

# PLL frequency synthesizer for tuners

## BU2611A / BU2611AF / BU2611AFS

The BU2611 PLL frequency synthesizers work up through the FM band. They feature built-in RF amps with low power dissipation and high sensitivity.

### ●Applications

Tuners (Mini components, radio cassette players, radio equipment, etc.)

### ●Features

- 1) Built-in high-speed prescaler can divide 130 MHzVCO.
- 2) In addition to the reference FM and AM, also offers the following 7 frequencies: 100kHz, 50kHz, 25kHz, 10kHz, 9kHz, 5kHz, and 1kHz.
- 3) 3-bit output port (open drain).
- 4) Clock output (400kHz).
- 5) Time base output (8Hz).
- 6) Serial data input (CE, CK, DA).

### ●Absolute maximum ratings (Ta = 25°C)

| Parameter                |                    | Symbol            | Limits                    | Unit | Conditions                  |
|--------------------------|--------------------|-------------------|---------------------------|------|-----------------------------|
| Power supply voltage     |                    | V <sub>DD</sub>   | -0.3~+7.0                 | V    |                             |
| Maximum input voltage    |                    | V <sub>IN</sub>   | -0.3~V <sub>DD</sub> +0.3 | V    | CE, CK, CA, XIN, FMIN, AMIN |
| Maximum output voltage 1 |                    | V <sub>OUT1</sub> | -0.3~+10.0                | V    | P1, P2, P3, P4              |
| Maximum output voltage 2 |                    | V <sub>OUT2</sub> | -0.3~V <sub>DD</sub> +0.3 | V    | PD1, PD2                    |
| Maximum output current   |                    | I <sub>OUT</sub>  | 0~+4.0                    | mA   | P1, P2, P3, P4              |
| Power dissipation        | BU2611A            | P <sub>D</sub>    | 1000 *1                   | mW   |                             |
|                          | BU2611AF/BU2611AFS |                   | 500 *2                    |      |                             |
| Operating temperature    |                    | T <sub>opr</sub>  | -25~+75                   | °C   |                             |
| Storage temperature      |                    | T <sub>stg</sub>  | -55~+125                  | °C   |                             |

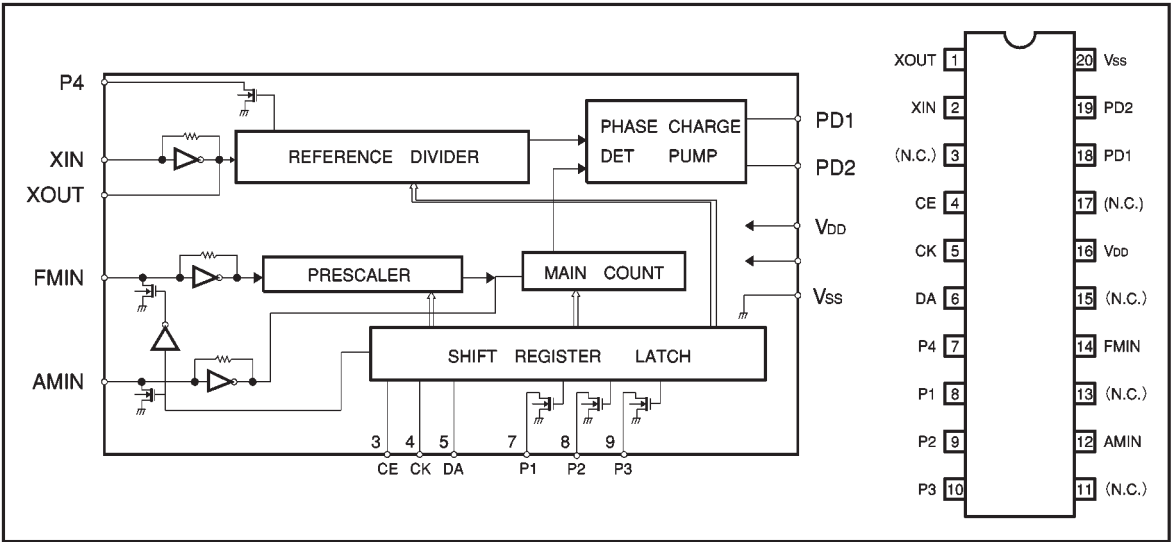
\*1 Reduced by 10mW for each increase in Ta of 1°C over 25°C.

