Video Switch · 75Ω driver · Y/C mix
Monolithic IC MM1501 Series

Outline

This IC extends the series of ICs for video/audio signal switching, with a 2-input 1-output single video switch, video signal/chroma signal 75Ω driver, and Y/C mixing circuit in one small package (SOT-26).

Features

(1) Low power consumption achieved.
(2) Low power supply voltage realized.
(3) Frequency bandwidth without 75Ω driver: 10MHz with 75Ω driver: 7MHz
(4) Cross talk 70dB When 4.43MHz
(5) With SAG measures pin (75Ω driver and Y/C mix driver)

Package

SOT-26A (with 75Ω driver)
SOT-26B (without 75Ω driver)

Applications

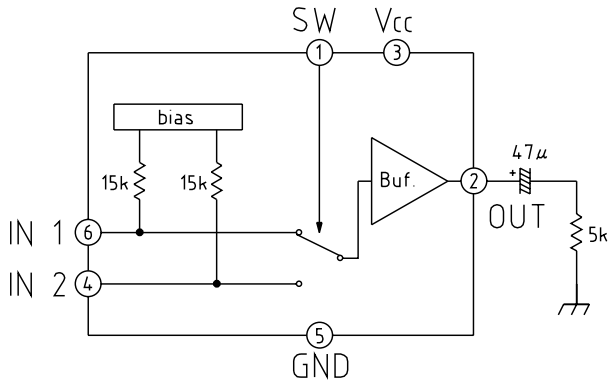
(1) TV
(2) VTR
(3) Video camera
(4) Digital still camera
(5) Other visual equipment

Line-up

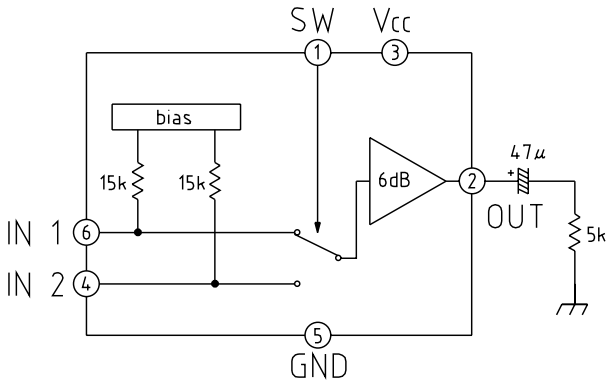
Functions	Model Name	Input	Output	Clamp	6dB amp	75Ω driver	SAG measures pin	Power supply voltage
Switch	MM1501	2	1	×	×	×	×	4.5~13.0V
	MM1502			×	○	×	×	4.5~13.0V
	MM1503			○	×	×	×	4.5~13.0V
	MM1504			○	○	×	×	4.5~13.0V
	MM1505			×	×	○	×	4.5~13.0V
	MM1506			×	○	○	×	4.5~13.0V
	MM1507			○	×	○	×	4.5~13.0V
	MM1508			○	○	○	×	4.5~13.0V
Driver	MM1509	1	1	×	○	○	○	4.5~13.0V
	MM1510			○	○	○	○	4.5~13.0V
Y/C mix	MM1511	1	1	○/×	×	×	×	4.5~13.0V
	MM1512			○/×	○	○	○	4.5~13.0V

