



LA8670M

Double-Conversion Narrow-Band FM IF System

Overview

The LA8670M is a narrow band FM IF system for use in communication equipment. In addition to the functions required for FM reception, the LA8670M provides a rich set of additional functions including noise detection and field strength detection, and is thus optimal for cordless telephones.

Functions

- First mixer, first local oscillator, first local oscillator buffer output, second mixer, second local oscillator
- IF amplifier, limiter, quadrature detector
- Signal meter
- Noise detector, noise amplifier, noise wave detector, Schmitt trigger

Features

- Low voltage operation: $V_{CC\text{ OP}} = 1.8$ to 6 V
- Signal meter linear over a wide range (70 dB typical)
- High sensitivity, high intercept point

Specifications

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

| Parameter | Symbol | Conditions | Ratings | Unit |
|-----------------------------|---------------------|-----------------------------|-------------|------------------|
| Maximum supply voltage | $V_{CC\text{ max}}$ | | 7.0 | V |
| Allowable power dissipation | $P_{d\text{ max}}$ | $T_a \leq 75^\circ\text{C}$ | 150 | mW |
| Operating temperature | T_{opr} | | -20 to +75 | $^\circ\text{C}$ |
| Storage temperature | T_{stg} | | -40 to +125 | $^\circ\text{C}$ |

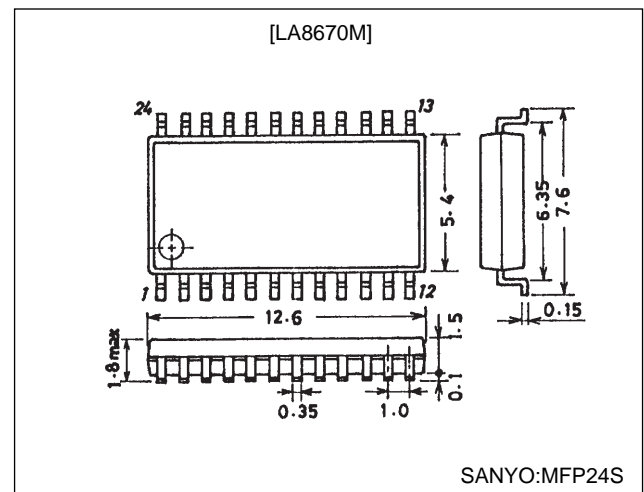
Operating Conditions at $T_a = 25^\circ\text{C}$

| Parameter | Symbol | Conditions | Ratings | Unit |
|----------------------------|--------------------|------------|------------|------|
| Recommended supply voltage | V_{CC} | | 3.0 | V |
| Operating supply voltage | $V_{CC\text{ OP}}$ | | 1.8 to 6.0 | V |

Package Dimensions

unit: mm

3112-MFP24S



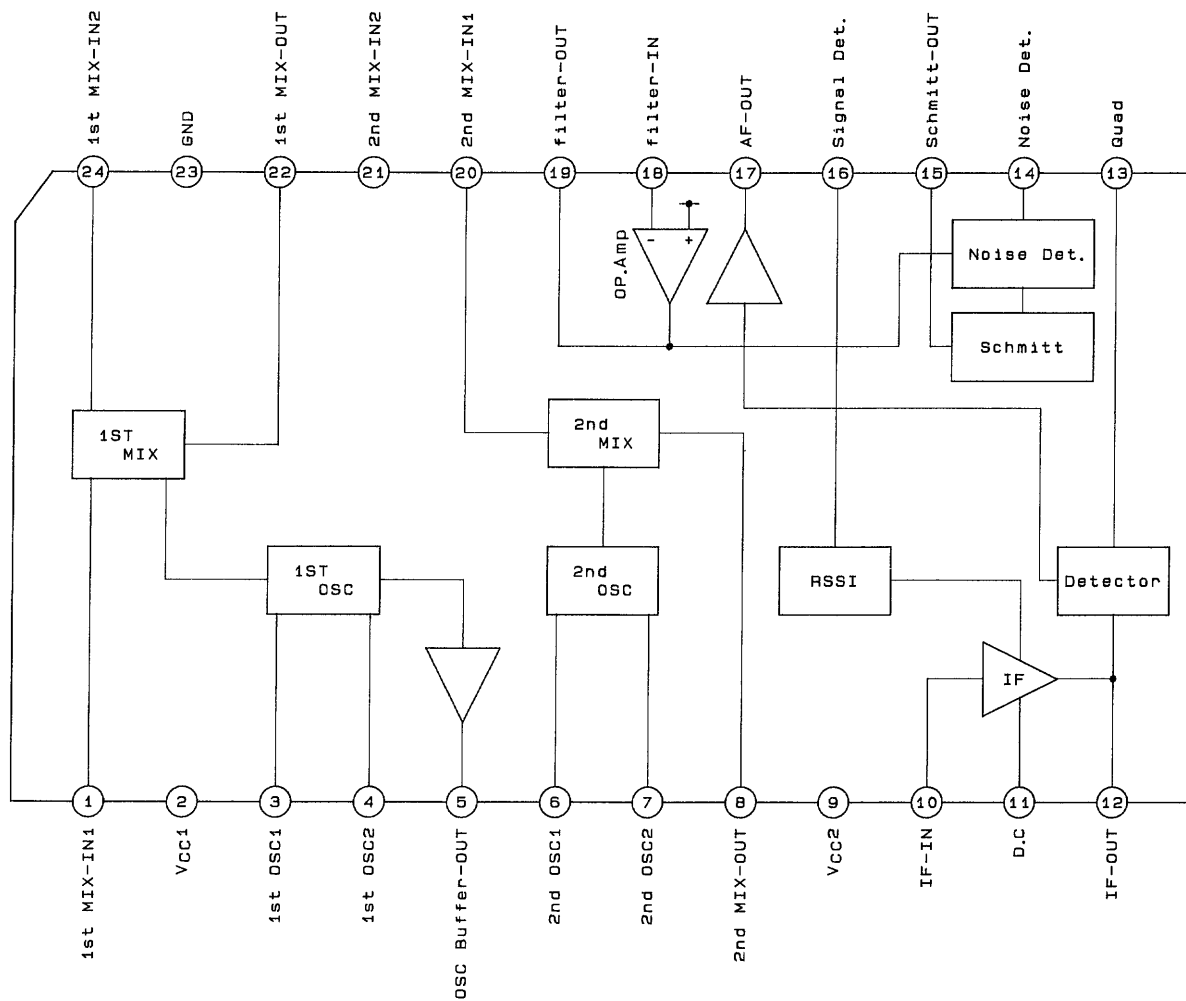
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Operating Characteristics at $T_a = 25^\circ\text{C}$, $V_{CC} = 3\text{ V}$, $f_C (\text{MIX}) = 49.830\text{ MHz}$, $f_{\text{mod}} = 1\text{ kHz}$, $\Delta f = \pm 3\text{ kHz}$

