

GemCore410-EMV

Technical Specifications



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Introduction

The GemCore410-EMV is a modular, yet compact coupler. This device offers the simplest means of integrating a smart card reader/writer into different types of electronic devices.

Built around the GemCore™ Lite V1.32 architecture, this coupler allows large systems to easily access all types of smart cards through an on-board or external smart card connector.

A Security Access Module (SAM) can also be connected to the board.

The interface with the host processor is a serial TTL or RS-232 link. The communication protocol, Gemplus Block Protocol (GBP), is supplied as a C language source code library. PC/SC drivers are provided for Windows environments.

The GemCore410-EMV complies with EMV Level 1 and CB (Carte Bancaire) standards. It meets the requirements of many applications, such as the following:

- Integration in payphones or screen-phones for all types of telecom applications
- Central component in payment terminals for all types of payment or electronic purse applications
- Interface with other devices for automatic vending applications
- Central component for dedicated access control (physical or logical) applications
- Metering

The GemCore410-EMV is physically compatible with its predecessors, the GemCore410 and the GCI400.

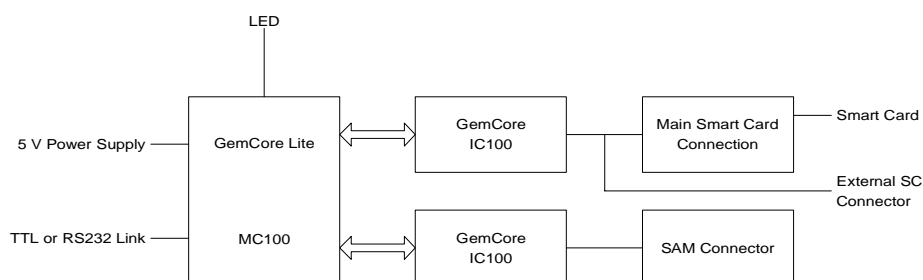


Figure 1 - GemCore410-EMV Architecture

Who Should Read This Book

This document provides detailed technical specifications for the GemCore410-EMV smart card coupler. It is designed for use by developers who have expert knowledge of electronics.

Contact Our Hotline

If you do not find the information you need in this manual, or if you find errors, contact the Gemplus hotline by phone, fax, or email. In your email, please include the document reference number, your job function, and the name of your company. (You will find the document reference number at the bottom of the legal notice on the inside front cover.)

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From Our Web Site

<http://www.gemplus.com>

Technical Features

Architecture

Firmware	GemCore™ Lite S024 V1.32 - GK
Hardware	<ul style="list-style-type: none">• Two IC100 interface chips: one for the smart card and another for the Security Access Module (SAM)• One LED• Connectors for the remote (non-EMV) smart card, the RS-232 link and the TTL link

Communication Interface

Smart Card	<ul style="list-style-type: none">• Has a transmission speed up to 115,200 bps• Reads from and writes to all ISO7816-1 to -4 microprocessor smart card (T=0, T=1) and all memory cards• Reads both EMV and non-EMV ISO cards
Host	<ul style="list-style-type: none">• Has a Serial link with TTL or RS-232 levels• Has a programmable transmission speed ranging from 9,600 bps to 76,800 bps• Plug and Play support

Power Supply

The GemCore410-EMV is supplied with a limited power source or class II < 100VA.
(See *UL 60950* §2.5).

Consumption	<ul style="list-style-type: none">• Typical: 25 mA• 60 mA additional consumption per powered smart card• Maximum: 200 mA
Coupler Voltage	4.75 V to 5.25 V
Smart Card Voltage	3 V or 5 V

Operating Conditions

Storage Temperature	-40°C to +85°C
Operating Temperature	0°C to +70°C
Humidity	95% at +40°C
Vibration	10 Hz to 150 Hz, 2g.

On-Board Smart Card Connector

Connector Parameters	<ul style="list-style-type: none">• Landing technology with smart card presence detection• Guaranteed for 80,000 insertion cycles (UTE C 93-421 standard), not recommended for intensive use such as access control• ISO chip location• Manual insertion
----------------------	---

Card Protection

- Protection from short circuits
- Protection from card withdrawal when the card is powered on
- ESD = 4KV on card pins, human body model

Physical Characteristics

Dimensions	45 mm x 80 mm x 20 mm
Weight	100 g

Compliance with Standards

Environment Standard	<ul style="list-style-type: none">• CE 89/336/EEC• FCC part 15 Class B
Security Levels	<ul style="list-style-type: none">• IEC 950• UL 60950
Other standards	<ul style="list-style-type: none">• EMVCo, CB, WHQL: see “<i>Appendix D - Certification</i>”

Note: FCC and CE certifications are only applicable when connector K2 is not connected.

Regulatory Information

This device is compliant with part 15 of the FCC rules. Operation is subject to the following two conditions :

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

Notice for the USA: FCC Statement

Federal Communications Commission (FCC) Radio Frequency Interference Statement (USA Only)

This equipment has been tested and found to comply with the limits for a class B digital device, pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try one of more of the following measures:

- Relocate the radio or television antenna.
- Plug the equipment away from the radio or television.
- Plug the equipment into a different electrical outlet, so that the equipment and the radio or television are on separate electrical circuits.
- Make sure that all your peripheral devices are also FCC Class B certified.

- Make sure you use only shielded cables to connect peripheral devices to your equipment.
- Consult your equipment dealer, or an experienced radio / television technician for help.

