

# M52755SP

## WIDE BAND ANALOG SWITCH

### DESCRIPTION

The M52755SP is a semiconductor integrated circuit for the RGBHV interface. The device features switching signals input from two types of image sources and outputting the signals to the CRT display, etc. Synchronous signals, meeting a frequency band of 10kHz to 200kHz, are output at TTL. The frequency band of video signals is 250MHz, acquiring high-resolution images, and are optimum as an interface IC with high-resolution CRT display and various new media.

### FEATURES

- Frequency band: RGB.....250MHz  
 HV.....10Hz to 200kHz  
 Input level:RGB.....0.7VP-P (typ.)  
 HV TTL input.....3.5VO-P (both channel)
- Only the G channel is provided with sync-on video output.
- The TTL format is adopted for HV output.

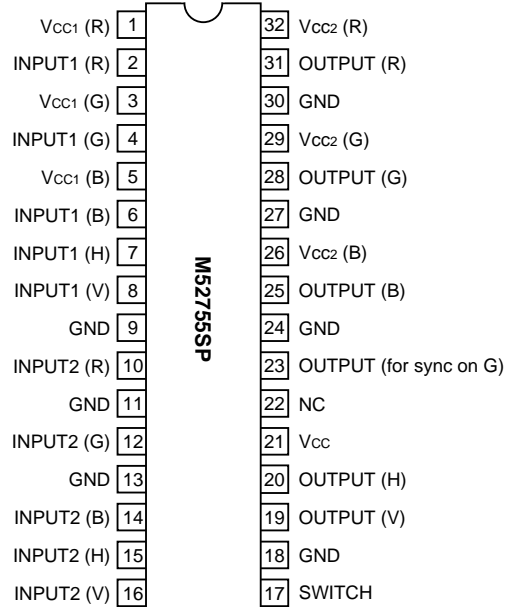
### APPLICATION

Display monitor

### RECOMMENDED OPERATING CONDITION

Supply voltage range.....4.5 to 5.5V  
 Rated supply voltage.....5.0V

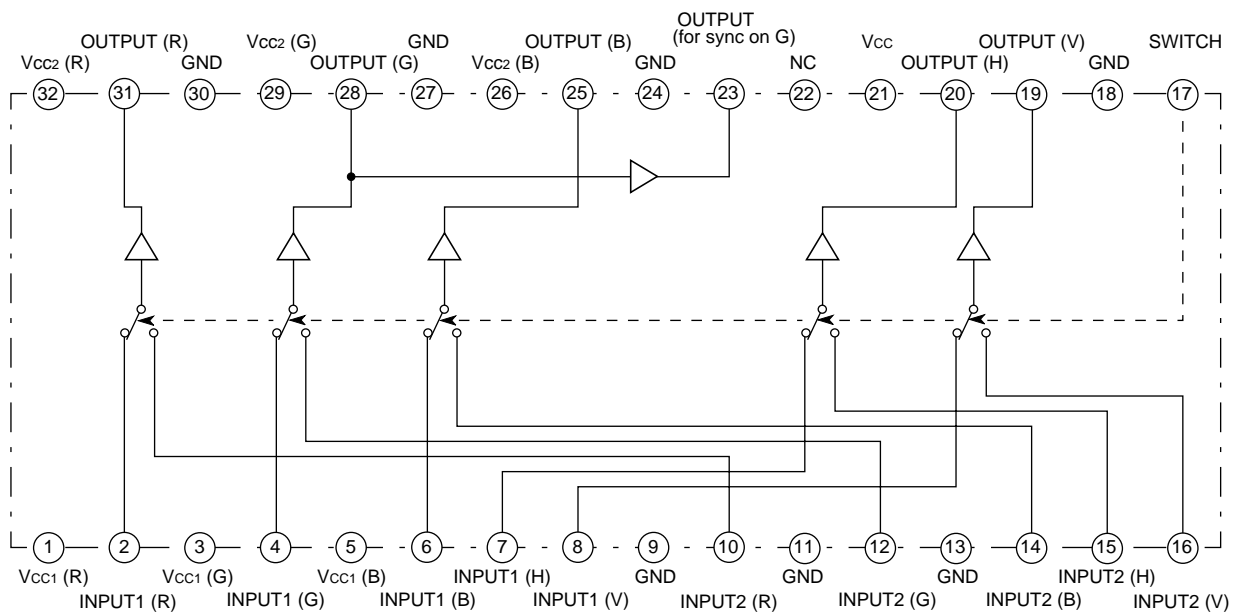
### PIN CONFIGURATION (TOP VIEW)



