

# Color TV Signal Encoder

## BA7232FS

The BA7232FS converts analog RGB signals into color TV signals in the NTSC and PAL formats. From inputs of analog RGB signals, a composite synch signal, burst pulses and a color carrier, this IC generates a color TV signal, and can be adapted for either NTSC or PAL standards, which are selected externally. When set to PAL, the BA7232FS changes chroma phase according to the burst flag pulses.

The chroma signals and luminosity signals can be combined into a color TV signal or output separately, making this IC suitable for S pins. Also, this IC comes with an output pin for the analog RGB signal. Each output has a built-in 75  $\Omega$  driver.

### ●Applications

TV peripherals

### ●Features

- 1) Can be adapted for NTSC and PAL formats.
- 2) Internal flip-flop for PAL phase switching.
- 3) Separate Y/C output pins.
- 4) Analog RGB signal output pins.
- 5) Internal 75  $\Omega$  driver. (outputs color TV signals, luminosity signals, chroma signals and analog RGB signals)
- 6) Adaptable for color subcarrier pulse input.

### ●Absolute maximum ratings (Ta = 25°C)

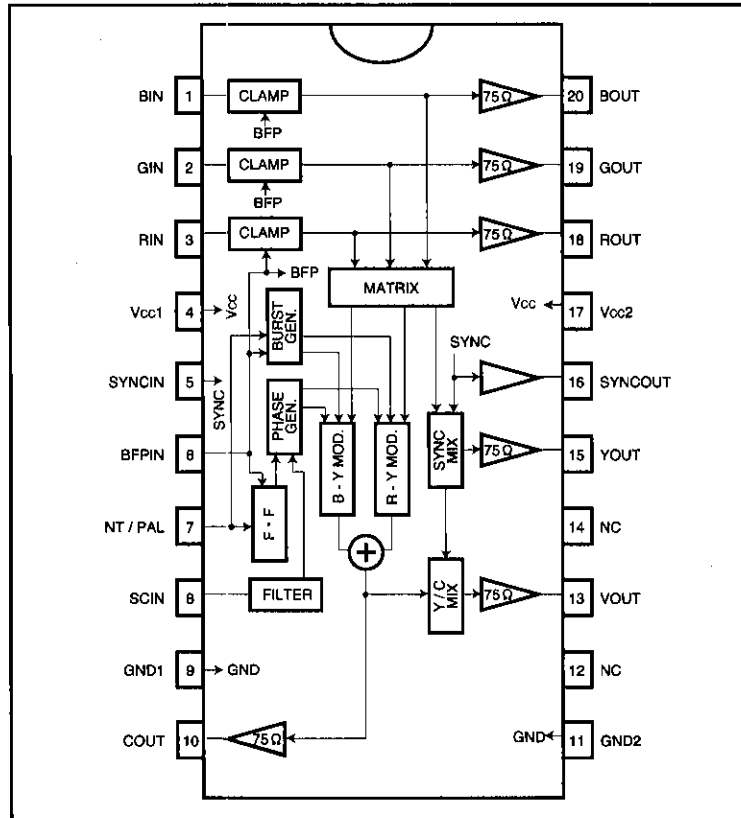
Parameter	Symbol	Limits	Unit
Power supply voltage	V <sub>CC</sub>	7	V
Power dissipation	P <sub>d</sub>	750 *	mW
Operating temperature range	T <sub>opr</sub>	-20~70	°C
Storage temperature range	T <sub>stg</sub>	-55~125	°C

\* Reduced by 7.5 mW for each increase in Ta of 1°C over 25°C.  
When mounted to a 50 × 50 × 1.6 mm glass epoxy board.

