

**SANYO**

No.3890A

**LA8604M****Narrowband FM IF Stage****OVERVIEW**

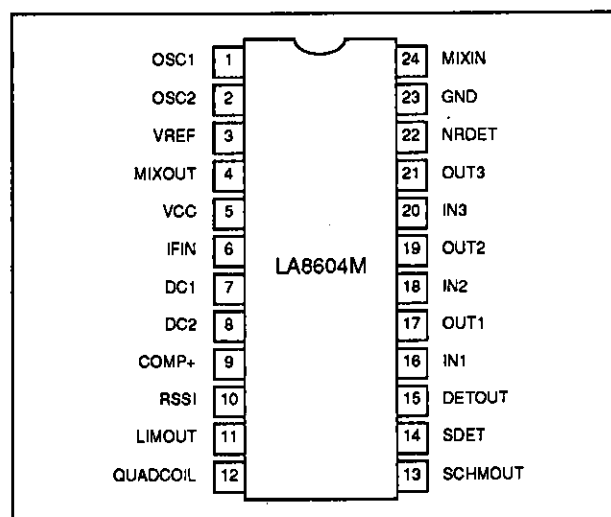
The LA8604M is a narrowband FM IF stage IC that incorporates all the functional blocks for a complete IF stage, including noise filtering, making it ideal for use in cordless telephones.

The LA8604M comprises a second-stage oscillator, a mixer, an IF amplifier, an FM detector, and noise detector, amplifier and rectifier circuits. A signal level meter output which is linear over a wide dynamic range of up to 70 dB is also incorporated.

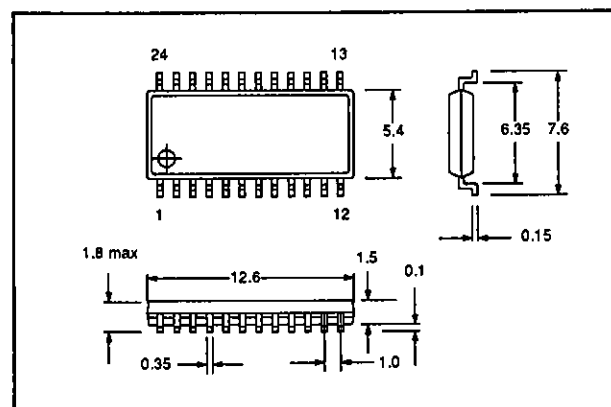
The LA8604M operates from a 2.4 to 6 V supply and is available in 24-pin MFPs.

