Rockchip Developer Guide Linux FLEXBUS

ID: RK-KF-YF-C10

Release Version: V1.0.0

Release Date: 2024-06-11

Security Level: ☐Top-Secret ☐Secret ☐Internal ■Public

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Preface

Overview

This document introduces how to use FLEXBUS on Linux.

Product Version

Chipset	Kernel Version
RK3576	6.1

Intended Audience

This document (this guide) is mainly intended for:

Technical support engineers

Software development engineers

Revision History

Version	Author	Date	Change Description
V1.0.0	Wesley Yao	2024-06-11	Initial version

Contents

1. FLEXBUS overview

The FLEXBUS module consists of two parts: FLEXBUS0 and FLEXBUS1. FLEXBUS0 supports TX, and TX then RX is supported in some modes. FLEXBUS1 supports only RX. FLEXBUS0 and FLEXBUS1 can connect to only one peripheral respectively. You can use both FLEXBUS0 and FLEXBUS1, or you can use only FLEXBUS0 or FLEXBUS1.

FLEXBUS0 supports the following modes:

1. High-speed parallel DAC (DAC for short)
2. Emulate SPI protocol, mainly used for Single/Quad SPI transmission, supports external SPI Flash and QSPI screen

FLEXBUS1 supports the following modes:

1. High-speed Parallel ADC (ADC for short)
2. DVP

FLEXBUS0 and FLEXBUS1 each have 1 CLK, 1 CSn, and 16 data pins. The actual pins that can be used depend on the platform limitations and IOMUX configuration.

2. Use of FLEXBUS

2.1 Kernel configuration

Device Drivers -> Multifunction device drivers -> Rockchip Flexbus

2.2 dtsi configuration

Take RK3576 platform and RK3576 TEST1 board, FLEXBUS0 for DAC, FLEXBUS1 for ADC as an example.

In rk3576.dtsi:

```
flexbus: flexbus@2a2f0000 {
    compatible = "rockchip,rk3576-flexbus";
    reg = <0x0 0x2a2f0000 0x0 0x200>;
    interrupts = <GIC_SPI 369 IRQ_TYPE_LEVEL_HIGH>;
    clocks = <&cru CLK_HSGPIO_TX>, <&cru CLK_HSGPIO_RX>,
    <&cru ACLK_HSGPIO>, <&cru HCLK_HSGPIO>;
    clock-names = "tx_clk_flexbus", "rx_clk_flexbus",
    "aclk_flexbus", "hclk_flexbus";
    rockchip,grf = <&ioc_grf>;  // GRF needs to be configured for FLEXBUS
    status = "disabled";
```

```
    flexbus_adc: adc {
        ......
    };

    flexbus_dac: dac {
        ......
    };
};
```

Modify the child node configuration (for example, flexbus_adc and flexbus_dac) based on the required mode. For details, see the documents corresponding to each mode. Other configurations usually do not need to be modified.

In arch/arm64/boot/dts/rockchip/rk3576-test1.dtsi:

```
&flexbus {
    rockchip,flexbus0-opmode = <ROCKCHIP_FLEXBUS0_OPMODE_DAC>;  // FLEXBUS0
selects DAC mode
    rockchip,flexbus1-opmode = <ROCKCHIP_FLEXBUS1_OPMODE_ADC>;  // FLEXBUS1
selects ADC mode
    status = "okay";    // Enable FLEXBUS
};

&flexbus_adc {
    pinctrl-names = "default";
    pinctrl-0 = <&flexbus1m4_csn &flexbus1_clk
             &flexbus1_d0 &flexbus1_d1 &flexbus1_d2 &flexbus1_d3
             &flexbus1_d4 &flexbus1_d5 &flexbus1_d6 &flexbus1_d7
             &flexbus1_d8 &flexbus1_d9 &flexbus1_d10 &flexbus1_d11
             &flexbus1m1_d12 &flexbus1m1_d13 &flexbus1m1_d14 &flexbus1m1_d15>;
// Configure IOMUX for FLEXBUS1 ADC mode
    status = "okay";    // Enable ADC mode
};

&flexbus_dac {
    pinctrl-names = "default";
    pinctrl-0 = <&flexbus0m4_csn &flexbus0_clk
             &flexbus0_d0 &flexbus0_d1 &flexbus0_d2 &flexbus0_d3
             &flexbus0_d4 &flexbus0_d5 &flexbus0_d6 &flexbus0_d7
             &flexbus0_d8 &flexbus0_d9 &flexbus0_d10 &flexbus0_d11
             &flexbus0_d12 &flexbus0m0_d13 &flexbus0m0_d14 &flexbus0m0_d15>;
// Configure IOMUX for FLEXBUS0 DAC mode
    status = "okay";    // Enable DAC mode
};
```

Set "rockchip,flexbus0-opmode" and "rockchip,flexbus1-opmode" to the actual modes used by FLEXBUS0 and FLEXBUS1. The mode is defined in include/dt-bindings/mfd/rockchip-flexbus.h. If not used, set it to `ROCKCHIP_FLEXBUS0_OPMODE_NULL` or `ROCKCHIP_FLEXBUS1_OPMODE_NULL`.

2.3 Driver file

The driver file is drivers/mfd/rockchip-flexbus.c. Only basic operations such as register read/write and initialization are included here. The codes for each modes are located in the corresponding frameworks. Please refer to the corresponding documentations for each modes.