

# OM5597/RD2612

## POS Reference Design

Rev. 1.2 — 20 September 2012  
208512

Objective short data sheet  
PUBLIC

## 1. General description

---

OM5597/RD2612 is a reference design of a cost effective EMV compliant Point of Sales Terminal based on NXP components. It provides an EMV Level 1 compliant software stack for contactless as well as contact payment based on PN512/C2 and TDA8026. The user interface composed out of an LCD screen and a keyboard demonstrates the following showcases:

- First steps of contact and contactless EMV payment with JCOP Dual Interface card
- First steps of payment with a mobile phone including P2P data exchange
- Closed loop payment based on MIFARE DESFire EV1 together with MIFARE SAM AV2

The OM5597/RD2612 board comes together with all design files including the hardware Gerber Files and the software source files.

## 2. Features and benefits

---

### 2.1 Features

- EMVCo compliant contactless smart card reader based on PN512/C2 with RF amplifier
- EMVCo compliant contact smart card reader based on TDA8026
- EMV Level 1 compliant contact and contactless software stack
- First step of contact and contactless EMV payment application selection with card/phoneshowcase
- Closed loop payment showcase
- NFC Peer to Peer communication showcase

### 2.2 Benefits

- Easy integration of NXP components into a cost efficient POS reader
- Fast development of a certifiable software stack, due to reuse of already EMV L1 certified source files
- Reusable showcase of closed loop payment, contact and contactless payment card selection as well as NFC functionality

## 3. Applications

---

- Payment



## 4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>DD</sub>	supply voltage	-	-	5.0	-	V
T <sub>amb</sub>	ambient temperature	-	-	+25	-	°C

## 5. Ordering information

Table 2. Ordering information

Type number	Package		
	Name	Description	Version
OM5597/RD2612	-	Package containing: POS Reference Design Board USB cable MIFARE DESFire EV1 card Pre Personalized JCOP Payment card	-

