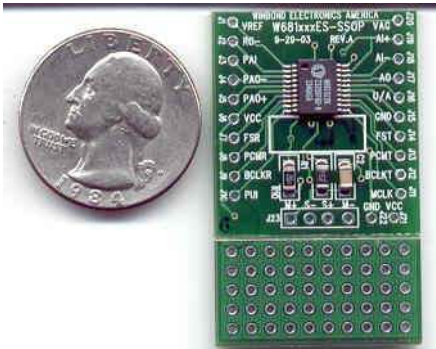


# Winbond Electronics Corporation America



## Single Channel CODEC Mini Evaluation Board W681xxxES User's Guide



**Rev 2.0**  
**October 23, 2003**

## 1 Description

The W681xxxR-ES has the bare minimum for a digital telephone handset application which will allow the designers to easily connect this small footprint daughter board to their applications. The evaluation system targets developers of such systems as VoIP, Digital Telephony, mobile devices (wireless headsets), PBX that would like to test and or develop with Winbond Family of Voice CODECs into a new system with minimal or no additional analog design at all ("Plug & Play").

## 2 Features

- Smallest form that contain the bare minimum components to allow a handset/headset application.
- It allows system developers to bypass the analog in and analog out components with a simplified procedure.
- Prototype area for developer to hook up the side-tone resistor on board or RJ9 (hand-set jack) or headset jack.
- The board has the resistors that will allow the maximum amplification for a 32 Ohm speaker and a standard microphone
- All CODEC pins lead to holes that enable the developer to solder wires to connect to his system board.
- The board is designed to minimize any outside noises for the cleanest signals possible.

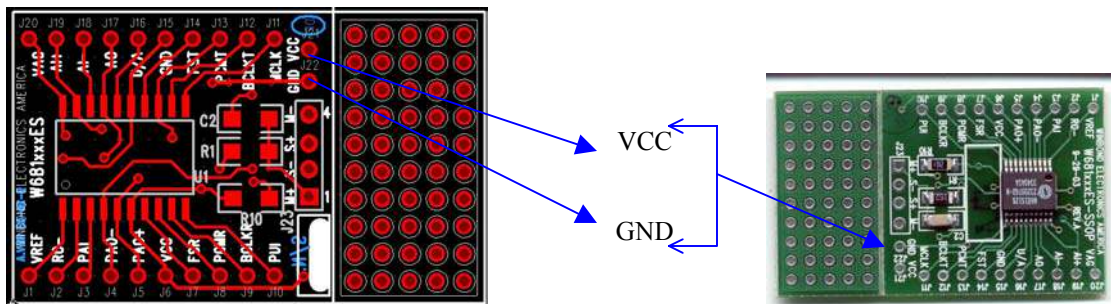
## 3 Hardware

### 3.1 Power supply requirements

3V or 5V depending on the selected CODEC.

Winbond Codec Part Number	Operating Voltage
W6810ES	5 V
W681512ES	5 V
W681310 ES	3 V

Table 3.1: Power Supply ( The User needs to connect VCC and GND Pins )



