

Application Note

ADC MONITOR

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Table of Contents

| | |
|--|---|
| Table of Contents | 2 |
| 1. Preface..... | 3 |
| 2. Technical Term..... | 3 |
| 3. Reference Document..... | 3 |
| 4. Target Sample Program..... | 4 |
| 5. Configuration Diagram..... | 4 |
| 6. Sample Program: ADC_MONITOR..... | 5 |
| 6.1. Outlines of Operation..... | 5 |
| 6.1.1. Sample A..... | 5 |
| 6.1.2. Sample B..... | 5 |
| 6.2. Function to Use | 5 |
| 6.3. Interrupt to Use..... | 5 |
| 6.4. Configuration | 5 |
| 6.5. Example of Terminal Emulator Output | 6 |
| 6.5.1. Sample A..... | 6 |
| 6.5.1.1. Normal Operation | 6 |
| 6.5.1.2. Case of Error Occurrence | 6 |
| 6.5.2. Sample B..... | 6 |
| 6.5.2.1. Normal Operation | 6 |
| 6.5.2.2. Case of Error Occurrence | 6 |
| 7. ADC Driver | 7 |
| 7.1. List of Drivers..... | 7 |
| 8. Revision History | 8 |
| RESTRICTIONS ON PRODUCT USE..... | 9 |

1. Preface

This application note describes the sample software of ADC_MONITOR using Analog to Digital Converter (ADC). This document helps the user check operation of a product under development and develop its program.

2. Technical Term

| Term/Abbreviation | Definition |
|-------------------|---|
| ADC | Analog to Digital Converter |
| AIN NTC | Analog Input of Negative Temperature Coefficient Thermistor |
| AIN VR | Analog Input of Variable Resistor |
| UART | Universal Asynchronous Receiver Transmitter |
| UART TXD | Universal Asynchronous Receiver Transmitter Data |
| T32A | 32-bit Timer Event Counter |

