◇ STRUCTURE   Silicon Monolithic Integrated Circuit

◇ PRODUCT I^2C BUS 4Kbit (512 × 8bit) EEPROM

◇ PART NUMBER   BR24G04-W Series

PART NUMBER	PACKAGE
BR24G04F-W	SOP8G
BR24G04FJ-W	SOP-J8G
BR24G04FV-W	SSOP-B8G
BR24G04FVT-W	TSSOP-B8G
BR24G04-W	DIP-T8

◇ FEATURES   Two wire serial interface

                Wide operating voltage range (1.8V～5.5V)

                Endurance : 1,000,000 erase/write cycles

◇ ABSOLUTE MAXIMUM RATING (Ta=25°C)

Parameter	Symbol	Rating		Unit
Supply Voltage	Vcc	−0.3～6.5		V
Power Dissipation	Pd	450 (BR24G04F-W)	*1	mW
		450 (BR24G04FJ-W)	*2	
		300 (BR24G04FV-W)	*3	
		330 (BR24G04FVT-W)	*4	
		800 (BR24G04-W)	*5	
Storage Temperature	Tstg	−65～150		°C
Operating Temperature	Topr	−40～85		°C
Terminal Voltage	—	−0.3～Vcc+0.3		V
Junction Temperature	Tjmax	150		°C

* Degradation is done at 4.5mW/°C (*1,*2), 3.0mW/°C(*3), 3.3mW/°C(*4),
8.0mW/°C(*5) for operation above 25°C.

◇ RECOMMENDED OPERATING CONDITION

Parameter	Symbol	Rating	Unit
Supply Voltage	Vcc	1.8～5.5	V
Input Voltage	VIN	0～Vcc	V

DESIGN	CHECK	APPROVAL	DATE : JUN/14/2010	SPECIFICATION No. : TSZ02201-BR24G04-W Series-1-2
			REV. C	ROHM Co.,Ltd.

TSZ22111·04·002

◇ MEMORY CELL CHARACTERISTICS (Ta=25°C, Vcc=1.8～5.5V)

Parameter		Specification			Unit
		Min.	Typ.	Max.	
Write/Erase Cycle	*1	1,000,000	-	-	Cycles
Data Retention	*1	40	-	-	Years

○Initial Data FFh in all address.   *1 Not 100% TESTED

◇ DC OPERATING CHARACTERISTICS
(Unless otherwise specified Ta=-40～85°C, Vcc=1.8～5.5V)

Parameter	Symbol	Specification			Unit	Test Condition
		Min.	Typ.	Max.		
"H" Input Voltage1	V_{IH1}	$0.7V_{cc}$	—	—	V	$2.5V \leqq V_{cc} \leqq 5.5V$
"L" Input Voltage1	V_{IL1}	—	—	$0.3V_{cc}$	V	$2.5V \leqq V_{cc} \leqq 5.5V$
"H" Input Voltage2	V_{IH2}	$0.8V_{cc}$	—	—	V	$1.8V \leqq V_{cc} < 2.5V$
"L" Input Voltage2	V_{IL2}	—	—	$0.2V_{cc}$	V	$1.8V \leqq V_{cc} < 2.5V$
"L" Output Voltage1	V_{OL1}	—	—	0.4	V	$I_{OL}=3.0mA, 2.5V \leqq V_{cc} \leqq 5.5V(SDA)$
"L" Output Voltage2	V_{OL2}	—	—	0.2	V	$I_{OL}=0.7mA, 1.8V \leqq V_{cc} < 2.5V(SDA)$
Input Leakage Current	I_{LI}	-1	—	1	μA	$V_{IN}=0V \sim V_{cc}$
Output Leakage Current	I_{LO}	-1	—	1	μA	$V_{OUT}=0V \sim V_{cc}(SDA)$
Operating Current	I_{CC1}	—	—	2.0	mA	$V_{cc}=5.5V, f_{SCL}=400kHz, t_{WR}=5ms$ Byte Write, Page Write
	I_{CC2}	—	—	0.5	mA	$V_{cc}=5.5V, f_{SCL}=400kHz$ Random Read, Current Read, Sequential Read
Standby Current	I_{SB}	—	—	2.0	μA	$V_{cc}=5.5V, SDA, SCL=V_{cc}$ A0,A1,A2=GND,WP=GND

