MITSUBISHI ELECTRIC

< Silicon RF Power MOS FET (Discrete) >

RD01MUS2B

RoHS Compliance, Silicon MOSFET Power Transistor 527MHz, 1W, 7.2V

DESCRIPTION

RD01MUS2B is a MOS FET type transistor designed for VHF/UHF RF driver device.

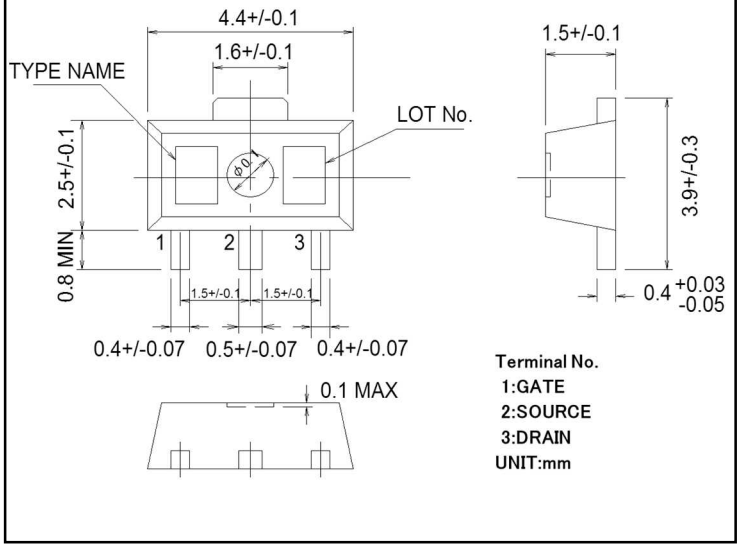
FEATURES

1.High Power Gain and High Efficiency
Pout>1.0W, Gp=15dB, Drain Effi. =70%typ
@ f=527MHz, V_{DS}=7.2V, Idq=40mA, Pin=30mW
2.Integrated gate protection diode

APPLICATION

For driver stage of high power amplifiers in VHF/UHF Band mobile radio sets.

OUTLINE DRAWING



RoHS COMPLIANT

RD01MUS2B-501, T513 is EU RoHS compliant.
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	V_{GS}=0V	25	V
VGSS	Gate to source voltage	V_{DS}=0V	-5/+10	V
Pch*	Channel dissipation	Tc=25°C	12.5	W
Pin	Input Power	Zg=Zl=50Ω	100	mW
ID	Drain Current	-	600	mA
Tch	Channel Temperature	-	150	°C
Tstg	Storage temperature	-	-40 to +125	°C

Note: Above parameters are guaranteed independently.
* Theoretical value in case of mounted on infinite heat sink.

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

SYMBOL	PARAMETER	CONDITIONS	LIMITS			UNIT
			MIN	TYP	MAX	
I_{DSS}	Zero gate voltage drain current	V_{DS}=17V, V_{GS}=0V	-	-	50	uA
I_{GSS}	Gate to source leak current	V_{GS}=10V, V_{DS}=0V	-	-	1	uA
Vth	Gate threshold Voltage	V_{DS}=7.2V, I_{DS}=1mA	0.5	1.0	1.5	V
Pout	Output power	V_{DD}=7.2V, Pin=30mW	1.0	1.6	-	W
ηD	Drain efficiency	f=527MHz,Idq=40mA	60	70	-	%

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

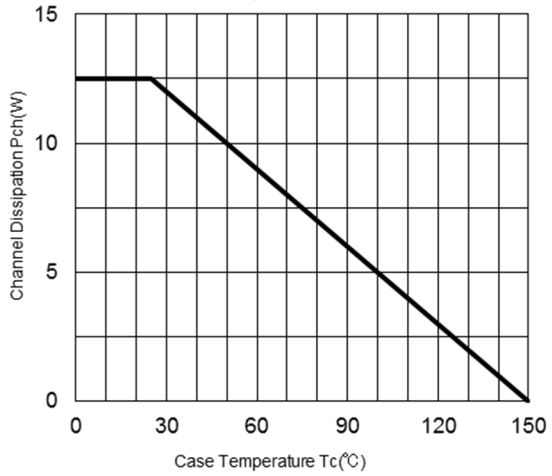
TEMPERATURE CHARACTERISTICS (Tc=25°C UNLESS OTHERWISE NOTED)

SYMBOL	PARAMETER	CONDITIONS	LIMITS			UNIT
			MIN	TYP	MAX	
Rth(j-c)	Thermal Resistance	Junction to Case	-	4.5	10.0	°C/W

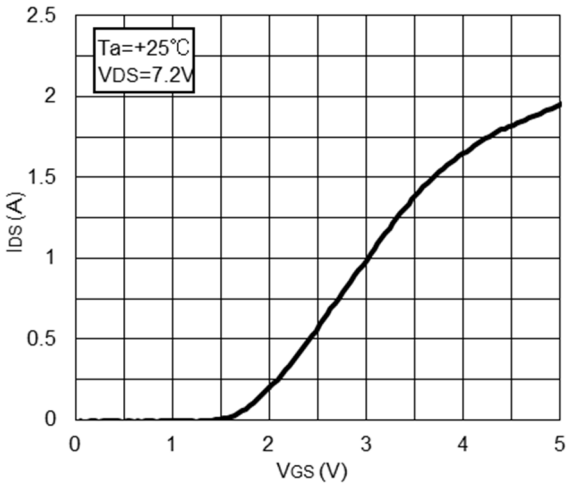
TYPICAL CHARACTERISTICS

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

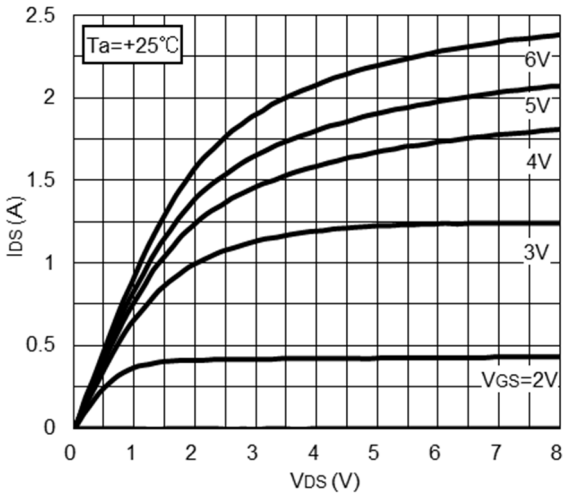
Channel Dissipation of total vs.Case Temperature