Warning: The system verification tests were conducted with Gemplus supported peripheral devices. Cables used with this equipment must be properly shielded to comply with the requirements of the FCC.

Changes or modifications not expressly approved by Gemplus could void the user's authority to operate the equipment.

"The Unit shall be supplied by a Limited Power Source circuit or Class 2 output"

Kits and Services

Gemplus supports its customers by offering high-quality services and tools including:

- Customized or standard **Training and Technical Assistance**
- The **PC/SC drivers** for Windows: use the same driver as the GemPC413 reader (refer to <http://www.gemplus.com>)
- The **Gemplus Block Protocol (GBP) Interface Library Kit** to accelerate the development of the reader application software (refer to <http://www.gemplus.com>)

See “*Appendix C - Drivers and Libraries*” for additional information.

Pin Connectors

The GemCore410-EMV has three connectors which are described in the following paragraphs.

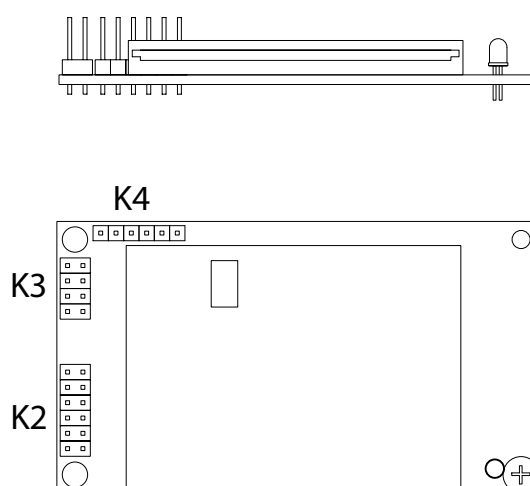


Figure 2 - GemCore410-EMV Pin Connectors

Connector K2

Connector K2 makes it possible to use a remote main smart card connector.

To Connect	Cut These Pins
ISO-only connector	1 and 2
AFNOR and ISO-location connector	11 and 12

Table 1 - Cutting the Pins

The remote connector must be connected as shown in the following figure:

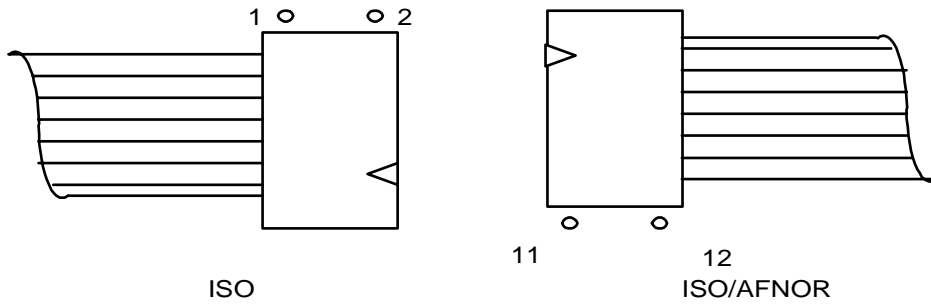


Figure 3 - Connecting the Remote Connector

Note: You cannot use a remote smart card interface and the GemCore410-EMV smart card interface at the same time.
 Commands to be used for the remote connector are the same as those for the main connector.

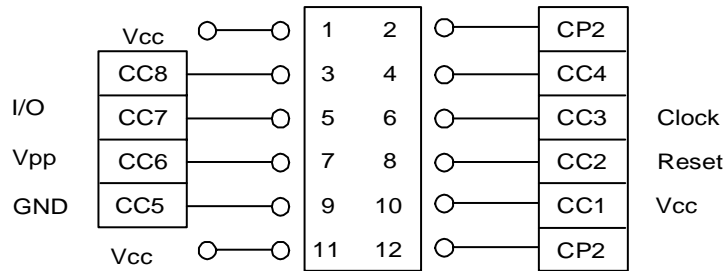


Figure 4 - Remote Smart Card Interface Pin Designations

- CC1 Smart card contact C1 (Vcc)
- CC2 Smart card contact C2 (RESET)
- CC3 Smart card contact C3 (CLOCK)
- CC4 Smart card contact C4
- CC5 Smart card contact C5 (GND)
- CC6 Not connected (NC)
- CC7 Smart card contact C7 (I/O)
- CC8 Smart card contact C8
- CP2 Card Presence 2
- GND Ground
- I/O Input/output

Vcc	Supply voltage
Vcc/CP2	Smart card presence switch detector (closed when a card is inserted).
Vpp	Programming voltage

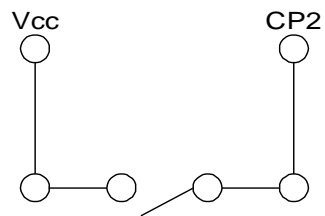


Figure 5 - Card Presence Detection

Connector K3

Connector K3 is used for the power supply and TTL serial links.

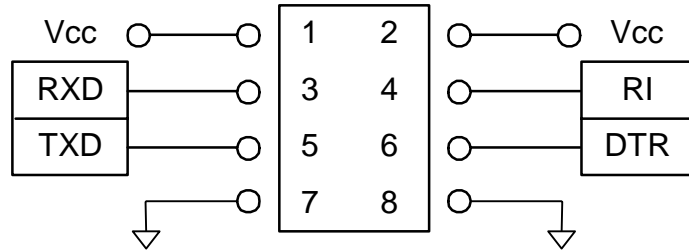


Figure 6 - K3 Pin Designations

Vcc	Power supply +5V ±5%
GND	Ground
RXD	Receive data line
TXD	Transmit data line
RI	Used for Presence Card
DTR	Used for Plug and Play (PnP)

Note: RXD, TXD, RI and DTR are TTL-level connections.

