

Preliminary Specifications

Drawing No.	USY1P-H1-23017-00
Issued Date.	Feb,24,2023

Messrs: Digi-Key

Note: Part Number will be revised in case of specification change.

Product Type	Crystal Units with Thermistor
Series	CT1612RB
Frequency	38400kHz
Customer Part Number	-
Customer Specification Number	-
KYOCERA Part Number	CT1612RB38400D0FLHA2
Remarks	Pb-Free, RoHS Compliant, MSL 1, Qualcomm Mini-Specification 80-NJ458-2 Rev. D Not applicable for military, automotive, base station, medical use, and applications which may cause loss of life or assets.

Customer Approval

Approval Signature	Approved Date	
	Department	
	Person in charge	

Seller

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Manufacturer

KYOCERA Corporation

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Design Department	Quality Assurance	Approved by	Examined by	Written by
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KYOCERA Corporation

Revision History

Rev.No.	Description of revise	Date	Approved by	Examined by	Written by
00	First Edition	Feb,24,2023	A.Iwaguchi	A.Hisako	K.Takahashi

Preliminary

1. APPLICATION

This specification sheet is applied to Crystal Units with Thermistor "CT1612RB" for GPS Quality.

2. KYOCERA PART NUMBER

CT1612RB38400D0FLHA2

3. RATINGS

Items	SYMB.	Rating	Unit	Remarks
Operating Temperature	Topr	-30~+105	°C	
Storage Temperature range	Tstg	-40~+105	°C	

4. CHARACTERISTICS

4-1 ELECTRICAL CHARACTERISTICS

Items	Electrical Specification					Test Condition	Remarks
	SYMB.	Min	Typ.	Max	Unit		
Mode of Vibration		Fundamental					
Nominal Frequency	F0		38.4		MHz		
Nominal Temperature	T _{NOM}		29		°C		
Load Capacitance	CL		8.0		pF		
Frequency Tolerance	dF	-10.0		+10.0	ppm	+25±3°C	
Frequency Temperature Characteristics	dF _T	-12.0		+12.0		-30~+85°C	
Frequency Aging Rate	Fa	-0.7		+0.7	ppm	1year	
Frequency drift after reflow		-2.0		+2.0	ppm	After two reflows	
Equivalent Series Resistance	ESR			50	Ω		
Quality factor	Q	75000					
Spurious mode series resistance		1100			Ω		±1 MHz
Pullability	S	7.0		16.0	ppm/pF		CL=8pF
Drive Level	Pd	0.01	0.05	0.2	mW	Remarks : Compliant with Qualcomm 0.1mW requirement	
Inflection point	t	27.5	29.0	30.5		$t = (t_0 - C_2 / (3 * C_3))$	
Insulation Resistance	IR	500			MΩ	100V(DC)	

4-2 ELECTRICAL CHARACTERISTICS (Thermistor)

Items	Electrical Specification					Remarks
	SYMB.	Min	Typ.	Max	Unit	
Resistance			100		kΩ	25°C
B-Constant			4250		K	25°C - 50°C
Tolerance		-1.0		1.0	%	

