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# AN1218A.01

## Application Note

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### *Voice communication using the XM1218A reference module*

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## INTRODUCTION

This application note shows how to implement a unidirectional voice communication based on XEMICS' XE1218A. A demonstration of this application is based on the XM1218A module.

Targeted for high volume manufacturing, the module has been optimized for performance and cost.

The module includes the RF IC XE1218A with its associated external RF circuitry tuned to an operating frequency of 160.325MHz.

## HOW TO USE THIS DOCUMENT

All data relevant to the application described herein (Gerber files and schematic) can be downloaded from: <http://www.xemics.com/download/>

Information contained in this document, as well as in the XM1218A Gerber files are for reference and information purposes only.

Should you want to develop your personalized board, you can start from this design and then make the necessary modifications to match your requirements.

The XE1218A datasheet, can be downloaded on XEMICS' website: <http://www.xemics.com/download/>

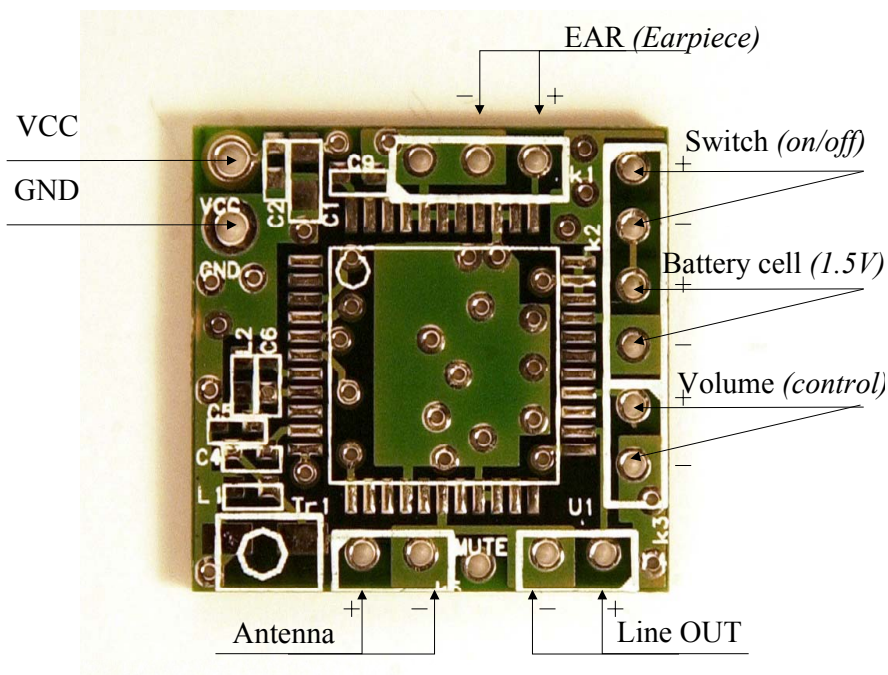
## XM1218A REFERENCE MODULE

The XM1218A reference module allows the user to quickly develop an independent, efficient and low cost application.

The module size is 21mm x 20mm.

## I/O LINES

An overview of I/O lines is given below in figure 1.



**Figure 1**

## POWER SUPPLY

The XM1218A module can be operated in continuous mode (power always applied) or through an on-board ON/OFF switch for battery powered applications.

For continuous mode supply power to the VCC and GND pins (figure 1, supply voltage from 1.1V to 1.6V), for battery operation apply battery power (1.5V) to the pin "Battery cell" (figure 1) and connect the power switch to the pin "Switch" (figure 1).

## EAR AND LINE OUT

Two types of audio outputs can be used:

- Line OUT; 10k $\Omega$  output impedance to connect an external audio processing circuit or amplifier
- EAR; for direct connection for an Earpiece (30 $\Omega$  to 100 $\Omega$ ).

## VOLUME CONTROL

An external potentiometer of 1M $\Omega$  allows for volume control.

## MUTE FUNCTION

The XE1218A is equipped with an automatic mute function that will turn off the audio output signal (both at EAR and LINE OUT) when the incoming RF signal goes below the circuit sensitivity level (-100dBm).

This function can be disabled by connecting pin #12 (MUTE) of the XE1218A to GND. On the XM1218A: if R1 (see figure3) is populated, the MUTE function is disabled. When R1 is not present, the MUTE function is active.

## ANTENNA

The entire antenna matching circuit and the antenna itself are tuned for an incoming frequency of 160.350MHz ( $F_o + F_{IF} = 160.325\text{MHz} + 25\text{kHz}$ ). The antenna is a short wire about 40mm long.

The value of the components of the matching circuit may slightly change for different PCBs and different antennas.

