TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT   SILICON MONOLITHIC

T A 1 2 1 1 N

Bi-SCANABLE RGB PROCESSOR

TA1211N is the RGB processing IC coping with bi-scan system. This IC converts Y / I / Q or Y / U / V signals to R / G / B. To cope with bi-scan, this IC has wide Y band. And there are R-Y / G-Y / B-Y output to adjust relative phase and amplitude flexibly.

TA1211N has an I²C bus interface, so many functions and features can be controlled via bus lines (SDA / SCL).

SDIP54-P-600-1.78

Weight : 5.44g (Typ.)

FEATURES

Video stage

- High Performance Y Frequency Response
- Black Expansion
- γ Correction
- External Quadratic Differential Input for Sharpness
- White Peak Suppressor

Chroma stage
- IQ / UV Switching
- Color Limiter
- Flesh Color
- Color γ Correction
- High-Bright Color
- Relative Phase / Amplitude Flexibility

Text stage
- Analog RGB Inputs
- Analog RGB Brightness
- Analog RGB Contrast
- Digital OSD Inputs
- Fast Blanking
- Half Tone
- RGB Cut Off Adjustable
- GB Drive Gain Adjustable
- Monitor Output

Others
- Y Clamp Circuit
- ACC Circuit
- 3 DAC (1bit) Outputs

961001EBA2

TERMINAL CONNECTION DIAGRAM
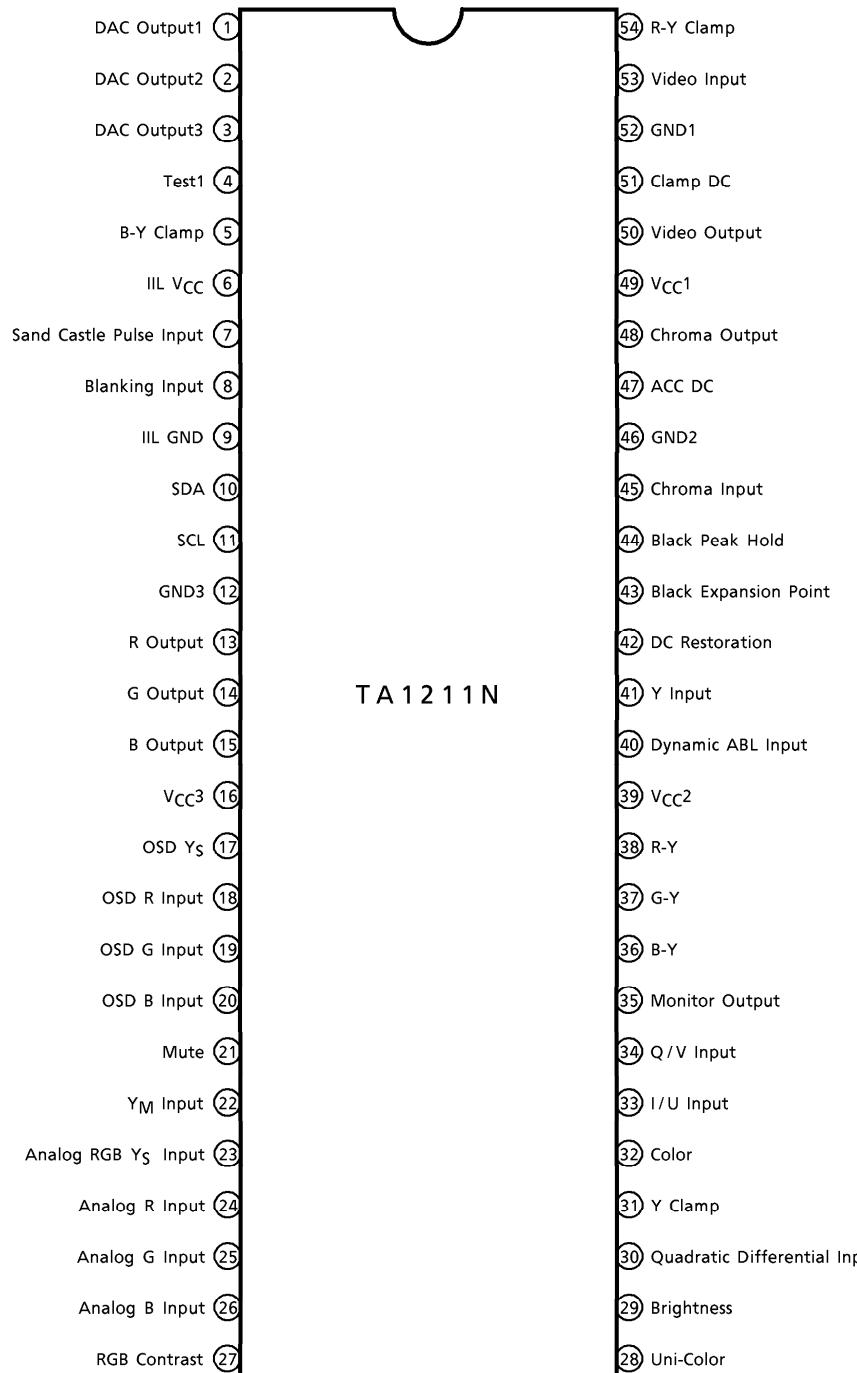
| Pin	Left		Pin	Right
1	DAC Output1		54	R-Y Clamp
2	DAC Output2		53	Video Input
3	DAC Output3		52	GND1
4	Test1		51	Clamp DC
5	B-Y Clamp		50	Video Output
6	IIL V_{CC}		49	$V_{CC}1$
7	Sand Castle Pulse Input		48	Chroma Output
8	Blanking Input		47	ACC DC
9	IIL GND		46	GND2
10	SDA		45	Chroma Input
11	SCL		44	Black Peak Hold
12	GND3		43	Black Expansion Point
13	R Output		42	DC Restoration
14	G Output		41	Y Input
15	B Output		40	Dynamic ABL Input
16	$V_{CC}3$		39	$V_{CC}2$
17	OSD Y_S		38	R-Y
18	OSD R Input		37	G-Y
19	OSD G Input		36	B-Y
20	OSD B Input		35	Monitor Output
21	Mute		34	Q / V Input
22	Y_M Input		33	I / U Input
23	Analog RGB Y_S Input		32	Color
24	Analog R Input		31	Y Clamp
25	Analog G Input		30	Quadratic Differential Input
26	Analog B Input		29	Brightness
27	RGB Contrast		28	Uni-Color

TA1211N

961001EBA2'

BLOCK DIAGRAM

TA1211N-3
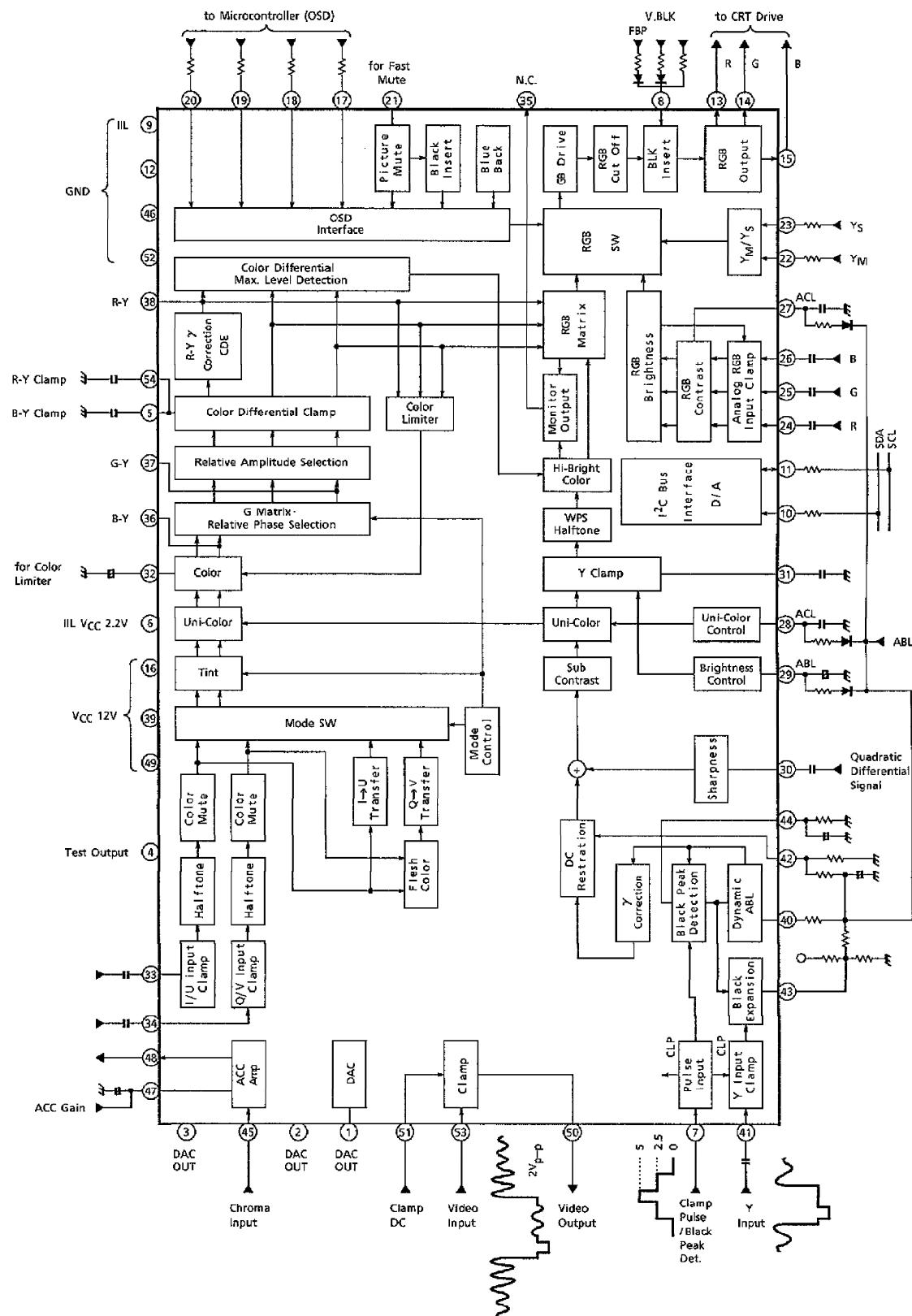
## TERMINAL FUNCTION

PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT
1 2 3	DAC Output1 DAC Output2 DAC Output3	The terminals for 1bit DAC Output. Controlled by I^{2}C Bus. When the data is "1", this terminal's voltage is 0V.	
4	Test Output1	The terminal for test of this IC. Please leave this terminal open.	
5	B-Y Clamp	The terminals for a filter to clamp B-Y signals. Pedestal levels of R-Y, B-Y and G-Y signal are made equal by the internal clamping circuit.	
6	I^{2}L V$_{CC}$	V$_{CC}$ of I^{2}L circuit. Please supply 2.2V to this terminal.	—
7	Sand Castle Pulse Input	The terminal for input of sand castle pulse (Black peak detection pulse + clamp pulse). Threshold level of B.P.D pulse is 2.1V and CLP pulse is 3.5V	

PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT
8	Blanking Pulse Input	The terminal for input of horizontal and vertical blanking pulse. Threshold level of H.BLK pulse is 4.0V and V.BLK pulse is 1.4V.	(circuit: pin 8, 1kΩ, 0.7V, 1.4V, 6.0V)
9	I²L GND	Ground of I²L circuit.	—
10	SDA	The terminals for input and output of I²C Bus data. Input threshold level is 2.3V.	(circuit: pin 10, 50Ω, 75kΩ, 100μA, 3.0V)
11	SCL	The terminals for input of I²C Bus clock. Input threshold level is 2.3V.	(circuit: pin 11, 50Ω, 75kΩ, 100μA, 3.0V)
12	GND3	Ground of RGB interface part, color-defference demodulation circuit and Digital / Analog Convertor.	—
13 14 15	R Output G Output B Output	The terminals for output of RGB primary color signals. Horizontal and vertical blanking signals are mixed with RGB signals.	(circuit: pins 13 14 15, 200Ω, 100Ω, 200μA, 2.0mA, BLK)
16	VCC3	VCC of RGB interface part, color-defference demodulation circuit and Digital / Analog Convertor. Please supply 12V to this terminal.	—
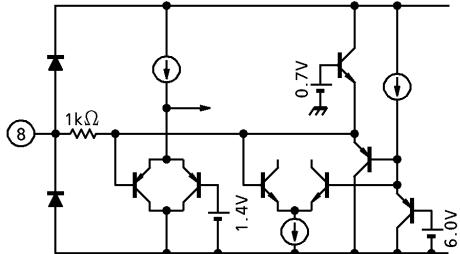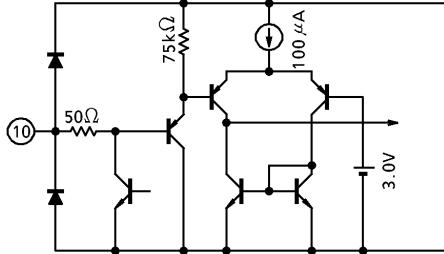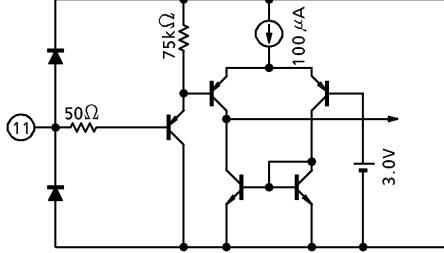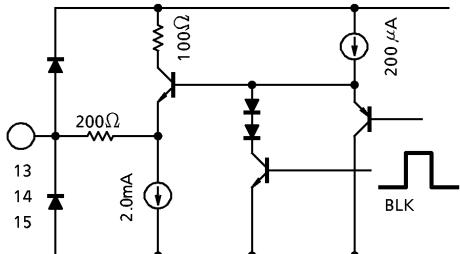
PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT
17	OSD Y$_S$ Input	The terminals for input of fast blanking signal for On Screen Display. Threshold level is 1.4V.	
18 19 20	OSD R Input OSD G Input OSD B Input	The terminals for input of RGB signals for OSD. Threshold levels are 1.4V. If Terminal 20 is connected with V$_{CC}$, it is test mode for this IC. Threshold level of test mode is V$_{CC}$-0.7V.	
21	Mute	The terminal for input a signal to mute the TV signal and Analog RGB signals. Threshold level of Picture mute (muting TV and Analog RGB) is 2.8V and TV mute (muting only TV) is 1.4V.	
22	Y$_M$ Input	The terminal for input a signal to reduce the contrast of TV signal. Threshold level is 1.4V.	
23	Analog RGB Y$_S$ Input	The terminal for input of fast blanking signal for Analog RGB. Threshold level is 1.4V.	

PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT
24 25 26	Analog R Input Analog G Input Analog B Input	The terminals for input of Analog RGB signals. These are clamped by internal clamping circuit. Recommended input levels are 1.0V$_{p-p}$.	
27	RGB Contrast	The terminal to control the contrast of Analog RGB signals.	
28	Uni-Color	The terminal for output of DAC to adjust Uni-Color and also for input of Automatic Contrast Limiter.	
29	Brightness	The terminal for output of DAC to adjust Brightness and also for input of Automatic Brightness Limiter.	
30	Quadratic Differential Input	The terminal for input of quadratic differential signal for sharpness control.	
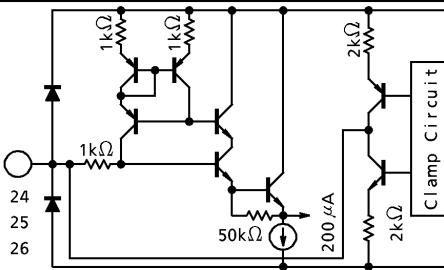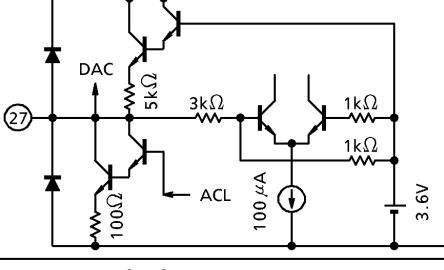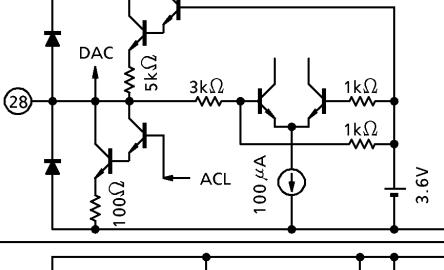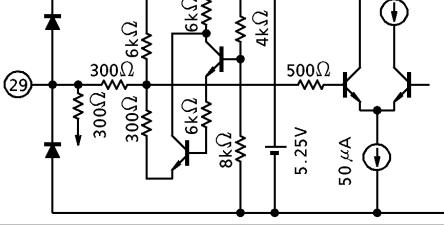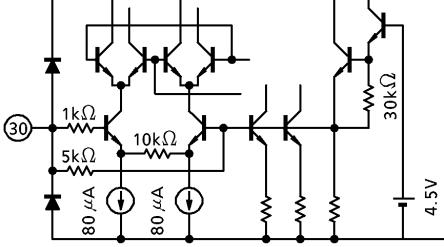
PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT
31	Y Clamp	The terminal for Y clamp filter. Please connect a capacitor between this terminal and GND. 0.01μF is recommended.	
32	Color Limiter	The terminal to fix time constant of Color Limiter. Please connect a capacitor between this terminal and GND. 10μF is recommended.	
33 34	I / U Input Q / V Input	The terminals for I / U and Q / V input. Please input the signals through capacitors because the signals are clamped at the inside of this IC.	
35	Monitor Output	The terminal to observe Y, R-Y, B-Y and G-Y signals. The signals are selected by I²C Bus.	
36	B-Y	The terminal for B-Y output to adjust relative phase and amplitude externaly.	
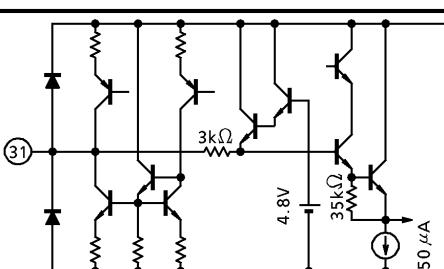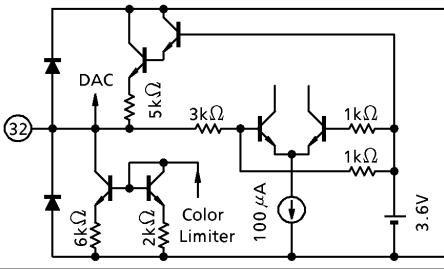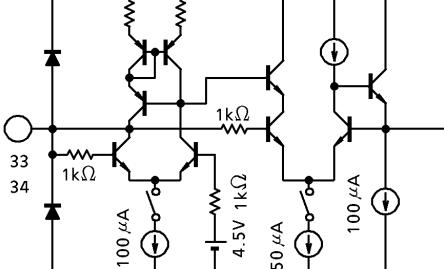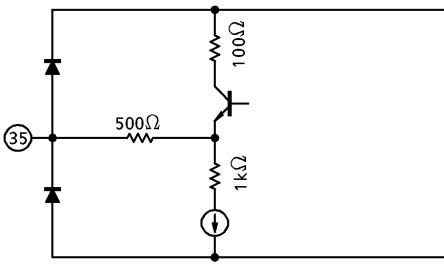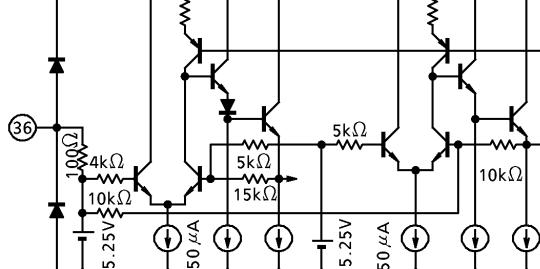
PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT
37	G-Y	The terminal for G-Y output to adjust relative phase and amplitude externaly.	
38	R-Y	The terminal for R-Y output to adjust relative phase and amplitude externaly.	
39	V$_{CC}$2	V$_{CC}$ of video and sharpness circuit. Please supply 12V to this terminal.	—
40	Dynamic ABL Input	The terminal to supply control current for Dynamic ABL and Black Peak Level Correction. D.ABL and B.P.L.C. are the functions to shift the level of Y signal toward black side when the most black level is still whitish after black expansion.	
41	Y Input	The terminal for Y input. Recommended input level is 1.0V$_{p-p}$. Because the pedestal level of Y signal is clamped at this terminal, please reduce the impedance of signal source.	

PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT
42	DC Restoration	The terminal to correct DC restoration ratio. The smaller the external resistance is, the larger the amount of correction is. With this terminal open, you can monitor the Y signal from which sync signal has been removed and which has been done black expansion.	
43	Black Expansion Point	The terminal to fix black expansion start point. The higher voltage is supplied, the higher the start point is.	
44	Black Peak Hold	The terminal to control the gain of black expansion and of black level shift for Dynamic ABL. Resistance connected between this terminal and GND makes black expansion change. The smaller the resistance is, the larger the black area is.	
45	Chroma Input	The terminal for chroma input to ACC AMP. Recommended input level is 100mV$_{p-p}$.	
46	GND2	GND of video sharpness circuit.	
47	ACC DC	The terminal to fix the gain off ACC AMP. The higher voltage is supplied (0~5V), the larger the gain is.	
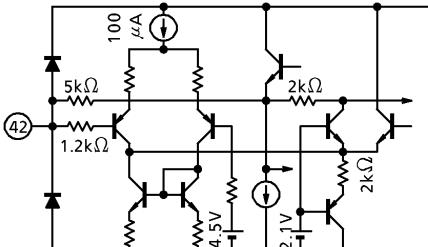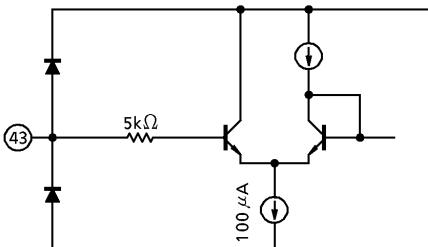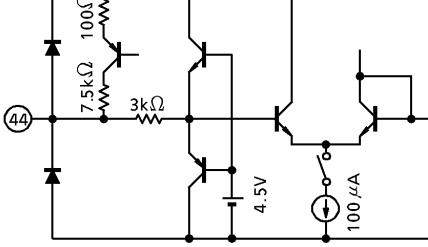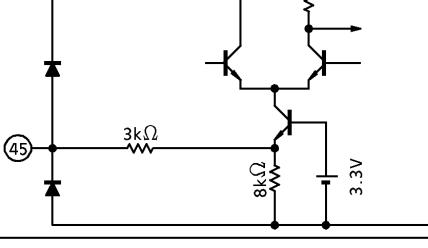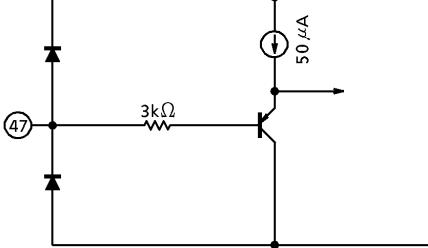
PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT
48	Chroma Output	The terminal for output for Chroma which has been input to terminal 45 and has passed ACC AMP.	
49	$V_{CC}1$	V_{CC} of ACC circuit. Please supply 12V to this terminal.	
50	Video Output	The terminal for output of Composite Video signal which has been input to terminal 53. This signal is outputted after clamped to the level which is fixed by terminal 51's voltage.	
51	Clamp DC	The terminal to fix clamping level for Composite Video signal which has been inputted to terminal 53. Please supply 0~5V to this terminal.	
52	GND1	GND of ACC circuit.	—
53	Video Input	The terminal for Composite Video signal input to clamp circuit. Recommended input level is 2V$_{p-p}$.	
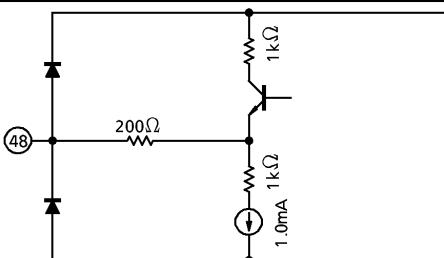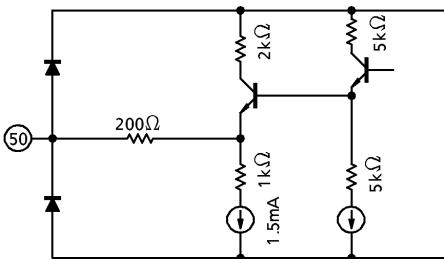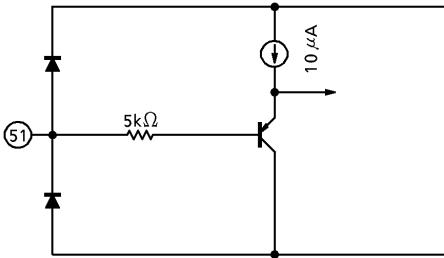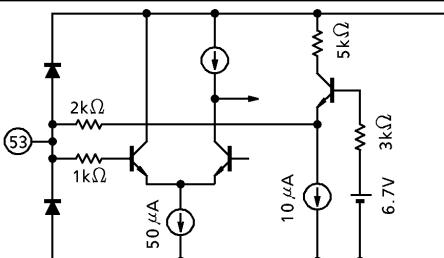
PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT
54	R-Y Clamp	The terminals for a filter to clamp R-Y signal. Pedestal levels of R-Y, B-Y and G-Y signal are made equal by the internal clamping circuit.	
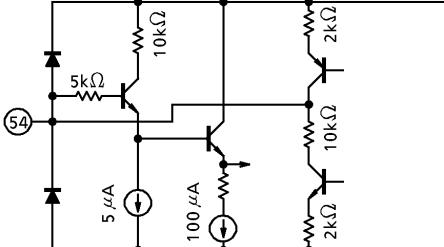
I²C BUS MAP

| SUB ADDRESS	D7	D6	D5	D4	D3	D2	D1	D0	PRESET	
00	Picture Mute	Uni-Color							0111	1111
01	Brightness								1000	0000
02	Color Mute	Color							0100	0000
03	Tint								1000	0000
04	Don't Care	Sharpness							/ 100	0000
05	Brightness Linking	Analog RGB Brightness							0100	0000
06	OSD Contrast	Analog RGB Contrast							1100	0000
07	Don't Care		Color Limiter Level		Sub Contrast				/ / 11	1000
08	R Cut Off								1000	0000
09	G Cut Off								1000	0000
0A	B Cut Off								1000	0000
0B	IQ / UV Switching	G Drive							0100	0000
0C	Blue Back ON / OFF	B Drive							0100	0000
0D	Color γ Correction	R-Y Phase	G-Y Phase	Flesh ON / OFF	Flesh Pull-in	Don't Care		DAC 1	1000	1 / / 0
0E	Service	High-Bright Color	Don't Care		DAC 2	WPS	Peak ACL ON / OFF		000 /	/ 000
0F	DAC 3	Black Exp. Gain	Black Detection Level		γ Correction Point		Monitor Output		0011	1100

Slave Address : 88H

CONTENTS OF BUS CONTROL

ITEM	CONTENTS	PRESET
Picture Mute	0 : OFF　　　　　　　　　　　1 : ON	OFF
Uni-Color	− 18dB～0dB　　　　　　　　　　　　　　　　　(7bit)	0dB
Brightness	− 1.3V～ + 1.3V　　　　　10mV / STEP　　　　(8bit)	0V
Color Mute	0 : OFF　　　　　　　　　　　1 : ON	OFF
Color	− 14dB～ + 4dB　　　　　　　　　　　　　　　(7bit)	0dB
Tint	− 51.2deg～ + 50.8deg　　　0.4deg / STEP　　(8bit)	0deg
Sharpness	− 6dB～ + 12dB　　　　　　　　　　　　　　　(7bit)	− 6dB
Brightness Linking	0 : OFF　(RGB Brightness is independent of TV Brightness.) 1 : ON　(RGB Brightness is linked with TV Brightness.)	OFF
RGB Brightness	− 0.9V～ + 0.9V　　　　　　　　　　　　　　(7bit)	0V
OSD Contrast	0 : 2.5V$_{p-p}$　　　　　　　　1 : 3.0V$_{p-p}$	3.0V$_{p-p}$
RGB Contrast	− 18dB～0dB　　　　　　　　　　　　　　　　(7bit)	− 5dB
Color Limiter Level	00 : + 1dB　　01 : 0dB　　　10 : − 1dB　　11 : OFF	OFF
Sub Contrast	− 2dB～ + 2dB　　　　　　0.25dB / STEP　　(4bit)	0dB
RGB Cut Off	− 0.3V～ + 0.7V　　　Against 3V DC　　4mV / STEP　　(8bit)	+ 0.2V
GB Drive	− 3dB～ + 3dB　　　　Against R Gain　　　　(7bit)	0dB
IQ→UV Switching	0 : ON (Input signals are shifted 33deg.)　　1 : OFF	ON
Blue Back ON / OFF	0 : OFF　　　　　　　　　　1 : 1.2V$_{p-p}$	OFF
Color γ Correction	0 : ON　　　　1 : OFF　　　on R-Y only	OFF
R-Y Relative Phase	0 : 99deg　　　　　　　　　1 : 94deg	94deg
G-Y Relative Phase	0 : 240deg　　　　　　　　1 : 236deg	240deg
Flesh Color ON / OFF	0 : OFF　　　　　　　　　　1 : ON	OFF
Flesh Color Pull-in Range	0 : ±33deg　1 : ±18deg　　Against I Axis	±18deg
DAC 1 / 2 / 3 Output	0 : OPEN　　　　　　　　　1 : ON	OPEN
Service Mode	0 : OFF　1 : ON (RGB Output Voltage turns to cut off Level.)	OFF
High-Bright Color	00 : OFF　　01 : 0.02　　10 : 0.09　　11 : 0.12	OFF
White Peak Slice Level	0 : 95IRE　　　　　　　　1 : 105IRE	95IRE
Peak ACL ON / OFF	0 : OFF　　　　　　　　　　1 : ON	OFF
Black Expansion Max. Gain	0 : + 3dB　　　　　　　　1 : OFF	+ 3dB
Black Detection Level	00 : 0IRE　　01 : 1.5IRE　　10 : 2.5IRE　　11 : 4IRE	4IRE
γ Correction Point	00 : 80IRE　　01 : 90IRE　　10 : 100IRE　　11 : OFF	OFF
Monitor Output Switching	00 : G-Y　　01 : R-Y　　10 : B-Y　　11 : Y	G-Y

I²C BUS CONTROLLED FORMAT SUMMARY

Bus controlled format of TA1211N is based of I²C Bus control format of Philips.

