Ordering number : EN5675

Monolithic linear IC

LA7170M

RF Modulator for UHF Band (Supports SECAM)

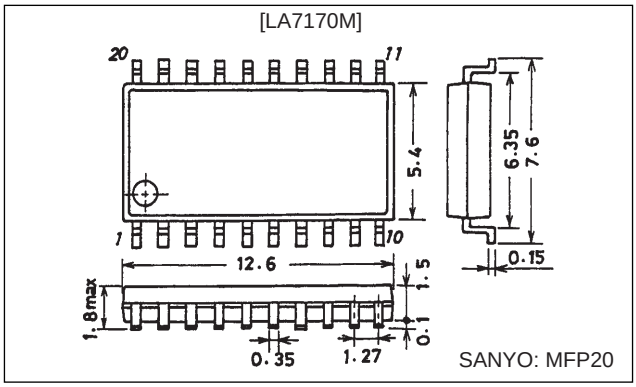
Overview

The LA7170M is a UHF band RF modulator whose built-in RF oscillator and mixer make it a single-chip RF modulator solution. It also supports image positivity modulation and AM sound modulation for SECAM systems.

Package Dimensions

unit: mm

3036B-MFP20



Specifications

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 ≤ 75°C	250	mW
Operating temperature	Topr		–20 to +75	°C
Storage temperature	Tstg		–55 to +150	°C

Operating Conditions at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Recommended operating voltage	V_{CC}		5.0	V
Operating supply voltage range	V_{CC} op		4.5 to 5.5	V

Operating Characteristics at Ta = 25°C, V_{CC} = 5 V, Unless otherwise specified, fp = 591.25 MHz, fs = 5.5 MHz, S9: ON, S10: B, S19A: B, S19B: B

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Current drain 1	$I_{CC}1$	With no input	24	30	36	mA
Regulator voltage	Vreq	With no input	3.7	3.9	4.1	V
[RF Output Level] (S19A: A, S19B: A)						
Picture carrier output	P	With no input, with 50 Ω terminator	77	79.5	82	dBμ
Sound carrier output ratio	P/S	Ratio of levels at fp and fp+fs	12.5	15	17.5	dB
Sound second harmonic distortion	P/S2	Ratio of levels at fp and fp+2fs	52	62		dB
Sound third harmonic distortion	P/S3	Ratio of levels at fp and fp+3fs	58	68		dB
Chrominance beat	P/CB	Ratio of P above to chrominance beat for V_{IN} = 0.4 Vp-p with 4.43-MHz sine wave input	65	75		dB
Picture harmonic distortion	P/V2	Ratio of P above to level at fp+2 MHz for V_{IN} = 1 Vp-p with 1-MHz sine wave input	50	62		dB