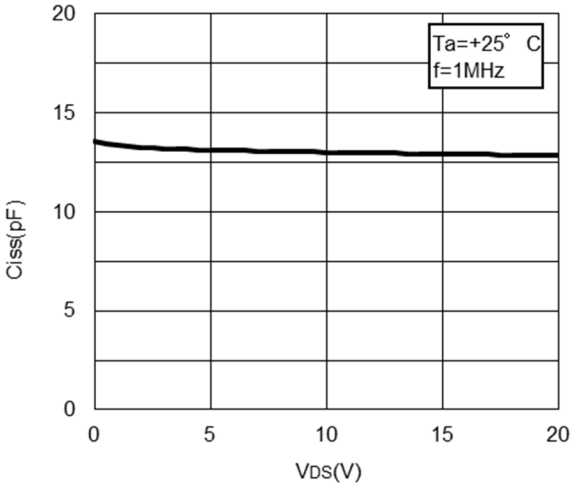
VGS - IDS CHARACTERISTICS



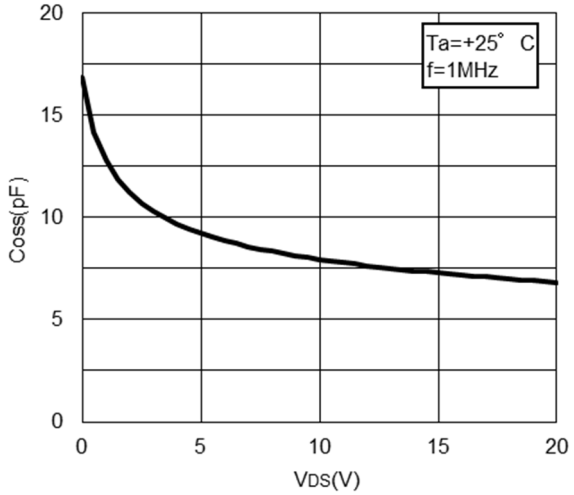
VDS - IDS CHARACTERISTICS



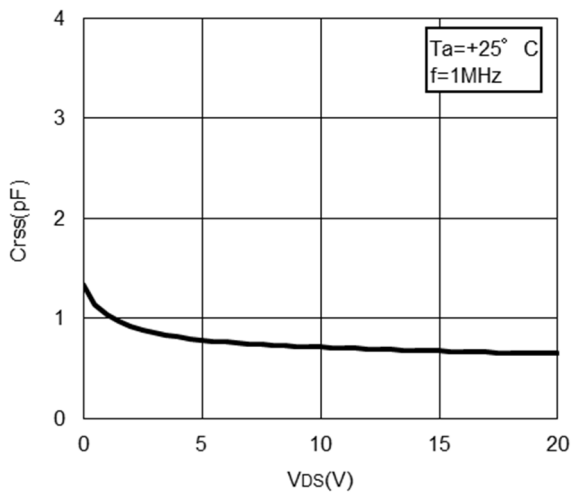
VDS vs. Ciss CHARACTERISTICS



VDS vs. Coss CHARACTERISTICS



VDS vs. Crss CHARACTERISTICS

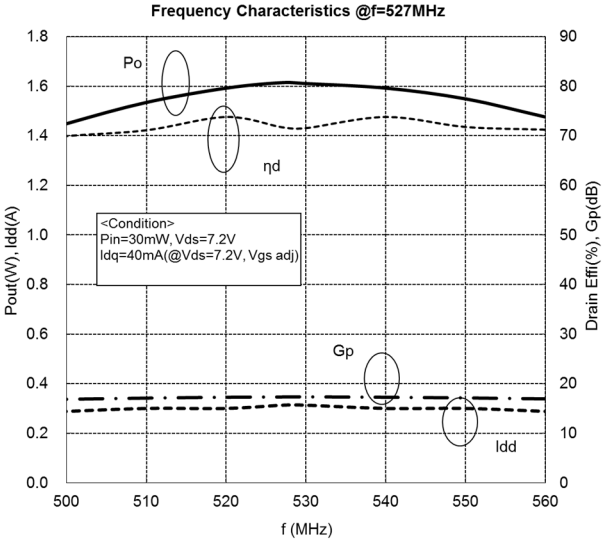


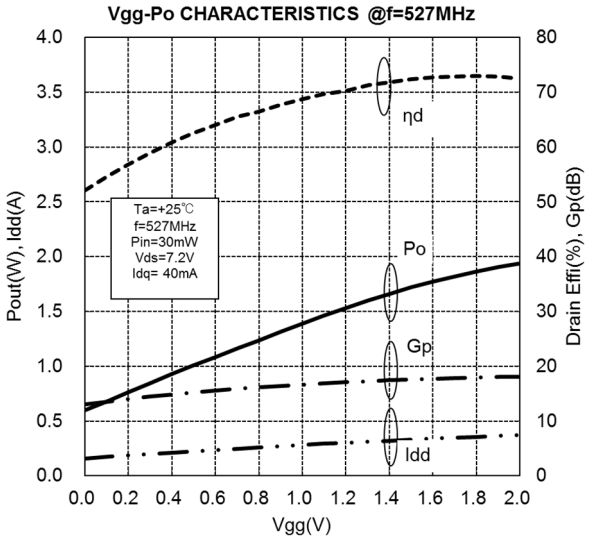
RD01MUS2B

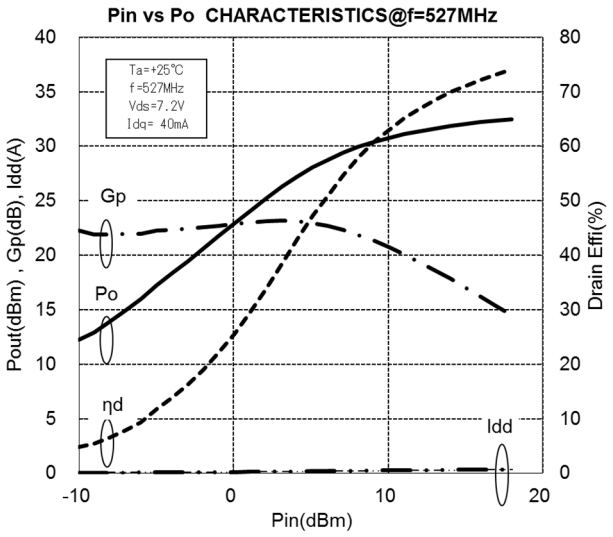
RoHS Compliance, Silicon MOSFET Power Transistor 527MHz, 1W, 7.2V

