ML7661/ML7660 Batteryless SDK Host MCU Sample Software Manual (ML63Q2557 Sensor)

Issue Date: Feb. 13, 2025

Preface

This document is a manual for the sample software for the host microcontroller when controlling the Tx side of the ML766XRT2-EVK-001 using the ML63Q2557 reference board.

Notation

Classification	Notation	Description
Numeric value	XXh, XXH, 0xXX	Indicates a hexadecimal number.
Unit	word, W	1 word = 16 bits
	byte, B	1 byte = 8 bits
	nibble, N	1 nibble = 4 bits
	mega-, M	10^6
	kilo-, K	2^{10} = 1024
	kilo-, k	10^3 = 1000
	milli-, m	10^{-3}
	micro-, μ	10^{-6}
	nano-, n	10^{-9}
	second, s (lower case)	second

Terms and Abbreviations

Terms and Abbreviations	Description
GUI	Graphical User Interface
URI	Uniform Resource Identifier
I2C	Inter Integrated Circuit
SPI	Serial Peripheral Interface
Tx / Poller	An NFC Forum Device in Poll Mode (Poll mode: The mode of an NFC Forum Device in which it sends Commands and receives Responses)
Rx / Listener	An NFC Forum Device in Listen Mode (Listen mode: The mode of an NFC Forum Device in which it receives Commands and sends Responses)
Short Packet Format	ROHM’s original packet format
T3T	Role of a Listener when it has gone through a number of States. In this mode, the Listener supports the execution of Type 3 Tag commands to read or write NDEF messages.

Table of Contents

1. Overview

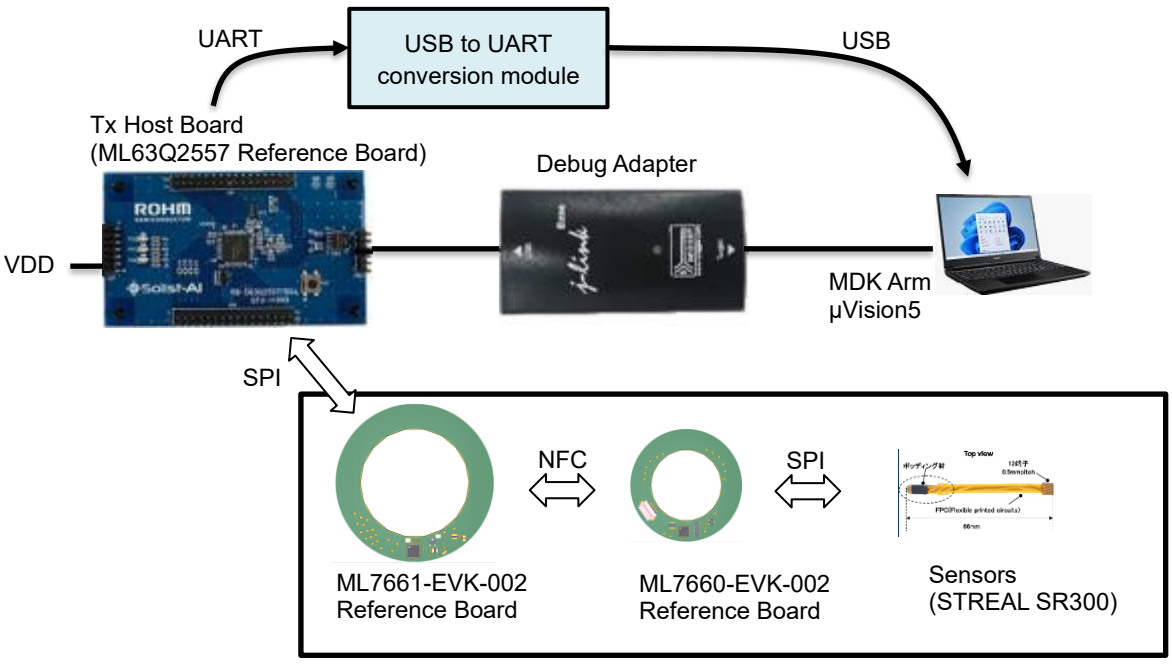
This document is a manual for the sample software for the host microcontroller when controlling the Tx side of the ML766XRT2-EVK-001 using the ML63Q2557 reference board.

