

RUC002N05HZGT116

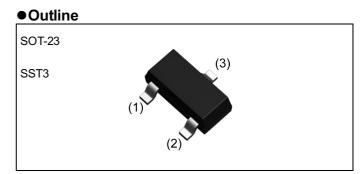
Nch 50V 200mA Small Signal MOSFET

AEC-Q101 Qualified

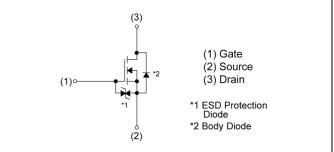
V _{DSS}	50V
R _{DS(on)} (Max.)	2.2Ω
I _D	±200mA
P _D	350mW

Features

- 1) Very fast switching
- 2) Ultra low voltage drive(1.2V drive)
- 3) AEC-Q101 Qualified
- 4) Pb-free lead plating ; RoHS compliant.
- 5) Halogen Free.



Inner circuit



Packaging specifications

		Packing	Embossed Tape
		Reel size (mm)	180
● Application	Туре	Tape width (mm)	8
Switching circuits		Basic ordering unit (pcs)	3000
Low-side loadswitch		Taping code	T116
Relay driver		Marking	RH

• Absolute maximum ratings (T_a = 25°C ,unless otherwise specified)

Parameter	Symbol	Value	Unit
Drain - Source voltage	V _{DSS}	50	V
Continuous drain current	۱ _D	±200	mA
Pulsed drain current	I _{DP} *1	±800	mA
Gate - Source voltage	V _{GSS}	±8	V
	P _D *2	350	mW
Power dissipation	P _D *3	200	mW
Junction temperature	Tj	150	°C
Operating junction and storage temperature range	T _{stg}	-55 to +150	°C

•Thermal resistance

Deremeter	Symbol	Values			1.1
Parameter		Min.	Тур.	Max.	Unit
Thermel resistance innetion embient	R_{thJA}^{*2}	-	-	357	°C/W
Thermal resistance, junction - ambient	R_{thJA}^{*3}	-	-	625	°C/W

•Electrical characteristics (T_a = 25°C)

Deremeter	Currence of	Symbol Conditions		Values			
Parameter Symbol C		Conditions	Min.	Тур.	Max.	Unit	
Drain - Source breakdown voltage	V _{(BR)DSS}	V _{GS} = 0V, I _D = 1mA	50	-	-	V	
Breakdown voltage temperature coefficient	$\frac{\Delta V_{(BR)DSS}}{\Delta T_j}$	I _D = 1mA referenced to 25°C	-	53.7	-	mV/°C	
Zero gate voltage drain current	I _{DSS}	V _{DS} = 50V, V _{GS} = 0V	-	-	1	μA	
Gate - Source leakage current	I _{GSS}	V _{GS} = ±8V, V _{DS} = 0V	-	-	±10	μA	
Gate threshold voltage	V _{GS(th)}	V _{DS} = 10V, I _D = 1mA	0.3	-	1.0	V	
Gate threshold voltage temperature coefficient	$\frac{\Delta V_{GS(th)}}{\Delta T_j}$	I _D = 1mA referenced to 25°C	-	-1.4	-	mV/°C	
		V _{GS} = 4.5V, I _D = 200mA	-	1.6	2.2		
		V _{GS} = 2.5V, I _D = 200mA	-	1.7	2.4		
Static drain - source on - state resistance	R _{DS(on)} *4	V _{GS} = 1.8V, I _D = 100mA	-	1.9	2.7	Ω	
		V _{GS} = 1.5V, I _D = 40mA	-	2.0	4.0		
		V _{GS} = 1.2V, I _D = 20mA	-	2.4	7.2		
Forward Transfer Admittance	Y _{fs} *4	V _{DS} = 10V, I _D = 200mA	0.4	-	-	S	

*1 Pw \leq 10µs, Duty cycle \leq 1%

- *2 Mounted on a ceramic board (7.0×5.0×0.8mm)
- *3 Mounted on a FR4 (20.0×12.0×0.8mm,Cu pad : 0.8mm²)
- *4 Pulsed



• Electrical characteristics ($T_a = 25^{\circ}C$)