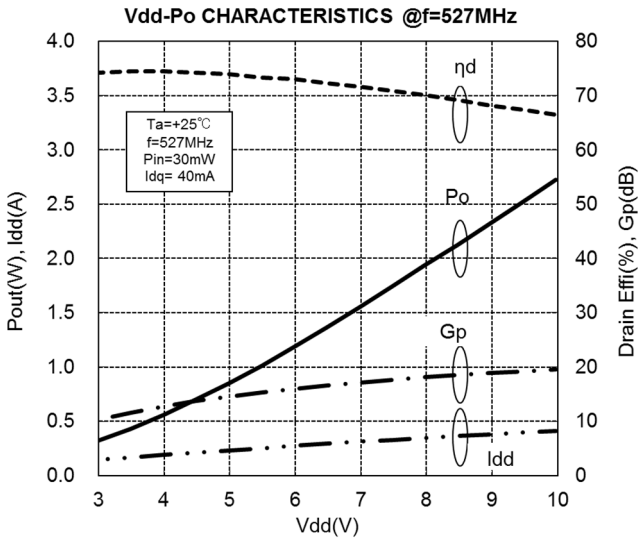
TYPICAL CHARACTERISTICS

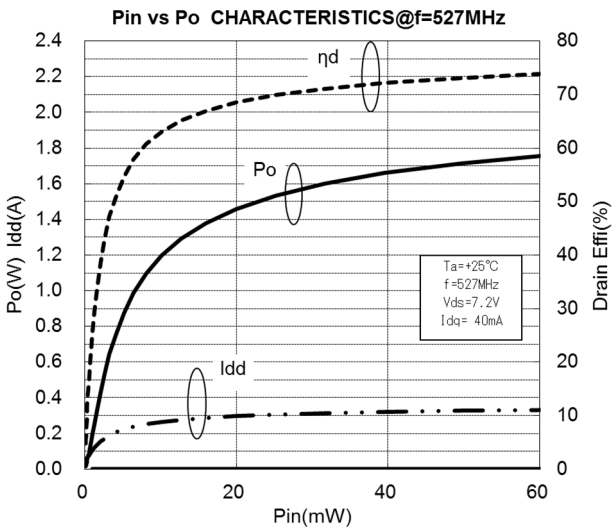
(These are only typical curves and devices are not necessarily guaranteed at these curves.)











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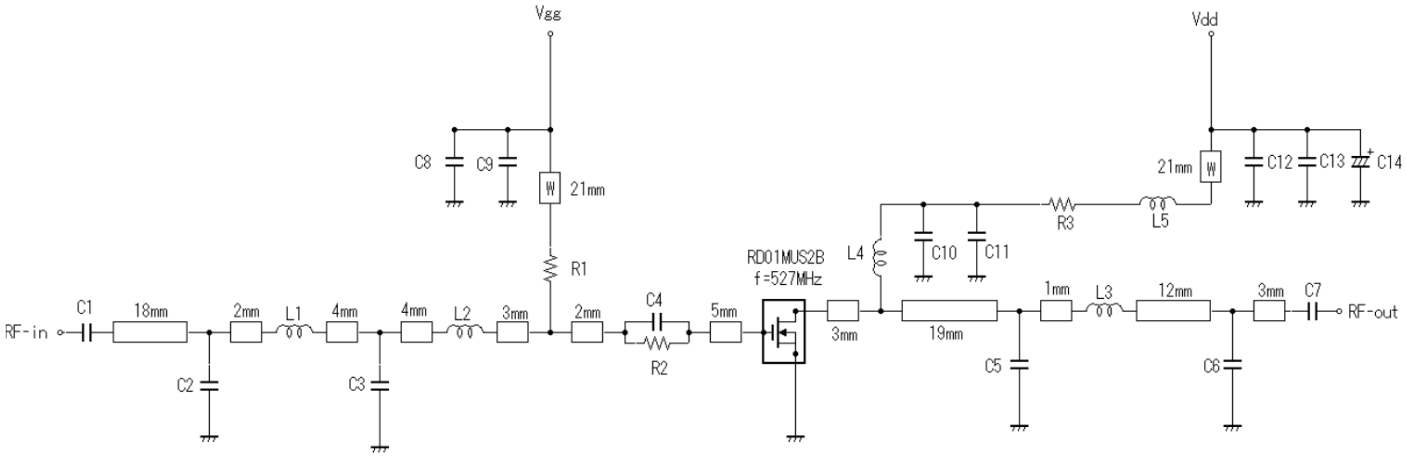
TEST CIRCUIT (f=527MHz)



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

Part	Description	Part number	Manufacturer
C1, C7, C9, C13	1000 pF	GRM1882C1H102JA01	MURATA MANUFACTURING CO.
C2	10 pF	GRM1882C1H100JA01	MURATA MANUFACTURING CO.
C3	33 pF	GRM2162C1H330JZ01	MURATA MANUFACTURING CO.
C4	22 pF	GRM2162C1H220JZ01	MURATA MANUFACTURING CO.
C5	12 pF	GRM1882C1H120JA01	MURATA MANUFACTURING CO.
C6	3 pF	GRM1882C1H3R0CA01	MURATA MANUFACTURING CO.
C8, C12	0.022 μF	GRM188B11H223KA01	MURATA MANUFACTURING CO.
C10, C11	82 pF	GRM2162C1H820JZ01	MURATA MANUFACTURING CO.
C14	22 μF	UVZ1H220MDD	NICHICON CORPORATION
L1, L2	8nH Enameled wire 2Turns, Diameter:0.23mm,φ1.62mm (the out side diameter)	2302S	Yoneda Processing Place Co.,Ltd.
L3, L4	12nH Enameled wire 3Turns, Diameter:0.23mm,φ1.62mm (the out side diameter)	2303S	Yoneda Processing Place Co.,Ltd.
L5	29nH Enameled wire 6Turns, Diameter:0.4mm,φ2.46mm (the out side diameter)	4006C	Yoneda Processing Place Co.,Ltd.
R1	4.7 kΩ	RPC05 472-J	TAIYOSHA ELECTRIC CO.
R2	100 Ω	RPC05 101-J	TAIYOSHA ELECTRIC CO.
R3	470 Ω	RPC05 0R0	TAIYOSHA ELECTRIC CO.

