

RAM_Run_Function_1 for KIT_AURIX_TC397_TFT

Function running from RAM

AURIX™ TC3xx Microcontroller Training
V1.0.2



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Scope of work

A function is stored and executed from SRAM.

This example implements twice the same function which toggles an LED with a wait loop. One function is implemented to be executed from SRAM and the other one from Flash memory.

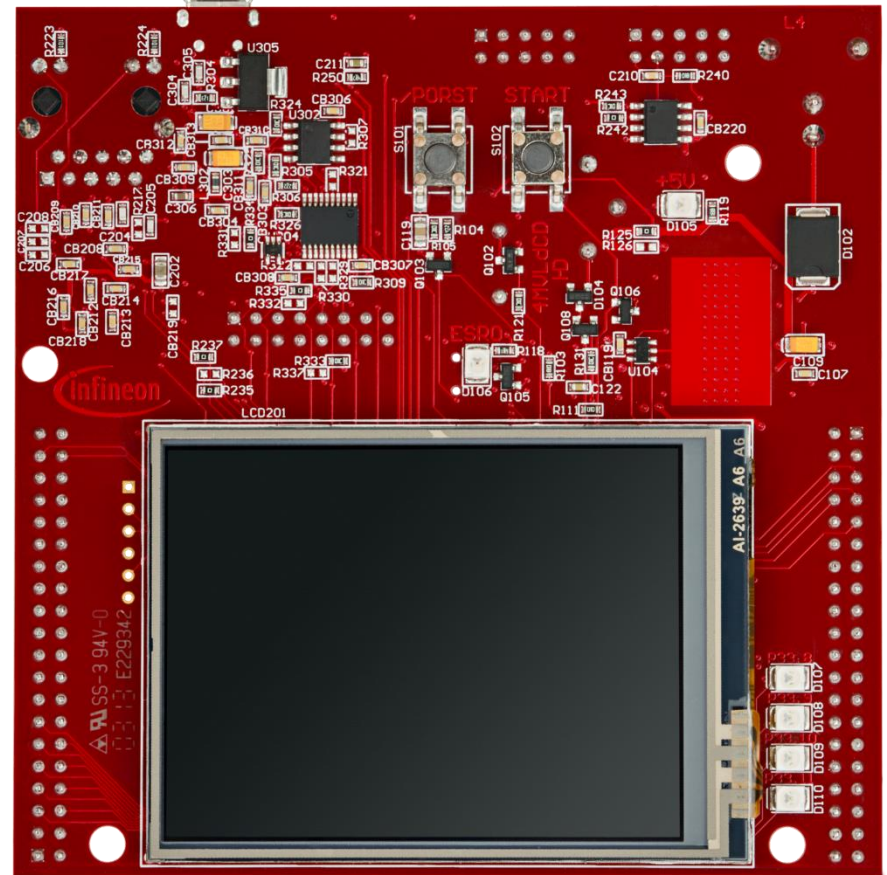
The SRAM function is toggling LED1 (P13.0), while the flash function is toggling LED2 (P13.1).

Introduction

- › The Local Memory Unit (LMU) SRAM can be used for **code execution**, data storage or overlay memory
- › The LMU can be accessed via cached (segment 9_H) or via non-cached (segment B_H) memory addresses
- › If a code is programmed to be executed from SRAM memory, it is copied from Flash to SRAM by the Start-up Software (SSW) code

Hardware setup

This code example has been developed for the board
KIT_A2G_TC397_5V_TFT.



Implementation

SRAM code section creation

The linker file “*Lcf_Tasking_Tricore_Tc.lsf*” is updated by adding a memory section (called ***code_lmuram_nc***) for code execution from LMURAM memory.

The memory section should be assigned to the **non-cached** memory addresses (segment B_H) to avoid any data inconsistency.

```
group code_lmuram_nc (ordered, attributes=rwx, copy, run_addr=mem:lmuram/not_cached)
{
    ...select "(.text.not_cached_lmuram*)";
    ...select "(.text.lmuram_not_cached*)";
}
```

Locating function code in a specific memory section

The ***pragma*** compiler keyword with the attribute ***section code*** “<***section identifier***>” is used to specify the memory section from which the implemented function code will be fetched and executed.

The ***section code restore*** attribute is used after the function implementation to ensure that next implemented functions will be located in the default code memory section (Flash memory).

Implementation

LED Toggling

Two functions are implemented, ***toggleLedSram()*** and ***toggleLedFlash()***, to toggle two LEDs from different memory regions.

Using the previously mentioned ***pragma*** compiler keyword, the ***toggleLedSram()*** can be executed from LMURAM memory not-cached addresses segment.