The host microcontroller configures various settings for the Tx side to control Batteryless communication operations. Additionally, it acquires data from the strain sensor (STREAL SR300) by GLOSEL Co., which is connected to the Rx side, via the Tx side, and outputs the results through UART."

1.1. Operation Environment

Please prepare the following to run the reference software.

Name	substance
Windows PC	Windows 10 (1903 or later) recommended
Software Development Environment	MDK Arm µVision 5.33 recommended. The sample software can also be checked in the evaluation version.
Debug Adapter	It is used to debug software and write programs to Flash. J-Link is recommended.
Tx Host Board	ML63Q2557 Reference Board (ML63Q2557TB64)
USB to UART conversion module	By connecting the ML63Q2557 reference board to a PC via a USB to UART conversion module, you can display the acquired sensor data.
ML766XRT2-EVK-001	Rotating Reference Kit for ML7661/ML7660



2. System Configuration

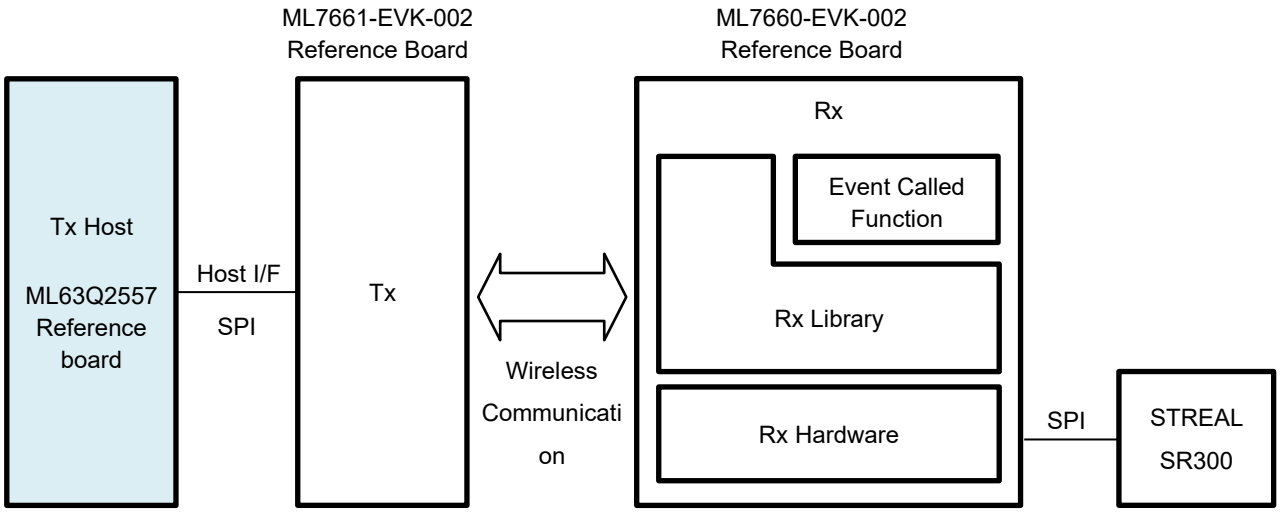
The system configuration is shown below. The ML766XRT2-EVK-001 consists of the ML7661-EVK-002 reference board and the ML7660-EVK-002 reference board.

This sample software operates as a Tx Host. The Tx Host board uses the ML63Q2557 reference board.

By developing the Event Called Function for the power transmission side (Tx side) Host and the power receiving side (Rx side), it is possible to use any peripheral device (sensors).

The sensor data is acquired by the Rx via SPI. The Tx communicates with the Rx to obtain the sensor data. The Tx Host controls the Tx and receives the sensor data acquired by the Rx.

For the Host I/F between the Tx Host and Tx, please refer to the NFC Reference Software Host Command Manual.



The Host I/F uses SPI. Please connect to the SPI-related pins of the ML7661. The ML63Q2557 side is the controller device, and the ML7661 side is the peripheral device.

Please connect the UART output of the ML63Q2557 to the terminal software on your PC. It will display the sensor information obtained from the ML766x.

