

Color TV signal encoder

BA7242F

The BA7242F is an IC which converts analog RGB signals to NTSC and PAL color TV signals. In addition to composite output, luminance output, chrominance output, and analog RGB output are available. Each type of output is equipped with an internal 75Ω driver.

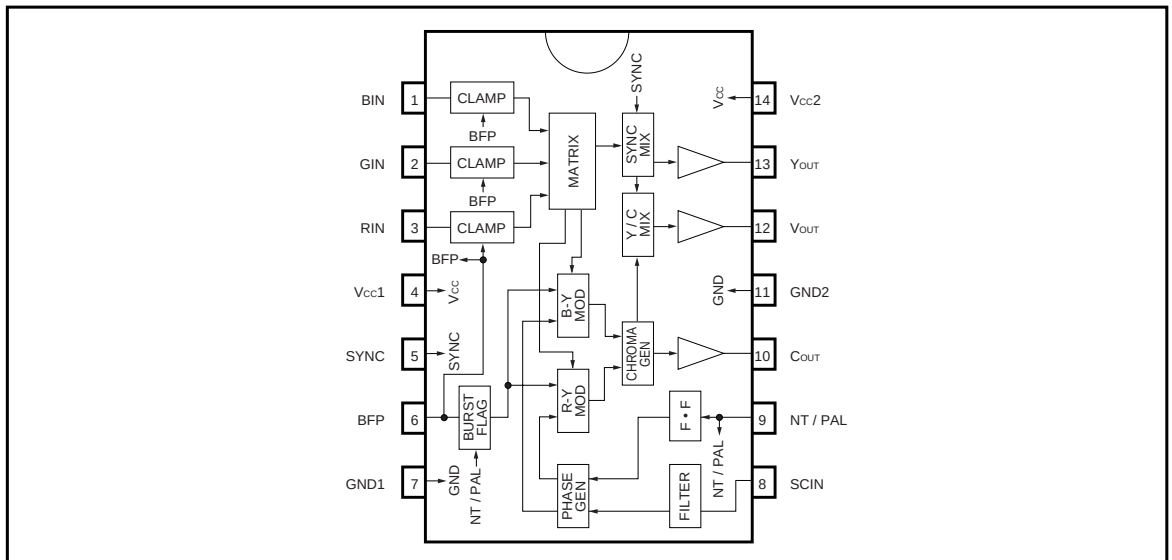
●Applications

TV peripheral devices

●Features

- 1) Supports both NTSC and PAL systems.
- 2) Internal flip-flop circuit for PAL common mode switching
- 3) Equipped with Y / C separated output pin.
- 4) Internal 75Ω driver
- 5) Supports subcarrier pulse for color input

●Block diagram



●Absolute maximum ratings (Ta = 25°C)

Parameter	Symbol	Limits	Unit
Power supply voltage	V _{CC}	7	V
Power dissipation	P _d	450*	mW
Operating temperature	T _{opr}	– 20 ~ + 70	°C
Storage temperature	T _{stg}	– 55 ~ + 125	°C

* Reduced by 4.5mW for each increase in Ta of 1°C over 25°C.
(When mounted on a 70mm × 70mm × 1.6mm glass epoxy board.)

●Recommended operating conditions (Ta = 25°C)

Parameter	Symbol	Limits	Unit
Power supply voltage	V _{CC}	4.5 ~ 5.5	V
RIN input level	V _{RI}	0 ~ 0.7	V _{P-P}
GIN input level	V _{GI}	0 ~ 0.7	V _{P-P}
BIN input level	V _{BI}	0 ~ 0.7	V _{P-P}
SCIN input level	V _{SC}	0.45 ~ 0.60	V _{P-P}

●Pin descriptions

Pin No.	Pin name	Function
1	BIN	Input for analog B signal. Operate with low impedance.
2	GIN	Input for analog G signal. Operate with low impedance.
3	RIN	Input for analog R signal. Operate with low impedance.
4	V _{CC} 1	V _{CC} for all except 75Ω driver.
5	SYNC	Input for composite SYNC signal. Outputs SYNC signal to VOUT and YOUT pins when input is LOW.
6	BFP	Input for burst timing signal. Simultaneously performs the burst output and initiates the pedestal clamp for the RIN, GIN, and BIN input signals when input is LOW.
7	GND1	GND for all except 75Ω driver.
8	SCIN	3.58MHz or 4.43MHz pulse signal input.
9	NT / PAL	Video signal output mode setting. HIGH level = NTSC, LOW level = PAL.
10	C _{OUT}	Chrominance signal output. Internal 75Ω driver.
11	GND2	GND for 75Ω driver.
12	V _{OUT}	Composite video signal output. Internal 75Ω driver.
13	Y _{OUT}	Luminance signal output. Internal 75Ω driver.
14	V _{CC} 2	V _{CC} for 75Ω driver.

