

- ◇ STRUCTURE                      Silicon Monolithic Integrated Circuit
- ◇ PRODUCT                        I<sup>2</sup>C BUS Serial EEPROMs
- ◇ SERIES                            SIGNATURE SERIES
- ◇ FAMILY                           BR24C□□ family
- ◇ TYPE                             Supply voltage 4.5V~5.5V/Operating temperature -40°C~+85°Ctype
- ◇ PART NUMBER                **BR24C□□-□□6TP**

PART NUMBER	PACKAGE	DENSITY
BR24C01-MN6TP	SO8 narrow	1Kbit
BR24C02-MN6TP		2Kbit
BR24C04-MN6TP		4Kbit
BR24C08-MN6TP		8Kbit
BR24C16-MN6TP		16Kbit
BR24C32-MN6TP		32Kbit
BR24C64-MN6TP		64Kbit
BR24C01-DW6TP	TSSOP8	1Kbit
BR24C02-DW6TP		2Kbit
BR24C04-DW6TP		4Kbit
BR24C08-DW6TP		8Kbit
BR24C16-DW6TP		16Kbit
BR24C32-DW6TP		32Kbit
BR24C01-DS6TP	TSSOP8 3 × 3mm <sup>2</sup>	1Kbit
BR24C02-DS6TP		2Kbit
BR24C04-DS6TP		4Kbit
BR24C08-DS6TP		8Kbit
BR24C16-DS6TP		16Kbit

◇ FEATURES

Two wire serial interface  
 Endurance : 1,000,000 erase/write cycles  
 Data retention : 40years  
 Initial Data FFh in all address

◇ ABSOLUTE MAXIMUM RATING

Symbol	Parameter	Min	Max	Unit
Tstg	Storage Temperature	-65	125	°C
V <sub>IO</sub>	Terminal Voltage	-0.3	V <sub>CC</sub> +0.3	V
V <sub>CC</sub>	Supply Voltage	-0.3	6.5	V

◇ POWER DISSIPATION (T<sub>a</sub>=25°C)

PACKAGE	Rating	Unit
SO8 narrow	450 *1	mW
TSSOP8	330 *2	mW
TSSOP8 3 × 3mm <sup>2</sup>	310 *3	mW

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

◇ RECOMMENDED OPERATING CONDITION

Symbol	Parameter	Min	Max	Unit
V <sub>cc</sub>	Supply Voltage	4.5	5.5	V
T <sub>A</sub>	Ambient Operating Temperature	-40	85	°C

◇ DC OPERATING CHARACTERISTICS  
(Unless otherwise specified Ta=-40~85°C, V<sub>cc</sub>=4.5~5.5V)

Parameter	Symbol	Min.	Max.	Unit	Test condition
Input Leakage Current (SCL,SDA)	I <sub>LI</sub>	-	±2	μA	VIN=Vss or Vcc
Output Leakage Current	I <sub>LO</sub>	-	±2	μA	VOUT= Vss or Vcc (SDA in Hi-Z)
Supply Current	I <sub>CC</sub>	-	2	mA	Vcc=5V, f <sub>c</sub> =400kHz
Stand-by Supply Current	I <sub>CC1</sub>	-	1 *1	μA	VIN =Vss or Vcc, Vcc=5V
		-	10 *2		
Input Low Voltage (E2,E1,E0,SCL,SDA)	V <sub>IL</sub>	-	0.3V <sub>cc</sub>	V	
Input Low Voltage ( $\overline{WC}$ )	V <sub>IL</sub>	-	0.5 *1	V	
		-	0.3V <sub>cc</sub> *2		
Input High Voltage (E2,E1,E0,SCL,SDA, $\overline{WC}$ )	V <sub>HI</sub>	0.7V <sub>cc</sub>	-	V	
Output Low Voltage	V <sub>OL</sub>	-	0.4	V	IOL=3mA, Vcc=5V

\*1 BR24C01/02/04/08/16

\*2 BR24C32/64

◇ AC OPERATING CHARACTERISTICS  
(Unless otherwise specified Ta=-40~85°C, V<sub>cc</sub>=4.5~5.5V)

Parameter	Symbol	Min	Max	Unit
Clock Frequency	f <sub>c</sub>	-	400	kHz
Clock Pulse Width High	t <sub>CHCL</sub>	600	-	ns
Clock Pulse Width Low	t <sub>CLCL</sub>	1300	-	ns
SDA Fall Time *1	t <sub>OL,OLZ</sub>	20	300	ns
Data In Set Up Time	t <sub>DSX</sub>	100	-	ns
Data In Hold Time	t <sub>CDX</sub>	0	-	ns
Data Out Hold Time	t <sub>CDX</sub>	200	-	ns
Clock Low to Next Data Valid(Access Time)	t <sub>CLDV</sub>	200	900	ns
Start Condition Set Up Time	t <sub>DSX</sub>	600	-	ns
Start Condition Hold Time	t <sub>PLX</sub>	600	-	ns
Stop Condition Set Up Time	t <sub>CHSX</sub>	600	-	ns
Time between Stop Condition and Next Start Condition	t <sub>MDL</sub>	1300	-	ns
Write Time	t <sub>w</sub>	-	5	ms

