SHARP

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To ;

REFERENCE

SPECIFICATIONS

Product Type VIDEO PROCESSING IC FOR TFT COLOR LCD

Model No. IR3Y29AM

※This specifications contains 43 pages including the cover and appendix.
If you have any objections, please contact us before issuing purchasing order.

CUSTOMERS ACCEPTANCE

DATE:

BY:

PRESENTED

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Tenri Integrated Circuits Group
SHARP CORPORATION

CONTENTS

1. Description

The Sharp IR3Y29AM is a multi-functional IC with a luminance, chroma, interface and sync separator circuit for NTSC/PAL TFT LCD color monitors all integrated onto a single chip. This IC contains a luminance AGC circuit, and gamma correction circuits to meet the specific requirements of the LCD panel. It converts the composite video signal or the Y/C separate video signal to the RGB signals that meet the specific requirements of the LCD panel adopting the source drivers operating at 5V.

Applications:
LCD color television sets, LCD color displays, LCD color monitors etc..

Features:
(1) Conforms to the TFT LCD adopting the source drivers operating at 5V.
(2) Low power dissipation. (190mW TYP.)
(3) Accepts to the NTSC and PAL video signal.
(4) Accepts the composite video signal and the Y/C signal.
(5) Built-in TRAP and HPF.
(6) Built-in image control circuit.
(7) Built-in gammma correction circuit.
(8) Built-in polarity inverting circuit.
(9) Built-in common voltage generating circuit.
(10) Built-in output DC component control circuit.
(11) Accepts external analog RGB signals.

* Not designed or rated as radiation hardened.	
* Package material:	Plastic
* Chip material and wafer substrate type:	P type silicon
* Number of pins and package type:	48-pin quad-flat package (pin pitch 0.5mm)
* Process (Structure):	Bipolar

●When using the products covered herein, please observe the conditions written herein and the precautions outlined in the following paragraphs. In no event shall the company be liable for any damages resulting from failure to strictly adhere to these conditions and precautions.

(1) The products covered herein are designed and manufactured for the following application areas. When using the products covered herein for the equipment listed in Paragraph (2), even for the following application areas, be sure to observe the precautions given in Paragraph (2). Never use the products for the equipment listed in Paragraph (3).

- Office electronics
- Instrumentation and measuring equipment
- Machine tools
- Audiovisual equipment
- Home appliances
- Communication equipment other than for trunk lines

(2) Those contemplating using the products covered herein for the following equipment which demands high reliability, should first contact a sales representative of the company and then accept responsibility for incorporating into the design fail-safe operation, redundancy, and other appropriate measures for ensuring reliability and safety of the equipment and the overall system.

- Control and safety devices for airplanes, trains, automobiles, and other transportation equipment
- Mainframe computers
- Traffic control systems
- Gas leak detectors and automatic cutoff devices
- Rescue and security equipment
- Other safety devices and safety equipment, etc.

(3) Do not use the products covered herein for the following equipment which demands extremely high performance in terms of functionality, reliability, or accuracy.

- Aerospace equipment
- Communications equipment for trunk lines
- Control equipment for the nuclear power industry
- Medical equipment related to life support, etc.

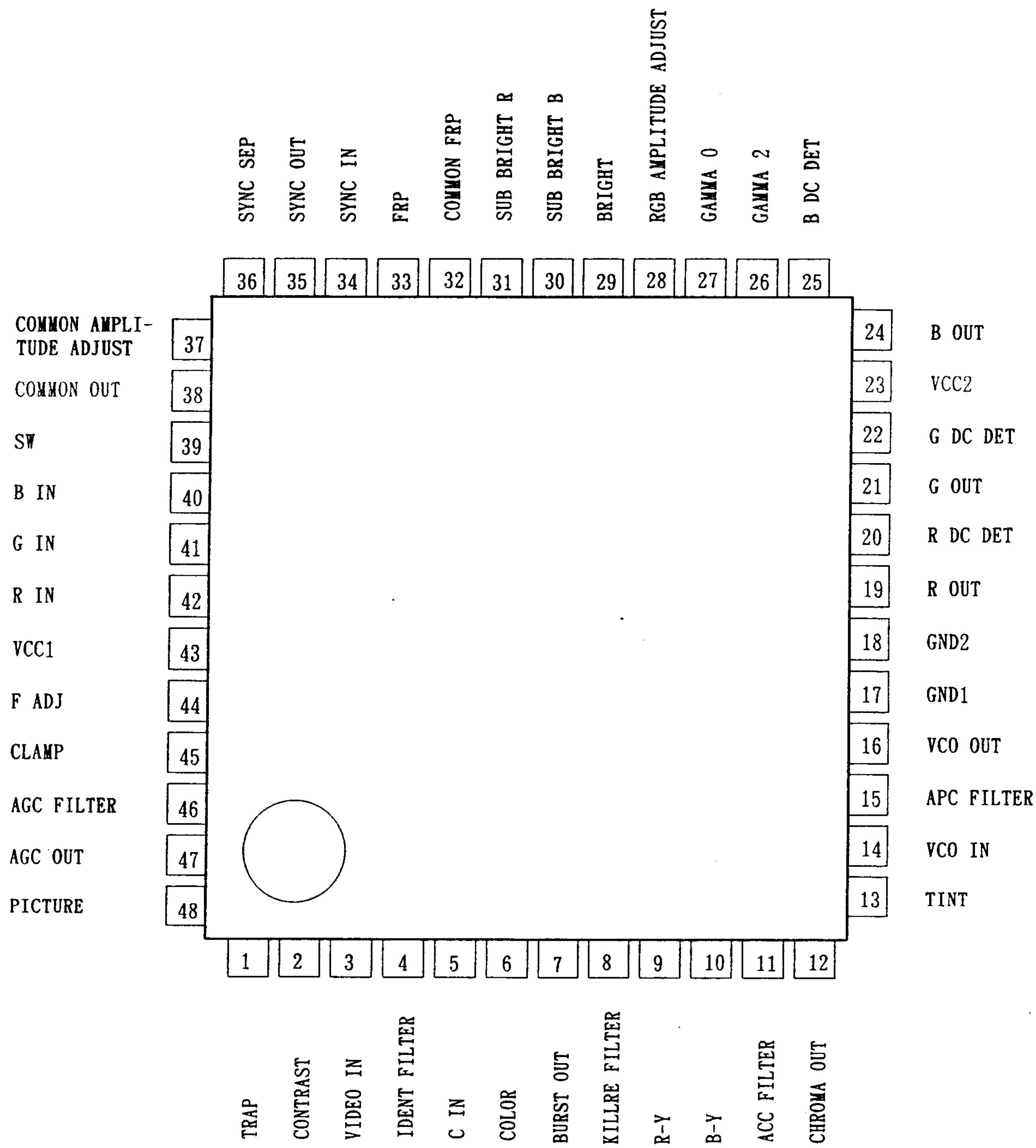
(4) Please direct all queries and comments regarding the interpretation of the above three Paragraphs to a sales representative of the company.

●Please direct all queries regarding the products covered herein to a sales representative of the company.

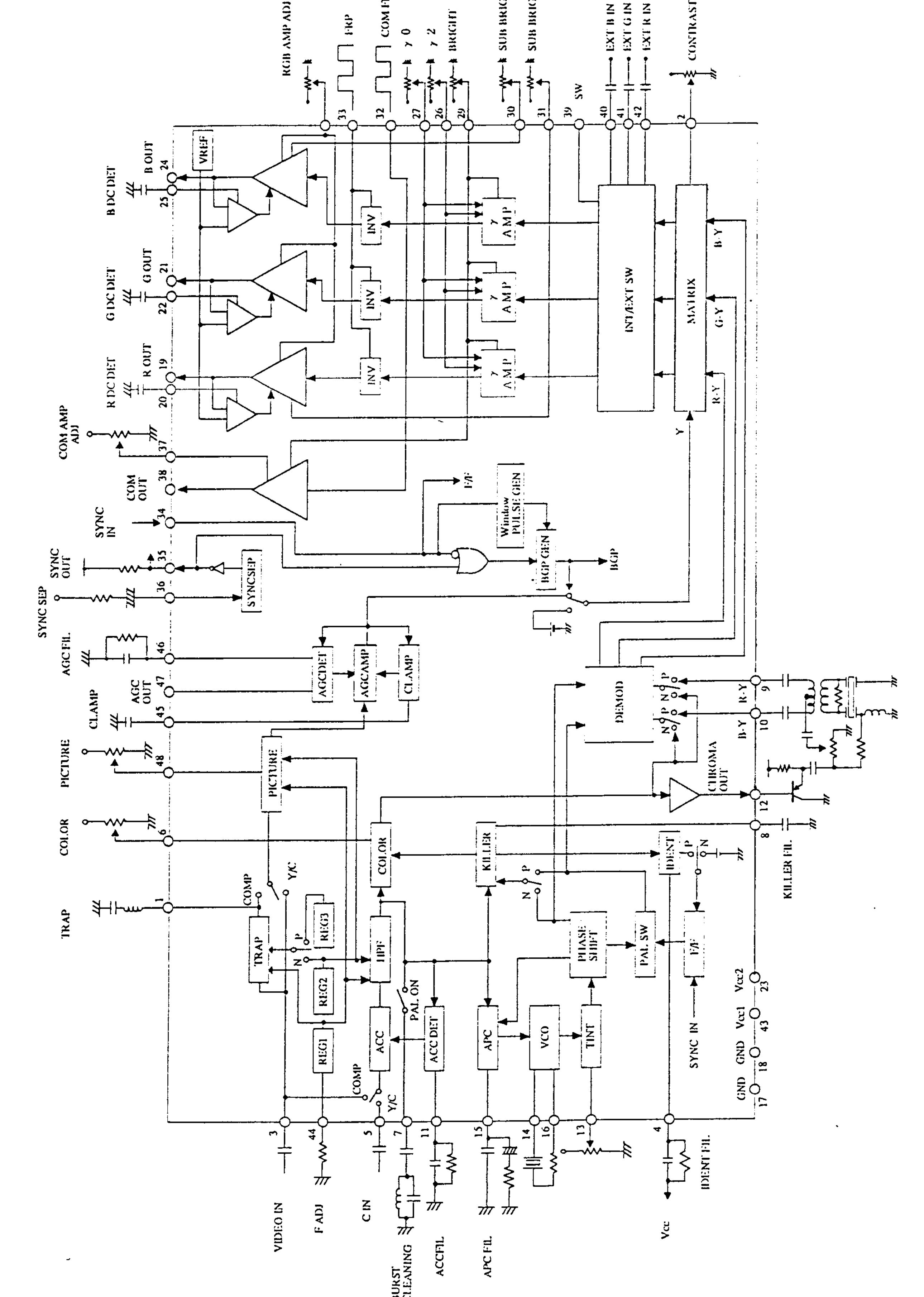
2. Terminal Name

Pin No.	Terminal name	Pin No.	Terminal name
1	TRAP	25	B DC DET
2	CONTRAST	26	GAMMA 2
3	VIDEO IN	27	GAMMA 0
4	IDENT FILTER	28	RGB AMPLITUDE ADJUST
5	C IN	29	BRIGHT
6	COLOR	30	SUB BRIGHT B
7	BURST OUT	31	SUB BRIGHT R
8	KILLER FILTER	32	COMMON FRP
9	R-Y	33	FRP
10	B-Y	34	SYNC IN
11	ACC FILTER	35	SYNC OUT
12	CHROMA OUT	36	SYNC SEP
13	TINT	37	COMMON AMPLITUDE ADJUST
14	VCO IN	38	COMMON OUT
15	APC FILTER	39	SW
16	VCO OUT	40	B IN
17	GND1	41	G IN
18	GND2	42	R IN
19	R OUT	43	VCC1
20	R DC DET	44	F ADJ
21	G OUT	45	CLAMP
22	G DC DET	46	AGC FILTER
23	VCC2	47	AGC OUT
24	B OUT	48	PICTURE

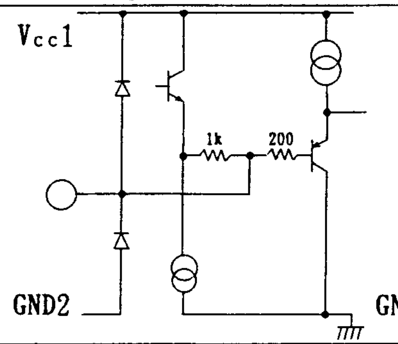
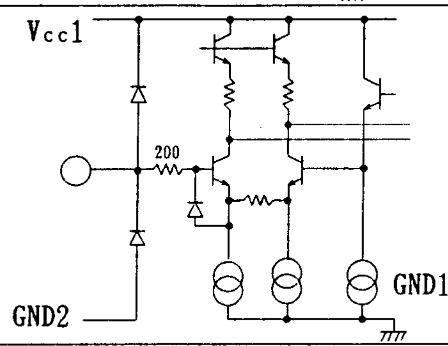
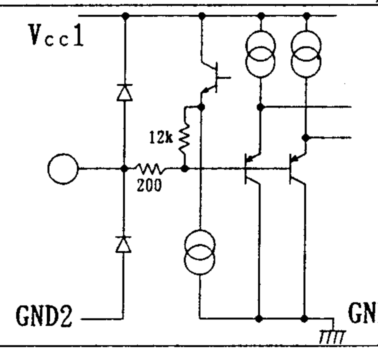
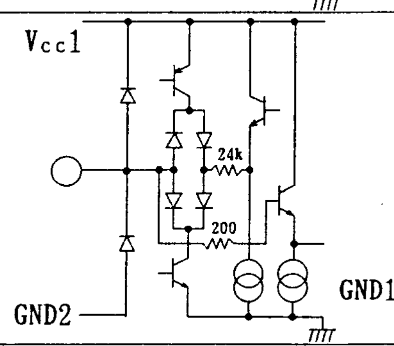
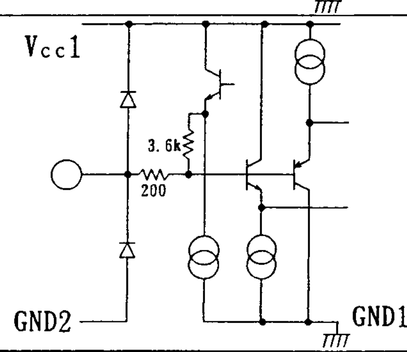
3. Terminal Connections (TOP VIEW)