Outline 32P4B

NC : NO CONNECTION

### BLOCK DIAGRAM



# M52755SP

## WIDE BAND ANALOG SWITCH

### ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

Symbol	Parameter	Ratings	Unit
V <sub>CC</sub>	Supply voltage	7.0	V
P <sub>d</sub>	Power dissipation	1603	mW
T <sub>opr</sub>	Ambient temperature	-20 to +85	°C
T <sub>stg</sub>	Storage temperature	-40 to +150	°C
V <sub>opr</sub>	Recommended supply voltage	5.0	V
V <sub>opr'</sub>	Recommended supply voltage range	4.5 to 5.5	V
Surge	Electrostatic discharge	±200	V

### ELECTRICAL CHARACTERISTICS (V<sub>CC</sub>=5V, Ta=25°C, unless otherwise noted)

Symbol	Parameter	Test conditions													Limits			Unit			
		Test point (s)	V <sub>CC</sub> (V)	Input											SW	Min.	Typ.		Max.		
				SW2 Rin1	SW4 Gin1	SW6 Bin1	SW7 Hin1	SW8 Vin1	SW10 Rin2	SW12 Gin2	SW14 Bin2	SW15 Hin2	SW16 Vin2	SW17 Switch							
I <sub>CC1</sub>	Circuit current1 (no signal)	A	5	b	b	b	b	b	b	b	b	b	b	b	b	b	b	46	66	86	mA
I <sub>CC2</sub>	Circuit current2 (no signal)	A	5	b	b	b	b	b	b	b	b	b	b	b	b	a	OPEN	46	66	86	mA
(RGB SW)																					
V <sub>DC1</sub>	Output DC voltage1	T.P.31 T.P.28 T.P.25	5	b	b	b	b	b	b	b	b	b	b	b	b	b	b	1.85	2.05	2.25	V
V <sub>DC2</sub>	Output DC voltage2	T.P.31 T.P.28 T.P.25	5	b	b	b	b	b	b	b	b	b	b	b	b	a	OPEN	1.85	2.05	2.25	V
V <sub>DC3</sub>	Output DC voltage3	T.P.23	5	b	b	b	b	b	b	b	b	b	b	b	b	b	b	0.75	1.15	1.55	V
V <sub>DC4</sub>	Output DC voltage4	T.P.23	5	b	b	b	b	b	b	b	b	b	b	b	b	a	OPEN	0.75	1.15	1.55	V
V <sub>imax1</sub>	Maximum allowable input1	T.P.2 T.P.4 T.P.6	5	abb SG1	bab SG1	bba SG1	b	b	b	b	b	b	b	b	b	b	b	2.0	2.4	-	V <sub>P-P</sub>
V <sub>imax2</sub>	Maximum allowable input2	T.P.10 T.P.12 T.P.14	5	b	b	b	b	b	b	abb SG1	bab SG1	bba SG1	b	b	b	a	OPEN	2.0	2.4	-	V <sub>P-P</sub>
G <sub>V1</sub>	Voltage gain1	T.P.31 T.P.28 T.P.25	5	abb SG2	bab SG2	bba SG2	b	b	b	b	b	b	b	b	b	b	b	0.3	0.9	1.5	dB
ΔG <sub>V1</sub>	Relative voltage gain1	Relative to measured values above													-0.4	0	0.4	dB			
G <sub>V2</sub>	Voltage gain2	T.P.31 T.P.28 T.P.25	5	b	b	b	b	b	b	abb SG2	bab SG2	bba SG2	b	b	b	a	OPEN	0.3	0.9	1.5	dB
ΔG <sub>V2</sub>	Relative voltage gain2	Relative to measured values above													-0.4	0	0.4	dB			
G <sub>V3</sub>	Voltage gain3	T.P.23	5	b	a SG2	b	b	b	b	b	b	b	b	b	b	b	b	-0.4	0.2	0.8	dB
G <sub>V4</sub>	Voltage gain4	T.P.23	5	b	b	b	b	b	b	b	a SG2	b	b	b	b	a	OPEN	-0.4	0.2	0.8	dB
F <sub>C1</sub>	Freq. characteristic1 (100MHz)	T.P.31 T.P.28 T.P.25	5	abb SG4	bab SG4	bba SG4	b	b	b	b	b	b	b	b	b	b	b	-1.0	0	1.0	dB
ΔF <sub>C1</sub>	Relative Freq. characteristic1 (100MHz)	Relative to measured values above													-1.0	0	1.0	dB			
F <sub>C2</sub>	Freq. characteristic2 (100MHz)	T.P.31 T.P.28 T.P.25	5	b	b	b	b	b	b	abb SG4	bab SG4	bba SG4	b	b	b	a	OPEN	-1.0	0	1.0	dB
ΔF <sub>C2</sub>	Relative Freq. characteristic2 (100MHz)	Relative to measured values above													-1.0	0	1.0	dB			
F <sub>C3</sub>	Freq. characteristic3 (250MHz)	T.P.31 T.P.28 T.P.25	5	abb SG5	bab SG5	bba SG5	b	b	b	b	b	b	b	b	b	b	b	-3.0	-1.5	1.0	dB
F <sub>C4</sub>	Freq. characteristic4 (250MHz)	T.P.31 T.P.28 T.P.25	5	b	b	b	b	b	b	abb SG5	bab SG5	bba SG5	b	b	b	a	OPEN	-3.0	-1.5	1.0	dB

