Ordering number : N5288A

Monolithic Linear IC

# LA7337

## SECAM-Format VCR Chroma Signal-Processing Circuit

## Overview

The LA7337 is an IC that implements SECAM-format VCR signal processing in a single chip. It incorporates band-pass filters and a SECAM discrimination circuit on chip and features automatic adjustment of the bell filter for a reduced number of external components and adjustment-free circuit operation.

## Features

- All required filters, except for the bell filter, incorporated on chip.
- Automatic adjustment of the bell filter $f_0$ parameter
- Built-in SECAM discrimination circuit

## Functions

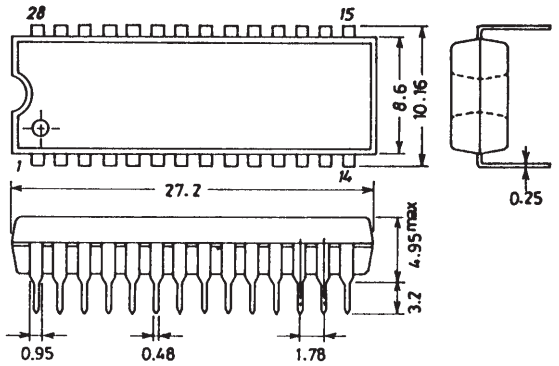
- 4.3-MHz and 1.1-MHz band-pass filters, limiter, AGC (in playback mode)
- Divide-by-four circuit, 4× frequency multiplier circuit, 2.2-MHz band-pass filter
- Bell filter $f_0$ automatic adjustment circuit, SECAM discrimination circuit
- Sync gate

## Package Dimensions

unit: mm

**3063-DIP28S**

[LA7337]




SANYO: DIP28S

## Specifications

### Absolute Maximum Ratings at Ta = 25°C

| Parameter | Symbol | Conditions | Ratings | Unit |
|---|---|---|---|---|
| Maximum supply voltage | $V_{CC}$ max | | 7 | V |
| Allowable power dissipation | Pd max | Ta ≤ 70°C | 600 | mW |
| Operating temperature | Topr | | –15 to +70 | °C |
| Storage temperature | Tstg | | –40 to +150 | °C |

### Operating Conditions at Ta = 25°C

| Parameter | Symbol | Conditions | Ratings | Unit |
|---|---|---|---|---|
| Recommended supply voltage | $V_{CC}$ | | 5 | V |
| Operating supply voltage range | $V_{CC}$ op | | 4.8 to 5.5 | V |


SANYO Electric Co.,Ltd. Semiconductor Bussiness Headquarters
TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110 JAPAN

