

# NTSC/PAL Encoder Monolithic IC MM1394

## Outline

This is an encoder IC that converts luminance signal Y, color difference signals R-Y and B-Y to composite video signals and RGB signals.

## Features

1. Operates on 5V single power supply
2. Low power consumption (265mW : video output ON)  
(165mW : video output OFF)
3. Supports both NTSC and PAL formats
4. Built-in 75Ω drive output (RGB output, composite output)
5. BPF and DELAY filters built-in
6. Built-in oscillator for subcarrier
7. Built-in video output ON/OFF circuit

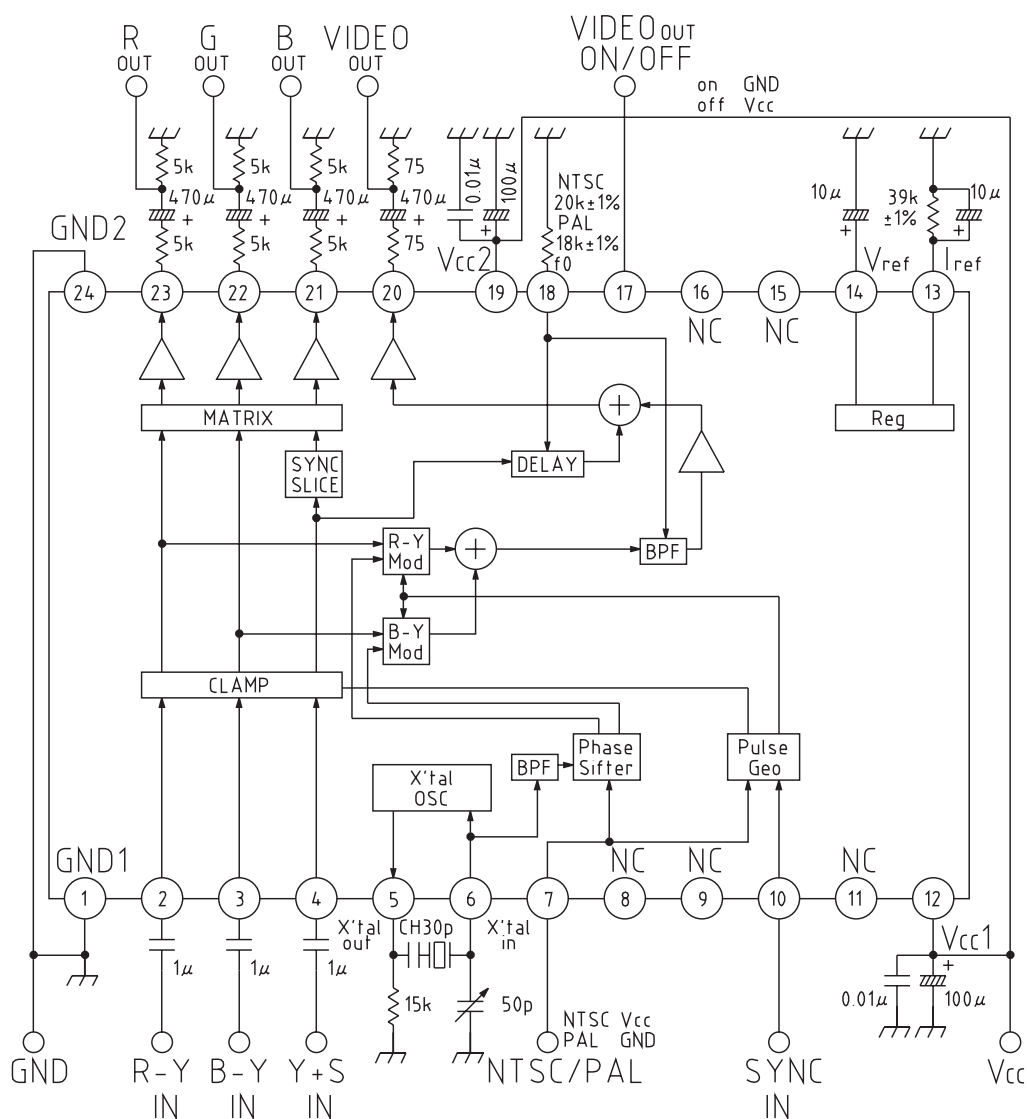
## Package

SOP-24

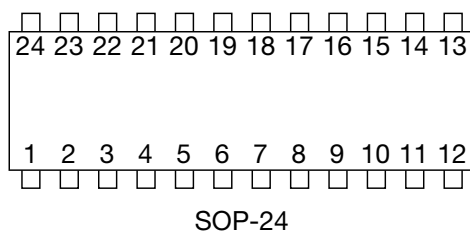
## Applications

1. Game equipment
2. Digital cameras
3. Other video equipment

## Block Diagram



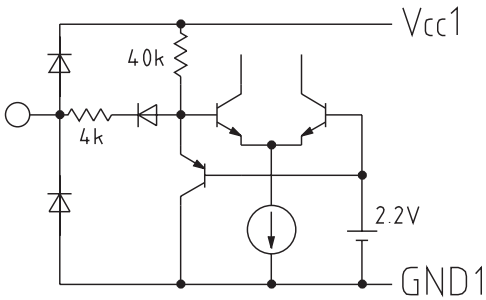
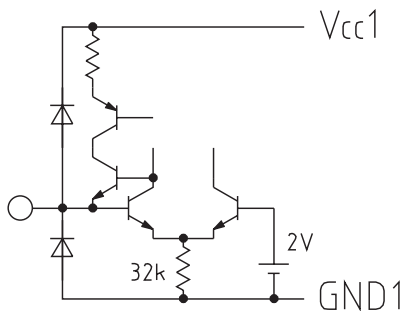
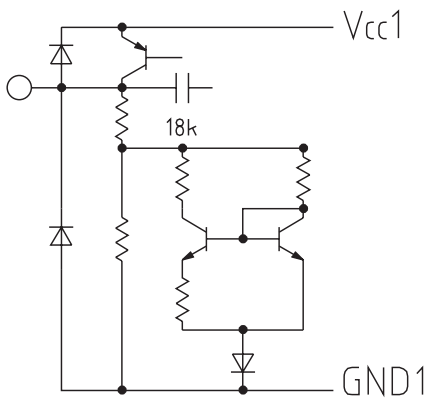
## Pin Assignment



1	GND1	9	NC	17	VIDEO OUT ON/OFF
2	R-Y IN	10	SYNC IN	18	f0
3	B-Y IN	11	NC	19	Vcc2
4	Y+S IN	12	Vcc1	20	VIDEO OUT
5	X'tal OUT	13	Iref	21	B OUT
6	X'tal IN	14	Vref	22	G OUT
7	NTSC/PAL	15	NC	23	R OUT
8	NC	16	NC	24	GND2

# Pin Description

Pin no.	Pin name	Function	Internal equivalent circuit diagram
1	GND1		
