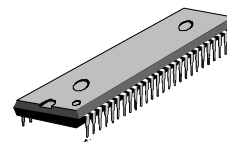


PAL/NTSC 1 CHIP IC FOR COLOR TELEVISION

The KA2161 combines an IF system and a video/chroma/deflection on a monolithic integrated circuit to provide a PAL/NTSC color television.

This device is suitable to a multi-CTV system on a 54 SDIP and includes VI F/SIF, video/chroma/deflection processor.

54-SDIP-600



FUNCTION

IF BLOCK

- VIF Amp.
- Video detector
- 1st, 2nd IF AGC filter
- Noise canceller
- AFT
- RFAGC
- SIF limiter Amp.
- Attenuator
- FM detector
- AF AMP

VIDEO

- Contrast control
- Brightness control
- Pedestal clamp circuit
- Sharpness control using internal D.L
- OSD(R,G,B) interface
- OSD brightness control

CHROMA

- ACC amplifier
- demodulator
- Color control
- Tint control for NTSC system
- APC circuit
- VCO (fsc)
- Killer detector
- Matrix circuit
- PAL/NTSC system SW

FEATURE

- Lower operation voltage: $V_{CC}=9V$
- Available Multi system (PAL/NTSC/SECAM) with SECAM decoder
- Minimum number of external parts required
- Small package type: 54 SDIP
- Suitable OSD interface
- Available 50/60 Hz auto switch
- Built in Delay Line for video sharpness

