M52030ASP

NTSC SYSTEM SINGLE-CHIP COLOR TV SIGNAL PROCESSOR

DESCRIPTION

The M52030ASP is a single-chip semiconductor integrated circuit that processes color television signals.
It features a variety of signal processing functions including video IF, sound IF, picture, color, on-screen character display and deflection signal processing. The M52030ASP also combines tuner and simple transistor output level to facilitate practical NTSC type color television set design.

FEATURES

- Large-scale, single-chip construction enhances practicality and reliability of the television set itself while contributing to lower power consumption.
- Equipped with direct output pins for FM sound detector and can be used with sound multiplex.
- Enables use of AFT defeat and sound muting.
- Employs a fully synchronized detector circuit that uses PLL as a video detector; exhibits good performance for DG, DP, 920kHz beat, crosscolor, etc.
- Equipped with quadrature detector circuit for FM detection of sound IF. Features exclusive coil, simple external circuitry and exhibits good linearity.
- Does not require horizontal free run frequency adjustment.
- Is capable of R, G, B signal output.
- Features built-in on-screen character display circuit and easy connection with exterior RGB input.
- Features DC voltage control for picture quality, contrast, luminance, color saturation, tint and volume.
- Double AFC in the horizontal circuit effectively reduces weak electric field horizontal "jitter," and minimizes "bending" on the screen due to luminance alteration. Sync detection circuit enables detection signaling for sound muting, automatic tuning.
- Contained inside 52-pin shrink DIP for compact mounting.

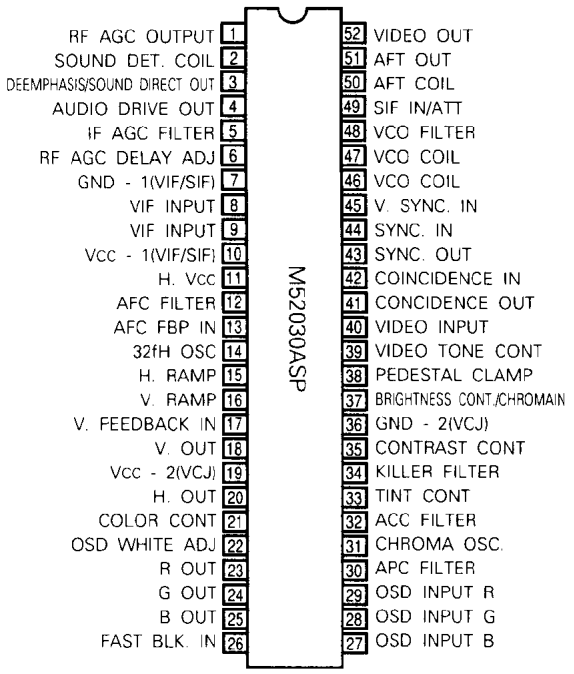
APPLICATION

NTSC-Type Color Television Receiver

RECOMMENDED OPERATING CONDITION

Supply Voltage	5V, 9V
Horizontal Supply Current	21mA
Operating Supply Voltage	4.5~5.5V, 8.5~9.5V
Operating Supply Current	18~25mA

PIN CONFIGURATION (TOP VIEW)



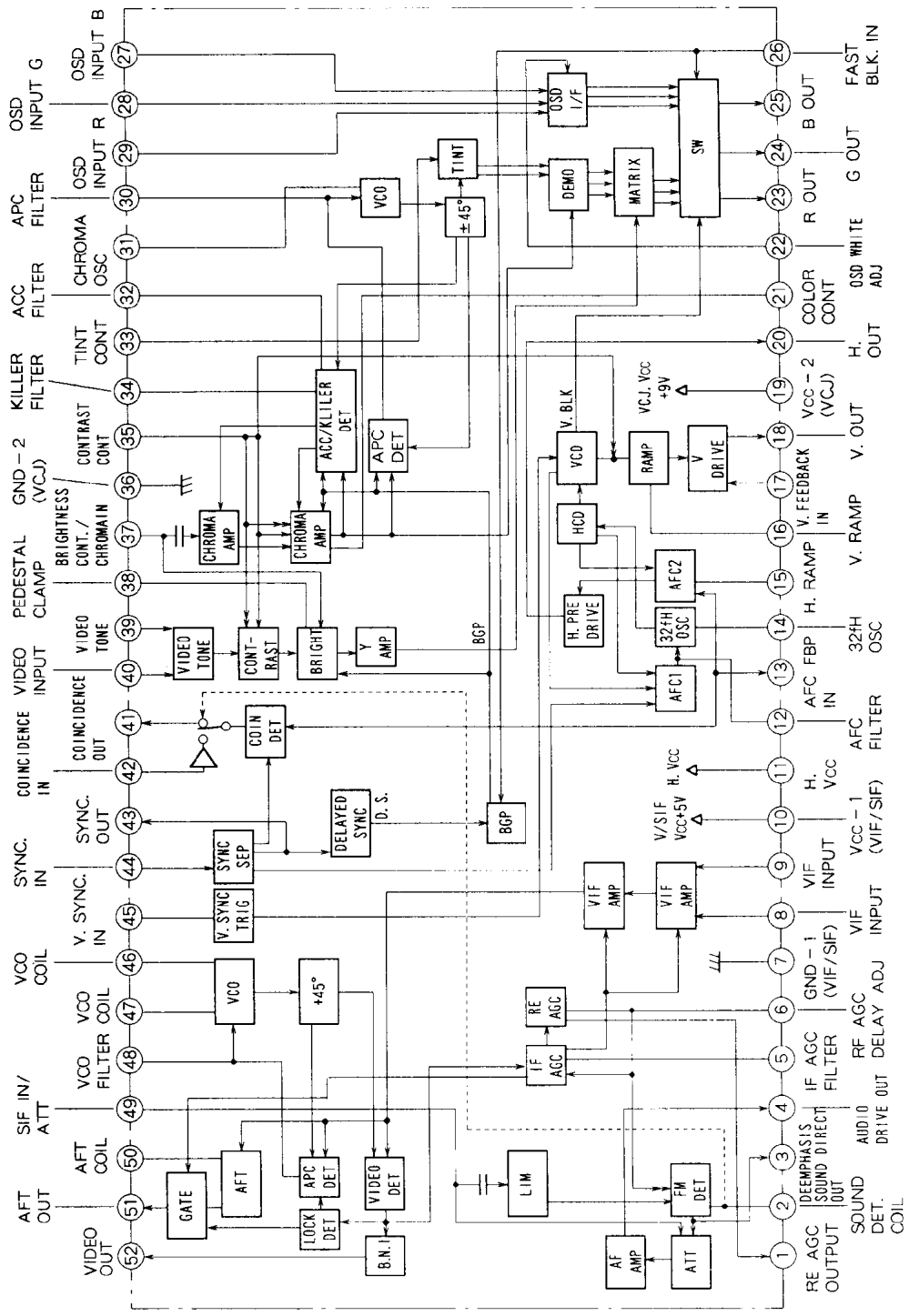
Outline 52P4B

MITSUBISHI ELECTRIC

M52030ASP

NTSC SYSTEM SINGLE-CHIP COLOR TV SIGNAL PROCESSOR

BLOCK DIAGRAM



M52030ASP

NTSC SYSTEM SINGLE-CHIP COLOR TV SIGNAL PROCESSOR

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Ratings	Unit
V_{CC}	Supply voltage	5.0, 9.0	V
P_d	Power dissipation	1.35	W
T_{opr}	Operating temperature	−20~65	°C
T_{stg}	Storage temperature	−40~125	°C

ELECTRICAL CHARACTERISTICS (Ta=25°C, unless otherwise noted)