Connector K4

K4 is used for power supply and serial RS-232 links.

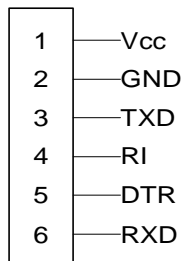


Figure 7 - K4 Pin Designations

Vcc	Power supply +5V \pm 5%
GND	Ground
TXD	Transmit data line RS232 (RXD_PC)
RI	Used for Presence Card
DTR	Used for Plug and Play (PnP)
RXD	Receive Data Line RS232 (TXD_PC)

Note: RXD, TXD, RI and DTR are RS-232-level connections.



Application Note

This appendix describes how to integrate a GemCore410-EMV coupler onto a PCB. It is designed to help users develop devices that are fully compliant with the previous version of couplers such as the GCI410.

This appendix lists the modifications in terms of:

- Mechanical compatibility
- Electrical compatibility
- Firmware compatibility

For a description of the compatibility between the GemCore410 and the earlier GCI400, refer to *GCI400/GCI410 Application Note* (document reference: DPD15361A0).

Compatibility between the GemCore410 and the GemCore410-EMV

The GemCore Firmware

The GemCore410 is based on the GemCore Original PLCC44 V1.10 operating system. The micro-controller type is Philips' P83C524.

The GemCore410-EMV is based on the GemCore Lite S024 V1.32-GK operating system. The micro-controller type is Atmel's T83C5101.

The firmware identifier version is: "**GemCore-R1.32-GK**".

The command sets used to operate these two versions are quite similar. The following are examples of differences:

- GemCore410-EMV includes the GemCore 2000 mechanism for the main interface. It is initialized in EMV mode.
- GemCore410-EMV does not allow for the execution of self-made application software in the external memory.
- With the GemCore410-EMV, access to some memory cards takes place through the Command Interpreter.

Product	Part Number
GemCore410	RPF11584
GemCore410-EMV	HWP107763

Table 2 - Part Numbers

Note: As was the case for GemCore410, GemCore410-EMV does not manage cards with V_{pp}.

Main Specifications for the GemCore410

- A SAM interface (IC100) with a remote connector. No on-board SAM connector.
- An on-board smart card ISO/AFNOR landing connector.
- Compatibility with the connector locations and the physical dimensions of the GCI400.
- A connector for external hardware extensions such as an LCD, keyboards and an external memory.
- A connector for a remote smart card connector (the remote connector).
- A connector for the power supply and the host interface communication at TTL levels.
- RS-232 connections are only available with external components.
- GemCore410 is not compatible with EMVCo, CB, PC/SC and other standard specifications.

Main Specifications for the GemCore410-EMV

- An on-board SAM connector.
- An on-board ISO smart card landing connector (see “*Smart Card Connector for the Main Interface*” below for details). The format of this connector is not compatible with AFNOR specifications.
- Compatibility with connector locations and physical dimensions of the GemCore410: see the paragraph “*Mechanical Compatibility*” below.
- No connector for external hardware extensions: memory management and access to other peripherals are no longer allowed.
- A connector for a remote smart card connector. For non-EMV applications see the flat cable restriction in “*Appendix D - Certification*”.
- A connector for the host interface communication at the TTL level and for the power supply.
- A connector for the host interface communication at the RS-232 level and for the power supply.
- EMV’96 3.11 certification by EMVCo as well as CB certification for the main interface.

Smart Card Connector for the Main Interface

The smart card connector is designed to receive smart cards with a thickness ranging from 0.68 mm to 0.84 mm in accordance with ISO7816. It is guaranteed for 80,000 cycles of smart card loading/ unloading with 0% malfunctions or for 150,000 cycles with 15 % malfunctions.

Smart Card Presence Notification

Smart card presence notification is only available for the main interface and is provided through the *RI* signal (output).

Note: Card presence notification is programmable. It is not activated by default. To activate it, the dedicated commands must be executed. See *GemCore Lite V1.3x-Based Reference Manual* for further information.

PnP Notification

In response to the DTR sequence, the PnP standard identification is sent to the serial line. This identification is “**GEM 0413 GEMPLUS Serial Smart Card Reader**”. It provides driver compatibility with the GemPC413.

Note: The DTR signal is mandatory for WHQL certification.

Power Supply

Unchanged.

Mechanical Compatibility

Physical Characteristics

GemCore410-EMV dimensions are the same as those of GemCore410, namely 80 mm x 45 mm. Coupler external dimensions and connector positions remain unchanged.

GemCore410 Pin Connectors

The GemCore410 has four pin connectors K2, K3, K4 and K6. Some versions of the GCI400 coupler contain an extension pin connector, namely K101, which is not described in this document.