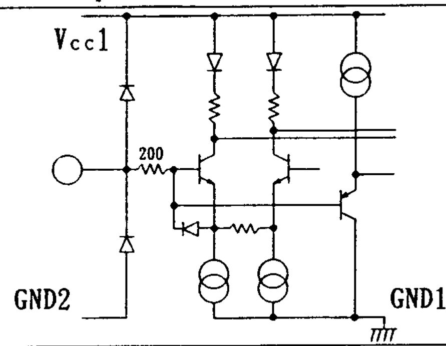
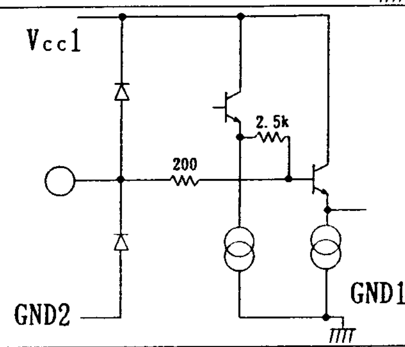
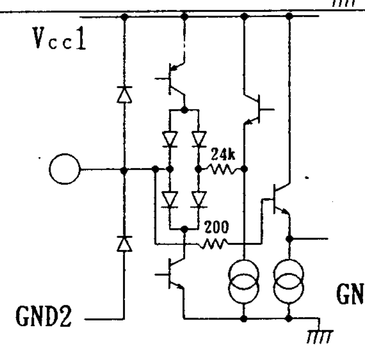
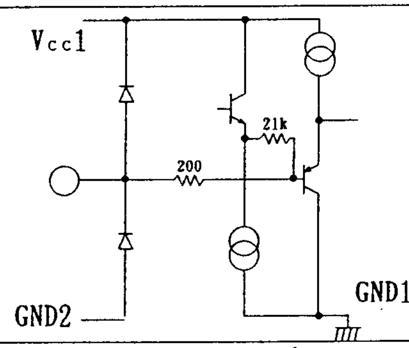
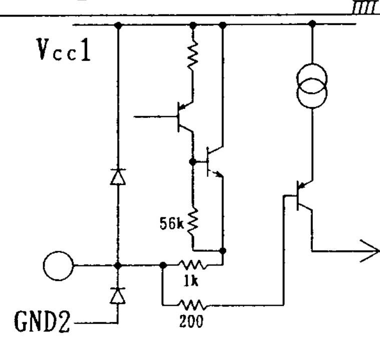


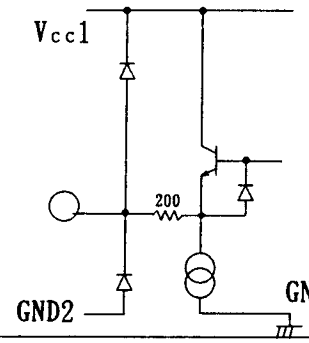
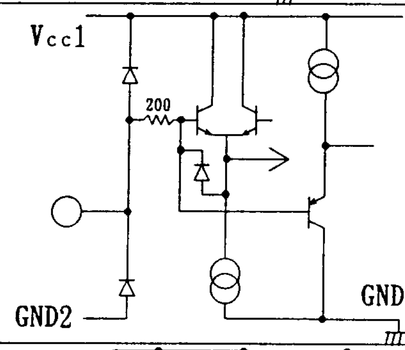
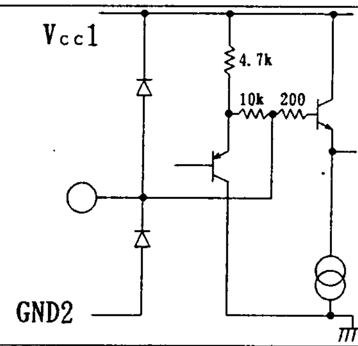
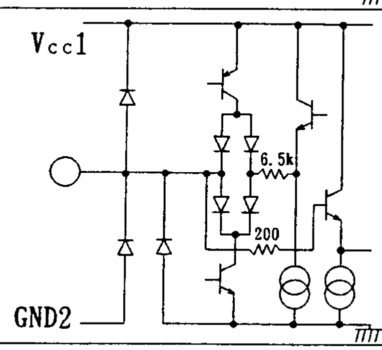
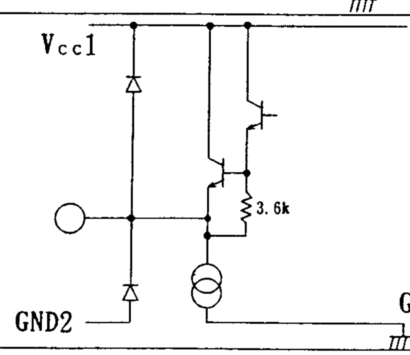
IV. Block Diagram

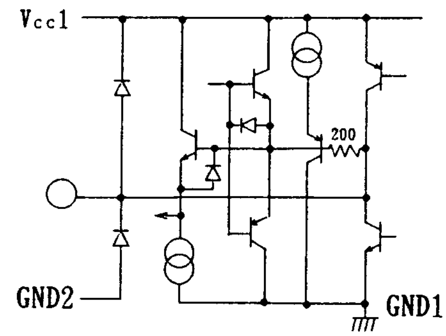
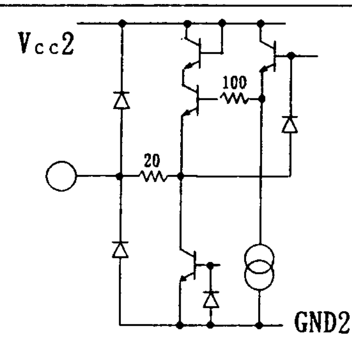
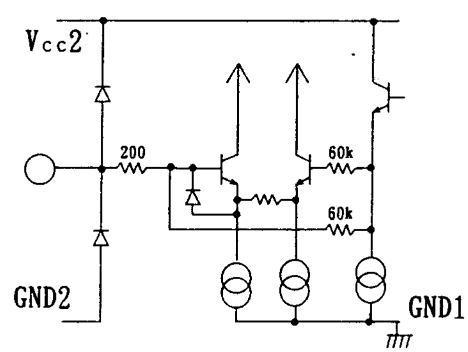
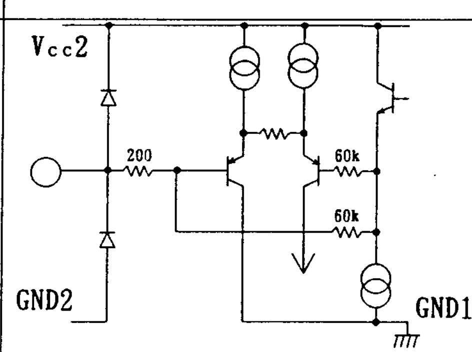
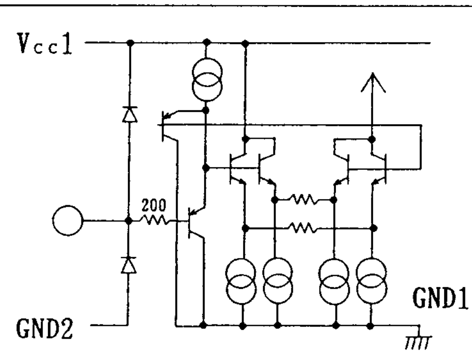


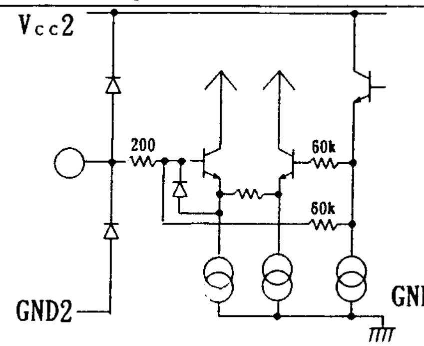
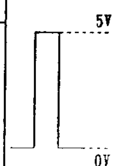
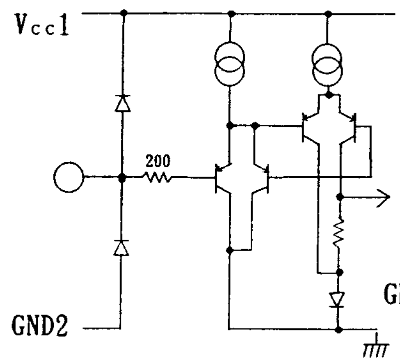
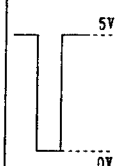
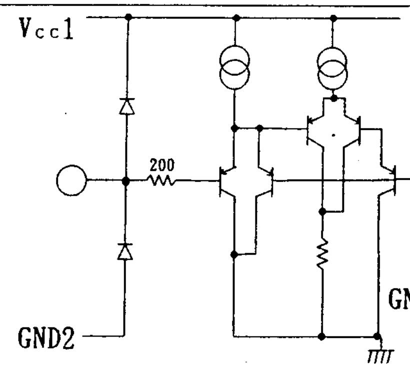
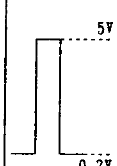
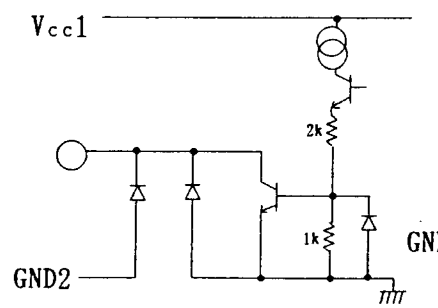
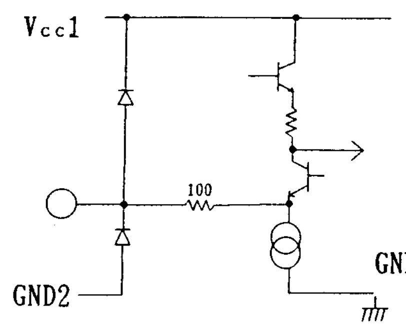
5. Description of Terminals (Vcc1=5.0V/Vcc2=7.5V These voltage are typical value.)

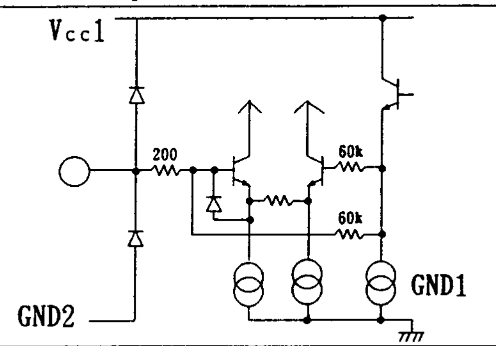
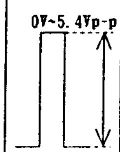
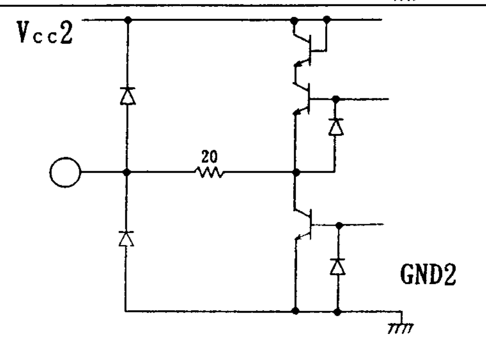
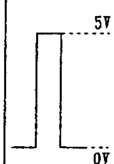
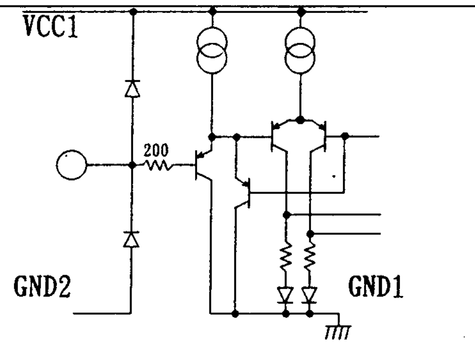
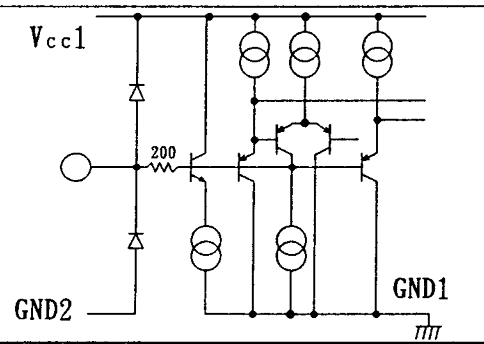
Pin. No.	Term. Name	Voltage	Equivalent circuit	Description
1	TRAP	2.2V		This terminal is connected to the TRAP filter. Output impedance:1kΩ
2	CONTRAST	1.1V ~3.7V		The DC voltage applied to this terminal adjusts the contrast of the composite or Y/C video signal.
3	VIDEO IN	2.2V		Input the composite video signal to this terminal. (In case of using the Y/C video signal. Input the luminance signal.)
4	IDENT FILTER	1.0V		This terminal is connected to the IDENT detection filter.
5	C IN	2.7V		In case of using the Y/C video signal. Input the chrominance signal. In case of using the composite video signal, connect this terminal to the ground.

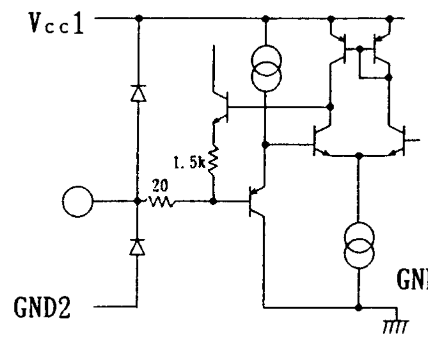
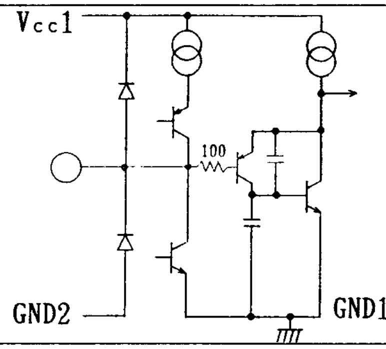
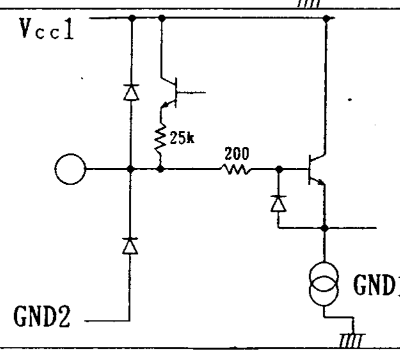
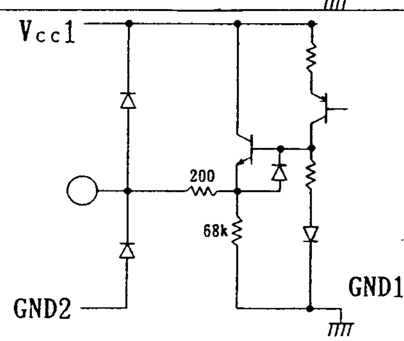
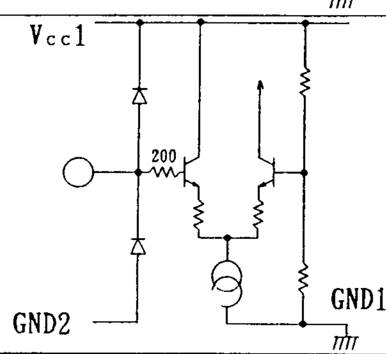
Term. No.	Term. Name	Voltage	Equivalent Circuit	Description
6	COLOR	1.8V ~4.1V		The DC voltage applied to this terminal adjusts the color gain.
7	BURST OUT	3.5V		In case of the PAL mode, this terminal is connected to the burst cleaning coil.
8	KILLER FILTER	1.7V		This terminal is connected to the KILLER detection filter.
9 10	R-Y B-Y	2.2V		Input the chrominance signal for the PAL demodulate circuit.
11	ACC FILTER	1.8V		This terminal is connected to the ACC detection filter.