## 6. Block diagram

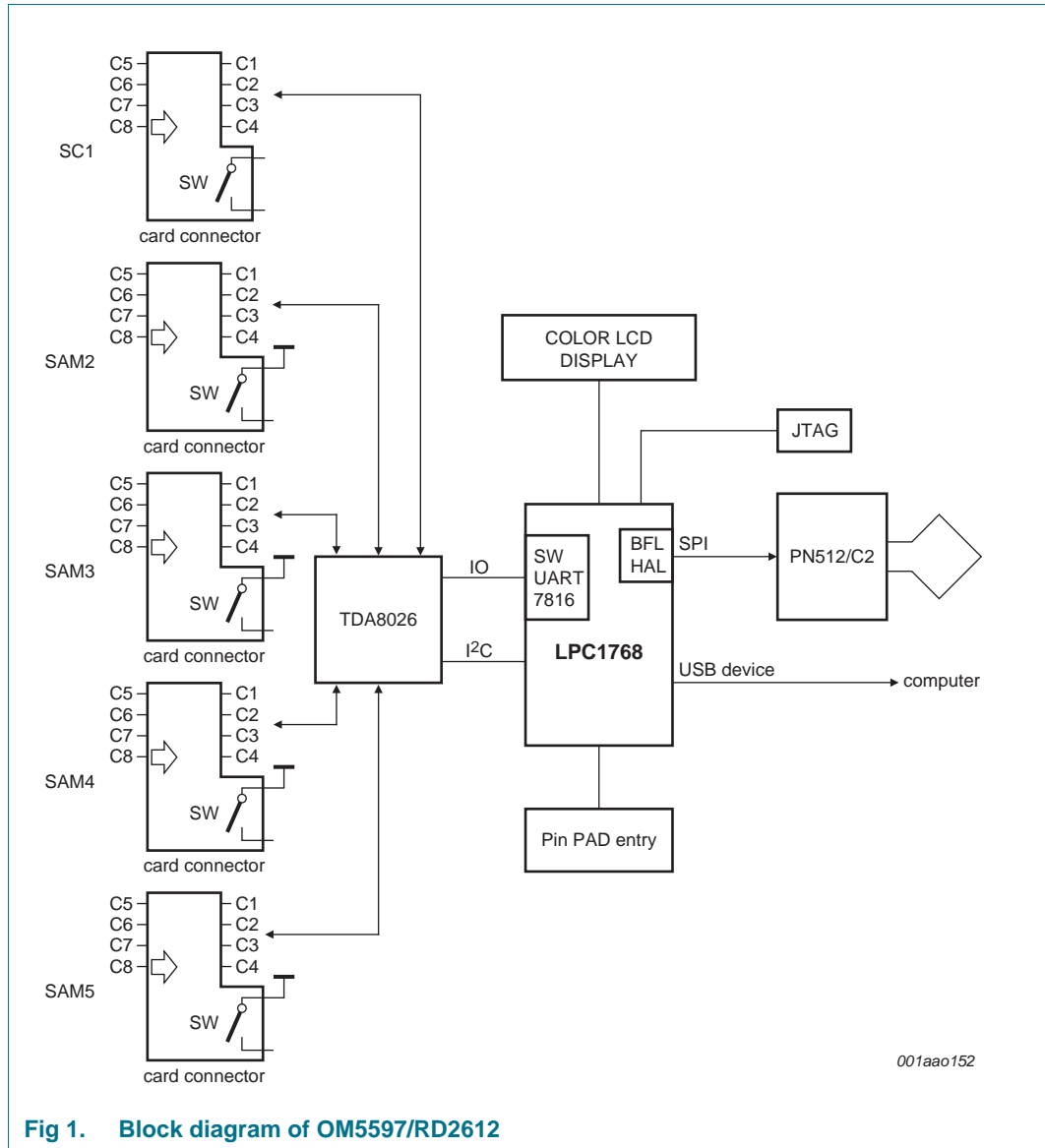


Fig 1. Block diagram of OM5597/RD2612

## 7. Functional description

### 7.1 Content

The kit includes the following items:

- OM5597/RD2612, Point of Sales board
- 1 USB cable
- 1 MIFARE DESFire EV1 card
- 1 pre personalized JCOP Dual Interface card

The MIFARE SAM AV2 needs to be organized separately.

### 7.2 Hardware architecture

The POS reference board, see [Figure 1](#), is composed out of the following NXP components:

- PN512/C2 contactless NFC reader IC supporting ISO/IEC 14443 type A and B, as described in [Ref. 1](#)
- RF Amplifier for the PN512, as described in [Ref. 8](#)
- TDA8026 5-slot contact smart card IC, as described in [Ref. 2](#)
- Cortex M3 LPC1768, as described in [Ref. 3](#)
- a display for the user interface
- a key pad for PIN entry within the closed loop payment showcase

The quick startup guide, see [Ref. 6](#), gives directions how to start working with the POS reference design. The board is structured of two main parts.

The main board provides the connections on the user interface (display and key pad), the daughter board implements the main electronics such as the PN512, TDA8026 and LPC1768. The antenna is part of the main board but is directly connected to the daughter board. If one wants to remove the daughter board, the antenna needs to be unsoldered in advance.

A serial interface (RS232) can be used to adapt or reprogram the software of the board using FlashMagic.

#### 7.2.1 Power supply

The board can be supplied using USB or over an external power supply connected to the powerplug. To power the board with USB, the type-B USB connector must be connected to a host computer through a USB cable. The jumper close to the USB type-B connector must be set in order to connect VBUS to the 5 V input.

### 7.3 Software architecture

The software stack coming together with the POS reference design is embedded into the FreeRTOS environment of the LPC1768. It can be compiled and adapted using the LPCXpresso environment. For more details, please refer to [Ref. 7](#).

