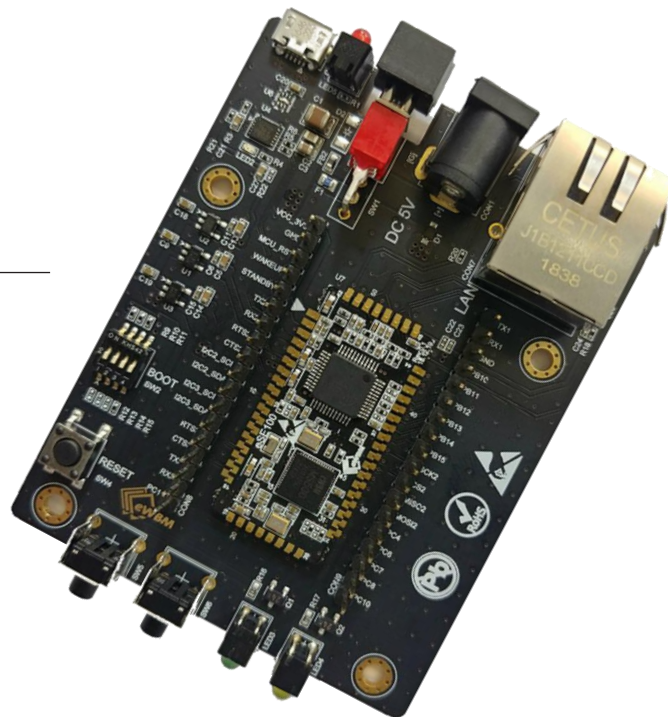


TS2E (TLS SERIAL TO ETHERNET) DEVELOPMENT KIT

eSE100-AZ (AW)^① & eSE100-EB^②

Reference Guide Manual

Ver 1.0



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Before starting to operate this unit, carefully read "SAFETY NOTES OF USING THE UNIT" (p. 17). After reading done, keep the document(s) nearby where it is available for immediate reference.

