AN10688_1

PN532C106 demoboard

Rev.0.1 — February 1, 2008 **Application note**

Document information

Info	Content
Keywords	NFC, PN532, PN532C106, demoboard
Abstract	This document describes PN532C106 demoboard.

Revision history

Rev	Date	Description
0.1	2008-02-01	Creation; related to C106 version of the PN532. Description of PCB1948-1.

Contact information

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1. Introduction

PN532 is an NFCIP-1 compliant chip, with following main features:

- Supports: NFCIP-1, Type B reader, Mifare Classic reader encryption
- Includes 80C51 micro-controller
- Integrated LDO to allow 2.7 to 5.4V power supply voltage
- Integrated antenna component detector
- Several power reduction modes (Hard power down, Soft power down per embedded SW)
- Several interfaces: SPI, I2C and HSU
- 7 selectable sources of wake-up from soft power down
- Several GP-IOs for external devices control
- Integrated power switch to allow supplying a companion chip (smart card)
- Integrated S2C interface with CLAD line
- Type B protocol selectable via assembly

The PN532C106 main differences compared with PN532C104:

- Possible host interface: HSU, I2C or SPI mode 0 (no more SPI mode 1, 2, 3)
- “Low battery” mode

“Low battery” mode is the default mode of PN532C106. It is described in the application note AN10609_2.

PN532/C106 demoboard is described in this application note.

Demoboard for the C106 version of the PN532 is called **PCB1948-1**.

It is described in paragraph 2:

Paragraph 2.1 describes which straps to close and which ones to open, depending on the interface with the application controller.

Paragraph 2.2 shows how to power the demoboard.

Paragraph 2.3 explains how to control hardware reset of the PN532C106.

Paragraph 2.4, 2.5, and 0 contain electrical schematics, layout and components information.

2. PN532C106 demoboard description

Board PCB1948-1 can be considered as a reference design for the PN532C106 IC.
The interface with the host controller is a high speed UART (HSU).
The demoboard PCB is split into 4 parts:

- The interface and power supply part
- The main part (containing PN532 IC)
- The antenna matching components part
- The antenna itself.

It is possible to break the PCB, for instance to remove the interface and power supply part, in order to connect it to a host controller with a different interface and power sources.

2.1 Possible configurations

This paragraph describes the board configuration for the PN532C106.

2.1.1 Interfaces with the host controller

P31 is not used to choose between handshake or standard mode: the PN532C106 implements **only handshake mode**, whatever P31 configuration (it is left not connected).

Selection of I2C, SPI (mode 0 only) or HSU:

The host interface selection is done by a hardware configuration (using interface mode lines I0 and I1) during the power up sequence of the chip.
The PN532 firmware reads I0, I1 ports during power up sequence and sets the ConfigI0_I1 register bits with the corresponding configuration.

PCB1948-1 is configured in HSU mode. However, it is possible to change the configuration, in order to use SPI mode 0 or I2C links.
I0 and I1 value can be chosen by using ST5 and ST6 straps.

Table 1. Interface selection

Host interface	I0 Pin (pin #16)	I1 pin (pin #17)	Strap connected	Strap not connected
HSU (high speed UART)	0	0	ST5 ST6	
I2C	1	0	ST6	ST5
SPI mode 0	0	1	ST5	ST6

2.1.2 Supply for a companion chip (SAM)

The power supply SVDD can either come from the PN532 (pin # 37) via an integrated power switch or can come from an external supply by using ST10 and ST11 straps.

Default configuration is use of the integrated power switch (ST10 connected, ST11 open). SIGIN signal coming from the companion chip is connected to a AND gate triggered by the integrated power switch. No external supply is needed.

When ST10 is open and ST11 is connected, an external supply SVDD has to be connected to SVDD_EXT input (=TP9). SIGIN signal coming from the companion chip is connected to a AND gate triggered by the integrated power switch. External SVDD voltage has to be lower than 3.8V.

2.1.3 PCB1948-1, HSU, handshake mode

This is the default configuration of the demoboard.

The PN532C106 implements **only handshake mode**.

The default serial speed is 115200 bauds.

