



## UA2311

CMOS IC

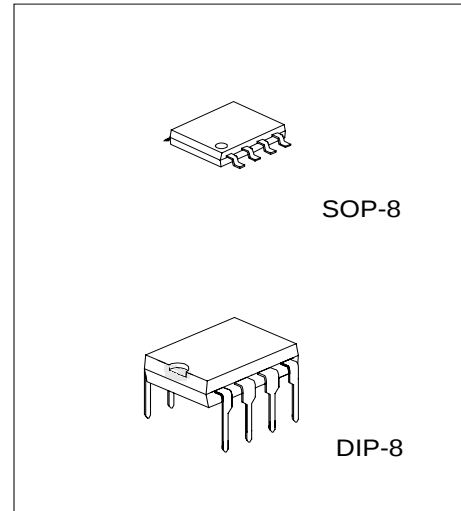
### 16 BITS DIGITAL to ANALOG CONVERTER

#### ■ DESCRIPTION

UTC **UA2311** is a 16-bits Digital-to-Analog Converter(DAC) designed for stereo audio applications and manufactured by CMOS Technologies with low power consumption. It converts the 16 bits serial data into an analog output voltage by an R-string voltage divider. Each output channel voltage is driven by an operational amplifier allowing easy analog output. In sound cards test, the 44.1KHz or higher sampling rate is available.

#### ■ FEATURES

- \* CMOS Technology
- \* Low Power Consumption
- \* Two Voltage Output Channels in the same chip
- \* 16-bits Dynamic Range
- \* Low Total Harmonic Distortion
- \* 5V(typ.) Single Power Supply



\*Pb-free plating product number: UA2311L

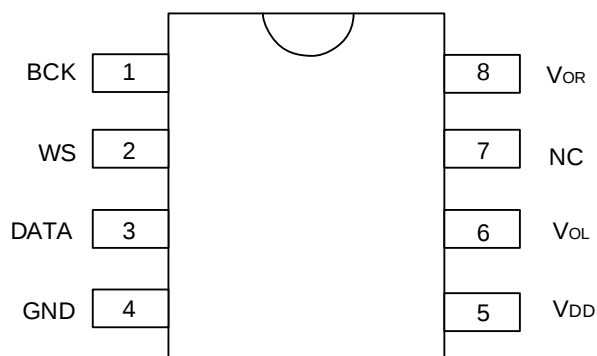
#### ■ PIN DESCRIPTION

| PIN NO | PIN NAME        | DESCRIPTION           |
|--------|-----------------|-----------------------|
| 1      | BCK             | Bit Clock Input       |
| 2      | WS              | Word Select Input     |
| 3      | DATA            | Data Input            |
| 4      | GND             | Ground                |
| 5      | V <sub>DD</sub> | Positive Power Supply |
| 6      | V <sub>OL</sub> | Left Channel Output   |
| 7      | NC              | Not Connected         |
| 8      | V <sub>OR</sub> | Right Channel Output  |

