

VIDEO IF+SIF SYSTEM

The KA2914A, KA2918 are silicon monolithic integrated circuits designed for the VIF and SIF stage in color and B/W television receivers.

KA2914A: for Reverse AGC type

KA2918: for Forward AGC type

FUNCTIONS

VIF

- Three controlled IF amplifier stages
- Video demodulator controlled by picture carrier
- Black noise and white noise inverter • Peak AGC.
- DC amplifier for RF AGC out

SIF

- Three differential IF amplifier stages • Phase detector
- DC controlled attenuator
- Audio amplifier stage with NFB terminal

FEATURES

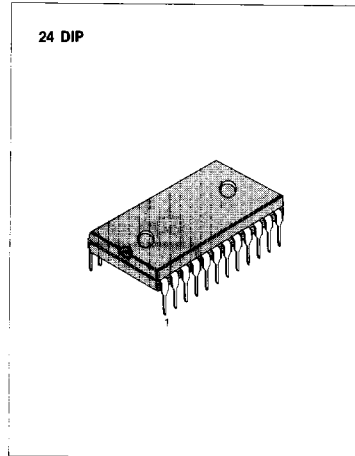
- PIF, SIF, ATT audio driver
- 2 chip color TV system is possible with the KA2153 or KA2154

VIF

- High gain, wide band IF amplifier
- AGC characteristics with excellent stability
- Excellent DG/DP characteristics
- Excellent S/N characteristics due to delayed 3-stage AGC action
- Negative video output signal
- Switch off the video part with VTR SW

SIF

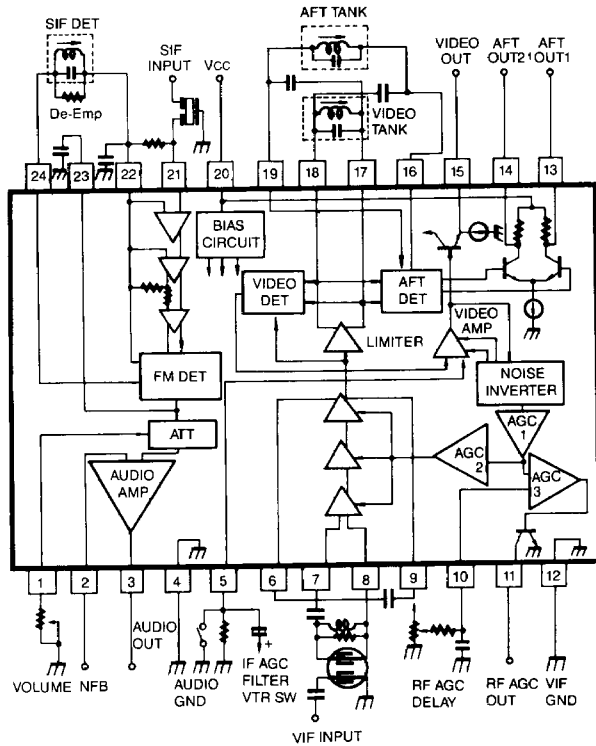
- Excellent limiter characteristics
- Excellent attenuator characteristics



ORDERING INFORMATION

Device	Package	Operating Temperature
KA2914A	24 DIP	- 20 ~ + 65°C
KA2918		

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS (T_a = 25°C)

Characteristic	Symbol	Value	Unit
Supply Voltage	V _{cc}	15	V
Terminal 11 Open Voltage	V ₁₁	15	V
Video DC Output Current	I ₁₅	6	mA
Audio DC Output Current	I ₃	3	mA
Terminal 2 Voltage	V ₂	15	V
Power Dissipation (Note)	P _d	1.6	W
Operating Temperature	T _{opr}	- 20 ~ 65	°C
Storage Temperature	T _{stg}	- 55 ~ 150	°C

Note: Derated above T_a = 25°C in the proportion of 12.8 mW/°C.

