TIME SLOT INTERCHANGE

DIGITAL SWITCH

256 x 256

FEATURES:

- 256 x 256 channel non-blocking switching at 2.048 Mb/s
- Accept 8 serial data streams of 2.048 Mb/s
- Per-stream frame delay offset programming
- Connection memory block programming
- Microprocessor Interface

DESCRIPTION:

The TDM Switch core is a non-blocking digital switch that has a capacity of 256 x 256 channels at 2.048 Mb/s. The serial input streams can have a bit rate of 2.048Mb/s and are arranged in 125 µs wide frames, witch contain 32 channels respectively. The data rates on input and output streams are indentical. All data received at negative edge of CLK_OUT and transmitted at positive edge of CLK_OUT. Some of the main features are: Processor Mode and input offset delay.

This IP core is synthesized for XILINX SPARTAN-II series FPGA, fit at xc2s50-6tq144 device and the post place & route simulation model simulate with Cadence NC-SIM simulator. In Table 2 we can find information about project files.

The Figure 1 describes the block diagram of Time Slot Interchange Digital Switch IP core.

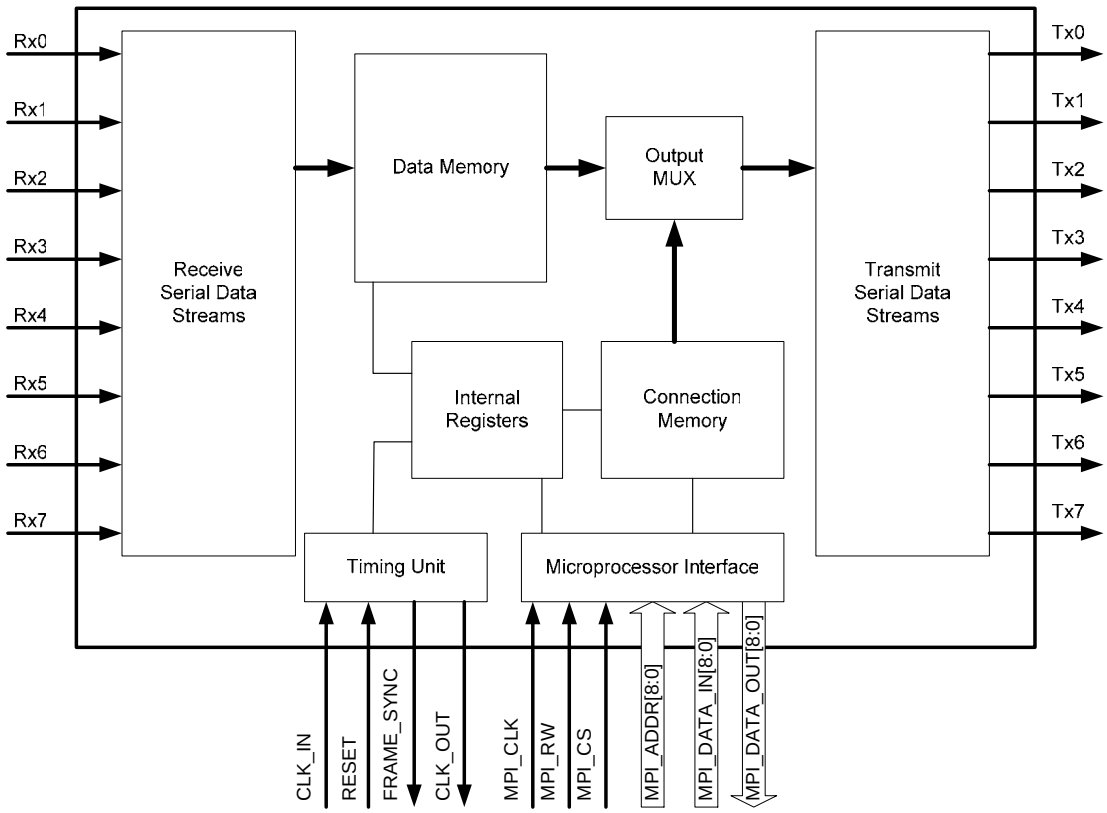

Figure 1. Block Diagram

PIN DESCRIPTION

The following table is defining the IP core pinout.

