

# NTSC/PAL Encoder Monolithic IC MM1394

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## Outline

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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

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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

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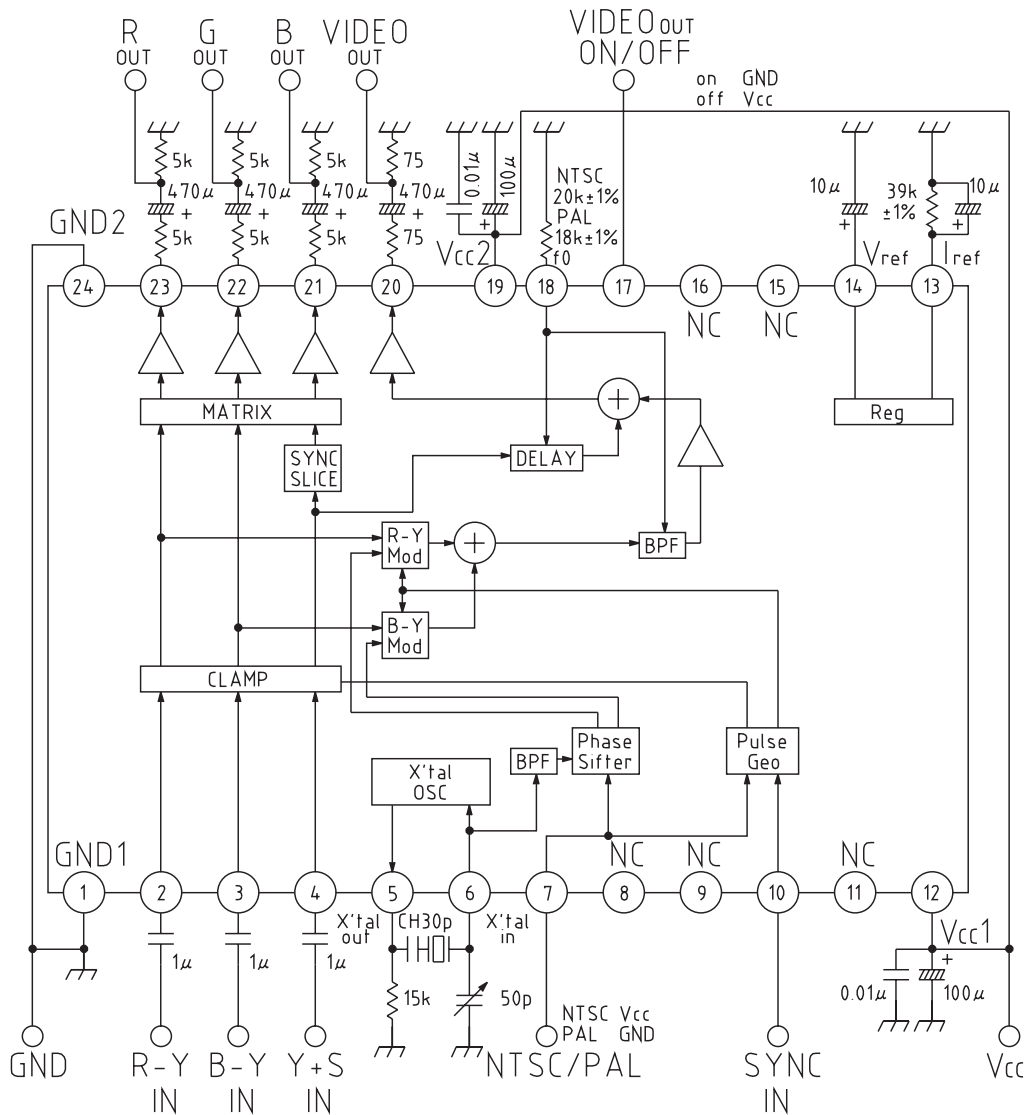
SOP-24

## Applications

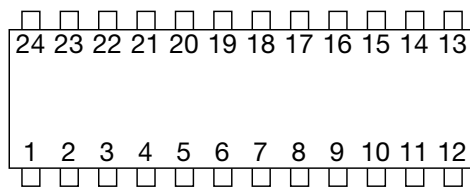
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1. Game equipment
  2. Digital cameras
  3. Other video equipment
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Block Diagram



Pin Assignment



SOP-24

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 3 4	R-Y <sub>IN</sub> B-Y <sub>IN</sub> Y+S <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.	
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 : Vcc	
18	f0	Determines f0 for filter and delay circuits. NTSC : 20k PAL : 16k	
19	Vcc2	Output stage power supply	
20	VIDEO OUT	Composite video signal output pin Can drive 75Ω load.	
21 22 23	BOUT GOUT BOUT	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 max.</sub>	+7	V
Allowable loss	P <sub>d</sub>	450	mW