ELECTRICAL CHARACTERISTICS

PIF Section ($T_a = 25^\circ\text{C}$, $V_{CC} = 12\text{V}$, $f_p = 45.75\text{MHz}$, $f_s = 41.25\text{MHz}$)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit	Test Fig
Recommended Supply Voltage	V_{CC}	—	10.8	12.0	13.2	V	—
Supply Current	I_{CC}	—	50	72	95	mA	1
Video DC Output Voltage	V_{15}	SW ₁ : 1 (KA2914A) SW ₂ : 2 (KA2918)	5.2	5.5	5.8	V	1
AFT DC Output Voltage	V_{13}	SW ₁ : 1 (KA2914A) SW ₂ : 2 (KA2918)	5.3	6.8	8.3	V	1
	V_{14}	SW ₁ : 1 (KA2914A) SW ₂ : 2 (KA2918)	5.3	6.8	8.3	V	1
AFT DC Offset Voltage	ΔV_{13-14}	SW: 1 (KA2914A) SW: 2 (KA2918)	-1.5	0	1.5	V	1
RF AGC Residual Output Voltage	$V_{11 \text{ Sat}}$	SW ₁ : 1 (KA2914A) SW ₂ : 2 (KA2918)	—	—	0.5	V	1
RF AGC Leak Current	$I_{11 \text{ LEAK}}$	SW ₁ : 1 (KA2918) SW ₂ : 1 (KA2914A)	—	—	1	μA	1
Video Sensitivity	v_i Pin 7-8	(Note 1)	60	150	250	μV_{rms}	2
AGC Range	ΔA_{VIF}	(Note 2)	60	64	—	dB	2
SYNC TIP Level Voltage	V_{SYNC} (V_{15})	(Note 3)	2.3	2.5	2.7	V	2
Max. IF Input Voltage	$v_{\text{IN Max}}$ PIF	(Note 4)	100	120	—	mV_{rms}	2
White Noise Threshold Level	V_{WTH} (V_{15})	(Note 5)	5.8	6.2	6.6	V	2
White Noise Clamp Level	V_{WCL} (V_{15})	(Note 5)	3.7	4.1	4.5	V	2

ELECTRICAL CHARACTERISTICS

PIF Section ($T_a = 25^\circ\text{C}$, $V_{CC} = 12\text{V}$, $f_p = 45.75\text{MHz}$, $f_s = 41.25\text{MHz}$)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit	Test Fig
Black Noise Threshold Level	V_{BTH} (V_{15})	(Note 5)	1.4	1.6	1.8	V	2
Black Noise Clamp Level	V_{BCL} (V_{15})	(Note 5)	2.9	3.3	3.7	V	2
Video Frequency Response	f_{BW}	(Note 6)	4.5	5.5	—	MHz	3
Suppression of Carrier	CL	(Note 7)	40	50	—	dB	4
Suppression of 2nd Carrier	I_{2nd}	(Note 8)	40	50	—	dB	4
920KHz Beat Level	I_{920}	(Note 9)	33	38	—	dB	4
Differential Phase	DP	(Note 10)	—	3.5	5	deg	5
Differential Gain	DG	(Note 10)	—	7	10	%	5
VIF Input Impedance	R_{IN} (VIF)	(Note 11)	1.5	3.0	6.0	$K\Omega$	6
	C_{IN} (VIF)		—	3.0	10.0	pF	
AFT Sensitivity	$\Delta F/V_{13-14}$	(Note 12)	—	16	—	kHz/V	2
AFT Output Voltage	Upper V_{13U} V_{14U}	(Note 13)	11.7	11.9	12.0	V	2
	Lower V_{13L} V_{14L}	(Note 13)	1.8	2.3	2.8	V	2
RF AGC Max Available Current	I_A Max	$SW_1: 1$ (KA2914A) $SW_2: 1$	0.3	—	—	mA	1
		$SW_1: 2$ $SW_2: 1$ (KA2918)	7.0	—	—		
RF AGC Delay Setting Range	V_{IN} Delay	(Note 14)	5	7	9	V	
AFT Band width	ΔF_W	(Note 13)	1.4	—	—	MHz	2
Video Output Voltage	V_{OUT}	(Note 15)	2.25	2.50	2.75	V	2

