Bluetooth® Module

EYMF2CAMM -XX(Embedded SPP)

Data Report

In case you adopt this module and design some appliance, please ask for the latest specifications to the local sales office.

Document constituent list

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Rev. record

18-Jul.-2003> Ver.1.0 Newly issued

17-Oct.-2003> Ver.1.1 Newly issued

Control No.		Control name
HD-AG-A021157	(1/4)	General Items

Scope

This specification ("Specification") applies to the hybrid IC "EYMF2CAMM-XX" for use ***Bluetooth***® module ("Product") manufacture by TAIYO YUDEN Co., Ltd. ("TAIYO YUDEN")

1. Part Number: EYMF2CAMM-XX (Embeded SPP)
   Degit 8: Baseband,LM version. ex) M;TAIYO YUDEN standard.
   Degit 9: Hardware code. ex) M;TAIYO YUDEN standard.
   Degit11,12: Firmware veriosn. ex) XX;TAIYO YUDEN standard.
   ***Part number may be modified for mass production or other cases.**
   Please see "m" for more information.
2. Function: Radio frequency transfer Module (power class 2 ***Bluetooth***® standard Ver 1.1 conformity
3. Application: PDA,Barcode Reader and Pos.
4. Structure: Hybrid IC loaded with silicon monolithic semiconductor
5. Outline: 34-pin leadless chip carrier
6. Marking: Part Number, BD_ADDR, Lot No. and manufacturer on Shielding Case.
7. Features:
   - ***Bluetooth***® 1.1 conformity
   -UART Interface
   Baud Rate: 115.2kbps
   -Point-to-Point
   -Serial Port Profile
   -Supported Link Type: ACL
8. Packing:
   Packaging method : Tray & aluminum moisture barrier bag
   Packaging unit : *** pieces/tray
   Material of tray : PPE (Heat proof 135deg)
   Tray Specification : JEDEC STD No. 95-1 Section 10 Revision C
9. Note:
   a. Any question arising from this Specification shall be solved through mutual discussion by the parties hereof.
   b. This Product is not designed for radiation durable and should not be used under the circumstance of radiation.
   c. The operating conditions of this Product are as shown in this Specification. Please note that TAIYO YUDEN shall not be liable for a failure and/or abnormality which is caused by use under the conditions other than the operating conditions hereof.
   d. This Product mentioned in this Specification is manufactured for use in PDA, Barcode Reader and Pos. Before using this Product in any special equipment (such as medical equipment, space equipment, air craft, disaster prevention equipment), where higher safety and reliability are duly required, the applicability and suitability of this Product must be fully evaluated by the customer at its sole risk to ensure correct and safety operation of those special equipments. Also, evaluation of the safety function of this Product even for use in general electronics equipment shall be thoroughly made and when necessary, a protective circuit shall be added in design stage, all at the customer's sole risk.
   e. TAIYO YUDEN warrants only that this Product is in conformity with this Specification for one year after purchase and shall in no event give any other warranty.
   f. The warranty period shall be one year.
   g. Communication between this Product and others might not be established nor maintained depending upon radio environment or operating conditions of this Product and other ***Bluetooth***® products.

Control No.		Control name
HD-AG-A021157	(2/4)	General Items

h. This Product is designed for use in products which comply with ***Bluetooth***® Specifications (ver 1.1) ("Bluetooth Specifications"). TAIYO YUDEN disclaims and is not responsible for any liability concerning infringement by this Product under any intellectual property right owned by third party in case the customer uses this Product in any product which does not comply with Bluetooth Specifications (the "non-complying products"). Furthermore, TAIYO YUDEN warrants only that this Product complies with this Specification and does not grant any other warranty including warranty for application of the non-complying products.

i. TAIYO YUDEN dose not render updating or upgrading service for the firmware in the Module.

j. In order to take tests for getting the certification of each country's Radio Law with a device incorporating this module, it is necessary to make the software in Host to put the module into test condition. Please contact TAIYO YUDEN for farther details.

k. Please evaluate adequately our module incorporated to your products before mass production.

l. This Product operates in the unlicensed ISM band at 2.4GHz. In case this Product is used around the other wireless devices which operate in same frequency band of this Product, there is a possibility that interference occurs between this Product and such other devices. If such interference occurs, please stop the operation of other devices or relocate this Product before using this Product or do not use this Product around the other wireless devices.

m. Part Number Modification Notice (***Bluetooth***® Modules)

Part numbers for sample modules or part numbers you see in this Specification are TAIYO YUDEN standard part numbers. In case of modification made to any modules, to meet requested specifics, the part number will carry a different part number, due to forfeit originality. Additionally, part numbers may be modified based on mass production stage, ***Bluetooth***® logo Qualification stage, or other related stages. Please contact TAIYO YUDEN to confirm whether your part number needs to be modified.

Please see the following examples for cases that part numbers are modified:

- for specific firmware version (our standard item firmware will be upgraded occasionally)
- for specific BD address (our standard item BD address is owned by TAIYO YUDEN)
- for different baud rate (our standard is 115.2kbps and partly 921.6kbps)
- for specific USB ID (our standard item USB ID is owned by TAIYO YUDEN or chip manufacture)
- for other related cases (specific or different setting, form, sizes, or display etc..)

In case you have applied for ***Bluetooth***® Qualification with our standard part number without previous notice to TAIYO YUDEN, we shall not be responsible for any expense that will be required to change its name/number.

This module is still under development, thus specifications do not guarantee both the quality and reliability at the time of shipment. Since the specifications and mass production of the module are not confirmed either, the contents of the technical notes are subject to change without any prior notice.

Control No.		Control name
HD-AG-A021157	(3/4)	General Items

Safety Precautions

RE:The use of Embedded Software and customer support

Before using ***Bluetooth***® product.
Please kindly read carefully and understand the following before using the Products.

1.Taiyo Yuden Co., Ltd. (hereinafter "TY"), lawfully has copyrights and other rights to the software embedded to the memory of the Products (the "Embedded Software"). Except as otherwise expressly provided herein, your company is not permitted to disclose or offer the Embedded Software, either wholly or partly, to any third party (including uploading to your company or third party(ies)'s web sites and downloading by third parties from such sites), nor to copy, revise, reverse engineer, upgrade, make specification change, or alienate the Embedded Software.

2. Before using the Products, your company need to check and confirm sufficient safety and operation of your company's products which incorporate the Products and interoperability and compatibility with other ***Bluetooth***® enabled products. By execution or approval of this Specification, your company shall be deemed to have fully evaluated and confirmed the Products (including the Embedded Software) (the Embedded Software that your company has so fully evaluated and confirmed is hereinafter referred to as "Approved Software").

