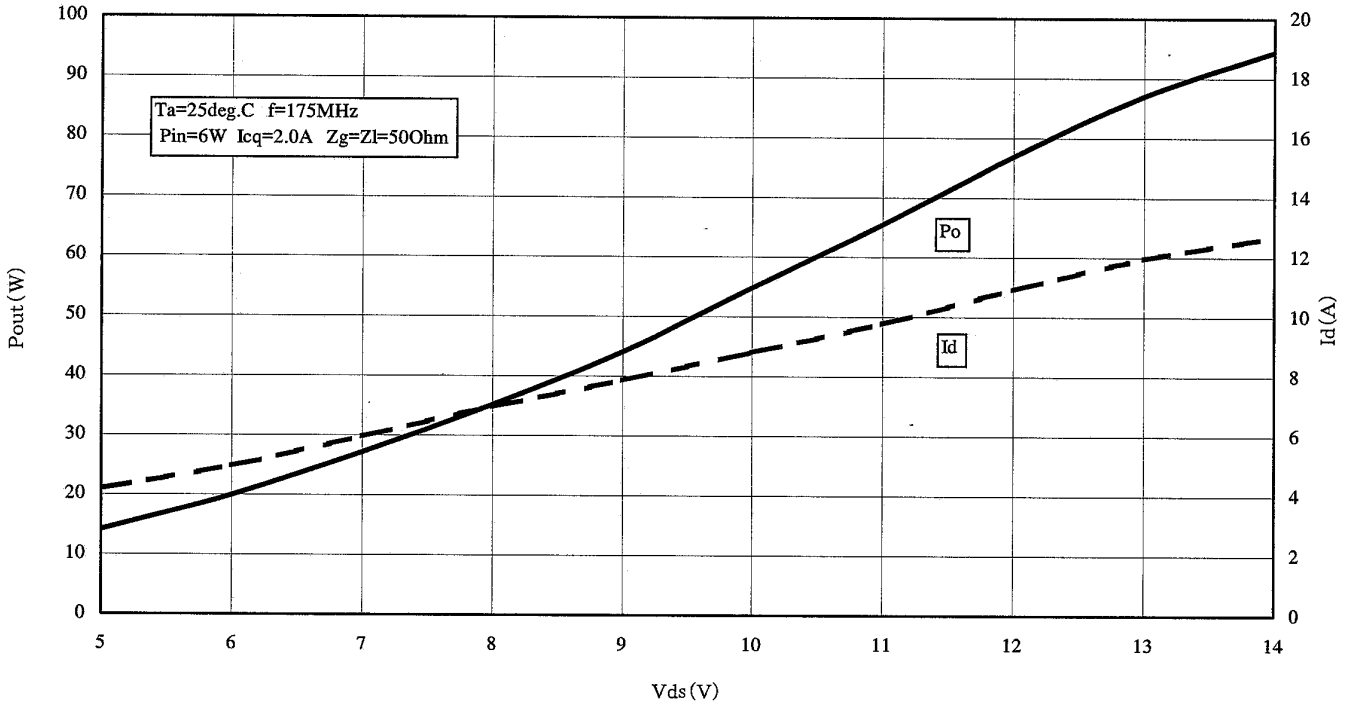
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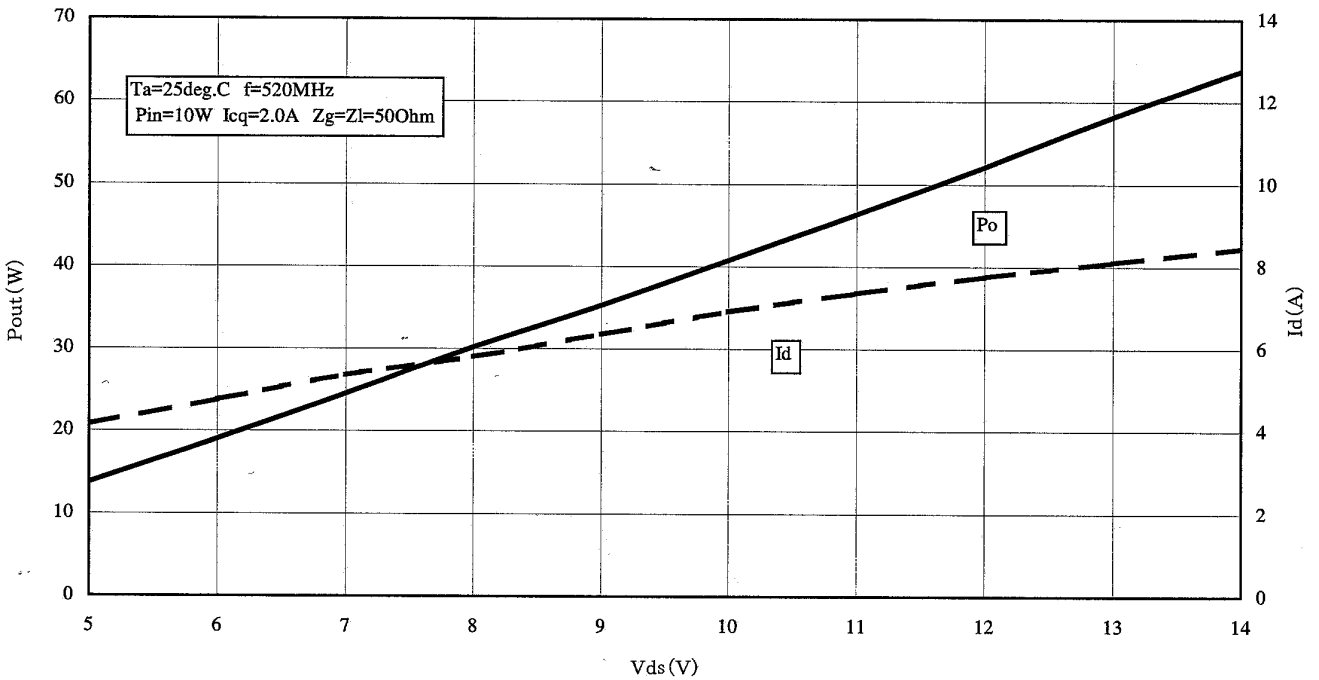
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● TYPICAL CHARACTERISTICS (f=175/520MHz)

