Application Note
BQ2562x Control Based on MSPM0 Through I2C

TEXAS INSTRUMENTS

Eason Zhou

ABSTRACT

The BQ2562x devices are highly-integrated 3.5A switch-mode battery charge management and system power path management devices for single cell Li-Ion and Li-polymer batteries. The MSPM0L1306 is a highly-integrated, ultra-low power 32bit microcontroller (MCU) of the MSPM0 family. This application note provides detailed instructions for the BQ2562x control based on MSPM0L1306 through I2C. The document includes descriptions of the necessary equipment, equipment setup, and procedures.

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1 Introduction

This application note gives a quick instruction on how to do basic set up for BQ2562x based on MSPM0. For more details and advanced usage, refer to the BQ25620/BQ25622 I2C Controlled 1-Cell, 3.5A, Maximum 18V Input, Buck Battery Charger with NVDC Power Path Management and OTG Output data sheet, BQ25620 and BQ25622 Evaluation Module User's Guide and MSPM0L1306 LaunchPad Development Kit (LP-MSPM0L1306) User's Guide.

Users can perform charging and system settings control on the BQ2562x though I2C with the example code provided in the application note. The example code can be download through this link: BQ25620_with_MSPM0L1306_ticlang.

2 Hardware Connection

Figure 2-1 shows the system block diagram. In the setup, use a power supply, a Li-ion battery, a MSPM0L1306 LaunchPad™ and a BQ2562x EVM. Users can do the setup by following the instructions.
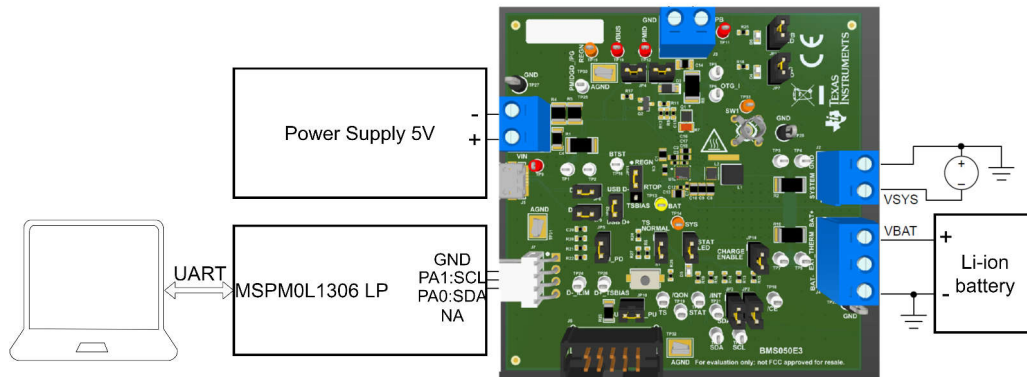

Figure 2-1. System Block Diagram
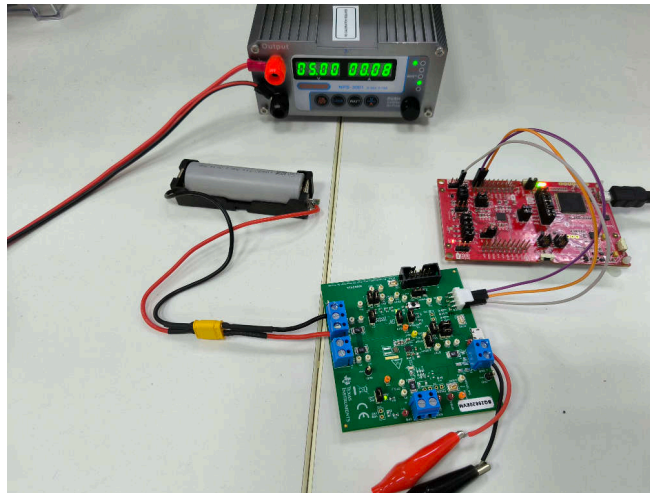
A real setup picture is shown in Figure 2-2.

**Figure 2-2. Real Hardware Setup**

For MSPM0L1306 LaunchPad, PA1 is configured as SCL pin, and PA0 is configured as SDA pin. The MSPM0L1306 is powered using the USB port on the host computer. Table 2-1 shows the signal and power connections between the two EVMs.

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Table 2-1. Connection between the EVM and LaunchPad

Connection Type	Connection Name	LP-MSPM0L1306 Pin Number	BQ2562xEVM Pin Number
I2C interface	I2C : SCL	PA1	J7-3
	I2C : SDA	PA0	J7-2
Power connections	Power : Ground	J1-1	J7-1

For the I2C interface, besides the connection of SCL and SDA, there are pull-up designs on both boards. The default hardware setting works well. Users can also select one EVM to pull up the SDA and SCL based on the application.

