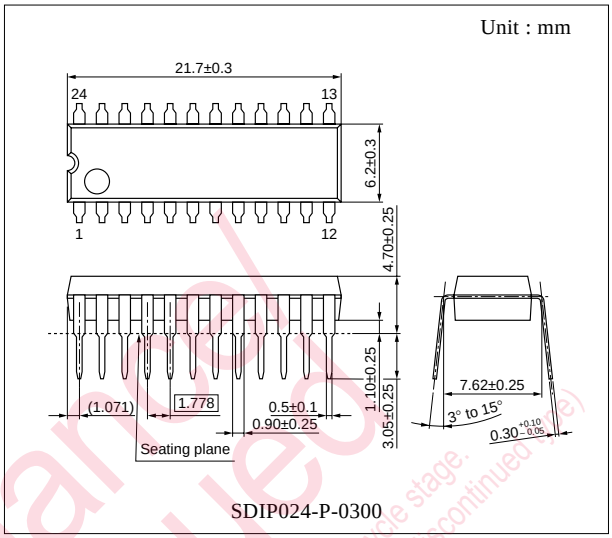
AN7348K

Dual Record/Playback Pre-Amplifier IC for Double Cassette

■ Overview

The AN7348K is a monolithic integrated circuit designed for double cassette recorder. It has dual channel PB/Rec. amplifier with ALC function. Tape A (PB only) and Tape B (PB/Rec.) select, Normal/Chrome select, Normal/High speed dubbing select and Rec./PB selection are easily controlled by 4pins. It requires no external FET switches at PB amp. input and Rec. amp. output. External components are also minimized. In addition, this IC has low susceptibility to EMC.



SDIP024-P-0300

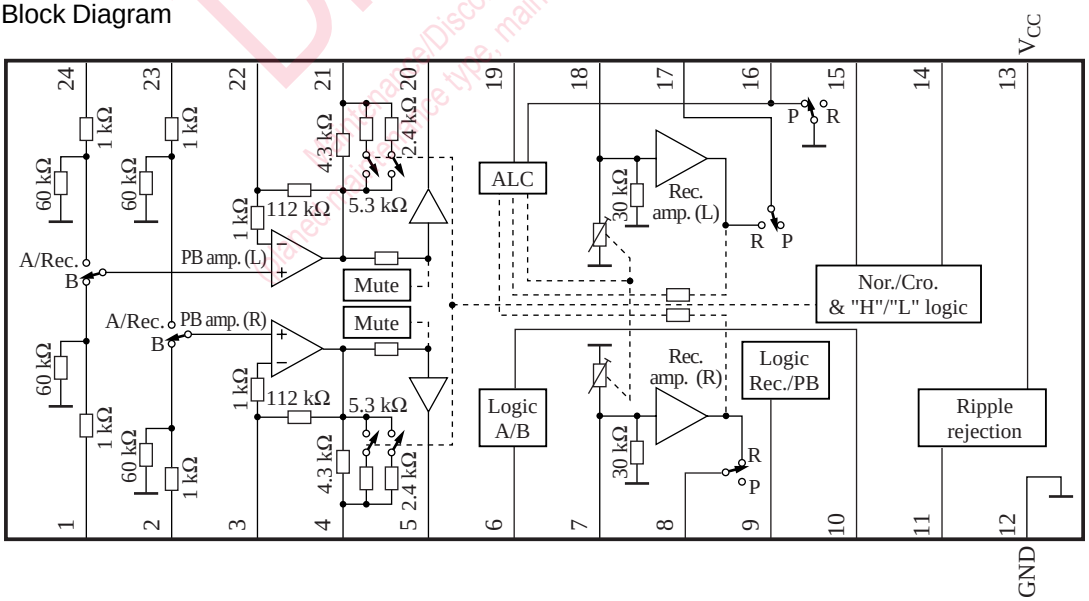
■ Features

- Built-in Normal/Chrome equalizier for PB amplifier
- Built-in Normal/High speed equalization for PB amplifier
- Built-in Tape A/B switching
- Built-in Rec./PB select
- ALC function for recording
- Wide operating supply voltage range : V_{CC} = 3.6 V to 12 V
- Can connect IC directly to tape head. No external FET switches are required
- Minimum switching noise

■ Applications

- Double cassette recorder

■ Block Diagram



■ Pin Descriptions

Pin No.	Description	Pin No.	Description
1	L-ch. playback amp. input (B)	13	V_{CC}
2	R-ch. playback amp. input (B)	14	Chrome/Normal
3	R-ch. playback negative feedback	15	"H"/"L"
4	R-ch. playback equalization	16	ALC τ
5	R-ch. playback amp. output	17	L-ch. rec. output
6	AB switch τ	18	L-ch. rec. input
7	R-ch. rec. input	19	ALC low cut
8	R-ch. rec. output	20	L-ch. playback amp. output
9	Rec./Playback switch	21	L-ch. playback equalization
10	AB switch	22	L-ch. playback negative feedback
11	Ripple filter	23	R-ch. playback amp. input (A)
12	GND	24	L-ch. playback amp. input (A)

■ Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Supply voltage	V_{CC}	12.4	V
Supply current	I_{CC}	40	mA
Power dissipation	P_D	500	mW
Operating ambient temperature	T_{opr}	−20 to +75	°C
Storage temperature	T_{stg}	−55 to +150	°C

■ Recommended Operating Range

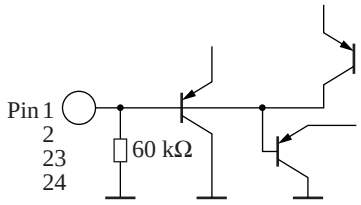
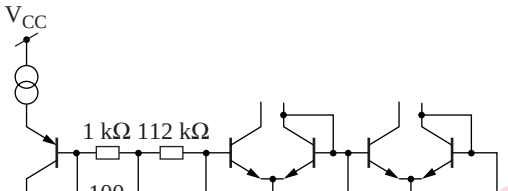
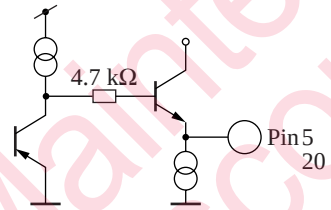
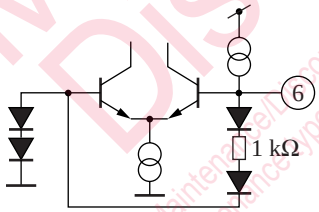
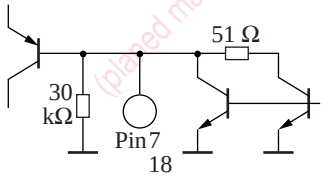
Parameter	Symbol	Range	Unit
Supply voltage	V_{CC}	3.6 to 12.0	V

■ Electrical Characteristics at V_{CC} = 5 V, T_a = 25 °C

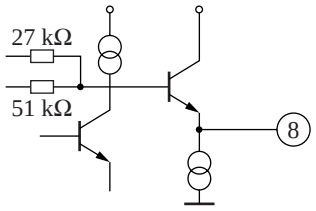
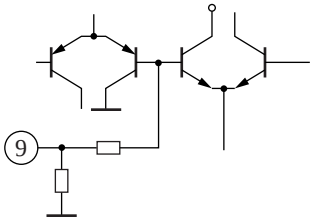
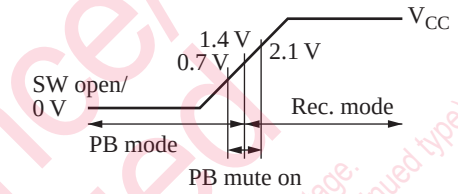
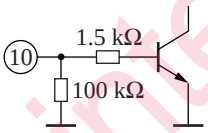
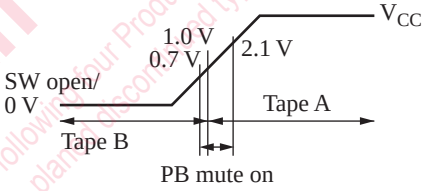
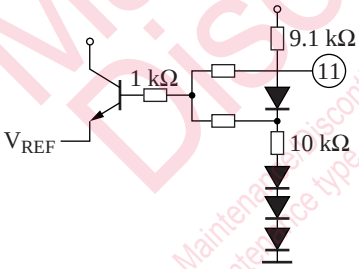
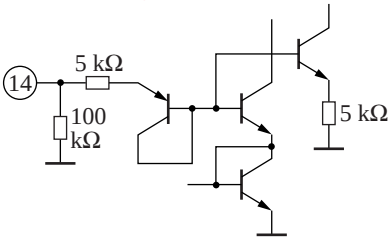
Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Quiescent circuit current (Rec.)	I_{CQrec}	V_{IN} = 0 V	12.0	18	24	mA
Playback amplifier						
Close loop gain	$G_{VC(P)}$	V_{IN} = 5.6 mV_{rms}	40	42.5	45	dB
Open loop gain	$G_{VO(P)}$	V_{IN} = 89 μV_{rms}	75	81	—	dB
Input noise	$V_{ni(p)}$	R_G = 2.2 kΩ, D_{IN}/Audio, V_{IN} = V_{NO}/G_{VC}	—	1.8	2.5	μV
Total harmonic distortion	$THD_{(P)}$	V_O = 1 V_{rms} , BPF	—	0.05	0.1	%
Max. output voltage	$V_{O(P)}$	THD = 3 %, BPF	1.4	1.7	—	V[rms]
Channel balance	$CB_{(P)}$	V_{IN} = 5.6 mV_{rms}	−1.5	0	1.5	dB
Channel crosstalk	$CT_{C(P)}$	V_{IN} = 5.6 mV_{rms} , R_G = 2.2 kΩ, D_{IN}/Audio	55	65	—	dB
Source crosstalk	$CT_{S(P)}$	V_{IN} = 5.6 mV_{rms} , R_G = 2.2 kΩ, D_{IN}/Audio	55	65	—	dB
Playback EQ						
120 μs/70 μs Δgain *1	ΔG_{vc1}	V_{IN} = 10 mV_{rms} , f = 10 kHz	4	4.6	5.2	dB
1x/2x Dubbing Δgain *2	ΔG_{vc2}	V_{IN} = 22 mV_{rms} , f = 10 kHz	4	4.6	5.2	dB
Record amplifier ALC off						
Output noise voltage	$V_{no(R)}$	R_G = 1.0 kΩ, D_{IN} audio	—	220	550	μV
Closed loop gain	$G_{VC(R)}$	V_{IN} = 12 mV_{rms}	35.5	38.5	42	dB
Total harmonic distortion	$THD_{(R)}$	V_O = 1.0 V_{rms} , BPF	—	0.05	0.17	%
Max. output voltage	$V_{O(R)}$	THD = 3 %, BPF	1.4	1.8	—	V
Channel crosstalk	$CT_{C(R)}$	V_{IN} = 8 mV_{rms} , R_G = 1.0 kΩ, D_{IN} Audio	55	66	—	dB
ALC (2-ch input) ALC on						
ALC voltage	V_{ALC}	R_{EXT} = 5.6 kΩ, Dual i/p, V_{IN} = 12 mV_{rms}	0.75	1.0	1.37	V[rms]
ALC range	W_{ALC}	R_{EXT} = 5.6 kΩ, from V_{IN} = 10 mV to V_O = +3 dB	35	51	—	dB
ALC channel balance	$CB_{(ALC)}$	R_{EXT} = 5.6 kΩ, V_{IN} = 12 mV_{rms}	−2	0	2	dB
Playback mode						
PB to rec. crosstalk *3	$CT_{R/P}$	V_{IN} = 12 mV_{rms} at rec. i/p, measure at rec. o/p	70	88	—	dB