Block Diagram

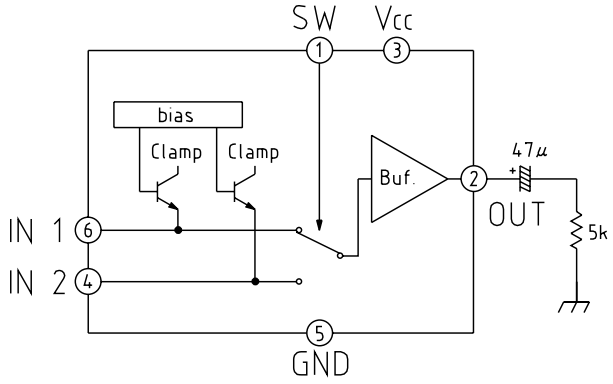
MM1501



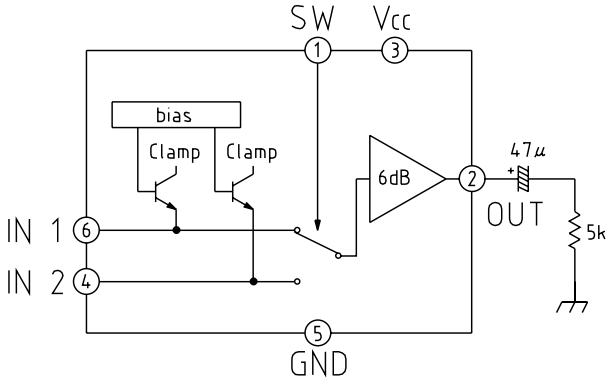
MM1502



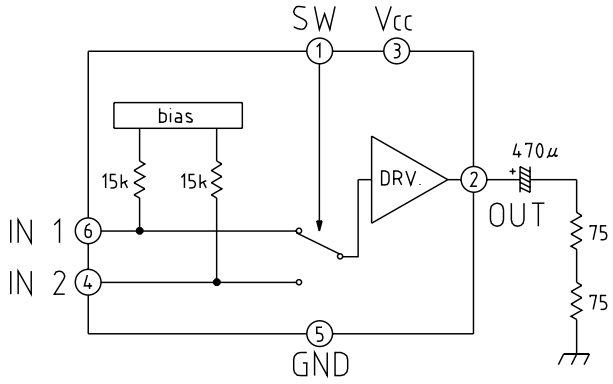
MM1503



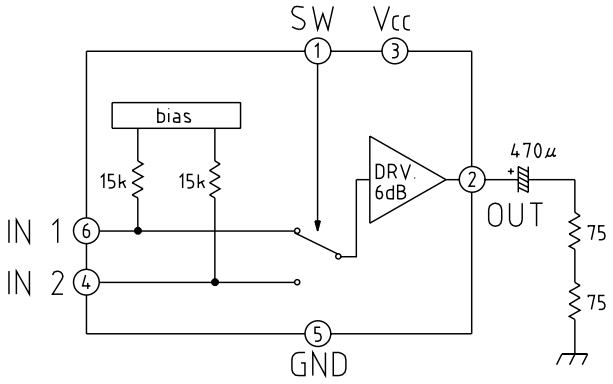
MM1504



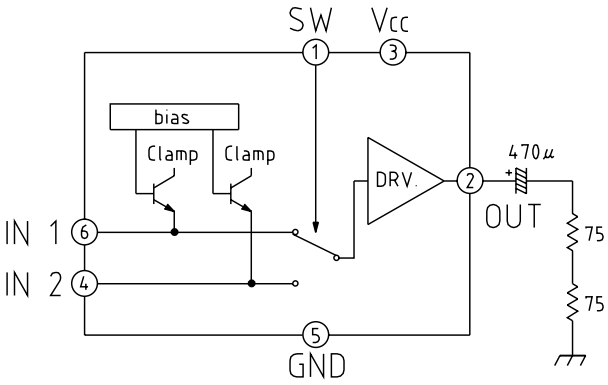
MM1505



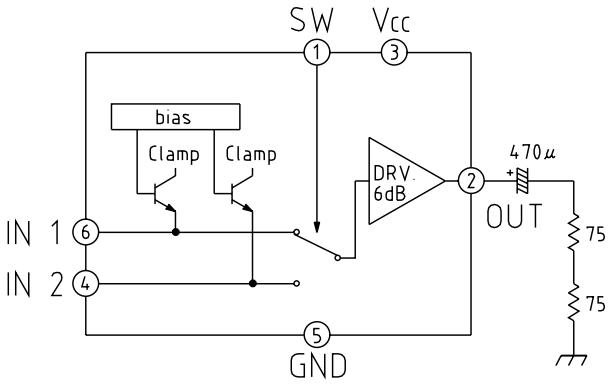
MM1506



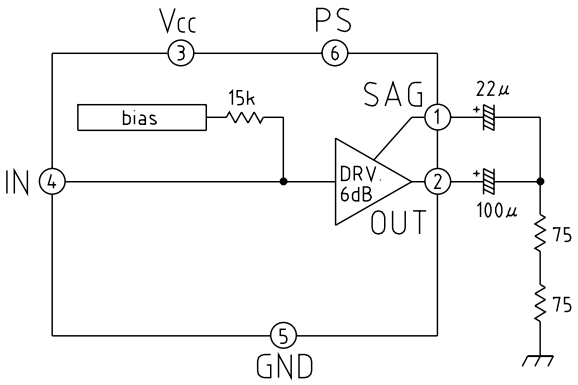
MM1507



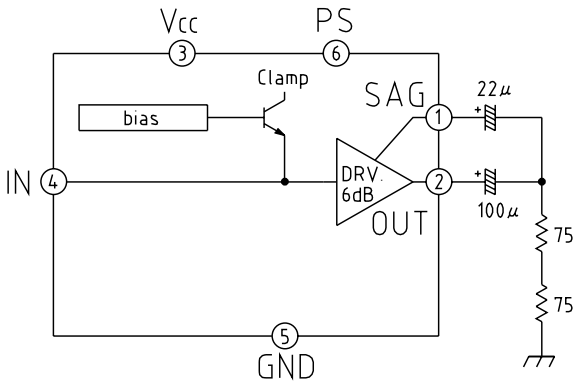
MM1508



MM1509



MM1510



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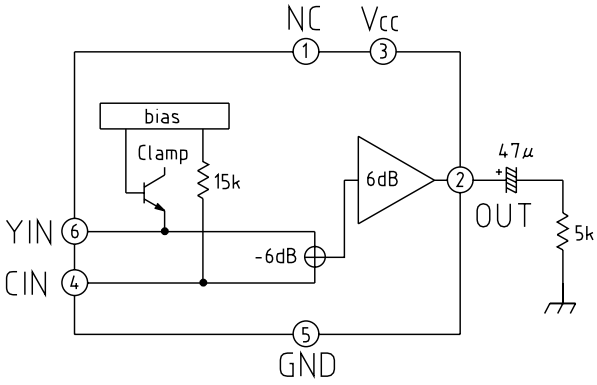
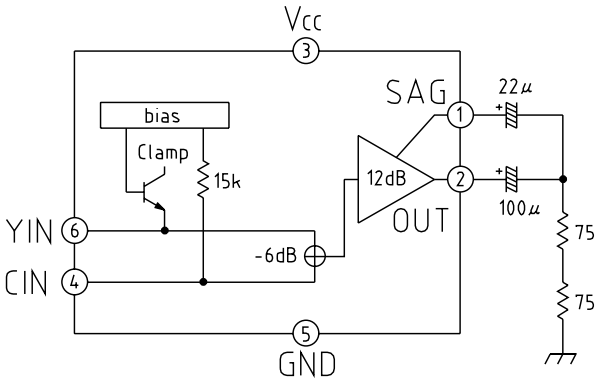


MM1512



Absolute Maximum Ratings (Ta=25°C)

Item		Symbol	Rating	Unit
Storage temperature		T_{STG}	–40~+125	°C
Operating temperature		T_{OPR}	–30~+75	°C
Power supply voltage		V_{CC}	15	V
Allowable loss	When alone	Pd	200	mW
	When mounted on board	Pd	350 (*)	mW

*Board size 100mm×100mm t=1.6

Recommended Operating Conditions

Item	Symbol	Rating	Unit
Power supply voltage	V_{CC}	4.5~13	V

Electrical Characteristics (Except where noted otherwise, Ta=25°C, V_{CC}=5V)