2	R-Y <sub>IN</sub>	Input pins. Maximum input voltage : R-Y 1.00V <sub>P-P</sub> B-Y 1.27V <sub>P-P</sub> Y+S 1.00V <sub>P-P</sub> (SYNC is 0.286V <sub>P-P</sub> ) DC level for clamp is 2.2V.	
3	B-Y <sub>IN</sub>		
4	Y+S <sub>IN</sub>		
5	X' tal out	Oscillator circuit output pin	
6	X' tal in	Subcarrier input pin Input a 0.4~1.0V <sub>P-P</sub> sine wave.	
7	NTSC/PAL	Mode setting pin NTSC : Vcc PAL : PAL	

Pin no.	Pin name	Function	Internal equivalent circuit diagram
8 9	NC	OPEN	
10	SYNC <sub>IN</sub>	Composite sync signal input pin	
11	NC	OPEN	
12	Vcc1		
13	Iref	Determines internal reference current. Connect a 47kΩ resistor between this pin and GND.	
14	Vref	Internal reference voltage pin Reference voltage : 4V Connect a 10μF capacitor between this pin and GND.	
15 16	NC	OPEN	

Pin no.	Pin name	Function	Internal equivalent circuit diagram
17	VIDEO OUT ON/OFF	Turns VIDEO output ON/OFF VIDEO output ON : GND OFF : V <sub>CC</sub>	
18	f0	Determines f0 for filter and delay circuits. NTSC : 20k PAL : 16k	
19	V <sub>CC2</sub>	Output stage power supply	
20	VIDEO OUT	Composite video signal output pin Can drive 75Ω load.	
21 22 23	B <sub>OUT</sub> G <sub>OUT</sub> B <sub>OUT</sub>	RGB signal output pin	
24	GND2	Output stage GND	

