

AN7348K

Dual Record/Playback Pre-Amplifier IC for Double Cassette

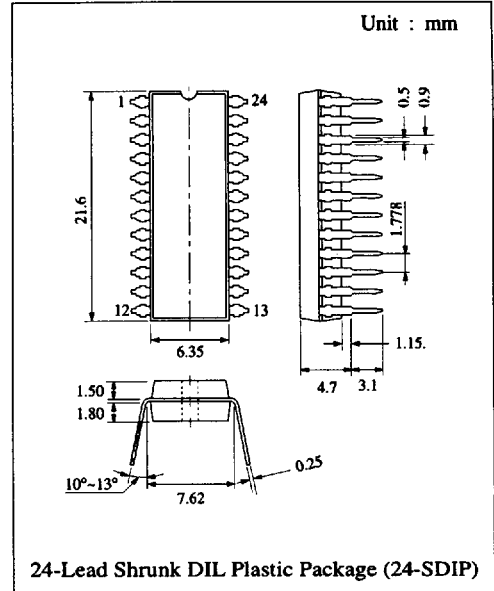
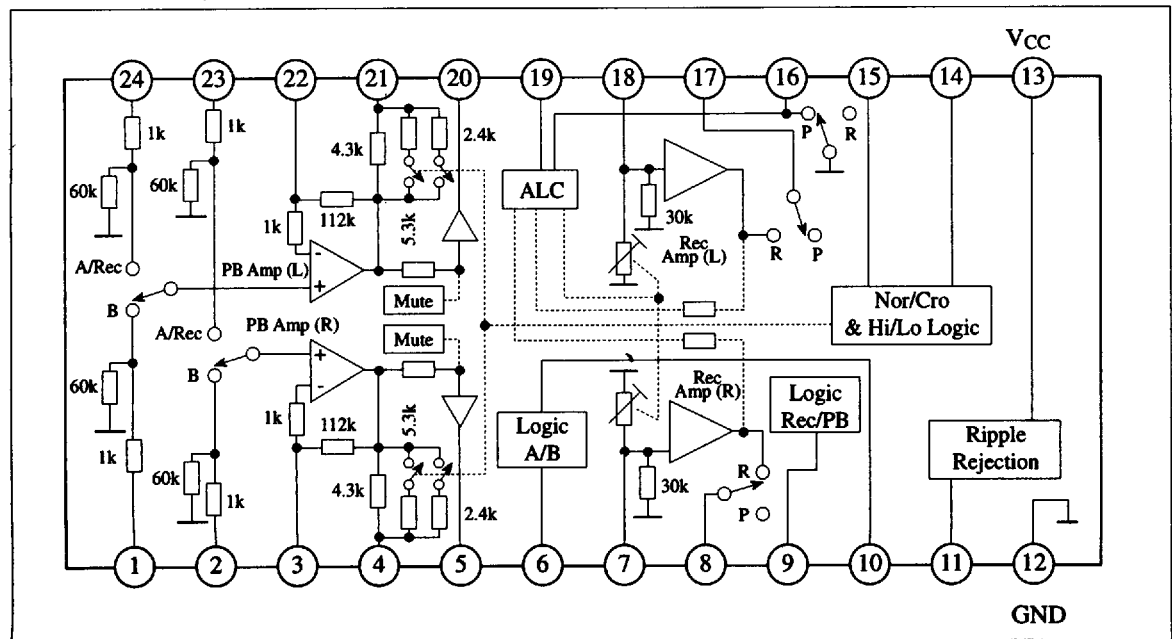
■ Description

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 4 pins. 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.

■ Features

- Built-in Normal / Chrome equalizer 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 :
Vcc = 3.6V ~ 12V
- Can connect IC directly to tape head. No external FET switches is required
- Minimum switching noise.

