Application Note

Astra™ Machina SL2600 Series SD and SDIO Host

Abstract: This application note provides detailed guidelines for connecting and configuring an SD card and SDIO M.2 module with the SL2610 RDK.

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1. Overview

The SL2610 RDK is a high-performance reference development kit designed for embedded systems, offering support for SD card and SDIO M.2 module to enable data storage and system expansion. The SL2600 series provide two SDIO 3.0 controller. The SD controllers operate at a 1.8V I/O voltage. However, SD cards support both 1.8V and 3.3V signaling. To ensure proper voltage compatibility and reliable communication, a level shifter is required to translate signals between the SL2600 and the SD card. For SDIO M.2 modules, normally work on 1.8V, so no level shifter is needed.

1.1. Scope

This application note focuses on the implementation of SD card and SDIO M.2 module connection with the SL2610 RDK. It provides detailed guidelines on hardware connections, voltage-level translation, and configuration to ensure reliable communication between the SD controller and SD peripherals. The document is intended for system designers and engineers working with the SL2610 RDK platform, enabling proper integration of SD card and SDIO M.2 interfaces for data storage and expansion.

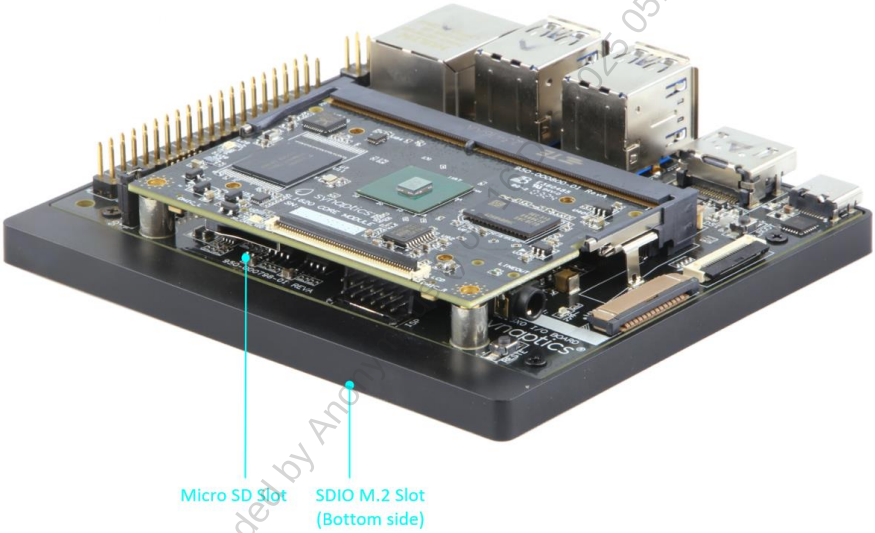

Figure 1. Overview of Astra Machina Foundation Series

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- SDIO1 connected to M.2 Slot, supports up to SDR104 (200MHz) mode.
- SDIO2 connected to SD card slot, supports up to SDR50 (100MHz) mode.

1.2. Hardware Connection of SDIO controllers on SL2610 RDK

1.2.1. SD card pin assignment

When operating the SD card in SDIO mode with a 4-bit data bus, the pin assignments are as follows:

Table 1. SD card pin assignment with Voltage

Pin #	Name	Description	Voltage Level
1	CLK	Clock	3.3V/1.8V
2	CMD	Command/Response	3.3V/1.8V
3	DAT0	Data Line 0	3.3V/1.8V
4	DAT1	Data Line 1	3.3V/1.8V
5	DAT2	Data Line 2	3.3V/1.8V
6	DAT3	Data Line 3	3.3V/1.8V
7	VDD	Supply voltage	3.3V
8	VSS	Ground	0V

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- **Pull-Up Resistors**: External pull-up resistors are not required in the hardware design, as the SL2600 Series feature internal pull-up resistors on the SDIO bus.
- **Power Supply**: The VDD pin of the SD card slot should be connected to a 3.3V power supply.
- **Level Shifter**: A level shifter is required for the SD bus because the SDIO signals of the SL2610 operates at 1.8V only. Depending on the SD card operation mode, the SD bus voltage for CLK, CMD, and DAT[3:0] signals can be either 3.3V or 1.8V.

1.2.2. SDIO M.2 module pin assignment

When connecting the SDIO module, the pin assignments are as shown in Table 3.

