# Procedure for checking over-voltage damage

Last modified: August 28, 2025

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# Introduction

Before you begin working on the RouterBOARD for your safety please make sure:

- The RouterBOARD is unplugged from the mains outlet.
- To discharge yourself from static electricity by touching a grounded metal surface or by wearing an antistatic wrist strap.
- After unplugging the RouterBOARD, to leave it for at least 15 minutes to allow all the power supply capacitors to discharge (This only applies to boards with built-in power supplies).
- To not touch the internal power supplies (danger of electrical shock)!

# CHECKING PROCEDURE FOR OVER-VOLTAGE DAMAGE

Over-voltage can be caused by the following reasons: high voltage surge, lightning, electrostatics etc..

You can check if RouterBoard was damaged by over-voltage, by using the following testing methods:

## Check Schottky diode

Schottky diode quality can be measured with digital multimeter in diode mode.

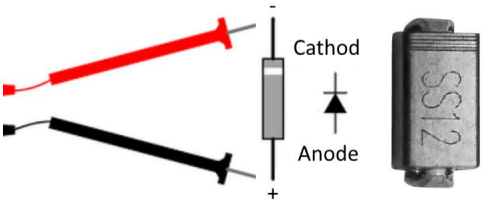
The diode has two terminals - the anode and the cathode. The anode is positive, and the cathode is negative (there is a strip on the diode case), see picture 2.

The diode needs to be checked in reverse switching, when a negative voltage is applied to the anode (multimeter black probe, "COM" probe), and a positive voltage is applied to the cathode (multimeter red probe, positive probe), see picture 2.

When the test probes are connected as shown in the picture 2, then value of measurement should be Open loop, as shown in the picture 1. This indicates that the p-n junction is normal and the current does not flow in the opposite direction.

If Schottky diode will be damaged, measurement will show some other value.


Picture 1

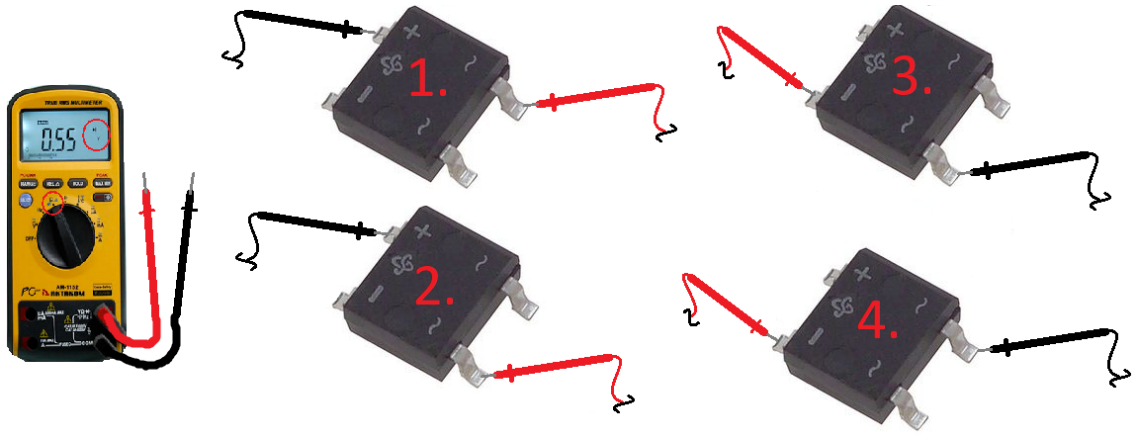



Picture 2

# Diode bridge measurement

This measurement is required only in cases where basic test gives uncertain results. This includes readings greater than 1V instead of OL or fluctuating readings.

