# 6-Input 1-Output Video Switch
# Monolithic IC MM1140

## Outline

This is a 6-input, 1-output high performance video switch for TV/BS signal switching. It is ideal for use when multiple input circuits are needed on 1 chip.

## Features

1. Built-in mute function (mute pin : input possible)
2. Crosstalk −70dB (at 4.43MHz)
3. Power supply voltage 5~13V
4. Frequency response 10MHz

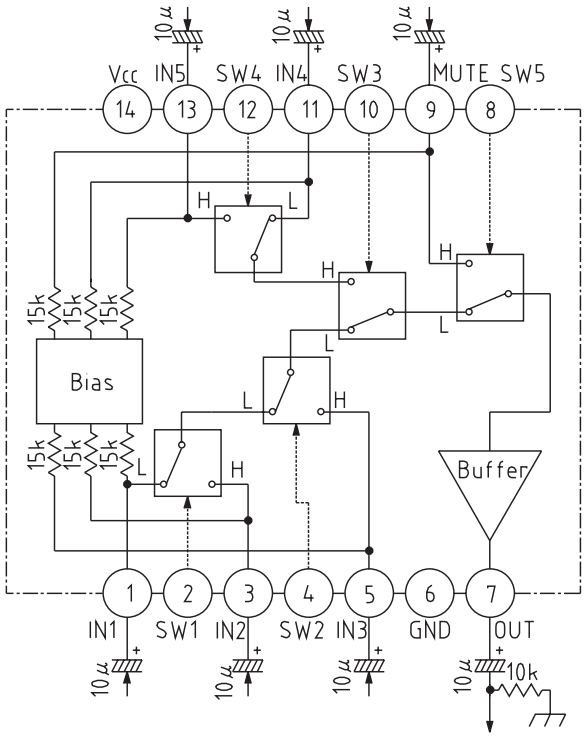
## Package

SOP-14B (MM1140XF)

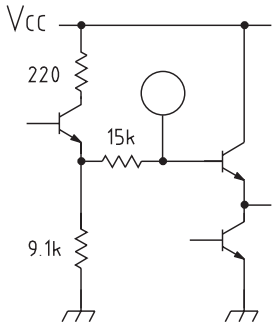
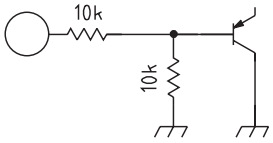
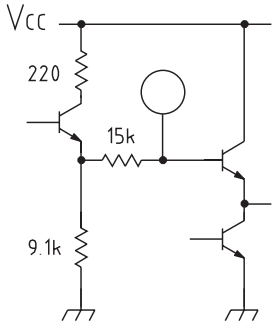
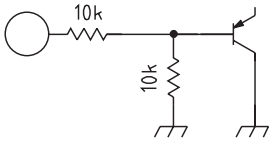
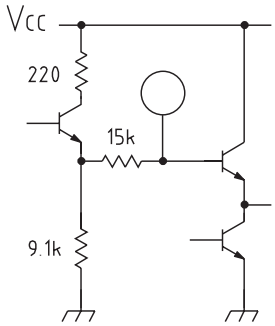
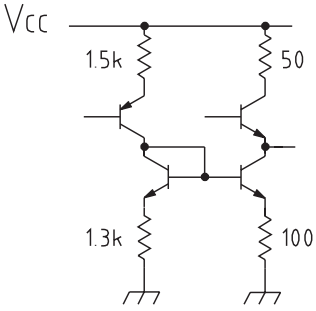
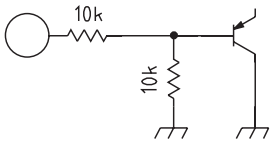
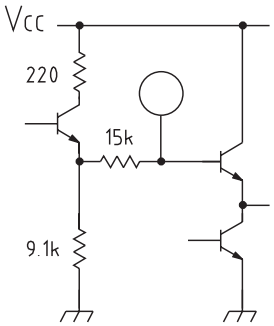
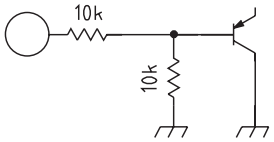
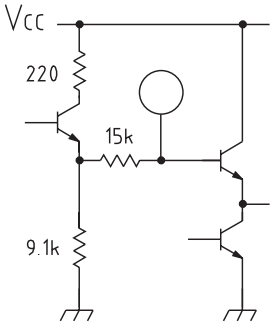
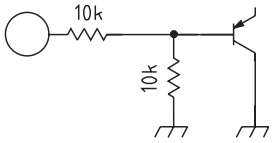
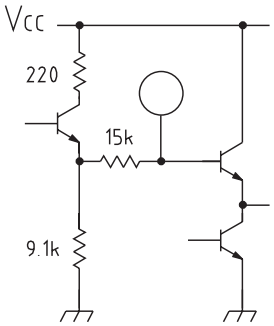
## Applications

1. TV
2. VCR
3. Other video equipment

## Block Diagram



## Pin Description

| Pin no. | Pin name | Internal equivalent circuit diagram |
|---|---|---|
| 1 | IN1 |  |
| 2 | SW1 |  |
| 3 | IN2 |  |
| 4 | SW2 |  |
| 5 | IN3 |  |
| 6 | GND | |
| 7 | OUT |  |
| 8 | SW5 |  |
| 9 | MUTE |  |
| 10 | SW3 |  |
| 11 | IN4 |  |
| 12 | SW4 |  |
| 13 | IN5 |  |
| 14 | Vcc | |