Note) *1 : ΔG_{vc1} = (G_{vc} at 120 μs) − (G_{vc} at 70 μs)
*2 : ΔG_{vc2} = (G_{vc} at 1x) − (G_{vc} at 2x)
*3 : $CT_{R/P}$ = 20 log (V_O(PB mode) / V_O(Rec.mode))

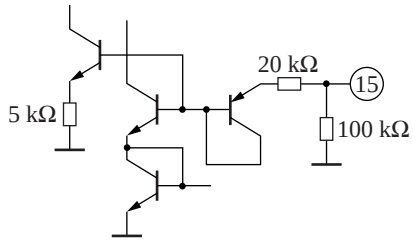
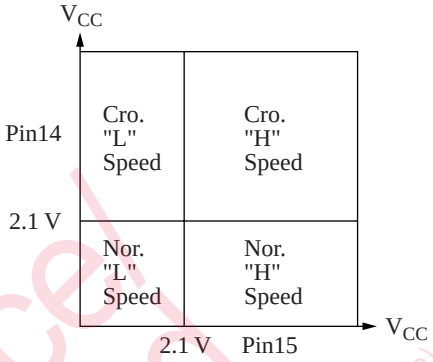
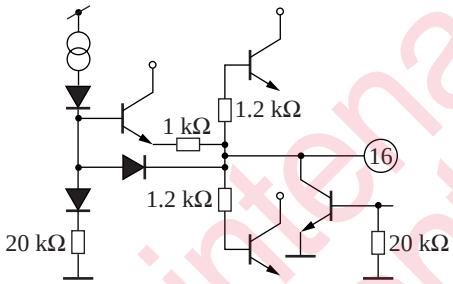
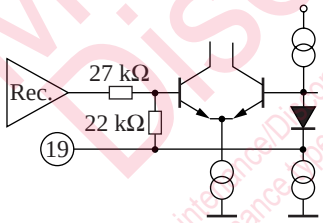
■ Terminal Equivalent Circuit

Pin No.	Equivalent circuit	Description
1 2		Pin1 ; L-ch. playback amp. input (B) Pin2 ; R-ch. playback amp. input (B) : Playback amp. input Input impedance = 61 kΩ Pin1, 2, 23 & 24 = 0 V (PB mode) Pin1, 2 = 2.1 V (Rec. mode) Pin23, 24 = 0 V (Rec. mode)
3		R-ch. playback negative feedback : Playback amp. feedback loop DC = 0.7 V
4		R-ch. playback equalization : Playback equalization for both Normal/Chrome and "H"/"L" dubbing
5		R-ch. playback amp. output : Low output impedance
6		AB switch τ : Determines the tape A/B switching time constant with an external capacitor DC : 2.8 V (Pin10 high) DC : 0.0 V (Pin10 open)
7		R-ch. rec. input : Rec. amp. input pin Input impedance = 30 kΩ

