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## L9963 14 Cells BMC IC Evaluation Board

### Introduction

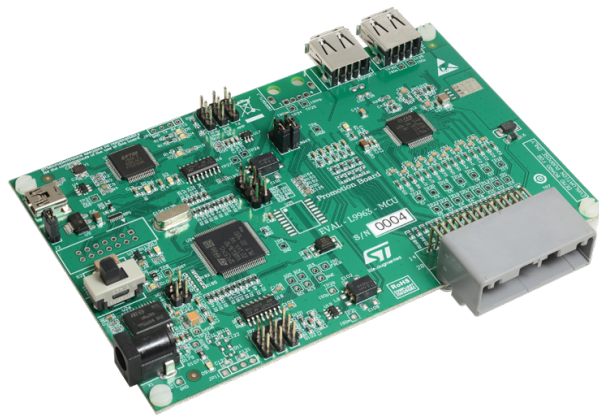
This document is intended as quick guide to help the user in the startup phase of EVAL-L9963-MCU combining and summarizing the information contained in EVAL-L9963-MCU and STSW-L9963 user manuals.

## 1 What you need

- EVAL-L9963-MCU
- USB cable
- Power supply (at least 3 output 0 – 30 V (if possible 60V):
  - 1 output to power L9963 (0:60 V)
  - 1 output to simulate Cells common mode voltage (0:60 V)
  - 1 output to simulate Cell voltage (0:5 V)
- L9963 evaluation GUI STSW-L9963
- NI Labview-runtime 2014
- NI VISA-RUNTIME

*Note:* Before using the UART/USB bridge FT232RL, the Virtual Com Port (VCP D2XX) driver needs to be installed. It can be downloaded by the FTDI Chip website.