VIF SECTION

Symbol	Parameter	Test point	Input (A)	Test conditions*																					Limits			Unit
				1	5	6	10	11A	19	48	51	52	52A	S1	S2	S5	S6	S10	S10A	S11A	S19	S50	S52	Note	Min.	Typ.	Max.	
Icc10	Circuit Current (VIF/SIF) PIN10, /Vcc=5V	A10	–				5V	11V	9V					ON			ON		ON	ON	ON				16	23	30	mA
V52	Video Detector Output DC Voltage	V52	–				5V	11V	9V					ON	ON	ON	ON	ON		ON	ON	ON			3.6	4.2	4.8	V
Vo52	Video Detector Output Signal Voltage	52	SG.1				5V	11V	9V					ON	ON		ON	ON		ON	ON	ON			1.6	2.0	2.4	V_{P-P}
S/N	Video S/N	52A	SG.2				5V	11V	9V					ON	ON		ON	ON		ON	ON	ON		1	–	−50	−43	dB
BW	Video Frequency Characteristics	52	SG.8				5V	11V	9V					ON	ON		ON	ON		ON	ON	ON		2	5.0	7.5	–	MHz
Vin (min)	Input Sensitivity	52A	SG.1				5V	11V	9V					ON	ON		ON	ON		ON	ON	ON		3	–	48	50	dB
Vin (max)	Maximum Allowable Input	52A	SG.4				5V	11V	9V					ON	ON		ON	ON		ON	ON	ON		4	110	115	–	dB
GR	IF AGC Control Range	5	SG.2		Ⓜ		5V	11V	9V					ON	ON		ON	ON		ON	ON	ON			57	63	–	dBμ
V_{STH}	Black Spot Noise Inverter Threshold Level	52	SG.1		Variable		5V	11V	9V					ON	ON		ON	ON		ON	ON	ON		5	1.0	1.3	1.6	V
V_{SCL}	Black Spot Noise Inverter Clamp Level		SG.2				5V	11V	9V					ON	ON		ON	ON		ON	ON	ON		5	2.3	2.7	3.1	V
IM	Intermodulation P=80dBμ P/C=P/S=10dBμ	52	SG.9				5V	11V	9V					ON	ON		ON	ON		ON	ON	ON		6	34	45	–	dB
V51	AFT Output DC Voltage	51	–				5V	11V	9V					ON	ON	ON	ON	ON		ON	ON				2.3	3.6	4.3	V
V51H	AFT Maximum Voltage	51	SG.6				5V	11V	9V					ON	ON		ON	ON		ON	ON			7	7.3	7.9	–	V
V51L	AFT Minimum Voltage	51	SG.7				5V	11V	9V					ON	ON		ON	ON		ON	ON			8	–	0.3	1.0	V
μAFT	AFT Detector Sensitivity	51	SG.3				5V	11V	9V					ON	ON		ON	ON		ON	ON			9	25	35	45	mV/kHz
V51D	AFT Switch Operation	51	SG.3				5V	11V	9V					ON	ON		ON	ON		ON	ON				3.4	3.8	4.2	V
V1H	RF AGC Maximum Voltage	1	SG.11				5V	11V	9V					ON	ON			ON		ON	ON				7.5	8.5	–	V
V1L	RF AGC Minimum Voltage	1	SG.10				5V	11V	9V					ON	ON			ON		ON	ON				–	0.0	0.5	V
V1D	RF AGC Delay Input	1	SG.2				5V	11V	9V					ON	ON			ON		ON	ON				110	–	–	dBμ
CRT	VCO Pull-In Range	52	SG.1				5V	11V	9V					ON	ON		ON	ON		ON	ON				2.0	2.8	–	MHz

VIF SECTION (cont.)

Symbol	Parameter	Test point	Input (A)	Test conditions*																						Limits			Unit
				1	5	6	10	11A	19	48	51	52	52A	S1	S2	S5	S6	S10	S10A	S11A	S19	S50	S52	Note	Min.	Typ.	Max.	
DG	DG	52A	SG.5				5V	11V	9V					ON	ON		ON	ON		ON	ON				–	3	5	%
DP	DP	52A	SG.5				5V	11V	9V					ON	ON		ON	ON		ON	ON				–	2	–	deg.

* : Indicates OPEN.

VIF SECTION

Symbol	Parameter	Test point	Input (A)	Test conditions*												Limits			Unit
				10	11A	19	S1	S2	S6	S10	S10A	S11A	S19	S50		Min.	Typ.	Max.	
GAW	Gated AFT Width	51A	SG.5	5V	11V	9V	ON	ON	ON	ON		ON	ON	ON		4.0	5.0	6.0	μsec
V51AH	Gated AFT Max. Voltage	51A	SG.16	5V	11V	9V	ON	ON	ON	ON		ON	ON			8.0	8.5	–	V
V51AL	Gated AFT Min. Voltage	51A	SG.17	5V	11V	9V	ON	ON	ON	ON		ON	ON			0	0.3	1.0	V
μGAFT	Gated AFT Sensitivity	51A	SG.18	5V	11V	9V	ON	ON	ON	ON		ON	ON			25	35	45	mV/kHz
V51AD	Gated AFT Defeat Voltage	51A	SG.5	5V	11V	9V	ON	ON	ON	ON		ON	ON	ON		4.2	4.5	4.8	V

* : Indicates OPEN.

SIF SECTION

Symbol	Parameter	Test point	Input (C)	Test conditions*													Limits			Unit
				10	11A	19	48	S1	S5	S6	S10	S11A	S19	S49A	S50	S52	Note	Min.	Typ.	Max.	
V3	AF Output DC Voltage	3	–	5V	11V	9V		ON	ON	ON	ON	ON	ON	ON	ON			1.2	1.7	2.3	V
VoAF	AF Output	3	SG. 12	5V	11V	9V		ON	ON	ON	ON	ON	ON	ON	ON	ON		250	350	450	mVrms
LIM	Input Limiting Sensitivity	3	SG. 13	5V	11V	9V		ON	ON	ON	ON	ON	ON	ON	ON	ON	10	–	42	50	dBμ
AMR	AMR	3	SG. 14	5V	11V	9V		ON	ON	ON	ON	ON	ON	ON	ON	ON	11	40	55	–	dB
Vo4	AF Direct Output Voltage	4	SG. 12	5V	11V	9V		ON	ON	ON	ON	ON	ON	ON	ON	ON		130	190	270	mVrms
Vo4 (max)	AF Direct Output Maximum Voltage	4	SG. 12	5V	11V	9V	5V	ON	ON	ON	ON	ON	ON	ON	ON	ON		250	350	450	mVrms
ATT	Maximum Attenuation	4	SG. 12	5V	11V	9V	0V	ON	ON	ON	ON	ON	ON	ON	ON	ON	12	–	–70	–60	dB
–	AF Direct Output Amplification	–	–	5V	11V	9V		ON	ON	ON	ON	ON	ON	ON	ON	ON	13	–1.0	0.0	1.0	dB
S/N AF	AF S/N	4	SG. 15	5V	11V	9V		ON	ON	ON	ON	ON	ON	ON	ON	ON	14	–	–70	–60	dB
THD AF	AF Output Distortion	4	SG. 12	5V	11V	9V		ON	ON	ON	ON	ON	ON	ON	ON	ON		–	–	1.0	%

* : Indicates OPEN.

CHROMA SECTION

Symbol	Parameter	Test point	Input (G)	Test conditions*													Limits			Unit
				10	11 A	19	21	33	35	37	39	S 10	S 19	S 34	S 11 A	Note	Min.	Typ.	Max.	
Cmax	Demodulated Maximum Output	25	SG.L 0dB	5V	11 V	9V	4V	2.5 V	4V	4V	0V	ON	ON		ON		4.5	5.0	–	V_{P-P}
Cnorm	Demodulated Typical Output	25	SG.L 0dB	5V	11 V	9V	2.3 V		2.5 V	4V	0V	ON	ON		ON	21	2.3	3.0	3.7	V_{P-P}
ACC1	ACC Characteristics 1	25	SG.L Vari	5V	11 V	9V		2.5 V		4V	0V	ON	ON		ON	22	–7.3	–2.3	2.7	dB
ACC1	ACC Characteristics 1																–3.2	–0.2	2.8	
CSmin	Color Control Variation Characteristics	25	SG.L 0dB	5V	11 V	9V	1V 2.3 V		2.5 V	4V	0V	ON	ON		ON	23	–	–30	–25	dB
CSmax		25		5V	11 V	9V	1V 2.3 V		2.5 V	4V	0V	ON	ON		ON	23	2	4	8	dB
CUmin	Color Tracking Variation Characteristics	25	SG.L 0dB	5V	11 V	9V	2.3 V		2.5 V	4V	0V	ON	ON		ON	24	–	–15	–8	dB
CUmax		25		5V	11 V	9V	2.3 V		2.5 V	4V	0V	ON	ON		ON	24	2	4	8	dB
Fpc	APC Pull-In Range	25	SG.M 0dB	5V	11 V	9V	2.3 V		2.5 V	4V	0V	ON	ON		ON	25	±400	±650	–	Hz
ViK	Killer Operation Input Level	25	SG.L Vari	5V	11 V	9V	2.3 V		2.5 V	4V	0V	ON	ON	ON	ON	26	–42	–38	–32	dB
R/B	Demodulated Output Amplitude Ratio	23 25	SG.N 50mV	5V	11 V	9V	2.3 V		2.5 V	4V	0V	ON	ON		ON	27	0.90	1.00	1.10	Ratio
G/B		24 25		5V	11 V	9V	2.3 V		2.5 V	4V	0V	ON	ON		ON	27	0.25	0.30	0.35	Ratio
θR-Y	Demodulated Output Phase Angle	23 25	SG.M	5V	11 V	9V	2.3 V		2.5 V	4V	0V	ON	ON		ON	28	102	112	122	deg.
θG-Y		24 25		5V	11 V	9V	2.3 V		2.5 V	4V	0V	ON	ON		ON	28	237	247	257	deg.
Tint Va	Tint Control Variation	23 24 25	SG.M	5V	11 V	9V	2.3 V		2.5 V	4V	0V	ON	ON		ON		75	90	–	deg.
Tmax	Tint Control Characteristics	25	SG.M	5V	11 V	9V	4V 1V		2.5 V	4V	0V	ON	ON		ON		–65	–45	–25	deg.
Tmin																	+25	+45	+65	
Tcen	Tint Center	25	SG.M	5V	11 V	9V	2.65 V		2.5 V	4V	0V	ON	ON		ON		–8.0	0	+8.0	deg.