Data transfer format

S	Slave address	0	A	Sub address	A	Data	A	P

MSB ↑ 7bit　　　MSB ↑ 8bit　　　MSB ↑ 8bit

S : Start condition
P : Stop condition
A : Acknowledge
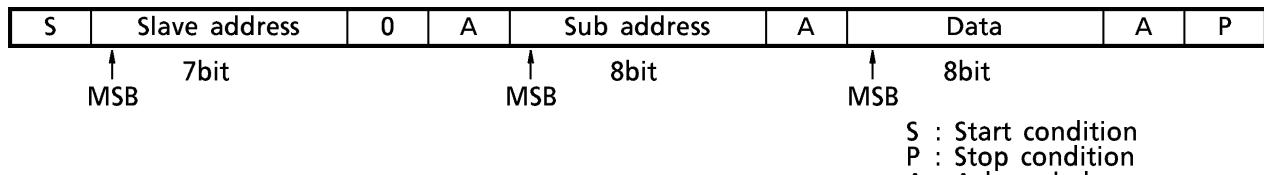
(1) Start and stop condition

SDA
SCL
S　　　　　　　　P
Start condition　　Stop condition

(2) Bit transfer

SDA
SCL
SDA cannot change.
SDA can change.

(3) Acknowledge

From Master SDA
High impedance
From Slave SDA
High impedance
From Master SCL
S　1　8　9
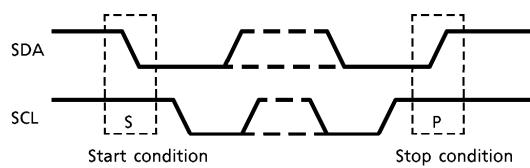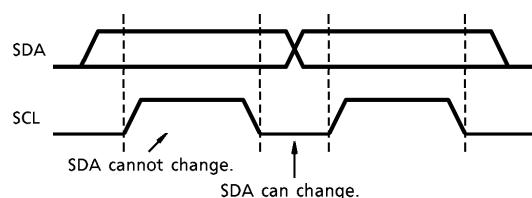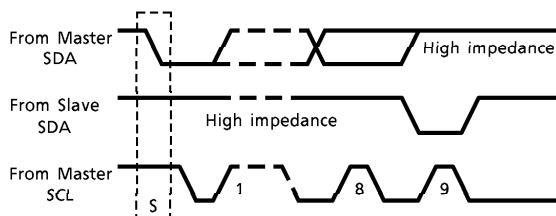
(4) Slave address

A6	A5	A4	A3	A2	A1	A0	R / $\overline{W}$
1	0	0	0	1	0	0	0

Purchase of TOSHIBA I²C components conveys a license under the Philips I²C Patent Rights to use these components in an I²C system, provided that the system conforms to the I²C Standard Specification as defined by Philips.

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V_{CC}	14.5	V
Power Dissipation	$P_D$max	1920 (Note)	mW
Input Treminal Voltage	V_{in}	GND − 0.3 ~ GND + 0.3	V
Operating Temperature	T_{opr}	− 20 ~ 65	°C
Storage Temperature	T_{stg}	− 55 ~ 150	°C

(Note)   When using this device at above Ta = 25°C, the power dissipation decreases by 15.4mV per 1°C rise.

Ta − P_D CURVE
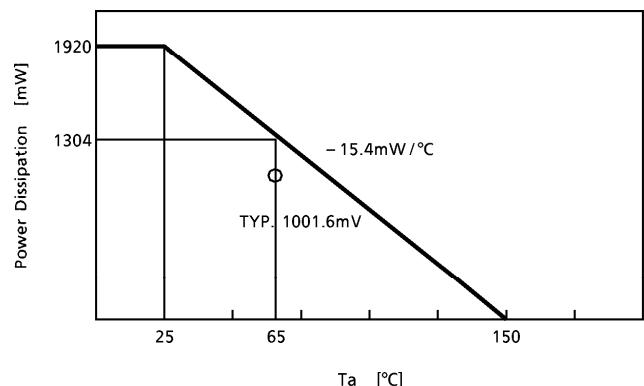
ELECTRICAL CHARACTERISTICS
DC CHARACTERISTICS
Terminal voltage

PIN No.	PIN NAME	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
4	Test1	V_4	1	—	6.15	6.65	7.15	V
5	B-Y Clamp	V_5	1	—	6.0	7.0	8.0	V
6	I²L V_{CC}	V_6	1	Supply 2.2V	—	2.2	—	V
7	Sand Castle Pulse Input	V_7	1	—	4.3	4.6	4.9	V
9	I²L GND	V_9	1	Grounded	—	0	—	V
12	GND3	V_{12}	1	Grounded	—	0	—	V
13	R Output	V_{13}	1	Cut-off & drive : center	3.1	3.3	3.5	V
14	G Output	V_{14}	1	Cut-off & drive : center	3.1	3.3	3.5	V
15	B Output	V_{15}	1	Cut-off & drive : center	3.1	3.3	3.5	V
16	$V_{CC}3$	V_{16}	1	Supply 12V	—	12	—	V
24	Analog RGB R Input	V_{24}	1	—	3.7	4.0	4.3	V
25	Analog RGB G Input	V_{25}	1	—	3.7	4.0	4.3	V
26	Analog RGB B Input	V_{26}	1	—	3.7	4.0	4.3	V
27	RGB Contrast	V_{27}	1	—	3.45	3.65	3.85	V
28	Uni-Color	V_{28}	1	—	3.45	3.65	3.85	V
29	Brightness	V_{29}	1	—	4.3	4.5	4.7	V
30	Quadratic Differential Input	V_{30}	1	—	2.8	3.0	3.2	V
31	Y Clamp	V_{31}	1	—	6.5	7.5	8.5	V
32	Color	V_{32}	1	—	3.45	3.65	3.85	V
33	I / R-Y Input	V_{33}	1	—	5.9	6.1	6.3	V
34	Q / B-Y Input	V_{34}	1	—	5.9	6.1	6.3	V
35	Monitor Output	V_{35}	1	—	4.5	4.7	4.9	V
36	B-Y Output	V_{36}	1	—	5.15	5.30	5.45	V
37	G-Y Output	V_{37}	1	—	5.15	5.30	5.45	V
38	R-Y Output	V_{38}	1	—	5.15	5.30	5.45	V
39	$V_{CC}2$	V_{39}	1	Supply 12V	—	12	—	V
40	Dynamic ABL Input	V_{40}	1	—	2.1	2.6	3.1	V
41	Y Input	V_{41}	1	—	4.3	4.5	4.7	V
42	DC Restoration	V_{42}	1	—	4.1	4.3	4.5	V
43	Black Expansion Point	V_{43}	1	—	4.1	4.3	4.5	V
44	Black Peak Hold	V_{44}	1	—	3.7	4.5	5.3	V
45	Chroma Output	V_{45}	1	—	2.3	2.6	2.9	V
46	GND2	V_{46}	1	Grounded	—	0	—	V
48	Chroma Output	V_{48}	1	—	4.05	4.20	4.35	V
49	$V_{CC}1$	V_{49}	1	Supply 12V	—	12	—	V
50	Video Output	V_{50}	1	—	2.1	2.3	2.5	V
52	GND1	V_{52}	1	Grounded	—	0	—	V
53	Video Input	V_{53}	1	—	6.15	6.35	6.55	V
54	R-Y Clamp	V_{54}	1	—	6.0	7.0	8.0	V

Current dissipation

PIN No.	PIN NAME	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
49	$V_{CC}1$	$I_{CC}1$	1	—	3.92	4.90	6.13	mA
39	$V_{CC}2$	$I_{CC}2$	1	—	14.64	18.30	22.88	mA
16	$V_{CC}3$	$I_{CC}3$	1	—	46.72	58.40	73.00	mA
6	$I^2L\ V_{CC}$	$I^2L\ I_{CC}$	1	—	8.16	10.20	12.75	mA

AC CHARACTERISTICS
Clamp stage

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Video Gain	G_{VIDEO}	2	(Note 1)	0.95	1.00	1.05	—
Video Frequency Response	GF_{VIDEO}	2	(Note 2)	—	-1	-3	dB
Dynamic Range of Video In / Output	DR_{VIDEO}	2	(Note 3)	5.6	6.2	—	V_{p-p}
	$V_{VIDEOMAX}$			7.0	7.4	—	V
	$V_{VIDEOMIN}$			—	0.1	0.5	V
Video Clamp Characteristics	DR_{CLP}	2	(Note 4)	3.8	4.0	4.2	V_{p-p}
	$V_{DRCLPCEN}$			2.35	2.40	2.55	V
	V_{CLPMAX}			4.4	4.6	4.8	V
	V_{CLPMIN}			2.1	2.3	2.5	V
Drive Current of Video Output	I_{VIDEO}	2	(Note 5)	1.2	1.5	1.8	mA

ACC stage

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
ACC Response	G_{ACCMAX}	2	(Note 6)	24	27	30	—
	G_{ACCCEN}			10.5	12.5	15.0	—
	G_{ACCMIN}			0.5	0.6	0.7	—
Dynamic Range of Chroma In / Output	DR_{CHROMA}	2	(Note 7)	1.7	1.9	2.1	V_{p-p}
	$V_{CHROMAMAX}$			5.4	5.6	5.8	V
	$V_{CHROMAMIN}$			2.6	2.8	3.0	V
Drive Current of Chroma Output	I_{CHROMA}	2	(Note 8)	0.7	1.0	1.3	mA

Video stage

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Y Input Pedestal Clamp Voltage	V_{YCLP}	3	(Note 9)	4.3	4.5	4.7	V
Dynamic Range of Y Input	DR_{YIN}	3	(Note 10)	1.0	1.2	1.4	V_{p-p}
Clamp Pulse Phase for Y Input	T_{YCLP1}	3	(Note 11)	—	0.0	1.0	μs
	T_{YCLP2}			2.0	2.2	2.4	μs
DC Restoration AMP Gain	G_{DCRES}	3	(Note 12)	0.28	0.34	0.40	—
Max. Sensitivity of Dynamic ABL	G_{DABL}	3	(Note 13)	3.5	5.0	6.5	mV / μA
Dynamic Range of Quadratic Differential Input	DR_{QDIN}	3	(Note 14)	1.15	1.45	1.75	V_{p-p}
Quadratic Differential Frequency Response	GF_{QD}	3	(Note 15)	-3.0	0.0	3.0	dB

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Sharpness Control Range	G_{SHPMAX}	3	(Note 16)	15	17	19	dB
	G_{SHPCEN}			9	11	13	
	G_{SHPMIN}			-9	-7	-5	
Black Expansion AMP Max. Gain	G_{BLEXP}	3	(Note 17)	1.3	1.4	1.5	—
Black Expansion Start Point	V_{BLST1}	3	(Note 18)	250	310	370	mV_{p-p}
	V_{BLST2}			340	430	520	
Black Peak Detection Pulse Threshold Level	$V_{BLDETON}$	3	(Note 19)	1.2	1.5	1.8	V
Black Peak Detection Level	V_{BLP1}	3	(Note 20)	-20	0	20	mV
	V_{BLP2}			3	11	18	
	V_{BLP3}			11	18	25	
	V_{BLP4}			21	28	35	
γ Correction Point	$V_{\gamma00}$	3	(Note 21)	530	575	620	mV
	$V_{\gamma01}$			600	645	690	
	$V_{\gamma10}$			670	715	760	
γ Correction Curve	G_{γ}	3	(Note 22)	-2.7	-2.0	-1.3	dB
Blanking Pulse Threshold Level	V_{BLKON}	3	(Note 23)	4.4	4.7	5.0	V
Clamp Pulse Threshold Level	V_{CLPON}	3	(Note 24)	3.2	3.5	3.8	V

Chroma stage

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Color Difference Input Clamp Voltage	V_{RYCL}	4	(Note 25)	5.9	6.1	6.3	V
	V_{BYCL}			5.9	6.1	6.3	
Color Difference Input Dynamic Range	DR_{RY}	4	(Note 26)	1.0	1.2	—	V_{p-p}
	DR_{BY}			1.0	1.2	—	
Uni-Color Control Characteristics for Chroma	$V_{RYUCMAX}$	4	(Note 27)	1.16	1.38	1.64	V_{p-p}
	$V_{RYUCCEN}$			0.67	0.80	0.95	V_{p-p}
	$V_{RYUCMIN}$			0.17	0.20	0.24	V_{p-p}
	G_{RYUC}			16.5	17.5	18.5	dB
	V_{BYCMAX}			1.45	1.72	2.04	V_{p-p}
	V_{BYCCEN}			0.84	1.00	1.19	V_{p-p}
	V_{BYCMIN}			0.21	0.25	0.30	V_{p-p}
	G_{BYUC}			16.5	17.5	18.5	dB
Uni-Color Control Characteristics Difference Between Axes	ΔV_{UCMAX}	4	(Note 28)	1.0	2.0	3.0	dB
	ΔV_{UCCEN}			1.0	2.0	3.0	
	ΔV_{UCMIN}			1.0	2.0	3.0	

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Color Control Characteristics	$V_{RYCOLMAX}$	4	(Note 29)	1.83	2.18	2.56	V_{p-p}
	$V_{RYCOLCEN}$			1.16	1.38	1.64	V_{p-p}
	$V_{RYCOLMIN}$			0.23	0.27	0.32	V_{p-p}
	$G_{RYCOLMAX}$			3.0	4.0	5.0	dB
	$G_{RYCOLMIN}$			-15	-14	-13	dB
	$V_{BYCOLMAX}$			2.29	2.72	3.23	V_{p-p}
	$V_{BYCOLCEN}$			1.45	1.72	2.04	V_{p-p}
	$V_{BYCOLMIN}$			0.29	0.34	0.40	V_{p-p}
	$G_{BYCOLMAX}$			3	4	5	dB
	$G_{BYCOLMIN}$			-15	-14	-13	dB
Color Control Characteristics Difference Between Axes	ΔV_{COLMAX}	4	(Note 30)	1.0	2.0	3.0	dB
	ΔV_{COLCEN}			1.0	2.0	3.0	
	ΔV_{COLMIN}			1.0	2.0	3.0	
Color Control Voltage Variable Range	ΔV_{32+}	4	(Note 31)	0.57	0.63	0.69	V
	ΔV_{32-}			0.57	0.63	0.69	
R-Y Relative Phase	$\Delta\theta R_{99}$	4	(Note 32)	96.5	99.0	101.5	°
	$\Delta\theta R_{94}$			91.5	94.0	96.5	°
R-Y Relative Amplitude	V_{RY}/V_{BY}			0.72	0.80	0.88	—
G-Y Relative Phase	$\Delta\theta G_{240}$	4	(Note 33)	237	240	243	°
	$\Delta\theta G_{236}$			233	236	239	
G-Y Relative Amplitude	V_{GY}/V_{BY}			0.36	0.40	0.44	—
Half Tone Characteristics for Color Difference	G_{HTRY}	4	(Note 34)	0.47	0.50	0.53	—
	G_{HTBY}			0.47	0.50	0.53	—
Color Difference Output DC Voltage	V_{RYDC}	4	(Note 35)	4.5	4.7	4.9	V
	V_{GYDC}			4.5	4.7	4.9	
	V_{BYDC}			4.5	4.7	4.9	
Color γ Correction Characteristics	$V_{COL\gamma}$	4	(Note 36)	0.0	0.2	0.5	V_{p-p}
	$\Delta\gamma$			0.51	0.64	0.77	—
Color Limiter Characteristics	CLT_{00}	4	(Note 37)	1.1	1.4	1.7	V_{p-p}
	CLT_{01}			1.5	1.8	2.1	
	CLT_{10}			1.8	2.1	2.4	
	CLT_{11}			3.8	4.0	4.2	
Gain of High-Bright Color	HBC_{00}	4	(Note 38)	—	0.00	0.02	—
	HBC_{01}			0.01	0.02	0.04	
	HBC_{10}			0.07	0.09	0.11	
	HBC_{11}			0.10	0.12	0.14	

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Tint Control Characteristics	$\theta_{RTINTMAX}$	4	(Note 39)	34	40	46	$\circ$
	$\theta_{RTINTMIN}$			-46	-40	-34	
	$\theta_{BTINTMAX}$			34	40	46	
	$\theta_{BTINTMIN}$			-46	-40	-34	
Flesh Color Characteristics	$F\alpha_{18}$	4	(Note 40)	0.46	0.58	0.70	—
	$F\alpha_{33}$			0.38	0.48	0.58	