■ Terminal Equivalent Circuit (continued)

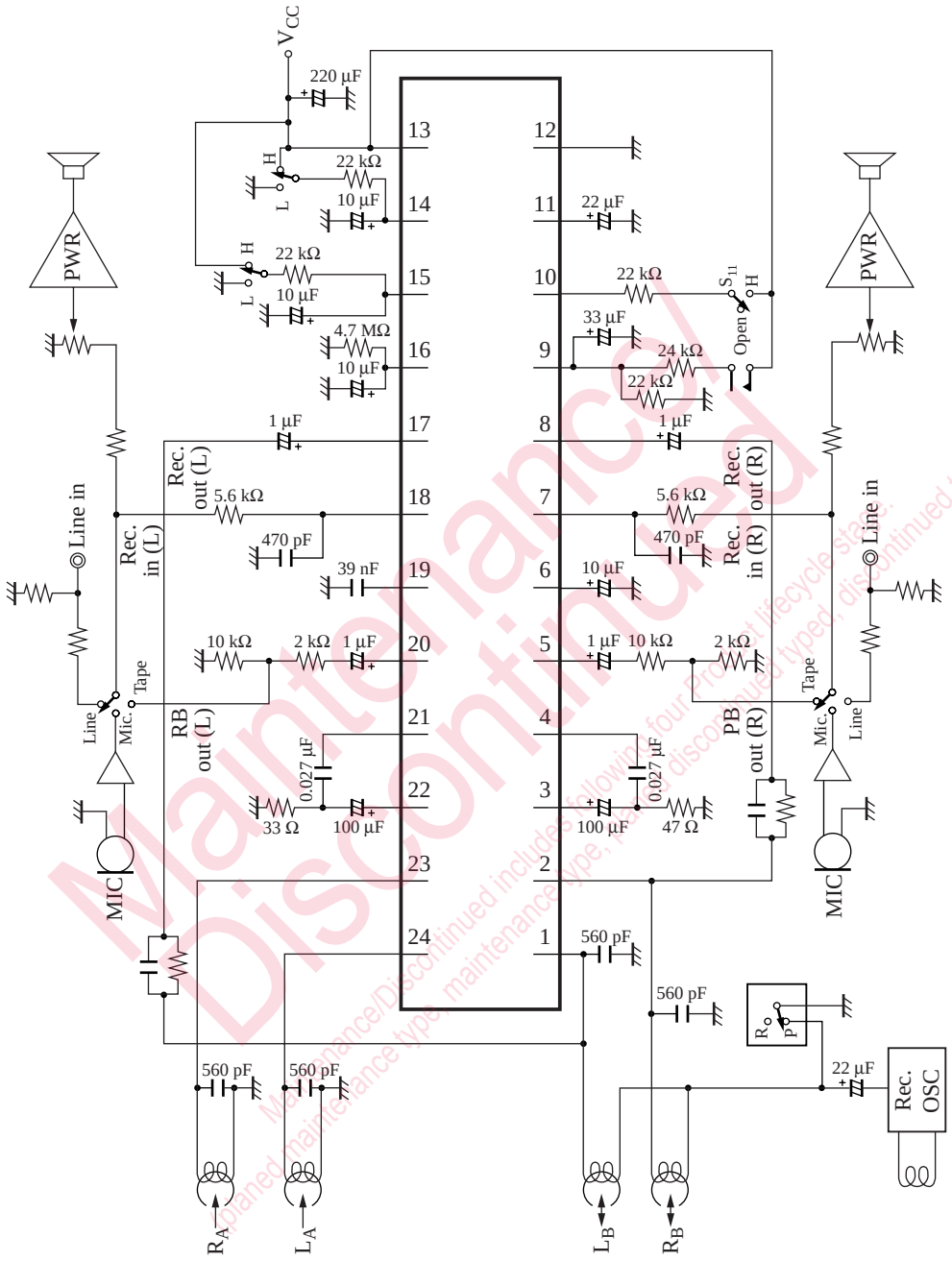
Pin No.	Equivalent circuit	Description
8		R-ch. rec. output : Rec. amp. output pin DC = V_{REF}, Z_{OUT} = Low (Pin9 high) DC = V, Z_{OUT} = High (Pin9 open)
9		Rec./Playback switch : Select rec. or playback mode 0.7 V > Threshold > 2.1 V 
10		AB switch : To select Tape A or Tape B 0.7 V > Threshold > 2.1 V 
11		Ripple filter : Connect with a capacitor to minimize ripple from V_{CC} DC = 4.4 V (V_{CC} = 6 V)
12	—	GND
13	—	V_{CC}
14		Chrome/Normal : Input to control playback EQ for Chrome or Normal tape

