

|                |                                                                                                                                                             |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| STRUCTURE      | Silicon Monolithic Integrated Circuit                                                                                                                       |
| PRODUCT SERIES | Low Voltage Detector IC with Adjustable Output Delay                                                                                                        |
| TYPE           | <b>BU42XXFVE Series</b>                                                                                                                                     |
| FEATURE        | <ul style="list-style-type: none"> <li>• Detection voltage lineup : 0.9V~4.8V</li> <li>• High precision detection voltage : <math>\pm 1\%</math></li> </ul> |

**ABSOLUTE MAXIMUM RATINGS (Ta=25°C)**

| Parameter                               | Symbol               | Limit                           | Unit |
|-----------------------------------------|----------------------|---------------------------------|------|
| Supply Voltage ※1                       | V <sub>DD</sub> —GND | -0.3 to +7                      | V    |
| Output Voltage ※1 Nch Open Drain Output | V <sub>OUT</sub>     | GND-0.3 to +7                   | V    |
| Input Voltage of CT                     | V <sub>CT</sub>      | GND-0.3 to V <sub>DD</sub> +0.3 | V    |
| Power Dissipation ※2                    | P <sub>d</sub>       | 210                             | mW   |
| Operating Temperature ※1                | T <sub>opr</sub>     | -40 to +125                     | °C   |
| Storage Temperature Range               | T <sub>stg</sub>     | -55 to +125                     | °C   |
| Junction Temperature                    | T <sub>jmax</sub>    | 125                             | °C   |

※1 Do not exceed P<sub>d</sub>.

※2 Mounted on 70mm×70mm×1.6mm Glass Epoxy PCB, P<sub>d</sub> derated at 2.1mW/°C for temperature above Ta=25°C

NOTE : The product described in this specification is a strategic product (and/or service) subject to COCOM regulations. It should not be exported without authorization from the appropriate government.

NOTE : This product is not designed for protection against radioactive rays.

**Status of this document**

The Japanese version of this document is the formal specification.

A customer may use this translation version only for a reference to help reading the formal version.

If there are any differences in translation version of this document, formal version takes priority.

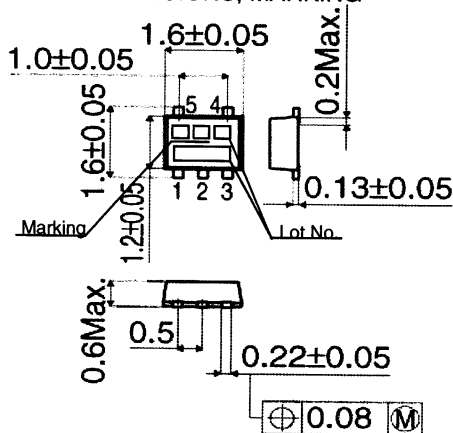
**OELECTRICAL CHARACTERISTICS (Unless Otherwise Specified Ta=-25 to 125°C)**