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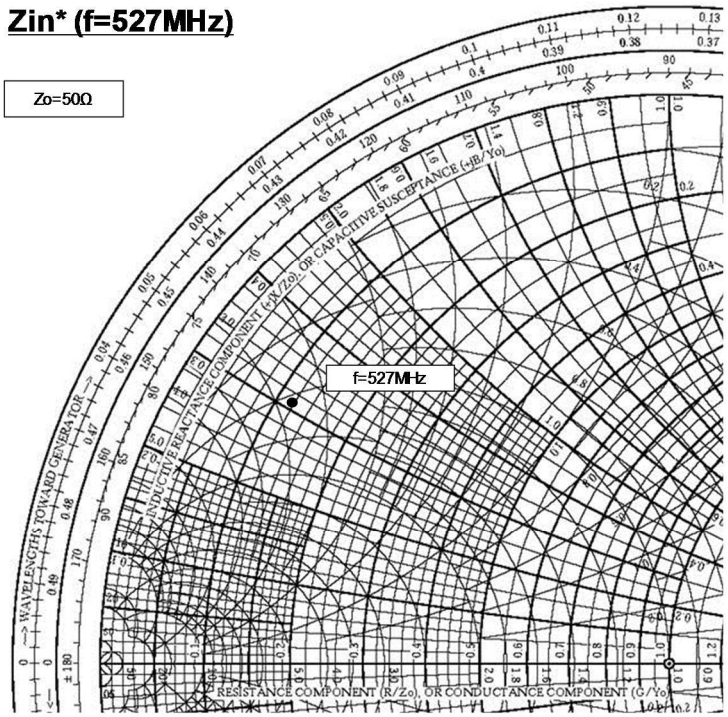
INPUT / OUTPUT IMPEDANCE VS. FREQUENCY CHARACTERISTICS

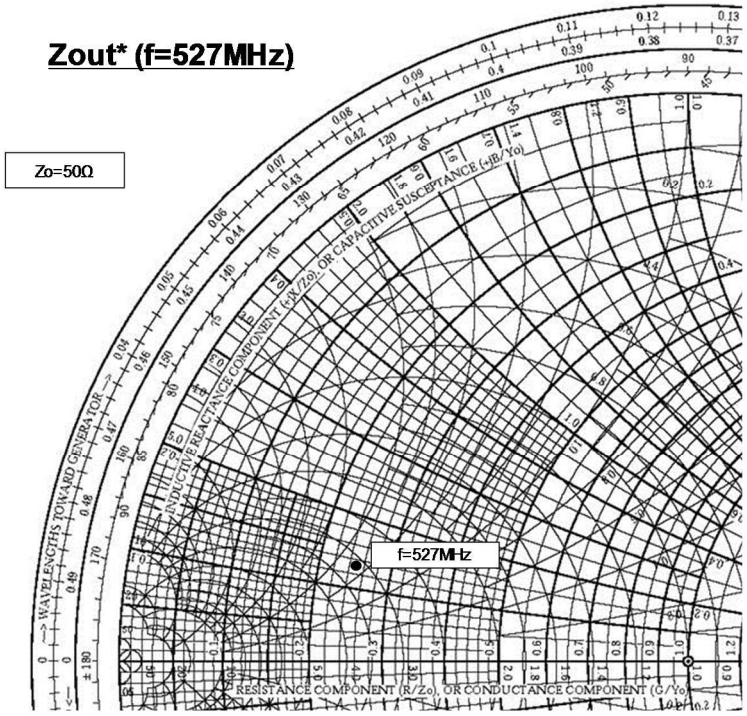
Zin* (f=527MHz)



f (MHz)	Zin* (Ω)
527	5.93 + j 15.54

Zin*: Complex conjugate of intput impedance

Zout* (f=527MHz)



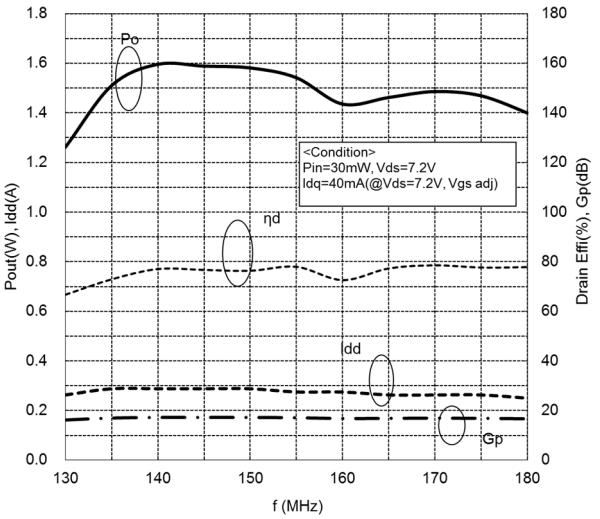
f (MHz)	Zout* (Ω)
527	12.67 + j 6.67

Zout*: Complex conjugate of output impedance

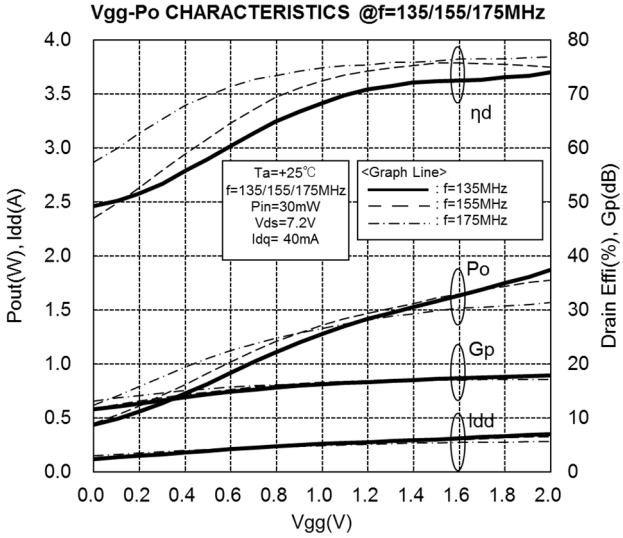
TYPICAL CHARACTERISTICS

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

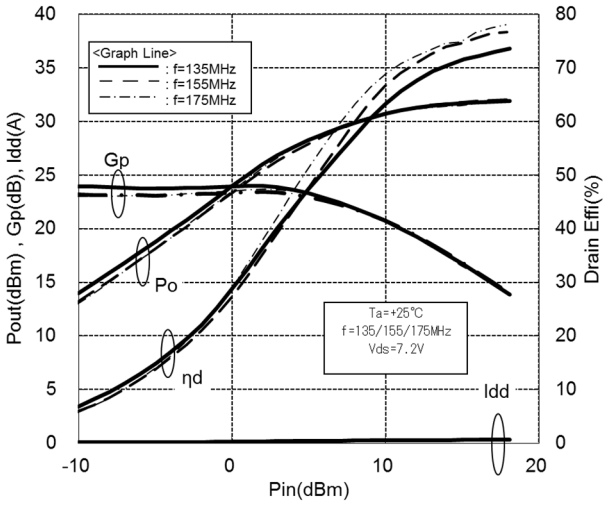
Frequency Characteristics @f=135-175MHz



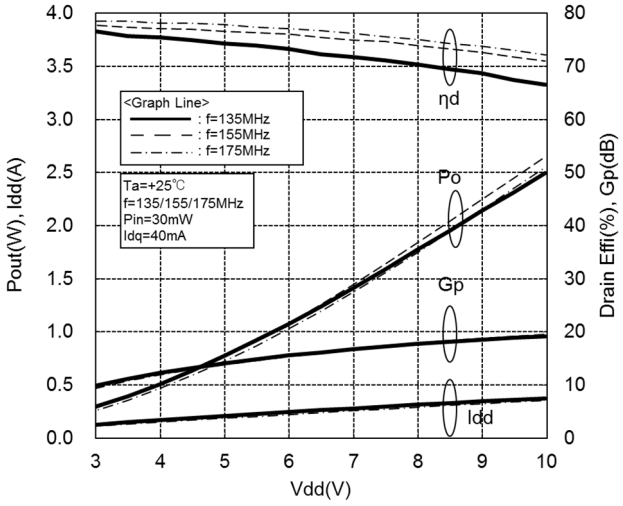
Vgg-Po CHARACTERISTICS @f=135/155/175MHz