MM1501

Item		Symbol	Measurement conditions	Min.	Typ.	Max.	Unit
Consumption current		I_{CC}	Refer to measurement procedures		3.7	4.8	mA
Input pin voltage		V_{IN}	No-signal, no-load	2.70	2.90	3.10	V
Output pin voltage		V_{OUT}	No-signal, no-load		2.15		V
Voltage gain		G_V	Refer to measurement procedures	–0.5	0	+0.5	dB
Frequency characteristic		fc	Refer to measurement procedures	–1	0	+1	dB
Differential gain	V_{CC}=9V	DG	Refer to measurement procedures	–3	0	+3	%
Differential phase	V_{CC}=9V	DP	Refer to measurement procedures	–3	0	+3	deg
Total harmonic distortion ratio		THD	Refer to measurement procedures		0.03	0.3	%
Output dynamic range		V_D	Refer to measurement procedures	3.5	3.8		V
Output offset voltage		V_{OFF}	Refer to measurement procedures			±15	mV
Cross talk		C_T	Refer to measurement procedures		–70	–60	dB
SW input voltage H		V_{IH}	Refer to measurement procedures	2.1			V
SW input voltage L		V_{IL}	Refer to measurement procedures			0.7	V
Input impedance		Zi			15		kΩ
Output impedance		Zo			75		Ω

MM1502

Item		Symbol	Measurement conditions	Min.	Typ.	Max.	Unit
Consumption current		I_{CC}	Refer to measurement procedures		4.7	6.1	mA
Input pin voltage		V_{IN}	No-signal, no-load	1.70	1.90	2.10	V
Output pin voltage		V_{OUT}	No-signal, no-load		2.10		V
Voltage gain		G_V	Refer to measurement procedures	5.5	6.0	6.5	dB
Frequency characteristic		fc	Refer to measurement procedures	–1	0	+1	dB
Differential gain	V_{CC}=9V	DG	Refer to measurement procedures	–3	0	+3	%
Differential phase	V_{CC}=9V	DP	Refer to measurement procedures	–3	0	+3	deg
Total harmonic distortion ratio		THD	Refer to measurement procedures		0.03	0.3	%
Output dynamic range		V_D	Refer to measurement procedures	3.5	3.8		V
Output offset voltage		V_{OFF}	Refer to measurement procedures			±30	mV
Cross talk		C_T	Refer to measurement procedures		–70	–60	dB
SW input voltage H		V_{IH}	Refer to measurement procedures	2.1			V
Sw input voltage L		V_{IL}	Refer to measurement procedures			0.7	V
Input impedance		Zi			15		kΩ
Output impedance		Zo			12		Ω

MM1503

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Unit
Consumption current	I_{CC}	Refer to measurement procedures		3.3	4.3	mA
Input pin voltage	V_{IN}	No-signal, no-load	1.80	2.00	2.20	V
Output pin voltage	V_{OUT}	No-signal, no-load		1.25		V
Voltage gain	G_V	Refer to measurement procedures	–0.5	0	+0.5	dB
Frequency characteristic	fc	Refer to measurement procedures	–1	0	+1	dB
Differential gain	DG	Refer to measurement procedures	–3	0	+3	%
Differential phase	DP	Refer to measurement procedures	–3	0	+3	deg
Total harmonic distortion ratio	THD	Refer to measurement procedures		0.03	0.3	%
Output dynamic range	V_D	Refer to measurement procedures	2.6	2.9		V
Output offset voltage	V_{OFF}	Refer to measurement procedures			±15	mV
Cross talk	C_T	Refer to measurement procedures		–70	–60	dB
SW input voltage H	V_{IH}	Refer to measurement procedures	2.1			V
SW input voltage L	V_{IL}	Refer to measurement procedures			0.7	V
Input impedance	Zo			75		Ω

MM1504

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Unit
Consumption current	I_{CC}	Refer to measurement procedures		4.4	5.7	mA
Input pin voltage	V_{IN}	No-signal, no-load	1.20	1.40	1.60	V
Output pin voltage	V_{OUT}	No-signal, no-load		1.25		V
Voltage gain	G_V	Refer to measurement procedures	5.5	6.0	6.5	dB
Frequency characteristic	fc	Refer to measurement procedures	–1	0	+1	dB
Differential gain	DG	Refer to measurement procedures	–3	0	+3	%
Differential phase	DP	Refer to measurement procedures	–3	0	+3	deg
Total harmonic distortion ratio	THD	Refer to measurement procedures		0.03	0.3	%
Output dynamic range	V_D	Refer to measurement procedures	2.6	2.9		V
Output offset voltage	V_{OFF}	Refer to measurement procedures			±30	mV
Cross talk	C_T	Refer to measurement procedures		–70	–60	dB
SW input voltage H	V_{IH}	Refer to measurement procedures	2.1			V
SW input voltage L	V_{IL}	Refer to measurement procedures			0.7	V
Input impedance	Zo			12		Ω

MM1505

Item		Symbol	Measurement conditions	Min.	Typ.	Max.	Unit
Consumption current		I_{CC}	Refer to measurement procedures		6.5	8.5	mA
Input pin voltage		V_{IN}	No-signal, no-load	2.35	2.55	2.75	V
Output pin voltage		V_{OUT}	No-signal, no-load		2.55		V
Voltage gain		G_V	Refer to measurement procedures	–0.5	0.0	0.5	dB
Frequency characteristic		fc	Refer to measurement procedures	–1	0	+1	dB
Differential gain	V_{CC}=9V	DG	Refer to measurement procedures	–3	0	+3	%
Differential phase	V_{CC}=9V	DP	Refer to measurement procedures	–3	0	+3	deg
Output dynamic range		V_D	Refer to measurement procedures	2.6	3.0		V
Output offset voltage		V_{OFF}	Refer to measurement procedures			±15	mV
Cross talk		C_T	Refer to measurement procedures		–70	–60	dB
SW input voltage H		V_{IH}	Refer to measurement procedures	2.1			V
SW input voltage L		V_{IL}	Refer to measurement procedures			0.7	V
Input impedance		Zi			15		kΩ

MM1506

Item		Symbol	Measurement conditions	Min.	Typ.	Max.	Unit
Consumption current		I_{CC}	Refer to measurement procedures		6.8	8.8	mA
Input pin voltage		V_{IN}	No-signal, no-load	1.75	1.95	2.15	V
Output pin voltage		V_{OUT}	No-signal, no-load		2.35		V
Voltage gain		G_V	Refer to measurement procedures	5.5	6.0	6.5	dB
Frequency characteristic		fc	Refer to measurement procedures	–1	0	+1	dB
Differential gain	V_{CC}=9V	DG	Refer to measurement procedures	–3	0	+3	%
Differential phase	V_{CC}=9V	DP	Refer to measurement procedures	–3	0	+3	deg
Output dynamic range		V_D	Refer to measurement procedures	3.0	3.3		V
Output offset voltage		V_{OFF}	Refer to measurement procedures			±30	mV
Cross talk		C_T	Refer to measurement procedures		–70	–60	dB
SW input voltage H		V_{IH}	Refer to measurement procedures	2.1			V
SW input voltage L		V_{IL}	Refer to measurement procedures			0.7	V
Input impedance		Zi			15		kΩ

