

- ◇ STRUCTURE                      Silicon Monolithic Integrated Circuit
- ◇ PRODUCT                        Microwire BUS 2Kbit (128 × 16bit) EEPROM
- ◇ PART NUMBER                **BR93H56-W Series**

PART NUMBER	PACKAGE
BR93H56RF-W	SOP8
BR93H56RFJ-W	SOP-J8

- ◇ FEATURES                      Microwire BUS EEPROM  
Wide action range -40~+125°C  
Electrostatic withstand voltage 8kV, about twice of other series (HBM method typ.)

◇ ABSOLUTE MAXIMUM RATING (Ta=25°C)

Parameter	Symbol	Rating	Unit
Supply Voltage	Vcc	-0.3~6.5	V
Power Dissipation	Pd	450 (BR93H56RF-W) *1	mW
		450 (BR93H56RFJ-W) *2	
Storage Temperature	Tstg	-65~150	°C
Operating Temperature	Topr	-40~125	°C
Terminal Voltage	—	-0.3~Vcc+0.3	V

\* Dergradation is done at 3.6mW for operation above 25°C

◇ RECOMMENDED OPERATING CONDITION

Parameter	Symbol	Rating	Unit
Supply Voltage	Vcc	2.7~5.5	V
Input Voltage	VIN	0~Vcc	V

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.

◇ MEMORY CELL CHARACTERISTICS (V<sub>CC</sub>=2.7~5.5V)

Parameter		Specification			Unit	Test Condition
		Min.	Typ.	Max.		
Erase/Write Cycle	※1	1,000,000	-	-	Cycles	T <sub>a</sub> ≤ 85°C
		500,000	-	-	Cycles	T <sub>a</sub> ≤ 105°C
		300,000	-	-	Cycles	T <sub>a</sub> ≤ 125°C
Data Retention	※1	40	-	-	Years	T <sub>a</sub> ≤ 25°C
		10	-	-	Years	T <sub>a</sub> ≤ 50°C

○Initial Data FFFFh in all address. ※1 Not 100% TESTED

◇ DC OPERATING CHARACTERISTICS

(Unless otherwise specified T<sub>a</sub>=-40~125°C, V<sub>CC</sub>=2.7~5.5V)

Parameter	Symbol	Specification			Unit	Test Condition
		Min.	Typ.	Max.		
"L" Input Voltage	V <sub>IL</sub>	-0.3	-	0.3 × V <sub>CC</sub>	V	
"H" Input Voltage	V <sub>IH</sub>	0.7 × V <sub>CC</sub>	-	V <sub>CC</sub> +0.3	V	
"L" Output Voltage1	V <sub>OL1</sub>	0	-	0.4	V	I <sub>OL</sub> =2.1mA, 4.0 ≤ V <sub>CC</sub> ≤ 5.5
"L" Output Voltage2	V <sub>OL2</sub>	0	-	0.2	V	I <sub>OL</sub> =100 μA, 2.7 ≤ V <sub>CC</sub> ≤ 4.0
"H" Output Voltage1	V <sub>OH1</sub>	2.4	-	V <sub>CC</sub>	V	I <sub>OH</sub> =-0.4mA, 4.0 ≤ V <sub>CC</sub> ≤ 5.5
"H" Output Voltage2	V <sub>OH2</sub>	V <sub>CC</sub> -0.2	-	V <sub>CC</sub>	V	I <sub>OH</sub> =-100 μA, 2.7 ≤ V <sub>CC</sub> ≤ 4.0
Input Leakage Current	I <sub>IL</sub>	-10	-	10	μA	V <sub>IN</sub> =0~V <sub>CC</sub>
Output Leakage Current	I <sub>ILO</sub>	-10	-	10	μA	V <sub>OUT</sub> =0~V <sub>CC</sub> , CS=0V
Operating Current	ICC1	-	-	3.0	mA	f <sub>SK</sub> =1.25MHz, t <sub>E/W</sub> =10ms (WRITE)
	ICC2	-	-	1.5	mA	f <sub>SK</sub> =1.25MHz (READ)
	ICC3	-	-	4.5	mA	f <sub>SK</sub> =1.25MHz, t <sub>E/W</sub> =10ms (WRAL)
Standby Current	ISB	-	0.1	10	μA	CS=0V, DO=OPEN

