MITSUBISHI ELECTRIC

< Silicon RF Power MOS FET (Discrete) >

RD07MUS2B

RoHS Compliance,Silicon MOSFET Power Transistor,175MHz,527MHz,870MHz,7W

DESCRIPTION

RD07MUS2B of RoHS-compliant product is a MOS FET type transistor specifically designed for VHF/UHF/870MHz RF power amplifiers applications.

FEATURES

High power gain and High Efficiency.

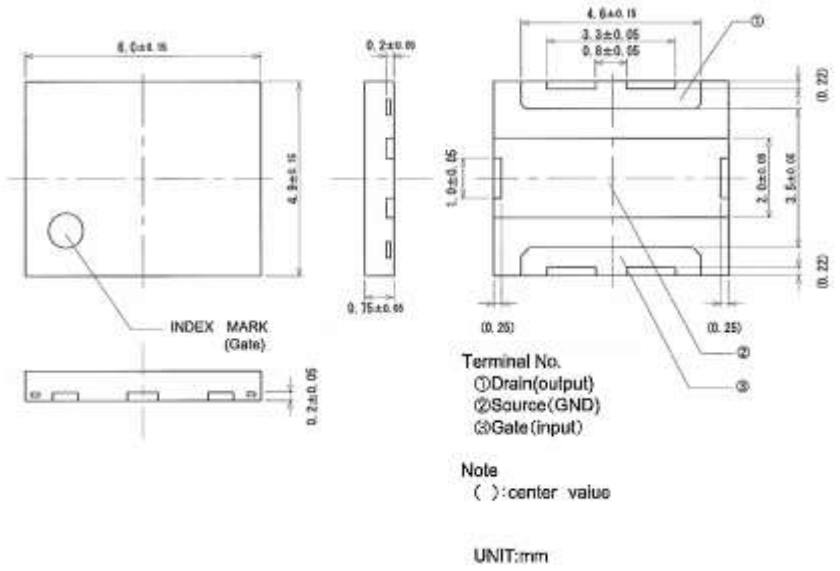
Typical	Po	Gp	ηD
(175MHz)	7.2W	13.8dB	65%
(527MHz)	8W	13.0dB	63%
(870MHz)	7W	11.5dB	58%

Integrated gate protection diode.

APPLICATION

For output stage of high power amplifiers in VHF/UHF/800MHz-band mobile radio sets.

OUTLINE DRAWING



RoHS COMPLIANT

RD07MUS2B is a RoHS compliant product.
RoHS compliance is indicating by the letter “G” after the Lot Marking.

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.	
I_{DSS}	Drain cutoff current	V_{DS}=17V, V_{GS}=0V	-	-	10	uA
I_{GSS}	Gate cutoff current	V_{GS}=5V, V_{DS}=0V	-	-	1	uA
V_{TH}	Gate threshold Voltage	V_{DS}=7.2V, I_{DS}=1mA	0.5	1	1.5	V
Pout1	Output power	f=175MHz,V_{DD}=7.2V	-	7.2*	-	W
ηD1	Drain efficiency	Pin=0.3W,Idq=250mA	-	65*	-	%
Pout2	Output power	f=527MHz ,V_{DD}=7.2V	7**	8**	-	W
ηD2	Drain efficiency	Pin=0.4W,Idq=250mA	58**	63**	-	%
Pout3	Output power	f=870MHz ,V_{DD}=7.2V	-	7***	-	W
ηD3	Drain efficiency	Pin=0.5W,Idq=250mA	-	58***	-	%
VSWRT	Load VSWR tolerance	V_{DD}=9.5V,Po=7W(Pin Control) f=527MHz,Idq=250mA,Zg=50Ω Load VSWR=20:1(All Phase)	No destroy			-

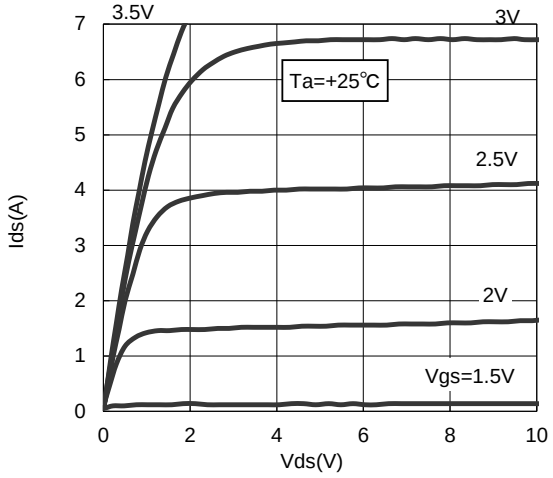
Note: Above parameters, ratings, limits and conditions are subject to change.

* At 135-175MHz broad matching ** At 450-527MHz broad matching *** At 763-870MHz broad matching