MM1507

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Unit
Consumption current	I_{CC}	Refer to measurement procedures		6.4	8.3	mA
Input pin voltage	V_{IN}	No-signal, no-load	1.15	1.35	1.55	V
Output pin voltage	V_{OUT}	No-signal, no-load		1.35		V
Voltage gain	G_V	Refer to measurement procedures	–0.5	0	+0.5	dB
Frequency characteristic	fc	Refer to measurement procedures	–1	0	+1	dB
Differential gain	DG	Refer to measurement procedures	–3	0	+3	%
Differential phase	DP	Refer to measurement procedures	–3	0	+3	deg
Output dynamic range	V_D	Refer to measurement procedures	2.6	2.9		V
Output offset voltage	V_{OFF}	Refer to measurement procedures			±15	mV
Cross talk	C_T	Refer to measurement procedures		–70	–60	dB
SW input voltage H	V_{IH}	Refer to measurement procedures	2.1			V
SW input voltage L	V_{IL}	Refer to measurement procedures			0.7	V

MM1508

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Unit
Consumption current	I_{CC}	Refer to measurement procedures		6.8	8.8	mA
Input pin voltage	V_{IN}	No-signal, no-load	1.15	1.35	1.55	V
Output pin voltage	V_{OUT}	No-signal, no-load		1.30		V
Voltage gain	G_V	Refer to measurement procedures	5.5	6.0	6.5	dB
Frequency characteristic	fc	Refer to measurement procedures	–1	0	+1	dB
Differential gain	DG	Refer to measurement procedures	–3	0	+3	%
Differential phase	DP	Refer to measurement procedures	–3	0	+3	deg
Output dynamic range	V_D	Refer to measurement procedures	2.6	3.0		V
Output offset voltage	V_{OFF}	Refer to measurement procedures			±30	mV
Cross talk	C_T	Refer to measurement procedures		–70	–60	dB
SW input voltage H	V_{IH}	Refer to measurement procedures	2.1			V
SW input voltage L	V_{IL}	Refer to measurement procedures			0.7	V

MM1509

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Unit
Consumption current	I_{CC1}	Refer to measurement procedures		6.3	8.2	mA
Current consumption for PS	I_{CC2}	Refer to measurement procedures		20	30	µA
PS input voltage L	V_{PSL}	Refer to measurement procedures			0.3	V
PS input voltage H	V_{PSH}	Refer to measurement procedures	1.8			V
Input pin voltage	V_{IN}	No-signal, no-load	1.75	1.95	2.15	V
Output pin voltage	V_{OUT}	No-signal, no-load		2.35		V
Voltage gain	G_V	Refer to measurement procedures	5.5	6.0	6.5	dB
Frequency characteristic	fc	Refer to measurement procedures	–1	0	+1	dB
Differential gain V_{CC}=9V	DG	Refer to measurement procedures	–3	0	+3	%
Differential phase V_{CC}=9V	DP	Refer to measurement procedures	–3	0	+3	deg
Output dynamic range	V_D	Refer to measurement procedures	2.9	3.2		V
Input impedance	Zi			15		kΩ

MM1510

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Unit
Consumption current	I_{CC1}	Refer to measurement procedures		6.4	8.3	mA
Current consumption for PS	I_{CC2}	Refer to measurement procedures		20	30	µA
PS input voltage L	V_{PSL}	Refer to measurement procedures			0.3	V
PS input voltage H	V_{PSH}	Refer to measurement procedures	1.8			V
Input pin voltage	V_{IN}	No-signal, no-load	1.15	1.35	1.55	V
Output pin voltage	V_{OUT}	No-signal, no-load		1.15		V
Voltage gain	G_V	Refer to measurement procedures	5.5	6.0	6.5	dB
Frequency characteristic	fc	Refer to measurement procedures	–1	0	+1	dB
Differential gain	DG	Refer to measurement procedures	–3	0	+3	%
Differential phase	DP	Refer to measurement procedures	–3	0	+3	deg
Output dynamic range	V_D	Refer to measurement procedures	2.6	3.0		V

MM1511

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Unit
Consumption current	I_{CC}	Refer to measurement procedures		4.4	5.7	mA
Y input pin voltage	V_{YIN}	No-signal, no-load	2.00	2.20	2.40	V
C input pin voltage	V_{CIN}	No-signal, no-load	1.85	2.05	2.25	V
Output pin voltage	V_{OUT}	No-signal, no-load		1.15		V
Voltage gain	G_V	Refer to measurement procedures	–0.5	0	6.5	dB
Frequency characteristic	fc	Refer to measurement procedures	–1	0	+0.5	dB
Differential gain	DG	Refer to measurement procedures	–3	0	+3	%
Differential phase	DP	Refer to measurement procedures	–3	0	+3	deg
Y output dynamic range	V_{DY}	Refer to measurement procedures	2.6	2.9		V
C output dynamic range	V_{DC}	Refer to measurement procedures	2.0			V
C input impedance	Zi			15		kΩ
Output impedance	Zo			25		Ω

MM1512

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Unit
Consumption current	I_{CC}	Refer to measurement procedures		6.9	9.0	mA
Y input pin voltage	V_{YIN}	No-signal, no-load	1.95	2.15	2.35	V
C input pin voltage	V_{CIN}	No-signal, no-load	1.80	2.00	2.20	V
Output pin voltage	V_{OUT}	No-signal, no-load		1.10		V
Voltage gain	G_V	Refer to measurement procedures	5.5	6.0	6.5	dB
Frequency characteristic	fc	Refer to measurement procedures	–1	0	+1	dB
Differential gain	DG	Refer to measurement procedures	–3	0	+3	%
Differential phase	DP	Refer to measurement procedures	–3	0	+3	deg
Y output dynamic range	V_{DY}	Refer to measurement procedures	2.6	2.9		V
C output dynamic range	V_{DC}	Refer to measurement procedures	2.0			V
C input impedance	Zi			15		kΩ