3. Although TY has made full assessment of the Embedded Software, there is still possibility of malfunction of quality or performance due to the bug or other causes existing in or arising out of the Embedded Software, or due to combination with other product including your product. ("Potential Failure").
Your company shall be deemed to have agreed with the following by the execution or approval of this Specification.

1)The Potential Failure shall not be deemed as defect or failure of the Embedded Software or the Products, under the agreement between TY and your company (executed either in past, or in the future) or under all applicable laws.

2)Your company shall indemnify, hold harmless and defend TY from and against any claims, lawsuits, or damages that arise or result from the Potential Failure.

4. TY have not evaluated and confirmed the interoperability, compatibility, etc. of the Products (including Embedded Software) with every kind of ***Bluetooth***® enabled product. In addition, TY does not guarantee interoperability and compatibility of the Product with certain devices. In order to minimize the damage or harm arising out of the Potential Failure or out of combination with other devices, TY recommend your company set up interface or external pin (for detail, please refer to Specification " Pin Layout " of this document) for rewriting the Embedded Software.

5. Except as mentioned in Paragraph 2 of "Support limitation when failure occurs" provided below, TY in principal will not accept your company request to update or change the specifications of the Approved Software. In case your company wishes TY to update or change the specifications of Approved Software, or your company do by yourself, please consult TY beforehand.

Support limitation when failure occurs.

1.Your company shall take full responsibility at your own expense and cost to resolve whatever kind/form of problem caused by the Potential Failure in the Embedded Software.

2.Please kindly notify TY of any Potential Failure. Upon your company's request, TY is ready to provide the following supports.

1)During one year from the date of the execution or approval of this Specification, TY will provide, free of charge, information or revised/restored Embedded Software then available to TY for resolving problems caused by the Potential Failure.

2)After one year period mentioned above, TY will provide the same supports as mentioned above with charge to your company. However, in case TY has discontinued manufacturing the Products, TY provides such supports during six (6) months from the discontinuation regardless of whether your company pays relevant costs and expenses.

Control No.		Control name
HD-AP-A021157	(1/4)	Soft Specification

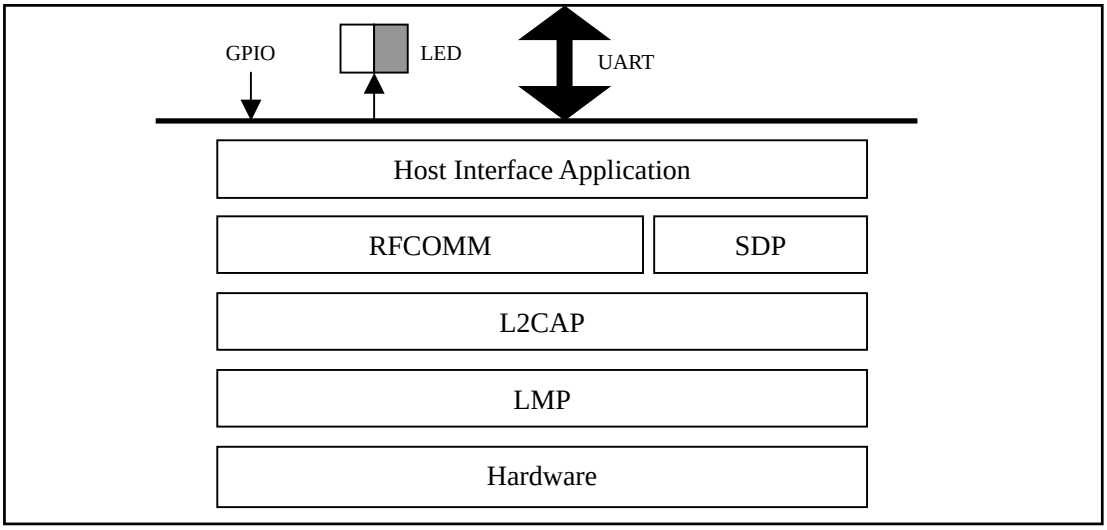
Copyright Information:

-TAIYO YUDEN Co.,Ltd. Embedded SPP Specification Documentation-

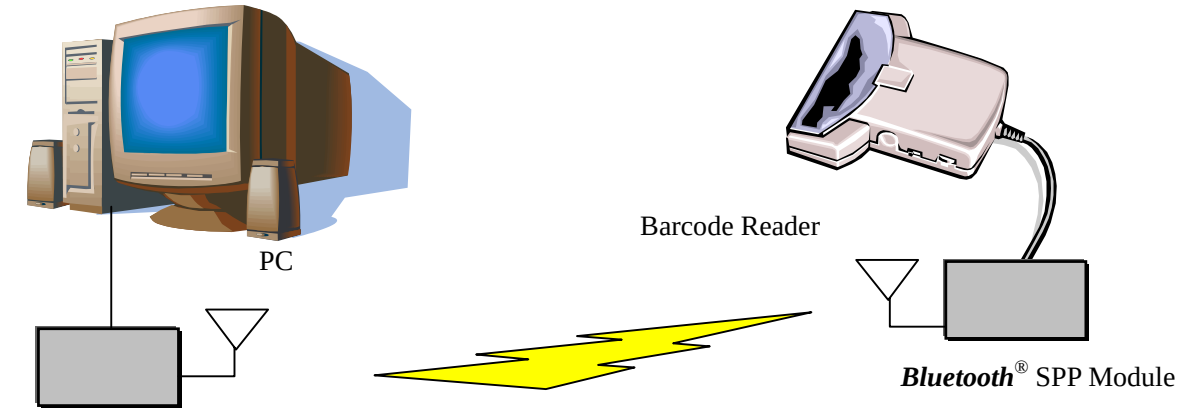
Control No.	Control name
HD-AP-A021157 (2/4)	Soft Specification

1. Overview

This specification is for simple cable replacement module based on Serial Port Profile (SPP). Target applications are POS, Handy Terminal, Telemetry, FA, etc. This specification will only define supporting point-to-point connections.



