

VIF/SIF signal processor

BA7356S

The BA7356S is a multi-format (M, B/G, D/F, and I) VIF/SIF signal processor for television and VCR applications. It features a built-in sound-trap and band-pass filters, and employs a pulse-count audio detector that does not require adjustment. This IC reduces external component requirements, and allows space savings.

● Applications

TVs and VCRs

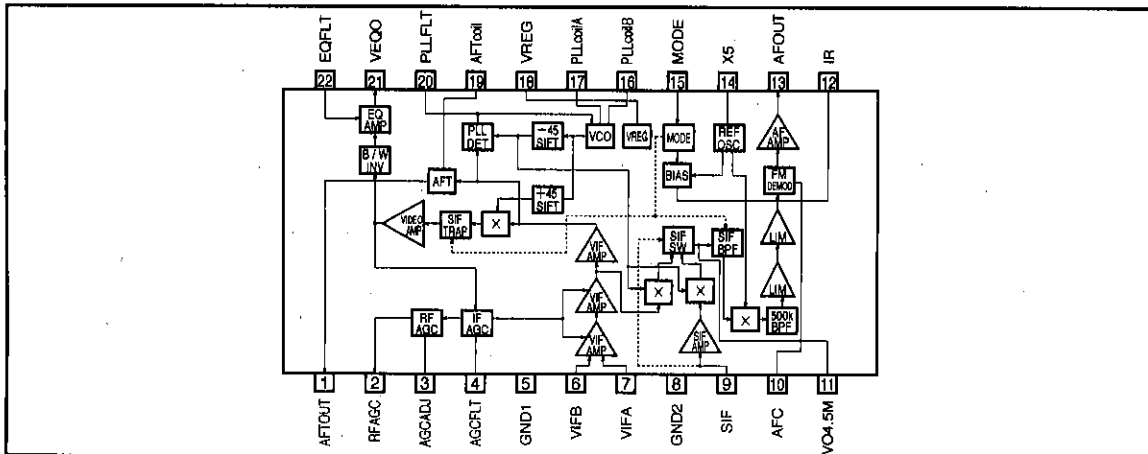
● Features

- 1) Separate-carrier PLL with full synchronous detection. Excellent DG/DP, CS beat (920kHz) and cross color. In addition, by pulling down the SIF input (pin 9) it can be used as an intercarrier.
- 2) The IF AGC time constant is dual-layered to allow faster speeds.
- 3) The variable-gain amplifier has excellent linearity to ensure low distortion, and AGC variance and temperature drift have been minimized.
- 4) Built-in SOUND filter (SOUND trap and SOUND BPF). The MODE switch can be used to switch between M, B/G, I, and D/K (4.5MHz, 5.5MHz, 6.0MHz, and 6.5MHz

respectively). In particular, the SOUND BPF gives a larger attenuation ratio than conventional discrete circuits by using two-layer SIF+500kHz BPFs.

- 5) The audio detector uses a 500kHz BEAT DOWN pulse-counter detector that does not require adjustment. This eliminates the need for a detector coil and gives better linearity and S/N.
- 6) Use of pulse-counter detection and the built-in SOUND filter means fewer pins, external components and adjustment locations are required. The IC is available in a 22-pin SDIP package and will enable cost and space savings.

● Block diagram



● Absolute maximum ratings (Ta=25°C)

| Parameter | Symbol | Limits | Unit |
|-----------------------|--------------------|-----------|------|
| Applied voltage | V _{CCMax} | 10.5 *1 | V |
| Power dissipation | P _{dMax} | 1250 *2 | mW |
| Operating temperature | T _{opr} | -15 ~ 65 | °C |
| Storage temperature | T _{stg} | -40 ~ 150 | °C |
| Pin 2 input voltage | V _{P2Max} | 10.5 | V |

*1 27 Ω resistor connected between V_{CC} and V_{REG}.

*2 When IC is stand alone, reduced by 12.5mW for each increase in Ta of 1°C over 25°C.

● Recommended operating conditions (Ta=25°C)

| Parameter | Symbol | Limits | Unit |
|----------------------------|---------------------|----------------|------|
| Power supply voltage (9V) | V _{CC 9V} | 8.8 ~ 9.2 *1 | V |
| Power supply voltage (12V) | V _{CC 12V} | 11.7 ~ 12.3 *2 | V |

*1 27 Ω resistor connected between V_{CC} and V_{REG}.

