**MITSUMI**

# S Video Amplifier
# Monolithic IC MM1024

## Outline

This is a video amp IC that supports S and also has border and superimpose functions.
Amp gain is as follows : 6dB for Y signal amplification, 10dB for C signal amplification and 6dB for composite signal amplification. A 75Ω driver is built in.

## Features

1. Supports S-VHS
2. Built-in superimpose function (character and border levels)
3. Built-in Y-C mix circuit
4. Vertical/horizontal sync signal output pin
5. Amp gain :  6dB for Y signal, 10dB for C signal and 6dB for composite signal
6. Built-in clamp circuit (for Y signal only)
7. 75Ω driver built in
8. Frequency response    Y : 7MHz
                          C : 5MHz
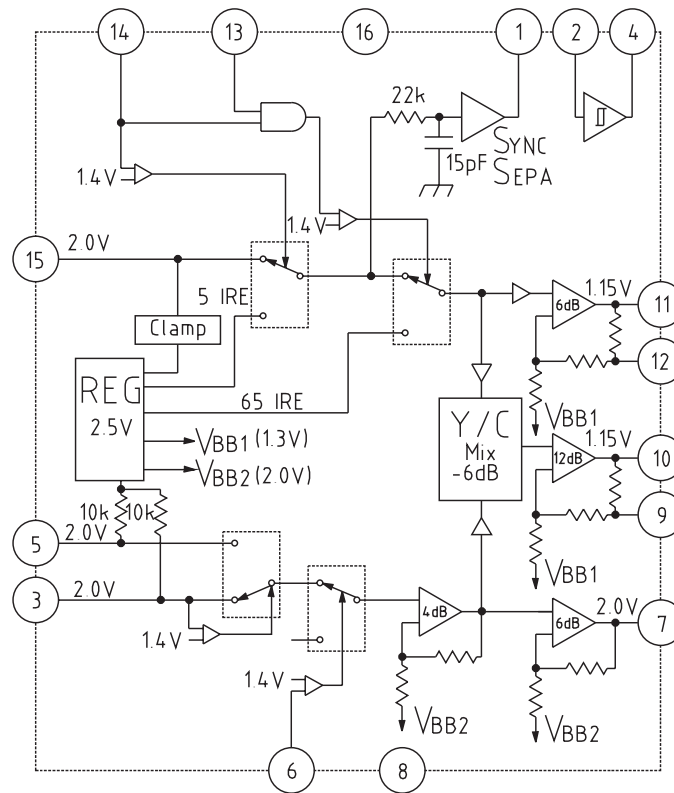9. Power supply voltage  4.7V~5.3V

## Package

SOP-16A (MM1024AF)

## Applications

1. TV
2. VCR
3. VCR with camera
4. Other video equipment

# Block Diagram



# Pin Description

| Pin no. | Pin name | Function |
|---------|----------|----------|
| 1 | R | Integrates sync signal and inputs to Schmidt circuit |
| 2 | C | |
| 3 | PB$_{IN}$ | Chroma signal input pin for other than playback |
| 4 | V$_{SYNC\ OUT}$ | Vertical sync signal output pin |
| 5 | PB$_{IN}$ | Chroma signal input pin for playback |
| 6 | Chroma mute input | Chroma mute signal input pin |
| 7 | C$_{HROMA\ OUT}$ | Chroma signal output pin |
| 8 | GND | |
| 9 | SUG | Anti-sag pin |
| 10 | V$_{IDEO\ OUT}$ | Composite video signal output pin |
| 11 | Y$_{OUT}$ | Y (luminance) signal output pin |
| 12 | SUG | Anti-sag pin |
| 13 | Character input | Character input pin for superimpose |
| 14 | Bordering input | Bordering input pin |
| 15 | Y$_{RO}$ V$_{IDEO\ IN}$ | Luminance or video signal input pin |
| 16 | V$_{CC}$ | |

