



Performance Report

SD/eMMC Host Controller IP Core

IP Ver:3.0 Date: 01-01-16

This report is intended to provide the information about the SLS SD/eMMC Host Controller IP core performance on USB3.0 Development board for eMMC Flash.

eMMC Performance

System Configuration:

Test Setup	
Development Board	USB 3.0 Development Board (r1c)
CPU/Memory Configuration	NIOS II/f 100MHz/64Mb SDRAM
Cache Memory	4KByte Instruction Cache
SD/eMMC Host Controller	
IP Core	SLS SD/eMMC Host Controller
Version	3.0
eMMC Frequency	50MHz
Interface Mode	DDR 8 Bit
eMMC	
eMMC Manufacturer	SanDisk
Size	4GB
Platform and Driver	
OS	Windows
Software Tools	Quartus II and NIOS II
Driver	SLS SDHC HAL
Driver Version	4.0.0

Test #1: Memory Data Performance Test

The memory data performance test is conducted using SD/eMMC Host Controller performance design which uses timer to measure the read/write speed to/from eMMC. The raw data stored in SDRAM is read/write on specified address for specified number of blocks of eMMC using DDR 8 bit interface mode. For one block the length of data is 512 bytes. Table-1 shows the performance report carried out on 4GB eMMC.

Table 1: Memory Data Performance Report			
eMMC		Speed(MB/s)	
eMMC Size	Block Depth	Read	Write
4GB	10K	35.87	18.5
	5K	33.1	13.8
	1	1.0	0.65



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Test #2: Mass Storage Performance Test

SLS USB3.0 Device and SLS Mass Storage Controller IP Core is used to transfer data between eMMC and Host PC. CrystalDiskMark utility is used to measure the speed. Table-2 shows the report generated by CrystalDiskMark utility.

Note : Standalone SD/eMMC Host Controller IP Core is used to measure speed using Mass Storage Application.

Table-2: Mass Storage Application Performance Report	
Test : 500 MB	
OS : Windows 7 SP1 [6.1 Build 7601] (x64)	
Sequential Read	24.697 MB/s
Sequential Write	5.119 MB/s
Random Read 512KB	24.511 MB/s
Random Write 512KB	1.510 MB/s
Random Read 4KB (QD=1)	4.842 MB/s [1182.1 IOPS]
Random Write 4KB (QD=1)	0.278 MB/s [68.0 IOPS]
Random Read 4KB (QD=32)	5.614 MB/s [1370.6 IOPS]
Random Write 4KB (QD=32)	0.169 MB/s [41.3 IOPS]



SD Card Performance

This report is intended to provide the information about the SLS SD/eMMC Host Controller IP core performance on SLS HSIC Development board for SD UHS-1(DDR50) Card.

System Configuration:

Test Setup	
Development Board	HSIC Development Board
CPU/Memory Configuration	NIOS II/f 100MHz/DDR2 RAM
Cache Memory	4KByte Instruction Cache
SD/eMMC Host Controller	
IP Core	SLS SD/eMMC Host Controller
Version	3.0
SD Card Frequency	50MHz
Interface Mode	4 Bit DDR
SD	
SD Card Manufacturer	Sony
Size	16GB
Platform and Driver	
OS	Windows
Software Tools	Quartus II and NIOS II
Driver	SLS SDHC HAL
Driver Version	4.0.0

Test #1 Memory Data Performance Test

The memory data performance test is conducted using SD/eMMC Host Controller performance design which uses timer to measure the read/write speed to/from SD Card. The raw data stored in DDR2 RAM is read/write on specified address for specified number of blocks of SD Card using (DDR50) 4 bit interface. For one block the length of data is 512 bytes. Table-1 shows the performance report carried out on 16GB SD Card.

Table 1: Memory Data Performance Report			
SD Card		Speed(MB/s)	
SD Card Size	Block Depth	Read	Write
16GB	10K	35.40	26.29
	5K	30.28	25.71
	1	25.43	14.92



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Test #2 Mass Storage Performance Test

SLS USB3.0 Device and SLS Mass Storage Controller IP Core is used to transfer data between SD Card and Host PC. CrystalDiskMark utility is used to measure the speed. Table-2 shows the report generated by CrystalDiskMark utility.

Note : Standalone SD/eMMC Host Controller IP Core is used to measure speed using Mass Storage Application.

Table-2: Mass Storage Application Performance Report	
Test : 1000 MB	
OS : Windows 7 SP1 [6.1 Build 7601] (x64)	
Sequential Read	28.55 MB/s
Sequential Write	6.341 MB/s
Random Read 512KB	28.51 MB/s
Random Write 512KB	3.080 MB/s
Random Read 4KB (QD=1)	4.863 MB/s [1187.3 IOPS]
Random Write 4KB (QD=1)	1.226 MB/s [299.3 IOPS]
Random Read 4KB (QD=32)	4.916 MB/s [1200.1 IOPS]
Random Write 4KB (QD=32)	0.388 MB/s [94.8 IOPS]