INTEGRATED CIRCUIT

TECHNICAL DATA

TA7644BP

TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT

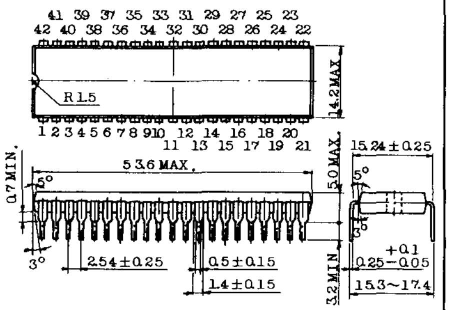
SILICON MONOLITHIC

VIDEO-CHROMA-DEFLECTION SYSTEM FOR A COLOR TELEVISION

The TA7644BP combines the Video-Chroma sub-system and the Deflection combination on a single monolithic integrated circuit to provide a Color Television Video-Chroma-Deflection system.

This device includes a Video amplifier, color demodulator that is designed to provide color differential output, and improved Sync-separator, Horizontal oscillator with saw tooth wave type AFC, Horizontal pre-driver with X'ray protection circuit, and Vertical oscillator, Vertical pre-driver in a 42 leads dual-in-line type plastic package.

Unit in mm



Lead pitch is 2.54 and tolerance is ±0.25 against theoretical center of each lead that is obtained on the basis of No.1 and No.42 leads.

JEDEC	–
TOSHIBA	5–54

FEATURES:

Video-Chroma Section

. 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_H Oscillator and Flip-Flop Circuit.

. Excellent Inter-race.

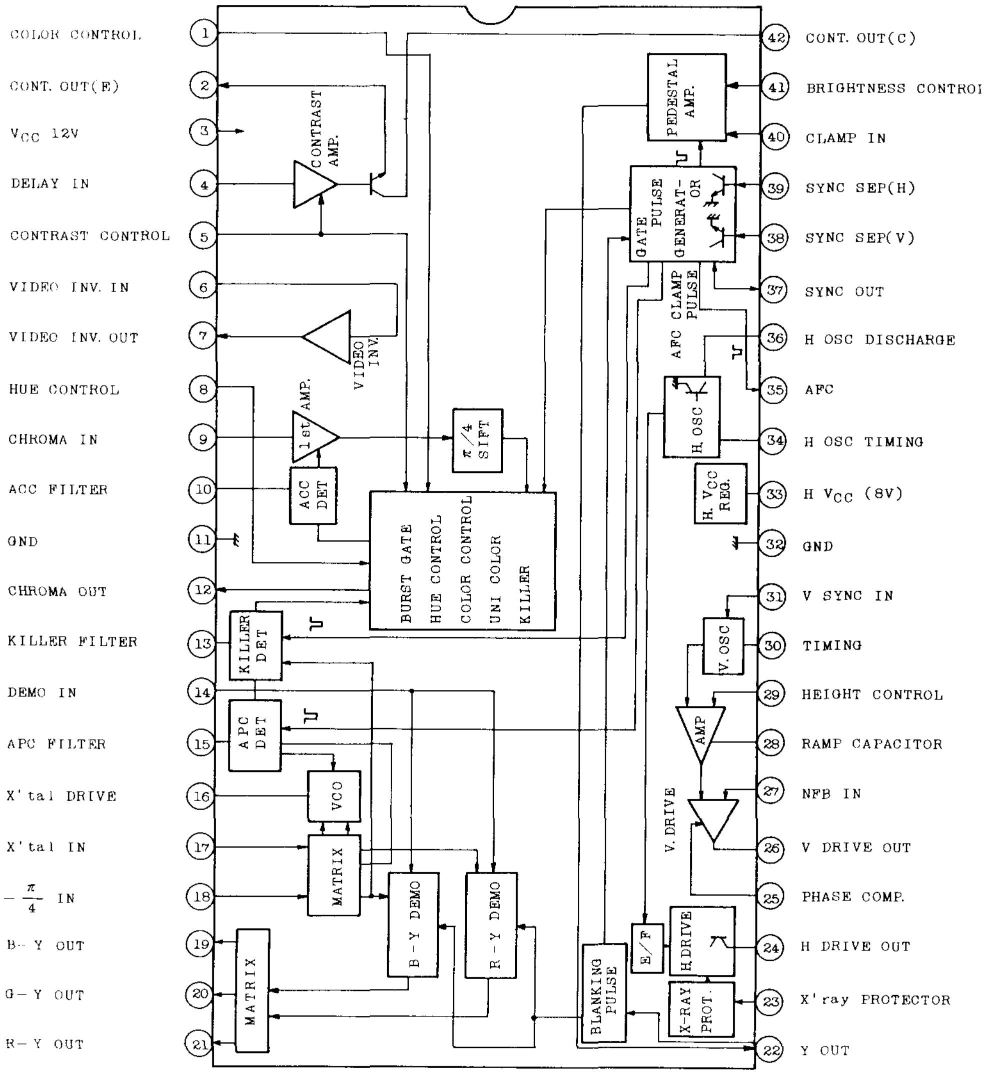
. Stable Sync Separator with V/H Input Terminals.

