Introduction

The STM8S-DISCOVERY is a quick start evaluation board which helps you to discover the STM8 features, and to develop and share your own application. It is based on an STM8S105 and includes an embedded debugger, ST-LINK, and a touch sensing button. Numerous applications are available from the STM8S-Discovery web page.

Features

- STM8S105C6T6 microcontroller, 32 KB Flash, 2 KB RAM, 1 KB EEPROM
- Powered by USB cable between PC and STM8S-DISCOVERY
- Selectable power of 5 V or 3.3 V
- Touch Sensing button, TS1
- User LED, LD1
- Extension header for all I/Os
- Wrapping area for users own application
- Embedded ST-LINK for STM8S
- USB interface for programming and debugging
- SWIM debug support

Figure 1. STM8S-DISCOVERY evaluation board
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1 Quick start

It is very simple to get started using the STM8S-DISCOVERY, just follow these four steps:
1. Connect the STM8S-DISCOVERY to a PC with a USB cable.
2. Press the TS1 button, and observe LED LD1 blinking.
3. Press the TS1 button to change blinking speed.
4. Visit www.st.com/stm8s-discovery and follow the tutorial, then discover other applications.

The STM8S-DISCOVERY helps you develop and share your own application.

You can discover more of the STM8S features by downloading and executing the proposed programs in the project list.

Note: The software code corresponding to this application is available under the name Discover in the project list of the STM8S-Discovery web page.
The STM8S-DISCOVERY is designed around the STM8S105C6T6 microcontroller in an LQFP48 package. It has two distinct sections that may be separated, the STM8S105C6T6 module and the ST-LINK module.

*Figure 2* illustrates the connections between the STM8S105C6T6 and its peripherals (ST-LINK, touch-sensing button, LED and connectors).

*Figure 3* helps you to locate these features on the STM8S-DISCOVERY board, as well as the potential point of separation (for more details refer to Section 2.2.2: Using the ST-LINK on other STM8S applications).

**Figure 2. Hardware block diagram**

![Hardware block diagram](image-url)
Figure 3. Top layout

- USB connector
- ST-LINK JTAG
- USB data transfer LED
- ST-LINK core
- SWIM connector
- Possible separation point
- LED (LD1)
- Power supply jumper
- External Osc. (16 MHz)
- STM8S105C6T6
- Touch sensing button (TS1)
- Wrapping area
- SO16 footprint

STM8S105C6T6 module

ST-LINK module
2.1 STM8S105C6T6 microcontroller

This device provides the following benefits:

- **Reduced system cost**
  - Integrated true data EEPROM for up to 300 K write/erase cycles
  - High system integration level; internal clock oscillators, brown-out reset, watchdog.

- **Performance and robustness**
  - 16 MHz CPU clock frequency
  - Up to 38 I/Os on a 48-pin package including 16 high sink outputs
  - Robust I/O immune against current injection
  - Independent watchdogs with separate clock source
  - Flexible clock control, 4 master clocks (HSI, LSI, HSE and external HSE)
  - Clock security system
  - A family of products for applications with 2.95 V to 5.5 V operating supply

- **Short development cycles**
  - Applications scalability across common family product architecture with compatible pinout, memory map and modular peripherals.
  - Full documentation and a wide choice of development tools
  - Standard S/W library for firmware and touch sensing development quick start
  - Numerous application notes and firmware examples available

- **Product longevity**
  - Advanced core and peripherals made in state-of-the-art technology
  - Low power modes (wait, active-halt, halt)
  - Auto wake-up timer for active halt
  - Permanently active, low consumption

- **Other features**
  - Nested interrupt controller with 32 interrupts
  - Up to 37 external interrupts on 6 vectors
  - 2 x 16-bit general purpose timers; with 2+3 CAPCOM channels (IC, OC or PWM)
  - Advanced control timer: 16-bit, 4 CAPCOM channels, 3 complementary outputs, dead-time insertion and flexible synchronization
  - 8-bit basic timer with 8-bit prescaler
  - UART with clock output for synchronous operation, Smartcard, IrDA, LIN
  - SPI interface up to 8 Mbit/s
  - I2C interface up to 400 Kbit/s
  - Analog-to-digital converter 10-bit, ±1 LSB ADC with up to 10 multiplexed channels
Figure 5. STM8S105 block diagram

