# MX5000A Development System Manual

## 1 System Overview

The MX5000A Development System allows manufacturers to easily evaluate and prototype system improvements by adding MaxxAudio psycho-acoustic processing to existing audio systems. The MX5000A Development System contains the small MX5000A Prototype Module as shown in Figure 1, with simple connections for analog stereo input and output.

The MX5000A Development System also includes a Telos USB to $I^2C$ emulator with a sophisticated PC graphic user interface. It also can be used without any external controls by using the on-board potentiometers as audio controls.

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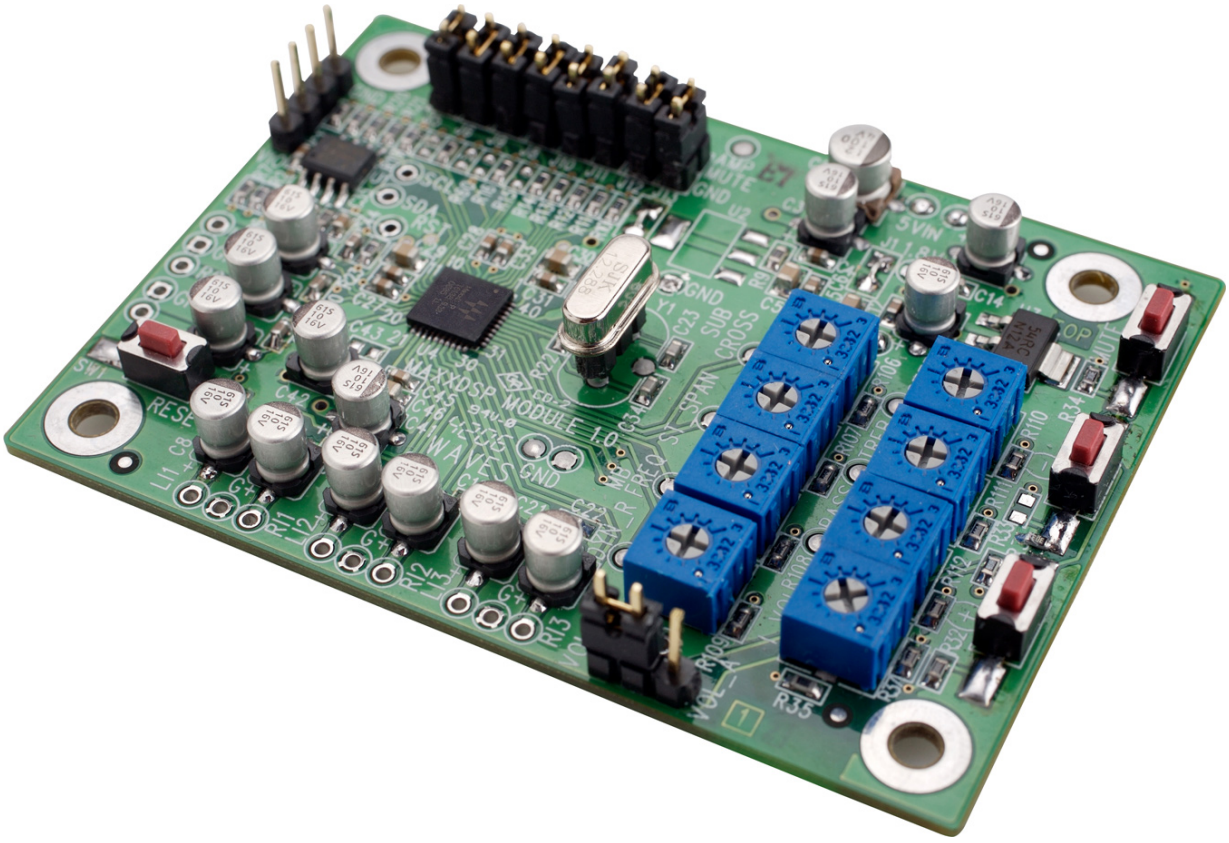
**Figure 1. MX5000 Prototyping Module**



## 2 Input/Output and Power Connections

Connect Inputs, Outputs, Power and Ground as described below. Please see Figures 2 and 3 for additional illustrations.

### Connect Inputs

- Three sets of stereo inputs are provided. Located on the bottom edge of the PCB, these are labeled as LI1/RI1, LI2/RI2, and LI3/RI3. Each stereo pair uses a common ground, labeled “G”, located between the left/right inputs.
- Connect stereo inputs and ground(s) as needed.
- All analog inputs support 4Vpp maximum input levels.

