TO :

DATE : 2001. 5. 29

S P E C I F I C A T I O N

T M B L O C K
(RF MOD. + TUNER + PIF)

PAL B/G MONO

T C M B 0 6 0 0 P D 1 3 A

WRITTEN	CHECKED	APPROVED

SAMSUNG ELECTRO-MECHANICS CO.,LTD.

- 314, METAN 3 DONG,PALDAL KU SUWON, KYUNGKI-DO, KOREA
TEL : (82)(31) 210-6026,5653
FAX : (82)(31) 210-6380,6385

- WELL GROW INDUSTRIAL ESTATES 935 T BANGSAMAK A. BANGPAKONG CHACHOENGSAO 24130,THAILAND
TEL : (66)(38) 570-191~6 (DIRECT 570-560,590)
FAX : (66)(38) 570-258, 311

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1. General

1-1. Application

This specification is applied to the VCR receiving the PAL B/G standard system with CATV(hyper) band.

1-2. Receiving Channels

* PAL B/G
* UHF : S37 ~ 69CH (431.25MHz ~ 855.25MHz)
* VHF High Band : S7 ~ S36CH (147.25MHz ~ 423.25MHz)
* VHF Low Band : E2 ~ S6CH (48.25MHz ~ 140.75MHz)

1-3. Intermediate Frequency

* PAL B/G
  Picture intermediate frequency : 38.9MHz
  Sound intermediate frequency : 33.40MHz(B/G)

1-4. Receiving System

* Upper Heterodyne System

1-5. Receiving tuning system

* Frequency synthesize system

1-6. RF MOD. output channels

* Output channels : 21 ~ 69CH

1-7. Unit setting conditions(RF MOD. input signal)

* Picture : Stair-step signal 1Vp-p
  Modulation setting - white signal 1Vp-p
* Sound : Set 1.23(-5dBs)Vp-p of sine wave 1KHz

1-8. Testing Ambient Condition

* Defined As Temperature of 25 ± 5℃ And Humidity Of 65 ± 10% RH

1-9. Input,output condition

* ANT in nominal impedance : 75Ω
* ANT out nominal impedance : 75Ω

1-10. Operating Conditions For Guarantee

* Temperature : -5 ~ 55℃, Humidity 85% Or Less

1-11. Storage Condition

* Temperature : - 20 ~ 70℃, Humidity 90% Or Less

2.Terminal names and functions

ITEM	PIN NO.	TERMINAL	FUNCTION	REMARK
R F SECTION		Din Jack	RF Signal Intput Terminal	
		Plug Din	RF Signal Output Terminal	
	1	BB+	Booster Supply	5V
	2	Audio in	Audio Signal Input	
	3	SDA	PLL Data Supply Terminal for MOD.	
	4	MB+	Modulator Supply	5V
	5	SCL	PLL Clock Supply Terminal for MOD.	
	6	Video in	Video Signal Input	
	7	MD TU	Tuning Voltage	32V
TUNER SECTION	8	RF AGC	AGC Voltage	
	9	N.C	-	
	10	AS	Address Terminal	
	11	SCL	PLL Clock Supply Terminal for TUNER	
	12	SDA	PLL Data Supply Terminal for TUNER	
	13	+B	Supply Voltage	5V
	14	+B	Supply Voltage	5V
	15	N.C(Lock)	-	
	16	TU	Tuning Voltage	32V
	17	T.P	-	
	18	IF OUT	IF TEST POINT	
PIF SECTION	19	SW1	N.C (NO CONNECTION)	
	20	SW2	N.C (NO CONNECTION)	
	21	Audio out	Audio Signal Output	
	22	SIF out	N.C (NO CONNECTION)	
	23	AFT	AFT Out Terminal	
	24	Video out	Video Signal Output	

3. Supply voltage and current consumption

3-1. current condition

Item	Standard Supply Voltage(V)		Current Consumption(mA)			Remark
			Min.	Typ.	Max.	
RF	BB+	5V DC	-	70	90	
	TU	32V DC	-	-	5	
	MB+	5V DC	-	62	80	
TUNER + PIF	B+	5V DC	-	-	200	
	TU	0~32V	-	-	5	
	AGC					
	AFT		-	-	-	

3-2. Supply voltage condition

Item	Standard Supply Voltage(V)	Available supply voltage(V)			Remark
		MIN.	TYP.	MAX.	
RF	BB+	4.8	5.0	5.2	
	TU	30.0	32.0	34.0	
	MB+	4.8	5.0	5.2	
TUNER + PIF	B+	4.8	5.0	5.2	
	TU	30.0	32.0	34.0	
	AGC	-	-	-	
	AFT	-	-	-	

4. RF MOD. bit allocation read/write

4-1. Characteristic

* Phase loop locked frequency synthesizer for the RF carrier & sound subcarrier.
* Programmable picture to sound ratio.
* Bus controlled test pattern signal generator.
* Bus controlled logic output port.

