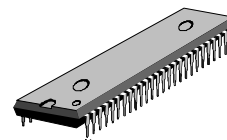


## PAL/NTSC 1 CHIP IC FOR COLOR TELEVISION

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

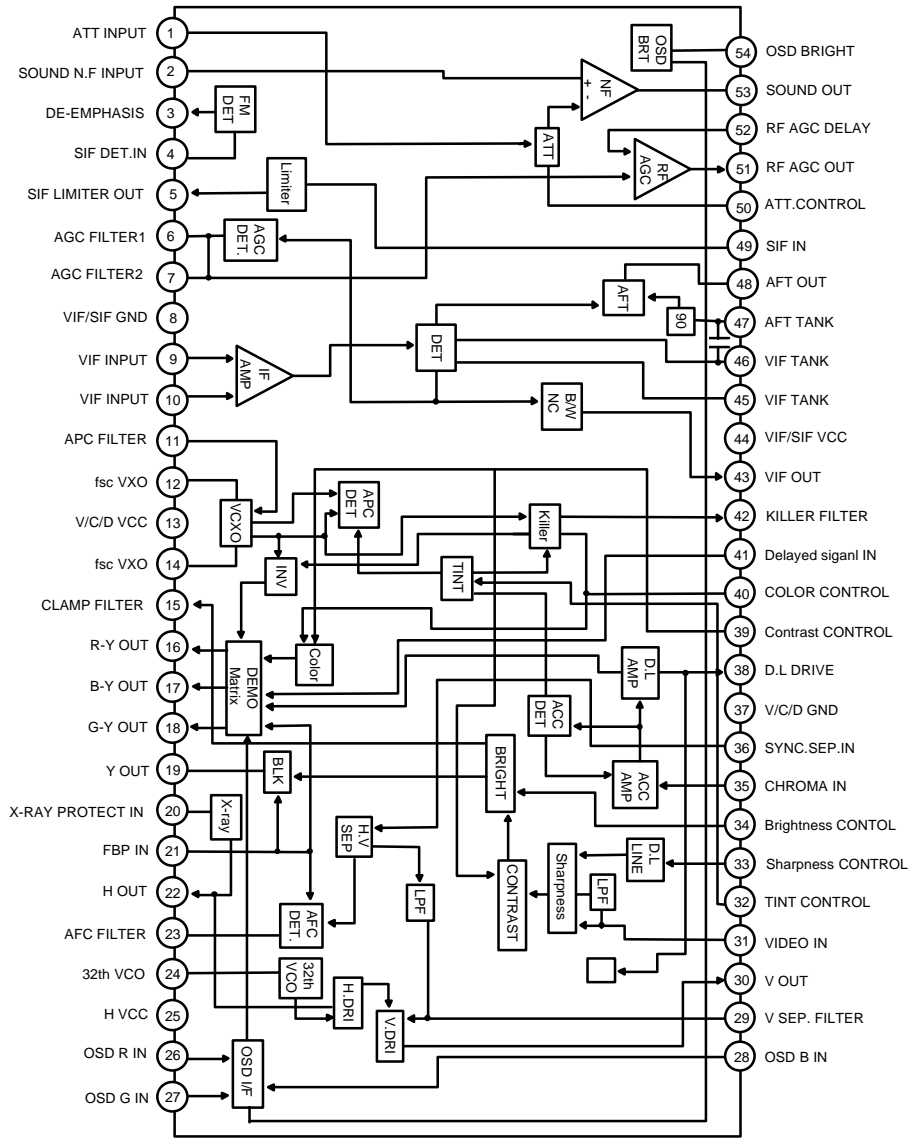
#### DEFLECTION

- 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 <sub>IS</sub>		-	40	45	dBu
VIF max input	V <sub>IM</sub>		110	110	-	dBu
AGC range	GR		60	71	-	dB
Video output amplitude	V <sub>O</sub>		1.7	2.0	2.3	Vp-p
Sync. tip level	V <sub>SYNC</sub>		2.2	2.4	2.7	V
Carrier leakage	CL		40	58	-	dB
Black noise clamp level	V <sub>BCI</sub>		3.2	3.6	4.0	V
Black noise threshold level	V <sub>BTI</sub>		1.5	1.8	2.1	V
White noise clamp level	V <sub>WCI</sub>		5.1	5.4	5.7	V
White noise threshold level	V <sub>WTI</sub>		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 <sub>AFT</sub>		15	23	30	KHz/V
FM det. output level	V <sub>O3</sub>		150	230	350	mVms
Sound distortion	THD		-	-	1.0	%
AM rejection	AMR		30	53	-	dB
SIF limiting voltage	V <sub>ILIM</sub>		-	34	45	dBu
MAX. attenuation	G <sub>ATT</sub>		65	80	-	dB
AF amp gain	G <sub>AF</sub>		17	20	23	dB
Y input impedance	Y <sub>INP</sub>		11	15	20	Kohm
Y input dynamic range	Y <sub>D</sub>		2.0	3.0	-	Vp-p
Max. video output level	Y <sub>MAX</sub>		6.3	6.8	7.3	V
Min. video output level	Y <sub>MIN</sub>		-	0.3	0.7	V
Video output drive current	Y <sub>SINK</sub>		1.3	2.0	3.0	mA
Video AC gain	G <sub>Y</sub>		9	12	15	dB
Brightness control	G <sub>BRT</sub>		2.0	3.0	4.0	times
DC restoration	T <sub>DC</sub>		95	99	-	%
Clamp terminal voltage	V <sub>CLAMP</sub>		2.8	3.3	3.8	V
Contrast control voltage	V <sub>CONT</sub>		1.0	1.25	1.5	V
Contrast gain range	G <sub>CONT</sub>		12	18	24	dB
V-blk pulse output level	V <sub>VBLK</sub>		8.5	-	-	V
H-blk pulse output level	V <sub>HBLK</sub>		8.5	-	-	V
V-blk pulse width (50Hz)	V <sub>PVBLK</sub>		19	21	23	H
