# Sync Separator with AFC
# Monolithic IC LVA519

## Outline

This is a sync separator IC with AFC. Stable operation even in a weak electric field is made possible with the built-in AFC circuit. A regulator also is built in, providing stable operation relative to power supply and temperature fluctuations.

## Features

1. Supports AFC (horizontal sync signal)
2. AFC OFF function
3. Horizontal and vertical sync signal output pins
4. Power supply voltage 4.7V~5.3V

## Package

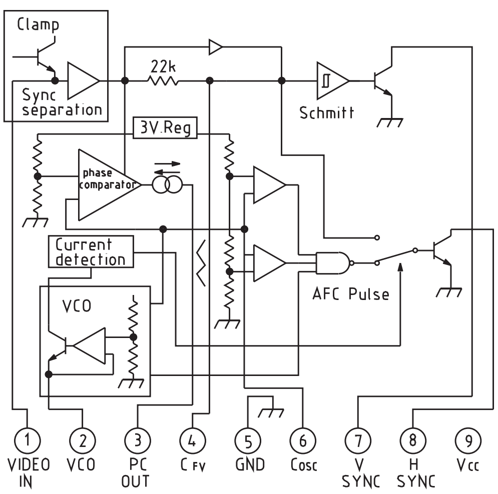
SIP-9A (LVA519S)
SOP-14A (LVA519F)

## Applications

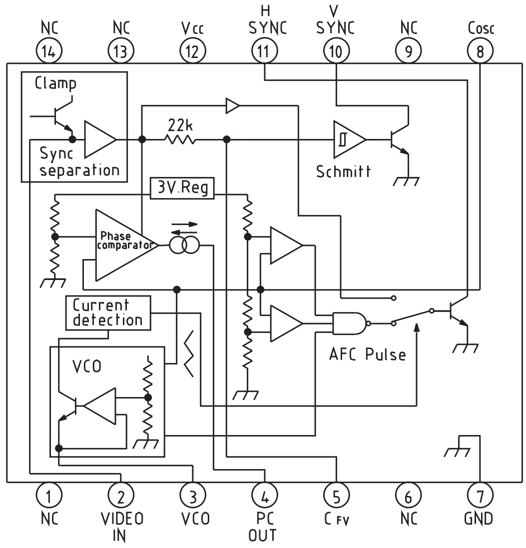
1. TV
2. VCR
3. Other video equipment

## Equivalent Circuit Diagram

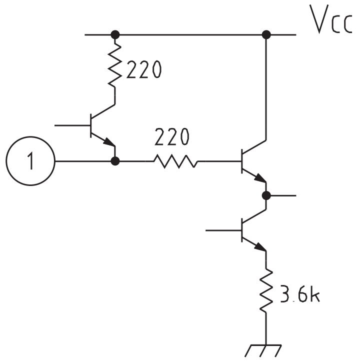
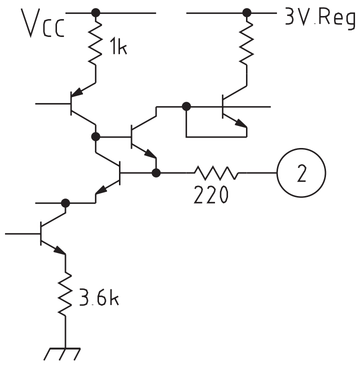
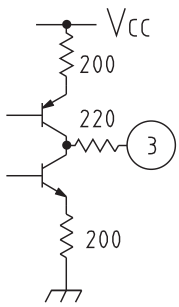
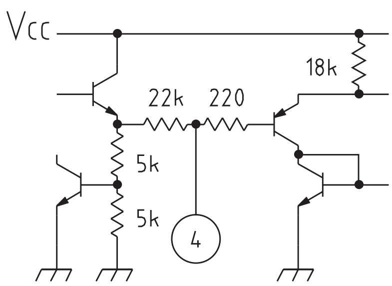
### SIP-9A

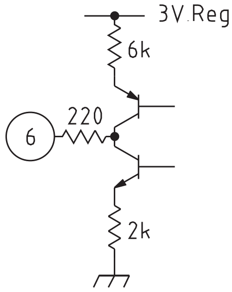
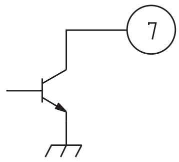
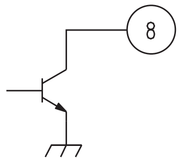



