TO :

SPECIFICATION

PRODUCT : RF MODULATOR

MODEL : RMUP74055AD

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Model Name : RMUP74055AD

Records of Revision

Date of Revision	Revision No	Description of Revision
APR. 13. 2004	V1.0	First Draft

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1. Scope

This specification outlines the pertinent electrical requirements of the RF output modulator which converts the TV video and TV audio signal into the RF signal for PAL-G/I/K , SECAM-K, NTSC-M color television.

2. General specifications

2-1. Output channel	CCIR 21 -- 69CH
2-2. Outgoing channel	40 channel
2-3. Power supply	BB+ (pin no. 1):Booster power supplies ⇒ 5±0.25V Ripple 10mVp-p MAX. Mod B+(pin no. 4):Modulation block power supplies ⇒ 5±0.25V Ripple 10mVp-p MAX.
2-4. Consumption current	BB+ : 50mA MAX. Mod B+ : 70mA MAX.
2-5. Operating temperature range	Temperature 5 to 65 ℃ , Humidity 80%
2-6. Storage temperature range	Temperature -10 to 70。C, Humidity 80%
2-7. Wave flow Soldering	300 °C for 10 seconds
2-8. The limits of performance guarantee	This specification is applied to CH.40 except channels pointed out especially. Besides it is guaranteed that the other channels fit for practical USE.
2-9. ESD protection	± 4 kV (at RF output connector)

3. Test conditions

3-1. Testing ambient conditions

Defined as temperature of 25±2℃ and humidity of 65±5% RH.

Note: That temperature of 5 ~ 30℃ and humidity of 45 ~ 85% RH may be regarded as standard.

3-2. Unit setting conditions

1) Picture --- Stair-Step signal : 1Vp-p,
and set modulation and V/S ratio standard values.
Note) Modulation setting - white signal, 1Vp-p : V/S = 7/3

2) Sound --- Set 1.23Vp-p of Sine wave 1KHz.

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4. Electrical performance

4-1. Video system characteristics

	parameter	specification			unit	remark
		min	typ	max		
4-1-1	Input impedance	0.7	1.0	1.3	KΩ	Measure at 0 ~ 5MHz
4-1-2	Input signal level		1.0		Vp-p	Negative synchronous
4-1-3	Modulation	70	80	90	%	Outgoing channel
4-1-4	White clip	86		99	%	Input signal : 1.5Vp-p star step or RAMP. Measure at the output of the standard demodulator
4-1-5	Amplitude frequency response	-3		3	dB	Measure multiburst or sweep RF output over a range of 0.5 ~ 5MHz with 1MHz as reference.
4-1-6	Differential gain	-10		10	%	80% modulation depth 10 ~ 90% APL.
4-1-7	Differential phase	-10		10	DEG	80% modulation depth 10 ~ 90% APL.
4-1-8	S/N	48	55		dB	Measure with respect to standard demodulator output. -.Video noisemeter: UPSF2 HPF:200KHz weight on -.Demodulator: EMFT(R/S)
4-1-9	V/S Ratio	6.7 / 3.3	7 / 3	7.3 / 2.7		Input signal : 1Vp-p 100% white V/S = 7/3

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4-2. Sound system characteristics

	parameter	specification			unit	remark
		min	typ	max		
4-2-1	Input impedance	10			KΩ	Measure at 0.1 ~ 10KHz
4-2-2	Modulation	70	90	110	%	100% = ±50KHz
4-2-3	Max modulation		180		%	
4-2-4	Amplitude frequency response	-3		2	dB	Measure deviation from theoretical value of 50usec pre-emphasis character over a range of 100Hz TO 10KHz with 1KHz as reference.
4-2-5	Distortion factor			2	%	Audio input signal : 1.23Vp-p sine wave 1KHz modulation 90% Video input signal : all black (sync. only) USE standard demodulator of inter-carrier system de-emphasis (50usec:PAL) is ON.
4-2-6	S/N	48	57		dB	The same as 4-2-5

