ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

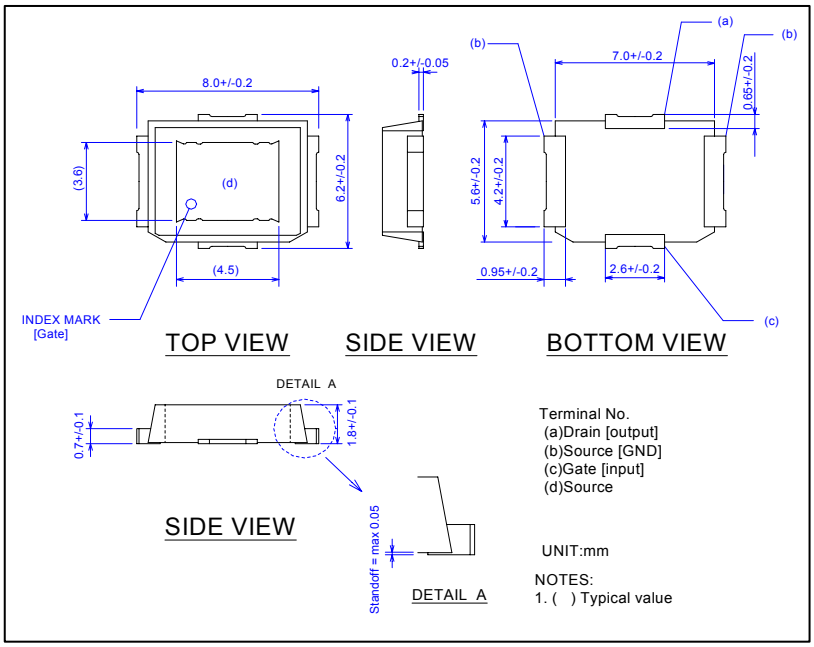
Silicon RF Power Semiconductors

RD09MUP2

RoHS Compliance, Silicon MOSFET Power Transistor, 520MHz, 8W

DESCRIPTION

RD09MUP2 is a MOS FET type transistor specifically designed for UHF RF power amplifiers applications.



FEATURES

- High power gain:
  Pout>8W, Gp>10dB@Vdd=7.2V,f=520MHz
- High Efficiency: 50%min. (520MHz)
- Integrated gate protection diode

APPLICATION

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

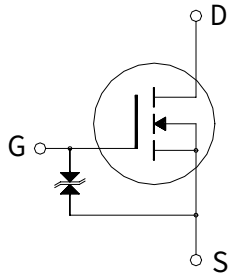
RoHS COMPLIANT

RD09MUP2 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 than85% lead.)

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 to +10	V
ID	Drain Current	-	4.0	A
Pin	Input Power	Zg=Zl=50Ω	1.6	W
Pch	Channel dissipation	Tc=25°C	83	W
Tj	Junction Temperature	-	150	°C
Tstg	Storage temperature	-	-40 to +125	°C
Rth j-c	Thermal resistance	Junction to case	1.5	°C/W



SCHEMATIC DRAWING

Note: Above parameters are guaranteed independently.

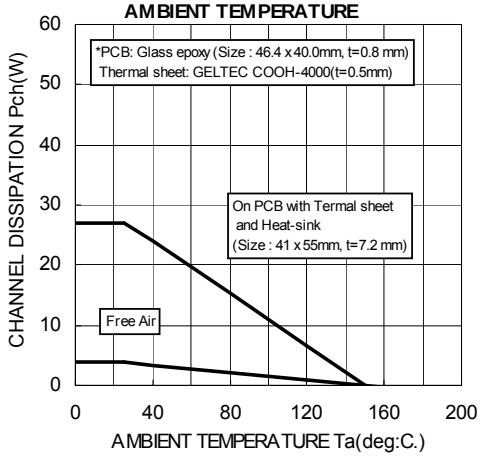
ELECTRICAL CHARACTERISTICS (Tc=25°C, UNLESS OTHERWISE NOTED)

SYMBOL	PARAMETER	CONDITIONS	LIMITS			UNIT
			MIN	TYP	MAX.	
IDSS	Zero gate voltage drain current	VDS=17V, VGS=0V	-	-	10	uA
IGSS	Gate to source leak current	VGS=10V, VDS=0V	-	-	1	uA
VTH	Gate threshold Voltage	VDS=12V, IDS=1mA	0.5	-	2.5	V
Pout	Output power	f=520MHz , VDD=7.2V	8	9	-	W
ηD	Drain efficiency	Pin=0.8W,Idq=1.0A	50	-	-	%
VSWRT	Load VSWR tolerance	VDD=9.5V,Po=8W(Pin Control) f=520MHz,Idq=1.0A,Zg=50Ω Load VSWR=20:1(All Phase)	No destroy			-