### SOP-14A

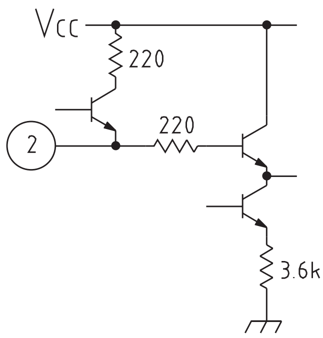
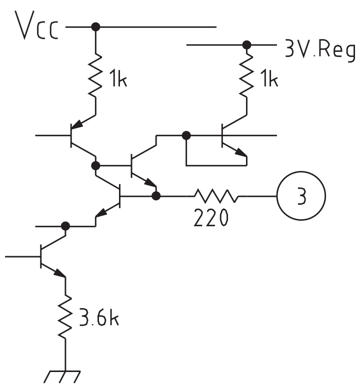


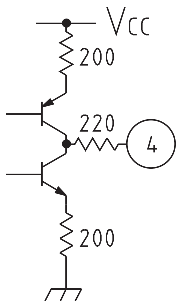
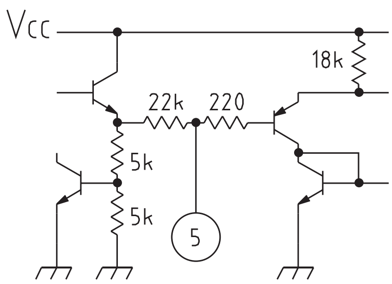
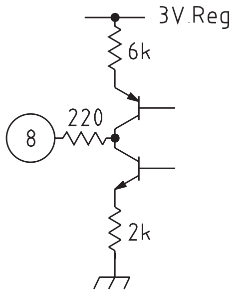
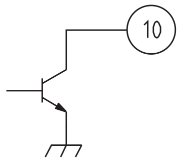
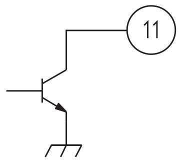
## Pin Description (LVA519S)

| Pin no. | Pin name | Function | Internal equivalent circuit diagram |
|---|---|---|---|
| 1 | VIDEO IN | Video signal input |  |
| 2 | VCO | Free run frequency setting |  |
| 3 | PC OUT | Phase comparison output |  |
| 4 | CFU | Integrates composite signal and inputs to vertical sync playback circuit |  |

| | | | |
|---|---|---|---|
| 5 | GND | GND | |
| 6 | Cosc | Free run frequency oscillation circuit |  |
| 7 | VSYNC | Vertical sync signal output |  |
| 8 | HSYNC | Horizontal sync signal output |  |
| 9 | Vcc | Power supply | |

## Pin Description (LVA519F)

| Pin no. | Pin name | Function | Internal equivalent circuit diagram |
|---|---|---|---|
| 1 | | NC | |
| 2 | VIDEO IN | Video signal input |  |
| 3 | Vco | Free run frequency setting |  |

<table>
<tr><td>4</td><td>PC OUT</td><td>Phase comparison output</td><td></td></tr>
<tr><td>5</td><td>CFU</td><td>Integrates composite signal and inputs to vertical sync playback circuit</td><td></td></tr>
<tr><td>6</td><td></td><td>NC</td><td></td></tr>
<tr><td>7</td><td>GND</td><td>GND</td><td></td></tr>
<tr><td>8</td><td>COSC</td><td>Free run frequency oscillation circuit</td><td></td></tr>
<tr><td>9</td><td></td><td>NC</td><td></td></tr>
<tr><td>10</td><td>VSYNC</td><td>Vertical sync signal output</td><td></td></tr>
<tr><td>11</td><td>HSYNC</td><td>Horizontal sync signal output</td><td></td></tr>
<tr><td>12</td><td>VCC</td><td>Power supply</td><td></td></tr>
<tr><td>13</td><td></td><td>NC</td><td></td></tr>
<tr><td>14</td><td></td><td>NC</td><td></td></tr>
</table>

## Absolute Maximum Ratings (Ta=25°C)

| Item | Symbol | Ratings | Units |
|---|---|---|---|
| Storage temperature | $T_{STG}$ | –40~+125 | °C |
| Operating temperature | $T_{OPR}$ | –2~+75 | °C |
| Power supply voltage | $V_{CC}$ max. | 7 | V |
| Allowable loss | Pd | 470 (SIP-9A)<br>350 (SOP-14A) | mW |

