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Evaluation Board for the ADG2108 I²C CMOS 8 × 10 Analog Switch Array with Dual/Single Supplies

FEATURES

Full-featured evaluation board for the ADG2108
Various link options
Direct hook up to the USB port of a PC
PC software for control of switches
Functions with or without a PC

GENERAL DESCRIPTION

This document describes the evaluation board for the ADG2108 I²C, CMOS, 8 × 10 analog switch array with dual/single supplies. The array is bidirectional, and, as a result, its rows and columns can be configured as either inputs or outputs. Any number of combinations can be active at one time.

The ADG2108 has a maximum difference of 15 V between its inputs, V_{DD} and V_{SS}. Therefore, care must be taken not to exceed this parameter when connecting the power supplies.

The evaluation board interfaces to the USB port of a PC. Software is available with the evaluation board that allows the user to easily program the ADG2108. The EVAL-ADG2108EBZ can also be used as a standalone board.

Complete specifications for the ADG2108 are available in the ADG2108 data sheet, available from Analog Devices, Inc., which should be consulted in conjunction with this user guide when using the evaluation board.
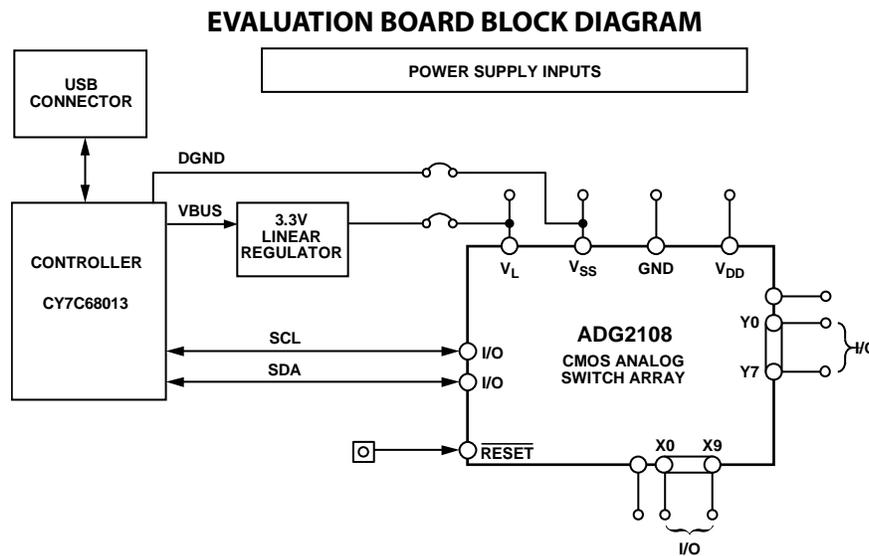
EVALUATION BOARD BLOCK DIAGRAM

Figure 1.

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REVISION HISTORY

EVALUATION BOARD HARDWARE

POWER SUPPLIES

The EVAL-ADG2108EBZ can be operated with both single and dual supplies. The device is specified to operate in single-supply mode at 12 V ± 10% and at 8 V ± 10% operation. It is also specified to operate at ±5 V dual supply. To apply these supplies to the evaluation board, the following guidelines apply:

- V_L provides the digital supply for the ADG2108 and all digital circuitry on the board. This supply can be applied externally, or the USB port can be used to power the digital circuitry (Link 5 inserted). Note that in this case, the logic supply power is 3.3 V.
- The positive supply voltage (for example, 8 V/12 V) is applied between the AVDD and AGND inputs of the ADG2108 evaluation board. Note that the maximum single supply the chip can handle is 15 V. In this case, AVSS must equal 0 V.
- The negative supply (for example, −5 V) is applied between AVSS and AGND inputs for the negative supply (V_{SS}) of the ADG2108. Note that the maximum voltage between AVDD and AVSS is 15 V.

Both analog GND and digital GND inputs are provided on the board. The AGND and DGND planes are connected at one location close to the ADG2108. It is recommended not to connect AGND and DGND elsewhere in the system to avoid ground loop problems.

Each supply is decoupled to the relevant ground plane with 10 μF and 0.1 μF capacitors. Each device supply pin is also decoupled with a 10 μF and 0.1 μF capacitor pair to the relevant ground plane.