RD70HVF1 Pout vs. Vdd characteristics



RD70HVF1 Pout vs. Vdd characteristics



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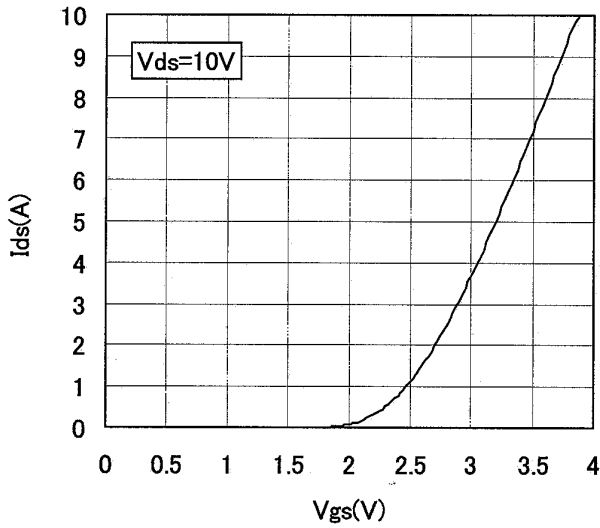
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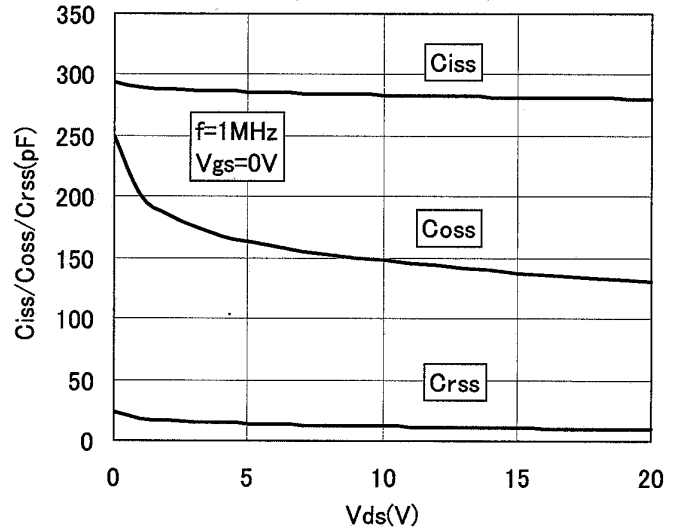
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RD70HVF1 V_{gs} - I_{ds} characteristics



