Serial-in / Parallel-out Driver Series

Serial-Parallel 3-input Driver

BA823F

No.09051EAT01

●Description

BA823F are an 8-bit serial-to-parallel-output driver, applicable for thermal printer heads or LED character display drivers.

●Features

1) Capable of driving a maximum of 200mA.
2) Non-driving current consumption can be reduced by controlling the strobe timing pulse.
3) Output data terminal can be used for a cascade configuration.
4) Digital ground and power ground are separated.
5) TTL and CMOS allow driving.

●Applications

Driver for thermal print head
Driver for LED character display

●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Power supply voltage		Vcc	7.0*1	V
Power dissipation	BA823F	Pd	500*3	mW
Input voltage		VIN MAX	+0.3 to +6.0	V
Operating temperature		Topr	-20 to +75	℃
Storage temperature		Tstg	-55 to +125	℃

*1 Voltage of $\overline{O}_0$~$\overline{O}_7$ terminals is 34V (Max.)
*2 Reduced by 5.5 mW/°C over 25°C.
*3 Reduced by 5.0 mW/°C over 25°C.

●Thermal derating curve

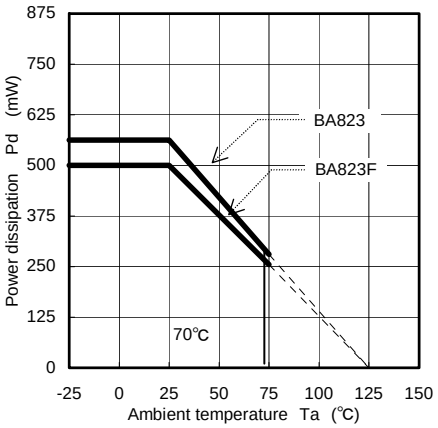


Fig.1

●**Electrical characteristics** (Unless otherwise specified, Ta=25℃,Vcc=+5.0V)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	Test Circuit
Power supply	V_{CC}	4.5	5.0	5.5	V	V_{CC} terminal	Fig.2
Current dissipation(no load)1	I_{O1}	-	4	6	mA	@All outputs = “0”	Fig.2
Current dissipation(no load)2	I_{O2}	-	8	11	mA	@All outputs = “0”	Fig.2
Input low level voltage	V_{IL}	-	-	0.8	V	-	Fig.2
Input high level voltage	V_{IH}	2	-	-	V	-	Fig.2
Input low level current	I_{IL}	-	-	0.4	mA	V_{IN}=4.5V	Fig.2
Input high level current	I_{IH}	-	-	100	μA	V_{IN}=2.0V	Fig.3
Maximum output voltage	$V_{O\ OFF}$	-	-	21.8	V	$\bar{O}_0$ to $\bar{O}_7$, Io=10μA	Fig.3
Output saturation voltage	$V_{O\ ON}$	-	0.8	1.3	V	@Io=100mA sink	Fig.3
Output current	I_{OL}	-	-	207	mA	External voltage = 11.8V	Fig.3
“H” output voltage	V_{DOH}	2.4	-	-	V	R_L=10kΩ	Fig.3
“L” output voltage	V_{DOL}	-	-	0.8	V	-	Fig.3
Minimum set up time	t_1	-	-	300	ns	V_{IH}=2.0V,V_{IL}=0.8V	-
Minimum shift clock width	T_2	-	-	1	μs	V_{IH}=2.0V,V_{IL}=0.8V	-
Minimum timing pulse width	T_3	-	-	1	μs	V_{IH}=2.0V,V_{IL}=0.8V	-
Maximum transfer time	f_{Max}	500	-	-	kHz	V_{IH}=2.0V,V_{IL}=0.8V	-

