



## Introduction

This user manual describes how to use the STM32-based capacitive touch demonstration kit to demonstrate the functionality and performance of the STMPE321, a 3-channel capacitive touchkey controller. Capacitance measurement is implemented in fully optimized hardware. All 3 I/Os can be configured as either capacitive touchkeys, or as GPIOs (general purpose I/O). This device is capable of interfacing with a main digital ASIC/controller through the 2-line communication protocol I<sup>2</sup>C.

In this demonstration kit, the STM32 microcontroller is used as the main digital controller to interface the STMPE321 device. The system utilizes the capacitive touchkey controller of the STMPE321 device and PWM features of STM32 to demonstrate the application.

The STMPE321 device controls 3 different touchkeys using an integrated capacitive touch controller. Touch events are indicated on the LEDs using the STM32 GPIO pins and the corresponding PWM frequency is generated on a separate LED using the STM32 timer generating PWM signals.

The demonstration requires two boards, connected using a 10-pin connector:

- STEVAL-PCC009V3 S-Touch™ family interface board based on the STM32
- STEVAL-ICB007V1 capacitive touch demonstration board based on the STMPE321

Please refer to the STEVAL-PCC009V3 BOM list and schematics contained in the UM0868 user manual.

Power to the STM32-based interface board is provided by a USB mini B-type connector, and power to the capacitive touch board is supplied by the STM32 interface board via the 10-pin connector.

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# 1 Getting started

## 1.1 System requirements

In order to use this demonstration board, only a USB power supply from the PC is required to power up the board.

## 1.2 Package contents

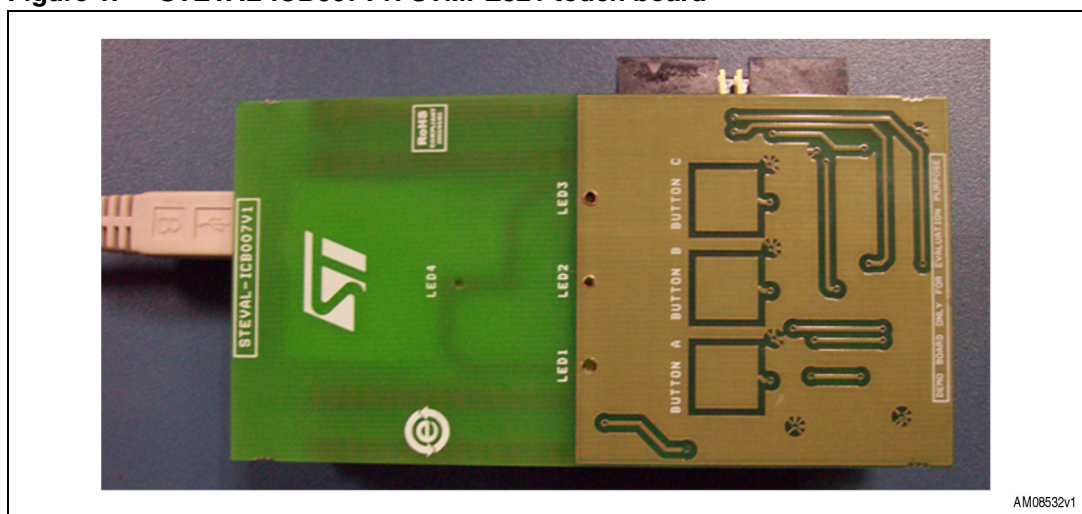
The STMPE321 demonstration board includes the following items:

- Hardware content:
  - STEVAL-PCC009V3: S-Touch family interface board based on STM32 with dfu capability
  - STEVAL-ICB007V1: Touch board with STMPE321 device
- Documentation:
  - User manual

