MITSUBISHI ELECTRIC

< Silicon RF Power MOS FET (Discrete) >

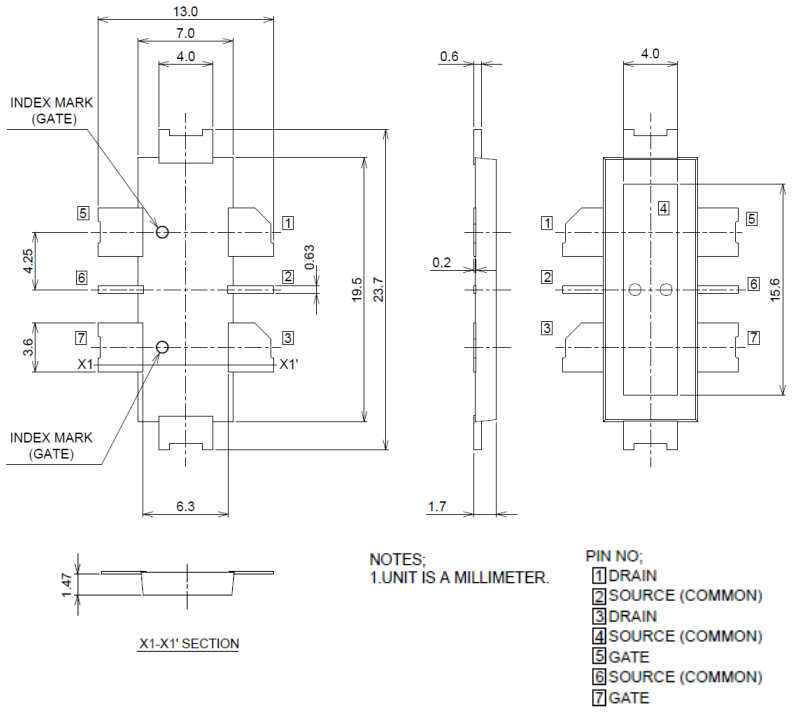
RD70HUP2

RoHS Compliance,Silicon MOSFET Power Transistor, 175MHz,530MHz, 70W, 12.5V

DESCRIPTION

RD70HUP2 is a MOS FET type transistor specifically designed for VHF/UHF RF power amplifiers applications.

OUTLINE DRAWING



FEATURES

1. Supply with Tape and Reel. 500 Units per Reel
2. Employing Mold Package
3. High Power and High Efficiency
Pout=75Wtyp, Drain Effi.=64.0%typ
@ Vds=12.5V Idq=1.0A Pin=5.0W f=530MHz
Pout=84Wtyp, Drain Effi.=74%typ
@ Vds=12.5V Idq=1.0A Pin=4.0W f=175MHz
4. Integrated gate protection diode.

APPLICATION

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

RoHS COMPLIANT

RD70HUP2 is EU RoHS compliant.
RoHS compliance is indicating by the letter “G” after the Lot Marking.

RD70HUP2

RoHS Compliance,Silicon MOSFET Power Transistor, 175MHz,530MHz, 70W, 12.5V

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	425	W
Pin	Input Power	Zg=Zl=50Ω	12	W
ID	Drain Current	-	20	A
Tch	Channel Temperature	-	175	°C
Tstg	Storage Temperature	-	-40 to +175	°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}*[1]	Zero Gate Voltage Drain Current	V_{DS}=37V, V_{GS}=0V	-	-	150	μA
I_{GSS}*[1]	Gate to Source Leak Current	V_{GS}=10V, V_{DS}=0V	-	-	2.5	μA
V_{TH}*[1]	Gate Threshold Voltage	V_{DS}=12V, I_{DS}=1mA	1.6	2.0	2.4	V
Pout1	Output Power	f=530MHz*[2],V_{DS}=12.5V, Pin=5.0W, Idq=2x500mA	-	75	-	W
ηD1	Drain Efficiency		-	64	-	%
Pout2	Output Power	f=175MHz*[3],V_{DS}=12.5V, Pin=4.0W, Idq=2x500mA	-	84	-	W
ηD2	Drain Efficiency		-	74	-	%
VSWRT1*[4]	Load VSWR Tolerance	Load VSWR=65:1(All Phase), V_{DS}=16.3V ,Pin=2W(Zg/Zl=50Ω) f=135MHz*[3], Idq=2x500mA	No destroy			-
VSWRT2	Load VSWR Tolerance	Load VSWR=20:1(All Phase), VDS=16.3V increased after Pout adjusted to 70W(Zg/Zl=50Ω) by Pin(under f=135MHz*[3], VDS=12.5V and Idq=2x500mA)	No destroy			-

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

*[1] Unilateral Measurement (Measured per Single Side)

*[2] In Mitsubishi UHF Evaluation Board

*[3] In Mitsubishi VHF Evaluation Board

*[4] Random sampling (22pcs/ Lot)

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

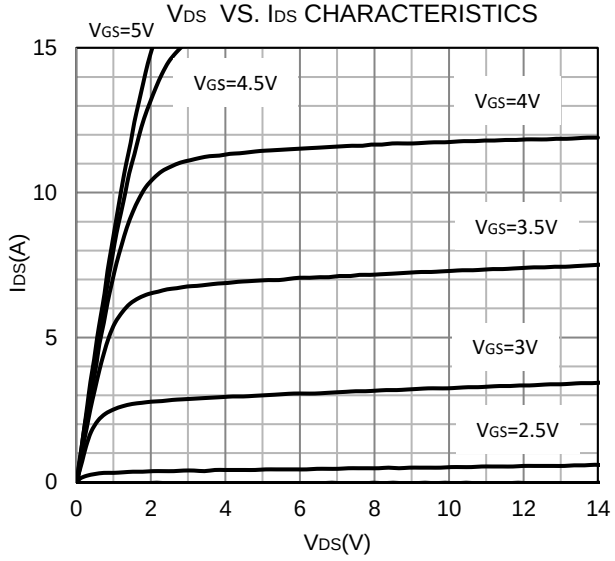
SYMBOL	PARAMETER	CONDITIONS	LIMITS			UNIT
			MIN	TYP.	MAX	
Rth j-c	Thermal Resistance	Junction to Case	-	0.17	0.35	°C/W

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

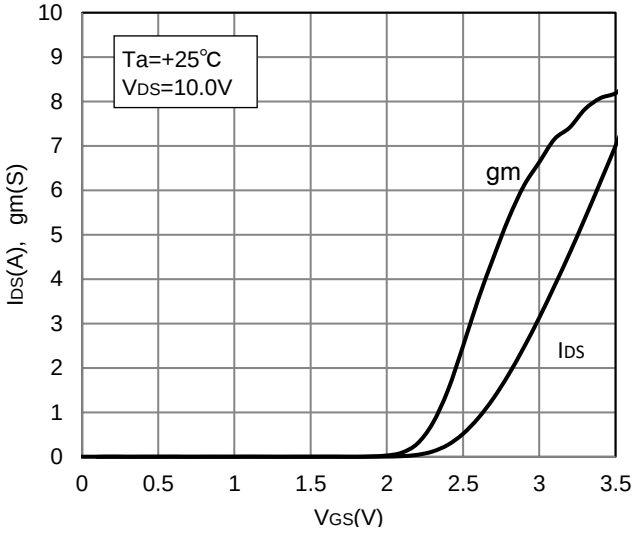
TYPICAL DC CHARACTERISTICS

(These are only typical curves and devices are not necessarily guaranteed at these curves.)
(These are Unilateral Measurement (Measured per Single Side))

