Evaluation Board for SMBus/I²C®, 10-Bit Digital Temperature Sensor

EVAL-AD7414/15EB

AD7414/AD7415 FEATURES

10-bit temperature-to-digital converter
Temperature range: −40°C to +125°C
Typical accuracy of ±0.5°C at +40°C
SMBus-/I²C-compatible serial interface
3 µA power-down current
Temperature conversion time: 29 µs typical
Space-saving, 6-lead SOT-23 (AD7414) and 5-lead SOT-23 (AD7415)
Pin-selectable addressing via AS
Overtemperature indicator (AD7414 Only)
SMBus alert function (AD7414 only)
4 versions allow 8 I²C addresses (AD7414)
2 versions allow 6 I²C addresses (AD7415)

AD7414/AD7415 APPLICATIONS

Hard disk drives
PCs
Electronic test equipment
Office equipment
Domestic appliances
Process controls
Cellular phones

INTRODUCTION

The AD7414/AD7415 evaluation board allows the AD7414/AD7415 digital temperature sensors to be quickly and easily evaluated using a PC.

Using the evaluation board and its accompanying software, the AD7414 /AD7415 evaluation board can be interfaced to any PC running Windows® XP, Windows 2000, or later via one of the computer's USB ports.

The software allows the configuration of the board and the monitoring of the AD7414/AD7415's temperature readings.

THE AD7414/AD7415

This section gives a brief description of the AD7414/AD7415 and the system overview. Additional information can be found in the AD7414/AD7415 data sheet.

The AD7414/AD7415 are complete temperature monitoring systems in a 6-lead SOT-23 (AD7414) package and a 5-lead SOT-23 (AD7415) package. They contain a band gap temperature sensor and a 10-bit ADC to monitor and digitize the temperature reading to a resolution of 0.25°C.

The AD7414/AD7415 provide a 2-wire serial interface that is compatible with SMBus and I²C interfaces. The parts come in four versions: the AD7414-0/AD7415-0, AD7414-1/AD7415-1, AD7414-2, and AD7414-3. The AD7414-0/AD7415-0 and AD7414-1/AD7415-1 versions provide a choice of three different SMBus addresses for each version. All four AD7414 versions give the possibility of eight different I²C addresses, while the two AD7415 versions allow up to six I²C addresses to be used.

The AD7414/AD7415's 2.7 V supply voltage, low supply current, serial interface, and small package size make them ideal for a variety of applications, including PCs, office equipment, cellular phones, and domestic appliances.

In the AD7414, on-chip registers can be programmed with high and low temperature limits, and an open-drain overtemperature indicator output (ALERT) becomes active when a programmed limit is exceeded. A configuration register allows programming of the state of the ALERT output (active high or active low). This output can be used as an interrupt or as a SMBus alert.

EVALUATION SYSTEM PACKAGE CONTENTS

The evaluation system package contains the following items:

- This document
- The AD7414/AD7415 evaluation board
- Evaluation software on CD-ROM
- An USB cable

