htmp. LED light panel 2023

Concept Paper

Contact:
Stefan Meyer
stefan@htmp.tech
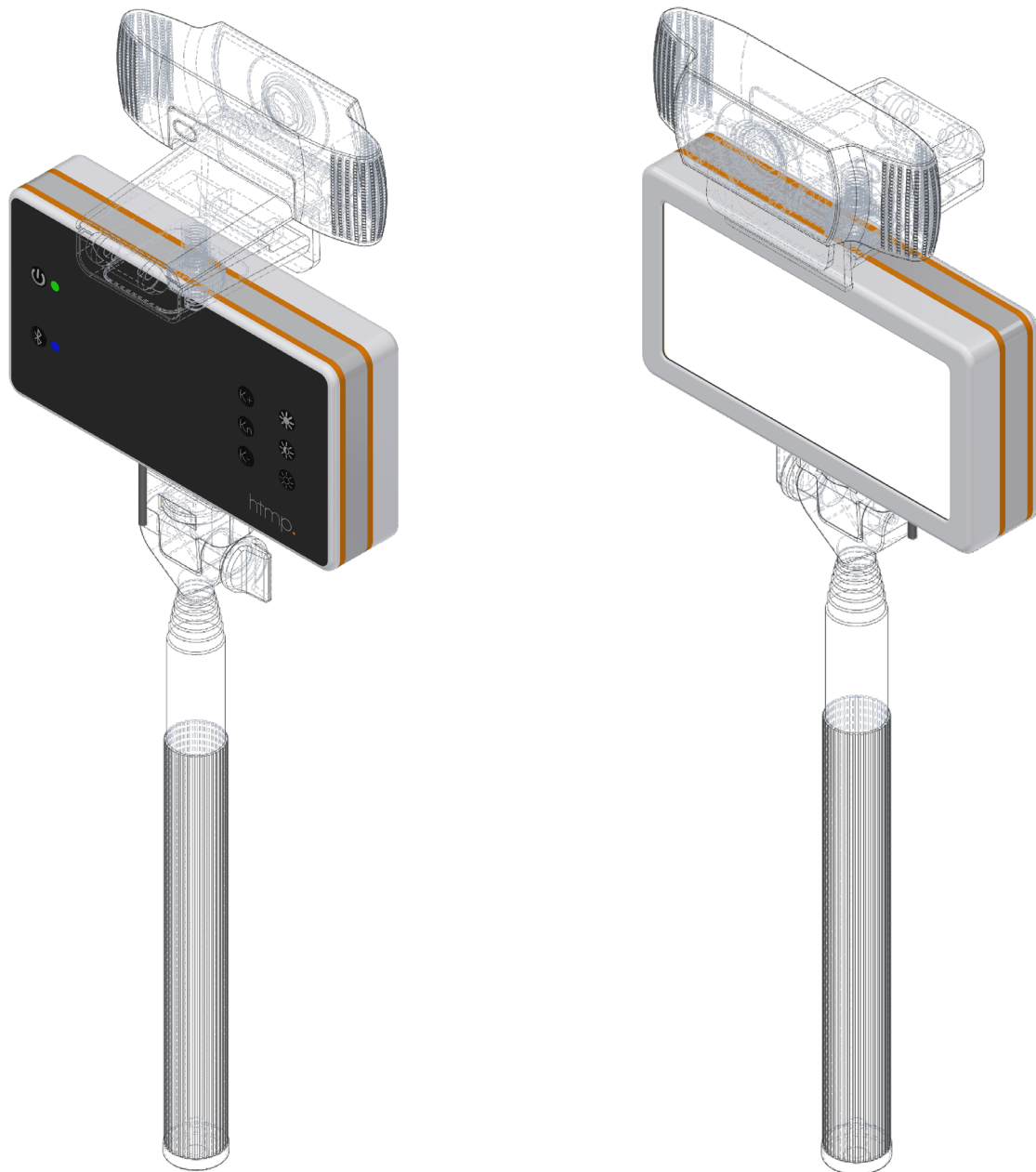
3. Introduction

3.1. Product Description

The htmp. LED Panel is a small but powerful photographic light source especially targeted for portable compact applications, like biometric registration / verification kits with optimized power consumption in relation to light output and standby status.
Dimensions: 120 x 65 x 25 mm / 4.72" x 2.65" x 1" (length x width x depth)

3.2. Physical Features

The htmp. LED Panel features two standard camera / tripod adapters in top and bottom sides of the device. Controls are located on the back of the device.

