

## **EVX-531 (VHF) Circuit Description**

### **1. Receiver System**

#### **1-1. Front-end RF amplifier**

Incoming RF signal from the antenna passes through the Low-pass filter, antenna switching diode D1513, D1514 (both 1SS390), and the RF attenuator Q1508 (SKY12338), and then removed undesired frequencies by the varactor tuned band-pass filter D1515 and D1517 (both 1SV325).

The filtered RF signal is amplified by Q1518 (2SC5006) and then passes through another varactor tuned band-pass filter D1520 and D1521 (both 1SV325) to remove the undesired frequencies, and then applied to the 1st mixer Q1523 (3SK293).

#### **1-2. First Mixer**

The RF signal is mixed with the 1st local signal between 186.85 and 224.85 MHz in the 1st mixer Q1523 (3SK293), to produce 50.85 MHz 1st IF signal.

The 1st local signal is generated by the VCO, which consists of Q1506 (2SC5006), varactor diodes D1502, D1504, D1507, and D1508 (all 1SV279). The 1st local signal is supplied to the 1st mixer Q1523 (3SK293) through the buffer amplifier Q1510 (2SC5005) and amplifier Q1524 (2SC5005).

#### **1-3. IF Amplifier & Demodulator**

The 1st IF signal is applied to the monolithic crystal filter XF1501 to strip away all but the desired signal, and then supplied to the custom IC Q1522 (RFIC) through the buffer amplifier Q1526 (2SC5226). The custom IC Q1522 (RFIC) converts the 1st IF signal into the Base Band signal.

The Base Band signal from the custom IC Q1522 (RFIC) is applied to another custom IC Q1306 (OMAP), which is demodulated by the Digital Signal Processor.

#### **1-4. Audio amplifier**

The demodulated signal from the custom IC Q1306 (OMAP) is applied to another custom IC Q1017 (PMAIC). The custom IC Q1017 (PMAIC) adjusts the audio volume level, and then amplifies the audio signal up to 500 mW. The output signal from the custom IC Q1017 (PMAIC) is applied to the audio speaker.

### **2. Transmitter System**

#### **2-1. MIC Amplifier and modulator**

The speech signal from internal microphone MC1001 or external microphone J1003 is supplied to the custom IC Q1017 (PMAIC), which is amplified the speech signal.

The amplified speech signal from the custom IC Q1017 (PMAIC) is supplied to another custom IC Q1306 (OMAP), which process the speech signal by the Digital Signal Processor.

The processed speech signal from the custom IC Q1306 (OMAP) is supplied to the modulator section of the custom IC Q1522 (RFIC), which modulates the speech signal into the FM or digital signal.

#### **2-2. Drive and Final Amplifier Stages**

The modulated signal from the custom IC Q1522 (RFIC) is buffered by Q1520 (2SC5227) and amplified by the driver amplifier Q1519 (RQA0004PXDQS), and then is applied to the final amplifier Q1513 (RQA0011DNS), which is amplified up to 5 watts output power.

The transmit signal then passes through the antenna switch D1512 (RN124S) and is low pass filtered to suppress away harmonic spurious radiation before delivery to the antenna.

### **2-3. Automatic Transmit Power Control**

The current detector Q1528-1 (AD8566ARM) detects the current of the final amplifier Q1513 (RQA0011DNS) and the driver amplifier Q1519 (RQA0004PXDQS), and converts the current difference to the voltage difference.

The output from the current detector Q1528-1 (AD8566ARM) is compared with the reference voltage and amplified by the power control amplifier Q1528-2 (AD8566ARM).

The output from the power control amplifier Q1528-2 (AD8566ARM) controls the gate bias of the driver amplifier Q1519 (RQA0004PXDQS) and the final amplifier Q1513 (RQA0011DNS). The reference voltage changes into four values (Transmit Power High and Low) controlled by custom IC Q1522 (RFIC).

### **3. PLL Frequency Synthesizer**

The frequency synthesizer consists of VCO, TCXO (X1501), and the custom IC Q1522 (RFIC). The output frequency from TCXO is 19.2 MHz and the tolerance is  $\pm 1.5$  ppm in the temperature range  $-22^{\circ}\text{F}$  to  $+140^{\circ}\text{F}$  ( $-30^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$ ).

#### **3-1. VCO (Voltage Controlled Oscillator)**

While the radio is receiving, the RX oscillator Q1506 (2SC5006) generates a programmed frequency between 186.85 and 224.85 MHz as 1st local signal.

While the radio is transmitting, the TX oscillator Q1505 (2SC5006) generates a frequency between 136-174 MHz.

The output from oscillator is amplified by buffer amplifier Q1510 (2SC5006) and then is divided, one is fed back to the PLL Circuit in the custom IC Q1522 (RFIC). The other one is supplied to the 1st mixer Q1523 (3SK293) through the buffer amplifier Q1524 (2SC5005) in case of the reception. In the transmission, the output is modulated to the FM (or digital) in the custom IC Q1522 (RFIC), and then supplied to the transmitter section described previously.

#### **3-2. VCV (Varactor Control Voltage) Control**

The tuning voltage (VCV) of the VCO establishes the lock range of VCO by controlling the cathode of varactor diode (D1502, D1504, D1507, D1508 for receiving, and D1501, D1503, D1505, D1506 for transmitting: all 1SV279) from the custom IC Q1522 (RFIC).

#### **3-3. PLL**

The main constitution product of the PLL is equipped all with in the custom IC Q1522 (RFIC), so that all processing regarding the frequency control is performed in the custom IC Q1522 (RFIC).