AN3380NK

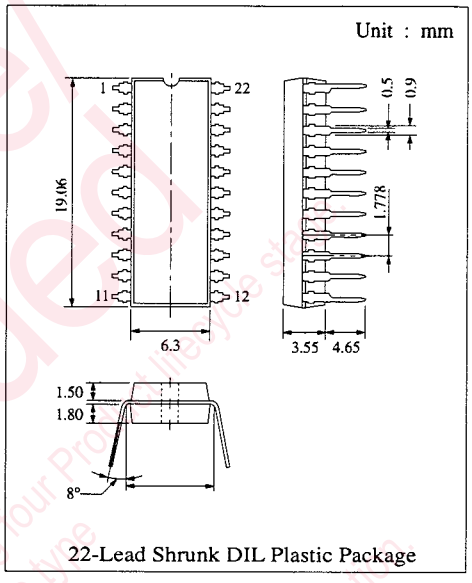
Head Recording Amplifier Circuit for VCR (2-Head Type)

■ Description

The AN3380NK is an integrated circuit designed for Head REC Amplifier circuit for VCR (2-Head Type).

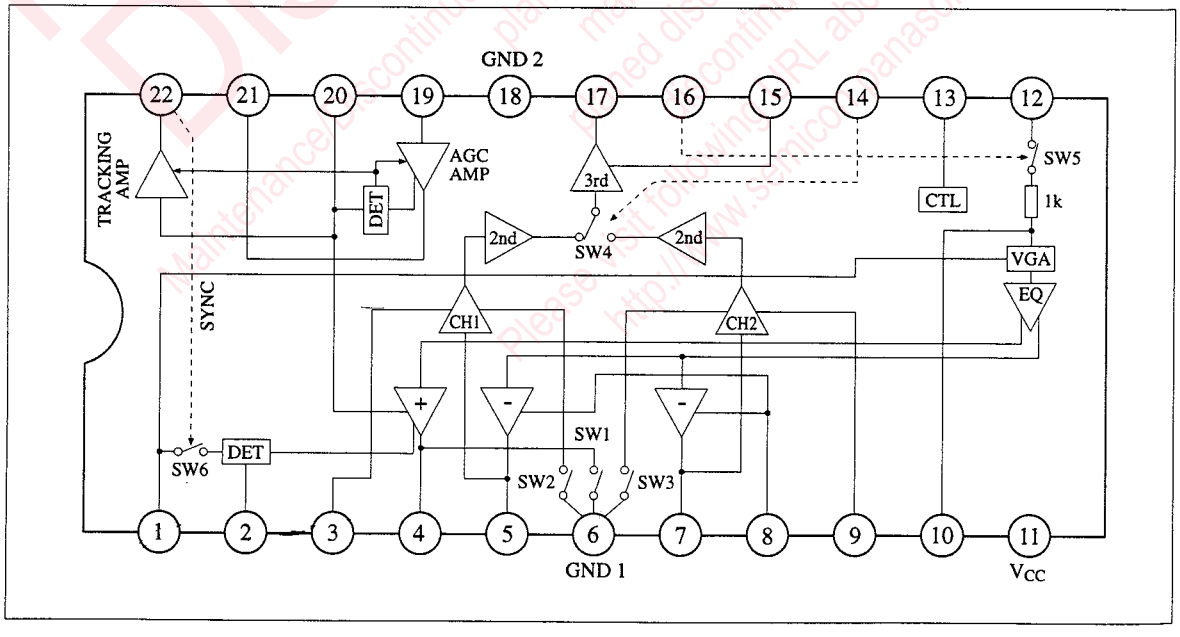
■ Features

- Single supply operation : Vcc = 5V (typ.)
- Record Amp use BTL connection current drive
- Built-in AGC circuit, current control not needed



22-Lead Shrunk DIL Plastic Package

■ Block Diagram



■ Absolute Maximum Ratings (Ta=25°C)

Item	Symbol	Rating	Unit
Supply Voltage	V_{CC}	6	V
Supply Current	I_{CC}	150	mA
Power Dissipation	P_D	1000	mW
Operating Ambient Temperature	Topr	-20 ~ +75	°C
Storage Temperature	Tstg	-55 ~ +150	°C

■ Recommended Operating Range (Ta=25°C)

Item	Symbol	Range
Operating Supply Voltage Range	V_{CC}	4.2V ~ 5.5V

■ Electrical Characteristics (Ta=25°C)