Rev. 0
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REVISION HISTORY

3/06—Revision 0: Initial Version

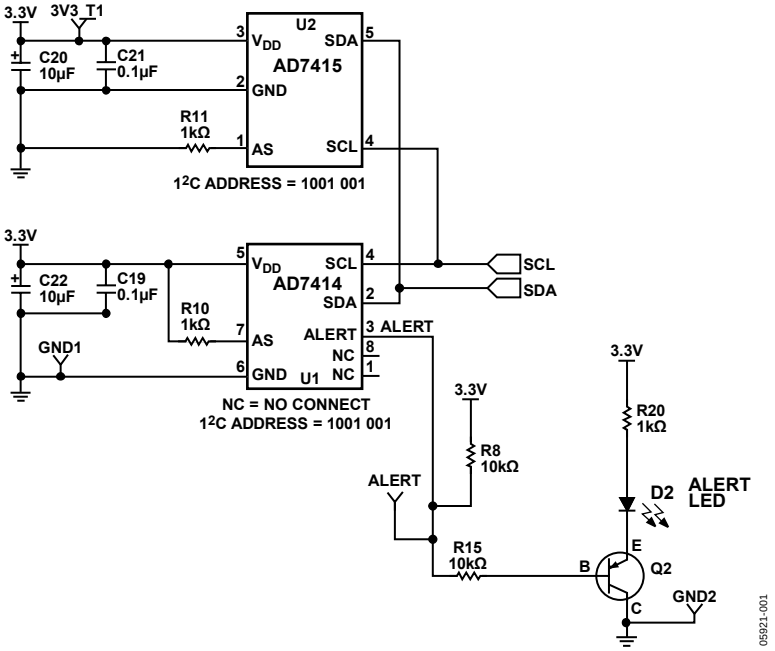

Figure 1. AD7414/AD7415 Evaluation Board Schematic

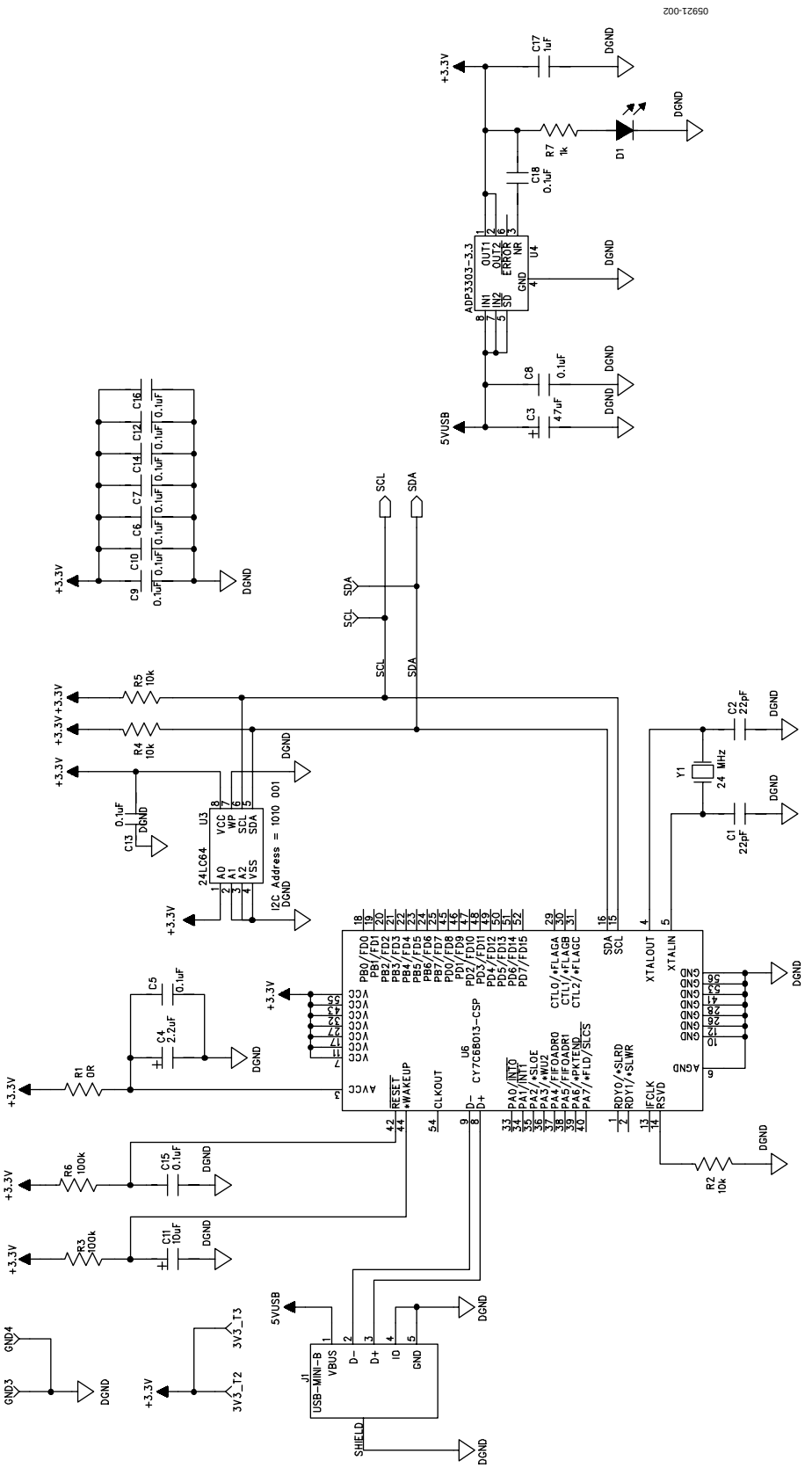

Figure 2. AD7414/AD7415 Evaluation Board Schematic (Continued)