RD70HVF1 Capacitance— V_{ds} characteristics



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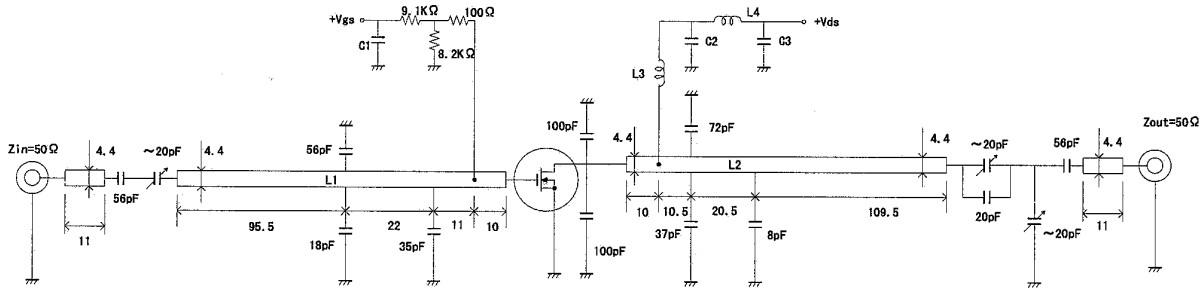
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MITSUBISHI RF POWER MOS FET

RD70HVF1

Silicon MOSFET Power Transistor, 175MHz 70W 520MHz 50W

● EQUIVALENT CIRCUIT (f=175MHz)



L1, L2: Microstrip Board Material 1.6mm Thick glass-terflon $\epsilon r=2.7$

L3: 6D 5T 1P Φ 1.6mm silverplated copperwire.

L4: 6D 4T 1P Φ 1.6mm silverplated copperwire.

C1: 2200pF 10 μ F in parallel

D: Inner diameter of coil

C2: 2200pF 2200pF in parallel

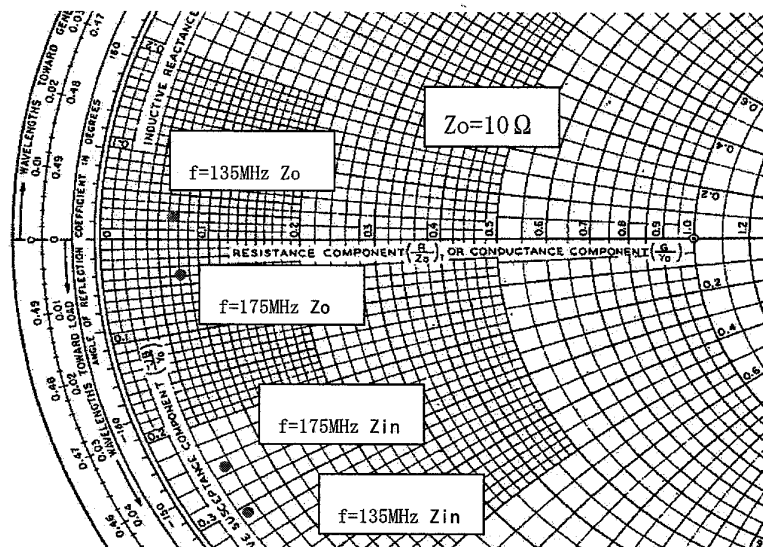
T: Coil Turn

C3: 2200pF 330 μ F in parallel

P: Coil pitch

Dimensions in mm

● INPUT/OUTPUT IMPEDANCE VS. FREQUENCY CHARACTERISTICS



● Zin, Zout

f (MHz)	Zin (ohm)	Zout (ohm)	Conditions
135	0.43-j3.19	0.70+j0.25	Po=90W, Vdd=12.5V, Pin=6W
175	0.55-j2.53	0.72-j0.36	Po=80W, Vdd=12.5V, Pin=6W