●Electrical characteristics (unless otherwise noted, Ta = 25°C, Vcc = 5V, SCIN = 3.579545MHz, NT / PAL = 5V)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditions
Current consumption		I _{CC}	23	34	45	mA	
YOUT VOUT	Luminance level	U _L	0.63	0.70	0.77	V _{P-P}	U _{RI} = U _{GI} = U _{BI} = 0.7V _{P-P}
	Luminance level R	U _{L(R)}	0.19	0.21	0.23	V _{P-P}	U _{RI} = 0.7V _{P-P} *2
	Luminance level G	U _{L(G)}	0.37	0.41	0.45	V _{P-P}	U _{GI} = 0.7V _{P-P} *2
	Luminance level B	U _{L(B)}	0.07	0.08	0.09	V _{P-P}	U _{BI} = 0.7V _{P-P} *2
	Synchronization level	U _S	0.27	0.30	0.33	V _{P-P}	
	Synchronization / luminance level ratio	R _{S / L}	0.38	0.43	0.48	—	R _{YO} = U _{YS} / U _{YL}
COUT VOUT	Red / burst level ratio	R _{R / BU}	2.84	3.16	3.48	—	U _{RI} = 0.7V _{P-P} *2
	Green / burst level ratio	R _{G / BU}	2.65	2.95	3.25	—	U _{GI} = 0.7V _{P-P} *2
	Blue / burst level ratio	R _{B / BU}	2.01	2.24	2.47	—	U _{BI} = 0.7V _{P-P} *2
	Red phase	θ _R	94	104	114	deg	*2
	Green phase	θ _G	231	241	251	deg	*2
	Blue phase	θ _B	337	347	357	deg	*2
	Burst level	U _{BU}	0.26	0.29	0.32	V _{P-P}	*4
	Carrier leak	U _{CL}	—	—	35	mV _{P-P}	*3
	PAL burst phase	θ _{BU +}	125	135	145	deg	NT / PAL = 0V*2
		θ _{BU -}	215	225	235	deg	NT / PAL = 0V*2
	PAL burst ratio	R _{BU}	0.9	1.0	1.1	—	NT / PAL = 0V*2
YOUT DC voltage		V _{YO}	1.60	2.00	2.40	V	
COUT DC voltage		V _{CO}	2.20	2.60	3.00	V	
VOUT DC Voltage		V _{VO}	1.35	1.75	2.15	V	
High level input voltage SYNC, BFP, NT / PAL		V _{IH}	2.0	—	—	V	
Low level input voltage SYNC, BFP, NT / PAL		V _{IL}	—	—	0.8	V	
Input current during high SYNC, BFP, NT / PAL		V _{IH}	—	—	300	μA	With 5V applied
Input current during low SYNC, BFP, NT / PAL		V _{IL}	—	—	200	μA	With 0V applied

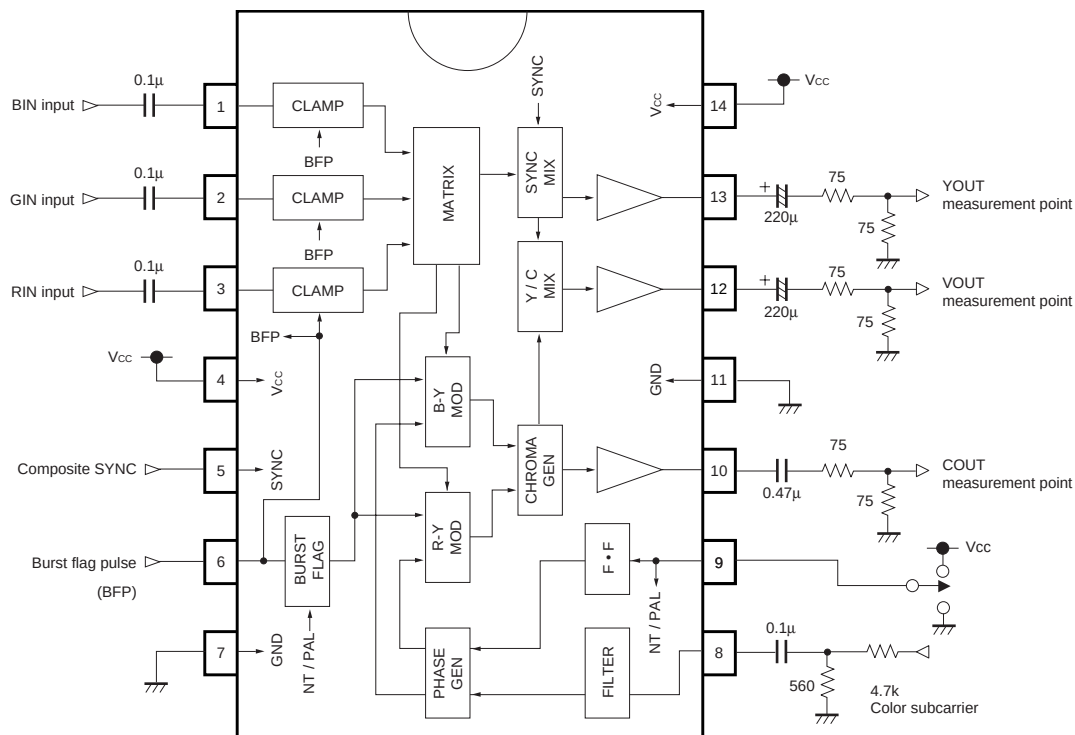
*2 Guaranteed design with these parameters

*3 Measured using a 3.58MHz BPF for 3.5μs after the burst.