ELECTRICAL CHARACTERISTICS

SIF Section ($T_a=25^\circ\text{C}$, $V_{CC}=12\text{V}$, $f_p=45.75\text{MHz}$, $f_s=41.25\text{MHz}$)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit	Test Fig	
SIF Output Voltage	V_{OUT}	(Note 16)	200	400	600	mV_{rms}	3	
Input Limiting Voltage	$V_{IN(LIM)}$	(Note 17) $R_D = \infty$	—	200	400	μV_{rms}	8	
AM Rejection Ratio	AMR	SIF IN: $f = 4.5\text{MHz}$ $f_m = 400\text{Hz}$, $\Delta f = \pm 25\text{kHz}$ AM 30%, $V_{IN} = 100\text{dBu}$	40	45	—	dB	8	
Recovered Output Voltage	V_{OD}	SIF IN: $f = 4.5\text{MHz}$ $f_m = 400\text{Hz}$, $\Delta f = \pm 25\text{kHz}$ $V_{IN} = 80\text{dBu}$, $R_D = 12\text{k}\Omega$	0.5	0.75	—	V_{rms}	8	
Total Harmonic Distortion	THD_{DET}	SIF IN: $f = 4.5\text{MHz}$ $f_m = 400\text{Hz}$, $\Delta f = \pm 25\text{kHz}$ $V_{IN} = 80\text{dBu}$	—	1.0	—	%	8	
Max. Audio Output Voltage	V_{OM}	SIF IN: $f = 4.4 \sim 4.6\text{MHz}$	4.0	—	—	$V_{\text{p-p}}$	8	
SIF Input Impedance	$R_{IN(SIF)}$	$f = 4.5\text{MHz}$	10.0	20.0	30.0	$\text{K}\Omega$	7	
	$C_{IN(SIF)}$		—	3.0	—	pF		
DET Output Impedance	$R_O(\text{DET})$	(Note 18)	10.0	15.0	20.0	$\text{K}\Omega$	9	
DC Voltage	Terminal 21	$\text{SW}_1: 1$ (KA2914A) $\text{SW}_2: 2$ (KA2918)	3.5	4.4	5.3	V	1	
	Terminal 23		4.8	6.0	7.2	V		
	Terminal 1		6.0	6.7	7.4	V		
Max. Attenuation	ATT Max	(Note 19)	60	—	—	dB	10	
DC Volume Gain	$G_{\text{ATT Min}}$	$R_A = 0$ $G_{\text{ATT Min}} = 20 \log \frac{V_2}{V_{23}}$	-5.5	-3.5	-1.5	dB	10	
ATT Characteristics	1	$V_1(1)$	*	3.4	3.8	4.2	V	10
	2	$V_1(2)$	**	4.5	4.9	5.3	V	10
Signal Leakage	V_{PT}	(Note 20)	—	1.0	3.0	mV_{rms}	11	
AF AMP. Gain	$G_V \text{ AF}$	(Note 21)	—	20	—	dB	13	
AF AMP. Distortion	THD AF	$P_{23A} = 1V_{\text{pp}}$, 400Hz $\text{SW}_3: \text{On}$ ATT: -26dB Setting	—	1.5	—	%	12	
AF AMP. Max. Output Voltage	$V_{\text{OAF Max}}$	(Note 21) $\text{THD}_{\text{AF}} 5\%$	1.5	2.0	—	V_{rms}	13	
AF Output DC Voltage	V_3	$\text{SW}_1: 1$ (KA2914A) $\text{SW}_2: 2$ (KA2918) $\text{SW}_3: 2$	6.7	7.7	8.8	V	1	

* Read the 400Hz component of V_{A1} at P_2 with $R_A = 0$, set R_A so that $V_{A1} = 1/2 V_{A1} (-6\text{dB})$, then read DC voltage of terminal 1 (V_1).

** Read the 400Hz component of V_{A1} at P_2 with $R_A = 0$. Set R_A so that $V_{A1} = 3.16 \times 10^{-3} V_{A1} (-50\text{dB})$ then read DC voltage of terminal 1 (V_1).