\*2 Reduced by 5mW for each increase in Ta of 1°C over 25°C.

### ●Recommended operating conditions

| Parameter            | Symbol          | Limits  | Unit |
|----------------------|-----------------|---------|------|
| Power supply voltage | V <sub>DD</sub> | 4.0~6.0 | V    |

● Block diagram



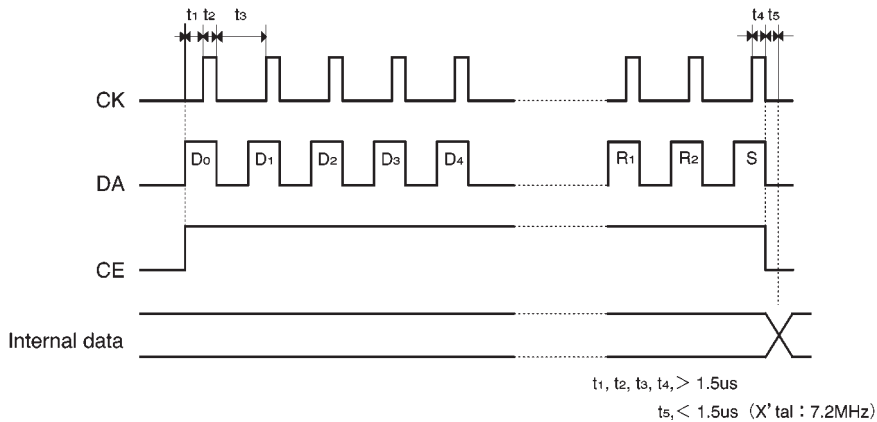
● Pin descriptions

| Pin name   | Function                               |
|------------|--|
| P4         | Controller clock (400 kHz) output      |
| XIN, XOUT  | X <sup>tal</sup> oscillation (7.2 MHz) |
| FMIN, AMIN | Local oscillation signal input         |
| CE, CK, DA | Data input                             |
| P1, P2, P3 | Output port                            |
| V          | Power supply                           |
| PD1, PD2   | Charge pump output                     |

●Electrical characteristics (unless otherwise noted, Ta = 25°C, VDD = 5.0V)

| Parameter                   | Symbol              | Min. | Typ. | Max. | Unit             | Conditions   |
|-----------------------------|---------------------|------|------|------|------------------|--|
| Power supply current        | IDD1                | —    | 4.8  | —    | mA               | F <sub>IN</sub> =130MHz, 100mV <sub>rms</sub>                      |
| Circuit current w/o signal  | IDD2                | —    | 300  | —    | μA               | No input, PLL = OFF  |
| Input high level voltage    | V <sub>IH</sub>     | 3.5  | —    | —    | V                | CE, CK, DA terminals   |
| Input low level voltage     | V <sub>IL</sub>     | —    | —    | 1.5  | V                | CE, CK, DA terminals   |
| Output low level voltage 1  | V <sub>OL1</sub>    | —    | 0.4  | —    | V                | P1, P2, P3, P4 I <sub>OUT</sub> =2.0mA                             |
| Off level leakage current 1 | I <sub>OFF1</sub>   | —    | —    | 1.0  | μA               | P1, P2, P3, P4 V <sub>OUT</sub> =10V                               |
| Output high level voltage   | V <sub>OH</sub>     | —    | 0.25 | —    | V                | PD1, PD2 I <sub>OUT</sub> =-1.0mA                                  |
| Output low level voltage 2  | V <sub>OL2</sub>    | —    | 0.15 | —    | V                | PD1, PD2 I <sub>OUT</sub> =1.0mA                                   |
| Off level leakage current 2 | I <sub>OFF2</sub>   | 100  | —    | 100  | nA               | PD1, PD2 V <sub>OUT</sub> =V <sub>DD</sub>                         |
| Off level leakage current 3 | I <sub>OFF3</sub>   | 100  | —    | —    | nA               | PD1, PD2 V <sub>OUT</sub> =V <sub>SS</sub>                         |
| Input frequency 1           | F <sub>IN1</sub>    | —    | 7.2  | —    | MHz              | XIN, sine wave, C coupling   |
| Input frequency 2           | F <sub>IN2</sub>    | 10   | —    | 130  | MHz              | FMIN, sine wave, C coupling V <sub>IN</sub> = 80 mV <sub>rms</sub> |
| Input frequency 3           | F <sub>IN3</sub>    | 0.5  | —    | 20   | MHz              | AMIN, sine wave, C coupling V <sub>IN</sub> = 80 mV <sub>rms</sub> |
| Input amplitude             | F <sub>INmax.</sub> | 0.08 | —    | 1.5  | V <sub>rms</sub> | XIN, FMIN, AMIN, sine wave, C coupling                             |

