

< Silicon RF Power MOS FET (Discrete) >

RD35HUP2

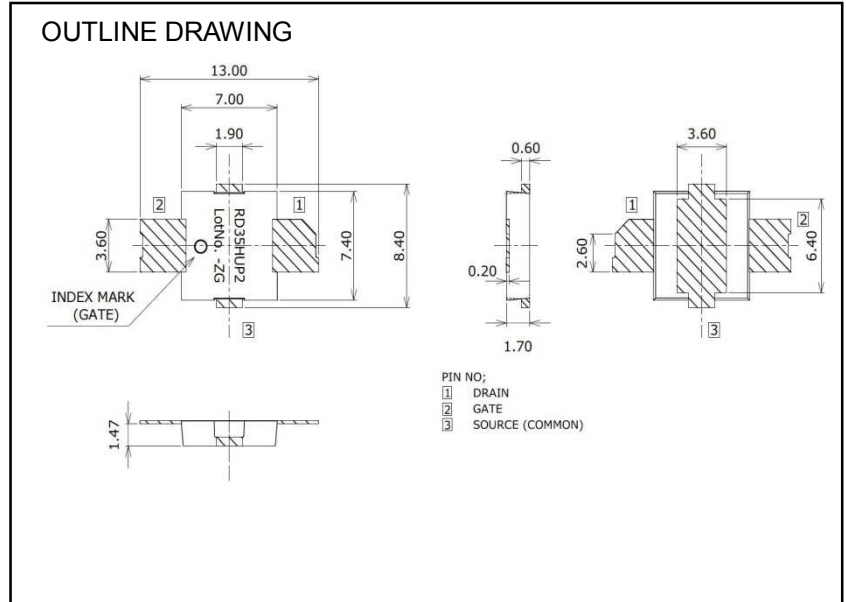
RoHS Compliance, Silicon MOSFET Power Transistor, 175MHz, 530MHz, 35W, 12.5V

DESCRIPTION

RD35HUP2 is a MOS FET type transistor specifically designed for VHF/UHF RF power amplifiers applications.

FEATURES

1. Supply with Tape and Reel. 500 Units per Reel
2. Employing Mold Package
3. High Power and High Efficiency
 $P_{out}=35W_{typ}$, Drain Eff.=64.0% $_{typ}$
@ $V_{ds}=12.5V$ $I_{dq}=0.5A$ $P_{in}=3.0W$ $f=530MHz$
4. Integrated gate protection diode.



APPLICATION

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

RoHS COMPLIANT

RD35HUP2 is EU RoHS compliant.

RoHS compliance is indicating by the letter "ZG" after the Lot Marking.

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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	40	V
VGSS	Gate to Source Voltage	Vds=0V	-5/+10	V
Pch	Channel Dissipation	Tc=25°C	166	W
Pin	Input Power	Zg=Zl=50Ω	6	W
ID	Drain Current	-	10	A
Tch	Channel Temperature	-	175	°C
Tstg	Storage Temperature	-	-40 to +175	°C

Note: 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=37V, VGS=0V	-	-	150	μA
IGSS	Gate to Source Leak Current	VGS=10V, VDS=0V	-	-	2.5	μA
VTH	Gate Threshold Voltage	VDS=12V, IDS=1mA	1.6	2.0	2.4	V
Pout	Output Power	f=530MHz* ¹ , VDS=12.5V,	-	35	-	W
ηD	Drain Efficiency	Pin=3.0W, Idq=0.5A	-	55	-	%
VSWRT1* ²	Load VSWR Tolerance	Load VSWR=65:1(All Phase), VDS=16.3V, Pin=1W(Zg/Zl=50Ω) f=135MHz* ¹ , Idq=0.5A	No destroy			-
VSWRT2	Load VSWR Tolerance	Load VSWR=20:1(All Phase), VDS=16.3V increased after Pout adjusted to 40W(Zg/Zl=50Ω) by Pin(under f=135MHz* ¹ , VDS=12.5V and Idq=0.5A)	No destroy			-

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

*¹ In Mitsubishi VHF Evaluation Board*² Random sampling (22pcs/ Lot)**TEMPERATURE CHARACTERISTICS** (Tc=25°C UNLESS OTHERWISE NOTED)

SYMBOL	PARAMETER	CONDITIONS	LIMITS			UNIT
			MIN	TYP.	MAX.	
Rth j-c	Thermal Resistance	Junction to Case	-	0.33	0.9	°C/W

