

# MAS9118

## MAS9118 Evaluation Kit

### DESCRIPTION

MAS9118 evaluation kit provides all the necessary hardware (excluding PC running Windows 9X) and software for evaluation of MAS9118 audio DAC with class-D output stage.

MAS9118 evaluation board has two adjustable voltage regulators for testing the input level shifters

of MAS9118 and for selecting various supply voltages for class-D output driver.

The evaluation kit includes an on-board buzzer. Optionally an external buzzer or loudspeaker can be easily connected to the demo board by using a jumper connector.

### FEATURES

- MAS9118 audio DAC with class-D output stage
- Power regulation
- Adjustable driver voltage
- Parallel port interface for PC
- Possibility to play wave files
- Software synthesizer for generating a test signal and multi-tone melodies

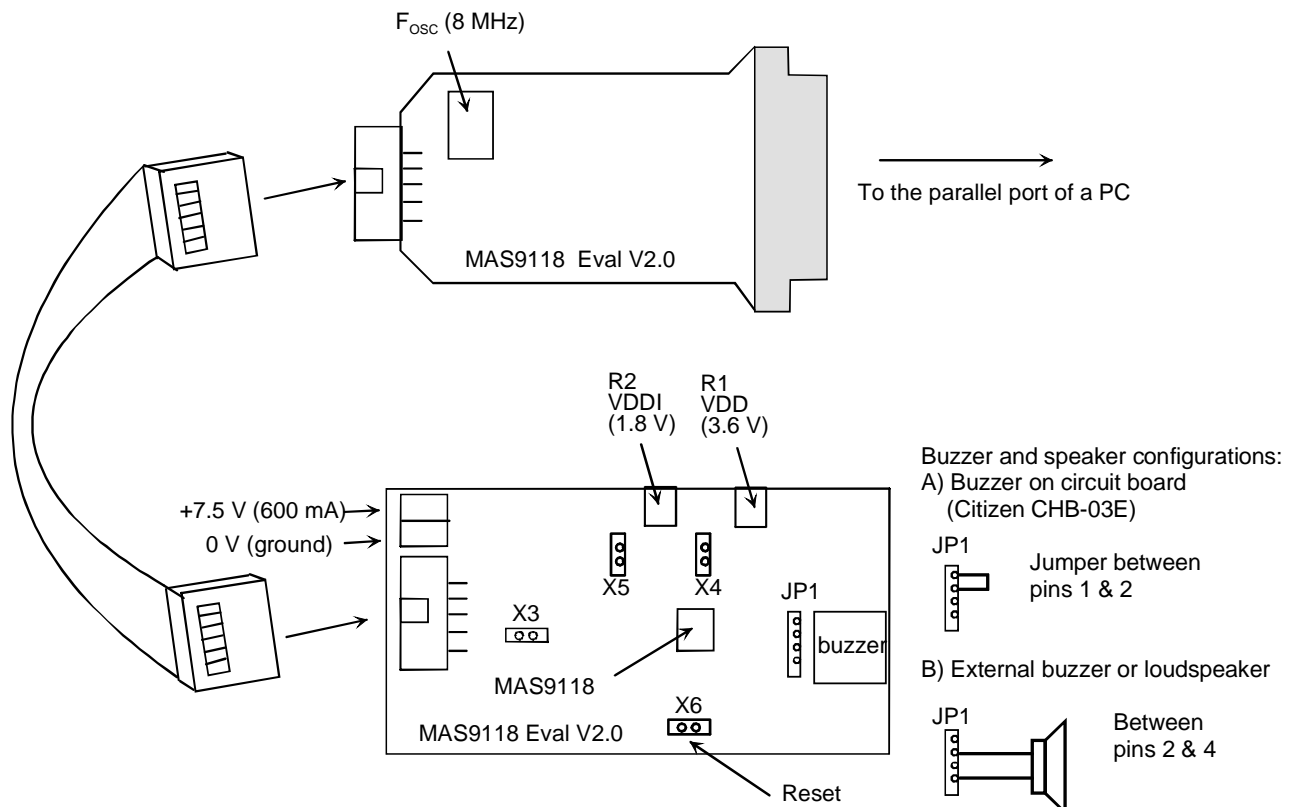


Figure 1.

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## QUICK START

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- 1 Copy files from the disk to the desired directory of a PC
- 2 Restart the PC in MS-DOS mode. **Note that DOS-Shell window is not enough!**
- 3 Connect the data bus between the two evaluation boards (PC adapter and buzzer boards)
- 4 Connect buzzer or loudspeaker to the JP1 of the buzzer board, see figure 1
- 5 Connect 7.5 V power supply to the buzzer board. Adjust current limiter to 600 mA if possible
- 6 Connect adapter board (PCB with 25-pin D-type connector) to the parallel port of the PC
- 7 Run the evaluation kit program by typing: `buzzer -p XX -m YY` (XX is the number of the parallel port, YY is the melody number)  
Example: `buzzer -p 1 -m 0`
- 8 You should hear the signal from the buzzer or the loudspeaker

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## DETAILED DESCRIPTION

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### Partitioning of the hardware

The hardware is partitioned into two PCBs in order to provide robust data transfer from a PC to MAS9118 even if the distance between the two is several meters. Most of the components on evaluation board are used for the data transfer from the PC to MAS9118.

