

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.

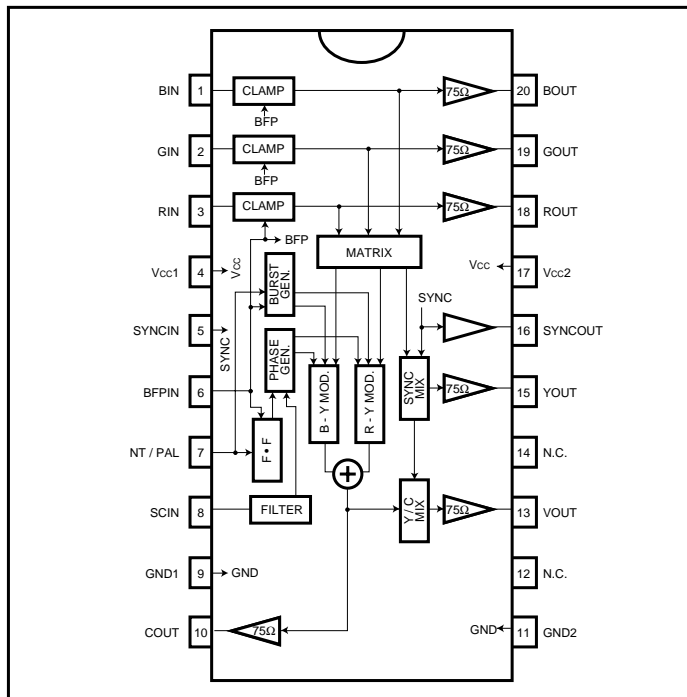
The chroma signals and luminosity signals can be combined into a color TV signal or output separately, making this IC suitable for S pins. Also, this IC comes with an output pin for the analog RGB signal. Each output has a built-in 75Ω driver.

●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 75Ω driver. (outputs color TV signals, luminosity signals, chroma signals and analog RGB signals)
- 6) Adaptable for color subcarrier pulse input.

●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 | Power supply pin for all drivers other than the 75Ω 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 75Ω driver |
| 10 | COUT | Chroma signal output. Internal 75Ω driver. |
| 11 | GND2 | Ground for the 75Ω driver |
| 12 | N.C. | This pin is not connected inside the IC. |
| 13 | VOUT | Color TV signal output. Internal 75Ω driver. |
| 14 | N.C. | This pin is not connected inside the IC. |
| 15 | YOUT | Luminance signal output. Internal 75Ω driver. |
| 16 | SYNCOUT | Composite synchronization signal output |
| 17 | Vcc2 | Power supply pin for all drivers other than the 75Ω driver |
| 18 | ROUT | Analog R signal output. Internal 75Ω driver |
| 19 | GOUT | Analog G signal output. Internal 75Ω driver. |
| 20 | BOUT | Analog B signal output. Internal 75Ω driver. |

●Absolute maximum ratings (Ta = 25°C)

| Parameter | Symbol | Limits | Unit |
|-----------------------|--------|--------------|------|
| Power supply voltage | Vcc | 7 | V |
| Power dissipation | Pd | 750* | mW |
| Operating temperature | Topr | - 20 ~ + 70 | °C |
| Storage temperature | Tstg | - 55 ~ + 125 | °C |

* Reduced by 7.5mW for each increase in Ta of 1°C over 25°C.
When mounted on a 70 × 70 × 1.6mm glass epoxy board.

●Recommended operating conditions (Ta = 25°C)

| Parameter | Symbol | Limits | Unit |
|----------------------|--------|------------|------------------|
| Power supply voltage | Vcc | 4.5 ~ 5.5 | V |
| RIN input level | vRI | 0 ~ 0.7 | V _{P-P} |
| GIN input level | vGI | 0 ~ 0.7 | V _{P-P} |
| BIN input level | vBI | 0 ~ 0.7 | V _{P-P} |
| SCIN input level | vSC | 0.45 ~ 0.6 | V _{P-P} |

