

Application Note

UART_TRANS

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Table of Contents

Table of Contents2
1. Preface
2. Technical Term
3. Reference Document
4. Target Sample Program
5. Configuration Diagram4
6. Sample Program: UART_TRANS5
6.1. Outlines of Operation
6.2. Function to Use
6.3. Interrupt to Use
6.4. Configuration
6.5. Example of Terminal Emulator Output7
6.6. How to switch DMAC function
6.6.1. IAR Embedded Workbench8
6.6.2. Keil μVision
6.6.3. SEGGER Embedded Studio12
7. Activity diagram
7.1. main
7.2. Interrupt
8. Revision History
RESTRICTIONS ON PRODUCT USE

1. Preface

This application note describes the sample software of UART_TRANS using Universal Asynchronous Receiver Transmitter (UART).

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

2. Technical Term

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

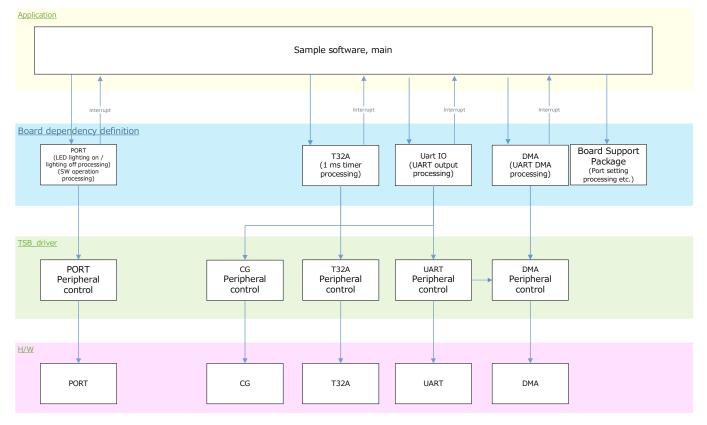
3. Reference Document

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
UART_TRANS	Sample program of UART function (UART Trans)

5. Configuration Diagram



6. Sample Program: UART_TRANS

This sample software uses the transmission function of the UART communication function to send string 1 to the terminal software, triggered by pressing a switch, and turns the LED on/off with each UART transmission.

6.1. Outlines of Operation

Wait for BSP_PSW_1 to be pressed. When BSP_PSW_1 is pressed, string 1 is sent via UART, BSP_LED_2 is turned on/off, and BSP_LED_3 is turned off. If an error occurs, BSP_LED_3 is turned on.

6.2. Function to Use

The functions to use are as follows:

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

IP	Channel	Objective
UART	BSP_UART_1	For terminal emulator communication
T32A	BSP_T32A_TIMER_1	Interval timer
PORT(Push-Switch)	BSP_PSW_1	Event Trigger
	BSP_LED_2	For operation check
PORT(LED)	BSP_LED_3	For operation check

6.3. Interrupt to Use

Interrupt	Outlines
(Note1)	T32A Timer A
	Timer counter increment every 1ms
(Note2)	UART transmit interrupt
(Note3)	UART error interrupt
INTDMAATC	DMA transmit end interrupt
INTDMAAERR	DMA error interrupt
Note1: For SBK-M471,	"INTT32A00AC".
Note2: For SBK-M471,	"INTSC0TX".
Note3: For SBK-M471,	"INTSCOERR".

6.4. Configuration

"main.c" configuration setting.

Configuration	Soft Definition Name	Current Value (Defaults)	Description
String 1	BSP_MCU_NAME	(Note1)	Character string to send
Communication Control Selection	NODMAC PJ option	(Note2) NODMAC	NODMAC (Does not use DMAC), DMA (Use DMAC) Can be switched

Note1: For SBK-M471, "TMPM471F10¥n"

Note2: For information on how to switch when using DMAC, see Chapter 6.6.



6.5. Example of Terminal Emulator Output

Outputs the sent character string

TMPM471F10 TMPM471F10

6.6. How to switch DMAC function

Follow the steps below to enable/disable the DMAC function.