## 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 | $V_{CC}$ | 15 | V |
| Allowable loss | Pd | 350 | mW |

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

| Item | | Symbol | Measurement conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|---|
| Operating power supply voltage range | | $V_{CC}$ | | 4.75 | 5.0 | 13.0 | V |
| Consumption current | | Id | Refer to Measuring Circuit | | 9.0 | 13.0 | mA |
| Voltage gain | | $G_V$ | Refer to Measuring Circuit | –0.5 | 0 | +0.5 | dB |
| Frequency characteristic | | $F_C$ | 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 |
| Crosstalk | | $C_T$ | Refer to Measuring Circuit | | –70 | –60 | dB |
| Total harmonic distortion | | THD | Refer to Measuring Circuit | | 0.01 | 0.3 | % |
| Output offset voltage | | Voff | Refer to Measuring Circuit | | | ±30 | mV |
| Switch input voltage | H | $V_{IH}$ | Refer to Measuring Circuit | 2.1 | | | V |
| | L | $V_{IL}$ | Refer to Measuring Circuit | | | 0.7 | V |
| Input impedance | | Ri | | | 15 | | kΩ |
| Output impedance | | Ro | | | 25 | | Ω |

## Measuring Procedures (Except where noted otherwise, $V_{CC}$=5.0V, VC1=$V_{CC}$, VC2=0V)

| Item | | Symbol | Switch state | Measuring Procedure |
|---|---|---|---|---|
| Consumption current | | Id | 1 | Connect a DC ammeter to the $V_{CC}$ pin and measure. $V_{CC}$ is 5V and the ammeter is shorted for use in subsequent measurements. |
| Voltage gain | | $G_V$ | 2 | Input a 2.0$V_{P-P}$, 100kHz sine wave to SG, and obtain $G_V$ from the following formula given TP12 voltage as V1 and TP14 voltage as V2. $G_V$=20LOG (V2/V1) dB |
| Frequency characteristic | | $F_C$ | 2 | For the above $G_V$ measurement, given TP14 voltage for 10MHz as V3, $F_C$ is obtained from the following formula. $F_C$=20LOG (V3/V2) dB |
| Differential gain | | DG | 2 | Input a 2.0$V_{P-P}$ staircase wave to SG, and measure differential gain at TP14. APL=10~90% |
| Differential phase | | DP | 2 | Proceed as for DG, and measure differential phase. |
| Total harmonic distortion | | THD | 2 | Input a 2.5$V_{P-P}$, 1kHz sine wave to SG, connect a distortion meter to TP14 and measure. |
| Output offset voltage | | Voff | 3 | Measure the DC voltage difference of each switch status at TP13. |
| Crosstalk | | $C_T$ | 9 | Assume VC1=2.1V, VC2=0.7V. Input a 2.0$V_{P-P}$, 4.43MHz sine wave to SG, and given TP12 voltage as V4 and TP14 voltage as V5, $C_T$ is obtained from the following formula. $C_T$=20LOG (V5/V4) dB |
| Switch 1 input voltage | H | $V_{IH}1$ | 4 | Impress different optional DC voltages on TP6 and TP7. Gradually raise from VC3=0V. TP1 voltage when TP7 voltage is output on TP13 is $V_{IH}1$. Gradually lower from VC3=$V_{CC}$. TP1 voltage when TP6 voltage is output on TP13 is $V_{IL}1$. |
| | L | $V_{IL}1$ | | |
| Switch 2 input voltage | H | $V_{IH}2$ | 5 | Impress different optional DC voltages on TP6 and TP8. Gradually raise from VC3=0V. TP2 voltage when TP8 voltage is output on TP13 is $V_{IH}2$. Gradually lower from VC3=$V_{CC}$. TP2 voltage when TP6 voltage is output on TP13 is $V_{IL}2$. |
| | L | $V_{IL}2$ | | |
| Switch 3 input voltage | H | $V_{IH}3$ | 6 | Impress different optional DC voltages on TP6 and TP9. Gradually raise from VC3=0V. TP3 voltage when TP9 voltage is output on TP13 is $V_{IH}3$. Gradually lower from VC3=$V_{CC}$. TP3 voltage when TP6 voltage is output on TP13 is $V_{IL}3$. |
| | L | $V_{IL}3$ | | |
| Switch 4 input voltage | H | $V_{IH}4$ | 7 | Impress different optional DC voltages on TP9 and TP10. Gradually raise from VC3=0V. TP4 voltage when TP10 voltage is output on TP13 is $V_{IH}4$. Gradually lower from VC3=$V_{CC}$. TP4 voltage when TP9 voltage is output on TP13 is $V_{IL}4$. |
| | L | $V_{IL}4$ | | |
| Switch 5 input voltage | H | $V_{IH}5$ | 8 | Impress different optional DC voltages on TP6 and TP11. Gradually raise from VC3=0V. TP5 voltage when TP11 voltage is output on TP13 is $V_{IH}5$. Gradually lower from VC3=$V_{CC}$. TP5 voltage when TP6 voltage is output on TP13 is $V_{IL}5$. |
| | L | $V_{IL}5$ | | |

## Switch Conditions Table

| Conditions | SW | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Control switching | | | | | Input switching | | | | | |
| | S1 | S2 | S3 | S4 | S5 | S6 | S7 | S8 | S9 | S10 | S11 |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| 3 | Conditions 2 | | | | | 0 | 0 | 0 | 0 | 0 | 0 |
| 4 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 6 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7 | 0 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| 9 | Combination of all control switching and input switching when no signal is output to TP14. | | | | | | | | | | |

## Control Input-Output Table

| SW | | | | | OUT |
|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | |
| L | L | L | – | L | IN1 |
| H | L | L | – | L | IN2 |
| – | H | L | – | L | IN3 |
| – | – | H | L | L | IN4 |
| – | – | H | H | L | IN5 |
| – | – | – | – | H | MUTE |

## Measuring Circuit