■ Terminal Equivalent Circuit (continued)

Pin No.	Equivalent circuit	Description
15		"H"/"L" : Input to control playback EQ for high & low dubbing 
16		ALC τ : Controls the attack and release time of ALC DC = 1.4 V → Rec. mode DC = 0 V → Playback mode
17	Refer to Pin8	L-ch. rec. output : Refer to Pin8
18	Refer to Pin7	L-ch. rec. input : Refer to Pin7
19		ALC low cut : ALC comparator circuit reference voltage
20	Refer to Pin5	L-ch. playback amp. output : Refer to Pin5
21	Refer to Pin4	L-ch. playback equalization : Refer to Pin4
22	Refer to Pin3	L-ch. playback negative feedback : Refer to Pin3
23	Refer to Pin1	R-ch. playback amp. input (A) : Refer to Pin1
24	Refer to Pin1	L-ch. playback amp. input (A) : Refer to Pin1

■ Application Circuit Example

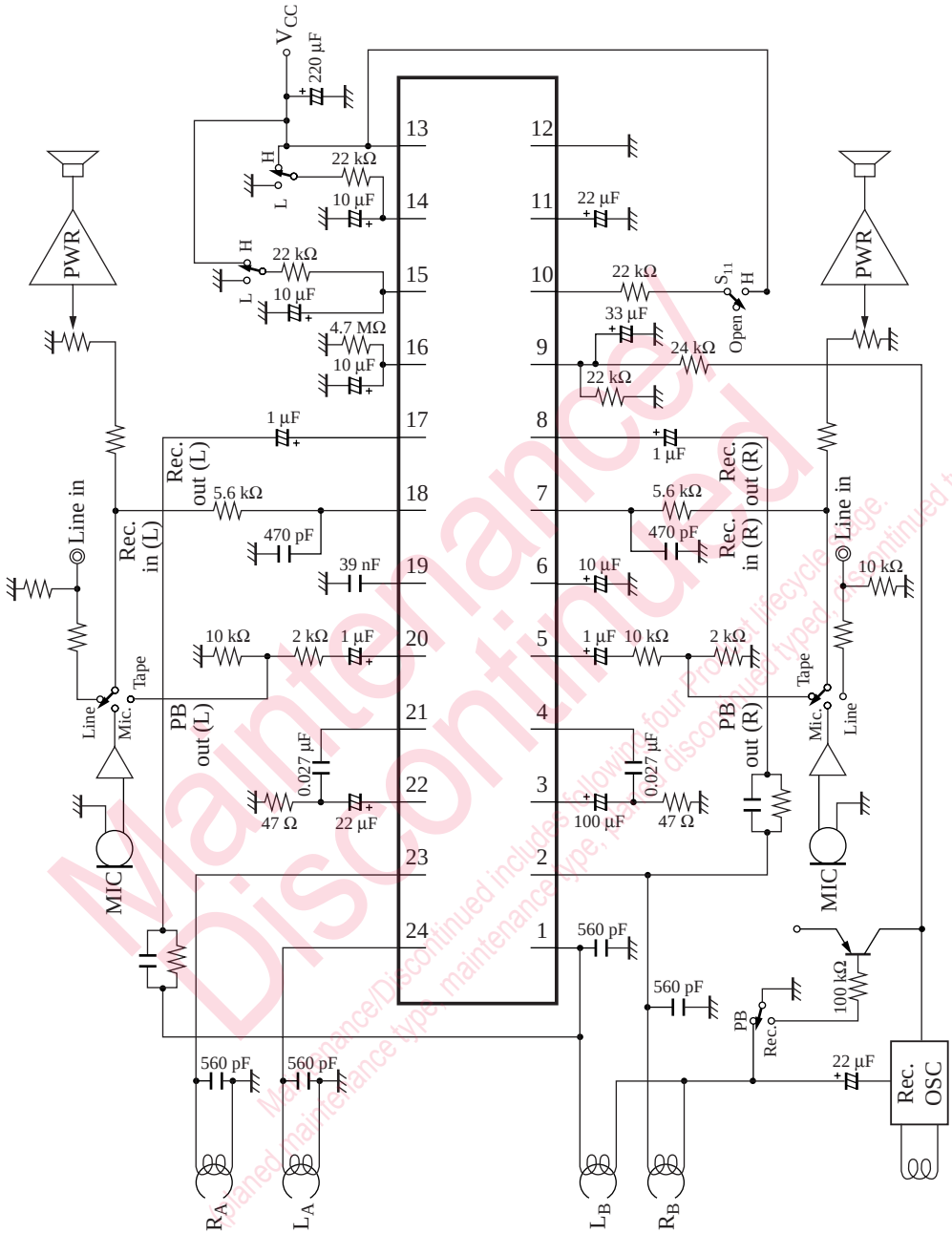
• Application Circuit(1)-Logic deck



Logic \ Pin	A/B (Pin10)	Rec./PB (Pin9)	Nor./Cro.(Pin14)	"H"/"L" (Pin15)
High	Tape A	Rec.	Chrome	2 x speed
Open	Tape B	PB	Normal	1 x speed
Low	Tape B	PB	Normal	1 x speed

