

# AN10683

PN533 demo board

Rev. 2.1 — 10 July 2018

Application note  
COMPANY PUBLIC

## Document information

Info	Content
<b>Keywords</b>	NFC, PN533, demo board
<b>Abstract</b>	This document describes the PN533 demo board.



**Revision history**

Rev	Date	Description
2.1.	20180710	Editorial changes
2.0	20171031	Security status changed into COMPANY PUBLIC, no content change
1.1	2008-08-18	Update
1.0	2008-06-20	Final version
0.1	2008-01-09	Creation. Description of PCB1950-1.

**Contact information**

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## 1. Introduction

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The **PN5331B3HN** with **embedded firmware** has following features:

- Supports ISO/IEC 14443A reader/writer up to 847Kbit/s
- Supports ISO/IEC 14443B reader/writer up to 847Kbit/s
- Supports MIFARE Classic with 1K/4K encryption in reader/writer mode at 106Kbit/s
- Supports all NFCIP-1 modes up to 424Kbit/s. The PN533 handles the complete NFC framing and error detection.
- Supports contactless RF communication according to the Felica protocol at 212Kbit/s and 424Kbit/s
- Embedded firmware commands allow compliancy with Paypass v1.1 and EMVCo v2.0 specifications
- Embedded firmware commands allow use of the NFC secure layer
- Embedded firmware commands allow RF Activation application
- Reader mode for Innovision Jewel cards
- Includes 80C51 micro-controller
- Integrated LDO to allow 2.7 to 5.4V power supply voltage
- Integrated antenna component detector
- Host interface: USB 2.0 full speed
- USB bus-powered or host-powered mode possibility
- On-chip PLL to generate internally 96MHz for the USB interface
- I2C master interface to fetch PID, VID, USB descriptor and RF settings from an external EEPROM
- I2C master interface to support the bridge to the TDA8029 contact reader (2 dedicated GP-IOs)
- 3 additional GP-IOs for external devices control

The PN533 demo board is described in this application note.

The PN533 demo board is called **PCB1950-1**. It is described in paragraph 2.1.

Paragraph 2.2 summarizes which straps to close and which ones to open, depending on the application.

Paragraphs 2.4, 2.5, and 2.6 contain electrical schematics, layout and components information.

## 2. PN533 demo board description (PCB1950-1)

PCB1950-1 is a reference design for PN533 IC. The interface with the host controller is USB Interface: USB 2.0 full speed.

The demo board PCB is split into 4 parts:

- The USB connector
- The main part (containing PN533 IC)
- The antenna matching components part
- The antenna itself.

It is possible to break the PCB, for instance either to remove the USB connector, in order to connect the demo board directly to the application, or to change antenna.

### 2.1 Description

The board uses a type B female USB connector to be connected to a PC.

The demo board is bus powered. All the IC supplies (DVDD, AVDD, TVDD) are generated from VBUS by the internal LDO regulator. PVDD is the supply for communication with the application host controller: it should be the same supply as the host controller. PVDD is connected to DVDD through the external zero-ohm resistor R7. In case a different PVDD supply is needed, R7 has to be removed and the external supply PVDD has to be connected to the test pin called PVDD.

The push button BP1 can be used to control the hard power down pin. This pin RSTPDN which is active low and referenced to PVDD supply, can also be directly driven by using the test pin called "reset".

Two test pins are connected to AUX1 and AUX2 outputs in order to monitor some test signals if needed (see data sheet).

An external connector called J3 provides following connections:

- GND and VBUS, DVDD supplies,
- I2C bus: SDA, SCL lines referenced to DVDD,
- Three GP-IOs: P30, P31, P33 referenced to PVDD.

These connections will be useful to control external devices like an external EEPROM and other particular application like a contact smart card reader (these applications will be implemented in the firmware of final samples).

Several straps are provided on the board to change configuration in order to adapt to a particular application.

## 2.2 Possible configurations

This paragraph describes the PCB1950 board which uses only USB interface.

Default configuration: all straps are left open.

Here is the description of the straps possible use:

**ST1 and ST2:** connection of AUX1 and AUX2 outputs to load resistors in case **test signals** from the internal current DAC are output (see data sheet).

**ST3 and ST4:** possible configuration of specific **test modes** (see application note), default configuration (straps are open) is standard mode.

ST3 closed, ST4 open: Emulation of the PN512.

ST3 closed, ST4 closed: RF field ON.

