Voltage Detector IC Series

Low Voltage Standard CMOS Voltage Detector ICs

BU48xx Series BU49xx Series

●General Description

ROHM standard CMOS reset IC series is a high-accuracy low current consumption reset IC series. The lineup was established with two output types (Nch open drain and CMOS output) and detection voltage 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

- Ultra-low voltage detection
- Ultra-low current consumption
- High accuracy detection
- Two output types (Nch open drain and CMOS output)
- Wide operating temperature range
- Very small and low height package

●Key Specifications

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

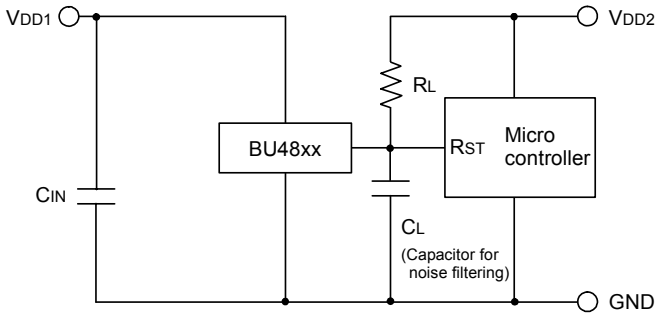
●Package

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

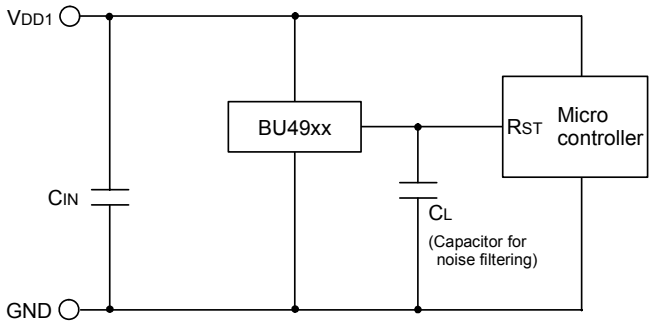
●Applications

All electronic devices that use micro controllers and logic circuits

●Typical Application Circuit



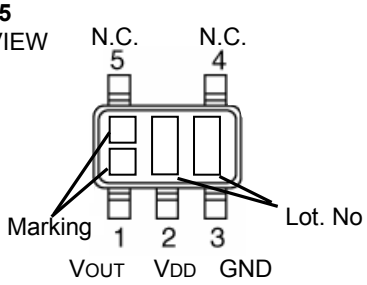
(Open Drain Output type)
BU48xx series



(CMOS Output type)
BU49xx series

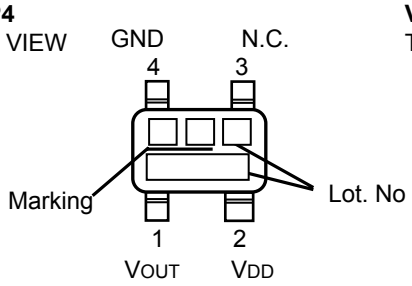
●Connection Diagram & Pin Descriptions

SSOP5
TOP VIEW



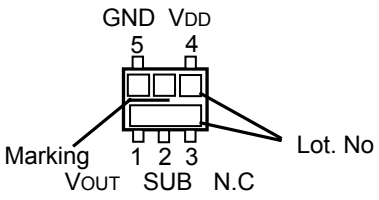
PIN No.	Symbol	Function
1	VOUT	Reset output
2	VDD	Power supply voltage
3	GND	GND
4	N.C.	Unconnected terminal
5	N.C.	Unconnected terminal

SOP4
TOP VIEW



PIN No.	Symbol	Function
1	VOUT	Reset output
2	VDD	Power supply voltage
3	N.C.	Unconnected terminal
4	GND	GND

VSOF5
TOP VIEW



PIN No.	Symbol	Function
1	VOUT	Reset output
2	SUB	Substrate*
3	N.C.	Unconnected terminal
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.

