Voltage Detector IC Series

Low Voltage Free Delay Time Setting CMOS Voltage Detector IC Series

BU42xx series BU43xx series

●General Description

ROHM CMOS reset IC series with adjustable output delay is a high-accuracy low current consumption reset IC series with a built-in delay circuit. The lineup was established with two output types (Nch open drain and CMOS output) and detection voltages range from 0.9V to 4.8V in increments of 0.1V, so that the series may be selected according to the application at hand.

●Features

- Free delay time setting by external capacitor
- Two output types (Nch open drain and CMOS output)
- Ultra-low current consumption
- Wide operating temperature range
- Very small and low height package
- Package SSOP5 and SOP4 is similar to SOT-23-5 and SC-82 respectively (JEDEC)

●Key Specifications

- Detection voltage: 0.9V to 4.8V (Typ.) 0.1V steps
- High accuracy detection voltage: ±1.0%
- Ultra-low current consumption: 0.55μA (Typ.)
- Operating temperature range: -40°C to +125°C

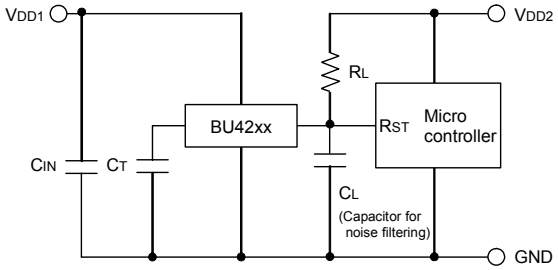
●Package

SSOP5: 2.90mm x 2.80mm x 1.15mm
SOP4: 2.00mm x 2.10mm x 0.95mm
VSOF5: 1.60mm x 1.60mm x 0.60mm

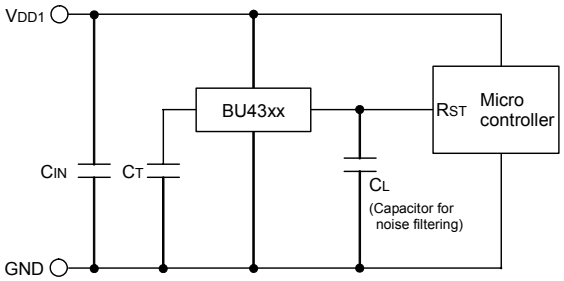
●Applications

All electronic devices that use micro controllers and logic circuits

●Typical Application Circuit



Open Drain Output type
BU42xx series

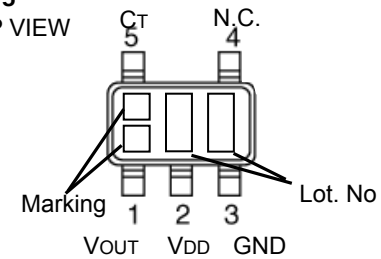


CMOS Output type
BU43xx series

●Connection Diagram & Pin Descriptions

SSOP5

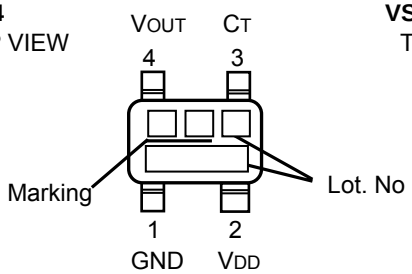
TOP VIEW



PIN No.	Symbol	Function
1	VOUT	Reset output
2	VDD	Power supply voltage
3	GND	GND
4	N.C.	Unconnected terminal
5	CT	Capacitor connection terminal for output delay time

SOP4

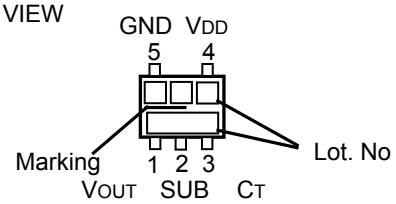
TOP VIEW



PIN No.	Symbol	Function
1	GND	GND
2	VDD	Power supply voltage
3	CT	Capacitor connection terminal for output delay time
4	VOUT	Reset output

VSOF5

TOP VIEW



PIN No.	Symbol	Function
1	VOUT	Reset output
2	SUB	Substrate*
3	CT	Capacitor connection terminal for output delay time
4	VDD	Power supply voltage
5	GND	GND

*Connect the substrate to VDD

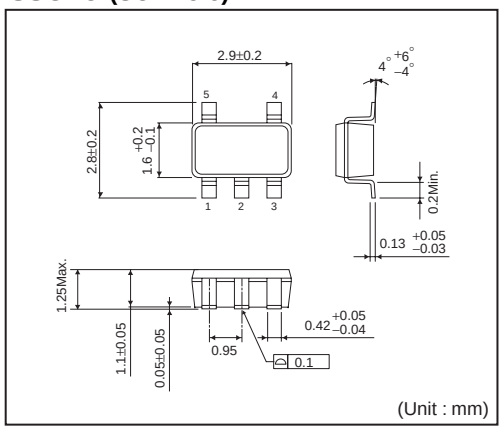
○Product structure：Silicon monolithic integrated circuit ○This product is not designed protection against radioactive rays.

●**Ordering Information**

B	U	x	x	x	x	x	−	T	R

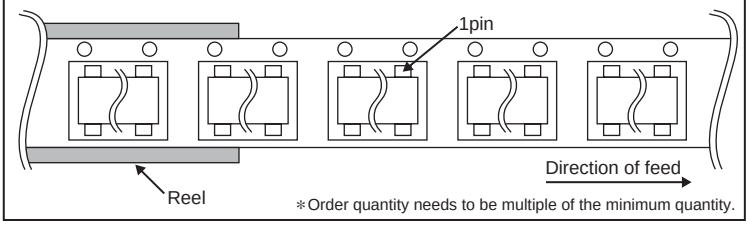
Part Number	Output Type 42 : Open Drain 43 : CMOS	Reset Voltage Value 09 : 0.9V ⇩ 0.1V step 48 : 4.8V	Package G : SSOP5 F : SOP4 FVE : VSOF5	Packageing and forming specification TR : Embossed tape and reel

SSOP5 (SOT-23-5)



