

## STM8L-DISCOVERY

# Introduction

The STM8L-DISCOVERY helps you to discover the STM8L ultralow power features and to develop and share your applications. It is based on an STM8L152C6T6 and includes an ST-Link embedded debug tool interface, LCD (24 segments, 4 commons), LEDs and push buttons.

**Figure 1. STM8L-DISCOVERY board**



# Contents

|          |                                                                  |           |
|----------|------------------------------------------------------------------|-----------|
| <b>1</b> | <b>Quick start</b>                                               | <b>3</b>  |
| 1.1      | Getting started                                                  | 3         |
| 1.2      | System requirements                                              | 3         |
| 1.3      | Development toolchain                                            | 4         |
| 1.4      | Demonstration software                                           | 4         |
| 1.5      | Order code                                                       | 4         |
| <b>2</b> | <b>Features</b>                                                  | <b>5</b>  |
| <b>3</b> | <b>Hardware and layout</b>                                       | <b>6</b>  |
| 3.1      | STM8L152C6T6 microcontroller                                     | 9         |
| 3.2      | Embedded ST-Link                                                 | 11        |
| 3.2.1    | Using the ST-Link to program/debug the STM8L on board            | 12        |
| 3.2.2    | Using the ST-Link to program/debug an external STM8L application | 12        |
| 3.3      | Power supply and power selection                                 | 13        |
| 3.4      | LEDs                                                             | 13        |
| 3.5      | Push buttons                                                     | 13        |
| 3.6      | Built-in IDD measurement circuit                                 | 14        |
| 3.6.1    | Run mode                                                         | 14        |
| 3.6.2    | Low power mode                                                   | 14        |
| 3.6.3    | Low power mode $I_{DD}$ measurement principle                    | 15        |
| 3.6.4    | Ibias current measurement procedure                              | 16        |
| 3.7      | Solder bridges                                                   | 16        |
| 3.8      | LCD (24 segments, 4 commons)                                     | 17        |
| <b>4</b> | <b>Extension connection</b>                                      | <b>19</b> |
| <b>5</b> | <b>Electrical schematics</b>                                     | <b>23</b> |
| <b>6</b> | <b>Revision history</b>                                          | <b>28</b> |

# 1 Quick start

The STM8L-DISCOVERY is a low-cost and easy-to-use development kit to quickly evaluate and start a development with an STM8L ultralow power microcontroller.

Before installing and using the product, please accept the Evaluation Product License Agreement from [www.st.com/stm8l-discovery](http://www.st.com/stm8l-discovery).

For more information on the STM8L-DISCOVERY and for demonstration software visit [www.st.com/stm8l-discovery](http://www.st.com/stm8l-discovery).

## 1.1 Getting started

1. Check jumper positions on the board, JP1 and CN3 ON (Discovery selected).
2. Connect the STM8L-DISCOVERY board to a PC with a USB cable to power the board. Red LED LD2 (PWR) then lights up.
3. Function 1 is executed and each click on user button B2 changes the executed function as described in [Table 1](#).

**Table 1. Functions**

| Function | LED LD3/4 | Bars                                                                                | Value displayed                                       |
|----------|-----------|-------------------------------------------------------------------------------------|-------------------------------------------------------|
| 1        | Blink     |  | STM8L V <sub>DD</sub> voltage measured                |
| 2        | Off       |  | STM8L consumption measured in Run mode                |
| 3        | Off       |  | STM8L consumption measured in Low power mode, LCD on  |
| 4        | Off       |  | STM8L consumption measured in Low power mode, LCD off |
| 5        | Off       |  | STM8L consumption measured in Halt mode, LCD off      |

To study or modify the DISCOVERY project related to this demo, visit [www.st.com/stm8l-discovery](http://www.st.com/stm8l-discovery) and follow the tutorial. Discover the STM8L features, download and execute programs proposed in the list of projects. This site also contains examples from which you can develop your own applications.

## 1.2 System requirements

- Windows PC (2000, XP, Vista)
- A/Mini-B USB cable

## 1.3 Development toolchain

- IAR, Embedded Workbench® for STM8
- STMicroelectronics, ST Visual Develop (STVD)

## 1.4 Demonstration software

Demonstration software is preloaded in the board's Flash memory. This demonstration uses the built-in IDD measurement feature of the STM8L-DISCOVERY to automatically measure and display on the LCD the consumption of the MCU in run and low power modes.

The latest versions of this demonstration source code and associated documentation can be downloaded from [www.st.com/stm8l-discovery](http://www.st.com/stm8l-discovery).

## 1.5 Order code

To order the STM8L ultralow power Discovery, use the order code STM8L-DISCOVERY.

## 2 Features

The STM8L-DISCOVERY offers the following features:

- STM8L152C6T6 microcontroller, 32 KB Flash, 2 KB RAM, 1 KB EEPROM in 48-pin LQFP
- On-board ST-Link with selection mode switch to use the kit as a stand-alone ST-Link (with SWIM connector for programming and debugging)
- Two red LEDs; LD1 for USB communication, LD2 for 3.3 V power on
- Designed to be powered by USB or an external supply of 5 V or 3.3 V
- Can supply target application with 5 volts and 3 volts
- Two user LEDs, LD3 and LD4 (green and blue)
- Two push buttons (User and Reset)
- $I_{DD}$  current measurement
- LCD 28-pin DIP (24 segments, 4 commons)
- Extension header for all QFP48 I/Os for quick connection to prototyping board for easy probing

### 3 Hardware and layout

The STM8L-DISCOVERY is designed around the STM8L152C6T6 microcontroller in a 48-pin LQFP package.

*Figure 2* illustrates the connections between the STM8L152C6T6 and its peripherals (ST-Link, push button, LED, LCD and connectors).

*Figure 3* and *Figure 4* help you to locate these features on the STM8L-DISCOVERY.