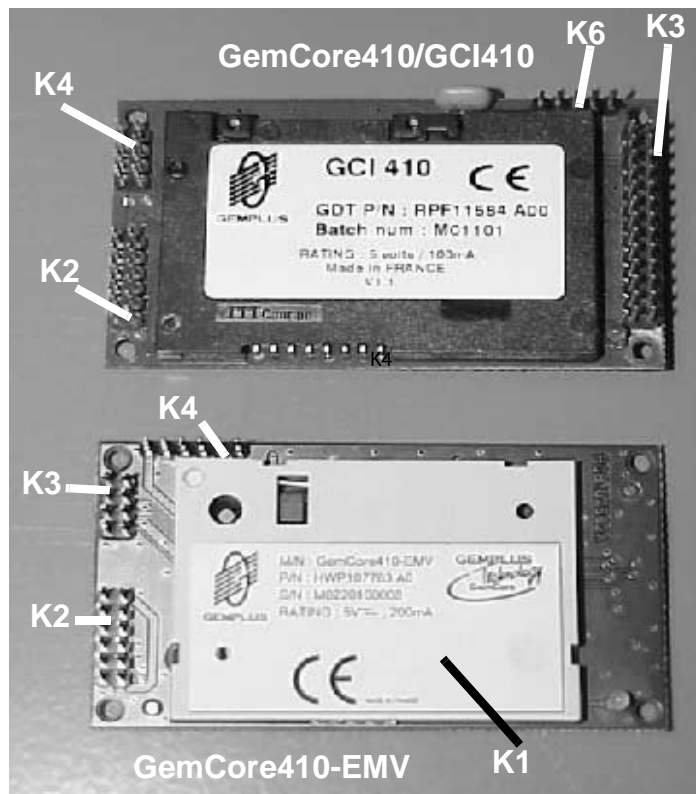


Figure 8 - GemCore410 and GemCore410-EMV - Top View

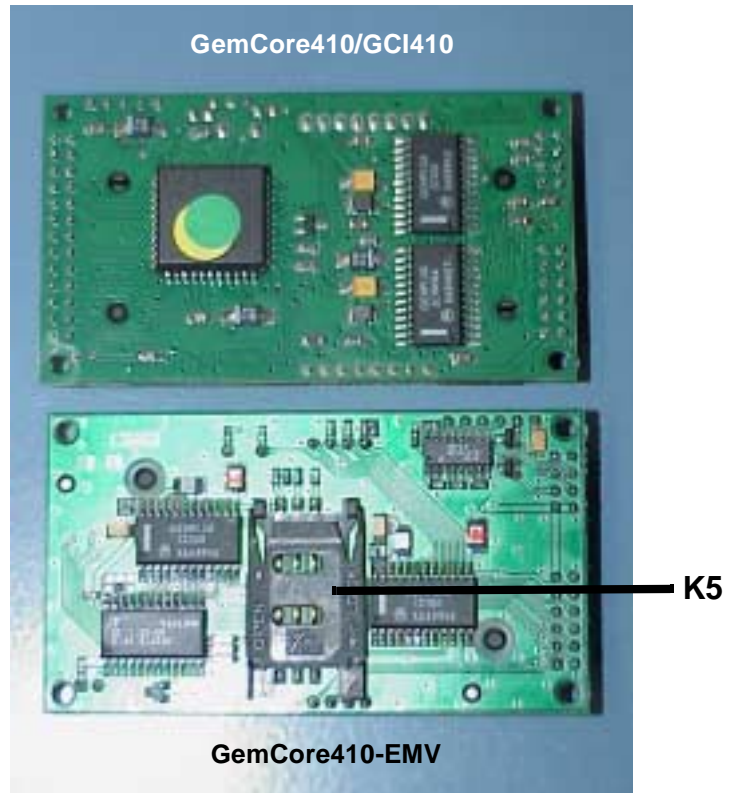


Figure 9 - GemCore410 and GemCore410-EMV - Bottom View

Note: The location of the smart card connector is slightly different from that of the GCI400 (see “Appendix B - Mechanical Diagrams”).

Pin Connector Designations.

- **GemCore410 Pin Connectors**

Pin Connector	Designation
K2	External smart card interface
K3	Micro-controller bus extension
K4	Input/output and standard option power supply
K6	Security module
K101 (not described)	Power supply - V_{PP} version

Table 3 - GemCore410 Pin Connectors

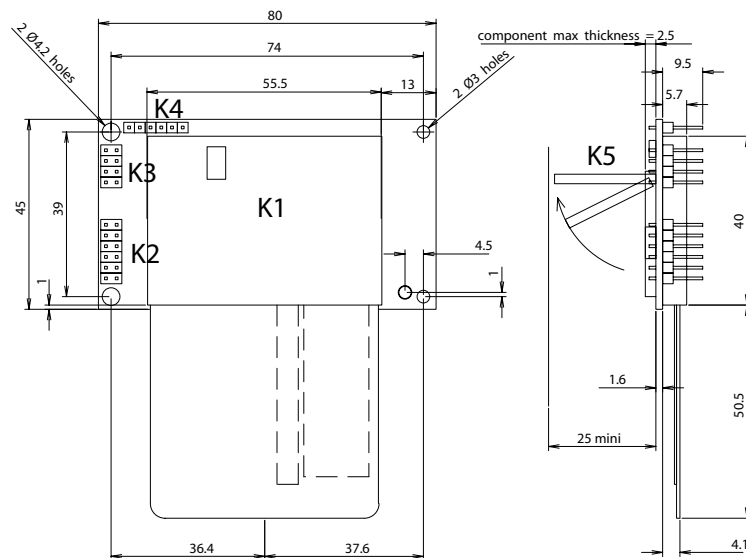
- **GemCore410-EMV Pin Connectors**

Pin Connector	Designation
K2	External smart card interface (non-EMV)
K3	Power supply and TTL serial link
K4	Power supply and RS-232 serial link
K5	Security module

