



LA7170M

RF Modulator for UHF Band (Supports SECAM)

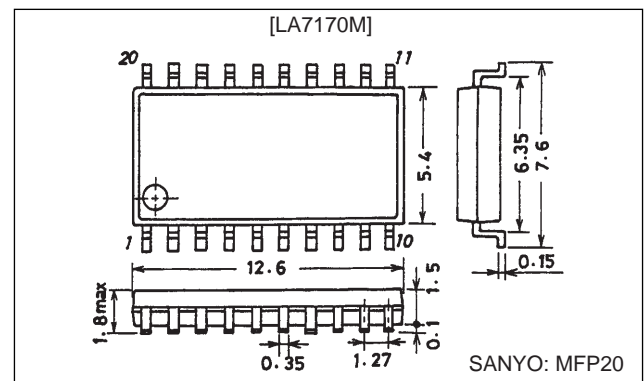
Overview

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 $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	$V_{CC\ max}$		7	V
Allowable power dissipation	$P_{d\ max}$	$T_a \leq 75^\circ\text{C}$	250	mW
Operating temperature	T_{opr}		-20 to +75	$^\circ\text{C}$
Storage temperature	T_{stg}		-55 to +150	$^\circ\text{C}$

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

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 $T_a = 25^\circ\text{C}$, $V_{CC} = 5\text{ V}$, Unless otherwise specified, $f_p = 591.25\text{ MHz}$, $f_s = 5.5\text{ MHz}$, S9: ON, S10: B, S19A: B, S19B: B

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Current drain 1	I_{CC1}	With no input	24	30	36	mA
Regulator voltage	V_{req}	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 $50\ \Omega$ terminator	77	79.5	82	$\text{dB}\mu$
Sound carrier output ratio	P/S	Ratio of levels at f_p and f_p+f_s	12.5	15	17.5	dB
Sound second harmonic distortion	P/S2	Ratio of levels at f_p and f_p+2f_s	52	62		dB
Sound third harmonic distortion	P/S3	Ratio of levels at f_p and f_p+3f_s	58	68		dB
Chrominance beat	P/CB	Ratio of P above to chrominance beat for $V_{IN} = 0.4\text{ Vp-p}$ with 4.43-MHz sine wave input	65	75		dB
Picture harmonic distortion	P/V2	Ratio of P above to level at $f_p+2\text{ MHz}$ for $V_{IN} = 1\text{ Vp-p}$ 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	$V_{IN} = 1 V_{p-p}$, 100% white	73	80	87	%	
Maximum picture modulation	mp max	$V_{IN} = 1.5 V_{p-p}$, 100% white	88	93	98	%	
SYNC compression	$\Delta(S/V)$	$V_{IN} = 1 V_{p-p}$, 100% white $\{1-(S/V)/(3/7)\} \times 100$		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	$V_{IN} = 1 V_{p-p}$, 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	$A_{IN} = 1.66 V_{p-p}$ with 1-kHz sine wave input; 100% modulation: ± 50 kHz; S10: b Note: $A_{IN} = 1 V_{p-p}$ 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	Δ ms 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; $V_{IN} = 1 V_{p-p}$ color bar; A_{IN} with 1-kHz sine wave input; ratio of level at $A_{IN} = 1 V_{p-p}$ to that at $A_{IN} = 0 V_{p-p}$	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; $A_{IN} = 1 V_{p-p}$ with 1-kHz sine wave input	43	50	57	%	
AM sound distortion ratio	THD AM	S10: a; $A_{IN} = 1 V_{p-p}$ with 1-kHz sine wave input		0.5	2	%	
AM sound signal-to-noise ratio	S/N AM	S10: a; $V_{IN} = 1 V_{p-p}$ color bar; A_{IN} with 1-kHz sine wave input; ratio of level at $A_{IN} = 1 V_{p-p}$ to that at $A_{IN} = 0 V_{p-p}$	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.

