GPS Module
SMD type (without Antenna)

GYSFFMAXB

Data Report

GYSFFMAXB

Document constituent list

Control name	Control No.	Document Page
General Items	HD-AG-A	1/4 - 4/4
Absolute maximum ratings	HD-AM- A	1/1
Electrical characteristics	HD-AE- A	1/4 - 4/4
Electrical characteristics	HD-AE- B	1/1
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Rev. record

09-May-2012　Ver.1.0

24-May-2012　Ver.1.1　　Change Operating and Storage Temperature Range.

17-Jul-2012　Ver.1.2　　Change Module P/N

12-Oct-2012　　Ver.1.3　　Change Icc _bk1 max 60uA (on page 8)

30-Jan-2013　　Ver1.4　　 Change description(29Pin, on Page 19)

28-Nov-2013　Ver1.5　　Change description(27Pin, on Page 19)

15-Mar-2015　Ver1.6　　Change description(on page18,19)

　　　　　　　　　　　Change Handling precaution(on page 20,21,22)

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GYSFFMAXB

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

(1)Scope

This specification ("Specification")applies to the hybrid IC " GYSFFMAXB "for use

GPS module(" Product") manufacture by TAIYO YUDEN Co., Ltd.("TAIYO YUDEN")

Please be noted that the product code shall be changed in mass production stage.

1)User's code   :   GYSFFMAXB

(Please state this code to order this product.)

2)Function・Features :

- GPS Module（L1：1575.42MHz C/A code）
- 22   tracking / 66 acquisition – channel GPS receiver
- 12 multi-tone   Active Interference Canceller（AIC）
- Support multi-GNSS, QZSS, SBAS（WAAS / EGNOS / MSAS / GAGAN ）
- Additional Features:（to be supported with firmware change）
  - AlwaysLocate^{TM} Advanced location awareness technology
  - EPO^{TM} / HotStill^{TM} orbit prediction
  - EASY^{TM} self-generation orbit prediction
  - Logger function support
- Interface: UART
- Ultra Low Power Consumption
- Embedded High-performance electrical parts:LNA, TCXO, RTC, SAW_FL

3)Application :   General Consumer Devices

4)Structure: Hybrid IC loaded with silicon ＆ GaAs   monolithic semiconductor

Propriety of Pb free Packaging by customer（thermal resistance）: Available

5)Outline：10.0mm(typ)×10.8mm(typ)×2.05mm(max) 46 Pin Leadless chip-carrier

6)Marking :   Parts Name & Lot Number

7)Packing   : Tape & Reel（MP）

GYSFFMAXB

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

8) Notes:

a. Limitation of Warranty

    i) TAIYO YUDEN provide warranties only if the Products is operated under the condition set forth in this Specification. Please note that TAIYO YUDEN shall not be liable for any defect and/or malfunction arising from use of the Product under the terms and conditions other than the operating conditions hereof. In addition when this Product is used under environmental conditions such as over voltage which are not guaranteed, it may be destroyed in short mode. To ensure the security of customer's product, please add an extra fuse or/and a protection circuit for over voltage.

    ii) This Product is designed for use in products which comply with GPS Specifications. TAIYO YUDEN disclaims and is not responsible for any liability concerning infringement by this Product under any intellectual property right owner by third party in case the customer uses this Product in any product which does not comply with GPS 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.

    iii) In some cases, TAIYO YUDEN may use replacements as component parts of Products. Such replacement shall apply only to component part of Products, which TAIYO YUDEN deems it possible to replace or substitute according to (i)scope of Warranty provided in this specification(e.g. Electric Characteristics, Outline, Dimension, Conditions of Use, Reliability Tests, Official Standard(Type Approvals etc.))and (ii)Quality of Products. TAIYO YUDEN also ensure traceability of such replacement on production lot basis.

b. Introduction for Use(CAUTION)

    i) Because Product is not designed for radiation durability, please refrain from exposing product to radiation in the use.

    ii) Communication between this Product and other might not be established nor maintained depending upon radio environment or operating condition of this Product and other products with GPS technology.

    iii) This Product mentioned in this Specification is manufactured for use in general consumer devices. 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 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.

TAIYO YUDEN

c. Terms of Support

　i) Customers are requested to fully check and confirm by the start of mass production of this Product that(1)no bug, defect or other failure is included in firmware incorporated in this Product("Incorporated Software"),(2)no bug, defect or other failure arising from installation of this Product in which is contained Incorporated Software into customer's product is included in Incorporated Software, and that Incorporated Software fully meets customer's intended use, although TAIYO YUDEN sufficiently inspects or verifies quality of Incorporated Software.

　ii) Please note that TAIYO YUDEN is not responsible for any failure arising out of bugs or Defects which you have not found in Incorporated Software prior to reaching an agreement of this Specification between customer and TAIYO YUDEN(including the bugs or defects found after customer's acceptance and evaluation).

iii) In the case of customer requests TAIYO YUDEN to customize the hardware or firmware of this product in order to meet such customer's specific needs, TAIYO YUDEN will make commercially reasonable effort to modify such hardware or software at customer's expense; provide however, the customer is kindly requested to agrees it doesn't mean that TAIYO YUDEN has obligations to do so even in the case it is technically difficult for TAIYO YUDEN.

　ⅳ) Any failure arising out of this Product will be examined by TAIYO YUDEN regardless of before or after mass production. Customer agree that once such failure is turned out not to be responsible for TAIYO YUDEN after aforesaid examination, some of the technical support shall be conducted by TAIYO YUDEN at customer's expense; provided however, exact cost of this technical support can be agreed though the negotiation by the parties.

　v) Do not alert hardware and/or firmware of this Product.
　　Please note that TAIYO YUDEN shall not be liable for any problem if it is caused by Customer's alteration of Hardware or/and Firmware without Taiyo Yuden's prior approvals.

TAIYO YUDEN

GYSFFMAXB

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

d. Cautions for Export Control

This Product may be subject to governmental approvals, consents, licenses, authorizations, Declarations, filings, and registrations for export or re-export of the Product, required

By *Japanese Foreign Exchange and Foreign Trade Law(including related laws and regulations)* and/or any other country's applicable laws or regulations related to export control. In case you will export or re-export this Product, you are strongly recommended to check and confirm, before exporting or re-exporting, necessary procedures for export or re-export of this Products which is required by applicable laws and regulations, and if necessary, you have to obtain necessary and appropriate approvals or licenses from governmental authority at your own risk and expense.

e. Warranty

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.

The warranty period shall be one year.

f. Items mentioned in the specification

Any question arising from this specification shall be solved through mutual discussion by the parties hereof.

TAIYO YUDEN

GYSFFMAXB

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

1.Maximum rating

Item	Symbol	MIN	TYP	MAX	Unit	Condition
Input voltage	VDD3V3	-0.3		4.3	V	Ta=25degrees-C
	VDD_BACKUP	-0.3		4.3		
	RESET, GIO/EINT, RX	-0.3		3.6		

2.Recommendation operating range

Item	Symbol	MIN	TYP	MAX	Unit	Condition
Operating input voltage	VDD3V3	3.0	3.3	4.3	V	
	VDD_BACKUP	2.0	3.3	4.3		
Supply voltage ripple and spike noise	VDD3V3			40	mV/p-p	
	VDD_BACKUP			40		
Operating temperature range	Topr	-30	25	85	degrees -C	Humidity =40%RH Note1
Storage temperature range	Tstg	-30	25	85	degrees -C	Humidity =40%RH Note2

Notes:

1. Operating temperature range is set to satisfy products electrical characteristics in the short terms. In terms of product

   life cycle when it is used in condition of varying from TYP standard in the long term, please refer to the

   reliability condition.