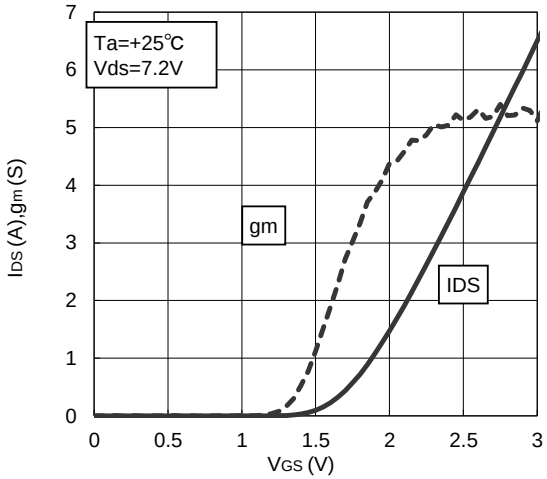
TYPICAL CHARACTERISTICS

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

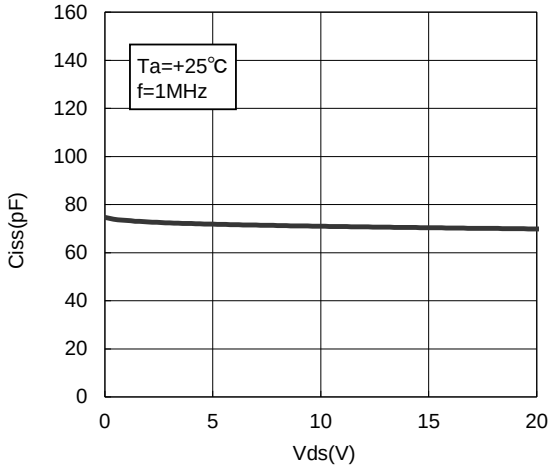
Vds-Ids CHARACTERISTICS



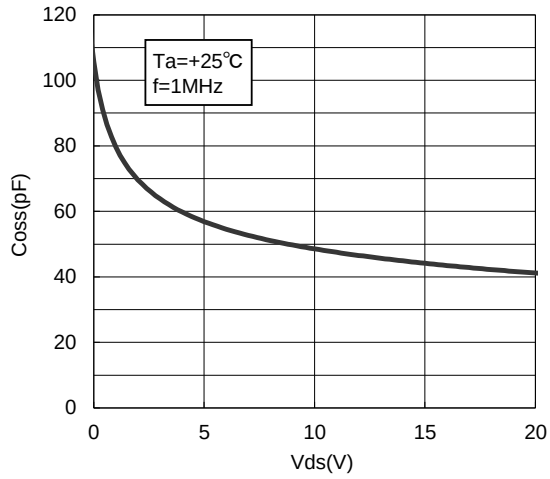
VGS-IDS CHARACTERISTICS



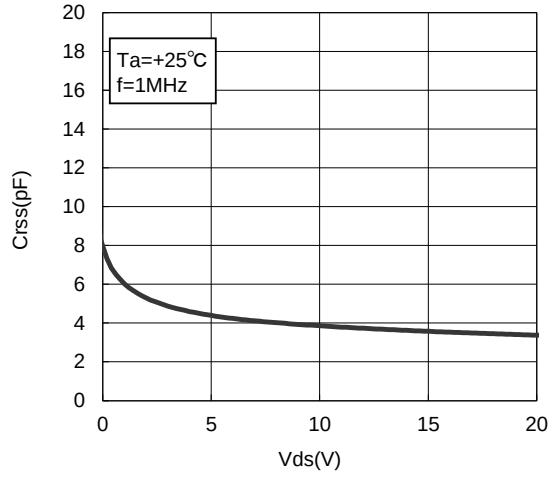
Vds VS. Ciss CHARACTERISTICS



Vds VS. Coss CHARACTERISTICS



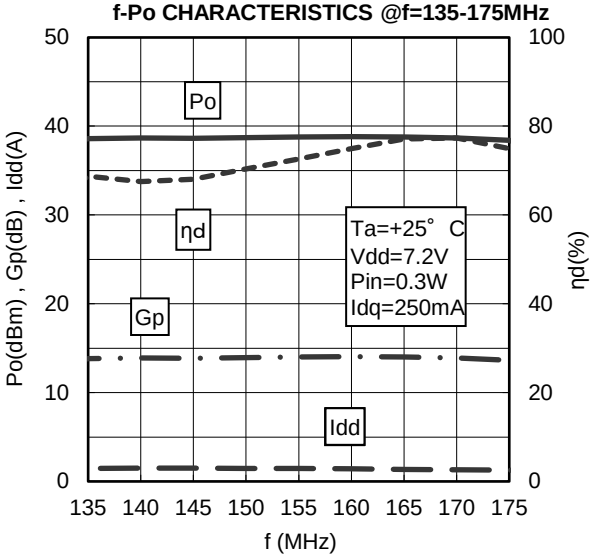
Vds VS. Crss CHARACTERISTICS



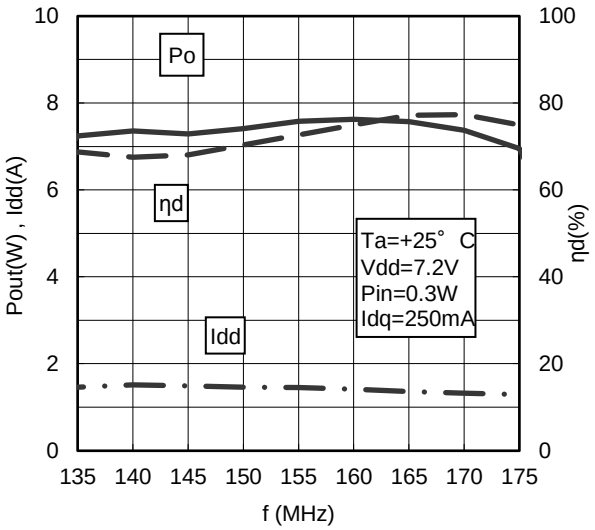
TYPICAL CHARACTERISTICS (135-175MHz)