Text stage

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
AC Gain	G_R	5	(Note 41)	3.5	4.0	4.6	—
RGB Frequency Response	GF_R	5	(Note 42)	0.0	-1.0	-2.5	dB
Uni-Color Control Characteristics for Luminance	V_{YUCMAX}	5	(Note 43)	1.11	1.26	1.41	V_{p-p}
	V_{YUCCEN}			0.64	0.73	0.82	V_{p-p}
	V_{YUCMIN}			0.16	0.18	0.20	V_{p-p}
	G_{YUC}			16.5	17.5	18.5	dB
Uni-Color Control Voltage Variable Range	ΔV_{28+}	5	(Note 44)	0.59	0.65	0.71	V
	ΔV_{28-}			0.59	0.65	0.71	
Brightness Control Characteristics	V_{BRMAX}	5	(Note 45)	5.8	6.0	6.2	V
	V_{BRCEN}			4.5	4.7	4.9	
	V_{BRMIN}			3.2	3.4	3.6	
Brightness Sensitivity Per Step	ΔV_{BR}	5	(Note 46)	9.2	10.2	11.2	mV
Brightness Control Voltage Variable Range	ΔV_{29+}	5	(Note 47)	1.30	1.45	1.60	V
	ΔV_{29-}			1.30	1.45	1.60	
White Peak Slice Level	V_{WPS0}	5	(Note 48)	5.9	6.1	6.3	V
	V_{WPS1}			6.2	6.4	6.6	
Black Peak Slice Level	V_{BPS}	5	(Note 49)	2.6	2.8	3.0	V
DC Restoration	V_{DCREST}	5	(Note 50)	—	0	50	mV
RGB Output Drive Current	I_R	5	(Note 51)	2.8	3.7	5.0	mA
Half Tone Characteristics for Luminance	G_{HTY}	5	(Note 52)	0.47	0.50	0.53	—
Half Tone ON Threshold Voltage	V_{HTON}	5	(Note 53)	1.2	1.5	1.8	V
Vertical Blanking Output Level	V_{RVBLK}	5	(Note 54)	0.3	0.8	1.3	V
Horizontal Blanking Output Level	V_{RHBLK}	5	(Note 55)	0.3	0.8	1.3	V
Delay Time of Blanking Pulse	T_{DBLKON}	5	(Note 56)	—	0.10	0.30	μs
	$T_{DBLKOFF}$			—	0.25	0.45	
Sub-Contrast Variable Range	G_{SCONT+}	5	(Note 57)	1.8	2.0	2.2	dB
	G_{SCONT-}			-2.4	-2.2	-2.0	
RGB Output Voltage	V_R	5	(Note 58)	3.1	3.3	3.5	V

| CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Cut Off Control Variable Range	ΔV_{RCO+}	5	(Note 59)	0.49	0.54	0.59	V
	ΔV_{RCO-}			−0.59	−0.54	−0.49	
Drive Control Variable Range	G_{GDRV+}	5	(Note 60)	3.5	4.0	4.5	dB
	G_{GDRV-}			−4.5	−4.0	−3.5	
Output Voltage at Mute Mode (Bus Control)	$V_{RMUTEBUS}$	5	(Note 61)	2.5	2.7	2.9	V
Output Voltage at Mute Mode (DC Control)	$V_{RMUTEDC}$	5	(Note 62)	2.5	2.7	2.9	V
Picture Mute Threshold Voltage	$V_{RPICMUTE}$	5	(Note 63)	2.4	2.7	3.0	V
TV Mute Threshold Voltage	$V_{RTVMUTE}$	5	(Note 64)	1.2	1.5	1.8	V
Output Voltage at Blue Back Mode	V_{RBB}	5	(Note 65)	2.5	2.7	2.9	V
	V_{GBB}			2.5	2.7	2.9	
	V_{BBB}			4.2	4.4	4.6	
Output Voltage at Service Mode	V_{RSER}	5	(Note 66)	3.1	3.3	3.5	V
Peak ACL Level	V_{ACL}	5	(Note 67)	2.8	3.0	3.2	V
Analog RGB Gain	G_{ANAR}	5	(Note 68)	4.5	5.1	5.7	—
Analog RGB Frequency Response	GF_{ANAR}	5	(Note 69)	0.0	−2.0	−4.0	dB
Analog RGB Input Dynamic Range	DR_{ANAR}	5	(Note 70)	1.0	1.5	—	V_{p-p}
Analog RGB White Peak Slice Level	$V_{ANARWPS}$	5	(Note 71)	6.80	7.00	7.25	V
Analog RGB Black Peak Slice Level	$V_{ANARBPS}$	5	(Note 72)	2.0	2.2	2.4	V
Analog RGB Contrast Control Characteristics	$V_{ANARCONMAX}$	5	(Note 73)	1.36	1.53	1.72	V_{p-p}
	$V_{ANARCONCEN}$			0.76	0.85	0.95	V_{p-p}
	$V_{ANARCONMIN}$			0.20	0.22	0.25	V_{p-p}
	$G_{ANARCON}$			15.8	16.8	17.8	dB
Analog RGB Contrast Control Voltage Variable Range	ΔV_{27+}	5	(Note 74)	0.59	0.65	0.71	V
	ΔV_{27-}			0.59	0.65	0.71	
Analog PGB Brightness Characteristics	$V_{ANARBRMAX1}$	5	(Note 75)	4.3	4.5	4.7	V
	$V_{ANARBRCEN1}$	5		3.4	3.6	3.8	
	$V_{ANARBRMIN1}$	5		2.5	2.7	2.9	
	$V_{ANARBRMAX2}$	5		5.7	5.9	6.1	
	$V_{ANARBRCEN2}$	5		4.4	4.6	4.8	
	$V_{ANARBRMIN2}$	5		3.1	3.3	3.5	
Analog PGB Brightness Sensitivity Per Step	$\Delta V_{ANARBR1}$	5	(Note 76)	12.7	14.1	15.5	mV
	$\Delta V_{ANARBR2}$			9.2	10.2	11.2	
Analog PGB Y_S Threshold Voltage	V_{ANARON}	5	(Note 77)	1.2	1.5	1.8	V

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Analog RGB Y_S Propagation Charcteristics	τR_{ANARYS}	5	(Note 78)	—	20	100	ns
	tPR_{ANARYS}			—	20	100	
	ΔtPR_{ANAYS}			—	0	20	
	τF_{ANARYS}			—	10	100	
	tPF_{ANARYS}			—	45	100	
	ΔtPF_{ANAYS}			—	0	20	
Analog RGB Propagation Charcteristics	τR_{ANAR}	5	(Note 79)	—	30	100	ns
	tPR_{ANAR}			—	15	100	
	ΔtPR_{ANA}			—	0	20	
	τF_{ANAR}			—	40	100	
	tPF_{ANAR}			—	20	100	
	ΔtPF_{ANA}			—	0	20	
Crosstalk from TV to Analog RGB	CT_{TV-ANA}	5	(Note 80)	—	−55	−50	dB
Crosstalk from Analog RGB to TV	CT_{ANA-TV}	5	(Note 81)	—	−55	−50	dB
Analog RGB Crosstalk Between Axes	CT_{ANARGB}	5	(Note 82)	—	−55	−40	dB
OSD Y_S Threshold Voltage	V_{OSDRON}	5	(Note 83)	1.2	1.5	1.8	V
OSD RGB Output Low Level	$V_{OSDRLOW}$	5	(Note 84)	2.5	2.7	2.9	V
OSD RGB Output High Level	$V_{OSDRHIGH1}$	5	(Note 85)	5.5	5.7	5.9	V
	$V_{OSDRHIGH0}$	5		5.0	5.2	5.4	V
OSD RGB Threshold Level	V_{OSDRTH}	5	(Note 86)	1.2	1.5	1.8	V
OSD RGB Y_S Propagation Charcteristics	τR_{OSDRYS}	5	(Note 87)	—	15	100	ns
	tPR_{OSDRYS}			—	20	100	
	ΔtPR_{OSDYS}			—	0	20	
	τF_{OSDRYS}			—	35	100	
	tPF_{OSDRYS}			—	25	100	
	ΔtPF_{OSDYS}			—	0	20	
OSD RGB Propagation Charcteristics	τR_{OSDR}	5	(Note 88)	—	25	100	ns
	tPR_{OSDR}			—	15	100	
	ΔtPR_{OSD}			—	0	20	
	τF_{OSDR}			—	35	100	
	tPF_{OSDR}			—	25	100	
	ΔtPF_{OSD}			—	0	20	

TEST CONDITION
Clamp stage

NOTE	CHARACTERISTIC	TEST CIR-CUIT	SW MODE				MEASUREMENT MEHOD
			S45	S47	S51	S53	TEST CONDITION ($V_{CC} = 12V$, I^2L $V_{CC} = 2.2V$, Ta = 25°C)
1	Video Gain	2	a	a	a	b	(1) Input a 100kHz, $0.5V_{p-p}$ sine wave into pin 53. (2) Measure the video gain from pin 53 to pin 50 ; G_{VIDEO}
2	Video Frequency Response	2	a	a	a	b	(1) Input a 8MHz, $0.5V_{p-p}$ sine wave into pin 53. (2) Measure the video gain from pin 53 to pin 50. (3) Calculate the difference of video gain between for 100kHz input and for 8MHz Input ; GF_{VIDEO}
3	Dynamic Range of Video In / Output	2	a	a	a	a	(1) Observe the pin 50's voltage change whilte varying pin 53's voltage. (2) Measure DR_{VIDEO}, $V_{VIDEOMAX}$ and $V_{VIDEOMIN}$.
4	Video Clamp Characteristics	2	a	a	b	a	(1) Observe the pin 50's voltage change whilte varying pin 51's voltage. (2) Measure DR_{CLP}, $V_{DRCLPCEN}$, V_{CLPMAX} and V_{CLPMIN}.
5	Drive Current of Video Output	2	a	a	a	a	(1) Measure the current flows into pin 50 when this pin is connected 6.0V via 200Ω resistor ; I_{VIDEO}
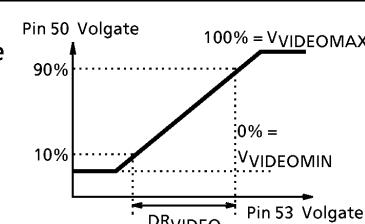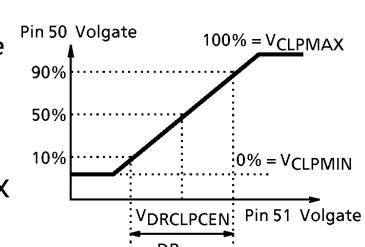
ACC stage

NOTE	CHARACTERISTIC	TEST CIR-CUIT	SW MODE				MEASUREMENT MEHOD
			S45	S47	S51	S53	TEST CONDITION ($V_{CC} = 12V$, I^2L $V_{CC} = 2.2V$, Ta = 25°C)
6	ACC Response	2	b	b	a	a	(1) Input a 3.58MHz, $50mV_{p-p}$ sine wave into pin 45. (2) Measure the ACC gain from pin 45 to pin 48 when 5.0V is supplied to pin 47 ; G_{ACCMAX} (3) Measure the ACC gain when 2.5V is supplied ; G_{ACCCEN} (4) Measure the ACC gain when 0V is supplied ; G_{ACCMIN}

NOTE	CHARACTERISTIC	TEST CIR-CUIT	SW MODE				MEASUREMENT MEHOD
			S45	S47	S51	S53	TEST CONDITION (V_{CC} = 12V, I²L V_{CC} = 2.2V, Ta = 25°C)
7	Dynamic Range of Chroma In / Output	2	b	b	a	a	(1) Input a 3.58MHz, $50mV_{p-p}$ sine wave into pin 45. (2) Supply 0V to pin 47. (3) While increasing input amplitude, measure the input amplitude at which output signal begins to be clipped ; DR_{CHROMA} (4) Supply 5.0V to pin 47. (5) While increasing input amplitude, measure the output voltage at which output signal is clipped on its high / low limit ; $V_{CHROMAMAX}$ / $V_{CHROMAMIN}$
8	Drive Current of Chroma Output	2	a	a	a	a	(1) Measure the current flows into pin 48 when this pin is connected 6.0V via 200Ω resistor ; I_{CHROMA}

Video stage

NOTE	CHARACTERISTIC	TEST CIR-CUIT	SW MODE							MEASUREMENT MEHOD
			S07	S08	S20	S40	S41	S43	S44	TEST CONDITION (V_{CC} = 12V, I²L V_{CC} = 2.2V, Ta = 25°C)
9	Y Input Pedestal Clamp Voltage	3	b	a	b	off	a	off	b	(1) Measure the pin 41's DC Voltage ; V_{YCLP}
10	Dynamic Range of Y Input	3	b	a	b	off	a	off	b	(1) Uni-Color : Center (2) Monitor Output : Y (3) Supply 4.0V to pin 30. (4) While increasing pin 41's voltage from V_{YCLP}, measure the pin 41's voltage at which pin 35's voltage is clipped. (5) Calculate the difference between (4)'s voltage and V_{YCLP} ; DR_{YIN}
11	Clamp Pulse Phase for Y Input	3	b	b	b	off	off	off	b	(1) Connect pin 41 to V_{CC} via 20kΩ. (2) Measure T_{YCLP1} and T_{YCLP2}.

NOTE	CHARACTERISTIC	TEST CIR-CUIT	TEST CONDITION (V_{CC} = 12V, I^2L V_{CC} = 2.2V, Ta = 25°C)							
			SW MODE							MEASUREMENT MEHOD
			S07	S08	S20	S40	S41	S43	S44	
12	DC Restoration AMP Gain	3	b	a	b	off	a	off	b	(1) Connect pin 42 to an extemal power supply and adjust the supply voltage so that pin 42's in / output current is 0A. (2) Monitor Output : Y (3) Set pin 42's voltage to (1)'s voltage + 0.1V and + 0.2V, then measure ΔV_1 and ΔV_2. (4) Calculate : $G_{DCRES} = (\Delta V_1 - \Delta V_2) / 0.1 / G_R$
13	Max. Sensitivity of Dynamic ABL	3	b	a	b	a	a	off	a	(1) Black Expansion : OFF (2) Measure ΔV. (3) Calculate : $G_{DABL} = \Delta V / 10$
14	Dynamic Range of Quadratic Differential Input	3	b	a	b	off	a	off	b	(1) Uni-Color : Center (2) Monitor Output : Y (3) Supply 4.35V to pin 41. (4) Sharpness : MAX. (5) Measure pin 31's voltage and fix to that voltage by extemal power supply. (6) Measure the DR_{QDIN}.
15	Quadratic Differential Frequency Response	3	b	a	a	off	b	off	b	(1) Sharpness : MAX. (2) Supply 4.85V to pin 41 (3) Input a 100kHz / 8MHz, 0.1Vp-p SIGNAL3 into pin 30, (4) Measure the pin 13's output amplitude and calculate the amplitude ratio between for 100kHz input and for 8MHz input ; GF_{OD}
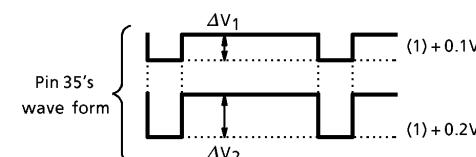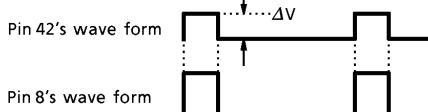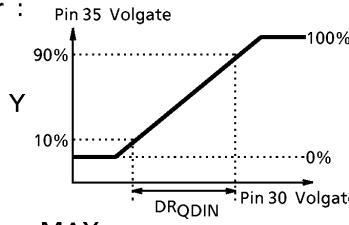
NOTE	CHARACTERISTIC	TEST CIR-CUIT	SW MODE							MEASUREMENT MEHOD
			S07	S08	S20	S40	S41	S43	S44	TEST CONDITION (V_{CC} = 12V, I^2L V_{CC} = 2.2V, Ta = 25°C)
16	Sharpness Control Range	3	b	a	a	off	b	off	b	(1) Monitor Output : Y (2) Input a 2.4MHz, $0.1V_{p-p}$ sine wave into pin 30. (3) Input a (2)'s signal into pin 41 with reversed phase. (4) Measure the gain between pin 41 and pin 35 with Sharpness MAX.　; G_{SHPMAX} Sharpness Center ; G_{SHPCEN} Sharpness MIN.　; G_{SHPMIN}
17	Black Expansion AMP Max. Gain	3	b	a	b	off	b	off	a	(1) Black Detection Level : 4IRE (2) Input a 500kHz, $0.1V_{p-p}$ sine wave into pin 41. (3) Supply 4.5V to pin 43. (4) Measure the pin 42's output amplitude with Black Expansion ON and OFF, and calculate the ratio ; G_{BLEXP}
18	Black Expansion Start Point	3	b	a	a	off	a	off	b or a	(1) Black Expansion Gain : + 3dB (2) While increasing pin 41's voltage from V_{YCLP}, observe the change of pin 42's voltage. (3) Measure the V_{BLST} when pin 43's voltage is V_{YCLP} ; V_{BLST1}, and when it is V_{YCLP} + 0.5V ; V_{BLST2}
19	Black Peak Detection Pulse Threshold Level	3	a	a	b	a	a	off	c	(1) Supply 4.0V to pin 41. (2) While increasing pin 7's voltage, measure the pin 7's voltage at which pin 44's voltage changes.

