

# 2-Input 1-Output Video Switch (75Ω driver)/3-Input 1-Output Video Switch (75Ω driver) Monolithic IC MM1221~MM1228

## Outline

These ICs are high grade video switches with 2-input 1-output or 3-input 1-output and built-in 75Ω driver. The series includes those with and without built-in clamp and 6dB amp circuits. Circuit configuration tables and block diagrams are as follows. MM1228 is used as the representative model in this description.

## MM1221~MM1228 Series Circuit Configuration Table

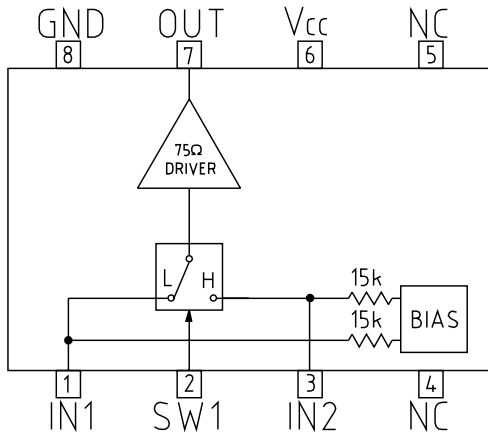
| Model name | # of Inputs | # of Outputs | 6dB amp circuit | Clamp circuit | Power supply voltage range |
|------------|-------------|--------------|-----------------|---------------|----------------------------|
| MM1221     | 2           | 1            | No              | No            | 8~13V                      |
| MM1222     | 2           | 1            | Yes             | No            | 8~13V                      |
| MM1223     | 3           | 1            | No              | No            | 8~13V                      |
| MM1224     | 3           | 1            | Yes             | No            | 8~13V                      |
| MM1225     | 2           | 1            | No              | Yes           | 4.7~13V                    |
| MM1226     | 2           | 1            | Yes             | Yes           | 4.7~13V                    |
| MM1227     | 3           | 1            | No              | Yes           | 4.7~13V                    |
| MM1228     | 3           | 1            | Yes             | Yes           | 4.7~13V                    |

## MM1221~MM1228 Input/Output Voltage Measurement Values (typ.)

| Model name | Power supply voltage | 5V   | 9V   | 12V  | Unit |
|------------|----------------------|------|------|------|------|
| MM1221     | Input voltage        |      | 4.53 | 6.05 | V    |
|            | Output voltage       |      | 4.5  | 6.1  | V    |
| MM1222     | Input voltage        |      | 4.05 | 5.4  | V    |
|            | Output voltage       |      | 5.34 | 7.12 | V    |
| MM1223     | Input voltage        |      | 4.53 | 6.05 | V    |
|            | Output voltage       |      | 4.5  | 6.1  | V    |
| MM1224     | Input voltage        |      | 4.05 | 5.4  | V    |
|            | Output voltage       |      | 5.34 | 7.12 | V    |
| MM1225     | Input voltage        | 1.27 | 2.17 | 2.86 | V    |
|            | Output voltage       | 1.31 | 2.25 | 2.96 | V    |
| MM1226     | Input voltage        | 1.3  | 2.2  | 2.9  | V    |
|            | Output voltage       | 1.4  | 2.23 | 2.88 | V    |
| MM1227     | Input voltage        | 1.27 | 2.17 | 2.86 | V    |
|            | Output voltage       | 1.31 | 2.25 | 2.96 | V    |
| MM1228     | Input voltage        | 1.3  | 2.2  | 2.9  | V    |
|            | Output voltage       | 1.4  | 2.23 | 2.88 | V    |