## Recommended Operating Conditions (Ta=25°C)

| Item | Symbol | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Recommended power supply voltage range | $V_{CC}$ | 4.7 | 5.0 | 5.3 | V |
| Recommended input signal voltage | $V_{IN}$ | 0.8 | 2.0 | 3.2 | $V_{P-P}$ |

## Electrical Characteristics (Except where noted otherwise, Ta=25°C, $V_{CC}$=5.0V, $V_{IN}$=2.0$V_{P-P}$)

| Item | | Symbol | Measurement conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|---|
| Consumption current | | Id | Refer to Measuring Circuit | | 7.0 | 10 | mA |
| Horizontal sync output (H) | | $V_{HH}$ | Refer to Measuring Circuit | 4.9 | 5.0 | | V |
| Horizontal sync output (L) | | $V_{HL}$ | Refer to Measuring Circuit | | 0.2 | 0.4 | V |
| Vertical sync output (H) | | $V_{VH}$ | Refer to Measuring Circuit | 4.9 | 5.0 | | V |
| Vertical sync output (L) | | $V_{VL}$ | Refer to Measuring Circuit | | 0.2 | 0.4 | V |
| Free-running frequency setting range | | fo | Refer to Measuring Circuit | 14.5 | | 17.0 | kHz |
| Power supply fluctuation of free-running frequency | | ⊿fo1 | Refer to Measuring Circuit | | 300 | | %/V |
| Free-running frequency temperature coefficient Capture range | | ⊿fo2 | Refer to Measuring Circuit | | 400 | | ppm/V |
| Capture range | | fc | Refer to Measuring Circuit | 1.0 | 1.3 | | kHz |
| Lock range | | $f_L$ | Refer to Measuring Circuit | 1.9 | 2.5 | | kHz |
| AFC output delay time | | td | Refer to Measuring Circuit | 0.3 | 0.7 | 1.1 | µS |
| AFC output pulse width | | Pw | Refer to Measuring Circuit | 3.5 | 5.0 | 6.5 | µS |
| Schmitt trigger threshold | (H) | $Vth_H$ | Refer to Measuring Circuit | 1.9 | 2.1 | 2.3 | V |
| | (L) | $Vth_L$ | Refer to Measuring Circuit | 1.1 | 1.3 | 1.5 | V |
| Sync separation level | | $V_{SEPA}$ | Refer to Measuring Circuit | 80 | 115 | 170 | mV |
| AFC off resistance | | $R_{AFC}$ | Refer to Measuring Circuit | 2.7 | 4.0 | 6.0 | kΩ |

## Measuring Procedures (Except where noted otherwise, Ta=25°C, $V_{CC}$=5.0V, $V_{IN}$=2.0$V_{P-P}$)

| Item | | Symbol | Switch state | | | | | Measuring Procedures |
|---|---|---|---|---|---|---|---|---|
| | | | S1 | S2 | S3 | S4 | S5 | |
| Consumption current | | Id | B | B | A | A | A | Connect a DC ammeter to $V_{CC}$ pin. |
| Horizontal sync output | (H) | $V_{HH}$ | B | A | B | B | A | Input standard color bar 2$V_{P-P}$. |
| | (L) | $V_{HL}$ | B | A | B | B | A | Measure at TP5 |
| Vertical sync output | (H) | $V_{VH}$ | B | A | B | B | A | Input standard color bar 2$V_{P-P}$. |
| | (L) | $V_{VL}$ | B | A | B | B | A | Measure at TP4. |
| Free-running frequency setting range | | fo | A | B | B | B | A | Adjust VR1 and measure frequency at TP5. |
| Power supply fluctuation of free-running frequency | | ⊿fo1 | A | B | B | B | A | With fo at 15.73kHz, vary Vcc between 4.0V~6.0V and measure at TP5. |
| Free-running frequency temperature coefficient | | ⊿fo2 | A | B | B | B | A | With fo at 15.73kHz, vary temperature between –20°C and 80°C and measure at TP5. |
| Capture range | | fc | B/A | A | B | B | A | Input standard color bar 2$V_{P-P}$ and measure at TP1 and TP5. *1 |
| Lock range | | $f_L$ | B/A | A | B | B | A | Input standard color bar 2$V_{P-P}$ and measure at TP1 and TP5. *1 |
| AFC output delay time | | td | A/B | A | B | B | A | Input standard color bar 2$V_{P-P}$ and measure at TP2 and TP5. *2 |
| AFC output pulse width | | Pw | A/B | A | B | B | A | Input standard color bar 2$V_{P-P}$ and measure at TP5. *2 |
| Schmitt trigger threshold | (H) | $V_{tHH}$ | B | A | B | B | A | Measure at TP3 and TP4. *3 |
| | (L) | $V_{tHL}$ | | | | | | |