6.6.1. IAR Embedded Workbench

ategory:		Factory Settings
eneral Options		
tatic Analysis	Discard Unused Publics	
untime Checking	Language 1 Language 2 Code Optim	izations Output
C/C++ Compiler Assembler	List Preprocessor Diagnostics Encodin	· · ·
Dutput Converter		5
Custom Build	Ignore standard include directories	
uild Actions	Additional include directories (one per line)	
inker	Additional include directories: (one per line)	
ebugger	<pre>\$PROJ_DIR\$¥¥src \$PROJ_DIR\$¥¥¥¥Utility¥inc</pre>	
Simulator	\$PROJ_DIR\$¥¥¥¥BSP¥SBK_M4KN¥inc	
CADI	\$PROJ_DIR\$¥¥¥¥MCU¥CMSIS	
CMSIS DAP	\$PROJ_DIR\$¥¥¥¥MCU¥CMSIS¥startup¥iar	
GDB Server	Preinclude file:	
I-jet		
J-Link/J-Trace		
TI Stellaris	Defined symbols: (one per line)	
Nu-Link	NODMAC Preprocesso	r output to file
PE micro	UART_DMA_TRANSFER_USE Preserve	comments
ST-LINK	Generate Generate	#line directives
Third-Party Driver	· · · · · · · · · · · · · · · · · · ·	

Change "Defined symbol" as follows: If you do not use DMAC: "NODMAC"

When using DMAC: "DMA", "UART_DMA_TRANSFER_USE"



Workspace	→ ↓ ×	
Sample_FYAx	~	
Files UART_RECEIV UBRT_RECEIV	_sbk	
H ■ bsp_or H ■ Startup H ■ TSB_drive H ■ Utility	Options Make Compile Rebuild All Clean	٦
	C-STAT Static Analysis Stop Build	>
UART_RECEIVE	Add Remove	>

ategory.	Override inherited settings			Factory Setting
tatic Analysis untime Checking				
C/C++ Compiler Custom Build	List Preprocessor Di	agnostics	Encodings	Extra Options
custom build	Language 1 Language 2	Code	Optimization	ns Output
	Language	Langu	age conformance	e
	OC	O Sta	andard with IAR e	extensions
	○ C++	⊖ Sta	andard	
	O Auto (extension-based)	⊖ Str	ict	
	C dialect	C++ o	ptions	
	C89	🗌 En	able exceptions	
	C Standard C	🗌 En	able RTTI	
	Allow VLA	De	stroy static object	rts

Right-click the file you want to configure, open options, and change "Exclude from build". If you want to use the file, uncheck "Exclude from build", otherwise uncheck "Exclude from build".

DMAC disabled:

bsp_config_sbk_m4xx_dmac.c	Don't use files
bsp_config_sbk_m4xx_uart_io.c	Use files
bsp_config_sbk_m4xx_uart_io_dma.c	Don't use files

DMAC enabled:

bsp_config_sbk_m4xx_dmac.c	U
bsp_config_sbk_m4xx_uart_io.c	D
bsp_config_sbk_m4xx_uart_io_dma.c	U

Use files Don't use files Use files

Please build after changing the settings.

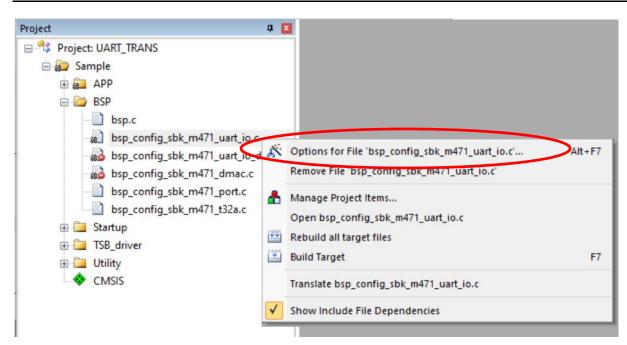
6.6.2. Keil µVision 🔣 Options for Target 'Sample_FYAx' Х Device Target Output Listing User C/C++ Asm Linker Debug Utilities Preprocessor Symbol DMA.UART DMA TRANSFER USE Defin Undefine: Language / Code Generation Execute-only Code Strict ANSI C Warnings: All Warnings -Enum Container always int Thumb Mode Optimization: Level 1 (-01) Ŧ Plain Char is Signed No Auto Includes Optimize for Time C99 Mode Split Load and Store Multiple Read-Only Position Independent One ELF Section per Function Read-Write Position Independent GNU extensions Include ¥.,¥.,¥.,¥.,¥Examples¥src¥UART¥UART_RECEIVE;.,¥.,¥.,¥.,¥Utility¥inc;.,¥.,¥.,¥.,¥.,¥MCU¥Driver Paths Misc Controls -c99 -c --cpu Cortex-M4.fp.sp -D__EVAL -g -O1 --apcs=interwork --split_sections -l ../../../.Examples/src/UART/UART_RECEIVE -l ../../../../Utility/inc -l Compiler control string OK Cancel Defaults Help