ORDERING INFORMATION

Device	Package	Operating Temperature
KA2161	54-SDIP-600	-20°C ~+70°C

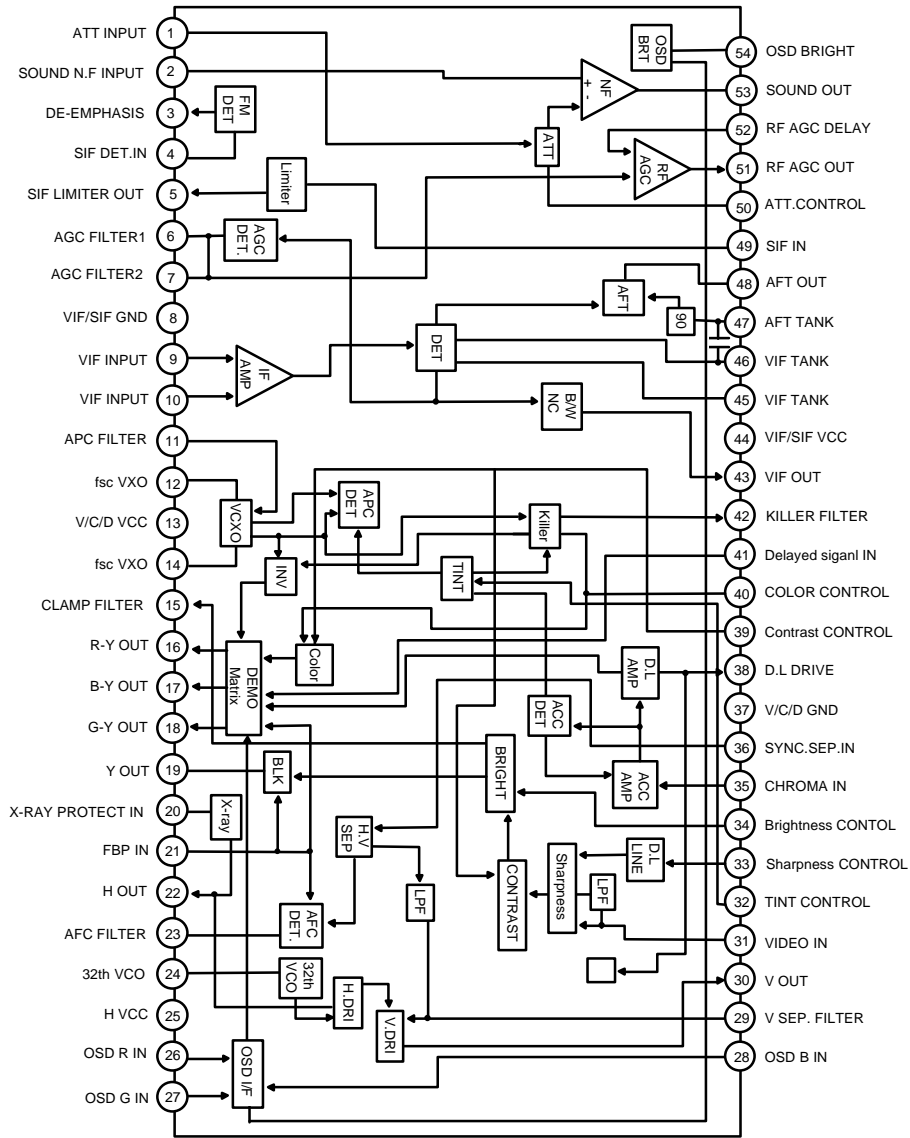
DEFLECTION

- Sync. separator
- AFC filter
- 32th VCO
- Horizontal driver
- X-ray protector
- 50/60 Hz auto detector
- Vertical driver

OSD

- OSD(R,G,B) interface circuit
- OSD brightness control

BLOCK DIAGRAM



PIN CONFIGURATION

Pin No.	DESCRIPTION	PIN NO	DESCRIPTION
1	ATT. INPUT	28	OSD B INPUT
2	SOUND NF INPUT	29	V. SYNC SEP. FILTER
3	DE-EMPHASIS	30	VERTICAL OUTPUT
4	SIF DET. INPUT	31	VIDEO INPUT
5	SIF LIMTER OUT	32	TINT CONTROL
6	AGC FILTER 1	33	SHARPNESS CONTROL
7	AGC FILTER 2	34	BRIGHTNESS CONTROL
8	VIF/SIF GROUND	35	CHROMA INPUT
9	VIF INPUT	36	SYNC. SEP. INPUT
10	VIF INPUT	37	V/C/D GROUND
11	APC FILTER	38	DELAY LINE DRIVE
12	fsc VCXO	39	CONTRAST CONTROL
13	V/C/D Vcc	40	COLOR CONTROL
14	fsc VCXO	41	DELAYED SIGNAL INPUT
15	CLAMP FILTER	42	KLLER DET. FILTER
16	R-Y OUTPUT	43	VIF OUTPUT
17	B-Y OUTPUT	44	VIF/SIF VCC
18	G-Y OUTPUT	45	VIF TANK COIL
19	-Y OUTPUT	46	VIF TANK COIL
20	X-RAY PROTECTOR	47	AFT TANK COIL
21	FBP IN	48	AFT TANK COIL
22	HORIZONTAL OUTPUT	49	SIF INPUT
23	AFC FILTER	50	ATT.CONTROL
24	$32f_H$ VCO	51	RF AGC OUTPUT
25	HORIZONTAL VCC	52	RF AGC DELAY
26	OSD R INPUT	53	SOUND OUTPUT
27	OSD G INPUT	54	OSD BRIGHT CONTROL

ABSOLUTE MAXIMUM RATINGS ($T_A=25^\circ\text{C}$)

Characteristic	Symbol	Value	Unit
Supply Voltage	V_{CCmax}	12	V
Supply current	I_{CCmax}	175	mA
Power dissipation	P_{Dmax}	2.1	W
Operating Temperature	T_{OPR}	-20~+70	$^\circ\text{C}$
Storage Temperature	T_{STG}	-55~+150	$^\circ\text{C}$

ELECTRICAL CHARACTERISTICS ($T_A=25^\circ\text{C}$, $V_{CC}=9\text{V}$)**DC CHARACTERISTICS**

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Max. total current	I_{CCmax}		-	175	-	mA
Total current	I_{CC}		-	135	-	mA
ATT. input voltage	V1		3.3	3.8	4.5	V
Sound N.F input voltage	V2		3.3	3.9	4.5	V
FM Det. output voltage	V3		3.3	3.8	4.5	V
SIF tank input voltage	V4		2.7	3.2	3.7	V
SIF limiter output voltage	V5		3.3	3.8	4.3	V
IF AGC filter voltage (1)	V6		7.8	8.5	-	V
VIF input voltage	V9		3.6	4.1	4.6	V
VIF input voltage	V10		3.6	4.1	4.6	V
VIF Output voltage	V43		4.0	4.5	5.0	V
VIF tank input voltage	V45		6.1	6.6	7.1	V
VIF tank input voltage	V46		6.1	6.6	7.1	V
AFT tank input voltage	V47		2.5	3.0	3.5	V
SIF input voltage	V49		2.5	3.0	3.5	V
Sound output voltage	V53		3.8	4.3	4.8	V

