SHARP

JUL 22 1993

TO:

DEVICE SPECIFICATION FOR

VIDEO PROSECCING IC FOR LCD COLOR VIEWFINDER

MODEL NO. I R 3 Y 0 5

SPEC NO.: EL047045

ISSUE : JUL.24.1992

CUSTOMERS APPROVAL

DATE:

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I . Description

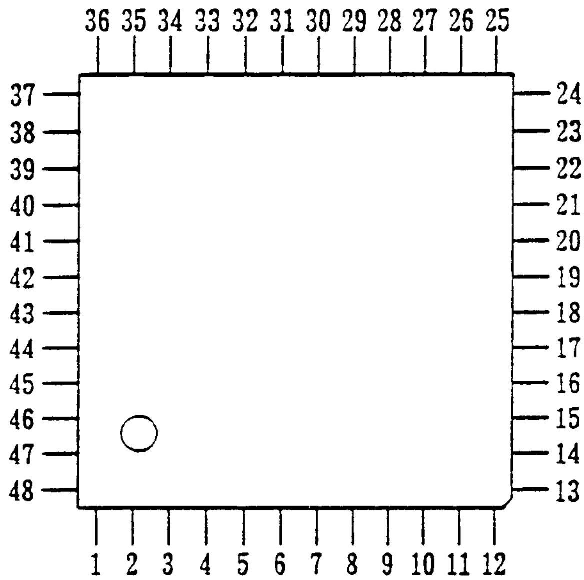
The Sharp IR3Y05 has a compact multi-functional IC with a luminance, chroma, and interface circuits for the NTSC LCD color viewfinders all integrated onto a single chip.
This IC contains various filters reducing the number of external devices required. It also contains a luminance AGC circuit, a gamma correction circuit to meet the specific requirements of the LCD panel.

Applications:
NTSC LCD color viewfinders

Features:
(1) Low power dissipation (145mW TYP.)
(2) 3.58MHz B.P.F., 3.58MHz TRAP,
D.L. built-in
(3) APC non regulating
(4) Built-in secondary differential type 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

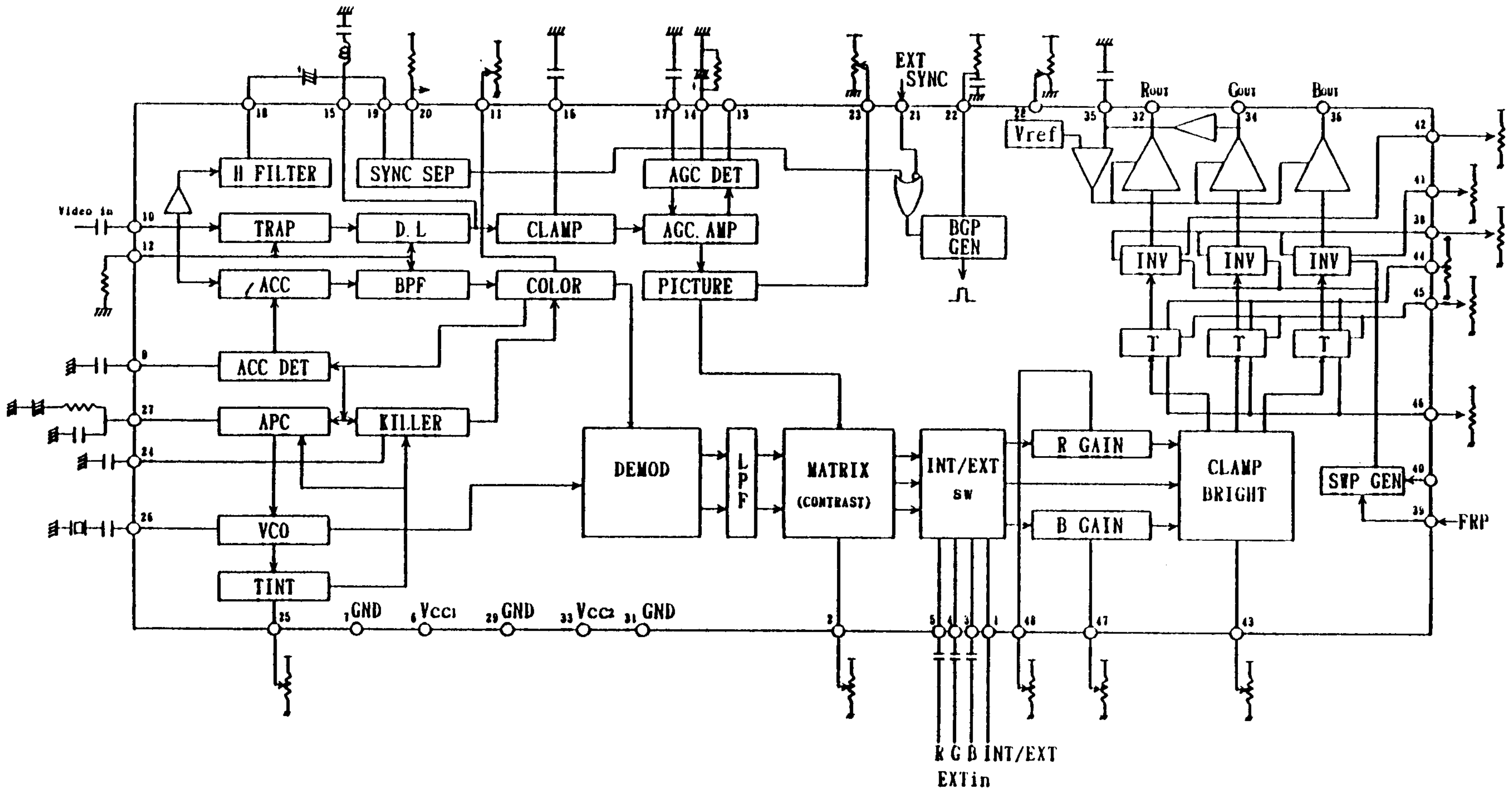
II . Terminal Connections (TOP VIEW)



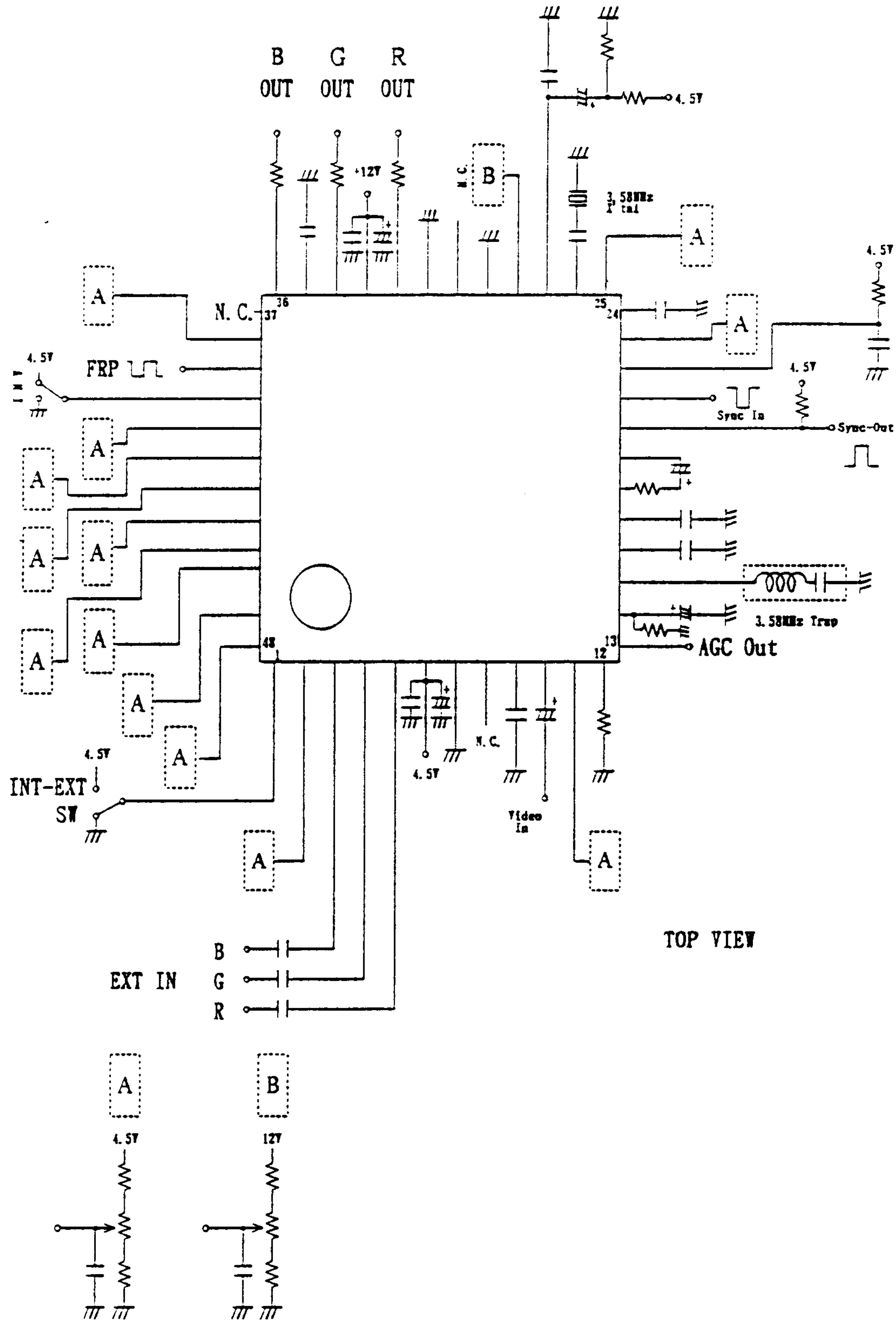
Ⅲ. Terminal Name

Pin NO.	Terminal name	Pin NO.	Terminal name
1	SW	25	TINT
2	CONTRAST	26	VCO
3	EXT IN B	27	APC FILTER
4	EXT IN G	28	OUT DC CONTROL
5	EXT IN R	29	GND
6	VCC1	30	N.C.
7	GND	31	GND
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

