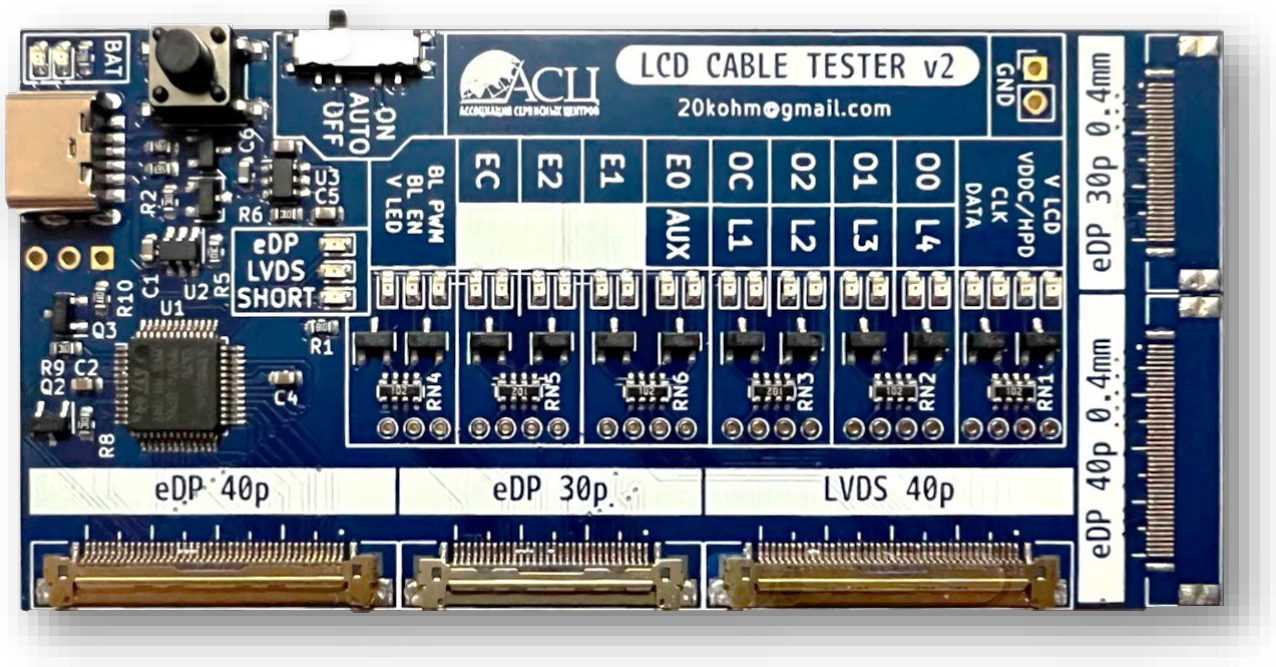

LAPTOP LCD CABLE TESTER

version 2

АССОЦИАЦИЯ СЕРВИСНЫХ ЦЕНТРОВ
по ремонту и обслуживанию ноутбуков и компьютерной техники