IF SECTION (VIF, SIF)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Min. RF AGC voltage	V51h		-	-	1.0	V
Max. RF AGC voltage	V51l		8.0	-	-	V
VIF input sensitivity	V _{IS}		-	40	45	dBu
VIF max input	V _{IM}		110	110	-	dBu
AGC range	GR		60	71	-	dB
Video output amplitude	V _O		1.7	2.0	2.3	V _{p-p}
Sync. tip level	V _{SYNC}		2.2	2.4	2.7	V
Carrier leakage	CL		40	58	-	dB
Black noise clamp level	V _{BCI}		3.2	3.6	4.0	V
Black noise threshold level	V _{BTI}		1.5	1.8	2.1	V
White noise clamp level	V _{WCI}		5.1	5.4	5.7	V
White noise threshold level	V _{WTI}		3.6	3.9	4.2	V
Max. AFT voltage	V48h		8.0	8.7	-	V
Min. AFT voltage	V48l		-	0.5	1.0	V
AFT det. sensitivity	S _{AFT}		15	23	30	KHz/V
FM det. output level	V _{O3}		150	230	350	mVms
Sound distortion	THD		-	-	1.0	%
AM rejection	AMR		30	53	-	dB
SIF limiting voltage	V _{ILIM}		-	34	45	dBu
MAX. attenuation	G _{ATT}		65	80	-	dB
AF amp gain	G _{AF}		17	20	23	dB
Y input impedance	Y _{INP}		11	15	20	Kohm
Y input dynamic range	Y _D		2.0	3.0	-	V _{p-p}
Max. video output level	Y _{MAX}		6.3	6.8	7.3	V
Min. video output level	Y _{MIN}		-	0.3	0.7	V
Video output drive current	Y _{SINK}		1.3	2.0	3.0	mA
Video AC gain	G _Y		9	12	15	dB
Brightness control	G _{BRT}		2.0	3.0	4.0	times
DC restoration	T _{DC}		95	99	-	%
Clamp terminal voltage	V _{CLAMP}		2.8	3.3	3.8	V
Contrast control voltage	V _{CONT}		1.0	1.25	1.5	V
Contrast gain range	G _{CONT}		12	18	24	dB
V-blk pulse output level	V _{VBLK}		8.5	-	-	V
H-blk pulse output level	V _{HBLK}		8.5	-	-	V
V-blk pulse width (50Hz)	V _{PVBLK}		19	21	23	H
V-blk pulse width (60Hz)	V _{NVBLK}		14	16	18	H

OSD SECTION

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
OSD input on current (R)	I_{ONR}		0.2	0.3	0.4	mA
OSD input on current (B)	I_{ONB}		0.2	0.3	0.4	mA
OSD input on current (G)	I_{ONG}		0.2	0.3	0.4	mA
OSD input off current (R)	I_{OFFR}		0.15	0.22	0.3	mA
OSD input off current (B)	I_{OFFB}		0.15	0.22	0.3	mA
OSD input off current (g)	I_{OFFG}		0.15	0.22	0.3	mA
OSD output high level	V_H		6.4	6.7	6.9	V
OSD output low level	V_L		4.4	4.7	5.0	V
Output rise time	T_R		-	15	100	nsec
Rise propagation delay	T_{FPRO}		-	40	100	nsec
Output fall time	T_F		-	15	100	nsec
Fall propagation delay	T_{FFPRO}		-	40	100	nsec
OSD → Y S/W time	T_{OY}		-	10	100	nsec
Y → OSD S/W time	T_{YO}		-	10	100	nsec
OSD → Y S/W delay time	T_{DOY}		-	10	100	nsec
Y → OSD S/W delay time	T_{DYO}		-	10	100	nsec
OSD → Y S/W time	T_{OY}		-	10	100	nsec
OSD brightness sensitivly	G_{BS}		0.5	1	1.5	times

