UM0868
User manual

STM32-based STMPE821 capacitive touch demonstration kit

Introduction

This user manual describes how to use the STM32-based capacitive touch demonstration kit to demonstrate the functionality and performance of the STMPE821, an 8-channel capacitive touch key controller.

The STMPE821 is a GPIO (general-purpose input/output) port expander with a built-in capacitive touch key controller. This device is capable of interfacing with a main digital ASIC/controller through the 2-line communication protocol I^2C.

In this demonstration, the STM32 microcontroller is used as the main digital controller to interface the STMPE821 device. The system utilizes the capacitive touch key controller, GPIO controller and PWM controller features of the STMPE821 device to demonstrate the application.

The STMPE821 device controls 3 different touch keys using an integrated capacitive touch controller. Touch events are indicated on the LEDs using the GPIO controller and the corresponding PWM frequency is generated on a separate LED using the PWM controller.

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

- **STEVAL-PCC009V3** S-Touch family interface board based on the STM32
- **STEVAL-ICB002V1** capacitive touch demonstration board based on the STMPE821

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

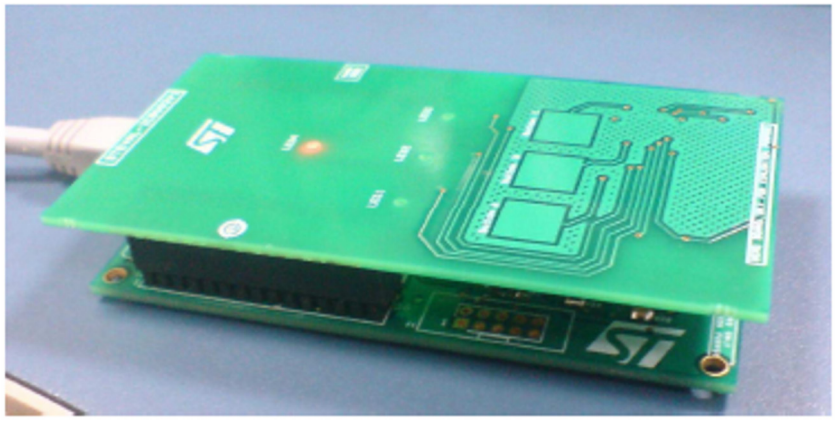
Only USB power from a PC is required to power up the demonstration board.

1.2 Package contents

The STMPE821 demonstration kit includes the following items:

- Hardware:
  - STEVAL-PCC009V3: S-Touch family interface board based on the STM32
  - STEVAL-ICB002V1: capacitive touch demonstration board based on the STMPE821
- Documentation:
  - User manual

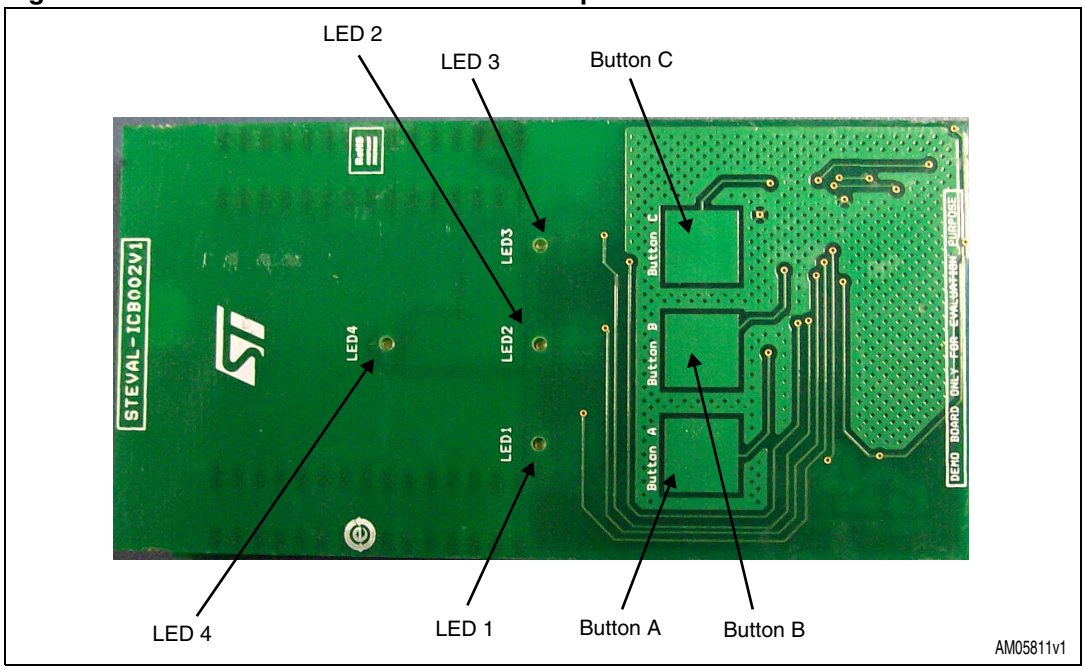
Figure 1. STM32-based STMPE821 capacitive touch demonstration kit



