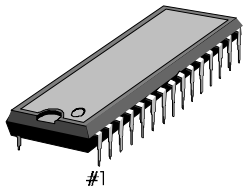
INTRODUCTION

The S1A0296X01 is a monolithic integrated circuit consisting of a dual input playback amplifier, 2-channel recording amplifier, outside input selecting switch, and MIC Amp.
The S1A0296X01 processes the MIC input mixing function, which makes it ideal for application in CD or radio casette tape players.

30–SDIP–400



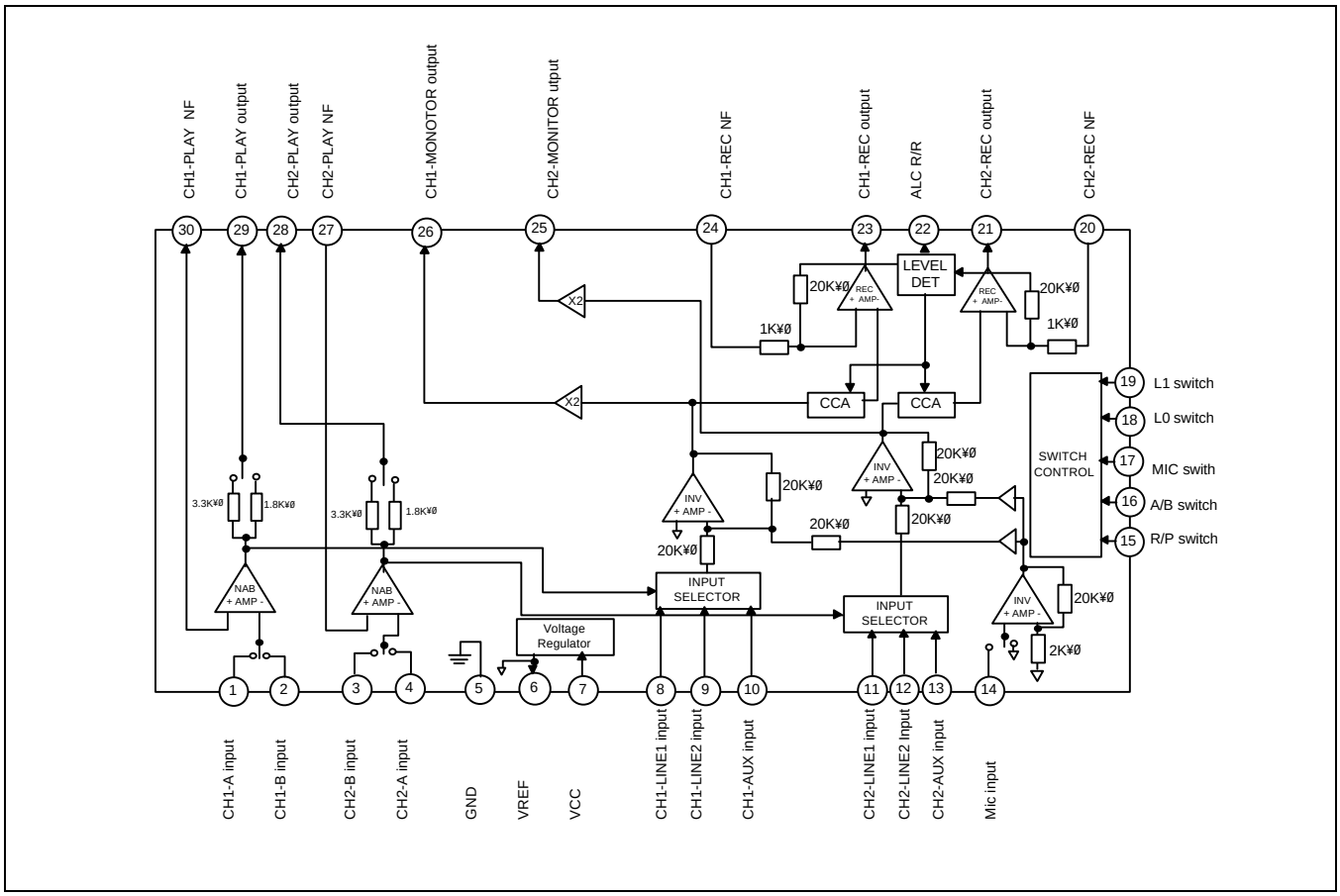
FEATURES

- Dual input 2-channel playback amplifier
- Recording / Playback function
- Tape dubbing function
- NAB EQ (60 us) 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 — 9V

ORDERING INFORMATION

Device	Package	Operating Temperature
S1A0296X01-A0B0	30–SDIP–400	–25°C – +75°C

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATING (Ta = 25°C)