The software stack is composed of the following items:

- A contactless EMV library based on a PN512 HAL
- A contact EMV library based on a TDA8026 HAL
- Drivers for the interaction with the user interface such as the display and key pad.
- A showcase using the LLCP protocol based on the contactless EMV library, showing the possible Peer to Peer communication of a POS terminal with a NFC phone
- A showcase using the contactless EMV library, performing a Paypass Payment Selection of a contactless payment media
- A showcase of a closed loop payment based on MIFARE DESFire EV1 and MIFARE SAM AV2
- A showcase using the contact EMV library, performing a Payment Selection of a contact payment card

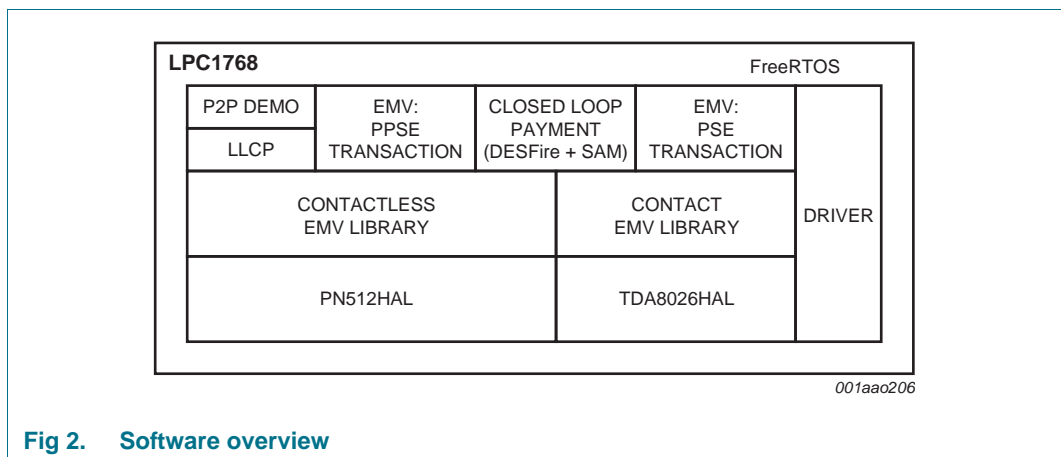


Fig 2. Software overview

### 7.4 Certification

The OM5597/RD2612 went successfully through the EMV L1 certification both for contact and contactless terminal certification.

## 8. Limiting values

**Table 3. Limiting values<sup>[1]</sup>**

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to VSS (ground = 0 V).

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>DD</sub>	supply voltage	active reader	-	5.00	-	V
T <sub>amb</sub>	ambient temperature	-	-	+25	-	°C
d <sub>cpl</sub>	coupling distance	measured from the center of the antenna	-	50	-	mm

[1] Stresses beyond those listed may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

## 9. Abbreviations

**Table 4. Abbreviations**

Acronym	Description
EMV	Europay Mastercard VISA (a Payment Industry organization publishing the EMV standard)
EMVCo	Compliant to the Europay Mastercard VISA standard
JCOP	Java Card Operating System
NFC	Near Field Communication
PIN	Personal Identification Number
POS	Point Of Sales
RF	Radio Frequency
RTOS	Real Time Operating System
USB	Universal Serial Bus

## 10. References

---

- [1] **Data sheet PN512/C2 Contactless reader IC** — available on NXP web
- [2] **Data sheet TDA8026 Contact reader IC** — available on NXP web
- [3] **Data sheet Cortex M3 LPC1768** — available on NXP web
- [4] **Short data sheet MF3ICD81 MIFARE DESFire EV1** — available on NXP web
- [5] **Short data sheet P5DF081 MIFARE SAM AV2** — available on NXP web
- [6] **User Manual POS Reference Design Quick Startup Guide** — available on NXP web
- [7] **User Manual POS Reference Design Firmware description** — available on NXP web
- [8] **Application Note AN10893 RF Amplifier for NXP contactless MFRC52x** — available on NXP web

## 11. Revision history

Table 5. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
OM5597_RD2612_SDS v 1.2	20120920	Objective short data sheet	-	OM5597_RD2612_SDS v 1.1
Modifications:	• <a href="#">Section 12.4 "Licenses"</a> . updated			
OM5597_RD2612_SDS v 1.1	20110803	Objective short data sheet	-	OM5597_RD2612_SDS v 1.0
Modifications:	• Table 2 "Ordering information": "CD with documentation and software" removed			
OM5597_RD2612_SDS v 1.0	20110526	Objective short data sheet	-	-



## 12. Legal information

### 12.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nxp.com>.

### 12.2 Definitions

**Draft** — The document is a draft version only. The content is still under internal review and subject to formal approval, which may result in modifications or additions. NXP Semiconductors does not give any representations or warranties as to the accuracy or completeness of information included herein and shall have no liability for the consequences of use of such information.