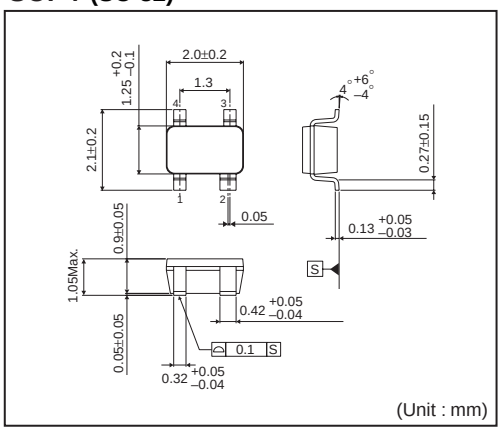
<Tape and Reel information>

Tape	Embossed carrier tape
Quantity	3000pcs
Direction of feed	TR (The direction is the 1pin of product is at the upper right when you hold reel on the left hand and you pull out the tape on the right hand)

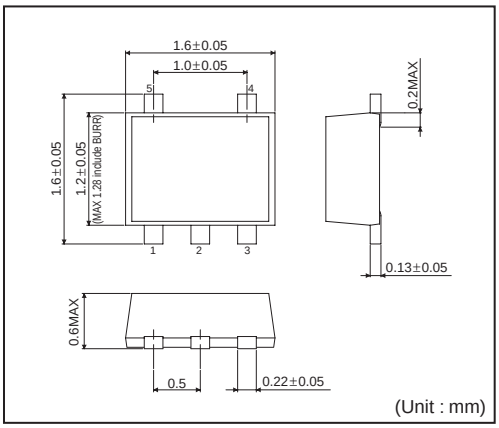


∗Order quantity needs to be multiple of the minimum quantity.

SOP4 (SC-82)



VSOF5



●**Lineup**

Making	Detection voltage	Part Number	Making	Detection voltage	Part Number	Making	Detection voltage	Part Number	Making	Detection voltage	Part Number
ZR	4.8V	BU4248	YV	2.8V	BU4228	1H	4.8V	BU4348	0M	2.8V	BU4328
ZQ	4.7V	BU4247	YU	2.7V	BU4227	1G	4.7V	BU4347	0L	2.7V	BU4327
ZP	4.6V	BU4246	YT	2.6V	BU4226	1F	4.6V	BU4346	0K	2.6V	BU4326
ZN	4.5V	BU4245	YS	2.5V	BU4225	1E	4.5V	BU4345	0J	2.5V	BU4325
ZM	4.4V	BU4244	YR	2.4V	BU4224	1D	4.4V	BU4344	0H	2.4V	BU4324
ZL	4.3V	BU4243	YQ	2.3V	BU4223	1C	4.3V	BU4343	0G	2.3V	BU4323
ZK	4.2V	BU4242	YP	2.2V	BU4222	1B	4.2V	BU4342	0F	2.2V	BU4322
ZJ	4.1V	BU4241	YN	2.1V	BU4221	1A	4.1V	BU4341	0E	2.1V	BU4321
ZH	4.0V	BU4240	YM	2.0V	BU4220	0Z	4.0V	BU4340	0D	2.0V	BU4320
ZG	3.9V	BU4239	YL	1.9V	BU4219	0Y	3.9V	BU4339	0C	1.9V	BU4319
ZF	3.8V	BU4238	YK	1.8V	BU4218	0X	3.8V	BU4338	0B	1.8V	BU4318
ZE	3.7V	BU4237	YJ	1.7V	BU4217	0W	3.7V	BU4337	0A	1.7V	BU4317
ZD	3.6V	BU4236	YH	1.6V	BU4216	0V	3.6V	BU4336	ZZ	1.6V	BU4316
ZC	3.5V	BU4235	YG	1.5V	BU4215	0U	3.5V	BU4335	ZY	1.5V	BU4315
ZB	3.4V	BU4234	YF	1.4V	BU4214	0T	3.4V	BU4334	ZX	1.4V	BU4314
ZA	3.3V	BU4233	YE	1.3V	BU4213	0S	3.3V	BU4333	ZW	1.3V	BU4313
YZ	3.2V	BU4232	YD	1.2V	BU4212	0R	3.2V	BU4332	ZV	1.2V	BU4312
YY	3.1V	BU4231	YC	1.1V	BU4211	0Q	3.1V	BU4331	ZU	1.1V	BU4311
YX	3.0V	BU4230	YB	1.0V	BU4210	0P	3.0V	BU4330	ZT	1.0V	BU4310
YW	2.9V	BU4229	YA	0.9V	BU4209	0N	2.9V	BU4329	ZS	0.9V	BU4309

●Absolute Maximum Ratings (Ta=25°C)

Parameter		Symbol	Limit	Unit
Power Supply Voltage		V_{DD}	-0.3 to +7	V
Output Voltage	Nch Open Drain Output	V_{OUT}	GND-0.3 to +7	V
	CMOS Output		GND-0.3 to V_{DD}+0.3	
Power Dissipation	SSOP5(SOT-23-5) *1*4	Pd	540	mW
	SOP4(SC-82) *2*4		400	
	VSOF5 *3*4		210	
Operation Temperature Range		Topt	-40 to +125	°C
Ambient Storage Temperature		Tstg	-55 to +125	°C

*1 When used at temperatures higher than Ta=25°C, the power is reduced by 5.4mW per 1°C above 25°C.
*2 When used at temperatures higher than Ta=25°C, the power is reduced by 4.0mW per 1°C above 25°C.
*3 When used at temperatures higher than Ta=25°C, the power is reduced by 2.1mW per 1°C above 25°C.
*4 When a ROHM standard circuit board (70mm×70mm×1.6mm, glass epoxy board)is mounted.