Open "Project" > "Options for Target 'Sample'" > "C/C++".

Change "Define:" of "Preprocessor Symbols" as shown below.

If you do not use DMAC, select "NODMAC"

"DMA" and "UART_DMA_TRANSFER_USE" when using DMAC



🔣 Options for File 'bsp_config_sbk_m471_uart_io.c' × Properties C/C++ (AC6) Path: ¥.¥.¥.¥B File Type: C Source file • Include in Target Build Size: 20396 Bytes Duild Generate Assembler SRC File last change: Mon Dec 9 13:50:23 2024 Assemble SRC File Stop on Exit Code: Not specified • ☑ Image File Compression Custom Arguments: Memory Assignment: <default> Ŧ Code / Const: • <default> Zero Initialized Data: Ŧ <default> Other Data: -<not assigned> Layer: Defaults OK Cancel Help

Right-click the file you want to configure, open Options for File 'xxxx.c' and change "Include in Target Build". If you want to use the file, check "Include in Target Build", otherwise uncheck "Include in Target Build".

DMAC disabled:

bsp_config_sbk_m4xx_dmac.c	Don't use files
bsp_config_sbk_m4xx_uart_io.c	Use files
bsp_config_sbk_m4xx_uart_io_dma.c	Don't use files

DMAC enabled:

bsp_config_sbk_m4xx_dmac.c	Use files
bsp_config_sbk_m4xx_uart_io.c	Don't use files
bsp_config_sbk_m4xx_uart_io_dma.c	Use files

Please build after changing the settings.