| Parameter                                 | Symbol               | Condition                                                                                            | Limit                          |                         |                                | Unit   |
|-------------------------------------------|----------------------|------------------------------------------------------------------------------------------------------|--------------------------------|-------------------------|--------------------------------|--------|
|                                           |                      |                                                                                                      | Min.                           | Typ.                    | Max.                           |        |
| Detection Voltage                         | V <sub>DET</sub>     | V <sub>DD</sub> =H→L Ta=25°C<br>R <sub>L</sub> =470kΩ                                                | V <sub>DET</sub> (T)<br>× 0.99 | V <sub>DET</sub> (T)    | V <sub>DET</sub> (T)<br>× 1.01 | V      |
| Circuit Current when ON                   | I <sub>DD1</sub>     | V <sub>DD</sub> =V <sub>DET</sub> -0.2V, V <sub>DET</sub> =0.9-1.3V                                  | -                              | 0.15                    | 0.88                           | μA     |
|                                           |                      | V <sub>DET</sub> =1.4-2.1V                                                                           | -                              | 0.20                    | 1.05                           |        |
|                                           |                      | V <sub>DET</sub> =2.2-2.7V                                                                           | -                              | 0.25                    | 1.23                           |        |
|                                           |                      | V <sub>DET</sub> =2.8-3.3V                                                                           | -                              | 0.30                    | 1.40                           |        |
|                                           |                      | V <sub>DET</sub> =3.4-4.2V                                                                           | -                              | 0.35                    | 1.58                           |        |
|                                           |                      | V <sub>DET</sub> =4.3-4.8V                                                                           | -                              | 0.40                    | 1.75                           |        |
| Circuit Current when OFF                  | I <sub>DD2</sub>     | V <sub>DD</sub> =V <sub>DET</sub> +2.0V, V <sub>DET</sub> =0.9-1.3V                                  | -                              | 0.30                    | 1.40                           | μA     |
|                                           |                      | V <sub>DET</sub> =1.4-2.1V                                                                           | -                              | 0.35                    | 1.58                           |        |
|                                           |                      | V <sub>DET</sub> =2.2-2.7V                                                                           | -                              | 0.40                    | 1.75                           |        |
|                                           |                      | V <sub>DET</sub> =2.8-3.3V                                                                           | -                              | 0.45                    | 1.93                           |        |
|                                           |                      | V <sub>DET</sub> =3.4-4.2V                                                                           | -                              | 0.50                    | 2.10                           |        |
|                                           |                      | V <sub>DET</sub> =4.3-4.8V                                                                           | -                              | 0.55                    | 2.28                           |        |
| Operating Voltage Range                   | V <sub>OPL</sub>     | V <sub>OL</sub> ≤0.4V, R <sub>L</sub> =470kΩ<br>Ta=25°C~125°C                                        | 0.70                           | -                       | -                              | V      |
|                                           |                      | V <sub>OL</sub> ≤0.4V, R <sub>L</sub> =470kΩ<br>Ta=-25°C~25°C                                        | 0.90                           | -                       | -                              |        |
| 'Low' Output Current (Nch)                | I <sub>OL</sub>      | V <sub>DS</sub> =0.05V, V <sub>DD</sub> =0.85V                                                       | 20                             | 100                     | -                              | μA     |
|                                           |                      | V <sub>DS</sub> =0.5V, V <sub>DD</sub> =1.5V, V <sub>DET</sub> =1.7-4.8V                             | 1.0                            | 3.3                     | -                              | mA     |
|                                           |                      | V <sub>DS</sub> =0.5V, V <sub>DD</sub> =2.4V, V <sub>DET</sub> =2.7-4.8V                             | 3.6                            | 6.5                     | -                              |        |
| Leak Current when OFF                     | I <sub>leak</sub>    | V <sub>DD</sub> =V <sub>DS</sub> =7V Ta=-40°C~85°C                                                   | -                              | 0                       | 0.1                            | μA     |
|                                           |                      | V <sub>DD</sub> =V <sub>DS</sub> =7V Ta=85°C~125°C                                                   | -                              | 0                       | 1                              |        |
| CT pin Threshold Voltage                  | V <sub>CTH</sub>     | V <sub>DD</sub> =V <sub>DET</sub> × 1.1 R <sub>L</sub> =470kΩ<br>Ta=25°C V <sub>DET</sub> =0.9V-2.5V | V <sub>DD</sub> × 0.35         | V <sub>DD</sub> × 0.45  | V <sub>DD</sub> × 0.55         | V      |
|                                           |                      | V <sub>DD</sub> =V <sub>DET</sub> × 1.1 R <sub>L</sub> =470kΩ<br>Ta=25°C V <sub>DET</sub> =2.6V-4.8V | V <sub>DD</sub> × 0.40         | V <sub>DD</sub> × 0.50  | V <sub>DD</sub> × 0.60         |        |
| Output Delay Resistance                   | R <sub>CT</sub>      | V <sub>DD</sub> =V <sub>DET</sub> × 1.1 V <sub>CT</sub> =0.5V<br>Ta=25°C                             | 9.0                            | 10.0                    | 11.0                           | MΩ     |
| CT pin Output Current                     | I <sub>CT</sub>      | V <sub>CT</sub> =0.1V V <sub>DD</sub> =0.85V                                                         | 5                              | 40                      | -                              | μA     |
|                                           |                      | V <sub>CT</sub> =0.5V V <sub>DD</sub> =1.5V, V <sub>DET</sub> =1.7V-4.8V                             | 200                            | 400                     | -                              |        |
| Detection Voltage Temperature coefficient | V <sub>DET</sub> /ΔT | Ta=-40°C~125°C (Designed Guarantee.)                                                                 | -                              | ±30                     | -                              | ppm/°C |
| Hysteresis Voltage                        | ΔV <sub>DET</sub>    | R <sub>L</sub> =470kΩ, V <sub>DD</sub> =L→H→L<br>Ta=-40°C~125°C                                      | V <sub>DET</sub> ≤1.0V         | V <sub>DET</sub> × 0.03 | V <sub>DET</sub> × 0.05        | V      |
|                                           |                      |                                                                                                      | V <sub>DET</sub> ≥1.1V         | V <sub>DET</sub> × 0.03 | V <sub>DET</sub> × 0.07        |        |