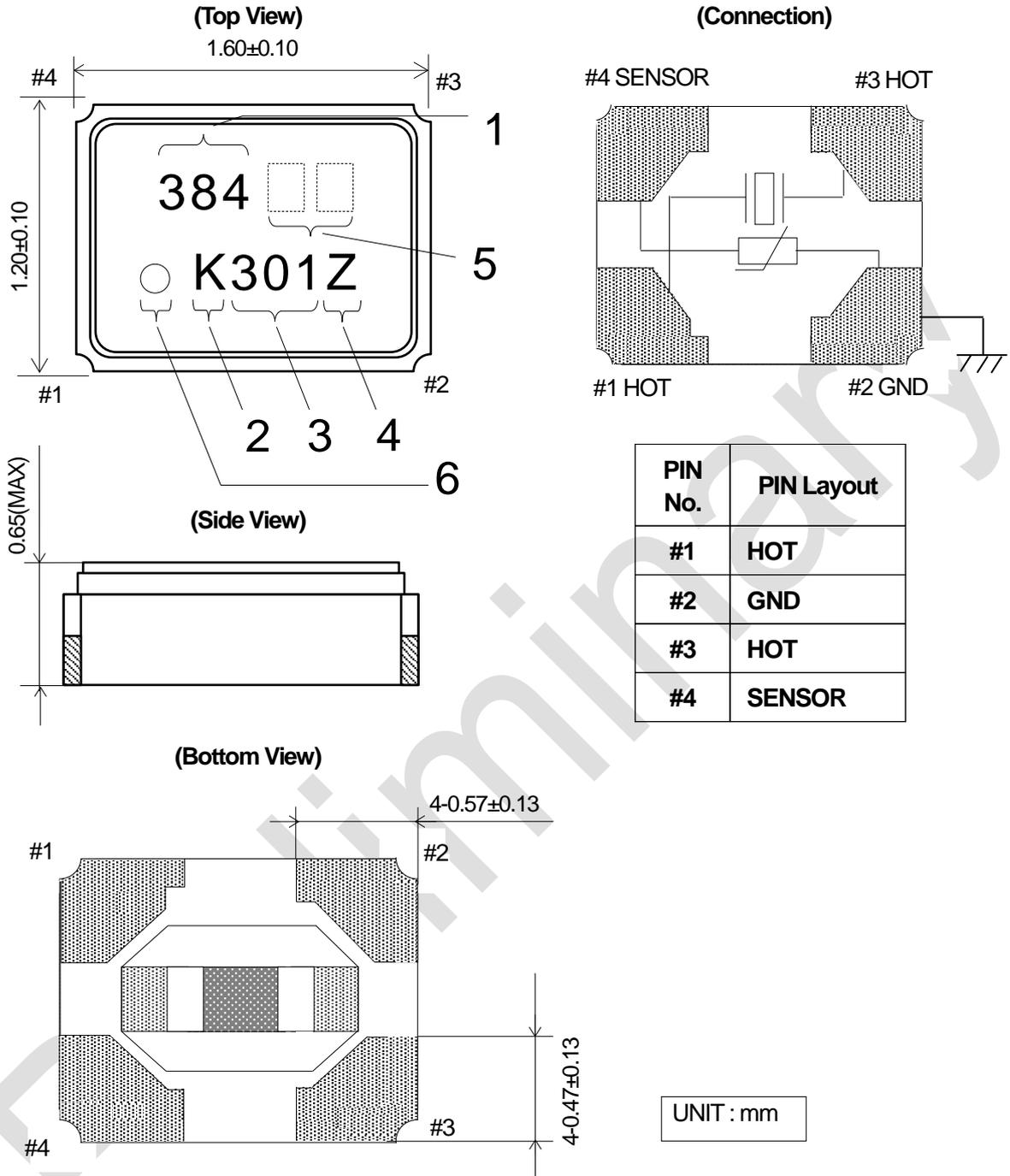
4-3 ELECTRICAL CHARACTERISTICS (Curve Fitting Parameter)

Items	Electrical Specification					Test Condition/ Remarks
	SYMB.	Min	Typ.	Max	Unit	
First-order curve fitting parameter	C1	-0.40		-0.10	ppm/°C	
Second-order curve fitting parameter	C2	-4.5	0	4.5	e ⁴ ppm/°C ²	
Third-order curve fitting parameter	C3	8.5	10	11.5	e ⁵ ppm/°C ³	
Residual Frequency Stability Slope		-100		100	ppb/°C	Temp. range:-30°C to -15°C
		-50		50		Temp. range:-15°C to +70°C
		-100		100		Temp. range:+70°C to +85°C
5°C Small orbit Hysteresis 1		-100		100	ppb/°C	Temp. range:-30°C to -15°C
		-50		50		Temp. range:-15°C to +70°C
		-100		100		Temp. range:+70°C to +85°C
5°C Small orbit Hysteresis 2				100	ppb pk-pk	Temp rate Change:1°C/minutes. Temp. range:-30°C to +85°C The average of the 9-point in any 5 °C step.