For the BQ2562x EVM, shorting JP2 and JP3 can pull up the SDA and SCL. The default value of the pull-up resistor is 10k ohm. This needs to be adjusted according the I2C bus speed. Figure 2-3 shows the pull-up jumper diagram on the BQ2562x EVM.
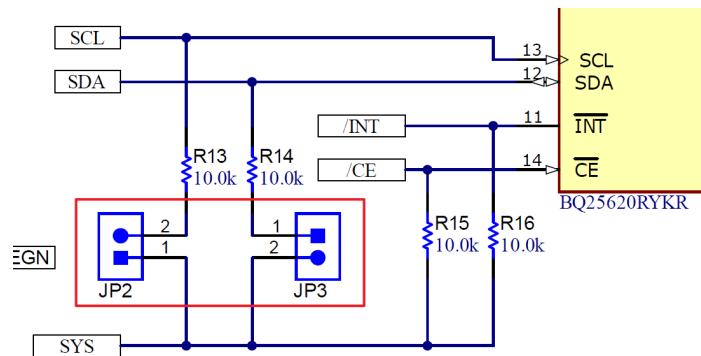
Figure 2-3. Pull-up in EVM

For the LaunchPad, shorting J9-2-3 and J10-2-3 can pull up the SDA and SCL. The default value of the pull-up resistor is 2.2k ohm. This can also be adjusted according the I2C bus speed. Figure 2-4 shows the pull-up jumper diagram on MSPM0L1306 LaunchPad.
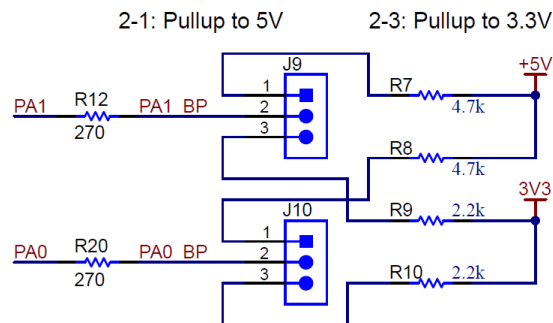
Figure 2-4. Pull-up in LaunchPad

3 Software Structure and Important Functions

The software project is developed in Code Composer Studio™ (CCS) and is shown in Figure 3-1. The software project mainly consists of four parts.

The BQ2562x_charger part contains the application level function control to configure the charger and the I2C communication to do the register configuration.

The BQ2562x_regmap part contains the BQ2562x register map.

The I2C_Comm part includes the write and read registers function based on I2C protocol for M0.

The main part includes the highest system function code. After MCU powers on, the MSPM0 starts to configure BQ2562x, and reads the status through I2C.
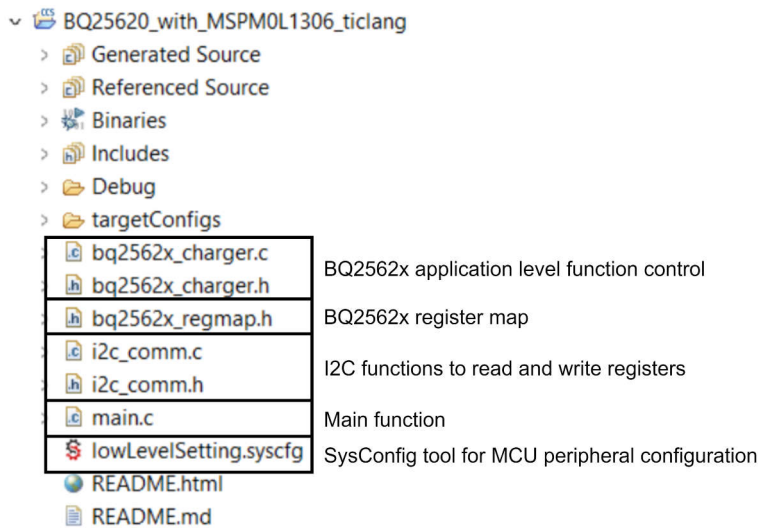
Figure 3-1. Software Project View

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4 Evaluation Steps

1. Input the battery information and the BQ2562x configuration before doing the setup in the main.c file as shown in Figure 4-1.

```c
31  */
32
33  #include "ti_msp_dl_config.h"
34  #include "bq2562x_charger.h"
35
36  //******************Parameter Init***********************//
37  battery_info batt_info = {
38      .constant_charge_current_max_ua = 1040000,   //1A
39      .constant_charge_voltage_max_uv = 42000000, //4.2V
40      .precharge_current_ua = 100000,
41      .charge_term_current_ua = 60000,
42  };
43
44  bq2562x_init_data bq_init_data = {
45      .iInputHighLim_uA = 1000000,
46      .vInputLowlim_uV = 4600000,
47      .watchdog_timer_s = 0,
48  };
49
```

Figure 4-1. Software Configuration

Table 4-1 shows the basic description for the configurations. Battery information, like max voltage and max current, can be obtained from the battery manufacturer. The precharge current and terminate current are obtained from experience and are according to the application requirement. For the BQ2562x configuration, TI recommends to add some margin based on the battery information.