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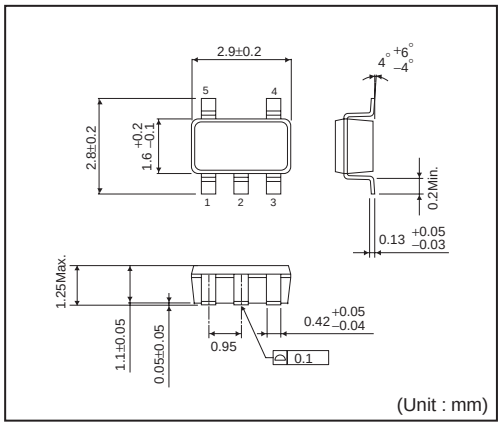
●Ordering Information

B	U	x	x	x	x	x	–	T	R

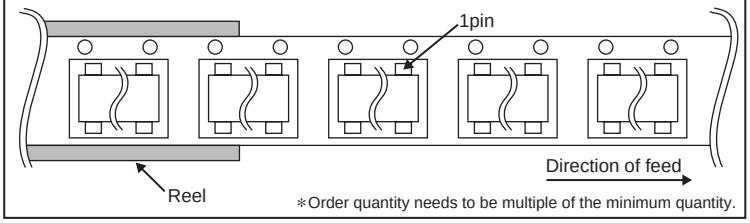
Part Number	Output Type 48 : Open Drain 49 : CMOS	Reset Voltage Value 09 : 0.9V ⇩ 0.1V step 48 : 4.8V	Package G : SSOP5 F : SOP4 FVE : VSOF5	Packageing and forming specification TR : Embossed tape and reel

SSOP5



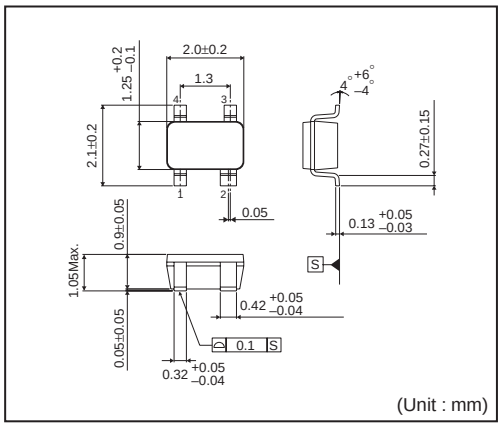
<Tape and Reel information>

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)

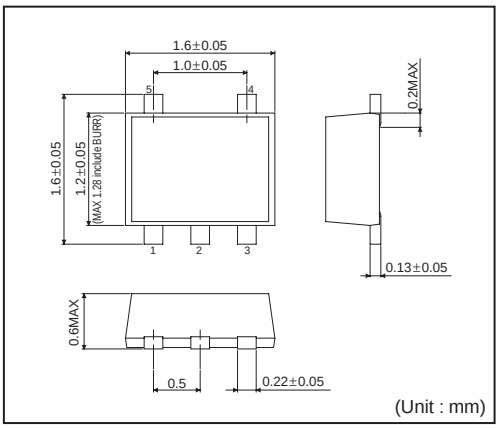


∗Order quantity needs to be multiple of the minimum quantity.