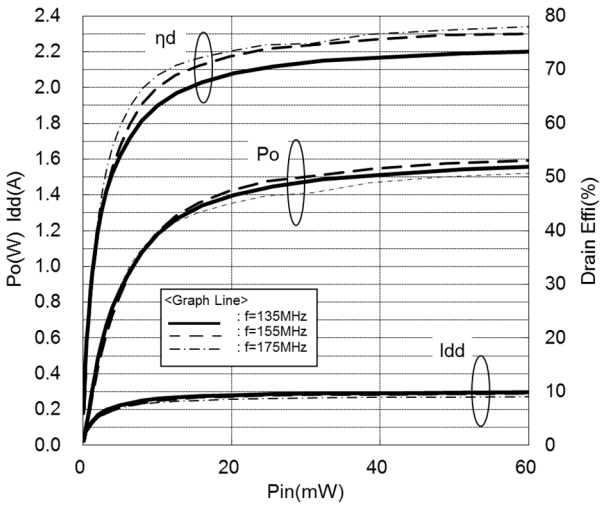
Pin vs Po CHARACTERISTICS@f=135/155/175MHz



Vdd-Po CHARACTERISTICS @f=135/155/175MHz



Pin vs Po CHARACTERISTICS@f=135/155/175MHz



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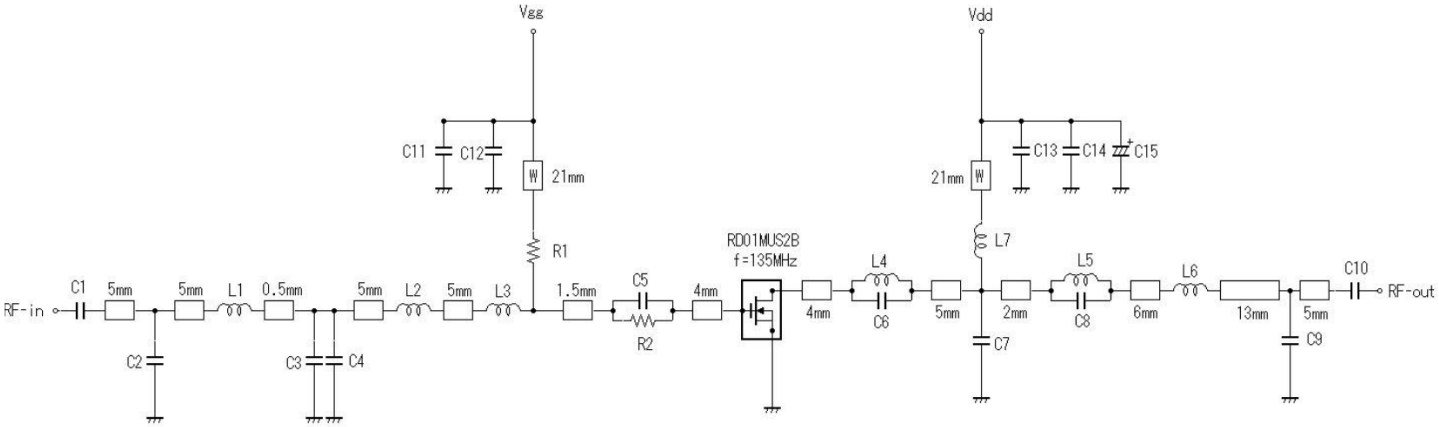
EQUIVALENT CIRCUITRY for VHF EVALUATION BOARD (f=135 – 175MHz)



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

Part	Description	Part number	Manufacturer
C1, C10	160 pF	GRM2162C1H161JA01	MURATA MANUFACTURING CO.
C2	36 pF	GRM1882C1H360JA01	MURATA MANUFACTURING CO.
C3, C5	22 pF	GRM1882C1H220JA01	MURATA MANUFACTURING CO.
C4	27 pF	GRM1882C1H270JA01	MURATA MANUFACTURING CO.
C6	430 pF	GRM1882C1H431JA01	MURATA MANUFACTURING CO.
C7	10 pF	GRM1882C1H100JA01	MURATA MANUFACTURING CO.
C8	7 pF	GRM1882C1H7R0JA01	MURATA MANUFACTURING CO.
C9	18 pF	GRM1882C1H180JA01	MURATA MANUFACTURING CO.
C11, C13	1000 pF	GRM1882C1H102JA01	MURATA MANUFACTURING CO.
C12, C14	0.022 μF	GRM188B11H223KA01	MURATA MANUFACTURING CO.
C15	22 uF	UVZ1H220MDD	NICHICON CORPORATION
L1, L3	40nH Enameled wire 9Turns, Diameter:0.23mm,φ1.62mm (the out side diameter)	2309A	Yoneda Processing Place Co.,Ltd.
L2	51nH Enameled wire 11Turns, Diameter:0.23mm,φ1.62mm (the out side diameter)	2311A	Yoneda Processing Place Co.,Ltd.
L4, L6	12nH Enameled wire 3Turns, Diameter:0.23mm,φ1.62mm (the out side diameter)	2303A	Yoneda Processing Place Co.,Ltd.
L5	17nH Enameled wire 4Turns, Diameter:0.23mm,φ1.62mm (the out side diameter)	2304C	Yoneda Processing Place Co.,Ltd.
L7	37nH Enameled wire 7Turns, Diameter:0.4mm,φ2.46mm (the out side diameter)	4007C	Yoneda Processing Place Co.,Ltd.
R1	4.7 kΩ	RPC05 472-J	TAIYOSHA ELECTRIC CO.
R2	47 Ω	RPC05 470-J	TAIYOSHA ELECTRIC CO.