Board Descriptions

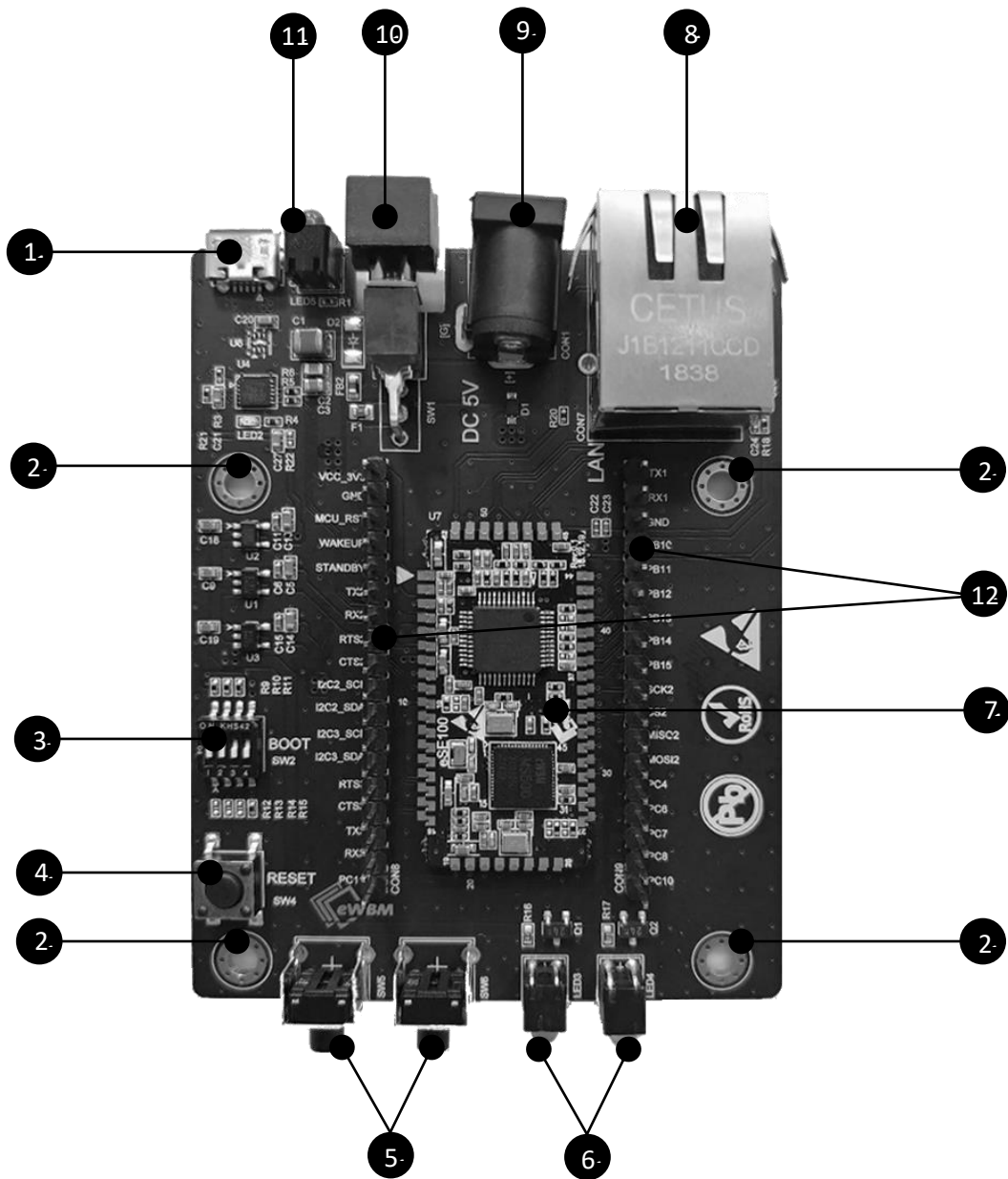


Figure 1. eSE100-DK-AZ (or AW), the Development Kit

The Development Kit (eSE100-DK-AZ (or AW)) consists of the eSE100-AZ (or AW) module and the evaluation board (eSE100-EB), where the eSE100-AZ module is mounted on the evaluation board via B2B connectors. Note that the evaluation board (eSE100-EB) is the base board itself where the module slot is empty.

Naming Convention depending on firmware Options: AZ or AW

The eSE100 module comes with two different firmware options depending on IoT Hub server which the module is applied for: Microsoft Azure Server (AZ) or Amazon Web Server (AW). For MS Azure applications, the module is pre-loaded with eSE100-AZ firmware. Similarly, for AWS applications, the module is pre-loaded with eSE100-AW firmware. When the eSE100 development kit (eSE100-DK) is mounted with eSE100-AZ module, the development kit is called eSE100-DK-AZ. Likewise, when the eSE100-DK is mounted with eSE100-AW module, the development kit is called eSE100-DK-AW.

1 Micro 5-Pin USB Connector

The micro 5-pin USB connector is used for downloading firmware. It can also be used as a debugging port to print out messages from the board during debugging process.

Note that when the connector is connected by a USB cable to host system (e.g. PC), since 5V power will be drawn to the board automatically, the external DC 5[V] power connector (component ⑨) should not be used.

(※ Refer to “Power Supply Settings” (p. 7))

2 Screw Holes

Four of screw holes can be used to fasten the board.

3 Boot Mode DIP Switch

The DIP switch determines the boot mode of the board.

(※ Refer to “Bood Mode Settings” (p.9))

4 Reset Button

Reset Button for system reset.

5 General Purpose Input Switches

Input1 (SW5)

When Input1 (SW5) button is pushed, a test packet is sent to the Microsoft Azure (or Amazon AWS) server to establish connection. If the connection to the server is successful, LED1 (Green) light is turned on.

Input2 (SW6)

When Input2 (SW6) button is pushed, the information about network connection (DHCP connection) is provided through the USB connector (i.e. component ①) whose signals are sourced from TX1/RX1 pins of UART channel of eSE100-AZ (AW) module.

※ Output Information

MAC address, IP, Gateway, Subnet Mask, DNS.

6 General Purpose Output Indicator LEDs

LED3 (Green)

When data is sent to Microsoft Azure (or Amazon AWS) server, the LEDs are turned on during transmission. When the transmission is completed, the LEDs are turned off. The transmission is started when the Input 1 (SW5) button is pushed. Alternatively, **AT + SEND** command can also be used for transmission.

LED4 (Yellow)

If connection to Microsoft Azure (or Amazon AWS) server is successful, the LED4 is turned on briefly for about 2 seconds, and then turned off.

7 TLS Serial to Ethernet Module (eSE100-AZ (or AW))

Power Supply via DC 5 [V] connector

When the micro-USB connector (component ①) is not used, the DC 5 [V] power connector (component ⑨) should be connected to external power supply.

(※ Refer to “Power Supply Settings” (p. 7))

Firmware Options: AZ or AW

- eSE100-AZ : eSE100 module with MS Azure firmware preloaded
- eSE100-AW : eSE100 module with AWS firmware preloaded

The eSE100-AZ acquired Microsoft Azure Certified for IoT. The certification ensures customers get IoT solutions up and running quickly with hardware and software that has been pre-tested and verified to work with Microsoft Azure IoT services. The module comes with built-in TLS functions and direct connection to Microsoft Azure IoT Cloud Servers where customers will enjoy developing a wide diversity of secure IoT sensor systems on Azure platforms.

The eSE100-AW has also passed AWS Device Qualification Program (DQP) so that customers can develop various IoT sensor systems on AWS platforms by simply applying the module where the highest level of security is provided with built-in TLS functions.

Powered by MS500, the security SoC

The built-in TLS functions are optimized to fully utilize the MS500 hardware crypto engines. The MS500 is the company's own security microprocessor with extensive security features, such as, hardwired crypto engines, secure storage, and secure booting features.

!!! CAUTION !!!

※ When the eSE100-AZ (or AW) module is mounted on the eSE100-EB board, make sure that the Pin 1 of the module is aligned to the white triangle symbol on the EB board as shown in Figure 2.

8 LAN connector (RJ45)

An Ethernet connector for network connection

9 External DC Power Jack (DC 5[V])

When the system runs without using the USB connector, the External DC 5 [V] power should be connected through the Jack. Note that the USB connector can be used as an alternative power supply.

(※ Refer to "Power Supply Settings" (p. 7))

10 Power Switch

The main power switch which turns on or off the 5[V] power supply.

11 Power On/Off Indicator LED

Power On or Off indicator. The LED turns on when the power supply is connected.

