

# 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.

#### FEATURES:

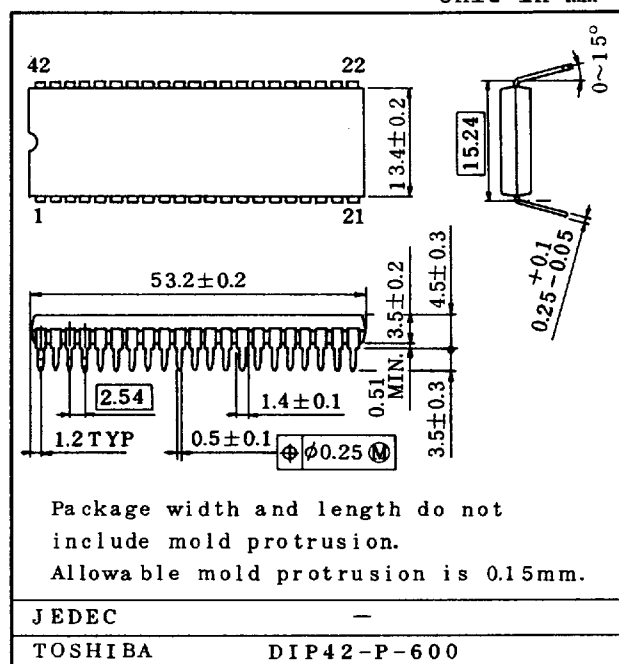
##### Video-Chroma Section

- . 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 Output Due to the 2-f<sub>H</sub> Oscillator and Flip-Flop Circuit.
- . Excellent Inter-race.

Unit in mm



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MAXIMUM RATINGS (Ta=25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V <sub>CC</sub> MAX	15	V
Horiz. Supply Current	I <sub>CC</sub> MAX	40	mA
Max. Input Signal Level	e <sub>IN</sub> 3,5,14,15,17, 19,28,37,39	5	V <sub>p-p</sub>
Max. Control Terminal Voltage	V <sub>4</sub> MAX, V <sub>5</sub> MAX, V <sub>7</sub> MAX, V <sub>9</sub> MAX	V <sub>CC</sub>	V
Term. 1 Max. Output Current	I <sub>1</sub> MAX	4	mA
Term. 8 Max. Output Current	I <sub>8</sub> MAX	10	mA
Term. 10 Max. Output Current	I <sub>10</sub> MAX	4	mA
Term. 13 Max. Output Current	I <sub>13</sub> MAX	4	mA
Min. Load Resistance	R <sub>LD</sub>	1.8	kΩ
Term. 23 Max. Output Current	I <sub>23</sub> MAX	4	mA
Vertical Stage Output Current	I <sub>24</sub> MAX	20	mA
Term. 25 Max. Output Current	I <sub>25</sub> MAX	4	mA
Term. 26 Max. Input Voltage	V <sub>26</sub> MAX	V <sub>CC</sub>	V
Term. 27 Max. Output Current	I <sub>27</sub> MAX	20	mA
Term. 30 MAX. Input Current	-I <sub>30</sub> MAX	1	mA
Horiz. Max. Sink Current	-I <sub>24</sub> MAX	30	mA
Horiz. Ave. Sink Current	-I <sub>24</sub>	15	mA
Term. 35 Max. Input Voltage	V <sub>35</sub> MAX	V <sub>CC</sub>	V
Term. 36 Max. Voltage	V <sub>36</sub> MAX	V <sub>CC</sub>	V
Term. 38 Max. Input Voltage	V <sub>38</sub> MAX	5	V
Term. 40 Max. Output Current	I <sub>40</sub> MAX	5	mA
Term. 42 Max. Sink Current	-I <sub>42</sub> MAX	4	mA
Max. Power Dissipation	P <sub>D</sub> MAX	2.2	W
Operating Temperature	T <sub>opr</sub>	-20~65	°C
Storage Temperature	T <sub>stg</sub>	-55~150	°C

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

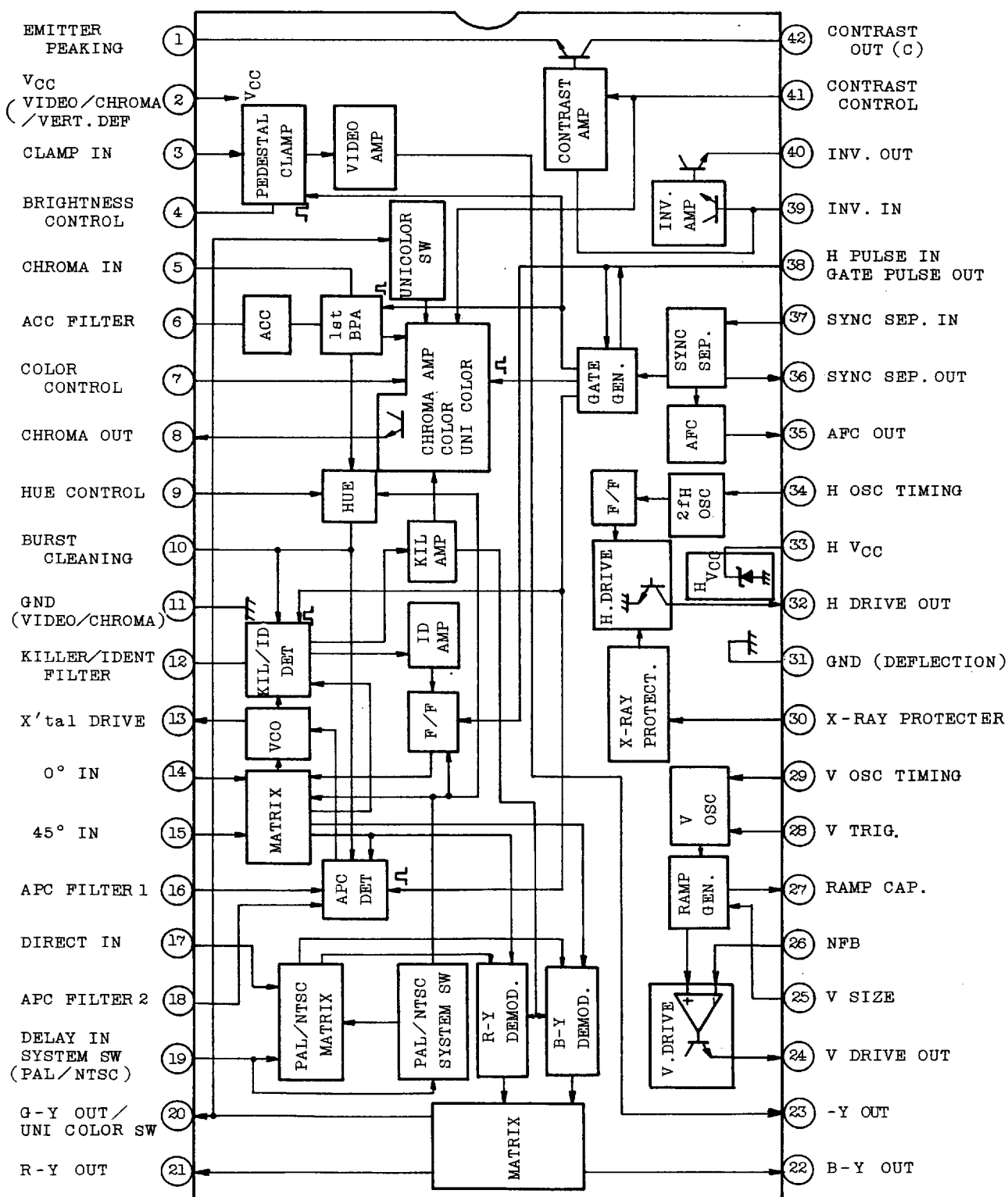
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## BLOCK DIAGRAM



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ELECTRICAL CHARACTERISTICS (Unless otherwise specified,  $V_2=12V$ ,  $T_a=25^\circ C$ )  
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	GV	2	23 39	OFF ON	ON	OFF	ON	$V_C=10V$ , $V_X=4.25V$ , $V_Z=4.0V$ $v_{39}$ : 500kHz 1Vp-p (Multi Burst) $G_V=20\log(v_{23}/v_{39})$	3	6	7	dB
Contrast Gain Control Range	$G_V$	2	23	OFF ON	ON	OFF	ON	$V_C=10V\sim 2V$ , $V_X=4.25V$ , $V_Z=4.0V$ $v_{39}$ : 500kHz 1Vp-p (Multi Burst) $G_V=20\log(v_{23}^{MAX.}/v_{23}^{MIN.})$	40	-	-	dB
Video Frequency Characteristics	$G_{VF}$	2	23	OFF ON	ON	OFF	ON	$V_C=10V$ , $V_X=4.25V$ , $V_Z=4.0V$ $v_{39}$ : 500kHz, 4.0MHz 1Vp-p (Multi Burst) $G_{VF}=20\log(v_{23}^{4MHz}/v_{23}^{500kHz})$	-3.5	-1.5	0.5	dB
DC Restoration Ratio	K	2	23	OFF ON	ON	OFF	ON	$V_C=10V$ , $V_Z=4.0V$ $V_X$ : Pedestal #39=3.25V $v_{39}$ : 2.5Vp-p 10 STEP APL 10%~90% $K = (1 - \frac{v_{23}^{pedestal}}{v_{23}^{100\% APL}}) \times 100$	63	70	77	%
Max. Video Output	$v_{23}^{MAX}$	2	23	OFF ON	ON	OFF	ON	$V_X=4.25V$ , $v_{39}$ : No Signal $V_Z=2V\sim 7V$ 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 ON	ON	OFF	ON	$V_X=4.25V$ , $V_Z=4.0V$ $v_{39}$ : No Signal $T_a=-20^\circ C\sim 65^\circ C$	-2.5	0	2.5	mV/ $^\circ C$