**Figure 1. EVAL-L9963-MCU board**

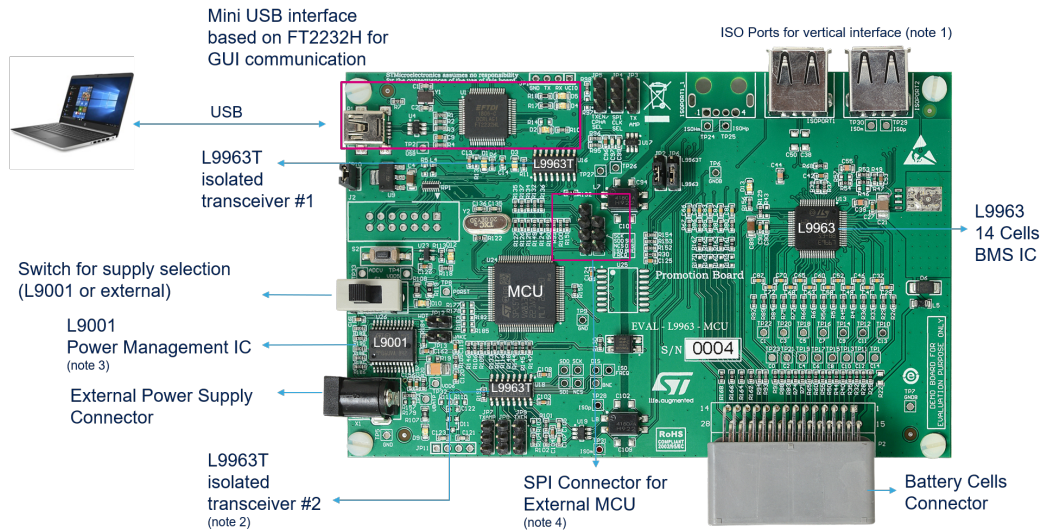


**Figure 2. EVAL-L9963-NDS board**



## 2 Board description

Figure 3. Main components and connectors

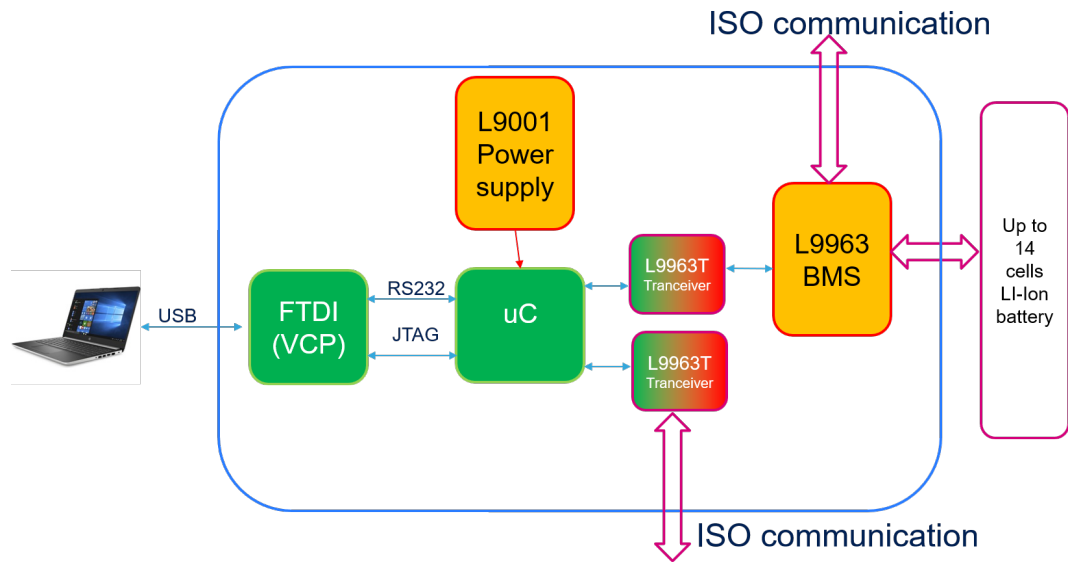


Note:

1. EVAL-L9963-MCU can be considered the only stage or the first stage of several stages. The port is the isolated vertical interface to the next stage (EVAL-L9963-NDS);
2. A second L9963T (optional) may be needed to create a direct loop with the last stage (dual ring access);
3. MCU can be supplied either by USB or by L9001 (PMIC);
4. On board MCU can be bypassed in case a different MCU is needed for the user trials; these pins allow an SPI connection with an external MCU (upon a specific board configuration). Anyway a specific board derivative of EVAL-L9963-MCU has been designed for this purpose (same form factor/layout with MCU not mounted: EVAL-L9963).