## Operating Characteristics at Ta = 25°C, $V_{CC}$ = 5 V

| Parameter | Symbol | Conditions | Ratings | | | Unit |
|---|---|---|---|---|---|---|
| | | | min | typ | max | |
| Record mode current drain | $I_{CCR}$ | V5 = V6 = 0 V, V16 = 0 V, S27 = composite sync., S15 = color bar signal | 50 | 70 | 90 | mA |
| 4.3-MHz band-pass filter characteristics (1) | $V_{F4C}$ | V6 = 5 V, V16 = 0 V, S27 = composite sync. S15 = sine wave (200 mVp-p, f = 4.286 MHz) | 145 | 180 | 215 | mVp-p |
| 4.3-MHz band-pass filter characteristics (2) | $G_{F4L1}$ | As above, except S15 = sine wave (200 mVp-p, f = 1.1 MHz), taking $V_{F4C}$ as the reference (0 dB) | | –30 | –20 | dB |
| 4.3-MHz band-pass filter characteristics (3) | $G_{F4L2}$ | As above, except S15 = sine wave (200 mVp-p, f = 2.2 MHz), taking $V_{F4C}$ as the reference (0 dB) | | –10 | –5 | dB |
| 4.3-MHz band-pass filter characteristics (4) | $G_{F4H}$ | As above, except S15 = sine wave (200 mVp-p, f = 7.5 MHz), taking $V_{F4C}$ as the reference (0 dB) | | –30 | –20 | dB |
| Record mode bell filter center frequency (1) | $F_{BLR1}$ | V5 = V6 = 0 V, V16 = 0 V, SW21B = on, S15 = sine wave (200 mVp-p, f = 4 to 5 MHz), S27 = composite sync. | 4.243 | 4.286 | 4.329 | MHz |
| Record mode bell filter center frequency (2) | $F_{BLR2}$ | As above, except V5 = 4 V. | 4.493 | 4.536 | 4.579 | MHz |
| Record mode bell filter characteristics (1) | $V_{BLRC}$ | V5 = V6 = 0 V, V16 = 0 V, SW21B = on, S15 = sine wave (200 mVp-p, f = FBLR1), S27 = composite sync. | 200 | 250 | 300 | mVp-p |
| Record mode bell filter characteristics (2) | $G_{BLRL}$ | As above, except S15 = sine wave (200 mVp-p, f = 3.8 MHz), taking $V_{BLRC}$ as the reference (0 dB) | –14 | –11 | –8 | dB |
| Record mode bell filter characteristics (3) | $G_{BLRH}$ | As above, except S15 = sine wave (200 mVp-p, f = 4.8 MHz), taking $V_{BLRC}$ as the reference (0 dB) | –14 | –11 | –8 | dB |
| Record mode killer operating level | $G_{KLR}$ | V5 = V6 = 0 V, S15 = a SECAM color bar signal (variable level), V16 = 0 V, SW21B = on, V23 = 3.4 V, V24 = 3.7 V, S27 = composite sync. | –28 | –23 | –18 | dB |
| Record equalization center frequency (1) | $F_{EQR1}$ | SW1 = on, V1 = 5 V, V5 = V6 = 0 V, V16 = 0 V, S21 = sine wave (200 mVp-p, f = 4 to 5 MHz), SW21A = SW21B = on, S27 = composite sync. | 1.0608 | 1.0715 | 1.0822 | MHz |
| Record equalization center frequency (2) | $F_{EQR2}$ | As above, except V6 = 4 V | 1.0788 | 1.0895 | 1.1002 | MHz |
| Record equalization characteristics (1) | $V_{EQRC}$ | SW1 = on, V1 = 5 V, V5 = V6 = 0 V, V16 = 0 V, S21 = sine wave (200 mVp-p, f = FEQR1 × 4), SW21A = SW21B = on, S27 = composite sync. | 65 | 85 | 105 | mVp-p |
| Record equalization characteristics (2) | $G_{EQRL}$ | As above, except S21 = sine wave (200 mVp-p, f = 3.8 MHz), taking $V_{EQRC}$ as the reference (0 dB) | 8 | 11 | 14 | dB |
| Record equalization characteristics (3) | $G_{EQRH}$ | As above, except S21 = sine wave (200 mVp-p, f = 4.8 MHz), taking $V_{EQRC}$ as the reference (0 dB) | 8 | 11 | 14 | dB |
| Record chrominance signal output level | $V_{OR}$ | SW1 = on, V1 = 5 V, V5 = V6 = 0 V, V16 = 0 V, S15 = sine wave (200 mVp-p, f = 4.4 MHz), SW21B = on, S27 = composite sync. | 80 | 110 | 140 | mVp-p |
| Record chrominance signal output unnecessary spectrum (1) | GSR1 | As above, except measure the 2.2 MHz component in the T11 signal. Taking $V_{OR}$ as the reference (0 dB). | | –30 | –20 | dB |
| Record chrominance signal output unnecessary spectrum (2) | GSR2 | As above, except measure the 3.3 MHz component in the T11 signal. Taking $V_{OR}$ as the reference (0 dB). | | –30 | –20 | dB |
| Playback mode current drain | $I_{CCP}$ | V5 = V6 = 0 V, V16 = 5 V, S27 = composite sync., S13 = sine wave (50 mVp-p, f = 1.0715 MHz) | 60 | 80 | 100 | mA |
| AGC control characteristics (1) | $V_{AGC}$ | V6 = 5 V, SW8B = on, V16 = 5 V, S27 = composite sync., S13 = sine wave (50 mVp-p, f = 1.0715 MHz) | 90 | 120 | 150 | mVp-p |
| AGC control characteristics (2) | $G_{AGC1}$ | As above, except S13 = sine wave (100 mVp-p, f = 1.0715 MHz) Taking $V_{AGC}$ as the reference (0 dB). | –1 | 0 | +1 | dB |
| AGC control characteristics (3) | $G_{AGC2}$ | As above, except S13 = sine wave (25 mVp-p, f = 1.0715 MHz) Taking $V_{AGC}$ as the reference (0 dB). | –1 | 0 | +1 | dB |
| 1.1-MHz band-pass filter characteristics (1) | $G_{F1L}$ | V6 = 5 V, SW14 = on, V14 = V14R, S13 = sine wave (50 mVp-p, f = 500 kHz), V16 = 5 V, S27 = composite sync., taking VAGC as the reference (0 dB). | –3 | 0 | +3 | dB |
| 1.1-MHz band-pass filter characteristics (2) | $G_{F1H1}$ | As above, except S13 = sine wave (50 mVp-p, f = 2.2 MHz) Taking $V_{AGC}$ as the reference (0 dB). | | –30 | –20 | dB |
| 1.1-MHz band-pass filter characteristics (3) | $G_{F1H2}$ | As above, except S13 = sine wave (50 mVp-p, f = 3.3 MHz) Taking $V_{AGC}$ as the reference (0 dB). | | –35 | –25 | dB |