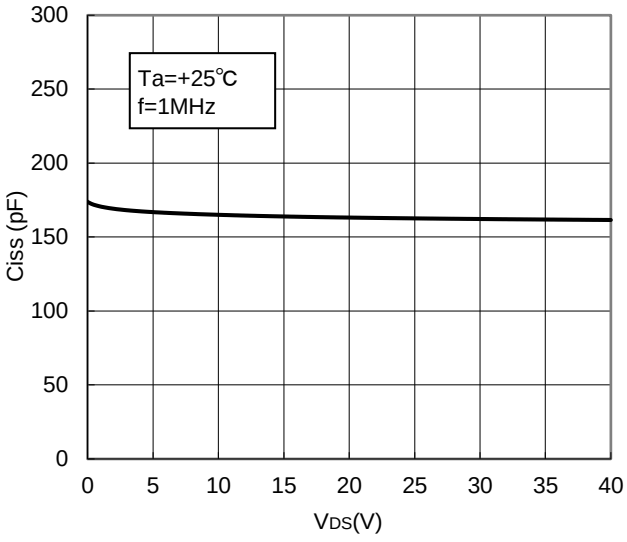
VDS VS. IDS CHARACTERISTICS



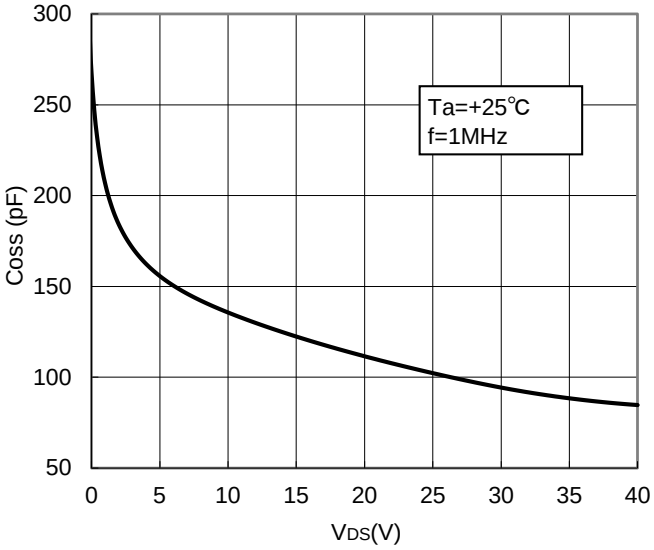
VGS VS. IDS CHARACTERISTICS



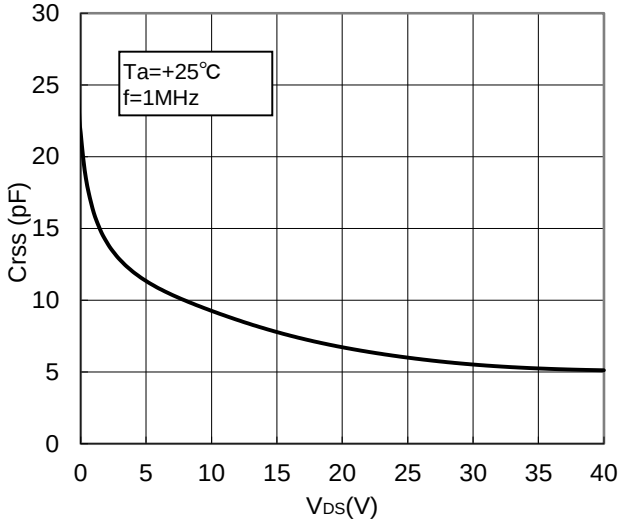
VDS VS. Ciss Characteristics



VDS VS. Coss CHARACTERISTICS

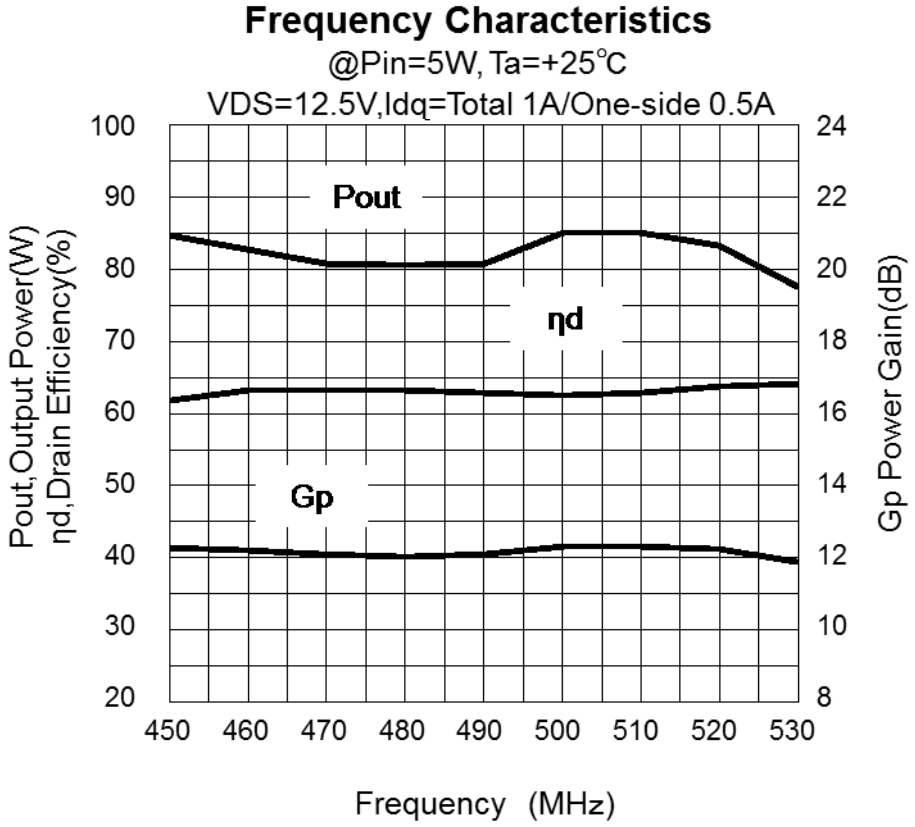


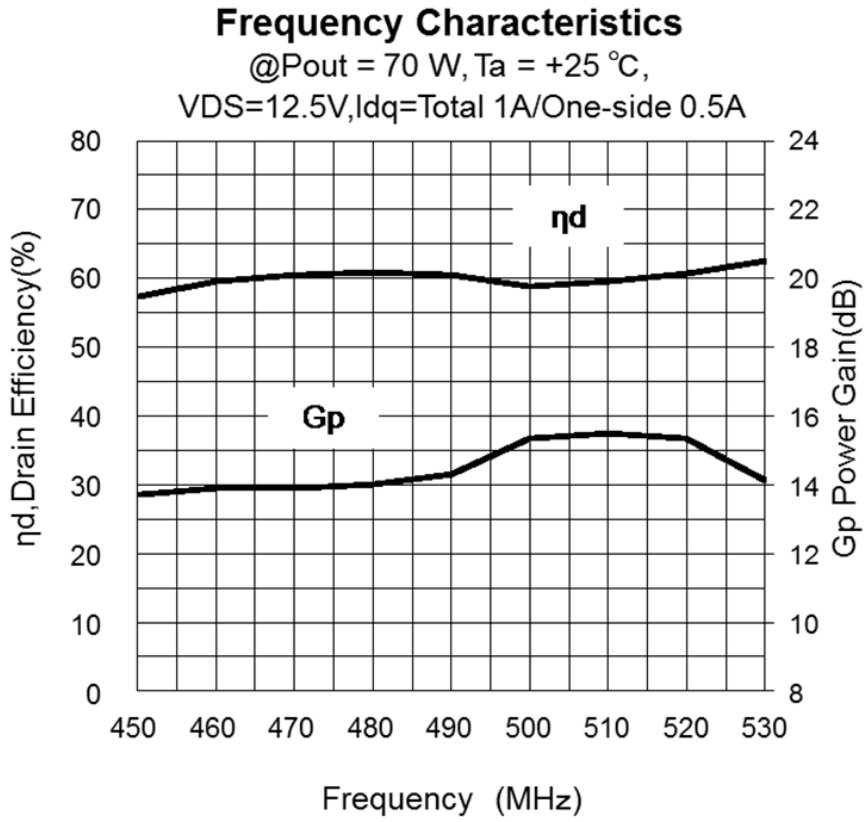
VDS VS. Crss CHARACTERISTICS



TYPICAL RF CHARACTERISTICS (Frequency vs P_{out} ,ηd , Gp , I_{DD})

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





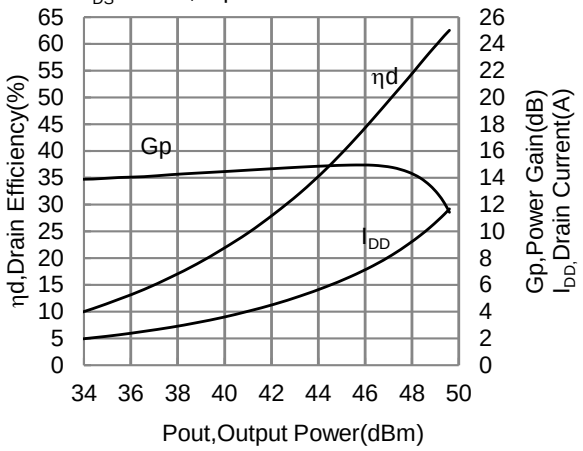
RD70HUP2

RoHS Compliance,Silicon MOSFET Power Transistor, 175MHz,530MHz, 70W, 12.5V

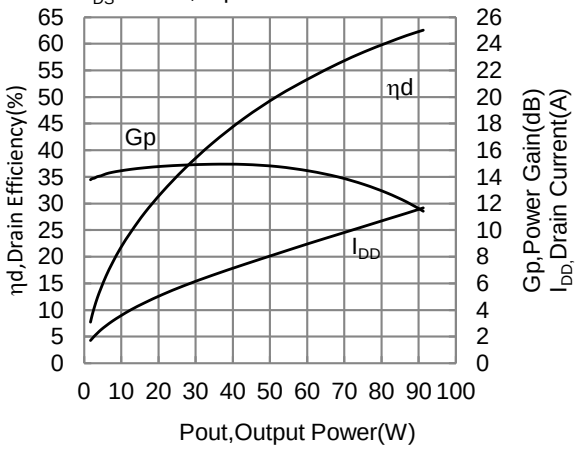
TYPICAL RF CHARACTERISTICS (Pout vs Gp , ηd , I_{DD})

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

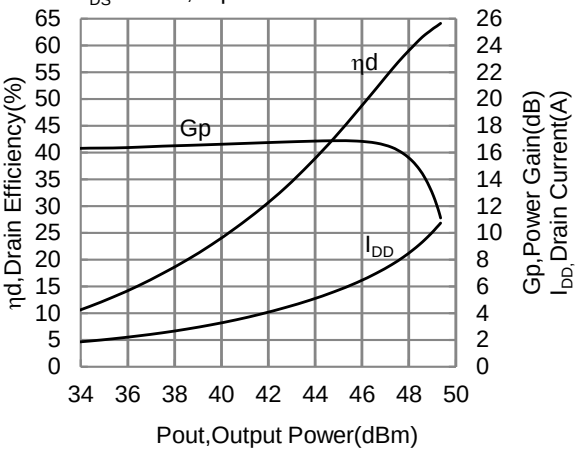
Pout Characteristics
@f=450MHz Ta=+25℃
V_{DS}=12.5V,Idq=Total 1A/One-side 0.5A



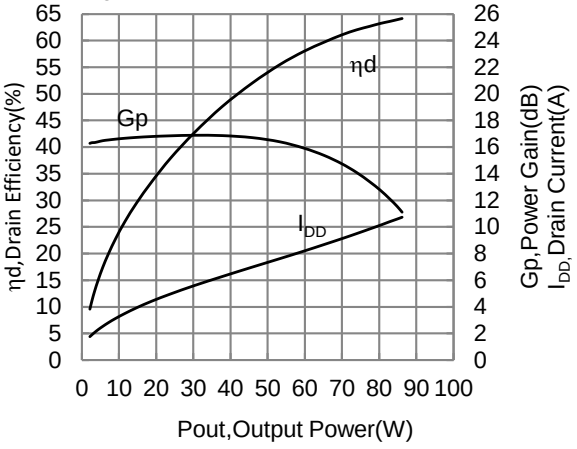
Pout Characteristics
@f=450MHz Ta=+25℃
V_{DS}=12.5V,Idq=Total 1A/One-side 0.5A



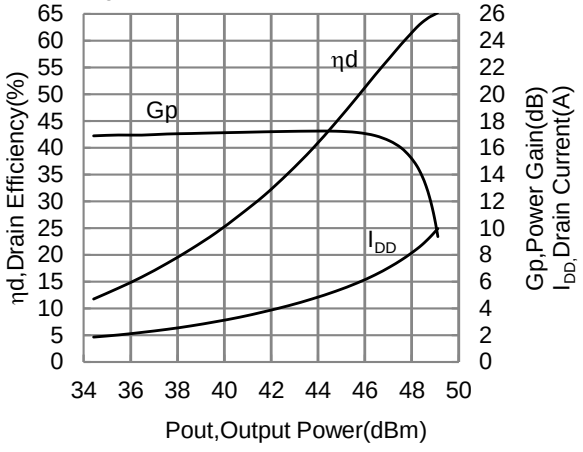
Pout Characteristics
@f=490MHz Ta=+25℃
V_{DS}=12.5V,Idq=Total 1A/One-side 0.5A