ELECTRICAL CHARACTERISTICS (cont.)

Symbol	Parameter	Test point (s)	Test conditions													Limits			Unit	
			Vcc (V)	Input												SW	Min.	Typ.		Max.
			Vcc	SW2 Rin1	SW4 Gin1	SW6 Bin1	SW7 Hin1	SW8 Vin1	SW10 Rin2	SW12 Gin2	SW14 Bin2	SW15 Hin2	SW16 Vin2	SW17 Switch						
C.T.I.1	Crosstalk between two inputs1 (10MHz)	T.P.31 T.P.28 T.P.25	5	abb SG3	bab SG3	bba SG3	b	b	b	b	b	b	b	b	b	GND ↓ OPEN	-	-60	-50	dB
C.T.I.2	Crosstalk between two inputs2 (10MHz)	T.P.31 T.P.28 T.P.25	5	b	b	b	b	b	abb SG3	bab SG3	bba SG3	b	b	b	GND ↓ OPEN	-	-60	-50	dB	
C.T.I.3	Crosstalk between two inputs3 (100MHz)	T.P.31 T.P.28 T.P.25	5	abb SG4	bab SG4	bba SG4	b	b	b	b	b	b	b	b	GND ↓ OPEN	-	-40	-35	dB	
C.T.I.4	Crosstalk between two inputs4 (100MHz)	T.P.31 T.P.28 T.P.25	5	b	b	b	b	b	abb SG4	bab SG4	bba SG4	b	b	b	GND ↓ OPEN	-	-40	-35	dB	
C.T.C.1	Crosstalk between channels1 (10MHz)	T.P.31 T.P.28 T.P.25	5	abb SG3	bab SG3	bba SG3	b	b	b	b	b	b	b	b	b GND	-	-50	-40	dB	
C.T.C.2	Crosstalk between channels2 (10MHz)	T.P.31 T.P.28 T.P.25	5	b	b	b	b	b	abb SG3	bab SG3	bba SG3	b	b	a OPEN	-	-50	-40	dB		
C.T.C.3	Crosstalk between channels3 (100MHz)	T.P.31 T.P.28 T.P.25	5	abb SG4	bab SG4	bba SG4	b	b	b	b	b	b	b	b GND	-	-30	-25	dB		
C.T.C.4	Crosstalk between channels4 (100MHz)	T.P.31 T.P.28 T.P.25	5	b	b	b	b	b	abb SG4	bab SG4	bba SG4	b	b	a OPEN	-	-30	-25	dB		
Tr1	Pulse characteristic1	T.P.31 T.P.28 T.P.25	5	a SG6	a SG6	a SG6	b	b	b	b	b	b	b	b GND	-	1.6	2.5	nsec		
Tf1		T.P.31 T.P.28 T.P.25	5	a SG6	a SG6	a SG6	b	b	b	b	b	b	b	b GND	-	1.6	2.5	nsec		
Tr2	Pulse characteristic2	T.P.31 T.P.28 T.P.25	5	b	b	b	b	b	a SG6	a SG6	a SG6	b	b	a OPEN	-	1.6	2.5	nsec		
Tf2		T.P.31 T.P.28 T.P.25	5	b	b	b	b	b	a SG6	a SG6	a SG6	b	b	a OPEN	-	1.6	2.5	nsec		
(HV SW)																				
VoH1	High level output voltage1	T.P.19 T.P.20	5	b	b	b	c 5.0V	c 5.0V	b	b	b	b	b	b GND	4.5	5.0	-	V		
VoH2	High level output voltage2	T.P.19 T.P.20	5	b	b	b	b	b	b	b	b	c 5.0V	c 5.0V	a OPEN	4.5	5.0	-	V		
VoL1	Low level output voltage1	T.P.19 T.P.20	5	b	b	b	c 0V	c 0V	b	b	b	b	b	b GND	-	0.2	0.5	V		
VoL2	Low level output voltage2	T.P.19 T.P.20	5	b	b	b	b	b	b	b	b	c 0V	c 0V	a OPEN	-	0.2	0.5	V		
Vith1	Input selectional voltage1	T.P.7 T.P.8	5	b	b	b	c Variable	c Variable	b	b	b	b	b	b GND	2.0	2.5	3.0	V		
Vith2	Input selectional voltage2	T.P.15 T.P.16	5	b	b	b	b	b	b	b	b	c Variable	c Variable	a OPEN	2.0	2.5	3.0	V		
Trd1	Rising delay time1	T.P.19 T.P.20	5	b	b	b	a SG7	a SG7	b	b	b	b	b	b GND	-	100	150	nsec		
Trd2	Rising delay time2	T.P.19 T.P.20	5	b	b	b	b	b	b	b	b	a SG7	a SG7	a OPEN	-	100	150	nsec		
Tfd1	Falling delay time1	T.P.19 T.P.20	5	b	b	b	a SG7	a SG7	b	b	b	b	b	b GND	-	50	100	nsec		
Tfd2	Falling delay time2	T.P.19 T.P.20	5	b	b	b	b	b	b	b	b	a SG7	a SG7	a OPEN	-	50	100	nsec		
Vsth1	Switching selectional voltage1	T.P.17	5	a SG1	a SG1	a SG1	a SG7	a SG7	b	b	b	b	b	c	0.5	1.5	2.0	V		
Vsth2	Switching selectional voltage2	T.P.17	5	b	b	b	b	b	a SG1	a SG1	a SG1	a SG7	a SG7	c	0.5	1.5	2.0	V		

