

General-purpose CMOS Logic IC Series (BU4S,BU4000B Series)

# Single Gate CMOS Logic ICs

## <Logic Gate>


**BU4S01G2, BU4S11G2, BU4SU69G2,BU4S71G2, BU4S81G2, BU4S584G2**

No.09050EAT01

### ●Description

The BU4SxxxG2 are 1ch logic ICs encapsulated in an SSOP5 package.  
 They are interchangeable with the general-purpose BU4000B series.

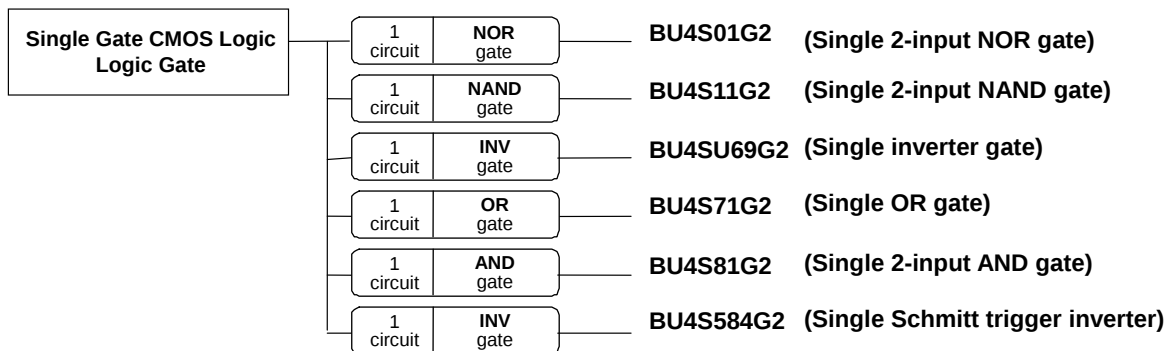
### ●Features

- 1) Low power consumption
- 2) Surface mount package (SSOP5)
- 3) Broad operating supply voltage range: 3V-16V
- 4) High input impedance
- 5) High fan out
- 6) L-TTL2 and LS-TTL1 inputs can be driven directly.
- 7) Function compatible with BU4000B series (1ch).

### ●Applications

Suitable for use where low power consumption and a high degree of noise tolerance are required.

### ●Lineup



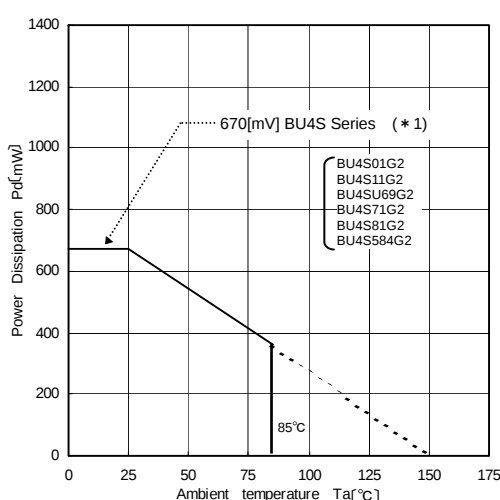
### ●Absolute Maximum Ratings

| Parameter                    | Symbol            | Limit           |          |           |          |          |           | Unit |
|------------------------------|-------------------|-----------------|----------|-----------|----------|----------|-----------|------|
|                              |                   | BU4S01G2        | BU4S11G2 | BU4SU69G2 | BU4S71G2 | BU4S81G2 | BU4S584G2 |      |
| Power supply voltage         | VDD               | -0.3 to 18      |          |           |          |          |           | V    |
| Supply current               | Iin               | ±10             |          |           |          |          |           | mA   |
| Operating temperature        | T <sub>opr</sub>  | -40 to 85       |          |           |          |          |           | °C   |
| Storage temperature          | T <sub>stg</sub>  | -55 to 150      |          |           |          |          |           | °C   |
| Input voltage                | VIN               | -0.3 to VDD+0.3 |          |           |          |          |           | V    |
| Maximum junction temperature | T <sub>jmax</sub> | 150             |          |           |          |          |           | °C   |

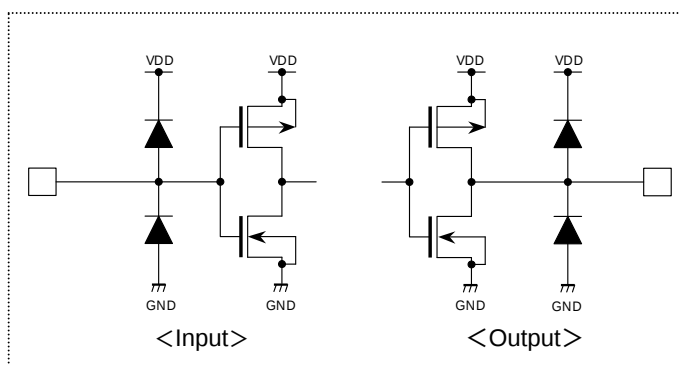
### ●Recommended Operating Conditions

| Parameter              | Symbol | Limit    |          |           |          |          |           | Unit |
|------------------------|--------|----------|----------|-----------|----------|----------|-----------|------|
|                        |        | BU4S01G2 | BU4S11G2 | BU4SU69G2 | BU4S71G2 | BU4S81G2 | BU4S584G2 |      |
| Operating power supply | VDD    | 3 to 16  |          |           |          |          |           | V    |
| Input voltage          | VIN    | 0 to VDD |          |           |          |          |           | V    |

### ●Thermal Derating Curve



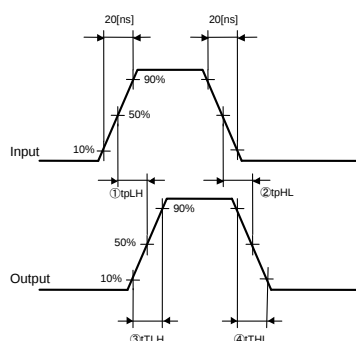
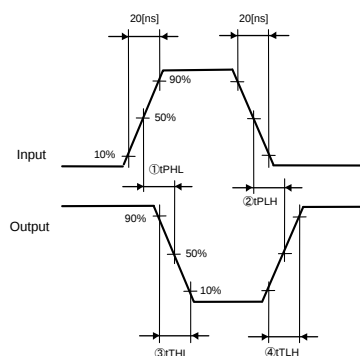
### ●Input / output Equivalent Circuits



| (*1) | UNIT  |
|------|-------|
| 5.3  | mW/°C |

When used at Ta=25[°C] or above, values of above are reduced per 1[°C].  
Power dissipation is the value for mounting 70[mm] x 70[mm] x 1.6[mm]  
FR4 glass epoxy circuit board (copper foil area is 3% or less).

### ●Switching Characteristics



#### Description of symbols

- (1) tPLH: Time up to 50% of rise time of input waveform  
~ 50% of fall time of output waveform
- (2) tPLH: Time up to 50% of fall time of input waveform  
~ 50% of rise time of output waveform
- (3) tTLH: Time up to 90% ~ 10% of fall time of output waveform
- (4) tTLH: Time up to 10% ~ 90% of rise time of output waveform

#### Description of symbols

- (1) tPLH: Time up to 50% of rise time of input waveform  
~ 50% of rise time of output waveform
- (2) tPLH: Time up to 50% of fall time of input waveform  
~ 50% of fall time of output waveform
- (3) tTLH: Time up to 10% ~ 90% of rise time of output waveform
- (4) tTLH: Time up to 90% ~ 10% of fall time of output waveform

## ●Electrical Characteristics (BU4S01G2)

DC Characteristics (Unless otherwise noted, VSS=0[V], Ta=25[°C])

| Parameter             | Symbol | Standard Value |     |      | Unit | VDD[V] | Condition                    | Fig. No |
|-----------------------|--------|----------------|-----|------|------|--------|------------------------------|---------|
|                       |        | MIN            | TYP | MAX  |      |        |                              |         |
| Input "H" voltage     | VIH    | 3.5            | -   | -    | V    | 5      | VOUT=0.5[V]                  | 1       |
|                       |        | 7.0            | -   | -    |      | 10     | VOUT=1.0[V]                  | 2       |
|                       |        | 11.0           | -   | -    |      | 15     | VOUT=1.5[V]<br> IOUT <1[μA]  | 3       |
| Input "L" voltage     | VIL    | -              | -   | 1.5  | V    | 5      | VOUT=4.5[V]                  | 1       |
|                       |        | -              | -   | 3.0  |      | 10     | VOUT=9.0[V]                  | 2       |
|                       |        | -              | -   | 4.0  |      | 15     | VOUT=13.5[V]<br> IOUT <1[μA] | 3       |
| Input "H" current     | IIH    | -              | -   | 0.3  | μA   | 15     | VIH=15[V]                    | -       |
| Input "L" current     | IIL    | -              | -   | -0.3 | μA   | 15     | VIL=0[V]                     | -       |
| Output "H" voltage    | VOH    | 4.95           | -   | -    | V    | 5      | IOUT <1[μA]<br>VIN=VSS       | 4       |
|                       |        | 9.95           | -   | -    |      | 10     |                              |         |
|                       |        | 14.95          | -   | -    |      | 15     |                              |         |
| Output "L" voltage    | VOL    | -              | -   | 0.05 | V    | 5      | IOUT <1[μA]<br>VIN=VDD       | 5       |
|                       |        | -              | -   | 0.05 |      | 10     |                              |         |
|                       |        | -              | -   | 0.05 |      | 15     |                              |         |
| Output "H" current    | IOH    | -0.51          | -   | -    | mA   | 5      | VOH=4.6[V]                   | 4       |
|                       |        | -2.1           | -   | -    |      | 5      | VOH=2.5[V]                   |         |
|                       |        | -1.3           | -   | -    |      | 10     | VOH=9.5[V]                   |         |
|                       |        | -3.4           | -   | -    |      | 15     | VOH=13.5[V]<br>VIN=VSS       |         |
| Output "L" current    | IOL    | 0.51           | -   | -    | mA   | 5      | VOL=0.4[V]                   | 5       |
|                       |        | 1.3            | -   | -    |      | 10     | VOL=0.5[V]                   |         |
|                       |        | 3.4            | -   | -    |      | 15     | VOL=1.5[V]                   |         |
|                       |        |                |     |      |      |        | VIN=VDD                      |         |
| Static supply current | IDD    | -              | -   | 0.25 | μA   | 5      | VIN=VSS,VDD                  | -       |
|                       |        | -              | -   | 0.5  |      | 10     |                              |         |
|                       |        | -              | -   | 1.0  |      | 15     |                              |         |

