unisystem

# UCB045-RGB-CMFDV1

## Unisystem's Capacitive Touch Button

Passion for displays

# Revision Table

| Revision | Description | Date |
|---|---|---|
| **1.0** | Initial release | 11.03.2025 |

# Contents


Revision Table ..... 1
Contents ..... 1
1 General Description ..... 2
2 Electrical Characteristic ..... 3
2.1 General Characteristic ..... 3
2.2 Pinout Assignment ..... 3
2.3 Connector Information ..... 4
2.4 LED Circuit ..... 4
2.4.1 $V_{LED}$ input voltage extension ..... 5
2.5 Buzzer connector ..... 6
2.6 Water protection ..... 6
3 Optical Characteristic ..... 6
4 Mechanical Characteristic ..... 7
4.1 Mechanical drawing ..... 7
4.2 General Characteristic ..... 8
4.3 Cable Mounting Instruction ..... 8
4.4 Guidelines for Preparation and Application of Double-Sided Tape ..... 9
4.4.1 Surface Preparation ..... 9
4.4.2 Enhancing Surface Adhesion ..... 9
4.4.3 Tape Application ..... 9
4.4.4 Curing Conditions ..... 9
4.4.5 Environmental Performance ..... 9
4.4.6 Additional Notes ..... 9
5 Contact Information ..... 10

# 1 General Description

**UCB045-RGB-CMFDV1** is an advanced touch interface based on a dedicated integrated circuit. It is characterized by high sensitivity, reliability, ease of integration, and user-friendly operation. It features uniform illumination provided by three RGB LEDs, with customizable colors to meet user requirements. Additionally, the device is equipped with a connector for buzzer, enhancing functionality, capabilities and providing additional feedback to the user. The button operates reliably even when covered with glass up to 4 mm thick. It operates reliably in the presence of water droplets and includes protection against false activations caused by excessive water exposure. Its design makes it suitable for a wide range of applications in modern electronic devices.

| Parameter | Value | Notes |
|---|---|---|
| **Power Supply** | 5 – 36 VDC | |
| **LED Power Supply** | 5 VDC | (1) |
| **Outline Dimensions** | 45.5 x 45.5 x 5.3 mm | |
| **Touch Detection Area** | ϕ16 mm | |
| **Mounting DST** | 3M 9448A | |
| **Glass thickness** | ≤ 4 mm | (2) |
| **PMMA thickness** | ≤ 4 mm | (2) |
| **Touch Type** | Capacitive | |
| **Operating Temperature** | -20°C – +70°C | (3) |
| **Storage Temperature** | -30°C – +80°C | |
| **Operating humidity** | max. 90% RH | |

**Notes:**
(1) For change, please check the 2.4. LED Circuit section.
(2) Working with the added surface up to a given thickness. The surface is provided by the user. In order to expand this parameter, please contact us (office@unisystem.com)
(3) Sudden temperature changes (thermal shock) can cause water vapor or frost to accumulate on the button surface, leading to responsiveness issues. Avoid exposing the button to rapid temperature shifts to maintain its proper functionality.

# 2 Electrical Characteristic

## 2.1 General Characteristic

| Parameter | Symbol | Value | Unit | Notes |
|---|---|---|---|---|
| **Power Supply** | $V_{IN}$ | 5 – 36 | VDC | (1) |
| **LED Power Supply** | $V_{LED}$ | 5 | VDC | |
| **LED Current Consumption** | $I_{LED}$ | max. 3 * 20 | mA | |
| **Reverse Polarity Protection** | - | Yes | - | (2) |
| **Output** | $BTN_{OUT}$, $GRD_{OUT}$ | Open-drain | - | (3) |
| **Operating temperature** | $T_{op}$ | -20 – +70 | °C | |
| **Storage temperature** | $T_{st}$ | -30 – +80 | °C | |