### 3 Block diagram

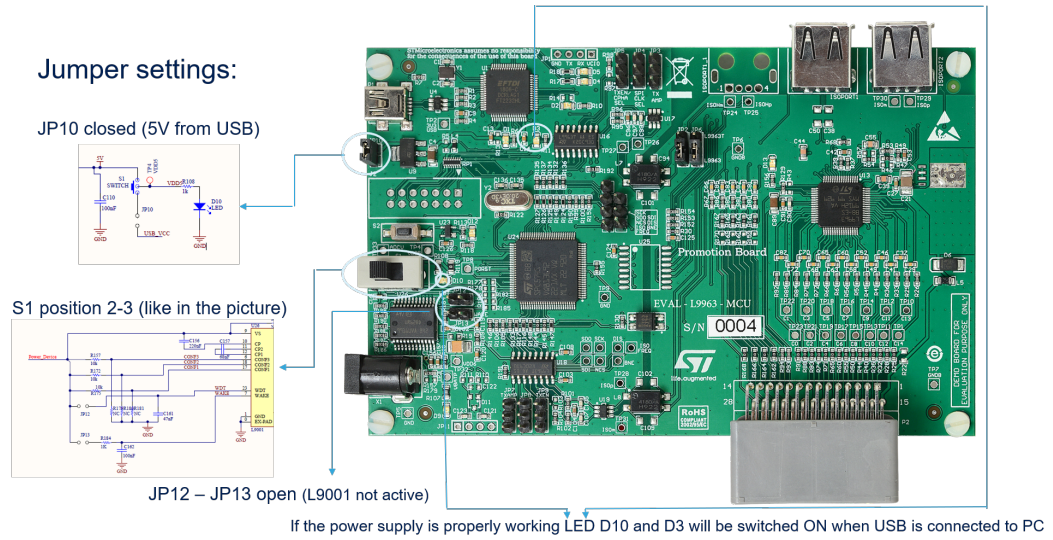
Figure 4. EVAL-L9963-MCU block diagram



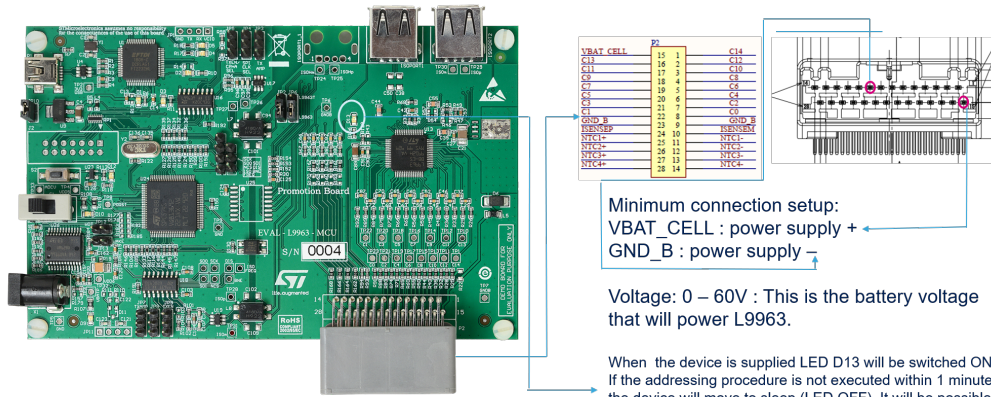


## 4 Microcontroller Power supply

Figure 5. Microcontroller Power supply

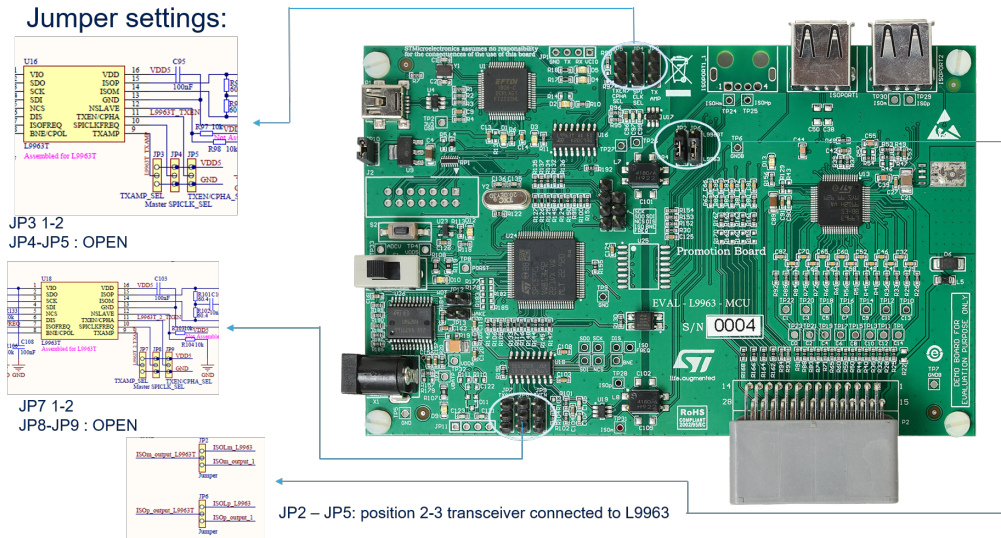


## 5 L9963 external connection and power supply

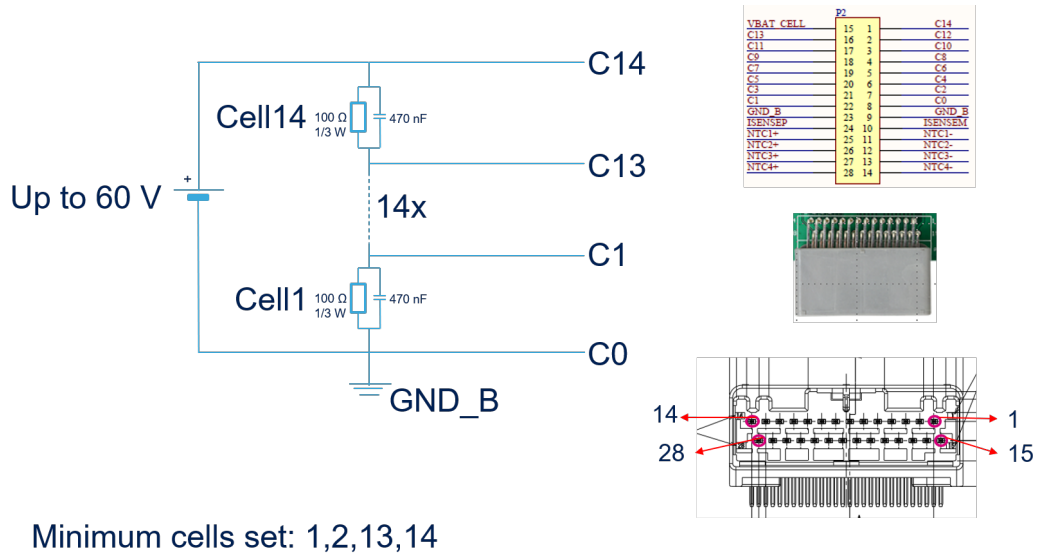
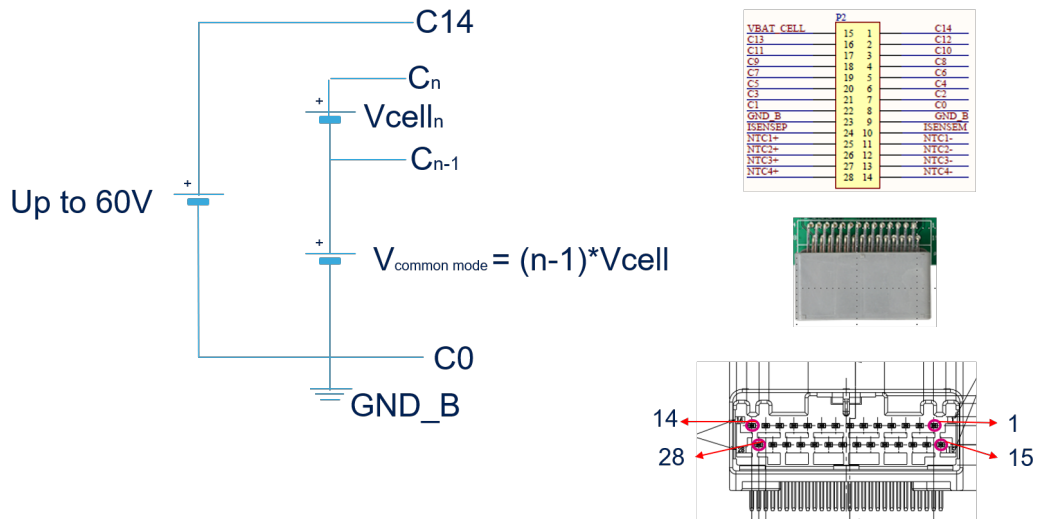
**Figure 6. L9963 external connection and power supply**


