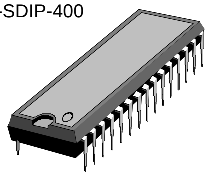
KA22296 DOUBLE DECK SYSTEM FOR RADIO CASSETTE

PLAYBACK / RECORD PRE AMPLIFIER FOR DOUBLE DECK

KA22296 is a monolithic intergrated circuit consisting of a dual input playback amplifier, two channel recording amplifier, 3 outside input selecting switch, and MIC Amp. Due to KA22296 possessing MIC input mixing function, it is practical to apply to systems like CD and radio cassette set.

30-SDIP-400



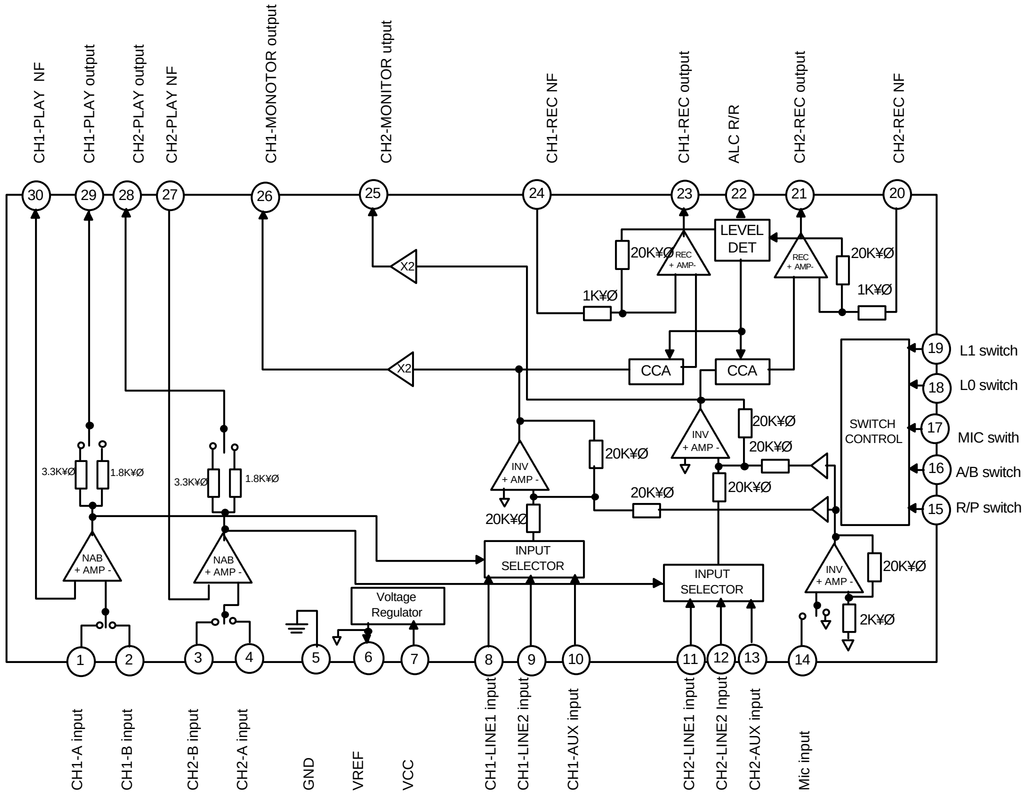
ORDERING INFORMATION

Device	Package	Operating Temperature
KA22296	30-SDIP-400	-25°C ~ +75°C

FEATURES

- Dual input two - channel playback amplifier.
- Recording / Playback function
- Tape dubbing function
- NAB EQ (60us) for High speed recording function
- Allowing 3 (Line 1, Line 2 and AUX) outside inputs
- MIC function (Independent and mixture)
- ALC function
- Operating voltage (4V ~ 10V) : recommended voltage 6 ~ 9 Volt
  30 SDIP

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATING *(Ta = 25 °C)*

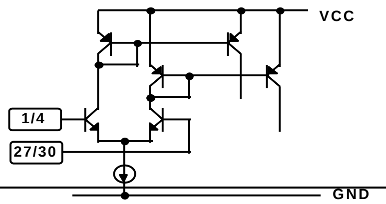
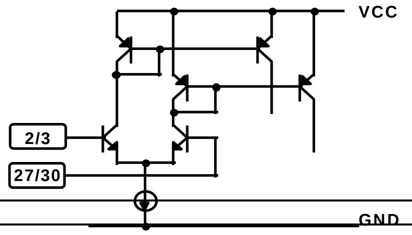
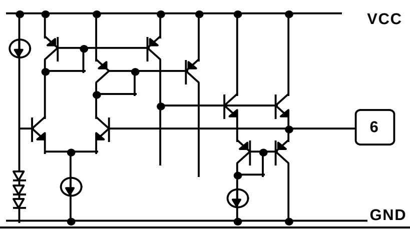
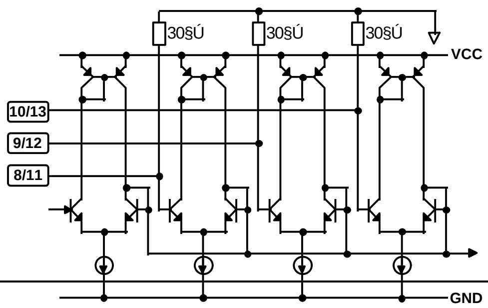
Characteristic	Symbol	Value	Unit
Supply Voltage	VCC	12	V
Power Dissipation	P_D	300	mW
Operating Temperature	T_{OPR}	-25 ~ +75	°C
Storage Temperature	T_{STG}	-55 ~ +125	°C