2. Storage temperature range is the condition for transportation and storage in temporary.

TAIYO YUDEN

GYSFFMAXB

Control No. HD-AE-A	(1/4)	Control name Electrical characteristics

Electrical characteristics

8/24

DC Specifications

The Specification applies for Topr.= 25 degrees-C, voltage=typical

No.	Parameter	Condition	Symbol	Min.	Typ.	Max.	Unit	Remark
1	Input Low Voltage	Rx, GIO/EINT, RESET	VIL18	-0.18	-	0.4	V	IO=1.8V
2	Input High Voltage		VIH18	1.5	-	1.98	V	IO =1.8V
3	Output Low Voltage	Tx, GIO/EINT	VOL18	-0.18	-	0.4	V	IO=1.8V
4	Output High Voltage		VOH18	1.4	-	2.13	V	IO =1.8V
5	Current MAIN	VDD3V3 Current Consumption (Average)	Icc_Ac	-	19	35	mA	Acquisition (EASY enable)
			Icc_Tr	-	16	35	mA	Tracking (EASY enable)
6	Current BK	VDD3V3_BACKUP Current Consumption	Icc _bk1	-	6	60	uA	Backup (VDD3V3=0 V)
			Icc _bk2	-	24	200	uA	Other mode

Note:

Please note that these electrical characteristics were measured under Taiyo Yuden evaluation environment.

TAIYO YUDEN

GYSFFMAXB

Control No.			Control name					
HD-AE-A		(2/4)	Electrical characteristics					

AC Specifications

The Specification applies for Topr .=25 degrees-C

No.	Parameter	Condition	Symbol	Min	Typ	Max	Unit	Remark
1	Time from VDD3V3_BACKUP rise to VDD3V3 rise		T1	1000			ms	
2	Time from VDD3V3 rise to RESET rise		T2	100			ms	
3	Time from RESET High to Module Ready		T3			1500	ms	
4	RESET Pulse Width		T4	10			ms	After power on
5	Time from VDD3V3 fall (0.5V) to VDD3V3_BACKUP fall		T5	20			ms	
6	VDD3V3 fall time from 3.0V to 0.5V		T6	100			ms	
7	Time from RESET Low to VDD3V3 fall		T7	10			ms	
8	Inrush Current	VDD3V3	Icc_rush	-	-	400	mA	Note1
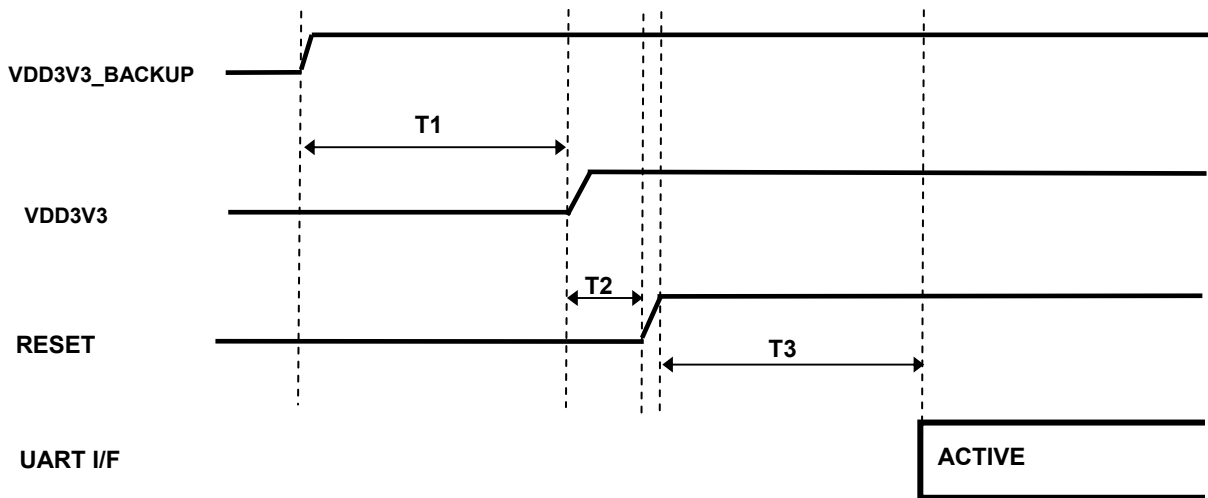
Power on timing
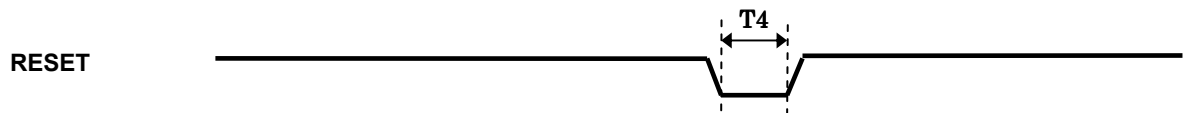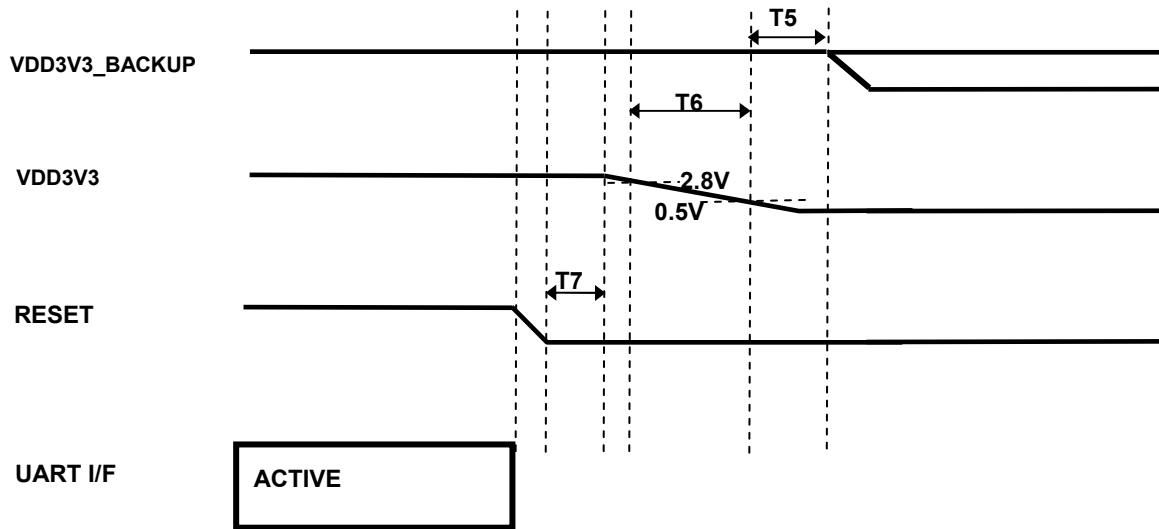

RESET Pulse Width

Note: UART I/F is not active during the assertion of RESET pin.