**Short data sheet** — A short data sheet is an extract from a full data sheet with the same product type number(s) and title. A short data sheet is intended for quick reference only and should not be relied upon to contain detailed and full information. For detailed and full information see the relevant full data sheet, which is available on request via the local NXP Semiconductors sales office. In case of any inconsistency or conflict with the short data sheet, the full data sheet shall prevail.

**Product specification** — The information and data provided in a Product data sheet shall define the specification of the product as agreed between NXP Semiconductors and its customer, unless NXP Semiconductors and customer have explicitly agreed otherwise in writing. In no event however, shall an agreement be valid in which the NXP Semiconductors product is deemed to offer functions and qualities beyond those described in the Product data sheet.

### 12.3 Disclaimers

**Limited warranty and liability** — Information in this document is believed to be accurate and reliable. However, NXP Semiconductors does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information. NXP Semiconductors takes no responsibility for the content in this document if provided by an information source outside of NXP Semiconductors.

In no event shall NXP Semiconductors be liable for any indirect, incidental, punitive, special or consequential damages (including - without limitation - lost profits, lost savings, business interruption, costs related to the removal or replacement of any products or rework charges) whether or not such damages are based on tort (including negligence), warranty, breach of contract or any other legal theory.

Notwithstanding any damages that customer might incur for any reason whatsoever, NXP Semiconductors' aggregate and cumulative liability towards customer for the products described herein shall be limited in accordance with the *Terms and conditions of commercial sale* of NXP Semiconductors.

**Right to make changes** — NXP Semiconductors reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

**Suitability for use** — NXP Semiconductors products are not designed, authorized or warranted to be suitable for use in life support, life-critical or safety-critical systems or equipment, nor in applications where failure or malfunction of an NXP Semiconductors product can reasonably be expected to result in personal injury, death or severe property or environmental damage. NXP Semiconductors and its suppliers accept no liability for inclusion and/or use of NXP Semiconductors products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

**Applications** — Applications that are described herein for any of these products are for illustrative purposes only. NXP Semiconductors makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

Customers are responsible for the design and operation of their applications and products using NXP Semiconductors products, and NXP Semiconductors accepts no liability for any assistance with applications or customer product design. It is customer's sole responsibility to determine whether the NXP Semiconductors product is suitable and fit for the customer's applications and products planned, as well as for the planned application and use of customer's third party customer(s). Customers should provide appropriate design and operating safeguards to minimize the risks associated with their applications and products.

NXP Semiconductors does not accept any liability related to any default, damage, costs or problem which is based on any weakness or default in the customer's applications or products, or the application or use by customer's third party customer(s). Customer is responsible for doing all necessary testing for the customer's applications and products using NXP Semiconductors products in order to avoid a default of the applications and the products or of the application or use by customer's third party customer(s). NXP does not accept any liability in this respect.

**Limiting values** — Stress above one or more limiting values (as defined in the Absolute Maximum Ratings System of IEC 60134) will cause permanent damage to the device. Limiting values are stress ratings only and (proper) operation of the device at these or any other conditions above those given in the Recommended operating conditions section (if present) or the Characteristics sections of this document is not warranted. Constant or repeated exposure to limiting values will permanently and irreversibly affect the quality and reliability of the device.

**Terms and conditions of commercial sale** — NXP Semiconductors products are sold subject to the general terms and conditions of commercial sale, as published at <http://www.nxp.com/profile/terms>, unless otherwise agreed in a valid written individual agreement. In case an individual agreement is concluded only the terms and conditions of the respective agreement shall apply. NXP Semiconductors hereby expressly objects to applying the customer's general terms and conditions with regard to the purchase of NXP Semiconductors products by customer.

**No offer to sell or license** — Nothing in this document may be interpreted or construed as an offer to sell products that is open for acceptance or the grant, conveyance or implication of any license under any copyrights, patents or other industrial or intellectual property rights.