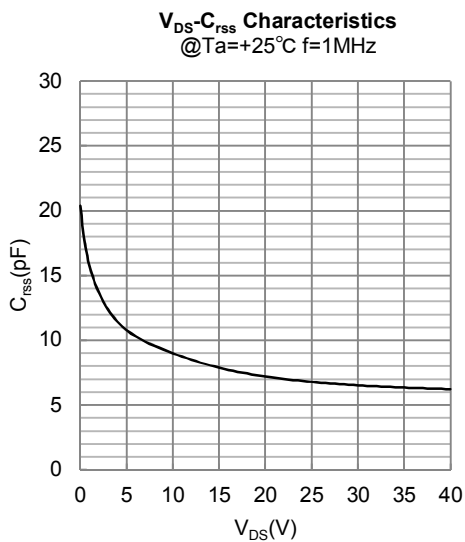
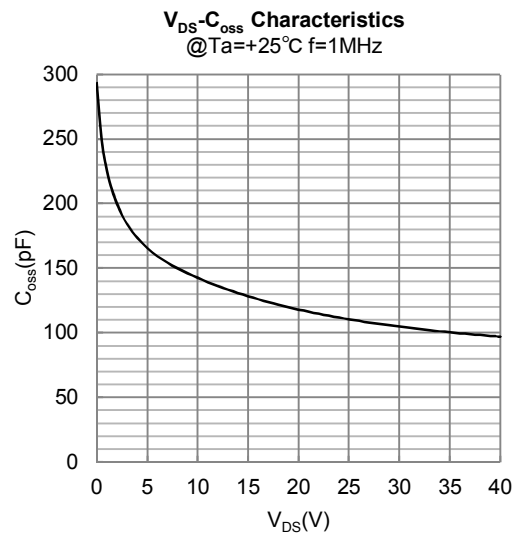
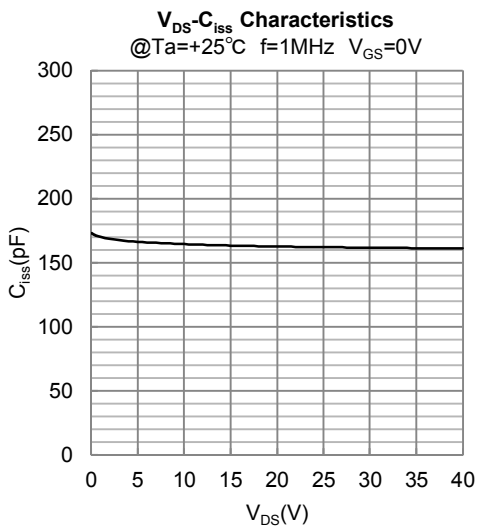
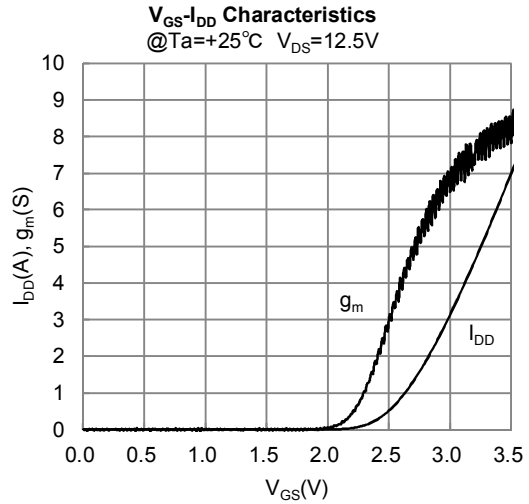
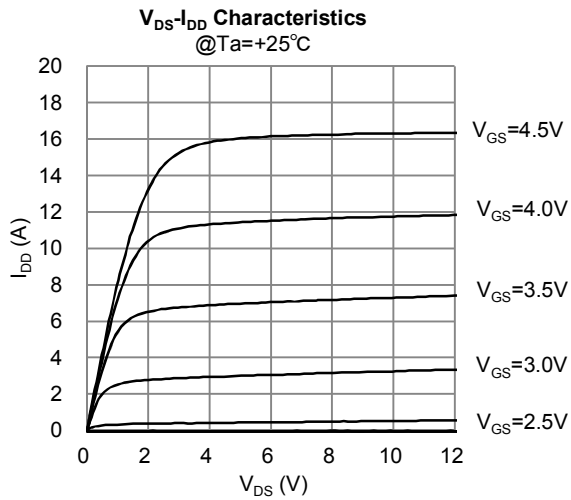
Note: Above characteristics is a Sampling test. (22pcs / Lot)

