T O : LG

DATE : 2005.11.22

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

T M B L O C K

(RF-MOD. + TUNER + PIF)

T C M N 0 6 8 2 P A 2 0 C T

(NTSC M / USA)

WRITTEN	CHECKED	APPROVED
		

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RECORD OF REVISION

DATE	REF. ITEM OR PAGE NO.	SUMMARY

CHANGE OF DATE

NO.	ITEM	DATE	LABEL	REMARK

INDEX

1. GENERAL SPECIFICATION

1) APPLICATION

This specification is applied to the VCR receiving the US 181 channel system VHF and UHF bands. (RF modulator output channel is 3 or 4 CH.)

2) RECEIVING CHANNELS

* M NTSC / USA
* UHF : CH. W+12 - CH. 69
* VHF HIGH BAND : CH. C - CH. W+11
* VHF LOW BAND : CH. 2 - CH. B

3) INTERMEDIATE FREQUENCY

* PIF : 45.75MHz
* SIF : 41.25MHz

4) RECEIVING SYSTEM

* UPPER HETERODYNE SYSTEM

5) OUTPUT CHANNEL OF MODULATION

* 3 CH. : OPEN (61.25MHz)
* 4 CH. : GND (67.25MHz) By controlled PIN NO.2 (CH)

6) OPERATING CONDITIONS FOR GUARANTEE

* TEMPERATURE : -10 ~ 60℃, HUMIDITY 85% OR LESS

7) STORAGE CONDITION

* TEMPERATURE : - 20 ~ 70℃, HUMIDITY 90% OR LESS

8) TESTING AMBIENT CONDITION

* DEFINED AS TEMPERATURE OF 25 ±5℃ AND HUMIDITY OF 65 ±10% RH

9) REGULATION

* TCMN0682PA20CT IS APPLIED FOR FCC REGULATION.

10) TERMINAL NAMES AND FUNCTIONS

ITEM	PIN NO.	TERMINAL	FUNCTION	REMARK
RF SECTION		RF INPUT	RF SIGNAL INTPUT TERMINAL	
		RF OUTPUT	RF SIGNAL OUTPUT TERMINAL	
	1	A I	AUDIO INPUT	
	2	C H	CHANNEL CONTROL(OPEN:3CH,GND:4CH)	
	3	B +	POWER SUPPLY TERMINAL	5V DC
	4	CONTROL	VIDEO /TV CONTROL TERMINAL	
	5	V I	VIDEO SIGNAL INPUT	
TUNER / PIF SECTION	6	N.C	-	
	7	N.C	-	
	8	SAS	ADDRESS TERMINAL	
	9	SCL	PLL CLOCK SUPPLY TERMINAL	
	10	SDA	PLL DATA SUPPLY TERMINAL	
	11	AFT	AFT OUTPUT TERMINAL	
	12	AO	AUDIO OUTPUT TERMINAL	
	13	SIF	SIF OUTPUT TERMINAL	
	14	BT	TUNING VOLTAGE POWER SUPPLY TERMINAL	33V DC
	15	N.C	-	
	16	VO	VIDEO OUTPUT TERMINAL	

11) SEMICONDUCTOR USED

ITEM	FUNCTION		Q'TY	NAME OF SEMICONDUCTOR	REMARK
R F SECTION	I C		1	TA1372FNG	
	S/W TRANSISTOR		2	BF799W OR EQUIVALENT DEVICE	
	S/W DIODE		1	KDS114E	
TUNER SECTION	MOPLL IC		1	TDA6509ATS	
	VVC DIODE		11	KDV215EA,KDV269E OR EQUIVALENT DEVICE	
	RF AMP	VHF	1	BG3130R	
		UHF	1	BF2030WR OR BF909WR	
PIF SECTION	I C		1	LA75676VA	
	VIDEO OUTPUT BUFFER		1	M1867M OR M1865D	
	FILTER	SAW-FILTER	1	TPS4.5MB, XT4.5MB	
		C - TRAP	1	SFSH4.5MDB, LT4.5MH	
		C - FILTER	1	TA1372FNG	

