MITSUBISHI RF POWER MOS FET

ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

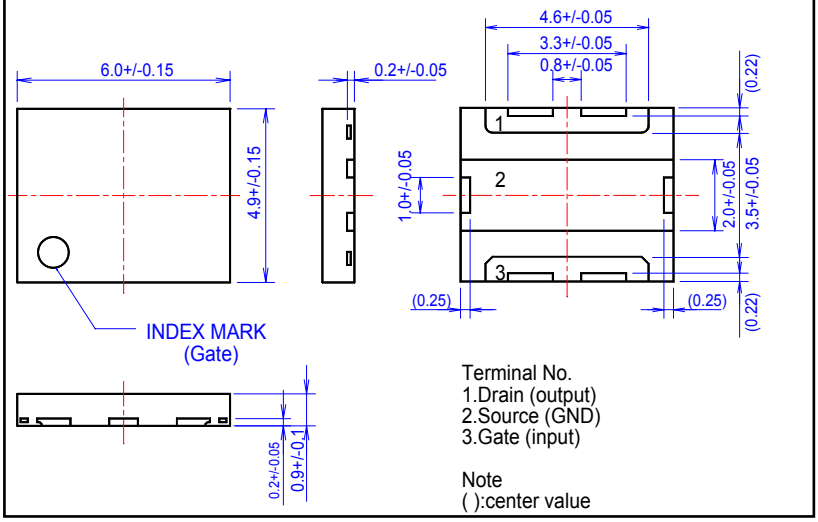
RD07MUS2B

RoHS Compliance, Silicon MOSFET Power Transistor,175MHz,527MHz,7W

DESCRIPTION

RD07MUS2B is a MOS FET type transistor specifically designed for VHF/UHF RF power amplifiers applications.

OUTLINE DRAWING



FEATURES

High power gain and High Efficiency.
- Gp>13.2dB 58%min. (175MHz)
- Gp> 12.4dB 58%min. (527MHz)
- Gp> 11.5dB 58%Typ. (870MHz)

Integrated gate protection diode.

APPLICATION

For output stage of high power amplifiers in VHF/UHF-band mobile radio sets.
The recommended frequency is 135-527MHz.

RoHS COMPLIANT

RD07MUS2B is a RoHS compliant product. RoHS compliance is indicating by the letter “G” after the Lot Marking. This product includes the lead in high melting temperature type solders.
However, it is applicable to the following exceptions of RoHS Directions.

1. Lead in high melting temperature type solders(i.e.tin-lead solder alloys containing more than85% lead.)

ABSOLUTE MAXIMUM RATINGS (Tc=25°C UNLESS OTHERWISE NOTED)

SYMBOL	PARAMETER	CONDITIONS	RATINGS	UNIT
VDSS	Drain to source voltage	Vgs=0V	25	V
VGSS	Gate to source voltage	Vds=0V	-5/+10	V
Pch	Channel dissipation	Tc=25°C	50	W
Pin	Input Power	Zg=Zl=50Ω	0.8*	W
ID	Drain Current	-	3	A
Tch	Junction Temperature	-	150	°C
Tstg	Storage temperature	-	-40 to +125	°C
Rth j-c	Thermal resistance	Junction to case	2.5	°C/W

Note: Above parameters are guaranteed independently.
*: 175MHz spec. is 0.6W

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

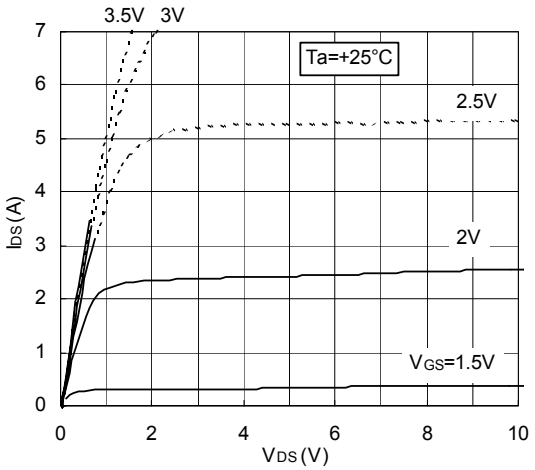
SYMBOL	PARAMETER	CONDITIONS	LIMITS			UNIT
			MIN	TYP	MAX.	
IDSS	Drain cutoff current	VDS=17V, VGS=0V	-	-	10	uA
IGSS	Gate cutoff current	VGS=5V, VDS=0V	-	-	1	uA
VTH	Gate threshold Voltage	VDS=7.2V, IDS=1mA	-	1	-	V
Pout1	Output power	f=175MHz,VDD=7.2V	6.3**	7.2**	-	W
ηD1	Drain efficiency	Pin=0.3W,Idq=250mA	58**	65**	-	%
Pout2	Output power	f=527MHz ,VDD=7.2V	7***	8***	-	W
ηD2	Drain efficiency	Pin=0.4W,Idq=250mA	58***	63***	-	%
VSWRT1	Load VSWR tolerance1	VDD=9.5V,Po=6.3W(Pin Control) f=175MHz,Idq=250mA,Zg=50Ω Load VSWR=20:1(All Phase)	No destroy			-
VSWRT2	Load VSWR tolerance2	VDD=9.5V,Po=7W(Pin Control) f=527MHz,Idq=250mA,Zg=50Ω Load VSWR=20:1(All Phase)	No destroy			-

Note: Above parameters, ratings, limits and conditions are subject to change.
** At 135-175MHz broad matching *** At 450-527MHz broad matching

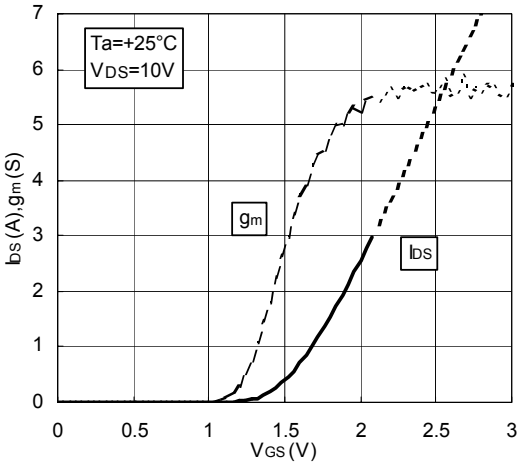
TYPICAL CHARACTERISTICS

(These are only typical curves and devices are not necessarily guaranteed at these curves.)