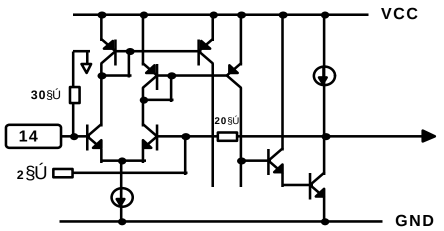
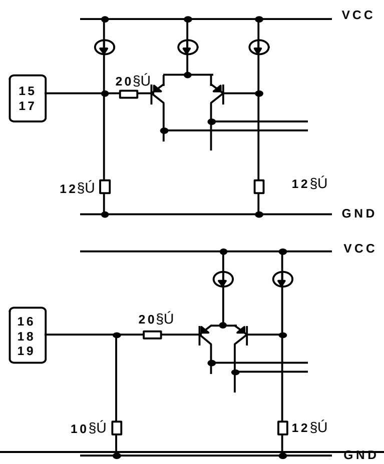
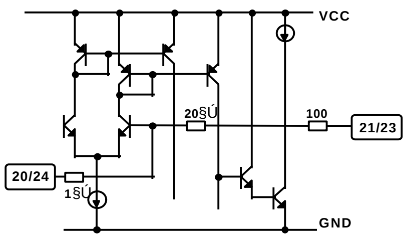
ELECTRICAL CHARACTERISTICS
(VCC = 6V, Ta = 25°C, f = 1Khz unless otherwise specified)

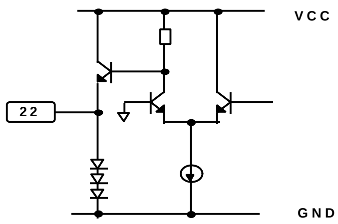
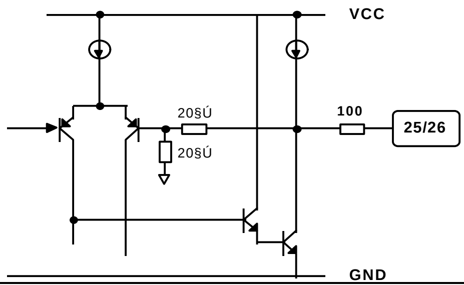
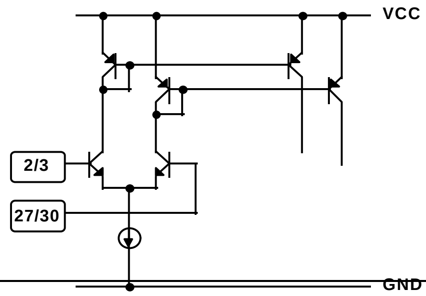
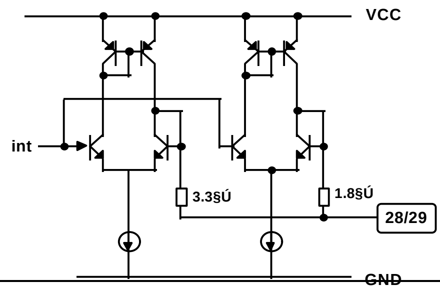
Characteristic			Symbol	Test Condition	Min	Typ	Max	Unit
Quiescent Circuit Current			I_{CC}	A test mode, VCC = 4V	7	12.5	20	mA
Reference Bias Voltage			Vref		1.7	2.1	2.4	V
Swtich Control Voltage	R/P Pin 15		V_{SW1}	Play	Below 0.4V			
			V_{SW1}	REC	Open or 1.3V-1.9V			
			V_{SW1}	High speed REC	Above 3V			
	A/B Pin16		V_{SW1}	A - deck	Open or Below 0.5V			
			V_{SW1}	B - deck	Above 2V			
	MIC Pin17		V_{SW1}	Mic off	Below 0.4V			
			V_{SW1}	Mic only	Open or 1.3V-1.9V			
			V_{SW1}	Mic Mix	Above 3V			
	L0, L1 Pin 18 / Pin 19		V_{SW1}	Low	0.6--0.8V			
			V_{SW1}	High	Above 2V			
Line/ AUX Mode	Play back	Voltage Gain	G_{V1}	V_O = 0.5Vrms	4	5.7	8	dB
		Max Output	Vom1	THD = 1%	0.75	1	-	Vrms
		Output Noise Voltage	Vno1	Rg = 600Ω, BW = 20-20KHz	-	35u	100u	Vrms
		Hormonic Distortion	THD1	V_O = 0.5Vrms BW = 20-20KHz	-	0.2	0.5	%
		Crosstalk	CT1	V_O = 0.5Vrms BW = 20-20KHz	-	-65	-	dB
		Ripple Rejection	RR1	ripple = 0.1Vrms/120Hz	-	-55	-	dB
	Record	Voltage Gain	G_{V2}	V_O = 0.5Vrms	25	27	29	dB
		Max Output	Vom2	THD = 1%	0.9	1.2	-	Vrms
		Output Noise Voltage	Vno2	Rg = 600ΩBW = 20-20KHz	-	500u	750u	Vrms
		ALC Ouptut	VA1	Vin = 0.5Vrms	0.6	0.75	0.9	Vrms
		Hormonic Distortion	THD2	V_O = 0.5Vrms BW = 20-20KHz	-	0.3	1.0	%
		Crosstalk	CT2	V_O = 0.5Vrms BW = 400-20KHz	-	-65	-	dB
		Ripple Rejection	RR2	ripple = 0.1V/120Hz	-	-30	-	dB

