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DS1070K EconOscillator Programming Kit

General Description

The DS1070K EconOscillator programming kit is a complete hardware/software solution for programming Dallas Semiconductor's 2-wire EconOscillator™ products for evaluation and prototyping new designs. The kit is compatible with the DS1077(L), DS1085(L), DS1086(L), and DS1087(L)*.

Features

♦ **Programs and Reads the Registers of the DS1077(L), DS1085(L), DS1086(L), DS1087(L)**

♦ **Built-in Settings Calculator Determines the Settings Required for the Desired Frequency**

♦ **Win95/WinNT 4.0-Compatible Software**

♦ **ZIF Sockets for Both 8-Pin µSOP and 8-Pin SO Devices**

♦ **2.7V to 5.5V Operation**

Kit Contents

3.5" Floppy Disk with Windows Software

Programming Board

DS3900 Communications Module

Serial Cable and Samples Not Included

Future product—contact factory for availability.

Ordering Information

PART	PACKAGE
DS1070K	Programming Kit for 8-Pin µSOP and 8-Pin SO

Component List

DESIGNATION	QTY	DESCRIPTION
C1	1	47µF capacitor, C (EIA) footprint
C2	1	10µF capacitor, X5R, 6.3V, 1206 footprint
C3	1	1µF capacitor, X7R, 0805 footprint
C4, C5	2	0.1µF capacitor, X7R, 0805 footprint
C6, C7	2	1nF capacitor, X7R, 0805 footprint
R1, R2	2	4.7kΩ resistor, 1/10W, 0805 footprint
R3	1	330Ω resistor, 1/10W, 0805 footprint
R4, R5, R6	3	10kΩ resistor, 1/10W, 0805 footprint
R7, R8	2	0Ω resistor, 1/10W, 0805 footprint
U1	1	ZIF socket, 8-pin SO, Enplas P/N OTS-8(16)-1.27-03
U2	1	ZIF socket, 8-pin µSOP, Wells CTI P/N 656-1082211

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DESIGNATION	QTY	DESCRIPTION
J1	1	Header connector, 1 x 2, 100mil spacing Digi-Key P/N A26513-ND
J2	1	Banana jack, red Mouser P/N 164-6219
J3	1	Banana jack, black Mouser P/N 164-6218
TP1–TP4	4	Test point, white Digi-Key P/N 5012K-ND
TP5	1	Test point, red Digi-Key P/N 5010K-ND
TP6–TP8	3	Test point, black Digi-Key P/N 5011K-ND
S1	1	Switch, DIP, 4-pos Digi-Key P/N CT2064-ND
D1	1	LED, red, 1206 footprint Digi-Key P/N 404-1042-1-ND

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For pricing, delivery, and ordering information, please contact Maxim/Dallas Direct! at 1-888-629-4642, or visit Maxim's website at www.maxim-ic.com.

DS1070K EconOscillator Programming Kit

Quick Start

The following section describes the user-supplied equipment and basics of operating the programming kit. Refer to the *Detailed Description* for further instruction.

Required Equipment

Dallas Semiconductor 2-Wire EconOscillator (Samples Not Included)

PC with Windows OS (Win95/WinNT 4.0 or Later) and 3.5" Floppy Disk Drive

Serial Cable (See Table 1 for Vendors)

3.3V or 5.0V Power Source

Table 1. Serial Cable Vendors

VENDOR	PART NUMBER
Radio Shack radioshack.com and local stores	26-117
Digi-Key digikey.com	AE1020-ND

Procedure

1) Copy the executable file (DS1070EVKit.exe) from the floppy disk to the PC's hard drive.

2) Install the DS3900 on the programming board with the orientation shown in Figure 1.

3) Disable the DS3900's pullup resistors by switching the two DIP switches to the side opposite the "CTS ON" label.

4) Connect the serial cable from the DS3900 to the PC.

5) Install the device to program in the proper socket. The top socket accommodates SO packages, the bottom socket accommodates μSOP packages. The device's pin 1 indicator (dot) should be pointed towards the DS3900 (see Figure 1). Ensure the other socket is empty.

6) If programming DS1086's or DS1087's, install the SPRD jumper to short the two terminals. Remove the SPRD jumper if programming DS1077's or DS1085's. This jumper connects the SPRD pin to the DIP switches.

7) Adjust the control switches to the desired positions. See Table 2 for a description of the switch functions by device type.

