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AND9111/D

BELASIGNA® R262 Analog Demonstrator User's Guide

APPLICATION NOTE

The BelaSigna R262 Analog Demonstrator

The BelaSigna R262 Analog Demonstrator is a self−contained, battery−powered unit that can be used to demonstrate and evaluate the performance of BelaSigna R262.

Key Features

The Analog Demonstrator is shown in Figure 1 and features:

- Compact form factor of only 51 mm x 24.5 mm x 20 mm

- The 30−ball WLCSP version of BelaSigna R262 (BR262W30A103E1G)
- Two MEMS microphones spaced 10 mm apart (Knowles part number SPU0410HR5H−PB)
- An onboard 2.048 MHz oscillator
- A stereo (line−level) output jack
- Onboard, dual AAA batteries for extended battery life and portable use
- Onboard SPI EEPROM
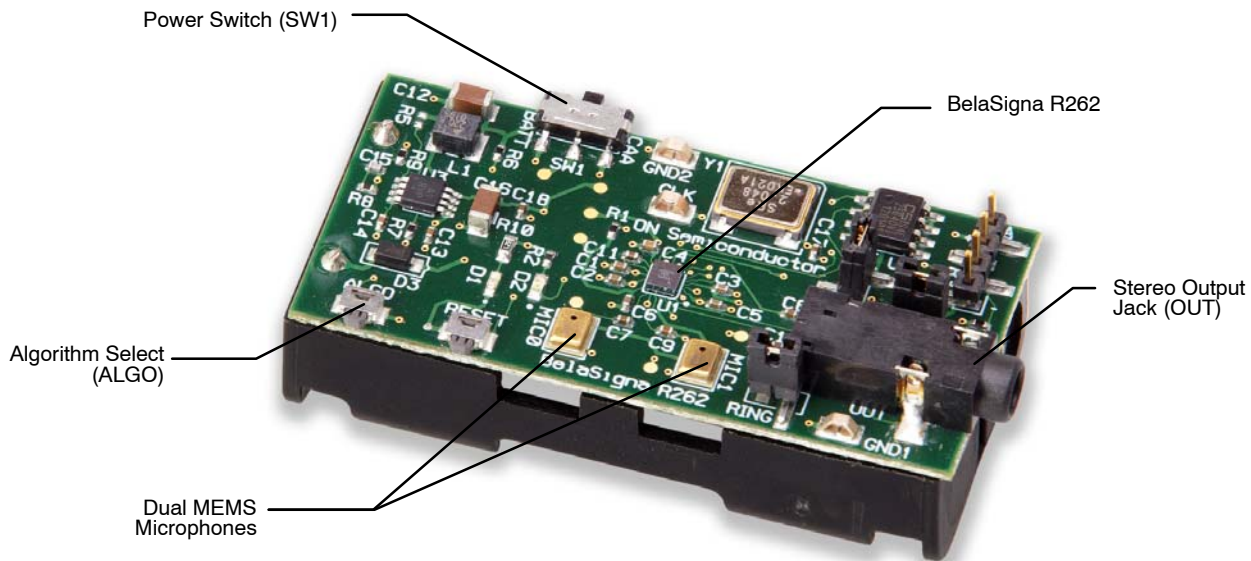
Figure 1. BelaSigna R262 Analog Demonstrator

Connecting the Analog Demonstrator

The analog output signals AO0 and AO1 are available on the stereo output jack labeled OUT. AO0 is connected to the jack tip, AO1 is connected to the ring, and the sleeve is connected to analog ground as shown in Figure 2.

If you are interested in using the analog demonstrator with a mono recording device, simply remove the RING jumper to disconnect the AO1 signal from the ring terminal of the 3.5 mm stereo output jack.