**Block Diagram** (MM1221~MM1228)

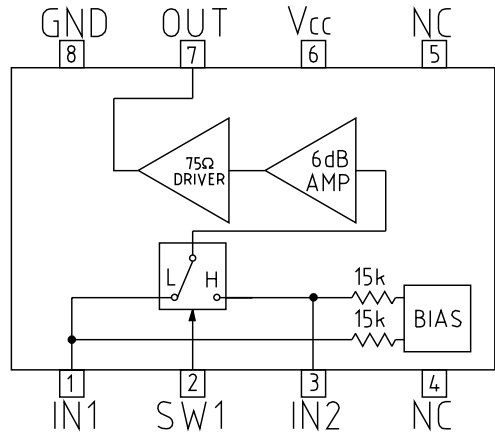
MM1221



Control input truth table

| SW | OUT |
|----|-----|
| L  | IN1 |
| H  | IN2 |

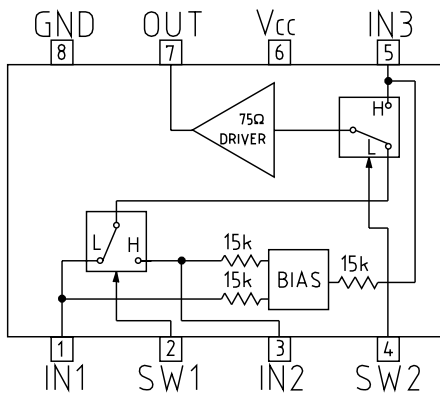
MM1222



Control input truth table

| SW | OUT |
|----|-----|
| L  | IN1 |
| H  | IN2 |

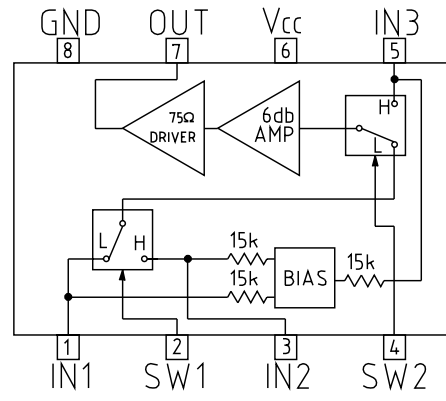
MM1223



Control input truth table

| SW1 | SW2 | OUT |
|-----|-----|-----|
| L   | L   | IN1 |
| H   | L   | IN2 |
| L/H | H   | IN3 |

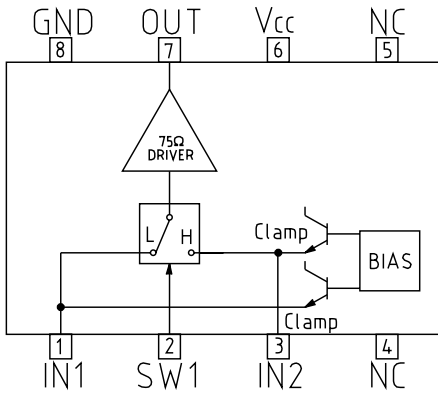
MM1224



Control input truth table

| SW1 | SW2 | OUT |
|-----|-----|-----|
| L   | L   | IN1 |
| H   | L   | IN2 |
| L/H | H   | IN3 |

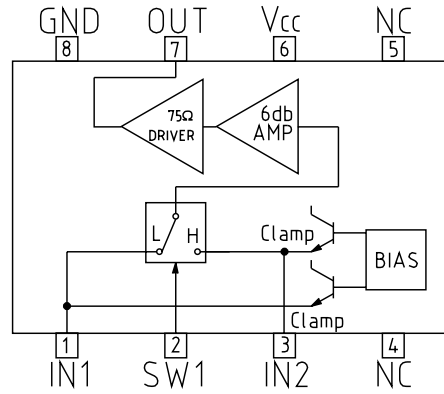
MM1225



Control input truth table

| SW | OUT |
|----|-----|
| L  | IN1 |
| H  | IN2 |

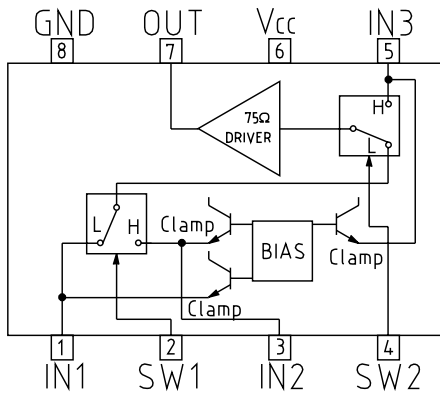
MM1226



Control input truth table

| SW | OUT |
|----|-----|
| L  | IN1 |
| H  | IN2 |

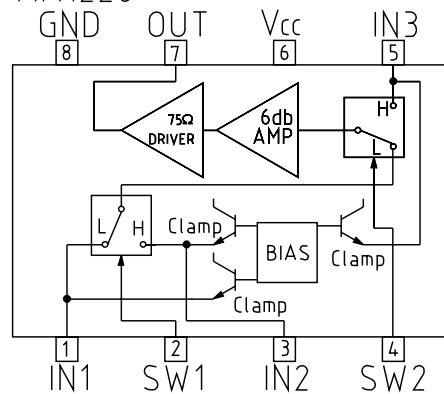
MM1227



Control input truth table

| SW1 | SW2 | OUT |