LINK OPTIONS

There are a number of links and switch options on the evaluation board that must be set for the required operating setup before using the board. The functions of these link options are described in Table 1.

Table 1. Link Functions

Link No.	Function
LK1	This link chooses the LSB bit of the chip address on the USB I2C interface. Note that the I2C address must be set before the evaluation board software is launched.
	When inserted, the address bit is set to 0.
	When removed, the address bit is set to 1.
LK2	This link chooses the second LSB bit of the chip address on the USB I2C interface. Note that the I2C address must be set before the evaluation board software is launched.
	When inserted, the address bit is set to 0.
	When removed, the address bit is set to 1.
LK3	This link chooses the third LSB bit of the chip address on the USB I2C interface. Note that the I2C address must be set before the evaluation board software is launched.
	When inserted, the address bit is set to 0.
	When removed, the address bit is set to 1.
LK4	This link selects whether the supply at V_{SS} is sourced from ground or from the input AVSS. If sourced from ground, it is a single-supply system.
	Position A: V_{SS} sourced from AVSS.
	Position B: V_{SS} is connected to ground. This implies single-supply operation of the ADG2108.
LK5	This link selects whether the logic supply power comes from the USB power (if connected to a PC) or from the user supplied V_L (if used as a standalone unit).
	When inserted, logic power supply comes from USB power, that is, 3.3 V.
	When removed, logic power supply comes from user supplied V_L.

Setup for PC Control

The default setup for the EVAL-ADG2108EBZ is for control by the PC via the USB port. The default link options are listed in Table 2.

Table 2. Default Link Options

Link No.	Option
LK1	Inserted; therefore, the LSB is 0.
LK2	Inserted; therefore, the second LSB is 0.
LK3	Inserted; therefore, the third LSB is 0.
LK4	Position A; therefore, AVSS is supplying the power to V_{SS}.
LK5	Inserted; therefore, logic power supply comes from USB power.

Setup for Control Without a PC

The EVAL-ADG2108EBZ can also be used as a standalone board. This option is designed for users with a PC without a USB port or for users wishing to hook the board up to their entire system. Table 3 lists the link options that must be set to operate the evaluation board in this way.

Table 3. Link Options Setup for Control Without a PC

Link No.	Option
LK1	User configurable. Does not affect whether the board is connected to a PC or not.
LK2	User configurable. Does not affect whether the board is connected to a PC or not.
LK3	User configurable. Does not affect whether the board is connected to a PC or not.
LK4	Position A.
LK5	Removed.

SMB connectors are provided for the SDA and SCL inputs. Switches are turned on and off via this I²C bus. The read/write procedures are also provided in the ADG2108 data sheet and should be consulted when using this evaluation board in its standalone mode.

EVALUATION BOARD SOFTWARE QUICK START PROCEDURES

The ADG2108 evaluation kit includes software on the CD-ROM. The evaluation software must be installed before connecting the evaluation board to the USB port of the PC to ensure that the evaluation board is correctly recognized when connected to the PC.

SOFTWARE INSTALLATION

To install the software,

1. Start the PC and insert the CD. The installation software should launch automatically. If it does not, use Windows® Explorer to locate the file **setup.exe** on the CD. Double-click this file to start the installation procedure.

2. At the prompt, select a destination directory. By default, it is **C:\Program Files\Analog Devices\ADG2108**. After the directory is selected, the installation procedure copies the files into the relevant directories on the hard drive. The installation program creates a program group called **Analog Devices** with a subgroup called **ADG2108** in the **Start** menu of the taskbar.

3. After the installation of the evaluation software is complete, a welcome window displays for the installation of the **ADI PAD Drivers**. Click **Install** to install the drivers.

4. After the installation of the drivers, power up the ADG2108 evaluation board as described in the Power Supplies section. Then, connect the board to the USB port of the PC using the supplied cable.