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

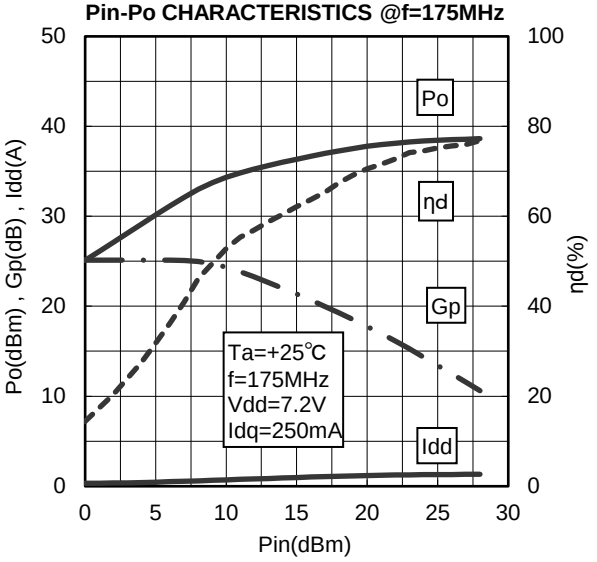
f-Po CHARACTERISTICS @f=135-175MHz



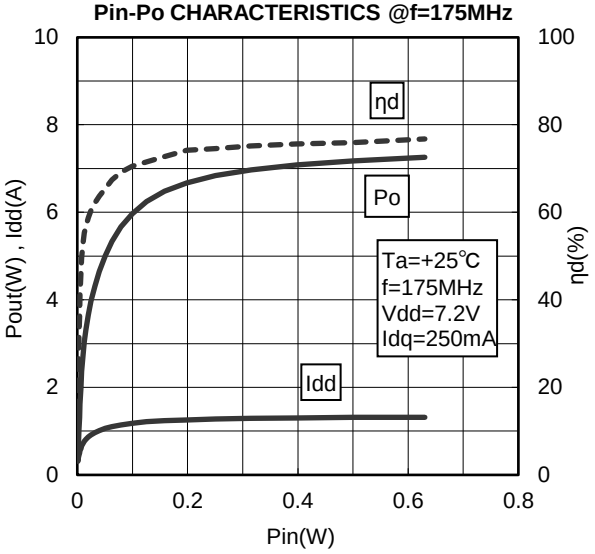
f-Po CHARACTERISTICS @f=135-175MHz



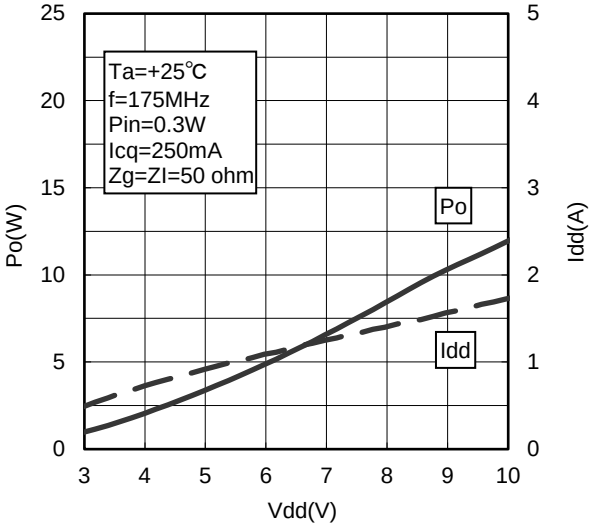
Pin-Po CHARACTERISTICS @f=175MHz



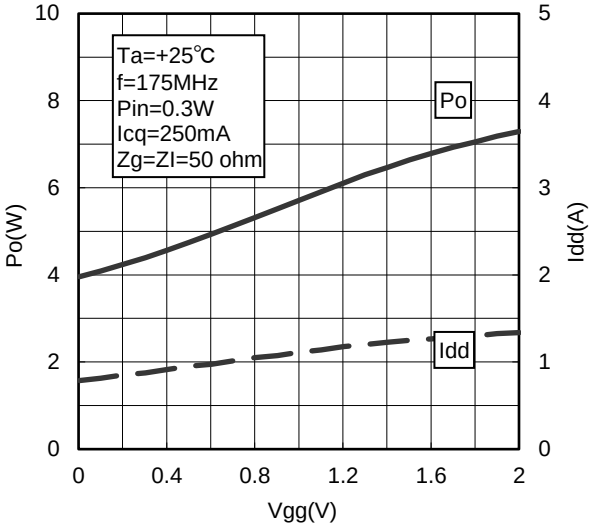
Pin-Po CHARACTERISTICS @f=175MHz



Vdd-Po CHARACTERISTICS @f=175MHz



Vgg-Po CHARACTERISTICS @f=175MHz



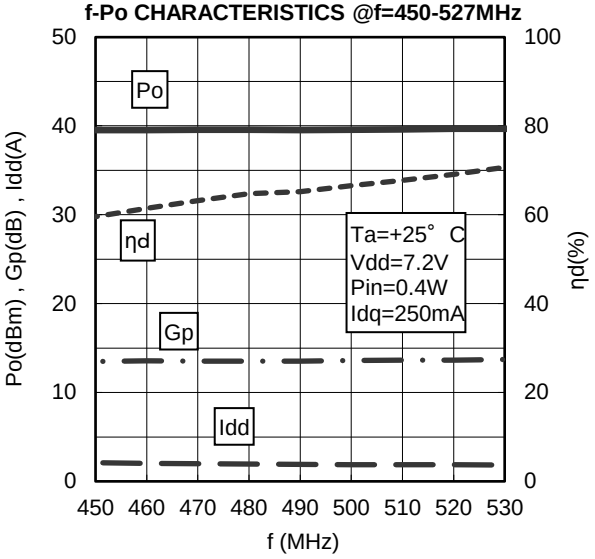
RD07MUS2B

RoHS Compliance,Silicon MOSFET Power Transistor,175MHz,527MHz,870MHz,7W

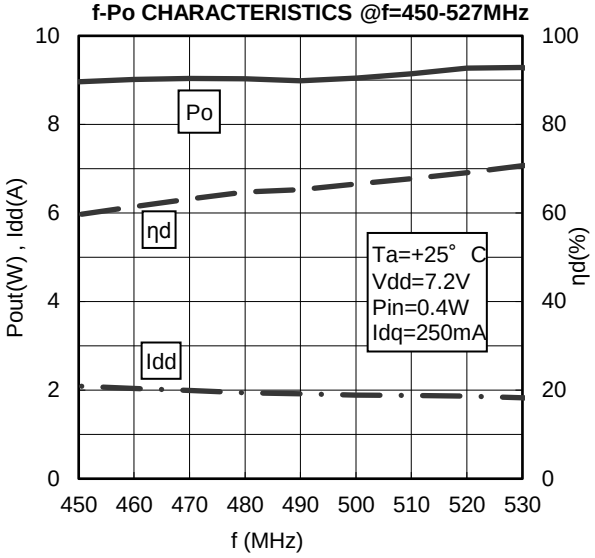
TYPICAL CHARACTERISTICS (450-527MHz)

