

**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

### Specifications

#### Absolute Maximum Ratings at $T_a = 25^\circ\text{C}$

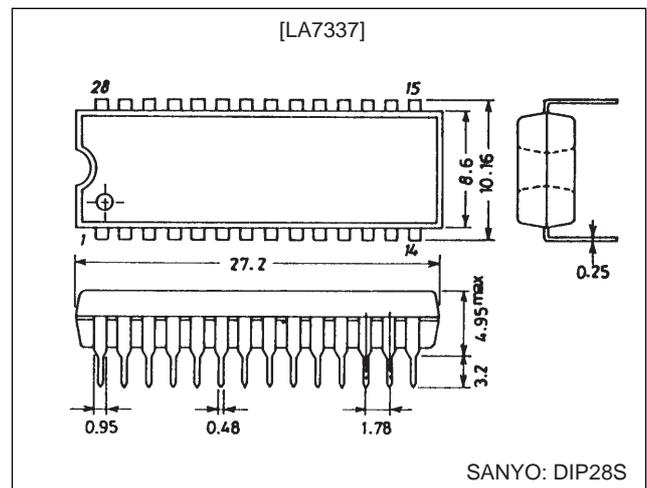
Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	$V_{CC \text{ max}}$		7	V
Allowable power dissipation	$P_d \text{ max}$	$T_a \leq 70^\circ\text{C}$	600	mW
Operating temperature	$T_{opr}$		-15 to +70	$^\circ\text{C}$
Storage temperature	$T_{stg}$		-40 to +150	$^\circ\text{C}$

