SHARP

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To: _____

SPECIFICATIONS

Product Type VIDEO PROSECCING IC FOR LCD COLOR VIEWFINDER

IR3Y15

Model No. _____

※This specifications contains 50 pages including the cover and appendix.
If you have any objections, please contact us before issuing purchasing order.

CUSTOMERS ACCEPTANCE

DATE: _____

BY: _____

PRESENTED

BY: Y. Minakuchi

Y. MINAKUCHI
Dept. General Manager

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PREPARED BY: T. Matsui

Device Engineering Dept.
TENRI Plant
Integrated Circuits Group
SHARP CORPORATION

CONTENTS

I. Description

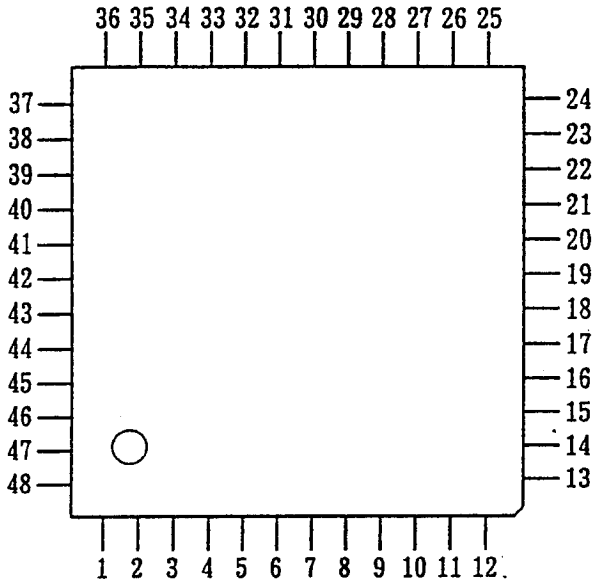
The Sharp IR3Y15 has a compact multi-functional IC with luminance, chroma, and interface circuits for the PAL LCD color viewfinders all integrated onto a single chip.
This IC contains various filters reducing the number of external devices required. It also contains a luminance AGC circuit, a gamma correction circuit to meet the specific requirements of the LCD panel.

Applications:
PAL LCD color viewfinders

Features:
(1) Low power dissipation (155mW TYP.)
(2) 3.58MHz B.P.F., 3.58MHz TRAP
D.L. built-in
(3) APC non regulating
(4) Built-in image control circuit
(5) Built-in polarity invertor circuit
(6) Built-in AGC circuit
(7) Built-in gamma correction circuit
(8) Built-in automatic output DC bias control circuit
(9) Accepts external R.G.B. input

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

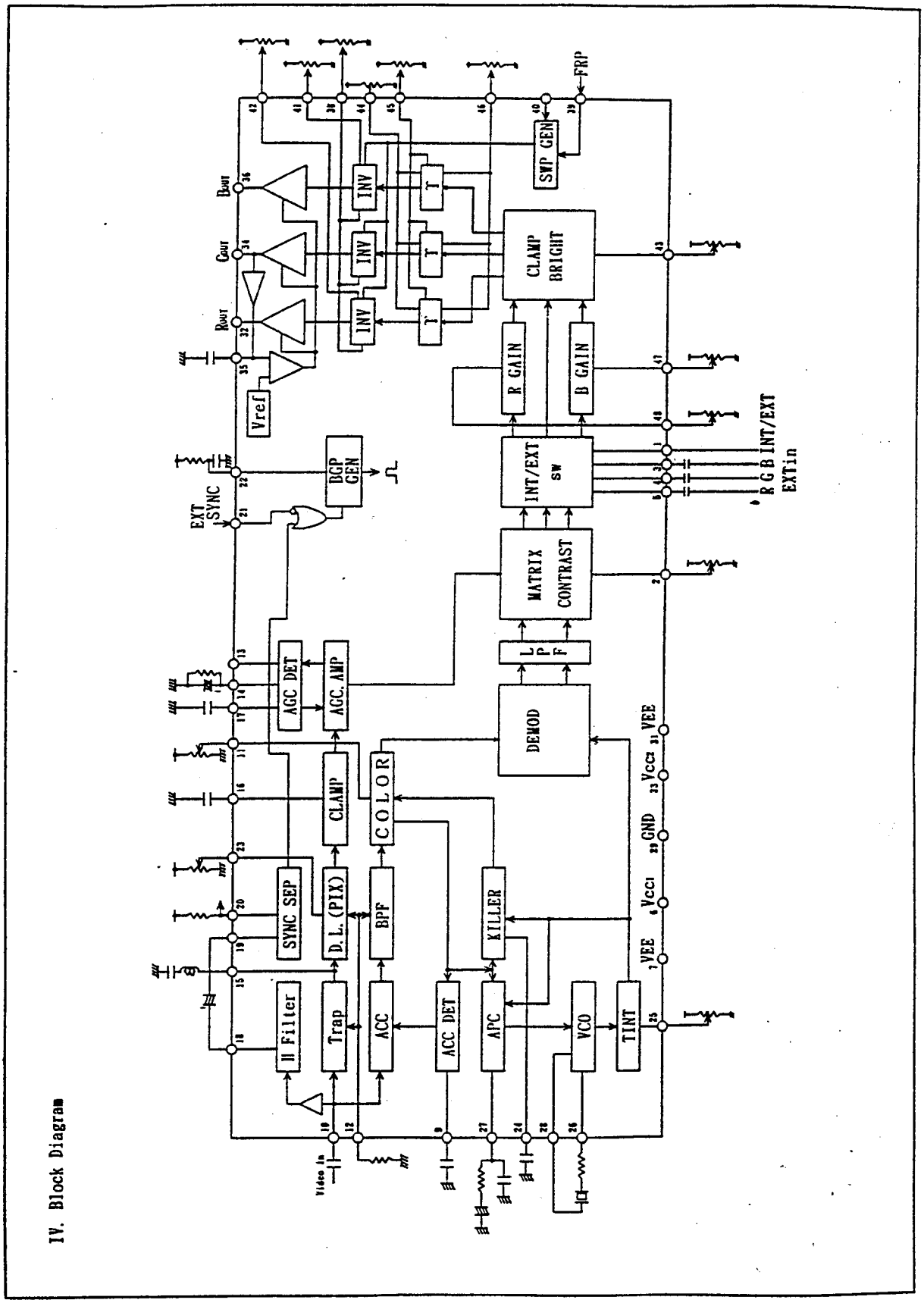
II. Terminal Connections (TOP VIEW)



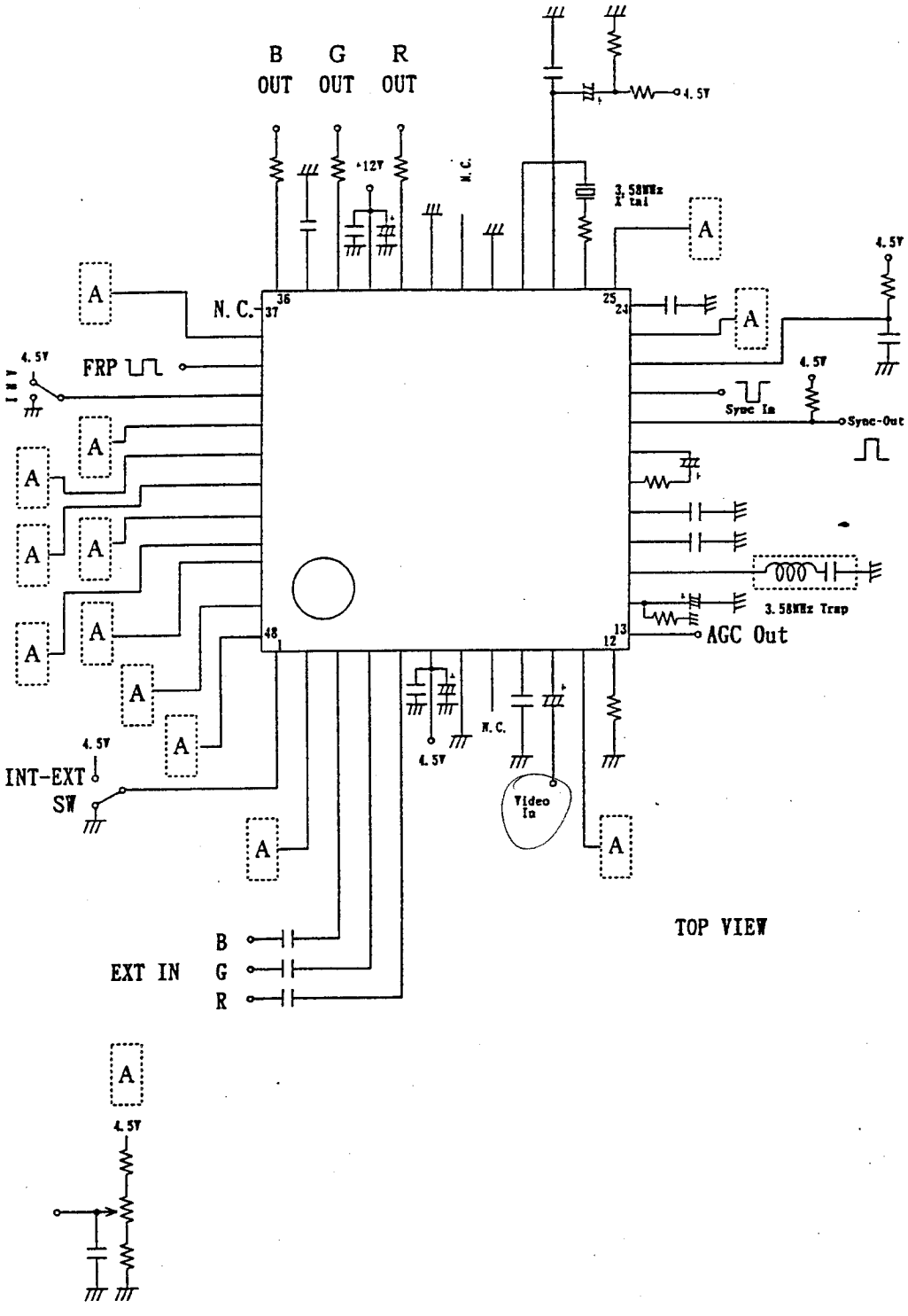
Ⅲ. Terminal Name

Pin NO.	Terminal name	Pin NO.	Terminal name
1	SW	25	TINT
2	CONTRAST	26	VCO OUT
3	EXT IN B	27	APC FILTER
4	EXT IN G	28	VCO IN
5	EXT IN R	29	GND
6	VCC1	30	N.C.
7	VEE	31	VEE
8	N.C.	32	R OUT
9	ACC FILTER	33	VCC2
10	VIDEO IN	34	G OUT
11	COLOR	35	OUT DC DET
12	F ADJ	36	B OUT
13	AGC OUT	37	N.C.
14	AGC FILTER	38	RGB AMPLITUDE
15	TRAP OUT	39	FRP
16	CLAMP	40	RGB INV
17	APL	41	SUB BRIGHT B
18	H FILTER OUT	42	SUB BRIGHT R
19	SYNC SEP	43	BRIGHT
20	SYNC OUT	44	GAMMA 2
21	SYNC IN	45	GAMMA 1
22	TIME CONSTANT	46	PEAK LIMITER
23	PICTURE	47	SUB CONTRAST B
24	KILLER FILTER	48	SUB CONTRAST R

