

< Silicon RF Power MOS FET (Discrete) >

RD05MMP1

RoHS Compliance, Silicon MOSFET Power Transistor, 941MHz, 5.5W

DESCRIPTION

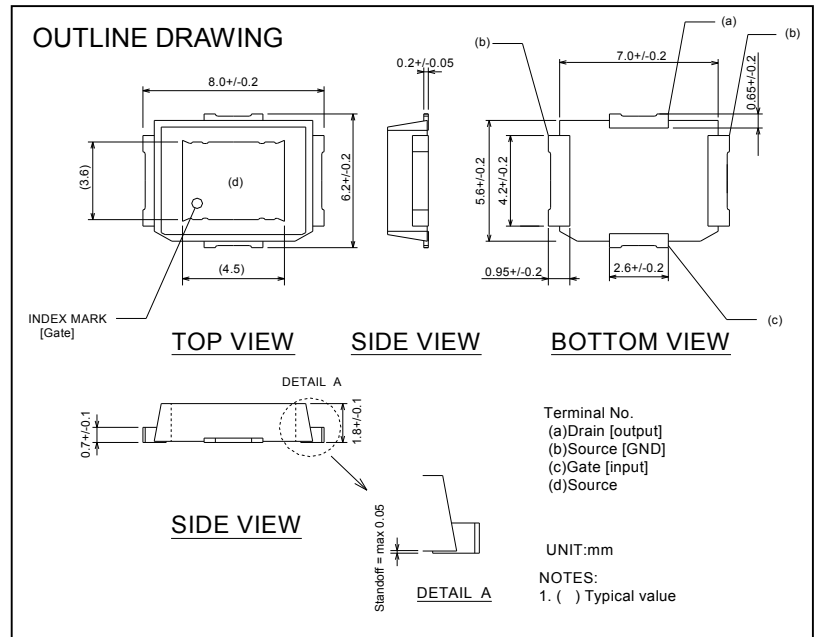
RD05MMP1 is a MOS FET type transistor specifically designed for UHF RF power amplifiers applications.

FEATURES

- High power gain:
Pout>5.5W, Gp>8.9dB@Vdd=7.2V,f=941MHz
- High Efficiency: 43%min. (941MHz)
- Integrated gate protection diode

APPLICATION

For output stage of high power amplifiers in 941MHz band mobile radio sets.



RoHS COMPLIANT

RD05MMP1 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 older alloys containing more than 85% lead.)

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	-5/+10	V
Pch *	Channel dissipation	Tc=25°C	73	W
Pin	Input Power	Zg=Zl=50Ω	1.4	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	1.7	°C/W

Note: Above parameters are guaranteed independently.

* Theoretical value in case of mounted on infinite heat sink.

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ELECTRICAL CHARACTERISTICS (T_c=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	-	-	10	uA
I _{GSS}	Gate to source leak current	V _{GS} =10V, V _{DS} =0V	-	-	1	uA
V _{TH}	Gate threshold Voltage	V _{DS} =12V, I _{DS} =1mA	0.5	-	2.5	V
P _{out}	Output power	f=941MHz, V _{DD} =7.2V	5.5	6	-	W
η _D	Drain efficiency	P _{in} =0.7W, I _{dq} =1.0A	43	-	-	%
V _{SWRT}	Load VSWR tolerance	V _{DD} =9.5V, P _o =5.5W (Pin Control) f=941MHz, I _{dq} =1.0A, Z _g =50Ω Load VSWR=20:1 (All Phase)	No destroy			-

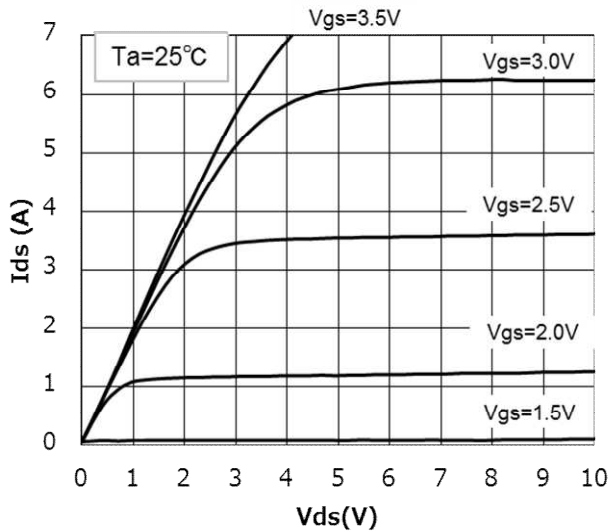
Note : Above parameters , ratings , limits and conditions are subject to change.