## 6 Transceiver settings

Figure 7. Transceiver settings



## 7 Possible connection for battery simulation

**Figure 8. Battery simulation 1**

**Figure 9. Battery simulation 2**


## 8 Preliminary action to open the GUI

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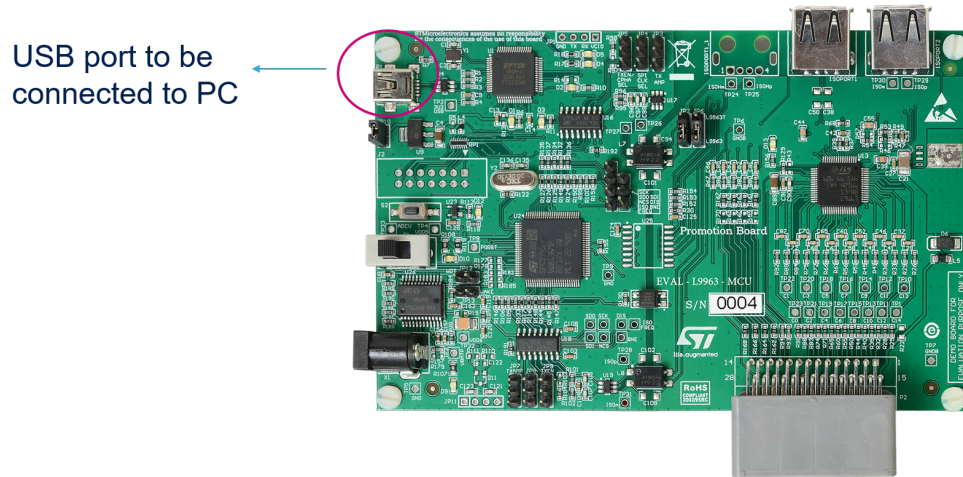
Install the following SW on your PC:

- NI Labview-runtime 2014
- NI VISA-RUNTIME
- FTDI driver
  - Before using the UART/USB bridge FT2232H, the Virtual Com Port (VCP) driver needs to be installed. It can be downloaded by the FTDI Chip website.

When all is installed reboot your PC and open STSW-L9963.exe

## 9 USB to PC connection

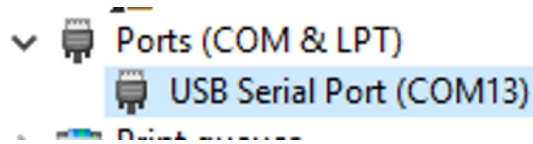
Figure 10. USB to PC connection



## 10 Device Manager appearance

If FTDI Virtual COM PORT (VCP D2XX) driver has been correctly installed, you will find in Windows Device manager a USB serial port under Ports (COM&LPT). Take note of the COM port number (i.e. COM13).

