MB39C811-EVBSK-01

Energy Harvesting for Buck Power Management Starter Kit Operation Guide

Doc. No. 002-08637 Rev. *A

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Preface

This manual explains how to use the Starter Kit. Be sure to read this manual before using the product.

For mass production/evaluation PMICs for this product, consult with sales representatives or support representatives.

Handling and Use

Handling and use of this product and notes regarding its safe use are described in the manuals for products bundled with the Starter Kit.

Follow the instructions in the manuals to use this product.

Keep this manual at hand so that you can refer to it anytime during use of this product.

Notice on this Document

All information included in this document is current as of the date it is issued. Such information is subject to change without any prior notice.

Please confirm the latest relevant information with the sales representatives.

Cautions

Caution of the Products Described in this Document

The following precautions apply to the product described in this manual.

⚠ **WARNING**	Indicates a potentially hazardous situation which could result in death or serious injury and/or a fault in the user's system if the product is not used correctly.

Electric shock, Damage	Before performing any operation described in this manual, turn off all the power supplies to the system. Performing such an operation with the power on may cause an electric shock or device fault.
Electric shock, Damage	Once the product has been turned on, do not touch any metal part of it. Doing so may cause an electric shock or device fault.

⚠ **CAUTION**	Indicates the presence of a hazard that may cause a minor or moderate injury, damages to this product or devices connected to it, or may cause to loose software resources and other properties such as data, if the device is not used appropriately.

Cuts, Damage	Before moving the product, be sure to turn off all the power supplies and unplug the cables. Watch your step when carrying the product. Do not use the product in an unstable location such as a place exposed to strong vibration or a sloping surface. Doing so may cause the product to fall, resulting in an injury or fault.
Cuts	The product contains sharp edges that are left unavoidably exposed, such as jumper plugs. Handle the product with due care not to get injured with such pointed parts.
Damage	Do not place anything on the product or expose the product to physical shocks. Do not carry the product after the power has been turned on. Doing so may cause a malfunction due to overloading or shock.
Damage	Since the product contains many electronic components, keep it away from direct sunlight, high temperature, and high humidity to prevent condensation. Do not use or store the product where it is exposed to much dust or a strong magnetic or electric field for an extended period of time. Inappropriate operating or storage environments may cause a fault.
Damage	Use the product within the ranges given in the specifications. Operation over the specified ranges may cause a fault.
Damage	To prevent electrostatic breakdown, do not let your finger or other object come into contact with the metal parts of any of the connectors. Before handling the product, touch a metal object (such as a door knob) to discharge any static electricity from your body.
Damage	When turning the power on or off, follow the relevant procedure as described in this document. Before turning the power on, in particular, be sure to finish making all the required connections. Furthermore, be sure to configure and use the product by following the instructions given in this document. Using the product incorrectly or inappropriately may cause a fault.
Damage	Always turn the power off before connecting or disconnecting any cables from the product. When unplugging a cable, unplug the cable by holding the connector part without pulling on the cable itself. Pulling the cable itself or bending it may expose or disconnect the cable core, resulting in a fault.
Damage	Because the product has no casing, it is recommended that it be stored in the original packaging. Transporting the product may cause a damage or fault. Therefore, keep the packaging materials and use them when re-shipping the product.

Contents

1. Description

The MB39C811-EVBSK-01 is an evaluation board that contains Energy Harvesting Power Management IC, MB39C811 (Buck DC/DC converter), which can be used in application on the Solar and Piezoelectric Energy Harvester. The MB39C811 has a wide input range from 4V up to 23V, and the output voltages are selectable from 1.5V to 5V. The board contains a low power microcontroller, FM3 (MB9AFA32N), which allows wireless data communications and displays sensor data on the LCD.

Figure 1-1. Diagram of the Starter Kit

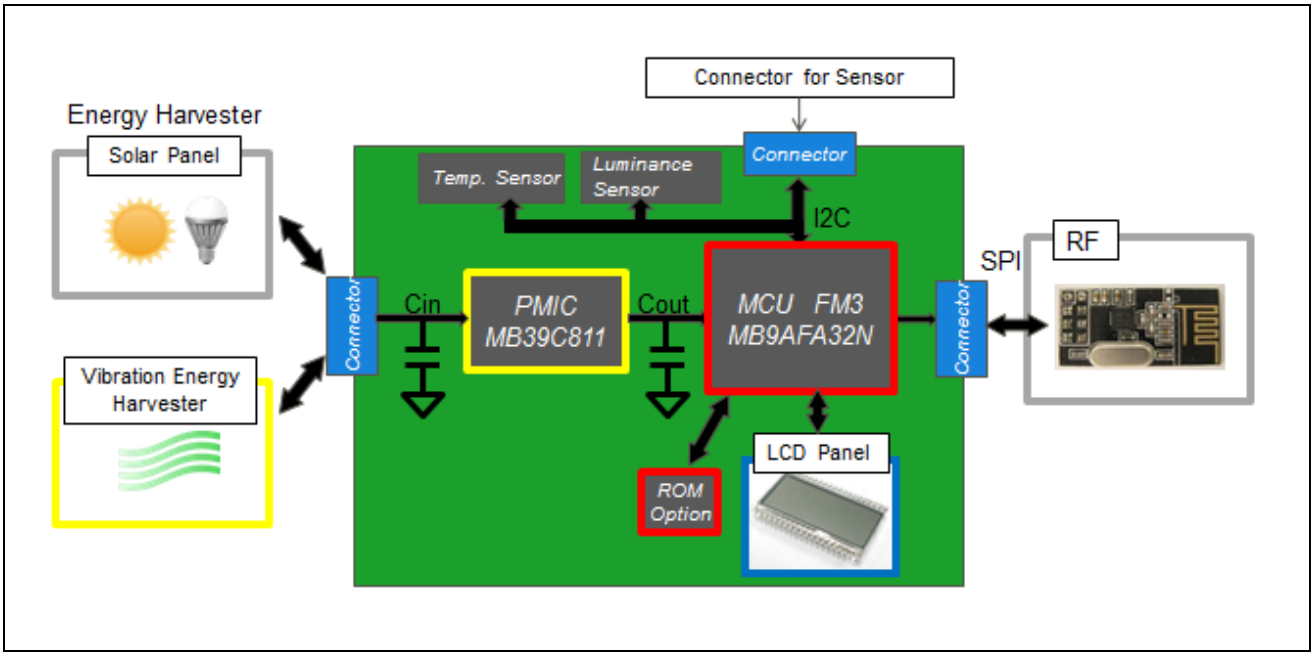
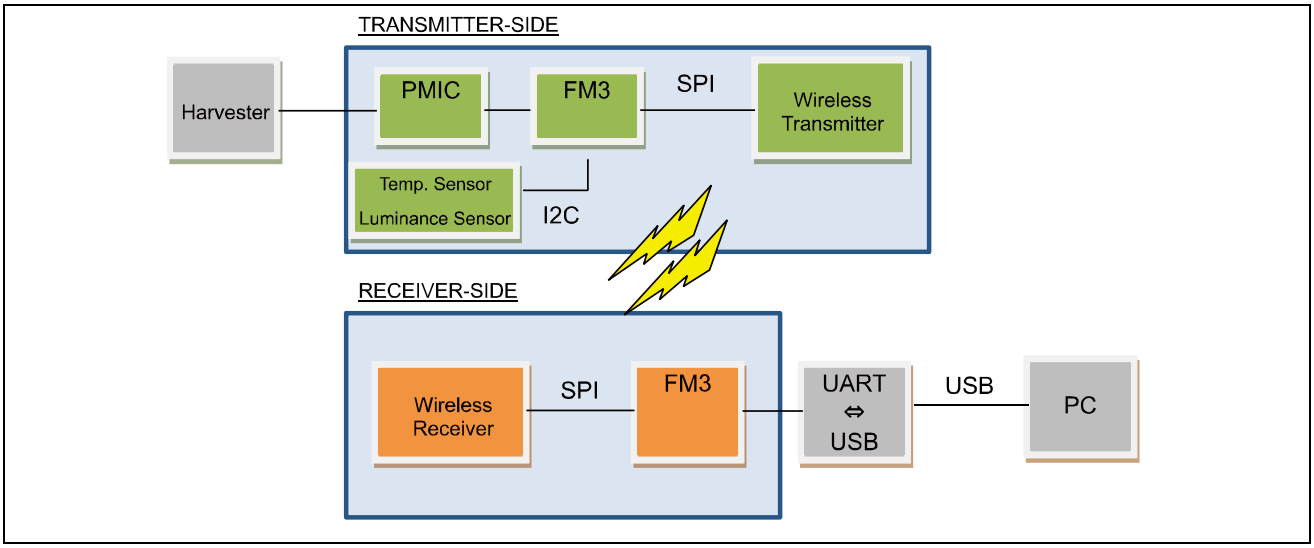


Figure 1-2. Example of the Application

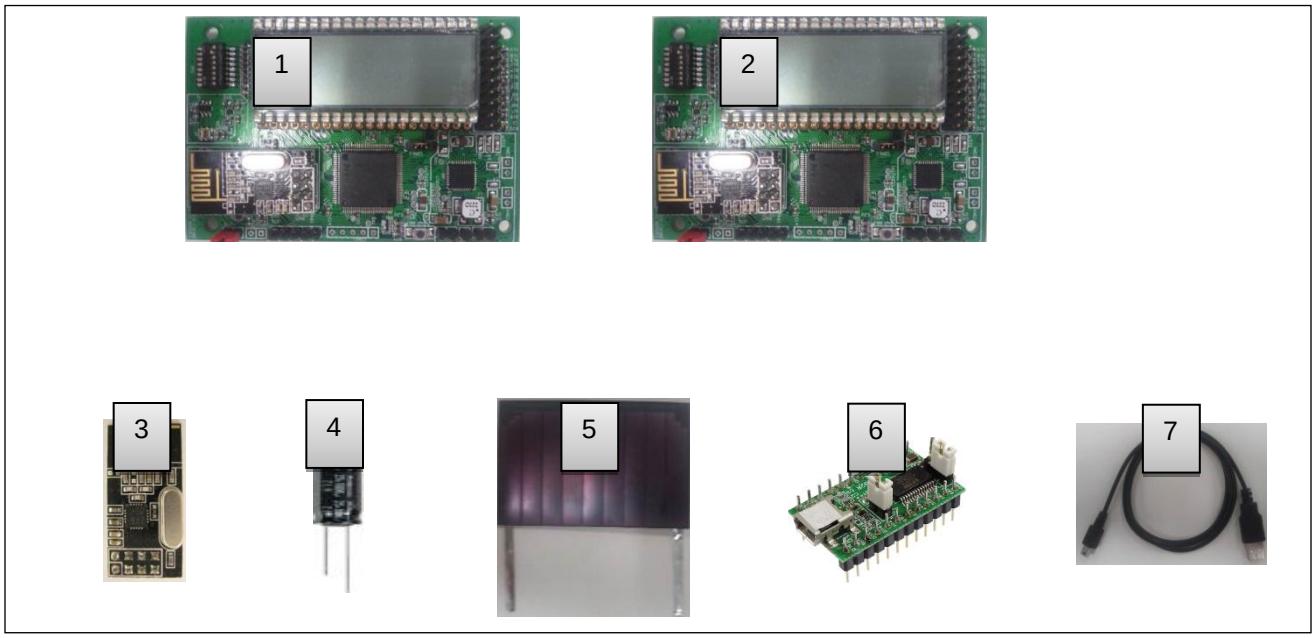


2. Setup

2.1 Contents in a package

No.	Contents	Description	Quantity	Note
1	MB39C811-EVBSK-01	Energy Harvesting Starter Kit Board for Transmitter	1	
2	MB39C8xx-EVBSK-01	Energy Harvesting Starter Kit Board for Receiver	1	
3	nRF24L01 module*1	2.4GHz RF Tx/Rx module	1	Implemented or Unimplemented
4	Electrolytic Capacitor	1000µF	1	For operation check
5	Solar Panel*2	Manufactured by TDK : BCS4630B9 (Amorphous Silicon)	1	For operation check
6	USB Serial Conversion Board	FT232RL	1	Implemented or Unimplemented
7	USB Cable	USB Min Conversion Cable	1	

*1 : You have to check the radio law of each country to use it.
*2 : The solar panel of TDK is sample for operation check. It isn't guaranteed the electrical characteristics, etc.