(Note for row 18 figure: Pin 42 Volgate; S44 : b; S44 : a; V_{BLST}; Pin 41 Volgate)

NOTE	CHARACTERISTIC	TEST CIR-CUIT	SW MODE							MEASUREMENT MEHOD
			S07	S08	S20	S40	S41	S43	S44	TEST CONDITION (V_{CC} = 12V, I^2L V_{CC} = 2.2V, Ta = 25°C)
20	Black Peak Detection Level	3	b	a	b	off	a	off	c	(1) Black Expansion Gain : +3dB (2) While increasing pin 41's voltage, measure the pin 41's voltage at which pin 44's voltage changes with Black Detection Level 0IRE ; V_{B0} Black Detection Level 1.5IRE ; V_{B1} Black Detection Level 2.5IRE ; V_{B2} Black Detection Level 4IRE ; V_{B3} (3) Calculate : $V_{BLP1} = V_{B3} - V_{YCLP}$ $V_{BLP2} = V_{B2} - V_{B3}$ $V_{BLP3} = V_{B1} - V_{B3}$ $V_{BLP4} = V_{B0} - V_{B3}$
21	γ Correction Point	3	b	a	b	off	a	off	b	(1) While increasing pin 41's voltage from V_{YCLP}, observe the change of pin 42's voltage. (2) Measure the $V\gamma$ With γ Correction Point 80IRE ; $V_{\gamma 00}$ γ Correction Point 90IRE ; $V_{\gamma 01}$ γ Correction Point 100IRE ; $V_{\gamma 10}$
22	γ Correction Curve	3	b	a	b	off	a	off	b	(1) Same as Note 21-(1). (2) Measure the gain with γ Correction ON against the gain with γ Correction OFF, which 0dB ; $G\gamma$
23	Blanking Pulse Threshold Level	3	b	b	b	off	a	off	b	(1) Supply 4.0V to pin 41. (2) While increasing pin 8's voltage, measure the pin 8's voltage at which pin 42's voltage changes ; V_{BLKON}
24	Clamp Pulse Threshold Level	3	a	b	b	off	a	off	b	(1) While increasing pin 7's voltage, measure the pin 7's voltage at which pin 41's voltage turns to V_{YCLP} ; V_{CLPON}

Chroma stage

NOTE	CHARACTERISTIC	TEST CIR-CUIT	SW MODE		MEASUREMENT MEHOD
			S33	S34	TEST CONDITION (V_{CC} = 12V, I²L V_{CC} = 2.2V, Ta = 25°C)
25	Color Difference Input Clamp Voltage	4	a	a	(1) Measure the pin 33's voltage ; V_{RYCL} (2) Measure the pin 34's voltage ; V_{BYCL}
26	Color Difference Input Dynamic Range	4	b	b	(1) Input a 100kHz, 0.1V_{p-p} SIGNAL3 into pin 34. (2) Input a signal whose phase is 90° advanced against SIGNAL3 into pin 33. (3) Color and Uni-Color : MIN. (4) Monitor Output : R-Y (5) While increasing input amplitude, measure the input amplitude at which pin 35's output signal begins to be clipped ; DR_{RY} (6) Monitor Output : B-Y (7) While increasing input amplitude, measure the input amplitude at which pin 35's output signal begins to be clipped ; DR_{BY}
27	Uni-Color Control Characteristics for Chroma	4	b	b	(1) Input a 100kHz, 0.2V_{p-p} SIGNAL3 into pin 34. (2) Input a signal whose phase is 90° advanced against SIGNAL3 into pin 33. (3) Monitor Output : R-Y (4) Measure the pin 35's amplitude with Uni-Color MAX. ; $V_{RYUCMAX}$ (5) Measure the pin 35's amplitude with Uni-Color Center ; $V_{RYUCCEN}$ (6) Measure the pin 35's amplitude with Uni-Color MIN. ; $V_{RYUCMIN}$ (7) Calculate : $G_{RYUC} = 20\ell og\ (V_{RYUCMAX} / V_{RYUCMIN})$ (8) Monitor Output : B-Y (9) Repeat (4)~(7) ; $V_{BYUCMAX}, V_{BYUCCEN}, V_{BYUCMIN}$ and G_{BYUC}
28	Uni-Color Control Characteristics Difference Between Axes	4	b	b	(1) Calculate : $\Delta V_{UCMAX} = 20\ell og\ (V_{BYUCMAX} / V_{RYUCMAX})$ (2) Calculate : $\Delta V_{UCCEN} = 20\ell og\ (V_{BYUCCEN} / V_{RYUCCEN})$ (3) Calculate : $\Delta V_{UCMIN} = 20\ell og\ (V_{BYUCMIN} / V_{RYUCMIN})$

NOTE	CHARACTERISTIC	TEST CONDITION (V_{CC} = 12V, I²L V_{CC} = 2.2V, Ta = 25°C)			
		TEST CIR-CUIT	SW MODE		MEASUREMENT MEHOD
			S33	S34	
29	Color Control Characteristics	4	b	b	(1) Input a 100kHz, 0.2V_{p-p} SIGNAL3 into pin 34. (2) Input a signal whose phase is 90° advanced against SIGNAL3 into pin 33. (3) Monitor Output : R-Y (4) Measure the pin 35's amplitude with Color MAX. ; $V_{RYCOLMAX}$ (5) Measure the pin 35's amplitude with Color Center ; $V_{RYCOLCEN}$ (6) Measure the pin 35's amplitude with Color MIN. ; $V_{RYCOLMIN}$ (7) Calculate : $G_{RYCOLMAX} = 20\log(V_{RYCOLMAX}/V_{RYCOLCEN})$ (8) Calculate : $G_{RYCOLMIN} = 20\log(V_{RYCOLMIN}/V_{RYCOLCEN})$ (9) Monitor Output : B-Y (10) Repeat (4)~(8) ; $V_{BYCOLMAX}$, $V_{BYCOLCEN}$, $V_{BYCOLMIN}$, $G_{BYCOLMAX}$ and $G_{BYCOLMIN}$
30	Color Control Characteristics Difference Between Axes	4	b	b	(1) Calculate : $\Delta V_{COLMAX} = 20\log(V_{BYCOLMAX}/V_{RYCOLMAX})$ (2) Calculate : $\Delta V_{COLCEN} = 20\log(V_{BYCOLCEN}/V_{RYCOLCEN})$ (3) Calculate : $\Delta V_{COLMIN} = 20\log(V_{BYCOLMIN}/V_{RYCOLMIN})$
31	Color Control Voltage Variable Range	4	a	a	(1) Measure the pin 32's voltage with Color MAX. ; V_{32MAX} (2) Measure the pin 32's voltage with Color Center ; V_{32CEN} (3) Measure the pin 32's voltage with Color MIN. ; V_{32MIN} (4) Calculate : $\Delta V_{32+} = V_{32MAX} - V_{32CEN}$ $\Delta V_{32-} = V_{32CEN} - V_{32MIN}$
32	R-Y Relative Phase [4] / R-Y Relative Amplitude [4]	4	b	b	(1) Input a 100kHz, 0.2V_{p-p} SIGNAL3 into pin 34. (2) Input a signal whose phase is 90° advanced against SIGNAL3 into pin 33. (3) R-Y Relative Phase : 99° (4) Monitor Output : R-Y and B-Y (5) Measure the R-Y Relative Phase against B-Y ; $\Delta\theta R_{99}$ (6) R-Y Relative Phase : 94° (7) Repeat (4) and (5) ; $\Delta\theta R_{94}$ (8) Measure the R-Y Relative Amplitude against B-Y ; V_{RY}/V_{BY}

NOTE	CHARACTERISTIC	TEST CIR-CUIT	SW MODE		MEASUREMENT MEHOD
			S33	S34	TEST CONDITION (V_{CC} = 12V, I^{2}L V_{CC} = 2.2V, Ta = 25°C)
33	G-Y Relative Phase	4	b	b	(1) Input a 100kHz, $0.2V_{p-p}$ SIGNAL3 into pin 34. (2) Input a signal whose phase is 90° advanced against SIGNAL3 into pin 33. (3) G-Y Relative Phase : 240° (4) Monitor Output : G-Y and B-Y (5) Measure the G-Y Relative Phase against B-Y ; $\Delta\theta G_{240}$ (6) G-Y Relative Phase : 236° (7) Repeat (4) and (5) ; $\Delta\theta G_{236}$ (8) Measure the G-Y Relative Amplitude against B-Y ; V_{GY}/V_{BY}
	G-Y Relative Amplitude	4			
34	Half Tone Characteristics for Color Difference	4	b	b	(1) Input a 100kHz, $0.2V_{p-p}$ SIGNAL3 into pin 33. (2) Monitor Output : R-Y (3) Measure the pin 35's output amplitude ; $V_{35RY}A$ (4) Supply 5.0V to pin 22. (5) Measure the pin 35's output amplitude ; $V_{35RY}B$ (6) Calculate : $G_{HTRY} = V_{35RY}B/V_{35RY}A$ (7) Input 100kHz, $0.2V_{p-p}$ SIGNAL3 into pin 34. (8) Monitor Output : B-Y (9) Repeat (3)~(6) ; G_{HTBY}
35	Color Difference Output DC Voltage	4	a	a	(1) Color Mute : ON (2) Monitor Output : R-Y, and measure the pin 35's DC voltage ; V_{RYDC} (3) Monitor Output : G-Y, and measure the pin 35's DC voltage ; V_{GYDC} (4) Monitor Output : B-Y, and measure the pin 35's DC voltage ; V_{BYDC}
36	Color γ Correction Characteristics	4	b	a	(1) Input a 100kHz, $0.1V_{p-p}$ SIGNAL3 into pin 33. (2) Monitor Output : R-Y (3) While vaying input amplitude, observe the change of pin 35's output amplitude with Color γ Correction ON and OFF. (4) Measure the start point ; $V_{COL\gamma}$ (5) Assuming that the inclination with OFF is "1", measure the inclination with ON ; Δ_γ
37	Color Limiter Characteristics	4	a	b	(1) Input a $0.3V_{p-p}$ SIGNAL2 into pin 34. (2) Color : MAX. (3) Monitor Output : B-Y (4) Measure the pin 35's output amplitude with Color Limiter Level +1dB, 0dB, −1dB and OFF ; CLT_{00}, CLT_{01}, CLT_{10} and CLT_{11}

NOTE	CHARACTERISTIC	TEST CONDITION (V_{CC} = 12V, I^2L V_{CC} = 2.2V, Ta = 25°C)			MEASUREMENT MEHOD
		TEST CIR-CUIT	SW MODE		
			S33	S34	
38	Gain of High-Bright Color	4	a	b	(1) Input a $0.2V_{p-p}$ SIGNAL2 into pin 34. (2) Monitor Output : B-Y (3) Adjust Color Control so that pin 35's output amplitude turns to $2V_{p-p}$. (4) Monitor Output : Y (5) Measure the pin 35's output amplitude with High-Bright Color OFF, 0.02, 0.09 and 0.12 ; $V35_{00}$, $V35_{01}$, $V35_{10}$ and $V35_{11}$ (6) Calculate : $HBC_{00} = V35_{00}/2$ $\qquad HBC_{01} = V35_{01}/2$ $\qquad HBC_{10} = V35_{10}/2$ $\qquad HBC_{11} = V35_{11}/2$
39	Tint Control Characteristics	4	b	b	(1) Input a 100kHz, $0.2V_{p-p}$ SIGNAL3 into pin 34. (2) Input a signal whose phase is 90° advanced against SIGNAL3 into pin 33. (3) Monitor Output : R-Y (4) Measure the phase shift of pin 35's output between Tint MAX. and Center ; $\theta_{RTINTMAX}$ (5) Measure the phase shift of pin 35's output between Tint MIN. and Center ; $\theta_{RTINTMIN}$ (6) Monitor Output : B-Y (7) Repeat (4) and (5) ; $\theta_{BTINTMAX}$ and $\theta_{BTINTMIN}$
40	Flesh Color Characteristics	4	b	b	(1) Input I/Q signal which is demodulated from Flesh-Bar Signal (its phase is −30~+240°, 15° intervals) into pin 33/34. (2) Flesh Color Pull-in Range : ±18degrees (3) Monitor Output : R-Y and B-Y (4) While observing pin 35's output, measure the color vector response like a right graph. (5) Measure the inclination near I axis with Flesh ON ; $F\alpha_{18}$ (6) Flesh Color Pull-in Range : ±33° (7) Repeat (3)~(5) ; $F\alpha_{33}$ Color Vector Phase [°] Flesh OFF inclination : $F\alpha$ Flesh ON Chroma Input Phase [°]