IV. Block Diagram

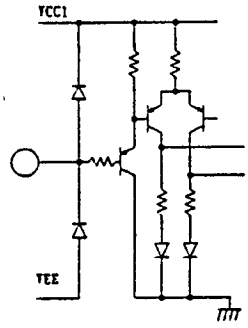


V. Basic Connection Diagram

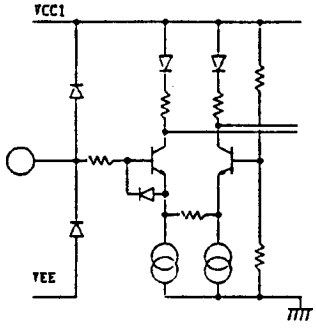


VI. Input/Output Circuit type

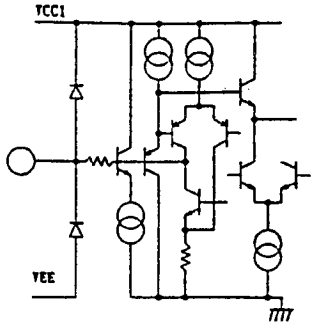
① SW



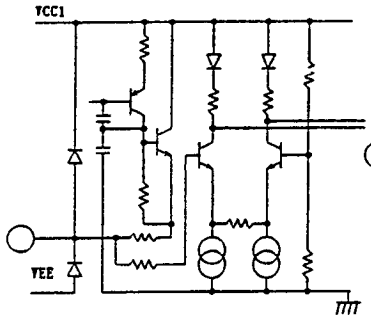
② CONTRAST
⑪ COLOR



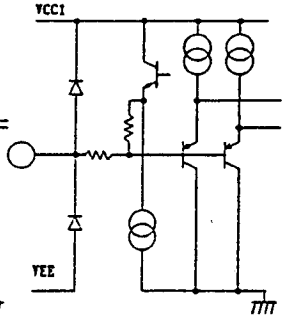
⑦ EXT IN B
⑧ EXT IN G
⑨ EXT IN R



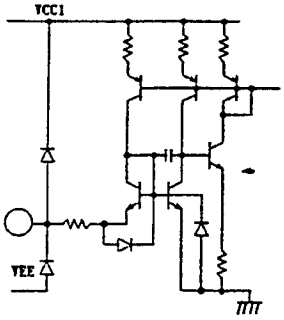
⑤ ACC FILTER



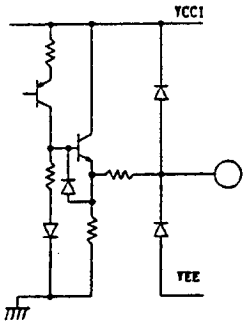
⑥ VIDEO IN



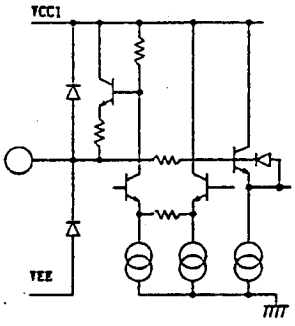
⑫ F ADJ



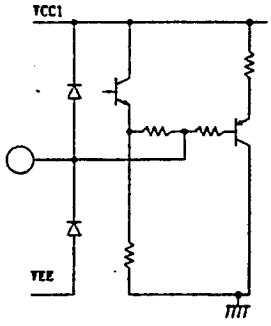
⑩ AGC OUT



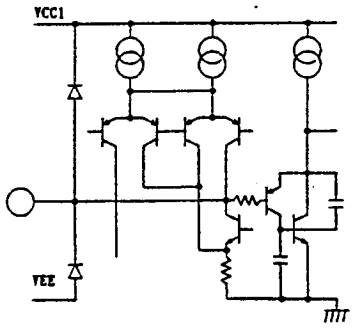
⑬ AGC FILTER



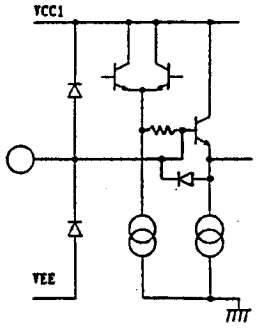
⑭ TRAP OUT



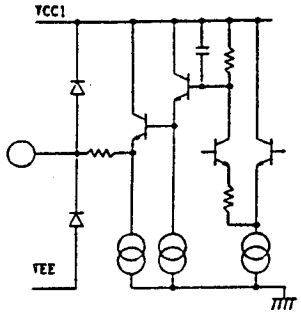
⑮ CLAMP



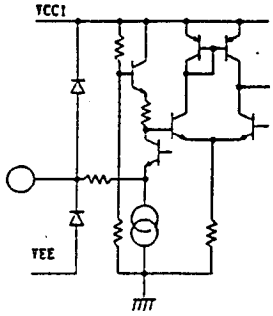
⑯ APL



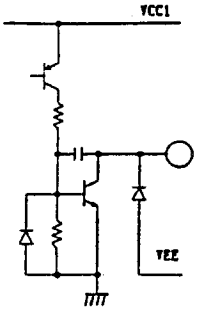
⑰ H FILTER OUT



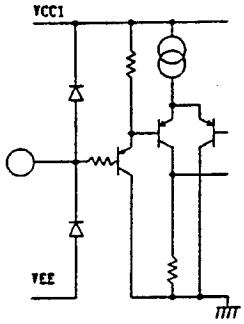
⑲ SYNC SEP



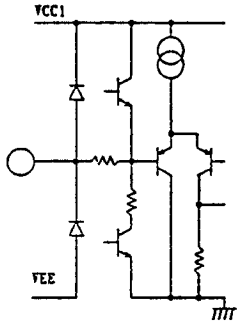
⑳ SYNC OUT



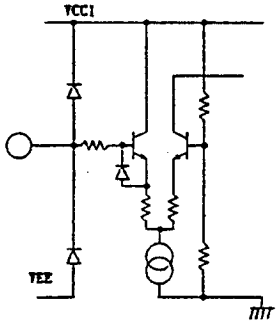
㉑ SYNC IN



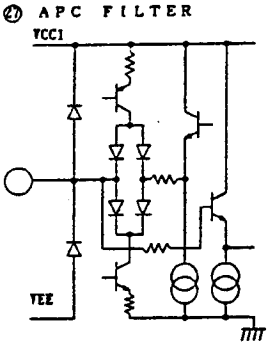
㉒ TIME CONSTANT



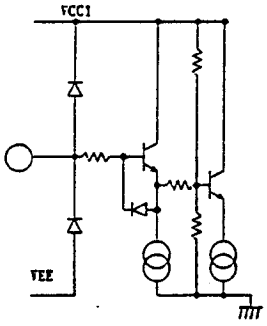
㉓ PICTURE



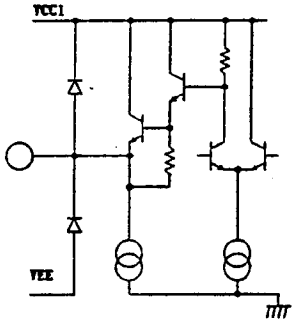
㉔ KILLER FILTER
㉗ APC FILTER



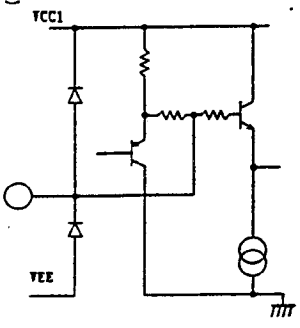
㉕ TINT



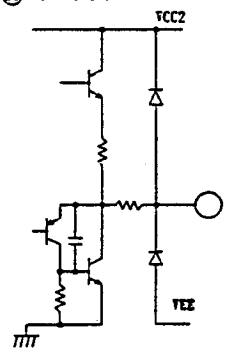
㉖ VCO OUT



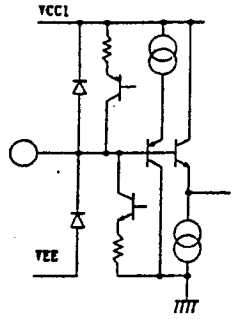
㉘ VCO IN



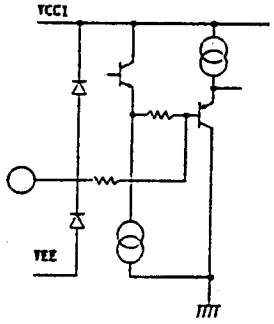
㉜ R OUT
㉞ G OUT
㊱ B OUT



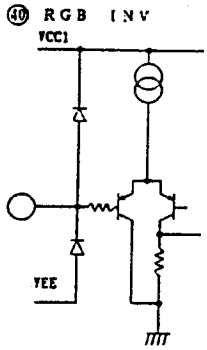
㉟ OUT DC DET



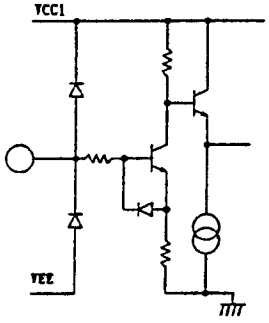
㊳ RGB AMPLITUDE
㊶ SUB BRIGHT B
㊷ SUB BRIGHT R
㊸ GAMMA2



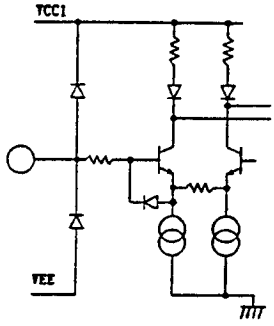
㊴ FRP
㊵ RGB INV



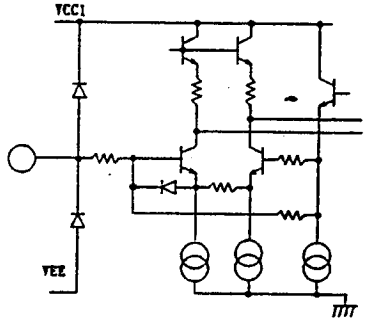
㊸ BRIGHT



㊺ GAMMA1
㊻ PEAK LIMITER



㊼ SUB CONTRAST B
㊽ SUB CONTRAST R



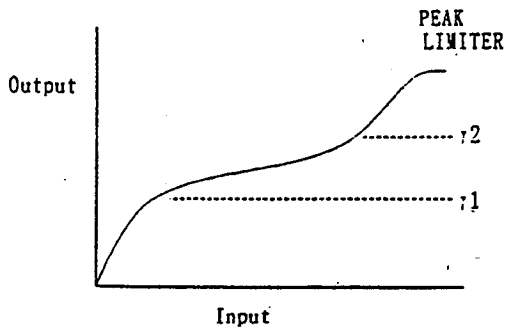
VII Description of Functional Operation

i) Terminal function

* SW (Pin 1)
  Switches between the signal (INT) from the luminance and chroma lines and the signal (EXT) from the EXT. R.G.B. inputs. Switched onto INT when it goes "Low" and onto EXT when it goes "High" or open.
* CONTRAST (Pin 2)
  The DC voltage applied to this pin adjusts the contrast of R.G.B. outputs.
* EXT IN B, EXT IN G, EXT IN R (Pins 3, 4, 5)
  External R.G.B. inputs. Input must be made via coupling capacitor.
* VCC 1 (Pin 6)
  Connected to positive going power supply.
* VEE (Pin 7,31)
  Connected to negative going power supply.
* ACC FILTER (Pin 9)
  Connected to the ACC detector filter.
* VIDEO IN (Pin 10)
  Inputs composite video signal.
* COLOR (Pin 11)
  The DC voltage applied to this pin adjusts the color.
* F ADJ (Pin 12)
  The value of the resistor connected between this pin and GND adjusts the frequency characteristics of the filter.
* AGC OUT (Pin 13)
  Outputs the voltage detected at the AGC detector circuit for video line.
* AGC FILTER (Pin 14)
  Connected to the AGC detector filter for luminance line.
* TRAP OUT (Pin 15)
  Connected to the 3.58MHz trap. The terminal impedance line is 1kΩ.