Measurement Procedures

MM1501~MM1508

· Switch Status

Item	Symbol	Switch status		
		S1	S2	S3
Consumption current	I_{CC}	2	2	2
Voltage gain	G_V	1	2	2
		2	1	1
Frequency characteristic	fc	1	2	2
		2	1	1
Differential gain	DG	1	2	2
		2	1	1
Differential phase	DP	1	2	2
		2	1	1

Item	Symbol	Switch status		
		S1	S2	S3
Total harmonic distortion ratio	THD	1	2	2
		2	1	1
Output dynamic range	V_D	1	2	2
		2	1	1
Output offset voltage	V_{OFF}	2	2	2
		2	2	1
Cross talk	C_T	1	2	1
		2	1	2
SW input voltage H	V_{IH}	2	2	1
SW input voltage L	V_{IL}			

·Measurement Procedures (MM1501 ~ MM1504)

Consumption current	I_{CC}	Connect a DC ammeter to V_{CC} pin and measure. Hereafter, short the ammeter to use.
Voltage gain	G_V	Input a 2.0V_{P-P} (1.0V_{P-P} for MM1502 and MM1504), 100kHz sine wave to SG1. If TP1 voltage is V1 and TP3 voltage is V2, find Gv using the following formula: $G_V = 20LOG\ (V2/V1)$ dB
Frequency characteristic	fc	In the above Gv measurement, if TP3 voltage at 10MHz is V3, find fc as follows: $fc = 20LOG\ (V3/V2)$ dB
Differential gain	DG	Input a 2.0V_{P-P} (1.0V_{P-P} for MM1502 and MM1504) staircase to SG1 and measure differential gain at TP3. APL = 10 ~ 90%
Differential phase	DP	The same as for DG, but measure differential phase.
Total harmonic distortion ratio	THD	Input a 2.5V_{P-P} (1.25V_{P-P} for MM1502, MM1504), 1kHz sine wave to SG1, connect a distortion factor meter to TP3 and measure.
Output dynamic range	V_D	Input a 100kHz sine wave to SG1. Change the amplitude of the sine wave, and measure V_D, the maximum amplitude under THD 1%, at TP3.
Output offset voltage	V_{OFF}	Measure the DC voltage difference of each switch status at TP2.
Cross talk	C_T	VC1 = 2.1V and VC2 = 0.7V. Input a 2.0V_{P-P}, 4.43MHz sine wave to SG1, and operate SW3. If TP3 voltage when there is an output signal on the OUT pin is V4, and when there is no signal TP3 voltage is V5, then find C_T by the following formula: $C_T = 20LOG\ (V5/V4)$ dB
SW input voltage	V_I	Impress an optional DC voltage on TP5 and TP6. Gradually increase from VC1 = 0V. When TP6 voltage is output on TP2, TP4 voltage is V_{IH}. Gradually lower from VC1 = V_{CC}, and when TP5 voltage is output on TP2, TP4 voltage is V_{IL}.

· Measurement Procedures (MM1505 ~ MM1508)

Consumption current	I_{CC}	Connect a DC ammeter to V_{CC} pin and measure. Hereafter, short the ammeter to use.
Voltage gain	G_V	Input a 2.0V_{P-P}(1.0V_{P-P} for MM1506 and MM1508), 100kHz sine wave to SG1. If TP1 voltage is V1 and TP3 voltage is V2, find G_V using the following formula: $G_V = 20LOG\ (V2/V1)$ dB
Frequency characteristic	fc	In the above GV measurement, if TP3 voltage at 7MHz is V3, find fc as follows: $fc = 20LOG\ (V3/V2)$ dB
Differential gain	DG	Input a 2.0V_{P-P} (1.0V_{P-P} for MM1506 and MM1508) staircase to SG1 and measure differential gain at TP3. APL = 10 ~ 90%
Differential phase	DP	The same as for DG, but measure differential phase.
Output dynamic range	V_D	Input a 100kHz sine wave to SG1. Change the amplitude of the sine wave, and measure V_D, the maximum amplitude under THD 1%, at TP3.
Output offset voltage	V_{OFF}	Measure the DC voltage difference of each switch status at TP2.
Cross talk	C_T	VC1 = 2.1V and VC2 = 0.7V. Input a 2.0V_{P-P}, 4.43MHz sine wave to SG1, and operate SW3. IF TP3 voltage when there is an output signal on the OUT pin is V4, and when there is no signal TP3 voltage is V5, then find C_T by the following formula: $C_T = 20LOG\ (V5/V4)$ dB
SW input voltage	V_I	Impress an optional DC voltage on TP6 and TP7. Gradually increase from VC1 = 0V. When TP7 voltage is output on TP2, TP5 voltage is V_{IH}. Gradually lower from VC1 = V_{CC}, and when TP6 voltage is output on TP2, TP5 voltage is V_{IL}.

MM1509 ~ MM1510

· Switch Status

Item	Symbol	Switch status	
		S1	S2
Consumption current	I_{CC1}	2	1
Consumption current for PS	I_{CC2}	2	3
PS input voltage L	V_{IL}	2	2
PS input voltage H	V_{IH}		
Voltage gain	G_V	1	1

Item	Symbol	Switch status	
		S1	S2
Frequency characteristic	fc	1	1
Differential gain	DG	1	1
Differential phase	DP	1	1
Output dynamic range	V_D	1	1

· Measurement Procedures

Consumption current	I_{CC1}	Connect a DC ammeter to the V_{CC} pin and measure.
Consumption current for PS	I_{CC2}	Connect a DC ammeter to the V_{CC} pin and measure.
PS input voltage	V_I	Connect a DC ammeter to the V_{CC} pin. Gradually lower from VC1 = V_{CC}. VC1 voltage when consumption current is reduced from I_{CC1} to 110% of I_{CC2} is V_{IL}. Gradually raise from VC1 = 0V. VC1 voltage when consumption current increases from I_{CC2} to 90% of I_{CC1} is V_{IH}. From here on, short the ammeter when using it.
Voltage gain	G_V	Input a 1.0V_{P-P}, 100kHz sine wave to SG1. If TP1 voltage is V1 and TP2 voltage is V2, find G_V by the following formula: $G_V = 20LOG\ (V2/V1)$ dB
Frequency characteristic	fc	In the above G_V measurement, if TP2 voltage at 7MHz is V3, find fc by the following formula. $fc = 20LOG\ (V3/V2)$ dB
Differential gain	DG	Input a 1.0V_{P-P} staircase to SG1 and measure differential gain at TP2. APL = 10 ~ 90%
Differential phase	DP	The same as for DG, but measure differential phase.
Output dynamic range	V_D	Input a 100kHz sine wave to SG1. Measure DR, the maximum amplitude under THD 1%, at TP2.

