

Structure                      Silicon Monolithic Integrated Circuit

Product Name                 Capacitive Sensor Switch Control IC

Product No.                    **BU21050FS**

Features                        8ch sensor input  
8ch PIO output, 4bit-binary output  
No software control is necessary  
Internal (CR) oscillation, integrated power-On reset  
Operating power supply voltage: 4.5 ~ 5.5V

○Absolute Maximum Ratings (Ta=25[°C])

Parameter	Symbol	Rating	Unit	Notes
Applied voltage	AVDD	-0.3~7.0	V	
	DVDD	-0.3~7.0	V	
Input voltage	V <sub>AIN</sub>	-0.3~AVDD + 0.3	V	
	V <sub>DIN</sub>	-0.3~DVDD + 0.3	V	
Storage temperature range	T <sub>stg</sub>	-55~125	°C	
Power dissipation	P <sub>d</sub>	760	mW	

(\*1) This is the power dissipation per IC unit. Reduce to 7.60 mW /°C when Ta = 25°C or above.

○Operating condition (Ta=25[°C])

Parameter	Symbol	Rating			Unit	Notes
		Min.	Typ.	Max.		
Applied voltage	AVDD*	4.5	5.0	5.5	V	
	DVDD*	4.5	5.0	5.5	V	
Operating temperature range	T <sub>opr</sub>	-40	25	85	°C	

This chip is not designed to protect itself against radioactive rays.

Status of this document

The Japanese version of this document is the 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.

Application example

- ROHM cannot provide adequate confirmation of patents.
- The product described in this specification is designed to be used with ordinary electronic equipment or devices (such as audio-visual equipment, office-automation equipment, communications devices, electrical appliances, and electronic toys).  
Should you intend to use this product with equipment or devices which require an extremely high level of reliability and the malfunction of which would directly endanger human life (such as medical instruments, transportation equipment, aerospace machinery, nuclear-reactor controllers, fuel controllers and other safety devices), please be sure to consult with our sales representative in advance.
- ROHM assumes no responsibility for use of any circuits described herein, conveys no license under any patent or other right, and makes no representations that the circuits are free from patent infringement.

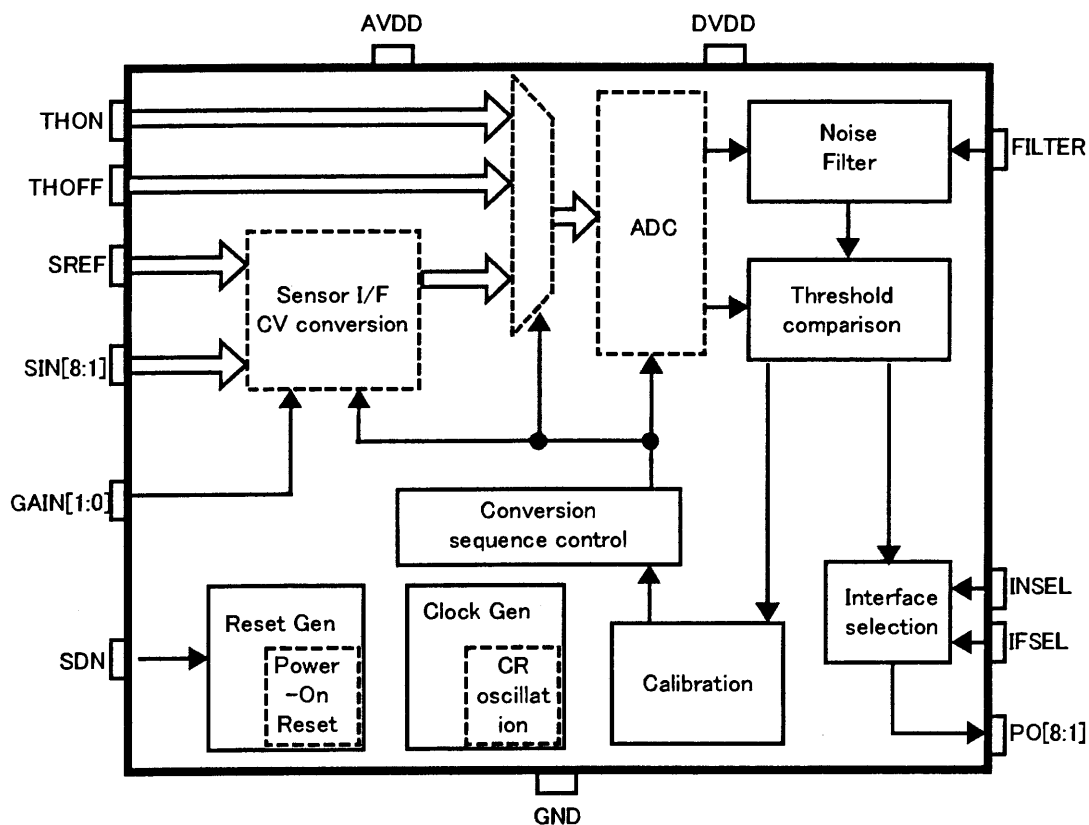
DESIGN <i>Kobayashi</i> Jan. 25.08	CHECK <i>Kobayashi</i> Jan. 25.08	APPROVAL <i>M. Noda</i> 25. Jan. 08	DATE: Jan./25/2008	SPECIFICATION No. : TSZ02201-BU21050FS-1-2
			REV. A	<b>ROHM CO., LTD.</b>