●Data format



|                |                |                |                |                |                |                |                |                |                |                 |                 |                 |                 |
|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-----------------|-----------------|-----------------|-----------------|
| D <sub>0</sub> | D <sub>1</sub> | D <sub>2</sub> | D <sub>3</sub> | D <sub>4</sub> | D <sub>5</sub> | D <sub>6</sub> | D <sub>7</sub> | D <sub>8</sub> | D <sub>9</sub> | D <sub>10</sub> | D <sub>11</sub> | D <sub>12</sub> | D <sub>13</sub> |
|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-----------------|-----------------|-----------------|-----------------|

← Input done from D<sub>0</sub>.

|                |                |                |                |                |                |                |                |                |   |
|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|---|
| T <sub>0</sub> | T <sub>1</sub> | P <sub>0</sub> | P <sub>1</sub> | P <sub>2</sub> | T <sub>B</sub> | R <sub>0</sub> | R <sub>1</sub> | R <sub>2</sub> | S |
|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|---|

(1) Division data: For D<sub>0</sub> through D<sub>13</sub> (For AMN, use D<sub>4</sub> through D<sub>13</sub>.)

|                |                |                |                |                |                |                |                |                |                |                 |                 |                 |                 |
|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-----------------|-----------------|-----------------|-----------------|
| D <sub>0</sub> | D <sub>1</sub> | D <sub>2</sub> | D <sub>3</sub> | D <sub>4</sub> | D <sub>5</sub> | D <sub>6</sub> | D <sub>7</sub> | D <sub>8</sub> | D <sub>9</sub> | D <sub>10</sub> | D <sub>11</sub> | D <sub>12</sub> | D <sub>13</sub> |
|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-----------------|-----------------|-----------------|-----------------|

1 1 0 0 1 0 1 0 0 0 1 0 0 0 →FMIN frequency = 1107  
 X X X X 0 1 1 1 1 0 0 1 1 1 →AMIN frequency = 926

(2) Test data: T<sub>0</sub> through T<sub>1</sub> are taken as (0, 0).

●Data format

(3) P<sub>0</sub>, P<sub>1</sub>, P<sub>2</sub>, P<sub>3</sub>, TB: port output, time base output

| Data           |                |                |    | Port output    |                |                |
|----------------|----------------|----------------|----|----------------|----------------|----------------|
| P <sub>0</sub> | P <sub>1</sub> | P <sub>2</sub> | TB | P <sub>1</sub> | P <sub>2</sub> | P <sub>3</sub> |
| 0              | 0              | 0              | 0  | *              | *              | *              |
| 0              | 0              | 1              | 0  | 0              | 0              | 1              |
| 0              | 1              | 0              | 0  | 0              | 1              | 0              |
| 0              | 1              | 1              | 0  | 0              | 1              | 1              |
| 1              | 0              | 0              | 0  | 1              | 0              | 0              |
| 1              | 0              | 1              | 0  | 1              | 0              | 1              |
| 1              | 1              | 0              | 0  | 1              | 1              | 0              |
| 1              | 1              | 1              | 0  | 1              | 1              | 1              |
| 0              | 0              | 0              | 1  | TB             | *              | *              |
| X              | 1              | 0              | 1  | TB             | 1              | 0              |
| X              | 0              | 1              | 1  | TB             | 0              | 1              |
| X              | 1              | 1              | 1  | TB             | 1              | 1              |
| 1              | 0              | 0              | 1  | TB             | 0              | 0              |