Note: The analog output impedance is 3 kΩ and is intended to drive a high−impedance (line−level) input, not speakers nor headphones directly. Refer to the BelaSigna R262 datasheet for information on output stage characteristics.
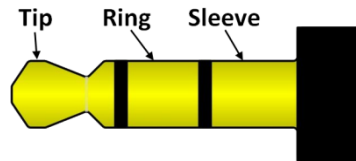
Tip: Analog Output 0 (AO0)
Ring: Analog Output 1 (AO1)
Sleeve: Analog Ground

Figure 2. Analog Demonstrator Output Jack Pinout

Jumper Configuration

There are three jumpers on the analog demonstrator: `EE`, `GND`, and `RING`.

By default, all three jumpers should be shorted. Their behavior is summarized in Table 1. Complete schematics and a component placement diagram for the analog demonstrator are provided in Appendix A.

Table 1. ANALOG DEMONSTRATOR JUMPER CONFIGURATION

Jumper	Shorted	Open	Default Position
EE	Boot the custom application contained in EEPROM	Boots the DSP to "I^2C host boot" mode, expecting an application to be downloaded via I^2C	Shorted
GND	Connects the ground pin of the `CAA` (I^2C) connector to ground	Lifts the ground pin of the `CAA` (I^2C) connector, avoiding a potential ground loop when the output jack of the demonstrator is connected to the same computer as the CAA. If powering the demonstrator from the CAA, ensure the output jack is connected prior to removing the GND jumper.	Shorted
RING	Connects the second analog output of BelaSigna R262 (`AO1`) to the ring terminal of the 3.5 mm stereo (`OUT`) jack	Disconnects the ring terminal of the 3.5 mm stereo (`OUT`) jack, which can be useful when connecting to mono recording equipment, or devices that bias the ring terminal	Shorted

Visual Indicators

There are two LEDs on the analog demonstrator. The green LED (`D1`) indicates that power is on. The blue LED (`D2`) indicates when the analog demonstrator is in Active Mode and is outputting processed audio. When the analog demonstrator is in Bypass Mode `D2` is off.

Default Configuration

The analog demonstrator boots to a custom application stored in an onboard SPI EEPROM. This custom application is pre−configured to simultaneously output two different noise reduction algorithm modes: near−talk on `AO0` and close−talk on `AO1`. The processed outputs from these two modes are available as single−ended analog outputs on the stereo output jack (`OUT`).

Near−Talk Mode

Near−talk mode features excellent noise reduction in applications where the speech source is located slightly further away from the microphones; typically 50 to 100 cm. This mode is suitable for handsfree devices and performs well in noise levels up to 70 dB SPL. Expected noise reduction performance in this mode is 10 to 20 dB SNR−I, depending on the type of noise.

Close−Talk Mode

Close−talk mode aggressively filters noise and manages gain to pick up speech within 5 to 10 cm from the microphone array, effectively attenuating both speech and noise that is farther away. This mode is suitable for mobile handsets and radios where the speech source is very close to the microphones and the noise level can be quite high; up to 90 dB SPL. Noise reduction performance in this mode ranges from 20 to 30 dB SNR improvement (SNR−I), depending on the type of noise.

Refer to the AND9109/D − BelaSigna R262 Getting Started Guide for details on the different algorithm modes and performance metrics.

Operating the Analog Demonstrator

There is a pushbutton on the demonstrator labeled `ALGO` that provides the ability to switch between the two processed algorithm outputs, and stereo bypass. Pressing and releasing the button will toggle between Bypass Mode, and Active

(algorithms on) Mode. When the analog demonstrator is in Active Mode and is outputting processed audio, the blue LED (D2) will be on. When the analog demonstrator is in Bypass Mode, D2 is off.

It is also possible to swap the stereo assignment of the two processed channels in Active mode, using the ALGO button. This is useful if you are interested in using the analog demonstrator with a mono recording device, but would prefer to record the processed signal on AO1 (close−talk), which is normally routed to the ring terminal of the stereo output jack. To swap the tip and ring of the stereo output jack, power on or reset the device while holding down the ALGO button. This can be accomplished by turning the power off and on again using SW1 while holding the ALGO button. Alternatively, this can also be achieved by holding the ALGO button down while momentarily pressing the

RESET button. Either method will swap the channel routing in Active mode, giving you access to the close−talk processed output on the tip terminal of the stereo output jack.