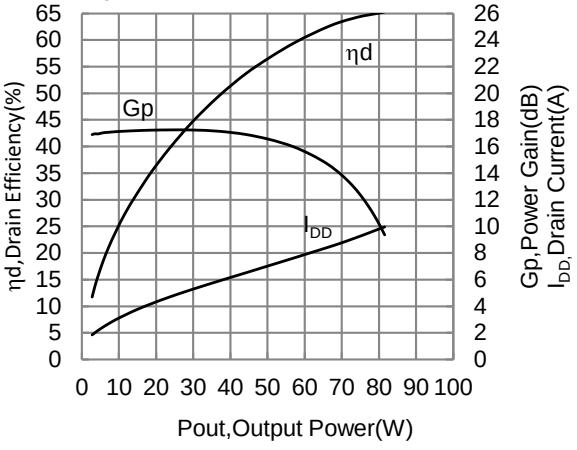
Pout Characteristics
@f=490MHz Ta=+25℃
V_{DS}=12.5V,Idq=Total 1A/One-side 0.5A



Pout Characteristics
@f=530MHz Ta=+25℃
V_{DS}=12.5V,Idq=Total 1A/One-side 0.5A



Pout Characteristics
@f=530MHz Ta=+25℃
V_{DS}=12.5V,Idq=Total 1A/One-side 0.5A

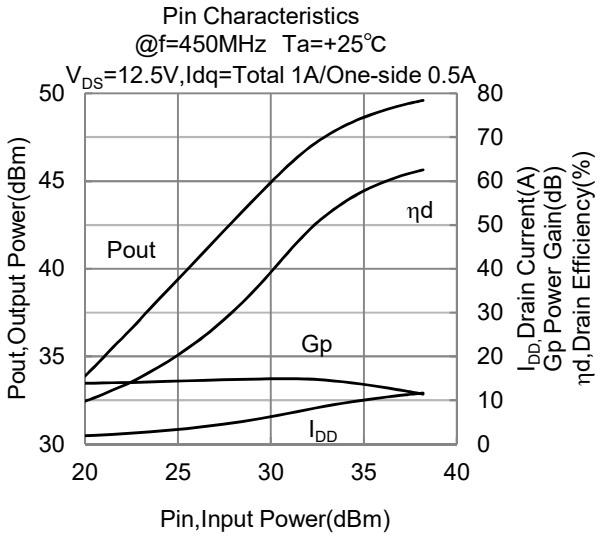


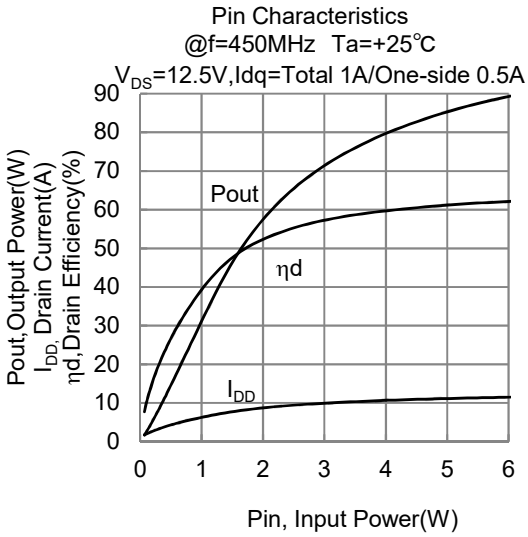
RD70HUP2

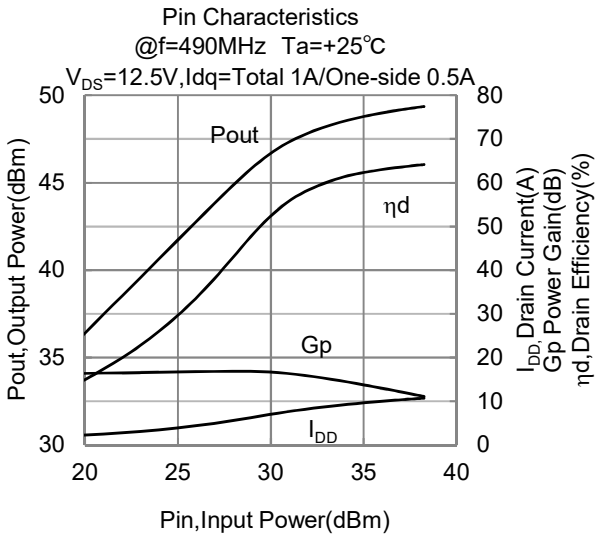
RoHS Compliance,Silicon MOSFET Power Transistor, 175MHz,530MHz, 70W, 12.5V

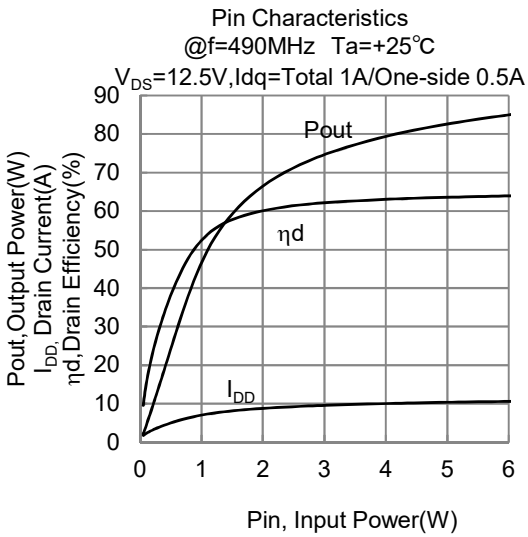
TYPICAL RF CHARACTERISTICS (Pin vs Pout Gp, ηd, I_{DD})

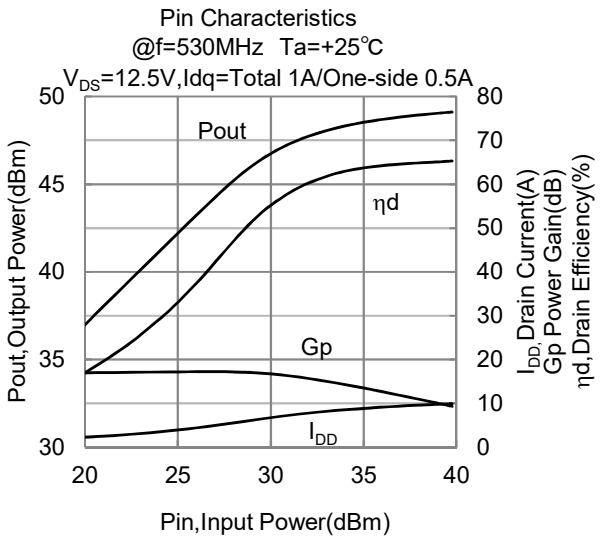
(These are only typical curves and devices are not necessarily guaranteed at these curves.)

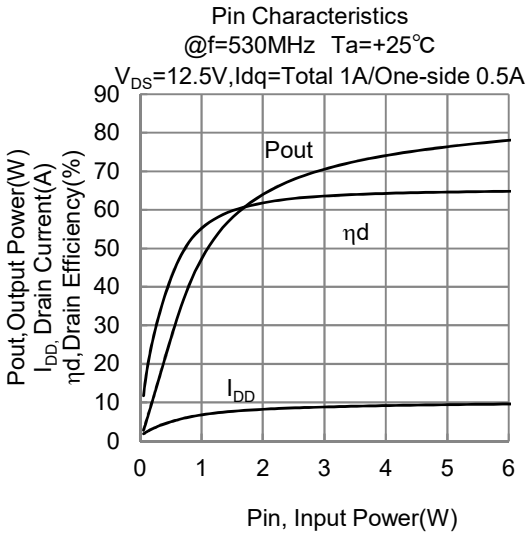






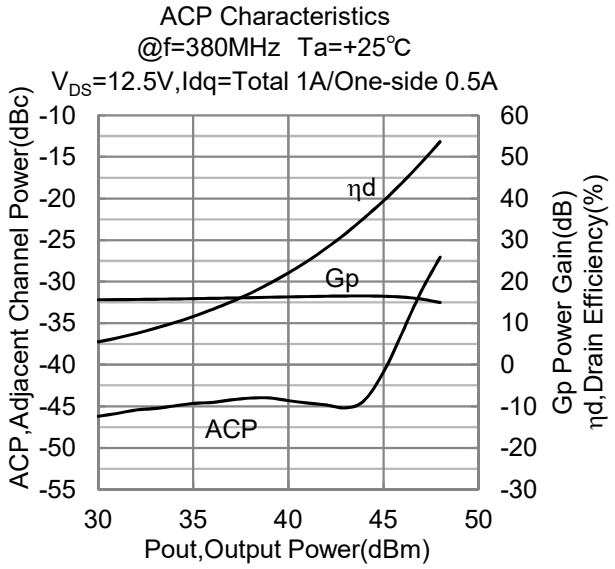


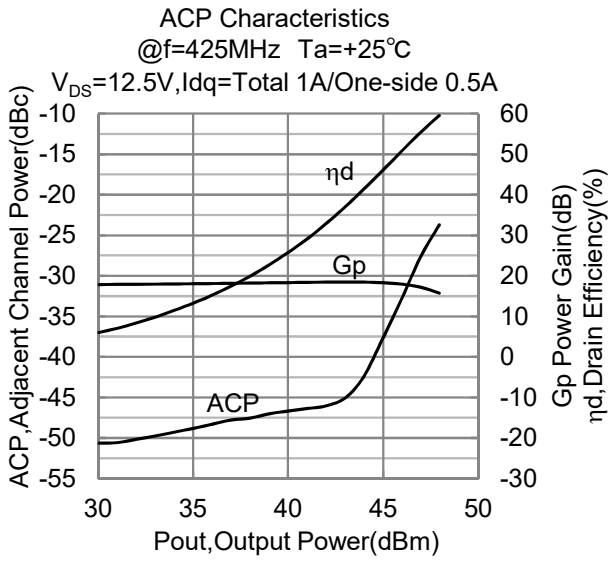


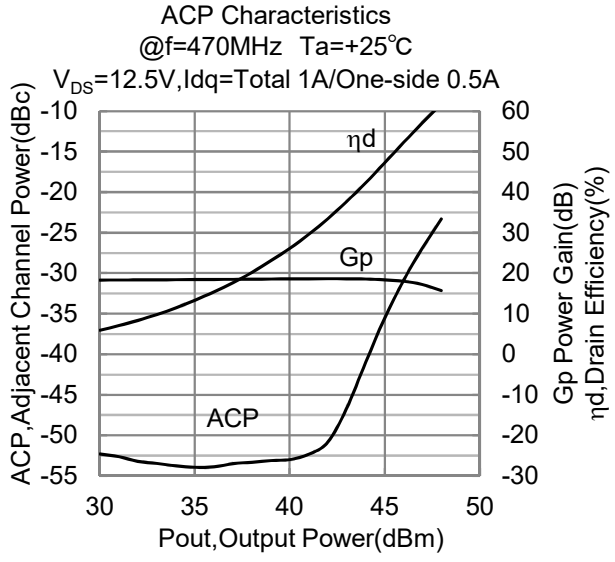


TYPICAL RF CHARACTERISTICS (P_{out} vs ACP ,ηd , Gp)