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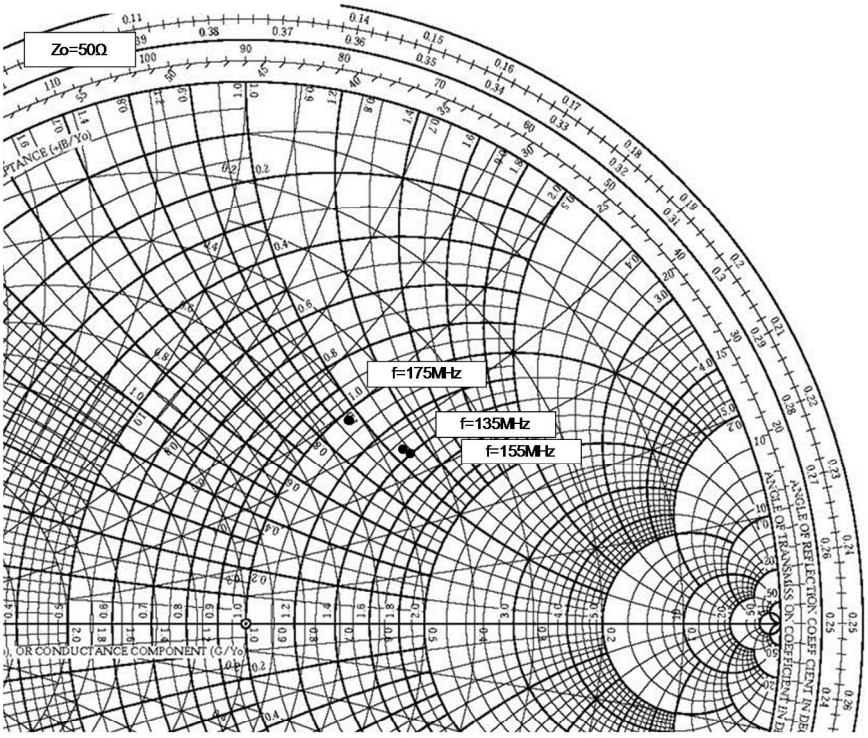
Input / Output Impedance VS. Frequency Characteristics

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

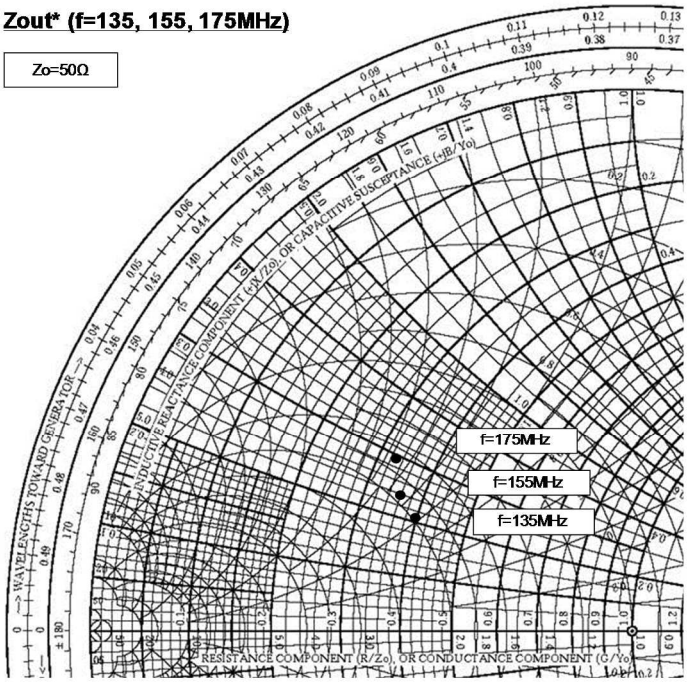


@Pin=30mW, Vds=7.2V,Idq=40mA

f (MHz)	Zin* (Ω)
135	67.91 + j 54.09
155	69.90 + j 54.62
175	51.90 + j 47.13

Zin*: Complex conjugate of intput impedance

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



@Pin=30mW, Vds=7.2V,Idq=40mA

f (MHz)	Zout* (Ω)
135	19.81 + j 10.17
155	18.09 + j 11.73
175	16.62 + j 14.82

Zout*: Complex conjugate of output impedance

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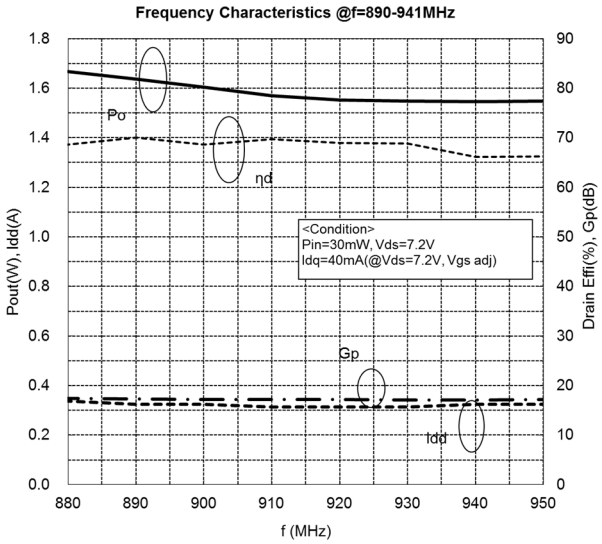
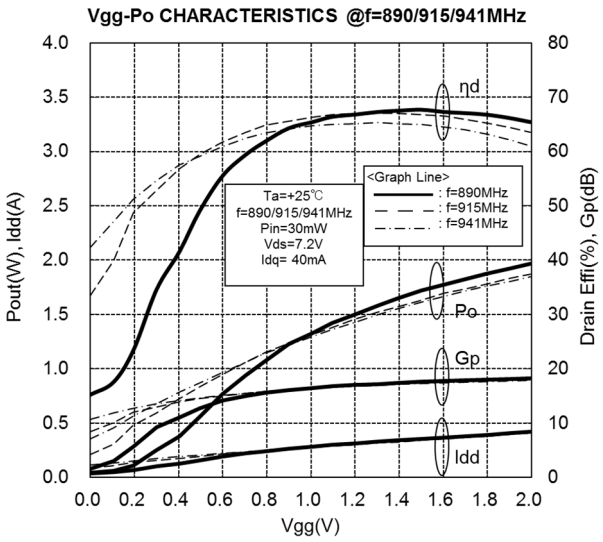
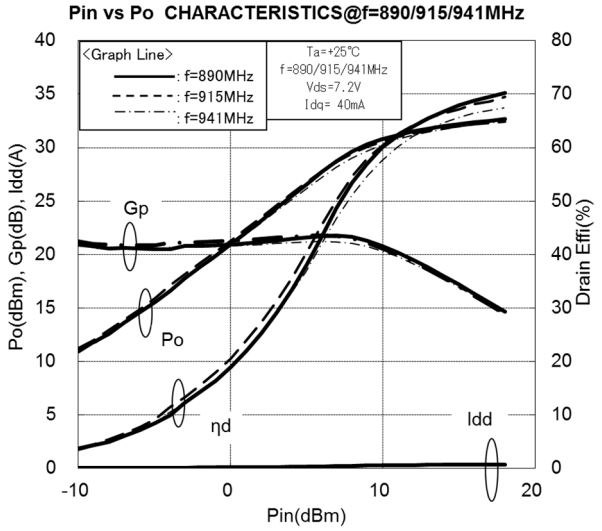
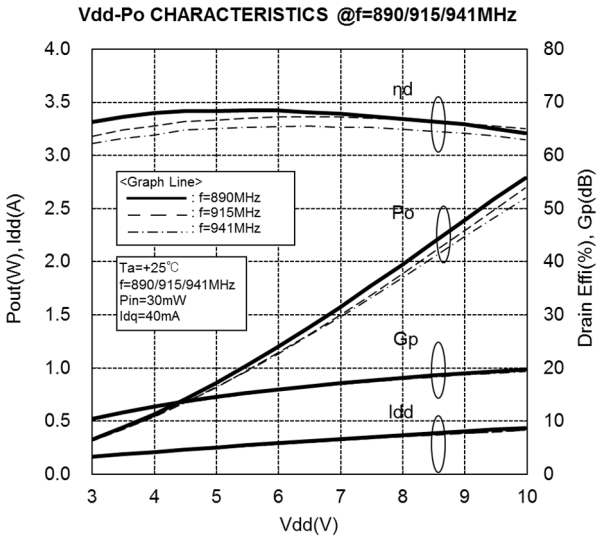
TYPICAL CHARACTERISTICS