Characteristic			Symbol	Test Condition	Min	Typ	Max	Unit
Line/ AUX Mode	Playback	Voltage Gain	G_{V3}	VO = 0.5Vrms	23.6	25.6	27.6	dB
		Max Output	Vom3	THD = 1%	0.75	1	-	Vrms
		Input Noise Voltage	Vni1	Rg = 600Ω, BW = 20-20KHz	-	60u	150u	Vrms
		Harmonic Distortion	THD3	V_O = 0.5Vrms BW = 20-20KHz	-	0.3	0.5	%
		Ripple Rejection	RR3	ripple = 0.1V/120Hz	-	-45	-	dB
	Record	Voltage Gain	G_{V4}	V_O = 0.5Vrms	45	47	49	dB
		Mak Output	Vom4	THD = 1%	0.9	1.2	-	Vrms
		Input Noise Voltage	Vni2	Rg = 600Ω, BW = 20-20KHz	-	0.8m	1.2m	Vrms
		ALC Output	VA2	Vin = 0.05Vrms	0.6	0.75	0.9	Vrms
		Harmonic Distortion	THD4	V_O = 0.5Vrms BW = 20-20KHz	-	0.3	1.0	%
		Ripple Rejection	RR4	ripple = 0.1V/120Hz	-	-25	-	dB
Tape Mode	Playback	Voltage Gain	G_{V5}	V_O = 0.5Vrms, Normal, 1KHz	40.1	42.1	44.4	dB
				V_O = 0.5Vrms, High, 1KHz	38.6	40.6	42.6	dB
		Max Output	Vom5	THD = 1%	0.75	1	-	Vrms
		Input Noise Voltage	Vni3	Rg = 600Ω, BW = 20-20KHz	-	240u	350u	Vrms
		Harmonic Distortion	THD5	V_O = 0.5Vrms BW = 20-20KHz	-	0.3	0.5	%
		Crosstalk	CT3	V_O = 0.5Vrms BW = 20-20KHz	-	-65	-	dB
		Ripple Rejection	RR5	ripple = 0.1V/120Hz	-	-36	-	dB
	Record	Voltage Gain	G_{V6}	V_O = 0.5Vrms, Normal, 1KHz	62	64	66	dB
		Max Output	Vom6	THD = 1%	0.9	1	-	Vrms
		Input Noise Voltage	Vni4	Rg = 600Ω, BW = 20-20KHz	-	2.0m	3.0m	Vrms
		ALC Output	VA3	Vin = 5mVrms	0.6	0.75	0.9	Vrms
		Harmonic Distortion	THD6	V_O = 0.5Vrms BW = 20-20KHz	-	0.3	1.0	%
		Crosstalk	CT4	V_O = 0.5Vrms BW = 20-20KHz	-	-60	-	dB
		Ripple Rejection	RR6	ripple = 0.1V/120Hz	-	-17	-	dB

PIN DESCRIPTION

No.	Symbol	I/O	Internal Equivalance Circuit
1/4	A - input	Playback Amplifier A - input	
2/3	B - input	Playback Amplifier B-input	
5	GND	GND	-
6	VREF	Reference Voltage	
7	VCC	Supply Voltage	-
8/11	LINE1 input	LINE 1 External Input Terminal	
9/12	LINE2 input	LINE2 External Input Terminal	
10/3	AUX input	AUX External Input Terminal	

No.	Symbol	I/O	Internal Equivalance Circuit
14	MIC input	Input Terminal	
15	R/P switch	Selecting Terminal	
16	A/B switch	A, B Playback Input Selecting Terminal	
17	MIC switch	MIC Input Selecting Terminal	
18	L0 switch	EXTERNAL LINE Selecting Terminal	
19	L1 switch		
20/24	REC NF	REC Amplifier, negative terminal	
21/23	REC output	REC Amplifier Output Terminal	

No.	Symbol	I/O	Internal Equivalance Circuit
22	ALC R/R	Ripple Rejection Termianl of ALC Detecting Output	
25/26	Monitor output	Monitor Output Terminal	
27/30	PB NF	Playback Amplifier	
28/29	PB output	Playback Amplifier Output Terminal for NAB EQ	

APPLICATION INFORMATION

1. SWITCH INPUT CONDITION

Tabel 1.