**Figure 2. Hardware block diagram**

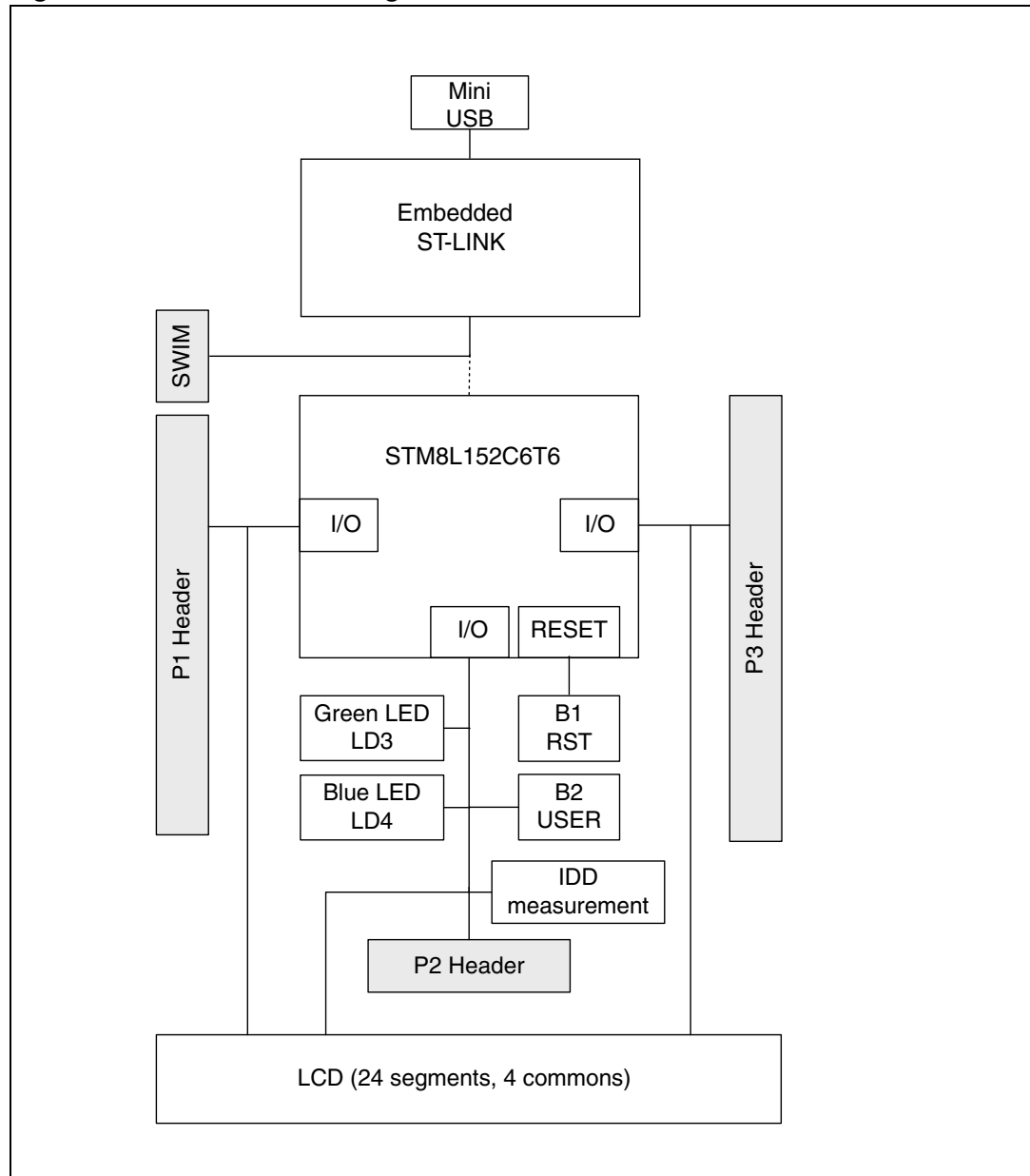


Figure 3. Top layout

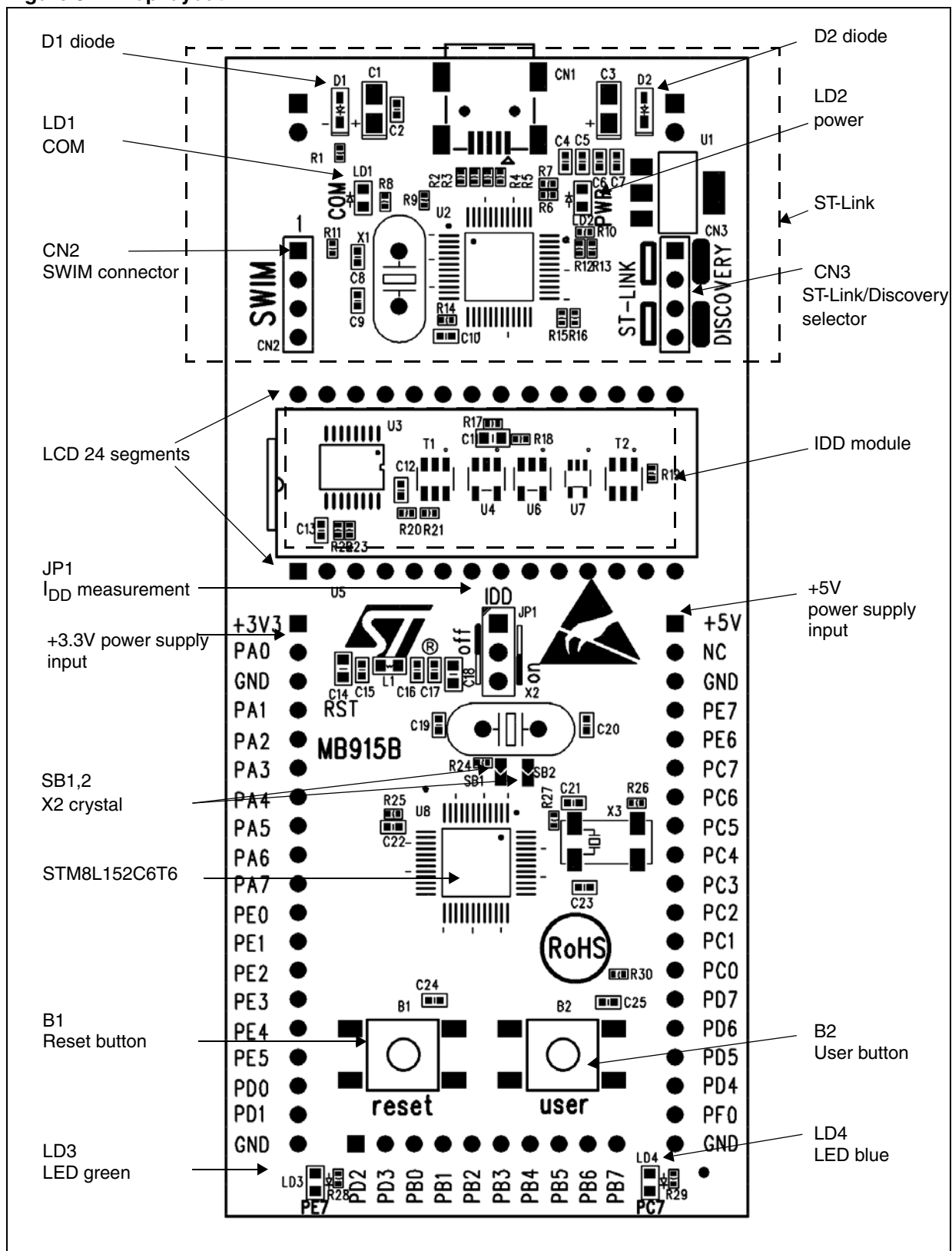
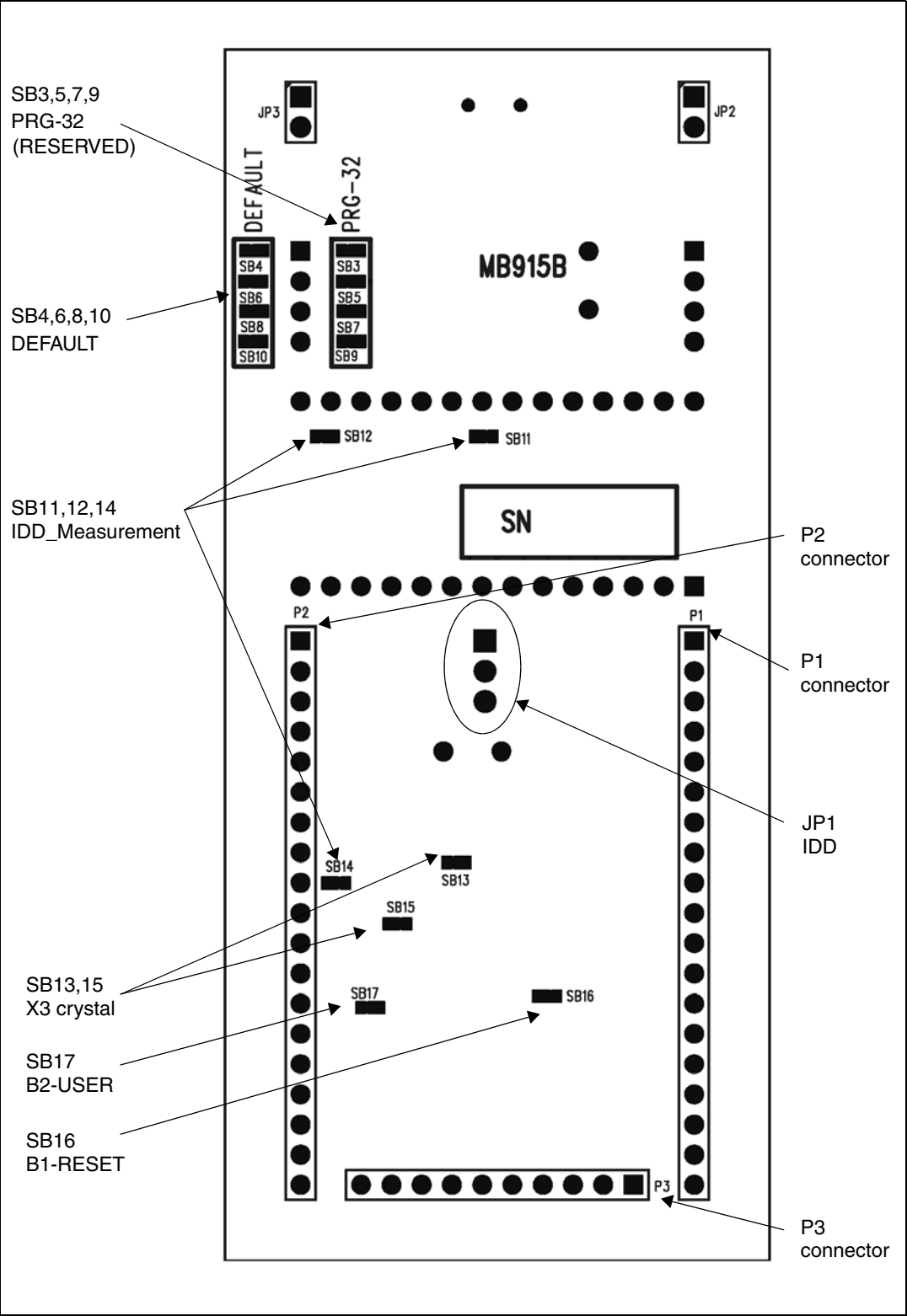


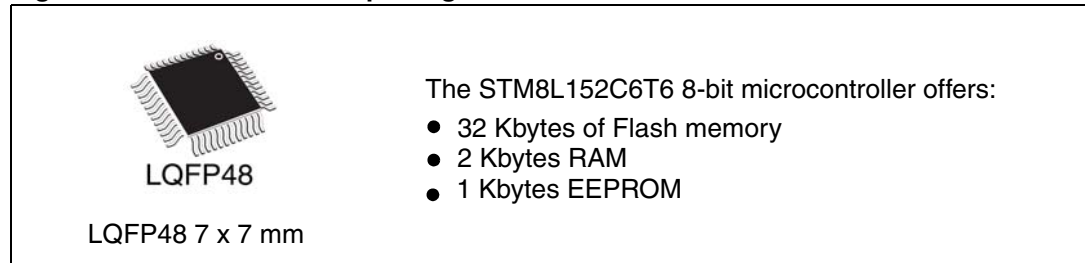
Figure 4. Bottom layout



### 3.1 STM8L152C6T6 microcontroller

This 8-bit ultralow power MCU has 32 KB Flash, 2 KB RAM, 1 KB data EEPROM, RTC, LCD, timers, USART, I2C, SPI, ADC, DAC and comparators.