* CLAMP (Pin 16)
  Connected to the capacitor that clamps the pedestal of the luminance signal.
* APL (Pin 17)
  Connected to the filter that detects the APL (Average Picture Level) of the luminance signal.
* H FILTER OUT (Pin 18)
  Output video signal for sync separator circuit.
* SYNC SEP (Pin 19)
  Inputs video signal to the sync separator circuit.
* SYNC OUT (Pin 20)
  Outputs the sync signal separated by the sync separator circuit. Because the output is provided by an open collector, it can be connected to a controller operating on another power supply. This output signal goes "High" level when in sync and "Low" level when out of sync.
* SYNC IN (Pin 21)
  Inputs a pulse that goes "Low" level (=0V) when in sync, and "High" level (=3V) when out of sync. This input sync signal and the sync signal separated by the sync separator circuit are ORed to be sent to the gate pulse generator circuit.
* TIME CONSTANT (Pin 22)
  The time constant (=CR) sets the width of the gate pulse.
* PICTURE (Pin 23)
  The DC voltage applied to this pin adjusts the frequency characteristics of the luminance line.
* KILLER FILTER (Pin 24)
  Connected to the killer detector filter.
* TINT (Pin 25)
  The DC voltage applied to this pin adjusts the hue.
* VCO OUT (Pin 26)
  Output for oscillator circuit.
* APC FILTER (Pin 27)
  Connected to the APC detector filter.
* VCO IN (Pin 28)
  Input to the oscillator circuit.

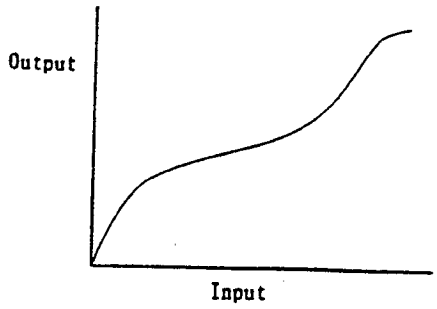
* GND (Pin 29)
  Ground
* R OUT, G OUT, B OUT (Pins 32, 34, 36)
  Output the primary color signal inverted according to the invert signal.
* VCC2 (Pin 33)
  Connected to positive going power supply for the R.G.B. outputs.
* OUT DC DET (Pin 35)
  Connected to the capacitor that smoothes and holds the deviation from the output DC bias voltage.
* RGB AMPLITUDE (Pin 38)
  Controls the amplitude between the inverted level and the non-inverted level of the R.G.B. outputs. This pin is preset inside the IC.
* FRP (Pin 39)
  Inputs the invert signal for the R.G.B. outputs.
* RGB INV (Pin 40)
  The voltage applied to this pin sets the polarity of the R.G.B. outputs with respect to the polarity of the FRP.
* SUB BRIGHT B (Pin 41)
  The DC voltage applied to this pin fine-adjusts the brightness of the B signal. This pin is preset inside the IC.
* SUB BRIGHT R (Pin 42)
  The DC voltage applied to this pin fine-adjusts the brightness of the R signal. This pin is preset inside the IC.
* BRIGHT (Pin 43)
  The DC voltage applied to this pin adjusts the brightness.
* Gamma 1, Gamma 2 (Pins 44, 45)
  The DC voltages applied to these pins set the inflection points on the DC voltage gain of the gamma correction. (See the figure to the right.) The Gamma 2 pin is preset inside the IC.



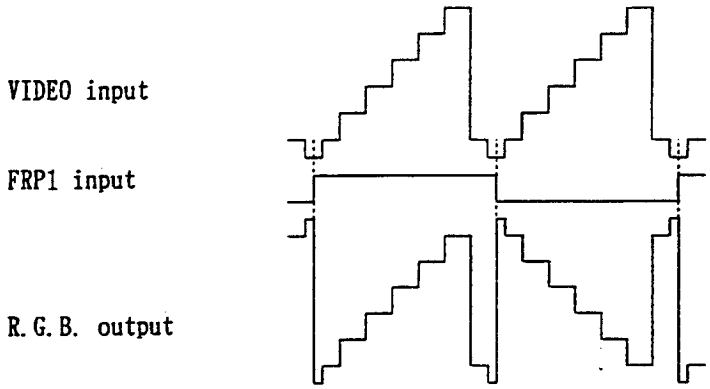
* PEAK LIMITER (Pin 46)
  The DC voltage applied to this pin sets the level of the white side peak limiter of the R.G.B. output.
* SUB CONTRAST B (Pin 47)
  The DC voltage applied to this pin fine-adjusts the contrast of the B signal. This pin is preset inside the IC.
* SUB CONTRAST R (Pin 48)
  The DC voltage applied to this pin fine-adjusts the contrast of the R signal. This pin is preset inside the IC.

ii) Functional operation
* ACC detection, ACC amplifier
  Detects the peak of the amplitude of the burst signal to form the ACC loop.
* VCO, APC detection
  The VCO local oscillator circuit is a pierce type X'tal oscillator circuit.
  Detects the phase of the burst signal and the VCO oscillation output to provide the output that controls the oscillating frequency of the VCO forming a PLL loop to eliminate the need for adjustment.
* Killer detection
  Detects the phase of the burst signal and the VCO oscillation output.
* AGC circuit
  Different AGC characteristics can be obtained according to the APL level of the luminance signal.
  The luminance signal has its high frequency components removed by the filter connected to Pin 17, then it's peak detected by the AGC detector.
* Adjusting the filter
  The resistance between Pin 12 and GND controls the frequency characteristics.
* External input switch
  The control signal to Pin 1 switches INT and EXT.
  The switch is a high speed type.

* Gamma correction and peak limiter
  Corrects the output characteristics curve as shown in right figure according to the LCD panel.
  Pins 44, 45, 46 adjust three positions where the ramp of the curve can be adjusted.



* RGB inversion
  The R.G.B. outputs (Pins 32, 34, 36) are inverted according to the FRP pulse input to Pin 39. The relationship among input, output, and invert pulse are as illustrated below when pin 40 is connected V_{cc}.



* R.G.B. output
  The push-pull is used to drive the capacitance load. The feedback that keeps the center voltage of the output signal at (VCC2-VEE)/2 is used to prevent the DC components from adding up to adversely affect the LCD panel.

iii) Precautions

* Power supply pin

Ensure Pins 7 and 31 are at the same potential and not open. Make sure the voltage applied to power supply pin must be as follows: VEE ≦ GND ≦ VCC1 ≦ VCC2.

* Range of supply voltages

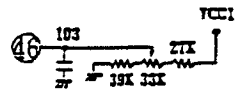
This IC's operation is recommended in the range of the supply voltage :VEE=GND=0V, VCC1=4.25V~5.25V, VCC2=11.25V~14.0V, however, it also operates with VEE=-7V~-8.75V, VCC1=4.25V~5.25V, VCC2=4.25V~5.25V, GND=0V.

* Whitebalance adjust

SUB BRIGHT R,B (Pin 41,42) and SUB CONTRAST R,B (Pin 47,48) are pre-set inside the IC. When these pre-set terminals are in operation without regulating whitebalance in LCD display system, the whitebalance could be lost by electronic components deviation in the system. Therefore, regulating the whitebalance, in someway, is recommended.

* The Peak Limiter Terminal

The voltage applied to this terminal should fall into the range of the voltages supplied by the circuit on the right.



VIII. Absolute Maximum Rating

(Unless otherwise specified Ta=25℃)

Parameter	Symbol	Conditions	Rating	Unit
Supply voltage *1	VCC2-VEE	VCC2-VEE	14.5	V
	VCC1-GND	VCC1-GND	6	V
	VEE-GND	VEE-GND	9	V
Power dissipation *2	PD	Ta≦25℃	580	mW
Derating ratio *2		Ta>25℃	5.8	mW/℃
Operating temperature range	Topr		-20~+70	℃
Storage temperature range	Tstg		-55~+150	℃
Video input pin signal voltage	VIN		3	V_{p-p}
Each adjust pin voltage *3	VIN1		VCC1	V
SYNC OUT output withstand voltage	VSD		VEE+14.5	V

*1 Ensure Pin 7 and Pin 31 are at the lowest electrical potential.

*2 This specification is just for the device, therefore, the power dissipation of the actual usage on the applicaation should be well considered on customer's side.

*3 Applies to Pins 2, 11, 23, 25, 38, 41, 42, 43, 44, 45, 46, 47 and 48.

Operating supply voltage range	VCC1-GND	4.25 ~ 5.25	V
	VCC2-VEE	11.25~ 13.75	V
	VEE-GND	0, -7.5~ -8.75	V

Recommended operating conditions

Parameter	Symbol	Conditions	Rating	Unit
Operating supply voltage	VCC2	GND=0V	11.25~14.0	V
	VCC1	GND=0V	4.25~5.25	
	VEE	GND=0V	0	
VIDEO IN input signal voltage *4	VVI		0.7	Vp-p
EXT RGB IN input signal voltage *4	VEXT (A)		0.7	Vp-p

*4 Determined by the amplitude between the pedestal level and the white level.

No.	Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit
70	External sync input voltage	Veth	Increase the voltage on (C) from 0V and measure the voltage on (C) that causes TP22 to go from "Low" (≒GND) to "High" (≒VCC).	1.1		2.1	V
71	H filter output gain	Ghf	With SG1(0.286Vp-p) applied to (A). Let the amplitude on TP18 be v1. $Ghf = 20 \log \frac{v1}{0.286}$	2	4		dB
72	H filter output propagation delay time (1)	tpHL(HF)	With SG1(0.286Vp-p) applied to (A), measure the prpagation delay time to TP18.		500		ns
73	H filter output propagation delay time (2)	tpLH(HF)			500		ns
74	Sync separator output propagation delay time(1)	tpHL (sync)	With SW19→b SG1(0.28Vp-p) applied to (A), measure the propagation delay time to TP20.	0.4	0.7	1.2	μs
75	Sync separator output propagation delay time(2)	tpLH (sync)		0.8	1.3	1.9	μs

vi) Interface section (Refer to Test circuit for interface section)
Unless otherwise specified: SW1→a, SW32→b, SW34→b, SW36→b, SW38→a, SW39→a, SW41→b, SW42→b, SW44→a, SW47→b, SW48→b, VCC1=4.5V, VCC2=12V, Ta=25℃ V1=4.50V, V2=2.25V, V40=4.50V, V43=1.5V, V44=2.0V, V45=2.4V, V46=3.5V and SG1(4.5Vp-p) applied to (C), SG9 applied to (I).

