

## Getting started with the evaluation kit for automotive rear lights with pattern animations based on ALED1262ZT and STM8AF6266

### Introduction

The STEVAL-LLL002V1 evaluation kit consists of the STEVAL-LLL002M1 main board and the STEVAL-LLL002D1 USB-UART bridge.

It has been designed to test and evaluate ALED1262ZT performance.

The STEVAL-LLL002M1 is a LED array driver system evaluation board with local dimming and diagnostics for automotive applications. It is based on the ALED1262ZT 12-channel LED driver controlled through the STM8AF6266 microcontroller I<sup>2</sup>C interface.

A 48 red LED matrix is driven by four ALED1262ZT LED drivers.

The on-board A7986A DC-DC converter, accepting standard adapter input voltages with reverse polarity protection, provides the voltages and power for the board operation.

The STEVAL-LLL002V1 evaluation kit jumpers simulate LED open circuit faults and the 4-pin SWIM connector is used to debug and develop the STM8AF6266 microcontroller firmware.

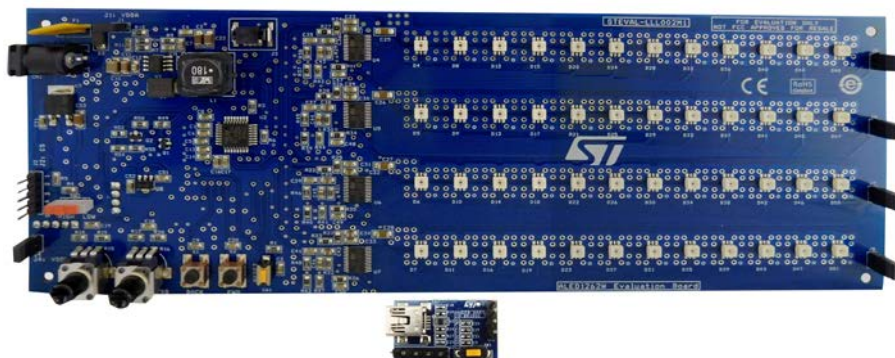
The evaluation kit can operate in bus driven mode (BDM), standalone mode (SAM) and GUI mode.

In the bus driven mode, the board is controlled via on-board push buttons and potentiometers. Commands to the ALED1262ZT driver are sent by STM8A microcontroller over I<sup>2</sup>C bus.

In the standalone mode, the STEVAL-LLL002V1 evaluation kit is not controlled by the MCU and you can select two possible output configurations using OTP ½ SPDT switch (SW2).

In the GUI mode, the board is connected to a PC via USB-UART bridge and you can observe and control various features of the driver through the graphical user interface.

Figure 1. STEVAL-LLL002V1 evaluation kit



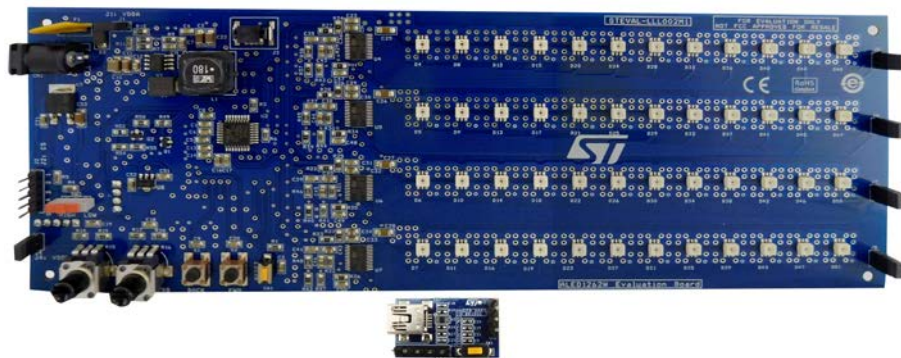
# 1 Hardware description

## 1.1 STEVAL-LLL002M1 main board

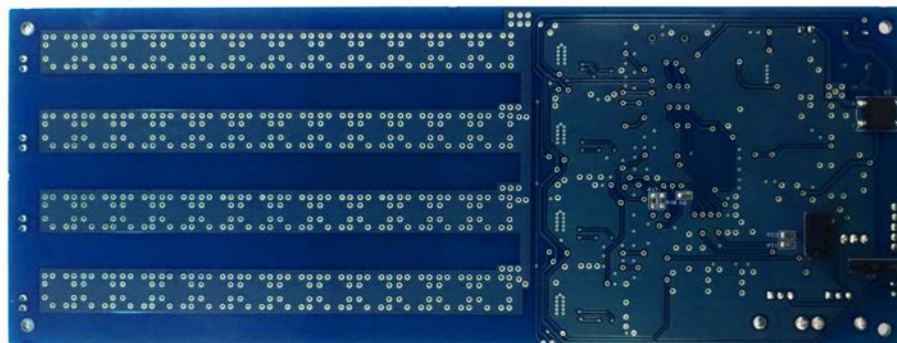
The STEVAL-LLL002M1 evaluation board includes four [ALED1262ZT](#) LED drivers, an 8-bit automotive grade MCU, a SWIM connector to program the MCU, 48 red LEDs, push buttons to switch modes, and potentiometers to control brightness and speed.

The on-board [A7986A](#) DC-DC converter, accepting standard adapter input voltages (12 – 24 V), provides the voltages and power for the board operation.

**Figure 2. STEVAL-LLL002V1M main board (top side)**



**Figure 3. STEVAL-LLL002V1M main board (bottom side)**



### 1.1.1 Chip select (CS) one time programming (OTP)

The STEVAL-LLL002M1 evaluation board has four [ALED1262ZT](#) drivers.

The ALED1262ZT LED driver is provided with five one time programming (OTP) memory cells that can be programmed to provide a permanent address to the device, creating a total of 32 driver addresses, that is, at a given time, a maximum of 32 drivers can be connected to the to the MCU via I<sup>2</sup>C bus.

**Table 1. STEVAL-LLL002M1 evaluation board: ALED1262ZT addresses**

ALED1262ZT	WRITE	READ
Default	0x40	0x41
LED driver - U4	0x42	0x43

ALED1262ZT	WRITE	READ
LED driver - U5	0x44	0x45
LED driver - U6	0x46	0x47
LED driver - U7	0x48	0x49

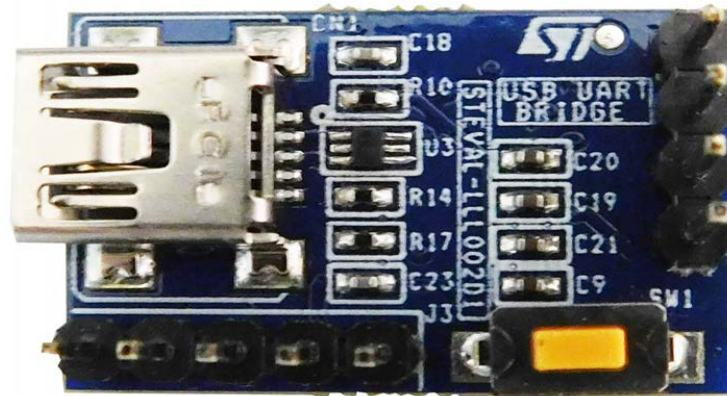
On-board J2 is used to select the ALED1262ZT device for OTP. The LED driver is given a particular command over I<sup>2</sup>C providing 18 V ( $\pm 1$  V) to be applied at the corresponding chip select (CS) pin.

*Note:* For more information please refer to the ALED1262ZT datasheet on [www.st.com](http://www.st.com).

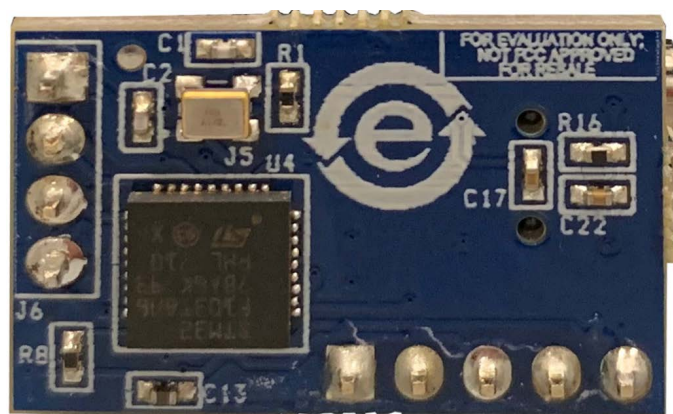
## 1.2 STEVAL-LLL002D1 USB-UART bridge

The [STEVAL-LLL002V1](#) evaluation kit is also equipped with a USB-UART bridge for the communication between PC and microcontroller.