**Figure 5. STM8L152C6T6 package**

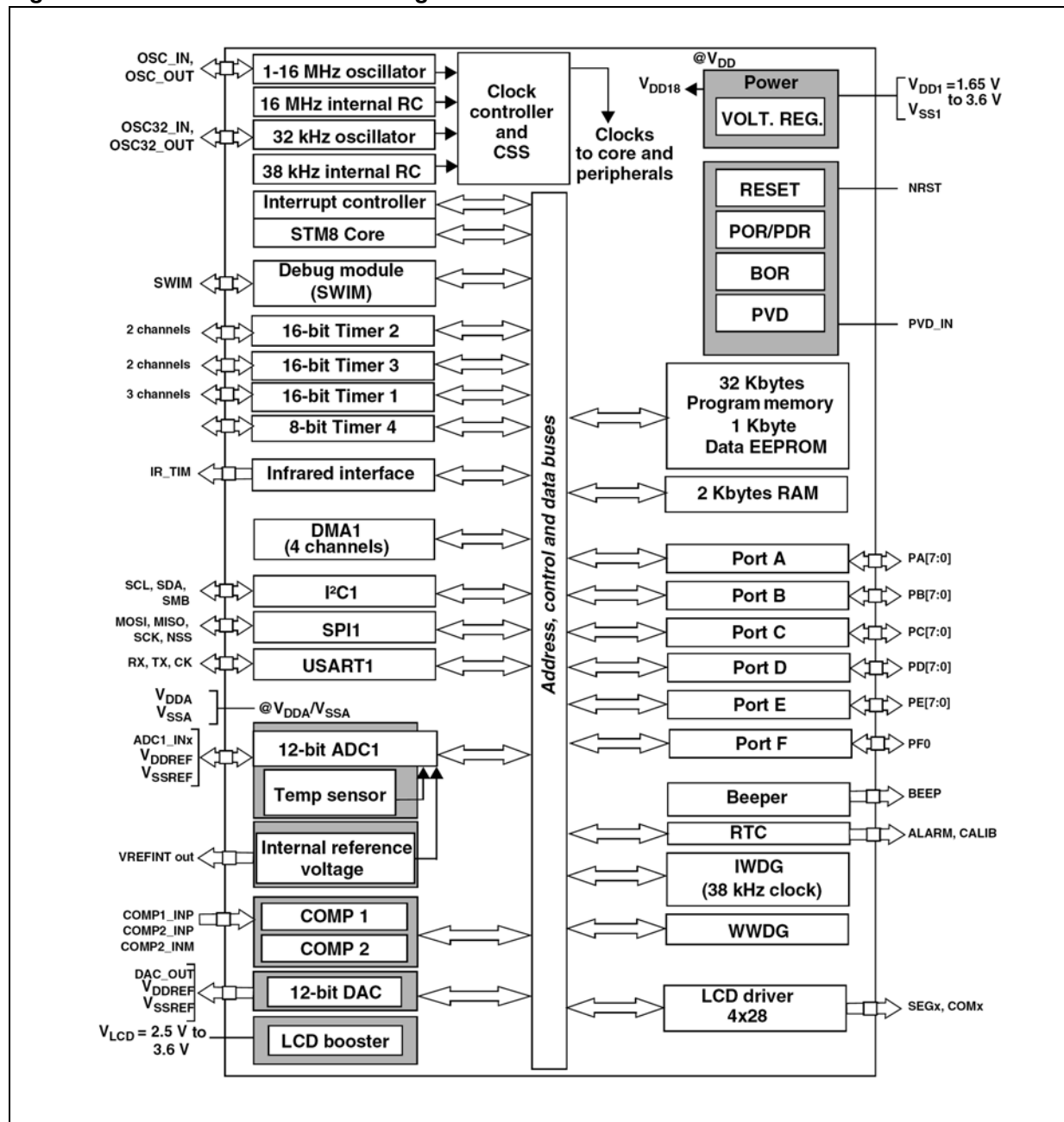


This device provides the following benefits:

- Ultralow power proprietary 130 nm technology:  
Speed and power consumption independent of MCU power supply, Ultralow leakage
- Ultralow power design (clock gating, low-power Flash with power-off capability):  
Reduced overall Run and Wait mode current consumption by turning off clocks of unused peripherals or Flash
- Sub 1  $\mu$ A hardware RTC and AWU system unit:  
Ultralow power modes for applications requesting regular wake up
- Range of Low power modes (up to 4):  
Suitable for many applications from complete switch off to continuous monitoring at ultralow frequency
- Advanced and flexible clock system (multiple internal and external clock sources):  
Switch and adjust frequency and clock sources on the fly depending on application needs
- Direct memory access on board (4-channel DMA):  
Autonomy for peripherals, independent from core; can switch off Flash memory and CPU (large current consumption contributors) while keeping peripherals active
- Ultralow power and ultrasafe reset system POR/PDR; additional optional activation BOR:  
Integrated safety and security for application
- Ultrafast wakeup from lowest Low power mode (4  $\mu$ s):  
Fast switching from Static and Dynamic power modes
- Analog functional down to 1.8 V, programming down to 1.65 V:  
Full functionality over the complete  $V_{DD}$  range

For more information see the STM8L152C6T6 datasheet (Doc ID 15962) on the ST website.

Figure 6. STM8L152C6T6 block diagram



## 3.2 Embedded ST-Link

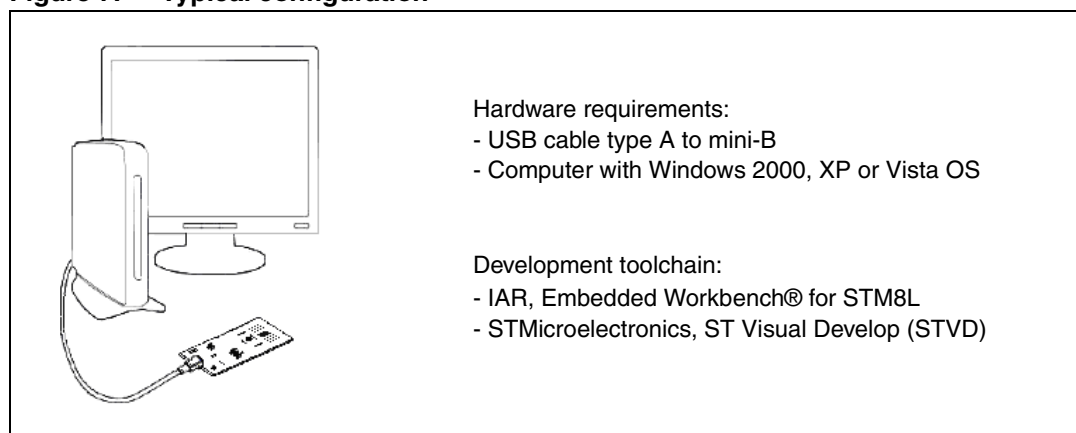
The ST-Link programming and debugging tool is integrated on the STM8L-DISCOVERY. The embedded ST-Link can be used in 2 different ways according to the jumper states (see [Table 2](#)):

- to program/debug the MCU on board,
- to program/debug an MCU in an external application board using a cable connected to SWIM connector CN2.

For information about debugging and programming features refer to ST-Link UM0627.

*Note:* *UM0627 contains information about all the ST-Link features. Usage in this situation is restricted to STM8 devices and SWIM support.*

**Figure 7. Typical configuration**



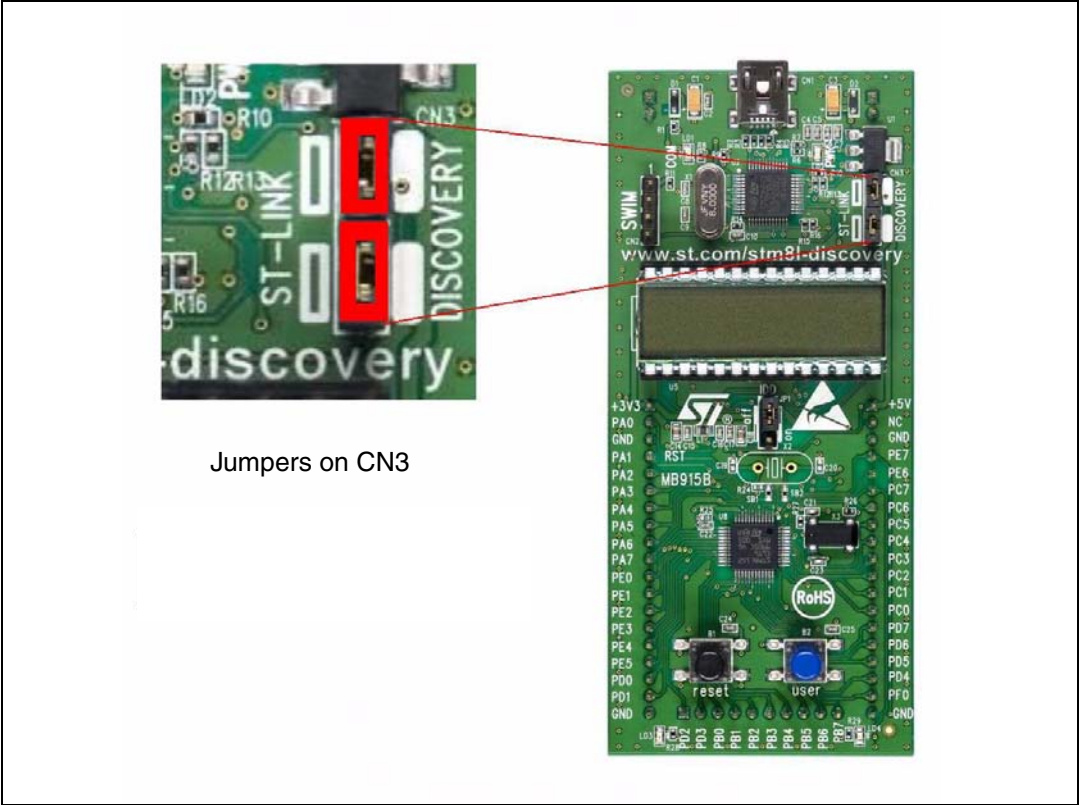
**Table 2. Jumper states**

| Jumper state         | Description                                                                                |
|----------------------|--------------------------------------------------------------------------------------------|
| Both CN3 jumpers ON  | ST-Link functions enabled for on board programming (default)                               |
| Both CN3 jumpers OFF | ST-Link functions enabled for external application through CN2 connector (SWIM supported). |

3.2.1 Using the ST-Link to program/debug the STM8L on board

To program the STM8L on board, simply plug in the two jumpers on CN3, as shown in [Figure 8](#) in red, but do not use the CN2 connector as that could disturb communication with the STM8L152C6T6 of the STM8L-DISCOVERY.

Figure 8. STM8L-DISCOVERY connections image



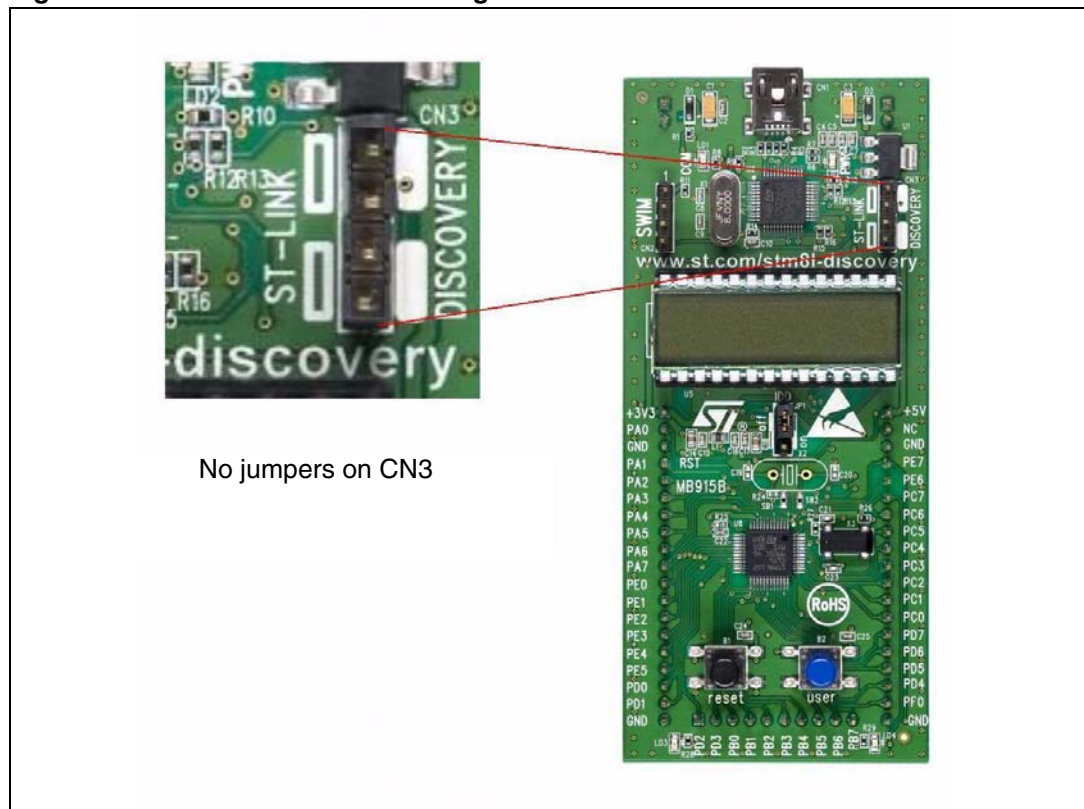
3.2.2 Using the ST-Link to program/debug an external STM8L application

It is very easy to use the ST-Link to program the STM8L on an external application. Simply remove the 2 jumpers from CN3 as shown in [Figure 9](#), and connect your application to the CN2 debug connector according to [Table 3](#).