2.2 Preparation

[Things to prepare]

- MB39C811-EVBSK-01 Starter Kit 1set (Including two boards)
- Windows PC with Windows7 or newer version 1PC

2.2.1 Preparation of Receiver

The original packaging is already configured. If the board is not default setting, execute this process.

Prepare MB39C8xx-EVBSK-01 board for Receiver.

Prepare the USB Serial Conversion Board.

Open the CON6 Jumper (Refer to Figure 2-1).

Installed in a jumper socket to MD0 Jumper in "L" position (Refer to Figure 2-1).

Turn off all of the SW1's switches (Refer to Figure 2-1).

Connect the CON9 Jumper on the "MB39C8xx-EVBSK-01 board" to the USB Serial Conversion Board by cables or soldering, as shown in Figure 2-1 and listed in the Table 2-1.

Figure 2-1. Preparation of Receiver

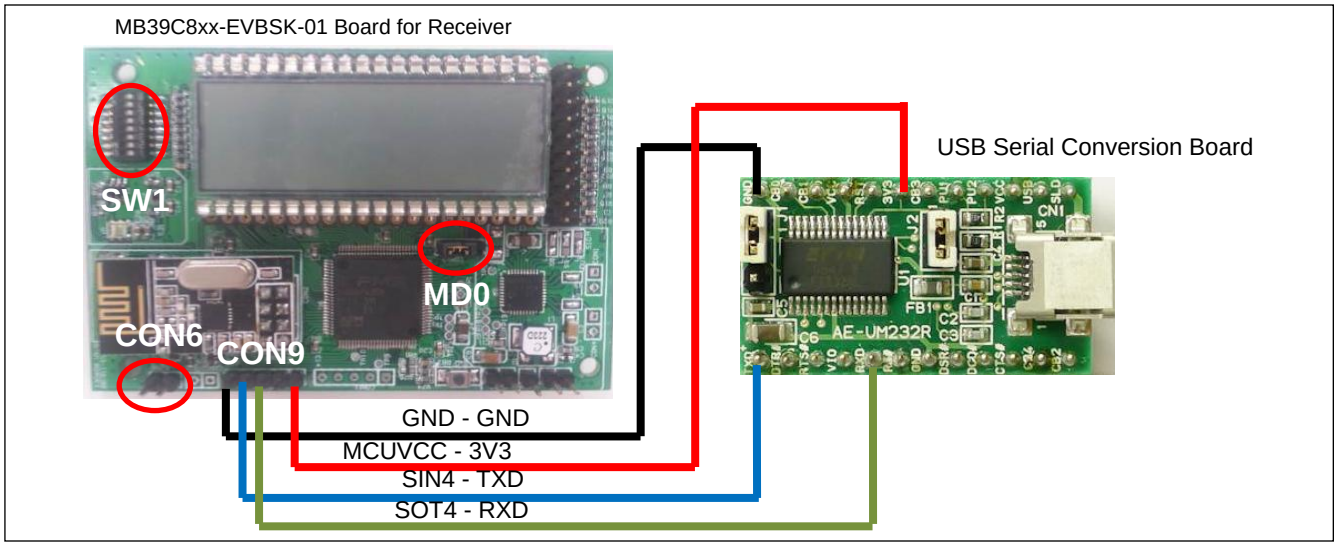


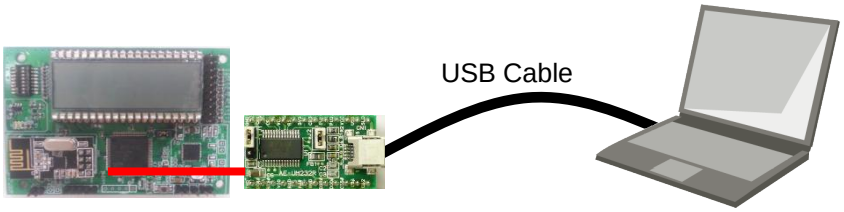
Table 2-1. Connection of Receiver

MB39C8xx-EVBSK-01Board (CON9)			USB Serial Conversion Board
Pin No.	Pin name		Pin name
1	MCUVCC		3V3
2	SCK4	No Connection	-
3	SOT4		RXD
4	SIN4		TXD
5	GND		GND

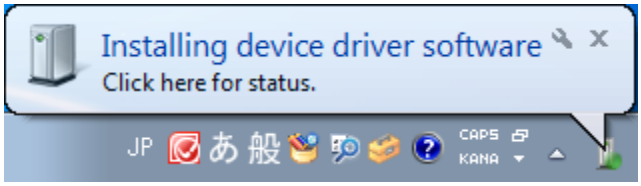
2.2.2 Setup of Receiving PC

Download the driver file for USB Serial Conversion Board (FT232RL) to a Windows PC with Windows7 or newer version, and Unzip the file to a folder.
FTDI maker website (FT232 Driver is available)
http: //www.ftdichip.com/

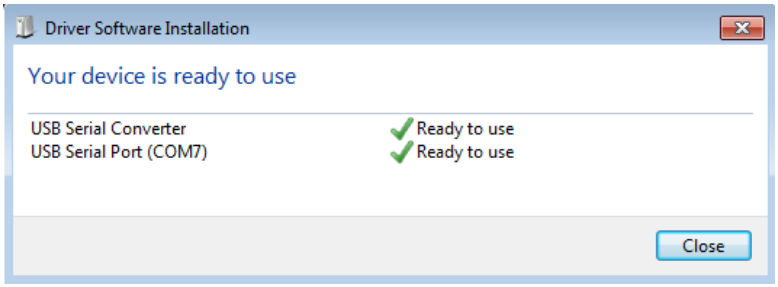
Connect the PC to the USB Serial Conversion Board using the USB cable.



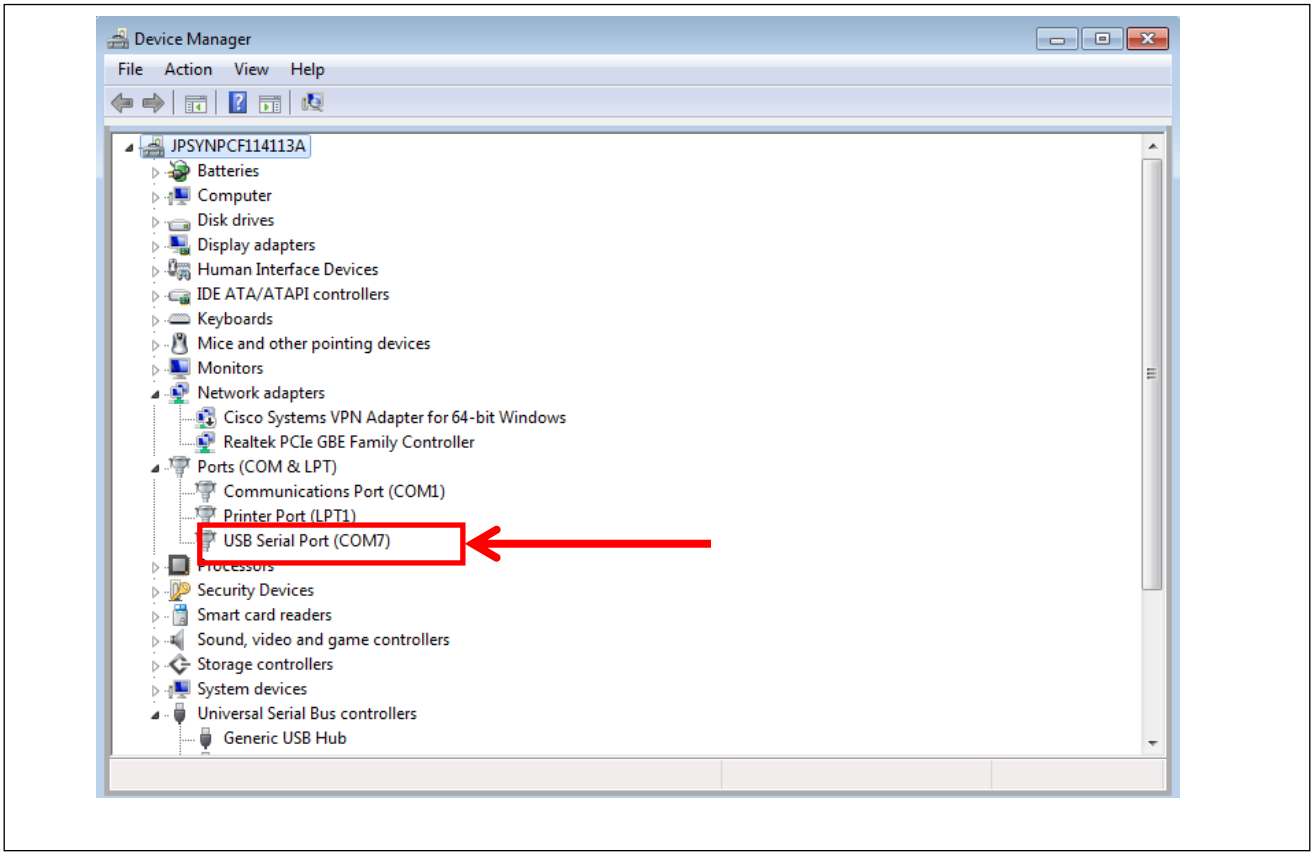
The driver Installation starts automatically and the message window will pop appear.



