

SANYO

No. 3935

LA7371A

Monolithic Linear IC

**Recording and Playback Amplifier
for VHS Video Recorders****OVERVIEW**

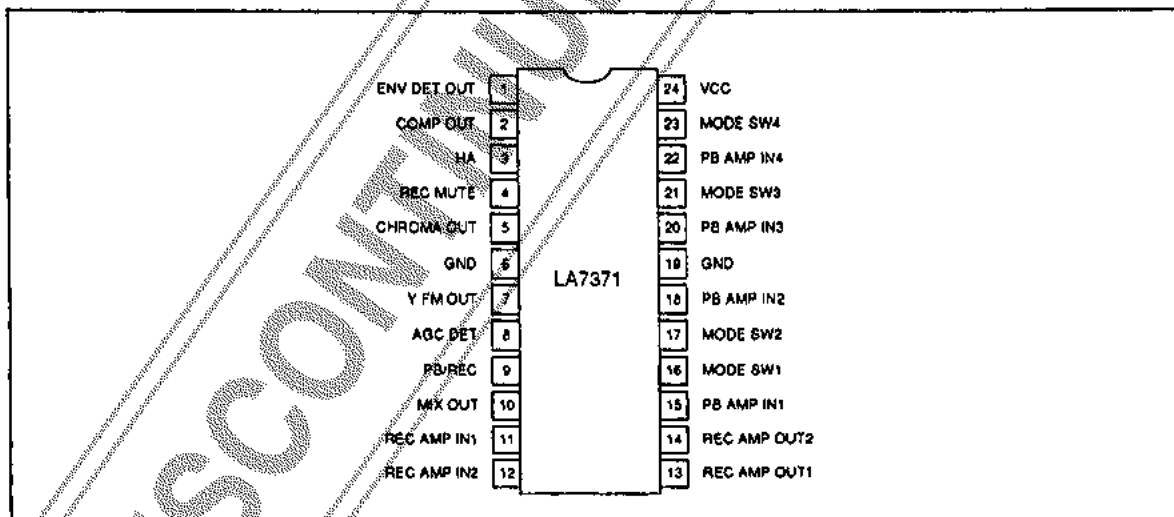
The LA7371A is a recording and playback amplifier for VHS-format video tape recorders. It incorporates a four-channel playback amplifier, making it ideal for applications that require slow motion playback, special effects and high quality picture-search.

The LA7371A features a constant-current output, a two-channel recording amplifier for stable operating characteristics, and an on-chip envelope detector and comparator for automatic tracking.

The LA7371A operates from a 5 V supply and is available in 24-pin DIPs.

FEATURES

- Four-channel playback amplifier
- Two-channel recording amplifier
- Automatic gain control
- On-chip envelope detector and comparator for automatic tracking
- 5 V supply
- 24-pin DIP

PINOUT

Specifications and information herein are subject to change without notice.

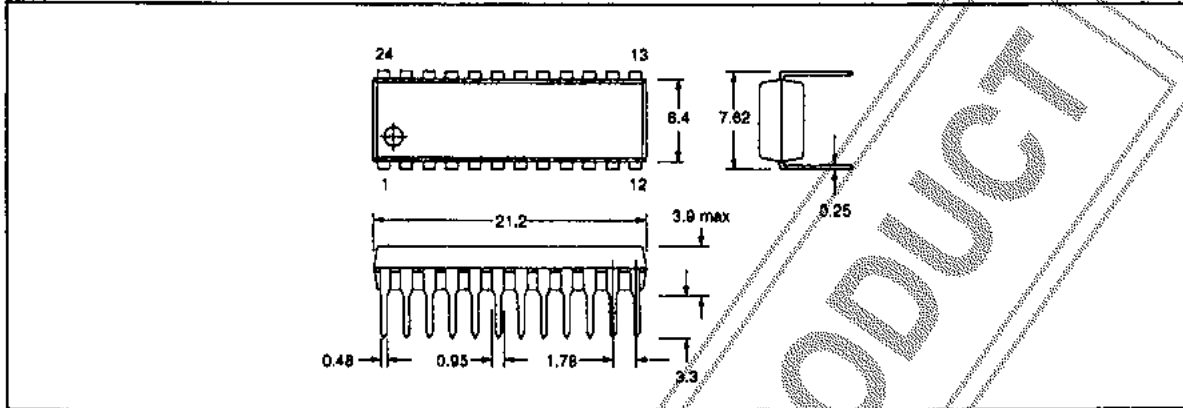
SANYO Electric Co., Ltd. Semiconductor Division
 Natsume Bldg., 18-6, 2-chome, Yushima, Bunkyo-ku, TOKYO 113 JAPAN