## 1.3 Hardware installation

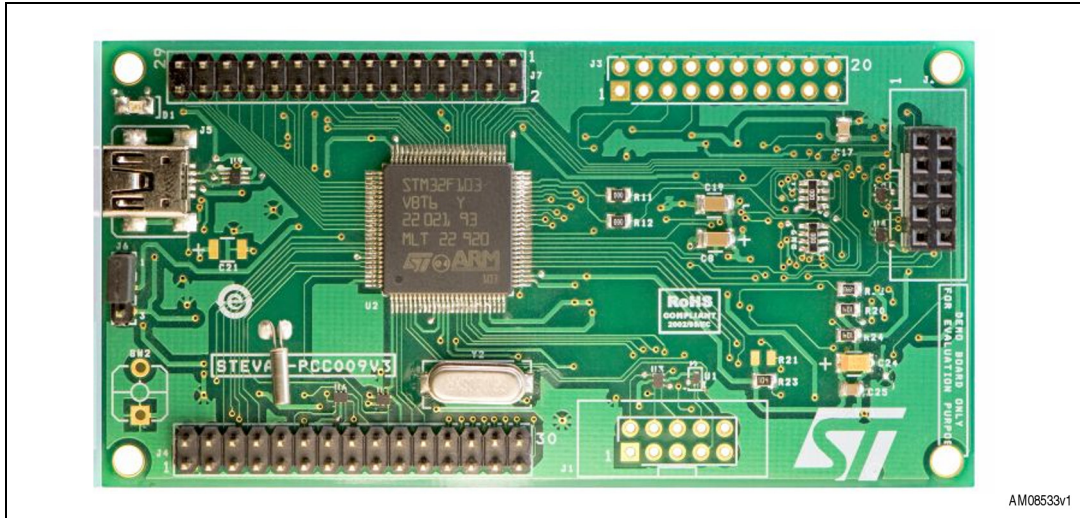
A snapshot of the STMPE321 touch board (STEVAL-ICB007V1) is shown in [Figure 1](#).

Figure 1. STEVAL-ICB007V1: STMPE321 touch board



A snapshot of the S-Touch family interface board based on STM32 (STEVAL-PCC009V3) is shown in [Figure 2](#).

**Figure 2. STEVAL-PCC009V3, STM32 interface board**



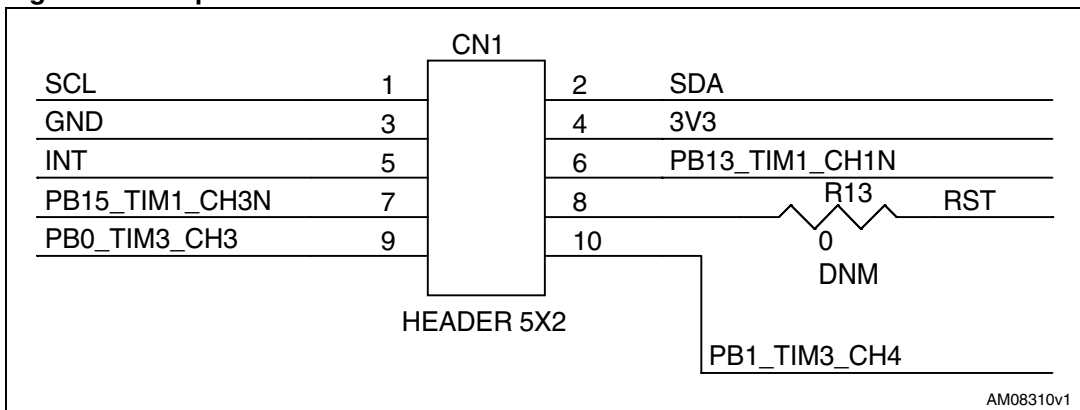
### 1.3.1 Power supply

The demonstration board is directly powered by the USB mini B-Type connector (J5 of STEVAL-PCC009V3).

### 1.3.2 Jumper / connector settings

- STEVAL-ICB007V1 touch board:
  - CN1: 10-pin connector interface to be connected to J2 of STM32 interface board (STEVAL-PCC009V3)

**Figure 3. 10-pin connector CN1**



- CN2 and CN3: support connectors to be connected to J4 and J7 respective of the STM32 interface board (STEVAL-PCC009V3).