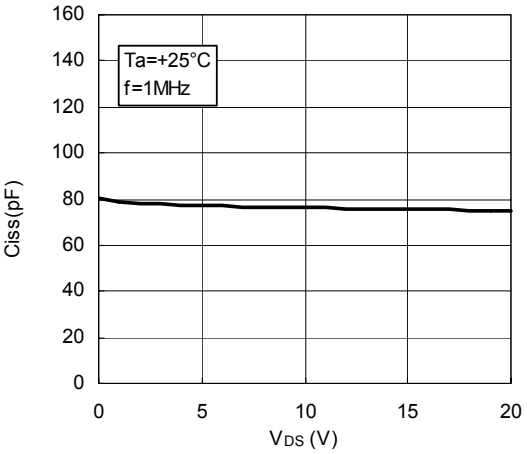
VDS-IDS CHARACTERISTICS



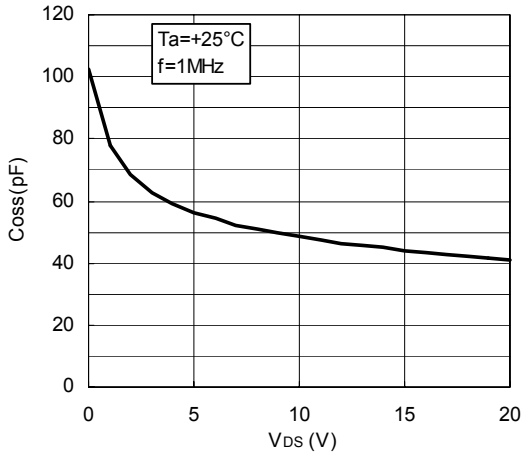
VGS-IDS CHARACTERISTICS



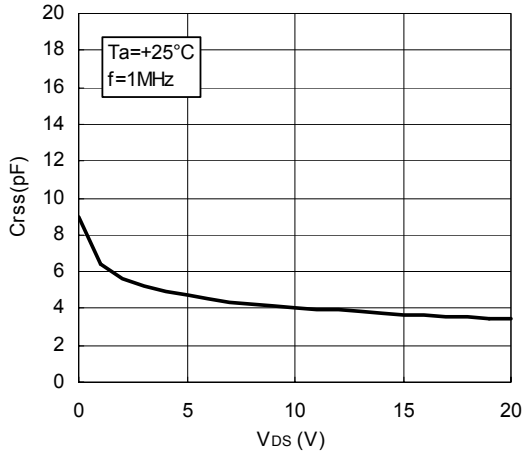
VDS VS. Ciss CHARACTERISTICS



VDS VS. Coss CHARACTERISTICS



VDS VS. Crss CHARACTERISTICS



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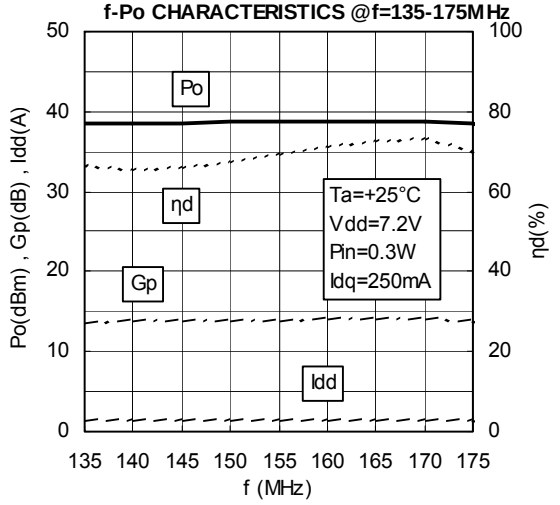
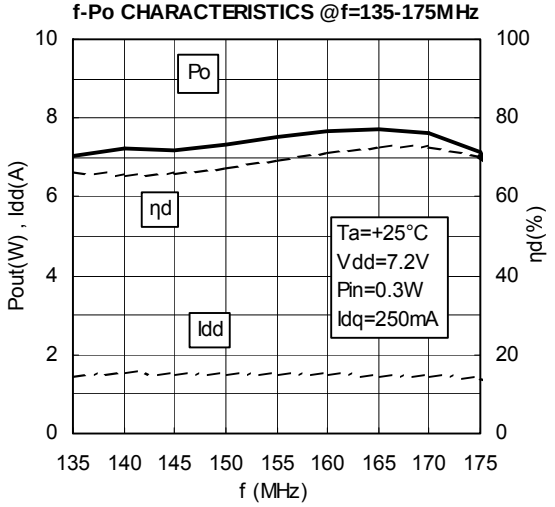
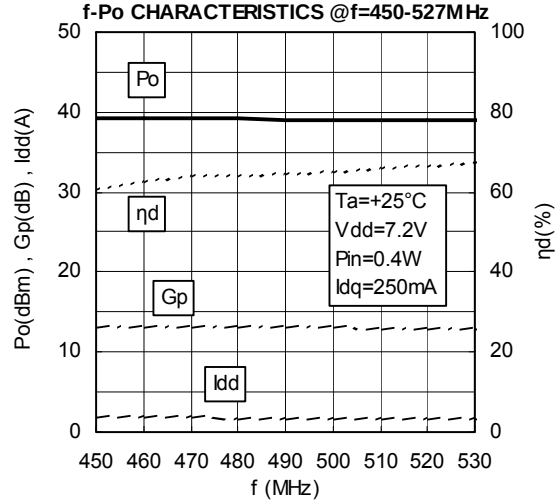
f-Po CHARACTERISTICS @f=135-175MHz



