

- ◇ STRUCTURE                      Silicon Monolithic Integrated Circuit
- ◇ PRODUCT                        I<sup>2</sup>C BUS 2Kbit (256 × 8bit) EEPROM
- ◇ PART NUMBER                BR24L02-W Series

| PART NUMBER  | PACKAGE |
|--------------|---------|
| BR24L02-W    | DIP8    |
| BR24L02F-W   | SOP8    |
| BR24L02FJ-W  | SOP-J8  |
| BR24L02FV-W  | SSOP-B8 |
| BR24L02FVM-W | MSOP8   |

- ◇ 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     | 800 (BR24L02-W)            *1 | mW   |
|                       |        | 450 (BR24L02F-W)           *2 |      |
|                       |        | 450 (BR24L02FJ-W)        *3   |      |
|                       |        | 300 (BR24L02FV-W)        *4   |      |
|                       |        | 310 (BR24L02FVM-W)      *5    |      |
| Storage Temperature   | Tstg   | -65~125                       | °C   |
| Operating Temperature | Topr   | -40~85                        | °C   |
| Terminal Voltage      | —      | -0.3~Vcc+0.3                  | V    |

\* Degradation is done at 8.0mW/°C(\*1), 4.5mW/°C(\*2,\*3), 3.0mW/°C(\*4), 3.1mW/°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    |

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(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     | VIH1   | 0.7Vcc        | -    | -      | V    | 2.5V ≤ Vcc ≤ 5.5V  |
| "L" Input Voltage1     | VIL1   | -             | -    | 0.3Vcc | V    | 2.5V ≤ Vcc ≤ 5.5V  |
| "H" Input Voltage2     | VIH2   | 0.8Vcc        | -    | -      | V    | 1.8V ≤ Vcc < 2.5V  |
| "L" Input Voltage2     | VIL2   | -             | -    | 0.2Vcc | V    | 1.8V ≤ Vcc < 2.5V  |
| "L" Output Voltage1    | VOL1   | -             | -    | 0.4    | V    | IOL=3.0mA, 2.5V ≤ Vcc ≤ 5.5V(SDA)                                |
| "L" Output Voltage2    | VOL2   | -             | -    | 0.2    | V    | IOL=0.7mA, 1.8V ≤ Vcc < 2.5V(SDA)                                |
| Input Leakage Current  | ILI    | -1            | -    | 1      | μA   | VIN=0V~Vcc   |
| Output Leakage Current | ILO    | -1            | -    | 1      | μA   | VOU=0V~Vcc(SDA)  |
| Operating Current      | ICC1   | -             | -    | 2.0    | mA   | Vcc=5.5V,fSCL=400kHz, tWR=5ms<br>Byte Write,Page Write           |
|                        | ICC2   | -             | -    | 0.5    | mA   | Vcc=5.5V,fSCL=400kHz<br>Random Read,Current Read,Sequential Read |
| Standby Current        | ISB    | -             | -    | 2.0    | μA   | Vcc=5.5V,SDA,SCL=Vcc<br>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         |      |      | STANDARD-MODE     |      |      | Unit |
|---------------------------------|----------|-------------------|------|------|-------------------|------|------|------|
|                                 |          | 2.5V ≤ Vcc ≤ 5.5V |      |      | 1.8V ≤ Vcc ≤ 5.5V |      |      |      |
|                                 |          | Min.              | Typ. | Max. | Min.              | Typ. | Max. |      |
| Clock Frequency                 | fSCL     | -                 | -    | 400  | -                 | -    | 100  | kHz  |
| Data Clock High Period          | tHIGH    | 0.6               | -    | -    | 4.0               | -    | -    | μs   |
| Data Clock Low Period           | tLOW     | 1.2               | -    | -    | 4.7               | -    | -    | μs   |
| SDA and SCL Rise Time           | tR       | -                 | -    | 0.3  | -                 | -    | 1.0  | μs   |
| SDA and SCL Fall Time           | tF       | -                 | -    | 0.3  | -                 | -    | 0.3  | μs   |
| Start Condition Hold Time       | tHD:STA  | 0.6               | -    | -    | 4.0               | -    | -    | μs   |
| Start Condition Setup Time      | tSU:STA  | 0.6               | -    | -    | 4.7               | -    | -    | μs   |
| Input Data Hold Time            | tHD:DAT  | 0                 | -    | -    | 0                 | -    | -    | ns   |
| Input Data Setup Time           | tSU:DAT  | 100               | -    | -    | 250               | -    | -    | ns   |
| Output Data Delay Time          | tPD      | 0.1               | -    | 0.9  | 0.2               | -    | 3.5  | μs   |
| Output Data Hold Time           | tDH      | 0.1               | -    | -    | 0.2               | -    | -    | μs   |
| Stop Condition Setup Time       | tSU:STO  | 0.6               | -    | -    | 4.7               | -    | -    | μs   |
| Bus Free Time                   | tBUF     | 1.2               | -    | -    | 4.7               | -    | -    | μs   |
| Write Cycle Time                | tWR      | -                 | -    | 5    | -                 | -    | 5    | ms   |
| Noise Spike Width (SDA and SCL) | tJ       | -                 | -    | 0.1  | -                 | -    | 0.1  | μs   |
| WP Hold Time                    | tHD:WP   | 0                 | -    | -    | 0                 | -    | -    | ns   |
| WP Setup Time                   | tSU:WP   | 0.1               | -    | -    | 0.1               | -    | -    | μs   |
| WP High Period                  | tHIGH:WP | 1.0               | -    | -    | 1.0               | -    | -    | μs   |

