M52737SP

3-CHANNEL VIDEO PREAMPLIFIER WITH OSD MIXING, RETRACE BLANKING

DESCRIPTION

The M52737SP is a semiconductor integrated circuit amplifies video signals, having a 3-channel amplifier with a band width of 150MHz. The circuit also features the OSD mixing function.

The circuit is most useful with high-resolution displays that have OSD, and its function are available for each channel, including OSD blanking, OSD mixing, retrace blanking, wide-band amplification, contrast control (main and sub), and brightness control.

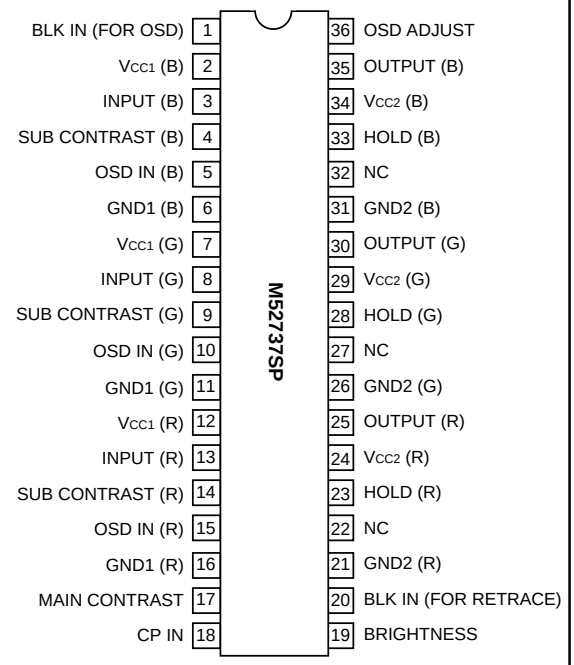
FEATURES

- Frequency band width: RGB.....150MHz ($3V_{P-P}$)
  OSD.....50MHz
  Input : RGB.....$0.7V_{P-P}$ (typ.)
  OSD.....$3.0V_{P-P}$ min. (positive)
  BLK (for OSD).....$3.0V_{P-P}$ min. (positive)
  Retrace BLK.....$3.0V_{P-P}$ min. (positive)
  Output : RGB.....$4.5V_{P-P}$ (max.)
  OSD.....$4.5V_{P-P}$ (max.)
- To adjust contrast and OSD Adj, for each, two types of controls are provided, main and sub. With the main control, the contrast or OSD Adj of the 3-channels can be changed simultaneously. Sub controls are used to adjust the contrast of a given channel individually. The control terminals can be controlled by applying a voltage of 0 to 5V.
- The DC power remains stable at the IC output terminal because a feedback circuit is built in.

APPLICATION

Display monitor

PIN CONFIGURATION (TOP VIEW)



Outline 36P4E

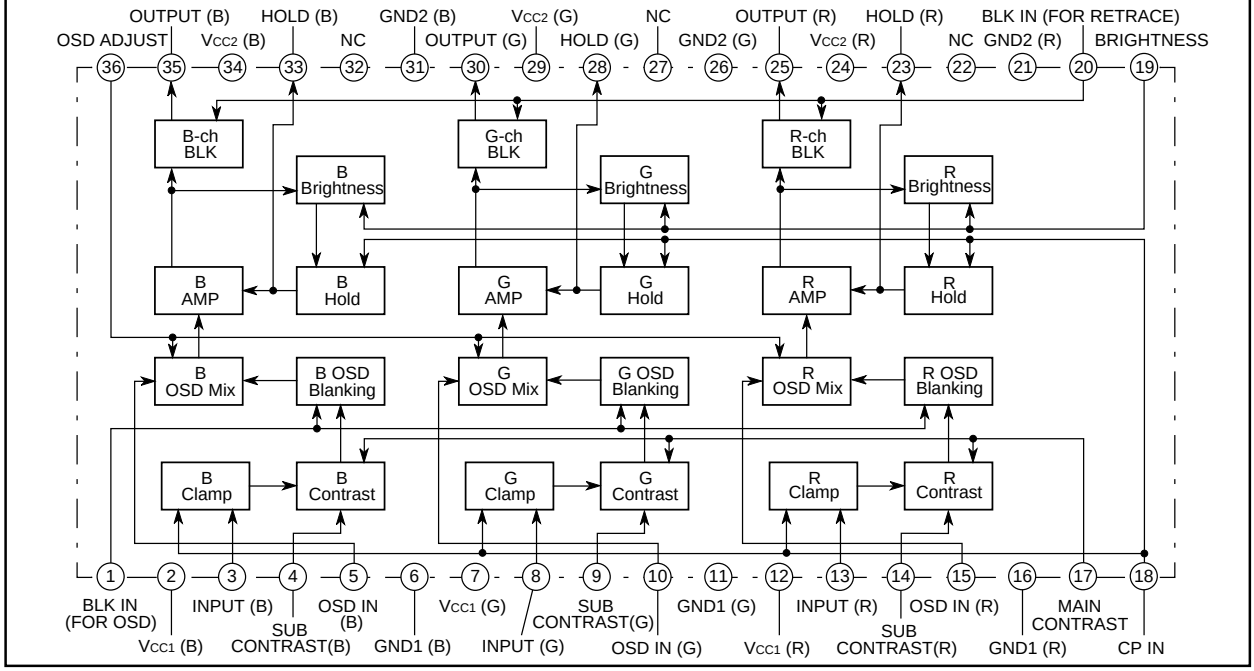
NC : NO CONNECTION

RECOMMENDED OPERATING CONDITION

Supply voltage range.....11.5 to 12.5V

Rated supply voltage.....12.0V

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

Symbol	Parameter	Ratings	Unit
V_{CC}	Supply voltage	13.0	V
P_d	Power dissipation	2403	mW
T_{opr}	Ambient temperature	-20 to +85	°C
T_{stg}	Storage temperature	-40 to +150	°C
V_{opr}	Recommended supply voltage	12.0	V
$V_{opr'}$	Recommended supply voltage range	11.5 to 12.5	V
Surge	Electrostatic discharge	±200	V

ELECTRICAL CHARACTERISTICS (V_{CC}=12V, Ta=25°C, unless otherwise noted)