**Figure 4. STEVAL-LLL002V1D (top side)**

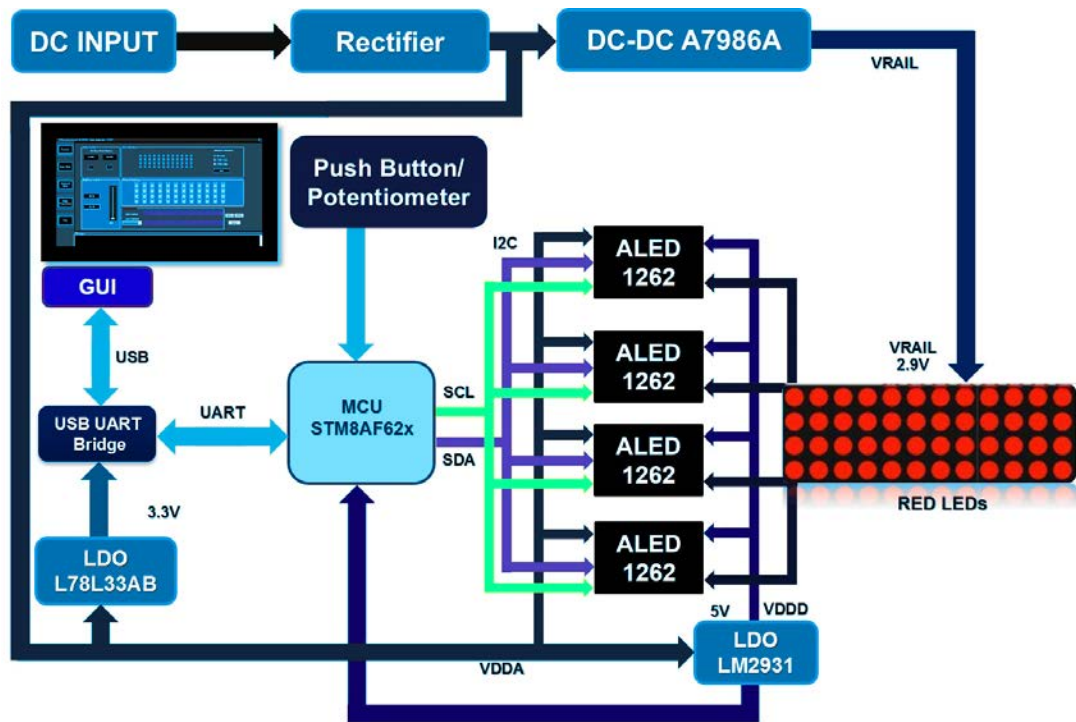


**Figure 5. STEVAL-LLL002V1D (bottom side)**



### 1.3 Evaluation kit block diagram

Figure 6. STEVAL-LLL002V1 block diagram



### 1.4 STEVAL-LLL002V1 key devices

The STEVAL-LLL002V1 main devices are:

- **A7986A**: a high efficiency step down 250 kHz (programmable up to 1 MHz) switching regulator with max. 3 A DC output current. Input voltage varies from 4.5 to 38 V and also depends on the required output. It supports low dropout operation along with zero load current operation. Overcurrent and thermal protection are provided for safe board operation. It powers the red LEDs.
- **LM2931**: an AEC-Q100 qualified 100 mA LDO regulator designed for automotive environments.
- **STM8AF6266**: an automotive grade 8-bit microcontroller, featuring 10 MIPS at 16 MHz CPU, advance timers, UART, ADC, robust I/O's, nested interrupt controller.
- **L78L33ACUTR**: a three terminal positive regulator. It gives output current up to 100 mA and output voltage of 3.3 V. The L78L series uses as Zener diode/resistor combination replacement, resulting in a lower quiescent current and lower noise.
- Diode bridge: at the power supply input ensures board operation regardless of the input voltage polarity.
- 48 red SMD LEDs mounted in a 12x4 matrix to display different patterns. The minimum luminous intensity of a LED is around 3.55 cd with wide viewing angle of 120° and wavelength of 623 nm.

## 2 STEVAL-LLL002V1 connections

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### 2.1 Power supply

The [STEVAL-LLL002V1](#) evaluation kit is powered by standard 12–24 V DC power adapter. The power source must deliver sufficient current depending on the input voltage for proper functioning. Reverse voltage protection and input surge protection are provided to avoid any damage.

### 2.2 Microcontroller SWIM

The STEVAL-LLL002V1M board is equipped with a standard 4-pin SWIM connector allowing to debug and develop the [STM8AF6266](#) microcontroller firmware.

### 2.3 Jumpers for LED open-circuit simulation

LED errors can be simulated by using J5 to J8 jumpers. Removing a jumper on J5, J6, J7 and J8 causes LED open-circuit error in D48, D49, D50 and D51 respectively. These simulated errors can be detected in error detection mode: the defective LED is signaled by lighting the adjacent LED on the board in standalone mode, and by flashing the corresponding light in the LED map in GUI mode.

### 2.4 USB-UART bridge

The [STEVAL-LLL002V1](#) communicates with the GUI via the USB-UART board, which acts as the bridge between [STM8AF6266](#) and your PC.

It communicates with the main board via UART interface and with PC via USB.

## 3 Operation modes

### 3.1 Bus driven mode

In this mode, [STEVAL-LLL002V1](#) is controlled via on-board push buttons and potentiometers. Commands to the [ALED1262ZT](#) LED driver are sent by [STM8AF6266](#) microcontroller through I<sup>2</sup>C interface. After DC input is applied for the first time, the board goes into free running mode and displays all patterns and modes, one after another. You can exit from this free running mode using the BCK or FWD button.

#### 3.1.1 Features

In bus driven mode, the board features:

- Pre-configured patterns (with adjustable brightness/speed) as rolling text, wave effect, super car scanning, dot sequence, etc.
- On-board push buttons to switch between the demos
- Potentiometers as sliders to control the pattern speed or brightness
- Open circuit error simulation using open circuit jumpers (J5-J8)
- Jumper to switch from bus driven mode to standalone mode (J4)
- OTP ½ switch (SW2) to choose between two different predefined pattern in SAM mode

#### 3.1.2 Normal mode

The [STEVAL-LLL002V1](#) evaluation kit enters the bus driven mode (BDM) when powered. In this mode, the MCU sends data over I<sup>2</sup>C bus to the [ALED1262ZT](#) LED driver.

*Note:* To operate in BDM mode, jumper J4 should be placed.

The bus driven mode main controls are:

- Push-buttons for transition among different demos:
  - BCK button: to switch on the previous pattern or mode
  - FWD button: to switch on the next pattern or mode
- Potentiometers:
  - Brightness and speed control: on rotating potentiometer clockwise/anticlockwise, brightness/speed among transitions increases/decreases.
- Open circuit error detection to detect LED failure

**Note:** On powering up, the evaluation board goes into free running mode displaying pattern changes after a fixed interval of time. You can exit from this mode by pressing FWD or BCK push buttons.

The evaluation board displays different patterns in BDM:

1. Dot Sequence Rail
2. Back Light (all LEDs on)
3. Super Car Scanning Effect - I
4. Alphanumeric Flashing
5. Super Car Scanning Effect - II
6. Alphanumeric Rolling
7. Animation – 3D
8. Horizontal Wave
9. Pattern – I
10. Vertical Wave
11. Diagonal Wave

- 12. Pattern – II
- 13. Error Detection

*Note:* In Alphanumeric Flashing Pattern, you can control the speed only.  
In Super Car Scanning Effect – I, Super Car Scanning Effect – II, Animation – 3D, Pattern – I and Pattern – II you cannot control brightness as the ALED1262ZT PWM (7-bit individual channel control) feature is enabled.

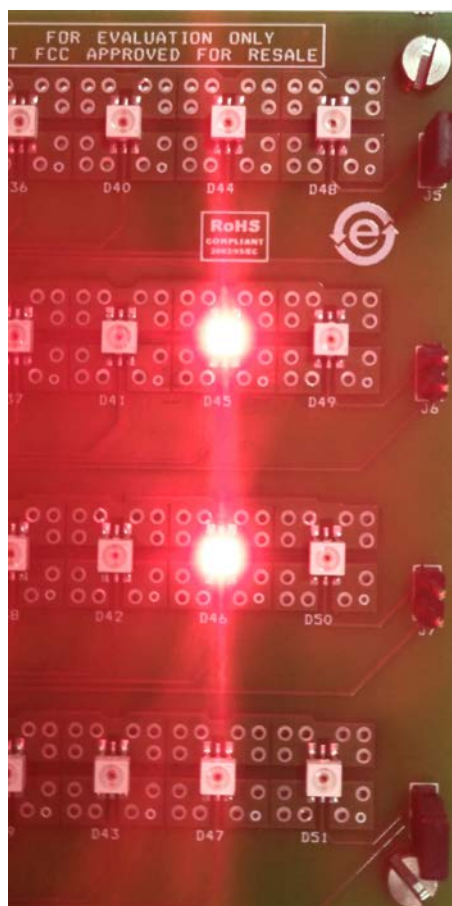
### 3.1.3 Error detection

ALED1262ZT driver is capable of detecting error for open circuit.  
The STEVAL-LLL002V1 evaluation kit provides the option to simulate and detect errors by entering the error detection mode using FWD or BCK buttons.  
Removing jumpers J5, J6, J7 and J8 causes LED open circuit error in D48, D49, D50 and D51 respectively.  
The defective LED is signaled by switching on the adjacent LED.

**Table 2. STEVAL-LLL002V1 error detection mode**

Jumper	Error in LED	Shown on LED
J5	D48	D44
J6	D49	D45
J7	D50	D46
J8	D51	D47

**Figure 7. STEVAL-LLL002V1 evaluation kit: error detection mode (J6 and J7 removed)**



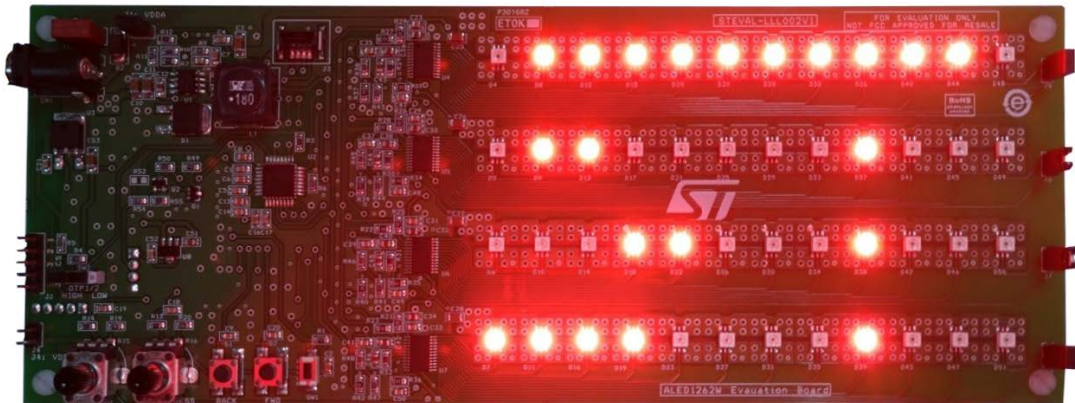
### 3.2 Standalone mode (SAM)

The STEVAL-LLL002V1 enters the SAM mode when the driver supply falls below 3 V (removing jumper J4 that is disconnecting the ALED1262ZT LED driver).