**FEATURES**

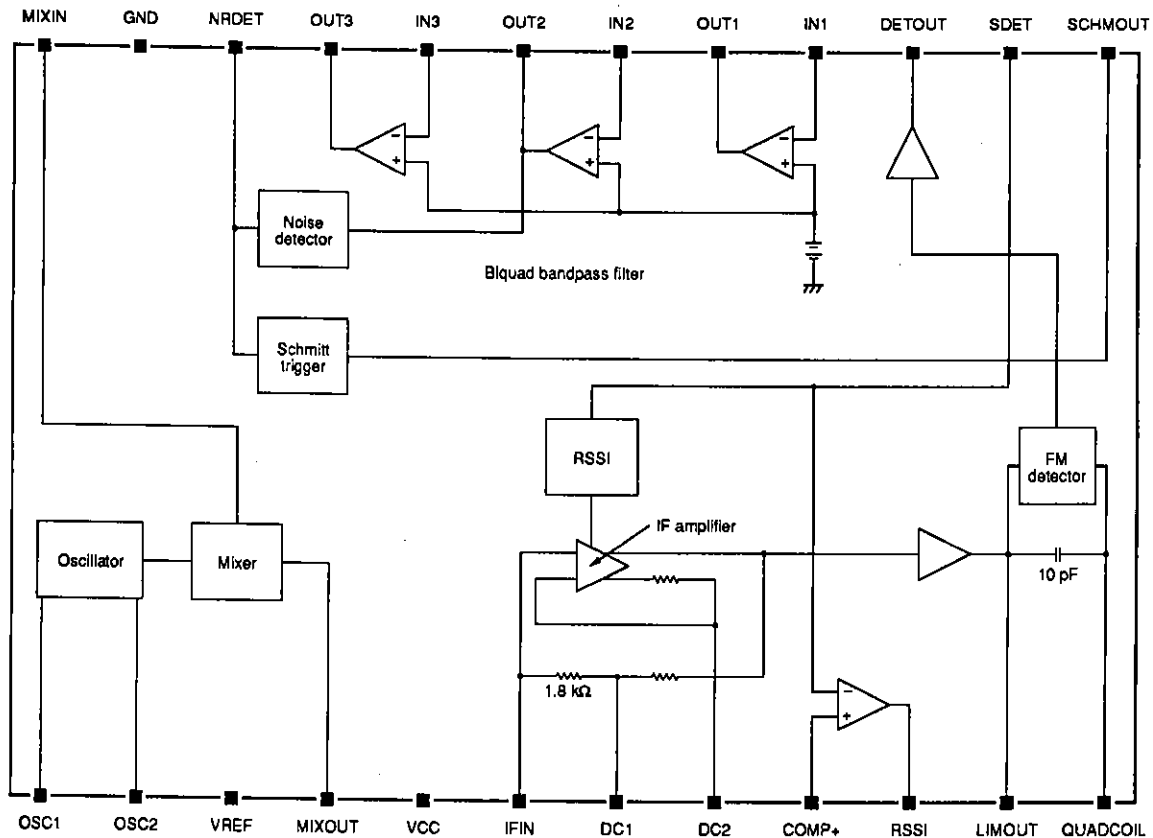
- On-chip mixer, IF amplifier and limiter
- On-chip noise filter buffer
- 70 dB (typ) signal level meter linearity
- Signal level meter output buffer
- 2.4 to 6 V supply
- 24-pin MFP

**PINOUT****PACKAGE DIMENSIONS**

Unit: mm

**3112-MFP24S**

## BLOCK DIAGRAM



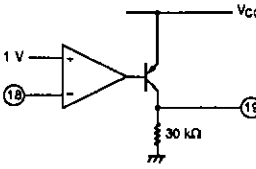
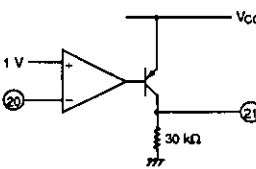
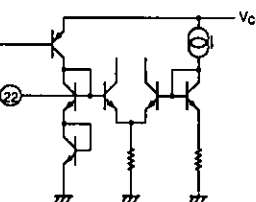
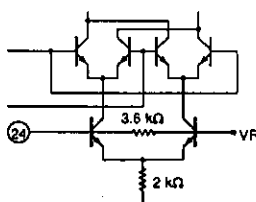
## PIN DESCRIPTION

Number	Name	Equivalent circuit	Description
1	OSC1		Colpitts oscillator crystal connection. Nominal voltage is $V_{CC}$ .
2	OSC2		Colpitts oscillator capacitor connection. Nominal voltage is $V_{CC} - 0.7$ V.
3	VREF		1.2 V reference voltage output
4	MIXOUT		Mixer buffer output. Nominal voltage is $V_{CC} - 0.3$ V.

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Number	Name	Equivalent circuit	Description
5	VCC		Supply voltage
6	IFIN		IF amplifier input. Nominal voltage is $V_{CC} - 0.9$ V.
7	DC1		IF amplifier feedback network connections. Nominal voltage is $V_{CC} - 0.9$ V.
8	DC2		
9	COMP+		RSSI comparator threshold input
10	RSSI		Open-collector, RSSI comparator output
11	LIMOUT		Limiter amplifier output. Nominal voltage is 0.2 V.
12	QUADCOIL		Detector tuning network connection. Nominal voltage is $V_{CC}$ .
13	SCHMOUT		Open-collector, noise comparator Schmitt-trigger output
14	SDET		Signal strength detector output. Nominal voltage is in the range 0.1 to 1.5 V.
15	DETOUT		FM detector output. Nominal voltage is 1.2 V.
16	IN1		Operational amplifier 1 inverting input. Nominal voltage is 1.0 V.
17	OUT1		Operational amplifier 1 output. Nominal voltage is 1.0 V.