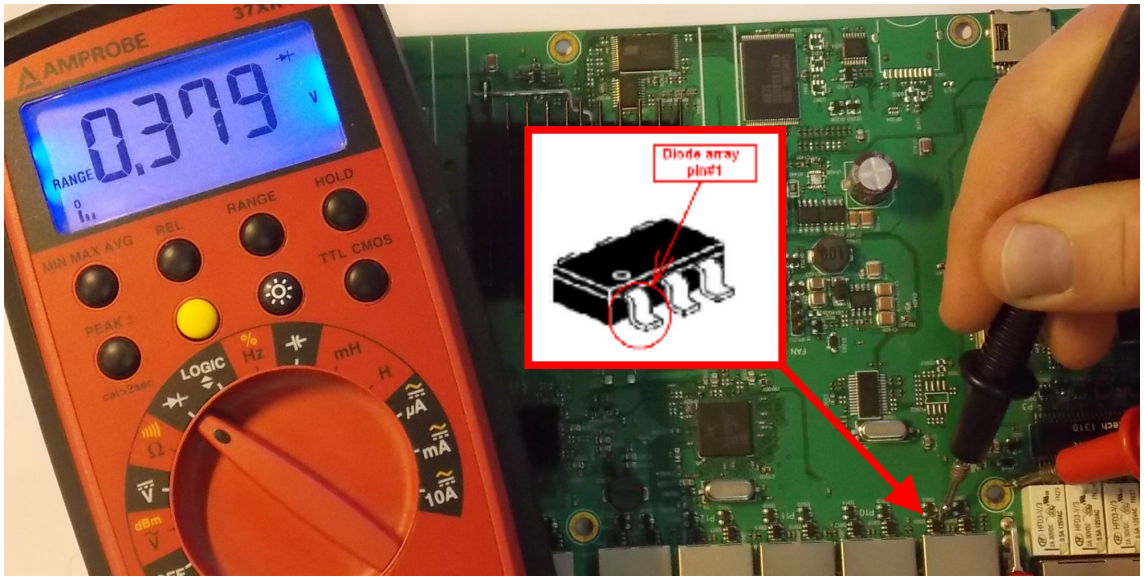
In such cases making sure that each of the bridge diodes have healthy forward voltage (0,45..0,65V) can confirm that there is no damage. In addition, the voltages obtained should not differ significantly (no more than 5%) from each other. This can be done in 4 measurements, by connecting the multi-meter as show in the following picture 3:




Picture 3

# Check voltage drop value between diode array pin#1 and Ground

You should measure in diode mode: hold red probe on the Ground and black probe to diode array pin#1. Diode array pin#1 is always marked by dot mark on the diode array case, see picture 4.




Picture 4

# Check voltage drop value between Ethernet transformer pins and Ground

You should measure in diode mode: hold red probe on the Ground and black probe to Ethernet transformer pins. In the picture 5 you can see an example of how to correctly measure.


Picture 5

# Check termination resistors resistance in RJ-45 connector

For this measurement you should take patch cord and plug it into the routerboard, see picture 6. After that measure resistance of termination resistors by digital multimeter.

Resistance value between Rx and Tx line must be 150 Ohm +/-4

If resistance value is smaller or higher then Tx/Rx line was damaged by high voltage surge.