Figure 11. Windows Device Manger COM port number



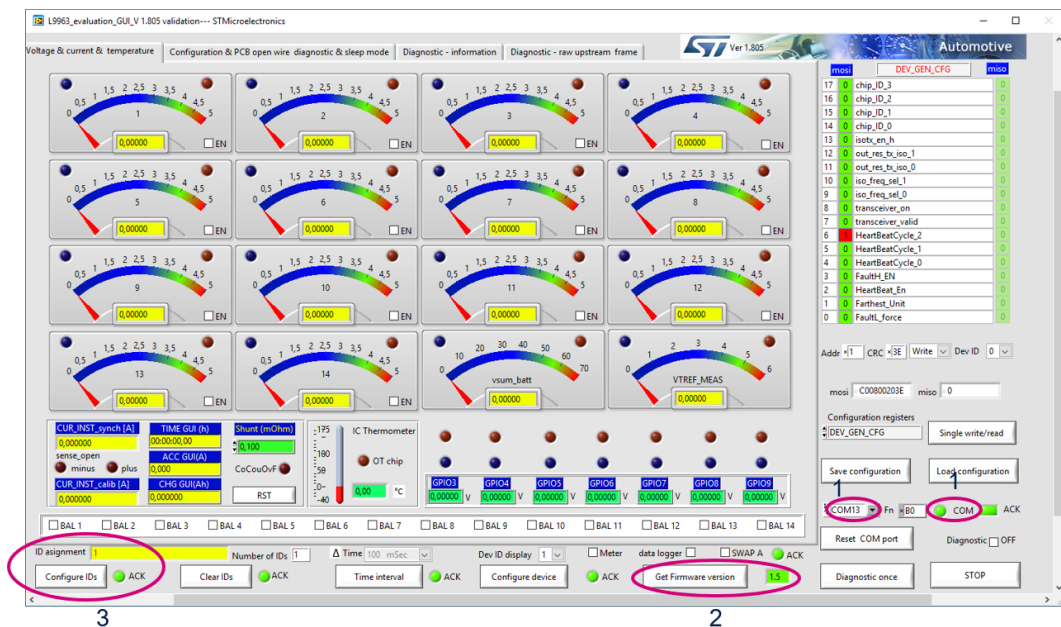
## 11 GUI usage and setup

### 11.1 Connection

Steps:

1. Select COM port according to your device manager. The COM led will become green;
2. Press on “get firmware version” button to check the communication with uC and the firmware version. The version should be 1.5;
3. In the “ID assignment” text box write 1 because you are using 1 L9963 then press “Configure IDs Button”, ACK LED will become green. If D13 LED on the board was switched OFF it will be switched ON and will not switch OFF anymore.

Figure 12. GUI connection





## 11.2 Threshold configuration

Steps:

1. Select Cell overvoltage and undervoltage. i.e. UV 2.8 V and OV 4.250 V;
2. The VCELL\_THRESH\_UV\_OV register will be automatically updated;
3. Select Dev ID 1;
4. Select Write;
5. Press on “Single write/read” button;
6. If communication with L9963 is ok the ACK LED will become green.

Figure 13. Threshold configuration 1

The screenshot shows the 'Automotive' configuration window for the L9963 evaluation board. The interface is divided into several sections:

- GPIO Thresholds:** A grid of input fields for GPIO3 through GPIO9, with sub-sections for OT (Over Temperature) and UT (Under Temperature) thresholds, all currently set to 0.000.
- Cell Voltage Thresholds:** A section containing:
  - threshVcellOV:** Set to 4.250 (highlighted with a red box and labeled '1').
  - threshVcellUV:** Set to 2.800 (highlighted with a red box and labeled '1').
  - VBATT\_SUM\_OV\_TH:** Set to 59.500.
  - VBATT\_SUM\_UV\_TH:** Set to 59.200.
  - CSA\_THRESH\_NORM (mV):** Set to 0.000000.
  - ADC\_FILTER\_SOC:** Set to 290 us.
  - adc\_cwr\_curr\_threshold\_sleep (mV):** Set to 0.000000.
- Configuration Registers:** A table on the right side of the window (labeled '2') listing registers like VCELL\_THRESH\_UV\_OV, threshVcellOV\_7, etc., with their addresses and values.
- Write/Read Controls:** A section with a 'Write' dropdown menu (labeled '4'), a 'Dev ID' dropdown menu set to '1' (labeled '3'), and a 'Single write/read' button (labeled '5').
- ACK Status:** A 'COM' status indicator with a green 'ACK' light (labeled '6').
- Other Settings:** Checkboxes for various features like GPIO\_CONV, CELL\_TERM\_CONV, SOC, CoulombCounter\_en, and HWSC.
- PCB Open Wire Diagnostic:** A row of LEDs labeled C0 through C14, with a 'Pcb open wire' indicator.
- Bottom Panel:** Includes 'ID assignment', 'Number of IDs' (set to 1), 'Time interval' (100 mSec), 'Dev ID display', and various control buttons like 'Configure device', 'Get Firmware version', 'Diagnostic once', and 'STOP'.

Steps:

1. Select Battery overvoltage and undervoltage. i.e. UV 39.2 V and OV 59.5 V;
2. The VBATT\_SUM\_TH register will be automatically updated;
3. Select Dev ID 1;
4. Select Write;
5. Press on “Single write/read” button;
6. If communication with L9963 is ok the ACK LED will become green.