## EXTERNAL COMPONENTS

### LO TANK

Components that make up the LO tank circuit are critical and must be selected carefully for proper operation. To verify that the circuit is properly adjusted, radiation from the LO tank components can be measured on a spectrum or frequency analyzer. The LO tank circuit must be tuned to 160.325MHz.

### LNA TANK

The LNA tank is composed of an LC resonator circuit tuned to the carrier frequency ( $F_o = 160.325\text{MHz}$  in this case).

### CRYSTAL INDUCTOR

The crystal inductor should be chosen according to the shunt capacitor of the crystal value.

## PERFORMANCES

### OUTPUT POWER AND CURRENT CONSUMPTION

The performance of the XE1218A module is described in the XE1218A datasheet. For more information see [XEMICS' web site](#).

The current consumption depends on the impedance of the ear piece and the volume of the headset. Both are in direct relation to the output power. On the XM1218A, the total current consumption will range between 7 to 12mA.

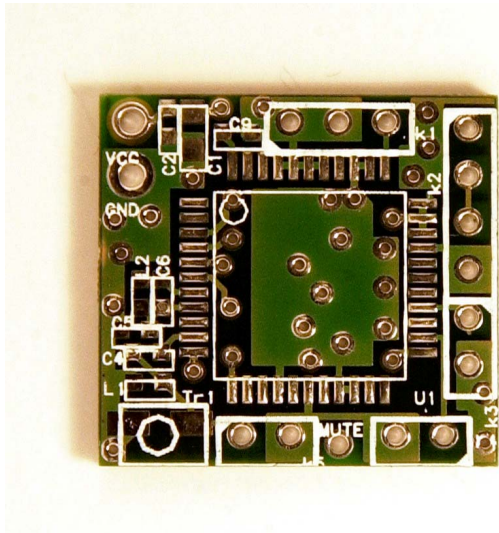
## HOW TO USE

This module was optimized for form-factor so that it can easily fit into a headset, so it is ideal for this application. Necessary external elements are the following:

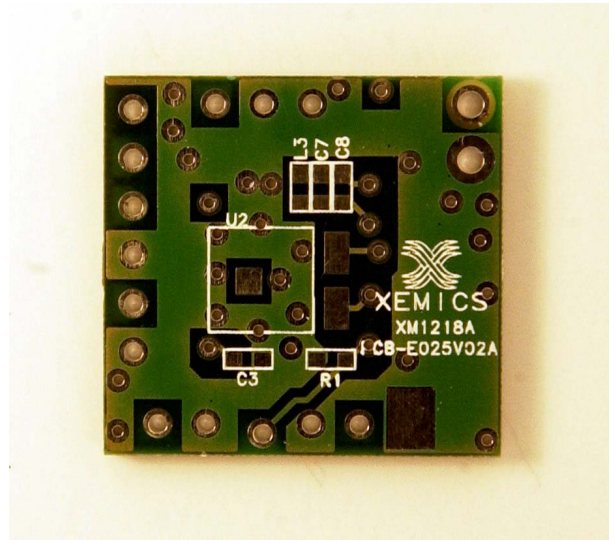
- Ear-piece
- Volume control
- Switch button and battery cell

## PCB

We strongly recommend using a PCB similar to the one described in Figures 2 and 3.



**Figure 2**



**Figure 3**

The XE1218A uses a low IF architecture with its local oscillator operating at 25kHz. To avoid self-mixing and DC bias, maximum isolation between the LO tank and the receiver antenna is essential.

Decoupling components should be placed as close as possible to the XE1218A circuit. They should not be connected through vias.

