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DEVICE SPECIFICATION for
DIGITAL DBS TUNER with LINK

MODEL NO. BS2F7HZ0165

FOR CUSTOMER'S APPROVAL

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SHARP	MODEL No. BS2F7HZ0165	SPEC No. EC-06X06	PAGE 2 / 17
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DESCRIPTION:

This specification covers DBS tuner intended for use in Digital Broadcasting Satellites. This tuner incorporates "LINK" section that is composed of 8bit ADC, multistandard DVB-S/DVB-S2 demodulator and multistandard FEC. This tuner has DVB common interface compliant transport stream output.

[1] GENERAL SPECIFICATIONS

1-1. Receiving frequency range	950MHz to 2150MHz
1-2. Input level	-65dBm to -25dBm
1-3. Input structure	F type Female
1-4. Nominal input impedance	75 ohm
1-5. Tuner IC	Conexant CX24118A Reference clock: Internal 40.444MHz crystal oscillation address: 14h
1-6. Channel selection system	PLL synthesizer built in tuner IC "CX24118A"
1-7. Demodulator IC	Conexant CX24116 Reference clock: 40.444MHz supplied from "CX24118A" 7-bit device address: 05h 8-bit device write address: 0Ah 8-bit device read address: 0Bh
1-8. Sample Frequency	91MHz
1-9. Multistandard demodulation and decoding	[DVB-S] >Channel symbol rate = 2 - 45MSps >Inner Viterbi and Outer Reed-solomon decoding >Punctured rates 1/2, 2/3, 3/4, 5/6, 6/7, 7/8 [DVB-S2] >Channel symbol rates = QPSK 10 - 30MSps, and 8PSK 10 - 30MSps >Inner LDPC and outer BCH decoding >Punctured rates 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10
1-10. Operating voltage	(B2, B3 and B4) 3.3V +/- 0.165V DC (VDD) 1.25V +/- 0.060V DC
1-11. Storage condition	Temperature 15 deg.C to 35 deg.C Humidity 25 %RH to 75 %RH Period 6 months
1-12. Environmental characteristics	RoHS compliant (RoHS refers to the "DIRECTIVE 2002/95/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.")

1-13. Attention items:

1) This unit contains components that can be damaged by electro-static discharge. Before handling this unit, ground your hands, tools, working desks and equipment to protect the unit from Electronic Static Destroy.
2) Avoid following actions;
   a) to store this unit in the place of the high temperature and humidity.
   b) to expose this unit to corrosive gases.

[2]MECHANICAL SPECIFICATION

2-1. Dimension and mounting details — see section [14]

2-2. Mass — 44g (typical)

2-3. Strength of F-connector — No severe transform or distortion at bending moment, 0.98N·m. To be connected electrically.

2-4. Clamp Torque of F-connector — No severe transform or distortion on the connection with F-connector at bending moment, 0.98N·m. To be connected electrically.

[3] ENVIRONMENTAL SPECIFICATION
(ELECTRICAL FUNCTIONAL OPERATION GUARANTEE)

3-1. Operating	Temperature	0deg.C to +60deg.C
	Humidity	Less than 85% No condensation
3-2. Storage	Temperature	-20deg.C to +85deg.C
	Humidity	Less than 95% Water vapor pressure 6643Pa max, without condensation

<Notice>
Please be careful that sudden temperature changes may cause condensation during storage, and such condensation may cause corrosion.

[4] ABSOLUTE MAXIMUM VOLTAGE

Pin name	Pin No.	MIN.	MAX	UNIT	Note
B1B	1		25	V	400mA max.
B1A	2		25	V	400mA max.
B4	3	-0.3	3.63	V	
B2	4	-0.3	3.6	V	
B3	11	-0.5	4.6	V	
VDD	13	-	1.8	V	
SDA, SCL, RESETB	8, 9, 26	-0.5	B3+0.3	V	

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[5] TESTING CONDITION

5-1. Supply voltage

Pin name	Pin No.	MIN.	TYP.	MAX.	UNIT	Note
B4	3	3.25	3.30	3.35	V	
B2	4	3.25	3.30	3.35	V	
B3	11	3.25	3.30	3.35	V	
VDD	13	1.23	1.25	1.27	V	

5-2. Ambient temperature 25deg.C +/- 5deg.C

5-3. Ambient humidity 65% +/- 10%

[6] ELECTRICAL SPECIFICATION (Unless otherwise stated testing condition 5-1～5-3.)

No.	Item		Specification				Condition
			MIN.	TYP.	MAX.	UNIT	
6-1	RF input VSWR			2.0	2.5		950MHz to 2150MHz
6-2	RF output VSWR			2.0	2.5		
6-3	RF output gain		-5	0	+5	dB	
6-4	L.O. leak at input terminal			-80	-70	dBm	950MHz to 2150MHz
6-5	PLL synthesizer tuning time			1	5	ms	limited to CX24118A
6-6	Symbol rate	DVB-S2/QPSK	10		30	MS/s	
		DVB-S2/8PSK	10		30	MS/s	
		DVB-S/QPSK	2		45	MS/s	
		DTV Legacy		20		MS/s	
6-7	Carrier acquisition range				+/-10	MHz	
6-8	Current consumption	B2		160	240	mA	3.3V
		B3		220	265	mA	3.3V
		B4		25	40	mA	3.3V
		VDD			1842	mA	1.25V

[7] ERROR RATE PERFORMANCE

Es/No performance at Quasi Error Free

Mode	ETSI Ideal	Performance (Typical)	Unit	Note
QPSK 1/2	1.00	1.2	dB	>DVB-S2 >Pilot: ON >BW = Synbol_rate >BERTester: SFU
QPSK 3/5	2.23	2.4		
QPSK 2/3	3.10	3.2		
QPSK 3/4	4.03	4.2		
QPSK 4/5	4.68	4.8		
QPSK 5/6	5.18	5.3		
QPSK 8/9	6.20	6.4		
QPSK 9/10	6.42	6.6		
8PSK 3/5	5.50	5.8		
8PSK 2/3	6.62	6.8		
8PSK 3/4	7.91	8.1		
8PSK 5/6	9.35	9.6		
8PSK 8/9	10.69	10.9		
8PSK 9/10	10.98	11.3		