Symbol	Parameter	Test conditions											Limits			Unit
		Test point (s)	Input			External power supply (V)				Pulse input			Min.	Typ.	Max.	
			SW13 R-ch	SW8 G-ch	SW3 B-ch	V4	V17	V19	V36	SW18	SW1, 5, 10, 15	SW20				
I_{CC}	Circuit current	A	a –	a –	a –	5	5	5	2	b SG4	a –	a –	72	93	115	mA
Vomax	Output dynamic range	T.P.35 T.P.30 T.P.25	b SG5	b SG5	b SG5	5	5	Vari-able	–	b SG4	a –	a –	6.2	7.7	9.2	V_{P-P}
Vimax	Maximum input	T.P.35 T.P.30 T.P.25	b SG5	b SG5	b SG5	5	2.5	2	–	b SG4	a –	a –	1	1.6	–	V_{P-P}
Gv	Maximum gain	T.P.35 T.P.30 T.P.25	b SG5	b SG5	b SG5	5	5	2	–	b SG4	a –	a –	16.4	17.8	19.4	dB
ΔGv	Relative maximum gain		Relative to measured values above										0.8	1	1.2	–
V_{CR1}	Contrast control characteristics (typical)	T.P.35 T.P.30 T.P.25	b SG5	b SG5	b SG5	5	4	2	–	b SG4	a –	a –	14.5	16.0	17.5	dB
ΔV_{CR1}	Contrast control relative characteristics (typical)		Relative to measured values above										0.8	1	1.2	–
V_{CR2}	Contrast control characteristics (minimum)	T.P.35 T.P.30 T.P.25	b SG5	b SG5	b SG5	5	1	2	–	b SG4	a –	a –	0.4	0.7	1.0	V_{P-P}
ΔV_{CR2}	Contrast control relative characteristics (minimum)		Relative to measured values above										0.8	1	1.2	–
V_{SCR1}	Sub contrast control characteristics (typical)	T.P.35 T.P.30 T.P.25	b SG5	b SG5	b SG5	4	5	2	–	b SG4	a –	a –	14.5	16.0	17.5	dB
ΔV_{SCR1}	Sub contrast control relative characteristics (typical)		Relative to measured values above										0.8	1	1.2	–
V_{SCR2}	Sub contrast control characteristics (minimum)	T.P.35 T.P.30 T.P.25	b SG5	b SG5	b SG5	1	5	2	–	b SG4	a –	a –	0.5	0.9	1.3	V_{P-P}
ΔV_{SCR2}	Sub contrast control relative characteristics (minimum)		Relative to measured values above										0.8	1	1.2	–
V_{SCR3}	Contrast/sub contrast control characteristics (typical)	T.P.35 T.P.30 T.P.25	b SG5	b SG5	b SG5	3	3	2	–	b SG4	a –	a –	1.1	1.8	2.5	V_{P-P}
ΔV_{SCR3}	Contrast/sub contrast control relative characteristics (typical)		Relative to measured values above										0.8	1	1.2	–
V_{B1}	Brightness control characteristics (maximum)	T.P.35 T.P.30 T.P.25	a –	a –	a –	5	5	4	–	b SG4	a –	a –	3.0	3.6	4.2	V
ΔV_{B1}	Brightness control relative characteristics (maximum)		Relative to measured values above										-0.3	0	0.3	V

ELECTRICAL CHARACTERISTICS (cont.)

Symbol	Parameter	Test conditions											Limits			Unit
		Test point (s)	Input			External power supply (V)				Pulse input						
			SW13 R-ch	SW8 G-ch	SW3 B-ch	V4	V17	V19	V36	SW18	SW1, 5, 10, 15	SW20	Min.	Typ.	Max.	
V_{B2}	Brightness control characteristics (typical)	T.P.35 T.P.30 T.P.25	a –	a –	a –	5	5	2	–	b SG4	a –	a –	1.2	1.8	2.4	V
ΔV_{B2}	Brightness control relative characteristics (typical)		Relative to measured values above										-0.3	0	0.3	V
V_{B3}	Brightness control characteristics (minimum)	T.P.35 T.P.30 T.P.25	a –	a –	a –	5	5	1	–	b SG4	a –	a –	0.3	0.7	1.1	V
ΔV_{B3}	Brightness control relative characteristics (minimum)		Relative to measured values above										-0.3	0	0.3	V
F_{C1}	Frequency characteristics 1 (f=50MHz;maximum)	T.P.35 T.P.30 T.P.25	b SG1	b SG1	b SG1	5	Vari-able	–	–	c –	a –	a –	-2	0	2.5	dB
ΔF_{C1}	Frequency relative characteristics 1 (f=50MHz;maximum)		Relative to measured values above										-1	0	1	–
$F_{C1'}$	Frequency characteristics 1 (f=150MHz;maximum)	T.P.35 T.P.30 T.P.25	b SG2	b SG2	b SG2	5	Vari-able	–	–	c –	a –	a –	-3	-2.0	3	dB
$\Delta F_{C1'}$	Frequency relative characteristics 1 (f=150MHz;maximum)		Relative to measured values above										-1	0	1	–
F_{C2}	Frequency characteristics 2 (f=150MHz; maximum)	T.P.35 T.P.30 T.P.25	b SG2	b SG2	b SG2	5	Vari-able	–	–	c –	a –	a –	-3	0	3	dB
ΔF_{C2}	Frequency relative characteristics 2 (f=150MHz; maximum)		Relative to measured values above										-1	0	1	–
C.T.1	Crosstalk 1 (f=50MHz)	T.P.35 T.P.30 T.P.25	b SG1	a –	a –	5	5	–	–	c –	a –	a –	–	-30	-20	dB
C.T.1'	Crosstalk 1 (f=150MHz)	T.P.35 T.P.30 T.P.25	b SG2	a –	a –	5	5	–	–	c –	a –	a –	–	-20	-15	dB
C.T.2	Crosstalk 2 (f=50MHz)	T.P.35 T.P.30 T.P.25	a –	b SG1	a –	5	5	–	–	c –	a –	a –	–	-30	-20	dB
C.T.2'	Crosstalk 2 (f=150MHz)	T.P.35 T.P.30 T.P.25	a –	b SG2	a –	5	5	–	–	c –	a –	a –	–	-20	-15	dB
C.T.3	Crosstalk 3 (f=50MHz)	T.P.35 T.P.30 T.P.25	a –	a –	b SG1	5	5	–	–	c –	a –	a –	–	-30	-20	dB
C.T.3'	Crosstalk 3 (f=150MHz)	T.P.35 T.P.30 T.P.25	a –	a –	b SG2	5	5	–	–	c –	a –	a –	–	-20	-15	dB
Tr	Pulse characteristics 1	T.P.35 T.P.30 T.P.25	b SG3	b SG3	b SG3	5	Vari-able	Vari-able	–	b SG4	a –	a –	–	2.5	–	nsec
Tf	Pulse characteristics 2	T.P.35 T.P.30 T.P.25	b SG3	b SG3	b SG3	5	Vari-able	Vari-able	–	b SG4	a –	a –	–	2.5	–	nsec
V14th	Clamp pulse threshold voltage	T.P.35 T.P.30 T.P.25	b SG5	b SG5	b SG5	5	5	2	–	b SG4	a –	a –	1.0	1.5	2.5	V_{DC}
W14	Clamp pulse minimum width	T.P.35 T.P.30 T.P.25	b SG5	b SG5	b SG5	5	5	2	–	b SG4	a –	a –	0.2	0.5	–	µsec
P_{DCH}	Pedestal voltage temperature characteristics1	T.P.35 T.P.30 T.P.25	b SG5	b SG5	b SG5	5	5	2	–	b SG4	a –	a –	-0.3	0	0.3	V_{DC}

ELECTRICAL CHARACTERISTICS (cont.)