Table 4 - GemCore410-EMV Pin Connectors

Mechanical Schematics

Unlike the GCI400, the GemCore410 and GemCore410-EMV do not have a cover for the component side. The mounting board has four holes which are positioned as illustrated in the following figure:



General tolerances: 0 mm to 10 mm +/- 0.1 mm
 10 mm to 30 mm +/- 0.15 mm
 30 mm to 60 mm +/- 0.2 mm
 60 mm and more +/- 0.3 mm

Figure 10 - General Mechanical Schematic

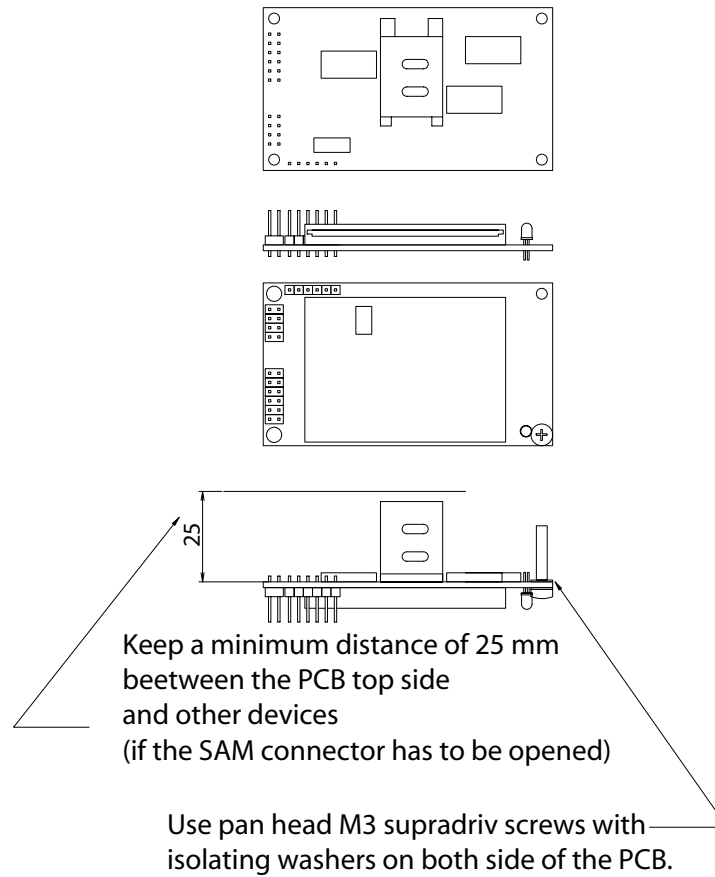


Figure 11 - Mechanical Installation Schematic

Smart Card Connector Locations

The smart card connectors of the GemCore410 and the GemCore410-EMV are located slightly differently from the connector of the GCI400, as is illustrated by the following figure.

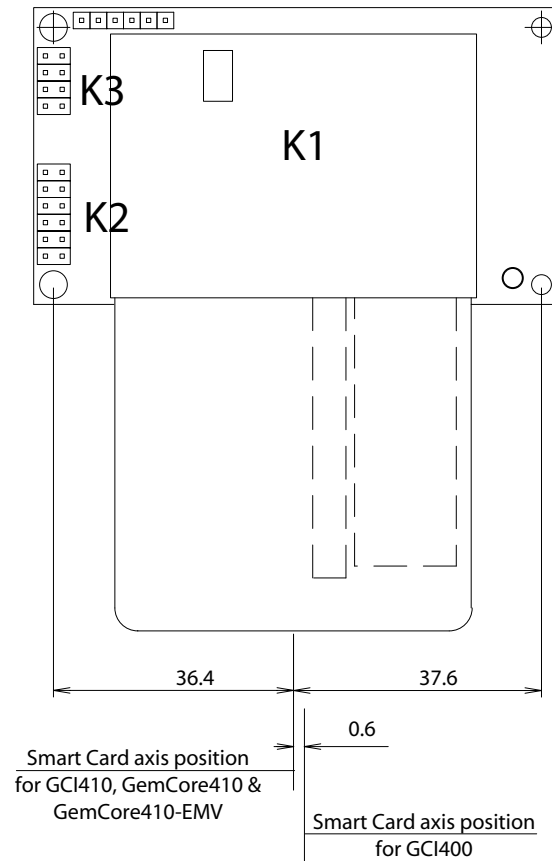


Figure 12 - Smart Card Connector Location

Drivers and Libraries

PC/SC Environment

Windows Operating System

GemCore410 can be reached in the following Windows environments: Win95, Win98-ME and WinNT4.

GemCore410-EMV can be reached in the above Windows environments as well as with Win2K and WinXP.

The dedicated package for both readers can be downloaded from the Gemplus web site at the following address:

http://www.gemplus.com/dwnld/819_PCSC_Reader_Install_v2_51_apr2002.zip

Other Operating Systems

No official driver exists for any other operating system.

Non-PC/SC Environment

The Gemplus Block Protocol Interface Library Kit supports all non-PC/SC environments. For additional information, refer to the following internet address:

<http://www.gemplus.com/techno/gbp-libraries>

The Gemplus Block Protocol Interface Library Kit consists of the source code for the GBP communication protocol layer, written in the C language. This layer is used for communication between the host system and GemCore. It has been designed to be universal, that is, independent from any development system and physical communication layer.