1.3 Hardware installation

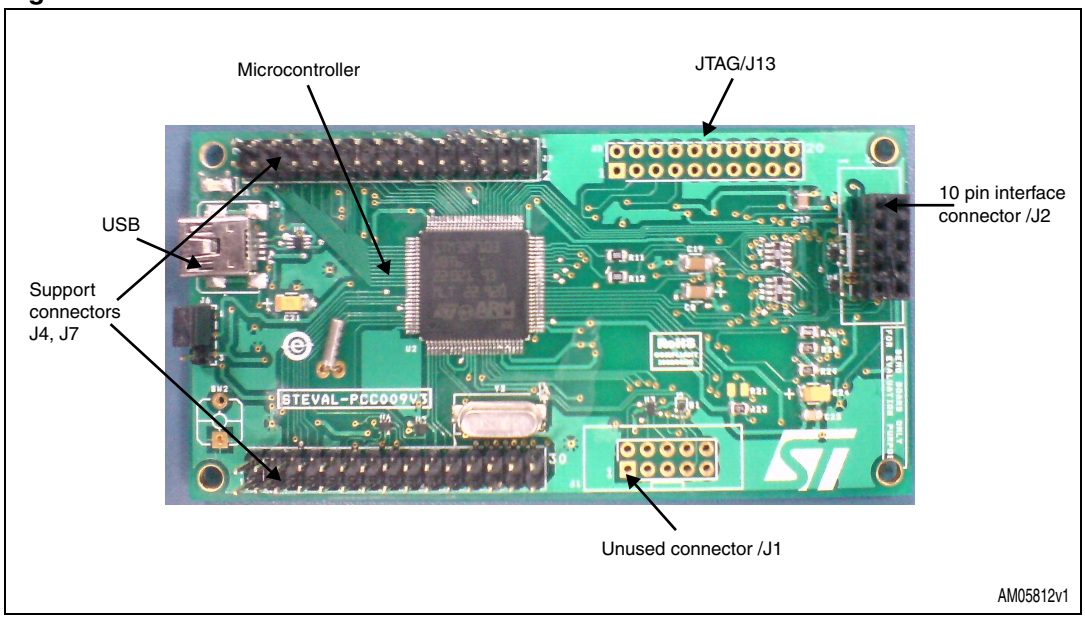
The capacitive touch STEVAL-ICB002V1 board is shown in *Figure 2* below.

Figure 2. STEVAL-ICB002V1: STMPE821 capacitive touch board



The STM32-based STEVAL-PCC009V3 interface board is shown in *Figure 3* below.