Switching Characteristics (Unless otherwise noted, VSS=0[V], Ta=25[°C], CL=50[pF])

| Parameter              | Symbol | Standard Value |     |     | Unit | VDD[V] | Condition | Fig. No |
|------------------------|--------|----------------|-----|-----|------|--------|-----------|---------|
|                        |        | MIN            | TYP | MAX |      |        |           |         |
| Output rising time     | tTLH   | -              | 70  | -   | ns   | 5      | -         | 6       |
|                        |        | -              | 35  | -   |      | 10     |           |         |
|                        |        | -              | 30  | -   |      | 15     |           |         |
| Output falling time    | tTHL   | -              | 70  | -   | ns   | 5      | -         | 7       |
|                        |        | -              | 35  | -   |      | 10     |           |         |
|                        |        | -              | 30  | -   |      | 15     |           |         |
| Propagation delay time | tPLH   | -              | 85  | -   | ns   | 5      | -         | 8       |
|                        |        | -              | 40  | -   |      | 10     |           |         |
|                        |        | -              | 30  | -   |      | 15     |           |         |
|                        | tPHL   | -              | 85  | -   | ns   | 5      | -         | 9       |
|                        |        | -              | 40  | -   |      | 10     |           |         |
|                        |        | -              | 30  | -   |      | 15     |           |         |
| Input capacitance      | CIN    | -              | 5   | -   | pF   | 5      | -         | -       |

# ●Electrical Characteristics(BU4S11G2)

DC Characteristics (Unless otherwise noted, VSS=0[V], Ta=25[°C])

| Parameter             | Symbol | Standard Value |     |      | Unit | VDD[V] | Condition                   | Fig. No |
|-----------------------|--------|----------------|-----|------|------|--------|-----------------------------|---------|
|                       |        | MIN            | TYP | MAX  |      |        |                             |         |
| Input "H" voltage     | VIH    | 3.5            | -   | -    | V    | 5      | VOU=0.5[V]                  | 10      |
|                       |        | 7.0            | -   | -    |      | 10     | VOU=1.0[V]                  | 11      |
|                       |        | 11.0           | -   | -    |      | 15     | VOU=1.5[V]<br> IOUT <1[μA]  | 12      |
| Input "L" voltage     | VIL    | -              | -   | 1.5  | V    | 5      | VOU=4.5[V]                  | 10      |
|                       |        | -              | -   | 3.0  |      | 10     | VOU=9.0[V]                  | 11      |
|                       |        | -              | -   | 4.0  |      | 15     | VOU=13.5[V]<br> IOUT <1[μA] | 12      |
| Input "H" current     | IIH    | -              | -   | 0.3  | μA   | 15     | VIH=15[V]                   | -       |
| Input "L" current     | IIL    | -              | -   | -0.3 | μA   | 15     | VIL=0[V]                    | -       |
| Output "H" voltage    | VOH    | 4.95           | -   | -    | V    | 5      | IOUT <1[μA]<br>VIN=VSS      | 13      |
|                       |        | 9.95           | -   | -    |      | 10     |                             |         |
|                       |        | 14.95          | -   | -    |      | 15     |                             |         |
| Output "L" voltage    | VOL    | -              | -   | 0.05 | V    | 5      | IOUT <1[μA]<br>VIN=VDD      | 14      |
|                       |        | -              | -   | 0.05 |      | 10     |                             |         |
|                       |        | -              | -   | 0.05 |      | 15     |                             |         |
| Output "H" current    | IOH    | -0.51          | -   | -    | mA   | 5      | VOH=4.6[V]                  | 13      |
|                       |        | -2.1           | -   | -    |      | 5      | VOH=2.5[V]                  |         |
|                       |        | -1.3           | -   | -    |      | 10     | VOH=9.5[V]                  |         |
|                       |        | -3.4           | -   | -    |      | 15     | VOH=13.5[V]<br>VIN=VSS      |         |
| Output "L" current    | IOL    | 0.51           | -   | -    | mA   | 5      | VOL=0.4[V]                  | 14      |
|                       |        | 1.3            | -   | -    |      | 10     | VOL=0.5[V]                  |         |
|                       |        | 3.4            | -   | -    |      | 15     | VOL=1.5[V]<br>VIN=VDD       |         |
| Static supply current | IDD    | -              | -   | 0.25 | μA   | 5      | VIN=VSS,VDD                 | -       |
|                       |        | -              | -   | 0.5  |      | 10     |                             |         |
|                       |        | -              | -   | 1.0  |      | 15     |                             |         |

Switching Characteristics (Unless otherwise noted, VSS=0[V], Ta=25[°C], CL=50[pF])

| Parameter              | Symbol | Standard Value |     |     | Unit | VDD[V] | Condition | Fig. No |
|------------------------|--------|----------------|-----|-----|------|--------|-----------|---------|
|                        |        | MIN            | TYP | MAX |      |        |           |         |
| Output rising time     | tTLH   | -              | 70  | -   | ns   | 5      | -         | 15      |
|                        |        | -              | 35  | -   |      | 10     |           |         |
|                        |        | -              | 30  | -   |      | 15     |           |         |
| Output falling time    | tTHL   | -              | 70  | -   | ns   | 5      | -         | 16      |
|                        |        | -              | 35  | -   |      | 10     |           |         |
|                        |        | -              | 30  | -   |      | 15     |           |         |
| Propagation delay time | tPLH   | -              | 85  | -   | ns   | 5      | -         | 17      |
|                        |        | -              | 40  | -   |      | 10     |           |         |
|                        |        | -              | 30  | -   |      | 15     |           |         |
|                        | tPHL   | -              | 85  | -   | ns   | 5      | -         | 18      |
|                        |        | -              | 40  | -   |      | 10     |           |         |
|                        |        | -              | 30  | -   |      | 15     |           |         |
| Input capacitance      | CIN    | -              | 5   | -   | pF   | 5      | -         | -       |

## ●Electrical Characteristics(BU4SU69G2)

DC Characteristics (Unless otherwise noted, VSS=0[V], Ta=25[°C])

| Parameter             | Symbol | Standard Value |     |      | Unit | VDD[V] | Condition                    | Fig. No |
|-----------------------|--------|----------------|-----|------|------|--------|------------------------------|---------|
|                       |        | MIN            | TYP | MAX  |      |        |                              |         |
| Input "H" voltage     | VIH    | 4.0            | -   | -    | V    | 5      | VOUT=0.5[V]                  | 19      |
|                       |        | 8.0            | -   | -    |      | 10     | VOUT=1.0[V]                  | 20      |
|                       |        | 12.0           | -   | -    |      | 15     | VOUT=1.5[V]<br> IOUT <1[μA]  | 21      |
| Input "L" voltage     | VIL    | -              | -   | 1.0  | V    | 5      | VOUT=4.5[V]                  | 19      |
|                       |        | -              | -   | 2.0  |      | 10     | VOUT=9.0[V]                  | 20      |
|                       |        | -              | -   | 3.0  |      | 15     | VOUT=13.5[V]<br> IOUT <1[μA] | 21      |
| Input "H" current     | IIH    | -              | -   | 0.3  | μA   | 15     | VIH=15[V]                    | -       |
| Input "L" current     | IIL    | -              | -   | -0.3 | μA   | 15     | VIL=0[V]                     | -       |
| Output "H" voltage    | VOH    | 4.95           | -   | -    | V    | 5      | IOUT <1[μA]<br>VIN=VSS       | 22      |
|                       |        | 9.95           | -   | -    |      | 10     |                              |         |
|                       |        | 14.95          | -   | -    |      | 15     |                              |         |
| Output "L" voltage    | VOL    | -              | -   | 0.05 | V    | 5      | IOUT <1[μA]<br>VIN=VDD       | 23      |
|                       |        | -              | -   | 0.05 |      | 10     |                              |         |
|                       |        | -              | -   | 0.05 |      | 15     |                              |         |
| Output "H" current    | IOH    | -0.51          | -   | -    | mA   | 5      | VOH=4.6[V]                   | 22      |
|                       |        | -2.1           | -   | -    |      | 5      | VOH=2.5[V]                   |         |
|                       |        | -1.3           | -   | -    |      | 10     | VOH=9.5[V]                   |         |
|                       |        | -3.4           | -   | -    |      | 15     | VOH=13.5[V]<br>VIN=VSS       |         |
| Output "L" current    | IOL    | 0.51           | -   | -    | mA   | 5      | VOL=0.4[V]                   | 23      |
|                       |        | 1.3            | -   | -    |      | 10     | VOL=0.5[V]                   |         |
|                       |        | 3.4            | -   | -    |      | 15     | VOL=1.5[V]                   |         |
|                       |        |                |     |      |      |        | VIN=VDD                      |         |
| Static supply current | IDD    | -              | -   | 0.25 | μA   | 5      | VIN=VSS,VDD                  | -       |
|                       |        | -              | -   | 0.5  |      | 10     |                              |         |
|                       |        | -              | -   | 1.0  |      | 15     |                              |         |