●Electrical Characteristics (Unless Otherwise Specified Ta=-25 to 125°C)

Parameter	Symbol	Condition		Limit Min.	Limit Typ.	Limit Max.	Unit
Detection Voltage	V_{DET}	V_{DD}=H→L, Ta=25°C, R_L=470kΩ		V_{DET}(T) ×0.99	V_{DET}(T)	V_{DET}(T) ×1.01	V
Circuit Current when ON	$I_{DD}1$	V_{DD}=V_{DET}-0.2V	V_{DET} =0.9 to 1.3V	-	0.15	0.88	μA
			V_{DET} =1.4 TO 2.1V	-	0.20	1.05	
			V_{DET} =2.2 TO 2.7V	-	0.25	1.23	
			V_{DET} =2.8 to 3.3V	-	0.30	1.40	
			V_{DET} =3.4 to 4.2V	-	0.35	1.58	
			V_{DET} =4.3 to 4.8V	-	0.40	1.75	
Circuit Current when OFF	$I_{DD}2$	V_{DD}=V_{DET}+2.0V	V_{DET} =0.9 TO 1.3V	-	0.30	1.40	μA
			V_{DET} =1.4 TO 2.1V	-	0.35	1.58	
			V_{DET} =2.2 to 2.7V	-	0.40	1.75	
			V_{DET} =2.8 to 3.3V	-	0.45	1.93	
			V_{DET} =3.4 to 4.2V	-	0.50	2.10	
			V_{DET} =4.3 to 4.8V	-	0.55	2.28	
Operating Voltage Range	V_{OPL}	V_{OL}≤0.4V, Ta=25 to 125°C, R_L=470kΩ		0.70	-	-	V
		V_{OL}≤0.4V, Ta=-40 to 25°C, R_L=470kΩ		0.90	-	-	
'High' Output Current (Pch)	I_{OH}	V_{DS}=0.5V V_{DD}=6.0V V_{DET}=4.0 to 4.8V		2.0	4.0	-	mA
'Low' Output Current (Nch)	I_{OL}	V_{DS}=0.05V V_{DD}=0.85V		20	100	-	μA
		V_{DS}=0.5V V_{DD}=1.5V V_{DET}=1.7 to 4.8V		1.0	3.3	-	mA
		V_{DS}=0.5V V_{DD}=2.4V V_{DET}=2.7 to 4.8V		3.6	6.5	-	
Leak Current when OFF	I_{leak}	V_{DD}=V_{DS}=7V Ta=-40 to 85°C		-	0	0.1	μA
		V_{DD}=V_{DS}=7V Ta=85 to 125°C		-	0	1	
'High' Output Current (Pch)	I_{OH}	V_{DS}=0.5V V_{DD}=4.8V V_{DET}=0.9 to 3.9V		1.7	3.4	-	mA
		V_{DS}=0.5V V_{DD}=6.0V V_{DET}=4.0 to 4.8V		2.0	4.0	-	
CT pin Threshold Voltage	V_{CTH}	V_{DD}=V_{DET}×1.1, V_{DET}=0.9 to 2.5V Ta=25°C R_L=470kΩ		V_{DD} ×0.35	V_{DD} ×0.45	V_{DD} ×0.55	V
		V_{DD}=V_{DET}×1.1, V_{DET}=2.6 to 4.8V Ta=25°C R_L=470kΩ		V_{DD} ×0.40	V_{DD} ×0.50	V_{DD} ×0.60	
Output Delay Resistance	R_{CT}	V_{DD}=V_{DET}×1.1 V_{CT}=0.5V Ta=25°C *1		9	10	11	MΩ
CT pin Output Current	I_{CT}	V_{CT}=0.1V V_{DD}=0.85V		5	40	-	μA
		V_{CT}=0.5V V_{DD}=1.5V V_{DET}=1.7 to 4.8V		200	400	-	
Detection Voltage Temperature coefficient	$V_{DET}/\Delta T$	Ta=-40°C to 125°C		-	±30	-	ppm/°C
Hysteresis Voltage	ΔVDET	V_{DD}=L→H→L Ta=-40 to 125°C R_L=470kΩ	V_{DET}≤1.0V	V_{DET} ×0.03	V_{DET} ×0.05	V_{DET} ×0.08	V
			V_{DET}≥1.1V	V_{DET} ×0.03	V_{DET} ×0.05	V_{DET} ×0.07	

*1: Designed guarantee. (Outgoing inspection is not done all products.)
V_{DET}(T): Standard Detection Voltage(0.9V to 4.8V, 0.1V step)
R_L: Pull-up resistor to be connected between V_{OUT} and power supply.