Text stage

| NOTE	CHARACTERISTIC	TEST CIR-CUIT	SW MODE				MEASUREMENT MEHOD
			S24	S25	S26	S41	TEST CONDITION (V_{CC} = 12V, I²L V_{CC} = 2.2V, Ta = 25°C)
41	AC Gain	5	a	a	a	b	(1) Input a 10kHz, 0.3V_{p-p} SIGNAL1 into pin 41. (2) Measure the AC gain from pin 41 to pin 13 ; G_R (3) Green and Blue channels have same spec.
42	RGB Frequency Response	5	a	a	a	b	(1) Input a 8MHz, 0.3V_{p-p} SIGNAL1 into pin 41. (2) Measure the AC gain from pin 41 to pin 13. (3) Calculate the difference of AC gain between for 10kHz input and for 8MHz Input ; GF_R (4) Green and Blue channels have same spec.
43	Uni-Color Control Characteristics for Luminance	5	a	a	a	b	(1) Input a 10kHz, 0.3V_{p-p} SIGNAL1 into pin 41. (2) Monitor Output : Y (3) Measure the pin 35's output amplitude with Uni-Color MAX., Center and MIN. ; V_{YUCMAX}, V_{YUCCEN} and V_{YUCMIN} (4) Calculate : $G_{YUC} = 20\ell og (V_{YUCMAX} / V_{YUCMIN})$
44	Uni-Color Control Voltage Variable Range	5	a	a	a	a	(1) Measure the pin 28's DC voltage with Uni-Color MAX., Center and MIN. ; V_{28MAX}, V_{28CEN} and V_{28MIN} (2) Calculate : $\Delta V_{28+} = V_{28MAX} - V_{28CEN}$ $\Delta V_{28-} = V_{28CEN} - V_{28MIN}$
45	Brightness Control Characteristics	5	a	a	a	a	(1) Monitor Output : Y (2) Measure the pin 35's output DC voltage in picture period with Brightness MAX., Center and MIN. ; V_{BRMAX}, V_{BRCEN} and V_{BRMIN}
46	Brightness Sensitivity Per Step	5	a	a	a	a	(1) Calculate : $\Delta V_{BR} = (V_{BRMAX} - V_{BRMIN}) / 256$
47	Brightness Control Voltage Variable Range	5	a	a	a	a	(1) Measure the pin 29's DC voltage with Brightness MAX., Center and MIN. V_{29MAX}, V_{29CEN} and V_{29MIN} (2) Calculate : $\Delta V_{29+} = V_{29MAX} - V_{29CEN}$ $\Delta V_{29-} = V_{29CEN} - V_{29MIN}$
48	White Peak Slice Level	5	a	a	a	a	(1) Uni-Color, Sub Contrast : MAX. (2) White Peak Slice Level : 95IRE (3) While increasing pin 41's DC voltage, measure the pin 13's output voltage at which the output is clipped ; V_{WPS0} (4) White Peak Slice Level : 105IRE (5) Repeat (3) ; V_{WPS1}

NOTE	CHARACTERISTIC	TEST CONDITION (V_{CC} = 12V, I^2L V_{CC} = 2.2V, Ta = 25°C)					
		TEST CIR-CUIT	SW MODE				MEASUREMENT MEHOD
			S24	S25	S26	S41	
49	Black Peak Slice Level	5	a	a	a	a	(1) Uni-Color, Sub Contrast : MAX. (2) While decreasing pin 41's DC voltage, measure the pin 13's output voltage at which the output is clipped ; V_{BPS}
50	DC Restoration	5	a	a	a	b	(1) Input a Stair Step Signal into pin 41. (2) Adjust Uni-Color so that the output amplitude turns to 1.25V_{p-p} (3) While varying input APL from 10% to 90%, measure the change of POINT A's voltage ; V_{DCREST} 1V_{p-p} Varying APL 1.25V_{p-p} POINT A Pin 41 Input Pin 13 Output
51	RGB Output Drive Current	5	a	a	a	a	(1) Adjust Brightness so that the pin 13's DC voltage turns to 3.2V in picture period. (2) Connect pin 13 to 4.2V via 100Ω, and measure the current flowing into pin 13 ; I_R (3) Green and Blue channels have same spec.
52	Half Tone Characteristics for Luminance	5	a	a	a	b	(1) Input a 100kHz, 0.3V_{p-p} SIGNAL1 into pin 41. (2) Measure the pin 13's amplitude in picture period ; V_{13A} (3) Supply 5.0V to pin 22. (4) Measure the pin 13's amplitude in picture period ; V_{13B} (5) Calculate : $G_{HTY} = V_{13B} / V_{13A}$
53	Half Tone ON Threshold Voltage	5	a	a	a	b	(1) Input a 100kHz, 0.3V_{p-p} SIGNAL1 into pin 41. (2) Increasing pin 22's voltage from 0V. (3) Measure the pin 22's voltage at which the pin 13's amplitude makes a change ; V_{HTON}
54	Vertical Blanking Output Level	5	a	a	a	a	(1) Measure the pin 13's DC voltage in a vertical blanking period ; V_{RVBLK} (2) Green and Blue channels have same spec.
55	Horizontal Blanking Output Level	5	a	a	a	a	(1) Measure the pin 13's DC voltage in a horizontal blanking period ; V_{RHBLK} (2) Green and Blue channels have same spec.

NOTE	CHARACTERISTIC	TEST CONDITION (V_{CC} = 12V, I^2L V_{CC} = 2.2V, Ta = 25°C)					
		TEST CIR-CUIT	SW MODE				MEASUREMENT MEHOD
			S24	S25	S26	S41	
56	Delay Time of Blanking Pulse	5	a	a	a	a	(1) Input a signal like a below figure into pin 8 and measure the T_{DBLKON} and $T_{DBLKOFF}$.
57	Sub-Contrast Variable Range	5	a	a	a	a	(1) Input a 10kHz, $0.3V_{p-p}$ SIGNAL1 into pin 41. (2) Measure the pin 13's amplitude in picture period with Sub Contrast MAX., Center and MIN. ; $V_{13SCMAX}$, $V_{13SCCEN}$ and $V_{13SCMIN}$ (3) Calculate : $G_{SCONT+} = 20\ell og\ (V_{13SCMAX} / V_{13SCCEN})$ $G_{SCONT-} = 20\ell og\ (V_{13SCMIN} / V_{13SCCEN})$
58	RGB Output Voltage	5	a	a	a	a	(1) Measure the pin 13's DC voltage in picture period ; V_R (2) Green and Blue channels have same spec.
59	Cut Off Control Variable Range	5	a	a	a	a	(1) Service Mode : ON (2) Measure the pin 13's DC voltage in picture period with R Cut Off MAX., Center and MIN ; V_{RCOMAX}, V_{RCOCEN} and V_{RCOMIN} (3) Calculate : $\Delta V_{RCO+} = V_{RCOMAX} - V_{RCOCEN}$ $\Delta V_{RCO-} = V_{RCOMIN} - V_{RCOCEN}$ (4) Green and Blue channels have same spec.
60	Drive Control Variable Range	5	a	a	a	b	(1) Input a 100kHz, $0.3V_{p-p}$ SIGNAL1 into pin 41. (2) Measure the pin 14's amplitude in picture period with G Drive MAX., Center and MIN ; V_{GDRMAX}, V_{GDRCEN} and V_{GDRMIN} (3) Calculate : $G_{GDRV+} = 20\ell og\ (V_{GDRMAX} / V_{GDRCEN})$ $G_{GDRV-} = 20\ell og\ (V_{GDRMIN} / V_{GDRCEN})$ (4) Blue channel has same spec.
61	Output Voltage at Mute Mode (Bus Control)	5	a	a	a	a	(1) Picture Mute : ON (2) Measure the pin 13's DC voltage in picture period ; $V_{RMUTEBUS}$ (3) Green and Blue channels have same spec.

NOTE	CHARACTERISTIC	TEST CONDITION (V_{CC} = 12V, I²L V_{CC} = 2.2V, Ta = 25°C)					
		TEST CIR-CUIT	SW MODE				MEASUREMENT MEHOD
			S24	S25	S26	S41	
62	Output Voltage at Mute Mode (DC Control)	5	a	a	a	a	(1) Supply 5.0V to pin 21. (2) Measure the pin 13's DC voltage in picture period ; $V_{RMUTEDC}$ (3) Green and Blue channels have same spec.
63	Picture Mute Threshold Voltage	5	a	a	a	a	(1) Analog RGB Brightness : MAX. (2) Supply 5.0V to pin 23. (3) Increasing pin 21's voltage from 0V, measure the pin 21's voltage at which pin 13's voltage makes a change ; $V_{RPICMUTE}$ (4) Green and Blue channels have same spec.
64	TV Mute Threshold Voltage	5	a	a	a	a	(1) Increasing pin 21's voltage from 0V, measure the pin 21's voltage at which pin 13's voltage makes a change ; $V_{RTVMUTE}$ (2) Green and Blue channels have same spec.
65	Output Voltage at Blue Back Mode	5	a	a	a	a	(1) Blue Back : ON (2) Measure the pin 13's DC voltage in picture period ; V_{RBB} (3) Measure the pin 14's DC voltage in picture period ; V_{GBB} (4) Measure the pin 15's DC voltage in picture period ; V_{BBB}
66	Output Voltage at Service Mode	5	a	a	a	a	(1) Service Mode : ON (2) Supply 5.0V to pin 21. (3) Measure the pin 13's DC voltage in picture period ; V_{RSER} (4) Green and Blue channels have same spec.
67	Peak ACL Level	5	a	a	a	a	(1) Peak ACL : ON (2) Color : MAX. (3) Switch S34 to b, and input SIGNAL2 into TP34A. (4) While increasing the SIGNAL2's amplitude, measure the pin 15's amplitude in picture period at which pin 28's voltage makes a change ; V_{ACL}

NOTE	CHARACTERISTIC	TEST CONDITION (V_{CC} = 12V, I²L V_{CC} = 2.2V, Ta = 25°C)					
		TEST CIR-CUIT	SW MODE				MEASUREMENT MEHOD
			S24	S25	S26	S41	
68	Analog RGB Gain	5	a / c	a / c	a / c	b	(1) Input a 10kHz, 0.3V_{p-p} SIGNAL1 into pin 41. (2) Adjust G / B Drive so that pin 14's / 15's amplitude turn to be equal with pin 13's one. (3) Supply 5.0V to pin 23. (4) Input a 10kHz, 0.3V_{p-p} SIGNAL1 into pin 24. (5) Measure the pin 13's amplitude in picture period ; V_{ANAR} (6) Calculate : $G_{ANAR} = V_{ANAR} / 0.3$ (7) Green and Blue channels have same spec.
69	Analog RGB Frequency Response	5	a / c	a / c	a / c	b	(1) Input a 10kHz, 0.3V_{p-p} SIGNAL1 into pin 41. (2) Adjust G / B Drive so that pin 14's / 15's amplitude turn to be equal with pin 13's one. (3) Supply 5.0V to pin 23. (4) Input a 8kHz, 0.3V_{p-p} SIGNAL1 into pin 24. (5) Measure the pin 13's amplitude in picture period ; V_{ANAR8M} (6) Calculate : $GF_{ANAR} = 20\ell og\ (V_{ANAR8M} / V_{ANAR})$ (7) Green and Blue channels have same spec.
70	Analog RGB Input Dynamic Range	5	a	a	a	a	(1) Supply 5.0V to pin 23. (2) RGB Contrast : MIN. (3) Input a SIGNAL2 into pin 24. (4) While increasing input amplitude, measure the input amplitude at which pin 13's output signal begins to be clipped ; DR_{ANAR} (5) Green and Blue channels have same spec.
71	Analog RGB White Peak Slice Level	5	a	a	a	a	(1) Input a 10kHz, 0.3V_{p-p} SIGNAL1 into pin 41. (2) Adjust G / B Drive so that pin 14's / 15's amplitude turn to be equal with pin 13's one. (3) Supply 5.0V to pin 23. (4) RGB Contrast : MAX. (5) While increasing pin 24's DC voltage, measure the pin 13's output voltage at which the output is clipped ; $V_{ANARWPS}$ (6) Green and Blue channels have same spec.

| NOTE	CHARACTERISTIC	TEST CONDITION (V_{CC} = 12V, I^2L V_{CC} = 2.2V, Ta = 25°C)					
		TEST CIR-CUIT	SW MODE				MEASUREMENT MEHOD
			S24	S25	S26	S41	
72	Analog RGB Black Peak Slice Level	5	a	a	a	a	(1) Input a 10kHz, 0.3V_{p-p} SIGNAL1 into pin 41. (2) Adjust G / B Drive so that pin 14's / 15's amplitude turn to be equal with pin 13's one. (3) Supply 5.0V to pin 23. (4) RGB Contrast : MAX. (5) While decreasing pin 24's DC voltage, measure the pin 13's output voltage at which the output is clipped ; $V_{ANARBPS}$ (6) Green and Blue channels have same spec.
73	Analog RGB Contrast Control Characteristics	5	a / c	a / c	a / c	b	(1) Input a 10kHz, 0.3V_{p-p} SIGNAL1 into pin 41. (2) Adjust G / B Drive so that pin 14's / 15's amplitude turn to be equal with pin 13's one. (3) Supply 5.0V to pin 23. (4) Input a 100kHz, 0.3V_{p-p} SIGNAL1 into pin 24. (5) Measure the pin 13's output amplitude with RGB Contranst MAX., Center and MIN. ; $V_{ANARCONMAX}$, $V_{ANARCONCEN}$ and $V_{ANARCONMIN}$ (6) Calculate : $G_{ANARCON} = 20\ell og$ $(V_{ANARCONMAX} / V_{ANARCONMIN})$ (7) Green and Blue channels have same spec.
74	Analog RGB Contrast Control Voltage Variable Range	5	a	a	a	a	(1) Supply 5.0V to pin 23. (2) Measure the pin 27's DC voltage with RGB Contranst MAX., Center and MIN. ; V_{27MAX} V_{27CEN} and V_{27MIN} (3) Calculate : $\Delta V_{27+} = V_{27MAX} - V_{27CEN}$ $\Delta V_{27-} = V_{27CEN} - V_{27MIN}$

NOTE	CHARACTERISTIC	TEST CONDITION (V_{CC} = 12V, I^2L V_{CC} = 2.2V, Ta = 25°C)					
		TEST CIR-CUIT	SW MODE				MEASUREMENT MEHOD
			S24	S25	S26	S41	
75	Analog RGB Brightness Characteristics	5	a	a	a	a	(1) Input a 10kHz, 0.3V_{p-p} SIGNAL1 into pin 41. (2) Adjust G / B Drive so that pin 14's / 15's amplitude turn to be equal with pin 13's one. (3) Supply 5.0V to pin 23. (4) Input a SIGNAL2 into pin 24. (5) Brightness Linking : OFF (6) Adjust the amplitude of SIGNAL2 so that pin 13's amplitude turns to 0.5V_{p-p} in picture period. (7) Measure the pin 13's output DC voltage in picture period with RGB Brightness MAX., Center and MIN. ; $V_{ANARBRMAX1}$, $V_{ANARBRCEN1}$ and $V_{ANARBRMIN1}$ (8) Brightness Linking : ON (9) Adjust the amplitude of SIGNAL2 so that pin 13's amplitude turns to 0.5V_{p-p} in picture period. (10) Measure the pin 13's output DC voltage in picture period with Brightness MAX., Center and MIN. ; $V_{ANARBRMAX2}$, $V_{ANARBRCEN2}$ and $V_{ANARBRMIN2}$ (11) Green and Blue channels have same spec.
76	Analog RGB Brightness Sensitivity Per Step	5	a	a	a	a	(1) Calculate : $\Delta V_{ANARBR1}$ = $(V_{ANARBRMAX1} - V_{ANARBRMIN1}) / 128$ $\Delta V_{ANARBR2}$ = $(V_{ANARBRMAX2} - V_{ANARBRMIN2}) / 256$ (2) Green and Blue channels have same spec.
77	Analog RGB Y_S Threshold Voltage	5	c	a	a	a	(1) Input a 10kHz, 0.3V_{p-p} SIGNAL1 into pin 24. (2) While increasing pin 23's DC voltage, measure the pin 23's voltage at which SIGNAL1 appears on pin 13 ; V_{ANARON} (3) Green and Blue channels have same spec.

| NOTE	CHARACTERISTIC	TEST CIR-CUIT	SW MODE				MEASUREMENT MEHOD
			S24	S25	S26	S41	TEST CONDITION (V_{CC} = 12V, I²L V_{CC} = 2.2V, Ta = 25°C)
78	Analog RGB Y_S Propagation Charcteristics	5	a	a	a	a	(1) RGB Brightness : MAX. (2) Input a 3V_{p-p} SIGNAL4 into pin 23. (3) According to SIGNAL5, measure the Propagation Characteristics at pin 13 ; τR_{ANARYS}, tPR_{ANARYS}, τF_{ANARYS} and tPF_{ANARYS} (4) Green and Blue channels have same spec. (5) Calculate the MAX. difference of raising time and falling time between axes ; ΔtPR_{ANAYS} and ΔtPF_{ANAYS}
79	Analog RGB Propagation Charcteristics	5	a / c	a / c	a / c	a	(1) Supply 5.0V to pin 23. (2) Input a 0.5V_{p-p} SIGNAL4 into pin 24. (3) According to SIGNAL5, measure the Propagation Characteristics at pin 13 ; τR_{ANAR}, tPR_{ANAR}, τF_{ANAR} and tPF_{ANAR} (4) Green and Blue channels have same spec. (5) Calculate the MAX. difference of raising time and falling time between axes ; ΔtPR_{ANA} and ΔtPF_{ANA}
80	Crosstalk from TV to Analog RGB	5	a	a	a	b	(1) Input a 4MHz, 0.7V_{p-p} SIGNAL1 into pin 41. (2) Adjust Sub Contrast so that the pin 13's amplitude turns to 3.0V_{p-p} in picture period. (3) Supply 5.0V to pin 23. (4) Measure the pin 13's amplitude in picture period ; V_{13CTA} (5) Calculate : CT_{TV-ANA} = 20ℓog (V_{13CTA} / 3) (6) Green and Blue channels have same spec.
81	Crosstalk from Analog RGB to TV	5	a / b	a / b	a / b	a	(1) Supply 5.0V to pin 23. (2) Input a 4MHz, 0.7V_{p-p} SIGNAL1 into pin 24. (3) Adjust RGB Contrast so that the pin 13's amplitude turns to 3.0V_{p-p} in picture period. (4) Shapness : Center (5) Measure the pin 13's amplitude in picture period ; V_{13CTB} (6) Calculate : CT_{ANA-TV} = 20ℓog (V_{13CTB} / 3) (7) Green and Blue channels have same spec.

