◇ STRUCTURE Silicon Monolithic Integrated Circuit

◇ PRODUCT Microwire BUS Serial EEPROMs

◇ SERIES SIGNATURE SERIES

◇ FAMILY BR93C□□ family

◇ TYPE Supply voltage 4.5V～5.5V/Opreating temperature −40℃～+85℃type

◇ PART NUMBER BR93C□□-□□□6TP

PART NUMBER	PACKAGE	DENSITY
BR93C46- MN6TP	SO8 narrow	1Kbit
BR93C56- MN6TP		2Kbit
BR93C66- MN6TP		4Kbit
BR93C76- MN6TP		8Kbit
BR93C86- MN6TP		16Kbit
BR93C46- TMN6TP	SO8 narrow (different pin assignment)	1Kbit
BR93C56- TMN6TP		2Kbit
BR93C66- TMN6TP		4Kbit
BR93C76- TMN6TP		8Kbit
BR93C86- TMN6TP		16Kbit
BR93C46- DW6TP	TSSOP8	1Kbit
BR93C56- DW6TP		2Kbit
BR93C66- DW6TP		4Kbit
BR93C76- DW6TP		8Kbit
BR93C86- DW6TP		16Kbit
BR93C46- DS6TP	TSSOP8 3×3mm^2	1Kbit
BR93C56- DS6TP		2Kbit
BR93C66- DS6TP		4Kbit
BR93C76- DS6TP		8Kbit
BR93C86- DS6TP		16Kbit

◇ FEATURES

Microwire BUS interface
Endurance : 1,000,000 erase/write cycles
Data retention : 40 years
Intial Data FFFFh in all address

◇ ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Min.	Max.	Unit
T_{STG}	Storage Temperature	−65	125	℃
V_{OUT}	Output Range(Q=V_{OH} or Hi-Z)	−0.3	Vcc+0.3	V
V_{IN}	Input range	−0.3	Vcc+0.3	V
V_{CC}	Supply Voltage	−0.3	6.5	V

◇ POWER DISSIPATION (Ta=25℃)

PACKAGE	Rating	Unit
SO8 narrow	450 *1	mW
TSSOP8	330 *2	mW
TSSOP8 3×3mm^2	310 *3	mW

* Degradation is done at 4.5mW/℃(*1), 3.3mW/℃(*2), 3.1mW/℃(*3) for operation above 25℃

◇ RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min.	Max.	Unit
V_{CC}	Supply Voltage	4.5	5.5	V
T_A	Ambient Operating Temperature	-40	85	℃

◇ DC OPERATING CHARACTERISTICS

(Unless otherwise specified, Ta=-40～85℃, Vcc=4.5～5.5V)

Parameter	Symbol	Specification			Unit	Test Condition
		Min.	Typ.	Max.		
Input Leakage Current	I_{LI}	–	–	±2.5	μA	0V≦V_{IN}≦Vcc
Output Leakage Current	I_L	–	–	±2.5	μA	0V≦V_{OUT}≦Vcc, Q in Hi-Z
Supply Current (CMOS Inputs)	I_{CC}	–	–	2	mA	Vcc=5V,S=V_{IH},f=2MHz
Supply Current(Stand-by)	I_{CC1}	–	–	15	μA	Vcc=2.5V,S=Vss,C=Vss
Input Low Voltage(D,C,S)	V_{IL}	-0.3	–	0.8	V	
Input High Voltage(D,C,S)	V_{IH}	2	–	Vcc+0.3	V	
Output Low Voltage(Q)	V_{OL}	–	–	0.4	V	Vcc=5V,I_{OL}=2.1mA
Output High Voltage(Q)	V_{OH}	2.4	–	–	V	Vcc=5V,I_{OH}=-400μA

◇ AC OPERATING CHARACTERISTICS

(Unless otherwise specified, Ta=-40～85℃, Vcc=4.5～5.5V)