12) CURRENT CONSUMPTION & SUPPLY VOLTAGE

TERMINAL		STANDARD SUPPLY VOLTAGE(V)	CURRENT CONSUMPTION(mA)			GURANTEE VOL.RATINS
			MIN.	TYP.	MAX.	
MOD.	MB	5 ± 0.1V DC	-	50	55	4.8 ~ 5.2 V
	CON.	5 ± 0.1V DC	-	0.047	0.173	4.8 ~ 5.2 V
TUNER AND PIF	BT	33 ± 0.1V DC	-	2.5	5	30 ~ 34 V
	BP	5V ± 0.1V DC	115	140	165	4.8 ~ 5.2 V

13) PLL DATA FORMAT

13-1) Description of Tuner PLL Block

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

13-2) INPUT SIGNAL LEVEL(SCL,SDA)

HIGH -LEVEL INPUT VOLTAGE : 3.0V MIN.

LOW -LEVEL INPUT VOLTAGE : 1.5V MAX.

13-3) X-TAL FREQUENCY : 4MHz

STEP SIZE IS CHANGED BY REFERENCE DIVIDER.

13-4) Address Setting

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

HEXA MODE = C2

13-5) Programming

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

fosc=fref * 8 * (32M+S)

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

13-6) The TDA6503ATS control format is as follows

13-6-1) Write-mode

Byte Write Data	Byte	Bits									Remarks
		MSB							LSB		
Address byte	ADB	1	1	0	0	0	MA1	MA0	0	A	
Divider byte 1	DB1	0	N14	N13	N12	N11	N10	N9	N8	A	
Divider byte 2	DB2	N7	N6	N5	N4	N3	N2	N1	N0	A	
Control byte	CB	1	0	0	0	*	0	1	0	A	
band SW byte	BB	X	X	X	X	PUHF	X	PVHFH	PVHFL	A	

13-6-2) 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	POR	FL	R	1	1	A2	A1	A0	A

13-6-3) Description of symbols used in table

SYMBOL	DESCRIPTION
A	Acknowledge bit
MA1,MA0	programmable address bits (MA1=0 ,MA0=1) ref: 13-4)
N14 to N0	programmable divider bits
CP	charge pump current bit(output current) logic 0 : charge pump current is 60μA logic 1 : charge pump current is 280μA(default)
OS	tuning amplifier control bits logic 0 : tuning voltage is 'on' (during normal operating) logic 1 : tuning voltage is 'off';high impedance output of pin VT(default)
PVHFL,PVHFH,PUHF and FMST	PMOS ports control bis: logic 0 : corresponding buffer is 'off'(default) logic 1 : corresponding buffer is 'on'
X	don't care : may be a logic 0 or a logic 1.
RSA and RSB	Reference Divider ratio select bits

RSA	RSB	Divider	FREQUENCY STEP(KHz)
X	0	80	50
0	1	128(1024)	31.25
1	1	64	62.5

POR	power-on reset flag: logic 0 : at power off logic 1 : at power on
FL	in-lock flag : logic 0 : loop is not locked logic 1 : loop is locked
R	ready flag: logic 0 : mode after power-on reset and the PLL is locked logic 1 : in other conditions
A2,A1 and A0	digital outputs of the 5-level ADC

2.ELECTRICAL CHARACTERISTICS

2-1.RF SECTION PERFORMANCE

2-1-1.VIDEO CHARACTERISTICS

ITEM	SPECIFICATION			UNIT	REMARK
	MIN.	TYP.	MAX.		
Video Modulation	72	80	88	%	Input signal:1Vp-p white stair step or ramp
Video Limiter Modulation	87	93	99	%	Input signal:1.5Vp-p stair step or ramp
V/S Ratio	10:3.8	10:4	10:4.1		Input signal:1Vp-p white V:S = 10:4
Video Amplitude Frequency Characteristics	-3.0	-0.5	+3.0	dB	Measure range:0.1MHz~4.2MHz Based on 1MHz Audio input signal:None
Differential Gain(DG)	-7	+2	+7	%	Input signal:1.0Vp-p stair step Video Mod. : 80% Luminance :10~90%
Differential Phase(DP)	-7	+1.5	+7	deg	Input signal:1.0Vp-p stair step Video Mod. : 80% Luminance :10~90%
Video S/N	45	47	-	dB	Measurement Conditions -Standard De-modulator. -S/N Meter H.P.F:100KHz, L.P.F:4.2MHz SC trap:ON, Weight:OFF *Input signal Video:100% White signal Audio:None Video band:0.1~4.2MHz
Chroma Beat	58	65		dB	Input signal Video:0.4Vp-p,3.58MHz, Sine wave Audio:None