* : Indicates OPEN.

DEFLECTION SECTION

Symbol	Parameter	Test point	Input (D)	Test conditions*													Limits			Unit
				10	11 A	19	S 10	S 11 A	S 11 B	S 12	S 12 A	S 15 A	S 19	S 20	S 44	Note	Min.	Typ.	Max.	
Icc11	Circuit Current (H/V)	A11	–	5V	11 V	9V	ON		ON	ON	ON	ON	ON	ON		29	18	21	24	mA
fH	Free Run Frequency	20	–	5V	11 V	9V	ON	ON		ON	ON	ON	ON	ON			15.300	15.734	16.000	kHz
V11 min	Oscillator Starting Voltage	11, 20	–	5V	Vari	9V	ON	ON		ON	ON	ON	ON	ON			–	4.4	5.3	V
fPH	Pull-In Range	D, 20	SG. B fVar	5V	11 V	9V	ON	ON		ON	ON	ON	ON	ON	ON	30	±500	±700	–	Hz
V20H	Horizontal Output Maximum Voltage	20	SG. B	5V	11 V	9V	ON	ON		ON	ON	ON	ON	ON	ON	31	3.0	3.8	–	V_{O-P}

VIDEO SECTION

Symbol	Parameter	Test point	Input (C)	Test conditions*																										Limits			Unit
				10	11A	15	19	35	37	38	39	S10	S11A	S12	S12A	S15A	S19	S19A	S20	S26	S34	S44	S2	S5A	S50	Note	Min.	Typ.	Max.	
Icc19	Circuit Current (Y/C/OSD) PIN ⑲, Vcc=9V	A19	–	5V	11V		9V		2.5V			ON	ON	ON	ON	ON		ON	ON	ON	ON		ON	ON	ON		40	55	70	mA
Ymax	Maximum Output	23 25	SG.F	5V	11V		9V		2.5V	Variable		ON	ON	ON	ON	ON	ON		ON	ON		ON	ON	ON	ON	15	4.0	5.0	–	V_{P-P}
GY	Standard Gain	23 25	SG.G	5V	11V		9V		2.5V			ON	ON	ON	ON	ON	ON		ON	ON		ON	ON	ON	ON	16	12	16	20	dB
GY norm	Contrast Variation Characteristics	23 25	SG.G	5V	11V		9V	2.5V	2.5V			ON	ON	ON	ON	ON	ON		ON	ON		ON	ON	ON	ON	17	−2	0	2	dB
GY min		23 25	SG.G	5V	11V		9V	1V	2.5V			ON	ON	ON	ON	ON	ON		ON	ON		ON	ON	ON	ON	17	–	−14	−9	dB
GY max		23 25	SG.G	5V	11V		9V	4V	2.5V			ON	ON	ON	ON	ON	ON		ON	ON		ON	ON	ON	ON	17	2	5	8	dB
V_{LUM} norm	Brightness Variation Characteristics	23 25	–	5V	11V		9V		2.5V			ON	ON	ON	ON	ON	ON		ON	ON		ON	ON	ON	ON		0.7	1.0	1.5	V
V_{LUM} min		23 25		5V	11V		9V		1V			ON	ON	ON	ON	ON	ON		ON	ON		ON	ON	ON	ON		0	0.4	0.6	V
V_{LUM} max		23 25		5V	11V		9V		4V			ON	ON	ON	ON	ON	ON		ON	ON		ON	ON	ON	ON		2.0	2.3	2.6	V
GP	Peaking Value	23A 24A 25A	SG.H SG.J	5V	11V		9V9		2.5V			ON	ON	ON	ON	ON	ON		ON	ON		ON	ON	ON	ON	18	6	8	13	dB
GTnorm	Picture Quality Variation Characteristics	23 24 25	SG.J	5V	11V		9V		2.5V	Variable	2.5V	ON	ON	ON	ON	ON	ON		ON	ON		ON	ON	ON	ON	19	−2	0	2	dB
GTmin		23 24 25		5V	11V		9V		2.5V		1V	ON	ON	ON	ON	ON	ON		ON	ON		ON	ON	ON	ON	19	–	−14	−9	dB
GTmax		23 24 25		5V	11V		9V		2.5V		4V	ON	ON	ON	ON	ON	ON		ON	ON		ON	ON	ON	ON	19	2	4	8	dB
FBY	Frequency Characteristics	23A 24A 25A	SG.K	5V	11V		9V		2.5V			ON	ON	ON	ON	ON	ON		ON	ON		ON	ON	ON	ON	20	7.0	10	–	mA

* : Indicates OPEN.

DEFLECTION SECTION (cont.)

Symbol	Parameter	Test point	Input (D)	Test conditions*													Limits			Unit
				10	11 A	19	S 10	S 11 A	S 11 B	S 12	S 12 A	S 15 A	S 19	S 20	S 44	Note	Min.	Typ.	Max.	
V20L	Horizontal Output Minimum Voltage	20	SG. B	5V	11 V	9V	ON	ON		ON	ON	ON	ON	ON	ON	32	–	0.01	0.3	Vo-P
Th	Horizontal Output Pulse Width	20	SG. B	5V	11 V	9V	ON	ON		ON	ON	ON	ON	ON	ON	33	22	24	26	µsec
FCV	Fly-Back Pulse Clamp Voltage	13	SG. A	5V	11 V	9V	ON	ON		ON	ON	ON	ON	ON	ON		8.0	8.5	–	Vo-P
Hp	Horizontal Phase Variable Characteristics	13	SG. A	5V	11 V	9V	ON	ON		ON	ON	ON	ON	ON	ON		–	±4.0	–	µsec
V_{43H}	Sync Separation Output Maximum Voltage	43	SG. A	5V	11 V	9V	ON	ON					ON		ON	41	8.0	8.9	–	Vo-P
V_{43L}	Sync Separation Output Minimum Voltage	43	SG. A	5V	11 V	9V	ON	ON					ON		ON	42	2.5	3.0	3.5	Vo-P

* : Indicates OPEN.

Symbol	Parameter	Test point	Input (D)	Test conditions*															Limits			Unit
				10	11 A	16 A	17	19	S 10	S 11 A	S 12	S 12 A	S 15 A	S 16	S 17	S 19	S 44	S 42	Note	Min.	Typ.	Max.	
fV	Vertical Free Run Frequency	16	–	5V	11 V	GND		9V	ON	ON	ON	ON	ON			ON				48.0	52.8	57.0	Hz
fPV	Vertical Pull - In Range	16	SG. E Vari	5V	11 V	GND		9V	ON	ON	ON	ON	ON			ON	ON		34	65.0	67.3	–	Hz
Tv	Vertical Output Pulse Width	16	SG. A	5V	11 V	GND		9V	ON	ON	ON	ON	ON			ON	ON			474	544	617	µsec
V18H	Vertical Output Maximum Voltage	18	SG. A	5V	11 V		3.7 V	9V	ON	ON	ON	ON	ON	ON		ON	ON		35	2.80	3.65	–	Vdc
V18L	Vertical Output Minimum Voltage	18	SG. A	5V	11 V		3.7 V	9V	ON	ON	ON	ON	ON	ON		ON	ON		36	–	0.01	0.3	Vdc
GP	Open Loop Gain	17, 18	Input (E) SG. C	5V	11 V	4.5 V Va	3.7 V	9V	ON						ON	ON	ON		37	16	20	24	dB
V11min	Vertical Oscillator Starting Voltage	11, 16	–	5V	11 V			Vari	ON	ON	ON	ON	ON			ON	ON		38	–	4.4	5.3	V
VRamp	Ramp Peak Voltage	16	SG. A	5V	11 V			9V	ON	ON	ON	ON	ON	ON		ON	ON		39	6.0	6.3	6.5	Vo-P
VRamp	Ramp Peak Amplitude	16	SG. A	5V	11 V			9V	ON	ON	ON	ON	ON	ON		ON	ON		40	1.4	1.7	2.0	Vo-P

DEFLECTION SECTION (cont.)

Symbol	Parameter	Test point	Input (D)	Test conditions*																		Limits			Unit
				10	11 A	16 A	17	19	S 10	S 11 A	S 12	S 12 A	S 15 A	S 16	S 17	S 19	S 44	S 42	Note	Min.	Typ.	Max.	
coin H	Agreement Detection Maximum Voltage	41	SG. A	5V	11 V			9V	ON	ON	ON	ON	ON			ON	ON	ON		4.0	4.3	–	V
coin L	Agreement Detection Minimum Voltage	41	SG. A	5V	11 V			9V	ON	ON	ON	ON	ON			ON				–	–	1.0	V

* : Indicates OPEN.