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| Parameter | Symbol | Conditions | Ratings | | | Unit |
|---|---|---|---|---|---|---|
| | | | min | typ | max | |
| Playback equalization center frequency (1) | $F_{EQP1}$ | V6 = 0 V, SW8B = on, SW14 = on, V14 = V14R, S13 = sine wave (50 mVp-p, f = 1 to 1.2 MHz), V16 = 5 V, S27 = composite sync. | 1.0608 | 1.0715 | 1.0822 | MHz |
| Playback equalization center frequency (2) | $F_{EQP2}$ | As above, except V6 = 4 V | 1.0788 | 1.0895 | 1.1002 | MHz |
| Playback equalization characteristics (1) | $V_{EQPC}$ | V6 = 0 V, SW8B = on, SW14 = on, V14 = V14R, S13 = sine wave (50 mVp-p, f = FEQP1), V16 = 5 V, S27 = composite sync. | 120 | 150 | 180 | mVp-p |
| Playback equalization characteristics (2) | $G_{EQPL}$ | As above, except S13 = sine wave (50 mVp-p, f = 950 kHz), taking $V_{EQP}$ as the reference (0 dB). | –14 | –11 | –8 | dB |
| Playback equalization characteristics (3) | $G_{EQPH}$ | As above, except S13 = sine wave (50 mVp-p, f = 1.2 MHz), taking $V_{EQP}$ as the reference (0 dB). | –14 | –11 | –8 | dB |
| Playback bell center frequency (1) | $F_{BLP1}$ | SW1 = on, V1 = 5 V, V5 = V6 = 0 V, SW8A = SW8B = on, V16 = 5 V, S27 = composite sync., S8 = sine wave (200 mVp-p, f = 1 to 1.2 MHz), | 4.243 | 4.286 | 4.329 | MHz |
| Playback bell center frequency (2) | $F_{BLP2}$ | As above, except V5 = 4 V | 4.493 | 4.536 | 4.579 | MHz |
| Playback bell characteristics (1) | $V_{BLPC}$ | SW1 = on, V1 = 5 V, V5 = V6 = 0 V, SW8A = SW8B = on, S8 = sine wave (200 mVp-p, f = FBLP × 1/4), V16 = 5 V, S27 = composite sync. | 65 | 85 | 105 | mVp-p |
| Playback bell characteristics (2) | $G_{BLPL}$ | As above, except S8 = sine wave (200 mVp-p, f = 950 kHz), taking $V_{BLPC}$ as the reference (0 dB). | 8 | 11 | 14 | dB |
| Playback bell characteristics (3) | $G_{BLPH}$ | As above, except S8 = sine wave (200 mVp-p, f = 1.2 MHz), taking $V_{BLPC}$ as the reference (0 dB). | 8 | 11 | 14 | dB |
| Playback chrominance signal output level | $V_{OP}$ | SW1 = on, V1 = 5 V, V5 = V6 = 0 V, V16 = 5 V, S13 = sine wave (200 mVp-p, f = 1.1 MHz), SW8B = on, S27 = composite sync. | 130 | 160 | 190 | mVp-p |
| Playback chrominance signal output unnecessary spectrum (1) | GSP1 | As above, except measure the 2.2 MHz component in the T17 signal. Taking $V_{OP}$ as the reference (0 dB). | | –25 | –15 | dB |
| Playback chrominance signal output unnecessary spectrum (2) | GSP2 | As above, except measure the 3.3 MHz component in the T17 signal. Taking $V_{OP}$ as the reference (0 dB). | | –20 | –10 | dB |
| CLK input level | $V_{CLK}$ | f = 4.433619 MHz | 100 | 200 | 800 | mVp-p |
| Synchronizing signal input threshold level | $V_{THS}$ | | 1.8 | 2 | 2.2 | V |
| Record mode sync gate start time (muting off) | $T_{RGB}$ | SW1 = on, V1 = 5 V, V5 = V6 = 0 V, V16 = 0 V, S15 = sine wave (200 mVp-p, f = 4.286 MHz), SW21B = on, S27 = composite sync. | –0.3 | +0.2 | +0.7 | µs |
| Record mode sync gate start time (muting on) | $T_{RGBM}$ | As above, except SW2 = on | 1.5 | 2 | 2.5 | µs |
| Record mode sync gate release time | $T_{RGE}$ | As above | 4.5 | 5.0 | 5.5 | µs |
| Record mode mute setting resistance | VTSP2 | | 10 | 20 | 30 | kΩ |
| Playback mode sync gate start time | $T_{PGB}$ | SW1 = on, V5 = V6 = 0 V, SW8B = on, S13 = sine wave (50 mVp-p, f = 1.0715 MHz), V16 = 5 V, S27 = composite sync. | 1.5 | 2 | 2.5 | µs |
| Playback mode sync gate release time | $T_{PGE}$ | As above | 4.5 | 5.0 | 5.5 | µs |
| BGP start time | $T_{BGB}$ | V5 = 0 V, V6 = 5 V, SW21B = on, V16 = 0 V, S27 = composite sync. | 6.0 | 6.5 | 7.0 | µs |
| BGP amplitude | $T_{BGW}$ | As above | 2.0 | 2.5 | 3.0 | µs |
| SECAM discriminator output resistance | R26 | SW25 = on, V25 = 5 V | 7 | 10 | 13 | kΩ |
| Record mode SECAM discriminator characteristics (1) | $V_{SCMR1}$ | V5 = V6 = 0 V, V16 = 0 V, SW21B = on, S27 = composite sync., S15 = SECAM color bar signal | 4.5 | | | V |
| Record mode SECAM discriminator characteristics (2) | $V_{SCMR2}$ | As above, except S15 = PAL color bar signal | | | 0.5 | V |