# Absolute Maximum Ratings (Ta=25°C)

| Item | Symbol | Ratings | Units |
|------|--------|---------|-------|
| Storage temperature | T$_{STG}$ | −40~+125 | °C |
| Operating temperature | T$_{OPR}$ | −20~+75 | °C |
| Power supply voltage | V$_{CC}$ max. | 7 | V |
| Allowable loss | P$_d$ | 350 | mW |

# Electrical Characteristics (Except where noted otherwise, Ta=25℃, Vcc=5.0V, pulse level 0V, SW1 : A, SW2 :

| Item | Symbol | Measurement circuit | Measurement conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|---|
| Operating power supply voltage | $V_{CC}$ | $V_{CC}$ | | 4.7 | 5.0 | 5.3 | V |
| Consumption current | Id | – | SG–1, SG–2, SG–3 : No signal Measure with DC ammeter. | | 25.0 | 33.0 | mA |
| **Y amp output** | | | | | | | |
| Voltage gain | $G_V1$ | TP11 | SG–1, sweep signal 1$V_{P-P}$, 0.1MHz | 5.5 | 6.0 | 6.5 | dB |
| Differential gain | DG1 | TP10 | SG–1, staircase wave, 1$V_{P-P}$ APL=10, 50, 90% | | 1.0 | 3.0 | % |
| Differential phase | DP1 | TP10 | SG–1, staircase wave, 1$V_{P-P}$ APL=10, 50, 90% | | 1.0 | 3.0 | deg |
| Frequency characteristic | fc1 | TP11 | SG–1, sweep signal, 1$V_{P-P}$ 5MHz/0.1MHz ✶1 | –1.0 | 0 | 1.0 | dB |
| **Video amp output** | | | | | | | |
| Voltage gain | $G_V2$ | TP8 | SG–1  sweep signal 1$V_{P-P}$, 0.1MHz | 5.5 | 6.0 | 6.5 | dB |
| Differential gain | DG2 | TP9 | SG–1, staircase wave 1$V_{P-P}$ APL=10, 50, 90% | | 1.0 | 3.0 | % |
| Differential phase | DP2 | TP9 | SG–1, staircase wave, 1$V_{P-P}$ APL=10, 50, 90% | | 1.0 | 3.0 | deg |
| Frequency characteristic | fc2 | TP8 | SG–1 sweep signal 1$V_{P-P}$ 5MHz/0.1MHz ✶2 | –1.0 | 0 | 1.0 | dB |
| **Chroma amp** | | | | | | | |
| Voltage gain | $G_V3$ | TP7 | SG–2, sine wave, 0.2$V_{P-P}$, 0.1MHz | 9.0 | 10.0 | 11.0 | dB |
| Frequency characteristic | fc3 | TP7 | SG–2, sine wave, 0.2$V_{P-P}$ 5MHz/0.1MHz ✶3 | –1.0 | 0 | 1.0 | dB |
| **Crosstalk** | | | | | | | |
| Crosstalk 1 $Y_{IN} → C_{OUT}$ | $C_T1$ | TP7 | SG–1, sine wave, 1.0$V_{P-P}$, 4MHz ✶2 | | –36 | –30 | dB |
| Crosstalk 2 $\overline{P_B} → Y_{OUT}$ | $C_T2$ | TP11 | SG–2, sine wave, 0.2$V_{P-P}$, 4MHz ✶3 | | –42 | –36 | dB |
| Crosstalk 3 $P_B → Y_{OUT}$ | $C_T3$ | TP11 | SG–3, sine wave, 0.2$V_{P-P}$, 4MHz SW2 : A  ✶3 | | –42 | –36 | dB |
| Crosstalk 4 $P_B → C_{OUT}$ | $C_T4$ | TP7 | SG–1, sine wave,0.2$V_{P-P}$, 4MHz ✶4 | | –50 | –40 | dB |
| **Superimpose** | | | | | | | |
| Edge level Y | $V_{EDY}$ | TP10 | SG–1, staircase wave (no chroma signal) 1$V_{P-P}$, TP13, pulse level, 5V | 0 | 5 | 10 | IRE |
| Edge level V | $V_{EDV}$ | TP9 | SG–1, staircase wave (no chroma signal) 1$V_{P-P}$, TP13, pulse level, 5V | 0 | 5 | 10 | IRE |
| Character level Y | $V_{CHY}$ | TP10 | SG–1, staircase wave (no chroma signal) 1$V_{P-P}$, TP12, 13, pulse level, 5V | 60 | 65 | 70 | IRE |
| Character level V | $V_{CHV}$ | TP9 | SG–1, staircase wave (no chroma signal) 1$V_{P-P}$, TP12, 13 pulse level 5V | 60 | 65 | 70 | IRE |
| **Input threshold voltage** | | | | | | | |
| Bordering input | $V_{TH}1$ | TP13 | SG–1, staircase wave (no chroma signal) 1$V_{P-P}$, TP13, pulse level, L→H ✶5 | 0.7 | 1.4 | 2.1 | V |
| Character input | $V_{TH}2$ | TP12 | SG-1, staircase wave (no chroma signal) 1$V_{P-P}$ TP12, 13, pulse level, L→H ✶5 | 0.7 | 1.4 | 2.1 | V |
| Chroma mute input | $V_{TH}3$ | TP5 | SG–2, sine wave, 0.1$V_{P-P}$, 4MHz TP5, pulse level, L→H ✶6 | 0.7 | 1.4 | 2.1 | V |
| **Sync separation** | | | | | | | |
| Sync separation level | $V_{SEPA}$ | TP14 | SG–1, staircase wave (no chroma signal) 1$V_{P-P}$ SG–1, SYNC level, max→min ✶7 | 55 | 110 | 165 | mV |
| Schmitt trigger threshold voltage | $V_{TH}4_H$ | TP1 | TP1, DC voltage, 0V→H ✶8 | 1.9 | 2.1 | 2.3 | V |
| | $V_{TH}4_L$ | | TP1, DC voltage, 5V→L ✶8 | 1.1 | 1.3 | 1.5 | V |
| Vertical sync output voltage | $V_{VH}$ | TP3 | TP1, DC voltage, 5V→L ✶9 | 4.8 | 5.0 | | V |
| | $V_{VL}$ | | TP1, DC voltage, 0V→H ✶9 | | 0.2 | 0.4 | V |