Figure 14. Threshold configuration 2

The screenshot shows the 'Automotive' configuration window for the L9963 evaluation GUI. The interface is divided into several sections:

- GPIO Thresholds:** A grid of input/output thresholds for GPIOs 3 through 9.
- Battery Thresholds:** Fields for `threshVcellOV` (4.250), `VBATT_SUM_OV_TH` (59.500), `threshVcellUV` (2.800), and `VBATT_SUM_UV_TH` (39.200). A red box labeled '1' highlights the `VBATT_SUM_UV_TH` field.
- Configuration Registers:** A list on the right side of the window. A red box labeled '2' highlights the `VBATT_SUM_TH` register at address 17.
- Write/Read Controls:** A panel with 'Write' and 'Read' buttons. A red box labeled '3' highlights the 'Write' button.
- Single Write/Read:** A button labeled 'Single write/read'. A red box labeled '5' highlights this button.
- ACK LED:** A green LED labeled 'COM ACK'. A red box labeled '6' highlights this LED.

At the bottom, there are control buttons for 'Configure IDs', 'Clear IDs', 'Time interval', 'Configure device', 'Get Firmware version', 'Reset COM port', 'Diagnostic once', and 'STOP'.

## 11.3 Measure enabling

Steps:

1. Select cell voltage gauge with the EN check box. At least Cells 1, 2, 13, 14 must be selected;
2. The VCELLS\_EN register will be automatically updated;
3. Select Dev ID 1;
4. Select Write;
5. Press on “Single write/read” button;
6. If communication with L9963 it's ok the ACK LED will become green.

Figure 15. Measure enabling

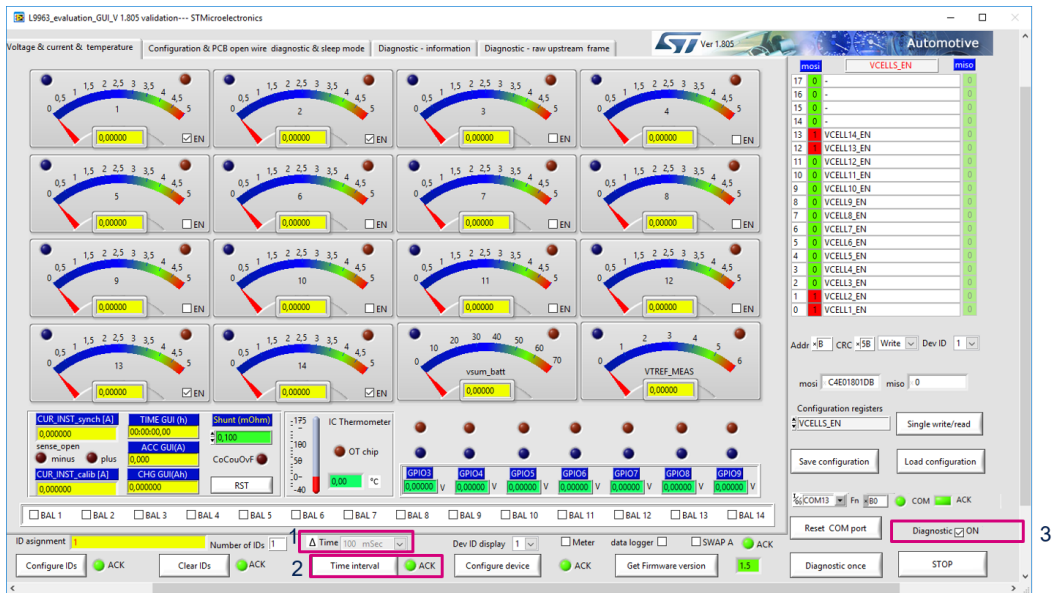


## 11.4 Measure starting

Steps:

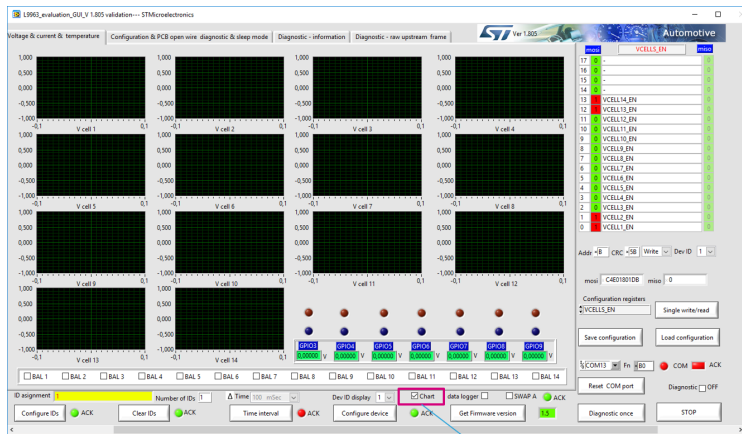
1. Select time interval. i.e. 100 ms. This is the refresh rate of GUI measurement;
2. Press on “Time interval” button to apply setting. ACK LED will become green;
3. Check Diagnostic checkbox to start measurement.