Figure 3. STEVAL-PCC009V3: STM32-based interface board



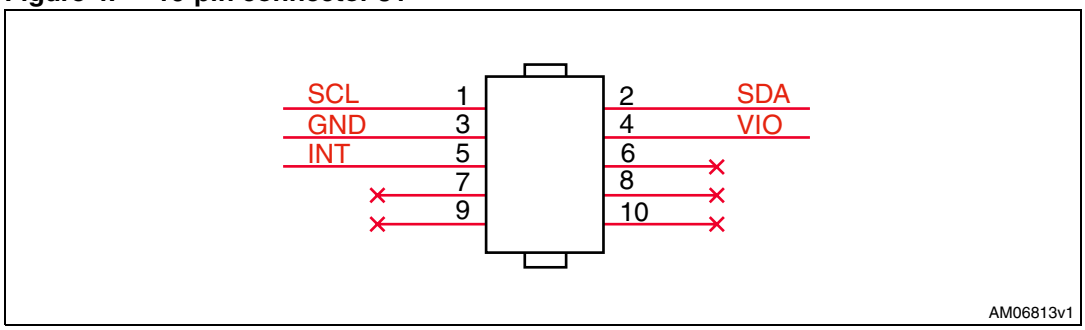
1.3.1 Power supply

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

1.3.2 Jumper/connector settings

- STEVAL-ICB002V1 capacitive touch board:
  - J1: 10-pin connector interface to be connected to J2 of the interface board (STEVAL-PCC009V3)

Figure 4. 10-pin connector J1



  - J3 and J4: support connectors to be connected to J4 and J7, respectively, of the interface board (STEVAL-PCC009V3)
- STEVAL-PCC009V3 S-Touch family interface board:
  - J2: 10-pin connector available as the interface for the STMPE821 board. It has the same electrical connections as those shown in *Figure 4* above
  - J4 and J7: support connectors for J4 and J3 of STMPE821 capacitive touch board
  - J3: standard 20-pin JTAG connector available on the demonstration board. It can be used to test the board in debug mode using any JTAG-based debugger for an STM32 device. This connector is not mounted on board.
  - J6: to enable the 3.3 V supply to the board. To be connected in 1-2 position

2 Running the demonstration

To run the demonstration perform the following steps:

1. Mount the STMPE821 capacitive touch board (STEVAL-ICB002V1) on the S-Touch family interface board (STEVAL-PCC009V3). When mounting the boards, the connectors should mate perfectly as shown in *Table 1*.

Table 1. Header overlapping for board mapping

STEVAL-ICB002V1 (touch board)	STEVAL-PCC009V3(STM32 board)
J3	J7
J4	J4
J1	J2

2. Connect the two boards as indicated in table above.
3. Connect the interface board to the PC with the USB mini B-type cable.

LED D1 glows on this board. On power-up, all 4 LEDs on the capacitive touch board glow for a moment. Upon touching a single pad or multiple pads, the corresponding LED glows (see table below):

Table 2. LED indication on touch

Touch event	LED
Button A	LED1
Button B	LED2
Button C	LED3

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

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.

3 Working in DFU mode

The required DFU setup (DFuSe) is available for download from the STMicroelectronics web site at http://www.st.com/mcu/familiesdocs-110.html, under section “Software-PC”.

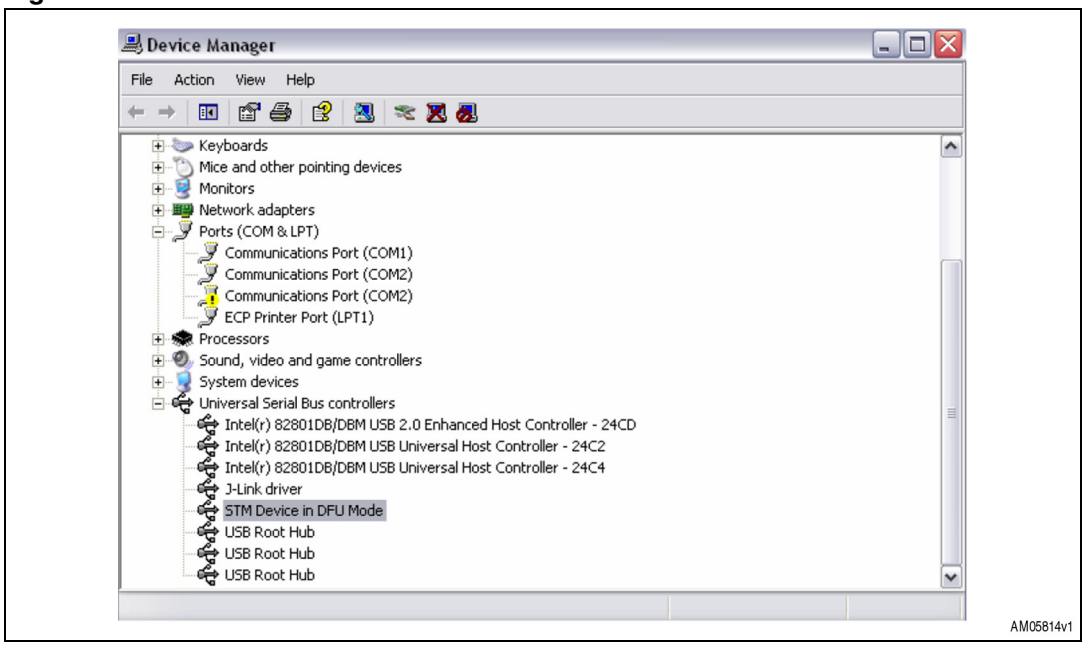
After installing the setup, plug in the board. When the PC prompts for a driver, follow the path: Program Files\STMicroclectronics\DFUSe\Driver, and select the driver