4-4 Specification for drive level dependency (DLD) measurement of the crystal

Item		Maximum - minimum	Repeatability	Condition
Drive level dependency	Frequency	< 6 ppm	< 0.7 ppm	0.01 μW to 200 μW to 0.01 μW
	ESR	< 20%	< 10%	

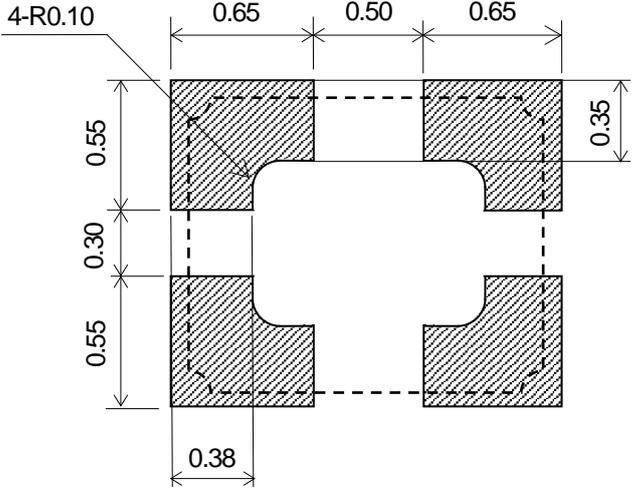
5. APPEARANCES, DIMENSIONS
OUTLINE DIMENSION (not to scale)



MARKING

- | | | |
|---|------------------------|---|
| 1 | Nominal Frequency | First 3digits of the frequency are indicated. |
| 2 | Identification | [K] is to indicate 1Pin direction |
| 3 | Date Code | Last 1 Digit of YEAR and WEEK
(Ex) 2023,Jan, 2 → 301 |
| 4 | Manufacturing Location | Y →Japan(Yamagata) Z →Japan(Shiga Yohkaichi) |
| 5 | Option Code | Alphabet & Number 2digits or blank.(For T-Sensor) |
| 6 | 1Pin mark | |

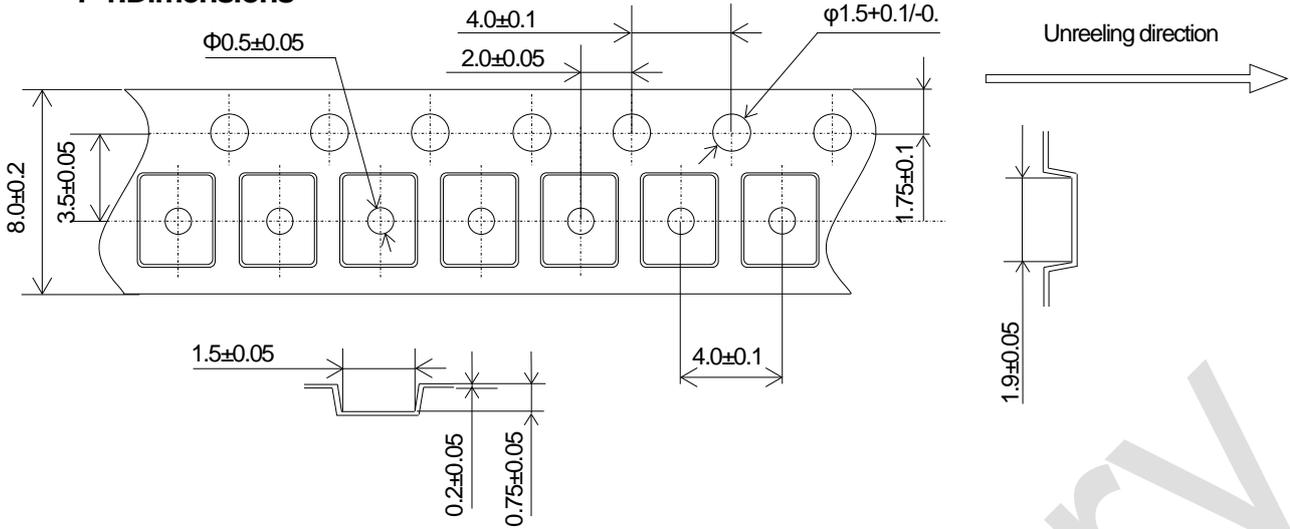
6. One of RECOMMENDED LAND PATTERN (not to scale)