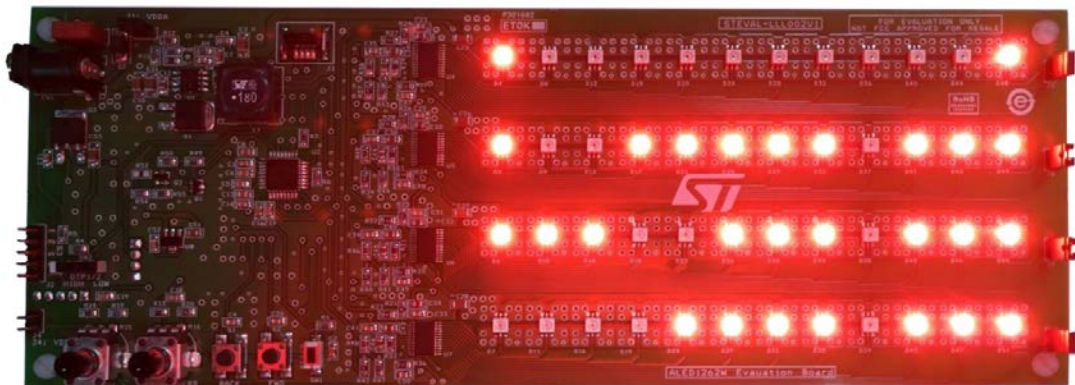
In standalone mode configuration, the device is not controlled by the MCU or a controller board.

You can select two possible output configurations using OTP ½ SPDT switch (SW2).

**Figure 8. STEVAL-LLL002V1 evaluation kit: standalone mode (configuration 1)**



**Figure 9. STEVAL-LLL002V1 evaluation kit: standalone mode (configuration 2)**



#### 3.2.1 Features

The board enters the standalone mode by removing J4.

This mode mainly features:

- ALED1262ZT working without external controller
- Two different outputs
- OTP ½ switch (SW2) to choose a configuration

### 3.3 GUI mode

The board can be connected to a PC through a USB-UART bridge using the graphical user interface (GUI) to control and evaluate the ALED1262ZT driver features.

#### 3.3.1 Features

All the bus driven mode features can also be controlled via GUI that manages also:

- Global brightness control to change the brightness of all the channels
- Frame programming mode and four predefined presets with variable transition time between frames



- Open circuit error detection in "no loop" and in 1 s and 2 s (approx.) loops
- Read/write configuration register
- Individual channel brightness control

### 3.3.2 GUI setup

To use the [STEVAL-LLL002V1](#) GUI, you have to install the virtual COM port (VCP) driver on your PC/laptop by following the procedure below.

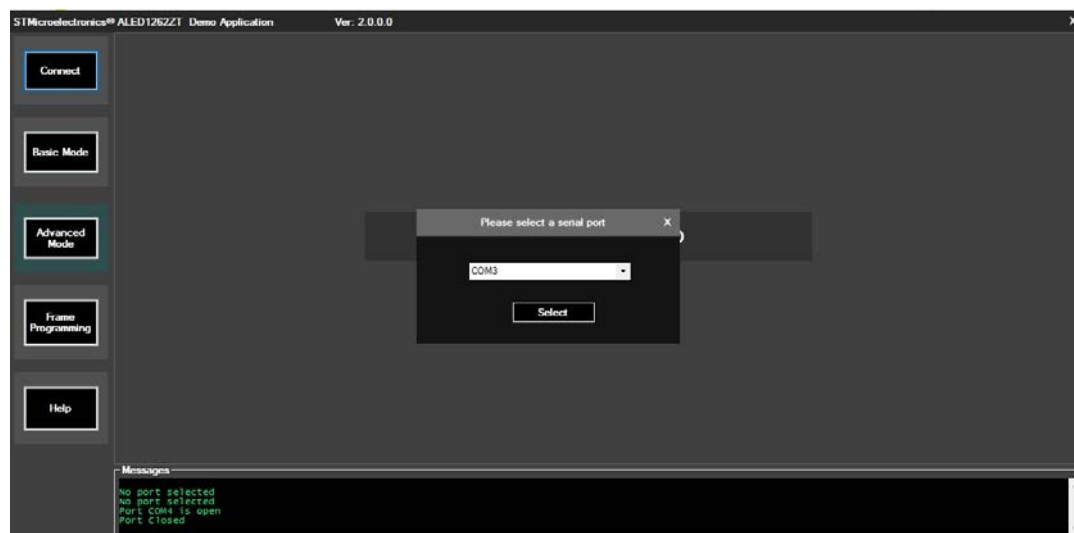
**Step 1.** Install the .exe file on your PC.

The GUI appears in your program list.

**Step 2.** If the VCP driver is not installed, install it from ...\*Program Files*\STMicroelectronics\*LED Driver Demo* \*ST VCP Driver*. A 32-bit version and a 64-bit version are included in the setup.

On launching the GUI, the initial screen appears as shown below.

Figure 10. STEVAL-LLL002V1 evaluation kit: GUI initial screen



**Step 3.** Connect the STEVAL-LLL002M1 to the PC and power it up.

**Step 4.** Press **[Connect]**.

The GUI identifies the board and automatically establishes a connection (COM3 is shown as an example in the picture above), otherwise it prompts the user to select the port to which the board is connected.

**Step 5.** If the GUI does not automatically identify the board, choose the port manually and press **[Select]**.

When the GUI is able to interact with the board, a "Port is open" message is shown.

**3.3.3 Modes**  
**3.3.3.1 Basic mode**

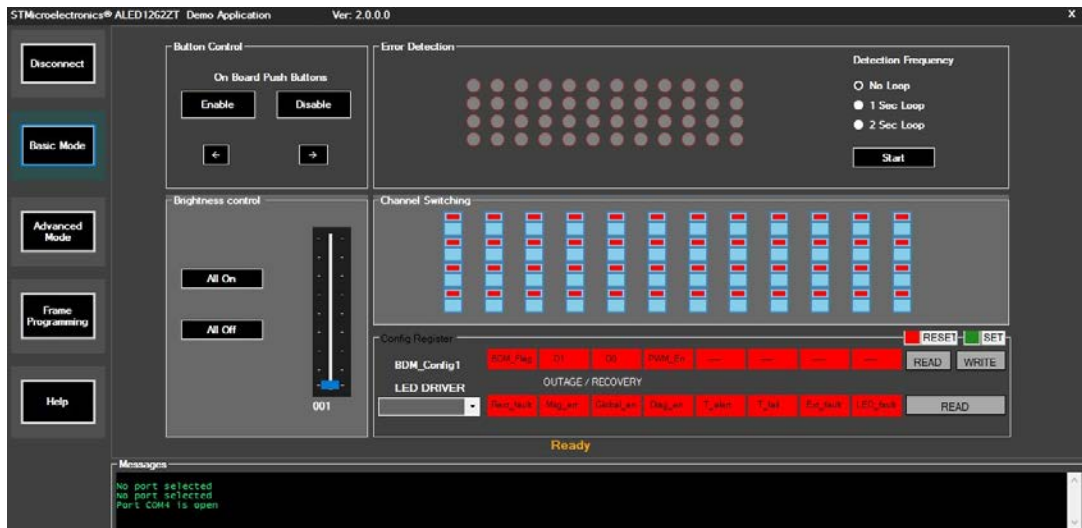
The STSW-LLL002GUI basic mode mainly features:

- Replication of on-board control buttons to select different modes from the GUI
- Buttons to enable/disable on-board push buttons
- Open circuit error detection with different frequencies
- Adjustable global brightness for all the channels
- Control registers write/read (BDM\_Conf 1)
- Various flag status reading (BDM\_status)

The basic mode has five sections to address different requirements:

- Button control
- Error detection
- Brightness control for all channels
- Configuration registers
- Individual channel ON/OFF control

Figure 11. STSW-LLL002GUI basic mode



**3.3.3.1.1 Button control**

The control buttons replicate the on-board BCK and FWD buttons and are used to toggle among preconfigured demos.

The on-board buttons can be enabled or disabled by pressing [Enable] or [Disable] respectively.

**3.3.3.1.2 Error detection**

The error detection section demonstrates open circuit error (if any) present in the 12x4 LED matrix.

Error detection frequency can be selected from three options:

- No loop - error detection is performed just once and the results are displayed till any other button is pressed
- 1 second loop - error detection is performed every 1 s by the drivers and the results are updated in real-time
- 2 second loop - same as 1 second loop but error detection is performed every 2 s

**3.3.3.1.3 Brightness control for all channels**

Brightness of all the channels is simultaneously changed by varying brightness control for all channel slider. Brightness can be varied in 256 steps (5% to 100%).