V-blk pulse width (60Hz)	V <sub>NVBLK</sub>		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 <sub>UNI</sub>		0.8	1.2	1.6	V
Uni-color control range	G <sub>UNI</sub>		20	-	-	dB
Color control voltage	V <sub>COL</sub>		0.8	1.2	1.6	V
Color control range	G <sub>COL</sub>		20	-	-	dB
Color residual voltage	V <sub>R</sub>		-	-	3.	mVp-p
Tint control voltage	V <sub>TINT</sub>		0.8	1.5	2.5	V
Tint range 1(3.58MHz)	T <sub>NTSC1</sub>		35	50	-	deg
Tint range 2(3.58MHz)	T <sub>NTSC2</sub>		-35	-50	-	deg
PAL/NTSC S/W voltage	V <sub>P/N</sub>		0.4	0.7	1.4	V
Killer sensitivity (3.58MHz)	K <sub>SN</sub>		-	1.0	3.0	mVp-p
Killer sensitivity (4.43MHz)	K <sub>SP</sub>		-	1.0	3.0	mVp-p
Killer voltage (1)	V <sub>KIL1</sub>		4.5	4.8	5.1	V
Killer voltage (2)	V <sub>KIL2</sub>		3.8	4.1	4.4	V
APC pull in range(3.58MHz)	f <sub>PN1</sub>		300	500	-	Hz
APC pull in range(3.58MHz)	f <sub>PNH</sub>		300	500	-	Hz
APC hold in range(3.58MHz)	f <sub>HN1</sub>		300	500	-	Hz
APC hold in range(3.58MHz)	f <sub>HNH</sub>		300	500	-	Hz
APC pull in range(4.43MHz)	f <sub>PP1</sub>		300	500	-	Hz
APC pull in range(3.58MHz)	f <sub>PPH</sub>		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	$\mu A$
H AFC phase det. current	$I_D$		200	300	400	$\mu A$
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	$\mu A$
AFC filter voltage	V23		6.5	7.3	8.0	V
Sync. sep. in voltage	V36		2.2	2.7	3.2	V

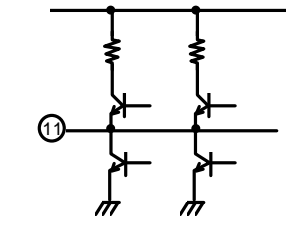
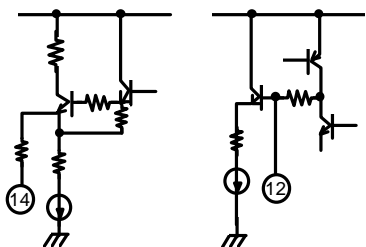
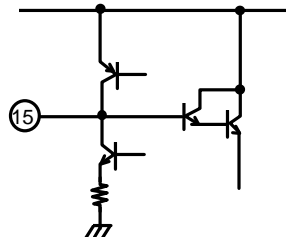
**PIN DESCRIPTION**

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.	

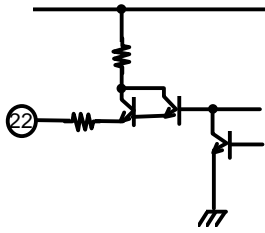
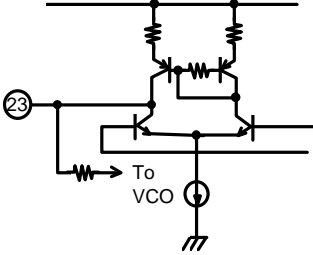
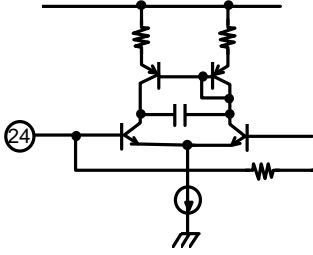
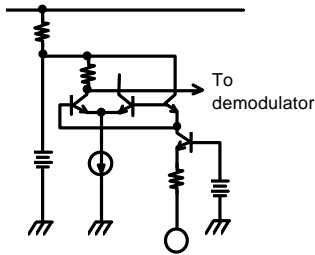
**PIN DESCRIPTION**

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.	