### ●Recommended operating conditions (Ta = 25°C)

Parameter	Symbol	Limits	Unit
Supply voltage	V <sub>CC</sub>	4.5~5.5	V
RIN input level	v <sub>RI</sub>	0~0.7	V <sub>P-P</sub>
GIN input level	v <sub>GI</sub>	0~0.7	V <sub>P-P</sub>
BIN input level	v <sub>BI</sub>	0~0.7	V <sub>P-P</sub>
SCIN input level	v <sub>SC</sub>	0.45~0.6	V <sub>P-P</sub>

●Block diagram



## ● Pin descriptions

Pin No.	Pin name	Function
1	BIN	Analog B signal input
2	GIN	Analog G signal input
3	RIN	Analog R signal input
4	Vcc1	Vcc for all drivers other than the 75 $\Omega$ driver
5	SYNCIN	Composite synchronization signal input (negative logic)
6	BFPIN	Burst flag pulse input (negative logic)
7	NT / PAL	Selecting the type of color TV signal output (high = NTSC, low = PAL)
8	SCIN	Color subcarrier input
9	GND1	Ground for all drivers other than the 75 $\Omega$ driver
10	COOUT	Chroma signal output. Internal 75 $\Omega$ driver.
11	GND2	Ground for the 75 $\Omega$ driver
12	NC	This pin is not connected inside the IC.
13	VOOUT	Color TV signal output. Internal 75 $\Omega$ driver.
14	NC	This pin is not connected inside the IC.
15	YOUT	Luminance signal output. Internal 75 $\Omega$ driver.
16	SYNCOUT	Composite synchronization signal output
17	Vcc2	Vcc for all drivers other than the 75 $\Omega$ driver
18	ROUT	Analog R signal output. Internal 75 $\Omega$ driver
19	GOUT	Analog G signal output. Internal 75 $\Omega$ driver.
20	BOUT	Analog B signal output. Internal 75 $\Omega$ driver.

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● Electrical characteristics (unless otherwise noted, Ta = 25°C, Vcc = 5V, XTAL = 3.58MHz)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	Measurement Circuit	
Supply current	I <sub>CC</sub>	33.0	48.0	63.0	mA		Fig.1	
YOUT VOUT	Luminance level	V <sub>L</sub>	0.63	0.70	0.77	V <sub>P-P</sub>	V <sub>RI</sub> = V <sub>GI</sub> = V <sub>BI</sub> = 0.7V <sub>P-P</sub>	Fig.1
	Luminance level R	V <sub>L (R)</sub>	0.19	0.21	0.23	V <sub>P-P</sub>	V <sub>RI</sub> = 0.7V <sub>P-P</sub> *1	Fig.1
	Luminance level G	V <sub>L (G)</sub>	0.37	0.41	0.45	V <sub>P-P</sub>	V <sub>GI</sub> = 0.7V <sub>P-P</sub> *1	Fig.1
	Luminance level B	V <sub>L (B)</sub>	0.07	0.08	0.09	V <sub>P-P</sub>	V <sub>BI</sub> = 0.7V <sub>P-P</sub> *1	Fig.1
	Synchronization level	V <sub>S</sub>	0.27	0.30	0.33	V <sub>P-P</sub>		Fig.1
	Synchronization/ luminance level ratio	R <sub>S/L</sub>	0.38	0.43	0.48		R <sub>Y0</sub> = V <sub>YS</sub> / V <sub>YL</sub>	Fig.1
COUT VOUT	R/burst level ratio	R <sub>R/BU</sub>	2.84	3.16	3.48		V <sub>RI</sub> = 0.7V <sub>P-P</sub> *1	Fig.1
	G/burst level ratio	R <sub>G/BU</sub>	2.65	2.95	3.25		V <sub>GI</sub> = 0.7V <sub>P-P</sub> *1	Fig.1
	B/burst level ratio	R <sub>B/BU</sub>	2.01	2.24	2.47		V <sub>BI</sub> = 0.7V <sub>P-P</sub> *1	Fig.1
	R phase	θ <sub>R</sub>	94	104	114	deg	*1	Fig.1
	G phase	θ <sub>G</sub>	231	241	251	deg	*1	Fig.1
	B phase	θ <sub>B</sub>	337	347	357	deg	*1	Fig.1
	Burst level	V <sub>BU</sub>	0.26	0.29	0.32	V <sub>P-P</sub>	*3	Fig.1
	Carrier leak	V <sub>CL</sub>	—	—	35	mV <sub>P-P</sub>	*2	Fig.1
	PAL burst phase	θ <sub>BU+</sub>	125	135	145	deg	SW1 = 2 *1	Fig.1
		θ <sub>BU-</sub>	215	225	235	deg	SW1 = 2 *1	Fig.1
PAL burst level ratio	R <sub>BU</sub>	0.9	1.0	1.1		SW1 = 2 *1	Fig.1	
SYNCOUT	Output level (HIGH)		2.00	2.50	5.00	V		Fig.1
	Output level (LOW)		0	—	0.40	V		Fig.1
ROUT output level	V <sub>RO</sub>	0.63	0.70	0.77	V <sub>P-P</sub>	V <sub>RI</sub> = 0.7V <sub>P-P</sub>	Fig.1	
GOUT output level	V <sub>GO</sub>	0.63	0.70	0.77	V <sub>P-P</sub>	V <sub>GI</sub> = 0.7V <sub>P-P</sub>	Fig.1	
BOUT output level	V <sub>BO</sub>	0.63	0.70	0.77	V <sub>P-P</sub>	V <sub>BI</sub> = 0.7V <sub>P-P</sub>	Fig.1	
YOUT DC voltage	V <sub>YO</sub>	1.60	2.00	2.40	V		Fig.1	
COUT DC voltage	V <sub>CO</sub>	2.20	2.60	3.00	V		Fig.1	
VOUT DC voltage	V <sub>VO</sub>	1.35	1.75	2.15	V		Fig.1	
ROUT DC voltage	V <sub>RO</sub>	1.25	1.65	2.05	V		Fig.1	
GOUT DC voltage	V <sub>GO</sub>	1.25	1.65	2.05	V		Fig.1	
BOUT DC voltage	V <sub>BO</sub>	1.25	1.65	2.05	V		Fig.1	
Input voltage "L" level SYNC, BFP, NT / PAL	V <sub>IL</sub>	—	—	0.8	V		Fig.1	
Input voltage "H" level SYNC, BFP, NT / PAL	V <sub>IH</sub>	2.2	—	—	V		Fig.1	
Input impedance SYNC, BFP, NT / PAL	Z <sub>I</sub>	8	13.5	—	kΩ		Fig.1	