TAIYO YUDEN

GYSFFMAXB

Control No. HD-AE-A	(3/4)	Control name Electrical characteristics

VDD3V3_BACKUP

T5

VDD3V3

T6

2.8V

0.5V

RESET
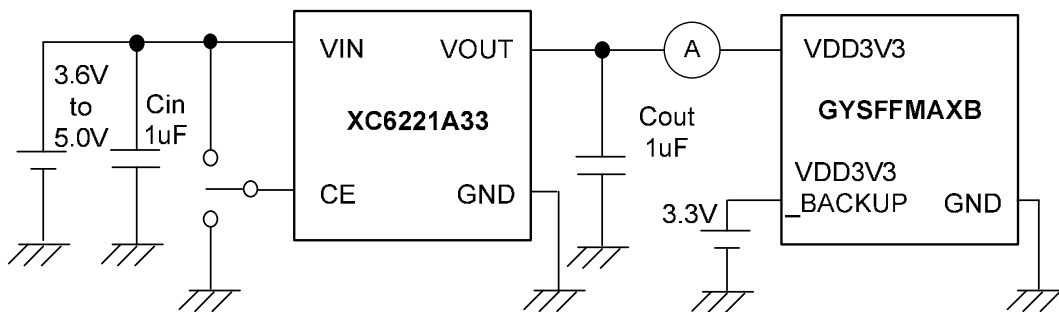
T7

UART I/F

ACTIVE

Power-off Timing

Recommended Parts for VDD3V3 Power Supply

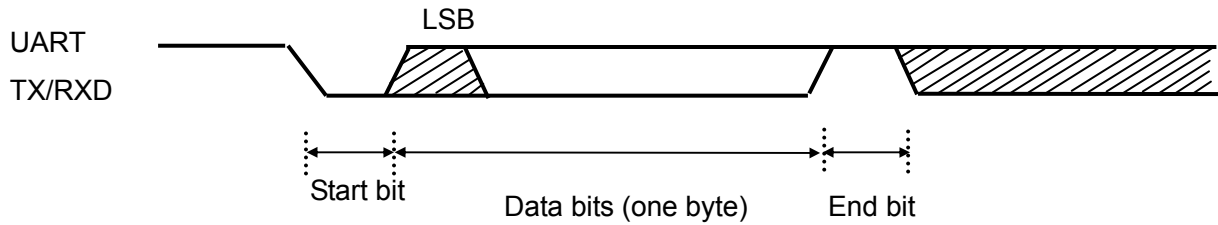XC6221（TOREX）(without discharge function type, Output Voltage3.3V)

Note1   **Inrush current test circuit**

3.6V
to
5.0V

Cin
1uF

VIN   VOUT

XC6221A33

CE   GND

Cout
1uF

A

3.3V

VDD3V3

GYSFFMAXB

VDD3V3
_BACKUP   GND

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GYSFFMAXB

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

UART Interface AC Specifications

The Specification applies for Ta=25 degrees-C

Baud Rate Required (bps)	Programmed Baud Rate (bps)
4800	4803
9600	9606
14400	14208
19200	19212
38400	38423
57600	56835
115200	113673
230400	227353
460800	454741
921600	909583

Default 115200bps

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GYSFFMAXB

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

RF Specifications

The Specification applies for Topr.=25 degrees-C

No	Parameter	Symbol	Spec			Unit	Remark
			Min	Typ	Max		
1	Frequency	Fc		1575.42		MHz	C/A code
2	Intermediate frequency	IF		4.092		MHz	
3	Image Rejection Ratio	IRR		30		dB	
4	VCO Oscillation Frequency	Fosc		3142.656		MHz	
5	Noise Figure	NF		1.0		dB	
6	Sensitivity 1	Hs1		-162		dBm	Hot start sensitivity
		Ws1		-146			Warm start sensitivity
		Cs1		-146			Cold start sensitivity
		Ts1		-164			Tracking sensitivity
7	TTFF 1	Ht1		1.0		sec	Hot start @-135dBm Note1
		Wt1		34			Warm start@-135dBm Note2
		Ct1		42			Cold start @-135dBm Note3
8	Accuracy 1	Ha1		2		m	Hot start @-135dBm
		Wa1		2			Warm start@-135dBm
		Ca1		2			Cold start @-135dBm

Note1 Hot start : Re-start in state with Data of Almanac, Ephemeris, and time information.

Note2 Warm start : Re-start in state with Data of Almanac.

Note3 Cold start : Start when there is not all information.

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GYSFFMAXB

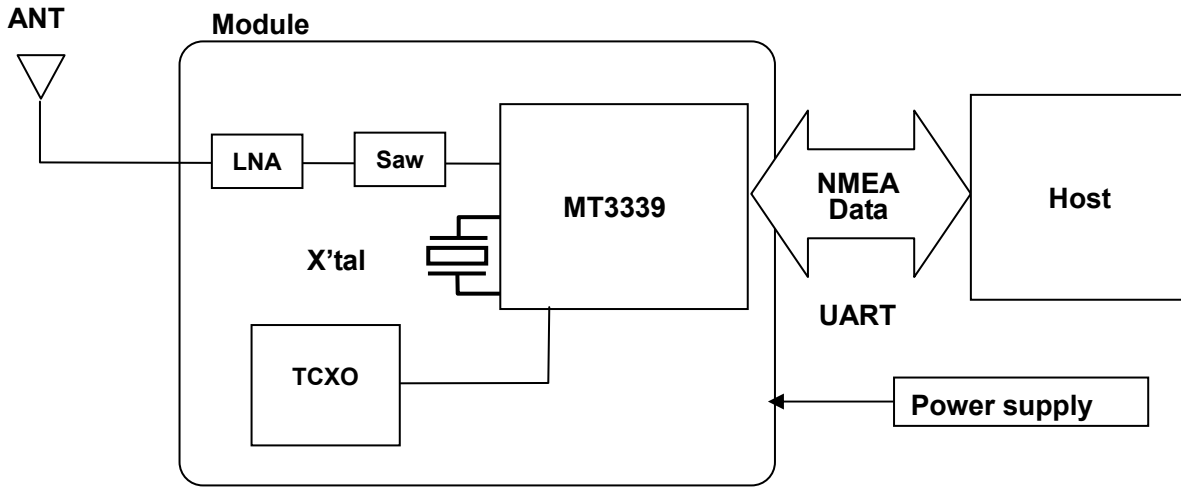| Control No.		Control name
HD-AE-C	(1/1)	Electrical characteristics

Firmware

   1. Embedded Firmware： Example for Firmware Name

        e.g　20091225 _TY_Module_A1.20P(C29)_00.bin

   2. MTK NMEA Packet Format

      Attachment Sheet： Please refer to ”MTK NMEA Packet User Manual”.