MM1511 ~ MM1512

· Switch Status

Item	Symbol	Switch status	
		S1	S2
Consumption current	I_{CC}	2	2
Voltage gain	G_V	1	2
		2	1
Frequency characteristic	fc	1	2
		2	1

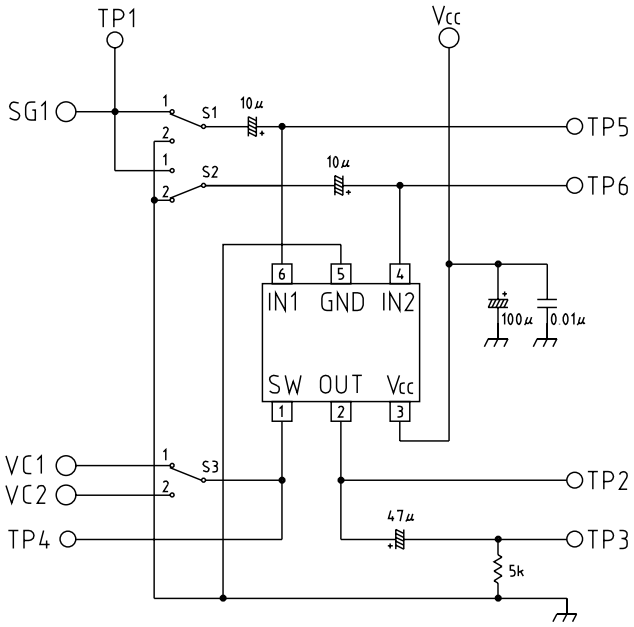
Item	Symbol	Switch status	
		S1	S2
Differential gain	DG	3	1
Differential phase	DP	3	1
Y output dynamic range	V_{DY}	2	1
C output dynamic range	V_{DC}	3	1

· Measurement Procedures

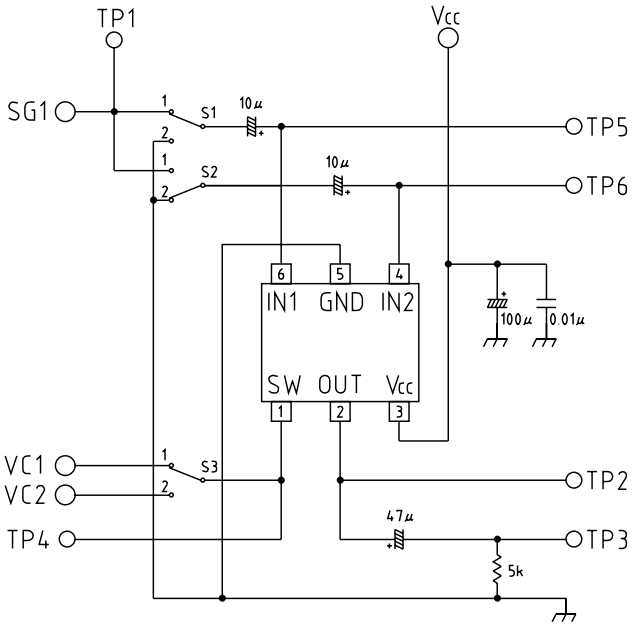
Consumption current	I_{CC1}	Connect a DC ammeter to the V_{CC} pin and measure. Hereafter, short the ammeter to use.
Voltage gain	G_V	Input a 2.0V_{P-P} (1.0V_{P-P} for MM1512), 100kHz sine wave to SG1. If TP1 voltage is V1 and TP2 voltage is V2, find G_V by the following formula: $G_V = 20LOG\ (V2/V1)$ dB
Frequency characteristic	fc	In the above G_V measurement, if TP2 voltage at 10MHz (7MHz for MM1512) is V3, find fc by the following formula. $fc = 20LOG\ (V3/V2)$ dB
Differential gain	DG	Input a 2.0V_{P-P} (1.0V_{P-P} for MM1512) to SG1, input a chroma signal to SG2, and measure differential gain at TP2. APL = 10 ~ 90%
Differential phase	DP	The same as for DG, but measure differential phase.
Y output dynamic range	V_{DY}	Input a 100kHz sine wave to SG1. Measure V_{DY}, the maximum amplitude under THD 1%, at TP2.
C output dynamic range	V_{DC}	Input an APL 50% luminance signal to SG1 and input a chroma signal to SG2. Change the chroma signal amplitude and measure V_{DC}, the maximum amplitude where there is no waveform distortion at TP2.

Measuring Circuit

MM1501



MM1502



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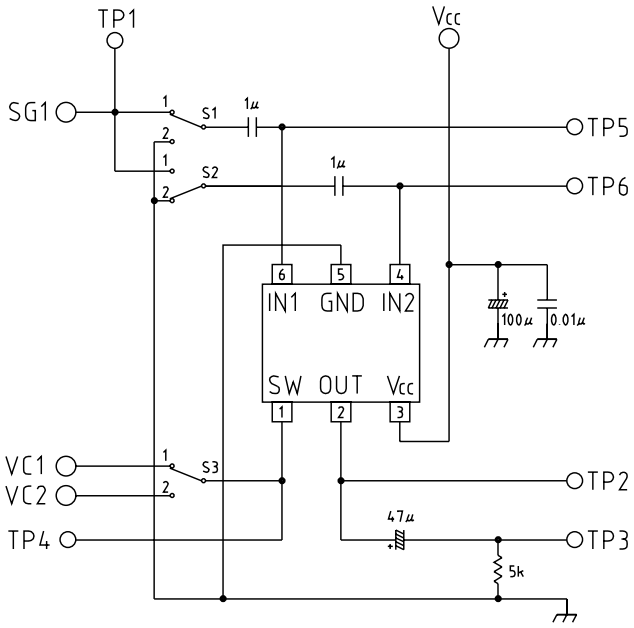