Table 2. PCB1948-1, HSU, handshake mode

Strap connected	Strap not connected	Explanation
	ST1 ST2	Could be used for connecting load resistors on AUX1and AUX2 test pins (not needed in standard application mode)
-	ST3 ST4	Could be closed to select special modes (cf. UM0701-02 table 1). (not connected in standard application mode)
ST5 ST6	-	Select host interface : see Table 1
-	ST7 ST8	Could be used with I2C interface: Pull-up resistors
-	ST9	Could be used with SPI interface
ST10	ST11	Could be used to supply companion chip (e.g. SAM like SmartMX) with an external supply
ST12	-	Could be removed to use a voltage source for PVDD that is different from VBAT (default: PVDD=VBAT)
ST14	ST13	Voltage sources connection. The strap ST14 could be opened to power the board with another supply than the 5V jack.
-	ST15 ST16	Could be closed to shortcut the 3.3V regulator.

2.1.4 PCB1948-1, I2C, handshake mode

Table 3. PCB1948-1, I2C, handshake mode

Strap connected	Strap not connected	Explanation
	ST1 ST2	Could be used for connecting load resistors on AUX1and AUX2 test pins (not needed in standard application mode)
-	ST3 ST4	Could be closed to select special modes (cf. UM0701-02 table 1). (not connected in standard application mode)
ST6	ST5	Select host interface : see Table 1
-	ST7 ST8	Could be used with I2C interface: Pull-up resistors
-	ST9	Could be used with SPI interface
ST10	ST11	Could be used to supply companion chip (e.g. SAM like SmartMX) with an external supply
ST12	-	Could be removed to use a voltage source for PVDD that is different from VBAT (default: PVDD=VBAT)
ST14	ST13	Voltage sources connection. The strap ST14 could be opened to power the board with another supply than the 5V jack.
-	ST15 ST16	Could be closed to shortcut the 3.3V regulator.

2.1.5 PCB1948-1, SPI mode 0, handshake mode

The PN532C106 implements **only mode 0**.

Table 4. PCB1948-1, SPI, handshake mode

Strap connected	Strap not connected	Explanation
	ST1 ST2	Could be used for connecting load resistors on AUX1and AUX2 test pins (not needed in standard application mode)
-	ST3 ST4	Could be closed to select special modes (cf. UM0701-02 table 1). (not connected in standard application mode)
ST5	ST6	Select host interface : see Table 1
-	ST7 ST8	Could be used with I2C interface: Pull-up resistors
ST9	-	Could be used with SPI interface when “Low battery” mode is used.
ST10	ST11	Could be used to supply companion chip (e.g. SAM like SmartMX) with an external supply
ST12	-	Could be removed to use a voltage source for PVDD that is different from VBAT (default: PVDD=VBAT)
ST14	ST13	Voltage sources connection. The strap ST14 could be opened to power the board with another supply than the 5V jack.
-	ST15 ST16	Could be closed to shortcut the 3.3V regulator.

2.2 Power supply

The demoboard shall be supplied with an external +5V supply voltage using a specific jack (figure 1).

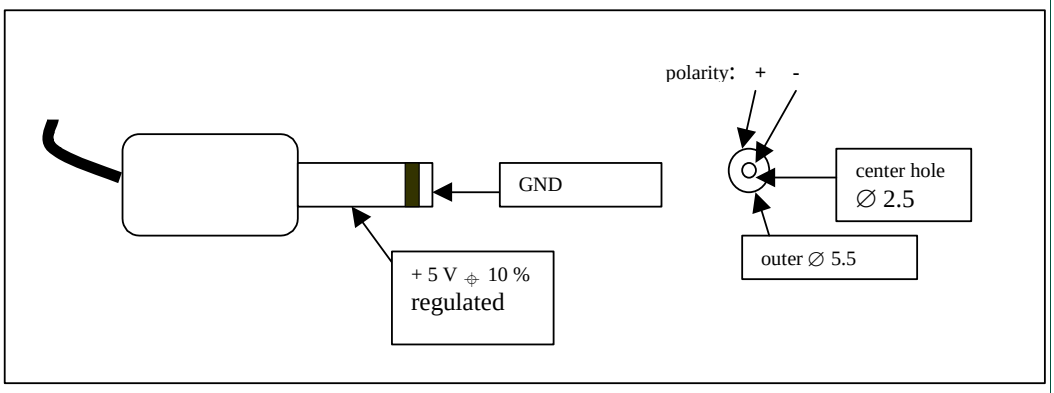

Fig 1. Supply of PCB1948-1

From this supply voltage is derived the 2 supplies used by the PN532: V_{BAT} and P_{VDD}. On the demoboard, V_{BAT} and P_{VDD} are connected, but it is possible to disconnect them (disconnect ST12, ST13 and ST14), in order to link V_{BAT} for example to a battery supply, and P_{VDD} to another supply voltage.