## Absolute Maximum Ratings (Ta=25°C)

Item	Symbol	Ratings	Units
Storage temperature	T <sub>STG</sub>	-40~+125	°C
Operating temperature	T <sub>OPR</sub>	-20~+75	°C
Power supply voltage	V <sub>CC</sub> max.	+7	V
Allowable loss	P <sub>d</sub>	450	mW

## Recommended Operating Conditions

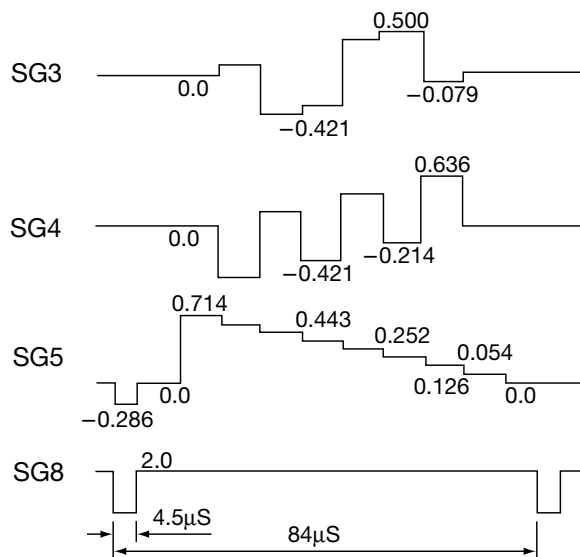
Item	Symbol	Ratings	Units
Operating temperature	T <sub>OPR</sub>	-20~+75	°C
Operating power supply	V <sub>OPR</sub>	4.75~5.25	V

## Electrical Characteristics (Except where noted otherwise, Ta=25°C, V<sub>CC</sub>=5.0V)

Item	Symbol	Measurement pin	Measurement conditions SW conditions SW (S1,S2,S3,S4,S5,S6,S7)	Min.	Typ.	Max.	Units
Consumption current 1	Icc1		V4 : SG6 V5 : SG8 SW (0, 0, 0, 0, 0, 0, 0)	23	33	43	mA
Consumption current 2	Icc2		V4 : SG6 V5 : SG8 SW (0, 0, 0, 0, 0, 1, 0)	14	20	26	mA
RGB output characteristics							
R output voltage	VR	D	V1 : SG3 V2 : SG4 V3 : SG5 SW (1, 0, 0, 0, 0, 0, 0)	0.64	0.71	0.78	V <sub>P-P</sub>
G output voltage	VG	C					
B output voltage	VB	B					
Rf characteristic	fR	D	V3 : SG2/SG1 V4 : SG6 SW (1, 1, 0, 0, 1, 0, 0) R, B frequency response Va=2.0V G frequency response Va=2.9V	-3.0 *1			dB
Gf characteristic	fG	C					
Bf characteristic	fB	B					
Red-1 level ratio	CL (R1)	A		2.62	2.92	3.21	
Red-1 phase	CP (R1)			94	104	114	deg
Red-2 level ratio	CL (R2)			2.62	2.92	3.21	
Red-2 phase	CP (R2)			2.46	2.56	2.66	deg
Green-1 level ratio	CL (G1)			2.46	2.74	3.02	
Green-1 phase	CP (G1)			231	241	251	deg
Green-2 level ratio	CL (G2)			2.46	2.74	3.02	
Green-2 phase	CP (G2)			109	119	129	deg
Blue-1 level ratio	CL (B1)			1.87	2.08	2.29	
Blue-1 phase	CP (B1)			337	347	357	deg
Blue-2 level ratio	CL (B2)			1.87	2.08	2.29	
Blue-2 phase	CP (B2)			3	13	23	deg
NTSC / PAL							
Burst position	td	A	V1 : SG3 V2 : SG4 V3 : SG5 V4 : SG6 V5 : SG8 SW (1, 0, 0, 0, 0, 0, 0) *6	0.4	0.6	0.75	μS
Burst width	tw			2.3	2.55	3.0	μS
Carrier leak	VL	A	V1, 2, 3 : no signal V4 : SG6 V5 : SG8 SW (1, 0, 0, 0, 0, 0, 0) *7			30	mV <sub>P-P</sub>
Oscillation circuit							
Gain	Gain	E	V1, 2, 3 : no signal V4 : SG9 V5 : SG8 SW (1, 0, 0, 0, 0, 0, 0)	8.5	9.5	10.5	dB
Phase		P			65		deg

