TO : SEC

DATE : 2004.11.23

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

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

NTSC M / USA

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

WRITTEN	CHECKED	APPROVED
		

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RECORD OF SPECIFICATION REVISION		
DATE	REF. ITEM OR PAGE NO.	SUMMARY

NTSC 3in1 TM Block TCMN0682PA26A

* INDEX

NTSC 3in1 TM Block TCMN0682PA26A

1. General

1-1. Features

* NTSC M / USA standard TV Systems Broadcast reception
* Full Frequency range from channel 2CH(55.25MHz) to 69CH(801.25MHz)
* Upper Heterodyne Receiving System
* Frequency synthesized Tuning system
* Programmable PLL step size (31.25 / 50 kHz / 62.5kHz)
* IIC-bus control of tuning, Address selection

1-2. Applied Regulation

FCC

1-3. Applied Safety Standards

IEC

1-4. Receiving Channels

Band	Channel	Freq
VHF low	CH.2~CH.B	55.25~127.25MHz
VHF high	CH.C~CH.W+11	133.25~361.25MHz
UHF	CH.W+12~CH.69	367.25~801.25MHz

1-5. OUTPUT CHANNEL OF MODULATION

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

1-6. Intermediate Frequency

SYSTEM	M
Picture Carrier	45.75
Color Carrier	42.17
Sound Carrier	41.25

1-7. Input,output condition

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

2. Terminal names and functions

ITEM	PIN NO.	TERMINAL	FUNCTION	REMARK
RF-MOD Section		RF INPUT	RF SIGNAL INTPUT TERMINAL	75Ω
		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	RF AGC	RF AGC Voltage out (TEST POINT)	TP
	7	X-TAL IN	N.C [Internal X-tal 3.58MHz applied]	
	8	SAS	PLL Address selection	
	9	SCL	PLL Clock Supply Terminal for Tuner	
	10	SDA	PLL Data Supply Terminal for Tuner	
	11	AFT	AFT Output Terminal	
	12	AUDIO	AUDIO Output Terminal	
	13	SIF	SIF OUT	
	14	VT	Tuning Voltage	33V
	15	IF OUT	IF (TEST POINT)	TP
	16	VIDEO OUT	Video Signal Output	1Vp-p

3. Limiting Values under Operation Conditions

3-1. Current Condition

Item	Standard Supply Voltage(V)		Current Consumption(mA)			Remark
			Min.	Typ.	Max.	
TUNER + IF	B+	5V DC	165	190	220	
	CON	5V DC	-	0.047	0.173	
	VT	33V DC	-	2.5	5	
	AGC	-	-	-	-	
	AFT	-	-	-	-	

3-2. Supply Voltage Condition

Item	Standard Supply Voltage(V)	Available supply voltage(V)			Remark
		MIN.	TYP.	MAX.	
TUNER + IF	B+	4.8	5.0	5.2	
	VT	32	33	34	
	AGC	-	-	-	
	AFT	-	-	-	

4. Environmental Conditions

Item		Temperature & Humidity			Remark
		MIN.	TYP.	MAX.	
Testing Ambient Condition	Temperature	20	25	30	℃
	Humidity	55	65	75	%
Operating Condition	Temperature	-10	-	60	℃
	Humidity	-	-	85	%
Storage Condition	Temperature	-20	-	70	℃
	Humidity	-	-	90	%

5. Description of TUNER PLL Block

The PLL on this IC supports the IIC bus control format.
The control formats are as shown in the table below.
ref.) SAS(Address selection), SCL(Serial Clock), SDA(Serial Data I/O)

5-1. Address setting

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

SAS pin voltage	MA1	MA0
0 to 0.1Vcc	0	0
ALWAYS VALID	0	1
0.4Vcc to 0.6Vcc	1	0
0.9Vcc to Vcc	1	1

