

ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

MITSUBISHI RF POWER MOS FET

RD02MUS1

RoHS Compliance, Silicon MOSFET Power Transistor 175MHz, 520MHz, 2W

DESCRIPTION

RD02MUS1 is a MOS FET type transistor specifically designed for VHF/UHF RF power amplifiers applications.

FEATURES

High power gain:

$P_{out} > 2W$, $G_p > 16dB$

@ $V_{dd} = 7.2V$, $f = 175MHz, 520MHz$

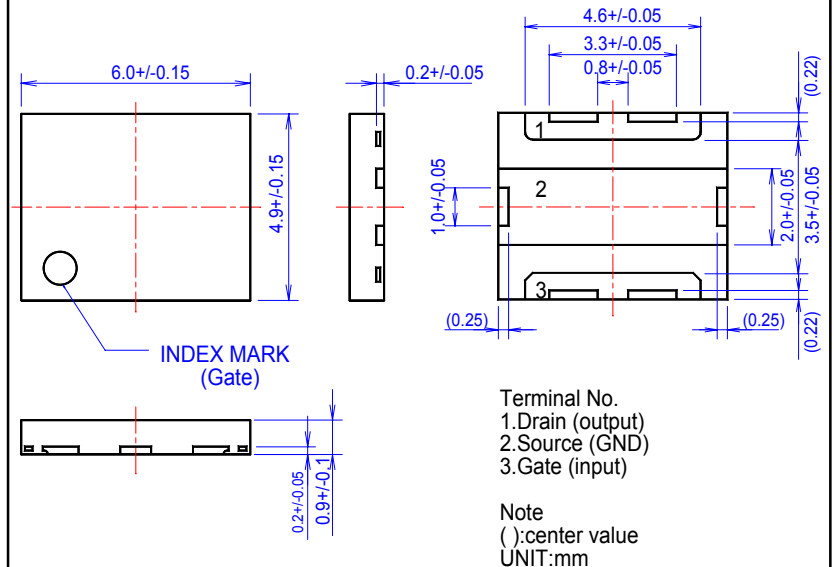
High Efficiency: 65% typ. (175MHz)

High Efficiency: 65% typ. (520MHz)

APPLICATION

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

OUTLINE DRAWING



RoHS COMPLIANT

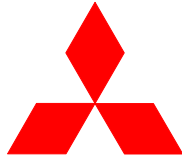
RD02MUS1-101, T112 is a RoHS compliant products.

RoHS compliance is indicate by the letter "G" after the Lot Marking.

This product include the lead in high melting temperature type solders.

How ever, it applicable to the following exceptions of RoHS Directions.

1. Lead in high melting temperature type solders (i.e. tin-lead solder alloys containing more than 85% lead.)



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ABSOLUTE MAXIMUM RATINGS

(Tc=25°C UNLESS OTHERWISE NOTED)

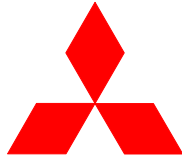
| SYMBOL | PARAMETER | CONDITIONS | RATINGS | UNIT |
|---------|-------------------------|------------------|-------------|------|
| VDSS | Drain to source voltage | Vgs=0V | 30 | V |
| VGSS | Gate to source voltage | Vds=0V | +/-20 | V |
| Pch | Channel dissipation | Tc=25°C | 21.9 | W |
| Pin | Input Power | Zg=Zl=50Ω | 0.1 | W |
| ID | Drain Current | - | 1.5 | A |
| Tch | Junction temperature | - | 150 | °C |
| Tstg | Storage temperature | - | -40 to +125 | °C |
| Rth j-c | Thermal resistance | Junction to case | 5.7 | °C/W |

Note 1: Above parameters are guaranteed independently.

