RA6M2 Group

Touchless Button Demo Solution Sample Software

Introduction

This application note describes touchless button demo solution (RTK0EG0036D01001BJ) Software specification using a sample application of self-capacitance method based on Capacitive Touch Sensor Unit (CTSU), the hardware that detects the contact or approach of human by measuring capacitance generated between touch electrodes and the human body.

Target Device

RA6M2 Group

Related Documents

1. RA Family Using QE and FSP to Develop Capacitive Touch Application (R01AN4934EJ0110)
2. RA6M2 Group Capacitive Touch Evaluation System User's Manual (R12UZ0085EJ0100)
3. RA2L1 Group Touchless Button Demo Solution (Hardware) (R01AN5812EJ0101)

Contents

1. Overview

This application note describes the sample software that runs on the touchless button demo solution. Please refer to ‘Touchless Button Demo Solution (Hardware)' (R01AN5812JJ0101) for the description of the corresponding hardware.

1.1 Software Structure

Figure 1.1 shows software structure of this application.

Capacitive measurement with CTSU employs software generated by QE for Capacitive Touch[RA,RL78,Synergy], a development tool for capacitive touch sensor applications, and FSP Configurator. The software is referred to as QE Touch Module and QE CTSU Module, respectively.

The application informs the detection result to the user via LEDs and buzzer sound on the touchless button demo solution.

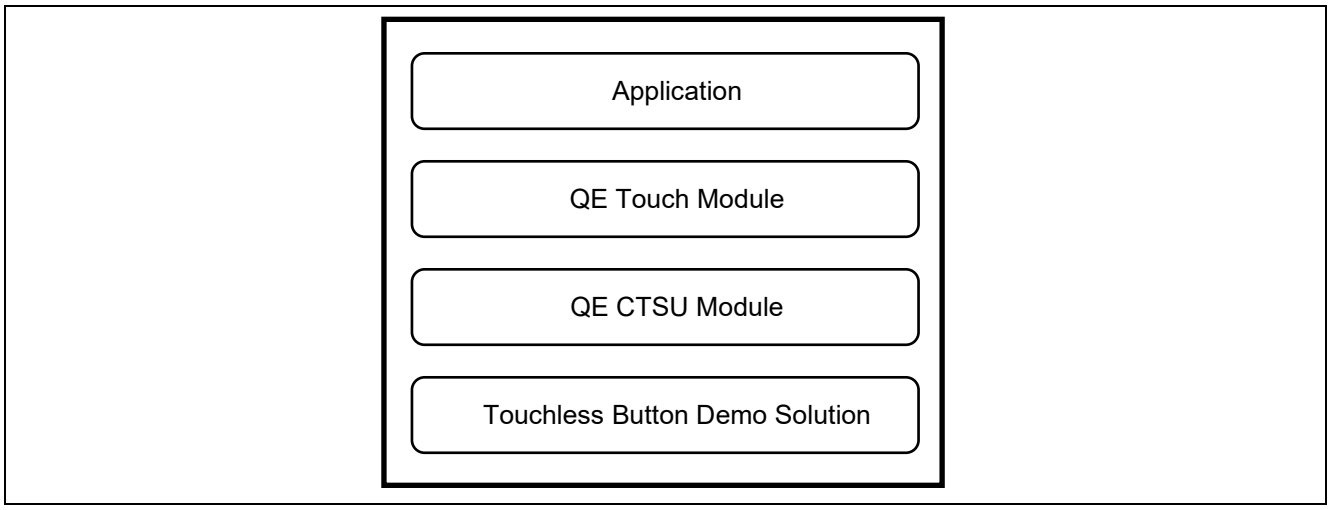

Figure 1.1 Software Structure Diagram

1.2 File Structure

Table 1.1 shows the file configuration used in this sample software. Source files and header files generated by QE touch module and FSP configurator have been omitted for brevity.

Table 1.1 File Configuration

Folder/File Name	Description
touchless_sample_project_ra6m2	Project folder
.cproject	C project file
.project	Project file
touchless_sample_project_ra6m2 Debug_Flat.launch	Debug configuration file
configuration.xml	FSP configurator configuration file
qe_gen	QE automatically generated file storage folder
qe_touch_config.c	QE Touch configuration definition source file
qe_touch_config.h	QE Touch configuration definition header file
qe_touch_define.h	QE Touch configuration definition header file
qe_touch_sample.c	Application file
src	Source/header file storage folder
r_touchless_led.c	Touchless Button Demo Solution LED control source file
r_touchless_led.h	Touchless Button Demo Solution LED control header file
r_touchless_buzzer.c	Touchless Button Demo Solution buzzer control source file
r_touchless_buzzer.h	Touchless Button Demo Solution buzzer control header file
QE-Touch	QE for Capacitive Touch generated folder
touchless_sample_project_ra6m2.tifcfg	Touch I/F configuration file

2. Operating Environment

Table 2.1 lists the operating conditions of the software.