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Number	Name	Equivalent circuit	Description
18	IN2		Operational amplifier 2 inverting input. Nominal voltage is 1.0 V.
19	OUT2		Operational amplifier 2 output. Nominal voltage is 1.0 V.
20	IN3		Operational amplifier 3 inverting input. Nominal voltage is 1.0 V.
21	OUT3		Operational amplifier 3 output. Nominal voltage is 1.0 V.
22	NRDET		Noise detector output. Nominal voltage is in the range 0 to 1.4 V.
23	GND		Ground
24	MIXIN		Mixer input. Nominal voltage is 1.2 V.

## SPECIFICATIONS

### Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Supply voltage	$V_{CC}$	8	V
Power dissipation	$P_D$	300	mW
Operating temperature range	$T_{OPR}$	-20 to 75	°C
Storage temperature range	$T_{STG}$	-40 to 125	°C

### Recommended Operating Conditions

$T_A = 25\text{ °C}$

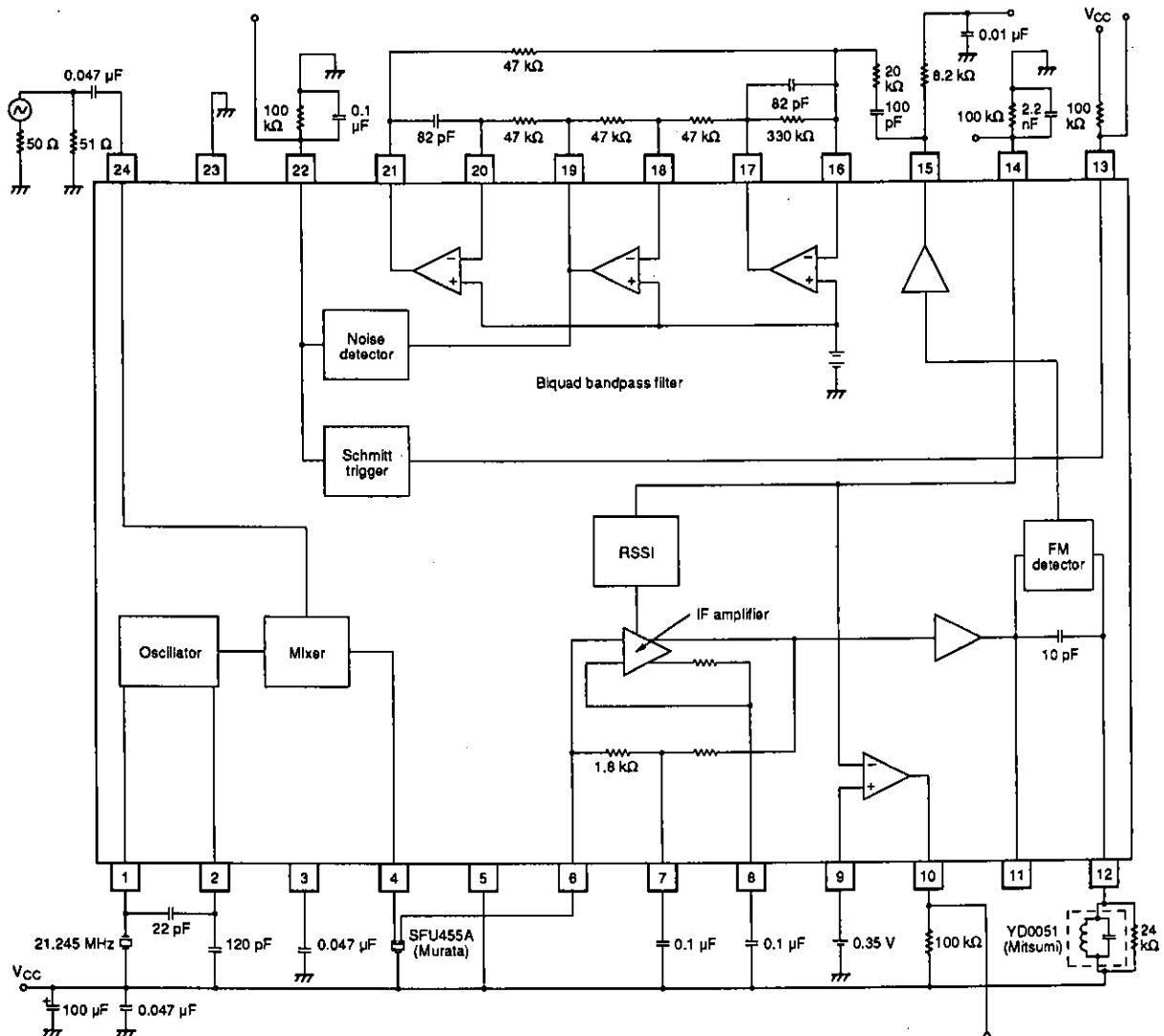
Parameter	Symbol	Rating	Unit
Supply voltage	$V_{CC}$	3	V
Supply voltage range	$V_{CC}$	2.4 to 6.0	V