**ELECTRICAL CHARACTERISTICS TEST METHOD**

It omits the SW.No accorded with signal input pin because it is already written in Table.

SW A, SW1, SW3, SW5 is in side a if there is not defined specially.

**Icc1, Icc2 Circuit current (no signal)**

The condition is shown as Table 1. Set SW17 to GND (or OPEN) and SW A to side b, measure the current by current meter A. The current is as Icc1 (Icc2).

**Vdc1, Vdc2 Output DC voltage**

Set SW17 to GND (or OPEN), measure the DC voltage of T.P.31 (T.P.28, T.P.25) when there is no signal input. The DC voltage is as Vdc1 (or Vdc2).

**Vdc3, Vdc4 Output DC voltage**

Measure the DC voltage of T.P.23 same as note2, the DC voltage is as Vdc3 (or Vdc4).

**Vimax1, Vimax2 Maximum allowable input**

Set SW17 to GND, SG1 as the input signal of Pin 2. Rising up the amplitude of SG1 slowly, read the amplitude of input signal when the output waveform is distorted. The amplitude is as Vimax1. And measure Vimax1 when SG2 as the input signal of Pin 4, Pin 6 in same way. Next, set SW to OPEN, measure Vimax2 when SG2 as the input signal of Pin10, 12, 14.

**Gv1, ΔGv1, Gv2, ΔGv2**

1. The condition is shown as Table.
2. Set SW17 to GND, SG2 as the input signal of Pin 2. At this time, read the amplitude output from T.P 31. The amplitude is as VOR1.
3. Voltage gain Gv1 is

$$Gv1 = 20 \text{ LOG } \frac{VOR1 [VP-P]}{0.7 [VP-P]} \text{ [dB]}$$

4. The method as same as 2 and 3, measure the voltage gain Gv1 when SG2 as the input signal of Pin 4, 6.
5. The difference of each channel relative voltage gain is as ΔGv1.
6. Set SW17 to OPEN, measure Gv2, ΔGv12 in the same way.