Symbol	Parameter	Test conditions											Limits			Unit
		Test point (s)	Input			External power supply (V)				Pulse input						
			SW13 R-ch	SW8 G-ch	SW3 B-ch	V4	V17	V19	V36	SW18	SW1, 5, 10, 15	SW20	Min.	Typ.	Max.	
PDCL	Pedestal voltage temperature characteristics2	T.P.35 T.P.30 T.P.25	b SG5	b SG5	b SG5	5	5	2	–	b SG4	a –	a –	-0.3	0	0.3	VDC
OTr	OSD pulse characteristics1	T.P.35 T.P.30 T.P.25	a –	a –	a –	5	5	Vari-able	Vari-able	b SG4	SW1...a other...b SG6	a –	–	3.5	8	nsec
OTf	OSD pulse characteristics2	T.P.35 T.P.30 T.P.25	a –	a –	a –	5	5	Vari-able	Vari-able	b SG4	SW1...a other...b SG6	a –	–	3.5	8	nsec
Oaj1	OSD adjusting control characteristics (maximum)	T.P.35 T.P.30 T.P.25	a –	a –	a –	5	5	2	4	b SG4	b SG6	a –	3.9	4.6	5.3	VP-P
ΔOaj1	OSD adjusting control relative characteristics (maximum)		Relative to measured values above										0.8	1	1.2	–
Oaj2	OSD adjusting control characteristics (minimum)	T.P.35 T.P.30 T.P.25	a –	a –	a –	5	5	2	0	b SG4	b SG6	a –	–	0	0.5	VP-P
ΔOaj2	OSD adjusting control relative characteristics (minimum)		Relative to measured values above										0.8	1	1.2	–
OSDth	OSD input threshold voltage	T.P.35 T.P.30 T.P.25	a –	a –	a –	5	5	2	5	b SG4	SW1...a other...b SG6	a –	1.7	2.5	3.5	VDC
V1th	BLK input threshold voltage	T.P.35 T.P.30 T.P.25	b SG5	b SG5	b SG5	5	5	2	5	b SG4	SW1...b SG6 other...a	a –	1.7	2.5	3.5	VDC
HBLK	Retrace BLK voltage	T.P.35 T.P.30 T.P.25	a –	a –	a –	5	5	2	0	a –	a –	b SG7	–	0.2	0.5	VDC
HVth	Retrace BLK input threshold voltage	T.P.35 T.P.30 T.P.25	a –	a –	a –	5	5	2	0	a –	a –	b SG7	0.5	1.5	2.5	VDC

ELECTRICAL CHARACTERISTICS TEST METHOD

1. Because a description of signal input pin and pulse input pin switch numbers is already given in Supplementary Table, only external power supply switch numbers are included in the notes below.

Sub contrast voltages V4, V9 and V14 are always set to the same voltage, therefore only V4 is referred to in Supplementary Table.

ICC Circuit current

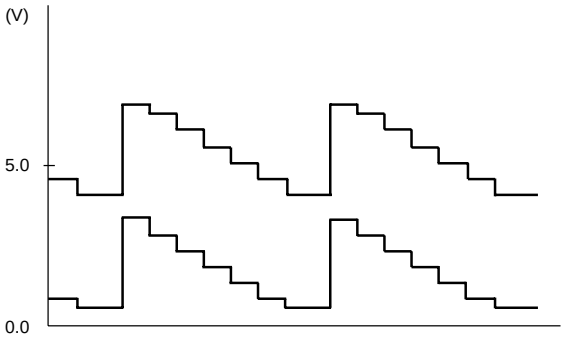
Measuring conditions are as listed in Supplementary Table.
Measured with an ammeter At test point A when SWA is set to b.

Vomax Output dynamic range

Voltage V19 is varied as described below:

1. Decrease V19 gradually while inputting SG5 to pin 13 (8 or 3). Measure the voltage when the bottom of the waveform output at T.P25 (30 or 35) is distorted. The voltage is called VOLR (VOLG or VOLB).
2. Increase V19 gradually, and measure the voltage when the top of the waveform output at T.P25 (30 or 35) is distorted. The voltage is called VOHR (VOHG or VOHB).
3. Voltage VOMAX is calculated by the equation below:

VOMAX=VOHR (VOHG, VOHB)-VOLR (VOLG, VOLB)



Waveform Output at T.P25
(Identical to output at T.P30 and T.P35.)

Vimax Maximum input

Voltage V17 is changed to 2.5V, and increase the input signal amplitude gradually, starting from 700mV$_{P-P}$.

Measure the amplitude when the output signal starts becoming distorted.

Gv Maximum gain

ΔGv Relative maximum gain

1. Input SG5 to pin 13 (8 or 3), and read the amplitude at output T.P25 (30 or 35). The amplitude is called V_{OR1} (V_{OG1} or V_{OB1}) .
2. Maximum gain G_V is calculated by the equation below:

$$G_V=20LOG\ \frac{V_{OR1}\ (V_{OG1},\ V_{OB1})\ \ [V_{P-P}]}{0.7\qquad\qquad [V_{P-P}]}$$

3. Relative maximum gain ΔG is calculated by the equation below:

$$\Delta G_V=V_{OR1}/V_{OG1},\ V_{OG1}/V_{OB1},\ V_{OB1}/V_{OR1}$$

V_{CR1} Contrast control characteristics (typical)

ΔV_{CR1} Contrast control relative characteristics (typical)

1. Measuring conditions are as given in Supplementary Table. The setting of V17 is changed to 4V.
2. Measure the amplitude output at T.P25 (30 or 35). The measured value is called V_{OR2} (V_{OG2} or V_{OB2}).
3. Contrast control characteristics V_{CR1} and relative characteristics ΔV_{CR1} are calculated, respectively, by the equations below:

$$V_{CR1}=20LOG\ \frac{V_{OR2}\ (V_{OG2},\ V_{OB2})\ \ [V_{P-P}]}{0.7\qquad\qquad [V_{P-P}]}$$

$$\Delta V_{CR1}=V_{OR2}/V_{OG2},\ V_{OG2}/V_{OB2},\ V_{OB2}/V_{OR2}$$

V_{CR2} Contrast control characteristics (minimum)

ΔV_{CR2} Contrast control relative characteristics (minimum)

1. Set V17 to 1.0V. Other conditions are as given in Supplementary Table.
2. Measure the amplitude output at T.P25 (30or 35). The measured value is called V_{OR3} (V_{OG3} or V_{OB3}), and is treated as V_{CR2}.
3. Contrast control relative characteristics ΔV_{CR2} are calculated by the equation below:

$$\Delta V_{OR2}=V_{OR3}/V_{OG3},\ V_{OG3}/V_{OB3},\ V_{OB3}/V_{OR3}$$

V_{SCR1} Sub contrast control characteristics (typical)

ΔV_{SCR1} Sub contrast control relative characteristics (typical)

1. Set V4, V9 and V14 to 4.0V. Other conditions are as given in Supplementary Table.
2. Measure the amplitude output at T.P25 (30 or 35). The measured value is called V_{OR4} (V_{OG4} or V_{OB4}).
3. Sub contrast control characteristics V_{SCR1} and relative characteristics ΔV_{SCR1} are calculated, respectively, by the equations below:

$$V_{SCR1}=20LOG\ \frac{V_{OR4}\ (V_{OG4},\ V_{OB4})\ \ [V_{P-P}]}{0.7\qquad\qquad [V_{P-P}]}$$

$$\Delta V_{SCR1}=V_{OR4}/V_{OG4},\ V_{OG4}/V_{OB4},\ V_{OB4}/V_{OR4}$$

V_{SCR2} Sub contrast control characteristics (minimum)

ΔV_{SCR2} Sub contrast control relative characteristics (minimum)