SOP4



VSOF5



●Lineup

Making	Detection voltage	Part Number	Making	Detection voltage	Part Number	Making	Detection voltage	Part Number	Making	Detection voltage	Part Number
JR	4.8V	BU4848	HV	2.8V	BU4828	LH	4.8V	BU4948	KM	2.8V	BU4928
JQ	4.7V	BU4847	HU	2.7V	BU4827	LG	4.7V	BU4947	KL	2.7V	BU4927
JP	4.6V	BU4846	HT	2.6V	BU4826	LF	4.6V	BU4946	KK	2.6V	BU4926
JN	4.5V	BU4845	HS	2.5V	BU4825	LE	4.5V	BU4945	KJ	2.5V	BU4925
JM	4.4V	BU4844	HR	2.4V	BU4824	LD	4.4V	BU4944	KH	2.4V	BU4924
JL	4.3V	BU4843	HQ	2.3V	BU4823	LC	4.3V	BU4943	KG	2.3V	BU4923
JK	4.2V	BU4842	HP	2.2V	BU4822	LB	4.2V	BU4942	KF	2.2V	BU4922
JJ	4.1V	BU4841	HN	2.1V	BU4821	LA	4.1V	BU4941	KE	2.1V	BU4921
JH	4.0V	BU4840	HM	2.0V	BU4820	KZ	4.0V	BU4940	KD	2.0V	BU4920
JG	3.9V	BU4839	HL	1.9V	BU4819	KY	3.9V	BU4939	KC	1.9V	BU4919
JF	3.8V	BU4838	HK	1.8V	BU4818	KX	3.8V	BU4938	KB	1.8V	BU4918
JE	3.7V	BU4837	HJ	1.7V	BU4817	KW	3.7V	BU4937	KA	1.7V	BU4917
JD	3.6V	BU4836	HH	1.6V	BU4816	KV	3.6V	BU4936	JZ	1.6V	BU4916
JO	3.5V	BU4835	HG	1.5V	BU4815	KU	3.5V	BU4935	JY	1.5V	BU4915
JB	3.4V	BU4834	HF	1.4V	BU4814	KT	3.4V	BU4934	JX	1.4V	BU4914
JA	3.3V	BU4833	HE	1.3V	BU4813	KS	3.3V	BU4933	JW	1.3V	BU4913
HZ	3.2V	BU4832	HD	1.2V	BU4812	KR	3.2V	BU4932	JV	1.2V	BU4912
HY	3.1V	BU4831	HC	1.1V	BU4811	KQ	3.1V	BU4931	JU	1.1V	BU4911
HX	3.0V	BU4830	HB	1.0V	BU4810	KP	3.0V	BU4930	JT	1.0V	BU4910
HW	2.9V	BU4829	HA	0.9V	BU4809	KN	2.9V	BU4929	JS	0.9V	BU4909

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●Absolute Maximum Ratings (Ta=25℃)

Parameter		Symbol	Limits	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 *1*4	Pd	540	mW
	SOP4 *2*4		400	
	VSOF5 *3*4		210	
Operation Temperature Range		T_{opt}	-40 to +125	℃
Ambient Storage Temperature		Tstg	-55 to +125	℃

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

●Electrical Characteristics

Parameter	Symbol	Condition		Limits Min.	Limits Typ.	Limits Max.	Unit
Detection Voltage	V_{DET}	V_{DD}=H→L , Ta=25℃ R_L=470kΩ	BU4848	4.752	4.800	4.848	V
			BU4847	4.653	4.700	4.747	
			BU4846	4.554	4.600	4.646	
			BU4845	4.455	4.500	4.545	
			BU4844	4.356	4.400	4.444	
			BU4843	4.257	4.300	4.343	
			BU4842	4.158	4.200	4.242	
			BU4841	4.059	4.100	4.141	
			BU4840	3.960	4.000	4.040	
			BU4839	3.861	3.900	3.939	
			BU4838	3.762	3.800	3.838	
			BU4837	3.663	3.700	3.737	
			BU4836	3.564	3.600	3.636	
			BU4835	3.465	3.500	3.535	
			BU4834	3.366	3.400	3.434	
			BU4833	3.267	3.300	3.333	
			BU4832	3.168	3.200	3.232	
			BU4831	3.069	3.100	3.131	
			BU4830	2.970	3.000	3.030	
			BU4829	2.871	2.900	2.929	
			BU4828	2.772	2.800	2.828	
			BU4827	2.673	2.700	2.727	
			BU4826	2.574	2.600	2.626	
			BU4825	2.475	2.500	2.525	
			BU4824	2.376	2.400	2.424	
			BU4823	2.277	2.300	2.323	
			BU4822	2.178	2.200	2.222	
			BU4821	2.079	2.100	2.121	
			BU4820	1.980	2.000	2.020	
			BU4819	1.881	1.900	1.919	
			BU4818	1.782	1.800	1.818	
			BU4817	1.683	1.700	1.717	
			BU4816	1.584	1.600	1.616	
			BU4815	1.485	1.500	1.515	
			BU4814	1.386	1.400	1.414	
			BU4813	1.287	1.300	1.313	
			BU4812	1.188	1.200	1.212	
			BU4811	1.089	1.100	1.111	
			BU4810	0.990	1.000	1.010	
			BU4809	0.891	0.900	0.909	
Detection Voltage Temperature Coefficient	$V_{DET}/\Delta T$	Ta=-40℃ to 125℃ *1		-	±30	-	ppm/℃
Hysteresis Voltage	ΔV_{DET}	V_{DD}=L→H→L Ta=-40℃ to 125℃ 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 on all products.)