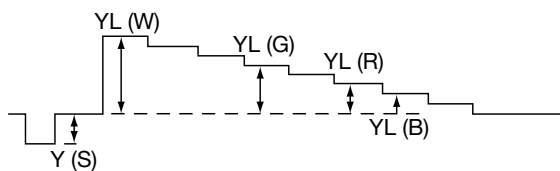
# Input Conditions

Symbol	Signal
SG1	sine wave 0.7V <sub>P-P</sub> f=200kHz
SG2	sine wave 0.7V <sub>P-P</sub> f=5kHz
SG3	color bar R-Y signal 1V <sub>P-P</sub>
SG4	color bar B-Y signal 1.27V <sub>P-P</sub>
SG5	color bar Y+S signal 1V <sub>P-P</sub>
SG6	sine wave 0.5V <sub>P-P</sub> f=3.58MHz
SG7	sine wave 0.5V <sub>P-P</sub> f=4.43MHz
SG8	0.8V-2.0V composite sync signal
SG9	sine wave 30mV <sub>P-P</sub> f=4.43MHz
SG10	white signal 1161RE



Note 1 : \*1 Frequency response is calculated at 20Log (5MHz output voltage/200kHz output 5MHz).

Note 2 : \*2 Luminance level measurement

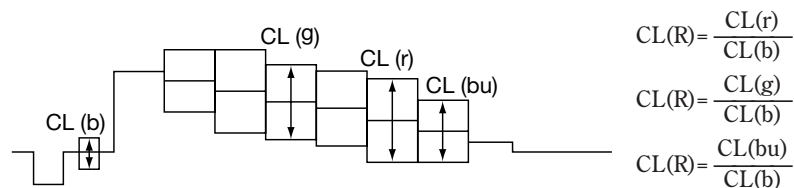


Note 3 : \*3 Frequency response is calculated at 20Log (5MHz output voltage/200kHz output 5MHz).

Note 4 : \*4 Chroma signal measurement (NTSC mode)

Chroma level ratio is the ratio between each color signal level and burst signal level.

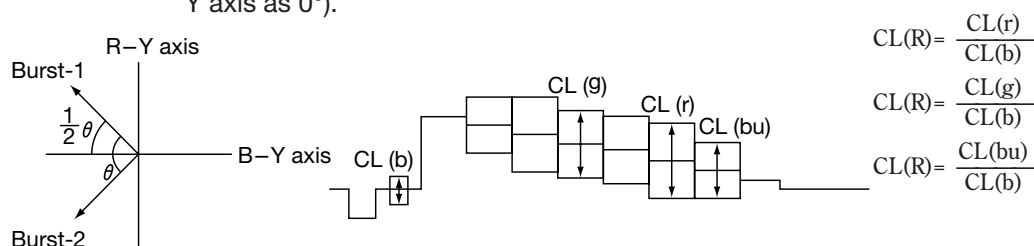
Each color phase is 180° from burst signal phase (given B-Y axis as 0°).



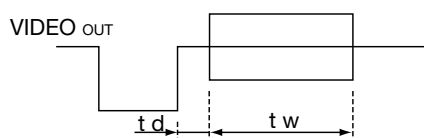
Note 5 : \*5 Chroma signal measurement (PAL mode)

Assume burst 135° side signal as color-1, and burst 225° side signal as color-2.

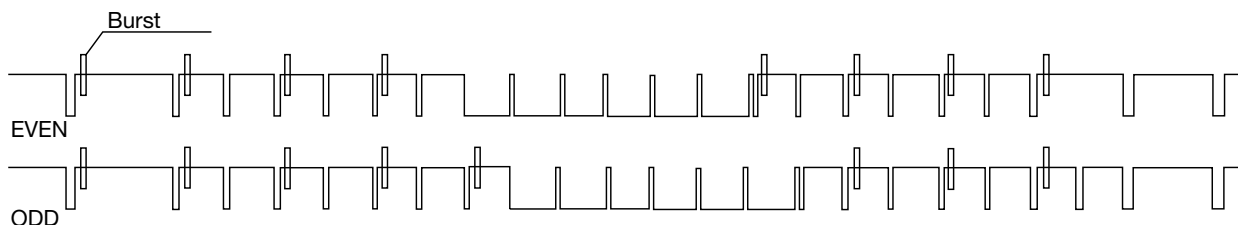
Phase measurement is done assuming the middle of burst-1 and burst-2 phase as 180° (given B-Y axis as 0°).