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

| SYMBOL | PARAMETER | CONDITIONS | LIMITS | | | UNIT |
|--------|---------------------------------|-----------------------------------------------------------------------------------------|------------|-----|------|------|
| | | | MIN | TYP | MAX. | |
| IDSS | Zero gate Voltage drain current | VDS=17V, VGS=0V | - | - | 100 | uA |
| IGSS | Gate to source leak current | VGS=10V, VDS=0V | - | - | 1 | uA |
| Vth | Gate threshold Voltage | VDS=12V, IDS=1mA | 1 | 1.8 | 3 | V |
| Pout1 | Output power | VDD=7.2V, Pin=50mW, | 2 | 3 | - | W |
| ηD1 | Drain efficiency | f=175MHz Idq=200mA | 55 | 65 | - | % |
| Pout2 | Output power | VDD=7.2V, Pin=50mW, | 2 | 3 | - | W |
| ηD2 | Drain efficiency | f=520MHz Idq=200mA | 50 | 65 | - | % |
| | Load VSWR tolerance | VDD=9.2V, Po=2W(PinControl) f=175MHz, Idq=200mA, Zg=50Ω Load VSWR=20:1(All Phase) | No destroy | | | - |
| | Load VSWR tolerance | VDD=9.2V, Po=2W(PinControl) f=520MHz, Idq=200mA, Zg=50Ω Load VSWR=20:1(All Phase) | No destroy | | | - |

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



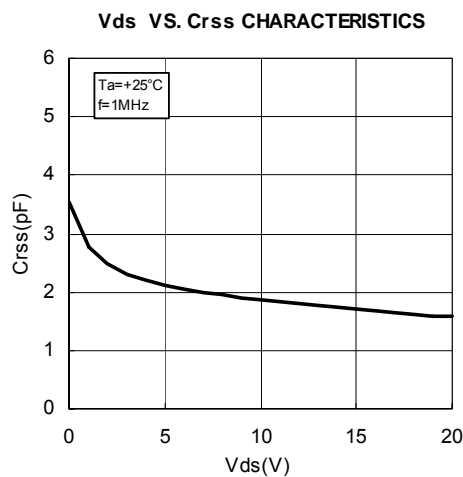
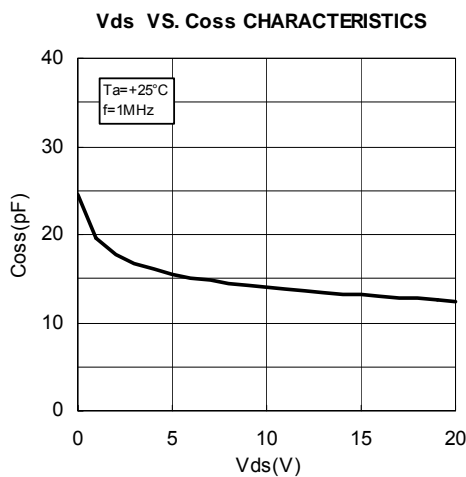
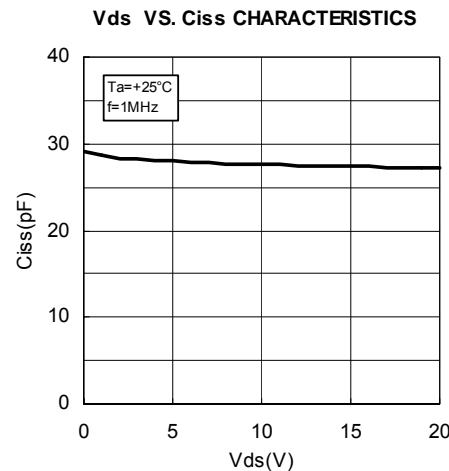
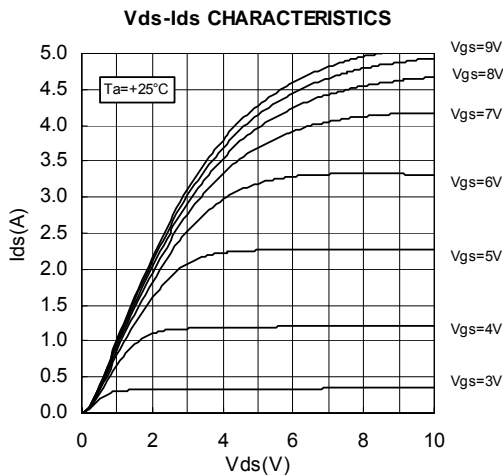
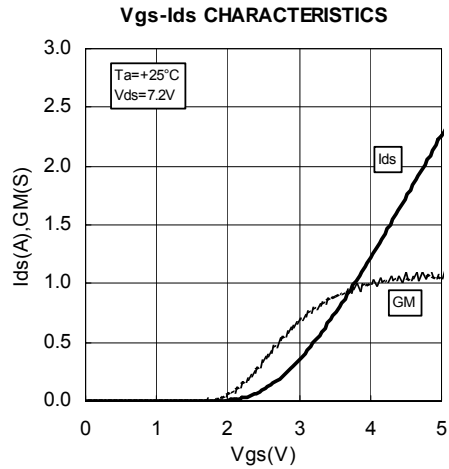
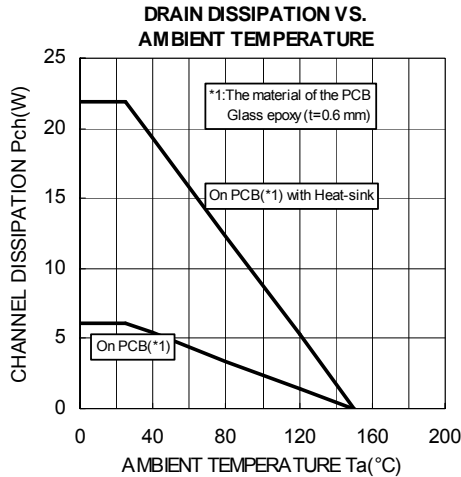
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OBSERVE HANDLING PRECAUTIONS