### Connect Outputs

- Connect stereo outputs, labeled LO and RO, on the left side of the PCB. LO and RO use a common ground labeled GND between the LO and RO connection points.
- Connect subwoofer output (labeled SUB) and ground (labeled GND) if needed.
- All analog output support 4Vpp maximum input levels.

### Connect Power Supply and Ground

- Provide an external 5.0V DC and ground to the 5VIN and GND pins to the upper right corner of the PCB. This needs to be a well regulated analog supply, since this voltage is connected directly to the analog_Vcc of the device without additional regulation.

**Figure 2. MX5000 Prototype Module Close-up**

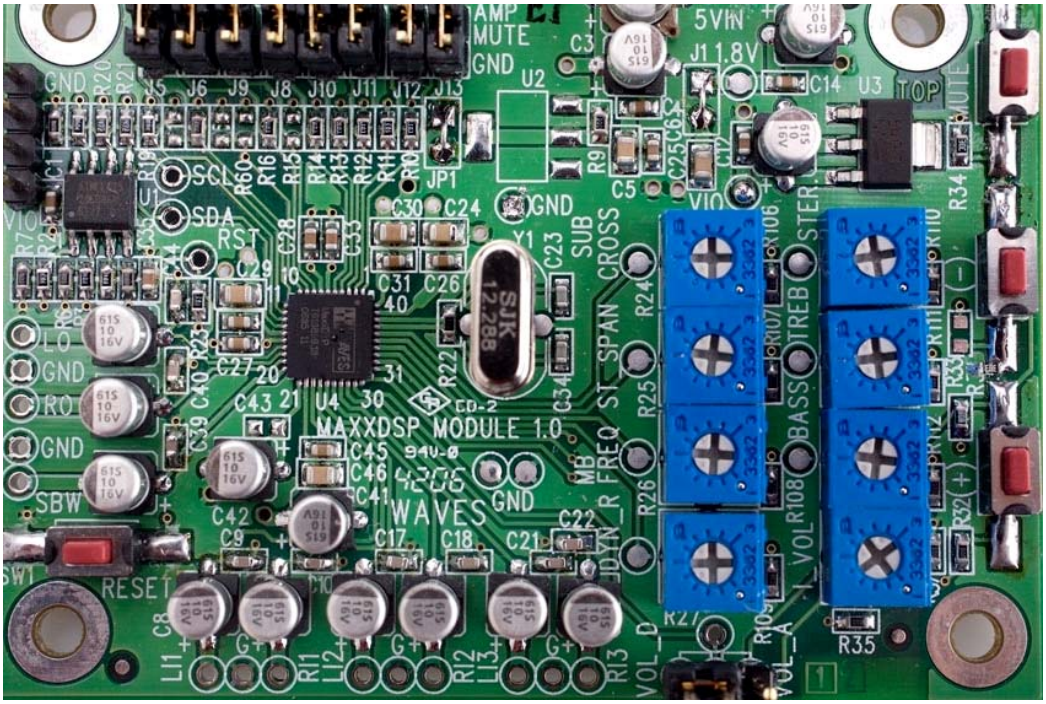
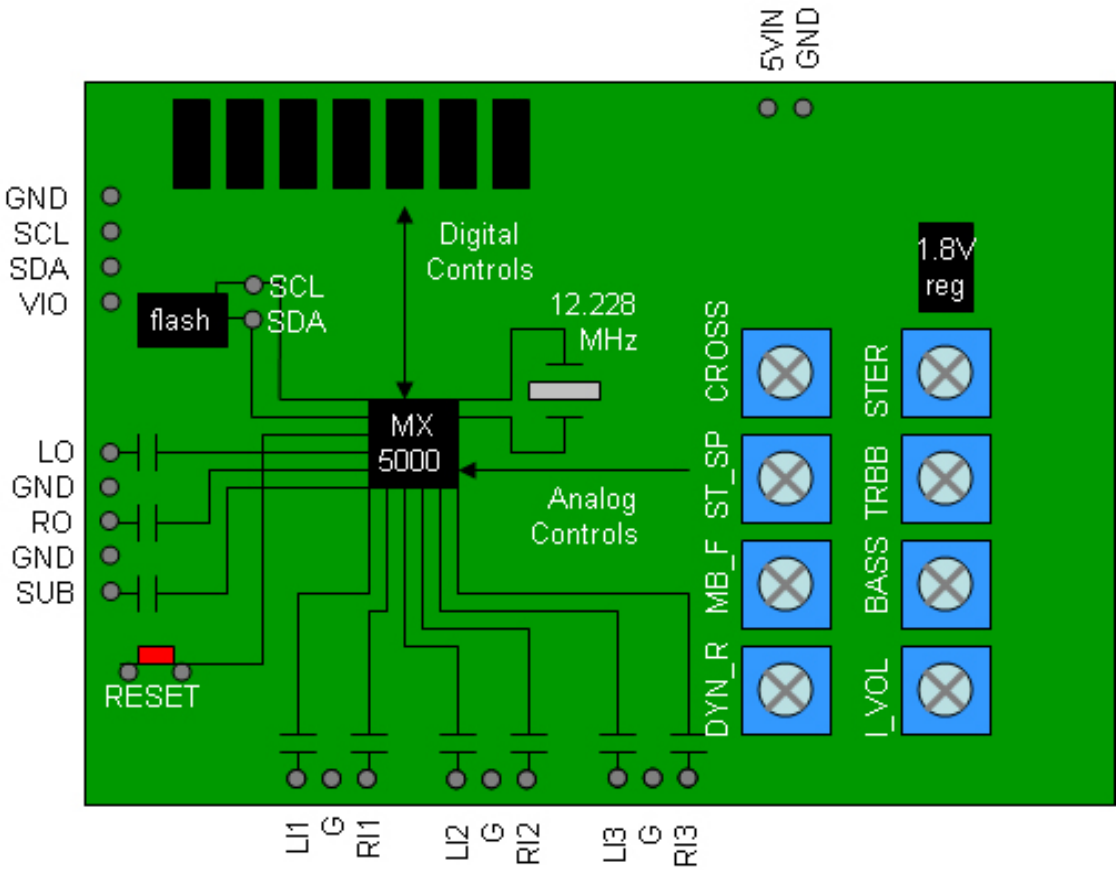