Pin Function	LOW	Open	High	Remark
Pin 15 REC/PB switch	Play only	Record only	High speed record	• NAB automatically alters to High EQ. within (pin 15 = high) high speed rec. mode.
Pin 16 A/B deck switch	A deck enable		B deck enable	•Due to external RC time constant, it is possible to delay the time of switching.
Pin 17 Mic switch	Mic off	Mic only	Mic mixing	•It is prohibited to mic input into the (pin 15 = high) high speed rec. mode.

Talbe 2.

Function Condition	Pin 18	Pin 19	High	Remark
Line 1	Open	High	In Mic only mode (pin 17 = open), all of (line 1, line 2, AUX, Tape function) will be somewhat disabled. Refer to note 3 open condition.	
Line 2	High	Open		
Aux	High	High		
Tape	Open	Open		

- According to each mode, function selection basically moved due to the conditions of above table 1,2
- Each function Pins possess characteristical representation of functions not in movement, in respect to its reprenting functions.
- By the virtue of each pin's combinations changing frequency, it is wise to set up or plan the circuit according to above table 1,2 input conditions.

2. DESCRIPTION OF SWITCH FUNCTION

2 - 1. Controlling the selection switch of pin 15 play / record

Pin 15 is not constructed with logic from inside, however it is constructed by controlling 3 level switches caused by external voltage input. As soon as the power is on, it really doesn't matter if the attach switch is in play (low mode). Nevertheless is open (record mode), it will turn to record stage and depending on it, the ALC circuit will function. After and at the incident of source of electric power being approved, all of the circuits will eventuate unstable and results in tendency not known. Sometime in the begining, it is necessary to find a method to stop ALC movement for a set period of time, and is developed through using original switch period.

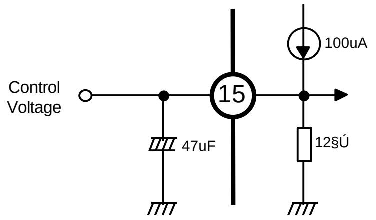


Fig 2 - 1

Immediately after the approval of source of electric power, through 100UA's current source with capacitor and resistance in the Pin 15, the Pin 15's current gradually increased. Until it reaches the setted voltage level, the record state can not be accomodated. While under this process, the circuit in record part will not receive any inputs, and by disc harging the generated increase voltage of ALC P/R, turn it into initiation.

In the section of high speed recording, 3.5 Volts of control voltage must be inflicted. But under this condition, it is wise to operate at high speed recording after delaying the time by connecting the resistance with the outside electrical series or just approval it first and apply the procedure next.

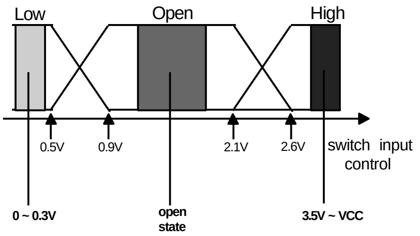


Fig 2 - 3

Note 1 : 3 steps of input switch (Pin 15, 17) controlled voltage.
In the 3 stepped switch recording system, play deciding Pin 15 exist and Mic mode deciding function P17 also exists as well. Voltage in the high mode is more than enough. Low mode's voltage will be achieved if the voltage goes below 0.3 V. The open mode does not deal with any other voltage so just open it.

2-2 Pin 16 A/B deck selecting switch control

Pin 16 is not set up interiorily through logic, but depending on the outside voltage input the changing procedure of voltage range exists as deck A or B. In order to delete the pop - noise which occurs at the time of A/B changing state, this transmission range is selected under the consideration of its design.
Even by delaying and reducing or creasing the pin 16s input voltage, the pop noise changes in sound can not be heard through our naked eye.

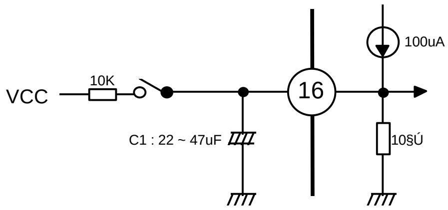


Fig 2 - 4

Note 2 : double input switch (Pin16) control voltage
The two step switch is Pin 16 which selects the A/B deck.
This control voltage is as Fig 2.6.
1. High mode's voltage is more than 2V which is more than sufficient. It is nice to have the low mode in 0.3 voltage or just open it as it is. When it isopened, Pin's voltage is almost zero and in turn results in low voltage.

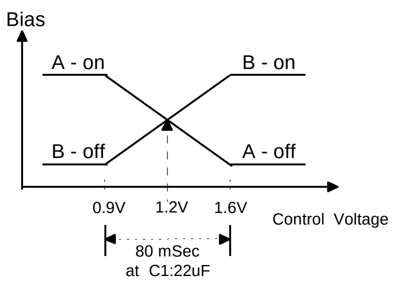


Fig 2 - 5

2. As seen in the Fig 2.6 graph, if 0 volts is inputted into DC direction under low condition, special blazing fire could result so it is wise to switch to low when using at open state or at pull down resistance state.