- STEVAL-PCC009V3 STM32 interface board:
  - J2: this is the 10-pin connector available as the interface for the STMPE321 board (STEVAL-ICB007V1). It has the same electrical connections as shown in [Figure 3](#).
  - J4 and J7: support connectors for CN2 and CN3 of the STMPE321 board (STEVAL-ICB007V1).
  - J3: this is the standard 20-pin JTAG connector available in the demonstration board. This can be used to test the demonstration board in debug mode using any JTAG based debugger for the STM32 device. This connector is not mounted on the board.
  - J6: to enable the 3V3 supply to the entire board. To be connected in 1-2 position.

## 2 Program STEVAL-PCC009V3 with STMPE321 demo firmware

By default, STEVAL-PCC009V3 is programmed to work with the STMPE821 touch device (STEVAL-ICB002V1). The user should program the firmware using DFU to make it work with STMPE321 demo firmware. To program the STEVAL-PCC009V3 the user needs to follow the steps below:

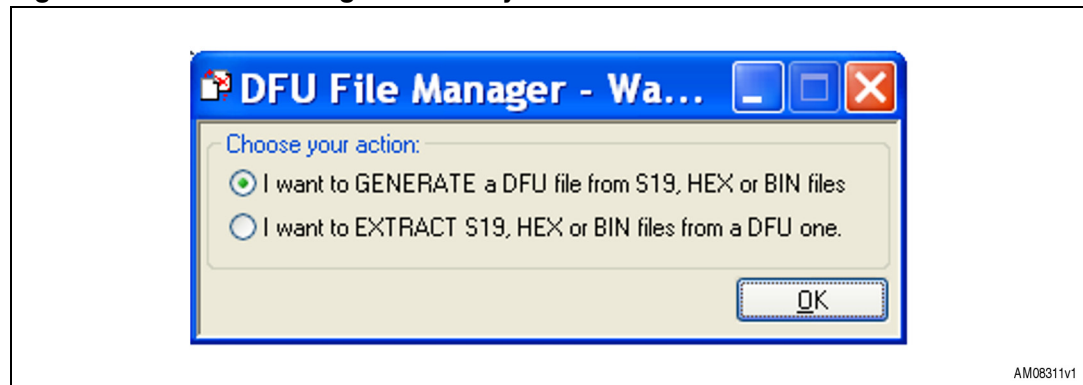
1. The DFU setup can be found in the UM0412 user manual
2. Steps for the DfuSe GUI demonstration:
  - Perform the software installation
  - Run the installation on the PC
  - Onboard connection to PC for DFU, a separate driver is required
  - The driver for the DFU is available in the installation folder (default path: C:\Program Files\STMicroelectronics\DfuSe driver)

For more details regarding DfuSe installation and operation, please refer to the UM0412 user manual available at C:\Program Files\STMicroelectronics\DfuSe\Sources\Doc.

3. In the STEVAL-PCC009V3 board, connect a jumper to connect pins 9 and 11 of J4 to enable DFU programming
4. Once the STEVAL-PCC009V3 board is connected to the PC, it asks for the driver. Please refer to step 2 to install the driver
5. Download the firmware HEX file from the IMS reference design area to a folder
6. Open the DFU file manager from Start -> All Programs -> STMicroelectronics -> DfuSe

The following window appears:

