MITSUBISHI ELECTRIC

< Silicon RF Power Semiconductors >

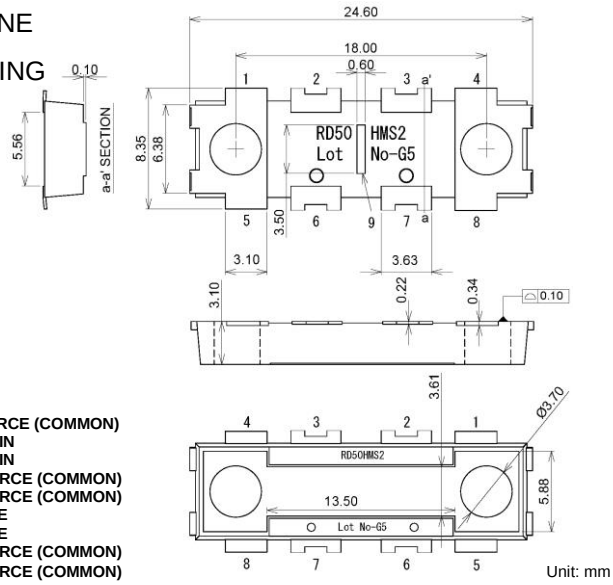
RD50HMS2

RoHS Compliance, Silicon MOSFET Power Transistor, 900MHz, 50W, 12.5V

DESCRIPTION

RD50HMS2 is MOS FET type transistor specifically designed for 900MHz RF power amplifiers applications.

OUTLINE DRAWING



Pin 1.SOURCE (COMMON)
2.DRAIN
3.DRAIN
4.SOURCE (COMMON)
5.SOURCE (COMMON)
6.GATE
7.GATE
8.SOURCE (COMMON)
9.SOURCE (COMMON)

FEATURES

1. Supply with Tape and Reel. 500 Units per Reel.
2. Employing Mold Package
3. High Power and High Efficiency
   Pout=57Wtyp, Drain Effi. =55%typ
   @ Vds=12.5V, Idq=1.0A, Pin=7W, f=900MHz
4. Integrated gate protection diode

APPLICATION

For output stage of high power amplifiers in 900MHz band mobile radio sets.

RoHS COMPLIANT

RD50HMS2-501, T5105 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 solders alloys containing more than85% lead.)

RD50HMS2

RoHS Compliance, Silicon MOSFET Power Transistor, 900MHz, 50W, 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	300	W
Pin	Input Power	Zg=Zl=50Ω	14	W
ID	Drain Current	-	20	A
Tch	Channel Temperature	-	175	°C
Tstg	Storage Temperature	-	-40 to +175	°C
Rth j-c	Thermal Resistance	Junction to Case	0.5	°C/W

Note: Above parameters are guaranteed independently.

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

SYMBOL	PARAMETER	CONDITIONS	LIMITS			UNIT
			MIN	TYP*3	MAX	
IDSS*1	Zero Gate Voltage Drain Current	VDS =37V, VGS=0V	-	-	150	μA
IGSS*1	Gate to Source Leak Current	VGS=10V, VDS =0V	-	-	2.5	μA
VTH*1	Gate Threshold Voltage	VDS =12V, IDS=1mA	1.6	2.0	2.4	V
Pout	Output Power	f=900MHz,VDS=12.5V, Pin=7W, Idq=2x500mA	-	57	-	W
ηD	Drain Efficiency		-	55	-	%
VSWRT	Load VSWR Tolerance	All phase, VDS=16.3V, increased after Pout adjusted to 50W (Zg/Zl=50Ω) by Pin (under f= 900MHz, VDS=12.5V and Idq= 2x500mA) Random sampling (AQL=0.065%) *2	20:1	-	-	VSWR

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

*1 Unilateral Measurement (Measured Per Single side).

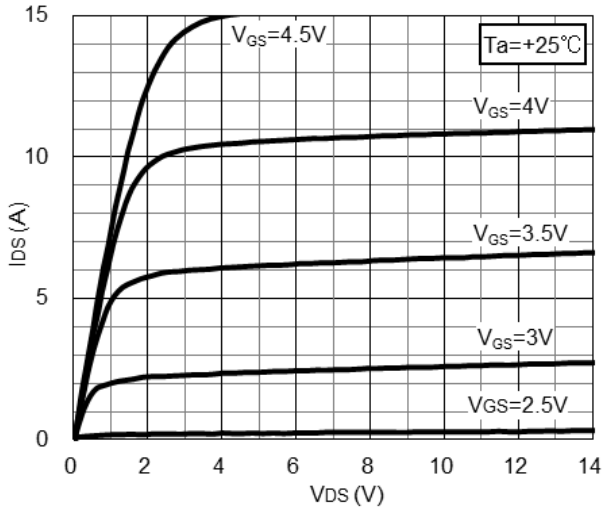
*2 Normal Inspection Based on ISO2859.

*3 Typical characteristics guaranteed as design value.

