



LA7170M

RF Modulator for UHF Band (Supports SECAM)

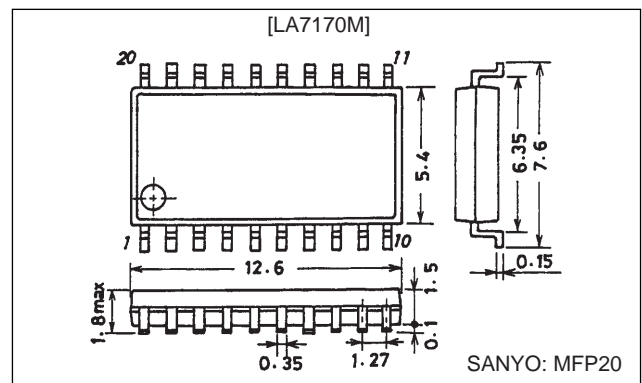
Overview

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 | P _d max | Ta ≤ 75°C | 250 | mW |
| Operating temperature | T _{opr} | | -20 to +75 | °C |
| Storage temperature | T _{stg} | | -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 _{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 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 | $V_{IN} = 1 V_{p-p}$, 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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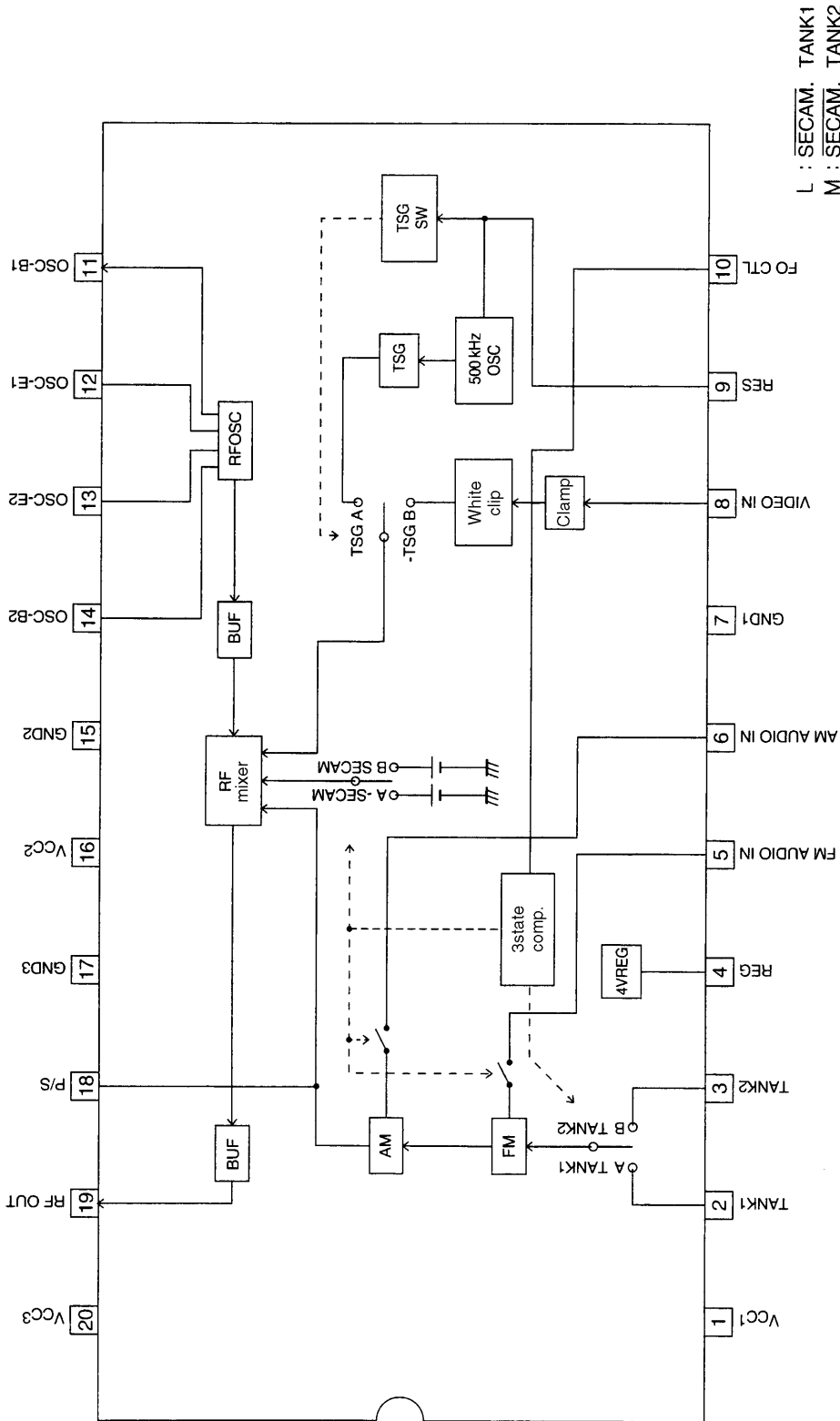
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| Pin No. | Symbol | Pin Voltage | Pin Description | Equivalent Circuit |
|----------------------|--------------------------------------|--------------------------|--|--|
| 10 | FoCTL | 2.6 (open) | L (0 to 1.5 V) : PAL-TANK1 M (2.1 to 3.2 V) : PAL-TANK2 H (3.8 to 5.0 V) : SECAM-TANK2 | <p style="text-align: right;">A07253</p> |
| 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. | <p style="text-align: right;">A07254</p> |
| 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. | <p style="text-align: right;">A07255</p> |
| 19 | RF OUT | 3.0 | RF mixer signal output | <p style="text-align: right;">A07256</p> |
| 20 | V _{CC} 3 | 5.0 | V _{CC} for RF mixer | |