Table 3. Debug connector CN2 (SWIM)

| Pin | CN2        | Designation            |
|-----|------------|------------------------|
| 1   | VDD_TARGET | VDD from application   |
| 2   | SWIM       | SWIM data input/output |
| 3   | GND        | Ground                 |
| 4   | SWIM_RST   | SWIM reset             |

Figure 9. ST-Link connections image



### 3.3 Power supply and power selection

The power supply is provided either by the host PC through the USB cable, or by external power supply (5 V or 3.3 V). The D1 and D2 protection diodes allow the 5V and 3V3 pins to be used independently as input or output power supplies (see [Figure 3](#)). The 5V and 3V3 pins can be used as an output power supply for use by an application board connected on pin headers (P1 to P3). In such a case, the 3V3 pin provides only a 3V power supply and the power consumption must be lower than 100 mA. The 5V and 3V3 pins can also be used as an input power supply for the board when the USB connector is not connected to the PC.

### 3.4 LEDs

- LD1 COM: Red LED indicates communication in progress between PC and ST-Link.
- LD2 PWR: Red LED indicates that the board is powered.
- LD3 PE7: Green LED is a user LED connected to the I/O PE7 of the STM8L152C6T6.
- LD4 PC7: Blue LED is a user LED connected to the I/O PC7 of the STM8L152C6T6.

### 3.5 Push buttons

- B1 RST: Push button is used to RESET the STM8L152C6T6.
- B2 USER: User push button connected to the I/O PC1 of the STM8L152C6T6.

### 3.6 Built-in $I_{DD}$ measurement circuit

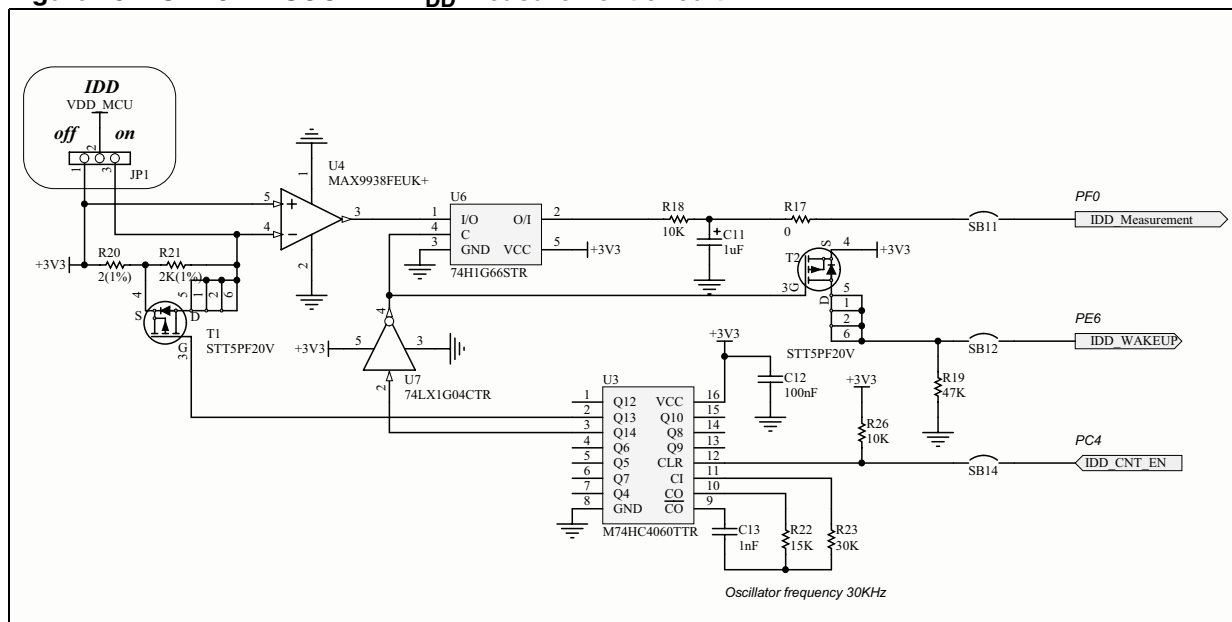
The STM8L-DISCOVERY built-in  $I_{DD}$  measurement circuit allows the consumption of the STM8L152C6T6 to be measured and displayed on the LCD Glass while the MCU is in Run or Low power saving modes.

- JP1 in ON position: STM8L152C6T6 is powered through  $I_{DD}$  measurement circuit (default).
- JP1 in OFF position: STM8L152C6T6 is powered directly by +3V3,  $I_{DD}$  measurement circuit is bypassed.

**Note:** When jumper JP1 is removed the current consumption of the STM8L152C6T6 can be measured by connecting an ammeter between jumper JP1 pin 1 and pin 2.

For  $I_{DD}$  measurement by the MCU itself, the circuit below is implemented on the STM8L-DISCOVERY. Solder bridges SB11, SB12 and SB14 must be closed and a jumper must be plugged between JP1 pin 2 and pin 3.

**Figure 10. STM8L-DISCOVERY  $I_{DD}$  measurement circuit**



#### 3.6.1 Run mode

In Run mode,  $I_{DD}$  current is measured using the operational amplifier MAX9938FEUK+ (U4) connected to the 2Ω shunt resistor (R20). In this case  $I_{DD\_CNT\_EN}$  remains high during measurement, so R21 remains in short-circuit during the measurement because of transistor T1 which remains ON permanently. The jumper JP1 must be connected between pins 2 and 3 of JP1.

#### 3.6.2 Low power mode

In Low power modes (Halt or Active halt), the operational amplifier MAX9938FEUK+ (U4) is connected to the 2KΩ shunt resistor (R21), controlled by the analogue switch STT5PF20V (T1). In this case the counter 74HC4060 (U3) enabled by  $I_{DD\_CNT\_EN}$  manages the measurement timing according to [Figure 11](#).

### 3.6.3 Low power mode $I_{DD}$ measurement principle

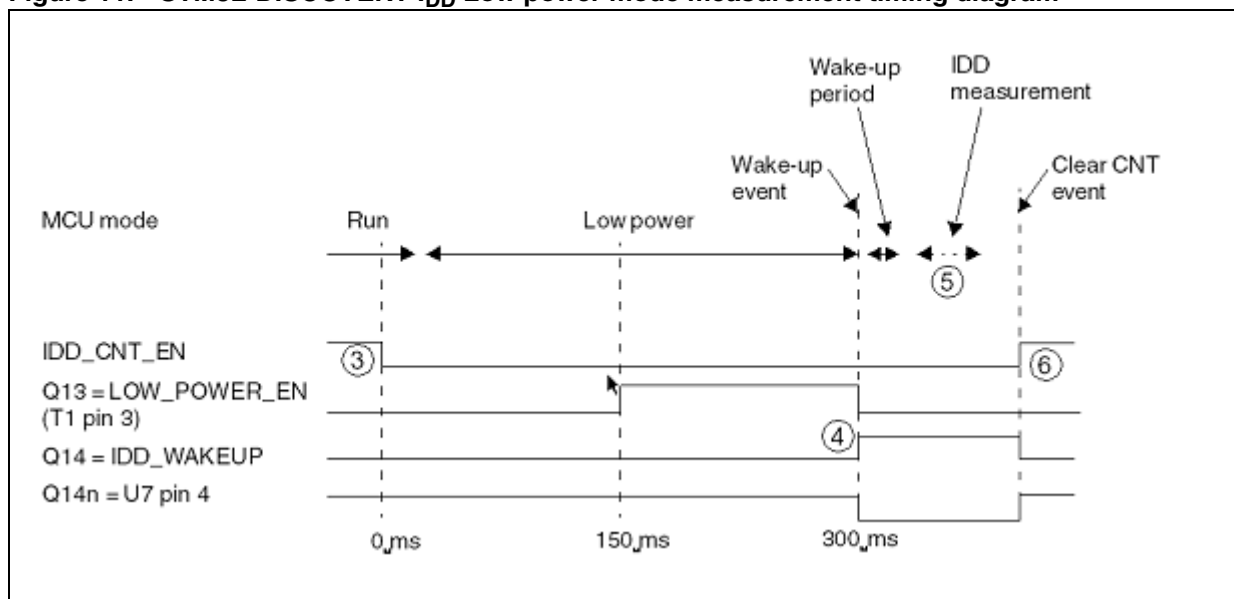
The principle used to measure a current when the STM8L152C6T6 is in Low power mode is:

1. Configure ADC to measure voltage on the IDD\_Measurement pin.
2. Configure PE6 to serve as wakeup pin.
3. Enter Low power mode after setting IDD\_CNT\_EN (PC4) signal low.
4. IDD\_WAKEUP rising edge wakes up the MCU after around 300 ms.
5. Start ADC conversion as soon as possible after wakeup in order to measure the voltage corresponding to Low power mode on capacitor C11.
6. Reset the counter by programming IDD\_CNT\_EN high (in less than 70 ms after the wakeup) to avoid the R21 2 K $\Omega$  resistor being connected later in Run mode.