Х

6.6.3. SEGGER Embedded Studio

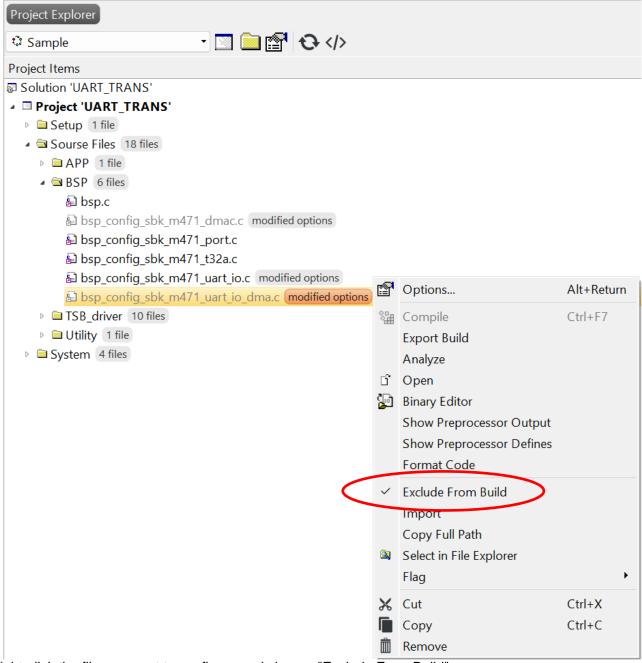
SEGGER Embedded Studio V8.10b - Options

Project 'UART_RECEIVE' Options ↑ ↓ 🗘 Sample_FYAx Search Option Show Modified Options Only Build Option Value Code Analyzer Macro Files Assembler Only Code Generation Macro Files C Compiler Only Compiler Macro Files C++ Compiler Only Compiler Warning DMA;UART_DMA_TRANSFER_USE modified;inherits Preprocessor Definitions External Build Preprocessor Definitions Assembler Only Preprocessor Definitions C Compiler Only File Libraries * Preprocessor Definitions C++ Compiler Only Preprocessor Undefinitions Library Preprocessor Undefinitions Assembler Only Preprocessor Undefinitions C Compiler Only Linker Preprocessor * Preprocessor Undefinitions C++ Compiler Only Printf/Scanf System Include Directories Runtime Memory Area Section Preprocessor Definitions Source Code Specifies one or more preprocessor definitions. This property will have macro expansion applied to it. User Build Step Inherits Debug MACHART DAMA TRANSFER HEE ОК Cancel

Open "Project" > "Options" > "Preprocessor". Change "Preprocessor Definitions" as shown below. If you do not use DMAC, select "NODMAC" "DMA" and "UART_DMA_TRANSFER_USE" when using DMAC

Note: Change "Common" as well as "Sample_xxx".

SEGGER Embedded Studio V8.10b - Optio	ns		>
Project 'UART_RECEIVE	' Options		
Sample_FYAx - Search	Setions		Show Modified Options Only
Bui Public Configurations	Potion	Value	
Co [©] Sample_F10Ax Co [©] Sample_FYAx Co Private Configurations	Macro Files Assembler Only Macro Files C Compiler Only Macro Files C++ Compiler Only		
Co Common	Preprocessor Definitions	DMA;UART_DMA_TRANSFER_USE modified;inherits	
External Build	Preprocessor Definitions Assembler Only		
File	Preprocessor Definitions C Compiler Only		
Libraries	 Preprocessor Definitions C++ Compiler Only 		
Library	Preprocessor Undefinitions		
Linker	Preprocessor Undefinitions Assembler Only		
Preprocessor	Preprocessor Undefinitions C Compiler Only		
Printf/Scanf	Preprocessor Undefinitions C++ Compiler Only		
Runtime Memory Area	 System Include Directories 		
Section	Preprocessor Definitions		
Source Code User Build Step	Specifies one or more preprocessor definitions. This property	will have macro expansion applied to it.	
Debug	Inherits		
- Debug		e	
			OK Cancel



Right-click the file you want to configure and change "Exclude From Build". If you want to use a file, uncheck "Exclude From Build", otherwise check "Exclude From Build".

DMAC disabled:

bsp_config_sbk_m4xx_dmac.c
bsp_config_sbk_m4xx_uart_io.c
bsp_config_sbk_m4xx_uart_io_dma.c

DMAC enabled:

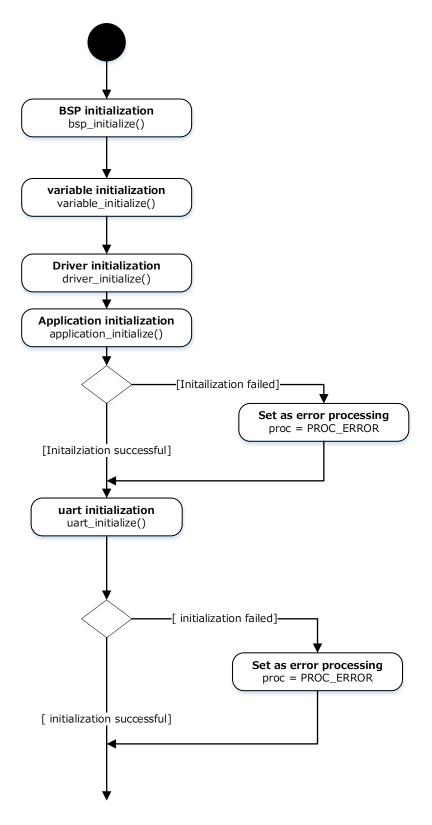
bsp_config_sbk_m4xx_dmac.c bsp_config_sbk_m4xx_uart_io.c bsp_config_sbk_m4xx_uart_io_dma.c Use files Don't use files Use files

Don't use files Use files Don't use files

Please build after changing the settings.