Software Block Diagram

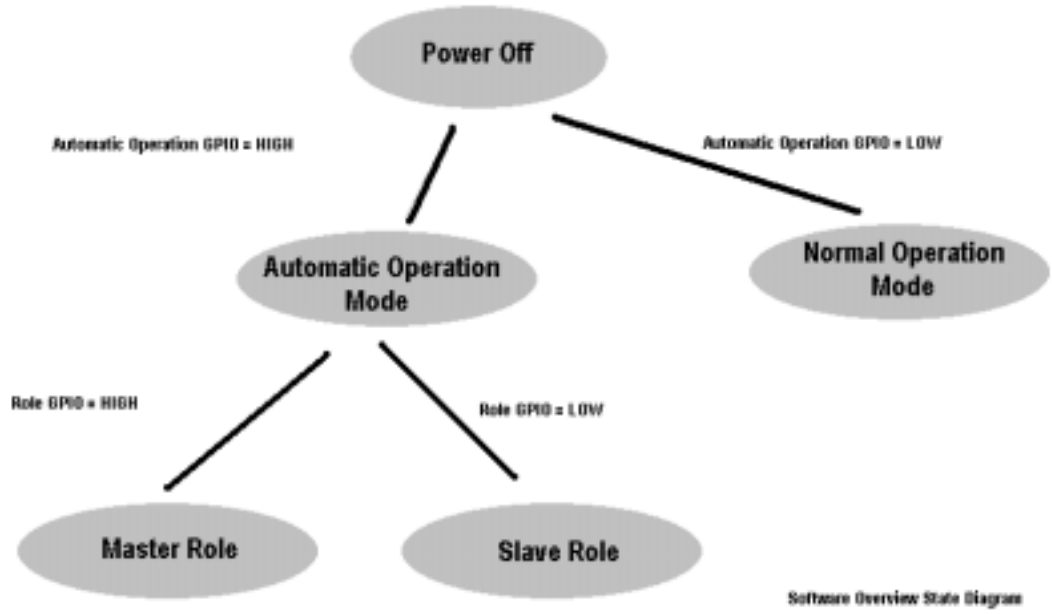


Usage Model

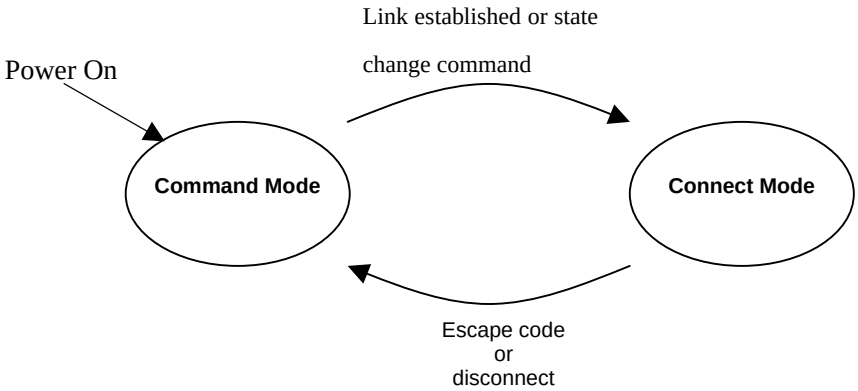
Control No.		Control name
HD-AP-A021157	(3/4)	Soft Specification

2. Basic software state diagram

Overview Tree:



Normal Operation Mode:



- **Command mode:**

  Module can only accept control commands in this mode.

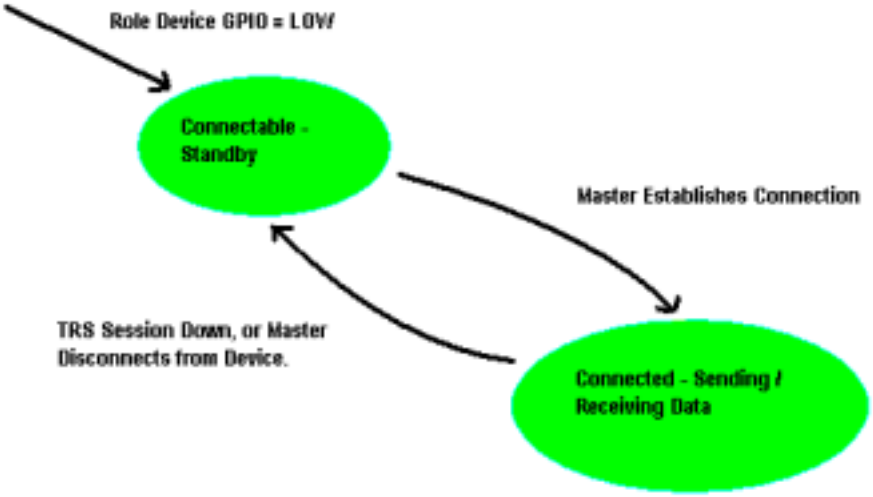
- **Connect mode:**

  In this mode, module can not accept control commands and will transparently send and receive data. When module gets escape command, it will exit this mode and return to Connect Mode.

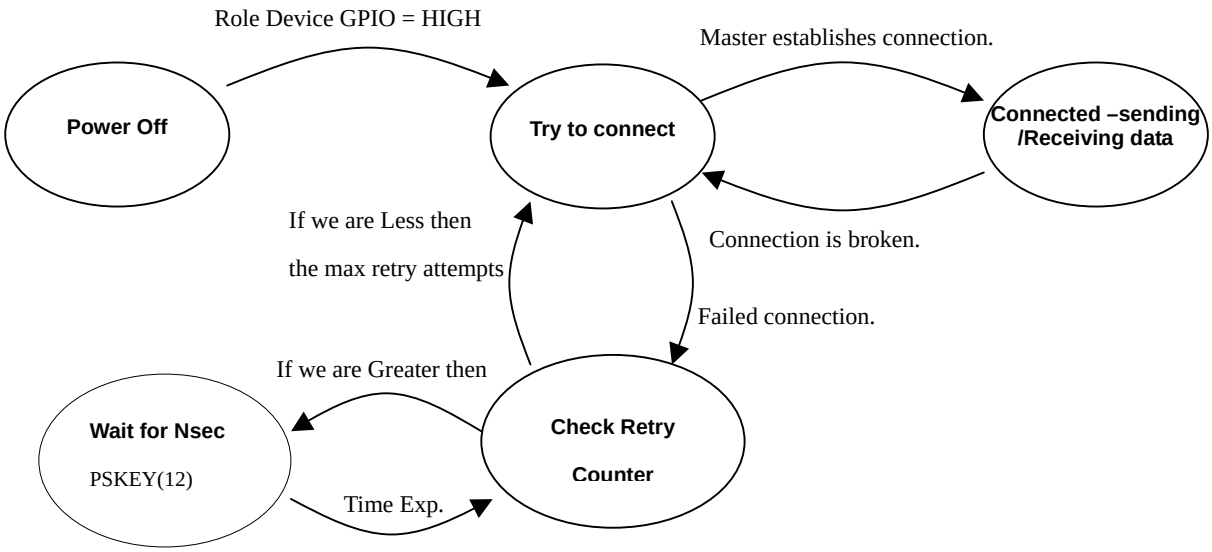
Control No.		Control name
HD-AP-A021157	(4/4)	Soft Specification

Automatic Operation Mode:

Slave Role



Master Role



Control No.		Control name
HD-AM- A021157	(1/1)	Absolute maximum ratings

Absolute maximum ratings

Item	Symbol	Rating				Remark
		Min.	Typ.	Max.	Unit	
Supply voltage	VDD_MEM, VDD_PIO	-0.3		3.6	V	
Supply voltage	VDD_1.8	-0.3		1.9	V	

Recommendation operating range

Item	Symbol	Rating				Remark
		Min.	Typ.	Max.	Unit	
Supply voltage 1	VDD_MEM	3.0	3.3	3.6	V	
Supply voltage 2	VDD_PIO	3.0	3.3	3.6	V	
Supply voltage 3	VDD_1.8	1.75	1.8	1.9	V	
Supply voltage ripple and spike noise	VDD_rn			TBD	mVp-p	Please add the external regulator
Operation temperature range	Topr	0	25	70	Degrees C	Humidity=40%RH Note 1

Note:

1. Operation temperature range is set to satisfy products electrical characteristics for a short period of time. Refer reliability condition to check the product life cycle if you use this module for a long period of time in the condition other than the Typ. standard.