Picture 6

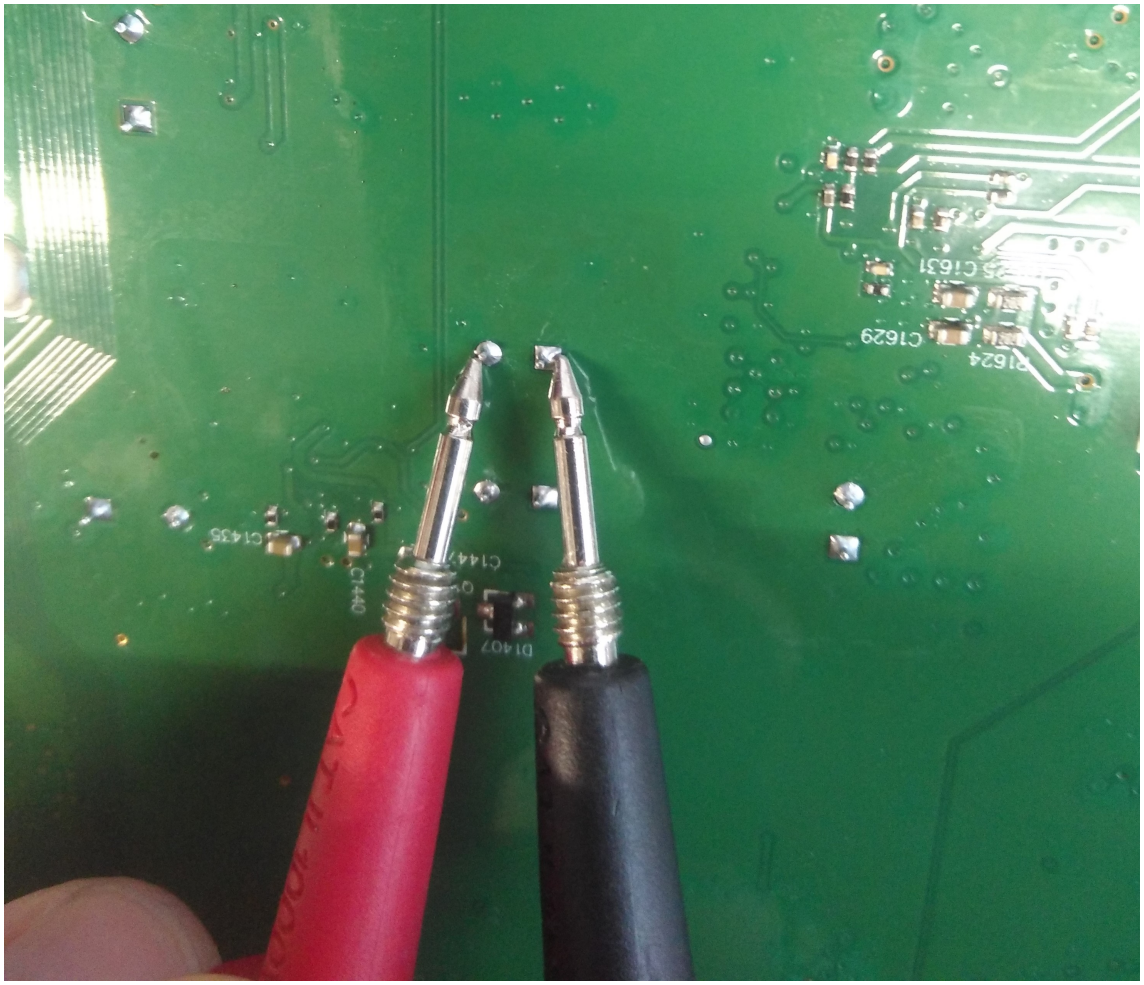
# Check resistance on transformer in RJ-45 connector

For this measurement you should take patch cord and plug it into the routerboard, see picture 7. After that measure resistance with digital multimeter. Resistance value for each twisted pair must be smaller than 5 Ohm. If resistance is higher that means line was damaged by high voltage surge.

Picture 7

# Fuse check

For this measurement you use your multimeter in resistance mode, if you do not have multimeter with auto range function use lowest resistance setting typically 200 Ohms. With both probes touch the selected fuse leads. Fuse is OK if the multimeter shows very low value (less than 1 Ohm). A display showing OL is a sign of damaged fuse.