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TYPICAL DC CHARACTERISTICS

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

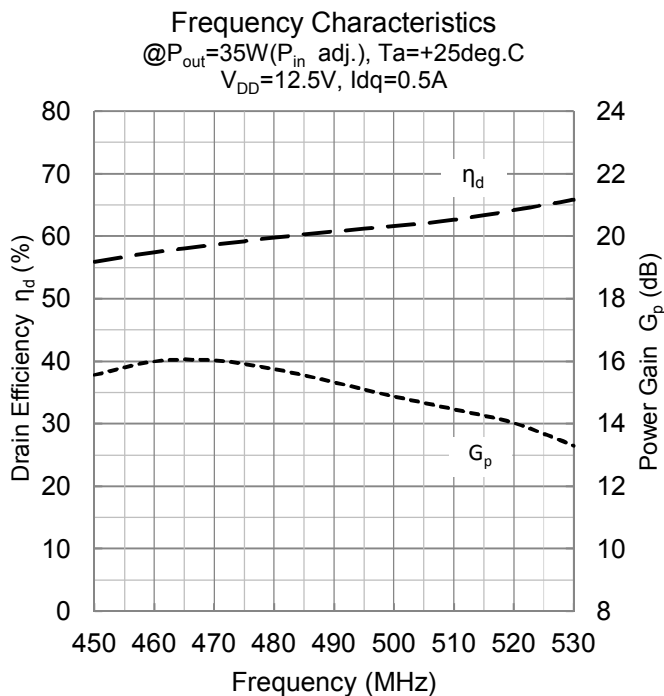
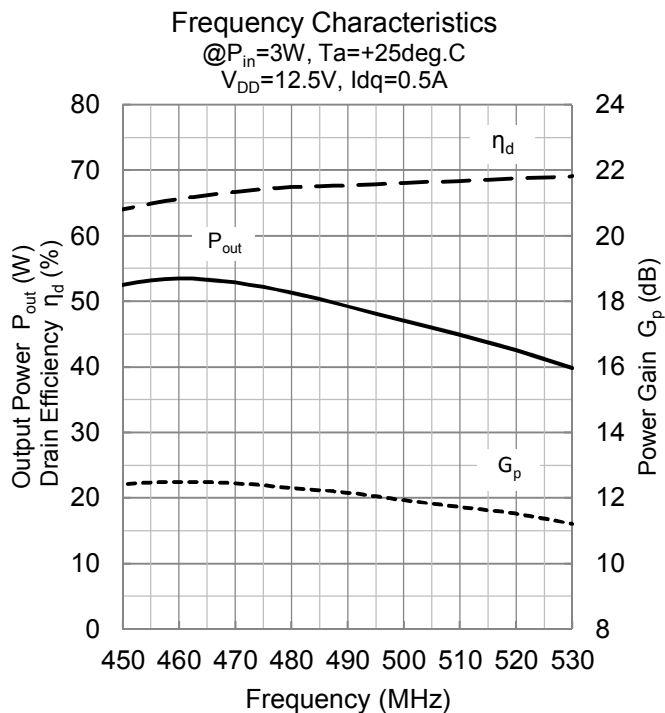


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TYPICAL RF CHARACTERISTICS (Frequency vs P_{out} , η_d , G_p)