Control No.	Control name
HD-AE- A021157 (1/7)	Electrical characteristics

Electrical characteristic

DC Specifications

The Specification applies for Topr.=25 degrees C, VDD_MEM= VDD_PIO =3.3V

VDD_1.8=1.8V

No.	Parameter	Condition	Symbol	Min.	Typ.	Max.	Unit	Remark
1	Operating Voltage 1	VDD_MEM= VDD_PIO	VDD_MEM	3	3.3	3.6	V	
2	Operating Voltage 2	VDD_MEM= VDD_PIO	VDD_PIO	3	3.3	3.6	V	
3	Operating Voltage 3		VDD_1.8	1.75	1.8	1.9	V	
4	Input Low Voltage	UART_CTS, UART_RX, PIO(0)-(11),AIO(0)-(1),RESET	VIL	-0.3	-	0.8	V	Note 1
5	Input High Voltage	UART_CTS, UART_RX, PIO(0)-(11), AIO(0)-(1),RESET	VIH	0.7VDD_PIO	-	VDD_PIO+0.3	V	Note 1
6	Output Low Voltage	UART_RTS, UART_TX, PIO(0)-(11), AIO(0)-(1)	VOL	-	-	0.4	V	Io=4mA
7	Output High Voltage	UART_RTS, UART_TX, PIO(0)-(11), AIO(0)-(1)	VOH	VDD_PIO-0.4	-	-	V	Io=-4mA
8	Peak current	Continuous Rx	Iccp1_3.3		17	40	mA	Note4
			Iccp1_1.8		50	80		
9	Average current1	Sniff mode (Slave only)	Icca1_3.3		2		mA	Note 2, 4
			Icca1_1.8		4			
10	Average current2	Standby mode	Icca2_3.3		1		mA	Note4
			Icca2_1.8		2			
11	Average current3	Send data (Master)	Icca3_3.3		10		mA	Note4
			Icca3_1.8		26			
12	Average current4	Receive data (Slave)	Icca4_3.3		10		mA	Note4
			Icca4_1.8		24			
13	Average current5	Park mode (Slave only)	Icca5_3.3		2		mA	Note3,4
			Icca5_1.8		4			

Note:

1. Please put the series resistance about 1k ohm into the signal line.
   As for the Power up Sequence, please refer the following page 2/6 and 3/6.
2. Sniff mode parameter. Max interval 0100h
   Min interval 0010h
   Attempt 000Ah
   Timeout 0005h

Control No.		Control name
HD-AE- A021157	(2/7)	Electrical characteristics

3. Park mode parameter. Max interval 0100h
   Min interval 0010h
4. The consumption current might fluctuate with the condition of radio communication, host performance and test circuit.

Control No.		Control name
HD-AE- A021157	(3/7)	Electrical characteristics

AC Specifications

The Specification applies for Topr.=25 degrees C, VDD_MEM= VDD_PIO =3.3V

VDD_1.8=1.8V

No.	Parameter	Condition	Symbol	Min	Typ	Max	Unit	Remark
1	VDD_MEM,VDD_PIO Rise Time from 0V to 3 V		t1			2	ms	Note1
2	VDD_1.8 Raise Time form 0V to 1.7V		t2			2	ms	Note1
3	VDD_MEM,VDDPIO 3V to VDD_1.8 1.8V		t3			10	ms	
4	Power on to stable condition		t4			t3+2	ms	Note2
5	RESET Pulse Width		t5	10			ms	
6	RESET Low to Module Ready		t6		450	1500	ms	
7	VDD_1.8 1.8V to VDD_MEM, VDDPIO 3V		t7	10			ms	
8	VDD_MEM,VDDPIO 3V to RESET High		t8	0			ms	Note3

Notes:

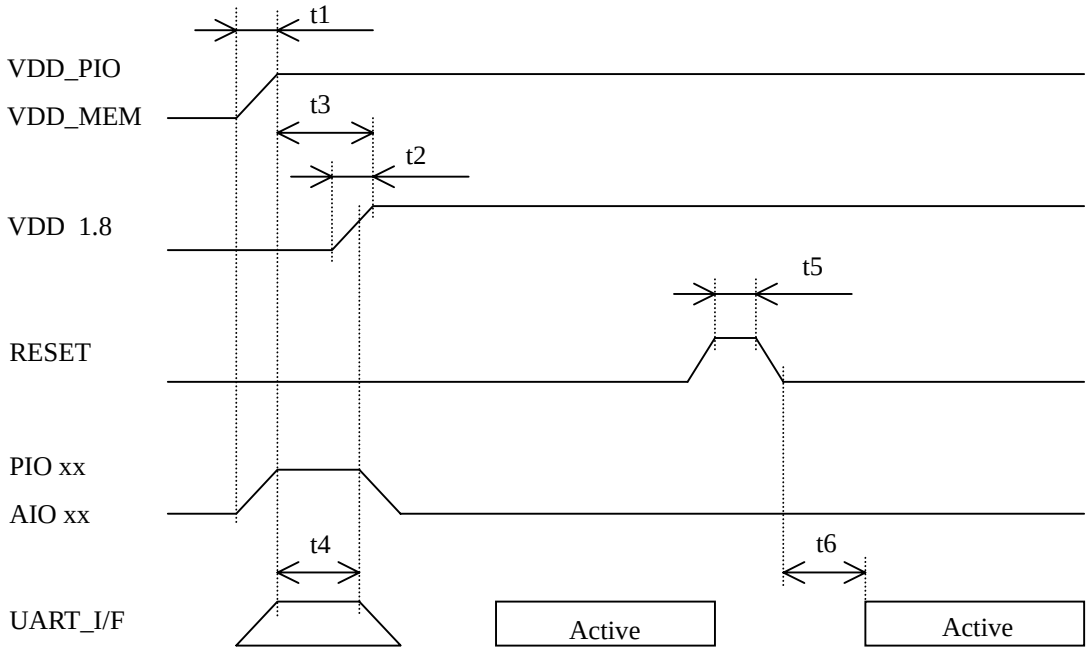
1.If t1 is not satisfied the rise time, please input RESET signal of 10ms or more after VDD_PIO, VDD_MEM and VDD_1.8 are in condition of steady state.