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## 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	Gr	2	40	OFF	OFF	OFF	OFF	V <sub>X</sub> =4.25V v <sub>39</sub> :500kHz, 1Vp-p Gr=20log(v <sub>40</sub> /v <sub>39</sub> )	2.2	3.5	4.6	dB
Inverter Amp. Differential	DGR	2	40	OFF	OFF	OFF	OFF	V <sub>X</sub> :3.3~5.3V v <sub>39</sub> :3.58MHz, 100mVp-p DGR=(v <sub>40</sub> MAX/v <sub>40</sub> MIN-1) X 100	-	2.5	5	%
Inverter Amp. Differential Phase	DPR	2	40	OFF	OFF	OFF	OFF	V <sub>X</sub> :3.3~5.3V v <sub>39</sub> :3.58MHz, 100mVp-p DPR=φ40MAX-φ40MIN	-	3	5	deg
Inverter Amp. Frequency Characteristics	4Grf	2	40	OFF	OFF	OFF	OFF	V <sub>X</sub> =4.25V v <sub>39</sub> =500kHz, 4MHz, 1Vp-p 4Grf=20log(v <sub>40</sub> 4MHz/v <sub>40</sub> 500kHz)	-3.5	-0.1	0.5	dB
Inverter Amp. 3.58MHz Linearity	v <sub>L39</sub>	2	39 40	OFF	OFF	OFF	OFF	V <sub>X</sub> =4.25V Measure #39 input level at #40 maximum output.	1.6	-	-	Vp-p
Contrast Control Open Voltage	V <sub>41</sub>	1	41	-	-	-	-		6.7	7.2	7.7	V
Color Control Open Voltage	V <sub>7</sub>	1	7	-	-	-	-		5.5	6.0	6.5	V
Tint Control Open Voltage	V <sub>9</sub>	1	9	-	-	-	-		5.5	6.0	6.5	V
Pedestal Amp. Gain	Gp		3 23	OFF	ON	OFF	ON	V <sub>X</sub> =4.25V, V <sub>Z</sub> =4V v <sub>39</sub> =500kHz, 1Vp-p(Multi Burst) Gp=20log(v <sub>23</sub> /v <sub>3</sub> )	9.5	12.0	13.5	dB

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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	TEST CONDITION						MIN.	TYP.	MAX.	UNIT
				SW 41	SW 7	SW 9	SW 12	SW 15	SW 20				
Max. Chroma Output Voltage	eCmp	3	8	ON	ON	OFF	a	b	ON	0.5	0.75	1.05	Vp-p
Burst Output Voltage	ebp	3	10	ON	ON	OFF	a	b	ON	0.45	0.70	0.95	Vp-p
ACC Characteristics (1)	eap	3	8	ON	ON	OFF	a	b	ON	0.2	0.43	-	Vp-p
ACC Characteristics (2)	Ap	3	8	ON	ON	OFF	a	b	ON	-	1.0	1.3	-
Chroma Input Dynamic Range	eC1p	3	8	ON	ON	OFF	a	b	ON	500	600	-	mVp-p
Uni Color Control Range (1)	4eC1p	3	8	ON	ON	OFF	a	b	ON	40	-	-	dB
(Uni Color) (Switch ON)													
Uni Color Control Range (2)	4eC2p	3	8	ON	ON	OFF	a	b	OFF	-	0	-	dB
(Switch OFF)													
Uni Color Control Phase Shift	4 $\theta$ Up	3	8	ON	ON	OFF	a	b	ON	-	-	5	deg
Residual Color	CKp	3	8	ON	ON	OFF	a	b	ON	-	-	3	mVp-p

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## 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	VC=10V, VS=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. Measure 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 0 to 150mVp-p. Measure 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	$\pm 300$	$\pm 500$	-	Hz
Phase Det. Sensitivity	$\mu p$	3	16 18	OFF	OFF	OFF	a	c	ON	$v_5=120mVp-p$ burst	-	25	-	mV/deg
Control Sensitivity	$\beta p$	3	13 16 18	OFF	OFF	OFF	a	a	ON	$v_5=120mVp-p$ burst	-	2.2	-	Hz/mV

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## 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	eORp	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
	eOG		20	ON	ON	OFF	a	a	ON		-	-	-	
	eOBp		22	ON	ON	OFF	a	a	ON		3.2	4.2	5.4	
Max. Color Differential Output Voltage	eORMp	3	21	ON	ON	OFF	a	a	ON	$v_{17}$ , $v_{19}$ : 500mVp-p 4.43618MHz	3.8	5.5	-	Vp-p
	eOGMp		20	ON	ON	OFF	a	a	ON		-	-	-	
	eOBMp		22	ON	ON	OFF	a	a	ON	CW: 4.433618MHz	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	ON	ON	OFF	a	a	ON		0.24	0.34	0.44	
Relative Phase	$\theta_{R-Yp}$	3	21/ 22	ON	ON	OFF	a	a	ON		220	90	100	deg
	$\theta_{G-Yp}$		20/ 22	ON	ON	OFF	a	a	ON			230	240	
Residual Carrier	ercRp	3	21	ON	ON	OFF	a	a	ON		-	-	300	mVp-p
	ercGp		20	ON	ON	OFF	a	a	ON					
	ercBp		22	ON	ON	OFF	a	a	ON					
Demodulator Bandwidth	fBRp	3	21	ON	ON	OFF	a	a	ON	$v_{17}$ : 200mVp-p 10kHz~5MHz	1.1	2.1	3.2	MHz
	fBGp		20	ON	ON	OFF	a	a	ON					
	fBBp		22	ON	ON	OFF	a	a	ON					
Demo. Output DC Voltage	EORp	1	21	OFF	OFF	OFF	a	b	ON		6.8	7.4	8.0	V
	EOGp		20	OFF	OFF	OFF	a	b	ON					
	EOBp		22	OFF	OFF	OFF	a	b	ON					
Demo. Output DC Voltage Difference	EO(R-G)p	1	21	OFF	OFF	OFF	a	b	ON	$v_{17}$ , $v_{19}$ no input	-0.2	0	0.2	V
	EO(R-B)p		20	OFF	OFF	OFF	a	b	ON					
	EO(B-G)p		22	OFF	OFF	OFF	a	b	ON					

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## CHROMA (3) PAL

CHARACTERISTIC	SYMBOL	TEST CCT	TEST PIN	TEST CONDITION							MIN.	TYP.	MAX.	UNIT
				SW 41	SW 7	SW 9	SW 12	SW 15	SW 20					
Demo. Output DC Voltage Therm. Co-effic.	$\Delta EOR_{\theta P}$	1	21											
	$\Delta EOG_{\theta P}$		20	OFF	OFF	OFF	a	b	ON	Ta=-20~65°C	-3	-0.5	2	mV/°C
	$\Delta EOB_{\theta}$		22											
Demo. Output Diffence Voltage Therm. Co-effic.	$EO(R-G)_{\theta P}$	1	21											
	$EO(R-B)_{\theta P}$		20	OFF	OFF	OFF	a	b	ON	Ta=-20°C~65°C	-2	0	2	mV/°C
	$EO(B-G)_{\theta}$		22											
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	$\Delta EOR$	3	21								-100	0	100	mV
	$\Delta EOG$		20	OFF	OFF	OFF	a	b	ON	$v_{17}$ :200mVp-p 4.43618MHz				
	$\Delta EOB$		22											

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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	TEST CONDITION								MIN.	TYP.	MAX.	UNIT
				SW 41	SW 7	SW 9	SW 12	SW 15	SW 20						
Max. Chroma Output Voltage	$e_{CMN}$	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	$e_{bN}$	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)	$e_{aN}$	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	$v_5=100mVp-p$ , $300mVp-p(B:C=1:1)$ $A_P = \frac{v_8(v_5=300mVp-p)}{v_8(v_5=100mVp-p)}$	-	1.0	1.3		
Chroma Input Dynamic Range	$e_{CIN}$	4	8	ON	ON	OFF	a	b	ON	$v_5=100mVp-p \rightarrow 800mVp-p$	500	600	-	mVp-p	
Uni Color Control Range (1) (Uni Color SW ON)	$e_{CU1N}$	4	8	ON	ON	OFF	a	b	ON	$V_C=4\sim 10V, V_S=10V$ $v_5=120mVp-p(B:C=1:1)$ $e_{CUP}=20\log \frac{v_8(v_C=10V)}{v_8(v_C=4V)}$	40	-	-	dB	
Uni Color Control Range (2) (SW OFF)	$e_{CU2N}$	4	8	ON	ON	OFF	a	b	OFF		-	0	-	dB	
Uni Color Control Phase Shift	$e_{\theta UN}$	4	8	ON	ON	OFF	a	b	ON	$V_C=4V\sim 10V, V_S=10V$ $v_5=120mVp-p(B:C=1:1)$	-	-	5	deg	
Residual Color	$e_{CKN}$	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	