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GYSFFMAXB

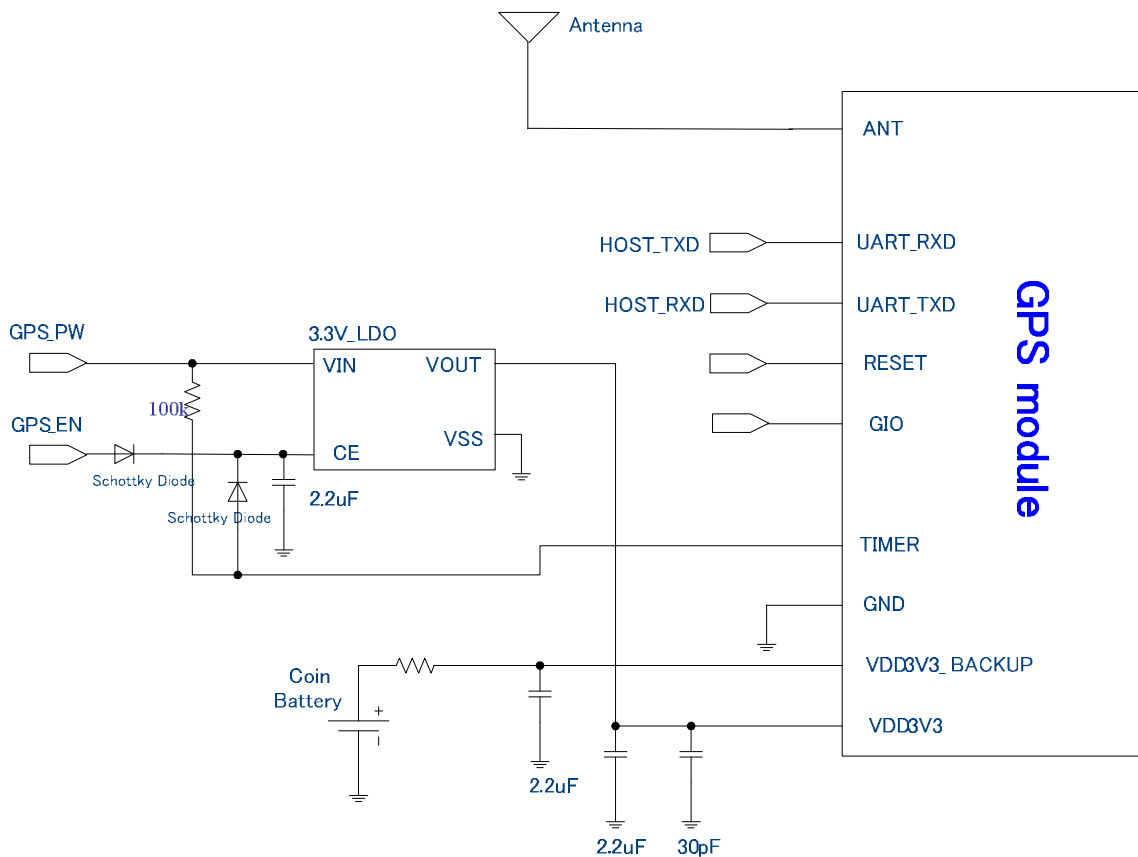| Control No. HD-MC-A (1/1)	Control name Circuit Schematic

Module Block Diagram

Reference   : Peripheral Circuits

（This Peripheral Circuits is reference only.

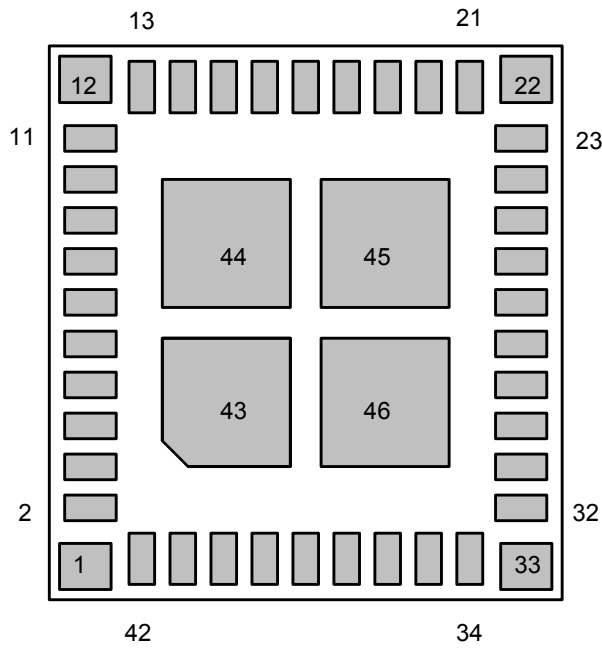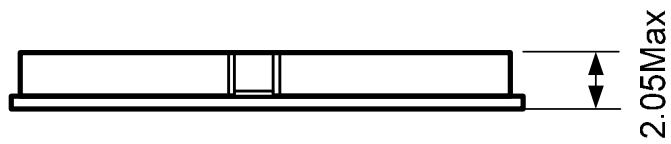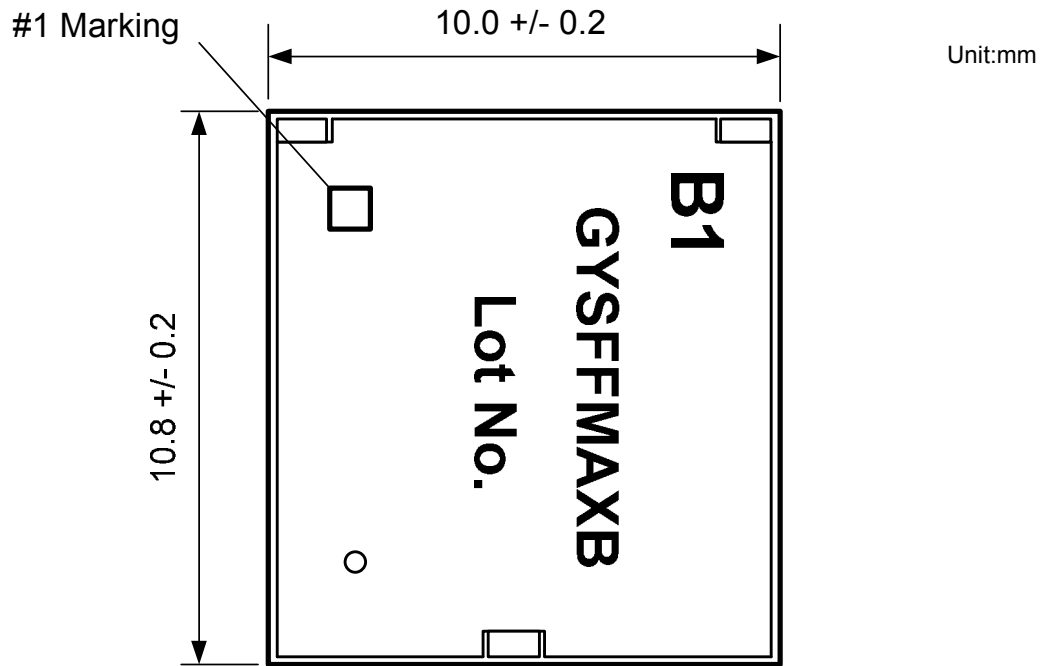   You are requested to fully check and confirm by the start of mass production of this Product.)

 Pin layout details, please refer to page 18-19.