Item	Symbol	Test Circuit	Condition	min.	typ.	max.	Unit
Playback Voltage Gain 1-1	G_{V11}	1	f=4MHz, 0.5mVp-p CH1 input, Gain ADJ Hi	60.5	63	65.5	dB
Playback Voltage Gain 1-2	G_{V12}	1	f=4MHz, 0.5mVp-p CH2 input, Gain ADJ Hi	60.5	63	65.5	dB
CH Gain Difference	ΔG_V	1	f=4MHz, 0.5mVp-p input, Gain ADJ Hi	-1	0	1	dB
Playback Voltage Gain 2-1	G_{V21}	1	f=4MHz, 0.5mVp-p CH1 input, Gain ADJ Low	57.5	60	62.5	dB
Playback Voltage Gain 2-2	G_{V22}	1	f=4MHz, 0.5mVp-p CH2 input, Gain ADJ Low	57.5	60	62.5	dB
Cross Talk 1	CT_1	1	f=4MHz, 0.5mVp-p CH1 input Head change-over SW, Low Hi output ratio			-35	dB
Cross Talk 2	CT_2	1	f=4MHz, 0.5mVp-p CH2 input Head change-over SW, Low Hi output ratio			-35	dB
PB Output Secondary Distortion 1	HDP_1	1	f=4MHz, 0.5mVp-p CH1 input, Ratio of output 8MHz component to 4MHz component			-40	dB
PB Output Secondary Distortion 2	HDP_2	1	f=4MHz, 0.5mVp-p CH2 input, Ratio of output 8MHz component to 4MHz component			-40	dB
Input Conversion Noise 1	N_1	1	Rg=10Ω, Head change-over SW, Low through 1MHz BPF, divide output by G_{V11}		0.6	1.0	μVrms
Input Conversion Noise 2	N_2	1	Rg=10Ω, Head change-over SW, Hi through 1MHz BPF, divide output by G_{V12}		0.6	1.0	μVrms
Head SW DC Unbalance	ΔV_{17}	1	Rg=10Ω, Head change-over SW Hi/Low output DC difference	-100	0	100	mV
AGC Level	V_{AGC}	2	AGC IN f=4MHz, 40mVp-p	255	320	390	mVp-p
AGC Control Characteristic	ΔV_{AGC}	2	AGC IN f=4MHz, 500mVp-p, Calculate $20\log(V_{AGC}(40mVpp)/V_{AGC}(500mVpp))$.	0	0.9	1.8	dB
AGC Output Distortion	HDA	2	AGC IN f=4MHz, 500mVp-p, Ratio of output 8MHz component to 4MHz component			-40	dB
Tracking Output 1	TR_1	2	AGC IN f=4MHz, 50mVp-p Measure TRACKING OUT DC.	1.4	1.8	2.2	V
Tracking Output 2	TR_2	2	AGC IN f=4MHz, 200mVp-p Measure TRACKING OUT DC.	2.75	3.2	3.65	V
Record Amp. Gain 1	I_{OR1}	3	REC IN f=4MHz, 20mVp-p, Calculate gain by output between Pin 4 and Pin 5.	300	415	535	mU
Record Amp. Gain 2	I_{OR2}	3	REC IN f=4MHz, 20mVp-p, Calculate gain by output between Pin 4 and Pin 7.	300	415	535	mU
REC AGC Level 1	I_{RAGC1}	3	REC IN f=4MHz, 125mVp-p, Output level between Pin 4 and Pin 5, R_{AGC}=33kΩ	16.5	19.6	23.2	mVp-p
REC AGC Control Characteristic	ΔI_{RAGC1}	3	REC IN f=4MHz, 250mVp-p, R_{AGC}=33kΩ, Calculate $20\log(I_{RAGC1}(125mVpp)/I_{RAGC1}(250mVpp))$.	0		1.0	dB
Record Current Secondary Distortion 1	HD_{21}	3	REC IN f=4MHz, 125mVp-p, R_{AGC}=33kΩ 8MHz/4MHz ratio			-41	dB
Record Current Secondary Distortion 2	HD_{22}	3	REC IN f=4MHz, 125mVp-p, R_{AGC}=33kΩ 8MHz/4MHz ratio			-41	dB

■ Electrical Characteristics (Ta=25°C) (Continue)

Item	Symbol	Test Circuit	Condition	min.	typ.	max.	Unit
Muting Ratio	M_R	3	REC IN f=4MHz, 125mVp-p, R_{AGC}=33kΩ MUTE ON/OFF ratio			-48	dB
REC AGC Level 2	I_{RAGC2}	3	REC IN f=2MHz, 190mVp-p, R_{AGC}=22kΩ	25.1	30	35.5	mAp-p
REC Quiescent Current	I_{RCQ}	3	REC mode, without signals I_{CC} ADJ R=15kΩ	60	80	100	mA
PB Quiescent Current	I_{PCQ}		PB mode, measure DC.	17.5	28.5	39.5	mA
PRE GAIN ADJ Hi Gain Holding Voltage	V_{PGAH}	2	Hi Gain	3.0		5.0	V
PRE GAIN ADJ Low Gain Holding Voltage	V_{PGAL}	2	Low Gain	0		2.0	V
Head SW FF CH1 ON Holding Voltage	V_{H51}	4	CH1 (Pin 5 input amp.)	0		2.0	V
Head SW FF CH2 ON Holding Voltage	V_{H52}	4	CH2 (Pin 7 input amp.)	3.0		5.0	V
SW1 ON Resistance	R_1		PB mode, Pin 4 impedance	1.5	3.5	5.5	Ω
REC Mute Threshold Value	V_M	5	REC mode	2.0		3.0	V
REC AGC OFF Holding Voltage	V_{RAGC}	5	REC AGC OFF	4.0		5.0	V
REC SYNC AGC ON Holding Voltage	V_{SSYN}	5	REC AGC ON	2.5		5.0	V
REC SYNC AGC OFF Holding Voltage	V_{SSYF}	5	REC AGC OFF	0		1.5	V
REC Mode Holding Voltage	V_{SREC}	5	REC IN f=4MHz, 125mVp-p, R_{AGC}=33kΩ	0		1.0	V
EE Mode Holding Voltage	V_{SEE}	5	REC IN f=4MHz, 125mVp-p, REC MUTE	2.0		3.0	V
PB Mode Holding Voltage	V_{SPB}	5	f=4MHz, 0.5mVp-p, GAIN ADJ LOW	4.0		5.0	V