■ Block Diagram



■ Absolute Maximum Ratings (Ta=25°C)

| Item | 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 ~ +75 | °C |
| Storage Temperature | T _{stg} | -55 ~ +150 | °C |

Operating Supply Voltage Range: V_{CC} = 3.6V ~ 12.0V

■ Electrical Characteristics (V_{CC}=5V, Ta=25°C)

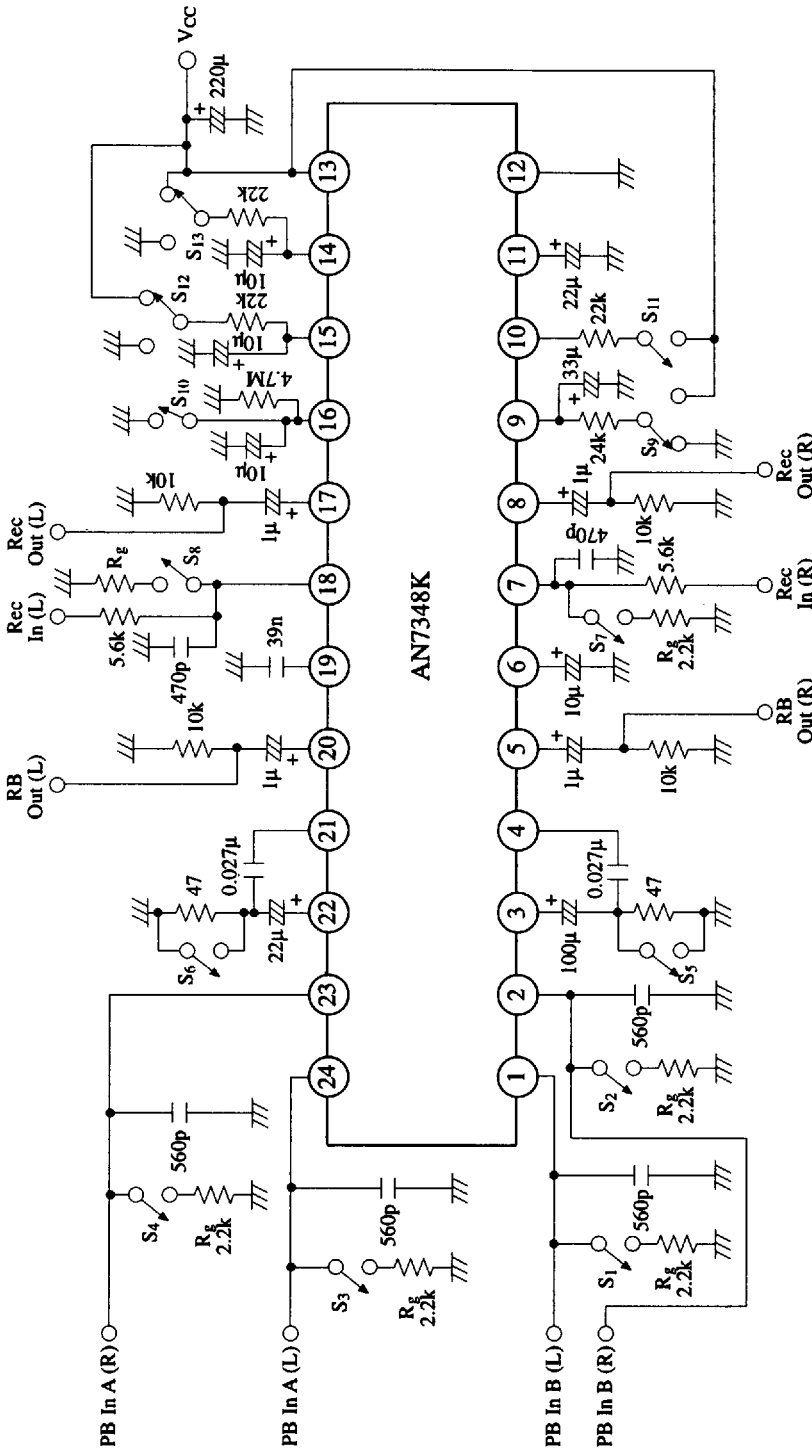
| Item | Symbol | Condition | min. | typ. | max. | Unit |
|-------------------------------------|---------------------|--|------|------|------|------|
| Quiescent Circuit Current (REC) | I _{CQrec} | V _{in} = 0V | 12.0 | 18 | 24 | mA |
| Playback Amplifier | | | | | | |
| Close Loop Gain | G _{VC(P)} | V _{in} = 5.6mVrms | 40 | 42.5 | 45 | dB |
| Open-Loop Gain | G _{VO(P)} | V _{in} = 89μVrms | 75 | 81 | | dB |
| Input Noise | V _{ni(P)} | R _g = 2.2kΩ, DIN/AUDIO, V _{in} = V _{no} / G _{VC} | | 1.8 | 2.5 | μV |
| Total Harmonic Distortion | THD _(P) | V _O = 1Vrms, BPF | | 0.05 | 0.1 | % |
| Max. Output Voltage | V _{O(P)} | THD = 3%, BPF | 1.4 | 1.7 | | Vrms |
| Channel Balance | CB _(P) | V _{in} = 5.6mVrms | -1.5 | 0 | 1.5 | dB |
| Channel Crosstalk | CT _{C(P)} | V _{in} = 5.6mVrms, R _g = 2.2kΩ, DIN/AUDIO | 55 | 65 | | dB |