TEST CIRCUIT

1. DC Characteristic

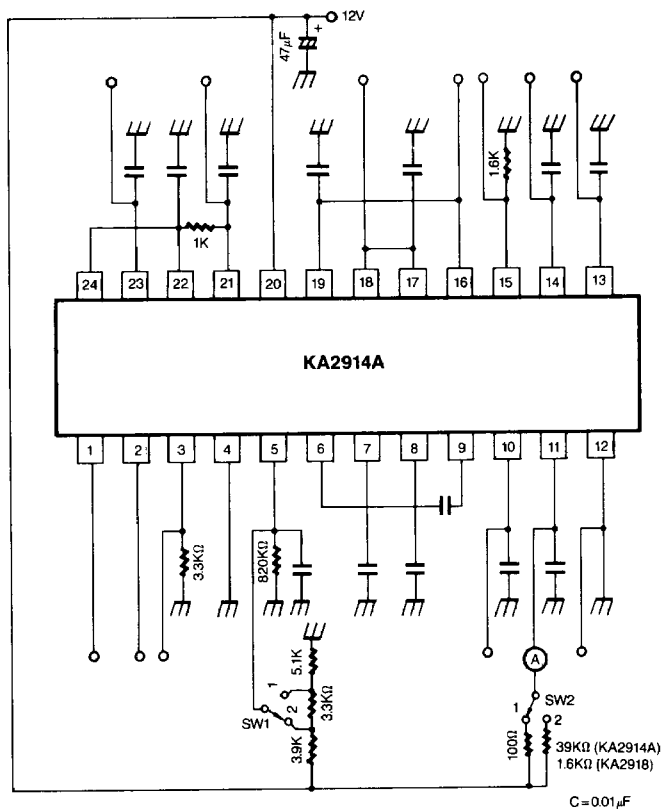


Fig. 1

2. AC Characteristic

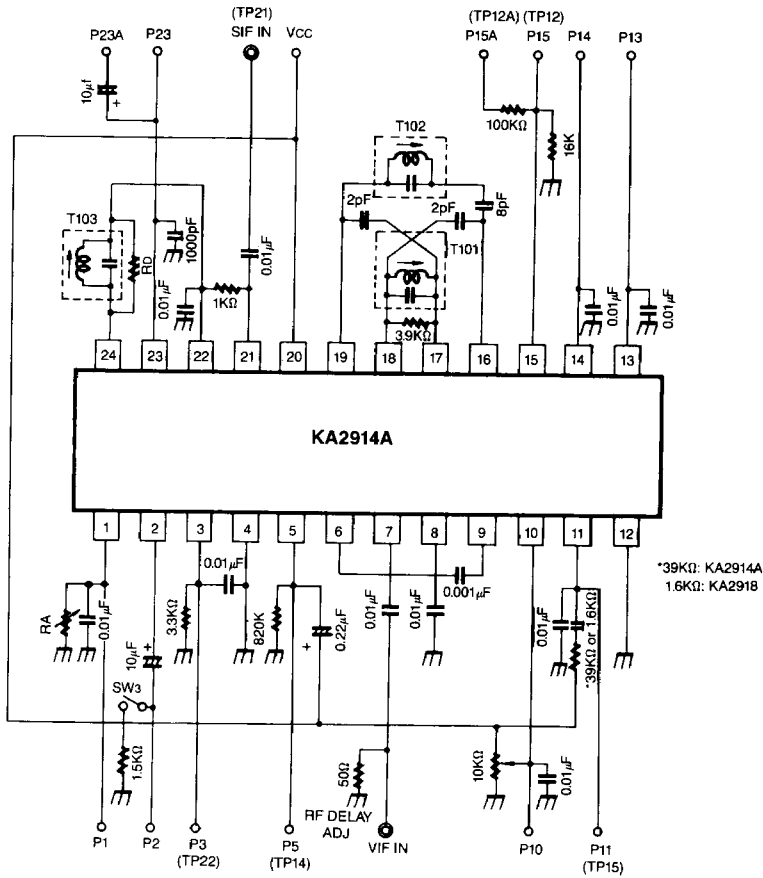


Fig. 2

3

3. Video Frequency Response and SIF Output Voltage

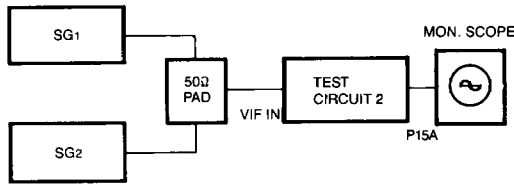


Fig. 3

4. Inter Modulation

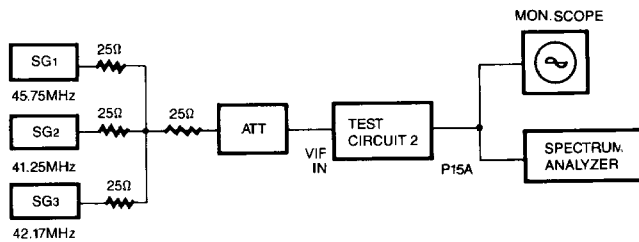