| Parameter | Symbol | Conditions | min | typ | max | Unit |
|------------------------------|-------------|--|------|------|------|------------|
| Quiescent current | I_{CCO} | No input | | 7.3 | 9.5 | mA |
| Mixer intercept point | I_{p3} | First mixer | | -4.8 | | dBm |
| 12 dB sensitivity | 12dB S/N | No input matching | | 3.2 | 5.0 | dB μ |
| Demodulator output | V_O | $V_{in} = 80\text{ dB}\mu$ | 143 | 180 | 227 | mVrms |
| Signal-to-noise ratio | S/N | No modulation, $V_{in} = 80\text{ dB}\mu$ | 60 | 67 | | dB |
| AM rejection ratio | AMR | AM 30% modulation | 35 | 43 | | dB |
| Total harmonic distortion | THD | $V_{in} = 80\text{ dB}\mu$ | | 2.2 | 3.0 | % |
| Signal meter output | $V_{SM(1)}$ | $V_{in} = 0\text{ dB}\mu$ | 0.05 | 0.30 | 0.65 | V |
| | $V_{SM(2)}$ | $V_{in} = 40\text{ dB}\mu$ | 0.60 | 0.90 | 1.40 | V |
| | $V_{SM(3)}$ | $V_{in} = 80\text{ dB}\mu$ | 1.05 | 1.40 | 1.85 | V |
| Noise detector output | $V_{ND(1)}$ | $f_i = 40\text{ kHz}$, $V_i = -50\text{ dBV}$ | | 0.10 | 0.25 | V |
| | $V_{ND(2)}$ | $f_i = 40\text{ kHz}$, $V_i = -30\text{ dBV}$ | 1.10 | 1.40 | 1.70 | V |
| Noise detector level | $V_{14(1)}$ | Schmitt on | 0.53 | 0.63 | 0.73 | V |
| | $V_{14(2)}$ | Schmitt off | 0.33 | 0.43 | 0.53 | V |
| Schmitt output level | $V_{SH(1)}$ | $V_{14} = 0.8\text{ V}$ | | | 0.3 | V |
| | $V_{SH(2)}$ | $V_{14} = 0.2\text{ V}$ | 2.8 | | | V |
| Mixer conversion gain | G_{M1} | First mixer | | 19 | | dB |
| | G_{M2} | Second mixer | | 24 | | dB |
| Mixer input frequency | | | | | 90 | MHz |
| Mixer input resistance | | First mixer | | 5 | | k Ω |
| | | Second mixer | | 330 | | Ω |
| Mixer output resistance | | First mixer | | 330 | | Ω |
| | | Second mixer | | 2.0 | | k Ω |
| FM detector output impedance | | | | 520 | | Ω |

Note: AC levels are all indicated for open (EMF) circuits.