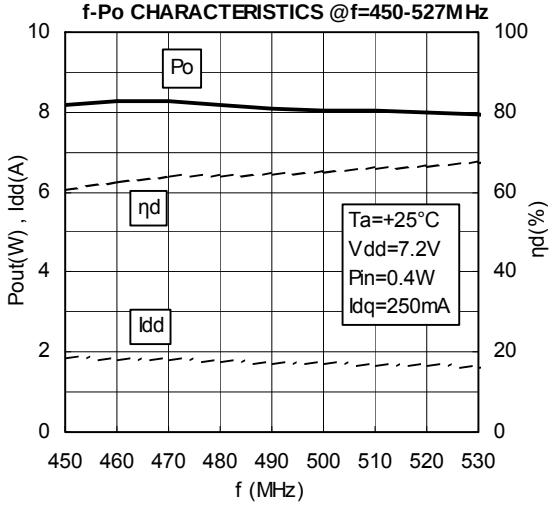
f-Po CHARACTERISTICS @f=135-175MHz



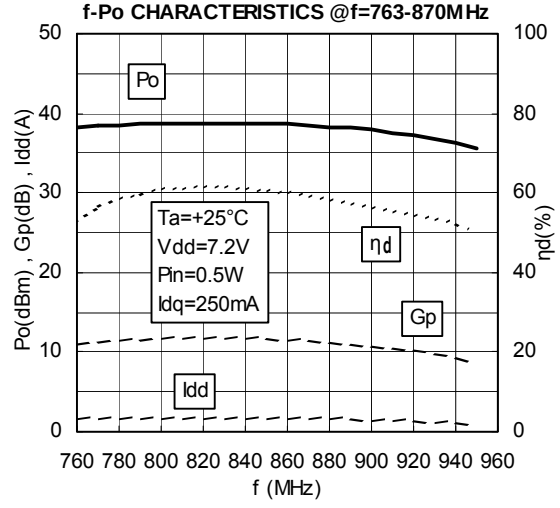
f-Po CHARACTERISTICS @f=450-527MHz



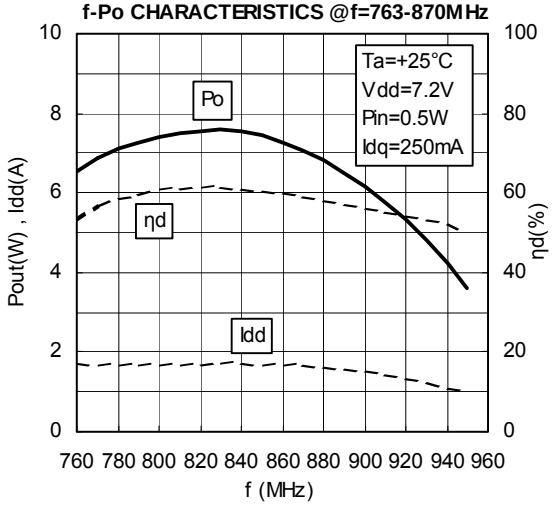
f-Po CHARACTERISTICS @f=450-527MHz



f-Po CHARACTERISTICS @f=763-870MHz



f-Po CHARACTERISTICS @f=763-870MHz



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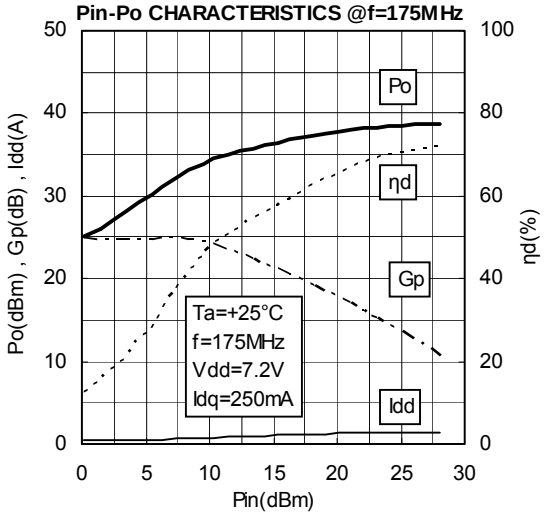