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

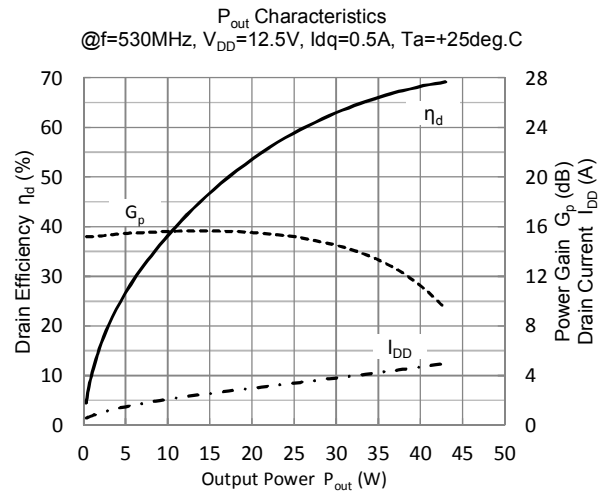
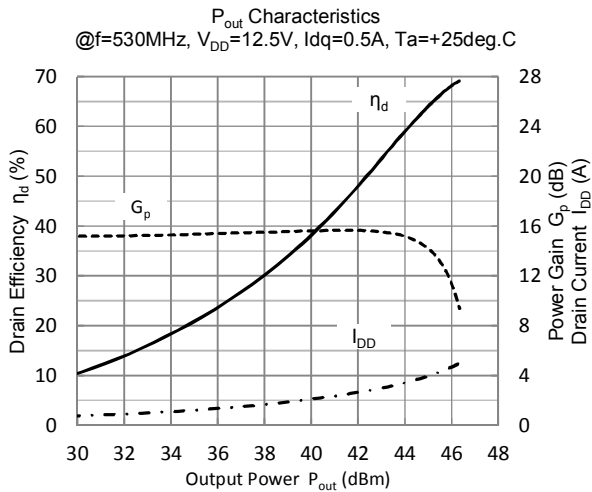
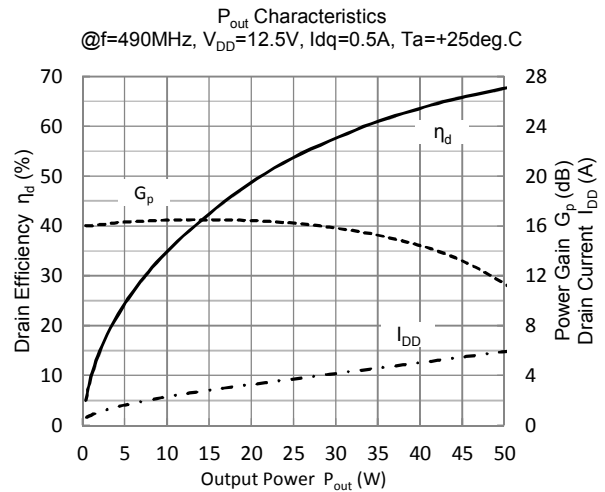
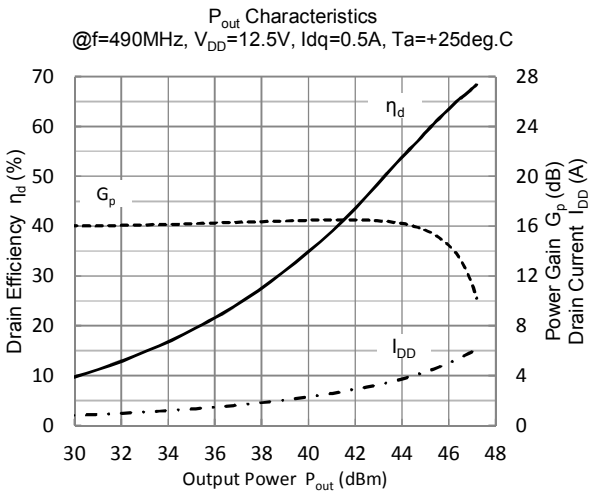
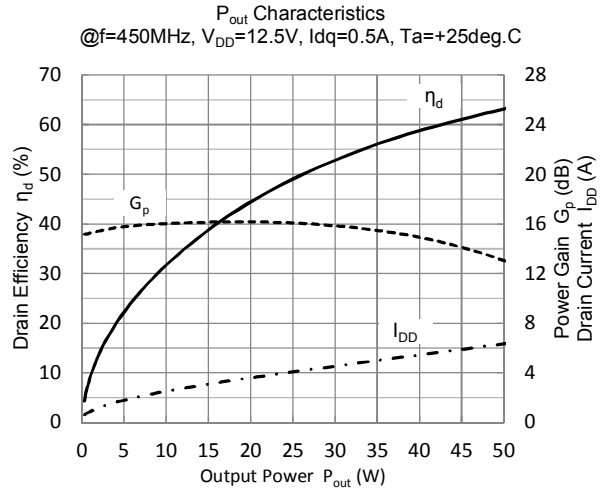
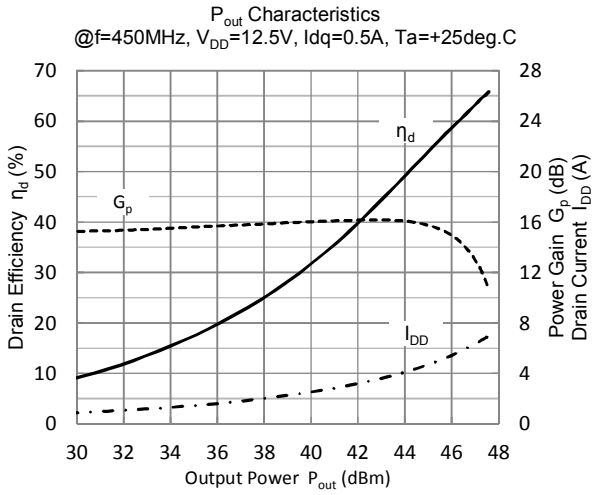