### 3.2 Schematics

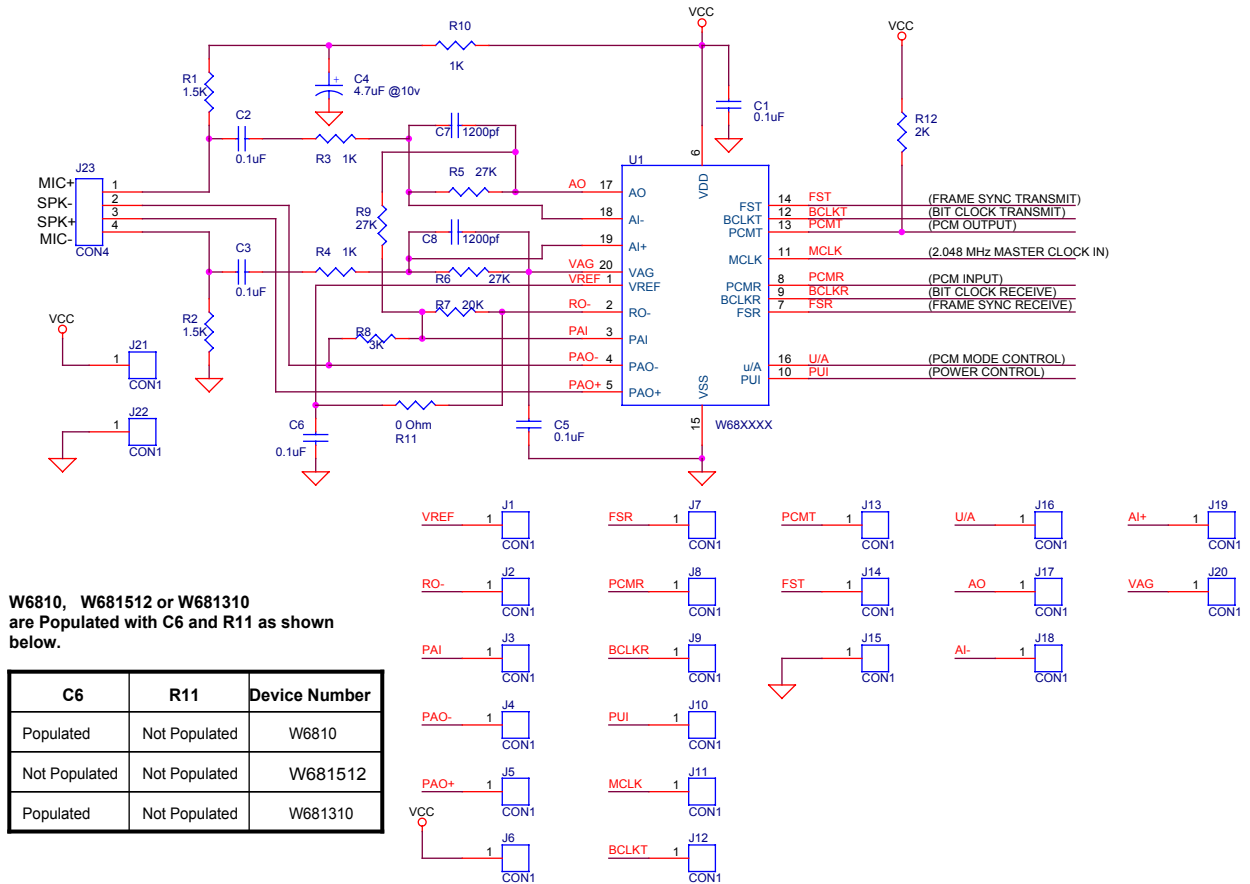


Figure 1: EW681xxxES Board Schematics Telephone Handset Default Diagram

## 4 Connecting Microphone and Speaker to the W681xxxES

J23 can be used to connect an RJ9 plug from a “standard” telephone handset or headset to the appropriate pins on the board (Table 4.0). The default resistor and capacitor values on the board are used for the maximum amplification with no saturation of a 32ohm speaker using a standard microphone. Unfortunately the only thing “standard” about the RJ9 handset jack is that the microphone and speaker are always on the same pins. BUT, the microphone polarity can be positive, or negative, depending upon how the manufacturer designed their telephone set. This means that one has about a 50% chance of wiring it up wrong the first time UNLESS you know ahead of time which polarity handset you have. Many years ago, with carbon microphones acting as variable resistors this was not an issue. But with today’s modern handsets using polarized electret microphones polarity is very important. The circuit in Figure 1 assumes that the positive side of the microphone is connected to pin 1 of the RJ9 plug and the negative side to pin 4. Reversing the wires from the RJ9 to the holes in J23 will solve the polarity problem if there is no audio.

Pin1	Pin2	Pin3	Pin4
Mic+	Speaker-	Speaker+	Mic -

Table 4.0 : J23 Pin assignments

Note: It is recommended to use short wires to hook up this board to the prototype system for minimal added noise.