**Figure 3. Connections for MX5000 Prototype Module**



# 3 Controls

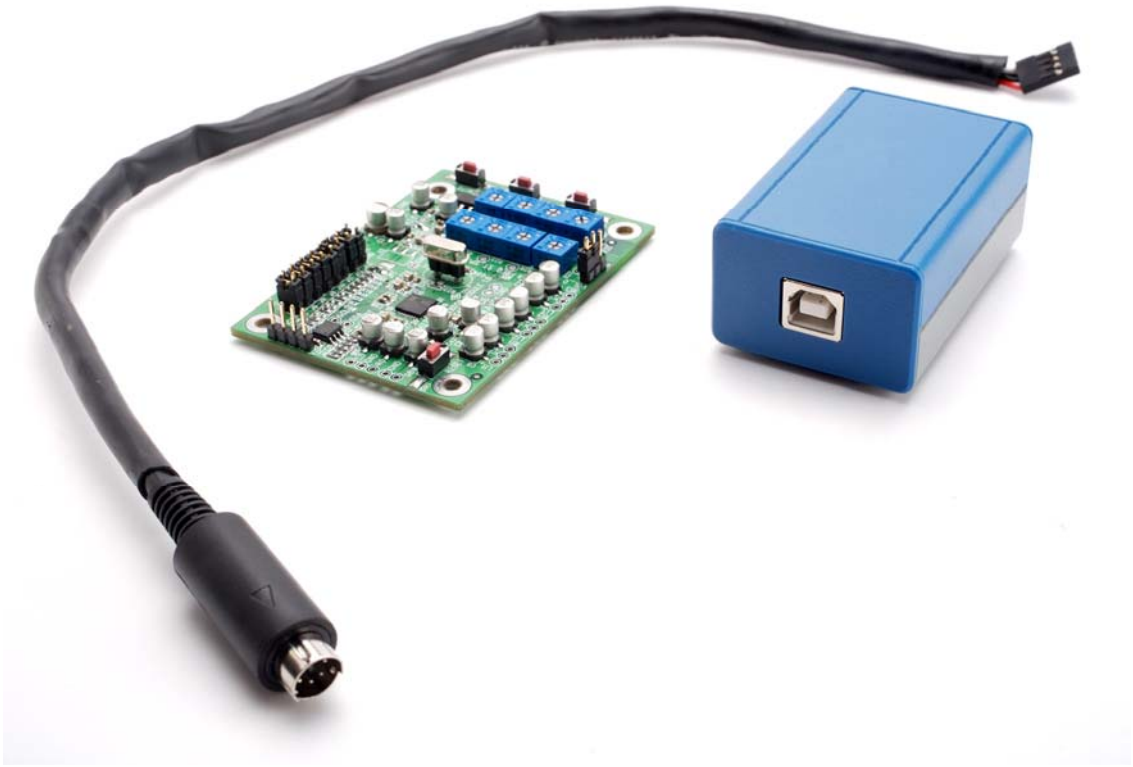
The MX5000 Prototyping Module supports two different control options.