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## 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	$\Delta\theta_{CCN}$	4	8	ON	ON	OFF	a	b	ON	$V_C=10V, V_S=2\sim10V$ $v_5=120mV_{p-p}(B:C=1:1)$	-	3	7	deg
Burst-Chroma Phase Difference	$\Delta\theta_{bCN}$	4	8 10	ON	ON	OFF	a	b	ON		-	60	-	deg
Tint Control Range	$\Delta\theta_{bH1N}$	4	10	ON	ON	ON	a	b	ON	$V_C=10V$ $V_1=2\sim10V$ $v_5=120mV_{p-p}$ (B:C=1:1)	75	95	110	deg
										$f=4.43MHz$	100	120	140	
Tint Control Phase Distribution	$\Delta\theta_{bH2N}$	4	10	ON	ON	ON	a	b	ON	$V_C=10V$ $v_5=120mV_{p-p}$ (B:C=1:1) $v_7$	34	47	62	deg
										$f=4.43MHz$	45	60	80	
Killer Det. Sensitivity	$e_{KN}$	4	8 10	OFF	ON	OFF	a	a	ON		15	30	75	mVp-p
APC Pull-in Range	$f_{PN}$	4	13	OFF	OFF	OFF	a	a	ON		$\pm 300$	$\pm 500$	-	Hz
Phase Det. Sensitivity	$\mu_N$	4	16 18	OFF	OFF	OFF	a	c	ON		-	25	-	mV/ deg
Control Sensitivity	$\rho_N$	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	eORN		21							$v_{17}$ : 100mVp-p	3.0	4.1	5.3	
	eOGN	4	20	ON	ON	OFF	a	a	ON	4.443618MHz	1.0	1.6	2.2	Vp-p
	eOBN		22							CW: 4.433618MHz	3.0	4.1	5.3	
Max. Color Differential Output Voltage	eORMN		21							$v_{17}$ : 500mVp-p	4.5	5.5	-	
	eOGMN	4	20	ON	ON	OFF	a	a	ON	4.443618MHz	1.4	1.8	-	Vp-p
	eOBMN		22							CW: 4.433618MHz	4.5	5.5	-	
Relative Amplitude	R-Y/B-YN	4	21/ 22	ON	ON	OFF	a	a	ON	$v_{17}$ : 100mVp-p	0.88	1.00	1.1	-
	G-Y/B-YN		20/ 22							4.443618MHz	0.28	0.38	0.48	
Relative Phase	$\theta$ R-YN	4	21/ 22	ON	ON	OFF	a	a	ON		-	105	-	deg
	$\theta$ G-YN		20/ 22								-	235	-	
Residual Carrier	ercRN		21								-	-	300	mVp-p
	ercGN	4	20	ON	ON	OFF	a	a	ON		-	-	-	
	ercBN		22								-	-	-	
Demodulator Band Width	fBRN		21											
	fBGN	4	20	ON	ON	OFF	a	a	ON	$v_{17}$ : 100mVp-p, 10kHz~5MHz	1.1	2.1	3.2	MHz
	fBBN		22											
Demo. Output DC Voltage	EORN		21											
	EOGN	1	20	OFF	OFF	OFF	a	b	ON	$v_{17}$ :	6.8	7.4	8.0	V
	EOBN		22											
Demo. Output DC Voltage Difference	EO(R-G)N		21											
	EO(G-B)N	1	20	OFF	OFF	OFF	a	b	ON	$v_{17}$ :	-0.3	0	0.3	V
	EO(B-G)N		22											

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## CHROMA (6) NTSC

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

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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	V33	1	33	-	-	-	-	-		7.4	8.2	9.0	V
Recommendable Supply Current	I33	5	33							22	26	30	mA
Horizontal Free Running Frequency	f <sub>H</sub>	5	34	OFF	OFF	OFF		a	V <sub>H</sub> =4V	14.725	15.625	16.125	kHz
f <sub>H</sub> Thermal Drift	4f <sub>HT</sub>	5	34	OFF	OFF	OFF		a	V <sub>H</sub> =4V Ta=-20~60°C	-90	70	230	Hz
AFC Clamping Voltage	V <sub>CL</sub>	1	35	-	-	-	-	a	SW1:a, SW2:a	3.9	4.5	5.1	V
AFC Sink Current	I <sub>IN35</sub>	1	35	-	-	-	-	a	SW1:a, SW2:b	2.7	3.7	5.0	mA
AFC Source Current	I <sub>O35</sub>	1	35	-	-	-	-	a	SW1:a, SW2:c	2.7	4.0	5.0	mA
Horiz. Drive Residual Voltage	V <sub>OL32</sub>	5	32	OFF	OFF	OFF		a	V <sub>H</sub> =4V Saturation Voltage of #32	-	-	0.3	V
Horiz. Output Pulse Duty	T <sub>O32</sub>	5	32	OFF	OFF	OFF		a	V <sub>H</sub> =4V T <sub>O32</sub> =Duty cycle of H period.	45	50	55	%
Horiz. Osc. Starting Voltage	V33 START	5	33	OFF	OFF	OFF		a	V <sub>B</sub> :Variable Measure min V <sub>B</sub> which provides 150% duty output to #32	-	-	4.0	V

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## 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 <sub>33</sub> START	5	33	OFF	OFF	OFF	b	a	V <sub>B</sub> =4V Measure I <sub>33</sub>	4.6	6.7	8.8	mA
AFC Pull-in Range	f <sub>H</sub> PULL	5	32 37	ON	ON	OFF	a b	a	V <sub>H</sub> :Variable Observe #32 and #37 waveform. S37 a→b, Measure the frequency difference.	-	±900	-	Hz
AFC Hold Range	f <sub>H</sub> HOLD	5	32 37	ON	ON	OFF	a b	a	Same as above	-	±1800	-	Hz
AFC Voltage Sensitivity	β <sub>H</sub>	5	32	OFF	OFF	OFF	b	a	V <sub>A</sub> =4.5V, Set V <sub>H</sub> so that f <sub>H</sub> will be 15.75kHz. Then, change V <sub>A</sub> 4V±0.5V, Measure f <sub>H</sub> difference.	-	1900	-	Hz/V
X'ray Protector Voltage Sensitivity	V <sub>IN30</sub>	5	30	OFF	OFF	OFF	b	a	Apply variable DC voltage to #30(V <sub>30</sub> ). Measure V <sub>30</sub> and I <sub>30</sub> when #32 output disappears.	0.75	0.93	1.1	V
X'ray Protector Current Sensitivity	I <sub>IN30</sub>	5	30	OFF	OFF	OFF	b	a		0.05	0.18	1.0	μA
H. Drive Output Excess Voltage Protector Current Sens.	I <sub>IN32</sub>	5	32	OFF	OFF	OFF	b	b	Apply variable DC voltage to #32 through 1kΩ resistor. Measure V <sub>32</sub> and I <sub>32</sub> just before V <sub>32</sub> goes down.	0.05	0.18	1.0	μA
Excess Voltage Protector Voltage Sens.	V <sub>IN32</sub>	5	32	OFF	OFF	OFF	b	b		7.1	8.6	9.5	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
Vertical Frequency	f <sub>v</sub>	5	27	OFF	OFF	OFF	c		47	50	54.1	Hz
Retrace Time	T <sub>r</sub>	5	27	OFF	OFF	OFF	c	H period of #27 output pulse	450	690	850	μsec
f <sub>v</sub> Pull-in Range	Δf <sub>v</sub> PULL	5	27	OFF	OFF	ON	b	Set f <sub>v</sub> to 50Hz at SW28:OFF ;f <sub>OSC</sub> 28 Measure f <sub>v</sub> at SW28:ON ;f <sub>OSC</sub> '28 Δf <sub>v</sub> PULL=f <sub>OSC</sub> 28-f <sub>OSC</sub> '28	9.0	10.0	11.0	Hz
Term. 27 Max. Output Voltage	V <sub>O27</sub>	1	27	-	-	-	-	SW29:ON, SW4:OFF	7.7	8.5	9.2	V
Term. 27 Max. Output Current	I <sub>O27</sub>	1	27	-	-	-	-	SW29:ON, SW4:ON	15	27	50	mA
Max. Common Mode Input Voltage	V <sub>IH26</sub>	5	26	ON	ON	OFF	a	V <sub>27</sub> =6 → 12V	11.9	-	-	V
Min. Common Mode Input Voltage	V <sub>IL26</sub>	5	26	ON	ON	OFF	a	V <sub>27</sub> =6 → 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 <sub>I27</sub>	5	27	ON	ON	OFF	a	V <sub>I27</sub> =6V	0.25	1.0	4.5	μA
Term. 26 Input Current	I <sub>I26</sub>	5	26	ON	ON	OFF	a	V <sub>I27</sub> =6V	0.18	1.0	6.3	μA
Max. Drive Output Voltage	V <sub>OH24</sub>	5	24	OFF	ON	OFF	d		7.3	8.0	8.7	V
Min. Drive Output Voltage	V <sub>OL24</sub>	5	24	OFF	OFF	OFF	d		-	-	0.3	V
Term. 25 Bias Voltage	V <sub>I25</sub>	5	25					I <sub>I25</sub> =-0.2mA	3.7	3.9	4.1	V
f <sub>v</sub> Thermal Drift	f <sub>VT</sub>	5	27	OFF	OFF	OFF	c	T <sub>a</sub> =-20~60°C	-1.0	0	2.0	Hz

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## 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	IIN37	5	36 37	OFF	OFF	OFF	c	Measure #37 input current when V36 goes L level to H.	18	35	113	$\mu$ A
Sync. Output H level	VOH36	5	36	OFF	OFF	OFF	c	V <sub>S</sub> =2V Measure V36	7.0	8.2	9.4	V
Sync. Output L level	VOL36	5	36	OFF	OFF	OFF	b	Measure V36	0	0.2	1.0	V
Gate Pulse H level	VOH38	5	38	OFF	OFF	OFF	b	V <sub>D</sub> =12V, V36=5V Measure V38	4.3	5.3	6.1	V
Gate Pulse L level	VOL38	5	38	OFF	OFF	OFF	b	V <sub>D</sub> =12V Measure V38	-	1.6	-	V
H Pulse Threshold	V38ON	5	38	OFF	OFF	OFF	b	V <sub>D</sub> :Variable 0~2V Measure V <sub>D</sub> when V38 goes H to L.	0.7	1	1.5	V