Term. No.	Term. Name	voltage	Equivalent Circuit	Description
12	CHROMA OUT	2.7V		This terminal outputs the chrominance signal whose color gain has been adjusted and whose burst signal has been removed.
13	TINT	0V ~5V		The voltage applied to this terminal adjusts the tint. This terminal also switches between the NTSC mode and the PAL mode. In case of the PAL mode, select this terminal is connected to the ground.
14	VCO IN	4.2V		The input terminal of the VCO circuit.
15	APC FILTER	2.6V		This terminal is connected to the APC detection filter.
16	VCO OUT	2.2V		The output terminal of the VCO circuit.
17, 18	GND1,2	0V		The terminals of GND1 and GND2 are not connection together. Please be sure that these terminals should be connected with same voltage

Term. No.	Term. Name	Voltage	Equivalent Circuit	Description
20 22 25	R DC DET G DC DET B DC DET	2.3V		This terminal is connected to the capacitor that smooths and holds the DC voltage of the RGB outputs. Because of the high impedance, use low leakage current capacitor.
19 21 24	R OUT G OUT B OUT	$\frac{Vcc1}{2}$ =2.5V		Output terminal of the RGB signals.
23	Vcc2			Connect to the power supply for the RGB outputs.
26	GAMMA 2	1.2V ~3.5V		The DC voltage applied to this terminal adjusts the γ2 point. This terminal is pre-set inside the IC.
28	RGB AMPLITUDE ADJUST	1.2V ~3.5V		The DC voltage applied to this terminal adjusts the amplitude (BLK-BLK) of the RGB output signals. This terminal is pre-set inside the IC.
27	GAMMA 0	1.2V ~3.5V		The DC voltage applied to this terminal adjusts γ0 point. This terminal is pre-set inside the IC.
29	BRIGHT	0.7V ~2.6V		The DC voltage applied to this terminal adjusts the position of the gamma correction curve and the amplitude of the common voltage.

Term. No.	Term. Name	voltage	Equivalent Circuit	Description
30 31	SUB BRIGHT B SUB BRIGHT R	1.0V ~3.5V		The DC voltage applied to these terminals adjust the brightness of the R and B signals finely by moving the gamma correction curve. These terminals are preseted inside the IC.
32	COMMON FRP			Input the switching signal of the common output.
33	FRP			Input the inverting signal of the RGB outputs. "LOW":Inverting. "HI" :Not inverting.
34	SYNC IN			Input the horizontal synchronizing pulse. (Active Low) In case of the PAL mode, inner flip-flop switches at the rising edge of the input pulse.
35	SYNC OUT			Outputs the composite synchronizing pulse separated by the SYNC-separation circuit. (Active High) The output is provided by an open collector circuit.
36	SYNC SEP	2.0V		The input terminal of the video signal for the SYNC-separation circuit.

Term. No.	Term. Name	Voltage	Equivalent Circuit	Description
37	COMMON AMPLITUDE ADJUST	1.0V ~3.5V		The DC voltage applied to this terminal adjusts the amplitude of the COM output. This terminal is preset inside the IC.
38	COMMON OUT			The output terminal of the COM signal.
39	SW			Input the video source selection signal. Give the "Low" level in case of the composite or Y/C input, and give the "High" level or open in case of the RGB inputs.
40 41 42	B IN G IN R IN	2.2V		The input terminal of the RGB signals. The signal is required to be AC coupled.

Term. No.	Term. Name	Volage	Equivalent Circuit	Description
43	Vcc1			Connect to the power supply.
44	F ADJ	1.3V		The resistor between this terminal and the ground adjusts the frequency characteristic of the inner filters. The registor of 18k ohms is recommended for the both mode. Resistance accuracy:±2% Temp. Stability:±200ppm/℃
45	CLAMP	2.4V		Connect the capacitor that clamps the pedestal level of the luminance signal. Because of the high impedance, use the low leackage carrent capacitor.
46	AGC FILTER	2.9V		Connect the AGC detection filter for luminance signal.
47	AGC OUT	0.75V ~3.1V		This terminal outputs the AGC detection voltage of the luminance signal. The output voltage increases with the increase of the AGC gain.
48	PICTURE	1.8V ~3.6V		The DC voltage applied to this terminal adjusts the frequency characteristic of the luminance signal. The outline is emphasized by reducing the voltage of this terminal.

6. Functional operation

* TRAP

The frequency of the TRAP is switched between 3.58MHz(NTSC) and 4.43MHz(PAL). In case of the Y/C input, the signal does not pass through the TRAP.

* AGC circuit

The AGC characteristic varies with the APL level of the luminance signal. The AGC circuit detects the peak of the amplitude of the luminance signal to form the AGC loop.

* ACC detector, ACC amplifier

The ACC circuit detects the peak of the amplitude of the burst signal to form the ACC loop.

* VCO, APC detector

The local oscillator circuit(VCO) is a pierce type X'tal oscillator circuit. The APC and the VCO form the PLL loop to eliminate the adjustment work. The APC detector compares the phase of the burst signal with that of the VCO oscillator output, and regulates the oscillation frequency of the VCO.

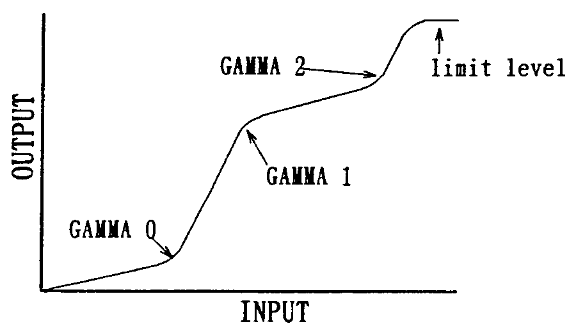
* RGB inputs

Because the each terminal of the RGB inputs is clamped, the signal is required to be AC coupled.
When giving the "H" level to the SW input or opening it, the RGB inputs are valid, and when giving the "L" level to it, the composite or Y/C input is valid. The RGB inputs accept the analog signals.

* Gamma correction

The output signals are corrected according to the characteristic of the LCD panel as shown in Figure 1. The pin 27 and 26 adjust the each relative position of the inflection $\gamma 0$, $\gamma 2$. The pin 32 (bright) adjusts these positions at the same time.

Figure 1



* RGB outputs

The RGB outputs (pin 19 pin 21 and pin 24) are inverted by the FRP signal applied to the pin 33 as shown in Figure 2.
The output circuits keep the DC voltage Vcc1/2.
The dynamic range is adjusted by the RGB AMPLITUDE terminal(pin 26).

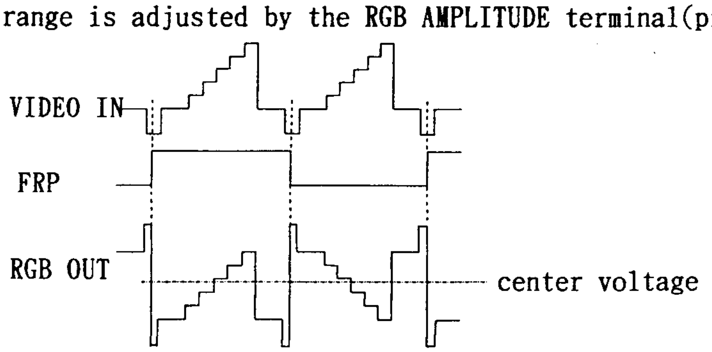


Figure 2

* Bright control

The gamma correction points of the RGB outputs and the amplitude of the COM output change according to the voltage applied to the BRIGHT terminal. (Fig. 3)
This circuit assumes that the COM output is amplified threefold outside.
The relation between the COM output amplitude and the gammma collection point is able to be adjusted according to the voltage applied to the COMMON AMPLITUDE ADJUST terminal.

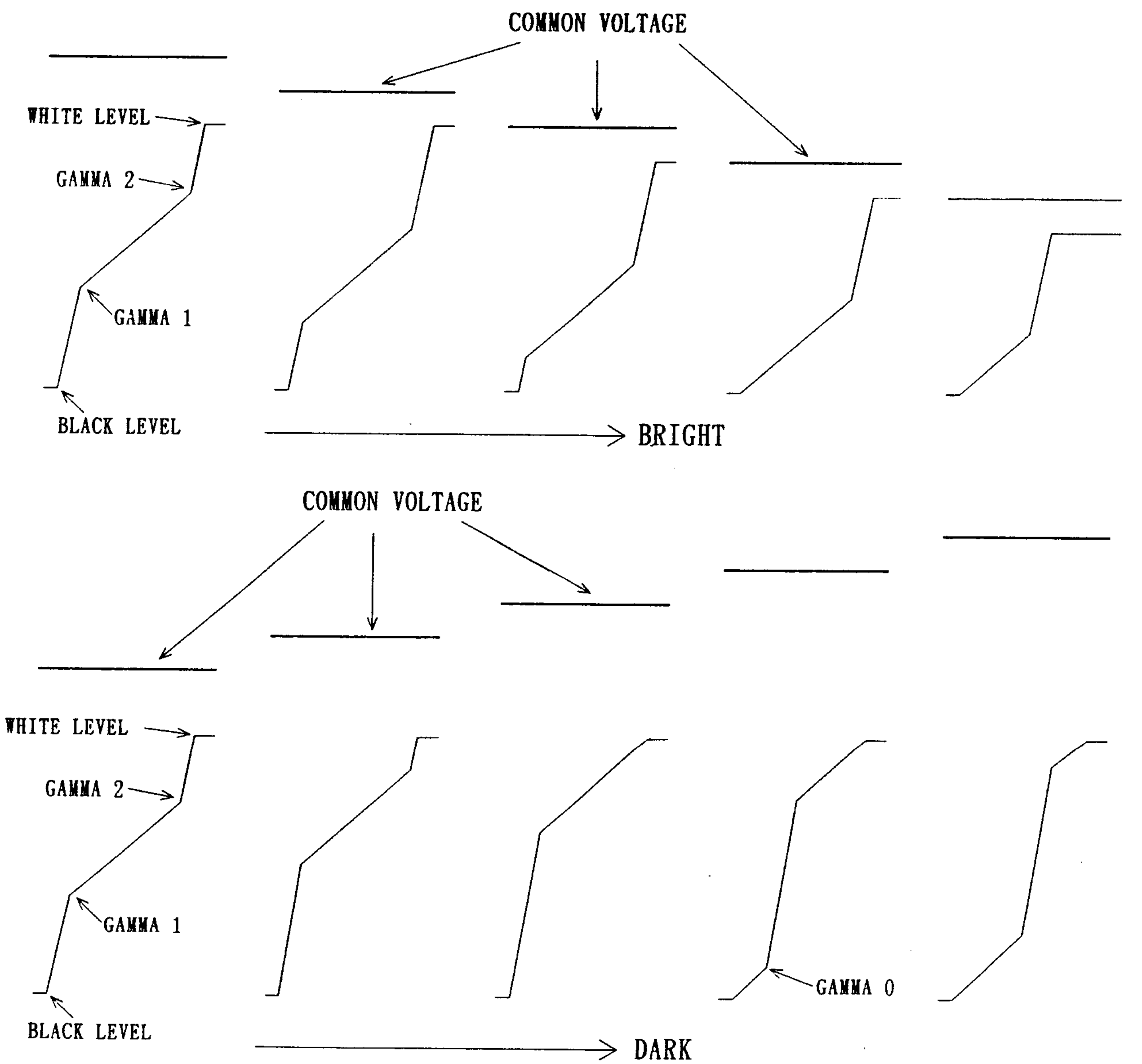


Figure 3

7. Precautions

* Power supply pin

Ensure that pin 17 and pin 18 are at the lowest potential, and do not open them. Make sure that the voltage applied to the power supply pin must be as follows: GND2 = GND1 ≦ Vcc1 ≦ Vcc2

* White-balance adjustment

The SUB BRIGHT B and R terminals(pin 30 and pin 31) are preseted inside the IC. When these preseted terminals are open, the white-balance could be lost by the deviation of the electronic components in the system. Therefore in someway, regulating the white-balance, is recommended.

* RGB outputs amplitude(between the black level and the following inverted black level)

Make the maximum amplitude of the RGB outputs below Vcc1-0.4V_{P-P}.(including the case that adjusted by the SUB BRIGHT and the RGB AMPLITUDE ADJUST terminals)

* RGB outputs terminal and COMMON output terminal

In case of connecting low impedance loads, because the consumption current of the Vcc2 terminal increase, pay attention to the maximum power dissipation of the package.

* Sync separator input

Make the impedance of the signal source connected to the sync-separator input as low as possible. otherwize, the ability of the sync-separator may decrease.

* Input of the signal

Synchronize all the input signals connected to the IC.

* F ADJ terminal

Because the impedance of this terminal is high, the crosstalk with neighboring signal lines may occur. Therefore, station the resistor connected to this terminal by the IC and design the PWB patterns in order to minimize the crosstalk.

* Bright control limit

In case of varing the BRIGHT control voltage or GAMMA 0 control voltage, make the gamma 0 position be below 1V above the pedestal level.

* Sync in (pin 34)

The horizontal synchronizing pulse synchronized with the output pulse of SYNC OUT pin 35 must be applied to pin 34. Please refer to No.169~No.171.(page 29) about pulse timing.

* Common Amplitude Adjust

It is recommended not to supply COMMON AMPLITUDE ADJUST with a constant voltage but to adjust it one by one. The output amplitude of COMMON OUT has a variability of 1.55±0.3V_{P-P} when COMMON AMPLITUDE ADJUST is supplied with a voltage of 2.05V and BRIGHT is supplied with a voltage of 1.0V.

It is afraid that the variability of luminance on the LCD display should increase at a constant COMMON AMPLITUDE ADJUST voltage, because both the output amplitude and the variability of COMMON OUT are amplitude, and a LCD module is supplied with them.

* Output dynamic range

Adjust RGB AMPLITUDE ADJUST(pin 28) to make the output dynamic range more than 3V_{P-P}.

8. Absolute Maximum Ratings (Ta=25℃)

Paramater	Symbol	Condition	Rating	Unit
Supply voltage	$V_{CC}1$ - GND		7	V
	$V_{CC}2$ - GND		10	V
Power dissipation	P_D	Ta ≦ 25℃	570	mW
Derating ratio		Ta > 25℃	4.5	mW/℃
Operating temperature range	Topr		-30 ～ 85	℃
Storage temperature range	Tstg		-55 ～ 150	℃
Each adjust pin voltage	V_{IN}		GND-0.3V ～Vcc1+0.3V	V
SYNC OUT output strength voltage	V_{SD}		10	V
Video input signal voltage			3	Vp-p
RGB input signals voltage			GND-0.3V ～Vcc1+0.3V*1	V
FRP input signal voltage			GND-0.3V ～Vcc1+0.3V	V
COM FRP input signal voltage			GND-0.3V ～Vcc1+0.3V	V
SYNC IN input signal voltage			GND-0.3V ～Vcc1+0.3V	V

*1) Means the potentials of pin 40, 41 and 42 are in this range.

Operating supply voltage range

Paramater	Symbol	Condition	Rating	Unit
Operating supply voltage range	$V_{CC}1$-GND		4.5～5.5	V
	$V_{CC}2$-GND		7.0～8.0	V
	Vcc2-Vcc1		≧2.0	V

Recommended operating conditions

Parameter	Symbol	Condition	Rating			Unit
			MIN	TYP	MAX	
COMPOSITE VIDEO IN input signal voltage	V_{IN}	*2		0.35	0.40	Vp-p
LUMINANCE IN input signal voltage	Y_{IN}	*2		0.35	0.40	Vp-p
CHROMINANCE IN input signal voltage	C_{IN}	*3		0.15	0.30	Vp-p
RGB analog input signals voltage	RGB_{INA}		0	0.70	2.0	Vp-p
FRP input "HI" level voltage	FRP_{INL}		2.0			V
FRP input "LOW" level voltage	FRP_{INH}				0.80	V
COM FRP input "HI" level voltage	$CFRP_{INH}$		2.0			V
COM FRP input "LOW" level voltage	$CFRP_{INL}$				0.80	V
SYNC IN input "HI" level voltage	SY_{INH}		2.0			V
SYNC IN input "LOW" level voltage	SY_{INL}				0.80	V
SYNC SEP input composite video signal voltage	V_{SYA}			0.5		Vp-p
SYNC SEP input digital signal voltage	V_{SYD}		0.5		2.0	Vp-p

*2 Between the pedestal level and the white level.
*3 Amplitude of the burst.