LA7371A

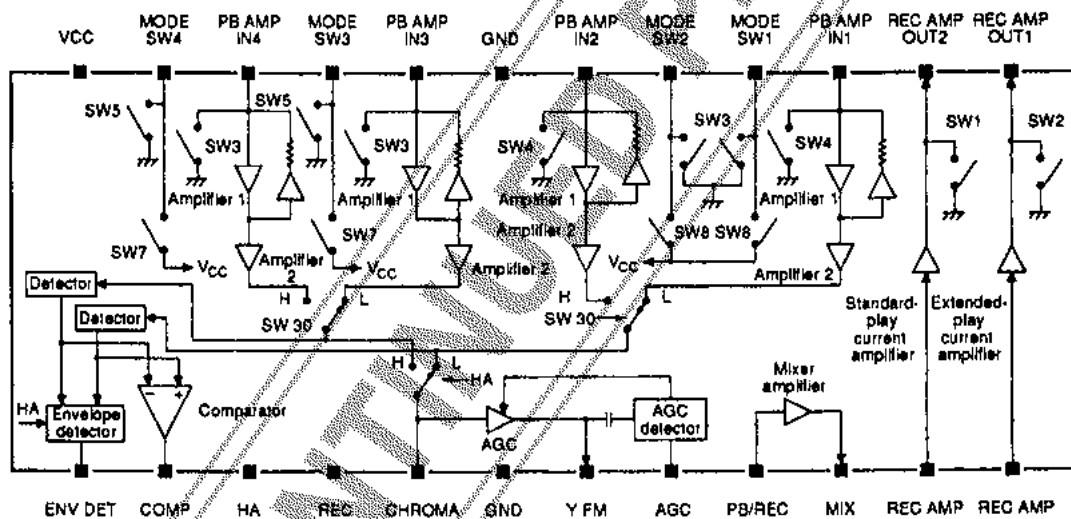
PACKAGE DIMENSIONS

Unit: mm

3067-DIP24S



BLOCK DIAGRAM



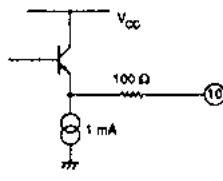
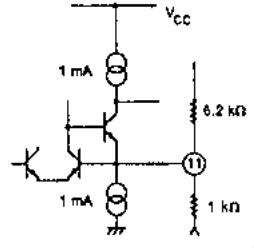
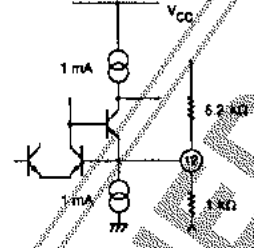
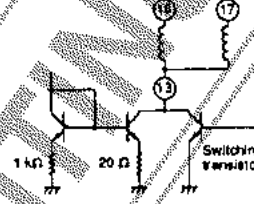
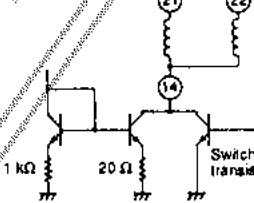
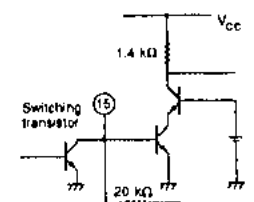
PIN DESCRIPTION

| Number | Name | Equivalent circuit | Description |
|--------|-------------|--------------------|---|
| 1 | ENV DET OUT | | Playback envelope detector output. Nominal voltages are 0.5 V (PB) and 0 V (REC). |
| 2 | COMP OUT | | RF envelope comparator output. Nominal voltage is 0 V (PB and REC). |