Table 2.1 Operating Environment

Item	Description
Evaluation board	RTK0EG0021S01001BJ
MCU used	RA6M2 (R7FA6M2AF3CFB)
Operating frequency	240MHz
Operating voltage	3.3V
Integrated Development Environment	e2 studio V2021-04
C compiler	GNU ARM Embedded 9.3.1.20200408
CTSU development support tool	QE for Capacitive Touch[RA,RL78,Synergy] V1.4.0.
Emulator	E2 emulator Lite

Figure 2.1 shows the device connection diagram.

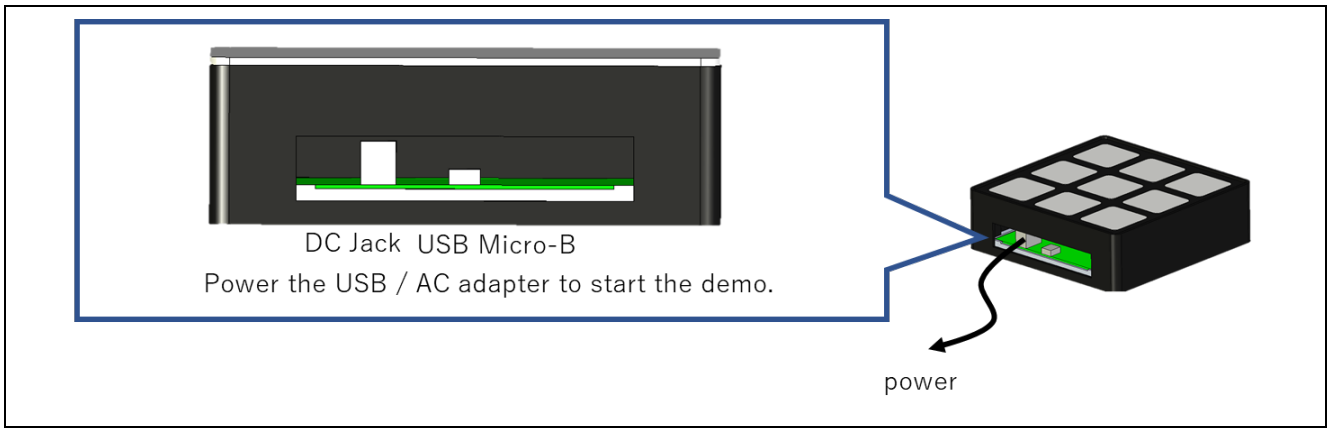

Figure 2.1 Device Connection Diagram

3. Sample Application

The following sample application using the Touchless button demo solution has been added to this sample software, based on QE Touch module application file qe_touch_sample.c

3.1 Touchless button demo solution Initialization

The following initialization functions have been added before the main function loop.

- r_touchless_led_initialize () - LED control initialization
- r_touchless_buzzer_initialize () - Buzzer control initialization

3.2 Results Notification

To notify the user of proximity (including touch) detection results, function r_touchless_led_control (), r_touchless_buzzer_control () has been added after RM_TOUCH_DataGet (), which is called in the main function loop.

This ensures that r_touchless_led_control (), r_touchless_buzzer_control () is called for each touch measurement cycle. Capacitance of 9 button electrodes is measured respectively. Proximity or touch is detected when the human body (fingers, hands, etc.) approaches and the measured value exceeds the threshold value, related LED is turned on and buzzer output is controlled.

3.3 Build Options

The sample application supports result notification by the following LEDs.

- Turns on the LED when the proximity (including touch) of 9 electrodes is detected
- Dim the LED according to the measured values of the 9 electrodes

The above result notification can be switched with the following build options.

Table 3.1 Build options（r_touchless_led.h）

Item	Description
ENABLE_LED_TOGGLE_LIGHT	With definition: enable LED lighting (default) No definition: enable LED dimming

It is possible to enable/disable buzzer.

The enable/disable of buzzer can be switched with following build options.

Table 3.2 Build options（r_touchless_buzzer.h）

Item	Description
ENABLE_RING_BUZZER	With definition: enable buzzer ringing (default) No definition: disable buzzer ringing

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http://japan.renesas.com/

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http://japan.renesas.com/contact/

Revision History

Rev.	Date	Description	
		Page	Summary
1.00	2021.8.31	-	First edition release

General Precautions in the Handling of Microprocessing Unit and Microcontroller Unit Products

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3. Input of signal during power-off state

   Do not input signals or an I/O pull-up power supply while the device is powered off. The current injection that results from input of such a signal or I/O pull-up power supply may cause malfunction and the abnormal current that passes in the device at this time may cause degradation of internal elements. Follow the guideline for input signal during power-off state as described in your product documentation.
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   After applying a reset, only release the reset line after the operating clock signal becomes stable. When switching the clock signal during program execution, wait until the target clock signal is stabilized. When the clock signal is generated with an external resonator or from an external oscillator during a reset, ensure that the reset line is only released after full stabilization of the clock signal. Additionally, when switching to a clock signal produced with an external resonator or by an external oscillator while program execution is in progress, wait until the target clock signal is stable.
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