9. Electrical Characteristics

Unless otherwise specified, $V_{cc}1$=5.0V, $V_{cc}2$=7.5V, GND1=GND2=GND, Ta=25℃, SW4→a, SW5→b, SW8→a SW11→a, SW12→a, SW13→b, SW15→a, SW19→OFF, SW21→OFF, SW24→OFF, SW26→OFF, SW27→ON, SW28→OFF SW30→OFF, SW31→OFF, SW36→a, SW37→OFF, SW40→a, SW41→a, SW42→a, SW45→a, SW46→OFF
V2=2.2V, V5=0V, V6=2.9V, V13=3.1V, V27=3.5V, V29=1.7V, V48=2.8V
(A), (B), (G), (H), (I), (J)=GND SG11 applied to (C), (D). SG7b(5Vp-p) applied to (E).
Note: SG5(4.43MHz, burst/chroma phase = ±135°) applied to (B), SG7a applied to (F), choose switches for PAL(SW5→a, SW13→a, SW12→b), adjust the burst-cleaning coil in order to equalize the amplitude of every output signal on TP19 by the 1H.

No.	Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
1	Current dissipation (Pin 43)	$I_{cc}1$			23.0	34.0	mA
2	Current dissipation (Pin 23)	$I_{cc}2$			9.0	15.0	mA
3	CONTRAST input current	I2	V2=3.3V		0.2	1.0	μA
4	IDENT input current	I4	SW4→b, V4=1V, (E)=0V	-0.1	0	0.1	μA
5	C IN input current	I5	SW5→b, V5=0V		4.0	6.0	μA
6	COLOR input current	I6	V6=3.9V		0.3	1.0	μA
7	KILLER input current	I8	SW8→c, V8=2.5V, (E)=0V	-0.1	0	0.1	μA
8	ACC FIL input current	I11	SW11=b, V11=0V, (E)=0V	-0.1	0	0.1	μA
9	TINT input current "H"	IH13	SW13→b, V13=4.4V		0.2	1.0	μA
10	TINT input current "L"	IL13	SW13→b, V13=0V		-0.2	-1.0	μA
11	APC FIL input current	I15	SW15→b, V15=2.5V, (E)=0V	-0.1	0	0.1	μA
12	BRIGHT input current	I29	V29=2.8V		0.2	1.0	μA
13	COM FRP input current "H"	IH32	(C)=5V	-0.1	0	0.1	μA
14	COM FRP input current "L"	IL32	(C)=0V		-0.2	-1.0	μA
15	FRP input current "H"	IH33	(D)=5V	-0.1	0	0.1	μA
16	FRP input current "L"	IL33	(D)=0V		-0.2	-1.0	μA
17	SYNC IN input current "H"	IH34	(E)=5V	-0.1	0	0.1	μA
18	SYNC IN input current "L"	IL34	(E)=0V		-0.2	-1.0	μA
19	SYNC SEP input current	I36	SW→b, V36=3.0V	8.0	14.0	19.0	μA
20	SW input current "H"	IH39	(G)=5V	-0.1	0	0.1	μA
21	SW input current "L"	IL39	(G)=0V		-0.2	-1.0	μA
22	B IN input current	I40	SW40→b, V40=2.5V, (E)=0V	-0.1	0	0.1	μA
23	G IN input current	I41	SW41→b, V41=2.5V, (E)=0V	-0.1	0	0.1	μA
24	R IN input current	I42	SW42→b, V42=2.5V, (E)=0V	-0.1	0	0.1	μA
25	CLAMP input current	I45	SW45→b, V45=1.0V, (E)=0V	-0.1	0	0.1	μA
26	PICTURE input current	I48	V48=3.3V		0.2	1.0	μA
27	TRAP terminal voltage	V1		1.9	2.2	2.5	V
28	VIDEO IN terminal voltage	V3		1.9	2.2	2.5	V
29	C IN terminal voltage	V5		2.4	2.7	3.2	V
30	BURST OUT terminal voltage	V7		2.9	3.3	3.6	V
31	R-Y terminal voltage	V9		1.7	2.1	2.5	V
32	B-Y terminal voltage	V10		1.7	2.1	2.5	V
33	CHROMA OUT terminal voltage	V12		2.1	2.6	2.9	V
34	GAMMA2 terminal voltage	V26		1.7	2.1	2.6	V
35	GAMMA0 terminal voltage	V27		1.7	2.1	2.6	V
36	RGB AMP terminal voltage	V28		1.7	2.1	2.6	V
37	SUB BRIGHT B terminal voltage	V30		1.7	2.1	2.6	V
38	SUB BRIGHT R terminal voltage	V31		1.7	2.1	2.6	V
39	SYNC SEP terminal voltage	V36		1.6	2.0	2.6	V
40	COM AMP terminal voltage	V37		1.7	2.1	2.6	V

No.	Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
41	SYNC OUT terminal voltage	V35		0	0.2	0.5	V
42	B IN tcrminal voltage	V40		1.3	2.2	3.0	V
43	G IN terminal voltage	V41		1.3	2.2	3.0	V
44	R IN terminal voltage	V42		1.3	2.2	3.0	V
45	TRAP output impedance	Z1		0.5	1.0	3.0	kΩ
46	VIDEO IN input impedance	Z3		8.0	12.0	20.0	kΩ
47	C IN input impedance	Z5		2.5	3.6	6.5	kΩ
48	BURST OUT output impedance	Z7		1.7	2.5	3.3	kΩ
49	R-Y input impedance	Z9		14.0	21.0	33.0	kΩ
50	B-Y input impedance	Z10		14.0	21.0	33.0	kΩ
51	GAMMA2 input impedance	Z26		40.0	60.0	95.0	kΩ
52	GAMMA0 input impedance	Z27		40.0	60.0	95.0	kΩ
53	RGB AMP input impedance	Z28		40.0	60.0	95.0	kΩ
54	SUB BRIGHT B input impedance	Z30		40.0	60.0	95.0	kΩ
55	SUB BRIGHT R input impedance	Z31		40.0	60.0	95.0	kΩ
56	COM AMP input impedance	Z37		40.0	60.0	95.0	kΩ

No.	Paramater	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
57	Luminance maximum gain	Gmax	With V2=1.3V and SG8 applied to (A), adjust the amplitude of SG8(vin) for making the amplitude(BLK-WHT) of TP21 2Vp-p. GMAX=20log(2.0/vin)	30	33	36	dB
58	Contrast adjust gain variable range (1)	Gct1	With SG8(amplitude:vin) applied to (A), define the each amplitude (BLK-WHT) at V2=1.3V, 2.2V and 3.7V as v1, v0 and v2. Gct1=20log(v1/v0), Gct2=20log(v2/v0)	1.0	2.5		dB
59	Contrast adjust gain variable range (2)	Gct2			-17	-10	dB
60	AGC detect volt. (1)	Vad1	With SG1(0dB) applied to (A), define the each voltage of TP47 at APL=10%, 50% and 90% as Vad1, Vad2 and Vad3.	2.7	3.1	3.4	V
61	AGC detect volt. (2)	Vad2		1.4	2.0	2.8	V
62	AGC detect volt. (3)	Vad3		0.3	0.75	1.2	V
63	AGC amplitude characteristic (1)	va1	WIth V2=3.1V and SG1(0dB) applied to (A), define the each amplitude (BLK-WHT) of TP47 at APL=10%, 50% and 90% as va1, va2 and va3.	1.6	2.1	2.6	Vp-p
64	AGC amplitude characteristic (2)	va2		1.3	1.8	2.4	Vp-p
65	AGC amplitude characteristic (3)	va3		0.7	1.1	1.7	Vp-p
66	Image quality adjust variable range (1) (Composite NTSC in)	Gp1	With SW46→ON, V46=4.0V, V2=2.6V and SG2 (100kHz) applied to (A), define the amplitude of the 100kHz component of TP21 as v1. With 2MHz SG2 applied, define the each 2MHz component at V48=2.0V and 3.6V as v2 and v3. Gp1=20log(v2/v1) Gp2=20log(v3/v1)	4.0	7.0		dB
67	Image quality adjust variable range (2) (Composite NTSC in)	Gp2			-4.0	-1.0	dB
68	Image quality adjust variable range (3) (Composite PAL in)	Gp3	With SW13→a, SW46→ON, V46=4.0V, V2=2.6V and 100kHz SG2 applied to (A), define the amplitude of the 100kHz component of TP21 as v1. With 2MHz SG2 applied, define the each 2MHz component of TP21 at V48=2.0V and 3.6V as v2 and v3. Gp3=20log(v2/v1), Gp4=20log(v3/v1)	5.5	8.5		dB
69	Image quality adjust variable range (4) (Composite PAL in)	Gp4			-3.5	-0.5	dB
70	Image quality adjust variable range (5) (Y/C input)	Gp5	With SW5→a SW46→ON, V46=4.0, V2=3.2V and 100kHz SG2 applied to (A), define the amplitude of the 100kHz component of. TP21 as v1. With 2.5MHz SG2 applied, define the each 2.5MHz component of TP21 at V48=2.0V and3.6V as v2 and v3. Gp5=20log v2/v1, Gp6=20log v3/v1	12	16.5		dB
71	Image quality adjust variable range (6) (Y/C input)	Gp6		2.5	5.0	dB	
72	Trap attenuation (NTSC) (1)	GcfNT	With SG3(100kHz, -6dB) applied to (A), define the amplitude of TP1 as v1. With SG3 (3.58MHz, -6dB) applied, define the amplitude of TP1 as v2. GcfNT=20log(v2/v1)	-30	-45		dB
73	Trap attenuation (PAL) (2)	GcfPAL	With SW13→a, SG3(100kHz, -6dB) applied to (A), define the amplitude of TP1 as v1. With SG3(4.43MHz, -6dB) applied, define the amplitude of TP1 as v2. GcfNT=20log(v2/v1)	-30	-45		dB

No.	Paramater	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
74	DC reproduction ratio	K	With V2=3.1V and SG1(APL=10%, 0dB) applied to (A), define the amplitude (BLK-BLK) of TP21 as v1. With SG1(APL=90%, 0dB) applied, define the amplitude (BLK-BLK) of TP21 as v2. $K=(v1-\|v1-v2\|)/v1\times100$	95			%

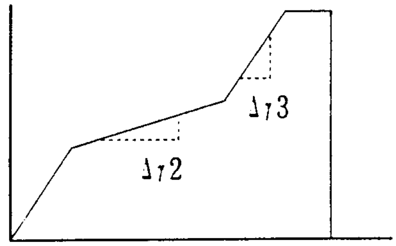
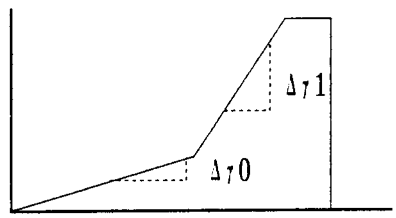
No.	Paramater	Symbol	Conditions	MIN	TYP	MAX	Unit
75	Chroma maximum output (Composite PAL in)	VCMAX1	With SW13→a, V6=4.0V and SG5(4.43MHz, burst/chroma phase=±135°) applied to (A), measure the chroma amplitude on TP12.	0.5	0.8	1.2	V_{P-P}
76	Chroma maximum output (Y/C input)	VCMAX2	With SW5→a, SW13→a, V6=4.0V and SG5(4.43 MHz, burst/chroma phase=±135°) applied to (A), measure the chroma amplitude of TP12.	0.5	0.8	1.2	V_{P-P}
77	ACC characteristic (1) (Composite NTSC in)	GA1	With SG5(3.58MHz, 0dB, +6dB and -25dB, burst/chroma phase=180°) applied to (A), measure the amplitude on TP12 at 0dB, +6dB and -25dB. Define the each value as v0, v1 and v2. GA1=20log(v1/v0), GA2=20log(v2/v0)		0	2.0	dB
78	ACC characteristic (2) (Composite NTSC in)	GA2		-10	-5.0		dB
79	ACC characteristic (3) (Y/C sep. NTSC in)	GA3	With SW5→b and SG5(3.58MHz, 0dB, +6dB and -25dB, burst/chroma phase=180°) applied to (B), measure the amplitude on TP12 at 0dB, +6dB and -25dB. Define the each value as v0, v1 and v2. GA1=20log(v1/v0), GA2=20log(v2/v0)		0	2.0	dB
80	ACC characteristic (4) (Y/C sep. NTSC in)	GA4		-8.0	-3.0		dB
81	ACC characteristic (5) (Composite PAL in)	GA5	With SW13→a and SG5(4.43MHz, 0dB, +6dB and -25dB, burst/chroma phase=±135°) applied to (A), measure the amplitude on TP12 at 0dB, +6dB and -25dB. Define the each value as v0, v1, and v2. GA1=20log(v1/v0), GA2=20log(v2/v0)		0	2.0	dB
82	ACC characteristic (6) (Composite PAL in)	GA6		-11	-6.0		dB
83	ACC characteristic (7) (Y/C sep. PAL in)	GA7	With SW5→a, SW13→a and SG5(4.43MHz, 0dB, +6dB and -25dB, burst/chroma phase=±135°) applied to (B), measure the amplitude on TP12 at 0dB, +6dB and -25dB. Define the each value as v0, v1 and v2. GA1=20log(v1/v0), GA2=20log(v2/v0)		0	2.0	dB
84	ACC characteristic (8) (Y/C sep. PAL in)	GA8		-10	-5.0		dB
85	Color control gain variable range (1)	GC1	With SW5→a and SG5(3.58MHz, 0dB, burst/chroma phase=±180°) applied to (B), define the each chroma amplitude of TP12 at V6=1.8V, 2.9V and 4.1V as v1, v0 and v2. GC1=20log(v1/v0), GC2=20log(v2/v0)		-30	-20	dB
86	Color control gain variable range (2)	GC2		3.0	6.0		dB
87	HPF freq. characteristic (Comp.)(1)	GHP1	With SG6(4.43, 2.32, 3.58MHz) applied to (A), define the each amplitude on TP12 at each frequency as v0, v1 and v2. GHP1=20log(v1/v0), GHP2=20log(v2/v0)		-30	-10	dB
88	HPF freq. charac-teristic (Comp.)(2)	GHP2		-6.0	-2.0	1.5	dB
89	HPF freq. characteristics (Y/C) (1)	GHP3	With SW5→a and SG6(4.43, 2.32, 3.58MHz) applied to (B), define the each amplitude on TP12 at each frequency as v0, v1 and v2. GHP3=20log(v1/v0), GHP4=20log(v2/v0)		-30	-10	dB
90	HPF freq. charac-terisric (Y/C) (2)	GHP4		-6.0	-2.0	1.5	dB
91	APC capture range (NTSC, upper side)	fN+	With SW5→a and SG5(0dB, 3.584545MHz) applied to (B), decrease the frequency until the voltage on TP8 drops below 2V. Work out the difference between the frequency at that time and 3.579545MHz.	+500	+1000		Hz