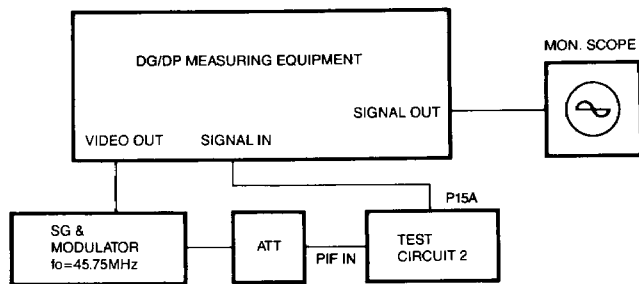


Fig. 4

5. DG, DP



APL=50%
ATT: ADJUST SYNC TIP LEVEL TO DC 2.5V

Fig. 5

6. VIF Input Impedance

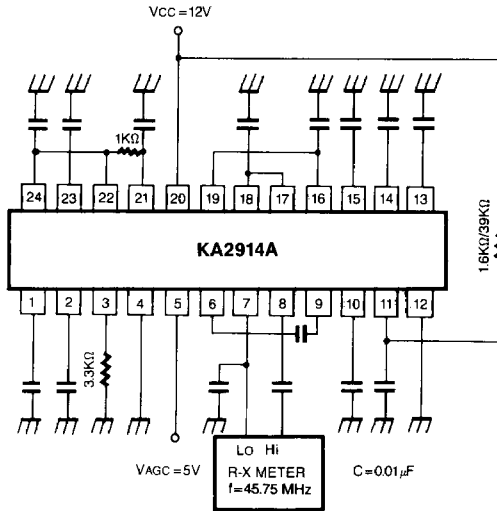


Fig. 6

7. SIF Input Impedance

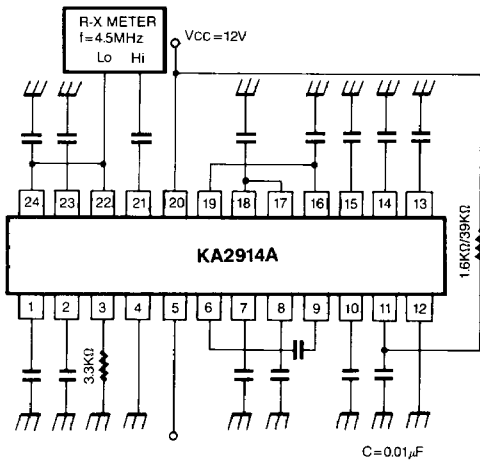


Fig. 7

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8. $v_{IN(LIM)}$, AMR, V_{OD} , THD, v_{OM}