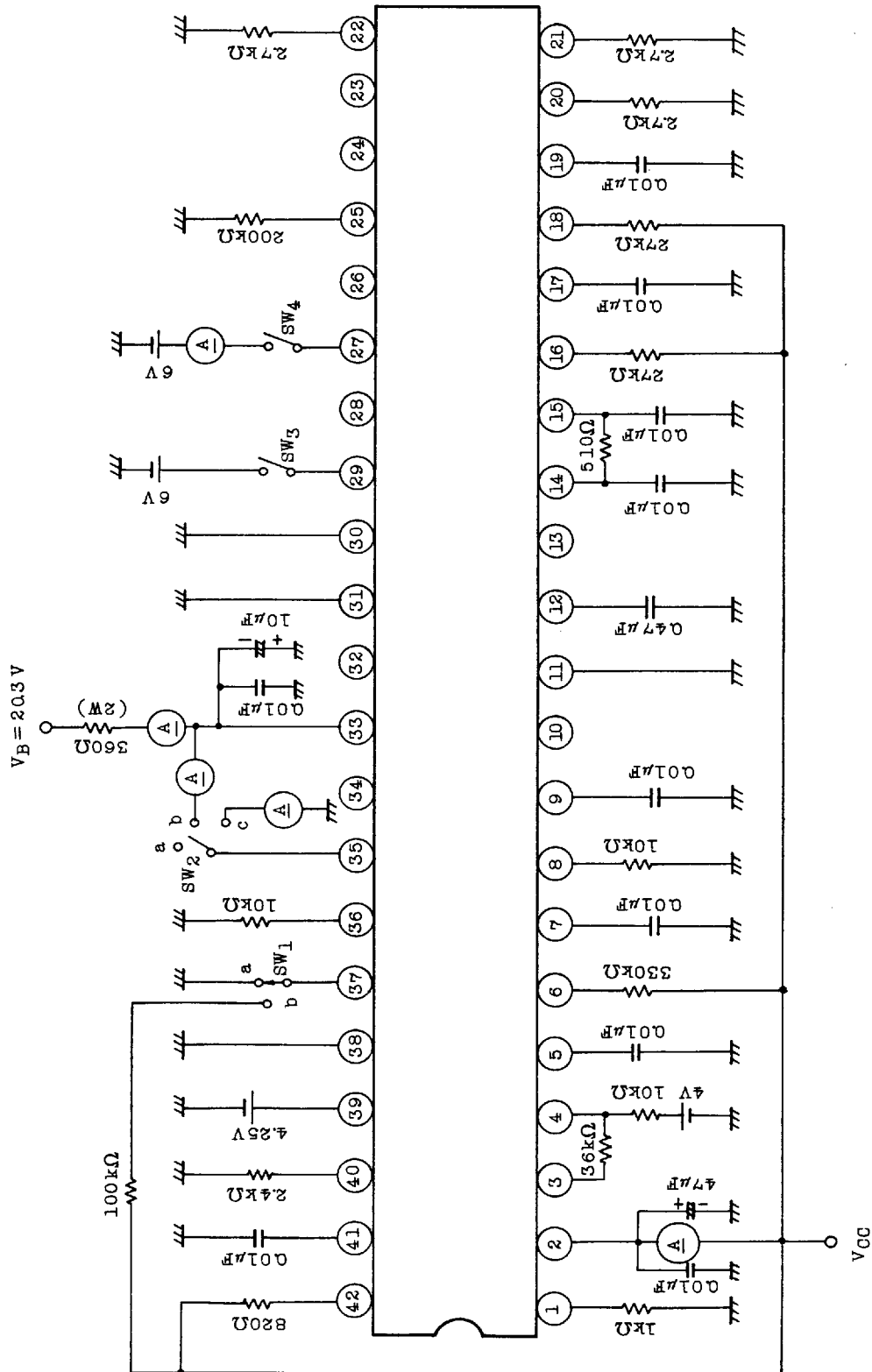
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TEST CIRCUIT 1. DC



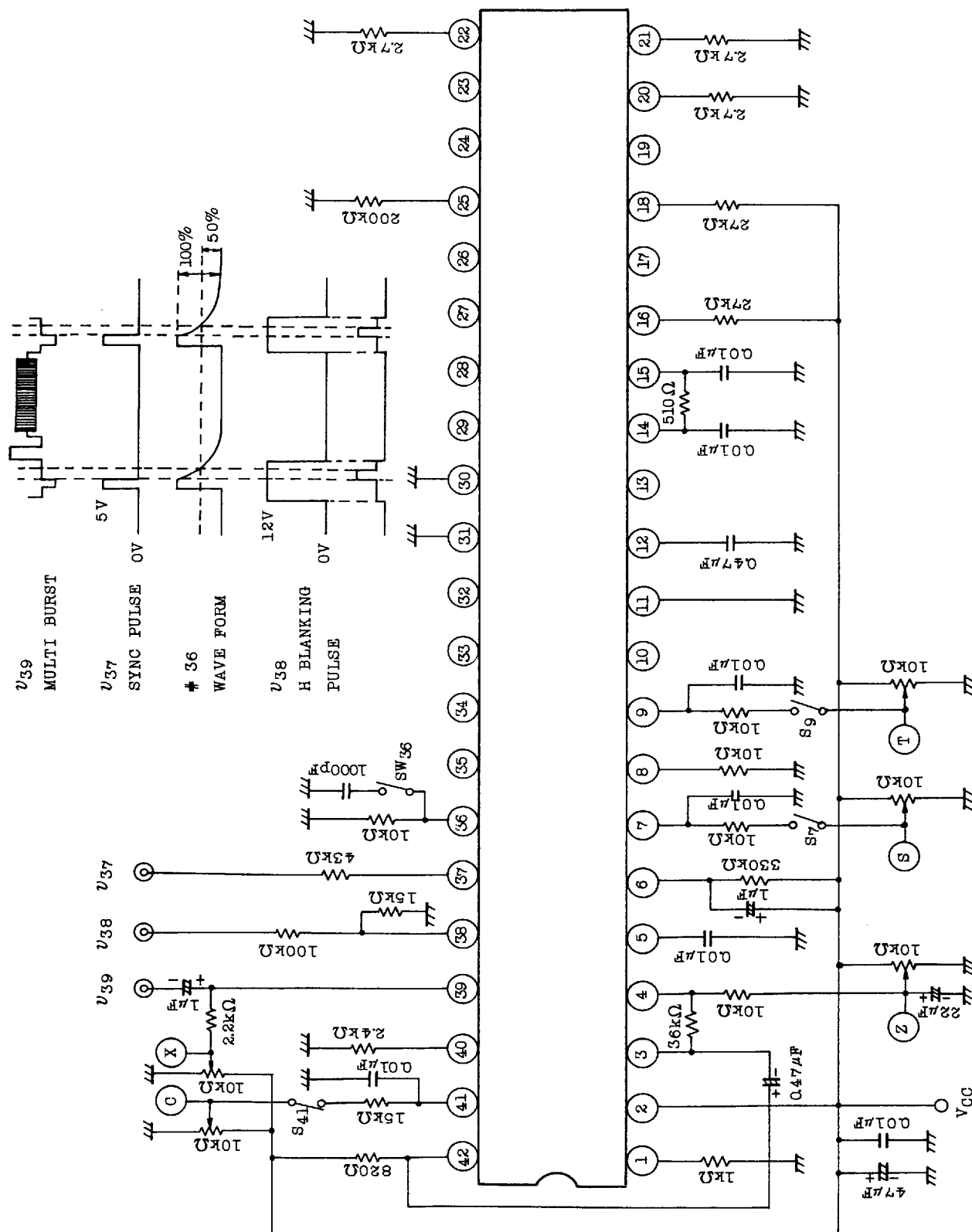
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## TEST CIRCUIT 2. Video

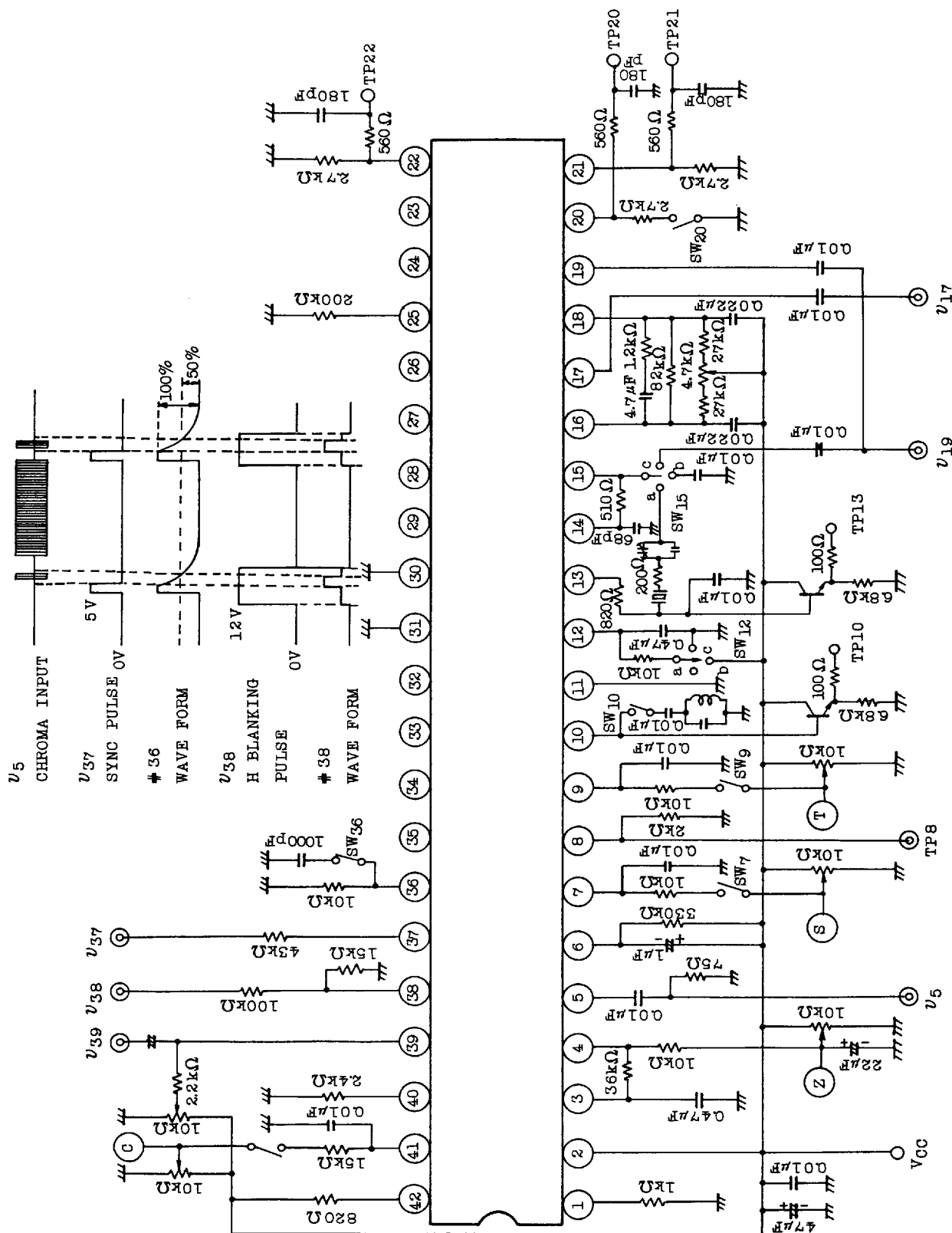


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TEST CIRCUIT 3. Chroma (PAL)

