VIDEO RF MODULATOR

The KCR102P is a electrical equipments of the video RF output modulator.
The RF output modulator which converters the TV video and TV audio signal into the RF signal for PAL G color television.

FEATURES

- Output Channel : 21~69 CH
- Outgoing Channel : 40 Channel

MAXIMUM RATINGS

CHARACTERISTIC		RATING	UNIT
Power Supply Voltage		5.0±0.25	V
Tunning Voltage		0.6~27	V
Current Consumption	BST.	Max 50	mA
	MOD.	Max 40	
	TUNING	Max 5	
Allowable Ripple Voltage		Max 5	mV_{P-P}
Operation Condition	Temp.	0~60	℃
	Humidity	Max 85	%
Storage Condition	Temp.	-10~70	℃
	Humidity	Max 90	%

ELECTRICAL PERFORMANCE

1. TEST CONDITIONS

CHARACTERISTIC		TEST CONDITION	REMARKS
Ambient Condition	Temperature	25±2℃	That temperature of 5~30℃ and humidity of 45~85% RH may be regarded as standard
	Humidity	65±5% RH	
Video Carrier Frequency (Outgoing Channel)		Min=623.15, Typ=623.25, Max=623.35MHz	Unless otherwise specified, the tests shall be made with the above frequency.
Unit Setting Condition	Picture	Apply 80% modulation color bar signal 1V_{P-P}(unloaded) and set modulation and V/S ratio standard values.	Modulation Setting-White Signal 1V_{P-P}(unloaded) : V/S = 7:3
	Sound	Set 0.98V_{P-P}(-7dBs) of sine wave 1kHz	

2. VIDEO PERFORMANCE

CHARACTERISTIC	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Input Impedance	Frequency 0~5MHz		1		kΩ
Input Signal Level	Mod. Loading		1.0		V_{P-P}
Modulation	Outgoing Channel	70	80	90	%
Amplitude Frequency Response	RF Output : 0.5~5MHz	-4		4	dB
Differential Gain	Superimposed sinuous wave(4.43MHz) is 20% of the step input level. Measure under the APL of 10~90% differential gain of demodulator unit is to be compensated.	-10		10	deg
Differential Phase		-10		10	%
Modulation Variation with Respect to APL	Measure modulation variation over a range of 10~90% APL with respect to 50% APL	-4		4	%
S/N	Use the standard demodulator	45			dB
Video Sync Ratio (V/S)	Input Ratio 7 : 3	6.5/3.5	7/3	7.5/2.5	

3. SOUND PERFORMANCE

CHARACTERISTIC	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Input Impedance	Measure at 0.1~10kHz	10			kΩ
Modulation	50kHz=100%	40	55	70	%
Amplitude Frequency Response	Mea	-4		4	dB
Distortion Factor	Measure deviation from theoretical value of 50μs pre-emphasis character over a range of 300Hz to 10kHz with 1kHz as reference.			4	%
S/N	With Buzz	45			dB