#### Operating Conditions at $T_a = 25^\circ\text{C}$

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

### Package Dimensions

unit: mm

**3063-DIP28S**

LA7337

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

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Record mode current drain	$I_{CCR}$	$V_5 = V_6 = 0\text{ V}$ , $V_{16} = 0\text{ V}$ , $S_{27} = \text{composite sync.}$ , $S_{15} = \text{color bar signal}$	50	70	90	mA
4.3-MHz band-pass filter characteristics (1)	$V_{F4C}$	$V_6 = 5\text{ V}$ , $V_{16} = 0\text{ V}$ , $S_{27} = \text{composite sync.}$ , $S_{15} = \text{sine wave (200 mVp-p, } f = 4.286\text{ MHz)}$	145	180	215	mVp-p
4.3-MHz band-pass filter characteristics (2)	$G_{F4L1}$	As above, except $S_{15} = \text{sine wave (200 mVp-p, } f = 1.1\text{ MHz)}$ , taking $V_{F4C}$ as the reference (0 dB)		-30	-20	dB
4.3-MHz band-pass filter characteristics (3)	$G_{F4L2}$	As above, except $S_{15} = \text{sine wave (200 mVp-p, } f = 2.2\text{ MHz)}$ , taking $V_{F4C}$ as the reference (0 dB)		-10	-5	dB
4.3-MHz band-pass filter characteristics (4)	$G_{F4H}$	As above, except $S_{15} = \text{sine wave (200 mVp-p, } f = 7.5\text{ MHz)}$ , taking $V_{F4C}$ as the reference (0 dB)		-30	-20	dB
Record mode bell filter center frequency (1)	$F_{BLR1}$	$V_5 = V_6 = 0\text{ V}$ , $V_{16} = 0\text{ V}$ , $SW_{21B} = \text{on}$ , $S_{15} = \text{sine wave (200 mVp-p, } f = 4\text{ to }5\text{ MHz)}$ , $S_{27} = \text{composite sync.}$	4.243	4.286	4.329	MHz
Record mode bell filter center frequency (2)	$F_{BLR2}$	As above, except $V_5 = 4\text{ V}$ .	4.493	4.536	4.579	MHz
Record mode bell filter characteristics (1)	$V_{BLRC}$	$V_5 = V_6 = 0\text{ V}$ , $V_{16} = 0\text{ V}$ , $SW_{21B} = \text{on}$ , $S_{15} = \text{sine wave (200 mVp-p, } f = F_{BLR1})$ , $S_{27} = \text{composite sync.}$	200	250	300	mVp-p
Record mode bell filter characteristics (2)	$G_{BLRL}$	As above, except $S_{15} = \text{sine wave (200 mVp-p, } f = 3.8\text{ MHz)}$ , taking $V_{BLRC}$ as the reference (0 dB)	-14	-11	-8	dB
Record mode bell filter characteristics (3)	$G_{BLRH}$	As above, except $S_{15} = \text{sine wave (200 mVp-p, } f = 4.8\text{ MHz)}$ , taking $V_{BLRC}$ as the reference (0 dB)	-14	-11	-8	dB
Record mode killer operating level	$G_{KLR}$	$V_5 = V_6 = 0\text{ V}$ , $S_{15} = \text{a SECAM color bar signal (variable level)}$ , $V_{16} = 0\text{ V}$ , $SW_{21B} = \text{on}$ , $V_{23} = 3.4\text{ V}$ , $V_{24} = 3.7\text{ V}$ , $S_{27} = \text{composite sync.}$	-28	-23	-18	dB
Record equalization center frequency (1)	$F_{EQR1}$	$SW_1 = \text{on}$ , $V_1 = 5\text{ V}$ , $V_5 = V_6 = 0\text{ V}$ , $V_{16} = 0\text{ V}$ , $S_{21} = \text{sine wave (200 mVp-p, } f = F_{EQR1} \times 4)$ , $SW_{21A} = SW_{21B} = \text{on}$ , $S_{27} = \text{composite sync.}$	1.0608	1.0715	1.0822	MHz
Record equalization center frequency (2)	$F_{EQR2}$	As above, except $V_6 = 4\text{ V}$	1.0788	1.0895	1.1002	MHz
Record equalization characteristics (1)	$V_{EQRC}$	$SW_1 = \text{on}$ , $V_1 = 5\text{ V}$ , $V_5 = V_6 = 0\text{ V}$ , $V_{16} = 0\text{ V}$ , $S_{21} = \text{sine wave (200 mVp-p, } f = F_{EQR1} \times 4)$ , $SW_{21A} = SW_{21B} = \text{on}$ , $S_{27} = \text{composite sync.}$	65	85	105	mVp-p
Record equalization characteristics (2)	$G_{EQRL}$	As above, except $S_{21} = \text{sine wave (200 mVp-p, } f = 3.8\text{ MHz)}$ , taking $V_{EQRC}$ as the reference (0 dB)	8	11	14	dB
Record equalization characteristics (3)	$G_{EQRH}$	As above, except $S_{21} = \text{sine wave (200 mVp-p, } f = 4.8\text{ MHz)}$ , taking $V_{EQRC}$ as the reference (0 dB)	8	11	14	dB
Record chrominance signal output level	$V_{OR}$	$SW_1 = \text{on}$ , $V_1 = 5\text{ V}$ , $V_5 = V_6 = 0\text{ V}$ , $V_{16} = 0\text{ V}$ , $S_{15} = \text{sine wave (200 mVp-p, } f = 4.4\text{ MHz)}$ , $SW_{21B} = \text{on}$ , $S_{27} = \text{composite sync.}$	80	110	140	mVp-p
Record chrominance signal output unnecessary spectrum (1)	$G_{SR1}$	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)	$G_{SR2}$	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	$I_{CCP}$	$V_5 = V_6 = 0\text{ V}$ , $V_{16} = 5\text{ V}$ , $S_{27} = \text{composite sync.}$ , $S_{13} = \text{sine wave (50 mVp-p, } f = 1.0715\text{ MHz)}$	60	80	100	mA
AGC control characteristics (1)	$V_{AGC}$	$V_6 = 5\text{ V}$ , $SW_{8B} = \text{on}$ , $V_{16} = 5\text{ V}$ , $S_{27} = \text{composite sync.}$ , $S_{13} = \text{sine wave (50 mVp-p, } f = 1.0715\text{ MHz)}$	90	120	150	mVp-p
AGC control characteristics (2)	$G_{AGC1}$	As above, except $S_{13} = \text{sine wave (100 mVp-p, } f = 1.0715\text{ MHz)}$ , Taking $V_{AGC}$ as the reference (0 dB).	-1	0	+1	dB
AGC control characteristics (3)	$G_{AGC2}$	As above, except $S_{13} = \text{sine wave (25 mVp-p, } f = 1.0715\text{ MHz)}$ , Taking $V_{AGC}$ as the reference (0 dB).	-1	0	+1	dB
1.1-MHz band-pass filter characteristics (1)	$G_{F1L}$	$V_6 = 5\text{ V}$ , $SW_{14} = \text{on}$ , $V_{14} = V_{14R}$ , $S_{13} = \text{sine wave (50 mVp-p, } f = 500\text{ kHz)}$ , $V_{16} = 5\text{ V}$ , $S_{27} = \text{composite sync.}$ , taking $V_{AGC}$ as the reference (0 dB).	-3	0	+3	dB
1.1-MHz band-pass filter characteristics (2)	$G_{F1H1}$	As above, except $S_{13} = \text{sine wave (50 mVp-p, } f = 2.2\text{ MHz)}$ , Taking $V_{AGC}$ as the reference (0 dB).		-30	-20	dB
1.1-MHz band-pass filter characteristics (3)	$G_{F1H2}$	As above, except $S_{13} = \text{sine wave (50 mVp-p, } f = 3.3\text{ MHz)}$ , Taking $V_{AGC}$ as the reference (0 dB).		-35	-25	dB