2.This unstable condition of t8 continues until the internal power of 1.8V reaches its steady state after VDD_PIO and VDD_MEM supply. After that, it takes some time to discharge when the unstable condition of PIO pin and UART pin are output high. Discharged time changes depending on the outside load. Please pull-down PIO pin with a 3k ohm resistor to reduce the discharged time. Please operate by using the Timing Diagram for Power Up Sequence 2 to eliminate the unstable condition.

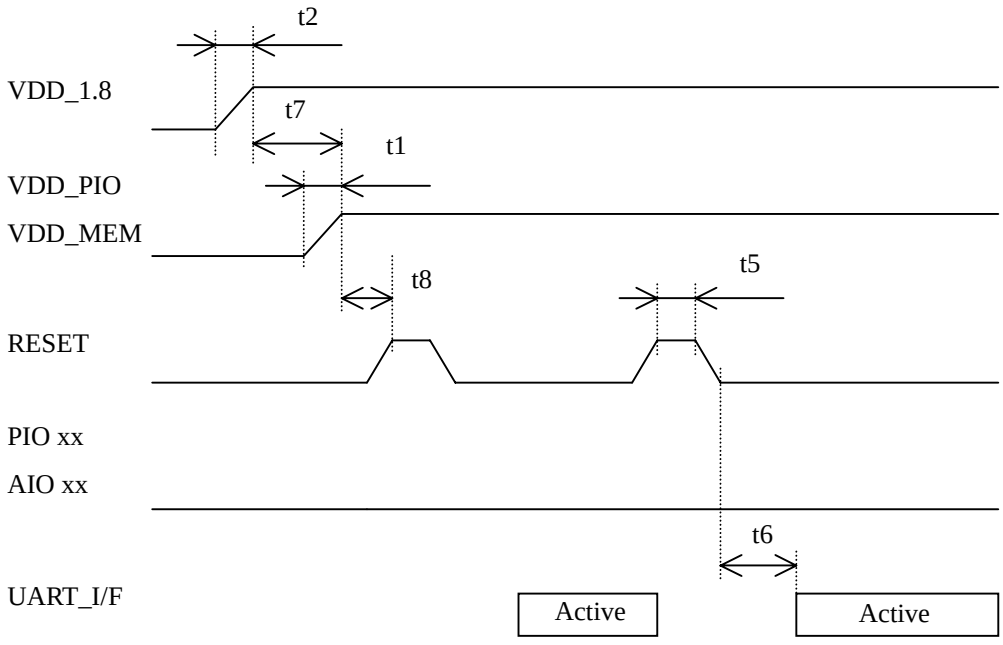
3.Please input RESET signal without fail, if you operate the module by Timing Diagram for Power Up Sequence 2.

4.When the module is ready to accept the command, its module outputs the "Init X.X.X.X (BuildXXX)" to the UART_TX signal. After that, please access to the module.
X:Firmware version and Build No.

Control No.		Control name
HD-AE- A021157	(4/7)	Electrical characteristics



Timing Diagram for Power Up Sequence 1



Timing Diagram for Power Up Sequence 2

Control No.		Control name
HD-AE- A021157	(5/7)	Electrical characteristics

UART Interface AC Specifications

Transmitting timing

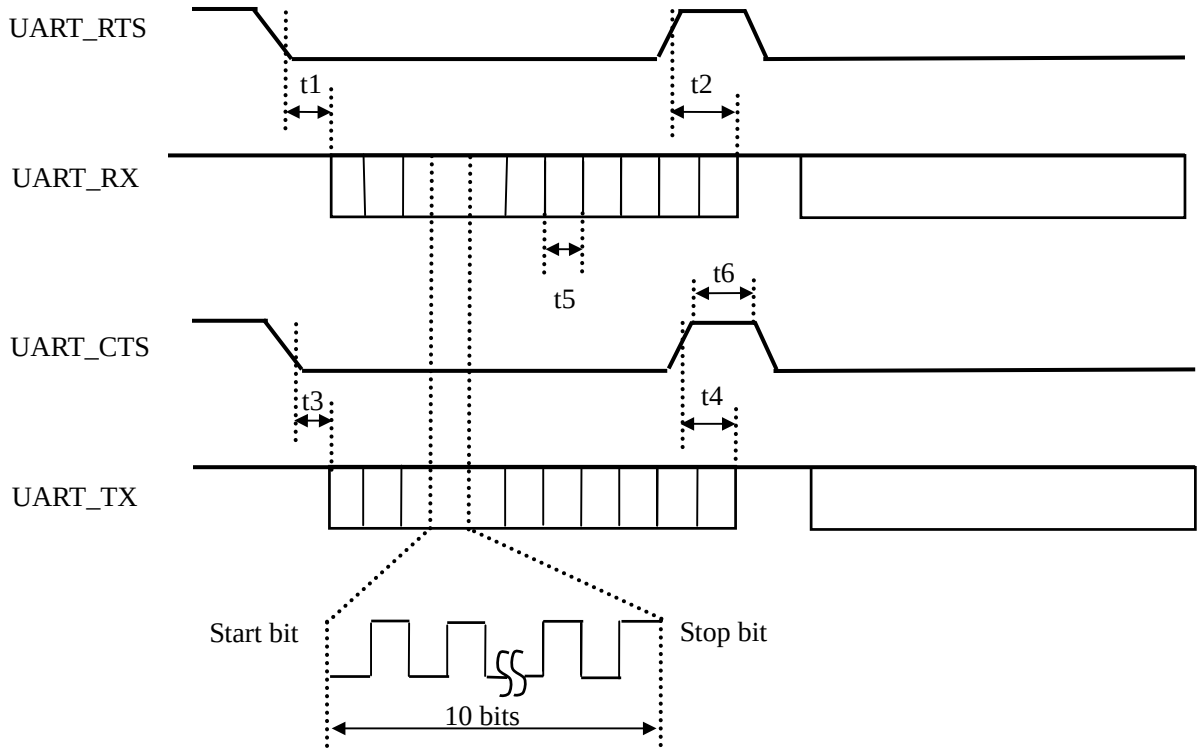
The Specification applies for Ta=25 degrees C, VDD=3.3V.

VDD_1.8=1.8V, Vss=GND

No.	Parameter	Condition	Symbol	Min	Typ	Max	Unit	Remark
1	RTS Low to RX Data On		t1	0			ms	
2	RTS High to RX Data Off		t2			1	byte	
3	CTS Low to TX Data On		t3	0			ms	
4	CTS High to TX Data Off		t4			2	byte	
5	Data 1 Character error (TX)		t5	-2		2	%	Notes 1, 2
6	Data 1 Character error (RX)		t5	-2		2	%	Notes 1, 3
7	CTS High Pulse Width		t6	4			bit	

Note:

1. +/- 2% of 10 bit width
2. Simulated value
3. Effective value



Timing Diagram for UART signals

Control No.	Control name
HD-AE- A021157 (6/7)	Electrical characteristics

UART Parameters

Item	Parameter
Baud Rate	115.2kbps, see Note
Date Bits	8bits
Stop Bits	1bit
Parity	None
Flow Control	CTS/RTS

Note:

You can also select other Baud Rate, 921.6kbps, for the different model of our module.