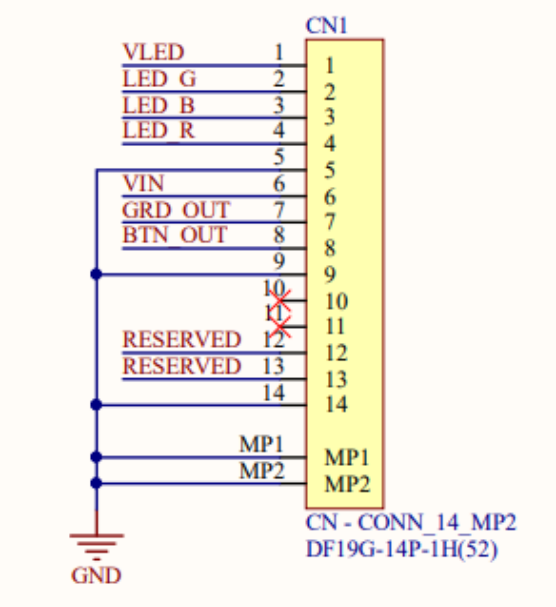
**Notes:**
(1) Wide input voltage range regulated by LDO (Low-dropout regulator)
(2) Realized by TVS diodes.
(3) Open-drain output, pull-up on user's side.

## 2.2 Pinout Assignment

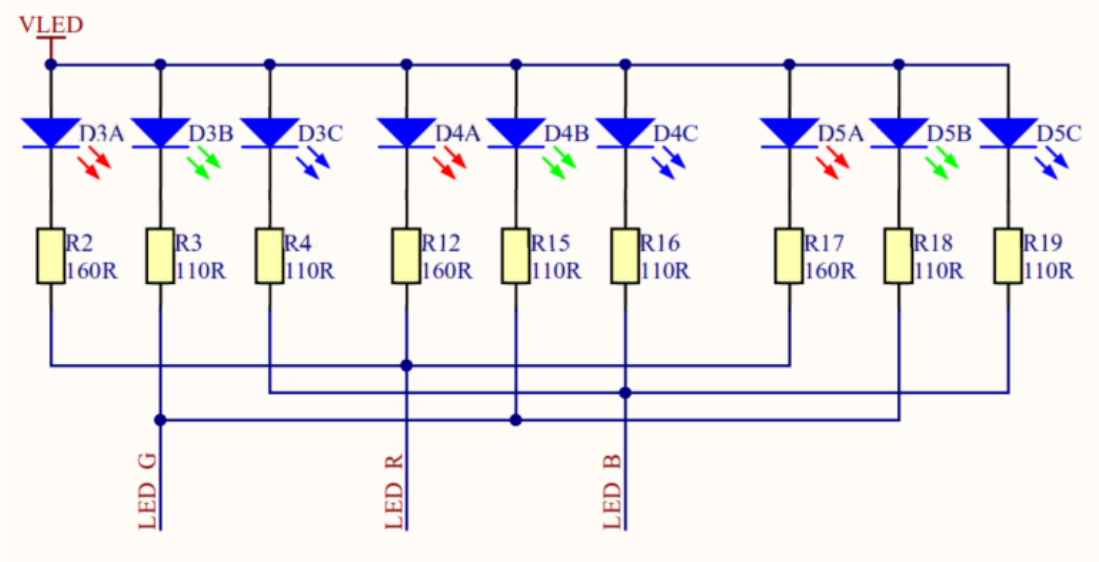
| Pin | Symbol | Description |
|---|---|---|
| **1** | $V_{LED}$ | Supply voltage for LEDs |
| **2** | $LED_G$ | Green LED control |
| **3** | $LED_B$ | Blue LED control |
| **4** | $LED_R$ | Red LED control |
| **5** | GND | Ground |
| **6** | $V_{IN}$ | Supply voltage |
| **7** | $GRD_{OUT}$ | Output for guard |
| **8** | $BTN_{OUT}$ | Output for button |
| **9** | GND | Ground |
| **10** | NC | Not connected |
| **11** | NC | Not connected |
| **12** | Reserved | for internal use only |
| **13** | Reserved | for internal use only |
| **14** | GND | Ground |

## 2.3 Connector Information

Connector: DF19G-14P-1H(52).
Mating connector: DF19G-14S-1C.