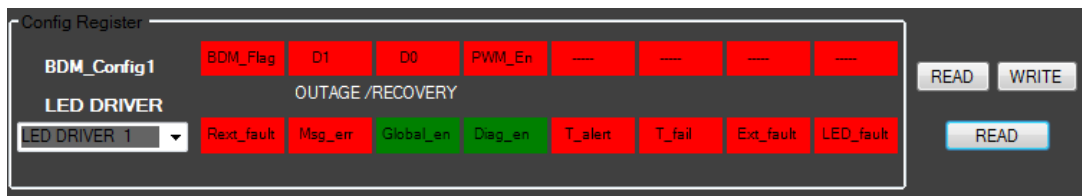
**3.3.3.1.4 Configuration registers**

The configuration register section represents two registers for the ALED1262ZT LED driver:

- **BDM\_Conf 1:** is common for all ALED1262ZT LED drivers. You can set or reset different bits of the registers.
- **BDM\_status:** gives the status information for a particular LED driver selected from the drop down bar.

For further details, refer to the ALED1262ZT datasheet on [www.st.com](http://www.st.com).

Figure 12. ALED1262ZT configuration register



### 3.3.3.2 Advanced mode

The advanced mode section displays the individual channel brightness control (0% to 100%).

The brightness of each channel can be adjusted through a 7 bit PWM grayscale brightness control according to local dimming register PWM\_gain\_x.

You can change the brightness using the scroll bars put in a 12x4 pattern.

Figure 13. STSW-LLL002GUI advanced mode



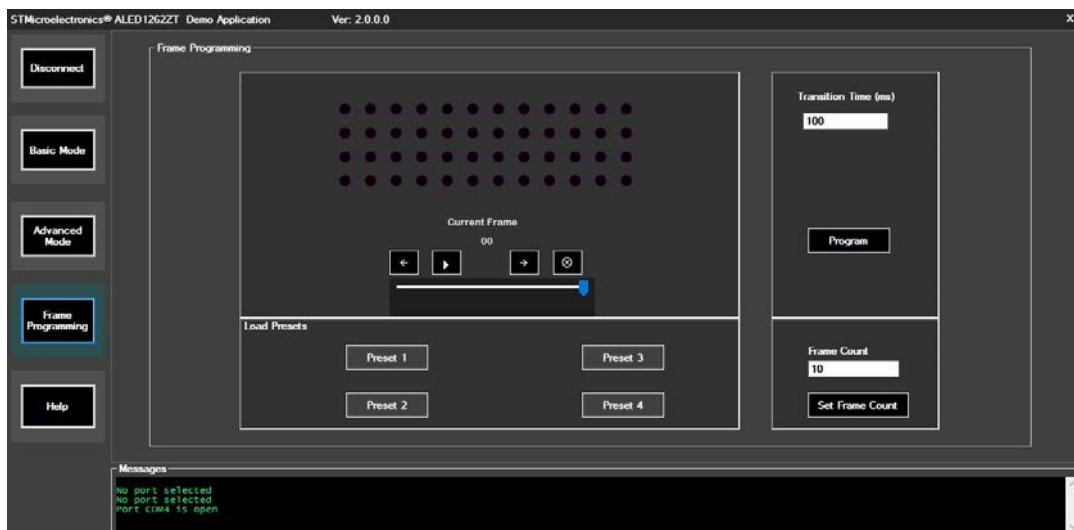
### 3.3.3.3 Frame programming mode

This mode features:

- Frame programming to display any arbitrary pattern up to 20 frames with variable transition speed
- Four preconfigured patterns for quick visualization of frame programming mode on the [STEWAL-LLL002V1](#) evaluation kit

Frame programming displays user defined patterns in round robin sequence on the evaluation board. This mode contains a set of 20 (maximum) independent frames and each frame represents one instance of the board LEDs. The frames can be designed by the user or you can select preconfigured frame patterns using [**Presets**]. Transition time among frames in milliseconds is set by the value in the [**Transition Time**] text box.

Figure 14. STSW-LLL002GUI frame programming mode



### 3.3.3.3.1 Frame design

A frame on the STSW-LLL002GUI represents LEDs on the evaluation board in a similar fashion. There are a maximum of 20 frames (00 to 19) to be set using [Set Frame Count]. To design the frames and demonstrate them on the evaluation board follow the procedure below.

- Step 1.** Click on the LEDs to configure them.
- Step 2.** Select the desired brightness using [Frame Brightness].
- Step 3.** Press the [Play] button for the STSW-LLL002GUI sequence of frames to visualize the whole pattern to be displayed on the board.
- Step 4.** Set the required transition time between the frames and press [Program].

*Note:* Transition time has to be set between 10 to 10000 milliseconds. If a wrong value is entered in the box, the color of the text box changes to red and no command is sent to the board.

### 3.3.3.3.2 Using preconfigured frame patterns

In frame programming mode, four preconfigured frame patterns called Presets are provided. Preset1, Preset2, Preset3 and Preset4 can be loaded by clicking on the corresponding preset button.

Figure 15. STSW-LLL002GUI frame programming mode Preset1

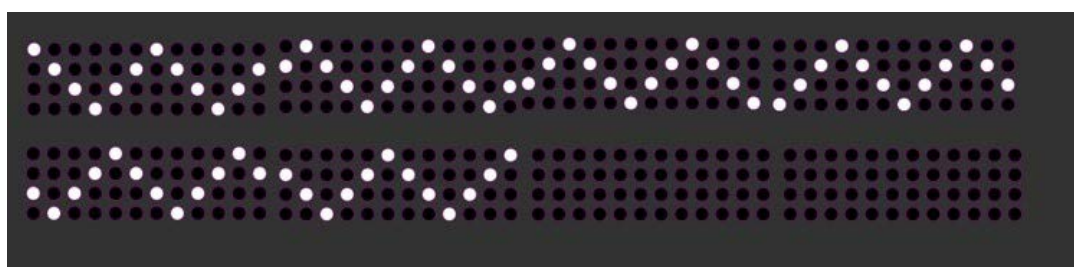


Figure 16. STSW-LLL002GUI frame programming mode Preset2

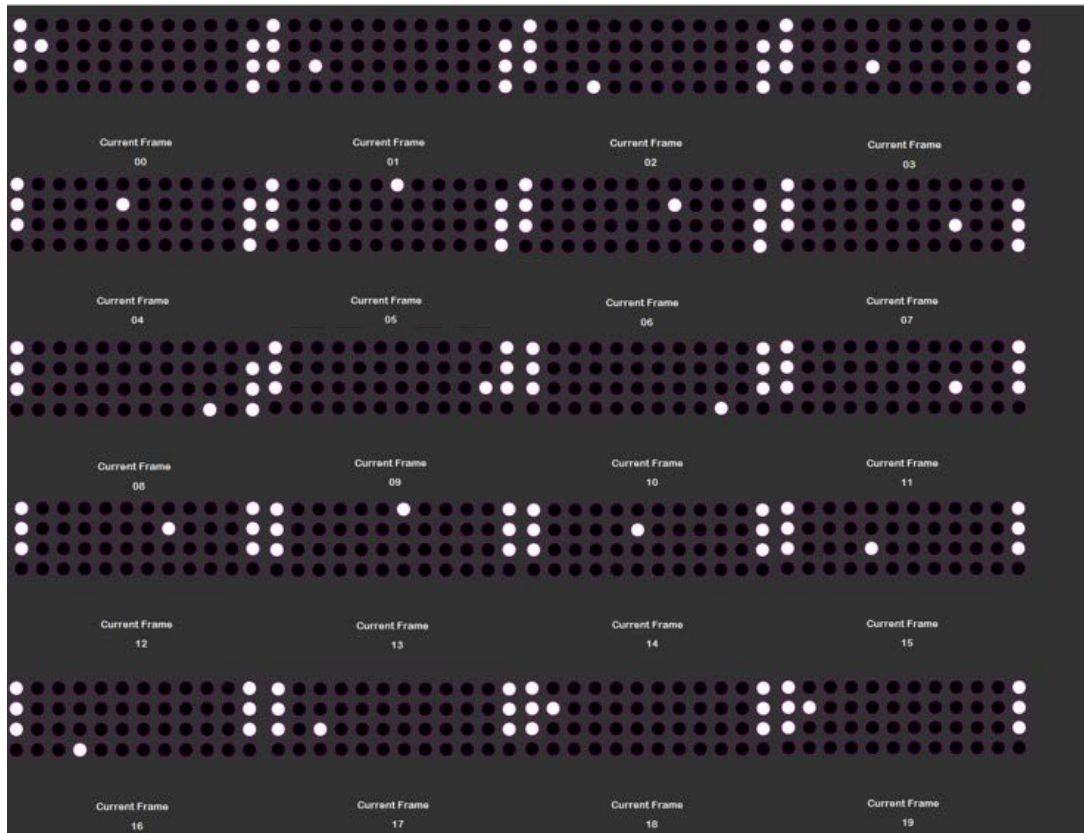
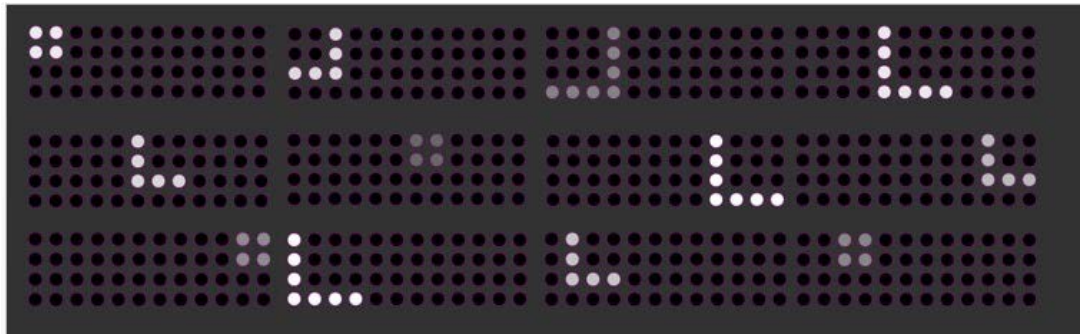