#### 4.1 Adjusting the Amplifier levels for optimal performance

In the handset, application the gain from the handset microphone is set to 27 for the input amplifier. This is because the acoustical chamber in the telephone type handset lets the electret microphone provide an output of  $\sim 28 \text{ mV}_{\text{RMS}}$ . The chamber typically has a gain of three over a bare microphone (or one placed with only a small opening to the outside world.) Because of the high sensitivity of the earphone ( $150 \Omega$  impedance) in a typical handset, the output gain from the Power Amp is set to  $\sim 0.16$  for a satisfactory listening level.

SCHEMATIC COMPONENT #	TELEPHONE HANDSET (Values Populated on the board)	VoIP PHONE SET (No acoustic Chamber)	600 $\Omega$ LINE IN/OUT (Tip/Ring)
R3,4	1K	1K	10K
R5,6	27K	91K	10K
C7,8	1200 pF	330 pF	N/U
R9	SELECT	SELECT	N/U
R7	20K	20K	27k
<b>R8</b>	<b>3K</b>	<b>3K</b>	<b>27k</b>

**Table 4.1: Suggested Components Values By Application**

In the VoIP telephone, or small wireless phones, the plastic case is typically too small to provide a reasonable acoustic chamber. Thus the output from the microphone is less than in the previous example. This results in having to set the input gain of the CODEC to  $\sim 75$  to  $90$ . This results in a comparable signal level to the receive telephone handset but, because of the increased gain, the Signal-to-Noise Ratio (SNR) has decreased and the signal sounds noisier. On the receive side, the gain is set as in the previous example. When the Power Amp gain is as low as  $0.16$  a  $32 \text{ ohm}$  load can be driven.

If the CODEC is used in a telephone Line Card or a VoIP gateway to the external telephone network then it will usually be set for 0TLP in and out. This means that the input gain and output gain will be 1:1 and the values of resistors will be different again. Note that the output of RO- is at 0TLP and going differential will double this level out of the Power Amp. However, R13 and R14 are  $300 \text{ ohm}$  resistors to match to the  $600 \text{ ohm}$  line and the voltage presented to the line will be 0TLP.

Resistor R9 sets the side-tone level (the signal fed back to the ear piece from the microphone so the telephone sounds “live”) to the level desired by the designer. In most  $600 \text{ ohm}$  audio line applications, this feature is not needed. R11 is a just a  $0 \text{ ohm}$  jumper to allow the board to be used with more than one model of CODEC. See the chart. R12 is a pull-up resistor for the PCM Transmit line if there is not one elsewhere in the application.