1. Set V4, V9 and V14 to 1.0V. Other conditions are as given in Supplementary Table.
2. Measure the amplitude output at T.P25 (30 or 35). The measured value is called V_{OR5} (V_{OG5} or V_{OB5}), and is treated as V_{SCR2}.
3. Relative characteristics ΔV_{SCR2} are calculated by the equation below:

$$\Delta V_{SCR2}=V_{OR5}/V_{OG5},\ V_{OG5}/V_{OB5},\ V_{OB5}/V_{OR5}$$

V_{SCR3} Contrast/sub contrast control characteristics (typical)

ΔV_{SCR3} Contrast/sub contrast control relative characteristics (typical)

1. Set V4, V9, V14 and V17 to 3.0V. Other conditions are as given in Supplementary Table.
2. Measure the amplitude at T.P25 (30 or 35). The measured value is called V_{OR6} (V_{OG6} or V_{OB6}). and is treated as V_{SCR3}.
3. Relative sub contrast control characteristics ΔV_{SCR3} is

$$\Delta V_{SCR3}=V_{OR6}/V_{OG6},\ V_{OG6}/V_{OB6},\ V_{OB6}/V_{OR6}$$

V_{B1} Brightness control characteristics (maximum)

ΔV_{B1} Brightness control relative characteristics (maximum)

1. Measuring conditions are as given in Supplementary Table.
2. Measure the output at T.P25 (30 or 35) with a voltmeter. The measured value is called V_{OR7} (V_{OG7} or V_{OB7}), and is treated as V_{B1}.
3. To obtain brightness control relative characteristics, calculate the difference in the output between the channels, using V_{OR7}, V_{OG7} and V_{OB7}.

$$\Delta V_{B1}=V_{OR7}-V_{OG7}\qquad [V]$$
$$=V_{OG7}-V_{OB7}$$
$$=V_{OB7}-V_{OR7}$$

V_{B2} Brightness control characteristics (typical)

ΔV_{B2} Brightness control relative characteristics (typical)

1. Measuring conditions are as given in Supplementary Table.
2. Measure the output at T.P25 (30 or 35) with a voltmeter. The measured value is called $V_{OR7'}$ ($V_{OG7'}$ or $V_{OB7'}$), and is treated as V_{B2}.
3. To obtain brightness control relative characteristics (ΔV_{B2}), calculate the difference in the output between the channels, using $V_{OR7'}$, $V_{OG7'}$, and $V_{OB7'}$.

$$\Delta V_{B2}=V_{OR7'}-V_{OG7'}\qquad [V]$$
$$=V_{OG7'}-V_{OB7'}$$
$$=V_{OB7'}-V_{OR7'}$$

V_{B3} Brightness control characteristics (minimum)
ΔV_{B3} Brightness control relative characteristics (minimum)

1. Measuring conditions are as given in Supplementary Table.
2. Measure the output at T.P25 (30 or 35) with a voltmeter.
   The measured value is called $V_{OR7"}$ ($V_{OG7"}$ or $V_{OB7"}$), and is treated as V_{B2}.
3. To obtain brightness control relative characteristics (ΔV_{B3}), calculate the difference in the output between the channels, using $V_{OR7"}$, $V_{OG7"}$ and $V_{OB7"}$.

$$\Delta V_{B3} = V_{OR7"} - V_{OG7"} \quad [V]$$
$$= V_{OG7"} - V_{OB7"}$$
$$= V_{OB7"} - V_{OR7"}$$

F_{C1} Frequency characteristics1 (f=50MHz; maximum)
ΔF_{C1} Frequency relative characteristics1 (f=50MHz; maximum)
F_{C1}' Frequency characteristics1 (f=150MHz; maximum)
ΔF_{C1}' Frequency relative characteristics1 (f=150MHz; maximum)

1. Measuring conditions are as given in Supplementary Table.
2. First, SGA is as input signal. Input a resister that is about 2KΩ to offer the voltage at input pins (Pin 3, Pin 8, Pin 13) in order that the bottom of input signal is 2.5V.
   Inputs the voltage at hold pins (Pin 23, Pin 28, Pin 33) in order that the bottom of sine wave output is 2V.
   Control the MAIN CONTRAST (V17) in order that the amplitude of sine wave output is 4.0V_{P-P}.
   By the same way, measure the output amplitude when SG1, SG2 is as input signal.
3. Supposing that the measured value is treated as amplitude V_{OR8} (V_{OG8} or V_{OB8}) when SG1 is input, or as V_{OR9} (V_{OG9} or V_{OB9}) when SG2 is input, frequency characteristics F_{C1} and $F_{C1'}$ are calculated as follows:

$$F_{C1} = 20\log \frac{V_{OR8}\ (V_{OG8},\ V_{OB8})\ [V_{P-P}]}{4.0\ [V_{P-P}]}$$

$$F_{C1}' = 20\log \frac{V_{OR9}\ (V_{OG9},\ V_{OB9})\ [V_{P-P}]}{4.0\ [V_{P-P}]}$$

4. Frequency relative band widths ΔF_{C1} and $\Delta F_{C1'}$ are equal to the difference in F_{C1} and $F_{C1'}$, respectively, between the channels.

F_{C2} Frequency characteristics2 (f=150MHz; maximum)
$\Delta F_{C2'}$ Frequency relative characteristics2 (f=150MHz; maximum)

Measuring conditions and procedure are the same as described in F_{C1}, ΔF_{C1}, $F_{C1'}$, $\Delta F_{C1'}$, except that Control the MAIN CONTRAST (V17) in order that the amplitude of sine wave output is 1.0V_{P-P}.

C.T.1 Crosstalk1 (f=50MHz)
C.T.1' Crosstalk1 (f=150MHz)

1. Measuring conditions are as given in Supplementary Table.
2. Input SG1 (or SG2) to pin 13 (R-ch) only, and then measure the waveform amplitude output at T.P25 (30 or 35). The measured value is called V_{OR}, V_{OG} and or V_{OB} respectively.
3. Crosstalk C.T.1 (C.T.1') is calculated by the equation below:

$$\underset{(C.T.1')}{C.T.1} = 20\log \frac{V_{OG} \text{ or } V_{OB}\ [V_{P-P}]}{V_{OR}\ [V_{P-P}]}\ [dB]$$

C.T.2 Crosstalk2 (f=50MHz)
C.T.2' Crosstalk2 (f=150MHz)

1. Change the input pin from pin 8 (G-ch), and measure the output in the same way as in C.T.1, C.T.1'.
2. Crosstalk C.T. 2 (C.T.2') is calculated by the equation below:

$$\underset{(C.T.2')}{C.T.2} = 20\log \frac{V_{OR} \text{ or } V_{OB}\ [V_{P-P}]}{V_{OG}\ [V_{P-P}]}\ [dB]$$

C.T.3 Crosstalk3 (f=50MHz)
C.T.3' Crosstalk3 (f=150MHz)

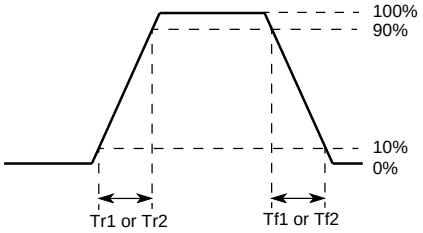
1. Change the input pin from pin 13 (R-ch) to pin 3 (B-ch), and measure the output in the same way as in C.T.1, C.T.1'.
2. Crosstalk C.T. 3 (C.T.3') is calculated by the equation below:

$$\underset{(C.T.3')}{C.T.3} = 20\log \frac{V_{OR} \text{ or } V_{OG}\ [V_{P-P}]}{V_{OB}\ [V_{P-P}]}\ [dB]$$