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## LA7337

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Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Playback equalization center frequency (1)	F <sub>EQP1</sub>	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 <sub>EQP2</sub>	As above, except V6 = 4 V	1.0788	1.0895	1.1002	MHz
Playback equalization characteristics (1)	V <sub>EQPC</sub>	V6 = 0 V, SW8B = on, SW14 = on, V14 = V14R, S13 = sine wave (50 mVp-p, f = F <sub>EQP1</sub> ), V16 = 5 V, S27 = composite sync.	120	150	180	mVp-p
Playback equalization characteristics (2)	G <sub>EQPL</sub>	As above, except S13 = sine wave (50 mVp-p, f = 950 kHz), taking V <sub>EQP</sub> as the reference (0 dB).	-14	-11	-8	dB
Playback equalization characteristics (3)	G <sub>EQPH</sub>	As above, except S13 = sine wave (50 mVp-p, f = 1.2 MHz), taking V <sub>EQP</sub> as the reference (0 dB).	-14	-11	-8	dB
Playback bell center frequency (1)	F <sub>BLP1</sub>	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 <sub>BLP2</sub>	As above, except V5 = 4 V	4.493	4.536	4.579	MHz
Playback bell characteristics (1)	V <sub>BLPC</sub>	SW1 = on, V1 = 5 V, V5 = V6 = 0 V, SW8A = SW8B = on, S8 = sine wave (200 mVp-p, f = F <sub>BLP</sub> × 1/4), V16 = 5 V, S27 = composite sync.	65	85	105	mVp-p
Playback bell characteristics (2)	G <sub>BLPL</sub>	As above, except S8 = sine wave (200 mVp-p, f = 950 kHz), taking V <sub>BLPC</sub> as the reference (0 dB).	8	11	14	dB
Playback bell characteristics (3)	G <sub>BLPH</sub>	As above, except S8 = sine wave (200 mVp-p, f = 1.2 MHz), taking V <sub>BLPC</sub> as the reference (0 dB).	8	11	14	dB
Playback chrominance signal output level	V <sub>OP</sub>	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 <sub>OP</sub> 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 <sub>OP</sub> as the reference (0 dB).		-20	-10	dB
CLK input level	V <sub>CLK</sub>	f = 4.433619 MHz	100	200	800	mVp-p
Synchronizing signal input threshold level	V <sub>THS</sub>		1.8	2	2.2	V
Record mode sync gate start time (muting off)	T <sub>RGB</sub>	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 <sub>RGBM</sub>	As above, except SW2 = on	1.5	2	2.5	μs
Record mode sync gate release time	T <sub>RGE</sub>	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 <sub>PGB</sub>	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 <sub>PGE</sub>	As above	4.5	5.0	5.5	μs
BGP start time	T <sub>BGB</sub>	V5 = 0 V, V6 = 5 V, SW21B = on, V16 = 0 V, S27 = composite sync.	6.0	6.5	7.0	μs
BGP amplitude	T <sub>BGW</sub>	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 <sub>SCMR1</sub>	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 <sub>SCMR2</sub>	As above, except S15 = PAL color bar signal			0.5	V