The user manual for the DFU GUI is available at the same link.

To work in DFU mode, remove the mini USB cable from the STM32-based interface board and power it down.

Short pin 9 and 11 of J4 by connecting the 2-pin jumper mounted on J4 of the STEVAL-PCC009V3 board. Then, connect the mini USB cable. At this point the board should be enumerated and listed in the device manager window, as shown in *Figure 5*. If this does not occur, please contact the technical support.

Figure 5. Enumeration in DFU mode



Appendix A Schematic diagrams and bill of material

A.1 Schematic diagrams

Figure 6. S-Touch family interface board schematics (STEVAL-PCC009V3)

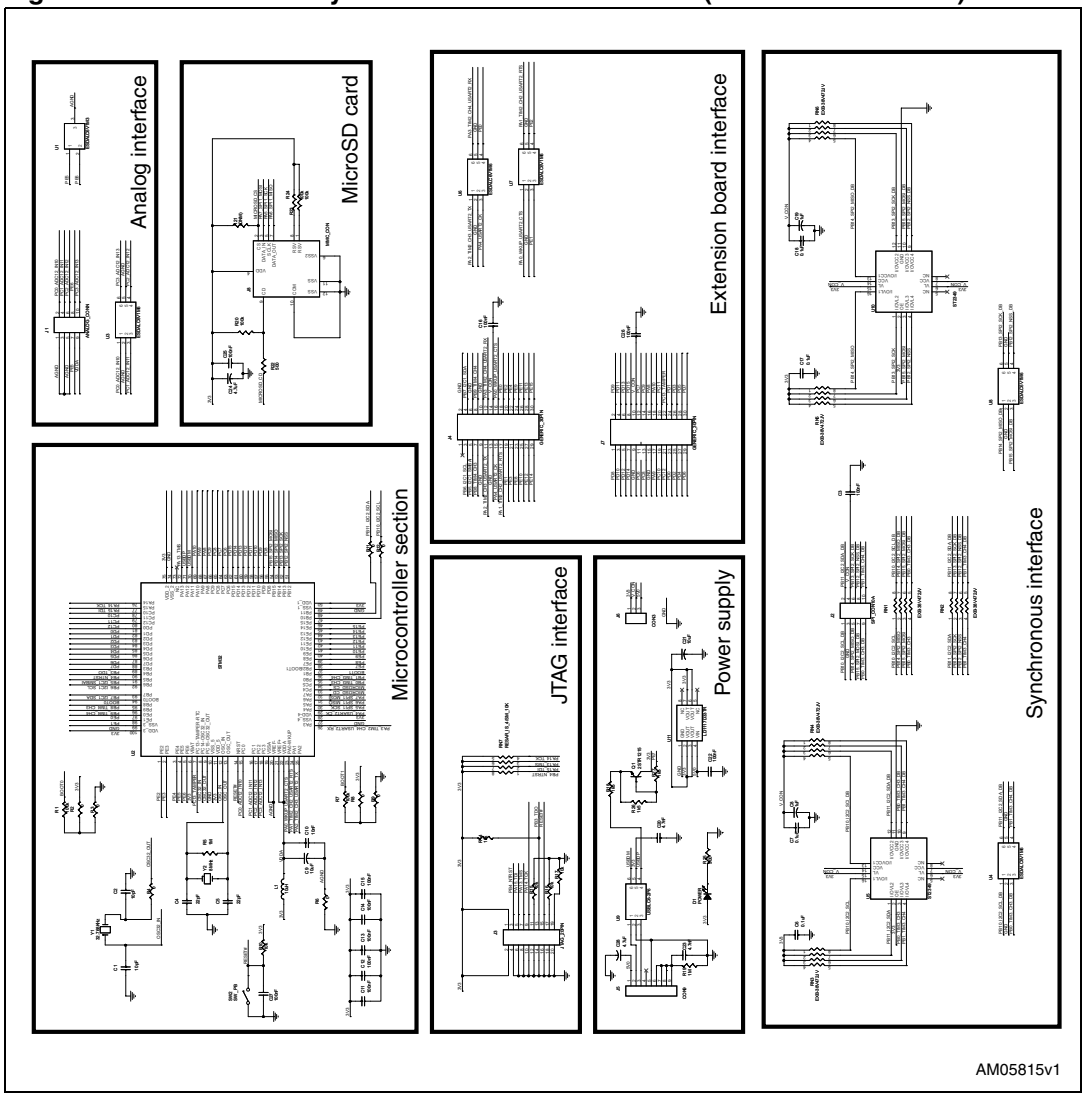


Figure 7. Capacitive touch board schematics (STEVAL-ICB002V1)