2-1-2. SOUND CHARACTERISTICS

ITEM	SPECIFICATION			UNIT	REMARK
	MIN.	TYP.	MAX.		
Audio Modulation	64	80	96	%	Input signal:1.1Vp-p Sine wave 1KHz (100% Mod.=±25KHzp-p dev.)
Audio Maximum Modulation	150				Input signal : 1KHz, Sine wave
Audio Amplitude Frequency Characteristics	-3	+0.2 -0.6	+3	dB	Input signal:1.1Vp-p Sine wave Measure range:50Hz~10KHz Based on 1KHz
Audio Distortion		0.3	2.0	%	Input signal: 1.1Vp-p,1KHz De-emphasis :ON(75usec)
Audio S/N	48	-	-	dB	Video input signal :Black burst Reference audio input signal :1.1Vp-p,1KHz,Sine wave

2-1-3. OUTPUT CHARACTERISTICS

ITEM	SPECIFICATION			UNIT	REMARK
	MIN.	TYP.	MAX.		
Video Carrier	-80	Fp	+80	KHz	Video input signal:None
Sound Carrier	-7	Fs	+7	KHz	Audio input signal:None
Outband spurious	30	-		dB	FCC Standard Precedure Measure range:0~1GHz
Inband spurious	60	-	-	dB	Input signal Video:None Audio:None Measure range:Fp ~ +4.5MHz
Video Carrier Output Level	63	66	69	dBμV	
P/S Ratio	13	16	19	dB	Audio input signal:None