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

ELECTRICAL CHARACTERISTICS

(V_{CC} = 6V, Ta = 25°C, f = 1kHz unless otherwise specified)

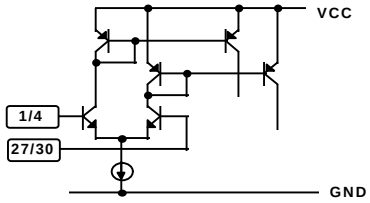
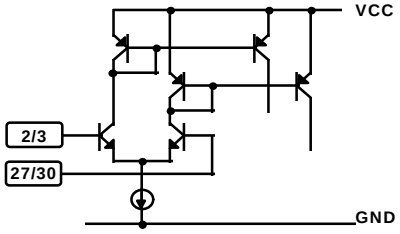
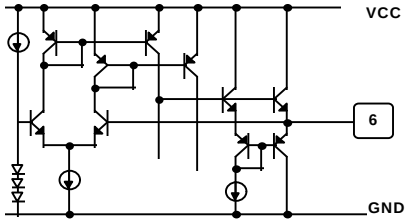
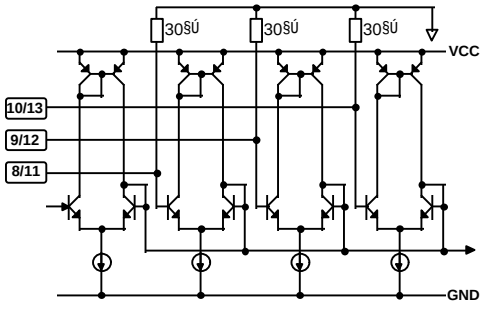
Characteristic			Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Quiescent Circuit Current			I_{CC}	A test mode, Vcc = 4V	7	12.5	20	mA
Reference Bias Voltage			Vref	–	1.7	2.1	2.4	V
Switch Control Voltage	R/P Pin 15		V_{SW1}	Play	Below 0.4V			
			V_{SW1}	REC	Open or 1.3V-1.9V			
			V_{SW1}	High speed REC	Above 3 V			
	A/B Pin 16		V_{SW1}	A - deck	Open or Below 0.5 V			
			V_{SW1}	B - deck	Above 2V			
	MIC Pin 17		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	$V_{OM}1$	THD = 1%	0.75	1	–	Vrms
		Output Noise Voltage	$V_{NO}1$	Rg = 600Ω, BW = 20-20kHz	–	35u	100u	Vrms
		Hormonic Distortion	THD1	V_O = 0.5Vrms BW = 20-20kHz	–	0.2	0.5	%
		Crosstalk Cross Talk	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 = 600Ω, BW = 20-20kHz	–	500u	750u	Vrms
		ALC Ouptut	VA1	Vin = 0.5Vrms	0.6	0.75	0.9	Vrms
		Harmanic Distortion	THD2	V_O = 0.5Vrms BW = 20-20kHz	–	0.3	1.0	%
		Crosstalk Cross Talk	CT2	V_O = 0.5Vrms BW = 400-20kHz	–	–65	–	dB
		Ripple Rejection	RR2	ripple = 0.1V/120Hz	–	–30	–	dB

ELECTRICAL CHARACTERISTICS (Continued)

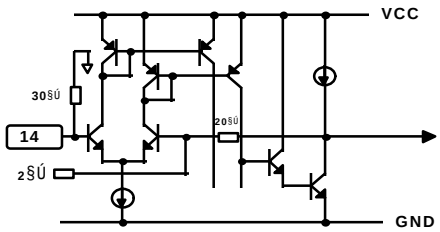
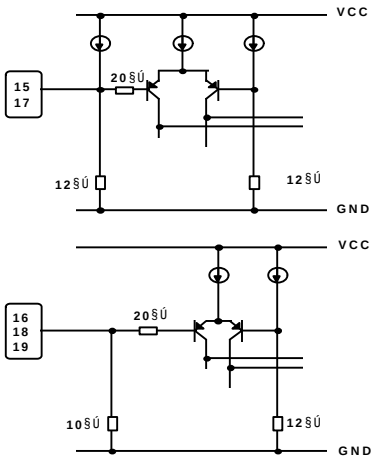
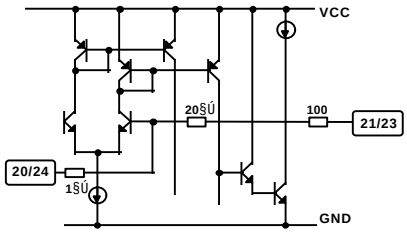
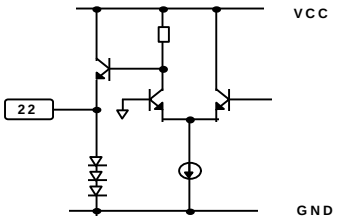
(V_{CC} = 6V, Ta = 25°C, f = 1kHz unless otherwise specified)