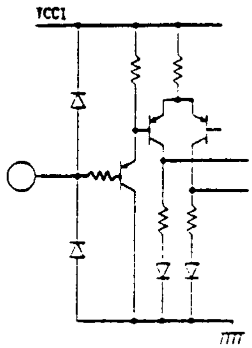


V . Basic Connection Diagram

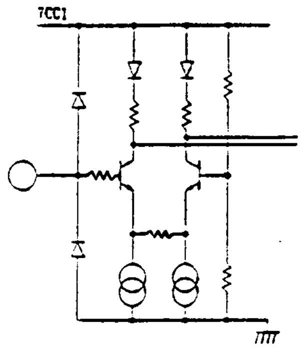


Ⅵ . Input/Output Circuit Type

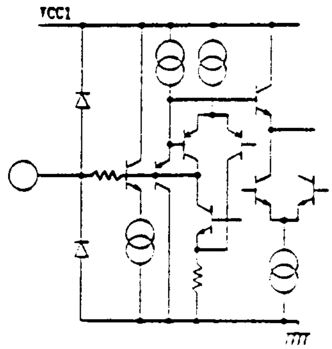
① SW



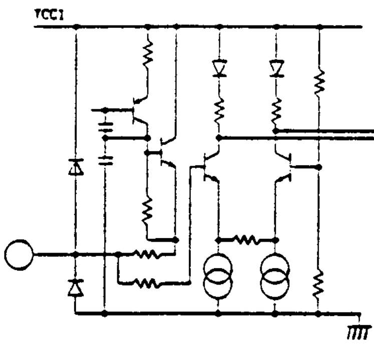
② CONTRAST
COLOR



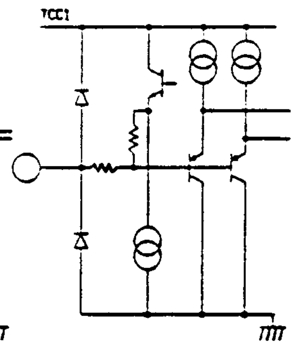
③ EXT IN B
④ EXT IN G
⑤ EXT IN R



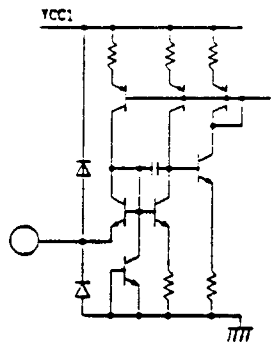
ACC FILTER



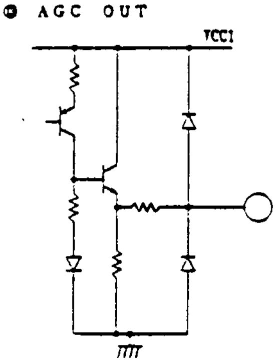
VIDEO IN



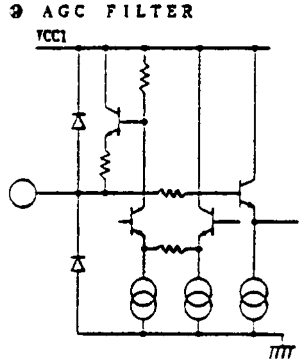
F ADJ



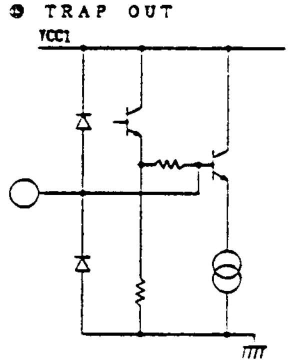
AGC OUT



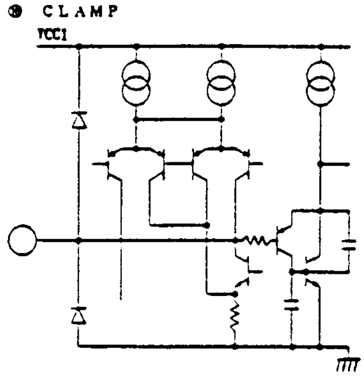
AGC FILTER



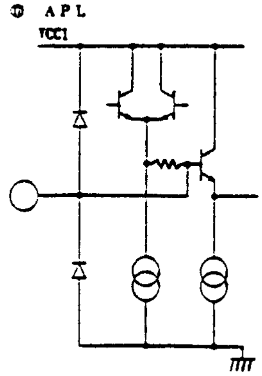
TRAP OUT



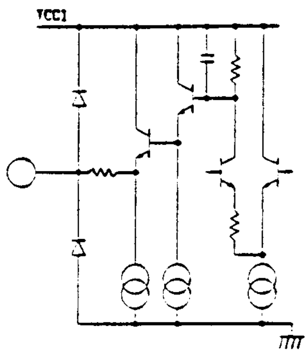
CLAMP



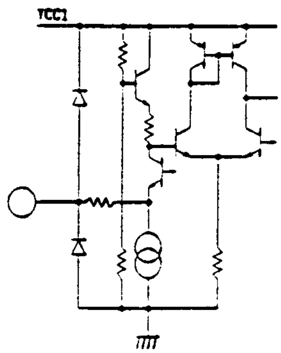
APL



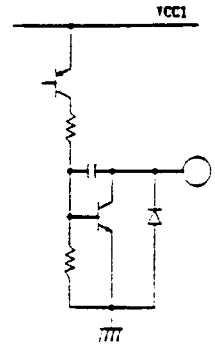
H FILTER OUT



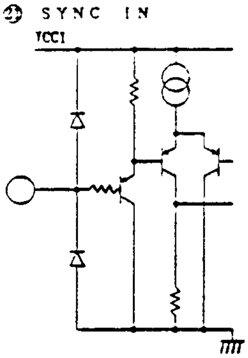
SYNC SEP



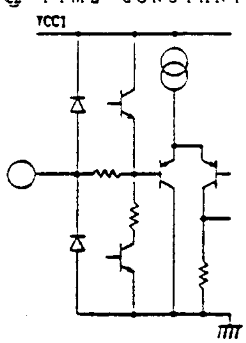
SYNC OUT



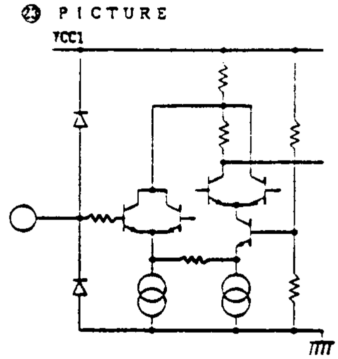
㉑ SYNC IN



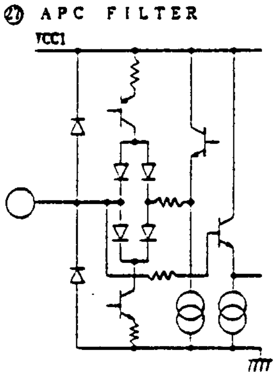
㉒ TIME CONSTANT



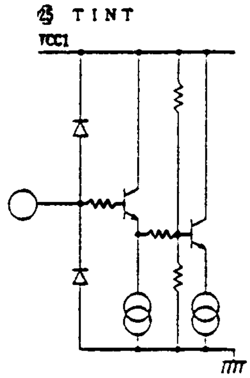
㉓ PICTURE



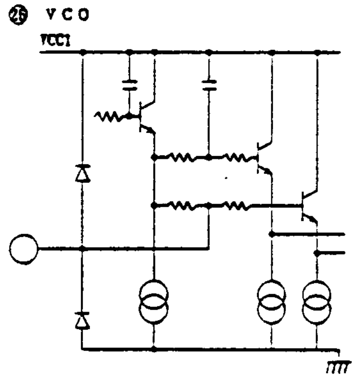
㉔ KILLER FILTER
㉗ APC FILTER



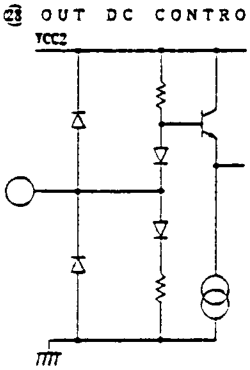
㉕ TINT



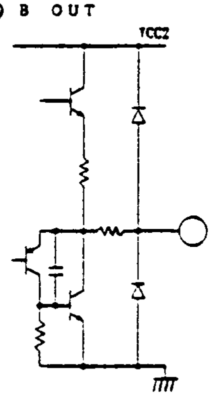
㉖ VCO



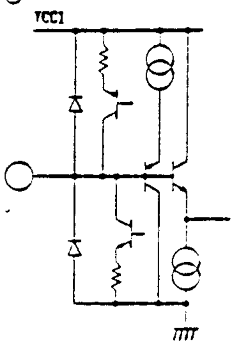
㉘ OUT DC CONTROL



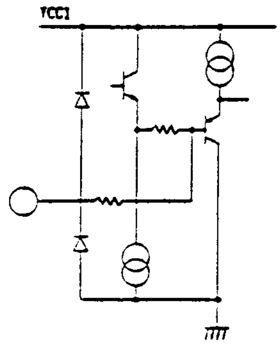
㉜ R OUT
㉞ G OUT
㊱ B OUT



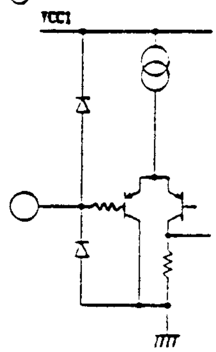
35 OUT DC DET



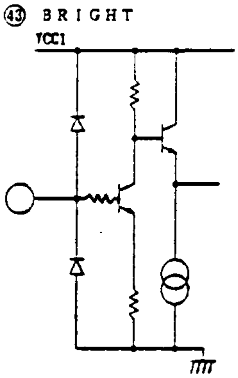
38 RGB AMPLITUDE
41 SUB BRIGHT B
42 SUB BRIGHT R
44 GAMMA2



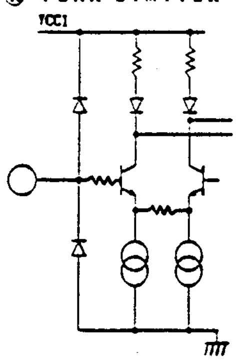
39 FRP
40 RGB INV



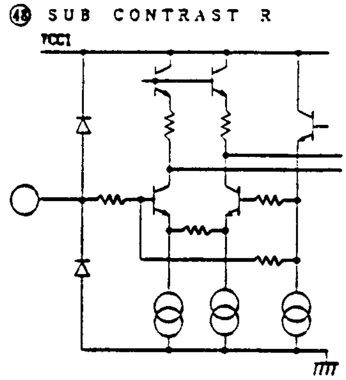
43 BRIGHT



45 GAMMA1
46 PEAK LIMITER



47 SUB CONTRAST B
48 SUB CONTRAST R



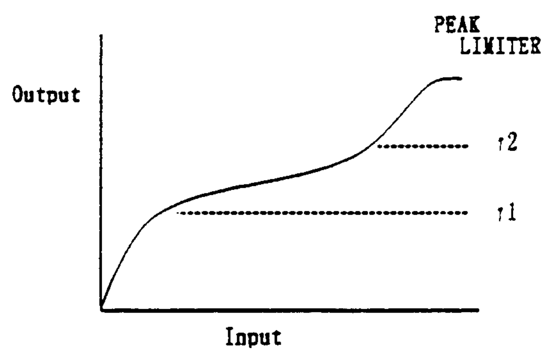
VII . Description of Functional Operation

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.
* VCC1 (Pin 5)
  Connected to power supply.
* GND (Pins 7, 29, 31)
  Ground
* 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 filters.
* AGC OUT (Pin 13)
  Outputs the voltage detected at the AGC detector circuit for luminance 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 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 (Pin 26)
  Connected to the X'tal resonator.
* APC FILTER (Pin 27)
  Connected to the APC detector filter.
* OUT DC CONTROL (Pin 28)
  The DC voltage applied to this pin adjusts the DC voltage of the R.G.B. outputs.
* 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 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 voltage, ($V_{cc2}/2$).