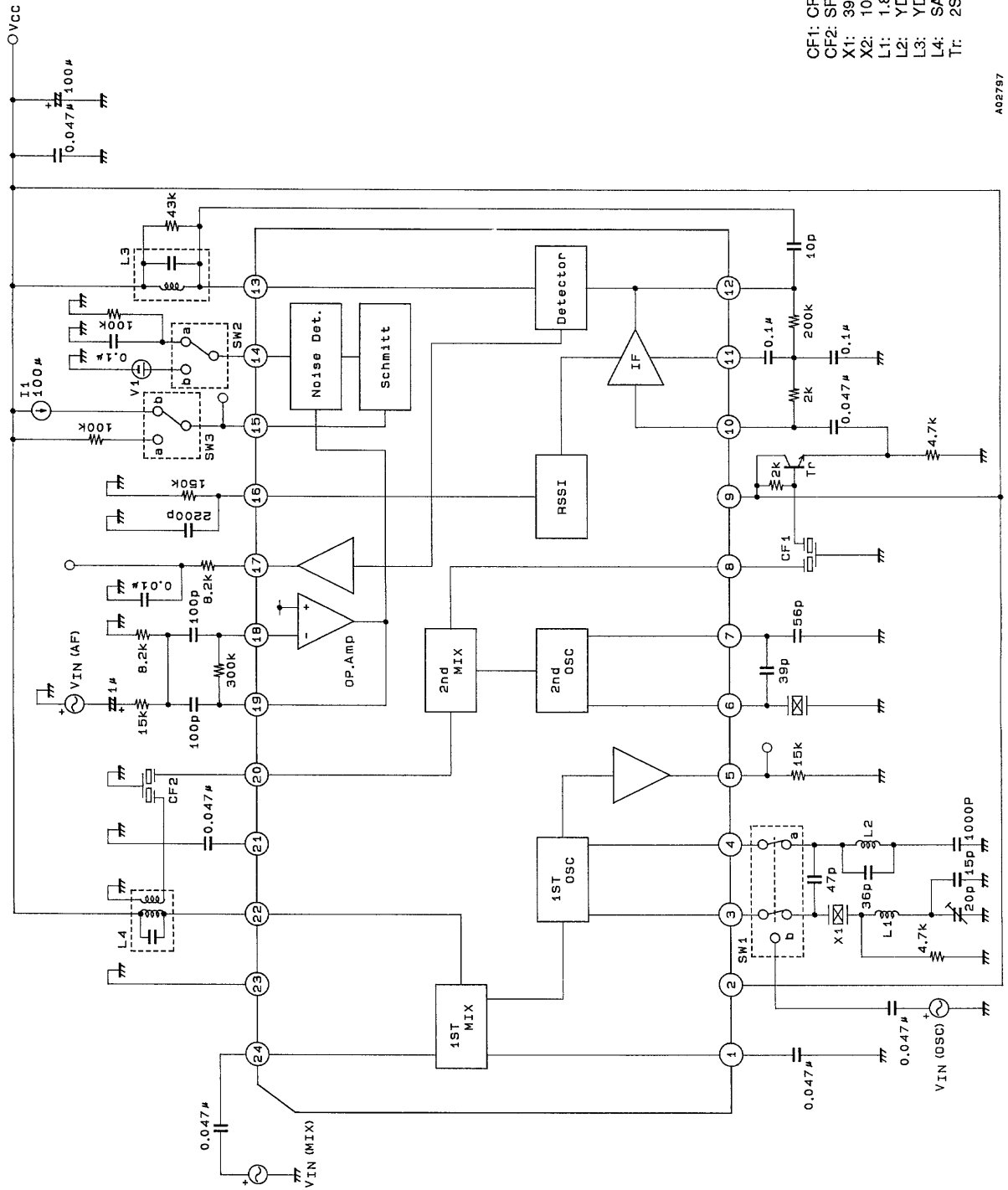
Equivalent Circuit Block Diagram



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Test Circuit

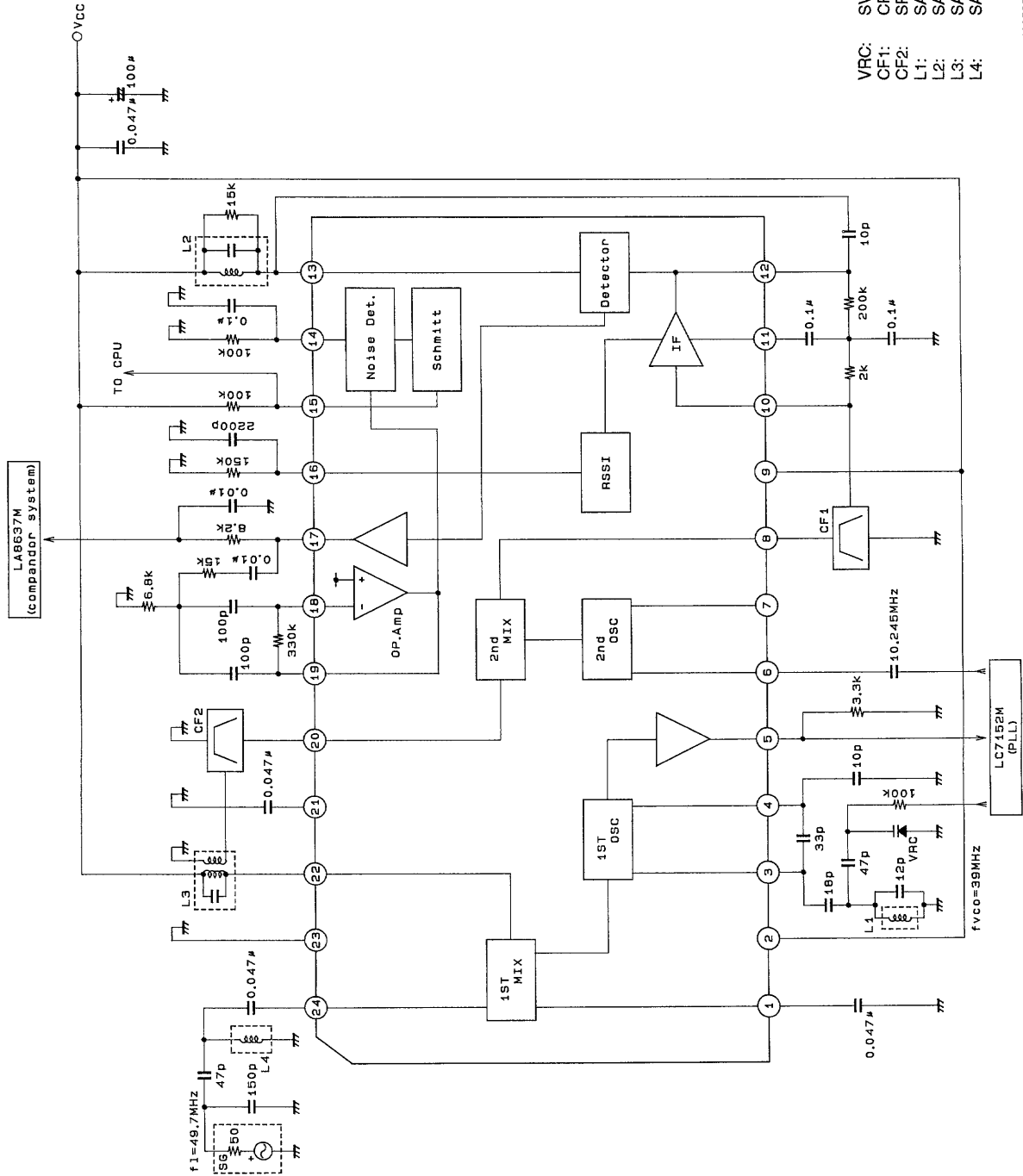


- CF1: CFW455F (Murata Mfg. Co., Ltd.)
- CF2: SFE10.7MS2 (Murata Mfg. Co., Ltd.)
- X1: 39.130 MHz
- X2: 10.245 MHz
- L1: 1.8 μH
- L2: YD1002 (Mitsumi Electric Co., Ltd.)
- L3: YD0051 (Mitsumi Electric Co., Ltd.)
- L4: SA-246 (Sumida)
- T: 2SC2999

Unit (resistance: Ω, capacitance: F)

A02797

Sample Application Circuit



- VFC: SVC201SPA (Sanyo Electric Co., Ltd.)