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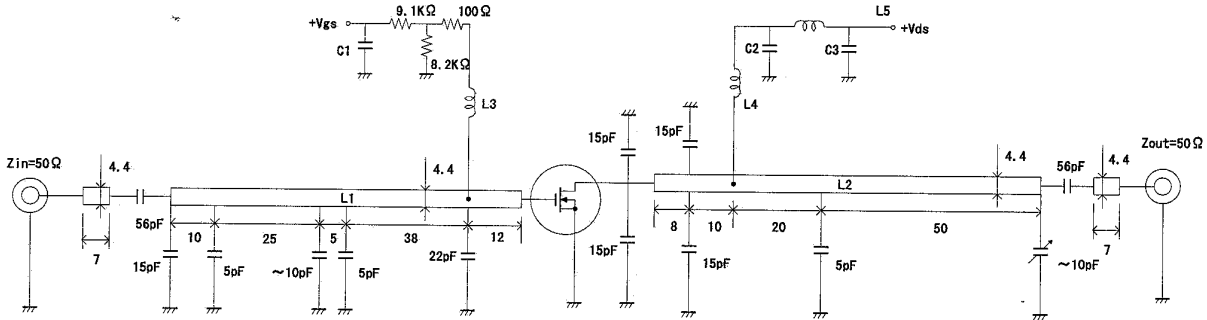
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MITSUBISHI RF POWER MOS FET

RD70HVF1

Silicon MOSFET Power Transistor, 175MHz70W 520MHz50W

● EQUIVALENT CIRCUIT (f=520MHz)



L1, L2: Microstrip Board Material 1.6mm Thick glass-epoxy $\epsilon_r=2.7$

L3: 6D 4T 1P Φ 1.6mm silverplated copperwire.

L4: 6D 2T 2P Φ 1.6mm silverplated copperwire.

L5: 6D 4T 1P Φ 1.6mm silverplated copperwire.

C1: 2200pF 10 μ F in parallel

D: Inner diameter of coil

C2: 2200pF 2200pF in parallel

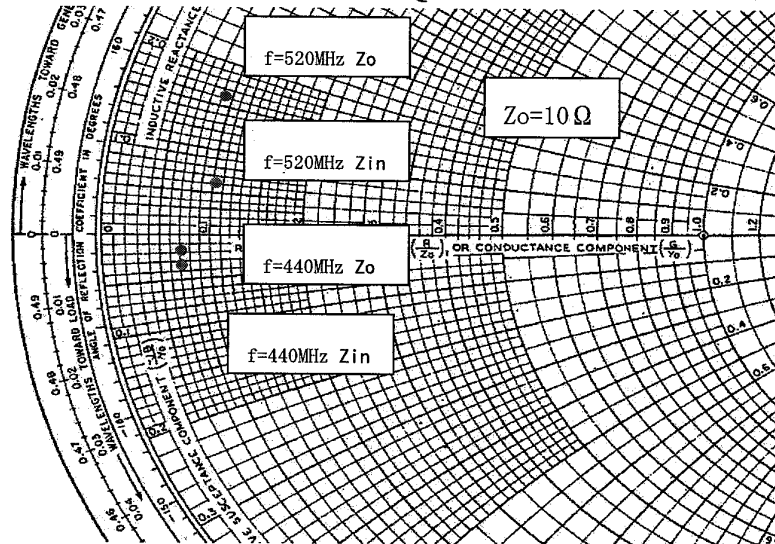
T: Coil Turn

C3: 2200pF 330 μ F in parallel

P: Coil pitch

Dimensions in mm

● INPUT/OUTPUT IMPEDANCE VS. FREQUENCY CHARACTERISTICS



● Zin, Zout

f (MHz)	Zin (ohm)	Zout (ohm)	Conditions
440	0.74-j0.34	0.71-j0.18	Po=60W, Vdd=12.5V, Pin=10W
520	1.04+j0.63	0.93+j1.62	Po=55W, Vdd=12.5V, Pin=10W

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RD70HVF1 S-PARAMETER DATA @V_{ds}=12.5V I_d=500mA