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

◇ AC OPERATING CHARACTERISTICS

(Unless otherwise specified T<sub>a</sub>=-40~125°C, V<sub>CC</sub>=2.7~5.5V)

Parameter	Symbol	2.7V ≤ V <sub>CC</sub> ≤ 5.5V			Unit
		Min.	Typ.	Max.	
SK Clock Frequency	f <sub>SK</sub>	-	-	1.25	MHz
SK High Time	t <sub>SKH</sub>	250	-	-	ns
SK Low Time	t <sub>SKL</sub>	250	-	-	ns
CS Low Time	t <sub>CS</sub>	200	-	-	ns
CS Setup Time	t <sub>CSS</sub>	200	-	-	ns
DI Setup Time	t <sub>DIS</sub>	100	-	-	ns
CS Hold Time	t <sub>CSH</sub>	0	-	-	ns
DI Hold Time	t <sub>DIH</sub>	100	-	-	ns
Data "1" Output Delay Time	t <sub>PD1</sub>	-	-	300	ns
Data "0" Output Delay Time	t <sub>PD0</sub>	-	-	300	ns
CS to Status Valid	t <sub>SV</sub>	-	-	200	ns
CS to Output High-Z	t <sub>DF</sub>	-	-	200	ns
Write Cycle time	t <sub>E/W</sub>	-	7	10	ms

◇ BLOCK DIAGRAM

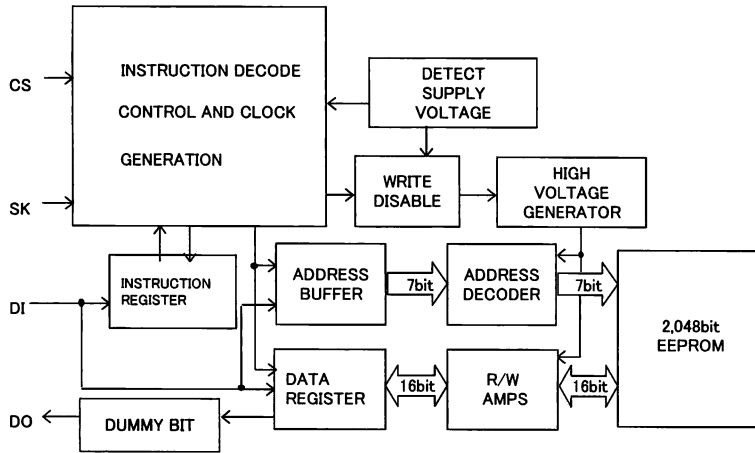


Fig.-1 BLOCK DIAGRAM

◇ PIN No. / PIN NAME

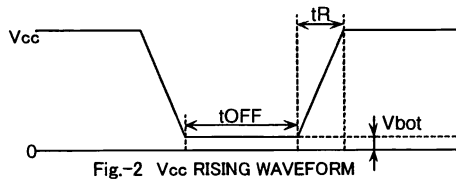
PIN No.	PIN NAME
1	CS
2	SK
3	DI
4	DO
5	GND
6	TEST
7	N.C.
8	V <sub>CC</sub>

◇ NOTES FOR POWER SUPPLY

This IC has a POR (Power On Reset) circuit as mistake write countermeasure.

After POR action, it gets in write disable status. The POR circuit is valid only when power is ON, and does not work when power is OFF. However, if CS is "H" at power ON/OFF, it may become write enable status owing to noises and the likes. For secure operations, observe the following conditions.

1. Set CS = "L".
2. Turn on power so as to satisfy the recommended conditions of tR, tOFF, Vbot for POR circuit operation.