8) Connect the power source to the board. For best results, devices should be powered to their nominal VCC levels.

9) Open the software (DS1070EVKit.exe) and select the device type to program on the startup screen.

Table 2. Control Switch Function by Device Type

DEVICE	SWITCH		
	SPRD	CTRL1	CTRL0
DS1077(L)	N/A	CTRL1	CTRL0
DS1085(L)	N/A	CTRL1	CTRL0
DS1086(L)	SPRD	PDN	OE
DS1087(L)	SPRD	PDN	OE

Detailed Description

Hardware

The DS1070K hardware (Figure 1) features a DS3900 communications module that allows a PC to communicate with 2-wire devices using its serial port. Test sockets for both the SO and μSOP packages allow the devices to be easily programmed before they are placed onto a customer's application board. The programming board's power connections are made using standard banana jacks, and test points are available for programming verification. DIP switches and jumpers allow the board to be configured to facilitate any of the supported oscillator types.

The Ready LED

The Ready LED indicates the DS3900 is powered up and operating properly. It can be disabled on the 2-wire page of the software by selecting the Ready LED off option. The Ready LED re-enables itself any time power is cycled. Disabling the Ready LED reduces the V_{CC} noise seen by the oscillator, which is advantageous when measuring the oscillator's output frequency.

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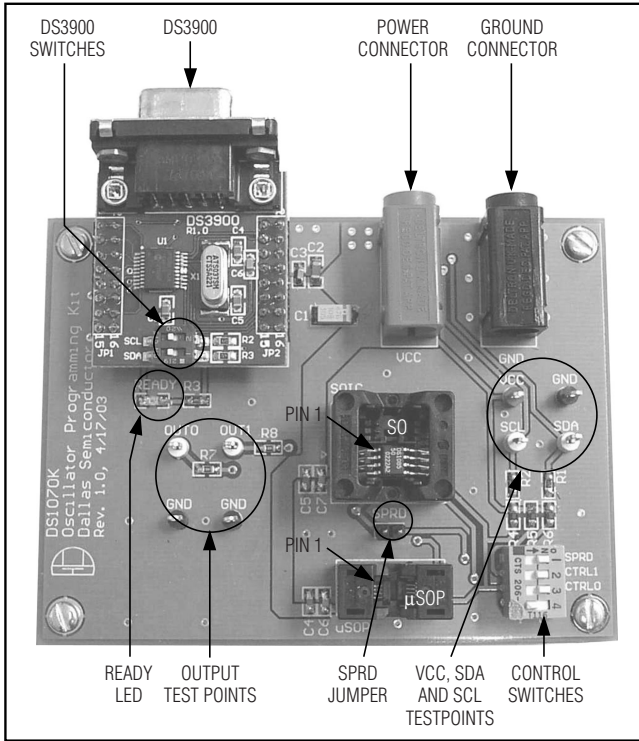# DS1070K EconOscillator Programming Kit

Figure 1. DS1070K Oscillator Programming Kit Hardware

Using the DS1070K Programming Kit to In-Circuit Program Evaluation Devices

The DS1070K oscillator programming kit can be used to in-circuit program devices that will be stand-alone during normal operation. To do this, the in-circuit oscillator must have its own pullups on the application board to prevent SDA and SCL from floating during normal operation. Connect the SDA and SCL test points on the programming kit to the SDA and SCL connections available on the application board. The program-

ming kit should be powered to the same voltage level as the application board and the two boards should share a common ground connection. Ensure no devices are installed in the kit board's sockets because they may cause a 2-wire addressing conflict if present. When the software is started it should be able to program the oscillator exactly as it would if the device was in one of the kit PCB's sockets. See Figure 2 for the hardware connections and the software section for information related to using the programming kit software.

Verifying the Oscillator's Frequency After Programming on the Kit PCB

The oscillator's output frequency can be verified after programming by using an oscilloscope connected to the OUT0 and OUT1 test points. The measurement should be made using a 10x probe to minimize the capacitance and inductance as best possible. Even with this precaution taken, significant overshoot and undershoot may be observed due to the probe's capacitance and the inductance of its ground lead. This overshoot and undershoot will not be present in a typical application. The DS1086(L) and DS1087(L) both only have one output that is connected to the OUT1 test point.