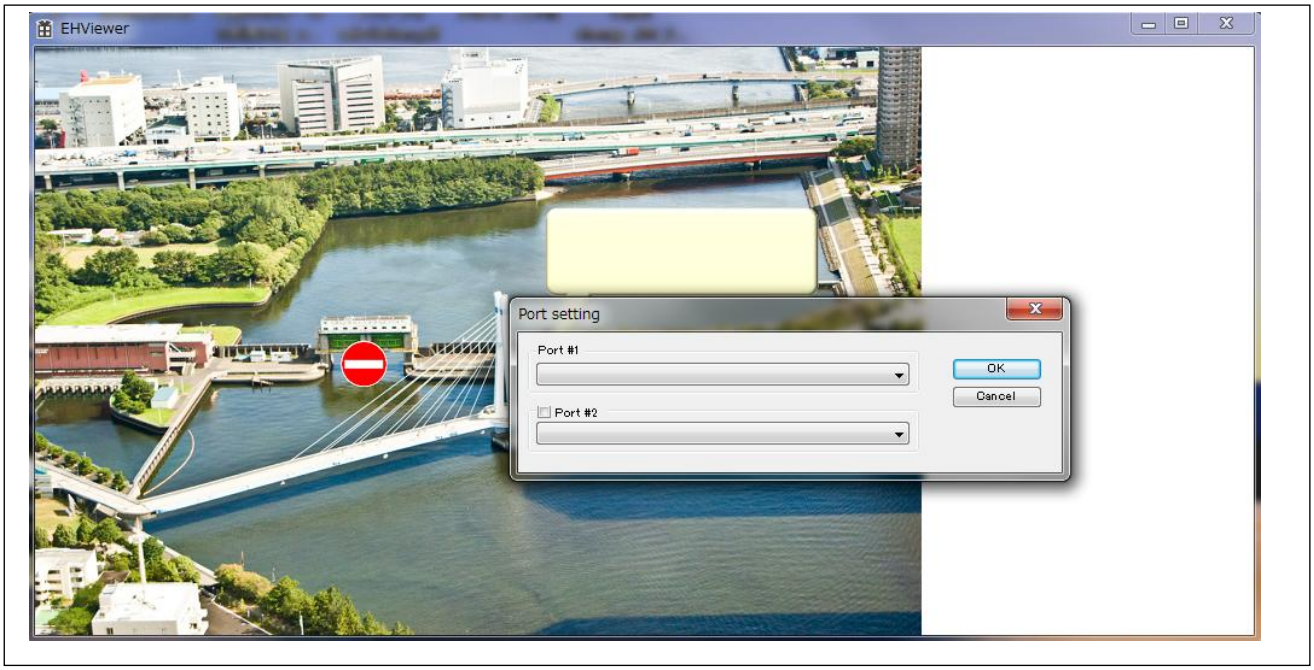
When the following window appears, the installation is completed.



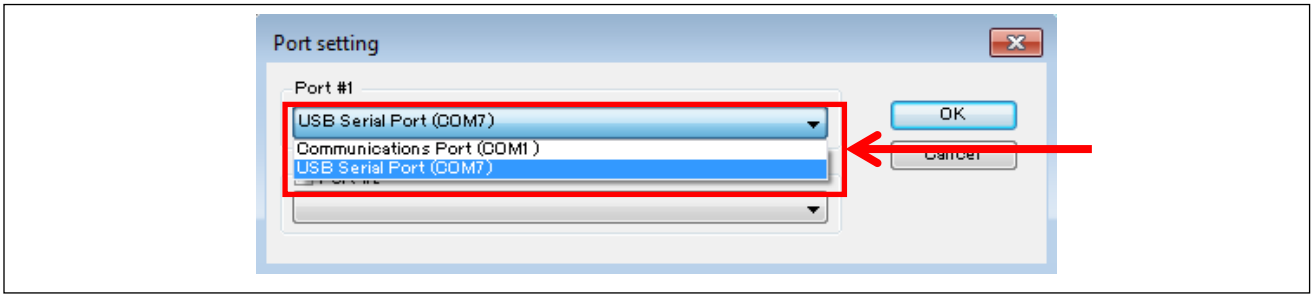
After the device driver installation, make sure that new COM port was added in the Windows Device Manager.
*Start Menu > Control Panel > Device Manager



Start up the Energy Harvesting Viewer to click on "EHViewer.exe" provided in this Kit.



In the "Port setting" Window, Select the "USB Serial Port (COM**) that just been added to the port, and then click an OK button.



That's the end of the Preparation of Receiver. Next, the Preparation of Transmitter and Sample (1).

2.2.3 Preparation of Transmitter and Sample (1)

Prepare the MB39C811-EVBSK-01 board for Transmitter.

Installed in a jumper Socket to the CON6 Jumper (Refer to Figure 2-2).

Installed in a jumper socket to MD0 Jumper in "L" Position (Refer to Figure 2-2).

Turn on 7pin in the SW1, and turn off the other switches in the SW1 (Refer to Figure 2-2).

Connect the Solar panel provided in this Kit to the Power Input terminal (CON5/7/8), as shown in Figure 2-2 and listed in the Table 2-2.

Figure 2-2. Preparation of Transmitter and Sample (1)

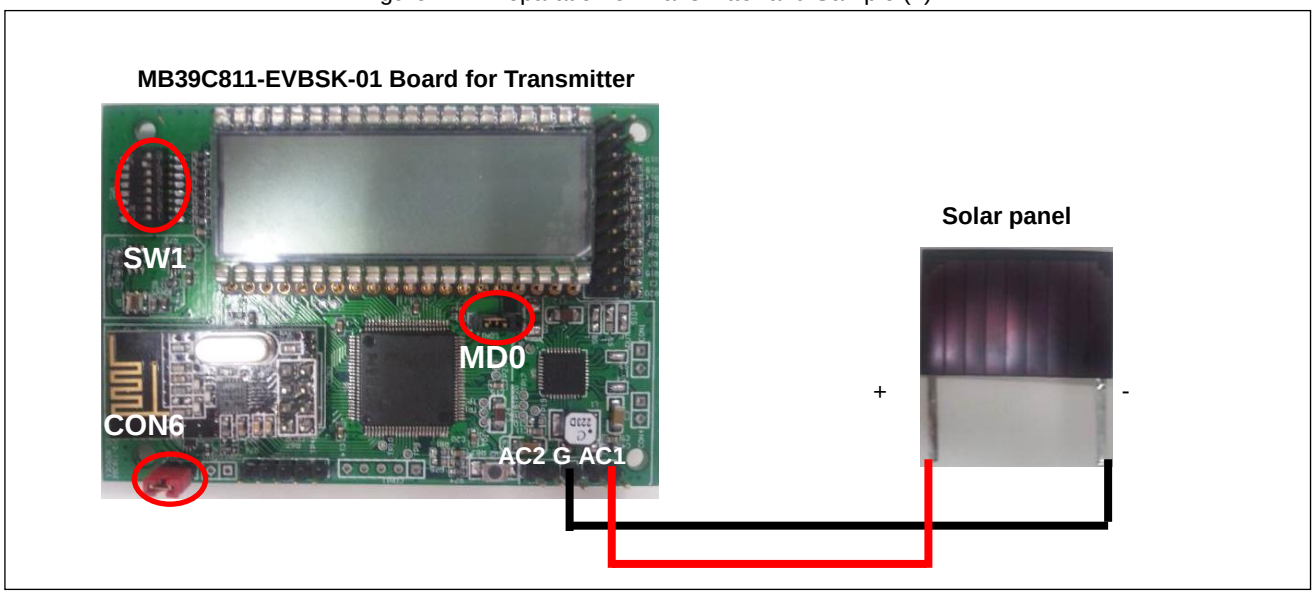


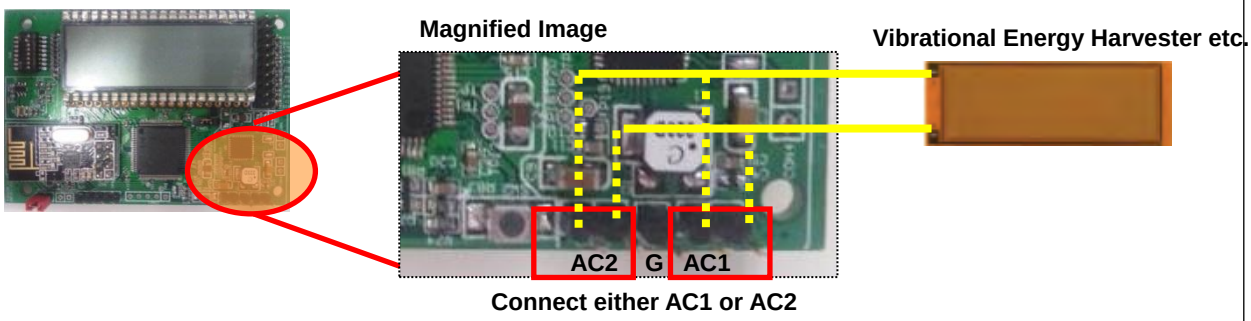
Table 2-2. Connection of Transmitter

MB39C811-EVBSK-01 Board (AC1/AC2)			Solar Panel
Connecter-Pin No.	**Pin name**		**Pin name**
CON5- 1pin CON5- 2pin CON7- 1pin CON7- 2pin	AC1 or AC2 (Possible to connect any pins in the left column.)	⟷	+ side
CON8- 1pin	GND	⟷	- side

After setting all the connections, the data transmission between the transmitter board and the receiver board automatically starts. If the "CAUTION" mark appears in the following Energy Harvesting Viewer (EH Viewer), the Sample (1) setting is completed.

The power source of the Sample (1) is only solar power. If the solar panel is covered with a hand, the data transmission stops. Then, take the hand off and shine light on the solar panel, the data transmission starts again.

The MB39C811-EVBSK-01 is capable of accepting AC source, such as Vibrational Energy Harvester and Electromagnetic Induction Elements. If AC source is used, input the power from the AC1 connector (CON5- 1pin ⇔ 2pin) or the AC2 connector (CON7- 1pin ⇔ 2pin). Then, the same operation as mentioned above can be confirmed.



That's the end of the Preparation of Transmitter and Sample (1). Next, the Preparation of Transmitter and Sample (2).

2.2.4 Preparation of Transmitter and Sample (2)

[Same as Sample (1)] Use the same board in section of "2.2.3 Preparation of Transmitter and Sample (1) ".

Turn off all of the SW1's switches, including a 7pin (Refer to Figure 2-3).

Connect the electrolytic capacitor (1000µF) provided in this Kit to the INcap terminal (CON4), as shown in Figure 2-3 and listed in the Table 2-3.