TAIYO YUDEN

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

Outline

#1 Marking

10.0 +/- 0.2

Unit:mm

10.8 +/- 0.2

B1
GYSFFMAXB
Lot No.

2.05Max

13   21

12   22

11   23

44   45

43   46

2   32

1   33

42   34

⟨ Bottom View ⟩

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GYSFFMAXB

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

Recommended Land Pattern (same as Module Land form)

Unit:mm

10.0

4.2

4.2

6.4 (Pitch 0.8 x 8)

38- 0.5x1.0

C0.5

4.6

7.2 (Pitch 0.8 x 9)

4.75

2.5

0.6

10.8

2.5

4.6

4.75

2.5

0.6

2.5

1.0

0.9

4.3

4.3

< Top View >

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GYSFFMAXB

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

Recommended Metal Masking(Solder Masking) URL pattern

Unit : mm

10.0

4.2

4.2

6.4 (Pitch 0.8 x 8)

38- 0.5x1.0

4.6

7.2 (Pitch 0.8 x 9)

C0.35

10.8

4.6

4.75

2.0

1.1

2.0

4.75

0.9

2.0

1.1

2.0

1.0

4.3

4.3

< Top View >

TAIYO YUDEN
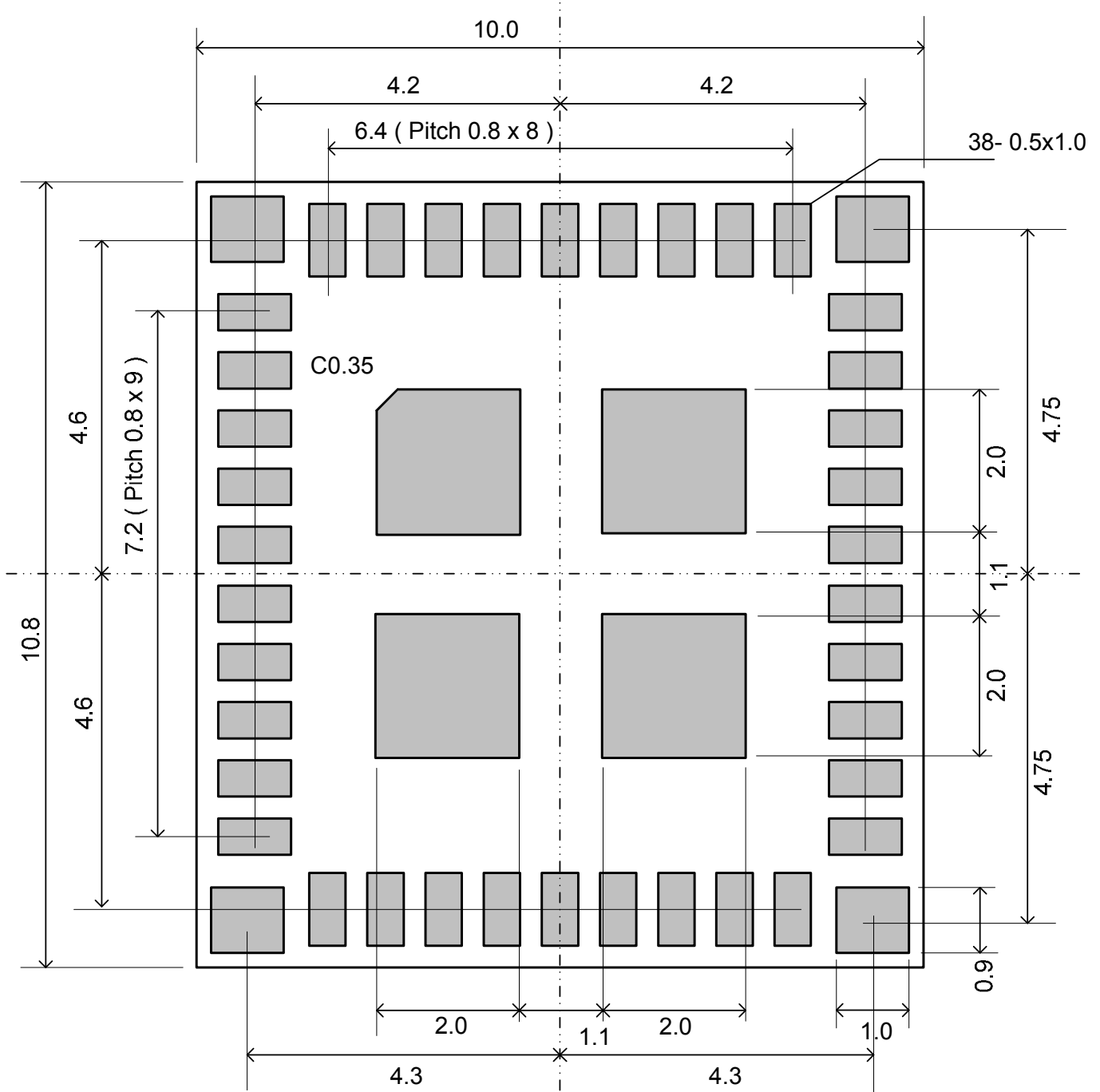
GYSFFMAXB

Control No.		Control name
HD-BA-A	(1/2)	Pin Layout

Pin Layout
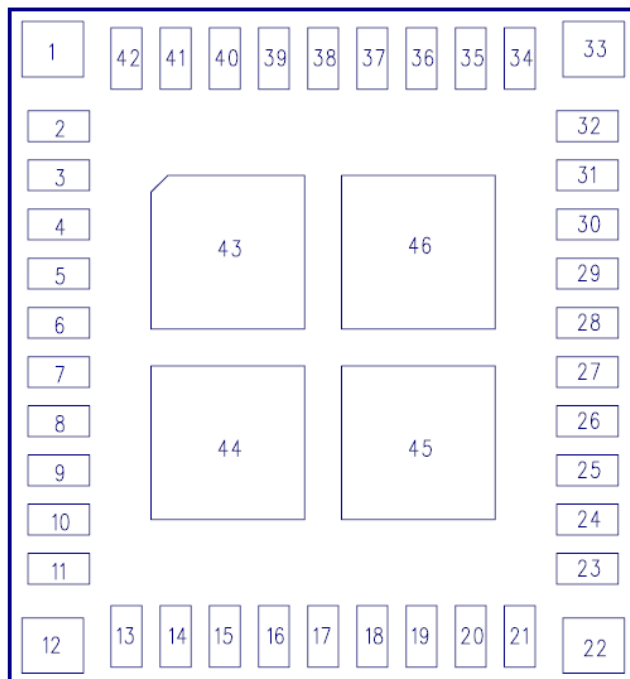
(Top View)

Descriptions

No.	Pin Name	Type	Block	I/O	Description
1	GND	Power	GND	-	GND
2	ANT	RF	RF	I	RF_IN Antenna port
3	GND	Power	GND	-	GND
4	VDD3V3	Power	RF & Digital	I	Power Supply voltage 3.3V Main power supply
5	NC		-	-	Never to connect
6	NC		-	-	Never to connect
7	NC		-	-	Never to connect
8	GND	Power	GND	-	GND
9	NC		-	-	Never to connect
10	GND	Power	GND	-	GND
11	NC	-	-	-	Never to connect
12	GND	Power	GND	-	GND
13	NC		-	-	Never to connect
14	VDD3V3_BACKUP	Power	Analog	I	Supply Voltage to RTC LDO. Back-up power supply ＊ at all times "ON" by button battery
15	NC		-	-	Never to connect
16	NC	-	-	-	Never to connect
17	32KHZ_OUT	Debug	CLK	O	RTC 32kHz clock output default no output, controlled by S/W build.(Optional) *Never to connect in case of an unnecessary