**Gv3, Gv4, Voltage gain**

1. The condition is shown as table. This test is by active probe.
2. Measure the amplitude output from T.P.23.
3. Measure the Gv3, Gv4 by the same way as Gv1, ΔGv1, Gv2, ΔGv2.

**Fc1, ΔFc1, Fc2, ΔFc2**

1. The condition is shown as table. This test is by active probe.
2. Set SW17 to GND, SG2 as the input signal of Pin 2. Measure the amplitude output from T.P.31. The amplitude is as VOR1. By the same way, measure the output when SG4 is as input signal of Pin 2, the output is as VOR2.

3. The frequency characteristic Fc1 is

$$Fc1 = 20 \text{ LOG } \frac{VOR2 [VP-P]}{VOR1 [VP-P]} \text{ [dB]}$$

4. The method as same as 2 and 3, measure the frequency Fc1 when input signal to Pin 4, 6.
5. The difference between of each channel frequency characteristic is as ΔFc1.
6. Set SW17 to OPEN, measure Fc2, ΔFc2.

**Fc3, Fc4 Freq. characteristic**

By the same way as Note7 measure the Fc3, Fc4 when SG5 of input signal.

**C.T.I.1, C.T.I.2 Crosstalk between two input**

1. The condition is shown as Table. This test is by active prove.
2. Set SW17 to GND, SG3 as the input signal of Pin 2. Measure the amplitude output from T.P.31. The amplitude is as VOR3.
3. Set SW17 to OPEN, measure the amplitude output from T.P.31. The amplitude is as VOR3'.
4. The crosstalk between two inputs C.T.I.1 is

$$C.T.I.1 = 20 \text{ LOG } \frac{VOR3' [VP-P]}{VOR3 [VP-P]} \text{ [dB]}$$

5. By the same way, measure the crosstalk between two inputs when SG3 as the input signal of Pin 4, Pin 6.
6. Next, set SW17 to OPEN, SG3 as the input signal of Pin 10, measure the amplitude output from T.P.31. The amplitude is as VOR4.
7. Set SW17 to GND, measure the amplitude output from T.P.31. The amplitude is as VOR4'.
8. The crosstalk between two inputs C.T.I.2 is

$$C.T.I.2 = 20 \text{ LOG } \frac{VOR4' [VP-P]}{VOR4 [VP-P]} \text{ [dB]}$$

9. By the same way, measure the crosstalk between channels when SG3 as the input signal of Pin 12,14.

**C.T.I.3, C.T.I.4 Crosstalk between two input**

Set SG4 as the input signal, and then the same method as table, measure C.T.I.3, C.T.I.4.

**C.T.C.1, C.T.C.2 Crosstalk between channel**

1. The condition is as Table. This test is by active prove.
2. Set SW17 to GND, SG3 as the input signal of Pin 2. Measure the amplitude output from T.P.31. The amplitude is as VOR5.
3. Next, measure T.P.28, T.P.25 in the same state, and the amplitude is as VOG5, VOB5.
4. The crosstalk between channels C.T.C.1 is

$$C.T.C.1 = 20 \text{ LOG } \frac{VOG5 \text{ or } VOB5}{VOR5} \text{ [dB]}$$

5. Measure the crosstalk between channels when SG3 is as the input signal of Pin 4, Pin 6 .
6. Next, set SW17 to OPEN, SG3 as the input signal of Pin10, measure the amplitude output from T.P.31. The amplitude is as VOR6.
7. Next, measure the amplitude output from T.P.28, T.P.25 in the same state. The amplitude is as VOG6, VOB6.
8. The crosstalk between channels C.T.C.2 is

$$C.T.C.2 = 20 \text{ LOG } \frac{V_{OG6} \text{ or } V_{OB6}}{V_{OR6}} \text{ [dB]}$$

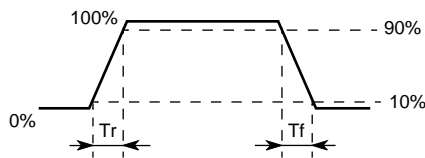
9. By the same way, measure the crosstalk between channels when input signal to Pin12, 14 .

**C.T.C.3, C.T.C.4 Crosstalk between channel**

Set SG4 as the input signal, and the same method as table, measure C.T.C.3, C.T.C.4.