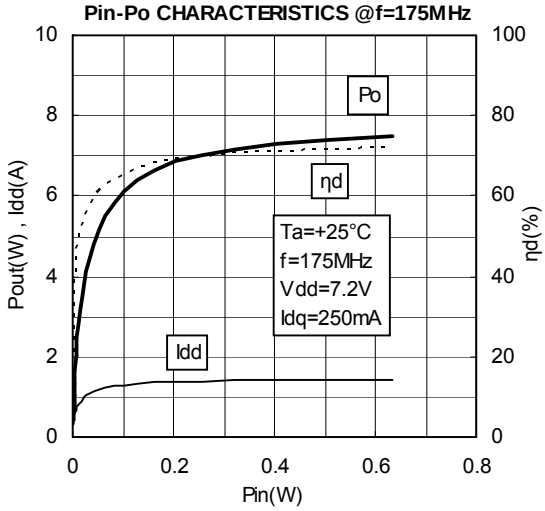

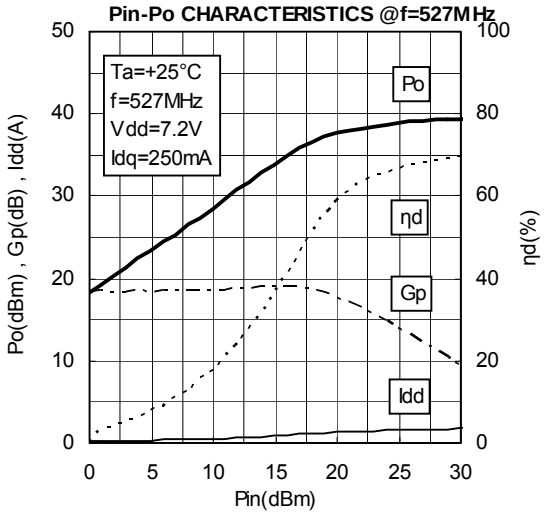

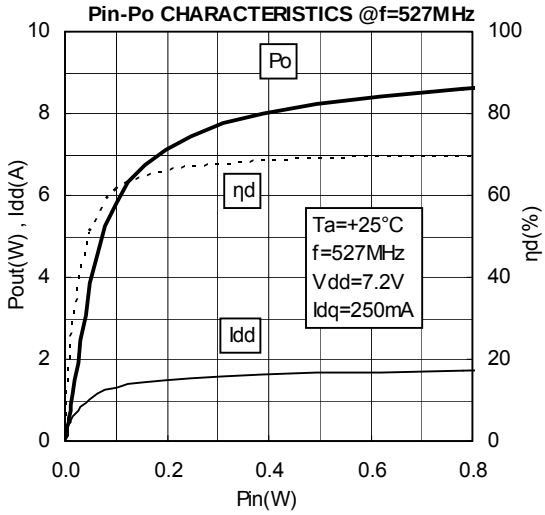

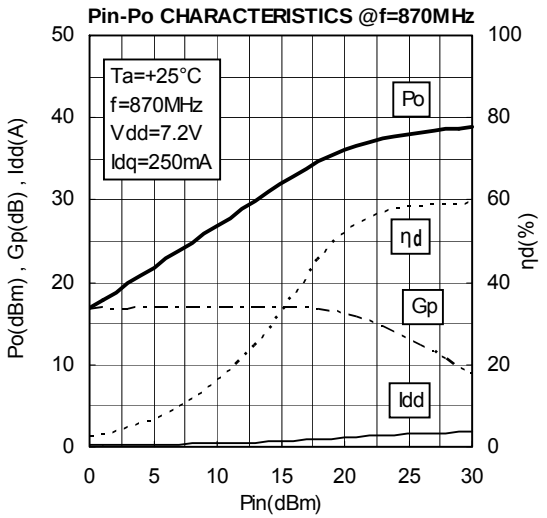

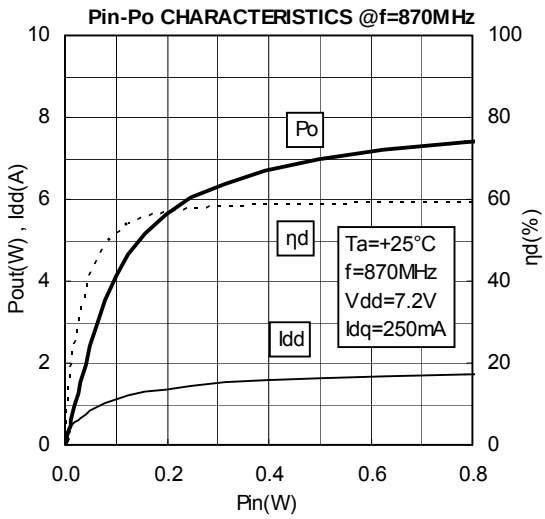

TYPICAL CHARACTERISTICS

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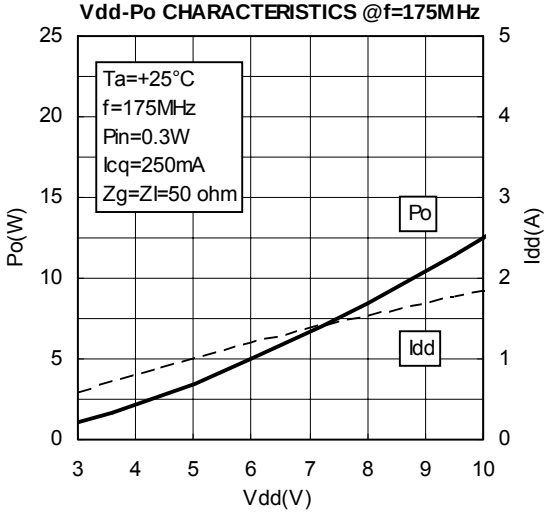
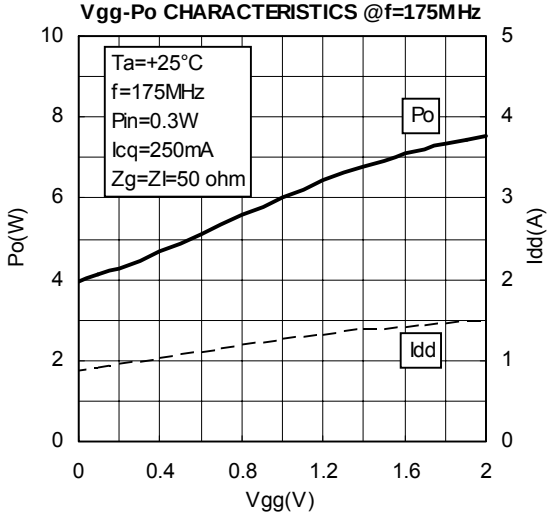
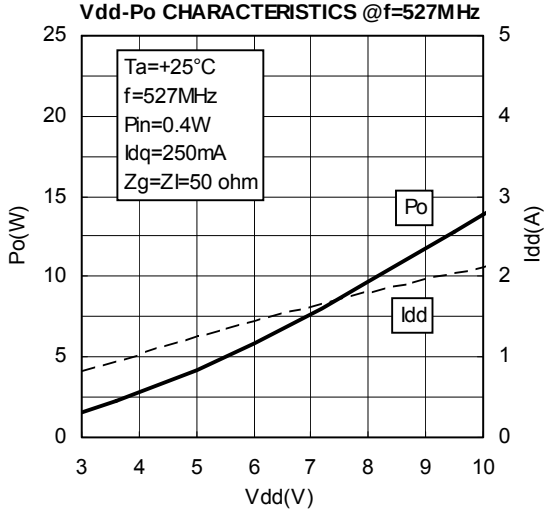
Vdd-Po CHARACTERISTICS @f=175MHz



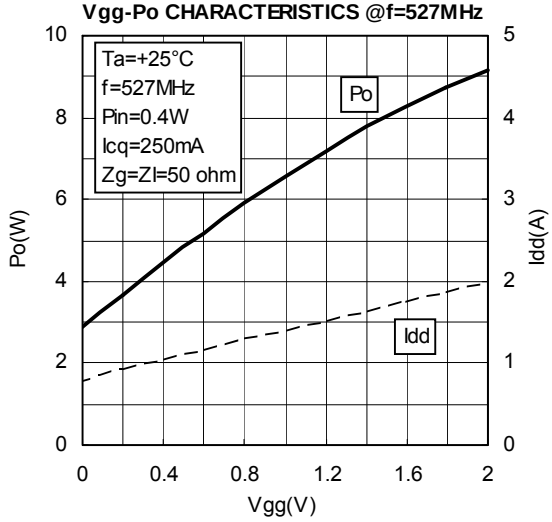
Vgg-Po CHARACTERISTICS @f=175MHz



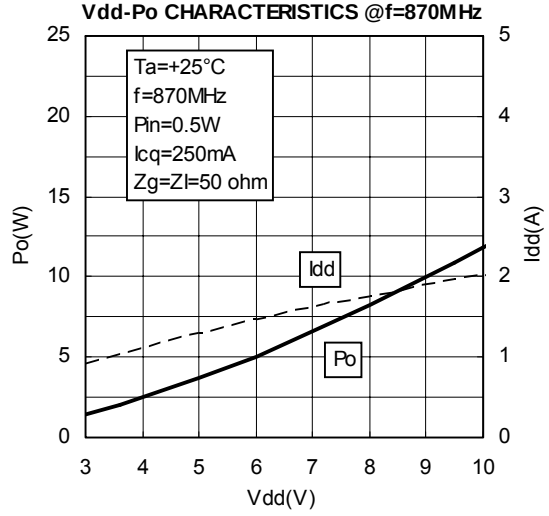
Vdd-Po CHARACTERISTICS @f=527MHz



Vgg-Po CHARACTERISTICS @f=527MHz



Vdd-Po CHARACTERISTICS @f=870MHz



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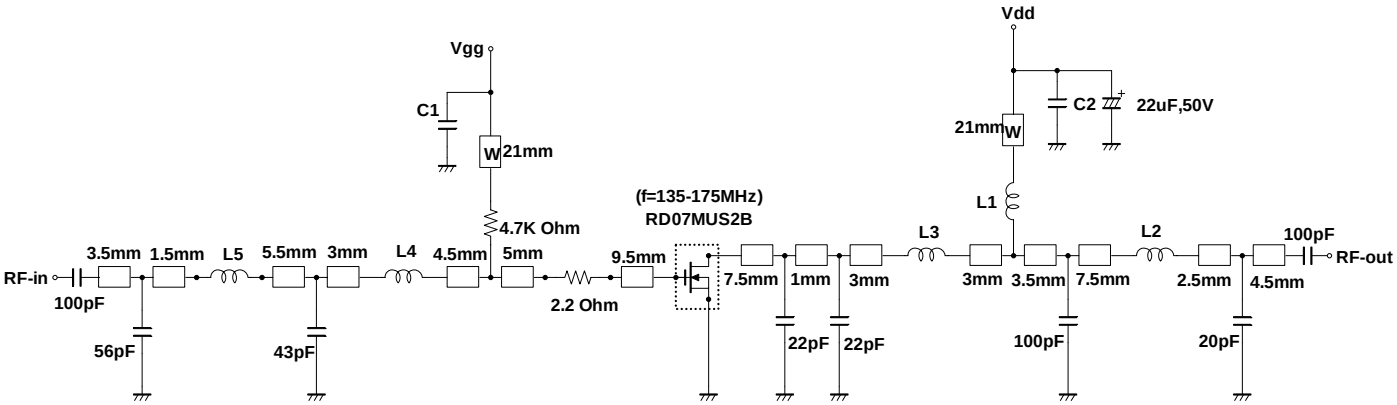
RoHS Compliance, Silicon MOSFET Power Transistor,175MHz,527MHz,7W