\*1 Not 100% TESTED

◇ BLOCK DIAGRAM

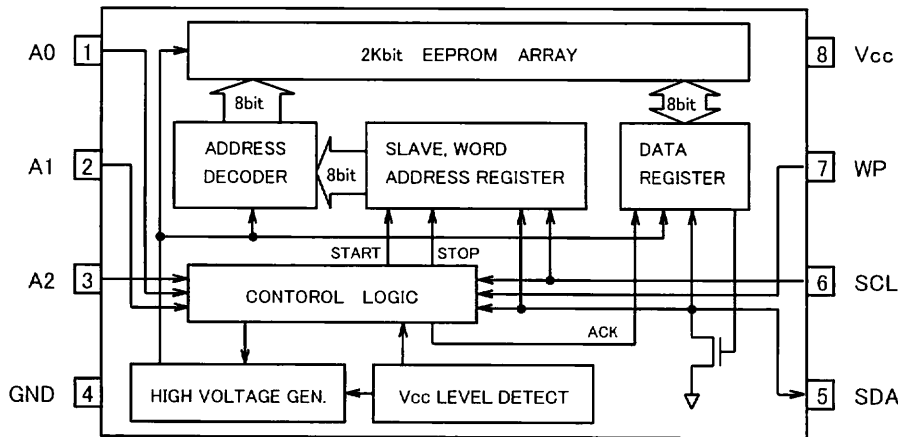


Fig.-1 BLOCK DIAGRAM

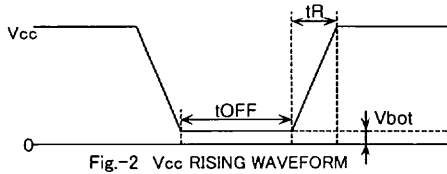
◇ PIN No. , PIN NAME

| 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.



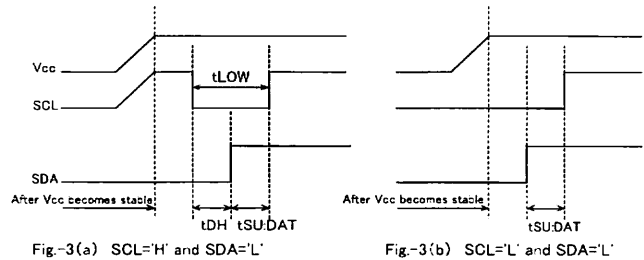
◇RECOMMENDED CONDITIONS OF tR, tOFF, Vbot

| 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.



◇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

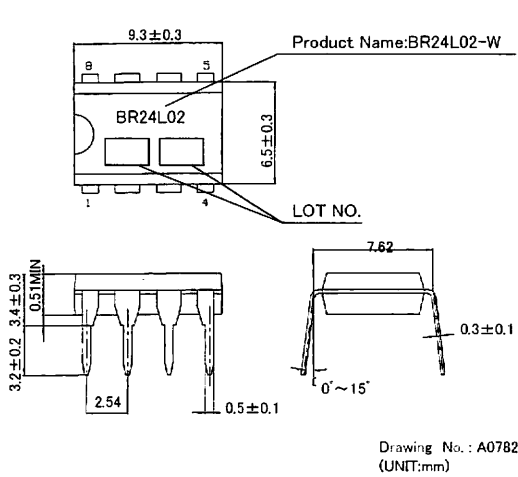


Fig.-4(a) PHYSICAL DIMENSION  
DIP8 (BR24L02-W)