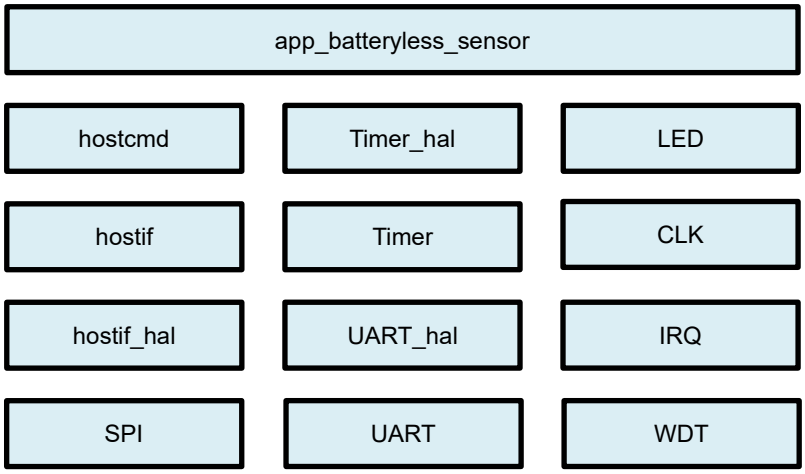
2.1. Board Connection

CN3 Pin No.	Pin Name	Function Pin Name	Function	Connection
1	VDD	VDD	VDD pin	Supply 5V
2	VSS	VSS	VSS pin	Connect to GND

CN2 Pin No.	Pin Name	Function Pin Name	Function	Connection
22	P63	SSNF1	SIOF1 select input/output	ML7661-EVK-002：FTDI-F1(Pin8 SCS_S)
23	P62	SINF1	SIOF1 data input	ML7661-EVK-002：FTDI-F1(Pin7 SDO_S)
24	P61	SOUTF1	SIOF1 data output	ML7661-EVK-002：FTDI-F1(Pin4 SDA/SDI)
25	P60	SCKF1	SIOF1 clock output	ML7661-EVK-002：FTDI-F1(Pin5 SCK/SCLK)
32	P21	TXDF0	UARTF0 Data output	Connect to PC via USB to UART conversion module
33 or 34	VSS	VSS	VSS pin	Connect to GND

3. Sample Software

3.1. Software Structure



3.2. File Structure

The file structure of this sample program is described below.

Folder / File Names	Description
ML63Q2500Sample	
SourceCode	
samples	
BatteryLess	
SensorSR300Demo	Sample program folder using STREAL SR300
main.c	Main routine files
main.h	
app_batteryless_sensor.c	Sensor Control files
app_batteryless_sensor.h	
hostcmd.c	Host Command files
hostcmd.h	
hostif.c	Host Interface files
hostif.h	
hostif_hal.c	Host Interface hardware access files
hostif_hal.h	
timer_hal.c	Timer access files
timer_hal.h	
uart_hal.c	UART access files
uart_hal.h	
codeoption.c	Configuration files
codeoption.h	
codeoption_config.h	
irq_SensorSR300Demo.c	Interrupt function source file

JLinkSettings.ini	Setting file
SensorSR300Demo.uvoptx	Project option file
SensorSR300Demo.uvprojx	Project file
RTE	RTE folder
driver	Peripheral driver folder
src	Folder storing source files for each peripheral driver
irq.c	Source file of IRQ driver
timer0_1.c	Source file of TIMER0 and TIMER1 drivers
wdt.c	Source file of WDT driver
ssiof1.c	Source file of SSIOF1 driver
uartf0.c	Source file of UARTF0 driver
inc	Folder storing header files for each peripheral driver
rdwr_reg.h	Folder storing header files for each peripheral driver
mcu.h	Header file of target device
clock.h	API definition header file of Clock driver
irq.h	API definition header file of IRQ driver
timer0_1.h	API definition header file of TIMER0 and TIMER1 drivers
timer_common.h	Common header file of Timer driver
wdt.h	API definition header file of WDT driver
ssiof1.h	API definition header file of SSIOF1 driver
ssiof_common.h	Common header file of SSIOF driver
uartf0.h	API definition header file of UARTF0 driver
uartf_common.h	Common header file of UARTF driver
utility	Source code of utility functions related to reference board control
board	
smpl_common.c	Common process for sample program
smpl_common.h	
smpl_common_led.c	Common process for using LED
smpl_common_led.h	