**Recommended Operating Conditions**

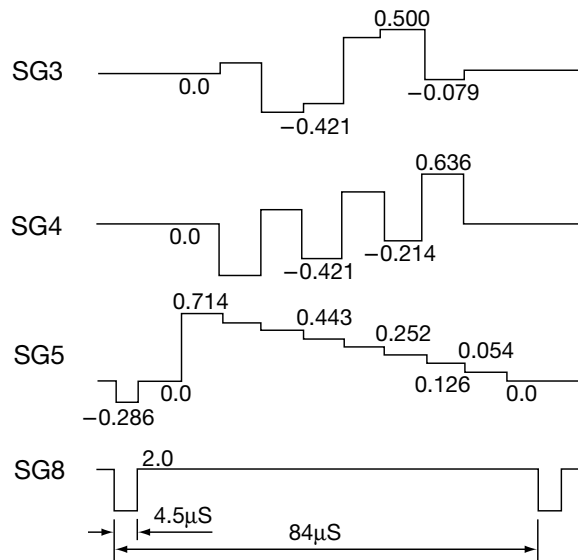
Item	Symbol	Ratings	Units
Operating temperature	T <sub>OPR</sub>	-20~+75	°C
Operating power supply	V <sub>OPR</sub>	4.75~5.25	V

**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	I <sub>CC1</sub>		V4 : SG6 V5 : SG8 SW (0, 0, 0, 0, 0, 0, 0)	23	33	43	mA		
Consumption current 2	I <sub>CC2</sub>		V4 : SG6 V5 : SG8 SW (0, 0, 0, 0, 0, 1, 0)	14	20	26	mA		
<b>RGB output characteristics</b>									
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	*		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		
<b>NTSC / PAL</b>									
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>
<b>Oscillation circuit</b>									
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	

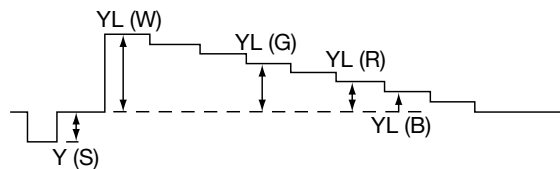
**Input Conditions**

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).

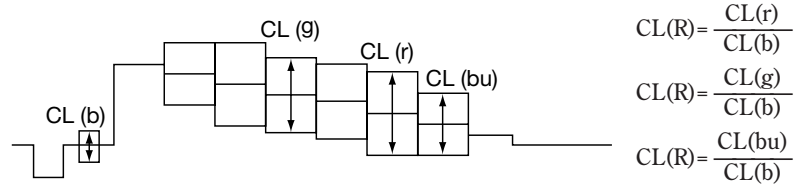
Note 2 : \*2 Luminance level measurement



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

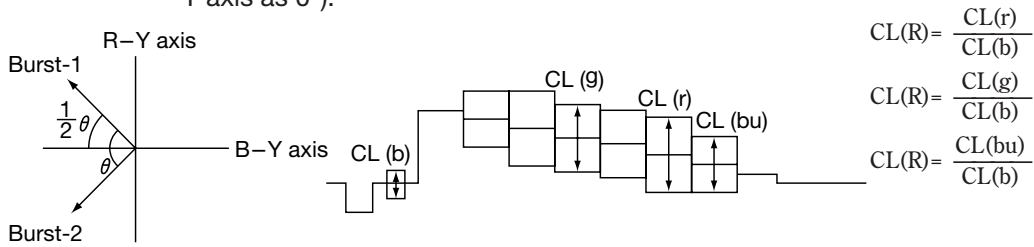
Note 4 : \*4 Chroma signal measurement (NTSC mode)

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°).