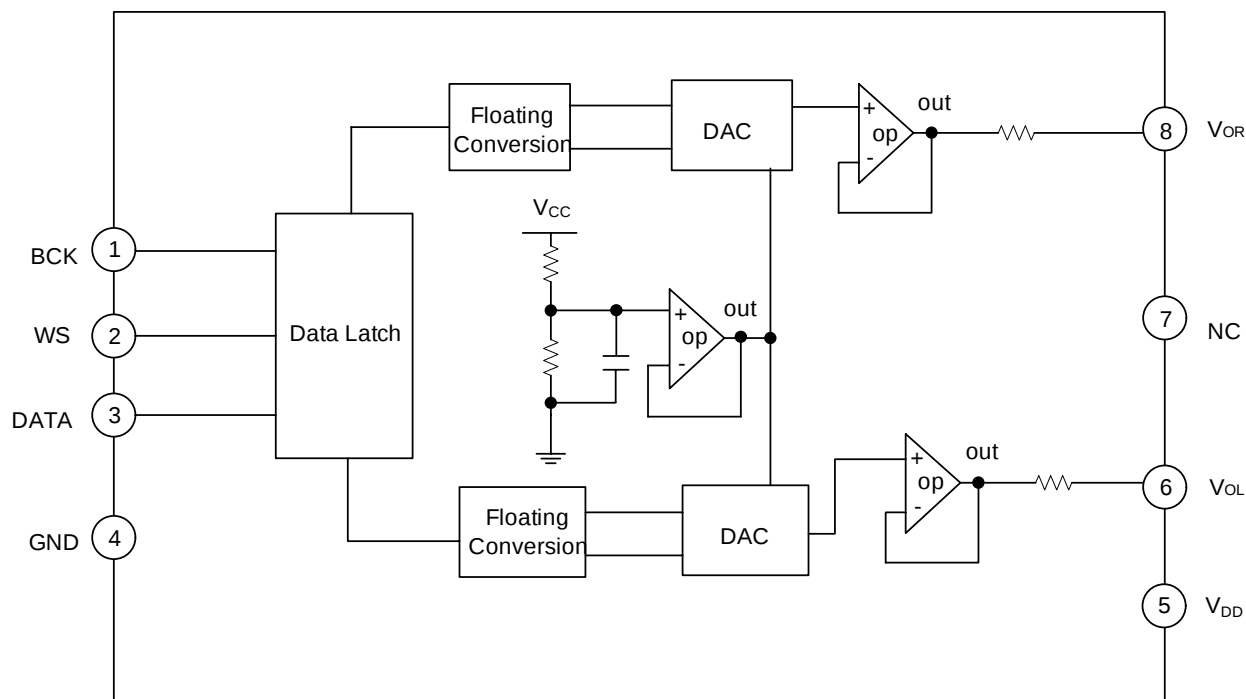
#### ■ ORDERING INFORMATION

| Ordering Number |                   | Package | Packing   |
|-----------------|-------------------|---------|-----------|
| Normal          | Lead Free Plating |         |           |
| UA2311-S08-R    | UA2311L-S08-R     | SOP-8   | Tape Reel |
| UA2311-S08-T    | UA2311L-S08-T     | SOP-8   | Tube      |
| UA2311-D08-T    | UA2311L-D08-T     | DIP-8   | Tube      |

## ■ PIN CONFIGURATION



## ■ BLOCK DIAGRAM



## ■ ABSOLUTE MAXIMUM RATING

| PARAMETER             | SYMBOL    | RATINGS             | UNIT |
|-----------------------|-----------|---------------------|------|
| Power Supply Voltage  | $V_{DD}$  | -3.0 ~ +7.0         | V    |
| Input Voltage         | $V_{IN}$  | -0.3 ~ $V_{DD}+0.3$ | V    |
| Operating Temperature | $T_{OPR}$ | 0 ~ +70             | °C   |
| Storage Temperature   | $T_{STG}$ | -40 ~ +150          | °C   |

Note: 1. The typical power supply voltage propose at 5V, and range from 4.75V~6V is recommended.

2. Operating temperature range between 0~+50°C is strongly recommended, Ta=25 is typical.

## ■ ELECTRICAL CHARACTERISTICS

DC CHARACTERISTICS (Ta=0 ~ 70°C,  $V_{DD}=5.0 \pm 0.25V$ )

| PARAMETER             | SYMBOL         | TEST CONDITIONS | MIN  | TYP           | MAX           | UNIT |
|-----------------------|----------------|-----------------|------|---------------|---------------|------|
| Input Voltage Level   | High           | $V_{IH}$        | Note | 0.66 $V_{DD}$ |               | V    |
|                       | Low            | $V_{IL}$        | Note |               | 0.30 $V_{DD}$ |      |
| Input Leakage Current | $I_{IN(LEAK)}$ | Note            |      |               | 0.1           | μA   |
| Input Capacitance     | $C_{IN}$       | Note            |      |               | 5             | pF   |
| Power Consumption     | W              | $V_{DD}=5.0V$   |      | 30            |               | mW   |
| Clock Frequency       | fc             |                 |      | 5.6448        | 18.4          | MHz  |

Note: Applicable to BCK, WS & DATA.

