FEATURES OF CIRCUIT DESIGN NARROWBAND MODULES

The CDP-TX-04S & CDP-RX-03S are FM narrowband miniature transmitters & receivers manufactured by Circuit Design, Inc. The low-cost compact modules are designed to operate with low voltage and current consumption, providing approximately 1km operating range. The miniaturization (22x12x6 mm) of the CDP-TX-04S is of particular note as compared with other narrowband FM modules. The TX & RX comply with EN300 220, ETS300 683 and EN60950.

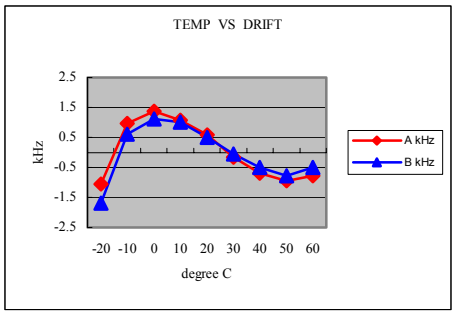

Fig 2

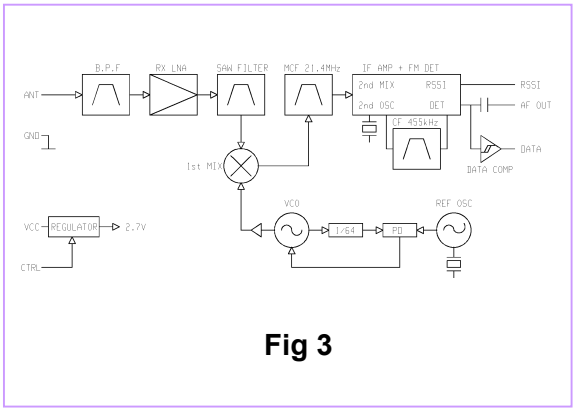

Fig 3

Transmitter: Technical details

Figure 1 shows functional block diagram.

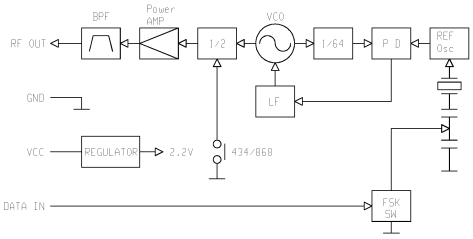

Fig 1

Oscillator consists of VCO, 1/64 pre-scaler, phase comparator, reference frequency oscillator and loop filter. Phase comparator frequency of 434.075MHz module is approx. 13.564MHz and bandwidth of loop filter is 300kHz. VCO output is to be transmission frequency directly, thus spurious components are harmonics of fundamental frequency only. More than 50dB of attenuation at 2 x f is achieved by inserting butterworth type BPF between RF out and Power amplifier. Reductions of frequency drift by antenna feedback and 3msec. or less actual start-up time of carrier are achieved by adopting higher phase comparator frequency. Reference frequency oscillator consists of high-stability AT cut crystal unit, temperature compensation circuit and modulator. Frequency stability is +/-4ppm (-10 to +60 degrees C). Stable FSK communication can be achieved in combination with narrowband receiver with BW (bandwidth) = +/-6kHz range. (See fig 2)
The modulator shifts the carrier to higher when input data is high (Vcc level), and to lower when the data is low (GND level). Maximum data rate is 4800bps.

Receiver: Technical details

Figure 3 shows functional block diagram.

The receiver is double superheterodyne type, which gives high sensitivity and selectivity. RF received signal is inputted to LNA through L.C butterworth type BPF. 2dB BPF insertion loss, LNA NF=2dB and LNA gain=15dB result 12.5dB total gain.
Output from LNA is inputted to SAW filter via matching circuit. Saw filter pass bandwidth is 2MHz, and attenuation is more than 50dB at centre frequency +/-20MHz. Unwanted RF input can be cut off by the filter. Total 9dB gain is earned with CG=15dB and NF=6dB in 1st MIX. Output signal frequency from 1st MIX is down-converted to 21.4MHz then inputted to crystal filter. Crystal filter that has pass band centre frequency +/-7.5kHz bandwidth cuts off the unwanted frequency components. IF signal that is down-converted to 21.4MHz at 1st MIX is converted to 455kHz at 2nd MIX, then inputted to ceramic filter. Ceramic filter pass bandwidth is +/-10kHz and attenuation is more than 40dB at centre frequency +/-20kHz. The signal is amplified approx. 100dB total in IF stage then goes to quadrature detection via limiter circuit; the base band signal (AF) is then demodulated.

AF signal is inputted to data comparator circuit through butterworth active type LPF with 3.2kHz cut-off frequency. Data comparator circuit compensates DC offset, which is generated by the carrier, and local oscillation frequency drift caused by temperature change. As a result, comparison voltage set to centre of AF signal. The circuit processes data with minimum pulse width 208µsec to maximum 20msec.

Start-up time of received signal is less than 10msec. after power on at normal temperature. RSSI output signal can be used to detect carrier signal with periodic receiving function and/or to cut off output data when carrier signal is not detected.
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