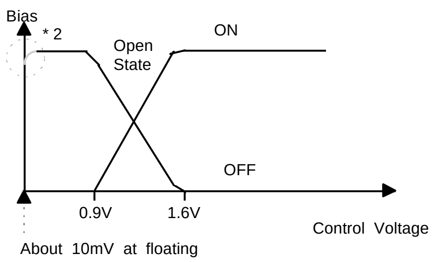


Fig 2 - 6

Note 3: Double input switch (Pin 18, Pin 19) controlled voltage
It is constructed into logic formation as different from A/B switch, and the input condition which applies to binary switch formation seem rather difficult. About the Low = 0.6 to 0.8 V should be inserted.
This under Pin 6 connects to Pin 18, Pin 19 with resisting value of 15§Ú. At open state, it becomes 0.7 Volt. High is more than 2 Volt.

3. Head Connection Method

3-1 Tape Head connecting method

By the virtue of NAB amplifier's input construction layout of this product, the input voltage bias is systemised to be supplied from an outside source and head's connection follow below constructed plan / layout's style.

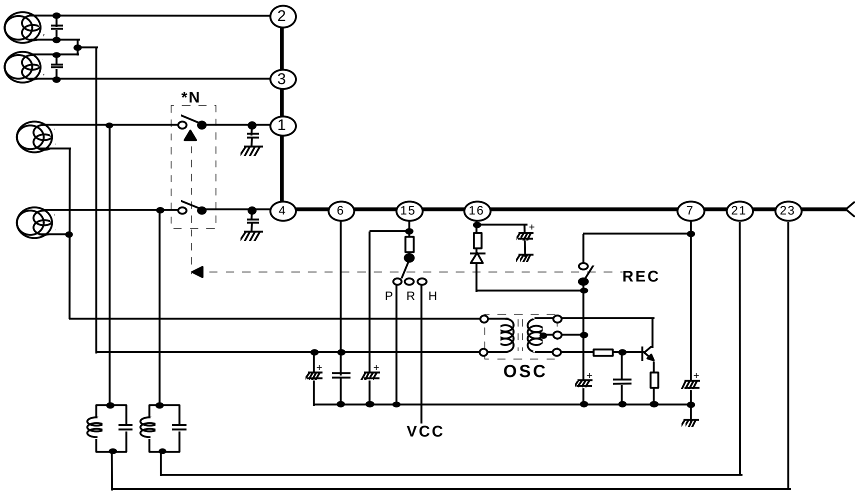


Fig 3 - 1

In employing record signal, the A/B switch input of pin 16 must be turned into B deck mode. (It only applies to the above situation). To suite the user's conviences A and B's extremeties are designed to be replaced. If the record OSC's ingredients exist in play back input, it will have damaging effect within the KA22296. That is why precautions are neccessary. And within recording output pin the ALC DET is internally connected, if recording AC bias appears in this terminal the ALC moves distortly, use the trap to make the recording output terminal bias as small as possible and choose the appropriate OSC frequency for the trap. Also at the play mode, since the recording terminals output D.C is bound by 2.1V and abandon it.
N : Use/ apply the above switch if OSC frequency find within record mode at the system for mation.

3 - 2. Head Input Circuit (FET switch)