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TYPICAL RF CHARACTERISTICS (P_{out} vs G_p, η_d, I_{DD})

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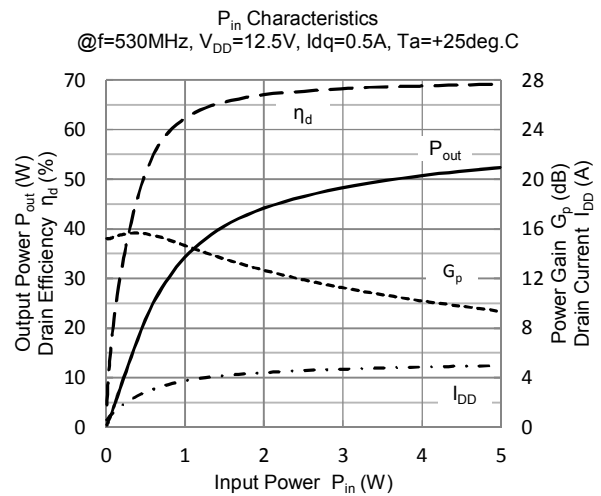
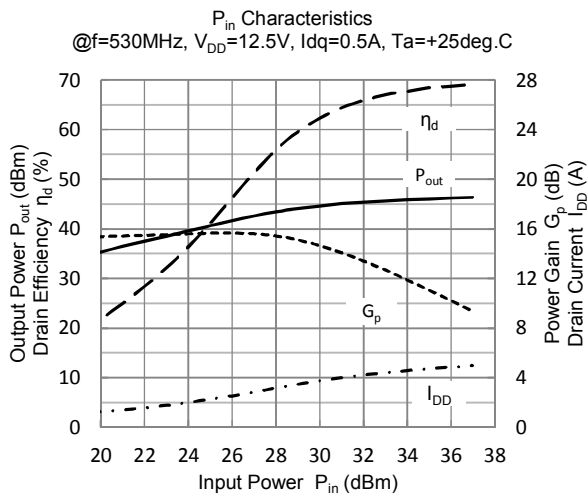
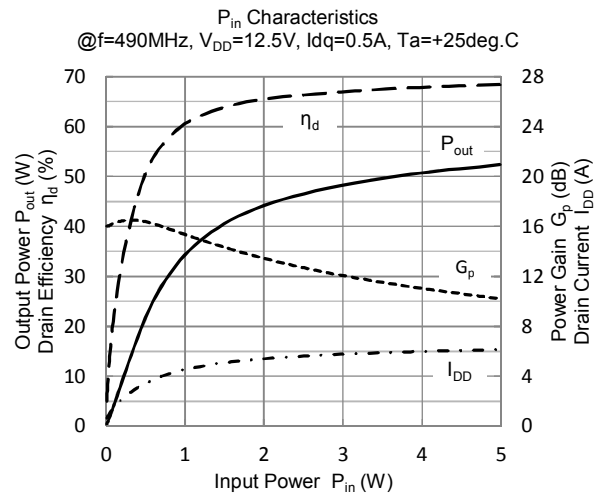
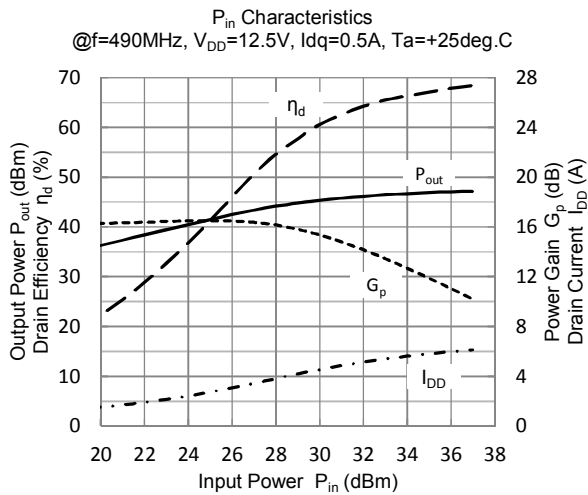
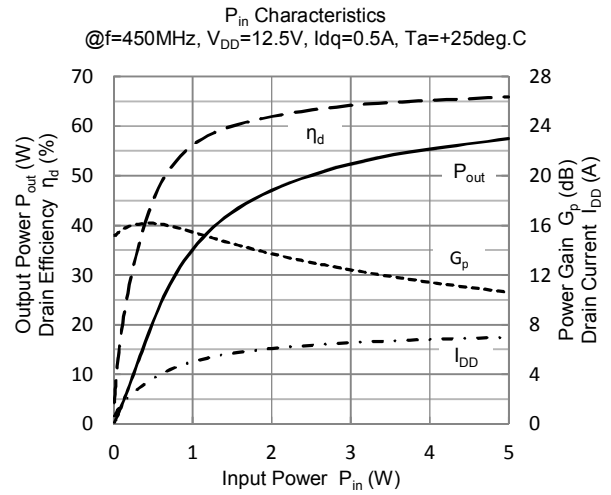
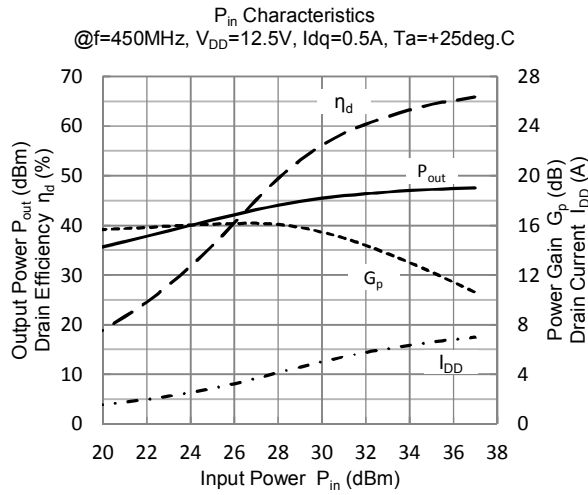