To restore the analog demonstrator to its default channel routing, ensure you are not holding down the ALGO button and cycle the power to the device or press the RESET button.

Demonstrator Positioning

The speech source can come from any direction (normally in front of the microphones), as long as it is within the "working sphere" of the current algorithm mode. For close−talk mode, the MRP should be located between 5 and 10 cm from the microphones.

For near−talk, the mouth reference point (MRP) should be located between 50 and 100 cm from the microphones.
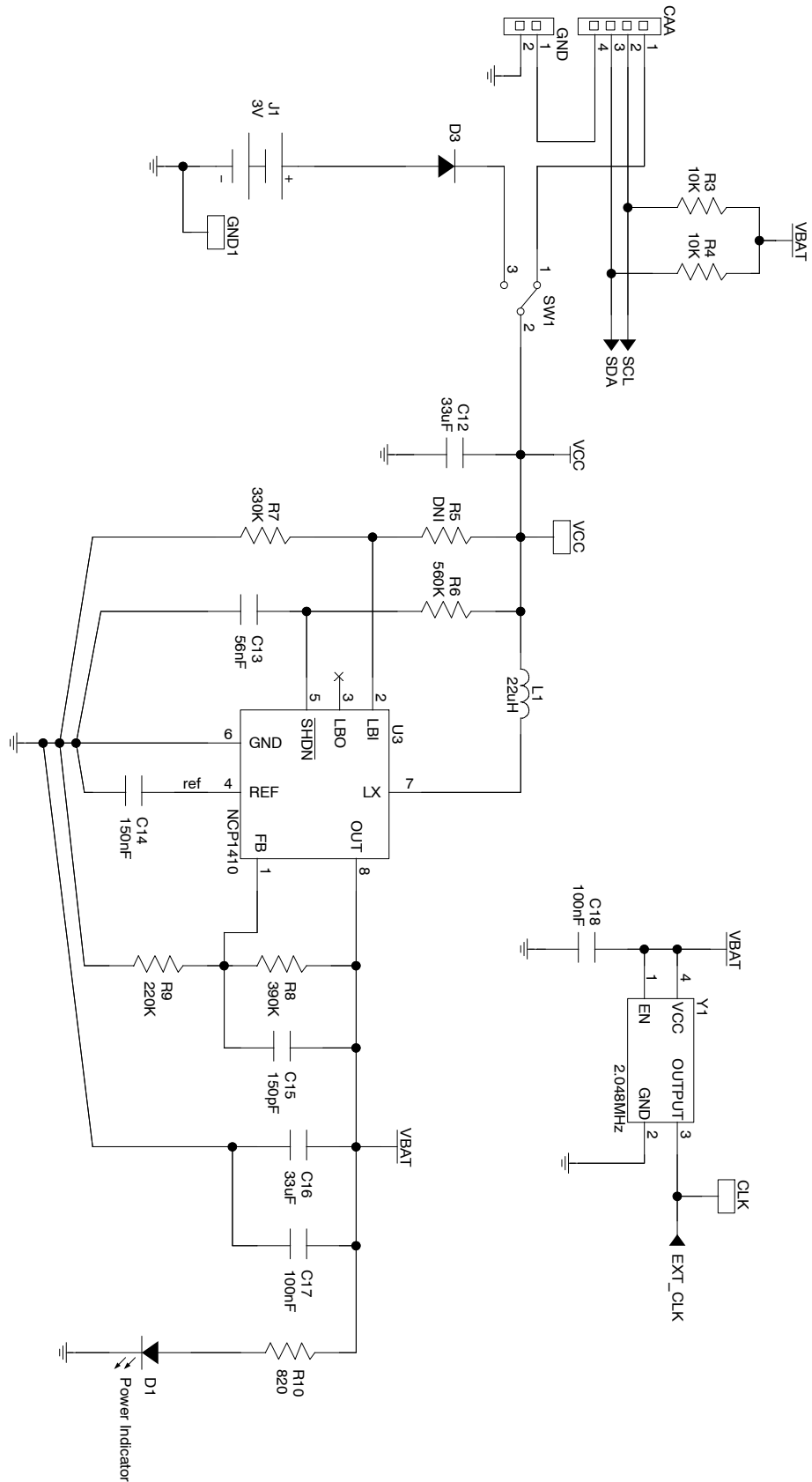
APPENDIX A