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







Modulation: TETRA

π/4DQPSK, Root Nyquist Filter (α=0.35),

Symbol rate=18ksps,

Band Width=18kHz, Cannel Spacing=25KHz

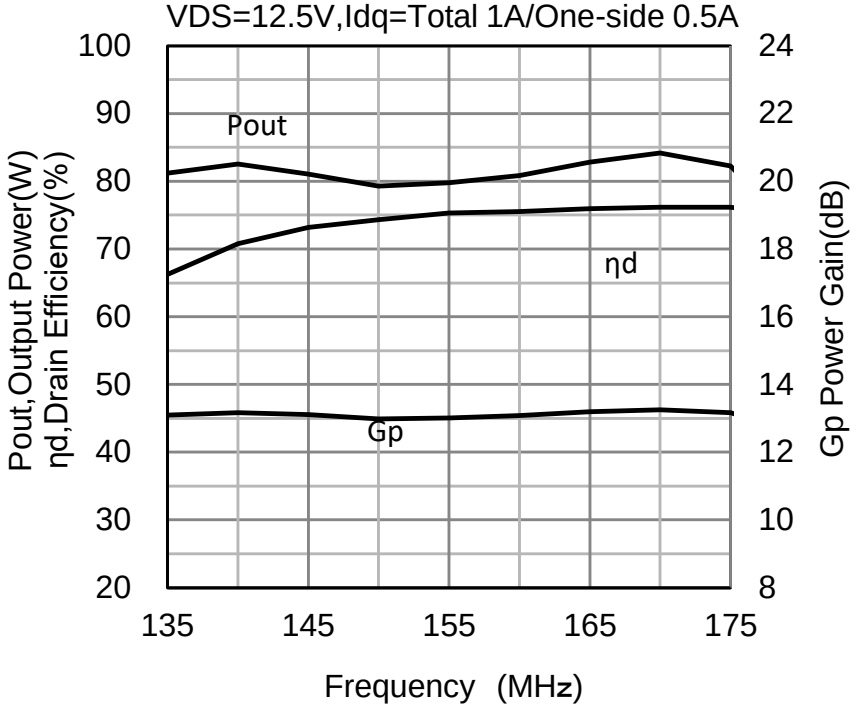
TYPICAL RF CHARACTERISTICS (Frequency vs P_{out} ,ηd , Gp , I_{DD})

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

Frequency Characteristics

@Pin=4W, Ta=+25℃

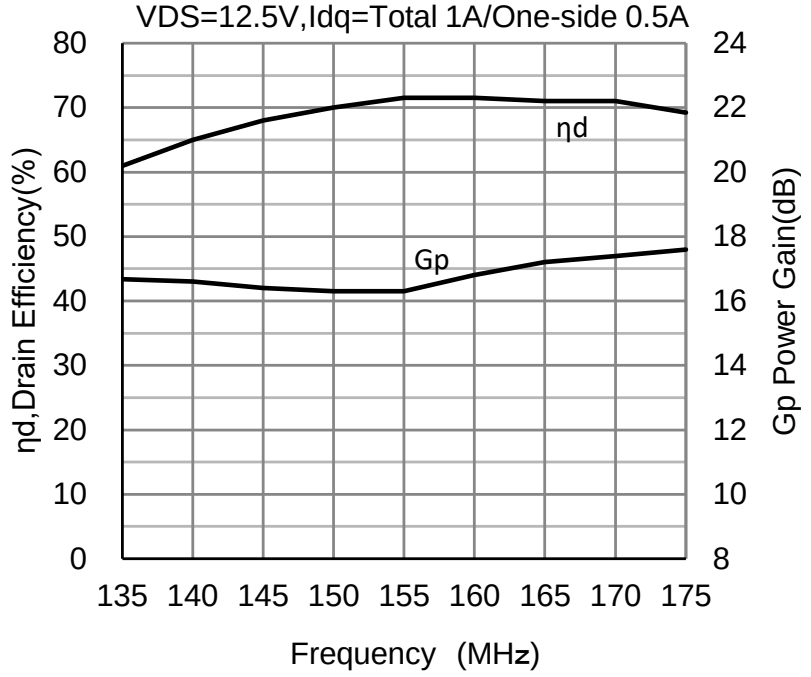
VDS=12.5V,Idq=Total 1A/One-side 0.5A



Frequency Characteristics

@Pout=70W(Pin adj.), Ta=+25℃

VDS=12.5V,Idq=Total 1A/One-side 0.5A



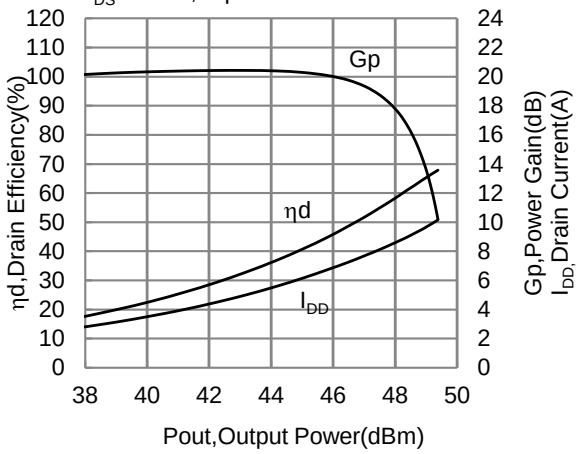
RD70HUP2

RoHS Compliance,Silicon MOSFET Power Transistor, 175MHz,530MHz, 70W, 12.5V

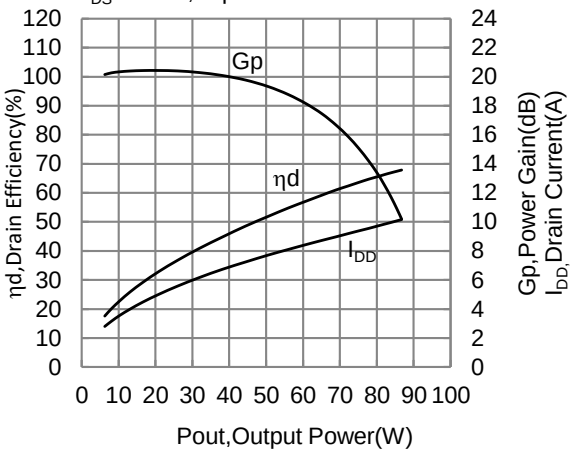
TYPICAL RF CHARACTERISTICS (Pout vs Gp , ηd , I_{DD})

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

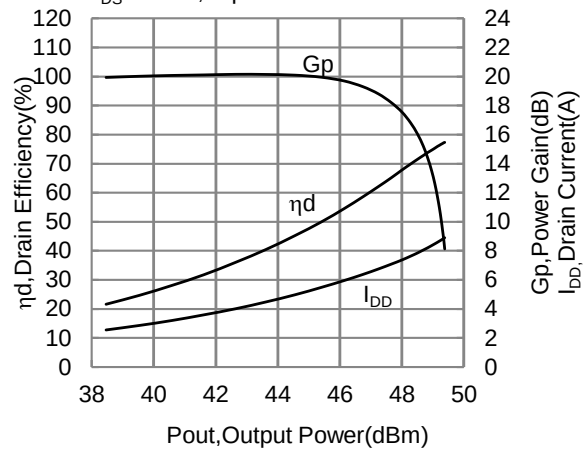
Pout Characteristics
@f=135MHz Ta=+25℃
V_{DS}=12.5V,Idq=Total 1A/One-side 0.5A



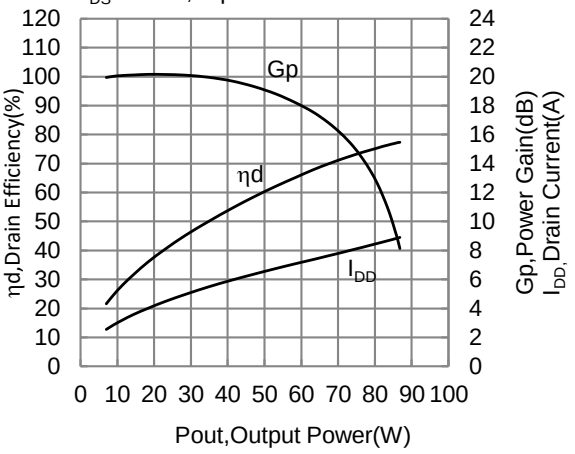
Pout Characteristics
@f=135MHz Ta=+25℃
V_{DS}=12.5V,Idq=Total 1A/One-side 0.5A



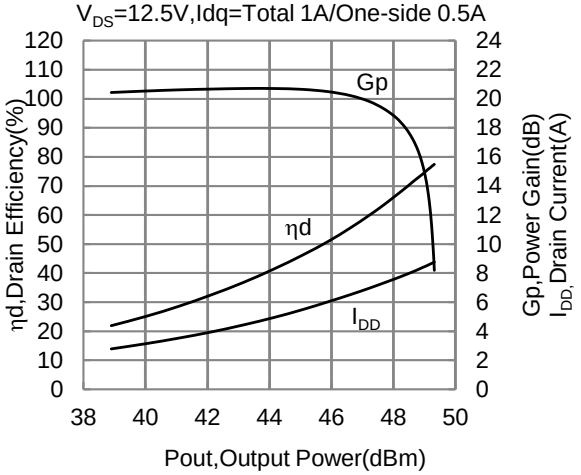
Pout Characteristics
@f=155MHz Ta=+25℃
V_{DS}=12.5V,Idq=Total 1A/One-side 0.5A