Parameter	Symbol	Specification			Unit
		Min.	Typ.	Max.	
Clock Frequency	f_C	D.C	–	2	MHz
Chip Select Low to Clock High	t_{SLCH}	50	–	–	ns
Chip Select Set-up Time	t_{SHCH}	50	–	–	ns
Chip Select Low to Chip Select High	t_{SLSH}	200	–	–	ns
Clock High Time	t_{CHCL} *1	200	–	–	ns
Clock Low Time	t_{CLCH} *1	200	–	–	ns
Data In Set-up Time	t_{DVCH}	50	–	–	ns
Data In Hold Time	t_{CHDX}	50	–	–	ns
Clock Set-up Time(relative to S)	t_{CLSH}	50	–	–	ns
Chip Select Hold Time	t_{CLSL}	0	–	–	ns
Chip Select to Ready/Busy Status	t_{SHQV}	–	–	200	ns
Chip Select Low to Output Hi-Z	t_{SLQZ}	–	–	100	ns
Delay to Output Low	t_{CHQL}	–	–	200	ns
Delay to Output Valid	t_{CHQV}	–	–	200	ns
Erase/Write Cycle time	t_W	–	–	5	ms

*1 $t_{CHCL}+t_{CLCH}$≧$1/f_C$

◇ BLOCK DIAGRAM

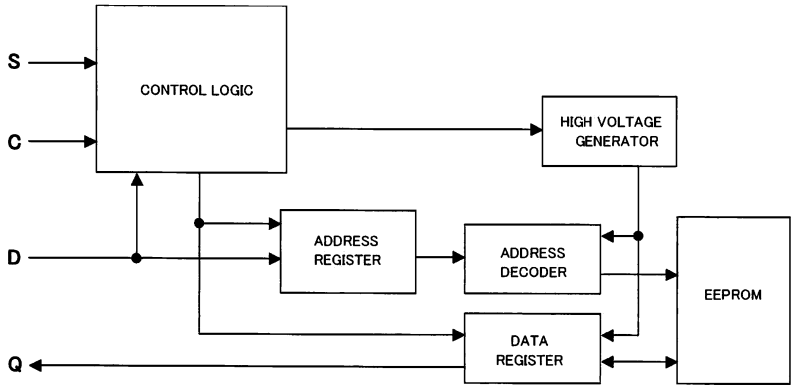


Fig.-1 BLOCK DIAGRAM

◇ PIN No., PIN NAME

PIN No.	PIN NAME	
1	S	DU
2	C	Vcc
3	D	S
4	Q	C
5	Vss	D
6	DU	Q
7	DU	Vss
8	Vcc	DU
PART NUMBER	BR93C46-MN6TP	BR93C46-TMN6TP
	BR93C56-MN6TP	BR93C56-TMN6TP
	BR93C66-MN6TP	BR93C66-TMN6TP
	BR93C76-MN6TP	BR93C76-TMN6TP
	BR93C86-MN6TP	BR93C86-TMN6TP
	BR93C46-DW6TP	
	BR93C56-DW6TP	
	BR93C66-DW6TP	
	BR93C76-DW6TP	
	BR93C86-DW6TP	
	BR93C46-DS6TP	
	BR93C56-DS6TP	
	BR93C66-DS6TP	
	BR93C76-DS6TP	
	BR93C86-DS6TP	

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

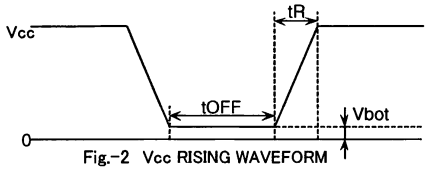


Fig.-2 Vcc RISING WAVEFORM

◇Recommended conditions of tR, tOFF, Vbot

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

◇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) Vss electric potential

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

(3) Thermal design

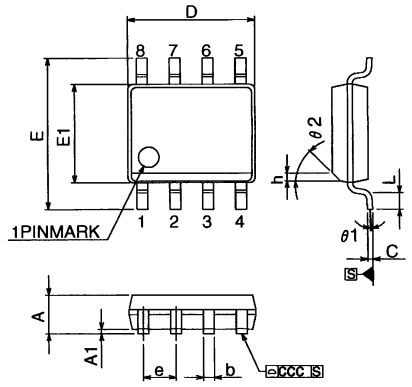
In consideration of permissible loss in actual use condition, carry out heat design with sufficient margin.

(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 Vss owing to foreign matter, LSI may be destructed.

