

< Silicon RF Power MOS FET (Discrete) >

# RD12MVP1

RoHS Compliance, Silicon MOSFET Power Transistor, 175MHz, 10W

## DESCRIPTION

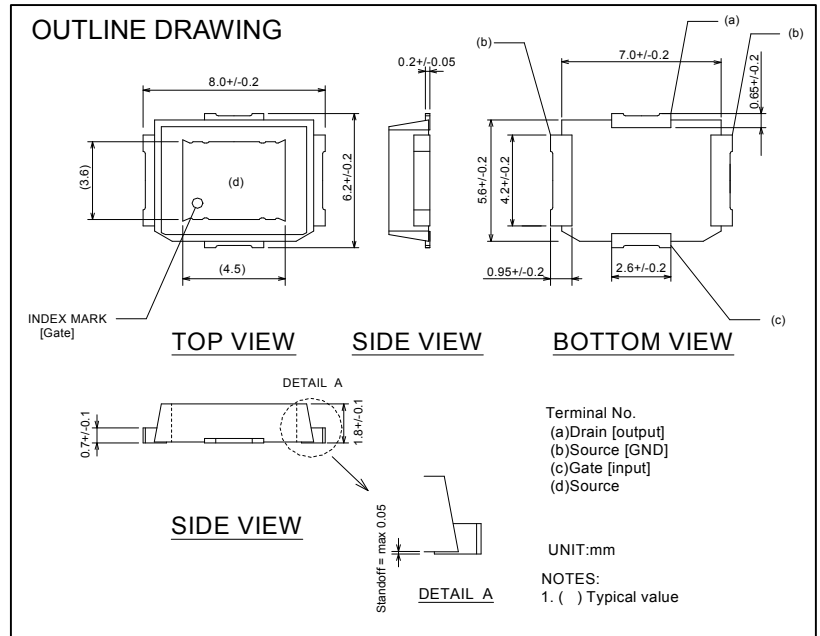
RD12MVP1 is a MOS FET type transistor specifically designed for VHF RF power amplifiers applications.

## FEATURES

- High Power Gain  
Pout>10W, Gp>13dB@Vdd=7.2V,f=175MHz
- High Efficiency: 55%min. (175MHz)
- No gate protection diode

## APPLICATION

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



## RoHS COMPLIANT

RD12MVP1 is a RoHS compliant product. RoHS compliance is indicated 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 solder alloys containing more than 85% lead.)

## ABSOLUTE MAXIMUM RATINGS (Tc=25°C, UNLESS OTHERWISE NOTED)

SYMBOL	PARAMETER	CONDITIONS	RATINGS	UNIT
V <sub>DSS</sub>	Drain to Source Voltage	V <sub>GS</sub> =0V	50	V
V <sub>GSS</sub>	Gate to Source Voltage	V <sub>DS</sub> =0V	-5 to +20	V
I <sub>D</sub>	Drain Current		4.0	A
P <sub>in</sub>	Input Power	Z <sub>g</sub> =Z <sub>l</sub> =50Ω	1.0	W
P <sub>ch</sub>	Channel Dissipation	T <sub>c</sub> =25°C	125	W
T <sub>j</sub>	Junction Temperature		+150	°C
T <sub>stg</sub>	Storage Temperature		-40 to +125	°C
R <sub>thj-c</sub>	Thermal Resistance	Junction to Case	1.5	°C/W

Note: Above parameters are guaranteed independently.