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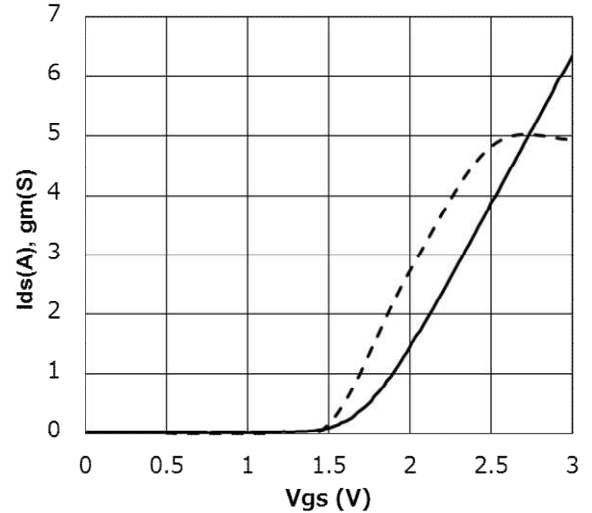
RoHS Compliance, Silicon MOSFET Power Transistor, 941MHz, 5.5W

TYPICAL CHARACTERISTICS

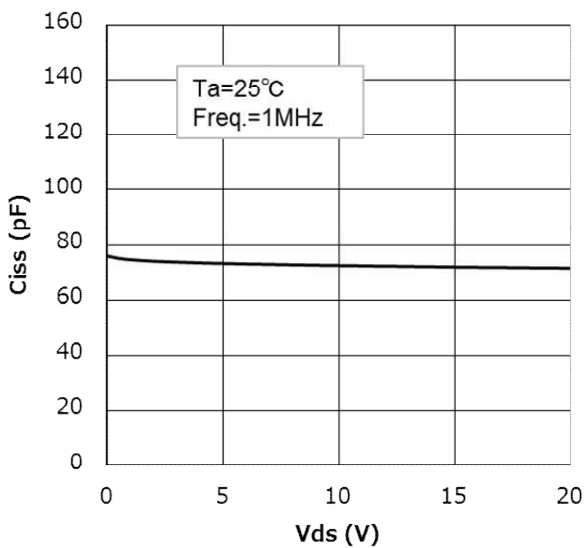
Vds-Ids CHARACTERISTICS



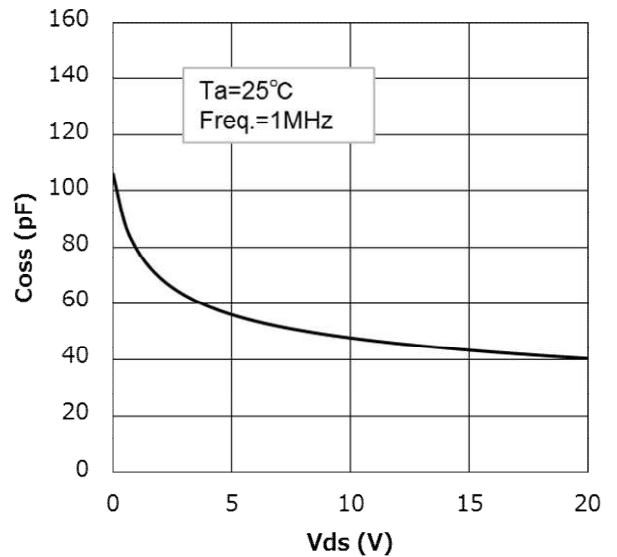
Vgs-Ids CHARACTERISTICS



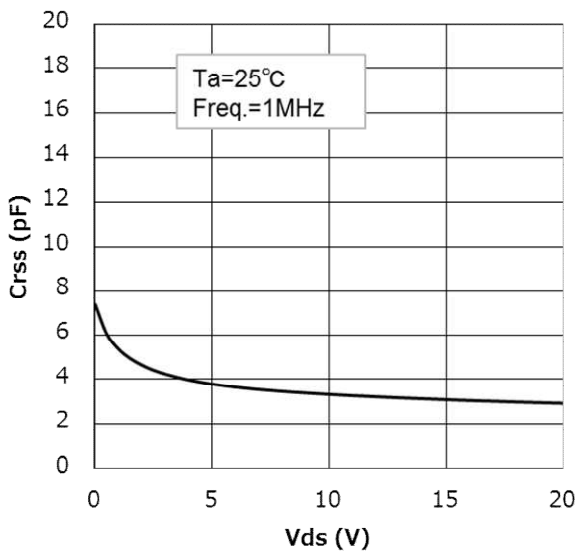
Vds vs. Ciss CHARACTERISTICS



Vds vs. Coss CHARACTERISTICS



Vds vs. Crss CHARACTERISTICS

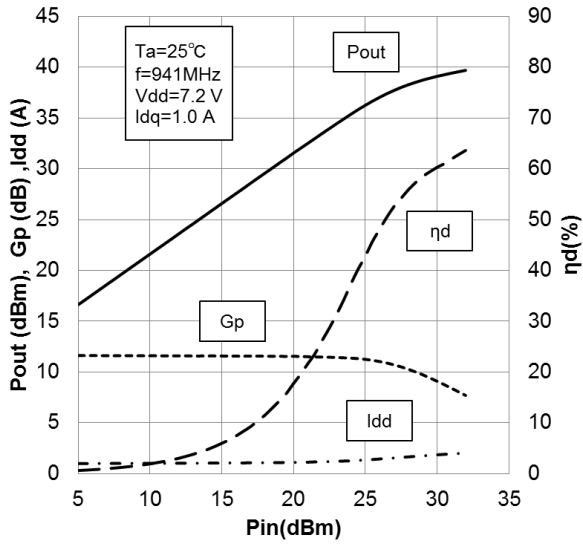


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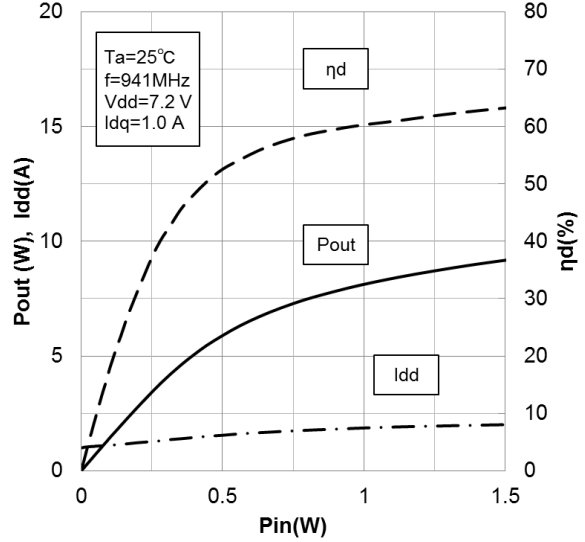
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TYPICAL CHARACTERISTICS