No.	Paramater	Symbol	Conditions	MIN	TYP	MAX	Unit
92	APC capture range (NTSC, lower side)	fN-	With SW5→a and SG5(0dB, 3.574545MHz) applied to (B), increase frequency until the voltage on TP8 drops below 2V. Work out the difference between the frequency at that time and 3.579545MHz	-500	-1000		Hz
93	APC capture range (PAL, upper side)	fP+	With SW5→a, SW13→a and SG5(0dB, 4.438619 MHz) applied to (B), decrease frequency until the voltage on TP8 drops below 2V. Work out the difference between the frequency at that time and 4.433619MHz.	+500	+1000		Hz
94	APC capture range (PAL, lower side)	fP-	With SW5→a, SW13→a and SG5(0dB, 4.428619 MHz) applied to (B), increase frequency until the voltage on TP8 drops below 2V. Work out the difference between the frequency at that time and 4.433619MHz.	-500	-1000		Hz
95	Killer operating input level (NTSC)	Vbk1	With SW5→a and SG5(burst/chroma phase=180°) applied to (B), observe the waveform on TP12. Decrease the input amplitude until the killer is turned on, and measure the input attenuation.		-42	-37	dB
96	Killer operating input level (PAL)	Vbk2	With SW5→a, SW13→a and SG5(burst/chroma phase=±135°) applied to (B), observe the waveform on TP12. Decrease the input amplitude until the killer is turned on, and measure the input attenuation.		-37	-32	dB
97	Killer color ghost (NTSC)	Vbs1	With SW5→a, SW8→b and SG5(burst/chroma phase=180°) applied to (B), measure the amplitude of the color difference output (TP24).		50	100	mV
98	Killer color ghost (PAL)	Vbs2	With SW5→a, SW8→b, SW12→b, SW13→a and SG5(burst/chroma phase=±135°) applied to (B), measure the amplitude of the color difference output on TP24.		50	100	mV
99	Demodulation output amplitude ratio (1) (NTSC)	$\frac{R-Y}{B-Y}$	With SW5→a, V6=2.4V and SG5(0dB) applied to (B), vary the chroma phase and observe the each amplitude on TP19, TP21 and TP24. Define the each maximum	0.56	0.66	0.76	
100	Demodulation output amplitude ratio (2) (NTSC)	$\frac{G-Y}{B-Y}$	amplitude on TP19, TP21 and TP24 as VR, VG and VB. (R-Y)/(B-Y)=VR/VB, (G-Y)/(B-Y)=VG/VB	0.29	0.36	0.44	
101	Demodulation output amplitude ratio (3) (PAL)	$\frac{R-Y}{B-Y}$	With SW5→a, SW12→b, SW13→a, V6=2.16V and SG5(0dB) applied to (B), vary the chroma phase and observe the each amplitude on TP19, TP21 and TP24.	0.56	0.66	0.84	
102	Demodulation output amplitude ratio (4) (PAL)	$\frac{G-Y}{B-Y}$	Define the each maximum amplitude on TP19, TP21 and TP24 as VR, VG and VB. (R-Y)/(B-Y)=VR/VB, (G-Y)/(B-Y)=VG/VB	0.29	0.36	0.44	

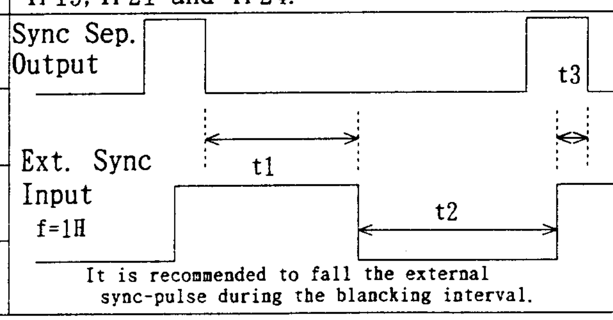
No.	Paramater	Symbol	Conditions	MIN	TYP	MAX	Unit
103	Demodulation relative phase (1) (NTSC)	θRB	With SW5→a, V6=2.4V and SG5(0dB) applied to (B), vary the chroma phase and observe the amplitude and phase on TP19, TP21 and TP24. Define the each phase causing the maximum amplitude on TP19, TP21 and TP24 as θR, θG and θB. θRB=θR-θB, θGB=θG-θB	80	90	100	deg
104	Demodulation relative phase (2) (NTSC)	θGB		230	240	250	deg
105	Demodulation relative phase (3) (PAL)	θRB	With SW5→a, SW12→b, SW13→a V6=2.4V and SG5 (0dB) applied to (B), vary the chroma phase and ouserve the amplitude and phase on TP19, TP21 and TP24. Define the each phase causing the maximum amplitude on TP19, TP21 and TP24 as θR, θG and θB. θRB=θR-θB, θGB=θG-θB	80	90	100	deg
106	Demodulation relative phase (4) (PAL)	θGB		230	240	254	deg
107	Demodulation output residual carrier (NTSC)	VCRN	With SW5→a, V6=2.4V, (D)=0.4V and SG5(0dB) applied to (B), adjust the chroma phase for maximizing the amplitude of TP24. Measure the ratio of the 7.15909MHz component to the 15.734kHz component.		-40	-30	dB
108	Demodulation output residual carrier (PAL)	VCRP	With SW5→a, SW12→b, SW13→a, V6=2.4V, (D)=0.4V and SG5(0dB) applied to (B), adjust the chroma phase for maximizing the amplitude of TP24. Measure the ratio of the 8.867238MHz component to the 15.625 kHz component.		-50	-40	dB
109	TINT variable range (1)	θ_+	With SW5→a, V6=2.4V and SG5(0dB) applied to (B), V13=1.5V, define the phase causing the maximum amplitude on TP24 as θ1.	30	45		deg
110	TINT variable range (2)	θ_-	Define the each phase causing the maximum amplitude at V13=3.2V and 5.0V on TP24 as θ2 and θ3. $\theta_+=\theta 1-\theta 2$, $\theta_-=\theta 3-\theta 2$	-25	-40		deg
111	Composite→Y/C input switching voltage	VthCY	With SW5→b and SG5(0dB) applied to (A), increase V5 until the signal on TP12 disappears. Then, measure the voltage on V5.	1.3	1.6	1.9	V
112	Y/C→Composite input switching voltage	VthYC	With SW5→b and SG5(0dB) applied to (A), decrease V5 until the signal on TP12 appears. Then, measure the voltage on V5.	0.7	1.0	1.3	V
113	NTSC←→PAL switching voltage	VthNP	With SW5→a and SG5(0dB, 3.579545MHz, burst/chroma phase=180°) applied to (B), decrease the voltage on TP13 until the signal on TP24 Disappears. Measure the voltage on V13.	0.4	0.6	1.0	V

No.	Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
114	Interface section maximum gain	GMAXI	With (G)=5.0V and SG8 applied to (H),(I) and (J), adjust the amplitude of SG8(vim) for making the amplitude(BLK-WHT) of the non-inverteding signal on TP21 2V. Then, define the non-inverting side of the amp amplitude on TP19, TP21 and TP24 as VRET, VGET and VBET, the invert side of them as VRETA, VGETA and VBETA. GMAXI=20log(VRET/vim), 20log(VGET/vim) 20Log(VBET/vim), 20log(VRETA/vim) 20log(VGETA/vim), 20log(VBETA/vim)	19	22	25	dB
115	Gain difference among RGB	ΔGRGB	ΔGRGB=20log(VRET/VGET), 20log(VGET/VBET) =20log(VBET/VRET)			±0.8	dB
116	Gain difference between invert and non-invert	ΔGINV	ΔGINV=20log(VRETA/VRET) =20log(VGETA/VGET) =20log(VBETA/VBET)			±0.7	dB
117	Sub-brightness adjust variable range	ΔV_{BS}	With (G)=5.0V SG8 applied to (H),(I) and (J) SW27→ON, V27=3.5V and V29=1.7V adjust the amplitude of SG8 for making the amplitude(BLK-WHT) of the non-inverting signal on TP21 2V. Then, define the amplitude of the second stage (a2-GND) on TP19 and TP24 as V_{R2T} and V_{B2T}. Similarly, at inverting side, V_{R2TA} and V_{B2TA}. Similarly, with SW30, 31→ON and V30, 31=1.0V, as V_{R2M}, V_{B2M}, V_{R2MA} and V_{B2MA}, with V30, 31=3.2V, as V_{R2N}, V_{B2N}, V_{R2NA} and V_{B2NA} $\Delta V_{BS}=V_{R2T}-V_{R2M}$, $V_{R2TA}-V_{R2MA}$, $V_{B2T}-V_{B2M}$, $V_{B2TA}-V_{B2MA}$, $V_{R2T}-V_{R2N}$, $V_{R2TA}-V_{R2NA}$, $V_{B2T}-V_{B2N}$, $V_{B2TA}-V_{B2NA}$	±0.35	±0.60		V
118	RGB outputs maximum amplitude	VBM	With SW28→ON and V28=1.7V, measure the ampltude of TP19, TP21 and TP24.	4.0	4.5		V_{P-P}
119	RGB outputs black level voltage difference	ΔVB	With (G)=5.0V. TP19, TP21 and TP24, define the non-inverting black level as VRB, VGB and VBB the inverting black level as VRBA, VGBA and VBBA. ΔVB=VRB-VGB, VGB-VBB, VBB-VRB =VRBA-VGBA, VGBA-VBBA, VBBA-VRBA			±300	mV
120	Peak limit characteristics	VP	With V29=2.45V and SG8(-6dB) applied to (A). Measure the amplitude(BLK-WHT) of non-inverting signal on TP19, TP21 and TP24.	1.6	2.0	2.4	V
121	RGB outs DC voltage	VC	Measure the average of TP19, TP21 and TP24.	2.3	2.5	2.7	V

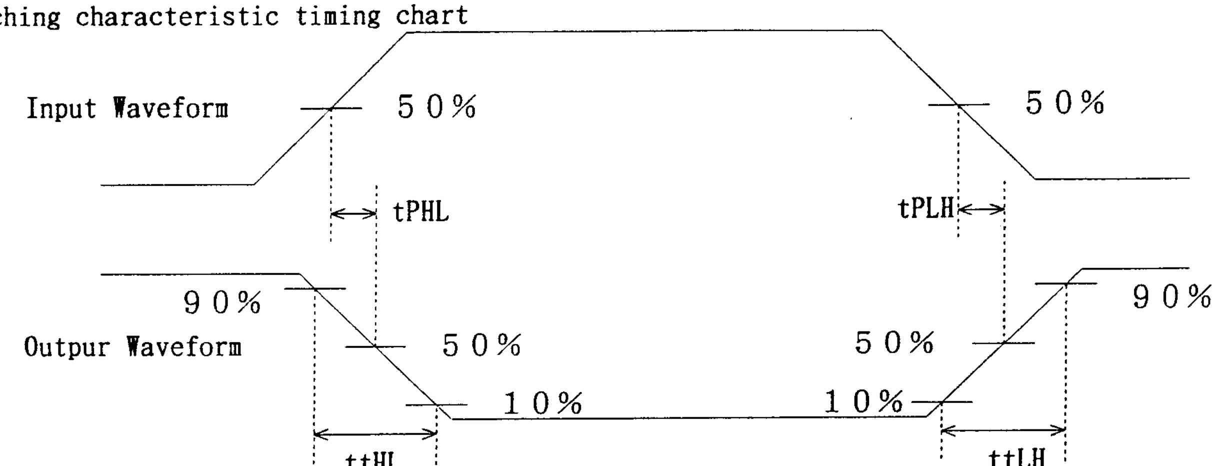
No.	Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
122	Interface section frequency characteristic	fC	With SW19→ON, SW21→ON, SW24→ON, (G)=5V, and SG12(f=100kHz) applied to (H), (I) and (J), adjust the amplitude of SG12(vi) for making the amplitude of sine wave part of the non-invert signal on TP21 2V. Inclease the frequency on TP19 and TP24 until attenuate by 3dB from the amplitude at the 100kHz.	5.0	6.5		MHz
123	Crosstalk among RGB	CTRGB	With (D)=0V, (G)=5.0V and SG12(f=1MHz, amplitude=vi) applied to (H), measure the amplitude of 1MHz component on TP19, TP21 and TP24. Calculate the amplitude ratio of TP19 and 21 to TP24. Similarly, with SG12(f=1MHz, amplitude=vi) applied to (I), measure the ratio of TP19 and TP24 to TP21. Similarly, with SG12(f=1MHz, amplitude=vi) applied to (J), measure the ratio of TP21 and TP24 to TP19.		50		dB
124	Crosstalk between inputs. (EXT→INT)	CTEI	With (D)=0V, (G)=5V and SG12(f=1MHz, amplitude=vi) applied to (H), measure the amplitude of 1MHz component on TP24. Then, with (G)=0V, measure the attenuation of 1MHz component on TP24. Similarly, to (I) and (J), measure one on TP21 and TP19.		45		dB
125	Crosstalk between inputs. (INT→EXT)	CTIR	With (D)=0V, (G)=0V and SG12(1MHz, -6dB) applied to (A), adjust V2 for making the amplitude of the sine wave part on TP21 2V. Then, With (G)=5V, measure the attenuation of 1MHz component on TP19, TP21 and TP24.		50		dB
126	COM OUT maximum amplitude	VCM	With SW37→ON, V37=3.0V and V29=1.0V, measure the amplitude on TP38.	5.0	5.4		V_{P-P}
127	COM OUT amplitude	DVCOM	SW37→ON, V37=2.05V and V29=2.0V measure the amplitude on TP38.	1.25	1.55	1.85	V_{P-P}
128	COM OUT amplitude adjustable range (1)	ΔVC1	With SW37→ON, V37=1.0V and V29=1.0V, measure the amplitude on TP38, define it as VCN. ΔVC1=VCM-VCN (In case of the contrary phase, define ΔVC1 as follows: ΔVC1=VCM+VCN.)	7.5	8.2	9.0	V_{P-P}
129	COM OUT amplitude adjustable range (2)	ΔVC2	With SW37→ON, V37=1.0V and V29=2.4V, measure the amplitude on TP38, define it as VCT. ΔVC1=VCM-VCT (In case of the contrary phase, define ΔVC1 as follows: ΔVC1=VCM+VCT.)	9.5	10.8		V_{P-P}
130	RGB outputs amplitude adjustable range	ΔVRGB	With SW28→ON, measure the differences of the amplitude(BLK-BLK) on TP19, TP21 and TP24, between V28=1.7V and V28=3.2V.	1.5	2.2		V_{P-P}