No.	Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit
62	Demodulation output ratio (2)	G-Y/B-Y	Let the amplitude causing the maximum amplitude on TP34 be VG. Let the amplitude causing the maximum amplitude on TP36 be VB. $\frac{R-Y}{B-Y} = \frac{VR}{VB}$, $\frac{G-Y}{B-Y} = \frac{VG}{VB}$	0.25	0.32	0.39	
63	Demodulation relative phase (1)	$\frac{\theta(R-Y)}{\theta(B-Y)}$	With SW10→b, and SG5(0dB) applied to (B), allow the chroma phase to change. Let the angle causing the maximum amplitude on TP32 be θR. Let the angle causing the maximum amplitude on TP34 be θG. Let the angle causing the maximum amplitude on TP36 be θB. $\frac{\theta(R-Y)}{\theta(B-Y)} = \theta R-\theta B$, $\frac{\theta(G-Y)}{\theta(B-Y)} = \theta G-\theta B$	95	105	115	degree
64	Demodulation relative phase (2)	$\frac{\theta(G-Y)}{\theta(B-Y)}$		230	240	250	degree
65	TINT variable range(1)	θ+	With SW10→b, and SG5(0dB) applied to (B), allow the chroma phase to change. Let the angle causing the maximum amplitude on TP36 be θ1 in the case of V25=1.5V. Let the angle causing the maximum amplitude on TP36 be θ2 in the case of V25=2.7V.	35	50		degree
66	TINT variable range(2)	θ-		-35	-50		degree

(to be continued)

No.	Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit
21	SUB CONTRAST R input impedance	Z48			75		kΩ
22	VIDEO IN pin voltage	V10			1.8		V
23	AGC OUT pin voltage	V13			0		V
24	TRAP OUT pin voltage	V15			2.0		V
25	APL pin voltage	V17			2.0		V
26	H FILTER OUT pin voltage	V18			3.0		V
27	SYNC SEP pin voltage	V19			1.7		V
28	VCO OUT pin voltage	V26			2.6		V
29	VCO IN pin voltage	V28			3.9		V
30	RGB AMPLITUDE pin voltage	V38			2.1		V
31	SUB BRIGHT B pin voltage	V41			2.1		V
32	SUB BRIGHT R pin voltage	V42			2.1		V
33	SUB CONTRAST B pin voltage	V47			2.5		V
34	SUB CONTRAST R pin voltage	V48			2.5		V
35	ƒ2 pin voltage	V44			2.5		V

ii) Supply voltage characteristics (Refer to Test circuit for supply voltage characteristics)

Unless otherwise specified: VCC1=4.5V, VCC2=12V, Ta=25℃, SG1(0.286Vp-p) applied to (A), SG9 applied to (E), and no input to (C), V1=2.25V, V11=2.25V, V23=2.25V, V25=2.7V, V43=1.50V, V45=3.5V, V46=3.5V
Note that V2 - V46 are the voltages that divides VCC1 in the ratio of the two resistances between VCC1 and GND. Therefore they will change with VCC1.

No.	Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit
86	RGB output DC voltage variable range (1)	ΔVRGB (1)	With (E), (F), (G)=GND, SW35→b, V35=1V, adjust V43 to set the amplitude on TP34 to 0V and measure the changes in voltage on TP32, TP34, and TP36.	1			V
87	RGB output DC voltage variable range (2)	ΔVRGB (2)	With (E), (F), (G)=GND, SW35→b, V35=3.7V, adjust V43 to set the amplitude on TP34 to 0V and measure the changes in voltage on TP32, TP34, and TP36.			-4	V
88	Character amplitude difference among RGB	ΔVSRGB	With V45=3.5V, (A)=GND, SW44→b, SG8(4.5Vp-p) applied to (J) and SG8(0.3Vp-p) applied to (E), (F) and (G), mesure the amplitude differences (white-black) on TP32, TP34 and TP36.			±500	mV
89	Frequency characteristics	Gf	With SW32, SW34, SW36→a, V45= 3.5V, SG7(100kHz) applied to (E), (F), and (G), adjust the amplitude of SG7 such that the amplitudes of the sine waves on TP32, TP34, and TP36 are 4Vp-p. Increase the frequency of the input sine wave until the amplitudes of the sine waves (to be continued)		4		MHz

No.	Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit
76	Interface gain	GvI	With SG2 applied to (E), (F), and (G), measure the amplitude (white-black) on TP32, TP34, and TP36. Let these measured amplitudes be, v32, v34, and v36 respectively. $GvI = \frac{v32(v34,\ v36)}{0.714}$	13	16	18	dB
77	Brightness adjust variable range (1)	ΔVb(1)	(E), (F), (G)=GND, V43=0.9V Measure the amplitudes (black-black) on TP32, TP34, and TP36.	8			Vp-p
78	Brightness adjust variable range (2)	ΔVb(2)	(E), (F), (G)=GND, V43=2.3V Measure the amplitudes (black-black) on TP32, TP34, and TP36. (Assign the negative value if they are not in the same phase as when V45=1.50V.)			1.5	Vp-p
79	RGB output black level voltage difference	ΔVbI	With (E), (F), (G)=GND, Measure the black level voltage difference from the average between maximum and minimum black level voltage on TP32, TP34, and TP36 when they are inverted and non-inverted.			±175	mV
80	RGB output amplitude adjust variable range	ΔVRGB	With (E), (F), (G)=GND, V38=1.8V, 2.6V, measure the amplitude differences (black-black) on TP32, TP34, and TP36 between SW38→b and SW38→a.	±2	±3		V

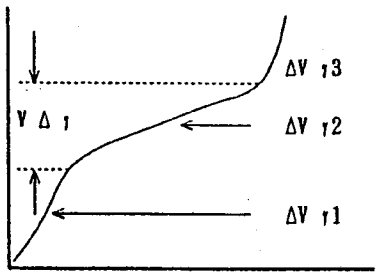
No.	Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit
50	Image quality adjust	ΔGp	SW14→a With SG4(f=1.8MHz) applied to (A), V23 is changed to 1.6V then 3V. The amplitude of the 1.8MHz component on TP34 at these two V23 voltages shall be v1 and v2, respectively. $\Delta Gp = 20 \log \frac{v1}{v2}$	4	7		dB
51	Trap attenuation	Gtf	With SG6(f=100kHz) to (A), observe the waveform on TP15, the amplitude of the 100kHz component of the signal shall be v0. Then, apply SG6(f=3.58MHz) the amplitude of the 3.58MHz component on TP15 shall be v1. $Gtf = 20 \log \frac{v1}{v0}$	-30	-45		dB
52	DC reproduction ratio	K	With SG3(APL=10%, 0dB) applied to (A), measure the amplitude (black-black) on TP34. Let the measured amplitude be V1. (to be continued)	95			%

No.	Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit
36	Current dissipation (Pin 6)	ICC1			26	34	mA
37	Current dissipation(Pin 33)	ICC2			3	6	mA
38	Luminance maximum gain supply voltage characteristics		With VCC1=4.25V ~ 5.25V, V2=1.5V SG3(APL=10%, variable amplitude applied to (A). Adjust the input amplitude such that the amplitude (black-white) of the output on TP34 is 6V. Let this input amplitude be v1. $Gvmax = 20 \log \frac{6}{v1}$	23	26	29	dB
39	Dependability of ACC on supply voltage	ACCG	With SG5(0dB, burst/chroma phase=180°) applied to (A) and SG1(4.4Vp-p) applied to (C), measure the change in TP36 amplitude as VCC1 is changed from 4.25V to 5.25V. $ACCG = 20 \log \frac{Vmax}{Vmin}$		2	4	dB

No.	Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit
			Let the angle causing the maximum amplitude on TP36 be θ3 in the case of V25=3.5V. θ+=θ1-θ2, θ-=θ3-θ2				
67	Demodulation output residual carrier	vCAR	With (E)=open, and SG5(0dB) applied to (A), adjust the chroma phase so that the amplitude on TP36 is at its maximum. Observe TP36 with a spectrum analyzer to measure the ratio of v1 to v0, where v1 is the 7.15909Hz component, v0 being the 15.734kHz component. $vCAR = 20 \log \frac{v1}{v0}$	-25	-40		dB

v) Sync section (Refer to Test circuit for luminance, chroma, sync sections)
Unless otherwise specified: VCC1=4.5V, VCC2=12V, Ta=25℃, SW10→a, SW14→b, SW19→a, SW22→b, SW24→a, V2=2.25V, V11=2.25V, V14=1.50V, V23=2.25V, V25=2.70V, V43=1.5V, V45=3.5V, V46=3.5V

No.	Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit
68	Sync separator input sensitivity current	Iis	Allow the current to flow out of (D), and measure the input current that causes TP20 to go from "High"(≒VCC) to "Low" (≒GND).		28		uA
69	Sync separator output ON-state voltage	Von	Measure the output voltage on TP20.			0.6	V

No.	Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit
96	RGB INV threshold voltage	Vthinv	With (E), (F), (G)=GND, increase V40 from 0V until the signals from TP32, TP34, and TP36 are inverted. Measure the voltage on V40 that inverts these signals.	1.8		3.0	V
97	Gamma correction characteristics (1)	$\Delta V_\gamma 1$	With (E), (F), (G)=SG10, measure the gradient at each specific point on the output waveform. With V44=1.8V, measure $\Delta V_\gamma 3$.		200		mV/μs
98	Gamma correction characteristics (2)	$\Delta V_\gamma 2$	With SW44=2.0V, measure $V\Delta_\gamma$.		65		mV/μs
99	Gamma correction characteristics (3)	$\Delta V_\gamma 3$			200		mV/μs
100	Gamma correction characteristics (4)	$V\Delta_\gamma$			1.5		V

IX. Electrical Characteristics

i) DC characteristics

Unless otherwise specified, VCC1=4.5V, VCC2=12V, Ta=25℃

No.	Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
1	SW "H" input current	IH1	V1=4.5V			0.1	μA
2	SW "L" input current	IL1	V1=0V		-2	-6	μA
3	CONTRAST input current	I2	V2=3.5V		0.3	1	μA
4	COLOR input current	I11	V11=3V		0.3	1	μA
5	SYNC IN "H" input current	IH21	V21=4.5V			0.1	μA
6	SYNC IN "L" input current	IL21	V21=0V		-1	-3	μA
7	PICTURE input current	I23	V23=3V		0.3	1	μA
8	TINT input current	I25	V25=4.5V		0.3	1	μA
9	FRP input current	I39	V39=0V		-1	-4	μA
10	RGB INV input current	I40	V40=0V		-1	-4	μA
11	BRIGHT input current	I43	V43=1.7V		0.2	1	μA
12	r1 input current	I45	V45=3.5V		0.2	1	μA
13	PEAK LIMITER input current	I46	V46=3.5V		0.5	2.5	μA
14	r2 input impedance	Z44			45		kΩ
15	VIDEO IN input impedance	Z10			16		kΩ
16	TRAP OUT input impedance	Z15			1		kΩ
17	RGB AMPLITUDE input impedance	Z38			75		kΩ
18	SUB BRIGHT B input impedance	Z41			75		kΩ
19	SUB BRIGHT R input impedance	Z42			75		kΩ
20	SUB CONTRAST B input impedance	Z47			75		kΩ

No.	Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit
			Then, with SG3(APL=90%, 0db) applied to (A), measure the amplitude (black-black) on TP34. Let the measured amplitude be V2. $K = \frac{V1 - V1\text{-}V2}{V1} \times 100$				

iv) Chroma section (Refer to Test circuit for luminance, chroma, sync sections)
Unless otherwise specified: VCC1=4.5V, VCC2=12V, Ta=25℃, SW10→a, SW14→b, SW19→a, SW22→a, SW24→a, SG1(4.5Vp-p) applied to (C), SG9 applied to (E), V2=2.25V, V11=2.25V, V23=2.25V, V14=1.5V, V25=2.70V, V43=1.50V, V45=3.5V, V46=3.5V

Note: The amplitude refers to the amplitude of the color difference signal.