CHROMA SECTION

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
ACC characteristic (1)	A1		0.5	0.85	-	Vp-p
ACC characteristic (2)	A2		0.9	1.0	1.2	ratio
Uni-color control voltage	V _{UNI}		0.8	1.2	1.6	V
Uni-color control range	G _{UNI}		20	-	-	dB
Color control voltage	V _{COL}		0.8	1.2	1.6	V
Color control range	G _{COL}		20	-	-	dB
Color residual voltage	V _R		-	-	3.	mVp-p
Tint control voltage	V _{TINT}		0.8	1.5	2.5	V
Tint range 1(3.58MHz)	T _{NTSC1}		35	50	-	deg
Tint range 2(3.58MHz)	T _{NTSC2}		-35	-50	-	deg
PAL/NTSC S/W voltage	V _{P/N}		0.4	0.7	1.4	V
Killer sensitivity (3.58MHz)	K _{SN}		-	1.0	3.0	mVp-p
Killer sensitivity (4.43MHz)	K _{SP}		-	1.0	3.0	mVp-p
Killer voltage (1)	V _{KIL1}		4.5	4.8	5.1	V
Killer voltage (2)	V _{KIL2}		3.8	4.1	4.4	V
APC pull in range(3.58MHz)	f _{PN1}		300	500	-	Hz
APC pull in range(3.58MHz)	f _{PNH}		300	500	-	Hz
APC hold in range(3.58MHz)	f _{HN1}		300	500	-	Hz
APC hold in range(3.58MHz)	f _{HNH}		300	500	-	Hz
APC pull in range(4.43MHz)	f _{PP1}		300	500	-	Hz
APC pull in range(3.58MHz)	f _{PPH}		300	500	-	Hz

CHROMA SECTION

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
APC hold range(4.43MHz)	f_{HPH}		300	500	-	Hz
APC hold range(4.43MHz)	f_{HPL}		300	500	-	Hz
Freq. sensitivity(3.58MHz)	f_{SENN}		0.5	1.0	1.5	KHz/V
Freq. sensitivity(4.43MHz)	f_{SENP}		0.5	1.0	1.5	KHz/V
Demo. color out R(NTSC)	V_M		2.9	3.6	4.7	Vp-p
Demo. color out B(NTSC)	V_{BN}		3.3	4.0	4.7	Vp-p
Demo. color out G(NTSC)	V_{GN}		0.9	1.4	1.9	Vp-p
Demo. color out R(PAL)	V_{RP}		1.2	1.8	2.4	Vp-p
Demo. color out B(PAL)	V_{BP}		2.2	2.8	3.4	Vp-p
Demo. color out G(PAL)	V_{GP}		0.7	1.2	1.7	Vp-p
Demo relative amplitude(NSTC)	$N_{R/B}$		0.8	0.9	1.1	ratio
Demo relative amplitude(NSTC)	$N_{G/B}$		0.28	0.34	0.48	ratio
Demo relative amplitude(PAL)	$P_{R/B}$		0.43	0.56	0.69	ratio
Demo relative amplitude(PAL)	$P_{G/B}$		0.27	0.34	0.46	ratio
Demo relative phase(NTSC)	$N_{P R/B}$		100	110	120	deg
Demo relative phase(NTSC)	$N_{P G/B}$		225	235	245	deg
Demo relative phase(PAL)	$P_{P R/B}$		78	90	96	deg
Demo relative phase(PAL)	$P_{P G/B}$		226	236	246	deg
Demo residual carrier R	V_{RCW}		-	-	20	mVp-p
Demo residual carrier G	V_{GCW}		-	-	20	mVp-p
Demo residual carrier B	V_{BCW}		-	-	20	mVp-p
Demo residual harmonic R	V_{RHC}		-	-	100	mVp-p
Demo residual harmonic G	V_{GHC}		-	-	100	mVp-p
Demo residual harmonic B	V_{BHC}		-	-	100	mVp-p
Demo output band width R	f_R		1.0	1.8	3.0	MHz
Demo output band width G	f_G		1.0	1.8	3.0	MHz
Demo output band width B	f_B		1.0	1.8	3.0	MHz
Demo output difference	V_{COL1}		-0.3	0	0.3	V
Demo output difference	V_{COL2}		-0.3	0	0.3	V
Demo output difference	V_{COL3}		-0.3	0	0.3	V
D.L amp characteristic	V_{DL}		0.7	1.3	2.1	Vp-p
Sweeper amplitude	SV1		4.5	5.0	5.5	V
Sweeper amplitude	SV2		3.5	4.0	4.5	V
Sweeper amplitude	SV3		0.8	1.0	1.4	V
Sweeper period	S_{T1}		60	110	140	msec
Sweeper period	S_{T2}		50	100	120	msec
Sweeper period	S_{T3}		5	10	15	msec

