

- ◇ STRUCTURE                      Silicon Monolithic Integrated Circuit
- ◇ PRODUCT                        SPI BUS Serial EEPROMs
- ◇ SERIES                          ADVANTAGE SERIES
- ◇ FAMILY                         BR25□□0 family
- ◇ TYPE                            Supply voltage 2.7V~5.5V/Operating temperature -40°C~+85°Ctype
- ◇ PART NUMBER    **BR25□□0-10□U-2.7**

| PART NUMBER        | PACKAGE              | DENSITY |
|--------------------|----------------------|---------|
| BR25010N -10SU-2.7 | 8-lead<br>JEDEC SOIC | 1Kbit   |
| BR25020N -10SU-2.7 |                      | 2Kbit   |
| BR25040N -10SU-2.7 |                      | 4Kbit   |
| BR25080N -10SU-2.7 |                      | 8Kbit   |
| BR25160N -10SU-2.7 |                      | 16Kbit  |
| BR25320N -10SU-2.7 |                      | 32Kbit  |
| BR25640N -10SU-2.7 |                      | 64Kbit  |
| BR25010 -10TU-2.7  | 8-lead<br>TSSOP      | 1Kbit   |
| BR25020 -10TU-2.7  |                      | 2Kbit   |
| BR25040 -10TU-2.7  |                      | 4Kbit   |
| BR25080 -10TU-2.7  |                      | 8Kbit   |
| BR25160 -10TU-2.7  |                      | 16Kbit  |

- ◇ FEATURES                      SPI BUS interface  
Endurance : 1,000,000 erase/write cycles  
Data retention : 100 years  
Initial Data: Memory array FFh

◇ ABSOLUTE MAXIMUM RATINGS

| Symbol           | Parameter           | Min. | Max.                 | Unit |
|------------------|---------------------|------|----------------------|------|
| T <sub>STG</sub> | Storage Temperature | -65  | 125                  | °C   |
| V <sub>IN</sub>  | Input range         | -0.3 | V <sub>CC</sub> +0.3 | V    |
| V <sub>CC</sub>  | Supply Voltage      | -0.3 | 6.5                  | V    |

◇ POWER DISSIPATION (Ta=25°C)

| PACKAGE           | Rating | Unit |
|-------------------|--------|------|
| 8-lead JEDEC SOIC | 450 *1 | mW   |
| 8-lead TSSOP      | 330 *2 | mW   |

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

## ◇ DC OPERATING CHARACTERISTICS

(BR25010/020/040, Unless otherwise specified,  $T_A = -40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ ,  $V_{CC} = +2.7\text{V}$  to  $+5.5\text{V}$ )