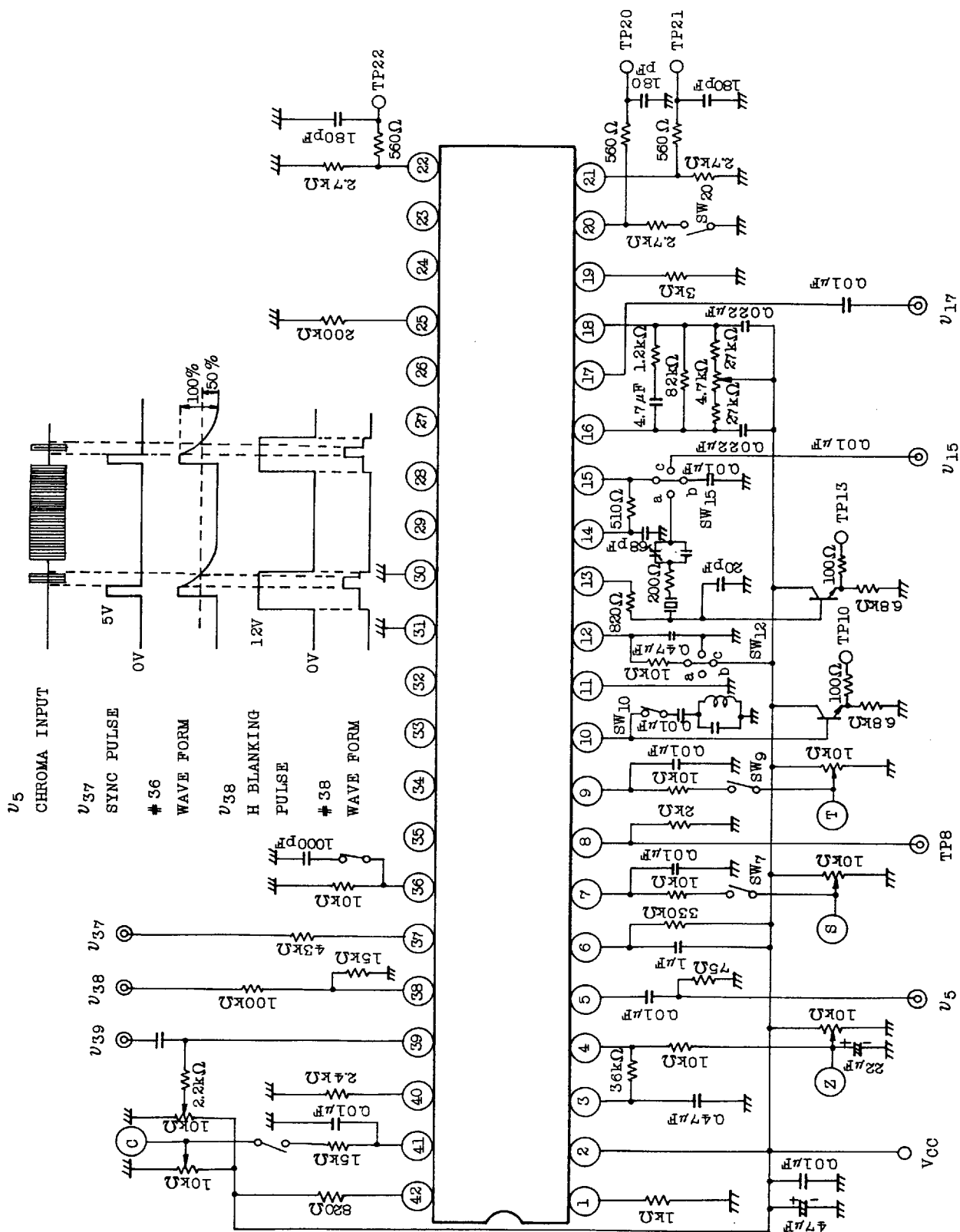


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TEST CIRCUIT 4. Chroma (NTSC)



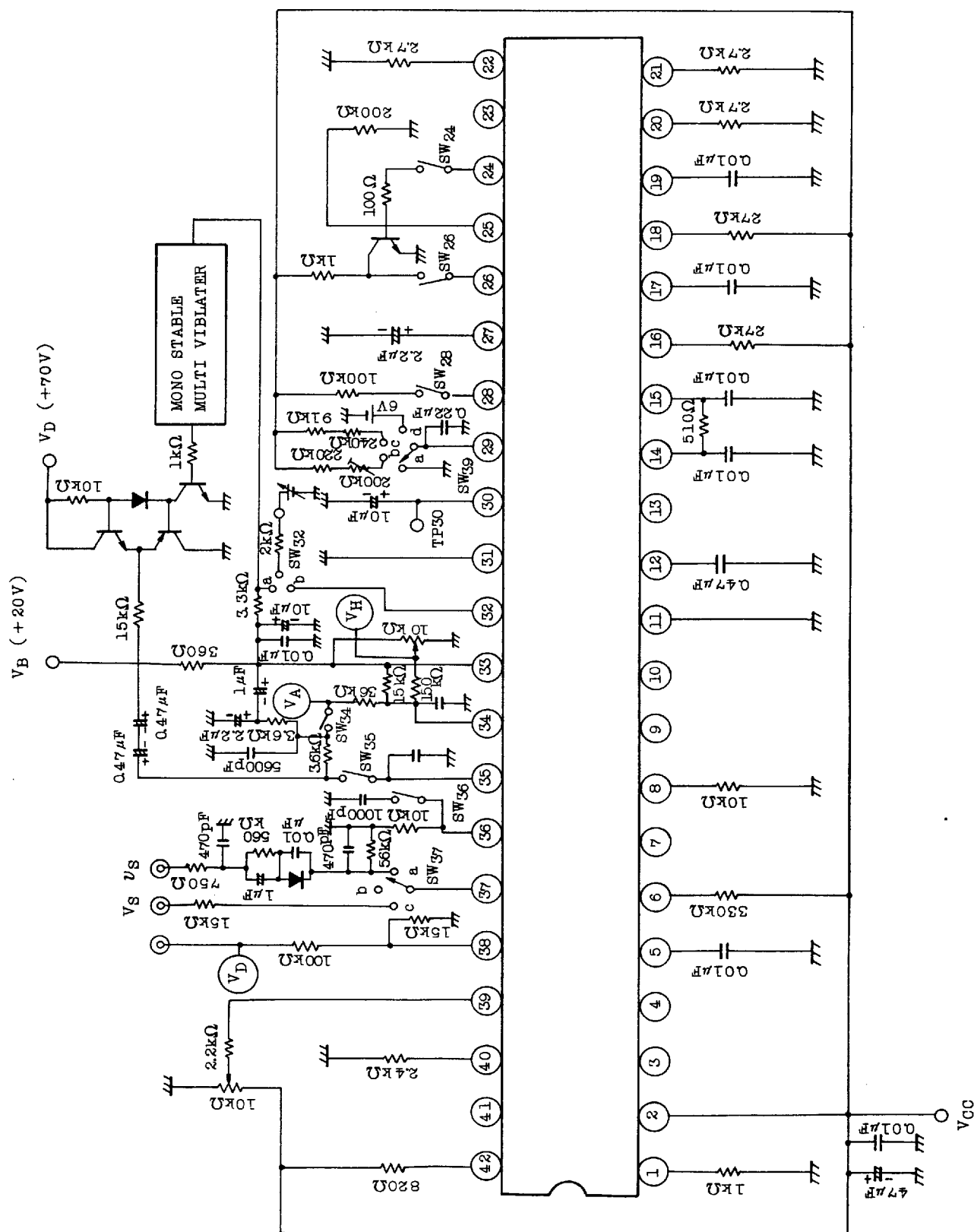
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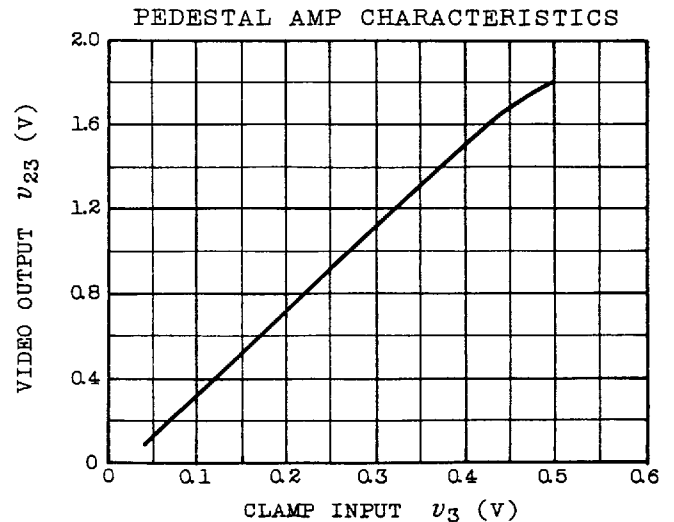
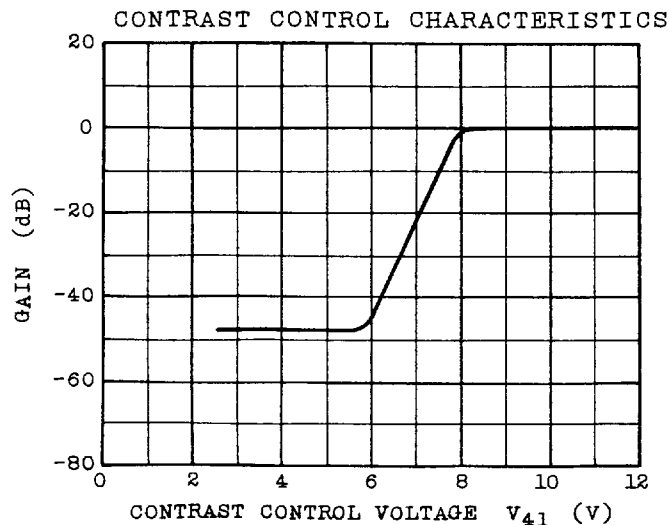
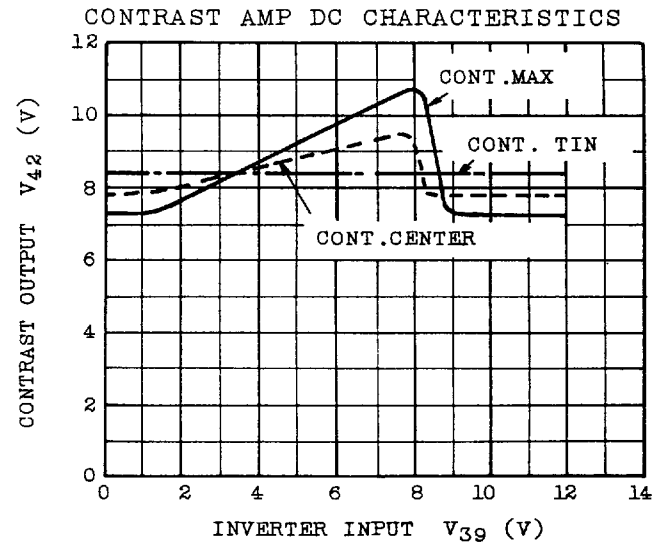
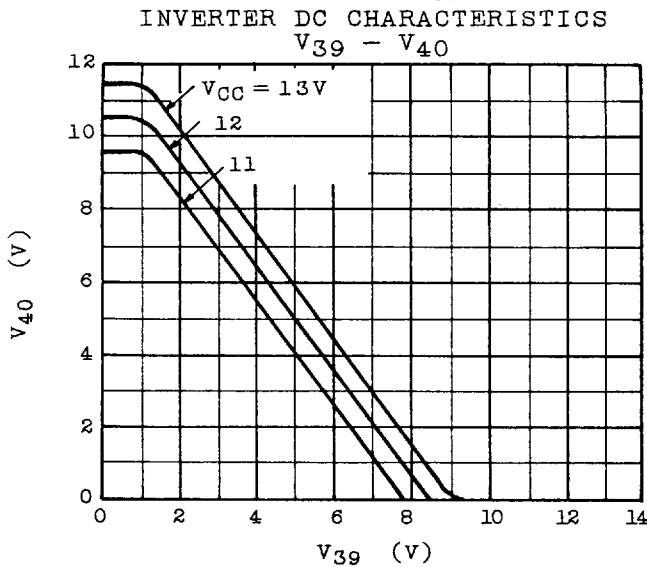
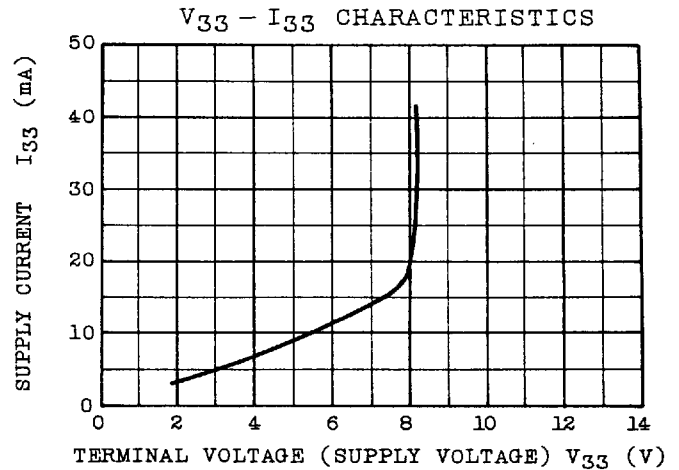
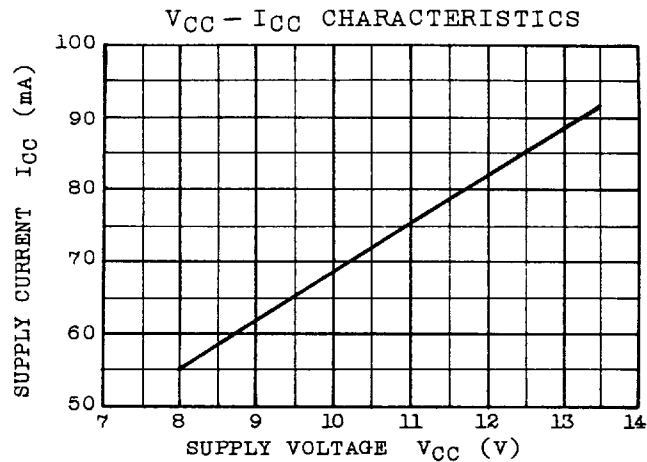
### TEST CIRCUIT 5. Deflection