**Export control** — This document as well as the item(s) described herein may be subject to export control regulations. Export might require a prior authorization from competent authorities.

**Quick reference data** — The Quick reference data is an extract of the product data given in the Limiting values and Characteristics sections of this document, and as such is not complete, exhaustive or legally binding.

**Non-automotive qualified products** — Unless this data sheet expressly states that this specific NXP Semiconductors product is automotive qualified, the product is not suitable for automotive use. It is neither qualified nor tested in accordance with automotive testing or application requirements. NXP Semiconductors accepts no liability for inclusion and/or use of non-automotive qualified products in automotive equipment or applications.

In the event that customer uses the product for design-in and use in automotive applications to automotive specifications and standards, customer (a) shall use the product without NXP Semiconductors' warranty of the product for such automotive applications, use and specifications, and (b) whenever customer uses the product for automotive applications beyond NXP Semiconductors' specifications such use shall be solely at customer's own risk, and (c) customer fully indemnifies NXP Semiconductors for any liability, damages or failed product claims resulting from customer design and use of the product for automotive applications beyond NXP Semiconductors' standard warranty and NXP Semiconductors' product specifications.

**Translations** — A non-English (translated) version of a document is for reference only. The English version shall prevail in case of any discrepancy between the translated and English versions.

## 13. Contact information

For more information, please visit: <http://www.nxp.com>

For sales office addresses, please send an email to: [salesaddresses@nxp.com](mailto:salesaddresses@nxp.com)

## 12.4 Licenses

### Purchase of NXP ICs with ISO/IEC 14443 type B functionality



This NXP Semiconductors IC is ISO/IEC 14443 Type B software enabled and is licensed under Innovatron's Contactless Card patents license for ISO/IEC 14443 B. The license includes the right to use the IC in systems and/or end-user equipment.

### RATP/Innovatron Technology

### Purchase of NXP ICs with NFC technology

Purchase of an NXP Semiconductors IC that complies with one of the Near Field Communication (NFC) standards ISO/IEC 18092 and ISO/IEC 21481 does not convey an implied license under any patent right infringed by implementation of any of those standards.

## 12.5 Trademarks

Notice: All referenced brands, product names, service names and trademarks are the property of their respective owners.

**MIFARE** — is a trademark of NXP B.V.

**DESFire** — is a trademark of NXP B.V.

## 14. Contents

---

<b>1</b>	<b>General description</b> .....	<b>1</b>
<b>2</b>	<b>Features and benefits</b> .....	<b>1</b>
2.1	Features .....	1
2.2	Benefits .....	1
<b>3</b>	<b>Applications</b> .....	<b>1</b>
<b>4</b>	<b>Quick reference data</b> .....	<b>2</b>
<b>5</b>	<b>Ordering information</b> .....	<b>2</b>
<b>6</b>	<b>Block diagram</b> .....	<b>3</b>
<b>7</b>	<b>Functional description</b> .....	<b>4</b>
7.1	Content .....	4
7.2	Hardware architecture .....	4
7.2.1	Power supply .....	4
7.3	Software architecture .....	5
7.4	Certification .....	5
<b>8</b>	<b>Limiting values</b> .....	<b>6</b>
<b>9</b>	<b>Abbreviations</b> .....	<b>6</b>
<b>10</b>	<b>References</b> .....	<b>7</b>
<b>11</b>	<b>Revision history</b> .....	<b>8</b>
<b>12</b>	<b>Legal information</b> .....	<b>9</b>
12.1	Data sheet status .....	9
12.2	Definitions .....	9
12.3	Disclaimers .....	9
12.4	Licenses .....	10
12.5	Trademarks .....	10
<b>13</b>	<b>Contact information</b> .....	<b>10</b>
<b>14</b>	<b>Contents</b> .....	<b>11</b>

---

Please be aware that important notices concerning this document and the product(s) described herein, have been included in section 'Legal information'.

---

© NXP B.V. 2012.

All rights reserved.

For more information, please visit: <http://www.nxp.com>

For sales office addresses, please send an email to: [salesaddresses@nxp.com](mailto:salesaddresses@nxp.com)

Date of release: 20 September 2012  
208512