Switching Characteristics (Unless otherwise noted, VSS=0[V], Ta=25[°C], CL=50[pF])

| Parameter              | Symbol | Standard Value |     |     | Unit | VDD[V] | Condition | Fig. No |
|------------------------|--------|----------------|-----|-----|------|--------|-----------|---------|
|                        |        | MIN            | TYP | MAX |      |        |           |         |
| Output rising time     | tTLH   | -              | 70  | -   | ns   | 5      | -         | 24      |
|                        |        | -              | 35  | -   |      | 10     |           |         |
|                        |        | -              | 30  | -   |      | 15     |           |         |
| Output falling time    | tTHL   | -              | 70  | -   | ns   | 5      | -         | 25      |
|                        |        | -              | 35  | -   |      | 10     |           |         |
|                        |        | -              | 30  | -   |      | 15     |           |         |
| Propagation delay time | tPLH   | -              | 55  | -   | ns   | 5      | -         | 26      |
|                        |        | -              | 30  | -   |      | 10     |           |         |
|                        |        | -              | 25  | -   |      | 15     |           |         |
|                        | tPHL   | -              | 55  | -   | ns   | 5      | -         | 27      |
|                        |        | -              | 30  | -   |      | 10     |           |         |
|                        |        | -              | 25  | -   |      | 15     |           |         |
| Input capacitance      | CIN    | -              | 5   | -   | pF   | 5      | -         | -       |

## ●Electrical Characteristics(BU4S71G2)

DC Characteristics (Unless otherwise noted, VSS=0[V], Ta=25[°C])

| Parameter             | Symbol | Standard Value |     |      | Unit | VDD[V] | Condition                     | Fig. No |
|-----------------------|--------|----------------|-----|------|------|--------|-------------------------------|---------|
|                       |        | MIN            | TYP | MAX  |      |        |                               |         |
| Input "H" voltage     | VIH    | 3.5            | -   | -    | V    | 5      | IOUT <1[μA]                   | 28      |
|                       |        | 7.0            | -   | -    |      | 10     |                               | 29      |
|                       |        | 11.0           | -   | -    |      | 15     |                               | 30      |
| Input "L" voltage     | VIL    | -              | -   | 1.5  | V    | 5      | IOUT <1[μA]                   | 28      |
|                       |        | -              | -   | 3.0  |      | 10     |                               | 29      |
|                       |        | -              | -   | 4.0  |      | 15     |                               | 30      |
| Input "H" current     | IIH    | -              | -   | 0.3  | μA   | 18     | VIH=18[V]                     | -       |
| Input "L" current     | IIL    | -              | -   | -0.3 | μA   | 18     | VIL=0[V]                      | -       |
| Output "H" voltage    | VOH    | 4.95           | -   | -    | V    | 5      | IOUT <1[μA]<br>VIN=VSS or VDD | 31      |
|                       |        | 9.95           | -   | -    |      | 10     |                               |         |
|                       |        | 14.95          | -   | -    |      | 15     |                               |         |
| Output "L" voltage    | VOL    | -              | -   | 0.05 | V    | 5      | IOUT <1[μA]<br>VIN=VSS        | 32      |
|                       |        | -              | -   | 0.05 |      | 10     |                               |         |
|                       |        | -              | -   | 0.05 |      | 15     |                               |         |
| Output "H" current    | IOH    | -0.51          | -   | -    | mA   | 5      | VOH=4.6[V]                    | 31      |
|                       |        | -2.1           | -   | -    |      | 5      | VOH=2.5[V]                    |         |
|                       |        | -1.3           | -   | -    |      | 10     | VOH=9.5[V]                    |         |
|                       |        | -3.4           | -   | -    |      | 15     | VOH=13.5[V]                   |         |
| Output "L" current    | IOL    | 0.51           | -   | -    | mA   | 5      | VOL=0.4[V]                    | 32      |
|                       |        | 1.3            | -   | -    |      | 10     | VOL=0.5[V]                    |         |
|                       |        | 3.4            | -   | -    |      | 15     | VOL=1.5[V]                    |         |
| Static supply current | IDD    | -              | -   | 0.25 | μA   | 5      | VIN=VSS,VDD                   | -       |
|                       |        | -              | -   | 0.5  |      | 10     |                               |         |
|                       |        | -              | -   | 1.0  |      | 15     |                               |         |

Switching Characteristics (Unless otherwise noted, VSS=0[V], Ta=25[°C], CL=50[pF])

| Parameter              | Symbol | Standard Value |     |     | Unit | VDD[V] | Condition | Fig. No |
|------------------------|--------|----------------|-----|-----|------|--------|-----------|---------|
|                        |        | MIN            | TYP | MAX |      |        |           |         |
| Output rising time     | tTLH   | -              | 70  | -   | ns   | 5      | -         | 33      |
|                        |        | -              | 35  | -   |      | 10     |           |         |
|                        |        | -              | 30  | -   |      | 15     |           |         |
| Output falling time    | tTHL   | -              | 70  | -   | ns   | 5      | -         | 34      |
|                        |        | -              | 35  | -   |      | 10     |           |         |
|                        |        | -              | 30  | -   |      | 15     |           |         |
| Propagation delay time | tPLH   | -              | 90  | -   | ns   | 5      | -         | 35      |
|                        |        | -              | 45  | -   |      | 10     |           |         |
|                        |        | -              | 30  | -   |      | 15     |           |         |
|                        | tPHL   | -              | 90  | -   | ns   | 5      | -         | 36      |
|                        |        | -              | 45  | -   |      | 10     |           |         |
|                        |        | -              | 30  | -   |      | 15     |           |         |
| Input capacitance      | CIN    | -              | 5   | -   | pF   | 5      | -         | -       |

# ●Electrical Characteristics(BU4S81G2)

DC Characteristics (Unless otherwise noted, VSS=0[V], Ta=25[°C])

| Parameter             | Symbol | Standard Value |     |      | Unit | VDD[V] | Condition                     | Fig. No |
|-----------------------|--------|----------------|-----|------|------|--------|-------------------------------|---------|
|                       |        | MIN            | TYP | MAX  |      |        |                               |         |
| Input "H" voltage     | VIH    | 3.5            | -   | -    | V    | 5      | IOUT <1[μA]                   | 37      |
|                       |        | 7.0            | -   | -    |      | 10     |                               | 38      |
|                       |        | 11.0           | -   | -    |      | 15     |                               | 39      |
| Input "L" voltage     | VIL    | -              | -   | 1.5  | V    | 5      | IOUT <1[μA]                   | 37      |
|                       |        | -              | -   | 3.0  |      | 10     |                               | 38      |
|                       |        | -              | -   | 4.0  |      | 15     |                               | 39      |
| Input "H" current     | IIH    | -              | -   | 0.3  | μA   | 18     | VIH=18[V]                     | -       |
| Input "L" current     | IIL    | -              | -   | -0.3 | μA   | 18     | VIL=0[V]                      | -       |
| Output "H" voltage    | VOH    | 4.95           | -   | -    | V    | 5      | IOUT <1[μA]<br>VIN=VSS or VDD | 40      |
|                       |        | 9.95           | -   | -    |      | 10     |                               |         |
|                       |        | 14.95          | -   | -    |      | 15     |                               |         |
| Output "L" voltage    | VOL    | -              | -   | 0.05 | V    | 5      | IOUT <1[μA]<br>VIN=VSS        | 41      |
|                       |        | -              | -   | 0.05 |      | 10     |                               |         |
|                       |        | -              | -   | 0.05 |      | 15     |                               |         |
| Output "H" current    | IOH    | -0.51          | -   | -    | mA   | 5      | VOH=4.6[V]                    | 40      |
|                       |        | -2.1           | -   | -    |      | 5      | VOH=2.5[V]                    |         |
|                       |        | -1.3           | -   | -    |      | 10     | VOH=9.5[V]                    |         |
|                       |        | -3.4           | -   | -    |      | 15     | VOH=13.5[V]                   |         |
| Output "L" current    | IOL    | 0.51           | -   | -    | mA   | 5      | VOL=0.4[V]                    | 41      |
|                       |        | 1.3            | -   | -    |      | 10     | VOL=0.5[V]                    |         |
|                       |        | 3.4            | -   | -    |      | 15     | VOL=1.5[V]                    |         |
| Static supply current | IDD    | -              | -   | 0.25 | μA   | 5      | VIN=VSS,VDD                   | -       |
|                       |        | -              | -   | 0.5  |      | 10     |                               |         |
|                       |        | -              | -   | 1.0  |      | 15     |                               |         |

Switching Characteristics (Unless otherwise noted, VSS=0[V], Ta=25[°C], CL=50[pF])

| Parameter              | Symbol | Standard Value |     |     | Unit | VDD[V] | Condition | Fig. No |
|------------------------|--------|----------------|-----|-----|------|--------|-----------|---------|
|                        |        | MIN            | TYP | MAX |      |        |           |         |
| Output rising time     | tTLH   | -              | 70  | -   | ns   | 5      | -         | 42      |
|                        |        | -              | 35  | -   |      | 10     |           |         |
|                        |        | -              | 30  | -   |      | 15     |           |         |
| Output falling time    | tTHL   | -              | 70  | -   | ns   | 5      | -         | 43      |
|                        |        | -              | 35  | -   |      | 10     |           |         |
|                        |        | -              | 30  | -   |      | 15     |           |         |
| Propagation delay time | tPLH   | -              | 90  | -   | ns   | 5      | -         | 44      |
|                        |        | -              | 45  | -   |      | 10     |           |         |
|                        |        | -              | 30  | -   |      | 15     |           |         |
|                        | tPHL   | -              | 90  | -   | ns   | 5      | -         | 45      |
|                        |        | -              | 45  | -   |      | 10     |           |         |
|                        |        | -              | 30  | -   |      | 15     |           |         |
| Input capacitance      | CIN    | -              | 5   | -   | pF   | 5      | -         | -       |