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**TOSHIBA CORPORATION**



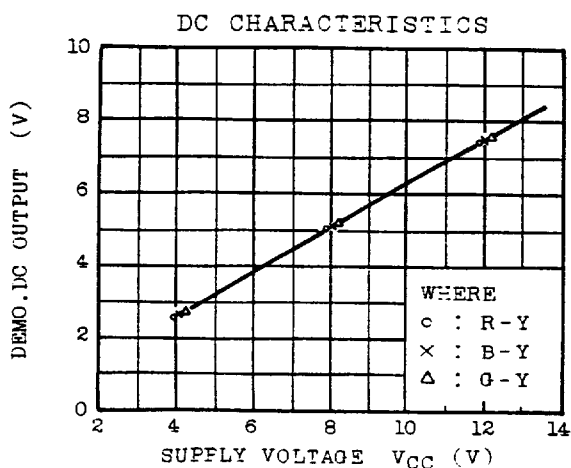
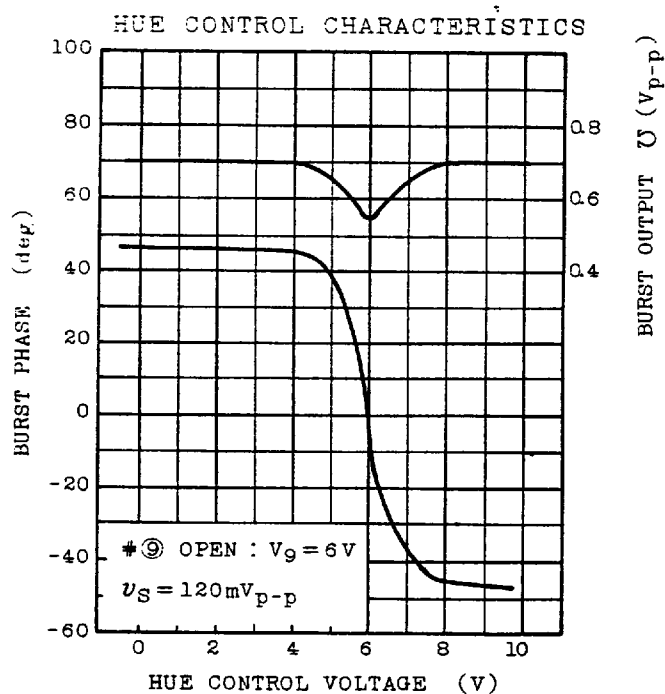
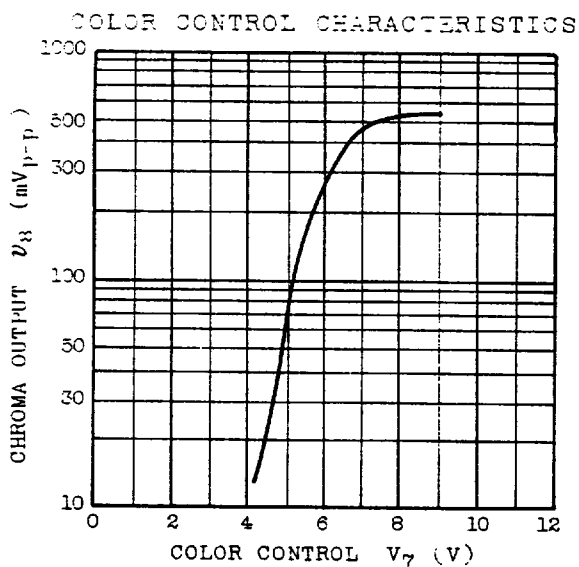
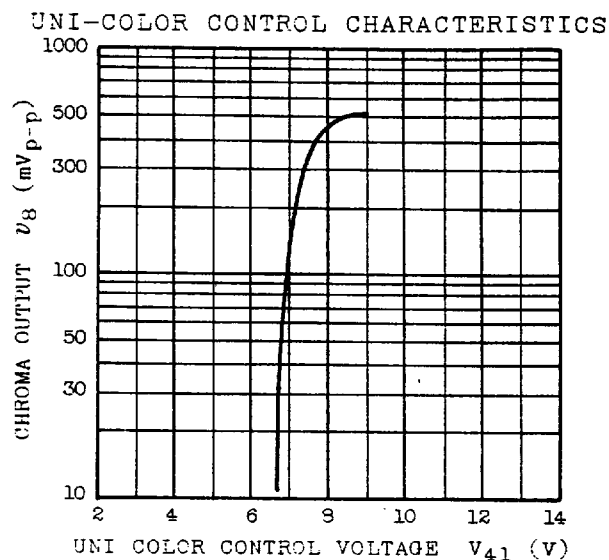
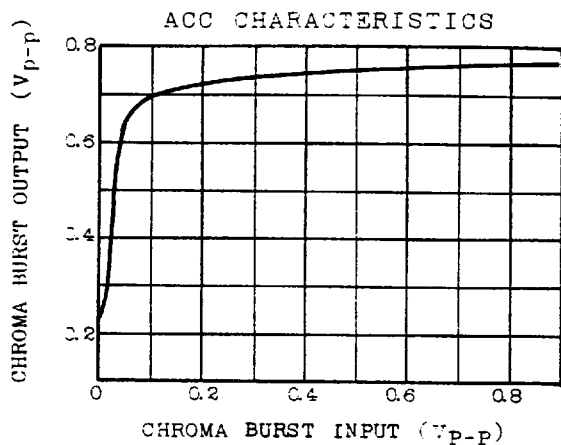
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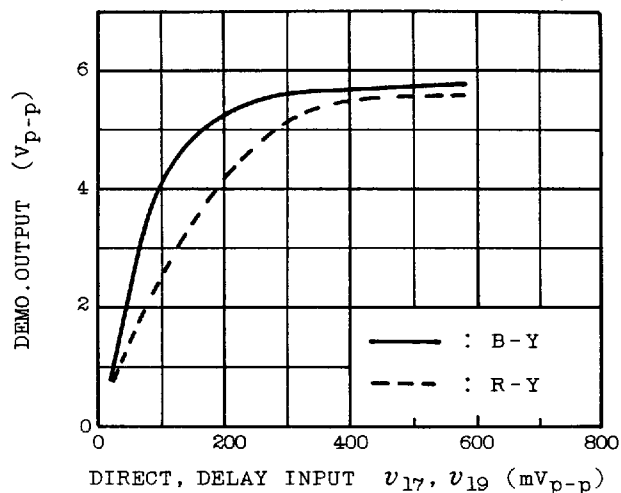
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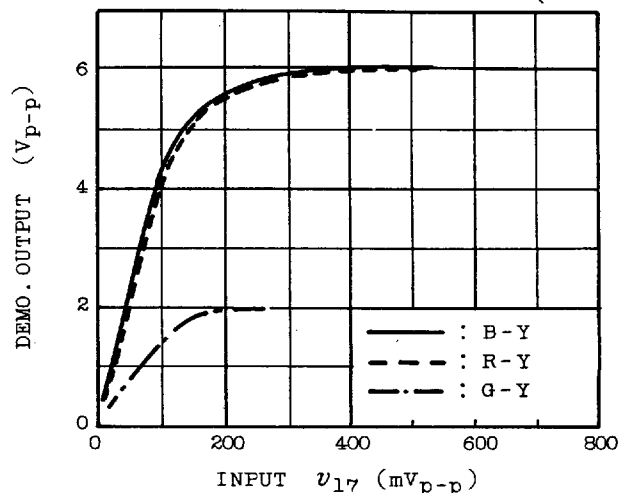
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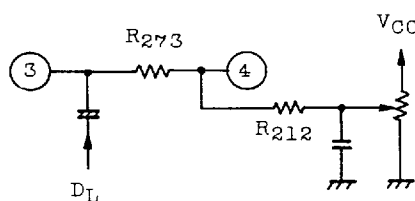
DEMO.OUTPUT CHARACTERISTICS (PAL)



