

Application Note

DMAC UART

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1. Preface

This application note describes sample software for the transfers data by UART communication using the DMAC function.

This document helps the user check operation of a product under development and develop its program.

2. Technical Term

Term/Abbreviation	Definition
DMAC	Direct Memory Access Controller
BSP	Board Support Package
CG	Clock control and Operation Mode
Timer	T32A : 32-bit Timer Event Counter
UART	Universal Asynchronous Receiver Transmitter

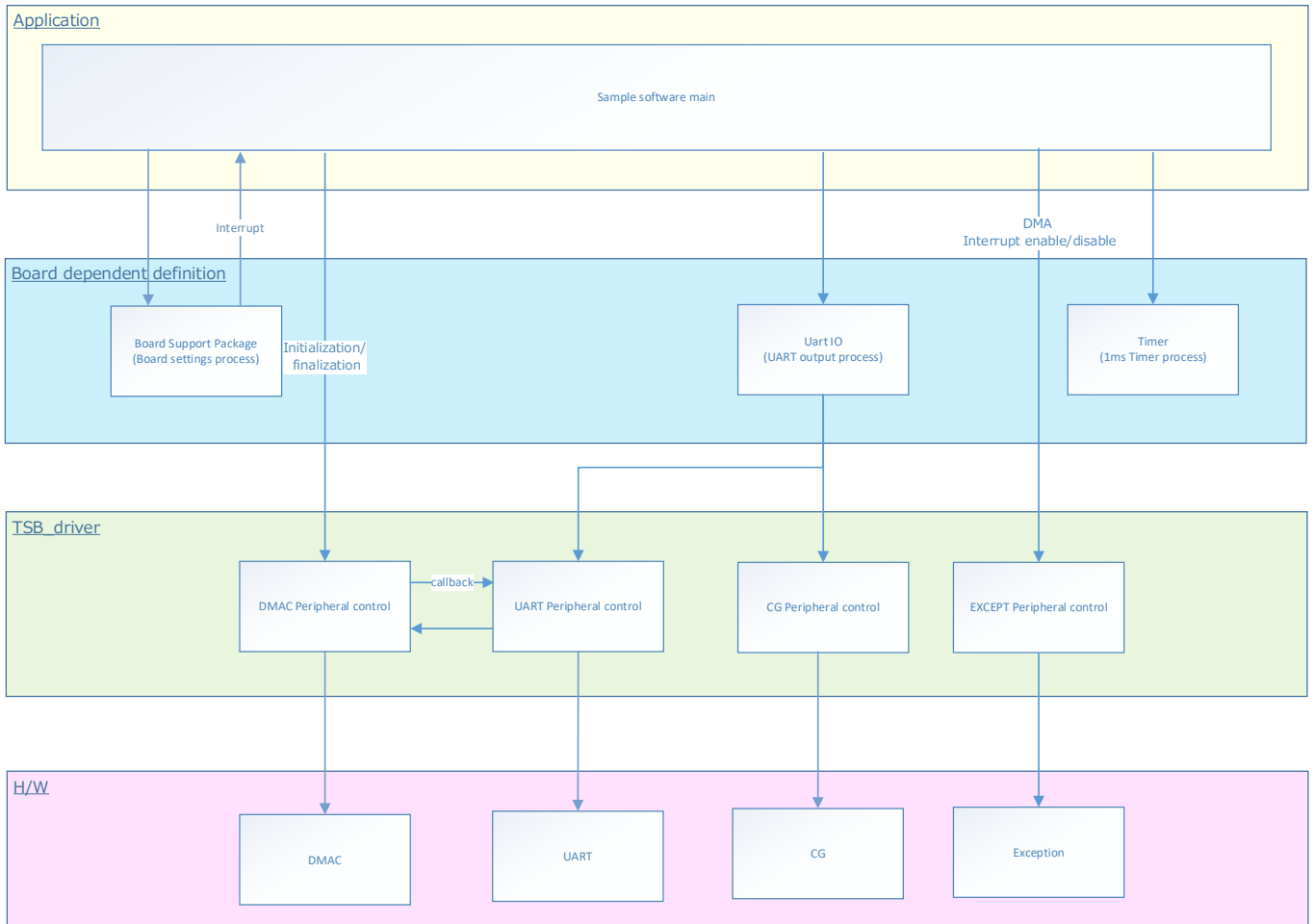
3. Reference Document

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 guide to be used.