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Unless Otherwise Specified Ta=-25 to 125℃

Parameter	Symbol	Condition		Limit			Unit
				Min.	Typ.	Max.	
Circuit Current when ON	$I_{DD}1$	$V_{DD}=V_{DET}-0.2V$	V_{DET}=0.9-1.3V	-	0.15	0.88	μA
			V_{DET}=1.4-2.1V	-	0.20	1.05	
			V_{DET}=2.2-2.7V	-	0.25	1.23	
			V_{DET}=2.8-3.3V	-	0.30	1.40	
			V_{DET}=3.4-4.2V	-	0.35	1.58	
			V_{DET}=4.3-4.8V	-	0.40	1.75	
Circuit Current when OFF	$I_{DD}2$	$V_{DD}=V_{DET}+2.0V$	V_{DET}=0.9-1.3V	-	0.30	1.40	μA
			V_{DET}=1.4-2.1V	-	0.35	1.58	
			V_{DET}=2.2-2.7V	-	0.40	1.75	
			V_{DET}=2.8-3.3V	-	0.45	1.93	
			V_{DET}=3.4-4.2V	-	0.50	2.10	
			V_{DET}=4.3-4.8V	-	0.55	2.28	
Operating Voltage Range	V_{OPL}	V_{OL}≤0.4V, Ta=25 to 125℃, R_L=470kΩ		0.70	-	-	V
		V_{OL}≤0.4V, Ta=-40 to 25℃, R_L=470kΩ		0.90	-	-	
‘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}=1.7-4.8V		1.0	3.3	-	mA
		V_{DS}=0.5V V_{DD}=2.4V V_{DET}=2.7-4.8V		4.0	7.2	-	
‘High’ Output Current (Pch) (only BU49xx)	I_{OH}	V_{DS}=0.5V V_{DD}=4.8V V_{DET}=0.9-3.9V		1.7	3.4	-	mA
		V_{DS}=0.5V V_{DD}=6.0V V_{DET}=4.0-4.8V		2.0	4.0	-	
Output Leak Current when OFF (only BU48xx)	I_{leak}	$V_{DD}=V_{DS}$=7V Ta=-40℃ to 85℃		-	0	0.1	μA
		$V_{DD}=V_{DS}$=7V Ta=85℃ to 125℃		-	0	1	

* This product is not designed for protection against radioactive rays.