●**Usage conditions range**

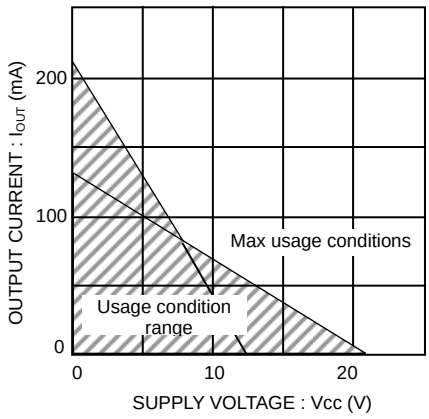
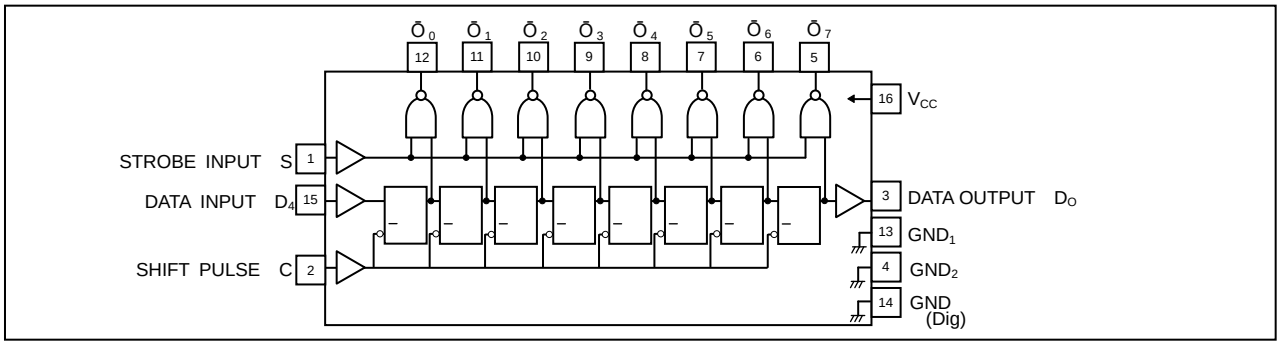


Fig.2 Power supply voltage and current usage conditions

Fig.2: Conditions to use supply voltage and output current (per circuit)
Maximum conditions of use in the diagram to the left, show the absolute maximum supply voltage and IC output current.
This product should not exceed the usage conditions range.

●Block diagram



●Pin descriptions

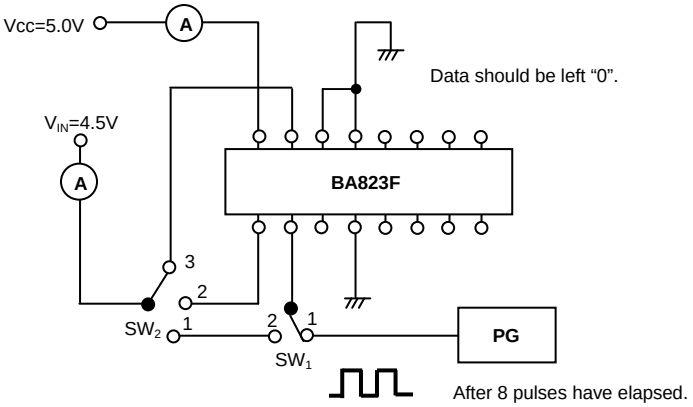
Pin No.	Pin Name	Symbol	Function
2	SHIFT PULSE	C	Shift pulse of shift register
15	DATA INPUT	D_1	Data input of shift register is stored during the shift pulse rise time.
1	STROBE	S	When “1” is effective, the content of shift register is outputted.
12	OUTPUT	$\bar{O}_0$	“0” is effective when the content of register is “1” on the 1st bit is outputted.
11	OUTPUT	$\bar{O}_1$	“0” is effective when the content of register is “1” on the 2nd bit is outputted.
10	OUTPUT	$\bar{O}_2$	“0” is effective when the content of register is “1” on the 3rd bit is outputted.
9	OUTPUT	$\bar{O}_3$	“0” is effective when the content of register is “1” on the 4th bit is outputted.
8	OUTPUT	$\bar{O}_4$	“0” is effective when the content of register is “1” on the 5th bit is outputted.
7	OUTPUT	$\bar{O}_5$	“0” is effective when the content of register is “1” on the 6tht bit is outputted.
6	OUTPUT	$\bar{O}_6$	“0” is effective when the content of register is “1” on the 7tht bit is outputted.
5	OUTPUT	$\bar{O}_7$	“0” is effective when the content of register is “1” on the 8th bit is outputted.
3	DATA OUTPUT	Do	Data having passed through the output circuit of $\bar{O}_7$ becomes the input of the next stage
16	V_{CC}	V_{CC}	5.0V .is used normally (±10%)
13	GND	GND_1	Especially, GND of the output circuit of $\bar{O}_0$~ $\bar{O}_3$
4	GND	GND_2	Especially, GND of the output circuit of $\bar{O}_4$~ $\bar{O}_7$
14	GND	GND(Dig)	Especially, GND of the logic circuit