Table 4-1. Configuration Description

Category	Parameters	Description
Battery information	Constant_charge_current_max_ua	Max constant charge current for battery.
	Constant_charge_voltage_max_uv	Max constant charge voltage for battery; this works at the end of charge.
	Precharge_current_uA	Precharge current for battery. Used to make sure the battery is healthy and in good connection.
BQ2562x configuration	iInputHighLim_uA	Max input current in power line side. If this is above the max input current, then the discharge is stopped.
	vInputLowLim_uV	Minimum input voltage in power line. If this is not satisfied, then the discharge current constantly decreases.
	Watchdog_timer_s	BQ2562x internal watchdog timer. Reset in the bq2562x_get_state() function.

2. Install CCS and load the code example from the link in Section 1.
3. Perform the hardware setup by following the instructions in Section 2.
4. Users can run a time check on the BQ2562x status by checking the variable bq_device->state in the debug mode of CCS, as shown in Figure 4-2.

Expression	Type	Value
∨ 📂 bq_device	struct bq2562x_device	{bat_info=0x2000001C {constant_charge_current_max_ua=10...
∨ ➡ bat_info	struct battery_info *	0x2000001C {constant_charge_current_max_ua=1040000,con...
∨ 📂 *(bat_info)	struct battery_info	{constant_charge_current_max_ua=1040000,constant_charge...
(x)= constant_charge_curren	unsigned int	1040000
(x)= constant_charge_voltag	unsigned int	42000000
(x)= precharge_current_ua	unsigned int	100000
(x)= charge_term_current_ua	unsigned int	60000
∨ ➡ init_data	struct bq2562x_init_da...	0x2000003C {iInputHighLim_uA=600000,vInputLowlim_uV=4...
∨ 📂 *(init_data)	struct bq2562x_init_da...	{iInputHighLim_uA=600000,vInputLowlim_uV=4600000,watc...
(x)= iInputHighLim_uA	unsigned int	600000
(x)= vInputLowlim_uV	unsigned int	4600000
(x)= watchdog_timer_s	unsigned int	0
∨ 📂 state	struct bq2562x_state	{chrg_status=CONSTANT_CURRENT,chrg_type=BQ2562X_US...
(x)= chrg_status	enum chg_status	CONSTANT_CURRENT (Hex)
(x)= chrg_type	enum bc1p2_mode	BQ2562X_USB_DCP (Hex)
(x)= health	unsigned char	0 '\x00'
(x)= fault_0	unsigned char	0 '\x00'
(x)= vbat_adc_uV	unsigned int	2911370
(x)= vbus_adc_uV	unsigned int	5022050
(x)= ibat_adc_uA	unsigned int	104000
(x)= ibus_adc_uA	unsigned int	84000

Figure 4-2. Result in Debug Mode

The result parameter description is shown in Table 4-2. For the parameter definitions, refer to the BQ25620/ BQ25622 I2C Controlled 1-Cell, 3.5A, Maximum 18V Input, Buck Battery Charger with NVDC Power Path Management and OTG Output data sheet.

Table 4-2. Result Description

Parameters	Description
Chrg_status	The battery charging status
Chrg_type	USB input source detection through D+/D− lines
Vbat_adc_uV	Battery voltage
Vbus_adc_uV	USB power line voltage
Ibat_adc_uA	Battery current
Ibus_adc_uA	USB power line current

5 Summary

This application note provides quick start instructions for evaluating resistive touch screens using MSPM0. The document not only shows a complete solution, but also describes the development challenges while developing resistive touch screen solutions. This application note provides convenience for users to develop resistive touch screens.

6 References

- Texas Instruments, LP-MSPM0L1306 LaunchPad, user's guide
- Texas Instruments, BQ25620/BQ25622 I2C Controlled 1-Cell, 3.5A, Maximum 18V Input, Buck Battery Charger with NVDC Power Path Management and OTG Output , data sheet
- Texas Instruments, BQ25620 and BQ25622 Evaluation Module, user's guide

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