ANALOG CHARACTERISTICS (Ta=25°C,  $V_{DD}=5.0V$ )

| PARAMETER                          | SYMBOL    | TEST CONDITIONS | MIN | TYP  | MAX | UNIT     |
|------------------------------------|-----------|-----------------|-----|------|-----|----------|
| Maximum Output Amplitude           | $V_{OUT}$ |                 |     | 2.5  |     | $V_{pp}$ |
| Total Harmonic Distortion (Note 1) | THD       | 1KHz, 0dB       |     | 0.13 |     | %        |
| Dynamic Range                      | DR        |                 |     | 16   |     | bit      |
| Signal-to-Noise Ratio (Note 2)     | S/N       | 1KHz, 0dB       |     | 82   |     | dB       |
| Cross Talk (Note 2)                | CT        | 1KHz, 0dB       |     | -85  |     | dB       |

Note 1. Measured with 176.4KHz sampling rate, 2K~ 20K Harmonics

2. Measured with an A/D & D/A Evaluation Board at sampling rate of 48KHz.

TIMING CHARACTERISTICS (refer to Figure 1)

| PARAMETER       | SYMBOL | MIN | TYP | MAX | UNIT |
|-----------------|--------|-----|-----|-----|------|
| High Level Time | $t_H$  | 25  |     |     | ns   |
| Rise Time       | $t_R$  |     |     | 20  | ns   |
| Fall Time       | $t_F$  |     |     | 20  | ns   |

## ■ FUNCTIONAL DESCRIPTION

The UTC **UA2311** accepts serial input data format of 16-bits word length. Both left and right data words are time multiplexed. The last 16 bits word before "WS" changes is recognized as the input data. The timing and input signal formats are shown in Figure 1 and 2.

The most significant bit (bit 1) must always be first. The serial input data is shifted and latched for the Right and Left Channels. With a HIGH level on the word select input (WS), data is placed in the left input register and with a LOW level on the WS input, data is placed in the right input register (see Block Diagram). The data in the input registers are simultaneously latched in the output registers which control the bit switches.

The 16 bits Right/Left Data is then converted to floating point expression whose format consists of 10 bits mantissa and 7 step exponent. This floating point expression is then converted to analog output voltage by the resistor-string. This signal is driven to the Right/Left Channel ( $V_{OR}/V_{OL}$ ) by the buffer operational amplifier.