Tr Pulse characteristics1
Tf Pulse characteristics2

1. Measuring conditions are as given in Supplementary Table. Control the MAIN CONTRAST(V17) in order that the amplitude of output signal is 4.0V_{P-P}. Control the BRIGHTNESS(V19) in order that the Black level of output signal is 2.0V.
2. Measure the time needed for the input pulse to rise from 10% to 90% (Tr1) and to fall from 90% to 10% (Tf1)with an active prove.
3. Measure the time needed for the output pulse to rise from 10% to 90% (Tr2) and to fall from 90% to 10% (Tf2) with an active prove.
4. Pulse characteristics Tr and Tf are calculated by the equation below:

$$Tr\ (nsec) = \sqrt{(Tr2)^2 - (Tr1)^2}$$
$$Tf\ (nsec) = \sqrt{(Tf2)^2 - (Tf1)^2}$$



V14th Clamp pulse threshold voltage

1. Measuring conditions are as given in Supplementary Table.
2. Turn down the SG4 input level gradually, monitoring the output (about 1.8 V_{DC}). Measure the top level of input pulse when the output pedestal voltage turn decrease with unstable.

W14 Clamp pulse minimum width

Decrease the SG4 pulse width gradually, monitoring the output. Measure the SG4 pulse width (a point of 1.5V) when the output pedestal voltage turn decrease with unstable.

P_{DCH} Pedestal voltage temperature characteristics1
P_{DCL} Pedestal voltage temperature characteristics2

1. Measuring conditions are as given in Supplementary Table.
2. Measure the pedestal voltage at room temperature.
   The measured value is called P_{DC1}.
3. Measure the pedestal voltage at temperatures of -20°C and 85°C. The measured value is called, respectively, P_{DC2} and $P_{DC}3$.
4. $P_{DCH}=P_{DC1} - P_{DC2}$
   $P_{DCL}=P_{DC1} - P_{DC3}$

OTr OSD pulse characteristics1
OTf OSD pulse characteristics2

1. Measuring conditions are as given in Supplementary Table.
   Control the MAIN OSD ADJUST(V36) in order that the amplitude of output signal is 3.0V_{P-P}. Control the BRIGHTNESS(V19) in order that the Black level of output signal is 2.0V.
2. Measure the time needed for the input pulse to rise from 10% to 90% (OTr1) and to fall from 90% to 10% (OTf1) with an active prove.
3. Measure the time needed for the output pulse to rise from 10% to 90% (OTr2) and to fall from 90% to 10% (OTf2) with an active prove.
4. Pulse characteristics Tr and Tf are calculated by the equations below :

$$OTr\ (nsec)=\sqrt{(OTr2)^2-(OTr1)^2}$$

$$OTf\ (nsec)=\sqrt{(OTf2)^2-(OTf1)^2}$$

Oaj1 OSD adjusting control characteristics (maximum)
ΔOaj1 OSD adjusting control relative characteristics (maximum)

1. Measuring conditions are as given in Supplementary Table.
2. Measure the output at T.P25 (30 or 35).
   The pedestal level is called V_{LRA} (V_{LGA} or V_{LBA}), and the OSD level is called V_{HRA} (V_{HGA} or V_{HBA}).
3. V_{LRA} (V_{LGA} or V_{LBA}) is treated as Oaj1.
   Oaj1=V_{ORA} (V_{OGA}, V_{OBA}) = V_{HRA}-V_{LRA}, (V_{HGA}-V_{LGA}, V_{HBA}-V_{LBA})
4. OSD adjusting control relative characteristics ΔOaj1 are calculated by the equation below:
   ΔOaj1=V_{ORA}/V_{OGA}, V_{OGA}/V_{OBA}, V_{OBA}/V_{ORA}

Oaj2 OSD adjusting control characteristics (minimum)
ΔOaj2 OSD adjusting control relative characteristics (minimum)

Measuring conditions and procedure are the same as described in Note 23, except that V36 is set to 0V.

OSDth OSD input threshold voltage

1. Measuring conditions are as given in Supplementary Table.
2. Reduce the SG6 input level gradually, monitoring output.
   Measure the SG6 level when the output reaches 0V.
   The measured value is called OSDth.

V1th BLK input threshold voltage

1. Measuring conditions are as given in Supplementary Table.
2. Make sure that signals are not being output synchronously with SG6 (blanking period).
3. Reduce the SG6 input level gradually, monitoring output.
   Measure the SG6 level when the blanking period disappears.
   The measured value is called V1th.

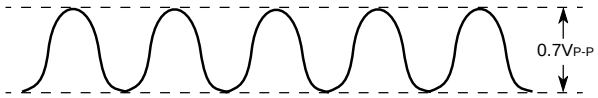
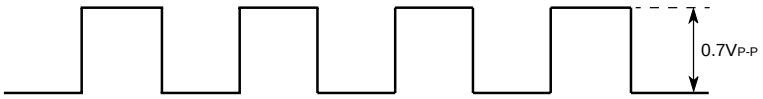
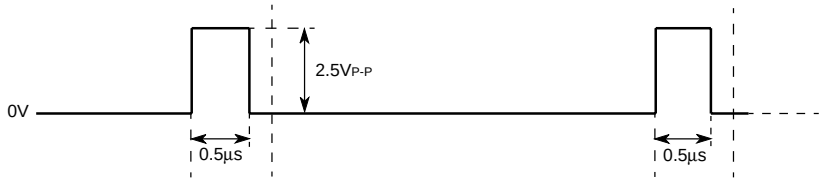
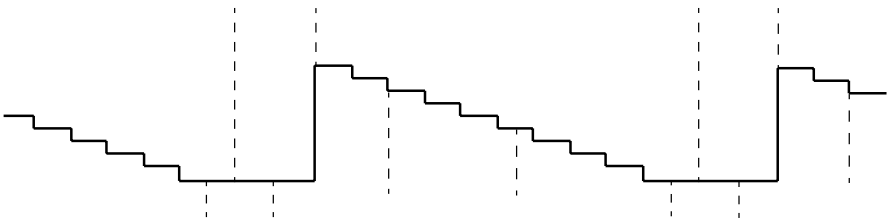
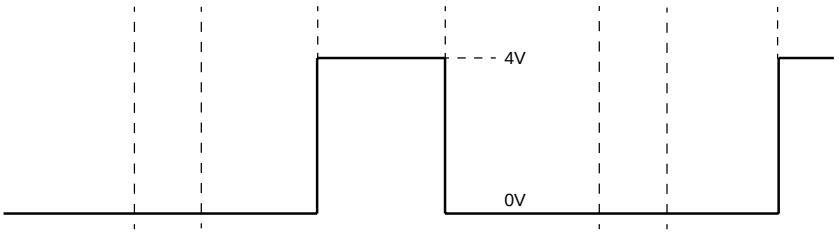
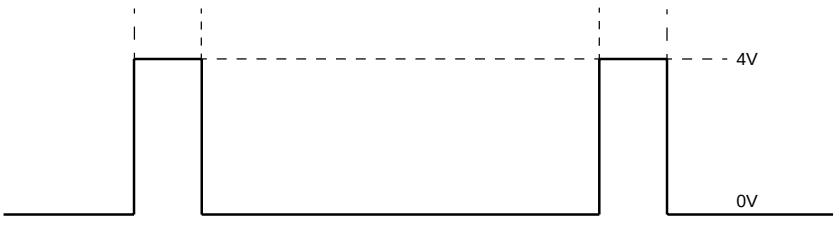
H_{BLK} Retrace BLK voltage

1. Measuring conditions are as given in Supplementary Table.
2. Monitoring to output at that time, read the level of retrace blanking.