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| Number | Name | Equivalent circuit | Description |
|--------|------------|--------------------|---|
| 3 | HA | | Extended-play/standard-play control input |
| 4 | REC MUTE | | Muting control input and playback SW30 switch |
| 5 | CHROMA OUT | | Playback chrominance output and recording H control input. Nominal voltages are 2.0 V (PB) and > 3.8 V (REC). |
| 6 | GND | | Ground |
| 7 | Y FM OUT | | Playback luminance FM output. Nominal voltages are 2.5 V (PB) and 4.0 V (REC). |
| 8 | AGC DET. | | Playback AGC detector output. Nominal voltages are 1.0 V (PB) and 0 V (REC). |
| 9 | PB/REC | | Playback special-effects mode select control and recording mixer input. Nominal voltages are 2.1 V (PB) and 1.65 V (REC) and > 3.5 V (special). Gain is 12 dB when R = 2 kΩ, and 6 dB, when 3.9 kΩ. |

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| Number | Name | Equivalent circuit | Description |
|--------|--------------|---|--|
| 10 | MIX OUT |  | Mixer amplifier output. Nominal voltages are 4.1 V (PB) and 1.8 V (REC). |
| 11 | REC AMP IN1 |  | Recording amplifier inputs. Nominal voltages are 1.77 V (PB) and 1.85 V (REC). |
| 12 | REC AMP IN2 |  | Recording amplifier inputs. Nominal voltages are 1.77 V (PB) and 1.85 V (REC). |
| 13 | REC AMP OUT1 |  | Recording amplifier outputs. Nominal voltages are 0 V (PB) and 4.2 V (REC). Switching transistor ON resistance is 5 Ω. |
| 14 | REC AMP OUT2 |  | Recording amplifier outputs. Nominal voltages are 0 V (PB) and 4.2 V (REC). Switching transistor ON resistance is 5 Ω. |
| 15 | PB AMP IN1 |  | Playback preamplifier input. Nominal voltages are 0.7 V (PB) and 0 V (REC). Low-noise input transistor |

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| Number | Name | Equivalent circuit | Description |
|--------|------------|--------------------|---|
| 16 | MODE SW1 | | Recording-mode/playback-mode switch outputs. Nominal voltages are 0 V (PB) and 4.2 V (REC). |
| 17 | MODE SW2 | | |
| 18 | PB AMP IN2 | | Playback preamplifier input. Nominal voltages are 0.7 V (PB) and 0 V (REC). Low-noise input transistor. |
| 19 | GND | | Preamplifier ground |
| 20 | PB AMP IN3 | | Playback preamplifier input. Nominal voltages are 0.7 V (PB) and 0 V (REC). Low-noise input transistor. |
| 21 | MODE SW3 | | Recording-mode/playback-mode switch outputs. Nominal voltages are 0 V (PB) and 4.2 V (REC). |
| 23 | MODE SW4 | | |
| 22 | PB AMP IN4 | | Playback preamplifier input. Nominal voltages are 0.7 V (PB) and 0 V (REC). Low-noise input transistor. |
| 24 | VCC | | 5 V supply |

SPECIFICATIONS

Absolute Maximum Ratings

| Parameter | Symbol | Rating | Unit |
|-----------------------------|-----------|----------------------------------|------------------|
| Supply voltage | V_{CC} | 7.0 | V |
| Power dissipation | P_D | 850 ($T_a = 65^\circ\text{C}$) | mW |
| Operating temperature range | T_{opg} | -10 to 65 | $^\circ\text{C}$ |
| Storage temperature range | T_{stg} | -40 to 150 | $^\circ\text{C}$ |

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Recommended Operating Conditions

T_a = 25 °C

| Parameter | Symbol | Rating | Unit |
|----------------------|-----------------|-------------|------|
| Supply voltage | V _{CC} | 5 | V |
| Supply voltage range | V _{CC} | 4.75 to 5.5 | V |