## ●Electrical Characteristics(BU4S584G2)

DC Characteristics (Unless otherwise noted, VSS=0[V], Ta=25[°C])

| Parameter          | Symbol          | Standard Value |     |      | Unit | VDD[V] | Condition                                        | Fig. No |
|--------------------|-----------------|----------------|-----|------|------|--------|--------------------------------------------------|---------|
|                    |                 | MIN            | TYP | MAX  |      |        |                                                  |         |
| Input "H" voltage  | VIH             | 2.6            | -   | -    | V    | 3      | -                                                | 46      |
|                    |                 | 3.5            | -   | -    |      | 5      |                                                  | 47      |
|                    |                 | 7.0            | -   | -    |      | 10     |                                                  | 48      |
|                    |                 | 11.0           | -   | -    |      | 15     |                                                  |         |
| Input "L" voltage  | VIL             | -              | -   | 0.4  | V    | 3      | -                                                | 46      |
|                    |                 | -              | -   | 1.5  |      | 5      |                                                  | 47      |
|                    |                 | -              | -   | 3.0  |      | 10     |                                                  | 48      |
|                    |                 | -              | -   | 4.0  |      | 15     |                                                  |         |
| Input "H" current  | I <sub>IH</sub> | -              | -   | 0.3  | μA   | 15     | V <sub>IH</sub> =15[V]                           | -       |
| Input "L" current  | I <sub>IL</sub> | -              | -   | -0.3 | μA   | 15     | V <sub>IL</sub> =0[V]                            | -       |
| Output "H" voltage | VOH             | 2.95           | -   | -    | V    | 3      | I <sub>O</sub> UT <1[μA]<br>V <sub>IN</sub> =VSS | 49      |
|                    |                 | 4.95           | -   | -    |      | 5      |                                                  |         |
|                    |                 | 9.95           | -   | -    |      | 10     |                                                  |         |
|                    |                 | 14.95          | -   | -    |      | 15     |                                                  |         |
| Output "L" voltage | VOL             | -              | -   | 0.05 | V    | 3      | I <sub>O</sub> UT <1[μA]<br>V <sub>IN</sub> =VDD | 50      |
|                    |                 | -              | -   | 0.05 |      | 5      |                                                  |         |
|                    |                 | -              | -   | 0.05 |      | 10     |                                                  |         |
|                    |                 | -              | -   | 0.05 |      | 15     |                                                  |         |
| Output "H" current | IOH             | -0.1           | -   | -    | mA   | 3      | V <sub>OH</sub> =2.7[V]                          | 49      |
|                    |                 | -0.51          | -   | -    |      | 5      | V <sub>OH</sub> =4.6 [V]                         |         |
|                    |                 | -2.1           | -   | -    |      | 5      | V <sub>OH</sub> =2.5[V]                          |         |
|                    |                 | -1.3           | -   | -    |      | 10     | V <sub>OH</sub> =9.5[V]                          |         |
|                    |                 | -3.4           | -   | -    |      | 15     | V <sub>OH</sub> =13.5[V]                         |         |
| Output "L" current | IOL             | 0.1            | -   | -    | mA   | 3      | V <sub>OL</sub> =0.3[V]                          | 50      |
|                    |                 | 0.51           | -   | -    |      | 5      | V <sub>OL</sub> =0.4[V]                          |         |
|                    |                 | 1.3            | -   | -    |      | 10     | V <sub>OL</sub> =0.5[V]                          |         |
|                    |                 | 3.4            | -   | -    |      | 15     | V <sub>OL</sub> =1.5[V]                          |         |
| Hysteresis voltage | VH              | 0.1            | -   | 0.5  | V    | 3      | -                                                | -       |
|                    |                 | 0.15           | -   | 0.6  |      | 5      |                                                  |         |
|                    |                 | 0.25           | -   | 1.0  |      | 10     |                                                  |         |
|                    |                 | 0.40           | -   | 1.5  |      | 15     |                                                  |         |
| Supply current     | IDD             | -              | -   | 0.2  | μA   | 3      | V <sub>IN</sub> =VSS or VDD                      | -       |
|                    |                 | -              | -   | 0.25 |      | 5      |                                                  |         |
|                    |                 | -              | -   | 0.5  |      | 10     |                                                  |         |
|                    |                 | -              | -   | 1.0  |      | 15     |                                                  |         |

Switching Characteristics (Unless otherwise noted, VSS=0[V], Ta=25[°C], CL=50[pF])

| Parameter              | Symbol           | Standard Value |     |     | Unit | VDD[V] | Condition | Fig. No |
|------------------------|------------------|----------------|-----|-----|------|--------|-----------|---------|
|                        |                  | MIN            | TYP | MAX |      |        |           |         |
| Output rising time     | t <sub>TLH</sub> | -              | 140 | -   | ns   | 3      | -         | 51      |
|                        |                  | -              | 70  | -   |      | 5      |           |         |
|                        |                  | -              | 35  | -   |      | 10     |           |         |
|                        |                  | -              | 30  | -   |      | 15     |           |         |
| Output falling time    | t <sub>THL</sub> | -              | 140 | -   | ns   | 3      | -         | 52      |
|                        |                  | -              | 70  | -   |      | 5      |           |         |
|                        |                  | -              | 35  | -   |      | 10     |           |         |
|                        |                  | -              | 30  | -   |      | 15     |           |         |
| Propagation delay time | t <sub>PLH</sub> | -              | 230 | -   | ns   | 3      | -         | 53      |
|                        |                  | -              | 125 | -   |      | 5      |           |         |
|                        |                  | -              | 60  | -   |      | 10     |           |         |
|                        |                  | -              | 50  | -   |      | 15     |           |         |
|                        | t <sub>PHL</sub> | -              | 230 | -   | ns   | 3      | -         | 54      |
|                        |                  | -              | 125 | -   |      | 5      |           |         |
|                        |                  | -              | 60  | -   |      | 10     |           |         |
|                        |                  | -              | 50  | -   |      | 15     |           |         |

## ●Electrical Characteristics Curves(BU4S01G2)

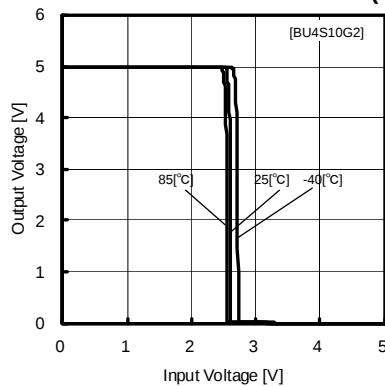


Fig.1

Output voltage—Input voltage characteristics  
(VDD=5[V] / VSS=0[V])

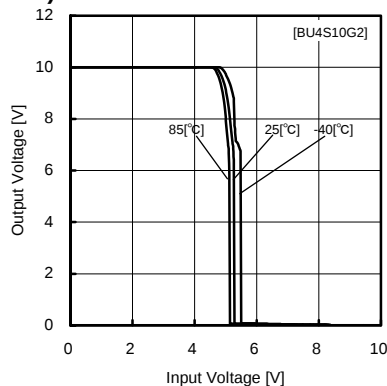


Fig.2

Output voltage—Input voltage characteristics  
(VDD=10[V] / VSS=0[V])

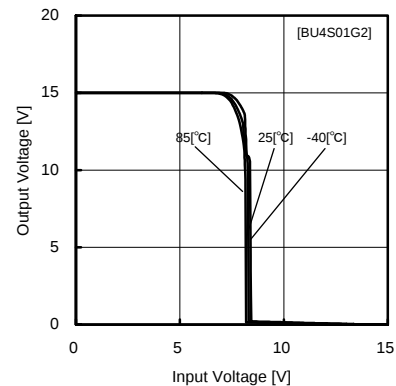


Fig.3

Output voltage—Input voltage characteristics  
(VDD=15[V] / VSS=0[V])

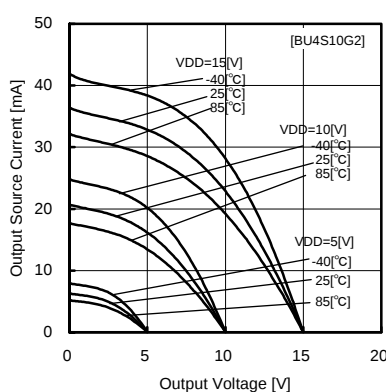


Fig.4

Output source current—voltage characteristics

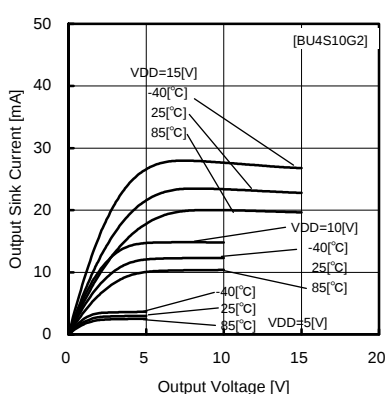


Fig.5

Output sink current—voltage characteristics

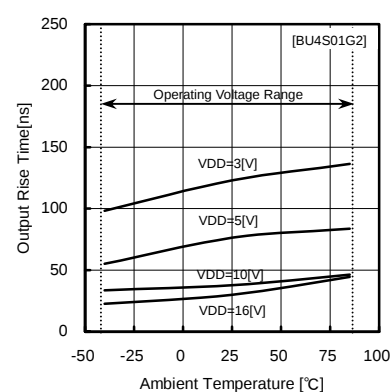


Fig.6

Output rising time tTLH

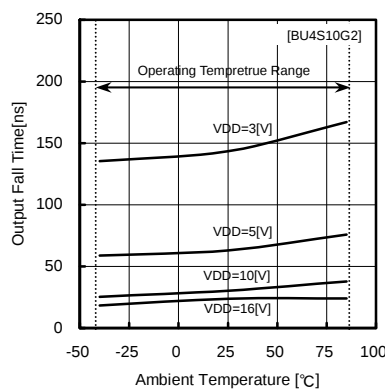


Fig.7

Output falling time tTHL

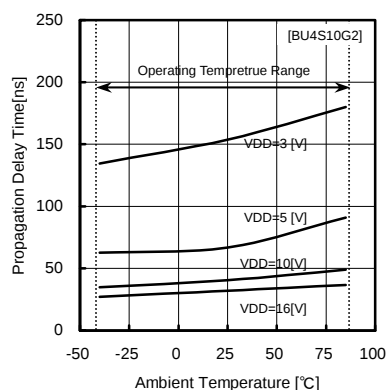


Fig.8

Propagation delay time tPLH

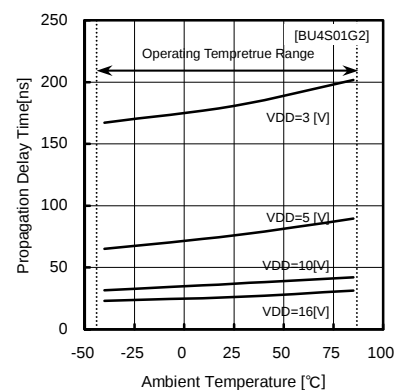
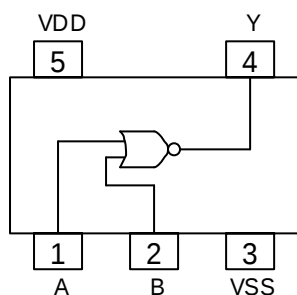