●Description of operation

BA823 is configured internally as shown in the block diagram. Terminals of clock C, data D1, and strobe S are used as input. Data input is synchronized with the clock, read serially during the rise time and latched at the rise time edge of the shifted shift register. The content of the set shift register appears on the output terminal of $\bar{O}_0$~ $\bar{O}_7$ when the strobe is input, as shown in the time chart of Fig.5. Pulse width is the same as that of the strobe input pulse.

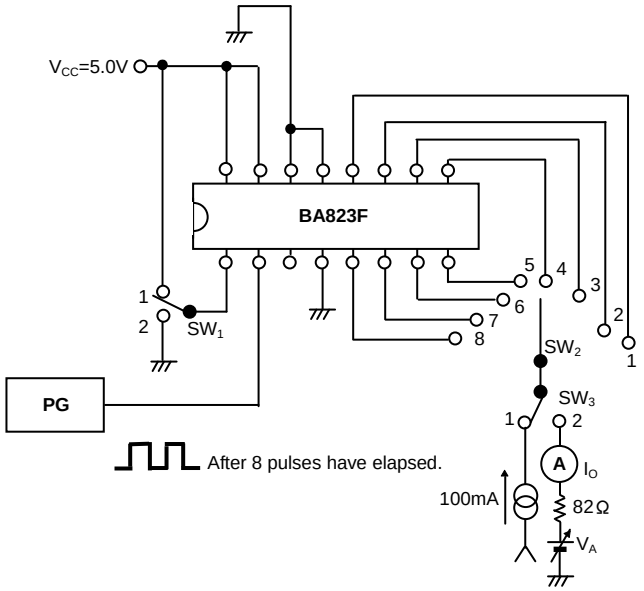
Data output terminal D0, is a terminal used for cascade connection of the IC, where the output of the final stage of the shift register has appeared, and is connected to the next data input terminal D1. In this case, when the clock and the strobe are used in conjunction, output terminal can be increased by 8 bits at a time.