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## LA7337

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Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Playback mode phase detector output difference voltage (1)	$V_{SCPD1}$	$V5 = V6 = 0\text{ V}$ , SW8B = on, $V16 = 5\text{ V}$ , S27 = composite sync., S13 = sine wave (50 mVp-p, $f = 1.0625/1.1016\text{ MHz}$ )	150	180		mV
Playback mode phase detector output difference voltage (2)	$V_{SCPD2}$	As above, except S13 = sine wave (50 mVp-p, $f = 627\text{ kHz}$ )			100	mV
Playback mode SECAM discriminator characteristics (1)	$V_{SCMP1}$	$V16 = 5\text{ V}$ , SW23 = SW24 = On	4.5			V
Playback mode SECAM discriminator characteristics (2)	$V_{SCMP2}$	$V16 = 5\text{ V}$ , 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	$V_{THSM}$	$V16 = 0\text{ V}$ , SW25 = on, $V25 = 3\text{ V}$ , S27 = composite sync., S15 = sine wave (200 mVp-p, $f = 4.286\text{ MHz}$ )			4	V
Forced mute mode threshold voltage	$V_{THMM}$	$V16 = 0\text{ V}$ , SW25 = on, $V25 = 4\text{ V}$ , S27 = composite sync., S15 = sine wave (200 mVp-p, $f = 4.286\text{ MHz}$ )	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 BPF A	230 ns
4.3 MHz BPF B	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 k $\Omega$  is required between this pin and  $V_{CC}$ .)

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

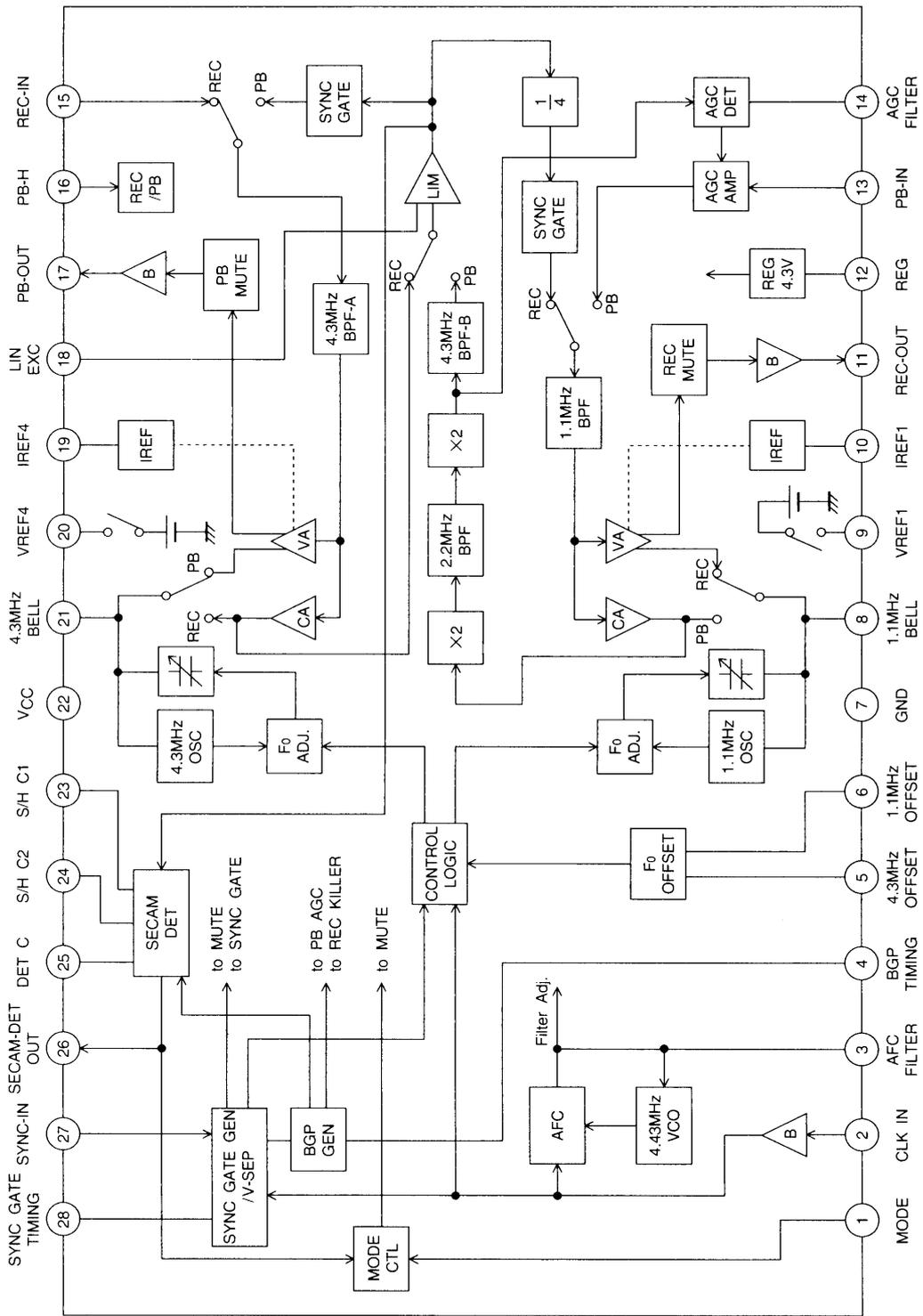
Pin 17: The 4.3-MHz band-pass filter output appears.