Characteristic			Symbol	Test Conditions	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 = 0.1 V/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 = 0.5rms 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 Cross Talk	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 Cross Talk	CT4	V_O = 0.5Vrms BW = 20-20kHz	–	–60	–	dB
		Ripple Rejection	RR6	ripple = 0.1V/120Hz	–	–17	–	dB

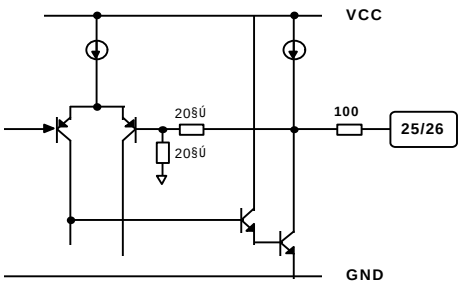
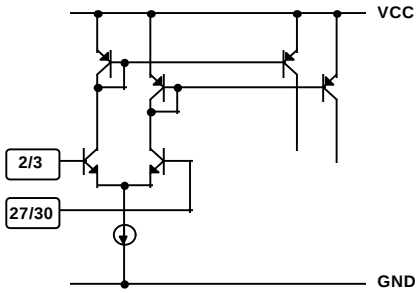
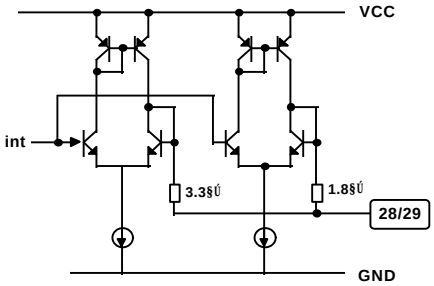
PIN DESCRIPTION

Pin No.	Symbol	I/O	Internal Equivalence 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	V_{CC}	Supply Voltage	–
8/11	LINE1 input	LINE1 External Input Terminal	
9/12	LINE2 input	LINE2 External Input Terminal	
10/3	AUX input	AUX External Input Terminal	

PIN DESCRIPTION (Continued)

Pin No.	Symbol	I/O	Internal Equivalence 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	
22	ALC R/R	Ripple Rejection terminal of ALC detecting output	

PIN DESCRIPTION (Continued)

Pin No.	Symbol	I/O	Internal Equivalence Circuit
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

Pin Function	LOW	Open	High	Remarks
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.

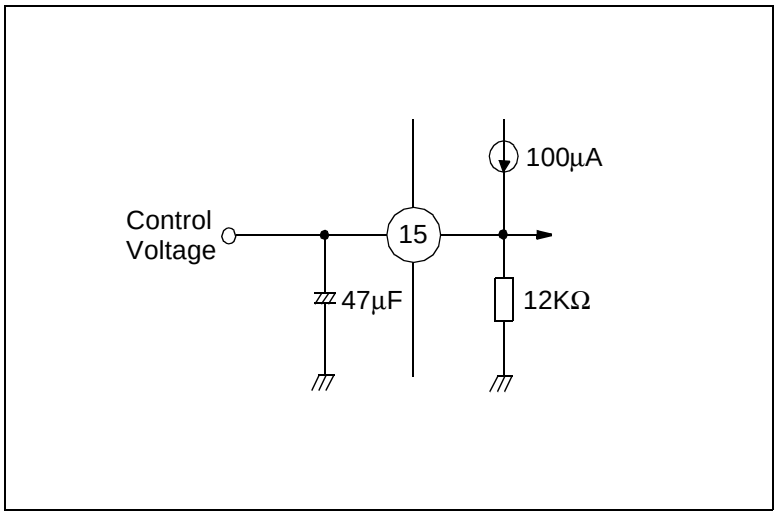
Function Condition	Pin 18	Pin 19	High	Remarks
Line 1	Open	High	In Mic only mode (pin 17 = open), all (line 1, line 2, AUX, Tape function) will be somewhat disabled. Refer to note 3 open condition.	
Line 2	High	Open		
Aux	High	High		
Tape	Open	Open		

- According to each mode, function selection basically moves due to the conditions of above table 1 and 2.
- Each function pin possesses characteristic representations of functions not in movement, in respect to its representing functions.
- By the virtue of each pin's combinations changing frequency, it is wise to set up or plan the circuit according to the input conditions of above Tables 1 and 2.