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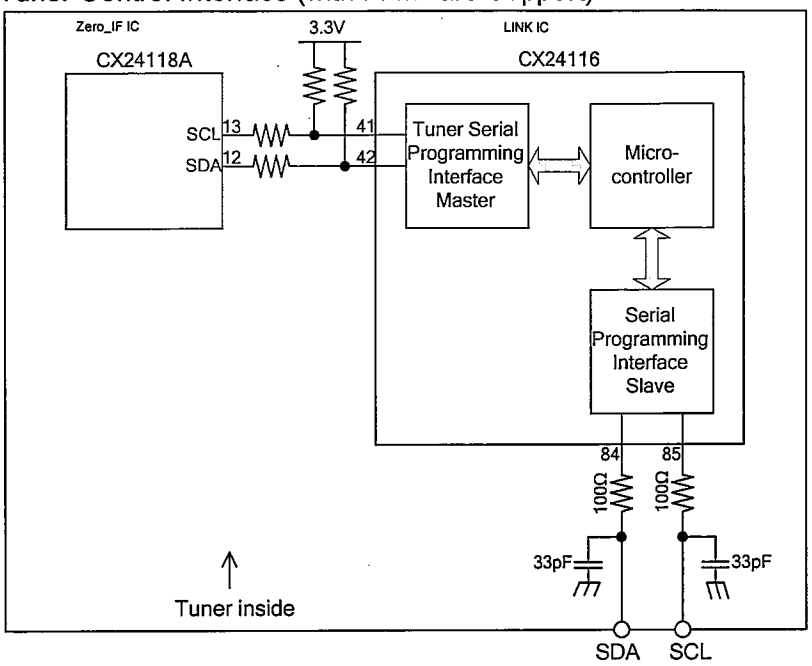
[8] SERIAL PROGRAMMING INTERFACE

8-1. Interface Control

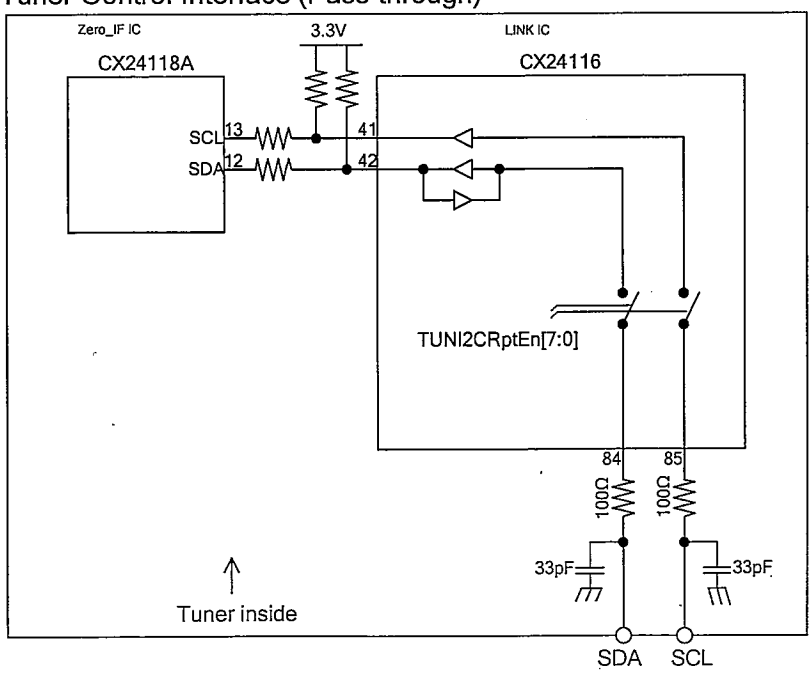
This tuner's control interface is a 400 kHz two wire serial programming interface, as following figure. The primary means of controlling the tuner is through the firmware, with no access from the host processor. This tuner is supported using this method.

Tuner Control Interface (with Firmware Support)



On the other hand, when the firmware is not used, tuner pass-through can be used. Following figure illustrates the tuner control interface in pass-through mode. To enable pass-through mode, write 0x55 to register field TUNI2CRptEn[7:0] (0xE9[7:0]). This will connect the main serial programming interface to the tuner bus. When a stop condition is issued by the master, serial programming interface pass-through is automatically disabled. The following examples illustrate how to use tuner serial programming interface pass-through.

Tuner Control Interface (Pass-through)



8-1-1. Tuner Pass-through Write Procedure

1. Send the start condition.
2. Send the CX24116's address with the read/write bit low (write), and receive an ACK.
3. Send address 0xE9, and receive an ACK.
4. Send 0x55 to TUNI2CRptEn[7:0] (0xE9[7:0]) and receive an ACK.
   – Pass-through is now enabled.
5. Send a repeat-start condition.
6. Send the tuner's address with the read/write bit low (write), and receive an ACK.
   – 0x28 or 0xA8 for the CX24118A tuner.
7. Send the tuner register address of interest, and receive an ACK.
8. Send one byte of data, and receive an ACK.
9. Step 7 can be repeated for multiple bytes in subsequent registers.
10. Send a stop condition.
    – When a stop condition is issued by the master, the CX24116 disables serial programming interface pass-through.