The measurement timing is given in [Figure 11](#). In Low power modes, the 2 K $\Omega$  resistor is connected when T1 goes off after entering Low power mode. Q13 output of the counter allows connection of the 2 K $\Omega$  resistor when the current  $I_{DD}$  becomes very low.

[Figure 11](#) shows how the counter and T1 ensure that, 150 ms after IDD\_CNT\_EN falling edge, the shunt resistor R21 is connected between VDD\_MCU and the power supply in order to reduce the measurement range to 30  $\mu$ A full scale. Then after another 150 ms for current stabilization, R21 is shorted, the IDD measurement is stored in C11, and the MCU is woken up. After wakeup the MCU can measure the IDD current corresponding to the Low power mode stored in C11.

**Figure 11. STM8L-DISCOVERY  $I_{DD}$  Low power mode measurement timing diagram**



The Low power mode measurement procedure can be used in Halt or Active halt mode if the  $I_{DD}$  current does not exceed 30  $\mu$ A, otherwise the  $I_{DD}$  measurement procedure in Run mode should be used up to 30 mA.

### 3.6.4 I<sub>bias</sub> current measurement procedure

In Low power mode the bias current of operational amplifier input (U4 pin 4) is not negligible compared to  $I_{DD}$  current (typical  $I_{bias}$  is ~240 nA). To obtain a reliable STM8L152  $I_{DD}$  measurement it is mandatory to subtract the bias current from the  $I_{DD}$  low power measurement since this current is not sunk by the MCU.  $I_{bias}$  is measured during production test and stored in the MCU EPROM. The demonstration software, Discover, uses this value to display the correct  $I_{DD}$ . The  $I_{bias}$  measurement procedure is part of the demonstration software and can be launched if required.

The procedure for  $I_{bias}$  measurement (implemented in the Demo) is:

1. Power off the board (disconnect the USB cable).
2. Set jumper JP1 to OFF position (pins 1 and 2).
3. Push down B2 (USER button), power on the board from the USB.
4. Wait at least 1 second before releasing B2, the LCD displays the  $I_{bias}$  measurement.
5. Power off the board (disconnect the USB cable).
6. Set jumper JP1 to ON position (pins 2 and 3). The  $I_{bias}$  value is now stored. The bias current is then subtracted from the  $I_{DD}$  measurement performed in Low power mode.

## 3.7 Solder bridges

Table 4. Solder bridge

| Bridge                          | State <sup>(1)</sup> | Description                                                                                      |
|---------------------------------|----------------------|--------------------------------------------------------------------------------------------------|
| SB1,2<br>(X2 crystal)           | Off                  | PA2, PA3 are disconnected from P1<br>X2, C19, C20 and R24 provide a clock as shown in schematics |
|                                 | On                   | PA2, PA3 are connected to P1 (X2, C19, C20, R24 must not be fitted)                              |
| SB3,5,7,9<br>(DEFAULT)          | On                   | Reserved, do not modify                                                                          |
| SB4,6,8,10<br>(PRG-32)          | Off                  | Reserved, do not modify                                                                          |
| SB11,12,14<br>(IDD_Measurement) | Off                  | PFO, PE6, PC4 are available and IDD module cannot be used<br>JP1 must be set to OFF              |
|                                 | On                   | PFO, PE6, PC4 are used by IDD module<br>JP1 must be set to ON                                    |
| SB13,15<br>(X3 crystal)         | Off                  | PC5, PC6 are only connected to P2 (but do not remove X3, C21, C23, R27)                          |
|                                 | On                   | PC5, PC6 are connected to P2. X3, C21, C23 and R27 provide 32 KHz clock                          |
| SB16<br>(B1-RESET)              | Off                  | PA1/RESET signal is only connected to P1                                                         |
|                                 | On                   | PA1/RESET signal is used by ST_LINK as SWIM_RST and also connected to P1                         |
| SB17<br>(B2-USER)               | Off                  | PC1 is only connected to P2                                                                      |
|                                 | On                   | PC1 is connected to P2 and push button B2 for user                                               |

1. Default state is in **bold** type.

### 3.8 LCD (24 segments, 4 commons)

This LCD allows the STM8L152C6T6 to display any information on six 14-segment digits and 4 BARs, using all COMs. (See the LCD segment mapping in [Figure 12](#) and pin connections in [Table 5](#).)

*Note:* This LCD also supports six 8-segment digits by only using COM0 and COM1. This configuration allows COM2 and COM3 to be used as I/O ports. In this case the 2 LCD pins must not be plugged into the LCD socket. To proceed with this configuration, remove the LCD carefully, slightly open the COM2 and COM3 pins (pin 13 and pin 14) of the LCD, then replug it in the socket.

Characteristics overview:

- 24 segments and 4 commons
- Drive method: multiplexed 1/4 duty, 1/3 bias
- Operating voltage: 3 V
- Operating temperature: 0 to 50°C
- Connector: 28-pin DIL 2.54 mm pitch

*Note:* When the LCD is plugged, all I/O ports listed in [Table 5](#) are unavailable. To use one of these as I/O, you must remove the LCD.

**Figure 12. LCD segment mapping**

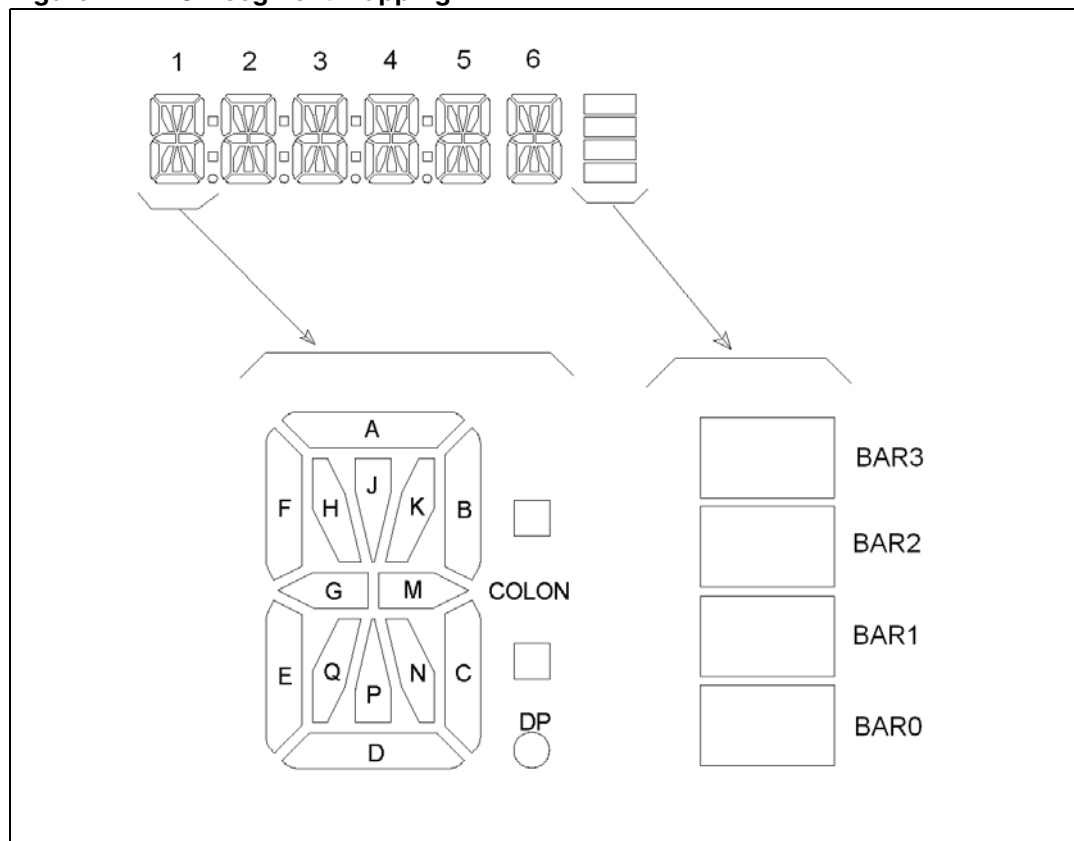


Table 5. LCD connections

| STM8L152C6T6 | LCD |      |        |      |      |
|--------------|-----|------|--------|------|------|
| Pin name     | Pin | COM3 | COM2   | COM1 | COM0 |
| PA7_LCDSEG0  | 1   | 1N   | 1P     | 1D   | 1E   |
| PE0_LCDSEG1  | 2   | 1DP  | 1COLON | 1C   | 1M   |
| PE1_LCDSEG2  | 3   | 2N   | 2P     | 2D   | 2E   |
| PE2_LCDSEG3  | 4   | 2DP  | 2COLON | 2C   | 2M   |
| PE3_LCDSEG4  | 5   | 3N   | 3P     | 3D   | 3E   |
| PE4_LCDSEG5  | 6   | 3DP  | 3COLON | 3C   | 3M   |
| PE5_LCDSEG6  | 7   | 4N   | 4P     | 4D   | 4E   |
| PD0_LCDSEG7  | 8   | 4DP  | 4COLON | 4C   | 4M   |
| PD2_LCDSEG8  | 9   | 5N   | 5P     | 5D   | 5E   |
| PD3_LCDSEG9  | 10  | BAR2 | BAR3   | 5C   | 5M   |
| PB0_LCDSEG10 | 11  | 6N   | 6P     | 6D   | 6E   |
| PB1_LCDSEG11 | 12  | BAR0 | BAR1   | 6C   | 6M   |
| PD1_LCDCOM3  | 13  | COM3 |        |      |      |
| PA6_LCDCOM2  | 14  |      | COM2   |      |      |
| PA5_LCDCOM1  | 15  |      |        | COM1 |      |
| PA4_LCDCOM0  | 16  |      |        |      | COM0 |
| PB2_LCDSEG12 | 17  | 6J   | 6K     | 6A   | 6B   |
| PB3_LCDSEG13 | 18  | 6H   | 6Q     | 6F   | 6G   |
| PB4_LCDSEG14 | 19  | 5J   | 5K     | 5A   | 5B   |
| PB5_LCDSEG15 | 20  | 5H   | 5Q     | 5F   | 5G   |
| PB6_LCDSEG16 | 21  | 4J   | 4K     | 4A   | 4B   |
| PB7_LCDSEG17 | 22  | 4H   | 4Q     | 4F   | 4G   |
| PD4_LCDSEG18 | 23  | 3J   | 3K     | 3A   | 3B   |
| PD5_LCDSEG19 | 24  | 3H   | 3Q     | 3F   | 3G   |
| PD6_LCDSEG20 | 25  | 2J   | 2K     | 2A   | 2B   |
| PD7_LCDSEG21 | 26  | 2H   | 2Q     | 2F   | 2G   |
| PC2_LCDSEG22 | 27  | 1J   | 1K     | 1A   | 1B   |
| PC3_LCDSEG23 | 28  | 1H   | 1Q     | 1F   | 1G   |

## 4 Extension connection

Male headers P1, P2 and P3 can connect the STM8L-DISCOVERY to a standard prototyping/wrapping board. All GPI/Os of STM8L152C6T6 are available on it. P1, P2 and P3 can also be probed by an oscilloscope, logical analyzer or voltmeter.

