Specifications

Digital QAM & Terrestrial NIM

SP8220BHb

SP8221BHb

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SERIT	Digital QAM & Terrestrial NIM Tuner	SP8220BHb SP8221BHb

Description : This specification covers digital tuner intended for use in digital QAM & Terrestrial set top box. This tuner incorporates link IC for QAM & Terrestrial demodulation and FEC decoding.

1. General Specifications

1) QAM Mode

1-1	Receiving Frequency Range	54 ~ 864 MHz
1-2	Input Structure	F Female or IEC Male, IEC Female
1-3	Nominal Input Impedance	75Ω
1-4	Nominal Output Impedance	75Ω
1-5	Input Level per Channel	-15dBmV ~ +25dBmV : 64QAM -10dBmV ~ +25dBmV : 256QAM (Single channel, No Noise)
1-6	IF Frequency	36 MHz or 44MHz
1-7	Channel Selection	Depending on PLL Setting
1-8	Tuner QAM Demodulator QAM mode QAM System Clock	EN4020 SI2165 64QAM, 256QAM 27MHz
1-9	FEC Decoder	Reed-Solomon
1-10	Operating Voltage	B1 (3.3VS) : 3.3V DC ±5% B2 (3.3VT) : 3.3V DC ±5% B3 (3.3VD) : 3.3V DC ±5% B4 (1.2VA) : 1.2V DC ±5%
1-11	Current Consumption	

	Min.	Typ.	Max.
B1 (3.3VS)		5mA	10mA
B2 (3.3VT)		170mA	185mA
B3 (3.3VD)		200mA	220mA
B4 (1.2VA)		70mA	80mA

2) OFDM Mode

1-1	Receiving Frequency Range	107 ~ 868 MHz
1-2	Input Structure	F Female or IEC Female, IEC Male
1-3	Nominal Input Impedance	75Ω
1-4	Nominal Output Impedance	75Ω
1-5	IF Frequency	36 MHz or 44MHz
1-6	Channel Selection	Depending on PLL Setting
1-7	Tuner Chip OFDM Demodulator Transmission mode Constellations Convolution code rates Guards Intervals	EN4020 Si2165 2K FFT, 8K FFT QPSK, 16QAM, 64QAM 1/2, 2/3, 3/4, 5/6, 7/8 1/4, 1/8, 1/16, 1/32
1-8	FEC Decoder	Reed-Solomon and Viterbi decoder
1-9	Operating Voltage	B1 (3.3VS) : 3.3V DC ±5% B2 (3.3VT) : 3.3V DC ±5% B3 (3.3VD) : 3.3V DC ±5% B4 (1.2VA) : 1.2V DC ±5%
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B3 (3.3VD)		200mA	220mA
B4 (1.2VA)		70mA	80mA

2. Environmental Specifications

No	Item	Specification				Condition
		Min	Typ	Max	Unit	
2-1	Temperature					
	Operating	0		60	℃	
	Storage	-20		85	℃	
2-2	Humidity					
	Operating			85	%RH	
	Storage			95	%RH	