Symbol	Parameter	Test point	Input (A)	Test conditions*																						Limits			Unit
				10	11 A	19	22	26	27	28	29	S 10	S 11 A	S 12	S 12 A	S 15 A	S 16	S 17	S 19	S 26	S 26 A	S 26 B	S 44	SD	Note	Min.	Typ.	Max.	
InIm	Input Impedance	26, 27 28, 29	–																							–	50	–	Ω
ThL	Threshold Level	23, 24 25	–	5V	11 V	9V		5V	Variable			ON	ON						ON		ON				43	1.7	1.9	2.1	V
VWAL1	White Adjuster Characteristics 1	23, 24 25	–	5V	11 V	9V	1V	5V	5V	5V	5V	ON	ON						ON		ON				44	–	–	0.6	V
VWAL2	White Adjuster Characteristics 2	23, 24 25	–	5V	11 V	9V	4.5 V	5V	5V	5V	5V	ON	ON						ON		ON				44	2.7	3.0	3.3	V
VWAL3	White Adjuster Characteristics 3	23, 24 25	–	5V	11 V	9V	8V	5V	5V	5V	5V	ON	ON						ON		ON				44	5.7	6.0	6.3	V
Tdrosd	On-Screen Delay Time (Rise)	23A, 24A, 25A, SG0	SG. 0	5V	11 V	9V		5V				ON	ON						ON		ON			②③④	45	–	–	100	nsec
Tdrosd	On-Screen Delay Time (Fall)			5V	11 V	9V		5V				ON	ON						ON		ON				45	–	–	100	nsec
Tdrblk	Fast Blanking Delay Time (Rise)			5V	11 V	9V			5V	5V	5V	ON	ON						ON			ON		①	46	–	–	100	nsec
Tdrblk	Fast Blanking Delay Time (Fall)			5V	11 V	9V			5V	5V	5V	ON	ON						ON			ON		①	47	–	–	100	nsec

* : Indicates OPEN.

ELECTRICAL CHARACTERISTICS TEST METHOD

Note1. Video Noise "S/N"

a. Input SG2 and test the rms value for 52A output signal.

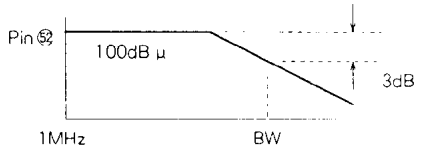
b. Standard $S/N = 20 \log \frac{\text{V0 Test Value } (V_{p\text{-}p}) \times 10}{\text{Test Value (mVrms)}}$ [dB]

Note2. Video Frequency Characteristics "BW"

a. Input SG8 and adjust f_2 of SG8 to 57.75MHz so that a 1MHz beat is output by pin ㉜.

b. Then adjust the applied voltage of pin ⑤ so that the 1MHz beat element of pin ㉜ is 100dBμ.

c. Sweep f_2 and test the beat frequency 3dB down from where the beat element is 1MHz.



Note3. Input Sensitivity "Vin min"

a. Indicated as input level 3dB down from the test value of item V3 "video output signal voltage" as the level of SG1 is decreased.

Note4. Maximum Allowable Input

a. SG.4 is input as 90dBμ.

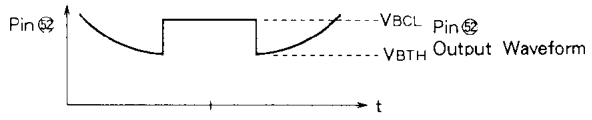
b. Make VA the output level of pin ㊷ at this time.

c. Expressed as input level 3dB down from output level of pin ㊷ being VA as the level of SG.4 is increased.

Note5. Black Spot Noise Inverter "V_{BTH}, V_{BCL}"

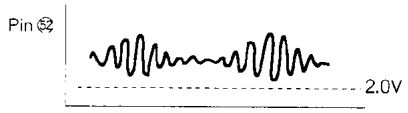
a. Input SG2 and adjust the applied voltage of pin ⑤ so that the voltage of pin ㊷ is 2.5V.

b. Input SG.1 and test V_{BTH} and V_{BCL} as shown in the figure below.



Note6. Intermodulation "IM"

a. Adjust the applied voltage of pin ⑤ so that the minimum voltage of output signal voltage from pin ㊷ is 2.0V.



b. Test the 920 kHz element and 3.58 MHz element of pin ㊷ output.

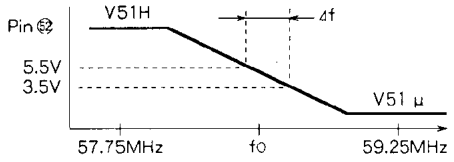
c. Standard IM = 20 log $\frac{\text{920kHz Element}}{\text{3.58MHz Element}}$ [dB]

Note7. AFT Output Maximum Voltage "V51H"

Note8. AFT Output Minimum Voltage "V51 μ"

Note9. AFT Sensitivity "μ AFT"

VH, Vμ and μAFT are shown in the figure below.



Standard μ AFT = $\frac{(5.5 - 3.5) \times 10^3 mV}{\Delta f\ kHz}$ [mV/kHz]

SIF SECTION

Note10.Limiting Sensitivity "LIM"

a. Decreasing the level of SG13, test the input level at test point 3 when the 400Hz element is 3dB down from AF output "AF direct output signal voltage" VOAF.

Note11.AMR "ATT"

a. Test the 400Hz element at test point 3 and make it "Vam."

Standard Value AMR = 20 log $\frac{V_{OAF}(mVrms)}{Vam(mVrms)}$ [dB]

Note12.Maximum Attenuation "ATT"

a. Test 400Hz element at pin ④ output.

b. Standard Value ATT = 20 log $\frac{V_{O4}max}{\text{Test Value}}$ [dB]

Note13.AF Driver Gain "GAF"

GAF = 20 log $\frac{V_{O4}max}{V_{OAF}}$ [dB]

Note14.Sound S/N "S/N AF"

a. Test 20Hz ~ 100kHz noise at pin ④ output.

S/NSF = 20 log $\frac{V_{O4}max}{\text{Test Value}}$ [dB]

VIDEO SECTION

Note15.Maximum Output "Ymax"

a. Adjust applied voltage of pin ㊳ so that the DC potential of pin ㉕ is 3.0V.

Note16.Standard Gain "GY"

a. Adjust pin ㊳ so that the DC potential of pin ㉕ is 3.0V.

b. GY = 20 log $\frac{\text{Test Value } mV_{p\text{-}p}}{200mV_{p\text{-}p}}$ [dB]

Note17.Contrast Control Characteristics "GYmin, GYmax"

a. Adjust voltage of pin ㊳ so that the DC potential of pin ㉕ is 3.0V.
(Apply voltage of pin ㊳ with standard gain.)

b. Change the applied voltage of pin ㉟ to 1.0V, 4.0V, 2.5V and make VA and VB the test values of pin ㉕ output signal.

c. GY min = 20 log $\frac{V_A(mV_{p\text{-}p})}{\text{GY Test Value } (mV_{p\text{-}p})}$ [dB]

GY max = 20 log $\frac{V_B(mV_{p\text{-}p})}{\text{GY Test Value } (mV_{p\text{-}p})}$ [dB]

GY norm = 20 log $\frac{V_C(mV_{p\text{-}p})}{\text{GY Test Value } (mV_{p\text{-}p})}$ [dB]

Note18.Peaking Value "GP"

a. Adjust applied voltage of pin ㊳ so that the DC potential of pin ㉕ is 3.0V.
(Apply voltage of pin ㊳ with standard gain.)

b. Make V_A the output signal voltage of pin ㉕ at time of SG.H input and make V_B the output signal voltage of pin ㉕ at time of SG.J input.

GP = 20 log $\frac{V_B}{V_A}$ [dB]

Note19.Picture Quality Control Characteristics "G_{TN}orm, G_{TM}in, G_{TM}ax"

a. Adjust applied voltage of pin ㊳ so that the DC potential of pin ㉕ is 3.0V.
(Apply voltage of pin ㊳ with standard gain.)

b. Change applied voltage of pin ㊴ to 2.5V, 4.0V, 1.0V and make V_A, V_B and V_C the output signal voltage test values of pin ㉕.

c. $G_{Tmin} = 20 \log \frac{V_A}{V_A}$ [dB], $G_{Tmax} = 20 \log \frac{V_C}{V_A}$ [dB]

G_{Tnorm} (dB) is the amount of change with V_B when picture quality control characteristic G_P was tested.

Note20. Frequency Characteristics "fB (Y)"

a. Adjust applied voltage of pin ㊳ so that the DC potential of pin ㉕ is 3.0V.
(Apply voltage of pin ㊳ with standard gain.)

b. Test frequency of SG. 3dB down from the value of V_A obtained when testing picture quality control characteristic G_P.