●Measurement circuits



Item	SW_1	SW_2
I_{CC}	1	1
I_{IH}	2	1～3

Fig.3 Icc 1st measurement circuit



Item	SW_1	SW_2	SW_3
$V_{O\ ON}$	1	1～8	1
I_{OL}	1	1～8	1
$V_{O\ OFF}$	2	1～8	2

IO = 10μA when VO OFF is measured
VA = 30V when IO ON is measured

Fig.4 $V_{O\ ON}$, $V_{O\ OFF}$, I_{OL} measurement circuit

●Input conditions

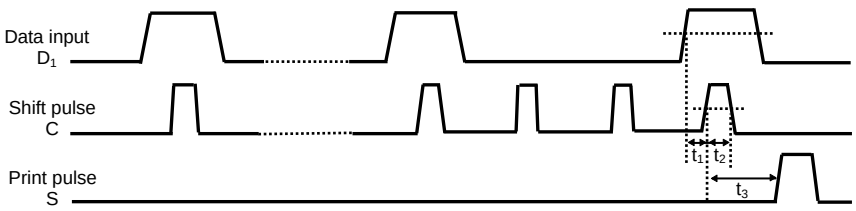


Fig.5

●Timing chart

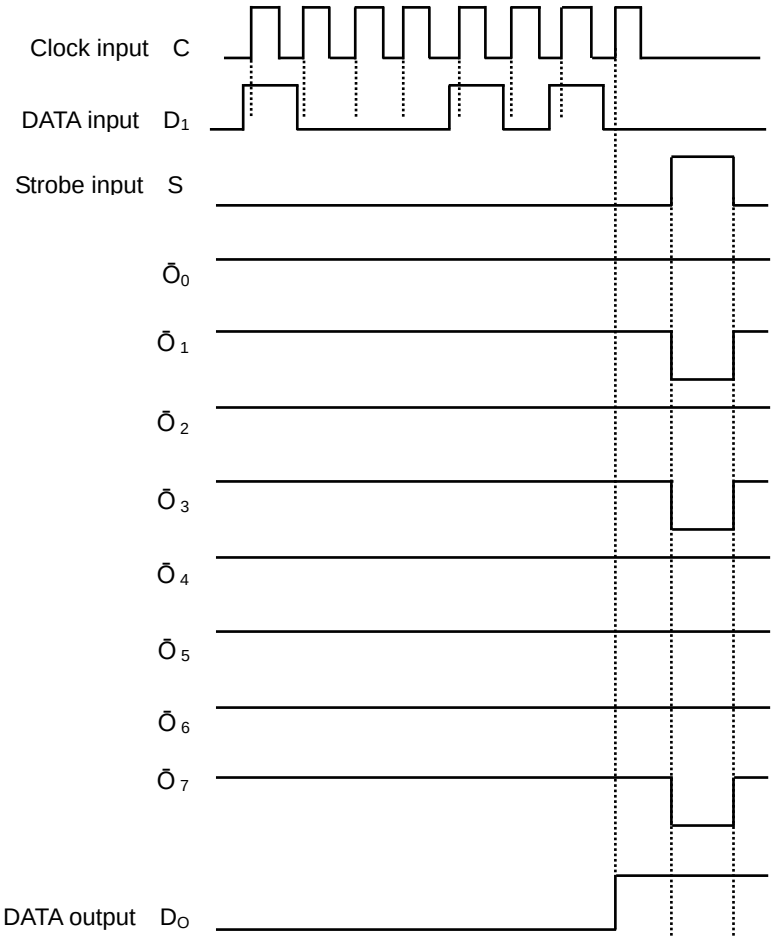


Fig.6

●Application example

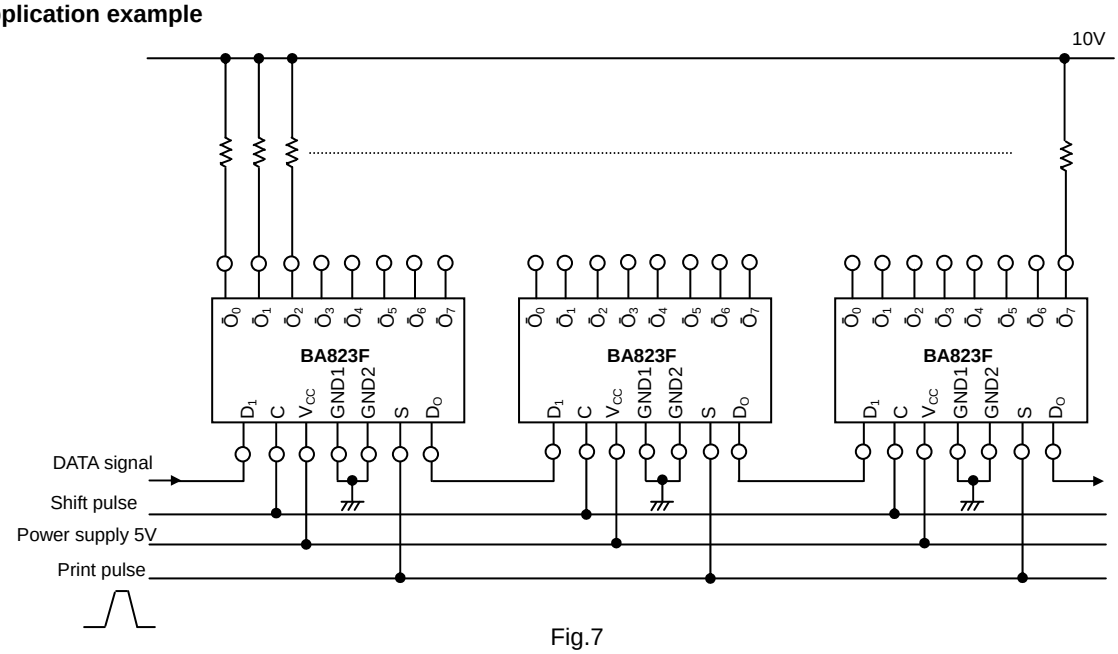


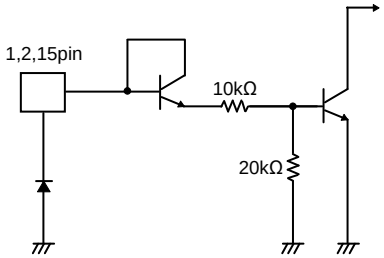
Fig.7

Example: Print head using the strobe function
Disabling the high current while the heating element is switched off is advantageous.

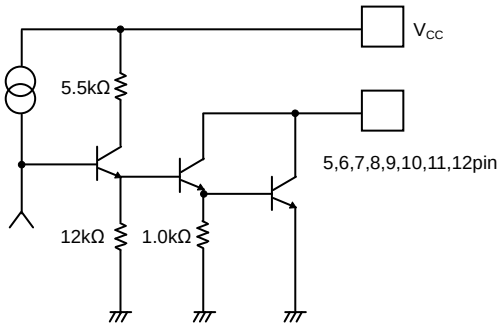
Use for thermal printer (when the timing is 1 phase) example

●Interfaces

(a) Input



(b) Output



(c) Serial data output

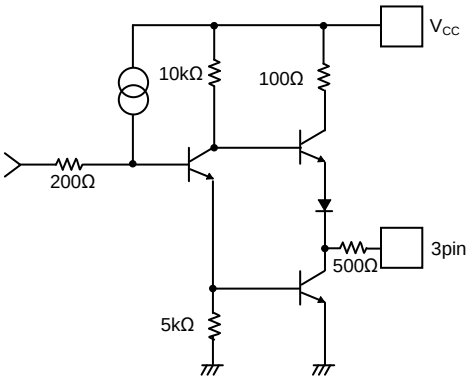
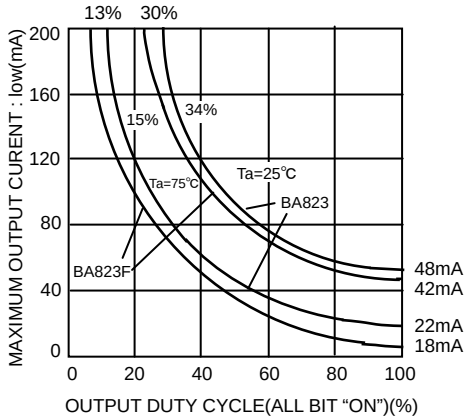


Fig.8

●Thermal derating curve



At repetition frequency 1Hz or higher

Fig.9 Output conditions

●Notes for 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 the devices, thus making impossible to identify breaking mode, such as a short circuit or an open circuit.
   If any over rated values will expect to exceed the absolute maximum ratings, consider adding circuit protection devices, such as fuses.

2. Connecting the power supply connector backward
   Connecting of the power supply in reverse polarity can damage IC. Take precautions when connecting the power supply lines. An external direction diode can be added.

3. Power supply lines
   Design PCB layout pattern to provide low impedance GND and supply lines. To obtain a low noise ground and supply line, separate the ground section and supply lines of the digital and analog blocks. Furthermore, for all power supply terminals to ICs, connect a capacitor between the power supply and the GND terminal. When applying electrolytic capacitors in the circuit, not that capacitance characteristic values are reduced at low temperatures.

4. GND voltage
   The potential of GND pin must be minimum potential in all operating conditions.

5. Inter-pin shorts and mounting errors
   Use caution when positioning the IC for mounting on printed circuit boards. The IC may be damaged if there is any connection error or if pins are shorted together.

6. Actions in strong electromagnetic field
   Use caution when using the IC in the presence of a strong electromagnetic field as doing so may cause the IC to malfunction.

7. Testing on application boards
   When testing the IC on an application board, connecting a capacitor to a pin with low impedance subjects the IC to stress. Always discharge capacitors after each process or step. Always turn the IC's power supply off before connecting it to or removing it from a jig or fixture during the inspection process. Ground the IC during assembly steps as an antistatic measure. Use similar precaution when transporting or storing the IC.