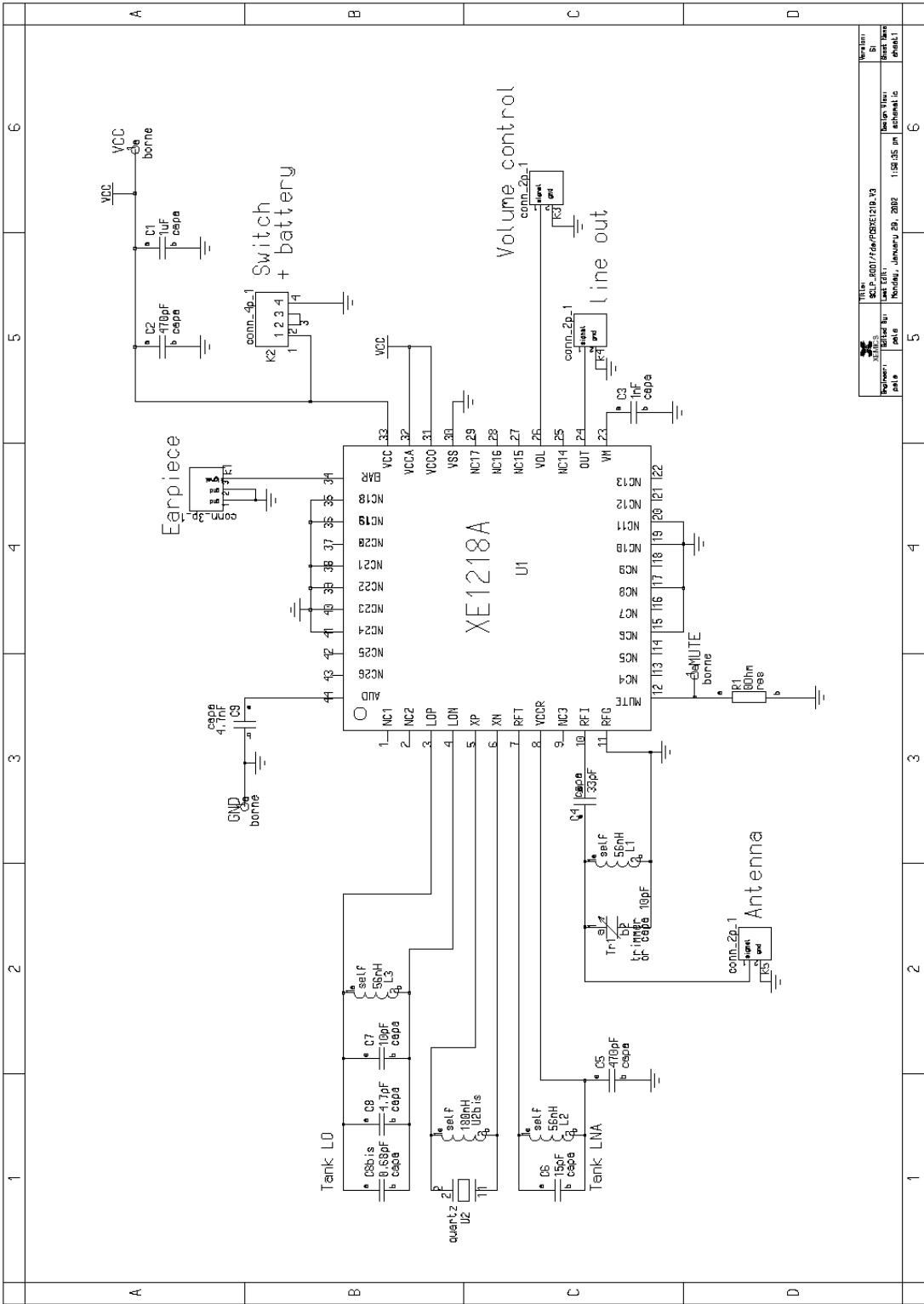
## COMPONENTS

Below is a list of components; it describes the types and references of the various selected components. When selecting an equivalent device, one should make sure performance such as tolerance and Q-factor is equal to or better than those indicated.

The crystal should have the following characteristics:

- $R_s < 110$  Ohms
- Frequency within XE1218A range (130MHz to 230MHz)
- The ideal frequency drift and tolerance in temperature are recommend in the parameters specified in the XE1218A datasheet.

EXHIBIT 1: BOARD DIAGRAM



**EXHIBIT 2: LIST OF COMPONENTS, REFERENCES**

Name	Type	Reference	Value	Form	Quantity
U1	XE1218A receiver IC	XE1218A		TQFP44	1
U2	Xtal Quartz	Telequartz HC52/SL	160.325MHz		1
C1	Decoupling capacitor	805	1uF	SMD0805	1
C2, C5	Decoupling capacitor	Epcos 0603 COG(+/-5%)	470pF	SMD0603	2
C3	Capacitor 0603	Epcos 0603 COG(+/-5%)	1nF	SMD0603	1
C4	Capacitor 0603	Epcos 0603 COG(+/-5%)	33pF	SMD0603	1
C6	Capacitor 0603	Epcos 0603 COG(+/-5%)	15pF	SMD0603	1
C7	Capacitor 0603	Epcos 0603 COG(+/-5%)	10pF	SMD0603	1
C8	Capacitor 0603	Epcos 0603 COG(+/-5%)	4.7pF	SMD0603	1
C8bis	Capacitor 0603	Epcos 0603 COG(+/-5%)	0.68pF	SMD0603	1
C9	Capacitor 0603	Epcos 0603 COG(+/-5%)	4.7nF	SMD0603	1
TR1	Trimmer or Capacitor 0603	Trimmer MuRata or Epcos 0603 COG(+/-5%)	Trimmer 3 to 10pF or 10pF capacitor		1
R1	Resistor 0603	Any	0Ohms	SMD0603	1
L1,L2, L3	Inductor	Inductor 0603 muRata	56nH	SMD0603	3
U2bis	Inductor	Inductor 0603 muRata	180nH	SMD0603	1

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