*4 Measured using a 3.58MHz BPF.

○ Not designed for radiation resistance

●Measurement circuit



●Operation description

(1) The composite SYNC is input to the SYNCIN pin. During Low level input, the SYNC signal is output to the YOUT, VOUT, and SYNCOUT pins.

(2) The burst flag pulse is input to the BFPIN pin. During Low level input, the burst signal is output to the COUT and VOUT pins. For PAL, the phase inversion of the chroma signal occurs according to this signal. Furthermore, this signal also acts as the timing for the pedestal clamp for the RIN, GIN, and BIN pins. By using an external condenser for charging during Low level input, the pedestal levels for the RIN, GIN, and BIN pins are maintained at a uniform level.

(3) The NT / PAL pin is for selecting either NTSC or

PAL. For NTSC, this pin is connected to V_{CC} and for PAL, this pin is connected to GND.

(4) The SCIN pin is the color subcarrier input pin. Input either a pulse wave or a sine wave of frequency 3.579545MHz for NTSC or of frequency 4.433619MHz for PAL.

(5) The COUT pin is the output pin for the chroma signal, and the YOUT pin is the output pin for the luminance signal. This is compatible with the S pin because the chroma signal and the luminance signal can be output separately. Both pins have internal 75Ω drivers.

(6) The VOUT pin is the output pin for a color TV signal and has an internal 75Ω driver.

The diagram illustrates the internal architecture of a color TV receiver IC. The 14 pins are configured as follows:

- Pin 1:** Analog B signal input through a 0.1μ capacitor.
- Pin 2:** Analog G signal input through a 0.1μ capacitor.
- Pin 3:** Analog R signal input through a 0.1μ capacitor.
- Pin 4:** V_{cc} supply connection.
- Pin 5:** Composite SYNC input.
- Pin 6:** Burst flag pulse (BFP) input.
- Pin 7:** GND / PAL selection input.
- Pin 8:** Color subcarrier output, connected to a 0.1μ capacitor, a 560Ω resistor, and a $4.7k\Omega$ resistor to ground.
- Pin 9:** V_{cc} supply connection.
- Pin 10:** CHROMA GEN output.
- Pin 11:** GND connection.
- Pin 12:** Color TV signal output, connected to a 75Ω load through a 220μ capacitor.
- Pin 13:** Y/C MIX output.
- Pin 14:** V_{cc} supply connection.

The internal blocks and their interconnections are as follows:

- CLAMP** blocks are connected to the analog input signals (B, G, R) and the BFP input.
- The **BFP** block is connected to the CLAMP blocks and the BURST FLAG block.
- The **MATRIX** block receives inputs from the CLAMP blocks and the BURST FLAG block.
- The **SYNC MIX** block receives input from the MATRIX block and the SYNC input.
- The **Y/C MIX** block receives input from the MATRIX block and the SYNC MIX block.
- The **B-Y MOD** and **R-Y MOD** blocks receive inputs from the MATRIX block and the BURST FLAG block.
- The **CHROMA GEN** block receives inputs from the B-Y MOD and R-Y MOD blocks.
- The **PHASE GEN** block receives input from the BURST FLAG block.
- The **F.F.** (Flip-Flop) block receives input from the PHASE GEN block.
- The **FILTER** block receives input from the PHASE GEN block.
- The **NT/PAL** block receives input from the PHASE GEN block.

- (1) Since analog RGB signals perform clamping at the input pin, input them with a low impedance.
- (2) Input a signal of duty 50% for the color subcarrier. If the duty fluctuates, it will affect the chroma phase. Furthermore, for the application example, a voltage-dividing resistor is assumed for the CMOS input of $5V_{P-P}$. For other input formats, regulate the SCIN pin for $0.5V_{P-P}$.
- (3) Input the composite SYNC and burst flag pulse according to the standard value. If the timing is off, the TV receiver may not show any color. As well, set the input level the same as the TTL level. The input impedance is $8k\Omega$.

The drawing illustrates the mechanical specifications of the SOP14 package. The top view shows a rectangular body with a width of 8.7 ± 0.2 and a total length of 62 ± 0.3 . The pin pitch is 1.27 , and the pin width is 0.4 ± 0.1 . The side view shows a maximum height of 1.5 ± 0.1 and a standoff height of 0.11 . A detail view of the pin shows a thickness of 0.15 ± 0.1 and a minimum fillet radius of 0.3Min. . A surface texture symbol indicates a maximum average roughness (R_a) of 0.15 .