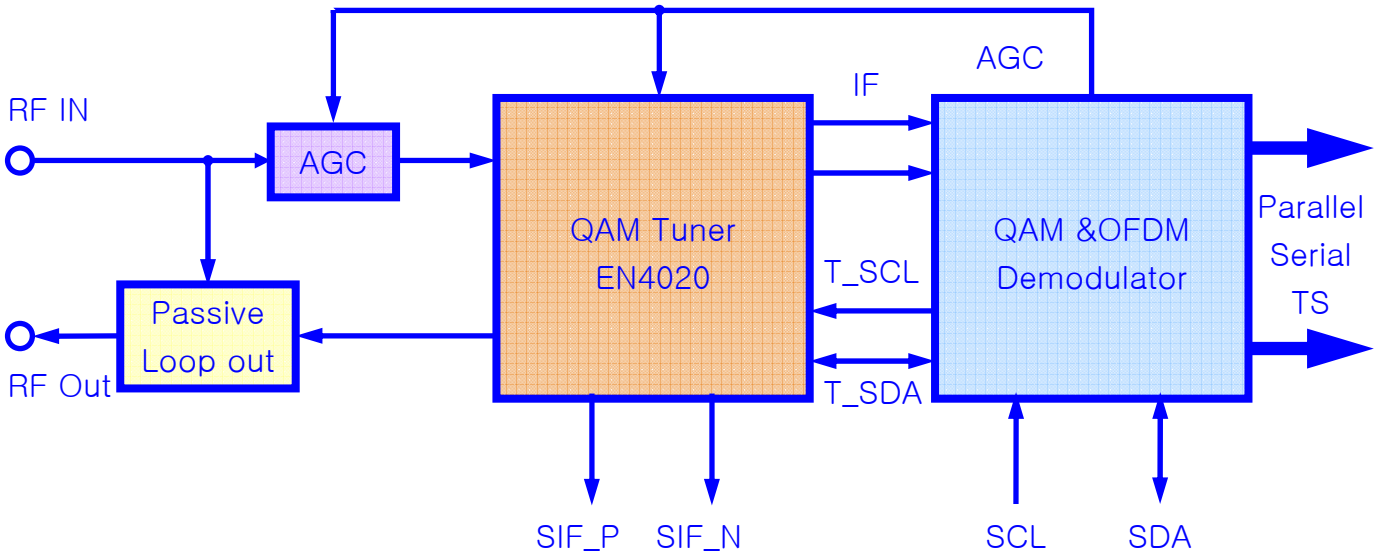
3. Electrical Specifications

No	Item		Specification				Condition
			Min	Typ	Max	Unit	
3-1	Return Loss	RF IN		7		dB	
		RF OUT		7			
3-2	Loop-Through Gain	Active	-2	0	2	dB	Power on mode
		Passive	-3		-2		Power off mode
3-3	Noise Figure			6		dB	
3-4	Inter Modulation at RF Out	IM2		-53	-45	dBc	
		IM3		-70	-55	dBc	
3-5	LO Harmonic Reception				-60	dBc	
3-6	Spurious at the RF Input			-50	-35	dBmV	

3-7	Phase Noise	1KHz		-90		dBc/Hz	
		10KHz		-100		dBc/Hz	
		100KHz		-130		dBc/Hz	
3-8	Image Rejection		55	65		dBc	
3-9	IF Output Bandwidth			8.0		MHz	Digital Adjacent Channel Filtering
				7.0		MHz	
				6.0		MHz	
3-10	AGC Voltage Range		0.5		3.0	Volt	Figure 1. View
3-11	Output Gain Flatness			2		dB	
3-12	CSO				-60	dBc	
3-13	CTB				-63	dBc	
3-14	Cross Modulation				-57	dBc	
3-15	C/N Ratio BER=2X10^{-4}	64 QAM			27.0	dB	0dBmV Input One Channel
		256 QAM			34.0		
3-16	Input Level BER<2^{-4}	64 QAM	-15		25	dBmV	No Noise Input
		256 QAM	-10		25	dBmV	
3-17	Symbol Rate		1		7	Msps	16, 32, 64QAM
			1		6	Msps	128, 256QAM
3-18	C/N Performance						
	QPSK puncture rate 1/2			4.0		dB	Gaussian Channel Pin : -50dBm Mode : 8K GI : 1/4
	16QAM puncture rate 3/4			13.0			
	64QAM puncture rate 2/3			17.5			
	64QAM puncture rate 7/8			21.0			