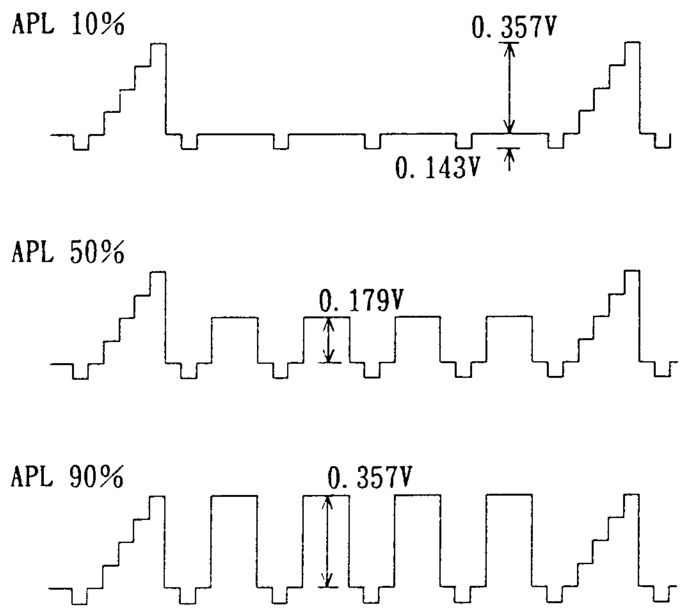
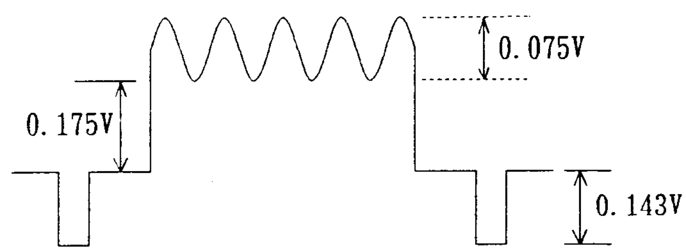
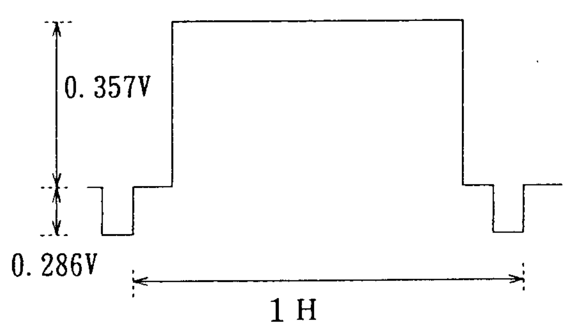
No.	Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
131	Gamma characteristic (1)	$\Delta\gamma 3$	With (G)=5.0V, V29=2.2V, SW27→OFF and SG9(0dB) applied to (H), (I) and (J), measure the slope on TP19, TP21 and TP24. 		220		mV/μs
132	Gamma characteristic (2)	$\Delta\gamma 2$			50		mV/μs
133	Gamma characteristic (3)	$\Delta\gamma 1$	Then, with V29=1.7V, measure the slope on TP19, TP21 and TP24. 		220		mV/μs
134	Gamma characteristic (4)	$\Delta\gamma 0$			50		mV/μs
135	Common-Gamma tracking ratio	R_γ	With SW26→ON, SW27→ON, V26=3.0V, V27=3.5V (G)=5V and SG8(0dB) applied to (H), (I) and (J), define the change of the amplitude between the BLACK level and the 7th state level(a0-a7) of the non-inverting signal on TP19, TP21 and TP24 as ΔVB. Define the change of the amplitude on TP38 as ΔVC. $R_\gamma=(2\Delta VB/\Delta VC)\times(\Delta\gamma 1/(\Delta\gamma 1-\Delta\gamma 2))$ Use the result of No. 131 and 132 for $\Delta\gamma 1$ and $\Delta\gamma 2$.	2.5	3.0	3.5	
136	SW pin "HI" level input voltage	VHSW		2.0			V
137	SW pin "LOW" level input voltage	VLSW				0.8	V
138	COM FRP pin "HI" level input voltage	VHCF		2.0			V
139	COM FRP pin "LOW" level input voltage	VLCF				0.8	V
140	FRP pin "HI" level input voltage	VHF		2.0			V
141	FRP pin "LOW" level input voltage	VLF				0.8	V
142	SYNC IN pin "HI" level input voltage	VHS		2.0			V
143	SYNC IN pin "LOW" level input voltage	VLS				0.8	V
144	Sync separator in. sensitivity curr.	IIS	Measure the input current on TP36 that causes TP35 to change from "L" to "H".		21	30	μA
145	Sync sep. output ON-state voltage	VON	Measure the voltage on TP35.		0.2	0.5	V

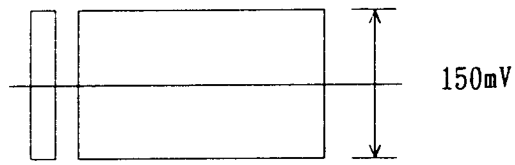
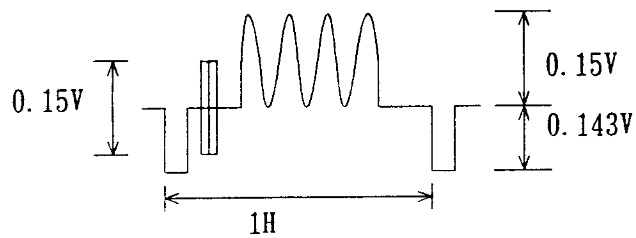
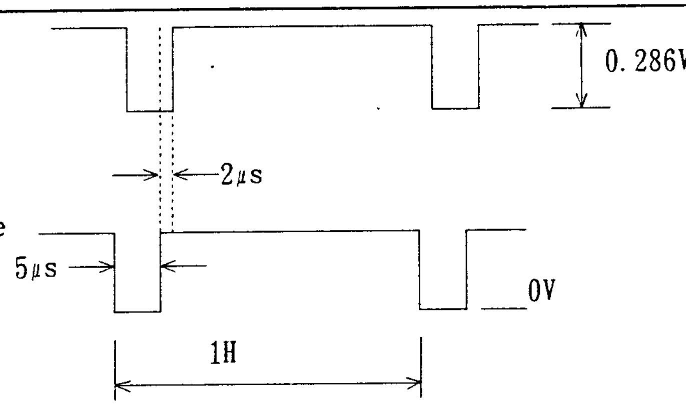
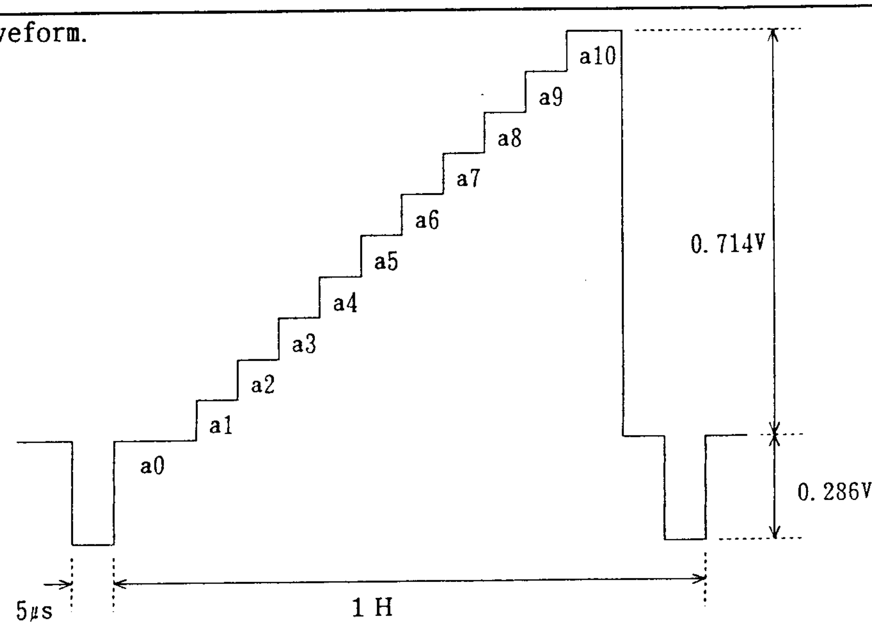
No.	Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
146	Sync sep. output OFF-state leakage current	ISL	With TP35=10V, drawing the 40μA current from TP36, measure the current from TP35 to pin 35			1.0	μA
147	Sync separator output propagation delay time (1)	tPHLSY	With SG7a(0.286Vp-p) applied to (F), measure the propagation delay time.		0.3		μs
148	Sync separator output propagation delay time (2)	tPLHSY			0.4		μs
149	Sync separator output fall time	ttHL	With SG7a(0.286Vp-p) applied to (F), measure the fall time and the rise time on TP35.		0.2		μs
150	Sync separator output rise time	ttLH			0.5		μs
151	RGB outputs propagation delay time (EXT.RGB in) (1)	tPHL (RGB)	With (G)=5.0V and SG4 applied to (I), adjust the amplitude of SG4 for making the amplitude (BLK-WHT) of the inverting output on TP21 2V, define it as vi. Measure the dilay time from (I) to TP21, the fall time and the rise time. Similarly, measure the delay time from (H) and (J) to TP19 and TP24, the fall time and the rise time.		0.1		μs
152	RGB outputs propagation delay time (EXT.RGB in) (2)	tPLH (RGB)			0.1		μs
153	RGB outputs fall time	ttHL			0.2		μs
154	RGB outputs rise time	ttLH			0.2		μs

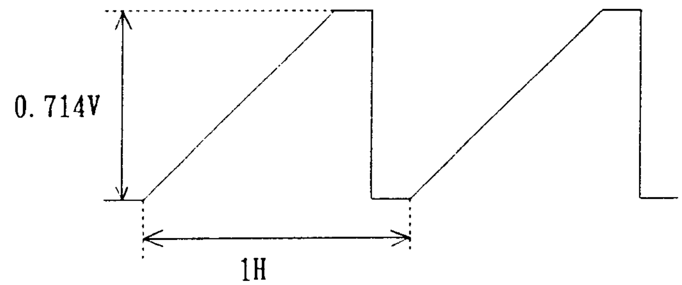
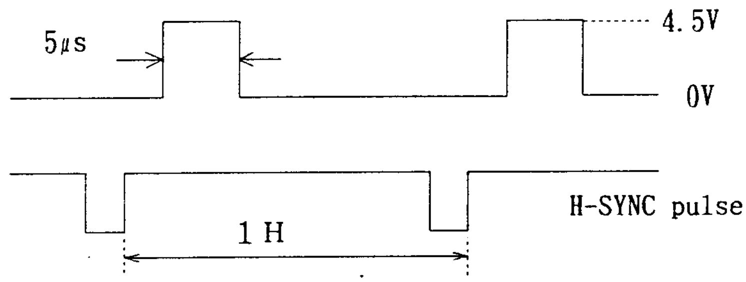
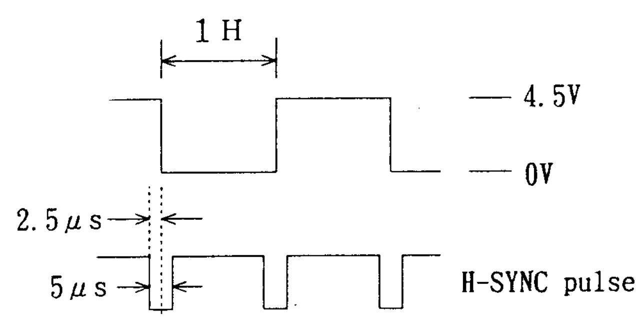
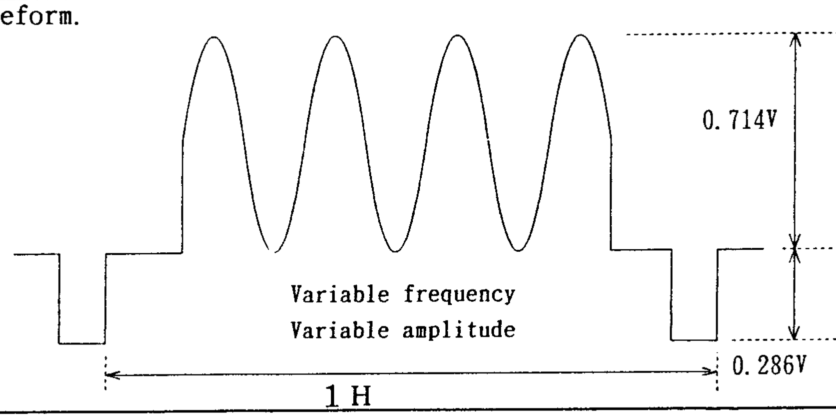
No.	項　　目		記　号	測　　定　　条　　件	MIN	TYP	MAX	単位
155	Inverting signal propagation delay time	(1)	tPHL (FRP)	Measure the propagation delay time from (D) to TP19, TP21 and TP24.		0.1		μs
156		(2)	tPLH (FRP)			0.1		μs
157	Inverting signal fall time		ttHL (FRP)	Measure the fall time of output signal on TP19, TP21 and TP24.		0.1		μs
158	Inverting signal rise time		ttLH (FRP)	Measure the rise time of output signal on TP19, TP21 and TP24.		0.1		μs
159	COM output propagation delay time	(1)	tPHL (COM)	Measure the propagation delay time from (C) to TP38.		0.1		μs
160		(2)	tPLH (COM)			0.1		μs
161	COM output fall time		ttHL (COM)	Measure the fall time of output signal on TP38.		0.1		μs
162	COM output rise time		ttLH (COM)	Measure the rise time of output signal on TP38.		0.1		μs
163	SW propagation delay time	(1)	tPHL (SW)	With SG4 applied to (A), adjust the voltage of V2 for making the amplitude of the non-inverting output(BLK-WHT) on TP21 2V. Then, with SG10 applied to (G), observe the waveform on SG10, TP19, TP21 and TP24.		0.1		μs
164		(2)	tPLH (SW)			0.1		μs
165	SW fall time		ttHL (SW)			0.1		μs
166	SW rise time		ttLH (SW)			0.1		μs
167	RGB outputs propagation delay time (Composite in.)	(1)	tPHL (COMP)	With SG4 applied to (A), adjust the voltage of V2 for making the amplitude of the non-inverting output on TP21 2V. Then, measure the delay time from(A) to TP19, TP21 and TP24.		0.5		μs
168		(2)	tPLH (COMP)			0.5		μs
169	External sync input	(1)	t1		3.5			μs
170		(2)	t2		2.0			μs
171		(3)	t3		1.6	2.0	2.4	μs

Switching characteristic timing chart

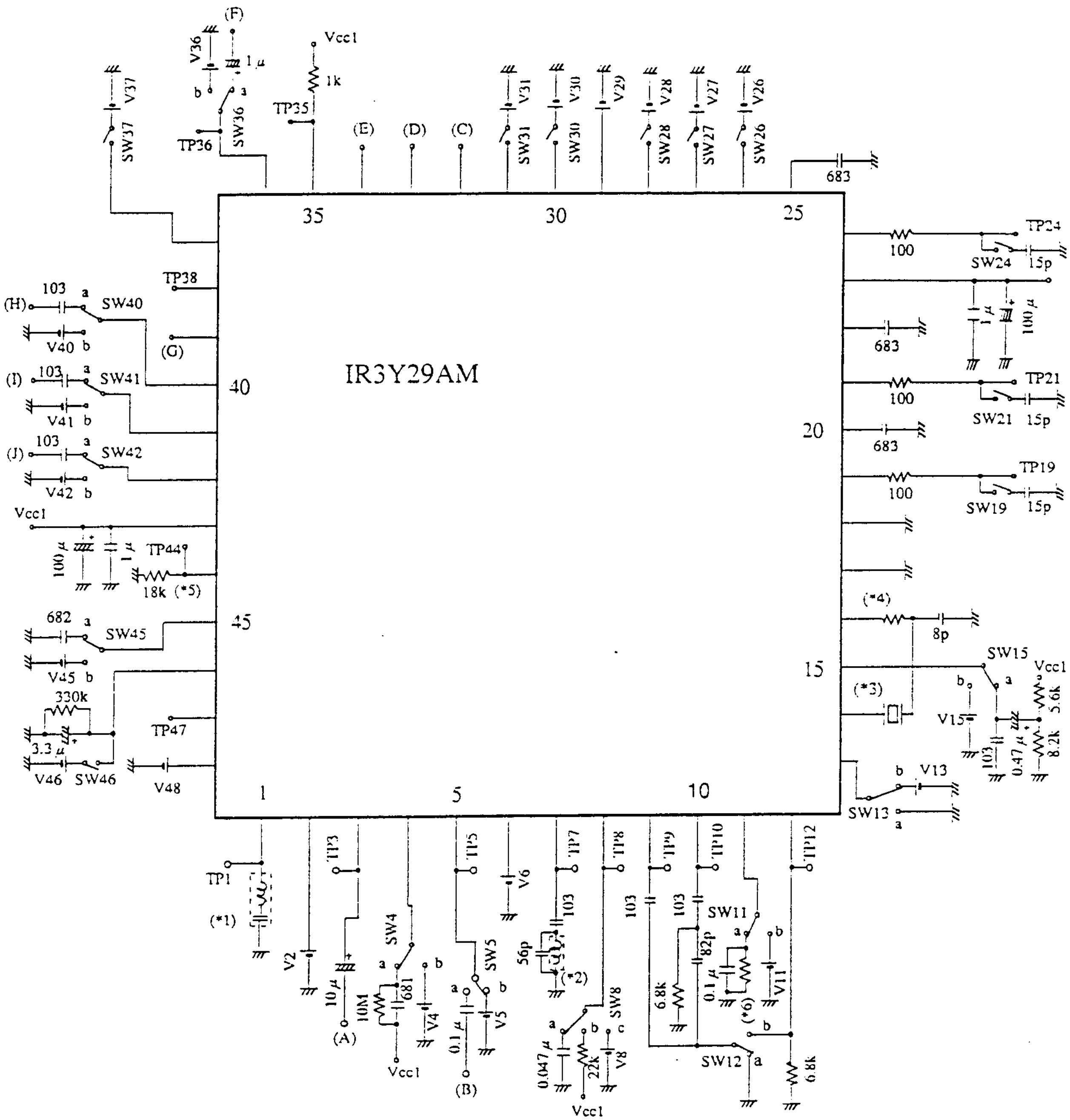


SG NO.	Waveform
SG 1	Variable APL 5stage stair wave signal. 
SG 2	Variable frequency and amplitude sine wave video signal. 
SG 3	Variable frequency sine wave signal, amplitude 150mVp-p
SG 4	Complete white video signal. 

