Si84xxISO Evaluation Board User's Guide

1. Introduction

The Si84xxISO evaluation board allows designers to evaluate Silicon Lab's family of ISOpro ultra-low-power isolators. These isolators are CMOS devices employing RF coupler technology to transmit digital information across an isolation barrier. Very high speed operation at low power levels is achieved. These products are based on Silicon Laboratories' proprietary RF isolation technology and offer shorter propagation delays, lower power consumption, improved noise immunity, smaller installed size, and more stable operation with temperature and age versus opto couplers. The Si841x/2x/3x/4x/5x/6x include up to six unidirectional isolated channels, permitting data transmission of data up to 150 Mbps. The Si840x series of isolators are single-package galvanic isolation solutions for I^2C, SMBus, and PMBus serial port applications. For more information, refer to the respective family datasheets.

A summary of the benefits provided by the Silicon Laboratories Si84xx ISOpro Digital Isolator family includes:

- High-speed operation
  - DC to 150 Mbps from –40 to 125 °C
  - <250 ps (peak) jitter
- Precise timing
  - Typical propagation delays <10 ns
  - 2 ns pulse width distortion
  - 1 ns channel-channel matching
  - 2 ns pulse width skew
- Ultra-low-power operation
  - <1.25 mA/channel @ 1 Mbps
  - Optional standby mode consumes <200 µA current
- I^2C compatible isolators
  - Bidirectional isolated Serial Data (SDA) and Serial Clock (SCL)
  - Data rates up to 1.7 Mbps
  - Available with two extra unidirectional isolated channels (Si8405)
- Robust noise tolerance
  - Up to 2.5 kVrms Isolation
  - >50 V/m immunity
  - 25 kV/µs common-mode transient immunity (CMTI)
  - FCC Class B compliant
- Class-leading ESD performance
  - 4 kV HBM, 2 kV CDM, 400 V MM
- Flexible packaging options
  - NB SOIC-8, WB SOIC-16, NB SOIC-16
  - RoHS-compliant

2. Kit Contents

The Si84xxISO Evaluation Kit contains the following items:

- Si84xxISO based evaluation board (Si84xxISO-EVB)
- Si8400, Si8421, Si8442 and Si8463 ISOpro digital isolators installed on the evaluation board
- Si84xxISO Evaluation Board User's Guide web site link (this document).