Table 1

SYMBOL	*NAME*	*I/O*	*DESCRIPTION*
Tx0-Tx7	*TX Output 0 to7*	**O**	Serial data output stream. These streams have a data rate of 2.048 Mb/s.
Rx0-Rx7	*RX Input 0 to7*	**I**	Serial data input stream. These streams have a data rate of 2.048 Mb/s.
CLK_IN	*Input Clock*	**I**	Serial clock for generation internal sync pulses. This input accepts a 4.096 MHz clock.
CLK_OUT	*Output Clock*	**O**	Serial clock for shifting data in/out on the serial streams (RX/TX 0-7). This output generate 2.048 MHz clock.
FRAME_SYNC	*Frame Sync. Signal*	**O**	Frame sync output. This output generate 8 kHz (125 us) frame pulses.
RESET	*Device Reset*	**I**	This input (active LOW) puts the device in its reset state that clears the device internal counters, registers. The time constant for a power up reset circuit must be a minimum of five times the rise time of the power supply. In normal operation, the RESET pin must be held LOW for a minimum of 100ns to reset the device.
MPI_CLK	*Memory clock*	**I**	Microprocessor interface input clock. To internal connection memory and control registers accessed with positive edge of MPI_CLK
MPI_RW	*Read/Write*	**I**	Microprocessor interface Read/Write input. The logic “1” is Read, “0” is Write.
MPI_CS	*Enable*	**I**	Microprocessor interface Chip Select input. The logic “1” define access to this chip.
MPI_ADDR	*Address [8-0]*	**I**	These lines provide the A8-A0 address lines to the internal memories.
MPI_DATA_IN	*Data Input [8:0]*	**I**	These lines provide the D8-D0 data input lines to the internal memories.
MPI_DATA_OUT	*Data Output [8:0]*	**O**	These lines provide the D8-D0 data output lines to the internal memories.

MEMORY MAP

The IP core consist of two memory ***DATA*** and ***CONNECTION***. The data memory consist two banks of memories. In first frame the data from input streams are stored in the data memory ***Bank 1***. At this time the data from data memory ***Bank 2*** are transmitted to output streams. In second frame the data memory banks are swap around.

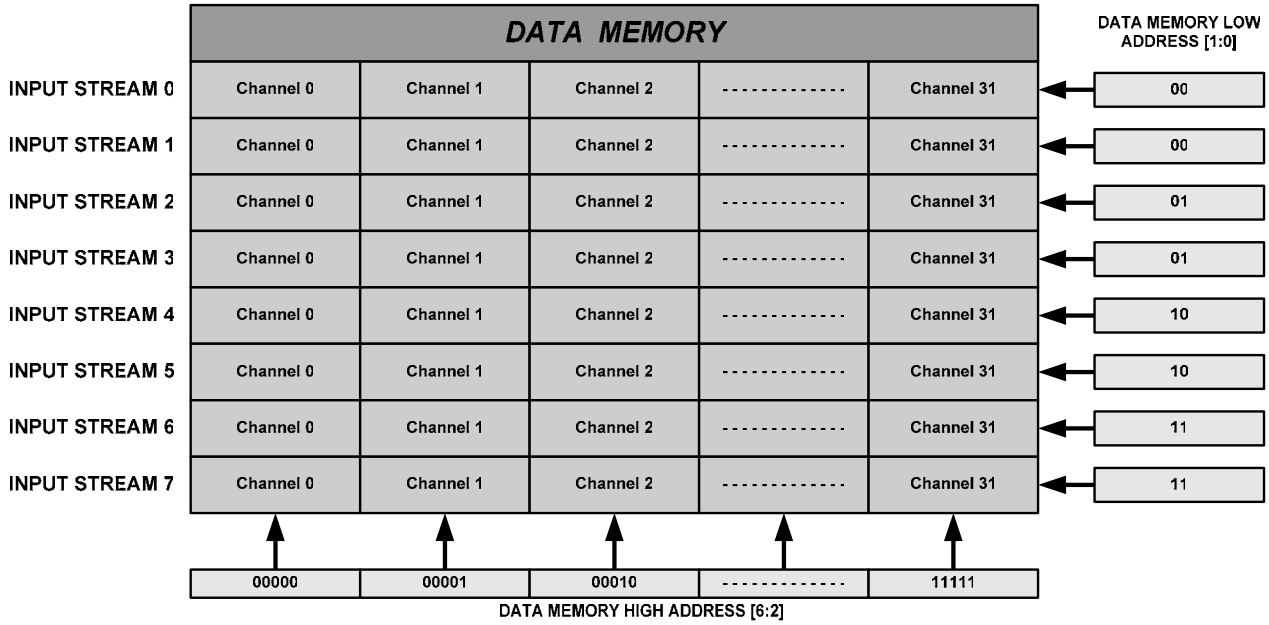

Figure 2. Data Memory Bank Map

The ***CONNECTION*** memory loaded from microprocessor interface (***MPI***) and consist information about connection between data memory and output streams.