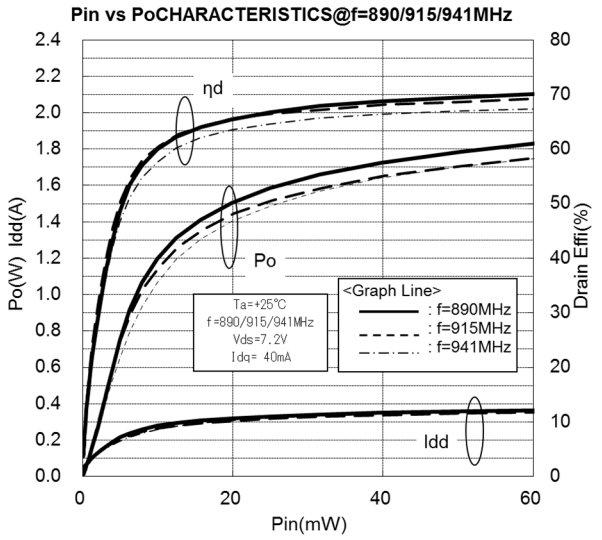
(These are only typical curves and devices are not necessarily guaranteed at these curves.)







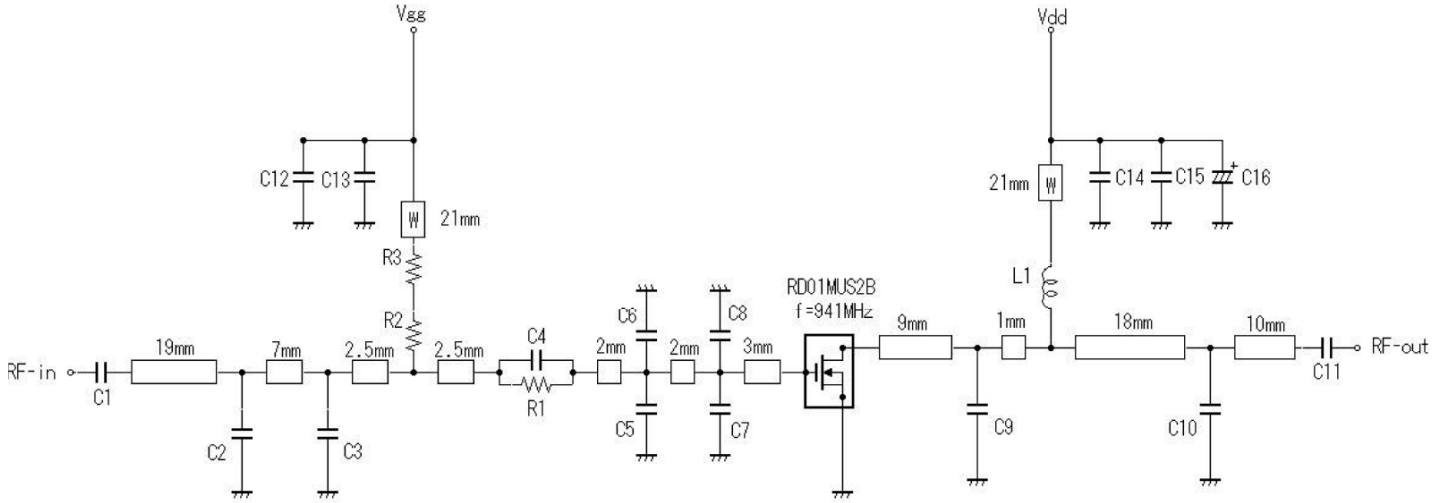




RD01MUS2B

RoHS Compliance, Silicon MOSFET Power Transistor 527MHz, 1W, 7.2V

EQUIVALENT CIRCUITRY for 900MHz EVALUATION BOARD (f=890 – 941MHz)