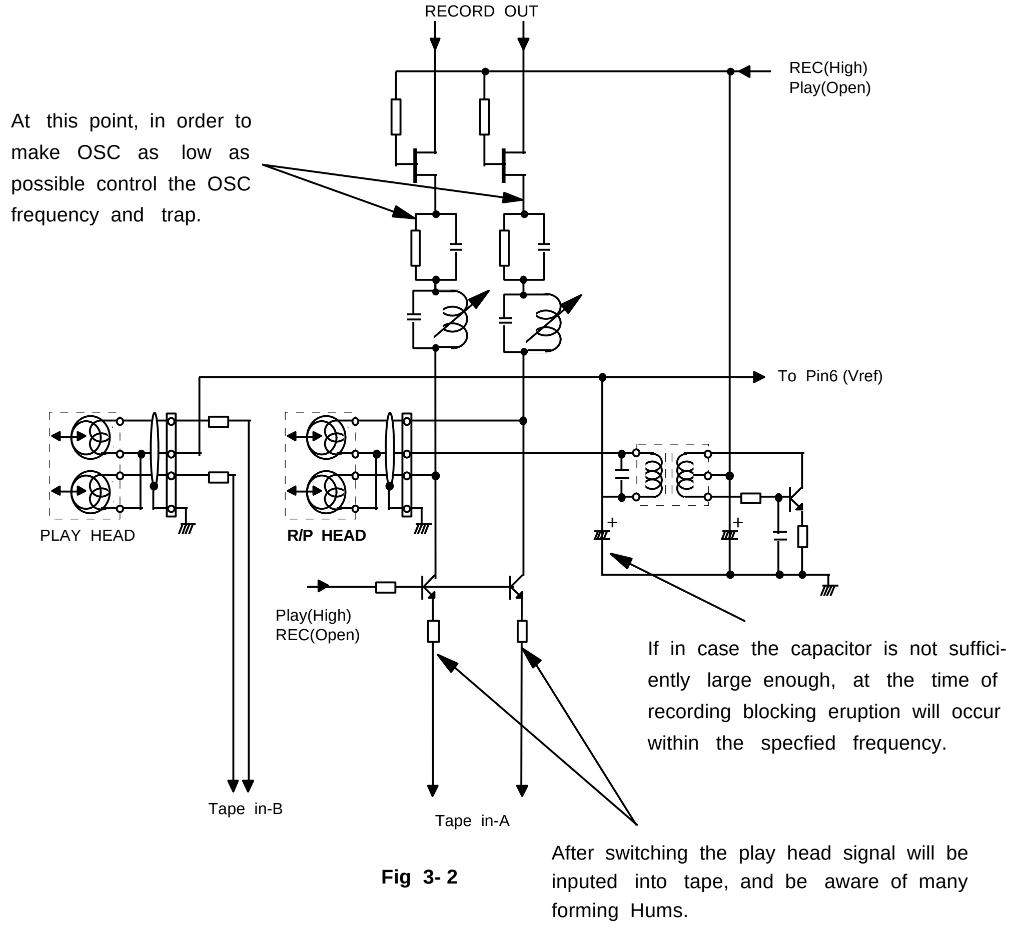


Fig 3- 2

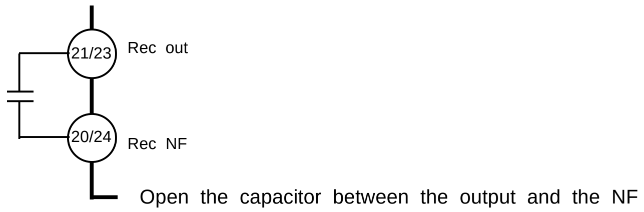


Fig 3- 3

4. Outside Input

This product is so designed to accomdate 3 types of outside input and 3 paired input terminals are also present too. It is possible to use each of them independently and their selection lies within the switch output condition of table 1,2. Under the condition of usage it is wise to be aware of situations since it could be inputed through reduction from outside. Take it as a reference when input impedance is reduced to approximately 30§Ú,especially the input dynamic range is 0.6Vrms.
The input monitor output gain is 6dB, and take it into an account that record output's gain is 26dB.

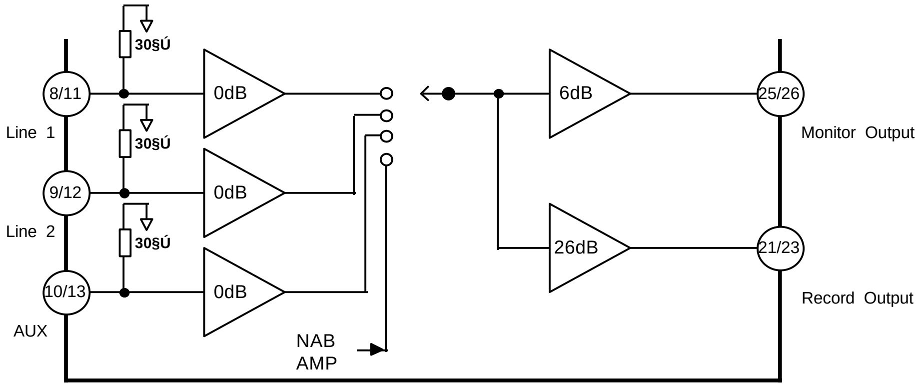


Fig 4 - 1

5. Mic Input

The MIC amplifier's advantage is 20dB. Attention MIC input signal level at MIC mixing mode or another input signal with mixing input signal can reduce because of ALC operating from excessing MIC input signal.

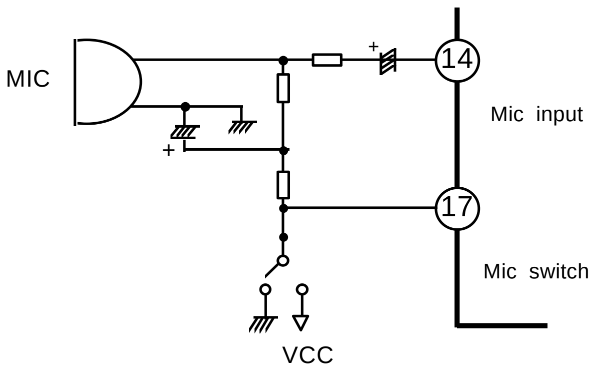


Fig 5 - 1

6. NAB CIRCUIT DESIGN

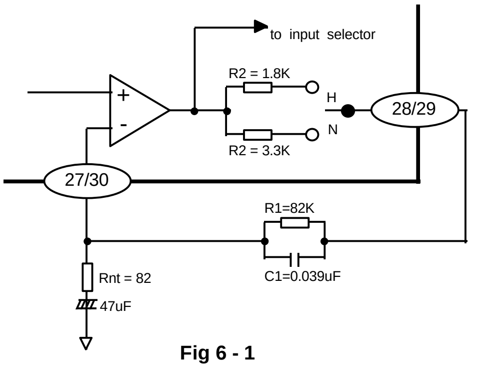


Fig 6 - 1

** Internal resistance R2's processor distribution is ¡¾ 20%.

NAB device is comprised of R1, R2, C1 and its impedance is as expressed and given.