| Parameter           | Symbol    | Specification       |      |                     | Units         | Test Conditions                                                                         |
|---------------------|-----------|---------------------|------|---------------------|---------------|-----------------------------------------------------------------------------------------|
|                     |           | Min.                | Typ. | Max.                |               |                                                                                         |
| Supply Current      | $I_{CC1}$ | -                   | -    | 3.0                 | mA            | $V_{CC} = 5.0\text{V}$ , $f_{SCK} = 1\text{MHz}$ ,<br>SO=Open, Read                     |
| Supply Current      | $I_{CC2}$ | -                   | -    | 6.0                 | mA            | $V_{CC} = 5.0\text{V}$ , $f_{SCK} = 2\text{MHz}$ ,<br>SO=Open, Read, Write              |
| Standby Current     | $I_{SA1}$ | -                   | -    | 5.0                 | $\mu\text{A}$ | $V_{CC} = 2.7\text{V}$ , CS=HOLD=WP=Vcc,<br>SCK=SI=Vcc or GND, SO=OPEN                  |
| Standby Current     | $I_{SA2}$ | -                   | -    | 10.0                | $\mu\text{A}$ | $V_{CC} = 5.0\text{V}$ , CS=HOLD=WP=Vcc,<br>SCK=SI=Vcc or GND, SO=OPEN                  |
| Input Leakage       | $I_L$     | -0.6                | -    | 3.0                 | $\mu\text{A}$ | $V_{IN} = 0\text{V} \sim V_{CC}$                                                        |
| Output Leakage      | $I_{OL}$  | -0.6                | -    | 3.0                 | $\mu\text{A}$ | $V_{IN} = 0\text{V} \sim V_{CC}$ , $T_{AC} = 0^{\circ}\text{C} \sim 70^{\circ}\text{C}$ |
| Input Low Voltage   | $V_{IL}$  | -                   | -    | $V_{CC} \times 0.3$ | V             | -                                                                                       |
| Input High Voltage  | $V_{IH}$  | $V_{CC} \times 0.7$ | -    | -                   | V             | -                                                                                       |
| Output Low Voltage  | $V_{OL1}$ | -                   | -    | 0.4                 | V             | $I_{OL} = 2.0\text{mA}$                                                                 |
| Output High Voltage | $V_{OH1}$ | $V_{CC} - 0.8$      | -    | -                   | V             | $I_{OH} = -1.0\text{mA}$                                                                |
| Output Low Voltage  | $V_{OL2}$ | -                   | -    | 0.2                 | V             | $2.7\text{V} \leq V_{CC} \leq 5.5\text{V}$ ,<br>$I_{OL} = 0.15\text{mA}$                |
| Output High Voltage | $V_{OH2}$ | $V_{CC} - 0.2$      | -    | -                   | V             | $2.7\text{V} \leq V_{CC} \leq 5.5\text{V}$ ,<br>$I_{OH} = -100\mu\text{A}$              |

## ◇ DC OPERATING CHARACTERISTICS

(BR25080/160/320/640, Unless otherwise specified,  $T_A = -40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ ,  $V_{CC} = +2.7\text{V}$  to  $+5.5\text{V}$ )

| Parameter           | Symbol    | Specification       |      |                     | Units         | Test Conditions                                                                         |
|---------------------|-----------|---------------------|------|---------------------|---------------|-----------------------------------------------------------------------------------------|
|                     |           | Min.                | Typ. | Max.                |               |                                                                                         |
| Supply Current      | $I_{CC1}$ | -                   | -    | 3.0                 | mA            | $V_{CC} = 5.0\text{V}$ , $f_{SCK} = 1\text{MHz}$ ,<br>SO=Open, Read                     |
| Supply Current      | $I_{CC2}$ | -                   | -    | 5.0                 | mA            | $V_{CC} = 5.0\text{V}$ , $f_{SCK} = 2\text{MHz}$ ,<br>SO=Open, Read, Write              |
| Standby Current     | $I_{SA1}$ | -                   | 0.2  | 2.0                 | $\mu\text{A}$ | $V_{CC} = 2.7\text{V}$ , CS=HOLD=WP=Vcc,<br>SCK=SI=Vcc or GND, SO=OPEN                  |
| Standby Current     | $I_{SA2}$ | -                   | 2.0  | 5.0                 | $\mu\text{A}$ | $V_{CC} = 5.0\text{V}$ , CS=HOLD=WP=Vcc,<br>SCK=SI=Vcc or GND, SO=OPEN                  |
| Input Leakage       | $I_L$     | -3.0                | -    | 3.0                 | $\mu\text{A}$ | $V_{IN} = 0\text{V} \sim V_{CC}$                                                        |
| Output Leakage      | $I_{OL}$  | -3.0                | -    | 3.0                 | $\mu\text{A}$ | $V_{IN} = 0\text{V} \sim V_{CC}$ , $T_{AC} = 0^{\circ}\text{C} \sim 70^{\circ}\text{C}$ |
| Input Low Voltage   | $V_{IL}$  | -                   | -    | $V_{CC} \times 0.3$ | V             | -                                                                                       |
| Input High Voltage  | $V_{IH}$  | $V_{CC} \times 0.7$ | -    | -                   | V             | -                                                                                       |
| Output Low Voltage  | $V_{OL1}$ | -                   | -    | 0.4                 | V             | $4.5\text{V} \leq V_{CC} \leq 5.5\text{V}$ ,<br>$I_{OL} = 3.0\text{mA}$                 |
| Output High Voltage | $V_{OH1}$ | $V_{CC} - 0.8$      | -    | -                   | V             | $4.5\text{V} \leq V_{CC} \leq 5.5\text{V}$ ,<br>$I_{OH} = -1.8\text{mA}$                |
| Output Low Voltage  | $V_{OL2}$ | -                   | -    | 0.2                 | V             | $2.7\text{V} \leq V_{CC} \leq 3.6\text{V}$ ,<br>$I_{OL} = 0.15\text{mA}$                |
| Output High Voltage | $V_{OH2}$ | $V_{CC} - 0.2$      | -    | -                   | V             | $2.7\text{V} \leq V_{CC} \leq 3.6\text{V}$ ,<br>$I_{OH} = -100\mu\text{A}$              |