Electrical Characteristics

Playback mode

V_{CC} = 5 V, T_a = 25 °C, SW2 is OFF

| Parameter | Symbol | Condition | Rating | | | Unit |
|---|--------------------|--|--------|------|-----|-------------------|
| | | | min | typ | max | |
| Supply current | I _{CCP} | | 43 | 50 | 57 | mA |
| Channel 1 standard-play mode voltage gain | G _{VP1} | V _{IN} = 38 mV _{P-P} f = 1 MHz | 54 | 56 | 58 | dB |
| Channel 2 standard-play mode voltage gain | G _{VP2} | | 54 | 56 | 58 | dB |
| Channel 3 extended-play mode voltage gain | G _{VP3} | | 55 | 57 | 59 | dB |
| Channel 4 extended-play mode voltage gain | G _{VP4} | | 55 | 57 | 59 | dB |
| Standard-play mode gain differential | ΔG _{VP1} | G _{VP1} - G _{VP2} | -1 | 0 | 1 | dB |
| Extended-play gain differential | ΔG _{VP2} | G _{VP3} - G _{VP4} | -1 | 0 | 1 | dB |
| Gain differential between modes | ΔG _{VP} | G _{VP2} - G _{VP1} | 0 | 1 | 2 | dB |
| Input conversion rms noise voltage | V _{NIN} | 1.1 MHz lowpass filter | - | 1.1 | 1.5 | μV |
| Frequency response | ΔV _{fp} | V _{IN} = 38 mV _{P-P} f = 7 MHz | -2.5 | 0 | - | dB |
| Second-harmonic distortion | V _{HDP} | V _{IN} = 38 mV _{P-P} f = 4 MHz | - | -33 | -30 | dB |
| Maximum output voltage | V _{OMP} | f = 1 MHz, -30 dB harmonic distortion | 0.8 | 1.0 | - | V _{P-P} |
| Standard-play mode and extended-play mode crosstalk | V _{CR} | 8.2 μH input inductor short circuited | - | -40 | -35 | dB |
| Output DC offset voltage between channels | V _{ODC} | | -300 | 0 | 300 | mV |
| AGC output voltage | V _{AGC} | f = 4 MHz, T _S = 250 mV _{P-P} | 280 | 310 | 340 | mV _{P-P} |
| AGC second-harmonic distortion | V _{HDAGC} | V _{IN} = 38 mV _{P-P} f = 4 MHz | - | -35 | -30 | dB |
| AGC control level | ΔV _{AGC} | f = 4 MHz, T _S = 500 mV _{P-P} | - | 1.0 | 1.5 | dB |
| | | f = 4 MHz, T _S = 125 mV _{P-P} | -1.2 | -0.7 | - | |
| Envelope detector quiescent output voltage | V _{ENVD} | T12 quiescent, no input | - | 0.5 | - | V |

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| Parameter | Symbol | Condition | Rating | | | Unit |
|--|-------------|---|--------|-----|-----|------|
| | | | min | typ | max | |
| Envelope detector output voltage | V_{ENV} | $f = 4 \text{ MHz}$, $T5 = 300 \text{ mV}_{p-p}$, $T12 = V_{CC} - V_{ENVO}$ | 2.6 | 2.9 | 3.2 | V |
| | | $f = 4 \text{ MHz}$, $T5 = 500 \text{ mV}_{p-p}$, $T12 = V_{CC} - V_{ENVO}$ | 3.0 | 3.2 | 3.4 | |
| | | $f = 3 \text{ MHz}$, $T5 = 300 \text{ mV}_{p-p}$, $T12 = V_{CC} - V_{ENVO}$ | 2.2 | 2.5 | 2.8 | |
| | | $f = 5 \text{ MHz}$, $T5 = 300 \text{ mV}_{p-p}$, $T12 = V_{CC} - V_{ENVO}$ | 2.7 | 3.0 | 3.3 | |
| Standard-play mode comparator output voltage | V_{COMP1} | $V_{IN} = 38 \text{ mV}_{p-p}$, $f = 4 \text{ MHz}$ | 0 | 0.1 | 0.2 | V |
| Extended-play mode comparator output voltage | V_{COMP2} | | 3.9 | 4.1 | 4.3 | V |