3-19	Sensitivity Condition					
	QPSK puncture rate 1/2		-96		dBm	Gaussian Channel GI : 1/4 Mode : 8K
	16QAM puncture rate 2/3		-90		dBm	
	64QAM puncture rate 7/8		-78		dBm	
3-20	Immunity to Analog Signals in other Channels (N-1)		35		dB	Adjacent Signal : -25dBm Mode : 8K Const.: 64QAM GI : 1/8 CR : 2/3
	Immunity to Analog Signals in other Channels (N+1)		35		dB	
	Immunity to Analog Signals in Image Channels (N+9)		50		dB	
3-21	Immunity to Digital Signals in other Channels (N-1)		40		dB	Adjacent Signal : -30dBm Mode : 8K Const.: 64QAM GI : 1/8 CR : 2/3
	Immunity to Digital Signals in other Channels (N+1)		40		dB	
	Immunity to Digital Signals in Image Channels (N+9)		54		dB	

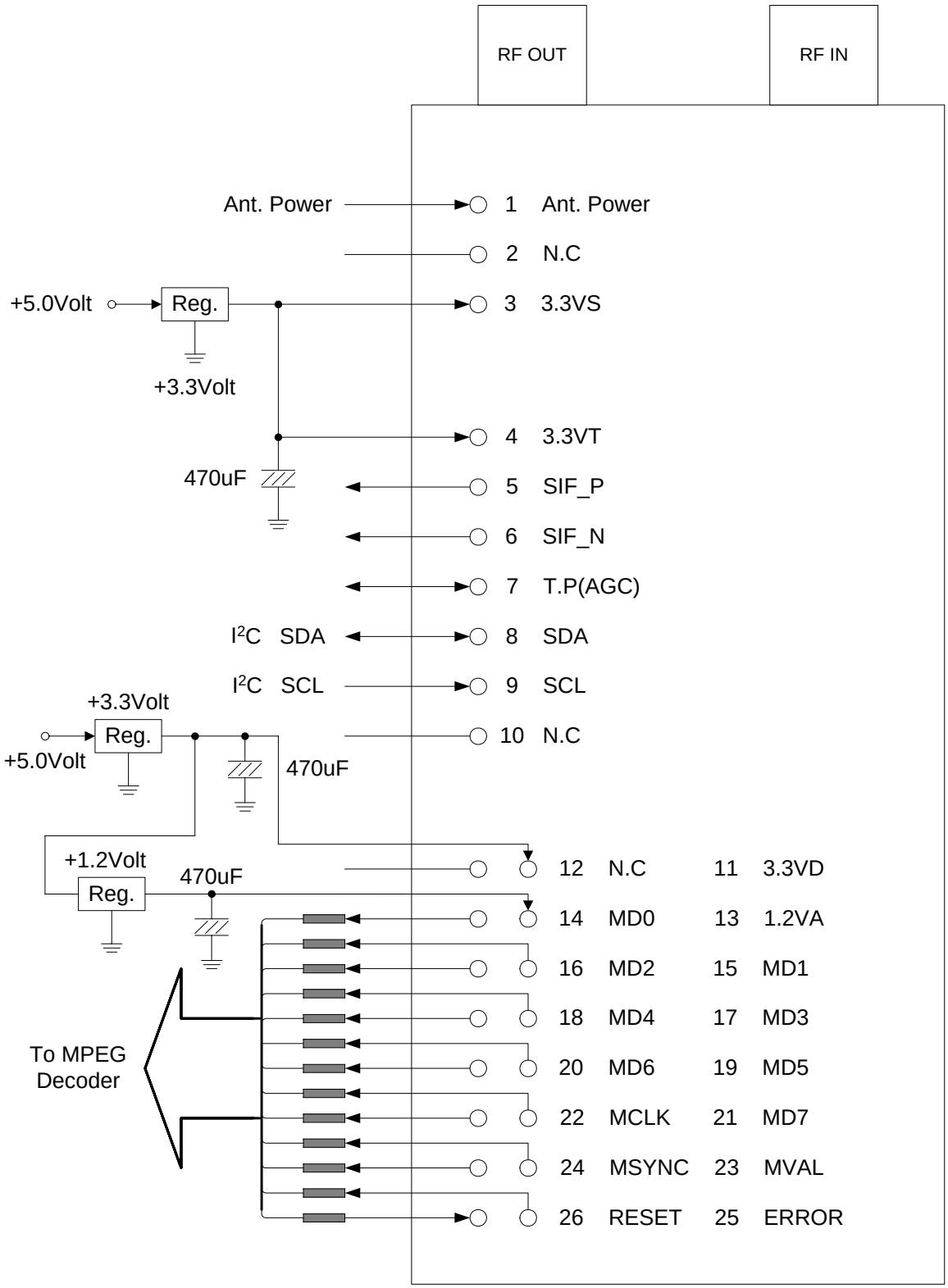
4. Block Diagram



5. Pin Description

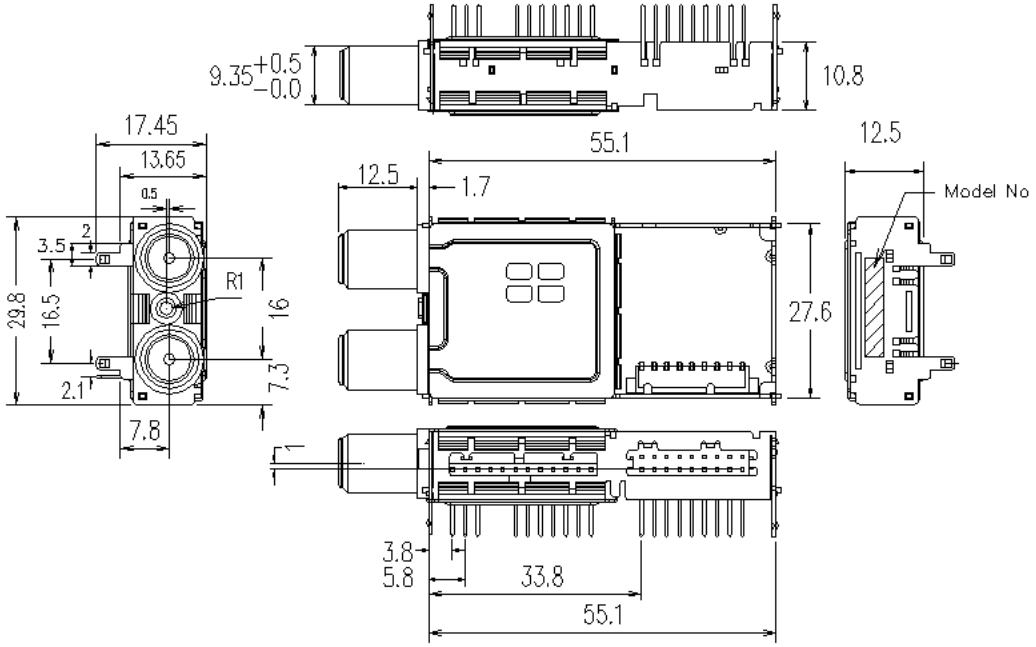
Pin No	Pin Name	Description
1	Ant. Power	Ant. Power DC Input
2	NC	No Connection
3	3.3VS	+3.3Volt Supply for Switch (or 5.0Volt)
4	3.3VT	+3.3Volt Tuner IC DC Input
5	SIF_P	Analog IF output_P
6	SIF_N	Analog IF output_N
7	TP(AGC_CTL)	AGC Control (Analog AGC)
8	SDA	I^2C Data
9	SCL	I^2C Clock
10	NC	No Connection
11	3.3VD	+3.3Volt Tuner & Demodulator IC DC Input
12	NC	No Connection
13	1.2VA	+1.2Volt Demodulator IC DC Input
14	MD0/SER	Transport stream MPEG data to transport IC / packet demultiplexer either in parallel or serial format.
15	MD1	〃
16	MD2	〃
17	MD3	〃
18	MD4	〃
19	MD5	〃
20	MD6	〃
21	MD7	〃
22	MCLK	Output byte clock / Output bit clock
23	MVAL	MPEG/TS output data valid flag
24	MSYNC	MPEG/TS frame start pulse
25	ERROR	Reed-Solomon error
26	nRESET	Hardware Reset. Active Low