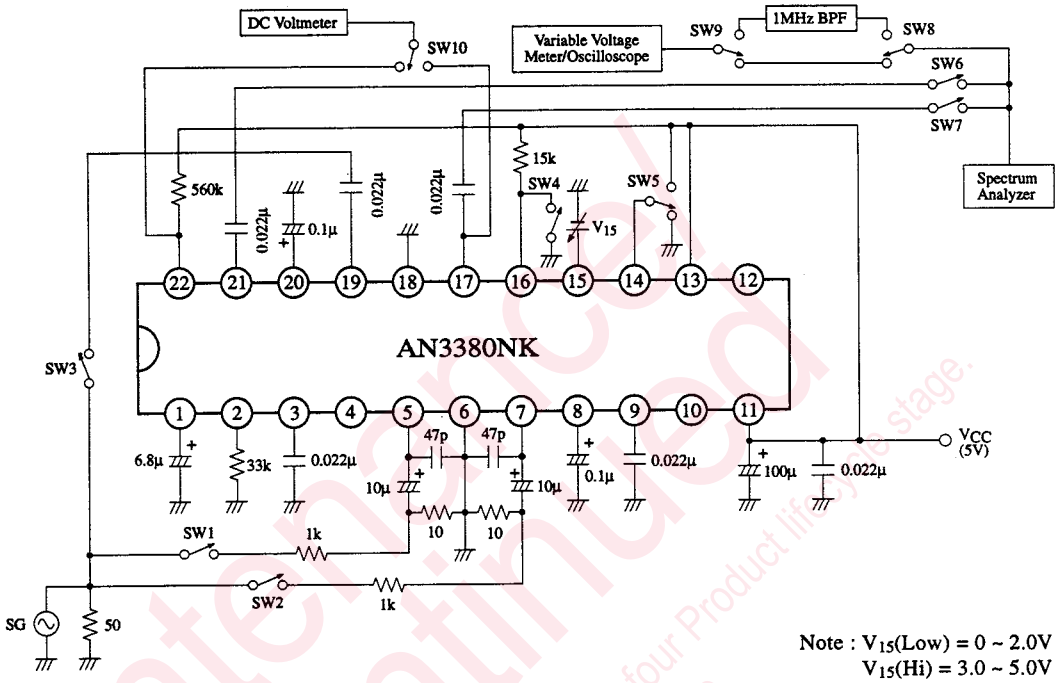
■ Supplementary Explanation

● Electrical Characteristics Design Reference Values (Ta=25°C)

Item	Symbol	Test Circuit	Condition	min.	typ.	max.	Unit
Record Current Tertiary Distortion	HD_3	6	REC IN f=4MHz, 125mVp-p, R_{AGC}=33kΩ 12MHz/4MHz ratio			-40	dB
Record Current Cross Modulation (±fc)	C_{M1}	6	fr=4MHz, 20mAp-p out, fc=630kHz -14dB down			-50	dB
Record Current Cross Modulation (±2fc)	C_{M2}	6	fr=4MHz, 20mAp-p out, fc=630kHz -14dB down			-50	dB
Record Amp. f Characteristic	ΔG_{If}	6	REC IN f=4MHz, 20mVp-p with EQ 4MHz/1MHz level ratio	-5.5	-4.5	-3.5	dB
Playback Amp. f Characteristic 1	ΔG_{Vf1}	7	Specify L and f_0=5MHz 5MHz/1MHZ level ratio	-8			dB
Playback Amp. f Characteristic 2	ΔG_{Vf2}	4	10MHz/1MHz level ratio	-4	-2.5	-1	dB

Note) The above characteristic is a design reference value, not a guarantee value.