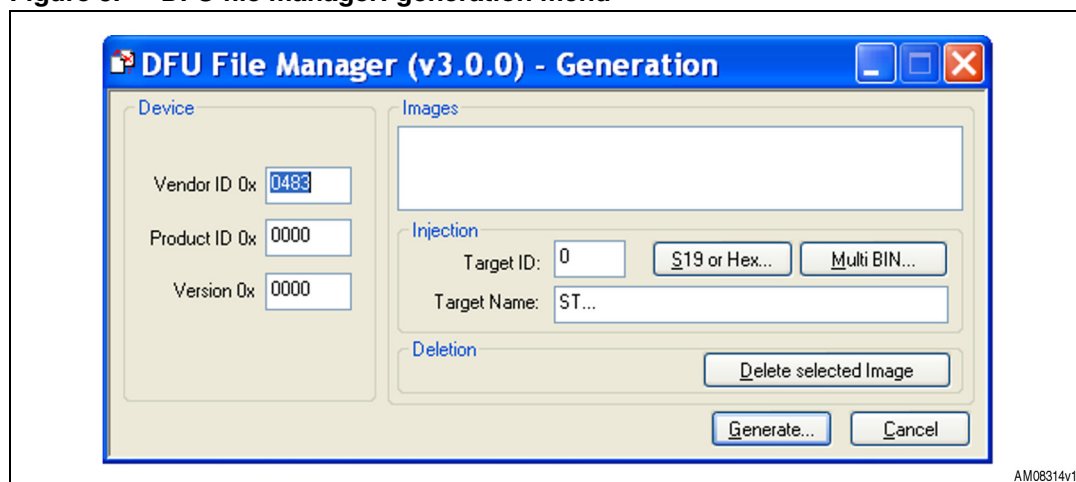
**Figure 4. DFU file manager “choose your action” menu**



7. Select the option “I want to GENERATE a DFU file from S19, HEX or BIN files”

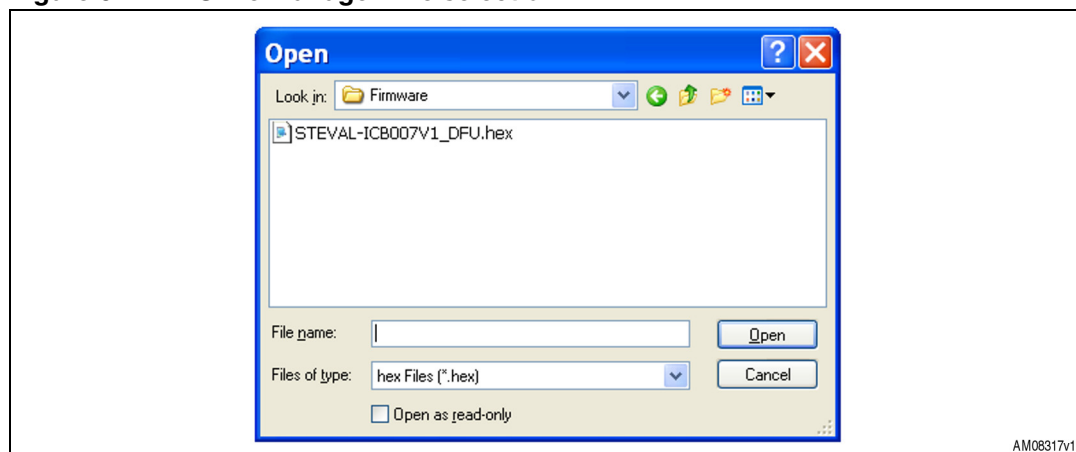
The following window appears:

**Figure 5. DFU file manager: generation menu**



8. Press S19 or HEX file and select the HEX file downloaded using the following option:

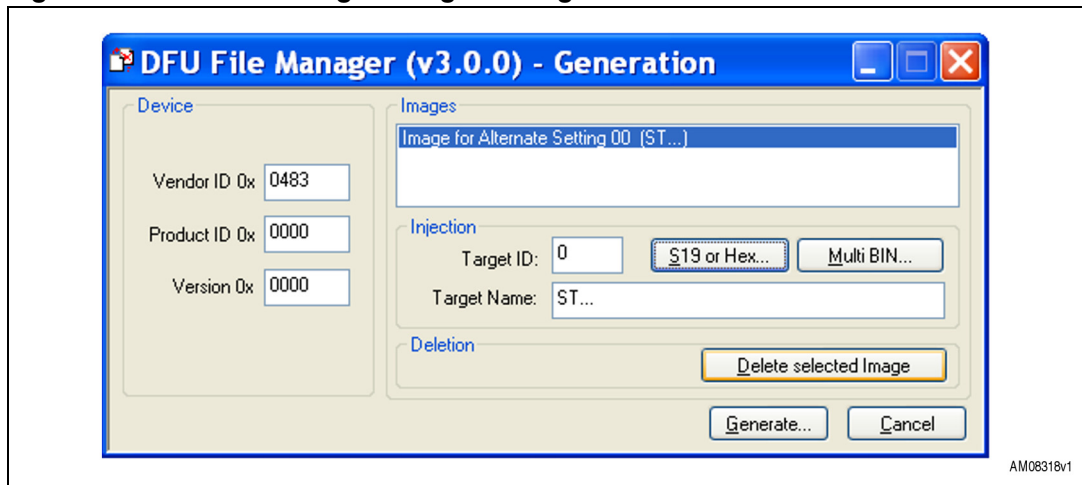
**Figure 6. DFU file manager: file selection**