MAXIMUM RATINGS (Ta=25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V_3 MAX.	15	V
Supply Current	I_{33} MAX.	40	mA
Input Signal Level	e_{IN}	5	V_{p-p}
Demo. Min. Load Resistance	R_{LD}	1.8	kΩ
Horiz. Drive Peak Current	$-I_{24}$ MAX.	30	mA
Horiz. Drive Operating Current	$-I_{24}$	15	mA
Vert. Output Current	I_{26} MAX.	-5	mA
Syncseparator Input Level	V_{38} MAX. V_{39} MAX.	8	V_{p-p}
Term. 7 Max. Operating Current	I_7	5	mA
Term. 2 Max. Operating Current	I_2	4	mA
Power Dissipation (Note)	P_D	2.2	W
Operating Temperature	T_{opr}	-20~65	°C
Storage Temperature	T_{stg}	-55~150	°C

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

BLOCK DIAGRAM



ELECTRICAL CHARACTERISTICS (Unless otherwise specified, V_3=12V, Ta=25°C)

VIDEO SECTION

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
12V Supply Current	I_{CC3}	1	Measure Term. 3 Current	60	82	100	mA
Video Gain	v_{22}/v_6	2	V_6=4.25V, v_6:4.0MHz, 1.0V_{p-p} V_5=10V, V_B=8.0V	2.0	3.5	5.0	dB
Contrast Gain Control Range	ΔG_V	2	V_6=4.25V, v_6:500kHz, 1.0V_{p-p} V_5 : 5 ~ 10V 20log(22 MAX./ 22 MIN.)	11.2	12.3	13.4	dB
Video Frequency Characteristics	ΔG_{Vf}	2	V_6=4.25V, V_5=10V, V_B=8.0V v_6:4.0MHz, 0.5MHz, 1.0V_{p-p} 20log(22 4MHz/ 22 0.5MHz)	-3.5	-1.5	0.5	dB
DC Restoration Ratio	K	2	V_{41}=4.1V Change APL 10% to 90% Measure Pedestal level Change of Term. 22	63	70	77	%
Max. Video Output	v_V MAX.	2	Term. 5 OPEN. Change V_{40} DC Voltage, Measure 90% of Voltage Change at Term. 22	5.0	7.5	-	V_{p-p}
Video DC Output Therm. Co-effic.	$\partial V_{22}/\partial T$	2	V_6=3.25V, V_{41}=4.1V Ta=-20 ~ 65°C	-2.5	0	2.5	mV/°C
Inv. Amp. Gain	v_7/v_6	2	V_6=4.25V, v_6:4.0MHz.1.0V_{p-p} V_5=10V, V_B=8.0V	2.2	3.5	4.6	dB
Inv. Amp. Differential Gain	DG_R	2	V_6 : 3.3 ~ 5.2V v_6 : 3.58MHz, 100mV_{p-p}	-	2.5	10	%
Inv. Amp. Differential Phase	DP_R	2	The Same Condition as Above	-	3	5	deg
Inv. Amp. Frequency Characteristics	ΔG_{Rf}	2	V_6=4.25V, V_5=10V, V_B=8.0V v_6:4.0MHz, 500kHz, 1.0V_{p-p} 20log(v_7(4MHz)/v_7(0.5MHz))	-3.5	-0.1	0.5	dB
Inv. Amp. 3.58MHz Linearity	L_7	2	V_6=4.0V, v_6=3.58MHz	1.6	-	-	V_{p-p}

CHROMA (1)