2. DESCRIPTION OF SWITCH FUNCTION

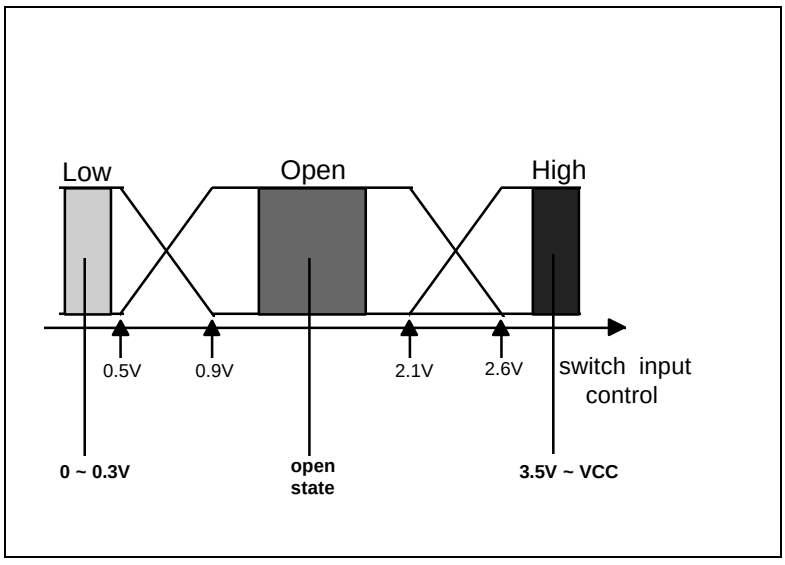
Controlling the selection switch of pin 15 play / record

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 doesnt matter if the attach switch is in play (low mode). Nevertheless, if open (record mode), it will turn to record stage and depending on it, the ALC circuit will function. When and after the source of electric power is approved, all of the circuits will become unstable and the results are unknown.
Sometime in the beginning, it is necessary to find a method to stop ALC movement for a set period of time, and is developed through using the original switch period.



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

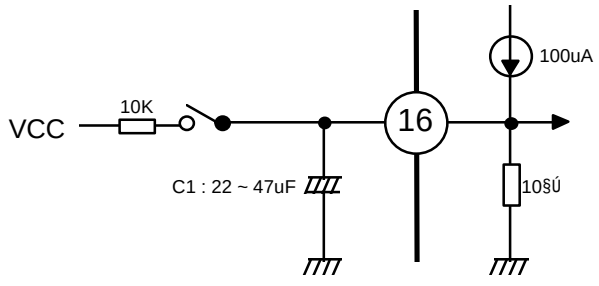
During of high speed recording, 3.5V of control voltage must be inflicted. But under this condition, it is wise to operate at high speed recording after delaying the time by connecting the resistance with the outside electrical series, or approve it first and then apply the procedure.

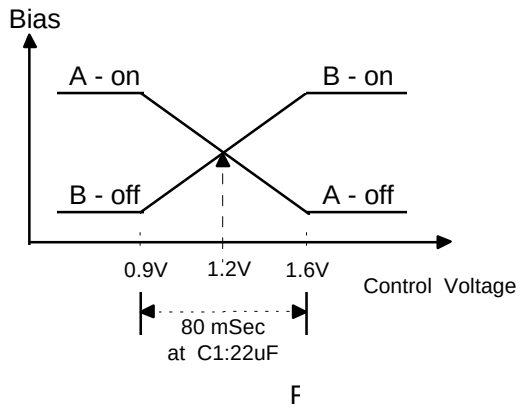


NOTE 1 : 3-step input switch-controlled voltage (Pin 15, 17).
In the 3-step switch recording system, Pin 15 which decides to play exists and Mic mode-deciding function P17 exists as well. Voltage in the high mode is more than enough. Low mode's voltage will be achieved if the voltage goes below 0.3 V.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

Pin 16 A/B deck selecting switch control

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





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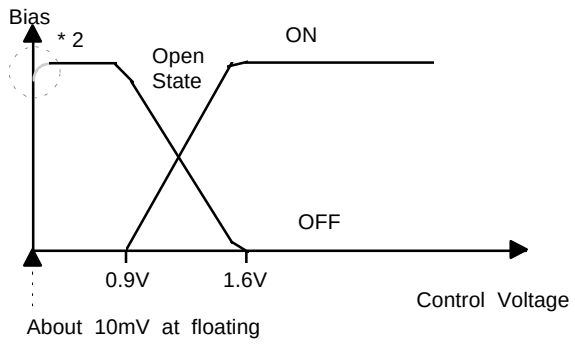


NOTE 2 : Double input switch (Pin16) control voltage
The 2-step switch is Pin 16 which selects the A/B deck.
This control voltage is as shown in Figure 4.
1. High mode's voltage is greater than 2 V, which is more than sufficient. It is nice to have the low mode in 0.3 V or just open it as it is. When it is opened, the Pin's voltage is almost zero and in turn results in low voltage.