No.	Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit
53	ACC characteristics (1)	GA1	With SG5(0dB, +6dB, -25dB, burst/chroma phase = ±180°) applied to (A), measure the amplitude of waveform on TP36 at 0dB, +6dB, and -25dB. Let the measured amplitude for each input (to be continued)		0	2	dB

No.	Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit
42	Contrast adjust gain variable range (1)	Gct1	With SG2(-6dB) applied to (A), observe the waveform on TP34 as V2 is changed to 1.5V, 2.25V then 3V. The amplitude between the black level and the white level at these V1 voltages shall be V1, V0, and V2, respectively. $Gct1 = 20 \log \frac{V1}{V0}$, $Gct1 = 20 \log \frac{V2}{V0}$	2	5.5		dB
43	Contrast adjust gain variable range (2)	Gct2		-20			dB
44	AGC amplitude characteristics (1)	val1	With SG3(0dB) applied to (A), observe the waveform on TP34 as APL is changed to 10%, 50% then 90%. The amplitude between the black level and the white level at these APL shall be val1, val2, and val3, respectively.	5.8	6.9	8.2	V
45	AGC amplitude characteristics (2)	val2		4.0	6.0	7.1	V
46	AGC amplitude characteristics (3)	val3		3.0	3.5	4.5	V
47	AGC detection output voltage (1)	Vad1	With SG3(0dB) applied to (A), when APL is changed to 10%, 50% then 90%, the voltages on TP13 shall be Vad1, Vad2, and Vad3, respectively.	2.8	3.3	3.6	V
48	AGC detection output voltage (2)	Vad2		2.0	3.0	3.4	V
49	AGC detection output voltage (3)	Vad3		0.4	0.8	1.4	V

No.	Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit
54	ACC characteristics (2)	GA2	be v0, v1, and v2. $GP1 = 20 \log \frac{v1}{v0}$ $GP2 = 20 \log \frac{v2}{v0}$	-6	-1		dB
55	ACC temperature characteristics	ΔVb	With SG5(0dB, burst/chroma phase = 180°) applied to (A), let the maximum and minimum amplitudes on TP36 be Vmax and Vmin as the ambient temperature is changed from -20℃ to +70℃. $\Delta Vb = 20 \log \frac{Vmax}{Vmin}$		1	3.5	dB
56	Color control gain variable range (1)	GC1	With SG5(0dB, burst/chroma phase = 180°) applied to (A), allow V11 to change to 1.5V, 2.25V, then 3V to measure the amplitude on TP36. Let these amplitudes be v1, v0, and v2, respectively. $GC1 = 20 \log \frac{v1}{v0}$, (to be continued)	-20			dB

No.	Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit
92	EXT→INT crosstalk	Cei	With V45=3.5V, SW39→b, V39=4V, (A)=GND, SG4(f=1MHz) applied to (E),(F), and (G), adjust the amplitude of SG4 such that the amplitudes of the sine waves on TP32, TP34, TP36 are 4V. Measure the ratio of 1MHz component of the output amplitudes on TP32, TP34, and TP36 to that obtained when above time and V1=0V using a spectrum analyzer.	-45	-52		dB
93	Peak limiter characteristics	Vpl	With V45=3.5V, V46=1.9V, SG11 applied to (E),(F), and (G), measure the white peak amplitudes on TP32, TP34, and TP36.	3.5	5.2	6.5	Vp-p
94	SW pin threshold voltage	Vthsw	With SG7(0.7Vp-p, f=100kHz) applied to (E),(F), and (G), increase V1 from 0V until the signals from TP32, TP34, and TP36 appear. Measure the voltage on V1 that causes these signals to start appearing.	1.4		2.8	V
95	FRP pin threshold voltage	Vthfrpl	With (E),(F),(G)=GND, SW39→b, increase V39 from 0V until the signals from TP32, TP34, and TP36 are inverted. Measure the voltage on V39 that inverts these signals.	1.8		3.2	V

No.	Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit
			on TP32, TP34, and TP36 are 3dB lower than when they are at the frequency of 100kHz. Measure the frequency of the input sine wave when this happens.				
90	Crosstalk between R, G and B	CTRGB	With V45=3.5V, SW39→b, V39=4V SG7(0.3Vp-p, 1MHz) applied to one of (E), (F), and (G) and other two pins connected to GND, measure the ratio of output amplitude of the 1MHz components of the signals on TP32, TP34, and TP36 using a spectrum analyzer.	-40	-47		dB
91	INT→EXT crosstalk	Cie	With V45=3.5V, V39=4V, V1=0V, SW39→b, (E), (F), (G)=GND, SG4 (f=1MHz) applied to (A), adjust V2 such that the amplitudes of the sine waves on TP32, TP34, TP36 are 4V. Measure the ratio of the 1MHz component of the output amplitudes on TP32, TP34, and TP36 to that obtained when above time and V1=4.5V using a spectrum analyzer.	-45	-52		dB

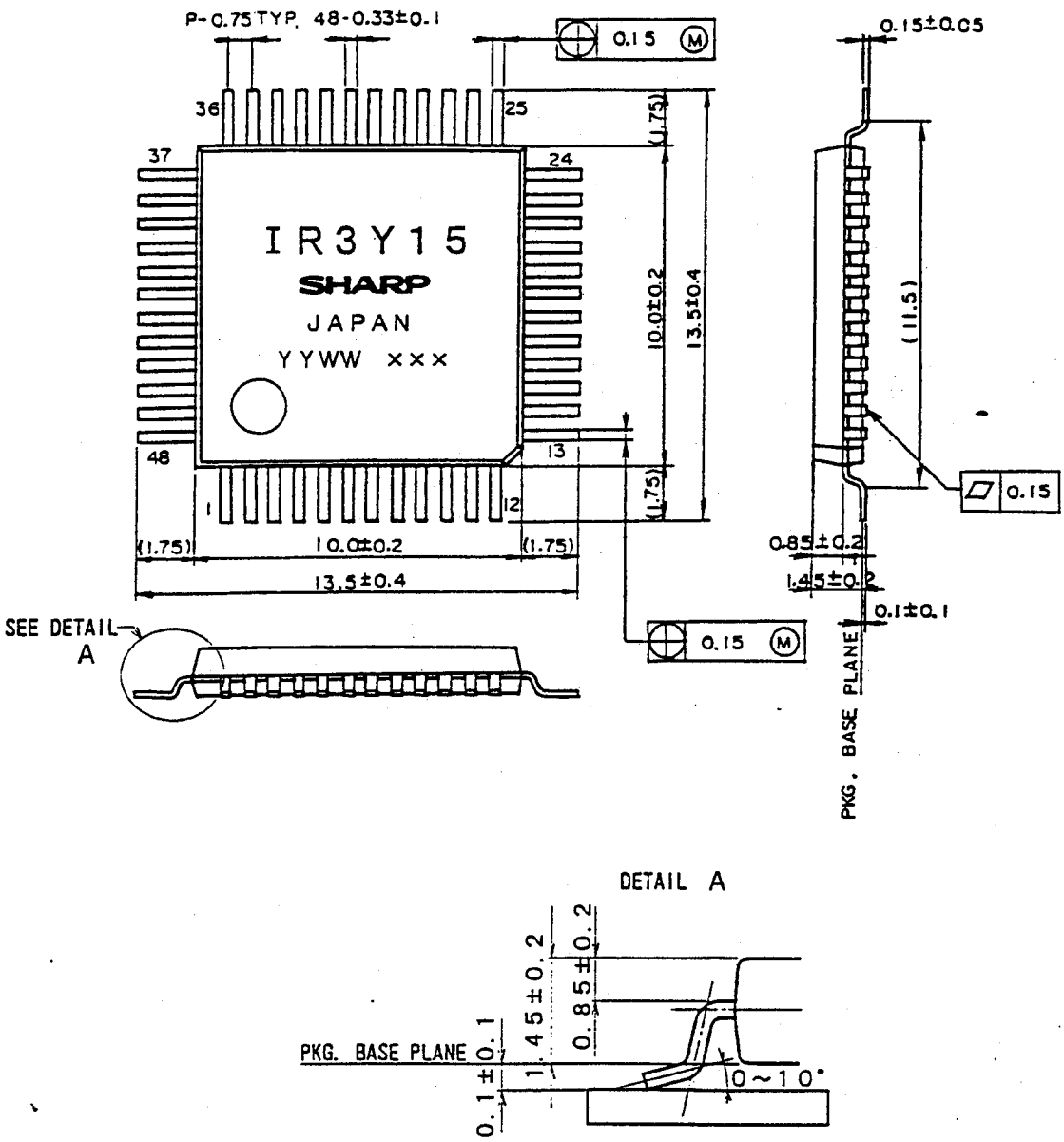
No.	Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit
57	Color control gain variable range (2)	GC2	$GC2 = 20 \log \frac{v2}{v0}$,	4	6		dB
58	APC capture range	fA	With SG6(0dB) applied to (A), allow the frequency of the burst signal to change to measure the input frequency at which the voltage on TP24 drops below 2V. Work out the difference by subtracting the measured frequency from 3.579545MHz.	±500	±1000		Hz
59	Killer operating input level	vbk	With SG5(variable amplitude, burst/chroma phase = 180°) applied to (A), observe the waveform on TP36 as decreasing the input amplitude until the killer turns on. Measure the input attenuation.		-35	-25	dB
60	Killer color ghost	vbs	With SW24→b, V2=0V, and SG5(0dB, burst/chroma phase = 180°) applied to (A), measure the amplitude of the chroma signal on TP36.		50		mVp-p
61	Demodulation output ratio (1)	R-Y/B-Y	With SG5(0dB) applied to (A), allow the chroma phase to change. Let the amplitude causing the maximum amplitude on TP32 be VR.	0.49	0.62	0.69	

(to be continued)

iii) Luminance section (Refer to Test circuit for luminance, chroma, sync sections)
Unless otherwise specified: VCC1=4.5V, VCC2=12V, Ta=25℃, SW10→a, SW14→b, SW19→b, SW22→a, SW24→a, no input to (C), SG9 applied to (E), V1=2.25V, V11=2.25V, V14=1.50V, V23=2.25V, V25=2.70V, V43=1.50V, V45=3.5V, V46=3.5V

No.	Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit
40	Luminance maximum gain	Gmax	With V2=1.5V, SG3(APL=10%, variable amplitude) applied to (A). Adjust the input amplitude such that the amplitude (black-white) of the output on TP34 is 6V. Let this input amplitude be v1. $Gmax = 20 \log \frac{6}{v1}$	22	25	28	dB
41	Luminance line gain temperature characteristics	ΔGY	With SG2 applied to (A), the maximum and the minimum of the amplitude (black-white) of the output on TP34 shall be Vmax and Vmin, respectively as the temperature is changed from -20 to +70℃. $\Delta GY = 20 \log \frac{Vmax}{Vmin}$			3	dB

No.	Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit
81	Sub-brightness adjust variable range	Vsb	With (E), (F), (G)=GND, V41=1.6V, 2.9V, V42=1.6V, 2.9V, measure the amplitude difference (black-black) on TP32, and TP36 between SW41→b, SW42→b, and SW41, SW42→a.	±1	±2		V
82	Gain difference among RGB	ΔGRGB	With SG7(0.7Vp-p, 100kHz) applied to (E), (F), and (G), measure the amplitude differences (white-black) on TP32, TP34, and TP36.			±0.85	dB
83	Sub-contrast gain adjust variable range	ΔGsc	With SG7(0.7Vp-p, 100kHz) applied to (E), (F), (G), SW47, SW48→b, and SW47, SW48→a, V47=1.6V, 3.3V, V48=1.6V, 3.3V measure the amplitude difference (white-black) on TP32, and TP36.	±0.7			dB
84	Gain difference between invert and non-invert	ΔGaI	With SG7(0.7Vp-p, 100kHz) applied to (E), (F), and (G), measure the amplitude difference invert and non-invert on TP32, TP34, and TP36			±0.85	dB
85	RGB output DC voltage	VRGB	With (E), (F), (G)=GND, adjust V43 to set the amplitude on TP34 to 0Vp-p and measure the DC voltage on TP32, TP34, and TP36.	5.80	6.00	6.20	V



名称 NAME	QFP48-P-1010	リード仕上 LEAD FINISH	TIN-LEAD PLATING	単位 UNIT	mm
シャープ株式会社 IC事業本部 SHARP CORP. IC GROUP			DRAWING NO.	AA873	

備考 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。
NOTE Plastic body dimensions do not include burr of resin.