Figure 17. STSW-LLL002GUI frame programming mode Preset3



Figure 18. STSW-LLL002GUI frame programming mode Preset4



# 4 Schematic diagrams

Figure 19. STEVAL-LLL002M1 circuit schematic

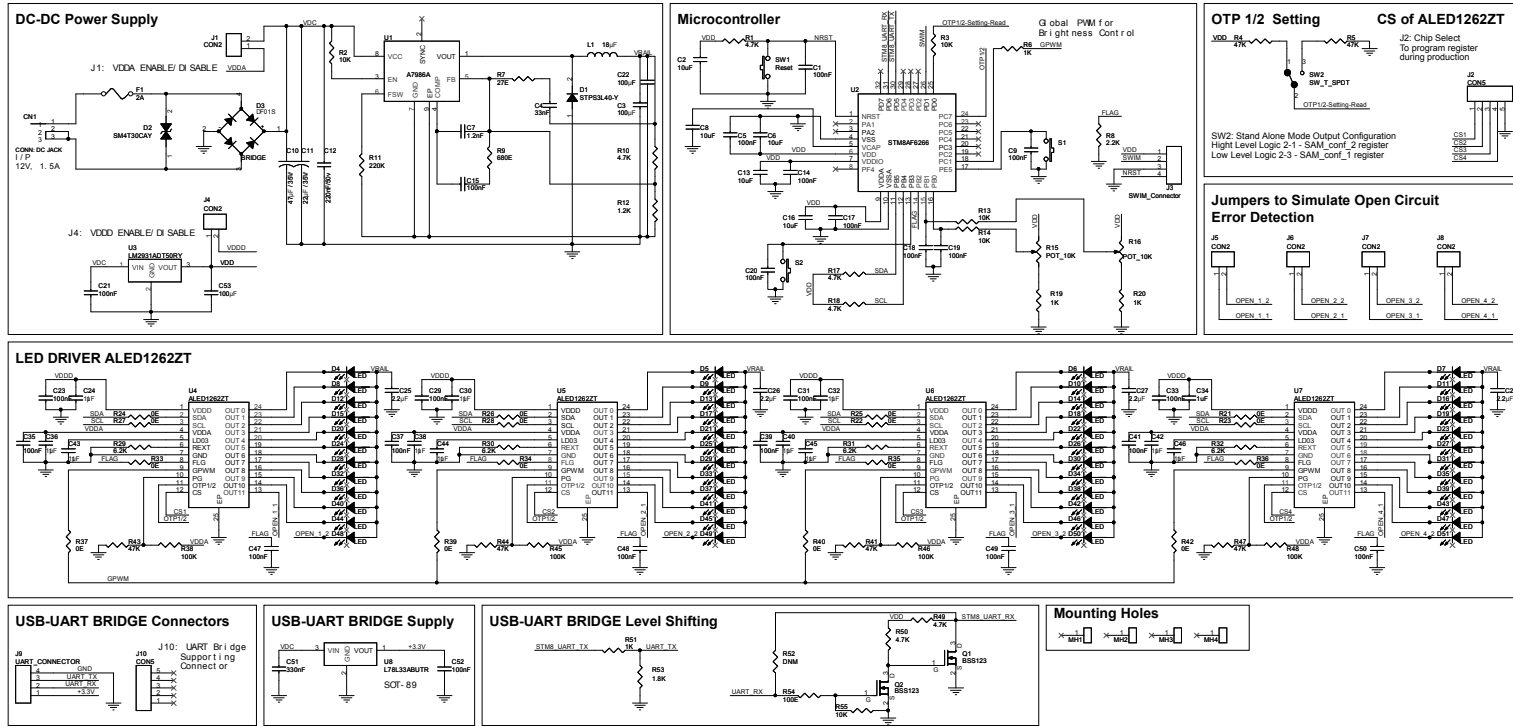
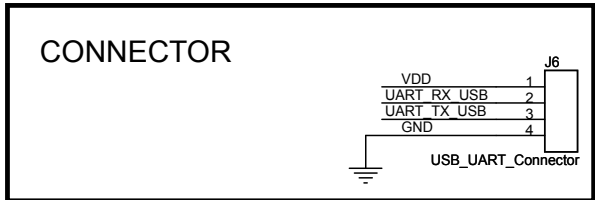
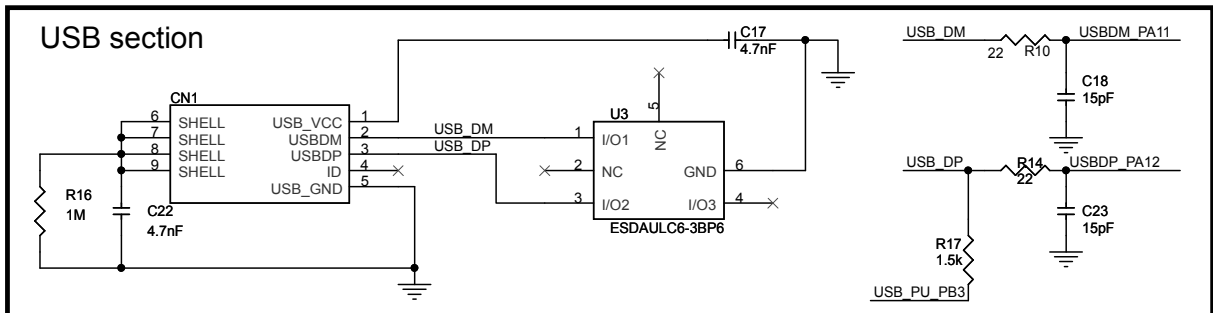
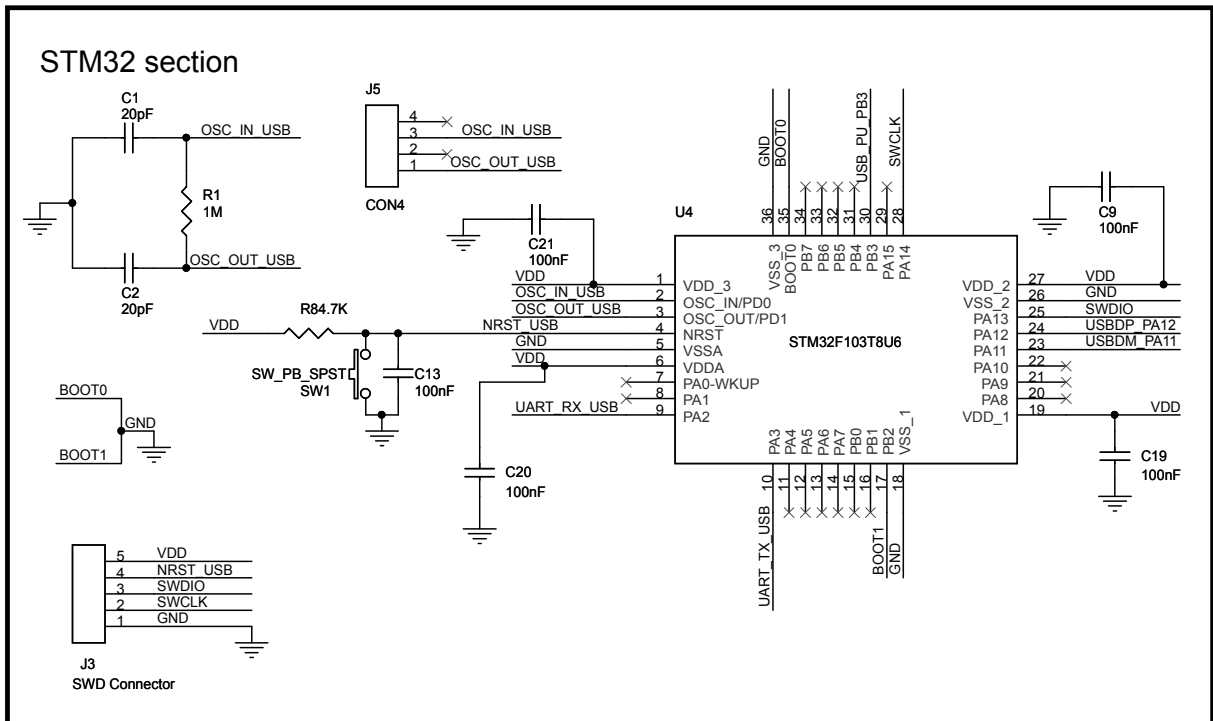