Picture 8

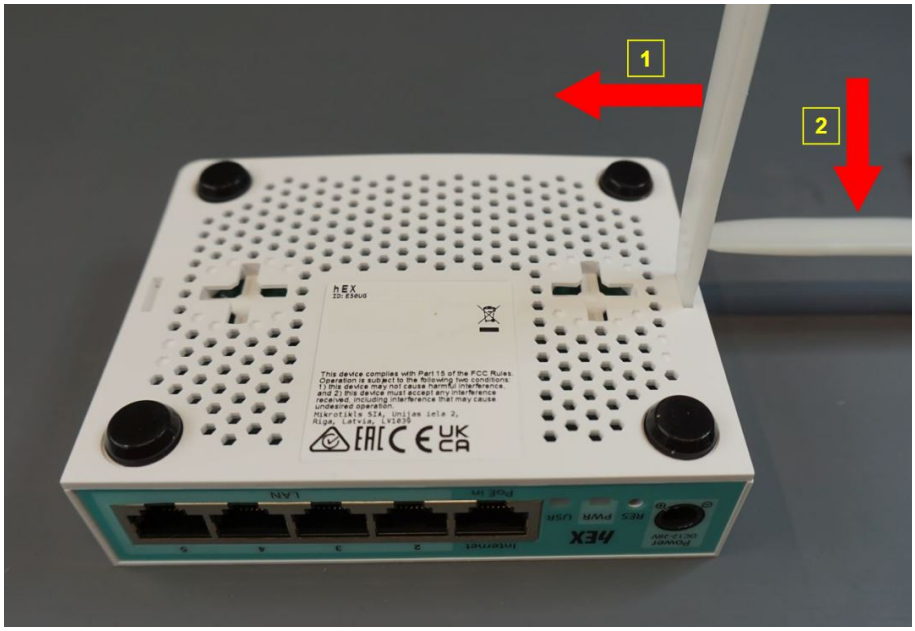
# HEX SERIES ROUTERBOARDS

# hEX (E50UG)

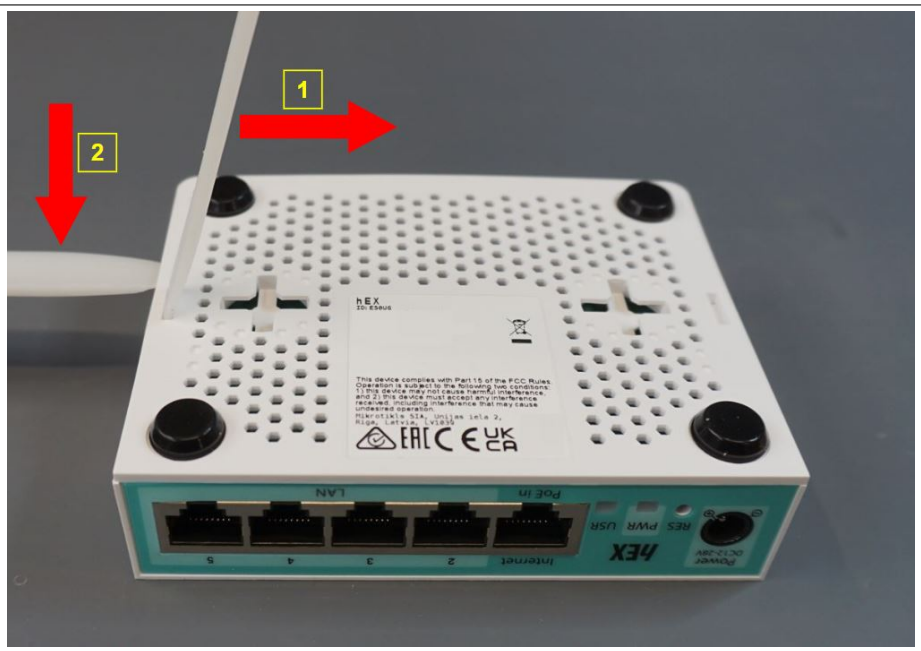

Picture 9

## Disassembling information

**Step 1:** Using plastic pry tools remove the back cover as shown in pictures 10 and 11.

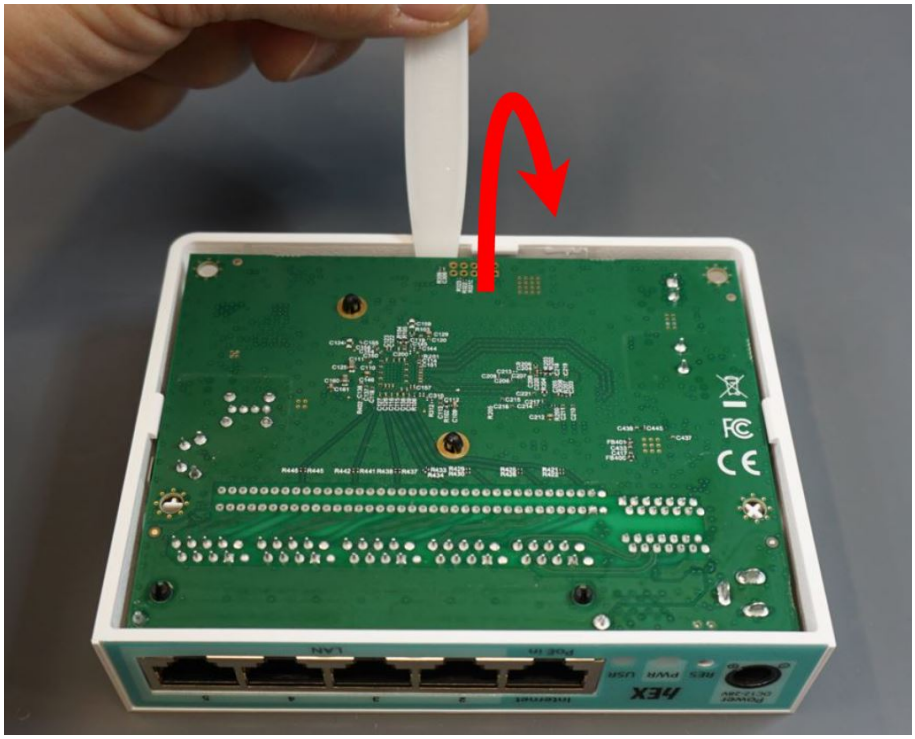



Picture 10




Picture 11