4. OUTPUT PERFORMANCE

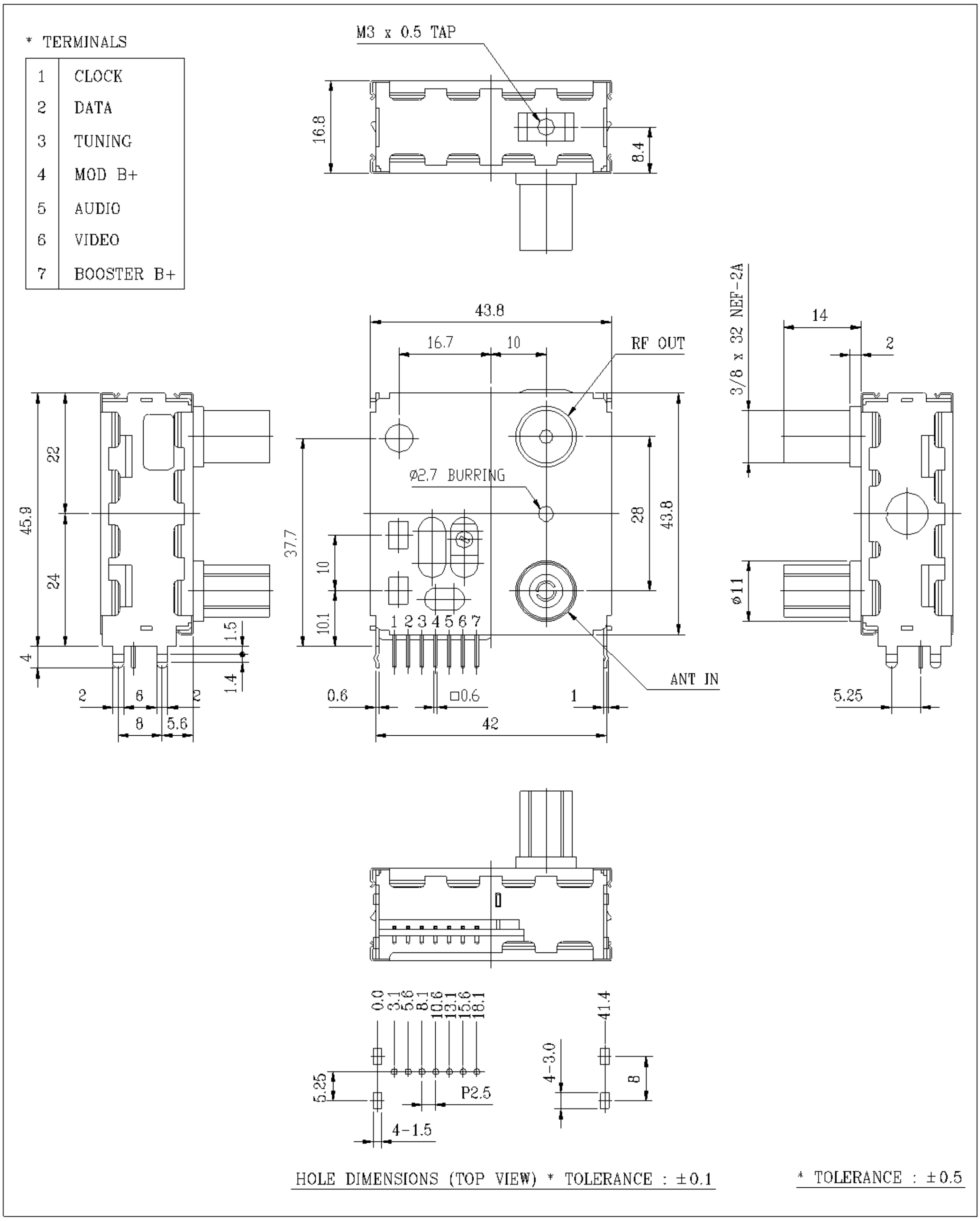
CHARACTERISTIC	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Video Carrier Frequency	Test at 25℃ temperature and 65% RH of humidity. fp : 623.25㎒, fs : 5.5㎒ (G)	-100	fp	100	㎑
Video Output Level		66	72	76	dBμ
Sound Output Level Difference	P/S Ratio	10	14	18	dB
Sound Carrier Frequency		-10	fs	10	㎑
Output Channel	Measurement difference video of carrier frequency output level for 0~1㎓. Except to fp, fp±fs against video carrier output level.	21	40	69	CH
Output Terminal Spurious Response		32			dB
Spurious response within Bandwidth		55			dB
Output Impedance	Unbalanced		75		Ω

5. BOOSTER PERFORMANCE

CHARACTERISTIC		TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Frequency Range			47 470		300 862	㎒
V.S.W.R.		75Ω Termination			4	
Power Gain		ANT--TV 75Ω Termination	-2	2	4	dB
Noise Figure		ANT--TV MOD. B+ : OFF 75Ω Termination			13	dB
Intermodulation	F1 = 175㎒ F2 = 230㎒ F(IM2) = 55㎒	ANT--TV Input level : 80dBμ (75Ω Termination MOD. B+ : OFF	50			dB
	F1 = 200㎒ F2 = 500㎒ F(IM2) = 700㎒		50			
	F1 = 600㎒ F2 = 650㎒ F(IM3) = 700㎒		60			
	F1 = 60㎒ F2 = 55㎒ F(IM3) = 50㎒		60			