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Pin Functions

Pin No.	Symbol	Pin Voltage	Pin Description	Equivalent Circuit
1	V _{CC1}	5.0	V _{CC} for baseband circuits	
2 3	TANK1 TANK2	3.9	Connect tank circuits between these pins and the REG pin.	<p style="text-align: right;">A07247</p>
4	REG	3.9	Regulator output	<p style="text-align: right;">A07248</p>
5	FM AUDIO IN	0	FM sound input	<p style="text-align: right;">A07249</p>
6	AM AUDIO IN	0	AM sound input	<p style="text-align: right;">A07250</p>
7	GND1	0	Ground for baseband circuits	
8	VIDEO IN	3.0	Picture input. Clamp at SYNC tip.	<p style="text-align: right;">A07251</p>
9	RES	2.6 (open)	Ground this pin through a 500-kHz oscillator. Open : TSG ON GND : TSG OFF	<p style="text-align: right;">A07252</p>

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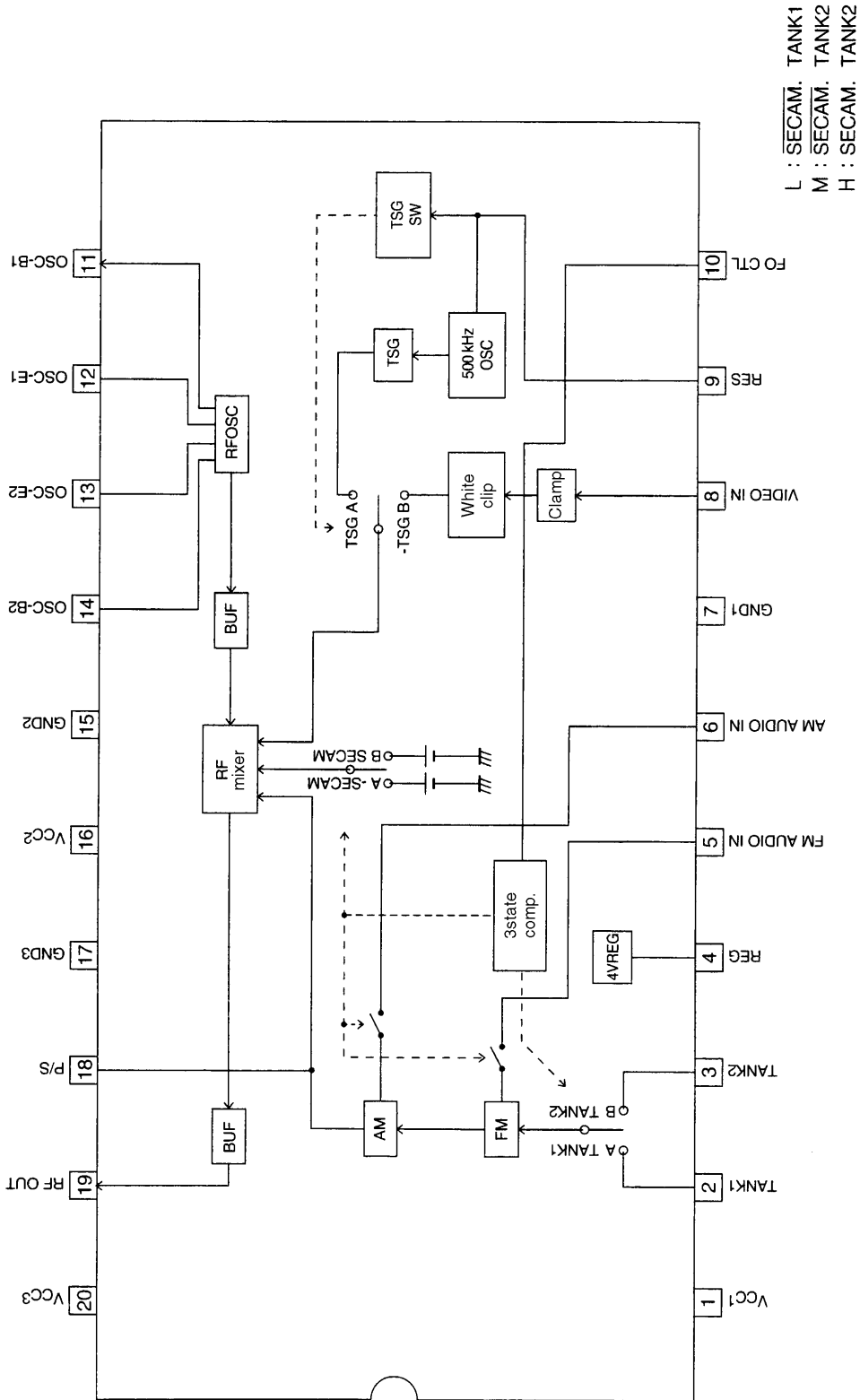
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Pin No.	Symbol	Pin Voltage	Pin Description	Equivalent Circuit
10	FoCTL	2.6 (open)	L (0 to 1.5 V) : PAL-TANK1 M (2.1 to 3.2 V) : PAL-TANK2 H (3.8 to 5.0 V) : SECAM-TANK2	
11 12 13 14	OSC-B1 OSC-E1 OSC-E2 OSC-B2	2.5 1.8 1.8 2.5	This circuit forms a Colpitts oscillator.	
15	GND2	0	Ground for RF oscillator	
16	V _{CC2}	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 _{CC3}	5.0	V _{CC} for RF mixer	