| Source Crosstalk | CT _{S(P)} | V _{in} = 5.6mVrms, R _g = 2.2kΩ, DIN/AUDIO | 55 | 65 | | dB |
| Playback EQ | | | | | | |
| 120μs / 70μs ΔGain*1 | ΔG _{vc1} | V _{in} =10mVrms, f=10kHz | 4 | 4.6 | 5.2 | dB |
| 1x / 2x Dubbing ΔGain*2 | ΔG _{vc2} | V _{in} =22mVrms, f=10kHz | 4 | 4.6 | 5.2 | dB |
| Record Amplifier ALC OFF | | | | | | |
| Output Noise Voltage | V _{no(R)} | R _g =1.0kΩ, DIN Audio | | 220 | 550 | μV |
| Closed-Loop Gain | G _{VC(R)} | V _{in} =12mVrms | 35.5 | 38.5 | 42 | dB |
| Total Harmonic Distortion | THD _(R) | V _O =1.0Vrms, 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} =8mVrms, R _g =1.0kΩ, Din Audio | 55 | 66 | | dB |
| ALC (2 Channel Input) ALC ON | | | | | | |
| ALC Voltage | V _{ALC} | R _{ext} =5.6kΩ, Dual i/p, V _{in} =12mVrms | 0.75 | 1.0 | 1.37 | Vrms |
| ALC Range | W _{ALC} | R _{ext} =5.6kΩ, from V _{in} =10mV to V _O =+3dB | 35 | 51 | | dB |
| ALC Channel Balance | CB _(ALC) | R _{ext} =5.6kΩ, V _{in} =12mVrms | -2 | 0 | 2 | dB |
| Playback Mode | | | | | | |
| PB to Rec Crosstalk*3 | CT _{R/P} | V _{in} =12mVrms at Rec i/p, measure at Rec o/p | 70 | 88 | | dB |