## Electrical Characteristics

 $V_{CC} = 3\text{ V}$ ,  $T_A = 25\text{ }^{\circ}\text{C}$ ,  $f_c = 21.7\text{ MHz}$ ,  $f_{mod} = 1\text{ kHz}$ ,  $\Delta f = \pm 3\text{ kHz}$ 

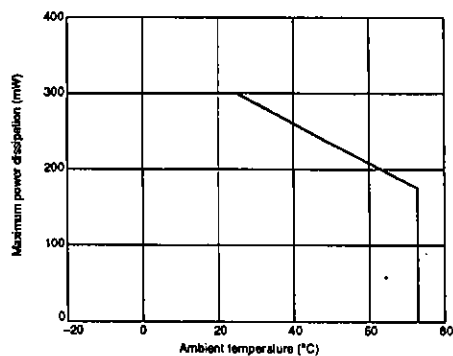
Parameter	Symbol	Condition	Rating			Unit
			min	typ	max	
Quiescent supply current	$I_{CCO}$		—	2.8	3.8	mA
Noise detector output voltage	$V_{ND}$	$V_i = 10\text{ dB}\mu$	1.1	1.4	—	V
		$V_i = 30\text{ dB}\mu$	—	0	0.1	
Schmitt-trigger output voltage	$V_{SH}$	$V_i = 10\text{ dB}\mu$	—	—	0.5	V
		$V_i = 25\text{ dB}\mu$	2.8	—	—	
Signal meter output voltage	$V_{SM}$	$V_i = 5\text{ dB}\mu$	—	0.1	0.3	V
		$V_i = 50\text{ dB}\mu$	0.8	1.1	1.4	
		$V_i = 80\text{ dB}\mu$	1.3	1.6	2.0	
RSSI output voltage	$V_{RSSI}$	$V_i = 5\text{ dB}\mu$	2.8	—	—	V
		$V_i = 35\text{ dB}\mu$	—	—	0.5	
Demodulated rms output voltage	$V_O$	$V_i = 80\text{ dB}\mu$	115	170	230	mV
-3 dB limiting sensitivity	-3dBLS	$V_i = 80\text{ dB}\mu$	—	5	11	dB $\mu$
Signal-to-noise ratio	S/N	$V_i = 80\text{ dB}\mu$ , zero modulation	54	60	—	dB
		$V_i = 20\text{ dB}\mu$ , zero modulation	20	25	—	
Amplitude modulation rejection ratio	AMR	30% AM modulation, $V_i = 80\text{ dB}\mu$	30	40	—	dB
Schmitt-trigger level	SH		10	18	25	dB $\mu$
Schmitt-trigger hysteresis	$SH_{HY}$		—	1	—	dB
Mixer conversion gain	$G_M$		—	20	—	dB
Mixer input frequency	$f_M$		—	—	90	MHz
Mixer input impedance	$R_{MI}$		—	3.6	—	k $\Omega$
Mixer output impedance	$R_{MO}$		—	1.8	—	k $\Omega$
IF amplifier input impedance	$R_{II}$		—	1.8	—	k $\Omega$
FM detector output impedance	$R_{FMO}$		—	2.4	—	k $\Omega$
Total harmonic distortion	THD	$V_i = 80\text{ dB}\mu$	—	0.7	2.0	%