4-2. I^2C Bus data format

Byte	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	ACK
Address Byte ADR	1	1	0	0	1	0	1	0	ACK
Control Byte C1	1	*	*	*	PS2	PS1	PS0	LE	ACK
Control Byte C2	W0	PSA	L0	FA1	FA0	*	*	*	ACK
Prog. Data Byte PD1	0	TSG	N10	N9	N8	N7	N6	N5	ACK
Prog. Data Byte PD2	N4	N3	N2	N1	0	1	0	0	ACK

* Don't Care

Bus data transmission
1) ADR + C1 + C2 + PD1 + PD2
2) ADR + PD1 + PD2 + C1 + C2
3) ADR + C1 + C2
4) ADR + PD1 + PD2

4-3. P/S ratio setting

P/S ratio	PS2	PS1	PS0
-10dB	0	0	0
-11dB	0	0	1
-12dB	0	1	0
-13dB	0	1	1
-14dB	1	0	0
-15dB	1	0	1
-16dB	1	1	0
-17dB	1	1	1

4-4. LE : System L enable
1 : SECAM L
0 : Other than SECAM L

4-5. WO : Control of white clip
1 : White clip off(SECAM L)
0 : on

4-6. PSA : Control of power save(Default 1)
1 : off(normal operation)
0 : on

4-7. LO : Control of logic out(Default 0)
1 : 12 pin become high voltage
0 : 12 pin become low voltage

4-8. FA : Sound carrier frequency setting

FA1	FA0	Sound Inter Carrier Frequency	Frequency Deviation
0	1	5.5MHz	± 50KHz
1	0	6.0MHz	± 50KHz
1	1	6.5MHz	± 50KHz

4-9. TPSG : Test pattern signal generator
1 : on
0 : off

4-10. N10 ~ N1 : Programmable signal generator
fvco = 31.25KHz * 32 * N + 250KHz
N = 512 * N10 + 256 * N9 + 128 * N8 + … + 2 * N2 + 1* N1

** Example
Outgoing CH : 40CH.(623.25MHz) | 1001101111
System : G(5.5MHz) | 01 TPSG : off | 0
P/S ratio : -15dB | 101 White clip : on | 0
Power save : off | 1 Logic output : low | 0

Byte	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	ACK
ADR	1	1	0	0	1	0	1	0	ACK
C1	1	*	*	*	1	0	1	0	ACK
C2	0	1	0	0	1	*	*	*	ACK
PD1	0	0	1	0	0	1	1	0	ACK
PD2	1	1	1	1	0	1	0	0	ACK

5. Description of TUNER PLL Block

The PLL on this IC supports the I²C bus control format.
The control pins are as shown in the table below.
ref) ADSW(Address selection),SCL(SCL input),SDA(SDA I/O)

5-1. Mode setting method

The mode for each frequency step are set according to the Ms pin voltage.

Mode	MS pin voltage	Main divider	Reference divider	Reference frequency
B-0	0 to 0.15 Vcc	15bit	1024	3.90625KHz
B-1	Open	14bit	512	7.8125KHz
B-2	0.45 Vcc to 0.55 Vcc	15bit	640	6.25KHz
B-3	0.65 Vcc to 0.75 Vcc	15bit	512	7.8125KHz
B-4	0.85 Vcc to Vcc	15bit	512/ 640/ 1024	7.8125KHz/ 6.25KHz/ 3.90625KHz

(*) Frequency step is for when X-TAL OSC=4MHz

5-2. Address setting (Terminal name : AS, PIN NO : 10)

The response address can be changed according to the ADSW pin voltage, so that multiple PLL can exist within one system.