CHROMA SECTION

Note21. Chroma Maximum Gain "Gc"

a. Set SG.L to −26dB (Burst: 2.5mV_{P-P}, Chroma: 5.0mV_{P-P}) and test the output signal voltage of pin ㉕.

b. $G_C = 20 \log \frac{\text{Test Value}(mV_{p-p})}{5mV_{p-p}}$ [dB]

Note22. ACC Characteristics "ACC-I, ACC-II"

a. Change the SG.L input level to 0, −20, +6dB and make the output signal voltages of pin ㉕ V_A, V_B and V_C respectively.

b. $ACC - I = 20 \log \frac{V_B}{V_C}$ [dB], $ACC - II = 20 \log \frac{V_C}{V_A}$ [dB]

Note23. Color Control Characteristics "Csmin, Csmax"

a. Change applied voltage of pin ㉑ to 1.0V, 4.0V and make V_A and V_B the output signal voltages of pin ㉕.

b. $Csmin = 20 \log \frac{V_A}{\text{Cnorm Test Value}}$ [dB]

$Csmax = 20 \log \frac{V_B}{\text{Cnorm Test Value}}$ [dB]

Note24. Color Tracking Characteristics "Csmin, Cumax"

a. Change applied voltage of pin ㉟ to 1.0V, 4.0V and make V_A and V_B the output signal voltages of pin ㉕.

b. $Cumin = 20 \log \frac{V_A}{\text{Cnorm Test Value}}$ [dB]

$Cumin = 20 \log \frac{V_B}{\text{Cnorm Test Value}}$ [dB]

Note25. APC Pull-In Range "f_{PCL}, f_{PCH}"

a. Input SG.M, increase burst and chroma frequency (fsb = fsc) the proper amount and set so that the DC voltage of pin ㉑ is low.

b. Test the input frequency where the DC voltage of pin ㉑ changes from low to high (~2.5) while gradually increasing the frequency.

c. Test upper side pull-in frequency in the same manner.

d. Standard value is expressed as difference from reference value 3,579,545Hz.

Note26. Killer Operation Input Level "Vik"

Expressed as the input level where the DC voltage of pin ㉑ becomes low when SG.L input level is decreased.

Note27. Demodulation Ratio "R/B, G/B"

a. Input SG.N 0.2V_{p-p}, and test each output signal voltage at 23A, 24A and 25A.

b. $\frac{R}{B} = \frac{\text{23A output signal voltage}}{\text{25A output signal voltage}}$

$\frac{G}{B} = \frac{\text{24A output signal voltage}}{\text{25A output signal voltage}}$

Note28. Demodulation Ratio "LR, LG/B"

Test the phase difference of R output (23A) and G output (24A) relative to the phase difference of B output (25A).

DEFLECTION SECTION

Note29. Horizontal Oscillator Starting Voltage "V_{11} min"

Expressed as applied voltage of pin ⑪ where pin output waveform of pin ⑳ can be generated as the applied voltage of pin ⑪ is gradually increased from low voltage (approx. 3V).

Note30. Horizontal Pull-In Range "f_{PHL} f_{PHH}"

a. Decrease the frequency of input signal SG.B the proper amount and set while the input signal and output waveform of pin ⑳ are not in sync.

b. Next, gradually increase the input frequency and test the input signal frequency exactly when the input signal and output waveform of pin ⑳ become synchronized.

c. Perform in the same manner for pull-in range for upper side.

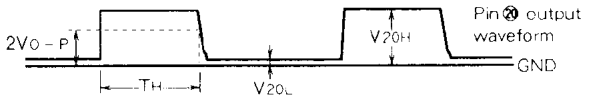
d. Expressed as difference from reference value of 15,734Hz.

Note31. Horizontal Output Maximum Voltage "V_{20H}"

Note32. Horizontal Output Minimum Voltage "V_{20L}"

Note33. Horizontal Output Pulse Width "V_H"

V_{20H}, V_{20L} and T_H are shown in the figure below.



Note34. Vertical Pull-In Frequency "f_{PV}"

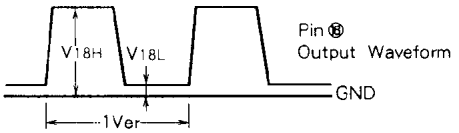
a. Increase the frequency of input signal SG.E the proper amount and set while the input signal and output waveform of pin ⑯ are not in sync.

b. Next, gradually decrease the input frequency and test the input signal frequency exactly when the input signal and output waveform of pin ⑯ become synchronized.

Note35.Vertical Output Maximum Voltage "V_{18H}"

Note36.Vertical Output Minimum Voltage "V_{18L}"

V_{18H} and V_{18L} are shown in the figure below.



Note37.Vertical Open Loop Gain "Gvv"

a. Input SG.C (2kHz, 100mVP-P, CW) into pin ⑰ and test the output amplitude of pin ⑱.

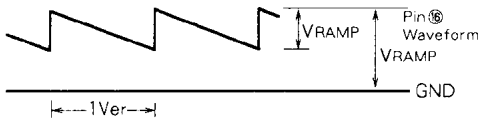
b. Standard Value = $20 \log \frac{\text{Pin ⑱ Output Amplitude}}{100mV_{P\text{-}P}}$ [dB]

Note38.Vertical Oscillator Starting Voltage "V19min"

Expressed as applied voltage of pin ⑲ where output waveform of pin ⑯ can be generated as the applied voltage of pin ⑲ is gradually increased from low voltage (approx. 3V).

Note39.Ramp Peak Voltage "V_{RAMP}"

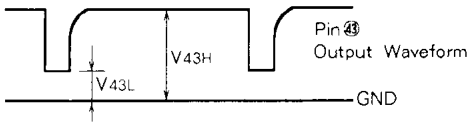
Note40.Ramp "V_{RAMP}"



Note41.Sync Separation Output Maximum Voltage "V_{43H}"

Note42.Sync Separation Output Minimum Voltage "V_{43L}"

V_{43H} and V_{43L} are shown in the figure below.



OSD SECTION

Note43.Threshold Level "Thl"

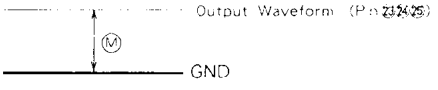
a. Set pin ㉖ to 5V.

b. Raise OSD (pins ㉗, ㉘, ㉙) voltage from "L" to "H," and test the applied voltage of OSD (pins ㉗, ㉘, ㉙) when the DC voltage of output pins (pins ㉓, ㉔, ㉕) changes from "L" to "H."

Note44.White Adjuster Level "V_{WAL1}, V_{WAL2}, V_{WAL3}"

a. Set pins ㉖, ㉗, ㉘, ㉙ to 5V.

b. Test the DC voltage of output pins (pins ㉓, ㉔, ㉕) when pin ㉒ white adjuster voltage is changed to 1.0V, 4.5V and 8.0V.

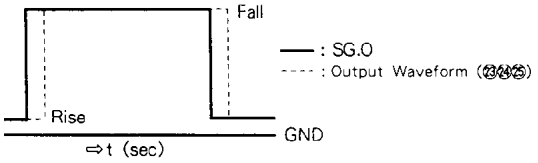


Note45.On-Screen Time Delay "Tdrosd, Tdfosd"

Input SG.O into OSD pins and test rise and fall time delay of output signals in relation to input signals.

Note46.Fast Blanking Time Delay "V_{WAL1}, V_{WAL2}, V_{WAL3}"

Input SG.O into F.BLK. pins and test rise and fall time delay of output signals in relation to input signals.



COIL ADJUSTMENT METHODS

1. VCO Coil

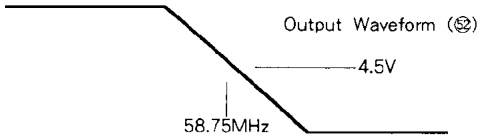
a. Without any input, ground the 1F AGC filter (pin ⑤), test the DC of APC (pin ㊽) and use the test value as V_A.

b. Next, input CW of Fo = 58.75MHz, Vi = 90dBu from input pin A, form a loop with IF AGC filter (pin ⑤), and adjust the VCO coil so that APC (pin ㊽) = V_A.

2. AFT Coil

a. Set testing conditions for test item "V9."

b. Input CW of Fo = 58.75MHz, Vi = 90dBu from input pin A and adjust the AFT coil so that the DC of AFT OUT (pin ㊶) is 1/2Vcc (4.5V).



3. SIF Coil

Set testing conditions for test item "S5." Adjust the SIF coil so that output waveform is maximum and distortion is minimum.

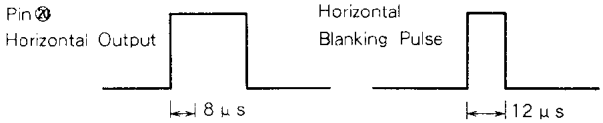
* Precautions When Testing Items Related to video and Chroma

The conditions listed below are usually set when testing items related to chroma (chroma maximum output, Notes 46 ~ 68).

a. Input signal SG.A into D input.