## Measurement Circuit



## Typical Performance Characteristics

### Maximum power dissipation vs. ambient temperature



## TYPICAL APPLICATIONS

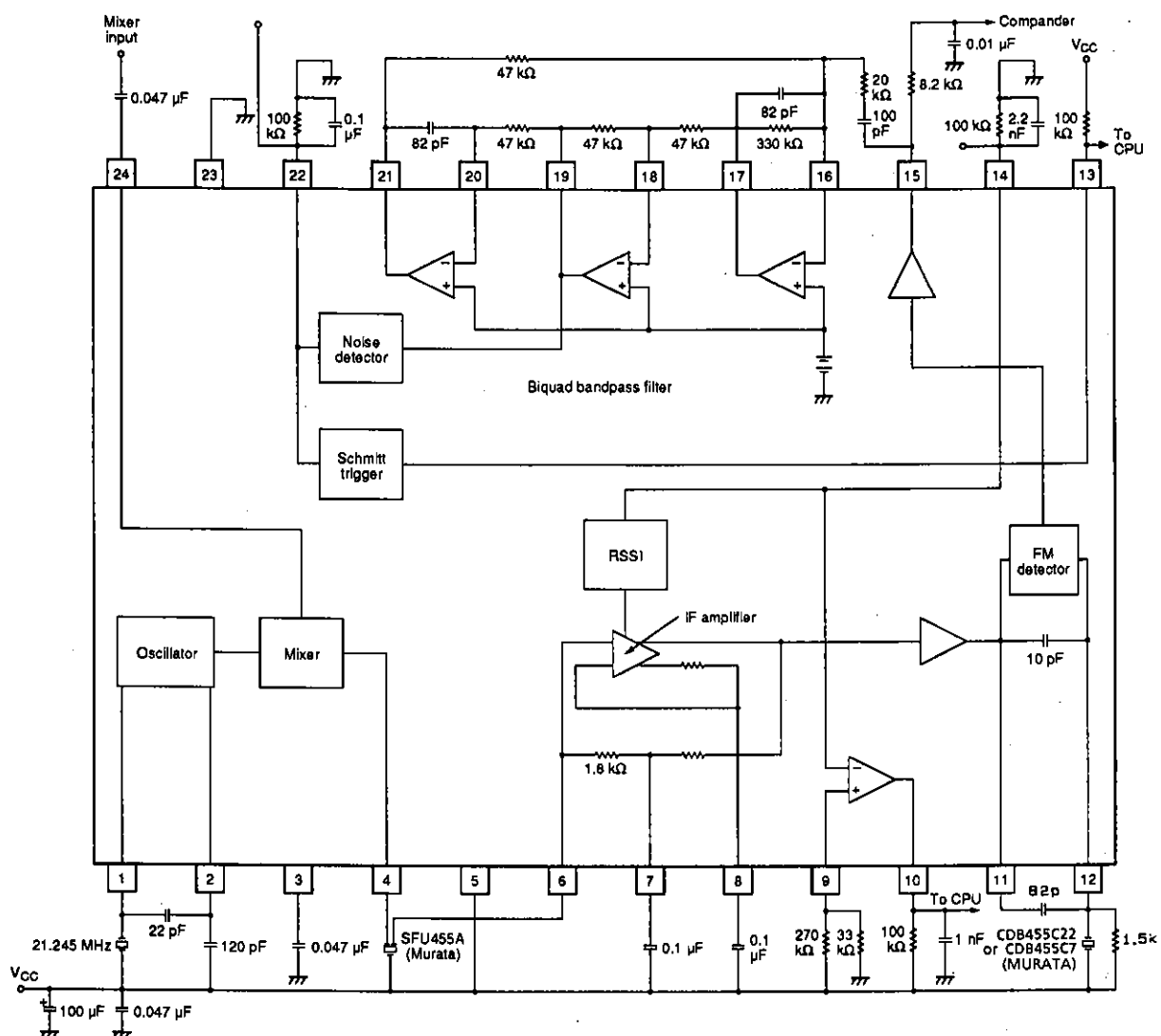