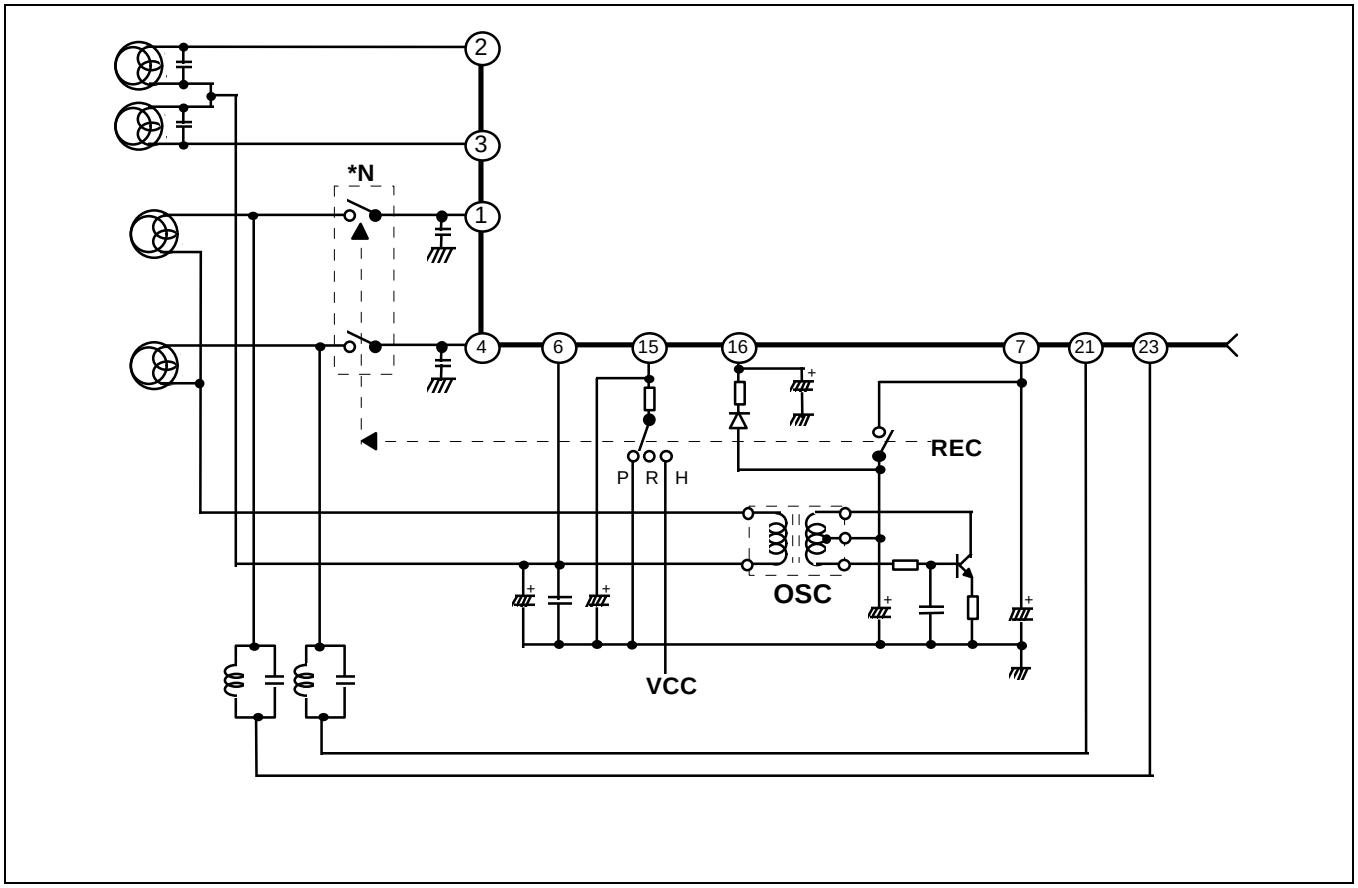
2. As seen in Figure 4 graph, if 0 V is input into DC direction under low condition, special blazing fire could result, so it is wise to switch to low when using at open state or at pull down resistance state.