12 I/O Interface Pins

Various sensor or actuators can be connected at the I/O interface pins.

First Time Preparation

Module Mounting on Evaluation Board

If the eSE100-AZ (or AW) module is not pre-mounted on the eSE100-EB board, follow the steps described below to mount before making any connections to the eSE100-EB board.

At the middle area of the EB board, there is a module connection area shown as wide white. The white triangle mark indicates the position of pin 1 (see Figure 2).

Now look at the silk print “1” on the eSE100-AZ (or AW) module which denotes the position of pin 1 on the module.

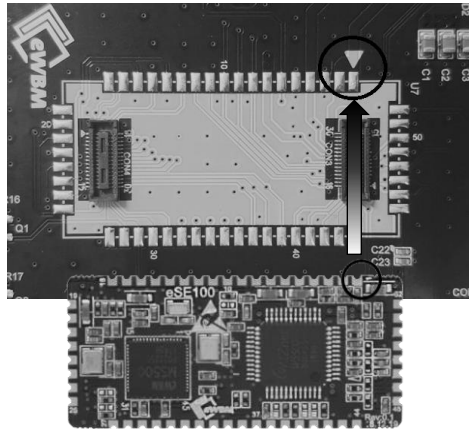


Figure 2. Mounting eSE100-AZ (or AW) module on eSE100-EB evaluation board

In order to mount the eSE100-AZ (or AW) module on the EB board, two “pin 1”s should be aligned correctly. Carefully press the module with the appropriate force so that the two parts are connected via B2B connectors with a click sound. The combined board is called the development kit, eSE100-DK-AZ (or AW).

Figure 3 shows the Development Kit after the correct mounting.

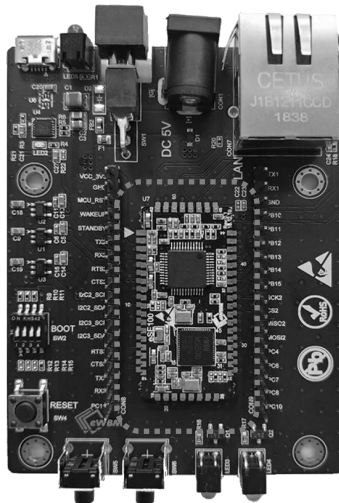


Figure 3. eSE100-DK-AZ (or AW) Design Kit

!!! CAUTION !!!

Be cautious to ensure that the pin connection is correctly made without flipping the pin direction in the wrong way. When the power supply is connected to the Development Kit whose pins are not correctly connected on the EB board, the system may be damaged.

Making connection to a third party MCU or Sensor Board

Figure 4 shows the interface pins of the eSE100-EB board. The pins come in header pin type to provide easy connection to a third party MCU or a sensor board for composing a complete target system. In addition to making pin connections for power supply or signals, make sure to connect the GND pins as well, since it is important to provide common ground basis throughout the entire system. The connected third party MCU or a sensor board should operate at 3.3 [V] to match the interface voltage (3.3 V) of the eSE100-DK-AZ (or AW) board. For more details on each I/O specification, please refer to the MS500 Datasheet which can be downloaded at www.ewbm.com.