**Tr1, Tf1, Tr2, Tf2 Pulse characteristic**

1. The condition is as Table. Set SW17 to GND (or OPEN).
2. The rising of 10% to 90% for input pulse is Tri, the falling of 10% to 90% for input pulse is Tfi.
3. Next, the rising of 10% to 90% for output pulse is Tro, the falling of 10% to 90% for output pulse is Tfo.
4. The pulse characteristic Tr1, Tf1 ( Tr2, Tf2 ) is



$$Tr1 \text{ (Tr2)} = \sqrt{(Tro)^2 - (Tri)^2} \text{ (nsec)}$$

$$Tf1 \text{ (Tf2)} = \sqrt{(Tfo)^2 - (Tfi)^2} \text{ (nsec)}$$

**VoH1, VoH2 High level output voltage**

The condition is as Table. Set SW17 to GND (OPEN), input 5V at input terminal. Measure the output voltage, the voltage is as VoH1 (VoH2).

**VoL1, VoL2 Low level output voltage**

The condition is as Table. Set SW17 to GND (OPEN), input 0V at input terminal. Measure the output voltage, the voltage is as VoL1 (VoL2).

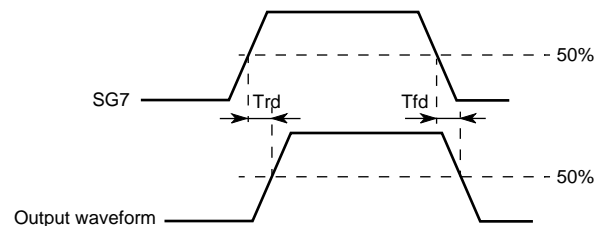
**Vith1, Vith2 Input selectional voltage**

The condition is as table. Set SW17 to GND (OPEN), increasing gradually the voltage of input terminal from 0V, measure the voltage of input terminal when output terminal is 4.5V. The input voltage is as Vith1 (Vith 2).

**Trd1, Trd2 Rising delay time**

**Tfd1, Tfd2 Falling delay time**

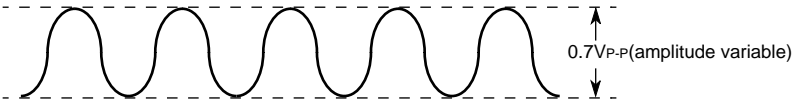
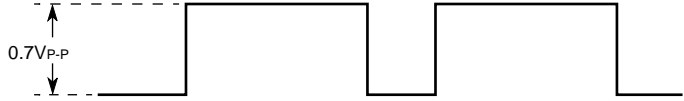
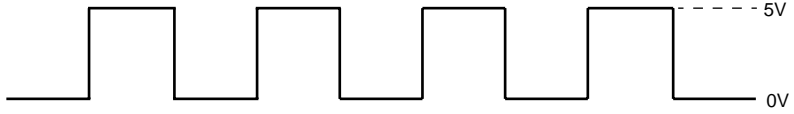
The condition is as table. Set SW17 to GND (OPEN), SG7 is as the input signal of input terminal, measure the waveform of output. Rising delay time is as Trd1 (Trd2). Falling delay time is as Tfd1 (Tfd2). Reference to the Fig. as shown below.



**Vsth1, Vsth2 Switching selectional voltage**

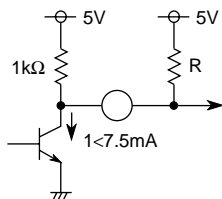
1. The condition is as table. SG1 is as the input signal of Pin 2, Pin4, Pin6, and SG7 is as the input signal of Pin7, Pin8. There is no input at another pins.
2. Input 0V at Pin17, confirm that there are signals output from T.P.19, T.P.20, T.P.23, T.P.25, T.P.28, T.P.31.
3. Increase gradually the voltage of terminal Pin17. Read the voltage when there is no signal output from the terminals listed as above. The voltage is as Vsth1.
4. SG1 as the input signal of Pin10, Pin12, Pin14, and SG7 as the input signal of Pin15, Pin16. There is no input at another pins.
5. Inputs 5V at Pin17, confirm that there is no signal output from T.P.19, T.P.20, T.P.23, T.P.25, T.P.28, T.P.31.
6. Decreasing gradually the voltage of terminal Pin 17. Read the voltage when there are signals output from the terminals listed as above. The voltage is as Vsth2.