5-2. Read mode : Slave Transmitter

Mode	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0	
Address byte	1	1	0	0	0	MA1	MA0	R/W=1	A
status byte	POR	FL	1	1	1	A2	A1	A0	A

* ADC status bit

Voltage at ADC	A2	A1	A0	DEC
(0~0.15)*Vcc	0	0	0	0
(015~0.3)*Vcc	0	0	1	1
(0.3~0.45)*Vcc	0	1	0	2
(0.45~0.6)*Vcc	0	1	1	3
(0.6~1)*Vcc	1	0	0	4

* Description of symbols used in Read mode table

SYMBOL	DESCRIPTION	DEFAULT
A	Acknowledge	
MA1,MA0	Address setting bits	
X	Don't care : May be a logic 0 or logic 1	
POR	Power - ON Reset	
FL	Lock detection signal	

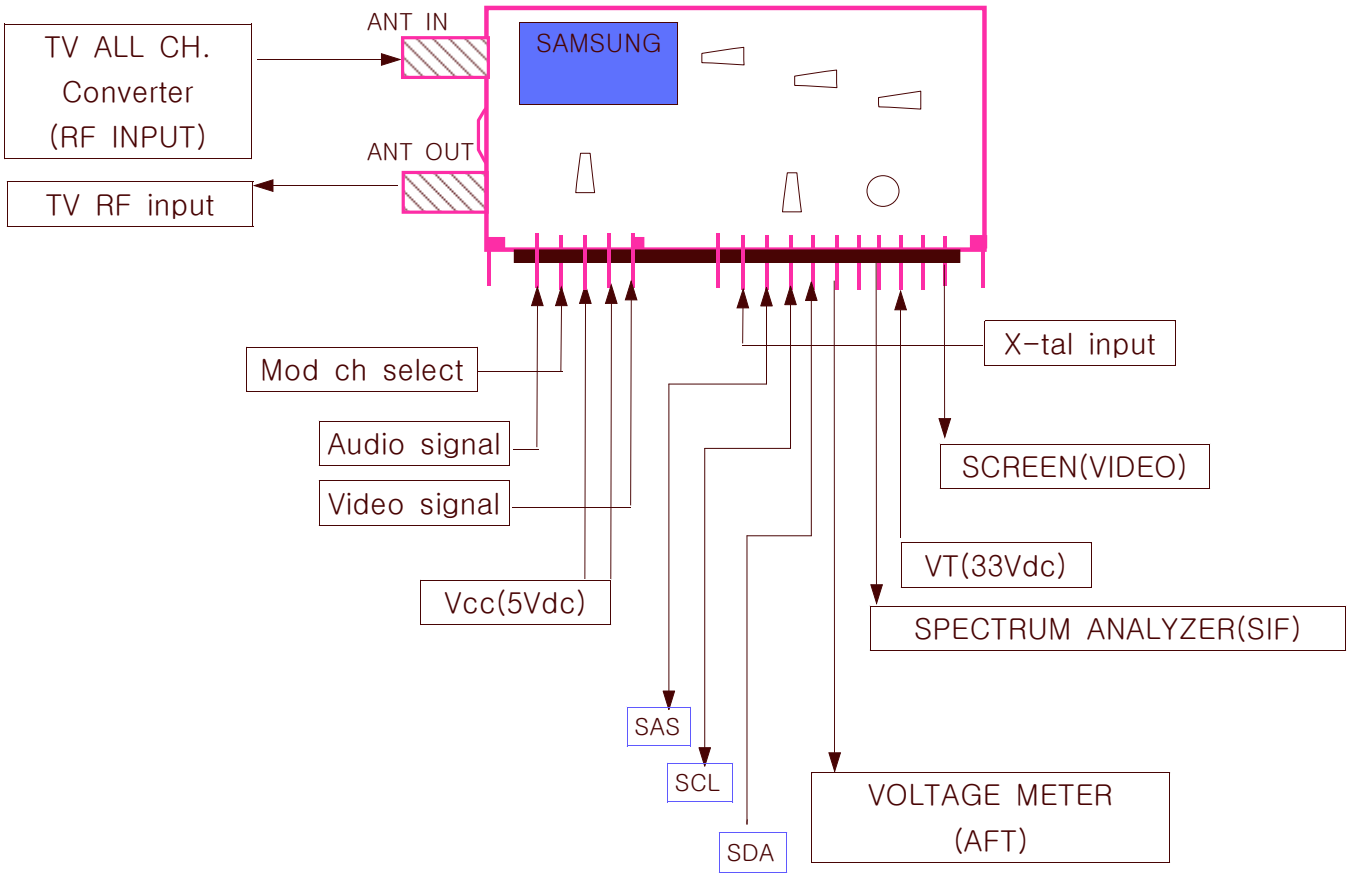
5-3. Write mode : Slave Receiver

MODE	MSB							LSB	
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0	
Address byte	1	1	0	0	0	MA1	MA0	R/W=0	A
Divider byte1	0	N14	N13	N12	N11	N10	N9	N8	A
Divider byte2	N7	N6	N5	N4	N3	N2	N1	N0	A
Control byte	1	CP	T2	T1	T0	RSA	RSB	OS	A
Band SW byte	P8	P7	P6	P5	BS4	BS3	BS2	BS1	A

* Description of symbols used in Write mode table

<table>
<tr><th>SYMBOL</th><th>DESCRIPTION</th><th>DEFAULT</th></tr>
<tr><td>A</td><td>Acknowledge</td><td></td></tr>
<tr><td>MA1,MA0</td><td>Address set bits</td><td></td></tr>
<tr><td>N14 to N0</td><td>Programmable counter set bit</td><td></td></tr>
<tr><td>CP</td><td>Charge pump current set bit(output current)
CP= 0 = ± 60㎂(Typ.)
CP= 1 = ±280㎂(Typ.)</td><td></td></tr>
<tr><td>OS</td><td>Tuning amplifier control bits
OS=0 ; Normal operation ; Tuning voltage 'ON'