Figure 2-3. Preparation of Transmitter and Sample (2)

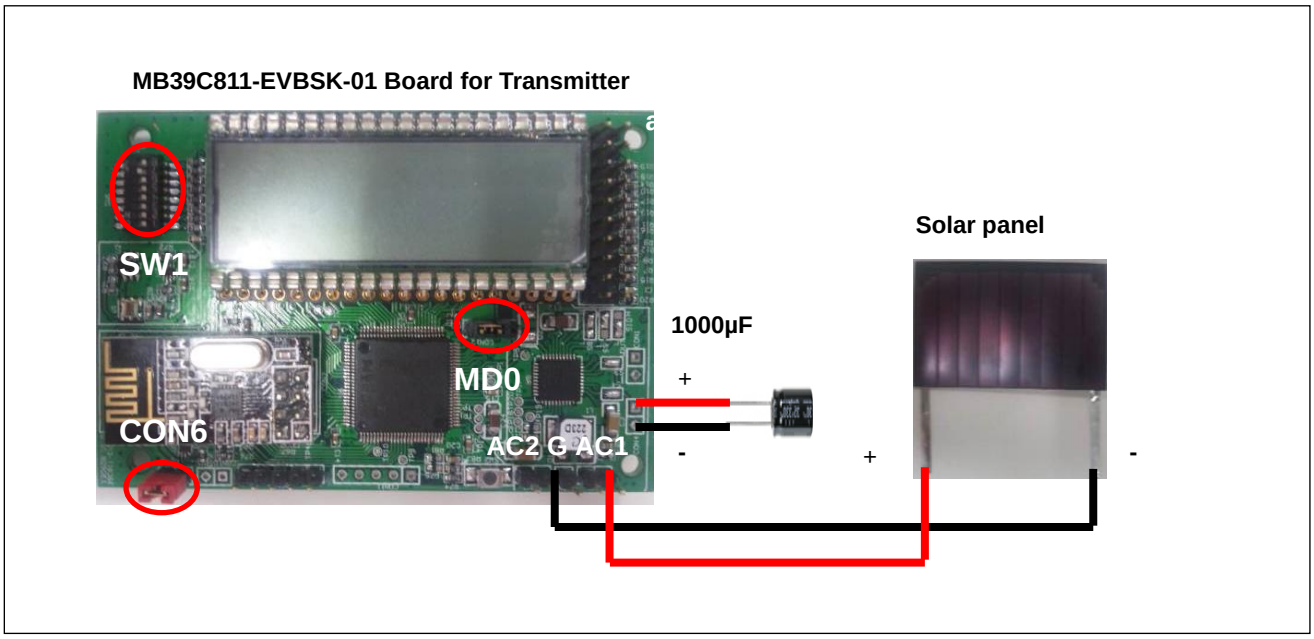


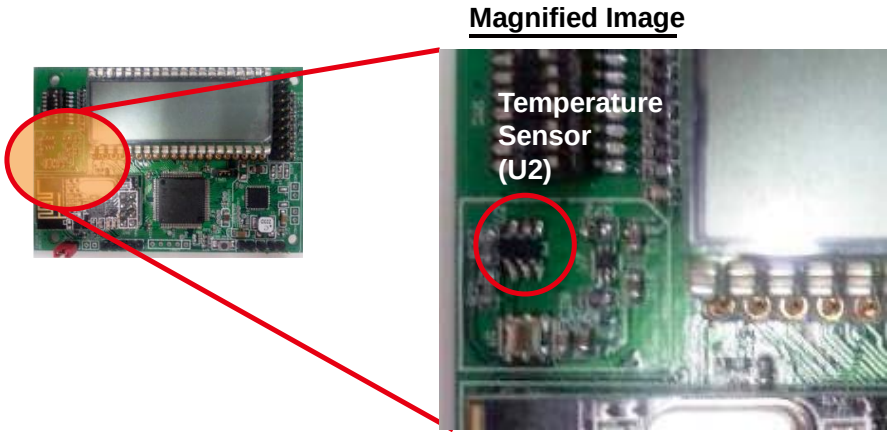
Table 2-3. Connection of Transmitter

MB39C811-EVBSK-01 Board (INcap)			Electrolytic Capacitor
Connecter-Pin No	Pin name		Pin name
CON4- 1pin	VOUT	→	+ side
CON4- 2pin	GND	→	- side

After setting all the connections, the data transmission between the transmitter board and the receiver board automatically starts. If the "Temperature" appears in the following Energy Harvesting Viewer (EH Viewer), the Sample (2) setting is completed.

The Sample (2) updates the temperature data every 20 seconds in a typical office which have an illuminance of about 500 lux except first charging. The first charging is updated about one minute.
The EH Viewer produces a time in updating the transmitted data and displays the data (year/month/date hour: minute: second) in the lower position of the temperature.

If the temperature sensor is warmed with a finger, the temperature displayed in the EH Viewer increases. Then, take the finger off, the temperature will decrease. When touching the Board, please be careful of the static electricity.



That's the end of the Preparation of Transmitter and Sample (2).

3. Specification of Energy Harvesting Power Management IC (MB39C811)

The following is the specification of Energy Harvesting Power Management IC (MB39C811) on this starter kit.

3.1 Recommended Operating Conditions

Table 3-1. Recommended Operating Conditions

Parameter	Symbol	Conditions	Value			Units
			Min	Typ	Max	
VIN pin input voltage	VVIN	VIN pin	2.6	-	23	V
VIN pin input slew rate	SRVIN	VIN pin	-	-	0.25	V/ms
AC pin input voltage	VPV	AC1_1, AC1_2, AC2_1, AC2_2 pins	-	-	23	V
AC pin input current	IPV	AC1_1, AC1_2, AC2_1, AC2_2 pins	-	-	50	mA
Input voltage	VSI	S0, S1, S2 pins	0	-	VVB*[1]	V
	VFB	VOUT pin	0	-	5.5	V
Operating ambient temperature	Ta	-	-40	-	+85	°C

*1 : Output Voltage for internal circuit

3.2 DC Characteristics

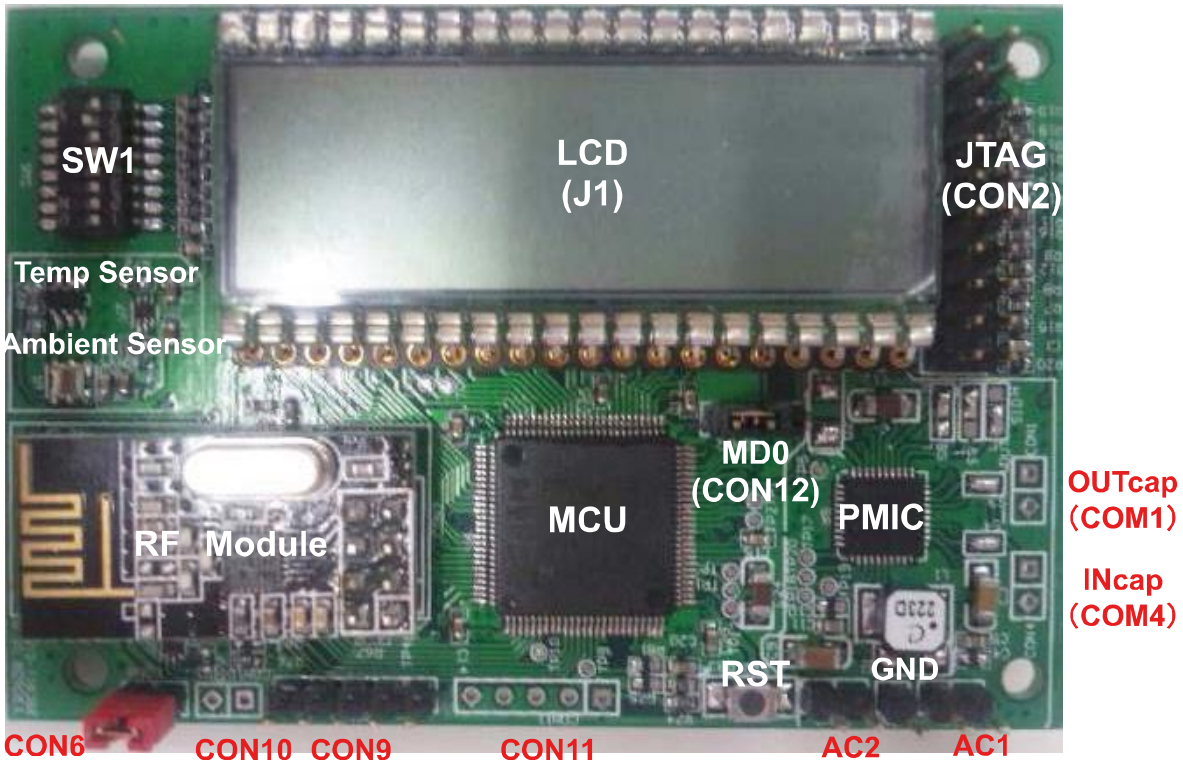
Table 3-2. DC Characteristics

Unless otherwise specified, Ta=-40°C to 85°C, VVIN=7.0V, L=22µH, CVOUT=47µF

Parameter	Symbol	Conditions	Value			Units
			Min	Typ	Max	
Input power supply voltage	VVIN		2.6	-	23	V
Input slew rate	SRVIN		-	-	0.25	V/ms
Preset output voltage	VVOUT	S2=L, S1=L, S0=L	1.457	1.5	1.544	V
		S2=L, S1=L, S0=H	1.748	1.8	1.852	V
		S2=L, S1=H, S0=L	2.428	2.5	2.573	V
		S2=L, S1=H, S0=H	3.214	3.3	3.386	V
		S2=H, S1=L, S0=L	3.506	3.6	3.694	V
		S2=H, S1=L, S0=H	3.993	4.1	4.207	V
		S2=H, S1=H, S0=L	4.383	4.5	4.617	V
		S2=H, S1=H, S0=H	4.870	5.0	5.130	V
Over current protection current	IPEAK		200	250	400	mA
Output current	IOUT		-	-	100	mA
UVLO release voltage (Input Power-Good detection voltage)	VUVLOH	S2=L, S1=L, S0=L	3.8	4.0	4.2	V
		S2=L, S1=L, S0=H	3.8	4.0	4.2	V
		S2=L, S1=H, S0=L	3.8	4.0	4.2	V
		S2=L, S1=H, S0=H	5.0	5.2	5.4	V
		S2=H, S1=L, S0=L	5.0	5.2	5.4	V
		S2=H, S1=L, S0=H	7.0	7.2	7.4	V
		S2=H, S1=H, S0=L	7.0	7.2	7.4	V
		S2=H, S1=H, S0=H	7.0	7.2	7.4	V
UVLO detection voltage (Input Power-Good reset voltage)	VUVLOL	S2=L, S1=L, S0=L	2.6	2.8	3.0	V
		S2=L, S1=L, S0=H	2.6	2.8	3.0	V
		S2=L, S1=H, S0=L	2.6	2.8	3.0	V
		S2=L, S1=H, S0=H	3.8	4.0	4.2	V
		S2=H, S1=L, S0=L	3.8	4.0	4.2	V
		S2=H, S1=L, S0=H	5.8	6.0	6.2	V
		S2=H, S1=H, S0=L	5.8	6.0	6.2	V
		S2=H, S1=H, S0=H	5.8	6.0	6.2	V