ADSW pin voltage	MA1	MA0
0 to 0.1Vcc	0	0
Open or 0.2Vcc to 0.3Vcc	0	1
0.4Vcc to 0.6Vcc	1	0
0.9Vcc to Vcc	1	1

5-3. Programming

The VCO lock frequency is obtained according to the following formula.

$$fosc = fre. * 8 * (32M+S)$$

The variable frequency division range of M and S are as follows, and are set as binary.

5-4. The control format is as follows.

Write mod : Slave Transmitter

Byte write data	Byte	Bits									Remark
		MSB								LSB	
Address byte	ADB	1	1	0	0	0	MA1	MA0	0	A	
divider byte 1	DB1	0	M9	M8	M7	M6	M5	M4	M3	A	
divider byte 2	DB2	M2	M1	M0	S4	S3	S2	S1	S0	A	
Control byte	CB	1	CP	T1	CD	X	X	X	OS	A	
Band SW byte	BB	X	X	X	X	BU	FMT	BVH	BVL	A	

Type1.(B-0/B-1/B-2/B-3 Modes) M9 is "0" for B-1 mode

Read mode : Slave Transmitter

Mode	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0	
Address byte	1	1	0	0	0	MA1	MA0	1	A
status byte	PR	FL	1	1	1	X	X	X	A

Write mode : Slave Receiver

	MSB							LSB	
MODE	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0	
Address byte	1	1	0	0	0	MA1	MA0	0	A
Divider byte1	0	M9	M8	M7	M6	M5	M4	M3	A
Divider byte2	M2	M1	M0	S4	S3	S2	S1	S0	A
Control byte	1	CP	T1	CD	X	R1	R0	OS	A
Band SW byte	X	X	X	X	BU	FMT	BVH	BVL	A

Type 2. B-4 Mode.(Our TM-B is set)

Reference Divider

R1	R0	Reference Divider
0	1	1024
1	1	512
X	0	640

X : Don't Care

5-5. Description of symbols used in table

Symbol	Description
A	Acknowledge
MA1,MA0	Programmable address bits
M9 to M0	Programmable divider bits(Main counter)
S4 to S0	Programmable divider bits(Swallow counter)
CP	Charge pump current bit(output current) CP=0=± 50㎂(Typ.) **CP=1=± 200㎂(Typ.) (SETTING)**
OS	Tuning amplifier control bits OS=0 ; Normal operation ; Tuning voltage 'ON' OS=1 ; Tuning voltage is 'OFF'(High impedance)
BU,BVH,BVL	PNP ports control bits bit=0 ; Buffer N is 'OFF'(Default) bit=1 ; Buffer N is 'ON'
X	Don't care : May be a logic 0 or logic 1
PR	Power - ON Reset
FL	Lock detection signal

6. RF MOD. Selection performance

6-1. Video system characteristics

Parameter	Specification			Unit	Remark
	Min.	Typ.	Max.		
Video Input Level	-	1	-	Vp-p	Negative sync
Video Modulation	70	80	90	%	PAL system input level : 1.0Vp-p
White Clip	85	92	100	%	Input voltage : 1.5Vp-p
V/S Ratio	6.7/ 3.3	7/ 3	7.3/ 2.7		Input signal :stair step signal. 1Vp-p Negative sync. (V/S = 7/3)
Video Amplitude Frequency Characteristics	-3	0	+2	dB	Deviate between Min. and Max. (0.5MHz~5MHz) Based on 1MHz. Apply sweep signal into Video input terminal, than measured at RF output Test Instrument : Spectrum Analyzer(300KHz)
Differential Gain	-10	+1	+10	%	Measure at APL 10% ~ 90%
Differential Phase	-15	-2	+15	deg	
Video S/N	45	55	-	dB	White 50% V/S = 0.35Vp-p/0.3p-p Weight Filter:ON, SC Trap:ON H.P.F:100KHz, L.P.F:5MHz

6-2. Sound system characteristics

Parameter	Specification			Unit	Remark
	Min.	Typ.	Max.		
Audio Input Level	-	-5	-	dBs	Sine wave 1.23Vp-p
Audio Amplitude Frequency Characteristics	-3	0	+3	dB	Measured between 0.1KHz and 10KHz. The value different from the theoretical curve of the pre-emphasis(50usec)
Audio Modulation	40	60	80	%	PAL:Based on 100%=± 50KHz
Audio Distortion	-	1	3	%	Standard modulation
Audio S/N	35	45	-	dB	Video signal : Color Bar 1Vp-p
Audio Carrier Frequency B/G	5493	5500	5507	KHz	Test condition Temperature : 25℃ Relative humidity : 65% RH The measurement is taken after 30sec form POWER-ON.