USER GUIDE

Oct 2022

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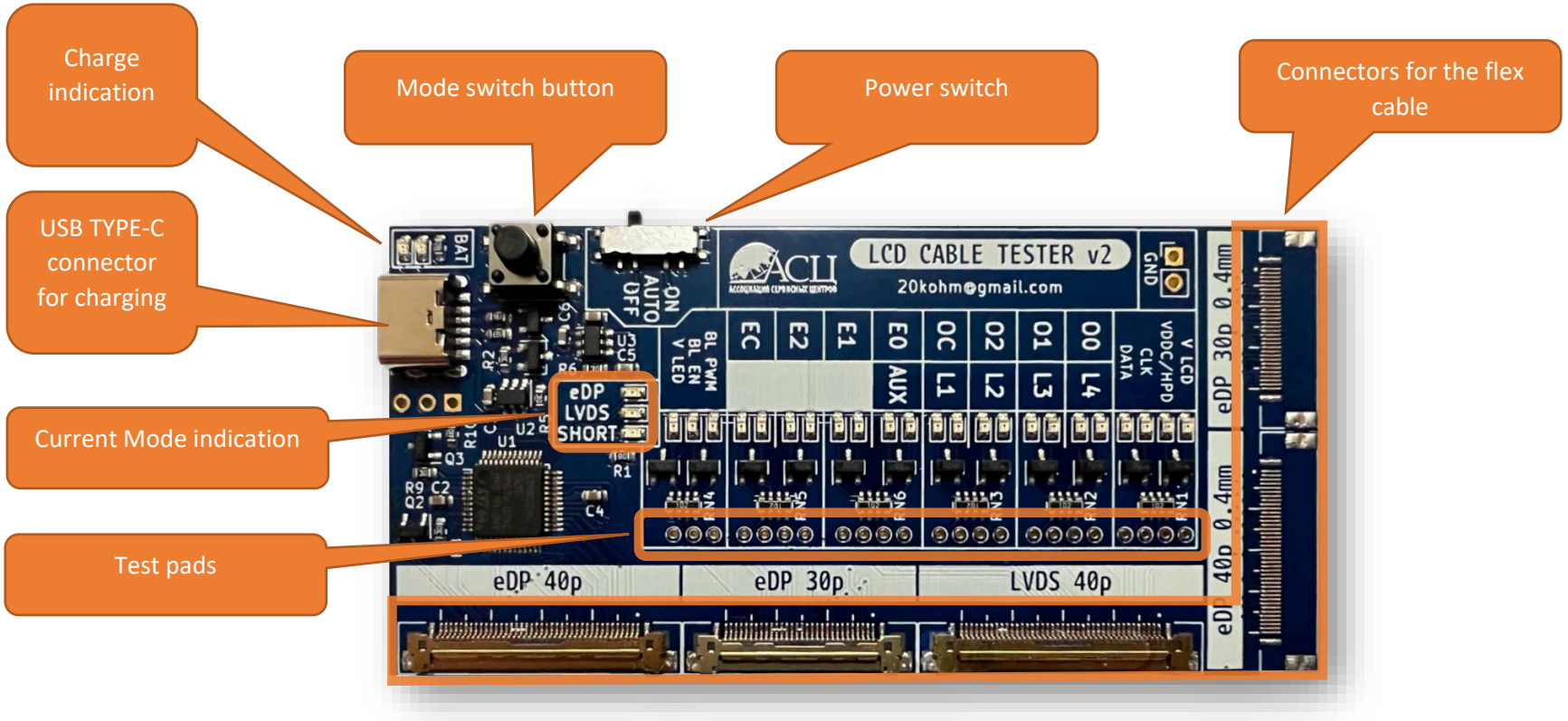
1 DESCRIPTION

The tester is designed to check the integrity of LVDS and eDP cables used in laptops. Only standard pinout cables are supported.

The device allows you to determine the damaged wires by the mechanical impact on the cable. The tester also allows you to determine the presence of short circuits in the cable.

For diagnostics, the cable has to be connected to the tester instead of the LCD panel. Breakage diagnostics are performed with a cable being connected to the laptop motherboard. Checking for short circuits is performed without connecting to the MB.

When using the tester, the motherboard must be disconnected from the power source and battery!



1.1 CONNECTORS

The tester has 6 footprints for connectors of different types of cables. 3 of them are pre-installed:

1. eDP 40-pin, 0.5 mm pitch – usually used for 4 channel 4K resolution panels.
2. eDP 30-pin, 0.5 mm pitch – connector for eDP panels with 1 or 2 channels, HD and FullHD.
3. LVDS 40-pin pitch 0.5 mm - connector for LVDS panels with 1 or 2 channels, HD and FullHD. This type of connector was widely used on laptops produced until about 2014.

The eDP 40-pin and LVDS 40-pin connectors are mechanically identical but incompatible.

Also, there are footprints for additional connectors. If necessary, these connectors can be removed from a damaged panel and installed on the tester by yourself.