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
Solder dipping	245℃ or less, duration less than 3 seconds/dip, total of 5 seconds	Solder bath
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℃

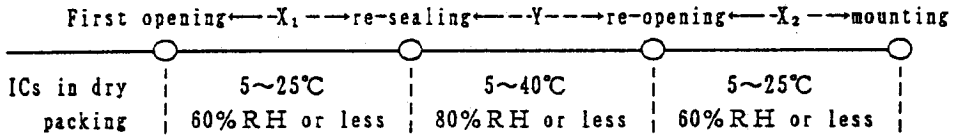
3－2. Outline dimension of tray
Refer to attached drawing

4. Storage and Opening of Dry Packing

4－1. Store under conditions shown below before opening the dry packing
(1) Temperature range : 5～40℃
(2) Humidity : 80% RH or less

4－2. Notes on opening the dry packing
(1) Before opening the dry packing, prepare a working table which is grounded against ESD and use a grounding strap.
(2) The tray has been treated to be conductive or anti-static. If the device is transferred to another tray, use a equivalent tray.

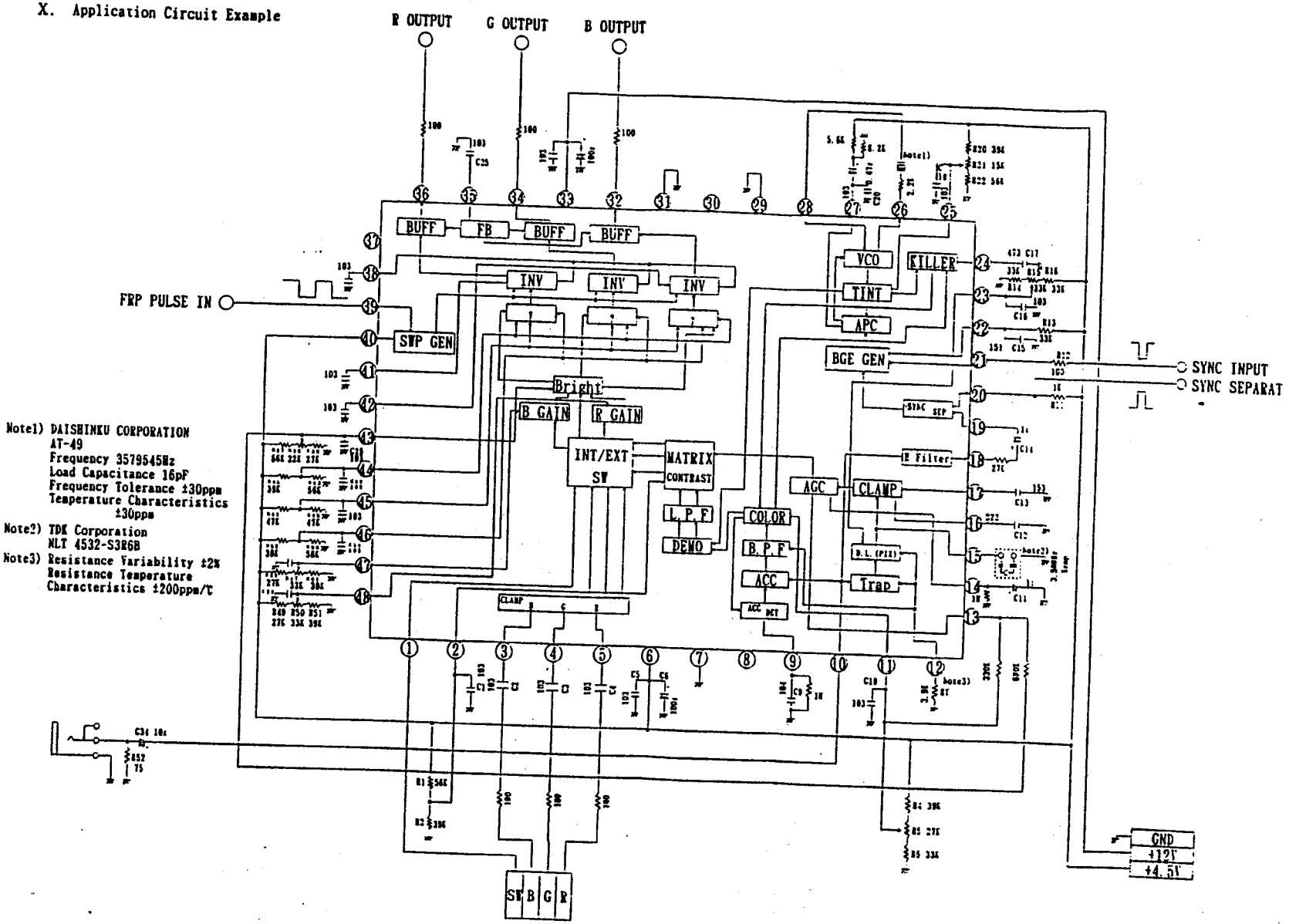
4－3. Storage after opening the dry packing
Perform the following to prevent absorption of moisture after opening.
(1) After opening the dry packing, store the ICs in an environment with a temperature of 5～25℃ and a relative humidity of 60% or less and mount ICs within 4 days after opening dry packing.
(2) To re-store the ICs for an extended period of time within 4 days after opening the dry packing, use a dry box or re-seal the ICs in the dry packing with desiccant (whoes indicater is blue), and store in an environment with a temperature of 5～40℃ and a relative humidity of 80% or less, and mount ICs within 2 weeks.
(3) Total period of storage after first opening and re-opening is within 4 days, and store the ICs in the same environment as section 4-3.(1).



X_1+X_2 : within 4 days
Y : within 2 weeks

4－4. Baking (drying) before mounting
(1) Baking is necessary
(A) If the humidity indicator in the desiccant becomes pink
(B) If the procedure in section 4－3 could not be performed
(2) Recommended baking conditions
If the above conditions (A) and (B) are applicable, bake it before mounting. The recommended conditions are 16～24 hours at 120℃ or 5～10 hours at 150℃. Note that the standard tray can not be baked. Use the heat resistant tray.
(3) Storage after baking
After baking ICs, store the ICs in the same environment as section 4-3.(1).

X. Application Circuit Example

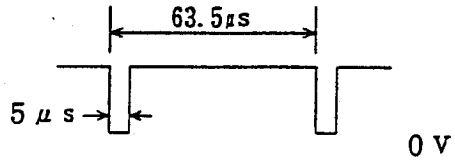
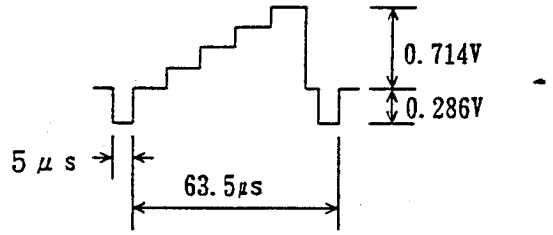
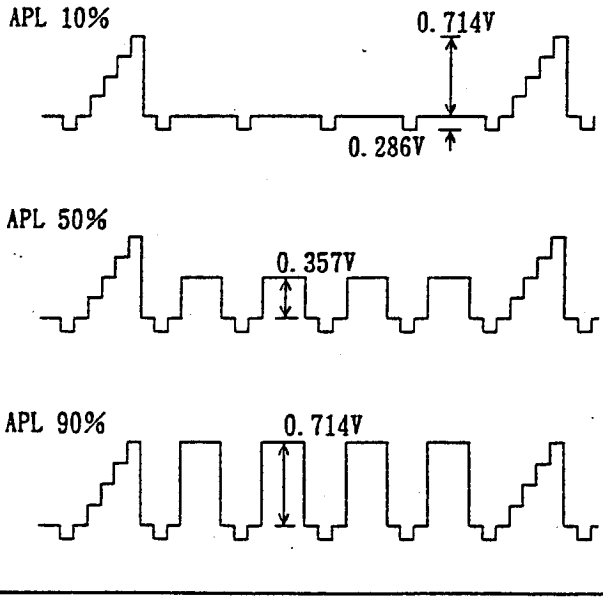


Note1) DAISHINKU CORPORATION
AT-49
Frequency 3579545Hz
Load Capacitance 16pF
Frequency Tolerance ±30ppm
Temperature Characteristics ±30ppm