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

### [Muting control table]

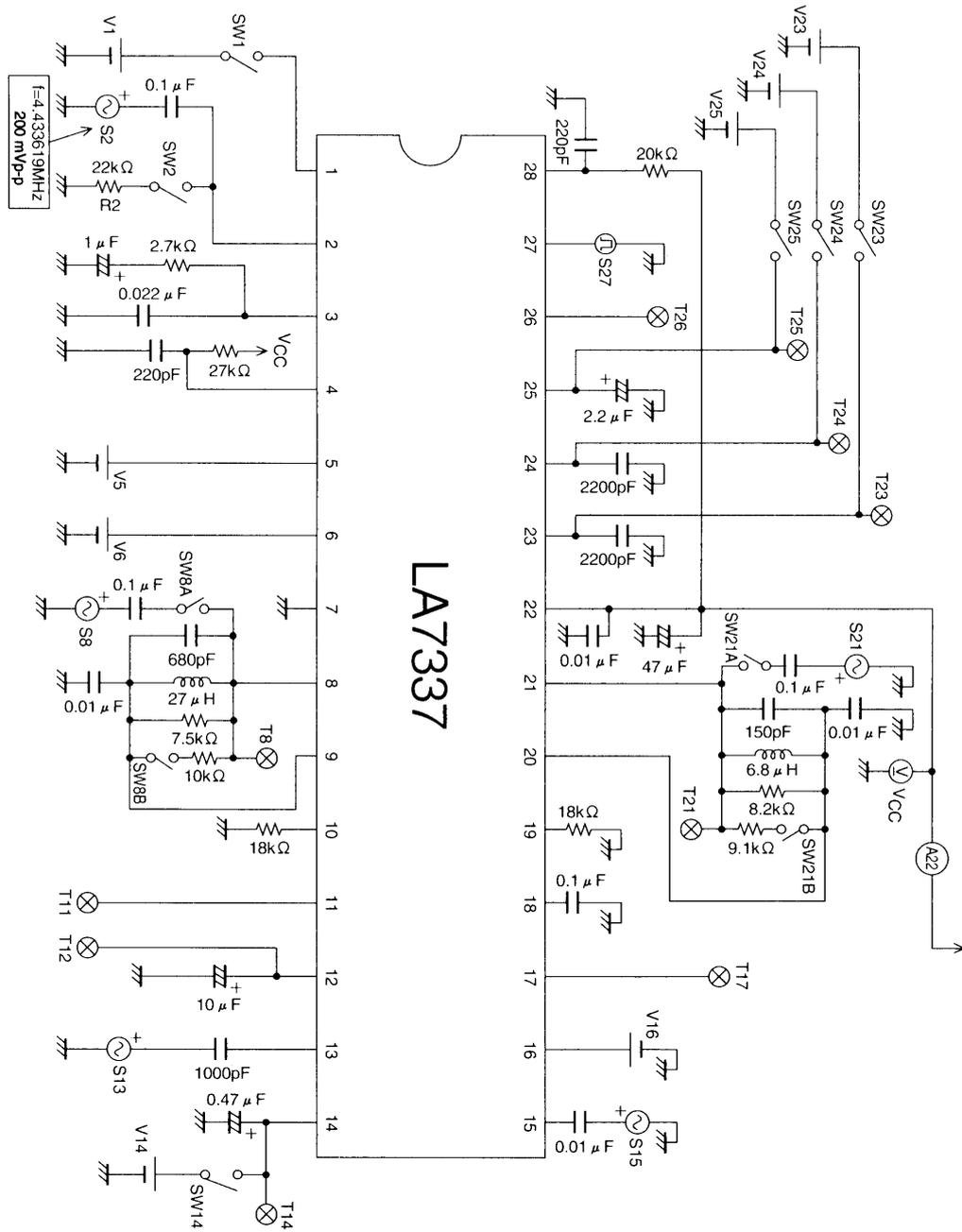
Voltage applied to pin 1	Output signal mode (pins 17 and 11)
4 V or higher	Forced SECAM
Open	AUTO (Uses the output of the internal discriminator)
1 V or lower	Forced mute mode

Block Diagram



A06251

Test Circuit Diagram



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