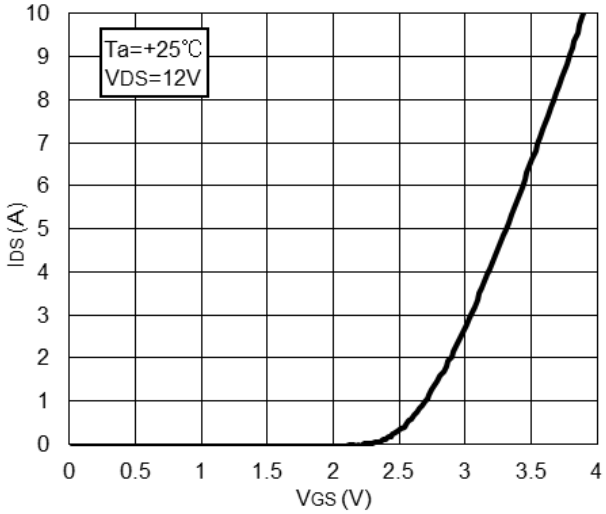
TYPICAL DC CHARACTERISTICS

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

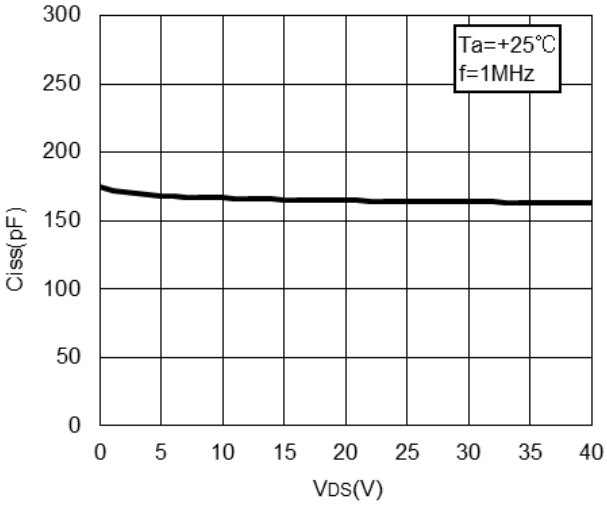
VDS - IDS CHARACTERISTICS



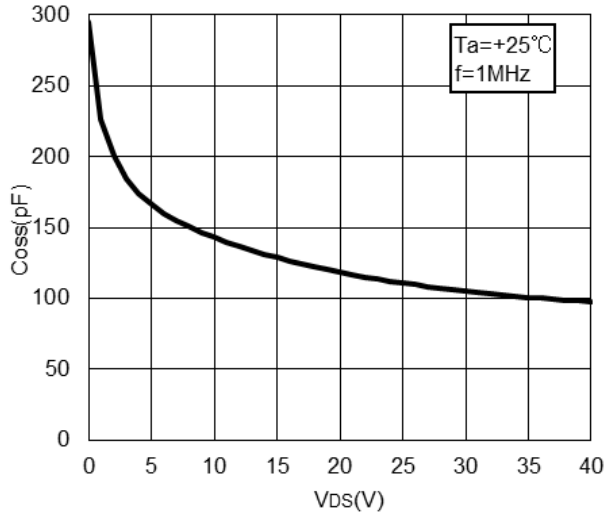
VGS - IDS CHARACTERISTICS



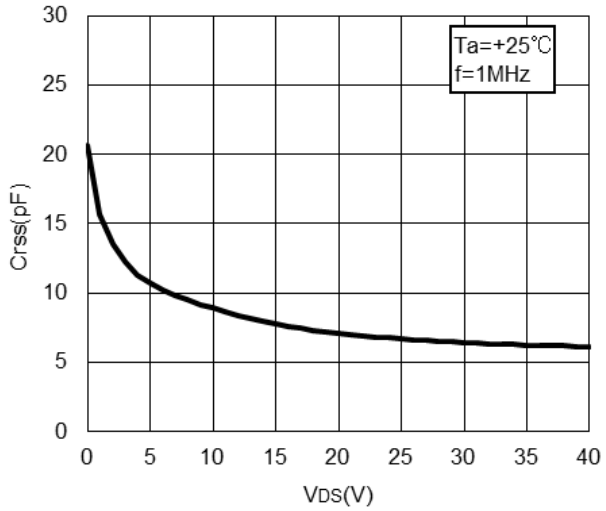
VDS vs. Ciss CHARACTERISTICS



VDS vs. Coss CHARACTERISTICS



VDS vs. Crss CHARACTERISTICS



RD50HMS2

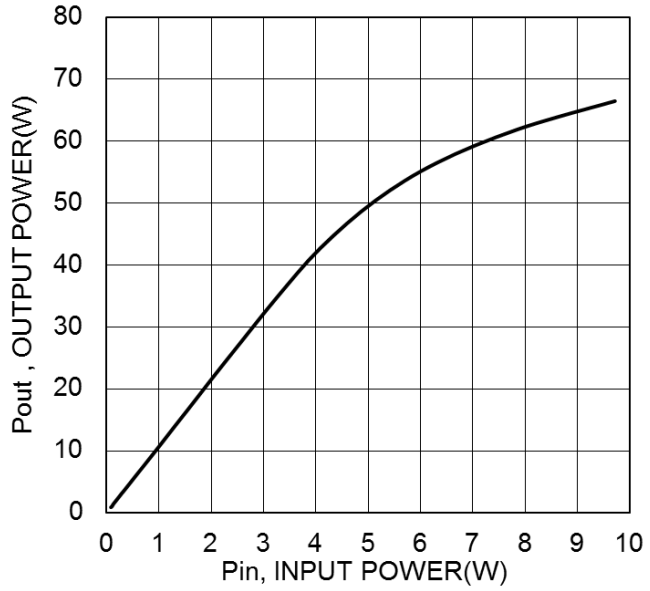
RoHS Compliance, Silicon MOSFET Power Transistor, 900MHz, 50W, 12.5V

900MHz SINGLE POINT TYPICAL RF CHARACTERISTICS

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

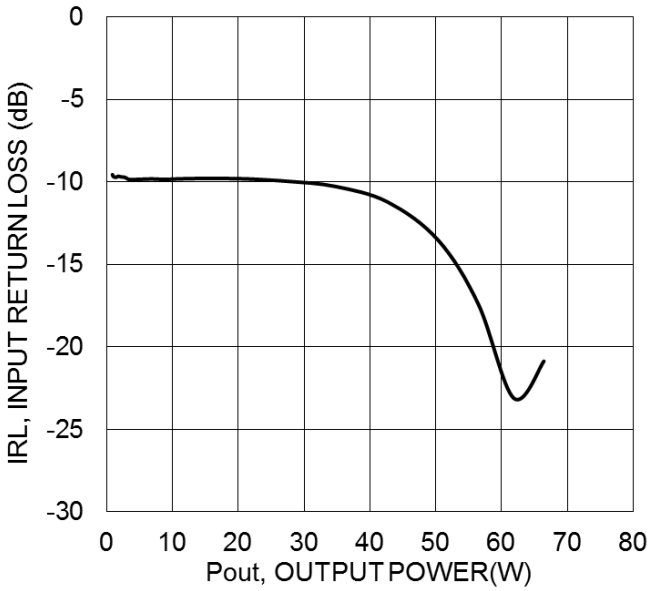
Pout versus Pin Characteristics

Ta=+25℃,Vds=12.5V, Idq=Total 1A/One side 0.5A



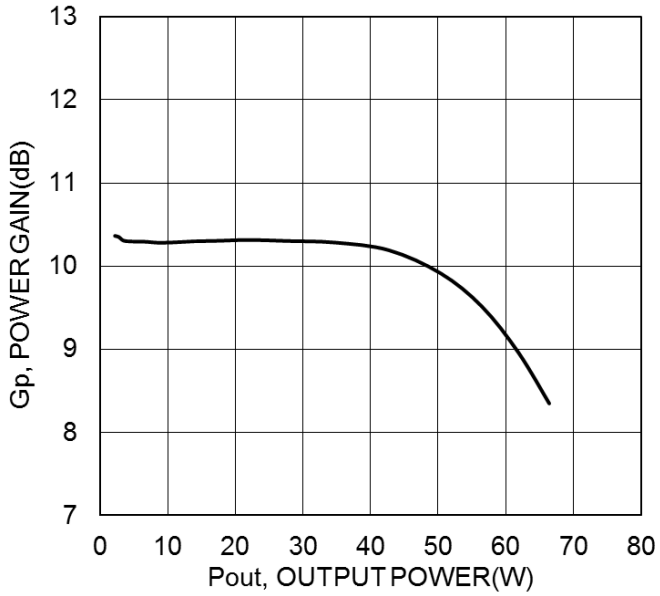
Input Return Loss versus Pout Characteristics