Therefore, it is easy to port this layer to any CPU environment, even if the latter requires a small memory.

This layer implements the GBP on any serial link, RS-232/422, I2C or equivalent. The kit includes software samples showing the operation of synchronous card access and EMV/ISO mode switch. Examples of EMV and APDU commands are also supplied.

Due to the GBP Interface Library structure, the application can use the same interface regardless of the physical layer. This structure also allows for the easy porting of the library onto another operating system and another physical port (for example, I2C).

The main task for end developers consists of interfacing the virtual port layer with their own specific port layer. The GBP-specific transport layer remains unchanged and thus protected.

Communication with a physical RS-232 interface in a Linux RedHat 7.1 test environment is supplied as an example. All the C source code (library and samples) are commented and comply with standard and documented programming rules.

Certification

EMVCo Certification

Regarding Europay the tests performed are compliant with the following specifications:

- IC Card Specifications for Payment Systems, [EMV'96-version 3.1.1, 31 March 1998]
- ICC Terminal Type Approval: Test Bench Description Executable Tests, [TBD/EXE/T01 Issue 2.04, 11 February 2000] + Erratum #3, 29 November 2000
- ICC Terminal Type Approval: Test Bench Description - Mechanical Tests, [TBD/MEC/T01 Issue 1.3, 21 January 1999]
- ICC Terminal Type Approval: Test Bench Description, [TBD/GEN/T01 Issue 2.1, 21 January 1999]
- ICC Terminal Type Approval: Implementation Conformance Statement, [TPL/ICS/T01, Version 1.2, January 20 1999]
- Guidelines for Electrical, Functional and Mechanical Tests, [Guidelines 2.2_EMV3.1.1, Version 2.2, February 2001]

Limitation for the Extended Connector

It is not currently possible to obtain EMVCo certification for the auxiliary card connector. To use this connector in a non-EMV context, the flat cable should be no longer than 10 cm.

CB Certification

Regarding CB, the tests performed are compliant with the following specifications:

- Coupler Specifications Version 1.0, March 31, 1998 (Spécifications Coupleur Version V1.0 du 31 mars 1998)
- Specifications of Coupler Test Version 3.0, May 28, 2001 (Spécifications d'Essai Coupleur Version 3.0 du 28 mai 2001)

WHQL Certification

For WHQL certification of GemCore410-EMV couplers, please contact the Gemplus support team.

Miscellaneous

The GemCore operating system has been designed to be compatible with other smart card standards. Please contact Gemplus for further details.