Parameter	Sumbol	Conditions	Values			Unit
Parameter	Symbol	Conditions	Min.	Тур.	Max.	Unit
Input capacitance	C _{iss}	V _{GS} = 0V	-	25	-	
Output capacitance	C _{oss}	V _{DS} = 10V	-	6	-	pF
Reverse transfer capacitance	C _{rss}	f = 1MHz	-	3	-	
Turn - on delay time	$t_{d(on)}^{*4}$	$V_{DD} \simeq 30V, V_{GS}$ = 4.5V	-	4	-	
Rise time	t _r *4	I _D = 100mA	-	6	-	20
Turn - off delay time	$t_{d(off)}^{*4}$	$R_L \simeq 300 \Omega$	-	15	-	ns
Fall time	t _f *4	R _G = 10Ω	-	55	-	

•Body diode electrical characteristics (Source-Drain) (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
	Symbol	Conditions	Min.	Тур.	Max.	Unit
Continuous forward current	۱ _s	$T = 25^{\circ}$	-	-	150	mA
Pulse forward current	I_{SP}^{*1}	T _a = 25°C	-	-	800	mA
Forward voltage	V_{SD}^{*4}	V _{GS} = 0V, I _S = 200mA	-	-	1.2	V



120

100

80

60

40

20

0

0

Power Dissipation :P_D/P_D max. [%]

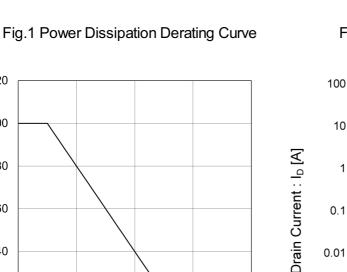


Fig.2 Maximum Safe Operating Area

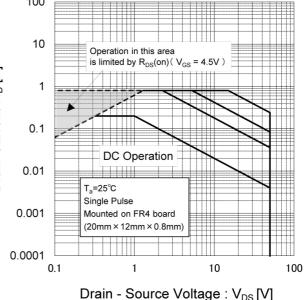


Fig.3 Normalized Transient Thermal Resistance vs. Pulse Width

100

Junction Temperature : T_i [°C]

150

200

Peak Transient Power : P(W)

4/11

50

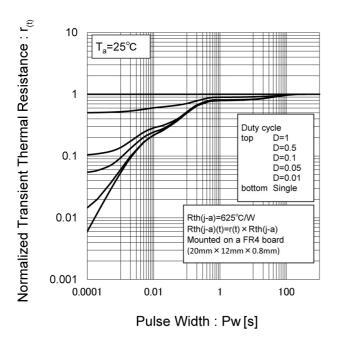
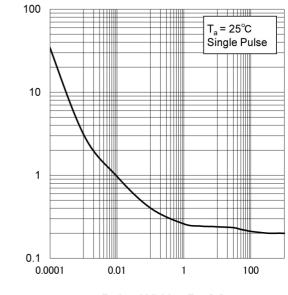


Fig.4 Single Pulse Maximum Power dissipation



Pulse Width : Pw[s]



Ta=25°C

Pulsed

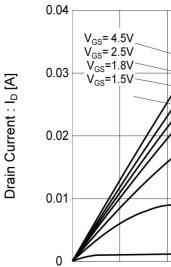
 V_{GS} = 1.2V

V_{GS}= 1.0V

V_{GS}= 0.8V

0.8

1



0

0.2

Fig.5 Typical Output Characteristics(I)

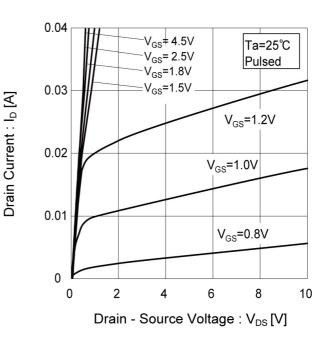


Fig.6 Typical Output Characteristics(II)



0.4

0.6

Drain - Source Voltage : V_{DS} [V]

Junction Temperature

Drain-Source Breakdown Voltage : V_{(BR)DSS} [V]