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

| Parameter | | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|--|--|-------------------|------|------|------|-------------------|---|
| Current dissipation | | I _{CC} | 33.0 | 48.0 | 63.0 | mA | — |
| YOUT VOUT | Luminance level | υ _L | 0.63 | 0.70 | 0.77 | V _{P-P} | υ _{RI} = υ _{GI} = υ _{BI} = 0.7V _{P-P} |
| | Luminance level R | υ _{L(R)} | 0.19 | 0.21 | 0.23 | V _{P-P} | υ _{RI} = 0.7V _{P-P} *1 |
| | Luminance level G | υ _{L(G)} | 0.37 | 0.41 | 0.45 | V _{P-P} | υ _{GI} = 0.7V _{P-P} *1 |
| | Luminance level B | υ _{L(B)} | 0.07 | 0.08 | 0.09 | V _{P-P} | υ _{BI} = 0.7V _{P-P} *1 |
| | Synchronization level | υ _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} = υ _S / υ _L |
| COUT VOUT | R / burst level ratio | R _{R/BU} | 2.84 | 3.16 | 3.48 | — | υ _{RI} = 0.7V _{P-P} *1 |
| | G / burst level ratio | R _{G/BU} | 2.65 | 2.95 | 3.25 | — | υ _{GI} = 0.7V _{P-P} *1 |
| | B / burst level ratio | R _{B/BU} | 2.01 | 2.24 | 2.47 | — | υ _{BI} = 0.7V _{P-P} *1 |
| | R phase | θ _R | 94 | 104 | 114 | deg | *1 |
| | G phase | θ _G | 231 | 241 | 251 | deg | *1 |
| | B phase | θ _B | 337 | 347 | 357 | deg | *1 |
| | Burst level | υ _{BU} | 0.26 | 0.29 | 0.32 | V _{P-P} | *3 |
| | Carrier leak | υ _{CL} | — | — | 35 | mV _{P-P} | *2 |
| | PAL burst phase | θ _{BU+} | 125 | 135 | 145 | deg | SW1 = 2*1 |
| | | θ _{BU-} | 215 | 225 | 235 | deg | SW1 = 2*1 |
| PAL burst level ratio | R _{BU} | 0.9 | 1.0 | 1.1 | — | SW1 = 2*1 | |
| SYNCOUT | Output level (HIGH) | — | 2.00 | 2.50 | 5.00 | V | — |
| | Output level (LOW) | — | 0 | — | 0.40 | V | — |
| ROUT output level | | υ _{RO} | 0.63 | 0.70 | 0.77 | V _{P-P} | υ _{RI} = 0.7V _{P-P} |
| GOUT output level | | υ _{GO} | 0.63 | 0.70 | 0.77 | V _{P-P} | υ _{GI} = 0.7V _{P-P} |
| BOUT output level | | υ _{BO} | 0.63 | 0.70 | 0.77 | V _{P-P} | υ _{BI} = 0.7V _{P-P} |
| 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 | — |
| ROUT DC voltage | | V _{RO} | 1.25 | 1.65 | 2.05 | V | — |
| GOUT DC voltage | | V _{GO} | 1.25 | 1.65 | 2.05 | V | — |
| BOUT DC voltage | | V _{BO} | 1.25 | 1.65 | 2.05 | V | — |
| Input voltage "L" level SYNC, BFP, NT / PAL | | V _{IL} | — | — | 0.8 | V | — |
| Input voltage "H" level SYNC, BFP, NT / PAL | | V _{IH} | 2.2 | — | — | V | — |
| Input impedance SYNC, BFP, NT / PAL | | Z _I | 8 | 13.5 | — | kΩ | — |