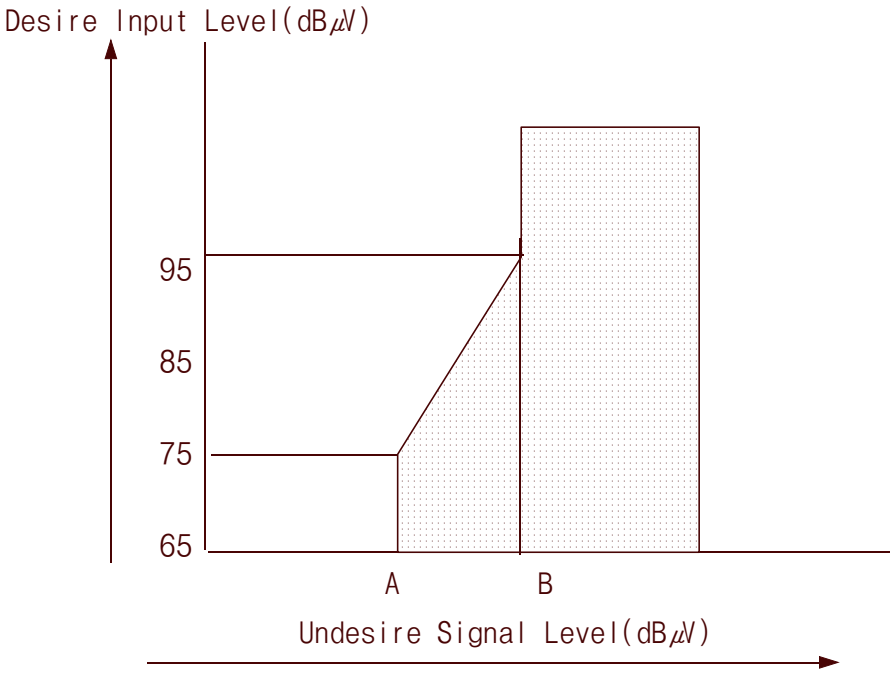
2-1-4. ANTENNA CHARACTERISTICS

ITEM	SPECIFICATION			UNIT	REMARK
	MIN.	TYP.	MAX.		
Insertion Loss	-	-	7.0	dB	ANT IN to ANT OUT Mode:TV (at MOD. OFF)
VSWR			3		ANT OUT Terminal Mode:TV (at MOD. OFF) 54~810MHz Mode:VCR(at MOD. ON) 61~ 72MHz
Isolation	60	-	-	dB	Isolation from ANT OUT to ANT IN:Mode-VCR(at MOD. ON) 61~72MHz
ANT. IN Leakage		5	9.5	dBμV	Mode:VCR (at MOD. ON) 0~1GHz ANTENA-OUT 75Ω Loaded **Applied for FCC**

2-2. TUNER SECTION

ITEM		SPECIFICATION MIN.	TYP.	MAX.	UNIT	REMARK	
IF Rejection					dB		
	UHF	60	90	-		GR = 0dB	(75Ω terminate) GR:Gain Reduction
	VHF High	60	90	-			
	VHF Low	55	80	-			
	UHF	40	65	-		GR = 30dB	
	VHF High	50	75	-			
	VHF Low	45	70	-			
Image Rejection							
	UHF	50	60	-		GR = 0dB	(75Ω terminate) GR:Gain Reduction
	VHF W+11~J	50	70	-			
	VHF 13~2	60	75	-			
	UHF	40	55	-		GR = 30dB	
	VHF W+11~J	45	60	-			
	VHF 13~2	50	65	-			
CH 6 Beat		50			dB	ANT INPUT Des:60dB(μV),(75Ω terminate) Und:54dB(μV),(75Ω terminate)	
CH A-5 Beat		50			dB	ANT INPUT Des:54dB(μV),(75Ω terminate)	
CB Rejection		0.535MHz ~ 30MHz -7dBm Min.				Desire:55.25MHz~83.25MHz (CH2 ~ CH6) -66dBm s/i=40dB	
Available Input signal level		90	100		dBμV	Distortion is nothing on normal condition.	

1% Cross Modulation



CH	A (dBμV)	B (dBμV)
UHF	≥64	≥84
VHF	≥64	≥84

Cross modulation value should be within hatched area.

A = GR = 0dB

B = GR = 30dB

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

Over Range

CH	OSC Fre.	MIN.	TYP.	MAX.	UNIT
UHF	High-end	+1			MHz
	Low -end	-2			
V High	High-end	+1			
	Low -end	-2			
V Low	High-end	+2			
	Low -end	-2			

Noise Figure

CH	MIN.	TYP.	MAX.	UNIT
VHF			12.5	dB
CATV			12.5	
UHF			14	

Lock-up time (Tuning searching time)

	Band low ch.<->high ch.	UNIT	REMARK
VHF	100(typ.)	ms	CP = 0 (Charge pump current=±50㎂)
CATV	100(typ.)		
UHF	100(typ.)		

ANT Local Radiation

Applied for FCC

When Tuner will be mounted in standard set box,field strength local oscillator should be measured.
(Measurement distance:3m)

Accuracy of Oscillator

MIN.	TYP.	MAX.	UNIT
-80		+80	KHz

2-3. IF SECTION

When test the electrical characteristics, Fp input level is 70dBμV, P/S=-7dB, unless otherwise specified.