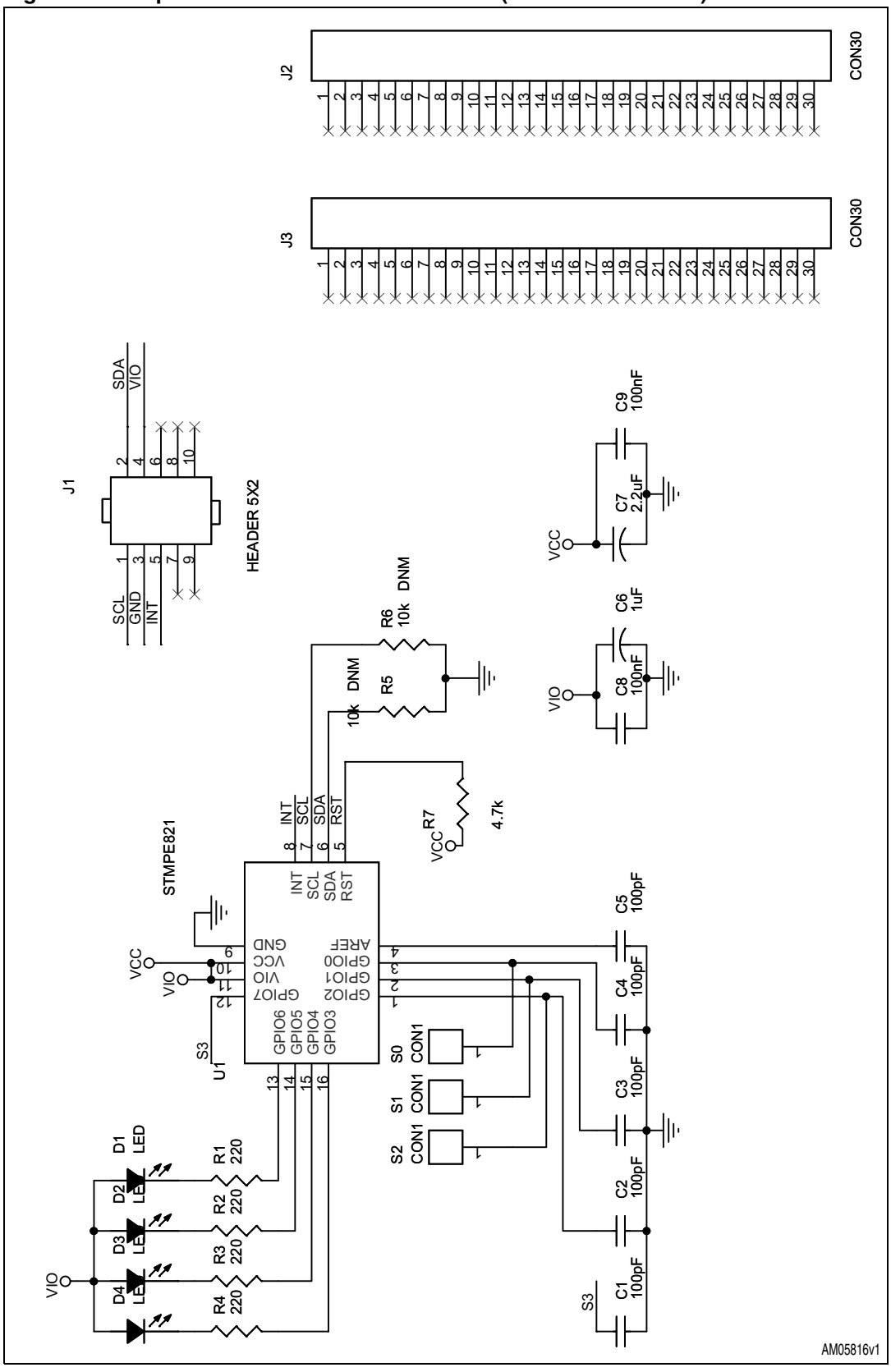


Table 3. Bill of material for the S-Touch family interface board (STEVAL-PCC009V3)

Category	Ref. Des.	Component description	Package	Manufacturer	Manufacturer order code / orderable part number	Supplier
ST devices	U1	ESDALC6V1M3	SOT883	STMicroelectronics	ESDALC6V1M3	STMicroelectronics
	U11	LD1117D33TR	SO-8	STMicroelectronics	LD1117D33TR	STMicroelectronics
	U5,U10	ST2349QTR (not mounted)	QFN16	STMicroelectronics	ST2349QTR (not mounted)	STMicroelectronics
	U2	STM32F103VBT6	LQFP100	STMicroelectronics	STM32F103VBT6	STMicroelectronics
	U9	USBLC6-2P6	SOT-666	STMicroelectronics	USBLC6-2P6	STMicroelectronics
	U3,U4,U6,U7,U8	ESDALC6V1M6	µQFN16	STMicroelectronics	ESDALC6V1M6	STMicroelectronics
Crystal and oscillator	Y2	8 MHz	11.35 x 4.5 mm crystal	ECS Inc	X1094-ND	
	Y1	32.768 kHz	Through-hole	Abracon	AB38T-32.768 kHZ	
Connectors and jumpers	J1	SPI_CON10A	Header 2x5 pin, 2.54 mm x 2.54 mm Pitch	Protectron	P9403-10-21	Protectron
	J2	JTAG_20PIN (not mounted)	Header 2x10 pin, 2.54 mm x 2.54 mm pitch	Protectron		Protectron
	J3	USB-B	USB mini B-type	Samtec	Any	Samtec
	J4,J7	30 pin connector	Support	Protectron	P9105-30-21	Protectron
	J5	Power selection jumper	Jumper 1x3 pin, 2.54 mm pitch	Any	Any	Any
	J6	Mode selection jumper	Jumper 1x2 pin, 2.54 mm pitch	Any	Any	Any
	SW2	RESET switch	Push button (not mounted)	Any	Any	Any
LEDs	D1	LED	3 mm SMD LED	Lite-On Inc	160-1176-1-ND	Digi-Key

Table 3. Bill of material for the S-Touch family interface board (STEVAL-PCC009V3) (continued)