freq. [MHz]	S11		S12		S21		S22	
	(mag)	(ang)	(mag)	(ang)	(mag)	(ang)	(mag)	(ang)
10	0.883	-151.54	0.014	7.86	43.900	99.31	0.727	-151.05
20	0.880	-165.64	0.014	-0.92	21.935	87.79	0.726	-164.26
30	0.880	-170.30	0.014	-7.80	14.570	82.12	0.729	-168.43
40	0.882	-172.49	0.014	-13.96	10.742	76.59	0.732	-169.64
50	0.885	-173.95	0.013	-16.22	8.441	72.42	0.745	-170.29
60	0.887	-174.74	0.012	-21.24	6.838	68.41	0.756	-170.47
70	0.892	-175.29	0.012	-23.62	5.724	64.76	0.769	-170.55
80	0.897	-175.91	0.012	-25.20	4.870	61.56	0.780	-170.58
90	0.901	-176.40	0.011	-27.68	4.196	58.15	0.791	-170.51
100	0.906	-176.83	0.011	-30.89	3.713	55.30	0.805	-170.48
110	0.912	-177.28	0.010	-33.09	3.253	51.95	0.821	-170.73
120	0.916	-177.66	0.010	-34.39	2.905	49.22	0.837	-171.32
130	0.920	-178.24	0.009	-37.54	2.593	46.43	0.846	-172.09
140	0.926	-178.72	0.009	-38.59	2.326	43.47	0.854	-172.47
150	0.930	-178.98	0.008	-39.50	2.095	41.17	0.860	-173.27
160	0.933	-179.52	0.008	-42.15	1.905	38.91	0.866	-173.74
170	0.935	179.92	0.007	-41.27	1.725	37.59	0.872	-174.34
180	0.941	179.63	0.007	-45.71	1.570	35.48	0.879	-174.74
190	0.944	179.28	0.006	-44.46	1.439	33.82	0.885	-175.01
200	0.946	178.72	0.006	-46.63	1.337	32.34	0.897	-175.63
210	0.951	178.29	0.005	-43.72	1.223	30.61	0.905	-175.87
220	0.954	177.96	0.005	-44.90	1.144	29.93	0.913	-176.29
230	0.954	177.48	0.005	-45.17	1.061	26.89	0.921	-176.90
240	0.956	177.03	0.004	-45.43	0.985	25.79	0.930	-177.52
250	0.957	176.71	0.004	-46.46	0.908	24.83	0.933	-178.06
260	0.960	176.38	0.004	-47.01	0.857	23.35	0.932	-178.61
270	0.960	175.92	0.004	-41.78	0.811	21.20	0.937	-179.14
280	0.962	175.46	0.003	-40.76	0.757	21.83	0.937	-179.80
290	0.963	175.10	0.003	-42.64	0.704	20.43	0.940	179.81
300	0.967	174.74	0.002	-40.85	0.661	19.41	0.935	179.40
310	0.966	174.28	0.003	-35.98	0.614	17.67	0.941	178.95
320	0.969	174.03	0.002	-32.71	0.595	17.95	0.945	178.60
330	0.966	173.55	0.002	-33.83	0.562	16.73	0.944	178.13
340	0.967	173.36	0.002	-28.82	0.524	15.78	0.946	177.70
350	0.969	173.03	0.001	-23.37	0.495	13.59	0.952	177.18
360	0.972	172.46	0.002	-4.06	0.470	14.76	0.953	176.56
370	0.970	172.17	0.001	-4.88	0.453	13.15	0.960	176.25
380	0.973	171.92	0.001	-0.54	0.434	10.38	0.965	175.63
390	0.974	171.53	0.001	7.68	0.419	13.52	0.964	175.13
400	0.976	171.02	0.002	38.18	0.378	12.25	0.965	174.97
410	0.974	170.82	0.001	37.42	0.373	9.73	0.965	174.48
420	0.977	170.35	0.001	48.81	0.351	8.42	0.965	174.04
430	0.973	169.92	0.002	56.34	0.336	5.55	0.963	173.77
440	0.975	169.66	0.002	62.28	0.338	8.17	0.966	173.26
450	0.974	169.62	0.003	73.55	0.316	5.37	0.965	172.88
460	0.977	169.13	0.002	64.70	0.315	7.84	0.964	172.77
470	0.976	168.77	0.003	67.73	0.285	8.18	0.965	172.43
480	0.978	168.39	0.003	72.65	0.284	5.57	0.966	172.16
490	0.980	168.19	0.003	75.59	0.261	4.09	0.970	171.70
500	0.980	167.98	0.003	75.59	0.276	2.32	0.973	171.38