Notes : *1   1.Voltage gain  $G_{V1}$, $G_{V2}$, $G_{V3}$

Given SG-1 input as V1 and TP11 output signal as V2, $G_{V1}$ is obtained as follows.
The same applies for $G_{V2}$ and $G_{V3}$.

$$GV1 = 20LOG \frac{V2}{V1} \ [dB]$$

2.Frequency response  $f_{C1}$, $f_{C2}$, $f_{C3}$

For the same conditions as the $G_{V1}$ measurement, given TP11 output for 0.1MHz as V3, and for 5MHz as V1, Fc1 is obtained as follows. The same applies for fc2 and fc3.

$$fc1 = 20LOG \frac{V4}{V3} \ [dB]$$

*2   Crosstalk  $Y_{IN} \rightarrow C_{OUT}$  $C_{T1}$

Given TP14 input signal as V5 and TP7 output signal as V6, CT1 is obtained as follows.

$$C_{T}1 = 20LOG \frac{V6}{V5} \ [dB]$$

*3   Crosstalk  $\overline{P_B}$, $P_B \rightarrow Y_{OUT}$  $C_{T2}$, $C_{T3}$

Give TP2 and TP4 input signals as V7, and TP11 output signal as V8, $C_{T2}$ and $C_{T3}$ are obtained as follows.

$$C_{T}2 = 20LOG \frac{V8}{V7} \ [dB]$$

1.When C is input to compare between $Y_{IN} \rightarrow C_{OUT}$ and $C_{IN} \rightarrow Y_{OUT}$, subtract the 4dB amp portion from crosstalk.