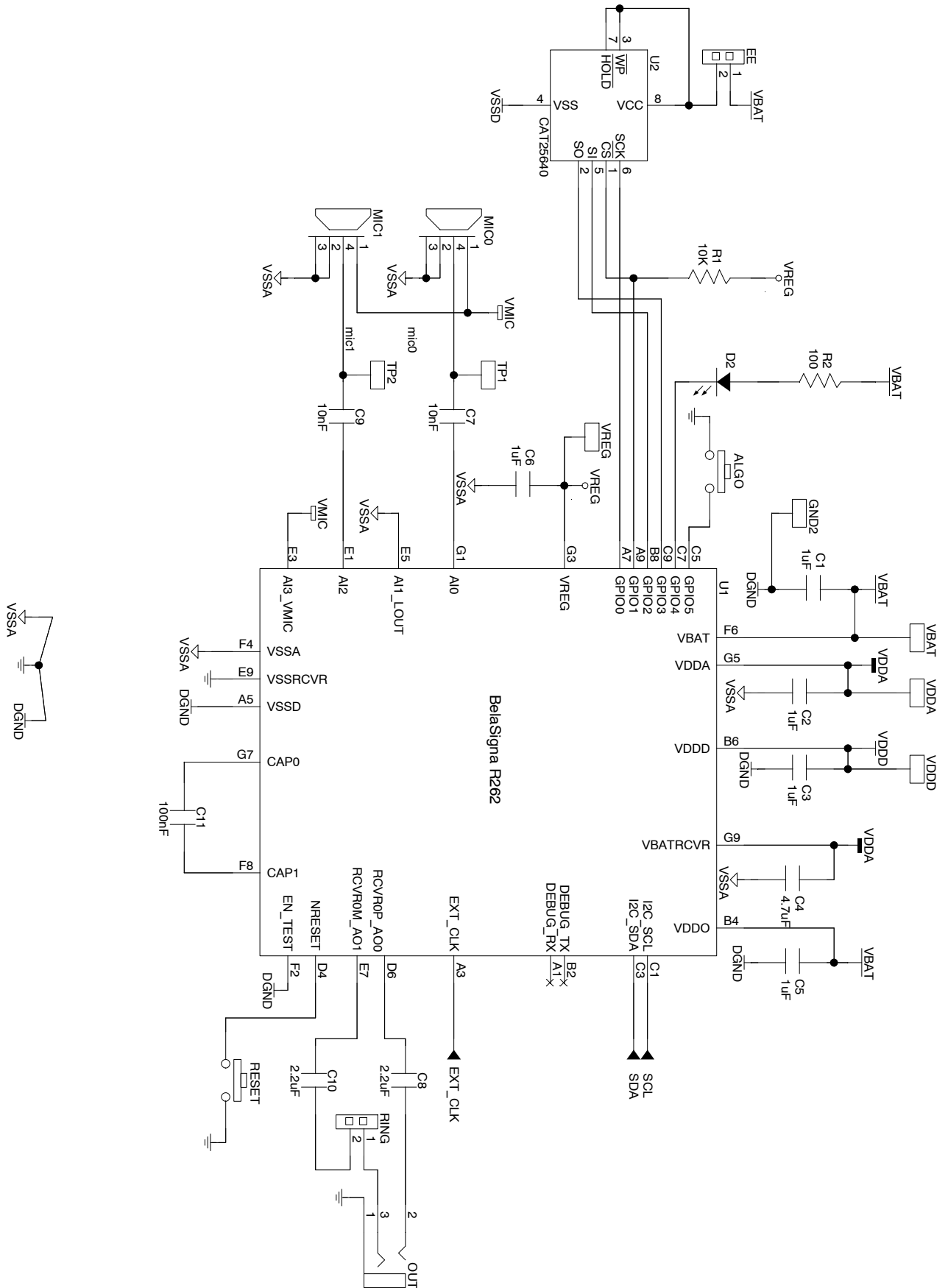**Figure 3. Schematic Sheet 1 of 2 – Power Supply and Clocking**
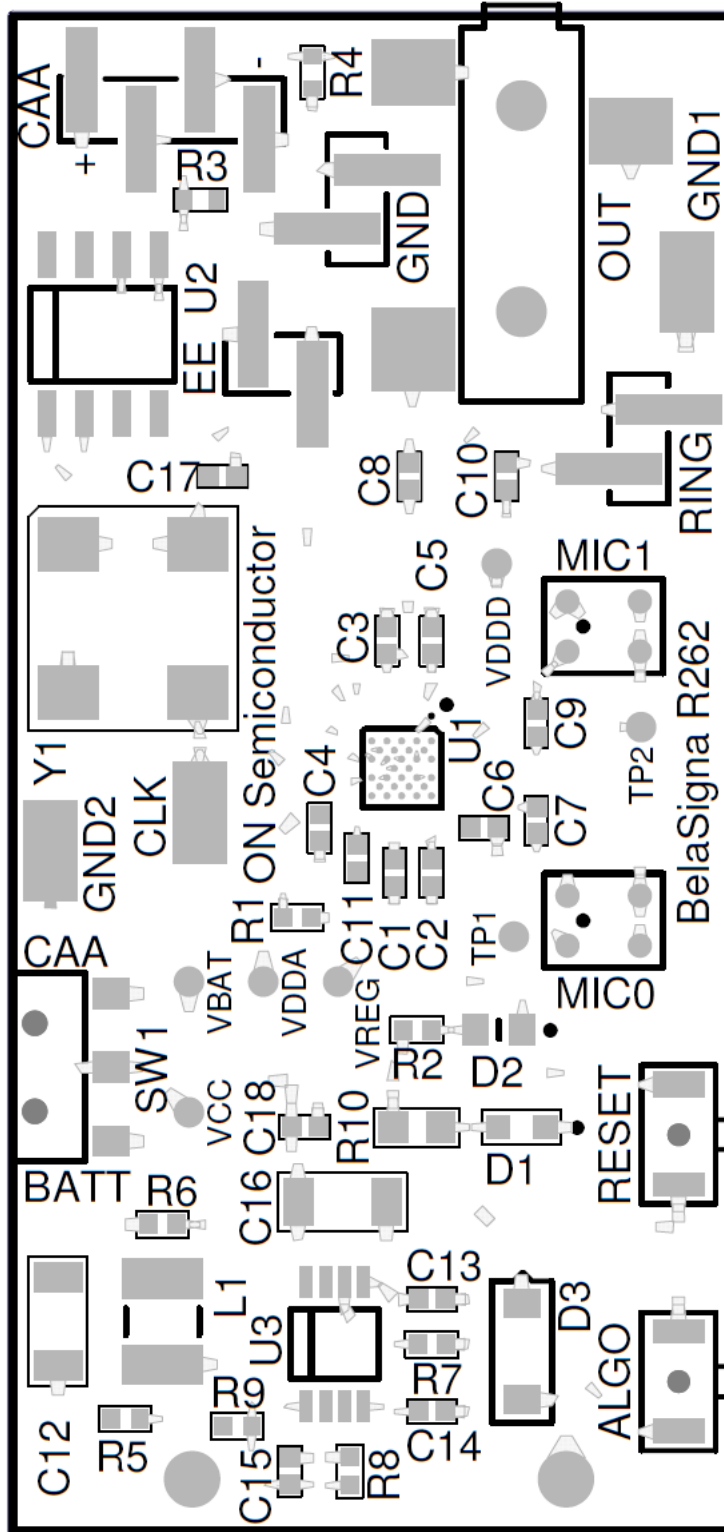
Figure 4. Schematic Sheet 2 of 2 − BelaSigna R262

Figure 5. BelaSigna R262 Component Placement

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