**ST5 and ST6:** connection of SDA and SCL outputs to pull-up resistors. This master I2C bus is used to control an external device. An external connector (J3) is also provided.

**ST7, ST8 and ST9:** possible connection of external pull-up resistors to control external devices with P33, P31 or P30 outputs. An external connector (J3) is also provided.

## 2.3 How to use this demo board

This demo board has simply to be connected through USB interface of a PC using a **PC/SC driver** or our proprietary **test tool SCRTTester** that we provide with the complete demo kit. Please refer to the **Quick Start Guide** of the demo kit for more details about installation and use.

## 2.4 Electrical diagram

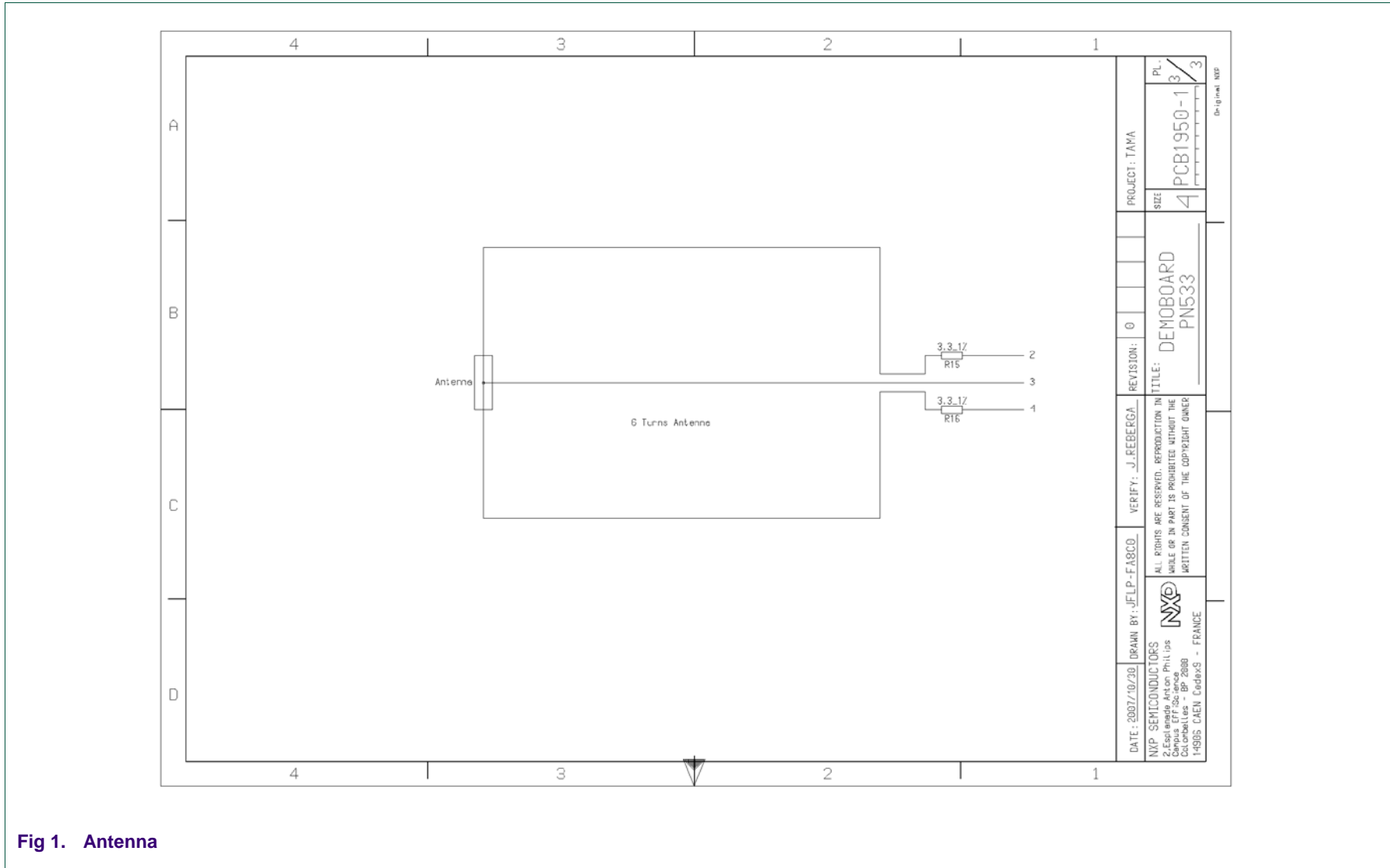


Fig 1. Antenna

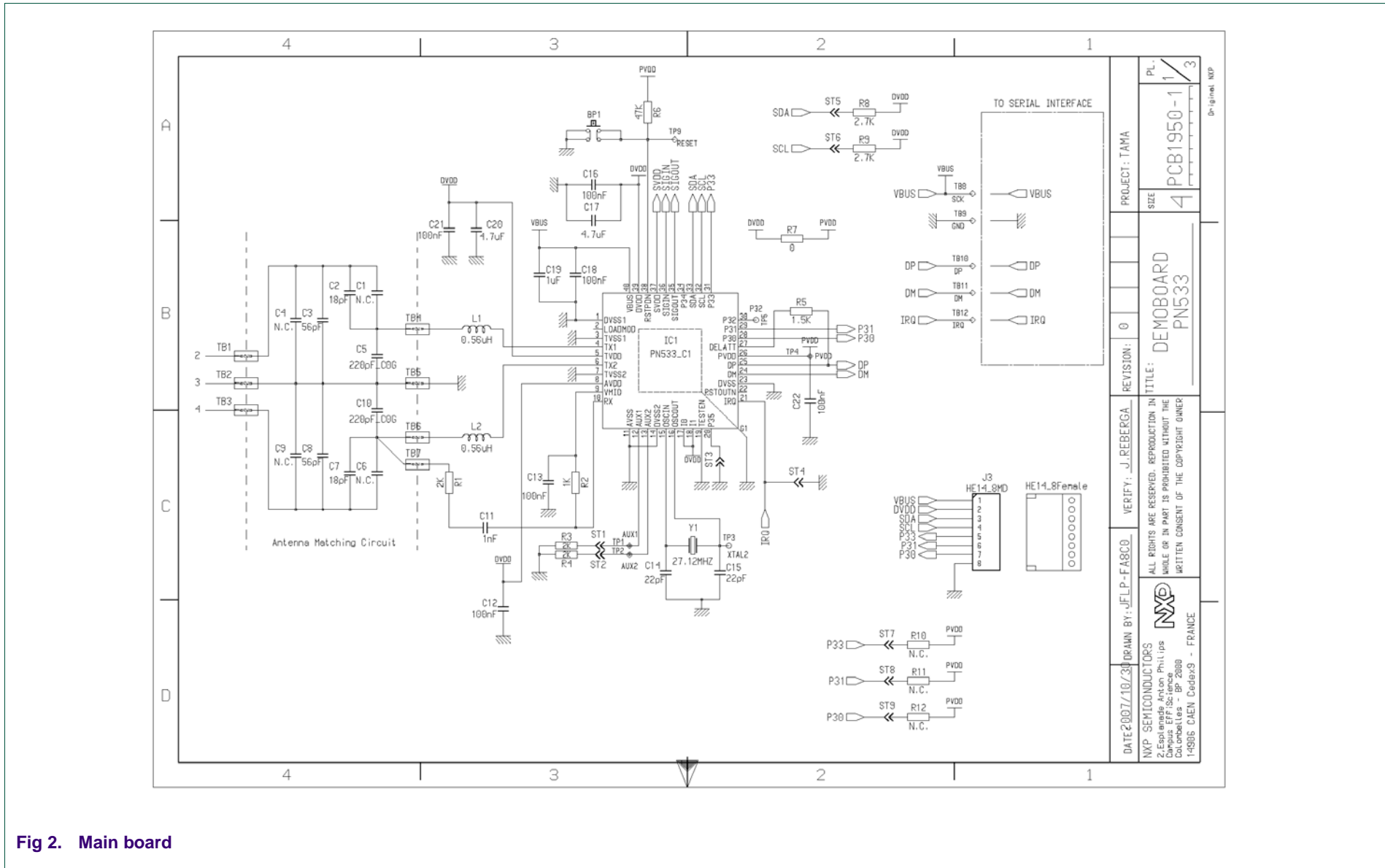
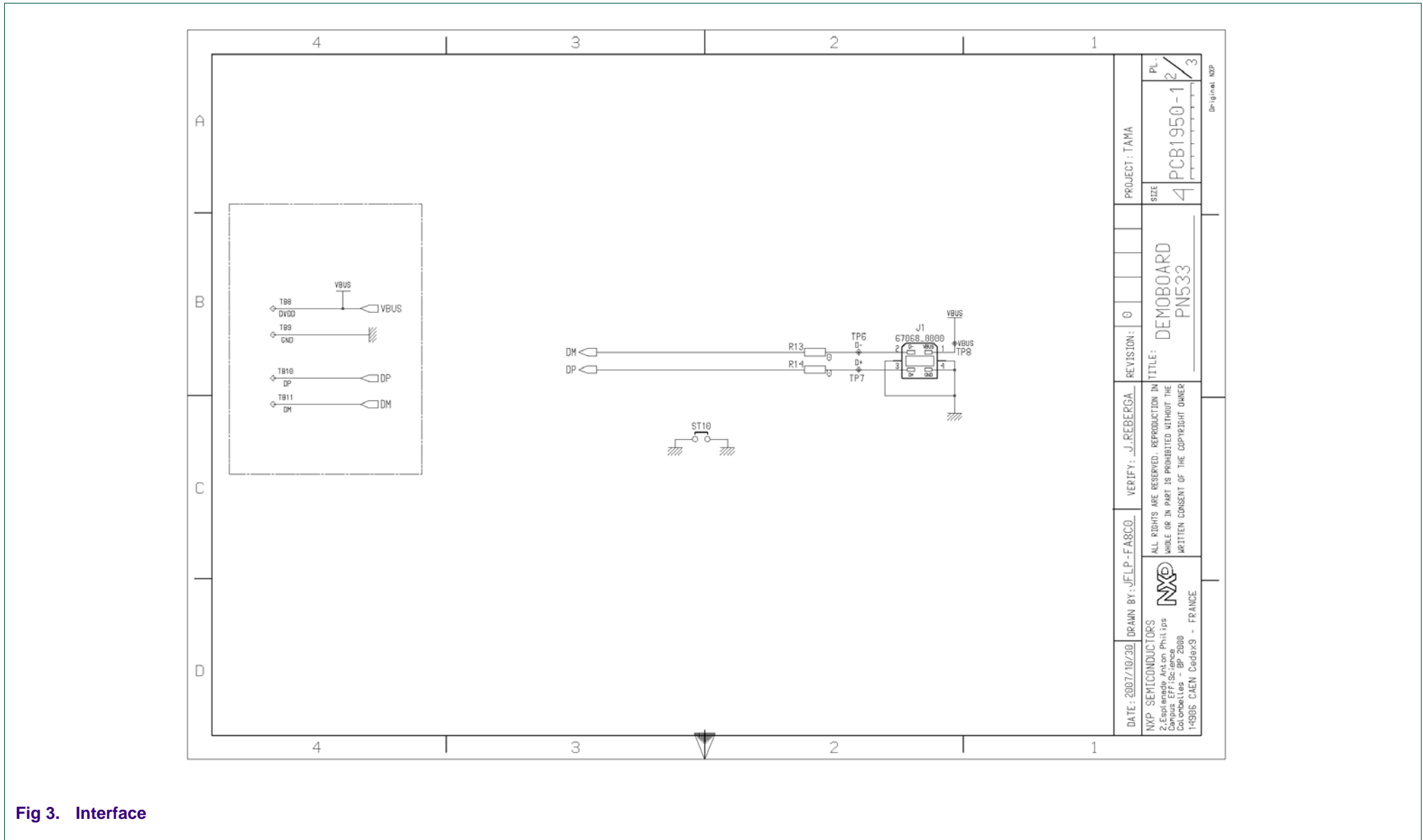