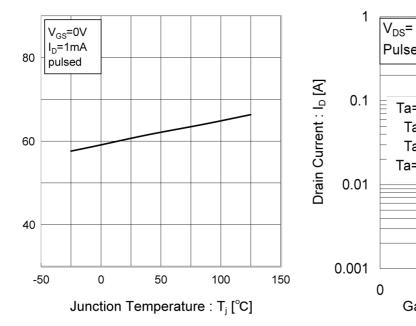
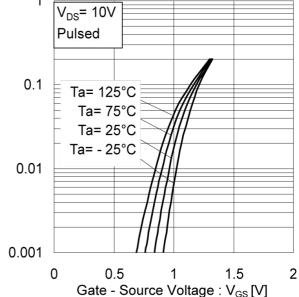


Fig.8 Typical Transfer Characteristics





• Electrical characteristic curves

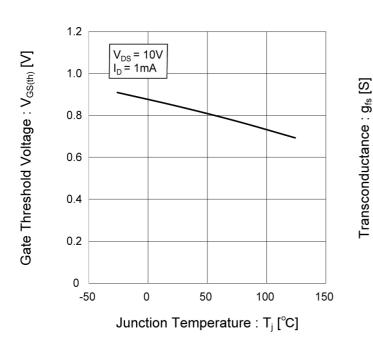
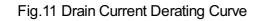
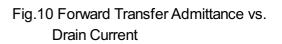


Fig.9 Gate Threshold Voltage vs. Junction Temperature





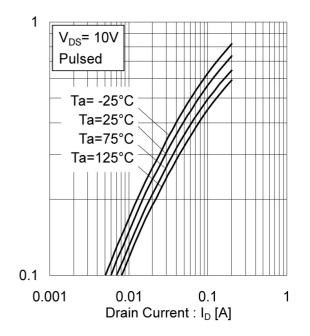
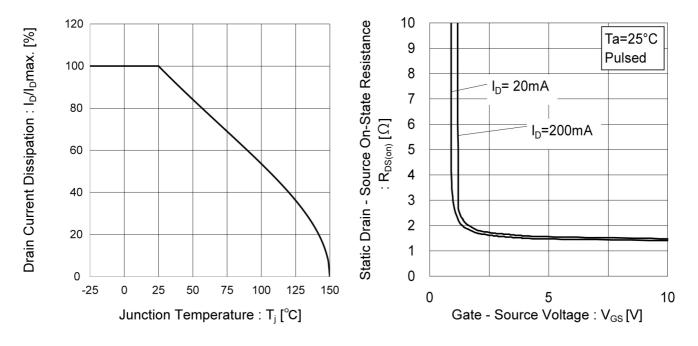


Fig.12 Static Drain - Source On - State Resistance vs. Gate Source Voltage





Electrical characteristic curves

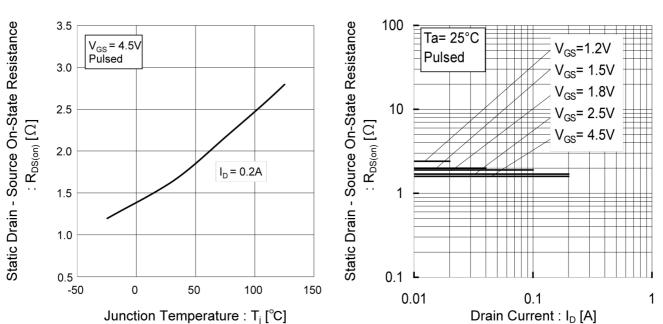


Fig.13 Static Drain - Source On - State Resistance vs. Junction Temperature Fig.14 Static Drain - Source On - State Resistance vs. Drain Current (I)

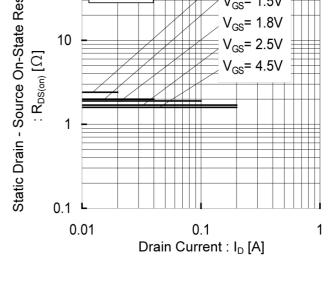
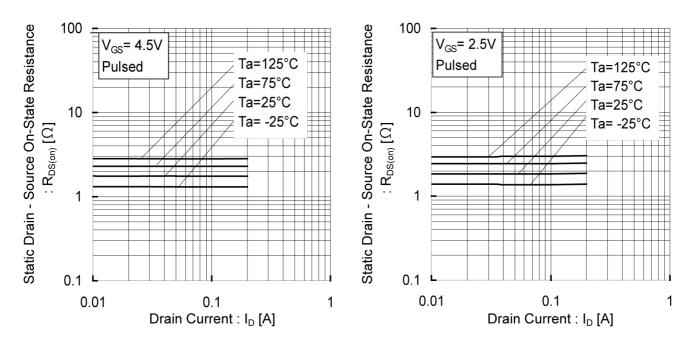