(Unless otherwise specified, Gate Pulse and Blanking Pulse of TEST CIRCUIT 2 is Applied)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Max. Chroma Output	e_{CM}	3	V_1=12V, V_5=10V, V_8:OPEN v_9:120mV_{p-p}(B:C=1:1) V_G=8V, V_B=15V, Measure Term. 12	0.5	0.75	1.05	V_{p-p}
Burst Output	e_B	3	The Same Condition as Above	0.45	0.70	0.95	V_{p-p}
ACC Characteristics (1)	e_a	3	V_1=12V, V_5=10V, V_8:OPEN v_9=15mV_{p-p}(B:C=1:1) Measure Chroma Amplitude Term. 12	0.16	0.34	–	V_{p-p}
ACC Characteristics (2)	A	3	v_9=100mV_{p-p}, 300mV_{p-p} (B:C=1:1) Chroma Amplitude Ratio at Term. 12 $A=\frac{v_{12}(v_9=300mV_{p-p})}{v_{12}(v_9=100mV_{p-p})}$	–	1.0	1.3	–
Color Control Residual Signal	e_{CS}	3	V_1=0V, V_5=10V, V_8:OPEN S1:1, S_2:1, V_G=8V, V_B=15V v_9=120mV_{p-p} (B:C=1:1)	–	–	3	mV_{p-p}
Uni Color Control Gain Range	Δe_{cu}	3	V_1=12.0V, V_5=5~10V, V_8:OPEN S_1:1, S_2:1, V_G=8V, V_B=15V v_9=120mV_{p-p} (B:C=1:1)	7.5	8.5	9.5	dB
Uni Color Control Phase Range	$\Delta\theta_{cu}$	3	The Same as Above. Burst Chroma Phase Change at Term. 12	–	4	10	deg
HUE Phase Control Range (1)	$\Delta\theta_{bH1}$	3	V_1=12V, V_5=10V, V_8=0 ~ 12V v_9=120mV_{p-p}, V_G=8V, V_B=15V Burst Chroma Phase Change at Term. 12 S_1:1, S_2:1	75	105	–	deg
HUE Phase Control Range (2)	$\Delta\theta_{bH2}$	3	The Same as Above. Phase Change from V_8 OPEN	37	51	62	deg

CHROMA (2)

(Unless otherwise specified, Gate Pulse and Blanking Pulse of TEST CIRCUIT 2 is Applied)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Color Control Phase Change	$\Delta\theta_{cc}$	3	V_1=0 ~12V, V_5:OPEN V_8:OPEN v_9=120mV_{p-p} (B:C=1:1) V_G=8V, V_B=15V, S_1:1, S_2:1	-	3	5	deg
Burst-Chroma Phase Difference	$\Delta\theta_{bc}$	3	V_1:OPEN The Same as Above	-8	0	8	deg
APC Pull-in Range	fp	3	v_{14}=0.6V_{p-p} (Burst) Measure Term. 16 Frequency Difference Between f_c and f_o when APC is Out	±250	±350	-	Hz
Killer Sensitivity	e_{bk}	3	v_{14} Burst Amplitude when V_1=2V S_1:1, S_2:2	18	29	45	mV_{p-p}
Residual Carrier of Demo. Output	e_{car} R e_{car} G e_{car} B	3	v_{14}:AC GND 3.58MHz Component at Term. 19, 20 and 21. S_1:1, S_2:2	-	-	300	mV_{p-p}
Color Diff. Sig. Output	e_{OR} e_{OG} e_{OB}	3	S_1:1, S_2:2 v_{14}:3.56954MHz, 0.2V_{p-p} CW:3.579545MHz	1.45 0.49 1.55	1.85 0.62 1.95	2.3 0.77 2.42	V_{p-p}
Color Diff. Sig. Relative Output	R-Y/B-Y G-Y/B-Y	3	The Same as Above	0.85 0.25	0.95 0.31	1.05 0.38	
Color Diff. Sig. Max. Output	e_{ORM} e_{OGM} e_{OBM}	3	S_1:1, S_2:2 v_{14}:3.56945MHz, 1.2V_{p-p} CW:3.579545MHz	4.5 1.4 4.5	5.5 1.8 5.5	- - -	V_{p-p}
Relative Phase	θ_{R-Y} θ_{G-Y}	3	S_1:1, S_2:2 v_{14}:Burst 0.6V_{p-p}, Chroma 0.2V_{p-p}	100 230	107 240	112 250	deg

CHROMA (3)