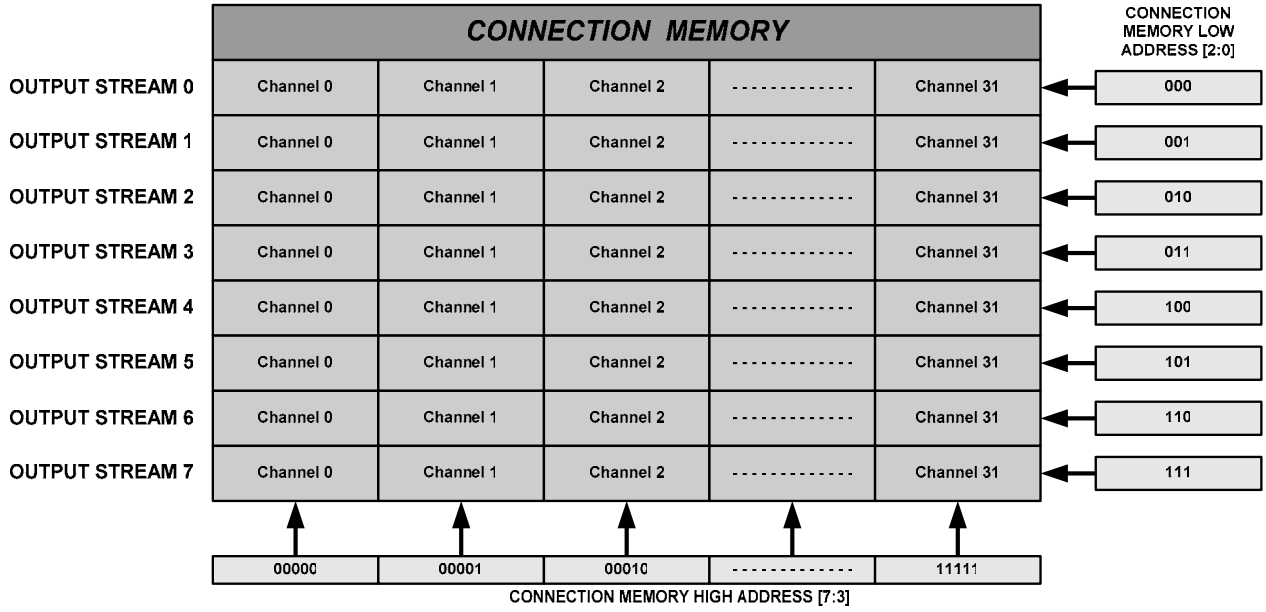

Figure 3. Connection Memory Map

FRAME DELAY REGISTERS also loaded from MPI. This registers are responsible to frame delay for each input stream correspondingly.

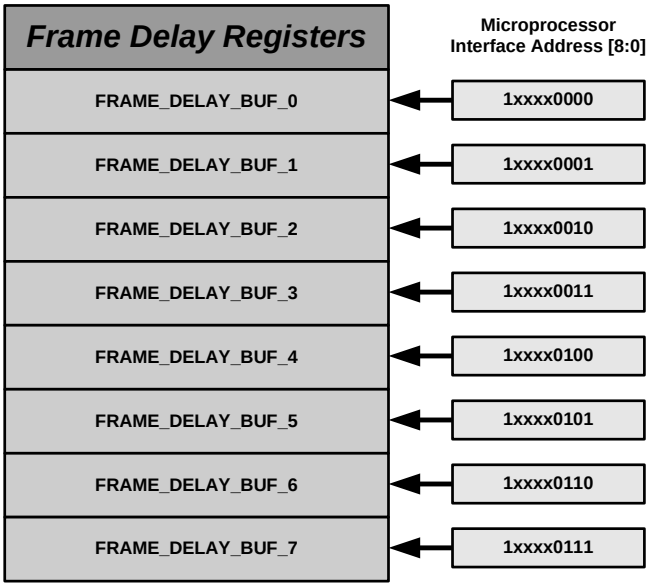

Figure 4. Frame Delay Registers Map

The Time Slot Interchange Digital Switch IP core files

Table 2

NAME	DESCRIPTION
TDM_Switch_DS.pdf	Data Sheet file
tdm_switch_top.v	Top module of Time Slot Interchange Digital Switch
tdm_switch_b.v	Top module of TDM Switch for behavioral simulation
testbench_top.v	Testbench for top module
map.dat	Data file for connection memory (line 1-256) and frame delay registers (line 257-264)
stream_0.dat	Data for input stream 0
stream_1.dat	Data for input stream 1
stream_2.dat	Data for input stream 2
stream_3.dat	Data for input stream 3
stream_4.dat	Data for input stream 4
stream_5.dat	Data for input stream 5
stream_6.dat	Data for input stream 6
stream_7.dat	Data for input stream 7
sim_result.dat	Simulation result file created by testbench “testbench_top.v”