Fig.15 Static Drain - Source On - State Resistance vs. Drain Current (II) Fig.16 Static Drain - Source On - State Resistance vs. Drain Current (III)





• Electrical characteristic curves

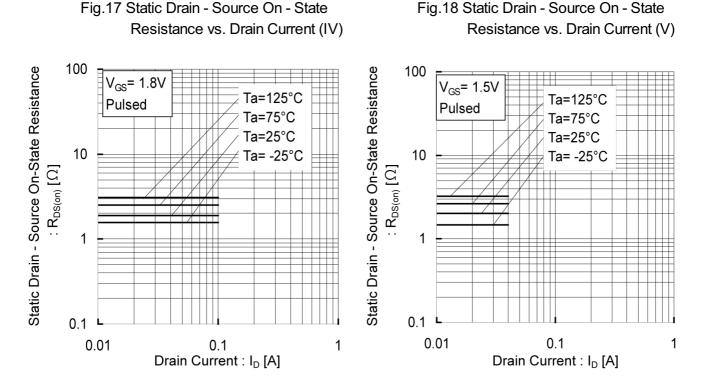


Fig.19 Static Drain - Source On - State Resistance vs. Drain Current (VI)

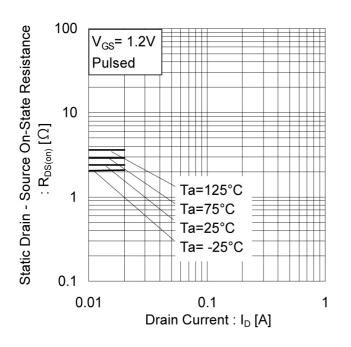
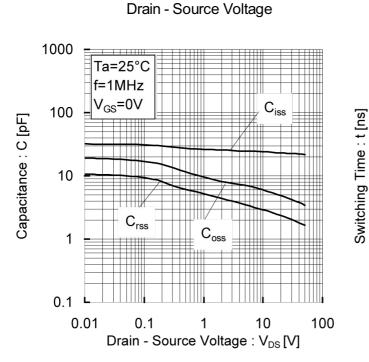
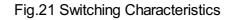






Fig.20 Typical Capacitance vs.





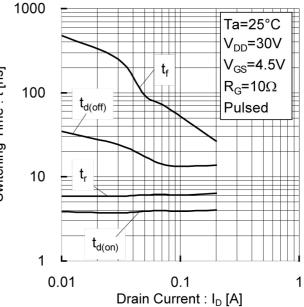
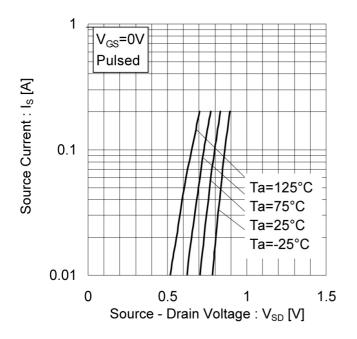
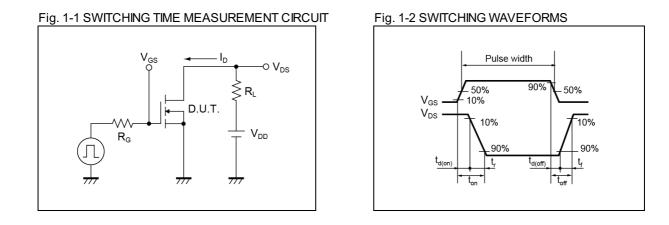


Fig.22 Source Current vs. Source Drain Voltage





Measurement circuits



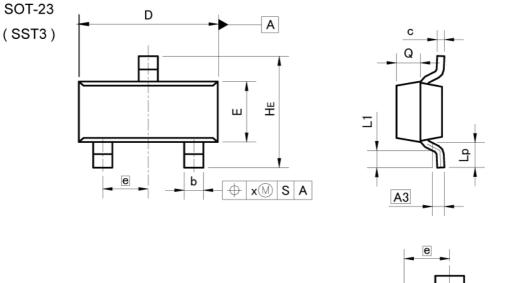
Notice

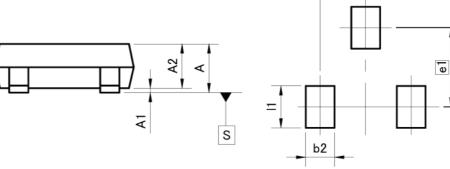
1. This product might cause chip aging and breakdown under the large electrified environment. Please consider to design ESD protection circuit.