●**Block Diagrams**

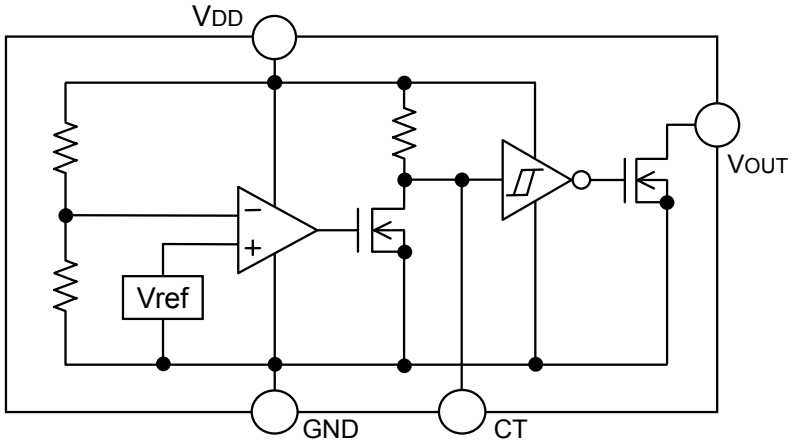


Fig.1 BU42xx Series

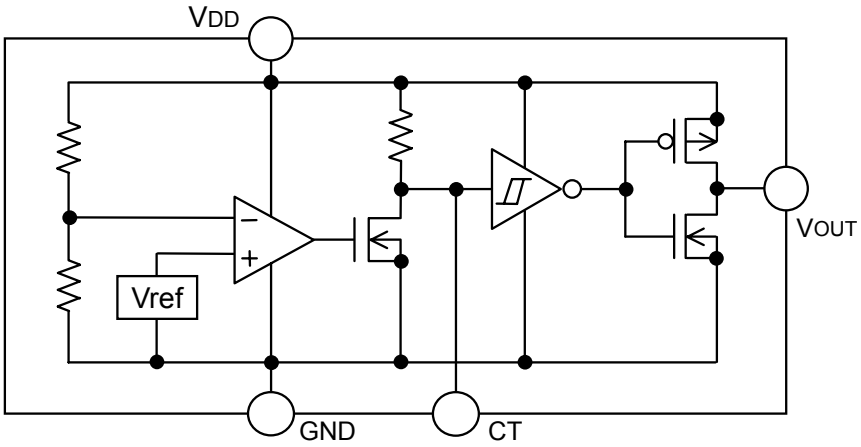


Fig.2 BU43xx Series

●**Typical Performance Curves**

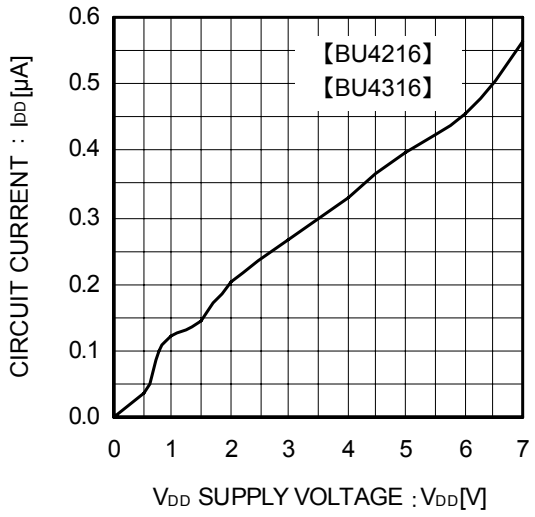


Fig.3 Circuit Current

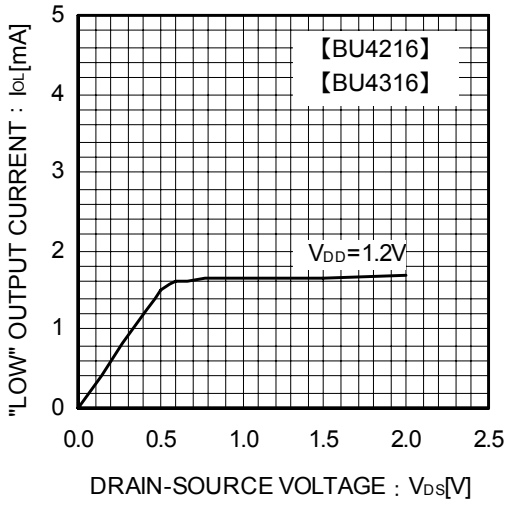


Fig.4 “LOW” Output Current

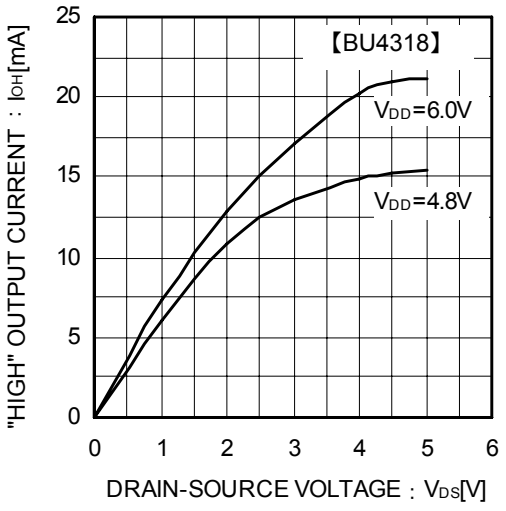


Fig.5 “High” Output Current

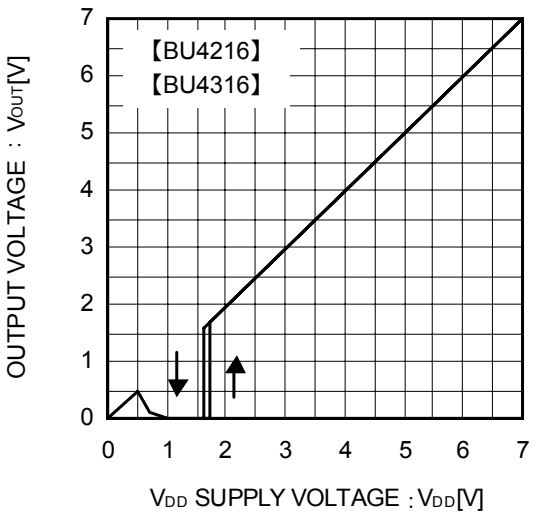


Fig.6 I/O Characteristics

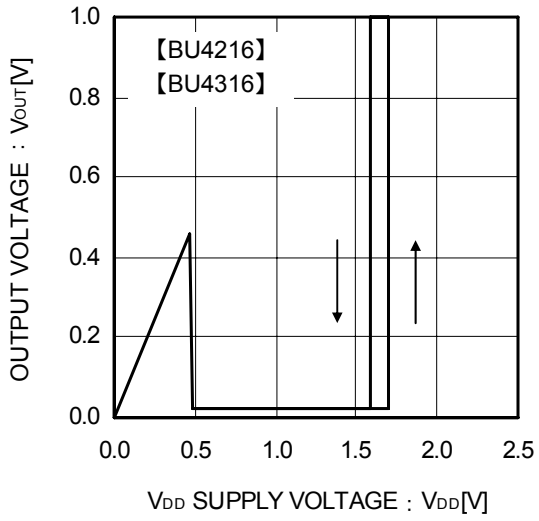


Fig.7 Operating Limit Voltage

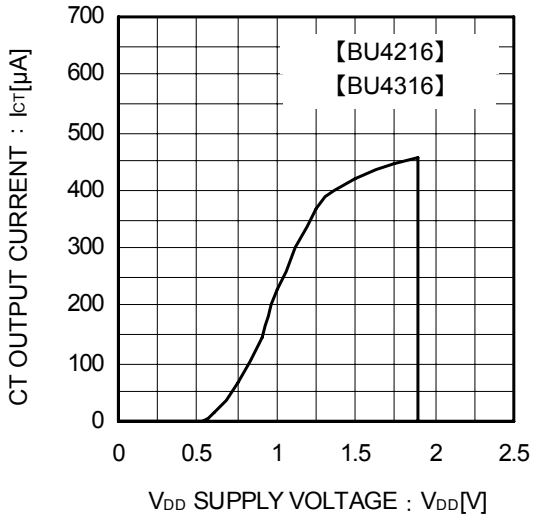


Fig.8 CT Terminal Current

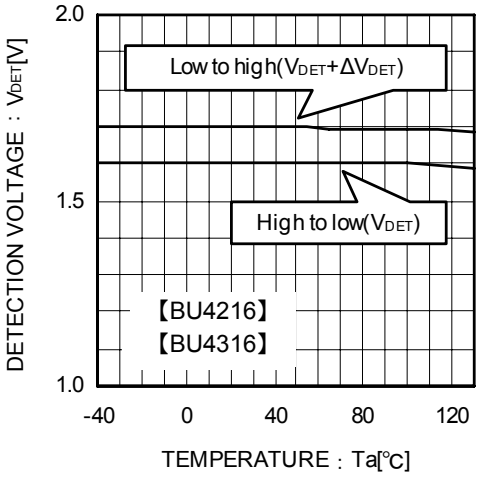


Fig.9 Detecting Voltage
Release Voltage

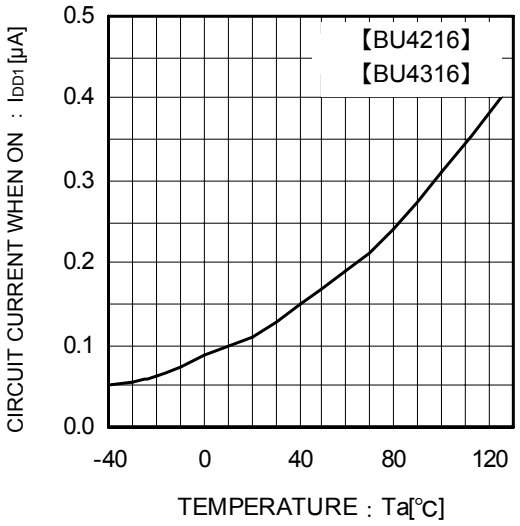


Fig.10 Circuit Current when ON

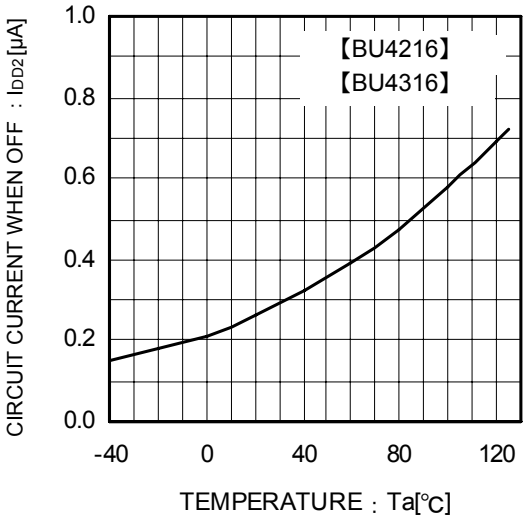


Fig.11 Circuit Current when OFF

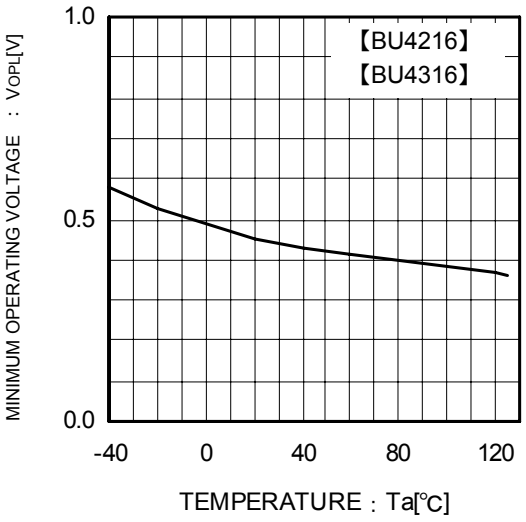


Fig.12 Operating Limit Voltage