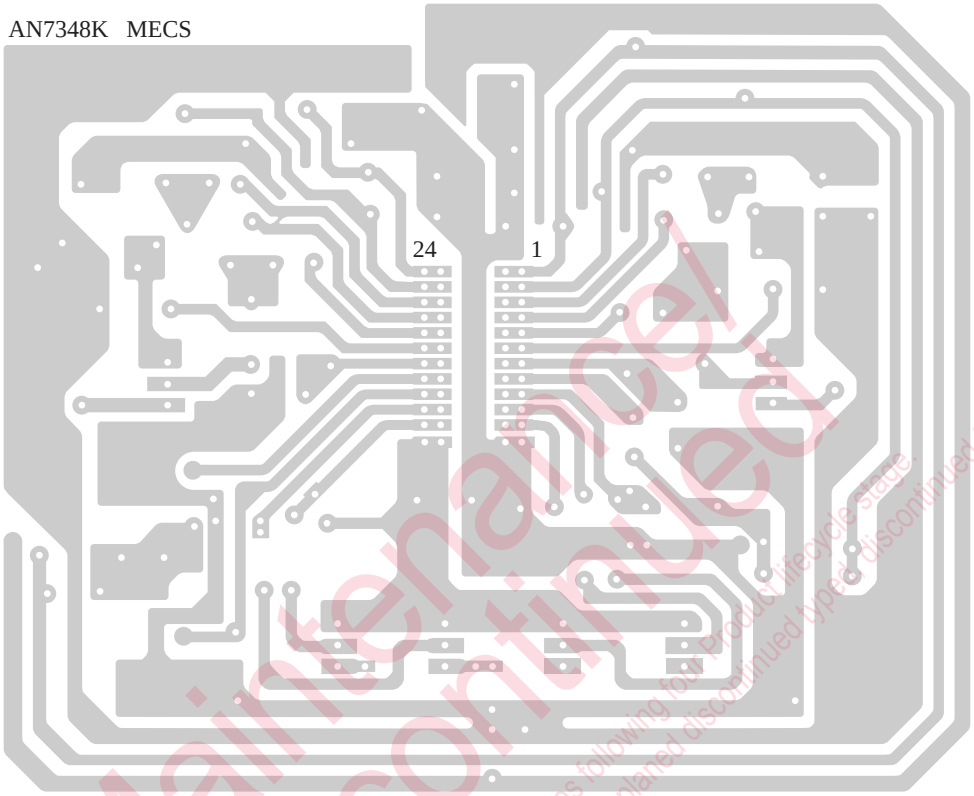
■ Application Circuit Example (continued)

• Application Circuit(2)-Logic deck



Logic \ Pin	A/B (Pin10)	Rec./PB (Pin9)	Nor./Cro.(Pin14)	"H"/"L" (Pin15)
High	Tape A	Rec.	Chrome	2 x speed
Open	Tape B	PB	Normal	1 x speed
Low	Tape B	PB	Normal	1 x speed

■ Printed Circuit Board Layout (Scale 1 : 1)

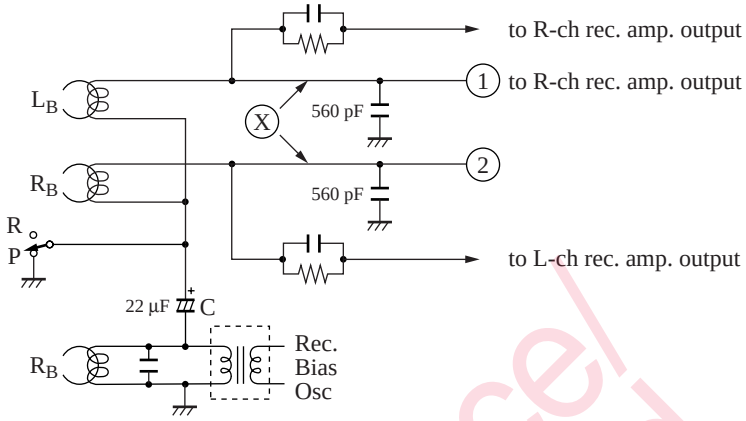


(Bottom view)