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4-3. Output system characteristics

	parameter	specification			unit	remark
		min	typ	max		
4-3-1	Video carrier frequency	-80	Fp	80	KHz	Test at 25℃ temperature and 65%RH of humidity. Fp:623.25MHz
4-3-2	Video output level	66	71	76	dBuV	Outgoing channel (40. CH)
4-3-3	Audio output level	11		19	dB	Programmable via I2C
4-3-4	Sound carrier frequency	-2	Fs	2	KHz	Input signal: none the measurement is taken after 30sec. From the power ON.
4-3-5	Output channel	21	40	69	CH	Measurement difference video of carrier frequency output level for 20 ~ 1GHz. except to Fp,Fp±Fs against video carrier output level.
4-3-6	Output terminal spurious reponse			46	dBuV	
4-3-7	Chroma beat	60			dB	Video input signal : 1Vp-p 4.43MHz sine wave
4-3-8	Output impedance		75		Ω	unbalanced
4-3-9	EN55013-A12-TABLE4 Harmonics level			54	dBuV	75Ω Termination 950 ~ 1750MHz
4-3-10	EN55013-A12-TABLE2 Antena Leakage			46	dBuV	75Ω Termination

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4-4. Booster system characteristics

	parameter	specification			unit	remark
		min	typ	max		
4-4-1	Used frequency	47		862	MHz	
4-4-2	V.S.W.R			4		75Ω termination.
4-4-3	Noise figure			9	dB	Ant → TV
4-4-4	Power gain	-2	2	5	dB	Ant → TV
4-4-5 Inter modul -ation	F1=175MHz , F2=230MHz F(IM2)=55MHz	50			dB	Ant → TV Input level : 80dBuV Mod B+ = off
	F1=600MHz , F2=650MHz F(IM2)=700MHz	50				
	F1=200MHz , F2=210MHz F(IM3)=220MHz	55				

4-5 I^2C Controller bus characteristics

Vcc=5V , TA=25℃ unless otherwise specified.

	parameter	specification			unit	remark
		min	typ	max		
4-5-1	Bus clock frequency			500	KHz	
4-5-2	High level voltage	3		Vcc	V	
4-5-3	Low level voltage	0		1.5	V	
4-5-4	ACK low level		0.4	1	V	
4-5-5	SDA/SCL outputput current	-	-	10	μA	at 0V
4-5-6	SDA/SCL input level	0	-	5.3	V	
4-5-7	SDA/SCL input current for input level from 0.4V to 0.3V Vcc	-5		5	V	

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4-6. Thermal characteristics

	parameter	specification			unit	remark
		min	typ	max		
4-6-1	Thermal stability in video modulation	-10	initial value	10	%	Test at 0℃～60℃ Temperture
4-6-2	Thermal stability in Video carrier frequency	-100	initial value	100	KHz	
4-6-3	Thermal stability in sound modulation	-10	initial value	10	%	
4-6-4	Thermal stability in sound carrier frequency	-7	initial value	7	KHz	
4-6-5	Thermal stability in video carrier level	-5	initial value	5	dB	
4-6-6	Thermal stability in sound output level diffrence	-4	initial value	4	dB	
4-6-7	Thermal stability in differential gain	-15	initial value	15	%	

Unless otherwise specified, The about test should be carried under condition OF +25℃, 1HR (initial value) → +0℃, 1HR → +60℃, 1HR.
humidity 45 ~ 80% RH.

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5. Environment tests

	parameter	specification	unit	remark
5-1	Heat resistance test 1. Video modulation 2. Audio modulation 3. Video carrier frequency 4. Audio carrier frequency 5. Video output level 6. audio output level	 initial ± 10 initial ± 15 initial ± 100 initial ± 10 initial ± 4 initial ± 4	 % % KHz KHz dB dB	A. Environmental conditions temperature: 60±3℃ B. Power supply: OFF C. Measurement: 96 hours D. After using the above conditions, the tested modulation is left for 2.0 hour at normal room temperature E. Humidity: 40% ~ 45%RH
5-2	Cold test	Same as in item 5-1		A. Environmental conditions temperature: -20±3℃ B. C,D,E same as B,C,D,E item 5-1
5-3	Humidity resistance storage test	Same as in item 5-1		A. Environmental conditions temperature: 40±3℃ B. Power supply: ON C,D. same as item 5-1 E. Humidity: 90% ~ 95%RH
5-4	Vibration	The rated perfo-rmance shall be satisfied.	Before measurement of performances, the vibration test fixture is used To give the modulator vibration with total amplitude of 2mm frequency range from 7Hz to 30Hz, once per minute consecutively for 3 minutes in each of three directions X,Y,Z	

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6. PLL FUNCTIONAL DESCRIPTION