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| Parameter | Symbol | Conditions | Ratings | | | Unit |
|---|---|---|---|---|---|---|
| | | | min | typ | max | |
| Playback mode phase detector output difference voltage (1) | $V_{SCPD1}$ | V5 = V6 = 0 V, SW8B = on, V16 = 5 V, S27 = composite sync., S13 = sine wave (50 mVp-p, f = 1.0625/1.1016 MHz) | 150 | 180 | | mV |
| Playback mode phase detector output difference voltage (2) | $V_{SCPD2}$ | As above, except S13 = sine wave (50 mVp-p, f = 627 kHz) | | | 100 | mV |
| Playback mode SECAM discriminator characteristics (1) | $V_{SCMP1}$ | V16 = 5 V, SW23 = SW24 = On | 4.5 | | | V |
| Playback mode SECAM discriminator characteristics (2) | $V_{SCMP2}$ | V16 = 5 V, SW23 = SW24 = On | | | 0.5 | V |
| SECAM discriminator comparator threshold voltage | $V_{TCOMP}$ | SW25 = On | 3.2 | 3.5 | 3.8 | V |
| Record/playback control threshold voltage | $V_{TRP}$ | | 2.3 | 2.5 | 2.7 | V |
| Forced SECAM mode threshold voltage | $V_{THSM}$ | V16 = 0 V, SW25 = on, V25 = 3 V, S27 = composite sync., S15 = sine wave (200 mVp-p, f = 4.286 MHz) | | | 4 | V |
| Forced mute mode threshold voltage | $V_{THMM}$ | V16 = 0 V, SW25 = on, V25 = 4 V, S27 = composite sync., S15 = sine wave (200 mVp-p, f = 4.286 MHz) | 1 | | | V |
| Reference voltage | $V_{REG}$ | | 4.1 | 4.3 | 4.5 | V |

Standard Input Signal Levels

| | |
|---|---|
| REC-IN (pin 15) | The 200 mVp-p ID component |
| PB-IN (pin 13) | 50 mVp-p |

Internal filter group delay times (reference values)

| | |
|---|---|
| 1.1 MHz BPF | 460 ns (PB) 430 ns (REC) |
| 2.2 MHz BPF | 180 ns |
| 4.3 MHz BPFA | 230 ns |
| 4.3 MHz BPFB | 170 ns |

[Record/playback mode settings]

Pin 16 = low → record mode

Pin 16 = high → playback mode

[Bell filter offset adjustment]

Increasing the pin 6 voltage increases the 1.1-MHz bell filter center frequency ($f_0$).