Fig.9

Propagation delay time tPHL

## ●Pinout Diagram • Pin Description • Input / Output Table



| PIN | PIN NAME | I/O | PIN FUNCTION    |
|-----|----------|-----|-----------------|
| 1   | A        | I   | Input           |
| 2   | B        | I   | Input           |
| 3   | VSS      | -   | Power supply(-) |
| 4   | Y        | O   | Output          |
| 5   | VDD      | -   | Power supply(+) |

| A | B | Y |
|---|---|---|
| L | L | H |
| L | H | L |
| H | L | L |
| H | H | L |

●Electrical Characteristics Curves(BU4S11G2)

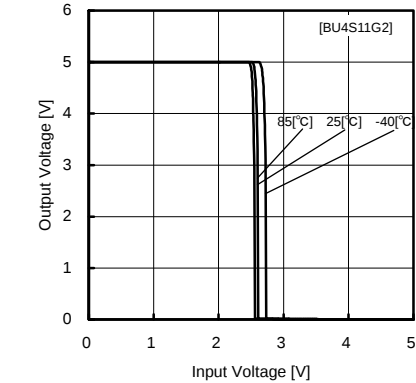


Fig.10  
Output voltage – Input voltage characteristics  
(VDD=5[V] / VSS=0[V])

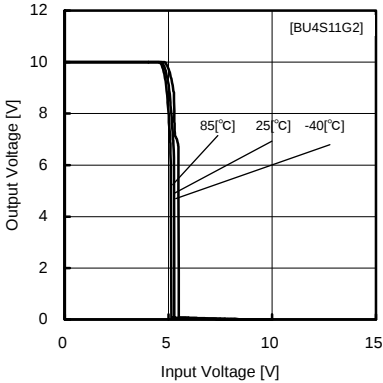


Fig.11  
Output voltage – Input voltage characteristics  
(VDD=10[V] / VSS=0[V])

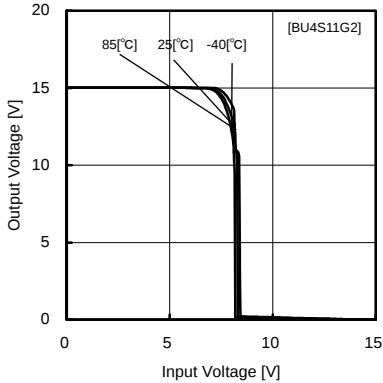


Fig.12  
Output voltage – Input voltage characteristics  
(VDD=15[V] / VSS=0[V])

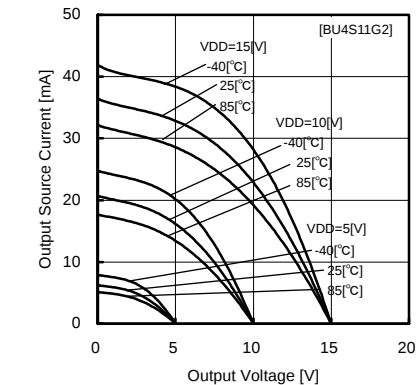


Fig.13  
Output source current – voltage characteristics

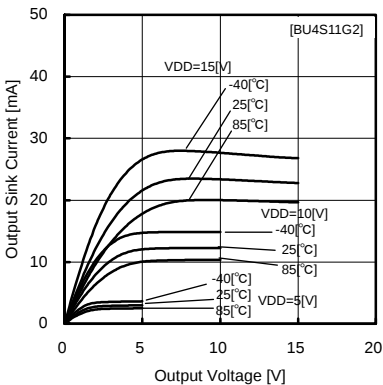


Fig.14  
Output sink current – voltage characteristics

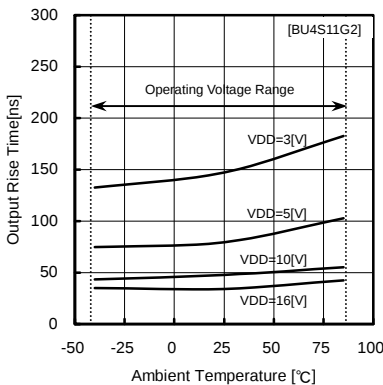


Fig.15  
Output rising time tTLH

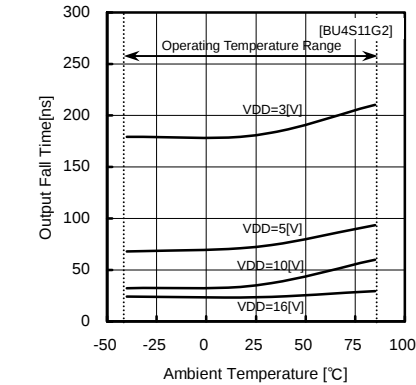


Fig.16  
Output falling time tTHL

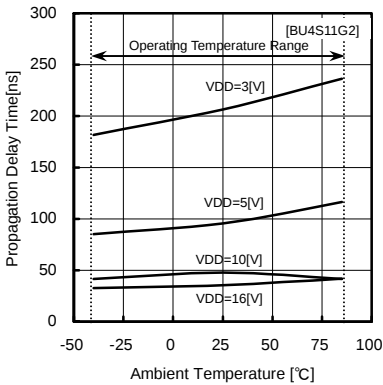


Fig.17  
Propagation delay time tPLH

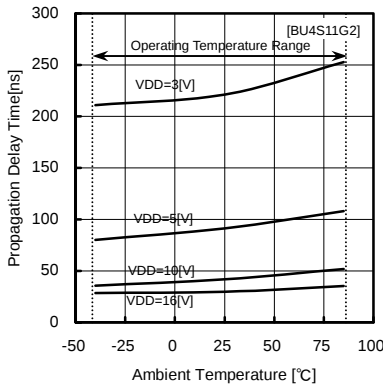
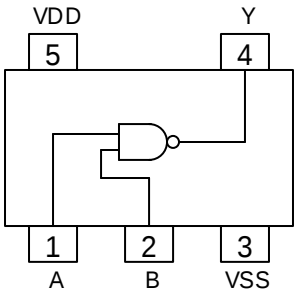


Fig.18  
Propagation delay time tPHL

●Pinout Diagram ・ Pin Description ・ Input / Output Table



| PIN | PIN NAME | I/O | PIN FUNCTION    |
|-----|----------|-----|-----------------|
| 1   | A        | I   | Input           |
| 2   | B        | I   | Input           |
| 3   | VSS      | -   | Power supply(-) |
| 4   | Y        | O   | Output          |
| 5   | VDD      | -   | Power supply(+) |

| A | B | Y |
|---|---|---|
| L | L | H |
| L | H | H |
| H | L | H |
| H | H | L |

●Electrical Characteristics Curves (BU4SU69G2)

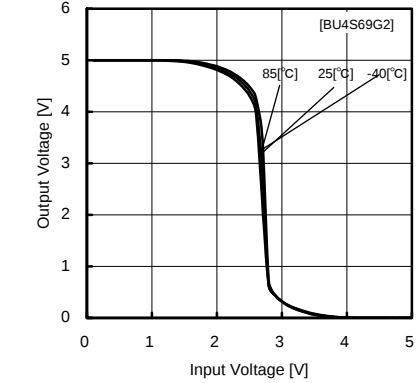


Fig.19  
Output voltage – Input voltage characteristics  
(VDD=5[V] / VSS=0[V])

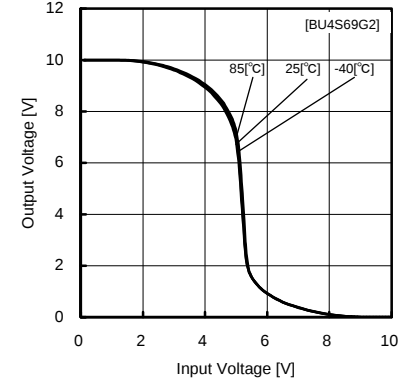


Fig.20  
Output voltage – Input voltage characteristics  
(VDD=10[V] / VSS=0[V])

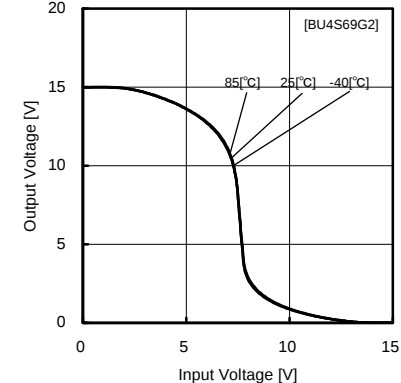


Fig.21  
Output voltage – Input voltage characteristics  
(VDD=15[V] / VSS=0[V])