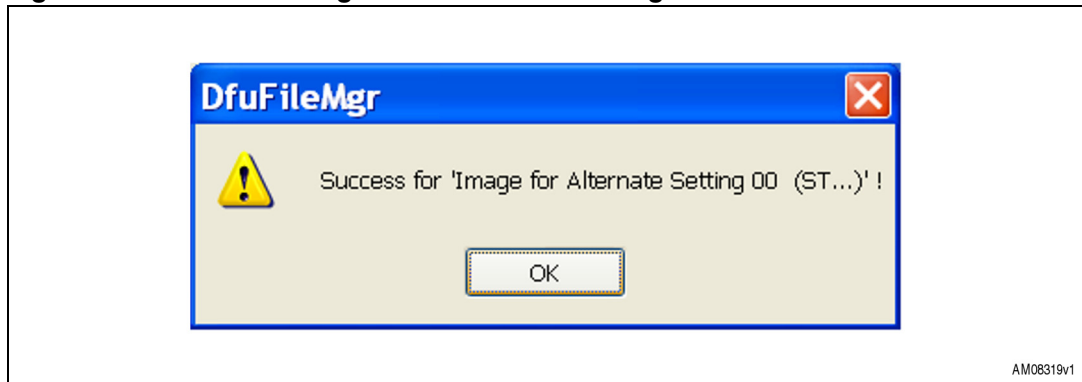
The following window appears:

**Figure 7. DFU file manager: image loading**



9. Press “Generate” and save the .dfu file generated

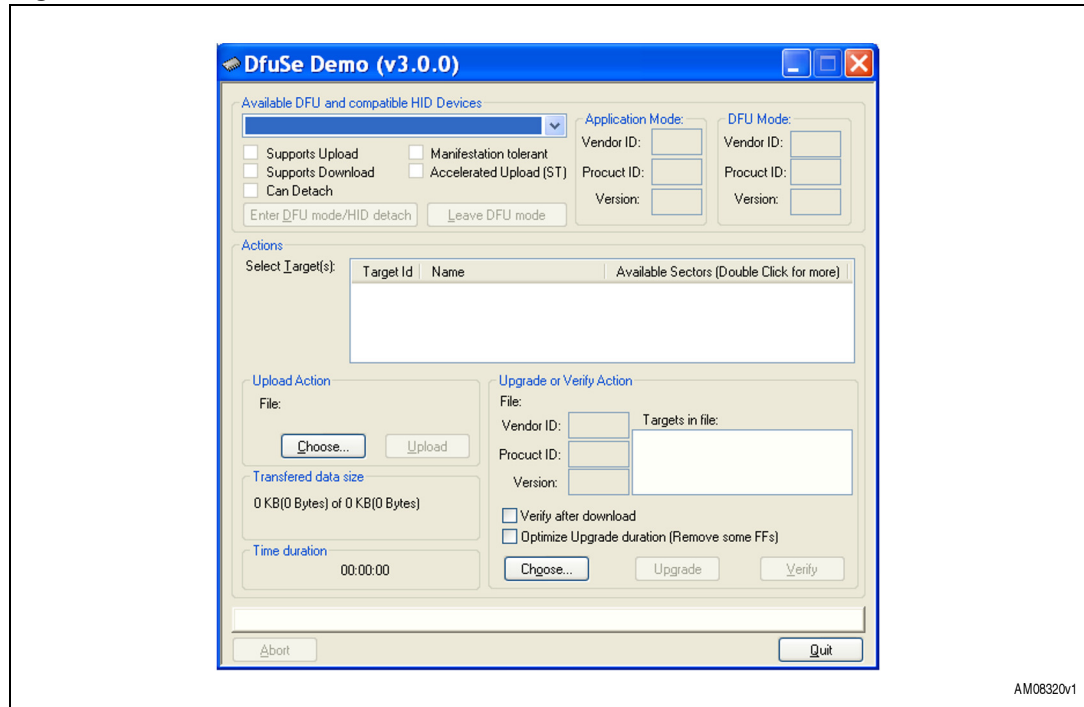
**Figure 8. DFU file manager: successful DFU file generator**