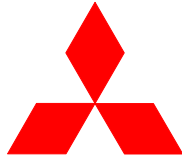
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TYPICAL CHARACTERISTICS





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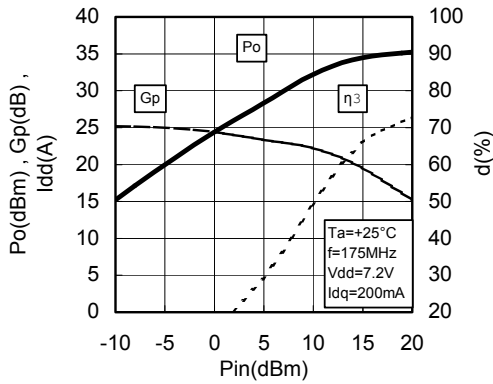
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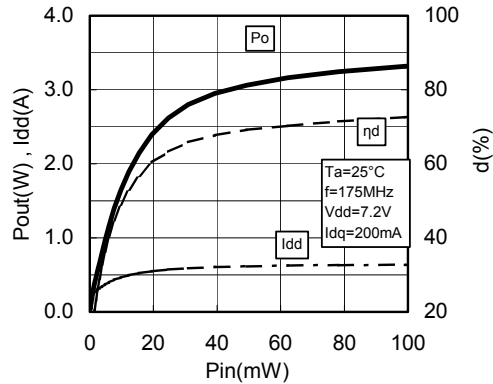
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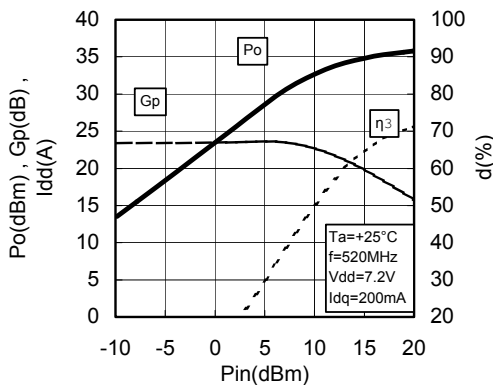
Pin-Po CHARACTERISTICS
@f=175MHz