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

◇ AC OPERATING CHARACTERISTICS
(Unless otherwise specified Ta=-40～85°C, Vcc=1.8～5.5V)

Parameter	Symbol	FAST-MODE $2.5V \leqq V_{cc} \leqq 5.5V$			STANDARD-MODE $1.8V \leqq V_{cc} \leqq 5.5V$			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
Clock Frequency	f_{SCL}	—	—	400	—	—	100	kHz
Data Clock High Period	t_{HIGH}	0.6	—	—	4.0	—	—	μs
Data Clock Low Period	t_{LOW}	1.2	—	—	4.7	—	—	μs
SDA and SCL Rise Time *1	t_R	—	—	0.3	—	—	1.0	μs
SDA and SCL Fall Time *1	t_F	—	—	0.3	—	—	0.3	μs
Start Condition Hold Time	$t_{HD:STA}$	0.6	—	—	4.0	—	—	μs
Start Condition Setup Time	$t_{SU:STA}$	0.6	—	—	4.7	—	—	μs
Input Data Hold Time	$t_{HD:DAT}$	0	—	—	0	—	—	ns
Input Data Setup Time	$t_{SU:DAT}$	100	—	—	250	—	—	ns
Output Data Delay Time	t_{PD}	0.1	—	0.9	0.2	—	3.5	μs
Output Data Hold Time	t_{DH}	0.1	—	—	0.2	—	—	μs
Stop Condition Setup Time	$t_{SU:STO}$	0.6	—	—	4.7	—	—	μs
Bus Free Time	t_{BUF}	1.2	—	—	4.7	—	—	μs
Write Cycle Time	t_{WR}	—	—	5	—	—	5	ms
Noise Spike Width (SDA and SCL)	t_I	—	—	0.1	—	—	0.1	μs
WP Hold Time	$t_{HD:WP}$	0	—	—	0	—	—	ns
WP Setup Time	$t_{SU:WP}$	0.1	—	—	0.1	—	—	μs
WP High Period	$t_{HIGH:WP}$	1.0	—	—	1.0	—	—	μs

*1 Not 100% TESTED

◇ BLOCK DIAGRAM
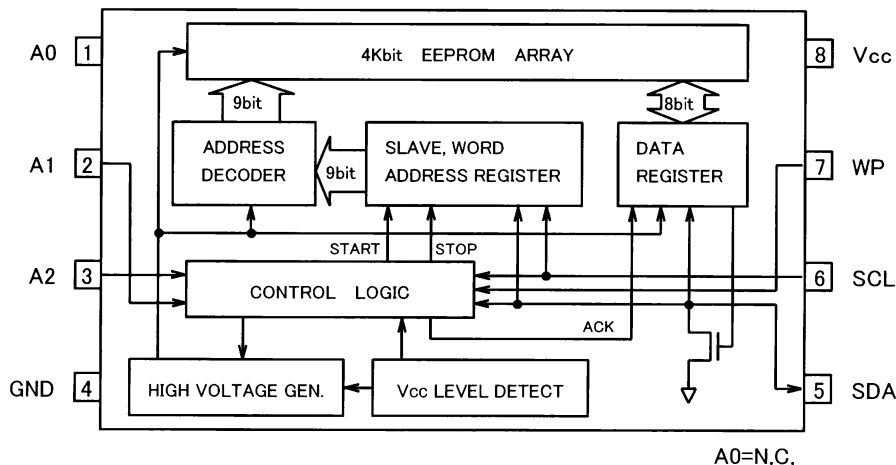
Fig.-1 BLOCK DIAGRAM

A0=N.C.

◇ PIN No., PIN NAME

PIN No.	PIN NAME
1	A0
2	A1
3	A2
4	GND
5	SDA
6	SCL
7	WP
8	Vcc

◇ NOTES FOR POWER SUPPLY

Vcc rises through the low voltage region in which internal circuit of IC and the controller are unstable, so that device may not work properly due to an incomplete reset of internal circuit. To prevent this, the device has the feature of P.O.R. and LVCC. In the case of power up, keep the following conditions to ensure functions of P.O.R. and LVCC.