\* 1 Guaranteed performance.

\* 2 Measured 3.5 [μ]S after burst with a 3.58 MHz BPF.

\* 3 Measured with a 3.58 MHz BPF.

© Not designed for radiation resistance.

● Measurement circuit

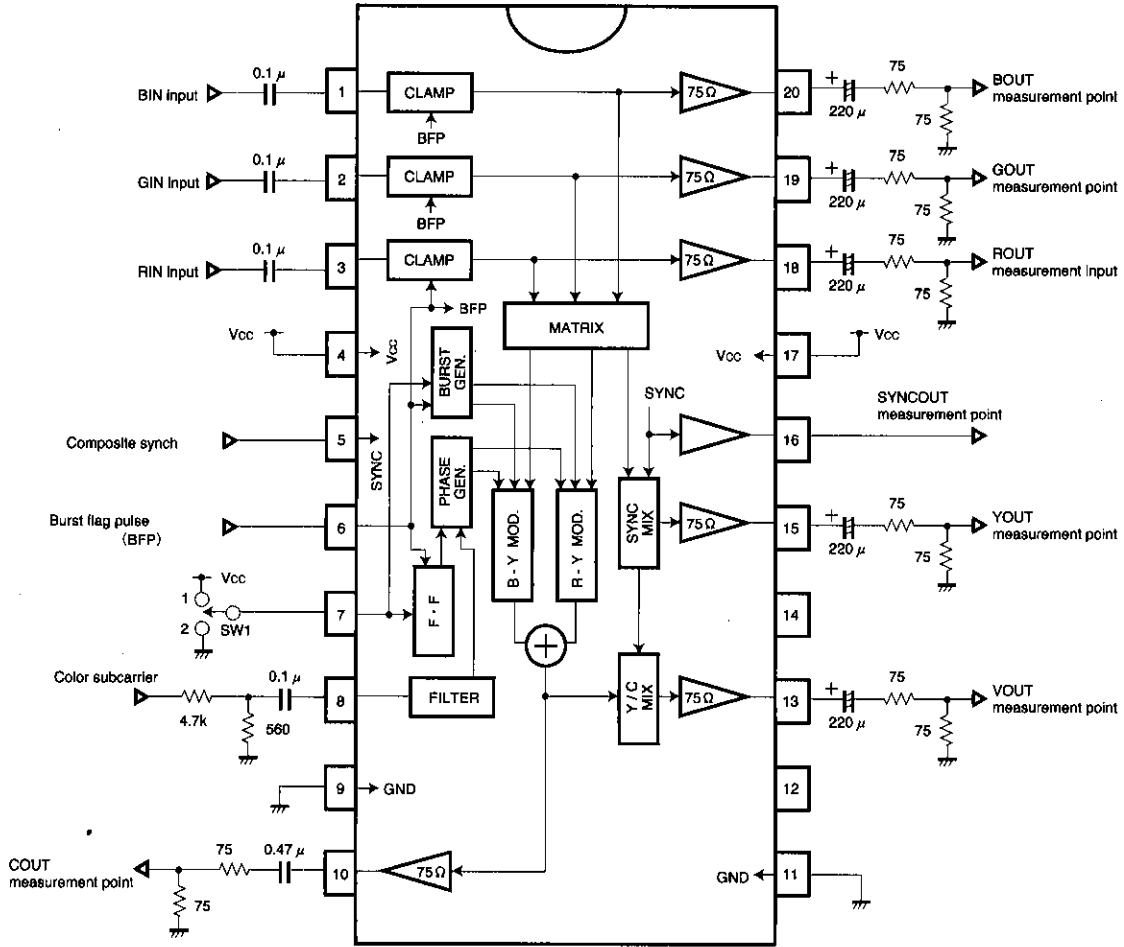


Fig. 1

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### ● Circuit operation

- SYNCIN is for composite synch input. During low input, the synchronization signal is output to YOUT, VOUT and SYNCOUT.
- BFP is for burst flag pulse input. During low input, the burst signal is output to pins CO and VO. When the IC is set to PAL, it is this signal that directs the phase inversion of the chroma signals. This signal also controls the timing of the pedestal clamps of RIN, GIN and BIN. During low input, the pedestal levels of RIN, GIN and BIN are kept constant by charging an attached capacitor.
- NT / PAL is the NTSC / PAL selector pin, and connects to  $V_{CC}$  when set to NTSC and to GND when set to PAL.
- SCIN is for color subcarrier input. Set input to a pulse wave or sine wave (3.579545MHz for NTSC and 4.433619MHz for PAL).