V<sub>DET</sub>(T) : Standard Detection Voltage (0.9V~4.8V, 0.1V step)

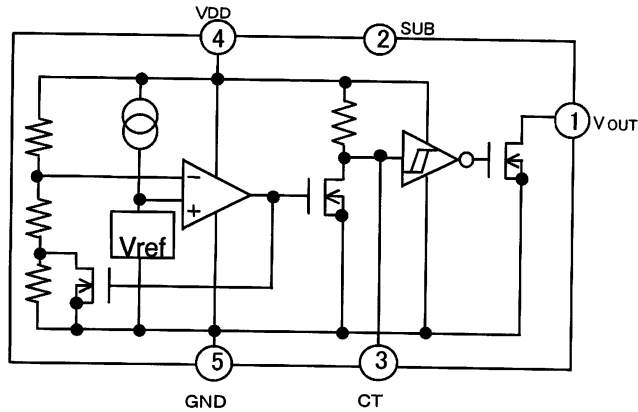
R<sub>L</sub> : Pull-up resistor to be connected between V<sub>OUT</sub> and power supply.

Designed Guarantee. (Outgoing inspection is not done on all products.)

**OPHYSICAL DIMENSIONS, MARKING**


VSO5 (UNIT:mm)

## OBLOCK DIAGRAM



## OPIN NO. , PIN NAME

| Pin Number | Pin Name |
|------------|----------|
| 1          | VOUT     |
| 2          | SUB      |
| 3          | CT       |
| 4          | VDD      |
| 5          | GND      |

NOTE: Substrate Pin should be connected with VDD

※ Please refer to technical note concerning application circuit, and etc.

## OSTANDARD DETECTION VOLTAGE AND MARKING

| Type   | Standard Detection Voltage[V] | Marking | Type   | Standard Detection Voltage[V] | Marking |
|--------|-------------------------------|---------|--------|-------------------------------|---------|
| BU4248 | 4.800                         | ZR      | BU4228 | 2.800                         | YV      |
| BU4247 | 4.700                         | ZQ      | BU4227 | 2.700                         | YU      |
| BU4246 | 4.600                         | ZP      | BU4226 | 2.600                         | YT      |
| BU4245 | 4.500                         | ZN      | BU4225 | 2.500                         | YS      |
| BU4244 | 4.400                         | ZM      | BU4224 | 2.400                         | YR      |
| BU4243 | 4.300                         | ZL      | BU4223 | 2.300                         | YQ      |
| BU4242 | 4.200                         | ZK      | BU4222 | 2.200                         | YP      |
| BU4241 | 4.100                         | ZJ      | BU4221 | 2.100                         | YN      |
| BU4240 | 4.000                         | ZH      | BU4220 | 2.000                         | YM      |
| BU4239 | 3.900                         | ZG      | BU4219 | 1.900                         | YL      |
| BU4238 | 3.800                         | ZF      | BU4218 | 1.800                         | YK      |
| BU4237 | 3.700                         | ZE      | BU4217 | 1.700                         | YJ      |
| BU4236 | 3.600                         | ZD      | BU4216 | 1.600                         | YH      |
| BU4235 | 3.500                         | ZC      | BU4215 | 1.500                         | YG      |
| BU4234 | 3.400                         | ZB      | BU4214 | 1.400                         | YF      |
| BU4233 | 3.300                         | ZA      | BU4213 | 1.300                         | YE      |
| BU4232 | 3.200                         | YZ      | BU4212 | 1.200                         | YD      |
| BU4231 | 3.100                         | YY      | BU4211 | 1.100                         | YC      |
| BU4230 | 3.000                         | YX      | BU4210 | 1.000                         | YB      |
| BU4229 | 2.900                         | YW      | BU4209 | 0.900                         | YA      |

## ONOTES FOR USE

### 1 . Absolute maximum range

Absolute Maximum Ratings are those values beyond which the life of a device may be destroyed. We cannot be defined the failure mode, such as short mode or open mode. Therefore a physical security countermeasure, like fuse, is to be given when a specific mode to be beyond absolute maximum ratings is considered.