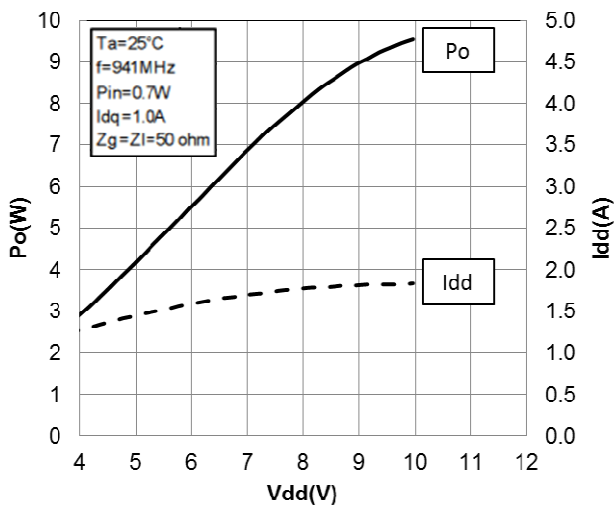
Pin-Po CHARACTERISTICS @f=941MHz



Pin-Po CHARACTERISTICS @f=941MHz



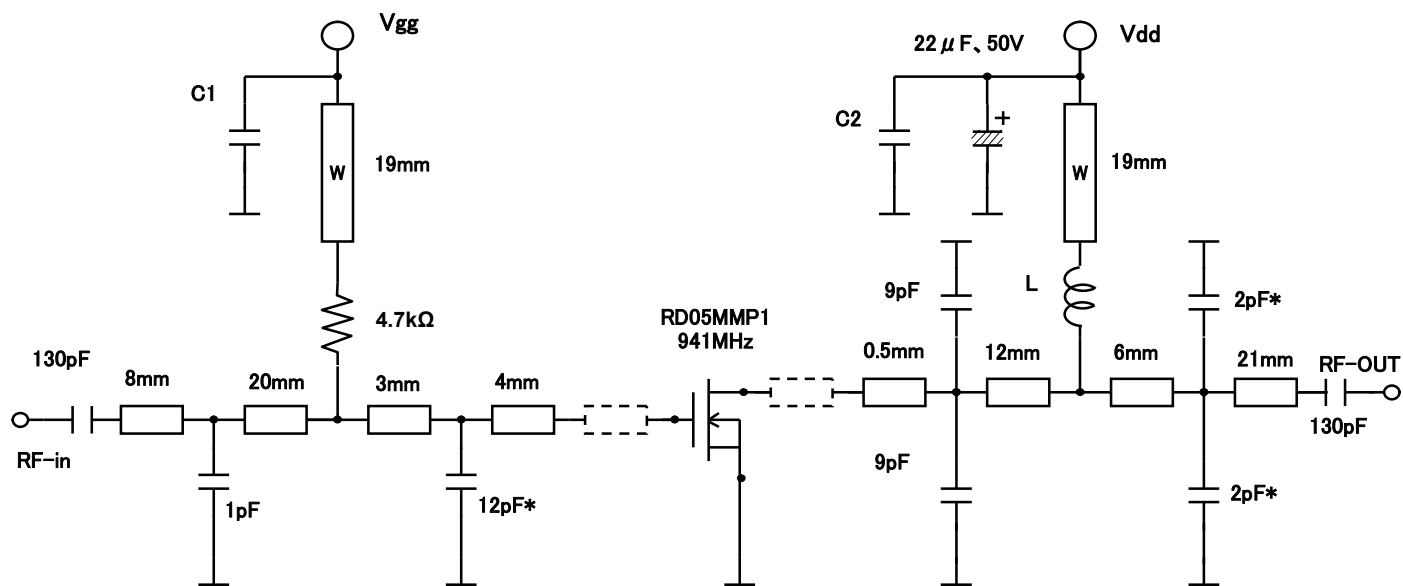
Vdd-Po CHARACTERISTICS @f=941MHz



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TEST CIRCUIT (f=941MHz)



Note: Board material PTFE substrate
 Micro strip line width=2.2mm/50, er:2.6, t=0.8mm
 W: Line width=1.0mm
 [---] : Spring (gilding), X:3mm Y:2.5mm

L: 24.9nH, 6Turns, D:0.43mm, ϕ 2.46mm (outside diameter)
 C: GRM39, " * " Mark C: GRM708
 C1, C2: 1000pF

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RD05MMP1 S-PARAMETER DATA (@Vdd=7.2V, Id=500mA)

Freq. (MHz)	S11		S21		S12		S22	
	(mag)	(ang)	(mag)	(ang)	(mag)	(ang)	(mag)	(ang)
100	0.853	-171.3	12.946	81.8	0.012	2.5	0.771	-170.8
125	0.855	-172.6	10.275	78.0	0.011	1.5	0.778	-171.6
150	0.858	-173.4	8.479	74.6	0.011	1.2	0.785	-172.0
175	0.862	-174.0	7.172	71.4	0.011	1.3	0.794	-172.2
200	0.866	-174.4	6.181	68.3	0.010	1.9	0.803	-172.3
225	0.871	-174.8	5.400	65.4	0.010	2.5	0.810	-172.6
250	0.877	-175.1	4.775	62.6	0.010	4.0	0.819	-172.6
275	0.882	-175.4	4.254	59.9	0.009	5.9	0.827	-172.8
300	0.887	-175.7	3.819	57.4	0.009	8.2	0.836	-173.0
325	0.892	-175.9	3.450	54.9	0.008	11.3	0.844	-173.1
350	0.898	-176.2	3.135	52.5	0.008	14.5	0.852	-173.3
375	0.903	-176.5	2.859	50.3	0.008	18.6	0.859	-173.7