Ta=+25℃,Vds=12.5V, Idq=Total 1A/One side 0.5A



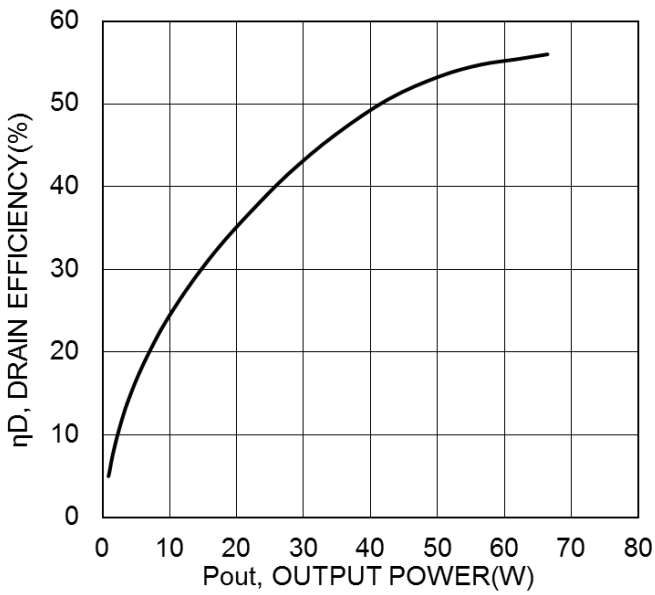
Gp versus Pout Characteristics

Ta=+25℃,Vds=12.5V, Idq=Total 1A/One side 0.5A



ηD versus Pout Characteristics

Ta=+25℃,Vds=12.5V, Idq=Total 1A/One side 0.5A



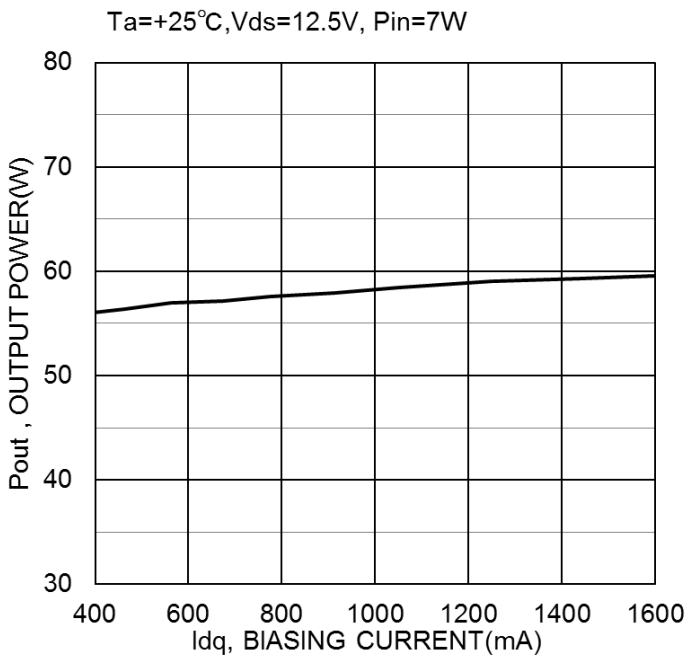
RD50HMS2

RoHS Compliance, Silicon MOSFET Power Transistor, 900MHz, 50W, 12.5V

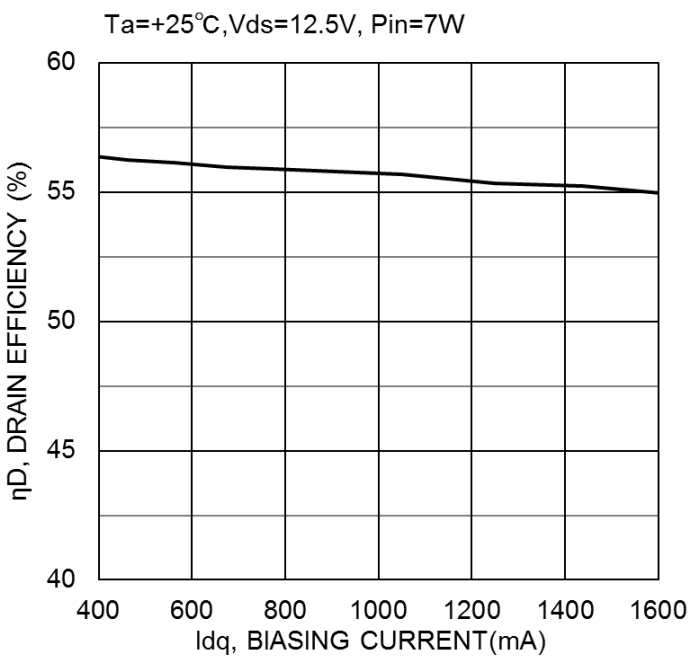
900MHz SINGLE POINT TYPICAL RF CHARACTERISTICS

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

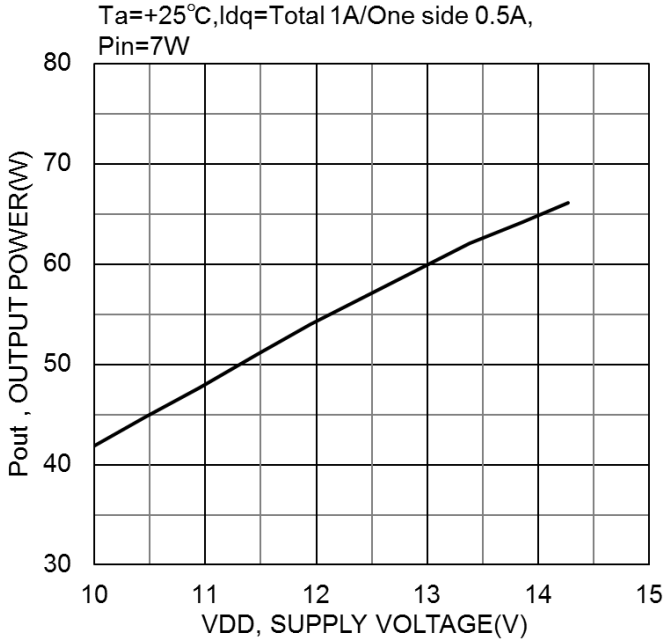
Pout versus Idq Characteristics



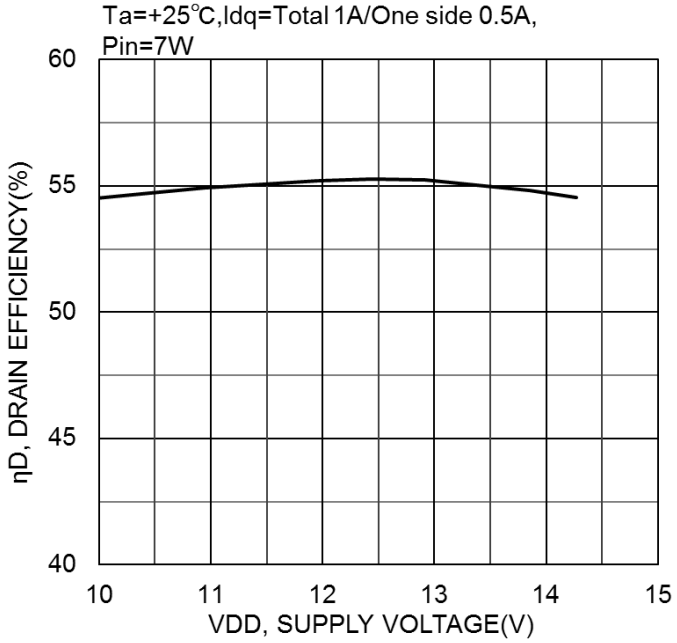
ηD versus Idq Characteristics



Pout versus VDD Characteristics



ηD versus VDD Characteristics



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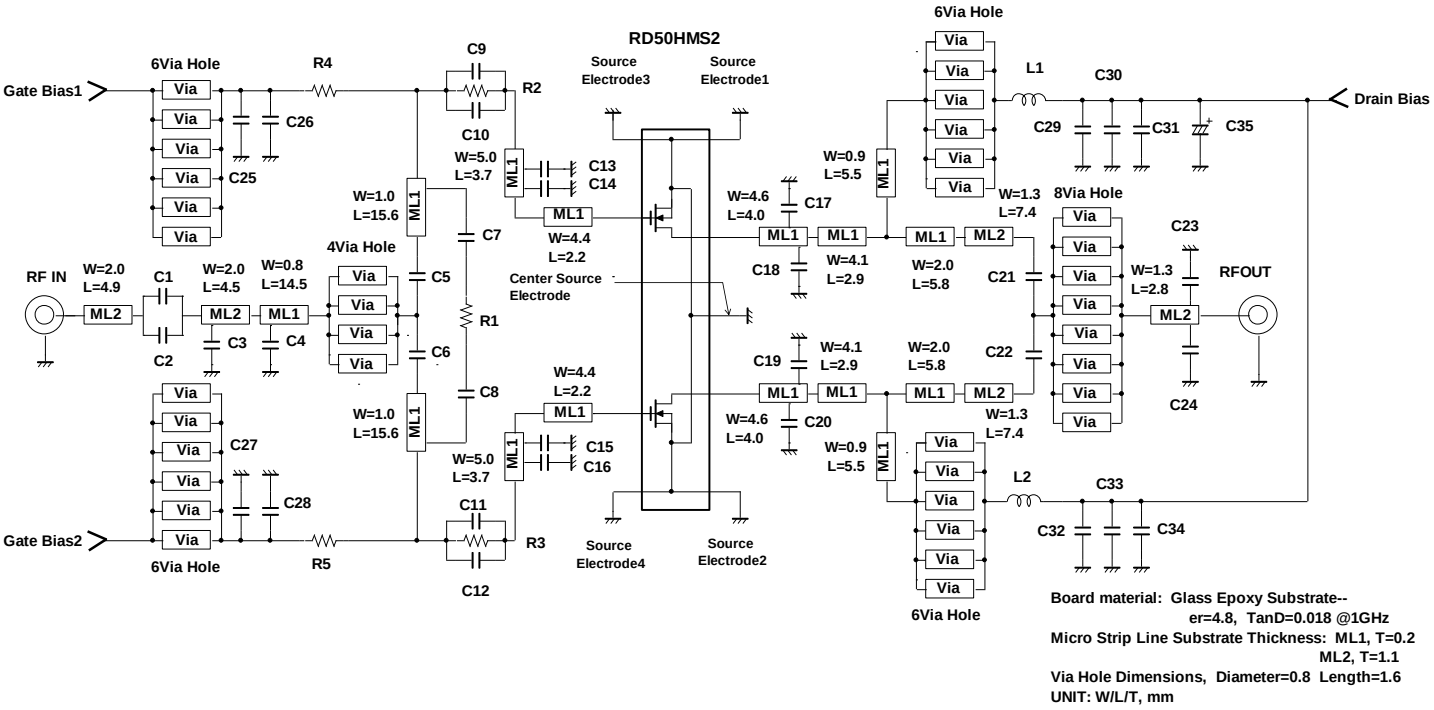
RoHS Compliance, Silicon MOSFET Power Transistor, 900MHz, 50W, 12.5V