4. eDP 40-pin pitch 0.4 mm - the connector is similar to the eDP 40-pin pitch of 0.5 mm, but with a smaller distance between the pins. Used in some new laptops, in the future it is expected to be more widespread of this type connectors.
5. eDP 30-pin pitch 0.4 mm - the connector is similar to the eDP 30-pin pitch of 0.5 mm, but with a smaller distance between the pins. Used in some new laptops, in the future it is expected to be more widespread of this type connectors.
6. LVDS 30-pin pitch 1.0 mm - legacy connector, used on panels with CCFL lamp illumination. Located on the back of the board. Not soldered since it is discontinued.

2 POWER

2.1 BATTERY

Before use, you must install the battery. Any lithium-ion battery will fit. Soldering pads are located on the back of the PCB. The recommended capacity is 100-1000 mAh. The default charging current is 100 mA. Can be increased to 500 mA by replacing the R5 resistor.

R5	Charge current (mA)
20K	50
10K	100
5K	200
4K	250
3K	300
2K	400
1K6	500

2.2 POWER ON

A 3-position switch is provided to control the power of the tester. In automatic mode, the tester turns on when the cable is connected to any of the connectors. One of the standard GND lines is used to turn on the tester.

If there is a non-standard or damaged cable, the automatic switching may not work. In this case, it is possible to force the tester to be turned on using a switch.

Also, in some cases, it may be useful to force the tester to turn it off. For example, to check the lines manually with a multimeter using the test pads on the tester. In this case, use the OFF position.

3 WORKFLOW

3.1 TESTING FOR BREAKAGES

1. Completely de-energize the laptop board by unplugging the power adapter and battery.
2. Disconnect the flex cable from the panel.
3. Connect the flex cable to the appropriate connector on the tester.
4. The tester will turn on automatically, or you can turn it on forcibly using a switch. By default, eDP mode will be enabled. (Suitable for testing both eDP and LVDS cables)
5. By the glow of the LEDs, determine the state of the cable. Examples of indications for good cables are given below.
6. Switch to LVDS mode if necessary