V_{BAT} must be between 2.7V and 5V; P_{VDD} must be between 1.6V and 3.6V. (Cf. PN532 datasheet). V_{BAT} must be present before P_{VDD}.

2.3 RESET control

A push button BP1 allows to reset the chip.

The hardware reset can also be controlled via the RESET input (=TP12) of the demoboard which is active on high level.

The PN532C106 implements the “Low battery” mode for mobile application; it means the PN532C106 can works like a virtual card even when PVDD (host controller supply) is absent. Therefore the RSTPDN pin of the PN532C106 has to be tied to high level even when PVDD is absent: an LDO regulator (output voltage=2.7V) is used on the demoboard to drive the RSTPDN pin from the VBAT supply.

2.4 Electrical diagram

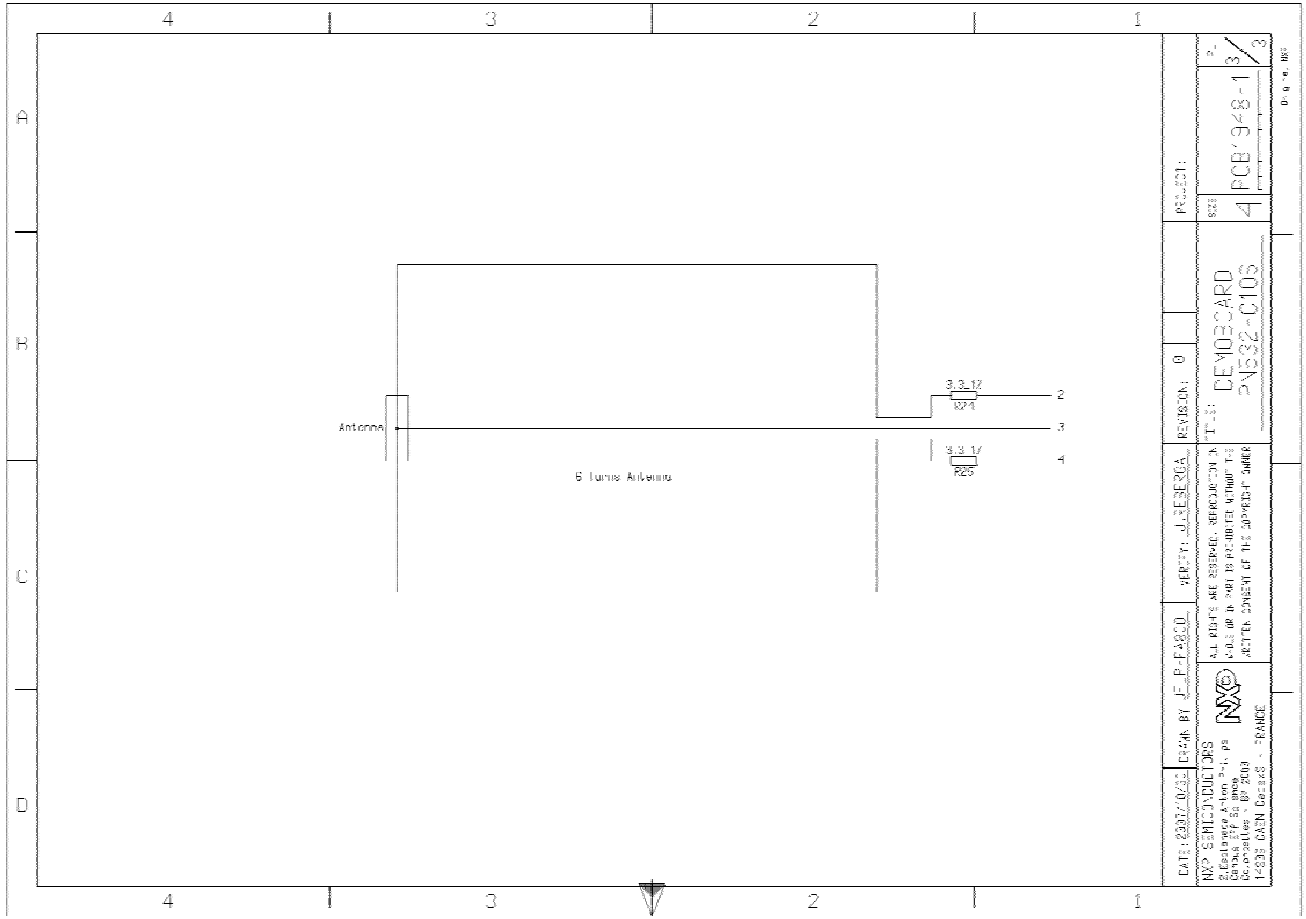

Fig 2. Antenna

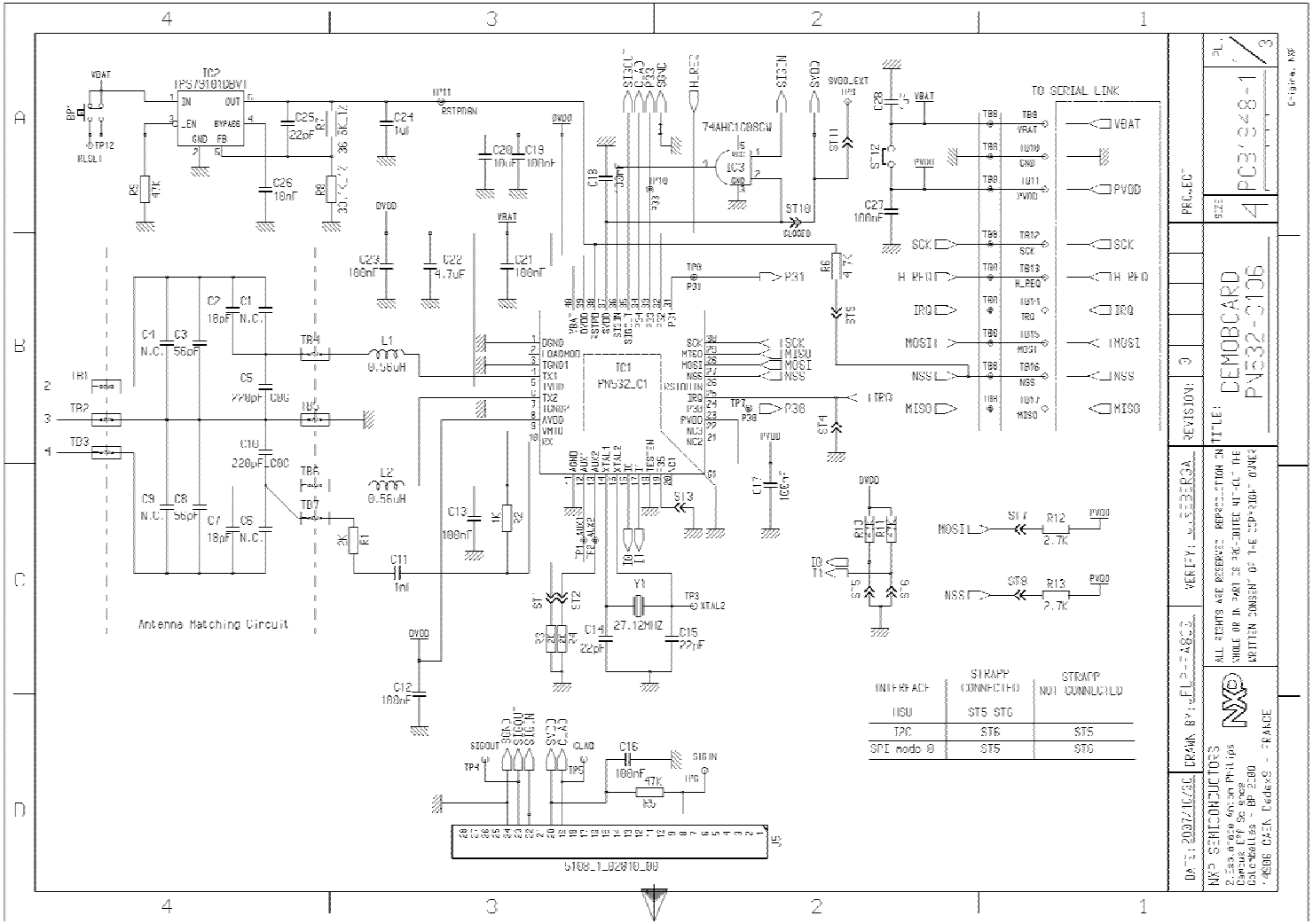

Fig 3. Main board

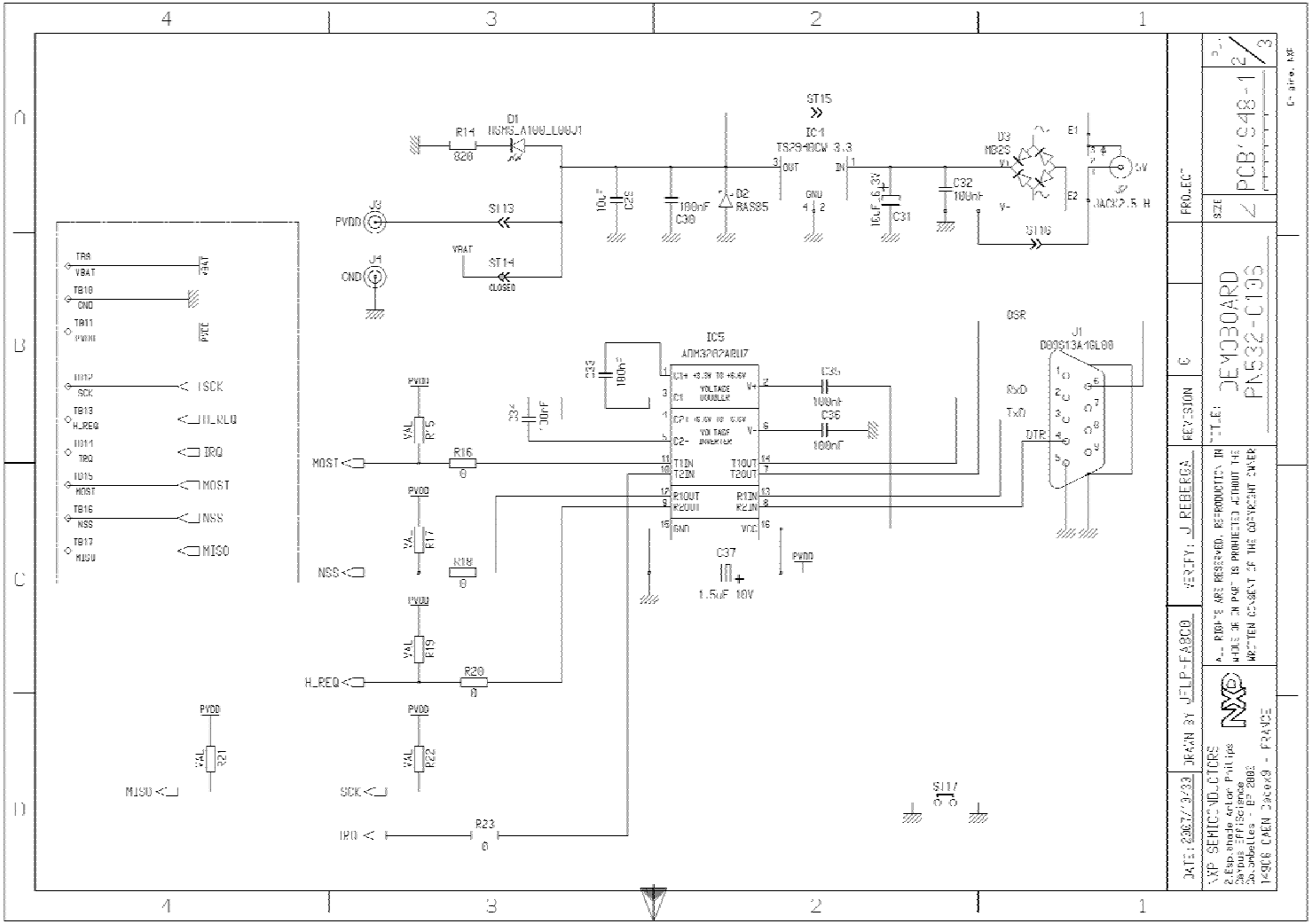