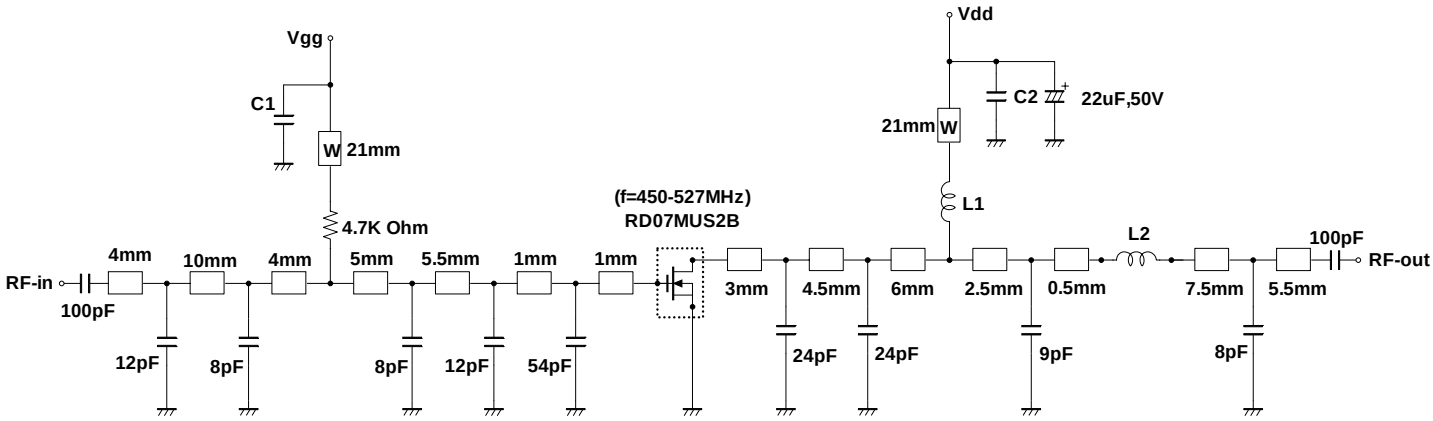
TEST CIRCUIT(f=135-175MHz)



Note:Board material- Glass-Epoxy Substrate
Micro strip line width=1.3mm/50OHM,er:4.8,t=0.8mm
W:Line width=1.0mm

L1,L2 : 31.0nH, Enameled wire 6Turns,D:0.23mm,1.66mmO.D
L3,L5 : 6.6nH, Enameled wire 2Turns,D:0.23mm,1.66mmO.D
L4 : 10.8nH, Enameled wire 4Turns,D:0.43mm,1.66mmO.D
C1,C2 : 1000pF,0.022uF in parallel

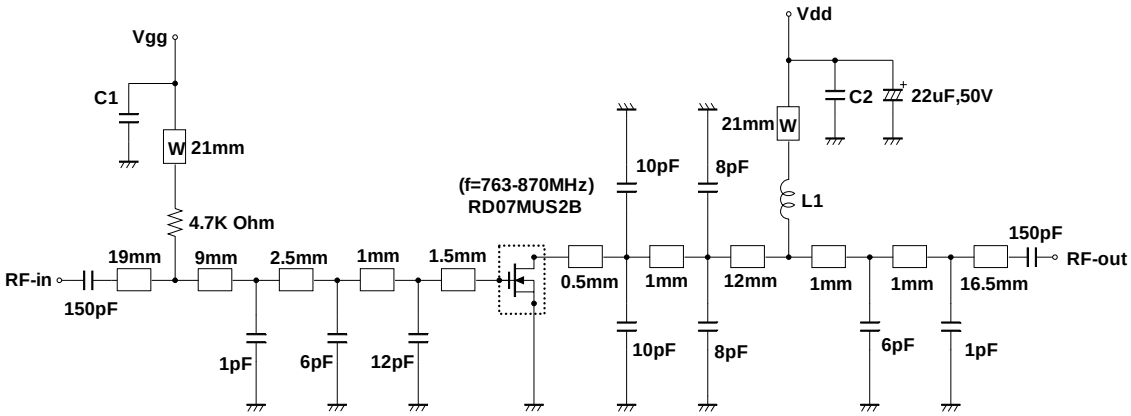
TEST CIRCUIT(f=450-527MHz)



Note:Board material- Glass-Epoxy Substrate
Micro strip line width=1.3mm/50OHM,er:4.8,t=0.8mm
W:Line width=1.0mm

L1 : 34.5nH, Enameled wire 5Turns,D:0.43mm,2.46mmO.D
L2 : 6.6nH, Enameled wire 2Turns,D:0.23mm,1.60mmO.D
C1,C2 : 1000pF,0.022uF in parallel

TEST CIRCUIT(f=763-870MHz)



Note:Board material- Glass-Epoxy Substrate
Micro strip line width=1.3mm/50OHM,er:4.8,t=0.8mm
W:Line width=1.0mm

L1 : 37.8nH, Enameled wire 7Turns,D:0.23mm,1.6mmO.D
C1,C2 : 1000pF,100pF in parallel

ELECTROSTATIC SENSITIVE DEVICE
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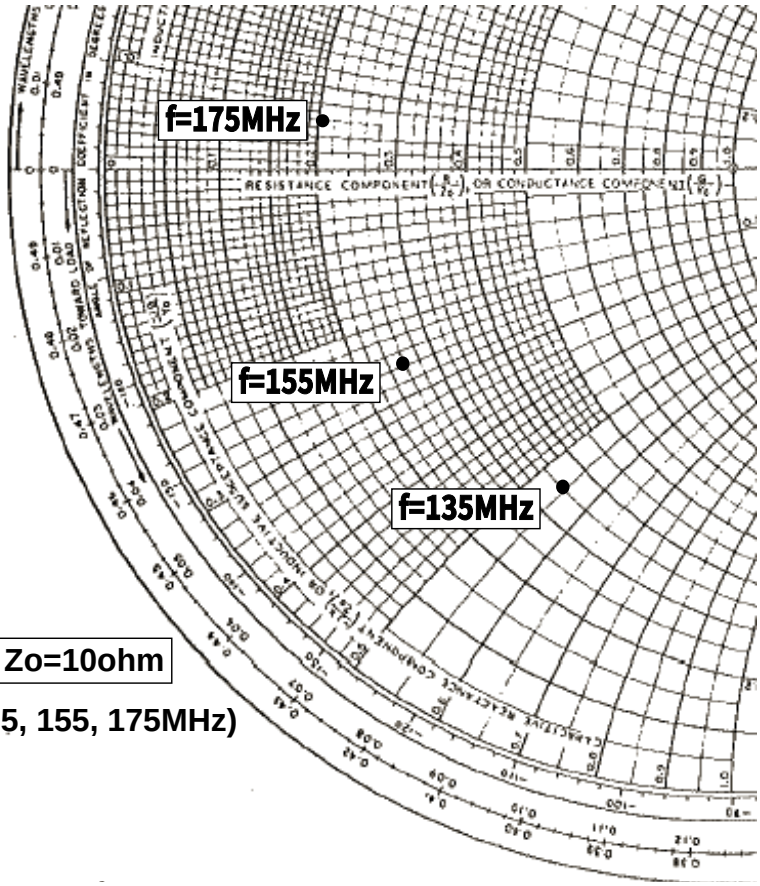
Input / Output Impedance VS. Frequency Characteristics