6-3. Output system characteristics

Parameter	Specification			Unit	Remark
	Min.	Typ.	Max.		
Video Output Level	67	72	76	dBuV	
Audio Output Level	12	16	20	dB	Measure the level difference between Video and Audio.
Out Band Spurious	-	-48	-40	dB	Signal : Stair step signal.
In Band Spurious	-	-70	-60	dB	Measure between fp and fs.
Harmonics of Video Carrier	-	49	54	dBuV	Video signal : Stair step signal 1Vp-p 950MHz ~ 1750MHz
Chroma Beat	-	-70	-58	dB	Based on standard modulated fp. Video signal : SC 4.43MHz 0.4Vp-p

6-4.Booster system characteristics

Parameter	Specification			Unit	Remark
	Min.	Typ.	Max.		
Gain	-2	2	6	dB	ANT in --> ANT out(47MHz ~ 862MHz)
Noise Figure	-	9	11		
V.S.W.R	-	3.5 2.5	4.5 3.5		ANT in ANT out
Voltage Leakage Aerial in Terminal Level	-	35	46	dBuV	75Ω terminate.

Intermodulation

f1 MHz	f2 MHz	f3 MHz	Input Level (75Ω Terminate) [dBuV]	Intermodulation ANT in - ANT out Typ.[dB]	Intermodulation ANT in - ANT out Min.[dB]
600	650	700	85	70	55
200	500	700	85	57	45

* MOD B+ : OFF

6-5. Thermal characteristics

Parameter	Specification			Unit	Remark
	Min.	Typ.	Max.		
Thermal Stability in Video Modulation	-12	± 3	+12	%	Measure variation with respect to initial value at 0 ~ 60℃ test channel.
Thermal Stability in Video Carrier Frequency	-500	± 0	+500	KHz	
Thermal Stability in Audio Carrier Frequency	-17	± 0	+17	KHz	
Thermal Stability in Video Output Level	-4	± 2	+4	dB	
Thermal Stability in Synchronous Level	2.6	2.9± 0.1	3.4		
Thermal Stability in Audio Output Level	-5	± 2	+5	dB	
Thermal Stability in Audio Modulation	-10	± 5	+10	%	
Thermal Stability in Differential Gain	-15	± 1.5	+15	%	
Unless otherwise the about test should be carried under condition of +25℃ 1 hour(Initial value) → +0℃, 1 hour → +60℃, 1 hour, humidity 45 ~ 80% RH.					

7. Tuner Section Performance

7-1. Rejection characteristics & gain

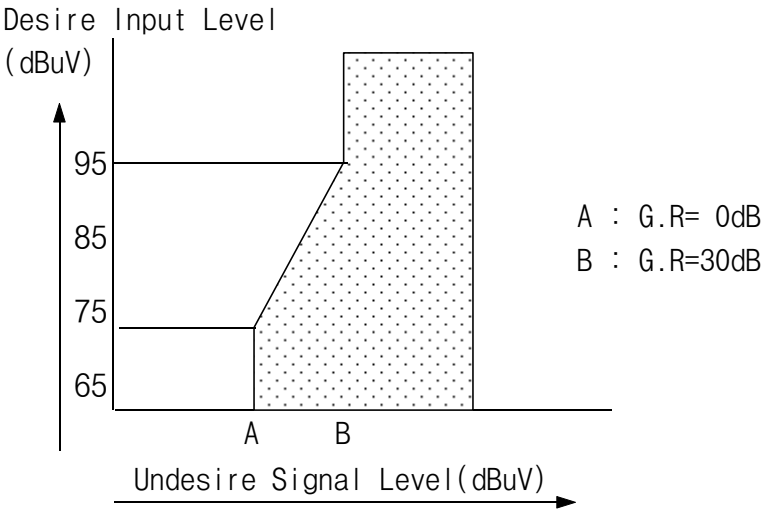
Parameter		Specification			Unit	Remark
		Min.	Typ.	Max.		
Power Gain	UHF	29	36		dB	
	VHF High	29	35			
	Low	30	35			
Gain Deviation	UHF	-	5	10	dB	
	VHF High	-	5	10		
	Low	-	5	10		
Gain Reduction	UHF	40	45	-	dB	AGC Voltage 4V ==> 0V
	VHF High	40	55	-		
	Low	40	55	-		
IF Rejection	UHF	60	75	-	dB	GAIN REDUCTION = 0dB
	VHF High	60	75	-		
	Low	50	60	-		
Image Rejection	UHF	45	55	-	dB	GAIN REDUCTION = 0dB
	VHF High	55	60	-		
	Low	55	60	-		
Special Channel Beat Rejection	E4	50	55	-	dB	Fp = 60dBuV Fs = 54dBuV
	X	45	50	-		
	Y	45	50	-		
Color Beat Rejection G.R = 0dB		55	60	-	dB	ANT input P : 60dBuV C : 44dBuV S : 54dBuV