8-1-2. Tuner Pass-through Read Procedure

1. Send the start condition.
2. Send the CX24116's address with the read/write bit low (write), and receive an ACK.
3. Send address 0xE9, and receive an ACK.
4. Send 0x55 to TUNI2CRptEn[7:0] (0xE9[7:0]), and receive an ACK.
   – Pass-through is now enabled.
5. Send a repeat-start condition.
6. Send the tuner's address with the read/write bit low (write), and receive an ACK.
   – 0x28 or 0xA8 for the CX24118A tuner.
7. Send the tuner register address of interest, and receive an ACK.
8. Send a repeat-start condition.
   – It is critical that a repeat-start condition is sent at this point instead of separate stop and start conditions, because the CX24116 disables serial programming interface pass-through when a stop condition is detected.
9. Send the tuner's address with the read/write bit high (read), and receive an ACK
   – 0x29 or 0xA9 for the CX24118A tuners.
10. Receive a byte from the desired register and transmit an ACK.
11. Step 9 can be repeated for multiple bytes in subsequent registers.
12. Transmit a stop condition.
    – When a stop condition is issued by the master, the CX24116 disables serial programming interface pass-through.

Note) Please refer to the CX24116 and CX24118A Data Sheet for details of the programming.

8-2. Digital Interface Specifications

No.	Item	Specification				Condition
		MIN.	TYP.	MAX.	UNIT	
8-1	Low-level input voltage: V_{IL}			0.8	V	All digital inputs
8-2	High-level input voltage: V_{IH}	2.0			V	All digital inputs
8-3	High-level output voltage: V_{OH}	2.4			V	All digital outputs
8-4	Low-level output voltage: V_{OL}			0.4	V	All digital outputs

Note) Applied to not only serial programming interface but also all digital I/O pins.

8-3. Serial Programming Interface Restrictions

For robust serial programming interface operation, care should be taken to avoid short glitches on the clock and data lines. A short glitch is a voltage transition from low to high to low (0 to 1 to 0) in less than 75 ns.

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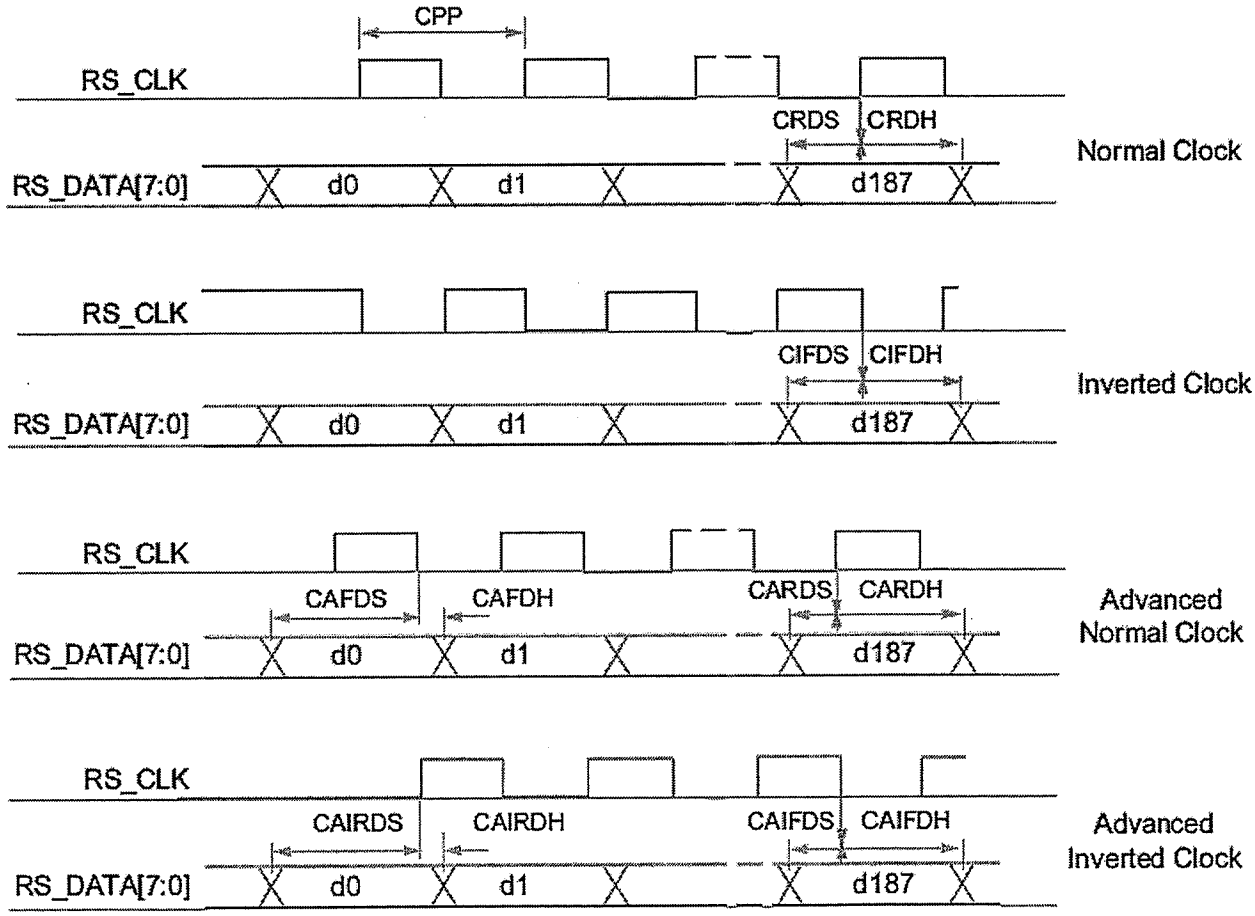
[9] MPEG OUTPUT TIMING

9-1. MPEG Parallel Output Mode

DATA TIMING	DEFINITION	MIN.	UNITS
CPP	Clock period in parallel mode.	100.00	ns
CRDS	Setup time, data to clock rise.	45.75	
CRDH	Hold time, clock rise to data.	49.66	
CIFDS	Setup time, data to inverted clock fall.	45.19	
CIFDH	Hold time, inverted clock fall to data.	50.10	
CAFDS	Setup time, data to advanced clock fall.	82.69	
CAFDH	Hold time, advanced clock fall to data.	12.60	
CARDS	Setup time, data to advanced clock rise.	33.24	
CARDH	Hold time, advanced clock rise to data.	62.16	
CAIRDS	Setup time, data to advanced inverted clock rise.	83.24	
CAIRDH	Hold time, advanced inverted clock rise to data.	12.16	
CAIFDS	Setup time, data to advanced inverted clock fall.	32.69	
CAIFDH	Hold time, advanced inverted clock fall to data.	62.60	