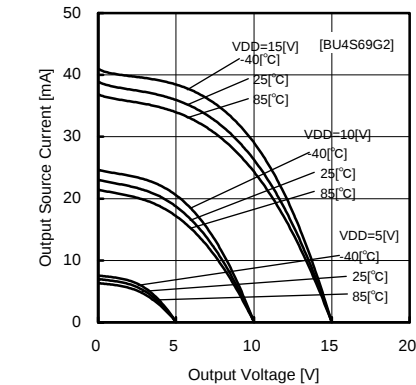


Fig.22  
Output source current – voltage characteristics

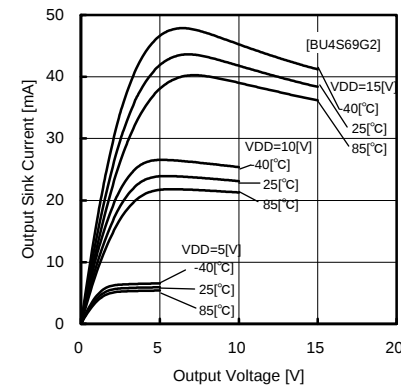


Fig.23  
Output sink current – voltage characteristics

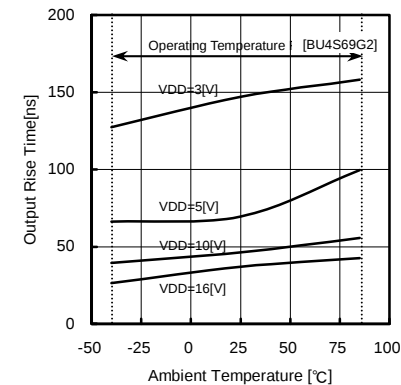


Fig.24  
Output rising time tRLH

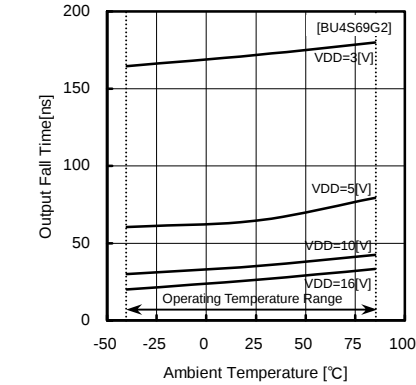


Fig.25  
Output falling time tTHL

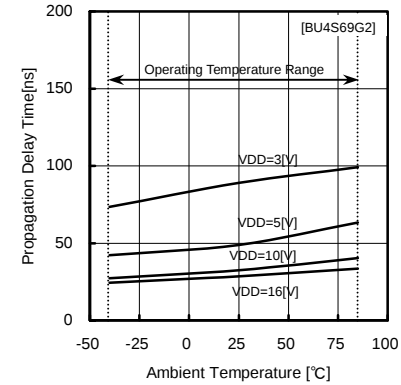


Fig.26  
Propagation delay time tPLH

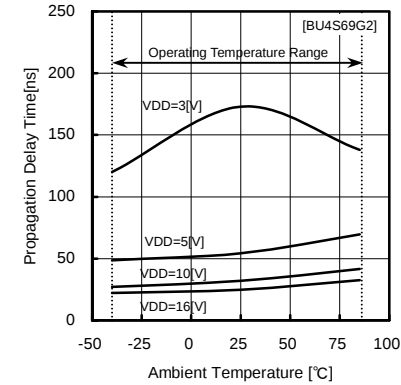
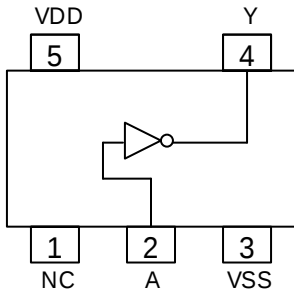


Fig.27  
Propagation delay time tPHL

●Pinout Diagram • Pin Description • Input / Output Table



| PIN | PIN NAME | I/O | PIN FUNCTION    |
|-----|----------|-----|-----------------|
| 1   | NC       | -   | NC              |
| 2   | A        | I   | Input           |
| 3   | VSS      | -   | Power supply(-) |
| 4   | Y        | O   | Output          |
| 5   | VDD      | -   | Power supply(+) |

|   |   |
|---|---|
| A | Y |
| L | H |
| H | L |

# ●Electrical Characteristics Curves (BU4S71G2)

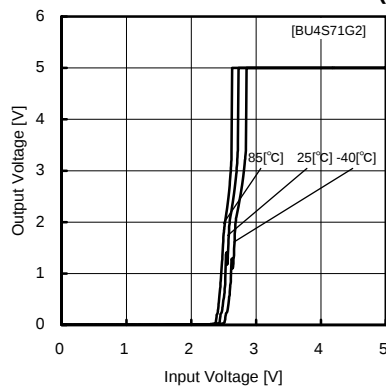


Fig.28

Output voltage—Input voltage characteristics  
(VDD=5[V] / VSS=0[V])

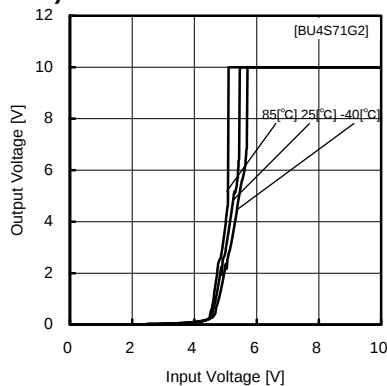


Fig.29

Output voltage—Input voltage characteristics  
(VDD=10[V] / VSS=0[V])

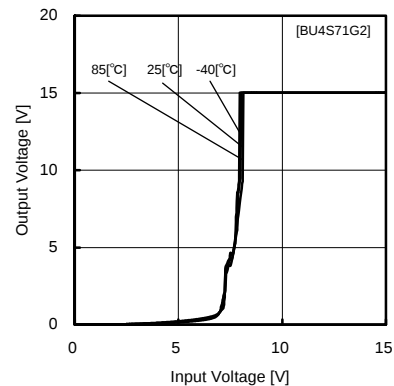


Fig.30

Output voltage—Input voltage characteristics  
(VDD=15[V] / VSS=0[V])

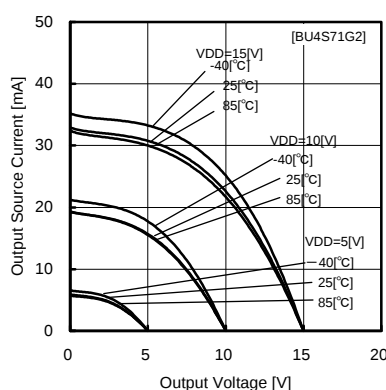


Fig.31

Output source current—voltage characteristics

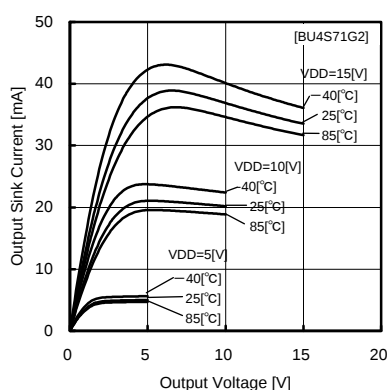


Fig.32

Output sink current—voltage characteristics

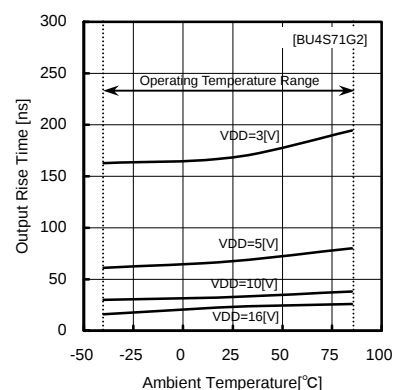


Fig.33

Rising time tTLH

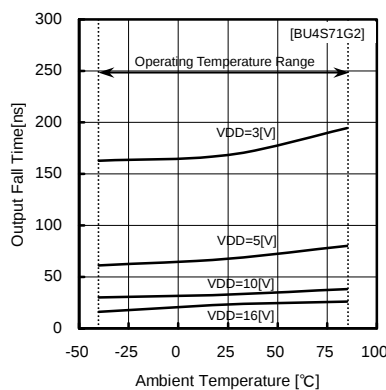


Fig.34

falling time tTHL

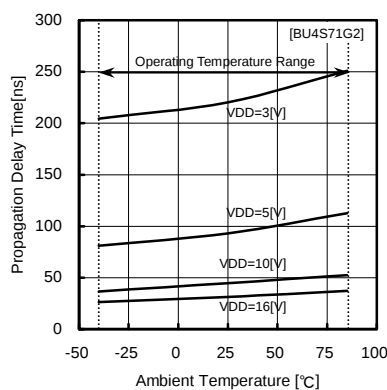


Fig.35

Propagation delay time tPLH

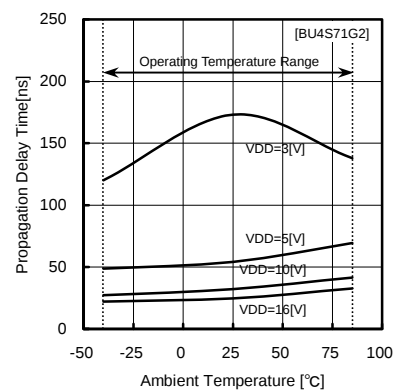
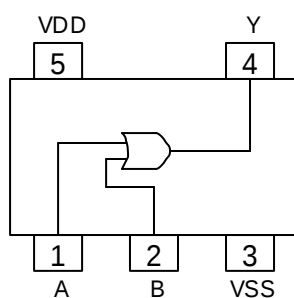