6-1. I2C BITS MAP

	Bit 7							Bit 0	ACK
WRITE MODE									
CA - Chip Address	1	1	0	0	1	0	1	0	ACK
C0 - Low Order Bits	0	OSC	ATT	SFD1	SFD0	0	0	0	ACK
C1 - High Order Bits	1	0	SO	0	PS (1)	0	X2(0)	0	ACK
FL - Low Order Bits	N5	N4	N3	N2	N1 (0)	N0 (1)	X1(0)	X0(0)	ACK
FM - High Order Bits	0	TPEN	N11	N10	N9	N8	N7	N6	ACK
READ MODE									
CHIP ADDRESS	1	1	0	0	1	0	1	1	ACK
R-Status byte	-	-	-	-	-	Y2	Y1	OOR	ACK

( ) : Recommend

Notes:

OSC : UHF Oscillator On/Off

ATT : Modulator Output Attenuated (Sound & Video Modulator On/Off)

SFD0-1 : Sound subcarrier frequency control bits.

SO : Sound Oscillator On / Off. PS : Picture to sound carrier ratio

TPEN : Test Pattern enable.

(" 1 " : Test Pattern ON , " 0 " : normal RF out operation)

Y1,Y2 : RF Oscillator operating range information.

OOR : RF Oscillator Out of frequency range information.

N0 ... N11 : UHF frequency programming bits, in steps of 250kHz.

ex) CCIR CH36(591.25MHz) : 1(N11),0,0,1,0,0,1(N5),1,1,1,0,1

Fosc = 2365 × 250kHz = 591.25MHz

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6-2. I2C-bus Programming

6-2-1. WRITE MODE

SOUND		
SFD1	SFD0	Sound sub carrier frequency [MHz]
0	0	4.5
0	1	5.5
1	0	6
1	1	6.5
PS		Picture to Sound Ratio [dB]
0		12
1		16
SO		Sound Oscillator
0		Sound Oscillator ON (Normal mode)
1		Sound Oscillator Disabled(PLL sections bias turned OFF)
UHF		
OSC		UHF Oscillator
0		UHF Oscillator Disabled(PLL sections bias turned OFF)
1		Normal operation
ATT		Modulator Output Attenuation
0		Normal operation
1		Modulator Output Attenuated (Video and Sound Modulators sections bias turned OFF)
STANDBY MODE		
OSC	SO	ATT	Combination of these 3 bits
0	1	1	Modulator Stanby mode(Sound & UHF Osc., Sound & Video Mod. Sections bias turned OFF, and I2C bus sections stanby mode)-BST is active

6-2-2. READ MODE

OOR	
0	Normal operation : VCO is in range
1	VCO is out of range
Y1	
0	VCO is out of range, freq too low ; Only valid if OOR = 1
1	VCO is out of range, freq too high ; Only valid if OOR = 1
Y2	
0	High VCO is active
1	Low VCO is active

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6-3. I2C Write mode format and bus receiver

Example 1	STA	CA	C1	C0	STO		
Example 2	STA	CA	FM	FL	STO		
Example 3	STA	CA	C1	C0	FM	FL	STO
Example 4	STA	CA	FM	FL	C1	C0	STO

STA : Start condition
CA : Chip Address
FM : Frequency information, high order bits
FL : Frequency information, low order bits
C1 : Control information, high order bits
C0 : Control information, low order bits
STO : Stop condition

6-4. Test Mode : VHF Range

X2	X1	X0	RF frequency divided for low frequency testing or VHF range
0	0	0	Normal operation
0	0	1	RF frequency ×1/2
0	1	0	RF frequency ×1/4
0	1	1	RF frequency ×1/8
1	0	0	RF frequency ×1/16

6-5. Timing characteristics

Ref	Symbol	Timing characteristics	Min	Typ	Max	Unit
6.5-1		Bus clock frequency	0	-	800	kHz
6.5-2	Tbuf	Bus free time between stop and start	200	-	-	ns
6.5-3	Tsu:sta	Setup time for start condition	500	-	-	ns
6.5-4	Thd:sta	Hold time for start condition	500	-	-	ns
6.5-5	Tsu:dat	Data setup time	0	-	-	ns
6.5-6	Thd:dat	Data hold time	0	-	-	ns
6.5-7	Tsu:sto	Setup time for stop condition	500	-	-	ns
6.5-8	Thd:sto	Hold time for stop condition	500	-	-	ns
6.5-9	Tack:low	Acknowledge propagation delay	-	-	300	ns
6.5-10		SDA fall time at 3mA sink and 130pF load	-	-	50	ns
6.5-11		SDA fall time at 3mA sink and 400pF load	-	-	80	ns
6.5-12		SDA /SCL rise time	-	-	300	ns
6.5-13		SCL fall time	-	-	300	ns
6.5-14	Tsp	Pulse width of spikes suppressed by the input filter	-	-	50	ns
6.5-15	ci	SDA/SCL capacitance	-	-	10	Pf
6.5-16		ACK low output level (sinking 3mA)	-	0.3	1	V
6.5-17		ACK low output level (sinking 15mA)	-	-	1.5	V