Test Circuit 1

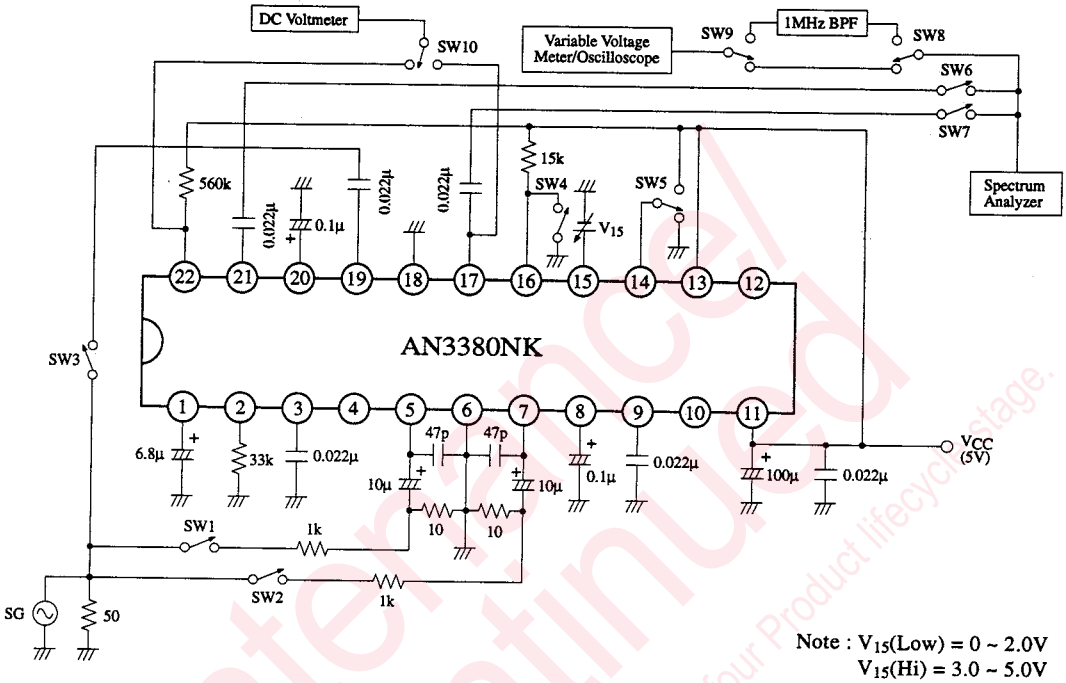


Note : V_{15}(Low) = 0 ~ 2.0V
V_{15}(Hi) = 3.0 ~ 5.0V

Test Method

No.	Item	Input Signal	V_{15}	ON SW 1	2	3	4	5	6	7	8	9	10	Measuring Instrument & Others
1	Playback Voltage Gain 1-1	SG f = 4MHz 50mVp-p	Hi	○						○				Oscilloscope (Calculate gain by dividing the output level by 0.5mVp-p.)
2	Playback Voltage Gain 1-2				○			○		○				
3	CH Gain Difference													Calculate No.2-No.1 (dB)
4	Playback Voltage Gain 2-1		Low	○						○				Oscilloscope (Calculate gain by dividing the output level by 0.5mVp-p.)
5	Playback Voltage Gain 2-2				○			○		○				
6	Crosstalk 1		Hi	○				○		○				Variable voltage meter (SW5 OFF→ON output level ratio)
7	Crosstalk 2				○			○		○				Variable voltage meter (SW5 ON→OFF output level ratio)
8	PB Output Secondary Distortion 1			○						○				Spectrum analyzer (Measure 8MHz component/ 4MHz component.)
9	PB Output Secondary Distortion 2				○			○		○				
10	Input Conversion Noise 1	0mVp-p								○	○	○		Variable voltage meter (Divide the output level by No.1 gain.)
11	Input Conversion Noise 2							○		○	○	○		Variable voltage meter (Divide the output level by No.2 gain.)
12	Head SW DC Unbalance							○					○	DC voltmeter (SW5 OFF→ON output DC difference)