Fig 4. Interface

2.5 Layout

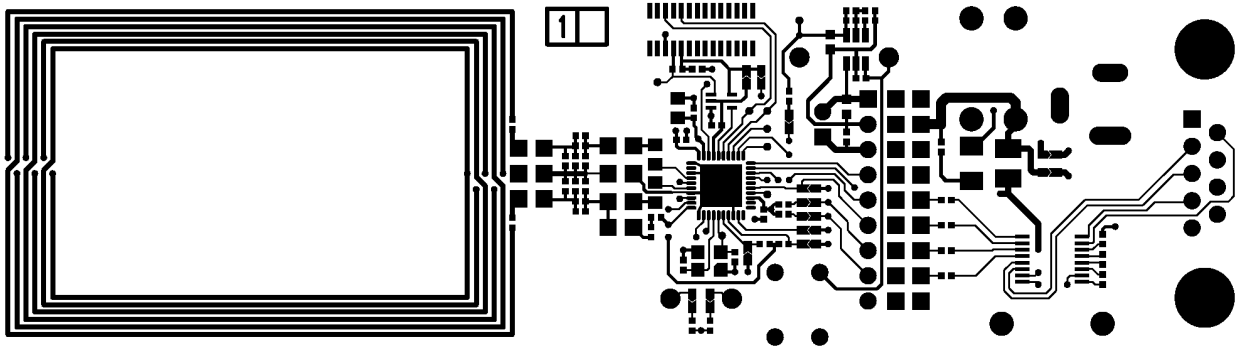

Fig 5. film 1

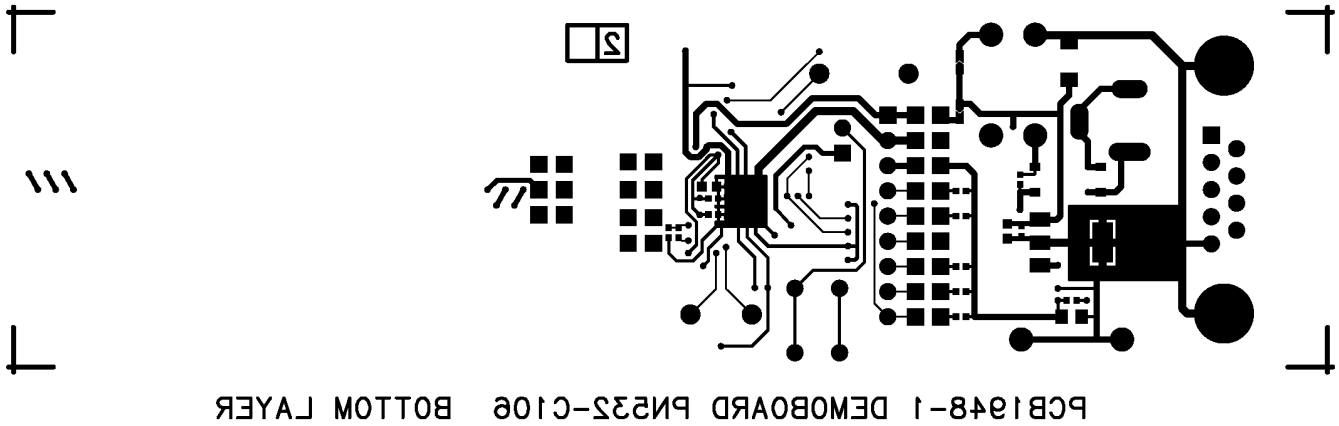

Fig 6. film 2

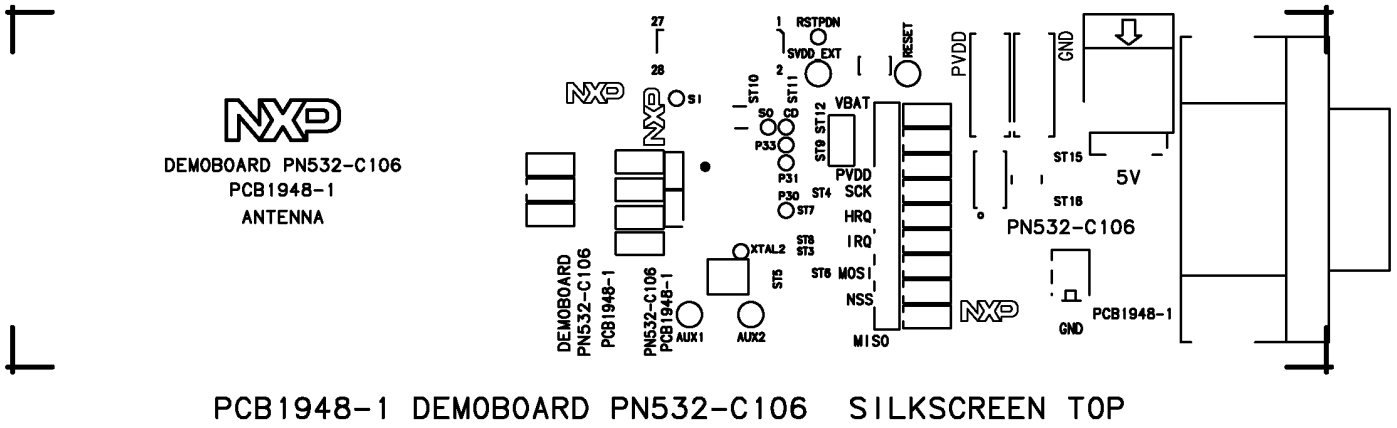

Fig 7. film 3

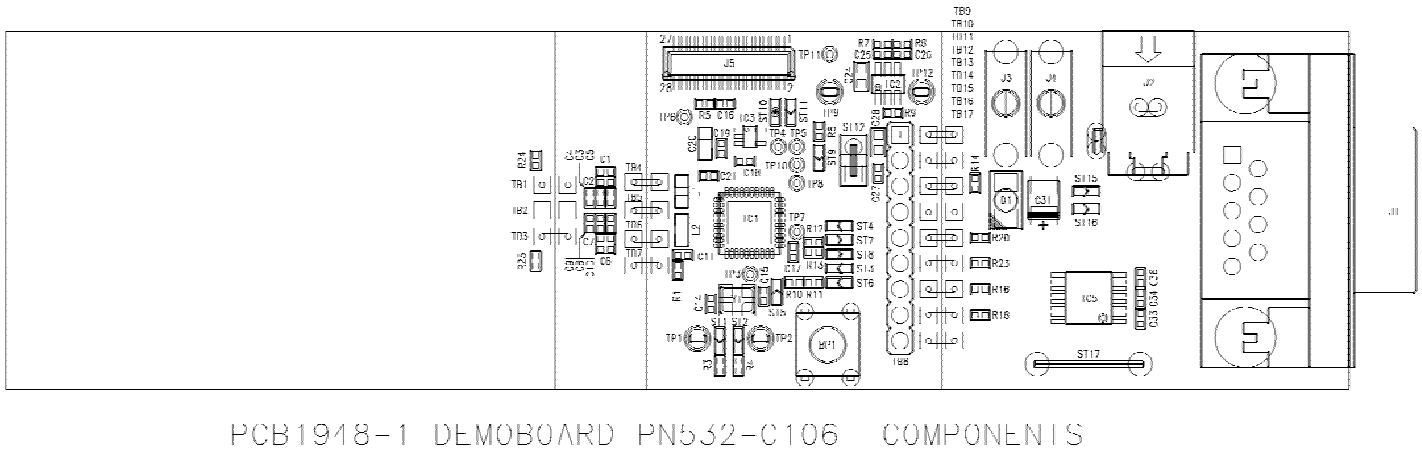

Fig 8. film 4

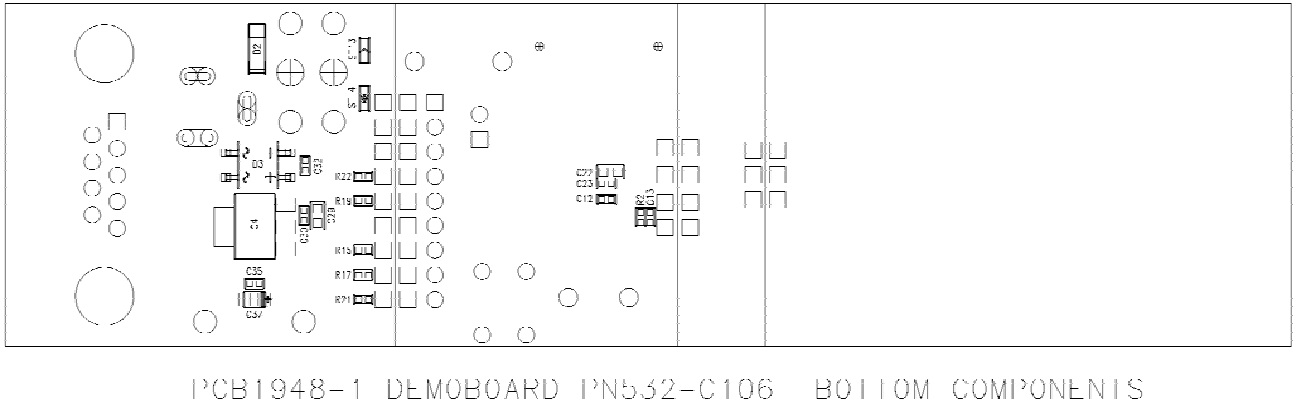

Fig 9. film 5

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,C0G,50V,5%
C3	c0402	56pF,	Capacitor,CER2,0402,C0G,50V,5%