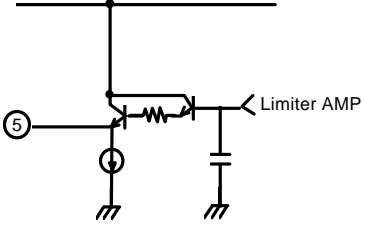
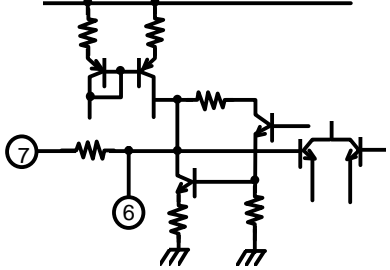
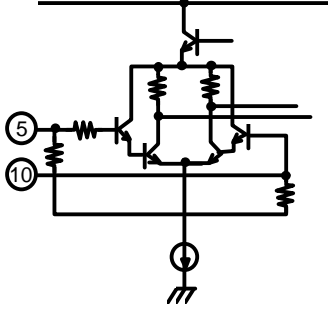
DEFLECTION SECTION

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Sync. sep. sensitivity current	I_{IN}		10	20	30	μA
H AFC phase det. current	I_D		200	300	400	μA
32 f_H VCO starting voltage	V_{FH}		2.0	3.0	4.0	V
H out osc. starting voltage	V_H		4.0	4.4	5.0	V
H free running frequency	f_H		15.4	15.6	15.7	KHz
H pull in range	f_{HPULL}		+/-500	-	-	Hz
H hold range	f_{HHOLD}		+/-500	-	-	Hz
H pulse duty	T_H		41	43	45	%
X-ray protector voltage	V20		1.1	1.3	1.5	V
X-ray protector hold voltage	V_{H20}		-	-	1.2	V
H output voltage (H)	V_{HH}		4.7	5.0	5.3	V
H output voltage (L)	V_{HL}		-	0	0.1	V
V output duty	T_V		9	10	11	%
V output voltage (H)	V_{VH}		4.7	5.0	5.3	V
V output voltage (L)	V_{VL}		-	0	0.1	V
V pull in range(50Hz)	f_{VPP1}		52	60	-	Hz
	f_{VPP2}		-	44	49	Hz
V pull in range(60Hz)	f_{VPN1}		62	67	-	Hz
	f_{VPN2}		-	53	58	Hz
V free running freq(50Hz)	f_{VP1}		40	44	48	Hz
V free running freq. (60Hz)	f_{VN}		49	53	58	Hz
50/60Hz S/W voltage (50)	V_{SP}		5.0	6.0	6.5	V
50/60Hz S/W voltage (60)	V_{SN}		2.5	3.0	3.5	V
50/60Hz S/W voltage (50)	V_{IP}		4.5	5.0	5.5	V
50/60Hz S/W voltage (60)	V_{IN}		0.5	1.0	1.5	V
H osc. control sensitivity	S_H		2.0	4.0	6.0	Hz/mV
Phase det. stop period(50)	T_{PP1}		290	309	-	Hz
	T_{PP2}		3	5	-	Hz
Phase det. stop period(60)	T_{PN1}		240	259	-	Hz
	T_{PN2}		3	5	-	Hz
Service S/W vert. voltage	V_{SV}		-	-	0.5	Vp-p
AFC voltage drift	V_D		-	-	+/-0.6	V
Osc. supply voltage drift	V_{OSC}		-	-	3	%
32 f_H voltage	V24		4.0	5.0	+/-6.0	V
AFC filter current	I_{AFC}		30	7.	140	μA
AFC filter voltage	V23		6.5	7.3	8.0	V
Sync. sep. in voltage	V36		2.2	2.7	3.2	V