6. Pin Application Circuit

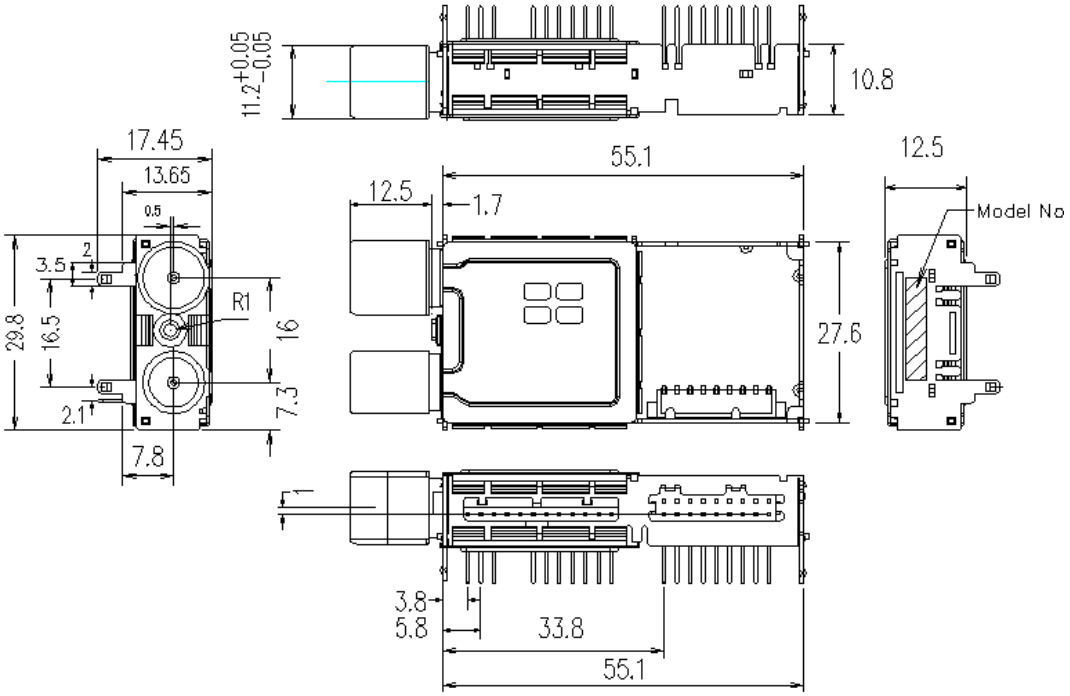


7. Outline Drawing

(1) Horizontal Chassis Type