**Step 2:** Remove the printer circuit board from the case, see picture 12.

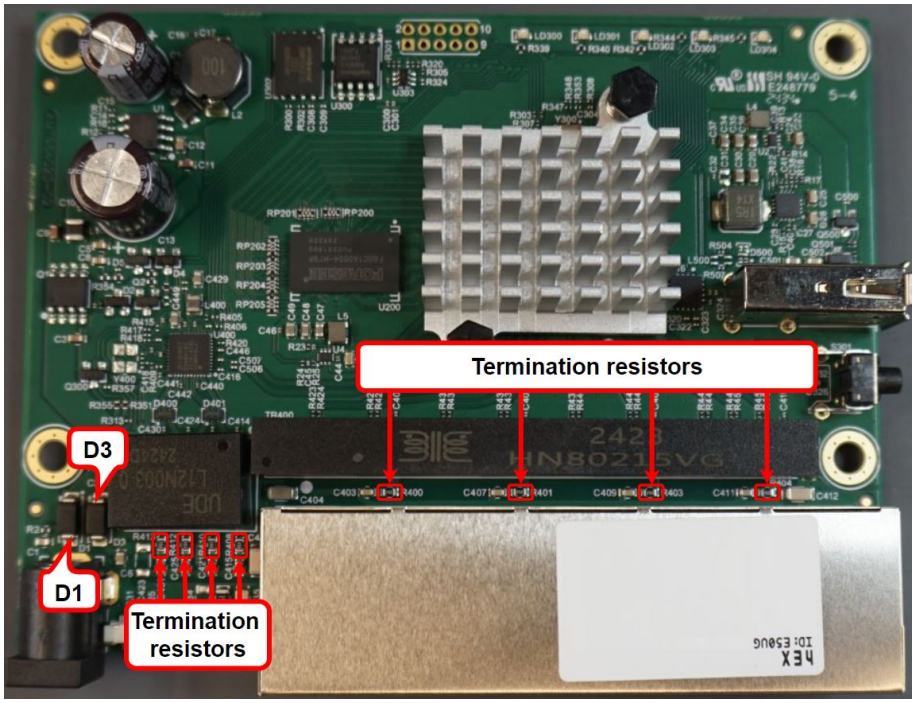


Picture 12

# Instructions for checking over-voltage

## Checking Schottky diodes

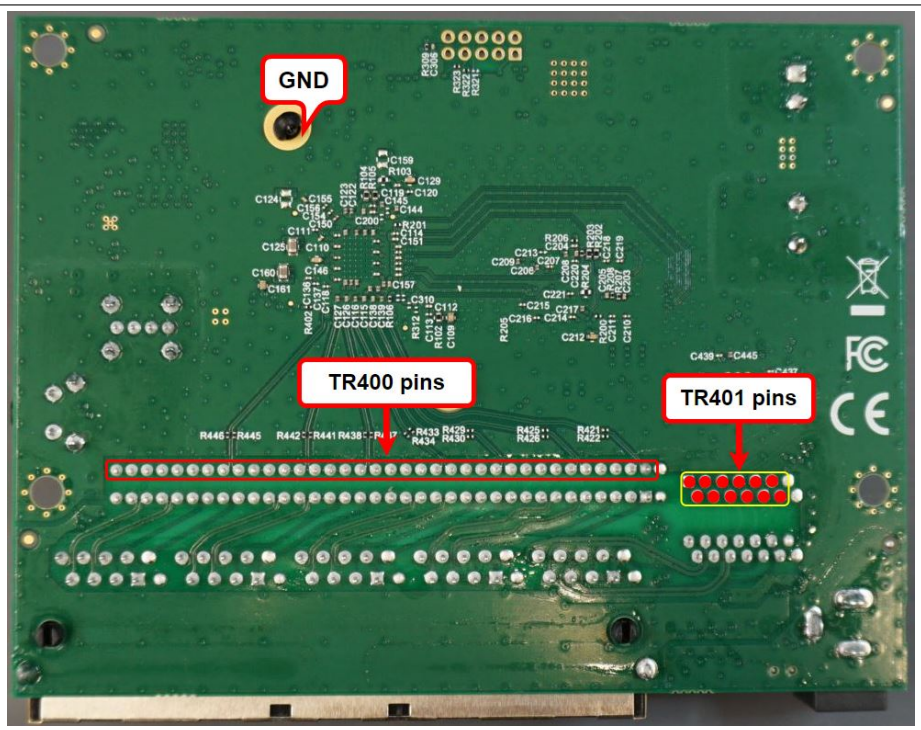
Check Schottky diodes D1 and D3. Location of the diodes on the board you can see in the picture 13. Schottky diode quality measurement method is described on page 4.




