TOSHIBA INTEGRATED CIRCUIT

TECHNICAL DATA

TA7698AP

TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT

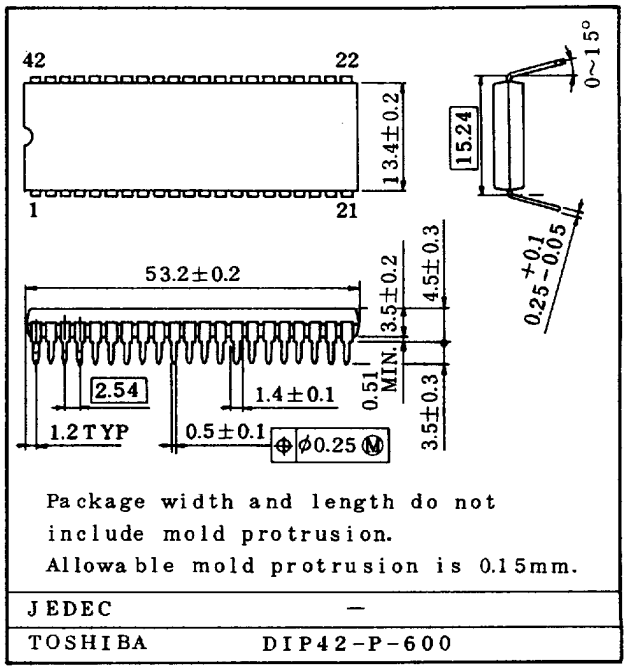
SILICON MONOLITHIC

TENTATIVE

VIDEO-CHROMA-DEFLECTION SYSTEM
FOR A COLOR TELEVISION (PAL, NTSC)

The TA7698AP combines a PAL/NTSC Video-Chroma subsystem and a Deflection combination on a single monolithic integrated circuit to provide a PAL or PAL/NTSC color television. This device includes a Video amplifier, PAL and NTSC color demodulator these are designed to provide color differential signal outputs, and improved Sync-separator, Horizontal oscillator with saw tooth wave type AFC, Horizontal pre-driver with X'ray protection circuit, Vertical oscillator and Vertical pre-driver in a 42 leads dual-in-line type plastic package.

Unit in mm



Package width and length do not include mold protrusion.
Allowable mold protrusion is 0.15mm.

JEDEC	—
TOSHIBA	DIP42-P-600

FEATURES:

Video-Chroma Section

. Simple PAL/NTSC System switch (Demodulator, Flip-flop, Tint control for NTSC)
. Suitable to a Multi-CTV System :
  TA7698AP ... PAL/NTSC Dual System
  TA7698AP + SECAM combination ... 3 or more system
. Minimum Numbers of External Parts Required.
. Stabilized with Respect to Variation of Temperature and Supply Voltage.
. A Few Initial Adjustment Required.

Deflection Section

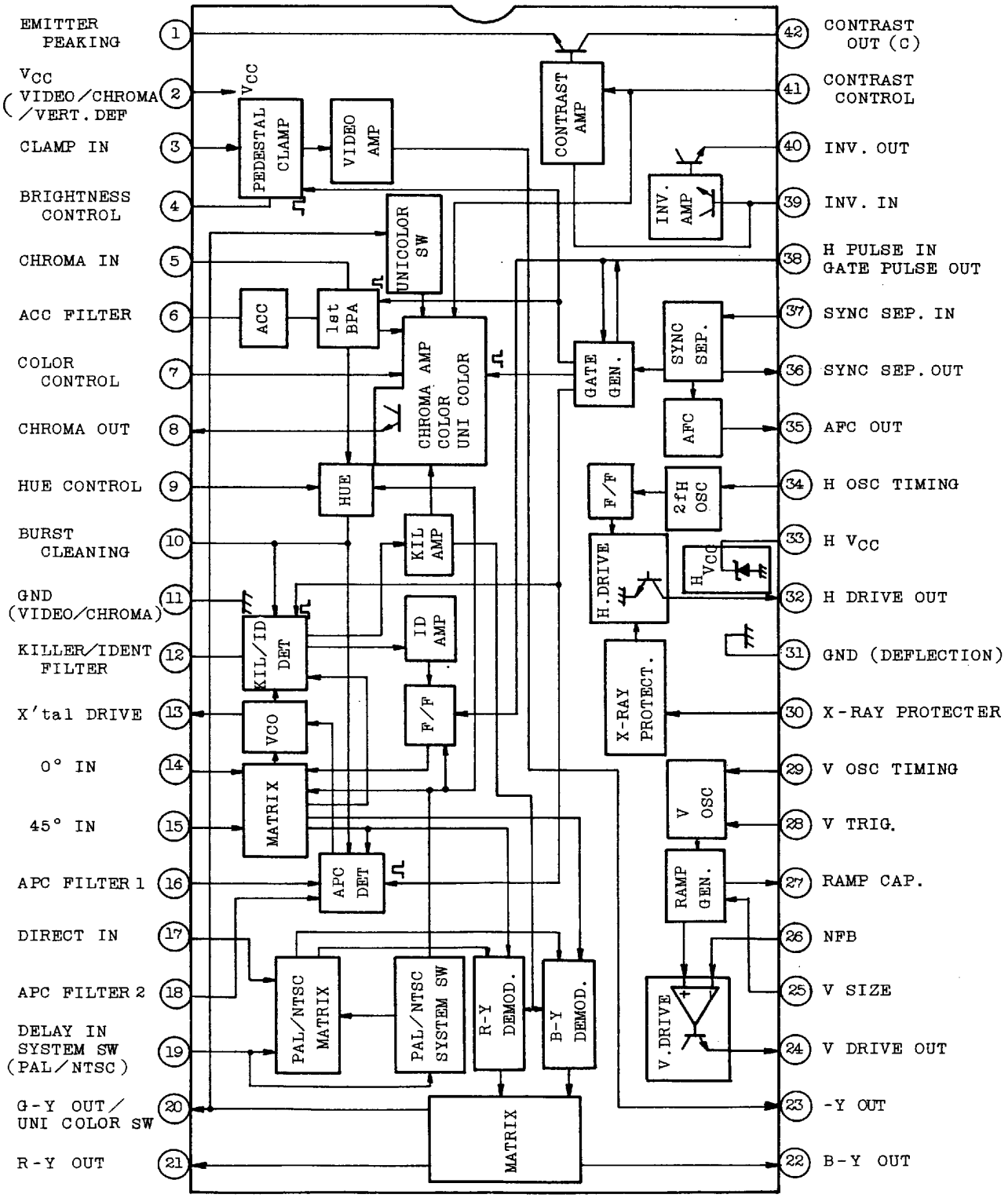
. Excellent Temperature Stability of Horizontal Oscillator.
. Exact 50% Duty Cycle Outupt Due to the 2-f_H Oscillator and Flip-Flop Circuit.
. Excellent Inter-race.

MAXIMUM RATINGS (Ta=25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V_{CC} MAX	15	V
Horiz. Supply Current	I_{CC} MAX	40	mA
Max. Input Signal Level	$e_{IN3,5,14,15,17,19,28,37,39}$	5	Vp-p
Max. Control Terminal Voltage	V_{4MAX}, V_{5MAX}, V_{7MAX}, V_{9MAX}	V_{CC}	V
Term. 1 Max. Output Current	I_1 MAX	4	mA
Term. 8 Max. Output Current	I_8 MAX	10	mA
Term. 10 Max. Output Current	I_{10} MAX	4	mA
Term. 13 Max. Output Current	I_{13} MAX	4	mA
Min. Load Resistance	R_{LD}	1.8	kΩ
Term. 23 Max. Output Current	I_{23} MAX	4	mA
Vertical Stage Output Current	I_{24} MAX	20	mA
Term. 25 Max. Output Current	I_{25} MAX	4	mA
Term. 26 Max. Input Voltage	V_{26} MAX	V_{CC}	V
Term. 27 Max. Output Current	I_{27} MAX	20	mA
Term. 30 MAX. Input Current	$-I_{30}$ MAX	1	mA
Horiz. Max. Sink Current	$-I_{24}$ MAX	30	mA
Horiz. Ave. Sink Current	$-I_{24}$	15	mA
Term. 35 Max. Input Voltage	V_{35} MAX	V_{CC}	V
Term. 36 Max. Voltage	V_{36} MAX	V_{CC}	V
Term. 38 Max. Input Voltage	V_{38} MAX	5	V
Term. 40 Max. Output Current	I_{40} MAX	5	mA
Term. 42 Max. Sink Current	$-I_{42}$ MAX	4	mA
Max. Power Dissipation	P_D MAX	2.2	W
Operating Temperature	Topr	-20~65	°C
Storage Temperature	Tstg	-55~150	°C

Note: Derated above Ta=25°C in the proportion of 17.6mW/°C.

BLOCK DIAGRAM



ELECTRICAL CHARACTERISTICS (Unless otherwise specified, V_2=12V, Ta=25°C)
VIDEO SECTION (1)

CHARACTERISTIC	SYMBOL	TEST CCT	TEST PIN	SW 36	SW 41	SW 4A	SW 4B	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Recommendable Supply Voltage	V_{CC1}								10.8	12	13.2	V
12V Supply Current	I_{CC1}	1	2						60	82	106	mA
Video Gain	G_V	2	23 39	OFF	ON	OFF	ON	V_C=10V, V_X=4.25V, V_Z=4.0V v_{39}:500kHz 1Vp-p(Multi Burst) $G_V=20\ell og(v_{23}/v_{39})$	3	6	7	dB
Contrast Gain Control Range	ΔG_V	2	23	OFF	ON	OFF	ON	V_C=10V~2V, V_X=4.25V, V_Z=4.0V v_{39}:500kHz 1Vp-p(Multi Burst) $\Delta G_V=20\ell og(v_{23}MAX./v_{23}\ MIN.)$	40	-	-	dB
Video Frequency Characteristics	ΔG_{Vf}	2	23	OFF	ON	OFF	ON	V_C=10V, V_X=4.25V, V_Z=4.0V v_{39}:500kHz, 4.0MHz 1Vp-p (Multi Burst) $\Delta G_{Vf}=20\ell og(v_{23}\ 4MHz/v_{23}\ 500kHz)$	-3.5	-1.5	0.5	dB
DC Restoration Ratio	K	2	23	OFF	ON	ON	ON	V_C=10V, V_Z=4.0V V_X:Pedestal #39=3.25V v_{39}:2.5Vp-p 10 STEP APL 10%~90% $K = (1 - \frac{\Delta v_{23}\ pedestal}{v_{23}\ 100\%\ APL}) \times 100$	63	70	77	%
Max. Video Output	$v_{23\ MAX}$	2	23	OFF	OFF	OFF	ON	V_X=4.25V, v_{39}:No Signal V_Z=2V~7V 10% to 90% of Variation	5.0	7.5	-	Vp-p
Video DC Output Term. Co-effici	$\partial V_{23}/\partial T$	2	23	OFF	OFF	OFF	ON	V_X=4.25V, V_Z=4.0V v_{39}:No Signal Ta=-20°C~65°C	-2.5	0	2.5	mV/°C

VIDEO SECTION (2)