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TYPICAL RF CHARACTERISTICS (Pin vs Pout Gp, ηd, IDD)

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

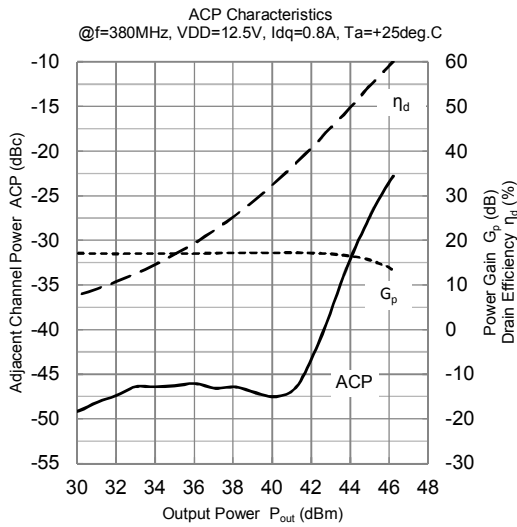


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TYPICAL RF CHARACTERISTICS (P_{out} vs ACP, η_d , G_p)

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

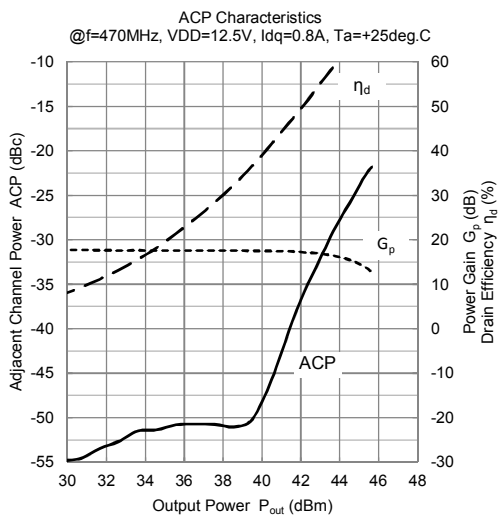
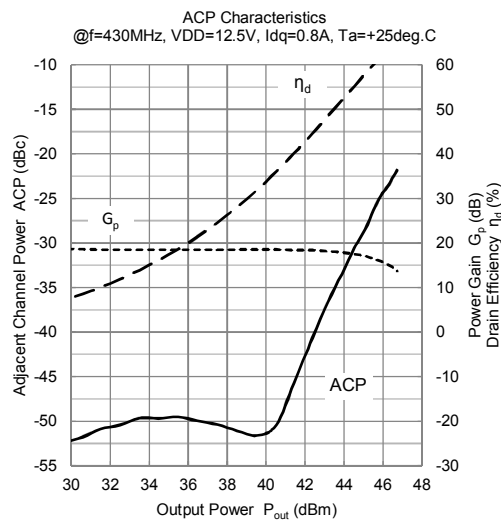