*2 62 Ω resistor connected between V_{CC} and V_{REG}.

● Pin description

| Pin No. | Pin Name | IN / OUT | Standard voltage | Equivalent circuit | Function |
|---------|-----------|----------|---|--------------------|--|
| 1 | AF - TOUT | OUT | — | | AFT output. VREG/GND push-pull output. |
| 2 | RF - AGC | OUT | — | | RF-AGC output. Open-collector output. Gain can be set using an external resistor (minimum value of the maximum sink current of pin 2 is 0.7mA). Keep the pin 2 voltage at 10.5V or less. |
| 3 | AGC - ADJ | — | 2.1V (when 100kΩ resistor connected) | | RF-AGC delay point adjustment. Connect to GND via a variable resistor (approx. 100kΩ). |
| 4 | AGC - FLT | — | 5.0V | | For filter time constant for VIF AGC. |
| 5 | GND1 | | 0V | | GND for VIF, AGC and AFT. |

| Pin No. | Pin Name | IN / OUT | Standard voltage | Equivalent circuit | Function |
|---------|--------------|----------|------------------|--------------------|---|
| 6 7 | VIFB VIFA | IN | 4.2V | | Video IF input. Use with balanced input. |
| 8 | GND2 | — | 0V | | SIF and PLL GND. |
| 9 | SIF | IN | 6.6V | | Audio IF input. Can set to intercarrier mode by pulling down via a 2k Ω resistor. |
| 10 | AFC | — | 2.7V | | Holding the audio output DC level fixed. Connect to GND via a 4.7 μ F capacitor and to VREG via a 10 μ F capacitor to reduce buzz. Set this pin to 0.3V or lower to apply audio/video mute. |
| 11 | VO - 4.5M | — | 5.2V | | 2nd SIF output. Connect a trap to this pin to vary the sound filter characteristics. The internal impedance is a high 1k Ω , so connect a buffer to output. |
| 12 | IR | — | 2.4V | | Reference current source for adjusting the internal filter. Use connected to GND via a 24k Ω resistor. Use an accurate resistor with good temperature characteristics (e.g. \pm 1% metal film). |
| 13 | AFOUT | OUT | 3.2V | | Audio signal output. The standard output in the case of B/G is 520mVrms (when $f = 50$ kHz). Connect to GND via a 10k Ω resistor. |

| Pin No. | Pin Name | IN / OUT | Standard voltage | Equivalent circuit | Function |
|----------|----------------------------|----------|------------------|--------------------|---|
| 14 | X5 | — | 5.0V | | For connection to a 5MHz oscillator (when M format is used). Use as a reference oscillator for automatic adjustment of the internal filter, and as the signal for the SIF signal low frequency conversion. (B/G, D/K format: 6MHz, I format: 6.5MHz). |
| 15 | MODE | IN | 3.4V | | Input Trap Filter switch. 0V: M format (4.5MHz) 2.4V: D/K format (6.5MHz) 4.3V: I format (6.0MHz) VREG: B/G format (5.5MHz) |
| 16 17 | PLL - COILA PLL - COILB | — | 3.6V | | For connection of IF detector VCO oscillator coil. |
| 18 | VREG | — | 6.6V | | IF circuit power supply. Pin 18 has a built-in shunt regulator. |
| 19 | AFT - COIL | — | 3.0V | | For connection of AFT coil. To apply AFT defeat, connect to GND via a 1kΩ (approx.) resistor. |
| 20 | PLL - FLT | — | 3.4V | | Time constant circuit for the PLL filter. |
| 21 | VEQO | OUT | 2.0V (SYNC) | | VIDEO output. Output is via the sound trap, B/W noise inverter, and EQ AMP. Connect to GND via a 4.7kΩ resistor. |
| 22 | EQFLT | — | 5.2V | | EQ Filter. Connect to GND via an LCR series resonant circuit. R should be $\geq 1k\Omega$ |

* Vcc and Vcc2 in the equivalent circuit diagrams are connected to the VREG pin (pin 18).