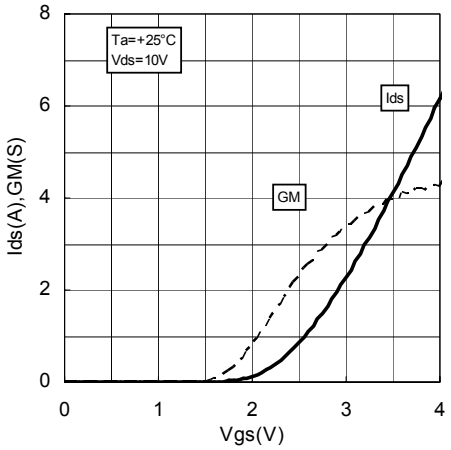
Note: Above parameters, ratings, limits and conditions are subject to change.

TYPICAL CHARACTERISTICS

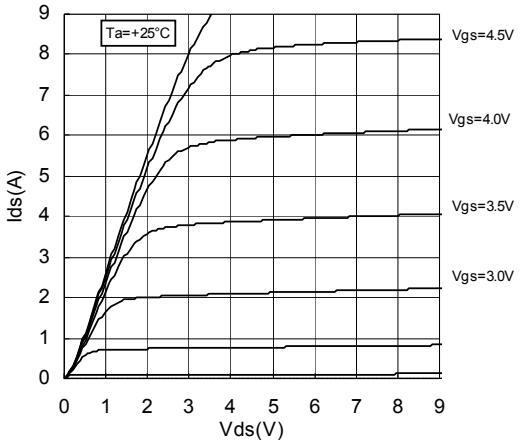
CHANNEL DISSIPATION VS. AMBIENT TEMPERATURE