SOFTWARE OPERATION

To launch the software, click **Start** > **All Programs** > **Analog Devices** > **ADG2108** > **ADG2108 Evaluation Software**. The **Configuration** tab of the evaluation software then displays as shown in Figure 2.
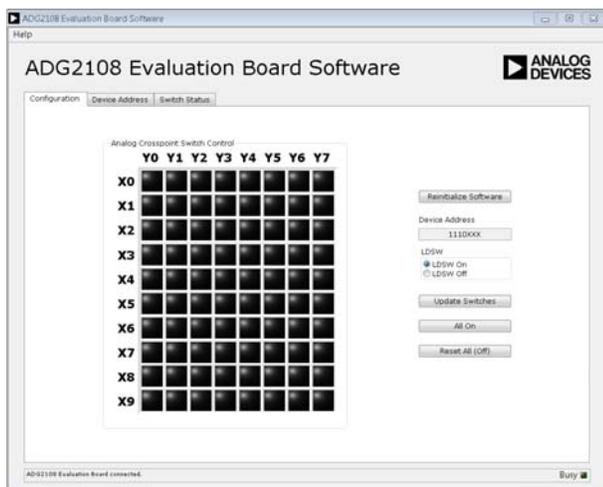
Figure 2. Configuration Tab

If the ADG2108 evaluation board is not connected to the USB port when the software is launched, a **Hardware Select** dialog box displays (shown in Figure 3). Connect the evaluation board to the USB port of the PC, wait for a few seconds, click **Rescan**, and then click **Select**. The **Configuration** tab of the evaluation software then displays, as shown in Figure 2.
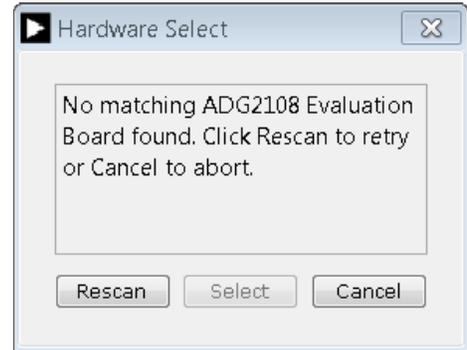

Figure 3. Hardware Select Dialog Box

Reinitialize Software

Click **Reinitialize Software** in the **Configuration** tab to reset the software to its default state. Reinitialize the software whenever the evaluation board is reconnected to the PC; otherwise, a new evaluation board is used.

Setting the I²C Address

The device address can be set in the **Device Address** tab (shown in Figure 4).
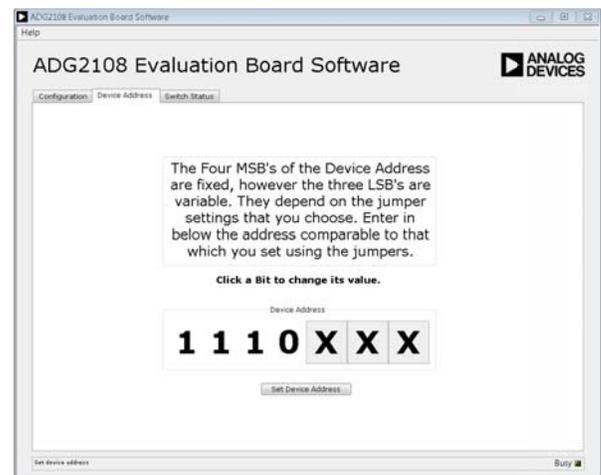

Figure 4. Device Address Tab

Set the device address by clicking the relevant bit. Remember to click **Set Device Address** to update the device address in the software. Note that the address set must correspond to the address set with the jumpers on the evaluation board; the address must be set before the evaluation board software works.

Load Switch (LDSW)

If the load switch function in the **Configuration** tab is on, the switches can be updated simultaneously (as an example, for the RGB colors in video switching). Otherwise, if the load switch is off, the switch condition updates upon completion of each I²C write, that is, immediately upon clicking an LED in **Analog Crosspoint Switch Control** in the **Configuration** tab. The LED is green when the switch is on and black when the switch is off.

If the load switch is on, clicking an LED in **Analog Crosspoint Switch Control** stores the switch status temporarily until **Update Switches** is clicked. When an LED is clicked, a red LED indicates that the switch is to be turned on and a dark green LED indicates that the switch is to be turned off. All switches are then updated simultaneously upon clicking **Update Switches**. The red LEDs then become green and the dark green LED becomes black, indicating that the switches are now on and off, respectively.