## ◇ AC OPERATING CHARACTERISTICS

(BR25010/020/040, Unless otherwise specified,  $T_A = -40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ ,  $V_{CC} = +2.7\text{V}$  to  $+5.5\text{V}$ ,  $C_L = 100\text{pF}$ )

| Parameter             | Symbol    | Specification |      |      | Unit          | Test Condition                             |
|-----------------------|-----------|---------------|------|------|---------------|--------------------------------------------|
|                       |           | Min.          | Typ. | Max. |               |                                            |
| SCK Clock Frequency   | $f_{SCK}$ | 0             | -    | 3.0  | MHz           | $4.5\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
|                       |           | 0             | -    | 2.1  |               | $2.7\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
|                       |           | 0             | -    | 0.5  |               | $1.8\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
| Input Rise Time       | $t_{RI}$  | -             | -    | 2    | $\mu\text{s}$ | $4.5\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
|                       |           | -             | -    | 2    |               | $2.7\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
|                       |           | -             | -    | 2    |               | $1.8\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
| Input Fall Time       | $t_{FI}$  | -             | -    | 2    | $\mu\text{s}$ | $4.5\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
|                       |           | -             | -    | 2    |               | $2.7\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
|                       |           | -             | -    | 2    |               | $1.8\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
| SCK High Time         | $t_{WH}$  | 133           | -    | -    | ns            | $4.5\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
|                       |           | 200           | -    | -    |               | $2.7\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
|                       |           | 800           | -    | -    |               | $1.8\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
| SCK Low Time          | $t_{WL}$  | 133           | -    | -    | ns            | $4.5\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
|                       |           | 200           | -    | -    |               | $2.7\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
|                       |           | 800           | -    | -    |               | $1.8\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
| CS High Time          | $t_{CH}$  | 250           | -    | -    | ns            | $4.5\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
|                       |           | 250           | -    | -    |               | $2.7\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
|                       |           | 1000          | -    | -    |               | $1.8\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
| CS Setup Time         | $t_{CS}$  | 250           | -    | -    | ns            | $4.5\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
|                       |           | 250           | -    | -    |               | $2.7\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
|                       |           | 1000          | -    | -    |               | $1.8\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
| CS Hold Time          | $t_{CH}$  | 250           | -    | -    | ns            | $4.5\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
|                       |           | 250           | -    | -    |               | $2.7\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
|                       |           | 1000          | -    | -    |               | $1.8\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
| Data In Setup Time    | $t_{DI}$  | 50            | -    | -    | ns            | $4.5\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
|                       |           | 50            | -    | -    |               | $2.7\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
|                       |           | 100           | -    | -    |               | $1.8\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
| Data In Hold Time     | $t_{DH}$  | 50            | -    | -    | ns            | $4.5\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
|                       |           | 100           | -    | -    |               | $2.7\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
|                       |           | 100           | -    | -    |               | $1.8\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
| Hold Setup Time       | $t_{HS}$  | 100           | -    | -    | ns            | $4.5\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
|                       |           | 100           | -    | -    |               | $2.7\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
|                       |           | 400           | -    | -    |               | $1.8\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
| Hold Hold Time        | $t_{HD}$  | 200           | -    | -    | ns            | $4.5\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
|                       |           | 200           | -    | -    |               | $2.7\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
|                       |           | 400           | -    | -    |               | $1.8\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
| Output Valid          | $t_V$     | 0             | -    | 133  | ns            | $4.5\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
|                       |           | 0             | -    | 200  |               | $2.7\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
|                       |           | 0             | -    | 800  |               | $1.8\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
| Output Hold Time      | $t_{HO}$  | 0             | -    | -    | ns            | $4.5\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
|                       |           | 0             | -    | -    |               | $2.7\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
|                       |           | 0             | -    | -    |               | $1.8\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
| Hold to Output Low Z  | $t_{LZ}$  | 0             | -    | 100  | ns            | $4.5\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
|                       |           | 0             | -    | 100  |               | $2.7\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
|                       |           | 0             | -    | 100  |               | $1.8\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
| Hold to Output High Z | $t_{HZ}$  | -             | -    | 100  | ns            | $4.5\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
|                       |           | -             | -    | 100  |               | $2.7\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
|                       |           | -             | -    | 100  |               | $1.8\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
| Output Disable Time   | $t_{OS}$  | -             | -    | 250  | ns            | $4.5\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
|                       |           | -             | -    | 500  |               | $2.7\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
|                       |           | -             | -    | 1000 |               | $1.8\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
| Write Cycle Time      | $t_{WC}$  | -             | -    | 5    | ms            | $4.5\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
|                       |           | -             | -    | 10   |               | $2.7\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
|                       |           | -             | -    | 20   |               | $1.8\text{V} \leq V_{CC} \leq 5.5\text{V}$ |
| Endurance *1          | -         | 1M            | -    | -    | Write Cycles  | -                                          |