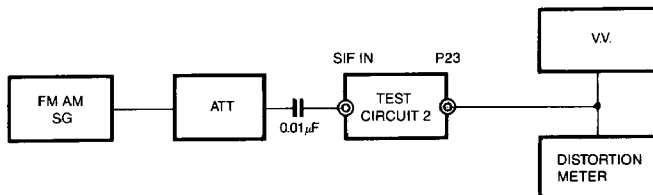


Fig. 8

9. Audio Output Impedance

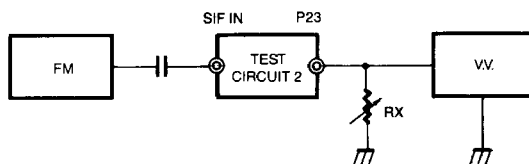


Fig. 9

10. $ATT_{MAX.}$, $G_{ATT_{MIN}}$, $V_1(1)$, $V_1(2)$

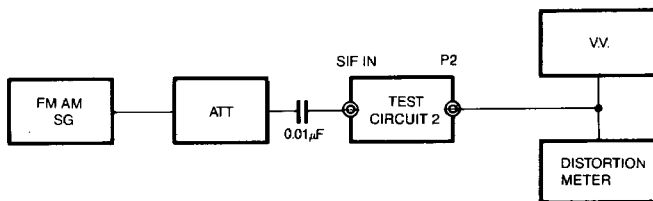


Fig. 10

11. v_{PT}

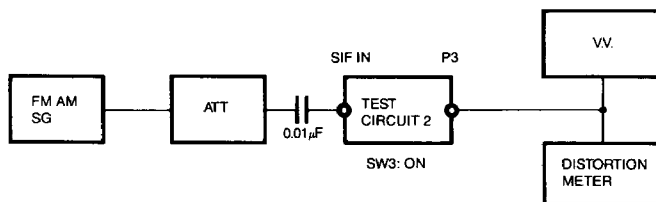


Fig. 11

12. THD_{AF}

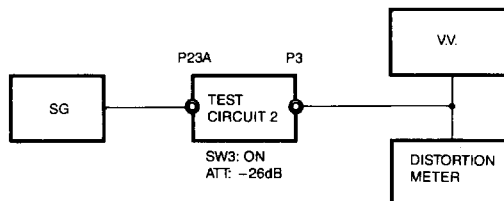


Fig. 12

13. G_v AF, $v_{OAF\ MAX}$

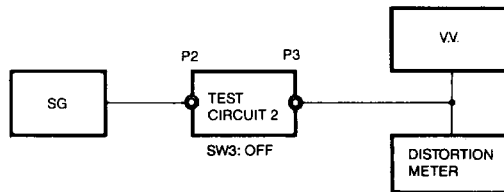


Fig. 13

TEST CONDITIONS

Note 1) V_{AGC} (P5 EXT. Applying voltage)=11.5V

VIF in: $f=45.75\text{MHz}$ 1kHz 30% AM modulation

Adjust the VIF input level v so that the detected output of P15A with high impedance probe will be $0.8V_{p-p}$ and measure the input level.

Note 2) $V_{AGC}=4\text{V}$

Measure VIF input level v same as note 1

$$\Delta A = 20 \log \frac{v}{V} \text{ (dB)}$$

Note 3) VIF IN: $f=45.75\text{MHz}$ CW 15mVrms

Measure the DC level of P15

Note 4) VIF IN: $f=45.75\text{MHz}$ APL 100%, 87.5% AM modulation.

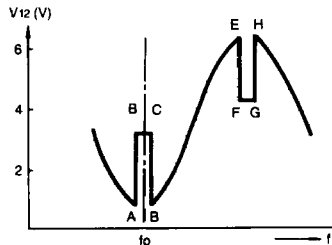
P5: open

(1) Adjust the VIF input level 50mV_{p-p} and measure the detected output level v_{01p-p}

(2) Then increase the input level so that the detected output level will be $1.1 \times v_{01p-p}$ and measure the input level.

Note 5) $V_{AGC}=8\text{V}$

VIF in: $f=45.75\text{MHz} \pm 10\text{MHz}$ variable or sweep 15mVrms measure the DC level of P15.



Note 6) $V_{AGC}=8\text{V}$ ($GR \approx 30\text{dB}$)

SG_1 : 45.75MHz CW

SG_2 : 45.75 – 40MHz variable

(1) Setting output of SG_1 , so that the DC level of P15 will be 4.0V

(2) Setting output off SG_2 (45.75MHz) so that the AC level of P15 will be $0.5V_{p-p}$

(3) Decreasing frequency of SG_2 until the AC level of P15 will be $0.35V_{p-p}$ (-3dB of $0.5V_{p-p}$) then read $f_{SG2} = F f_{BW} = 45.75 - F \text{ MHz}$

- Note 7) SG₁: 45.75MHz, 1kHz 80% AM modulation 100mVrms
 SG₂, SG₃: off
 Setting V_{AGC} so that the output AC level of P15 will be 2.7V_{p-p}
 Measure CL of P15 after setting to 0% AM of SG₁

$$CL = 20 \log \frac{2.7}{V_{CR} (V_{P-P})} \text{ (dB)}$$

- Note 8) Measure I_{2nd} of P15 the same as note 7

- Note 9) V_{AGC}=8V

SG₁: 45.75MHz (P: picture) 100mVrms
 SG₂: 41.25MHz (S: sound) 32mVrms (-10dB of SG₁)
 SG₃: 42.17MHz (C: chroma) 32mVrms (-10dB of SG₁)