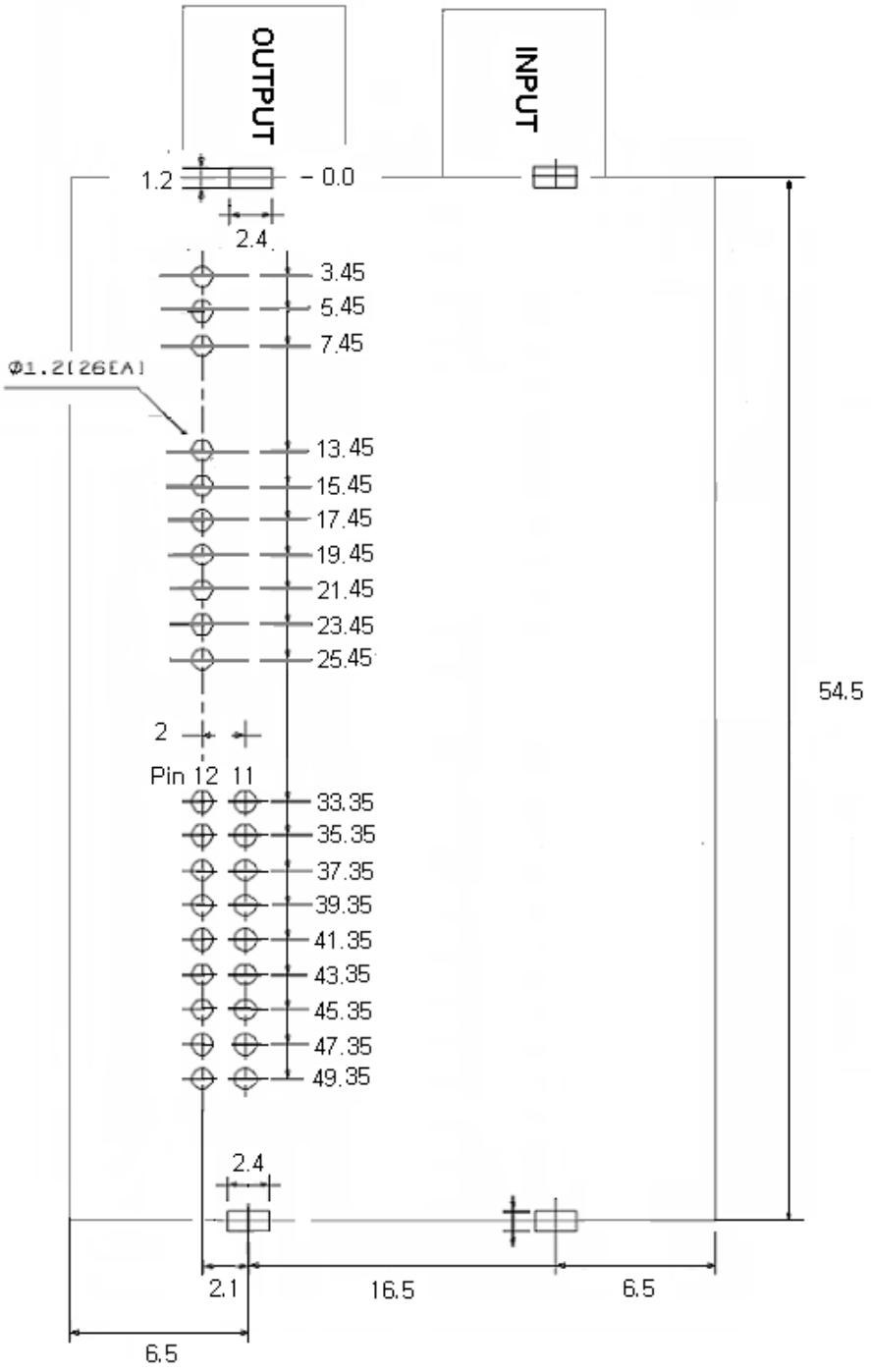


[SP8220BHb F Connector Type]



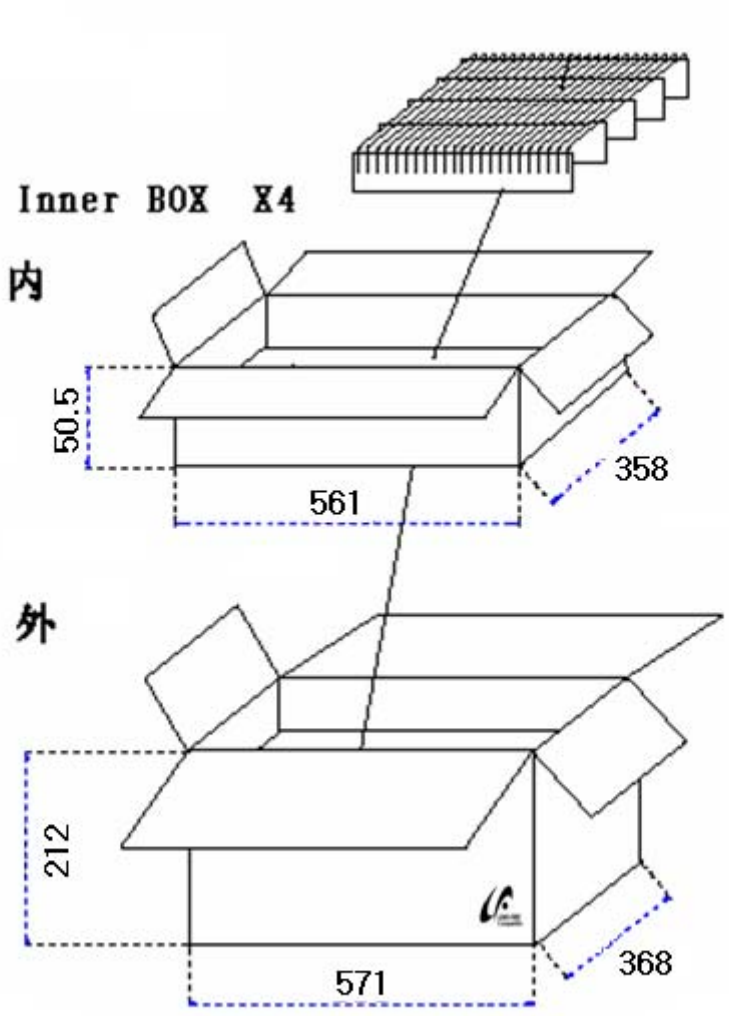
[SP8221BHb IEC Connector Type]