For more information see the STM8S105xx datasheet (Doc ID 14771) on the ST website.
2.2 ST-LINK

The ST-LINK provides a USB interface for programming and debugging using a single wire interface module (SWIM). The ST-LINK module of the STM8S-DISCOVERY also supplies 5 V and 3.3 V to the STM8S105C6T6 module.

2.2.1 Using the ST-LINK

Figure 6. Typical configuration

Note: The driver for ST-LINK is installed automatically when the USB is connected.

For information about debugging and programming features refer to ST-LINK UM0627, UM0036 STVD and RN0011 STVP. For information about SWIM refer to UM0470.

2.2.2 Using the ST-LINK on other STM8S applications

You can connect your ST-LINK to other STM8S applications in 2 ways.

- By removing the solder bridges: This way uses the ST-LINK without breaking the PCB. Unsolder the two solder bridges SB1 and SB2 under the SWIM connector. See Figure 7. You can re-solder the two bridges at a later date thus keeping the STM8S-DISCOVERY usable.

- By removing it from your board: This way constitutes a good alternative to programming the STM8S devices in other applications. See Figure 8.

Note: This ST-LINK only supports the STM8S family. Do not use it with other STM8 families.

Figure 7. ST-LINK without breaking the PCB
Warning: By removing this module you will lose power supply on the STM8S105C6T6 evaluation board. In consequence, you will not be able to program and use the STM8S105C6T6 board without a SWIM cable and an external power supply.

To reconnect your STM8S105C6T6 use connector CNn see Section 3: Daughterboard connection.

2.3 Power supply and power selection

The power supply is provided by a USB connector. Jumper JP1 selects the VDD value (5 V or regulated 3.3 V) see Figure 9.

Figure 8. Separated ST-LINK module

Figure 9. Power selection
2.4 Single touch sensing

A touch sensing button TS1 is available on the STM8S-DISCOVERY (see Figure 10).

Figure 10. Touch sensing schematic

To disable the touch sensing interface and to use PC1, PC2 and PC3 as standard I/O, you need to unsolder the 2-1 connection and solder 2-3 connection on SB4 and SB3, you also need to unsolder the R2 resistor.

RC acquisition principle

The RC acquisition method detects a human touch on key touch sensor (TS1) by measuring the small variation of the touch electrode capacitance. Electrode capacitance is periodically charged and discharged through a fixed resistor (R6).

The capacitance value depends on the following parameters: electrode area (A), relative dielectric constant of the insulator (eR), the relative permittivity of air (e0) and the distance between the two electrodes.

For more information about touch sensing please refer to AN2927.
3 Daughterboard connection

Four 12-pin male headers CN1, CN2, CN3 and CN4 are connected to the STM8S105C6T6 microcontroller. See the following tables for pin assignments.

### Table 1. CN1 pinout

<table>
<thead>
<tr>
<th>Pin number (Cn1)</th>
<th>Pin number (chip)</th>
<th>Pin name</th>
<th>Type</th>
<th>Main function</th>
<th>Alternate function</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>NRST</td>
<td>IO</td>
<td>Reset</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>OSCIN/PA1</td>
<td>IO</td>
<td>Port A1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>OSCOUT/PA2</td>
<td>IO</td>
<td>Port A2</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>Vssio_1</td>
<td>S</td>
<td>I/O ground</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>Vss</td>
<td>S</td>
<td>Digital ground</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>VCAP</td>
<td>S</td>
<td>1.8V regulator capacitor</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>7</td>
<td>Vdd</td>
<td>S</td>
<td>Digital power supply</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>8</td>
<td>Vddio_1</td>
<td>S</td>
<td>I/O power supply</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>9</td>
<td>PA3</td>
<td>IO</td>
<td>Port A3</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>10</td>
<td>PA4</td>
<td>IO</td>
<td>Port A4</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>11</td>
<td>PA5</td>
<td>IO</td>
<td>Port A5</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>12</td>
<td>PA6</td>
<td>IO</td>
<td>Port A6</td>
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### Table 2. CN2 pinout