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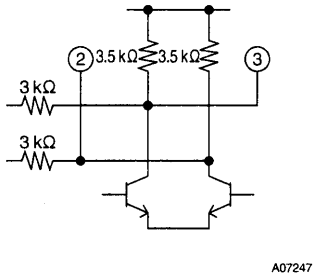
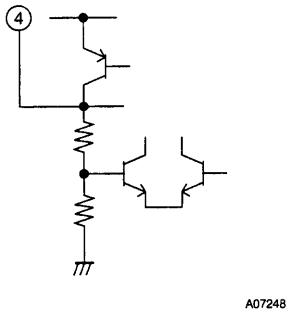
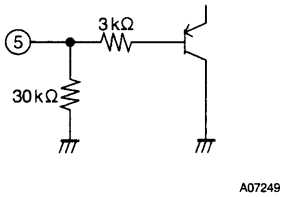
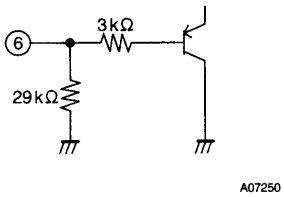
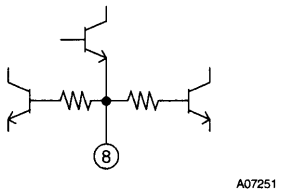
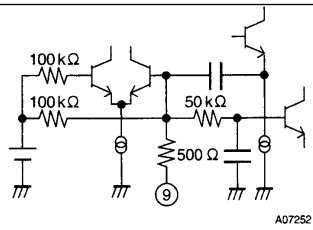
Parameter		Symbol	Conditions	Ratings			Unit
				min	typ	max	
[Picture]							
Picture modulation		mp	V_{IN} = 1 Vp-p, 100% white	73	80	87	%
Maximum picture modulation		mp max	V_{IN} = 1.5 Vp-p, 100% white	88	93	98	%
SYNC compression		Δ(S/V)	V_{IN} = 1 Vp-p, 100% white {1–(S/V)(3/7)} × 100		1.5	5	%
Differential gain		DG	V_{IN} : 5-stair step, mp = 80%, at fourth step		2	5	%
Differential phase		DP	V_{IN} : 5-stair step, mp = 80%, at fourth step	–6	0	+6	deg
SECAM picture modulation		mp SCM	V_{IN} = 1 Vp-p, 100% white S10 : a	88	93	98	%
TSG picture modulation		mp TSG	S9 : off	70	80	90	%
TSG SV ratio		V/S	S9 : off	6.3/3.7	6.8/3.2	7.3/2.7	
TSG horizontal period		TS	S9 : off	63.7	64.0	64.3	µs
TSG synchronization pulse width		HS	S9 : off	3.6	4.0	4.4	µs
TSG white signal width		HV	S9 : off	3.6	4.0	4.4	µs
TSG first white rising edge		TV1	S9 : off	22	24	26	µs
TSG second white rising edge		TV2	S9 : off	38	40	42	µs
[Sound]							
FM sound modulation	Rank A	ms FM	A_{IN} = 1.66 Vp-p with 1-kHz sine wave input; 100% modulation: ±50 kHz; S10: b Note: A_{IN} = 1 Vp-p normally produces 60% modulation.	73	81	89	%
	Rank B			81	90	99	%
	Rank C			90	100	110	%
	Rank D			99	110	121	%
	Rank E			109	121	133	%
Interchannel FM sound modulation ratio		Δms FM	ms FM ratio with S10: off	0.93	0.98	1.03	
FM sound distortion		THD FM	S10: b/off; A_{IN} = 1 V_{p-p} with 1-kHz sine wave input		0.3	1.0	%
FM sound signal-to-noise ratio		S/NFM	S10: b/off; V_{IN} = 1 Vp-p color bar; A_{IN} with 1-kHz sine wave input; ratio of level at A_{IN} = 1 Vp-p to that at A_{IN} = 0 Vp-p	43	55		dB
Maximum FM modulation		ms max	Maximum modulation possible with S10: b/off and sound distortion ratio within 3%	400			%
AM sound modulation		ms AM	S10: a; A_{IN} = 1 Vp-p with 1-kHz sine wave input	43	50	57	%
AM sound distortion ratio		THD AM	S10: a; A_{IN} = 1 Vp-p with 1-kHz sine wave input		0.5	2	%
AM sound signal-to-noise ratio		S/N AM	S10: a; V_{IN} = 1 Vp-p color bar; A_{IN} with 1-kHz sine wave input; ratio of level at A_{IN} = 1 Vp-p to that at A_{IN} = 0 Vp-p	42	47		dB

Note: The AM sound items refer to direct AM detection from the sound carrier (fp + sound intercarrier). This device requires the special care associated with all high-frequency devices.

Pin Functions

Pin No.	Symbol	Pin Voltage	Pin Description	Equivalent Circuit
1	$V_{CC}1$	5.0	V_{CC} for baseband circuits	
2 3	TANK1 TANK2	3.9	Connect tank circuits between these pins and the REG pin.	
4	REG	3.9	Regulator output	
5	FM AUDIO IN	0	FM sound input	
6	AM AUDIO IN	0	AM sound input	
7	GND1	0	Ground for baseband circuits	
8	VIDEO IN	3.0	Picture input. Clamp at SYNC tip.	
9	RES	2.6 (open)	Ground this pin through a 500-kHz oscillator. Open : TSG ON GND : TSG OFF	