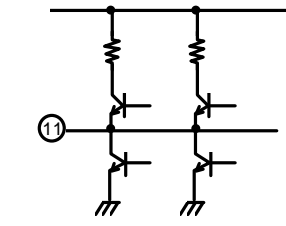
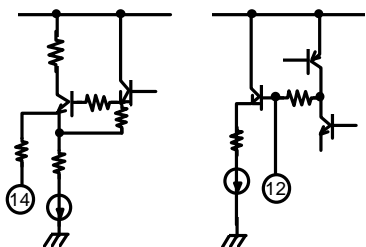
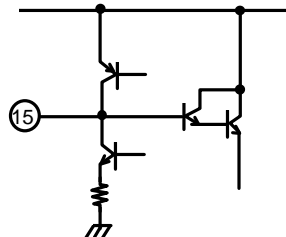
PIN DESCRIPTION

PIN NO.	FUNCTION	DESCRIPTION	EQUIVALENT CIRCUIT
1	ATT. IN.	Detected audio signals provided to ATT. Amp	
2	SOUND N.F IN	AC and DC feedback audio signals from power amp are supplied to A.F amp	
3	SOUND De-emphasis	The external capacitor eliminates high frequency components in F.M det.	
4	SIF Det.IN	Connected SIF tank coil. The SIF limiting signal is supplied from SIF limiter (PIN 5).	

PIN DESCRIPTION

PIN No.	FUNCTION	DESCRIPTION	EQUIVALENT CIRCUIT
5	SIF limiter OUT	The limiting SIF signal is taken from limiter AMP.	
6 7	AGC filter 1 AGC filter 2	Connected external resistors, capacitors. Dual time constant improve high speed AGC time speed in TV.	
8	VIF/SIF GND	VIF/SIF GROUND	
9 10	IF IN	IF input terminals provide IF output signals to IF AMP stage in differential AMP.	

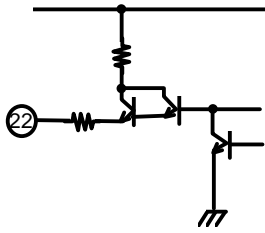
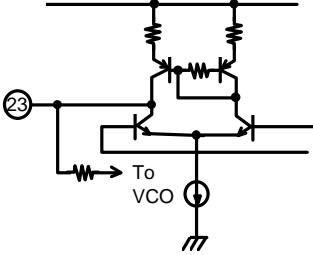
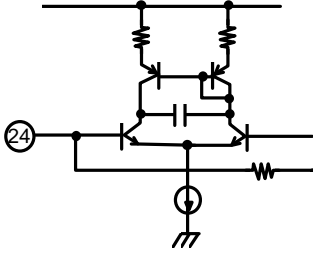
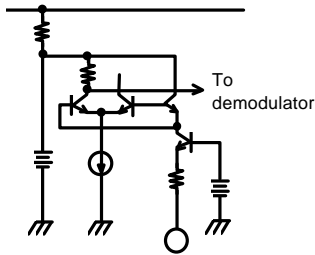
PIN DESCRIPTION

PIN No.	FUNCTION	DESCRIPTION	EQUIVALENT CIRCUIT
11	APC. filter	The APC filter terminal is connected external R,C The APC functions filtering AC signals and provide error voltage to fsc VCO block.	
12 14	fsc VCO fsc VCO	The fsc VCO is connected X-tal.	
13	V/C/D GND	Video/Chroma/Deflection GROUND	
15	CLAMP filter	The clamp filter terminal is connected capacitor. Using clamp circuit, pedestal level of video signal is clamped.	

PIN DESCRIPTION

PIN No.	FUNCTION	DESCRIPTION	EQUIVALENT CIRCUIT
16 17 18	R-Y OUT B-Y OUT G-Y OUT	Color output terminals for color differential signal.	
19	-Y OUT	Terminal for -Y signal.	
20	X-RAY protect IN	Terminal for X-ray protect turns on 1.4V Detected over voltage in CRT, X-ray protect stops oscillating the Hori. out	
21	FBP IN	Terminal for FBP input FBP signals are supplied from FBT. In order to synchronize Hori. scanning, The AFC compares Hori. sync with FBP signals.	