Picture 13

## Checking voltage drop value between Ethernet transformers pins and Ground

Check voltage drop value between Ethernet transformers TR400, TR401 pins and Ground, see picture 14. Voltage drop value on the transformer TR400 should be in the range from 0,35V to 0,40V and on the transformer TR401 should be in the range from 0,40V to 0,45V. Voltage drop measurement method is described on page 7.




Picture 14

### Checking 75 Ohm termination resistors resistance

Check value of each termination resistor. It should be 75 Ohms +/- 1%. Location of resistors is shown in picture 13.

# hEX S(E60iUGS)


Picture 15

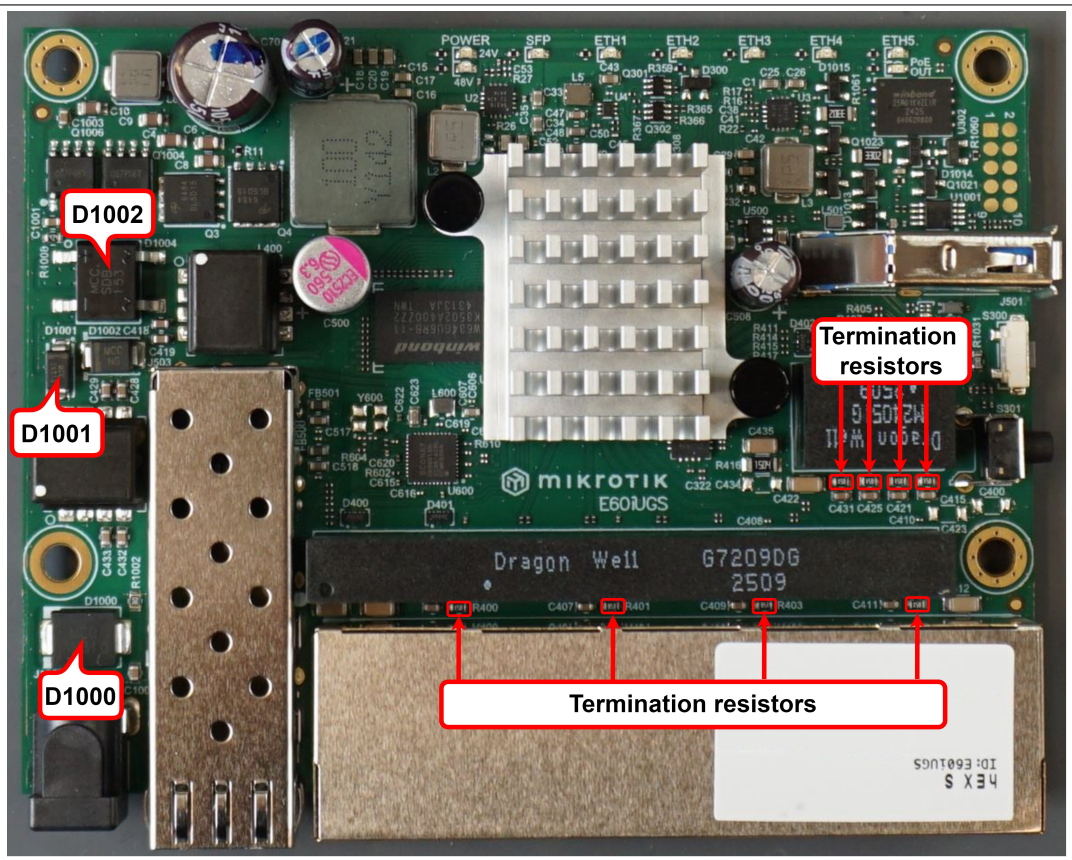
## Disassembling information

Disassembling method is the same as for hEX (E50UG), see page 9.