6. THERMAL PERFORMANCE

CHARACTERISTIC	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Thermal Stability in Video Modulation	Measure variation with respect to initial value at 0~60℃ outgoing channel. Unless otherwise specified, the about test should be carried under condition of 25℃, 1HR(Initial Value)---0℃, 1HR---25℃, 1HR---60℃, 1HR. Humidity 45~80% RH.	-12	Initial-Value	12	%
Thermal Stability in Video Carrier Frequency		-100	Initial-Value	100	㎑
Thermal Stability in Sound Modulation		-15	Initial-Value	15	%
Thermal Stability in Sound Carrier Frequency		-20	Initial-Value	20	㎑
Thermal Stability in Video Carrier Level		-5	Initial-Value	5	dB
Thermal Stability in Sound Output Level Difference		-4	Initial-Value	4	dB
Thermal Stability in Synchronizing Level		6.5/3.5	7/3	7.5/2.5	
Thermal Stability in Differential Gain		-15	Initial-Value	15	%


* TERMINALS
1 CLOCK
2 DATA
3 TUNING
4 MOD B+
5 AUDIO
6 VIDEO
7 BOOSTER B+
M3 x 0.5 TAP
16.8
8.4
43.8
16.7
10
RF OUT
3/8 x 32 NEF-2A
14
2
Ø2.7 BURRING
45.9
22
24
37.7
28
43.8
10
10.1
1 2 3 4 5 6 7
Ø11
1.5
1.4
4
2
6
2
8
5.6
0.6
□0.6
1
42
ANT IN
5.25
0.0
3.1
5.6
8.1
10.6
13.1
15.6
18.1
41.4
4-3.0
8
5.25
P2.5
4-1.5
HOLE DIMENSIONS (TOP VIEW) * TOLERANCE : ±0.1
* TOLERANCE : ±0.5

I^2C bus programmable modulator for negative video modulation and fm sound

The oscillator frequency is set by a programmable PLL frequency synthesizer in accordance with equation :

$f_{osc} = 8 \times N \times f_{ref}$

Where :

f_{osc} is the local oscillator frequency.

N is a 12-bit dividing number (10 bits are programmable by the I^2C-bus)

f_{ref} is the crystal frequency (4MHz) divided by 128 (31.25KHz)

The circuit allows a step of 250KHz but because only 10bits are programmable, the programming steps are 1MHz.

Where the PLL loop is locked, both inputs of the phase comparator are equal, which gives equation :

$$f_{DIV} = \frac{f_{osc}}{8 \times N} = \frac{f_{xtal}}{128} = f_{ref}$$

During the test mode operation, f_{DIV} and f_{ref} can be monitored on the output Port pin(pin 14).

Software information

The synthesizer is controlled via a two-wire I^2C-bus receiver. For programming, the address byte(C8 HEX) has to be sent first. Then one or two data bytes are used to set the 10 programmable bits of the dividing number N, the test bits(see Table 1) and the output Port state. Note that after power-up of the IC, the two data bytes must be sent.

Table 1 Data format ; notes 1 and 2

BYTE	BIT 7 MSB	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0 LSB	Acknowledge BIT
Address byte C8	1	1	0	0	1	0	0	0	ACK
Data byte 1	0	b11	b10	b9	b8	b7	b6	b5	ACK
Data byte 2	1	T0(3)	T1(3)	T2(3)	P0(4)	b4	b3	b2	ACK

Notes

1. The 10 programmable bits of N are : b2 to b11.
2. Internal hardware sets : b1=0 and b0=1.
3. T0, T1 and T2 are bits used for test purposes(see Table 5).
4. P0 is a bit used for controlling the state of the output Port(see Table 6).