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

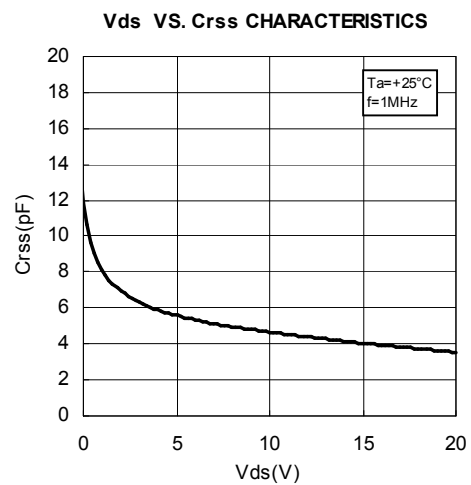
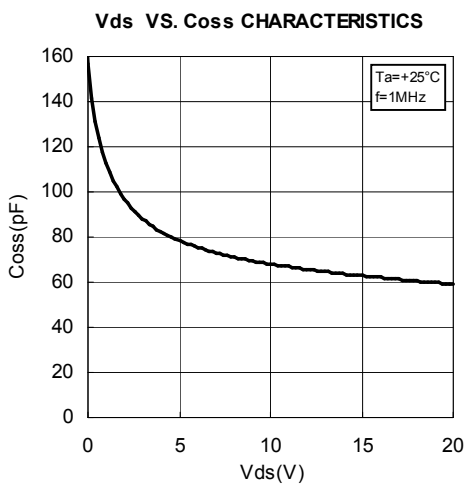
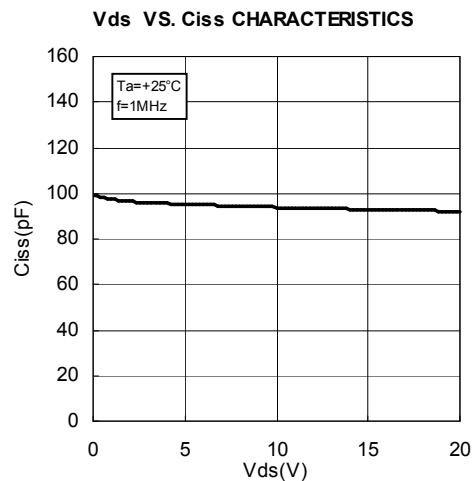
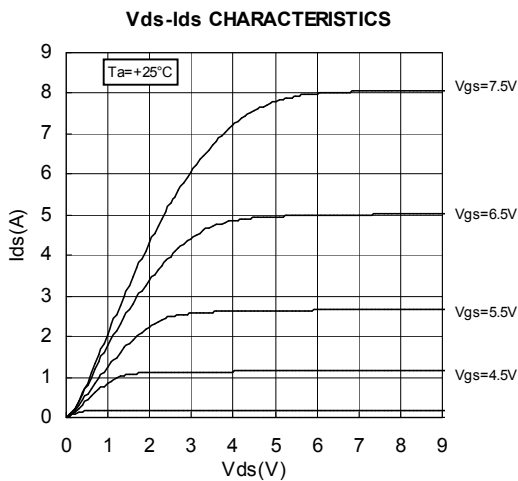
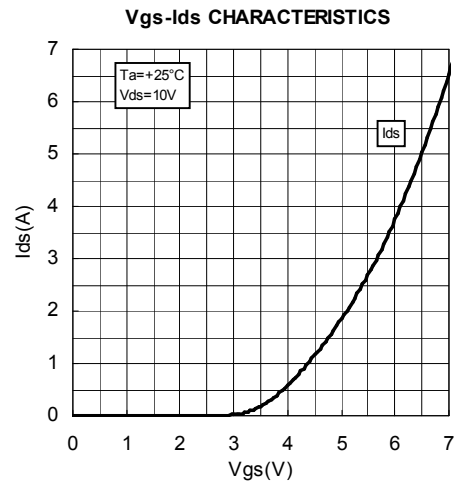
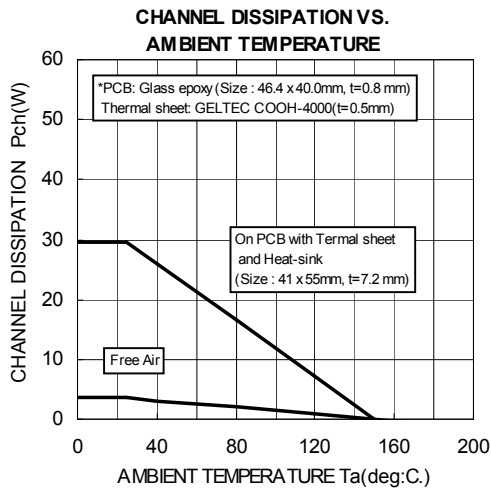
SYMBOL	PARAMETER	CONDITIONS	LIMITS			UNIT
			MIN.	TYP.	MAX.	
Idss	Zero Gate Voltage Drain Current	VDS=17V, VGS=0V	-	-	10	uA
Igss	Gate to Source Leak Current	VGS=10V, VDS=0V	-	-	1.0	uA
VTH	Gate Threshold Voltage	VDS=12V, IDS=1mA	1.8	-	4.4	V
Pout	Output Power	f=175MHz, VDD=7.2V	10	12	-	W
$\eta_D$	Drain Efficiency	Pin=0.5W, Idq=1.0A	55	57	-	%
VSWRT	Load VSWR tolerance	VDD=9.5V, Po=10W(Pin Control) f=175MHz, Idq=1.0A, Zg=50Ω Load VSWR=20:1(All Phase)	No destroy			-