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

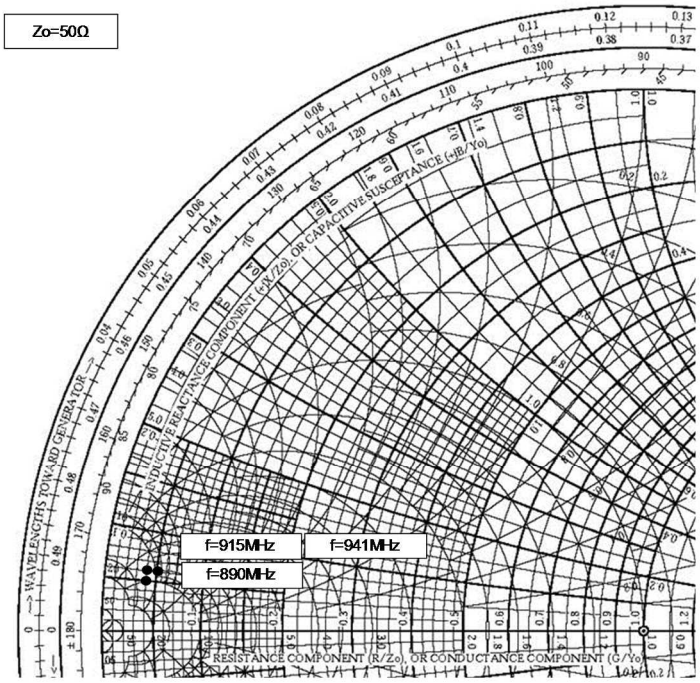
Part	Description	Part number	Manufacturer
C1, C11	150 pF	GRM2162C1H151JA01	MURATA MANUFACTURING CO.
C2, C3	4 pF	CRM2162C1H4R0CD01	MURATA MANUFACTURING CO.
C4	30 pF	GRM1882C1H300JA01	MURATA MANUFACTURING CO.
C5, C6, C7, C8	10 pF	GRM1882C1H100JA01	MURATA MANUFACTURING CO.
C9	8 pF	CRM2162C1H8R0DZ01	MURATA MANUFACTURING CO.
C10	2 pF	CRM2162C1H2R0CD01	MURATA MANUFACTURING CO.
C12, C14	100 pF	GRM2162C1H101JA01	MURATA MANUFACTURING CO.
C13, C15	1000 pF	GRM1882C1H102JA01	MURATA MANUFACTURING CO.
C16	22 uF	UVZ1H220MDD	NICHICON CORPORATION
L1	37nH Enameled wire 7Turns, Diameter:0.4mm,φ2.46mm (the out side diameter)	4007C	Yoneda Processing Place Co.,Ltd.
R1	18 Ω	RPC05 180-J	TAIYOSHA ELECTRIC CO.
R2	4.7 kΩ	RPC10 472-J	TAIYOSHA ELECTRIC CO.
R3	0 Ω	RPC10 0R0	TAIYOSHA ELECTRIC CO.

RD01MUS2B

RoHS Compliance, Silicon MOSFET Power Transistor 527MHz, 1W, 7.2V

Input / Output Impedance VS. Frequency Characteristics

Zin* (f=890, 915, 941MHz)

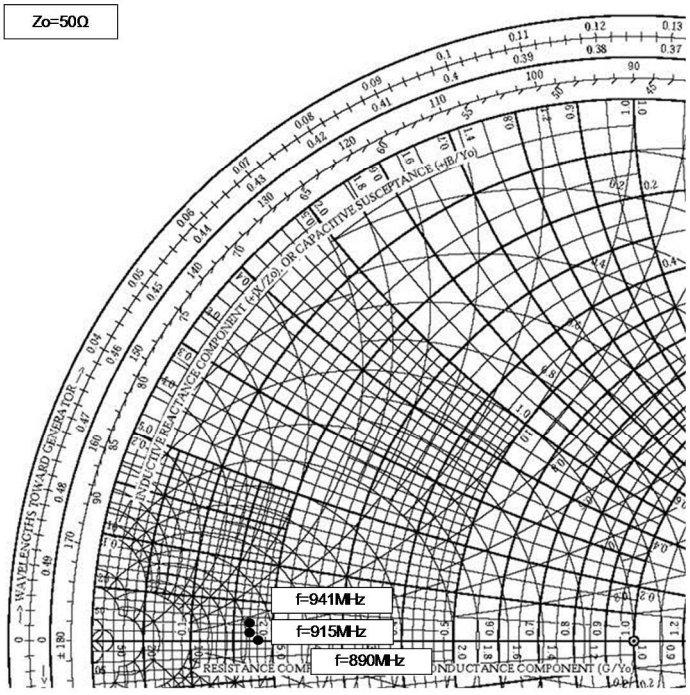


@Pin=30mW, Vds=7.2V,Idq=40mA

f (MHz)	Zin* (Ω)
890	2.09 + j 2.48
915	2.19 + j 2.78
941	2.37 + j 2.82

Zin*: Complex conjugate of intput impedance

Zout* (f=890, 915, 941MHz)



@Pin=30mW, Vds=7.2V,Idq=40mA

f (MHz)	Zout* (Ω)
890	8.80 - j 0.18
915	8.60 + j 0.37
941	8.39 + j 1.01

Zout*: Complex conjugate of output impedance

RD01MUS2B

RoHS Compliance, Silicon MOSFET Power Transistor 527MHz, 1W, 7.2V

S-PARAMETER DATA(V_{DS}=7.2V, Idq=40mA)

Freq.	S11		S21		S12		S22	
(MHz)	(mag)	(ang)	(mag)	(ang)	(mag)	(ang)	(mag)	(ang)
100	0.91	-67	21.21	133	0.03	44	0.82	-53
135	0.87	-83	18.35	122	0.04	33	0.76	-67
155	0.85	-91	16.87	116	0.04	27	0.74	-74
175	0.84	-97	15.56	111	0.04	22	0.72	-79
200	0.83	-104	14.09	106	0.04	17	0.70	-85
250	0.81	-115	11.72	96	0.04	9	0.68	-95
300	0.81	-124	9.91	89	0.04	1	0.67	-103
350	0.80	-130	8.50	82	0.04	-5	0.67	-110
400	0.81	-135	7.38	76	0.04	-10	0.68	-115
450	0.81	-140	6.47	71	0.04	-15	0.69	-120
500	0.82	-143	5.72	66	0.04	-19	0.71	-124
520	0.82	-145	5.46	65	0.04	-20	0.71	-125
530	0.82	-145	5.33	64	0.04	-21	0.71	-126
550	0.83	-146	5.10	62	0.04	-23	0.72	-128
600	0.83	-149	4.57	58	0.04	-26	0.74	-131
650	0.84	-152	4.12	54	0.03	-29	0.75	-134
700	0.85	-154	3.73	51	0.03	-32	0.76	-137
750	0.86	-156	3.39	48	0.03	-34	0.78	-140
800	0.86	-158	3.10	45	0.03	-37	0.79	-142
850	0.87	-160	2.84	42	0.03	-39	0.80	-145
900	0.88	-161	2.61	39	0.03	-41	0.81	-147
950	0.88	-163	2.41	36	0.03	-43	0.82	-149
1000	0.89	-164	2.23	34	0.02	-45	0.83	-151
1050	0.89	-166	2.07	31	0.02	-47	0.84	-153
1100	0.90	-167	1.92	29	0.02	-48	0.85	-155
1150	0.90	-168	1.79	27	0.02	-49	0.86	-157
1200	0.90	-170	1.67	25	0.02	-50	0.86	-159
1250	0.91	-171	1.56	23	0.02	-51	0.87	-160
1300	0.91	-172	1.47	20	0.02	-52	0.88	-162
1350	0.91	-173	1.38	19	0.01	-52	0.88	-163
1400	0.92	-174	1.30	17	0.01	-53	0.88	-165
1450	0.92	-176	1.22	15	0.01	-53	0.88	-167
1500	0.92	-177	1.15	13	0.01	-52	0.89	-168

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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