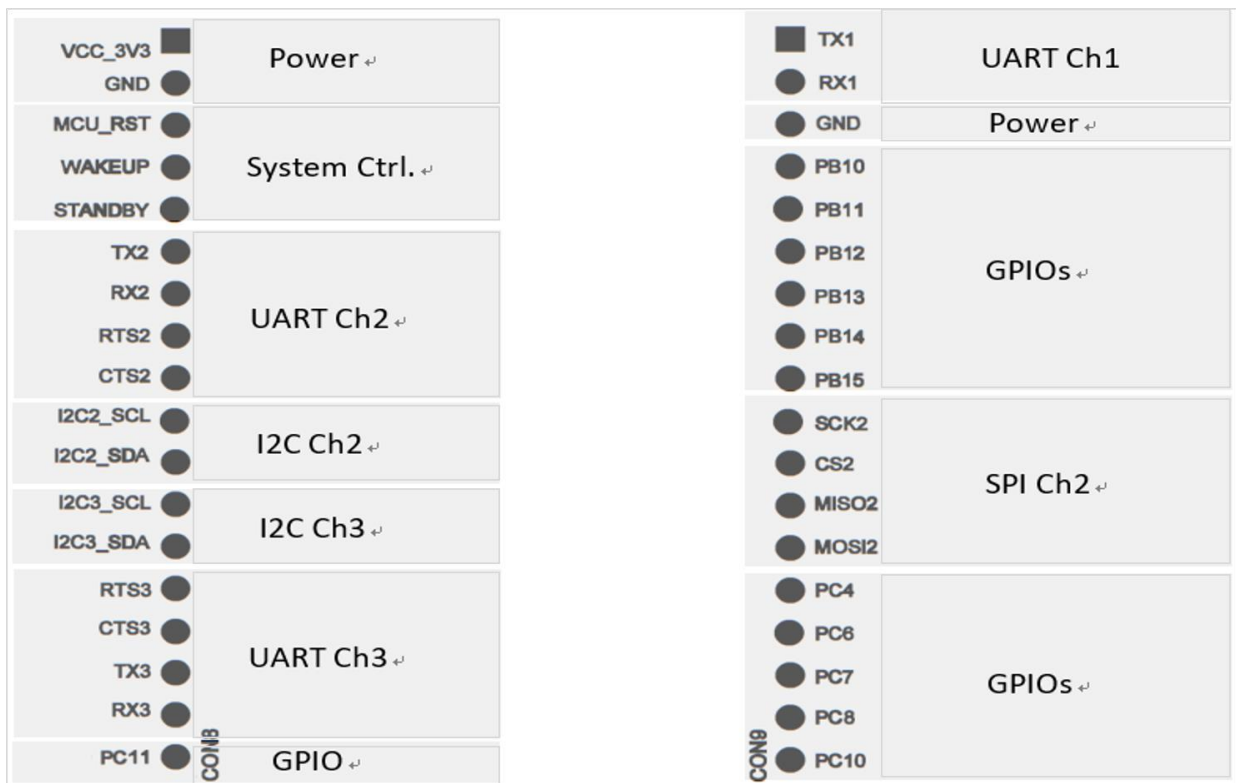


Figure 4. I/O Header Pins of eSE100-DK-AZ (or AW)

Power Supply Settings

The supplying power to the eSE100-DK-AZ (or AW) is available in two ways.

One way is to supply the 5 [V] power using a USB cable [Type B]. The other way is to supply the power through a separate 5 [V] DC adapter.

!!! CAUTION !!!

Please note that only one power supply is necessary, not both.

Supplying power by mini 5-Pin USB [Type B] Cable

On the left side of the power LED on the EB board, there is a USB connector used for debugging, status checking, and firmware updating. The USB connector is also used as a power supply. Connect the USB cable to the connector and connect the other side of the cable to the PC. (Figure 5)

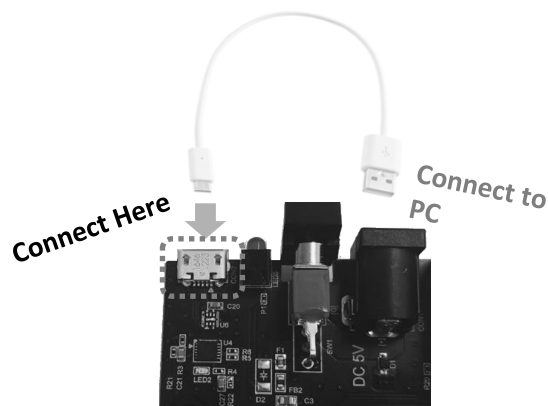


Figure 5. USB port connection

Supplying power by 5[V] DC adapter

As shown in Figure 6, the 5[V] DC adapter can be used as an alternative power supplier when the Development Kit is ready for independent operation mode where the USB cable is not necessary, assuming the UART debugging is completed where the firmware update is not needed anymore. When the USB cable is disconnected, the external 5[V] DC adapter should be connected to supply the power.

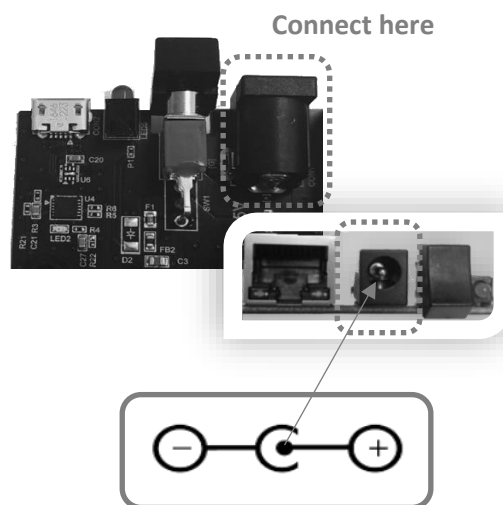


Figure 6. 5[V] DC connector

!!! CAUTION !!!

Check to confirm the polarity of power jack before making the connection.

If you insert the jack in the opposite polarity, the board may be damaged. The polarity of DC Jack is shown in Figure 6.

Turn On or OFF the Power of eSE100-EB

Once the USB cable or the 5[V] DC Jack is connected to the board, press the top portion of the power switch to connect the power to the board (see Figure 7). The Power LED (Red) lights up with the connection.

Press the bottom portion of the Power switch to shut off the power, resulting the Power LED (Red) turning off.

!! CAUTION !!!

If the Power LED (Red) does not light, or if there is any indication of a burning odor, immediately turn off the switch and check the status of the board. Also check the connection status of eSE100-AZ (or AW) module. The connection status of the USB cable and DC Jack should be also checked.

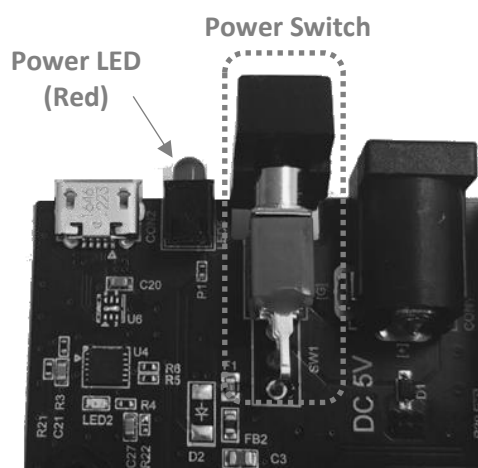


Figure 7. Power Switch

LAN (RJ45) Cable Connection

Once all the steps previously described are completed, the LAN cable can be connected to the RJ45 jack while the power is turned on (See Figure 8). When the LED of the LAN connector is remained as turned on, it is considered that the board enters a normal state.