\*1 This parameter is characterized and is not 100% tested.

OThis product is not designed for protection against radioactive rays.

## ◇ AC OPERATING CHARACTERISTICS

(BR25080/160/320/640, Unless otherwise specified,  $T_A = -40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ ,  $V_{CC} = +2.7\text{V}$  to  $+5.5\text{V}$ ,  $C_L = 100\text{pF}$ )

| Parameter                             | Symbol           | Specification |      |      | Unit         | Test Condition                |
|---------------------------------------|------------------|---------------|------|------|--------------|-------------------------------|
|                                       |                  | Min.          | Typ. | Max. |              |                               |
| SCK Clock Frequency                   | f <sub>SCK</sub> | 0             | –    | 3.0  | MHz          | 4.5V ≤ V <sub>CC</sub> ≤ 5.5V |
|                                       |                  | 0             | –    | 2.1  |              | 2.7V ≤ V <sub>CC</sub> ≤ 5.5V |
|                                       |                  | 0             | –    | 0.5  |              | 1.8V ≤ V <sub>CC</sub> ≤ 5.5V |
| Input Rise Time                       | t <sub>RI</sub>  | –             | –    | 2    | μs           | 4.5V ≤ V <sub>CC</sub> ≤ 5.5V |
|                                       |                  | –             | –    | 2    |              | 2.7V ≤ V <sub>CC</sub> ≤ 5.5V |
|                                       |                  | –             | –    | 2    |              | 1.8V ≤ V <sub>CC</sub> ≤ 5.5V |
| Input Fall Time                       | t <sub>FI</sub>  | –             | –    | 2    | μs           | 4.5V ≤ V <sub>CC</sub> ≤ 5.5V |
|                                       |                  | –             | –    | 2    |              | 2.7V ≤ V <sub>CC</sub> ≤ 5.5V |
|                                       |                  | –             | –    | 2    |              | 1.8V ≤ V <sub>CC</sub> ≤ 5.5V |
| SCK High Time                         | t <sub>WH</sub>  | 133           | –    | –    | ns           | 4.5V ≤ V <sub>CC</sub> ≤ 5.5V |
|                                       |                  | 200           | –    | –    |              | 2.7V ≤ V <sub>CC</sub> ≤ 5.5V |
|                                       |                  | 800           | –    | –    |              | 1.8V ≤ V <sub>CC</sub> ≤ 5.5V |
| SCK Low Time                          | t <sub>WL</sub>  | 133           | –    | –    | ns           | 4.5V ≤ V <sub>CC</sub> ≤ 5.5V |
|                                       |                  | 200           | –    | –    |              | 2.7V ≤ V <sub>CC</sub> ≤ 5.5V |
|                                       |                  | 800           | –    | –    |              | 1.8V ≤ V <sub>CC</sub> ≤ 5.5V |
| CS High Time                          | t <sub>CH</sub>  | 250           | –    | –    | ns           | 4.5V ≤ V <sub>CC</sub> ≤ 5.5V |
|                                       |                  | 250           | –    | –    |              | 2.7V ≤ V <sub>CC</sub> ≤ 5.5V |
|                                       |                  | 1000          | –    | –    |              | 1.8V ≤ V <sub>CC</sub> ≤ 5.5V |
| CS Setup Time                         | t <sub>CS</sub>  | 250           | –    | –    | ns           | 4.5V ≤ V <sub>CC</sub> ≤ 5.5V |
|                                       |                  | 250           | –    | –    |              | 2.7V ≤ V <sub>CC</sub> ≤ 5.5V |
|                                       |                  | 1000          | –    | –    |              | 1.8V ≤ V <sub>CC</sub> ≤ 5.5V |
| CS Hold Time                          | t <sub>CH</sub>  | 250           | –    | –    | ns           | 4.5V ≤ V <sub>CC</sub> ≤ 5.5V |
|                                       |                  | 250           | –    | –    |              | 2.7V ≤ V <sub>CC</sub> ≤ 5.5V |
|                                       |                  | 1000          | –    | –    |              | 1.8V ≤ V <sub>CC</sub> ≤ 5.5V |
| Data In Setup Time                    | t <sub>DI</sub>  | 50            | –    | –    | ns           | 4.5V ≤ V <sub>CC</sub> ≤ 5.5V |