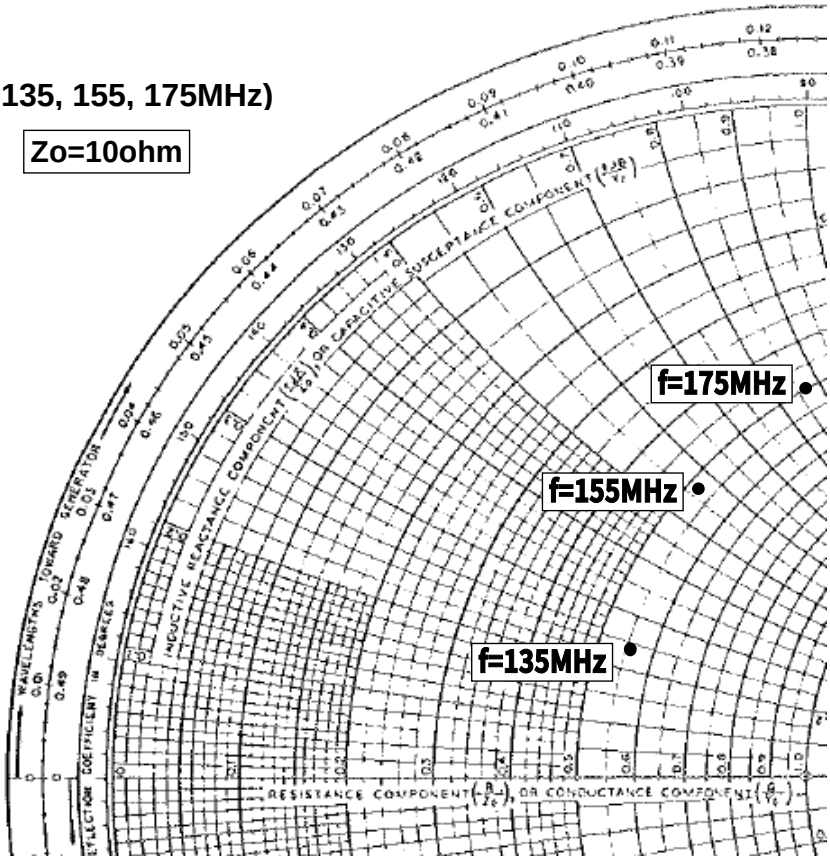
@Pin=0.3W, Vdd=7.2V,
Idq=250mA(Vgg adj.)

f (MHz)	Zout* (ohm)
135	3.50-j5.54
155	2.57-j2.57
175	2.06+j0.62

Zo=10ohm

Zout* (f=135, 155, 175MHz)

Zout*: Complex conjugate of output impedance



Zin* (f=135, 155, 175MHz)

Zo=10ohm

@Pin=0.3W, Vdd=7.2V,
Idq=250mA(Vgg adj.)

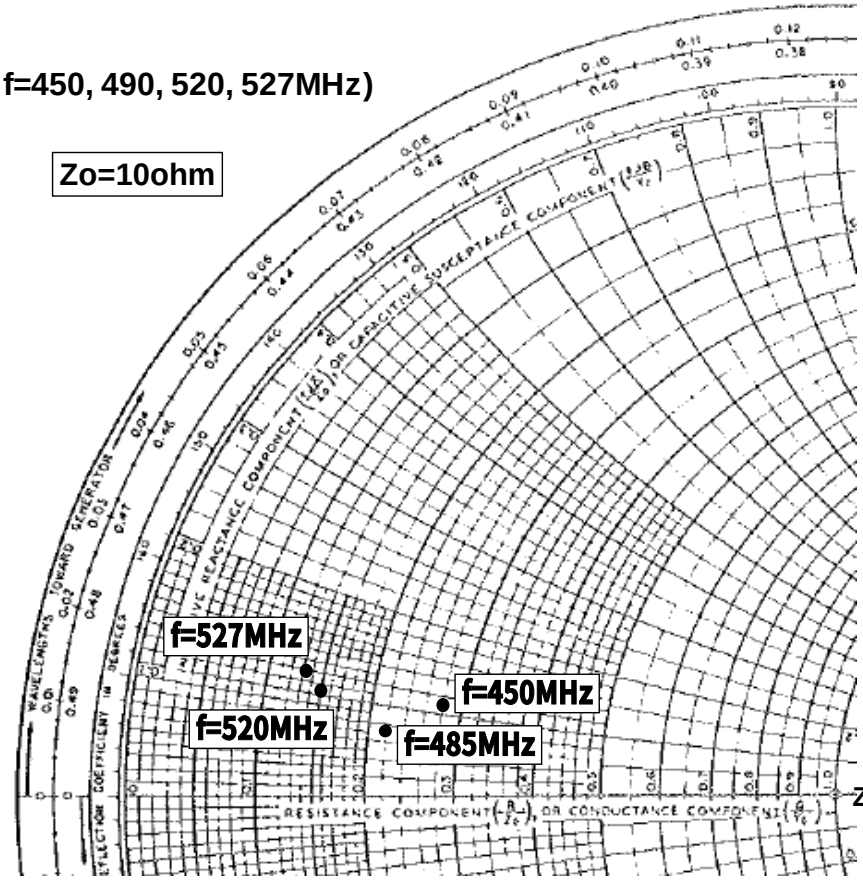
f (MHz)	Zin* (ohm)
135	5.58+j2.43
155	5.25+j5.60
175	5.01+j8.65

Zin*: Complex conjugate of input impedance

Input / Output Impedance VS. Frequency Characteristics

Zout* (f=450, 490, 520, 527MHz)

Zo=10ohm



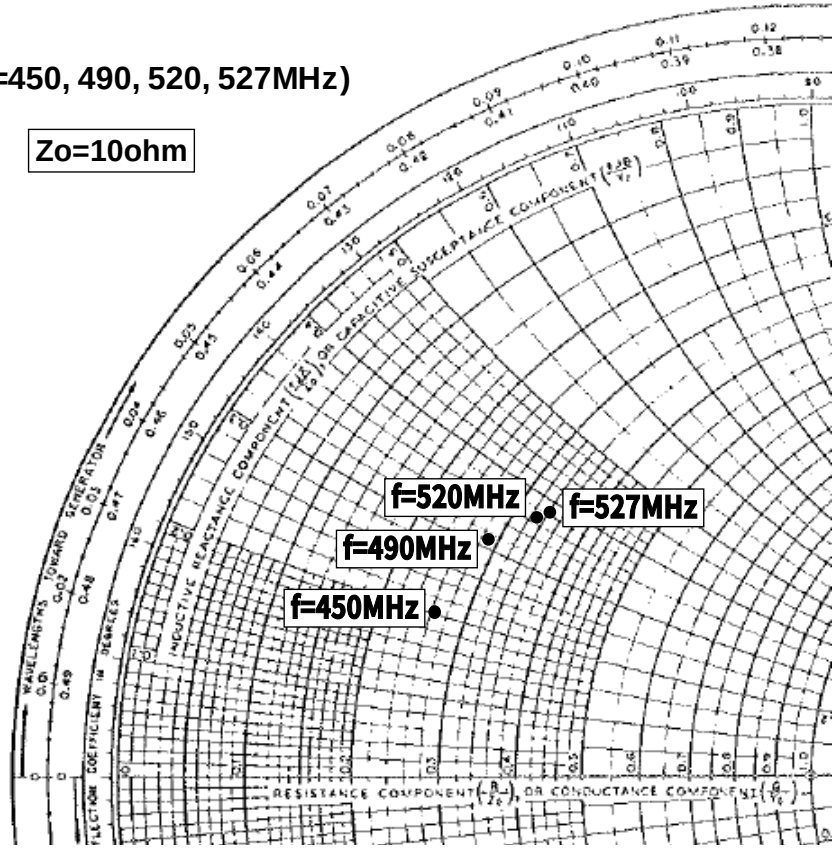
@Pin=0.4W, Vdd=7.2V, Idq=250mA(Vgg adj.)

f (MHz)	Zout* (ohm)
450	2.80+j1.07
490	2.25+j0.75
520	1.51+j1.04
527	1.36+j1.20

Zout*: Complex conjugate of output impedance

Zin* (f=450, 490, 520, 527MHz)

Zo=10ohm



@Pin=0.4W, Vdd=7.2V, Idq=250mA(Vgg adj.)