EQUIVALENT CIRCUITRY for 900MHz SINGLE POINT RF EVALUATION BOARD

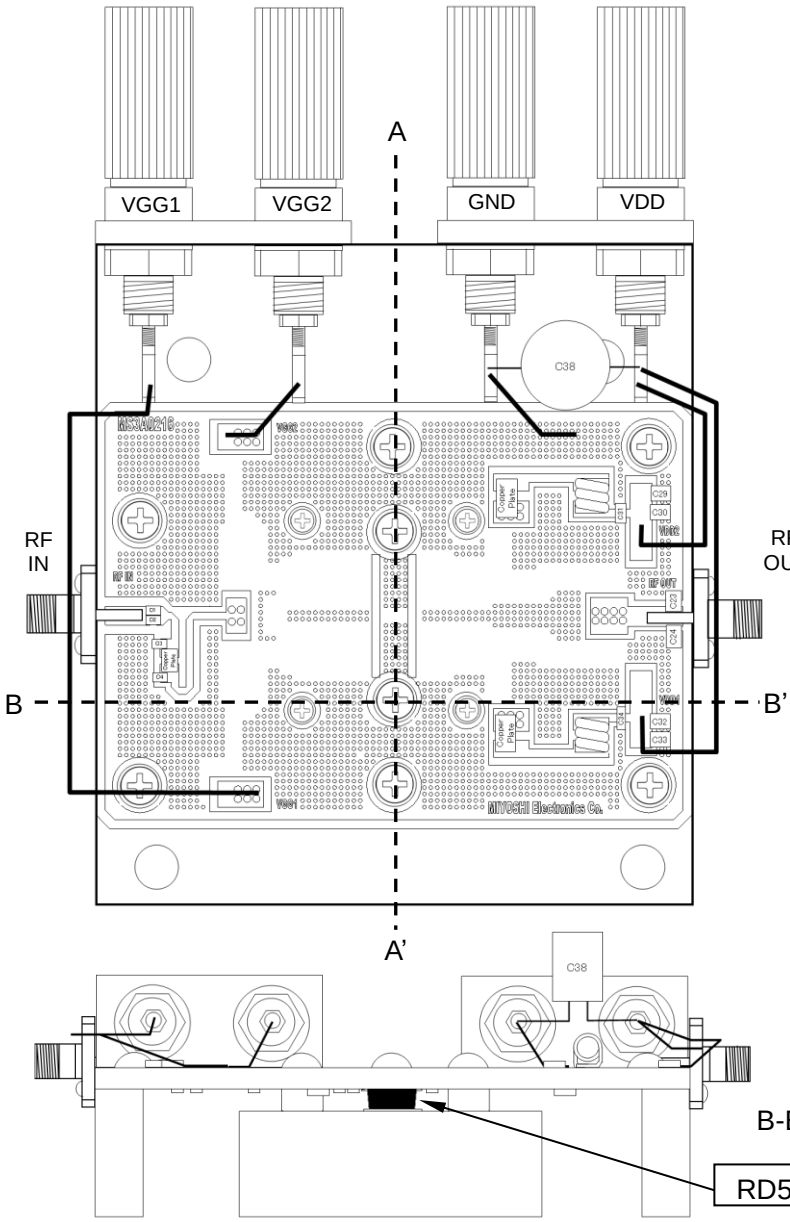


C1,C2,C5,C6	20 pF	1.6*0.8	High Q Chip Ceramic Capacitors
C3, C4	1.0 pF	1.6*0.8	High Q Chip Ceramic Capacitors
C7, C8	1000 pF	1.6*0.8	Chip Ceramic Capacitors
C9, C10, C11,C12	30 pF	2.0*1.2	High Q Chip Ceramic Capacitors
C13, C14,C15, C16	12 pF	1.6*0.8	High Q Chip Ceramic Capacitors
R1	2.2 ohm	2.0*1.2	Chip Resistors
R2, R3	100 ohm	2.0*1.2	Chip Resistors
R4, R5	2.2k ohm	1.6*0.8	Chip Resistors
C17,C18,C19,C20	15 pF	2.0*1.2	High Q Chip Ceramic Capacitors
C21,C22	100 pF	2.0*1.2	High Q Chip Ceramic Capacitors
C23,C24	2.2 pF	2.0*1.2	High Q Chip Ceramic Capacitors
C25,C27,C29,C30,C32,C33	1000 pF	2.0*1.2	Chip Ceramic Capacitors
C26,C28,C31,C34	10000 pF	1.6*0.8	Chip Ceramic Capacitors
C35	220 uF	-	35V, Electrolytic Capacitor
L1,L2	12 nH	-	3Turn Rolling Coil

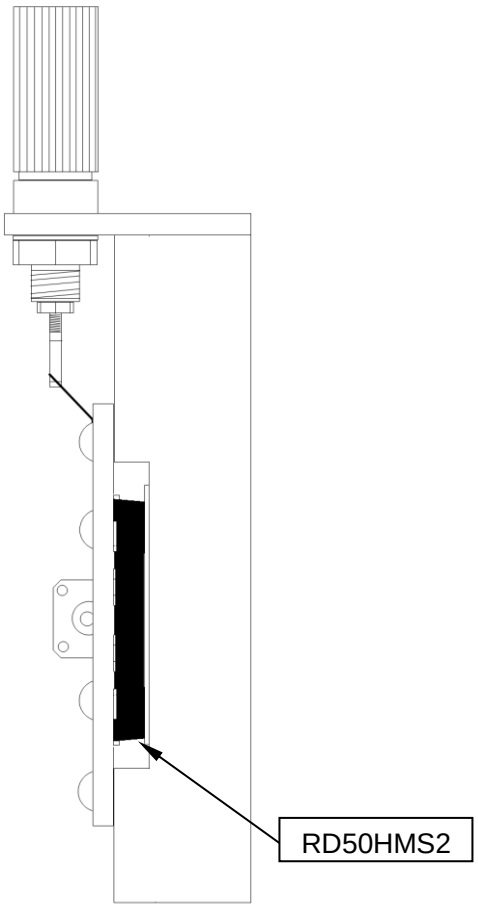
COMPONENT LAYOUT for 900MHz SINGLE-POINT RF EVALUATION BOARD

BOARD OUTLINE: 75.0*46.0(mm)

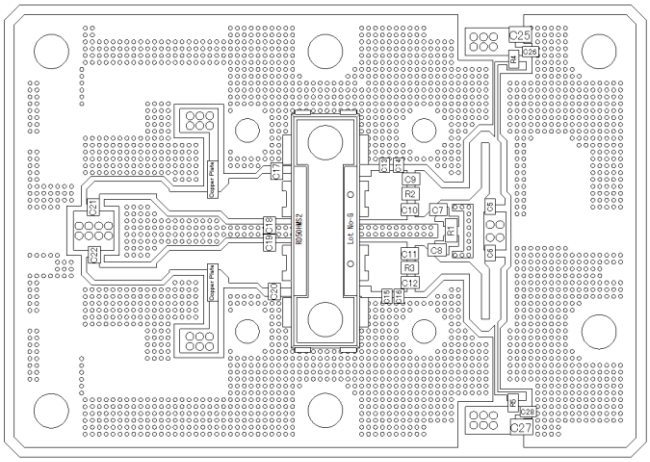
TOP VIEW



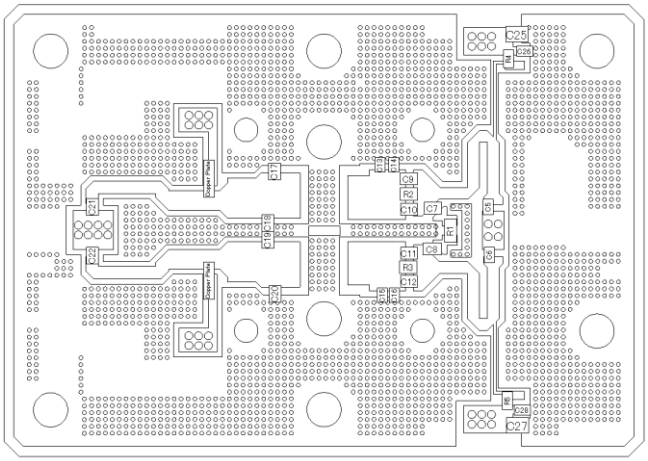
A-A' CROSS-SECTION VIEW



B-B' CROSS-SECTION VIEW



PCB BOTTOM VIEW



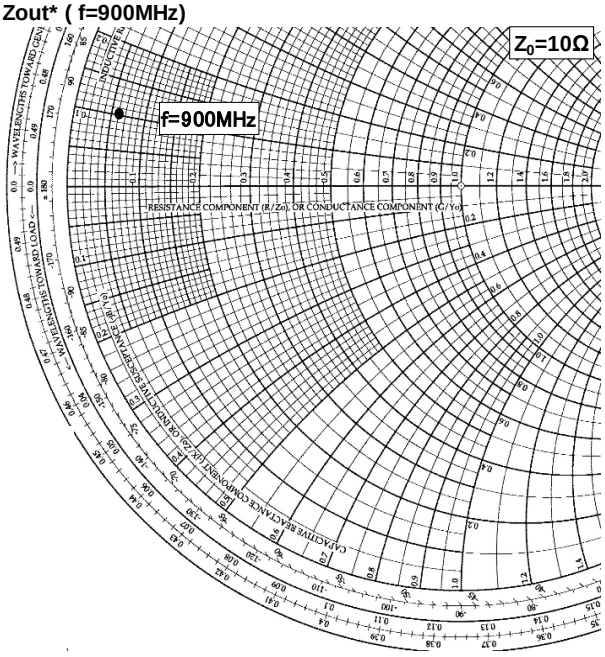
PCB BOTTOM VIEW WITHOUT DEVICE

RD50HMS2

RoHS Compliance, Silicon MOSFET Power Transistor, 900MHz, 50W, 12.5V

Input / Output Impedance VS. Frequency Characteristics

Zout* (f=900MHz)