10. Open the DfuSe demonstration from Start -> All Programs -> STMicroelectronics -> DfuSe

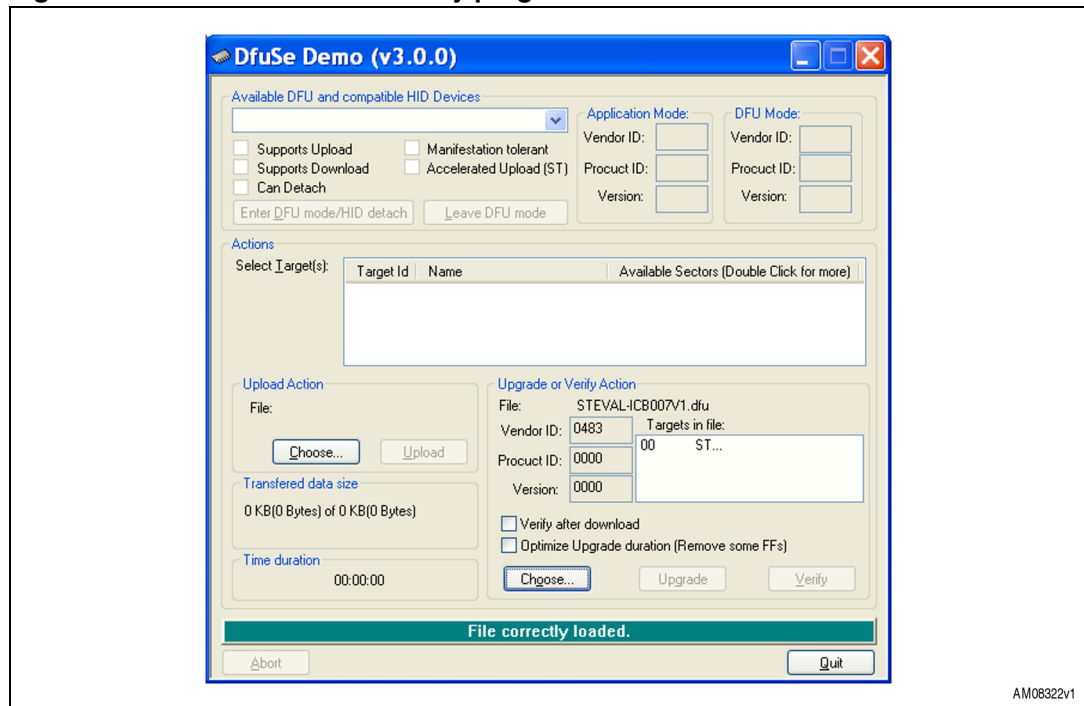
The following window appears:

**Figure 9. DfuSe demo: file selection menu**



11. Select the .dfu file using the button shown in the image above. If the .dfu file is correctly loaded the following window appears:

**Figure 10. DfuSe - file successfully programmed**



12. Press upgrade and the PCC009V3 is programmed with STMPE321 firmware.

### 3 Running the demonstration board

To run the demonstration board, firstly mount the STMPE321 board (STEVAL-ICB007V1) on the S-Touch family interface board based on the STM32 (STEVAL-PCC009V3).

On mounting the boards, the following onboard connectors should match perfectly.