3.3. Technical Features / Basic Specifications

3.3.1. LEDs

For an even light emission 72 LEDs are distributed on the LED PCB (PCB 1).
There are 36 LEDs with 2700 K light colour and 36 LEDs with 6500 K light colour
The light output should exceed 1000 lm.
Each LED features an idividual LED resistor.

3.3.2. Power Supply

Power supply for the LEDs / electronic, and a data connection for remote device control are provided by the USB C cable.
The maximum wattage is limited by the USD PD.
A power output of 5V@3A = 15W seems sufficient, and would be available in several USB PD standards.
LEDs are powered via a switching power supply and the modulation of the switching frequency changes brightness and emitted colour temperature.
The switching frequency should be high enough to avoid any out-of-sync interferences with cameras when taking photos or videos in all LED panel brightness levels.

3.3.3. Controls

Controls are placed on the back of the device with a button sticker and features:

3.3.3.1. On / Off Button, Function [O-O].

- Press to light up the LEDs
- The device status is indicated by a LED.
- Green light indicates "ready" with USB C power source plugged in.
- Yellow light indicates "LEDs on".

3.3.3.2. Brightness Control, Function [B+/B-]

- Pressing the B+ or B- button increases or decreases the light output of the device.
- An additional button B~ (default brightness) changes the brightness level to a default intensity level.
- When the device is connected to the power source, and LEDs are fired up for the first time,
  the brightness should initially be B~.
- When the LEDs are switched off (with [O-O] function), and subsequently switched on again,
  the device should memorize the previous brightness level.
- The B~ brightness level should be adjustable with the LED panel software.

3.3.3.3. Colour Temperature Control, Function [K+/K-]

- Pressing the K+ or K- button increases or decreases the emitted colour temperature of the device.
- An additional button K~ (default colour temperature) changes the colour temperature level to default K~.
- K~ = 5000K
- When the device is connected to the power source, and LEDs are fired up for the first time, the colour temperature should initially be K~.
- When the LEDs are switched off (with [O-O] function), and subsequently switched on again, the device should memorize the previous colour temperature level.
- The K~ default colour temperature should be adjustable with the LED panel software.
- It should be possible to reset K~ to the default value with the LED panel software.

3.3.3.4. Control Options
There are three options to control the LED panel

3.3.3.4.1. Manual Controls
Direct control of device functions with buttons, located on the back side button panel.
The button sticker is connected to PCB2 by a FFC cable.

3.3.3.4.2. Software Control / USB C connection
Wired control with software, if the deive is connected to the PC via a USB C power and data connection.

3.3.3.4.3. Software Control / Wireless
Wireless Bluetooth control with software, if the device is not connected to the to the PC with a wired data connection, typically when the USB C port is used only for power delivery from a battery or AC-adapter.

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3.4. Software

3.4.1. Software Control Functions

- On / off [O-O]
- Set timer for auto off
- Brightness [B+/B-]
- Set default brightness [B~]
- Colour Temperature [K+/K-]
- Set default colour temperature [K~]
- Enable / disable Bluetooth

3.4.2. Operating Systems

- Windows 11
- Apple macOS 14
- Android 14 (t.b.d)
- Apple iPhone iOS / iPadOS 17 (t.b.d)

3.4.3. USB / Wired

- Installation software for
- dedicated USB driver.
- Set of commands for all control functions.
- Recognize device on plugin and establish connection.

3.4.4. Bluetooth / Wireless

- Pair device with control device (laptop or mobile).
- Communicate commands analog USB wired connection.

3.4.5. User Interface

- Consistent over all platforms.
- Modern look and userfriendly logical menus.