It should be noted that the programming kit's primary function is not to characterize oscillators. The board was designed with test sockets to facilitate programming multiple devices without solder connections. The impedance of the test socket limits the effectiveness of the supply decoupling capacitors, which limits the performance of the oscillator. Because of these limitations, devices perform better in applications with good supply decoupling capacitors and the part soldered to the PCB.
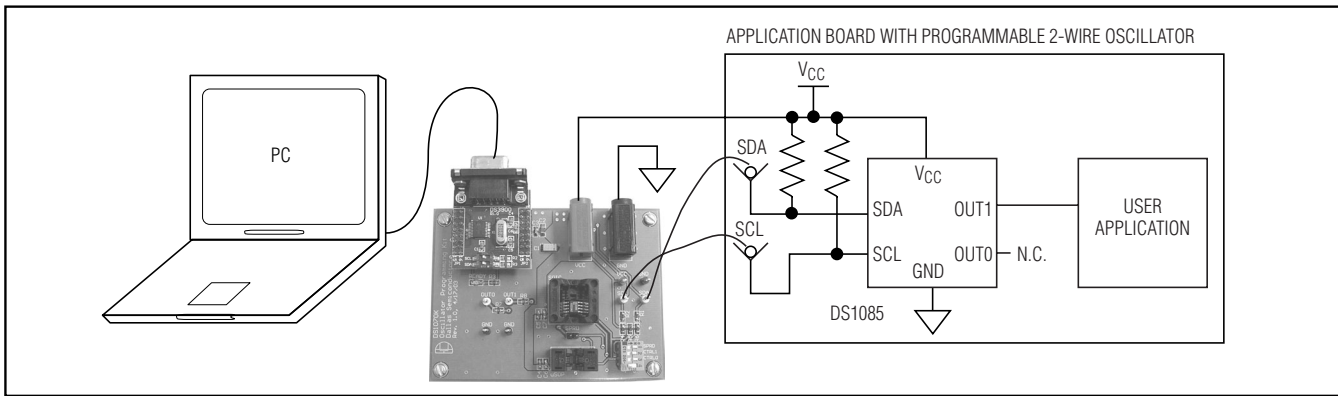

Figure 2. In-Circuit Programming Configuration with DS1085 Example Circuit

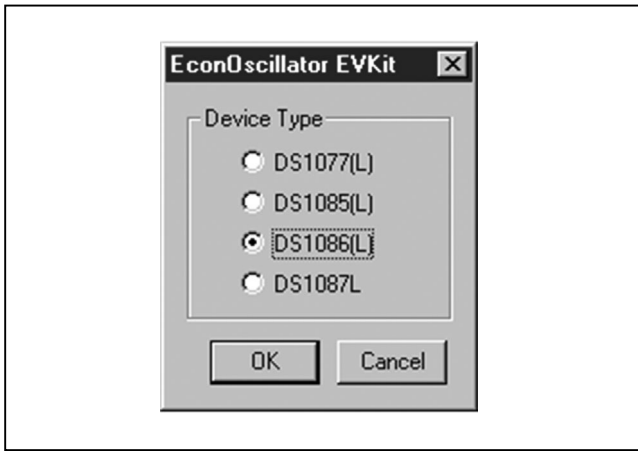# DS1070K EconOscillator Programming Kit

Figure 3. Oscillator Selection Dialog

Improving the Quality of the Waveforms on the Kit PCB.

The overshoot and undershoot observed on the kit PCB can be dramatically reduced by replacing R7 and R8 with 450Ω resistors and using a oscilloscope with 50Ω termination. The amplitude of the output in this configuration will be approximately 10x less than the standard configuration due to the voltage divider between the 450Ω resistors and the 50Ω termination resistor within the oscilloscope.

Software

The most recent version of the software available at the time the kit was packaged comes standard with the programming kit. Check Dallas Semiconductor's FTP site for updated software: (ftp.dalsemi.com/pub/silicon_timed/DS1070K).

The oscillator programming software initially launches a dialog box (Figure 3) to prompt the user for the base part number of the oscillator to program.