Please contact us for more details. (Baud Rate : 9.6k,19.2k,38.4k,57.6k,115.2k,230.4k,460.8k,921.6k)

Control No.		Control name
HD-AE- A021157	(7/7)	Electrical characteristics

RF Specifications

The Specification applies for Ta=25 degrees C, VDD_MEM= VDD_PIO = 3.3V,

VDD_1.8=1.8V

No.	Parameter	Condition	Symbol	Min	Typ	Max	Unit	Remark
1	Frequency range		FREQ	2402		2480	MHz	
2	Initial Carrier Frequency		ICF	-75		+75	kHz	
3	Frequency Drift	DH1	FD	-25		+25	kHz	
4	Tx power		PO	-6	0	+4	dBm	
5	20 dB Bandwidth		20D			1	MHz	
6	Modulation characteristics	dF1: F0	M1	140		175	kHz	
7	Modulation characteristics	dF2: AA	M4	115			kHz	
8	Output Load VSWR	at 50 ohm System	VSWR			5:1		No Damage
9	Out of band spurious1	30MHz to 1GHz	OSE1			-36	dBm	
10	Out of band spurious2	1 to 12.75GHz	OSE2			-30	dBm	
11	Out of band spurious3	1.8 to 1.9GHz 5.15 to 5.3 GHz	OSE3			-47	dBm	
12	Rx sensitivity		SEN		-80	-70	dBm	
13	Maximum Input Level		MIL	-20			dBm	
14	C/I co-channel		CIC			11	dB	
15	C/I 1MHz		CI1			0	dB	
16	C/I 2MHz		CI2			-30	dB	
17	C/I >= 3MHz		CI3			-40	dB	
18	C/I Image		CI4			-9	dB	-3MHz offset
19	C/I Image +/- 1MHz		CI5			-20	dB	

Note:

Bluetooth® standard Ver 1.1 conformity

Control No.		Control name
HD-AE-C021157	(1/1)	Electrical characteristics

PICS for Firmware Version1.0.1.22

Serial Port Profile Capabilities (based on PICS proforma for Serial port Profile)

Table K:5.1: Device role

Item	Capability	Status	Support
1	Device A (DevA)	O.1	Yes
2	Device B (DevB)	O.1	Yes

O.1: It is mandatory to support at least one of the defined roles.

Table K:5.2: Application procedures (DevA)

Item	Capability	Status	Support
1	Establish link and set up virtual serial connection	M	Yes
2	Accept link and virtual serial connection establishment	X	No
3	Register Service record for application in local SDP database	X	no
4	No release in Sniff mode. Sniff mode enabled in the Link Manager	O	Yes
5	No release in Hold mode. Hold mode enabled in the Link Manager	O	No
6	No release in Park mode. Park mode enabled in the Link Manager	O	Yes
7	No release after Master/Slave switch. M/S switch enabled in the link manager	O	No

X – Not used in DevA role

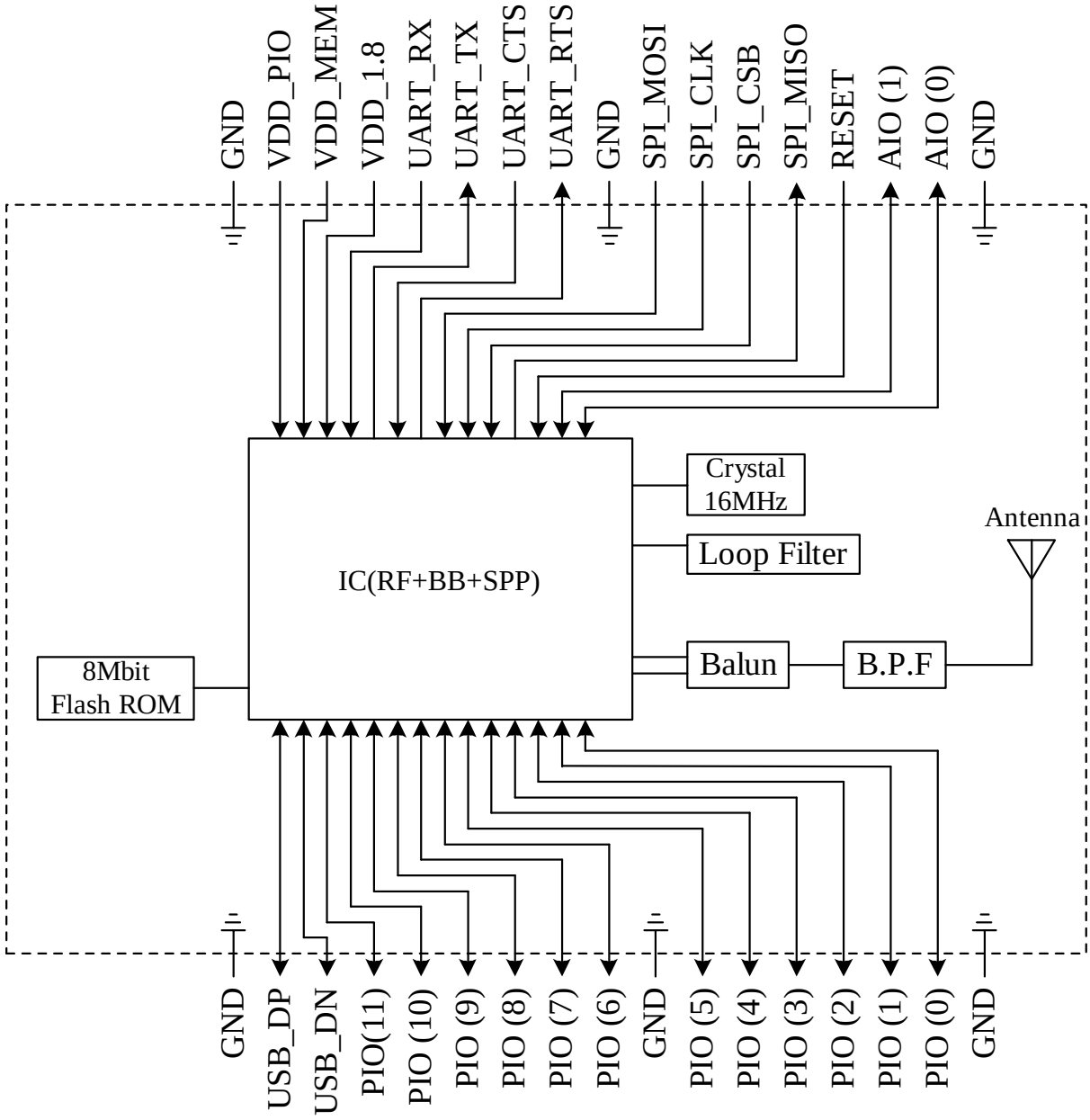
Table K:5.8: Application procedures (DevB)