|-----|-----|-----|
| L   | L   | IN1 |
| H   | L   | IN2 |
| L/H | H   | IN3 |

MM1228



Control input truth table

| SW1 | SW2 | OUT |
|-----|-----|-----|
| L   | L   | IN1 |
| H   | L   | IN2 |
| L/H | H   | IN3 |

Introduction of Main Model

# 3-Input 1-Output Video Switch (with 75Ω driver, clamp and 6dB amp) Monolithic IC MM1228

## Outline

This is a high performance 3-input 1-output video switch IC with 6dB amp, clamp and 75Ω driver circuits. Output is 75Ω, and a 1V<sub>P-P</sub> video signal can be output externally.

## Features

1. Built-in 75Ω driver circuit
2. Built-in 6dB amp
3. Built-in clamp circuit
4. Models in the MM1221~MM1228 series without clamp circuits able to support audio or chroma circuits
5. Mute operation possible
6. Wide operating power supply voltage range      4.7~13V
7. Low current consumption
8. Wideband frequency response                      7MHz @ 0dB
9. Crosstalk    -70dB (4.43MHz)

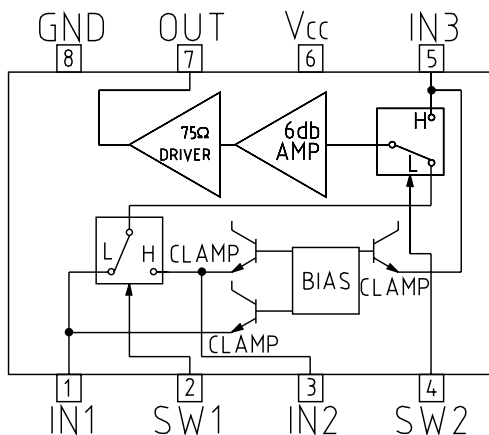
## Package

- SOP-8C (MM1228XF)
- SIP-8A (MM1228XS)