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

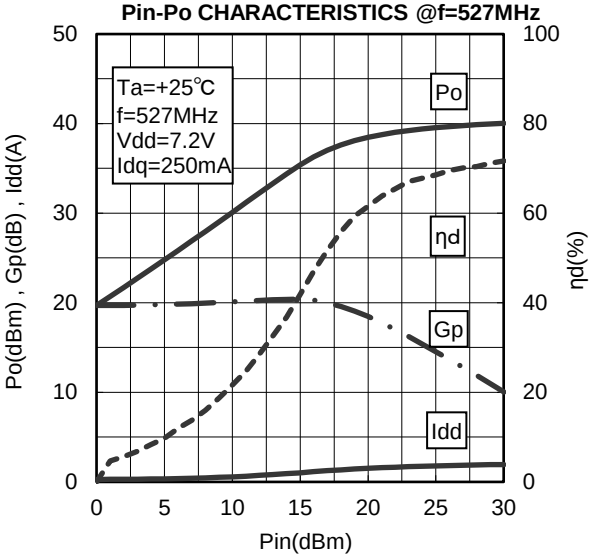
f-Po CHARACTERISTICS @f=450-527MHz



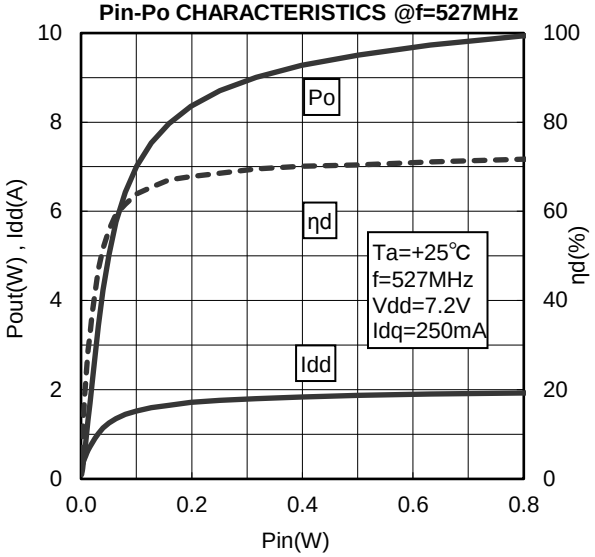
f-Po CHARACTERISTICS @f=450-527MHz



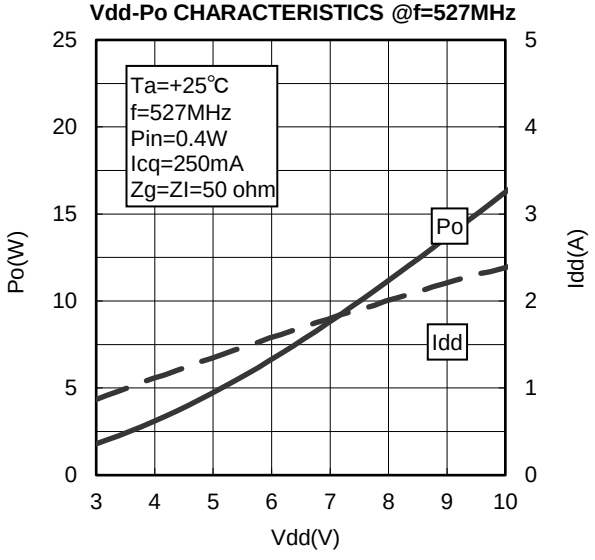
Pin-Po CHARACTERISTICS @f=527MHz



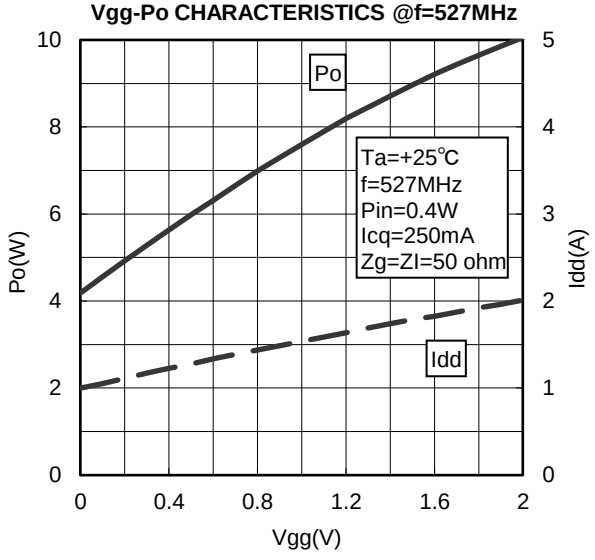
Pin-Po CHARACTERISTICS @f=527MHz



Vdd-Po CHARACTERISTICS @f=527MHz



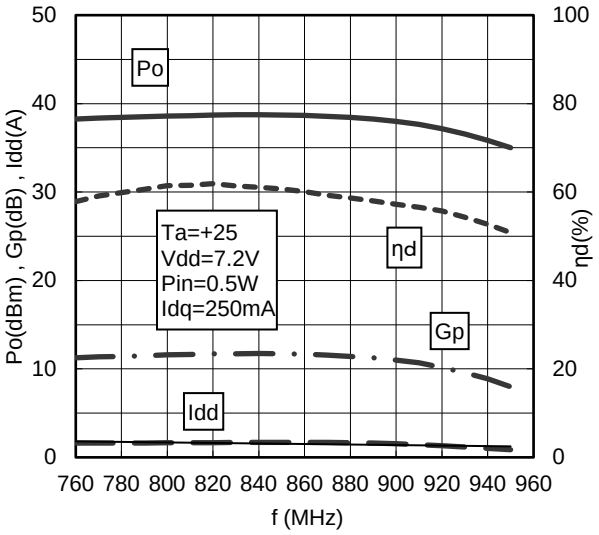
Vgg-Po CHARACTERISTICS @f=527MHz



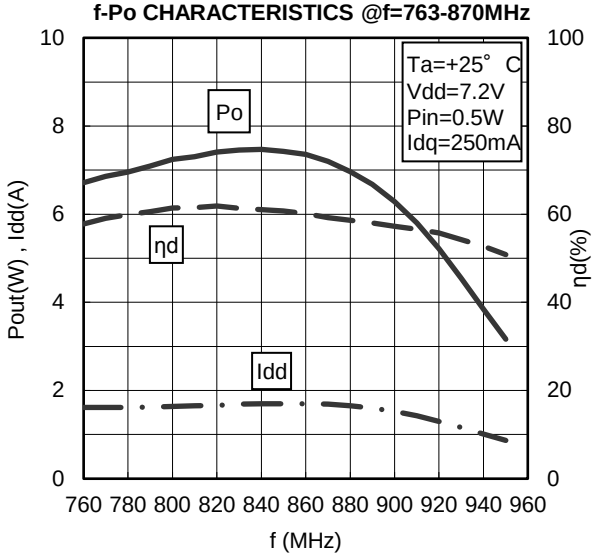
TYPICAL CHARACTERISTICS (763-870MHz)