CHARACTERISTIC	SYMBOL	TEST CCT	TEST PIN	SW 36	SW 41	SW 4A	SW 4B	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Inverter Amp. Gain	G_R	2	40	OFF	OFF	OFF	OFF	V_X=4.25V v_{39}:500kHz, 1Vp-p $G_R=20\ell og(v_{40}/v_{39})$	2.2	3.5	4.6	dB
Inverter Amp. Differential	DG_R	2	40	OFF	OFF	OFF	OFF	V_X:3.3~5.3V v_{39}:3.58MHz, 100mVp-p $DG_R=(v_{40MAX}/v_{40MIN}-1)$ X 100	-	2.5	5	%
Inverter Amp. Differential Phase	DP_R	2	40	OFF	OFF	OFF	OFF	V_X:3.3~5.3V v_{39}:3.58MHz, 100mVp-p $DP_R=\phi_{40MAX}-\phi_{40MIN}$	-	3	5	deg
Inverter Amp. Frequency Characteristics	ΔG_{Rf}	2	40	OFF	OFF	OFF	OFF	V_X=4.25V v_{39}=500kHz, 4MHz, 1Vp-p $\Delta G_{Rf}=20\ell og$ (v_{40} 4MHz/v_{40} 500kHz)	-3.5	-0.1	0.5	dB
Inverter Amp. 3.58MHz Linearity	v_{L39}	2	39 40	OFF	OFF	OFF	OFF	V_X=4.25V Measure #39 input level at #40 maximum output.	1.6	-	-	Vp-p
Contrast Control Open Voltage	V_{41}	1	41	-	-	-	-		6.7	7.2	7.7	V
Color Control Open Voltage	V_7	1	7	-	-	-	-		5.5	6.0	6.5	V
Tint Control Open Voltage	V_9	1	9	-	-	-	-		5.5	6.0	6.5	V
Pedestal Amp. Gain	G_P		3 23	OFF	ON	OFF	ON	V_X=4.25V, V_Z=4V v_{39}=500kHz,1Vp-p(Multi Burst) $G_P=20\ell og(v_{23}/v_3)$	9.5	12.0	13.5	dB

CHROMA (1) PAL (Unless otherwise specified, V_C=10V, V_S=10V, SW36:ON, SW10:OFF, SW4A:ON, SW4B:ON)

CHARACTERISTIC	SYMBOL	TEST CCT	TEST PIN	SW 41	SW 7	SW 9	SW 12	SW 15	SW 20	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Max. Chroma Output Voltage	e_{CMp}	3	8	ON	ON	OFF	a	b	ON	v_5:120mVp-p(B:C=1:1)	0.5	0.75	1.05	Vp-p
Burst Output Voltage	e_{bp}	3	10	ON	ON	OFF	a	b	ON	v_5:120mVp-p(B:C=1:1)	0.45	0.70	0.95	Vp-p
ACC Characteristics (1)	e_{ap}	3	8	ON	ON	OFF	a	b	ON	v_5:15mVp-p(B:C=1:1)	0.2	0.43	-	Vp-p
ACC Characteristics (2)	Ap	3	8	ON	ON	OFF	a	b	ON	v_5:100mVp-p, 300mVp-p (B:C=1:1) $Ap=\frac{v_8(v_5=300mVp\text{-}p)}{v_8(v_5=100mVp\text{-}p)}$	-	1.0	1.3	-
Chroma Input Dynamic Range	e_{CIp}	3	8	ON	ON	OFF	a	b	ON	v_5=100mVp-p→800mVp-p	500	600	-	mVp-p
Uni Color Control Range (1) (Uni Color Switch ON)	Δe_{CU1p}	3	8	ON	ON	OFF	a	b	ON	V_C=4~10V, V_S=10V v_5=120mVp-p(B:C=1:1) $\Delta e_{CUp}=20\log\frac{v_8(v_C=10V)}{v_8(v_C=4V)}$	40	-	-	dB
Uni Color Control Range (2) (Switch OFF)	Δe_{CU2p}	3	8	ON	ON	OFF	a	b	OFF	Same as above	-	0	-	dB
Uni Color Control Phase Shift	$\Delta\theta_{Up}$	3	8	ON	ON	OFF	a	b	ON	V_C=4V~10V, V_S=10V v_5=120mVp-p(B:C=1:1)	-	-	5	deg
Residual Color	CK_p	3	8	ON	ON	OFF	a	b	ON	V_C=10V, V_S=0V v_5=120mVp-p(B:C=1:1)	-	-	3	mVp-p

CHROMA (2) PAL

CHARACTERISTIC	SYMBOL	TEST CCT	TEST PIN	SW 41	SW 7	SW 9	SW 12	SW 15	SW 20	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Color Control Phase Shift	$\Delta\theta_{CCP}$	3	8	ON	ON	OFF	a	b	ON	V_C=10V, V_S=2~10V v_5=120mVp-p(B:C=1:1)	-	3	-	deg
Burst-Chroma Phase Difference	$\Delta\theta_{bCP}$	3	8 10	ON	ON	OFF	a	b	ON	Burst phase difference between pin 8 and pin 10.	-	60	-	deg
Tint Control Range	$\Delta\theta_{bH1P}$	3	10	ON	ON	ON	a	b	ON		-	0	-	deg
Tint Control Phase Distribution	$\Delta\theta_{bH2P}$	3	10	ON	ON	ON	a	b	ON		-	0	-	deg
Killer Det. Sensitivity	e_{KP}	3	8 10	OFF	ON	OFF	a	a	ON	Change the burst level at pin 5 from 0 to 150mVp-p. Mesure burst level at pin 10 when killer starts to operate.	30	60	110	mVp-p
Ident Det. Sensitivity	e_{IP}	3	21 10	OFF	ON	OFF	a	a	ON	Change burst level at pin 5 from o to 150mVp-p. Mesure burst level at pin 10 when ident starts to operate.	-	60	-	mVp-p
APC Pull-in Range	f_{PP}	3	13	OFF	OFF	OFF	a	a	ON	v_5:120mVp-p burst	±300	±500	-	Hz
Phase Det. Sensitivity	μ_P	3	16 18	OFF	OFF	OFF	a	c	ON	v_5:120mVp-p burst	-	25	-	mV/deg
Control Sensitivity	β_P	3	13 16 18	OFF	OFF	OFF	a	a	ON	v_5:120mVp-p burst	-	2.2	-	Hz/mV

CHROMA (3) PAL

CHARACTERISTIC	SYMBOL	TEST CCT	TEST PIN	SW 41	SW 7	SW 9	SW 12	SW 15	SW 20	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Color Differential Output Voltage	e_{ORp}	3	21	ON	ON	OFF	a	a	ON	v_{17}, v_{19}:100mVp-p 4.443618MHz CW:4.433618MHz	1.8	2.4	3.0	Vp-p
	e_{OG}		20								-	-	-	
	e_{OBp}		22								3.2	4.2	5.4	
Max. Color Differential Output Voltage	e_{ORMp}	3	21	ON	ON	OFF	a	a	ON	v_{17}, v_{19}:500mVp-p 4.43618MHz CW:4.433618MHz	3.8	5.5	-	Vp-p
	e_{OGMp}		20								-	-	-	
	e_{OBMp}		22								3.8	5.5		
Relative Amplitude	R-Y/B-Yp	3	21/22	ON	ON	OFF	a	a	ON	v_{17}:200mVp-p 4.443618MHz CW:4.433618MHz	0.46	0.56	0.66	-
	G-Y/B-Yp		20/22								0.24	0.34	0.44	
Relative Phase	θ_{R-Yp}	3	21/22	ON	ON	OFF	a	a	ON			90	100	deg
	θ_{G-Yp}		20/22								220	230	240	
Residual Carrier	e_{rcRp}	3	21	ON	ON	OFF	a	a	ON		-	-	300	mVp-p
	e_{rcGp}		20											
	e_{rcBp}		22											
Demodulator Bandwidth	f_{BRp}	3	21	ON	ON	OFF	a	a	ON	v_{17}:200mVp-p 10kHz~5MHz	1.1	2.1	3.2	MHz
	f_{BGp}		20											
	f_{BBp}		22											
Demo. Output DC Voltage	E_{ORp}	1	21	OFF	OFF	OFF	a	b	ON		6.8	7.4	8.0	V
	E_{OGp}		20											
	E_{OBp}		22											
Demo. Output DC Voltage Difference	$E_{O(R-G)p}$	1	21	OFF	OFF	OFF	a	b	ON	v_{17}, v_{19} no input	-0.2	0	0.2	V
	$E_{O(R-B)p}$		20											
	$E_{O(B-G)p}$		22											

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TA12(2)

CHROMA (3) PAL

CHARACTERISTIC	SYMBOL	TEST CCT	TEST PIN	SW 41	SW 7	SW 9	SW 12	SW 15	SW 20	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Demo.Output DC Voltage Therm. Co-effic.	$\Delta E_{OR\theta P}$ $\Delta E_{OG\theta P}$ $\Delta E_{OB\theta}$	1	21 20 22	OFF	OFF	OFF	a	b	ON	Ta=-20~65°C	-3	-0.5	2	mV/°C
Demo. Output Diffence Voltage Therm. Co-effic.	$E_{O(R-G)\theta P}$ $E_{O(R-B)\theta P}$ $E_{O(B-G)\theta}$	1	21 20 22	OFF	OFF	OFF	a	b	ON	Ta=-20°C~65°C	-2	0	2	mV/°C
System SW Threshold	V_{thS}	3	19	OFF	OFF	OFF	a	b	ON	v_{17}:200mVp-p 4.443618MHz CW:4.433618MHz	2.4	3	3.6	V
DC Change by System SW	ΔE_{OR} ΔE_{OG} ΔE_{OB}	3	21 20 22	OFF	OFF	OFF	a	b	ON	v_{17}:200mVp-p 4.43618MHz	-100	0	100	mV

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CHROMA (4) NTSC (Unless otherwise specified, V_C=10V, V_S=10V, SW36:ON, SW10:OFF, SW4A:ON, SW4B:ON)

CHARACTERISTIC	SYMBOL	TEST CCT	TEST PIN	SW 41	SW 7	SW 9	SW 12	SW 15	SW 20	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Max. Chroma Output Voltage	e_{CM_N}	4	8	ON	ON	OFF	a	b	ON	v_5:120mVp-p(B:C=1:1)	0.5	0.75	1.05	Vp-p
Burst Output Voltage	e_{b_N}	4	10	ON	ON	OFF	a	b	ON	v_5:120mVp-p(B:C=1:1)	0.45	0.70	0.95	Vp-p
ACC Characteristics (1)	e_{a_N}	4	8	ON	ON	OFF	a	b	ON	v_5:15mVp-p(B:C=1:1)	0.2	0.43	-	Vp-p
ACC Characteristics (2)	A_N	4	8	ON	ON	OFF	a	b	ON	v_5:100mVp-p, 300mVp-p(B:C=1:1) $A_P = \frac{v_8(v_5=300mVp\text{-}p)}{v_8(v_5=100mVp\text{-}p)}$	-	1.0	1.3	
Chroma Input Dynamic Range	e_{CI_N}	4	8	ON	ON	OFF	a	b	ON	v_5=100mVp-p → 800mVp-p	500	600	-	mVp-p
Uni Color Control Range (1) (Uni Color SW ON)	Δe_{CU1_N}	4	8	ON	ON	OFF	a	b	ON	V_C=4~10V, V_S=10V v_5=120mVp-p(B:C=1:1) $\Delta e_{CUp}=20\ell og\frac{v_8(v_C=10V)}{v_8(v_C=4V)}$	40	-	-	dB
Uni Color Control Range (2) (SW OFF)	Δe_{CU2_N}	4	8	ON	ON	OFF	a	b	OFF		-	0	-	dB
Uni Color Control Phase Shift	$\Delta\theta_{U_N}$	4	8	ON	ON	OFF	a	b	ON	V_C=4V~10V, V_S=10V v_5=120mVp-p(B:C=1:1)	-	-	5	deg
Residual Color	e_{CK_N}	4	8	ON	ON	OFF	a	b	ON	V_C=10V, V_S=0V v_5=120mVp-p(B:C=1:1)	-	-	3	mVp-p