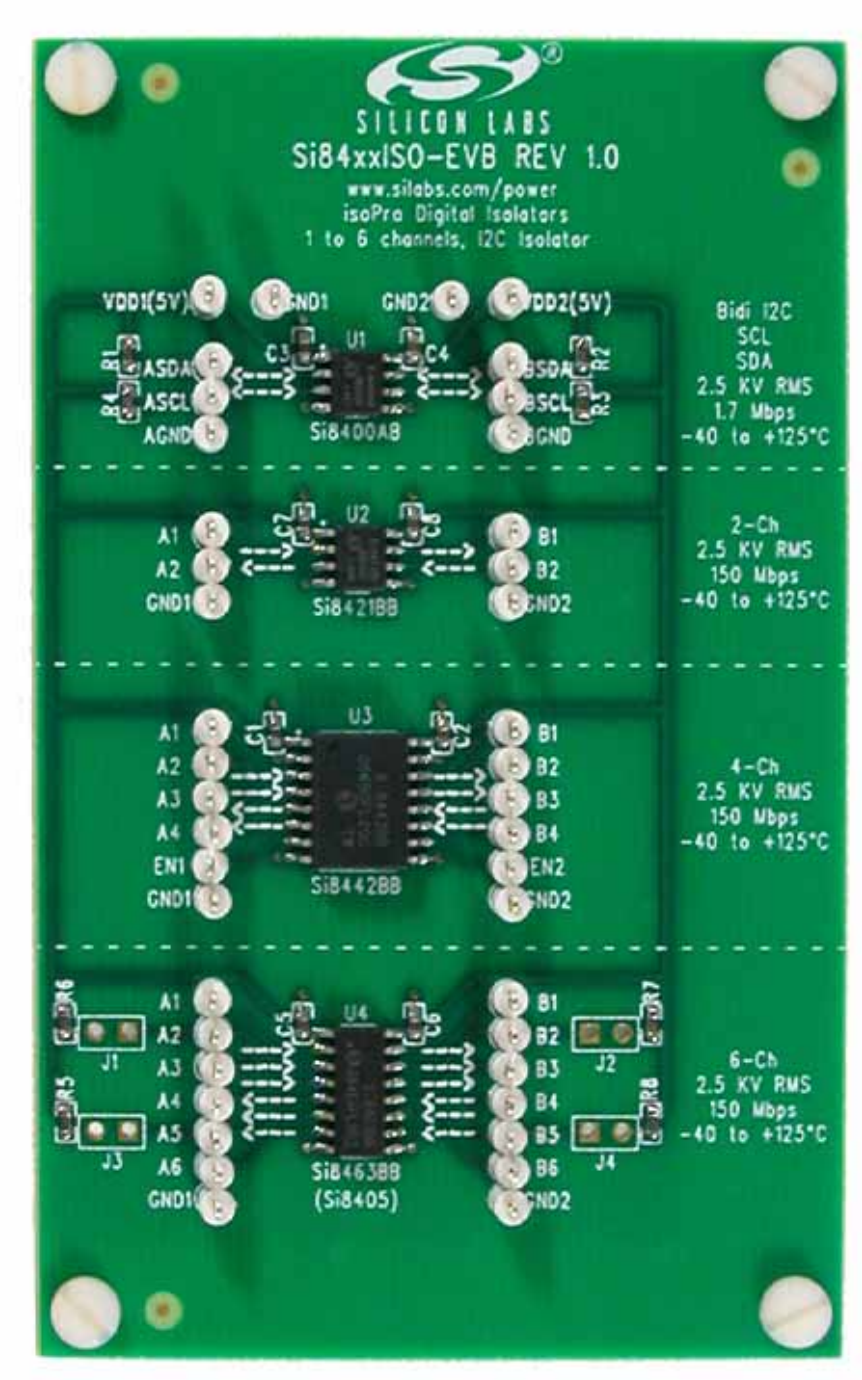

Figure 1. Si84xxISO Evaluation Board Overview

3. Hardware Overview and Setup

The Si84xxISO evaluation board comes populated with an Si8400 (isolated I^2C), Si8421 (2-channel digital isolator, one forward, one reverse), Si8442 (4-channel digital isolator, two forward, two reverse), and Si8463 (6-channel digital isolator, three forward, three reverse) installed. The board is designed to be powered from two separate 5 V supplies (100 mA) that power all the isolators on the board. Power should be applied to the board before evaluating any isolated channel. Power is applied by connecting 5 V supplies to the topmost terminals (VDD1 and GND1, VDD2 and GND2). Note that supplies as low as 2.7 V can be used. If a user wants to evaluate an isolator other than the ones pre-populated, this can be accomplished by removing the footprint-compatible device installed on the evaluation board and replacing it with the desired isolator device. Figure 2 provides a silkscreen overview of the board.