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RD70HVF1 S-PARAMETER DATA @V_{ds}=12.5V I_d=500mA

freq. [MHz]	S11		S12		S21		S22	
	(mag)	(ang)	(mag)	(ang)	(mag)	(ang)	(mag)	(ang)
510	0.984	167.66	0.003	76.42	0.246	3.44	0.970	170.99
520	0.978	167.18	0.003	75.33	0.247	0.94	0.974	170.58
530	0.981	166.83	0.004	68.51	0.240	2.48	0.976	170.20
540	0.982	166.65	0.004	77.29	0.231	4.04	0.972	169.64
550	0.980	166.21	0.004	69.20	0.216	-0.20	0.975	169.50
560	0.979	166.05	0.004	76.18	0.202	3.40	0.975	169.17
570	0.977	165.48	0.005	78.85	0.192	4.08	0.974	168.71
580	0.980	165.29	0.005	79.07	0.189	-1.03	0.975	168.67
590	0.980	165.17	0.005	74.73	0.179	-1.06	0.974	167.96
600	0.980	164.64	0.005	74.32	0.176	-1.52	0.974	167.82
610	0.979	164.36	0.005	78.18	0.169	1.25	0.976	167.68
620	0.980	164.05	0.005	76.84	0.171	1.99	0.979	167.30
630	0.979	163.90	0.006	75.95	0.167	0.00	0.977	166.95
640	0.981	163.55	0.006	81.79	0.154	-0.87	0.981	166.68
650	0.982	163.27	0.007	79.31	0.156	-1.41	0.979	166.32
660	0.983	163.08	0.007	75.34	0.151	-0.87	0.981	166.17
670	0.983	162.71	0.007	78.89	0.152	-1.44	0.982	166.01
680	0.983	162.49	0.007	76.75	0.147	-1.60	0.984	165.41
690	0.982	162.32	0.007	74.85	0.134	-2.67	0.982	165.36
700	0.985	161.97	0.007	75.45	0.126	-3.35	0.983	164.86
710	0.980	161.63	0.007	76.88	0.133	-1.82	0.986	164.68
720	0.985	161.53	0.007	78.00	0.126	-2.50	0.983	164.44
730	0.982	161.08	0.007	75.78	0.123	-3.14	0.977	163.99
740	0.982	161.01	0.008	75.33	0.122	-7.68	0.982	163.62
750	0.982	160.73	0.007	76.65	0.108	-1.95	0.982	163.61
760	0.983	160.33	0.007	77.31	0.123	0.04	0.981	162.98
770	0.984	160.28	0.007	75.94	0.105	-7.97	0.984	162.75
780	0.983	159.95	0.008	79.24	0.103	-4.11	0.983	162.60
790	0.981	159.55	0.008	78.14	0.106	-5.44	0.983	162.41
800	0.982	159.41	0.009	77.15	0.106	-1.10	0.984	161.96
810	0.989	159.10	0.009	77.20	0.095	-9.98	0.990	161.73
820	0.983	158.99	0.009	75.69	0.098	-8.42	0.986	161.84
830	0.984	158.73	0.009	75.64	0.092	-1.82	0.986	161.17
840	0.988	158.29	0.009	77.87	0.094	-5.90	0.989	161.23
850	0.984	158.11	0.009	72.61	0.107	-8.97	0.989	160.91
860	0.988	158.15	0.009	72.89	0.092	-11.01	0.986	160.74
870	0.987	157.70	0.009	73.86	0.101	-13.53	0.985	160.50
880	0.982	157.50	0.010	72.54	0.090	-8.17	0.982	160.19
890	0.984	157.18	0.010	73.05	0.076	-11.37	0.985	159.95
900	0.983	156.95	0.010	72.10	0.078	-13.36	0.983	159.57
910	0.982	156.91	0.010	73.80	0.078	-6.38	0.984	159.25
920	0.986	156.51	0.010	74.97	0.081	-8.94	0.989	159.06
930	0.985	156.27	0.010	74.64	0.085	-10.43	0.985	158.71
940	0.984	156.18	0.010	73.09	0.076	-6.57	0.985	158.31
950	0.984	155.88	0.011	74.36	0.079	-4.49	0.987	158.22
960	0.985	155.48	0.011	75.51	0.072	-14.88	0.988	158.13
970	0.983	155.36	0.011	75.47	0.070	-2.44	0.988	157.84
980	0.980	155.26	0.011	76.69	0.078	-14.97	0.987	157.71
990	0.980	154.92	0.011	73.82	0.065	-17.24	0.989	157.50
1000	0.985	154.62	0.011	72.69	0.067	-5.30	0.993	157.32
1010	0.988	154.51	0.011	72.79	0.066	-3.40	0.988	157.10