|                                       |                  | 50            | –    | –    |              | 2.7V ≤ V <sub>CC</sub> ≤ 5.5V |
|                                       |                  | 100           | –    | –    |              | 1.8V ≤ V <sub>CC</sub> ≤ 5.5V |
| Data In Hold Time                     | t <sub>DI</sub>  | 50            | –    | –    | ns           | 4.5V ≤ V <sub>CC</sub> ≤ 5.5V |
|                                       |                  | 50            | –    | –    |              | 2.7V ≤ V <sub>CC</sub> ≤ 5.5V |
|                                       |                  | 100           | –    | –    |              | 1.8V ≤ V <sub>CC</sub> ≤ 5.5V |
| Hold Setup Time                       | t <sub>HS</sub>  | 100           | –    | –    | ns           | 4.5V ≤ V <sub>CC</sub> ≤ 5.5V |
|                                       |                  | 100           | –    | –    |              | 2.7V ≤ V <sub>CC</sub> ≤ 5.5V |
|                                       |                  | 400           | –    | –    |              | 1.8V ≤ V <sub>CC</sub> ≤ 5.5V |
| Hold Hold Time                        | t <sub>HD</sub>  | 200           | –    | –    | ns           | 4.5V ≤ V <sub>CC</sub> ≤ 5.5V |
|                                       |                  | 200           | –    | –    |              | 2.7V ≤ V <sub>CC</sub> ≤ 5.5V |
|                                       |                  | 400           | –    | –    |              | 1.8V ≤ V <sub>CC</sub> ≤ 5.5V |
| Output Valid                          | t <sub>V</sub>   | 0             | –    | 133  | ns           | 4.5V ≤ V <sub>CC</sub> ≤ 5.5V |
|                                       |                  | 0             | –    | 200  |              | 2.7V ≤ V <sub>CC</sub> ≤ 5.5V |
|                                       |                  | 0             | –    | 800  |              | 1.8V ≤ V <sub>CC</sub> ≤ 5.5V |
| Output Hold Time                      | t <sub>HO</sub>  | 0             | –    | –    | ns           | 4.5V ≤ V <sub>CC</sub> ≤ 5.5V |
|                                       |                  | 0             | –    | –    |              | 2.7V ≤ V <sub>CC</sub> ≤ 5.5V |
|                                       |                  | 0             | –    | –    |              | 1.8V ≤ V <sub>CC</sub> ≤ 5.5V |
| Hold to Output Low Z                  | t <sub>LZ</sub>  | 0             | –    | 100  | ns           | 4.5V ≤ V <sub>CC</sub> ≤ 5.5V |
|                                       |                  | 0             | –    | 100  |              | 2.7V ≤ V <sub>CC</sub> ≤ 5.5V |
|                                       |                  | 0             | –    | 100  |              | 1.8V ≤ V <sub>CC</sub> ≤ 5.5V |
| Hold to Output High Z                 | t <sub>HZ</sub>  | –             | –    | 100  | ns           | 4.5V ≤ V <sub>CC</sub> ≤ 5.5V |
|                                       |                  | –             | –    | 100  |              | 2.7V ≤ V <sub>CC</sub> ≤ 5.5V |
|                                       |                  | –             | –    | 100  |              | 1.8V ≤ V <sub>CC</sub> ≤ 5.5V |
| Output Disable Time                   | t <sub>OS</sub>  | –             | –    | 250  | ns           | 4.5V ≤ V <sub>CC</sub> ≤ 5.5V |
|                                       |                  | –             | –    | 250  |              | 2.7V ≤ V <sub>CC</sub> ≤ 5.5V |
|                                       |                  | –             | –    | 1000 |              | 1.8V ≤ V <sub>CC</sub> ≤ 5.5V |
| Write Cycle Time                      | t <sub>WC</sub>  | –             | –    | 5    | ms           | 4.5V ≤ V <sub>CC</sub> ≤ 5.5V |
|                                       |                  | –             | –    | 10   |              | 2.7V ≤ V <sub>CC</sub> ≤ 5.5V |
|                                       |                  | –             | –    | 20   |              | 1.8V ≤ V <sub>CC</sub> ≤ 5.5V |
| Endurance *1<br>5.0V, 25°C, Page Mode | –                | 1M            | –    | –    | Write Cycles | –                             |