OS=1 ; Tuning voltage is 'OFF'(High impedance)</td><td>OS = 0</td></tr>
<tr><td>T2,T1,T0</td><td>Test bits Normal mode : T2~T0 = 0</td><td>Tn = 0</td></tr>
<tr><td>RSA, RSB</td><td>Reference divider ratio selection bits
<table>
<tr><th>RSA</th><th>RSB</th><th>Reference Divider</th></tr>
<tr><td>0</td><td>1</td><td>1024</td></tr>
<tr><td>1</td><td>1</td><td>512</td></tr>
<tr><td>X</td><td>0</td><td>640</td></tr>
</table></td><td>512</td></tr>
<tr><td>BS4 ~ BS1</td><td>Band switch ports control bits
BSn = 0 : off , 1 = on
Band selection by BS1,2,4 (x : don't care)
<table>
<tr><th></th><th>BS1</th><th>BS2</th><th>BS4</th></tr>
<tr><td>VHF-LOW</td><td>1</td><td>0</td><td>0</td></tr>
<tr><td>VHF-HIGH</td><td>0</td><td>1</td><td>0</td></tr>
<tr><td>UHF</td><td>0</td><td>0</td><td>1</td></tr>
</table></td><td></td></tr>
<tr><td>X</td><td>Don't care : May be a logic 0 or logic 1</td><td></td></tr>
<tr><td>P8...P5</td><td>NPN OPEN COLLECTOR PORT CONTROL BITS</td><td>Pn=0</td></tr>
<tr><td>POR</td><td>Power - ON Reset</td><td></td></tr>
<tr><td>FL</td><td>Lock detection signal</td><td></td></tr>
</table>

6. TEST Diagram



* The front-end characteristics are measured according to the test diagram

7. RF SECTION PERFORMANCE

7-1.VIDEO CHARACTERISTICS

ITEM	SPECIFICATION			UNIT	REMARK
	MIN.	TYP.	MAX.		
Video Modulation	72	80	88	%	Input signal:1Vp-p white stair step or ramp
Video Maximum 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