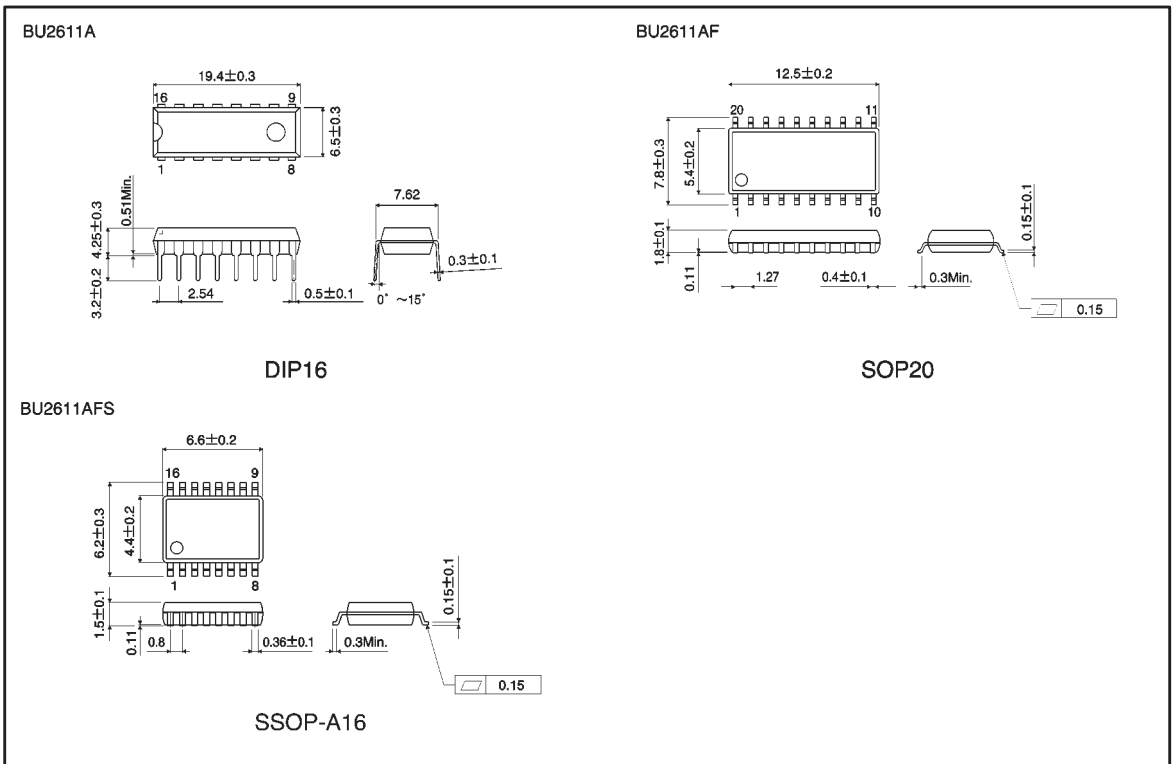
\* : Determined on the basis of R<sub>0</sub> - R<sub>2</sub>.  
 X : Irrelevant  
 TB: 8 Hz

(4) R<sub>0</sub>, R<sub>1</sub>, R<sub>2</sub>, standard frequency data

| Data           |                |                | Standard frequency | Port output    |                |                |
|----------------|----------------|----------------|--------------------|----------------|----------------|----------------|
| R <sub>0</sub> | R <sub>1</sub> | R <sub>2</sub> |                    | P <sub>1</sub> | P <sub>2</sub> | P <sub>3</sub> |
| 0              | 0              | 0              | 100kHz             | 1              | 1              | 0              |
| 0              | 0              | 1              | 50                 | 1              | 1              | 0              |
| 0              | 1              | 0              | 25                 | 1              | 1              | 0              |
| 0              | 1              | 1              | 5                  | 0              | 0              | 1              |
| 1              | 0              | 0              | 10                 | 1              | 0              | 1              |
| 1              | 0              | 1              | 9                  | 1              | 0              | 1              |
| 1              | 1              | 0              | 1                  | 0              | 1              | 1              |
| 1              | 1              | 1              | 5                  | 0              | 0              | 1              |

(5) S: input selection data 1: FMIN 0: AMIN

●External dimensions (Units: mm)



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