AMSAT-DL U/S-upconverter
for Es'hail-2/QO-100
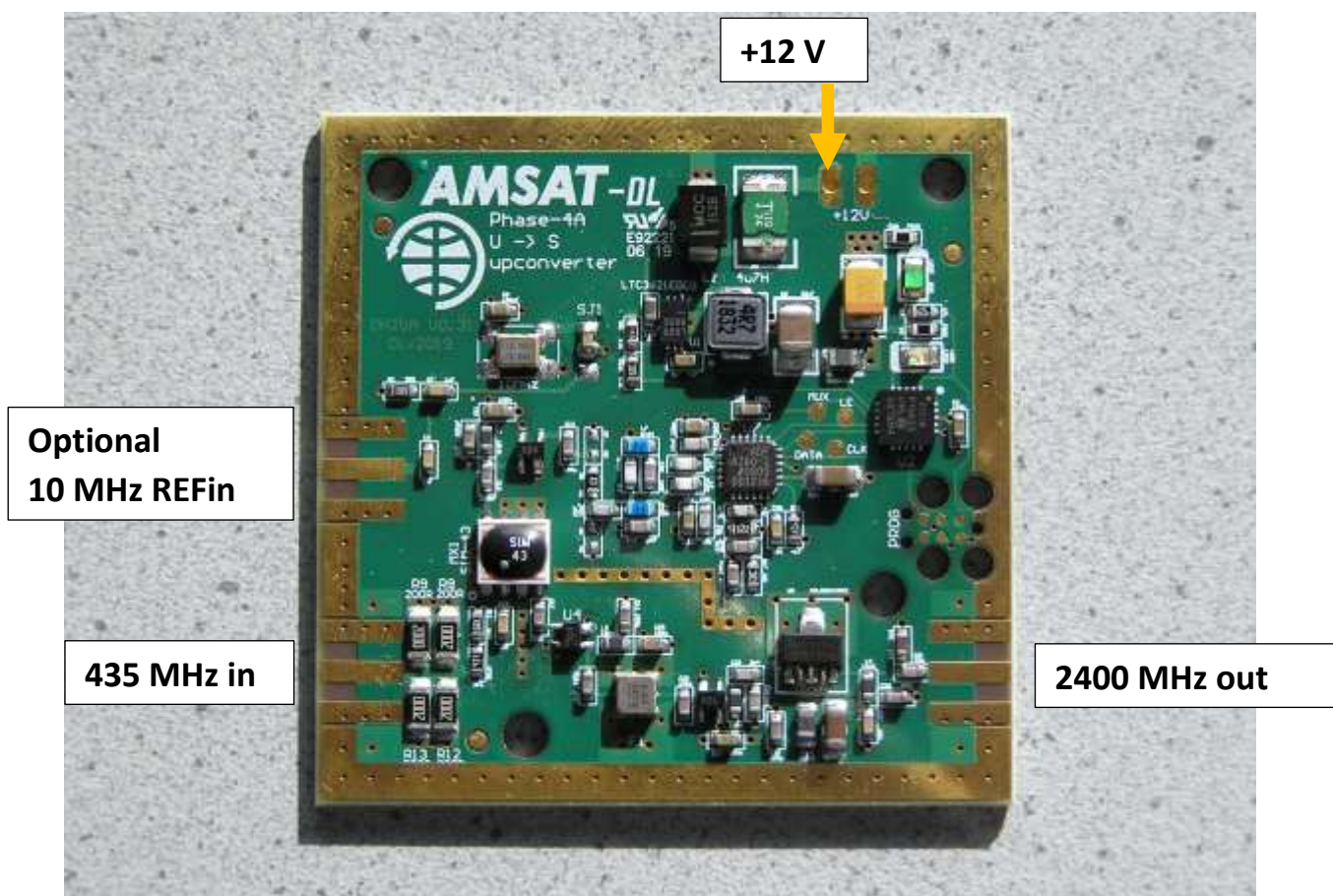
Description

The upconverter is based around a SIM-43LH Level 10 mixer from Mini-Circuits. An attenuator on its IF port allows to use a 70cm input power level of up to 0.5 Watt (+27 dBm). The local oscillator generates 1965 MHz, resulting in a 2400 MHz RF signal for an IF signal of 435 MHz. After the mixer, the RF signal is filtered with an SAW filter and amplified to an output power of ca. 50 mW (+17 dBm).

The LO signal (1965 MHz) and the image signal (1965-435 = 1530 MHz) are only -30 dB suppressed with respect to the RF signal, so additional filtering (either with a dedicated 13 cm bandpass or the frequency selectivity of the final amplifier) is required to keep unintended emissions below the legal limit.

Final assembly

At least two SMA jacks need to be installed. When the PCB is oriented such that the AMSAT-DL logo is upright, the bottom left SMA jack will be the 435 MHz IF input and the bottom right jack is the 2400 MHz RF output. Use a powerful soldering iron for the ground pins (large thermal mass!) and solder on both sides of the PCB for extra stability.

The third SMA footprint is for an optional 10 MHz input. If used, you have to relocate the 10 nF (0603 size) capacitor on SJ1 from the upper-middle position (default) to the middle-lower position.

CAUTION: specification for 10 MHz input is 1-10 dBm into 50 Ohm (3.3 Vpp max.). Take care about extra low jitter (excellent phase noise) of the external 10 MHz reference as any impurities will be amplifier by 1965 / 10 MHz = 196.5 !

Connect the positive power supply 5-15V (idle 5 V / 165 mA or 12 V / 77 mA) to the left hole in the top right corner. Connect GND to any location on the PCB edge.

Operation

When powered on, voltages are present and PLL locked LED will light up. If LED is rapidly blinking, check 10 MHz reference signal (PLL not locked).

Max. input power on 435 MHz is 0.5 Watt (+27 dBm) for an output signal of ca. 50 mW (+17 dBm). Current consumption then 5 V / 210 mA or 12 V / 100 mA.