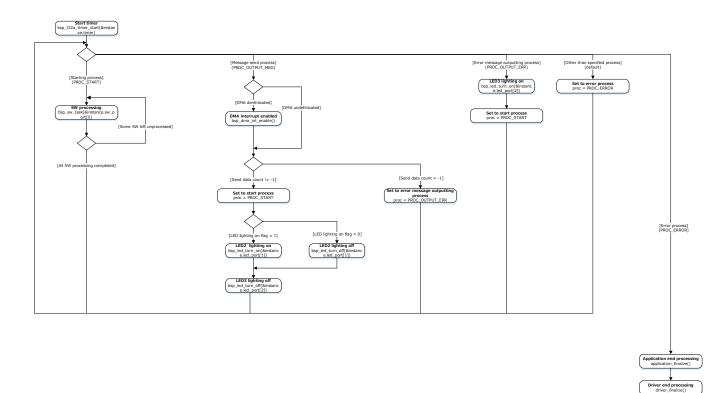
7. Activity diagram

7.1. main



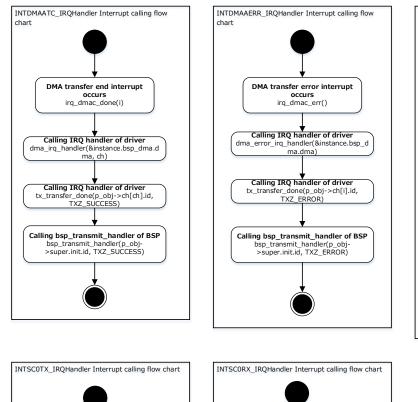


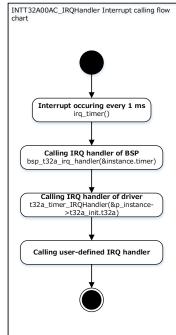
BSP end pro bsp_fina

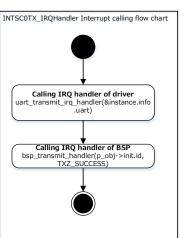


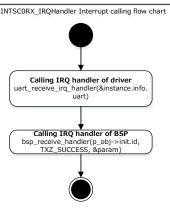
UART_TRANS Application Note

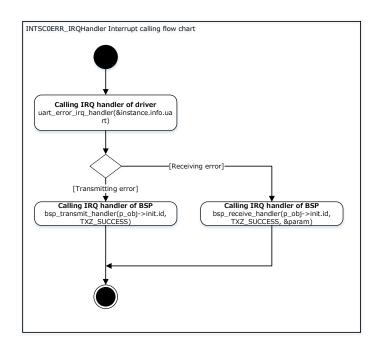
7.2. Interrupt



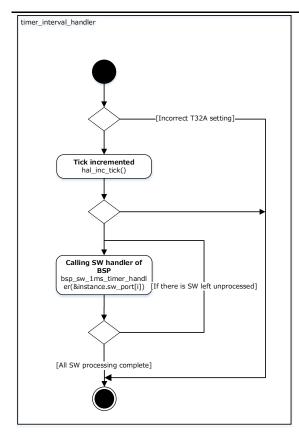


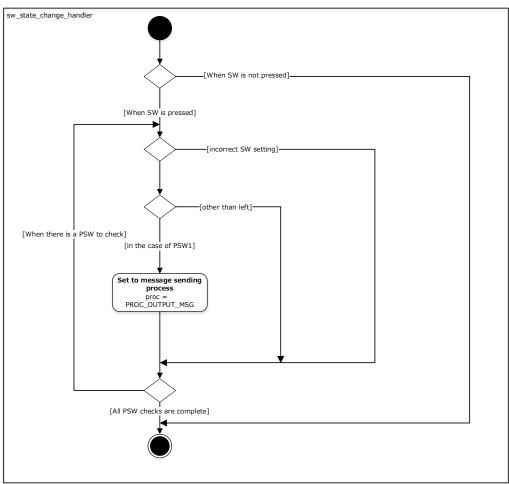














8. Revision History

Revision	Date	Description
1.0	2025-01-20	First release

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