PSDB_SDI

(Serial Digital Interface Daughterboard)

Preliminary Data Book
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1. Introduction

The GiDEL line of ***PROC boards*** provides a high capacity, high-speed FPGA-based platform equipped with high throughput and massive memory resulting in a powerful and highly flexible system. The PROC boards are designed to support GiDEL daughterboards (**PSDB**s) enabling to connect external IO lines, to add unique features, and to expand the FPGA's connectivity.

The GiD*EL **PSDB_SDI*™** daughter board enables a Serial Digital Interface(SDI) connection to the GiDEL ***PROC*** boards. ***PSDB_SDI*** supports most SDI standards including: 3G-SDI, HD-SDI and SD-SDI.

The Gidel PSDB family includes two types of daughterboards referred to as **PSDB1** and **PSDB2**, each composed of single and dual connectors, respectively. The ***PSDB_SDI*** is a PSDB1-type daughterboard. To determine if your PROC board supports PSDB1 daughterboards, refer to the ***PSDB Compatibility Data Sheet.***

2. PSDB_SDI Key Features

PSDB_SDI key features include:

- ✓ Supports 270 Mbps SD-SDI standard, as defined by SMPTE259M-1997 10-Bit 4:2:2 Component Serial Digital Interface
- ✓ Supports 1.5-Gbps HD-SDI standard, as defined by SMPTE292M-1998 Bit-Serial Digital Interface for High Definition Television Systems
- ✓ Supports 2.97 Gbps 3G-SDI standard, as defined by SMPTE 424M
- ✓ 5 SDI channels: 1 dedicated IN, 1 dedicated OUT and 3 IN/OUT channels using 75 Ω BNC connectors
- ✓ Auto detect and auto switch features between SD, HD, and 3G-SDI
- ✓ Gidel PROCWizard software PSDB_SDI auto detect

3. System Description

PSDB_SDI modules include equalizers and cable drivers for transmitting and receiving SDI signals and a Gidel SDI controller interfacing between the SDI interface and the Gidel PROC board.

The following schematic illustrates the ***PSDB_SDI*** signal flow:

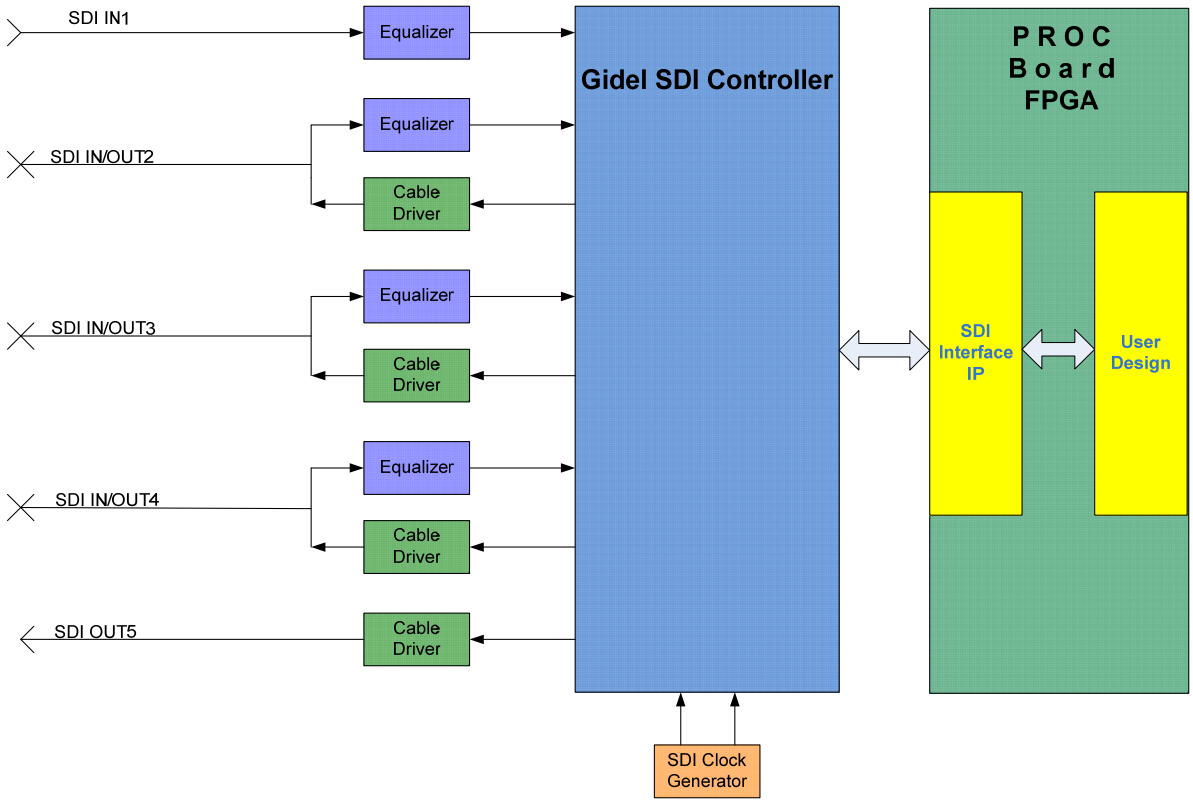

Figure 1: PSDB_SDI Signal Flow Block Diagram

The SDI signals connect to the ***PSDB_SDI*** via five 75 Ω BNC connectors. The five SDI channels function as follows:

Channel	I/O Funtion
IN1	Input
IN/OUT 2	Input/Output(software selectable)
IN/OUT 3	Input/Output(software selectable)
IN/OUT 4	Input/Output(software selectable)
OUT5	Output

Table 1: SDI Channels I/O Functions

SDI controller automatically detects the SDI standard of incoming stream, SD-SDI, HD-SDI or 3G-SDI.

4. System Connectivity

The following table describes the signals and buses as they appear in the top-level design generated by ***GiDEL PROCWizard***.

Signal	Function	Direction
sdi1_in[19:0], sdi2_in[19:0], sdi3_in[19:0] sdi4_in[19:0]	Parallel data received from channel 1,2,3 and 4 This data is synchronized with sdi1_in_clk to sdi4_in_clk respectively. SD-SDI :[19:10] - unused, [9:0] – multiplexed Y,Cr,Y,Cb HD-SDI:[19:10] - Y, [9:0] -C	Output
sdi1_in_clk sdi2_in_clk sdi3_in_clk sdi4_in_clk	Clock to data reception from channels 1 to 4. SD-SDI - 148.5 MHz HD-SDI - 74.25 MHz	Output
sdi1_dval sdi2_dval sdi3_dval sdi4_dval	Data valid signal for sdi1_in to sdi4_in data signals, determines whether the received data is valid. Synchronized with sdi1_in_clk to sdi4_in_clk respectively. SD-SDI – goes high for one clock each 5 clocks. HD-SDI - Constantly high	Output
sdi2_out sdi3_out sdi4_out sdi5_out	Parallel data transmitted to channels 2,3,4 and 5 The data on this bus must be synchronized to clocks sdi2_out_clk to sdi5_out_clk respectively. SD-SDI:[19:10] - unused, [9:0] - multiplexed Y,Cr,Y,Cb HD-SDI:[19:10] - Y, [9:0] -C	Input
sdi2_out_clk sdi3_out_clk sdi4_out_clk sdi5_out_clk	Clocks for parallel data transmit for sdi2_out to sdi5_out SD-SDI - 27 MHz HD-SDI - 74.25 or 74.175 MHz depending on the outgoing data frame rate	Output
sdi2_dir sdi3_dir sdi4_dir	Reports the direction of each bidirectional channel 2,3 and 4. '0' - Input '1' - Output	Output

Table 2 : SDI I/Os

5. *PSDB_SDI* LEDs

The Gidel PSDB_SDI daughterboard has seven LEDs enabling to monitor visually the board's operations.

There are two types of LEDs:

1. **General Purpose LEDs**: 4 LED for monitoring board's general operations
2. **IN/OUT Channel LEDs**: 3 LEDs, one per IN/OUT channel, for monitoring the channel's mode of operation

The LEDs are located on the PSDBs component side as shown in the following figure:

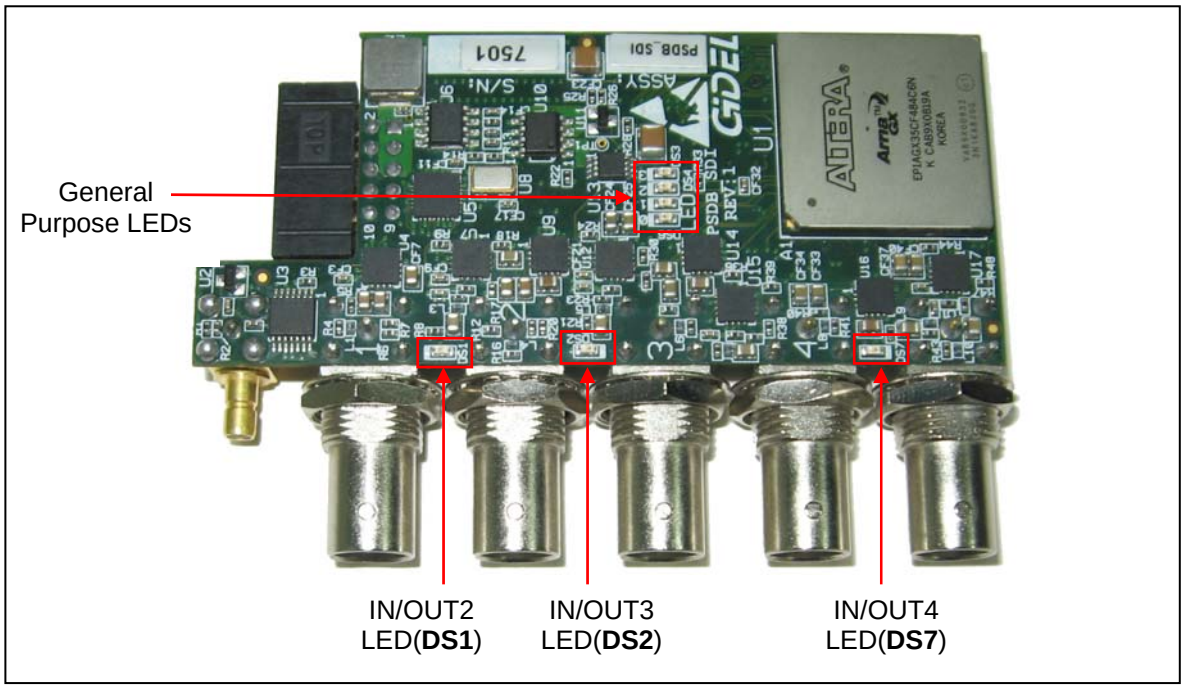

Figure 2: PSDB_SDI LEDs

The General Purpose LEDs indicate the following:

LED	Indication
LED0	Blinks when the on-PSDB FPGA die temperature reaches 70 C
LED1	N/A
LED2	N/A
LED3	**ON** if PSDB_SDI has loaded successfully

Table 3 : General LED Functions

The IN/OUT LEDs function as follows:

LED	Indication
DS1	**ON** if IN/OUT2 is in input mode. **OFF** if IN/OUT2 is in output mode
DS2	**ON** if IN/OUT3 is in input mode. **OFF** if IN/OUT3 is in output mode
DS7	**ON** if IN/OUT4 is in input mode. **OFF** if IN/OUT4 is in output mode

Table 4 : IN/OUT LED Functions

6. *PSDB_SDI* Power Consumption

The PSDB_SDI daughterboard receives its power form the PROC board as detailed in the following table:

Voltage	Maximal current [A]
3.3V	0.8
12V	0.15

Table 5 : PSDB_CL_IO power consumption

The PSDB_SDI maximum power consumption is:

$$\mathbf{P_{Total}} = 3.3\times0.8+12\times0.15 = 4.44\ \text{W}$$

7. Mechanical Specifications

PSDB_SDI is a compliant with the PSDB1 mechanical description as detailed in Figure 3**.**