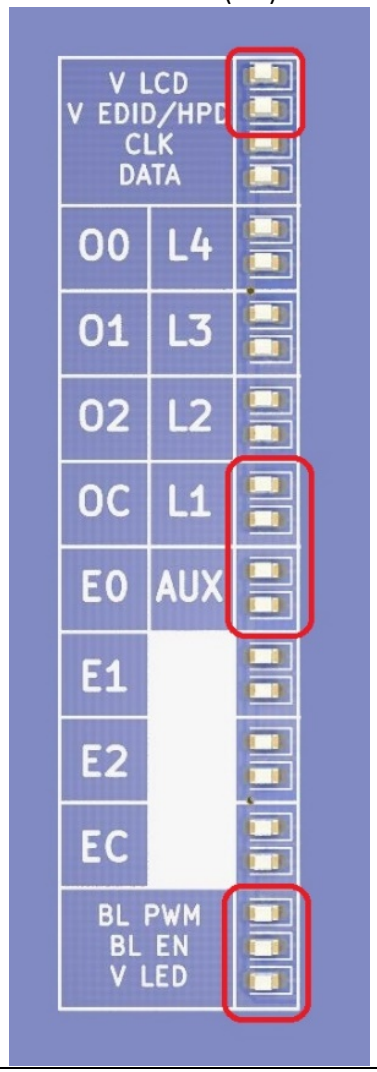
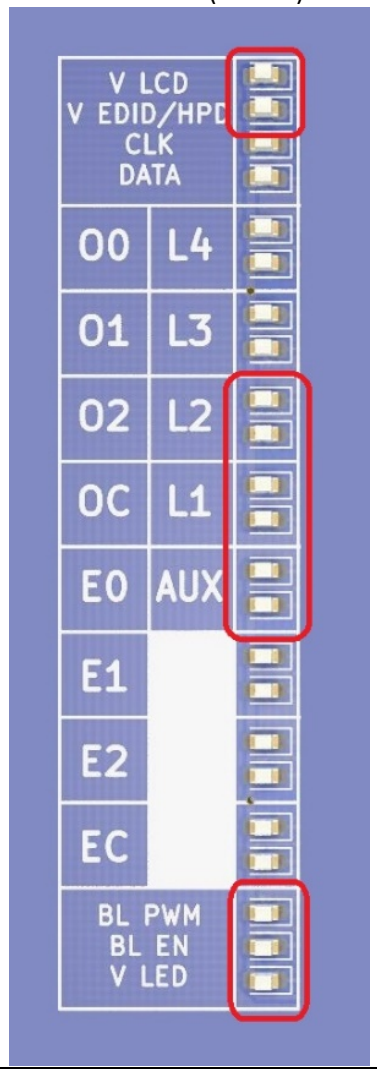
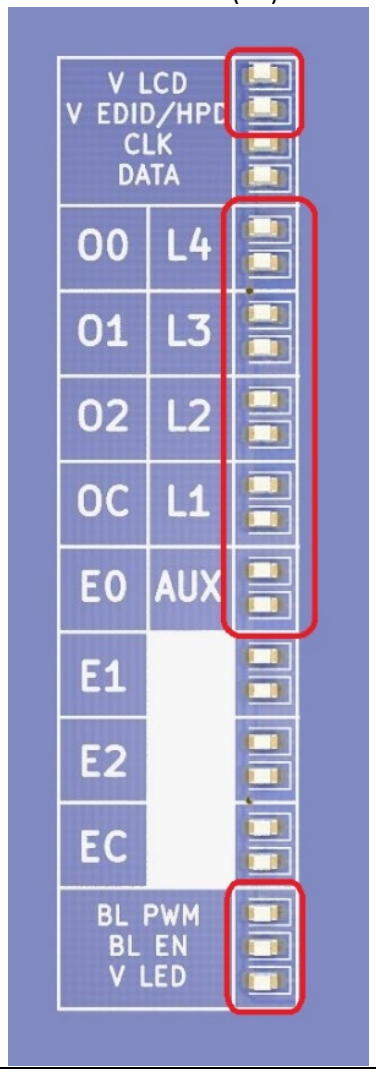
3.2 TESTING FOR SHORT CIRCUITS

1. Unplug the cable from the laptop motherboard
2. Disconnect the cable from the panel
3. Connect the cable to the appropriate connector on the tester.
4. The tester will turn on automatically, or you can turn it on forcibly using a switch.
5. With two presses of the button, switch the tester to SHORT mode.
6. By the glow of the LEDs, determine the presence of short circuits, at the same time you can move the cable. In the presence of short circuits, the LEDs of the corresponding lines will be turned on. The short-circuit indication is turned off with a delay, which allows you to detect short-term short-circuits.