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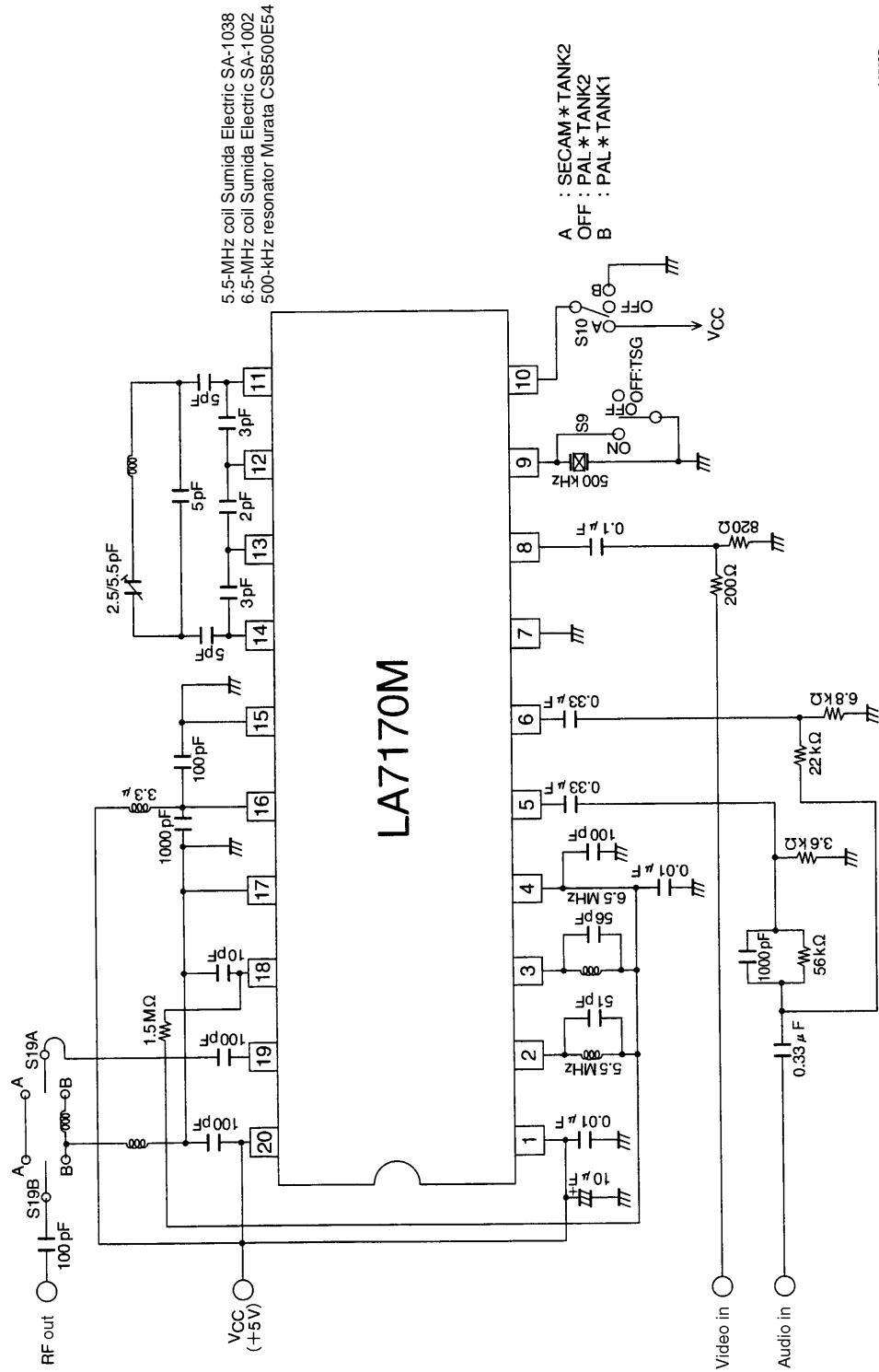
Block Diagram