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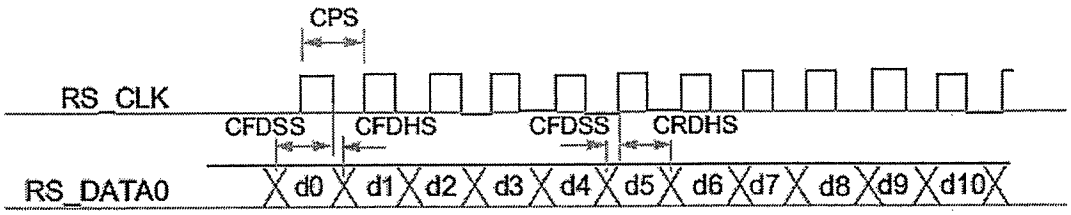
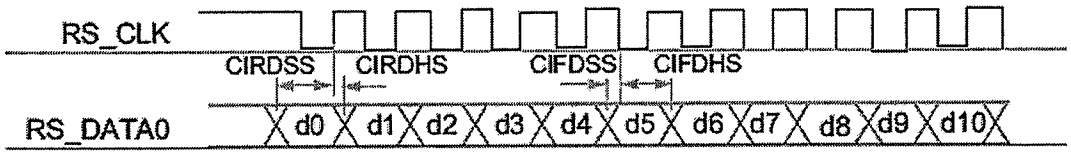
9-2. MPEG Serial Output Mode

DATA TIMING	DEFINITION	MIN.	UNITS
CPS	Clock period in serial mode.	100.00	ns
CFDSS	Setup time, data to clock fall.		
CFDHS	Hold time, clock fall to data.		
CRDSS	Setup time, data to clock rise.		
CRDHS	Hold time, clock rise to data.		
CIRDSS	Setup time, data to inverted clock rise.		
CIRDHS	Hold time, inverted clock rise to data.		
CIFDSS	Setup time, data to inverted clock fall.		
CIFDHS	Hold time, inverted clock fall to data.		



Normal Clock



Inverted Clock

[10] Reliability

10-1. High temperature high humidity load (40deg.C, 90% RH, 500h)

1) After leaving DUT at room temperature and humidity for 24h or longer, measure the initial value.
2) After cycling DUT in the constant chamber at 40deg.C/90-95% RH in on state, for total 500h, leave the DUT at room temperature and humidity for 2h and then measure value after test.
3) Must meet the specifications of Table 10-2.
4) The contact resistance of F-connector must be less than 0.02 ohm. (*)

10-2. High temperature load (70deg.C, 40% RH, 500h)

1) After leaving DUT at room temperature and humidity for 24h or longer, measure the initial value.
2) After leaving DUT in the constant chamber at 70+/-2deg.C/40% RH for total 500h, leave the DUT at room temperature and humidity for 2h and then measure value after test.
3) Must meet the specifications of Table 10-2.

10-3. Cold test (-25deg.C, 500h)

1) After leaving DUT at room temperature and humidity for 24h or longer, measure the initial value.
2) After leaving DUT in the constant temperature chamber at -25deg.C for 500h, leave the DUT at room temperature and humidity for 2h and then measure the values after test.
3) Must meet the specifications of Table 10-2.

10-4. Shock (686 m/s^2, 6 planes, 3 times)

1) After leaving DUT at room temperature and humidity for 24h or longer, measure the initial values.
2) Using the shock tester, apply shock of 686 m/s^2 three times to each of 6 planes and then measure the values.
3) Must meet the specifications of Table 10-2.
4) This test is to be conducted using a single tuner.

10-5. Vibration (10-55 Hz, 1.5 mm, in each of three mutually perpendicular directions, each 2 times)

1) After leaving DUT at room temperature and humidity for 24h or longer, measure the initial values.
2) Using the vibration tester, apply motion having an amplitude of 1.5 mm (constant), the frequency being varied uniformly between 10 and 55 Hz, to DUT, for 2h in each of three mutually perpendicular directions (X, Y and Z, total of 6h). After the test, measure the values.
3) Must meet the specifications of Table 10-2.
4) This test is to be conducted using a single tuner.

10-6. Heat shock test (1 cycle=1h (-20deg.C; 0.5h, 70deg.C;0.5h), 50 cycles))

1) After leaving DUT at room temperature and humidity for 24h or longer, measure the initial value
2) Using the heat shock tester, apply heat shock to DUT. After the test, measure the values.
3) Must meet the specifications of Table 10-2.
4) The contact resistance of F-connector must be less than 0.02 ohm. (*)

10-7. Solderability of terminal

Pretreatment of heating terminal at 150deg.C for 1h is performed and leave it at room temperature for 2h or longer. Immerse 1.9 mm length of terminal (from the tip) to be soldered into rosin (JIS-K-5902), isopropyl alcohol (JIS-K-8839 or JIS-K-1522, rosin concentration (10-35% range) approx. 25% by weight unless otherwise specified) or equivalent solution for 3–5s, and then immerse the length of the terminal into a pool of molten solder (Sn/3.0Ag/0.5Cu, or equivalent) at 240 +/-2deg.C for 3s.Dipped terminal portion shall be wetted by more than 95%. (Excluding the cutting plane of the chassis)

10-8. Soldering heat resistance

Immerse the terminal mounted on a PCB (1.6t thick) into solder at 350±5deg.C for 3.0-3.5 seconds or at 260 +/-5deg.C for 10 +/-1 seconds. Remove the PCB from the solder and leave it for 1 hour at room temperature. The test sample shall show no degradation in appearance and electrical characteristics.