Increasing the pin 5 voltage increases the 4.3-MHz bell filter center frequency ($f_0$).

[Test mode settings]

The IC enters test mode if pin 6 is set to 5 V. The pin 5, 11, 17, and 26 outputs behave as follows in this mode.

Pin 5: The 4.43-MHz VCO output appears (However, note that a load of about 1 kΩ is required between this pin and $V_{CC}$.)

Pin 11: The 1.1-MHz band-pass filter output appears.

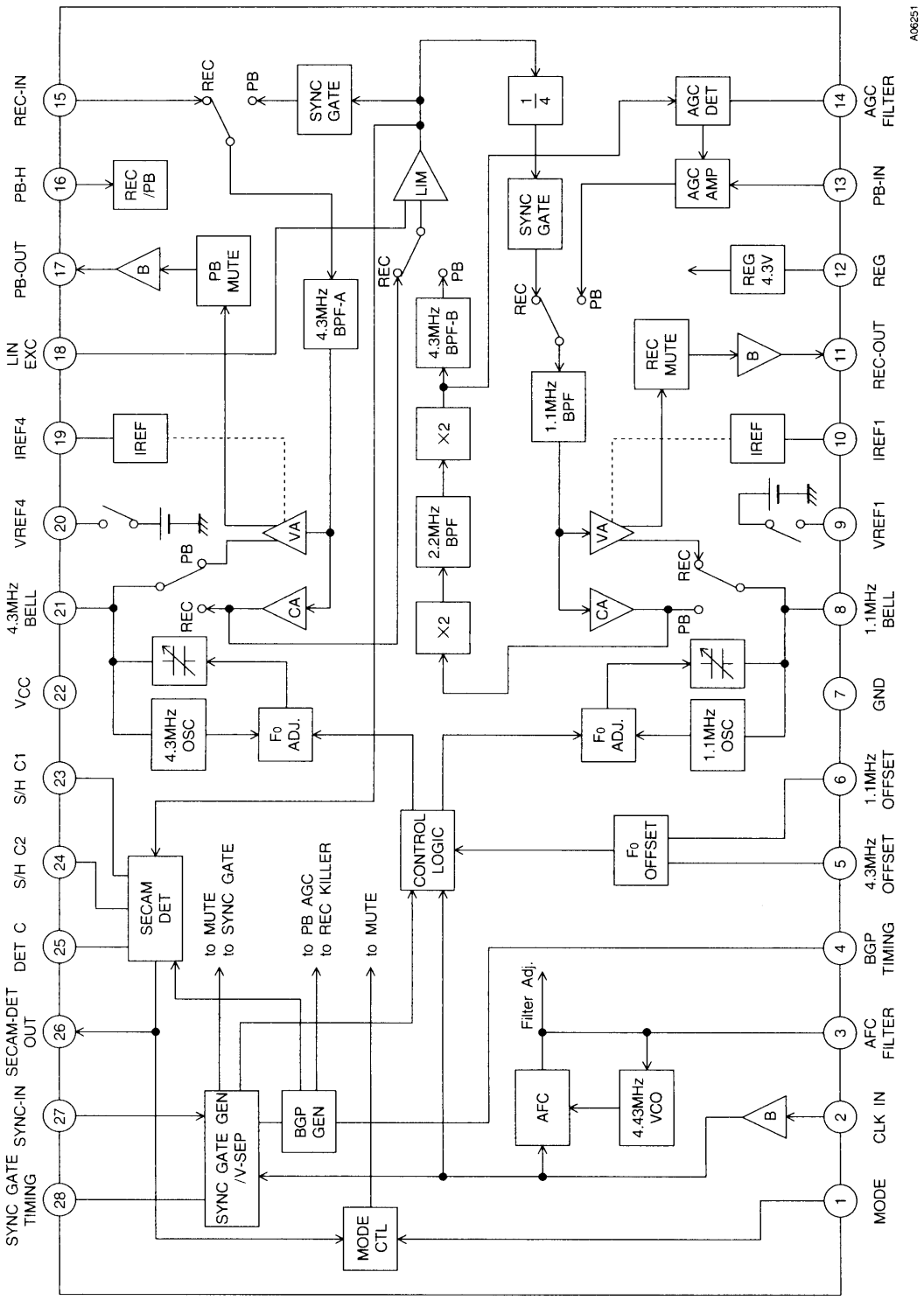
Pin 17: The 4.3-MHz band-pass filter output appears.