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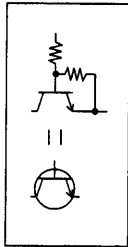
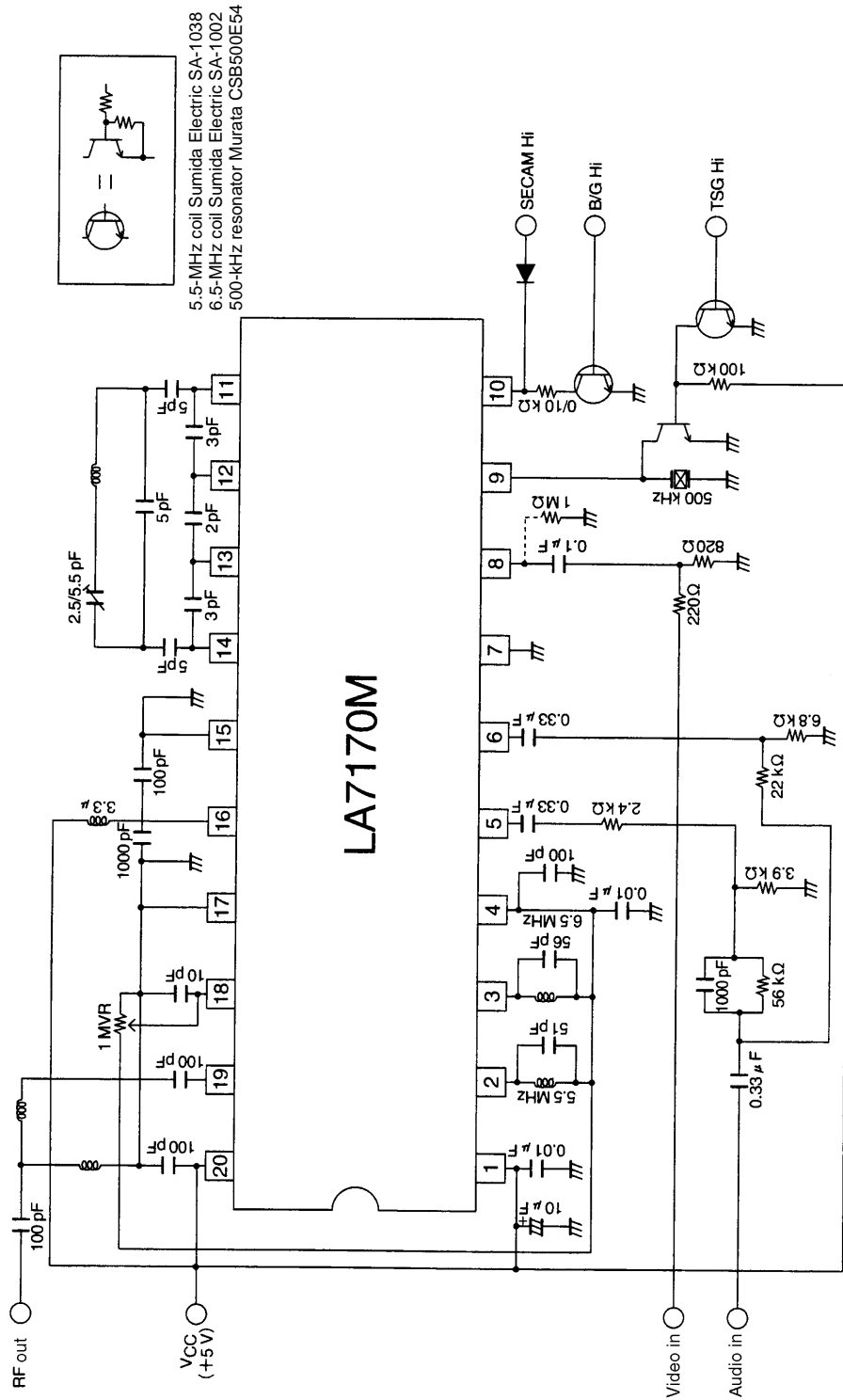
Test Circuit



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Sample Application Circuit



- 5.5-MHz coil Sumida Electric SA-1038
- 6.5-MHz coil Sumida Electric SA-1002
- 500-kHz resonator Murata CSB500E54

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