### 2 . GND potential

GND terminal should be a lowest voltage potential every state.

Please make sure all pins which are over ground even if include transient feature.

### 3 . Electrical Characteristics

Be sure to check the electrical characteristics, that is one the tentative specification will be changed by temperature, supply voltage, and external circuit.

## 4 . Bypass Capacitor for Noise Rejection

Please put into the to reject noise between VDD pin and GND. If extremely big capacitor is used, transient response might be late. Please confirm sufficiently for the point.

## 5 . Short Circuit between Terminal and Soldering

Don't short-circuit between Output pin and VDD pin, Output pin and GND pin, or VDD pin and GND pin. When soldering the IC on circuit board, please be unusually cautious about the orientation and the position of the IC. When the orientation is mistaken the IC may be destroyed.

## 6 . Electromagnetic Field

Mal-function may happen when the device is used in the strong electromagnetic field.

## 7 . The VDD line impedance might cause oscillation because of the detection current.

## 8 . A VDD -GND capacitor (as close connection as possible) should be used in high VDD line impedance condition.

## 9 . Lower than the minimum input voltage makes the VOUT high impedance, and it must be VDD in pull up (VDD) condition.

## 10. Case of needless Delay time, recommended to insert more 470kΩ resistor between VDD and CT.

## 11. Recommended value of RL Resistar is over 10kΩ . (VDET ≥ 1.5V) over 100kΩ . (VDET ≤ 1.4V)

## 12. BU42XXFVE has extremely high impedance terminals. Small leak current due to the uncleanness of PCB surface might cause unexpected operations. Application values in these conditions should be selected carefully. If 10MΩ leakage is assumed between the CT terminal and the GND terminal, 1MΩ connection between the CT terminal and the VDD terminal would be recommended. Also, if the leakage is assumed between the VOUT terminal and the GND terminal, the pull up resistor should be less than 1/10 of the assumed leak resistance. The value of RCT depends on the external resistor that is connected to CT terminal, so please consider the delay time that is decided by $\tau \times RCT \times CCT$ changes.

## 13. Delay time (tPLH)

$$t_{PLH} = \tau \times RCT \times CCT \text{ (sec)}$$

$\tau$  : time constant

RCT : 10MΩ (typ.) (built-in resistor)

CCT : capacitor connected CT pin.

Recommended value of CCT capacitor TS over 100pF.

The reference value

$$(\tau \times RCT) \times 10^6$$

VDET = 0.9 to 2.5V

Ta = 25°C (min. =  $5.1 \times 10^6$  typ. =  $6.9 \times 10^6$  max =  $6.9 \times 10^6$ )

Ta = -25 to 125°C (min. =  $3.3 \times 10^6$  typ. =  $6.9 \times 10^6$  max =  $8.7 \times 10^6$ )

VDET = 2.6 to 4.8V

Ta = 25°C (min. =  $5.9 \times 10^6$  typ. =  $6.0 \times 10^6$  max =  $7.9 \times 10^6$ )

Ta = -25 to 125°C (min. =  $3.8 \times 10^6$  typ. =  $6.0 \times 10^6$  max =  $10.0 \times 10^6$ )

## 14. External parameters

The recommended parameter range for CT is 10pF~0.1 μF. For RL, the recommended range is 50kΩ ~1MΩ. When attempting to operate beyond these parameters, be sure to verify the actual operation before continuing use.

## 15. CT pin discharge

Due to the capabilities of the CT pin discharge transistor, the CT pin may not completely discharge when a short input pulse is applied, and in this case the delay time may not be controlled. Please verify the actual operation.

## 16. Power on reset operation

Please note that the power on reset output varies with the Vcc rise up time. Please verify the actual operation.

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