7-2. SOUND CHARACTERISTICS

ITEM	SPECIFICATION			UNIT	REMARK
	MIN.	TYP.	MAX.		
Audio Modulation	72	90	108	%	Input signal:1.23Vp-p Sine wave 1KHz (100% Mod.=±25KHzp-p dev.)
Audio Maximum Modulation	150				Input signal : 1KHz, Sine wave
Audio Amplitude Frequency Characteristics	-3	+1.0	+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

7-3. 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
Out band spurious	30	-		dB	Measure range:0~1GHz
In band 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

7-4. 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		6	9.5	dBμV	Mode:VCR (at MOD. ON) 0~1GHz ANTENNA-OUT 75Ω Loaded Applied for FCC

8. Tuner Section Performance

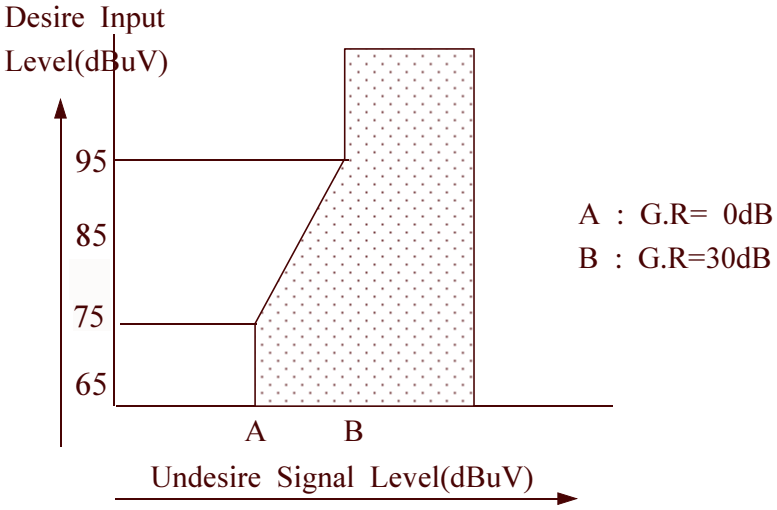
8-1. Rejection characteristics & gain

Parameter			Specification			Unit	Remark
			Min.	Typ.	Max.		
Power Gain	UHF		28	34		dB	
	VHF	High	29	34			
		Low	29	33			
IF Rejection	UHF		60	90	-	dB	
	VHF	High	60	90	-		
		Low	55	80	-		
Image Rejection	UHF		45	60	-	dB	
	VHF	High	50	70	-		
		Low	50	75	-		
CB Rejection			0.535MHz ~ 30MHz -7dBm MIN.			dB	Desire : CH2 ~ CH6 -66dBms/i = 40dB
CH A-5 BEAT			50			dB	ANT INPUT Desired signal:60dBuV
CH6 BEAT			50			dB	ANT INPUT Desired signal:60dBuV Undesired signal:54dBuV

8-2. Tuning margin and cross modulation

Parameter	Band	OSC Freq.	Specification			Unit	Remark
			Min.	Typ.	Max.		
Margin Frequency	VHF LOW	High end	+2	-	-	MHz	
		Low end	+2	-	-		
	VHF HIGH	High end	+1	-	-		
		Low end	+1	-	-		
	UHF	High end	+1	-	-		
		Low end	+1	-	-		

1% Cross Modulation



CH.	A(dBuV)	B(dBuV)
UHF	≥ 65	≥ 84
VHF	≥ 65	≥ 84

Cross modulation value should be within hatched area.

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

9. IF Section performance

When the test electrical characteristics when there are no instruction,
Fp input level is 70dBuV and P/S ratio is -7dB.