■ Technical Information

• Supplementary Explanation

1) Recording mode

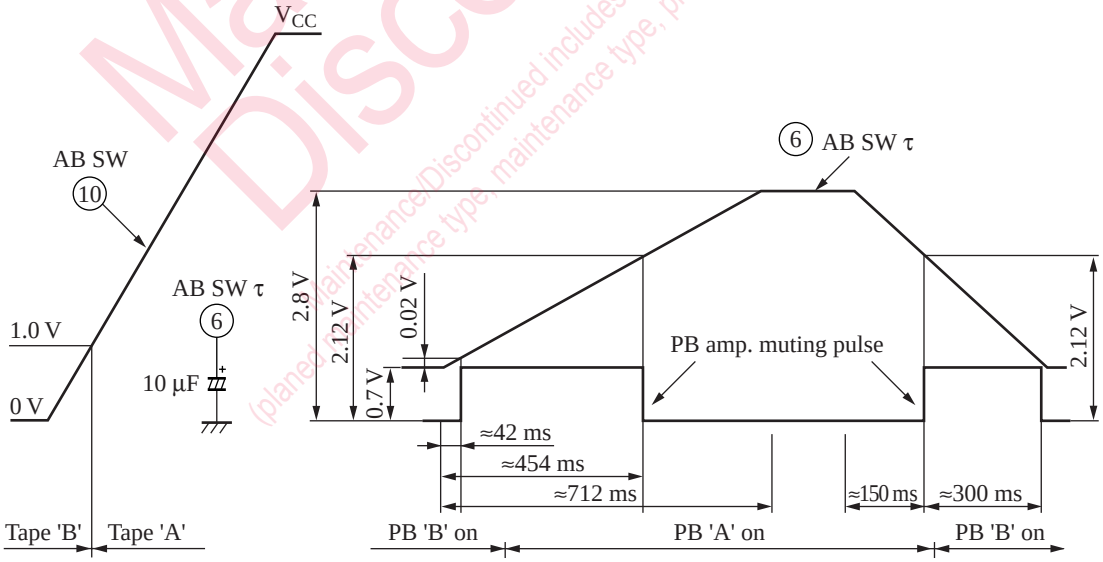


During dubbing mode, SW1 will be in rec. position and point X will be biased at 2.1 V internally (V_{CC} = 6 V). This is to ensure enough dynamic swing for the recording signal. Capacitor C is therefore necessary to couple the dc bias at point X to rec. bias oscillator. When in playback mode, point X will return to 0 V and SW1 is switched to PB position. Capacitor C should be chosen carefully to avoid degradation of the rec. bias Osc. signal & recording signal. The recommended value is 22 µF.

2) ALC detector

The ALC circuit will be cut off during playback mode. This is achieved internally in the IC by shorting pin16 to ground. By chosing different values of R, C combination at pin16, the ALC attack and release time can be varied.

3) A/B switch muting

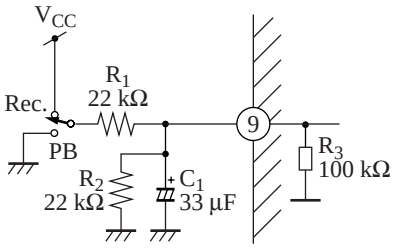


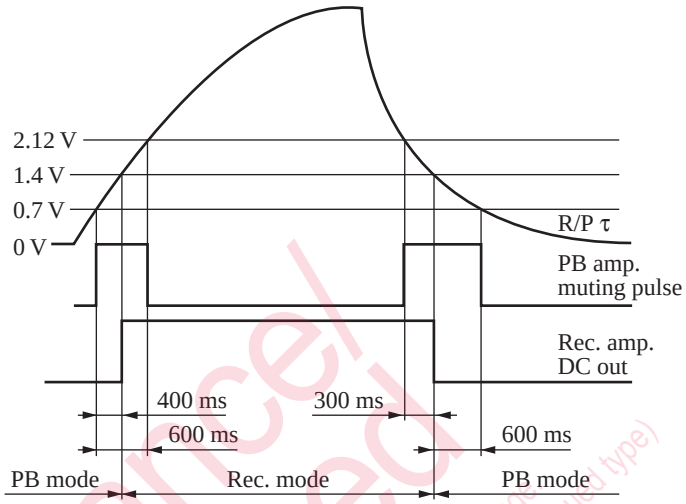
■ Technical Information (continued)

- Supplementary Explanation (continued)

4) R/PB switching muting

(A/B SW = 'B' mode)



