

## ULev-160 Design Notes

The purpose of the design is to provide an analogue front end for ultrasonic levitation systems that can be used with different configurations of compute back end e.g multiplexer, FPGA. This modular approach also has the effect of reducing environmental impact and cost so that when a board is re-spun for the compute side the front end does not have to be replaced too.

Analogue temperature sensors are provided as the speed of sound is strongly correlated with temperature and this will have a significant impact on the phase shift in beam forming and hence compromise performance of the device. It is recommended that these sensors be used as the input to a calibrated mathematical model at a range of operating conditions together with the hygrometer. This will result in a model that better represents the effects on the ultrasonic wave propagation, but derived from the more easily measured board level temperature and humidity.

Holes are provided for high power RGB LEDs (1W to 3W) to pass through but should ideally be mounted on a board behind and be driven by PWM. This is a 4 layer board (top to bottom):

L1: Ground

L2: Ground

L3: High voltage supply for transducers (<30V)

L4: Ground

### **Connectivity**

The front end is configured in 10 columns of 16 ultrasonic transducers, with pairs of 2 columns sharing a single 36 pin 0.5mm FPC connector. Pin 36 is ground, pins 35 through 20 (inclusive) are the first column, pins 19 through 4 (inclusive) are the second column, and pins 3, 2, and 1 are used for monitoring purposes.

#### FPC 1 (leftmost)

Optional I2C port for an ADC to read the temperature sensors, or the pins can be used for analogue output of the temperature sensors. Pin 3 (SCL), pin 2 (SDA). Selection via jumpers SJ1 and SJ2.

#### FPC 2 and FPC 4

I2C port on pin 3 (SCL) and pin 2 (SDA) for a 2 channel I2C multiplexer which in turn connects to a pair of VL53L0 infrared distance sensor and an SHTC3 environmental sensor . FPC 2 covers the left side of the board and FPC 4 the right side of the board. The multiplexer is controlled via the I2C port directly not via external control lines.

#### FPC 1, 3, 5

Pins 3 to 1 inclusive can be used as a direct output for the analogue temperature sensors.

### Disclaimer

Designs are used at your own risk. No liability accepted or implied.

### Attribution

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