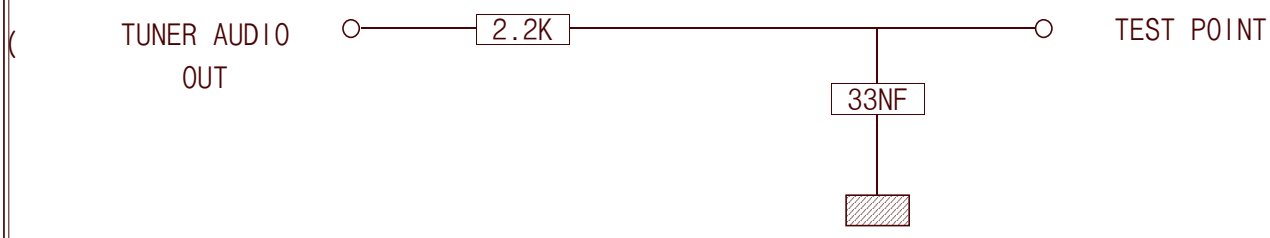
ITEM	SPECIFICATION			UNIT	REMARK
	MIN.	TYP.	MAX.		
Video S/N VHF UHF	 44 44	 46 45		dB	100% white signal. 87.5% modulation. Subcarrier trap:ON HPF:100KHz, LPF:4.2MHz ANT input level VHF:70dBμV, UHF:70dBμV (75Ω terminate)
Video Noise Limit Sensitivity VHF UHF			 48 48	dBμV	100% white signal. 87.5% modulation. Subcarrier trap:ON HPF:100KHz, LPF:4.2MHz Video S/N=30dB
Video Output Level	0.8	1.0	1.2	Vp-p	Standard color bar:87.5% mod.
Sync Ratio	23.6	28	33.6	%	Standard color bar:87.5% mod. V+S=100%
Color Burst Level	220	270	320	mV	Input Level : 70dBμV Standard color bar:87.5% mod.

ITEM	SPECIFICATION			UNIT	REMARK
	MIN.	TYP.	MAX.		
Video Amplitude Frequency Characteristics 1.0 MHz 2.0 MHz 3.0 MHz 3.58MHz	 -3 -3 -4 -4	 -1 -1 -1 -2	 2 2 2.5 2	dB	Multi-burst Signal:87.5% mod. 0.5MHz standard
Sin^2 2T Pulse Response	80	90		%	Sin^2 2T Pulse & bar:87.5% mod.
Differential Gain		4	8	%	5 stair step:87.5% mod. Set modulation at the peak of 5th chroma signal.
Differential Phase		4	8	deg	5 stair step:87.5% mod. Set modulation at the peak of 5th chroma signal.
Y/C Delay time	-200	-50	100	nSec	Input Sin^2 2T Pulse & Bar. Use VM700A(Tektronix)
Chroma S/N AM PM	 47 46	 52 51		dB	100% Chroma signal(RED) 87.5% modulation. Subcarrier trap:OFF HPF:100Hz, LPF:500KHz Ant input level VHF:70dBμV, UHF:70dBμV (75Ω terminate)
Audio Output Level	400	500	600	mV rms	1KHz/±25KHz Dev.(100%) Standard color bar:87.5% mod. De-emphasis:ON (ref: figure A of page 16)
Audio Distortion [CH:11]		0.5	3	%	1KHz/±25KHz Dev.(100%) Standard color bar:87.5% mod. De-emphasis:ON (ref: figure A of page 16)

ITEM	SPECIFICATION			UNIT	REMARK
	MIN.	TYP.	MAX.		
Audio Frequency 50 Hz 10KHz	 -3 -3	 0 0	 3 3	dB	50Hz~10KHz 1KHz/±15KHz Standard Standard color bar:87.5% De-emphasis:ON (ref: figure A of page 16)
Audio S/N	43	48		dB	1KHz/±25KHz Dev. Standard color bar:87.5% mod. use 30KHz filter De-emphasis:ON (ref: figure A of page 16)
Audio Buzz		40	100	mV(p-p)	Standard color bar:87.5% mod. Ant input level:70dB(μV) P/S=-10dB De-emphasis:ON (ref: figure A of page 16)
AFT Alignment Accuracy	-50	0	50	KHz	Alignment center:2.5V RF input level:70dB(μV) P/S=-7dB Standard color bar:87.5% mod. Testing channel:11CH
920KHz Beat	40	48		dB	11CH,100dB(μV)(75Ω term.) P/S=-7dB Video:100% Chroma(RED) $S/i = \frac{3.58\,MHz\ signal\ level}{920\,KHz\ beat\ level}$ *Check at Video output terminal