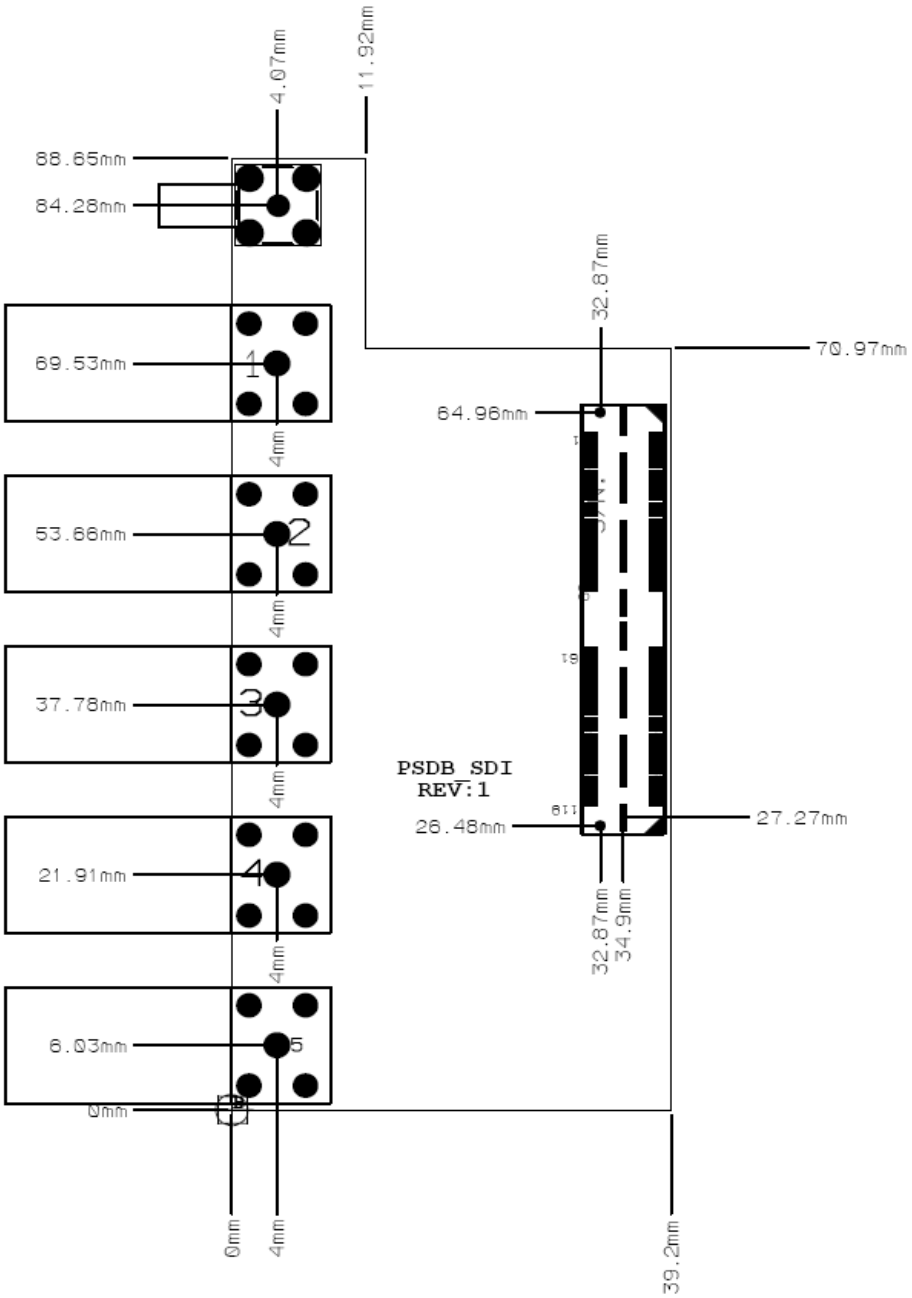

Figure 3: *PSDB_SDI* Mechanical Dimensions (top view)

8. Installation

To install the ***PSDB_SDI*** daughterboard, perform the following steps:

1. Turn off the system power.
2. Dismount the PROC board from the computer slot.
3. Select on the PROC board a PSDB mounting position in accordance to the board's Data Book. Note that ***PSDB_SDI*** is a PSDB type1 board.
4. Mount the ***PSDB_SDI*** daughterboard onto the PROC board, insuring that the connectors' orientation is correct.
5. Unscrew the BNC connector's nuts, insert a metal bracket, and screw back the nuts.
6. Mount the PROC board onto the computer slot and secure with a screw.
7. Secure with a screw the ***PSDB_SDI*** bracket onto the computer's chassis.
8. Connect the external SDI cables to the BNC connector
9. Power up the computer and run the GiDEL PROCWizard software. The PROCWizard will automatically recognize the ***PSDB_SDI***.

9. Getting Started

The PROCWizard software automatically identifies the ***PSDB SDI*** and accordingly generates the top-level connections between the PROC board and the ***PSDB SDI***.

To begin working with your installed ***PSDB_SDI***, the ***PSDB_SDI*** daughterboard must first be initialized. At power-up, the ***PSDB_SDI*** default values are as follows:

- All SDI channels are disabled
- All channels are set to Input mode.
- Output channels are set to Group 1 frame rate type.

The PROC API has a class of SDI functions that enable the user to initialize and configure the ***PSDB_SDI***. In general, the SDI class includes:

- ***PSDB_SDI*** general functions such as POF version, board temperature, revision number and assembly revision.
- Data control functions such as I/O channel direction, channel enable, channel reset, channel status and so forth
- SDI configuration functions such as SDI standard and frame rate.

For detailed explanations of the SDI functions, please refer to the ***PROC API*** document.

Gidel provides an example file that demonstrates the initialization workflow. The example file, ***SDI_Example.qar***, is located in the ***C:\Program Files\PROCWizard\examples*** directory.

When outputting SDI data from PROC board, the user **must** encode the data in accordance to the SDI standard format as defined by SMPTE 259, 274 and 292.

10. Revision History

Table 6: Data Book History

Date	Changes
04/2009	Initial document