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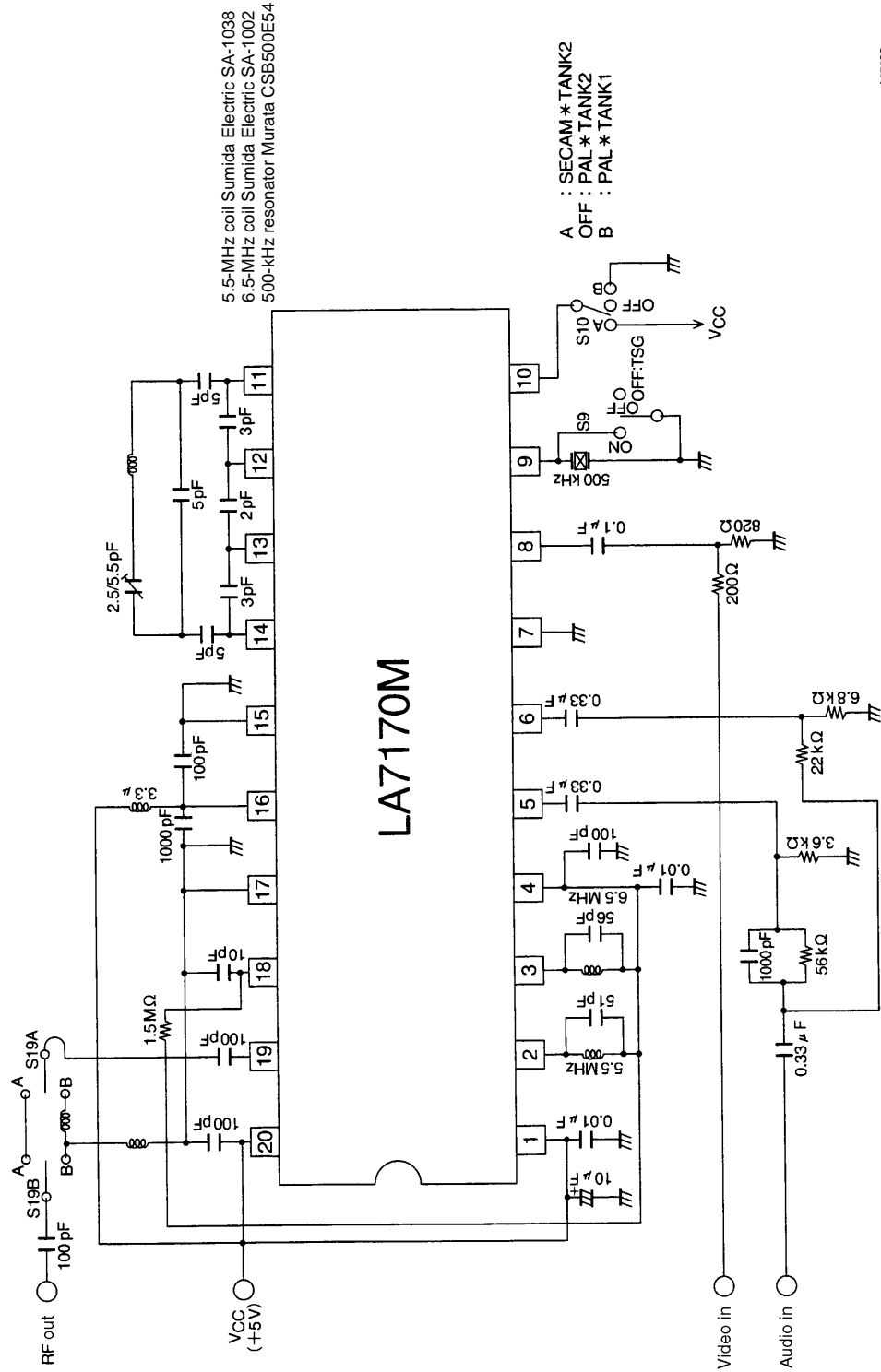
Block Diagram