- CF1: CFW455F (Murata Mfg. Co., Ltd.)
- CF2: SFE10.7MS2 (Murata Mfg. Co., Ltd.)
- L1: SA-254 (Sumida)
- L2: SA-257 (Sumida)
- L3: SA-246 (Sumida)
- L4: SA-289 (Sumida)

A05789 Unit (resistance: Ω, capacitance: F)

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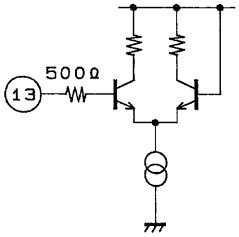
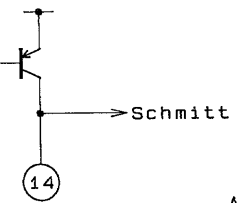
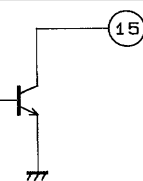
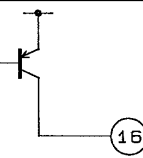
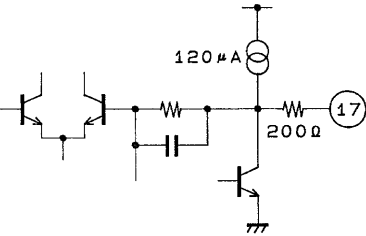
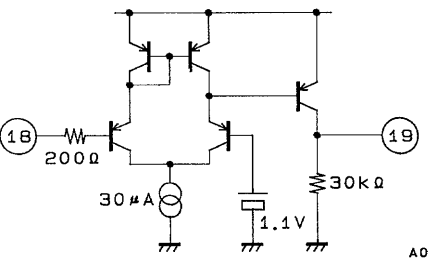
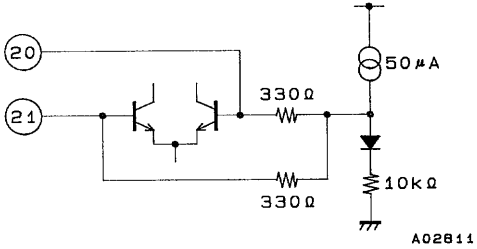
Pin Functions