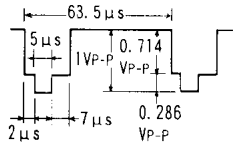
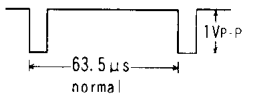
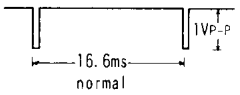
b. Turn switches S2, S5, S11A, S12, S12A, S15, S20, S26 and S44 on.

Note: Adjust the one-shot multivibrator's potentiometer so that the timing of the horizontal blanking pulse and pulse width are as shown in the figure.

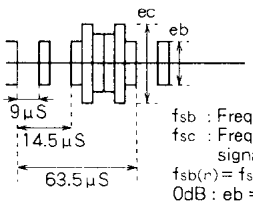


Set 8μs via the pin ⑮ potentiometer of TTL IC M74LS221P and set 12μs via the pin ⑦ potentiometer.

INPUT SIGNAL

SG. No.	Signals (50Ω termination)
SG. 1	f_1=58.75MHz, 90dBμ, fm=16kHz, AM77.8%
SG. 2	f_1=58.75MHz, 90dBμ, CW
SG. 3	f_1=58.75MHz, CW, Level variable
SG. 4	f_1=58.75MHz, fm=16kHz, AM. 16.0%, Level variable
SG. 5	f_1=58.75MHz, 90dBμ, 10 - step wave 87.5%, TV modulation (fsc=3.58MHz)
SG. 6	f_1=57.75MHz, 80dBμ, CW
SG. 7	f_1=59.25MHz, 80dBμ, CW
SG. 8	f_1=58.75MHz, 90dBμ, CW f_1=53 ± 5MHz, 70dBμ, CW } Mixed signal
SG. 9	f_1=58.75MHz, 80dBμ, CW f_2=55.17MHz, 70dBμ, CW f_3=54.25MHz, 70dBμ, CW } Mixed signal
SG. 10	f_0=58.75MHz, 110dBμ, CW
SG. 11	f_0=58.75MHz, 60dBμ, CW
SG. 12	f_0=4.5MHz, 90dBμ, fm=400Hz, FM ± 25kHz dev
SG. 13	f_0=4.5MHz, fm=400Hz, FM ± 25kHz dev. Level variable
SG. 14	f_0=4.5MHz, 90dBμ, fm=400Hz, AM30%
SG. 15	f_0=4.5MHz, 90dBμ, CW
SG. 16	f_0=45.25MHz, 80dBμ, 10 - step wave 87.5%, TV modulation
SG. 17	f_0=46.25MHz, 80dBμ, 10 - step wave 87.5%, TV modulation
SG. 18	f_0=45.75MHz, 80dBμ, 10 - step wave 87.5%, TV modulation f_0 variable.
SG. A	Make input for sync separation NTSC type APL 100% normal video signal shown in the figure on the right. Vertical must be interlaced at 60Hz. 
SG. B	Horizontal sync signal duty 92% input level and sync are adjustable. 
SG. C	f=2kHz, 100mVP-P, CW
SG. E	Vertical sync signal duty 99.2% input level and sync are adjustable. 
SG. F	f=200kHz, 2VP-P, CW
SG. G	f=200kHz, 200mVP-P, CW
SG. H	f=200kHz, 50mVP-P, CW
SG. J	f=2MHz, 50mVP-P, CW
SG. K	f=2MHz~10MHz Variable, 50mVP-P, CW

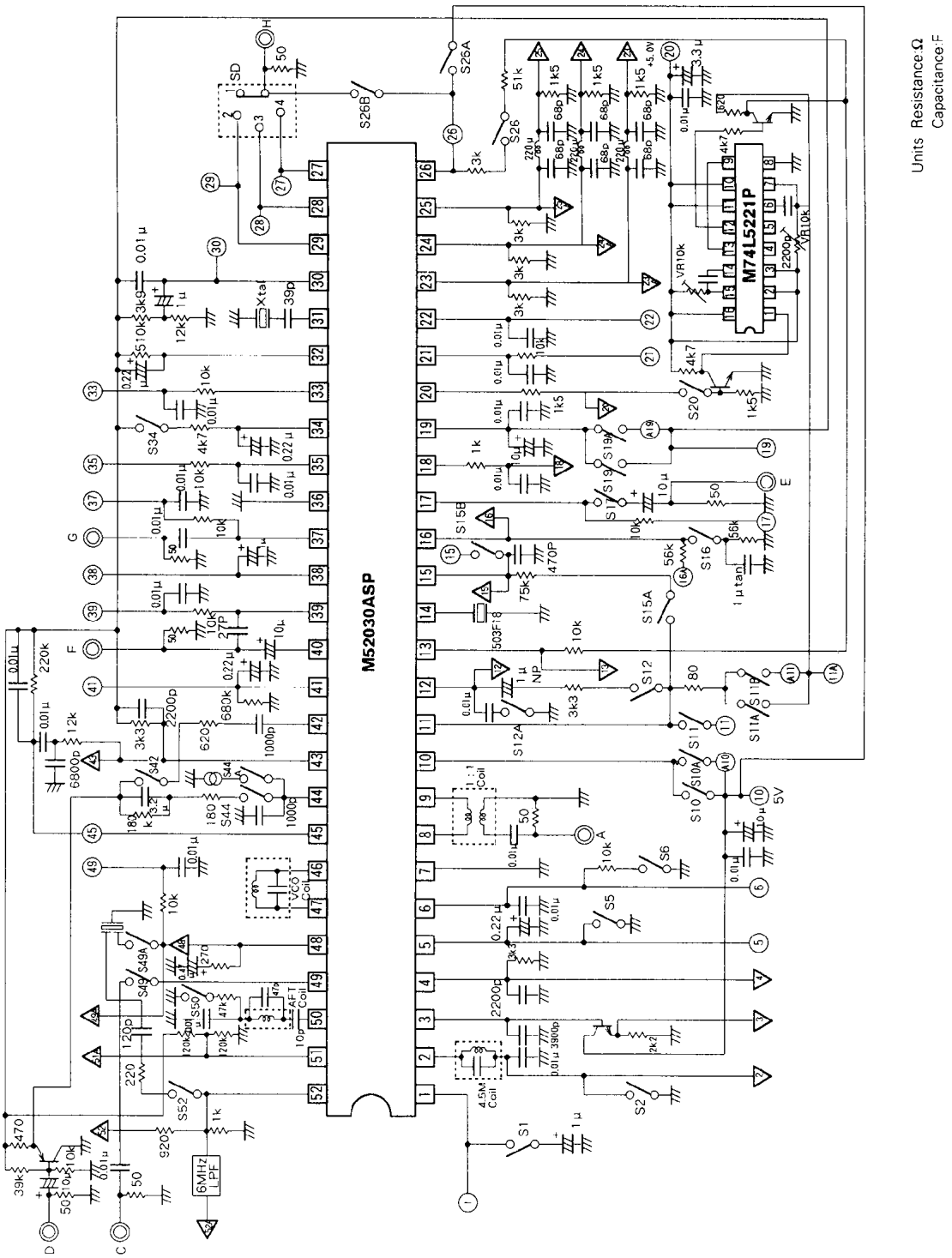
INPUT SIGNAL (cont.)

SG. No.	Signals (50Ω termination)
SG. L	NTSC Simple Chroma Signal  f_{sb} : Frequency of burst signal f_{sc} : Frequency of chroma signal $f_{sb(n)} = f_{sc(n)}$ = 3.579545MHz 0dB : eb = 50mVP-P ec = 100mVP-P
SG. M	With NTSC simple chroma signals of SG.L, burst signal and chroma signal are the same phase, and their frequencies can be adjusted.
SG. N	f=3.68MHz, CW, Level variable
SG. O	f=16kHz, Duty 50%, LEVEL 2VP-P, offset 1V, SQUARE wave

Special Note

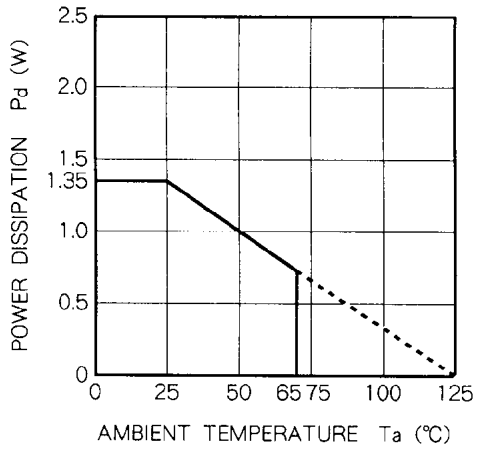
NTSC color televisions can be designed for export overseas by replacing the AFT coil and VCO coil with coils that are able to handle 45MHz. However if replaced, the carrier wave for the signal used for VIF test item must also be altered to 45MHz. (SG.1~SG.11).

