SD/eMMC Analyzer -- SGDK330A

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Overview

Mini POD   Main POD   Main BOX   USB
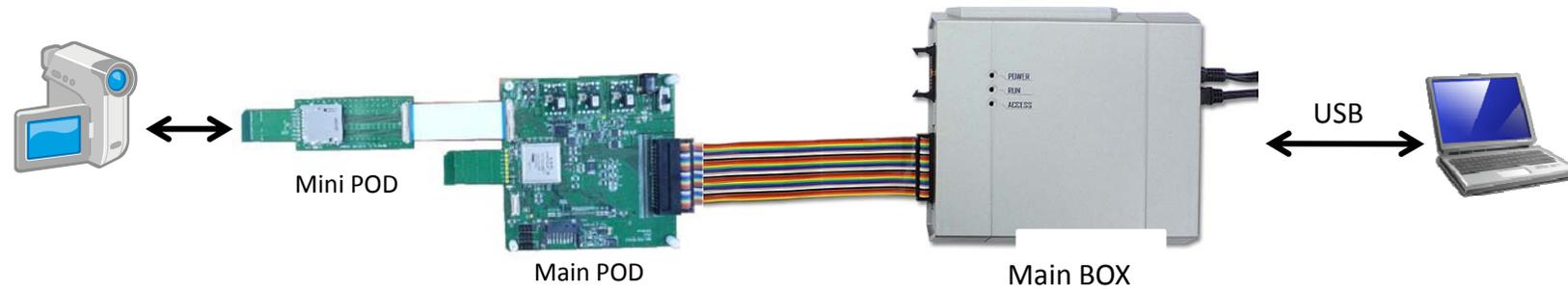
- ☐ SGDK330A is controlled by application software installed in Windows PC.
- ☐ SGDK330A supports SD, SDIO and eMMC media.
- ☐ SDA licensee can download application software to see log file.

Feature

- **SGDK330A analyzes protocol between Host Product and Media.**
- **SGDK330A supports**
  - ✓ **SD card ver3.00**
    - **SDSC/SDHC/SDXC**
    - **UHS-I mode (208MHz)**
  - ✓ **SDIO ver3.00**
  - ✓ **eMMC ver4.51**
    - **4bit/8bit**
    - **HS200 (200MHz)**

    <u>**In some cases, Host product may not be able to access to media correctly at higher frequency because of influence of added capacitance of Mini POD.**</u>

- **SGDK330A captures signals, analyzes its protocol, and displays logged information to the PC screen in user friendly format.**
- **Media access speed information, such as read latency and busy time, is displayed on the log.**
- **User can define up to four commands, such as vendor unique command.**
- **4 level sequence trigger is supported. Trigger events are "error condition (CRC error, status error)", "address hit" ,"long busy" or external trigger in.**

Mini POD

☐ Signals between Host and media are propagated to SGDK330A through Mini POD. There are 4 kinds Mini POD. Mini POD for SD, for microSD, for eMMC/SDIO wire type and for eMMC socket type.
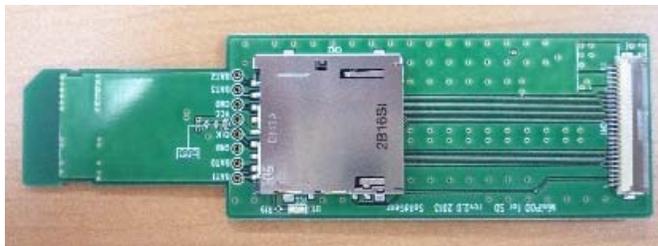
[Mini POD for SD card]
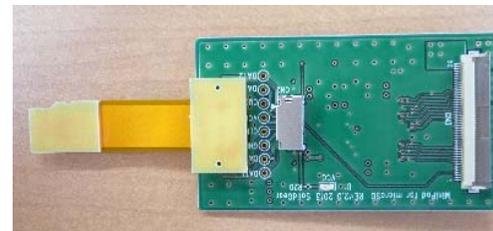
[Mini POD for micro SD card]

[Mini POD for eMMC/SDIO wire type]

[Mini POD for eMMC socket type]

Sample LOG


```
002 ms   CMD18(...   ARG:0002A140 CRC:60        SC:8 IO=1.8V      SD :211.2MHz   Nrc:24
000 us     R1         RSP:1200000900D3 [47:0]    -                 SD :-          Ncr:10
186 us       Read     2E202020 20202020 202020... waitTime:186us   SD :4bit       Nac:38225
005 us       Read     00000000 00000000 000000... waitTime:0us     SD :4bit       Nac:38
005 us       Read     00000000 00000000 000000... waitTime:0us     SD :4bit       Nac:38
005 us       Read     00000000 00000000 000000... waitTime:0us     SD :4bit       Nac:39
005 us       Read     00000000 00000000 000000... waitTime:0us     SD :4bit       Nac:39
005 us       Read     00000000 00000000 000000... waitTime:0us     SD :4bit       Nac:38
005 us       Read     00000000 00000000 000000... waitTime:0us     SD :4bit       Nac:39
005 us       Read     00000000 00000000 000000... waitTime:0us     SD :4bit       Nac:39
076 us   CMD12(...   ARG:00000000 CRC:30        SC:8 fromCMD:3...  SD :198.0MHz   Nrc:65153
000 us       Read     00000000 00000000 000000... waitTime:0us     SD :4bit       Nac:27
000 us     R1b        RSP:0C00000B007F [47:0]    -                 SD :-          Ncr:6
005  s   CMD13(...   ARG:35D00000 CRC:27        - IO=1.8V          SD :211.2MHz   Nrc:24
000 us     R1         RSP:0D000009003F [47:0]    -                 SD :-          Ncr:6
```