●Electrical characteristics (Unless otherwise specified Ta=25°C, Vcc=9V, and P=38.9MHz)

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Conditions | |
|--------------------------------|---------------------|------------------|------|------|------------------|--|--|
| (VREG) | | | | | | | |
| Circuit current | I _{CC} | — | 92 | 105 | mA | | |
| Regulated voltage | V _{REG} | 6.2 | 6.6 | 7.0 | V | | |
| (VIF) | | | | | | | |
| Input sensitivity | V _{VMin.} | 38 | 43 | 48 | dB μ | V _{VO} = -3dB point | |
| Maximum allowable input level | V _{VMax.} | 100 | 110 | — | dB μ | V _{VO} = +1dB point | |
| AGC range | GR | 62 | 66 | — | dB | V _{VO} = \pm 3dB range | |
| Quiescent video output voltage | V _{P21} | 3.9 | 4.3 | 4.7 | V | No signal, V _{P4} = V _{REG} | |
| Video detector output level | V _{VO} | 1.7 | 2.0 | 2.4 | V _{P-P} | V _i = 80dB μ , AM87.5%MOD | |
| Synchronous signal tip voltage | V _{P21SY} | 1.7 | 2.0 | 2.3 | V | 100% white video signal | |
| Video output DG | DG | — | 2 | 8 | % | V _i = 80dB μ , AM87.5%MOD | |
| Video output DP | DP | — | 3 | 8 | deg | 3STEP video signal | |
| Sound Trap attenuation | M, B / G | G _{VOS} | 33 | 45 | — | dB | 20 * LOG (V _{OS} / V _{O0.2M}) |
| | D / K, I | | 28 | 45 | — | | |
| 920kHz beat level | I ₉₂₀ | 37 | 44 | — | dB | P=0, P / C=4, P / S=14dB | |
| Video output S/N | S / N _v | 47 | 53 | — | dB | V _i = 90dB μ , 100% white | |
| White noise threshold voltage | V _{WTH} | 4.7 | 5.0 | 5.3 | V | CW = 70dB μ frequency variation and pin 21 voltage variation | |
| White noise clamp voltage | V _{WCL} | 2.9 | 3.2 | 3.5 | V | | |
| Black noise threshold voltage | V _{BTH} | 1.1 | 1.4 | 1.7 | V | | |
| Black noise clamp voltage | V _{BCL} | 2.6 | 2.9 | 3.2 | V | | |
| RFAGC maximum sink current | I _{P2SI} | 0.7 | 1.2 | — | mA | CW=100dB μ , AGCADJ=100k | |
| (AFT) | | | | | | | |
| Maximum AFT voltage | V _{P1Max.} | 6.0 | 6.4 | — | V | CW=38.4MHz | |
| Minimum AFT voltage | V _{P1Min.} | — | 0.3 | 0.8 | V | CW=39.4MHz | |
| AFT detection sensitivity | S _i | 35 | 50 | — | mV / kHz | CW frequency variation | |
| AFT defeat starting voltage | V _{AFTDET} | — | — | 1.2 | V | CW=38.4MHz | |
| AFT defeat voltage | V _{1DEF} | 2.9 | 3.3 | 3.6 | V | CW=38.4MHz | |
| (PLL) | | | | | | | |
| PLL capture range 1 | f _{CU} | 0.6 | +1.2 | — | MHz | CW = 80dB μ frequency variation | |
| PLL capture range 2 | f _{CL} | — | -1.2 | -0.6 | MHz | | |
| PLL lock range 1 | f _{LU} | 0.6 | +1.3 | — | MHz | | |
| PLL lock range 2 | f _{LL} | — | -1.3 | -0.6 | MHz | | |
| VCO control sensitivity | β | 0.5 | 1.0 | — | kHz / mV | | |