**INPUT SIGNAL**

SG No.	Signals
SG1	Sine wave (f=60kHz, 0.7V <sub>P-P</sub> , amplitude variable) 
SG2	Sine wave (f=1MHz, amplitude 0.7V <sub>P-P</sub> )
SG3	Sine wave (f=10MHz, amplitude 0.7V <sub>P-P</sub> )
SG4	Sine wave (f=100MHz, amplitude 0.7V <sub>P-P</sub> )
SG5	Sine wave (f=250MHz, amplitude 0.7V <sub>P-P</sub> )
SG6	Pulse with amplitude 0.7V <sub>P-P</sub> (f=60kHz, duty80%) 
SG7	Square wave (Amplitude 5.0V <sub>O-P</sub> TTL, f=60kHz, duty50%) 

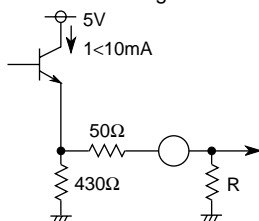
**NOTE HOW TO USE THIS IC**

1. R, G, B input signal is 0.7V<sub>P-P</sub> of standard video signal.
2. H, V input is 5.0V TTL type.
3. Input signal with sufficient low impedance to input terminal.
4. The terminal of H, V output pin are shown as Fig.1. It is possible to reduce rise time by insert the resistor between V<sub>cc</sub> line and H, V output Pin, but set the value of resistor in order that the current is under 7.5mA. Setting the value of R is more than 2kΩ as shown in Fig.1.



**Fig.1**

5. The terminal of R,G,B output pin (Pin 25, 28, 31). It is possible to add a pull-up resistor according as drive ability. but set the value of resistor in order that the current is under 10mA. Setting the value of R is more than 500Ω as shown in Fig.2.



**Fig.2**

6. Switch (Pin 17) can be changed when this terminal is GND or OPEN

When GND : Signal output from input 1

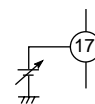
When OPEN : Signal output from input 2

When the switch is being used as Fig.3

0 to 0.5V : Signal output from input 1

2 to 5V : Signal output from input 2

It is not allowable to set voltage higher than V<sub>cc</sub>.



**Fig.3**

**NOTICE OF MAKING PRINTED CIRCUIT BOARD.**

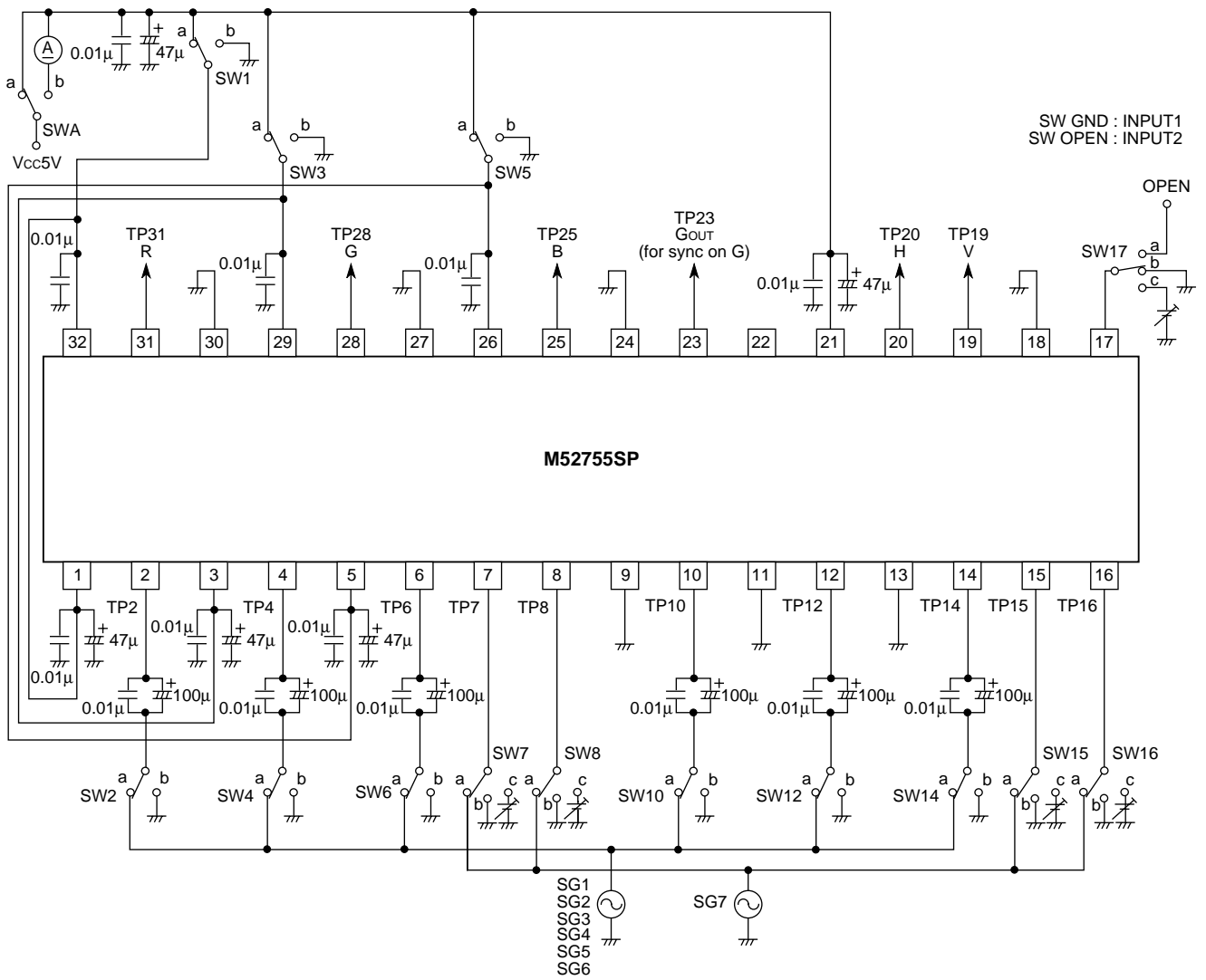
Please notice following as shown below. It will maybe cause something oscillation because of the P.C.B. layout of the wide band analog switch.