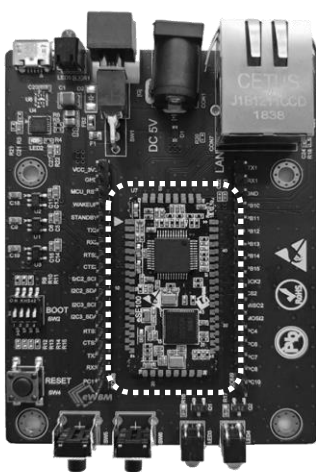


Figure 8. LAN cable connection

Altering the Mode Setting

DIP Switch Setting for Operation Mode



► ROM Boot (Default) Mode: [0000b]

※ Normal Functional Use



► Firmware Update Mode: [0100b]

※ A new updated firmware can be downloaded at manufacturer site. (www.ewbm.com)

→ After firmware is updated, please change DIP switch (SW2) setting to **ROM Boot (Default) Mode** and then push the **Reset** button (SW4).

Figure 9. Mode setting

NOTE

In addition to the DIP switch settings described in Figure 9, there are few more settings exist, but they are for the manufacturer's use only. Users are not supposed to change the settings other than the ones specified in this document.

New Firmware

The number of AT command sets may be increased without prior notice to the user. To reflect important firmware update, please visit the homepage frequently to check if any new firmware is released.



<http://www.ewbm.com>

Firmware Update

* Please download the firmware update tool ("MS500FW_Update.exe ") and a updated firmware (*.bin) file from the eWBM's homepage (www.ewbm.com).

* Execute the firmware update tool as shown in Figure 10, and then follow the steps below.

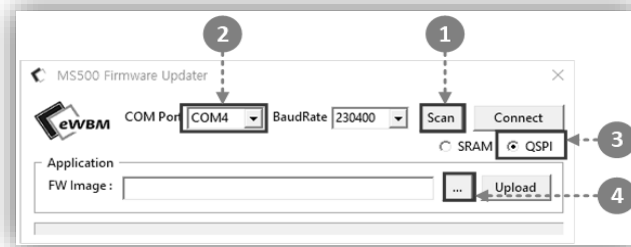


Figure 10. Firmware Update Tool

[1] Make sure that the eSE100-DK-AZ (or AW) board is connected to the PC, and then click the Scan button.

[2] After figuring out the port number assigned by PC, select the corresponding port number in the COM Port button. Once it is done correctly, the board is now connected to the PC.

[3] Select QSPI.

[4] Click <...> button to select the path and the updated binary file (i.e. the updated firmware file (*.bin)).

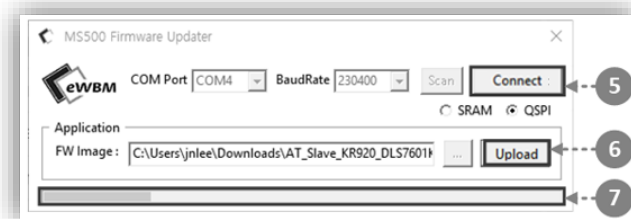


Figure 11. Firmware Upload

[5] Click <Connect> button

[6] Click <Upload> button

[7] Check the progress of the update on the Progressive Bar.

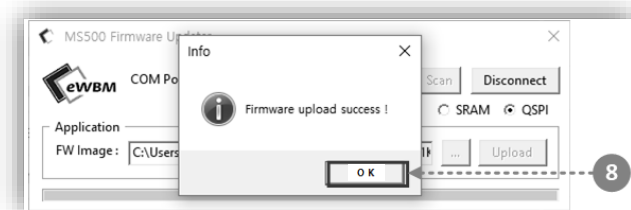


Figure 12. Firmware Update Successful

[8] Confirm the message "Firmware upload success !" and the click the OK button.

※ After firmware update is completed, change the DIP switch (SW2) setting to **ROM Boot (Default) Mode** and then press the **Reset** button (SW4) for system boot.

Network Connection to Cloud Server

Connecting to Microsoft Azure Cloud Server

Preparation for connection

- [1] First, access to <https://portal.azure.com/> to create a Microsoft Azure user account,
- [2] Create an Azure Cloud Server for IoT device connection.
 - ※ For more information, please refer to Microsoft's Azure guide document or use Internet search.
- [3] Register the IoT device to connect to the Azure Cloud Server and obtain Connection String information. (The Cloud Server creates the String automatically when an IoT device is registered).
 - ※ The Connection String information is an unique key concept for identifying IoT devices registered in MS Azure server, so even if same device is connected multiple times, each time creates different connection string.
 - ※ For more information, please refer to Microsoft's Azure guide document or use Internet search.

After Creating Azure Account and Cloud Server

- [1] Copy the connection string information of the registered IoT device at <https://portal.azure.com/>
- [2] The UART1 port of eSE100-AZ module makes connection to Tx/Rx pin of UART channel of external MCU or PC. (If you connect to a non-MCU or non-PC, you must use a separate gender to match the voltage level of the signal.)
- [3] Send the copied Connection String information to the module by using **AT + Command**.