HVth Retrace BLK input threshold voltage

1. Measuring conditions are as given in Supplementary Table.
2. Confirm that output signal is being blanked by the SG7 at the time.
   Monitoring to output signal, decreasing the level of SG7.
   Measure the top level of SG7 when the blanking period is disappeared.

INPUT SIGNAL

SG No.	Signals
SGA	Sine wave with amplitude of 0.7V_{P-P} (f=1MHz) 
SG1	Sine wave with amplitude of 0.7V_{P-P} (f=50MHz)
SG2	Sine wave with amplitude of 0.7V_{P-P} (f=150MHz)
SG3	Pulse with amplitude of 0.7V_{P-P} (f=1MHz, duty=50%) Pulses which are synchronous with SG4 pedestal portion 
SG4	Pulses which are synchronous with standard video step waveform pedestal portion: amplitude, 2.5V_{P-P}; and pulse width, 0.5µs 
SG5 Standard video step waveform	 Video signal with amplitude of 0.7V_{P-P} (f=30kHz, amplitude sometimes variable)
SG6 OSD BLK and OSD signals	 Pulses which are synchronous with standard video step waveform's video portions: amplitude, 4.0V_{P-P}; and pulse width, 15µs
SG7 Retrace BLK signals	 Pulses which are synchronous with standard video step waveform's video portions: amplitude, 4.0V_{P-P}; and pulse width, 3µs

APLLICATION METHOD FOR M52737SP

1) CLAMP PULSE INPUT

Input positive pulse.

The calculating of clamp pulse threshold voltage is by the method as shown right.

The voltage more than 2.2V is limited.

Recommended clamp pulse voltage is as the Fig. shown right.

pulse width is recommended

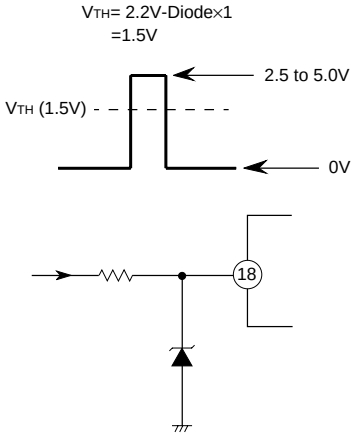
above 15kHz, 1.0µsec

above 30kHz, 0.5µsec

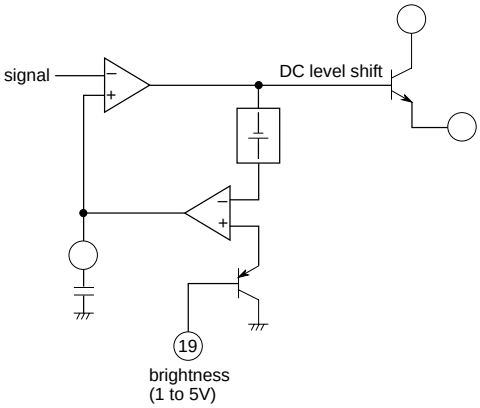
above 64kHz, 0.3µsec .

The clamp pulse circuit in ordinary set is a long roundabout way, and beside high voltage, sometimes connected to external terminal, it is very easy affected by large surge.

Therefore, the Fig. shown right is recommended.



2) Brightness action

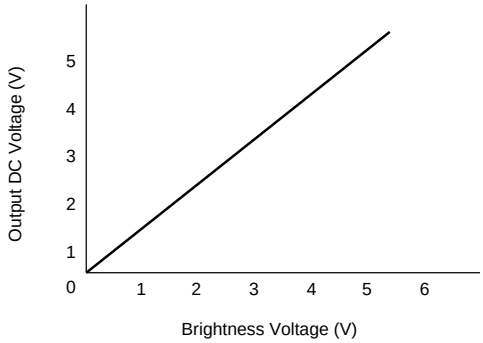


The upper figure is principle

2-1) Brightness terminal

Used range is 1 to 5V

Control characteristic is shown in the right Fig. .



2-2) Sub brightness

There is no sub brightness control function in this IC.

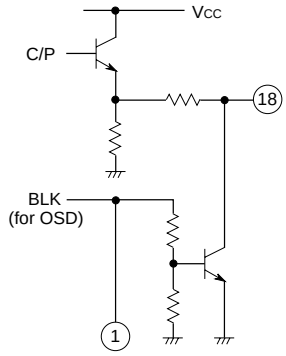
2-3) Hold capacitor

It is necessary more than 0.01µF for this IC (when fH=15kHz).

In fact it is changed according with hold time (except clamping time). It is need more capacitance for longer the hold time. In other way, for application. The smaller the capacitance is, the higher the response. The more the capacitance is, the more stable the action. According to signal, it is free to set the value. (especially the status of pulse for vertical sync timing).

3) BLK (for OSD) input terminal

- Input type is open base (reference to page 4).
- Threshold voltage is 2.5V.
- If input of OSD signal without input of BLK pulse, the action will be strange. Therefore, it is necessary to input BLK pulse when input of OSD signal.
- Grounding this terminal when the OSD function is not used.
- If overlay OSD display period with clamp pulse period, the action will be strange. The method for this situation, recommended external circuit is as the right Fig.

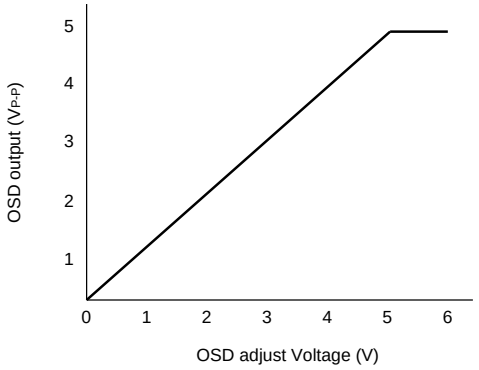


4) Retrace BLK input terminal

- Input type is open base. (reference to page 5).
- Threshold voltage is 1.5V.
- Grounding this terminal when retrace blanking function is not used.