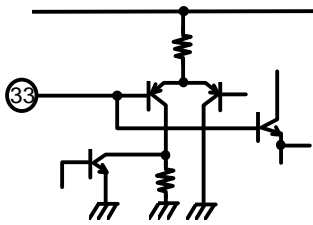
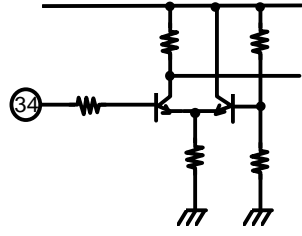
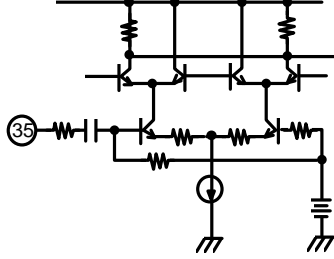
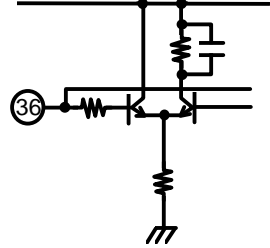
PIN DESCRIPTION

PIN No.	FUNCTION	DESCRIPTION	EQUIVALENT CIRCUIT
22	Hori. OUT	Terminal for Hori. output	
23	AFC filter	The AFC filter terminal is connected external R,C for low pass filter. AFC voltage provides error voltage to 32 fH VCO block.	
24	32fh VCO	This terminal is connected the 503 kHz resonator.	
25	Hori. VCC	Hori. supply voltage is 9V.	
26 27 28	OSD R IN OSD G IN OSD B IN	Terminal for OSD input OSD input signals are supplied from micro-controller, etc. It is suitable to interfacing OSD.	

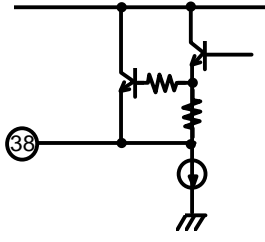
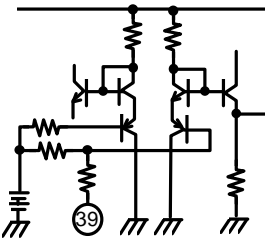
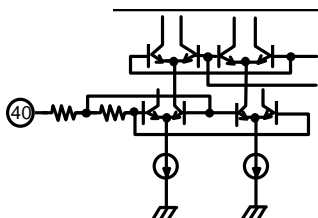
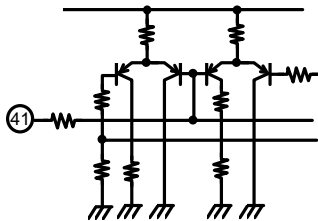
PIN DESCRIPTION

PIN No.	FUNCTION	DESCRIPTION	EQUIVALENT CIRCUIT
29	Vert. separate filter	Terminal for vert. separate filter is connected with external capacitor.	
30	Vert. OUT	Vert. output pulses provide vert. AMP block for driving D.Y coil.	
31	VIDEO IN	Terminal for video signal input	
32	Sharpness control	Using the external variable resistor, sharpness of video signals are changed for emphasis high freq. of video signals.	

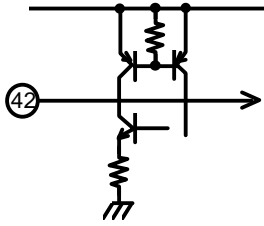
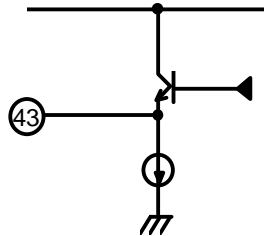
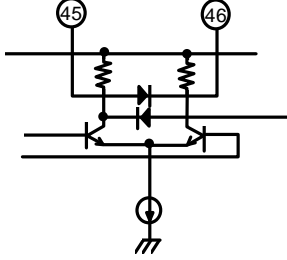
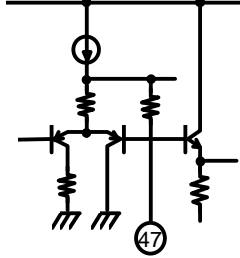
PIN DESCRIPTION

PIN No.	FUNCTION	DESCRIPTION	EQUIVALENT CIRCUIT
33	Tint control & PAL/NTSC SW	Using the external variable resistor, tint of color are changed in NTSC system only	
34	Brightness control	Terminal for brightness control.	
35	Chroma IN	Chroma signals are supplied from composite video signals using B.P.F	
36	Sync.separate IN	Sync. signals are taken from composite video signals using L.P.F.	
37	V/C/C GND	Video/Chroma/Deflection GROUND	