(2) Reference drawing (PCB Layout)



(3) Packing Details

Model	Weight	수량	Size	Carton weight
SP8220LHb	35g	352ea	571*368*212mm	15.5 Kg



8. Electrostatic discharge

(1) Test

Each front-end must be capable of normal performance after following tests:

ESD TEST

Test is performed with a voltage discharge from a 150 PF capacitor over a 330Ω series resistor in the discharge path. There is a direct connect between the test probe head and the unit under test , using the test points and conditions detailed below:

- Test to pins 1 through 22
  4 successive ESD discharges of ±2KVDC between each pin and the front-end frame.

(2) Handling

Anyone handling a front-end must wear a properly grounded anti-static Discharge bracelet to minimize ESD damage.

9. Heat load Test

- Measure the DUTs at room temperature
- Load the DUTs into chamber of the following conditions
  Temperature : 60 ℃
  Period : 160 hrs

10. Cold Test

- Measure the DUTs at room temperature
- Load the DUTs into chamber of the following conditions
  Temperature : -20 ℃
  Period : 160 hrs

11. Thermal shock

- Measure the DUTs at room temperature
- Load the DUTs into chamber of the following conditions

  Temperature : -40℃ for 60 min

  ↑ ↓

  +85℃ for 60 min

  Period : 24 Cycle

12. Humidity load test

- Measure the DUTs at room temperature
- Load the DUTs into chamber of the following conditions