$$Z = (R1 + R2)\,\frac{1 + j\,w\,C1\,\{R1\,R2 / (R1 + R2)\}}{1 + j\,w\,C1\,R1}$$

And

T1 = C1R1,

T2 = C1 (R1 // R2),

T1 = 3198mSec,

T2 = 123mSec (Nomal) ¡¾24mSec,

= 70mSec (High) ¡¾14mSec

Frequency gain can be esaily discovered as per given.

$$Gv = 20\log((Rnf + Z) / Rnf)$$

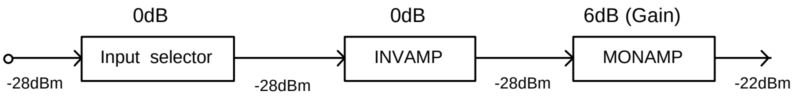
7. Etc

- At the time of High speed copying mode, the ALC will be off and actual recorded system is used while for normal speed it is recorded through ALC.
- Within the switch input, it is advisable to keep the voltage below 6V for security.
- It may consider the external peaking circuit for recording at high speed recording mode. The head switching is used as mechanical switch or FET switch for recording circuit.

8. AMP GAIN DIAGRAM OF EACH MODE

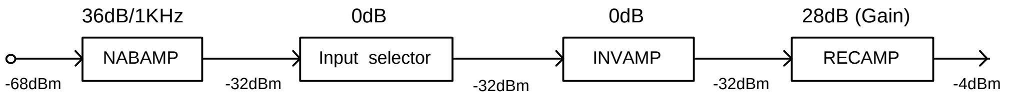
8 - 1. Tape Playback ¡æ Monitor output

8 - 2. EXT Playback ¡æ Monitor output

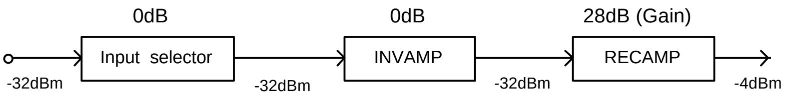


8 - 3. MIC Playback ¡æ Monitor output

8 - 4. Tape Playback ¡æRecord output

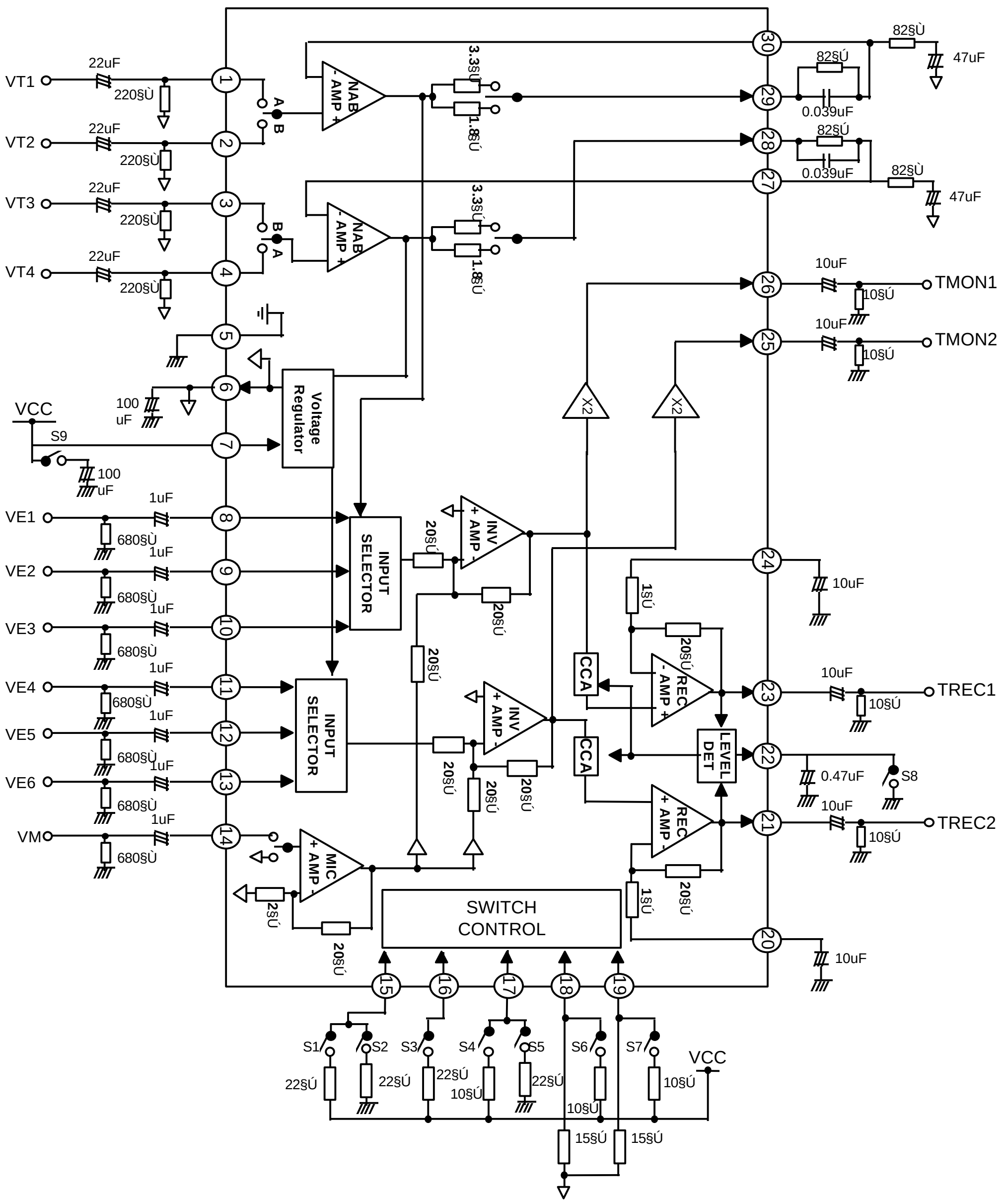


8 - 5. EXT Playback ¡æRecord output



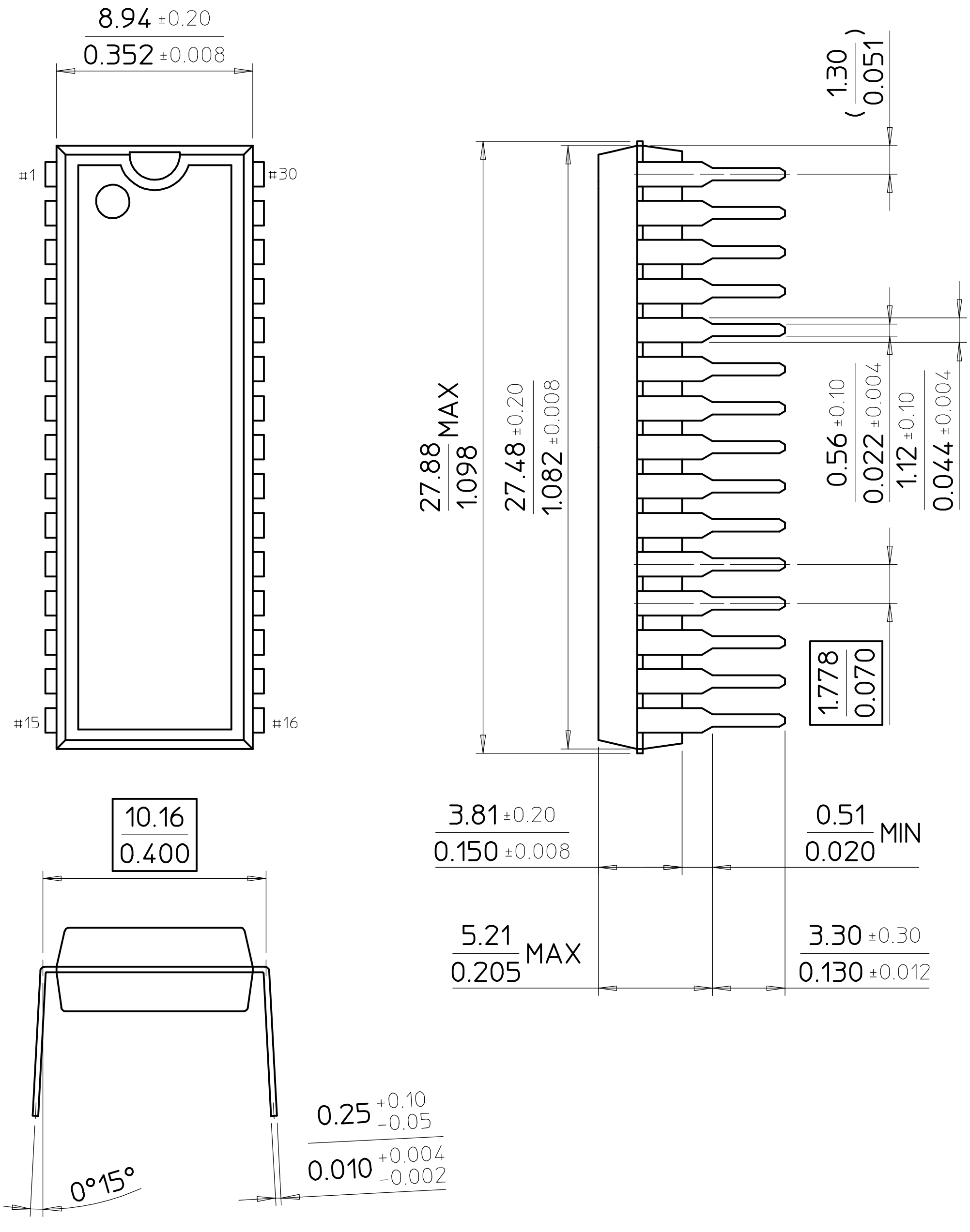
8 - 6. MIC Playback ¡æ Record output

9. TEST CIRCUIT



30-SDIP-400

Dimensions in Milimeters/inches



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