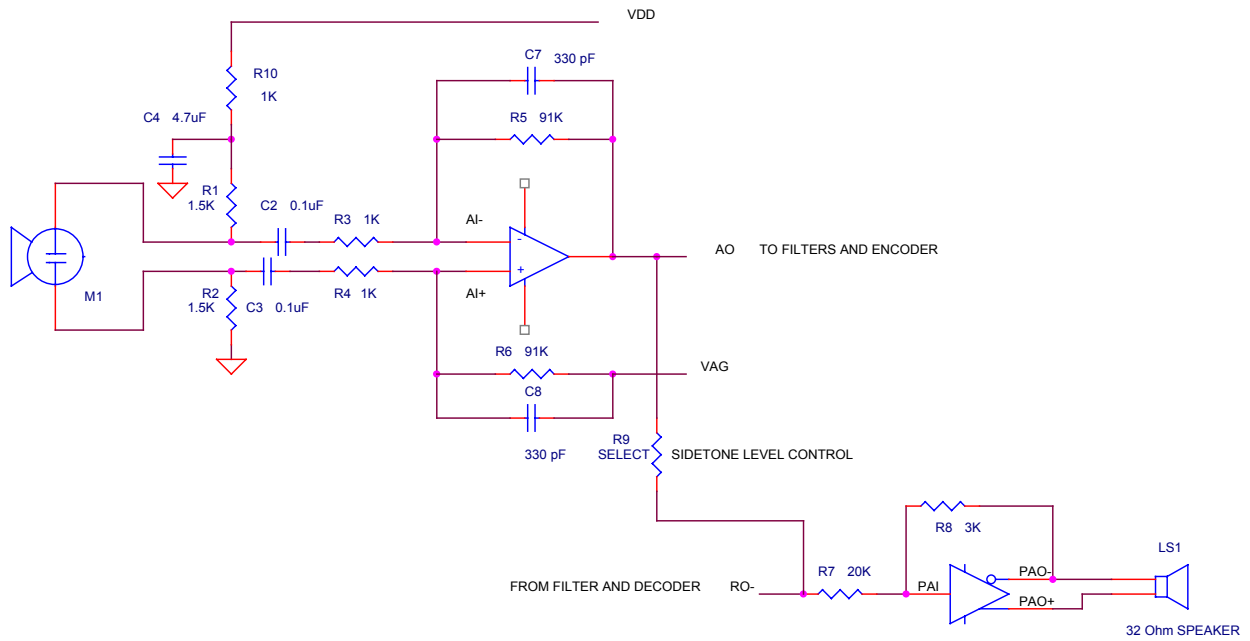


Figure 2: VoIP Phone Set Diagram

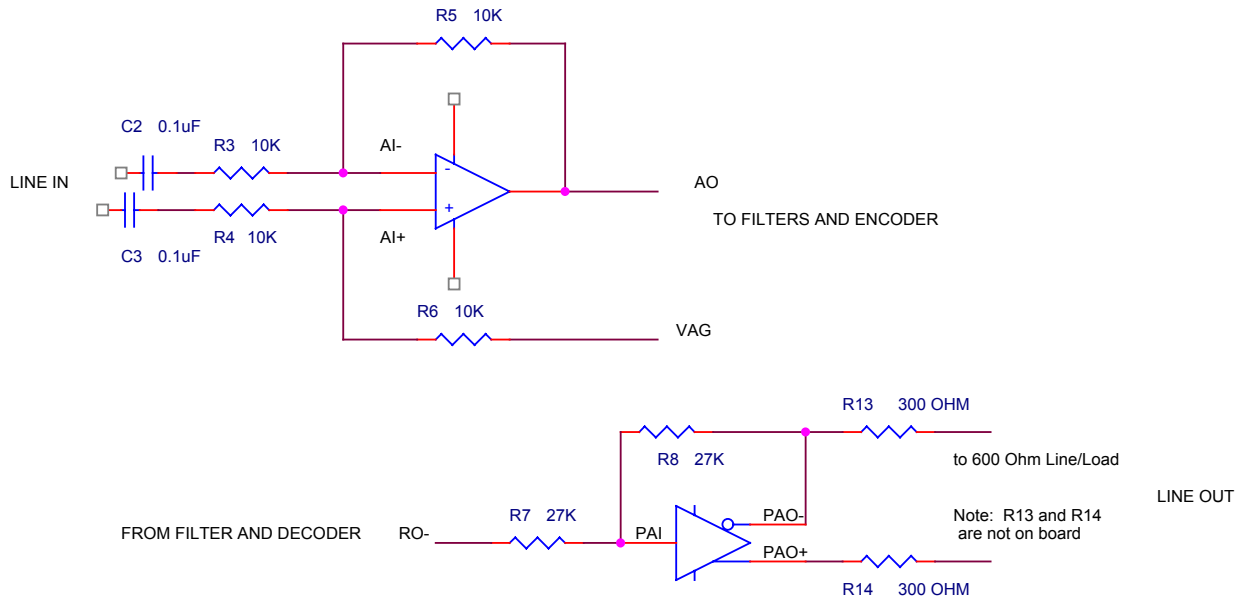


Figure 3: 600 Ohm Line IN/OUT Diagram

## 5 Ordering information

Table 5.0 describes the various CODEC Evaluation Systems.

Evaluation Board part Number	Winbond Codec Part number
W6810ES	W6810IR
W681512ES	W681512R
W681310 ES	W681310R

Table 5.0: W681xxxES Part Number

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