○Electrical characteristics (Unless otherwise noted Ta=25[°C],GND=0[V])

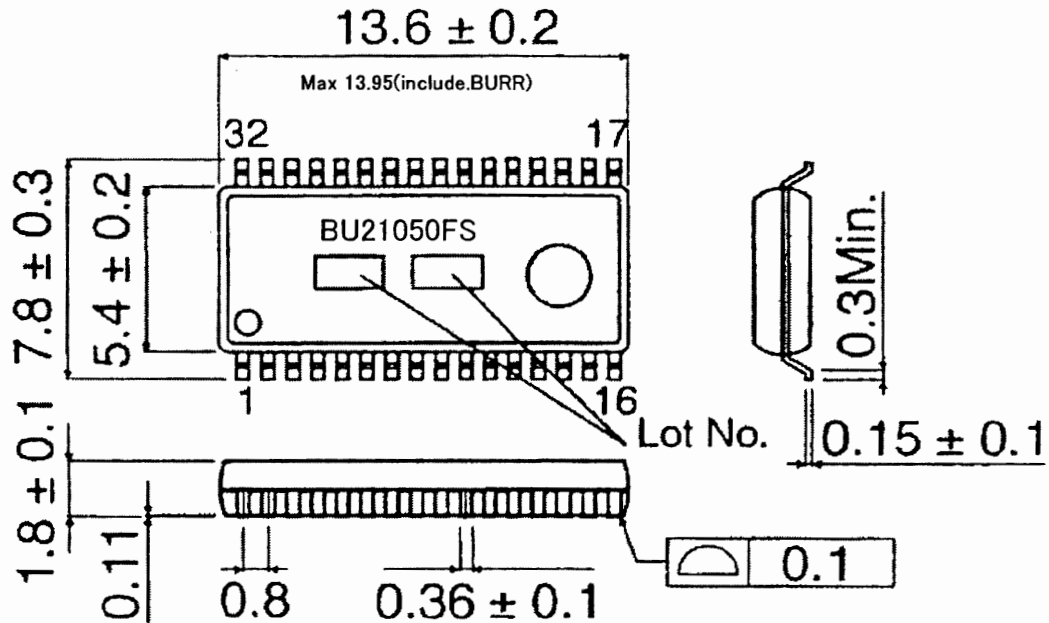
Parameter	Symbol	Rating			Unit	Notes
		Min.	Typ.	Max.		
DC characteristic						
H input voltage	$V_{IH0}$	DVDD x 0.9	-	DVDD + 0.2	V	
L input voltage	$V_{IL0}$	GND - 0.2	-	DVDD x 0.1	V	
H output voltage	$V_{OH0}$	DVDD x 0.8	-	DVDD	V	I <sub>OH</sub> =-2mA undershoot is excluded
L output voltage	$V_{OL}$	GND	-	DVDD x 0.2	V	I <sub>OH</sub> =2mA undershoot is excluded
Input leakage current	$I_{IZ}$	-1	-	1	μA	
Off leakage current	$I_{OZ}$	-	-	1	μA	
Standby current	$I_{ST}$	-	-	2	μA	Shutdown on (SDN = 'L')
Operation current	$I_{OD}$	-	550	-	μA	

\*T<sub>opr</sub> = 25[°C], AVDD = DVDD = 5[V], GND = 0

○Block diagram



○External measure and View



Package SSOP-A32 (Unit:mm)

○Pin description

Pin No.	Pin Name	Function	Pin No.	Pin Name	Function
1	SDN	Shutdown	17	IFSEL	Output interface selection
2	DVDD	Digital part power supply	18	INSEL	Simultaneous pushing detection
3	GND	Ground	19	GAIN [0]	Gain level selection
4	SREF	Sensor standard capacity	20	GAIN [1]	Gain level selection
5	SIN1	Sensor input 1	21	PO8	Sensor output 8
6	SIN2	Sensor input 2	22	PO7	Sensor output 7
7	SIN3	Sensor input 3	23	PO6	Sensor output 6
8	SIN4	Sensor input 4	24	PO5	Sensor output 5
9	SIN5	Sensor input 5	25	PO4	Sensor output 4 / Binary out [3]
10	SIN6	Sensor input 6	26	PO3	Sensor output 3 / Binary out [2]
11	SIN7	Sensor input 7	27	PO2	Sensor output 2 / Binary out [1]
12	SIN8	Sensor input 8	28	PO1	Sensor output 1 / Binary out [0]
13	THON	Sensor ON Threshold voltage	29	TST0	Digital part test pins [0]
14	THOFF	Sensor OFF Threshold voltage	30	TST1	Digital part test pins [1]
15	AVDD	Analog part power supply	31	TST2	Digital part test pins [2]
16	FILTER	Filter effect selection	32	TST3	Digital part test pins [3]