5) OSD adjust terminal

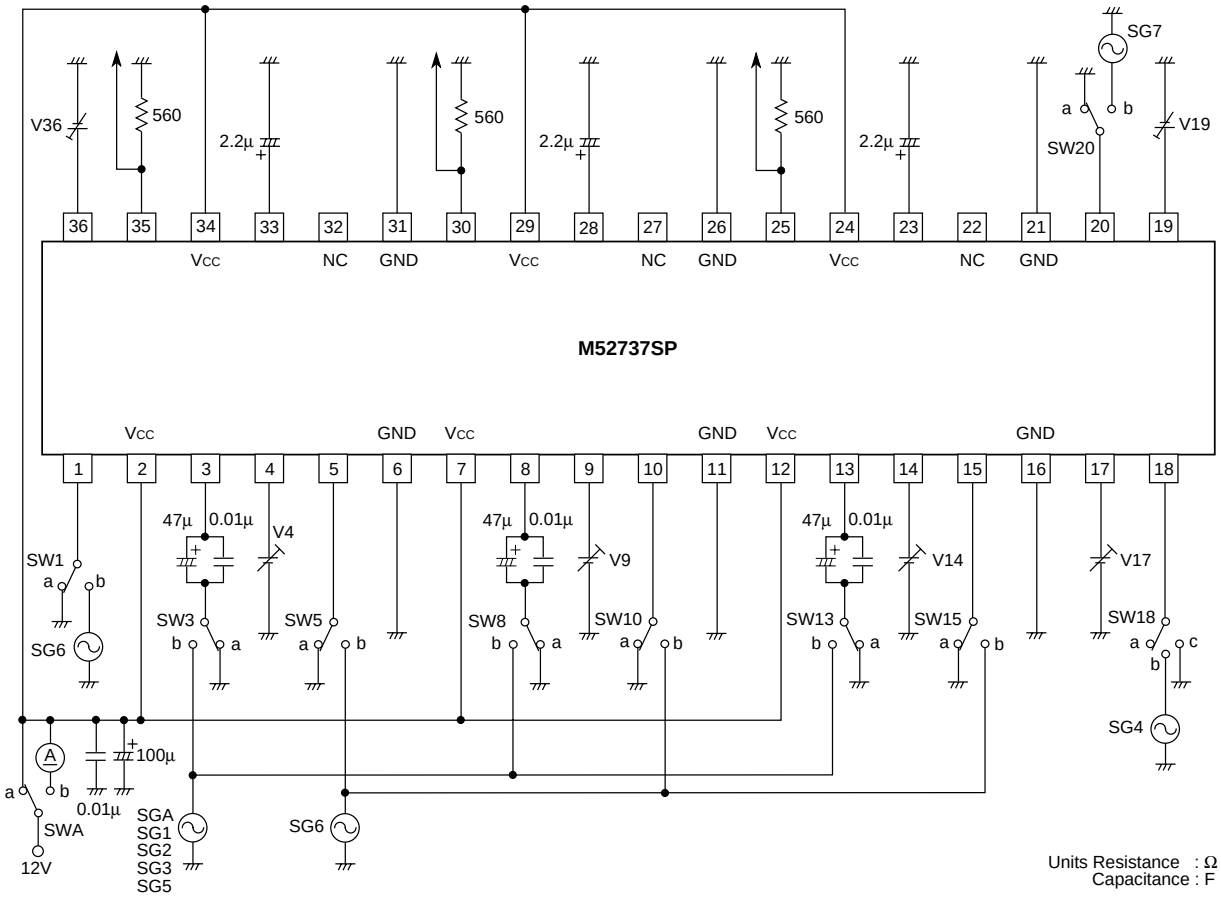
- Used range is 0 to 5V.
- Control characteristic is shown in the right Fig. .
- If there are something noises from the external of the terminals, and it also affect the output of the terminals, add capacitances will be effective for it.
- Make the terminals of OSD adjust open or GND, when OSD function is not used.



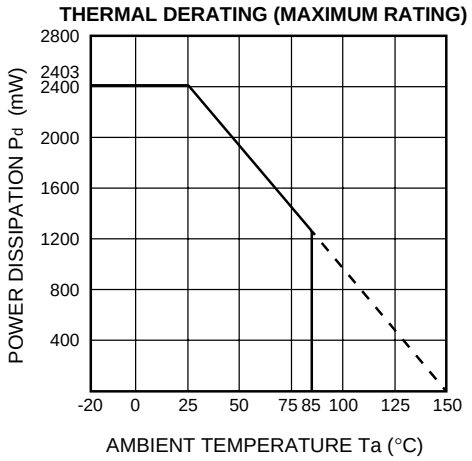
Notice of application

- Make the nearest distance between output pin and pull down resister.
- Recommended pedestal voltage of IC output signal is 2V.