(Unless otherwise specified, Gate Pulse and Blanking Pulse of TSET CIRCUIT 2 is Applied)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Demodulator Band Width	f_{BR} f_{BG} f_{BB}	3	S_1:1, S_2:2 v_{14}:10kHz ~ 5MHz, 0.2V_{p-p} -3dB Frequency (0dB; 10kHz)	1.13	1.77	3.16	MHz
Blanking Operation Voltage	$V_{\#22B}$	3	S_1:1, S_2:2 v_{14}:Burst 0.6V_{p-p}, Chroma 0.2V_{p-p} Blanking Pulse Height when Demo. Output is Disappear	10.4	11.1	-	V
Demo. Output DC Voltage	E_{OR} E_{OG} E_{OB}	1	S_1:1, S_2:2 v_{14}: AC GND	7.00	7.71	8.35	V
Demo. Output Difference Voltage	$E_{O(R-G)}$ $E_{O(R-B)}$ $E_{O(B-G)}$	1	The Same as Above	-0.3	-	0.3	V
Demo. DC Output Therm. Co-efficient	$\Delta E_{OR\theta}$ $\Delta E_{OG\theta}$ $\Delta E_{OB\theta}$	1	The Same as Above Ta=-20°C ~ 65°C	-3	0	2	mV/°C
DC Output Voltage Difference Component Therm. Co-efficient	$\Delta E_{O(R-G)\theta}$ $\Delta E_{O(R-B)\theta}$ $\Delta E_{O(B-G)\theta}$	1	The Same as Above	-2	0	2	mV/°C
Color Control Terminal Voltage	V_1	1	Measure Term. 1 Open Circuit Voltage	5.4	6.0	6.52	V
Uni-color Control Terminal Voltage	V_5	1	Measure Term. 5 Open Circuit Voltage	6.9	7.5	8.02	V
HUE Control Terminal Voltage	V_8	1	Measure Term. 8 Open Circuit Voltage	5.4	6.0	6.52	V

HORIZONTAL (1)

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Horizontal V_{CC}	V_{33}	1	V_B=20.3V	7.40	8.20	9.0	V
Recommendable Supply Current	I_{33}	-	-	22	26	30	mA
Horizontal Frequency	f_H	4	S_{39}:b, S_{38}:b, S_{35}:ON V_x=4V	15.069	15.569	16.069	kHz
f_H Thermal Drift	Δf_{HT}	4	The Same as Above Ta=-20~60°C	-70	80	230	Hz
AFC Clamping Voltage	V_{CL}	1	Measure Term. 35 Open Circuit Voltage S_1:ON	3.71	4.2	4.75	V
AFC Input Current	I_{IN35}	1	S_1:ON, S_5:2	2.2	3.62	5.1	mA
AFC Output Current	I_{O35}	1	S_1:ON, S_5:1	2.4	3.99	5.6	mA
Horiz. Drive Sat. Voltage	V_{OL24}	1	S_1:ON, S_3:ON Measure V_{24}	-	-	0.3	V
Horiz. Drive Output Duty Cycle	T_{O24}	4	S_{39}:b, S_{38}:b, S_{35}:OPEN V_x=4V, $\frac{\text{H Level Period}}{\text{1 Cycle Period}} \times 100$ Measure v_{24} Wave form	45	50	55	%
Oscillator Starting Voltage	V_{33} MIN.	4	Minimum V_{33} when Output Duty of Term. 24 is 50%	-	-	4.0	V
Starting Supply Current	I_{33} MIN.	4	V_{33}=4V, Measure I_{33}	5.5	8.8	11.5	mA
AFC Pull-in Range	Δf_{HPULL}	4	S_{38}:a, S_{35}:ON S_{39}:a Changing V_x, Measure Pull-in Range	-	±600	-	Hz

HORIZONTAL (2)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
AFC Hold-in Range	Δf_H HOLD	4	The Same as Pull-in Range. Measure Hold-in Range.	-	±1000	-	Hz
X'ray Protector Voltage Sensitivity	V_{IN23}	4	Measure V_{23} when v_{24} Output Becames L Level. Ta=25°C	0.50	0.88	1.10	V
X'ray Protector Current Sensitivity	I_{IN23}	4	Measure I_{23} when v_{24} Output Becames L Level. Ta=25°C	0.060	0.178	1.00	μA
X'ray Protector Operating Voltage	$V_{IN23\theta}$	4	The Same as V_{IN23} Ta=-20~65°C	0.30	0.88	1.28	V
X'ray Protector Operating Current	$I_{IN23\theta}$	4	The Same as I_{IN23} Ta=-20~65°C	0.03	0.178	2.0	μA