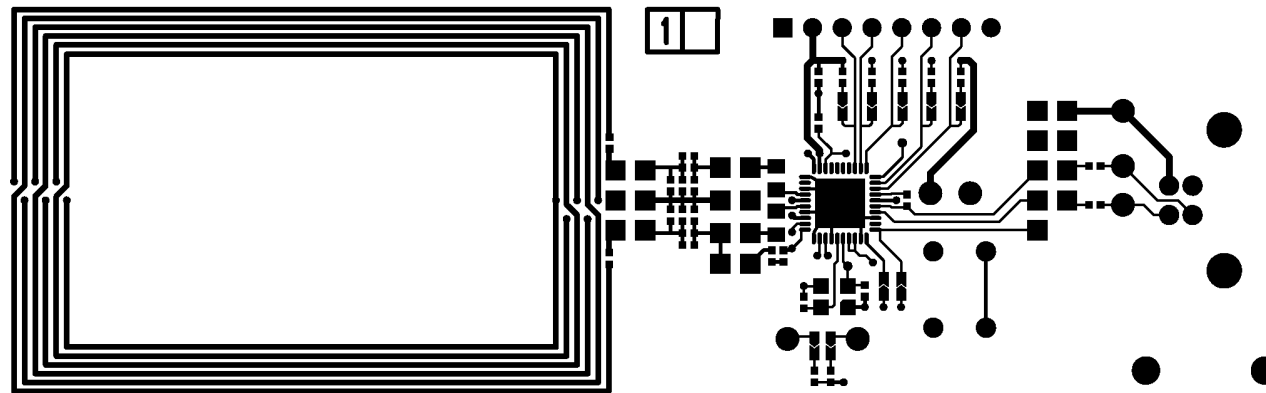
Fig 2. Main board



DATE: 2007/10/30	DRAWN BY: JFLP-FABCO	VERIFY: J. REBERGA	REVISION: 0	PROJECT: TAMA	PL: 3
NXP SEMICONDUCTORS 2, Esplanade Anton Philips Campus EFP-Scopac-Boulevard 14906 CAEN Cedex9 - FRANCE				TITLE: DEMOBOARD PN533	SIZE: 4 PCB1950-12
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## 2.5 Layout