| Pin No. | Symbol | Internal equivalent circuit | Note |
|---------|------------------|-----------------------------|---|
| 24 | 1st MIX-IN 2 | | First mixer inputs |
| 1 | 1st MIX-IN 1 | | |
| 2 | V _{CC1} | | Power supply for the first mixer |
| 3 | 1st OSC 1 | | Local oscillator inputs |
| 4 | 1st OSC 2 | | |
| 5 | OSC Buffer-OUT | | Local oscillator buffer output |
| 6 | 2nd OSC 1 | | Local oscillator inputs When external insertion is used, input the signal to pin 6 and leave pin 7 open. |
| 7 | 2nd OSC 2 | | |
| 8 | 2nd MIX-OUT | | Second mixer output |
| 9 | V _{CC2} | | Power supply |
| 10 | IF-IN | | IF amplifier input |
| 11 | D.C | | IF amplifier DC feedback |
| 12 | IF-OUT | | Limiter amplifier output |

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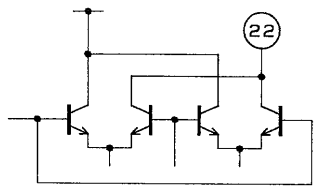
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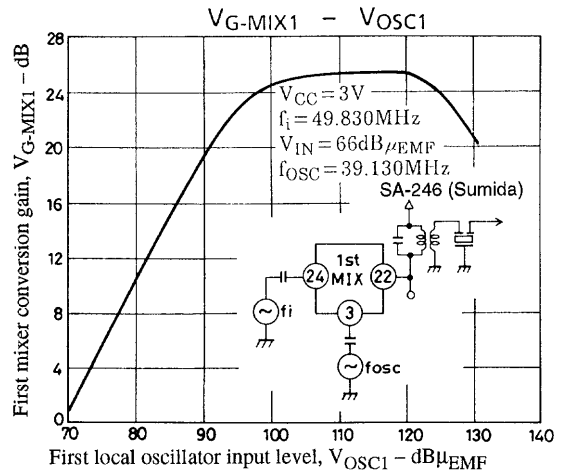
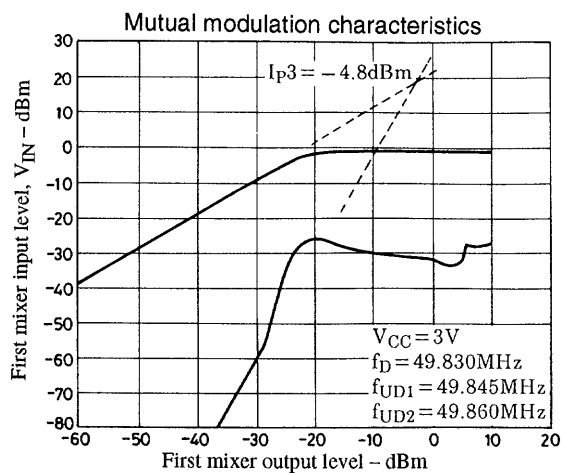