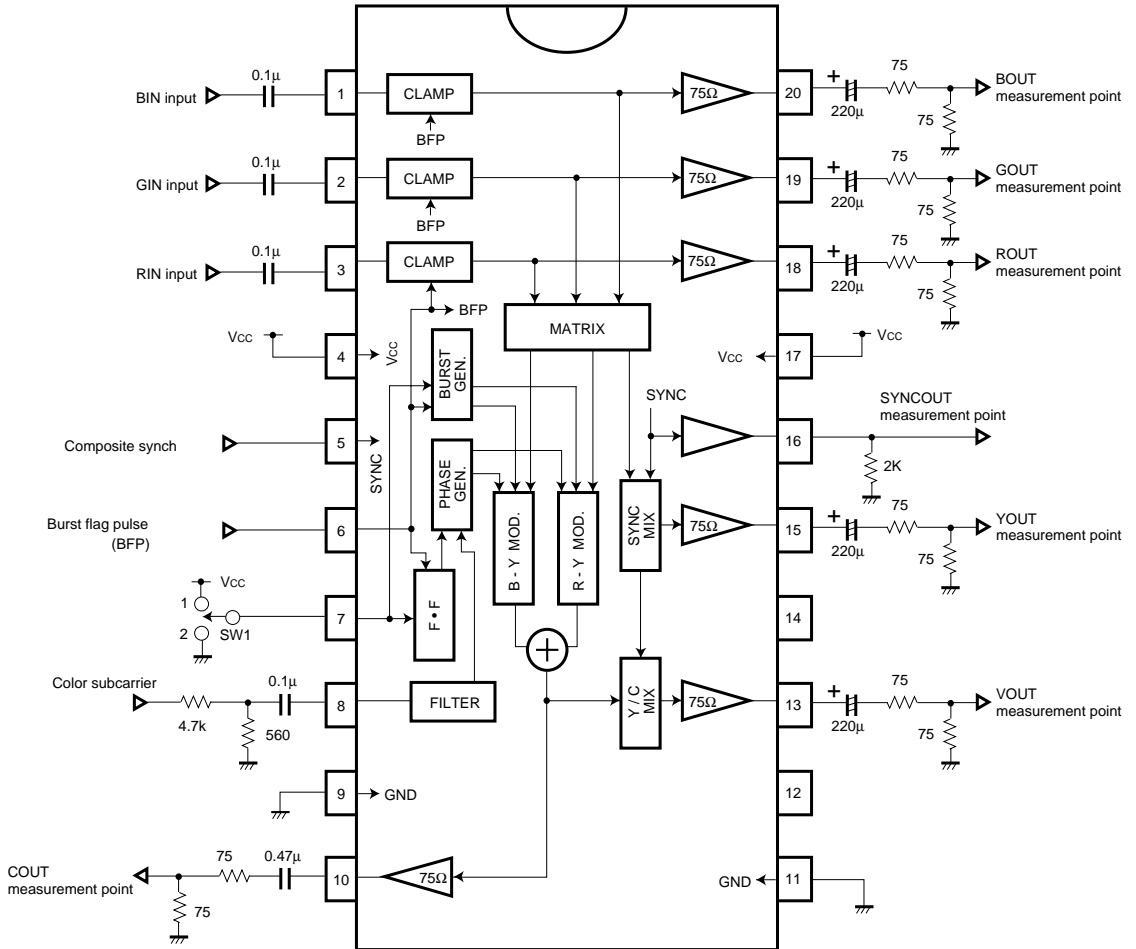
*1 Guaranteed performance.

*2 Measured 3.5 μs after burst with a 3.58 MHz BPF.

*3 Measured with a 3.58 MHz BPF.

○ Not designed for radiation resistance.

● Measurement circuit



●Circuit operation

(1) SYNCIN is for composite sych input. During low input, the synchronization signal is output to YOUT, VOUT and SYNCOUT.

(2) 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.

(3) NT / PAL is the NTSC / PAL selector pin, and connects to V_{CC} when set to NTSC and to GND when set to PAL.

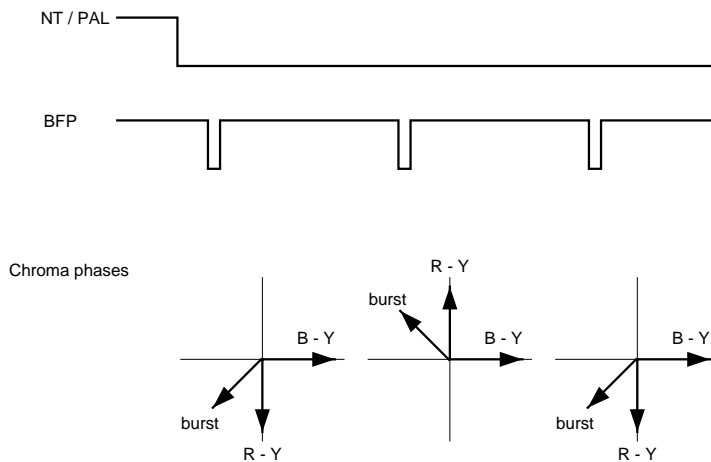
(4) SCIN is for color subcarrier input. Set input to a pulse wave or sine wave (3.579545MHz for NTSC and 4.433619MHz for PAL).

(5) 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 75Ω driver.