## Measuring Procedures (Except where noted otherwise, Ta=25°C, $V_{CC}$=5.0V, $V_{IN}$=2.0$V_{P-P}$)

| Item | Symbol | Switch state | | | | | Measuring Procedures |
|---|---|---|---|---|---|---|---|
| | | S1 | S2 | S3 | S4 | S5 | |
| Sync separation level | $V_{SEPA}$ | B | A | B | B | A | Raise horizontal sync signal level of input standard color bar 2$V_{P-P}$ and measure the level when a signal is output at TP5. |
| AFC switching resistance | $R_{AFC}$ | B | A | B | B | B | With Fo at 15.73kHz, vary Iafc, and determine according to Iafc value when TP5 output signal switches to a composite signal, and TP6 voltage V6. $R_{AFC}$=V6/$I_{A1}$ |

Notes:

*1 Capture range (fc)························ Vary VR1 between max→min and min→max with SW1, and for each lock make SW1 A and measure at TP5.

15.73KHz

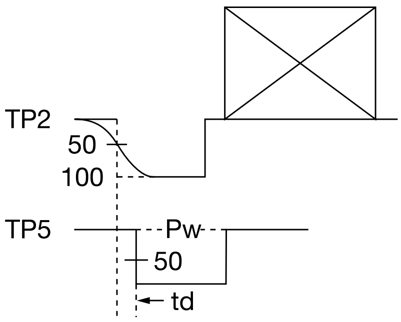
fc1 fc2 ····Data : fc1 and fc2 smaller value

Lock range (fL)····················· With SW1 at B and locked, vary VR1 and when the lock is released, make SW1 A and measure at TP5.

15.73KHz

fL1 fL2 ····Data : $f_L$1 and $f_L$2 smaller value

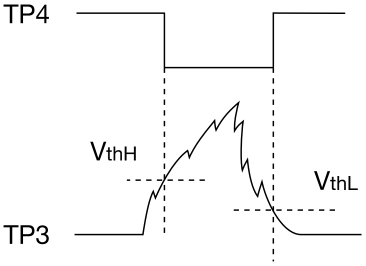
*2




* AFC output delay time (td)
Set SW1 at A and adjust TP5 output to 15.73kHz. Then set SW1 to B and measure td from TP2 and TP5 waveforms. (specified at 50% of sync signal amplitude)

* AFC output pulse width (Pw)
Set SW1 at A and adjust TP5 output to 15.73kHz. Then set SW1 to B and measure Pw from TP5 waveform. (specified at 50% of sync signal amplitude)

*3

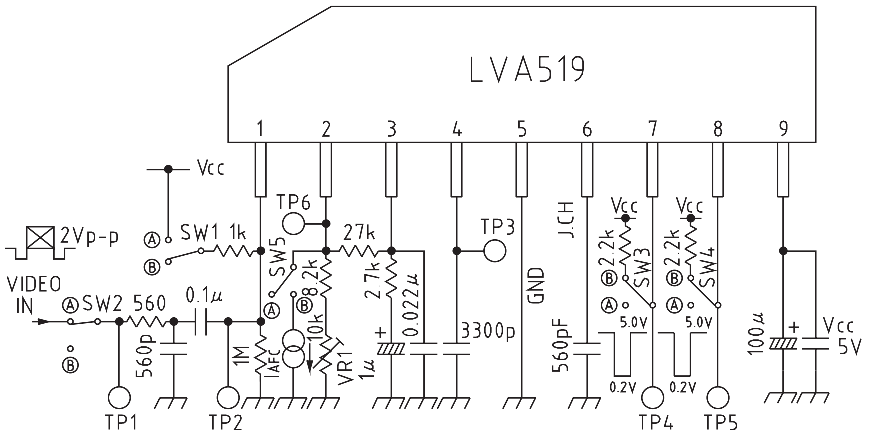



* Schmidt trigger threshold
($Vth_H$) ($Vth_L$)

