

SATA-IP Device Demo Instruction on AC701

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This document describes SATA-IP Device evaluation procedure on AC701 using SATA-IP Device reference design bit-file. This design support fixed SATA-II speed.

1 Environment Requirement

To run the demo on FPGA development board, please prepare following environment

- 1. Xilinx Artix-7 FPGA AC701 Evaluation Kit
- 2. PC which supports SATA-II speed for connecting with SATA-II storage.
- 3. PC with installing Xilinx programmer software (Vivado) and SATA device connector on PC. <u>Note</u>: Serial console software such as HyperTerminal or TeraTerm for optional to monitor status. Set baud rate=115,200 / data=8bit / Non-Parity / Stop=1bit.
- 4. AB02-CROSSOVER with SATA standard cable to be SATA crossover cable
- 5. AB10-PATAFMC to be SATA connector of AC701 board
- AB14-CLKSMA to be clock generator for SATA application <u>Note</u>: AB02-CROSSOVER, AB10-PATAFMC, and AB14-CLKSMA are provided by Design Gateway
- 7. micro USB cable for programming FPGA, connecting between FPGA board and PC
- 8. (Optional) mini USB cable for Serial console, connecting between FPGA board and PC



Figure 1-1 SATA device demo test environment



2 Demo setup

- 1. Power off system
- 2. Connect AB14-CLKSMA board to AC701 board. J1 and J2 which are SMA connector on AB14-CLKSMA board are connected to J25 and J26 which are SMA connector on AC701 board, as shown in Figure 2-1.
- 3. Connect power connector (Red cable) of AB14-CLKSMA board to pin 1 of J54 on AC701 board, as shown in Figure 2-1.

Note: AB14-CLKSMA board is provided by Design Gateway.



Figure 2-1 CLKSMA board connecting to AC701 board

4. As shown in Figure 2-2, connect SATA cable to AB02-CROSSOVER and then connect to AB10-PATAFMC. After that, connect another side of SATA cable to SATA-II connector on PC.





5. Connect AB10-PATAFMC to FMC-HPC connector (J30) on AC701, as shown in Figure 2-3



- 6. Connect micro USB cable from Digilent (U26) on AC701 board to PC for JTAG programming as shown in USB connector on AC701.
- (Optional) Connect mini USB cable from AC701 board to PC for UART connection to display debug message. Open serial monitoring software such as TeraTerm. Terminal settings: Baud Rate=115,200 / Data=8 bit / Non-Parity / Stop=1.



8. Connect Power cable to AC701 board and then power up.



9. Download and program configuration file and firmware to AC701 by using Vivado tool, as shown in Figure 2-5.



Figure 2-5 Programming configuration file

10. After FPGA starts operation, check GPIO LEDs status on AC701 board at LED0-LED1 that must be ON, as shown in Figure 2-6. Each LED description is described in Table 2-1.



Figure 2-6 LED status after system set up complete

Table 2-1 LED Status of device reference design on AC701 board

LED	ON	OFF		
LED0	OK	150 MHz of SATA clock on CLKSMA cannot lock.		
		Please check 150 MHz clock source on CLKSMA board.		
LED1	OK	SATA-IP cannot detect SATA-II host (PC).		
		Please check SATA-II host and the connection.		
LED2	Always OFF			
LED3				



11. (Optional) On PC Serial console, "Start SATA device design" and "Link up" are displayed, as shown in Figure 2-7. Now new disk is ready for Host PC.

	IP Information
+++ SATAIP SATA Device T	est design [IPVer = 4.3] +++
Start SATA Device design	
Link up	Welcome message
SATA connection is	link up

Figure 2-7 Welcome message and status of SATA device demo



3 Operation Test on OS

 Open Device Manager on Windows10 OS. New SATA Device disk (DG SATA Device) is detected under "Disk drives". If new disk is not auto-detected, open device manager and then select "Scan for hardware changes" under Disk drives icon to re-start new disk detection.

<u>Note</u>: If the SATA device is connected as hot-plug (run after Windows OS boot-up completely), the M/B must be configured to support hot-plug detection on SATA connection. Otherwise, the user needs to reboot the PC to detect the new disk.



2. Generally, the pop-up menu to initialize disk is displayed. Click "OK" button to confirm new disk initialization, as shown in the right window of Figure 3-2.

<u>Note</u>: If no pop-up menu is displayed, select Computer Management -> Disk Management. The new disk which is unallocated is displayed. Select the new disk and select Initialize Disk menu, as shown in the left window of Figure 3-2.

If new disk which is unallocated is not displayed, please close and re-open Disk Management.





3. Wait until disk initialization is completed. After that, run the new disk test by Format the new disk. The first step is creating the new partition by right-click at Unallocated disk and select "New Simple Volume...". After that, "New Simple Volume Wizard" is displayed. Click "Next" button to continue next step.





4. Click "Next" button for 3 times to continue next step, and then click "Finish" button to start Format disk. Wait until Format is completed.

New Simple Volume Wizard		× New Simple Volu	ume Wizard X
Specify Volume Size Choose a volume size that is betw	veen the maximum and minimum sizes.	Assign Drive For easier a	Letter or Path access, you can assign a drive letter or drive path to your partition.
Maximum disk space in MB: Minimum disk space in MB: Simple volume size in MB:	750 8 750	Assign t Mount i Do not a	the following drive letter: D ~ In the following empty NTFS folder: Browse assign a drive letter or drive path
New Simple Volume Wizard	< Back Next > Cancel	X New Simple Volu	< Back Next > Cancel
To store data on this partition, you	u must format it first.		Volume Wizard
Choose whether you want to form Do not format this volume 	at this volume, and if so, what settings you want to use.		You have successfully completed the New Simple Volume Wizard. You selected the following settings: [Volume type: Simple Volume
Format this volume with the	following settings		Disk selected: Disk 3 Volume size: 750 MB
<u>Fi</u> le system:	NTFS ~		Drive letter or path: D: File system: NTFS
Allocation unit size:	Default ~		Volume label: New Volume
<u>V</u> olume label:	New Volume		To close this viscost cital. Date:
Perform a quick form	at		to ciose this wizard, click Hinish.
<u>Enable file and folder</u>	r compression		
	< Back Next > Cancel		< Back Finish Cancel
	Figure 3-4 F	Format menu s	setup





Figure 3-5 Format Complete

5. When the format is completed, new drive is ready to use, as shown in Figure 3-5. Now the user can run disk benchmark such as CrystalDiskMark for checking the operation and disk performance. Figure 3-6 shows example of disk performance by using CrystalDiskMark benchmark.

🖀 CrystalDiskMark 7.0.0 x64 [ADMIN] — 🗆 🗙				
<u>F</u> ile <u>S</u> ettings <u>P</u> rofile <u>T</u> heme <u>H</u> elp <u>L</u> anguage				
9 ~ 512MiB ~ D: 2% (17/750MiB) ~ N				
	Read [MB/s]	Write [MB/s]		
SEQ8M	224.04	210.20		
Q8T1	25 4.84	2 19.50		
SEQ8M	222.45	247.50		
Q1T1	233.15	217.58		
RND4K	100.40	100 50		
Q32T16	106.48	100.59		
RND4K	74 45			
Q1T1	/1.45	66.64		

Figure 3-6 Disk perfornance test by benchmark (SATA-II device demo)



4 Revision History

Revision	Date	Description
1.0	11-Apr-14	Initial version release
1.1	17-Jun-21	Update adapter and SATA speed