Recording mode

$V_{CC} = 5 \text{ V}$, $T_a = 25 \text{ }^\circ\text{C}$, SW2 is ON

| Parameter | Symbol | Condition | Rating | | | Unit |
|---|------------------|---|--------|------|------|-------------------|
| | | | min | typ | max | |
| Supply current | I_{CCR} | | 60 | 65 | 70 | mA |
| Standard-play mode voltage gain | G_{VRSP} | $V_{IN} = 150 \text{ mV}_{p-p}$, $f = 4 \text{ MHz}$ | -5 | -3 | -1 | dB |
| Extended-play mode voltage gain | G_{VREP} | | -5 | -3 | -1 | dB |
| Gain differential between modes | ΔG_{VR} | $G_{VREP} - G_{VRSP}$ | - | 0 | - | dB |
| Standard-play mode frequency response | ΔV_{fRS} | $V_{IN} = 150 \text{ mV}_{p-p}$, $f = 1 \text{ to } 7 \text{ MHz}$ | -2.0 | -0.5 | - | dB |
| Extended-play mode frequency response | ΔV_{fRE} | | -2.0 | -0.5 | - | dB |
| Standard-play mode second-harmonic distortion | V_{HDRS} | $V_{OUT} = 150 \text{ mV}_{p-p}$, $f = 4 \text{ MHz}$ | - | -45 | -40 | dB |
| Extended-play mode second-harmonic distortion | V_{HDRE} | | - | -45 | -40 | dB |
| Standard-play mode output voltage | V_{OMPS} | $f = 4 \text{ MHz}$, -40 dB harmonic distortion | 15 | 20 | - | mV_{p-p} |
| Extended-play mode output voltage | V_{OMPE} | | | | | |
| Standard-play mode muting attenuation | V_{MRS} | $V_{IN} = 150 \text{ mV}_{p-p}$, $f = 4 \text{ MHz}$ | - | -45 | -40 | dB |
| Extended-play mode muting attenuation | V_{MRE} | | - | -45 | -40 | dB |
| Standard-play mode intermodulation distortion | V_{CYSP} | $f_{(T0)} = 4 \text{ MHz}$, $f_{(T0C)} = 629 \text{ kHz}$, $T16A = 150 \text{ mV}_{p-p}$, $T16 = 40 \text{ mV}_{p-p}$ | - | -45 | -40 | dB |
| Extended-play mode intermodulation distortion | V_{CYEP} | | - | -45 | -40 | dB |
| Luminance and chrominance mixer voltage gain | G_{MX} | $V_{IN} = 150 \text{ mV}_{p-p}$, $f = 4 \text{ MHz}$ | 8.5 | 10.5 | 12.5 | dB |

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Switching transistors

 $V_{CC} = 5 \text{ V}$, $T_a = 25 \text{ }^\circ\text{C}$

| Parameter | Symbol | Condition | Rating | | | Unit |
|---|------------|---------------------------------------|--------|-----|-----|----------|
| | | | min | typ | max | |
| SW1 and SW2 ON resistance | R_{ON1} | Measured with 1 mA and 2 mA DC inputs | – | 5 | 8 | Ω |
| SW5 and SW6 ON resistance | R_{ON2} | Measured with 1 mA and 2 mA DC inputs | – | 6 | 10 | Ω |
| Recording/playback switch threshold voltage | SW_{REC} | | 3.8 | | 5.0 | V |

Playback-mode threshold voltages

 $V_{CC} = 5 \text{ V}$, $T_a = 25\text{ }^\circ\text{C}$

| Parameter | Symbol | Condition | Rating | | | Unit |
|-----------------------------------|-----------|--------------------|--------|-----|-----|------|
| | | | min | typ | max | |
| Trick H (pin 9) threshold voltage | TR | $T2 = 4 \text{ V}$ | 3.7 | – | 5.0 | V |
| | | $T2 = 0 \text{ V}$ | – | – | 3.3 | |
| SW30 (pin 4) threshold voltage | $SW30_1$ | Channel 1 to 2 | 1.2 | – | 5.0 | V |
| | $SW30_2$ | Channel 2 to 1 | 0 | – | 0.8 | |
| HA (pin 3) threshold voltage | HA_{P1} | Channel 1 to 3 | 2.7 | – | 5.0 | V |
| | HA_{P2} | Channel 3 to 1 | 0 | – | 2.3 | V |

Recording-mode threshold voltages

 $V_{CC} = 5 \text{ V}$, $T_a = 25\text{ }^\circ\text{C}$

| Parameter | Symbol | Condition | Rating | | | Unit |
|---|-----------|-----------|--------|-----|-----|------|
| | | | min | typ | max | |
| HA REC (pin 3) HIGH-level threshold voltage | HA_{R1} | | 2.7 | – | 5.0 | V |
| HA REC (pin 3) LOW-level threshold voltage | HA_{R2} | | 0 | – | 2.3 | V |
| MUTE HIGH-level threshold voltage | $MUTE_1$ | | 3.7 | – | 5.0 | V |
| MUTE LOW-level threshold voltage | $MUTE_2$ | | 0 | – | 3.3 | V |