TEST CIRCUIT



TYPICAL CHARACTERISTICS

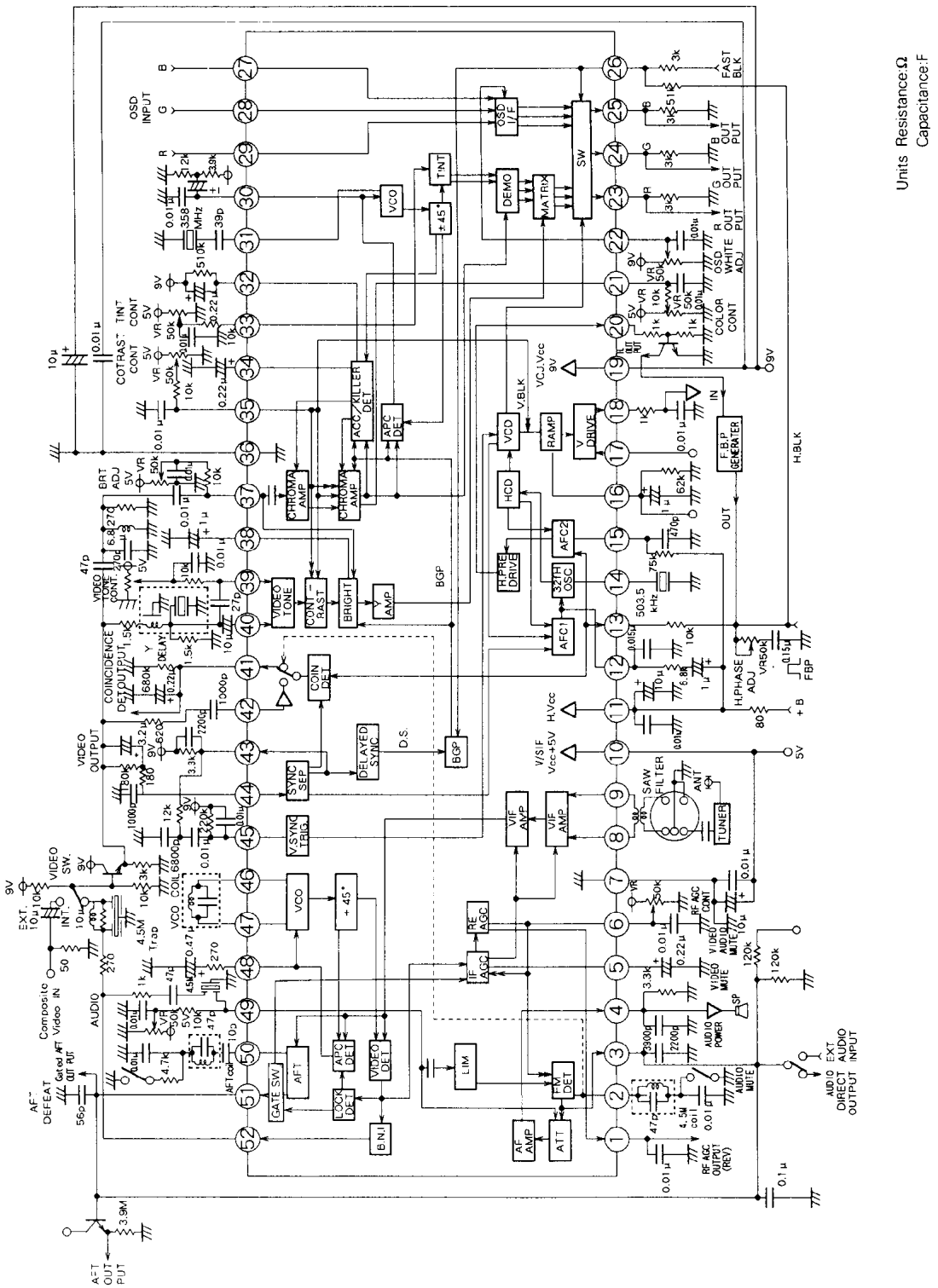
THERMAL DERATING(MAXIMUM RATING)



M52030ASP

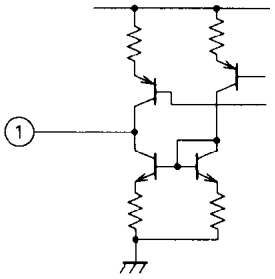
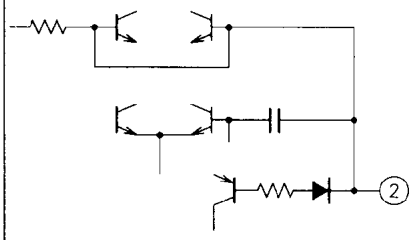
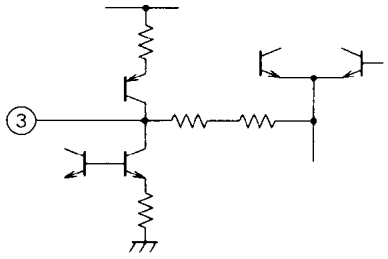
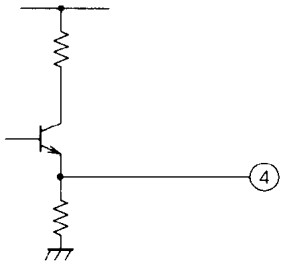
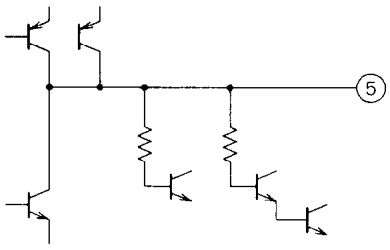
NTSC SYSTEM SINGLE-CHIP COLOR TV SIGNAL PROCESSOR

APPLICATION EXAMPLE

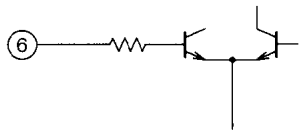
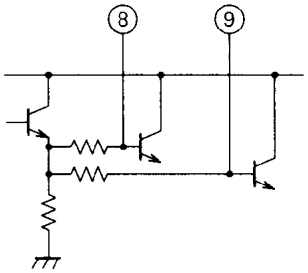
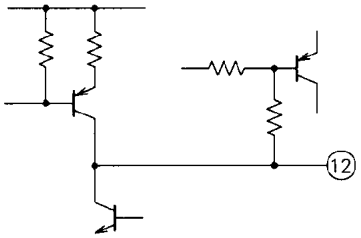
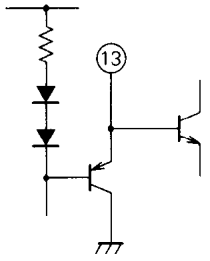
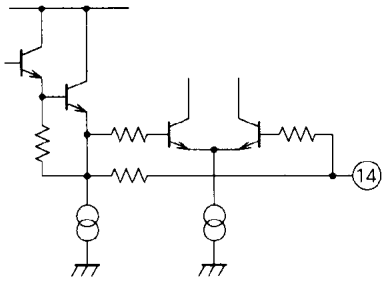


MITSUBISHI ELECTRIC

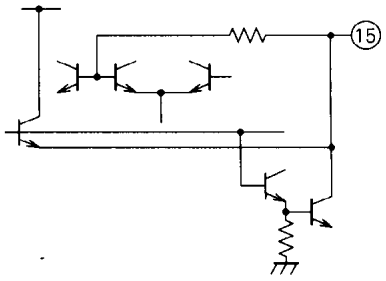
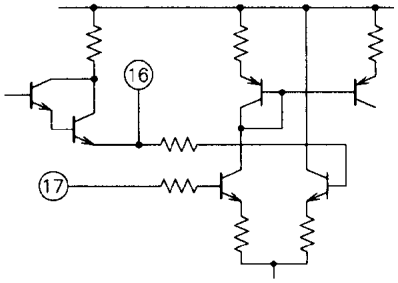
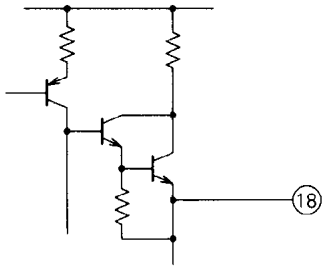
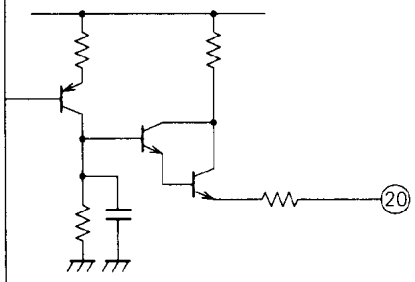
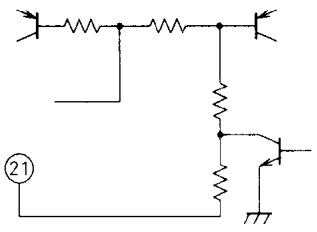
DESCRIPTION OF PIN

Pin No.	Name	Peripheral circuit of pins
①	RF AGC OUT.	
②	4.5M COIL	
③	DE EMPHASIS	
④	AF OUT	
⑤	IF AGC	