*4   Crosstalk  $PB \rightarrow C_{OUT}$  CT4

Given TP4 input signal as V9 and TP7 output signal as V10, CT4 is obtained as follows.

$$C_{T}4 = 20LOG \frac{V10}{V9} \ [dB]$$

*5   Input threshold voltage  Bordering input, character input  $V_{TH1}$, $V_{TH2}$

For the same conditions as $V_{EDY}$ and $V_{CHY}$ measurement, raise TP13 and TP12 pulse levels gradually. TP13 and TP12 pulse levels when bordering signal and character signal appear on TP11 are, respectively, $V_{TH1}$ and $V_{TH2}$.

*6   Input threshold voltage  Chroma mute input  $V_{TH3}$

Gradually raise TP5 pulse level. TP5 pulse level when a sine wave is no longer output on TP7 is $V_{TH3}$.

*7   Sync separation level  $V_{SEPA}$

Gradually reduce SG-1 SYNC level from maximum to minimum. Measure the SYNC signal level at TP14 when a sync separation signal is no longer output on TP15 to obtain $V_{SEPA}$.
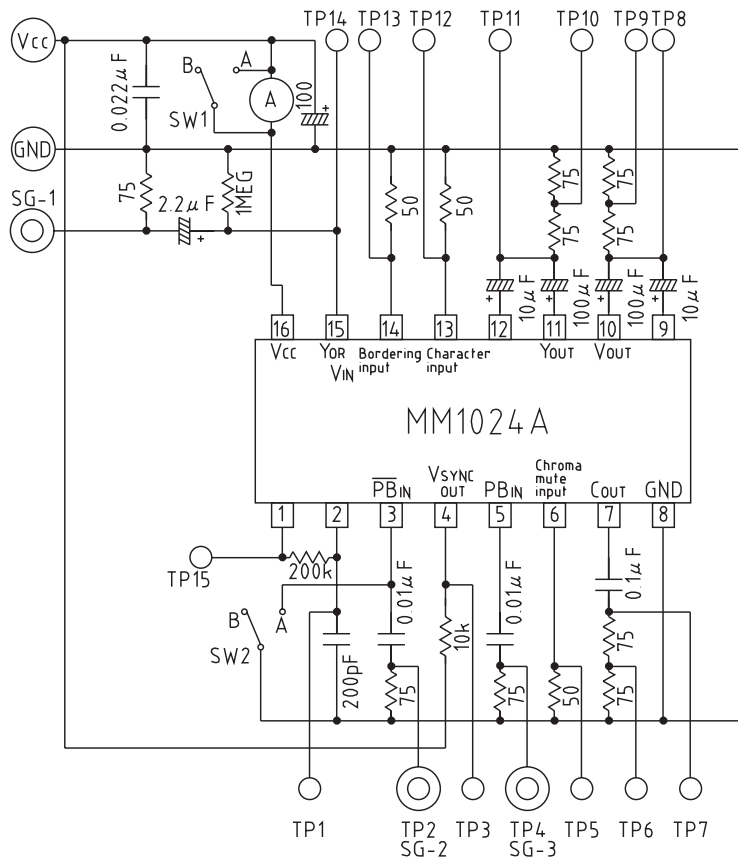
*8   Schmidt trigger threshold level  $V_{TH4H}$, $V_{TH4L}$

Impress external DC voltage on TP1 and gradually raise from 0V. TP1 level when TP3 level goes from high to low is $V_{TH4H}$. Gradually lower from 5V. TP1 level when TP3 level goes from low to high is $V_{TH4L}$.

*9   Vertical sync output voltage  $V_{VH}$, $V_{VL}$

TP3 low level for $T_{TH4H}$ measurement is $V_{VL}$, and TP3 high level for $V_{TH4L}$ is Vvh.

## Measuring Circuit



## Application Circuits