3.4.6. Software distribution

- QR scan, or web address for
- download of driver installation software and operating manual from htmp. website, and/or
- Google Play Store / Apple APP Store

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4.2. PCBs

Thickness PCB1 / PCB2: 1mm
Components should be:
- cost efficient
- widely available in T/R or tray packaging for efficient SMT placement
- no Chinese proprietary parts
- LEDs feature
  - - DLC Premium Classification
  - - high CRI (min. 90 / typ. 92)
  - - high efficacy
  - - wide beam angle (120°)
  - - long lifetime

4.2.1. PCB 1 / LEDs [2.1]

4.2.1.1. PCB1 Modules / Components

LEDs / "warm light"
- Osram GW QTLTS2.QM-GWH5-XX58-1
- 2700K
- Viewing angle: Typ. 120 degrees
- 2.5 / 2.71 / 2.9 V (min. / typ. / max.)
- 176.15 mW
- 27.0 / 34.5 / 36 lm (min. / typ. / max.)
- 36x
- DigiKey order no. Q65113A3495
- Datasheet download link:
  https://cdn.htmp.tech/LED-panel/ELT/PCB1/LED/GW_20QTLTS2.QM_datasheet_19110922_EN.pdf
- 3D step. download link:
  https://cdn.htmp.tech/LED-panel/ELT/PCB1/LED/GW_QTLTS2.QM-GWH5-XX58-1_2700K.stp

LEDs / "cool light"
- Osram GW QTLTS2.QM-H3H8-XX51-1
- 6500K
- Viewing angle: Typ. 120 degrees
- 2.5 / 2.71 / 2.9 V (min. / typ. / max.)
- 176.15 mW
- 31.5 / 34 / 40.5 lm (min. / typ. / max.)
- 36x
- DigiKey order no. Q65113A3501
- Datasheet download link:
  https://cdn.htmp.tech/LED-panel/ELT/PCB1/LED/GW_QTLTS2.QM_datasheet_19110922_EN.pdf
- 3D step. download link:
  https://cdn.htmp.tech/LED-panel/ELT/PCB1/LED/GW_QTLTS2.QM-H3H8-XX51-1_6500K.stp

4.2.1.1.3. LED resistors
- RES 2.2 OHM
- 5%
- 1/4W
- 0805 / 2012 (imperial / metric)
- KOA Speer Electronics, Inc. #RK73B2ATTD2R2J
- DigiKey order no. 2019-RK73B2ATTD2R2JTR-ND - Tape & Reel (TR)
- Datasheet download link:
  https://cdn.htmp.tech/LED-panel/ELT/PCB1/RES/RK73B.pdf

4.2.1.1.4. Connector to PCB2
- solid connection between PCB1 and PCB2
- through hole design preferred
- **Female** receptacle, 4 mm
- Rating 3A / pos.
- 14 pos.
- 0.1" / 2.54 mm pitch or smaller
- like GTC BG095-14-A-N-D, DigiKey order no. 2073-BG095-14-A-N-D-ND
- Datasheet download link:
 https://cdn.htmp.tech/LED-panel/ELT/PCB1/CON/BG095.pdf
- 3D step. file download link:
 https://cdn.htmp.tech/LED-panel/ELT/PCB1/CON/GCT_fem_2.54_5mm_14pos.step

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4.2.1.2. Form Factor

PCB1 - front view (from front of the device)

A No placement area, 7.5 mm from left and right PCB edge (precise)
B Pin Connector to PCB2 (+/-) but must match position connector on PCB2!

4.2.1.3. Download links

- Image / illustration download:
https://cdn.htmp.tech/LED-panel/ELT/PCB1/htmp_LED_panel_PCB1_v2.0.png

https://cdn.htmp.tech/LED-panel/ELT/PCB1/htmp_LED_panel_PCB1_v2.0_with LEDs.png

- Autocad dwg PCB1 outline file download:
https://cdn.htmp.tech/LED-panel/ELT/PCB1/CON/htmp_LED_panel_PCB1_v2.0_outline.dwg

4.2.2. PCB 2 / Control [2.2]

4.2.2.1. PCB2 Modules / Components

Components should be:
- cost efficient
- widely available in T/R or tray packaging for efficient SMT placement
- no Chinese proprietary parts

