

24-pin smartcard interface ST8034HC demonstration board

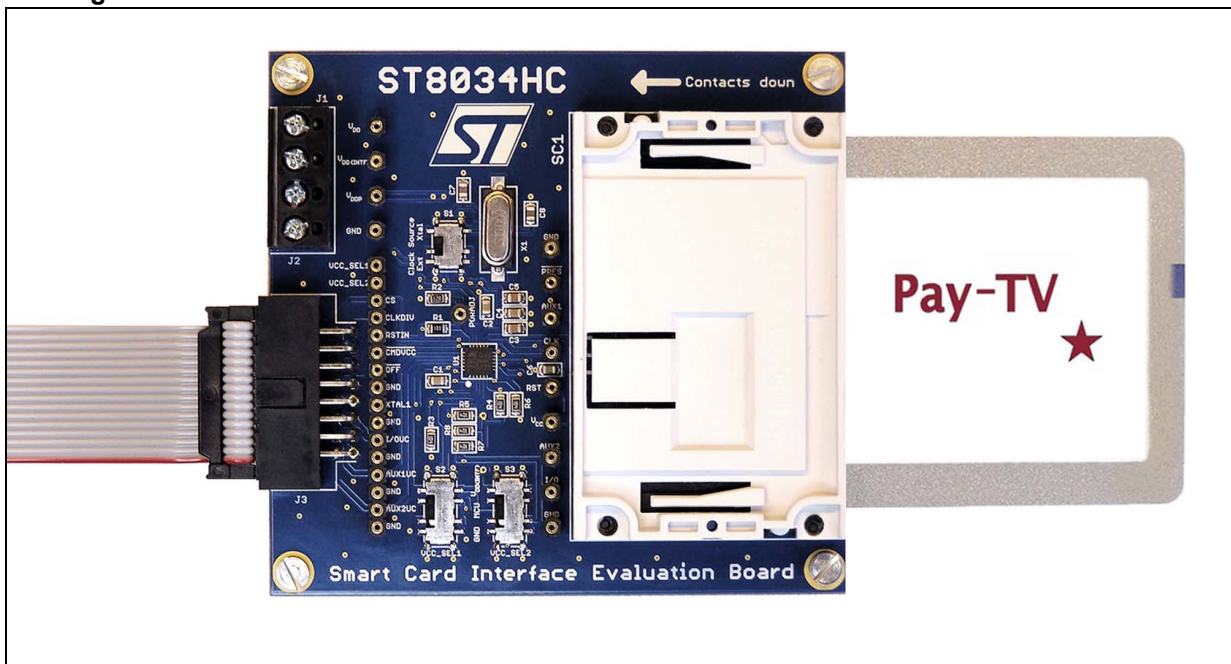
Introduction

The purpose of this document is to describe, and provide information on, how to efficiently use the ST8034HC smartcard interface device demonstration board.

The ST8034xx is a family of complete smartcard interface devices, compatible with ISO 7816, NDS and EMV™ 4.3 payment systems that provide selectable supply voltage for the smartcard with automatic deactivation sequence in case of overload, short-circuit or undervoltage, with programmable internal or external clock signal, reset signal and protected I/O data lines. The ST8034HC and ST8034C product variants also provide a chip select function that allows the device interface to be isolated from the microcontroller bus signals and to share the bus among multiple card interface devices in a parallel combination.

In summary, ST8034xx interface devices are placed between the smartcard and the microcontroller to provide all supply, protection, detection and control functions, with just minimum external components.

Figure 1. Demonstration board with card connector and microcontroller board interface