After the base part number is selected, the software (Figure 4) utilizes a simple graphical interface that allows the user to calculate their device settings, enter the decimal settings in manually, or directly enter the hexadecimal register values to program into the devices. The software for all the device types except the DS1087(L) have the same basic program flow described by Figure 5. Because the DS1087(L) has so few programming options the software only supports the hexadecimal register section of the software.
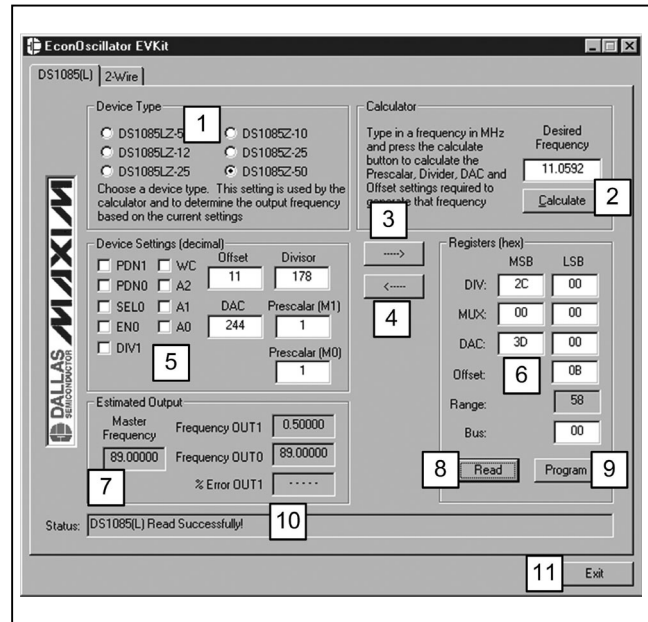

Figure 4. Software Description

The items highlighted in Figure 4 are described below.

1) The Device Type box allows the user to select the variant of the base part type they are using. This allows them to choose between the 3V and 5V device types, or select the DS1077's master frequency.

2) The Calculate button adjusts the device settings (item 5) required to reach the desired frequency. Items not directly related to the frequency output of the part must be manually changed in the device settings box.

3) The Settings to Register button (——>) calculates the hexadecimal register values (item 8) that must be programmed into the part to make it function with the parameters shown in the device settings section (item 5).

4) The Registers to Settings button (<——) calculates the devices settings based on the register values currently shown.

5) The Device Settings area is used to enter the programming parameters using decimal units and check boxes for the various control bits. The only control bit modified by the calculator is the DIV1 bit on the DS1077 and DS1085 devices. The remainder of these bits must be adjusted manually before calculation the hexadecimal registers values using the ——-> button. The prescalar setting for OUT0 on the DS1077 and DS1085 devices must also be manually adjusted.

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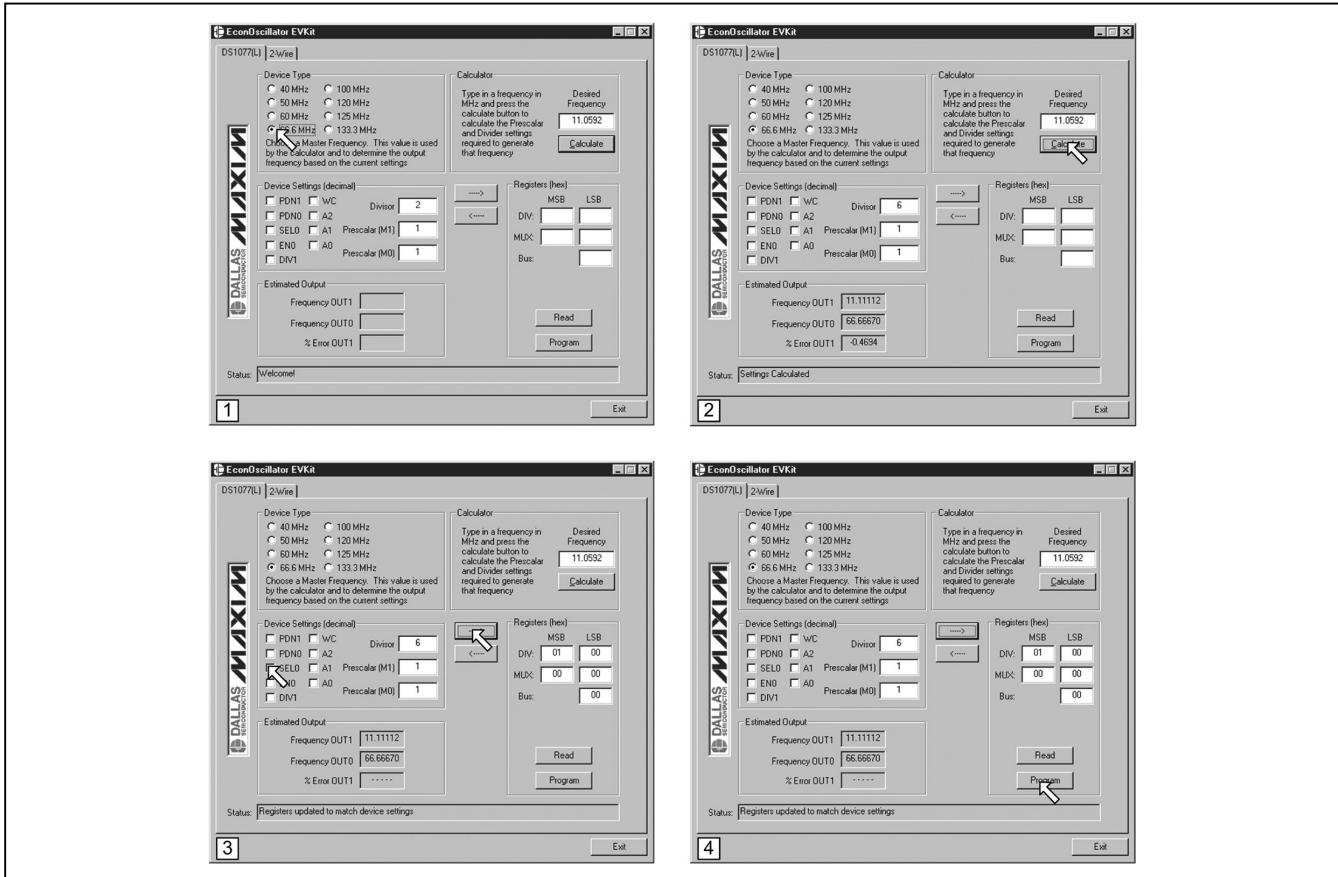
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Figure 5. Typical Programming Sequence