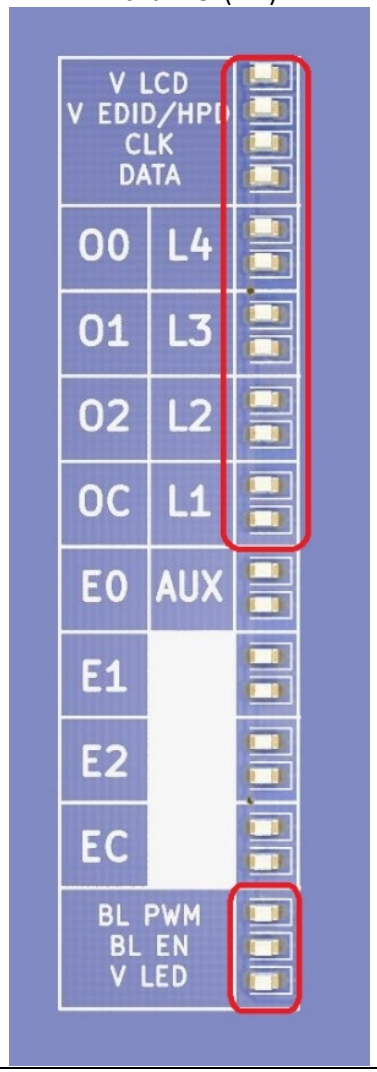
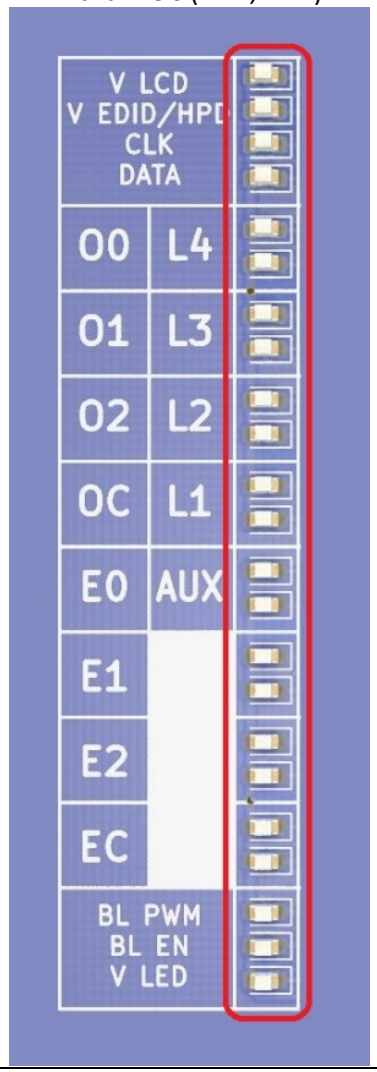
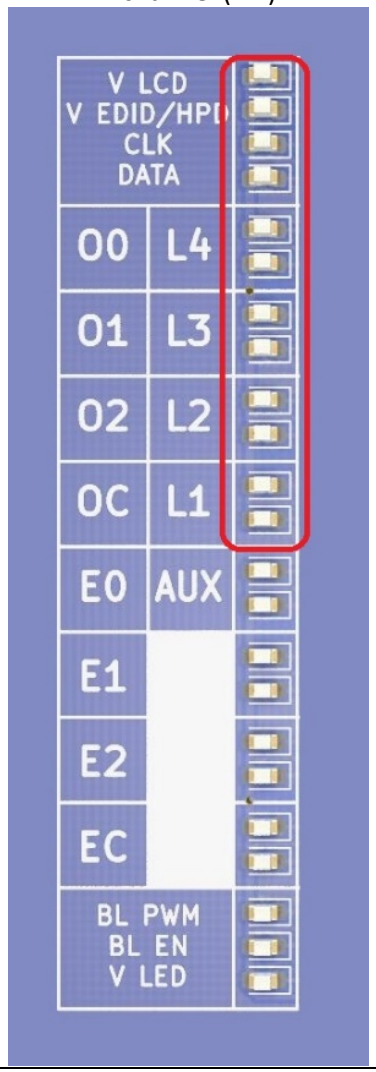
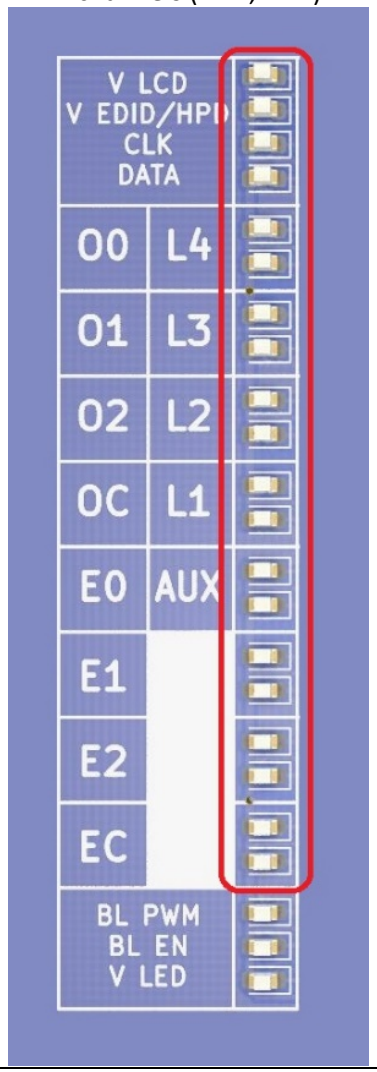
Video with a demonstration of the operation of the short circuit search mode:

https://youtu.be/iUBZm0eUyr0

3.3 EXAMPLES OF INDICATIONS FOR A WORKING EDP CABLE

eDP 30-pin 1 channel (HD)	eDP 30-pin 2 channels (FullHD)	eDP 40-pin 4 channels (4K)
		

