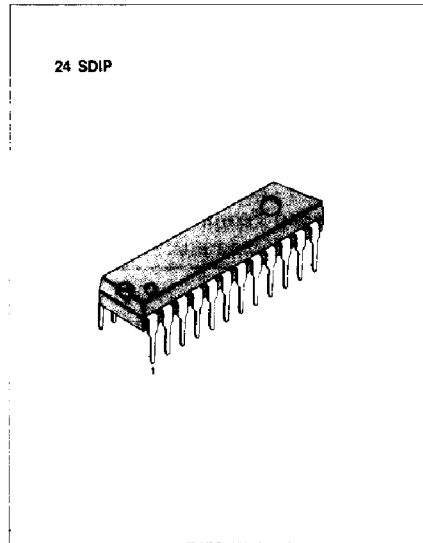


**FM RECEIVER**

The KA8509 is complete FM narrowband dual conversion receiver from RF amplifier to audio pre-amplifier output. It contains oscillator, mixer, limiter and meter drive, quadrature detector, carrier detect, and a comparator circuit for FSK data detection. This device operates superior to low power in the VHF bandwidth.



**FEATURES**

- Complete dual conversion circuit
- Operating voltage range: 2 – 7V
- Typical supply current (4.5mA at 5V)
- Excellent input sensitivity (– 3dB limiting, 0.7uVrms typ)
- RSSI has 60dB dynamic range, slope of 100nA/dB