## 2.4 LED Circuit




$T_A$ = 25°C

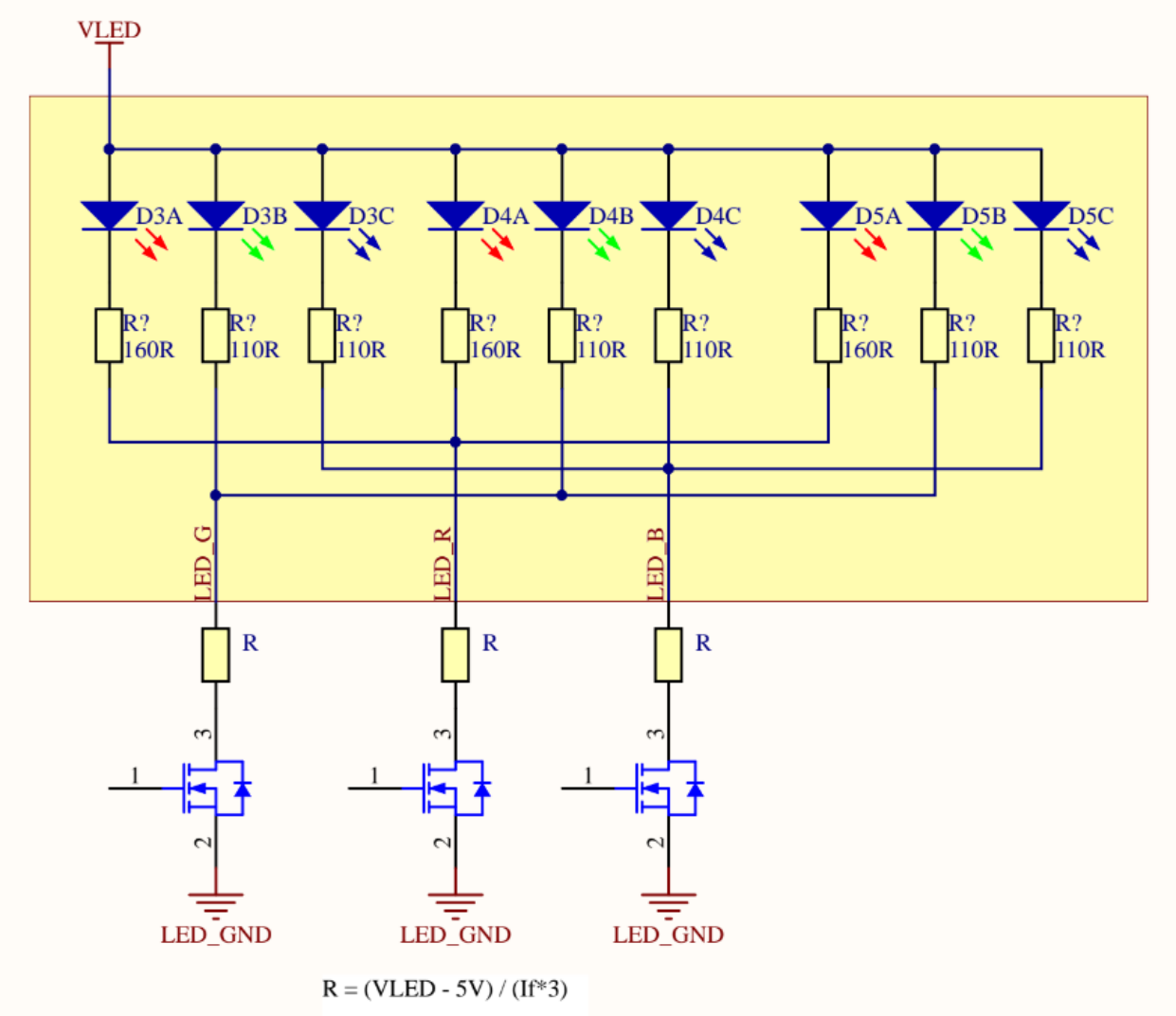
| Emission color | $V_{LED}$ [V] ($I_F$ = 20 mA) | $V_F$ [V] typ. | $V_F$ [V] max. |
|---|---|---|---|
| **Red** | 5 | 1.6 | 2.6 |
| **Green** | 5 | 2.8 | 3.6 |
| **Blue** | 5 | 2.8 | 3.6 |

### 2.4.1 $V_{LED}$ input voltage extension

There is a possibility to extend the input voltage of $V_{LED}$. In this case there's a need to add three external resistors of a given value on the output of each signal: LED_G, LED_R, LED_B, according to the formula:

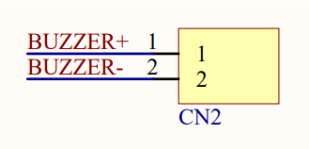
$$\mathbf{R = (V_{LED} - 5V) / (I_f * 3)}$$

$I_f$ = max. 20 mA



## 2.5 Buzzer connector

Connector: BM02B-ACHSS-GAN-TF.
Mating connector: ACHR-02V-S.