● Application example

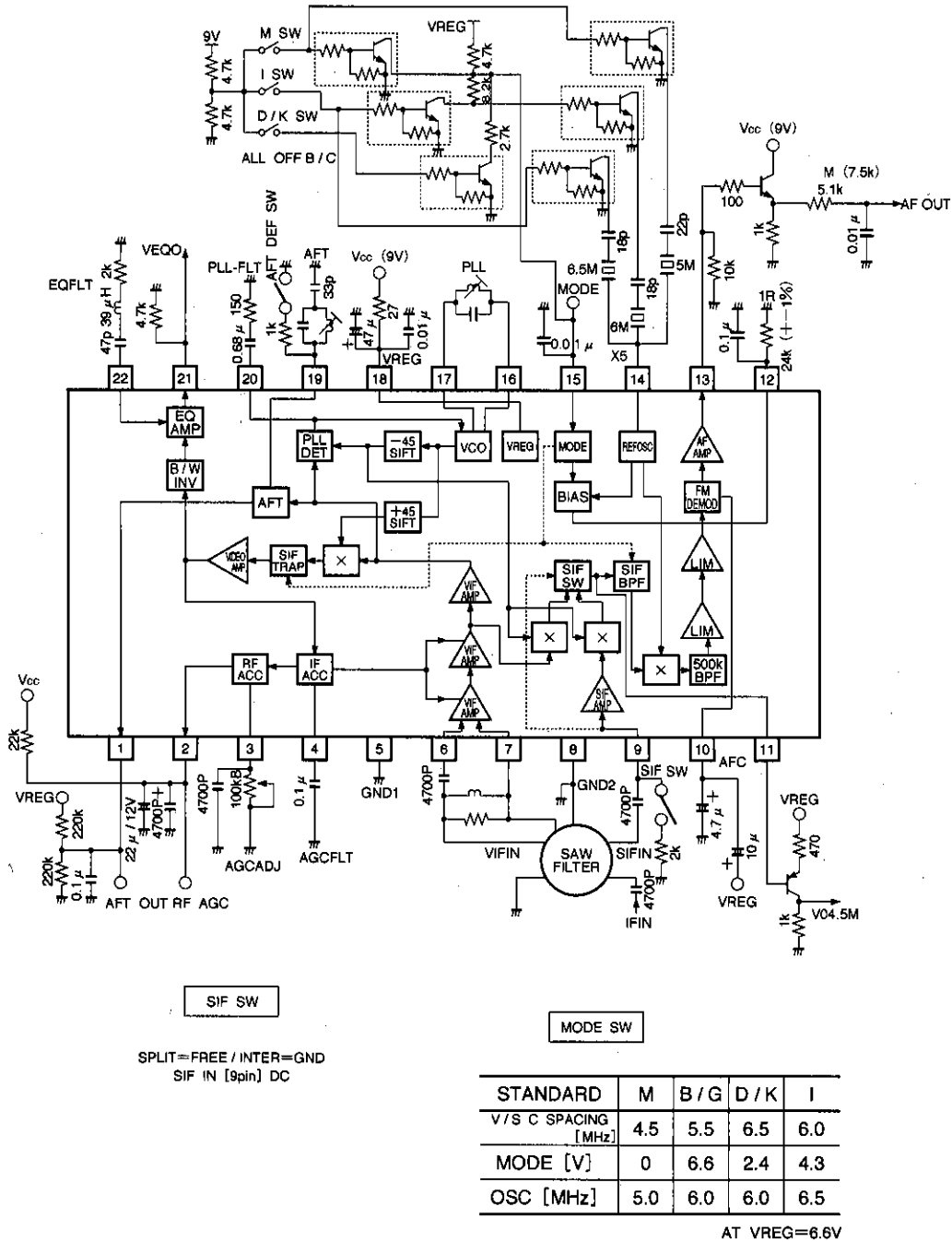


Fig.2

● Operation notes

- Simultaneous audio and video output muting function
It is possible to simultaneously mute the audio and video output by pulling the AFC filter pin down.
- AFT defeat function
AFT defeat can be applied by pulling the AFT coil pin down via a 1kΩ resistor.
- Recommended SIF input range for intercarrier mode P/S=20 to 30dB (including SAW-FILTER).
- IF input range for RF-AGC switching
60 to 95dB μ.
- Intercarrier mode switching
Intercarrier mode can be set by pulling the SIF pin down via a 2kΩ resistor.
- IR pin external resistor
This resistor sets the filter system reference current, so use an accurate component that has good temperature characteristics.

- Adjustment of the evaluation board
Before performing measurements, adjust the coils as described below.

1. VCO coil

Lower the VIF input level, and apply a voltage of AGCFLT=6V. Monitor the PLL-FIL voltage (V1). Next, input a signal of VIFIN=80dB μ, 38.9MHz, and with the AGCFLT free, adjust the VCO so that the voltage at this time, V2, becomes the same as V1.

2. AFT coil

Input a signal of VIFIN=80dB μ, 38.9MHz, set the AFT defeat switch to open, and monitor the AFT output pin voltage. Rotate the AFT coil, adjust the output voltage to 1/2VREG (Typ. 3.3V) at the point where the output voltage changes steeply.

● External dimensions (Units: mm)