4. Specification of Starter Kit

4.1 Layout of the Board



4.2 Input/Output Pin Description

Table 4-1. Input/Output Pin Description

Circuit Pin No.	Silk-Printed Name	I/O	Description
CON5 - 1pin	AC1	I	Bridge Rectifier1 AC input pin1
CON5 - 2pin	AC1	I	Bridge Rectifier1 AC input pin2
CON8 - 1pin	G	-	GND Pin
CON7 - 1pin	AC2	I	Bridge Rectifier2 AC input pin1
CON7 - 2pin	AC2	I	Bridge Rectifier2 AC input pin2
CON4 - 1pin	INcap	-	Expandable input capacitor +pin
CON4 - 2pin	G	-	Expandable input capacitor -pin
CON1 - 1pin	OUTcap	-	Expandable output capacitor +pin
CON1 - 2pin	G	-	Expandable output capacitor -pin
CON9 - 1pin	V	-	MCU power supply input pin (Typ: 3.3V)
CON9 - 2pin	-	I/O	SCK4 expandable multifunction serial pin
CON9 - 3pin	-	I/O	SOT4 expandable multifunction serial pin
CON9 - 4pin	-	I/O	SIN4 expandable multifunction serial pin
CON9 - 5pin	G	-	GND pin
CON11 - 1pin	V	-	MCU power supply input pin (3.3V)
CON11 - 2pin	-	I/O	SCK7 expandable multifunction serial pin
CON11 - 3pin	-	I/O	SOT7 expandable multifunction serial pin
CON11 - 4pin	-	I/O	SIN7 expandable multifunction serial pin
CON11 - 5pin	G	-	GND pin
CON10 - 1pin	-	I/O	AN15 expandable input/output pin (Support Analog input)
CON10 - 2pin	-	-	GND pin
CON3 - 1 to 20pin	-	-	MCU JTAG pin
CON12 - 1 to 3pin	MD0	-	MCU mode switching pin (H: writing mode, L: RUN mode)
CON6	-	-	PMIC power output -> MCU power supply jumper (Typ: 3.3V) installed: Power is supplied from PMIC open: Power is supplied from the outside

4.3 Switch Description

Table 4-2. Switch Description

Circuit Reference Name	Silk Printed Name	Description
SW2	RST	Microcomputer reset push switch
SW1	-	Mode switch (during use of the Transmitter Sample soft) 1: unused 3, 2: RF transmission frequency selection OFF/OFF: 2402MHz ON/OFF: 2441MHz xxx/ON: 2480MHz 4: unused 5: unused 6: unused 7: Transmitter Sample selection OFF: Sample(2), ON: Sample(1) 8: RF test mode OFF: normal operation, ON: test mode

4.4 Jumper Description

Table 4-3. Jumper Description

Circuit Reference Name	Description	Default Settings
S4	Bridge Rectifier1 Select "Open" or "Short" Open : DC Output Pin (DCOUT1) Short : DC Power Input Pin (VIN)	Short*1
S3	Bridge Rectifier2 Select "Open" or "Short" Open : DC Output Pin (DCOUT2) Short : DC Power Input Pin (VIN)	Short*1
S10*2	Output Voltage Setting Switching H/L for S2 Pin of MB39C811	L*1
S9*2	Output Voltage Setting Switching H/L for S1 Pin of MB39C811	H*1
S8*2	Output Voltage Setting Switching H/L for S0 Pin of MB39C811	H*1

*1: Set "Open/Short" and "H/L" by soldering.

*2: Set the output voltage from the "Table 4-4. Output Voltage Setting". The default value is 3.3V.

Table 4-4. Output Voltage Setting

S10 (S2 Pin)	S9 (S1 Pin)	S8 (S0 Pin)	Preset Output Voltage [V]
L	L	L	1.5
L	L	H	1.8
L	H	L	2.5
L	H	H	3.3
H	L	L	3.6
H	L	H	4.1
H	L	L	4.5
H	H	H	5.0

5. Operation of Sample Application

5.1 Description of Transmitter Sample (1) Application

The following describes the hardware block and the processing flow for the Sample (1) Application.

Green part : Transmitter
Orange part : Receiver

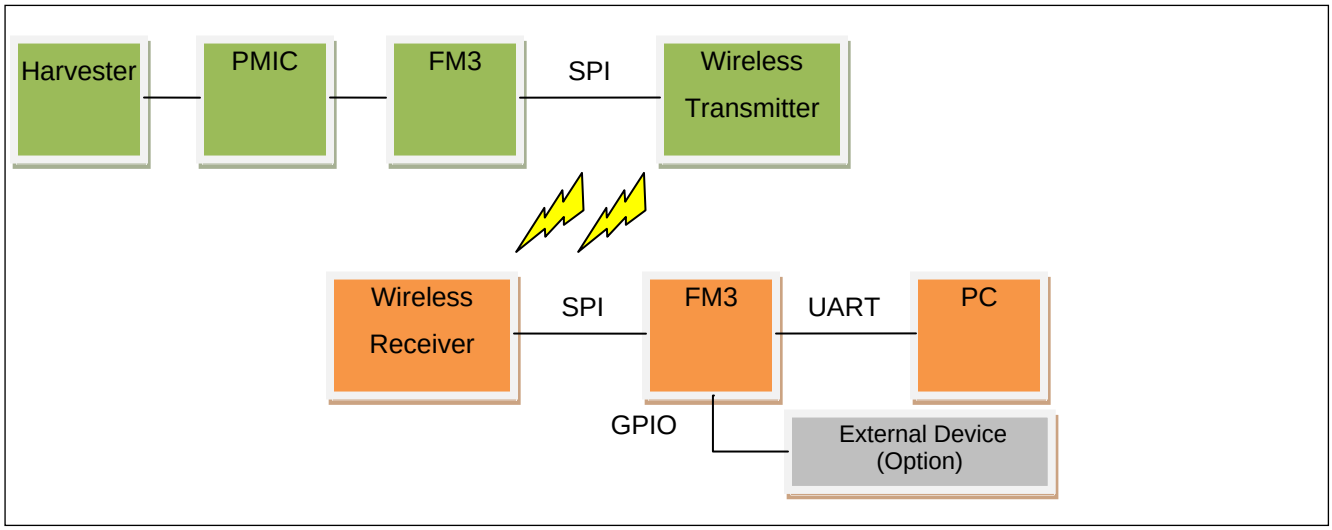


Table 5-1 Processing Flow for the Sample (1) Application

No.	communication	Processing Flow	Note
1	Transmitter	(1) Power ON (2) Read the stage of DIP switch (RF frequency, Decision of Operating mode) (3) Initialize the registers from FM3 to wireless transmitter by SPI. (4) Transmit*1 packets of Sample Application (1) data from the wireless transmitter (5) Infinite loop (When depleting the input capacitor, the power drops)	*1: Refer to the 5.3 section for the packet payload
2	Receiver	(1) Power ON (2) Initialize the registers from FM3 to wireless Receiver by SPI. (3) Transit to the wireless reception state. (4) After receiving the wireless packets, the packet is sent to the PC by the UART. (5) After receiving the wireless packets, the pin for the external device (CON10-1pin) keeps the voltage level high for 5 seconds. Moreover, if the next packet is received within 5 seconds, the pin keeps the voltage level high for 5 seconds again. (6) After 5 seconds, the pin for the external device becomes low level. (Hereafter, this operation, (2) to (6), is repeated)	The receiver does not reply to the transmitter.

5.2 Description of Transmitter Sample (2) Application

The following describes the hardware block and the processing flow for the Sample (2) Application.

Green part : Transmitter
Orange part : Receiver

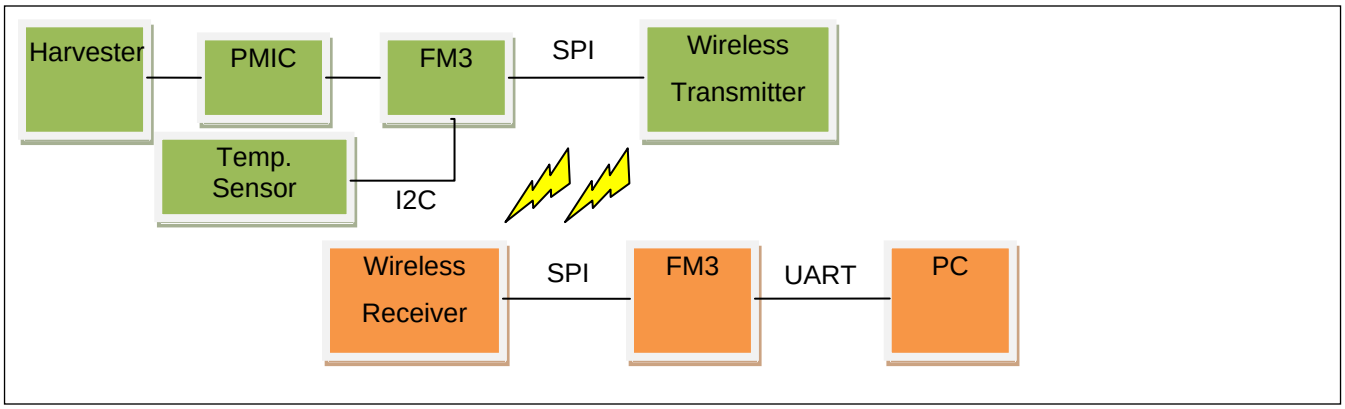


Table 5-2 Processing Flow for the Sample (2) Application

No.	communication	Processing Flow	Note
1	Transmitter	(1) Power ON (2) Read the stage of DIP switch (RF frequency, Decision of Operating mode) (3) Start the temperature measurement by the temperature sensor (4) Wait for completion of the temperature measurement (5) Read the measurement data (6) Initialize the registers from FM3 to wireless transmitter by SPI. (7) Transmit*1 packets of Sample Application (2) data from the wireless transmitter (8) Infinite loop (When depleting the input capacitor, the power drops)	*1: Refer to the 5.3 section for the packet payload
2	Receiver	(1) Power ON (2) Initialize the registers from FM3 to wireless Receiver by SPI. (3) Transit to the wireless reception state. (4) After receiving the wireless packets, the packets are sent to the PC by the UART. (Hereafter, this operation, (3) to (4), is repeated)	The receiver does not reply to the transmitter.

5.3 Specification of Data Communication

5.3.1 Specification of RF Data Communication

- Transmit the temperature sensing data (2 bytes) and illuminance sensing data (2 bytes).
- Packet format: the following is 15Byte (only payload) in big-endian format.
- Added the header and footer automatically by the RF module.

+0	+1	+2	+3	+4	+5	+6	+7	+8						+14
ID	MD	STT	TMP		STI	ILM		*	*	*	*	*	*	*

ID : Device Number (1 Byte): 1 to 254 (255 is reserved for broadcast)
0x01: Devices for the ON commands
(Transmitter Devices for receiving packets. Ignore data other than the ID data)
0x02: Transmit Devices for temperature and illuminance

MD: Sensor Mode (0x00: temperature, 0x01: illuminance)

STT: Status of temperature sensor (0x00: No error, 0xFF: An error)

TMP: Temperature -128°C to +128°C (Follow the temperature format in the datasheet)

STI: Status of illuminance sensor (0x00: No error, 0xFF: An error)

ILM: Illuminance data (2Byte) 0 to 65535lx
Ignore +8 to +14Byte

Example: Device ID=0x01, 25.5°C (0x0198), 750lx (0x02EE), Temperature display, error at temperature sensor error exists, No error at illuminance sensor
2Byte data is in big-endian format.