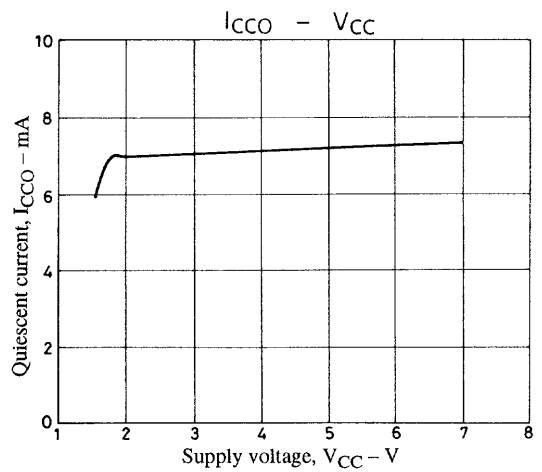
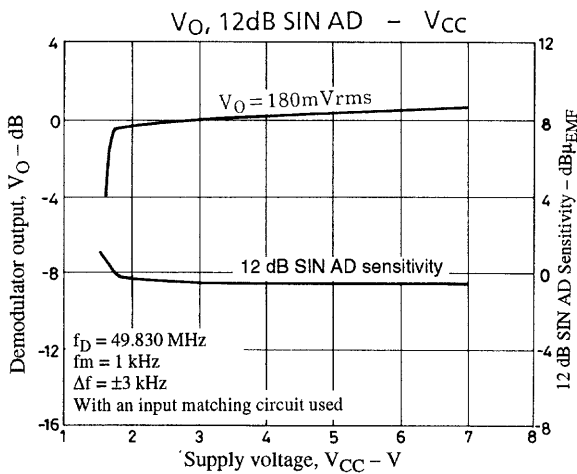
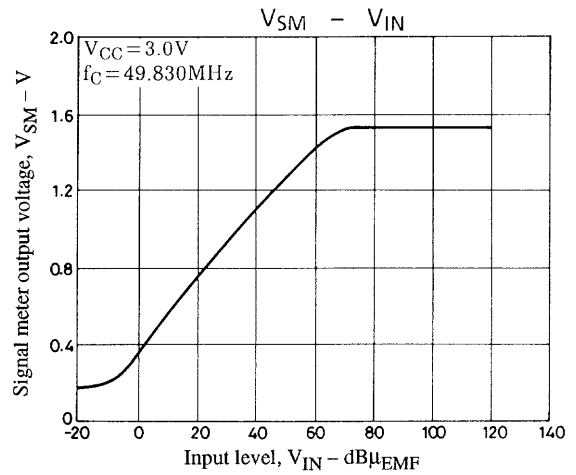
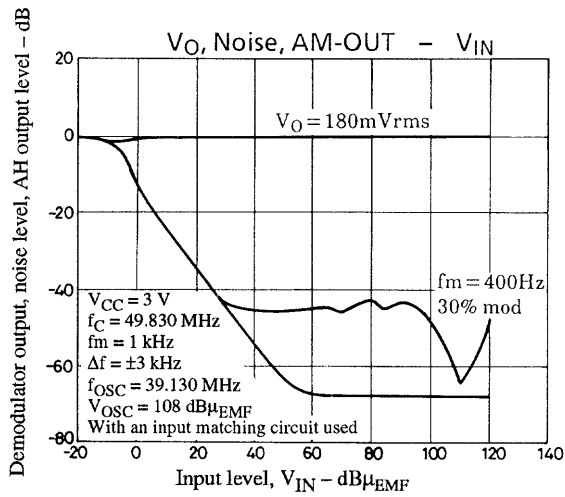
| Pin No. | Symbol | Internal equivalent circuit | Note |
|---------|--------------|--|------------------------------|
| 13 | Quad. |  <p style="text-align: right;">A02805</p> | Discriminator connection |
| 14 | Noise det. |  <p style="text-align: right;">A02806</p> | Noise detector |
| 15 | Schmitt-OUT |  <p style="text-align: right;">A02807</p> | Noise Schmitt output |
| 16 | Signal DET. |  <p style="text-align: right;">A02808</p> | Field strength signal output |
| 17 | AF-OUT |  <p style="text-align: right;">A02809</p> | FM detector output |
| 18 | Filter-IN |  <p style="text-align: right;">A02810</p> | Noise filter input |
| 19 | Filter-OUT | | Noise filter output |
| 20 | 2nd MIX-IN 1 |  <p style="text-align: right;">A02811</p> | Second mixer input |
| 21 | 2nd MIX-IN 2 | | |