PCB1950-1 DEMOBOARD PN533 TOP LAYER

Fig 4. film 1

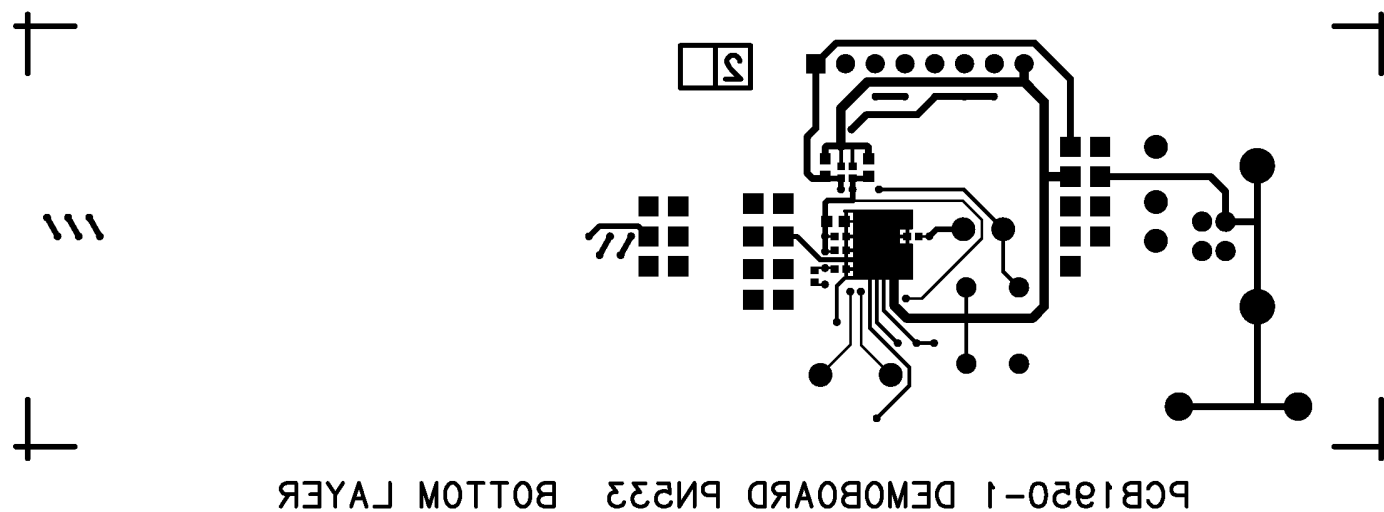


Fig 5. film 2