6) The register values are a hexadecimal representation of the values read from the part using the Read button, or they are the values that will be programmed into the part using the Program button. When programming, these settings can be calculated from the decimal device settings using the ——> button or they can be directly entered. These values will be updated to match the parts current settings after a successful read operation.

7) The Estimated Output section calculates the master frequency when it is adjustable and the output frequencies of the oscillator based on the device settings. This section is updated when either the Calculate button, ——> button, or the <—— button is pressed. When the Calculate button (item 2) is used, the software also calculates the % error of the ideal output frequency to the desired output frequency. The % error calculated does not account for the master oscillator frequency tolerance.

8) The Read button reads the device's registers to update the hexadecimal register values shown in the software. If the program has trouble reading from the device, see *Troubleshooting*.

9) The program button programs the device with the current hexadecimal register values. If problems occur, see *Troubleshooting*.

10) The status bar informs the user of the success or failure of an operation.

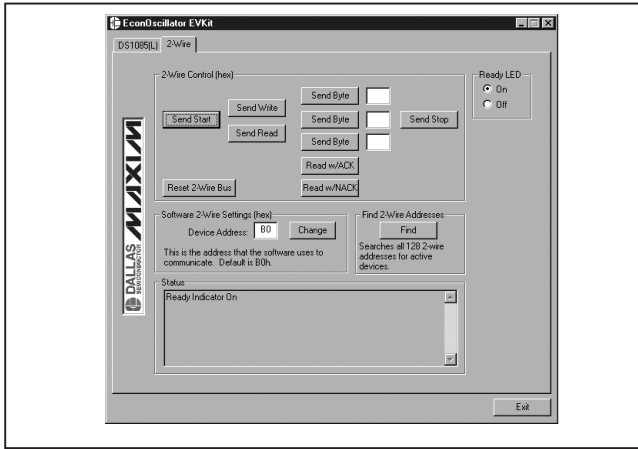11) The exit button closes the programming kit software.

Figure 6. The 2-Wire Page

Typical Programming Sequence

Screen shots of a typical programming sequence are shown in Figure 5. First select the specific device type and the then enter the desired frequency and press the Calculate button. Next, change the non-frequency related device settings and press the ———> button. Finally, press the Program button to program the part.

Reading a Device's Registers

To read a device's registers press the Read button. If the device is successfully read the software prompts the user to determine if it should update the device settings section to reflect the new register values. This is recommended because it decodes the hexadecimal registers into their easily understood decimal equivalents. If the software has trouble reading the part see *Troubleshooting*.