10-9. ESD protection

Table 10-1; ESD Test Condition (IEC61000-4-2 Compliant)

Terminal	Limits	Condition
RF_IN (coaxial center)	+/-6kV DC	150pF/330ohm each 5 times
Others	+/-200V DC	150pF/330ohm each 5 times

Table 10-2

No.	Item		Spec.	UNIT	Condition
10-1	Current consumption	B2	< 240	mA	3.3V
		B3	< 265	mA	3.3V
		B4	< 40	mA	3.3V
		VDD	< 1842	mA	1.25V
10-2	Es/No at QEF	8PSK 3/4	< 8.2	dB	DVB-S2, Pilot: ON

(*)Method of measuring contact resistance

Center-contact

Insert the gauge pin(φ0.8mm) to F-connector.

Measure the resistance between the gauge and the center-contact of F-connector.

Outer-shell

Connect the plug(3/8-32 UNEF-2B) to F-connector at 29.4N·cm of the clamping torque.

Measure the resistance between the plug and chassis.

(Measuring device: Milliohm meter)

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[11] BLOCK DIAGRAM

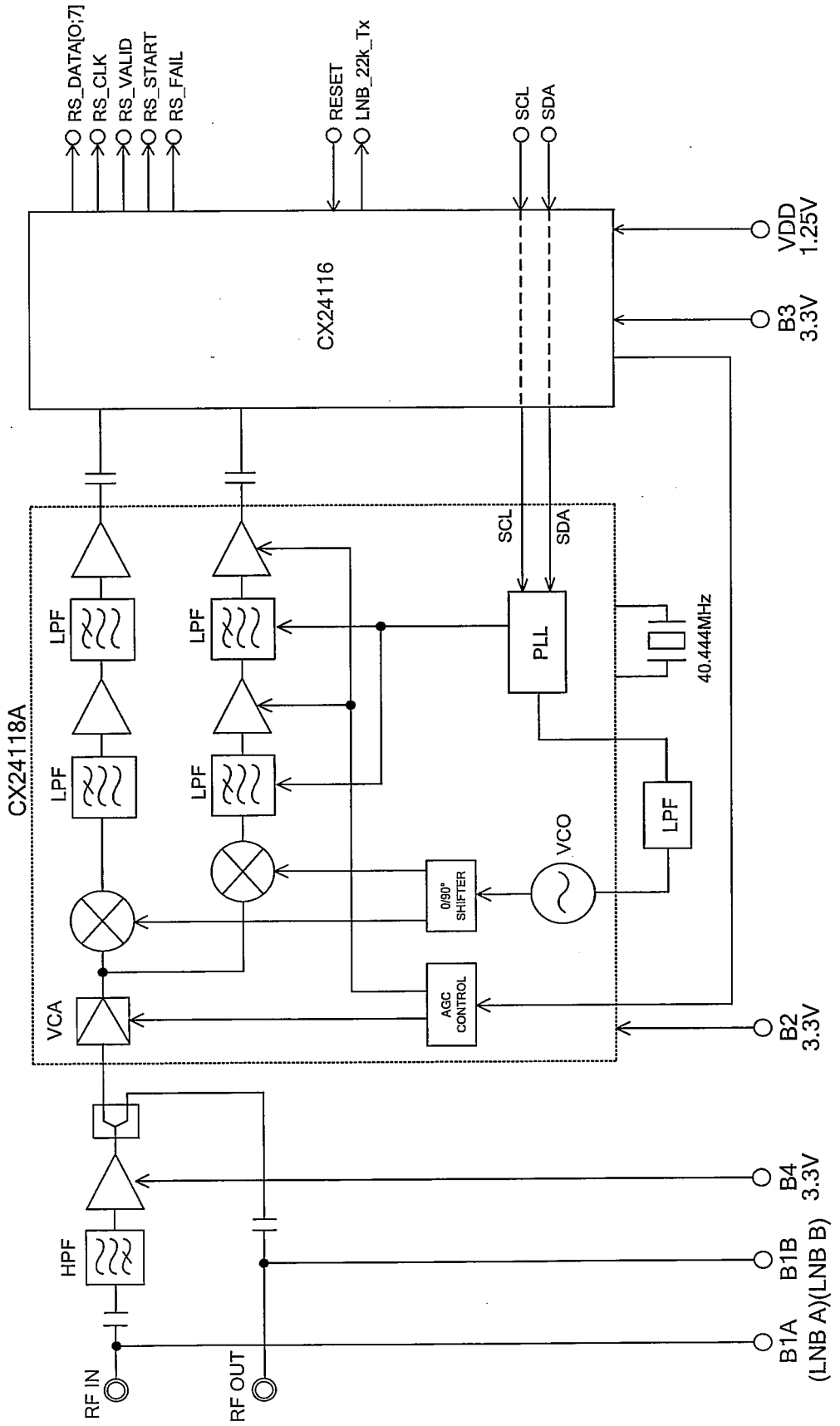

Fig 1. BLOCK DIAGRAM

[12] PIN LIST

No.	NAME	Logic	PIN DESCRIPTION
1	B1B		Voltage supply for LNB B. Please ground it with a 1000pF ceramic capacitor.
2	B1A		Voltage supply for LNB A. Please ground it with a 1000pF ceramic capacitor.
3	B4		3.3V supply for Booster Amp. within this module.
4	B2		3.3V supply for CX24118A tuner IC.
5,6,7,10	NC		It is not connected inside the unit. We advice to ground it.
8	SDA	3.3V	Serial programming interface data. Please connect a pull-up resistor which is more than 2k ohm outside of the tuner.
9	SCL	3.3V	Serial programming interface clock. Please connect a pull-up resistor which is more than 2k ohm outside of the tuner.
11	B3		3.3V supply for CX24116 demodulator IC.
12	LNB_22k_ Tx	3.3V	LNB tone transmit signal. Output only. DiSEqC modulated/unmodulated tone burst or continuous tone can be selected.
13	VDD		1.25V supply for CX24116 demodulator IC. Note1)
14,...,21	RS_DATA [7;0]	3.3V	MPEG data interface data pins. In serial mode, data can be produced on RS_DATA[0] or RS_DATA[7].
22	RS_CLK	3.3V	MPEG data interface clock pin.
23	RS_VALID	3.3V	MPEG data interface control signal - VALID.
24	RS_START	3.3V	MPEG data interface control signal - START.
25	RS_FAIL	3.3V	MPEG data interface control signal - FAIL.
26	RESET	3.3V	CX24116 chip reset. Active low. Internally pulled up. Note2)