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 <sub>CC1</sub>	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.

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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 VCC 1 and GND 1.
12	Killer Ident Filter	A capacitor for an ident filter is connected. The terminal voltage is VCC (color), 8V typ (B/W) and GND (Ident).
13	X'tal Drive	Terminals for a sub-carrier oscillator.
14	-45° Input	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.
15	0° Input	
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.

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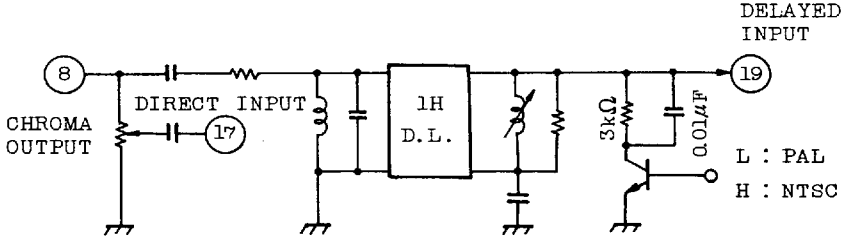
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T1A12(2)

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.																																
			<table><tr><th rowspan="2"></th><th colspan="2">RELATIVE PHASE</th><th colspan="2">RELATIVE AMPLITUDE</th><th rowspan="2">MATRIX</th><th rowspan="2">TINT CONTROL</th><th rowspan="2">FLIP·FLOP</th></tr><tr><th>R-Y</th><th>G-Y</th><th>B-Y/R-Y</th><th>G-Y/B-Y</th></tr><tr><td>PAL</td><td>±90°</td><td>230°</td><td>1.78</td><td>0.58</td><td>PAL</td><td>OFF</td><td>ON</td></tr><tr><td>NTSC</td><td>105°</td><td>235°</td><td>0.95</td><td>0.31</td><td>NTSC</td><td>ON</td><td>STOP</td></tr></table>						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
	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																												
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.																																

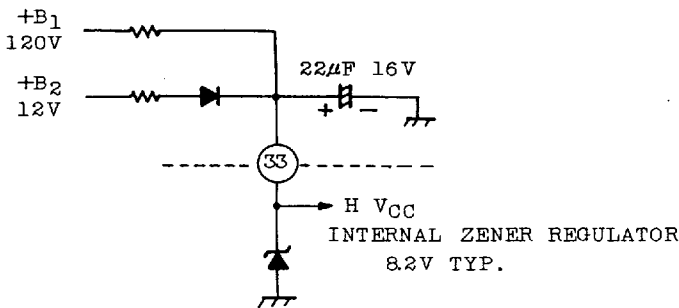
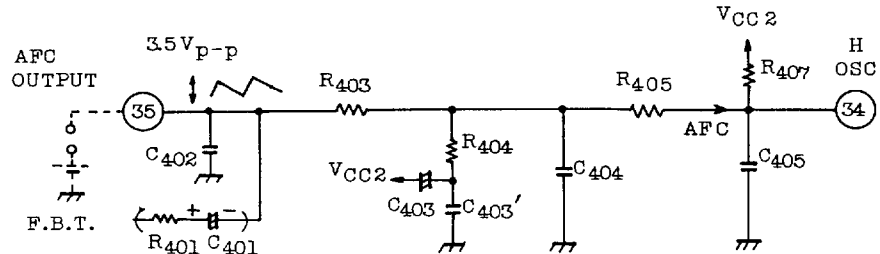
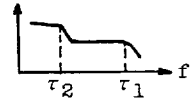
**TERMINAL DISCRIPTION (4)**

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 $\tan \delta$ value. (2.2 $\mu$ F 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 VCC1 and VCC2 should be connected to this GND.

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**1988-10-25**
**TOSHIBA CORPORATION**
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T1A12(2)

TERMINAL DISCRIPTION (5)

TERMINAL		FUNCTION
32	H. Drive Output	Open collector output for Horizontal driver. External load resistor is required.
33	V <sub>CC2</sub> (H. V <sub>CC</sub> )	Supply terminal for horizontal deflection circuit starting up.  
34	Horizontal Oscillator Timing Constant	2f <sub>H</sub> oscillator timing CR is connected. Thermal co-efficient of this CR should be selected to compensate f <sub>H</sub> thermal drift which is specified.
35	AFC Output	I/O terminal of horizontal AFC circuit. The refference voltage of AFC is 4.5V typ..   <p>C402 : Flyback Pulse integral capacitor C405, R407 : Horizontal Osc. Timing constant R403, C404 : AFC time constant <math>\tau_1</math> R404, C403, C403' : AFC <math>\tau_2</math> R405 : Determines AFC control sensitivity.</p> 

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TERMINAL DISCRIPTION (6)

TERMINAL		FUNCTION
36	Sync. Sep. Output	<p>Output terminal of composite sync signal/Timing constant for gate pulse generation. Falling edge of the gate pulse (<math>t_2</math>) is adjusted by external capacitor and resistor. Rising edge (<math>t_1</math>) is internally determined. It adjustment of <math>t_1</math> is required, a capacitor which connected between #37 (Sync. Sep. Input) and GND will be changed to shift sync signal timing.</p> <div data-bbox="751 653 1501 863"> <p>COMPOSITE VIDEO SIGNAL</p> <p># 37 OUTPUT</p> <p>INTERNAL GATE PULSE</p> <p><math>t_1</math> <math>t_2</math> <math>t_2'</math></p> <p>8.4V</p> <p><math>V_{th} = 4.2V</math></p> </div> <p>Generated gate pulse is masked by flyback pulse from #38, and applied to the pedestal clamp circuit and the burst gate circuit.</p>
37	Sync Sep. Input	<p>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.</p> <div data-bbox="639 1209 1493 1388"> </div> <p>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.</p> <p>To deepen the slice level  Horizontal : R301 increase or R303 decrease  Vertical : R301 increase or R302 decrease</p>

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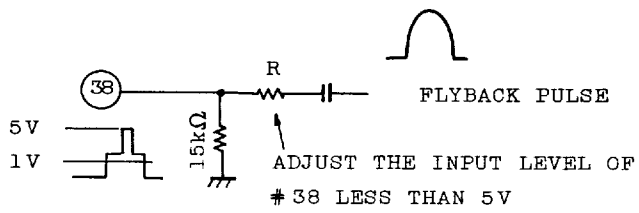
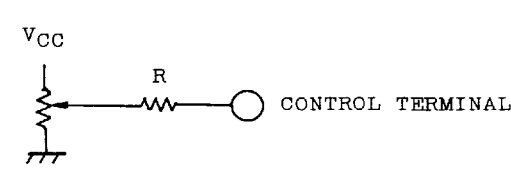
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T1A12(2)



TERMINAL DISCRIPTION (7)