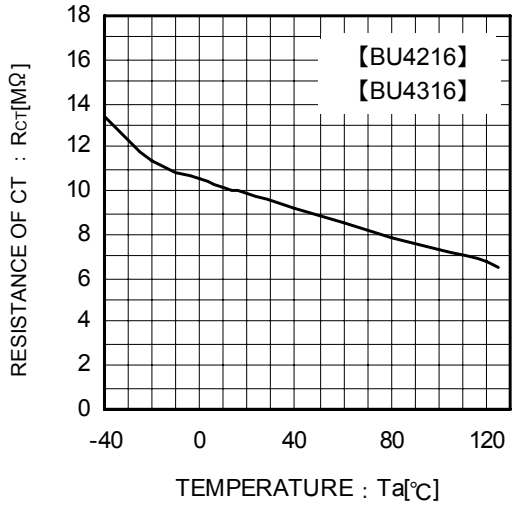


Fig.13 C_T Terminal Circuit Resistance

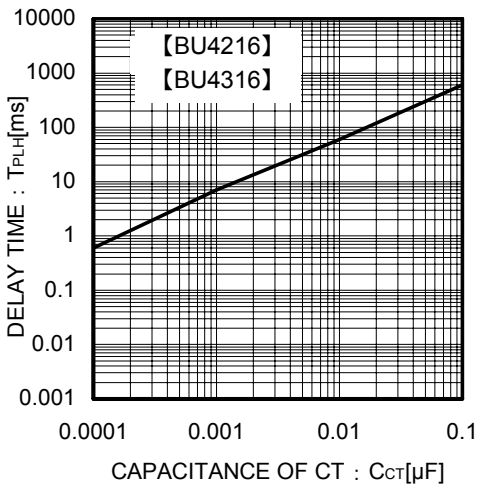


Fig.14 Delay Time (t_{PLH}) and C_T Terminal External Capacitance

●Application Information

Explanation of Operation

For both the open drain type(Fig.15)and the CMOS output type(Fig.16), the detection and release voltages are used as threshold voltages. When the voltage applied to the VDD pins reaches the applicable threshold voltage, the VOUT terminal voltage switches from either “High” to “Low” or from “Low” to “High”. BU42xx and BU43xx series have delay time function which set tPLH (Output “Low”→”High”) using an external capacitor (CCT). Because the BU42xx series uses an open drain output type, it is possible to connect a pull-up resistor to VDD or another power supply [The output “High” voltage (VOUT) in this case becomes VDD or the voltage of the other power supply].