Note : *1 ΔG_{vc1} = (G_{vc} at 120μs) - (G_{vc} at 70μs)

*2 ΔG_{vc2} = (G_{vc} at 1x) - (G_{vc} at 2x)

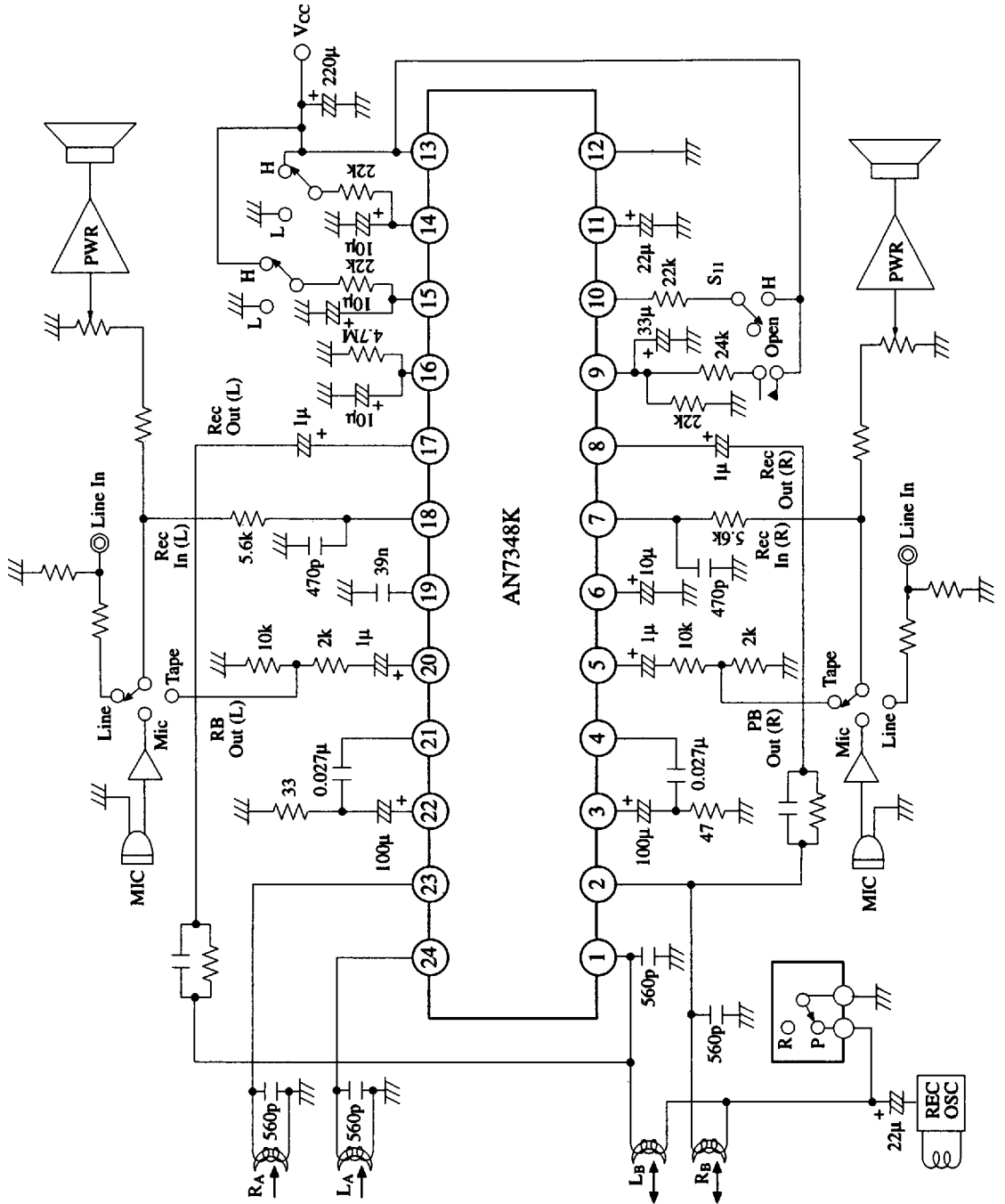
*3 CT_{R/P} = 20log(V_b (PB mode) + V_b (REC mode))