Dimensions





Pattern of terminal position areas [Not a pattern of soldering pads]

I

۱

DIM	MILIMETERS		INC	HES	
DIM	MIN	MAX	MIN	MAX	
А	0.90	1.20	0.035	0.047	
A1	0.00	0.10	0.000	0.004	
A2	0.85	1.15	0.033	0.045	
A3	0.1	25	0.0	10	
b	0.35	0.50	0.014	0.020	
С	0.09	0.25	0.004	0.010	
D	2.70	3.10	0.106	0.122	
E	1.20	1.50	0.047	0.059	
е	0.	95		.037	
HE	2.20	2.60	0.087	0.102	
L1	0.20	-	0.008	-	
Lp	0.30	-	0.012	-	
Q	0.40	0.60	0.016	0.024	
х	-	0.10	-	0.004	
	MILIM	ETERS	INC	HES	

DIM	MILIMETERS		INC	HES
DIN	MIN	MAX	MIN	MAX
b2	-	0.60	-	0.024
e1	1.70		0.0	67
1	-	0.90	-	0.035

Dimension in mm/inches





Notice

Precaution on using ROHM Products

1. If you intend to use our Products in devices requiring extremely high reliability (such as medical equipment ^(Note 1), aircraft/spacecraft, nuclear power controllers, etc.) and whose malfunction or failure may cause loss of human life, bodily injury or serious damage to property ("Specific Applications"), please consult with the ROHM sales representative in advance. Unless otherwise agreed in writing by ROHM in advance, ROHM shall not be in any way responsible or liable for any damages, expenses or losses incurred by you or third parties arising from the use of any ROHM's Products for Specific Applications.

JAPAN	USA	EU	CHINA
CLASSI	CLASSⅢ	CLASS II b	CLASSII
CLASSⅣ	CLASSI	CLASSⅢ	CLASSII

2. ROHM designs and manufactures its Products subject to strict quality control system. However, semiconductor products can fail or malfunction at a certain rate. Please be sure to implement, at your own responsibilities, adequate safety measures including but not limited to fail-safe design against the physical injury, damage to any property, which a failure or malfunction of our Products may cause. The following are examples of safety measures:

[a] Installation of protection circuits or other protective devices to improve system safety

[b] Installation of redundant circuits to reduce the impact of single or multiple circuit failure

- 3. Our Products are not designed under any special or extraordinary environments or conditions, as exemplified below. Accordingly, ROHM shall not be in any way responsible or liable for any damages, expenses or losses arising from the use of any ROHM's Products under any special or extraordinary environments or conditions. If you intend to use our Products under any special or extraordinary environments or conditions (as exemplified below), your independent verification and confirmation of product performance, reliability, etc, prior to use, must be necessary:
 - [a] Use of our Products in any types of liquid, including water, oils, chemicals, and organic solvents
 - [b] Use of our Products outdoors or in places where the Products are exposed to direct sunlight or dust
 - [c] Use of our Products in places where the Products are exposed to sea wind or corrosive gases, including Cl₂, H₂S, NH₃, SO₂, and NO₂
 - [d] Use of our Products in places where the Products are exposed to static electricity or electromagnetic waves
 - [e] Use of our Products in proximity to heat-producing components, plastic cords, or other flammable items
 - [f] Sealing or coating our Products with resin or other coating materials
 - [g] Use of our Products without cleaning residue of flux (even if you use no-clean type fluxes, cleaning residue of flux is recommended); or Washing our Products by using water or water-soluble cleaning agents for cleaning residue after soldering
 - [h] Use of the Products in places subject to dew condensation
- 4. The Products are not subject to radiation-proof design.
- 5. Please verify and confirm characteristics of the final or mounted products in using the Products.
- 6. In particular, if a transient load (a large amount of load applied in a short period of time, such as pulse. is applied, confirmation of performance characteristics after on-board mounting is strongly recommended. Avoid applying power exceeding normal rated power; exceeding the power rating under steady-state loading condition may negatively affect product performance and reliability.
- 7. De-rate Power Dissipation depending on ambient temperature. When used in sealed area, confirm that it is the use in the range that does not exceed the maximum junction temperature.
- 8. Confirm that operation temperature is within the specified range described in the product specification.
- 9. ROHM shall not be in any way responsible or liable for failure induced under deviant condition from what is defined in this document.