**ORDERING INFORMATION**

**BLOCK DIAGRAM**

Device	Package	Operating Temperature
†KA8509	24 SDIP	– 40 ~ + 85°C

†: New Product

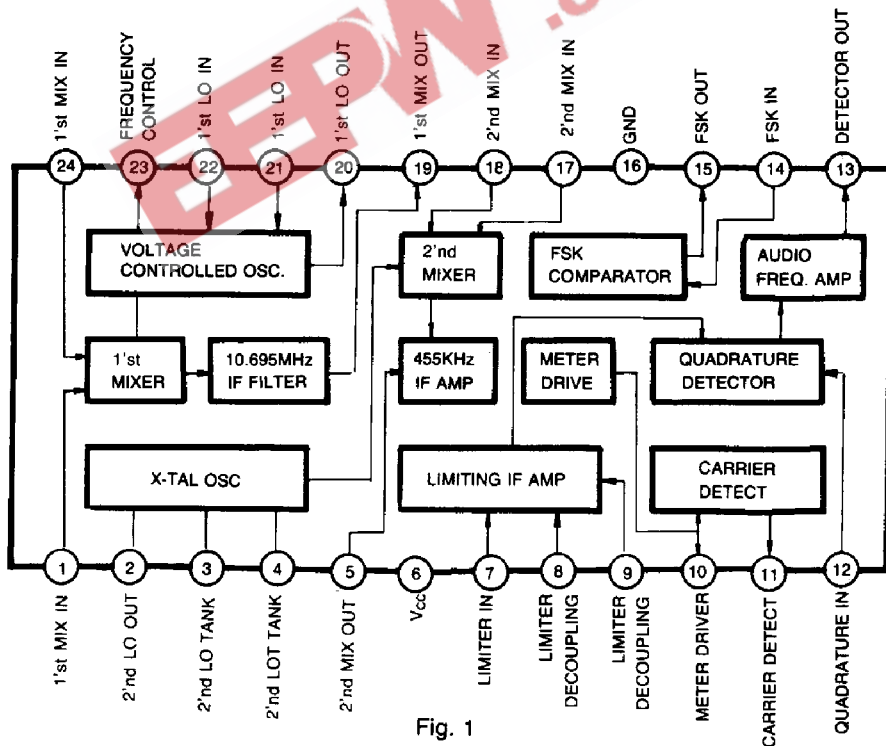


Fig. 1

PIN CONFIGURATION

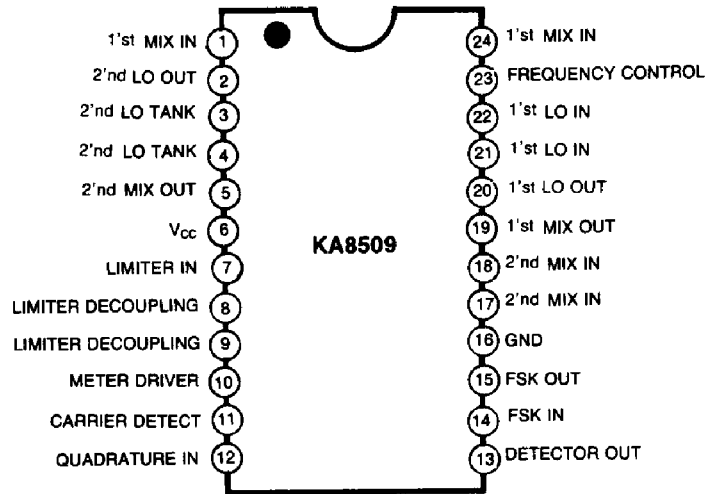


Fig. 2

PIN DESCRIPTION

Pin No	Symbol	Description
1	1'st MIX IN	FIRST MIXER INPUT
2	2'nd LO OUT	SECOND LOCAL OSCILLATOR OUTPUT
3	2'nd LO TANK	SECOND LOCAL OSCILLATOR TANK
4	2'nd LO TANK	SECOND LOCAL OSCILLATOR TANK
5	2'nd MIX OUT	SECOND MIXER OUTPUT
6	V <sub>cc</sub>	SUPPLY VOLTAGE
7	LIMITER IN	LIMITER INPUT
8	LIMITER DECOUPLING	LIMITER DECOUPLING
9	LIMITER DECOUPLING	LIMITER DECOUPLING
10	METER DRIVER	METER DRIVER
11	CARRIER DETECT	CARRIER DETECTOR
12	QUADRATURE IN	QUADRATURE INPUT
13	DETECTOR OUT	AUDIO FREQUENCY DETECTOR OUTPUT
14	FSK IN	COMPARATOR INPUT
15	FSK OUT	COMPARATOR OUTPUT
16	GND	GROUND
17	2'nd MIX IN	SECOND MIXER INPUT
18	2'nd MIX IN	SECOND MIXER INPUT
19	1'st MIX OUT	FIRST MIXER OUTPUT
20	1'st LO OUT	FIRST LOCAL OSCILLATOR OUTPUT
21	1'st LO IN	FIRST LOCAL OSCILLATOR INPUT
22	1'st LO IN	FIRST LOCAL OSCILLATOR INPUT
23	FREQUENCY CONTROL	FREQUENCY CONTROL (VARICAP CONTROL)
24	1'st MIX IN	FIRST MIXER INPUT

3

**ABSOLUTE MAXIMUM RATINGS** ( $T_a = 25^\circ\text{C}$ )

Characteristic	Symbol	Value	Unit
Maximum Supply Voltage	$V_{CC}(\text{max})$	8	V
Operating Supply Voltage	$V_{CC}$	2 ~ 7	V
Input Voltage	$V_{I(1-24)}$	1.0	mVrms
Operating Temperature	$T_{OPR}$	-40 ~ +85	$^\circ\text{C}$
Storage Temperature	$T_{STG}$	-65 ~ +150	$^\circ\text{C}$