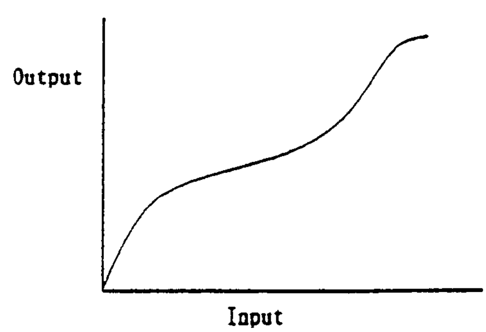
* RGB AMPLITUDE (Pin 38)
  Controls the amplitude between the inverted level and the non-inverted level of the R.G.B. output. This pin is preset inside the IC.
* FRP (Pin 39)
  Inputs the invert signal for the R.G.B. outputs.
* RGB INV (Pin 40)
  The voltage applied to this pin sets the polarity of the 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.



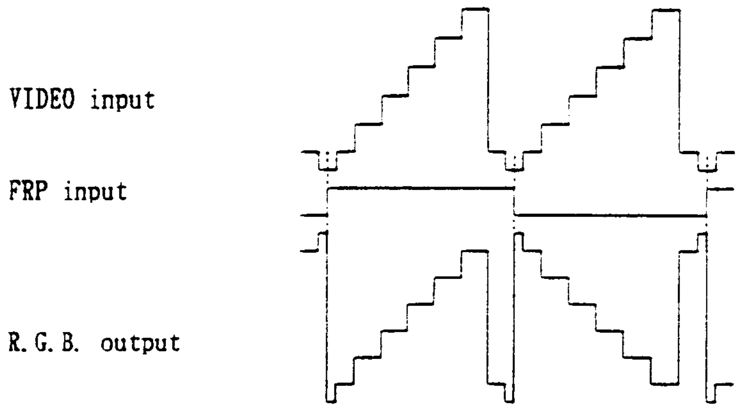
* PEAK LIMITER (Pin 46)
  The DC voltage applied to this pin sets the level of the white side peak limiter of the R.G.B. output.
* SUB CONTRAST B (Pin 47)
  The DC voltage applied to this pin fine-adjusts the contrast of the B signal. This pin is preset inside the IC.
* SUB CONTRAST R (Pin 48)
  The 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 color 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.
* Image adjusting circuit
  The high range component signal obtained by secondary-differentiating the luminance signal has its noise reduced and its gain controlled by the voltage on Pin 23. This signal is added to the luminance signal to control the frequency characteristics of the luminance line.
* 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 $V_{cc2}/2$ is used to prevent the DC components from adding up to adversely affect the LCD panel.

iii) Precautions
* External input
Although both analog and digital inputs can be accepted as an external signal, the analog input cannot be displayed simultaneously with the signal from external input and the signal from the video input on the same screen. Only when the external input is digital, is it possible to display both the signals.
* Power supply pin
Ensure Pins 7, 29 and 31 are at the same potential and not open. Make sure the voltage applied to power supply pin must be as follows: GND $\leqq$ V_{cc1} $\leqq$ V_{cc2}

VII. Absolute Maximum Rating

(Unless otherwise specified Ta=25℃)

Parameter	Symbol	Conditions	Rating	Unit
Supply voltage *1	V_{CC2}		14	V
	V_{CC1}		6	V
Power dissipation	P_D	Ta≦ 25℃	580	mW
Derating ratio		Ta≦ 25℃	5.8	mW/℃
Operating temperature range	T_{opr}		-20~+70	℃
Storage temperature range	T_{stg}		-55~+150	℃
Video input pin signal voltage	V_{IN}		3	V
Each adjust pin voltage *2	V_{IN}		V_{CC1}	V
Each adjust pin voltage *3	V_{IN}		V_{CC2}	V
SYNC OUT output withstand voltage	V_{SD}		14	V

*1 Ensure Pins 7, 29 and 31 (GND) are at the same potential.
*2 Applies to Pins 2, 11, 23, 25, 38, 41, 42, 43, 44, 45, 46, 47 and 48.
*3 Applies to Pin 28.

Operating supply voltage range	V_{CC1}	4.25 ~ 5.25	V
	V_{CC2}	11.25 ~ 13.75	V

Recommended operating conditions

Parameter	Symbol	Conditions	Rating	Unit
VIDEO IN input signal voltage	υ_{VI}		0.7	V_{P-P} *4
EXT RGB IN input signal voltage (analog input)	υ_{EXT} (A)		0.7	V_{P-P} *4
EXT RGB IN input signal voltage (digital input)	υ_{EXT} (D)		2.0~V_{CC1}	V_{P-P}

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

IX . Electrical Characteristics

i) DC characteristics

Unless otherwise specified, $V_{CC1}=4.5V$, $V_{CC2}=12V$, $Ta=25℃$

No.	Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
1	SW "H" input current	I_{H1}	$V_1=4.5V$			0.1	μA
2	SW "L" input current	I_{L1}	$V_1=0V$		-2	-6	μA
3	CONTRAST input current	I_2	$V_2=3.5V$		0.3	1	μA
4	COLOR input current	I_{11}	$V_{11}=3V$		0.3	1	μA
5	SYNC IN "H" input current	I_{H21}	$V_{21}=4.5V$			0.1	μA
6	SYNC IN "L" input current	I_{L21}	$V_{21}=0V$		-1	-3	μA
7	PICTURE input current	I_{23}	$V_{23}=3V$		0.3	1	μA
8	TINT input current	I_{26}	$V_{26}=4.5V$		0.3	1	μA
9	FRP input current	I_{39}	$V_{39}=0V$		-1	-4	μA
10	RGB INV input current	I_{40}	$V_{40}=0V$		-1	-4	μA
11	BRIGHT input current	I_{43}	$V_{43}=1.7V$		0.2	1	μA
12	γ 1 input current	I_{45}	$V_{45}=3.5V$		0.2	1	μA
13	PEAK LIMITER input current	I_{46}	$V_{46}=3.5V$		0.5	2.5	μA
14	γ 2 input impedance	Z_{44}			45		kΩ
15	VIDEO IN input impedance	Z_{10}			16		kΩ
16	RGB AMPLITUDE input impedance	Z_{38}			75		kΩ
17	SUB BRIGHT B input impedance	Z_{41}			75		kΩ
18	SUB BRIGHT R input impedance	Z_{42}			75		kΩ
19	SUB CONTRAST B input impedance	Z_{47}			75		kΩ

No.	Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
20	SUB CONTRAST R input impedance	Z_{48}			75		kΩ
21	VIDEO IN terminal voltage	V_{10}			1.8		V
22	AGC OUT terminal voltage	V_{13}			0		V
23	TRAP OUT terminal voltage	V_{16}			1.8		V
24	APL terminal voltage	V_{17}			2.7		V
25	H FILTER OUT terminal voltage	V_{18}			3.0		V
26	SYNC SEP terminal voltage	V_{19}			1.7		V
27	VCO terminal voltage	V_{26}			3.3		V
28	OUT DC CONTROL terminal voltage	V_{28}			6.0		V
29	RGB AMPLITUDE terminal voltage	V_{38}			2.1		V
30	SUB BRIGHT B terminal voltage	V_{41}			2.1		V
31	SUB BRIGHT R terminal voltage	V_{42}			2.1		V
32	SUB CONTRAST B terminal voltage	V_{47}			2.5		V
33	SUB CONTRAST B terminal voltage	V_{48}			2.5		V
34	γ 2 terminal voltage	V_{44}			2.5		V

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

Unless otherwise specified: V_{cc1}=4.5V, V_{cc2}=12V, Ta=25℃, SG1(4.5V_{p-p}) applied to (C), SG10 applied to (E), and no input to (A), V_2=2.25V, V_{11}=2.25V, V_{23}=2.25V, V_{26}=2.70V, V_{43}=1.50V, V_{46}=3.5V, V_{48}=3.5V

Note that V_2~V_{48} are the voltages that divides V_{cc1} in the ratio of the two resistances between V_{cc1} and GND.

Therefore they will change with V_{cc1}.