- The distance between resistor and output pin is as short as possible when insert a output pull-down resistor.
- The capacitance of output terminal as small as possible.
- Set the capacitance between V<sub>cc</sub> and GND near the pins if possible.
- Using stable power-source (if possible the separated power-source will be better).
- It will reduce the oscillation when add a resistor that is tens of ohms between output pin and next stage.
- Assign an area as large as possible for grounding.

# M52755SP

## WIDE BAND ANALOG SWITCH

### TEST CIRCUIT

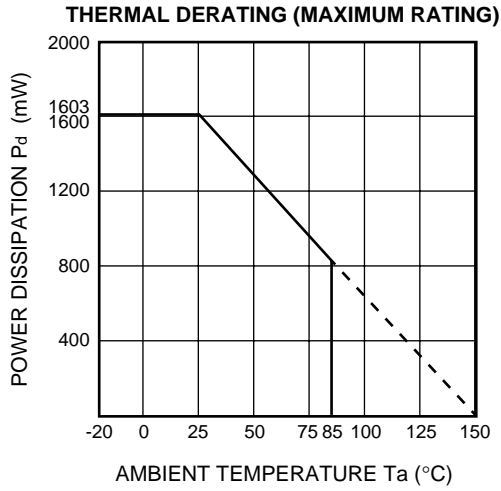


Units Resistance :  $\Omega$   
Capacitance : F

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## WIDE BAND ANALOG SWITCH

### TYPICAL CHARACTERISTICS



### DESCRIPTION OF PIN

Pin No.	Name	DC voltage (V)	Peripheral circuit of pins	Remarks
1 3 5	Vcc1 (R) Vcc1 (G) Vcc1 (B)	5.0	—	
2 4 6	Input1 (R) Input1 (G) Input1 (B)	1.5		Input signal with low impedance.
7 8	Input1 (H) Input1 (V)	—		Input pulse between 3V and 5V. 
9, 11, 13, 18, 24, 27, 30	GND	GND	—	



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## WIDE BAND ANALOG SWITCH

### DESCRIPTION OF PIN (cont.)

Pin No.	Name	DC voltage (V)	Peripheral circuit of pins	Remarks
10 12 14	Input2 (R) Input2 (G) Input2 (B)	1.5		Input signal with low impedance.
15 16	Input2 (H) Input2 (V)	-		Input pulse between 3V and 5V. 
17	Switch	2.6		Switch by OPEN and GND.
19 20	Output (V) Output (H)	-		Output impedance is built-in.
21	Vcc (H, V, Switch)	5	-	
22	NC	-	-	
23 25 28 31	Output (Sync onG) Output (B) Output (G) Output (R)	1.15  2.05		Output impedance is built-in.
26 29 32	Vcc2 (B) Vcc2 (G) Vcc2 (R)	5	-	