●Block Diagrams

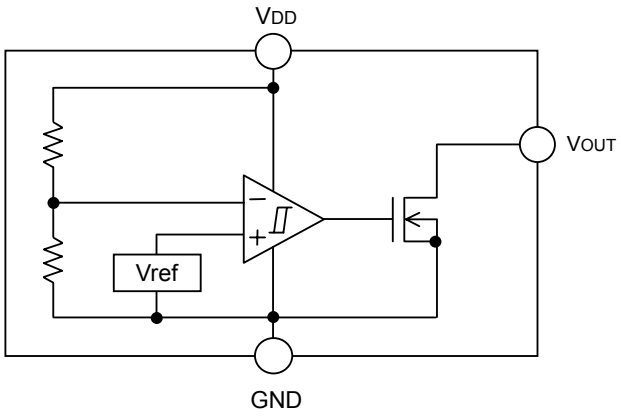

Fig.1 BU48xx Series

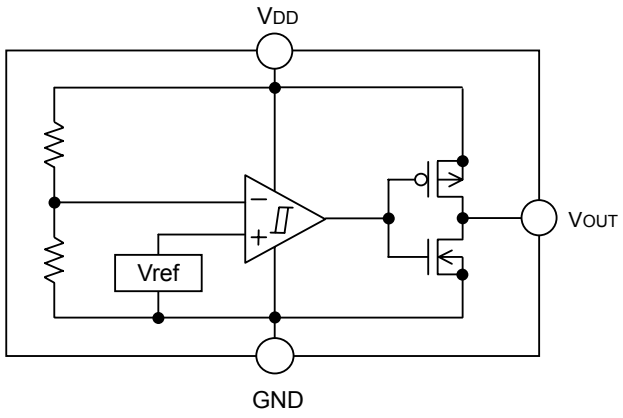

Fig.2 BU49xx Series

●Typical Performance Curves

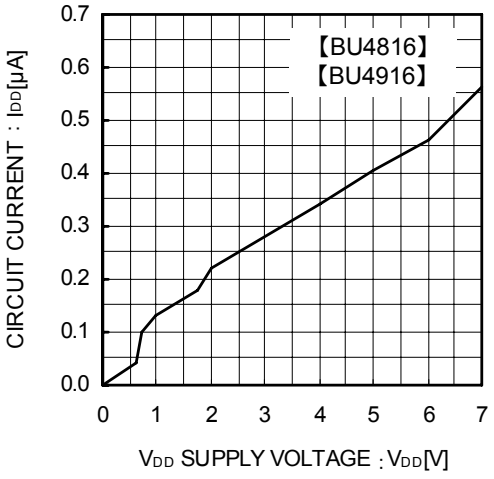

Fig.3 Circuit Current

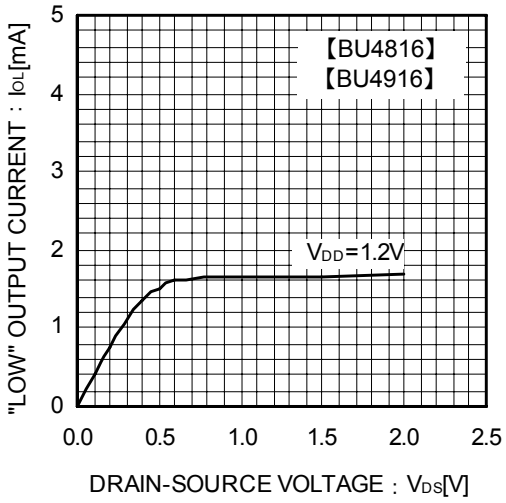

Fig.4 “LOW” Output Current

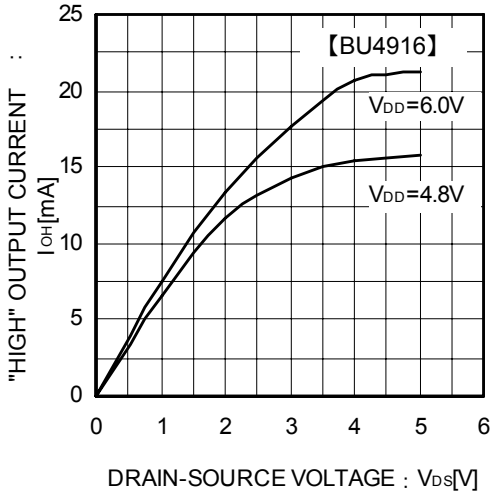

Fig.5 “High” Output Current

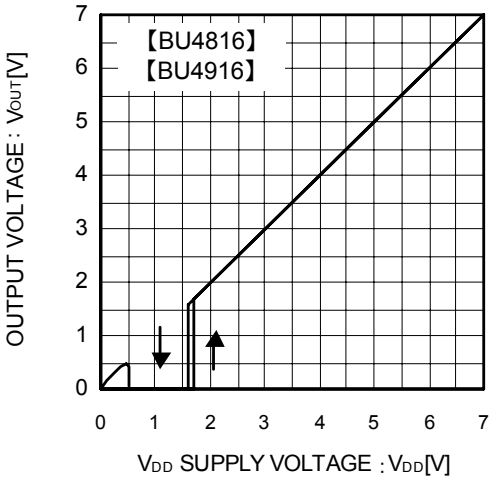

Fig.6 I/O Characteristics

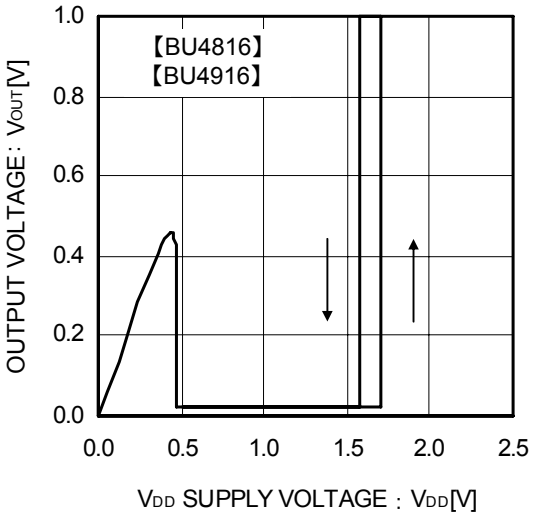

Fig.7 Operating Limit Voltage

