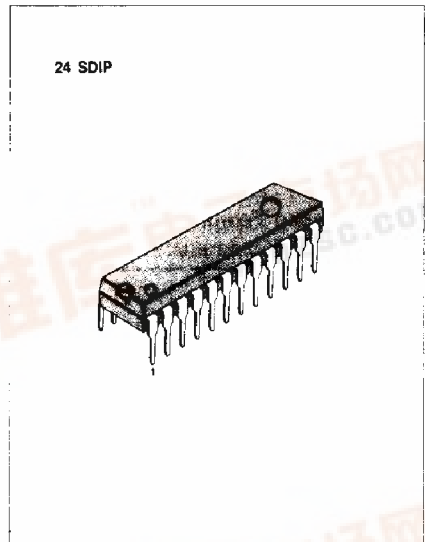


KA8509

LINEAR INTEGRATED CIRCUIT

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

BLOCK DIAGRAM

ORDERING INFORMATION

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

†: New Product

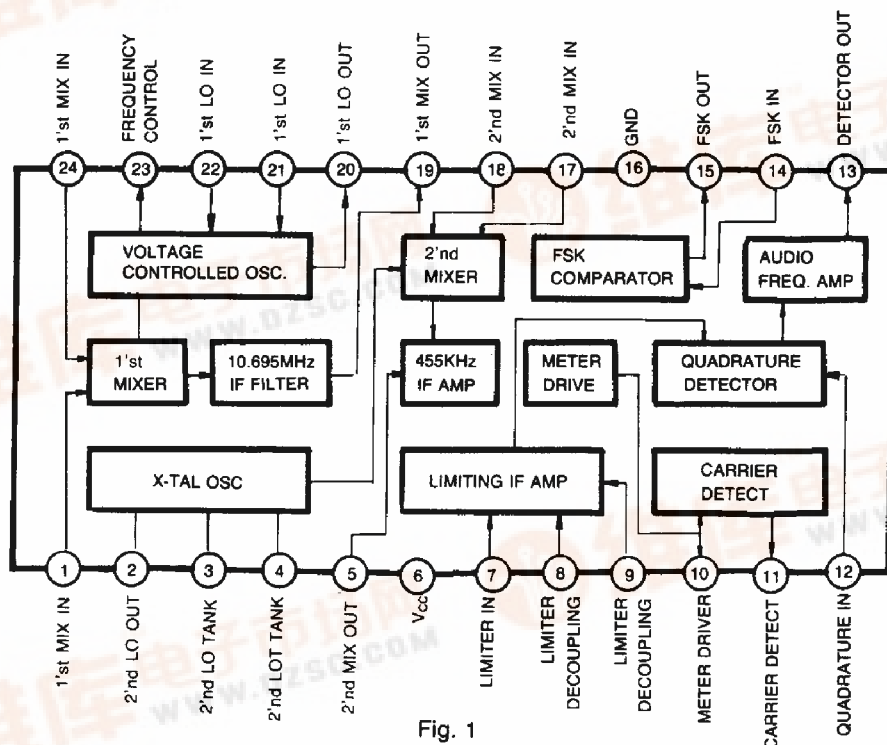


Fig. 1

PIN CONFIGURATION

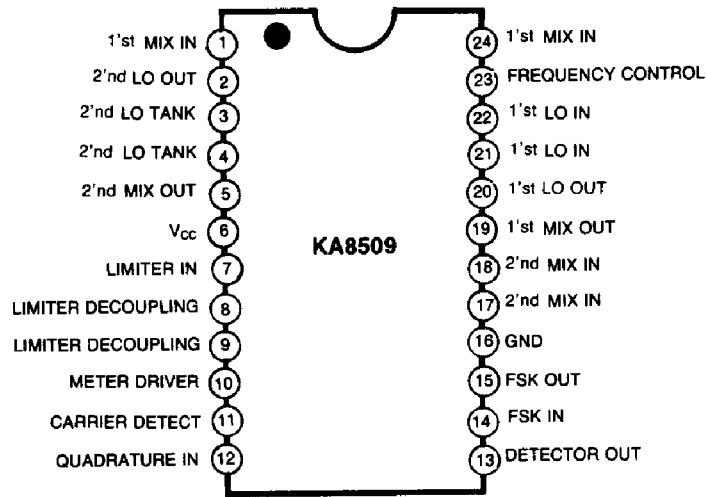


Fig. 2

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 _{cc} | 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} | RFin = 1mVrms | | 4.5 | 7.0 | mA |
| Operating Current II | I_{CC2} | $V_{CC} = 8\text{V}$, RFin = 1mVrms | | 5.5 | 8.0 | mA |
| Input for -3dB Limiting | V_{LIM} | RFin = 1mVrms | | 0.7 | 2.0 | uVrms |
| 20dB (S + N)/N | $V_{I(SEN)}$ | Modulation Input Nonmodulation Input | | 0.7 | 2.0 | uVrms |
| S/N Ratio | S/N | RFin = 1mVrms to 0mVrms | 48 | 55 | | dB |
| Recovered Audio Output | $V_{O(RA)}$ | RFin = 1mVrms | 210 | 350 | 490 | mVrms |
| Noise Output Level | V_{NO} | RFin = 0mVrms | | 250 | 400 | mVrms |
| Recovered Audio Output Voltage Drop | $V_{O(RAD)}$ | $V_{CC} = 5\text{V to } 2\text{V}$ RFin = 1mVrms | -8 | -1.5 | | dB |
| Detect Output Voltage | $V_{O(DET)}$ | RFin = 1mVrms | 1.6 | 2.3 | 3.0 | Vdc |
| Carrier Detector Threshold | $V_{TH(DET)}$ | RFin = None Input, $R_{L(10)} = 10\text{K}\Omega$ | 0.53 | 0.64 | 0.77 | Vdc |