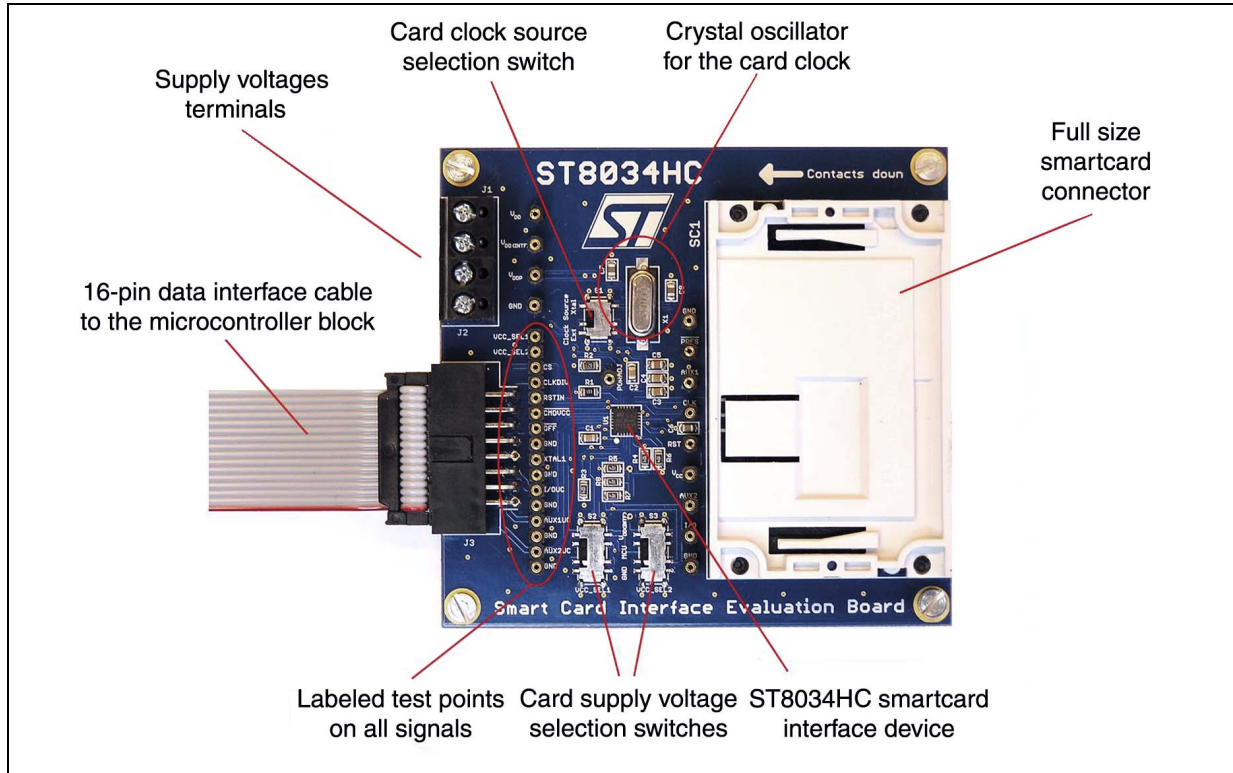
1 Applications

Smartcard readers for

- Set-top boxes
- Pay-TV
- Identification
- Tachographs
- Banking

2 Description

Figure 2. Demonstration board description



2.1 Use of the demonstration board

The ST8034HC demonstration board is designed both for standalone operation or to be fully controlled by the microcontroller; it is fully configurable and provides access to all the signals including supply voltages through labeled test points and uses a standard connector for a simple communication interface with the microcontroller block. The labeled test points on the board are in the same order as the signals in the flat interface cable.

The following blocks provide the demonstration board configurability:

- Crystal clock oscillator (10 MHz): can be used to provide card clock in a standalone operation.
- Card clock source selection switch: allows selection between the onboard crystal oscillator as the card clock source (clock source switch position “Xtal”), or an external clock source provided by the microcontroller block through the MCU interface together with the data signals (clock source switch position “Ext”).
- Card supply (V_{CC}) selection switches: the demonstration board provides easy but flexible card supply voltage selection either by the onboard configuration switches or by the microcontroller. Put the VCC_SEL1 and VCC_SEL2 switches to the position “V_{DD(INTF)}” (logic high level) or “GND” (logic low level) to select the desired V_{CC} value (5.0 V, 3.0 V or 1.8 V) according to [Table 1](#), or to the center position (“MCU”) which connects this signal to the microcontroller interface to allow its control of these input signals.