CHROMA (5) NTSC

CHARACTERISTIC	SYMBOL	TEST CCT	TEST PIN	SW 41	SW 7	SW 9	SW 12	SW 15	SW 20	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Color Control Phase Shift	$\Delta\theta_{CC_N}$	4	8	ON	ON	OFF	a	b	ON	V_C=10V, V_S=2~10V v_5=120mVp-p(B:C=1:1)		-	3	7	deg
Burst-Chroma Phase Difference	$\Delta\theta_{bC_N}$	4	8 10	ON	ON	OFF	a	b	ON			-	60	-	deg
Tint Control Range	$\Delta\theta_{bH1_N}$	4	10	ON	ON	ON	a	b	ON	V_C=10V V_T=2~10V v_5=120mVp-p (B:C=1:1)	f=4.43MHz	75	95	110	deg
											f=3.58MHz	100	120	140	
Tint Control Phase Distribution	$\Delta\theta_{bH2_N}$	4	10	ON	ON	ON	a	b	ON	V_C=10V v_5=120mVp-p (B:C=1:1) v_7	f=4.43MHz	34	47	62	deg
											f=3.58MHz	45	60	80	
Killer Det. Sensitivity	e_{K_N}	4	8 10	OFF	ON	OFF	a	a	ON			15	30	75	mVp-p
APC Pull-in Range	f_{P_N}	4	13	OFF	OFF	OFF	a	a	ON			±300	±500	-	Hz
Phase Det. Sensitivity	μ_N	4	16 18	OFF	OFF	OFF	a	c	ON			-	25	-	mV/deg
Control Sensitivity	β_N	4	13 16 18	OFF	OFF	OFF	a	a	ON			-	2.2	-	Hz/mV

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CHROMA (6) NTSC

CHARACTERISTIC	SYMBOL	TEST CCT	TEST PIN	SW 41	SW 7	SW 9	SW 12	SW 15	SW 20	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Color Differential Output Voltage	e_{ORN} e_{OGN} e_{OBN}	4	21 20 22	ON	ON	OFF	a	a	ON	v_{17}:100mVp-p 4.443618MHz CW:4.433618MHz	3.0 1.0 3.0	4.1 1.6 4.1	5.3 2.2 5.3	Vp-p
Max. Color Differential Output Voltage	e_{ORMN} e_{OGMN} e_{OBMN}	4	21 20 22	ON	ON	OFF	a	a	ON	v_{17}:500mVp-p 4.443618MHz CW:4.433618MHz	4.5 1.4 4.5	5.5 1.8 5.5	- - -	Vp-p
Relative Amplitude	R-Y/B-Y_N G-Y/B-Y_N	4	21/22 20/22	ON	ON	OFF	a	a	ON	v_{17}:100mVp-p 4.443618MHz CW:4.433618MHz	0.88 0.28	1.00 0.38	1.1 0.48	-
Relative Phase	θR-Y_N θG-Y_N	4	21/22 20/22	ON	ON	OFF	a	a	ON		- -	105 235	- -	deg
Residual Carrier	e_{rcRN} e_{rcGN} e_{rcBN}	4	21 20 22	ON	ON	OFF	a	a	ON		-	-	300	mVp-p
Demodurator Band Width	f_{BRN} f_{BGN} f_{BBN}	4	21 20 22	ON	ON	OFF	a	a	ON	v_{17}:100mVp-p,10kHz~5MHz	1.1	2.1	3.2	MHz
Demo. Output DC Voltage	E_{ORN} E_{OGN} E_{OBN}	1	21 20 22	OFF	OFF	OFF	a	b	ON	v_{17}:	6.8	7.4	8.0	V
Demo. Output DC Voltage Difference	$E_O(R-G)_N$ $E_O(G-B)_N$ $E_O(B-G)_N$	1	21 20 22	OFF	OFF	OFF	a	b	ON	v_{17}:	-0.3	0	0.3	V

CHROMA (6) NTSC

CHARACTERISTIC	SYMBOL	TEST CCT	TEST PIN	SW 41	SW 7	SW 9	SW 12	SW 15	SW 20	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Demo. Output DC Voltage Therm. Co-effic.	$\Delta E_{OR\theta N}$	1	21	OFF	OFF	OFF	a	b	ON	Ta=-20~65°C	-3	0	2	mV/°C
	$\Delta E_{OG\theta N}$		20											
	$\Delta E_{OB\theta N}$		22											
Demo. Output Diff. Voltage Therm. Co-effic.	$\Delta E_{O(R-G)\theta N}$	1	21	OFF	OFF	OFF	a	b	ON	Ta=-20~65°C	-2	0	2	mV/°C
	$\Delta E_{O(R-B)\theta N}$		20											
	$\Delta E_{O(B-G)\theta N}$		22											

HORIZONTAL SECTION (1) (SW24, SW27, SW28 : OFF, SW29:a)

CHARACTERISTIC	SYMBOL	TEST CCT	TEST PIN	SW 34	SW 35	SW 36	SW 37	SW 32	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Horizontal Regulated Voltage	V_{33}	1	33	-	-	-	-			7.4	8.2	9.0	V
Recommendable Supply Current	I_{33}	5	33							22	26	30	mA
Horizontal Free Running Frequency	f_H	5	34	OFF	OFF	OFF	b	a	V_H=4V	14.725	15.625	16.125	kHz
f_H Thermal Drift	Δf_{HT}	5	34	OFF	OFF	OFF	b	a	V_H=4V Ta=-20~60°C	-90	70	230	Hz
AFC Clamping Voltage	V_{CL}	1	35	-	-	-	-	a	SW1:a, SW2:a	3.9	4.5	5.1	V
AFC Sink Current	I_{IN35}	1	35	-	-	-	-	a	SW1:a, SW2:b	2.7	3.7	5.0	mA
AFC Source Current	I_{O35}	1	35	-	-	-	-	a	SW1:a, SW2:c	2.7	4.0	5.0	mA
Horiz. Drive Residual Voltage	V_{OL32}	5	32	OFF	OFF	OFF	b	a	V_H=4V Saturation Voltage of #32	-	-	0.3	V
Horiz. Output Pulse Duty	T_{O32}	5	32	OFF	OFF	OFF	b	a	V_H=4V T_{O32}=Duty cycle of H period.	45	50	55	%
Horiz. Osc. Starting Voltage	V_{33} START	5	33	OFF	OFF	OFF	b	a	V_B:Variable Measure min V_B which provides 150% duty output to #32	-	-	4.0	V

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T1A12(2)

HORIZONTAL SECTION (2)

CHARACTERISTIC	SYMBOL	TEST CCT	TEST PIN	SW 34	SW 35	SW 36	SW 37	SW 32	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
4V Supply Current	I_{33} START	5	33	OFF	OFF	OFF	b	a	V_B=4V Measure I_{33}	4.6	6.7	8.8	mA
AFC Pull-in Range	Δf_H PULL	5	32 37	ON	ON	OFF	a → b	a	V_H:Variable Observe #32 and #37 waveform. S_{37} a→b, Measure the frequency difference.	-	±900	-	Hz
AFC Hold Range	Δf_H HOLD	5	32 37	ON	ON	OFF	a → b	a	Same as above	-	±1800	-	Hz
AFC Voltage Sensitivity	β_H	5	32	OFF	OFF	OFF	b	a	V_A=4.5V, Set V_H so that f_H will be 15.75kHz. Then, change V_A 4V+0.5V, Measure f_H difference.	-	1900	-	Hz/V
X'ray Protector Voltage Sensitivity	V_{IN30}	5	30	OFF	OFF	OFF	b	a	Apply variable DC voltage to #30(V_{30}). Measure V_{30} and I_{30} when #32 output disappers.	0.75	0.93	1.1	V
X'ray Protector Current Sensitivity	I_{IN30}	5	30	OFF	OFF	OFF	b	a		0.05	0.18	1.0	μA
H. Drive Output Excess Voltage Protector Current Sens.	I_{IN32}	5	32	OFF	OFF	OFF	b	b	Apply variable DC voltage to #32 through 1kΩ resistor. Measure V_{32} and I_{32} just before V_{32} goes down.	0.05	0.18	1.0	μA
Excess Voltage Protector Voltage Sens.	V_{IN32}	5	32	OFF	OFF	OFF	b	b		7.1	8.6	9.5	V

VERTICAL SECTION

CHARACTERISTIC	SYMBOL	TEST CCT	TEST PIN	SW 24	SW 26	SW 28	SW 29	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Vertical Frequency	f_V	5	27	OFF	OFF	OFF	c		47	50	54.1	Hz
Retrace Time	Tr	5	27	OFF	OFF	OFF	c	H period of #27 output pulse	450	690	850	μsec
f_V Pull-in Range	Δf_V PULL	5	27	OFF	OFF	ON → OFF	b	Set f_V to 50Hz at SW28:OFF ;f_{OSC28} Measure f_V at SW28:ON ;$f_{OSC'28}$ Δf_V PULL=$f_{OSC28}-f_{OSC'28}$	9.0	10.0	11.0	Hz
Term. 27 Max. Output Voltage	V_{O27}	1	27	-	-	-	-	SW29:ON, SW4:OFF	7.7	8.5	9.2	V
Term. 27 Max. Output Current	I_{O27}	1	27	-	-	-	-	SW29:ON, SW4:ON	15	27	50	mA
Max. Common Mode Input Voltage	V_{IH26}	5	26	ON	ON	OFF	a	$V_{27}=6 \rightarrow 12V$	11.9	-	-	V
Min. Common Mode Input Voltage	V_{IL26}	5	26	ON	ON	OFF	a	$V_{27}=6 \rightarrow 0V$	-	2.8	3.7	V