For any buzzer customization requests, please contact us (office@unisystem.com).

## 2.6 Water protection

The implemented configuration of the capacitive button is optimized to function correctly in the presence of water droplets. It has been calibrated to differentiate between intentional touch inputs and incidental water droplets, ensuring reliable performance under typical operating conditions.
In the event of water stream, where the water presence exceeds acceptable levels, the button's operation is automatically blocked to prevent false activations. This condition is indicated by shorting **$GRD_{OUT}$** to GND, providing an immediate and clear signal of the abnormal water presence. Functionality is restored once the excess water is eliminated.

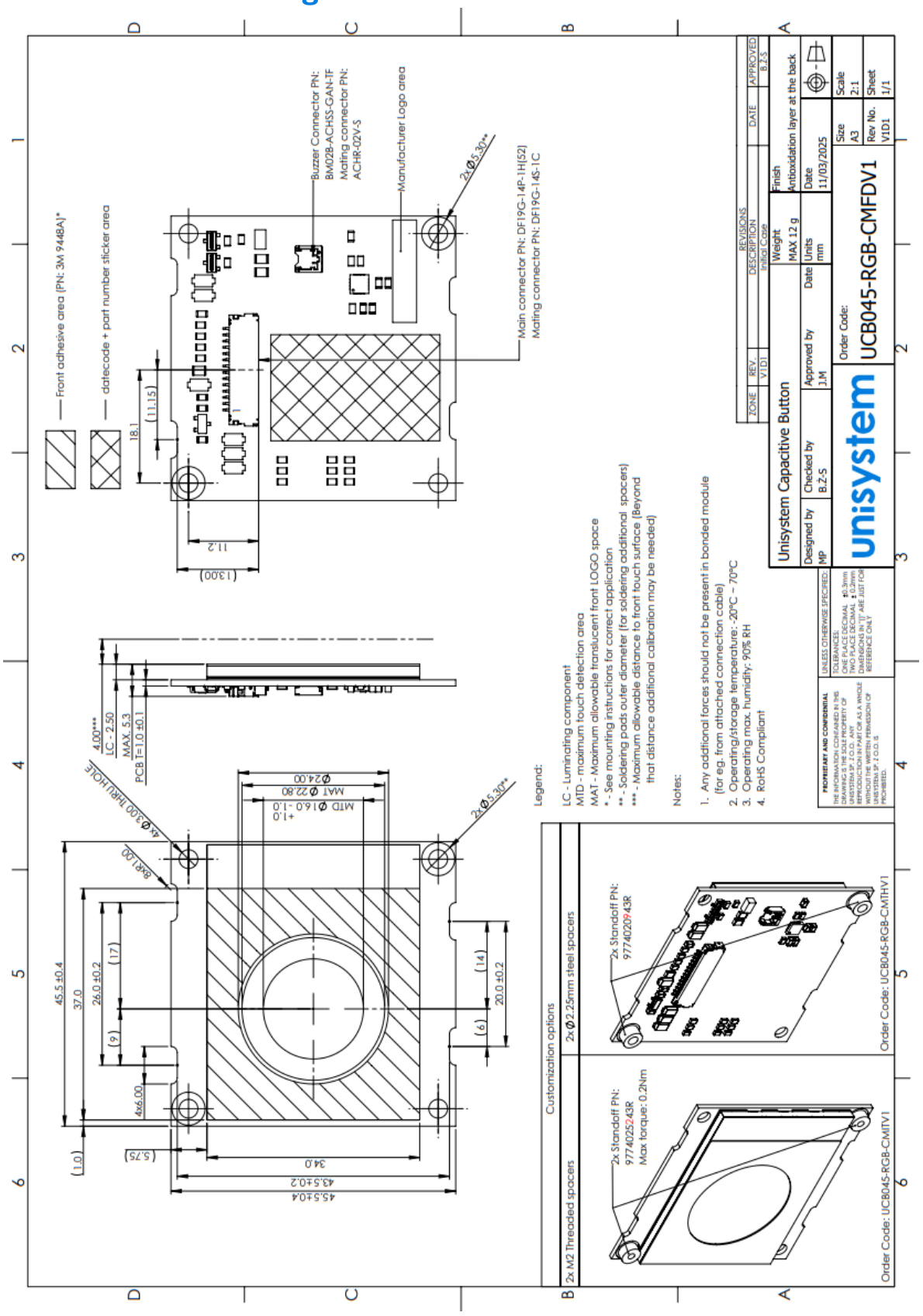
# 3 Optical Characteristic

| Emission Color | $V_{LED}$ [V] | Brightness [cd/m$^2$] | |
|---|---|---|---|
| | | min. | max. |
| **White** | 5 | 850 | 950 |
| **Red** | 5 | 90 | 100 |
| **Green** | 5 | 750 | 800 |
| **Blue** | 5 | 40 | 60 |

**Note:** The touch button may exhibit slight side leakage. If necessary, consider implementing and additional boundary enclosure to minimize light dispersion.