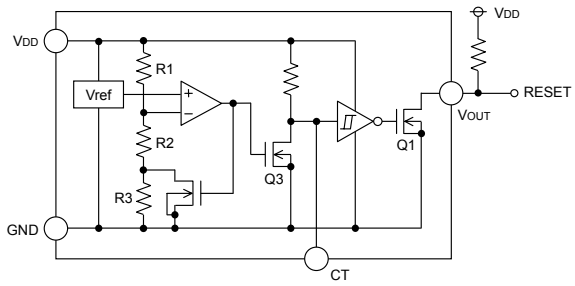


Fig.15 BU42xx type internal block diagram

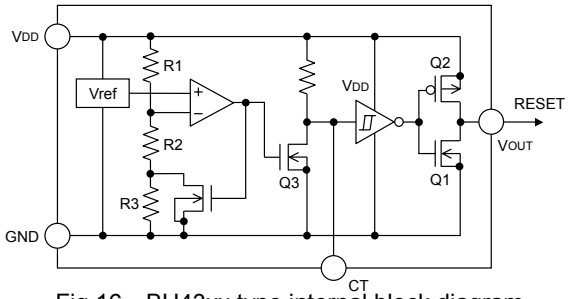


Fig.16 BU43xx type internal block diagram

Setting of Detector Delay Time

This detector IC can be set delay time at the rise of VDD by the capacitor connected to C_T terminal.

Delay time at the rise of VDD t_{PLH}:Time until when VOUT rise to 1/2 of VDD after VDD rise up and beyond the release voltage($V_{DET}+\Delta V_{DET}$)

$$T_{PLH}=-1\times C_{CT}\times R_{CT}\times \ln\left(\frac{V_{DD}-V_{CTH}}{V_{DD}}\right)$$

C_{CT}: C_T pin Externally Attached Capacitance
R_{CT}: C_T pin Internal Impedance(P.3 R_{CT} refer.)
V_{CTH}: C_T pin Threshold Voltage(P.3 VCTH refer.)
In: Natural Logarithm

Reference Data of Falling Time (t_{PHL}) Output

Examples of Falling Time (t_{PHL}) Output

Part Number	t_{PHL} [μs]
BU4245	275.7
BU4345	359.3

* This data is for reference only.
The figures will vary with the application, so please confirm actual operating conditions before use.

Timing Waveforms

Example: the following shows the relationship between the input voltage VDD, the C_T Terminal Voltage VCT and the output voltage VOUT when the input power supply voltage VDD is made to sweep up and sweep down (The circuits are those in Fig.15 and 16).

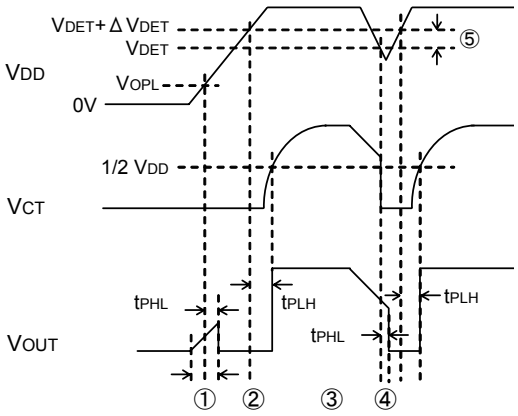


Fig.17 Timing Waveforms

① When the power supply is turned on, the output is unsettled from after over the operating limit voltage (VOPL) until tPHL. There fore it is possible that the reset signal is not outputted when the rise time of VDD is faster than tPHL.

② When VDD is greater than VOPL but less than the reset release voltage (VDET+ΔVDET), the CT terminal (VCT) and output (VOUT) voltages will switch to L.

③ If VDD exceeds the reset release voltage (VDET+VDET), then VOUT switches from L to H (with a delay to the CT terminal).

④ If VDD drops below the detection voltage (VDET) when the power supply is powered down or when there is a power supply fluctuation, VOUT switches to L (with a delay of tPHL).

⑤ The potential difference between the detection voltage and the release voltage is known as the hysteresis width (VDET). The system is designed such that the output does not flip-flop with power supply fluctuations within this hysteresis width, preventing malfunctions due to noise.

●**Circuit Applications**

1) Examples of a common power supply detection reset circuit

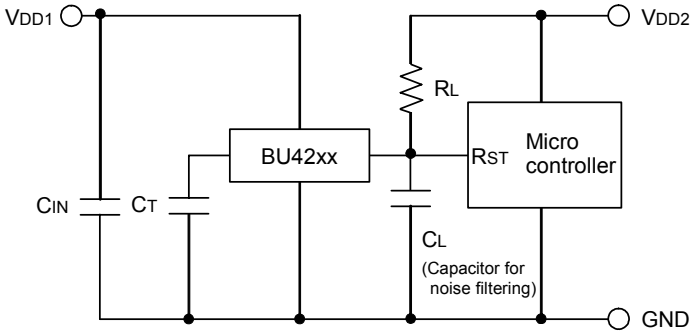


Fig.18 Open Drain Output type

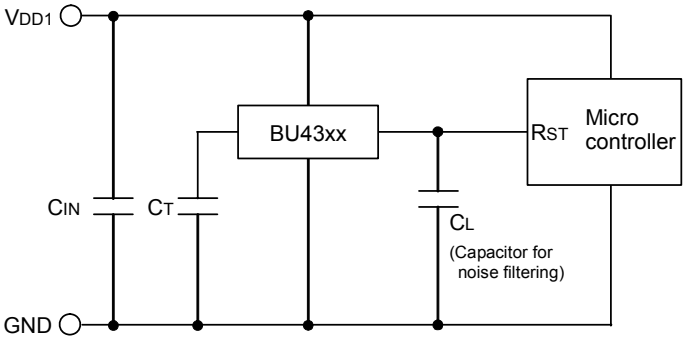


Fig.19 CMOS Output type

Application examples of BU42xx series (Open Drain output type) and BU43xx series (CMOS output type) are shown below.