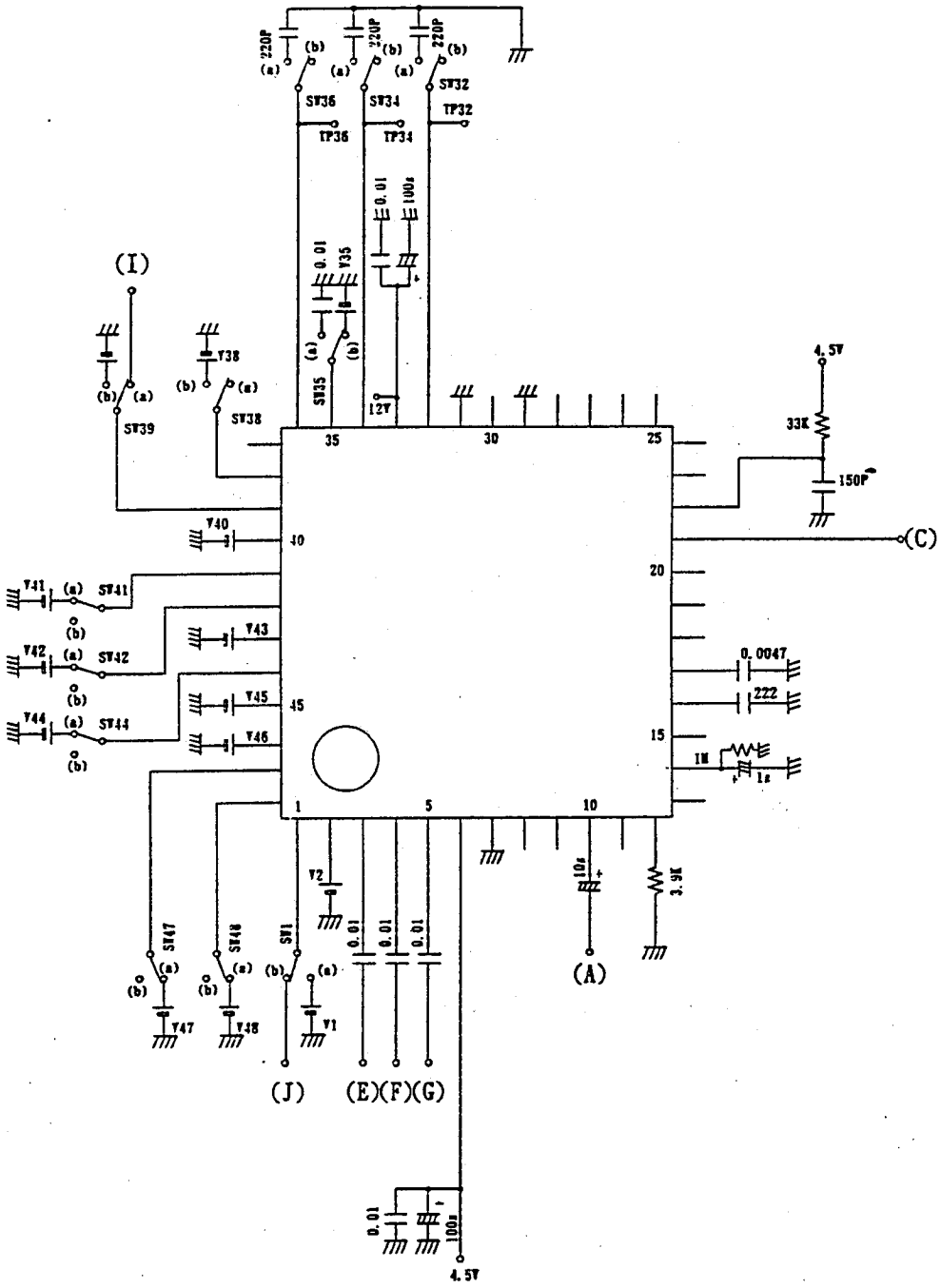
Note2) TDK Corporation
NLT 4532-S3R6B

Note3) Resistance Variability ±2%
Resistance Temperature Characteristics ±200ppm/℃

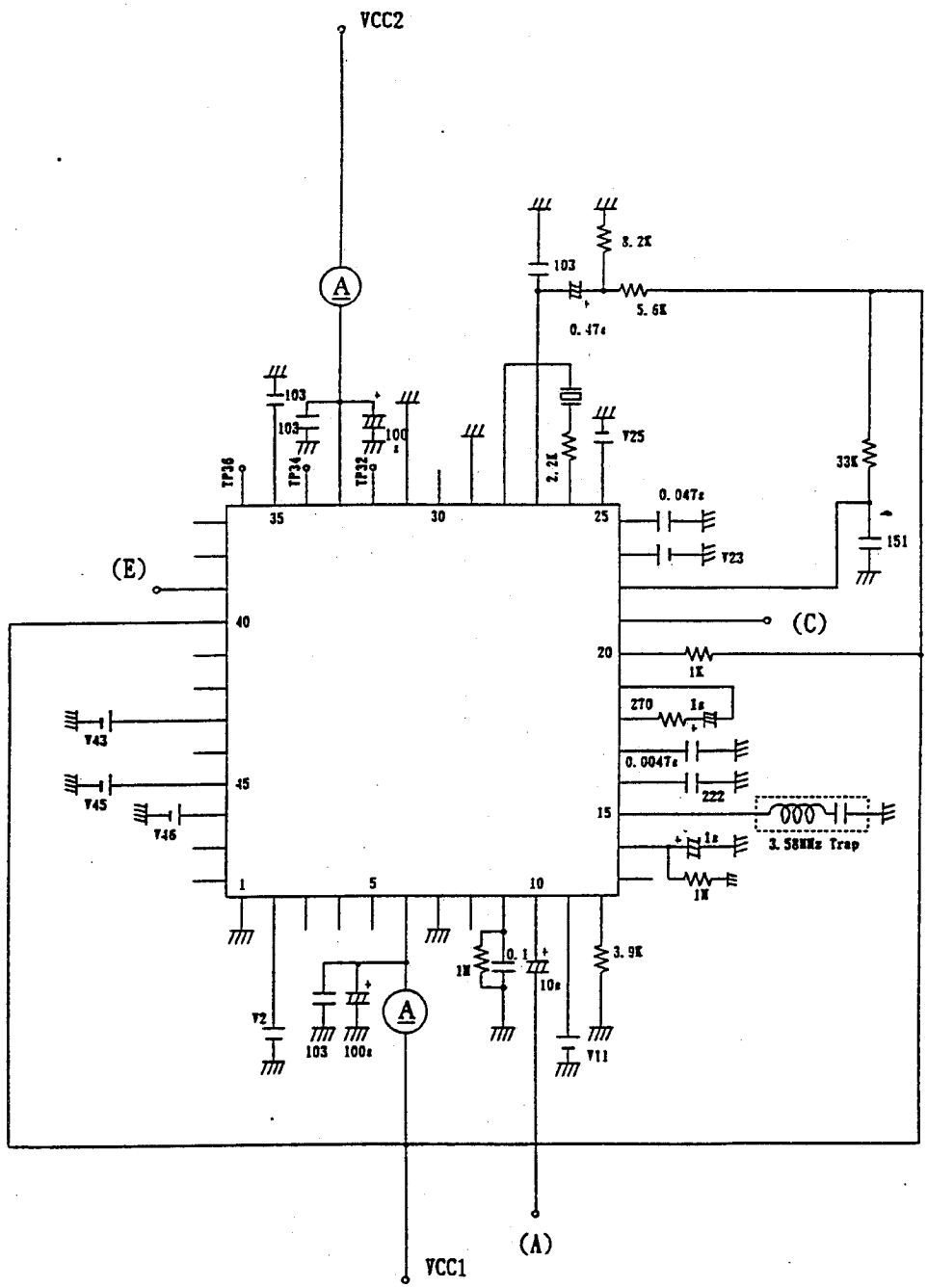
viii) Input Signals

SG NO.	Signal Name	
SG 1	Sync Signal	Synchronizing pulse, variavle amplitude 
SG 2	Video signal(1)	0dB 5step stair signal 
SG 3	Video signal(2)	Variavle APL 5step stair signal 

xi) Test circuit for interface sections



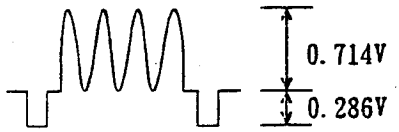
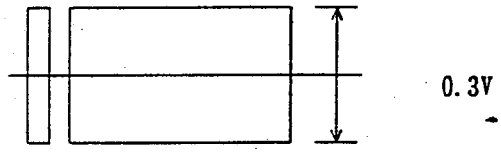
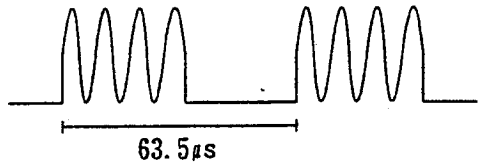
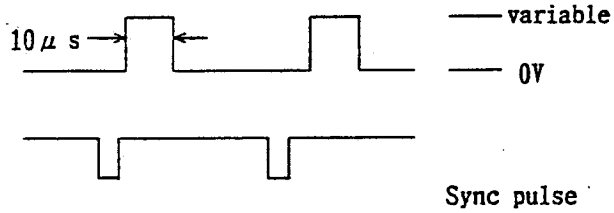
ix) Test circuit for supply voltage characteristics



vii) Switching characteristics (Refer to Switching characteristic timing chart, Test circuit for interface section.)

Unless otherwise specified: SW1→a, SW32→a, SW34→a, SW36→a, SW38→a, SW39→a
SW41→b, SW42→b, SW44→b, SW47→b, SW48→b,
VCC1=4.5V, VCC2=12V, Ta=25℃, V1=4.5V, V2=2.25V,
V40=4.5V, V43=1.5V, V45=2.4V, V46=3.5V
SG1(4.5Vp-p) applied to (C), SG9 applied to (I)

No.	Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit
101	"H→L" RGB output Propagation delay time	tpHL (RGB)	(E), (F), (G)=GND Adjust V43 such that the amplitude of TP32, TP34, and TP36 are 6Vp-p and measure the waveform of TP32, TP34, and TP36.		0.2		μs
102	"L→H" RGB output Propagation delay time	tpLH (RGB)			0.2		μs
103	RGB output Fall time	tTHL (RGB)	(E), (F), (G)=GND Adjust V43 such that the amplitude of TP32, TP34, and TP36 are 6Vp-p and measure the waveform of TP32, TP34, and TP36.		0.2		μs
104	RGB output Rise time	tTLH (RGB)			0.2		μs
105	"H→L" INT/EXT SW propagation delay time	tpHL (SW)	SW1→b, (E), (F), (G)=GND, SG8 applied to (J), SG11 applied to (A), and measure the waveform of TP32, TP34, and TP36.		0.2		μs
106	"L→H" INT/EXT SW propagation delay time	tpLH (SW)			0.2		μs

SG NO.	Signal name	
SG 4	Video signal(4)	Sine video signal. variable frequency 
SG 5	Chrominance signal	Burst and chroma amplitude 300mVp-p Burst and chroma frequency 3.579545MHz Variable chroma phase 
SG 6	Sine signal	Sine signal amplitude 300mVp-p, variable frequency
SG 7	Video signal(5)	Sine video signal. variable frequency and amplitude 
SG 8	SW signal	Synchronized with sync pulse variable amplitude. tr, tf < 50ns 

XI. PACKAGE AND PACKING SPECIFICATION

1. Package Outline Specification

Refer to drawing No. AA873

2. Markings

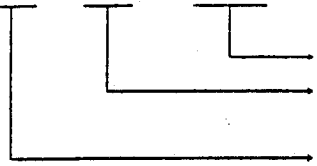
2−1. Marking contents

(1) Product name : IR3Y15

(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 (1~3)

Denotes the production week. (01,02,03,・・・・・52,53)

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. AA873

(This layout do not define the dimensions of marking character and marking position.)

3. Packing Specification (Dry packing for surface mount packages)

Dry packing is used for the purpose of maintaining IC quality after mounting packages on the PCB (Printed Circuit Board).

When the epoxy resin which is used for plastic packages is stored at high humidity, it may absorb 0.15% or more of its weight in moisture. If the surface mount type package for a relatively large chip absorbs a large amount of moisture between the epoxy resin and insert material (e.g. chip,lead frame) this moisture may suddenly vaporize into steam when the entire package is heated during the soldering process (e.g. VPS). This causes expansion and results in separation between the resin and insert material, and sometimes cracking of the package. This dry packing is designed to prevent the above problem from occurring in surface mount packages.