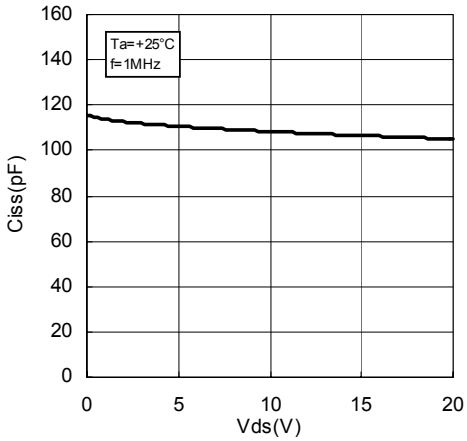
Vgs-Ids CHARACTERISTICS



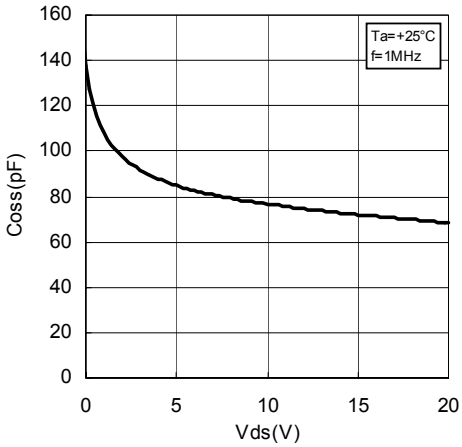
Vds-Ids CHARACTERISTICS



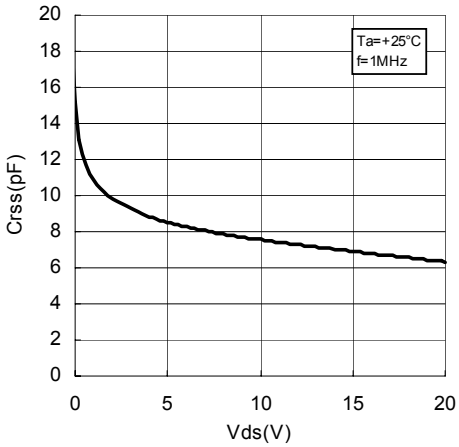
Vds VS. Ciss CHARACTERISTICS



Vds VS. Coss CHARACTERISTICS

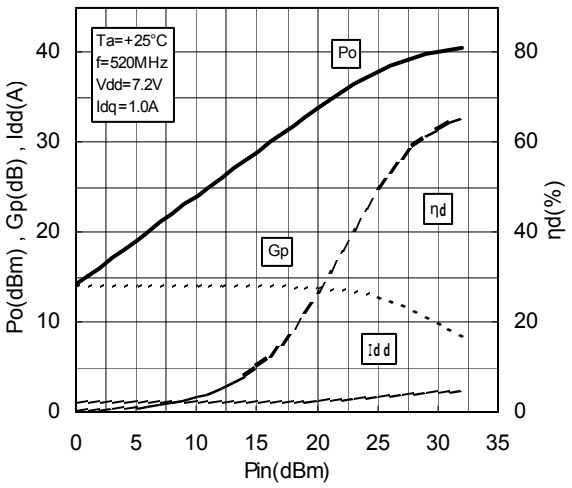


Vds VS. Crss CHARACTERISTICS

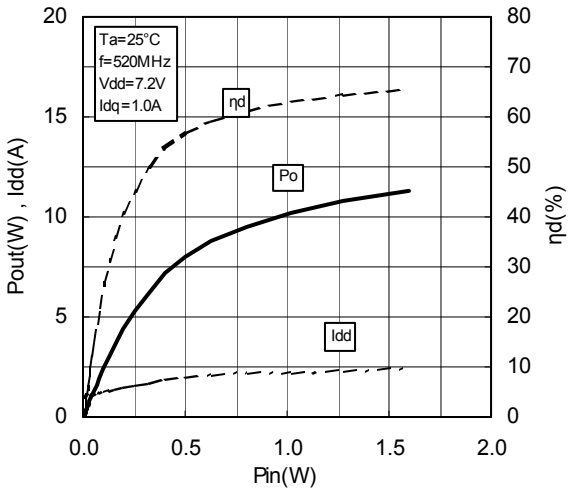


TYPICAL CHARACTERISTICS

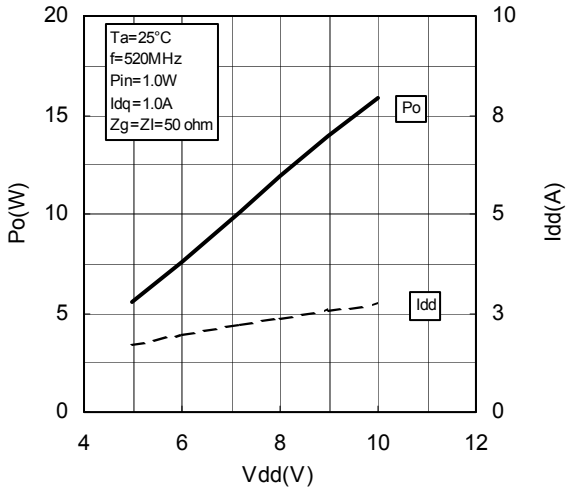
Pin-Po CHARACTERISTICS @f=520MHz



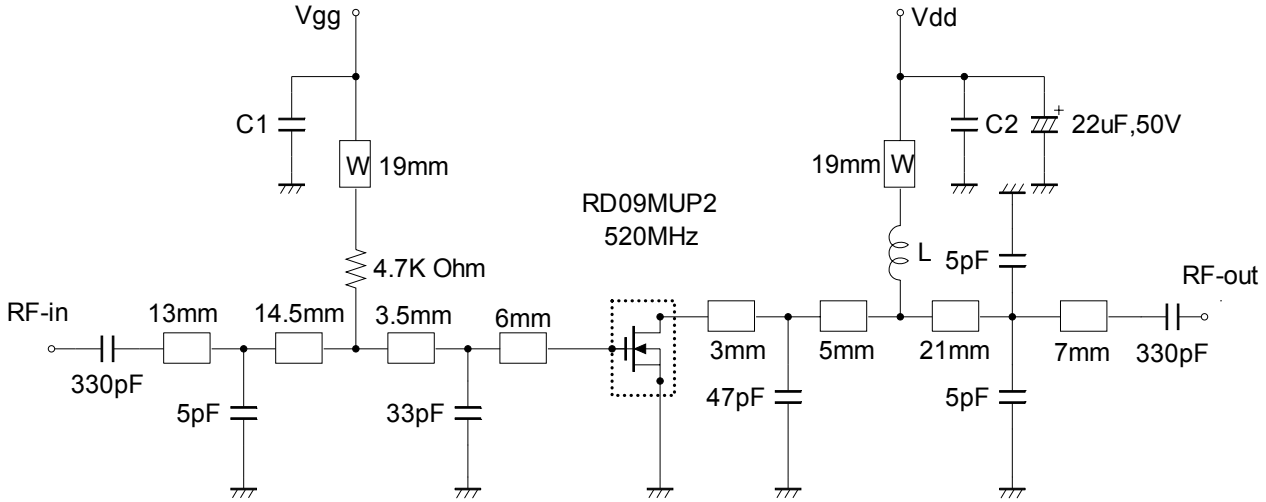
Pin-Po CHARACTERISTICS @f=520MHz



Vdd-Po CHARACTERISTICS @f=520MHz



TEST CIRCUIT (f=520MHz)