■ Test Circuit



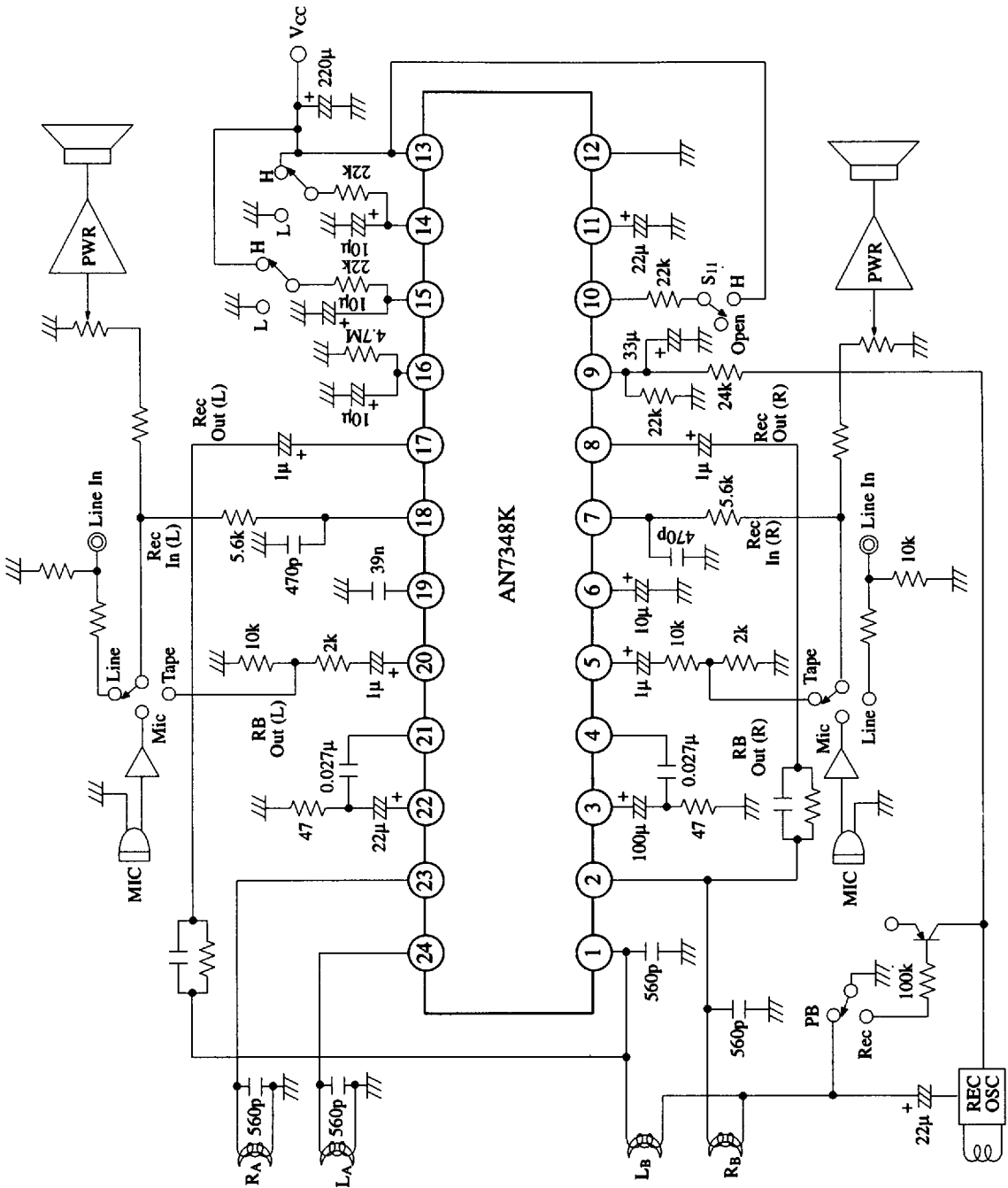
| Switch Logic | A/B (S11) | Rec / PB (S9) | Nor / Cro (S13) | Hi / Lo (S12) |
|--------------|-----------|---------------|-----------------|---------------|
| High | Tape A | Rec | Chrome | 2 x speed |
| Open | Tape B | PB | Normal | 1 x speed |
| Low | Tape B | PB | Normal | 1 x speed |

■ Application Circuit - Logic Deck



| Logic Pin | A/B (P10) | Rec / PB (P9) | Nor / Cro (P14) | Hi / Lo (P15) |
|-----------|-----------|---------------|-----------------|---------------|
| 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 2



| Pin / Logic | A/B (P10) | Rec / PB (P9) | Nor / Cro (P14) | Hi / Lo (P15) |
|-------------|-----------|---------------|-----------------|---------------|
| High | Tape A | Rec | Chrome | 2 x speed |
| Open | Tape B | PB | Normal | 1 x speed |
| Low | Tape B | PB | Normal | 1 x speed |