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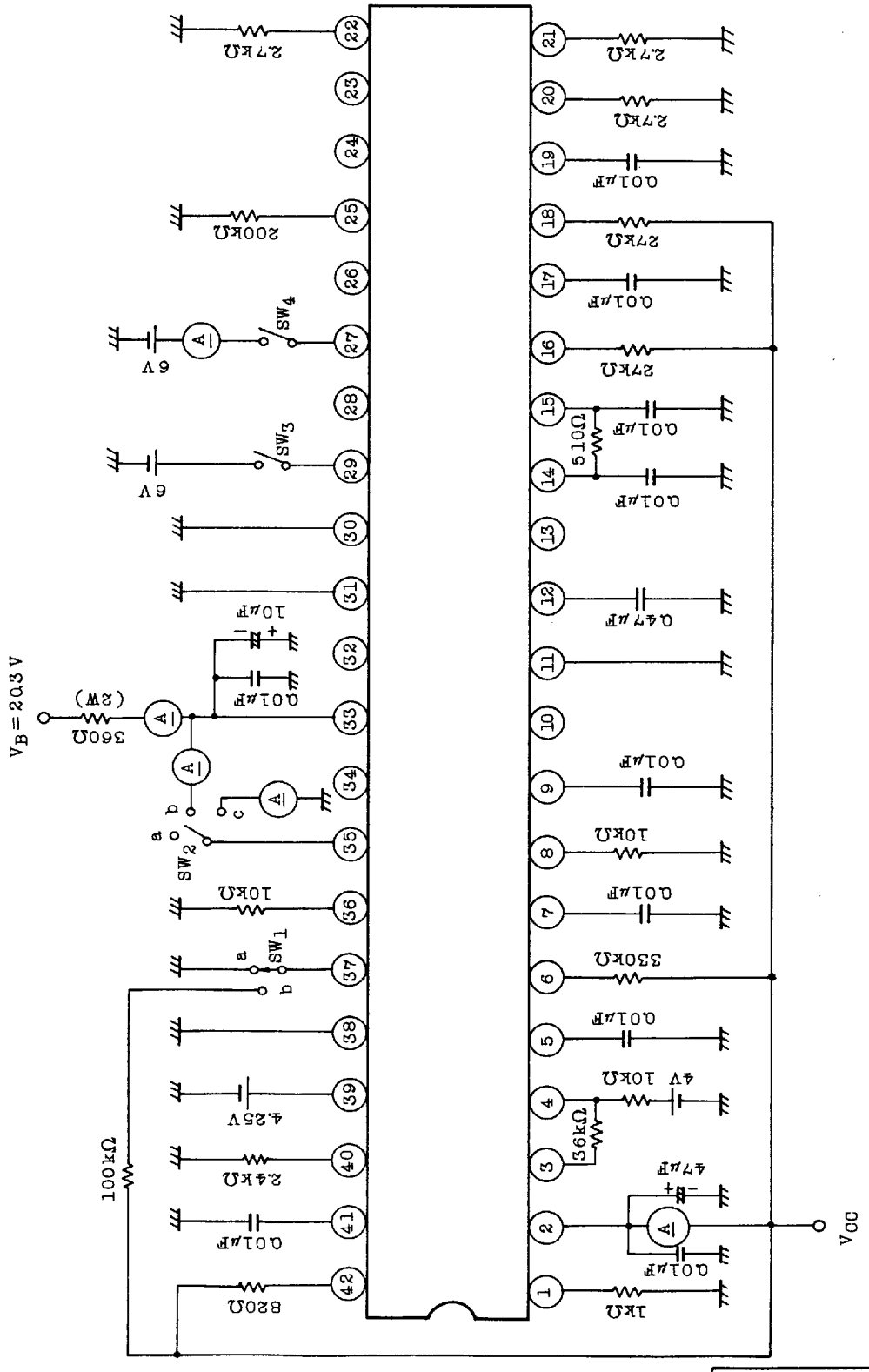
VERTICAL SECTION

CHARACTERISTIC	SYMBOL	TEST CCT	TEST PIN	SW 24	SW 26	SW 28	SW 29	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Term. 27 Input Current	I_{I27}	5	27	ON	ON	OFF	a	V_{27}=6V	0.25	1.0	4.5	μA
Term. 26 Input Current	I_{I26}	5	26	ON	ON	OFF	a	V_{27}=6V	0.18	1.0	6.3	μA
Max. Drive Output Voltage	V_{OH24}	5	24	OFF	ON	OFF	d		7.3	8.0	8.7	V
Min. Drive Output Voltage	V_{OL24}	5	24	OFF	OFF	OFF	d		-	-	0.3	V
Term. 25 Bias Voltage	V_{25}	5	25					I_{25}=-0.2mA	3.7	3.9	4.1	V
fV Thermal Drift	Δf_{VT}	5	27	OFF	OFF	OFF	c	Ta=-20~60°C	-1.0	0	2.0	Hz

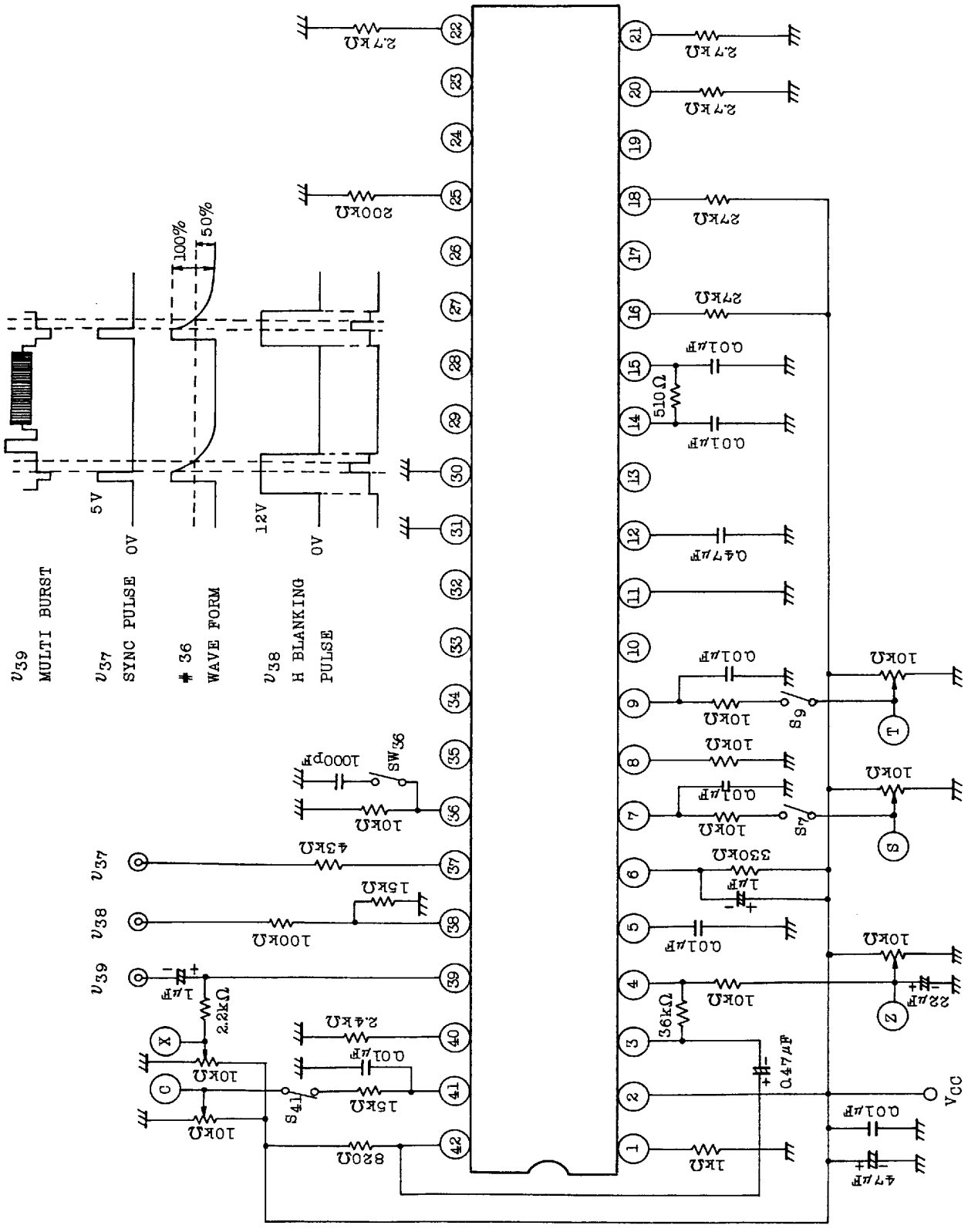
SYNC SEPARATOR

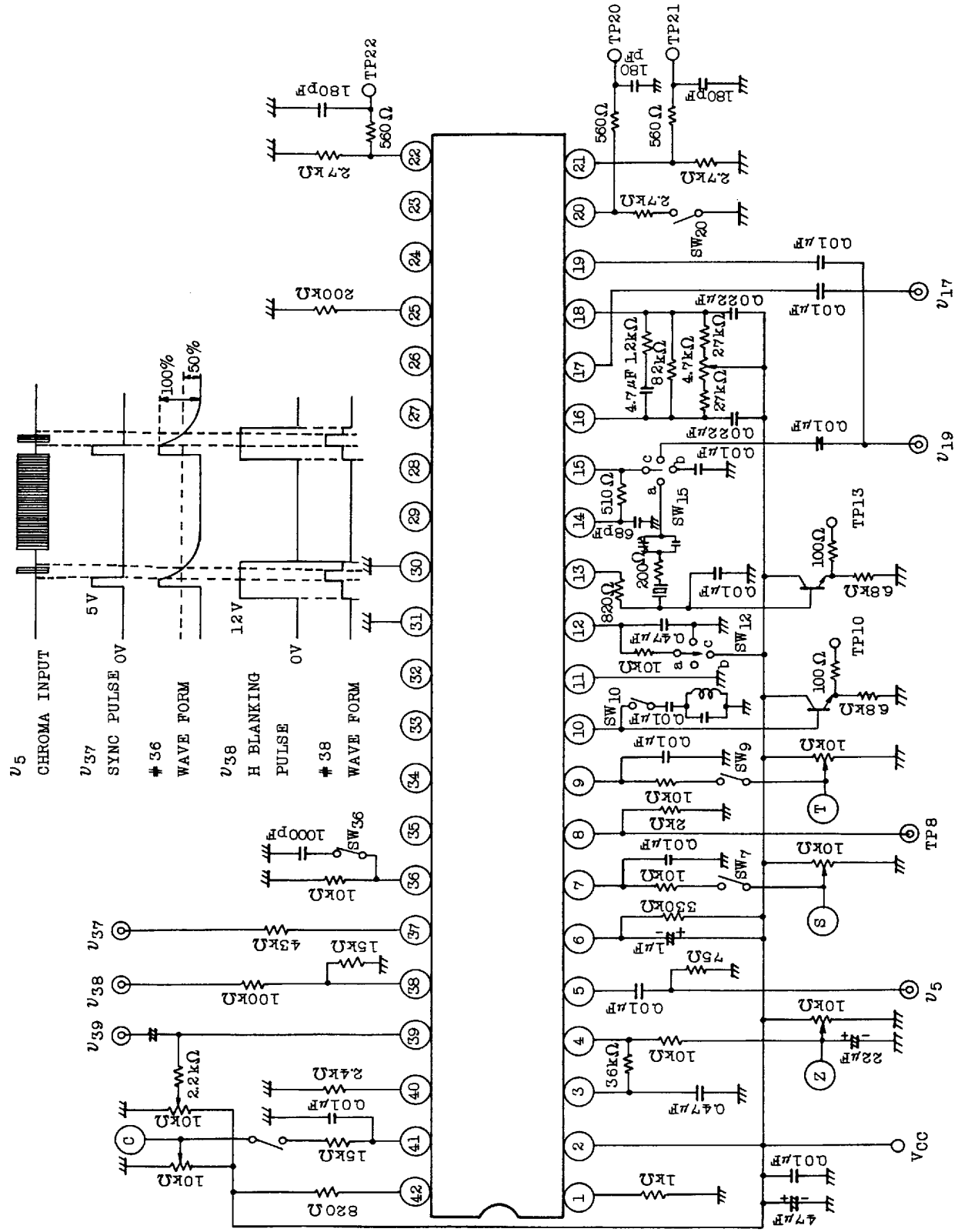
CHARACTERISTIC	SYMBOL	TEST CCT	TEST PIN	SW 34	SW 35	SW 36	SW 37	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Sync. Separator Current Sensitivity	I_{IN37}	5	36 37	OFF	OFF	OFF	c	Measure #37 input current when V_{36} goes L level to H.	18	35	113	μA
Sync. Output H level	V_{OH36}	5	36	OFF	OFF	OFF	c	V_S=2V Measure V_{36}	7.0	8.2	9.4	V
Sync. Output L level	V_{OL36}	5	36	OFF	OFF	OFF	b	Measure V_{36}	0	0.2	1.0	V
Gate Pulse H level	V_{OH38}	5	38	OFF	OFF	OFF	b	V_D=12V, V_{36}=5V Measure V_{38}	4.3	5.3	6.1	V
Gate Pulse L level	V_{OL38}	5	38	OFF	OFF	OFF	b	V_D=12V Measure V_{38}	-	1.6	-	V
H Pulse Threshold	V_{38ON}	5	38	OFF	OFF	OFF	b	V_D:Variable 0~2V Measure V_D when V_{38} goes H to L.	0.7	1	1.5	V