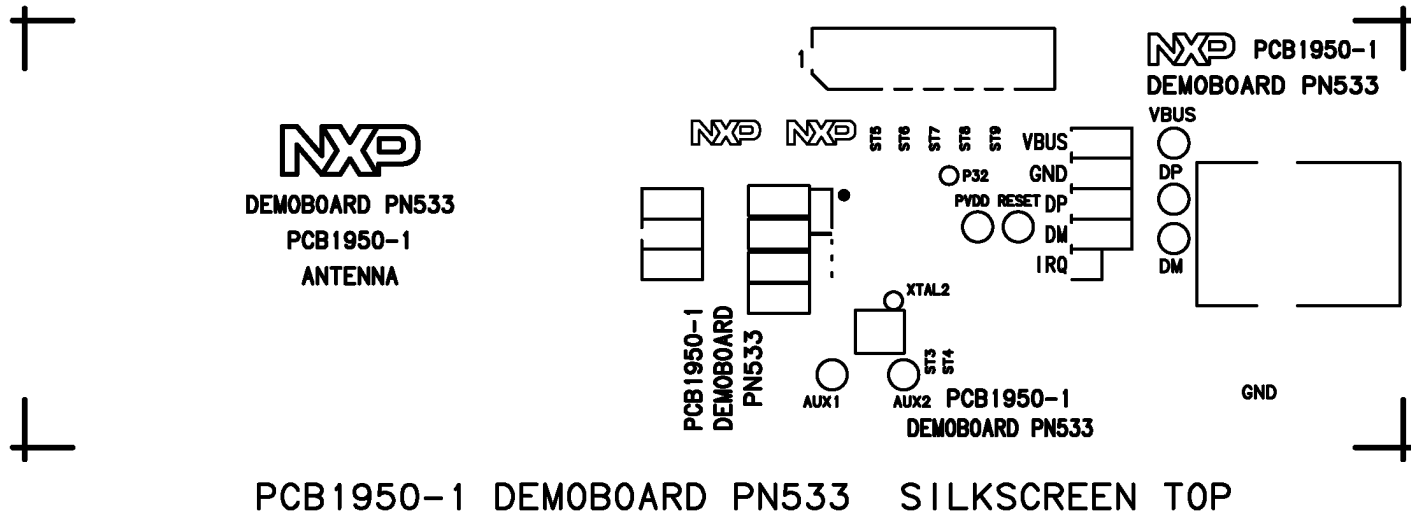
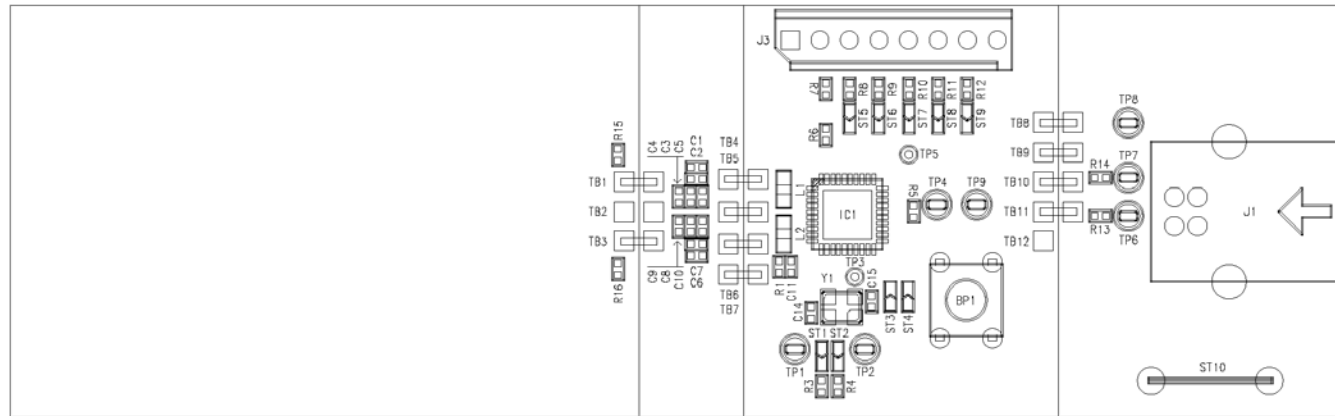
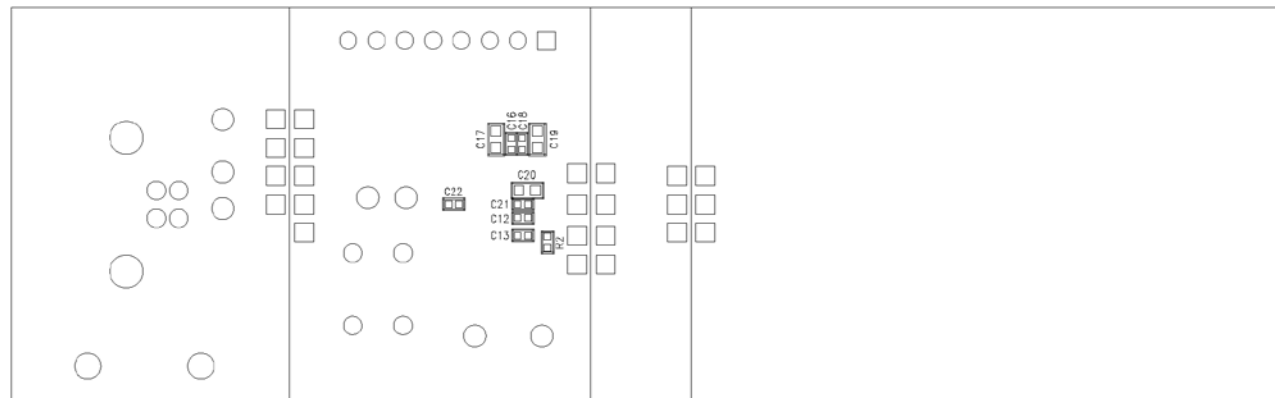