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

◇ PHYSICAL DIMENSION

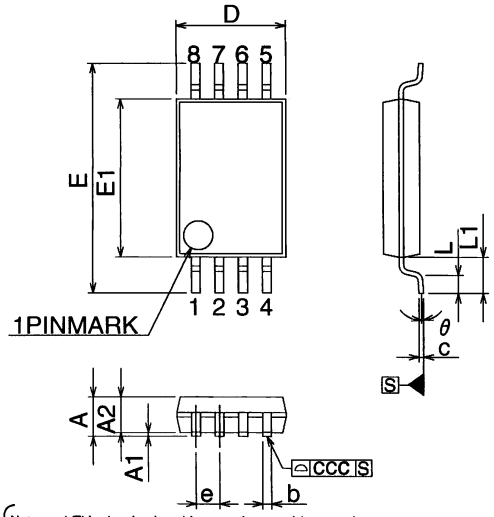


Notes
1.This drawing is subject to change without notice.
2.Body dimensions do not include mold flash or protrusion, or gate burns.
3.Reference JEDEC MS-012 variation AA.

Fig.-3 SO8 narrow Package Outline

◇ SO8 narrow Package size data

Symb.	mm			inches		
	Typ.	Min.	Max.	Typ.	Min.	Max.
A	–	1.35	1.75	–	0.053	0.069
A1	–	0.10	0.25	–	0.004	0.010
b	–	0.33	0.51	–	0.013	0.020
c	–	0.19	0.25	–	0.007	0.010
D	–	4.80	5.00	–	0.189	0.197
e	1.27	–	–	0.05	–	–
E	–	5.80	6.20	–	0.228	0.244
E1	–	3.80	4.00	–	0.150	0.157
L	–	0.40	1.27	0.05	0.016	0.050
θ1	–	0°	8°	–	0°	8°
ccc	–	–	0.10	–	–	0.004
h	–	0.25	0.50	–	0.010	0.020
θ2	45°	–	–	45°	–	–

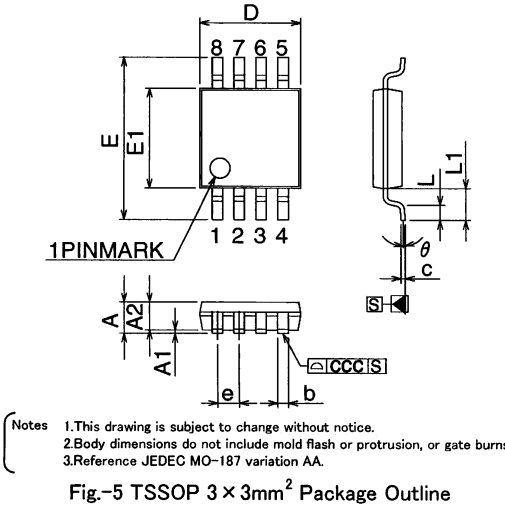


Notes
1.This drawing is subject to change without notice.
2.Body dimensions do not include mold flash or protrusion, or gate burns.
3.Reference JEDEC MO-153.

Fig.-4 TSSOP Package Outline

◇ TSSOP8 Package size data

Symb.	mm			inches		
	Typ.	Min.	Max.	Typ.	Min.	Max.
A	-	-	1.200	-	-	0.0472
A1	-	0.050	0.150	-	0.0020	0.0059
A2	1.000	0.800	1.050	0.0394	0.0315	0.0413
b	-	0.190	0.300	-	0.0075	0.0118
c	-	0.090	0.200	-	0.0035	0.0079
D	3.000	2.900	3.100	0.1181	0.1142	0.1220
e	0.650	-	-	0.0256	-	-
E	6.400	6.200	6.600	0.2520	0.2441	0.2598
E1	4.400	4.300	4.500	0.1732	0.1693	0.1772
L	0.600	0.450	0.750	0.0236	0.0177	0.0295
L1	1.000	-	-	0.0394	-	-
ccc	-	-	0.100	-	-	0.0039
θ	-	0°	8°	-	0°	8°



Notes
1.This drawing is subject to change without notice.
2.Body dimensions do not include mold flash or protrusion, or gate burns.
3.Reference JEDEC MO-187 variation AA.