# ◇NOTES FOR POWER SUPPLY

In order to prevent an inadvertent write, the device has the feature of P.O.R.

After the power is on, the device is in the write disable mode. P.O.R. works only during power up. The noise may force the device write enable mode with  $\overline{CS}$ ="H" during power ON/OFF. In the case of power up, keep the following conditions to ensure to make the function of P.O.R.

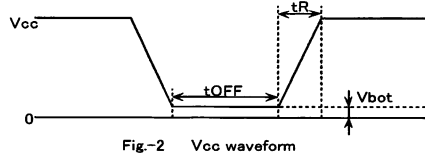


Fig.-2 Vcc waveform

## ◇RECOMMENDED CONDITIONS OF tR, tOFF, Vbot

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

Please keep  $\overline{CS}$  "H" during power ON/OFF.

The device is an active state during  $\overline{CS}$  is low. The extraordinary function or data collaption may occur because of noise etc., if power-up is done with  $\overline{CS}$  "L". In order to prevent above errors from happening, keep  $\overline{CS}$  "H" (=Vcc) during power ON. (The device does not receive any command during  $\overline{CS}$  is high.)

It may continue at low Vcc by capacitance of Vcc line during power off.

Please keep  $\overline{CS}$  "H" during power off because of the device may make malfunction and inadvertent write.

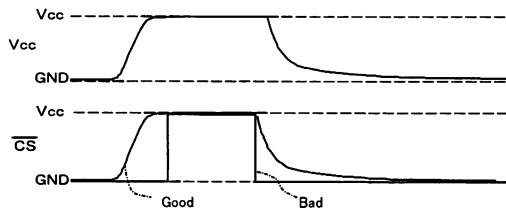


Fig.-3  $\overline{CS}$  TIMING DURING POWER ON/OFF

(Good example)

$\overline{CS}$  follows Vcc. ( $\overline{CS}$  is pull up to Vcc)

(Bad example)

$\overline{CS}$  is low during power ON/OFF.