No.	Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
35	Current dissipation (Pin 6)	I_{cc1}			20	28	mA
36	Current dissipation (Pin 33)	I_{cc2}			4	6	mA
37	Luminance maximum gain supply voltage characteristics		With V_{cc1}=4.25V~5.25V, V_2=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 υ_i. $Gvmax = 20 \log \frac{6}{\upsilon_i}$	23	26	29	dB
38	Dependability of ACC on supply voltage	ACCG	With SG6(0dB, burst/chroma phase = 180°) applied to (A), measure the change in TP36 amplitude as V_{cc1} is changed from 4.25V to 5.25V. $ACCG = 20 \log \frac{\upsilon_{max}}{\upsilon_{min}}$		2	4	dB

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iii) Luminance section (Refer to Test circuit for luminance, chroma, sync sections)

Unless otherwise specified: V_{CC1}=4.5V, V_{CC2}=12V, Ta=25℃, SW10→a, SW19→a, SW22→a, SW24→a, SG1(4.5V_{P-P}) applied to (C), SG10 applied to (E), V_2=2.25V, V_{11}=2.25V, V_{25}=2.7V, V_{23}=2.25V, V_{43}=1.50V, V_{45}=3.5V, V_{48}=3.5V

No.	Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
39	Luminance maximum gain	G_{max}	With V_2=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 υ_1. $Gmax = 20 \log \frac{6}{\upsilon_1}$	23	26	29	dB
40	Luminance gain temperature characteristics	ΔG_Y	With SG2 applied to (A), the maximum and the minimum of the amplitude (black-white) of the output on TP34 shall be υ_{max} and υ_{min}, respectively as the temperature is changed from -20 to +70℃. $G_Y = 20 \log \frac{\upsilon_{max}}{\upsilon_{min}}$			3.0	dB

No.	Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
41	Contrast adjust gain variable range (1)	G_{c11}	With SG2(-6dB) applied to (A), observe the waveform on TP34 as V_2 is changed to 1.5V, 2.25V then 3V. The amplitude between the black level and the white level at these V_1 voltages shall be υ_1, υ_0, and υ_2, respectively. $G_{c11}=20\log\frac{\upsilon_1}{\upsilon_0}$, $G_{c12}=20\log\frac{\upsilon_2}{\upsilon_0}$	2	5.5		dB
42	Contrast adjust gain variable range (2)	G_{c12}		-20			dB
43	AGC amplitude characteristics (1)	V_{a11}	With SG3(0dB) applied to (A), observe the waveform on TP34 as APL is changed to 10%, 50% then 90%. The voltage between the black level and the white level at these APL shall be V_{a11}, V_{a12}, and V_{a13}, respectively.	6.1	7.2	8.5	V
44	AGC amplitude characteristics (2)	V_{a12}		5.0	5.8	7.1	V
45	AGC amplitude characteristics (3)	V_{a13}		3.0	3.5	4.5	V
46	AGC detection output voltage (1)	V_{ad1}	With SG3(0dB) applied to (A), when APL is changed to 10%, 50% then 90%, the voltages on TP13 shall be V_{ad1}, V_{ad2}, and V_{ad3}, respectively.	3.0	3.3	3.6	V
47	AGC detection output voltage (2)	V_{ad2}		2.2	2.6	3.0	V
48	AGC detection output voltage (3)	V_{ad3}		0.3	0.55	0.7	V

No.	Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
49	Image quality adjust variable range (1)	G_{r1}	With SG4(f=100kHz) applied to (A), observe the waveform on TP34, the amplitude of the 100kHz component of the signal shall be υ_0. Then, with SG4(f=1.8MHz) applied to (A), V_{23} is changed to 1.6V then 3V. The amplitude of the 1.8MHz component on TP34 at these two V_{23} voltages shall be υ_1 and υ_2, respectively. $G_{r1}=20\log\frac{\upsilon_1}{\upsilon_0}$, $G_{r2}=20\log\frac{\upsilon_2}{\upsilon_0}$	3	9		dB
50	Image quality adjust variable range (2)	G_{r2}		-8	-2		dB
51	Trap attenuation	G_{tf}	With SG7(f=100kHz, -6dB) to (A), observe the waveform on TP15, the amplitude of the 100kHz component of the signal shall be υ_0. Then, apply SG7(f=3.58MHz, -6dB), the amplitude of the 3.58MHz component on TP15 shall be υ_1. $Gtf = 20\log\frac{\upsilon 1}{\upsilon_0}$	-30	-45		dB

No.	Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
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 $\upsilon 1$. Then, with SG3 (APL=90%, 0db) applied to (A), measure the amplitude (black-black) on TP34. Let the measured amplitude be $\upsilon 2$. $K = \frac{\upsilon_1 - \lvert \upsilon_1 - \upsilon_2 \rvert}{\upsilon_1} \times 100$	95			%
53	Delay line propagation delay time (1)	$t_{PHL(D)}$	With SG12 applied to (A), measure the propagation delay time to TP15.		350		ns
54	Delay line propagation delay time (2)	$t_{PLH(D)}$			350		ns

iv) Chroma section (Refer to Test circuit for luminance, chroma, sync sections)

Unless otherwise specified:

V_{CC1}=4.5V, V_{CC2}=12V, Ta=25℃, SW10→a, SW19→a, SW22→a, SW24→a,
SG1(4.5V_{P-P}) applied to (C), SG10 applied to (E),
V_2=2.25V, V_{11}=2.25V, V_{23}=2.25V, V_{26}=2.70V, V_{43}=1.5V, V_{46}=3.5V, V_{48}=3.5V

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

No.	Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
55	ACC characteristics (1)	G_{A1}	With SG6(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 be υ_0, υ_1, and υ_2. $G_{P1}=20\log\frac{\upsilon_1}{\upsilon_0}$, $G_{P2}=20\log\frac{\upsilon_2}{\upsilon_0}$		0	2	dB
56	ACC characteristics (2)	G_{A2}		-6	-1		dB
57	ACC temperature characteristics	$\Delta\upsilon_b$	With SG6(0dB, burst/chroma phase = 180°) applied to (A), let the maximum and minimum amplitudes on TP36 be V_{max} and V_{min} as the ambient temperature is changed from -20℃ to +70℃. $\Delta\upsilon_b = 20\log\frac{\upsilon_{max}}{\upsilon_{min}}$		1	3.5	dB

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No.	Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
58	Color control gain variable range (1)	G_{c1}	With SG6 (0dB, burst/chroma phase = 180°) applied to (A), allow V_{11} to change to 1.5V, 2.25V, then 3V to measure the amplitude on TP36. Let these amplitudes be υ_1, υ_0 and υ_2, respectively. $G_{c1} = 20\log\frac{\upsilon_1}{\upsilon_0}$, $G_{c1} = 20\log\frac{\upsilon_2}{\upsilon_0}$	-20			dB
59	Color control gain variable range (2)			4	6		dB
60	APC capture range	f_A	With SG7 (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
61	Killer operating input level	υ_{bk}	With SG6 (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	-30	dB
62	Killer color ghost	υ_{b*}	With SW24→b, V_2=0V, and SG6 (0dB, burst/chroma phase = 180°) applied to (A), measure the amplitude of the chroma signal on TP36.		50		mV_{p-p}

26

No.	Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
63	Demodulation output ratio (1)	R-Y/B-Y	With SG6 (0dB) applied to (A), allow the chroma phase to change. Let the amplitude causing the maximum amplitude on TP32 be υ_R. Let the amplitude causing the maximum amplitude on TP34 be υ_G.	0.50	0.63	0.70	
64	Demodulation output ratio (2)	G-Y/B-Y	Let the amplitude causing the maximum amplitude on TP36 be υ_B. $\frac{R-Y}{B-Y} = \frac{\upsilon_R}{\upsilon_B}$, $\frac{G-Y}{B-Y} = \frac{\upsilon_G}{\upsilon_B}$	0.25	0.32	0.39	
65	Demodulation relative phase (1)	$\frac{\theta_{(R-Y)}}{\theta_{(B-Y)}}$	With SW10→b, and SG6(0dB) applied to (B), allow the chroma phase to change. Let the angle causing the maximum amplitude on TP32 be θ_R. Let the angle causing the maximum amplitude on TP34 be θ_G.	100	109	118	degre
66	Demodulation relative phase (2)	$\frac{\theta_{(G-Y)}}{\theta_{(B-Y)}}$	Let the angle causing the maximum amplitude on TP36 be θ_B. $\frac{\theta_{(R-Y)}}{\theta_{(B-Y)}} = \theta_R - \theta_B$, $\frac{\theta_{(G-Y)}}{\theta_{(B-Y)}} = \theta_G - \theta_B$	234	242	255	degre
67	TINT variable range (1)	θ_+	With SW10→ b, and SG6(0dB) applied to (B), allow the chroma phase to change. (to be continued)	35	50		degre

No.	Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
68	TINT variable range (2)	θ_-	Let the angle causing the maximum amplitude on TP36 be θ_1 in the case of V_{26}=0V. Let the angle causing the maximum amplitude on TP36 be θ_2 in the case of V_{26}=2.7V. Let the angle causing the maximum amplitude on TP36 be θ_3 in the case of V_{26}=4V. $\theta_+ = \theta_1 - \theta_2$, $\theta_- = \theta_3 - \theta_2$	-35	-50		degree
69	Demodulation output residual carrier	υ_{CAR}	With (E)=open, and SG6(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 υ_1 to υ_0, where υ_1 is the 7.15909MHz component, υ_0 being the 15.734kHz component. $\upsilon_{CAR} = 20 \log \frac{\upsilon_1}{\upsilon_0}$	-25	-40		dB

v) Sync section (Refer to Test circuit for luminance, chroma, sync sections)

Unless otherwise specified: V_{CC1}=4.5V, V_{CC2}=12V, Ta=25℃, SW10→a, SW19→a, SW22→b, SW24→a, V_2=2.25V, V_{11}=2.25V, V_{23}=2.25V, V_{25}=2.7V, V_{43}=1.5V. V_{45}=3.5V, V_{46}=3.5V

No.	Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
70	Sync separator input sensitivity current	I_{is}	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		μA
71	Sync separator output ON-state voltage	V_{on}	Measure the output voltage on TP20.			0.6	V
72	External sync input voltage	V_{sth}	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
73	H filter output gain	G_{hf}	With SG1(0.286V_{P-P}) applied to (A). Let the amplitude on TP18 be υ_1. G_{hf} = 20 log (υ_1 / 0.286)	2	4		dB
74	H filter output propagation delay time (1)	t_{pHL}(HF)	With SG1(0.286V_{P-P}) applied to (A), measure the prpagation delay time to TP18.		500		ns
75	H filter output propagation delay time (2)	t_{pLH}(HF)			500		ns
76	Sync separator output propagation delay time (1)	t_{pHL} (sync)	With SW19→b, and SG1(0.286V_{P-P}) applied to (A), measure the propagation delay time to TP20.	0.4	0.7	1.2	μs
77	Sync separator output propagation delay time (2)	t_{pLH} (sync)		0.8	1.3	1.9	μs

vi) Interface section (Refer to Test circuit for interface section)

Unless otherwise specified:

V_{CC1}=4.5V, V_{CC2}=12V, Ta=25℃, SW1→a, SW28→b, SW32→b, SW34→b, SW36→b, SW38→a, SW39→a,

(to be continued)

SW41→b, SW42→b, SW44→a, SW47→b, SW48→b, V_1=4.5V, V_2=2.25V, V_{28}=6.0V, V_{40}=4.5V, V_{43}=1.5V, V_{44}=2.6V, V_{45}=2.3V, V_{48}=3.5V, and SG1(4.5V_{P-P}) applied to (C), SG10 applied to (I).