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

3. HEAD CONNECTION METHOD

Tape Head connecting method

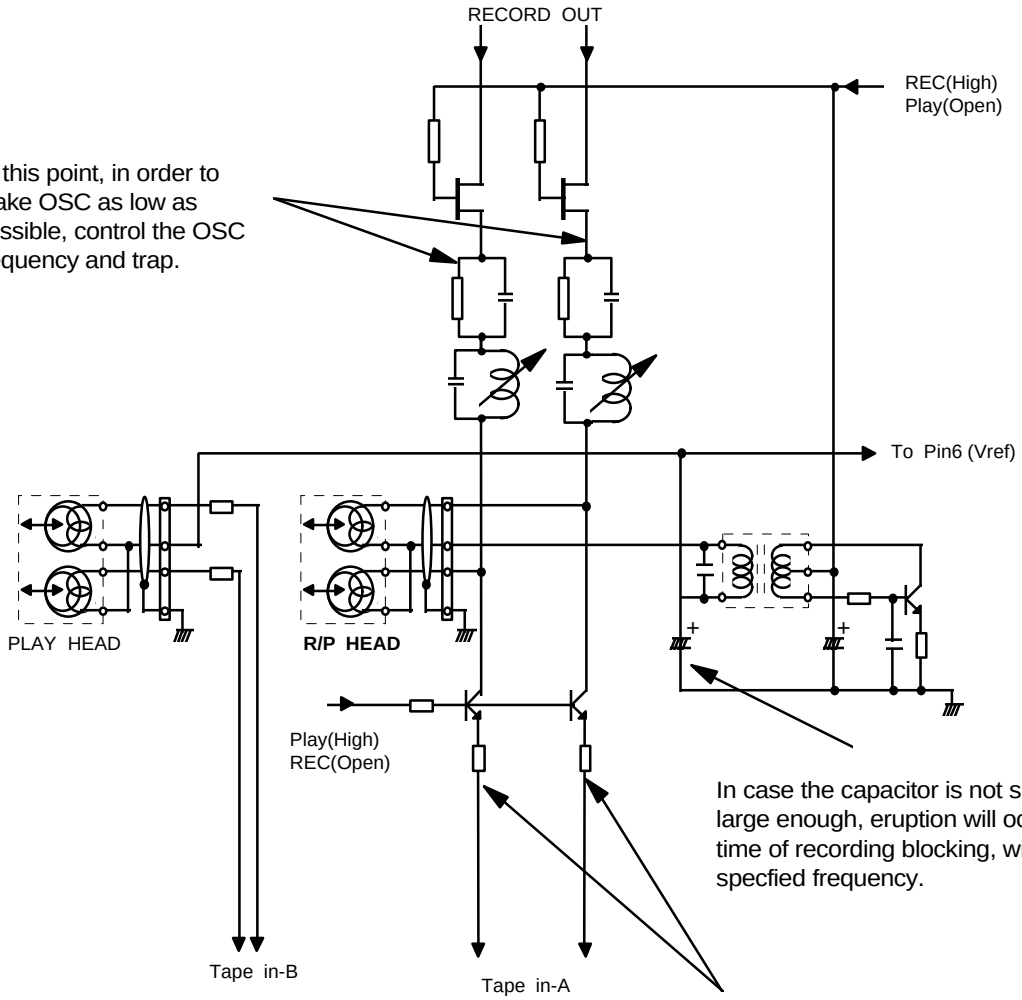
By the virtue of NAB amplifiers input construction layout of this product, the input voltage bias is systemized to be supplied from an outside source and head connection follows the constructed plan/layouts style shown below.

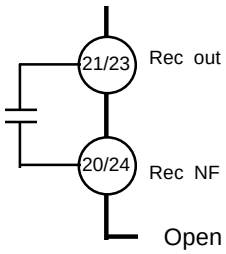


In employing the record signal, the A/B switch input of pin 16 must be turned into B deck mode(It only applies to the above situation). For your conviences A and Bs extremetie are designed to be replaced. If the record OSCs ingredients exist in playback input, it will have damaging effect within the S1A0296X01. That is why precautions are neccessary. And within the recording output pin the ALC DET is internally connected. If recording AC bias appears in this terminal, the ALC moves in a distorted manner. 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 play mode, since the recording terminals output D.C is bound by 2.1V and abandon it.

NOTE: Use/apply theabove switch if OSC frequency find within record mode at the system for mation.