Measurement Condition Internal Switch Positions

Playback mode

| Parameter | Channel | Test points | | Switch positions | | | | |
|--|---------|---------------|------------|------------------|----|----|----|----|
| | | Input | Output | TR | RP | 3D | MU | HA |
| Supply current | | VCC | | F | F | F | F | F |
| Voltage gain, input conversion noise voltage, frequency response, harmonic distortion and maximum output level | 1 | T15 | T5 | F | F | F | F | F |
| | 2 | T18 | T5 | F | F | F | F | F |
| | 3 | T20 | T5 | F | F | N | F | F |
| | 4 | T23 | T5 | F | F | N | F | N |
| Standard-play mode crosstalk | 1 | T18, T20, T23 | T5 | N | F | F | F | F |
| | 2 | T15, T20, T23 | T5 | N | F | N | F | F |
| Extended-play mode crosstalk | 3 | T15, T18, T23 | T5 | N | F | F | F | N |
| | 4 | T15, T18, T20 | T5 | N | F | N | F | N |
| Output DC offset voltage | 1 to 2 | | CHROMA OUT | N | F | × | F | F |
| | 3 to 4 | | CHROMA OUT | N | F | × | F | N |
| | 1 to 3 | | CHROMA OUT | N | F | F | F | × |
| | 2 to 4 | | CHROMA OUT | N | F | N | F | × |
| | 1 to 4 | | CHROMA OUT | N | F | × | F | × |
| | 2 to 3 | | CHROMA OUT | N | F | × | F | × |
| AGC measurements | | T15 | T7 | F | F | F | F | F |
| Envelope detector quiescent output | | | T1 | F | F | F | F | F |
| Envelope detector output voltage | | T15 | T1 | F | F | F | F | F |
| V _{COMP1} comparator output voltage | | T15 | T2 | N | F | F | F | F |
| V _{COMP2} comparator output voltage | | T20 | T2 | N | F | F | F | N |

Note

× = don't care

Recording mode

| Parameter | Channel | Test points | | Switch positions | | | | |
|--|---------|-------------|--------|------------------|----|----|----|----|
| | | Input | Output | TR | RP | 3D | MU | HA |
| Supply current | | VCC | | F | N | F | F | F |
| Gain, gain differential, frequency response, harmonic distortion, output level | 1, 2 | T16 | | F | N | F | F | F |
| | 3, 4 | | T21 | F | N | F | F | N |

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| Parameter | Channel | Test points | | Switch positions | | | | |
|--|---------|-------------|--------|------------------|----|----|----|----|
| | | Input | Output | TR | RP | 3D | MU | HA |
| Muting attenuation | 1, 2 | T9Y | T16 | F | N | F | N | F |
| | 3, 4 | T9Y | T21 | F | N | F | N | N |
| Intermodulation distortion | 1, 2 | T9Y, T9C | T16 | F | N | F | F | F |
| | 3, 4 | T9Y, T9C | T21 | F | N | F | F | N |
| Luminance and chrominance mixer voltage gain | | T9Y | T10 | F | N | F | F | × |

Note

× = don't care

Switching transistors

| Parameter | Channel | Test points | | Switch positions | | | | |
|---|---------|-------------|-----------------------|------------------|----|----|----|----|
| | | Input | Output | TR | RP | 3D | MU | HA |
| Playback mode switching-transistor ON resistance | 1, 2 | | REC AMP OUT2 | × | F | × | × | × |
| | 3, 4 | | REC AMP OUT1 | × | F | × | × | × |
| | 1 | | MODE SW1 | F | F | × | × | N |
| | 2 | | MODE SW2 | F | F | × | × | N |
| | 3 | | MODE SW3 | F | F | × | × | N |
| | 4 | | PB AMP IN4 | F | F | × | × | F |
| Recording mode switching-transistor ON resistance | 1, 2 | | REC AMP OUT2 | × | N | × | × | N |
| | 3, 4 | | REC AMP OUT1 | × | N | × | × | F |
| | 1, 2 | | MODE SW1 and MODE SW2 | × | N | × | F | N |
| | 3, 4 | | PB AMP IN4 | × | N | × | × | N |