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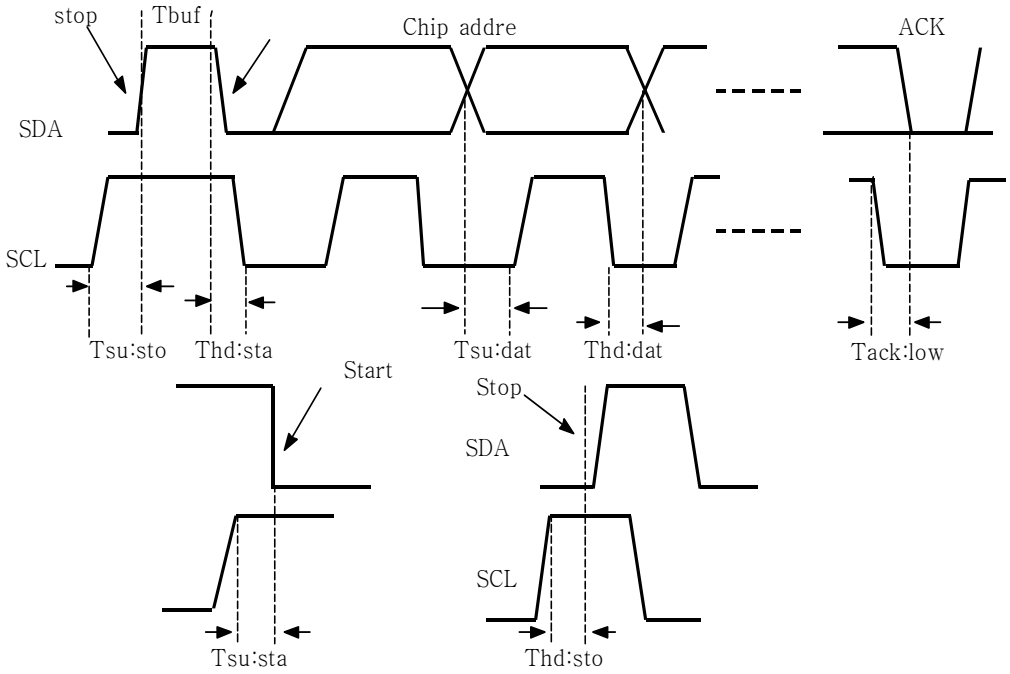
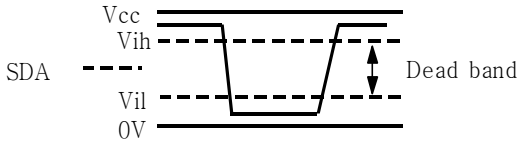
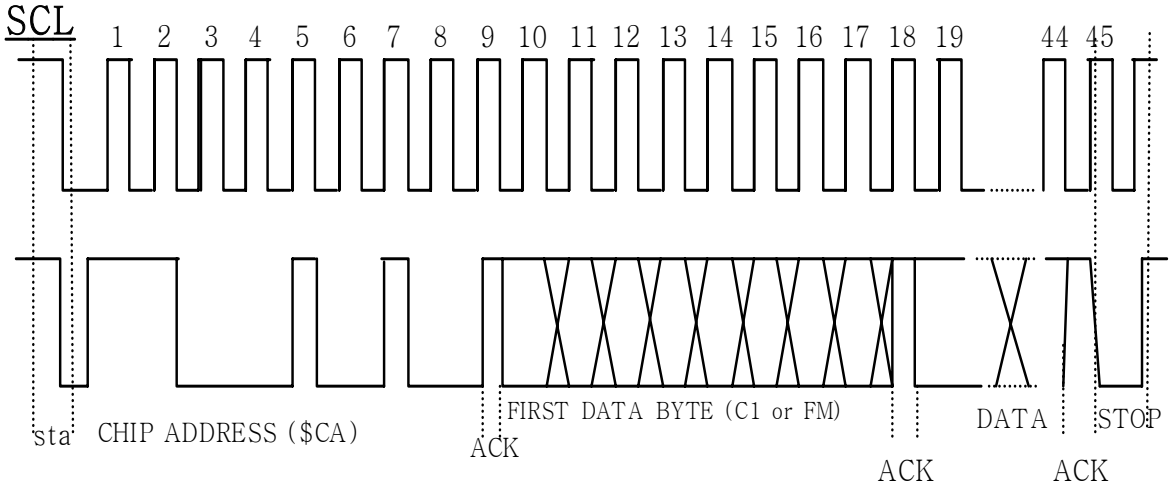
6-6. Timings definition:



6-7. Levels definition :



6-8. High Speed I2C Compatible Format

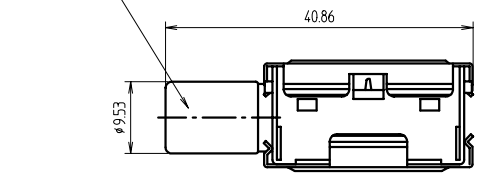


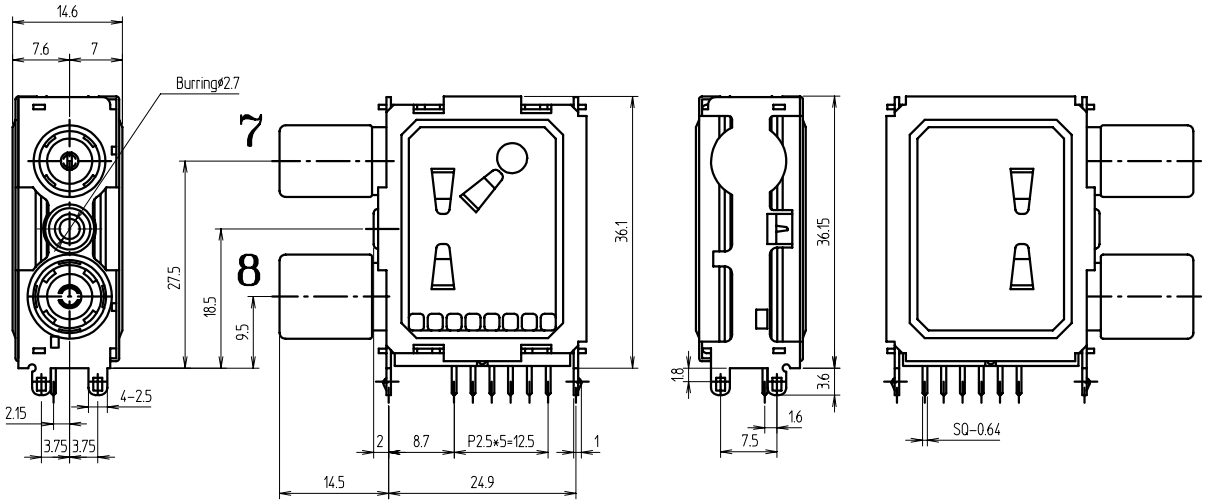
A4

NO	PART NAME	Q'TY	MATERIAL	FINISH	REMARK
	OUTDRAWING				

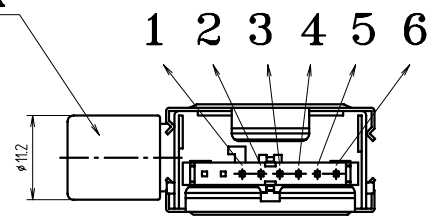
NO	NAME
1	BOOSTER B+
2	VIDEO IN
3	AUDIO IN
4	MOD B+
5	SDA
6	SCL
7	RF-OUTPUT
8	RF-INPUT

DIN-PLUG

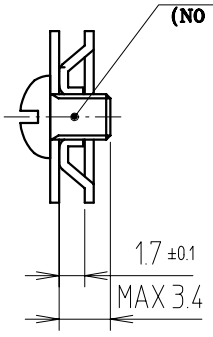




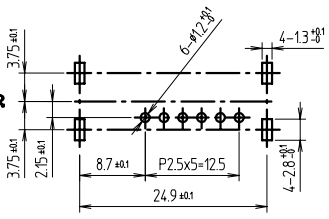
DIN-JACK



BURRING FOR M3
(NO TAPPING)



ANT CENTER



Dimension of P.C.B for RF Modulator Mounting (Viewed from Copper Pattern)

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	H.J.H	H.J.H	J.B.H		MODEL NAME	RF MOD 14SERIES
TOLERANCE	±0.5	2004.04.23	PDM	PDM			SEMCO P/N	RMUP74055AD
		File name	RMUP74055AD					
		3RD ANGLE PROJECTION				NO.	B-10300-12000ZZ-0	

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