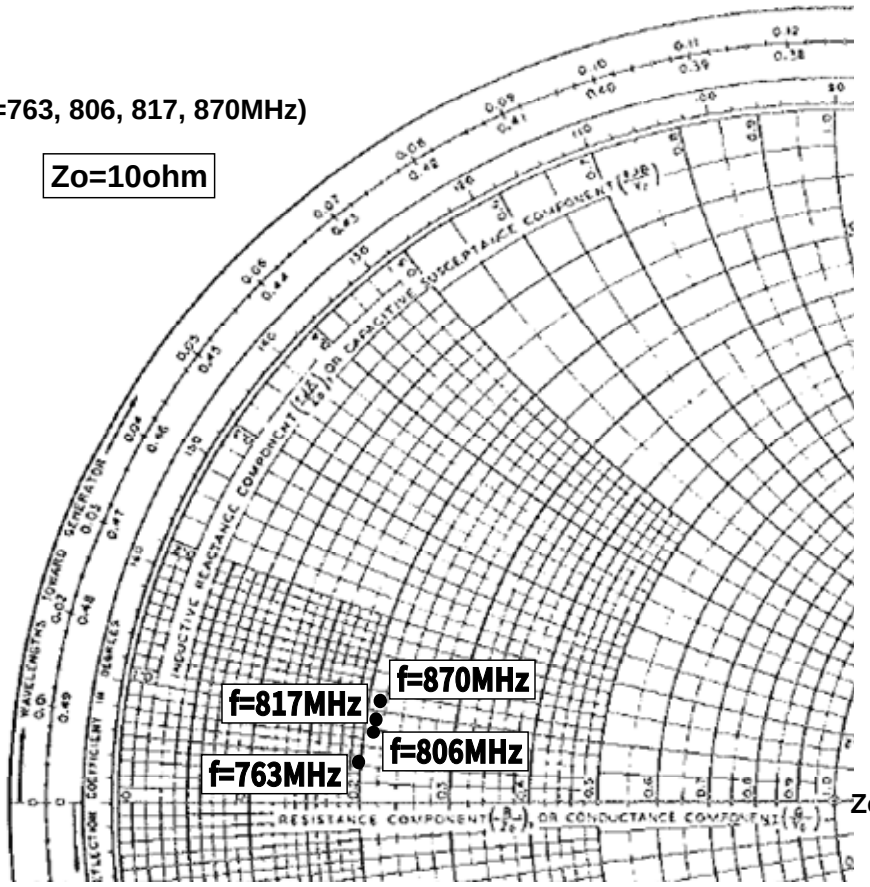
f (MHz)	Zin* (ohm)
450	2.62+j2.02
490	2.90+j3.07
520	3.29+j3.70
527	3.40+j3.81

Zin*: Complex conjugate of input impedance

In put / Output Impedance VS. Frequency Characteristics

Zout* (f=763, 806, 817, 870MHz)

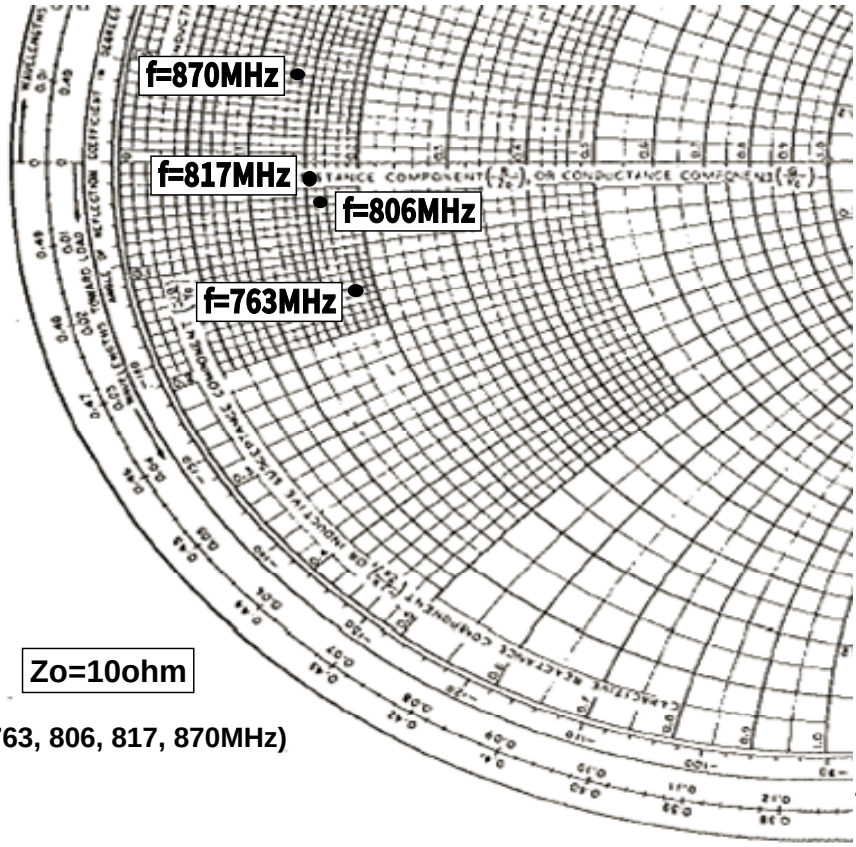
Zo=10ohm



@Pin=0.5W, Vdd=7.2V, Idq=250mA(Vgg adj.)

f (MHz)	Zout* (ohm)
763	2.01+j0.43
806	2.16+j0.80
817	2.17+j0.85
870	2.17+j1.07

Zout*: Complex conjugate of output impedance



@Pin=0.5W, Vdd=7.2V, Idq=250mA(Vgg adj.)

f (MHz)	Zin* (ohm)
763	1.72-j1.54
806	1.55-j0.50
817	1.46-j0.23
870	1.28+j0.95

Zo=10ohm

Zin* (f=763, 806, 817, 870MHz)

Zin*: Complex conjugate of input impedance

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RD07MUS2B S-PARAMETER DATA (@Vdd=7.2V, Id=250mA)