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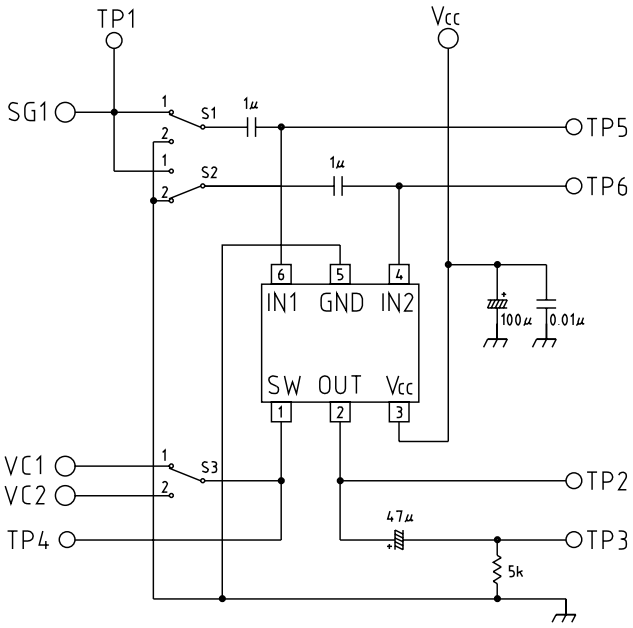
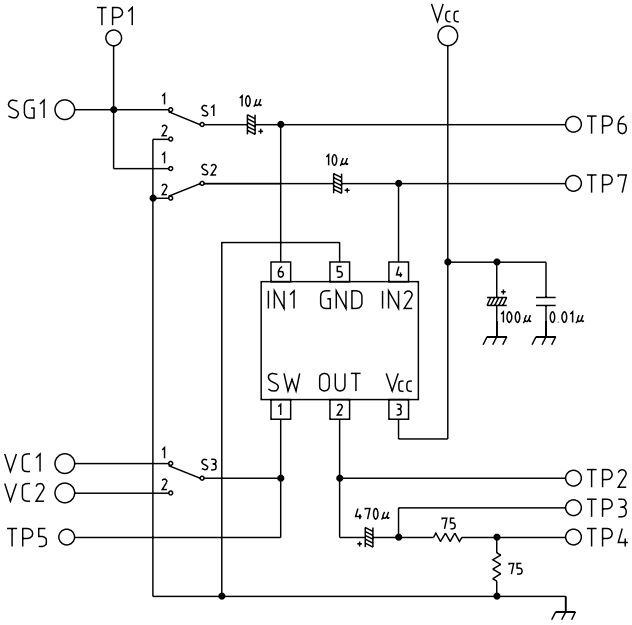


MM1505



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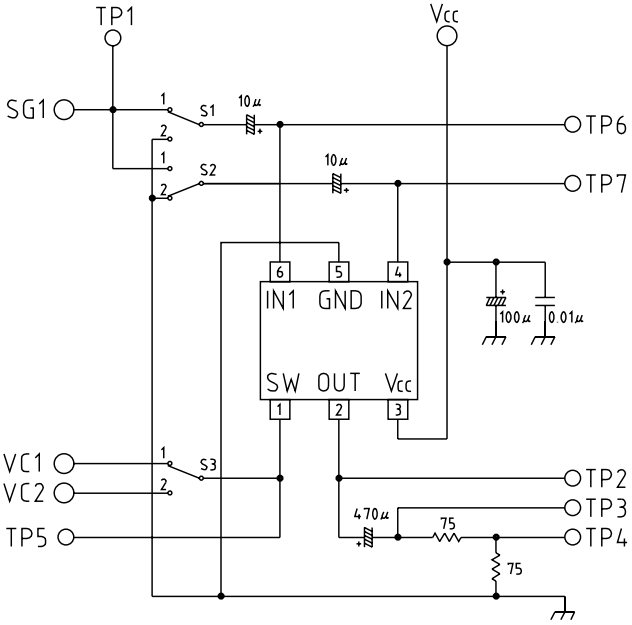

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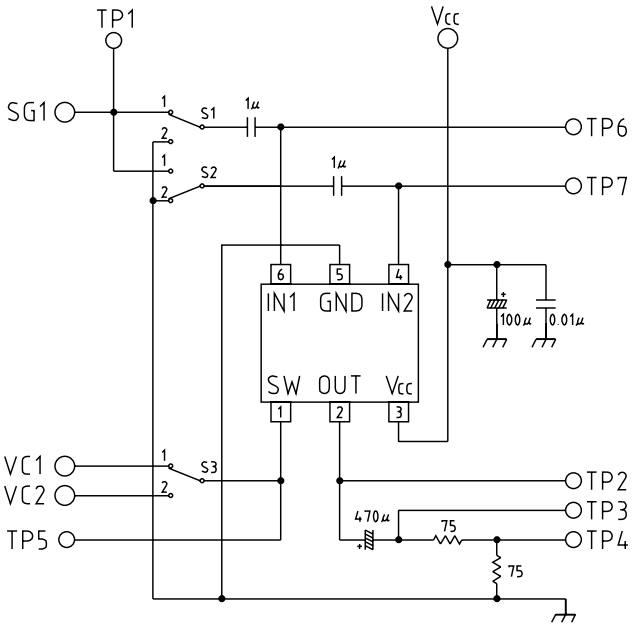