## Instructions for checking over-voltage

### Checking Schottky diodes and diode bridge

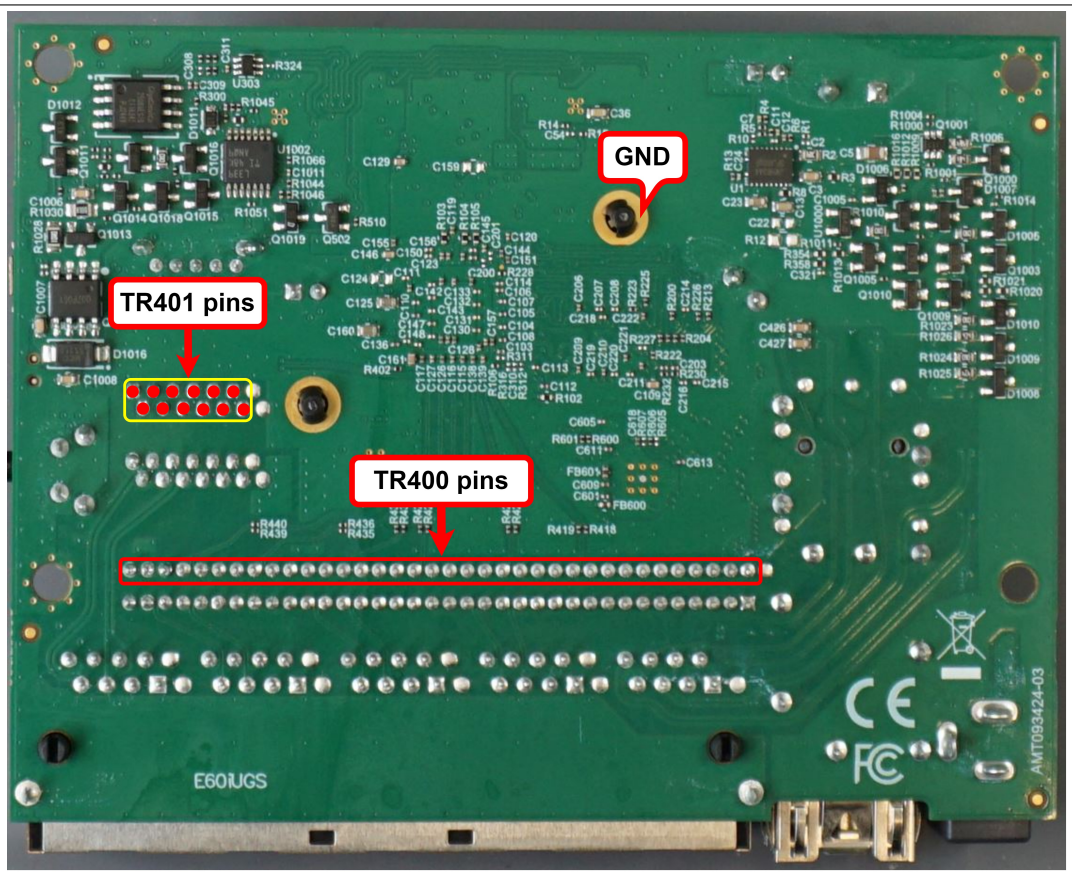
Check Schottky diodes D1000, D1001 and diode bridge D1002. Location of the diodes on the board you can see in the picture 16. Schottky diode quality measurement method is described on page 4. Diode bridge quality measurement method is described on page 5.




Picture 16

### Checking voltage drop value between Ethernet transformers pins and Ground

Check voltage drop value between Ethernet transformers TR400, TR401 pins and Ground, see picture 17. Voltage drop value on the transformer TR400 should be in the range from 0,30V to 0,40V and on the transformer TR401 should be in the range from 0,37V to 0,47V. Voltage drop measurement method is described on page 7.




Picture 17

### Checking 75 Ohm termination resistors resistance

Check value of each termination resistor. It should be 75 Ohms +/- 1%. Location of resistors is shown in picture 13.