No.	Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
78	Interface gain	G_{V1}	With SG2 applied to (E), (F) and (G), measure the amplitude(white-black) on TP32, TP34 and TP36, and let these measured amplitudes be υ_{32}, υ_{34} and υ_{36} respectively.. $G_{V1} = 20 \log \frac{\upsilon_{32}(\upsilon_{34}, \upsilon_{36})}{0.714}$	14	16	18	dB
79	Brightness adjust variable range (1)	$\Delta V_{b(1)}$	With (E),(F),(G)=GND and V_{43}=0.9V, measure the amplitudes(black-black) on TP32, TP34 and TP36.	8			V_{P-P}
80	Brightness adjust variable range (2)	$\Delta V_{b(2)}$	With (E),(F),(G)=GND and V_{43}=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 V_{45}=1.50V.)			1.5	V_{P-P}
81	RGB output black level voltage difference	ΔV_{b1}	With (E),(F),(G)=GND, measure the black level voltage differences between the average of maxmum and minimum black level voltage on TP32, TP34 and TP36 when they are inverted and non-inverted.			±150	mV
82	RGB output amplitude adjust variable range	ΔV_{RGB}	With (E),(F),(G)=GND, and V_{38}=1.8V and 2.6V, measure the amplitude differences(black-black) on TP32, TP34 and TP36 between SW38→b and SW38→a.	±2	±3		V

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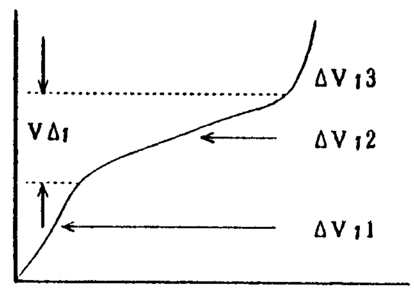
No.	Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
83	Sub-brightness adjust variable range	V_{SB}	With (E),(F),(G)=GND, V_{41}=1.6V,2.9V, V_{42}=1.6V,2.9V, measure the amplitude difference(black-black) on TP32 and TP36 between SW41→b, SW42→b, and SW41→a, SW42→a.	±1	±2		V
84	Gain difference among RGB	ΔG_{RGB}	With SG8(0.7V_{P-P}, 100kHz) applied to (E),(F) and (G), measure the amplitude differences(white-black) on TP32, TP34 and TP36.			±0.6	dB
85	Sub-contrast gain adjust variable range	ΔG_{SC}	With SG8(0.7V_{P-P}, 100kHz) applied to (E),(F),(G), and V_{47}=1.6V,3.3V, V_{48}=1.6V,3.3V, measure the amplitude differences(white-black) on TP32 and TP36 between SW47→b, SW48→b, and SW47→a, SW48→a.	±0.7			dB
86	Gain difference between invert and non-invert	ΔG_{NI}	With V_{44}=2.6V, SG8(0.7V_{P-P}, 100kHz) appliedto (E),(F) and (G), measure the amplitude differences(white-black) on TP32, TP34 and TP36 between invert and non-invert.			±0.6	dB
87	RGB output DC voltage	V_{RGB}	With (E),(F),(G)=GND, adjust V_{43} to set the amplitude on TP34 to 0V_{P-P} and measure the DC voltage on TP32, TP34 and TP36.	5.80	6.00	6.20	V
88	RGB output DC voltage variable range (1)	ΔV_{RGB} (1)	With (E),(F),(G)=GND, V_{28}=8.5V and SW28→a, adjust V_{43} to set the amplitude on TP34 to 0V_{P-P} and measure the voltage on TP32, TP34 and TP36.	8.0	8.5	9.0	V

No.	Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
89	RGB output DC voltage variable range (2)	ΔV_{RGB} (2)	With (E), (F), (G)=GND, SW28→a, V_{28}=3.5V, adjust V_{45} to set the amplitude on TP34 to $0V_{P-P}$ and measure the voltage on TP32, TP34 and TP36.	3.0	3.5	4.0	V
90	Frequency characteristics	G_1	With SW32→a, SW34→a, SW36→a, V_{45}= 3.5V, SG8(100kHz) applied to (E), (F) and (G), adjust the amplitude of SG8 such that the amplitude of the sine waves on TP32, TP34 and TP36 are $4V_{P-P}$. Increase the frequency of the input sine wave until the amplitudes of the sine waves 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.		4		MHz
91	Crosstalk between R,G and B	CT_{RGB}	With V45=3.5V, SW39→b, V_{39}=4V, SG8(0.3V_{P-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

No.	Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
92	INT→ EXT crosstalk	C_{IE}	With V_1=0V, V_{46}=3.5V, V_{39}=4V, SW39→b, (E), (F), (G)=GND, SG5 (f=1MHz) applied to (A), adjust V_2 such that the amplitudes of the sine waves on TP32, TP34, TP36 are $4V_{P-P}$. Measure the ratio of the 1MHz component of the output amplitudes on TP32, TP34 and TP36 to that obtained when above time and V_1=4.5V using a spectrum analyzer.	-45	-52		dB
93	EXT→ INT crosstalk	C_{EI}	With V_{46}=3.5V, SW39→b, V39=4V, (A) =GND, SG5(f=1MHz) applied to (E), (F) and (G), adjust the amplitudes of SG5 such that the amplitudes of the sine waves on TP32, TP34, TP36 are $4V_{P-P}$. Measure the ratio of the 1MHz component of the output amplitudes on TP32, TP34 and TP36 to that obtained when above time and V_1=0V using a spectrum analyzer.	-45	-52		dB
94	Peak limiter characteristics	V_{PL}	With V_{46}=3.5V, V_{48}=2.4V, SG12 applied to (E), (F) and (G), measure the white peak amplitudes on TP32, TP34 and TP36.	4.0	5.2	6.5	V_{P-P}
95	SW threshold voltage	V_{thSW}	With SG8(0.7Vp-p, f=100kHz) applied to (E), (F) and (G), increase V_1 from 0V until the signals from (to be continued)	1.4		2.8	V

No.	Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
			TP32, TP34 and TP36 appear. Measure the voltage on V_1 that causes these signals to start appearing.				
96	FRP threshold voltage	V_{thFRP}	With (E), (F), (G)=GND, SW39→b, increase V_{39} from 0V until the signals on TP32, TP34 and TP36 are inverted. Measure the voltage on V_{39} that inverts these signals.	1.8		3.2	V
97	RGB INV threshold voltage	V_{thRGB}	With (E), (F), (G)=GND, increase V_{40} from 0V until the signals on TP35, TP37 and TP39 are inverted. Measure the voltage on V_{40} that inverts these signals.	1.8		3.0	V
98	Gamma correction characteristics (1)	$\Delta V_{\gamma 1}$	With (E), (F), (G)=SG11, measure the gradient at each specific point on the output waveform. With V_{44}=2.2V, measure $\Delta V_{\gamma 3}$. With SW44→b, measure $V\Delta_{\gamma}$.		200		mV/μs
99	Gamma correction characteristics (2)	$\Delta V_{\gamma 2}$			65		mV/μs
100	Gamma correction characteristics (3)	$\Delta V_{\gamma 3}$			200		mV/μs
101	Gamma correction characteristics (4)	$V\Delta_{\gamma}$			1.5		V

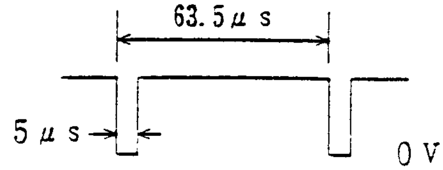
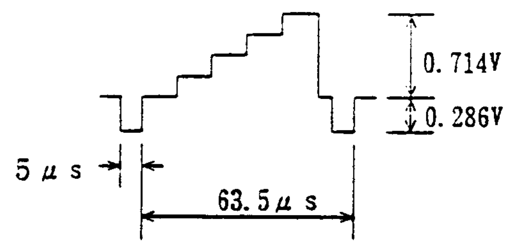
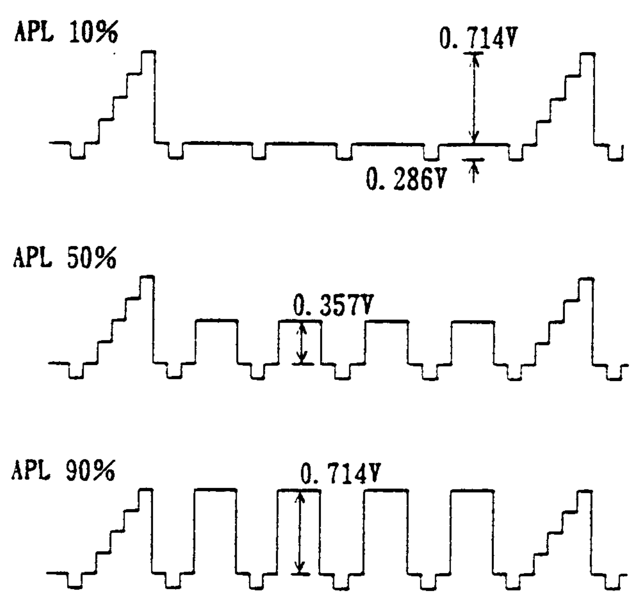


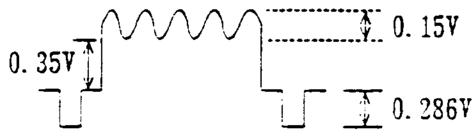
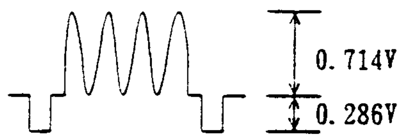
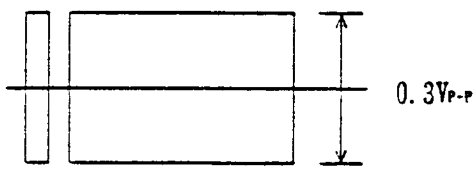
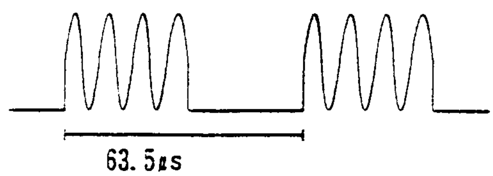
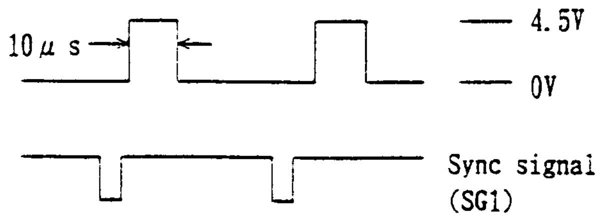
vii) Switching characteristics (Refer to Switching characteristic timing chart, Test circuit for interface section.)