Switch Status

To see what the status of the switch array is at any given time, click the **Switch Status** tab (shown in Figure 5). The green LED in the **Analog Crosspoint Switch Status** indicates that the switch is on and the black LED indicates that the switch is off.
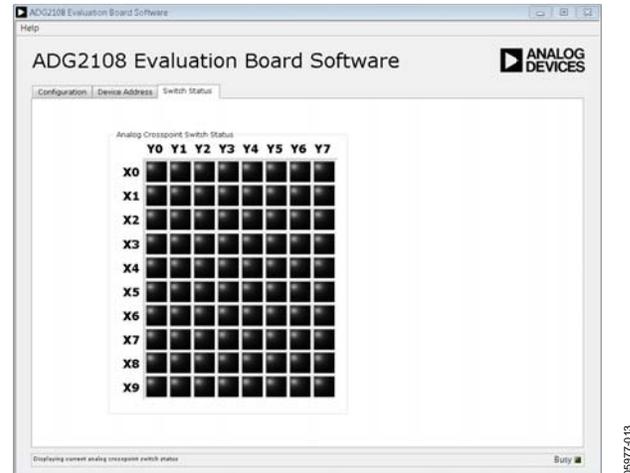
Figure 5. Switch Status Tab

RESET Function

There is a RESET button on the board (see RESET on the schematic) that can be used to reset the switch array. Alternatively, clicking **Reset All (Off)** in the **Configuration** tab of the software resets all switches.

All On Function

Clicking **All On** in the **Configuration** tab of the software turns on all of the switches.

EVALUATION BOARD SCHEMATICS AND ARTWORK

Figure 6. Schematic of USB Controller Circuitry
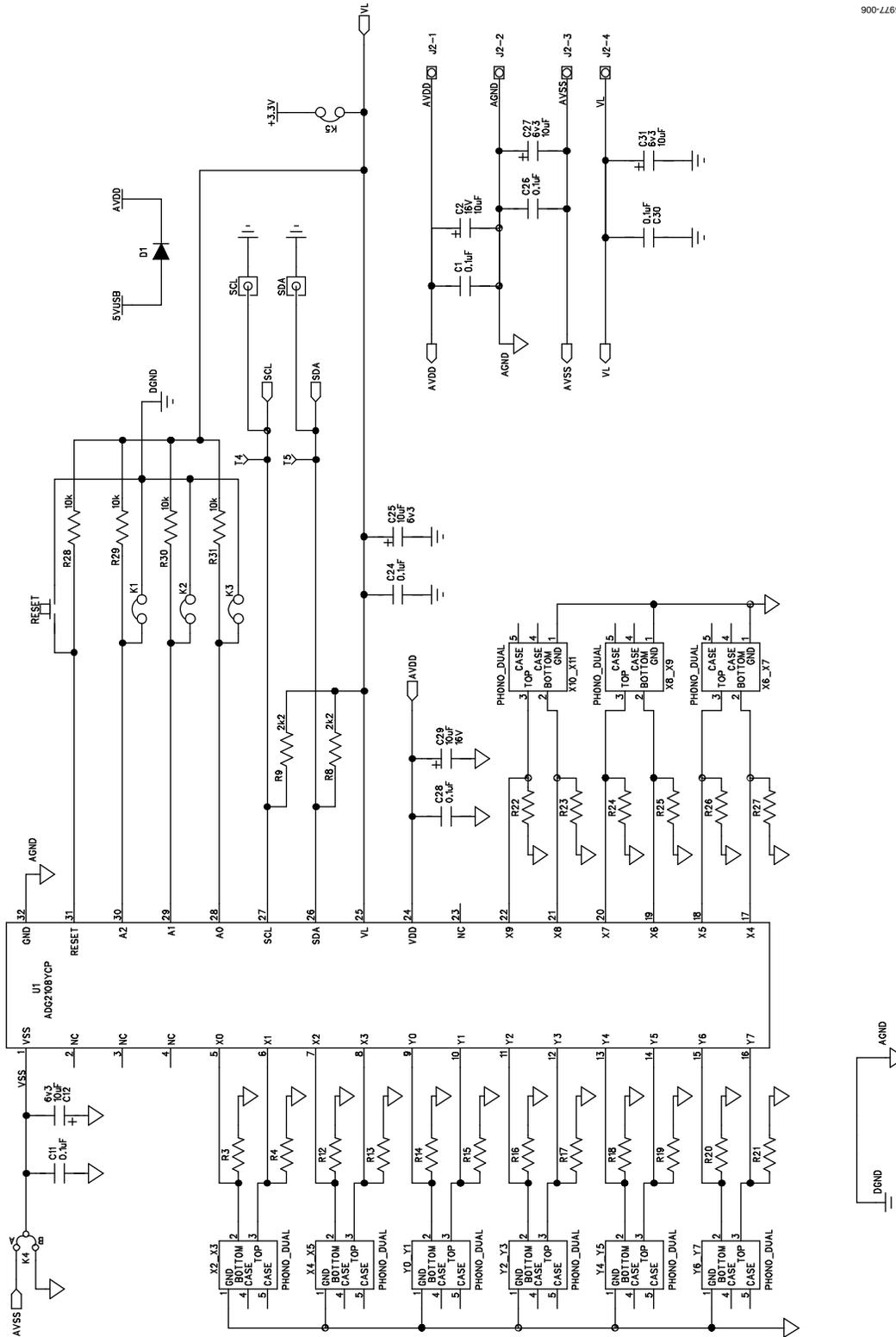
Figure 7. Schematic of ADG2108 Circuitry