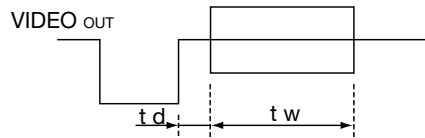


Note 5 : \*5 Chroma signal measurement (PAL mode)

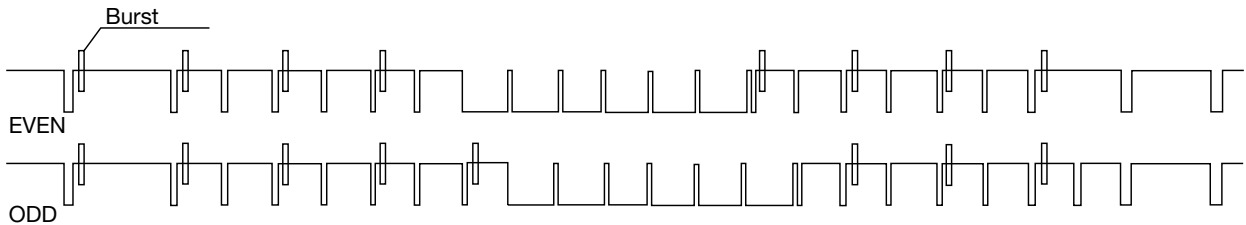
Assume burst 135° side signal as color-1, and burst 225° side signal as color-2.  
 Phase measurement is done assuming the middle of burst-1 and burst-2 phase as 180° (given B-Y axis as 0°).



Note 6 : \*6 Burst signal

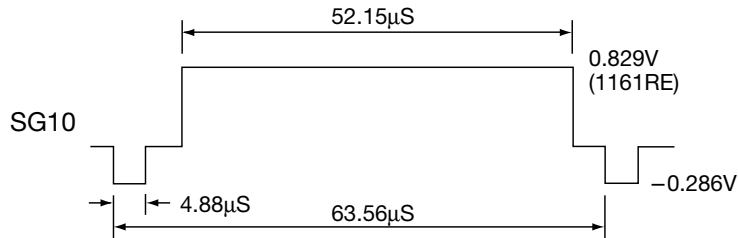


Note 7 : \*7 3.58MHz component level for RGB input no signal.



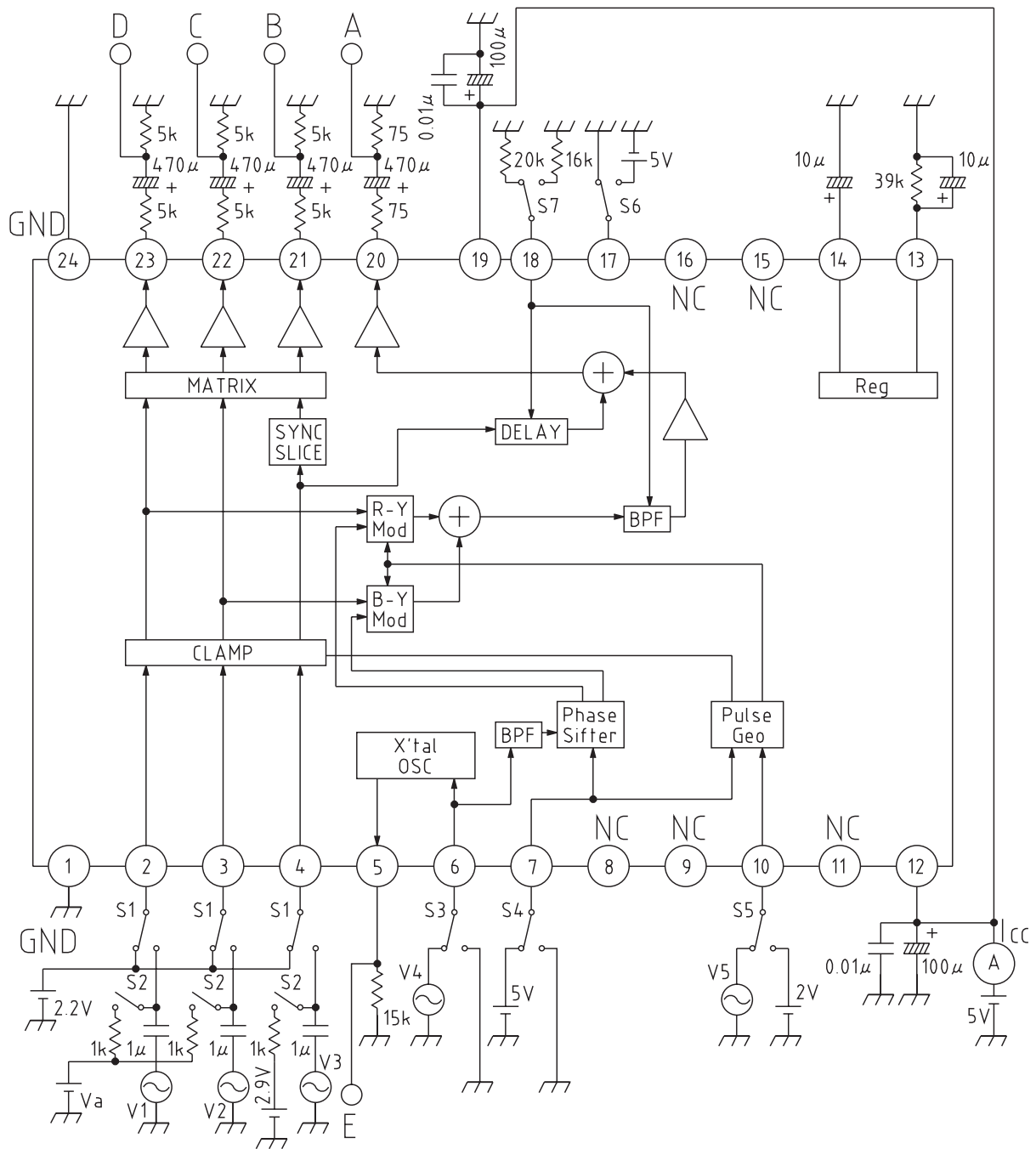
Note 8 : \*8 Input dynamic range measurement