Figure 1. Crystal detector

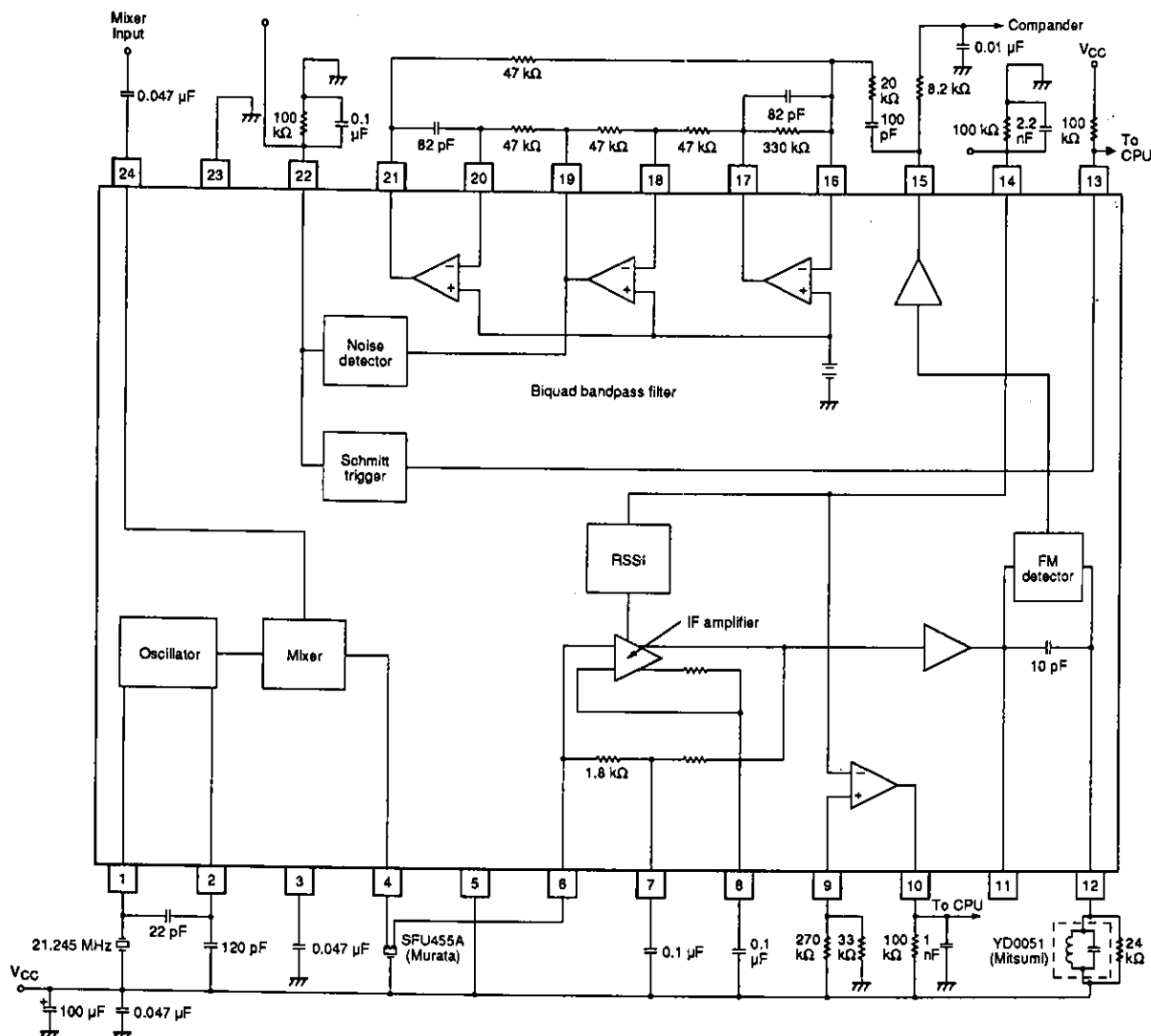


Figure 2. LC network detector

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