## ○Cautions on use

### (1) Absolute Maximum Ratings

An excess in the absolute maximum ratings, such as supply voltage, temperature range of operating conditions, etc., can break down devices, thus making impossible to identify breaking mode such as a short circuit or an open circuit. If any special mode exceeding the absolute maximum ratings is assumed, consideration should be given to take physical safety measures including the use of fuses, etc.

### (2) Operating conditions

These conditions represent a range within which characteristics can be provided approximately as expected. The electrical characteristics are guaranteed under the conditions of each parameter.

### (3) Reverse connection of power supply connector

The reverse connection of power supply connector can break down ICs. Take protective measures against the breakdown due to the reverse connection, such as mounting an external diode between the power supply and the IC's power supply terminal.

### (4) Power supply line

Design PCB pattern to provide low impedance for the wiring between the power supply and the GND lines. In this regard, for the digital block power supply and the analog block power supply, even though these power supplies has the same level of potential, separate the power supply pattern for the digital block from that for the analog block, thus suppressing the diffraction of digital noises to the analog block power supply resulting from impedance common to the wiring patterns. For the GND line, give consideration to design the patterns in a similar manner.

Furthermore, for all power supply terminals to ICs, mount a capacitor between the power supply and the GND terminal. At the same time, in order to use an electrolytic capacitor, thoroughly check to be sure the characteristics of the capacitor to be used present no problem including the occurrence of capacity dropout at a low temperature, thus determining the constant.

### (5) GND voltage

Make setting of the potential of the GND terminal so that it will be maintained at the minimum in any operating state. Furthermore, check to be sure no terminals are at a potential lower than the GND voltage including an actual electric transient.

### (6) Short circuit between terminals and erroneous mounting

In order to mount ICs on a set PCB, pay thorough attention to the direction and offset of the ICs. Erroneous mounting can break down the ICs. Furthermore, if a short circuit occurs due to foreign matters entering between terminals or between the terminal and the power supply or the GND terminal, the ICs can break down.

### (7) Operation in strong electromagnetic field

Be noted that using ICs in the strong electromagnetic field can malfunction them.

### (8) Inspection with set PCB

On the inspection with the set PCB, if a capacitor is connected to a low-impedance IC terminal, the IC can suffer stress. Therefore, be sure to discharge from the set PCB by each process. Furthermore, in order to mount or dismount the set PCB to/from the jig for the inspection process, be sure to turn OFF the power supply and then mount the set PCB to the jig. After the completion of the inspection, be sure to turn OFF the power supply and then dismount it from the jig. In addition, for protection against static electricity, establish a ground for the assembly process and pay thorough attention to the transportation and the storage of the set PCB.

### (9) Input terminals

In terms of the construction of IC, parasitic elements are inevitably formed in relation to potential. The operation of the parasitic element can cause interference with circuit operation, thus resulting in a malfunction and then breakdown of the input terminal. Therefore, pay thorough attention not to handle the input terminals, such as to apply to the input terminals a voltage lower than the GND respectively, so that any parasitic element will operate. Furthermore, do not apply a voltage to the input terminals when no power supply voltage is applied to the IC. In addition, even if the power supply voltage is applied, apply to the input terminals a voltage lower than the power supply voltage or within the guaranteed value of electrical characteristics.

### (10) Ground wiring pattern

If small-signal GND and large-current GND are provided. It will be recommended to separate the large-current GND pattern from the small-signal GND pattern and establish a single ground at the reference point of the set PCB so that resistance to the wiring pattern and voltage fluctuations due to a large current will cause no fluctuations in voltages of the small-signal GND. Pay attention not to cause fluctuations in the GND wiring pattern of external parts as well.

### (11) External capacitor

In order to use a ceramic capacitor as the external capacitor, determine the constant with consideration given to a degradation in the nominal capacitance due to DC bias and changes in the capacitance due to temperature, etc.

### (12) Rush current

The IC with some power supplies has a capable of rush current due to procedure and delay at power-on. Pay attention to the capacitance of the coupling condensers and the wiring pattern width and routing of the power supply and the GND lines.

### (13) Others

In case of use this LSI, please peruse some other detail documents, we called, Technical note, Functional description, Application note.