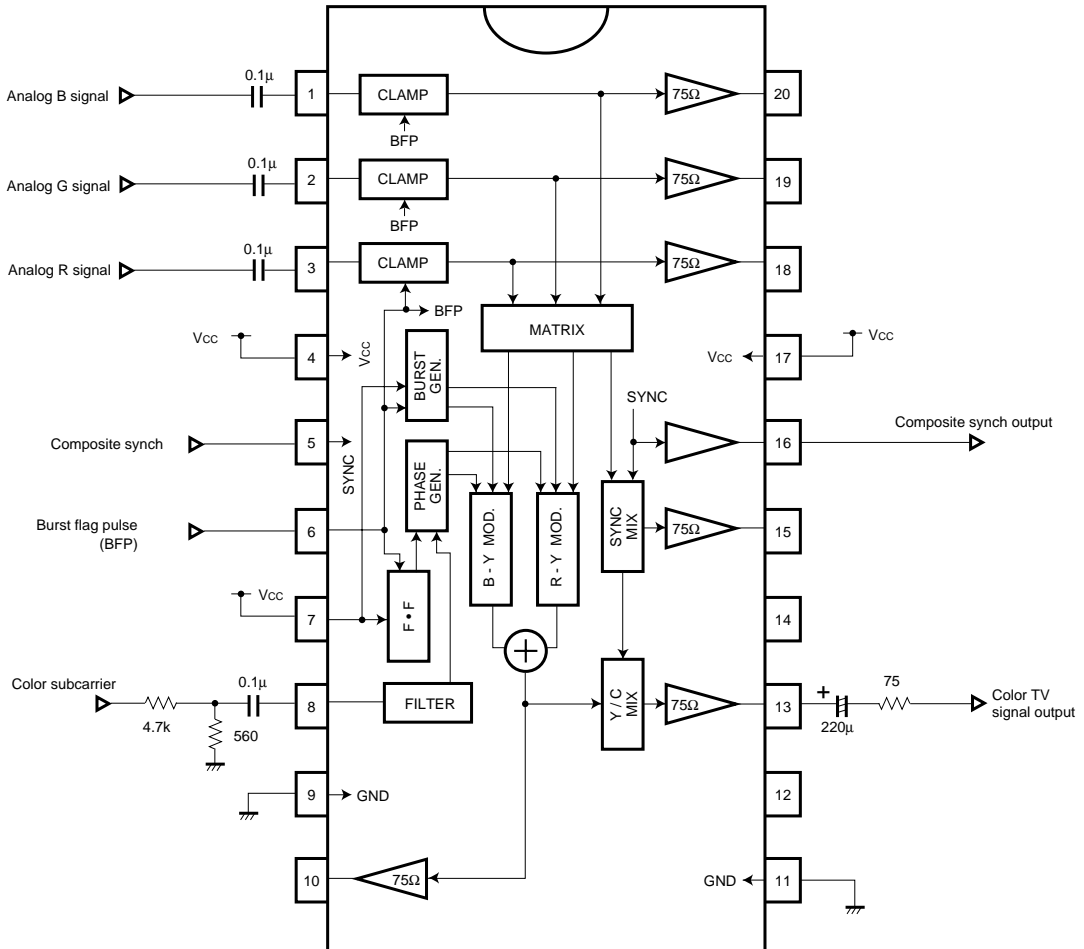
(6) VOUT is for color TV signal output, and has an internal 75Ω driver.

(7) ROUT, GOUT and BOUT are for analog RGB signal output, and have an internal 75Ω driver.

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



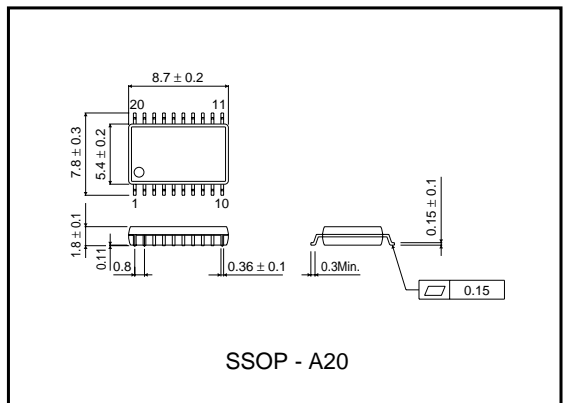
●Application example (NTSC color TV signals)



●Operation notes

- (1) Input impedance at the input terminals should be as low as possible as the analog RGB signal is clamped there.
- (2) 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_{P-P} CMOS input. For other types of input, adjust to 0.5V_{P-P} at SCIN.
- (3) 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 8kΩ.

●External dimensions (Units: mm)



SSOP - A20