Figure 8. Component Placement Drawing
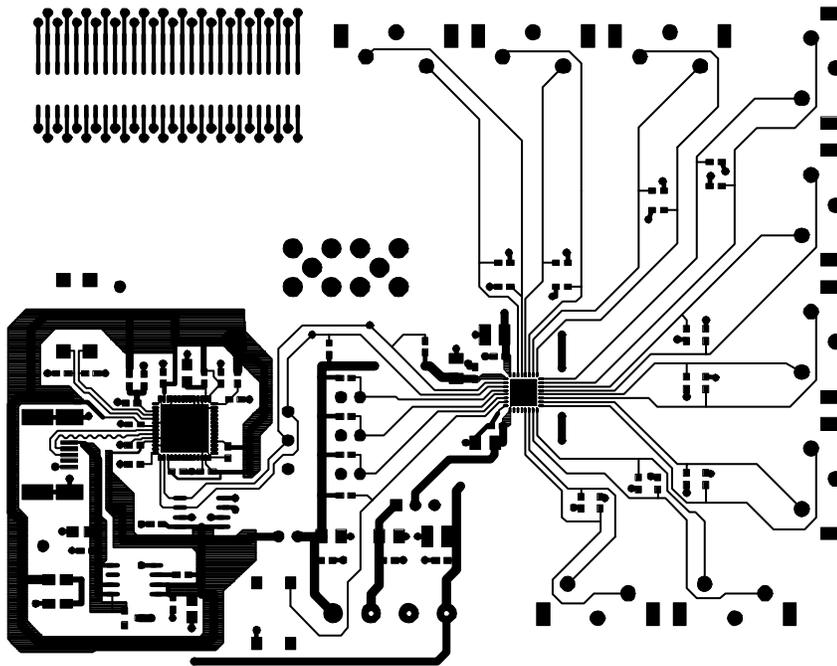
Eval-ADG2108EBZ Rev. 0 - (Component Side View) Component Side