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

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## TYPICAL CHARACTERISTICS

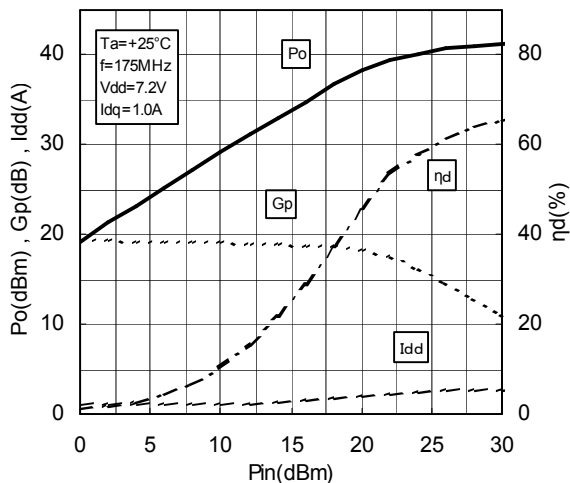


# RD12MVP1

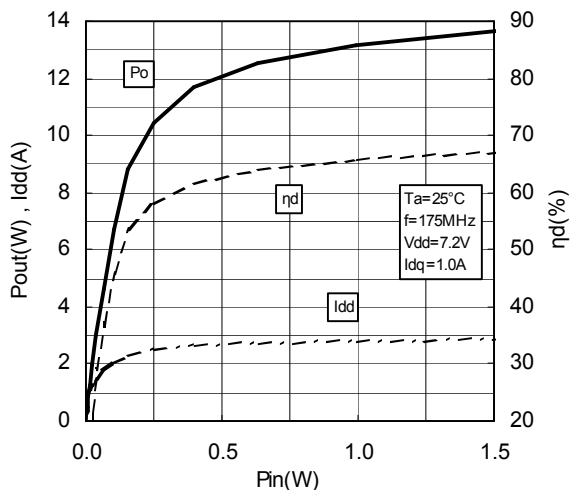
RoHS Compliance, Silicon MOSFET Power Transistor, 175MHz, 10W