400	0.908	-176.7	2.618	48.1	0.008	23.4	0.866	-173.8
425	0.913	-177.0	2.403	46.1	0.008	28.4	0.872	-174.1
450	0.917	-177.3	2.214	44.2	0.008	33.4	0.879	-174.3
475	0.922	-177.5	2.044	42.4	0.008	38.5	0.884	-174.6
500	0.926	-177.8	1.894	40.6	0.008	43.6	0.889	-174.7
525	0.930	-178.1	1.757	39.0	0.008	47.8	0.893	-175.0
550	0.933	-178.4	1.636	37.5	0.009	51.9	0.898	-175.2
575	0.937	-178.6	1.525	36.1	0.009	55.7	0.903	-175.3
600	0.940	-178.9	1.427	34.7	0.010	58.8	0.908	-175.7
625	0.943	-179.1	1.337	33.4	0.010	60.9	0.912	-175.8
650	0.947	-179.4	1.257	32.2	0.011	62.8	0.917	-176.0
675	0.949	-179.7	1.182	31.0	0.011	65.1	0.922	-176.3
700	0.952	-179.9	1.115	29.8	0.012	66.6	0.927	-176.5
725	0.955	-179.9	1.053	28.6	0.013	67.7	0.930	-176.8
750	0.957	-179.6	0.996	27.5	0.013	69.0	0.934	-177.0
775	0.959	-179.4	0.941	26.5	0.014	69.7	0.938	-177.4
800	0.961	-179.1	0.893	25.6	0.014	70.8	0.941	-177.6
825	0.963	-178.9	0.848	24.6	0.015	71.3	0.944	-177.8
850	0.965	-178.7	0.805	23.8	0.015	72.4	0.947	-178.1
875	0.966	-178.5	0.766	22.9	0.016	73.4	0.950	-178.3
900	0.968	-178.3	0.731	22.1	0.017	73.9	0.952	-178.5
925	0.969	-178.1	0.696	21.3	0.017	73.6	0.953	-178.8
950	0.971	-177.9	0.665	20.5	0.018	74.8	0.956	-179.0
975	0.972	-177.7	0.635	19.9	0.018	75.0	0.957	-179.2
1000	0.973	-177.5	0.608	19.3	0.019	75.7	0.959	-179.3