Note 6 : \*6 Burst signal

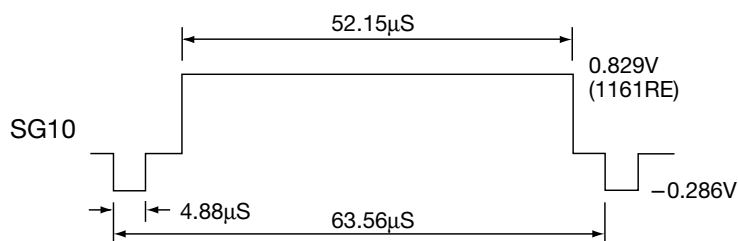


Note 7 : \*7 3.58MHz component level for RGB input no signal.



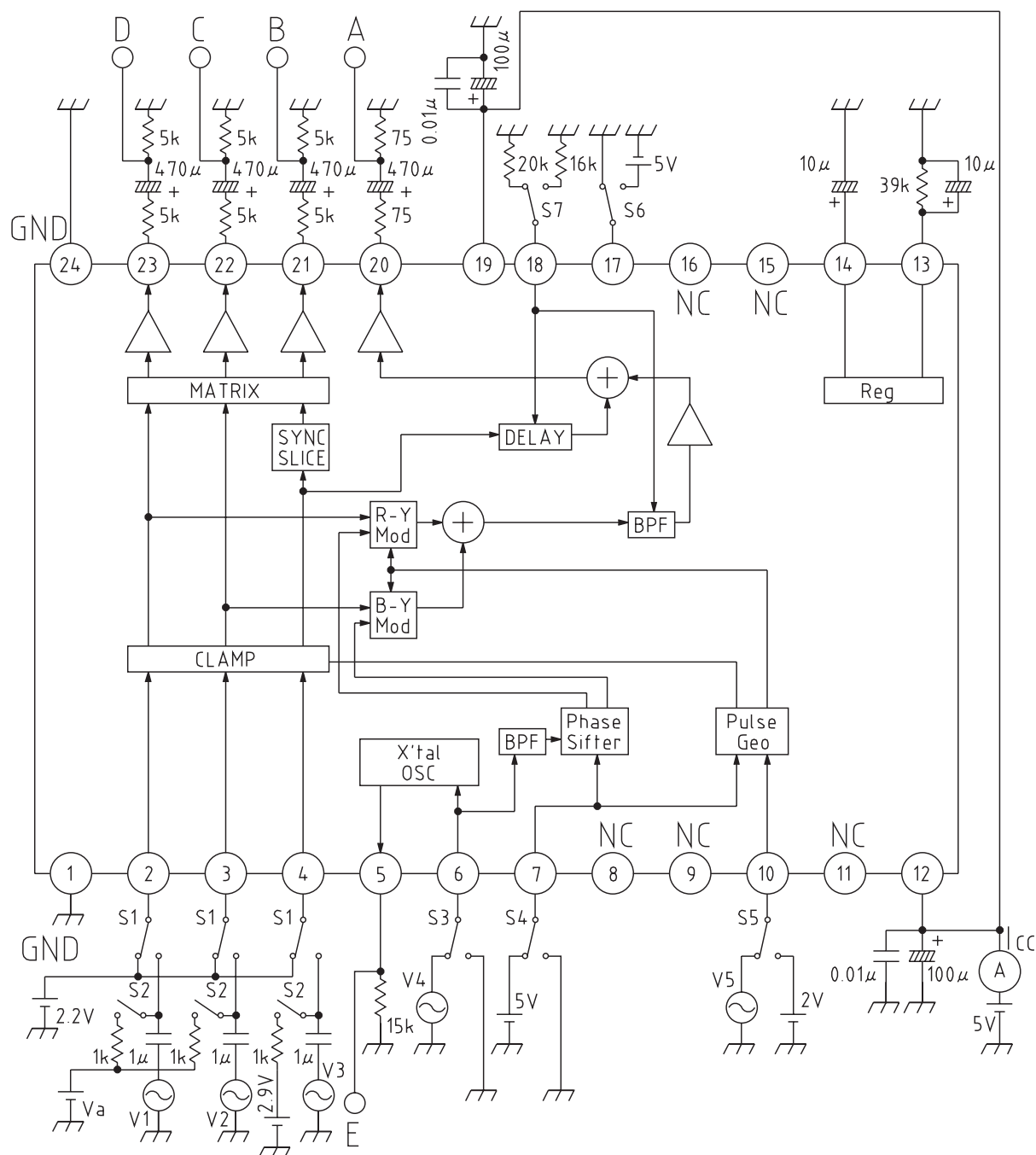
Note 8 : \*8 Input dynamic range measurement

Input the signal shown below and measure video output sync level. Sync level between 0.26~0.33V is acceptable.