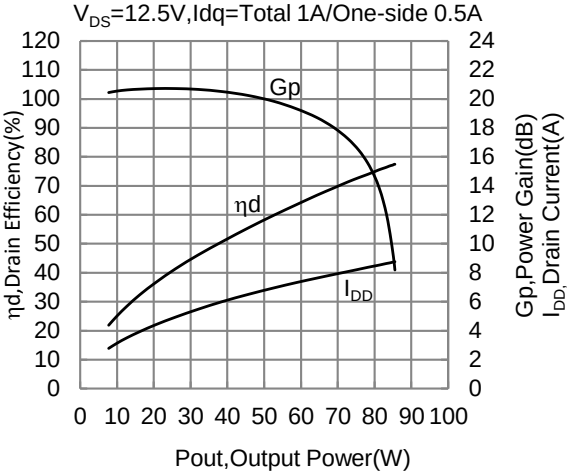
Pout Characteristics
@f=155MHz Ta=+25℃
V_{DS}=12.5V,Idq=Total 1A/One-side 0.5A



Pout Characteristics
@f=175MHz Ta=+25℃
V_{DS}=12.5V,Idq=Total 1A/One-side 0.5A

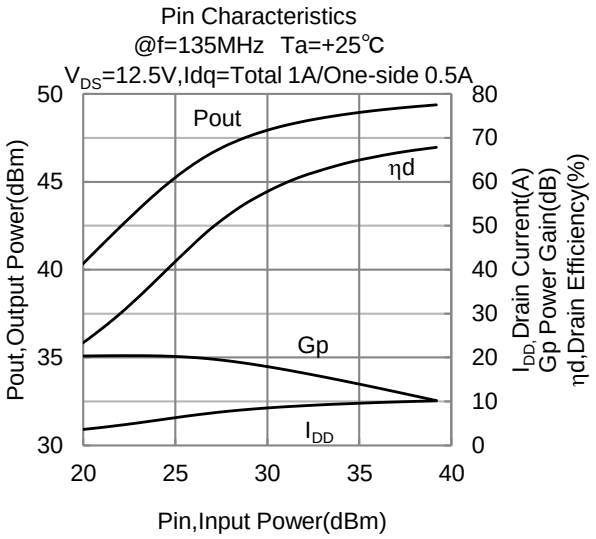


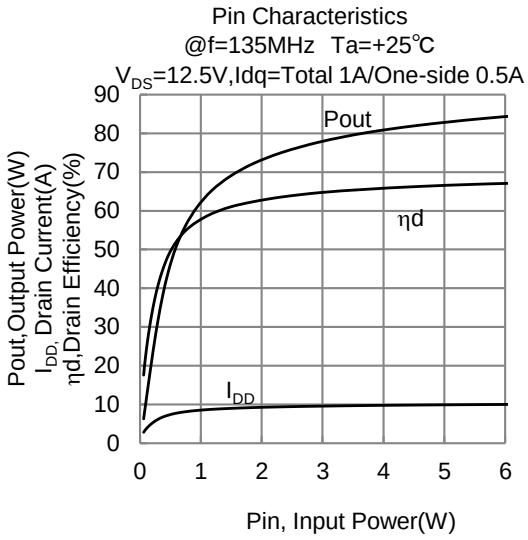
Pout Characteristics
@f=175MHz Ta=+25℃
V_{DS}=12.5V,Idq=Total 1A/One-side 0.5A

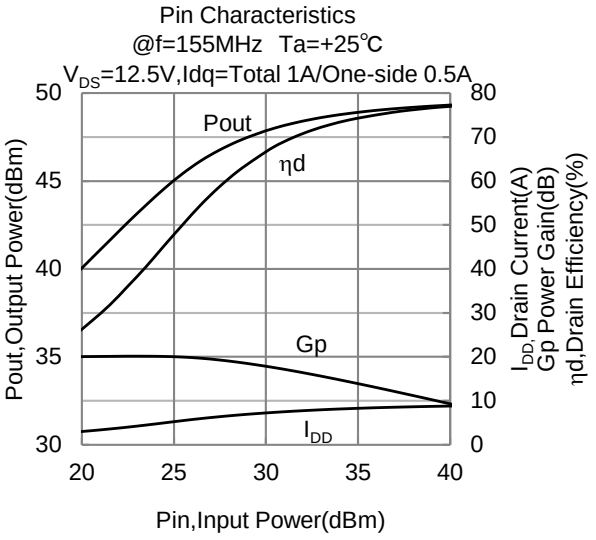


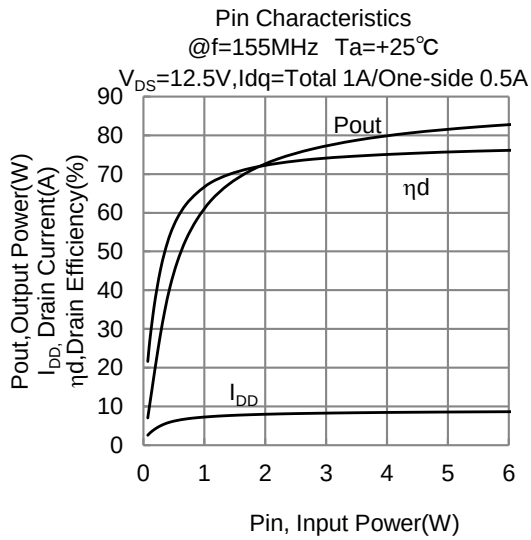
TYPICAL RF CHARACTERISTICS (Pin vs Pout Gp, ηd, I_{DD})

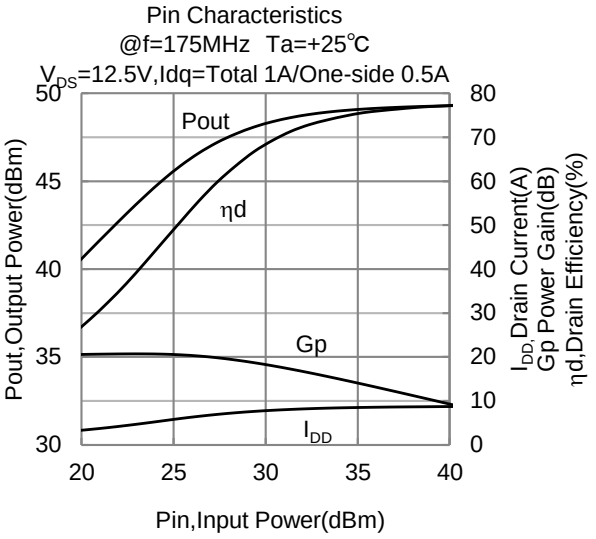
(These are only typical curves and devices are not necessarily guaranteed at these curves.)