Note:Board material= glass-Epoxy Substrate
Micro strip line width=1.3mm/50OHM,er=4.8,t=0.8mm
W:Line width=1.0mm

L:43.7nH,6Turns,D:0.43mm,2.46mm(outside diameter)
C1,C2:2200pF

RD09MUP2 S-PARAMETER DATA (@Vdd=7.2V, Id=500mA)

Freq.	S11		S21		S12		S22	
[MHz]	(mag)	(ang)	(mag)	(ang)	(mag)	(ang)	(mag)	(ang)
100	0.900	-175.7	4.425	75.0	0.016	-7.1	0.798	-173.9
120	0.901	-176.4	3.651	71.1	0.014	-8.2	0.804	-174.4
140	0.905	-176.7	3.056	67.4	0.014	-10.4	0.808	-174.9
160	0.908	-177.2	2.614	64.2	0.013	-10.9	0.812	-175.1
180	0.909	-177.5	2.273	61.4	0.013	-10.0	0.819	-175.2
200	0.912	-177.6	2.003	58.7	0.011	-8.4	0.830	-175.1
220	0.916	-178.0	1.787	55.9	0.011	-6.0	0.842	-175.3
240	0.918	-178.5	1.602	53.3	0.010	-4.1	0.851	-175.3
260	0.922	-178.7	1.442	50.6	0.010	-5.6	0.857	-175.8
280	0.923	-178.9	1.297	48.0	0.009	0.6	0.859	-176.1
300	0.928	-179.0	1.176	45.8	0.008	2.6	0.863	-176.3
320	0.930	-179.1	1.075	44.1	0.008	8.2	0.866	-176.8
340	0.933	-179.3	0.989	42.3	0.008	15.1	0.878	-177.1
360	0.936	-179.6	0.910	40.0	0.008	25.3	0.889	-177.4
380	0.937	179.9	0.841	37.9	0.007	27.2	0.895	-177.8
400	0.939	179.7	0.775	36.3	0.008	35.5	0.897	-178.1
420	0.939	179.3	0.718	34.7	0.008	40.1	0.899	-178.6
440	0.945	179.1	0.667	33.4	0.008	45.0	0.900	-178.8
460	0.947	178.9	0.622	32.1	0.009	51.3	0.906	-179.3
480	0.950	178.8	0.582	30.7	0.009	56.2	0.913	-179.5
500	0.952	178.7	0.548	29.2	0.010	56.9	0.919	179.8
520	0.950	178.3	0.513	28.0	0.011	59.9	0.921	179.6
540	0.952	178.1	0.480	26.8	0.012	64.2	0.924	179.0
560	0.953	177.6	0.455	25.7	0.012	67.0	0.925	178.8
580	0.953	177.2	0.427	24.4	0.012	66.6	0.924	178.6
600	0.956	177.0	0.402	23.7	0.014	68.9	0.928	178.2
620	0.957	177.0	0.383	23.2	0.014	70.7	0.933	177.7
640	0.961	176.9	0.362	22.1	0.015	70.9	0.937	177.3
660	0.957	176.8	0.344	21.3	0.015	72.1	0.939	177.0
680	0.961	176.5	0.326	20.4	0.016	72.0	0.936	176.7
700	0.962	176.2	0.311	19.5	0.017	74.3	0.937	176.4
720	0.960	176.0	0.298	19.0	0.018	74.2	0.937	176.1
740	0.962	175.5	0.283	18.6	0.019	74.5	0.938	175.8
760	0.963	175.3	0.269	17.5	0.019	74.9	0.943	175.5
780	0.963	175.2	0.259	17.2	0.020	74.1	0.944	175.0
800	0.964	175.0	0.247	16.9	0.021	72.8	0.949	174.7
820	0.962	175.0	0.237	16.5	0.022	75.4	0.946	174.7
840	0.964	174.7	0.230	15.8	0.022	75.1	0.946	174.5
860	0.965	174.5	0.220	16.2	0.023	76.0	0.944	174.1
880	0.965	174.1	0.211	15.4	0.024	75.8	0.948	173.8
900	0.962	173.8	0.202	15.1	0.025	75.0	0.949	173.4
920	0.967	173.5	0.193	15.0	0.026	75.8	0.952	172.8
940	0.963	173.5	0.189	14.4	0.026	75.8	0.952	172.7
960	0.964	173.2	0.180	13.8	0.027	75.6	0.949	172.7
980	0.966	173.1	0.176	14.6	0.028	76.0	0.951	172.6
1000	0.964	173.0	0.170	14.0	0.029	76.5	0.952	172.2