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

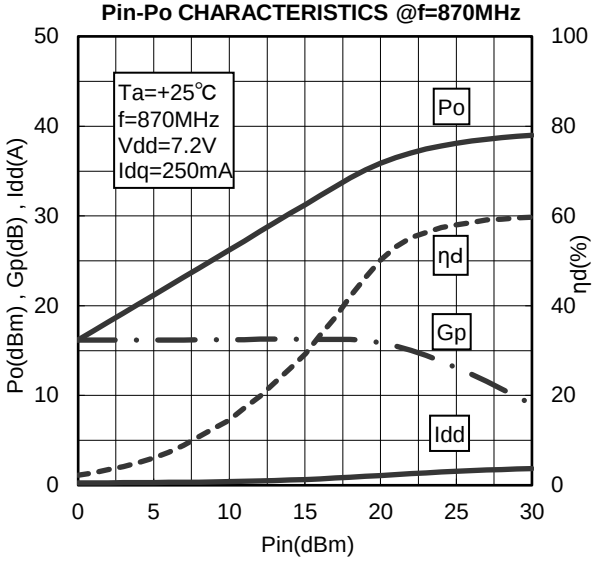
f-Po CHARACTERISTICS @f=763-870MHz



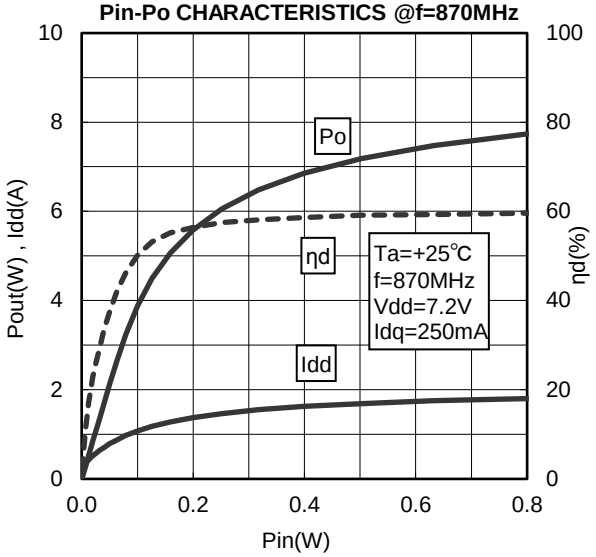
f-Po CHARACTERISTICS @f=763-870MHz



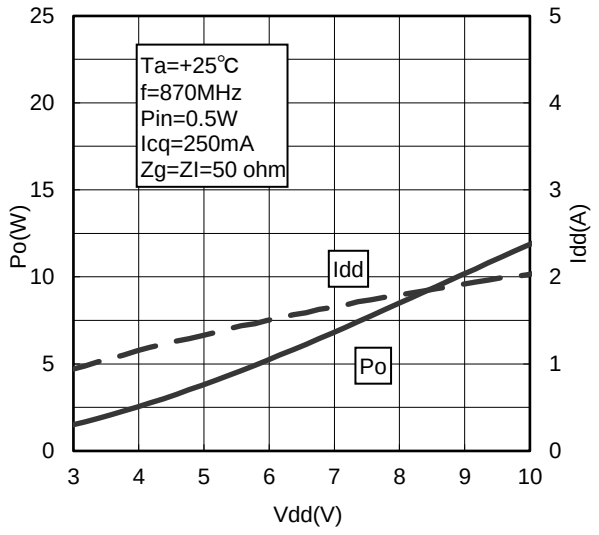
Pin-Po CHARACTERISTICS @f=870MHz



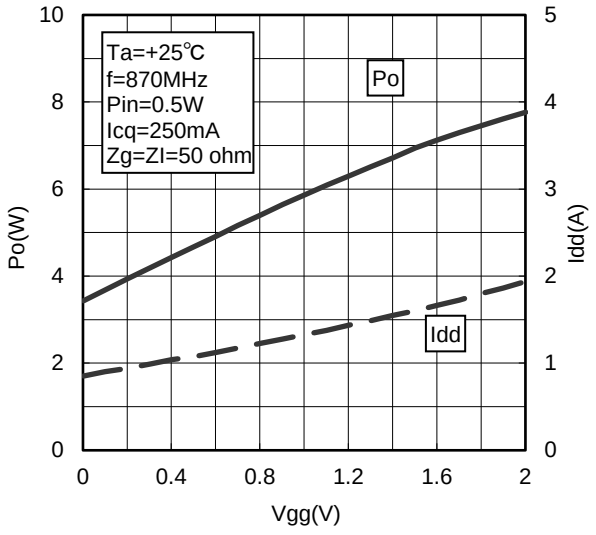
Pin-Po CHARACTERISTICS @f=870MHz



Vdd-Po CHARACTERISTICS @f=870MHz



Vgg-Po CHARACTERISTICS @f=870MHz



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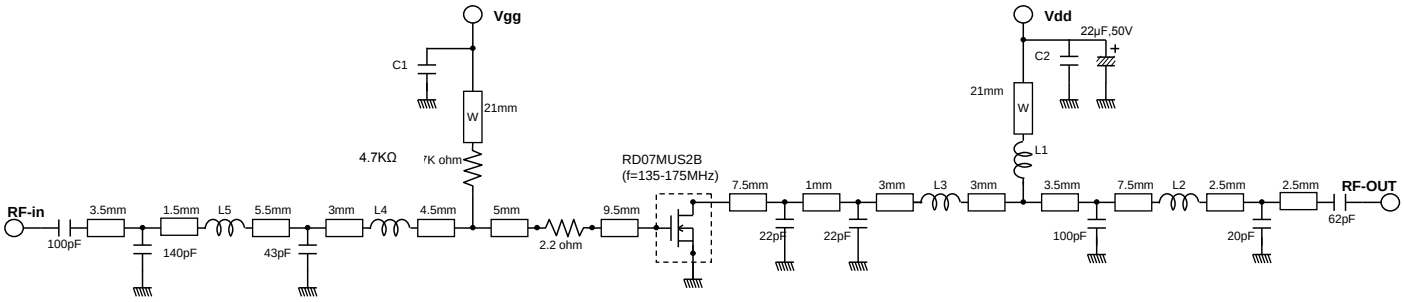
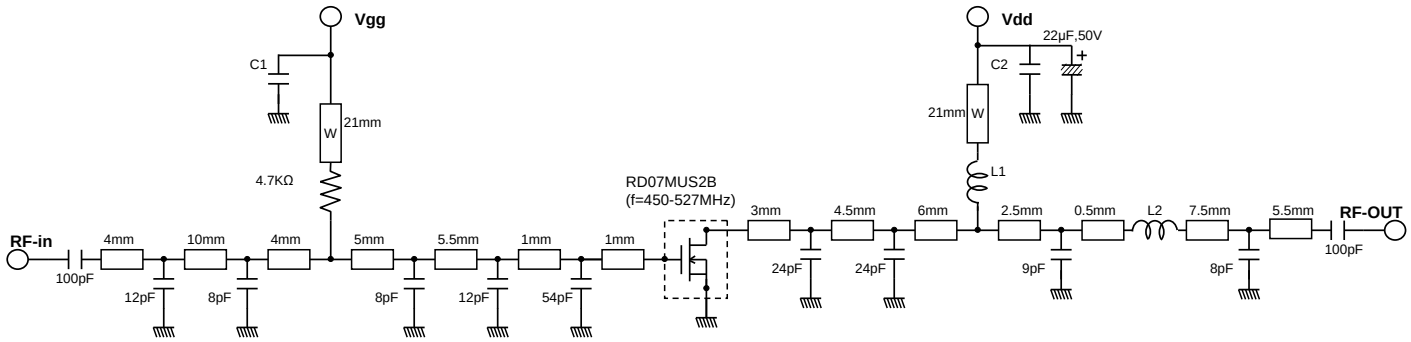
TEST CIRCUIT(f=135-175MHz)



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

L1,L2:Enameled wire 6 Turns,D:0.23mm,1.66mm O.D
L3,L5:Enameled wire 2 Turns,D:0.23mm,1.66mm O.D
L4 :Enameled wire 4 Turns,D:0.43mm,1.66mm O.D
C1,C2:1000pF,0.0022μF in parallel

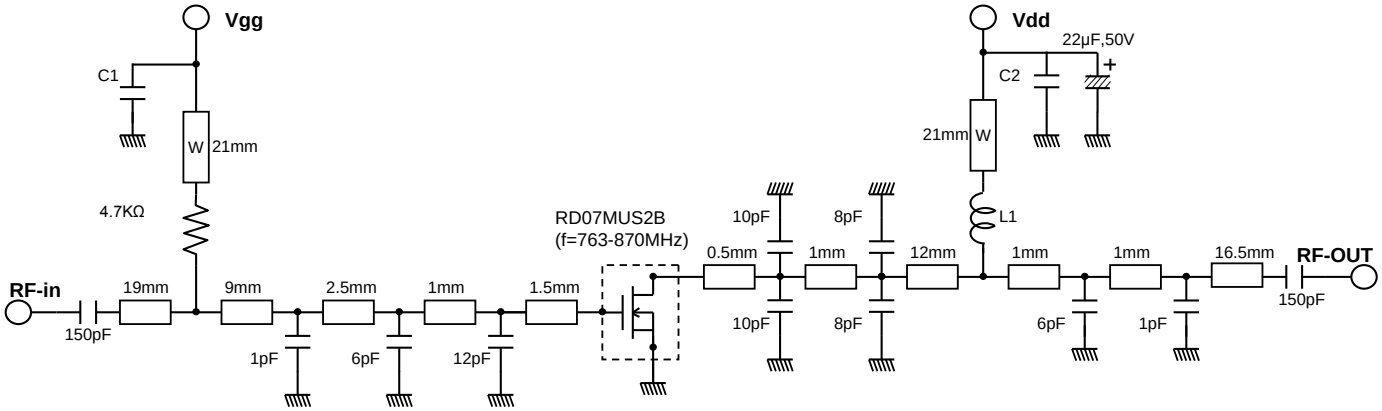
TEST CIRCUIT(f=450-527MHz)



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

L1:Enameled wire 5 Turns,D:0.43mm,2.46mm O.D
L2:Enameled wire 2 Turns,D:0.23mm,1.66mm O.D
C1,C2:1000pF,0.0022μF in parallel

TEST CIRCUIT(f=763-870MHz)