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



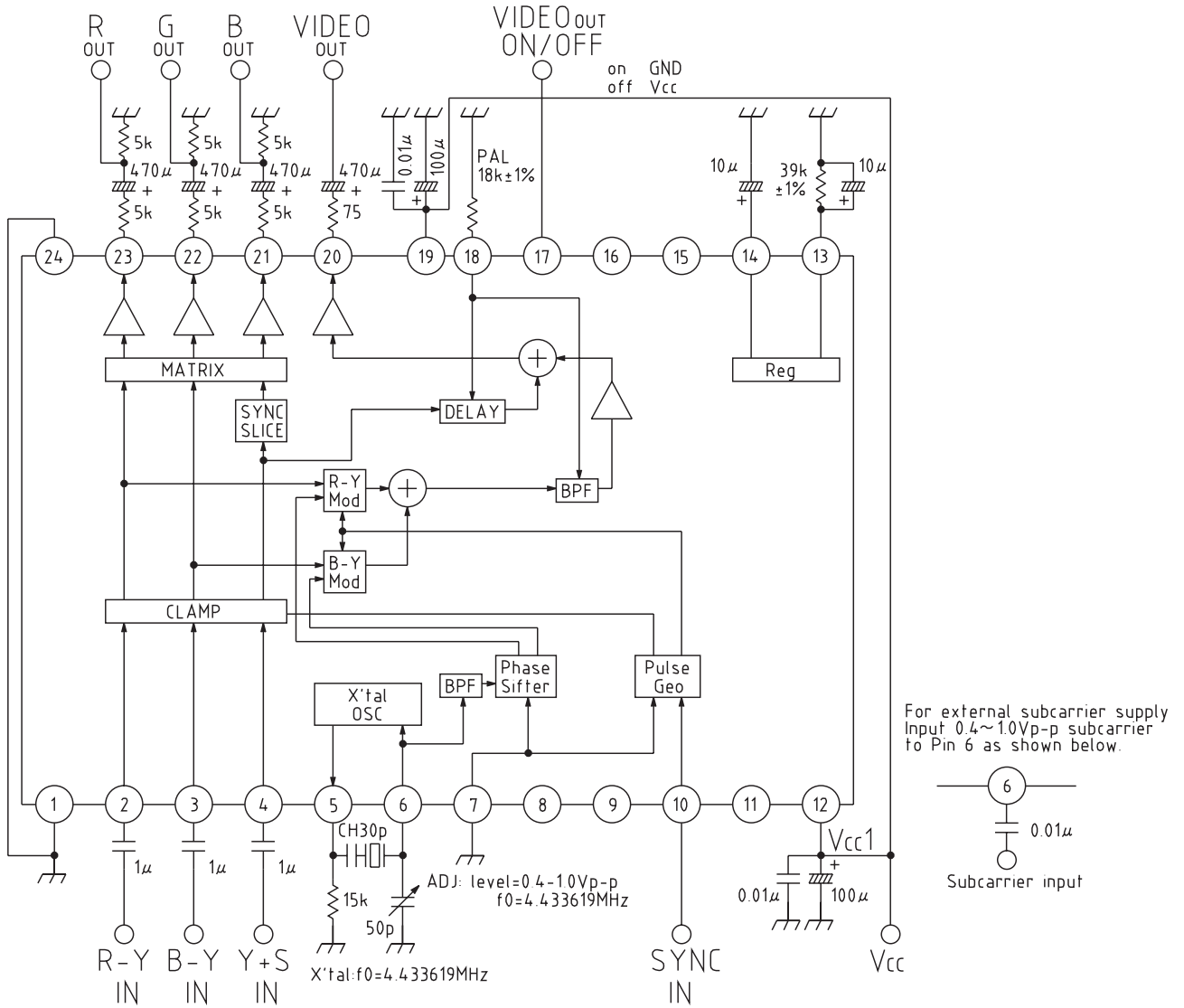


**Measuring Circuit** SW conditions : SW status in the circuit diagram below is SW (0,0,0,0,0,0).