Item	Capability	Status	Support
1	Establish link and set up virtual serial connection	X	No
2	Accept link and virtual serial connection establishment	M	Yes
3	Register Service record for application in local SDP database	M	Yes
4	No release in Sniff mode. Sniff mode enabled in the Link Manager	O	Yes
5	No release in Hold mode. Hold mode enabled in the Link Manager	O	No
6	No release in Park mode. Park mode enabled in the Link Manager	O	Yes
7	No release after Master/Slave switch. M/S switch enabled in the link manager	O	No

X – Not used in DevB role

Control No.		Control name
HD-MC- A021157	(1/1)	Circuit Schematic

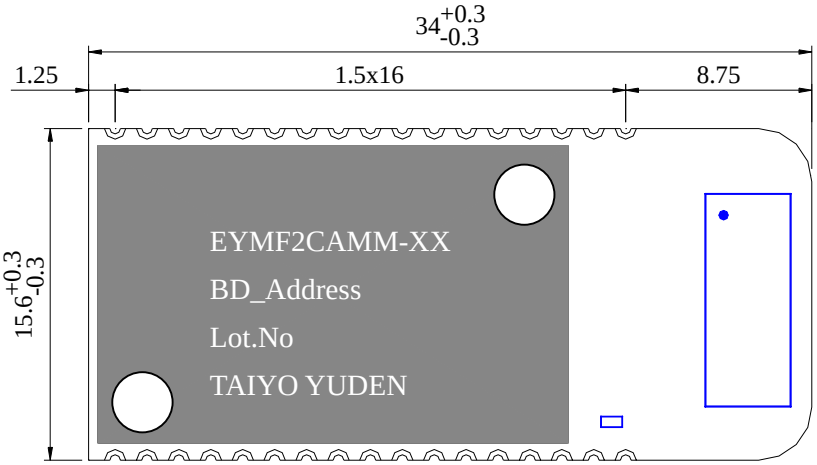
Block Diagram



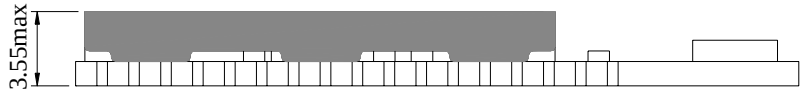
EYMF2CAMM-XX

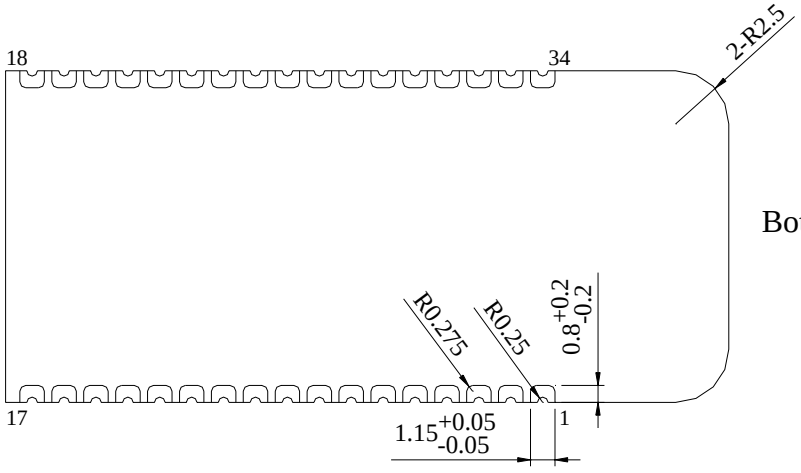
Control No.		Control name
HD-AD- A021157	(1/3)	Outline/Appearance