8. Regarding input pin of the IC
   This monolithic IC contains P+ isolation and P substrate layers between adjacent elements in order to keep them isolated. P-N junctions are formed at the intersection of these P layers with the N layers of other elements, creating a parasitic diode or transistor. For example, the relation between each potential is as follows:
   When GND > Pin A and GND > Pin B, the P-N junction operates as a parasitic diode.
   When GND > Pin B, the P-N junction operates as a parasitic transistor.
   Parasitic diodes can occur inevitable in the structure of the IC. The operation of parasitic diodes can result in mutual interference among circuits, operational faults, or physical damage. Accordingly, methods by which parasitic diodes operate, such as applying a voltage that is lower than the GND (P substrate) voltage to an input pin, should not be used.

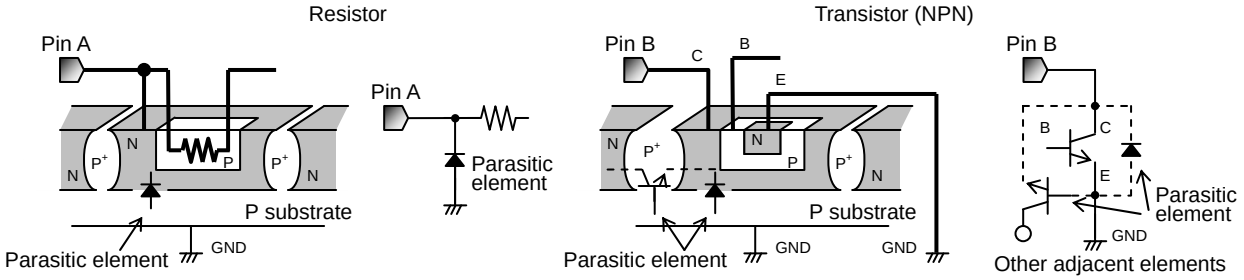


Fig.10 Example of IC structure

9. Ground Wiring Pattern
   When using both small signal and large current GND patterns, it is recommended to isolate the two ground patterns, placing a single ground point at the ground potential of application so that the pattern wiring resistance and voltage variations caused by large currents do not cause variations in the small signal ground voltage. Be careful not to change the GND wiring pattern of any external components, either.

●Ordering part number

B	D	8	2	3	F	-	E	2

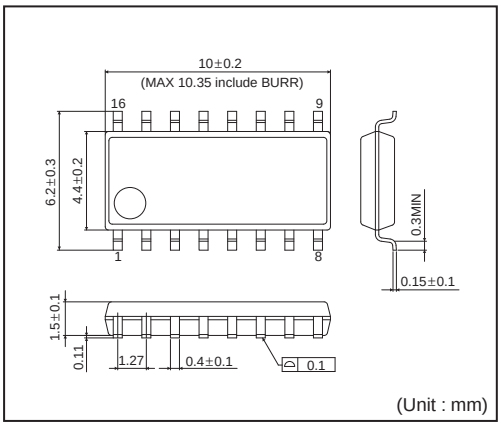
Part No. (BD)

Part No. (823)

Package
F: SOP16

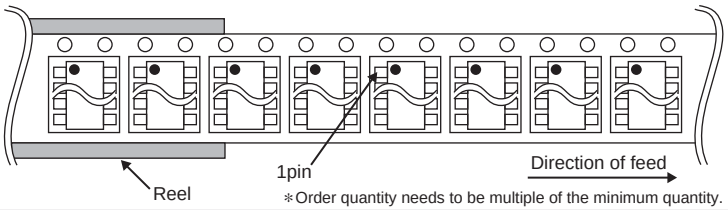
Packaging and forming specification
E2: Embossed tape and reel

SOP16



<Tape and Reel information>

Tape	Embossed carrier tape
Quantity	2500pcs
Direction of feed	E2 (The direction is the 1pin of product is at the upper left 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.

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JAPAN	USA	EU	CHINA
CLASSⅢ	CLASSⅢ	CLASSⅡb	CLASSⅢ
CLASSⅣ		CLASSⅢ	

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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.

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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.

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