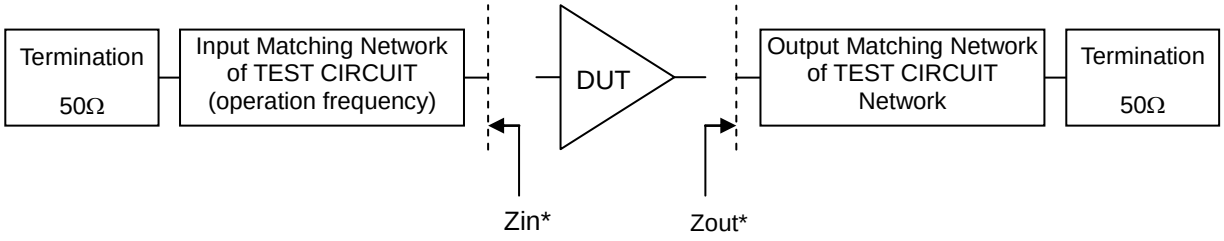


Note:Board material Glass-Epoxy substrate
Micro strip line width=1.3mm/50Ω,er:4.8,t=0.8mm
W:line width=1.0mm

L1:Enameled wire 7 Turns,D:0.23mm,1.66mm O.D
C1,C2:1000pF,100pF in parallel

Input / Output Impedance VS. Frequency Characteristics

Method of Measurement

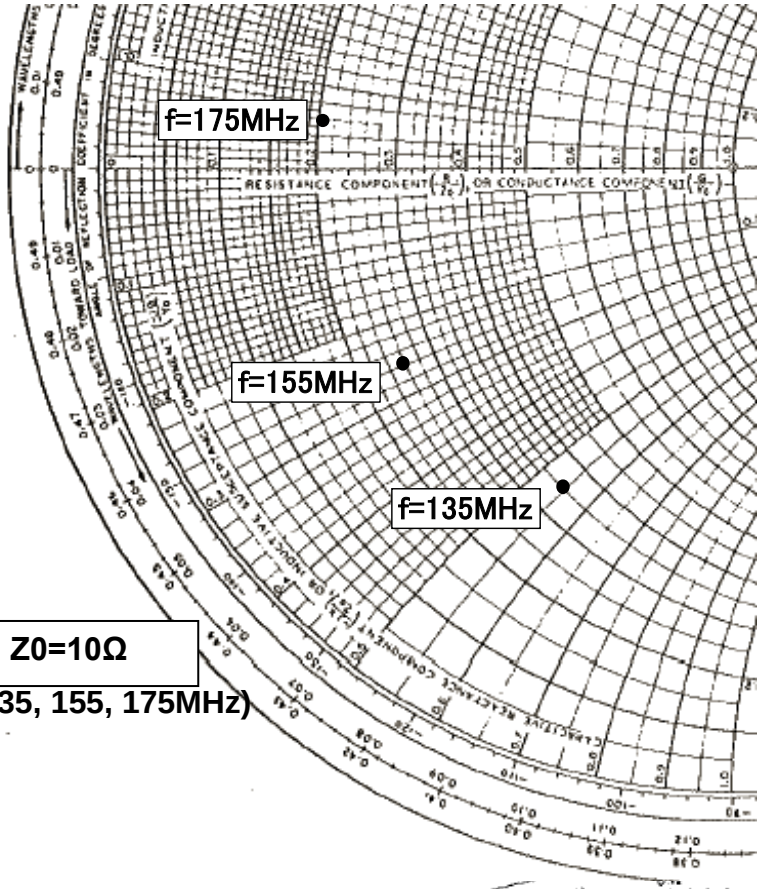


Zin*: Input Matching Network impedance measured from DUT

Zout*: Output Matching Network impedance measured from DUT

Z0: Characteristic impedance

Input / Output Impedance VS. Frequency Characteristics



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

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

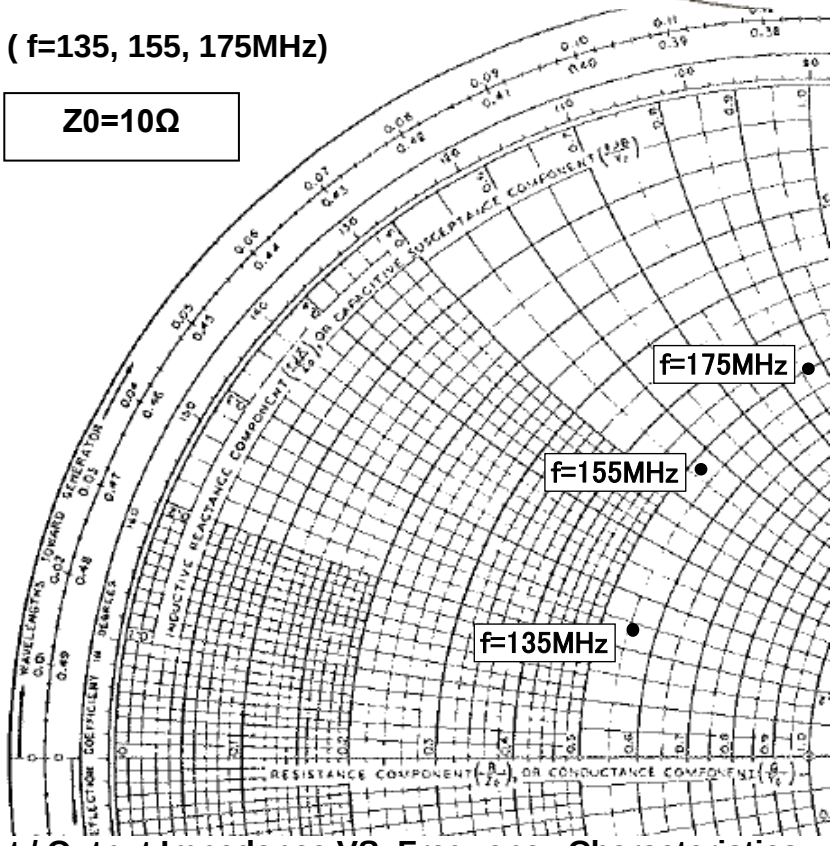
Z0=10Ω

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

Zout*: Complex conjugate of output impedance