Figure 20. STEVAL-LLL002D1 circuit schematic





## 5 Bill of materials

**Table 3. STEVAL-LLL002V1M bill of materials**

Item	Q.ty	Ref.	Part/Value	Description	Manufacturer	Order code
1	1	U1	A7986A 38 V/3 A HSOP8	3 A step-down switching regulator for automotive applications	ST	A7986A
2	1	U2	STM8AF6266 LQFP32	Automotive 8-bit MCU	ST	STM8AF6266TDY
3	1	U3	LM2931ADT50R 5 V DPAK	Very low drop voltage regulators with inhibit function	ST	LM2931ADT50RY
4	4	U4, U5, U6, U7	ALED1262W TSSOP24	Automotive-grade 12-channel LED driver	ST	ALED1262ZTTR
5	1	U8	L78L33ABUTR 3.3 V/100 mA SOT-89	0.1 A positive voltage regulators	ST	L78L33ABUTR
6	1	D1	STPS3L30-Y 30 V SMC	Automotive power Schottky rectifier	ST	STPS3L40SY
7	1	D2	SM4T30CAY 400 W SMA	Automotive 400 W TVS in SMA	ST	SM4T30CAY
8	1	R10	4.7 K 1/8 W $\pm 1\%$ SMD-0805	Thick film resistors	ANY	ANY
9	5	R1, R17, R18, R49, R50	4.7 K 1/8 W $\pm 5\%$ SMD-0805	Thick film resistors	ANY	ANY
10	5	R2, R3, R13, R14, R55	10 K 1/8 W $\pm 5\%$ SMD-0805	Thick film resistors	ANY	ANY
11	6	R4, R5, R41, R43, R44, R47	47 K 1/8 W $\pm 5\%$ SMD-0805	Thick film resistors	ANY	ANY
12	4	R6, R19, R20, R51	1 K 1/8 W $\pm 5\%$ SMD-0805	Thick film resistors	ANY	ANY
13	1	R7	27 E 1/8 W $\pm 5\%$ SMD-0805	Thick film resistors	ANY	ANY
14	1	R8	2.2 K 1/8 W $\pm 5\%$ SMD-0805	Thick film resistors	ANY	ANY
15	1	R9	680 E 1/8 W $\pm 5\%$ SMD-0805	Thick film resistors	ANY	ANY
16	1	R11	220 K 1/8 W $\pm 5\%$ SMD-0805	Thick film resistors	ANY	ANY
17	1	R12	1.2 K 1/8 W $\pm 1\%$ SMD-0805	Thick film resistors	ANY	ANY
18	2	R15, R16	10 K 20 V $\pm 30\%$ Through Hole	Potentiometer	Alps	RK09K1130AP5
19	16	R21, R22, R23, R24, R25, R26, R27, R28, R33, R34, R35, R36, R37, R39, R40, R42	0 E $\pm 10\%$ SMD-0805	Thick film resistors	ANY	ANY

Item	Q.ty	Ref.	Part/Value	Description	Manufacturer	Order code
20	4	R29, R30, R31, R32	6.2 K 1/8 W ±1% SMD-0805	Thick film resistors	ANY	ANY
21	4	R38, R45, R46, R48	100 K 1/8W ±10% SMD-0805	Thick film resistors	ANY	ANY
22	1	R52	SMD-0805	Thick film resistors (not mounted)		
23	1	R53	1.8 K 1/8 W ±5% SMD-0805	Thick film resistors	ANY	ANY
24	1	R54	100 E 1/8 W ±5% SMD-0805	Thick film resistors	ANY	ANY
25	23	C1, C5, C9, C14, C15, C17, C18, C19, C20, C21, C23, C29, C31, C33, C35, C37, C39, C41, C47, C48, C49, C50, C52	100 nF 25 V ±10% SMD-0805	Ceramic capacitors	ANY	ANY
26	5	C2, C6, C8, C13, C16	10 µF 25 V ±10% SMD-0805	Ceramic capacitors	ANY	ANY
27	4	C25, C26, C27, C28	2.2 µF 6.3 V ±10% SMD-1206	Ceramic capacitors	ANY	ANY
28	1	C53	100 µF 16 V ±10% SMD-1206	Ceramic capacitors	ANY	ANY
29	2	C3, C22	100 µF 6.3 V ±10% SMD-1206	Ceramic capacitors	ANY	ANY
30	1	C4	33 nF 25 V ±10% SMD-0805	Ceramic capacitors	ANY	ANY
31	1	C7	1.2 nF 25 V ±10% SMD-0805	Ceramic capacitors	ANY	ANY
32	1	C10	47 µF 35 V ±10% SMD-1206	Ceramic capacitors	ANY	ANY
33	1	C11	22 µF 35 V ±10% SMD-1206	Ceramic capacitors	ANY	ANY
34	1	C12	220 nF 50 V ±10% SMD-0805	Ceramic capacitors	ANY	ANY
35	12	C24, C30, C32, C34, C36, C38, C40, C42, C43, C44, C45, C46	1 µF ±10% SMD-0805	Ceramic capacitors	ANY	ANY
36	1	C51	330 nF ±10% SMD-0805	Ceramic capacitors	ANY	ANY
37	1	D3	200 V/2 A SMD	Bridge rectifier	Comchip Technology	DF201ST-G

Item	Q.ty	Ref.	Part/Value	Description	Manufacturer	Order code
38	48	D4, D5, D6, D7, D8, D9, D10, D11, D12, D13, D14, D15, D16, D17, D18, D19, D20, D21, D22, D23, D24, D25, D26, D27, D28, D29, D30, D31, D32, D33, D34, D35, D36, D37, D38, D39, D40, D41, D42, D43, D44, D45, D46, D47, D48, D49, D50, D51	LED 2.1 V/140 mA PLCC-6	High Power red LED	Osram Opto Semiconductor	LR G6SP-CBEA-1-1-Z
39	1	F1	2 A 60 V through hole	Fuse	Littelfuse Inc.	RKEF160
40	1	L1	18 µH 4.2 A 0.2 SMD/SMT	Fixed inductors	Würth Electronics	744770118
41	2	Q1,Q2	N Channel MOSFET 100 V SOT-23	N channel logic level MOSFET	Fairchild Semiconductor	BSS123
42	6	J1, J4, J5, J6, J7, J8	CON2 2X1 through hole	2.54 mm pitch berg stick male	ANY	ANY
43	1	J2	CON5 5X1 through hole	2.54 mm pitch berg stick male	ANY	ANY
44	1	J10	CON5 5X1 through hole	2.54 mm pitch berg stick male	ANY	ANY
45	1	J3	SWIM_Connector	Connector	ERNI	284697
46	1	J9	CON4 4X1 through hole	2.54 mm pitch berg stick female	ANY	ANY
47	1	SW1	SW reset 12 V/ 50 mA SMD	Reset switch/ SPST	Multicomp	DTSM-32S-B
48	1	SW2	Switch KEY-SPDT 30 V/ 100 mA through hole	SPDT	EAO	09.03201.02
49	2	S1,S2	PUSHBUTTON SMD	SPST-NO	TE Connectivity	FSM4JSMATR
50	1	CN1	DC Jack 24VDC / 5A Through Hole	Input power jack	CUI Inc	PJ-102AH

**Table 4. STEVAL-LLL002V1M bill of materials**

Item	Q.ty	Ref.	Part/Value	Description	Manufacturer	Order code
1	1	U3	ESDAULC6-3BP6 SOT666	ESD protection for high speed interface	ST	<a href="#">ESDAULC6-3BP6</a>
2	1	U4	STM32F103T8U6 VFQFPN 36 6x6x1-0	Mainstream performance line, ARM Cortex-M3 MCU	ST	<a href="#">STM32F103T8U6</a>
3	1	SW1	SPST 12 V SMD	Switch	Multicomp	DTSM-32S-B
4	1	CN1	SMD	USB-B type	Samtec Inc	MUSB-05-S-B-SM-A

Item	Q.ty	Ref.	Part/Value	Description	Manufacturer	Order code
5	1	J3	Connector, male 5x1 through hole	2.54 mm pitch berg stick male	ANY	ANY
6	1	J5	16 MHz 4-SMD	Crystal	ABRACON	ABM10-16.000MHZ-E20-T
7	1	J6	Connector, male 4x1 through hole	2.54 mm pitch berg stick male	ANY	ANY
8	2	R1, R16	1 M 1/16 W $\pm 1\%$ SMD0402	Thin Film	ANY	ANY
9	1	R8	4.7 K 1/16 W $\pm 1\%$ SMD0402	Thin Film	ANY	ANY
10	2	R10, R14	22 E 1/16 W $\pm 1\%$ SMD0402	Thin Film	ANY	ANY
11	1	R17	1.5 k 1/16 W $\pm 1\%$ SMD0402	Thin Film	ANY	ANY
12	2	C1, C2	20 pF 50 V SMD0402	Ceramic	ANY	ANY
13	5	C9, C13, C19, C20, C21	100 nF 50 V SMD0402	Ceramic	ANY	ANY
14	2	C17, C22	4.7 nF 50 V SMD0402	Ceramic	ANY	ANY
15	2	C18, C23	15 pF 50 V SMD0402	Ceramic	ANY	ANY