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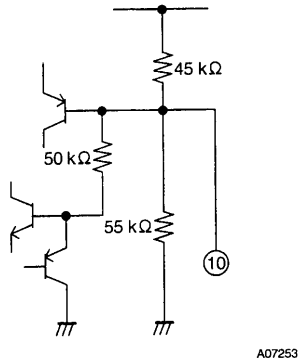
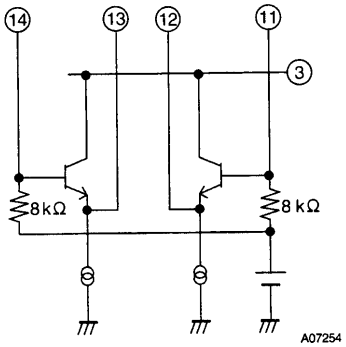
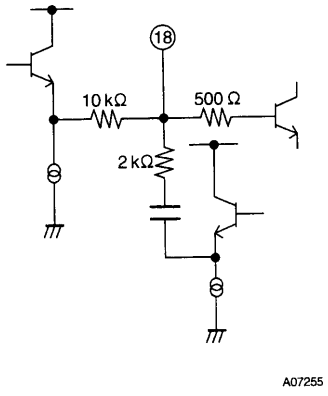
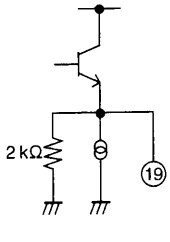
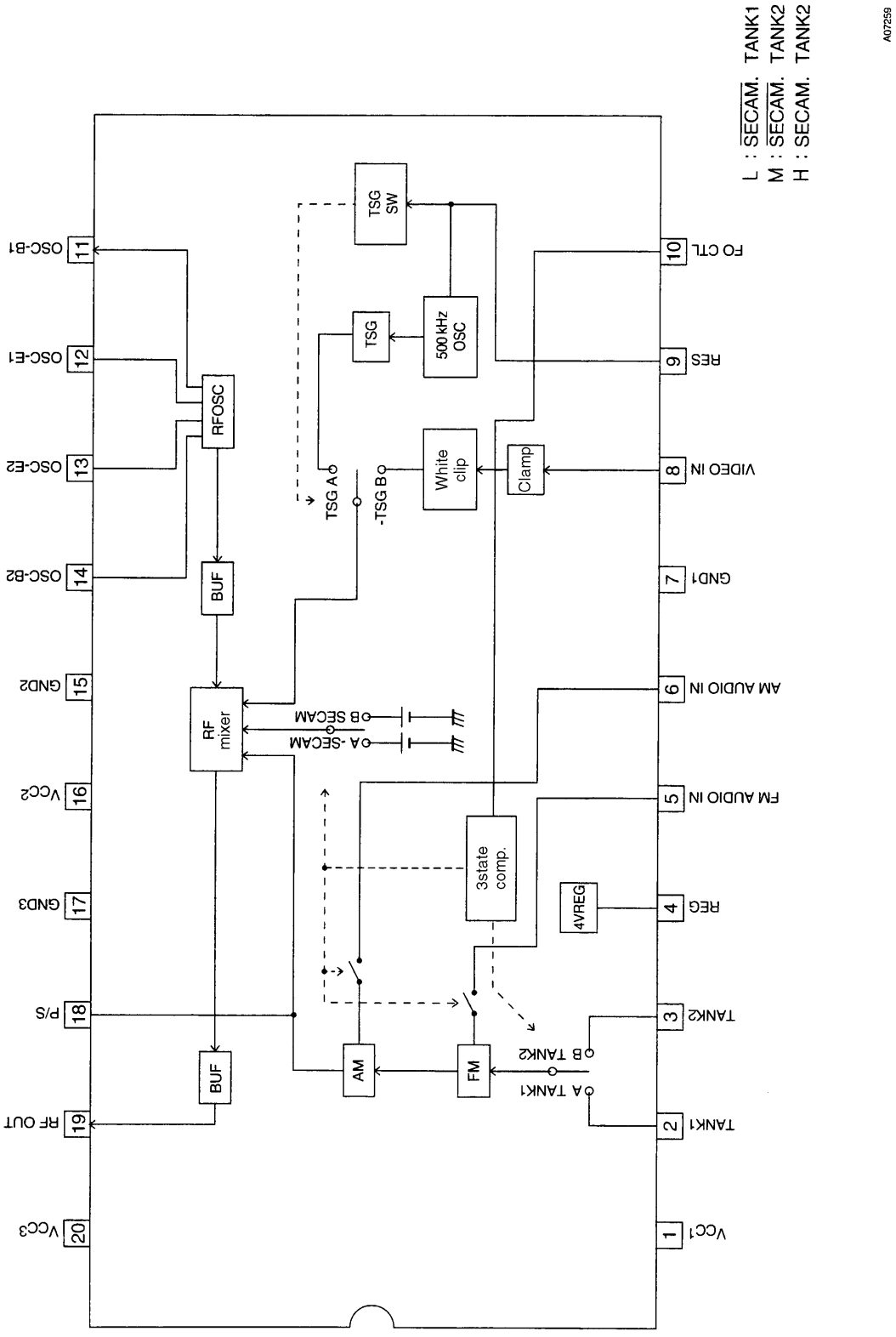
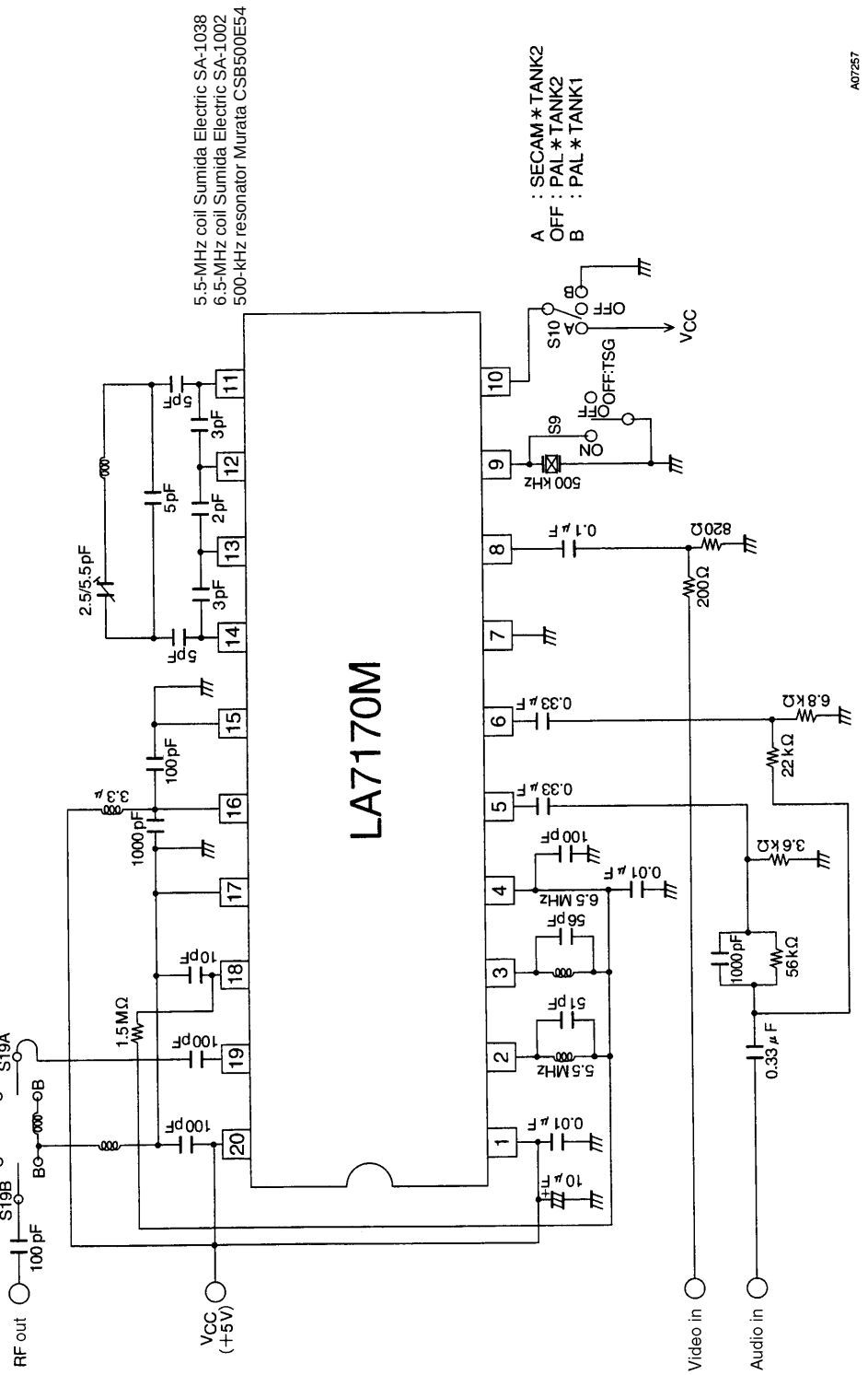
Pin No.	Symbol	Pin Voltage	Pin Description	Equivalent Circuit
10	FoCTL	2.6 (open)	L (0 to 1.5 V) : PAL-TANK1 M (2.1 to 3.2 V) : PAL-TANK2 H (3.8 to 5.0 V) : SECAM-TANK2	
11 12 13 14	OSC-B1 OSC-E1 OSC-E2 OSC-B2	2.5 1.8 1.8 2.5	This circuit forms a Colpitts oscillator.	
15	GND2	0	Ground for RF oscillator	
16	$V_{CC}2$	5.0	V_{CC} for RF oscillator	
17	GND3	0	V_{CC} for RF mixer	
18	P/S	1.7	Grounding this pin through a capacitor or resistor attenuates the sound intercarrier level.	
19	RF OUT	3.0	RF mixer signal output	
20	$V_{CC}3$	5.0	V_{CC} for RF mixer	

Block Diagram



Test Circuit



Sample Application Circuit