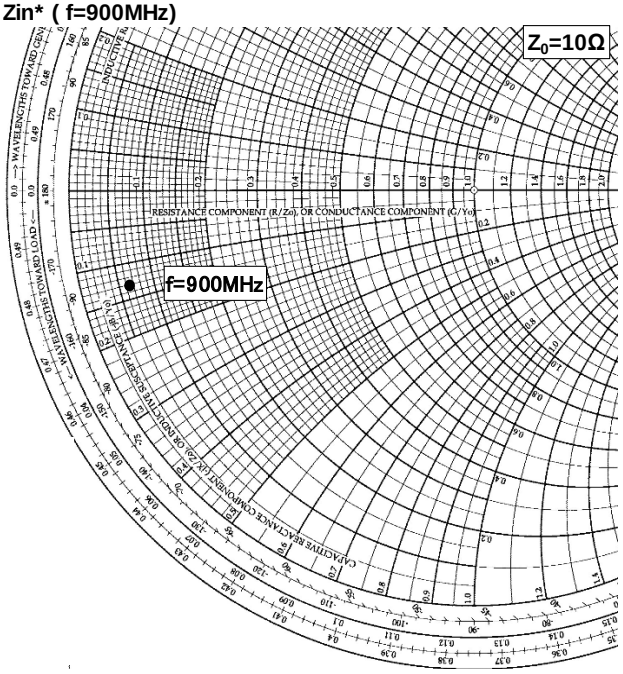


@Pin=7W, Vds=12.5V,
Idq=One Side 0.5/Total 1.0A

f (MHz)	Zout* (Ω)
900	0.63+j1.01

Zout*: Complex conjugate of output impedance

Zin* (f=900MHz)

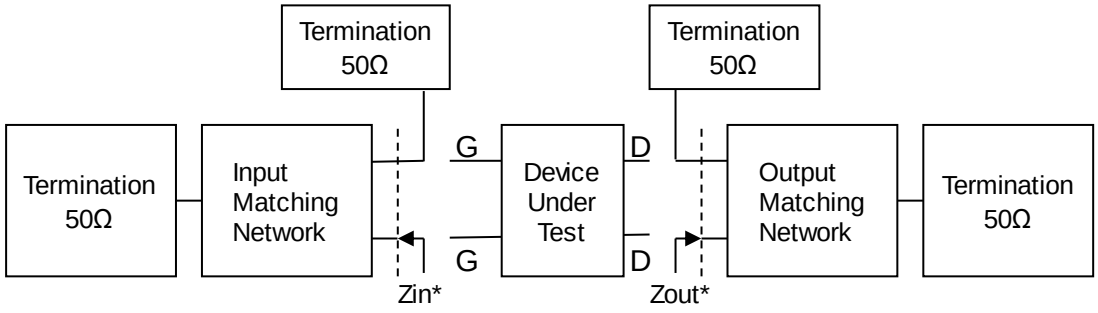


@Pin=7W, Vds=12.5V,
Idq=One Side 0.5/Total 1.0A

f (MHz)	Zin* (Ω)
900	0.59-j1.41

Zin*: Complex conjugate of input impedance

Method of Measurement

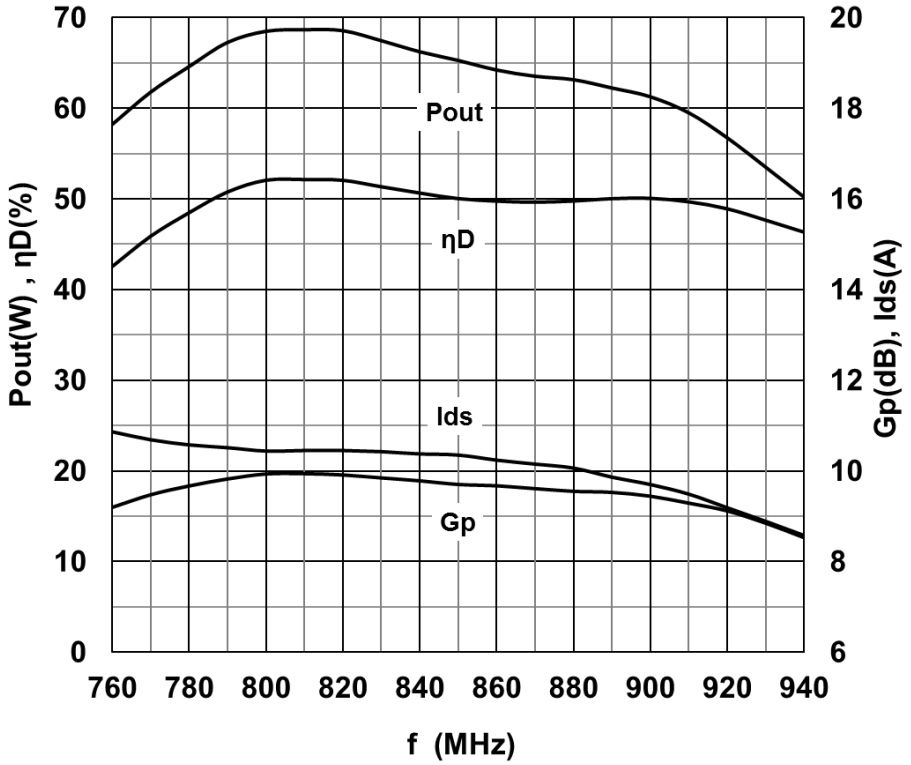


764 - 900MHz, TYPICAL RF CHARACTERISTICS

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

Frequency Characteristics

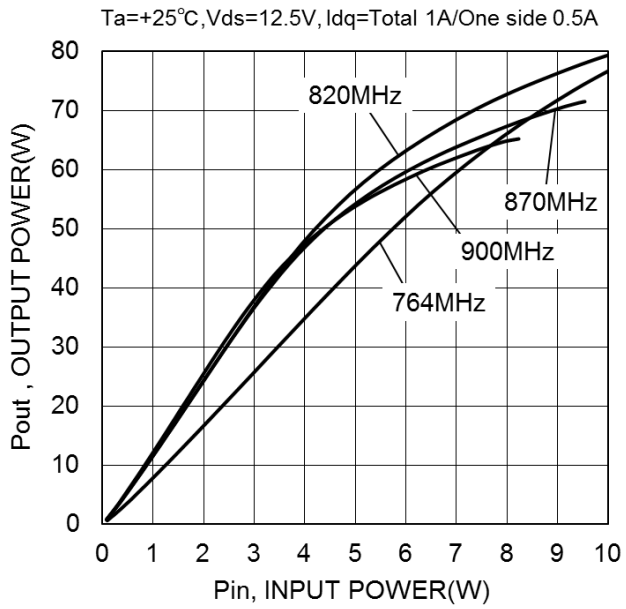
Ta=+25℃,
Vds=12.5V, Idq=Total 1A/One side0.5A,Pin=7W



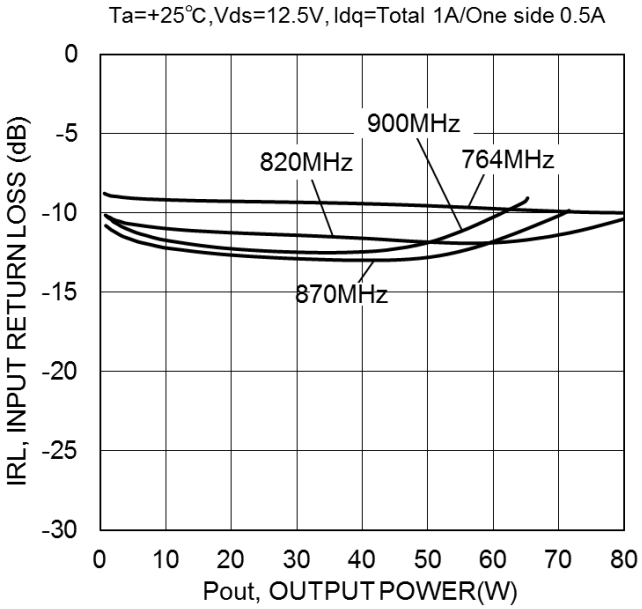
764 - 900MHz, TYPICAL RF CHARACTERISTICS