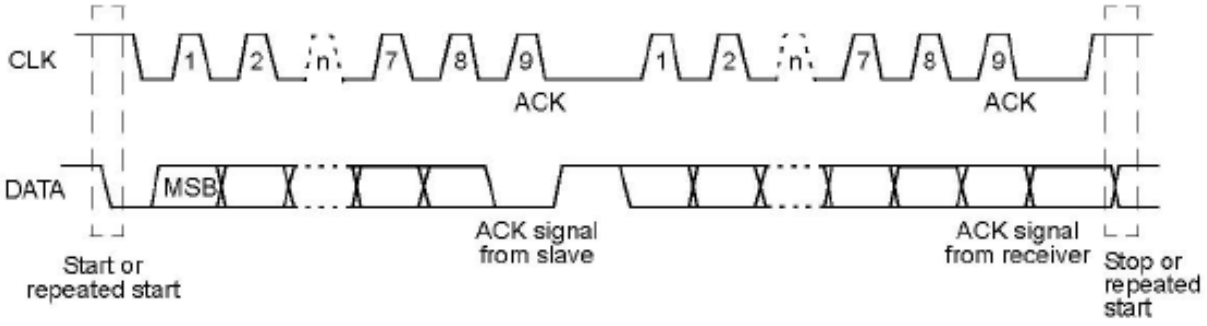
  Temperature : 40℃

  Humidity : 90%

  Period : 96 hrs

13. Tuner IC

(1) Data Transfer Timing Diagram



(2) Recommended Software Setting

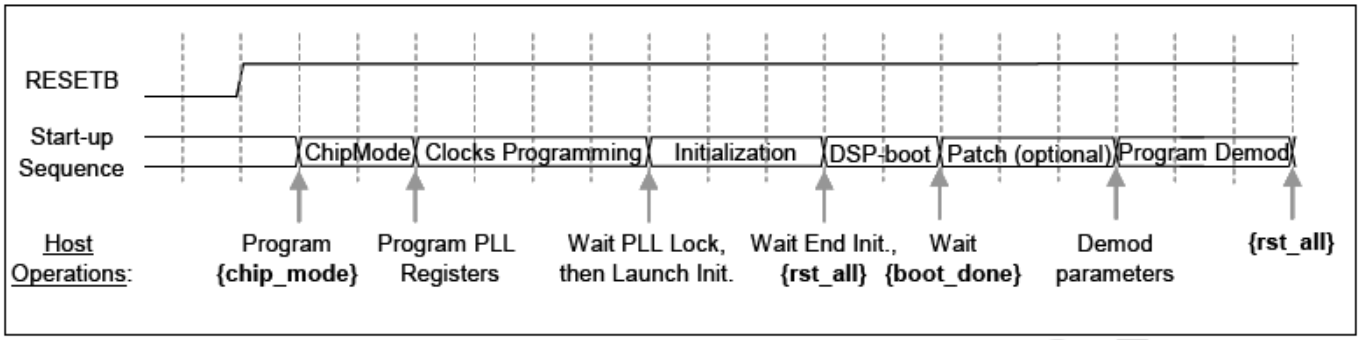
Frequency	Spectrum Inversion	Attenuator IA-Series-Shunt	IF Freq	IF BW	IF OUT	Gain Control	Modulation	Medium Type
54-864	Demodulator dependent	*OFF-ON-ON See note	36 or [4~10]	6/7/8	IF1	Demodulator	Digital	OTA/CATV

Table 5 DVB-C/QAM software default values

Note: Select IA ON for maximum dynamic range (best maximum input power)

14. COFDM Demodulator IC

(1) Initialization Sequence



(2) I²C Device Address Selection

device_address[7..3]	device_address[2:1]	ADDR Voltage (V) (Pin Connection)	device_address[0]
1 1 0 0 1	*1 1*	V_{DDH_VANA} (ADDR tied to V_{DDH_VANA})	R = 1 / W = 0
1 1 0 0 1	*1 0*	2/3 x V_{DDH_VANA} ± 10% (220 kΩ pull-up to V_{DDH_VANA})	R = 1 / W = 0
1 1 0 0 1	*0 1*	1/3 x V_{DDH_VANA} ± 10% (220 kΩ pull-down to ground)	R = 1 / W = 0
1 1 0 0 1	*0 0*	0 (ADDR tied to ground)	R = 1 / W = 0

(3) 16-Bit vs. 8-Bit Address Mode Selection

Host Controller	Si2165	Action Required	Register Address	Value
16-bit mode	16-bit mode	Change Si2165 to 8-bit address mode	(FF00h)	00h
8-bit mode	16-bit mode	Change Si2165 to 8-bit address mode	(FFh)	00h
8-bit mode	8-bit mode	Host controller changing address page	(FFh)	Page (hexa)

15. Products Numbering System

Digital Comb Tuner Model Number Structure

Company Name	Model Number	Size	RF Solution	Input Type & Option	Demodulator Chip	Chassis Type	Remark
SP	8	2	2	0	L	H	b
Serit Platform	8 : Combo	0: 10cc 1: 2: 12cc 3: 4: 14cc 5: 6: 16cc 7: 07cc 8: 18cc 9: 09cc	0: Microtune 1: Max Linear 2: Entropic 3: Maxim 4: Silabs	0: F-Type 1: IEC-Type	N: Half NIM S: STV0362 L: Si2161 Z: WJCE6355 P: TDA10047 L: SI2165	V: Vertical H: Horizontal	b: Pb Free