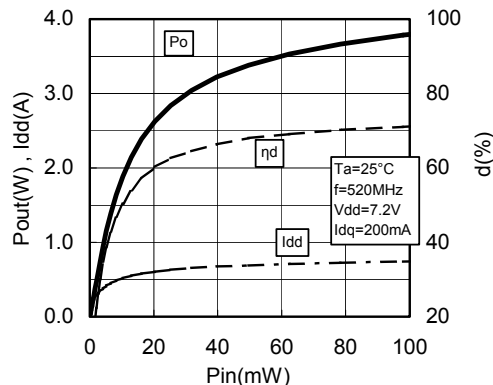
Pin-Po CHARACTERISTICS
@f=175MHz



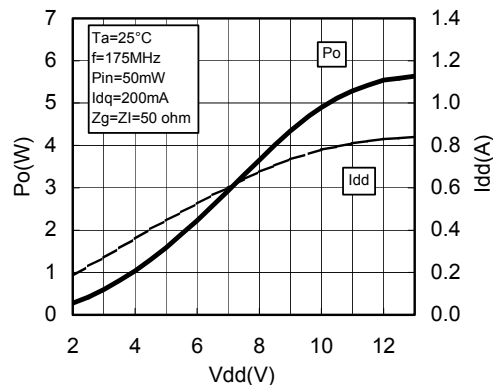
Pin-Po CHARACTERISTICS
@f=520MHz



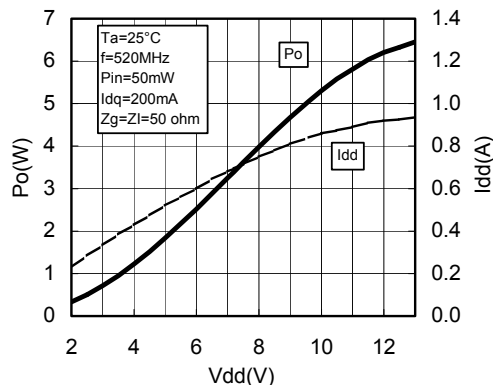
Pin-Po CHARACTERISTICS
@f=520MHz

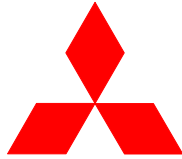


Vdd-Po CHARACTERISTICS
@f=175MHz



Vdd-Po CHARACTERISTICS
@f=520MHz





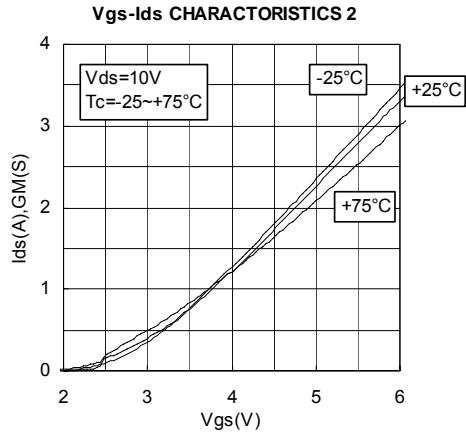
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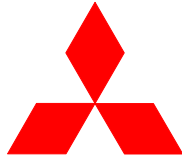
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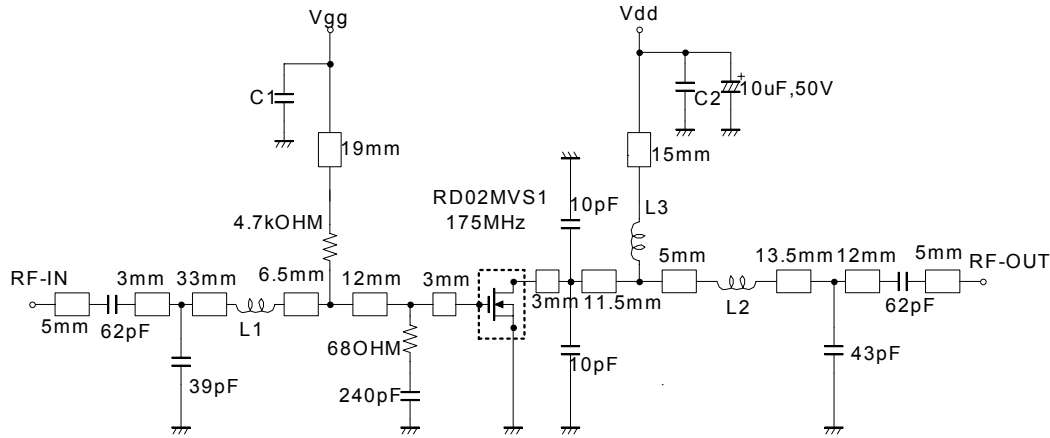
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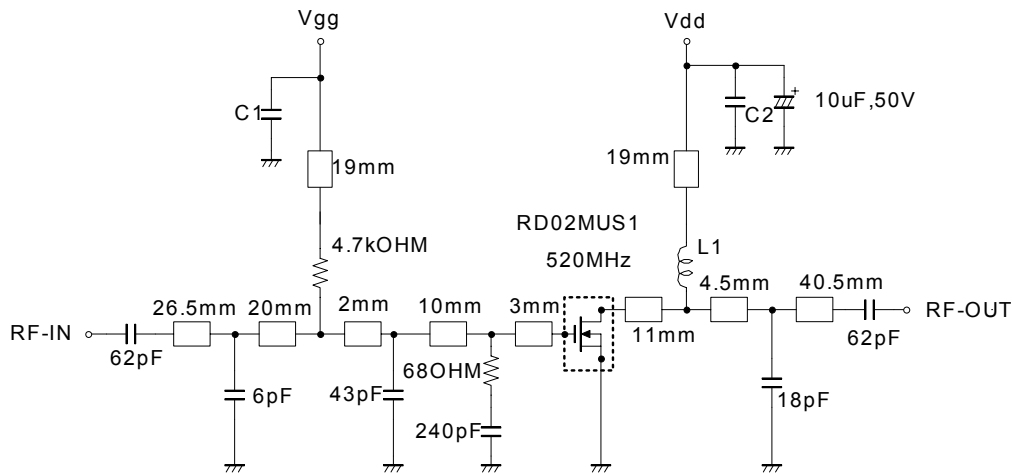
TEST CIRCUIT(f=175MHz)