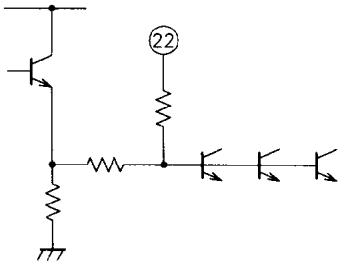
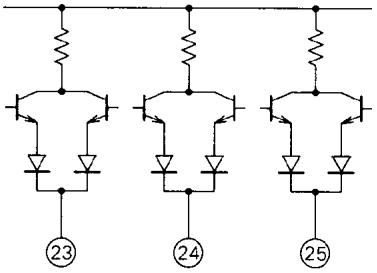
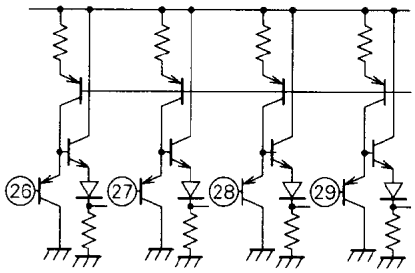
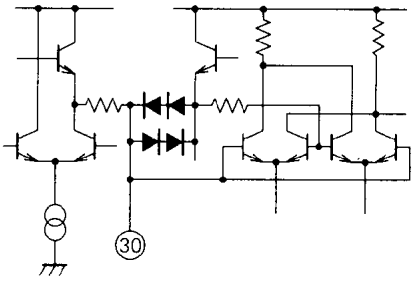
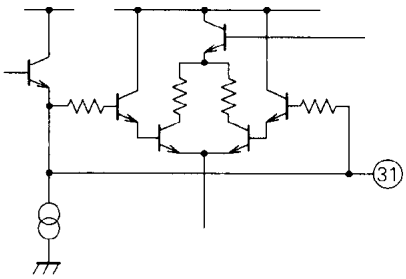
DESCRIPTION OF PIN (cont.)

Pin No.	Name	Peripheral circuit of pins
⑥	RF AGC DELAY	
⑦	GND	—
⑧ ⑨	VIF IN VIF IN	
⑩	Vcc 5V	—
⑪	Vcc H	—
⑫	AFC	
⑬	FBP IN	
⑭	32 FH	

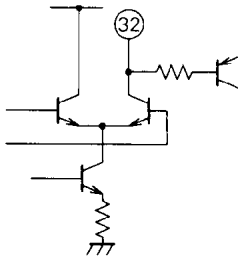
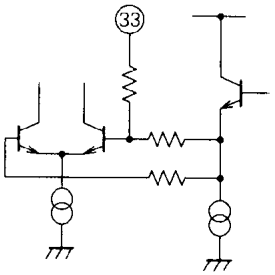
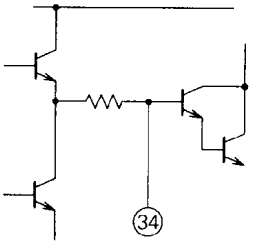
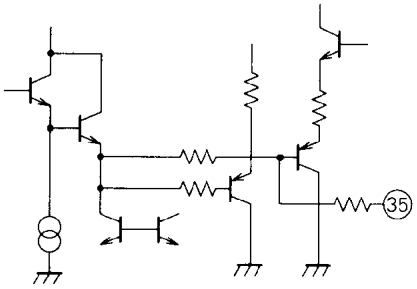
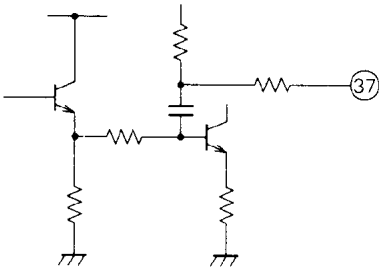
DESCRIPTION OF PIN (cont.)

Pin No.	Name	Peripheral circuit of pins
⑮	H. RAMP.	
⑯ ⑰	V. RAMP V. FEED BACK	
⑱	V. OUT	
⑲	Vcc 9V	—
⑳	H OUT	
㉑	COLOR CONT.	

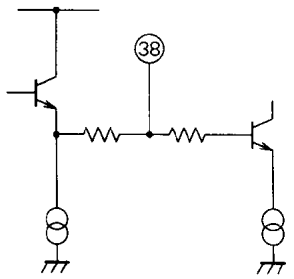
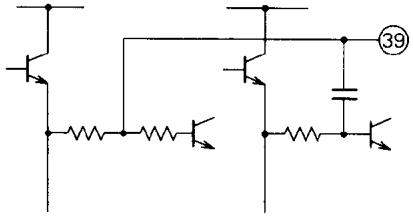
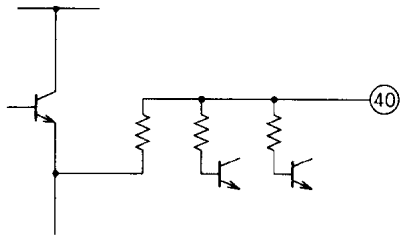
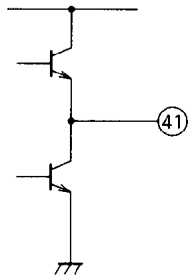
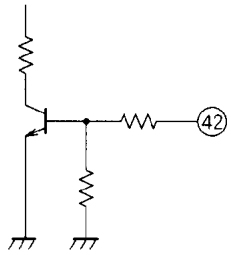
DESCRIPTION OF PIN (cont.)

Pin No.	Name	Peripheral circuit of pins
㉒	OSD WHITE ADJ.	
㉓ ㉔ ㉕	R G B	
㉖ ㉗ ㉘ ㉙	FAST BLK OSD B OSD G OSD R	
㉚	CHROMA APC FILTER	
㉛	X-TAL	

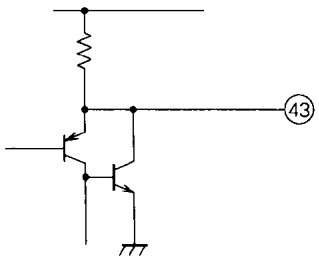
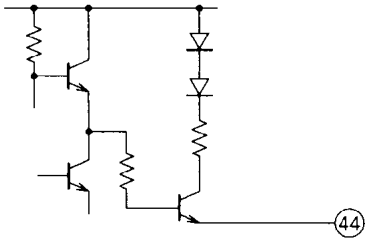
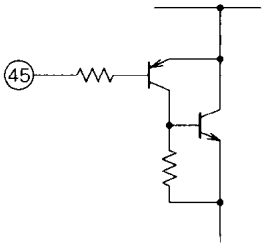
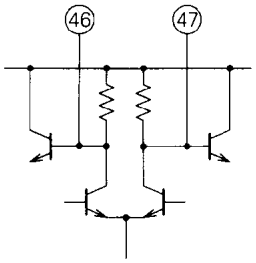
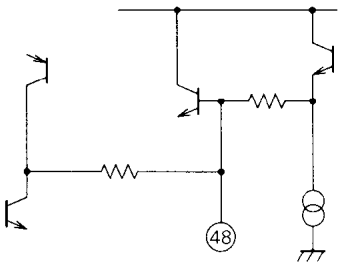
DESCRIPTION OF PIN (cont.)

Pin No.	Name	Peripheral circuit of pins
㉜	ACC FILTER	
㉝	TINT	
㉞	KILLER FILTER	
㉟	CONTRAST/ SERVICE SW	
㊱	GND	—
㊲	BRIGHT/ CHROMA AMP.	

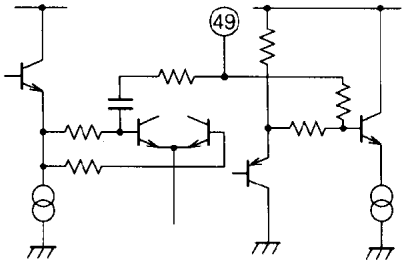
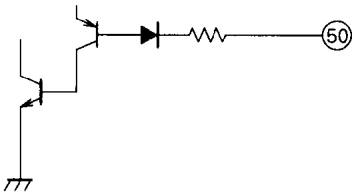
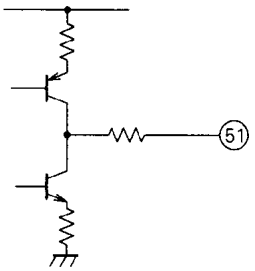
DESCRIPTION OF PIN (cont.)

Pin No.	Name	Peripheral circuit of pins
㊳	PEDESTAL CLAMP	
㊴	VIDEO TONE	
㊵	VIDEO IN	
㊶	COINCIDENCE OUT	
㊷	COINCIDENCE IN	

DESCRIPTION OF PIN (cont.)

Pin No.	Name	Peripheral circuit of pins
㊸	SYNC OUT	
㊹	SYNC SEP. IN	
㊺	V SYNC TRG.	
㊻ ㊼	VCO COIL VCO COIL	
㊽	VIF VCO FILTER	

DESCRIPTION OF PIN (cont.)

Pin No.	Name	Peripheral circuit of pins
㊾	ATT/SIF IN	
㊿	AFT COIL	
(51)	AFT OUT	
(52)	VIDEO OUT