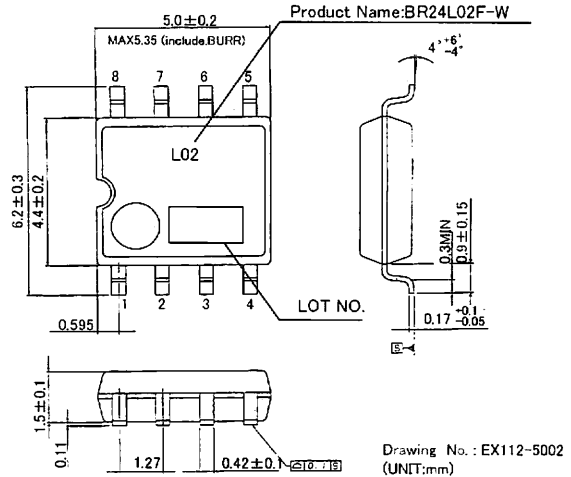


Fig.-4(b) PHYSICAL DIMENSION  
SOP8 (BR24L02F-W)

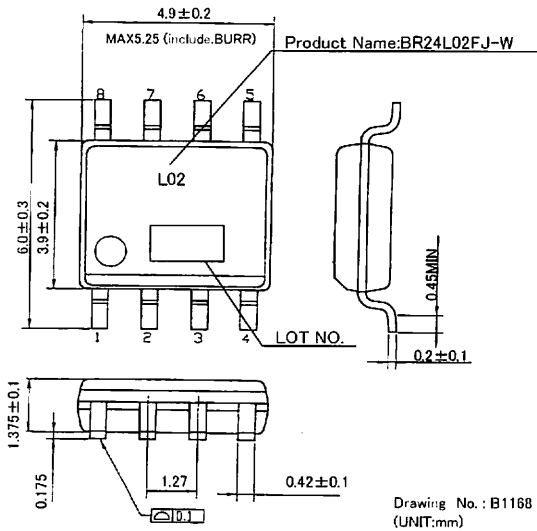


Fig.-4(c) PHYSICAL DIMENSION  
SIP-J8 (BR24L02FJ-W)

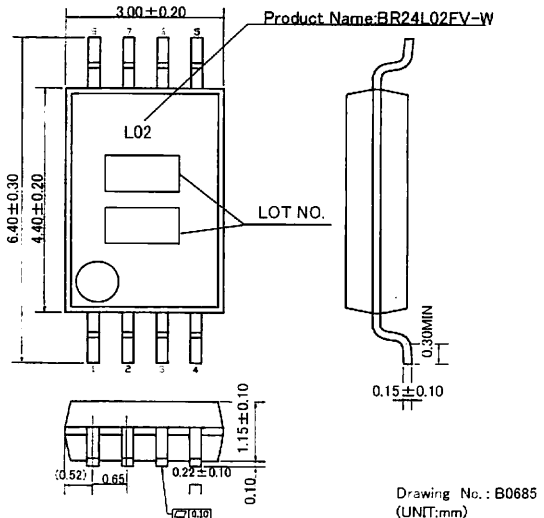


Fig.-4(d) PHYSICAL DIMENSION  
SSOP-B8 (BR24L02FV-W)

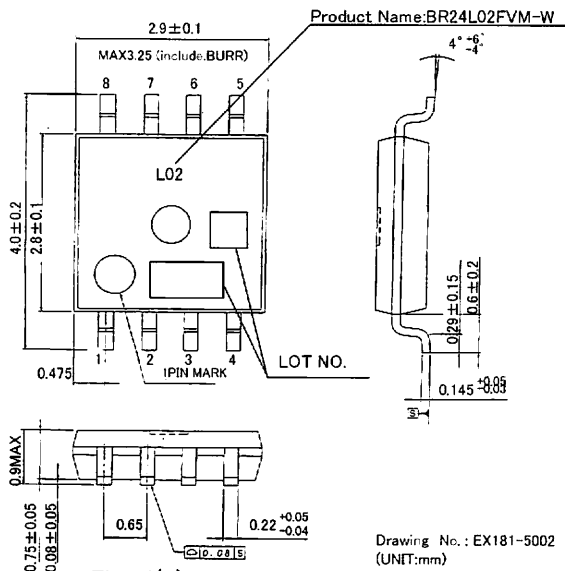


Fig.-4(e) PHYSICAL DIMENSION  
MSOP8 (BR24L02FVM-W)

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