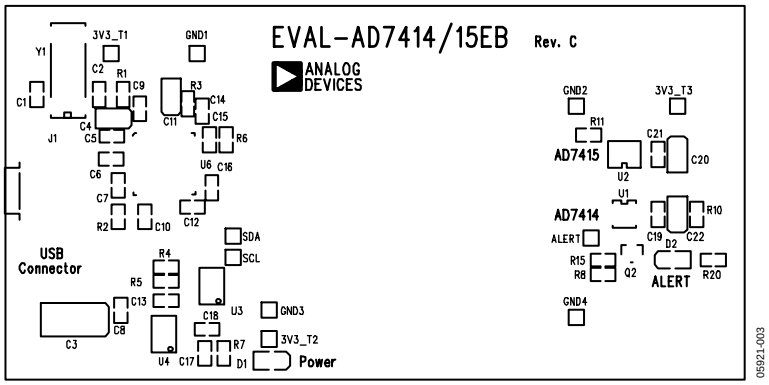

Figure 3. AD7414/AD7415 Evaluation Board Silkscreen

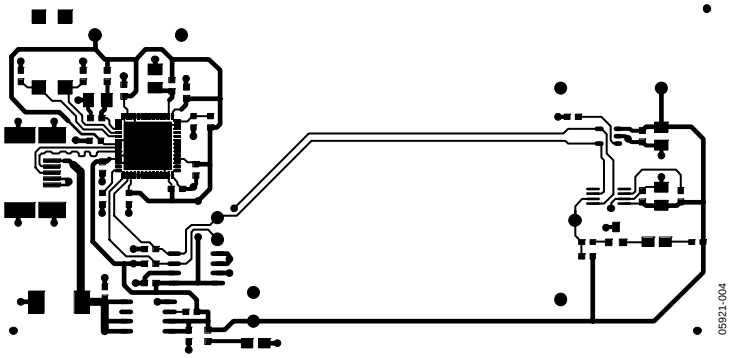

Figure 4. AD7414/AD7415 Evaluation Board Component Side

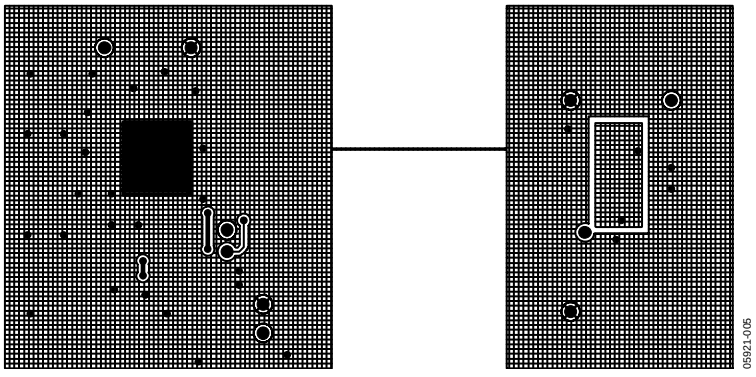

Figure 5. AD7414/AD7415 Evaluation Board Solder Side

EVALUATION BOARD HARDWARE

The AD7414/AD7415 evaluation board contains the following main components, which can also be identified in the printed circuit board silkscreen and schematic diagrams shown in Figure 1 through Figure 3:

- AD7414 IC, U1
- AD7415 IC, U2
- USB microcontroller, U6
- ALERT LED, D2
- Power LED, D1
- Connector for USB interface, J1

USING THE HARDWARE

The hardware is extremely simple to use. Before connecting the evaluation board to the USB port on the PC, using the USB A to mini-B cable provided, make sure that the software is installed. No external power supply is required.

MINI-B USB CONNECTOR J1

The connections to J1 are shown in Table 1.

Table 1. J1 Connections

J1 Pin	Mini-B Function
1	5 V
2	−Data
3	+Data
4	Key (Not Used—Connected to Ground)
5	Ground

The communication between the mini-B plug and the rest of the evaluation board is handled by the USB microcontroller, U6.

TEST POINTS

Various system logic signals, ground, and the power rail are available at the test points on the board.

EVALUATION BOARD SOFTWARE

The software allows the AD7414/AD7415's functions to be controlled from a PC via an easy-to-use interface operating under Windows XP, Windows 2000, or higher. The contents of the device's internal registers can be easily read or altered through a user friendly interface, while the Visual Display window gives a graphical display of the temperature and allows the overtemperature and undertemperature limit to be altered using a slider control.