Electrical Diagrams

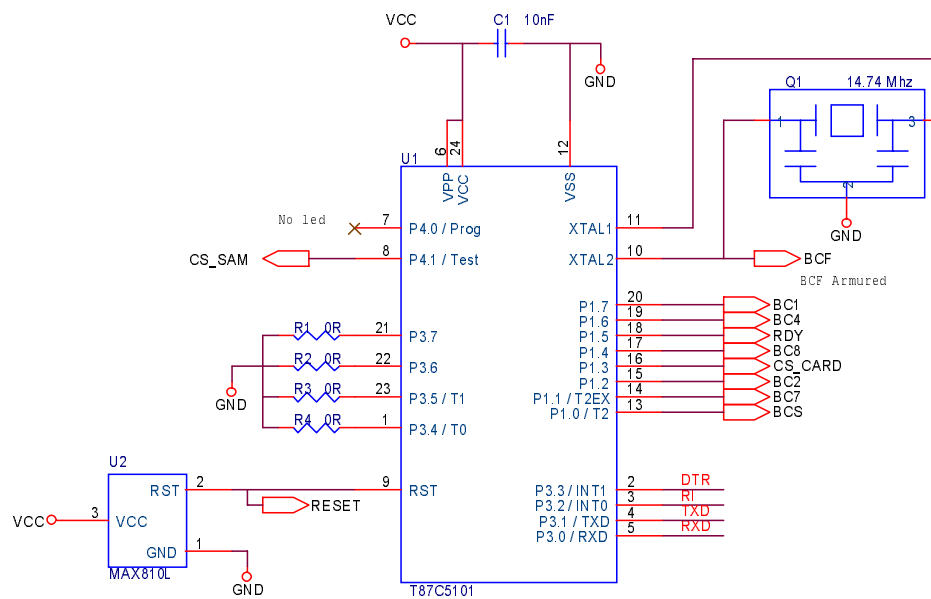
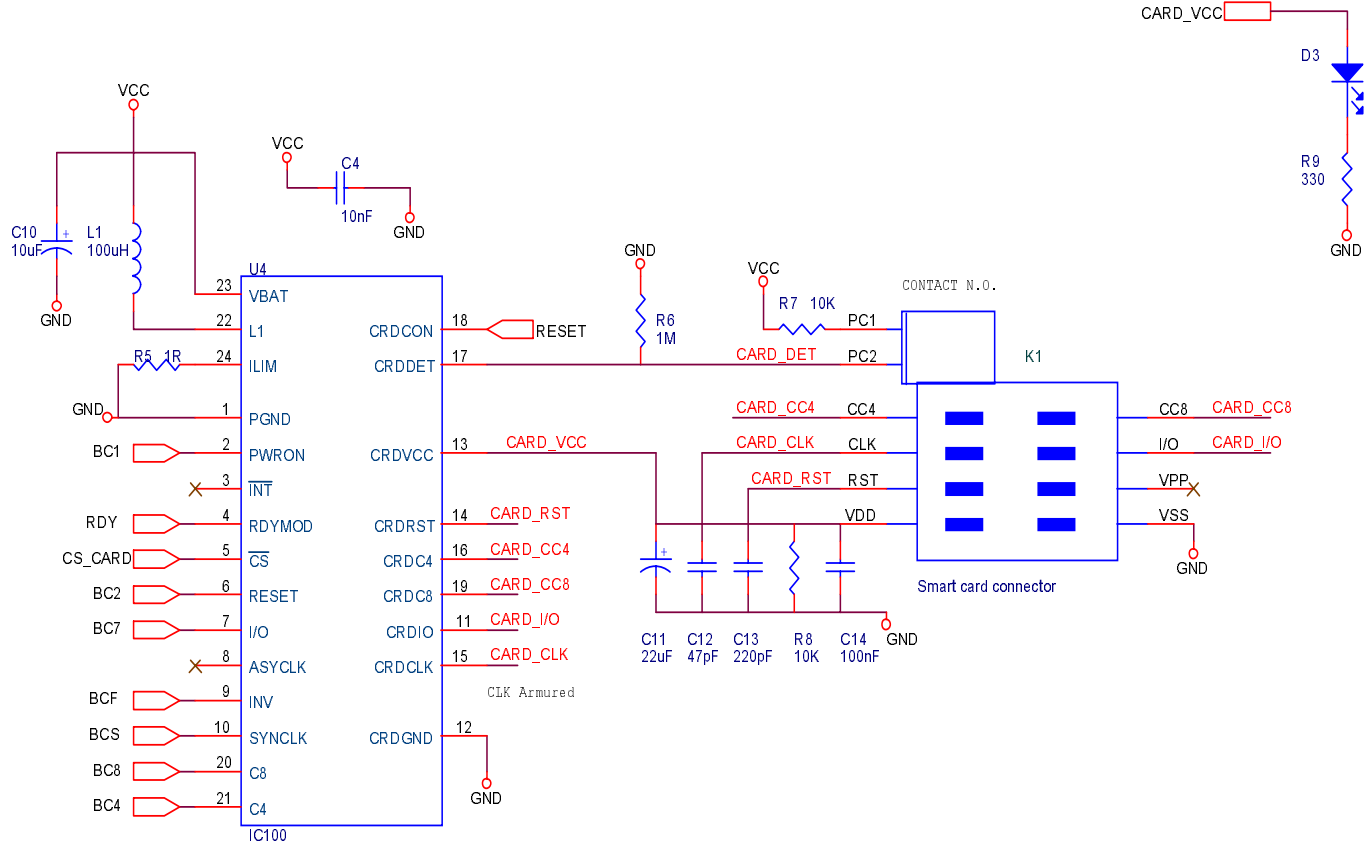