Unit:mm



Top View



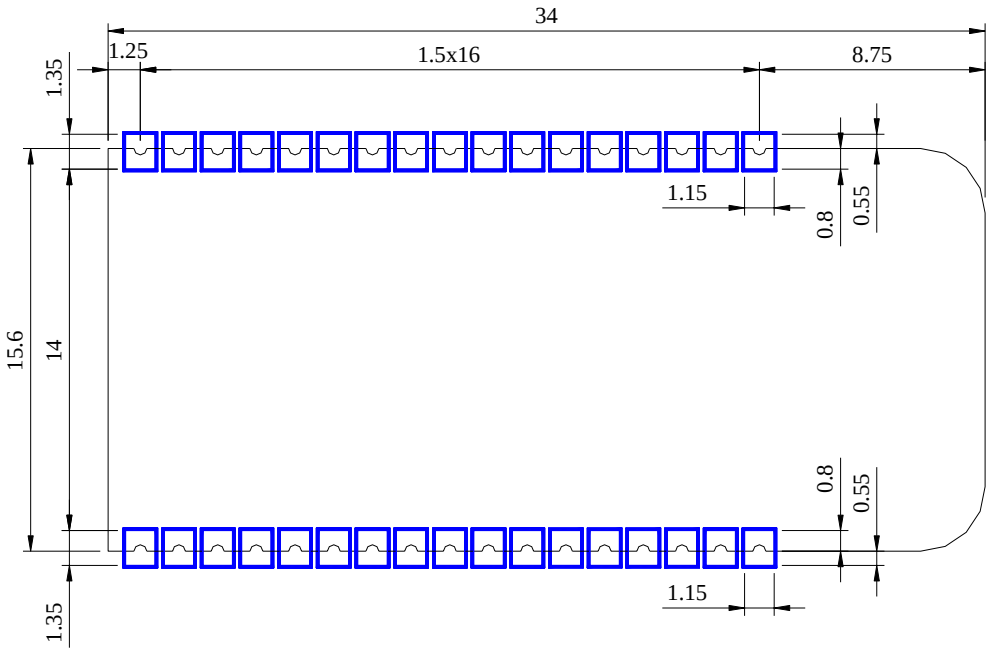


Bottom View

Control No.		Control name
HD-AD- A021157	(2/3)	Outline/Appearance

LAND PATTERN EXAMPLE

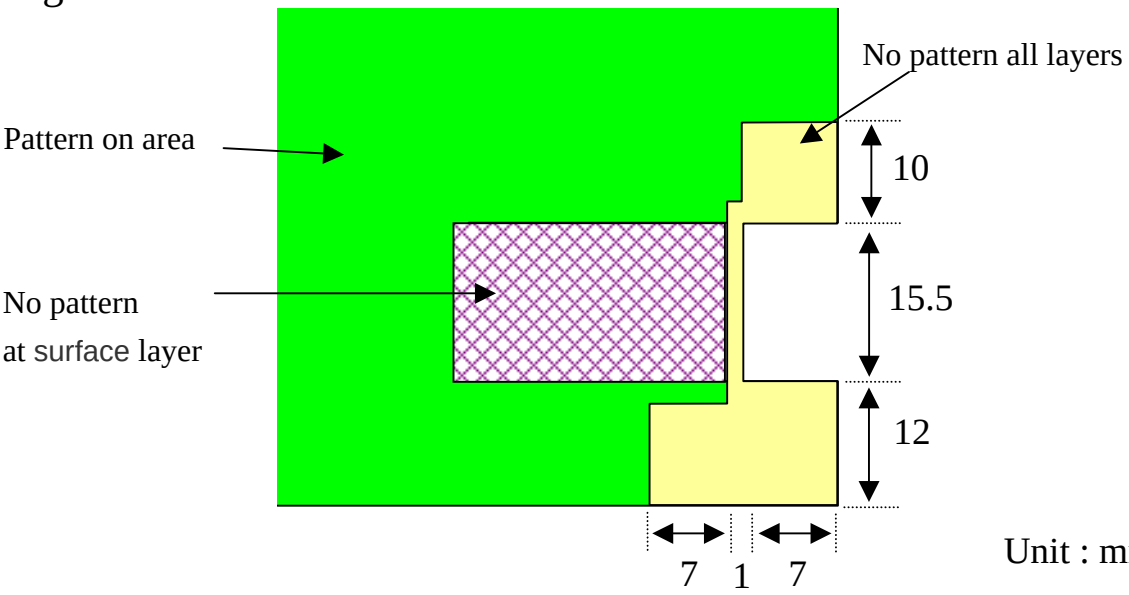
Unit: mm



Control No.		Control name
HD-AD- A021157	(3/3)	Outline/Appearance

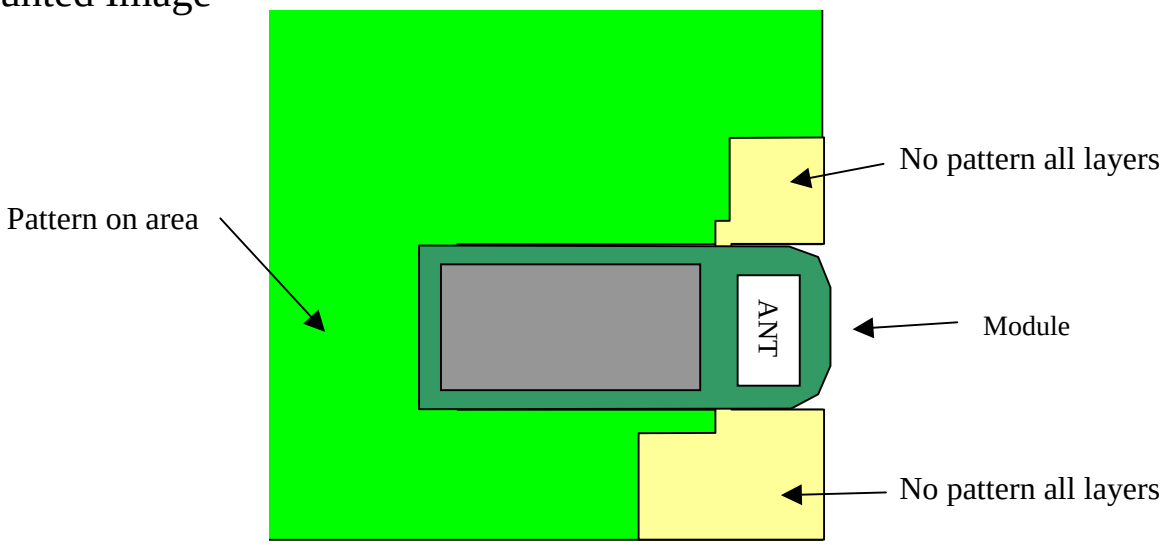
Design example of antenna area (Taiyo Yuden Eva Board)

1.Design Dimension



Unit : mm

2.Mounted Image



*** We recommend the spacing between antenna and case is 1 mm and more.**
Please try to avoid using metal and material contained metal for case material.
We'd like to have additional meeting for this actual use.

Control No.		Control name
HD-BA- A021157	(1/1)	Pin Layout

Pin Description of module

No.	Pin Name	I/O	Description	Block
1	GND	-	Ground	Power
2	AIO(0)	Input/Output	Not use	GPIO
3	AIO(1)	Input/Output		GPIO
4	RESET	Input	Active high RESET. With 51k ohm internal pull-down	RESET
5	SPI_MISO	Output	Notes 1	SPI
6	SPI _CSB	Input	Notes 1	SPI
7	SPI _CLK	Input	Notes 1	SPI
8	SPI _MOSI	Input	Notes 1	SPI
9	GND	-	Ground	Power
10	UART_RTS	Output	Request to send.(flow control signal from host) Tri-statable with internal pull-up	UART
11	UART_CTS	Input	Clear to send.(flow control signal to host) With weak internal pull-down	UART
12	UART_TX	Output	TX data to host.	UART
13	UART_RX	Input	RX data from host. With weak internal pull-down	UART
14	VDD_1.8	Input	DC supply 1.8V	Power
15	VDD_MEM	Input	DC supply 3.3V	Power
16	VDD_PIO	Input	DC supply 3.3V	Power
17	GND	-	Ground	Power
18	GND	-	Ground	Power
19	USB_DP	Input/Output	This signal should be connected to ground	USB
20	USB_DN	Input/Output	This signal should be connected to ground	USB
21	PIO(11)	Input/Output	Not use	GPIO
22	PIO(10)	Input	Baud Rate[0]	GPIO
23	PIO(9)	Input	Baud Rate[1]	GPIO
24	PIO(8)	Input	Baud Rate[0]	GPIO
25	PIO(7)	Input	Role	GPIO
26	PIO(6)	Input	Operation Mode	GPIO
27	GND	-	Ground	Power
28	PIO(5)	Output	LED1	GPIO
29	PIO(4)	Input	Message Enable	GPIO
30	PIO(3)	Output	LED0	GPIO
31	PIO(2)	Input/Output	Not use	GPIO
32	PIO(1)	Input/Output	Not use	GPIO
33	PIO(0)	Input/Output	Not use	GPIO
34	GND	-	Ground	Power

Note**:** 1. The pin is used for the firmware update, PS_KEY setting and Test mode. It connects to PC.
Please contact TAIYO YUDEN if you want detail information.

2. Unused pins should not be connected.

Control No. (1/1)	Control name Reflow profile