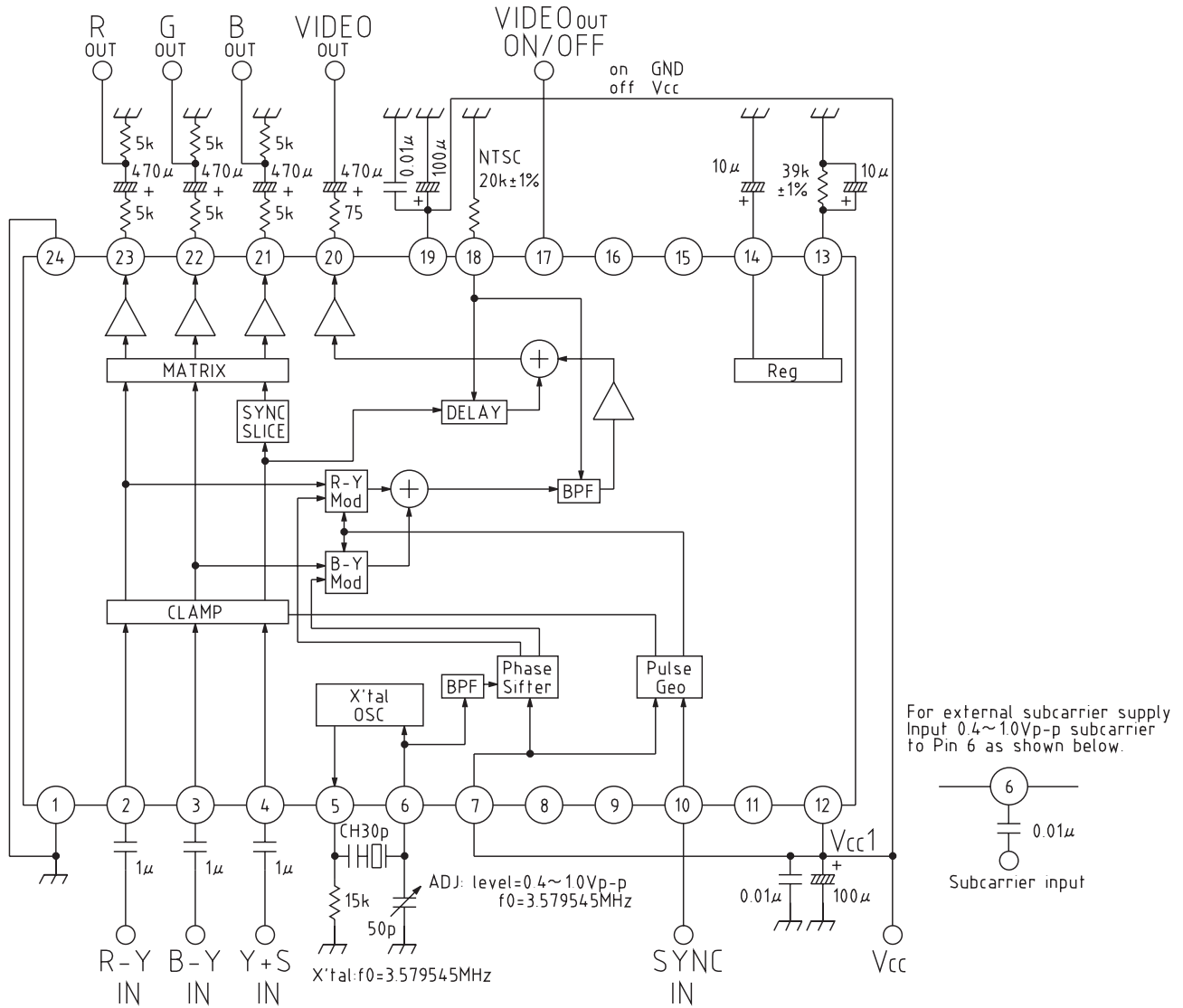
Application Circuits

NTSC mode



Application Circuits

PAL mode



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