a) I$^2$C Slave Mode
b) I$^2$C Host Mode

## 3.1 I$^2$C Slave Mode Controls

In addition to the MX5000 Prototyping Module, the MX5000A Development System is supplied with a Telos USB to I$^2$C Emulator. www.telos.info Waves recommends the Connii MM or Connii which enables connection to the USB port of a Windows XP PC along with associated software. A special cable is also provided to connect between the Telos emulator and the 4pin I$^2$C header on the MX5000A Prototyping Module. These three items are shown in Figure 4.

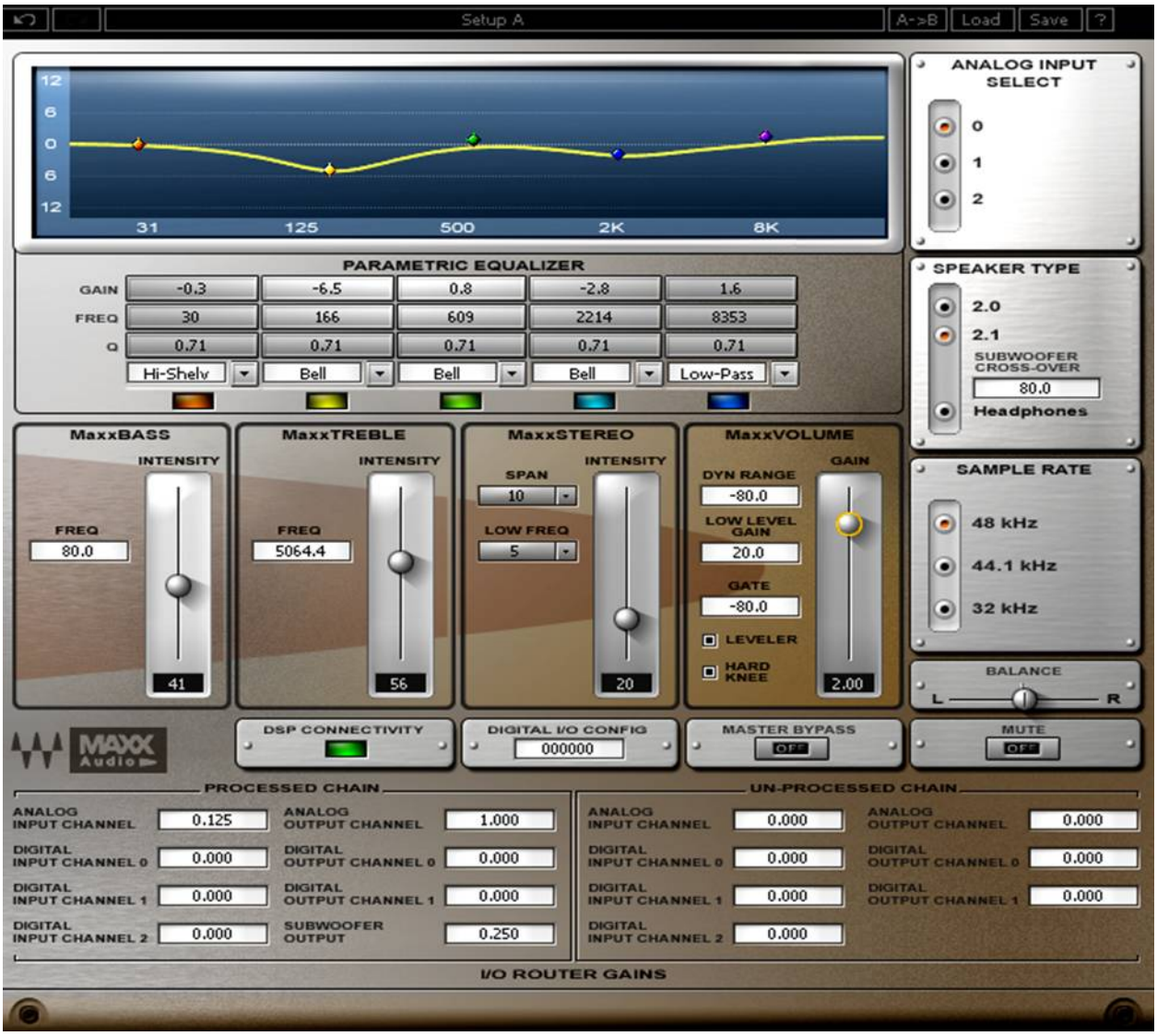
**Figure 4. MX5000A Development System Hardware Components**