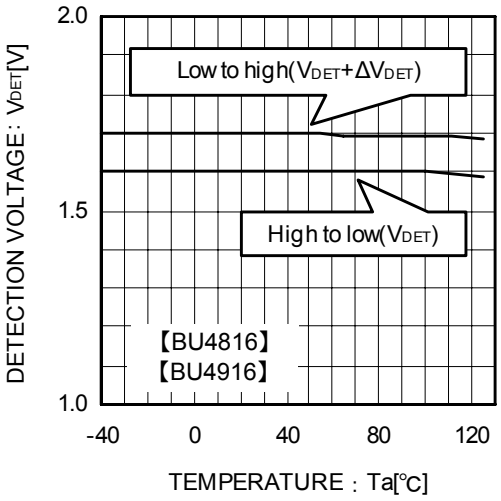

Fig.8 Detecting Voltage
Release Voltage

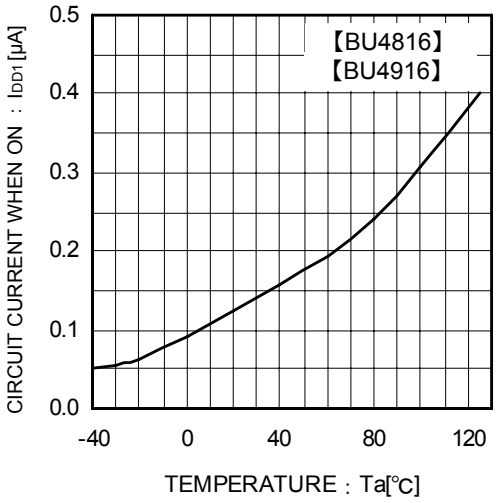

Fig.9 Circuit Current when ON

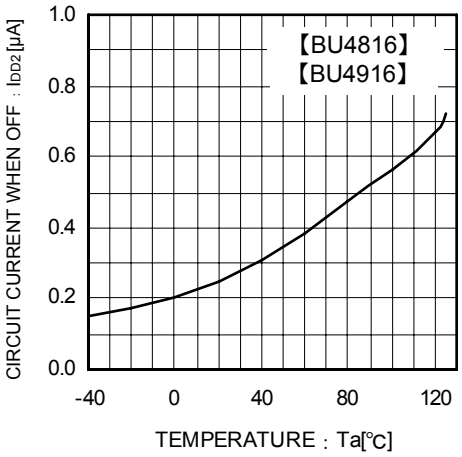

Fig.10 Circuit Current when OFF

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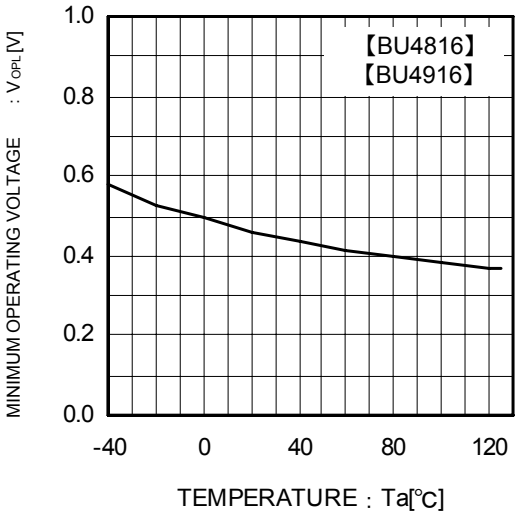

Fig.11 Operating Limit Voltage

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●Application Information

Explanation of Operation