Table 2 Structure of the dividing number N

RESULT	BITS[1]											
	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1[1]	b0[1]
Frequency(MHz)[3]	512	256	128	64	32	16	8	4	2	1	0.5	0.25

Notes

1. Bits b2 to b11 are programmable and represent the integer part of the frequency in MHz. Bits b1 and b0 are fixed internally to b1=0 and b0=1 to get the added 0.25MHz, common for most TV channels.
2. Bits b1 and b0 are not programmable.
3. f_{osc} = 512b11 + 256b10 + 128b9 + 64b8 + 32b7 + 16b6 + 8b5 + 4b4 + 2b3 + b2 + 0.25(MHz)

Table 3 Dividing number N for programmable channel 21 (471.25MHz)

RESULT	BITS[1]											
	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1[1]	b0[1]
Value	0	1	1	1	0	1	0	1	1	1	0	1
Frequency(MHz)[3]	0	256	128	64	0	16	0	4	2	1	0	0.25

Notes

1. Bits b1 and b0 are not programmable.
2. f_{osc} = 0 + 256 + 128 + 64 + 0 + 16 + 0 + 4 + 2 + 1 + 0 + 0.25(MHz) = 471.25MHz

Table 4 Content of the data bytes to programmable channel 21 (471.25MHz)

BYTE	BIT 7 MSB	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0 LSB	Acknowledge BIT
Address byte C8	1	1	0	0	1	0	0	0	ACK
Data byte 1	0	0	1	1	1	0	1	0	ACK
Data byte 2	1	0	0	0	0	1	1	1	ACK

It is possible to change only data byte. The circuit will recognize which one is received with the value of MSB (0 for data byte 1 and byte 2). It is possible to change the frequency by 1 MHz with data byte 2. It is easy to increment the channel frequency when its frequency width is 8 MHz by simply incrementing data byte 1.

The bits T0 to T2 are available for test purposes and the possibilities are shown in Table 5.

Table 5 Test modes

T0	T1	T2	OPERATION MODE
0	0	0	normal operation
0	0	1	Test Pattern Signal Generator (TPSG) on; note 1
0	1	0	RF oscillator off'; note 2
0	1	1	balance test; note 3
1	0	0	f_{ref} out (if p0=0); note 4
1	0	1	high-impedance test; note 5
1	1	0	f_{DIV} out (if p0=0); note 4
1	1	1	phase detector disabled; baseband signals on RF output; note 6

Notes

1. In 'TPSG on' mode the video carrier is modulated by the test signal consisting of synchronization pulse and two vertical white bars on a black screen. This mode should be selected to adjust the TV set receiving the modulated signal to the right frequency.
2. In 'RF oscillator off' mode, the RF oscillator and the RF mixer are switched-off and there is no RF carried coming out of the device. This mode can be selected to avoid RF radiation to other parts when the modulator output is not used.
3. In 'balance test', the video carrier is over modulated. This simplifies residual carrier measurements.
4. In 'f_{ref} and f_{DIV}' modes, the reference frequency f_{ref} in the phase comparator or the divided RF oscillator frequency f_{DIV} is available on the output Port pin. This mode requires that bit P0=0.
5. The 'high-impedance test' mode may be used to inject an external tuning voltage to the RF tank circuit, to test the oscillator. In this mode, the phase detector is disabled and the external transistor of the tuning amplifier is switched-off. The AMP output(pin 7) is LOW(<200mV).
6. In the 'phase detector disabled' mode, it is possible to measure the leakage current at the input of the tuning amplifier, on the CP pin. In this mode the RF oscillator is off, and the baseband TV channel signal is present on the RF outputs for testing the audio and video parts.

The possibilities of bit P0, which controls the output Port (pin 14) are given in Table 6.
The Port is an NPN open-collector type. For monitoring the f_{ref} of f_{DIV} frequency on the output Port, the P0 bit must be logic 0 to let the output Port free.

Table 6 Output Port programming

P0	OUTPUT PORT STATE
0	off; high impedance
1	on; sinking current