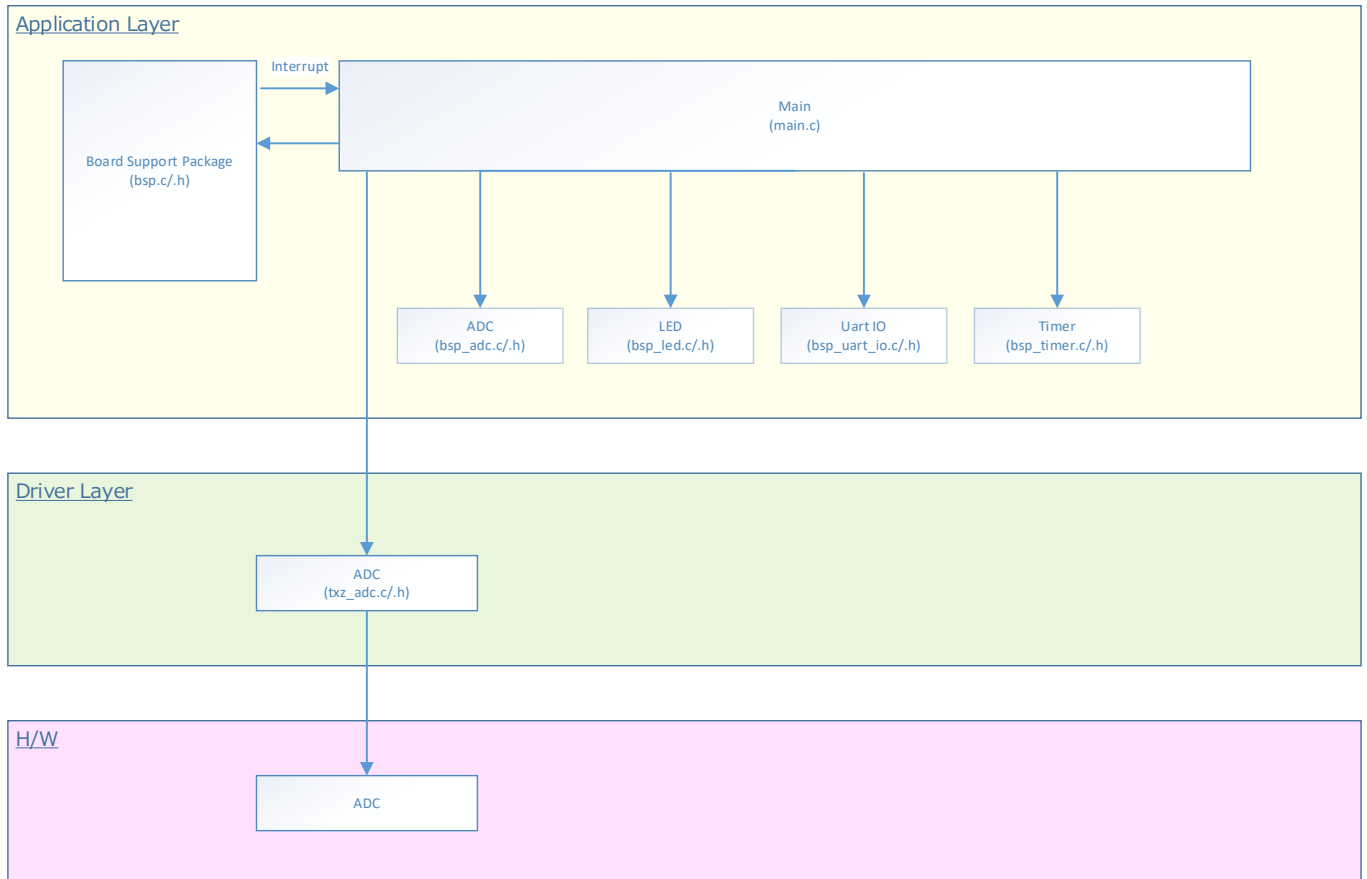
3. Reference Document

| Document | Notes |
|------------------------------------|--|
| Data sheet | Refer to the data sheet of MCU to be used. |
| Reference manual | Refer to the reference manual of each IP to be used. |
| Application note MCU User Guide | Refer to the MCU user manual to be used. |

4. Target Sample Program

| Sample Program | Outlines |
|----------------|-------------------------------------|
| ADC_MONITOR | Sample of ADC surveillance function |

5. Configuration Diagram



6. Sample Program: ADC_MONITOR

This sample program uses ADC surveillance function. When the AD conversion value becomes over the maximum setting value or under the minimum setting value, corresponding LED's turn on.

6.1. Outlines of Operation

6.1.1. Sample A

Measure the output voltage of a thermistor by BSP_ADC_1, it is converted to temperature by the CPU and output to the terminal emulator via USB-UART. The output period is set by 6.4 configuration.

When the temperature is between 25°C and 35°C, the BSP_LED_0 and the BSP_LED_1 light.

When the temperature is 24°C or less, all LED's turn off. When, 36°C or more, all LED's turn on.

6.1.2. Sample B

Measure variable resistance values by BSP_ADC_0, and Output to terminal emulator via USB-UART. The output period is set by 6.4 configuration.

When the AD value range is between "0x400" and "0xa00", the BSP_LED_0 and the BSP_LED_1 light.

When the AD value is "0x400" or less, all LED's turn off. When, "0xa00" or more, all LED's turn on.

6.2. Function to Use

The functions to use are as follows.

For the Port assignment of each channel, refer to the MCU user manual.

| IP | Channel | Objective |
|------|---------------|--|
| ADC | BSP_ADC_0 | Output voltage of a variable resistance. |
| | BSP_ADC_1 | Output voltage of a thermistor |
| UART | BSP_UART_0 | Communication with the terminal emulator |
| PORT | BSP_LED_0 | LED control |
| | BSP_LED_1 | LED control |
| | BSP_LED_2 | LED control |
| | BSP_LED_3 | LED control |
| T32A | BSP_TIMER_1MS | Interval Timer |

6.3. Interrupt to Use

| Interrupt | Outlines |
|---------------------------------|-----------------------------------|
| Surveillance function Interrupt | Surveillance function 0 interrupt |
| | Surveillance function 1 interrupt |
| UART Interrupt | UART reception interrupt |
| | UART transmission interrupt |
| | UART ERROR interrupt |
| Interval timer Interrupt | Interval timer interrupt |

6.4. Configuration

"ADC_MONITOR" configuration setting

| Configuration | Current Value | Description |
|---------------------|---------------|---|
| CFG_OUTPUT_INTERVAL | 5000 | Terminal emulator output cycle (Unit: ms) |

6.5. Example of Terminal Emulator Output

6.5.1. Sample A

6.5.1.1. Normal Operation

Output at temperature value (Celsius value).

```
Temp:26degrees
```

6.5.1.2. Case of Error Occurrence

Nothing.

6.5.2. Sample B

6.5.2.1. Normal Operation

Output AD measurement.

```
Convert Result Value[VR1]:0x74d
```

6.5.2.2. Case of Error Occurrence

Nothing.

7. ADC Driver

7.1. List of Drivers

The ADC is controlled by using the following drivers.
For an example of use, refer to the source code.

| Interface Name | Control Outlines |
|-----------------------|--|
| adc_channel_clear | ADC channel is cleared. |
| adc_channel_get_value | ADC value is acquired. |
| adc_channel_setting | ADC channel is set. |
| adc_cmp_deinit | ADC Compare register is released. |
| adc_cmp_init | ADC Compare register is initialized. |
| adc_deinit | ADC object is released. |
| adc_get_status | Conversion status is acquired. |
| adc_init | ADC object is initialized. |
| adc_poll_conversion | Wait for the end of a single conversion. |
| adc_start | Conversion is started. |
| adc_stop | Conversion is stopped. |

8. Revision History

| Revision | Date | Description |
|----------|------------|---------------|
| 1.0 | 2021-10-13 | First release |

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