RD09MUP2 S-PARAMETER DATA (@Vdd=7.2V, Id=900mA)

Freq.	S11		S21		S12		S22	
[MHz]	(mag)	(ang)	(mag)	(ang)	(mag)	(ang)	(mag)	(ang)
100	0.914	-176.9	4.363	78.5	0.012	0.2	0.825	-175.5
120	0.918	-177.4	3.638	74.9	0.012	-0.6	0.833	-176.2
140	0.920	-178.0	3.060	71.4	0.011	0.3	0.832	-177.1
160	0.922	-178.3	2.614	68.8	0.011	1.6	0.829	-177.3
180	0.921	-178.6	2.287	66.7	0.011	4.4	0.833	-177.4
200	0.921	-178.8	2.039	64.6	0.010	6.5	0.846	-177.2
220	0.922	-179.3	1.840	62.1	0.010	8.5	0.863	-177.4
240	0.925	-179.4	1.665	59.6	0.010	8.0	0.870	-177.5
260	0.924	-179.8	1.503	56.8	0.009	10.9	0.868	-177.9
280	0.928	180.0	1.364	54.7	0.009	13.1	0.864	-178.2
300	0.929	-180.0	1.240	52.9	0.009	18.6	0.860	-178.1
320	0.936	180.0	1.144	51.1	0.009	26.6	0.866	-178.4
340	0.935	179.8	1.064	49.4	0.009	27.8	0.879	-178.8
360	0.936	179.4	0.993	47.2	0.009	32.4	0.891	-179.0
380	0.937	179.0	0.923	45.2	0.009	34.4	0.896	-179.4
400	0.937	178.9	0.851	43.5	0.009	40.1	0.896	-179.7
420	0.939	178.5	0.795	41.7	0.009	47.0	0.895	-179.8
440	0.941	178.5	0.738	40.4	0.009	52.8	0.892	-180.0
460	0.944	178.3	0.696	39.3	0.010	50.3	0.898	179.6
480	0.946	178.1	0.654	38.0	0.011	56.9	0.908	179.3
500	0.948	178.0	0.619	36.5	0.011	59.5	0.912	178.8
520	0.950	177.9	0.585	34.8	0.012	62.7	0.914	178.4
540	0.949	177.5	0.549	33.5	0.012	63.1	0.915	178.1
560	0.948	177.1	0.518	32.2	0.014	63.6	0.916	178.0
580	0.950	177.0	0.491	31.1	0.014	65.6	0.918	177.8
600	0.952	176.6	0.467	30.3	0.014	66.3	0.919	177.6
620	0.954	176.5	0.444	29.5	0.015	67.6	0.924	177.0
640	0.958	176.5	0.426	28.5	0.016	69.8	0.930	176.4
660	0.954	176.4	0.400	27.2	0.017	69.8	0.932	176.3
680	0.957	176.3	0.382	26.3	0.017	70.8	0.929	176.0
700	0.956	176.0	0.367	25.6	0.018	71.9	0.929	175.9
720	0.955	175.5	0.350	24.9	0.019	72.4	0.931	175.8
740	0.956	175.2	0.334	23.9	0.019	72.5	0.930	175.3
760	0.959	174.9	0.319	23.4	0.020	73.0	0.934	174.8
780	0.958	175.0	0.308	22.3	0.021	72.7	0.939	174.5
800	0.959	174.8	0.293	22.0	0.021	74.0	0.944	174.3
820	0.962	174.8	0.281	21.5	0.022	73.9	0.939	174.1
840	0.962	174.5	0.271	21.0	0.023	74.2	0.938	174.0
860	0.961	174.3	0.261	20.4	0.023	74.1	0.939	173.9
880	0.960	174.0	0.252	20.0	0.025	73.9	0.940	173.4
900	0.961	173.6	0.244	19.5	0.025	74.6	0.942	173.0
920	0.961	173.3	0.233	18.9	0.026	74.4	0.944	172.5
940	0.960	173.3	0.225	18.5	0.027	74.7	0.945	172.3
960	0.962	173.1	0.219	18.2	0.027	74.7	0.945	172.3
980	0.962	172.9	0.211	17.5	0.029	74.3	0.948	172.4
1000	0.960	172.8	0.206	18.0	0.029	74.4	0.948	172.0

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. 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. Examples of critical communications elements would include transmitters for base station applications and fixed station applications that operate with long term continuous transmission and a higher on-off frequency during transmitting, especially for systems that may have a high impact to society.

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 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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