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

Z0=10Ω



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

f (MHz)	Zin* (Ω)
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

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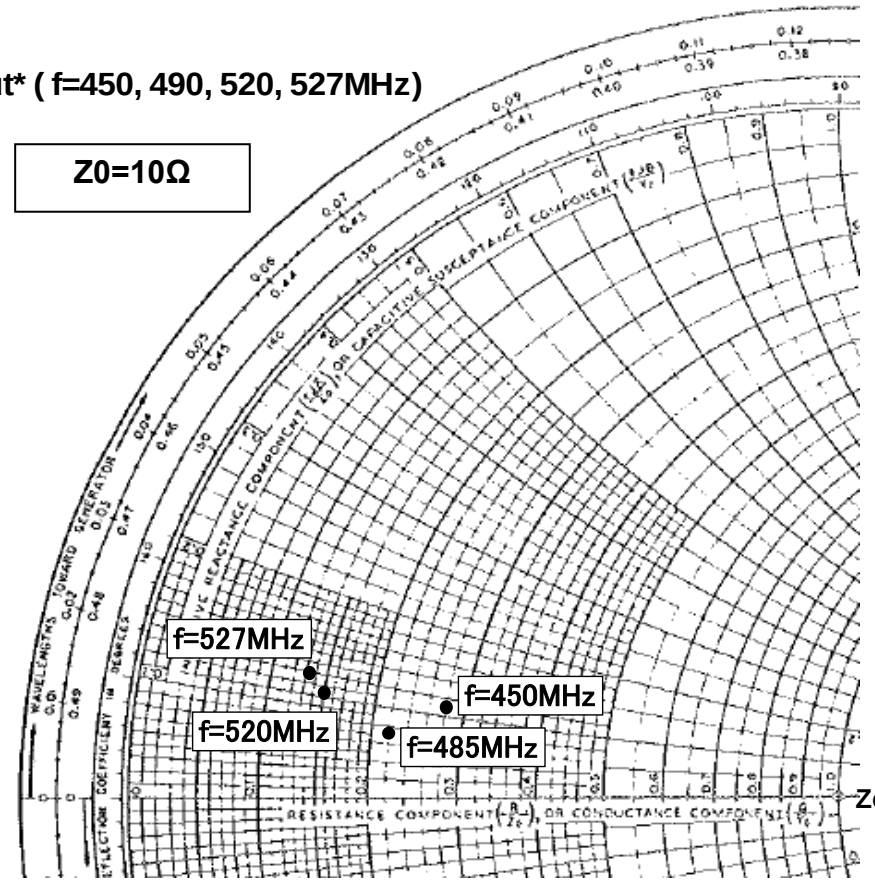
Zout* (f=450, 490, 520, 527MHz)

Z0=10Ω



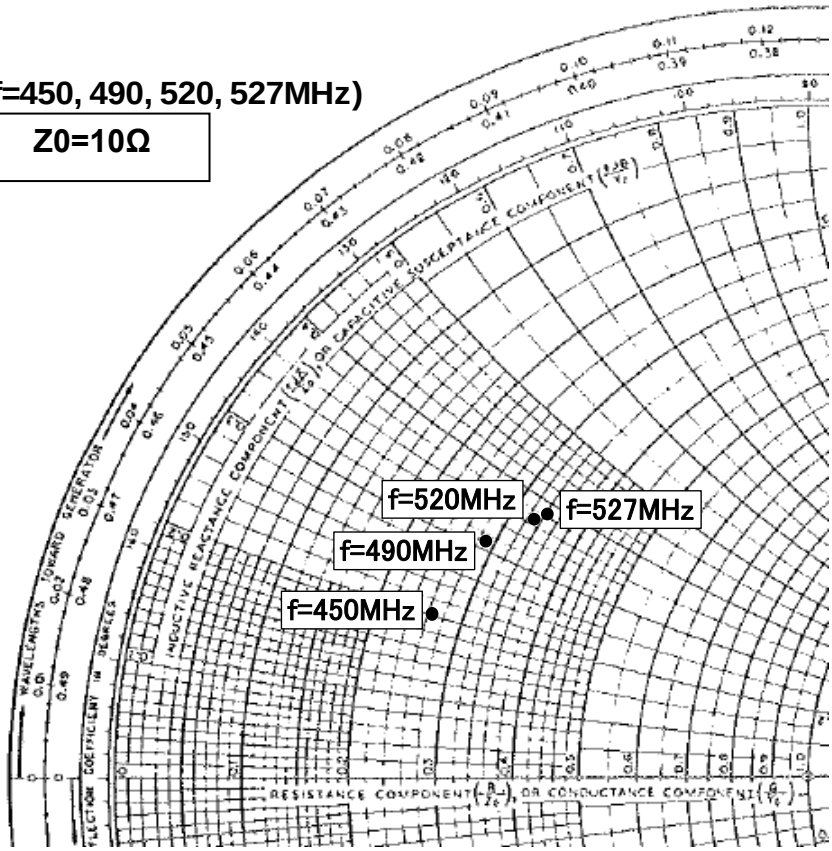
@Pin=0.4W, Vdd=7.2V, Idq=250mA(Vgg adj.)

f (MHz)	Zout* (Ω)
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)

Z0=10Ω



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

f (MHz)	Zin* (Ω)
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

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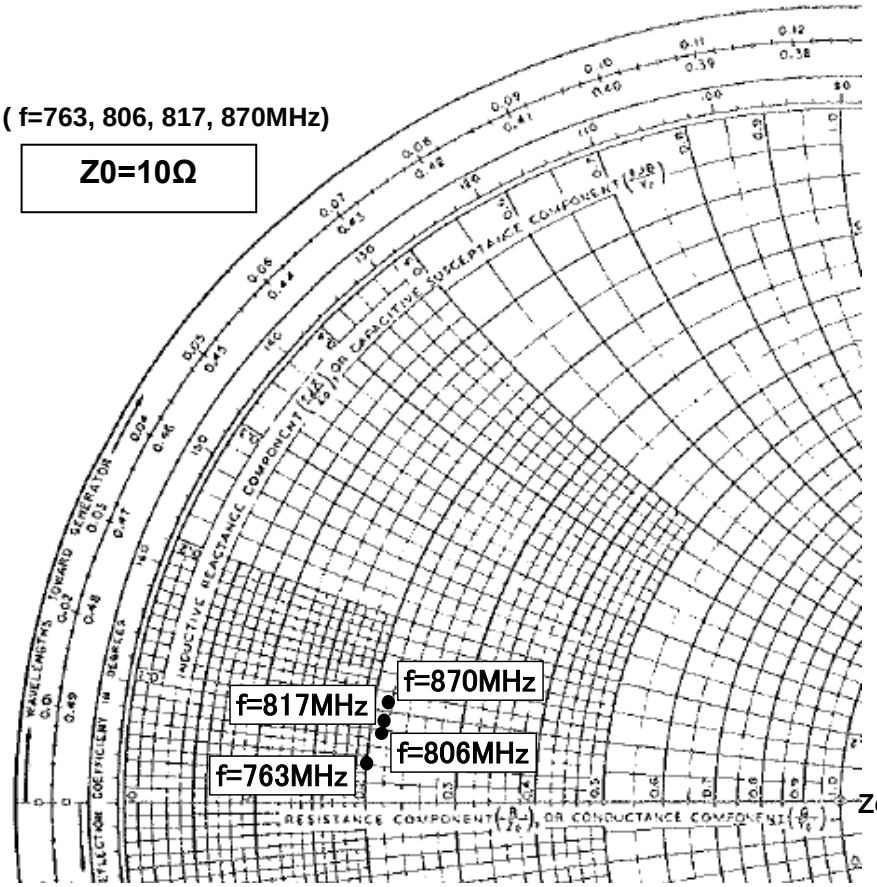
Input / Output Impedance VS. Frequency Characteristics