**Table 1. Header overlapping for board mapping**

| STEVAL-ICB007V1 (touch board) | STEVAL-PCC009V3 (STM32 board) |
|-------------------------------|-------------------------------|
| CN3                           | J7                            |
| CN2                           | J4                            |
| CN1                           | J2                            |

- Connect the two boards as explained in [Table 1](#)
- Connect the STM32 interface board to the PC with the USB mini B-type cable. LED D1 glows on this board
- Also, on power-up, all 4 LEDs on the touch board glow for a moment
- On touching a single pad or multiple pads, the corresponding LED glows, as shown in [Table 2](#)

**Table 2. LED indication on touch**

| Touch event | LED   |
|-------------|-------|
| Button A    | LED 1 |
| Button B    | LED 2 |
| Button C    | LED 3 |

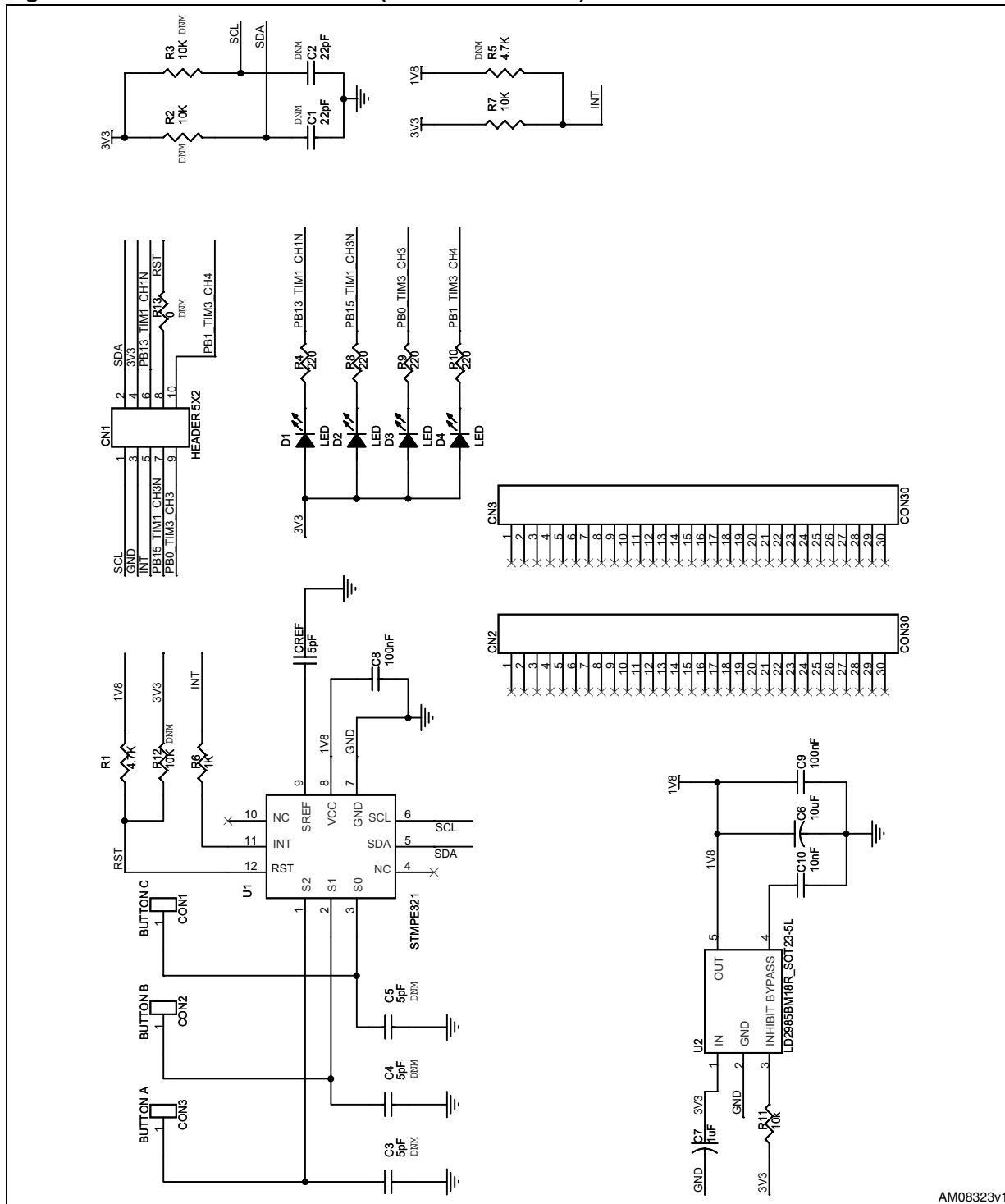
- LED4 blinks with a unique PWM frequency for each touch event.1