Test Circuit 2

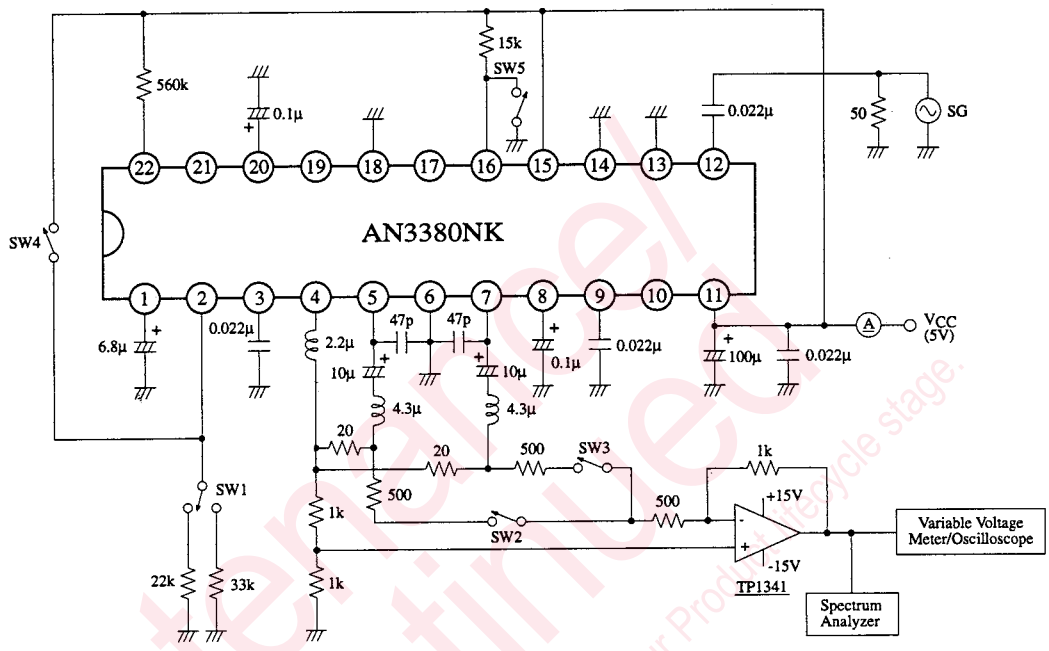


Note : V_{15}(Low) = 0 ~ 2.0V
V_{15}(Hi) = 3.0 ~ 5.0V

Test Method

No.	Item	Input Signal	V_{15}	ON SW										Measuring Instrument & Others
				1	2	3	4	5	6	7	8	9	10	
13	AGC Level	SG f = 4MHz 40mVp-p	Hi			○			○					Oscilloscope
14	AGC Control Characteristic	SG f = 4MHz 500mVp-p				○			○					Oscilloscope (Divide the output level by No.13 result.)
15	AGC Output Distortion					○			○					Spectrum analyzer (Measure 8MHz component/ 4MHz component.)
16	Tracking Output 1	SG f = 4MHz 50mVp-p				○								DC voltmeter
17	Tracking Output 2	SG f = 4MHz 200mVp-p				○								
28	PRE GAIN ADJ Hi Gain Holding Voltage	SG f = 4MHz 50mVp-p	3.0V	○						○				Oscilloscope/Variable voltage meter (Check No.1 and its gain.)
29	PRE GAIN ADJ Low Gain Holding Voltage		2.0V	○						○				Oscilloscope/Variable voltage meter (After checking No.4 and its gain, calculate No.29-No.28 (dB). It should be in range of -4.2~-1.8dB.)

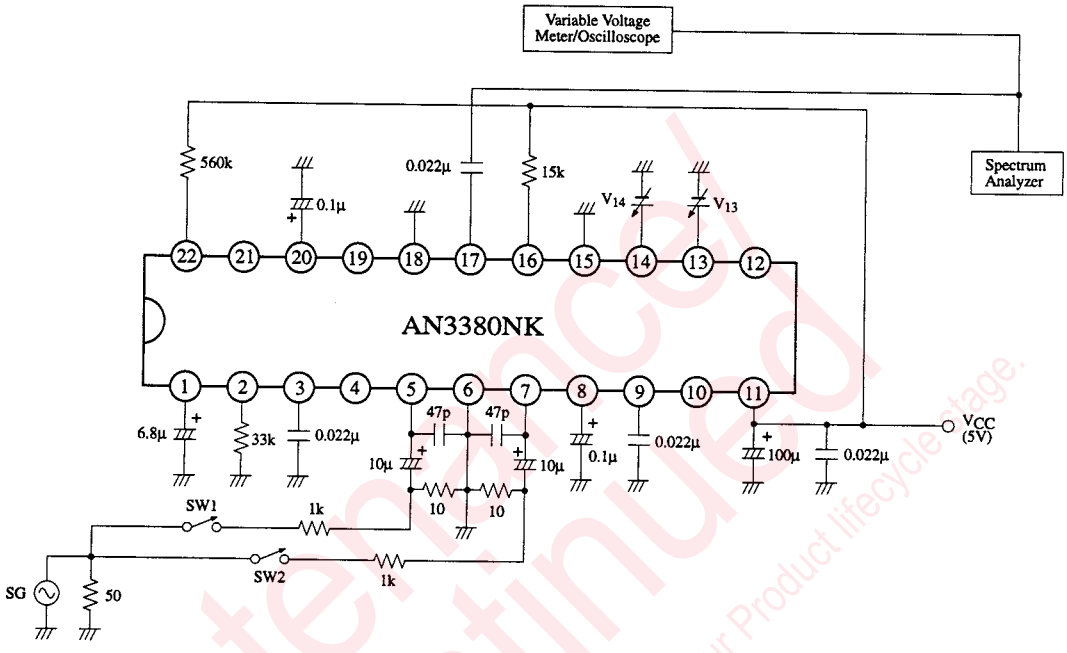
Test Circuit 3



Test Method

No.	Item	Input Signal	ON SW 1	2	3	4	5	Measuring Instrument & Others
18	Record Amp. Gain 1	SG f = 4MHz 20mVp-p		○		○		Oscilloscope (Calculate gain by the output level)
19	Record Amp. Gain 2				○	○		
20	REC AGC Level 1	SG f = 4MHz, 125mVp-p		○				Oscilloscope
21	REC AGC Control Characteristic	SG f = 4MHz, 250mVp-p		○				Oscilloscope (Divide the output level by No.20 result)
22	Record Current Secondary Distortion 1	SG f = 4MHz 125mVp-p		○				
23	Record Current Secondary Distortion 2				○			Spectrum analyzer (Measure 8MHz component/4MHz component)
24	Muting Ratio			○			○	Variable voltage meter (SW5 ON→OFF output level ratio)
25	REC AGC Level 2	SG f = 2MHz, 190mVp-p	○	○				Oscilloscope
26	REC Quiescent Current	0mVp-p						Ammeter