Using the 2-Wire Page

The 2-wire page (Figure 6) is used to change the 2-wire device address, enable and disable the ready LED, and as a flexible tool to communicate with any 2-wire device. Clicking on a 2-wire control immediately performs the corresponding function. A list of 2-wire functions is shown in Table 3.

The 2-Wire Device Address

The Send Write and Send Read buttons on the 2-wire page and the Read and Program buttons on the main page of the software use the Device Address as the 2-wire slave address when communicating. The software's default value matches the devices' factory default value of B0h. To change the device address, modify the value shown in the edit box and click the change button. The value entered into the box should be an even hexadecimal number equivalent to the slave address with a zero for the read/write bit ($R/\overline{W}$ = 0). The software automatically sends the slave address with $R/\overline{W}$ = 1 during read operations.

Enabling and Disabling the Ready LED

The ready LED on the DS1070K board can be enabled or disabled by clicking "ON" or "OFF" in the Ready LED section of the 2-wire page.

2-Wire Page Communication Functions

Table 3 shows a complete summary of the communication functions of the 2-wire page.

The Status Box

The 2-wire page's status box tracks all of the actions that have been recently performed. The status box automatically scrolls to allow the user to see an entire transaction.

Table 3. 2-Wire Page Function Descriptions

FUNCTION	DESCRIPTION
Send Start	Performs 2-wire start and repeated start functions.
Send Write	Writes the device address (R/W = 0) listed in the Software 2-Wire Settings section over the 2-wire bus.
Send Read	Writes the device address (R/W = 1) listed in the Software 2-Wire Settings section over the 2-wire bus.
Send Byte	Sends the hexadecimal byte in the edit box located immediately to the right of the send byte button over the 2-wire bus. Three Send Byte buttons are provided for the user's convenience.
Read w/ACK	Reads one byte and acknowledges (ACK) the data transfer.
Read w/NACK	Reads one byte and does not acknowledge (NACK) the data transfer.
Send Stop	Performs 2-wire stop condition.
Reset 2-Wire Bus	This function clocks the bus 9-times and sends a stop condition. In the event that the 2-wire bus appears to become non-responsive, the reset 2-wire bus function returns control of the bus to the user.
Find	The Find button searches for all the 2-wire devices present on the 2-wire bus and lists their addresses. This can be used to determine the address of a 2-wire device if it has been modified from its default value.

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Accessing a Device Using the 2-Wire Page

To access a device using the 2-wire page, the user must manually instruct the DS3900 to perform the 2-wire functions in the proper sequence. A DS1085 example is shown below.

Example: Write the offset register (memory address 0Eh) of a DS1085 (device address B2h) to 10h.

The user must:

1) Change the device address to B2h (B0h, software default).

2) Send start (issues a 2-wire start condition).

3) Send write (writes B2h, the device address, over the 2-wire bus).

4) Send data 0Eh (writes 0E, the memory address of the offset register).

5) Send data 10h (writes 10h, the data, to the offset register).

6) Send stop (issues a 2-wire stop condition).

_____Troubleshooting

This section offers suggestions for correcting common user problems with evaluation kits. Help beyond these suggestions can be obtained by email (MixedSignal.Apps@dalsemi.com) or by calling our technical support group at 972-371-4076.

Table 4. Troubleshooting Guide

SYMPTOM	CAUSE	SOLUTION
"Board Not Found" Error Message	Board not properly connected	Ensure the serial cable is connected between the PC and DS3900. Verify the DS3900 is firmly in place on the EV board. Verify the power is on. When the evaluation board is not found the software must be shutdown and restarted after the board is properly connected before it can be used.
Communication Errors	No oscillator in socket	Verify a device is in <u>one</u> of the sockets. Verify the type of oscillator in the socket is the type intended for programming.
	2-wire device address mismatch	Verify the device address on the 2-wire page matches the oscillator's slave address. The Find button on the 2-wire page can be used to verify the oscillator's slave address.
	DS3900 switches ON	Turn the DS3900 switches off.
	Device in socket backward	Ensure the pin 1 indicator of the device is properly oriented in the socket. See Figure 1.
	Board not properly connected	Occasionally kit board setup may be disturbed after the board is initially powered up. Re-verify board connections.
Not Able to Write to EEPROM	WC bit set	The Write Control (WC) bit allows the frequency of an oscillator to be changed without committing the changes to EEPROM. Deselect this bit to write to EEPROM.
Spread Control Switch Not Working	Jumper not installed	Install SPRD jumper. This jumper should only be installed when using DS1086(L) or DS1087(L) devices.
Output(s) Not Working	Control pin switches and/or control pin device settings mismatch	DS1077/85: Reprogram the part paying particularly close attention to the control bits. Ensure switches are in desired position. If only output 0 is not functioning, remove the SPRD jumper if it is populated. DS1086/87: Ensure switches are in proper position for operation. Both PDN and OE must be high for the output to oscillate.