INSTALLING THE SOFTWARE

To install the software:

- Insert the CD-ROM.
- Click **Start > Run.**
- Enter X: AD7414_15_Eval_v2.0.0.exe, where X is the letter of your CD-ROM drive.
- Click **OK**.

Alternatively, run Windows Explorer or My Computer, select the CD-ROM drive, and double-click AD7414_15_Eval_v2.0.0.exe.

The installer extracts the files needed to install the software and starts the InstallShield Wizard (see Figure 6).

Figure 6. InstallShield Wizard Dialog Box

Click **Next >** to continue the installation. Various installation options are available, depending on whether a version of the software is already installed. If this is a new installation, a license agreement will appear. Click **Yes** to accept the agreement and continue with the installation.

If you want to install the software in the default folder shown, click **Next >**. Otherwise, click **Browse…** and choose a different folder. The folder chosen is where the program will be installed. Once you have chosen, click **OK**.

You are now given the option of a Typical, Compact, or Custom installation of the software.

Select the desired option, then click **Next >**. If Custom is selected, a window will appear that allows individual components to be installed.

Uncheck any component you do not wish to install, and click **Next >**. If Typical or Compact installation is selected, this step is omitted, and the Select Program Folder dialog box will appear. This allows you to select the program folder to which program icons will be added. Select the desired folder and click **Next >**.

The InstallShield Wizard will now install the program files to the selected folders. Click **Finish** to complete the installation.

If an existing version of the software is found during installation, you can modify the existing installation by adding or removing components, repair the installation by replacing existing files with ones from the CD (useful if a file has been corrupted), or uninstall the entire software package.

Select the desired option and click **Next >**. If **Modify** is selected, you can add or remove components. If **Repair** is selected, the installed files are replaced with new files from the CD-ROM.

If **Remove** is selected, you will be prompted to confirm the complete removal of the software. Click **OK** to confirm removal of the software. During removal of the software, you may need to confirm removal of some files.

These files can be used by other Analog Devices, Inc. software. If no other Analog Devices, Inc. software is installed on the system, it is safe to delete them. To remove all shared files without further prompting, select **Don't display this message again** before clicking **Yes**.

Click **Finish** to complete the maintenance procedure.

USING THE SOFTWARE

When using the software, first ensure that the evaluation board is powered up and connected to the USB port.

To start the software, click: **Start > All Programs > Analog Devices > AD7414 &AD7415 Evaluation Software > AD7414 Evaluation Software**. The software will search for the evaluation board and initialize it.

Figure 7. AD7414/AD7415 Found

If the evaluation board is not found, the following message will appear:

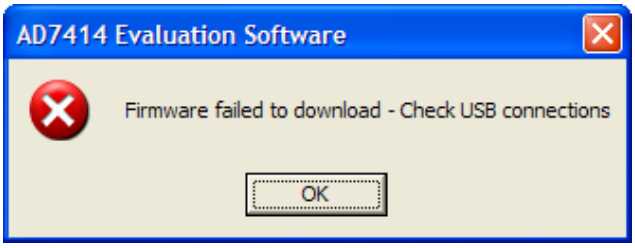

Figure 8. AD7414/AD7415 Not Found

If this happens, check that the evaluation board is correctly connected, that D1 is lit, and try again.

There are three tabs at the top of the program window: General, Readings, and Settings. These can be used to access the various functions of the software.

The General tab shows the software version.

Temperature Reading

The Readings tab allows the temperature to be displayed as a rolling graph. Measurement limits are also displayed for the AD7414 only. To view the graphic data in more or less detail, move the arrow pointers on the X-axis and Y-axis to zoom in or zoom out (see Figure 9).

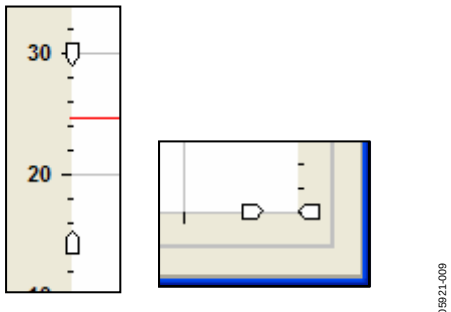

Figure 9. Zoom Controls

Temperature Limits

The upper and lower alert limits can be set by dragging the blue and grey sliders to the desired temperature values.