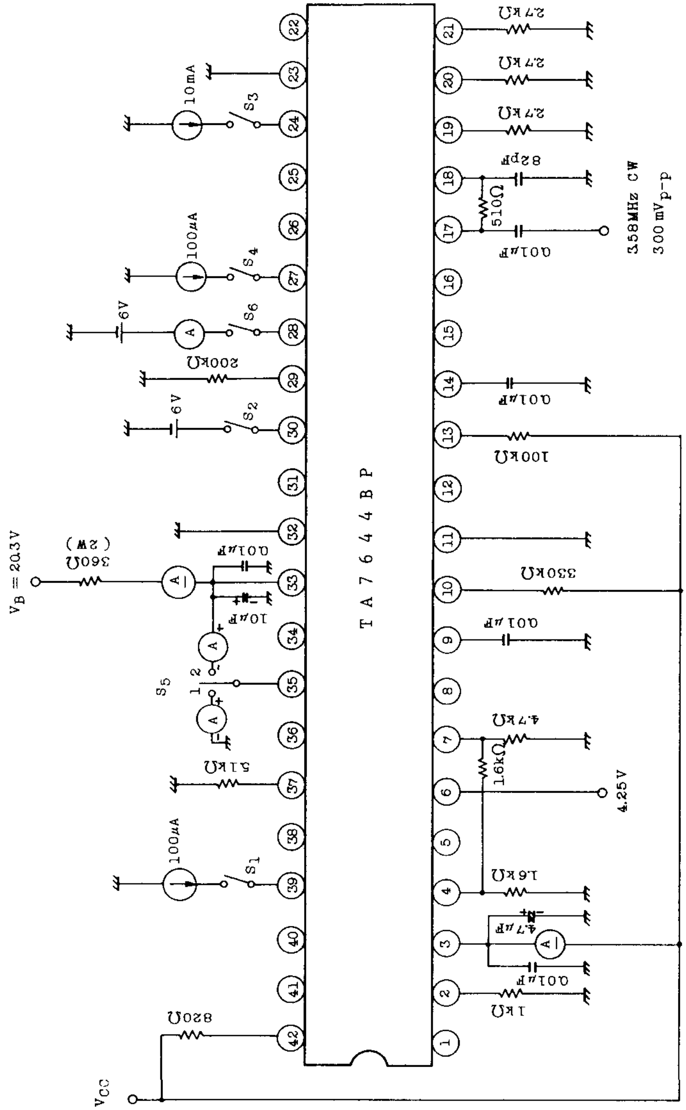
SYNCSEPARATOR

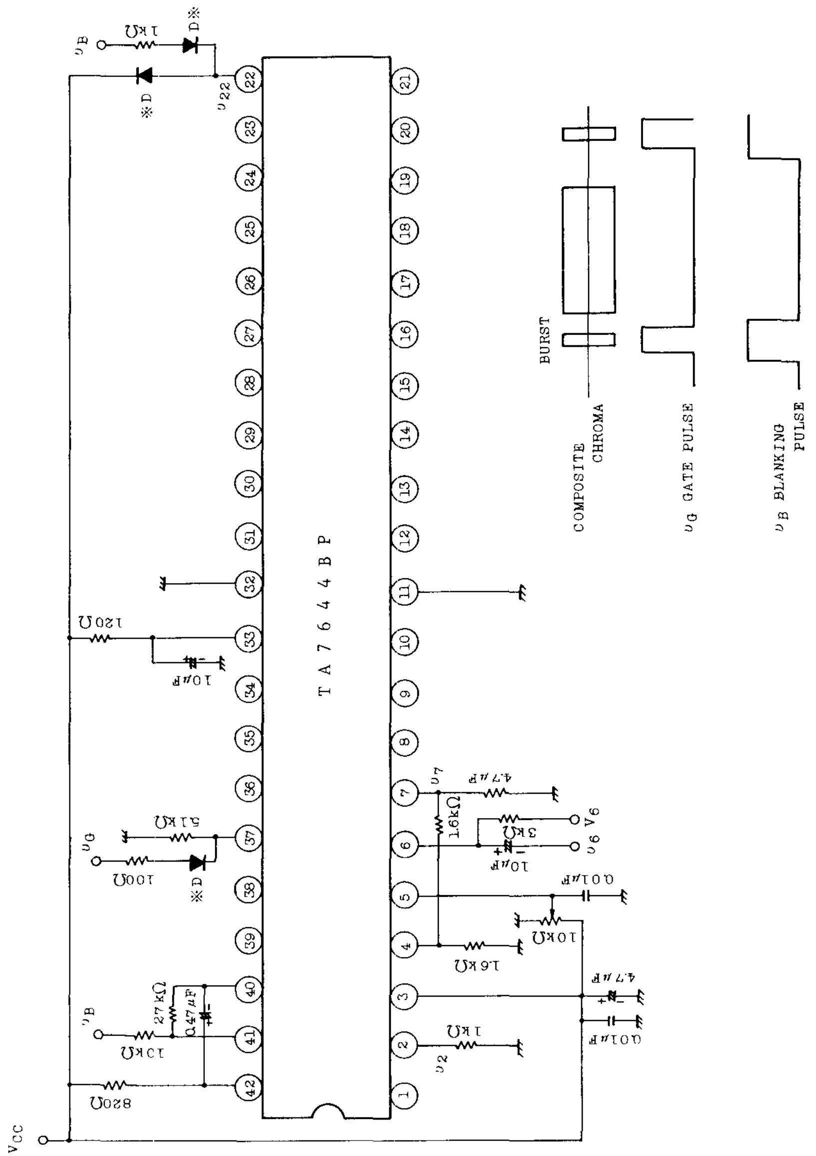
CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Syncseparator Sensitivity (1)	I_{IN39}	4	Term. 38:OPEN Measure I_{39} when V_{37} is L→H.	18.1	35.0	11.3	μA
Syncseparator Sensitivity (2)	I_{IN38}	4	Term. 39:OPEN Measure I_{38} Same as Above	13.3	21.4	54.2	μA
Sync Output H Level	V_{OH37}	4	Term. 38:OPEN	7.04	8.19	9.34	V
Sync Output L Level	V_{OL37}	4		0	1.5	2.4	V
Sync Clamp Voltage	V_{CL31}	4	Measure V_{31} at I_{31}=-1mA	-0.85	-0.63	-0.5	V