Table 1. V_{CC} selection by VCC_SEL1 and VCC_SEL2 switches

VCC_SEL1 position	VCC_SEL2 position	V _{CC}
GND	x ⁽¹⁾	1.8 V
V _{DD(INTF)}	V _{DD(INTF)}	5 V
V _{DD(INTF)}	GND	3 V
MCU	MCU	Set by the microcontroller

1. x = don't care, however, please note that a combination of VCC_SEL1 = VCC_SEL2 = GND and CMDVCC = high puts the ST8034HC device into a deep shutdown mode.

For an easy connection of oscilloscope probes to the test points, remove the plastic tip with the hook from the probes and insert the center pin into the test point terminal. Ground test points are available in a sufficient amount throughout the board.

2.2 Smartcard interface

The demonstration board contains a full size smartcard connector. Insert the smartcard from the right-hand side, card contacts facing down. Card presence detection is implemented (a presence switch inside the card connector, normally open).

2.3 Interface to a microcontroller block

A standard 16-pin header connector with a standard cable is used to interconnect the ST8034HC demonstration board module with a microcontroller block. The voltage level for communication on this interface is V_{DD(INTF)}.

2.4 Default functionality notes

- No floating pins: for simple standalone testing, all the input signal levels are softly defined by pull-up or pull-down resistors on the board, refer to [Figure 4: Schematic diagram](#).
- The PORADJ undervoltage threshold on the V_{DD(INTF)} supply voltage (UVLO) is set by R1 and R2 to 1.5 V typ. The resistors can be replaced with different values to set different undervoltage thresholds on V_{DD(INTF)}:

$$V_{DD(INTF)} \text{ UVLO threshold (falling)} = (R1 + R2) / R2 \times V_{TH(PORADJ)}$$

$$V_{DD(INTF)} \text{ UVLO threshold (rising)} = (R1 + R2) / R2 \times (V_{TH(PORADJ)} + V_{HYST(PORADJ)})$$

For detailed specifications of the voltage threshold values, refer to Table 6 of the ST8034HC datasheet.

The sum of R1 + R2 should be about 100 kΩ, which is a good compromise between a sufficient robustness and a minimum current consumption.

Please consider tolerance ranges of the resistors used in the resistor divider and specifications range of the V_{TH(PORADJ)} to make sure that even in the worst case the real V_{DD(INTF)} undervoltage deactivation threshold does not fall in the desired operating voltage range (i.e. consider also voltage supply tolerance range).