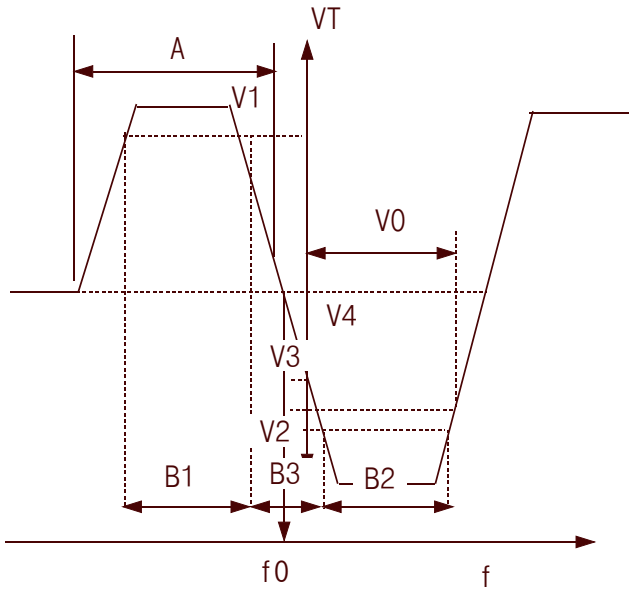
ITEM	SPECIFICATION			UNIT	REMARK
	MIN.	TYP.	MAX.		
Side CH. Rejection	30	37		dB	11CH,70dB(㎶)(75Ω term.) P/S=-7dB $S/i = \frac{500KHz\ 0.25V\ level}{Side\ CH\ signal\ level}$ *Check at Video output terminal
Side CH. Rejection	25	35		dB	11CH,70dB(㎶)(75Ω term.) P/S=-7dB SG3:fp-1.5MHz 70dB(㎶) $S/i = \frac{500KHz\ 0.25V\ level}{Side\ CH\ signal\ level}$ *Check at Video output terminal
4.5MHz Signal Leakage	40	48		dB	11CH,100dB(㎶)(75Ω term.) P/S=-7dB Video:100% Chroma(RED) $S/i = \frac{3.58\,MHz\ signal\ level}{4.5\,MHz\ beat\ level}$ *Check at Video output terminal
SIF LEVEL (4.5MHz)	50	60		dB㎶	Standard color bar:87.5% mod. Ant input level:70dB(㎶) P/S=-7dB

「 Figure A 」



[De-emphasis circuits for Test (Audio)

"S" Characteristics Curve [CH:11]



	Modulation 87.5% Color bar
V1:High level voltage	more than 4.0V
V2:Low level voltage	less than 1.5V
B1:Width of high level	more than 600KHz
B2:Width of low level	more than 300KHz
B3:Width of "S"curve slope	10KHz/V typ.(at 0.3~0.9Vcc)
V3:Center frequency	2.5V ↓
V4:Center - 1step	2.8V ↑

Testing Channel : 11CH.

3.ENVIRONMENT TEST

ITEM	SPECIFICATION		TEST CONDITION
	TUNER	IF	
Heat Load Test	OSC frequency UHF:±2.0MHz VHF:±2.5MHz	*VIDEO S/N ± 6dB *VIDEO OUTPUT LEVEL ± 0.2Vp-p *NOISE LIMIT SENSITIVITY ± 6dB *AUDIO OUTPUT LEVEL ± 30% MAX	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 hours. 3.Supply voltage : Standard ± 10% 4.Supply voltage cycle : 1.5H ON,0.5H OFF
Humidity Load Test			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 96±5% RH hours, for 96 ± 5 hours, and in standard test condition for 30minutes then take measurement within 1 hours. 3.Supply voltage : Standard ± 10% 4.Supply voltage cycle : 1.5 hours ON , 0.5 hours OFF
Cold Test			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 hours.
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	OSC frequency UHF:±2.0MHz VHF:±2.5MHz	*VIDEO S/N ± 6dB *VIDEO OUTPUT LEVEL ± 0.2Vp-p *NOISE LIMIT SENSITIVITY ± 6dB *AUDIO OUTPUT LEVEL ± 30% MAX	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
High Test **(Static Electricity Test)**			5KV~20KV, 3 times(150pF charged) series R = 330ohm Terminal: Between RF-IN,RF-OUT & GND Standard pulse at 5KV~20KV

Dimensions of PCB for Two-Block Stimulus
(Thermal Cross Copper Pattern)