Figure 9. Component Side PCB Drawing
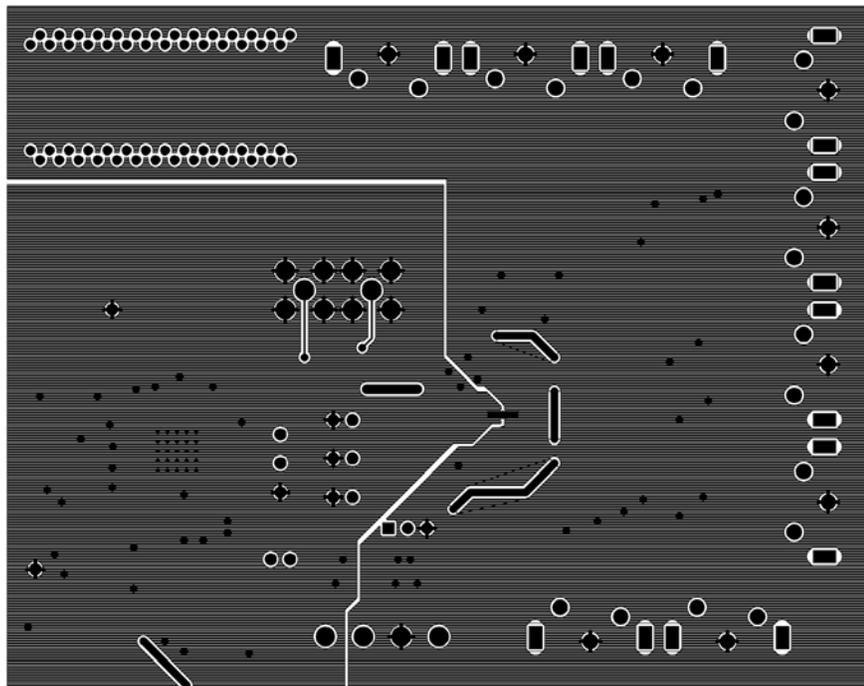
Eval-ADG2108EBZ Rev. 0 - (Component Side View)
Solder Side

Figure 10. Solder Side PCB Drawing

ORDERING INFORMATION

BILL OF MATERIALS

Table 4. Component Listing

Qty	Reference Designator	Description	Supplier/Number
19	C1, C3, C5 to C9, C11, C15, C16, C18 to C22, C24, C26, C28, C30	0.1 µF (0603 package), 50 V, X7R, SMD, ceramic capacitor	FEC 476–5837
2	C2, C29	10 µF, TAJ_B, 16 V, SMD, tantalum capacitor	FEC 498-737
3	C4, C13, C14	10 µF (0805 package), X5R, ceramic capacitor	Digikey 490-1709-1-ND
4	C12, C25, C27, C31	10 µF, TAJ_A, 6.3 V, SMD, tantalum capacitor	FEC 197-130
2	C10, C17	22 pF (0603 package), 50 V, X7R, SMD, ceramic capacitor	FEC 722-005
1	C23	2.2 µF (0603 package), 6.3 V, X5R, SMD, ceramic capacitor	Digikey 490-1552-1-ND
1	D1	Diode, SOT23	FEC 984–3728
1	D4	LED (0805 package)	FEC 579–0852
1	J1	USB Mini-B connector	FEC 978–6490, Digikey WM2499CT-ND
1	J2	4-pin terminal block	FEC 151-791
5	K1 to K5	SIP-2P, two-pin header and shorting shunt	FEC 102–2247, FEC 150-411
18	R3, R4, R12 to R27	SMD, resistor (0603 package)	Not inserted
2	R5, R6	75 Ω, SMD, resistor (0603 package)	FEC 933–1549
1	R7	0 Ω, SMD, resistor (0603 package)	FEC 933–1662
2	R8, R9	2.2 kΩ, SMD, resistor (0603 package)	FEC 933-0810
1	R10	10 kΩ, SMD, resistor (0603 package)	FEC 933–0399
1	R11	1 kΩ, SMD, resistor (0603 package)	FEC 933-0380
4	R28 to R31	10 kΩ, SMD, resistor (0603 package)	FEC 933–0399
1	$\overline{\text{RESET}}$	Push button switch (sealed 6 mm × 8 mm)	FEC177-807
5	T1 to T5	Test point	Not inserted
1	U1	8 × 10 analog switch array	Analog Devices ADG2108YCP
1	U2	24LC64	Digikey 24LC64-I/SN-ND
1	U3	USB microcontroller	Cyprus CY7C68013-56LFC
1	U5	3.3 V regulator	Analog Devices ADP3303AR-3.3
2	SCL, SDA	50 Ω, straight, SMB jack	FEC 111–1349
9	X2_X3, X4_X5, X6_X7, X8_X9, X10_X11, Y0_Y1, Y2_Y3, Y4_Y5, Y6_Y7	Socket, phono, PCB, gold, 1 pair	FEC 128–0669
1	XTAL1	24 MHz, CM309S, SMD, crystal	FEC 950–9658

NOTES

I²C refers to a communications protocol originally developed by Philips Semiconductors (now NXP Semiconductors).

ESD Caution

ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

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