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RD05MMP1 S-PARAMETER DATA (@Vdd=7.2V, Id=900mA)

Freq. (MHz)	S11		S21		S12		S22	
	(mag)	(ang)	(mag)	(ang)	(mag)	(ang)	(mag)	(ang)
100	0.876	-172.8	13.583	83.3	0.009	6.9	0.798	-173.2
125	0.876	-174.1	10.816	80.0	0.009	7.1	0.803	-173.9
150	0.877	-174.9	8.962	77.0	0.009	8.0	0.808	-174.3
175	0.879	-175.5	7.615	74.2	0.009	9.2	0.814	-174.4
200	0.882	-175.9	6.590	71.4	0.009	10.8	0.820	-174.5
225	0.886	-176.3	5.787	68.8	0.009	12.7	0.827	-174.6
250	0.889	-176.6	5.142	66.3	0.009	14.9	0.832	-174.9
275	0.892	-176.8	4.607	63.9	0.008	17.5	0.838	-174.9
300	0.896	-177.1	4.158	61.5	0.008	20.4	0.844	-174.9
325	0.900	-177.3	3.778	59.3	0.008	23.5	0.850	-175.1
350	0.904	-177.6	3.451	57.1	0.008	27.1	0.857	-175.3
375	0.908	-177.8	3.164	54.9	0.008	30.6	0.861	-175.5
400	0.912	-178.0	2.913	52.8	0.008	35.0	0.866	-175.6
425	0.915	-178.2	2.688	50.9	0.008	39.1	0.872	-175.8
450	0.919	-178.4	2.486	49.0	0.008	42.8	0.877	-176.0
475	0.923	-178.6	2.307	47.2	0.009	46.6	0.881	-176.1
500	0.926	-178.9	2.146	45.4	0.009	50.4	0.884	-176.3
525	0.929	-179.1	1.999	43.8	0.009	53.3	0.887	-176.4
550	0.932	-179.3	1.867	42.3	0.010	56.2	0.890	-176.6
575	0.935	-179.5	1.748	40.9	0.010	58.8	0.895	-176.7
600	0.939	-179.7	1.639	39.5	0.011	61.6	0.900	-176.8
625	0.941	-180.0	1.541	38.2	0.011	63.0	0.903	-176.8
650	0.944	179.8	1.453	36.9	0.012	64.2	0.907	-176.9
675	0.947	179.6	1.372	35.7	0.012	65.6	0.912	-177.1
700	0.949	179.4	1.298	34.5	0.013	67.0	0.916	-177.3
725	0.951	179.2	1.229	33.3	0.014	67.9	0.921	-177.4
750	0.953	178.9	1.165	32.1	0.014	68.8	0.926	-177.7
775	0.956	178.8	1.106	31.0	0.015	69.1	0.928	-178.0
800	0.958	178.6	1.050	30.1	0.015	70.4	0.933	-178.1
825	0.959	178.4	1.000	28.9	0.016	70.7	0.935	-178.3
850	0.961	178.2	0.953	28.1	0.016	71.5	0.939	-178.6
875	0.963	177.9	0.908	27.1	0.017	72.3	0.941	-178.8
900	0.964	177.8	0.867	26.2	0.018	72.8	0.944	-179.0
925	0.966	177.6	0.829	25.4	0.018	73.0	0.944	-179.2
950	0.967	177.4	0.792	24.5	0.018	74.0	0.947	-179.4
975	0.969	177.3	0.759	23.7	0.019	74.3	0.950	-179.5
1000	0.970	177.0	0.727	22.9	0.020	74.8	0.951	-179.7

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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.

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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.

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