**Table 6. P1 pinout**

| Pin number (P1) | Pin number (STM8L) | Board pin name | Type | Main function | Alternate function                                                           | LCD (U5) |
|-----------------|--------------------|----------------|------|---------------|------------------------------------------------------------------------------|----------|
| 1               |                    | +3V3           |      |               | 3.3 V board power supplied or supply external application when USB connected |          |
| 2               | 1                  | PA0            | I/O  | Port A0       | PA0/[USART1_CK](3)/SWIM/BEEP/IR_TIM (7)                                      |          |
| 3               | 9/40               | GND            |      |               | Ground                                                                       |          |
| 4               | 2                  | PA1            | I/O  | Reset         | NRST/PA1(1)                                                                  |          |
| 5               | 3                  | PA2            | I/O  | Port A2       | PA2/OSC_IN/[USART1_TX](3)/[SPI1_MISO] (3)                                    |          |
| 6               | 4                  | PA3            | I/O  | Port A3       | PA3/OSC_OUT/[USART1_RX](3)/[SPI1_MOSI](3)                                    |          |
| 7               | 5                  | PA4            | I/O  | Port A4       | PA4/TIM2_BKIN/LCD_COM0(2)/ADC1_IN2/COMP1_INP                                 | LCD_COM0 |
| 8               | 6                  | PA5            | I/O  | Port A5       | PA5/TIM3_BKIN/LCD_COM1(2)/ADC1_IN1/COMP1_INP                                 | LCD_COM1 |
| 9               | 7                  | PA6            | I/O  | Port A6       | PA6/[ADC1_TRIG](3)/LCD_COM2(2)/ADC1_IN0/COMP1_INP                            | LCD_COM2 |
| 10              | 8                  | PA7            | I/O  | Port A7       | PA7/LCD_SEG0(2)(4)                                                           | LCD_SEG0 |
| 11              | 14                 | PE0            | I/O  | Port E0       | PE0(4)/LCD_SEG1(2)                                                           | LCD_SEG1 |
| 12              | 15                 | PE1            | I/O  | Port E1       | PE1/TIM1_CH2N / LCD_SEG2(2)                                                  | LCD_SEG2 |
| 13              | 16                 | PE2            | I/O  | Port E2       | PE2/TIM1_CH3N / LCD_SEG3(2)                                                  | LCD_SEG3 |
| 14              | 17                 | PE3            | I/O  | Port E3       | PE3/LCD_SEG4(2)                                                              | LCD_SEG4 |
| 15              | 18                 | PE4            | I/O  | Port E4       | PE4/LCD_SEG5(2)                                                              | LCD_SEG5 |

**Table 6. P1 pinout (continued)**

| Pin number (P1) | Pin number (STM8L) | Board pin name | Type | Main function | Alternate function                                                                         | LCD (U5) |
|-----------------|--------------------|----------------|------|---------------|--------------------------------------------------------------------------------------------|----------|
| 16              | 19                 | PE5            | I/O  | Port E5       | PE5/LCD_SEG6(2)/<br>ADC1_IN23/<br>COMP2_INP/<br>COMP1_INP                                  | LCD_SEG6 |
| 17              | 20                 | PD0            | I/O  | Port D0       | PD0/TIM3_CH2/<br>[ADC1_TRIG](3)/<br>LCD_SEG7(2)/<br>ADC1_IN2 2/<br>COMP2_INP/<br>COMP1_INP | LCD_SEG7 |
| 18              | 21                 | PD1            | I/O  | Port D1       | PD1/TIM3_TRIG/<br>LCD_COM3(2)/<br>ADC1_IN21/<br>COMP2_INP/<br>COMP1_INP                    | LCD_COM3 |
| 19              | 9/40               | GND            |      |               | Ground                                                                                     |          |

**Table 7. P2 pinout**

| Pin number (P2) | Pin number (STM8L) | Pin name | Type | Main function | Alternate function                                                                        | LCD (U5) |
|-----------------|--------------------|----------|------|---------------|-------------------------------------------------------------------------------------------|----------|
| 1               |                    | +5V      |      |               | 5 Volts board power supplied or supply external application when USB connected            |          |
| 2               |                    | NC       |      |               |                                                                                           |          |
| 3               | 9/40               | GND      |      |               | Ground                                                                                    |          |
| 4               | 48                 | PE7      | I/O  | Port E7       | PE7/LCD_SEG27(2)                                                                          |          |
| 5               | 47                 | PE6      | I/O  | Port E6       | PE6/LCD_SEG26(2)/<br>PVD_IN                                                               |          |
| 6               | 46                 | PC7      | I/O  | Port C7       | PC7/LCD_SEG25(2)/<br>ADC1_IN3/<br>COMP2_INM/<br>COMP1_INP                                 |          |
| 7               | 45                 | PC6      | I/O  | Port C6       | PC6/OSC32_OUT/<br>[SPI1_SCK](3)/<br>[USART1_RX](3)                                        |          |
| 8               | 44                 | PC5      | I/O  | Port C5       | PC5/OSC32_IN /<br>[SPI1_NSS](3)/<br>[USART1_TX](3)                                        |          |
| 9               | 43                 | PC4      | I/O  | Port C4       | PC4/[USART1_CK](3)/<br>I2C1_SMB/CCO/<br>LCD_SEG24(2)/<br>ADC1_IN4/COMP2_INM/<br>COMP1_INP |          |

Table 7. P2 pinout (continued)

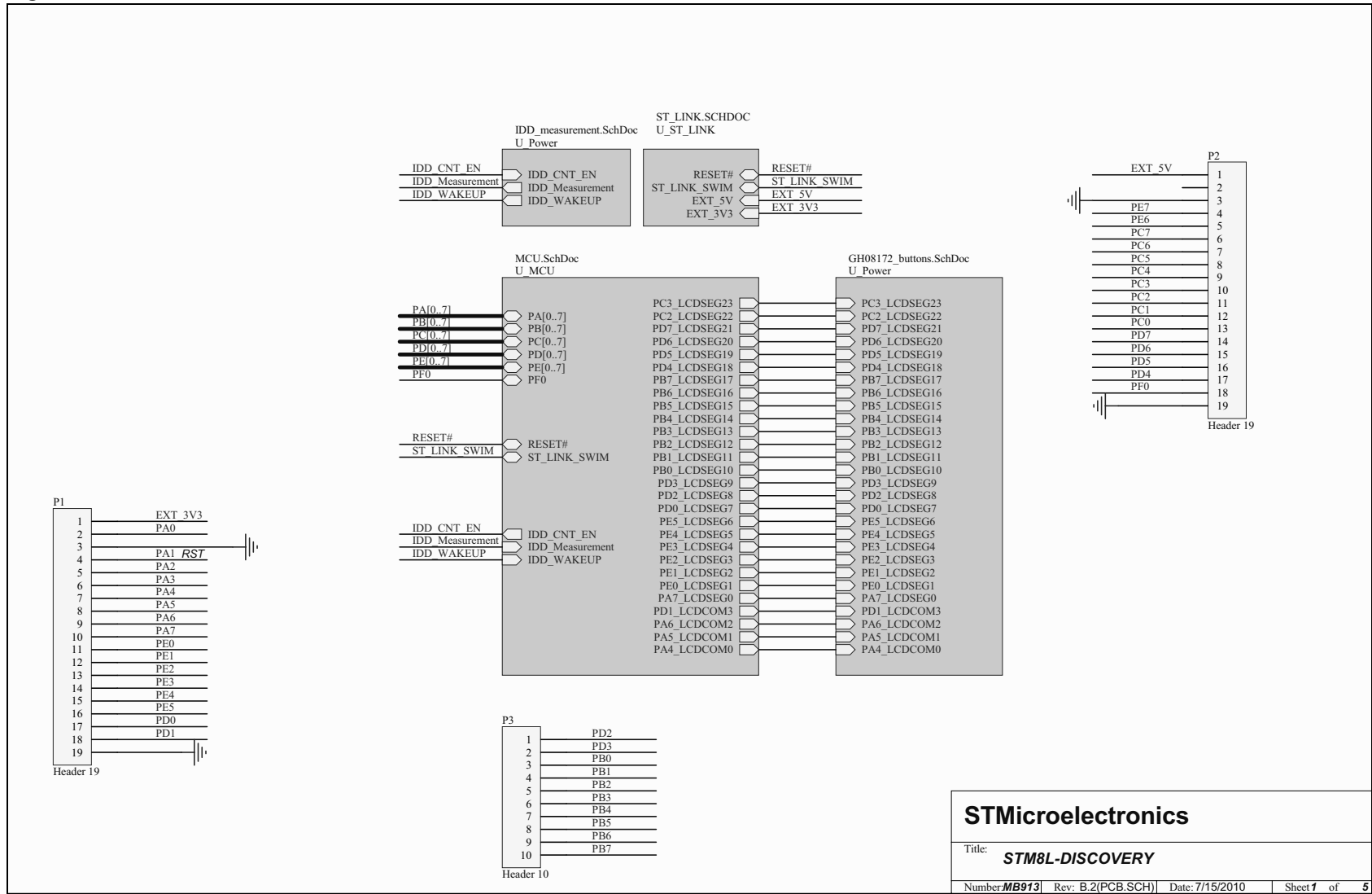
| Pin number (P2) | Pin number (STM8L) | Pin name | Type | Main function | Alternate function                                                                    | LCD (U5)  |
|-----------------|--------------------|----------|------|---------------|---------------------------------------------------------------------------------------|-----------|
| 10              | 42                 | PC3      | I/O  | Port C3       | PC3/[USART1_TX](3)/<br>LCD_SEG23(2)/<br>ADC1_IN5/<br>COMP1_INP/<br>COMP2_INM          | LCD_SEG23 |
| 11              | 41                 | PC2      | I/O  | Port C2       | PC2/[USART1_RX](3)/<br>LCD_SEG22/<br>ADC1_IN6/<br>COMP1_INP/<br>VREF_OUT              | LCD_SEG22 |
| 12              | 38                 | PC1      | I/O  | Port C1       | PC1(4)/I2C1_SCL                                                                       |           |
| 13              | 37                 | PC0      | I/O  | Port C0       | PC0(4)/I2C1_SDA                                                                       |           |
| 14              | 36                 | PD7      | I/O  | Port D7       | PD7/TIM1_CH1N /<br>LCD_SEG21(2)/<br>ADC1_IN7/<br>RTC_ALARM/<br>VREF_OUT/<br>COMP1_INP | LCD_SEG21 |
| 15              | 35                 | PD6      | I/O  | Port D6       | PD6/TIM1_BKIN /<br>LCD_SEG20(2)/<br>ADC1_IN8/<br>RTC_CALIB/<br>VREF_OUT/<br>COMP1_INP | LCD_SEG20 |
| 16              | 34                 | PD5      | I/O  | Port D5       | PD5/TIM1_CH3 /<br>LCD_SEG19(2)/<br>ADC1_IN9/<br>COMP1_INP                             | LCD_SEG19 |
| 17              | 33                 | PD4      | I/O  | Port D4       | PD4/TIM1_CH2 /<br>LCD_SEG18(2)/<br>ADC1_IN10/<br>COMP1_INP                            | LCD_SEG18 |
| 18              | 32                 | PF0      | I/O  | Port F0       | PF0/ADC1_IN24/<br>DAC_OUT                                                             |           |
| 19              | 9/40               | GND      |      |               | Ground                                                                                |           |