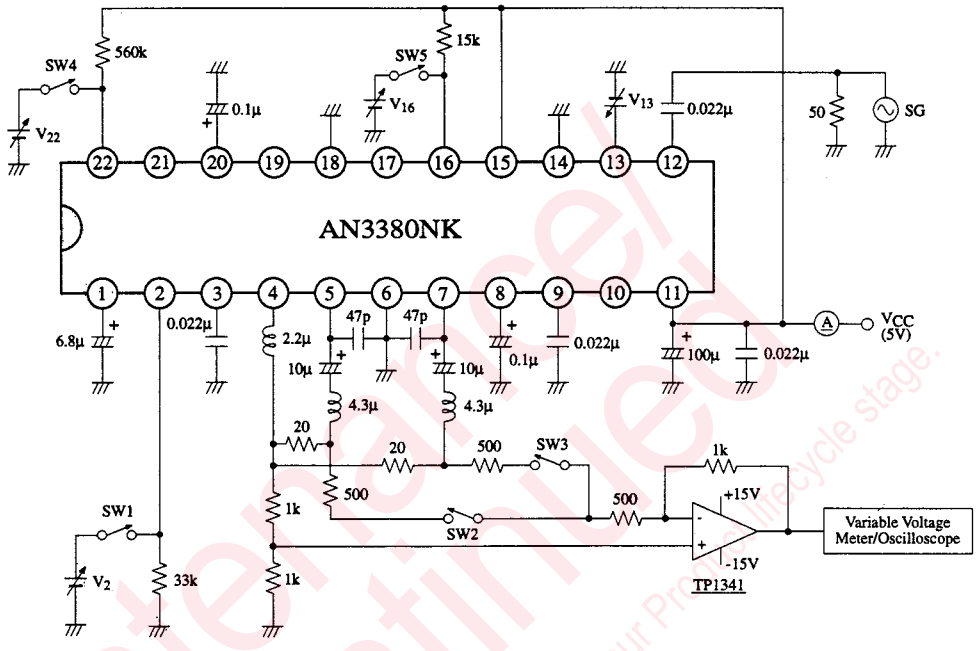
Test Circuit 4



Test Method

No.	Item	Input Signal	V_{13}	V_{14}	ON SW 1	ON SW 2	Measuring Instrument & Others
30	Head SW FF CH1 ON Holding Voltage	SG f = 4MHz 50mVp-p	5.0V (V_{CC})	0V→2.0V	○		Oscilloscope (The same gain as No.4 on the condition of V_{14} change.)
31	Head SW FF CH2 ON Holding Voltage			3.0V→5.0V		○	Oscilloscope (The same gain as No.5 on the condition of V_{14} change.)
39	PB Mode Holding Voltage		5.0V→4.0V	0V	○		Oscilloscope (The same gain as No.4 on the condition of V_{13} change.)
45	Playback Amp. f Characteristic	SG 50mVp-p f = 1MHz→10MHz	5.0V (V_{CC})	0V	○		Spectrum analyzer (10MHz output level/1MHz output level)
				0V		○	