- COUT and YOUT are for output of chroma signals and luminosity signals, respectively. Because the chroma signal and luminosity signals can be output separately, the IC can be adapted for S pins. Each has a 75  $\Omega$  driver.
- VOUT is for color TV signal output, and has an internal 75  $\Omega$  driver.
- ROUT, GOUT and BOUT are for analog RGB signal output, and have an internal 75  $\Omega$  driver.

The relationship between chroma phase and burst phase during PAL processing is as follows.

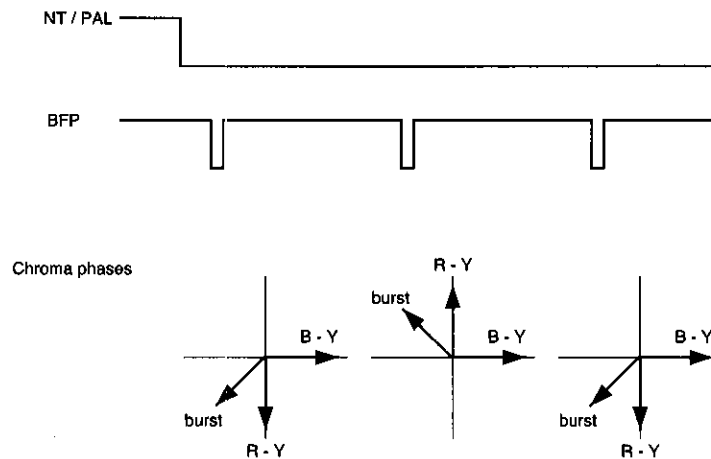


Fig. 2

### ● Operation notes

- Input impedance at the input terminals should be as low as possible as the analog RGB signal is clamped there.
- The color subcarrier should have a duty of 50%. Duty fluctuation will affect chroma phase. Resistance-splitting input is used in the "Application example" to accommodate 5V<sub>P-P</sub> CMOS input. For other types of input, adjust to 0.5V<sub>P-P</sub> at SCIN.
- Composite synch and burst flag pulse inputs should conform to their respective standards, as improper timing between them can prevent the TV from displaying color images. For input, use the TTL level and an impedance of 8k  $\Omega$ .