CASE1:The power supply of the microcontroller ($V_{DD}2$) differs from the power supply of the reset detection ($V_{DD}1$).

Use the Open Drain Output Type (BU42xx series) attached a load resistance (R_L) between the output and V_{DD2}. (As shown Fig.18)

CASE2:The power supply of the microcontroller ($V_{DD}1$) is same as the power supply of the reset detection ($V_{DD}1$).

Use CMOS output type (BU43xx series) or Open Drain Output Type (BU42xx series) attached a load resistance (R_L) between the output and $V_{DD}1$. (As shown Fig.19)

When a capacitance C_L for noise filtering is connected to the V_{OUT} pin (the reset signal input terminal of the microcontroller), please take into account the waveform of the rise and fall of the output voltage (V_{OUT}).

2) Examples of the power supply with resistor dividers

In applications where the power supply input terminal (VDD) of an IC with resistor dividers, it is possible that a through current will momentarily flow into the circuit when the output logic switches, resulting in malfunctions (such as output oscillatory state).

(Through-current is a current that momentarily flows from the power supply (VDD) to ground (GND) when the output level switches from “High” to “Low” or vice versa.)

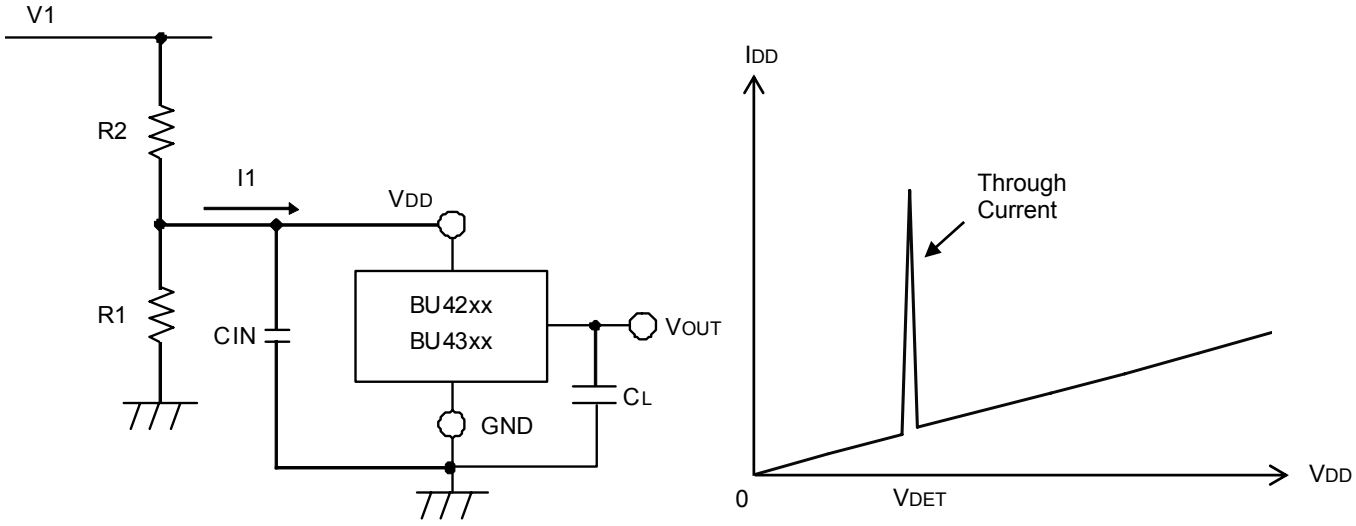


Fig.20

A voltage drop of [the through-current (I1)] × [input resistor (R2)] is caused by the through current, and the input voltage to descends, when the output switches from “Low” to “High”. When the input voltage decreases and falls below the detection voltage, the output voltage switches from “High” to “Low”. At this time, the through-current stops flowing through output “Low”, and the voltage drop is eliminated. As a result, the output switches from “Low” to “High”, which again causes the through current to flow and the voltage drop. This process is repeated, resulting in oscillation.

Consider the use of BD52xx when the power supply input it with resistor dividers.

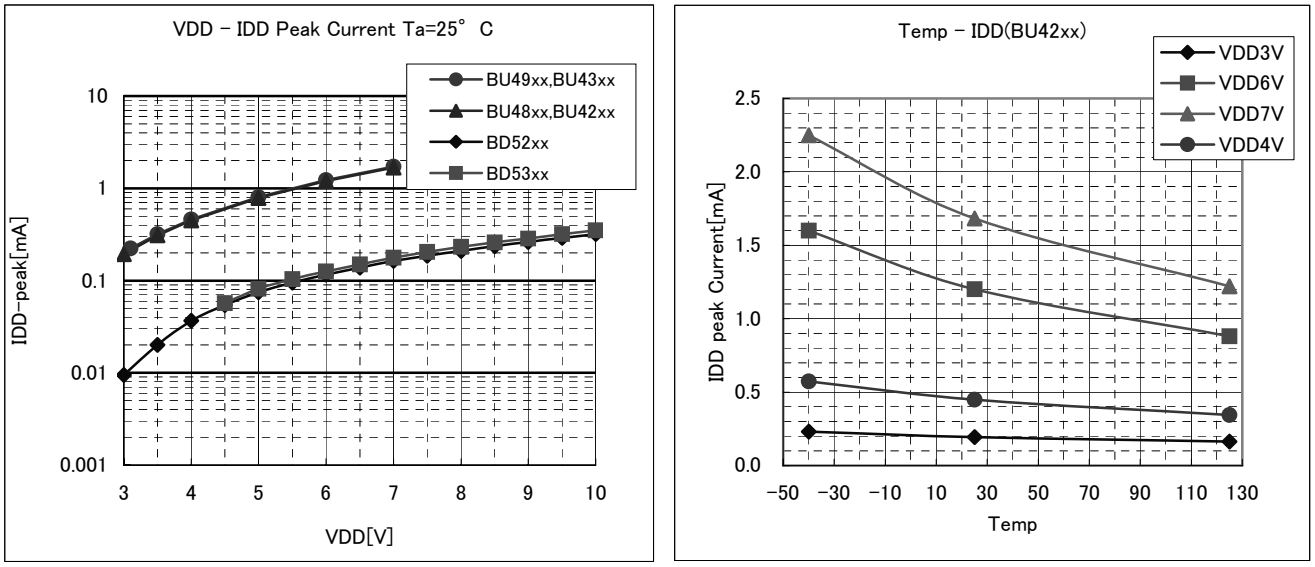


Fig.21 Current Consumption vs. Power Supply Voltage

* This data is for reference only.