Category	Ref. Des.	Component description	Package	Manufacturer	Manufacturer order code / orderable part number	Supplier
Capacitors	C1,C2	10 pF	SMD0805	Any	N.A.	Any
	C3,C11,C12,C13, C14,C15,C16,C22 ,C25,C26,C27	100 nF	SMD0805	Any	N.A.	Any
	C4,C5	22 pF	SMD0805	Any	N.A.	Any
	C6,C7,C17,C18	0.1 µF	SMD0805	Any	N.A.	Any
	C9,C21	10 µF	SMD0805	Taiyo Yuden	587-1339-2-ND	Digi-Key
	C10	10 nF	SMD0805	Any	N.A.	Any
	C20,C23	4.7 nF	SMD0805	Any	N.A.	Any
	C8,C19	1 µF	SMD1206	TDK Corporation	445-1383-2-ND	Digi-Key
	C24,C28	4.7 µF	SMD1206	Any		Any
Inductors	L1	10 µH	SMD inductor	TDK Corporation	445-1059-1-ND	Digi-Key

Table 3. Bill of material for the S-Touch family interface board (STEVAL-PCC009V3) (continued)

Category	Ref. Des.	Component description	Package	Manufacturer	Manufacturer order code / orderable part number	Supplier
Resistors	R1,R7,R20,R23, R24	100 kΩ	SMD0805	Yageo	311-100KARTR-ND	Digi-Key
	R2,R3,R4,R6,R8, R9	0	SMD0805	Stackpole Electronics	RMCF1/100RTR-ND	Digi-Key
	R5,R19	1 MΩ	SMD0805	Stackpole Electronics	RMCF1/101MJRTRND	Digi-Key
	R10,R14,R15,R16 ,R17	10 kΩ	SMD0805	Rohm Semiconductors	RHM10.0KCCTND	Digi-Key
	R18	1.5 Ω	SMD0805	Stackpole Electronics	RMCF1/101.5KJRTRND	Digi-Key
	R21	(DNM)	SMD0805	Any	N.A.	Digi-Key
	R22, R25	500 Ω	SMD0805	Any	N.A.	Digi-Key
	RN1,RN2,	0 Ω resistor array (4 resistor)	1608 matrix	Panasonic-ECG	Y9000CT-ND	Digi-Key
	RN3,RN5,	4.7 kΩ resistor array (not mounted)	1608 matrix	Any	N.A.	Digi-Key
	RN7	10 kΩ resistor array (4 resistor)	1608 matrix	Panasonic-ECG	Y9103CT-ND	Digi-Key
	RN4,RN6	4.7 kΩ resistor array (4 resistor)	1608 matrix	Yageo	YC164J-4.7KCT-ND	Digi-Key

Table 4. Bill of material for the capacitive touch board (STEVAL-ICB002V1)

Category	Ref. des.	Component description	Package	Manufacturer	Manufacturer order code / orderable part number	Supplier
ST devices	U1	STMPE821	QFN16	STMicroelectronics	STMPE821QTR	STMicroelectronics
Connectors and jumpers	J1	Header 5x2 (interface connector)	5x2 (2.54 mm pitch)	Protectron	P9105-10-121	Protectron
	J2,J3	CON30 (support connectors)	15x2 (2.54 mm pitch)	Protectron	P9403-30-21	Protectron
LEDs	D1,D2,D3,D4	LED (red)	805	Lite-On Inc	160-1176-1-ND	Digi-Key
Capacitors	C1,C2,C3,C4,C5	100 pF	805	Phillips	399-1177-1-ND	Digi-Key
	C6	1 µF	1206	Phillips	445-1383-2-ND	Digi-Key
	C7	2.2 µF	1206	Phillips	490-3381-1-ND	Digi-Key
	C8,C9	100 nF	805	Phillips	PCC2452TR-ND	Digi-Key
Resistors	R1,R2,R3,R4	220 Ω	805	Panasonic-ECG	P220DACT-ND	Digi-Key
	R5,R6	10 kΩ DNM	805	Rohm semiconductor	RHM10.0KCCTND	Digi-Key
	R7	4.7 kΩ	805	Panasonic-ECG	P4.7KACT-ND	Digi-Key

Revision history

Table 5. Document revision history

Date	Revision	Changes
21-Jan-2010	1	Initial release.

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