TEST CIRCUIT 1. DC

TEST CIRCUIT 2. Video





TEST CIRCUIT 3. Chroma (PAL)

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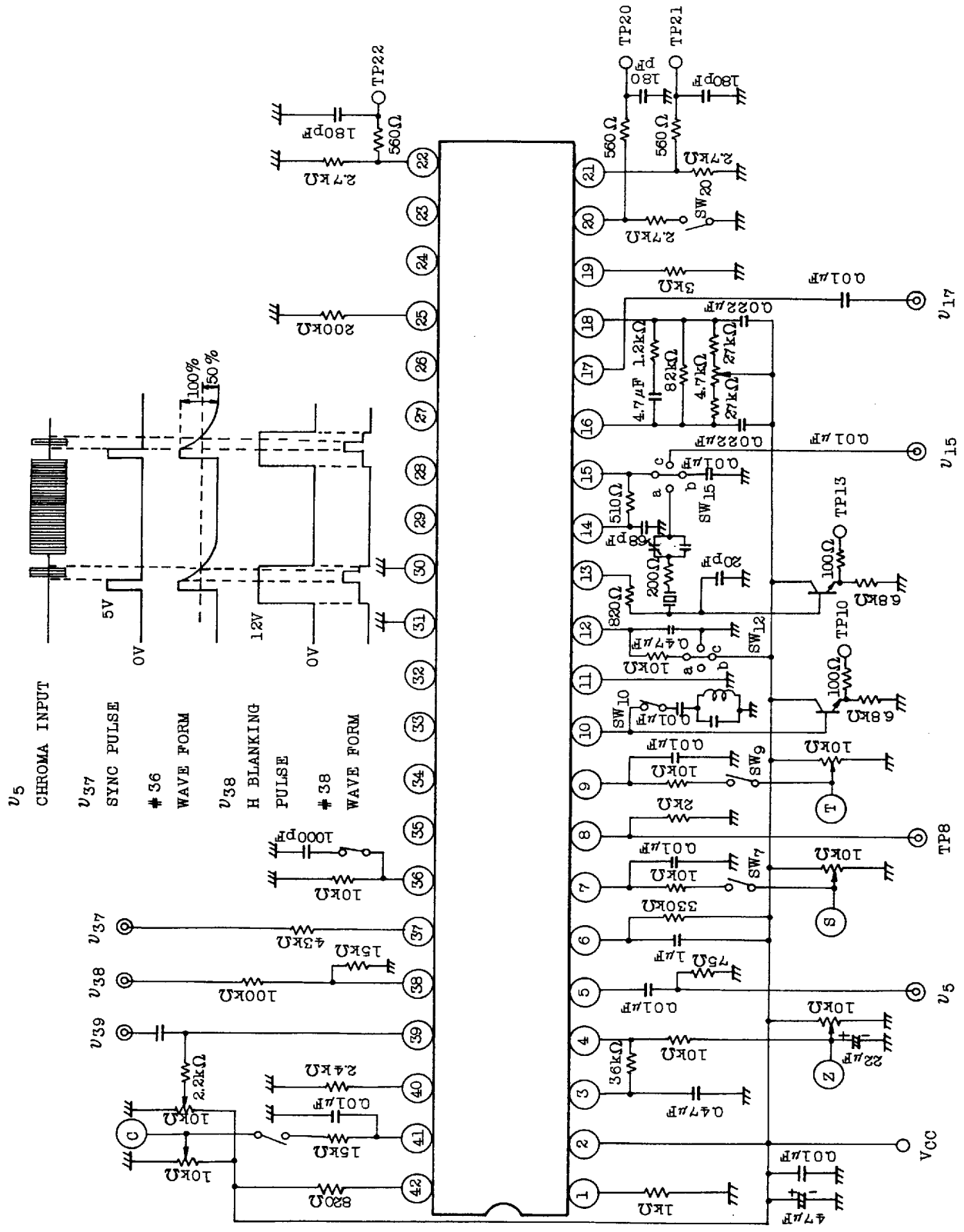
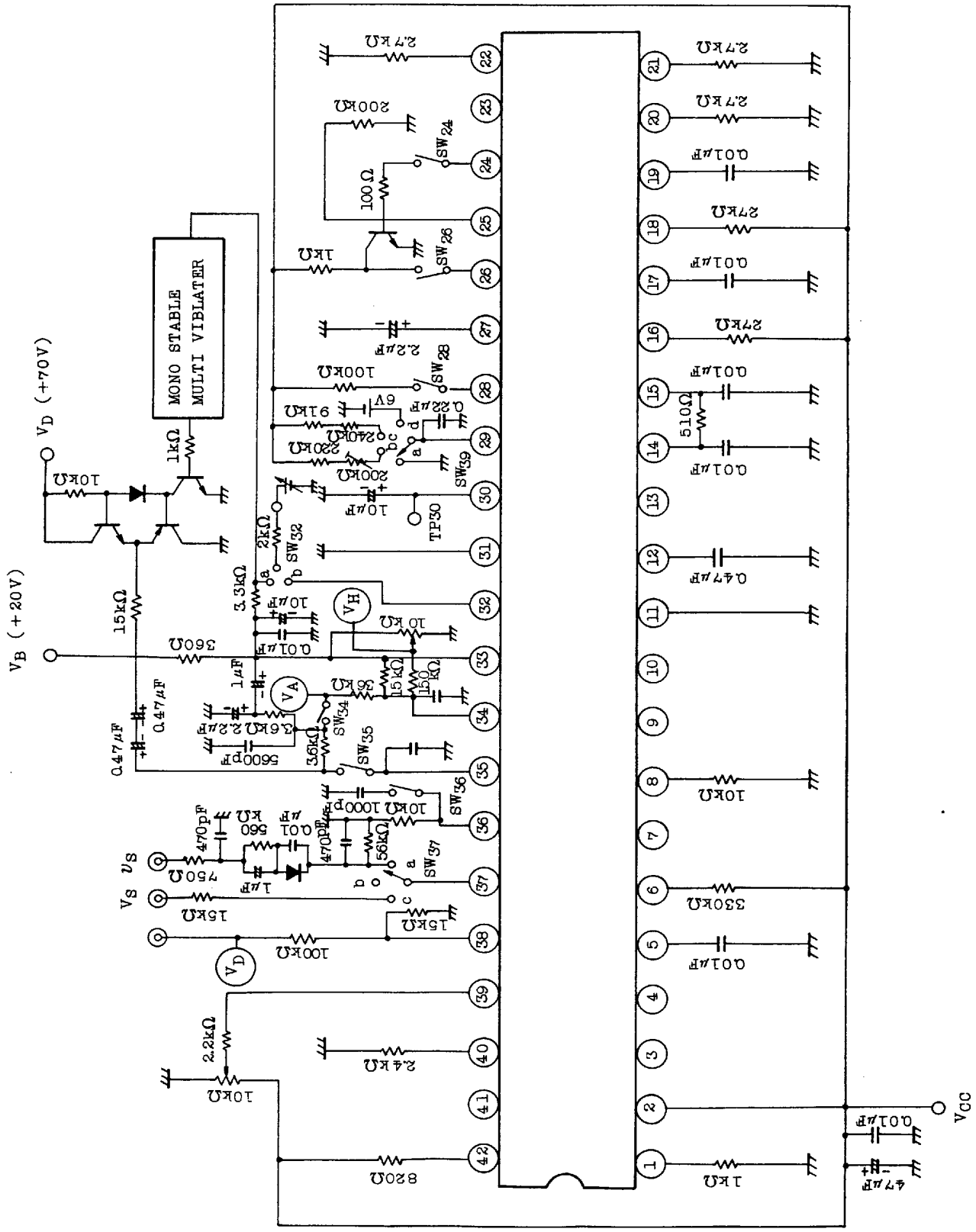
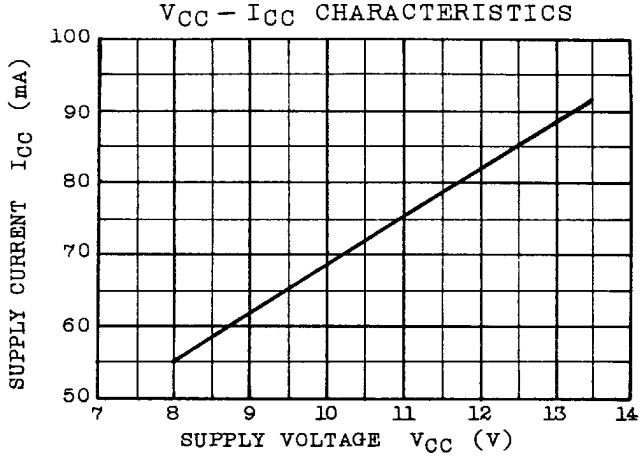
TEST CIRCUIT 4. Chroma (NTSC)