Note 1)

Care should be taken to ensure that current fluctuations do not cause the voltage to go outside of the voltage operating condition requirement of 1.25 V ±5 percent. To achieve this, it is recommended that a 1000uF capacitor be placed near the 1.25 V voltage regulator and that several 1 uF capacitors be placed near VDD pins. Trace impedance between the regulator and the tuner should also be kept to a minimum; ideally a power plane should be used.

Note 2)

RESET pin should be held low until after both power supplies (B3 and VDD) have been brought up. Minimum pulse duration is 10us.

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[13] CONNECTION DIAGRAM

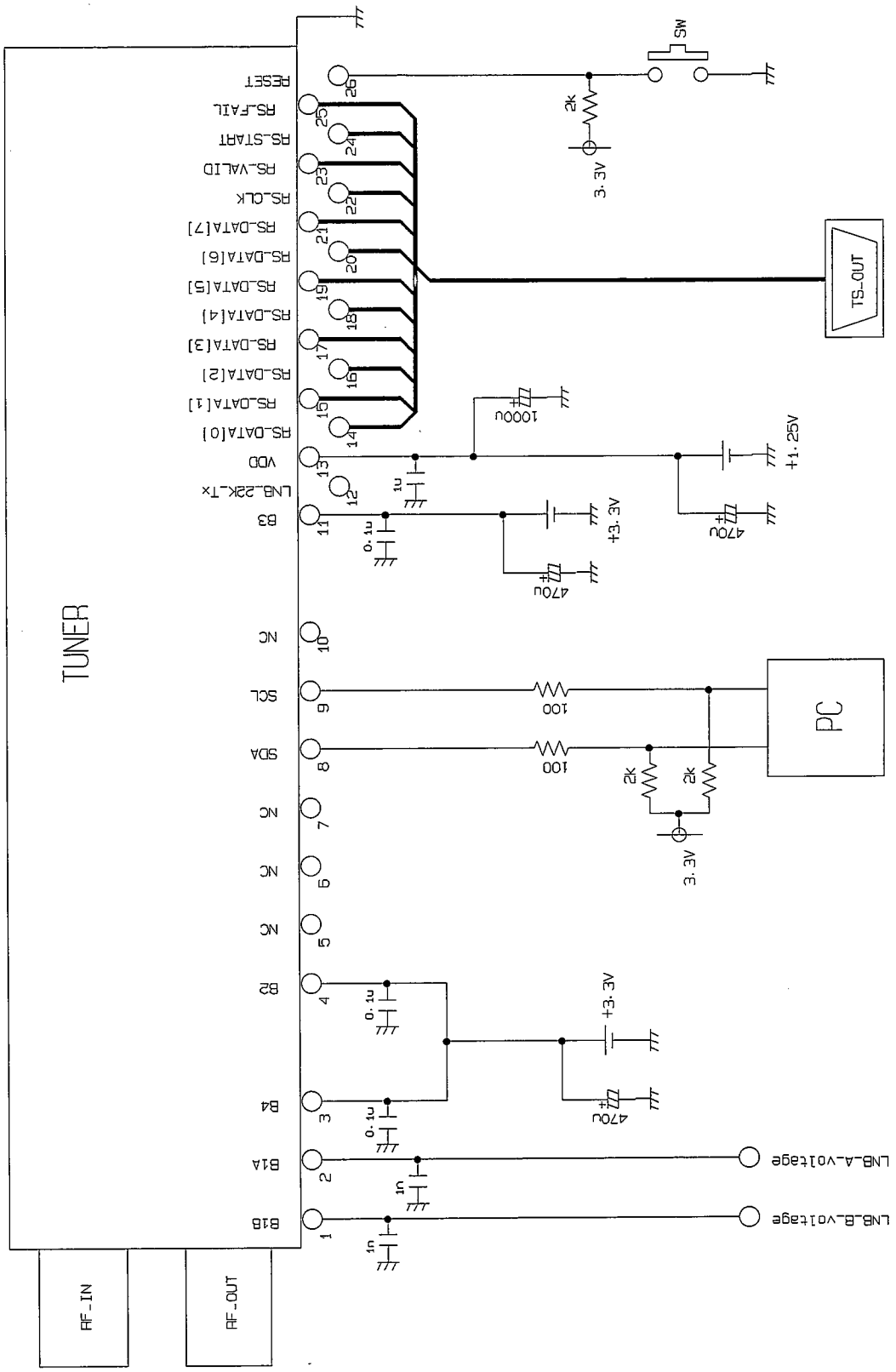

Fig 2. CONNECTION DIAGRAM

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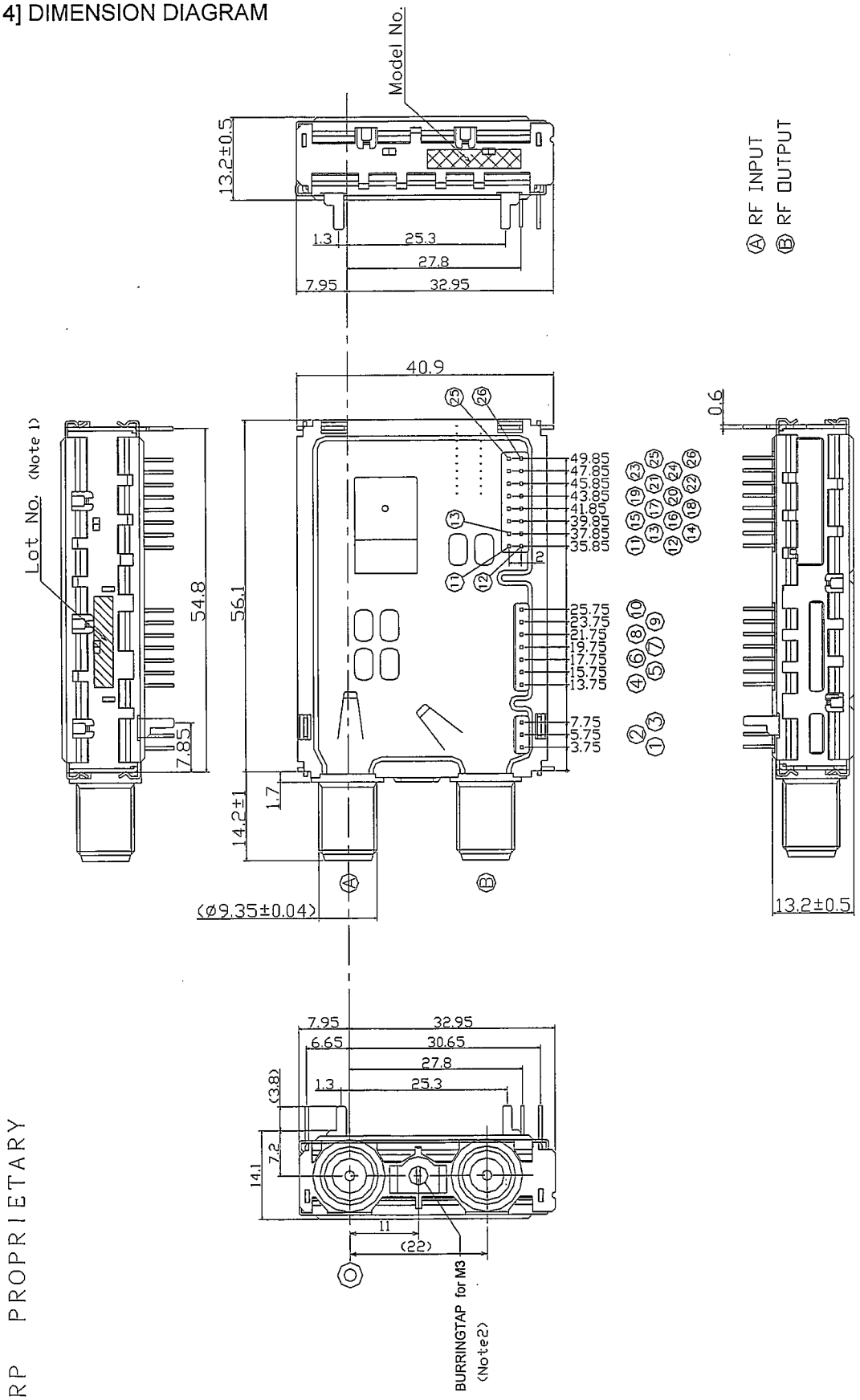
[14] DIMENSION DIAGRAM



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Note1 : The first letter of lot number "W" means made in China.
This tuner is made in China.

Note2 : The length of screw(inside of tuner) should be less than 2mm.

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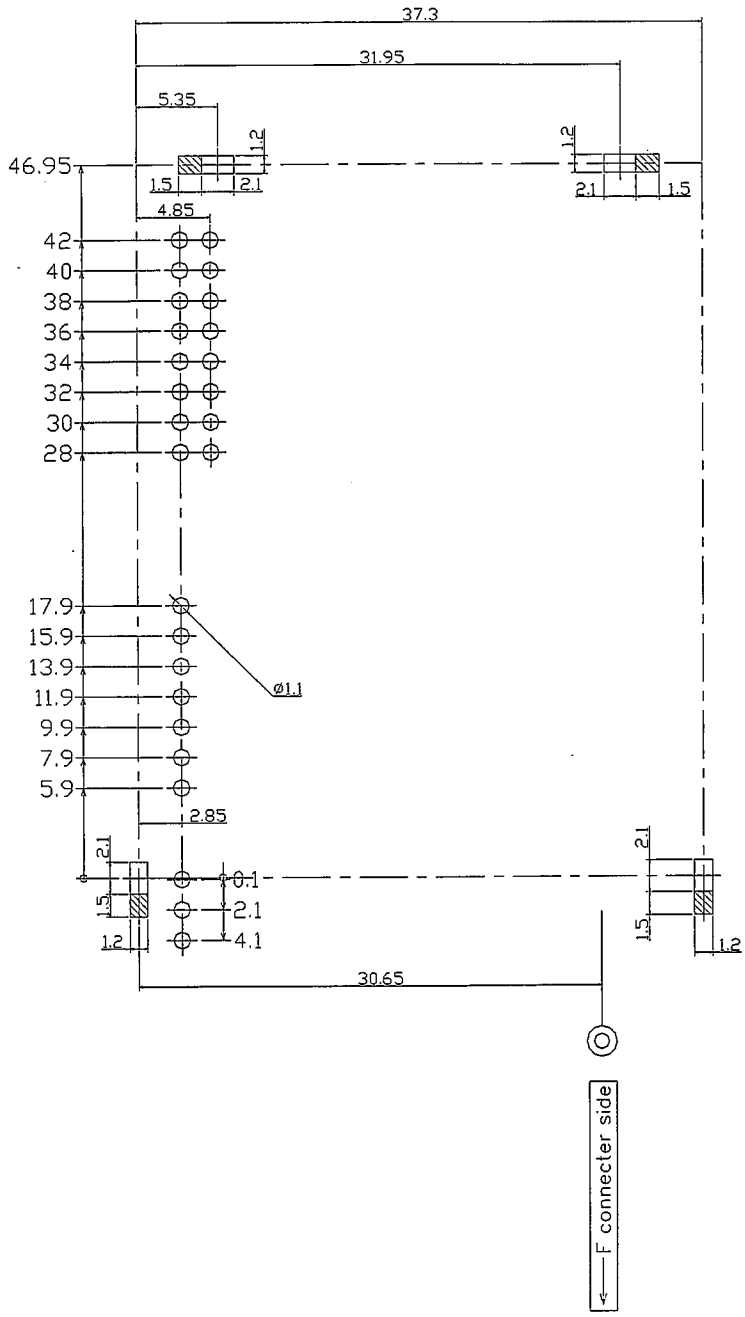
[15] MOUNTING DETAILS