TAIYO YUDEN

GYSFFMAXB

Control No.				Control name
HD-BA-A		(2/2)		Pin Layout

No.	Pin Name	Type	Block	I/O	Description
18	NC		-	-	**Never to connect.**
19	NC		-	-	**Never to connect.**
20	NC		-	-	**Never to connect.**
21	NC		-	-	**Never to connect.**
22	GND	Power	GND	-	GND
23	NC		-	-	**Never to connect.**
24	NC		-	-	**Never to connect.**
25	UART_RXD	CMOS	UART	I	Serial data input for the UART Interface. Internal 75kΩpull up.
26	UART_TXD	CMOS	UART	O	Serial data output for the UART Interface. Internal 75kΩpull up.
27	TIMER	CMOS	CLK	O	In Backup mode, count and output time interval. Open drain output. It doesn't PULL UP in IC. Prefer to PULL Up outside of IC ***Please Connect to GND in case of an unnecessary.**
28	NC		-	-	**Never to connect.**
29	1PPS	CMOS	Digital	I/O	1pps signal output (Default: Duty cycle 0.1/ Timing: 3DFix)
30	NC		-	-	**Never to connect.**
31	NC		-	-	**Never to connect.**
32	RESET	CMOS	Digital	I	RESET terminal, active LOW Internal 75kΩpull up
33	GND	Power	GND	-	GND
34	NC		-	-	**Never to connect.**
35	NC		-	-	**Never to connect.**
36	GND	Power	GND	-	GND
37	GND	Power	GND	-	GND
38	GND	Power	GND	-	GND
39	GND	Power	GND	-	GND
40	GND	Power	GND	-	GND
41	GND	Power	GND	-	GND
42	GND	Power	GND	-	GND
43	GND	Power	GND	-	GND
44	GND	Power	GND	-	GND
45	GND	Power	GND	-	GND
46	GND	Power	GND	-	GND

TAIYO YUDEN

GYSFFMAXB

Control No. HQ-BA-523 (1/2)	Control name Handling Precaution

This specification describes desire and conditions especially for mounting.

Desire／Conditions

(1)   Environment conditions for use and storage

   1. Store the components in an environment of < **40deg-C/90%RH** if they are in a moisture barrier bag packed by TAIYO YUDEN.

   2. Keep the factory ambient conditions at < **30deg-C/60%RH** .

   3. Store the components in an environment of < **25±5deg-C/10%RH** after the bag is opened.
      (The condition is also applied to a stay in the manufacture process).

(2)   Conditions for handling of products

   Make sure all of the moisture barrier bags have no holes, cracks or damages at receiving. If an abnormality is found on the bag, its moisture level must be checked in accordance with 2 in (2).
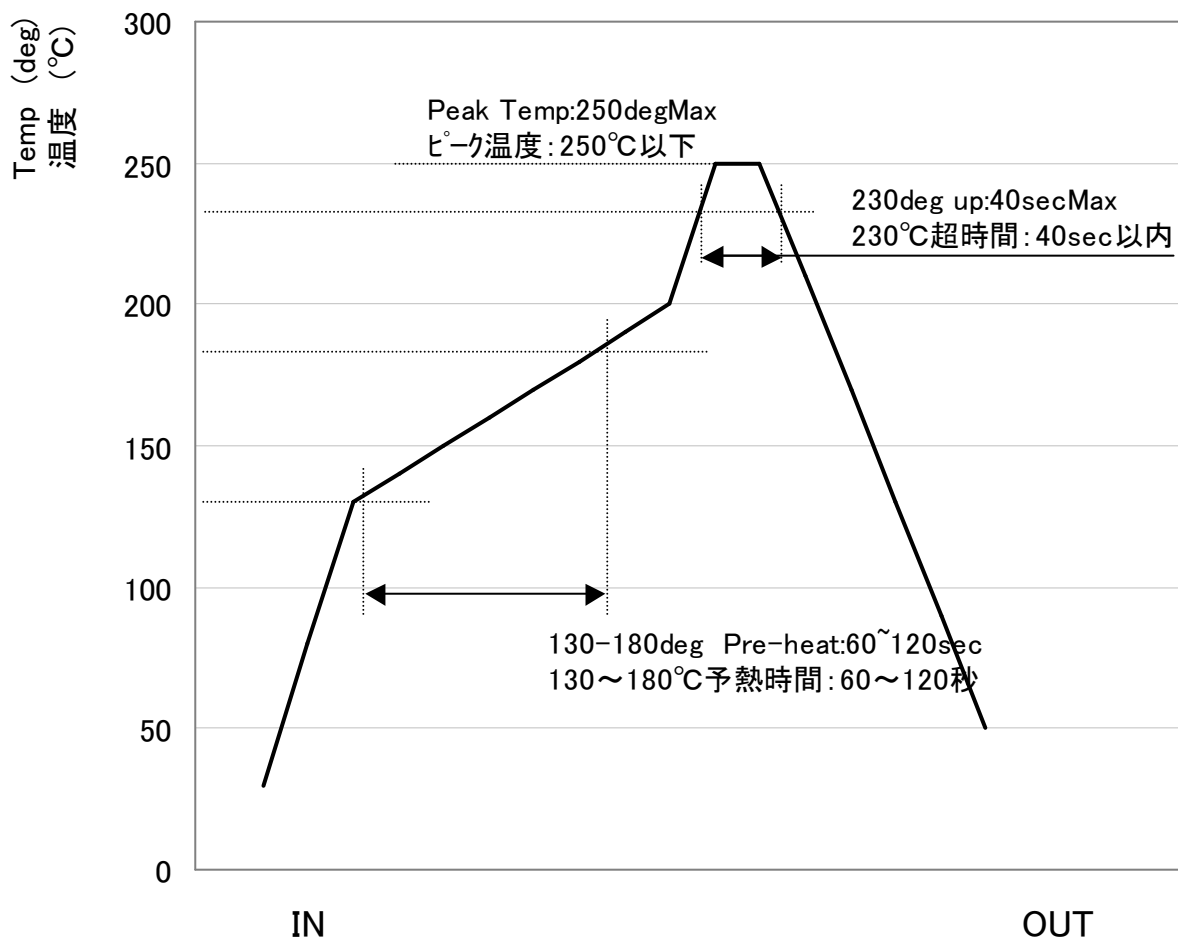
   Refer to the label on the bag.

   1.All of the surface mounting process (reflow process) must be completed **in 12 months** from the
      bag sea date.

   2. Make sure humidity in the bag is less than **10%RH** immediately after open, using a humidity indicator card sealed with the components.

   3. **All** of the surface mounting process (reflow process including rework process) must be completed in **168 hours** after the bag is opened (inclusive of any other processes).