3.3. Parameters

File Name: app_batteryless_sensor.h

<table>
<tr><th>Definition</th><th>Description</th></tr>
<tr><td>SETTING_PRM_COMMHIGH</td><td>RF field (modulation) upper level setting during communication.
<table><tr><td>Default</td><td>60</td></tr><tr><td>Range</td><td>0 to 255</td></tr></table>Used as PRM1 in the Batteryless Setting Command</td></tr>
<tr><td>SETTING_PRM_COMMLOW</td><td>RF field (modulation) lower level setting during communication.
<table><tr><td>Default</td><td>40</td></tr><tr><td>Range</td><td>0 to 255</td></tr></table>Used as PRM2 in the Batteryless Setting Command</td></tr>
<tr><td>SETTING_PRM_CHARGEHIGH</td><td>RF field (modulation) lower level setting during power supply.
<table><tr><td>Default</td><td>60</td></tr><tr><td>Range</td><td>0 to 255</td></tr></table>Used as PRM3 in the Batteryless Setting Command</td></tr>
<tr><td>SETTING_PRM_COMMFEED</td><td>RF field (feed size) setting during communication
<table><tr><td>Default</td><td>5</td></tr><tr><td>Range</td><td>0 to 63</td></tr></table>Used as PRM4 in the Batteryless Setting Command</td></tr>
<tr><td>SETTING_PRM_CHARGEFEED</td><td>RF field (feed size) setting during power supply
<table><tr><td>Default</td><td>5</td></tr><tr><td>Range</td><td>0 to 63</td></tr></table>Used as PRM5 in the Batteryless Setting Command</td></tr>
<tr><td>CH0STRAIN</td><td>Control for acquiring strain sensor value on Channel 0
<table><tr><td>0</td><td>Disabled</td></tr><tr><td>1</td><td>Enabled (Default)</td></tr></table></td></tr>
<tr><td>CH0TEMPERATURE</td><td>Control for acquiring temperature sensor value on Channel 0
<table><tr><td>0</td><td>Disabled</td></tr><tr><td>1</td><td>Enabled (Default)</td></tr></table></td></tr>
<tr><td>CH1STRAIN</td><td>Control for acquiring strain sensor value on Channel 1
<table><tr><td>0</td><td>Disabled</td></tr><tr><td>1</td><td>Enabled (Default)</td></tr></table></td></tr>
<tr><td>CH1TEMPERATURE</td><td>Control for acquiring temperature sensor value on Channel 1
<table><tr><td>0</td><td>Disabled</td></tr><tr><td>1</td><td>Enabled (Default)</td></tr></table></td></tr>
<tr><td>PACKET_FORMAT</td><td>Data Format Selection
<table><tr><td>T3T_FORMAT</td><td>Select T3T Format</td></tr><tr><td>SHORT_PACKET_FORMAT</td><td>Select Short Packet Format (Default)</td></tr></table></td></tr>
</table>

<table>
<tr><td>LATENCY_TIME</td><td>Latency Time Control
<table><tr><td>0</td><td>Disabled</td></tr><tr><td>1</td><td>Enabled (Default)</td></tr></table></td></tr>
<tr><td>DATA_BYTE_NUM</td><td>Number of Bytes of Received Data
Automatically calculated using the following formula:
(LATENCY_TIME * 4 + (CH0STRAIN + CH0TEMPERATURE + CH1STRAIN + CH1TEMPERATURE) * 2)
<table><tr><td>Default</td><td>12</td></tr><tr><td>Range</td><td>at Type 3 Tag Communication: 1 to 80
at Short Packet Format Communication: 1 to 253</td></tr><tr><td>Unit</td><td>Bytes</td></tr></table>Used as PRM2 in the Batteryless Execution Command</td></tr>
<tr><td>CYCLE</td><td>Data Acquisition Cycle Control
Specify the Interval for Issuing the Batteryless Data Acquisition Command
<table><tr><td>Default</td><td>0</td></tr><tr><td>Range</td><td>0 to 65535</td></tr><tr><td>Unit</td><td>Milliseconds</td></tr></table>Used as PRM4 and PRM5 in the Batteryless Execution Command</td></tr>
<tr><td>COMM_TIMEOUT</td><td>Timeout Duration During Communication
<table><tr><td>Default</td><td>10</td></tr><tr><td>Range</td><td>0 to 65535</td></tr><tr><td>Unit</td><td>Milliseconds</td></tr></table>Used as PRM6 and PRM7 in the Batteryless Execution Command</td></tr>
<tr><td>WRITE_TO_APP_TIMEOUT</td><td>Host Command Timeout Duration (During Application Data Write Command)
<table><tr><td>Default</td><td>1</td></tr><tr><td>Range</td><td>0 to 255</td></tr><tr><td>Unit</td><td>Seconds</td></tr></table></td></tr>
</table>

4. How to Operate the Sample Software

The sample program includes project files for MDK-ARM µVision, so you can easily verify operation and modify the program.