■ Pin Descriptions

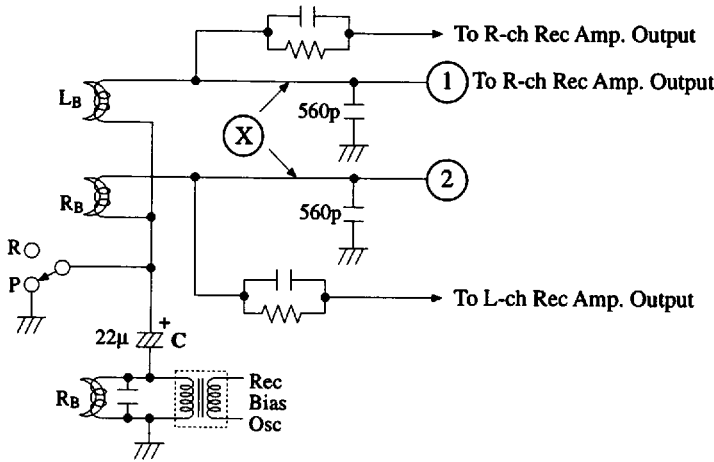
| Pin No. | Pin Name | Equivalent Circuit | Description |
|---------|---------------------------------|--------------------|--|
| 1 | L-ch Playback Amp. Input (B) | | <p>Playback amp. input Input impedance = 61kΩ Pin 1, 2, 23 & 24 = 0V (PB mode) *Pin 1, 2 = 2.1V (Rec mode) *Pin 23, 24 = 0V (Rec mode)</p> |
| 2 | R-ch Playback Amp. Input (B) | | |
| 23 | R-ch Playback Amp. Input (A) | | |
| 24 | L-ch Playback Amp. Input (A) | | |
| 3 | R-ch Playback Negative Feedback | | <p>Playback amp. feedback loop DC = 0.7V.</p> <p>Playback equalization for both Normal / Chrome and High / Low dubbing</p> |
| 22 | L-ch Playback Negative Feedback | | |
| 4 | R-ch Playback Equalization | | |
| 21 | L-ch Playback Equalization | | |
| 5 | R-ch Playback Amp Output | | <p>Low output impedance</p> |
| 20 | L-ch Playback Amp Output | | |
| 6 | AB Switch τ | | <p>Determines the tape A/B switching time constant with an external capacitor DC : 2.8V (pin 10 high) DC : 0.0V (pin 10 open)</p> |
| 7 | R-ch Rec Input | | <p>Rec amp input pin Input impedance = 30kΩ</p> |
| 18 | L-ch Rec Input | | |
| 8 | R-ch Rec Output | | <p>Rec amp output pin DC = Vref, Zout = Low (pin 9 High) DC = =V, Zout = High (pin 9 Open)</p> |
| 17 | L-ch Rec Output | | |
| 9 | Rec / Playback Switch | | <p>Select Rec or playback mode 0.7V > Threshold > 2.1V</p> |

■ Pin Descriptions (Continue)

| Pin No. | Pin Name | Equivalent Circuit | Description | | | | | | | | |
|---------|-----------------|--------------------|--|--------|--------------|--------------|--------------|--------------|--|--|--------|
| 10 | AB Switch | | To select Tape A or Tape B $0.7V > \text{Threshold} > 2.1V$ SW open / 0V Tape B Tape A PB mute ON $1.0V$ $0.7V$ $2.1V$ V_{cc} | | | | | | | | |
| 11 | Ripple Filter | | Connect with a capacitor to minimize ripple from Vcc DC = 4.4V ($V_{cc} = 6V$) | | | | | | | | |
| 12 | GND | | | | | | | | | | |
| 13 | Vcc | | | | | | | | | | |
| 14 | Chrome / Normal | | Input to control Playback EQ for Chrome or Normal Tape | | | | | | | | |
| 15 | Hi / Lo | | Input to control Playback EQ for High or Low dubbing <table border="1"> <tr> <td rowspan="2">Pin 14</td> <td>Cro Lo Speed</td> <td>Cro Hi Speed</td> </tr> <tr> <td>Nor Lo Speed</td> <td>Nor Hi Speed</td> </tr> <tr> <td colspan="2"></td> <td>Pin 15</td> </tr> </table> | Pin 14 | Cro Lo Speed | Cro Hi Speed | Nor Lo Speed | Nor Hi Speed | | | Pin 15 |
| Pin 14 | Cro Lo Speed | Cro Hi Speed | | | | | | | | | |
| | Nor Lo Speed | Nor Hi Speed | | | | | | | | | |
| | | Pin 15 | | | | | | | | | |
| 16 | ALC τ | | Controls the attack and release time of ALC DC = 1.4V → Rec mode DC = 0V → Playback mode | | | | | | | | |
| 19 | ALC Low Cut | | ALC comparator circuit reference voltage | | | | | | | | |