Head Input Circuit (FET switch)

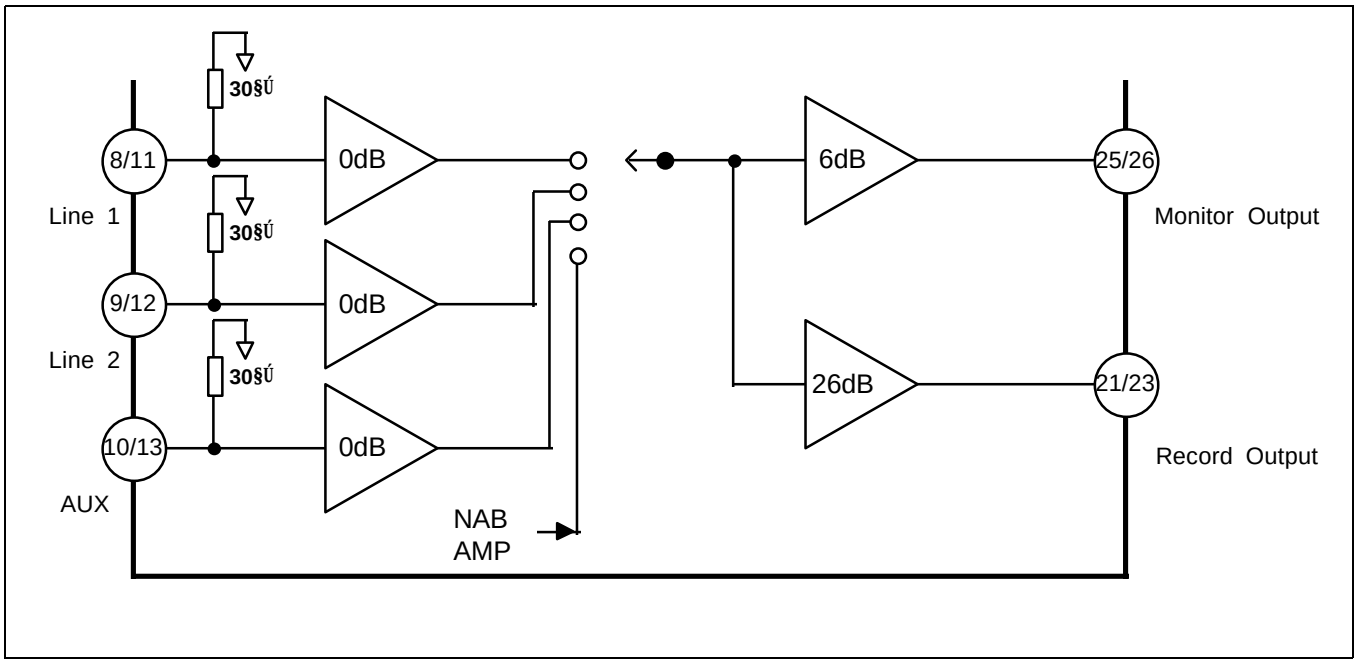




Open the capacitor between the output and the NF

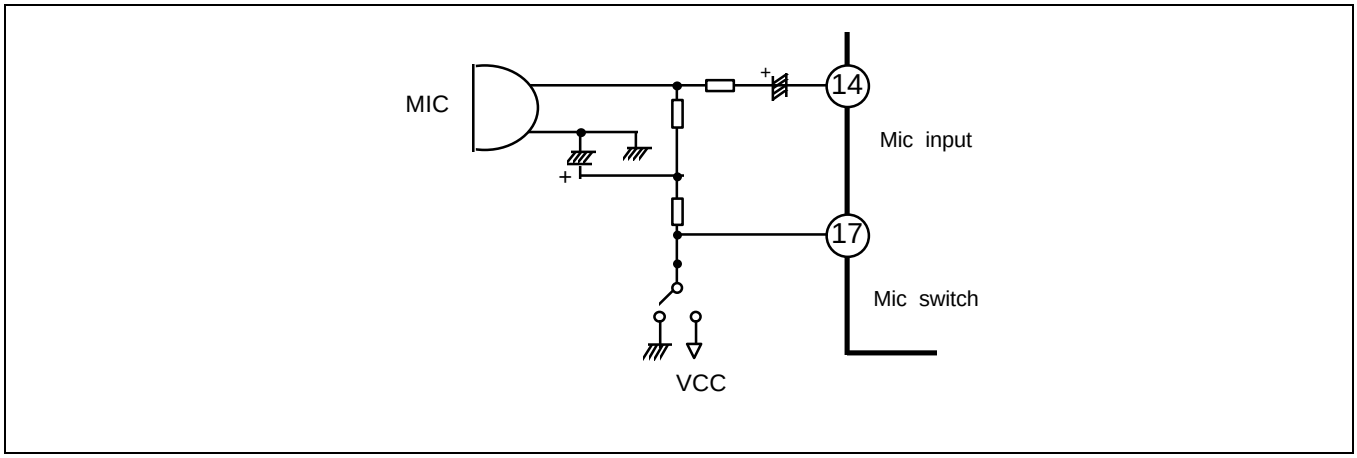
4. OUTSIDE INPUT

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

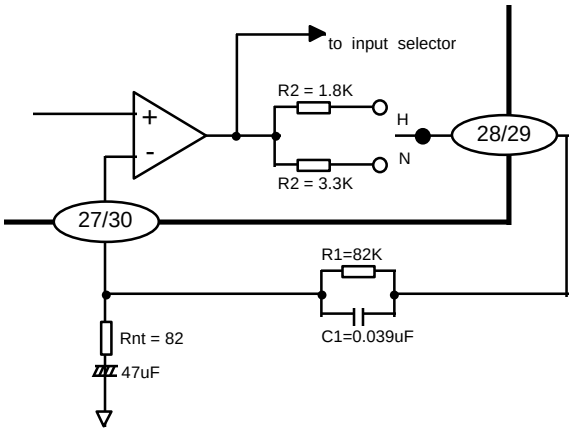


5. MIC INPUT

The MIC amplifiers advantage is 20 dB. Attention MIC input signal level at MIC mixing mode or another input signal with mixing input signal can be reduce becaused of ALC operating from accessing MIC input signal.



6. NAB CIRCUIT DESIGN



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

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

And

T1 = C1R1,

T2 = C1 (R1//R2),

T1 = 3198µsec

T2 = 123µsec(normal) ± 24µsec,

= 70µsec(high) ±14µsec