As an example, if the Connection String is

```
"HostName = sS2E.azure-devices.net; DeviceId = sS2E;  
SharedAccessKey = xxyFf3QDz + va3YVpNO +  
brhuFBICtsgbiEMSEfrhZqexx"
```

Then, the corresponding AT+Command looks like below:

```
AT + CONNECTSTR = HostName = sS2E.azure-devices.net; DeviceId = sS2E;  
SharedAccessKey = xxyFf3QDz + va3YVpNO +brhuFBICtsgbiEMSEfrhZqexx
```

- [4] Set the parameters of the terminal program to the following values to enable serial communication.
The eSE100-AZ module is set to the values as a default in the firmware.

- ✓ Baud rate: 115200bps
- ✓ Data: 8bit
- ✓ Parity: None
- ✓ Stop bit: 1bit
- ✓ Flow Control: None

- [5] With all the above steps done, the connection to the Azure Cloud is complete, and the board is ready to go.

Connecting to AWS Cloud Server

Preparation for connection

- [1] First, access to <https://aws.amazon.com/iot> to create an AWS user account,
- [2] Create an AWS Cloud Server for IoT device connection.
 - ※ For more information, please refer to AWS IoT guide document or use Internet search.
- [3] Register the IoT device to the AWS cloud server and obtain Connection String and Certification information. (The AWS Cloud creates it automatically when an IoT device is registered)
 - ※ The Connection String information is an unique key concept for identifying IoT devices registered in AWS cloud server, so even if same device is connected multiple times, each time creates different connection string.
 - ※ For more information, please refer to AWS IoT document or use Internet search.

After Creating AWS Account and Cloud Server

- [1] Copy the connection string information of the registered IoT device at <https://aws.amazon.com/iot>
- [2] The UART1 port of eSE100-AZ module makes connection to Tx/Rx pin of UART channel of external MCU or PC. (If you connect to a non-MCU or non-PC, you must use a separate gender to match the voltage level of the signal.)
- [3] Send the copied Connection String information to the module by using **AT + Command**.

As an example, if the Connection String is

```
"HostName = aksjr6sdyxlbp-ats.iot.us-east-2.amazonaws.com; DeviceId  
= eWBM; ThingName= sS2E"
```

Then, the corresponding AT+Command looks like below:

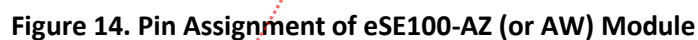
```
AT + CONNECTSTR = HostName = aksjr6sdyxlbp-ats.iot.us-east-  
2.amazonaws.com; DeviceId = eWBM; ThingName= sS2E
```

- [4] Set the parameters of the terminal program with the following values to enable serial communication. The eSE100-AW module is set to the values as a default in the firmware.

✓	Baud rate:	115200bps
✓	Data:	8bit
✓	Parity:	None
✓	Stop bit:	1bit
✓	Flow Control:	None

- [5] With all the above steps done, the connection to the AWS Cloud is complete, and the board is ready to go.

Dimension & Pin Assignment of eSE100-AZ (or AW)