1. It is necessary to be "SDA='H'" and "SCL='L' or 'H'".
2. Follow the recommended conditions of tR, tOFF, Vbot for the function of P.O.R. during power up.
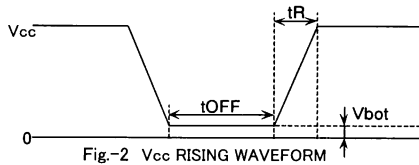
Fig.-2 Vcc RISING WAVEFORM

◇RECOMMENDED CONDITIONS OF tR, tOFF, Vbot

tR	tOFF	Vbot
Below 10ms	Above 10ms	Below 0.3V
Below 100ms	Above 10ms	Below 0.2V

3. Prevent SDA and SCL from being "High-Z".
In case that condition 1. and/or 2. cannot be met,
take following actions.
A) Unable to keep condition 1.
(SDA is "LOW" during power up.)
→ Control SDA ,SCL to be "HIGH" as Fig.-3(a),
3(b).
B) Unable to keep condition 2.
→ After power becomes stable, execute
software reset.
C) Unable to keep both conditions 1 and 2.
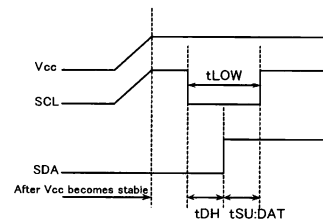→ Follow the instruction A first, then the instruction B.
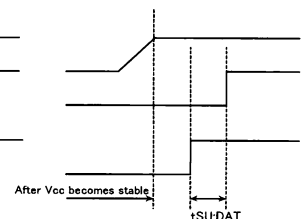
Fig.-3(a) SCL='H' and SDA='L'

Fig.-3(b) SCL='L' and SDA='L'

◇CAUTIONS ON USE

(1) Absolute maximum ratings

If the absolute maximum ratings such as impressed voltage and action temperature range and so forth are exceeded, LSI may be destructed. Do not impress voltage and temperature exceeding the absolute maximum ratings. In the case of fear exceeding the absolute maximum ratings, take physical safety countermeasures such as fuses, and see to it that conditions exceeding the absolute maximum ratings should not be impressed to LSI.

(2) GND electric potential

Set the voltage of GND terminal lowest at any action condition. Make sure that each terminal voltage is lower than that of GND terminal.

(3) Thermal design

In consideration of permissible loss in actual use condition, carry out heat design with sufficient margin.

(4) Terminal to terminal shortcircuit and wrong packaging

When to package LSI onto a board, pay sufficient attention to LSI direction and displacement. Wrong packaging may destruct LSI. And in the case of shortcircuit between LSI terminals and terminals and power source, terminal and GND owing to foreign matter, LSI may be destructed.

(5) Use in a strong electromagnetic field may cause malfunction, therefore, evaluated design sufficiently.
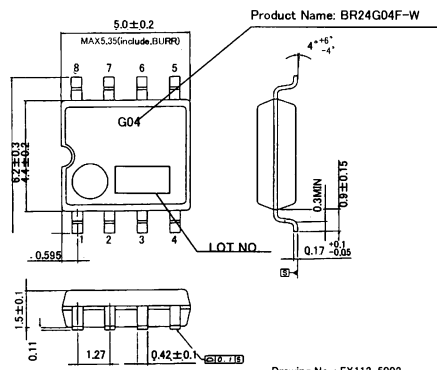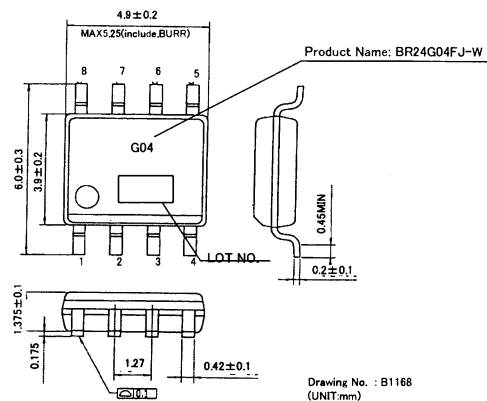
◇PHYSICAL DIMENSION

Product Name: BR24G04F-W

5.0±0.2
MAX5.35(include.BURR)

8 7 6 5

G04

1 2 3 4   LOT NO.

0.595

4°+6°−4°
0.3MIN
0.9±0.15
0.17 +0.1 −0.05

6.2±0.3
4.4±0.2

1.5±0.1
0.11
1.27   0.42±0.1

Drawing No. : EX112-5002
(UNIT:mm)

Fig.-4(a) PHYSICAL DIMENSION
SOP8G(BR24G04F-W)

Product Name: BR24G04FJ-W

4.9±0.2
MAX5.25(include.BURR)

8 7 6 5

G04

1 2 3 4   LOT NO.