## 3.2 Graphic User Interface

The GUI for the MX5000 Prototyping Module is shown in Figure 5.

**Figure 5. MX5000A GUI**



## 3.3 Digital Audio Input/Ouput

For digital audio I/O, the system supports three stereo inputs and two stereo outputs as shown in Table 1. All inputs and outputs are synchronous with shared clock and synch pins. The digital audio input/output is supported only in $I^2C$ Slave Mode of the MX5000A.

**Table 1. Digital Audio Input/Output Connections**

| | PIN NUMBER | GPIO | CONNECTION ON THE BOARD |
|---|---|---|---|
| Clock | 1 | 0 | Pin 2 of J13 |
| Synch | 2 | 1 | Pin 2 of J12 |
| Digital Input0 | 3 | 2 | Pin 2 of J11 |
| Digital Input1 | 4 | 3 | Pin 2 of J10 |
| Digital Input2 | 5 | 4 | Pin 2 of J8 |
| Digital Output0 | 8 | 5 | Pin 2 of J9 |
| Digital Output1 | 9 | 6 | Pin 2 of J6 |

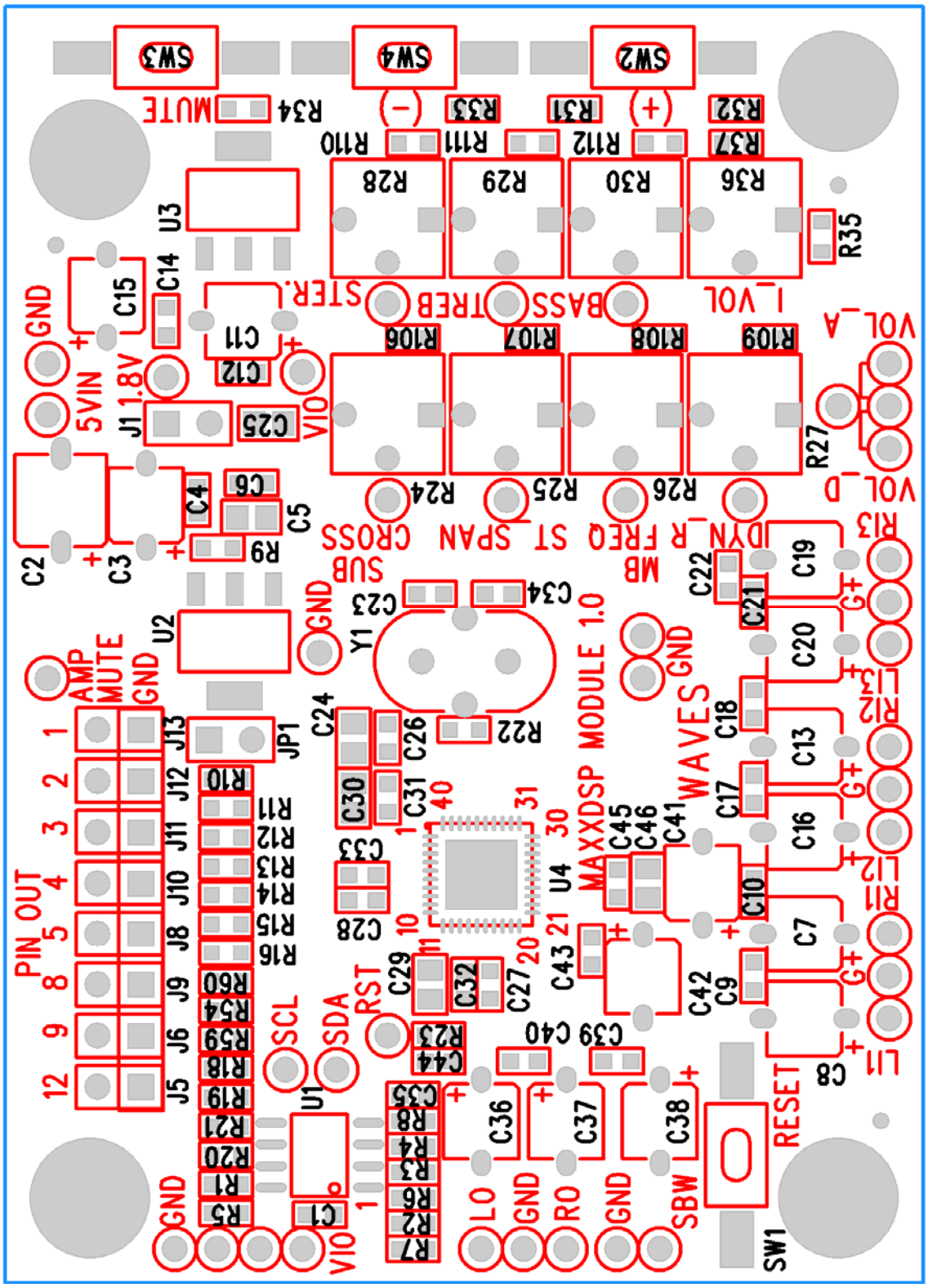
* pin 2 of Ji (were i=6, 5,...13) located on the edge of the board. See Figure 6.