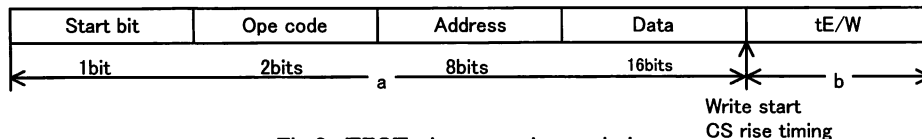
◇Recommended conditions of tR, tOFF, Vbot

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

◇ NOTES AT TEST PIN WRONG INPUT

As for TEST pin, input must be GND or OPEN. If "H" level is input, the following may occur.

1. At WEN, WDS, READ command input  
There is no influence by TEST pin.
2. WRITE, WRAL command input



- a. There is no influence by TEST pin.
- b. If "H" during write execution, it may not be written correctly. And "H" area remains BUSY and READY does not go back. Avoid noise input, and at use, be sure to connect it to GND terminal or set it OPEN.

◇ 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 not lower than that of GND terminal in consideration of transition status.

(3) Heat design

In consideration of allowable 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

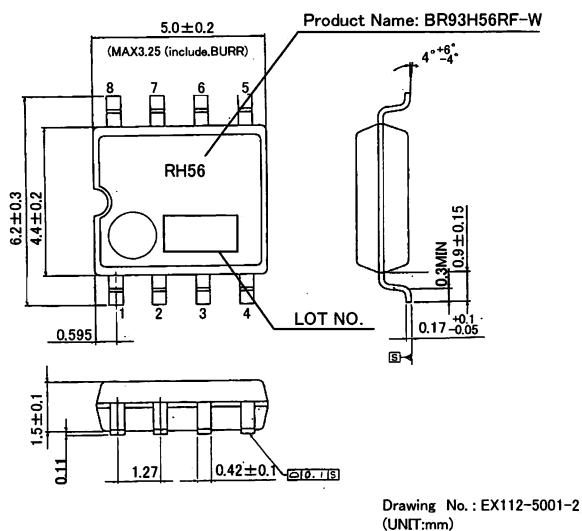


Fig.4-(a) PHYSICAL DIMENSION SOP8 (BR93H56RF-W)

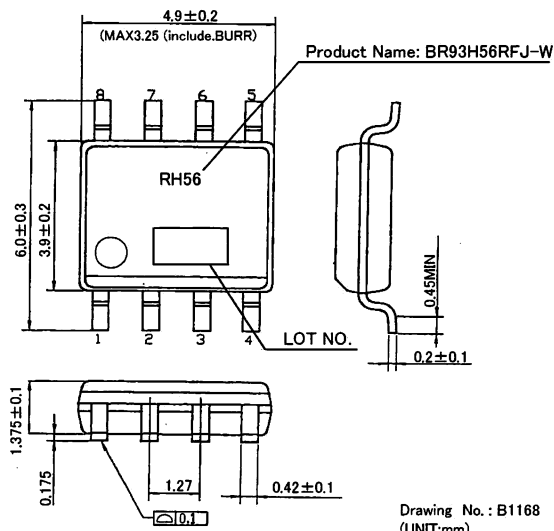


Fig.4-(b) PHYSICAL DIMENSION SOP-J8 (BR93H56RFJ-W)

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Japan /  
(Internal Sales)

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Yokohama	2-4-8, Shin Yokohama, Kohoku-ku, Yokohama, Kanagawa 222-8575	TEL : +81(45)476-2131	FAX : +81(45)476-2128
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Kyoto	579-32 Higashi Shiokouji-cho, Karasuma Nishi-iru, Shiokoujidori, Shimogyo-ku, Kyoto 600-8216	TEL : +81(75)311-2121	FAX : +81(75)314-6559

(Contact address for overseas customers in Japan)

Yokohama	TEL : +81(45)476-9270	FAX : +81(045)476-9271
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