Both functions are implemented as following:

- Switch On the LED by calling ***IfxPort_setPinLow()***
- Wait for a one second delay
- Switch Off the LED by calling ***IfxPort_setPinHigh()***
- Wait for a one second delay

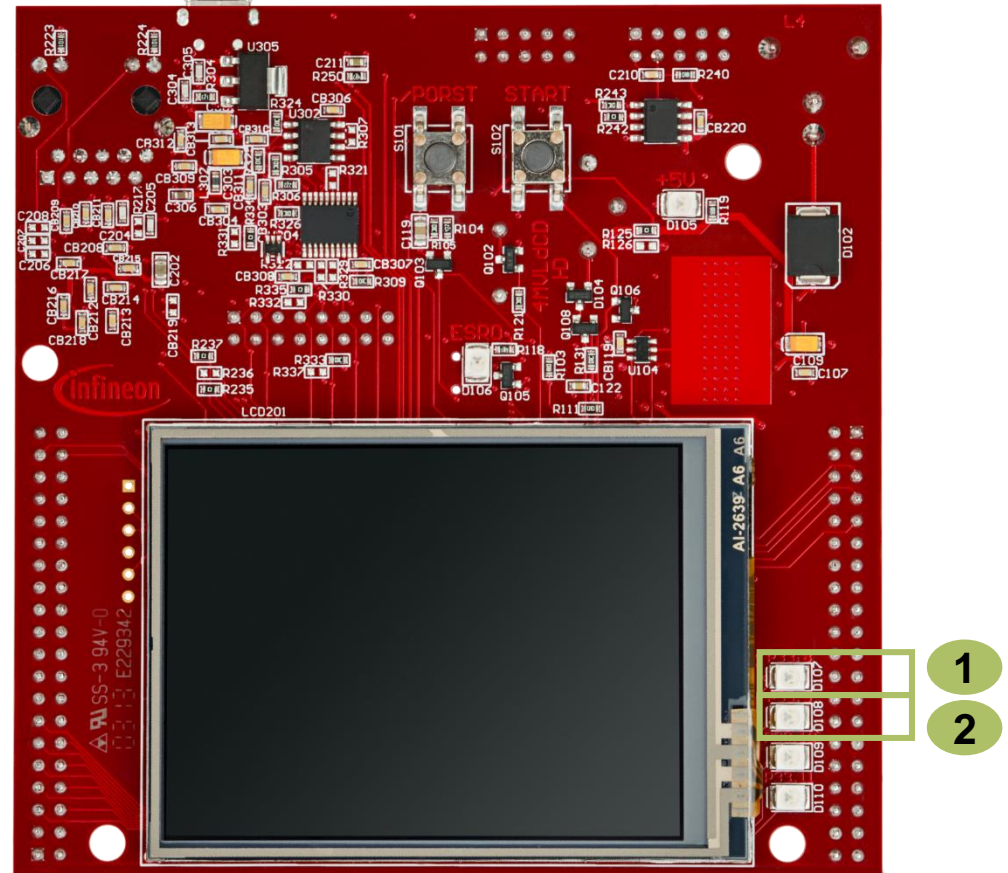
The above Port functions can be found in the iLLD header ***IfxPort.h***.

Note: The LEDs on the used board are low-level active.

Run and Test

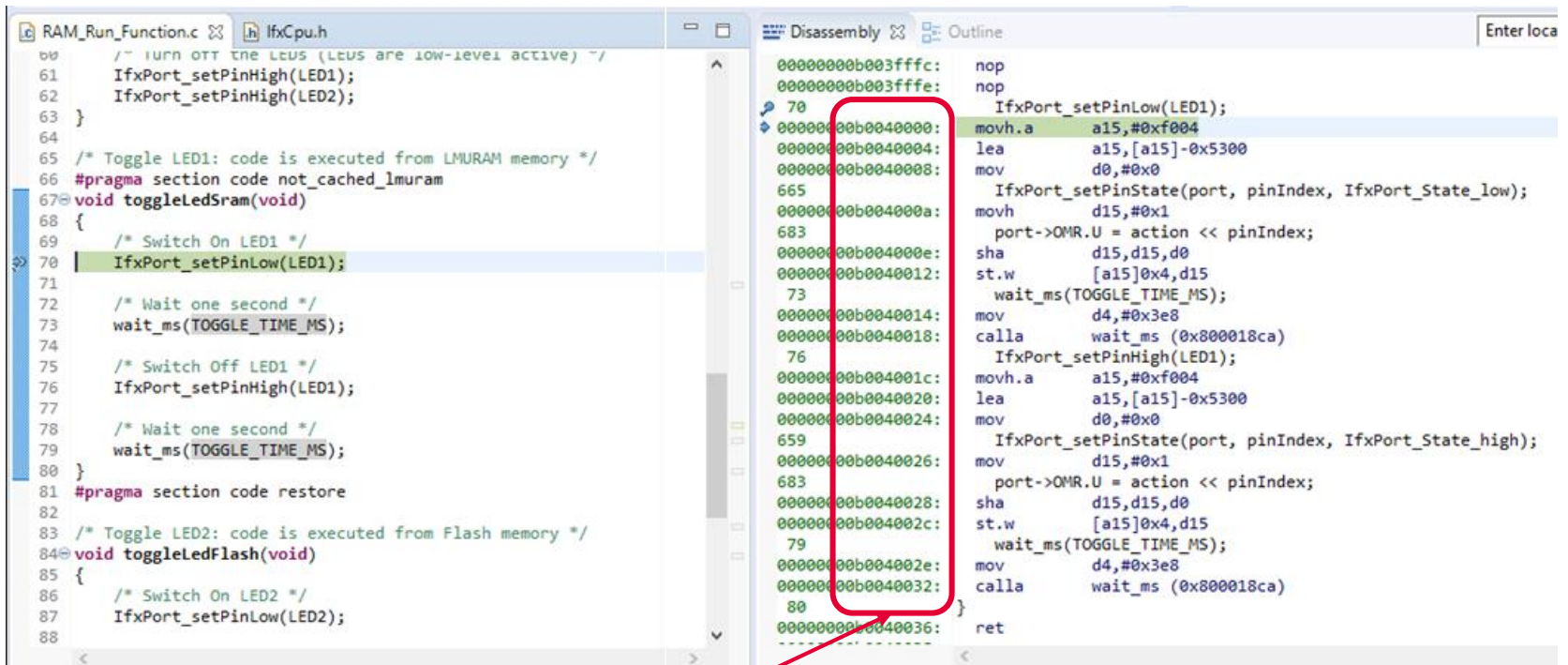
After code compilation and flashing the device:

- › Check that LED1 (D107) and LED2 (D108) are toggling



Run and Test

Additionally, the execution from RAM can be checked by adding a breakpoint inside the ***toggleLedSram()*** function and verify in the disassembly window of the debugger that the CPU is executing it from LMURAM (Addresses segment B_H).



```

RAM_Run_Function.c | IfxCpu.h
00  /* Turn off the LEDs (LEDs are low-level active) */
61  IfxPort_setPinHigh(LED1);
62  IfxPort_setPinHigh(LED2);
63  }
64
65  /* Toggle LED1: code is executed from LMURAM memory */
66  #pragma section code not_cached_lmuram
67  void toggleLedSram(void)
68  {
69      /* Switch On LED1 */
70      IfxPort_setPinLow(LED1);
71
72      /* Wait one second */
73      wait_ms(TOGGLE_TIME_MS);
74
75      /* Switch Off LED1 */
76      IfxPort_setPinHigh(LED1);
77
78      /* Wait one second */
79      wait_ms(TOGGLE_TIME_MS);
80  }
81  #pragma section code restore
82
83  /* Toggle LED2: code is executed from Flash memory */
84  void toggleLedFlash(void)
85  {
86      /* Switch On LED2 */
87      IfxPort_setPinLow(LED2);
88
Disassembly | Outline | Enter loca
00000000b003fffc: nop
00000000b003ffe: nop
70
00000000b0040000: movh.a a15,#0xf004
00000000b0040004: lea a15,[a15]-0x5300
00000000b0040008: mov d0,#0x0
665 IfxPort_setPinState(port, pinIndex, IfxPort_State_low);
00000000b004000a: movh d15,#0x1
683 port->OMR.U = action << pinIndex;
00000000b004000e: sha d15,d15,d0
00000000b0040012: st.w [a15]0x4,d15
73 wait_ms(TOGGLE_TIME_MS);
00000000b0040014: mov d4,#0x3e8
00000000b0040018: calla wait_ms (0x800018ca)
76 IfxPort_setPinHigh(LED1);
00000000b004001c: movh.a a15,#0xf004
00000000b0040020: lea a15,[a15]-0x5300
00000000b0040024: mov d0,#0x0
659 IfxPort_setPinState(port, pinIndex, IfxPort_State_high);
00000000b0040026: mov d15,#0x1
683 port->OMR.U = action << pinIndex;
00000000b0040028: sha d15,d15,d0
00000000b004002c: st.w [a15]0x4,d15
79 wait_ms(TOGGLE_TIME_MS);
00000000b004002e: mov d4,#0x3e8
00000000b0040032: calla wait_ms (0x800018ca)
80
00000000b0040036: ret
  
```

- › Addresses from where the ***toggleLedSram()*** function is executed

References



- › AURIX™ Development Studio is available online:
- › <https://www.infineon.com/aurixdevelopmentstudio>
- › Use the „*Import...*“ function to get access to more code examples.



- › More code examples can be found on the GIT repository:
- › https://github.com/Infineon/AURIX_code_examples



- › For additional trainings, visit our webpage:
- › <https://www.infineon.com/aurix-expert-training>



- › For questions and support, use the AURIX™ Forum:
- › <https://www.infineonforums.com/forums/13-Aurix-Forum>

Revision history

Revision	Description of change
V1.0.2	Added screenshot of .lsl file in Implementation slides
V1.0.1	Changed picture in Run and Test slide
V1.0.0	Initial version

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Edition 2021-06

Published by

Infineon Technologies AG

81726 Munich, Germany

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Document reference

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