Fig.36

Propagation delay time tPHL

# ●Pinout Diagram • Pin Description • Input / Output Table



| PIN | PIN NAME | I/O | PIN FUNCTION    |
|-----|----------|-----|-----------------|
| 1   | A        | I   | Input           |
| 2   | B        | I   | Input           |
| 3   | VSS      | -   | Power supply(-) |
| 4   | Y        | O   | Output          |
| 5   | VDD      | -   | Power supply(+) |

| A | B | Y |
|---|---|---|
| L | L | L |
| L | H | H |
| H | L | H |
| H | H | H |

# ●Electrical Characteristics Curves(BU4S81G2)

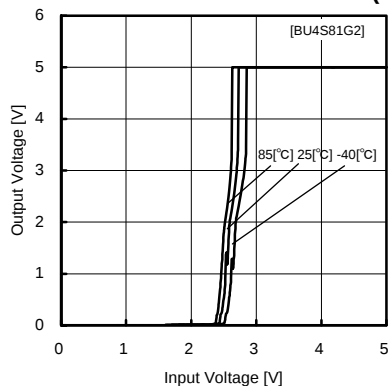


Fig.37

Output voltage—Input voltage characteristics  
(VDD=5[V] / VSS=0[V])

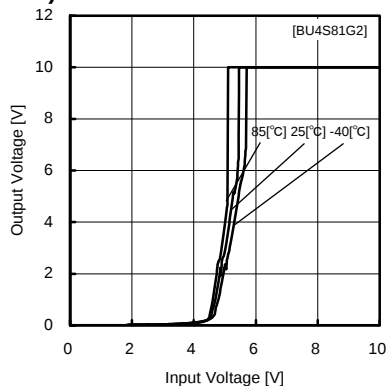


Fig.38

Output voltage—Input voltage characteristics  
(VDD=10[V] / VSS=0[V])

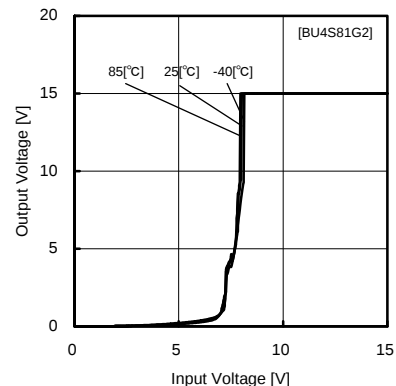


Fig.39

Output voltage—Input voltage characteristics  
(VDD=15[V] / VSS=0[V])

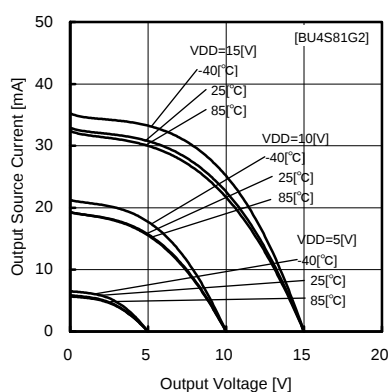


Fig.40

Output source current—voltage characteristics

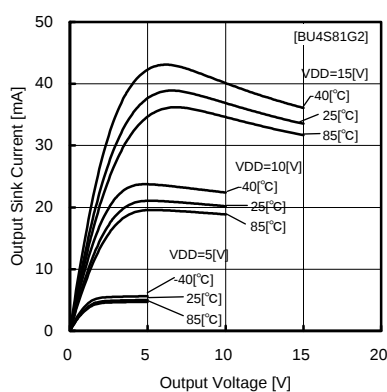


Fig.41

Output sink current—voltage characteristics

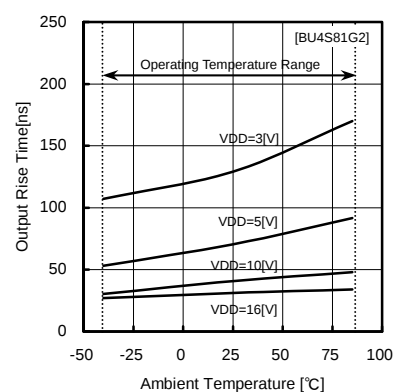


Fig.42

Output rising time tRLH

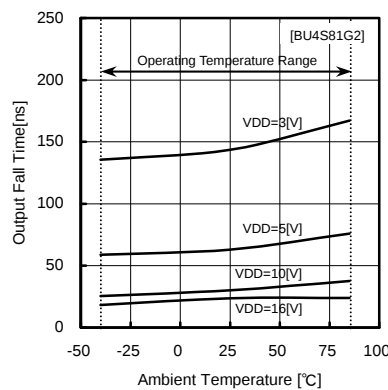


Fig.43

Output falling time tFHL

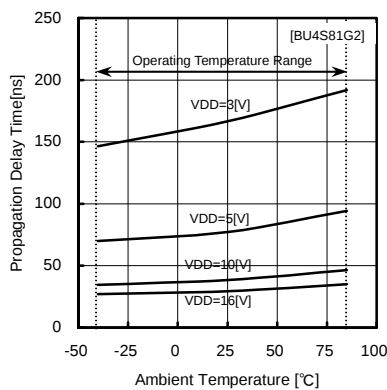


Fig.44

Propagation delay time tPLH

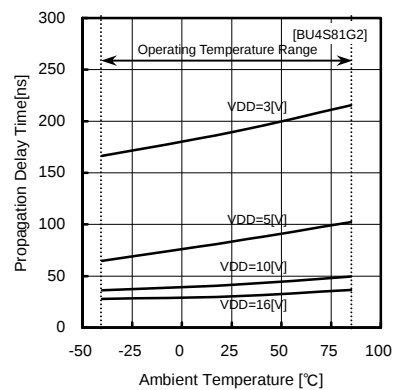
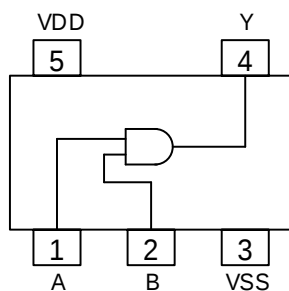


Fig.45

Propagation delay time tPHL

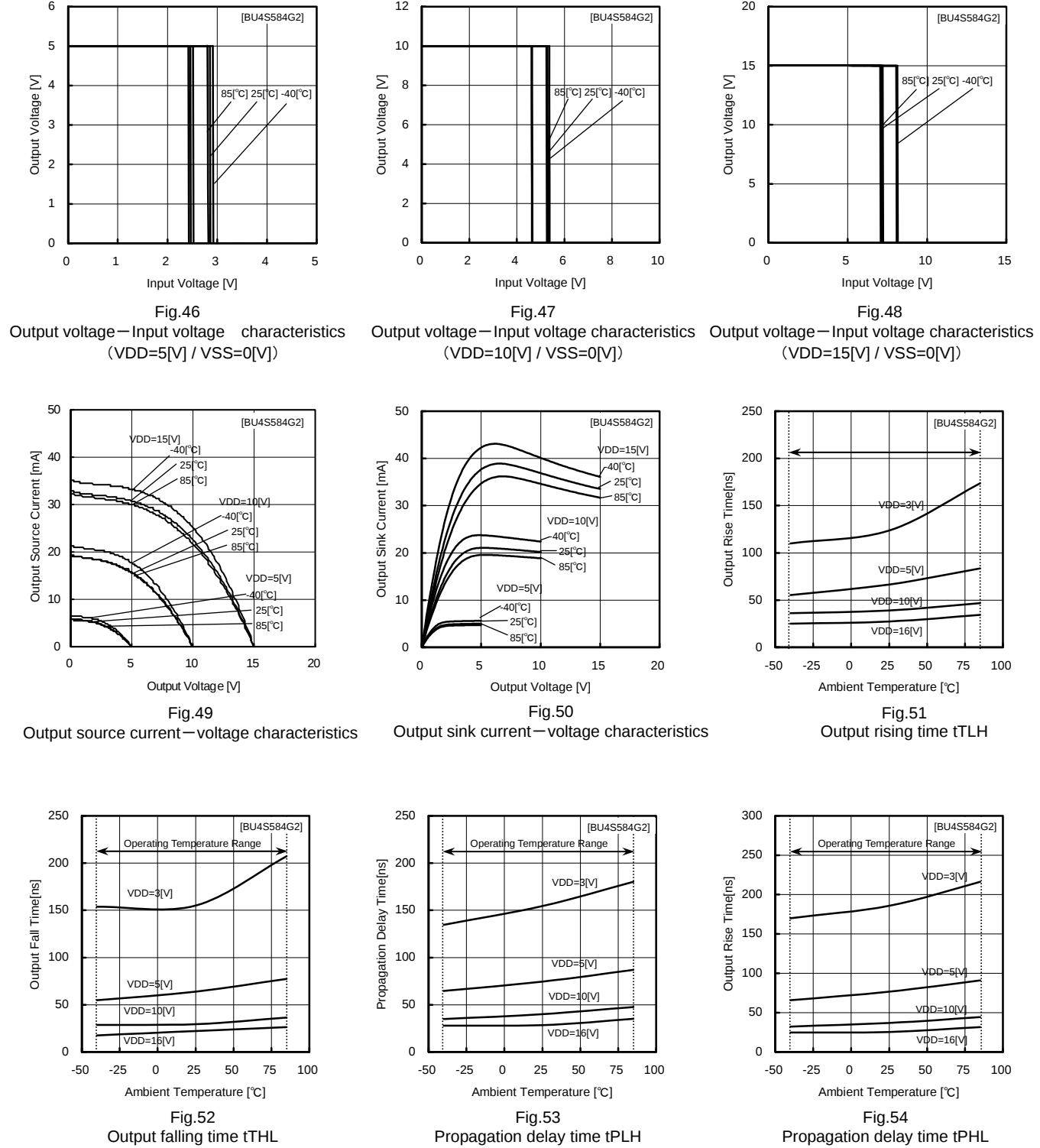
# ●Pinout Diagram • Pin Description • Input / Output Table



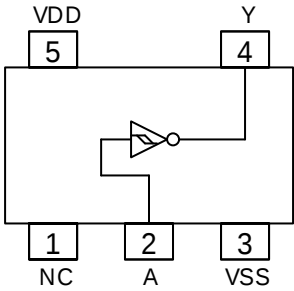
| PIN | PIN NAME | I/O | PIN FUNCTION    |
|-----|----------|-----|-----------------|
| 1   | NC       | -   | Input           |
| 2   | A        | I   | Input           |
| 3   | VSS      | -   | Power supply(-) |
| 4   | Y        | O   | Output          |
| 5   | VDD      | -   | Power supply(+) |

| A | B | Y |
|---|---|---|
| L | L | L |
| L | H | L |
| H | L | L |
| H | H | H |

●Electrical Charasteristics Curves(BU4S584G2)



●Pinout Diagram・Pin Description・Input / Output Table



| PIN | PIN NAME | I/O | PIN FUNCTION    |
|-----|----------|-----|-----------------|
| 1   | NC       | -   | NC              |
| 2   | A        | I   | Input           |
| 3   | VSS      | -   | Power supply(-) |
| 4   | Y        | O   | Output          |
| 5   | VDD      | -   | Power supply(+) |

|   |   |
|---|---|
| A | Y |
| L | H |
| H | L |

**●Notes for use****1. Absolute Maximum ratings**

An excess in the absolute maximum ratings, such as supply voltage, temperature range of operating conditions, etc., can break down the devices, thus making impossible to identify breaking mode, such as short circuit or an open circuit. If any over rated values will expect to exceed the absolute maximum ratings, consider adding circuit protection devices, such as fuses.