NOTE	CHARACTERISTIC	TEST CONDITION (V_{CC} = 12V, I^2L V_{CC} = 2.2V, Ta = 25°C)					
		TEST CIR-CUIT	SW MODE				MEASUREMENT MEHOD
			S24	S25	S26	S41	
82	Analog RGB Crosstalk Between Axes	5	a / b	a / b	a / b	a	(1) Supply 5.0V to pin 23. (2) Input a 1MHz, $0.5V_{p-p}$ SIGNAL1 into pin 24. (3) Measure the pin 13's, 14's and pin 15's amplitude in picture period and calculate the Crosstalk between axes. (4) Input a 1MHz, $0.5V_{p-p}$ SIGNAL1 into pin 25 / 26. (5) Repeat (3) and pick up the MAX. Crosstalk amog all pairs of channels ; CT_{ANARGB}
83	OSD Y_S Threshold Voltage	5	a	a	a	a	(1) While increasing pin 17's DC voltage, measure the pin 17's voltage at which the pin 13's voltage makes a change ; V_{OSDRON} (2) Green and Blue channels have same spec.
84	OSD RGB Output Low Level	5	a	a	a	a	(1) Supply 5.0V to pin 17. (2) Measure the pin 13's DC voltage in picture period ; $V_{OSDRLOW}$ (3) Green and Blue channels have same spec.
85	OSD RGB Output High Level	5	a	a	a	a	(1) Supply 5.0V to pin 17. (2) Supply 5.0V to pin 18. (3) Measure the pin 13's DC voltage in picture period with OSD Contranst $3.0V_{p-p}$ and $2.5V_{p-p}$; $V_{OSDRHIGH1}$ and $V_{OSDRHIGH0}$
86	OSD RGB Threshold Level	5	a	a	a	a	(1) Supply 5.0V to pin 17. (2) While increasing pin 18's DC voltage, measure the pin 18's voltage at which the pin 13's voltage makes a change ; V_{OSDRTH} (3) Green and Blue channels have same spec.
87	OSD RGB Ys Propagation Charcteristics	5	a	a	a	a	(1) Input a $3V_{p-p}$ SIGNAL4 into pin 17. (2) According to SIGNAL6, measure the Propagation Characteristics at pin 13 ; τR_{OSDRYS}, tPR_{OSDRYS}, τF_{OSDRYS} and tPF_{OSDRYS} (3) Green and Blue channels have same spec. (4) Calculate the MAX. difference of raising time and falling time between axes ; ΔtPR_{OSDRYS} and ΔtPF_{OSDRYS}
88	OSD RGB Propagation Charcteristics	5	a	a	a	a	(1) Supply 5.0V to pin 17. (2) Input a $3.0V_{p-p}$ SIGNAL4 into pin 18. (3) According to SIGNAL5, measure the Propagation Characteristics at pin 13 ; τR_{OSDR}, tPR_{OSDR}, τF_{OSDR} and tPF_{OSDR} (4) Green and Blue channels have same spec. (5) Calculate the MAX. difference of raising time and falling time between axes ; ΔtPR_{OSD} and ΔtPF_{OSD}

SIGNALS FOR MEASUREMENT
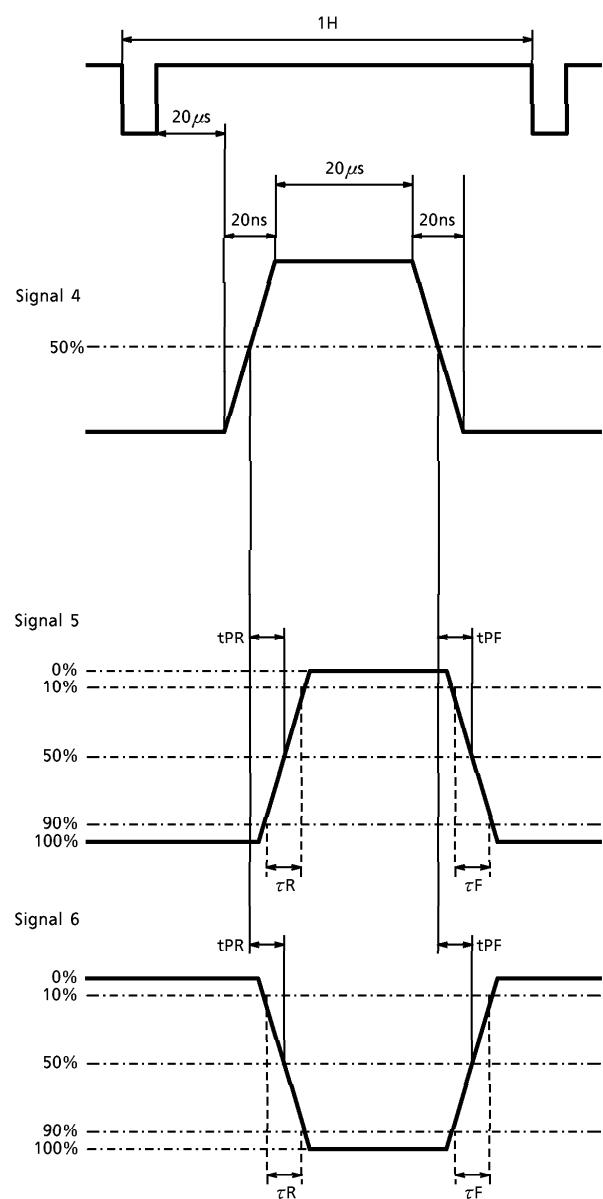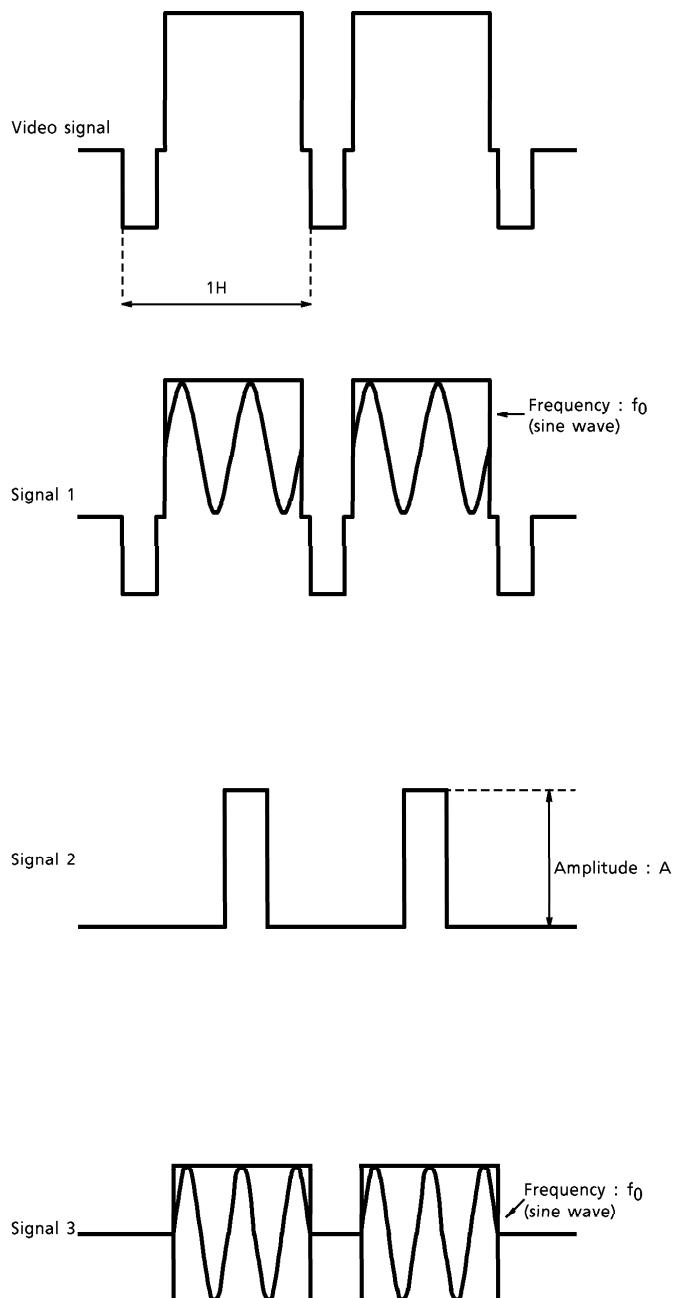
TEST CIRCUIT 1

For DC characteristics

V$_{CC}$ 12V

Pin	Left label		Right label	Pin
1	DAC output1		R-Y clamp	54
2	DAC output2		Video input	53 N.C
3	DAC output3		GND1	52
4	Test1 (N.C)		Clamp DC	51
5	B-Y clamp		Video output	50 N.C
6	I²L V$_{CC}$		V$_{CC}$1	49
7	SCP input		Chroma output	48 N.C
8	Blanking input		ACC DC	47
9	I²L GND		GND2	46
10	SDA (N.C)		Chroma input	45 N.C
11	SCL (N.C)		Black peak hold	44
12	GND3		Black expansion point	43
13	R output (N.C)		DC restoration	42
14	G output (N.C)		Y input	41
15	B output (N.C)		Dynamic ABL input	40
16	V$_{CC}$3		V$_{CC}$2	39
17	OSD Y$_S$		R-Y	38 N.C
18	OSD R input		G-Y	37 N.C
19	OSD G input		B-Y	36 N.C
20	OSD B inpuit		Monitor output	35 N.C
21	Mute		Q / V input	34
22	Y$_M$ input		I / U input	33
23	Analog RGB Y$_S$ input		Color	32 N.C
24	Analog R inout		Y clamp	31
25	Analog G input		Quadratic differential input	30 N.C
26	Analog B input		Brightness	29 N.C
27	RGB contrast (N.C)		Uni-color	28 N.C

TA1211N

R$_1$ 100kΩ
R$_2$ 100kΩ
R$_3$ 100kΩ
0.01μF C$_5$
V$_{CC}$ 2.2V
4.7kΩ R$_{7A}$
R$_{7B}$ 7.5kΩ
C$_{16}$ 0.01μF
C$_{24}$ 0.01μF
C$_{25}$ 0.01μF
C$_{26}$ 0.01μF

C$_{54}$ 0.01μF
C$_{49}$ 0.01μF
C$_{44}$ 0.01μF
C$_{42}$ 0.01μF
C$_{41}$ 0.01μF
C$_{40}$ 240kΩ
C$_{39}$ 0.01μF
C$_{34}$ 0.01μF
C$_{33}$ 0.01μF
C$_{31}$ 0.01μF