## Applications

1. TV
2. VCR
3. Video cameras
4. Other video equipment

## Block Diagram



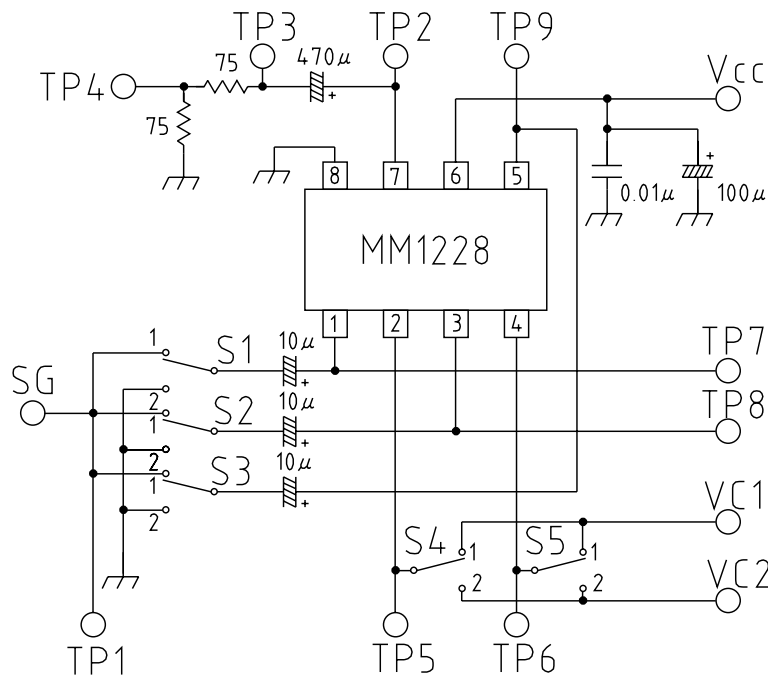
Control input truth table

| SW1 | SW2 | OUT |
|-----|-----|-----|
| L   | L   | IN1 |
| H   | L   | IN2 |
| L/H | H   | IN3 |

**Pin Description**

| Pin no.     | Pin name          | Function     | Internal equivalent circuit diagram |
|-------------|-------------------|--------------|-------------------------------------|
| 1<br>3<br>5 | IN1<br>IN2<br>IN3 | Input        |                                     |
| 2<br>4      | SW1<br>SW2        | Switch       |                                     |
| 7           | OUT               | Output       |                                     |
| 6           | Vcc               | Power supply |                                     |
| 8           | GND               | Ground       |                                     |

Measuring Circuit



Absolute Maximum Ratings (Ta=25°C)

| Item                  | Symbol           | Ratings  | Units |
|-----------------------|------------------|----------|-------|
| Storage temperature   | T <sub>STG</sub> | -40~+125 | °C    |
| Operating temperature | T <sub>OPR</sub> | -20~+75  | °C    |
| Power supply voltage  | V <sub>CC</sub>  | 15       | V     |
| Allowable loss        | P <sub>d</sub>   | 300      | mW    |

Electrical Characteristics (Except where noted otherwise, Ta=25°C, V<sub>CC</sub>=5.0V)

| Item                                 | Symbol           | Measurement conditions     | Min. | Typ. | Max. | Units |
|--------------------------------------|------------------|----------------------------|------|------|------|-------|
| Operating power supply voltage range | V <sub>CC</sub>  |                            | 4.7  |      | 13.0 | V     |
| Consumption current                  | I <sub>d</sub>   | Refer to Measuring Circuit |      | 8.4  | 10.9 | mA    |
| Voltage gain                         | G <sub>v</sub>   | Refer to Measuring Circuit | +5.5 | +6.0 | +6.5 | dB    |
| Frequency characteristic             | F <sub>c</sub>   | Refer to Measuring Circuit | -1   | 0    | +1   | dB    |
| Differential gain                    | DG               | Refer to Measuring Circuit |      | 0    | ±3   | %     |
| Differential phase                   | DP               | Refer to Measuring Circuit |      | 0    | ±3   | deg   |
| Output offset voltage                | V <sub>off</sub> | Refer to Measuring Circuit |      |      | ±30  | mV    |
| Crosstalk                            | C <sub>T</sub>   | Refer to Measuring Circuit |      | -64  | -54  | dB    |
| SW1 input voltage H                  | V <sub>IH1</sub> | Refer to Measuring Circuit | 2.1  |      |      | V     |
| SW1 input voltage L                  | V <sub>IL1</sub> | Refer to Measuring Circuit |      |      | 0.7  | V     |
| SW2 input voltage H                  | V <sub>IH2</sub> | Refer to Measuring Circuit | 2.1  |      |      | V     |
| SW2 input voltage L                  | V <sub>IL2</sub> | Refer to Measuring Circuit |      |      | 0.7  | V     |