# 4 Mechanical Characteristic

## 4.1 Mechanical drawing

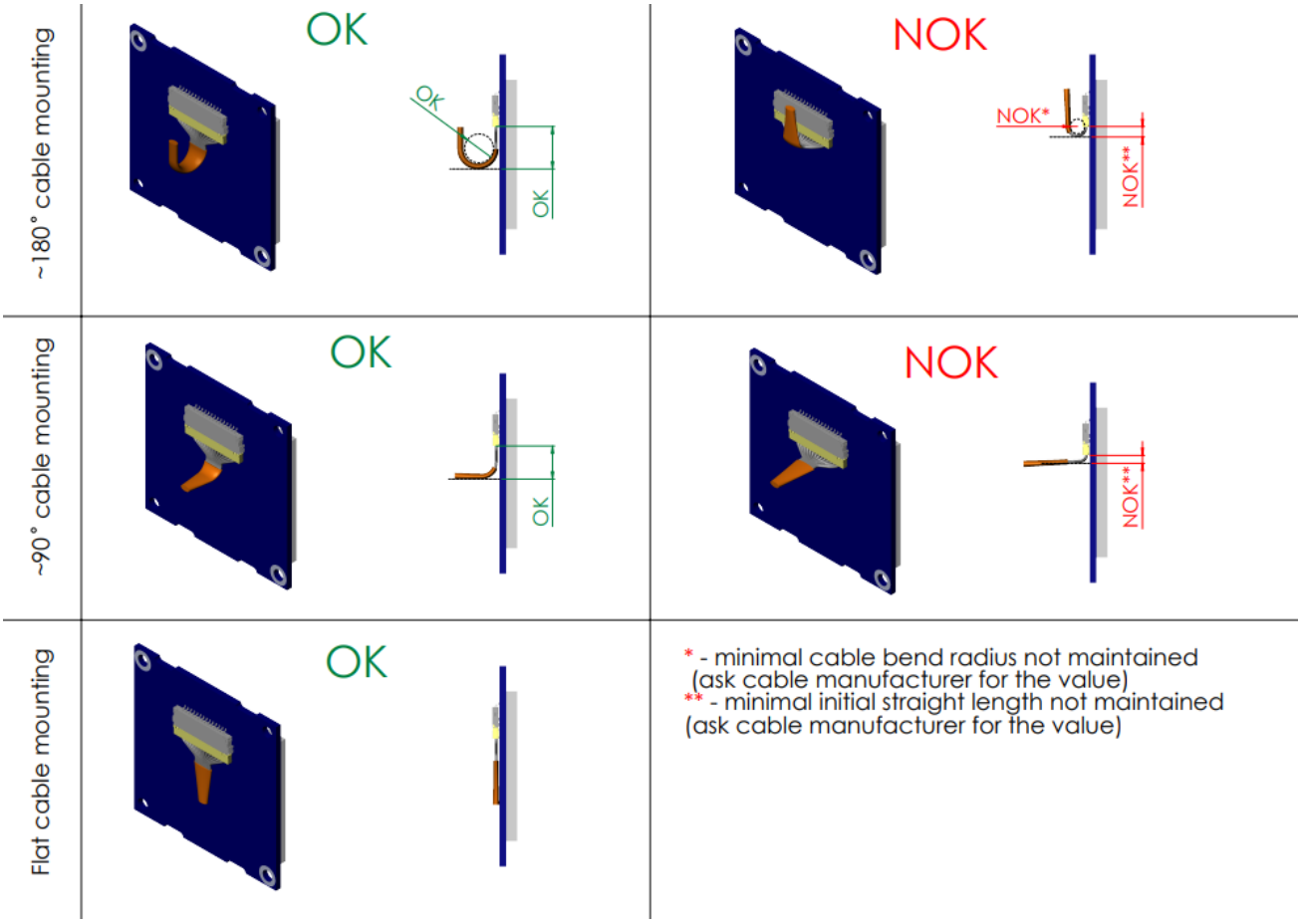


## 4.2 General Characteristic

| Parameter | Value | Unit |
|---|---|---|
| **Outline Dimensions** | 45.5 x 45.5 x 5.3 | mm |
| **Touch Detection Area** | ϕ16 | mm |
| **Mounting DST** | 3M 9448A | - |
| **Glass thickness** | ≤ 4 | mm |
| **PMMA thickness** | ≤ 4 | mm |

## 4.3 Cable Mounting Instruction

- Fix module in place while attaching/deattaching cable.
- Ensure correct pinout between module and cable.
- Mind first pin indicator while pluggin-in.
- Before connecting or disconnecting the cable, ensure that the PCB is securely fixed in place.



## 4.4 Guidelines for Preparation and Application of Double-Sided Tape

### 4.4.1 Surface Preparation

- **Cleaning:** Ensure that surfaces are clean and free from contaminants such as dust, oils, wax, or residue from old adhesives. Use isopropyl alcohol (IPA) or another appropriate cleaning agent that leaves no residue. After cleaning, the surface must be completely dry.
- **Removing loose particle:** Surface should be flat and even, remove any loose particles using brush or compressed air.
- **Degreasing:** Additionally, degrease the surface, especially for materials such as metal, glass, or plastic.

### 4.4.2 Enhancing Surface Adhesion

- **Surface energy requirements:** Ensure that the material to which the touch button is being adhered has a minimum surface energy of **38 dynes/cm** or higher. Low-energy surfaces (e.g., certain plastic like polyethylene or polypropylene) may require surface treatment such as corona, flame, or plasma treatment to enhance adhesion.
- **Sanding (if necessary):** For rough or painted surfaces, lightly sand the surface with 320-400 grit sandpaper to increase the contact area. After sanding, clean the surface again with isopropyl alcohol.