## 6 Layout

Figure 21. STEVAL-LLL002V1M layout: top layer

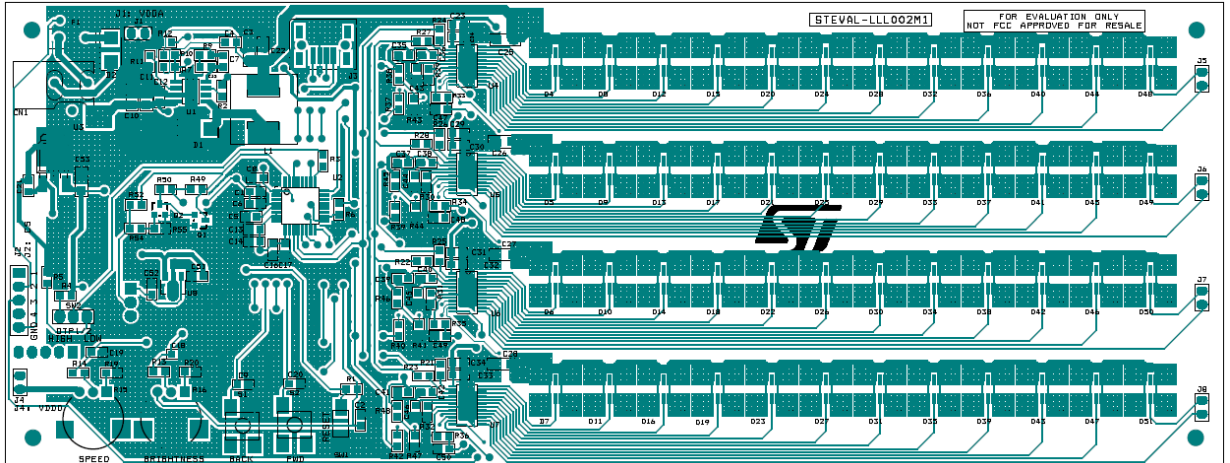
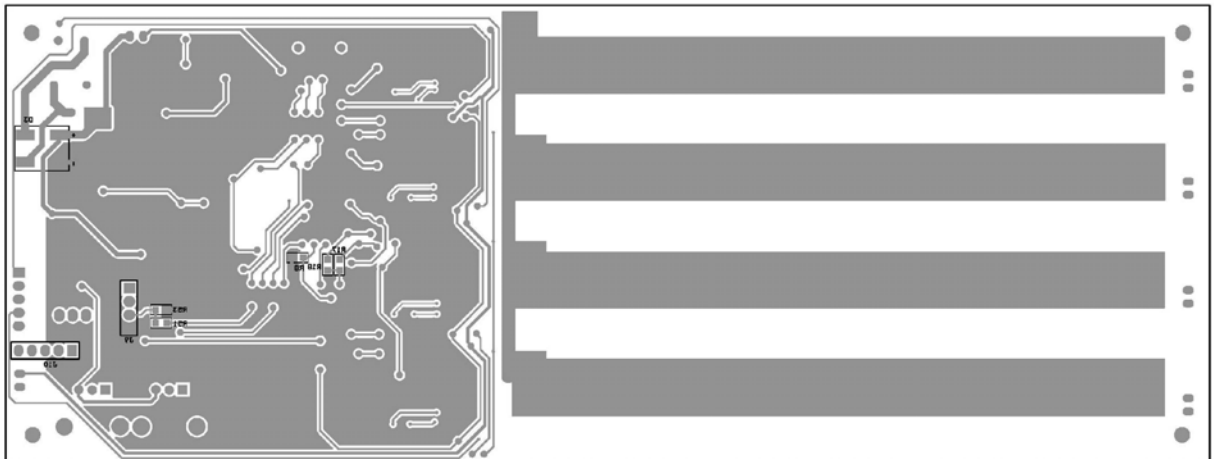


Figure 22. STEVAL-LLL002V1M layout: bottom layer



## 7 Thermal behavior

The [ALED1262ZT](#) is available in a TSSOP24-EP package (mounted on the evaluation board) with 37.5 °C/W thermal resistance.

The average forward voltage drop of red channels is 2 V and the maximum channel current is configured for 42.5 mA.

The [STEVAL-LLL002V1](#) evaluation kit thermal image at the  $\approx 45$  mA current in all the channels are shown below.

Figure 23. STEVAL-LLL002V1 thermal layout at 12 V DC input (top side)

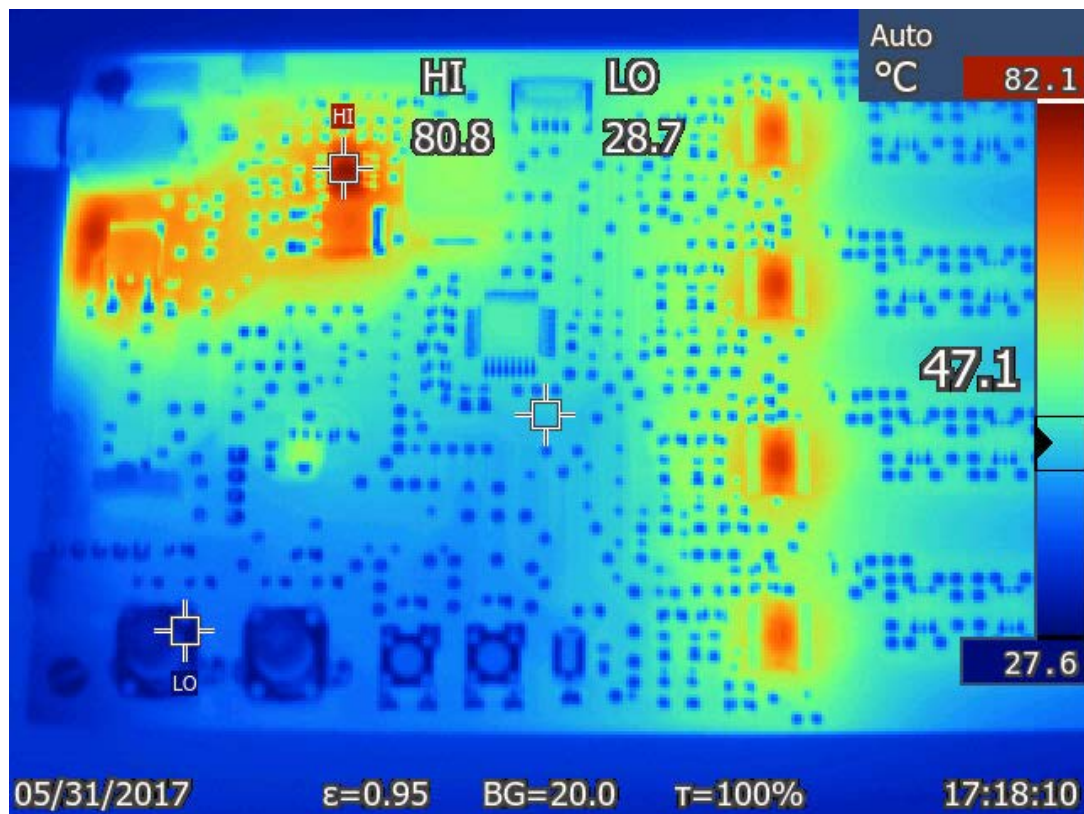


Figure 24. STEVAL-LLL002V1 thermal layout at 12 V DC input (bottom side)

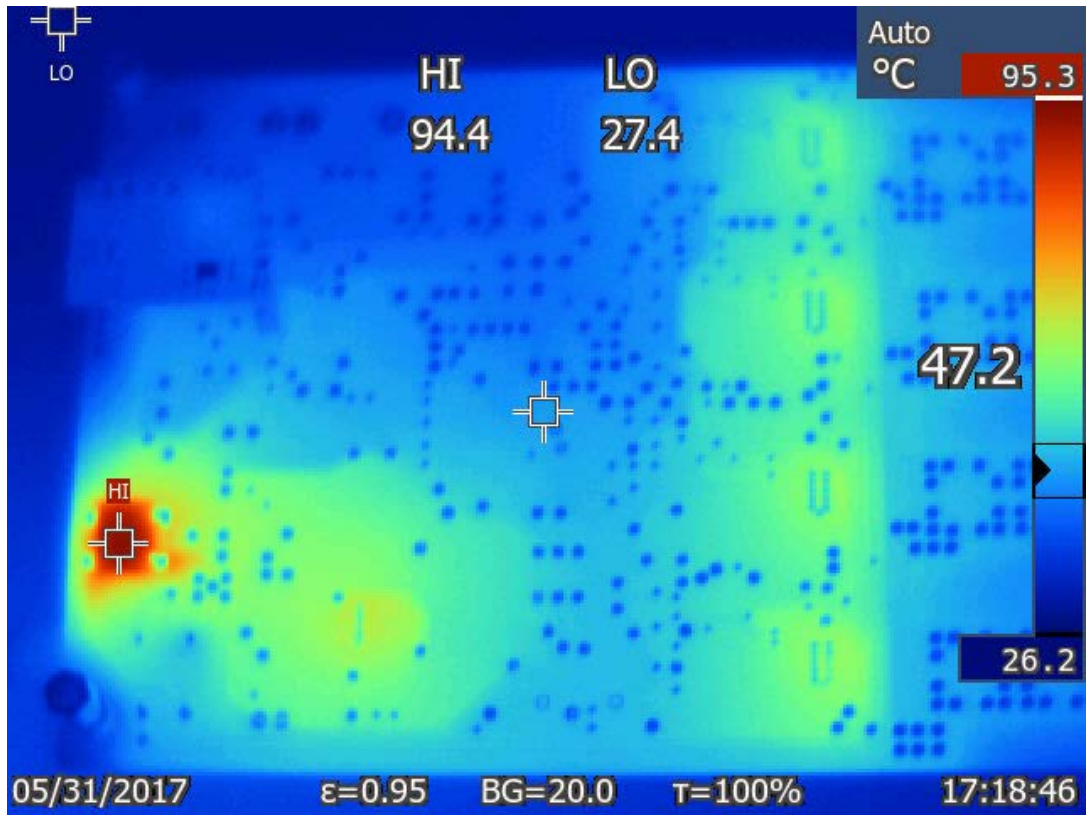


Figure 25. STEVAL-LLL002V1 thermal layout at 20 V DC input (top side)