L1: Enameled wire 5Turns, D:0.43mm, 2.46mm O.D
L2: Enameled wire 3Turns, D:0.43mm, 2.46mm O.D
L3: Enameled wire 9Turns, D:0.43mm, 2.46mm O.D
C1, C2: 1000pF, 0.0022uF in parallel

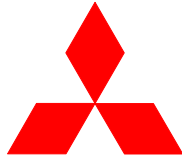
Note: Board material-Teflon substrate
Micro strip line width=2.2mm/50OHM, er:2.7, t=0.8mm

TEST CIRCUIT(f=520MHz)



L1: Enameled wire 9Turns, D:0.43mm, 2.46mm O.D
C1, C2: 1000pF, 0.022uF in parallel

Note: Board material-Teflon substrate
Micro strip line width=2.2mm/50OHM, er:2.7, t=0.8mm



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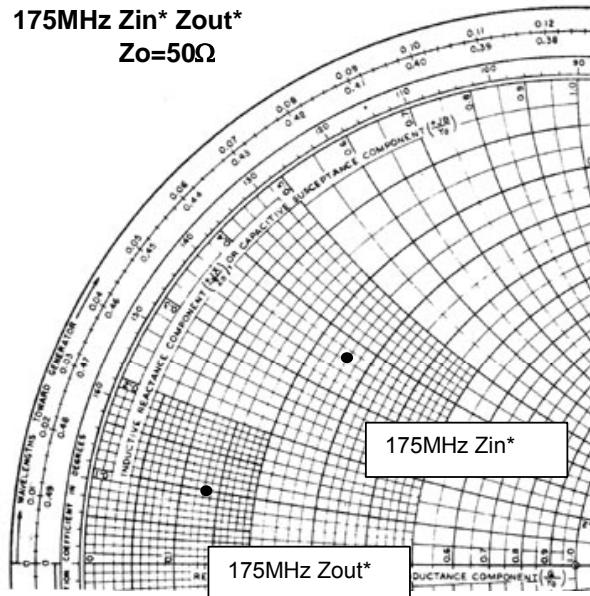
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INPUT/OUTPUT IMPEDANCE VS. FREQUENCY CHARACTERISTICS