**Measuring Procedures** ( $V_{CC}=5.0V$ ,  $V_{C1}=V_{CC}$ ,  $V_{C2}=0V$ )

| Item                     | Symbol           | Switch state |    |    |    |    | Measuring Procedure  |
|--------------------------|------------------|--------------|----|----|----|----|--|
|                          |                  | S1           | S2 | S3 | S4 | S5 |  |
| Consumption current      | Id               | 2            | 2  | 2  | 2  | 2  | Connect a DC ammeter to the Vcc pin and measure. The ammeter is shorted for use in subsequent measurements.  |
|                          |                  |              |    |    |    |    |  |
| Voltage gain             | Gv               | 1            | 2  | 2  | 2  | 2  | Input a 1.0V <sub>P-P</sub> , 100kHz sine wave to SG, and obtain G <sub>v</sub> from the following formula given TP1 voltage as V1 and TP3 voltage as V2.<br>$G_v=20\text{LOG}(V_2/V_1)$ dB  |
|                          |                  | 2            | 1  | 2  | 1  | 2  |  |
|                          |                  | 2            | 2  | 1  | 1  | 1  |  |
|                          |                  | 2            | 2  | 1  | 2  | 1  |  |
| Frequency characteristic | Fc               | 1            | 2  | 2  | 2  | 2  | For the above G <sub>v</sub> measurement, given TP3 voltage for 7MHz as V3, F <sub>c</sub> is obtained from the following formula.<br>$F_c=20\text{LOG}(V_3/V_2)$ dB   |
|                          |                  | 2            | 1  | 2  | 1  | 2  |  |
|                          |                  | 2            | 2  | 1  | 1  | 1  |  |
|                          |                  | 2            | 2  | 1  | 2  | 1  |  |
| Differential gain        | DG               | 1            | 2  | 2  | 2  | 2  | Input a 1.0V <sub>P-P</sub> staircase wave to SG, and measure differential gain at TP4.<br>APL=10~90%  |
|                          |                  | 2            | 1  | 2  | 1  | 2  |  |
|                          |                  | 2            | 2  | 1  | 1  | 1  |  |
|                          |                  | 2            | 2  | 1  | 2  | 1  |  |
| Differential phase       | DP               | 1            | 2  | 2  | 2  | 2  | Proceed as for DG, and measure differential phase.   |
|                          |                  | 2            | 1  | 2  | 1  | 2  |  |
|                          |                  | 2            | 2  | 1  | 1  | 1  |  |
|                          |                  | 2            | 2  | 1  | 2  | 1  |  |
| Output offset voltage    | Voff             | 2            | 2  | 2  | 2  | 2  | Measure the DC voltage difference of each switch status at TP2.  |
|                          |                  | 2            | 2  | 2  | 1  | 2  |  |
|                          |                  | 2            | 2  | 2  | 1  | 1  |  |
| Crosstalk                | CT               | 1            | 2  | 2  | 1  | 2  | Assume V <sub>C1</sub> =2.1V, V <sub>C2</sub> =0.7V.<br>Input a 1.0V <sub>P-P</sub> , 4.43MHz sine wave to SG, and given TP1 voltage as V4 and TP3 voltage as V5, C <sub>T</sub> is obtained from the following formula.<br>$C_T=20\text{LOG}(V_5/V_4)$ dB                               |
|                          |                  | 1            | 2  | 2  | 2  | 1  |  |
|                          |                  | 1            | 2  | 2  | 1  | 1  |  |
|                          |                  | 2            | 1  | 2  | 2  | 2  |  |
|                          |                  | 2            | 1  | 2  | 2  | 1  |  |
|                          |                  | 2            | 1  | 2  | 1  | 1  |  |
|                          |                  | 2            | 2  | 1  | 2  | 2  |  |
| Switch 1 input voltage H | V <sub>IH1</sub> | 2            | 2  | 2  | 1  | 2  | Impress an optional DC voltage on TP7 and TP8. Gradually raise from V <sub>C1</sub> =0V. TP5 voltage when TP8 voltage is output on TP2 is V <sub>IH1</sub> . Gradually lower from V <sub>C1</sub> =V <sub>CC</sub> . TP5 voltage when TP7 voltage is output on TP2 is V <sub>IL1</sub> . |
|                          |                  |              |    |    |    |    |  |
| Switch 1 input voltage L | V <sub>IL1</sub> |              |    |    |    |    |  |
|                          |                  |              |    |    |    |    |  |
| Switch 2 input voltage H | V <sub>IH2</sub> | 2            | 2  | 2  | 2  | 1  | Impress an optional DC voltage on TP7 and TP9. Gradually raise from V <sub>C1</sub> =0V. TP5 voltage when TP9 voltage is output on TP2 is V <sub>IH2</sub> . Gradually lower from V <sub>C1</sub> =V <sub>CC</sub> . TP6 voltage when TP7 voltage is output on TP2 is V <sub>IL2</sub> . |
|                          |                  |              |    |    |    |    |  |
| Switch 2 input voltage L | V <sub>IL2</sub> |              |    |    |    |    |  |
|                          |                  |              |    |    |    |    |  |