PIN DESCRIPTION

PIN No.	FUNCTION	DESCRIPTION	EQUIVALENT CIRCUIT
38	Delay Line drive OUT	Terminal for output of D.L AMP for 1 H delay line.	
39	Contrast Control	Using the external variable resistor, contrast control is changed for controlled video/ color output level.	
40	Color Control	Using the external variable resistor, color is changed for controlled color output level.	
41	Delayed signal INPUT & 50/60 Hz forced S/W	Through the 1 H delay line chroma signals provide to demodulator block. And we can forcely select 50Hz: 3.0V 60Hz: 6.0V	

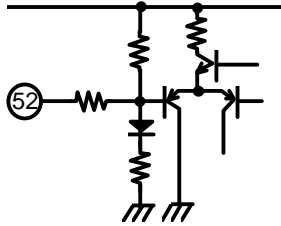
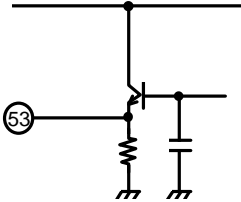
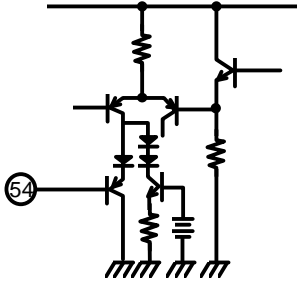
PIN DESCRIPTION

PIN No.	FUNCTION	DESCRIPTION	EQUIVALENT CIRCUIT
42	Killer DET. filler	Terminal for killer detect filler. In case of no color signals or low RF input signals, Killer det. operates to kill the color process.	
43	VIF DET. OUT	Terminal for output of VIF DET.	
44	VIF/SIF VCC	Supply voltage is 9V.	
45 46	VIF tank coil	Connected VIF tank coil between PIN 45 and PIN 46. VIF detector is quadrature detecting system using tank coil.	
47	AFT tank coil	Terminal for AFT tank coil If this pin is connected 100 Ω to ground, we defeat AFT function.	

PIN DESCRIPTION

PIN No.	FUNCTION	DESCRIPTION	EQUIVALENT CIRCUIT
48	AFT OUT	Terminal for AFT output	
49	SIF IN	SIF signals provide to this terminal.	
50	ATT. control	Attenuation of sound output changes the external variable resistor	
51	RF AGC OUT	RF AGC OUT terminal feeds output voltage to tuner in order to improve AGC range. This terminal is connected a pull-up resistor to Vcc. (open collector)	

PIN DESCRIPTION

PIN No.	FUNCTION	DESCRIPTION	EQUIVALENT CIRCUIT
52	RF AGC delay control	RF AGC delay control terminal is connected to external variable resistor. Using thr esternal variable resistor, RF AGC OUT delay point is changed for fitting the tuner characteristics.	 <p>The diagram shows a circuit with a horizontal supply line at the top. A variable resistor (indicated by a diagonal line through the resistor symbol) is connected between this supply line and the base of a transistor. The emitter of this transistor is connected to ground. The collector is connected to another transistor's base. This second transistor's emitter is also connected to ground, and its collector is connected to a third transistor's base. The third transistor's emitter is connected to ground, and its collector is connected to the output terminal labeled 52.</p>
53	Sound OUT	Sound OUT terminal. Sound signals are provided to sound power AMP.	 <p>The diagram shows a horizontal supply line at the top. A transistor's base is connected to the supply line through a resistor. The emitter of this transistor is connected to ground through a resistor. The collector is connected to the output terminal labeled 53. A capacitor is connected between the collector and ground.</p>
54	SOD brightness control	OSD brightness control terminal	 <p>The diagram shows a complex circuit with a horizontal supply line at the top. It features multiple transistors and resistors. A resistor connects the supply line to the base of a transistor. The emitter of this transistor is connected to ground. Its collector is connected to the base of another transistor. This second transistor's emitter is connected to ground, and its collector is connected to the base of a third transistor. The third transistor's emitter is connected to ground, and its collector is connected to the output terminal labeled 54. There are several other resistors and a capacitor in the circuit, including one connected to the supply line and another connected to ground.</p>

APPLICATION CIRCUIT