Fig.-5 TSSOP 3×3mm^2 Package Outline

◇ TSSOP8 3×3mm^2 Package size data

Symb.	mm			inches		
	Typ.	Min.	Max.	Typ.	Min.	Max.
A	–	–	1.100	–	–	0.0433
A1	–	0.050	0.150	–	0.0020	0.0059
A2	0.850	0.750	0.950	0.0335	0.0295	0.0374
b	–	0.250	0.400	–	0.0098	0.0157
c	–	0.120	0.230	–	0.0047	0.0091
D	3.000	2.900	3.100	0.1181	0.1142	0.1220
e	0.650	–	–	0.0256	–	–
E	4.900	4.650	5.150	0.1929	0.1831	0.2028
E1	3.000	2.900	3.100	0.1181	0.1142	0.1220
L	0.550	0.400	0.700	0.0217	0.0157	0.0276
L1	0.950	–	–	0.0374	–	–
ccc	–	–	0.100	–	–	0.0039
θ	–	0°	6°	–	0°	6°

Notes

- No technical content pages of this document may be reproduced in any form or transmitted by any means without prior permission of ROHM CO.,LTD.
- The contents described herein are subject to change without notice. The specifications for the product described in this document are for reference only. Upon actual use, therefore, please request that specifications to be separately delivered.
- Application circuit diagrams and circuit constants contained herein are shown as examples of standard use and operation. Please pay careful attention to the peripheral conditions when designing circuits and deciding upon circuit constants in the set.
- Any data, including, but not limited to application circuit diagrams information, described herein are intended only as illustrations of such devices and not as the specifications for such devices. ROHM CO.,LTD. disclaims any warranty that any use of such devices shall be free from infringement of any third party's intellectual property rights or other proprietary rights, and further, assumes no liability of whatsoever nature in the event of any such infringement, or arising from or connected with or related to the use of such devices.
- Upon the sale of any such devices, other than for buyer's right to use such devices itself, resell or otherwise dispose of the same, no express or implied right or license to practice or commercially exploit any intellectual property rights or other proprietary rights owned or controlled by
- ROHM CO., LTD. is granted to any such buyer.
- Products listed in this document are no antiradiation design.

The products listed in this document are 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 these products with equipment or devices which require an extremely high level of reliability and the malfunction of with 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.

About Export Control Order in Japan

Products described herein are the objects of controlled goods in Annex 1 (Item 16) of Export Trade Control Order in Japan.
In case of export from Japan, please confirm if it applies to "objective" criteria or an "informed" (by MITI clause) on the basis of "catch all controls for Non-Proliferation of Weapons of Mass Destruction.

Thank you for your accessing to ROHM product informations.

More detail product informations and catalogs are available,

please contact your nearest sales office.

Please contact our sales offices for details ;

U.S.A / San Diego	TEL : +1(858)625-3630	FAX : +1(858)625-3670
Atlanta	TEL : +1(770)754-5972	FAX : +1(770)754-0691
Dallas	TEL : +1(972)312-8818	FAX : +1(972)312-0330
Germany / Dusseldorf	TEL : +49(2154)9210	FAX : +49(2154)921400
United Kingdom / London	TEL : +44(1)908-282-666	FAX : +44(1)908-282-528
France / Paris	TEL : +33(0)1 56 97 30 60	FAX : +33(0) 1 56 97 30 80
China / Hong Kong	TEL : +852(2)740-6262	FAX : +852(2)375-8971
Shanghai	TEL : +86(21)6279-2727	FAX : +86(21)6247-2066
Dilian	TEL : +86(411)8230-8549	FAX : +86(411)8230-8537
Beijing	TEL : +86(10)8525-2483	FAX : +86(10)8525-2489
Taiwan / Taipei	TEL : +866(2)2500-6956	FAX : +866(2)2503-2869
Korea / Seoul	TEL : +82(2)8182-700	FAX : +82(2)8182-715
Singapore	TEL : +65-6332-2322	FAX : +65-6332-5662
Malaysia / Kuala Lumpur	TEL : +60(3)7958-8355	FAX : +60(3)7958-8377
Philippines / Manila	TEL : +63(2)807-6872	FAX : +63(2)809-1422
Thailand / Bangkok	TEL : +66(2)254-4890	FAX : +66(2)256-6334

Japan /
(Internal Sales)

Tokyo 2-1-1, Yaesu, Chuo-ku, Tokyo 104-0082
TEL : +81(3)5203-0321 FAX : +81(3)5203-0300

Yokohama 2-4-8, Shin Yokohama, Kohoku-ku, Yokohama, Kanagawa 222-8575
TEL : +81(45)476-2131 FAX : +81(45)476-2128

Nagoya Dainagayo Building 9F 3-28-12, Meieki, Nakamura-ku, Nagoya,Aichi 450-0002
TEL : +81(52)581-8521 FAX : +81(52)561-2173

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

As of 18th. April 2005