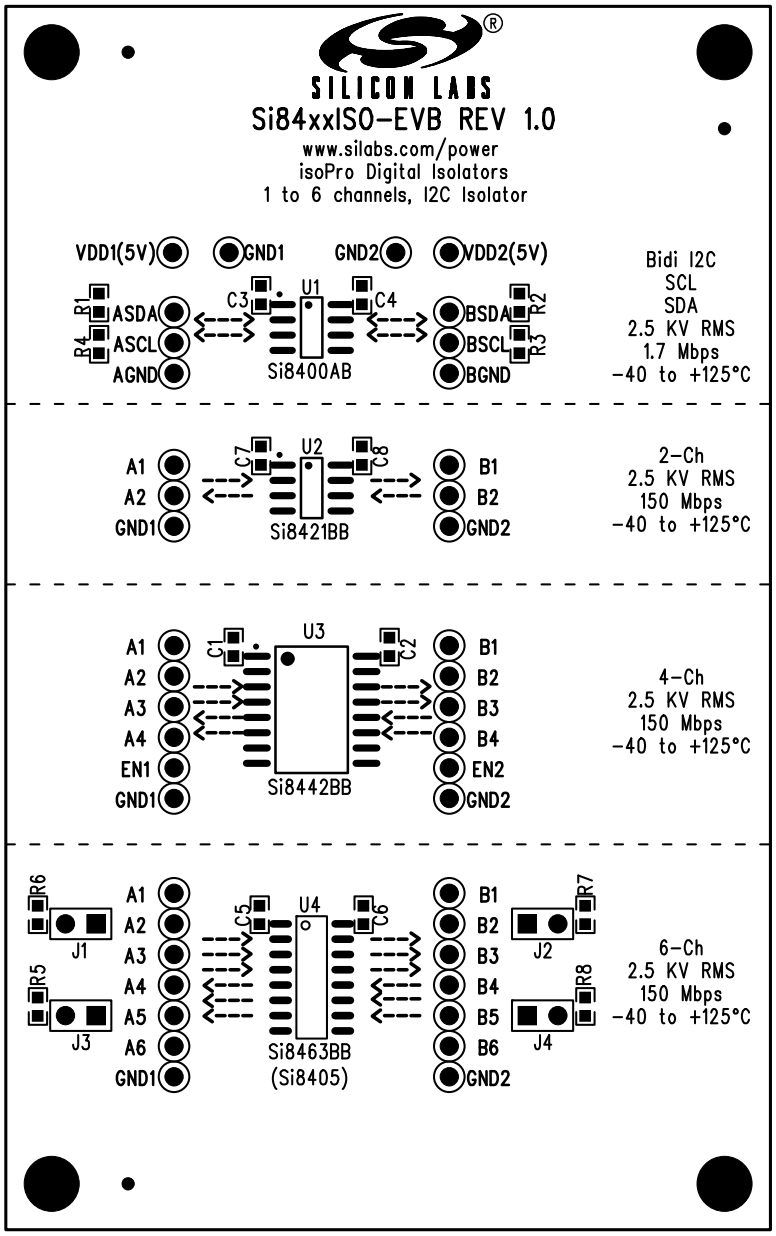

Figure 2. Si84xxISO Evaluation Board Silkscreen

3.1. Digital Isolator Considerations

The Si84xxISO evaluation board (see Figure 1) provides a means to evaluate the Si841x,2x,3x,4x,5x,6x digital isolator families as well as the Si8400 isolated I^2C family. After power has been supplied to the board, connect a digital input signal (5 Vpeak max, with desired clock frequency up to 150 Mbps) to the desired input channel. To view the isolated channel's data transmission, connect a scope probe to the output channel of interest. Note that there are various inputs and outputs on either side of the board depending on the device one chooses to evaluate, as indicated by the silk screen. The board can be used to measure propagation delay, pulse-width distortion, channel-channel matching, pulse-width skew, and various other parameters.

The nominal output impedance of an isolator driver channel is approximately 50 Ω, ±40%, which is a combination of the values of the on-chip series termination resistor and the channel resistance of the output driver FET. When driving loads where transmission line effects will be a factor, output pins should be terminated with 50 Ω controlled impedance PCB traces.

Figure 3 illustrates the Si8421 transmitting a 500 kHz (5 Vpeak) signal through the Si8421. Note that VDD1 and VDD2 were powered from 5 V. Channel 1 illustrates the input, and Channel 2 illustrates the output.