Dimension of eSE100-DK-AZ (or AW) Development Kit

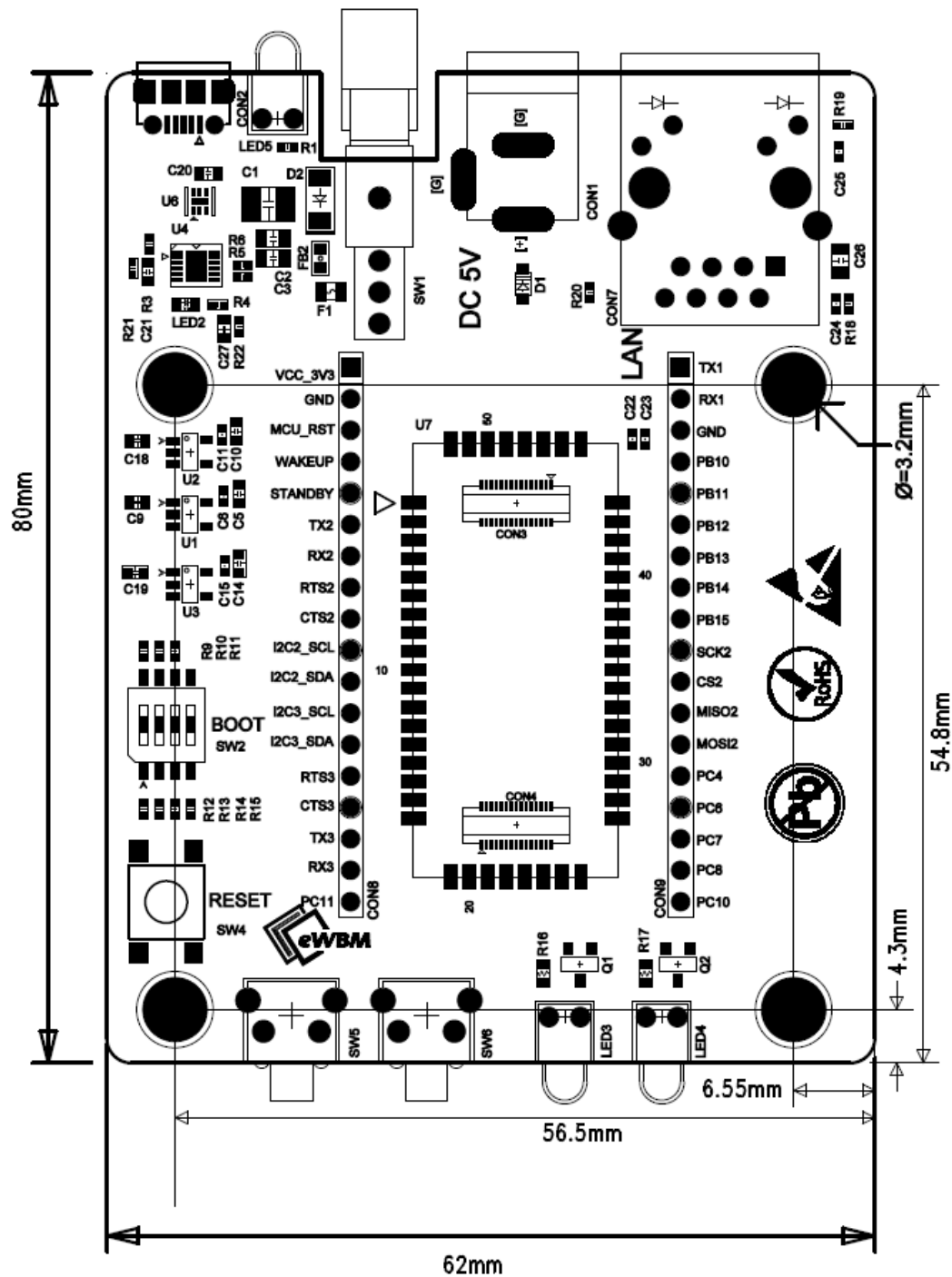


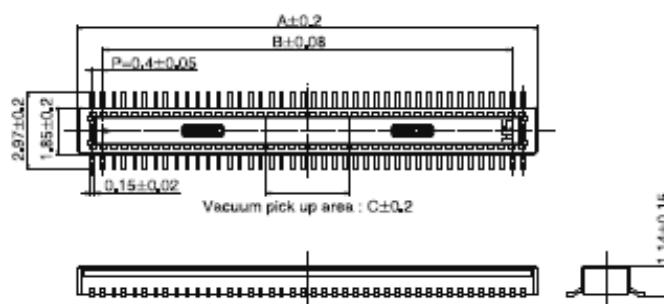
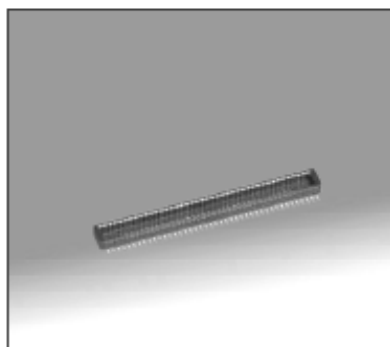
Figure 16. Physical Dimension of eSE100-EB Board

Connectors of eSE100-AZ (or AW) Module

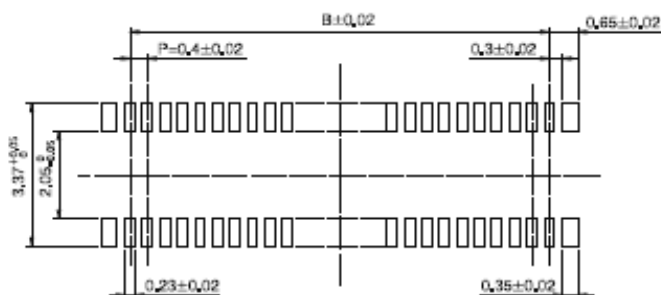
The DF40C-30DP-0.4V(51) [HIROSE] products are used at **eSE100-AZ (or AW)**.

DF40 Series 0.4mm Pitch, 1.5 to 4.0mm Height, Board-to-Board and Board-to-FPC Connectors

Header



Recommended PCB layout



Unit : mm

Part No.	HRS No.	No. of Contacts	A	B	C
DF40C-10DP-0.4V(51)	684-4035-0 51	10	3.52	1.6	1.0
DF40C-12DP-0.4V(51)	684-4149-9 51	12	3.92	2.0	
DF40C-20DP-0.4V(51)	684-4010-9 51	20	5.52	3.6	
DF40C-24DP-0.4V(51)	684-4011-1 51	24	6.32	4.4	1.2
DF40C-30DP-0.4V(51)	684-4012-4 51	30	7.52	5.6	1.5
DF40C-34DP-0.4V(51)	684-4024-3 51	34	8.32	6.4	2.3
DF40C-40DP-0.4V(51)	684-4013-7 51	40	9.52	7.6	3.2
DF40C-44DP-0.4V(51)	684-4077-0 51	44	10.32	8.4	
DF40C-50DP-0.4V(51)	684-4014-0 51	50	11.52	9.6	
DF40C-60DP-0.4V(51)	684-4003-3 51	60	13.52	11.6	
DF40C-70DP-0.4V(51)	684-4015-2 51	70	15.52	13.6	
DF40C-80DP-0.4V(51)	684-4001-8 51	80	17.52	15.6	
DF40C-90DP-0.4V(51)	684-4125-0 51	90	19.52	17.6	
DF40C-100DP-0.4V(51)	684-4032-1 51	100	21.52	19.6	