Figure 13 - The GemCore410-EMV CPU

Figure 14 - The Main Smart Card Interface



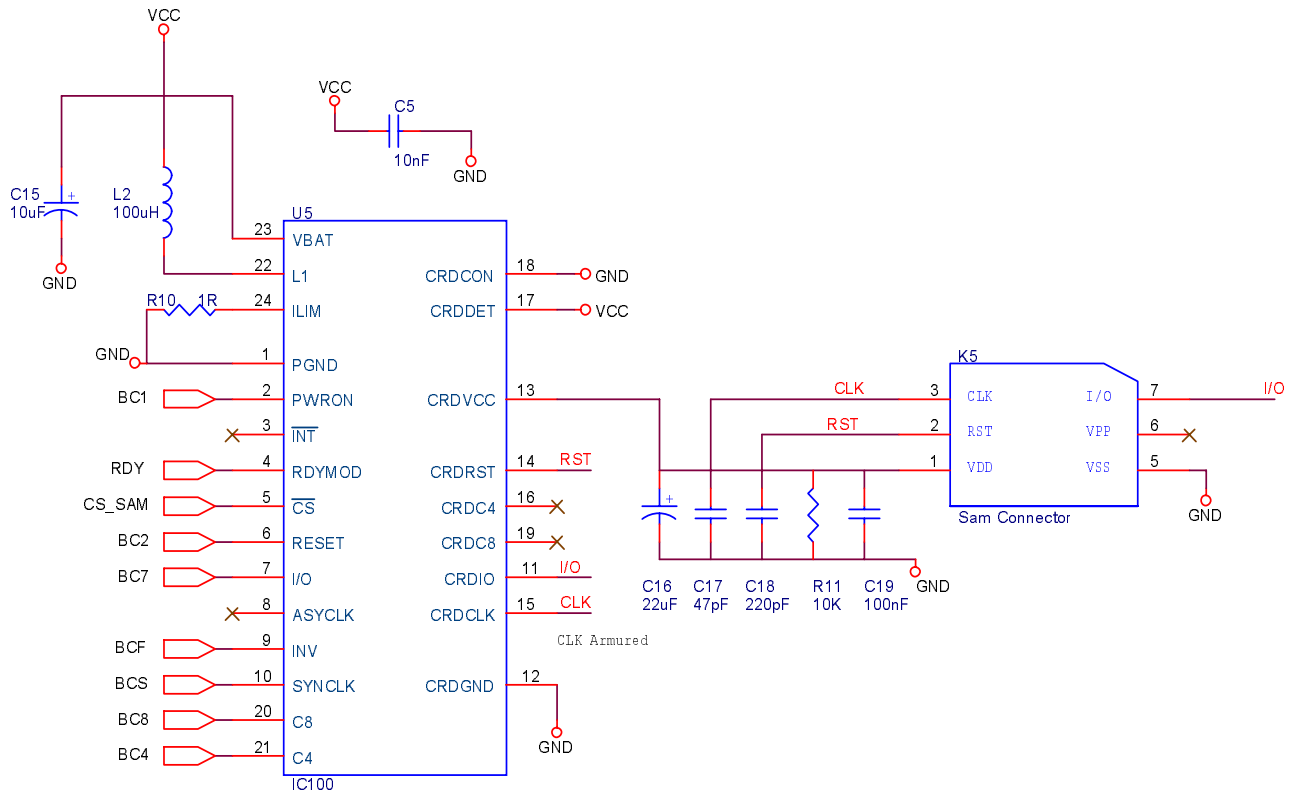


Figure 15 - The Auxiliary Smart Card Interface

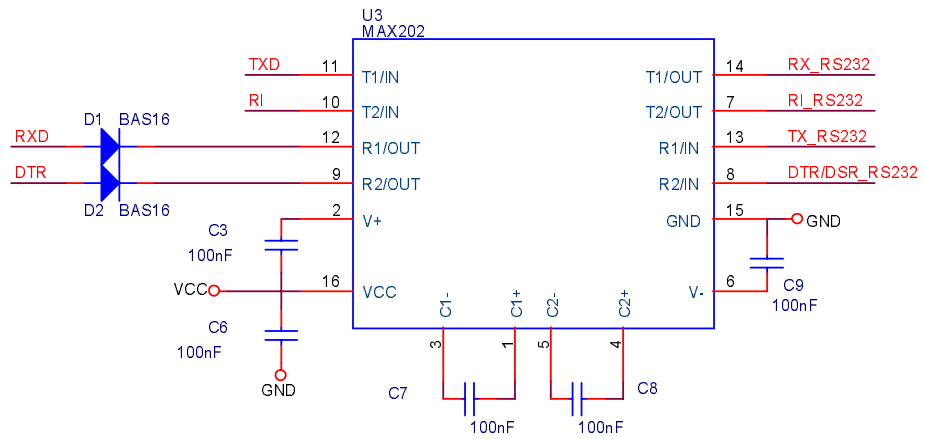


Figure 16 - The Communication Line

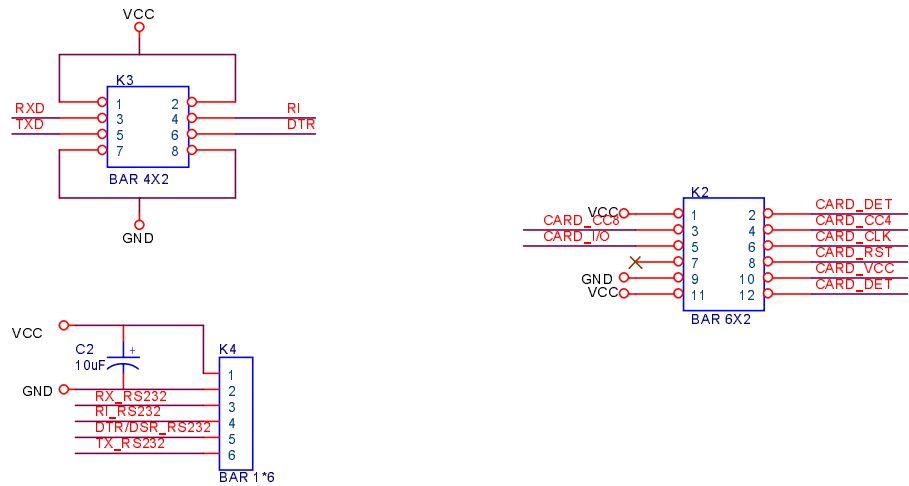


Figure 17 - The Connectors

For More Information

GemCore Lite V1.32

- *GemCore Lite V1.3x Technical Specifications*
- *GemCore Chipset Host Interface Programmer's Guide*
- *GemCore Lite V1.3x-Based Reader Reference Manual*
- *GemCore-Based Reader Testing Guidelines V5.0*

GemCore Original V1.10

- *GemCore V1.10 Technical Specifications*
- *GemCore V1.10-Based Reader Reference Manual*

GBP Interface Library Kit

GBP Interface Library Kit Programmer's Guide

Terminology

Abbreviations

AFNOR	Association française de normalisation (French standards association)
bps	bits per second
CB	Carte bancaire (French banking organization)
CCx	Card contact
EMV	Europay MasterCard Visa
GBP	Gemplus block protocol
GND	Ground
I/O	input/output
IEC	International electrotechnical commission
ISO	International standards organization
LED	Light-emitting diode
NC	Not connected
PC/SC	Personal computer/smart card
PnP	Plug and play
SAM	Security access module
SC	Smart card
TTL	Transistor - transistor logic
Vcc	Supply voltage
Vpp	Programming voltage
WHQL	Windows hardware quality labs

Glossary

Auxiliary Connector

Security access module connector.

Remote Connector

Main smart card connector.