Figure 16. Measure starting



## 11.5 Alternative measure setting

Figure 17. Alternative measure setting



Selecting Chart, the voltage will be plotted on a time diagram

## 11.6 Measurements example

Figure 18. Setup

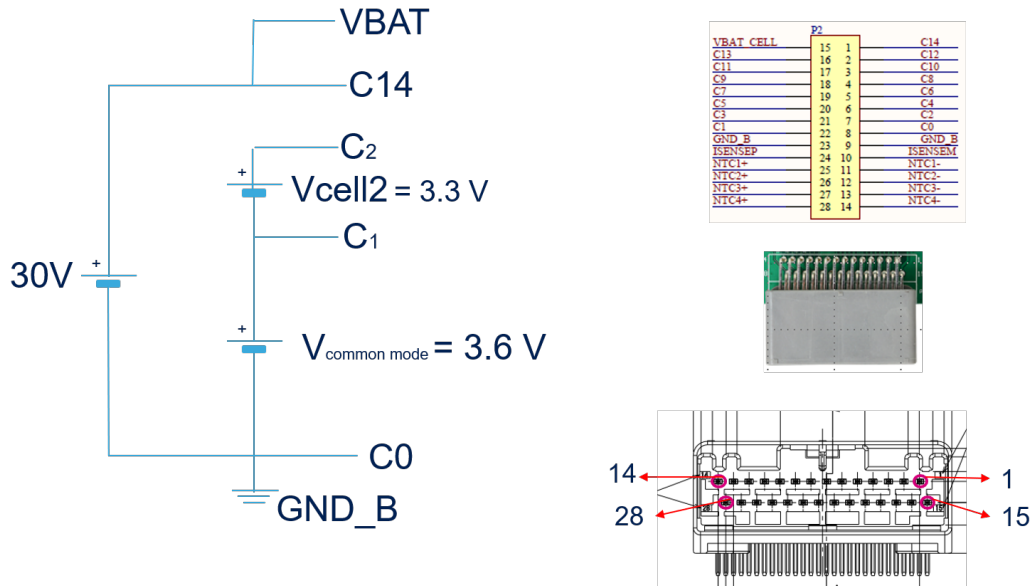
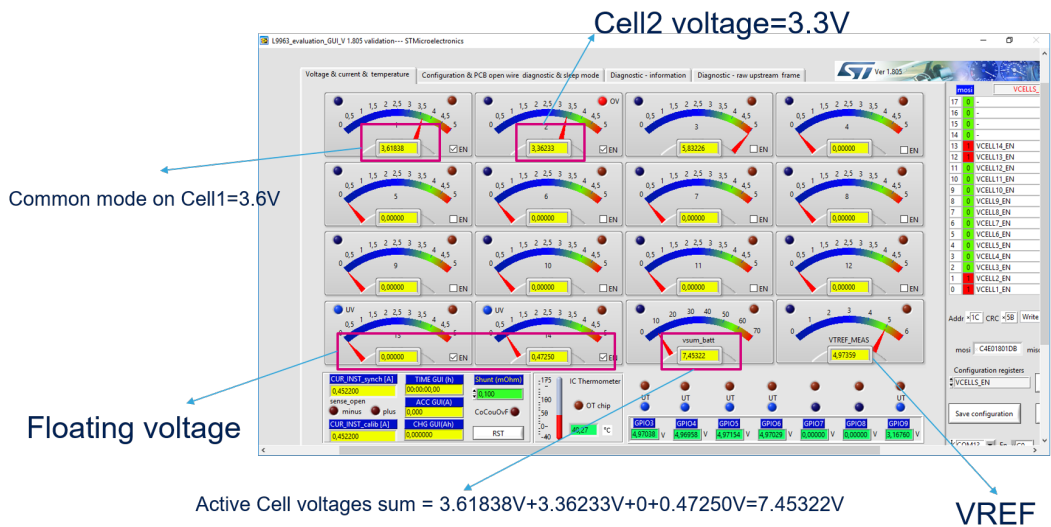