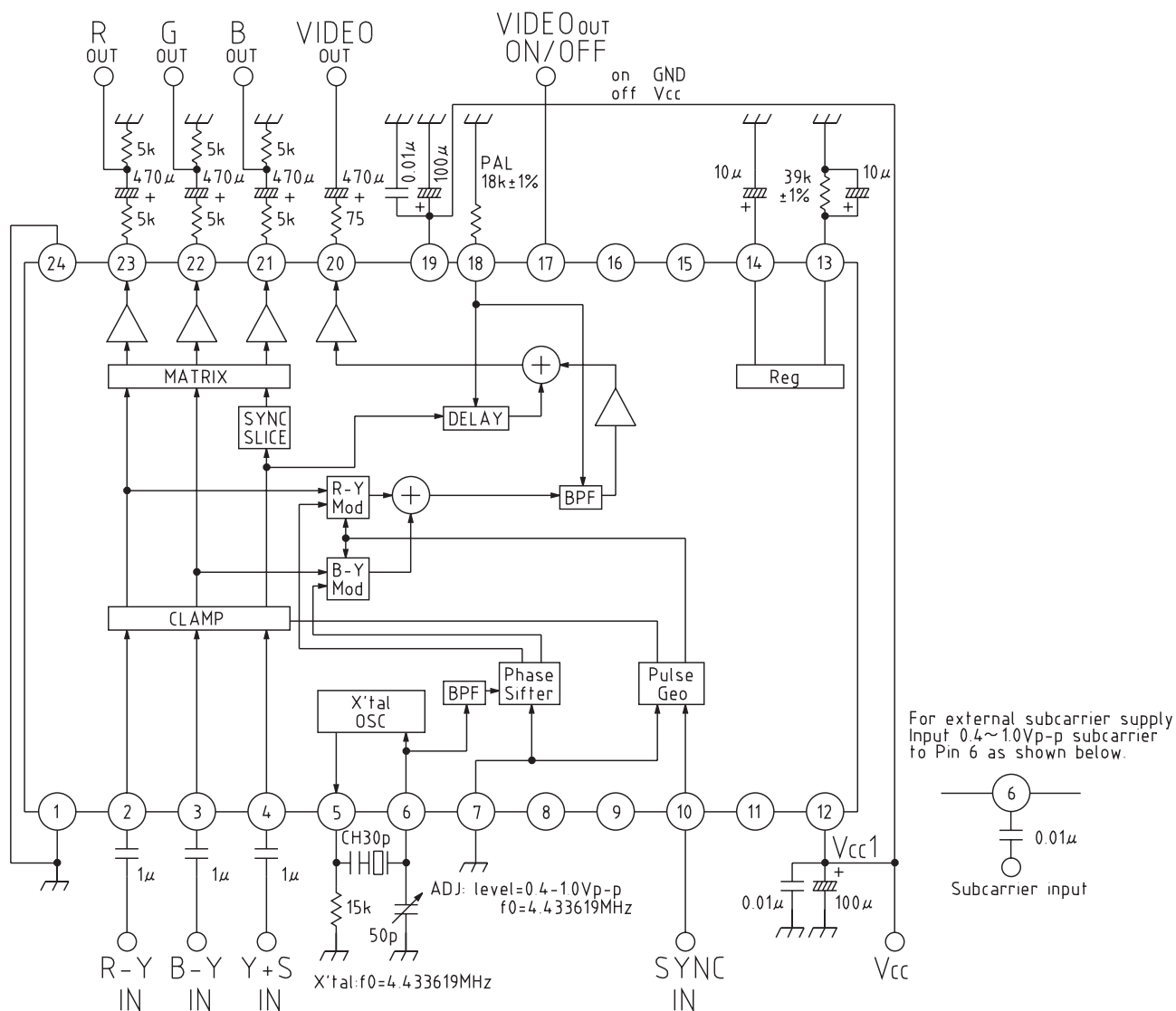


**Measuring Circuit** SW conditions : SW status in the circuit diagram below is SW (0,0,0,0,0,0).



## Application Circuits

### NTSC mode



# Application Circuits

## PAL mode