## TYPICAL CHARACTERISTICS

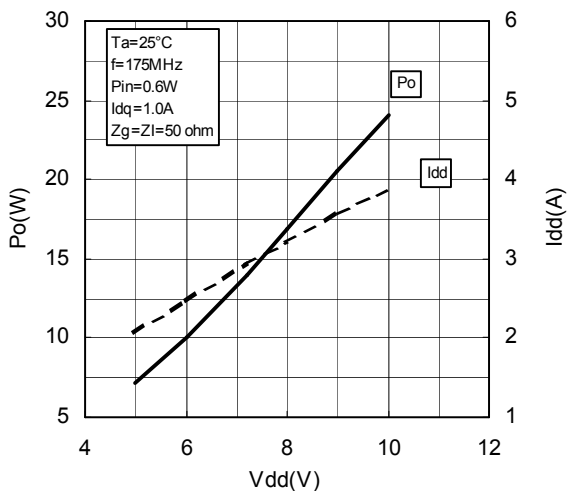
Pin-Po CHARACTERISTICS @f=175MHz



Pin-Po CHARACTERISTICS @f=175MHz



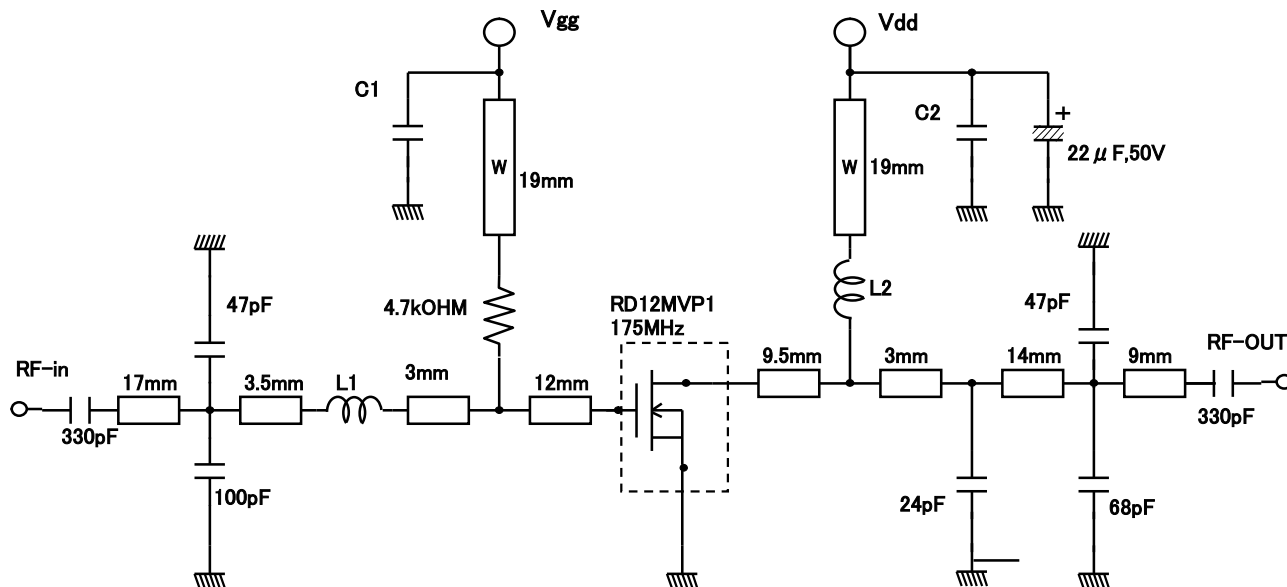
Vdd-Po CHARACTERISTICS @f=175MHz



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## TEST CIRCUIT (f=175MHz)



Note:Boad material Glass-Epoxy substrate  
Micro strip line width=1.3mm/50 OHM, er:4.8, t=0.8mm  
W:Line width=1.0mm

L:Enameled Wire  
L1:4Turns, D:0.43mm,  $\phi$  1.66mm(outside diameter)  
L2:6Turns, D:0.43mm,  $\phi$  2.46mm(outside diameter)  
C1, C2:2200pF

**RD12MVP1**

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**RD12MVP1 S-PARAMETER DATA (@Vdd=7.2V, Id=500mA)**

Freq. [MHz]	S11		S21		S12		S22	
	(mag)	(ang)	(mag)	(ang)	(mag)	(ang)	(mag)	(ang)
100	0.782	-165.5	6.105	69.0	0.024	-16.8	0.743	-162.7
125	0.801	-166.9	4.716	62.4	0.022	-20.5	0.766	-164.0
150	0.817	-168.0	3.724	56.4	0.021	-25.7	0.783	-165.6
175	0.833	-168.8	3.023	51.6	0.019	-27.3	0.799	-166.4
200	0.847	-169.7	2.519	47.5	0.016	-31.1	0.825	-167.2
225	0.860	-170.6	2.137	43.5	0.015	-30.0	0.845	-167.7
250	0.872	-171.6	1.828	39.6	0.013	-34.0	0.864	-168.6
275	0.882	-172.4	1.569	36.0	0.012	-30.9	0.871	-169.6
300	0.894	-173.0	1.361	33.4	0.010	-31.7	0.879	-170.4
325	0.901	-173.5	1.193	31.0	0.008	-24.1	0.888	-171.3
350	0.910	-174.2	1.062	28.5	0.007	-20.9	0.901	-172.1
375	0.917	-175.2	0.947	25.9	0.006	-13.8	0.915	-172.9
400	0.918	-176.1	0.844	23.5	0.005	-1.5	0.918	-173.6
425	0.923	-176.7	0.756	21.5	0.004	16.0	0.917	-174.4
450	0.930	-177.2	0.683	20.4	0.005	35.4	0.922	-174.8
475	0.933	-177.7	0.623	18.7	0.005	43.3	0.928	-175.5
500	0.938	-178.1	0.568	17.2	0.006	53.6	0.935	-176.3
525	0.939	-178.8	0.520	15.7	0.007	58.5	0.943	-176.8
550	0.942	-179.3	0.477	14.3	0.008	63.6	0.941	-177.1
575	0.943	-179.7	0.439	13.3	0.009	68.8	0.941	-177.8
600	0.946	-179.5	0.407	12.2	0.011	73.9	0.945	-178.3
625	0.950	-179.1	0.378	11.3	0.011	72.4	0.949	-178.9
650	0.950	-178.8	0.350	10.4	0.012	74.8	0.950	-179.5
675	0.953	-178.3	0.327	9.8	0.013	79.1	0.952	-179.8
700	0.952	-177.9	0.306	8.9	0.014	77.0	0.954	-179.8
725	0.954	-177.5	0.286	8.3	0.015	77.2	0.951	-179.4
750	0.955	-176.9	0.268	7.7	0.016	79.2	0.955	-178.9
775	0.954	-176.4	0.252	7.2	0.018	78.9	0.957	-178.6
800	0.955	-176.3	0.238	7.0	0.018	79.9	0.958	-178.1
825	0.958	-175.9	0.225	6.4	0.020	78.9	0.961	-177.7
850	0.958	-175.6	0.213	5.9	0.021	80.1	0.954	-177.5
875	0.956	-175.1	0.203	5.5	0.022	79.0	0.960	-177.3
900	0.958	-174.5	0.192	5.3	0.023	79.6	0.958	-176.8
925	0.956	-174.3	0.182	5.3	0.024	79.3	0.962	-176.4
950	0.958	-174.0	0.175	5.3	0.025	78.3	0.964	-176.0
975	0.957	-173.8	0.166	5.2	0.026	80.7	0.964	-176.0
1000	0.959	-173.6	0.158	5.7	0.026	78.8	0.962	-175.8