VERTICAL (Unless otherwise specified, V_{CC}=12V, Ta=25°C)

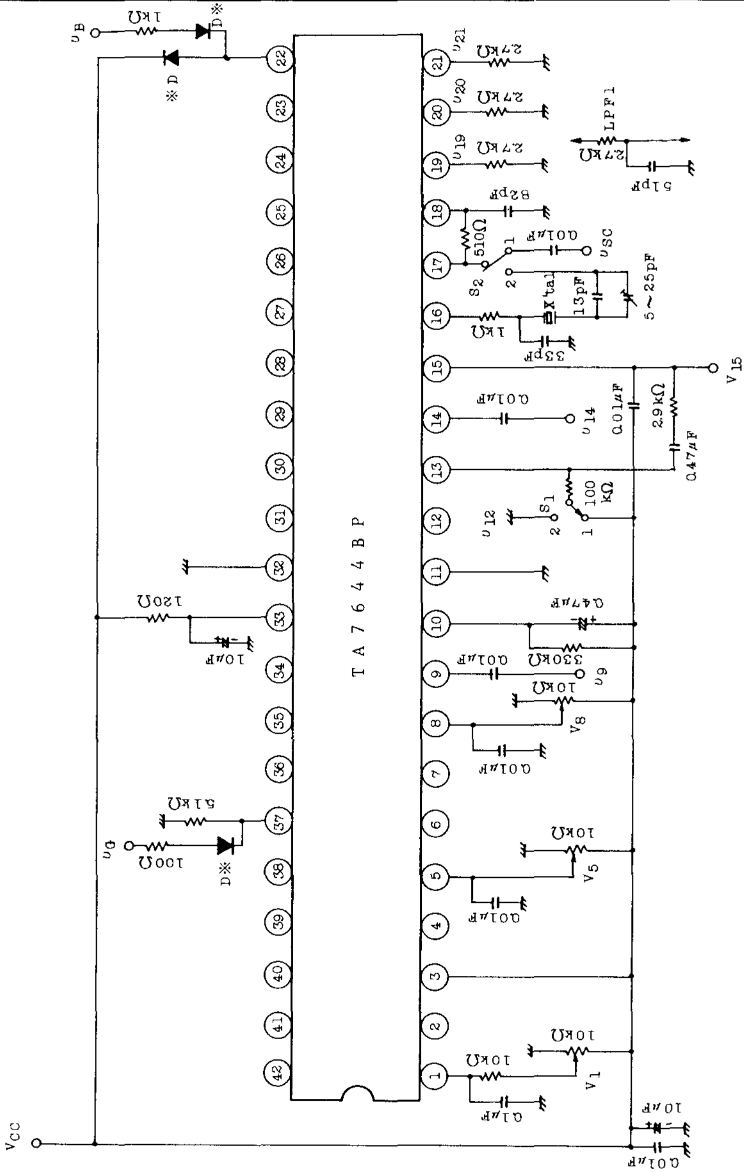
CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Vert. Freerun Frequency	f_V	4	S_{31}:ON, Measure Term. 28	56	60	64	Hz
Retrace Time	T_r	4	Term. 28 Output Pulse	500	690	850	μs
f_V Pull-in Range	$\Delta f_{V\ PULL}$	4	S_{31}:ON/OFF, Term. 30→VR S_{31} OFF f_{OSC28}=60Hz S_{31} ON Measure f_{OSC28}' $\Delta f_{VPULL}=f_{OSC28}'$-60Hz	11.1	12.1	12.9	Hz
Ramp Max. Voltage	V_{O28}	1	V_{30}=6V, Measure V_{28}	7.05	7.65	8.25	V
Ramp Max. Current	I_{O28}	1	V_{30}=6V, Measure I_{28}, S_6:ON	16.7	26.8	48.4	mA
Max. Common Mode Input Voltage	V_{IH28}	4	S_{26},S_{27}:ON, V_{30}=0V V_{28}=6→12V, Measure V_{28} when V_{27} is Saturate.	11.9	-	-	V
Min. Common Mode Input Voltage	V_{IL28}	4	V_{28}=6→0V The Same as Above	-	2.86	3.7	V
Term. 28 Input Current	I_{I28}	4	S_{26},S_{27}:ON, V_{30}=0V Measure I_{28} at V_{28}=6V	0.25	0.98	4.50	μA
Term. 27 Input Current	I_{I27}	4	The Same as Above Measure I_{27} at V_{28}=6V	0.18	0.94	6.21	μA
Max. Vertical Output Voltage	V_{OH26}	4	S_{26}:OFF, S_{27}:ON, V_{30}=6V Measure V_{26}	5.6	6.3	7.2	V
Min. Vertical Output Voltage	V_{OL26}	4	S_{26},S_{27}:OFF, V_{30}=6V Measure V_{26}	-	-	0.3	V
Term. 29 Bias Voltage	V_{29}	4	Measure V_{29} when I_{29}=-0.2mA	3.7	3.9	4.1	V