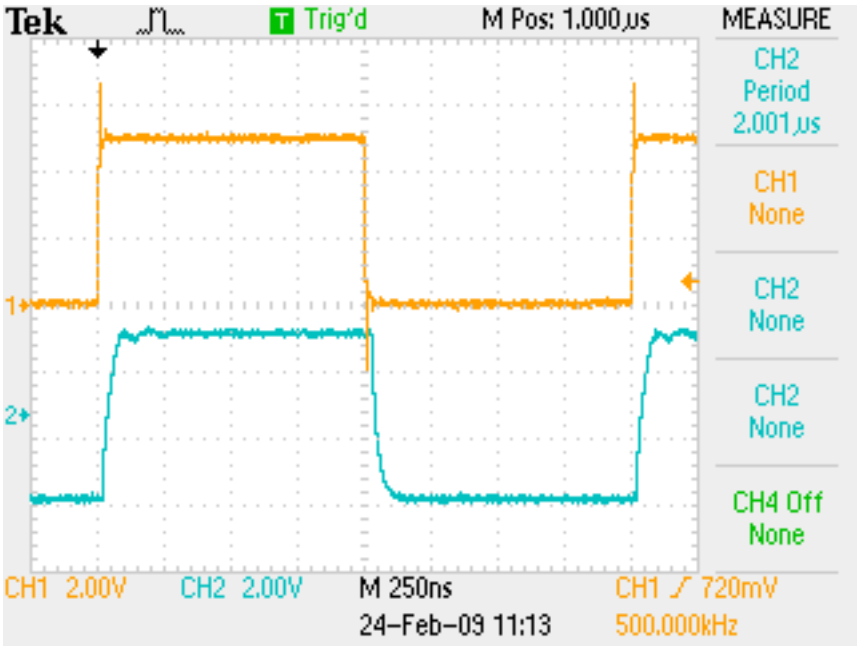

Figure 3. 500 kHz (5 V Peak) Signal

3.2. I²C Isolator Considerations

After power has been supplied to the board, connect a digital square wave input (5 Vpeak max, with desired clock frequency up to 1.7 MHz) to the desired input channel. The Si8400 I²C isolator has 1 kΩ pull-up resistors already installed. If these resistors are redundant with another board that is being used to evaluate the Si8400, the user should remove the redundant pull-up resistors to accommodate adequate drive current for the test being performed. Moreover, note that the Si8463 can be replaced with an Si8405 (Bidirectional I²C Isolator with two unidirectional digital channels). Pull-up resistors of 1 kΩ are already installed to accommodate the Si8405's evaluation. Pull-up jumpers J1, J2, J3, and J4 need to be installed to evaluate the Si8405. They will need to be removed or not installed (default from factory) to evaluate the Si8463.

Figure 4 illustrates Side B Pulling Up, with Side A following for the Si8400. The Si8400 was powered from 5 V on both sides with a 100 kHz input test signal.

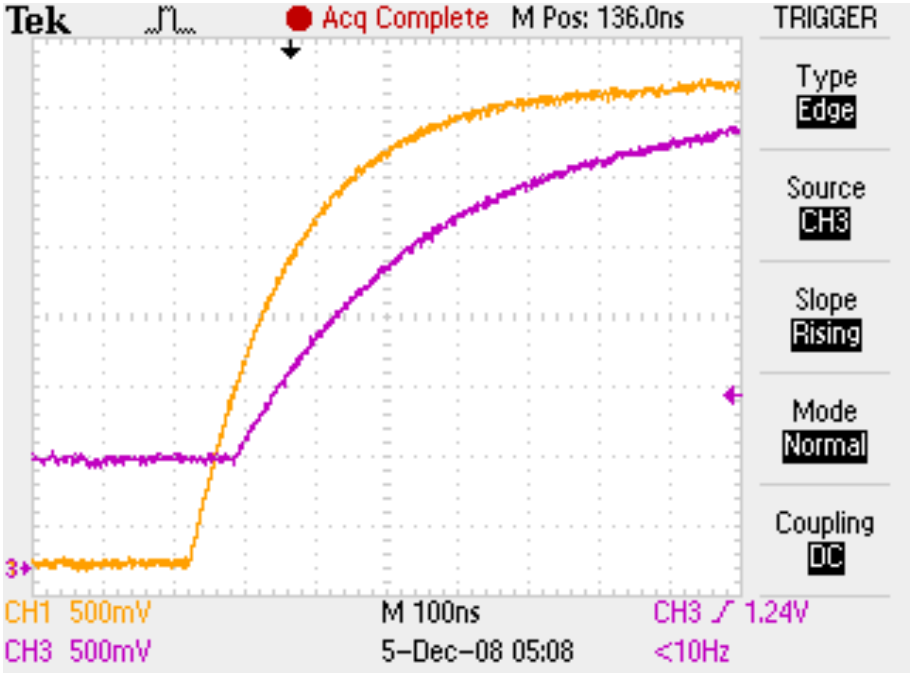

Figure 4. Side B Pulling Up, Side A Following

Note: The test points in front of each device have 1 mm spacing. If desired, the test points can be replaced with a 1 mm spacing terminal block to assist in evaluation.