Modulation: TETRA

$\pi/4$ DQPSK, Root Nyquist Filter ($\alpha=0.35$),

Symbol rate=18ksps,

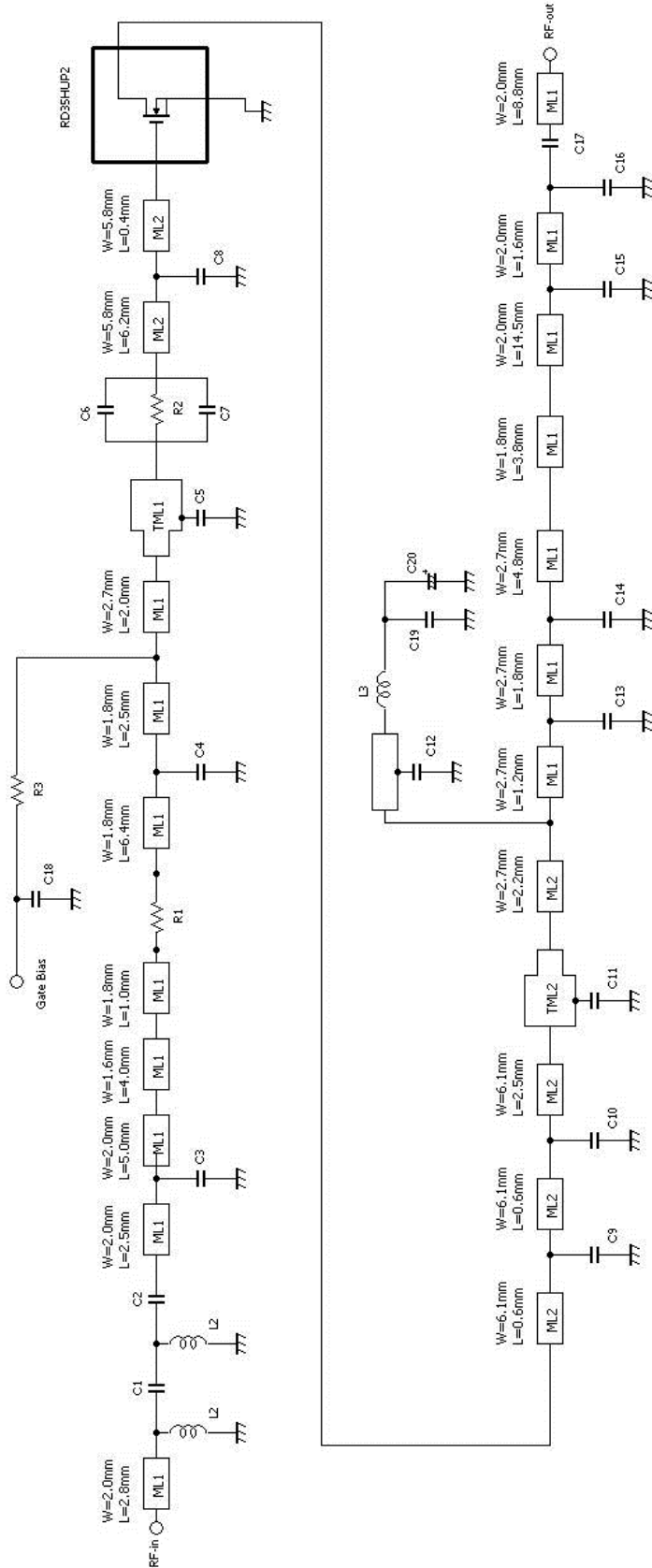
Band Width=18kHz, Cannel Spacing=25KHz



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EQUIVALENT CIRCUITRY for UHF Circuit for f=450-530MHz



Note:
 Evaluation board materials
 Glass-Epoxy substrate (Er=4.8, t=1.6mm, TanD=0.015@1.0GHz)