TEST CIRCUIT 1
(DC)



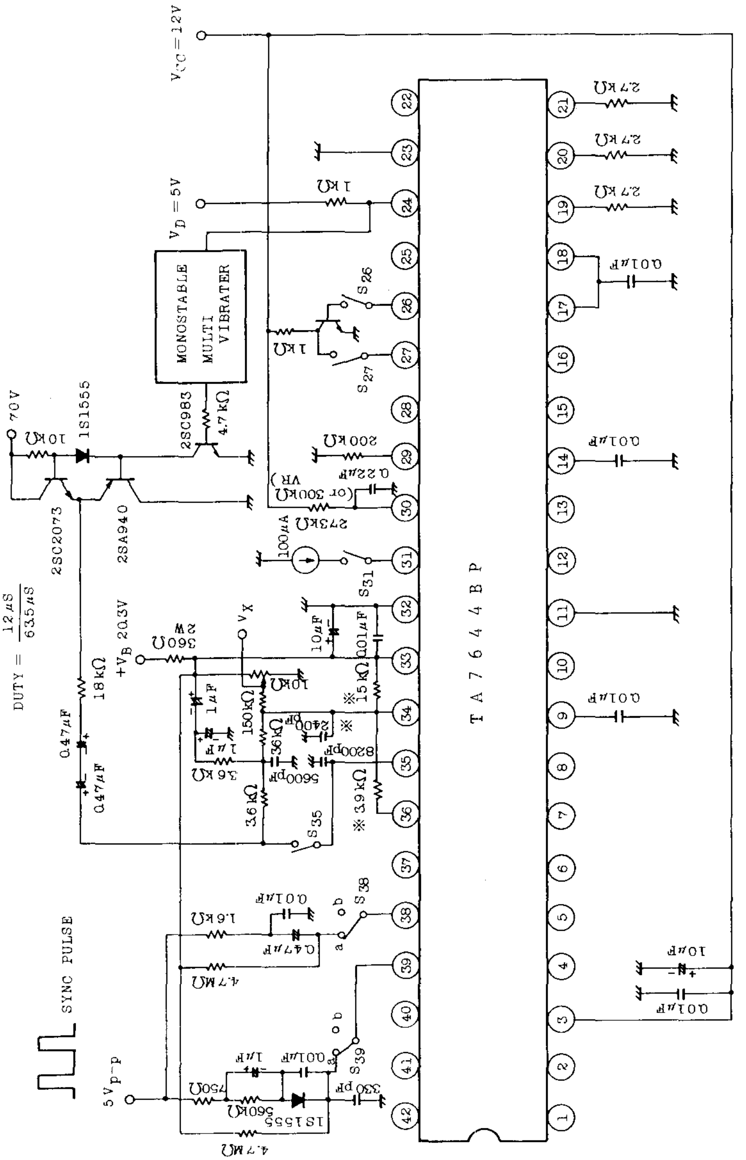


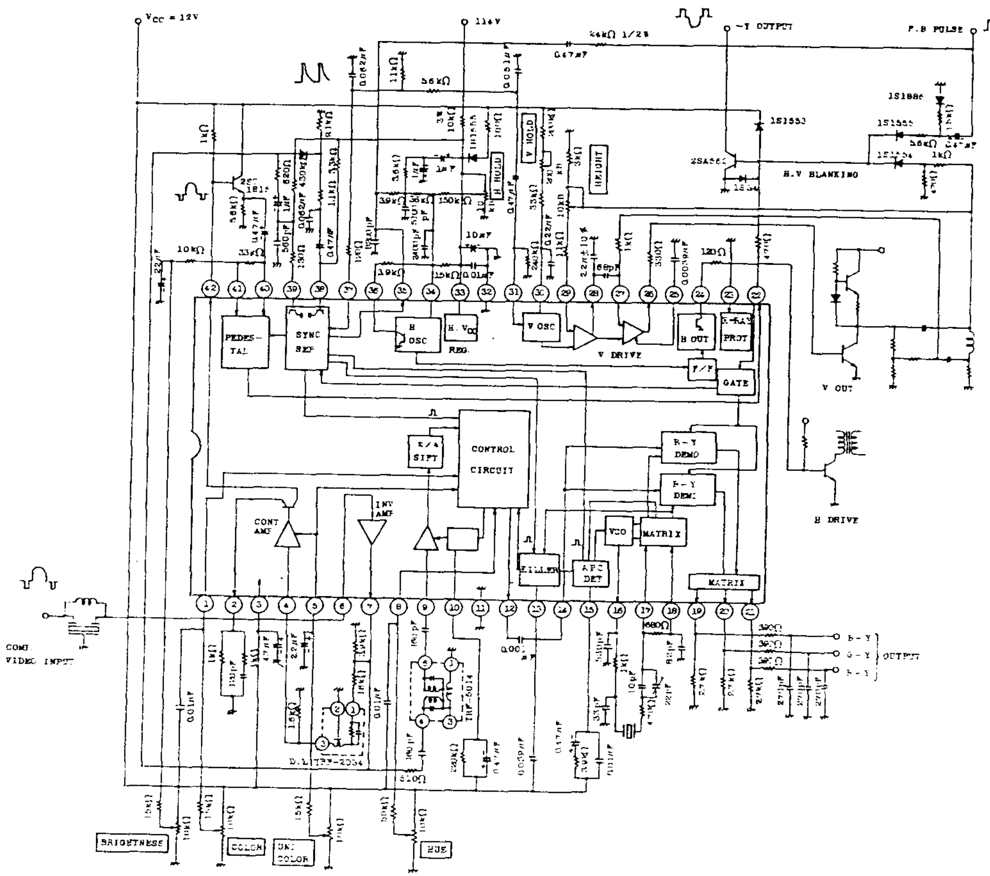
TEST CIRCUIT 2
(VIDEO)



TEST CIRCUIT 3
(CHROMA OSC. DEMO.)

TEST CIRCUIT 4
(HORIZONTAL, VERTICAL)




PEDES-TAL
SYNC SEP
H OSC
H. VCC REG.
V OSC
V DRIVE
H OUT
X-RAY PROT
F/F
GATE
CONTROL CIRCUIT
R-Y DEMO
B-Y DEMO
VCO
MATRIX
KILLER
APC DET
CONT AMP
INV AMP
V OUT
H DRIVE
H.V BLANKING
H HOLD
V HOLD
HEIGHT
P.B PULSE
-Y OUTPUT
COMP. VIDEO INPUT
BRIGHTNESS
COLOR
UNI COLOR
HUE
OUTPUT