3.4 EXAMPLES OF INDICATIONS FOR A WORKING LVDS CABLE

LVDS 40-pin LED 1 channel (HD)	LVDS 40-pin LED 2 channels (HD+, FHD)	LVDS 30-pin CCFL 1 channel (HD)	LVDS 30-pin CCFL 2 channels (HD+, FHD)
			

4 OPERATING MODES

The tester has 3 modes of operation:

1. eDP: Alternating signal mode (works by default immediately after power on).
2. LVDS: Constant signal mode.
3. SHORT: Short circuit search mode.

4.1 eDP: ALTERNATING SIGNAL MODE

In this mode, the tester outputs an alternating signal to all test lines through LEDs and current-limiting resistors. An alternating signal is necessary for the diagnosis of eDP lines because the signal for eDP panels comes through capacitors, which do not pass direct current.

4.2 LVDS: CONSTANT SIGNAL MODE

In this mode, the test lines are supplied with a constant power supply. The mode can be useful, for example, in cases where there is an unwanted glow of LEDs in eDP mode caused by a parasitic capacity of the lines.

4.3 SHORT: SHORT CIRCUIT SEARCH MODE.

In SHORT mode, the tester turns on the indicators of the lines on which a short circuit is detected. Testing must be performed on the cable disconnected from the motherboard. When the short circuit disappears, the indication is turned off with a delay, which makes it possible to detect short-term short circuits. In this mode, on a good cable, the "running light" effect will be visible on the indicators.

5 REFERENCE

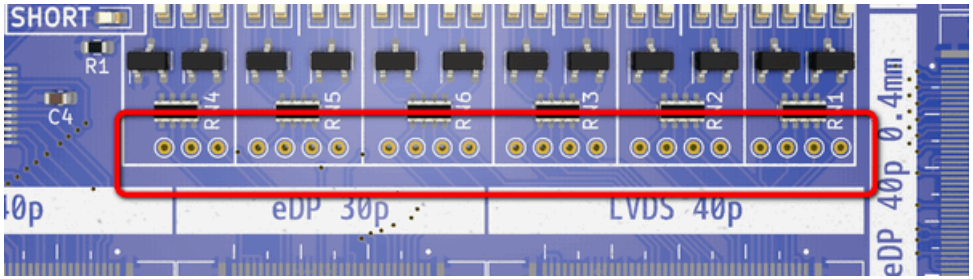
5.1 BRIGHTNESS AND UNIFORMITY OF THE INDICATORS

The brightness of the eDP or LVDS signal lines (differential pairs) LEDs may differ at different MB. With a good cable and MB, the brightness is usually the same on all lines. The difference in brightness may indicate a fault in the cable or MB. In this case, it makes sense to make measurements at test pads for further analysis and diagnosis.

The brightness of the control line LEDs depends on how they are implemented in the MB: using an MCU, GPU, buffer or logic ICs, etc. In some cases, for example, if the signal on the MB is turned on by a FET, the glow can be very weak, even if the cable is OK.

5.2 TEST PADS

The tester has test pads for the probe of the oscilloscope or multimeter. They are connected directly to the pins of the connector. This allows you to analyze the signal and thus diagnose not only the cable but also the MB. Also, with the help of test pads, you can test the lines manually, having previously turned off the tester forcibly (switch to the OFF position). It can also be useful for determining the pinout of the MB connector in the absence of schematics drawings.