Please take more than 10ms between power ON and power OFF, or the internal circuit is not always reset.

# ◇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

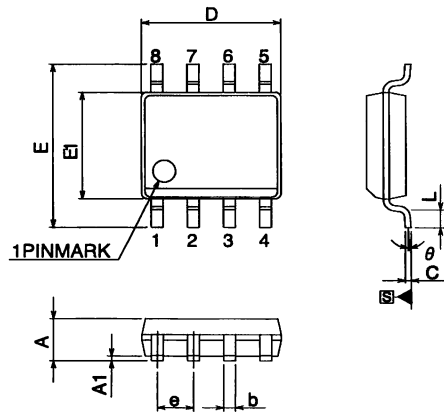
In consideration of permissible loss in actual use condition, carry out heat design with sufficient margin.

## (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



- 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.

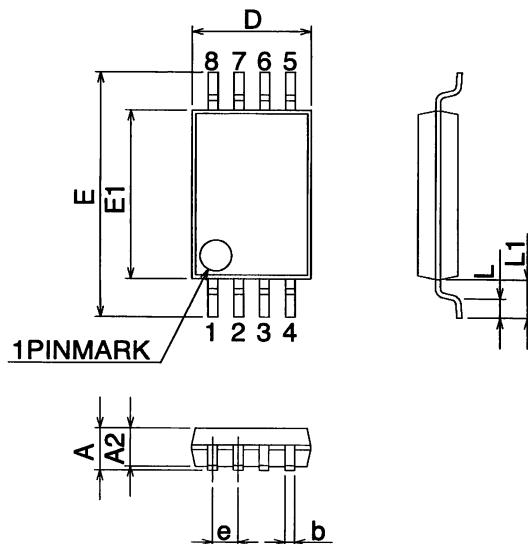
Fig.-4 8-lead JEDEC SOIC Package Outline

◇ 8-lead JEDEC SOIC Package Size Data

| Symbol | 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      | -           | 0.31 | 0.51 | -            | 0.012 | 0.020 |
| c      | -           | 0.17 | 0.25 | -            | 0.007 | 0.010 |
| D      | -           | 4.80 | 5.00 | -            | 0.189 | 0.197 |
| e      | 1.27<br>BSC | -    | -    | 0.050<br>BSC | -     | -     |
| E      | -           | 5.79 | 6.20 | -            | 0.228 | 0.244 |
| E1     | -           | 3.81 | 3.99 | -            | 0.150 | 0.157 |
| L      | -           | 0.40 | 1.27 | -            | 0.016 | 0.050 |
| θ      | -           | 0°   | 8°   | -            | 0°    | 8°    |

◇ 8-lead TSSOP Package Size Data

| Symbol | mm          |      |      | inches |       |       |
|--------|-------------|------|------|--------|-------|-------|
|        | Typ.        | Min. | Max  | Typ.   | Min.  | Max   |
| A      | -           | -    | 1.20 | -      | -     | 0.047 |
| A2     | 1.00        | 0.80 | 1.05 | 0.039  | 0.031 | 0.041 |
| b      | -           | 0.19 | 0.30 | -      | 0.007 | 0.012 |
| D      | 3.00        | 2.90 | 3.10 | 0.118  | 0.114 | 0.122 |
| e      | 0.65<br>BSC | -    | -    | 0.025  | -     | -     |
| E      | 6.40<br>BSC | -    | -    | 0.252  | -     | -     |
| E1     | 4.40        | 4.30 | 4.50 | 0.173  | 0.169 | 0.177 |
| L      | 0.60        | 0.45 | 0.75 | 0.023  | 0.017 | 0.030 |
| L1     | 1.00<br>BSC | -    | -    | 0.039  | -     | -     |



- 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.-5 8-lead TSSOP Package Outline

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