Table 8. P3 pinout

| Pin number (P3) | Pin number (STM8L) | Pin name | Type | Main function | Alternate function                                              | LCD (U5)  |
|-----------------|--------------------|----------|------|---------------|-----------------------------------------------------------------|-----------|
| 1               | 22                 | PD2      | I/O  | Port D2       | PD2/TIM1_CH1 /<br>LCD_SEG8(2)/<br>ADC1_IN20/<br>COMP1_INP       | LCD_SEG8  |
| 2               | 23                 | PD3      | I/O  | Port D3       | PD3/ TIM1_TRIG/<br>LCD_SEG9(2)/<br>ADC1_IN1 9/<br>COMP1_INP     | LCD_SEG9  |
| 3               | 24                 | PB0      | I/O  | Port B0       | PB0/TIM2_CH1/<br>LCD_SEG10(2)/<br>ADC1_IN18/<br>COMP1_INP       | LCD_SEG10 |
| 4               | 25                 | PB1      | I/O  | Port B1       | PB1/TIM3_CH1/<br>LCD_SEG11(2)/<br>ADC1_IN17/<br>COMP1_INP       | LCD_SEG11 |
| 5               | 26                 | PB2      | I/O  | Port B2       | PB2/ TIM2_CH2/<br>LCD_SEG12(2)/<br>ADC1_IN16/<br>COMP1_INP      | LCD_SEG12 |
| 6               | 27                 | PB3      | I/O  | Port B3       | PB3/TIM2_TRIG/<br>LCD_SEG13(2)/<br>ADC1_IN15/<br>COMP1_INP      | LCD_SEG13 |
| 7               | 28                 | PB4      | I/O  | Port B4       | PB4/[SPI1_NSS](3)/<br>LCD_SEG14(2)/<br>ADC1_IN14/<br>COMP1_INP  | LCD_SEG14 |
| 8               | 29                 | PB5      | I/O  | Port B5       | PB5/[SPI1_SCK](3)/<br>LCD_SEG15(2)/<br>ADC1_IN13/<br>COMP1_INP  | LCD_SEG15 |
| 9               | 30                 | PB6      | I/O  | Port B6       | PB6/[SPI1_MOSI](3)/<br>LCD_SEG16(2)/<br>ADC1_IN12/<br>COMP1_INP | LCD_SEG16 |
| 10              | 31                 | PB7      | I/O  | Port B7       | PB7/[SPI1_MISO](3)/<br>LCD_SEG17(2)/<br>ADC1_IN11/<br>COMP1_INP | LCD_SEG17 |

## 5 Electrical schematics

Figure 13. STM8L-DISCOVERY



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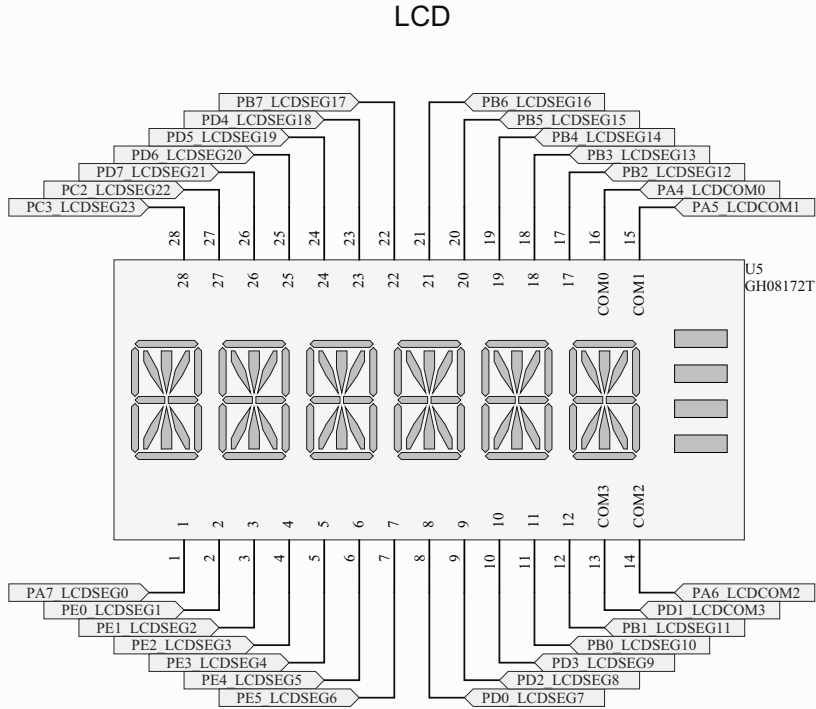
Title: **STM8L-DISCOVERY**