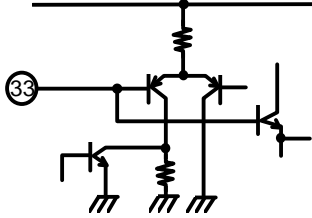
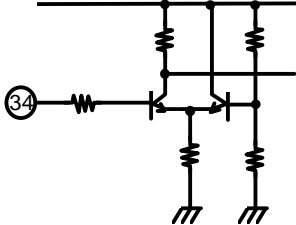
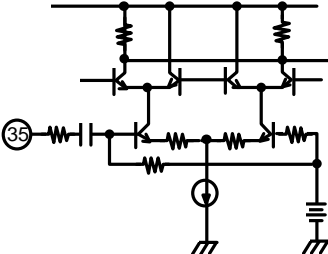
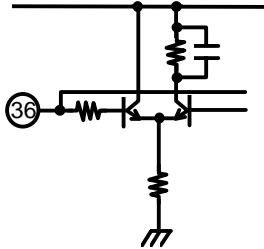
**PIN DESCRIPTION**

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

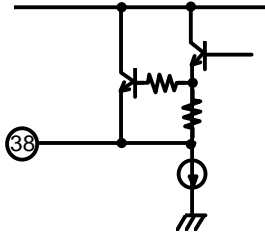
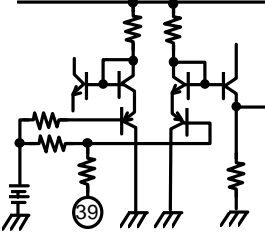
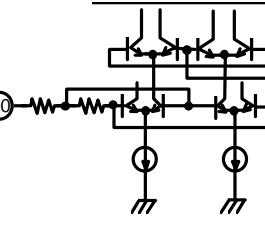
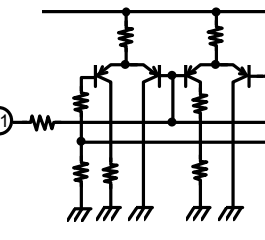
PIN No.	FUNCTION	DESCRIPTION	EQUIVALENT CIRCUIT
29	Vert. separate filter	Terminal for vert. separate filter is connected with external capacitor.	
30	Vert. OUT	Vert. output pulses provide vert. AMP block for driving D.Y coil.	
31	VIDEO IN	Terminal for video signal input	
32	Sharpness control	Using the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

**PIN DESCRIPTION**

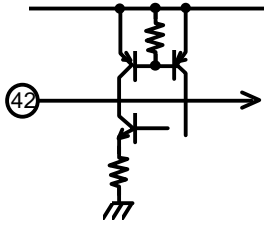
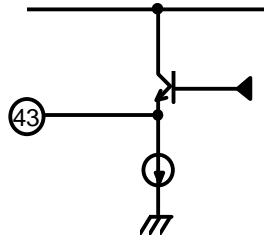
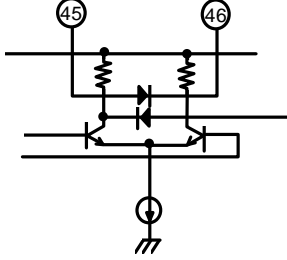
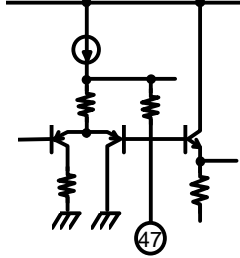
PIN No.	FUNCTION	DESCRIPTION	EQUIVALENT CIRCUIT
33	Tint control & PAL/NTSC SW	Using the external variable resistor, tint of color are changed in NTSC system only	
34	Brightness control	Terminal for brightness control.	
35	Chroma IN	Chroma signals are supplied from composite video signals using B.P.F	
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	

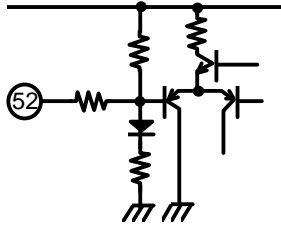
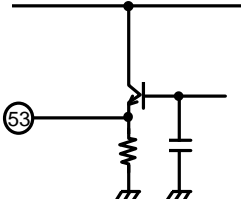
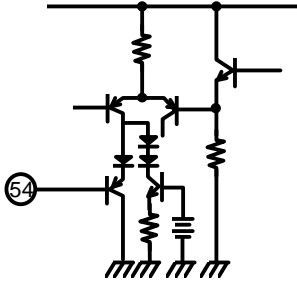
**PIN DESCRIPTION**

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 variable resistor connected to the base of a transistor. The emitter is grounded, and the collector is connected to a supply rail through a resistor. Another transistor is connected to the collector of the first transistor.</p>
53	Sound OUT	Sound OUT terminal. Sound signals are provided to sound power AMP.	 <p>The diagram shows a transistor with its emitter grounded and its collector connected to a supply rail through a resistor. The base is connected to pin 53.</p>
54	SOD brightness control	OSD brightness control terminal	 <p>The diagram shows a complex circuit with multiple transistors and resistors. Pin 54 is connected to the base of one of the transistors. The circuit includes several resistors and a capacitor, with some components connected to ground.</p>

APPLICATION CIRCUIT