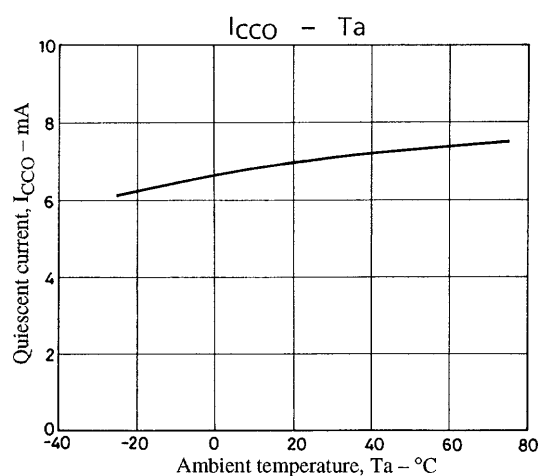
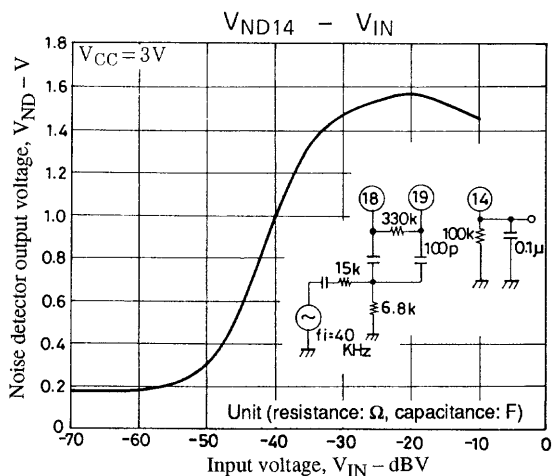
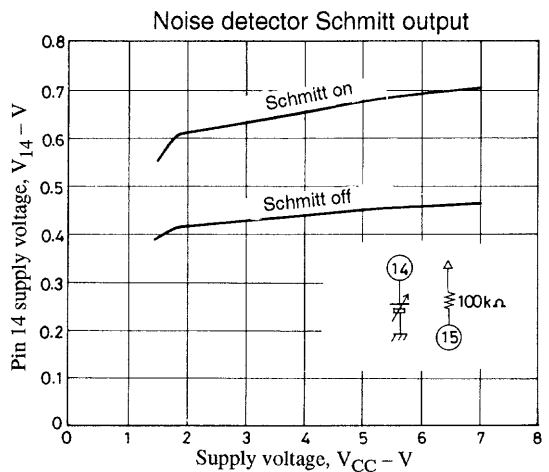
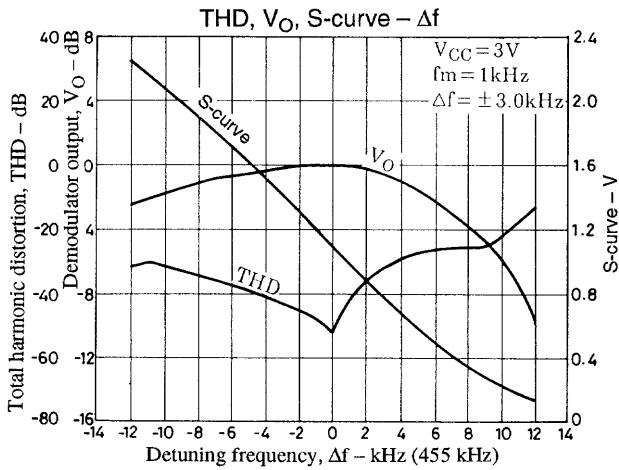
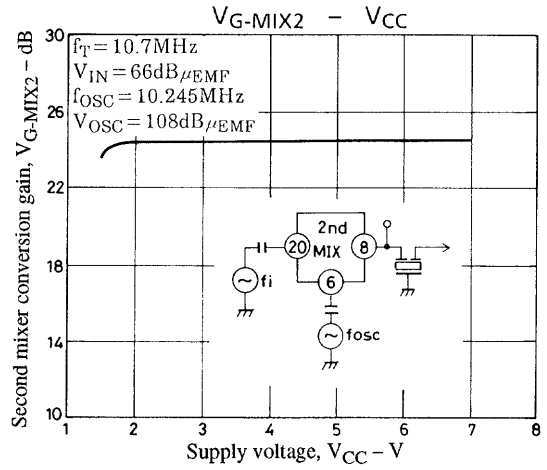
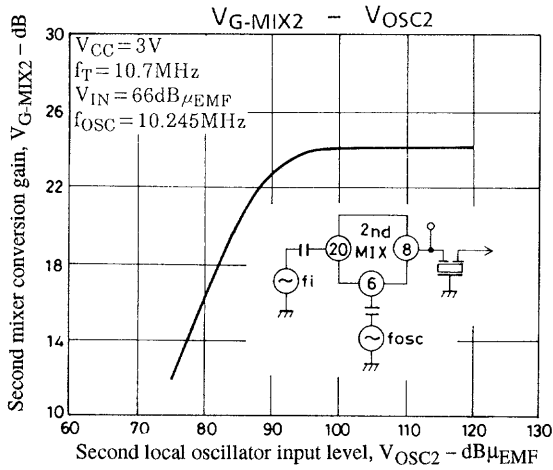
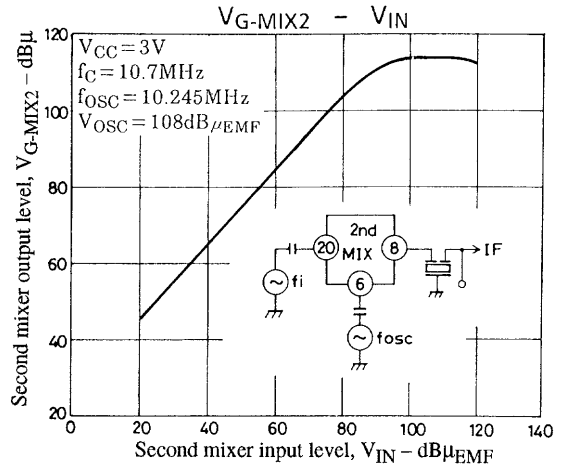
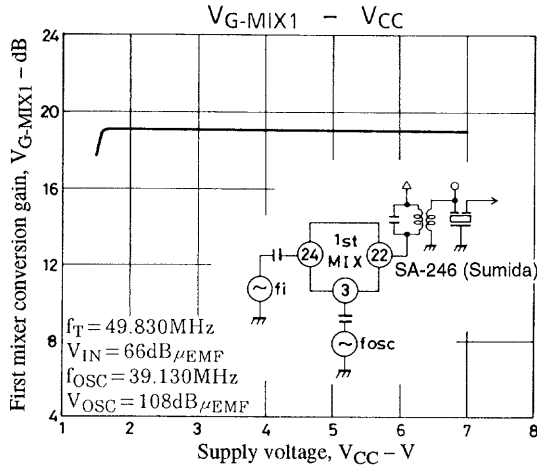
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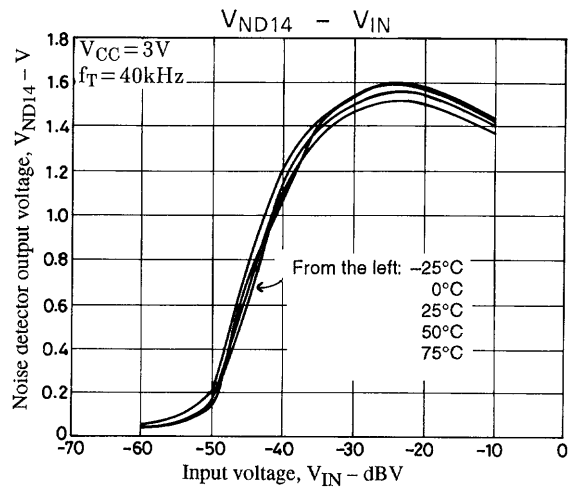