**ELECTRICAL CHARACTERISTICS**

( $V_{CC} = 5.0\text{V}$ ,  $f_o = 49.7\text{MHz}$ , Deviation = 3.0KHz,  $T_a = 25^\circ\text{C}$ , unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Operating Current I	$I_{CC1}$	$R_{Fin} = 1\text{mVrms}$		4.5	7.0	mA
Operating Current II	$I_{CC2}$	$V_{CC} = 8\text{V}$ , $R_{Fin} = 1\text{mVrms}$		5.5	8.0	mA
Input for -3dB Limiting	$V_{LIM}$	$R_{Fin} = 1\text{mVrms}$		0.7	2.0	$\mu\text{Vrms}$
20dB (S + N)/N	$V_{I(\text{SEN})}$	Modulation Input Nonmodulation Input		0.7	2.0	$\mu\text{Vrms}$
S/N Ratio	S/N	$R_{Fin} = 1\text{mVrms}$ to $0\text{mVrms}$	48	55		dB
Recovered Audio Output	$V_{O(\text{RA})}$	$R_{Fin} = 1\text{mVrms}$	210	350	490	mVrms
Noise Output Level	$V_{NO}$	$R_{Fin} = 0\text{mVrms}$		250	400	mVrms
Recovered Audio Output Voltage Drop	$V_{O(\text{RAD})}$	$V_{CC} = 5\text{V to } 2\text{V}$ $R_{Fin} = 1\text{mVrms}$	-8	-1.5		dB
Detect Output Voltage	$V_{O(\text{DET})}$	$R_{Fin} = 1\text{mVrms}$	1.6	2.3	3.0	Vdc
Carrier Detector Threshold	$V_{TH(\text{DET})}$	$R_{Fin} = \text{None Input}$ , $R_{L(10)} = 10\text{K}\Omega$	0.53	0.64	0.77	Vdc
Comparator Threshold Voltage Difference	$\Delta V_{TH(\text{COMP})}$	$V_{\text{comp}} = 150\text{mVp-p}$ $R_{L(14)} = 180\text{K}\Omega$	70	110	150	mV
Comparator Output Vtg. I	$V_{OH(\text{COMP})}$	$V_{\text{comp}} = 150\text{mVp-p}$ $R_{L(14)} = 180\text{K}\Omega$	3.8	4.25		Vdc
Comparator Output Vtg. II	$V_{OL(\text{COMP})}$	$V_{\text{comp}} = 150\text{mVp-p}$ $R_{L(14)} = 180\text{K}\Omega$		0.25	0.5	Vdc
First Mixer Conversion Voltage Gain	$G_{V(M1)}$	$V_{I1} = 10\text{mVrms}$ $R_{L(19)} = 330\Omega$	14	18	22	dB
Second Mixer Conversion Voltage Gain	$G_{V(M2)}$	$V_{I7} = 1\text{mVrms}$ , $f_o = 10.7\text{MHz}$ $R_{L(5)} = 1.5\text{K}\Omega$	17	21	25	dB

**ELECTRICAL CHARACTERISTICS** (Continued)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
AM Rejection Ratio	AMR	RFin = 1mVrms AM Mod = 30%	25	35		dB
Detector Output Distortion	THD <sub>DET</sub>	RFin = 1mVrms		2.0	3.0	%
Detector Output Resistance	R <sub>O (DET)</sub>	RFin = 1mVrms		1.4	2.0	KΩ
Detector Output DC Voltage Change Ratio	ΔV <sub>O (DET)</sub>	RFin = 1mVrms		0.12	0.2	V/KHz
Meter Drive Slope	MDS		70	100	135	nA/dB
First Mixer Input Resistance	R <sub>I (M1)</sub>	f <sub>o</sub> = 50MHz	500	690		ohm
First Mixer Input Capacitance	C <sub>I (M1)</sub>	f <sub>o</sub> = 50MHz		7.2	10	pF
Limiter Input Sensitivity	V <sub>I (LIM)</sub>	f <sub>o</sub> = 455KHz, 20dB S/N		100	250	uVrms
Second Mixer Input Sensitivity	S <sub>V (M2)</sub>	f <sub>o</sub> = 10.7MHz, 20dB S/N		10	25	uVrms
First Mixer 3rd Order Intercept	3RD	RFin = 1mVrms		-22		dBm

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