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

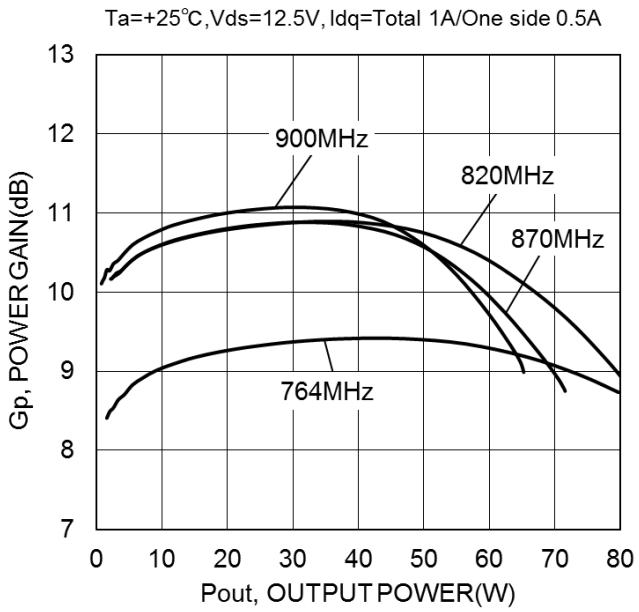
Pout versus Pin Characteristics



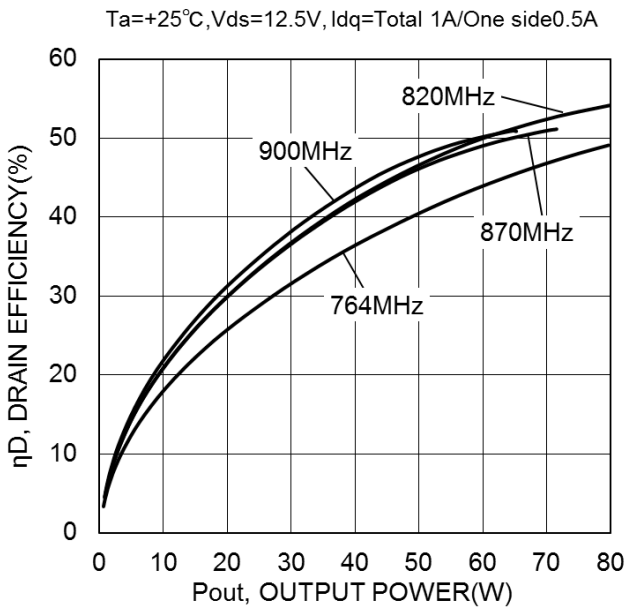
Input Return Loss versus Pout Characteristics



Gp versus Pout Characteristics



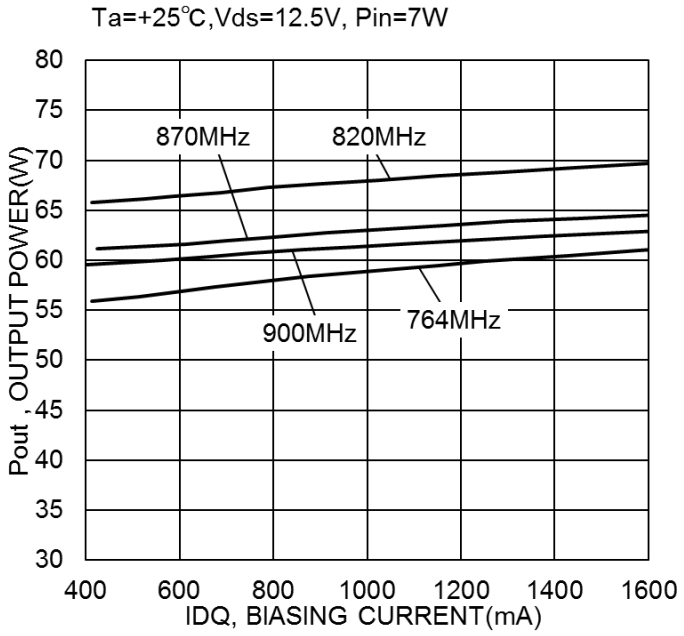
ηD versus Pout Characteristics



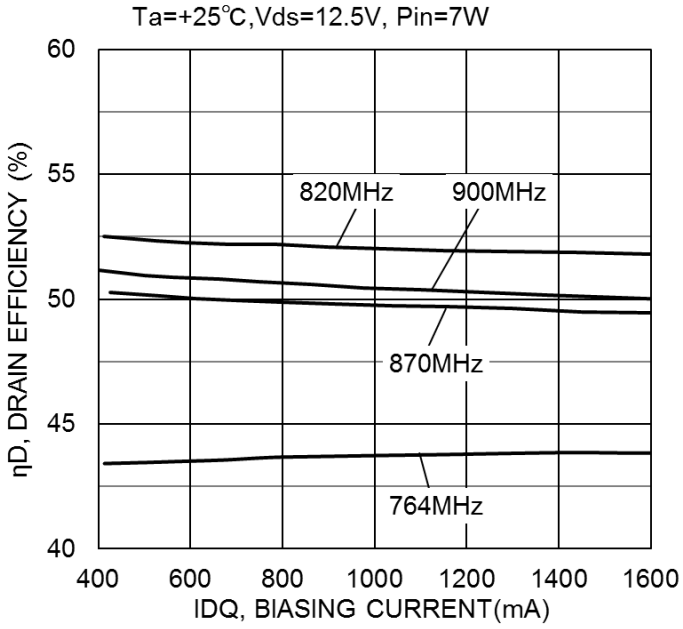
764 - 900MHz, TYPICAL RF CHARACTERISTICS