NOTE: Internal resistance R2's processor distribution is ± 20%

Frequency gain cab be easily discovered as given.

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

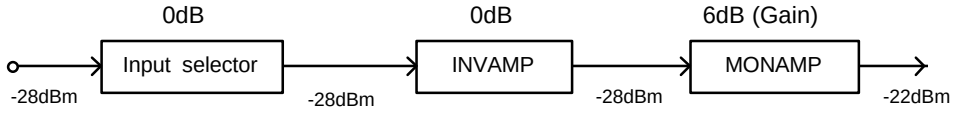
7. ETC

When in High speed copying mode, the ALC will be off and the 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.

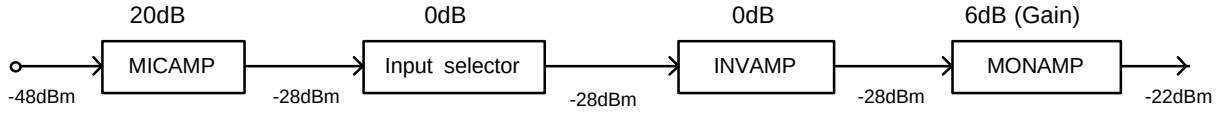
8. AMP GAIN DIAGRAM OF EACH MODE

8 - 1. Tape Playback ¡æ Monitor output

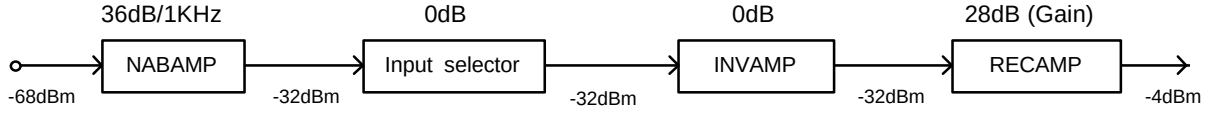
8 - 2. EXT Playback ¡æ Monitor output



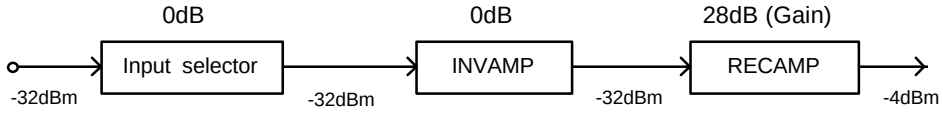
8 - 3. MIC Playback ¡æ Monitor output



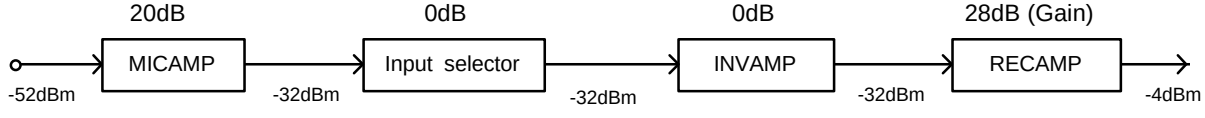
8 - 4. Tape Playback ¡æ Record output



8 - 5. EXT Playback ¡æ Record output



8 - 6. MIC Playback ¡æ Record output



TEST CIRCUIT