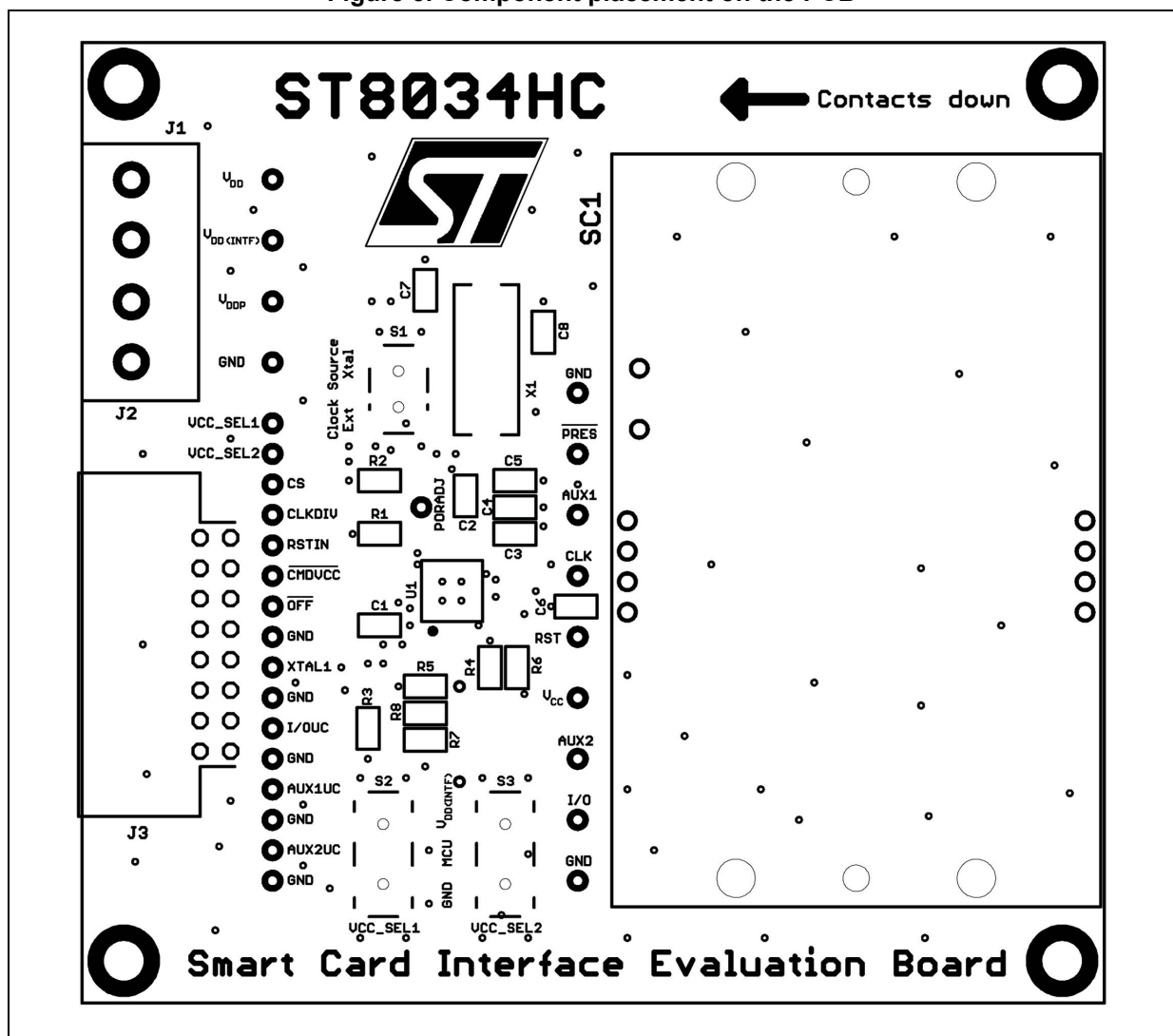
3 Board layout

3.1 Layout recommendations

The ST8034xx family of devices includes an LDO block to generate V_{CC} supply voltage for the smartcard, which (in contrast to previous ST8024/8024L devices with a charge pump) does not generate any noise and therefore even the requirements for a printed circuit board layout and external component selection are not so strict (general PCB layout rules apply). On the other hand, the LDO requires the input voltage (V_{DDP}) to be at least about 100 mV greater than the desired output voltage (V_{CC}). Place the decoupling capacitors as close as possible to the appropriate pin of the ST8034 device and use sufficiently wide PCB tracks. Make the data and clock lines as short as possible and use a ground plane.

3.2 Component placement

Figure 3. Component placement on the PCB



5 Bill of material

Table 2. Bill of material

Component	Value	Type	Manufacturer	Note
U1		ST8034HCQR	STMicroelectronics®	QFN24 4 x 4 x 0.8 mm package
SC1		7434L0825S01LF	FCI	
J1		ARK210/2EX	Xinya	
J2		ARK210/2EX	Xinya	
J3		T821116A1R100CEU	Amphenol	
S1		SSSS820201	ALPS	
S2		SSSS820501	ALPS	
S3		SSSS820501	ALPS	
X1	10 MHz	Q 10.0-SMU4-30-30	Jauch	
R1	18 kΩ	0805		
R2	82 kΩ	0805		
R3	100 kΩ	0805		
R4	100 kΩ	0805		
R5	100 kΩ	0805		
R6	100 kΩ	0805		
R7	100 kΩ	0805		
R8	100 kΩ	0805		
C1	100 nF	0805		
C2	100 nF	0805		
C3	100 nF	0805		
C4	100 nF	0805		
C5	10 μF	0805		
C6	220 nF	0805		
C7	10 pF	0805		
C8	10 pF	0805		
Cable connectors	2 x 8 pins / 16-lead	T812116A101CEU	Amphenol	
Cable	16-lead	1-57040-6	TE Connectivity	

6 Revision history

Table 3. Document revision history

Date	Revision	Changes
02-May-2013	1	Initial release.

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