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

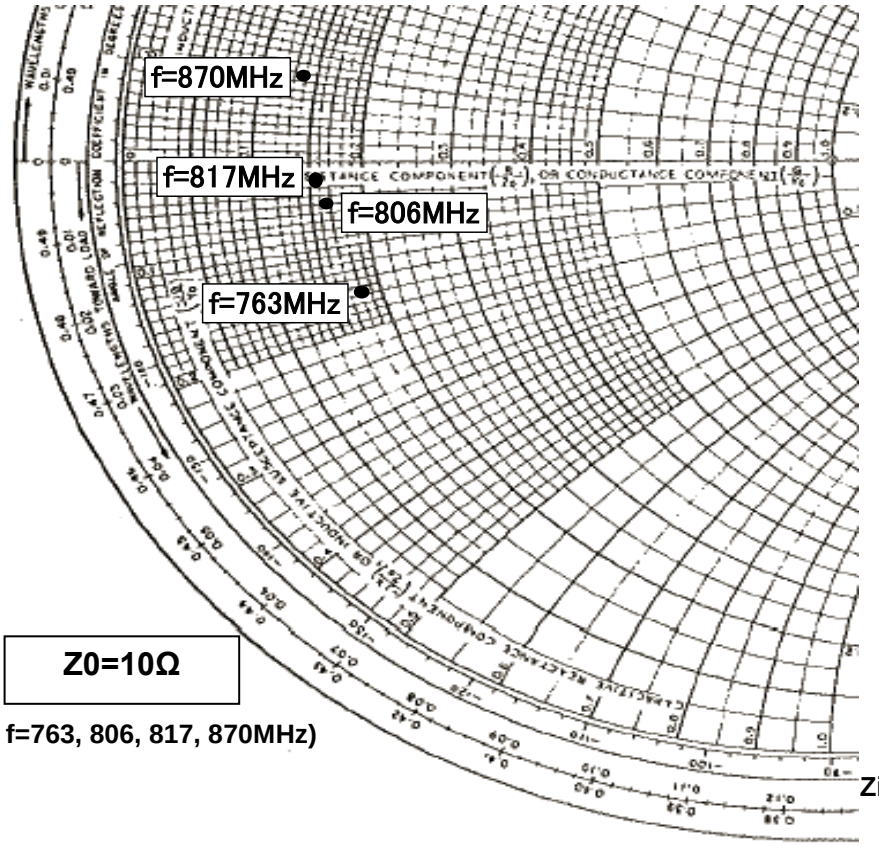
Z0=10Ω



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

f (MHz)	Zout* (Ω)
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* (Ω)
763	1.72−j1.54
806	1.55−j0.50
817	1.46−j0.23
870	1.28+j0.95

Z0=10Ω

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

Zin*: Complex conjugate of input impedance

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

Freq.	S11		S21		S12		S22	
[MHz]	(mag)	(ang)	(mag)	(ang)	(mag)	(ang)	(mag)	(ang)
100	0.838	-168.9	10.744	80.7	0.016	-7.6	0.752	-168.4
135	0.843	-170.7	7.837	74.8	0.015	-12.7	0.764	-169.6
150	0.845	-171.2	6.996	72.6	0.015	-14.5	0.769	-169.8
175	0.851	-171.8	5.894	68.9	0.015	-17.6	0.779	-170.0
200	0.857	-172.3	5.051	65.4	0.014	-20.4	0.790	-170.3
250	0.870	-173.1	3.857	59.2	0.014	-25.5	0.810	-170.6
300	0.882	-173.8	3.048	53.6	0.013	-29.7	0.829	-171.1
350	0.893	-174.5	2.472	48.5	0.012	-33.5	0.846	-171.6
400	0.903	-175.1	2.041	44.0	0.010	-36.3	0.861	-172.2
450	0.912	-175.7	1.709	40.1	0.009	-38.6	0.874	-172.8
500	0.919	-176.3	1.451	36.5	0.009	-40.2	0.886	-173.4
520	0.922	-176.6	1.363	35.3	0.008	-40.7	0.890	-173.5
527	0.923	-176.7	1.333	34.8	0.008	-40.8	0.891	-173.6
550	0.926	-177.0	1.244	33.4	0.008	-41.2	0.895	-173.9
600	0.931	-177.5	1.079	30.6	0.007	-41.8	0.904	-174.4
650	0.936	-178.2	0.944	28.1	0.006	-41.6	0.912	-174.9
700	0.940	-178.7	0.834	25.7	0.005	-40.8	0.920	-175.4
750	0.943	-179.3	0.741	23.6	0.005	-38.9	0.926	-175.9
763	0.944	-179.5	0.720	23.0	0.005	-38.3	0.927	-176.0
800	0.946	-179.9	0.662	21.5	0.004	-36.4	0.931	-176.4
806	0.946	-180.0	0.654	21.3	0.004	-35.8	0.932	-176.5
817	0.947	179.9	0.638	20.9	0.004	-35.2	0.933	-176.6
850	0.948	179.5	0.595	19.7	0.004	-32.4	0.935	-177.0
870	0.949	179.3	0.571	19.0	0.003	-30.3	0.937	-177.2
900	0.950	178.9	0.538	18.0	0.003	-26.7	0.939	-177.4
950	0.952	178.4	0.489	16.4	0.003	-19.4	0.942	-177.9
1000	0.953	177.9	0.446	14.9	0.002	-10.3	0.944	-178.2
1050	0.955	177.3	0.409	13.5	0.002	1.1	0.946	-178.6
1100	0.955	176.8	0.376	12.1	0.002	13.3	0.948	-178.9

ATTENTION:

1.High Temperature ; This product might have a heat generation while operation,Please take notice that have a possibility to receive a burn to touch the operating product directly or touch the product until cold after switch off. At the near the product,do not place the combustible material that have possibilities to arise the fire.

2.Generation of High Frequency Power ; This product generate a high frequency power. Please take notice that do not leakage the unnecessary electric wave and use this products without cause damage for human and property per normal operation.

3.Before use; Before use the product,Please design the equipment in consideration of the risk for human and electric wave obstacle for equipment.

PRECAUTIONS FOR THE USE OF MITSUBISHI SILICON RF POWER 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 and In the application, which is base station applications and fixed station applications that operate with long term continuous transmission and a higher on-off frequency during transmitting, please consider the derating, the redundancy system, appropriate setting of the maintain period and others as needed. For the reliability report which is described about predicted operating life time of Mitsubishi Silicon RF Products , please contact Mitsubishi Electric Corporation or an authorized Mitsubishi Semiconductor product distributor.

3. 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 channel temperature for RD series products lower than 120deg/C(in case of Tchmax=150deg/C) ,140deg/C(in case of Tchmax=175deg/C) under standard conditions.

6. 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.

7. For specific precautions regarding assembly of these products into the equipment, please refer to the supplementary items in the specification sheet.

8. 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.

9. For additional “Safety first” in your circuit design and notes regarding the materials, please refer the last page of this data sheet.

10. Please avoid use in the place where water or organic solvents can adhere directly to the product and the environments with the possibility of caustic gas, dust, salinity, etc. Reliability could be markedly decreased and also there is a possibility failures could result causing a serious accident. Likewise, there is a possibility of causing a serious accident if used in an explosive gas environment. Please allow for adequate safety margin in your designs.

11. Please refer to the additional precautions in the formal specification sheet.

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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