*Note:* The user can touch multiple LEDs at the same time. The corresponding LED glows to indicate all touch pads and LED4 glows with a particular PWM frequency.

# Appendix A Schematic and bill of materials

## A.1 Schematic

Figure 11. Touch board schematic (STEVAL-ICB007V1)



AM08323v1



## A.2 BOM list

Table 3. BOM list for the STEVAL-ICB007V1

| Category               | Reference designator | Component description            | Package           | Manufacturer          | Manufacturer's ordering code / orderable part number | Supplier           |
|------------------------|----------------------|----------------------------------|-------------------|-----------------------|--|--------------------|
| ST devices             | U1                   | STMPE321                         | QFN12             | STMicroelectronics    | STMPE321QTR  | STMicroelectronics |
|                        | U2                   | LD2985BM18R                      | SOT23-5L          | STMicroelectronics    | LD2985BM18R  | STMicroelectronics |
| Connectors and jumpers | CN1                  | Header 5X2 (interface connector) | Double row 10-pin | Protectron            | P9105-10-121   | Protectron         |
|                        | CN2,CN3              | CON30 (support connectors)       | Double row 30-pin | Protectron            | P9403-30-21  | Protectron         |
| LEDs                   | D1, D2,D3, D4        | LED                              | 0805              | Lite-On Inc           | 160-1176-1-ND  | Digi-Key           |
| Capacitors             | C1, C2               | 22 pF DNM                        | SMD0805           | Any                   | Any  | Any                |
|                        | C3, C4, C5           | 5 pF DNM                         | 0805              | Any                   | Any  | Any                |
|                        | C6                   | 10 $\mu$ F                       | 1206              |                       | 1213794  | Farnell            |
|                        | C7                   | 1 $\mu$ F                        | 1206              | Phillips              | 445-1383-2-ND  | Digi-Key           |
|                        | C8                   | 100 nF                           | 0805              | Any                   | Any  | Any                |
|                        | C9                   | 100 nF                           | 805               | Phillips              | PCC2452TR-ND   | Digi-Key           |
|                        | C10                  | 10 nF                            | SMD0805           | Any                   | Any  | Any                |
| Resistors              | CREF                 | 5 pF                             | 0805              | Any                   | Any  | Any                |
|                        | R1, R5               | 4.7 k $\Omega$                   | 0805              | Panasonic-ECG         | P4.7KACT-ND  | Digi-Key           |
|                        | R2, R3, R7, R11, R12 | 10 k $\Omega$                    | 0805              | Rohm Semiconductor    | RHM10.0KCCTND  | Digi-Key           |
|                        | R4, R8, R9, R10      | 220 $\Omega$                     | 0805              | Any                   | 1646159  | Farnell            |
|                        | R6                   | 1 k $\Omega$                     | 0805              | Any                   | Any  | Any                |
| MISC                   | R13                  | 0 DNM                            | SMD0805           | Stackpole Electronics | RMCF1/100RTR-ND                                      | Digi-Key           |
|                        | S1,S2,S0             | CON1 (touch pads)                | N.A.              | N.A.                  | N.A.   | N.A.               |

## Revision history

**Table 4. Document revision history**

| Date        | Revision | Changes          |
|-------------|----------|------------------|
| 28-Nov-2011 | 1        | Initial release. |

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