\*1 Not 100% TESTED

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

◇ BLOCK DIAGRAM

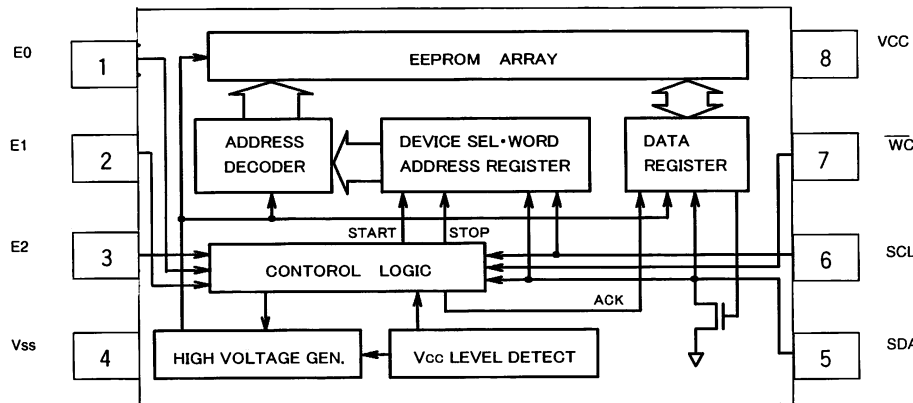


Fig.-1 BLOCK DIAGRAM

◇ PIN No., PIN NAME

PIN No.	PIN NAME
1	E0
2	E1
3	E2
4	Vss
5	SDA
6	SCL
7	$\overline{WC}$
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.

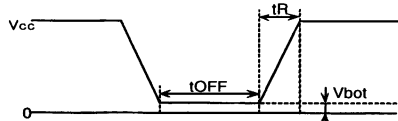


Fig.-2 Vcc RISING WAVEFORM

◇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.

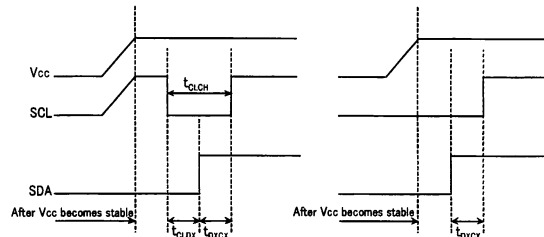


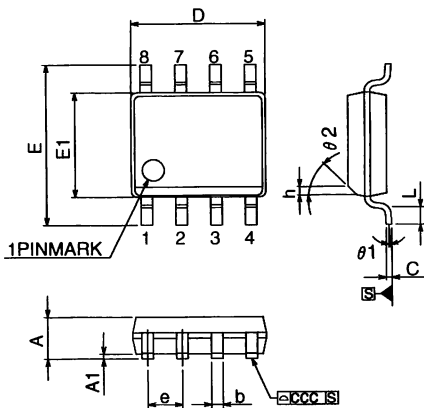
Fig.-3(a) SCL='H' and SDA='L'

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

◇CAUTIONS ON USE

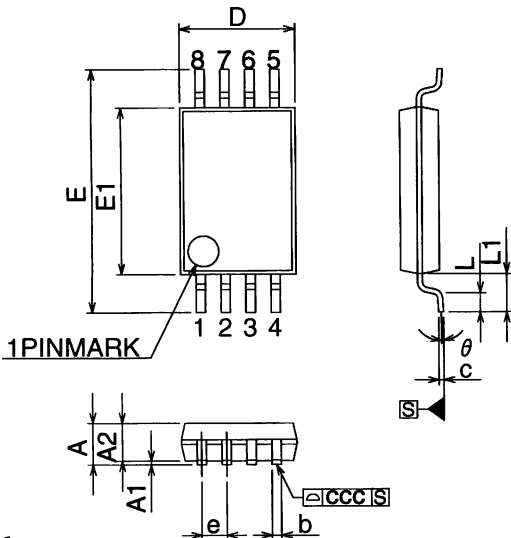
- (1) Absolute maximum ratings  
If the absolute maximum ratings such as impressed voltage and action temperature range and so forth are exceeded, LSI may be destructed. Do not impress voltage and temperature exceeding the absolute maximum ratings. In the case of fear exceeding the absolute maximum ratings, 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) 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



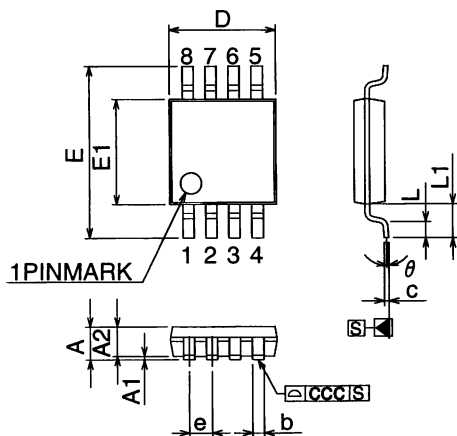
- Notes
- 1.This drawing is subject to change without notice.
  - 2.Body dimensions do not include mold flash or protrusion, or gate burns.
  - 3.Reference JEDEC MS-012 variation AA.

Fig.-4 SO8 narrow Package Outline



- 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 variation AA.

Fig.-5 TSSOP Package Outline



- 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.-6 TSSOP 3 x 3mm<sup>2</sup> 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	-	-	0.050	-	-
E	-	5.80	6.20	-	0.228	0.244
E1	-	3.80	4.00	-	0.150	0.157
L	-	0.40	1.27	0.050	0.016	0.050
theta 1	-	0°	8°	-	0°	8°
ccc	-	-	0.10	-	-	0.004
h	-	0.25	0.50	-	0.010	0.020
theta 2	45°	-	-	45°	-	-

◇ 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
theta	-	0°	8°	-	0°	8°

◇ TSSOP8 3 x 3mm<sup>2</sup> 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
theta	-	0°	6°	-	0°	6°

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