4.2.2.1.1. Connector to PCB 1
- solid connection between PCB1 and PCB2
- through hole design preferred
- Header, Male pins, 4 mm
- Rating 3A / pos.
- 14 pos.
- 0.1" / 2.54 mm pitch or smaller
- cave space for screws [4.1] (head diameter ca. 4mm) next to connector body
- like GTC 2073-BG030-14-A-0400-0300-N-G-ND
- Datasheet download link:
  https://cdn.htmp.tech/LED-panel/ELT/PCB1/CON/BG030.pdf
- 3D step. file download link:
  https://cdn.htmp.tech/LED-panel/ELT/PCB1/CON/GCT_male_2.54_5mm_14pos.step

4.2.2.1.2. Power supply unit
- USB C cable, soldered (power and data)
- USB chip for power delivery (USB PD 2.0 / 5V@3A, max. 15W)
- and device port implementation, like FUSB3028.
- Power rail for LED control unit (5V)
- Power rail for electronics (3.3V or similar)

4.2.2.1.3. Control unit
 - switching power supply for LEDs
 - adjustable brightness via modulation of LED switching
 - adjustable power distribution between warm and cold light LEDs for K+ / K-
 - three control functions:
   - - on-off / standby with green / yellow light-on indicator LED [O-O]
   - - brightness +/- [B+/B-]
   - - color temperature [K+/K-]
 - control bus for
   - - button controls on device (button sticker [1.7] connected via FFC cable)
   - - for wireless bluetooth and
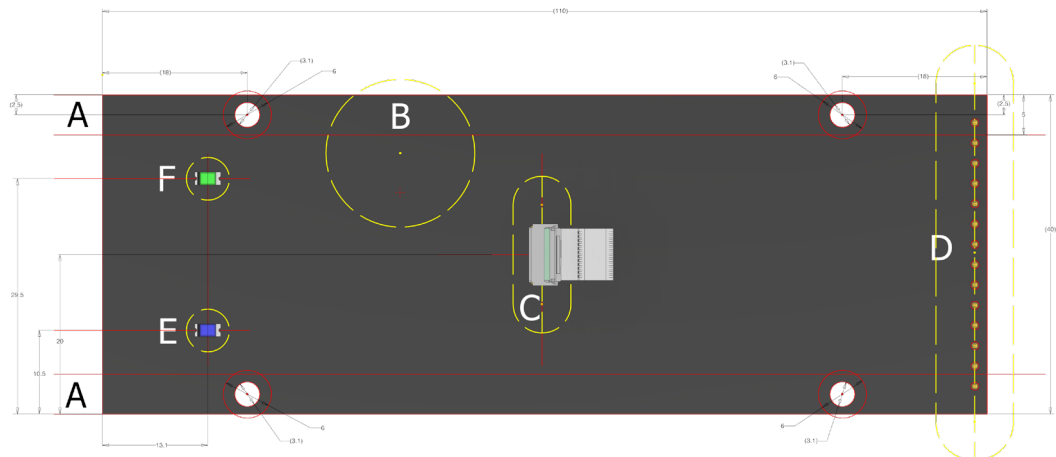   - - wired USB control

4.2.2.1.4. Bluetooth unit
- reset / pair button
- blue indicator LED

4.2.2.1.5. USB (wired) interface
- Microcontroller for USB protocol, incl. programming
- C++ code for host - device communication and control of [O-O], [B+/B-] and [K+/K-].

4.2.2.2. Form Factor

PCB2 - back view (from rear of the device) v.3.0

A No placement area, 5 mm from upper and lower PCB edge (precise)
B USB C cable solder area (precise)
C FFC connector area (+/-)
D Pin Connector to PCB1 (+/-) but must match position connector on PCB1!
E Location LED / green (precise)
F Location LED / blue (precise)

4.2.2.3. Download Links

- outline files download:
https://cdn.htmp.tech/LED-panel/ELT/PCB2/htmp_LED_panel_v3.0_PCB2_outline.png

https://cdn.htmp.tech/LED-panel/ELT/PCB2/htmp_LED_panel_v3.0_PCB2_outline.dwg

4.2.3. Block Diagram

Block diagram PCB2 modules

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