Note

× = don't care

Threshold voltages

| Parameter | Channel | Test points | | Switch positions | | | | |
|--|------------|-------------|--------|------------------|----|----|----|----|
| | | Input | Output | TR | RP | 3D | MU | HA |
| Special-effects mode threshold voltage | 1, 2, 3, 4 | T20 | T2 | × | F | F | F | × |
| SW30 threshold voltage | 1, 2, 3, 4 | T15, T18 | T5 | × | F | × | F | F |
| HA playback-mode threshold voltage | 1, 2, 3, 4 | T15, T20 | T5 | F | F | F | F | × |
| Muting threshold voltage | 1, 2, 3, 4 | T9Y | T10 | × | N | × | × | × |
| HA recording-mode threshold voltage | 1, 2, 3, 4 | T9Y | T21 | × | N | × | F | × |

Note

× = don't care

Mode Selection

| Mode | HA | Playback ON-transistor switches | | Playback amplifier control switches | | Head short-circuit switches | | Recording drive current | |
|-----------|-------|---------------------------------|-----|-------------------------------------|-----|-----------------------------|-----|-------------------------|-----|
| | | SW1 | SW2 | SW3 | SW4 | SW5 | SW6 | SW7 | SW8 |
| Recording | SP | LOW | OFF | ON | ON | ON | OFF | OFF | ON |
| | EP | HIGH | ON | OFF | ON | ON | ON | ON | OFF |
| Playback | SP | LOW | ON | ON | OFF | ON | OFF | OFF | OFF |
| | EP | HIGH | ON | ON | OFF | ON | OFF | OFF | OFF |
| | Trick | HIGH | ON | ON | OFF | OFF | OFF | OFF | OFF |

Note

HA is HIGH when greater than 2.5 V.

TYPICAL APPLICATION

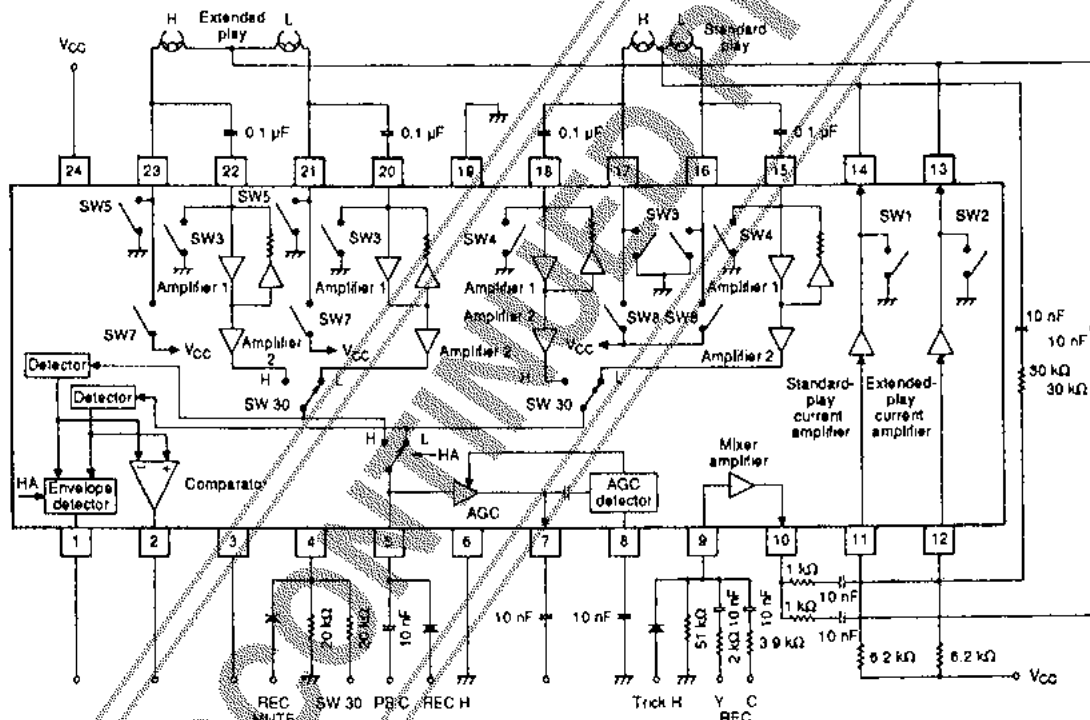


Figure 1. Tape head amplifier

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