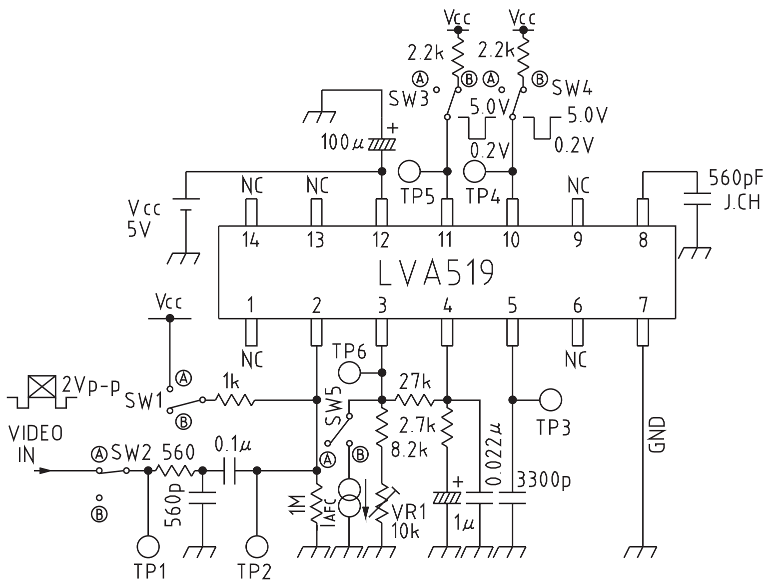
Measure $Vth_H$ and $Vth_L$ at TP3 and TP4.

## Measuring Circuit

### SIP-9A

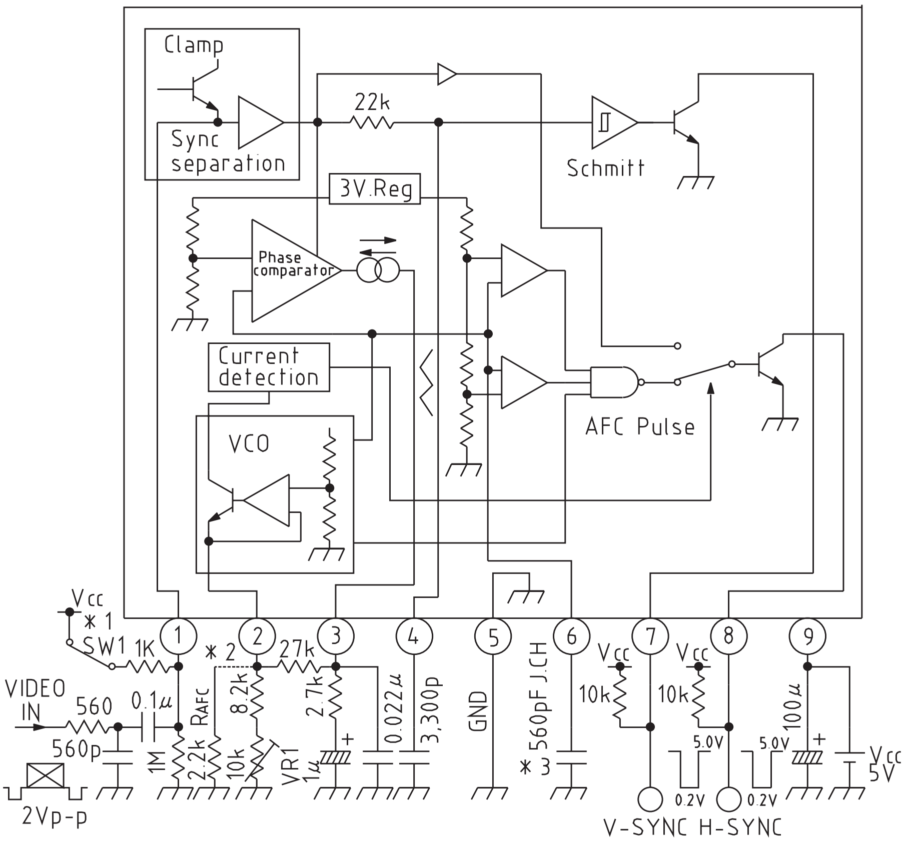



### SOP-14A



# Application Circuits

## SIP-9A




## SOP-14A