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<tr>
<th>Pin number (Cn2)</th>
<th>Pin number (chip)</th>
<th>Pin name</th>
<th>Type</th>
<th>Main function</th>
<th>Alternate function</th>
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<tbody>
<tr>
<td>1</td>
<td>25</td>
<td>PE5</td>
<td>IO</td>
<td>Port E5</td>
<td>SPI master / slave</td>
</tr>
<tr>
<td>2</td>
<td>26</td>
<td>PC1/TS1</td>
<td>IO</td>
<td>Port C1</td>
<td>Timer 1 - channel 1 / UART2 synchronous clock</td>
</tr>
<tr>
<td>3</td>
<td>27</td>
<td>PC2/TS1_load</td>
<td>IO</td>
<td>Port C2</td>
<td>Timer 1 - channel 2</td>
</tr>
<tr>
<td>4</td>
<td>28</td>
<td>PC3</td>
<td>IO</td>
<td>Port C3</td>
<td>Timer 1 - channel 3</td>
</tr>
<tr>
<td>5</td>
<td>29</td>
<td>PC4</td>
<td>IO</td>
<td>Port C4</td>
<td>Timer 1 - channel 4</td>
</tr>
<tr>
<td>6</td>
<td>30</td>
<td>PC5</td>
<td>IO</td>
<td>Port C5</td>
<td>SPI clock</td>
</tr>
<tr>
<td>7</td>
<td>31</td>
<td>Vssio_2</td>
<td>S</td>
<td>I/O ground</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>32</td>
<td>Vddio_2</td>
<td>S</td>
<td>I/O power supply</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>33</td>
<td>PC6</td>
<td>IO</td>
<td>Port C6</td>
<td>SPI master out / slave in</td>
</tr>
<tr>
<td>10</td>
<td>34</td>
<td>PC7</td>
<td>IO</td>
<td>Port C7</td>
<td>SPI master in / slave out</td>
</tr>
<tr>
<td>11</td>
<td>35</td>
<td>PG0</td>
<td>IO</td>
<td>Port G0</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>36</td>
<td>PG1</td>
<td>IO</td>
<td>Port G1</td>
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### Table 3. CN3 pinout

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<th>Pin number (Cn3)</th>
<th>Pin number (chip)</th>
<th>Pin name</th>
<th>Type</th>
<th>Main function</th>
<th>Alternate function</th>
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<tr>
<td>1</td>
<td>13</td>
<td>Vdda</td>
<td>S</td>
<td>Analog power supply</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>14</td>
<td>Vssa</td>
<td>S</td>
<td>Analog ground</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>15</td>
<td>PB7</td>
<td>IO</td>
<td>Port B7</td>
<td>Analog input 7</td>
</tr>
<tr>
<td>4</td>
<td>16</td>
<td>PB6</td>
<td>IO</td>
<td>Port B6</td>
<td>Analog input 6</td>
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<tr>
<td>5</td>
<td>17</td>
<td>PB5</td>
<td>IO</td>
<td>Port B5</td>
<td>Analog input 5</td>
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<tr>
<td>6</td>
<td>18</td>
<td>PB4</td>
<td>IO</td>
<td>Port B4</td>
<td>Analog input 4</td>
</tr>
<tr>
<td>7</td>
<td>19</td>
<td>PB3</td>
<td>IO</td>
<td>Port B3</td>
<td>Analog input 3</td>
</tr>
<tr>
<td>8</td>
<td>20</td>
<td>PB2</td>
<td>IO</td>
<td>Port B2</td>
<td>Analog input 2</td>
</tr>
<tr>
<td>9</td>
<td>21</td>
<td>PB1</td>
<td>IO</td>
<td>Port B1</td>
<td>Analog input 1</td>
</tr>
<tr>
<td>10</td>
<td>22</td>
<td>PB0</td>
<td>IO</td>
<td>Port B0</td>
<td>Analog input 0</td>
</tr>
<tr>
<td>11</td>
<td>23</td>
<td>PE7</td>
<td>IO</td>
<td>Port E7</td>
<td>Analog input 8</td>
</tr>
<tr>
<td>12</td>
<td>24</td>
<td>PE6</td>
<td>IO</td>
<td>Port E6</td>
<td>Analog input 9(2)</td>
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### Table 4. CN4 pinout