The current temperature reading is represented by the red bar as well as in text at the bottom of the dialog box.

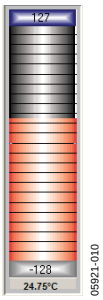

Figure 10. Temperature Reading

Settings

Click the Settings tab to access the Settings dialog box. This dialog box allows the selection of what part is being read, the AD7414 or the AD7415 (see Figure 11).

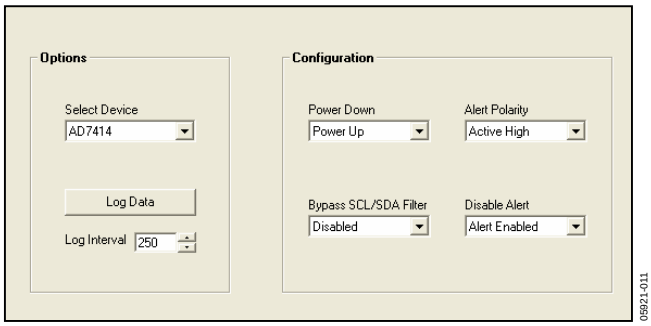

Figure 11. Device Options

You can select or enable/disable various options within this dialog box, including the following:

- Power Up/Power Down.
- Alert Polarity (AD7414 Only).

  Active Low → Alert Diode D2 is lit when an overtemperature condition happens (current temperature reading higher than the temperature set by the blue slider).

  Active High → Alert Diode D2 is lit when an under-temperature condition happens (current temperature reading lower than the temperature set by the grey slider).
- Bypass SCL/SDA Filter → Switching off the input filters improves the transfer rate but has a negative effect on the EMC behavior of the part.
- Disable Alert (AD7414 Only).

Data Logging

The Settings dialog box also allows you to log data into a file.

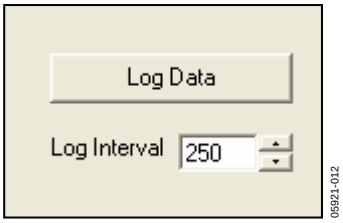

Figure 12. Data Logging

Log Interval sets the time in milliseconds between samples. Once this has been set, click on **Log Data.** The dialog box in Figure 13 will then appear.

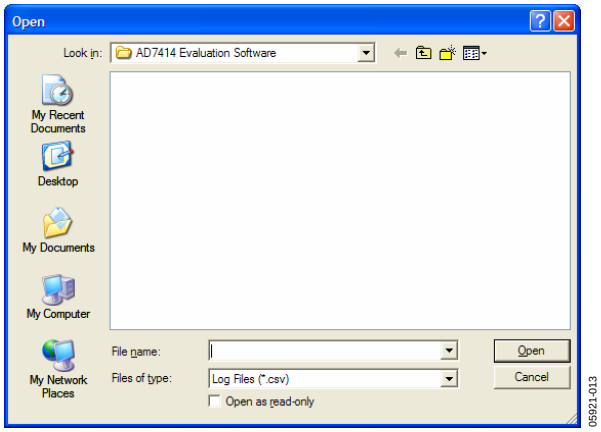

Figure 13. Opening or Creating A Log File

You can use this dialog box to open an existing log file or create a new log file by typing in a new file name.

After selecting an existing file or typing in a new file name, click **Open** to begin data logging. To stop data logging, click **Stop Logging…**