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

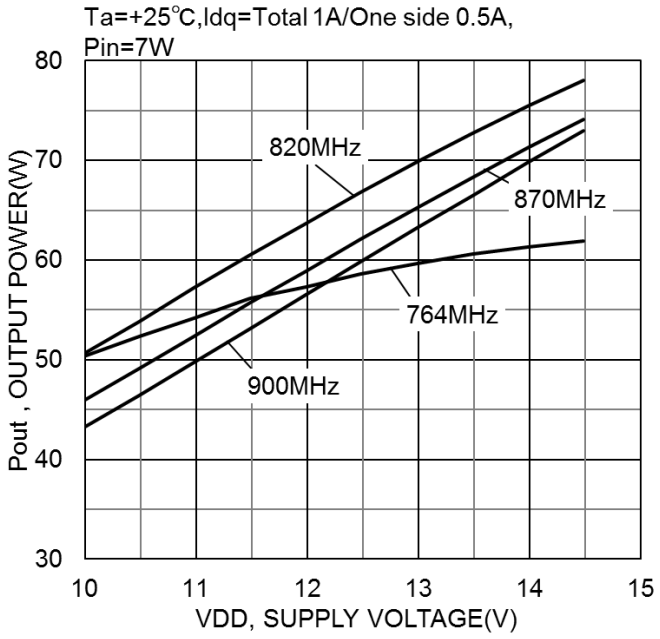
Pout versus Idq Characteristics



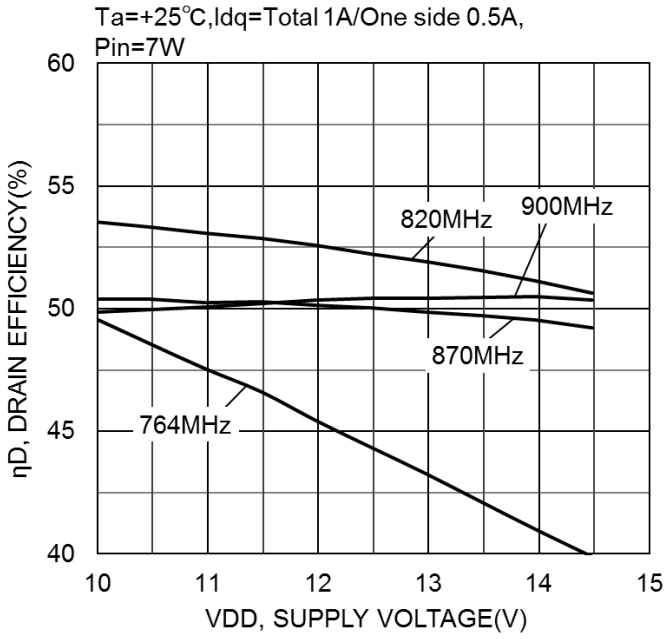
ηD versus Idq Characteristics



Pout versus VDD Characteristics



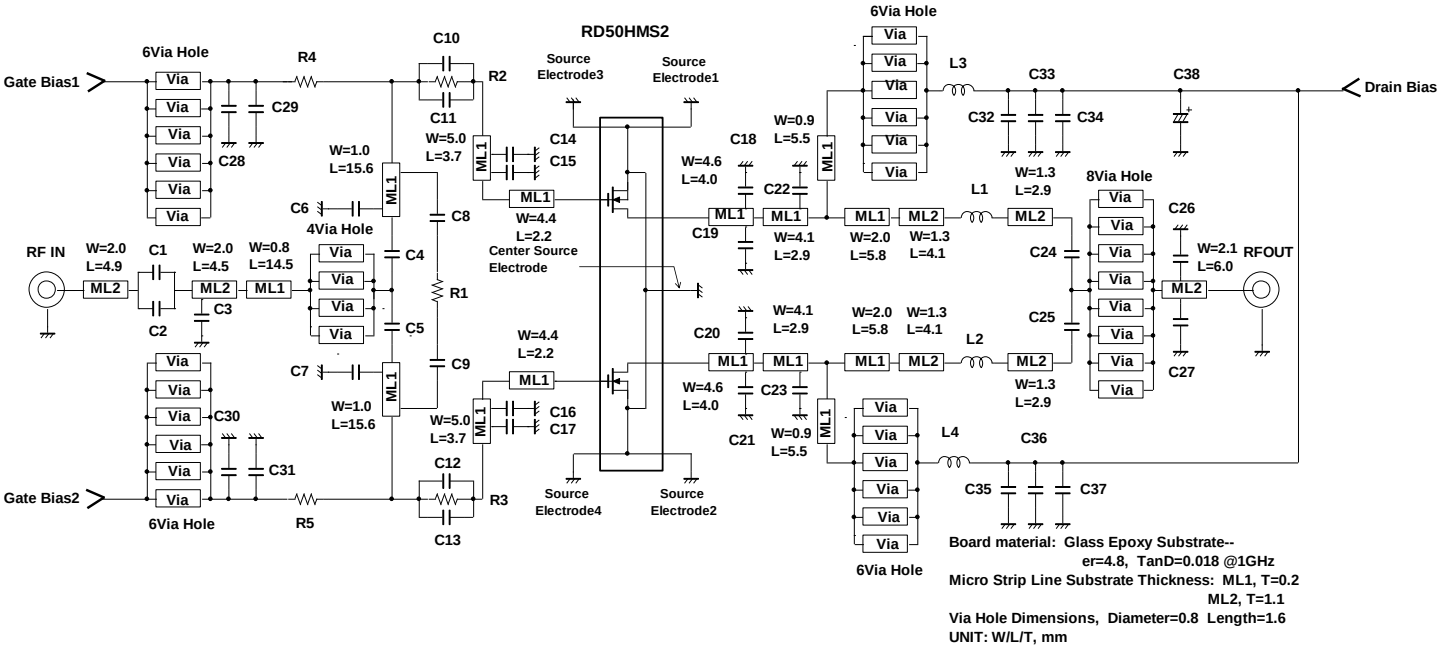
ηD versus VDD Characteristics



RD50HMS2

RoHS Compliance, Silicon MOSFET Power Transistor, 900MHz, 50W, 12.5V

EQUIVALENT CIRCUITRY for 764-900MHz BROADBAND RF EVALUATION BOARD



C1,C2,C4,C5	20 pF	1.6*0.8	High Q Chip Ceramic Capacitors
C3	3.6 pF	1.6*0.8	High Q Chip Ceramic Capacitors
C6, C7	4.7 pF	1.6*0.8	High Q Chip Ceramic Capacitors
C8, C9	1000 pF	1.6*0.8	Chip Ceramic Capacitors
C10, C11, C12,C13	27 pF	2.0*1.2	High Q Chip Ceramic Capacitors
C14, C15,C16, C17	12 pF	1.6*0.8	High Q Chip Ceramic Capacitors
R1	2.4 ohm	2.0*1.2	Chip Resistors
R2, R3	100 ohm	2.0*1.2	Chip Resistors
R4, R5	2.2k ohm	1.6*0.8	Chip Resistors
C18,C19,C20,C21	15 pF	2.0*1.2	High Q Chip Ceramic Capacitors
C22,C23	8.2 pF	2.0*1.2	High Q Chip Ceramic Capacitors
C24,C25	100 pF	2.0*1.2	High Q Chip Ceramic Capacitors
C26,C27	3.6 pF	2.0*1.2	High Q Chip Ceramic Capacitors
C28,C30,C32,C33,C35,C36	1000 pF	2.0*1.2	Chip Ceramic Capacitors
C29,C31,C34,C37	10000 pF	1.6*0.8	Chip Ceramic Capacitors
C38	220 uF	-	35V, Electrolytic Capacitor
L1,L2	2 nH	-	Homebuilt Inductance
L3,L4	12 nH	-	3Turn Rolling Coil