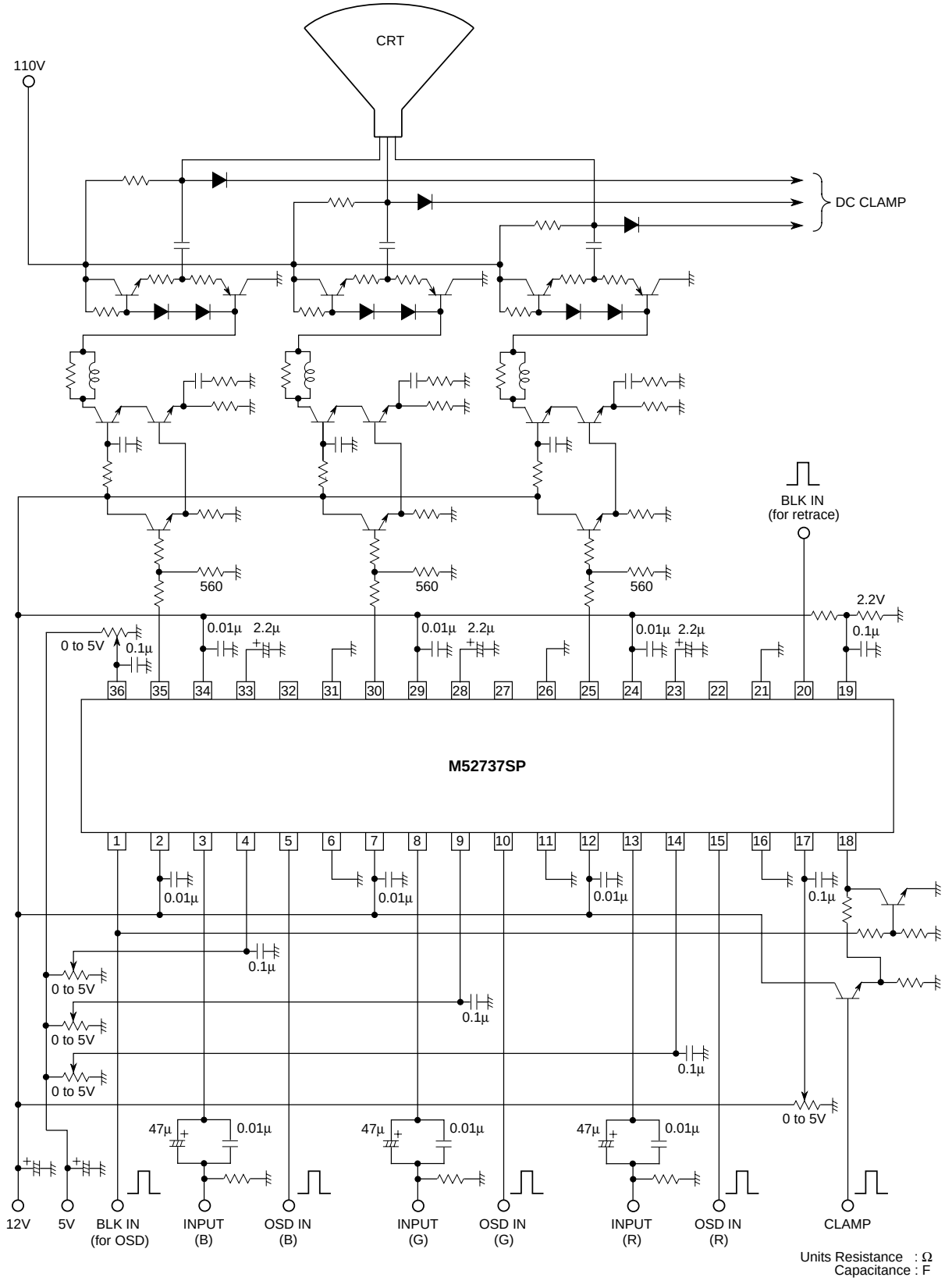
TEST CIRCUIT



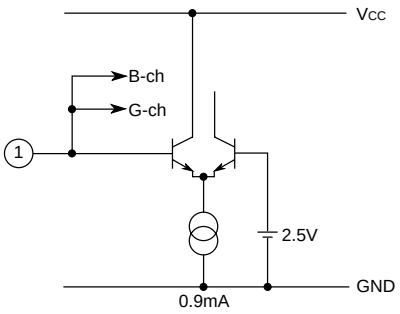
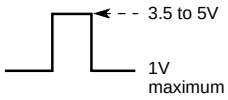
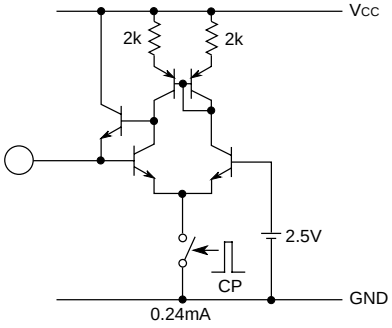
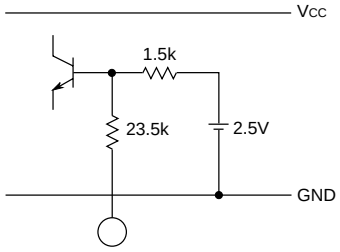
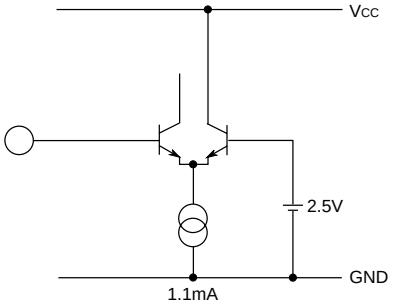
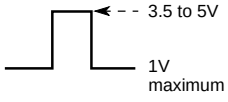
TYPICAL CHARACTERISTICS



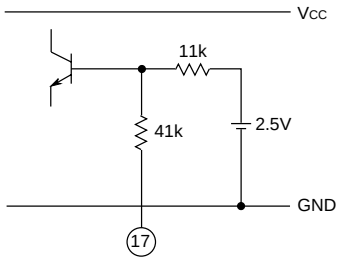
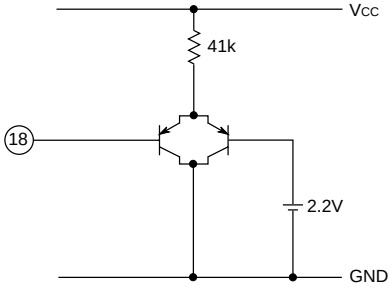
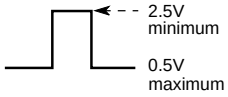
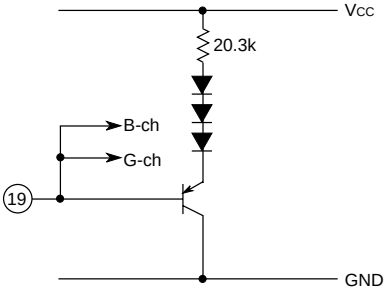
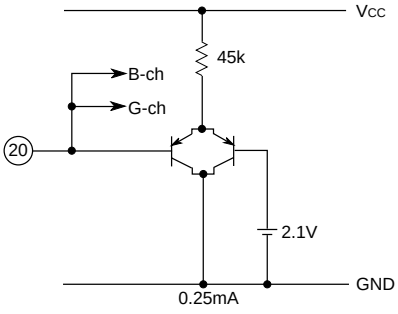
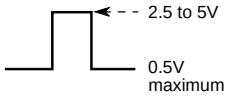
APPLICATION EXAMPLE



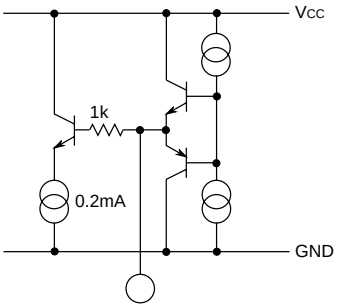
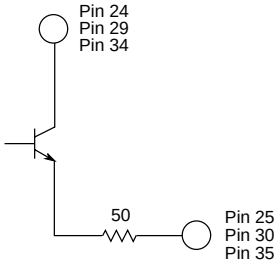
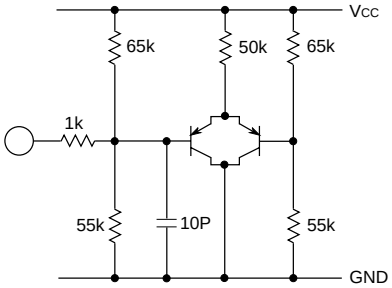
DESCRIPTION OF PIN

Pin No.	Name	DC voltage (V)	Peripheral circuit of pins	Description of function
1	BLK IN (for OSD)	–		·Input pulses of minimum 3.5V.  ·Connected to GND if not used.
2 7 12	Vcc (B-ch) Vcc (G-ch) Vcc (R-ch)	12	–	·Apply equivalent voltage to 3 channels.
3 8 13	INPUT (B) INPUT (G) INPUT (R)	2.5		·Clamped to about 2.5V due to clamp pulses from pin 18. ·Input at low impedance.
4 9 14	Subcontrast (B) Subcontrast (G) Subcontrast (R)	2.5		·Use at maximum 5V for stable operation.
5 10 15	OSD IN (B) OSD IN (G) OSD IN (R)	–		·Input pulses of minimum 3.5V.  ·Connected to GND if not used.

DESCRIPTION OF PIN (cont.)

Pin No.	Name	DC voltage (V)	Peripheral circuit of pins	Description of function
6, 31 11, 26 16, 21	GND (B) GND (G) GND (R)	GND	–	
17	Main contrast	2.5		·Use at maximum 5V for stable operation.
18	CP IN	–		·Input pulses of minimum 2.5V.  ·Input at low impedance.
19	Brightness	–		
20	BLK IN (for retrace)	–		·Input pulses of minimum 2.5V.  ·Connected to GND if not used.

DESCRIPTION OF PIN (cont.)

Pin No.	Name	DC voltage (V)	Peripheral circuit of pins	Description of function
22, 27, 32	NC			
23 28 33	Hold (R) Hold (G) Hold (B)	Variable		·A capacity is needed on the GND side.
24 29 34	Vcc2 (R) Vcc2 (G) Vcc2 (B)	Apply 12		·Used to supply power to output emitter follower only. ·Apply equivalent voltage to 3 channels.
25 30 35	OUTPUT (R) OUTPUT (G) OUTPUT (B)	Variable		·A resistor is needed on the GND side. Set discretionally to maximum 15mA, depending on the required driving capacity.
36	OSD adjust	at open 5.5V		·Pulled up directly to Vcc or open if not used.