TEST CIRCUIT 2
For clamp / ACC stage
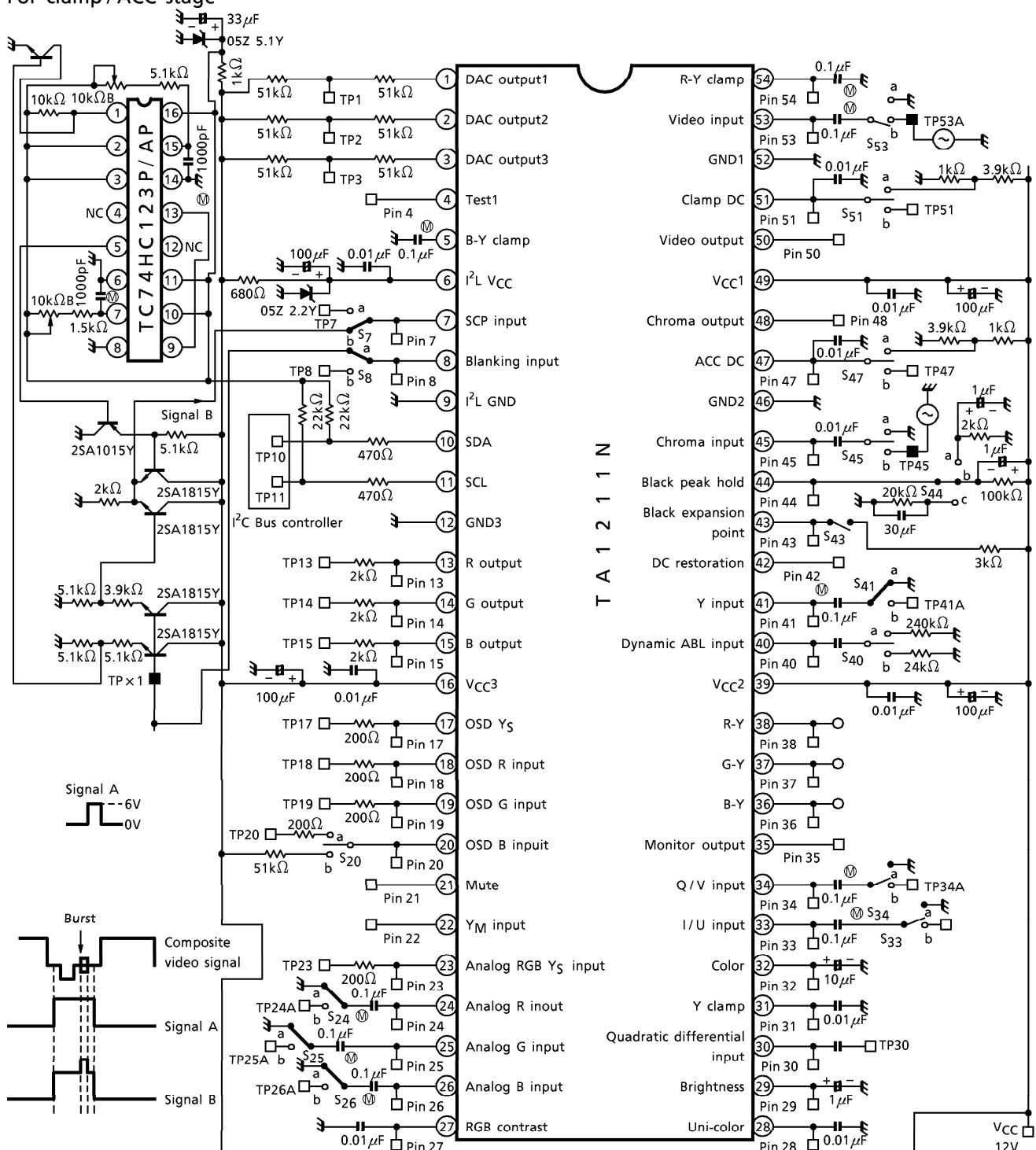
TEST CIRCUIT 3
For video stage
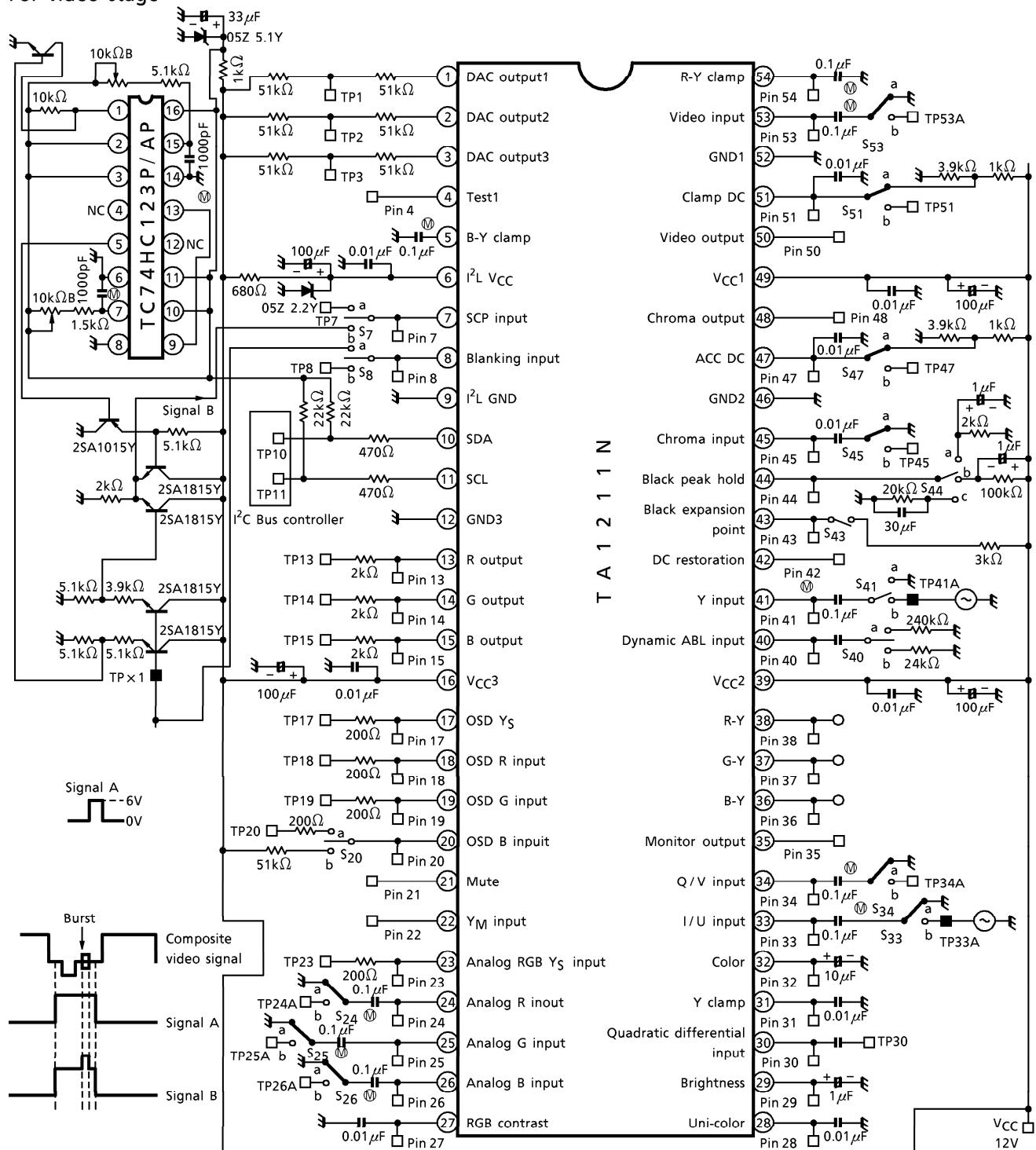
TEST CIRCUIT 4
For chroma stage
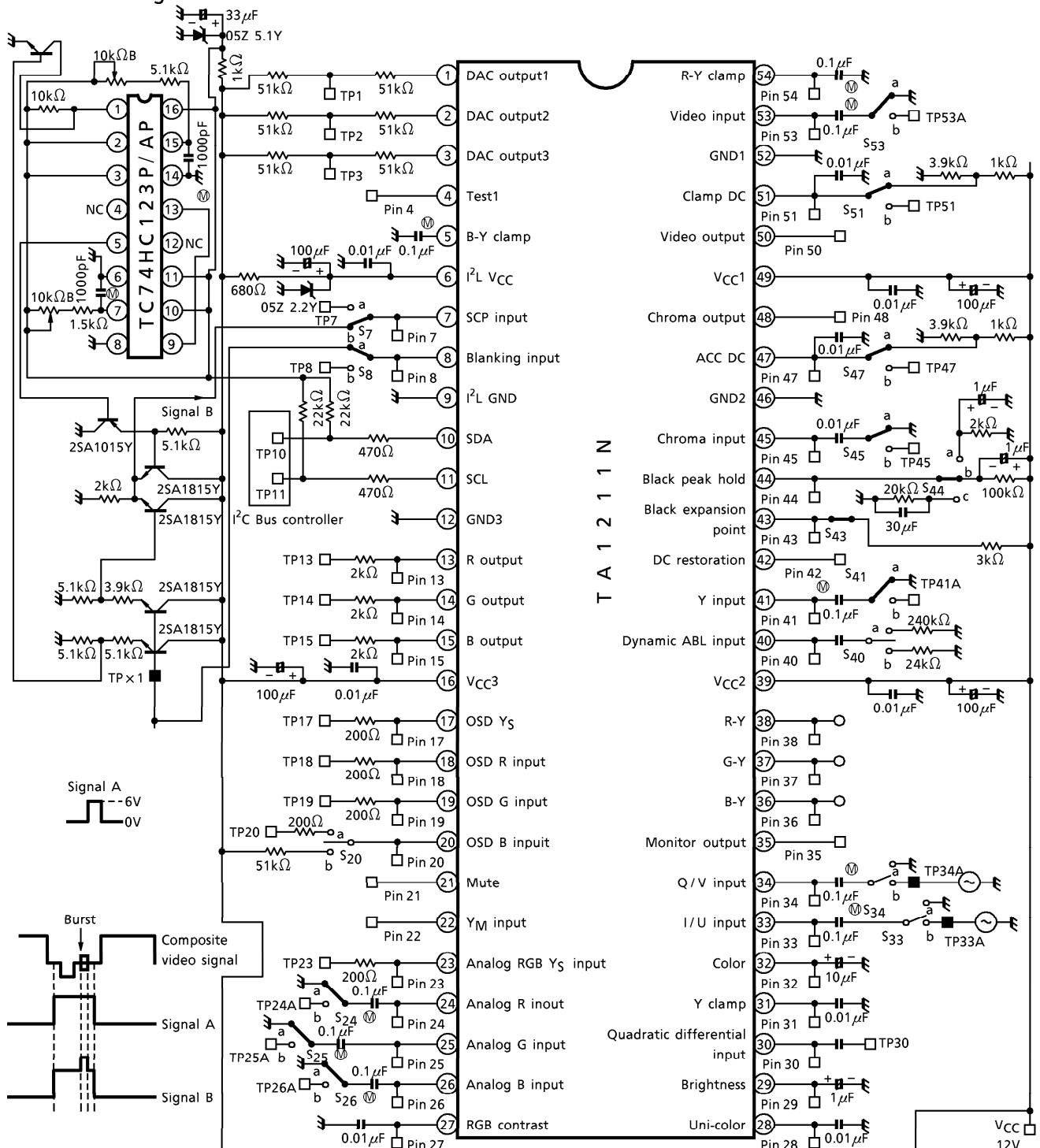
TEST CIRCUIT 5
## For text stage
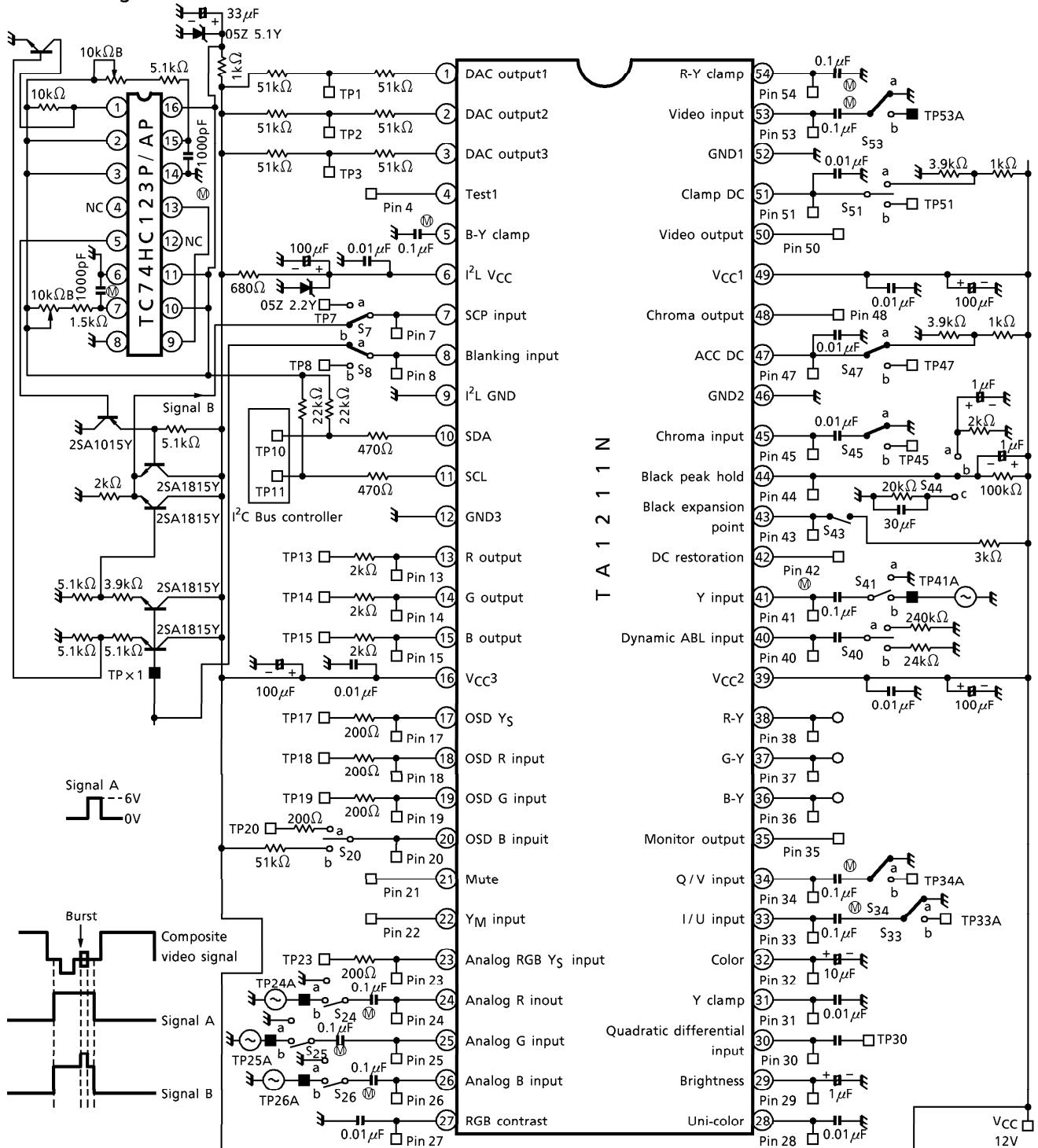
APPLICATION CIRCUIT
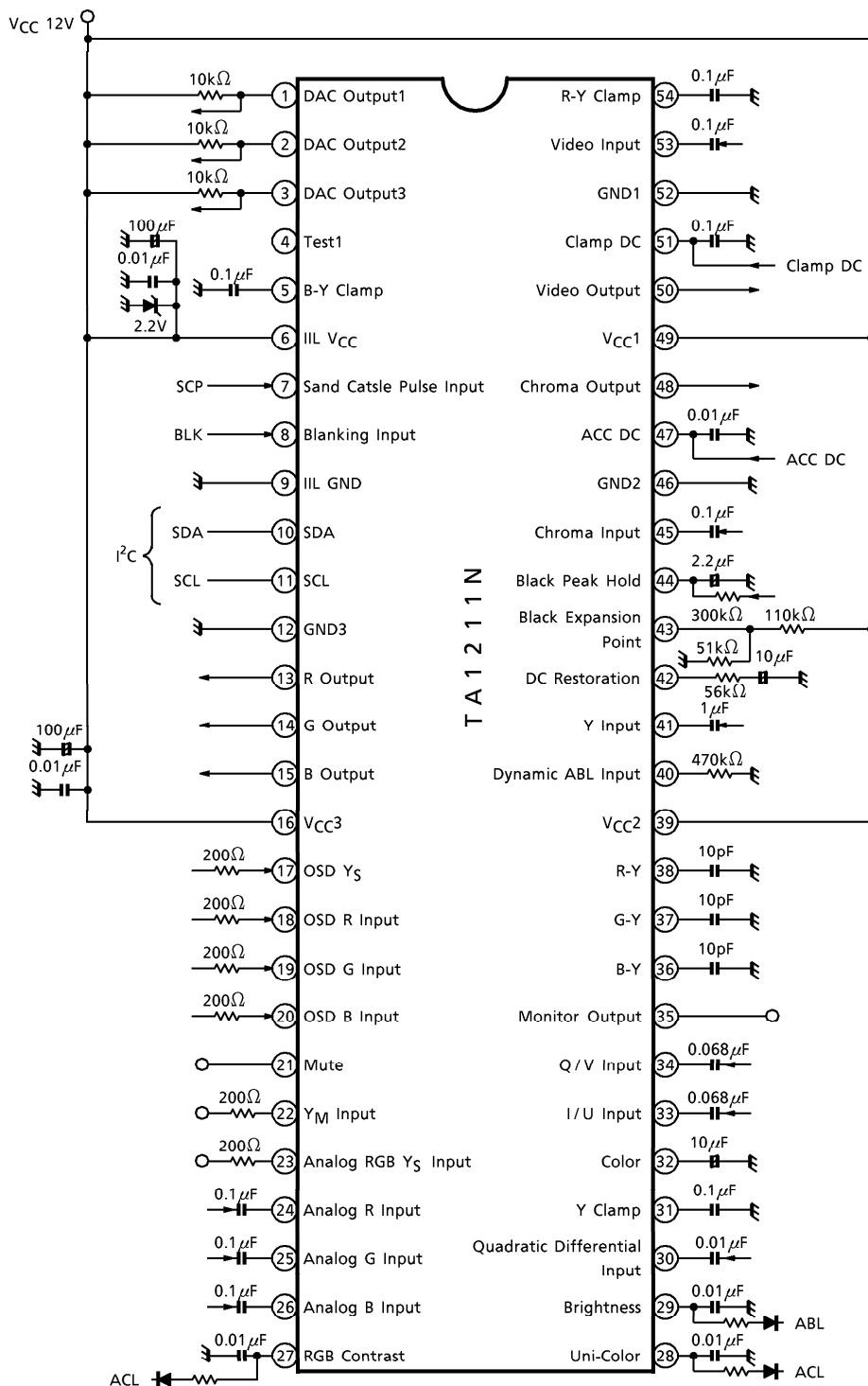
OUTLINE DRAWING
SDIP54-P-600-1.78

Unit : mm

Weight : 5.44g (Typ.)