+0	+1	+2	+3	+4	+5	+6	+7	+8						+14
01	00	01	01	98	00	02	EE	*	*	*	*	*	*	*

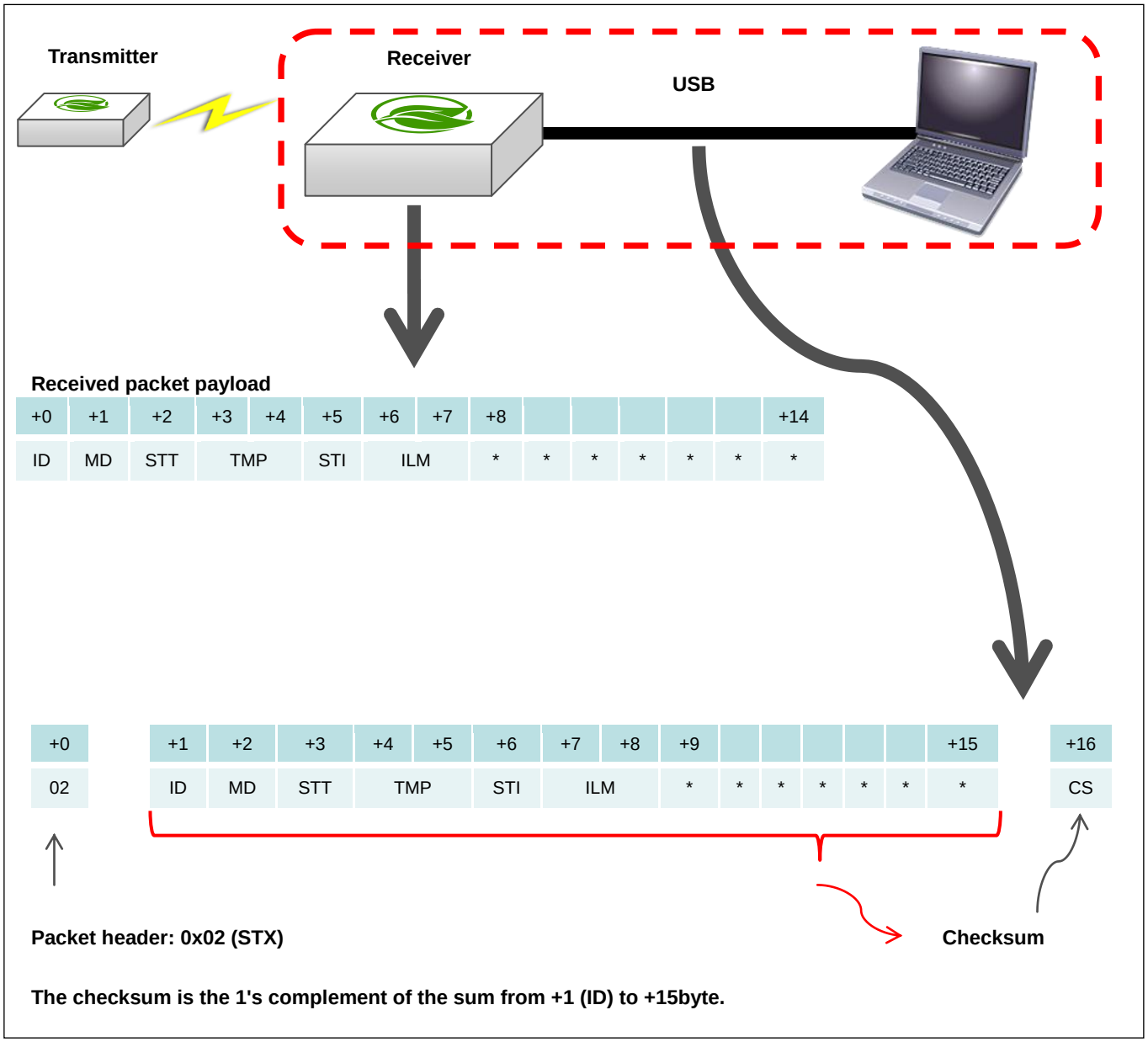
5.3.2 Specification of Sample and Communication Packet Payload

The following table is the communication summary between the FM3 and the PC.

Table 5-3 Communication summary between the FM3 and the PC

No.	cases	Description	Note
1	Sample (1) Application	Transmit from receiver to PC	Use UART I/F for FM3
2	Sample (2) Application	Transmit from receiver to PC	Use UART I/F for FM3

- Specification of Communication Packet Payload



6. Programming and Debug

6.1 Structure of Files

The following describes the structure of Sample software. There is a file that is depending on Sample software.

```
+---mb9afa3xn_mfserial-v10_xxxx
        +---common                                  : common header file directory
            +---mb9aa30n.h                          : peripheral definition header file
            +---system_mb9afa3x.c                   : system setting source file
            +---system_mb9afa3x.h                   : system setting definition header file
        +---drivers                                 : driver directory
            +---mfserial                            : MFS driver directory
                +---i2c                             : I2C driver directory
                    +---I2cDev.h                    : I2C driver definition header file
                    +---I2cDev_FM3.c                : I2C driver source file
                    +---I2cDev_FM3.h                : I2C driver definition header file
                +---sio                             : CSIO driver directory
                    +---SioDev.h                    : CSIO driver definition header file
                    +---SioDev_FM3.c                : CSIO driver source file
                    +---SioDev_FM3.h                : CSIO driver definition header file
                +---spi                             : SPI driver directory
                    +---SpiDev.h                    : SPI driver definition header file
                    +---SpiDev_FM3.c                : SPI driver source file
                    +---SpiDev_FM3.h                : SPI driver definition header file
                +---uart                            : UART driver directory
                    +---UartDev.h                   : UART driver definition header file
                    +---UartDev_FM3.c               : UART driver source file
                    +---UartDev_FM3.h               : UART driver definition header file
                +---MfsDev_FM3.c                    : MFS driver channel control source file
                +---MfsDev_FM3.h                    : MFS driver channel control definition header file
        +---example                                 : sample directory
            +---ARM                                 : project directory for KEIL
                +---FLASH_DEBUG_README.txt              : FLASH load read me text
                +---MB9A130_128.FLM                     : FLASH load file
                +---mb9afa3xn_mfseria.uvopt             : object file
                +---mb9afa3xn_mfseria.uvproj            : project file
                +---startup_mb9afa3x.s                  : startup assembler file
                        (Others are omitted)
            +---IAR                                 : project directory for IAR
                +---config                          : configuration file directory
                        +---mb9afa32.icf                : linker setting file
                        +---reset.mac                   : startup macro file
```

```
                    (Others are omitted)
                +---flashloader              : flash loader directory
                    +---flashLoader.board    : flash loader setting file
                    +---flashMB9A130.flash       : flash loader setting file
                    +---flashMB9A130.flash       : flash loader startup macro file
                    +---flashMB9A130.out         : main file for flash loader
            +---mb9afa3xn_mfseria.dep        : dependence definition information file
            +---mb9afa3xn_mfseria.ewd        : project setting file
            +---mb9afa3xn_mfseria.ewp        : project file
            +---mb9afa3xn_mfseria.eww        : workspace file
            +---startup_mb9afa3x.s           : startup assembler file
                    (Others are omitted)
+---source                                   : sample source directory
(Depending on Sample software)
            +---base_types.h                 : standard type definition header file
            +---clock_def.h                  : frequency clock definition header file
            +---debug.h                      : inout definition header file for debug
            +---mcu.h                        : MCU dependence including header file
            +---main.c                       : sample main source file
```

6.2 Programing and method of execution by using Debugger

6.2.1 KEIL integrated development tool

Open the CON6 Jumper (Refer to Figure 6-1).

Installed in a jumper socket to MD0 Jumper in "H" position (Refer to Figure 6-1).

H: writing mode L: RUN mode.

To supply from the external power, connect the Pin.5 ("G" silk on board) of CON9 Jumper to GND, and the Pin.1 ("V" silk on board) of CON9 Jumper to 3.3V. If you don't have any power supply, you can supply the power by using USB Serial Conversion Board. However, the communication error is sometime occurred when you connect both USB cable (ICE and USB Serial Conversion Board) to same PC. And therefore please connect as Figure 6-1.

Connect the ICE (U-LINK2 or U-LINK Me) between PC and Board (Refer to Figure 6-1).

Notice to connect 1pin sign on board.

Figure 6-1. Preparation of KEIL's programmer

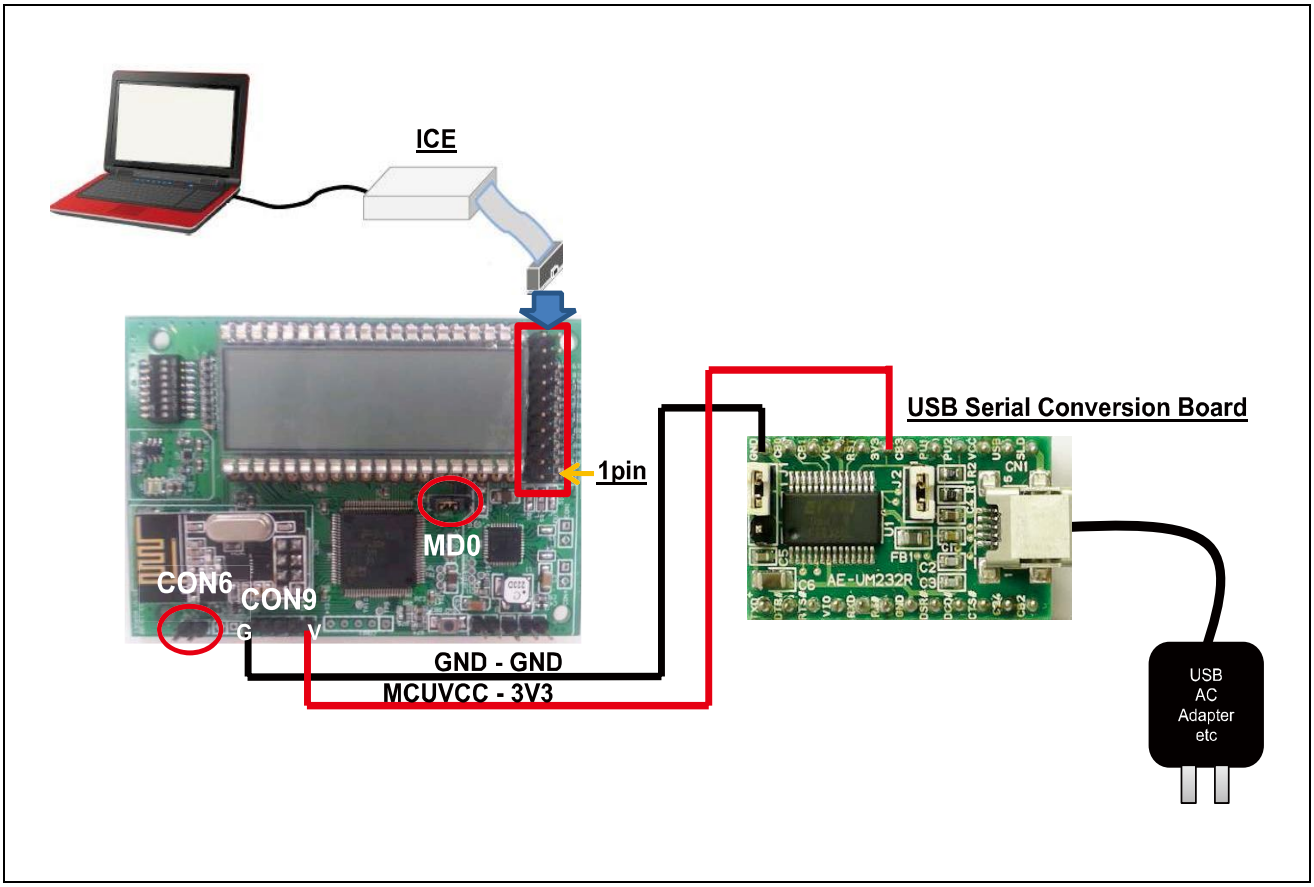
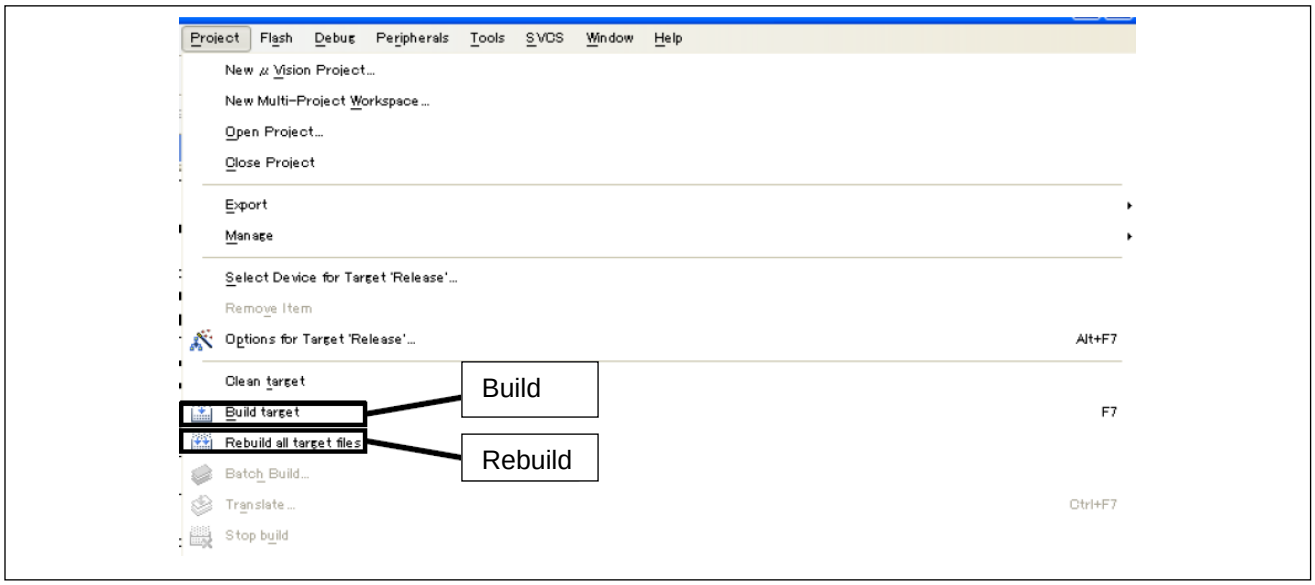