| Comparator Threshold Voltage Difference | $\Delta V_{TH(Comp)}$ | $V_{comp} = 150\text{mVp-p}$ $R_{L(14)} = 180\text{K}\Omega$ | 70 | 110 | 150 | mV |
| Comparator Output Vtg. I | $V_{OH(Comp)}$ | $V_{comp} = 150\text{mVp-p}$ $R_{L(14)} = 180\text{K}\Omega$ | 3.8 | 4.25 | | Vdc |
| Comparator Output Vtg. II | $V_{OL(Comp)}$ | $V_{comp} = 150\text{mVp-p}$ $R_{L(14)} = 180\text{K}\Omega$ | | 0.25 | 0.5 | Vdc |
| First Mixer Conversion Voltage Gain | $G_{V(M1)}$ | $V_1 = 10\text{mVrms}$ $R_{L(19)} = 330\Omega$ | 14 | 18 | 22 | dB |
| Second Mixer Conversion Voltage Gain | $G_{V(M2)}$ | $V_{17} = 1\text{mVrms}$, $f_o = 10.7\text{MHz}$ $R_{L(5)} = 1.5\text{K}\Omega$ | 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 _{DET} | RFin = 1mVrms | | 2.0 | 3.0 | % |
| Detector Output Resistance | R _{O (DET)} | RFin = 1mVrms | | 1.4 | 2.0 | KΩ |
| Detector Output DC Voltage Change Ratio | ΔV _{O (DET)} | RFin = 1mVrms | | 0.12 | 0.2 | V/KHz |
| Meter Drive Slope | MDS | | 70 | 100 | 135 | nA/dB |
| First Mixer Input Resistance | R _{I (M1)} | f _o = 50MHz | 500 | 690 | | ohm |
| First Mixer Input Capacitance | C _{I (M1)} | f _o = 50MHz | | 7.2 | 10 | pF |
| Limiter Input Sensitivity | V _{I (LIM)} | f _o = 455KHz, 20dB S/N | | 100 | 250 | uVrms |
| Second Mixer Input Sensitivity | S _{V (M2)} | f _o = 10.7MHz, 20dB S/N | | 10 | 25 | uVrms |
| First Mixer 3rd Order Intercept | 3RD | RFin = 1mVrms | | - 22 | | dBm |