Table 2. SDIO module pin assignment with Voltage

Pin #	Name	Description	Voltage Level
1	CLK	Clock	1.8V
2	CMD	Command/Response	1.8V
3	DAT0	Data Line 0	1.8V
4	DAT1	Data Line 1	1.8V
5	DAT2	Data Line 2	1.8V
6	DAT3	Data Line 3	1.8V
7	VIO_SD	IO voltage	1.8V
8	VSS	Ground	0V

- **Pull-Up Resistors**: External pull-up resistors are not required in the hardware design, as the SL2600 Series feature internal pull-up resistors on the SDIO bus.

1.2.3. SDIO structure of SL2610 RDK

Figure 1 illustrates the SDIO connection for the SL2610.

- **SDIO_VOL_SEL:** This signal controls the SD bus I/O voltage level, switching between 3.3V and 1.8V. Refer to the CMD11 I/O voltage switching sequence in the SD card specification for further details.
- **SDIO_PWR_ON:** This signal controls the power supply to the SD card, enabling the 3.3V VDD power.

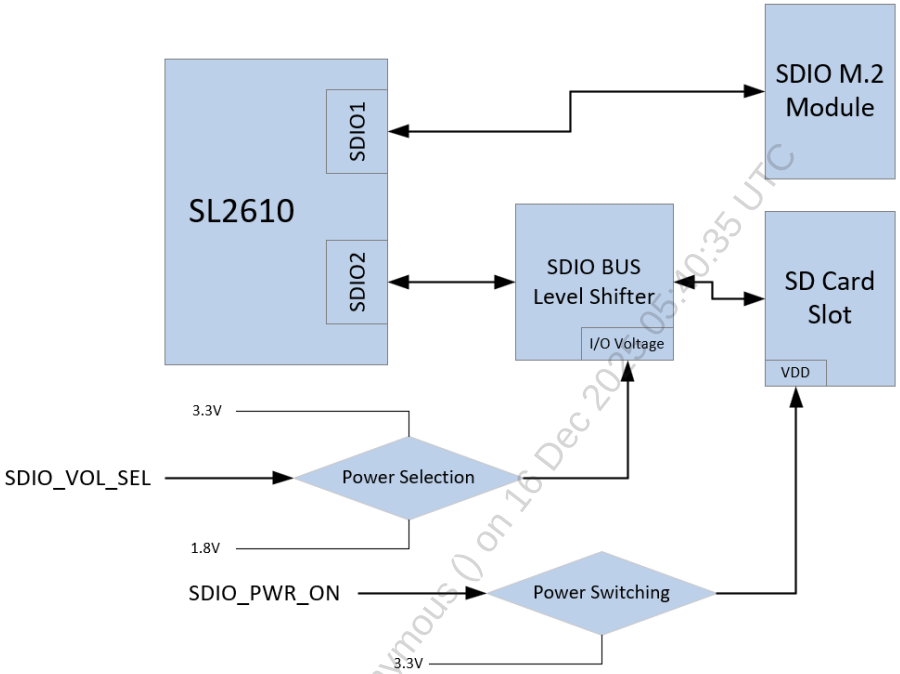

Figure 2. SDIO Connection of SL2610 RDK

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1.3. SD card Configuration of SL2610 RDK

Table 2 is the SD card related Control signals configuration of SL2610 RDK.

Table 3. SD card Configuration of SL2610 RDK

Signal #	Name	Description	Source
1	SDIO_PWR_ON	0: Power OFF SD card slot 1: Power ON SD card slot	IOEXP: TW1 (0x44) GPIO1_7
2	SDIO_VOL-SEL	0: 1.8V 1: 3.3V	IOEXP: TW0 (0x43) GPIO0_0

1.4. SDIO M.2 module Configuration of SL2610 RDK

Table 4 is the SDIO M.2 module related Control signals configuration of SL2610 RDK.

Table 4. SDIO M.2 Configuration of SL2610 RDK

Signal #	Name	Description	Source
1	BT_REG_ON	0: BT Regulator OFF 1: BT Regulator ON	IOEXP: TW1 (0x44) GPIO1_5
2	WL_REG_ON	0: WL Regulator OFF 1: WL Regulator ON	IOEXP: TW1 (0x44) GPIO1_2

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2. References

- *SL2610 Production Line of Embedded Processors Datasheet* (PN: 505-001501-01)
- *Astra Machina SL2600 Series Single Board Computer (SBC) User Guide (EMMC DDR4)* (PN: 511-001454-01)

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3. Revision History

Revision	Description
A	Initial release.

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