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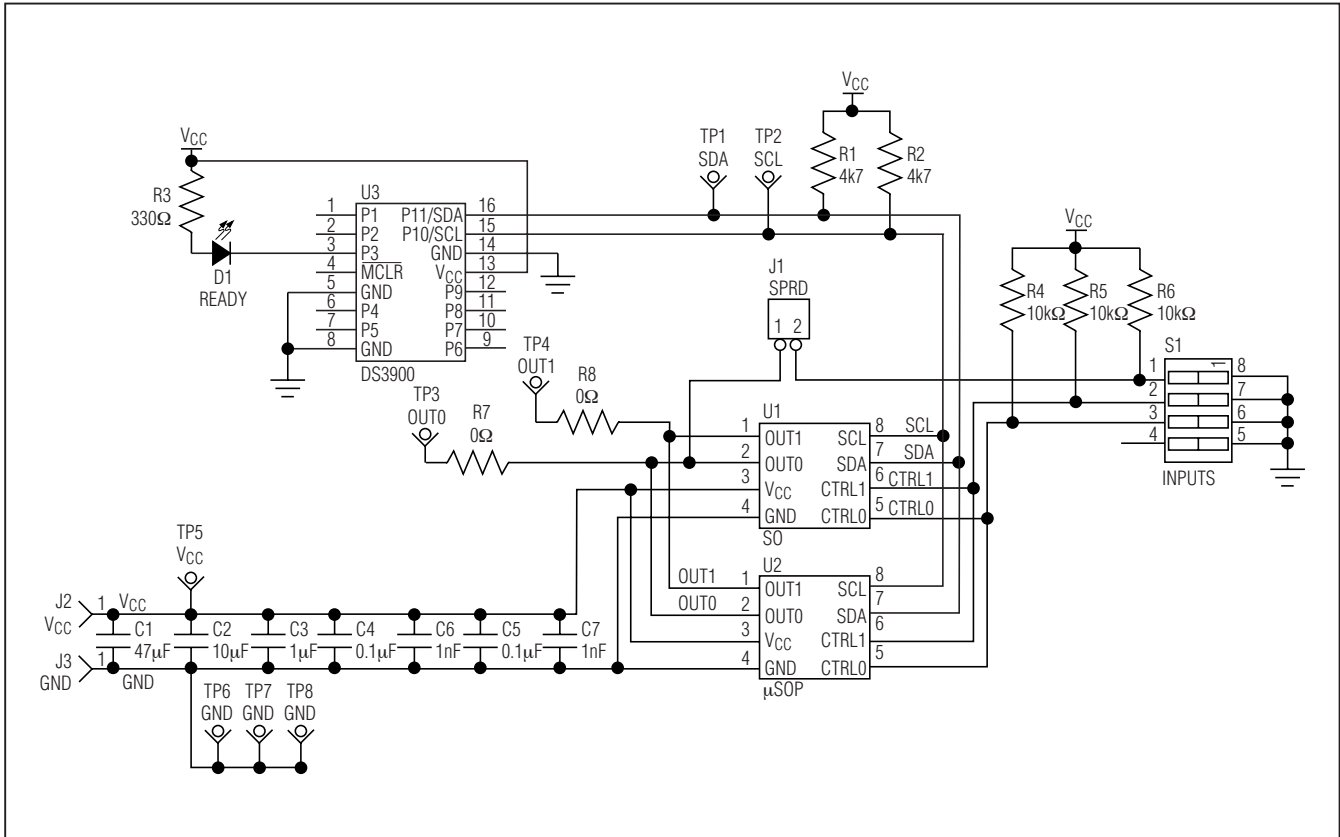
Figure 7. DS1070K Schematic