Pin 26: The BGP (used for SECAM discrimination, playback AGC, and record killer) can be monitored.

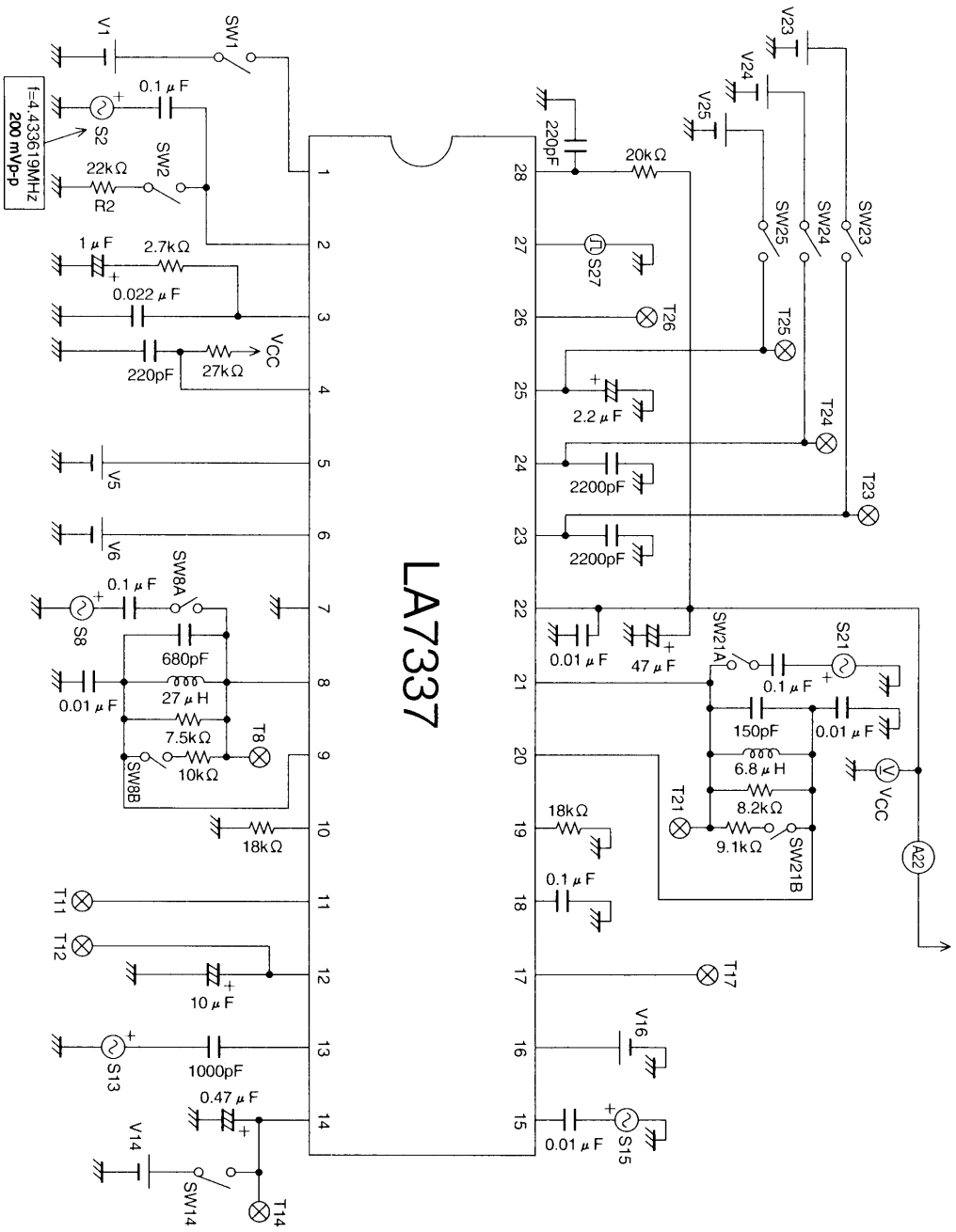
[Muting control table]

| Voltage applied to pin 1 | Output signal mode (pins 17 and 11) |
|---|---|
| 4 V or higher | Forced SECAM |
| Open | AUTO (Uses the output of the internal discriminator) |
| 1 V or lower | Forced mute mode |

## Block Diagram



## Test Circuit Diagram




Note: Use an FET probe when measuring T8, T21, and BGP.

## Test Circuit Diagram