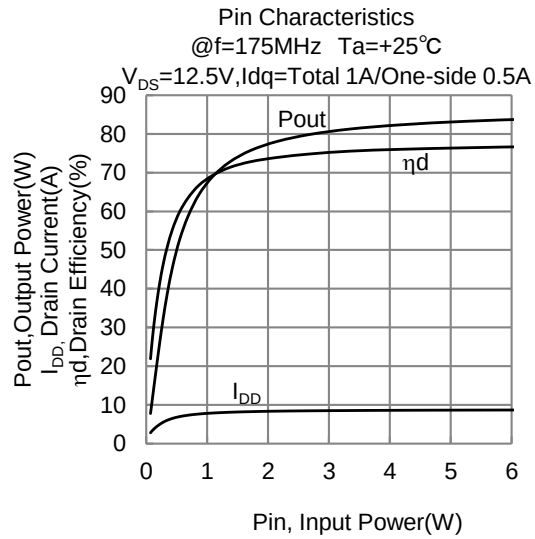








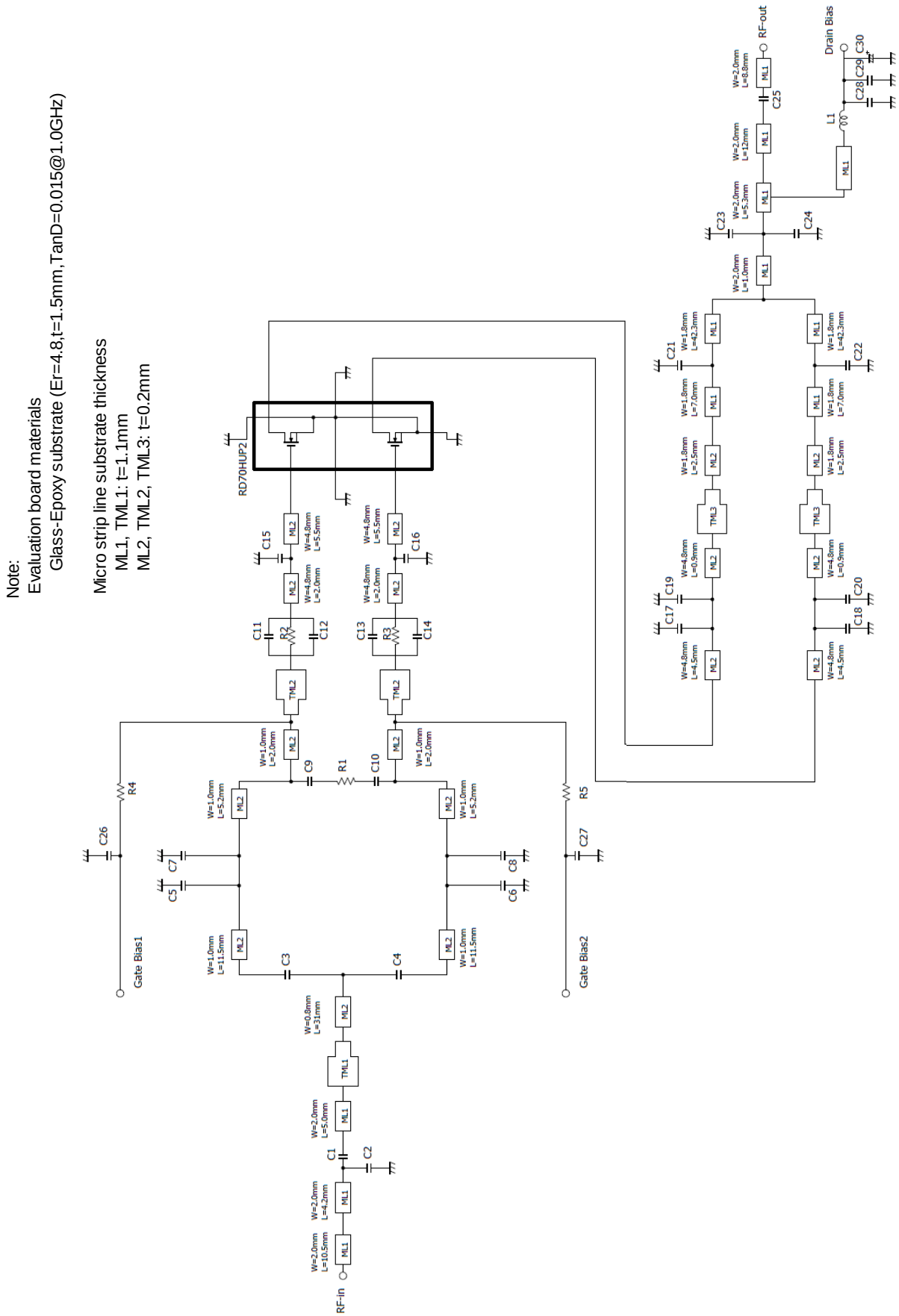




RD70HUP2

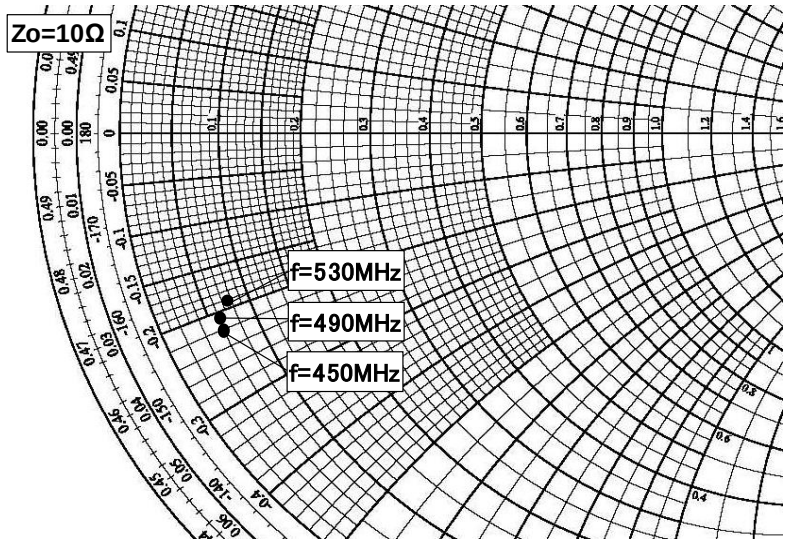
RoHS Compliance,Silicon MOSFET Power Transistor, 175MHz,530MHz, 70W, 12.5V

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



Input / Output Impedance VS. Frequency Characteristics

Zout*(f=450MHz, 490MHz, 530MHz)

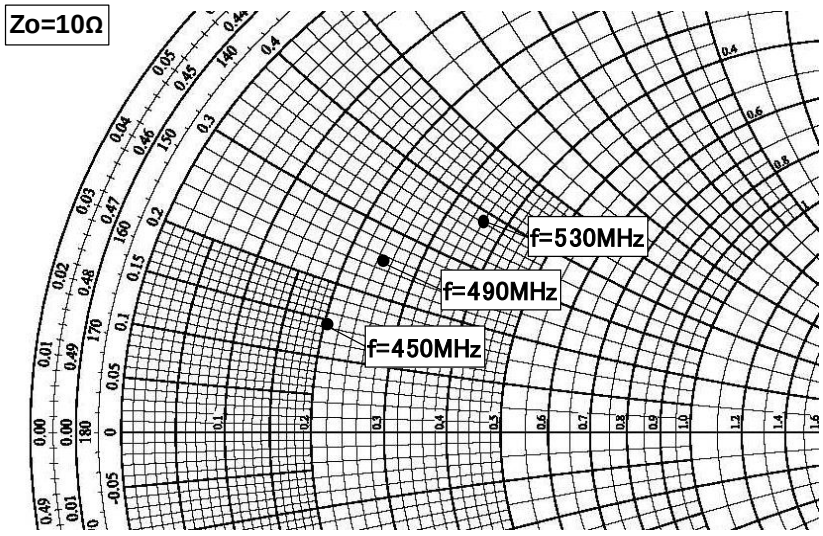


f (MHz)	Zout* (Ω)
450	0.62-j2.18
490	0.62-j2.08
530	0.74-j1.89

Zout*: Complex conjugate of output impedance

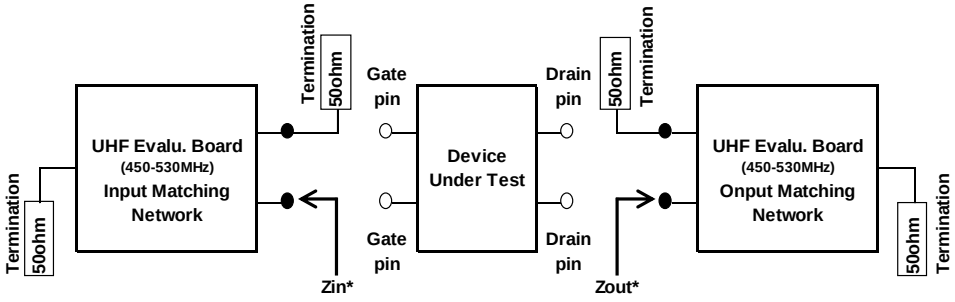
@Pin=5W,Vds=12.5V
Idq=One Side 0.5/Total 1.0A