■ Supplementary Explanation

1) Recording mode

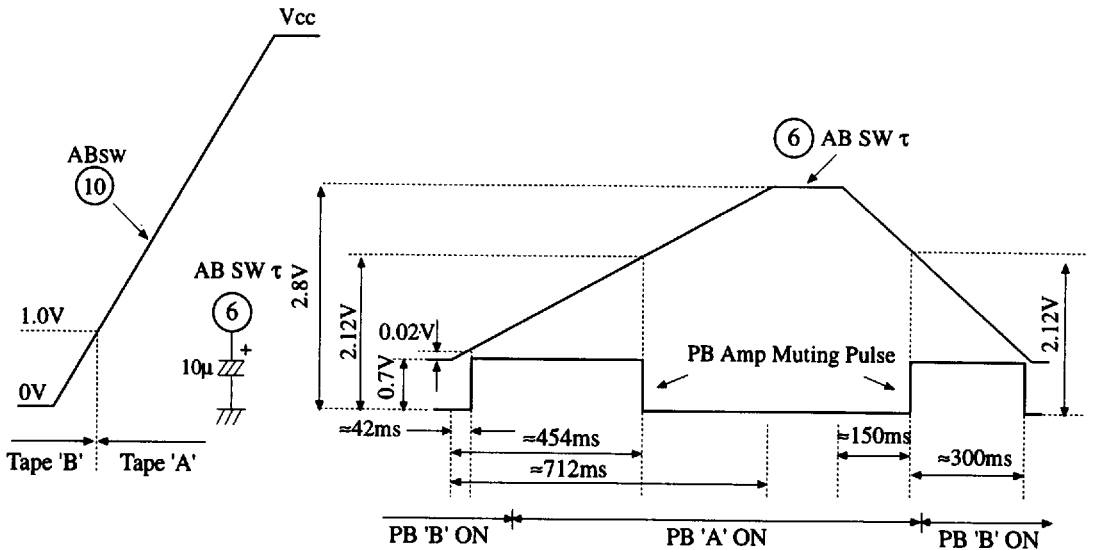


During dubbing mode, Sw1 will be in Rec position and point X will be bias at 2.1V internally (Vcc = 6V). This is to ensure enough dynamic swing for the recording signal. Capacitor C is therefore necessary to couple the dc bias at point X to Rec bias oscillator. When in playback mode, point X will return to 0V and Sw1 is switch to PB position. Capacitor C should be chosen carefully to avoid degradation of the Rec bias Osc.signal & recording signal. The recommended value is 22µF.

2) ALC Detector

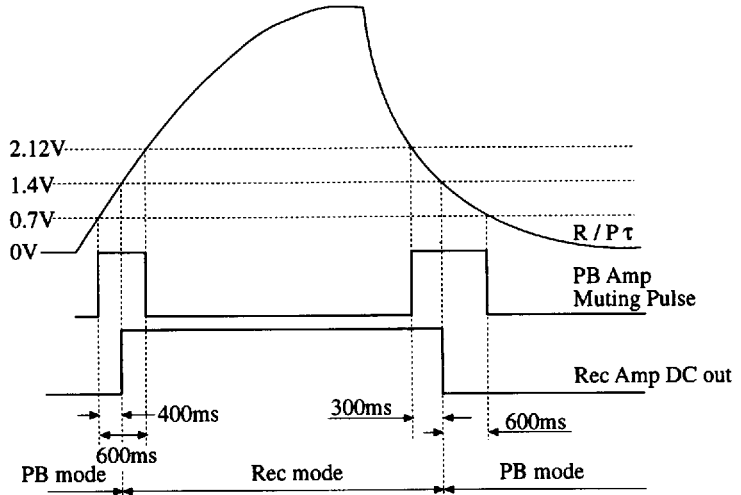
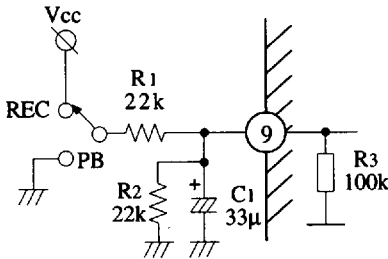
The ALC circuit will be cut off during playback mode. This is achieved internally in the IC by shorting pin 16 to ground. By choosing different values of R, C combination at pin 16, the ALC attack and release time can be varied.

3) A/B Switch muting



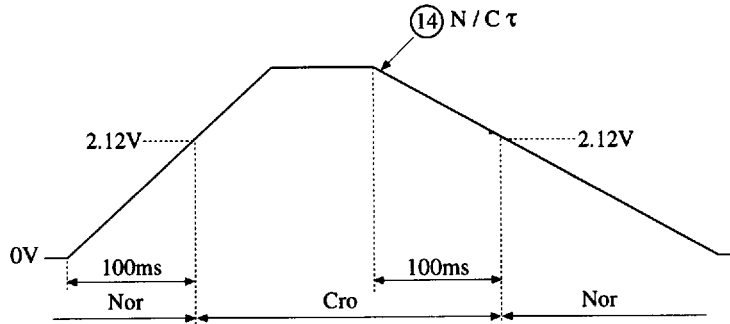
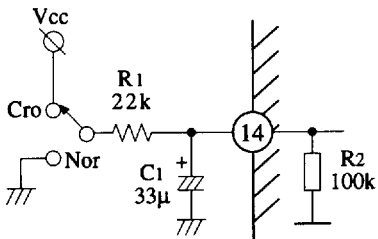
■ Supplementary Explanation (Continue)