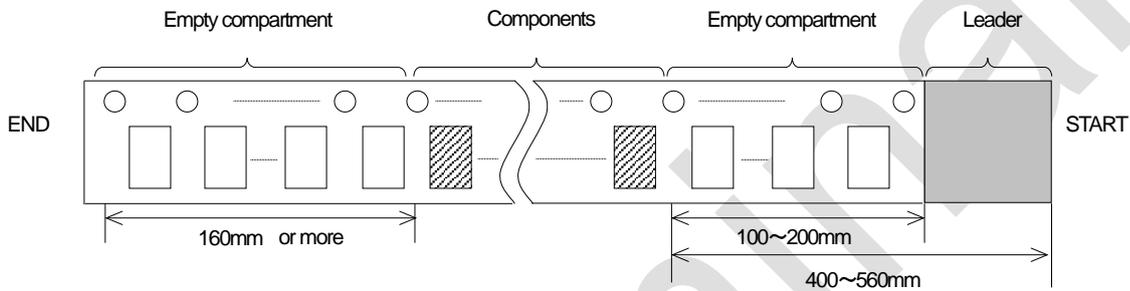
UNIT : mm

Preliminary

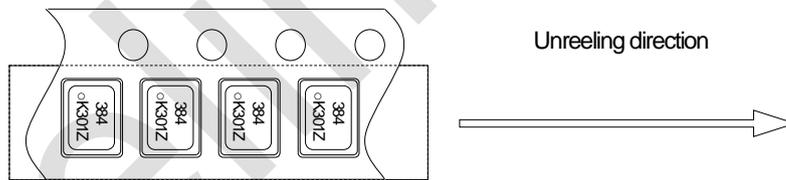
7-1. Dimensions



7-2. Leader and trailer tape

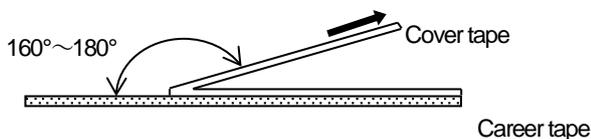


7-3. Direction (The direction shall be seen from the top cover tape side)

