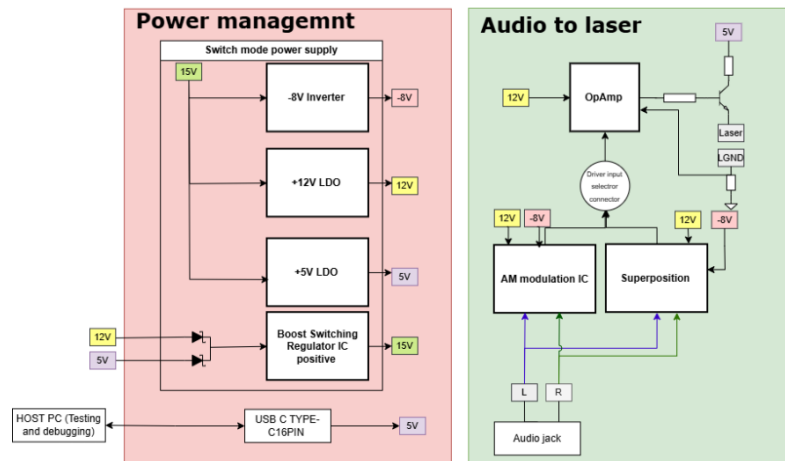


Analog Audio-Guided Laser Therapy Device

An audio-to-laser modulation system was designed to synchronize laser brightness with audio input for therapeutic applications. The project involved analog hardware design, PCB layout, signal conditioning, and laser driver development within a 50mm × 60mm area.

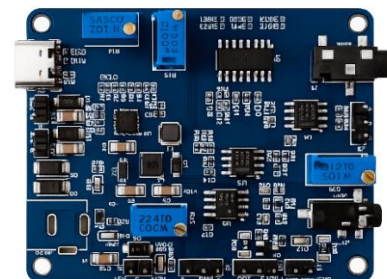
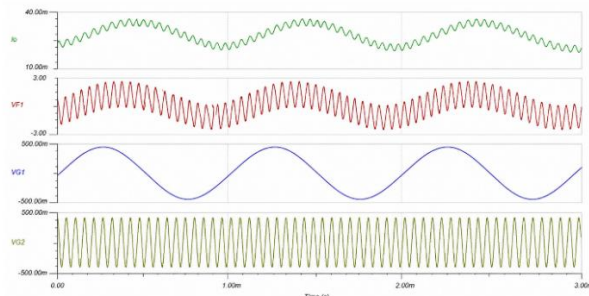


Key Features:

- Analog signal processing with no switching artifacts or flicker
- True amplitude modulation via a balanced modulator IC
- Adjustable gain for varying audio input levels
- 20Hz–100kHz operating bandwidth
- DIN EN 60825-1 compliant laser output

Hardware Development:

- Designed analog signal processing architecture
- Implemented balanced modulator IC for amplitude modulation
- Designed the Howland current pump with rail-to-rail op-amp
- Designed 50mm × 60mm PCB



Applications:

- Therapeutic laser systems
- Audio-visual therapy devices
- Photobiomodulation devices

Technologies Used:

- **Signal Processing:** Balanced Modulator IC
- **Laser Driver:** Howland Current Pump with Rail-to-Rail Op-Amp
- **Power Management:** Variable-voltage regulator (4V–13V)
- **PCB:** 50mm × 60mm custom layout
- **Safety Standard:** DIN EN 60825-1 (Class 1 laser compliance)