4) R / PB Switching muting
(A/B sw = 'B' mode)



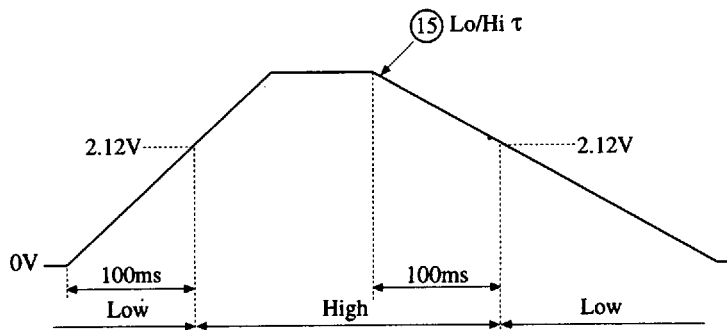
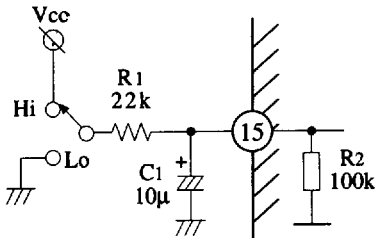
Charging $\tau = R1 * C1$
Discharging $\tau = (R2/R3) * C1$
 $0.7V > \text{Threshold Voltage} > 2.1V$

5) Nor / Cro Switching



Charging $\tau \approx R1 * C1$
Discharging $\tau = (R1/R2) * C1$

6) I o / Hi Dubbing Switching

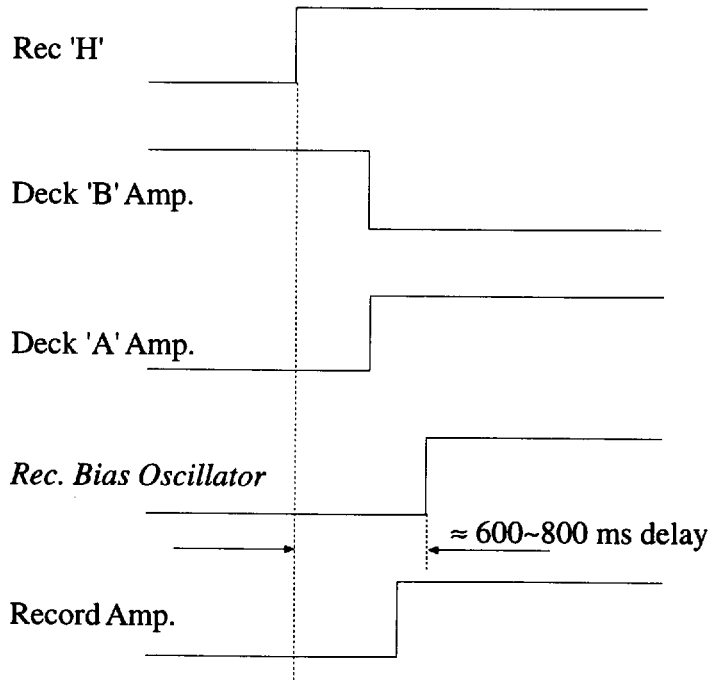


Charging $\tau \approx R1 * C1$
Discharging $\tau = (R1/R2) * C1$

■ Supplementary Explanation (Continue)

7) Rec 'H' swiching

When the Rec/PB switch (pin 9) is switched to record mode, the pre-amp will switch from deck 'B' to deck 'A' mode (if the ABsw, pin 10 is low). The pre-amp switching τ is govern by the capacitor at pin 6. 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 prefer switching sequence is shown below.



8) PCB layout for Pre -amp INPUTs.

To prevent oscillation, the input paths for pin 1 & 2 should avoid crossing or running next to the input paths for pin 23 & 24. This will also ensure minimum source leakage especially during record mode.

■ Printed Circuit Board Layout (Scale 1:1)