Zin(f=450MHz, 490MHz, 530MHz)**



f (MHz)	Zin** (Ω)
450	2.05+j1.46
490	2.49+j2.52
530	3.69+j3.83

Zin: Complex conjugate of input impedance**

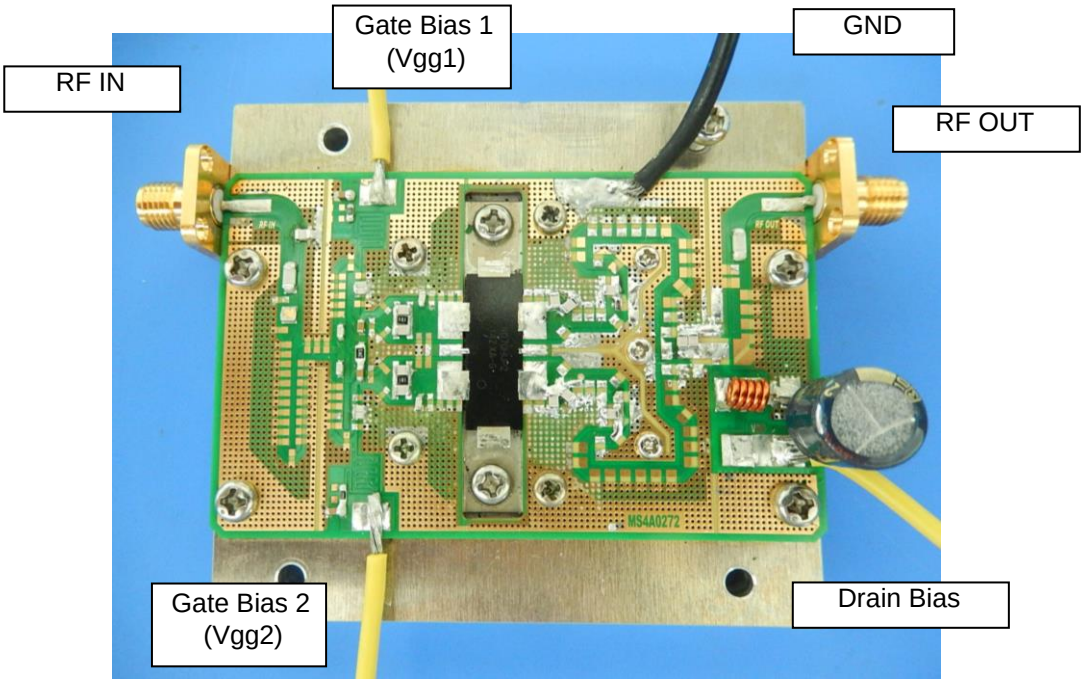


●: Edge of a footprint pad placed for a pin

○: Boundary surface between a pin and package plastics

RD70HUP2

RoHS Compliance,Silicon MOSFET Power Transistor, 175MHz,530MHz, 70W, 12.5V



EVB(Evaluation Board) for UHF

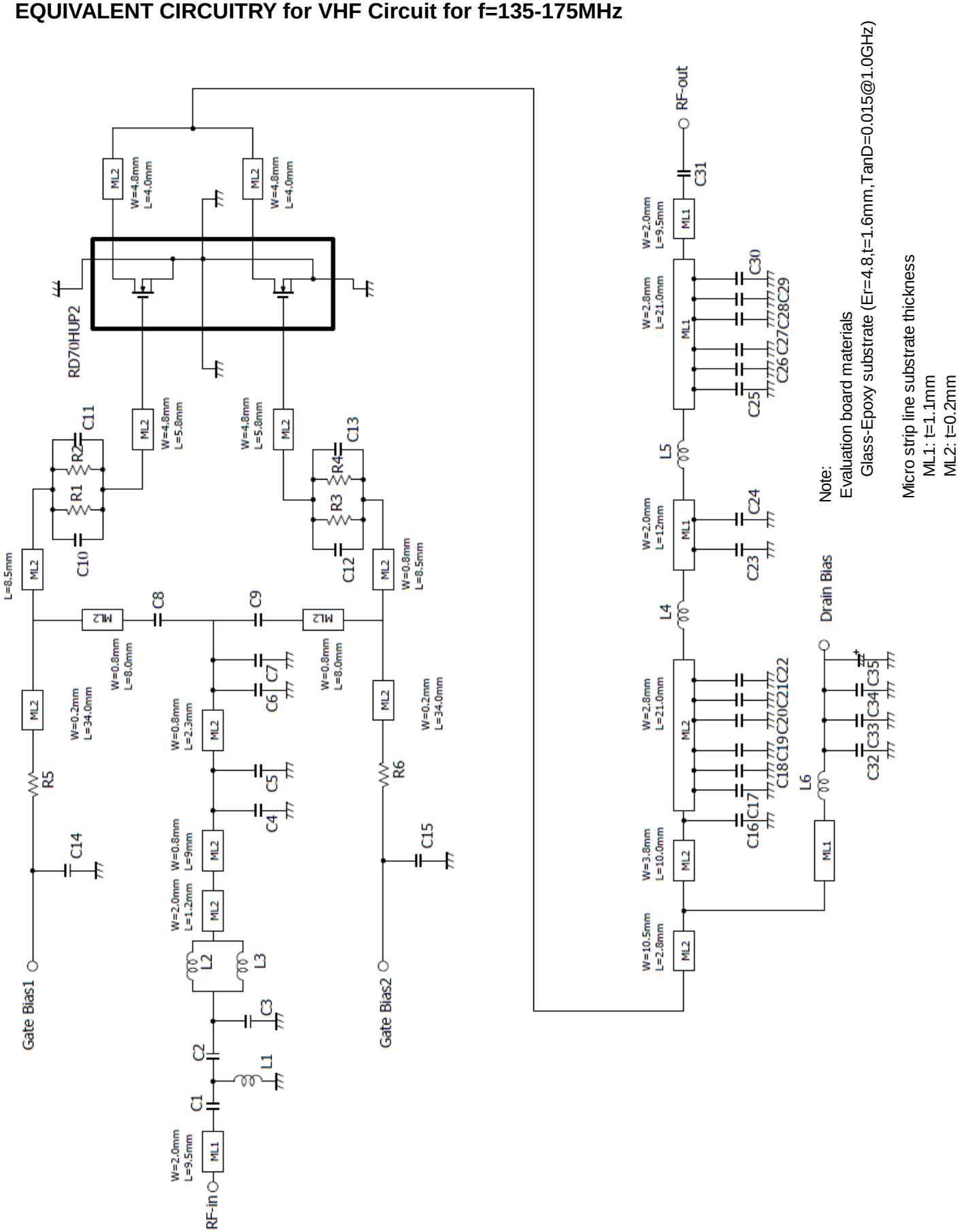
COMPONENT LIST

Parts Type	Symbol	Description			Type name	Vender
Capasitor	C 1	330 pF	3216		GRM31A5C2J331JW01D	Murata Manufacturing Co.,Ltd
	C 2	6.2 pF	1608	Hi-Q	GQM1882C2A6R2DB01D	Murata Manufacturing Co.,Ltd
	C 3	100 pF	1608	Hi-Q	GQM1882C1H101JB01D	Murata Manufacturing Co.,Ltd
	C 4	100 pF	1608	Hi-Q	GQM1882C1H101JB01D	Murata Manufacturing Co.,Ltd
	C 5	20 pF	1608	Hi-Q	GQM1882C1H200JB01D	Murata Manufacturing Co.,Ltd
	C 6	20 pF	1608	Hi-Q	GQM1882C1H200JB01D	Murata Manufacturing Co.,Ltd
	C 7	9.2 pF	1608	Hi-Q	GQM1882C1H9R2CB01D	Murata Manufacturing Co.,Ltd
	C 8	9.2 pF	1608	Hi-Q	GQM1882C1H9R2CB01D	Murata Manufacturing Co.,Ltd
	C 9	1000 pF	1608		GRM188R11H102KA01D	Murata Manufacturing Co.,Ltd
	C 10	1000 pF	1608		GRM188R11H102KA01D	Murata Manufacturing Co.,Ltd
	C 11	100 pF	2012	Hi-Q	GQM2195C2E101JB12D	Murata Manufacturing Co.,Ltd
	C 12	100 pF	2012	Hi-Q	GQM2195C2E101JB12D	Murata Manufacturing Co.,Ltd
	C 13	100 pF	2012	Hi-Q	GQM2195C2E101JB12D	Murata Manufacturing Co.,Ltd
	C 14	100 pF	2012	Hi-Q	GQM2195C2E101JB12D	Murata Manufacturing Co.,Ltd
	C 15	18 pF	1608	Hi-Q	GQM1882C1H180JB01D	Murata Manufacturing Co.,Ltd
	C 16	18 pF	1608	Hi-Q	GQM1882C1H180JB01D	Murata Manufacturing Co.,Ltd
	C 17	39 pF	2012	Hi-Q	GQM2195C2E390JB12D	Murata Manufacturing Co.,Ltd
	C 18	39 pF	2012	Hi-Q	GQM2195C2E390JB12D	Murata Manufacturing Co.,Ltd
	C 19	33 pF	2012	Hi-Q	GQM2195C2E330JB12D	Murata Manufacturing Co.,Ltd
	C 20	33 pF	2012	Hi-Q	GQM2195C2E330JB12D	Murata Manufacturing Co.,Ltd
	C 21	20 pF	2012	Hi-Q	GQM2195C2E200JB12D	Murata Manufacturing Co.,Ltd
	C 22	20 pF	2012	Hi-Q	GQM2195C2E200JB12D	Murata Manufacturing Co.,Ltd
	C 23	6.2 pF	2012	Hi-Q	GQM2195C2E6R2CB12D	Murata Manufacturing Co.,Ltd
	C 24	6.2 pF	2012	Hi-Q	GQM2195C2E6R2CB12D	Murata Manufacturing Co.,Ltd
	C 25	330 pF	3216		GRM31A5C2J331JW01D	Murata Manufacturing Co.,Ltd
	C 26	1000 pF	1608		GRM188R11H102KA01D	Murata Manufacturing Co.,Ltd
	C 27	1000 pF	1608		GRM188R11H102KA01D	Murata Manufacturing Co.,Ltd
	C 28	1000 pF	2012		GRM2162C2A102JA01	Murata Manufacturing Co.,Ltd
	C 29	1000 pF	2012		GRM2162C2A102JA01	Murata Manufacturing Co.,Ltd
	C 30	220 µF			EEUFC1V221	Panasonic Corporation
Resistance	R 1	2.2 Ω			RPC10T2R2J	Taiyosha Electiric Co.,Ltd
	R 2	100 Ω			RPC10T101J	Taiyosha Electiric Co.,Ltd
	R 3	100 Ω			RPC10T101J	Taiyosha Electiric Co.,Ltd
	R 4	2.2 kΩ			RPC05T222J	Taiyosha Electiric Co.,Ltd
	R 5	2.2 kΩ			RPC05T222J	Taiyosha Electiric Co.,Ltd
Inductance	L 1	25nH Enameled wire 5Turns, Diameter,0.8mm, φ2.2mm(inside diameter)			8005C	YC Corporation Co.,Ltd

RD70HUP2

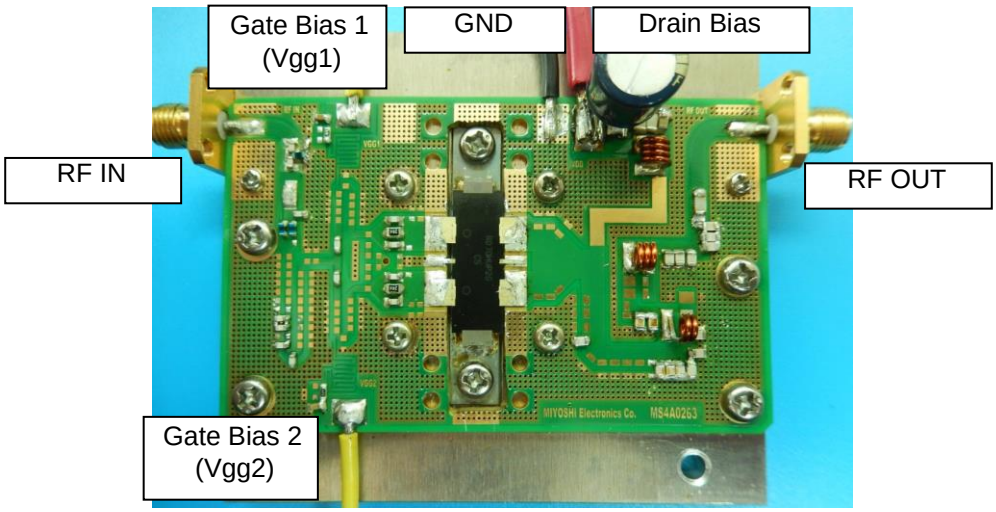
RoHS Compliance,Silicon MOSFET Power Transistor, 175MHz,530MHz, 70W, 12.5V