6.0±0.3
3.9±0.2

0.45MIN
0.2±0.1

1.375±0.1
0.175
1.27   0.42±0.1

Drawing No. : B1168
(UNIT:mm)

Fig.-4(b) PHYSICAL DIMENSION
SOP-J8G(BR24G04FJ-W)

Product Name: BR24G04FV-W

3.00±0.20

8 7 6 5

G04

LOT NO.

1 2 3 4

6.40±0.30
4.40±0.20

0.20MIN
0.15±0.10

1.15±0.10
0.52 0.65   0.22±0.10   0.10

Drawing No. : B0685
(UNIT:mm)
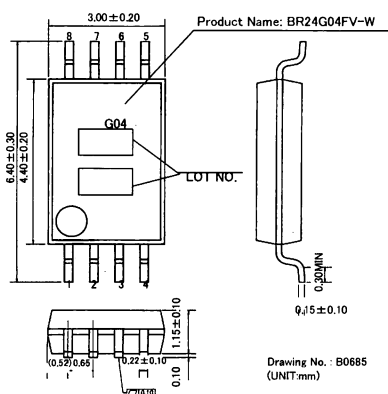
Fig.-4(c) PHYSICAL DIMENSION
SSOP-B8G(BR24G04FV-W)

Product Name: BR24G04FVT-W

3.0±0.1
MAX3.35(include.BURR)

G04

LOT NO.

0.525   1PIN MARK

6.4±0.2
4.4±0.1

4°±4°
0.5±0.15
1.0±0.2
0.145 +0.05 −0.04

1.2MAX
1.0±0.05
0.1±0.05
0.1   0.65   0.245 +0.05 −0.04

Drawing No. : EX165-5002
(UNIT:mm)
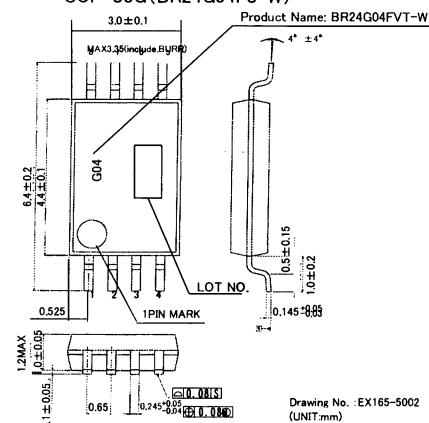
Fig.-4(d) PHYSICAL DIMENSION
TSSOP-B8G(BR24G04FVT-W)

Product Name: BR24G04-W

9.3±0.3

8   5

BR24G04

1   4   LOT NO.

7.62

6.5±0.3

3.2±0.2 3.4±0.3 0.5MIN
2.54   0.5±0.1
0°~15°
0.3±0.1

Drawing No. : A0782
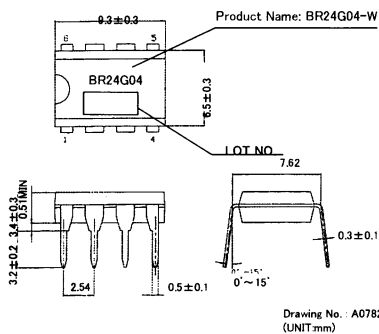(UNIT:mm)

Fig-4(e) PHYSICAL DIMENSION
DIP-T8(BR24G04-W)

Notice

Precaution on using ROHM Products

1. Our Products are designed and manufactured for application in ordinary electronic equipment (such as AV equipment, OA equipment, telecommunication equipment, home electronic appliances, amusement equipment, etc.). If you intend to use our Products in devices requiring extremely high reliability (such as medical equipment [(Note 1)], transport equipment, traffic equipment, aircraft/spacecraft, nuclear power controllers, fuel controllers, car equipment including car accessories, safety devices, 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.

(Note1) Medical Equipment Classification of the Specific Applications

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

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 designed and manufactured for use under standard conditions and not 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 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 (Exclude cases where no-clean type fluxes is used. However, recommend sufficiently about the residue.) ; 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 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 Cl_2, H_2S, NH_3, SO_2, and NO_2
   [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.

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