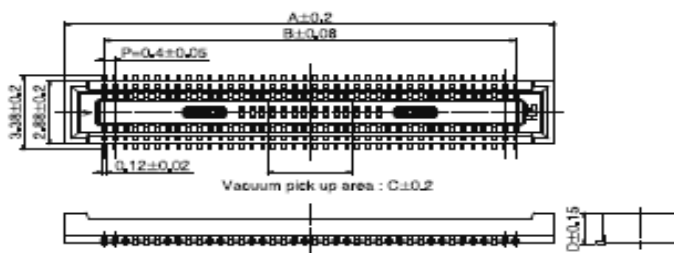
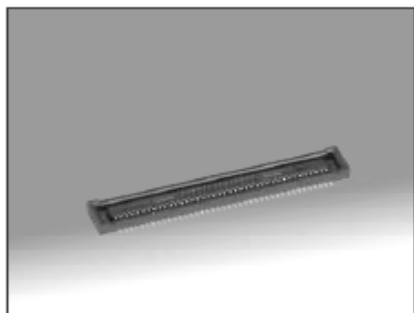
Figure 17. B2B Connector on eSE100-AZ (or AW) Module

Connectors of eSE100-EB Development Kit

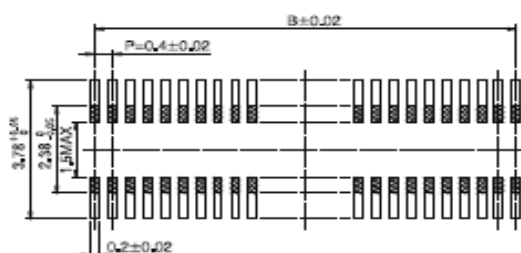
The DF40C-30DS-0.4V(51) [HIROSE] products are used at **eSE100-EB**

DF40 Series●0.4mm Pitch, 1.5 to 4.0mm Height, Board-to-Board and Board-to-FPC Connectors

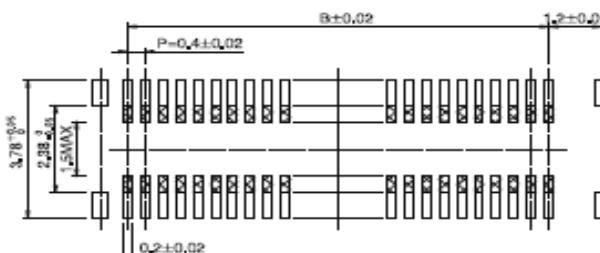
■Receptacle (Stacking height 1.5mm)



◆Recommended PCB layout



DF40C(Without reinforcing metal fitting)



DF40B(With reinforcing metal fitting)

■Stacking height 1.5mm

【Specification No.】
(51) : Embossed package 5,000 pcs/reel

Unit : mm						
Part No.	HRS No.	No. of Contacts	A	B	C	D
DF40B-10DS-0.4V(51)	684-4038-8 51	10	4,6	1,6	1,0	1,45
DF40B-12DS-0.4V(51)	684-4152-3 51	12	5,0	2,0	1,0	
DF40B-30DS-0.4V(51)	684-4090-8 51	30	8,6	5,6	1,5	
DF40B-50DS-0.4V(51)	684-4018-0 51	50	12,6	9,6	3,2	
DF40B-60DS-0.4V(51)	684-4049-4 51	60	14,6	11,6	3,2	
DF40B-80DS-0.4V(51)	684-4052-9 51	80	18,6	15,6	3,2	
DF40C-20DS-0.4V(51)	684-4005-9 51	20	6,6	3,6	1,0	
DF40C-24DS-0.4V(51)	684-4006-1 51	24	7,4	4,4	1,2	
DF40C-30DS-0.4V(51)	684-4007-4 51	30	8,6	5,6	1,5	
DF40C-34DS-0.4V(51)	684-4023-0 51	34	9,4	6,4	2,3	
DF40C-40DS-0.4V(51)	684-4008-7 51	40	10,6	7,6	3,2	1,45
DF40C-50DS-0.4V(51)	684-4009-0 51	50	12,6	9,6		
DF40C-60DS-0.4V(51)	684-4004-6 51	60	14,6	11,6		
DF40C-70DS-0.4V(51)	684-4016-5 51	70	16,6	13,6		
DF40C-80DS-0.4V(51)	684-4002-0 51	80	18,6	15,6		
DF40C-90DS-0.4V(51)	684-4124-8 51	90	20,6	17,6		
DF40C-100DS-0.4V(51)	684-4033-4 51	100	22,6	19,6		

Figure 18. B2B Connector on eSE100-AZ (or AW) Module

Safety Notes of Using the Unit



WARNING

Do not allow metallic foreign objects or liquids to drop on board



Never allow metallic foreign objects (e.g., coins, wires, etc.) or liquids (e.g., water or juice) to drop on board. Doing so may cause short circuits, faulty operation, or other malfunctions.



Turn off the unit if an abnormality or malfunction occurs

In the following cases, immediately turn off the power and contact your retailer, or an authorized distributor for service.

- If smoke or unusual odor occurs; or
- Objects have fallen into, or liquid has been spilled onto the board; or
- The unit has been exposed to rain (or otherwise has become wet); or
- The unit does not appear to operate normally



For a list of eWBM service centers and official A/S Policy, refer to the eWBM website