5.3 NON-STANDARD CABLES

In some cases, there may be non-standard signals in the cable.

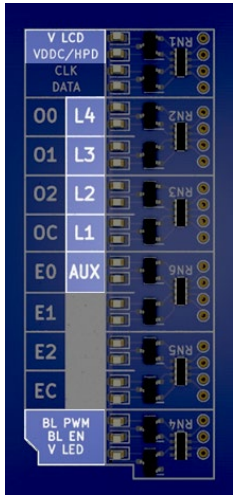
For example, the MB_Petra_UMA platform uses the EDP#_LVDS_R signal, which is connected to the GND inside the cable. Without this signal, there is no image on the screen, even though all standard signals can be present.

Also, the tester does not check the availability and quality of GND. You can check that yourself with a multimeter or duplication.

5.4 DESCRIPTION OF EDP SIGNALS

For the operation of the eDP interface, up to 5 differential pairs (10 wires) and 5 control signals are used, for a total of up to 15 lines.

Of these, the following 9 lines are always present:



1. Power supply panel V LCD, +3V
2. HPD Signal: Hot Plug Detect.
3. L1 Channel 1 P line
4. L1 Channel 1 N line
5. AUX P line
6. AUX N line
7. BL PWN – PWM signal for backlight brightness control.
8. BL EN – backlight enabling signal.
9. V LED – backlight power supply, usually from 7.4 to 19 V.

For higher resolution (Full HD) panels, a second channel is added:

10. L2 Channel 2 P line
11. L2 Channel 2 N line

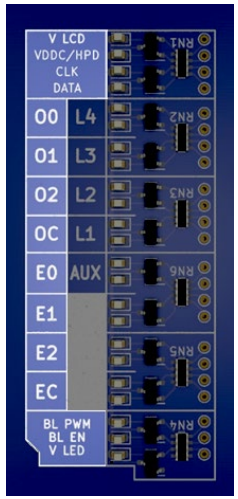
For panels with maximum resolution (Ultra HD 4K), as well as with high refresh rates (120Hz or more), two more channels are added:

12. L3 Channel 3 P line
13. L3 Channel 3 N line
14. L4 Channel 3 P line
15. L4 Channel 3 N line

5.5 DESCRIPTION OF LVDS SIGNALS

For the operation of the LVDS interface, up to 8 differential pairs (16 wires) and 7 control signals are used, for a total of up to 23 lines.

Of these, the following 12 lines are always present, relevant for obsolete panels with CCFL lamp backlight, connected to the 30-pin connector with a 1 mm pin pitch:



1. Power supply panel V LCD, +3V
2. VDDC power supply for EDID firmware, +3V
3. EDID CLK signal
4. EDID DATA signal
5. OC signal P line (RXC+, sync)
6. OC signal N line (RXC-, sync)
7. O0 signal P line (RX0+, red)
8. O0 signal N line (RX0-, red)
9. O1 signal P line (RX1+, green)
10. O1 signal N line (RX1-, green)
11. O2 signal P line (RX2+, blue)
12. O2 signal N line (RX2-, blue)

For panels with higher resolution (Full HD), a second channel is added, in this case, the channels work interlaced: lines O (Odd) - on odd lines, lines E (Even) - on even ones.

13. EC signal P line (RXC+, sync)
14. EC signal N line (RXC-, sync)
15. E0 signal P line (RX0+, red)
16. E0 signal N line (RX0-, red)
17. E1 signal P line (RX1+, green)
18. E1 signal N line (RX1-, green)
19. E2 signal P line (RX2+, blue)
20. E2 signal N line (RX2-, blue)

For more modern LED-backlit panels, backlight control signals and backlight power are added in the 40-pin connector with a 0.5 mm pin pitch, the rest of the signals are similar to panels with CCFL lamp backlighting.

21. BL PWN – PWM signal for backlight brightness control.
22. BL EN – backlight enable signal.
23. V LED – backlight power supply, usually from 7.4 to 19 V.

5.6 SUPPORT

For support feel free to contact: mailto:20kohm@gmail.com