Fig 6. film 3



PCB1950-1 DEMOBOARD PN533 TOP COMPONENTS

Fig 7. film 4



PCB1950-1 DEMOBOARD PN533 BOTTOM COMPONENTS

Fig 8. film 5

## 2.6 Components list

REFERENCE	GEOMETRY	VALUE	DESCRIPTION
BP1	int_mcdts6	MCDTS6_1N,	MULTICOMP:Tact,Switch,6x6,H=4.3mm,160gf
C1	c0402	N.C.,	Capacitor,CER2,0402,***NOT,CONNECTED***
C2	c0402	18pF,	Capacitor,CER2,0402,COG,50V,5%
C3	c0402	56pF,	Capacitor,CER2,0402,COG,50V,5%
C4	c0402	N.C.,	Capacitor,CER2,0402,***NOT,CONNECTED***
C5	c0402	220pF_COG,	Capacitor,CER2,0402,COG,50V,GPR15_5C_1H_221
C6	c0402	N.C.,	Capacitor,CER2,0402,***NOT,CONNECTED***
C7	c0402	18pF,	Capacitor,CER2,0402,COG,50V,5%
C8	c0402	56pF,	Capacitor,CER2,0402,COG,50V,5%
C9	c0402	N.C.,	Capacitor,CER2,0402,***NOT,CONNECTED***
C10	c0402	220pF_COG,	Capacitor,CER2,0402,COG,50V,GPR15_5C_1H_221
C11	c0402	1nF,	Capacitor,CER2,0402,X7R,50V,10%
C12	c0402	100nF,	Capacitor,CER2,0402,Y5V,16V,-20+80%
C13	c0402	100nF,	Capacitor,CER2,0402,Y5V,16V,-20+80%
C14	c0402	22pF,	Capacitor,CER2,0402,COG,50V,5%
C15	c0402	22pF,	Capacitor,CER2,0402,COG,50V,5%
C16	c0402	100nF,	Capacitor,CER2,0402,Y5V,16V,-20+80%
C17	c0603	4.7uF,	Capacitor,CER2,0603,X5R,6.3V,10%
C18	c0402	100nF,	Capacitor,CER2,0402,Y5V,16V,-20+80%
C19	c0603	1uF,	Capacitor,CER2,0603,X5R,16V,10%
C20	c0603	4.7uF,	Capacitor,CER2,0603,X5R,6.3V,10%
C21	c0402	100nF,	Capacitor,CER2,0402,Y5V,16V,-20+80%
C22	c0402	100nF,	Capacitor,CER2,0402,Y5V,16V,-20+80%
IC1	mlf6x40_0.5	PN533_C1,	PHILIPS:Package:HVQFN40
J1	usb_b	67068_0000,	MOLEX:USB,Type,B,Right-Angle,Receptacle
J3	he14_1x8md	HE14_8MD,	KONTEK_COMATEL:47503341084401,HE14,Connector,1x8,Straight,Male
L1	self_mlf2012	0.56uH,	TDK:MLF2012DR56K,Chip,Inductor,SMD,0.15A,10%
L2	self_mlf2012	0.56uH,	TDK:MLF2012DR56K,Chip,Inductor,SMD,0.15A,10%
R1	r0402	2K,	Resistor,Package:0402,5%,1/16W
R2	r0402	1K,	Resistor,Package:0402,5%,1/16W
R3	r0402	2K,	Resistor,Package:0402,5%,1/16W
R4	r0402	2K,	Resistor,Package:0402,5%,1/16W
R5	r0402	1.5K,	Resistor,Package:0402,5%,1/16W
R6	r0402	47K,	Resistor,Package:0402,5%,1/16W
R7	r0402	0,	Resistor,Package:0402,5%,1/16W