7-2. Tuning margin and cross modulation

Parameter	Band	OSC Freq.	Specification			Unit	Remark
			Min.	Typ.	Max.		
Margin Frequency	VHF LOW	High end	1.5	-	-	MHz	
		Low end	1.5	-	-		
	VHF HIGH	High end	1.5	-	-		
		Low end	1.5	-	-		
	UHF	High end	1.5	-	-		
		Low end	1.5	-	-		

1% Cross Modulation

(30% 100KHz AM MOD)



CH.	A(dBuV)	B(dBuV)
UHF	65	75
VHF	65	75

Cross modulation value should be within hatched area.

※ Tuner should be measured for 1% cross modulation with ± 2 channel undesired signal.

7-3. Local oscillation characteristics

ITEM	BAND	SPECIFICATION			UNIT	NOTES
		MIN	TYP	MAX		
+B Voltage Drift	VHF	-	-	±300	KHz	+B ±5%
	UHF	-	-	±300		
Warm - up Drift	VHF	-	-	±500	KHz	S/W on 1 min ~ 1 hr
	UHF	-	-	±500		
Temperature Drift	VHF	-	-	±1500	KHz	20℃ ± 25℃
	UHF	-	-	±1500		
OSC Stop Voltage	VHF	4.0	-	-	V	
	UHF	4.0	-	-		
IF Leakage	VHF	-	-	90	dBuV	
	UHF	-	-	90		

8. IF Section performance

When the test electrical characteristics when there are no instruction,
fp input level is 70dBuV and P/S ratio is 13dB.

8-1. PIF characteristics

Parameter		Specification			Unit	Remark
		Min.	Typ.	Max.		
Video Output Level		0.8	1.0	1.2	Vp-p	Standard color bar PAL : 87.5% mod.
Sync Ratio		27	30	33	%	Standard color bar PAL : 87.5% mod. Sync ratio of input signal:30%
Video S/N	VHF UHF	43 42	46 45	- -	dB	Input level : VHF 70dBuV UHF 74dBuV HPF : 100KHz LPF : 5MHz, SC trap : ON 100% white signal (0.7Vp-p) PAL : 87.5% mod.
Sensitivity		-	45	52	dBuV	S/N = 30dB HPF : 100KHz LPF : 5MHz, SC trap : ON 100% white signal PAL : 87.5% mod.
Chroma Distortion	DP	-10	± 1	+10	Deg	10 stair step PAL : 87.5% mod.
	DG	-10	± 2	+10	%	
Burst Level		150	250	400	mV	Standard color bar
Y/C Delay		-150	-30	+150	nsec	Y is reference
Video Frequency Response	1.0MHz 2.0MHz 3.0MHz 4.43MHz	-2.5 -3.0 -3.0 -5.0	0 0 0 -1.0	+1.5 +2.5 +2.5 +2.0	dB	Input level : 70dBuV Standard : 0.5MHz Full sweep. 87.5% mod.

8-2. AFT Characteristics

Parameter	Specification			Unit	Remark
	Min.	Typ.	Max.		
AFT Alignment Accuracy		± 0	± 50	KHz	Alignment center : 2.5V IF input level : 95dBuV PAL B/G P/S = -10dB Standard color bar :87.5% mod.