- (1) Setting V_{AGC} so that the output tip level (lower) of P15 will be 3.0V DC
 (2) Measure the level difference (dB) between the C-level and 920kHz level

- Note 10) V_{AGC}=8V

VIF IN: f=45.75MHz video signal (RAMP) 87.5% AM 100mV_{p-p}
 Setting ATT so that the SYNC TIP level of P15 will be 2.5V DC.
 Measure DP and DG

- Note 11) V_{AGC}=5V f=45.75MHz

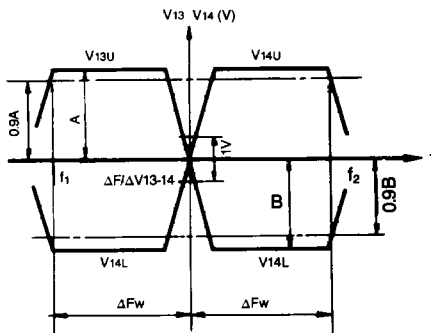
Measure R_{IN}, C_{IN}

- Note 12) AFT sensitivity $\Delta F/\Delta (V_{13}-V_{14})$

- (1) INT, AGC (P5 open)
 (2) VIF input: 45.75MHz \pm 1.0MHz, CW 15mVrms
 (3) Read the frequency (f₁) of VIF when V₁₃-V₁₄ = -1V
 (4) Read the frequency (f₂) of VIF when V₁₃-V₁₄ = 1V then calculate
 $\Delta F/\Delta (V_{13}-V_{14}) = |f_1 - f_2|$

- Note 13) ΔF_W , V_{13U}, V_{14U}, V_{13L}, V_{14L}

- (1) INT AGC (P5 open)
 (2) VIF IN: 45.75MHz \pm 10MHz CW 15mVrms
 (3) 8pF at Pin 16 should be shorted
 (4) Read the frequency (f₁ or f₂) when the V₅ or V₆ is reduced to 90% of the level of A or B with varying the frequency. Then the band width is the difference from center frequency (f₀).



Note 14) P5: Open

VIF IN: 45.75MHz CW 20mVrms

- (1) Adjust the voltage of Terminal 3 so that the voltage of Terminal 4 will be 6.0V DC
- (2) Measure the voltage of Terminal 3

Note 15) P5: Open

VIF in: 45.75MHz 100% APL 87.5% AM modulation signal amplitude 50mV_{p-p} Measure the detected output voltage (White peak to sync tip)

Note 16) P5: Open

SG₁: 45.75MHz CW 100mVrmsSG₂: 41.25MHz CW 25mVrms

Measure SIF (4.5MHz) output voltage at P15

Note 17) SIF IN: f=4.5MHz FM f_{MOD}=400Hz Δf=±25kHz,

- (1) Adjust the SIF input level 100mV_{p-p} and measure the detected output level v_{OS}
- (2) Then decrease the input level so that the detected output level will be 3dB down of V_{OS} and measure the input level

Note 18) Output impedance

(1) SIF IN: f=4.5MHz f_{MOD}=400Hz, Δf=±25kHz, 80dB_μ

- (2) At P23 read the V₀₁ at R_X = ∞, then read the R_X when the recovered output becomes V_{01/2} by varying the R_X. The R_X is the output impedance.

Note 19) ATT MAX

(1) SIF in: f=4.5MHz, f_{MOD}=400Hz, Δf=±25kHz, 80dB_μ

- (2) Read the 400Hz component of V_{A1} at P2 with R_A=0, then read V_{A1'} with R_A=∞

$$\text{ATT MAX} = 20 \log \frac{V_{A1}}{V_{A1'}}$$

Note 20) U_{PT}(1) SIF IN: f=4.5MHz, f_{MOD}=400Hz, Δf=±25kHz, 80dB_μ

- (2) Read the 400Hz component at P3

Note 21) G_V AF

(1) Apply 400Hz 0.1Vrms signal to P2

- (2) Read the output voltage at P3

TYPICAL APPLICATION CIRCUIT