[SD card UHS-I 208MHz]


```
718 ms   CMD52(IO_RW_...  ARG:80000E03 CRC:0A     Write FN0 Ad...  SD :51.1MHz   Nrc:Ove
001 us     R5            RSP:340000100749 [47:0]   Data:07          SD :-         Ncr:7
001 ms       int assert  -                         -                SD :-         -
018 ms   CMD53(IO_RW_...  ARG:28024610 CRC:36     Read Block F...   SD :51.1MHz   Nrc:Ove
000 us       int negate  -                         -                SD :-         -
001 us     R5            RSP:35000010005B [47:0]   Data:00          SD :-         Ncr:7
000 us       Read        21230000 21230001 21230... waitTime:1us    SD :8bit      Nac:57
004 us       Read        21230100 21230101 21230... waitTime:1us    SD :8bit      Nac:65
004 us       Read        21230200 21230201 21230... waitTime:1us    SD :8bit      Nac:65
004 us       Read        21230300 21230301 21230... waitTime:1us    SD :8bit      Nac:65
004 us       Read        21230400 21230401 21230... waitTime:1us    SD :8bit      Nac:65
```

[SDIO 8bit]

Sample LOG

```
003  s     CMD23(SET_BL...   ARG:00000040 CRC:73      -                 MMC:51.1MHz    Nrc:5352
001 us     R1                RSP:17000009001D [47:0]   -                 MMC:-          Ncr:7
013 us     CMD18(READ_M...   ARG:0009820E CRC:0E       SC:64             MMC:51.1MHz    Nrc:504
001 us     R1                RSP:1200000900D3 [47:0]   -                 MMC:-          Ncr:9
484 us       Read            F8FFFF0F ....             WaitTime:484us    MMC:8bit, DDR  Nac:24227
005 us       Read            81000000 ....             WaitTime:0us      MMC:8bit, DDR  Nac:14
005 us       Read            01010000 ....             WaitTime:0us      MMC:8bit, DDR  Nac:14
005 us       Read            81010000 ....             WaitTime:0us      MMC:8bit, DDR  Nac:14
005 us       Read            01020000 ....             WaitTime:0us      MMC:8bit, DDR  Nac:14
005 us       Read            81020000 ....             WaitTime:0us      MMC:8bit, DDR  Nac:14
005 us       Read            01030000 ....             WaitTime:0us      MMC:8bit, DDR  Nac:14
```

[eMMC 8bit DDR]

```
152 us     CMD23(SET_BL...   ARG:00000010 CRC:0E       -                 MMC:211.2MHz   Nrc:58099
000 us     R1                RSP:17000009001D [47:0]   -                 MMC:-          Ncr:8
000 us     CMD18(READ_M...   ARG:00C66600 CRC:1D       SC:16             MMC:211.2MHz   Nrc:17
000 us     R1                RSP:1200000900D3 [47:0]   -                 MMC:-          Ncr:10
111 us       Read            28421800 50000000 2E010... WaitTime:111us   MMC:8bit       Nac:22275
002 us       Read            00000082 0700008F 07000... WaitTime:0us     MMC:8bit       Nac:28
002 us       Read            6E746966 69657320 74686... WaitTime:0us     MMC:8bit       Nac:28
002 us       Read            4F532069 73205570 67726... WaitTime:0us     MMC:8bit       Nac:29
002 us       Read            32352220 2F312E32 4D422... WaitTime:0us     MMC:8bit       Nac:28
002 us       Read            69732073 7570706F 72746... WaitTime:0us     MMC:8bit       Nac:28
002 us       Read            656E7420 42494F53 206C6... WaitTime:0us     MMC:8bit       Nac:29
002 us       Read            00000A00 00800308 00000... WaitTime:0us     MMC:8bit       Nac:29
```

[eMMC HS200]

SGDK330 vs. SGDK330A

❑ **Mini POD for eMMC Socket type and Interposer board are newly added**

With using these boards, eMMC HS200 system can be analyzed more stable than wire connection type Mini POD.

❑ **LVDS (differential signaling) is adopted between Mini POD and Main POD**

To minimize influence of noise and crosstalk, LVDS buffer IC is used on Mini POD.

On the other hand, SGDK330 uses LVCMOS buffer IC.

❑ **Resistor is inserted between signals (CLK/CMD/DATA) and Buffer IC on Mini POD**

To be able to minimize influence of added capacitance of input pin of Buffer IC on Mini POD, resistor is inserted and can be changed its value by user. Its main purpose is to let Host can access media stably when Mini POD is inserted between Host and media.

* Please note that it is not guaranteed that every Host can access media correctly when Mini POD is inserted between Host and media. If IO drive strength of Host controller or Media controller is weak, some Host may not access media correctly at higher frequency such as 200MHz, because of added capacitance of Mini POD.