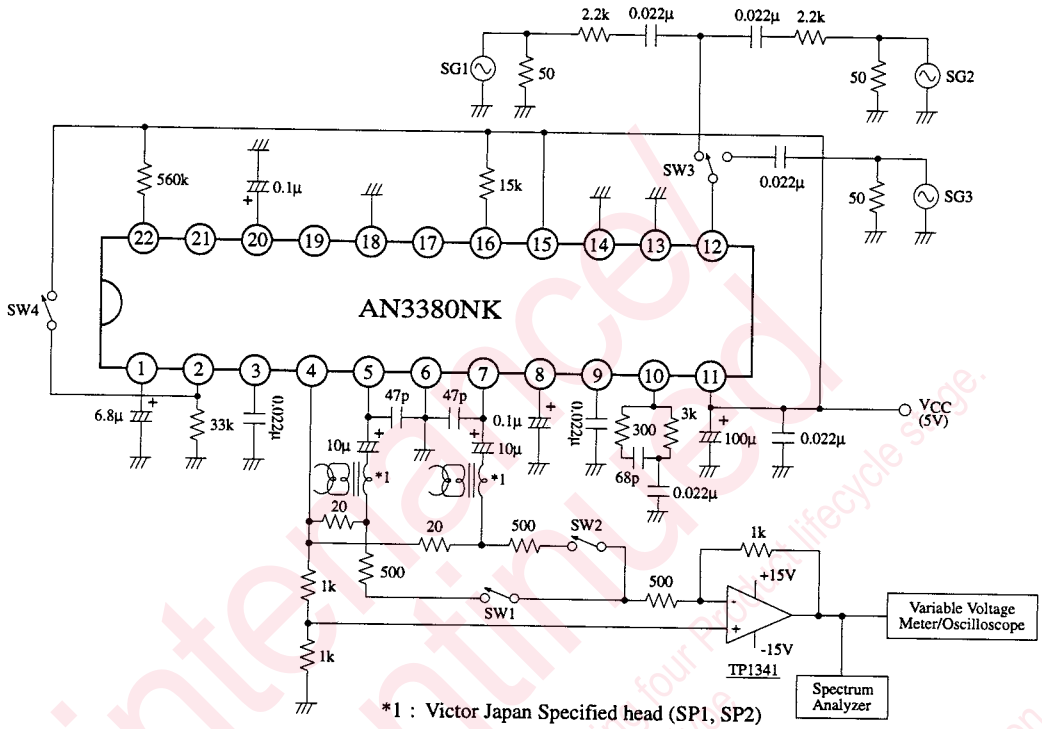
Test Circuit 5



Test Method

No.	Item	Input Signal	V2	V13	V16	V22	ON SW 1	2	3	4	5	Measuring Instrument & Others
33	REC Mute Threshold Value	SG f = 4MHz 125mVp-p			2V			○			○	Variable voltage meter (SW5 ON→OFF, the same as No.24)
34	REC AGC OFF Holding Voltage		4V ↓ 5V	0V			○	○				Oscilloscope (Higher in output level than No.20)
35	REC SYNC AGC ON Holding Voltage					2.5V ↓ 5.0V		○		○		Oscilloscope (The same output level as No.20)
36	REC SYNC AGC OFF Holding Voltage					0V ↓ 1.5V		○		○		Oscilloscope (Higher in output level than No.20)
37	REC Mode Holding Voltage			0V ↓ 1.0V				○				Oscilloscope (The same output level as No.20)
38	EE Mode Holding Voltage			2.0V ↓ 3.0V				○				Variable voltage meter (REC Mute)

Test Circuit 6

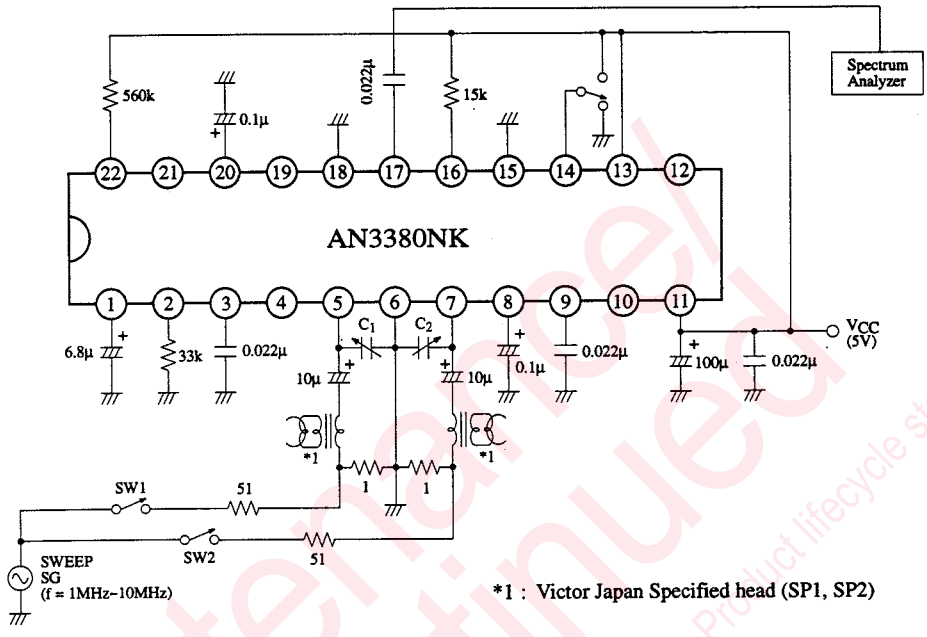


*1 : Victor Japan Specified head (SP1, SP2)

Test Method

No.	Item	Input Signal 1	Input Signal 2	ON SW 1	2	3	4	Measuring Instrument & Others
40	Record Current Tertiary Distortion	SG3 f = 4MHz 125mVp-p		○		○		Spectrum analyzer (12MHz component/4MHz component)
					○	○		
41	Record Current Cross Modulation (±fc)	SG1 f = 4MHz Set the input level so that 4MHz output level will come to 400mVp-p (20mAp-p).	SG2 f = 630kHz Set the input level so that 630kHz output level will come to -14dB against 4MHz output level.	○			○	Spectrum analyzer (Ratio of the bigger one of 4.63MHz component and 3.37MHz component to 4MHz component)
					○		○	
42	Record Current Cross Modulation (±2fc)			○			○	Spectrum analyzer (Ratio of the bigger one of 5.26MHz component and 2.74MHz component to 4MHz component)
					○		○	
43	Record Amp. f Characteristic	SG3 20mVp-p f = 1MHz→4MHz		○		○	○	Spectrum analyzer (4MHz output level/1MHz output level)