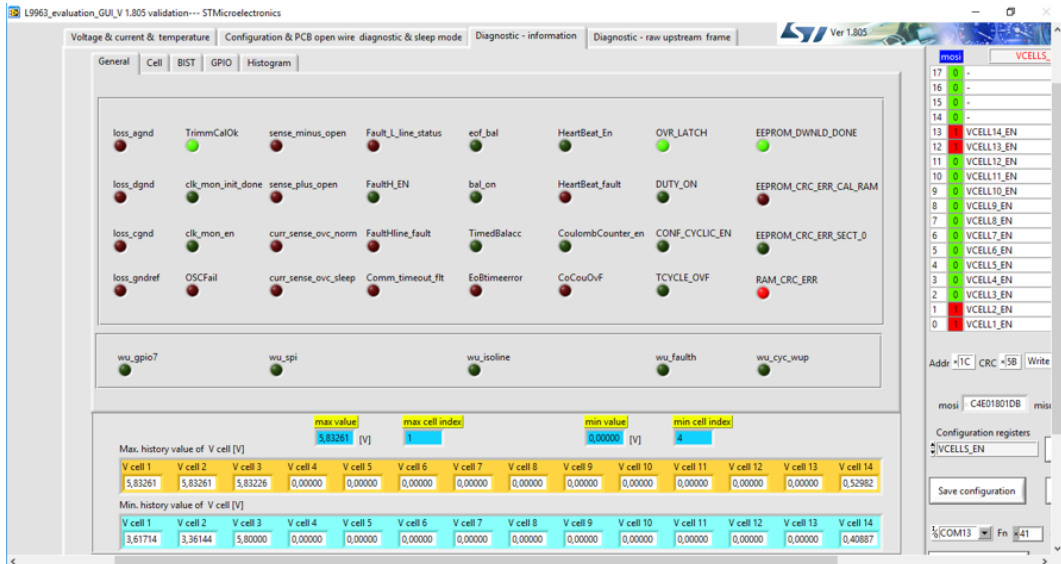
Figure 19. Results



## 11.7 Diagnostic

All the diagnostics are available in the Diagnostic-Information tab. They are updated at the same rate as measurement.

Figure 20. Diagnostic



## Appendix A Reference documents

Table 1. Reference documents

Doc Name	ID	Title
UM2698	034111	EVAL-L9963-MCU Evaluation Board
UM2734	034356	L9963 evaluation graphical user interface



## Revision history

**Table 2. Document revision history**

Date	Version	Changes
15-Sep-2020	1	Initial release.

## Contents

<b>1</b>	<b>What you need</b>	<b>2</b>
<b>2</b>	<b>Board description</b>	<b>3</b>
<b>3</b>	<b>Block diagram</b>	<b>4</b>
<b>4</b>	<b>Microcontroller Power supply</b>	<b>5</b>
<b>5</b>	<b>L9963 external connection and power supply</b>	<b>6</b>
<b>6</b>	<b>Transceiver settings</b>	<b>7</b>
<b>7</b>	<b>Possible connection for battery simulation</b>	<b>8</b>
<b>8</b>	<b>Preliminary action to open the GUI</b>	<b>9</b>
<b>9</b>	<b>USB to PC connection</b>	<b>10</b>
<b>10</b>	<b>Device Manager appearance</b>	<b>11</b>
<b>11</b>	<b>GUI usage and setup</b>	<b>12</b>
11.1	Connection	12
11.2	Threshold configuration	13
11.3	Measure enabling	15
11.4	Measure starting	16
11.5	Alternative measure setting	17
11.6	Measurements example	18
11.7	Diagnostic	19
<b>Appendix A</b>	<b>Reference documents</b>	<b>20</b>
	<b>Revision history</b>	<b>21</b>

## List of tables

<b>Table 1.</b>	Reference documents . . . . .	20
<b>Table 2.</b>	Document revision history . . . . .	21

## List of figures

<b>Figure 1.</b>	EVAL-L9963-MCU board . . . . .	2
<b>Figure 2.</b>	EVAL-L9963-NDS board . . . . .	2
<b>Figure 3.</b>	Main components and connectors . . . . .	3
<b>Figure 4.</b>	EVAL-L9963-MCU block diagram . . . . .	4
<b>Figure 5.</b>	Microcontroller Power supply . . . . .	5
<b>Figure 6.</b>	L9963 external connection and power supply . . . . .	6
<b>Figure 7.</b>	Transceiver settings . . . . .	7
<b>Figure 8.</b>	Battery simulation 1 . . . . .	8
<b>Figure 9.</b>	Battery simulation 2 . . . . .	8
<b>Figure 10.</b>	USB to PC connection . . . . .	10
<b>Figure 11.</b>	Windows Device Manger COM port number . . . . .	11
<b>Figure 12.</b>	GUI connection . . . . .	12
<b>Figure 13.</b>	Threshold configuration 1 . . . . .	13
<b>Figure 14.</b>	Threshold configuration 2 . . . . .	14
<b>Figure 15.</b>	Measure enabling . . . . .	15
<b>Figure 16.</b>	Measure starting . . . . .	16
<b>Figure 17.</b>	Alternative measure setting . . . . .	17
<b>Figure 18.</b>	Setup . . . . .	18
<b>Figure 19.</b>	Results . . . . .	18
<b>Figure 20.</b>	Diagnostic . . . . .	19

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