175MHz Z_{in}^* Z_{out}^*
 $Z_o=50\Omega$

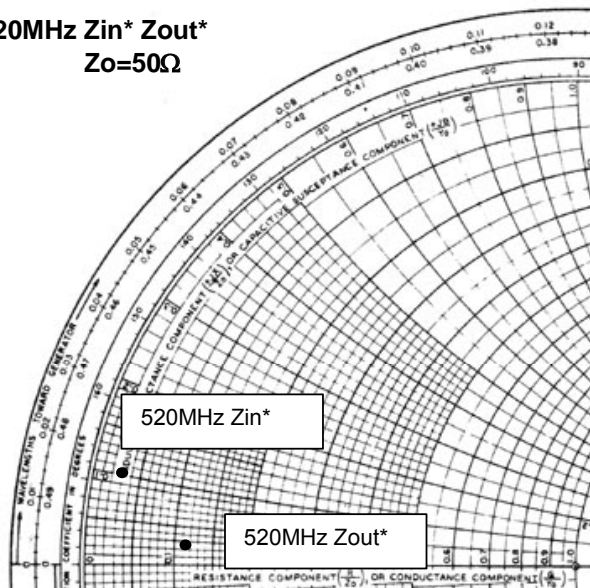


Vdd=7.2V, Idq=200mA(Vgg adj.), Pin=0.05W

$Z_{in}^*=11.61+j17.88$
 $Z_{out}^*=6.83+j5.21$

Z_{in}^* : Complex conjugate of input impedance
 Z_{out}^* : Complex conjugate of input impedance

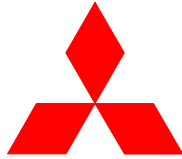
520MHz Z_{in}^* Z_{out}^*
 $Z_o=50\Omega$



Vdd=7.2V, Idq=200mA(Vgg adj.), Pin=0.05W

$Z_{in}^*=1.20+j5.47$
 $Z_{out}^*=5.56+j1.31$

Z_{in}^* : Complex conjugate of input impedance
 Z_{out}^* : Complex conjugate of input impedance



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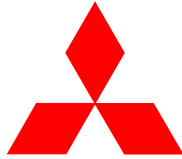
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RD02MSU1 S-PARAMETER DATA (@V_{dd}=7.5V, I_d=200mA)

| Freq. [MHz] | S11 | | S21 | | S12 | | S22 | |
|----------------|-------|--------|--------|-------|-------|-------|-------|--------|
| | (mag) | (ang) | (mag) | (ang) | (mag) | (ang) | (mag) | (ang) |
| 100 | 0.814 | -132.9 | 16.154 | 102.5 | 0.039 | 14.9 | 0.591 | -125.5 |
| 150 | 0.807 | -147.2 | 11.503 | 92.9 | 0.040 | 5.9 | 0.585 | -138.6 |
| 175 | 0.804 | -151.6 | 9.965 | 89.3 | 0.040 | 2.7 | 0.586 | -142.6 |
| 200 | 0.804 | -154.8 | 8.689 | 86.2 | 0.040 | -0.1 | 0.590 | -145.5 |
| 250 | 0.806 | -159.4 | 6.872 | 81.1 | 0.039 | -4.3 | 0.606 | -149.3 |
| 300 | 0.812 | -162.6 | 5.687 | 76.5 | 0.038 | -8.2 | 0.621 | -151.7 |
| 350 | 0.817 | -164.9 | 4.749 | 72.3 | 0.036 | -11.4 | 0.639 | -153.5 |
| 400 | 0.824 | -166.8 | 4.078 | 69.3 | 0.035 | -13.2 | 0.659 | -155.2 |
| 450 | 0.830 | -168.5 | 3.560 | 65.2 | 0.033 | -16.8 | 0.677 | -156.6 |
| 500 | 0.837 | -169.7 | 3.087 | 62.8 | 0.031 | -17.4 | 0.697 | -157.8 |
| 520 | 0.840 | -170.3 | 2.960 | 61.9 | 0.030 | -17.9 | 0.705 | -158.4 |
| 550 | 0.844 | -171.1 | 2.767 | 59.8 | 0.030 | -19.1 | 0.715 | -159.2 |
| 600 | 0.851 | -172.3 | 2.439 | 57.1 | 0.028 | -20.9 | 0.731 | -160.6 |
| 650 | 0.857 | -173.3 | 2.196 | 55.2 | 0.025 | -20.9 | 0.747 | -161.8 |
| 700 | 0.862 | -174.4 | 1.987 | 52.6 | 0.024 | -21.9 | 0.763 | -162.9 |
| 750 | 0.869 | -175.5 | 1.796 | 51.0 | 0.022 | -23.3 | 0.773 | -164.3 |
| 800 | 0.873 | -176.6 | 1.632 | 49.1 | 0.020 | -21.9 | 0.787 | -165.5 |
| 850 | 0.879 | -177.5 | 1.520 | 47.6 | 0.019 | -20.4 | 0.799 | -166.5 |
| 900 | 0.882 | -178.5 | 1.366 | 45.3 | 0.017 | -21.1 | 0.806 | -167.7 |
| 950 | 0.886 | -179.6 | 1.281 | 45.6 | 0.015 | -18.4 | 0.818 | -169.0 |
| 1000 | 0.889 | -179.5 | 1.197 | 42.5 | 0.014 | -17.2 | 0.826 | -170.0 |
| 1050 | 0.891 | -178.4 | 1.077 | 42.1 | 0.012 | -11.9 | 0.832 | -171.1 |
| 1100 | 0.896 | -177.2 | 1.047 | 41.3 | 0.011 | -6.6 | 0.840 | -172.6 |