Table 6-1. Connection of Power

MB39C8xx-EVBSK-01 Board (CON9)			USB Serial Conversion Board
Pin No.	Pin name		Pin name
1	MCUVCC	⟷	3V3
2	SCK4	No Connection	-
3	SOT4	No Connection	-
4	SIN4	No Connection	-
5	GND	⟷	GND

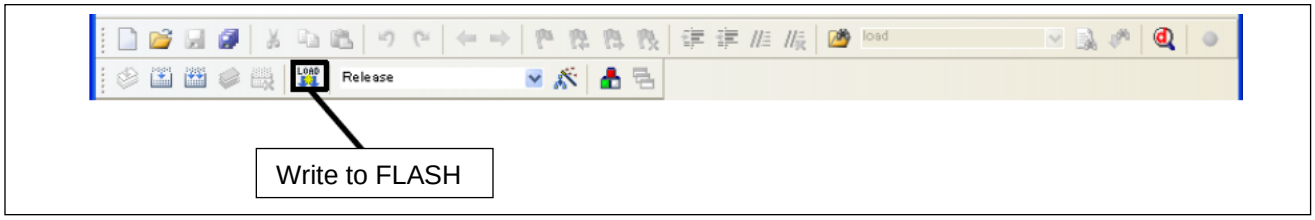
KEIL integrated development tool is opened when you execute the "xxxxxxxx.uvproj" file in ARM folder, and then the program is builded when click the "Build target" or "Rebuild all target files" on "Project".

Figure 6-2. Build target



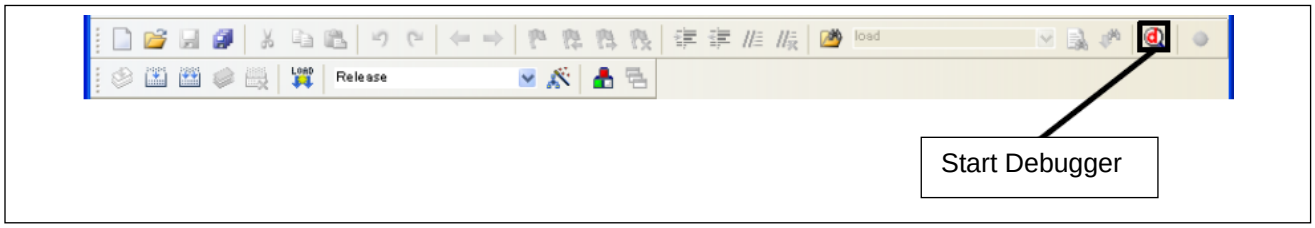
Write to FLASH and execute the program. To write the program to FLASH, push "LOAD" button, as shown in Figure 6-3

Figure 6-3. Write to FLASH



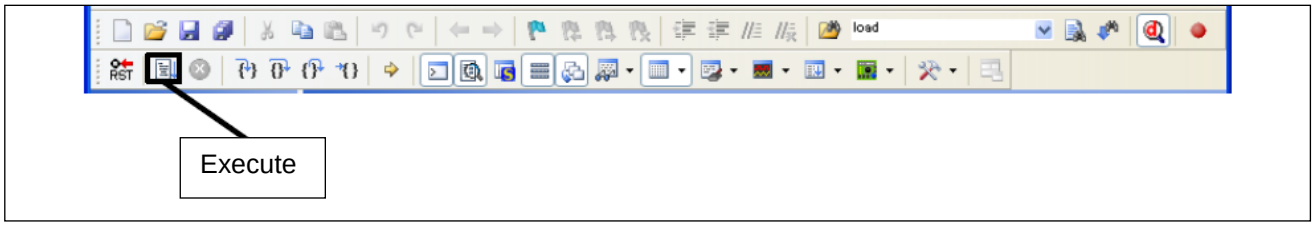
The debugger starts by clicking "d" button as shown below.

Figure 6-4. Start Debugger



To execute the program, push "execute" button after start debugger, as shown Figure 6-4.

Figure 6-5. Execute the program



That's the end of programing by KEIL integrated development tool.

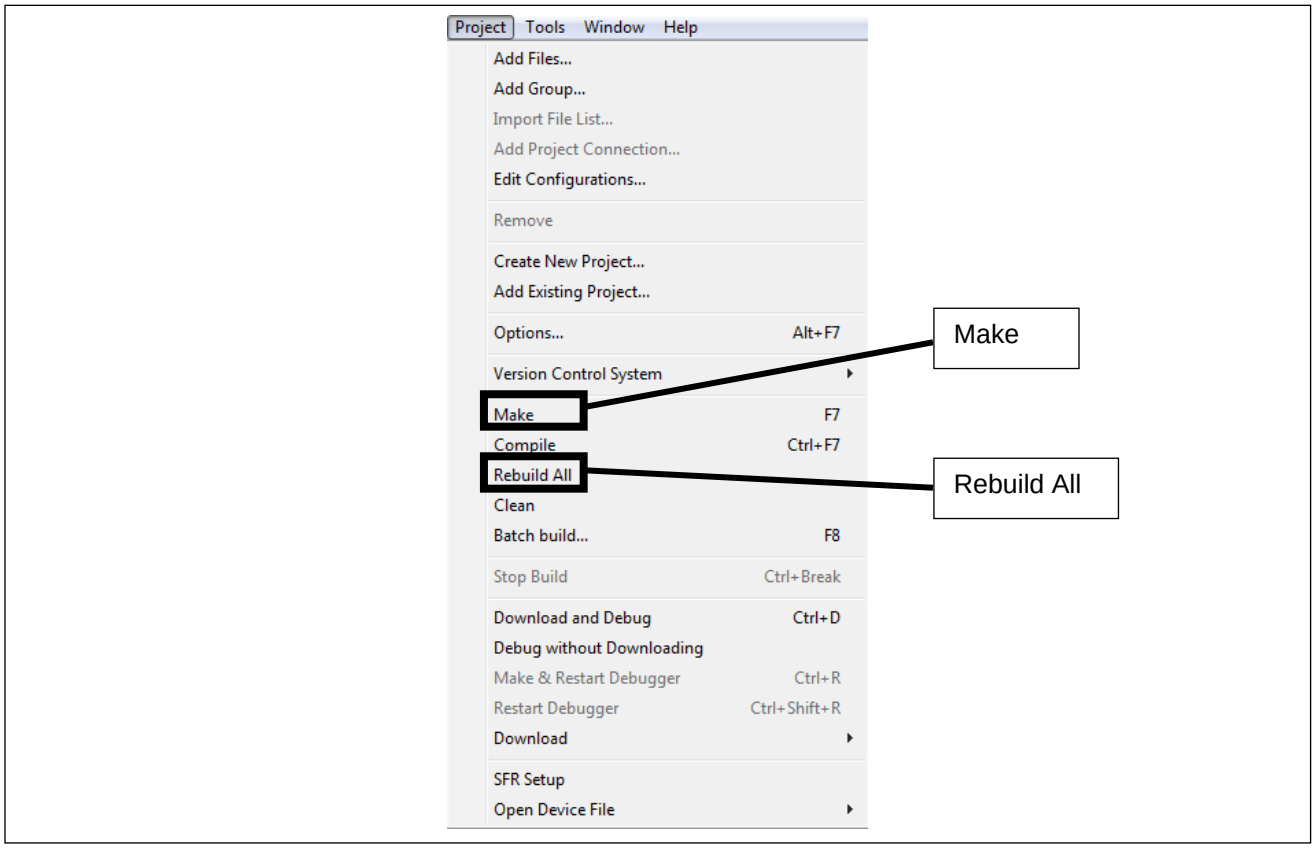
To execute the program by stand-alone, please turn off the power after stopping debugger. Then disconnect the ICE, and installed in a jumper socket to MD0 Jumper in "L" position. The stand-alone program will start when the power was turned on. If you want to operate by using Energy Harvester, please install in a jumper socket the CON6.

6.2.2 IAR Embedded Workbench for ARM

[Same as 6.2.1] Use the same step1 to 4 in "6.2.1 KEIL integrated development tool".

5. IAR Embedded Workbench for ARM is opened when you execute the "xxxxxxxx. eww" file in IAR folder, and then the program is builded when click the "Make" or "Rebuild All" on "Project".