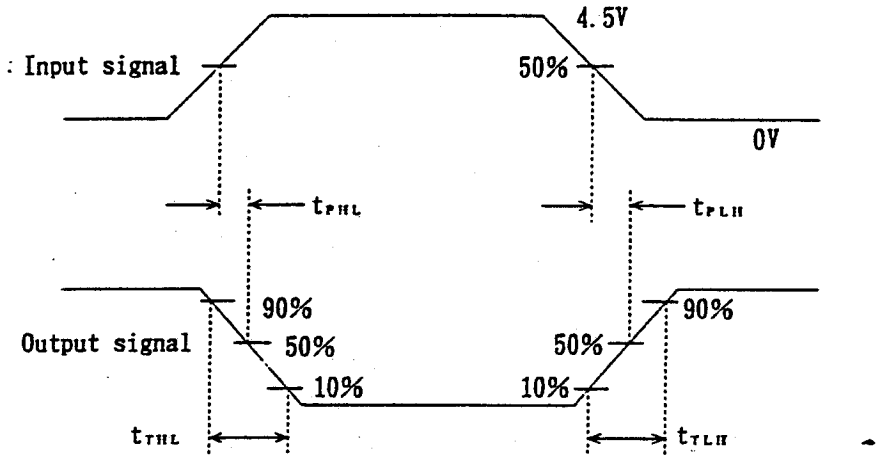
3−1. Packing Materials

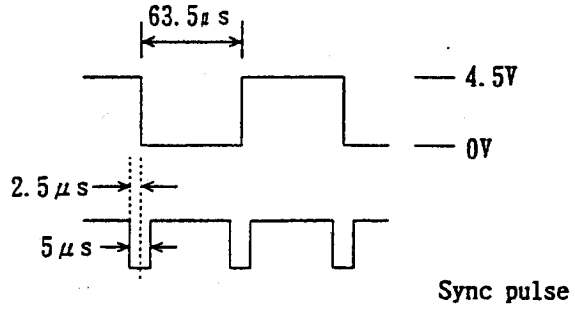
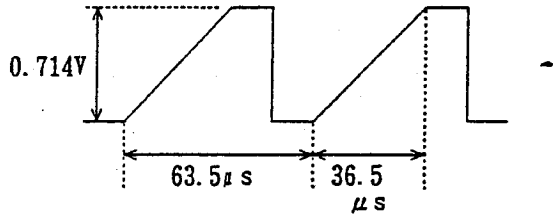
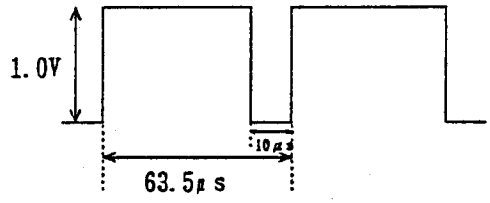
Material Name	Material Specificaiton	Purpose
Tray	Conductive plastic (80devices/tray)	Fixing of device
Upper cover tray	Conductive plastic (1tray/case)	Fixing of device
Laminated aluminum bag	Aluminum polyethylene (1bag/case)	Drying of device
Desiccant	Silica gel	Drying of device
Rubber band	Rubber (6pcs/case)	Fixing of tray
Inner case	Card board (800devices/case)	Packaging of device
Label	Paper	Indicates part number,quantity and date of manufacture
Outer case	Card board	Outer packing of tray

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

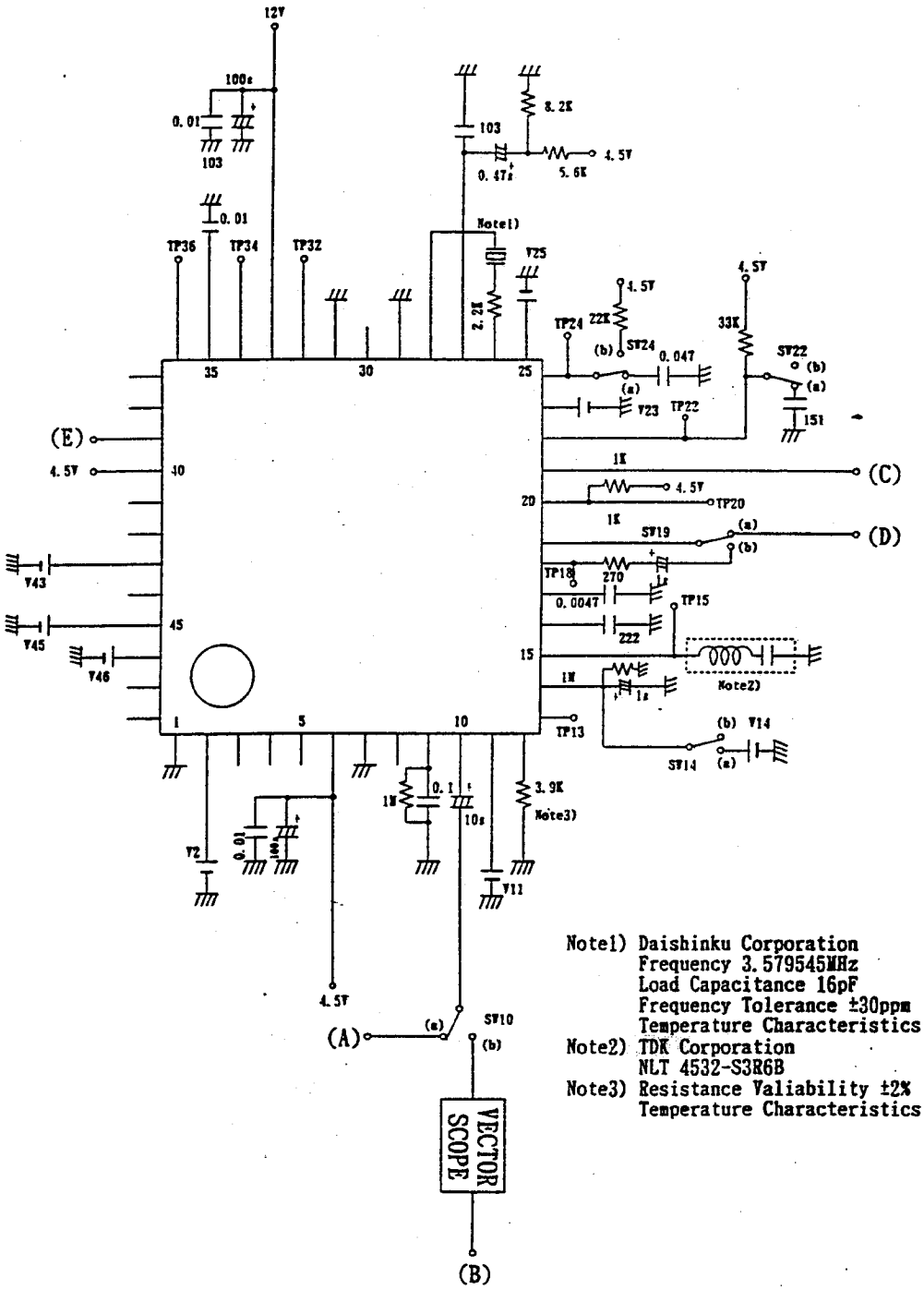
ISSUE DATE	'94.03.23				(NOTE)
ISSUE NUMBER	I40323-02				
S/C NUMBER	IR3Y15				(DOCUMENT No. 873-TDE)

xii) Switching characteristic timing chart

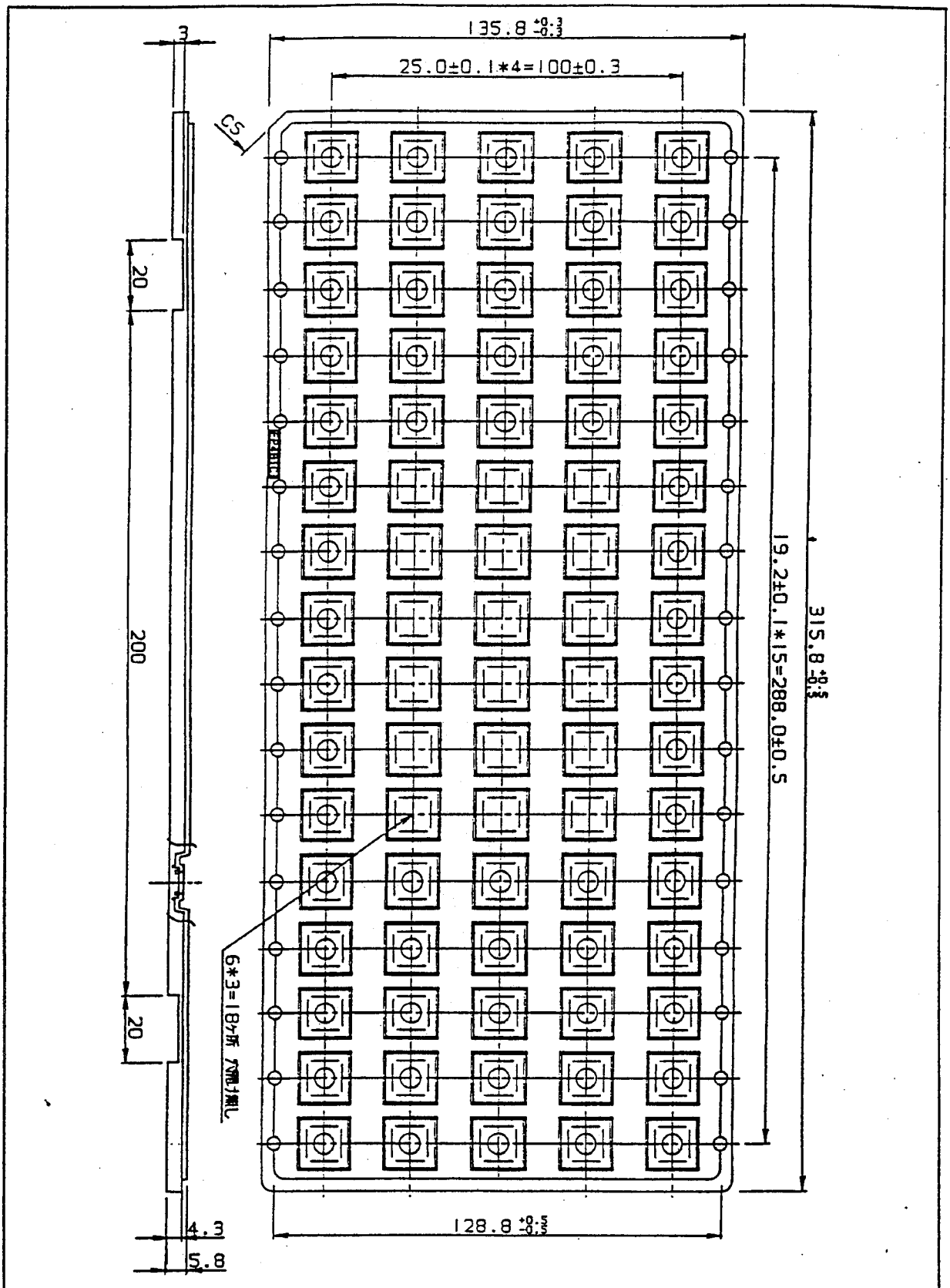


SG NO.	Signal name	
SG 9	FRP pulse	tr. tf < 50ns 
SG10	Video signal(7)	
SG11	Video signal(8)	

x) Test circuit for luminance, chroma and sync sections



Note1) Daishinku Corporation
Frequency 3.579545MHz
Load Capacitance 16pF
Frequency Tolerance ±30ppm
Temperature Characteristics
Note2) TDK Corporation
NLT 4532-S3R6B
Note3) Resistance Valiability ±2%
Temperature Characteristics



名称 NAME	FP48TCI	単位 UNIT	mm	備考 NOTE
シャープ株式会社 IC事業本部 SHARP CORP. IC GROUP		DRAWING NO.	CV561	