9-1. PIF characteristics

Parameter		Specification			Unit	Remark
		Min.	Typ.	Max.		
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.
Video S/N		43	45		dBrms	Input level : 70dBuV HPF : 100KHz, LPF : 4.2MHz SC trap : ON 100% white signal 87.5% mod.
Luminance Sensitivity			45	50	dBuV	HPF : 100KHz, LPF : 4.2MHz SC trap : ON 100% white signal 87.5% mod. RF level at Video S/N = 30dB
Chroma Distortion	DP		5	+10	Deg	10 stair step : 87.5% mod.
	DG		5	+10	%	
Chroma S/N	AM	49	52		dB	100% Chroma Signal (RED) HPF : 100Hz, LPF : 0.5MHz SC trap : OFF
	PM	48	51			
Burst Level		150	250	400	mVp-p	Standard color bar
Y/C Delay		-200	-50	+100	nSec	Input Sin^2 2T Pulse & Bar. Use VM700A(Tektronix)
Video Frequency Response 1.0MHz 2.0MHz 3.0MHz 3.58MHz		 -3.0 -3.0 -4.0 -4.0	 -1.0 -1.0 -1.0 -2.0	 +2.0 +2.0 +2.5 +2.0	dB	Multi-burst Signal : 87.5%mod. 0.5MHz standard

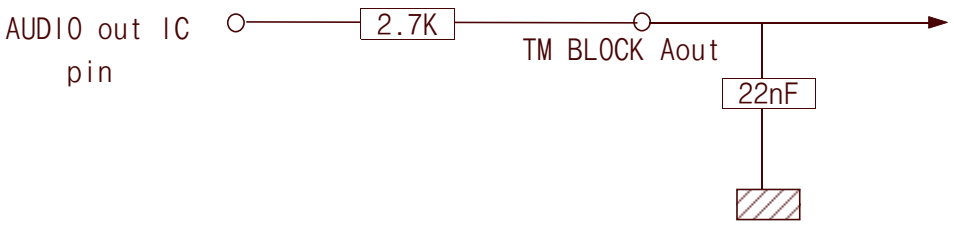
9-2. AFT characteristics

Parameter	Specification			Unit	Remark
	Min.	Typ.	Max.		
AFT Alignment	-50	0	+50	KHz	Center voltage : 2.5V RF input level : 70dBuV P/S = -7dB Standard color bar : 87.5% mod. Testing channel : 11CH[199.25MHz]

9-3. SIF characteristics

Parameter	Specification			Unit	Remark
	Min	Typ	Max		
SIF output level	70	77	-	dBuV	1KHz without FM Modulation Standard color bar : 87.5% De-emphasis ON
Audio output level	200	300	400	mVrms	1KHz/±15KHz FM(60%) Standard color bar : 87.5% mod. De-emphasis ON
Audio Frequency Response 50Hz 10KHz	-3 -3	0 0	+3 +3	dB	1KHz/±15KHz FM Standard color bar : 87.5% mod. Variation from standard De-emphasis ON
Audio S/N ratio	45	48	-	dB	1KHz/±25KHz FM Standard color bar : 87.5% mod. Use CCITT Filter De-emphasis ON
Audio Distortion	-	0.6	3.0	%	1KHz/±25KHz FM(100%) Standard color bar : 87.5% mod. De-emphasis ON

「 Figure A 」



[De-emphasis circuits for Test (Audio)

10. Reliability test

10-1. Environmental 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 hour. 3.Supply voltage : Standard ± 10% 4.Supply voltage cycle : 1.5H ON,0.5H OFF
Humidity Load Time			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 hour. 3.Supply voltage : Standard ± 10% 4.Supply voltage cycle : 1.5H ON, 0.5H 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 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.
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

10-2. Antenna electrostatic surge test

Test condition : Applied 15KV standard pulse 3 times at ANT and IF terminal.(330ohm and 15pF series connect)

Specification : There shall be no trouble on the practical operation.

11. Regulation

* FCC

12. Mechanical Characteristics