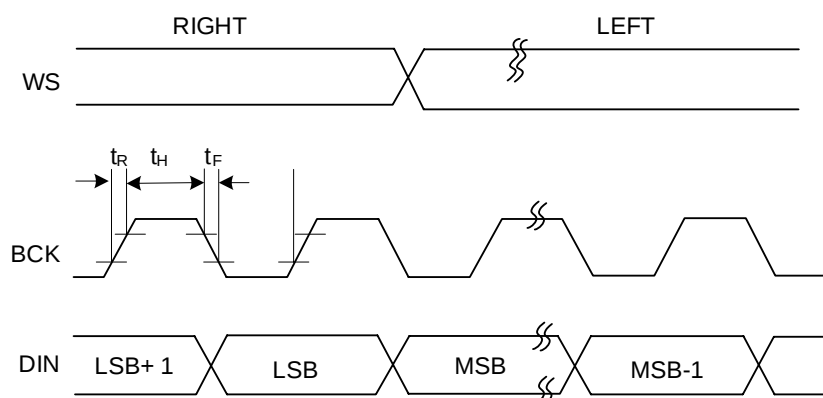


Figure.1 Input Signal Format

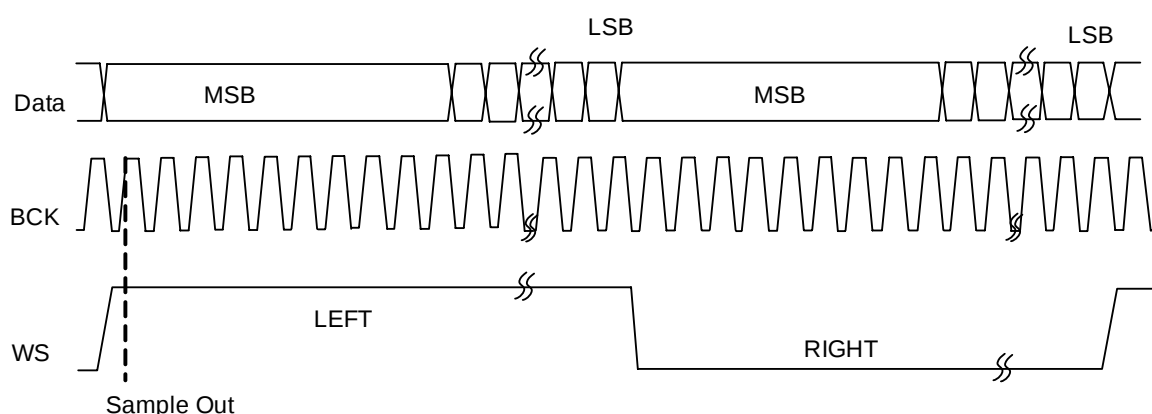
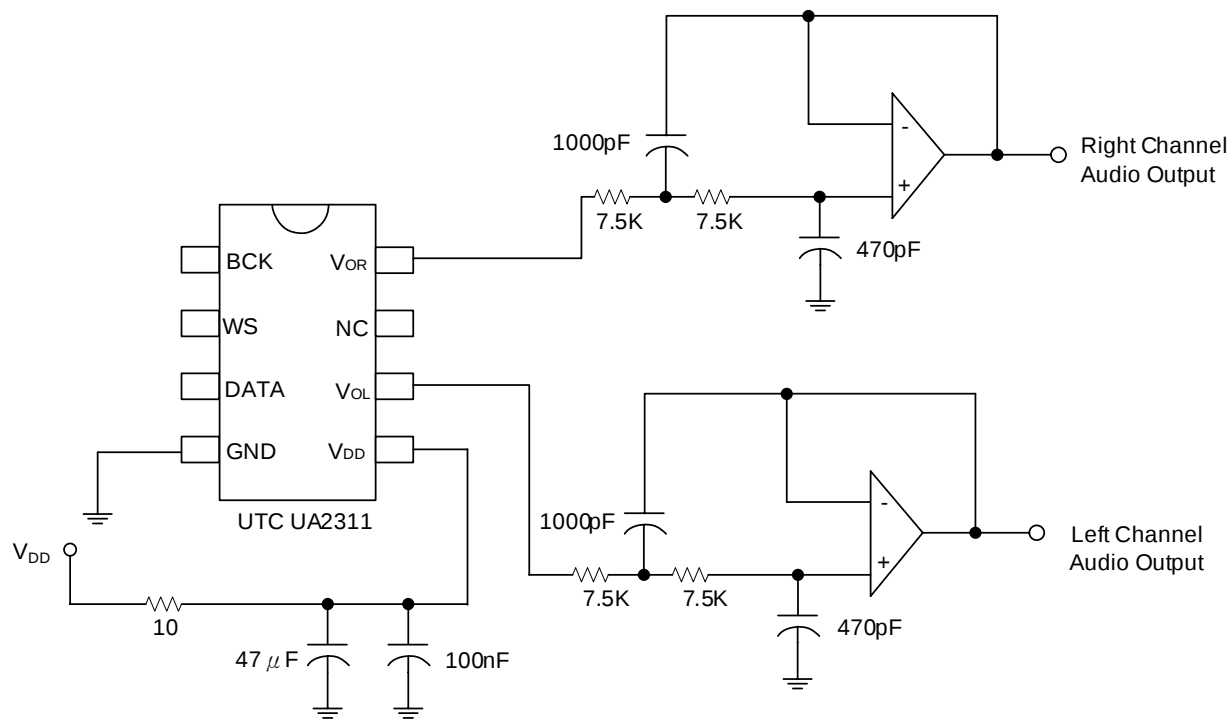


Figure.2 Timing and Input Signal Formats

## ■ APPLICATION CIRCUIT

A typical example of CD-ROM application is showed as below. It features typical decoupling components and a second-order analog post-filter stage providing a line output.



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