### Clock generation

The time domain is synchronized to the crystal oscillator frequency ( $F_{osc}$ ) of 8.0 MHz. Other clock frequencies are generated from this frequency as follows:

$$F_{MCLK} = \frac{F_{osc}}{8} = 1000 \text{ kHz} \quad (1)$$

$$F_{XCS} = \frac{F_{osc}}{128} = 62.5 \text{ kHz} \quad (2)$$

$$F_{CCLK} = \frac{F_{osc}}{8} = 1000 \text{ kHz} \quad (3)$$

### Jumpers

The PCB including buzzer (buzzer board) adjusts supply and signal voltages of MAS9118. It has five jumpers, see figure 1.

X3 is used for connecting 5 V for the interface logic (default position is ON).

X5 is used for connecting the interface voltage level to MAS9118 (default position is ON). The voltage is normally 1.8 V and can be adjusted by R2 trimmer.

X4 is used for connecting the operating voltage to MAS9118 (default position is ON). The voltage is normally 3.6 V and can be adjusted by R1 trimmer.

**Note that this voltage affects the buzzer and loudspeaker volume.**

X6 is used for generating reset signal to MAS9118 (default position is OFF). Since MAS9118 has power-on-reset this jumper can normally be off.

JP1 is used for connecting a buzzer, a loudspeaker or a measurement instrument to the output pins of MAS9118 (OUTP, OUTN).

### Software

The data is read from the PC at the rate of  $F_{XCS}$  (62.5 kHz). MS-DOS mode is required in order to guarantee continuous data flow.

Note that the `buzzer.exe` program will disable the PC system clock interrupt and stop the PC system time. Therefore, it is recommended to boot the PC after using the program in order to retrieve the right system time.

The help of the `buzzer.exe` program is shown each time the program is started.

The melodies are started by typing

```
buzzer -p #port -m #melody
```

where `#port` is the parallel port of the PC used for the data transfer (0...3) and

`#melody` is the number of the pre-programmed melody (0...5).

The audio quality test is best performed by using the build-in sine generator of the `buzzer.exe` program. It is started by typing

```
buzzer -p #port -s #freq -a #atten
```

where `#port` is the parallel port of the PC used for the data transfer (0...3) and

`#freq` is the sine frequency in Hz and

`#atten` is the attenuation of the sine amplitude in dB ( $\geq 0$ ).

For example, a test signal using parallel port 1 of the PC, having peak signal to noise ratio at 1000 Hz and 1 dB attenuation of the maximum level is obtained by typing

```
buzzer -p 1 -s 1000 -a 1
```

The wave files can be played by typing

```
buzzer -w #file.wav [-f/F] [-c/C] [-d/D]
```

where `#file.wav` is the name of an 8-bit wave file (sample frequency 62.5 kHz) and

-f turns additional highpass filter on (default)

-F turns additional highpass filter off

-c turns dynamic compander on (default)

-C turns dynamic compander off

-d turns dynamic booster on

-D turns dynamic booster off (default)

Note that the wav file has to be in a specific format. **Only the wav files with the sample rate of 62.5 kHz can be played correctly with the evaluation kit, since its clock frequencies are fixed.** Additionally the wav files have to be in mono and signed 8-bit format. The conversion from the CD quality data (44.1 kHz, 16-bit, stereo) to the evaluation kit's format (62.5 kHz, 8-bit, mono) can be easily made with the most of the audio softwares.

**Note that if the wave file specified after -w cannot be found, the PC has to be restarted in order to get the `buzzer.exe` program to run properly again.**

At the nominal output voltage of 3.6 V the on-board voltage regulator (R1) can deliver required current to the class-D output stage of MAS9118. At higher voltages (up to 5.5 V) an external voltage source should be used if the load is as low as 8 Ohms. The external voltage source should be connected between the lower pin of the jumper X4 (jumper short removed) and the left pin of the jumper X6 (board ground), see figure 2.

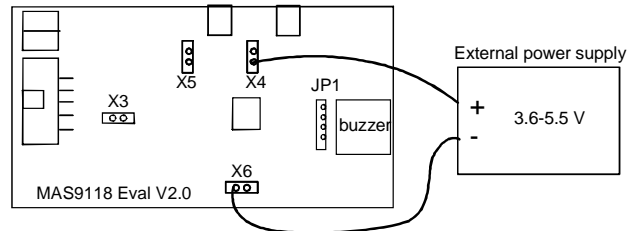


Figure 2.

## Deliverables

MAS9118 evaluation kit consists of the following deliverables:

- 1 MAS9118 evaluation board V2.0 (2 pieces)
- 2 Control bus cable
- 3 Disk containing `buzzer.exe`, `cwsdpmi.exe`, sample wave files and the data sheets of MAS9118 and the evaluation kit

## Revision notes

Due to the class-D operation MAS9118 generates some out-of-band noise, which may cause problems for test equipment when using automatic scaling. For example Audio Precision audio analyzer will generate much additional distortion due to signal overload when auto scaling is used. Auto scaling does not take into account the existing high frequency components causing wrong scaling and leading to distortious signal clipping.

Also some test equipment can not synchronize to the test sine frequency due to the out-of-band noise. Usually a first order RC filter, when added before the input of the test equipment, filters out the high switching frequency. Remember to use high quality components (especially capacitor) in order to minimize the additional distortion caused by this filter.

The evaluation board consumes about 0.5 A current when the load is 8 Ohms. Use low ohmic wires from power supply to the evaluation board.

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## LOCAL DISTRIBUTOR

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