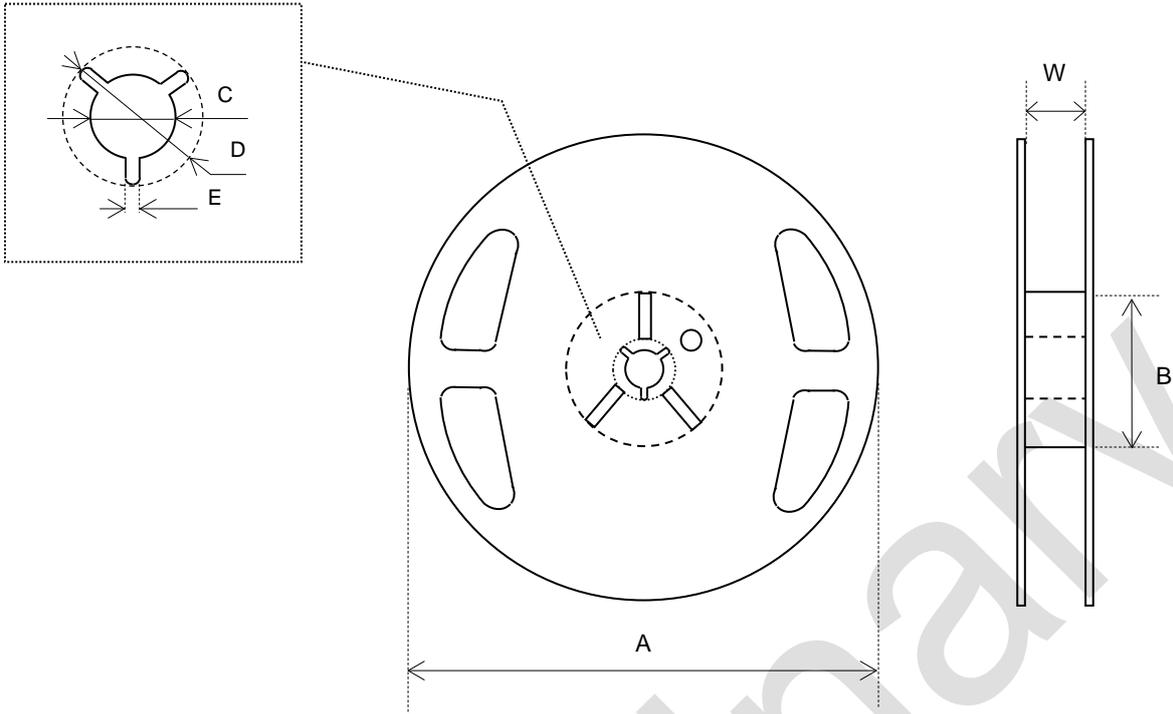


7-4. Specification

1. Material of the carrier tape is either polystyrene or A-PET (ESD).
2. Material of the cover tape is polyester (ESD).
3. The seal tape shall not cover the sprocket holes and not protrude from the carrier tape.
4. Tensile strength of carrier tape: 10N or more.
5. The R of the corner of each cavity is 0.2RMAX.
6. The alignment between centers of the cavity and sprocket hole shall be 0.05mm or less.
7. The orientation shall be checked from the top cover tape side as shown in 7-3.
8. Peeling force of cover tape: 0.1 to 1.0N.
9. The component will fall out naturally when cover tape is removed and set upside down.



Reel specifications



φ330 Reel (15,000pcs MAX)

(Unit : mm)

Symbol	A	B	C
Dimension	$\phi 330 \pm 2.0$	$\phi 100 \pm 1.0$	$\phi 13 \pm 0.2$
Symbol	D	E	W
Dimension	$\phi 21 \pm 0.8$	2.0 ± 0.5	9.4 ± 1

8.Environmental requirements

After following test, frequency shall not change more than $\pm 10.0 \times 10^{-6}$

And CI, $\pm 20\%$ or 5Ω of large value.

- 8.1 Resistance to Shock Test condition
3times natural drop from 100cm onto hard wooden board.
- 8.2 Resistance to Vibration Test condition
frequency : 10-55 -10 Hz
Amplitude : 1.5mm
Cycle time : 15 minutes
Direction : X,Y,Z (3direction), 2 hrs each.
- 8.3 Resistance to Heat Test condition
The quartz crystal unit shall be stored at a temperature of $+85 \pm 2^\circ\text{C}$ for 500h and subjected to room temperature for 1h before measurement.
- 8.4 Resistance to Cold Test condition
The quartz crystal unit shall be stored at a temperature of $-40 \pm 2^\circ\text{C}$ for 500h and subjected to room temperature for 1h before measurement.
- 8.5 Thermal Shock Test condition
The quartz crystal unit shall be subjected to 500 temperature cycles shown in table below, Then it shall be subjected to room temperature for 1h before measurement.
Cycle : $-40 \pm 2^\circ\text{C}$ (30min.) \rightarrow $+25 \pm 2^\circ\text{C}$ (5min.)
 \rightarrow $+85 \pm 2^\circ\text{C}$ (30min.) \rightarrow $+25 \pm 2^\circ\text{C}$ (5min.)

8.6 Resistance to Moisture

Test condition

The quartz crystal unit shall be stored at a temperature of $+60\pm 2^{\circ}\text{C}$ with relative humidity of 90% to 95% for 240 h. Then it shall be subjected to room temperature for 1h before measurement.