For both the open drain type(Fig.12)and the CMOS output type(Fig.13), 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”. Because the BU48xx 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].

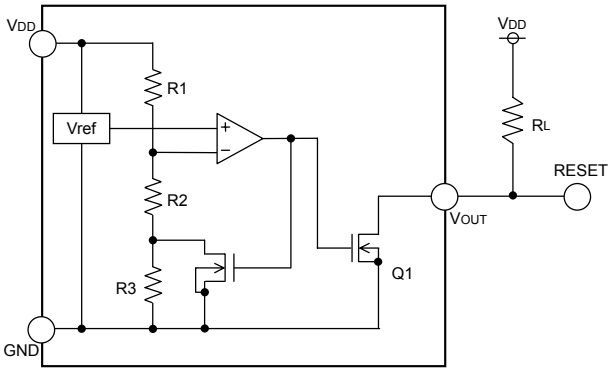

Fig.12 (BU48xx type internal block diagram)

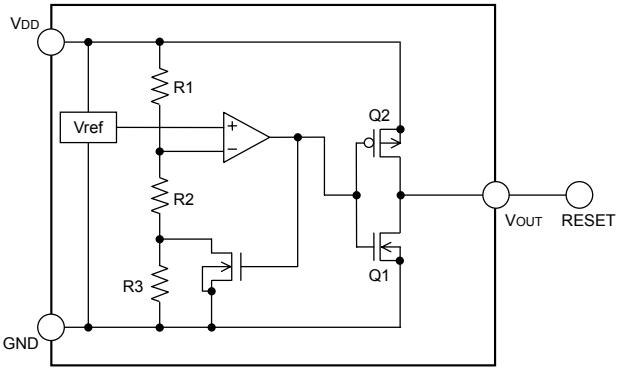

Fig.13 (BU49xx type internal block diagram)

Reference Data

Examples of Output rising value(tPLH)and Output falling value(tPHL)

Part Number	tPLH[μs]	tPHL[μs]
BU4845	23.3	275.9
BU4945	3.5	354.3
	VDD=4.3V→5.1V	VDD=5.1V→4.3V

* This data is for reference only.