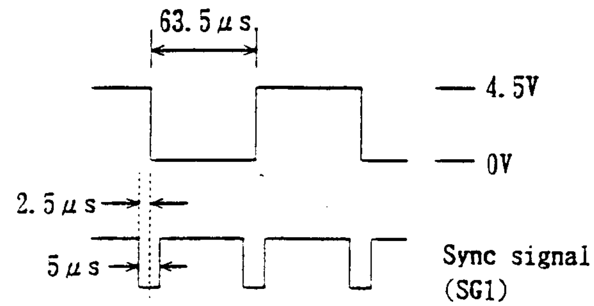
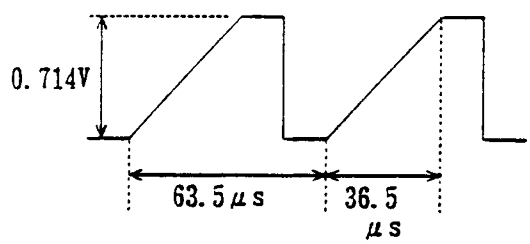
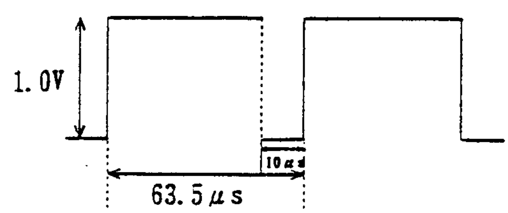
Unless otherwise specified: V_{CC1}=4.5V, V_{CC2}=12V, Ta=25℃,
SW1→a, SW28→b, SW32→a, SW34→a, SW36→a, SW38→a, SW39→a, SW41→b,
SW42→b, SW44→b, SW47→b, SW48→b, V_1=4.5V V_2=2.25V, V_{28}=6.0V,
V_{40}=4.5V, V_{43}=1.5V, V_{45}=2.3V, V_{46}=3.5V,
SG1(4.5Vp-p) applied to (C), SG10 applied to (I).

No.	Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
102	"H→L" RGB output Propagation delay time	t_{pHL} (RGB)	With (E),(F),(G)=GND, adjust V_{43} such that the amplitude of TP32, TP34 and TP36 are $6V_{P-P}$ and measure the waveform of TP32, TP34, TP36 and (I).		0.2		μs
103	"L→H" RGB output Propagation delay time	t_{pLH} (RGB)			0.2		μs
104	RGB output Fall time	t_{THL} (RGB)			0.2		μs
105	RGB output Rise time	t_{TLH} (RGB)			0.2		μs
106	"H→L" INT/EXT SW propagation delay time	t_{pHL} (SW)	With SW1→b, (E),(F),(G)=GND, SG9 applied to (J), SG12 applied to (A), and measure the waveform of TP32, TP34, TP36 and (J).		0.2		μs
107	"L→H" INT/EXT SW propagation delay time	t_{pLH} (SW)			0.2		μs

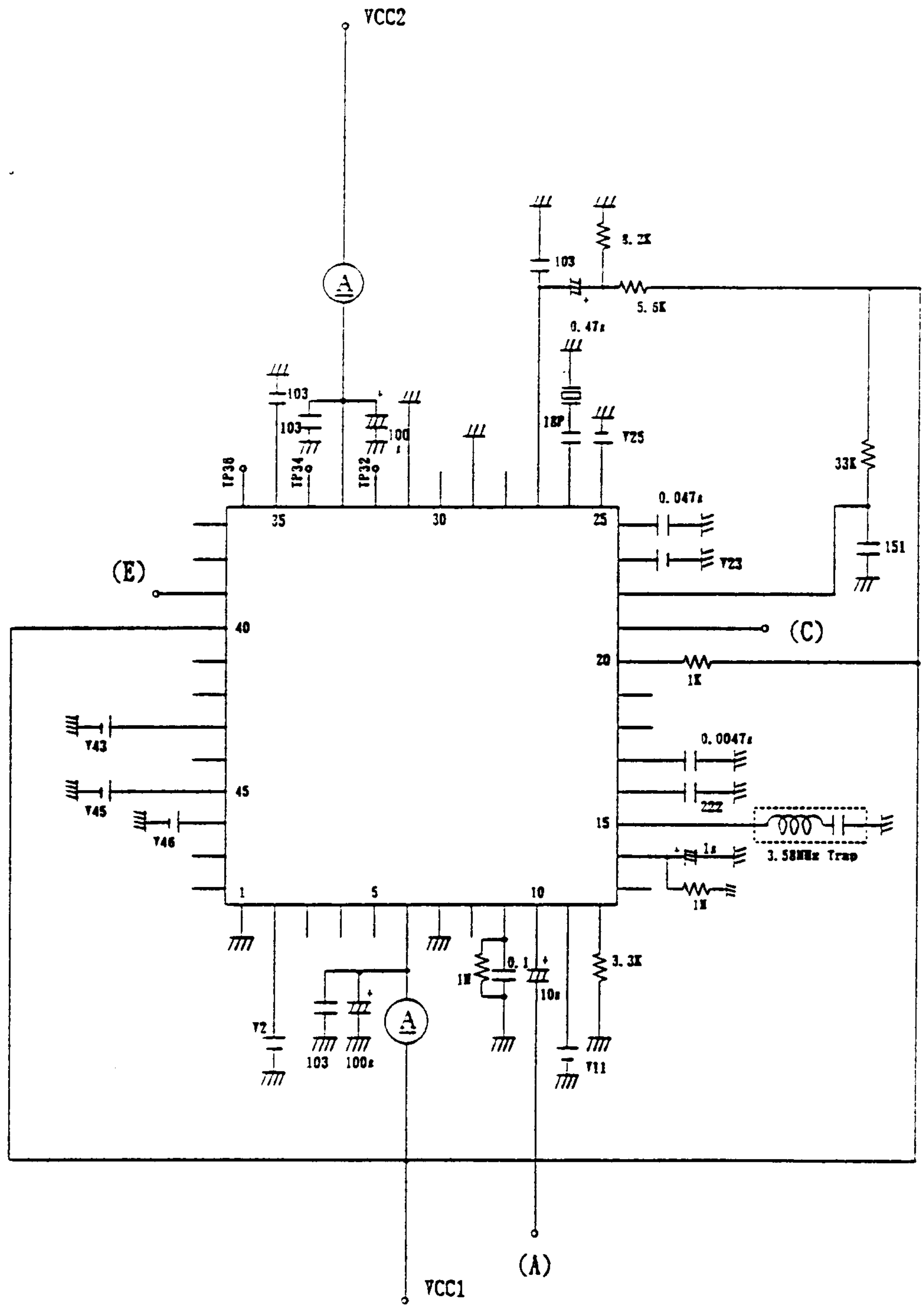
Ⅷ) Input Signal

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

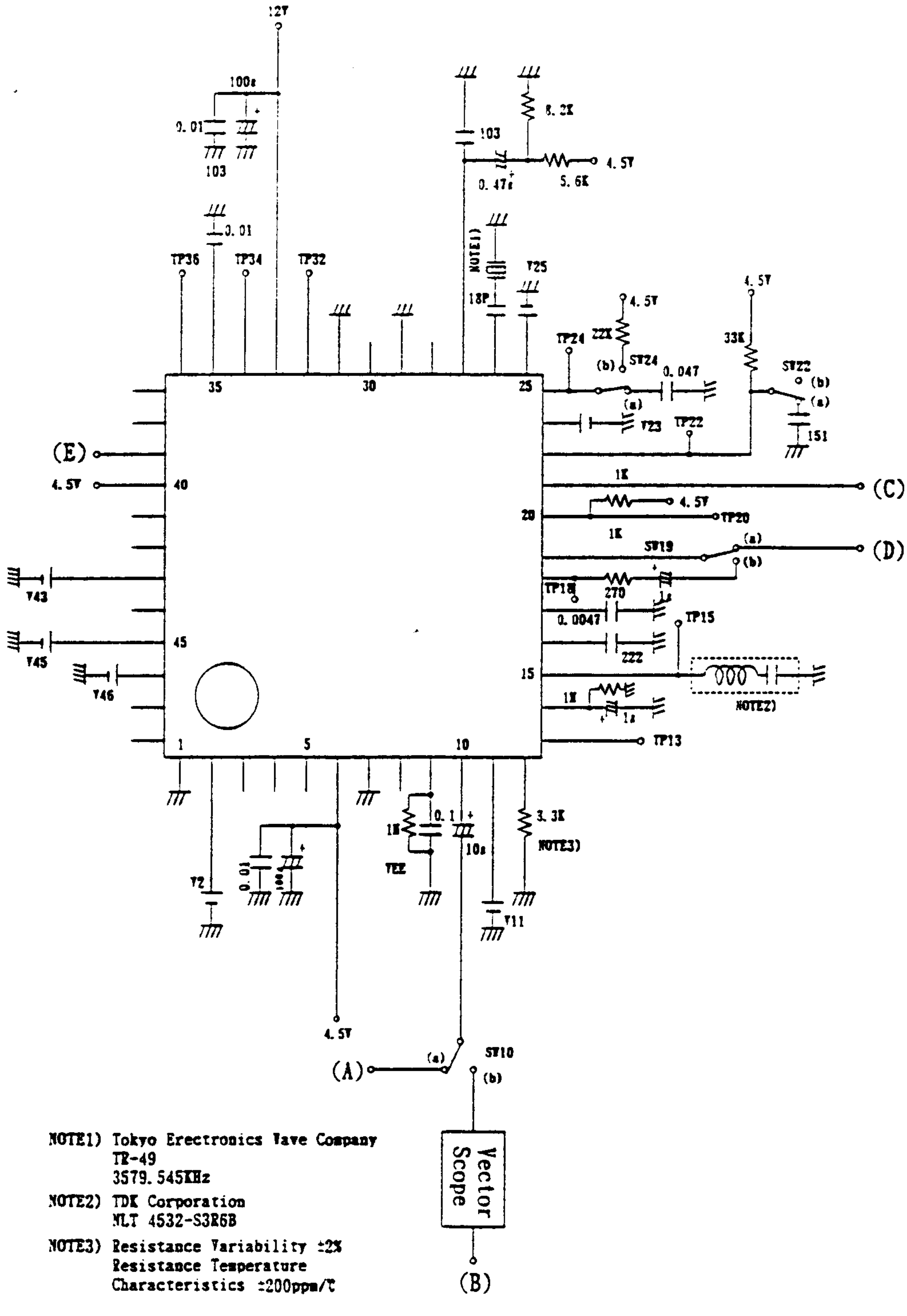
SG NO.	Signal name	
SG 4	Video signal(3)	0 db sine video signal. Variable frequency 
SG 5	Video signal(4)	Sine video signal. Variable frequency 
SG 6	Chrominance signal	Burst and chroma amplitude 300mVp-p Burst and chroma frequency 3.579545MHz Variable chroma phase 
SG 7	Sine signal	Sine signal amplitude 300Vp-p. Variable frequency
SG 8	Video signal(5)	Sine video signal. variable frequency and amplitude 
SG 9	S W Signal	Synchronized with sync pulse 