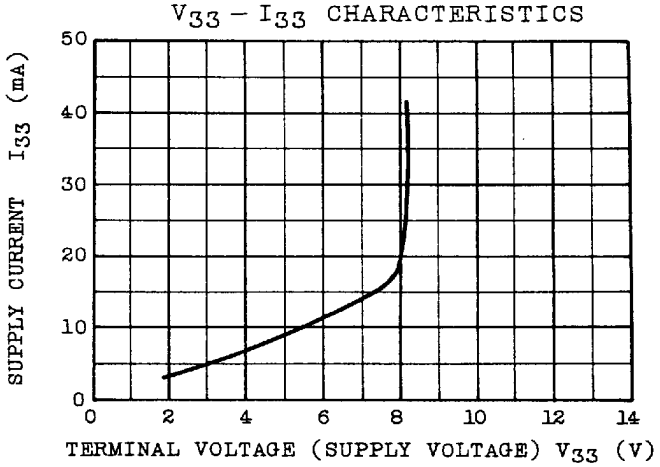
TEST CIRCUIT 5. Deflection



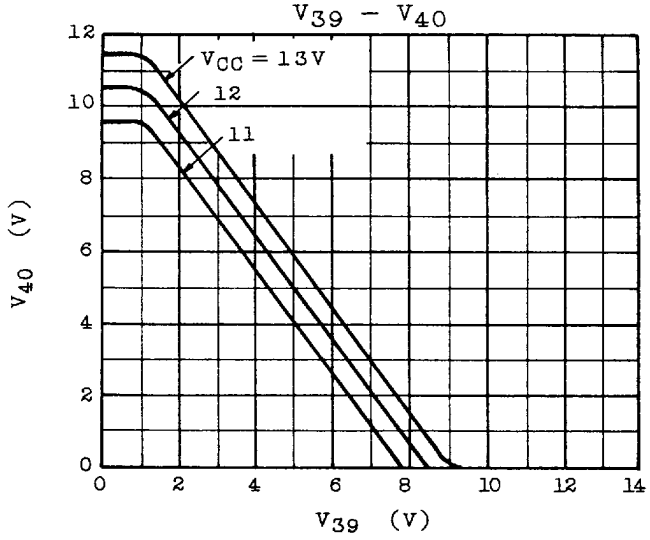
$V_{CC} - I_{CC}$ CHARACTERISTICS



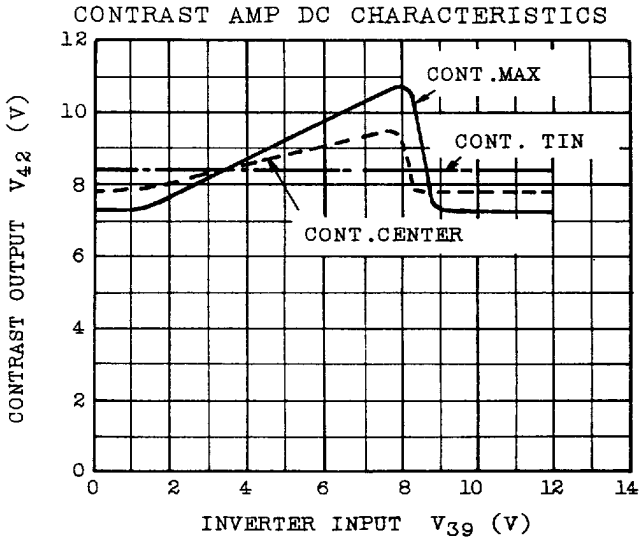
$V_{33} - I_{33}$ CHARACTERISTICS



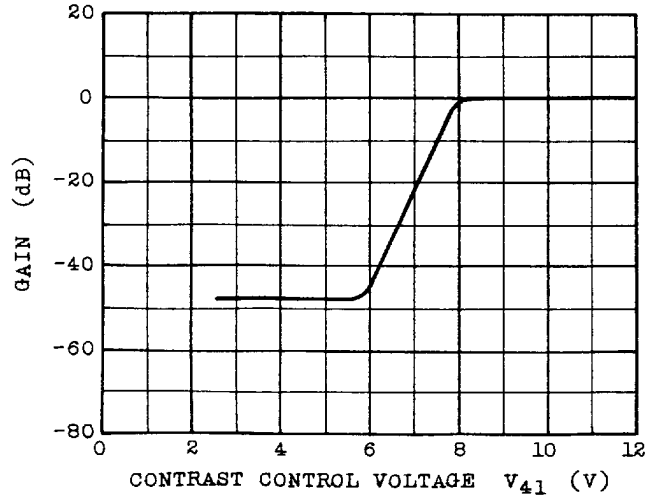
INVERTER DC CHARACTERISTICS
$V_{39} - V_{40}$



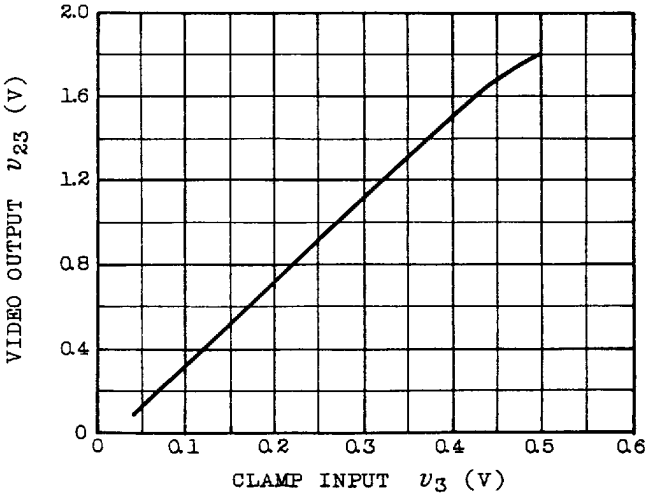
CONTRAST AMP DC CHARACTERISTICS



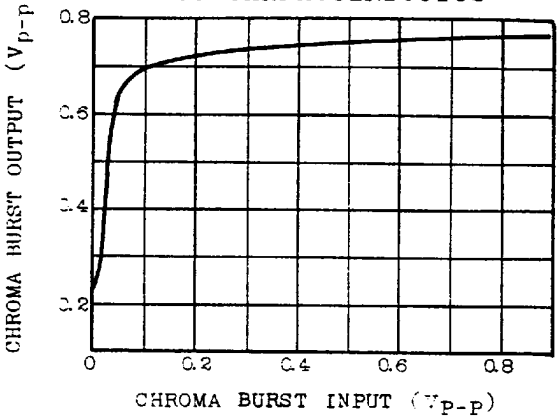
CONTRAST CONTROL CHARACTERISTICS



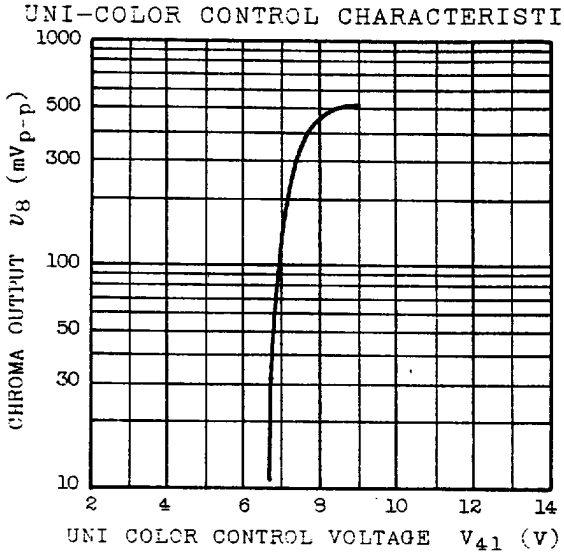
PEDESTAL AMP CHARACTERISTICS



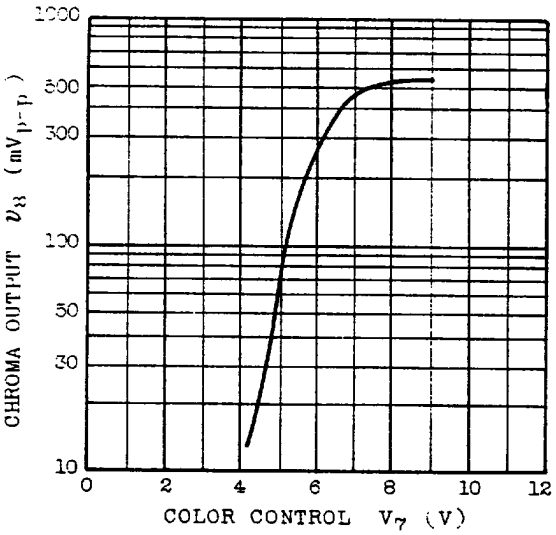
ACC CHARACTERISTICS



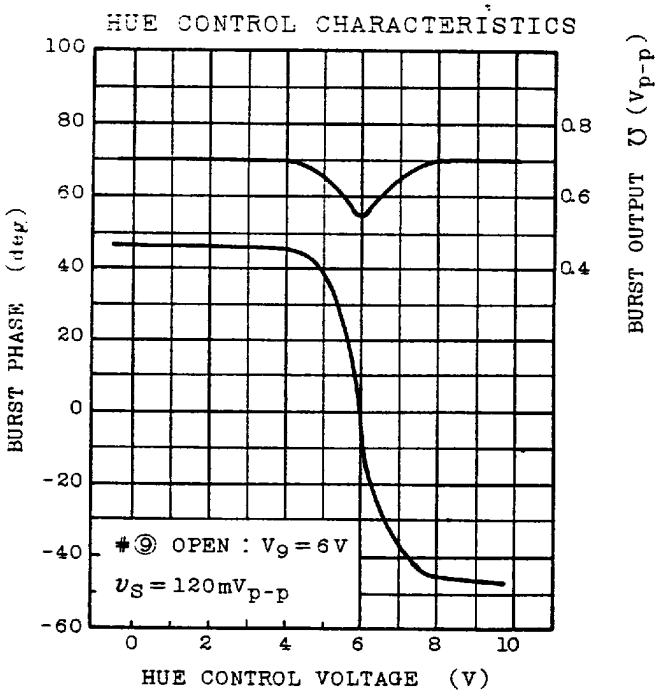
UNI-COLOR CONTROL CHARACTERISTICS



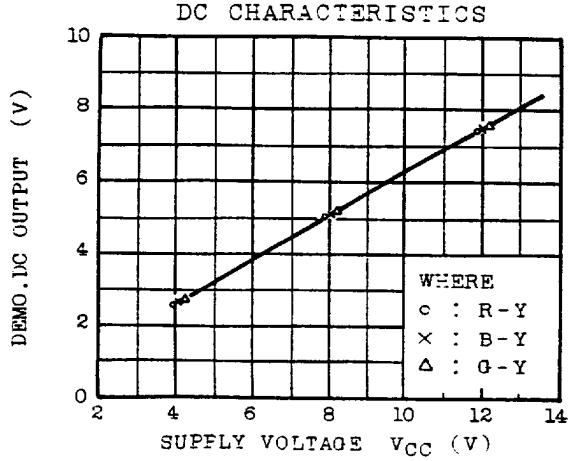
COLOR CONTROL CHARACTERISTICS



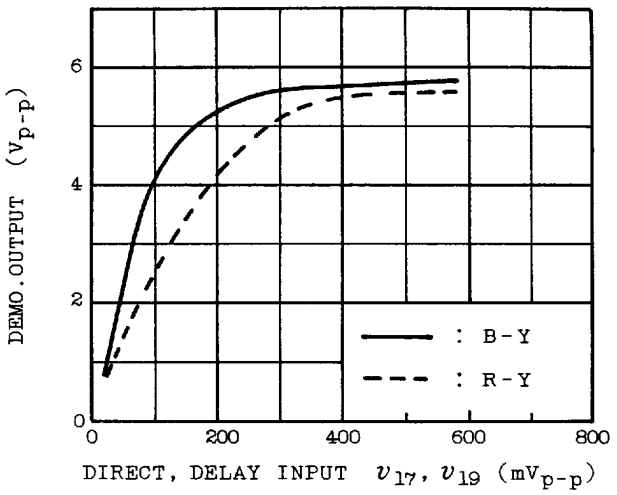
HUE CONTROL CHARACTERISTICS



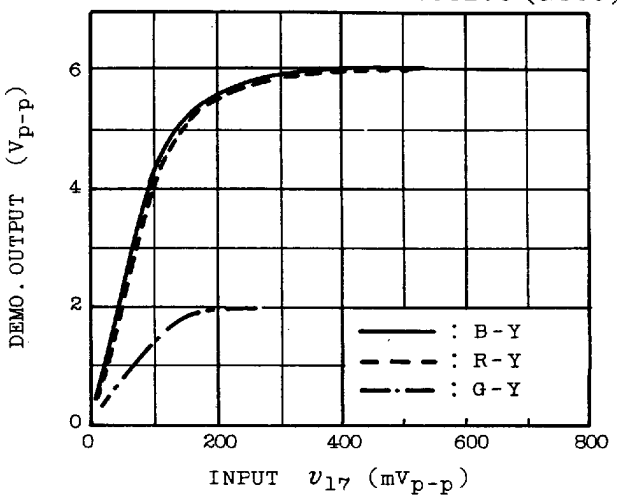
DC CHARACTERISTICS



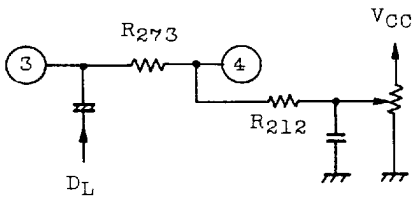
DEMO.OUTPUT CHARACTERISTICS (PAL)



DEMO.OUTPUT CHARACTERISTICS (NTSC)



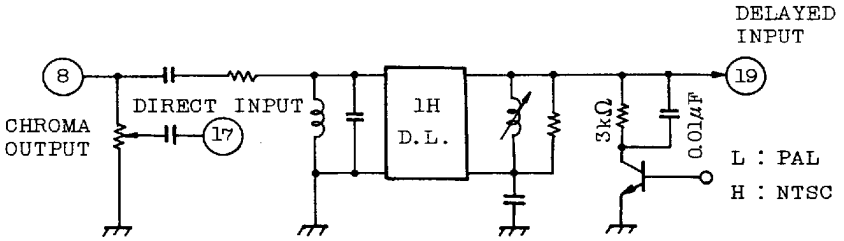
TERMINAL DESCRIPTION (1)

TERMINAL		FUNCTION
1	Emitter Peaking	An Emitter-output of the contrast amplifier. Contrast gain and peaking characteristics are determined by a ratio of load impedances connected to #1 and #42 terminal.
2	V_{CC1}	Supply terminal for Video, Chroma, Sync Sep and vertical Deflection. 12V typ is recommended.
3	Pedestal Clamp Input	Delayed video signal is applied. The typical gain of the pedestal amplifier is 12.6dB.
4	Brightness Control*	Control terminal of Brightness (DC level of -Y output). The DC restoration ratio is adjustable by superposing video signal component from the pedestal clamp input. 
5	Chroma Input	Chroma signal from a chroma take off coil is applied. The typical input level is 120mVp-p burst amplitude.
6	ACC Filter	Filter capacitor is connected.
7	Color Control* (Killer Output)	Control terminal of color saturation. Terminal voltage of #7 turns to low level when color Killer operates.
8	Chroma Output	Output terminal of chroma signal which is color controled, uni-color controled and burst gated.