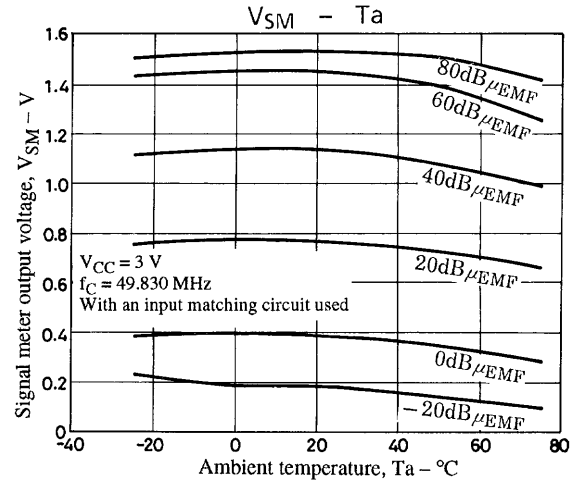
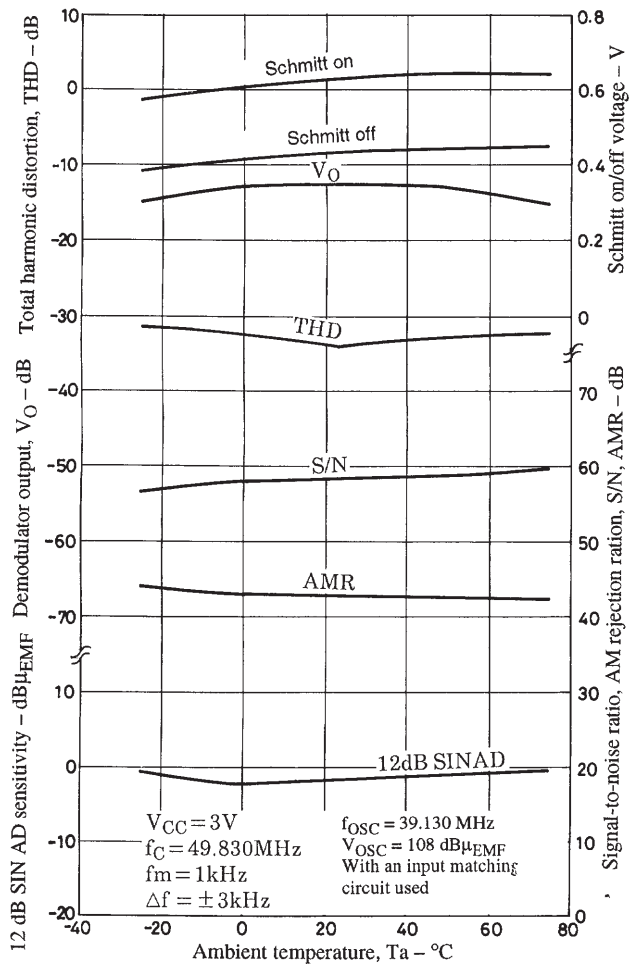
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| Pin No. | Symbol | Internal equivalent circuit | Note |
|---------|-------------|--|--------------------|
| 22 | 1st MIX-OUT |  <p style="text-align: right;">A02B12</p> | First mixer output |
| 23 | GND | | Ground |







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