Test Circuit 7



*1 : Victor Japan Specified head (SP1, SP2)

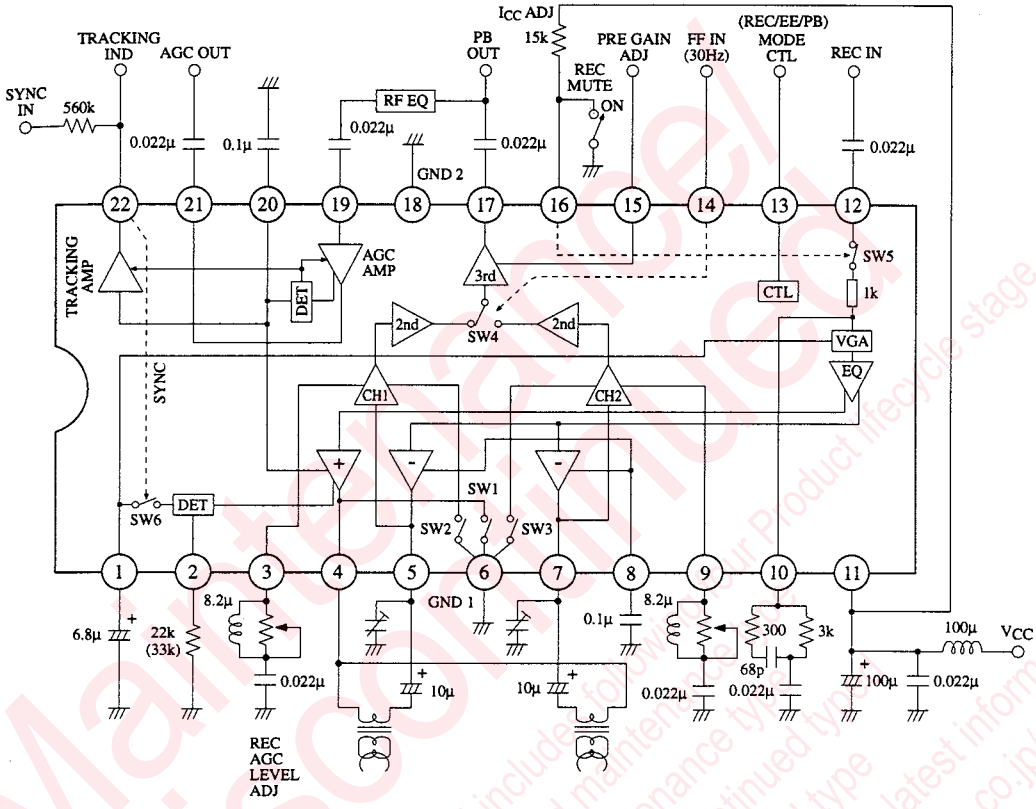
Test Method

No.	Item	Input Signal	ON SW 1	ON SW 2	ON SW 3	Measuring Instrument & Others
44	Playback Amp. f Characteristic	SG f = 1MHz~10MHz 25mVp-p	○			Spectrum analyzer (5MHz/1MHz level ratio at f_O=5MHz gotten by adjusting C_1 or C_2)
				○	○	

No.	Item	Symbols	Measured Pin No.	Pin No.																										Note
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
27	PB Quiescent Current	I_{PCQ} I_{11}	11		33k 0V			0V	0V	0V				5V		5V	0V	0V	15k 5V		0V	4.1 V	0V									
32	SW1 ON Resistance	R_1 $V_{4\text{-}18}$	4		33k 0V		0 mA	0V	0V	0V				5V		5V	0V	0V	15k 5V		0V	4.1 V	0V									
32	SW1 ON Resistance	R_1 $\Delta V_{4\text{-}18}$	4		33k 0V		30 mA	0V	0V	0V				5V		5V	0V	0V	15k 5V		0V	4.1 V	0V									

Note : Symbols on the upside are ones for the specification and symbols on the underside, for measured contents.

■ Application Circuit



■ Pin Descriptions

Pin No.	Pin Name	Pin No.	Pin Name
1	REC AGC DET	12	REC Input
2	REC AGC Level ADJ	13	Mode Change-over Control
3	CH1 Damping ADJ	14	Head Change-over Control
4	Common to PB/REC ⊕ Amp. Output	15	Playback Gain Change-over Control
5	PB CH1 Input/REC ⊖ Amp. Output	16	ICC ADJ/Muting Control
6	GND	17	PB Output
7	PB CH2 Input/REC ⊖ Amp. Output	18	GND
8	REC ⊖ Amp. DC Feedback	19	AGC Amp. Input
9	CH2 Damping ADJ	20	AGC DET/REC ⊕ Amp. DC Feedback
10	REC EQ	21	AGC Amp. Output
11	VCC Supply	22	Tracking Output/Sync. Input

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