This figure will vary with the application, so please confirm actual operation 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.12 and 13).

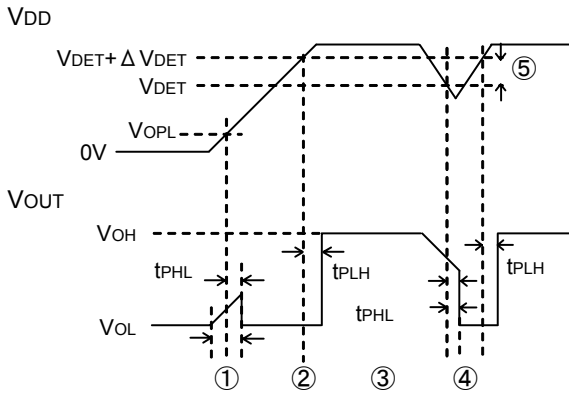

Fig.14 Timing Waveforms

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

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

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

④If 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).

⑤The potential deference 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.

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●**Circuit Applications**

Examples of a common power supply detection reset circuit

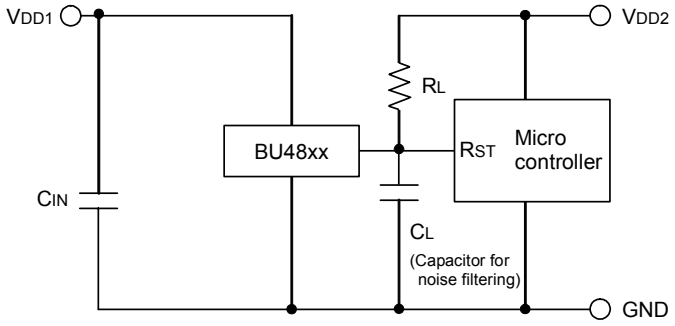

Fig.15 Open Drain Output type

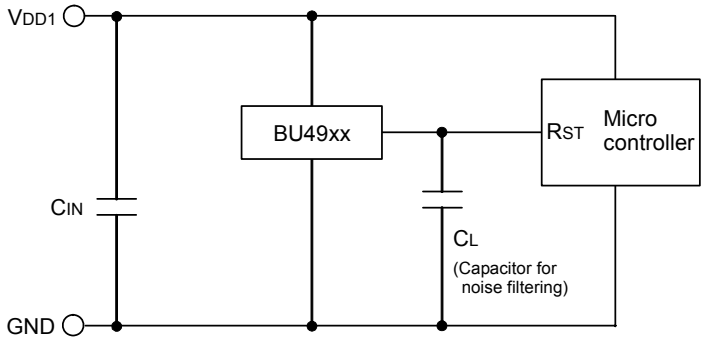

Fig.16 CMOS Output type

Application examples of BU48xx series
(Open Drain output type) and BU49xx 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 (BU48xx series)
attached a load resistance (R_L) between the output and $V_{DD}2$. (As shown Fig.15)

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 (BU48xx series) attached a load resistance (R_L) between the output and $V_{DD}1$.
(As shown Fig.16)

When a capacitance C_L for noise filtering or setting the output delay time 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}).

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●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 minimum input voltage makes the V_{OUT} high impedance, and it must be V_{DD} in pull up (V_{DD}) condition.

10. Recommended value of R_L Resistar is over 10kΩ (V_{DET}=1.5V 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 CT 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.

12. External parameters
For R_L, the recommended range is 10kΩ to 1MΩ. There are many factors (board layout, etc) that can affect characteristics. Please verify and confirm using practical applications.

13. 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.

14. 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.

15. When the power supply, is turned on because of incertain 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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Notice

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   [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 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.

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●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.

●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 Ionizer, 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

QR code 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 our Products might fall under controlled goods prescribed by the applicable foreign exchange and foreign trade act, please consult with ROHM representative in case of export.

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