**2. Connecting the power supply connector backward**

Connecting of the power supply in reverse polarity can damage IC. Take precautions when connecting the power supply lines. An external direction diode can be added.

**3. Power supply lines**

Design PCB layout pattern to provide low impedance GND and supply lines. To obtain a low noise ground and supply line, separate the ground section and supply lines of the digital and analog blocks. Furthermore, for all power supply terminals to ICs, connect a capacitor between the power supply and the GND terminal. When applying electrolytic capacitors in the circuit, not that capacitance characteristic values are reduced at low temperatures.

**4. GND voltage**

The potential of GND pin must be minimum potential in all operating conditions.

**5. Thermal design**

Use a thermal design that allows for a sufficient margin in light of the power dissipation (Pd) in actual operating conditions.

**6. Inter-pin shorts and mounting errors**

Use caution when positioning the IC for mounting on printed circuit boards. The IC may be damaged if there is any connection error or if pins are shorted together.

**7. Actions in strong electromagnetic field**

Use caution when using the IC in the presence of a strong electromagnetic field as doing so may cause the IC to malfunction.

**8. Testing on application boards**

When testing the IC on an application board, connecting a capacitor to a pin with low impedance subjects the IC to stress. Always discharge capacitors after each process or step. Always turn the IC's power supply off before connecting it to or removing it from a jig or fixture during the inspection process. Ground the IC during assembly steps as an antistatic measure. Use similar precaution when transporting or storing the IC.

**9. Ground Wiring Pattern**

When using both small signal and large current GND patterns, it is recommended to isolate the two ground patterns, placing a signal ground point at the ground potential of application so that the pattern wiring resistance and voltage variations caused by large currents do not cause variations in the small signal ground voltage. Be careful not to change the GND wiring pattern of any external components, either.

**10. Unused input terminals**

Connect all unused input terminals to VDD or VSS in order to prevent excessive current or oscillation. Insertion of a resistor (100kΩ approx.) is also recommended.

●Ordering part number

|   |   |
|---|---|
| B | U |
|---|---|

Part No.

|   |   |   |   |
|---|---|---|---|
| 4 | S | 0 | 1 |
|---|---|---|---|

Part No.

4S01 , 4S11  
4SU69 , 4S71  
4S81 , 4S584

|   |   |
|---|---|
| G | 2 |
|---|---|

Package

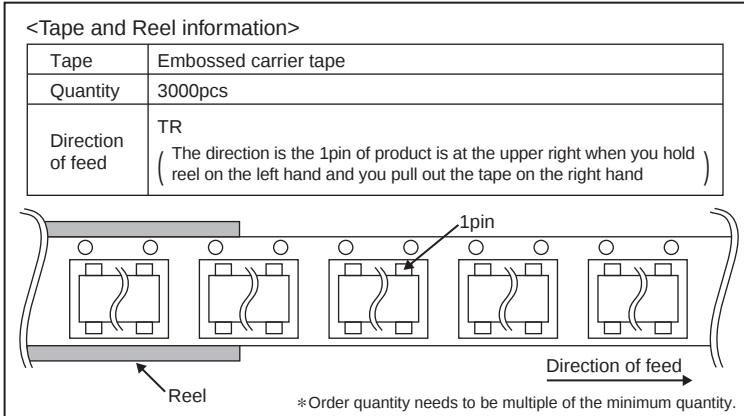
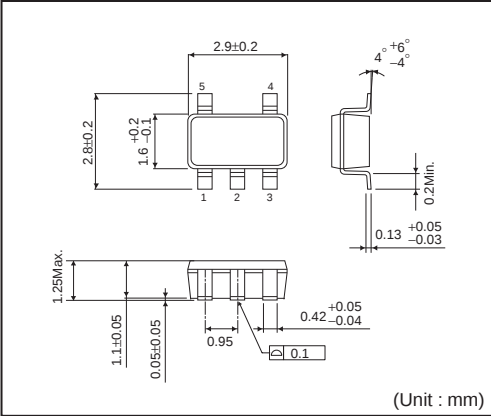
G2: SSOP5

-

|   |   |
|---|---|
| T | R |
|---|---|

Packaging and forming specification  
TR: Embossed tape and reel

SSOP5



# Notice

## Precaution on using ROHM Products

- Our Products are designed and manufactured for application in ordinary electronic equipments (such as AV equipment, OA equipment, telecommunication equipment, home electronic appliances, amusement equipment, etc.). If you intend to use our Products in devices requiring extremely high reliability (such as medical equipment <sup>(Note 1)</sup>, transport equipment, traffic equipment, aircraft/spacecraft, nuclear power controllers, fuel controllers, car equipment including car accessories, safety devices, etc.) and whose malfunction or failure may cause loss of human life, bodily injury or serious damage to property ("Specific Applications"), please consult with the ROHM sales representative in advance. Unless otherwise agreed in writing by ROHM in advance, ROHM shall not be in any way responsible or liable for any damages, expenses or losses incurred by you or third parties arising from the use of any ROHM's Products for Specific Applications.

(Note1) Medical Equipment Classification of the Specific Applications

| JAPAN     | USA       | EU         | CHINA     |
|-----------|-----------|------------|-----------|
| CLASS III | CLASS III | CLASS II b | CLASS III |
| CLASS IV  |           | CLASS III  |           |

- ROHM designs and manufactures its Products subject to strict quality control system. However, semiconductor products can fail or malfunction at a certain rate. Please be sure to implement, at your own responsibilities, adequate safety measures including but not limited to fail-safe design against the physical injury, damage to any property, which a failure or malfunction of our Products may cause. The following are examples of safety measures:
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  - Installation of redundant circuits to reduce the impact of single or multiple circuit failure
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  - Use of our Products in places where the Products are exposed to static electricity or electromagnetic waves
  - Use of our Products in proximity to heat-producing components, plastic cords, or other flammable items
  - Sealing or coating our Products with resin or other coating materials
  - Use of our Products without cleaning residue of flux (even if you use no-clean type fluxes, cleaning residue of flux is recommended); or Washing our Products by using water or water-soluble cleaning agents for cleaning residue after soldering
  - Use of the Products in places subject to dew condensation
- The Products are not subject to radiation-proof design.
- Please verify and confirm characteristics of the final or mounted products in using the Products.
- In particular, if a transient load (a large amount of load applied in a short period of time, such as pulse. is applied, confirmation of performance characteristics after on-board mounting is strongly recommended. Avoid applying power exceeding normal rated power; exceeding the power rating under steady-state loading condition may negatively affect product performance and reliability.
- De-rate Power Dissipation (Pd) depending on Ambient temperature (Ta). When used in sealed area, confirm the actual ambient temperature.
- Confirm that operation temperature is within the specified range described in the product specification.
- ROHM shall not be in any way responsible or liable for failure induced under deviant condition from what is defined in this document.

## Precaution for Mounting / Circuit board design

- When a highly active halogenous (chlorine, bromine, etc.) flux is used, the residue of flux may negatively affect product performance and reliability.
- In principle, the reflow soldering method must be used; if flow soldering method is preferred, please consult with the ROHM representative in advance.

For details, please refer to ROHM Mounting specification

## Precautions Regarding Application Examples and External Circuits

1. If change is made to the constant of an external circuit, please allow a sufficient margin considering variations of the characteristics of the Products and external components, including transient characteristics, as well as static characteristics.
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## Precaution for Electrostatic

This Product is electrostatic sensitive product, which may be damaged due to electrostatic discharge. Please take proper caution in your manufacturing process and storage so that voltage exceeding the Products maximum rating will not be applied to Products. Please take special care under dry condition (e.g. Grounding of human body / equipment / solder iron, isolation from charged objects, setting of ionizer, friction prevention and temperature / humidity control).

## Precaution for Storage / Transportation

1. Product performance and soldered connections may deteriorate if the Products are stored in the places where:
  - [a] the Products are exposed to sea winds or corrosive gases, including Cl<sub>2</sub>, H<sub>2</sub>S, NH<sub>3</sub>, SO<sub>2</sub>, and NO<sub>2</sub>
  - [b] the temperature or humidity exceeds those recommended by ROHM
  - [c] the Products are exposed to direct sunshine or condensation
  - [d] the Products are exposed to high Electrostatic
2. Even under ROHM recommended storage condition, solderability of products out of recommended storage time period may be degraded. It is strongly recommended to confirm solderability before using Products of which storage time is exceeding the recommended storage time period.
3. Store / transport cartons in the correct direction, which is indicated on a carton with a symbol. Otherwise bent leads may occur due to excessive stress applied when dropping of a carton.
4. Use Products within the specified time after opening a humidity barrier bag. Baking is required before using Products of which storage time is exceeding the recommended storage time period.

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QR code printed on ROHM Products label is for ROHM's internal use only.

## Precaution for Disposition

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