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## RD12MVP1 S-PARAMETER DATA (@Vdd=7.2V, Id=900mA)

Freq. [MHz]	S11		S21		S12		S22	
	(mag)	(ang)	(mag)	(ang)	(mag)	(ang)	(mag)	(ang)
100	0.799	-169.4	5.980	72.2	0.021	-11.2	0.757	-166.6
125	0.813	-170.7	4.690	65.9	0.020	-14.9	0.780	-167.5
150	0.825	-171.3	3.726	60.1	0.019	-17.2	0.785	-168.8
175	0.835	-171.9	3.045	55.9	0.017	-21.5	0.794	-169.3
200	0.846	-172.5	2.569	52.3	0.016	-22.4	0.821	-169.3
225	0.857	-173.4	2.206	48.4	0.015	-21.1	0.846	-169.5
250	0.868	-174.3	1.904	44.3	0.013	-21.2	0.863	-170.4
275	0.877	-174.9	1.648	40.7	0.011	-21.3	0.864	-170.9
300	0.886	-175.3	1.436	38.2	0.010	-19.9	0.864	-171.4
325	0.895	-175.7	1.270	35.8	0.009	-15.8	0.876	-172.0
350	0.900	-176.4	1.141	33.1	0.008	-11.9	0.891	-172.6
375	0.907	-177.3	1.023	30.4	0.007	-7.2	0.906	-173.1
400	0.909	-178.1	0.917	27.7	0.007	1.3	0.915	-173.9
425	0.913	-178.7	0.820	25.8	0.005	20.2	0.908	-174.4
450	0.921	-179.1	0.745	24.6	0.006	27.4	0.910	-174.5
475	0.925	-179.6	0.683	23.0	0.006	36.9	0.921	-175.2
500	0.932	-180.0	0.627	21.2	0.007	50.8	0.933	-175.9
525	0.931	179.2	0.575	19.4	0.007	53.6	0.937	-176.6
550	0.933	178.6	0.529	18.1	0.008	57.3	0.935	-176.8
575	0.937	178.0	0.486	16.6	0.009	67.9	0.931	-177.0
600	0.943	177.7	0.452	16.1	0.010	70.4	0.935	-177.4
625	0.943	177.3	0.422	14.9	0.011	70.9	0.945	-178.0
650	0.946	177.0	0.391	14.0	0.013	73.8	0.948	-178.6
675	0.947	176.6	0.366	12.7	0.013	75.6	0.946	-179.0
700	0.946	175.9	0.341	12.0	0.015	76.9	0.946	-179.3
725	0.951	175.5	0.322	11.3	0.015	75.8	0.945	-179.6
750	0.949	175.0	0.302	10.5	0.016	76.4	0.949	179.9
775	0.951	174.7	0.284	9.6	0.017	77.8	0.952	179.4
800	0.950	174.5	0.269	9.3	0.019	79.0	0.955	179.0
825	0.956	174.3	0.253	9.2	0.020	77.8	0.954	178.9
850	0.956	173.7	0.240	8.7	0.020	78.7	0.950	178.9
875	0.956	173.3	0.228	7.9	0.021	78.7	0.952	178.4
900	0.953	172.8	0.218	7.1	0.023	77.3	0.953	177.9
925	0.948	172.5	0.206	6.6	0.024	76.8	0.958	177.4
950	0.955	172.2	0.196	7.0	0.024	78.3	0.959	177.3
975	0.955	172.0	0.186	7.3	0.025	78.6	0.958	177.4
1000	0.957	171.8	0.178	7.1	0.026	79.1	0.956	177.1

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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.
10. Please refer to the additional precautions in the formal specification sheet.



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## **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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