APPENDIX A

Table 2. Parts List for EVAL-AD7414/15EB Evaluation Board

Name	Part Type	Value	Tolerance	Part Description
ALERT	Testpoint			Terminal, PCB Red
3V3_T1	Testpoint			Terminal, PCB Red
3V3_T2	Testpoint			Terminal, PCB Red
3V3_T3	Testpoint			Terminal, PCB Red
C1	Capacitor	22 pF	5%	Capacitor, 0603, 22 pF, 50 V
C2	Capacitor	22 pF	5%	Capacitor, 0603, 22 pF, 50 V
C3	Capacitor+	47 µF	10%	Capacitor, Case D, 47 µF, 10 V
C4	Capacitor+	2.2 µF	10%	Capacitor, Case A, 2.2 µF, 10 V
C5	Capacitor	0.1 µF	(+80%, −20%)	Capacitor, 0603, 100 nF, 25 V
C6	Capacitor	0.1 µF	(+80%, −20%)	Capacitor, 0603, 100 nF, 25 V
C7	Capacitor	0.1 µF	(+80%, −20%)	Capacitor, 0603, 100 nF, 25 V
C8	Capacitor	0.1 µF	(+80%, −20%)	Capacitor, 0603, 100 nF, 25 V
C9	Capacitor	0.1 µF	(+80%, −20%)	Capacitor, 0603, 100 nF, 25 V
C10	Capacitor	0.1 µF	(+80%, −20%)	Capacitor, 0603, 100 nF, 25 V
C11	Capacitor+	10 µF	10%	Capacitor, Case A, 10 µF, 10 V
C12	Capacitor	0.1 µF	(+80%, −20%)	Capacitor, 0603, 100 nF, 25 V
C13	Capacitor	0.1 µF	(+80%, −20%)	Capacitor, 0603, 100 nF, 25 V
C14	Capacitor	0.1 µF	(+80%, −20%)	Capacitor, 0603, 100 nF, 25 V
C15	Capacitor	0.1 µF	(+80%, −20%)	Capacitor, 0603, 100 nF, 25 V
C16	Capacitor	0.1 µF	(+80%, −20%)	Capacitor, 0603, 100 nF, 25 V
C17	Capacitor	1 µF	(+80%, −20%)	Capacitor, 0603, 1 µF, 10 V
C18	Capacitor	0.1 µF	(+80%, −20%)	Capacitor, 0603, 100 nF, 25 V
C19	Capacitor	0.1 µF	(+80%, −20%)	Capacitor, 0603, 100 nF, 25 V
C20	Capacitor+	10 µF	10%	Capacitor, CASE A, 10 µF, 10 V
C21	Capacitor	0.1 µF	(+80%, −20%)	Capacitor, 0603, 100 nF, 25 V
C22	Capacitor+	10 µF	10%	Capacitor, Case A, 10 µF, 10 V
D1	LED			LED, Green SMD
D2	LED			LED, Red SMD
GND1	Testpoint			Terminal, PCB Black
GND2	Testpoint			Terminal, PCB Black
GND3	Testpoint			Terminal, PCB Black
GND4	Testpoint			Terminal, PCB Black
J1	USB Mini-B			Socket, USB Mini-AB SMT (USB-OTG)
Q2	BC807-40LT1			Transistor, PNP, SOT-23
R1	Resistor	0R	1%	Resistor, 0603, 0R0
R2	Resistor	10 kΩ	1%	Resistor, 0603, 10 kΩ
R3	Resistor	100 kΩ	1%	Resistor, 0603, 100 kΩ
R4	Resistor	10 kΩ	1%	Resistor, 0603, 10 kΩ
R5	Resistor	10 kΩ	1%	Resistor, 0603, 10 kΩ
R6	Resistor	100 kΩ	1%	Resistor, 0603, 100 kΩ
R7	Resistor	1 kΩ	1%	Resistor, 0603, 1 kΩ
R8	Resistor	10 kΩ	1%	Resistor, 0603, 10 kΩ
R10	Resistor	1 kΩ	1%	Resistor, 0603, 1 kΩ
R11	Resistor	1 kΩ	1%	Resistor, 0603, 1 kΩ
R15	Resistor	10 kΩ	1%	Resistor, 0603, 10 kΩ
R20	Resistor	1 kΩ	1%	Resistor, 0603, 1 kΩ
SCL	Testpoint			Terminal, PCB Red

Name	Part Type	Value	Tolerance	Part Description
SDA	Testpoint			Terminal, PCB Red
U1	AD7414	AD7414ARMZ-0		SMBus/I²C Digital Temperature Sensor
U2	AD7415	AD7415ARTZ-0		Digital Output Temperature Sensor
U3	24LC64			IC, SM EEPROM SERIAL 64 kΩ
U4	ADP3303-3.3			Precision Low Dropout Voltage Regulator
U6	CY7C68013-CSP			IC MCU USB PERIPH HI SPD 56QFN (CY7C68013A-56LFXC)
Y1	XTAL-CM309S	24 MHz		Crystal, SMD 24.000000 MHz

ORDERING GUIDE

Model	Description
EVAL-AD7414/15EB	AD7414/AD7415 Evaluation Board

NOTES

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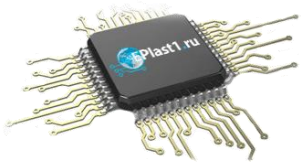

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