SG NO.	Waveform
SG 5	Chrominance signal (0 dB) Burst and chroma amplitude 150mVp-p Burst and chroma frequency 4.433619MHz(PAL)/3.579545MHz(NTSC) Variable chroma phase 
SG 6	Variable frequency sine wave video signal. 
SG 7	(a) Video input sync signal (b) External sync pulse variable frequency 
SG 8	0dB waveform. 

SG NO.	Waveform
SG 9	0dB waveform. 
SG 10	tr, tf<50ns Synchronised with H-SYNC pulse 
SG 11	FRP square wave tr, tf < 50ns 
SG 12	0dB waveform. 

X. Test Circuit



Notes

(*1) TDK NLT 4532 - S3R6B(NTSC MODE)
NLT 4532 - S4R4 (PAL MODE)

(*2) TOKO 332PN - 2636BS

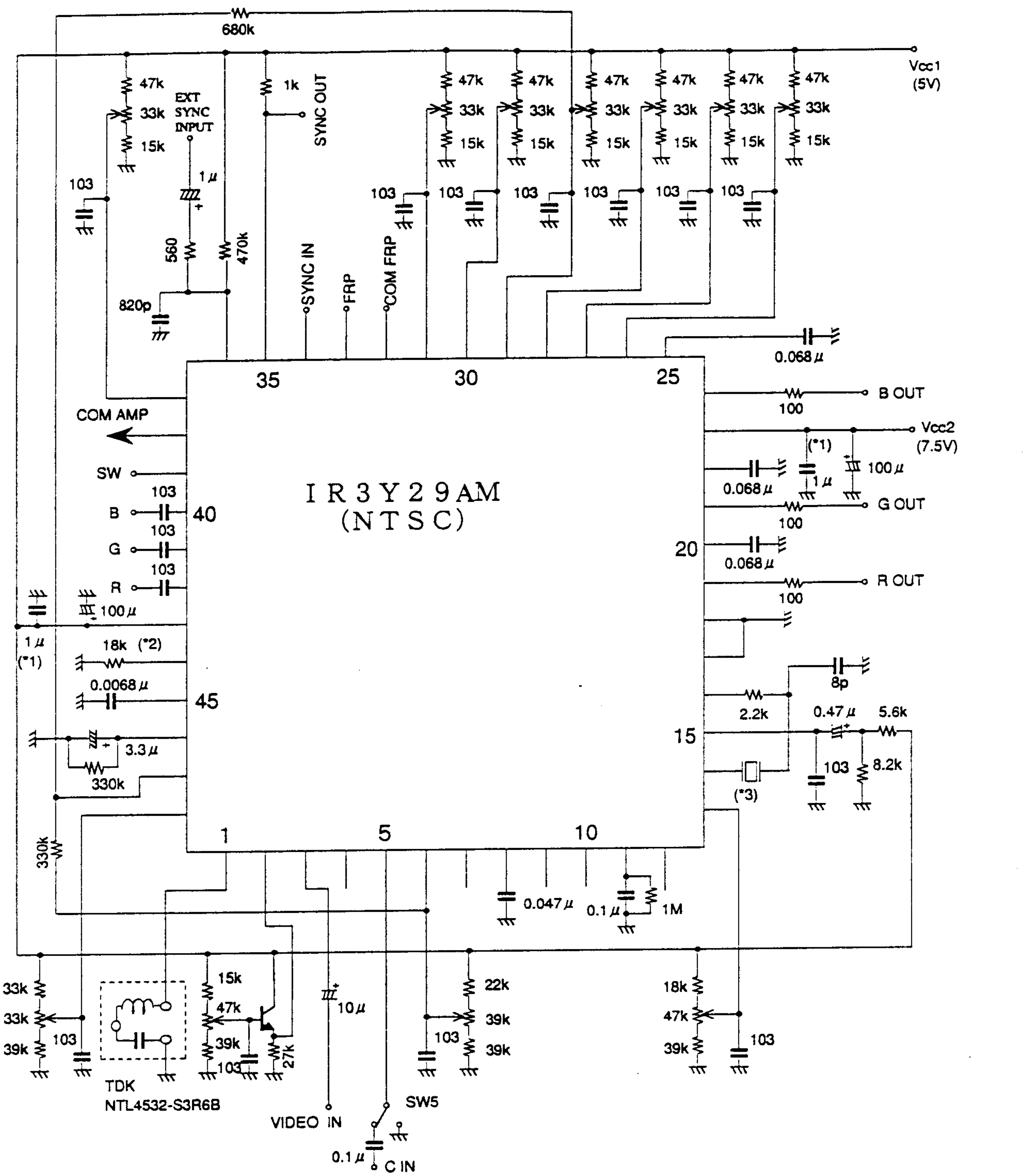
(*3) DAISHINKU CORPORATION AT-49
Frequency : 3.579545MHz (NTSC MODE)
4.433619MHz (PAL MODE)
Load Capacitance 16pF , Frequency Tolerance ±30ppm
Temperature Characteristics ±30ppm

(*4) 2.2kΩ (NTSC) , 680Ω (PAL)

(*5) Resistance Accuracy ±2% , Temperature Characteristics ±200ppm / ℃

(*6) 1MΩ (NTSC) , 5.6MΩ (PAL)

11. Application circuit example



Notes

(*1) Use ceramic capacitance as decoupling capacitance for a voltage source, and connect it close to the Pin of the IC.

(*2) Resistance Accuracy ±2% Temperature Characteristics ±200ppm / ℃

(*3) DAISHINKU CORPORATION AT-49

Frequency : 3.579545MHz (NTSC MODE)

Load Capacitance 16pF

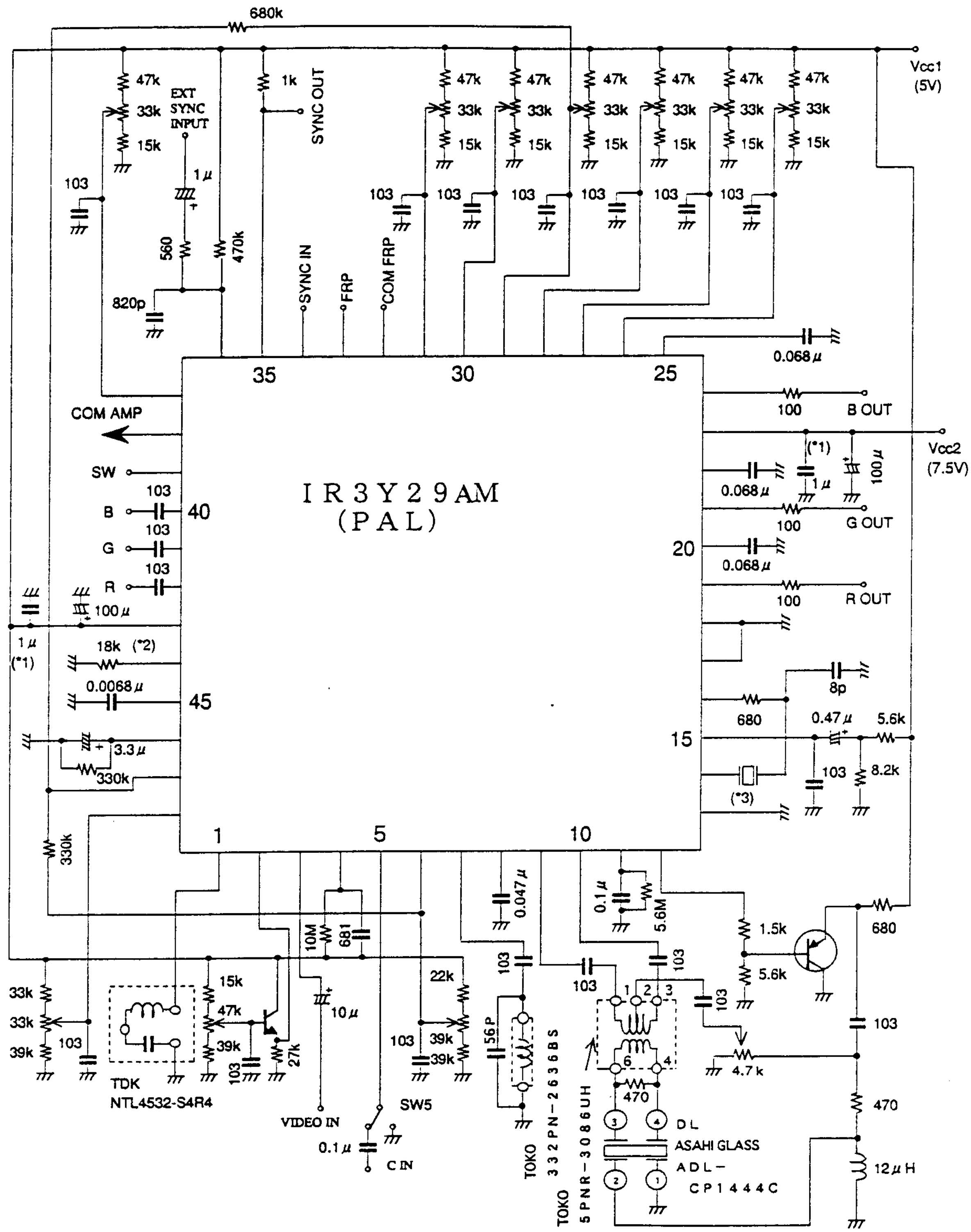
Frequency Tolerance ±30ppm

Temperature Characteristics ±30ppm

† In the case of composite video signal input mode, connect C IN to GND and input signal to VIDEO IN.

† In the case of Y-C input mode, input luminance signal to VIDEO IN, and chrominance signal to C IN. In this case, TRAP connected to Pin1 is not necessary.

11. Application circuit example



Notes

(*1) Use ceramic capacitance as decoupling capacitance for a voltage source, and connect it close to the Pin of the IC.

(*2) Resistance Accuracy ±2% Temperature Characteristics ±200ppm / ℃

(*3) DAISHINKU CORPORATION AT-49

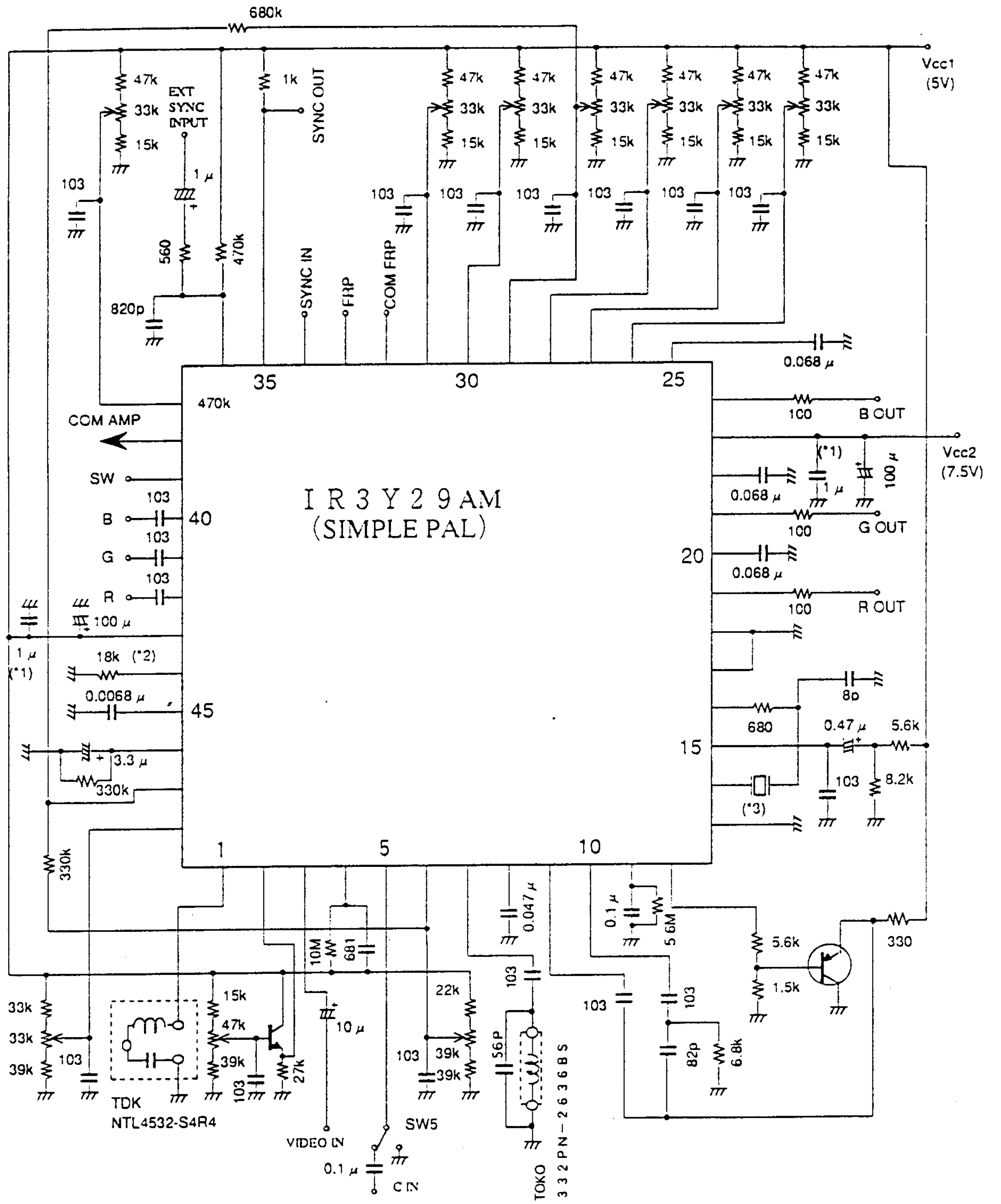
Frequency : 4.433619MHz (NTSC MODE) Load Capacitance 16pF

Frequency Tolerance ±30ppm Temperature Characteristics ±30ppm

† In the case of composite video signal input mode, connect C IN to GND and input signal to VIDEO IN.