Figure 6-6. Make the program

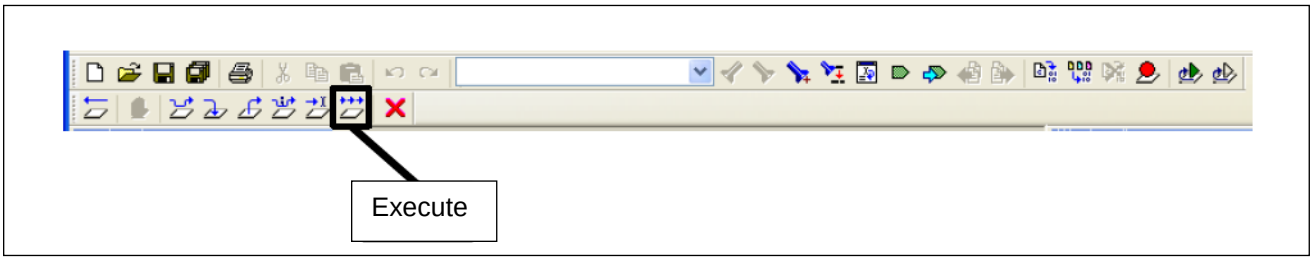


6. Write to FLASH and execute the program. To write the program to FLASH, push "Download and Debug" button, as shown in Figure 6-7.

Figure 6-7. Download and debug

To execute the program, push "execute" button after start debugger, as shown Figure 6-9.

Figure 6-8 Execute the program



That's the end of programing by IAR Embedded Workbench for ARM.
To execute the program by stand-alone, please turn off the power after stopping debugger. Then disconnect the ICE, and installed in a jumper socket to MD0 Jumper in "L" position. The stand-alone program will start when the power was turned on. If you want to operate by using Energy Harvester, please install in a jumper socket the CON6.

6.3 Programming method using "FLASH MCU Programmer"

Please download the "FLASH MCU Programmer" on web site.
www.cypress.com/flash-mcu-programmer

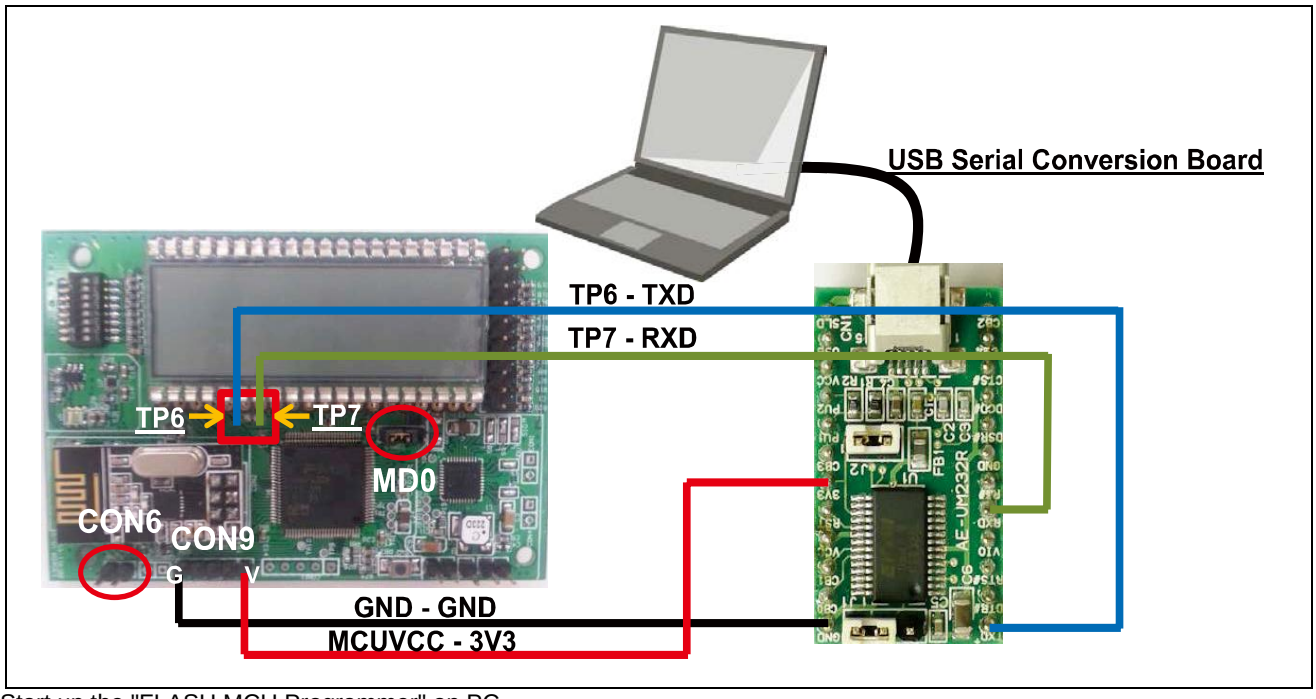
Open the CON6 Jumper (Refer to Figure 6-1).

Installed in a jumper socket to MD0 Jumper in "H" position (Refer to Figure 6-1).

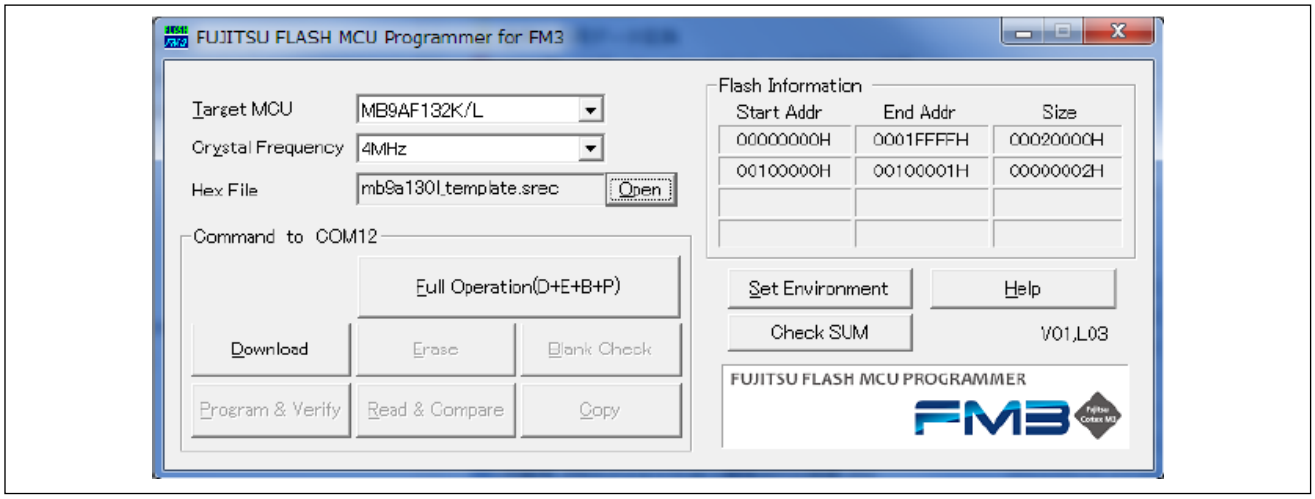
H: writing mode L: RUN mode.

Program by using USB Serial Conversion Board. Connect the USB Serial Conversion Board by cables or soldering, as shown in Figure 6-9. Then connect the USB Serial Conversion Board to PC by using attached USB cable.

Figure 6-9 Preparation of FLASH MCU Programmer



Start up the "FLASH MCU Programmer" on PC.



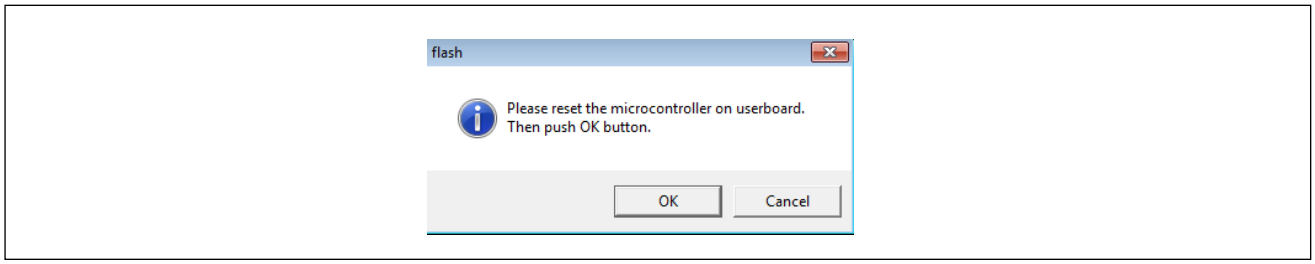
Select "MB9AFA32L/M/N" on "Target MCU" window.

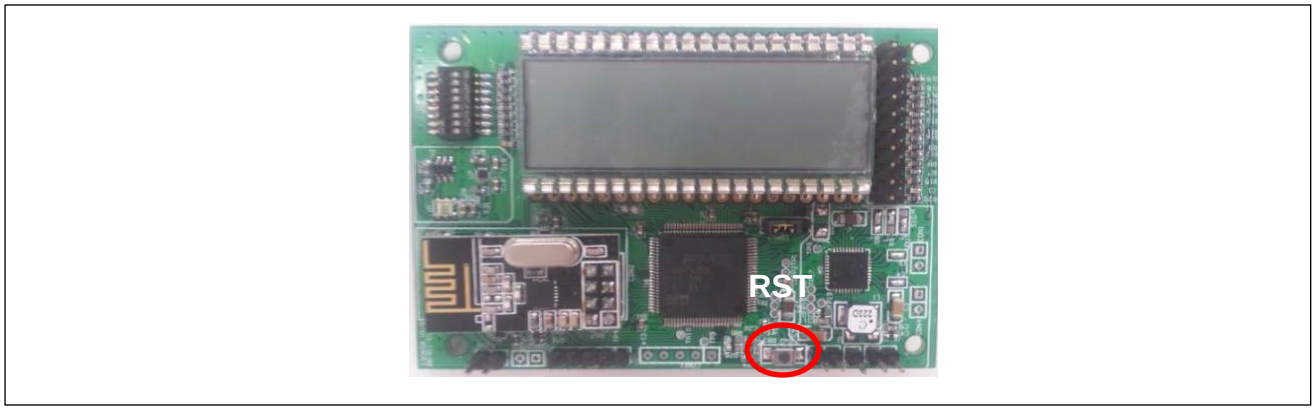
Select "4MHz" on "Crystal Frequency" window.

Click "Open" button on "Hex File" window, then select the target file.
(Example file name: xxxxx.srec)

Click "Full Operation" button.

Please push the reset switch on board when the window appears as below.





Finish the programing after appearing Indicator on "FLASH MCU Programmer".

To operate by stand-alone, installed in a jumper socket to MD0 Jumper in "L" position, then turn off/on the power.

That’s the end of programing by FLASH MCU Programmer.

7. Ordering Information

Table 7-1 Ordering Information

Part number	Version	Note
MB39C811-EVBSK-01	Rev 1.0	----

Revision History

Document Revision History

Document Title: MB39C811-EVBSK-01 Energy Harvesting for Buck Power Management Starter Kit Operation Guide Document Number: 002-08637			
Revision	**Issue Date**	**Origin of Change**	**Description of Change**
**	02/26/2014	EIFU	Initial release
*A	04/28/2016	EIFU	Migrated Spansion Guide from MB39C811-EVBSK-01_SS901-00019-1v0-Eto Cypress format