### 4.4.3 Tape Application

- **Application temperature:** Ensure the application occurs within the ambient temperature range recommended by the tape manufacturer (typically 20 – 30°C). Low temperature can reduce adhesion.
- **Removing the protective liner:** Remove the tape's protective liner without touching the adhesive surface.
- **Application pressure:** Attach the tape to target surface, lightly pressing it into place, then apply consistent and firm pressure across the entire surface using a hand press to ensure optimal contact.
- **Bonding the parts:** Carefully join the two parts, applying even pressure for a few seconds to ensure maximum surface contact between the adhesive layers.

### 4.4.4 Curing Conditions

- **Curing time:** If possible, leave the bonded parts undisturbed for at least 24 hours to achieve full bond strength.
- **Ambient temperature:** Ensure the parts remain at room temperature throughout the curing process.

### 4.4.5 Environmental Performance

- **Humidity resistance:** The adhesive demonstrates excellent performance in high humidity environments. After seven days of exposure at 90°F (32°C) and 90% relative humidity, there is no significant reduction in bond strength.
- **UV resistance:** Proper application ensures that product is not negatively affected by UV exposure, maintaining its integrity and appearance.
- **Chemical resistance:** When applied correctly, the adhesive holds securely under exposure to various chemicals such as oil, mild acids, and alkalis, ensuring reliable performance in demanding environments.

### 4.4.6 Additional Notes

- **Surface compatibility:** Ensure the tape is compatible with the surface material, particularly if the material has been treated or coated.
- **Quality control:** After bonding, perform a quality control test to confirm adequate adhesion.

# 5 Contact Information

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