TERMINAL DISCRIPTION (2)

TERMINAL		FUNCTION
9	Tint (Hue) Control*	Control terminal of Tint (Hue). Burst phase is controled.
10	Burst Cleaning	Burst cleaner (tuned Tank) is connected. Burst signal at this terminal is already phase-shifted by Tint control(NTSC). It is possible to set a phase shift between burst signal and chroma signal by the tank circuit alingment.
11	GND 1	GND terminal for Video and Chroma section. Suitable de-coupling capacitor should be connected between V_{CC} 1 and GND 1.
12	Killer Ident Filter	A capacitor for an ident filter is connected. The terminal voltage is V_{CC} (color), 8V typ (B/W) and GND (Ident).
13 14 15	X'tal Drive -45° Input 0° Input	Terminals for a sub-carrier oscillator. A X'tal is connected between #13 and #15 and a 45° ($\frac{\pi}{4}$) phase shift circuit is between #15 and #14. Reference vectors for color demodulator, APC detector and Killer/Ident detector are composed from sub-carrier signals of #14 and #15.
16 18	APC Filter	APC Filter circuit is connected. Two terminals are provided for reducing internal off-set.
17	Direct Dig. Input	Chroma signal from #8 (chroma output) is attenuated and applied to this terminal. The input level is 0.25Vp-p typ. (Burst level). When PAL application, input levels of #17 and #19 should be the same. Internal PAL matrix circuit reduces cross-talk between the direct signal and delayed signal. When NTSC application, internal gain changes to keep the same demodulator outputs as PAL-application.

TERMINAL DISCRIPTION (3)

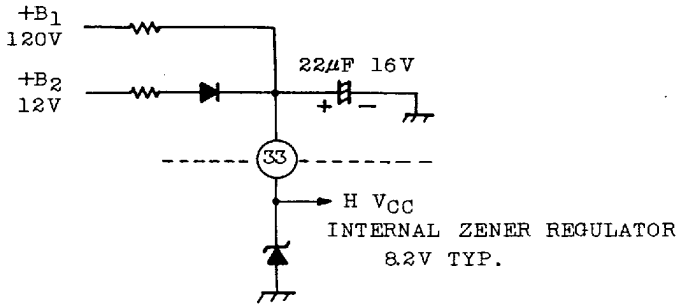
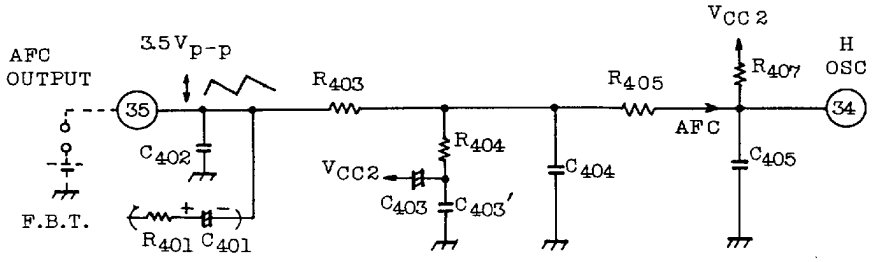
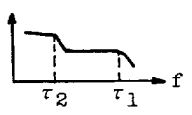
TERMINAL		FUNCTION
19	Delayed Signal Input PAL/NTSC System SW	Chroma signal from #8 (Chroma Output) is applied to this terminal through an 1H delay line. The input level is 0.25Vp-p typ. (Burst level). PAL/NTSC System SW Function When #19 terminal voltage is below 2V, internal switch turns to NTSC mode. To reduce external parts number, an application circuit shown below is recommendable.  A transistor switch shunt the delayed chroma signal and shift #19 DC voltage below 2V.
20	G-Y Output	G-Y demodulator output terminal/Uni-color switch. When a load resistor is connected between #20 and GND, G-Y output and Uni-color function are enabled. When #20 is open, Uni-color function is disabled and #41 controls only contrast for PAL/SECAM or PAL/NTSC/SECAM applications.
21	R-Y Output	R-Y demodulator output terminal.
22	B-Y Output	B-Y demodulator output terminal.

	RELATIVE PHASE		RELATIVE AMPLITUDE		MATRIX	TINT CONTROL	FLIP·FLOP
	R-Y	G-Y	B-Y/R-Y	G-Y/B-Y			
PAL	±90°	230°	1.78	0.58	PAL	OFF	ON
NTSC	105°	235°	0.95	0.31	NTSC	ON	STOP

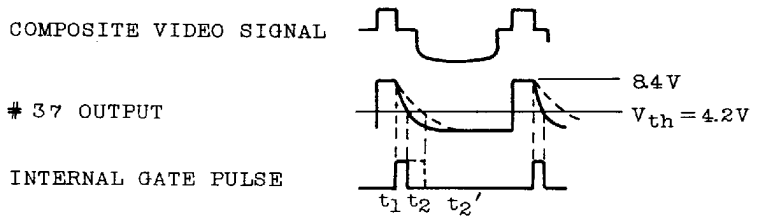
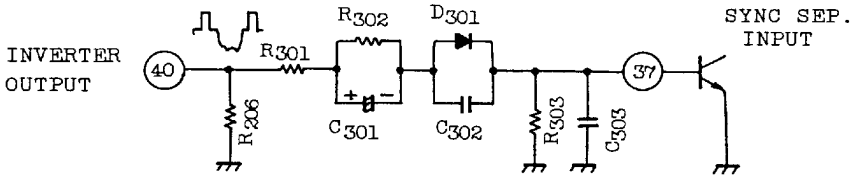
TERMINAL DISCRIPTION (4)

TERMINAL		FUNCTION
23	-Y Output	Output terminal of -Y (Luminance) signal which is contrast/brightness controled.
24	Vertical Output	Vertical driver output terminal (Emitter follower). It is capable to drive SRPP output circuit directly.
25	Vertical Height	Constant current discharge rate of ramp capacitor connected #27 terminal is determined by a resistor value which connected between this terminal and GND. (Vertical amplitude is in the propotion of the discharge rate).
26	NFB	NFB terminal for DC/AC. NFB wave form is compared with ramp wave form of #27 terminal.
27	Ramp Capacitor	A ramp capacitor is connected. It should be stable and having low tan δ value. (2.2μF tantalum capacitor is recommended.) The ramp capacitor is charged to a reference voltage determined internally during retrace period, and discharged constantly to get required linearlity during trace period.
28	Vertical Sync Input (V. trig.)	Composite sync signal from #36 (Sync Output) is integrated and applied to this terminal.
29	Vertical Oscillator Timing Constant	CR timing constant for vertical oscillator is connected. Vertical retrace time is determined the timing resistor value and internal discharge resistor value.
30	X-ray Protector	SCR type X-ray protector. The threshold is 0.9V typ. When X-ray protector operate, horizontal drive output #32 turns to low level. It also operates when #32 voltage exceeds 9V (typ.).
31	GND 2	GND terminal for Vertical/Horizontal, AFC and Synce Separator. De-coupling capacitors from V_{CC1} and V_{CC2} should be connected to this GND.

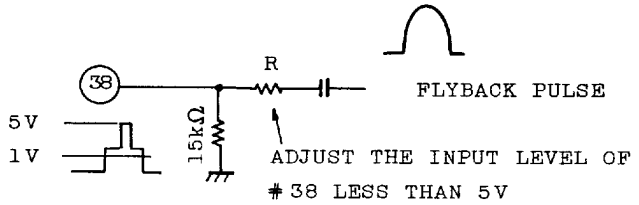
TERMINAL DISCRIPTION (5)

TERMINAL		FUNCTION
32	H. Drive Output	Open collector output for Horizontal driver. External load resistor is required.
33	V_{CC2} (H. V_{CC})	Supply terminal for horizontal deflection circuit starting up. 
34	Horizontal Oscillator Timing Constant	$2f_H$ oscillator timing CR is connected. Thermal co-efficient of this CR should be selected to compensate f_H thermal drift which is specified.
35	AFC Output	I/O terminal of horizontal AFC circuit. The refference voltage of AFC is 4.5V typ..  C_{402} : Flyback Pulse integral capacitor C_{405}, R_{407} : Horizontal Osc. Timing constant R_{403}, C_{404} : AFC time constant τ_1 $R_{404}, C_{403}, C_{403}'$: AFC τ_2 R_{405} : Determines AFC control sensitivity. 

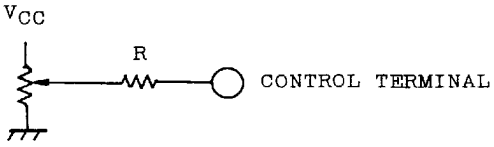
TERMINAL DISCRIPTION (6)