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

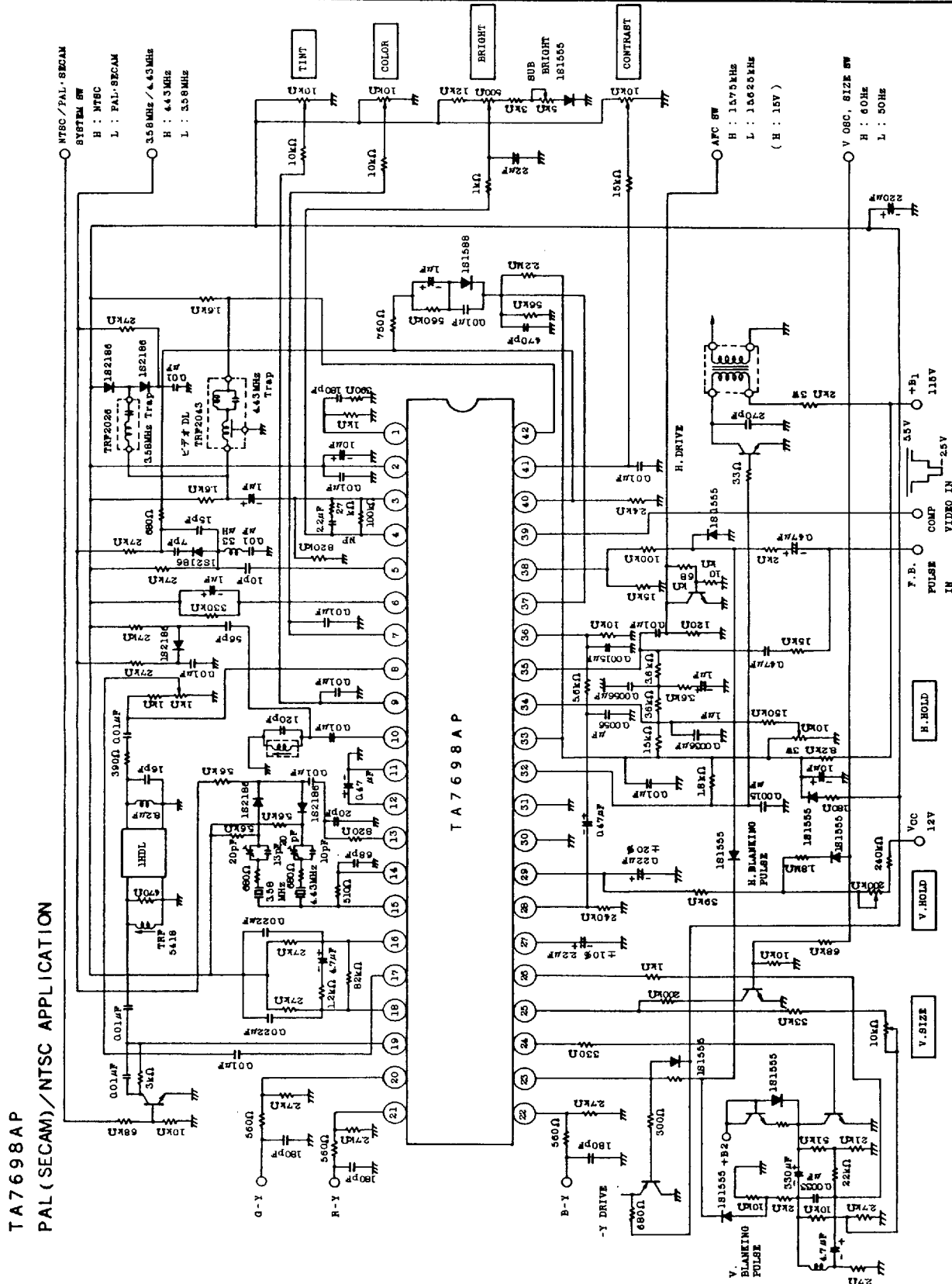
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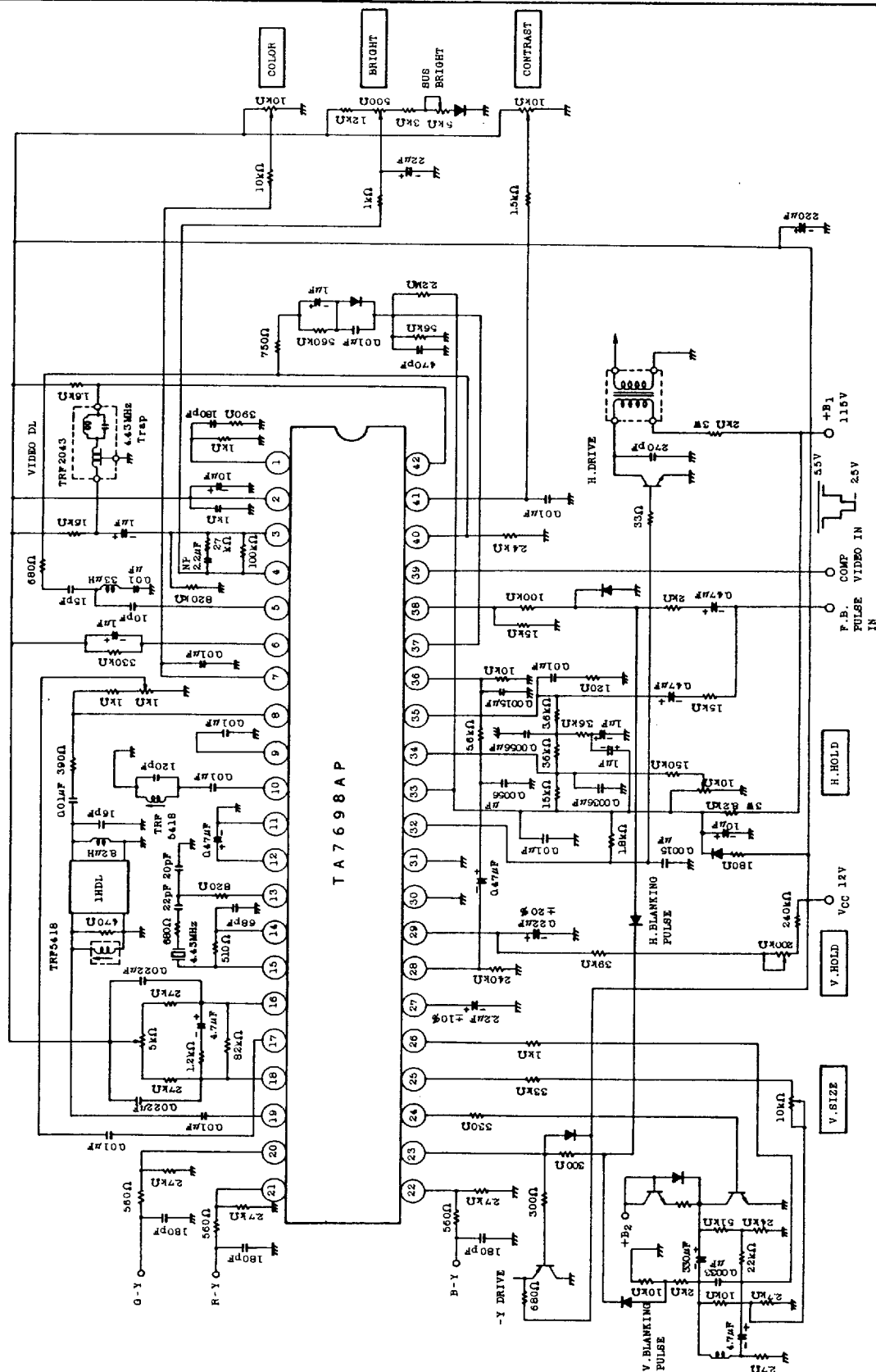


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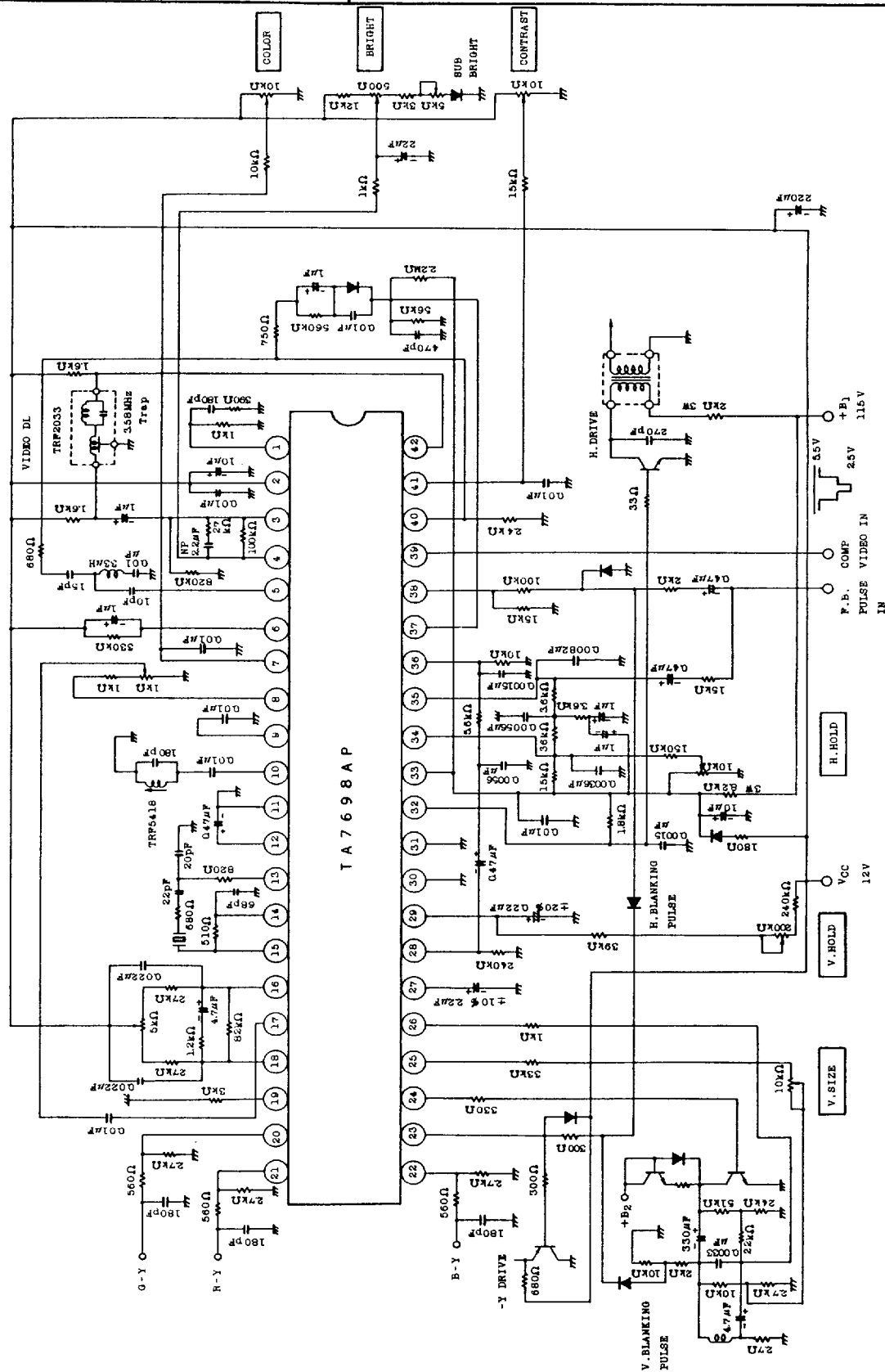
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### TA7698AP PAL APPLICATION



TA7698AP  
NTSC APPLICATION



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