8-3. Audio characteristics

Parameter	Specification			Unit	Remark
	Min	Typ	Max		
Audio output level	0.7	1.0	1.3	V	1KHz/± 30KHz FM Standard color bar : 87.5% mod.
Audio Frequency Response 50Hz 1KHz 12KHz	 -3 -3 -4	 0 0 -2	 +3 +3 +1	dB	1KHz/± 30KHz FM Standard color bar:87.5% mod. Variation from standard De-emphasis curve
Audio S/N ratio	45	55	-	dB	1KHz/± 30KHz FM Standard color bar:87.5% mod. Use IHF Filter
Audio Distortion	-	0.8	2.0	%	1KHz/± 50KHz FM Standard color bar 87.5% mod.

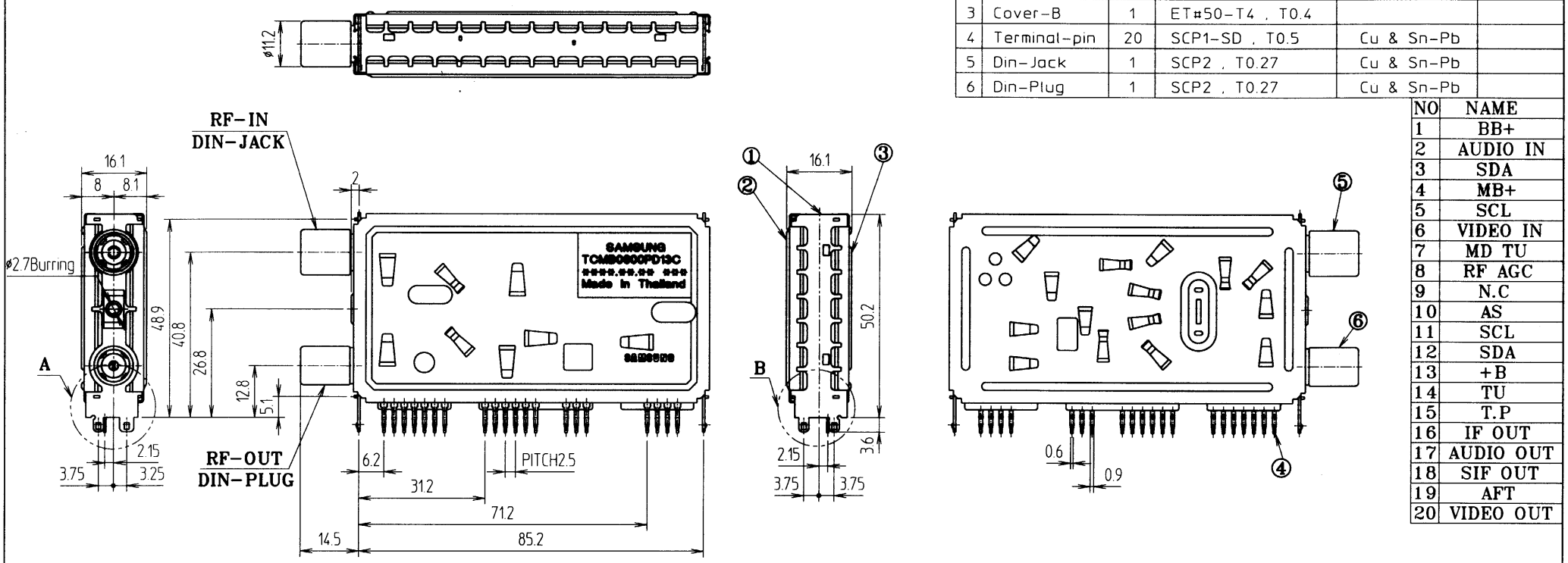
9. Environmental test

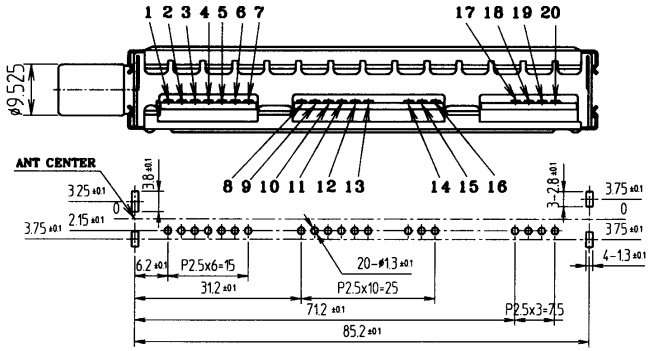
ITEM	SPECIFICATION		TEST CONDITION
	TUNER	IF	
Heat Load Test			1.Initial value measure at standard test condition. 2.Leave samples in 70℃±2℃ for 96±5 hours, and in standard test condition for 30 minutes,then take measurements within 1 hour. 3.Supply voltage : Standard ± 10% 4.Supply voltage cycle : 1.5H ON,0.5H OFF
Humidity Load Time		*VIDEO S/N ± 6dB *VIDEO OUTPUT LEVEL ± 0.2Vp-p *NOISE LIMIT SENSITIVITY ± 6dB *AUDIO OUTPUT LEVEL ± 30% MAX	1.Leave samples in 40℃±5℃ for 24±2 hours,and in standard test condition for 30 minutes,then take measurements 2.Leave samples in 40℃±2℃ for 90±5% RH , for 96 ± 5 hours, and in standard test condition for 30minutes then take measurement within 1 hour. 3.Supply voltage : Standard ± 10% 4.Supply voltage cycle : 1.5H ON, 0.5H OFF
Cold Test	OSC frequency UHF:±2.0MHz VHF:±2.5MHz		1.Initial value measure at standard test condition. 2.Leave samples in -20℃±2℃ for 96±5 hours,and in standard test condition for 2 hours,then take measurements within 1 hour.