Micro strip line substrate thickness

ML1, TML1: t=1.3mm
 ML2, TML2: t=0.2mm

Via hole dimensions
 Diameter=0.8mm, Length=1.5mm

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COMPONENT LIST

Parts Type	Symbol	Description	Type name	Vender
Capasitor	C 1	6.8 pF 2012 Hi-Q	GQM2195C2E6R8DB12	Murata Manufacturing Co.,Ltd
	C 2	16 pF 2012 Hi-Q	GQM2195C2E160JB12	Murata Manufacturing Co.,Ltd
	C 3	8.2 pF 1608 Hi-Q	GQM1882C1H8R2DB01	Murata Manufacturing Co.,Ltd
	C 4	6.2 pF 1608 Hi-Q	GQM1882C2A6R2DB01	Murata Manufacturing Co.,Ltd
	C 5	33 pF 1608 Hi-Q	GQM1882C1H330JB01	Murata Manufacturing Co.,Ltd
	C 6	130 pF 2012	GRM2162C2A131JA01	Murata Manufacturing Co.,Ltd
	C 7	130 pF 2012	GRM2162C2A131JA01	Murata Manufacturing Co.,Ltd
	C 8	51 pF 1608 Hi-Q	GQM1882C1H510JB01	Murata Manufacturing Co.,Ltd
	C 9	30 pF 2012 Hi-Q	GQM2195C2E300JB12	Murata Manufacturing Co.,Ltd
	C 10	33 pF 2012 Hi-Q	GQM2195C2E330JB12	Murata Manufacturing Co.,Ltd
	C 11	5.1 pF 2012 Hi-Q	GQM2195C2E5R1DB12	Murata Manufacturing Co.,Ltd
	C 12	2.7 pF 2012 Hi-Q	GQM2195C2E2R7CB12	Murata Manufacturing Co.,Ltd
	C 13	10 pF 2012 Hi-Q	GQM2195C2E100JB12	Murata Manufacturing Co.,Ltd
	C 14	10 pF 2012 Hi-Q	GQM2195C2E100JB12	Murata Manufacturing Co.,Ltd
	C 15	4.7 pF 2012 Hi-Q	GQM2195C2E4R7CB12	Murata Manufacturing Co.,Ltd
	C 16	4.7 pF 2012 Hi-Q	GQM2195C2E4R7CB12	Murata Manufacturing Co.,Ltd
	C 17	62 pF 2012 Hi-Q	GQM2195C2E620JB12	Murata Manufacturing Co.,Ltd
	C 18	1000 pF 1608	GRM188R61H102KA01	Murata Manufacturing Co.,Ltd
	C 19	100000 pF 2012	GRM21BB11H104KA01	Murata Manufacturing Co.,Ltd
	C 20	220 μ F	EEUFC1V221	Panasonic Corporation
Register	R 1	0 Ω	RPC05T0R0J	Taiyosha Electric Co.,Ltd
	R 2	2.2 Ω	RPC10T2R2J	Taiyosha Electric Co.,Ltd
	R 3	2.2 k Ω	RPC05T222J	Taiyosha Electric Co.,Ltd
Inductor	L 1	39 nH 1608	LQW18AN39NJ00	Murata Manufacturing Co.,Ltd
	L 2	18 nH 1608	LQW18AN18NJ10	Murata Manufacturing Co.,Ltd
	L 3	17nH Enameled wire 4Turns, Diameter,0.8mm, ϕ 2.2mm(inside diameter)	8004C	YC Corporation Co.,Ltd

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Recommended device usage as power amplifier

(1) Mitsubishi recommends a structure mounted like Figure 1 for this device used in the power amplifier.

Please fix the source of device backside directly on heat sink by solder.

(If heat dissipation is insufficient, there is a possibility that the destruction caused by heat is generated.)

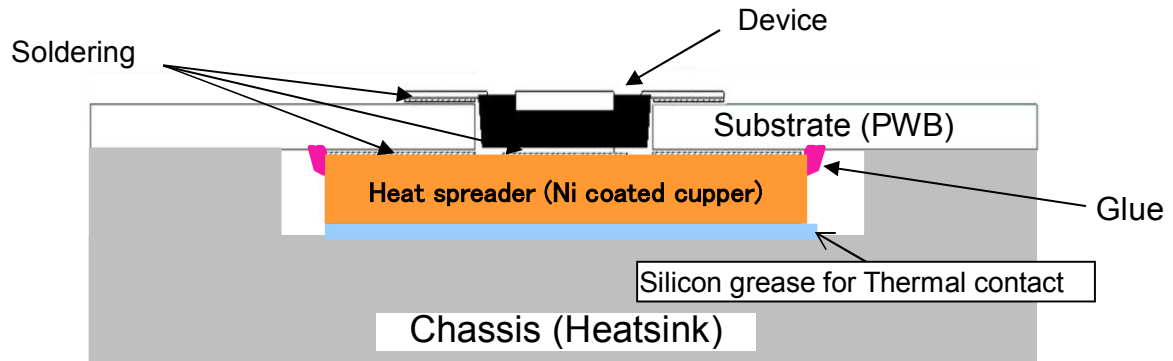


Fig.1

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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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