1 General Description

The GIGA3 HF transceiver board is designed to allow a full radio communication at 1Mbits/s provided by the WL800/WL600 integrated communication products produced by Mitel Semiconductor.

Its external interfaces are a 40 way AMP connector (EC1), and a Radial RF antenna connector (ANT).
These are all situated on the component side of the PCB.

The antenna connector is used in conjunction with the TXRX switch (IC6), and can be configured for transmitting, or receiving.

All input signals were buffered and the internal supply is regulated. The output power is independent from power supply and input signal level.

1.1 Features

Operation Range	2.403GHz to 2.481GHz
Supply Range	4.75V to 5.25V
Internal Supply	3V
Supply current	< 200mA
Number of Channels	78
Channels spacing	1MHz
Ouput IERP power	1mW

1.2 Device Description

WL600

The WL600 IC is a 48 pin LQFP package, and is basically an RF/IF circuit for use in digital radio. The receiver part contains a low noise amplifier, a down converter / quadrature

demodulator which generates the 43MHz IF, and an IF limiting strip which provides the IF gain and the RSSI output. The IC also contains a power amplifier driver stage with a ramp facility which controls the drive level to the external power amplifier.

WL800

The WL800 is a 32 pin TQFP packaged device, and contains a frequency synthesizer. The reference frequency is generated using a external 20MHz crystal which is divided by 20 to produce the 1MHz reference required. The divide ratios of the A and M counters are programmable to allow the external oscillator to be tuned over the required frequency range of 144 channels (1MHz spacing).

1.3 Circuit Operation

1.3.1 Transmit (TXD)

In transmit, the formatted (5V, 1Mbits/s) balanced data from the controller is applied to the TXD input. This feeds through a 20K Ohm resistor to the WL800 where it is buffered and fed to a current source. This current output (IDOUT) then goes through the modulation filter, and is applied to the resistor on the anode of the varactor (D1) which controls the frequency of the local oscillator.

This discrete local oscillator circuit is used to drive both the WL600 and the WL800, and is separated on board by a delta configures 6dB splitter. The oscillator is phase locked, and is tunable (IN TX) between 2.4GHz and 2.5GHz. A 1 MHz reference frequency used by the phase locked loop is generated using an internal divider (÷20), a 20MHz crystal and an on-chip oscillator maintaining circuit.

To correct for the shift in oscillator frequency due to the low frequency content of the data, an anti-modulation circuit is incorporated within the WL800. This circuit applies an opposing current into the PLL to cancel out the attempted correction.

The modulated signal drives the LO_IN port of the WL600, where it is amplified and used to produce the DRIVE output to the power amplifier. Ramping of this signal is performed

by the WL600. The PA switches on simultaneously with the output being ramped up, and switches off as the output is being ramped down.

This is achieved on the radio demonstration board by connecting the PA_ON signal to the driver circuit for the PA and the TXRX switch.

The discrete single stage power amplifier uses a Hewlett Packard MMIC device, and produces an output level of around 1 mW.

The signal is passed through a Murata Low pass filter to help reduce harmonic levels at the output of the radio, and is then fed through the NEC transmit/receive switch (IC6) and onto the antenna (ANT) via the TOKO filter (FILT2).

1.3.2 Receive(RXD)

In receive, the signal arrives at the antenna (ANT) and goes back through the TOKO filter and NEC TXRX switch. It is then fed into the RF_IN port of the WL600, the internal image reject mixer uses the local oscillator signal to produce the down converted 43MHz IF signal.

The local oscillator frequency must be set 43MHz lower than the received signal, and hence is tuned between 2.357GHz and 2.457GHz for receive. It should be noted that the synthesizer should be reprogrammed at the beginning of every TX cycle and every RX cycle. This should occur directly after TXRXB signal to the radio is switched.

Due to this necessary change in LO frequency, the TXRX time to valid data Hop times are specified as <200µs.

The differential signals (IF_OUT +/-) from the WL600 are amplified by a discrete amplifier, and then filtered using a Thomson 43MHz SAW filter, which is coupled via

matching networks to produce the correct filter response. The signals are then returned to the WL600 where it is amplified in the limiting log amplifier strip.

The differential IF signals are demodulated, fed through the demodulator filter and the returned to the WL600 where they are buffered, and used to produce the RXD_H and RXD_HB signals. These two signals drive inputs of voltage comparator, the MAX941 (IC7), whose output is the RXD signal (TTL compatible).

The Demodulator levels are set by a trimmer Quad tank circuit (Quad+/-) on the WL600.

The sensitivity of the GIGA3 board is typically better then –85dBm.

1.3.3 Control Signals

The level of all input control signals has be switched from +5V TTL to +3.3V LV TTL by the octal buffer, the MC74VHC541 (IC8).

There are several signals which need controlling on the board. These should be provided at the following levels. (VCC = 5V)

Logic low voltage = 0V (0.8V max)

Logic High Voltage = VCC (VCC-0.7 min)

TXRXB

This signal is used by the WL600. It controls whether the device is in transmit or receive.

Transmit Mode = Logic 1

Receive Mode = Logic 0