Precaution for Mounting / Circuit board design

- 1. When a highly active halogenous (chlorine, bromine, etc.) flux is used, the residue of flux may negatively affect product performance and reliability.
- 2. In principle, the reflow soldering method must be used on a surface-mount products, the flow soldering method must be used on a through hole mount products. If the flow soldering method is preferred on a surface-mount products, please consult with the ROHM representative in advance.

For details, please refer to ROHM Mounting specification

Precautions Regarding Application Examples and External Circuits

- 1. If change is made to the constant of an external circuit, please allow a sufficient margin considering variations of the characteristics of the Products and external components, including transient characteristics, as well as static characteristics.
- 2. You agree that application notes, reference designs, and associated data and information contained in this document are presented only as guidance for Products use. Therefore, in case you use such information, you are solely responsible for it and you must exercise your own independent verification and judgment in the use of such information contained in this document. ROHM shall not be in any way responsible or liable for any damages, expenses or losses incurred by you or third parties arising from the use of such information.

Precaution for Electrostatic

This Product is electrostatic sensitive product, which may be damaged due to electrostatic discharge. Please take proper caution in your manufacturing process and storage so that voltage exceeding the Products maximum rating will not be applied to Products. Please take special care under dry condition (e.g. Grounding of human body / equipment / solder iron, isolation from charged objects, setting of lonizer, friction prevention and temperature / humidity control).

Precaution for Storage / Transportation

- 1. Product performance and soldered connections may deteriorate if the Products are stored in the places where:
 - [a] the Products are exposed to sea winds or corrosive gases, including Cl2, H2S, NH3, SO2, and NO2
 - [b] the temperature or humidity exceeds those recommended by ROHM
 - [c] the Products are exposed to direct sunshine or condensation
 - [d] the Products are exposed to high Electrostatic
- 2. Even under ROHM recommended storage condition, solderability of products out of recommended storage time period may be degraded. It is strongly recommended to confirm solderability before using Products of which storage time is exceeding the recommended storage time period.
- 3. Store / transport cartons in the correct direction, which is indicated on a carton with a symbol. Otherwise bent leads may occur due to excessive stress applied when dropping of a carton.
- 4. Use Products within the specified time after opening a humidity barrier bag. Baking is required before using Products of which storage time is exceeding the recommended storage time period.

Precaution for Product Label

A two-dimensional barcode printed on ROHM Products label is for ROHM's internal use only.

Precaution for Disposition

When disposing Products please dispose them properly using an authorized industry waste company.

Precaution for Foreign Exchange and Foreign Trade act

Since concerned goods might be fallen under listed items of export control prescribed by Foreign exchange and Foreign trade act, please consult with ROHM in case of export.

Precaution Regarding Intellectual Property Rights

- 1. All information and data including but not limited to application example contained in this document is for reference only. ROHM does not warrant that foregoing information or data will not infringe any intellectual property rights or any other rights of any third party regarding such information or data.
- 2. ROHM shall not have any obligations where the claims, actions or demands arising from the combination of the Products with other articles such as components, circuits, systems or external equipment (including software).
- 3. No license, expressly or implied, is granted hereby under any intellectual property rights or other rights of ROHM or any third parties with respect to the Products or the information contained in this document. Provided, however, that ROHM will not assert its intellectual property rights or other rights against you or your customers to the extent necessary to manufacture or sell products containing the Products, subject to the terms and conditions herein.

Other Precaution

- 1. This document may not be reprinted or reproduced, in whole or in part, without prior written consent of ROHM.
- 2. The Products may not be disassembled, converted, modified, reproduced or otherwise changed without prior written consent of ROHM.
- 3. In no event shall you use in any way whatsoever the Products and the related technical information contained in the Products or this document for any military purposes, including but not limited to, the development of mass-destruction weapons.
- 4. The proper names of companies or products described in this document are trademarks or registered trademarks of ROHM, its affiliated companies or third parties.