● Application example (NTSC color TV signals)

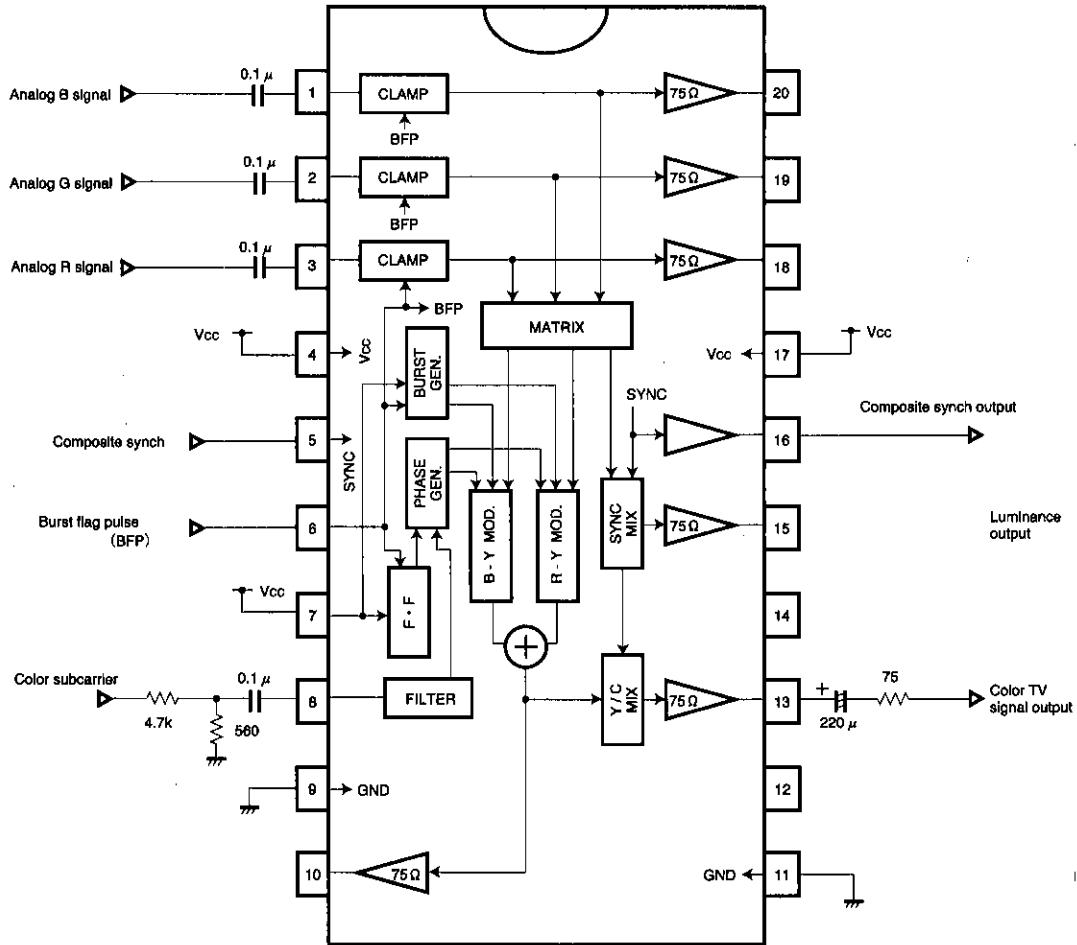
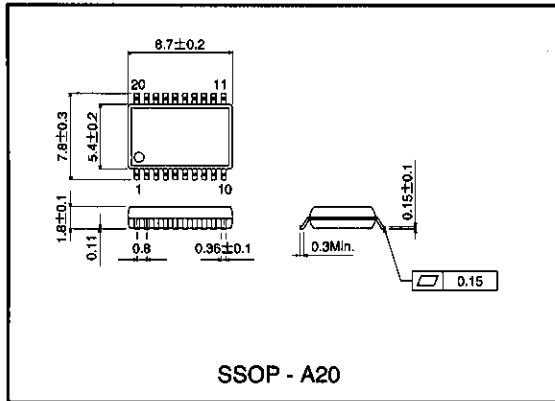


Fig. 3

● External dimensions (Units: mm)



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