† In the case of Y-C input mode, input luminance signal to VIDEO IN, and chrominance signal to C IN. In this case, TRAP connected to Pin1 is not necessary.

11. Application circuit example



Notes

(*1) Use ceramic capacitance as decoupling capacitance for a voltage source, and connect it close to the Pin of the IC.

(*2) Resistance Accuracy ±2% Temperature Characteristics ±200ppm / ℃

(*3) DAISHINKU CORPORATION AT-49

Frequency : 4.433619MHz (NTSC MODE) Load Capacitance 16pF

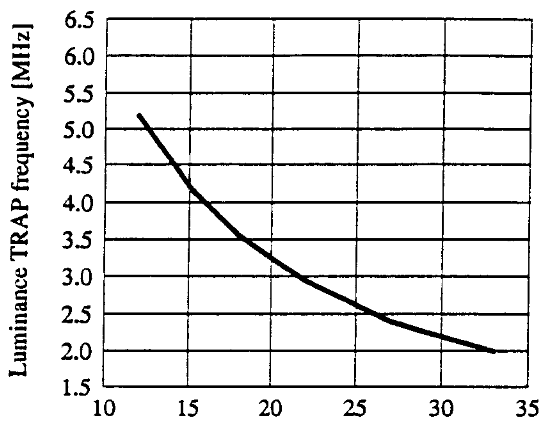
Frequency Tolerance ±30ppm Temperature Characteristics ±30ppm

† In the case of composite video signal input mode, connect C IN to GND and input signal to VIDEO IN.

† In the case of Y-C input mode, input luminance signal to VIDEO IN, and chrominance signal to C IN. In this case, TRAP connected to Pin1 is not necessary.

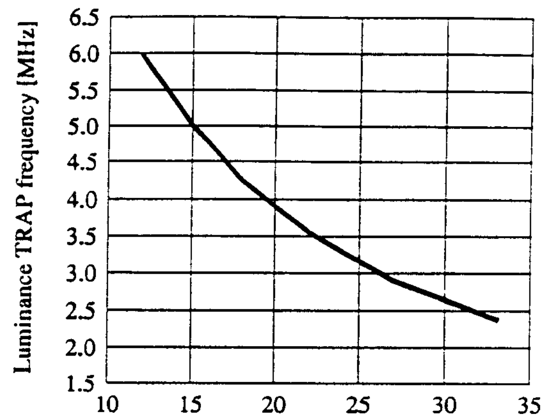
Electrical Characteristic Curves (Vcc1=5.0V、Vcc2=7.5V、Ta=25℃)

NTSC MODE



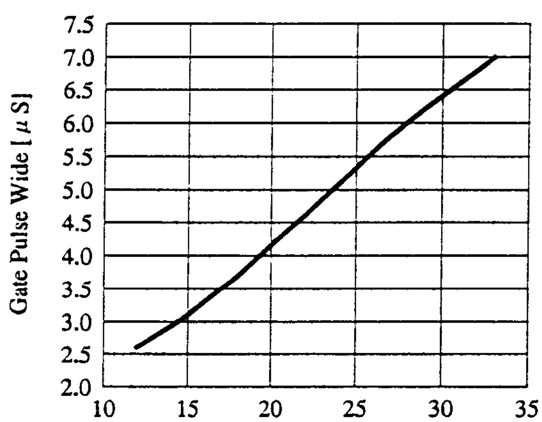
Resistance of pin 44 [kΩ]

PAL MODE



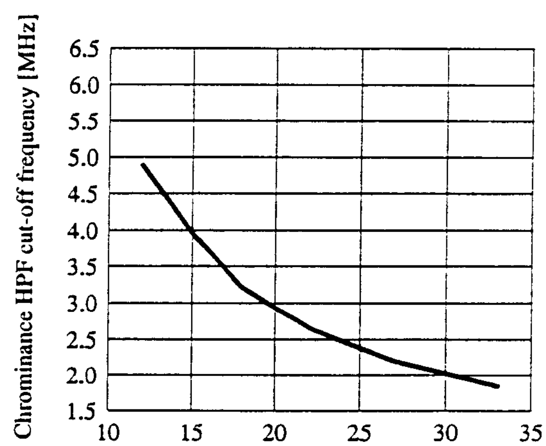
Resistance of pin 44 [kΩ]

PAL/NTSC MODE



Resistance of pin 44 [kΩ]

PAL/NTSC MODE



Resistance of pin 44 [kΩ]

12 Package and packing specification

1. Package Outline Specification
   Refer to drawing No. AA1035

2. Markings

2-1. Marking contents

(1) Product name : IR3Y29A

(2) Company name : SHARP

(3) Date code

(Example) YY WW × — Indicates the product was manufactured in the WWth week of 19YY.

- × → Denotes the production ref.code.
- WW → Denotes the production week. (01,02,03, · · · · · 52,53)
- YY → Denotes the production year. (Lower two digits of the year.)

(4) The marking of "JAPAN" indicates the country of origin.

2-2. Marking layout
   Refer to drawing No. AA1035
   (This layout do not define the dimensions of marking character and marking position.)

3. Packing Specification

3-1. Packing materials

Material Name	Material Specification	Purpose
Tray	Conductive plastic (80devices/tray)	Fixing of device
Upper cover tray	Conductive plastic (1tray/case)	Fixing of device
Laminated aluminum bag	Aluminum polyethylene (1bag/case)	Drying of device
Desiccant	Silica gel	Drying of device
P P band	polypropylene (3 pcs/case)	Device tray fixing
Inner case	Card board (800devices/case)	Packaging of device
Label	Paper	Indicates part number, quantity and date of manufacture
Outer case	Cardboard	Outer packing of device case

(Devices shall be placed into a tray in the same direction.)

3-2. Outline dimension of tray
   Refer to attached drawing

4. Precausion For Unpacking

(1) Unpacking should be done on the stand as well as human body treated with anti-ESD.

(2) Conductive treatment or anti-ESD treatment is given to a dray.
Use the equivalent tray, if it is changed to another one.

5. Surface Mount Conditions

Please perform the following conditions when mounting ICs not to deteriorate IC quality.

5－1. Soldering conditions (The following conditions are valid only for one time soldering.)

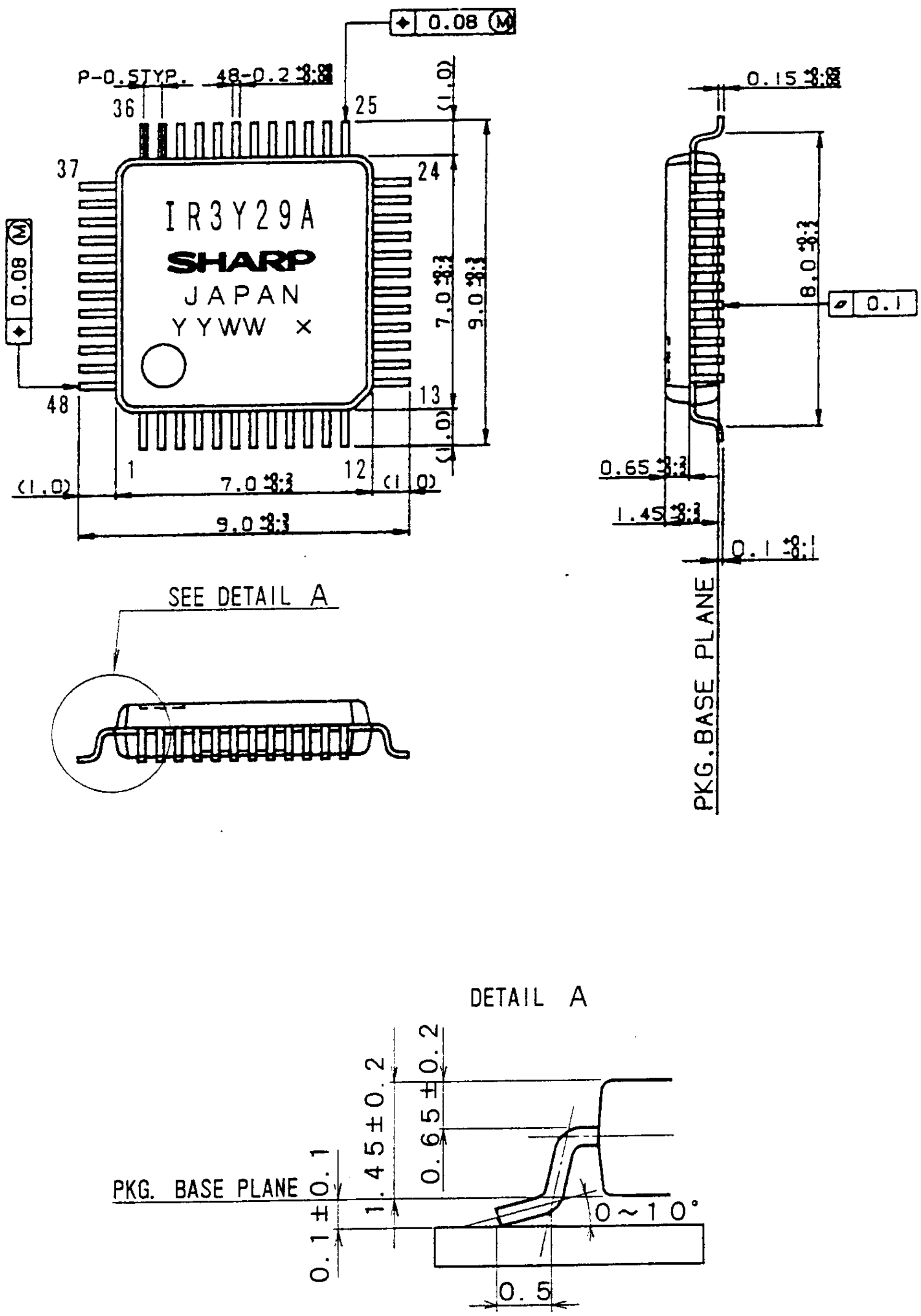
Mounting Method	Temperature and Duration	Measurement Point
Reflow soldering (air)	Peak temperature of 240℃, duration less than 15 seconds above 230℃, temperature increase rate of 1～4℃/second	IC surface
Vapor phase solderring	215℃ or less, duration less than 40 seconds above 200℃	Steam
Manual soldering (soldering iron)	260℃ or less, duration less than 10 seconds	IC outer lead surface

5－2. Conditions for removal of residual flux

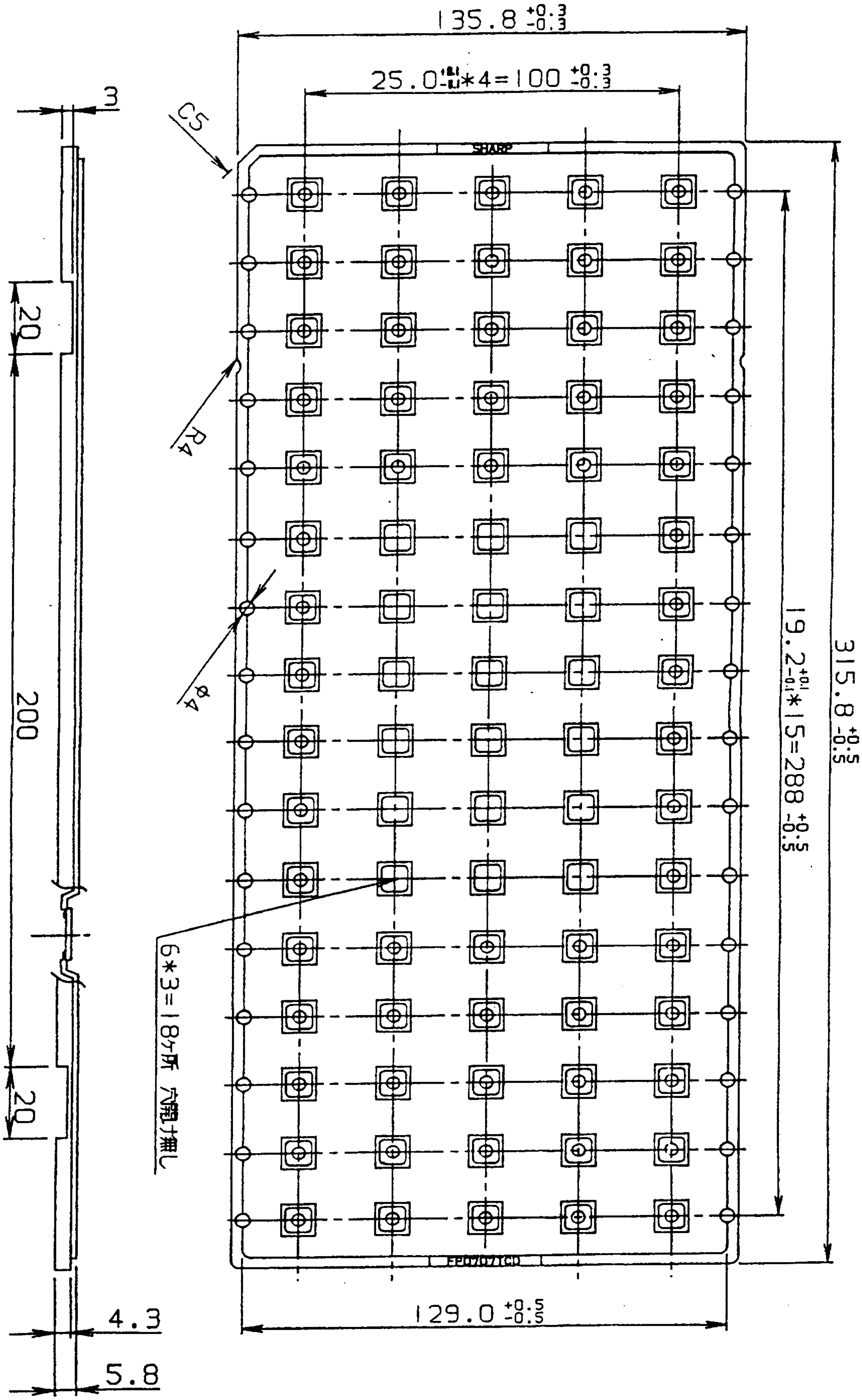
(1) Ultrasonic washing power : 25 Watts/liter or less

(2) Washing time : Total 1 minute maximum

(3) Solvent temperature : 15～40℃



名称 NAME	QFP48-P-0707	リード仕上 LEAD FINISH	TIN-LEAD PLATING	備考 NOTE	プラスチックパッケージ外形寸法は、バリを含まないものとする。 Plastic body dimensions do not include burr of resin.
		単位			



名称 NAME	FP0707TCD	備考 NOTE
	単位	