RD02MSU1 S-PARAMETER DATA (@V_{dd}=12.5V, I_d=200mA)

| Freq. [MHz] | S11 | | S21 | | S12 | | S22 | |
|----------------|-------|--------|--------|-------|-------|-------|-------|--------|
| | (mag) | (ang) | (mag) | (ang) | (mag) | (ang) | (mag) | (ang) |
| 100 | 0.829 | -127.5 | 16.693 | 104.9 | 0.037 | 17.6 | 0.557 | -118.4 |
| 150 | 0.820 | -143.3 | 12.079 | 94.6 | 0.039 | 7.8 | 0.550 | -132.5 |
| 175 | 0.817 | -148.2 | 10.504 | 90.7 | 0.039 | 4.3 | 0.551 | -136.7 |
| 200 | 0.815 | -151.8 | 9.178 | 87.5 | 0.038 | 1.1 | 0.556 | -139.9 |
| 250 | 0.817 | -157.0 | 7.273 | 82.0 | 0.037 | -2.9 | 0.574 | -144.2 |
| 300 | 0.822 | -160.7 | 6.018 | 77.3 | 0.036 | -7.1 | 0.592 | -146.8 |
| 350 | 0.827 | -163.3 | 5.033 | 72.8 | 0.035 | -10.7 | 0.613 | -149.0 |
| 400 | 0.833 | -165.5 | 4.317 | 69.6 | 0.033 | -12.6 | 0.636 | -150.9 |
| 450 | 0.838 | -167.3 | 3.772 | 65.5 | 0.032 | -16.2 | 0.656 | -152.5 |
| 500 | 0.846 | -168.8 | 3.269 | 63.0 | 0.030 | -16.9 | 0.678 | -153.9 |
| 520 | 0.848 | -169.3 | 3.132 | 62.0 | 0.029 | -17.4 | 0.686 | -154.6 |
| 550 | 0.852 | -170.2 | 2.928 | 59.8 | 0.028 | -18.7 | 0.698 | -155.5 |
| 600 | 0.858 | -171.6 | 2.582 | 57.1 | 0.026 | -20.3 | 0.716 | -157.0 |
| 650 | 0.863 | -172.6 | 2.324 | 55.1 | 0.024 | -21.1 | 0.733 | -158.5 |
| 700 | 0.868 | -173.8 | 2.102 | 52.5 | 0.023 | -21.8 | 0.750 | -159.7 |
| 750 | 0.874 | -175.0 | 1.899 | 50.8 | 0.021 | -24.5 | 0.761 | -161.2 |
| 800 | 0.879 | -176.1 | 1.726 | 48.8 | 0.019 | -21.5 | 0.777 | -162.6 |
| 850 | 0.884 | -177.1 | 1.606 | 47.3 | 0.017 | -21.5 | 0.789 | -163.7 |
| 900 | 0.888 | -178.2 | 1.445 | 45.0 | 0.016 | -21.1 | 0.798 | -165.0 |
| 950 | 0.890 | -179.3 | 1.351 | 45.2 | 0.014 | -18.0 | 0.810 | -166.5 |
| 1000 | 0.894 | -179.8 | 1.265 | 42.1 | 0.013 | -15.9 | 0.818 | -167.5 |
| 1050 | 0.895 | -178.6 | 1.138 | 41.6 | 0.011 | -11.0 | 0.825 | -168.7 |
| 1100 | 0.899 | -177.5 | 1.104 | 40.9 | 0.010 | -4.9 | 0.833 | -170.3 |



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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.

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.