R8	r0402	2.7K,	Resistor,Package:0402,5%,1/16W
R9	r0402	2.7K,	Resistor,Package:0402,5%,1/16W
R10	r0402	N.C.,	Resistor,Package:0402,***NOT,CONNECTED***
R11	r0402	N.C.,	Resistor,Package:0402,***NOT,CONNECTED***
R12	r0402	N.C.,	Resistor,Package:0402,***NOT,CONNECTED***
R13	r0402	0,	Resistor,Package:0402,5%,1/16W
R14	r0402	0,	Resistor,Package:0402,5%,1/16W
R15	r0402	3.3_1%,	Resistor,Package:0402,1%,1/16W
R16	r0402	3.3_1%,	Resistor,Package:0402,1%,1/16W
ST1	chevron_a	OPEN,	***OPEN,BY,DEFAULT***
ST2	chevron_a	OPEN,	***OPEN,BY,DEFAULT***
ST3	chevron_a	OPEN,	***OPEN,BY,DEFAULT***
ST4	chevron_a	OPEN,	***OPEN,BY,DEFAULT***
ST5	chevron_a	OPEN,	***OPEN,BY,DEFAULT***
ST6	chevron_a	OPEN,	***OPEN,BY,DEFAULT***
ST7	chevron_a	OPEN,	***OPEN,BY,DEFAULT***
ST8	chevron_a	OPEN,	***OPEN,BY,DEFAULT***
ST9	chevron_a	OPEN,	***OPEN,BY,DEFAULT***
ST10	cav1016_lp	D3082-B01,	HARWIN:Jumper,1mm,Pitch=10.16
TB1	cav2sp	CAVAL_2.54,	ANTELEC:CCM1D,Jumper,Pitch:2.54
TB2	cav2sp_nc	CAVAL_2.54,	Pattern,Single,Pitch:2.54
TB3	cav2sp	CAVAL_2.54,	ANTELEC:CCM1D,Jumper,Pitch:2.54
TB4	cav2sp	CAVAL_2.54,	ANTELEC:CCM1D,Jumper,Pitch:2.54
TB5	cav2sp	CAVAL_2.54,	ANTELEC:CCM1D,Jumper,Pitch:2.54
TB6	cav2sp	CAVAL_2.54,	ANTELEC:CCM1D,Jumper,Pitch:2.54
TB7	cav2sp	CAVAL_2.54,	ANTELEC:CCM1D,Jumper,Pitch:2.54
TB8	cav2sp	CAVAL_2.54,	ANTELEC:CCM1D,Jumper,Pitch:2.54
TB9	cav2sp	CAVAL_2.54,	ANTELEC:CCM1D,Jumper,Pitch:2.54
TB10	cav2sp	CAVAL_2.54,	ANTELEC:CCM1D,Jumper,Pitch:2.54
TB11	cav2sp	CAVAL_2.54,	ANTELEC:CCM1D,Jumper,Pitch:2.54
TB12	tpvia0.9	TPVIA0.9,	Hole,0.9
TP1	tpboucle1.0	5001,	KEYSTONE:Black,Testpoint,Type1
TP2	tpboucle1.0	5001,	KEYSTONE:Black,Testpoint,Type1
TP3	plage.75	PLAGE.75,	***NOT,CONNECTED***
TP4	tpboucle1.0	5001,	KEYSTONE:Black,Testpoint,Type1
TP5	plage.75	PLAGE.75,	***NOT,CONNECTED***
TP6	tpboucle1.0	5001,	KEYSTONE:Black,Testpoint,Type1
TP7	tpboucle1.0	5001,	KEYSTONE:Black,Testpoint,Type1
TP8	tpboucle1.0	5001,	KEYSTONE:Black,Testpoint,Type1
TP9	tpboucle1.0	5001,	KEYSTONE:Black,Testpoint,Type1
Y1	tas3225	27.12MHZ,	TOKYO-DENPA:TAS-3225A,Type,Quartz,Crystal,SMD

BUBBLE01:Printed\_Circuit\_Board PCB1950-1

BUBBLE02:KONTEK\_COMATEL:4782837108440\_Female\_HE14\_Single\_Row\_8\_pins

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