4. Si84xxISO Evaluation Board Schematic

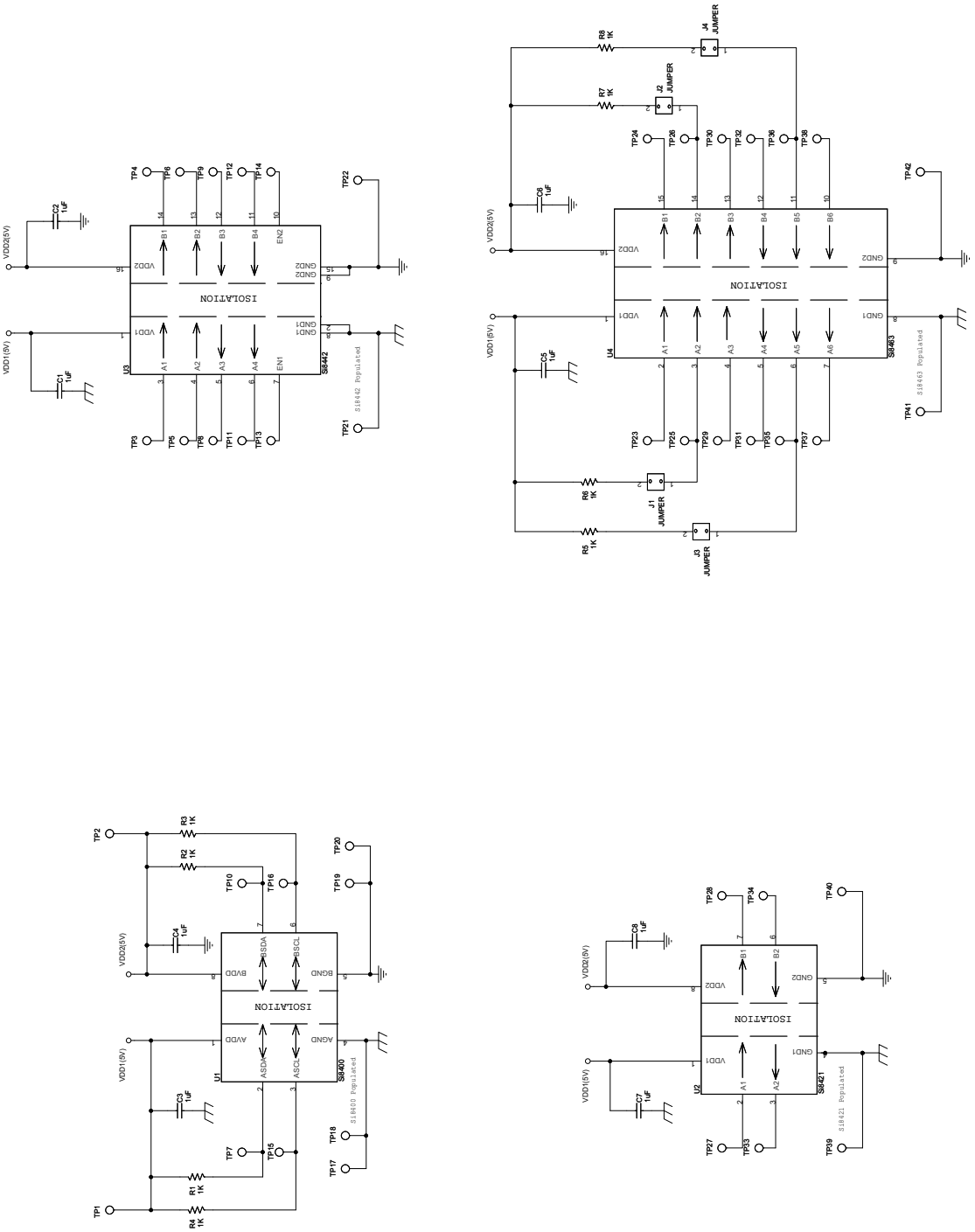

Figure 5. Si84xxISO Evaluation Board Schematic

5. Bill of Materials

Table 1. Si84xxISO Evaluation Board Bill of Materials

Item	Qty	Reference	Value	Voltage	Tol	Part Number	Mfr
1	8	C1,C2,C3,C4, C5,C6,C7,C8	1 µF	25 V	±10%	C0603X5R250-105K	Venkel
2	4	J1,J2,J3,J4	Jumper			TSW-102-07-T-S	Samtec
3	8	R1,R2,R3,R4, R5,R6,R7,R8	1 kΩ		±1%	CR0603-10W-1001F	Venkel
4	42	TP1,TP2,TP3,TP4, TP5,TP6,TP7,TP8, TP9,TP10,TP11, TP12,TP13,TP14, TP15,TP16,TP17, TP18,TP19,TP20, TP21,TP22,TP23, TP24,TP25,TP26, TP27,TP28,TP29, TP30,TP31,TP32, TP33,TP34,TP35, TP36,TP37,TP38, TP39,TP40,TP41, TP42	White			151-201-RC	Kobiconn
5	1	U1	Si8400	2500 VRMS		Si8400AB-A-IS	SiLabs
6	1	U2	Si8421	2500 VRMS		Si8421AB-C-IS1	SiLabs
7	1	U3	Si8442	2500 VRMS		Si8442BB-C-IS	SiLabs
8	1	U4	Si8463	2500 VRMS		Si8463BB-A-IS1	SiLabs

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