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<th>Pin number (chip)</th>
<th>Pin name</th>
<th>Type</th>
<th>Main function</th>
<th>Alternate function</th>
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<tbody>
<tr>
<td>1</td>
<td>37</td>
<td>PE3</td>
<td>IO</td>
<td>Port E3</td>
<td>Timer 1 – break Input</td>
</tr>
<tr>
<td>2</td>
<td>38</td>
<td>PE2</td>
<td>IO</td>
<td>Port E2</td>
<td>I2C data</td>
</tr>
<tr>
<td>3</td>
<td>39</td>
<td>PE1</td>
<td>IO</td>
<td>Port E1</td>
<td>I2C clock</td>
</tr>
<tr>
<td>4</td>
<td>40</td>
<td>PE0</td>
<td>IO</td>
<td>Port E0</td>
<td>Configurable clock output</td>
</tr>
<tr>
<td>5</td>
<td>41</td>
<td>PD0/LED</td>
<td>IO</td>
<td>Port D0</td>
<td>Timer 3 - channel 2</td>
</tr>
<tr>
<td>6</td>
<td>42</td>
<td>PD1/SWIM</td>
<td>IO</td>
<td>Port D1</td>
<td>SWIM data interface</td>
</tr>
<tr>
<td>7</td>
<td>43</td>
<td>PD2</td>
<td>IO</td>
<td>Port D2</td>
<td>Timer 3 - channel 1</td>
</tr>
<tr>
<td>8</td>
<td>44</td>
<td>PD3</td>
<td>IO</td>
<td>Port D3</td>
<td>Timer 2 - channel 2</td>
</tr>
<tr>
<td>9</td>
<td>45</td>
<td>PD4</td>
<td>IO</td>
<td>Port D4</td>
<td>Timer 2 - channel 1</td>
</tr>
<tr>
<td>10</td>
<td>46</td>
<td>PD5</td>
<td>IO</td>
<td>Port D5</td>
<td>UART2 data transmit</td>
</tr>
<tr>
<td>11</td>
<td>47</td>
<td>PD6</td>
<td>IO</td>
<td>Port D6</td>
<td>UART2 data receive</td>
</tr>
<tr>
<td>12</td>
<td>48</td>
<td>PD7</td>
<td>IO</td>
<td>Port D7</td>
<td>Top level interrupt</td>
</tr>
</tbody>
</table>
4 Mechanical drawing

Figure 11. STM8S-DISCOVERY
Figure 12. STM8S-DISCOVERY

- U_ST_LINK: ST_LINK.SCHDOC
- U_MCU: MCU.SCHDOC
- RESET# / ST_LINK/SWIM
- SB1
- SB2
- ST_LINK/SWIM

Electrical schematics
Figure 14. STM8S-DISCOVERY ST-LINK (SWIM only)
6 Revision history

Table 5. Document revision history

<table>
<thead>
<tr>
<th>Date</th>
<th>Revision</th>
<th>Changes</th>
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<tr>
<td>05-Oct-2009</td>
<td>1</td>
<td>Initial release.</td>
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<tr>
<td>22-Feb-2010</td>
<td>2</td>
<td>Section 2.4 modified.</td>
</tr>
<tr>
<td>28-Jul-2011</td>
<td>3</td>
<td>Section 4 added.</td>
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