The figures will vary with the application, so please confirm actual operating conditions before use.

●Operational Notes

1. Absolute Maximum Range
   Absolute Maximum Ratings are those values beyond which the life of a device may be destroyed. We cannot be defined the failure mode, such as short mode or open mode. Therefore a physical security countermeasure, like fuse, is to be given when a specific mode to be beyond absolute maximum ratings is considered.

2 . GND Potential
   GND terminal should be a lowest voltage potential every state.
   Please make sure all pins that are over ground even if include transient feature.

3 . Electrical Characteristics
   Be sure to check the electrical characteristics, that are one the tentative specification will be changed by temperature, supply voltage, and external circuit.

4 . Bypass Capacitor for Noise Rejection
   Please put into the to reject noise between V_{DD} pin and GND with 1uF over and between V_{OUT} pin and GND with 1000pF. If extremely big capacitor is used, transient response might be late. Please confirm sufficiently for the point.

5 . Short Circuit between Terminal and Soldering
   Don't short-circuit between Output pin and V_{DD} pin, Output pin and GND pin, or V_{DD} pin and GND pin. When soldering the IC on circuit board please is unusually cautious about the orientation and the position of the IC. When the orientation is mistaken the IC may be destroyed.

6 . Electromagnetic Field
   Mal-function may happen when the device is used in the strong electromagnetic field.

7 . The V_{DD} line inpedance might cause oscillation because of the detection current.

8 . A V_{DD} -GND capacitor (as close connection as possible) should be used in high V_{DD} line impedance condition.

9 . Lower than the mininum input voltage makes the V_{OUT} high impedance, and it must be V_{DD} in pull up (V_{DD}) condition.

10. Case of needless Delay time, recommended to insert more 470kΩ resister between V_{DD} and C_T.
   Recommended value of R_L Resistar is over 50kΩ (V_{DET}=1.5 to 4.8V),over 100kΩ (V_{DET}=0.9 to 1.4V).

11. This IC has extremely high impedance terminals. Small leak current due to the uncleanness of PCB surface might cause unexpected operations. Application values in these conditions should be selected carefully. If 10MΩ leakage is assumed between the C_T terminal and the GND terminal, 1MΩ connection between the C_T terminal and the V_{DD} terminal would be recommended. Also, if the leakage is assumed between the V_{OUT} terminal and the GND terminal, the pull up resistor should be less than 1/10 of the assumed leak resistance.
   The value of R_{CT} depends on the external resistor that is connected to C_T terminal, so please consider the delay time that is decided by $\tau \times R_{CT} \times C_{CT}$ changes.

12. Delay time (t_{PLH})
   $t_{PLH} = \tau \times R_{CT} \times C_{CT}$ (sec)
   τ: time constant
   R_{CT} : 10MΩ (typ.) (built-in resistor)
   C_{CT} : capacitor connected C_T pin.
   Recommended value of C_{CT} capacitor is over 100pF.

   The reference value
   $(\tau \times R_{CT}) \times 10^6$
   V_{DET} = 0.9 to 2.5V
   Ta = 25°C (min. = 5.1×10^6 typ.= 6.0×10^6 max = 6.9×10^6)
   Ta = -25 to 125°C (min. = 3.3×10^6 typ. = 6.0×10^6 max = 8.7×10^6)
   V_{DET} = 2.6 to 4.8V
   Ta = 25°C (min. = 5.9×10^6 typ.= 6.9×10^6 max = 7.9×10^6)
   Ta = -25 to 125°C (min. = 3.8×10^6 typ.= 6.9×10^6 max = 10.0×10^6)

13. External parameters
   The recommended parameter range for C_T is 100pF to 0.1μF. For R_L, the recommended range is 50kΩ to 1MΩ. There are many factors (board layout, etc) that can affect characteristics. Please verify and confirm using practical applications.

14. C_T pin discharge
   Due to the capabilities of the C_T pin discharge transistor, the C_T pin may not completely discharge when a short input pulse is applied, and in this case the delay time may not be controlled. Please verify the actual operation.

15. Power on reset operation
   Please note that the power on reset output varies with the V_{DD} rise up time. Please verify the actual operation.

16. Precautions for board inspection
    Connecting low-impedance capacitors to run inspections with the board may produce stress on the IC.
    Therefore, be certain to use proper discharge procedure before each process of the test operation.
    To prevent electrostatic accumulation and discharge in the assembly process, thoroughly ground yourself and any equipment that could sustain ESD damage, and continue observing ESD-prevention procedures in all handing, transfer and storage operations. Before attempting to connect components to the test setup, make certain that the power supply is OFF. Likewise, be sure the power supply is OFF before removing any component connected to the test setup.

17. When the power supply, is turned on because of in certain cases, momentary Rash-current flow into the IC at the logic unsettled, the couple capacitance, GND pattern of width and leading line must be considered.

Status of this document
The Japanese version of this document is formal specification. A customer may use this translation version only for a reference to help reading the formal version.
If there are any differences in translation version of this document formal version takes priority.

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   [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 Cl_2, H_2S, NH_3, SO_2, and NO_2
   [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 (Pd) depending on Ambient temperature (Ta). When used in sealed area, confirm the actual ambient 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; if flow soldering method is preferred, 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.

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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 Ionizer, friction prevention and temperature / humidity control).

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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.

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●Precaution for Disposition

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