Unit : mm



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Recommended dimension of pin holes on mother PWB.
(Viewed from mounting side)
– Reference drawing –

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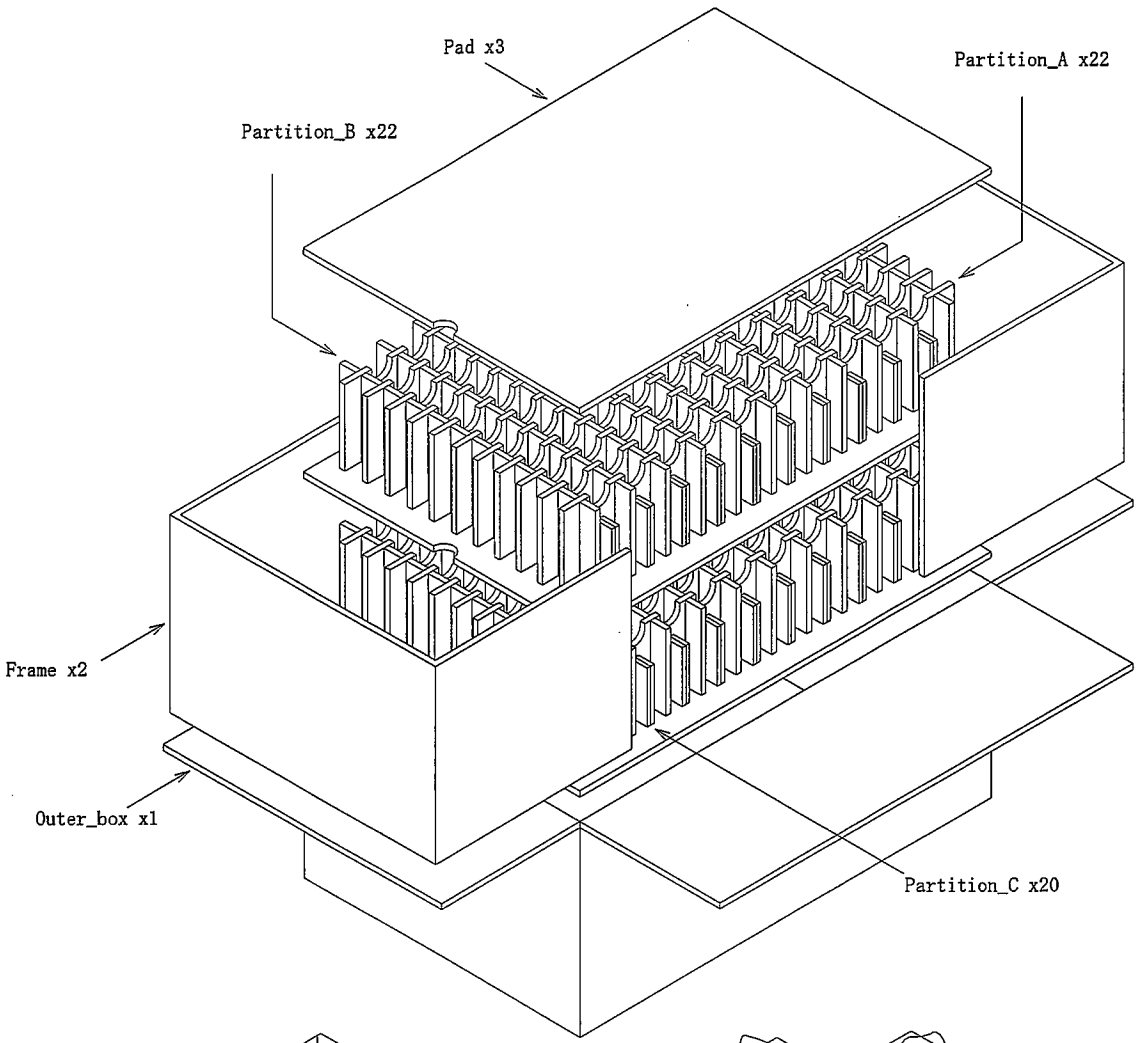
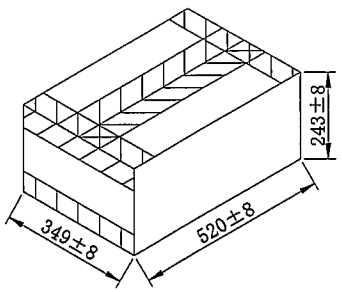
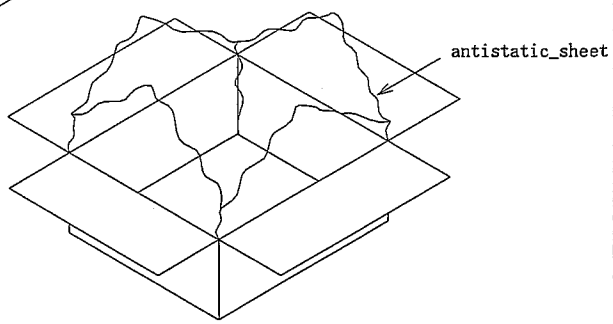
[16] PACKAGING DETAILS







UNIT :mm
QUANTITY :200pcs