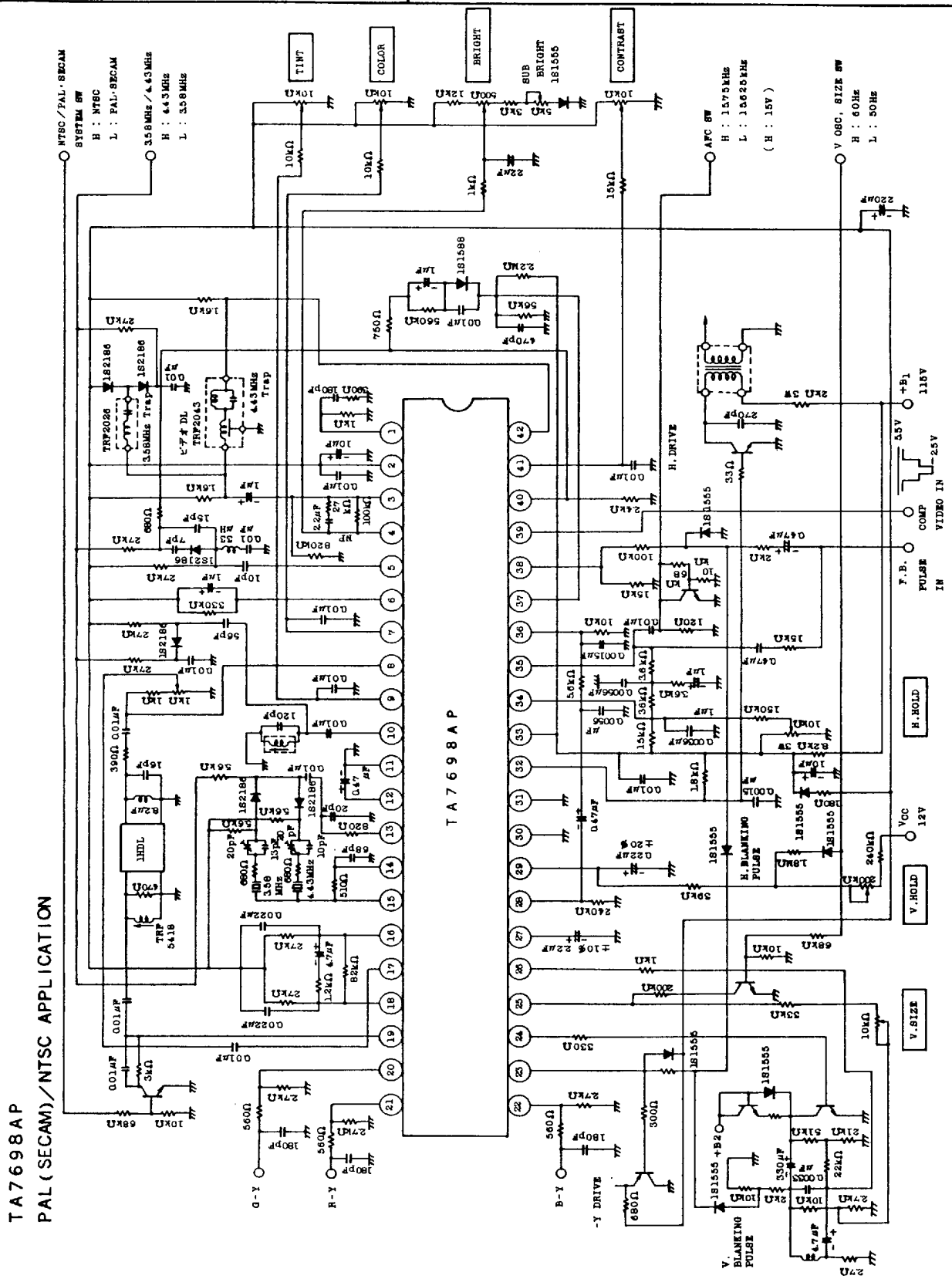
TERMINAL		FUNCTION
36	Sync. Sep. Output	Output terminal of composite sync signal/Timing constant for gate pulse generation. Falling edge of the gate pulse (t_2) is adjusted by external capacitor and resistor. Rising edge (t_1) is internally determined. It adjustment of t_1 is required, a capacitor which connected between #37 (Sync. Sep. Input) and GND will be changed to shift sync signal timing.  Generated gate pulse is masked by flyback pulse from #38, and applied to the pedestal clamp circuit and the burst gate circuit.
37	Sync Sep. Input	Input terminal of the base-time constant type sync separator. Composite video signal from #40 (Inverter Output) is applied through sync sep. time constant circuit. Slice level of horizontal sync and vertical sync can be set independently.  R206 : #40 load resistor R301,C302,R303 : Horizontal sync slice level R301,C301,R302 : Vertical sync slice level D301 : Timing constant separation C303 : Noise Filter/Gate pulse rising edge timing. To deepen the slice level Horizontal : R301 increase or R303 decrease Vertical : R301 increase or R302 decrease

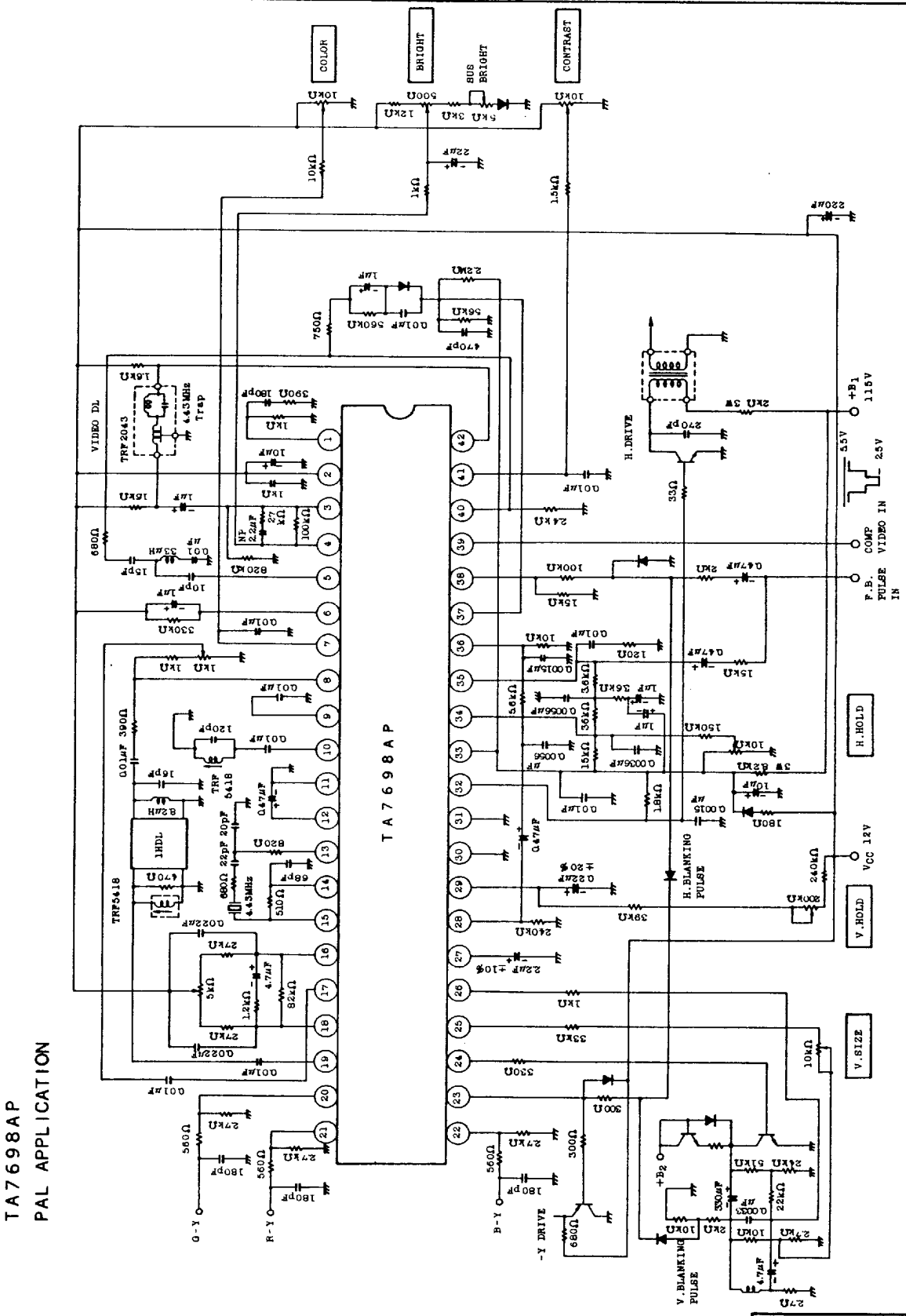
TERMINAL DISCRIPTION (7)

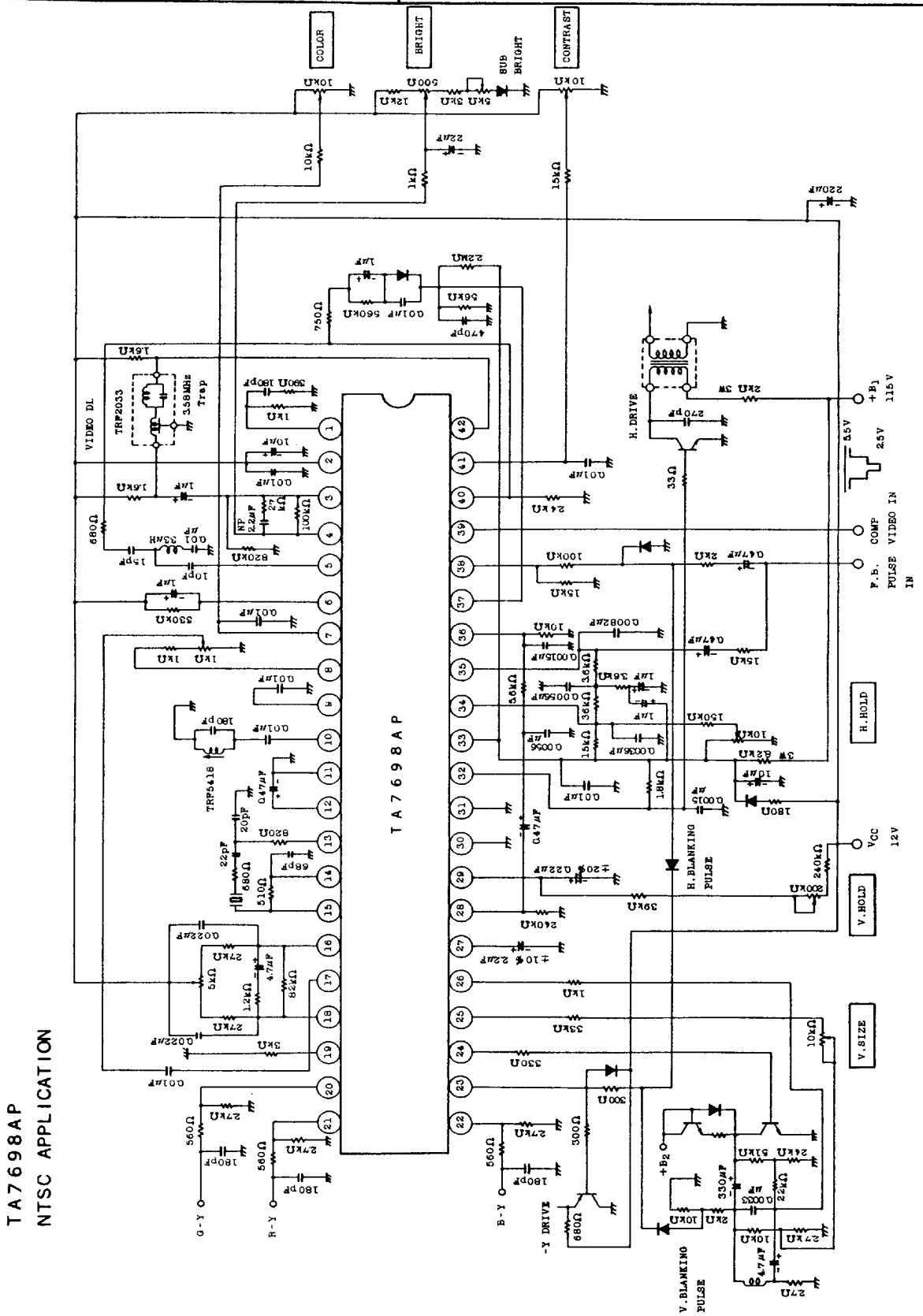
TERMINAL		FUNCTION
38	Flyback Pulse Input	Input terminal of flyback pulse for flip-flop driving, horizontal blanking and gate pulse masking. Pulse height of flyback pulse should be less than 5V. #38 terminal voltage is clamped to 5V during gate pulse period. 
39	Inverter Amp. Input	Composite video signal from PIF is applied directly. Input dynamic range is 2.0V to 6.5V. (Sync negative composite video is required.)
40	Inverter Amp. Output	Output terminal of the inverter amplifier. The output signal is applied to the sync. separator and the chroma band pass circuit.
41	Contrast Control*	Contrast/Contrast·Uni-color control See #20
42	Contrast Amp. Output	Collector output of contrast amplifier. See #1. #42 terminal voltage (operating) should be above 6V.

* Control sensitivity of each control terminal is adjustable by a series resister R.









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