EQUIVALENT CIRCUITRY for VHF Circuit for f=135-175MHz



RD70HUP2

RoHS Compliance,Silicon MOSFET Power Transistor, 175MHz,530MHz, 70W, 12.5V



COMPONENT LIST

Parts Type	Symbol	Description			Type name	Vender
Capasitor	C 1	47 pF	1608	Hi-Q	GQM1882C1H470JB01D	Murata Manufacturing Co.,Ltd
	C 2	47 pF	1608	Hi-Q	GQM1882C1H470JB01D	Murata Manufacturing Co.,Ltd
	C 3	56 pF	1608	Hi-Q	GQM1882C1H560JB01D	Murata Manufacturing Co.,Ltd
	C 4	56 pF	1608	Hi-Q	GQM1882C1H560JB02D	Murata Manufacturing Co.,Ltd
	C 5	56 pF	1608	Hi-Q	GQM1882C1H560JB03D	Murata Manufacturing Co.,Ltd
	C 6	56 pF	1608	Hi-Q	GQM1882C1H560JB04D	Murata Manufacturing Co.,Ltd
	C 7	56 pF	1608	Hi-Q	GQM1882C1H560JB05D	Murata Manufacturing Co.,Ltd
	C 8	300 pF	1608		GRM1882C1H301JA01D	Murata Manufacturing Co.,Ltd
	C 9	300 pF	1608		GRM1882C1H301JA01D	Murata Manufacturing Co.,Ltd
	C 10	68 pF	1608	Hi-Q	GQM2195C2E680JB12D	Murata Manufacturing Co.,Ltd
	C 11	68 pF	1608	Hi-Q	GQM2195C2E680JB12D	Murata Manufacturing Co.,Ltd
	C 12	68 pF	1608	Hi-Q	GQM2195C2E680JB12D	Murata Manufacturing Co.,Ltd
	C 13	68 pF	1608	Hi-Q	GQM2195C2E680JB12D	Murata Manufacturing Co.,Ltd
	C 14	1000 pF	1608		GRM188R11H102KA01D	Murata Manufacturing Co.,Ltd
	C 15	1000 pF	1608		GRM188R11H102KA01D	Murata Manufacturing Co.,Ltd
	C 16	47 pF	2012	Hi-Q	GQM2192C1H470JB01D	Murata Manufacturing Co.,Ltd
	C 17	68 pF	2012	Hi-Q	GQM2192C1H680JB01D	Murata Manufacturing Co.,Ltd
	C 18	68 pF	2012	Hi-Q	GQM2192C1H680JB01D	Murata Manufacturing Co.,Ltd
	C 19	68 pF	2012	Hi-Q	GQM2192C1H680JB01D	Murata Manufacturing Co.,Ltd
	C 20	68 pF	2012	Hi-Q	GQM2192C1H680JB01D	Murata Manufacturing Co.,Ltd
	C 21	68 pF	2012	Hi-Q	GQM2192C1H680JB01D	Murata Manufacturing Co.,Ltd
	C 22	68 pF	2012	Hi-Q	GQM2192C1H680JB01D	Murata Manufacturing Co.,Ltd
	C 23	56 pF	2012	Hi-Q	GQM2192C1H560JB01D	Murata Manufacturing Co.,Ltd
	C 24	8.2 pF	2012	Hi-Q	GQM2192C2A8R2CB01D	Murata Manufacturing Co.,Ltd
	C 25	3.9 pF	2012	Hi-Q	GQM2192C2A3R9CB01D	Murata Manufacturing Co.,Ltd
	C 26	3.9 pF	2012	Hi-Q	GQM2192C2A3R9CB01D	Murata Manufacturing Co.,Ltd
	C 27	3.9 pF	2012	Hi-Q	GQM2192C2A3R9CB01D	Murata Manufacturing Co.,Ltd
	C 28	3.9 pF	2012	Hi-Q	GQM2192C2A3R9CB01D	Murata Manufacturing Co.,Ltd
	C 29	3.9 pF	2012	Hi-Q	GQM2192C2A3R9CB01D	Murata Manufacturing Co.,Ltd
	C 30	6 pF	2012	Hi-Q	GQM2192CA26R0CB01D	Murata Manufacturing Co.,Ltd
	C 31	330 pF	3216		GRM31A5C2H331JW01	Murata Manufacturing Co.,Ltd
	C 32	0.22 μF	2012		GRM21BR71H224KA01	Murata Manufacturing Co.,Ltd
	C 33	390 pF	3216		GRM31A5C2H391JW01	Murata Manufacturing Co.,Ltd
	C 34	390 pF	3216		GRM31A5C2H391JW01	Murata Manufacturing Co.,Ltd
	C 35	220 μF			EEUFC1V221	Panasonic Corporation
Resistance	R 1	2.4 Ω			RPC10T2R4J	Taiyosha Electiric Co.,Ltd
	R 2	2.4 Ω			RPC10T2R4J	Taiyosha Electiric Co.,Ltd
	R 3	2.4 Ω			RPC10T2R4J	Taiyosha Electiric Co.,Ltd
	R 4	2.4 Ω			RPC10T2R4J	Taiyosha Electiric Co.,Ltd
	R 5	4.7 kΩ			RPC05T472J	Taiyosha Electiric Co.,Ltd
	R 6	4.7 kΩ			RPC05T472J	Taiyosha Electiric Co.,Ltd
Inductance	L 1	51 nH	1608		LQW18CN51NJ00D	Murata Manufacturing Co.,Ltd
	L 2	33 nH	1608		LQW18CN33NJ00D	Murata Manufacturing Co.,Ltd
	L 3	33 nH	1608		LQW18CN33NJ00D	Murata Manufacturing Co.,Ltd
	L 4	8.4nH Enameled wire 2Turns, Diameter,0.8mm, φ2.2mm(inside diameter)			8002C	YC Corporation Co.,Ltd
	L 5	13.2nH Enameled wire 3Turns, Diameter,0.8mm, φ2.2mm(inside diameter)			8003C	YC Corporation Co.,Ltd
	L 6	20.6nH Enameled wire 4Turns, Diameter,0.8mm, φ2.2mm(inside diameter)			8004C	YC Corporation Co.,Ltd

RD70HUP2

RoHS Compliance,Silicon MOSFET Power Transistor, 175MHz,530MHz, 70W, 12.5V

S-Parameter of One Side of RD70HUP2

Bias Condition: Vds=12.5V, Idq=One Side 0.5A/Total 1.0A

Freq.	S11		S21		S12		S22	
(MHz)	(mag)	(ang)	(mag)	(ang)	(mag)	(ang)	(mag)	(ang)
30	0.889	-166.0	18.243	90.8	0.010	1.9	0.821	-172.3
50	0.881	-170.9	10.858	83.3	0.010	-4.6	0.831	-174.2
100	0.889	-174.1	5.187	70.2	0.009	-15.2	0.851	-174.9
135	0.899	-174.8	3.666	62.8	0.008	-20.3	0.867	-174.9
155	0.905	-175.1	3.097	59.0	0.008	-22.7	0.876	-175.0
175	0.912	-175.4	2.655	55.4	0.007	-24.7	0.886	-175.1
180	0.913	-175.5	2.557	54.5	0.007	-25.6	0.888	-175.1
200	0.919	-175.8	2.220	51.2	0.007	-27.0	0.897	-175.3
250	0.932	-176.6	1.621	44.0	0.006	-30.6	0.917	-175.9
300	0.943	-177.5	1.233	38.0	0.005	-30.1	0.930	-176.6
380	0.956	-178.8	0.846	30.1	0.003	-21.8	0.946	-178.0
400	0.958	-179.0	0.775	28.5	0.003	-18.5	0.948	-178.3
435	0.962	-179.6	0.673	25.8	0.002	-11.4	0.952	-178.9
450	0.963	-179.8	0.635	24.8	0.002	-6.1	0.953	-179.1
470	0.964	179.9	0.589	23.5	0.002	2.4	0.955	-179.4
500	0.967	179.4	0.529	21.7	0.002	16.3	0.956	-179.7
530	0.970	179.0	0.477	20.0	0.002	30.2	0.958	179.9
535	0.970	178.9	0.470	19.8	0.002	32.2	0.958	179.8
550	0.971	178.7	0.447	19.0	0.002	39.5	0.958	179.6
600	0.973	178.1	0.384	16.9	0.003	55.8	0.962	179.1
650	0.976	177.3	0.334	14.7	0.003	65.6	0.966	178.6
700	0.977	176.7	0.294	12.9	0.004	70.5	0.970	177.9
750	0.978	175.9	0.260	10.9	0.004	74.6	0.974	177.1
800	0.979	175.2	0.232	9.2	0.005	77.4	0.976	176.3
850	0.980	174.3	0.209	7.8	0.006	78.7	0.978	175.6
900	0.982	173.5	0.189	6.3	0.007	78.6	0.980	174.8
950	0.983	172.8	0.173	5.0	0.007	78.7	0.981	173.9
1000	0.985	171.9	0.157	3.5	0.008	79.0	0.982	173.0
1100	0.985	170.2	0.133	0.9	0.009	78.3	0.984	171.2
1200	0.986	168.5	0.112	-0.7	0.011	78.0	0.984	169.2
1300	0.986	166.4	0.097	-1.3	0.012	76.8	0.985	167.1
1400	0.988	164.3	0.087	-0.5	0.014	74.8	0.985	164.8
1500	0.988	161.9	0.078	-1.2	0.015	73.0	0.986	162.3

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.)

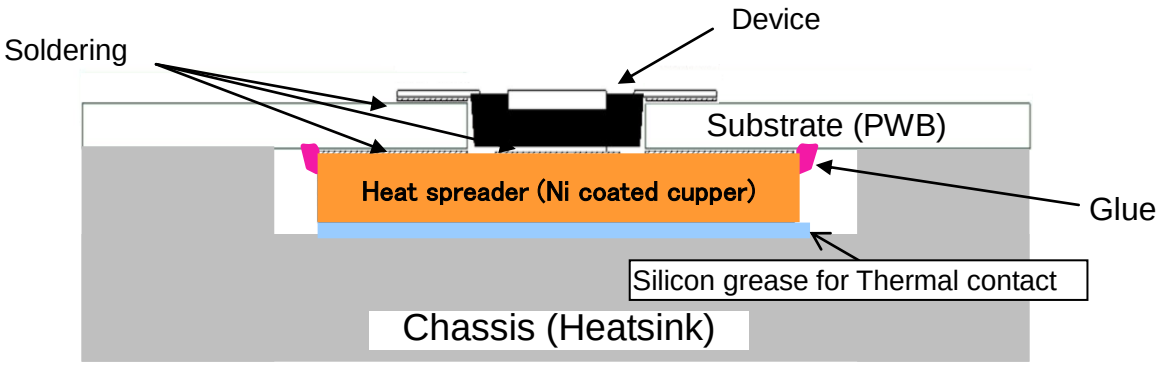


Fig.1

(2) Semiconductor has dispersion of characteristics. Therefore, for balanced operation, it is recommended that Idq is set independently to each gate.

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

- These materials are intended as a reference to assist our customers in the selection of the Mitsubishi semiconductor product best suited to the customer's application; they do not convey any license under any intellectual property rights, or any other rights, belonging to Mitsubishi Electric Corporation or a third party.
- Mitsubishi Electric Corporation assumes no responsibility for any damage, or infringement of any third-party's rights, originating in the use of any product data, diagrams, charts, programs, algorithms, or circuit application examples contained in these materials.
- All information contained in these materials, including product data, diagrams, charts, programs and algorithms represents information on products at the time of publication of these materials, and are subject to change by Mitsubishi Electric Corporation without notice due to product improvements or other reasons. It is therefore recommended that customers contact Mitsubishi Electric Corporation or an authorized Mitsubishi Semiconductor product distributor for the latest product information before purchasing a product listed herein.
  The information described here may contain technical inaccuracies or typographical errors. Mitsubishi Electric Corporation assumes no responsibility for any damage, liability, or other loss rising from these inaccuracies or errors.
  Please also pay attention to information published by Mitsubishi Electric Corporation by various means, including the Mitsubishi Semiconductor home page (http://www.MitsubishiElectric.com/).
- When using any or all of the information contained in these materials, including product data, diagrams, charts, programs, and algorithms, please be sure to evaluate all information as a total system before making a final decision on the applicability of the information and products. Mitsubishi Electric Corporation assumes no responsibility for any damage, liability or other loss resulting from the information contained herein.
- Mitsubishi Electric Corporation semiconductors are not designed or manufactured for use in a device or system that is used under circumstances in which human life is potentially at stake. Please contact Mitsubishi Electric Corporation or an authorized Mitsubishi Semiconductor product distributor when considering the use of a product contained herein for any specific purposes, such as apparatus or systems for transportation, vehicular, medical, aerospace, nuclear, or undersea repeater use.
- The prior written approval of Mitsubishi Electric Corporation is necessary to reprint or reproduce in whole or in part these materials.
- If these products or technologies are subject to the Japanese export control restrictions, they must be exported under a license from the Japanese government and cannot be imported into a country other than the approved destination.
  Any diversion or re-export contrary to the export control laws and regulations of Japan and/or the country of destination is prohibited.
- Please contact Mitsubishi Electric Corporation or an authorized Mitsubishi Semiconductor product distributor for further details on these materials or the products contained therein.

© 2016 MITSUBISHI ELECTRIC CORPORATION. ALL RIGHTS RESERVED.