*Please note: There are pull-up resistors connected to those pins. You may decide to leave them as is or to disconnect them, depending on your system.*

The list of those resistors:

| | Pull-up to VIO resistor | GPIO | |
|---|---|---|---|
| Clock | R10 | 0 | Pin 2 of J13 |
| Synch | R11 | 1 | Pin 2 of J12 |
| Digital Input0 | R12 | 2 | Pin 2 of J11 |
| Digital Input1 | R13 | 3 | Pin 2 of J10 |
| Digital Input2 | R14 | 4 | Pin 2 of J8 |
| Digital Output0 | R15 | 5 | Pin 2 of J9 |
| Digital Output1 | R16 | 6 | Pin 2 of J6 |

**Figure 6. MX5000A Prototyping Module Layout**




Full schematics, bill of materials, and layout files for this system is available to customers.

## 3.4 I²C Host Mode Controls

In I²C Host Mode, the MX5000 will read audio parameters from the external serial flash ROM after reset. After reset, the system will continuously monitor the value of external analog control pins for real-time audio controls. These pins are connected to eight potentiometers on the MX5000 Prototyping Module for OEM presets and user controls, which are summarized in Table 2.

The MX5000 will support most of its major functions in I²C Host mode. Some functions, like MaxxEQ, require modifying the flash ROM for static customized parameters, or can be used fully dynamically (and clicklessly) in I²C Slave Mode.

**Table 2. Analog Control Potentiometers**

| Potentiometer Label | Function | Full Counterclock-wise Value | Full Clockwise Value |
|---|---|---|---|
| I_VOL | MaxxVolume ™ Gain | Mute / -80dB | + 20dB |
| BASS | MaxxBass ® Intensity | Bypass MaxxBass | 100% intensity |
| TREB | MaxxTreble ™ Intensity | Bypass MaxxTreble | 100% intensity |
| STER | MaxxStereo ™ Intensity | Bypass MaxxStereo | 100% intensity |
| DYN_R | MaxxVolume ™ Dynamic Range | 80dB | 20dB |
| MB_FREQ | MaxxBass ® Frequency | 20 Hz | 320 Hz |
| ST_SP | MaxxStereo ™ Speaker Span | 5 degrees | 30s degrees |
| CROSS | Subwoofer Crossover (active only when subwoofer out enabled) | 20 Hz | 320 Hz |

## 5 Ordering Part Numbers

**MX5000ADS**
For MX5000A Development System

Includes:
MX5000A Prototyping Module (MX5000APM)
Telos Connii or Connii MM with software
Waves Control GUI software
4 wire cable – Telos connector to $I^2C$ header

Note: ‘A’ in MX5000A refers to hardware/software version of the MX5000.

**MX5000APM**
For MX5000A Prototyping Module

Includes:
MX5000A Prototyping Module PCB only

Note: ‘A’ in MX5000A refers to hardware/software version of the MX5000.

## 6 Trademark Notice