Number **MB913** Rev: B.2(PCB.SCH) Date: 7/15/2010 Sheet **1** of **5**

Figure 14. LCD

24/29

Doc ID 17693 Rev 1



**STMicroelectronics**

Title: **STM8L-DISCOVERY LCD**

Number: **MB915** | Rev: B.2(SCH.PCB) | Date: 7/15/2010 | Sheet **2** of **5**

Figure 15.  $I_{DD}$  measurement

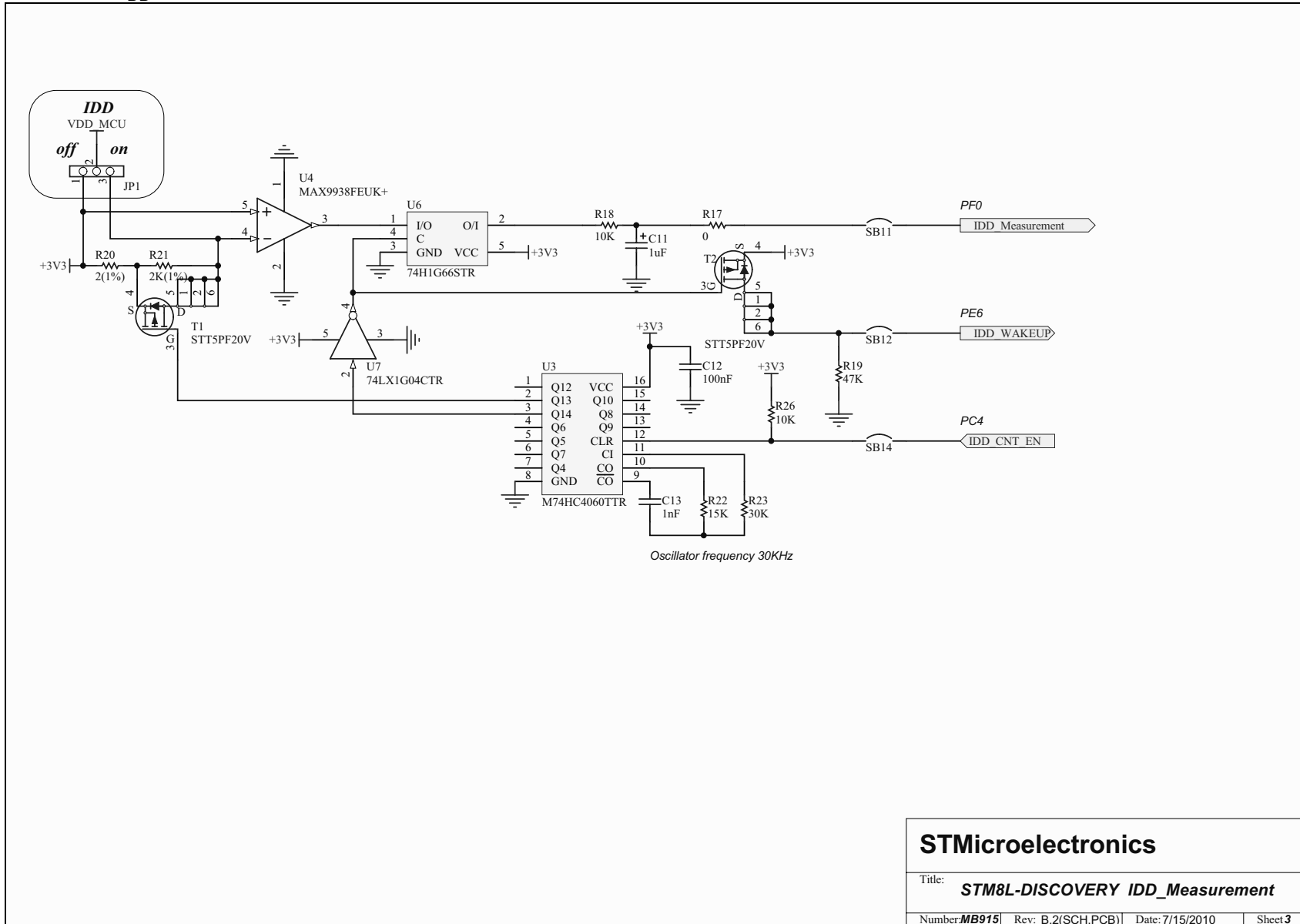
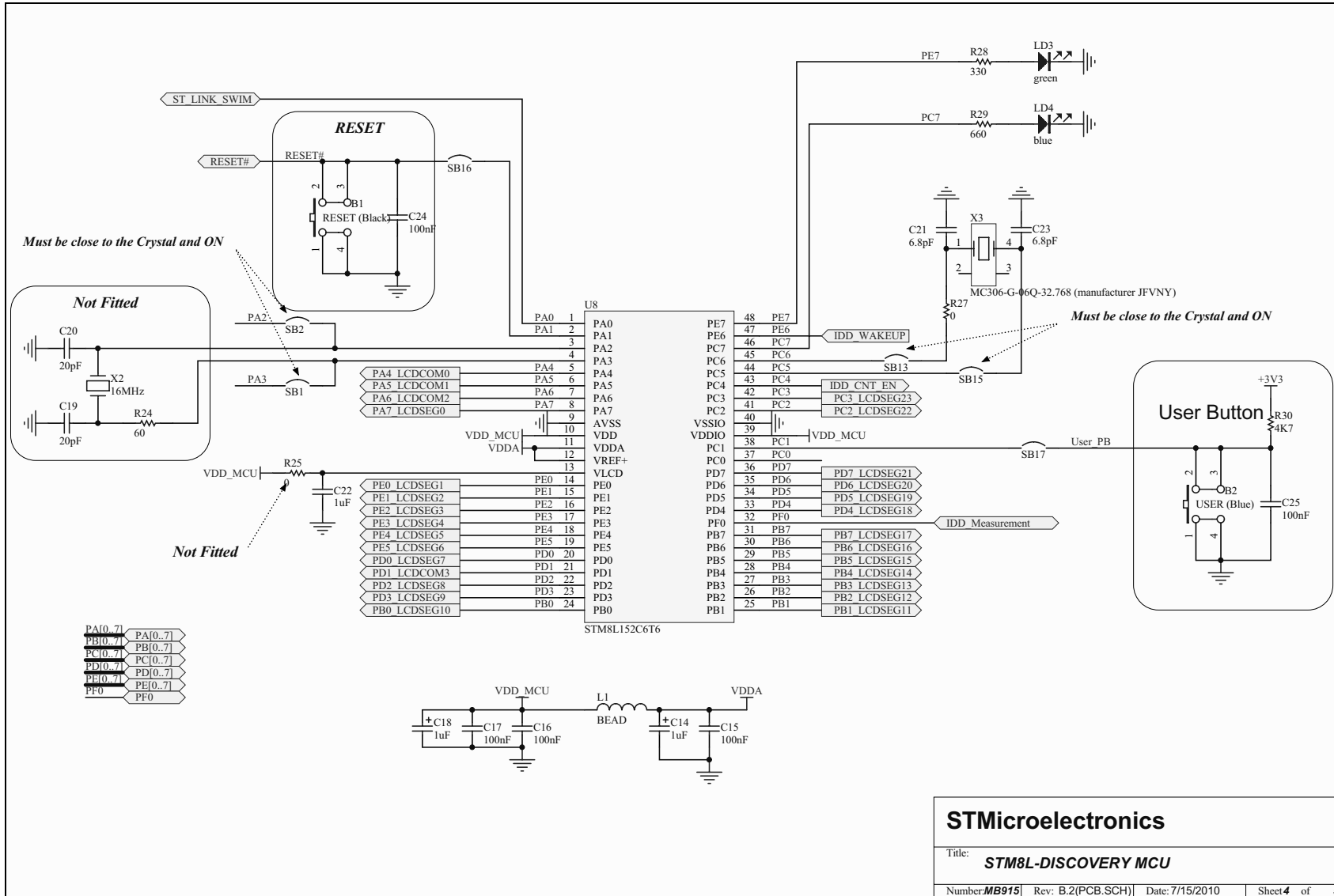


Figure 16. STM8L MCU

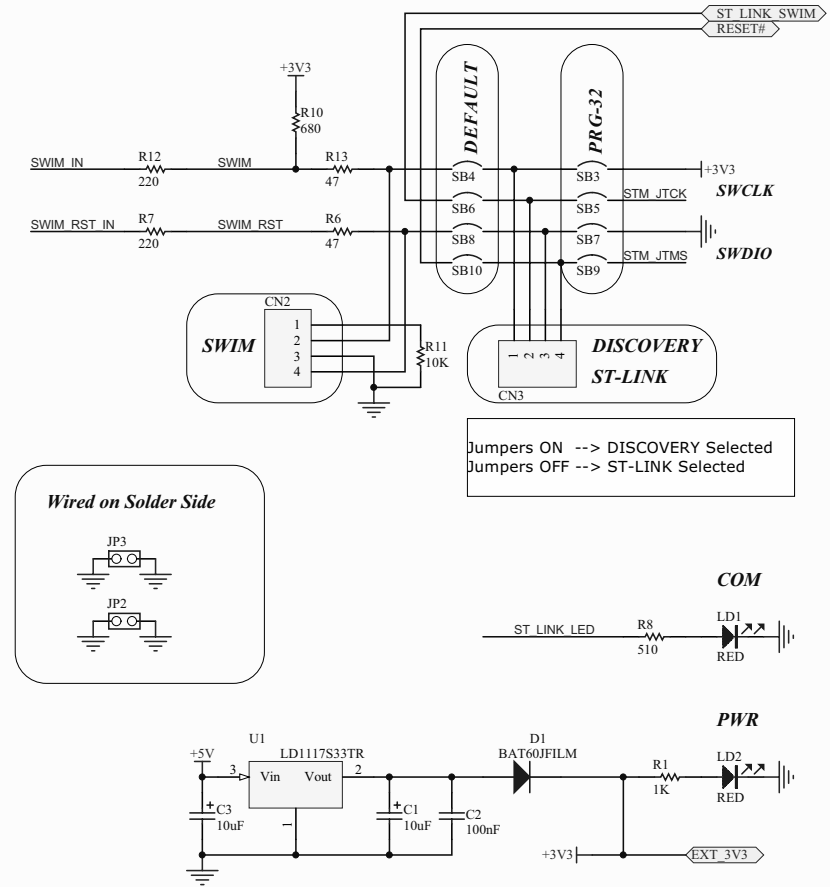
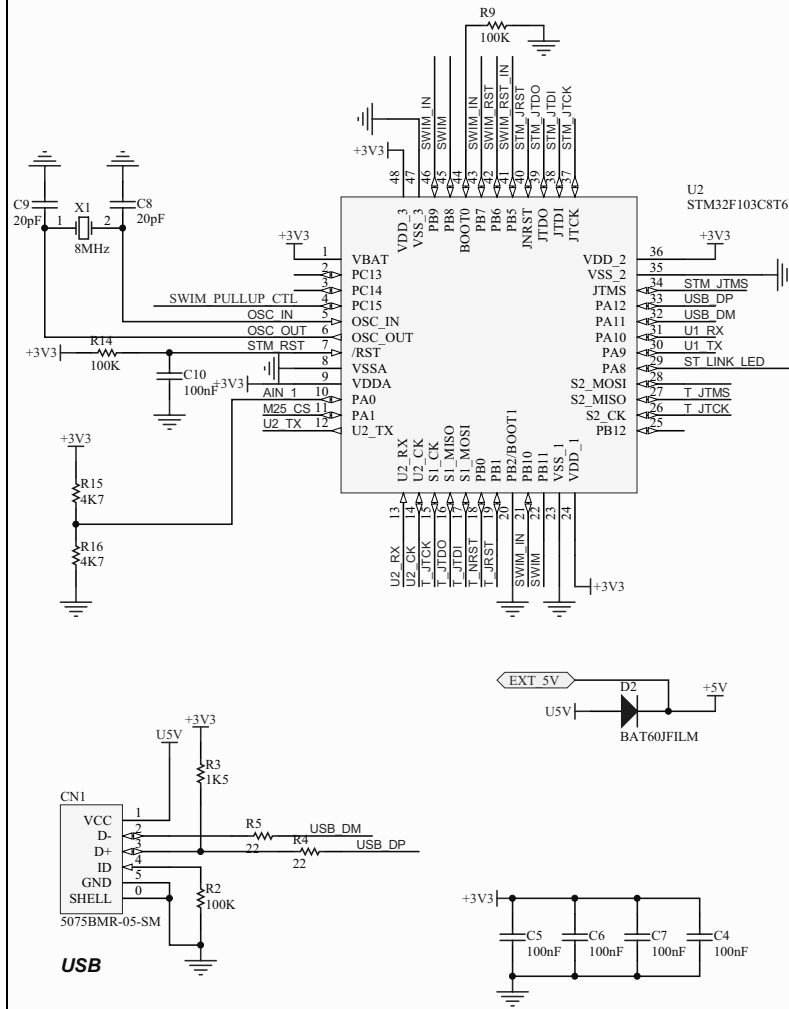


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Title: STM8L-DISCOVERY MCU

Number MB915 Rev: B.2(PCB.SCH) Date: 7/15/2010 Sheet 4 of 5

### Figure 17. ST-Link (SWIM only)

**STMicroelectronics**

Title: **STM8L-DISCOVERY ST-LINK (SWIM only)**

|                      |                   |                 |                            |
|----------------------|-------------------|-----------------|----------------------------|
| Number: <b>MB915</b> | Rev: B.2(PCB.SCH) | Date: 7/15/2010 | Sheet <b>5</b> of <b>5</b> |
|----------------------|-------------------|-----------------|----------------------------|

## 6 Revision history

**Table 9. Document revision history**

| Date        | Revision | Changes          |
|-------------|----------|------------------|
| 24-Sep-2010 | 1        | Initial release. |

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