   4. If any conditions in (1) or condition 2 and 3 in (2) are not met, bake the components in accordance with the conditions at **125deg-C   24hours**

   5. As a rule, baking the components in accordance with conditions 4 in (2) shall be once.

TAIYO YUDEN

GYSFFMAXB

Control No.		Control name
HQ-BA-523	(2/2)	Handling Precaution

6. Since semi-conductors are inside of the components, they must be free from static electricity while handled.(<100V)   Use ESD protective floor mats, wrist straps, ESD protective footwear, air ionizers etc. , if necessary.

7. Please make sure that there are lessen mechanical vibration and shock for this module, and do not drop it.

8. Please recognize pads of back side at surface mount.

9. Please do not wash this module.

10. Please perform temperature conditions of module at reflow within the limits of the following.

   Please give the number of times of reflow as a maximum of 2 times.

Peak Temp:250degMax
ピーク温度：250℃以下

230deg up:40secMax
230℃超時間：40sec以内

130-180deg Pre-heat:60~120sec
130～180℃予熱時間：60～120秒

Temp (deg)
温度 (℃)

IN   OUT

TAIYO YUDEN

GYSFFMAXB

Control No. HD-BB-A	(1/3)	Control name Packaging Specification

Packaging Specification
梱包仕様

(1) Packaging Material　　梱包材料

| Name 部材名	Outline 概要	Materials 材質	Note 備考
Emboss エンボス	24mm wide – 16mmPitch 24mm幅 – 16mmピッチ	Conductive PS 導電性 PS	
Cover Tape カバーテープ			
Reel リール	φ 330 mm	Conductive PS 導電性 PS	
Desiccant 乾燥剤	30g×1		
Humidity indicator card 湿度インジケータ			
Aluminum moisture barrier bag アルミ防湿袋	420×460(mm)	(AS)PET/AL/NY/PE(AS)	
Label ラベル			
Corrugated cardboard box(Inner) 個装箱	340×352×77(mm)		
Corrugated cardboard box(Outer) 外装箱	380×380×250(mm)		

(2) Packaging Unit
　　梱包数量
　　　Max　1000　pieces/Reel　　　　　Max　3000　pieces/Box(Outer)

(3) Packaging Figure
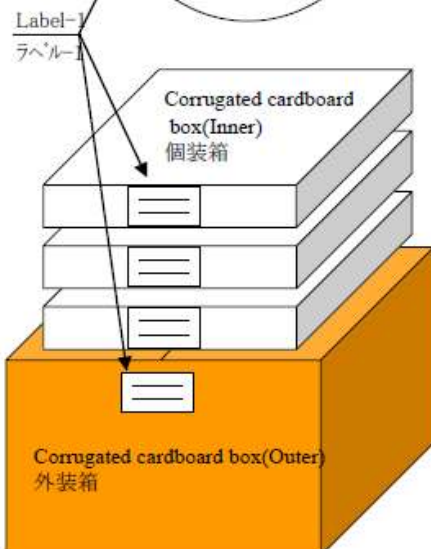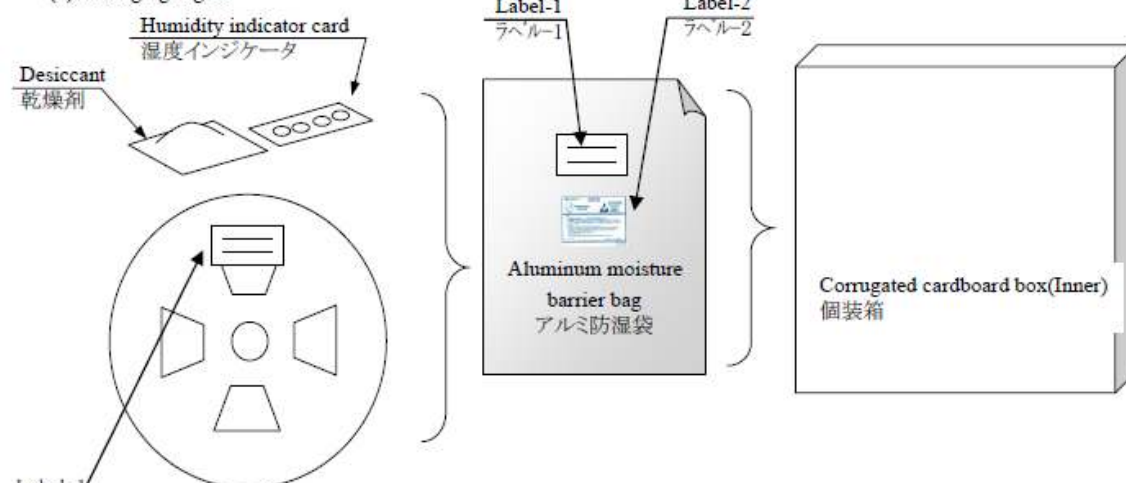
(4) Label
　　ラベル
　　　Label-1
　　　　・CAMPANY NAME　御社名
　　　　・PURCHASE ORDER　注文番号
　　　　・DESCRIPITON　品名
　　　　・QUANTITY　数量
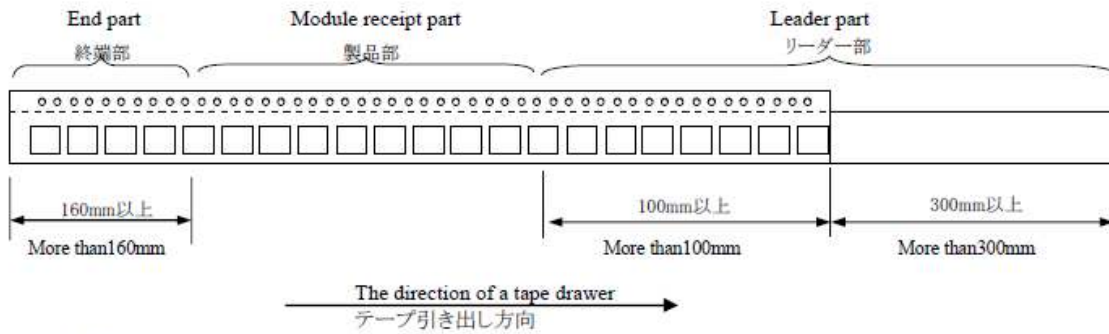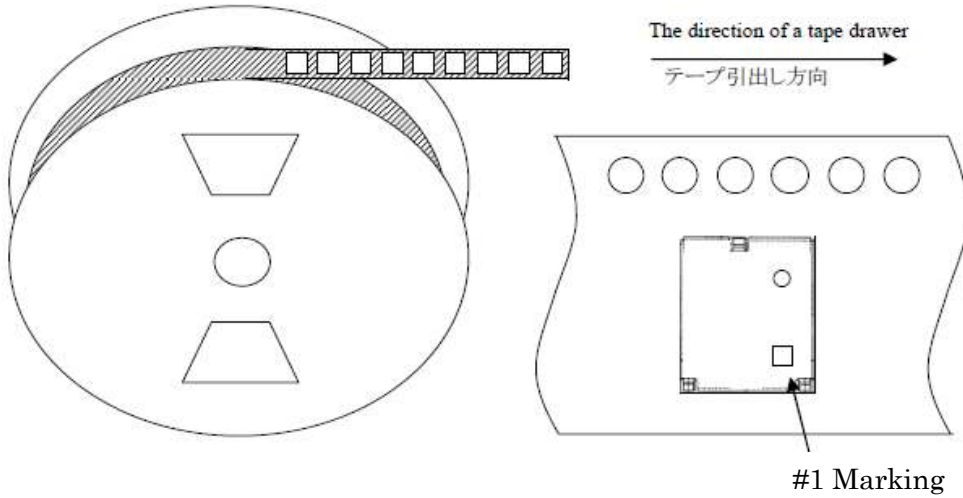　　△　・LotNo.　ロット番号