4.1. Operation Verification Procedure

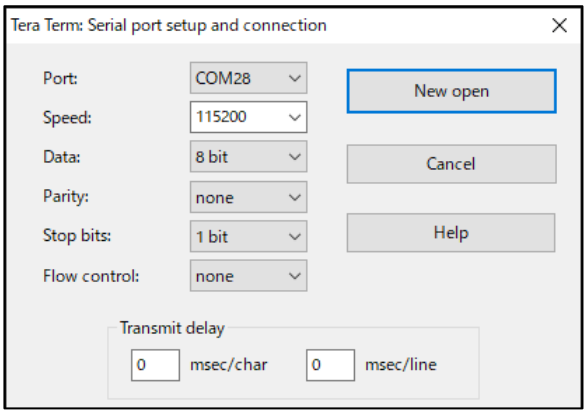
Step-1. Install the MDK-ARM development environment

Step-2. Launch the µVision project file of this sample program

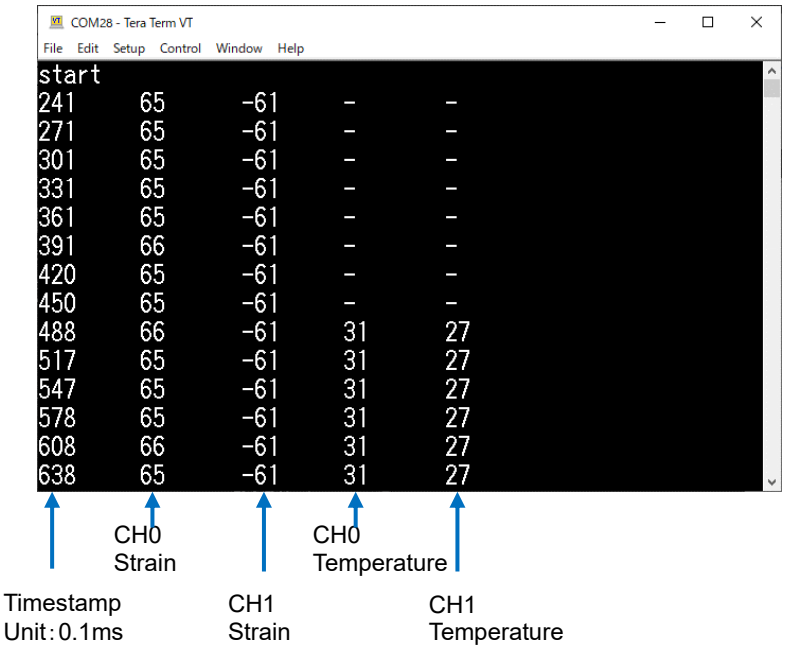
Step-3. Write the program to the ML63Q2557 reference board

The program will light up the LED (P50) after startup. Then, it will send commands to the Tx side, configure the settings, and start Batteryless communication. It will continuously acquire data and output the results via UART.

By using terminal software, you can display the acquired sensor values. Below is an example of the terminal software settings.



Here is an example of how the acquired data can be displayed:



If LATENCY_TIME is defined as 0 (Disabled), the timestamp will not be output.

Only the sensor values defined as 1 (Enabled) will be output:
CH0STRAIN
CH0TEMPERATURE
CH1STRAIN
CH1TEMPERATURE、

5. Supplementary Information

When using the SDK with sensors, the parameter for the Batteryless execution command can only be set to ‘synchronous’ mode.

When using the SDK with sensors, it is recommended to use the Short Packet Format for communication when acquiring sensor data.

6. Revision History

No.	Date	Page		Descriptions
		Previous Edition	Current Edition	
1	Feb 13, 2025	-	-	First edition issued

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