A07259

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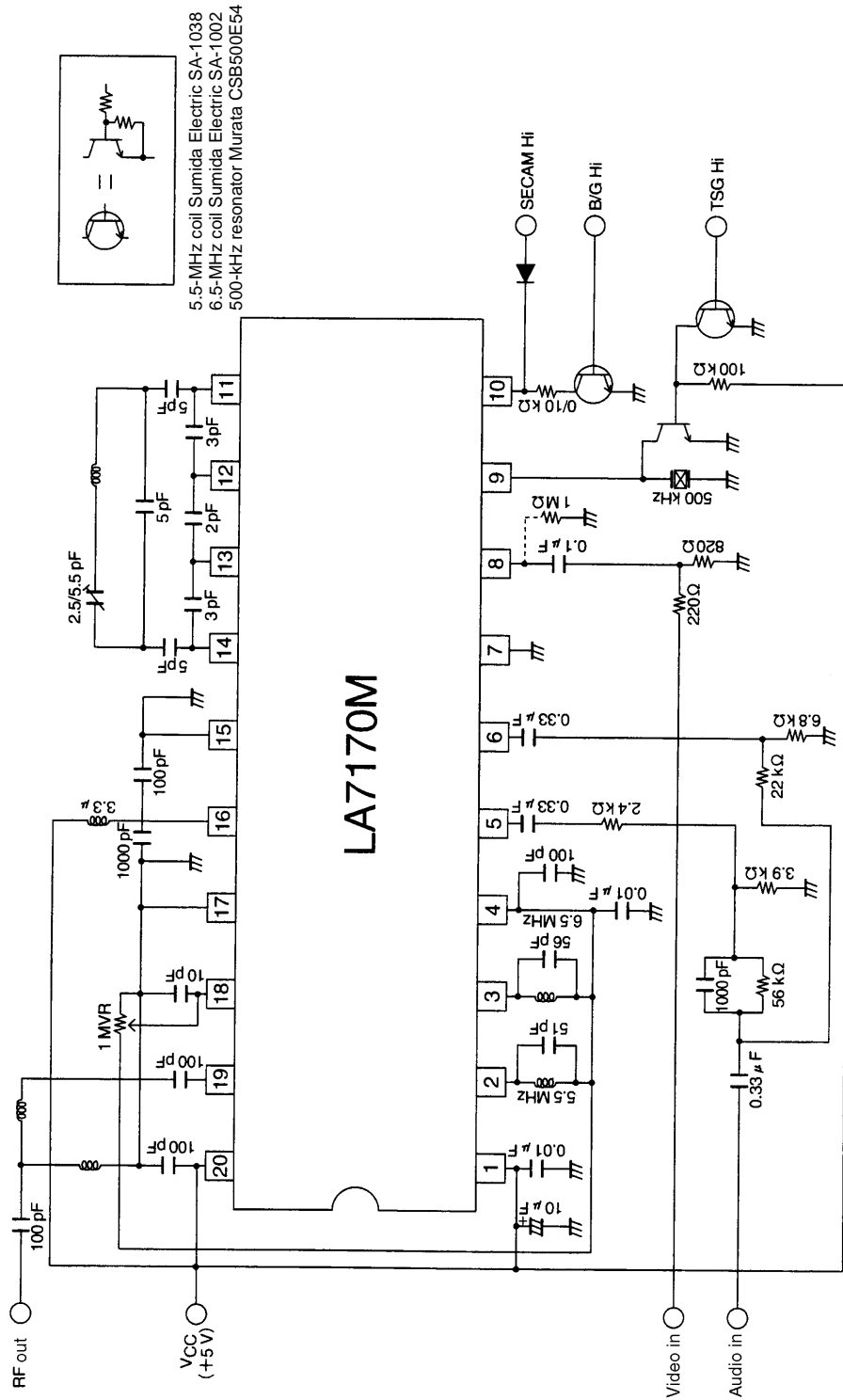
Test Circuit



A07257

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Sample Application Circuit



A07258

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