Freq.	S11		S21		S12		S22	
[MHz]	(mag)	(ang)	(mag)	(ang)	(mag)	(ang)	(mag)	(ang)
100	0.850	-170.8	10.060	79.2	0.016	-9.1	0.745	-168.8
135	0.857	-173.2	7.300	73.1	0.016	-14.2	0.759	-169.5
150	0.858	-173.7	6.509	70.7	0.015	-15.2	0.763	-170.0
175	0.863	-174.6	5.435	66.9	0.015	-18.8	0.773	-170.7
200	0.871	-175.4	4.687	63.5	0.014	-23.8	0.781	-170.6
250	0.881	-176.8	3.556	56.7	0.013	-27.4	0.806	-171.0
300	0.889	-178.1	2.791	51.2	0.013	-32.8	0.825	-171.7
350	0.903	-179.0	2.261	45.7	0.011	-36.7	0.843	-172.4
400	0.910	-180.0	1.861	40.9	0.010	-39.7	0.859	-173.2
450	0.918	178.8	1.559	36.7	0.009	-41.9	0.874	-173.9
500	0.927	177.7	1.320	33.0	0.008	-44.9	0.888	-174.5
520	0.928	177.2	1.236	31.5	0.008	-45.1	0.893	-174.8
527	0.929	177.2	1.212	31.2	0.008	-44.2	0.894	-174.9
550	0.931	176.7	1.130	29.5	0.008	-46.4	0.896	-175.4
600	0.934	175.6	0.974	26.5	0.007	-46.4	0.909	-176.0
650	0.940	174.4	0.848	23.4	0.006	-48.0	0.915	-176.5
700	0.943	173.5	0.745	20.9	0.005	-46.0	0.921	-177.4
750	0.946	172.6	0.660	18.6	0.005	-45.9	0.928	-177.8
763	0.948	172.3	0.638	18.0	0.004	-44.9	0.931	-178.0
800	0.950	171.5	0.587	16.5	0.004	-42.0	0.931	-178.3
806	0.951	171.7	0.578	16.3	0.004	-45.4	0.931	-178.3
817	0.950	171.3	0.563	15.8	0.004	-43.6	0.933	-178.6
850	0.950	170.8	0.522	14.5	0.003	-41.8	0.934	-178.8
870	0.955	170.6	0.502	13.8	0.003	-39.4	0.935	-178.9
900	0.952	170.0	0.471	12.9	0.003	-33.7	0.941	-179.2
950	0.956	169.2	0.427	11.1	0.002	-26.6	0.943	-179.5
1000	0.957	168.4	0.387	9.7	0.002	-17.3	0.943	179.9
1050	0.960	167.7	0.353	8.1	0.002	-7.4	0.949	179.7
1100	0.961	167.1	0.323	6.9	0.002	8.9	0.949	179.6

RD07MUS2B S-PARAMETER DATA (@Vdd=3.6V, Id=250mA)

Freq.	S11		S21		S12		S22	
[MHz]	(mag)	(ang)	(mag)	(ang)	(mag)	(ang)	(mag)	(ang)
100	0.850	-172.3	8.581	78.7	0.016	-9.3	0.782	-171.0
135	0.855	-174.2	6.239	73.0	0.016	-13.3	0.793	-171.6
150	0.856	-174.7	5.564	70.6	0.016	-17.3	0.797	-172.0
175	0.862	-175.3	4.661	66.8	0.015	-20.0	0.806	-172.5
200	0.869	-176.2	4.030	63.5	0.015	-23.1	0.812	-172.7
250	0.881	-177.4	3.057	56.8	0.014	-28.7	0.831	-173.0
300	0.887	-178.5	2.400	51.3	0.013	-32.8	0.849	-173.6
350	0.901	-179.5	1.945	46.0	0.012	-36.0	0.863	-174.3
400	0.909	179.6	1.606	41.2	0.010	-40.7	0.877	-175.0
450	0.917	178.6	1.345	37.2	0.009	-42.4	0.890	-175.5
500	0.927	177.5	1.139	33.2	0.008	-45.0	0.902	-176.2
520	0.929	177.0	1.068	31.9	0.008	-45.4	0.904	-176.3
527	0.926	176.9	1.048	31.6	0.008	-44.5	0.907	-176.4
550	0.929	176.4	0.975	29.9	0.008	-45.1	0.909	-176.9
600	0.933	175.3	0.841	26.9	0.007	-47.2	0.918	-177.4
650	0.937	174.2	0.732	23.8	0.006	-47.4	0.925	-178.0
700	0.944	173.4	0.644	21.4	0.005	-46.7	0.931	-178.6
750	0.945	172.5	0.571	19.2	0.005	-44.2	0.935	-179.0
763	0.947	172.2	0.552	18.4	0.005	-44.2	0.939	-179.1
800	0.949	171.6	0.508	17.0	0.004	-43.7	0.938	-179.3
806	0.949	171.5	0.502	16.8	0.004	-42.8	0.938	-179.5
817	0.951	171.4	0.488	16.2	0.004	-42.3	0.940	-179.6
850	0.949	170.8	0.454	15.0	0.003	-40.8	0.941	-179.8
870	0.953	170.5	0.436	14.3	0.003	-37.7	0.940	-180.0
900	0.952	169.9	0.408	13.3	0.003	-32.1	0.946	179.8
950	0.957	169.2	0.370	11.8	0.003	-25.2	0.949	179.5
1000	0.959	168.2	0.335	10.3	0.002	-18.0	0.949	179.0
1050	0.960	167.7	0.306	8.6	0.002	-6.7	0.955	178.8
1100	0.960	167.0	0.280	7.4	0.002	6.9	0.954	178.7

ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

Precautions for the use of MITSUBISHI silicon RF power amplifier devices

1. The specifications of mention are not guarantee values in this data sheet. Please confirm additional details regarding operation of these products from the formal specification sheet. For copies of the formal specification sheets, please contact one of our sales offices.
2. RA series products (RF power amplifier modules) and RD series products (RF power transistors) are designed for consumer mobile communication terminals and were not specifically designed for use in other applications. In particular, while these products are highly reliable for their designed purpose, they are not manufactured under a quality assurance testing protocol that is sufficient to guarantee the level of reliability typically deemed necessary for critical communications elements. Examples of critical communications elements would include transmitters for base station applications and fixed station applications that operate with long term continuous transmission and a higher on-off frequency during transmitting, especially for systems that may have a high impact to society.
3. RA series and RD series products use MOSFET semiconductor technology. They are sensitive to ESD voltage therefore appropriate ESD precautions are required.
4. In the case of use in below than recommended frequency, there is possibility to occur that the device is deteriorated or destroyed due to the RF-swing exceed the breakdown voltage.
5. In order to maximize reliability of the equipment, it is better to keep the devices temperature low. It is recommended to utilize a sufficient sized heat-sink in conjunction with other cooling methods as needed (fan, etc.) to keep the case temperature for RA series products lower than 60deg/C under standard conditions, and less than 90deg/C under extreme conditions.
6. RA series products are designed to operate into a nominal load impedance of 50 ohms. Under the condition of operating into a severe high load VSWR approaching an open or short, an over load condition could occur. In the worst case there is risk for burn out of the transistors and burning of other parts including the substrate in the module.
7. The formal specification includes a guarantee against parasitic oscillation under a specified maximum load mismatch condition. The inspection for parasitic oscillation is performed on a sample basis on our manufacturing line. It is recommended that verification of no parasitic oscillation be performed at the completed equipment level also.
8. For specific precautions regarding assembly of these products into the equipment, please refer to the supplementary items in the specification sheet.
9. Warranty for the product is void if the products protective cap (lid) is removed or if the product is modified in any way from it's original form.
10. For additional "Safety first" in your circuit design and notes regarding the materials, please refer the last page of this data sheet.
11. Please refer to the additional precautions in the formal specification sheet.

warning !

Do not use the device at the exceeded the maximum rating condition. In case of plastic molded devices, the exceeded maximum rating condition may cause blowout, smoldering or catch fire of the molding resin due to extreme short current flow between the drain and the source of the device. These results causes in fire or injury.

ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

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.

Notes regarding these materials

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