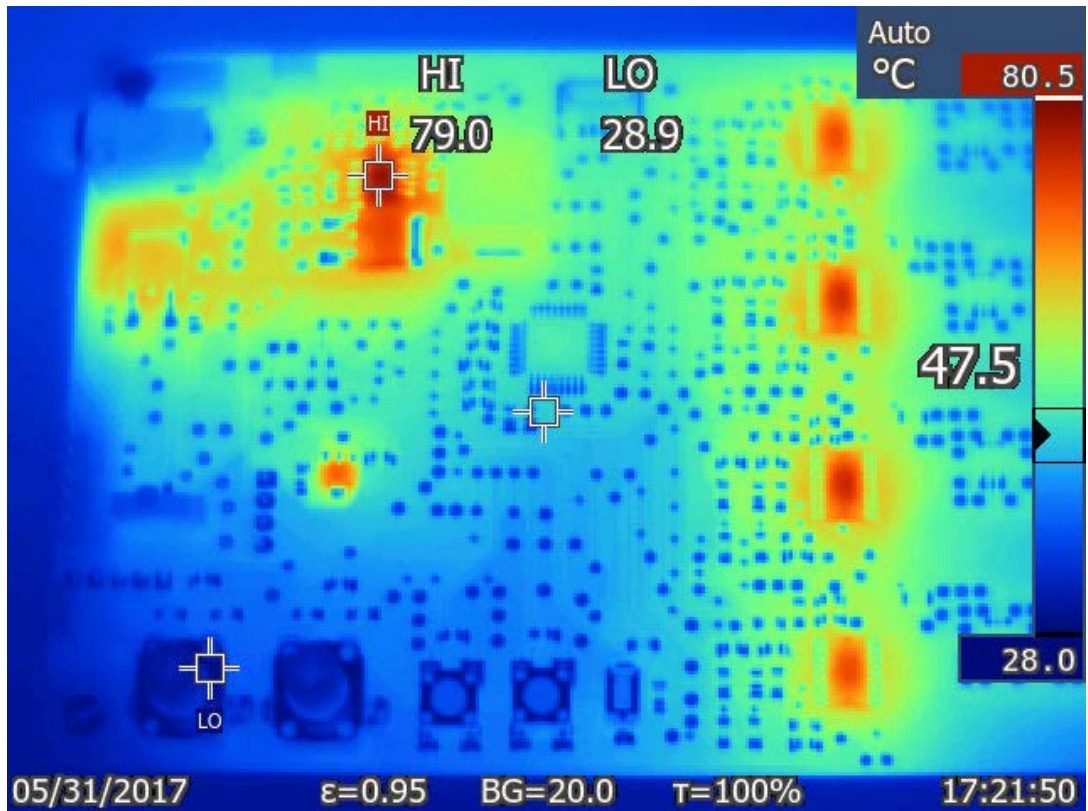
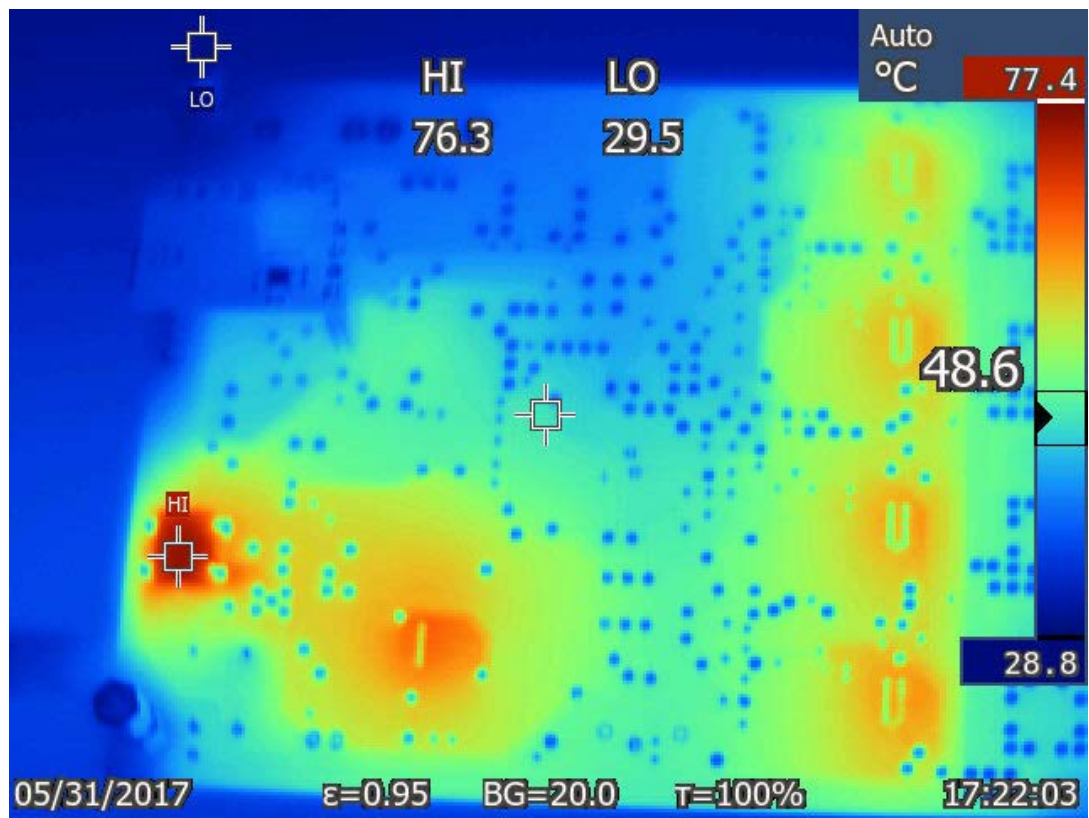


Figure 26. STEVAL-LLL002V1 thermal layout at 20 V DC input (bottom side)





## Revision history

**Table 5. Document revision history**

Date	Version	Changes
03-Jun-2019	1	Initial release.

## Contents

<b>1</b>	<b>Hardware description</b>	<b>2</b>
1.1	STEVAL-LLL002M1 main board	2
1.1.1	Chip select (CS) one time programming (OTP)	2
1.2	STEVAL-LLL002D1 USB-UART bridge	3
1.3	Evaluation kit block diagram	3
1.4	STEVAL-LLL002V1 key devices	4
<b>2</b>	<b>STEVAL-LLL002V1 connections</b>	<b>5</b>
2.1	Power supply	5
2.2	Microcontroller SWIM	5
2.3	Jumpers for LED open-circuit simulation	5
2.4	USB-UART bridge	5
<b>3</b>	<b>Operation modes</b>	<b>6</b>
3.1	Bus driven mode	6
3.1.1	Features	6
3.1.2	Normal mode	6
3.1.3	Error detection	7
3.2	Standalone mode (SAM)	7
3.2.1	Features	8
3.3	GUI mode	8
3.3.1	Features	8
3.3.2	GUI setup	9
3.3.3	Modes	10
<b>4</b>	<b>Schematic diagrams</b>	<b>15</b>
<b>5</b>	<b>Bill of materials</b>	<b>17</b>
<b>6</b>	<b>Layout</b>	<b>21</b>
<b>7</b>	<b>Thermal behavior</b>	<b>22</b>
	<b>Revision history</b>	<b>25</b>

## List of tables

<b>Table 1.</b>	STEVAL-LLL002M1 evaluation board: ALED1262ZT addresses . . . . .	2
<b>Table 2.</b>	STEVAL-LLL002V1 error detection mode . . . . .	7
<b>Table 3.</b>	STEVAL-LLL002V1M bill of materials . . . . .	17
<b>Table 4.</b>	STEVAL-LLL002V1M bill of materials . . . . .	19
<b>Table 5.</b>	Document revision history . . . . .	25

## List of figures

Figure 1.	STEVAL-LLL002V1 evaluation kit . . . . .	1
Figure 2.	STEVAL-LLL002V1M main board (top side) . . . . .	2
Figure 3.	STEVAL-LLL002V1M main board (bottom side) . . . . .	2
Figure 4.	STEVAL-LLL002V1D (top side) . . . . .	3
Figure 5.	STEVAL-LLL002V1D (bottom side) . . . . .	3
Figure 6.	STEVAL-LLL002V1 block diagram . . . . .	4
Figure 7.	STEVAL-LLL002V1 evaluation kit: error detection mode (J6 and J7 removed). . . . .	7
Figure 8.	STEVAL-LLL002V1 evaluation kit: standalone mode (configuration 1) . . . . .	8
Figure 9.	STEVAL-LLL002V1 evaluation kit: standalone mode (configuration 2) . . . . .	8
Figure 10.	STEVAL-LLL002V1 evaluation kit: GUI initial screen . . . . .	9
Figure 11.	STSW-LLL002GUI basic mode . . . . .	10
Figure 12.	ALED1262ZT configuration register . . . . .	11
Figure 13.	STSW-LLL002GUI advanced mode. . . . .	11
Figure 14.	STSW-LLL002GUI frame programming mode. . . . .	12
Figure 15.	STSW-LLL002GUI frame programming mode Preset1 . . . . .	12
Figure 16.	STSW-LLL002GUI frame programming mode Preset2. . . . .	13
Figure 17.	STSW-LLL002GUI frame programming mode Preset3. . . . .	13
Figure 18.	STSW-LLL002GUI frame programming mode Preset4. . . . .	14
Figure 19.	STEVAL-LLL002M1 circuit schematic . . . . .	15
Figure 20.	STEVAL-LLL002D1 circuit schematic. . . . .	16
Figure 21.	STEVAL-LLL002V1M layout: top layer . . . . .	21
Figure 22.	STEVAL-LLL002V1M layout: bottom layer . . . . .	21
Figure 23.	STEVAL-LLL002V1 thermal layout at 12 V DC input (top side) . . . . .	22
Figure 24.	STEVAL-LLL002V1 thermal layout at 12 V DC input (bottom side). . . . .	23
Figure 25.	STEVAL-LLL002V1 thermal layout at 20 V DC input (top side) . . . . .	23
Figure 26.	STEVAL-LLL002V1 thermal layout at 20 V DC input (bottom side). . . . .	24

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