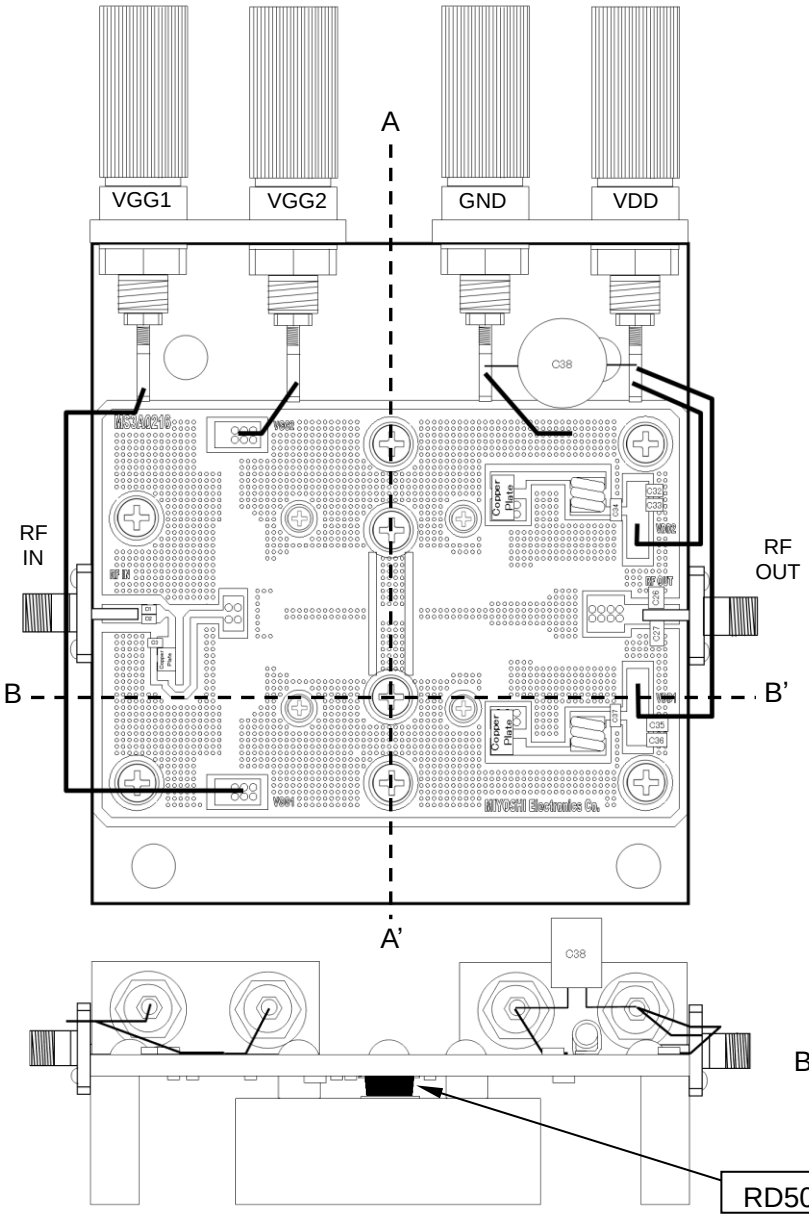
RD50HMS2

RoHS Compliance, Silicon MOSFET Power Transistor, 900MHz, 50W, 12.5V

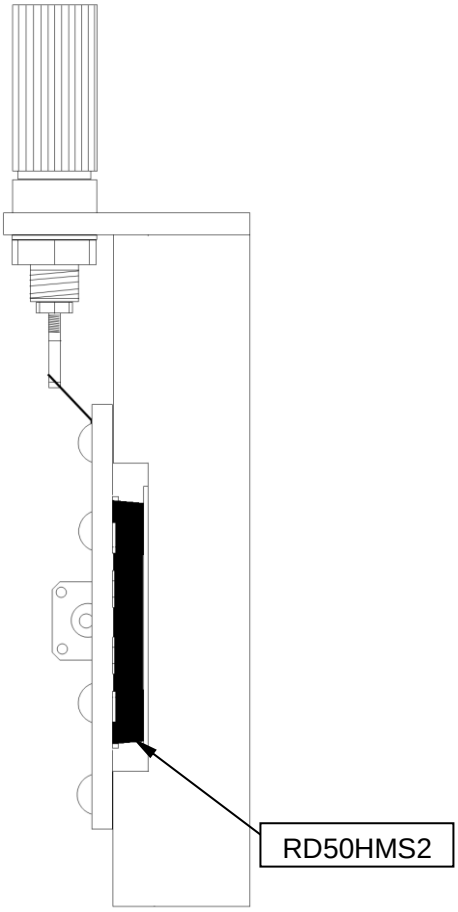
COMPONENT LAYOUT for 764-900MHz BROADBAND RF EVALUATION BOARD

BOARD OUTLINE: 75.0*46.0(mm)

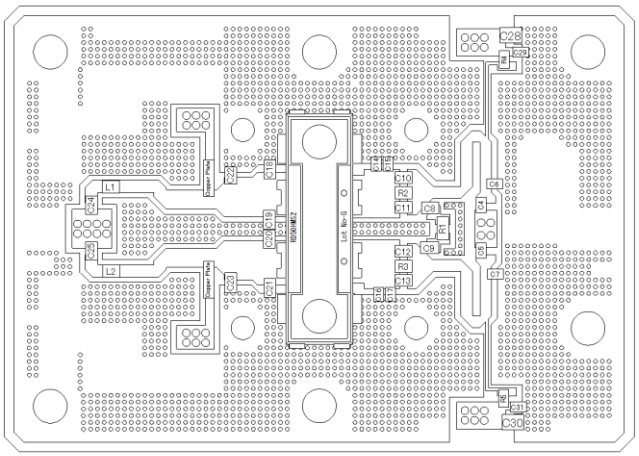
TOP VIEW



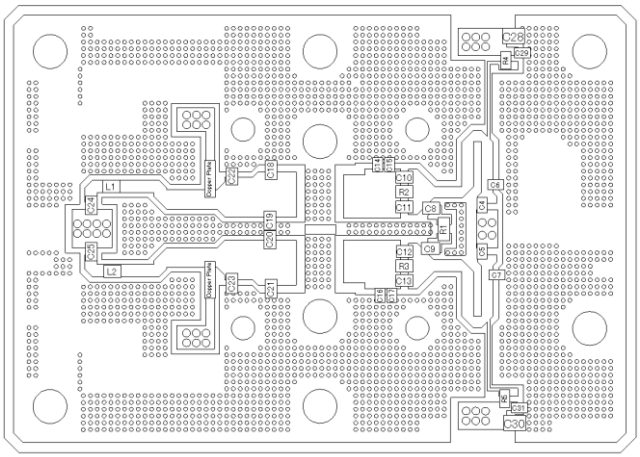
A-A' CROSS-SECTION VIEW



B-B' CROSS-SECTION VIEW



PCB BOTTOM VIEW



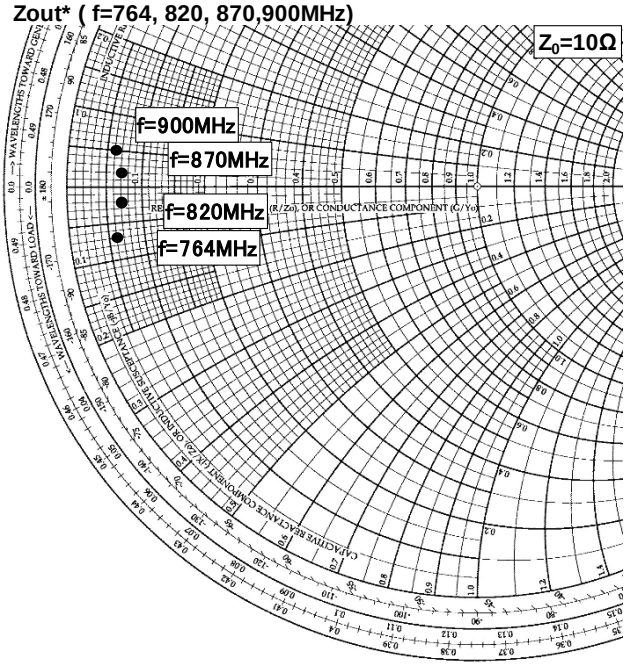
PCB BOTTOM VIEW WITHOUT DEVICE

RD50HMS2

RoHS Compliance, Silicon MOSFET Power Transistor, 900MHz, 50W, 12.5V

Input / Output Impedance VS. Frequency Characteristics

Zout* (f=764, 820, 870,900MHz)

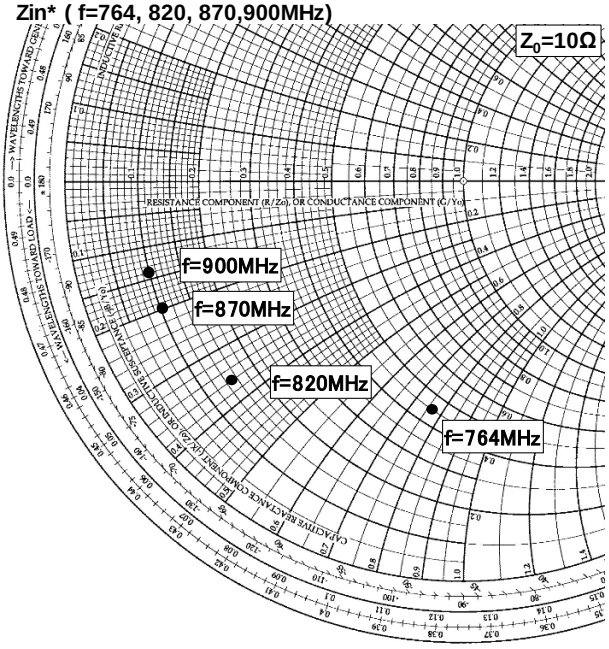


@Pin=7W, Vds=12.5V,
Idq=One Side 0.5/Total 1.0A

f (MHz)	Zout* (Ω)
764	0.62-j0.69
820	0.68-j0.15
870	0.68+j0.25
900	0.68+j0.46

Zout*: Complex conjugate of output impedance

Zin* (f=764, 820, 870,900MHz)

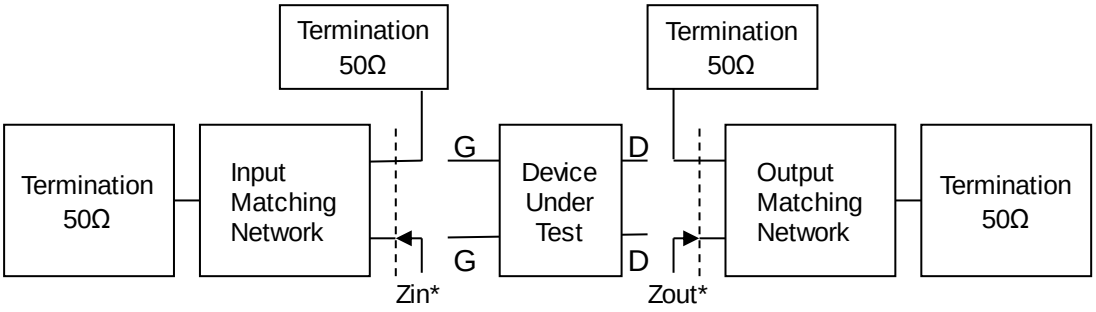


@Pin=7W, Vds=12.5V,
Idq=One Side 0.5/Total 1.0A

f (MHz)	Zin* (Ω)
764	4.45-j7.59
820	1.54-j3.61
870	1.14-j2.04
900	1.02-j1.37

Zin*: Complex conjugate of input impedance

Method of Measurement



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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