　　　Label-2
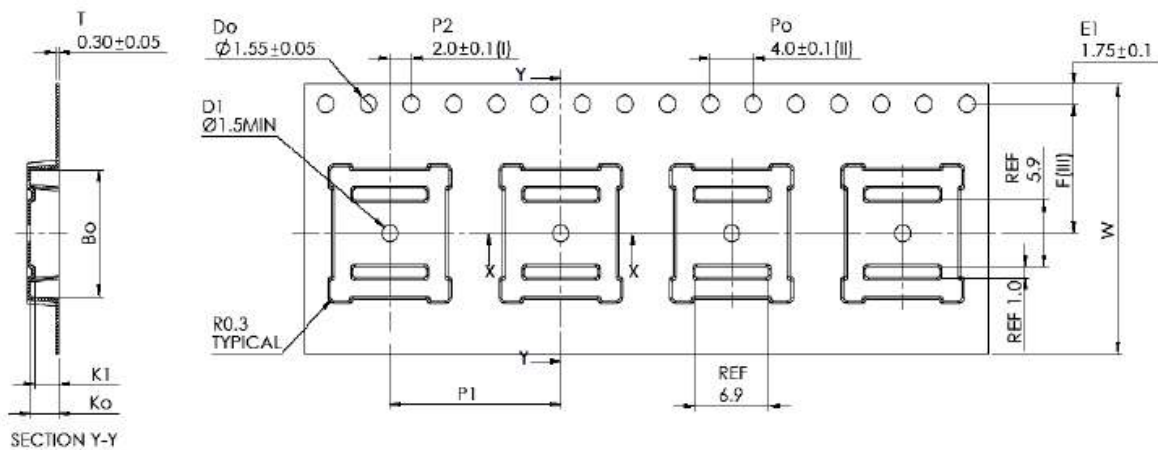　　　　CAUTION　LABEL
　　　　注意ラベル

TAIYO YUDEN

Control No.		Control name
HD-BB-A	(2/3)	Packaging Specification

Tape specification
テーピング仕様

The direction of a tape drawer
テープ引出し方向

#1 Marking

End part 終端部	Module receipt part 製品部	Leader part リーダー部

160mm以上
More than160mm

100mm以上
More than100mm

300mm以上
More than300mm

The direction of a tape drawer
テープ引き出し方向

キャリアエンボス図面

T
0.30±0.05

Do
Ø1.55±0.05

P2
2.0±0.1 (I)

Po
4.0±0.1 (II)

E1
1.75±0.1

D1
Ø1.5MIN

REF
5.9

F(III)

W

R0.3
TYPICAL

REF 1.0

K1

Ko

SECTION Y-Y

P1

REF
6.9

Y

REF 1.0

Ao	10.40 +/− 0.1
Bo	11.20 +/− 0.1
Ko	2.65 +/− 0.1
K1	2.25 +/− 0.1
F	11.50 +/− 0.1
P1	16.00 +/− 0.1
W	24.00 +/− 0.3

Ao

SECTION X-X

TAIYO YUDEN
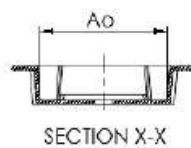
Control No. HD-BB-A	(3/3)	Control name Packaging Specification

Reel specification
リール仕様

(Unit:mm)

φ330±2

φ13±0.2

W-1.5/+2
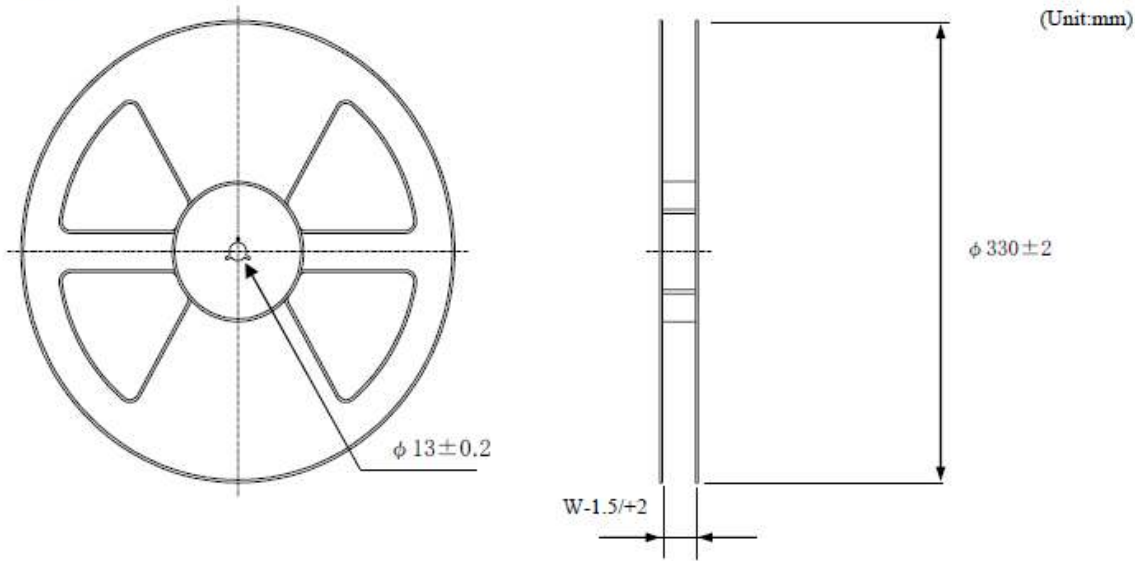
Tape wide	8mm	12mm	16mm	24mm	32mm	44mm
W	9.4mm	13.4mm	17.4mm	25.4mm	33.4mm	45.4mm

Taping performance
テーピング性能

Both of an embossing tape top cover tape bear this, when the power of 10N is applied in the direction of a drawer.
・エンボステープ、トップカバーテープともに、引き出し方向に10Nの力を加えた場合に、これに耐えうること.

The exfoliation adhesion of a top cover tape is the intensity of 0.1〜1.3N.
(The angle to pull is 165〜180 degrees. The speed to pull is 300 mm/min.)
・トップカバーテープの剥離強度は、角度165〜180度に保ち、300mm/minのスピードでトップカバーテープを引っ張ったとき、
  0.1〜1.3Nとする.

Note
備考

△ Lack of the parts in 1 reel is with two or less pieces.
  1リール中の部品の欠落は2個までとします。(ラベル表示数量と梱包数は同じです。欠落とはテープ内でのモジュール抜け
  が2個まで許容させていただくという意味になります。)

MSL Level 3 Under control
MSL はレベル3 で管理しています。