Vibration Test			1.Vibration test fixture is used to vibrate the tuner with a total amplitude of 1mm and frequency ranging from 10 to 55Hz,once per minute consecutively,for 40minutes in each of three directions X,Y and Z.

ITEM	SPECIFICATION		TEST CONDITION
	TUNER	IF	
Operating Life Test			1.Take measurements in standard test condition. 2.Leave samples for 1000 hours, then take measurements. 3.Supply voltage : Standard
Impact Test			1.Impact acceleration : 50 m/s^2 2.Impact time : 11msec 3.Impact direction : 6 sides per each direction

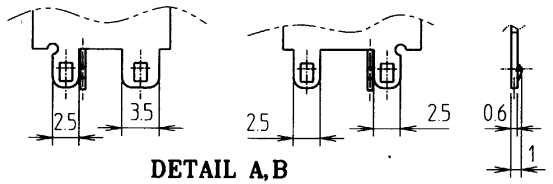
NO	PART NAME	Q'TY	MATERIAL	FINISH	REMARK
1	Chassis	1	ET#50-T2 , T0.6		
2	Cover-A	1	ET#50-T4 , T0.4		
3	Cover-B	1	ET#50-T4 , T0.4		
4	Terminal-pin	20	SCP1-SD , T0.5	Cu & Sn-Pb	
5	Din-Jack	1	SCP2 , T0.27	Cu & Sn-Pb	
6	Din-Plug	1	SCP2 , T0.27	Cu & Sn-Pb	

NO	NAME
1	BB+
2	AUDIO IN
3	SDA
4	MB+
5	SCL
6	VIDEO IN
7	MD TU
8	RF AGC
9	N.C
10	AS
11	SCL
12	SDA
13	+B
14	TU
15	T.P
16	IF OUT
17	AUDIO OUT
18	SIF OUT
19	AFT
20	VIDEO OUT





Dimention of P.C.B for TM-Block Mounting
(Viewed from Copper Pattern)



DETAIL A,B

SAMSUNG ← Maker
TCMB0600PD13C ← Model Name
*****.**.** *** ← Manufacture Date, Product Line & Revision
Made In Thailand ← Manufacture Factory

三星電機株式會社
出圖
2001. 2. 02
第 号
상업디지탈그룹TU연구

용도 방송용

Rev	DATE	WRITTEN BY	CHECKED BY	REVISION RECORD	REMARK
3					
2					
1					

UNIT	m/m	DRAW	DESIGNED	CHECKED	APPROVED	NAME	PART NAME	OUTDRAWING
SCALE	1/1	CAD	S.C.M				MODEL NAME	TM-BLOCK 13SERIES
TOLERANCE	±0.5	2001.02.02					SEMCO P/N	COMPACT 3-IN-1
SAMSUNG ELECTRO-MECHANICS		File name TCMB0600PD13C		3RD ANGLE PROJECTION			NO.	B-17700-13000ZZ-0