8.7 Soldering condition

1.) Type of solder

Material → lead free solder paste

Melting point → $+220\pm 5^{\circ}\text{C}$

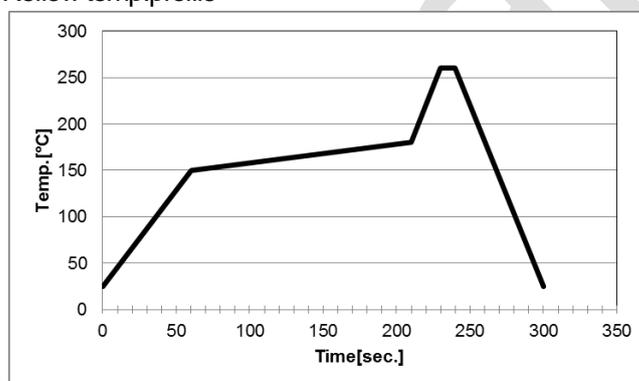
2.) Reflow temp.profile

	Temp [$^{\circ}\text{C}$]	Time[sec]
Preheating	+150 to +180	150 (typ.)
Peak	$+260\pm 5$	10 (max.)
Total	-	300 (max.)

3.) Hand Soldering $+350^{\circ}\text{C}$ 3 sec max

4.) Reflow Times 2 times in below Reflow temp. profile

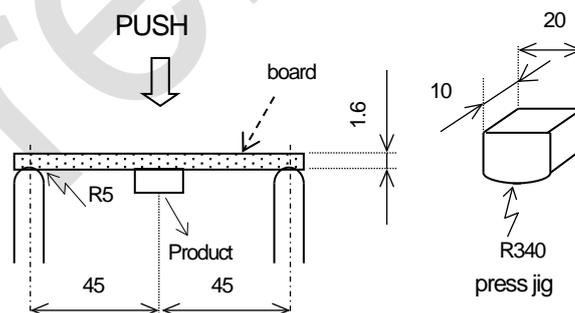
Reflow temp.profile



8.8 Bending Strength

Solder this product onto the center of a 40mm × 100mm circuit board, and add a deflection of 3mm as shown below.

Test board : $t=1.6\text{mm}$



UNIT : mm

9. Cautions for use

(1) Soldering upon mounting

There is a possibility to influence product characteristics when Solder paste or conductive glue comes in contact with product lid or surface.

(2) When using mounting machine

Please minimize the shock when using Mounting Machine to avoid any excess stress to the product.

(3) Conformity of a circuit

We strongly recommend to make sure that Negative resistance (Gain) of IC is designed to be 3 times the ESR (Equivalent Series Resistance) of Crystal unit.

(4) Application instructions

This product is designed to be used for general electronic device and is not designed in the high reliability application listed below.

Please inform the department in charge when using the product for following applications.

Utility in nuclear power plant	Traffic signal control system
Utility in space	security and disaster-prevention
Aircraft	Transporter (car, train, ship, etc.)
under water or ground	Medical
other - applications requires same environmental status as above.	

This product must not be used in every application which are primary - intended to damage human race or their property.

Arms (missile, bomb and other application to damage human)

Weapons (transports act for combat)

Controller with primary – intended to military use.

(5) This product is not applicable for molding.

10. Storage conditions

Please store product in below conditions, and use within 6 months.

Temperature +18 to +30°C, and Humidity of 20 to 70 % in the packaging condition.

11. Manufacturing location

KYOCERA Corporation Shiga Yohkaichi Plant

KYOCERA Corporation Yamagata Higashine Plant

12. Quality Assurance

Location

KYOCERA Corporation Yamagata Higashine Plant: Quality Assurance Division

KYOCERA Corporation Shiga Yohkaichi Plant: Quality Assurance Division

13. Quality guarantee

In the case when KYOCERA Corporation rooted failure occurred within 1 year after its delivery, substitute product will be arranged based on discussion. Quality guarantee of product after 1 year of its delivery is waived.

14. Others

In case of any questions or opinions regarding the Specification, please have it in written manner within 45 days after issued date.