SG NO.	Signal name	
SG10	FRP Pulse	$t_r, t_f < 50ns$ 
SG11	Video signal(7)	
SG12	Video signal(8)	

ix) Test circuit for supply voltage characteristics



x) Test circuit for luminance, chroma and sync sections

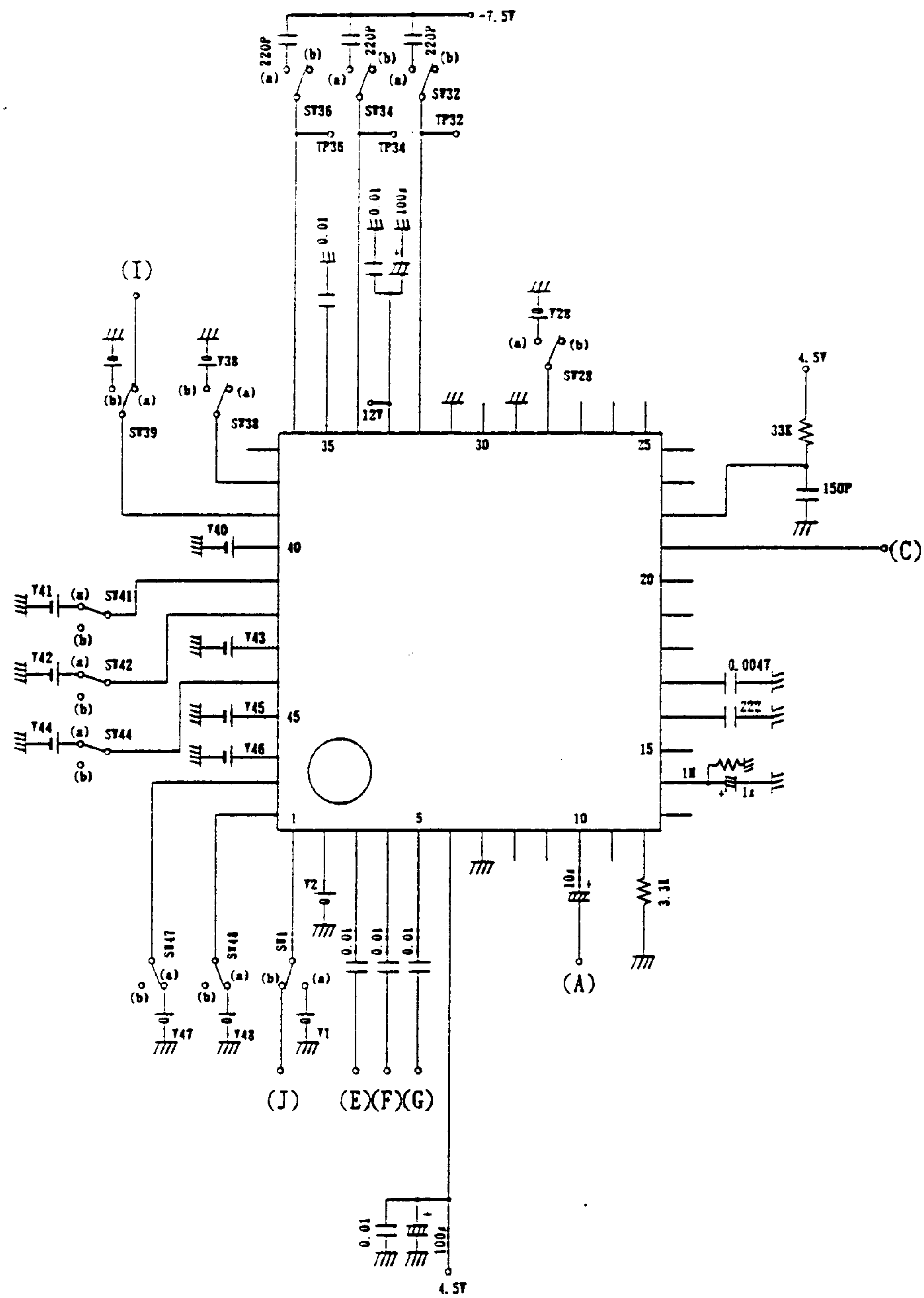


NOTE1) Tokyo Erectronics Wave Company
TR-49
3579.545KHz

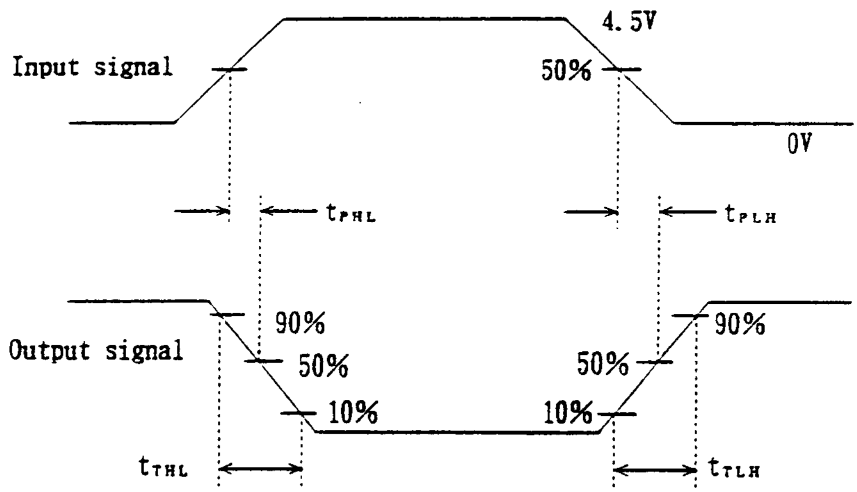
NOTE2) TDK Corporation
NLT 4532-S3R6B

NOTE3) Resistance Variability ±2%
Resistance Temperature
Characteristics ±200ppm/℃

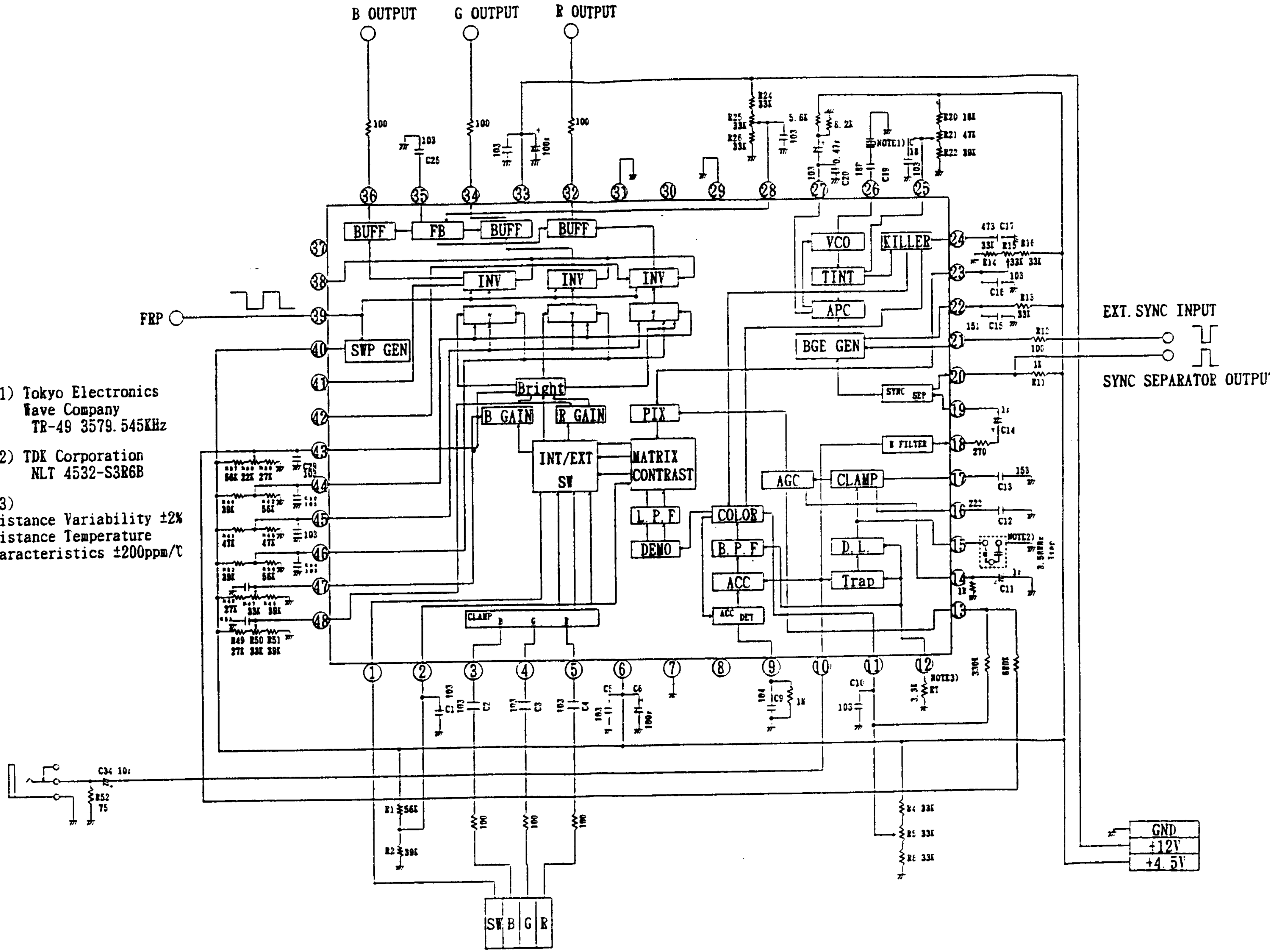
xi) Test circuit for interface section



xii) Switching characteristic timing chart



X . Application Circuit Example



NOTE1) Tokyo Electronics
Wave Company
TR-49 3579.545KHz

NOTE2) TDK Corporation
NLT 4532-S3R6B

NOTE3)
Resistance Variability ±2%
Resistance Temperature
Characteristics ±200ppm/℃

XI PACKAGE AND PACKING SPECIFICATION

1. Package Outline Specification
   Refer to drawing No. AA873

2. Markings
   2 − 1. Marking contents
   (1) Product name : IR3Y05
   (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)
   - WW → Denotes the production week. (01, 02, 03, · · · · · 52, 53)
   - YY → Denotes the production year. (Lower two digit 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
Air cap bag	Anti-static treated air cap	Protecting of device
Desiccant	Silica gel	Drying of device
Polypropylene band	Polypropylene	Fixing of tray
Inner case	Card board (800device/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.)