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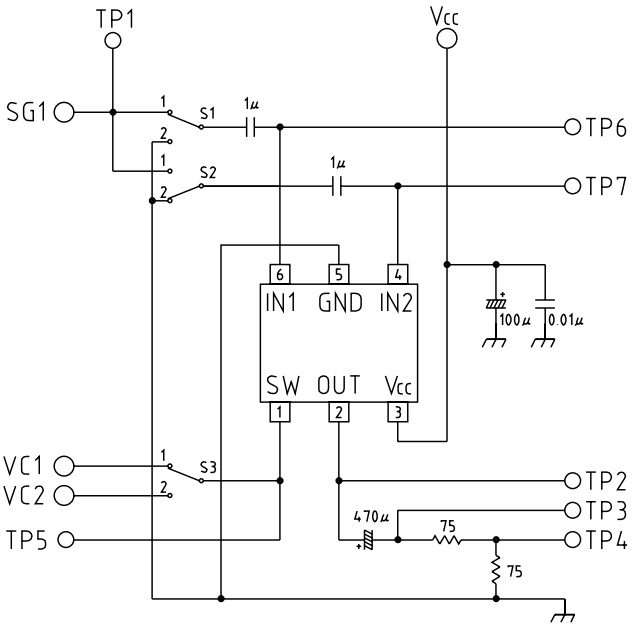

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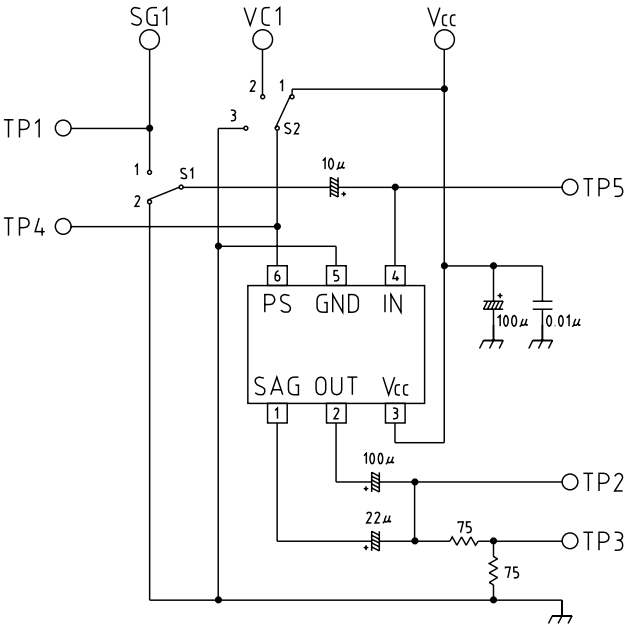

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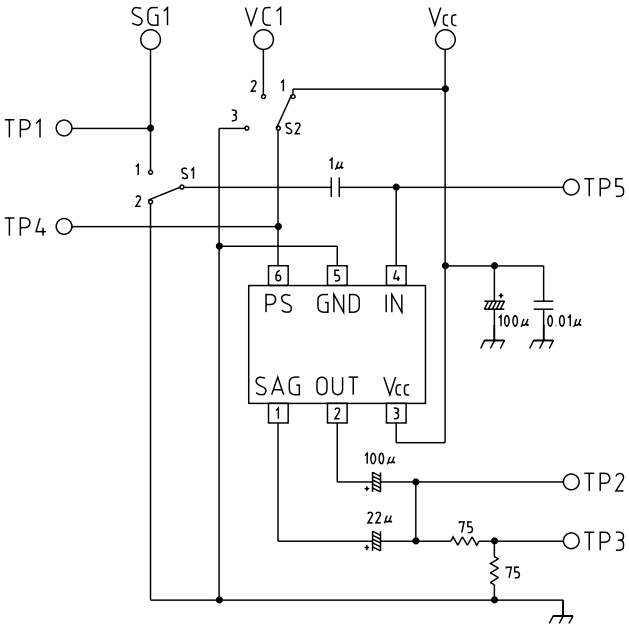

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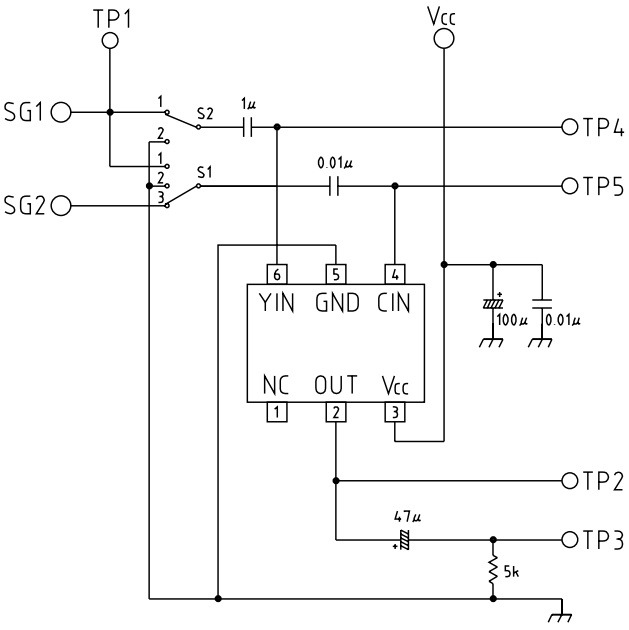
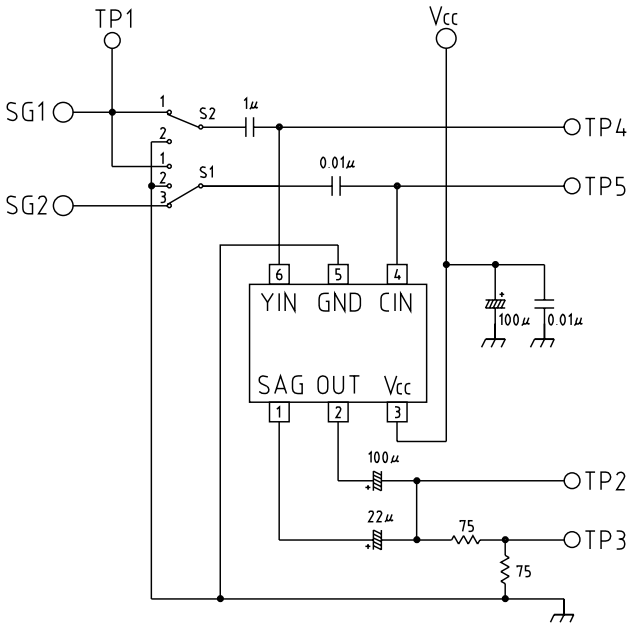
MM1512