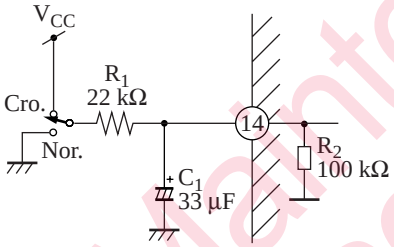


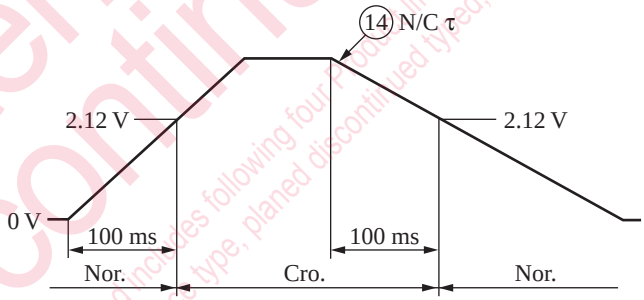
Charging $\tau \approx R_1 \times C_1$

Discharging $\tau \approx (R_2 // R_3) \times C_1$

0.7 V > Threshold voltage > 2.1 V

5) Nor./Cro. switching

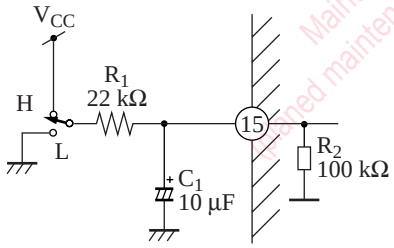


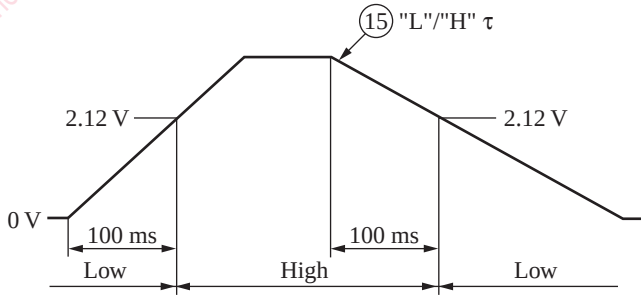


Charging $\tau \approx R_1 \times C_1$

Discharging $\tau \approx (R_1 // R_2) \times C_1$

6) Low/High dubbing switching





Charging $\tau \approx R_1 \times C_1$

Discharging $\tau \approx (R_1 // R_2) \times C_1$

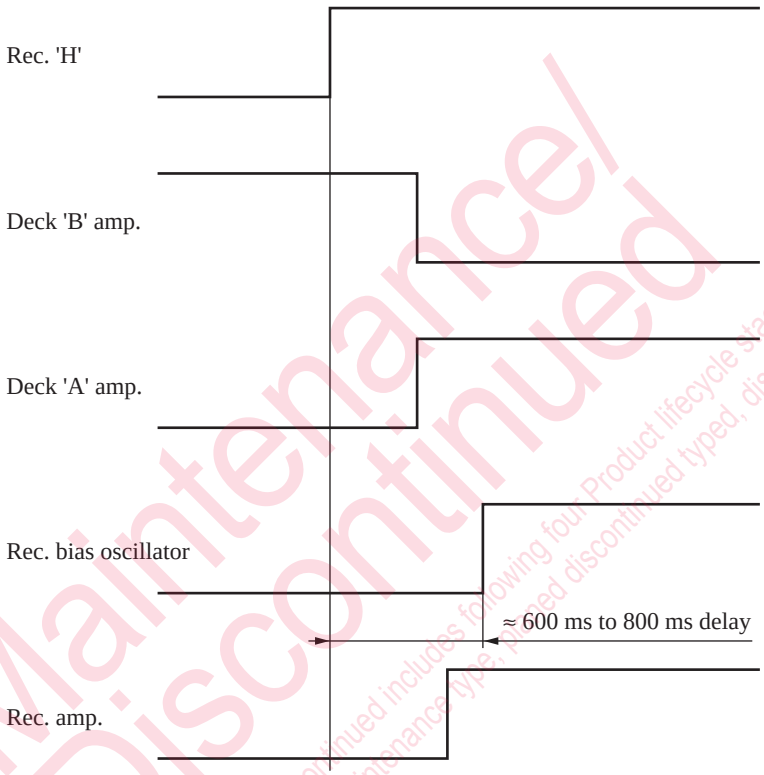
■ Technical Information (continued)

- Supplementary Explanation (continued)

7) Rec. 'H' switching

When the Rec./PB switch (Pin9) is switched to record mode, the pre-amp. will switch from deck 'B' to deak 'A' mode (if the AB SW, Pin10 is low). The pre-amp. switching τ is govern by the capacitor at Pin6.

Therefore it is necessary to delay the turning on time of the record bias oscillator circuit. This is to prevent any switching noise from the oscillator circuit from leaking through the 'B' amp. during the initial switching period. The preferable switching sequence is shown below.



8) PCB layout for pre-amp. INPUTs.

To prevent oscillation, the input paths for Pin1 & 2 should avoid crossing or running next to the input paths for Pin23 & 24. This will also ensure minimun source leakage especially during record mode.

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