		APPROVE	CHECK	DESIGN	(NOTE)
ISSUE DATE	'92.07.23				
ISSUE NUMBER	I20723-01	T. Maeda	K. Sato	M. Kawabata	
S/C NUMBER	IR3Y05				(DOCUMENT No. 873-TDE)

3－2. Outline dimension of tray
Refer to drawing No. CV561

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).

First opening←X_1→re-sealing←Y→re-opening←X_2→mounting

ICs in dry packing	5～25℃ 60%RH or less	5～40℃ 80%RH or less	5～25℃ 60%RH or less

$X_1 + X_2$	: 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).

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.)

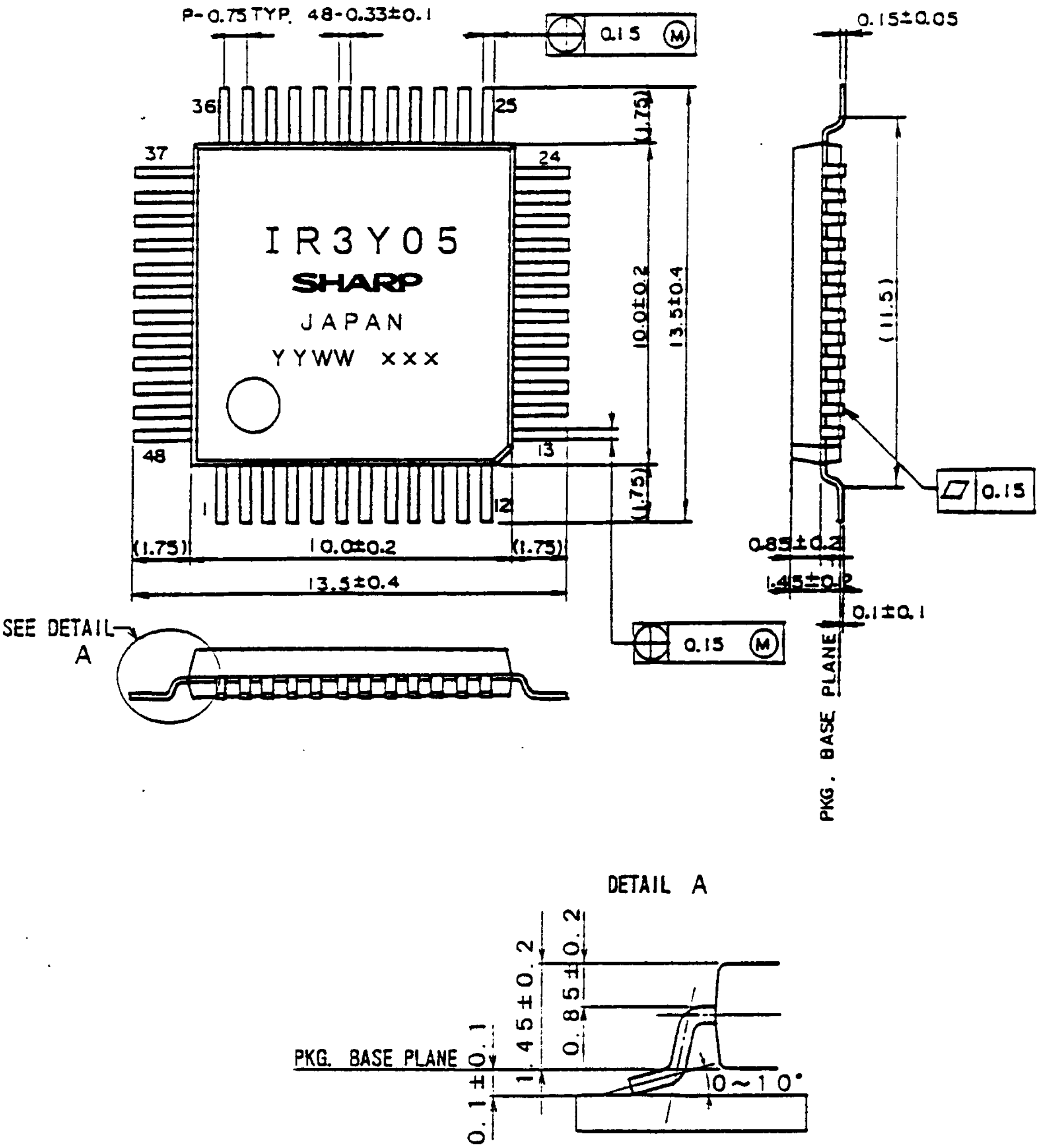
Mounting Method	Temperature and Duration	Measurement Point
Reflow soldering (air)	Peak temperature of 240℃, duration less than 15 seconds above 230℃, temperature increase rate of 1～4℃/second	IC surface
Solder dipping	245℃ or less, duration less than 3 seconds/dip, total of 5 seconds	Solder bath
Vapor 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

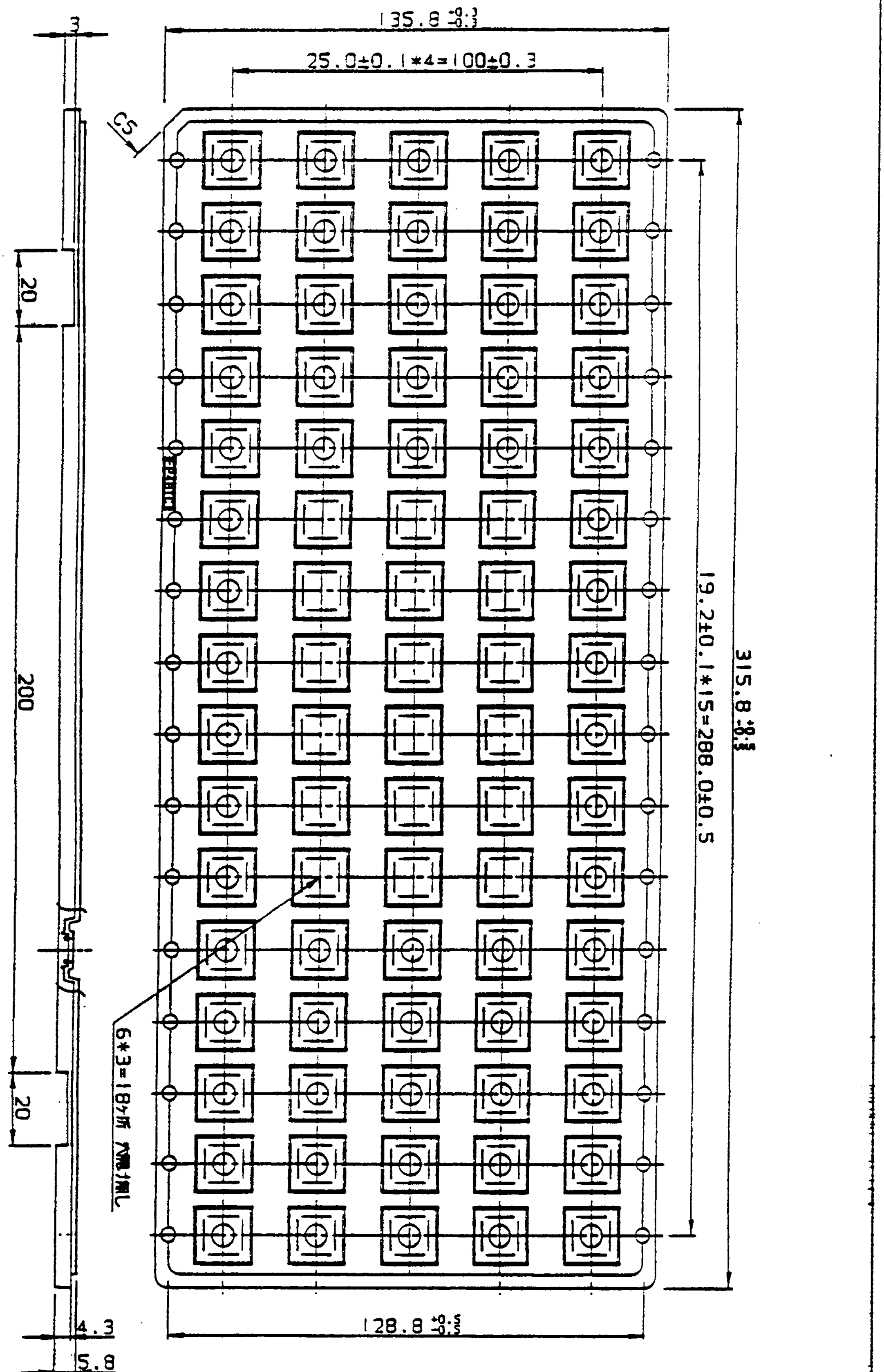
(1) Ultrasonic washing power : 25 Watts/liter or less

(2) Washing time : Total 1 minute maximum

(3) Solvent temperature : 15～40℃



名称 NAME	QFP48-P-1010	リード仕上 LEAD FINISH	TIN-LEAD PLATING	単位 UNIT	mm	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。
シャープ株式会社 SHARP CORP.	IC事業本部 IC GROUP		DRAWING NO.	AA873		NOTE	Plastic body dimensions do not include burr of resin.



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			038329