4. Target Sample Program

Sample Program	Outline
DAC_UART	Sample program of DMAC function

5. Configuration Diagram



6. Sample Program : DMAC_UART

This is sample software that performs memory to peripheral / peripheral to memory transfer using the DMAC function and UART communication.

6.1. Outlines of Operation

Echo back the data input from the terminal emulator.
DMAC is used for data input / output with the terminal emulator.

6.1.1. Basic operation

Output Log_1 to BSP_UART_1 (terminal emulator) and wait for data input of BSP_UART_1.
Input of BSP_UART_1 and reception of [Line feed] are judged as input completion.
After outputting Log_2 to BSP_UART_1, the input data is echoed back.

6.1.2. Processing when an error occurs

If the BSP_UART_1 input exceeds the Max data size, error Log_1 is output to BSP_UART_1.

6.2. Function to Use

The functions to use are as follows.
For the Port assignment of each channel, refer to the MCU user guide.

IP	Channel	Objective
UART	BSP_UART_1	For terminal emulator communication (Outputs log)

6.3. Interrupt to Use

Interrupt	Outlines
INTDMAATC	DMAC Unit A Transfer end interrupt
INTDMAAERR	DMAC Unit A Transfer error interrupt
INTT32A00A	T32A Timer A Timer counter increment every 1ms for display update

6.4. Configuration

Configuration	Current Value	Description
Max Data size	32	32 characters
DMAC Transfer (for reception)	1	Forwarding address increment (byte)
	1	Forwarding data size (byte)
	No increment	Increment of forwarding address (byte)
	1	Transfer source data size (byte)
	1	Execution unit of arbitration
	Burst transfer	Single / burst transfer
	Unit normal transfer	Transfer mode
DMAC Transfer (for transmission)	No increment	Forwarding address increment (byte)
	1	Forwarding data size (byte)
	1	Increment of forwarding address (byte)
	1	Transfer source data size (byte)
	1	Execution unit of arbitration
	Burst transfer	Single / burst transfer
	Unit normal transfer	Transfer mode
Output Log_1	"Input = "	Input is confirmed by "[line feed]"
Output Log_2	"Echo = xx[line feed]"	xx : Data from terminal software
Error Log_1	Error Log_ input value	-

6.5. Example of Terminal Emulator Output

6.5.1. Normal Operation

```
Input = 12345
Echo = 12345
```

```
Input = 12345678901234567890123456789012
Echo = 12345678901234567890123456789012
```

6.5.2. Case of Error Occurrence

```
Input = 123456789012345678901234567890123
Input Error !!
```

7. DMAC Driver

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

Driver	Control Outlines
dma_init	DMAC Initialize the object
dma_deinit	DMAC Release the object
dma_irq_handler	IRQ Handler
dma_error_irq_handler	Error IRQ Handler
dma_get_error	Get error
dma_clear_error	Clear error
dma_ch_init	DMAC Initialization of channel object
dma_ch_deinit	DMAC Release channel object
dma_startlt	DMAC Mode start
dma_stoplt	DMAC Mode stop
dma_sw_request	DMAC Request Self Trigger
dma_normal_startlt	DMAC Start normal mode
dma_normal_stoplt	DMAC Stop in normal mode
dma_normal_cnt_startlt	DMAC Continuation Start mode
dma_normal_cnt_stoplt	DMAC Continuation Stop mode
dma_cnt_chain_startlt	DMAC Continuation Chain Start mode
dma_cnt_chain_stoplt	DMAC Continuation Chain Stop mode
dma_chain_startlt	DMAC Chain Start mode
dma_chain_stoplt	DMAC Chain Stop mode

8. UART Driver

See the application note "UART" for details.

9. Revision History

Revision	Date	Description
1.0	2023-06-28	First release

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