C4	c0402	N.C.,	Capacitor,CER2,0402,***NOT,CONNECTED***
C5	c0402	220pF_C0G,	Capacitor,CER2,0402,C0G,50V,GPR15_5C_1H_221
C6	c0402	N.C.,	Capacitor,CER2,0402,***NOT,CONNECTED***
C7	c0402	18pF,	Capacitor,CER2,0402,C0G,50V,5%
C8	c0402	56pF,	Capacitor,CER2,0402,C0G,50V,5%
C9	c0402	N.C.,	Capacitor,CER2,0402,***NOT,CONNECTED***
C10	c0402	220pF_C0G,	Capacitor,CER2,0402,C0G,50V,GPR15_5C_1H_221
C11	c0402	1nF,	Capacitor,CER2,0402,X7R,50V,10%
C12	c0402	100nF,	Capacitor,CER2,0402,X7R,16V,10%
C13	c0402	100nF,	Capacitor,CER2,0402,X7R,16V,10%
C14	c0402	22pF,	Capacitor,CER2,0402,C0G,50V,5%
C15	c0402	22pF,	Capacitor,CER2,0402,C0G,50V,5%
C16	c0402	100nF,	Capacitor,CER2,0402,X7R,16V,10%
C17	c0402	100nF,	Capacitor,CER2,0402,X7R,16V,10%
C18	c0402	100nF,	Capacitor,CER2,0402,X7R,16V,10%
C19	c0402	100nF,	Capacitor,CER2,0402,X7R,16V,10%
C20	c0805	10uF,	Capacitor,CER2,0805,X5R,6.3V,10%

C35	c0402	100nF,	Capacitor,CER2,0402,X7R,16V,10%
C36	c0402	100nF,	Capacitor,CER2,0402,X7R,16V,10%
C37	taj_r	1.5uF_10V,	AVX:TAJR155K010R,Tantal,Capacitor,Package:R,10%
D1	topled	HSMS_A100_L00J1,	AGILENT:Red,LED,Topled,30mA
D2	sod80	BAS85,	PHILIPS:Schottky,Barrier,Diode,30V,0.2A,
D3	to269aa	MB2S,	GENERAL_SEMICONDUTOR:SMD,Bridge,Rectifier,200V,0.5A
IC1	mlf6x40_0.5	PN532_C1,	PHILIPS:Package:HVQFN40
IC2	sot23_6	TPS79101DBVT,	TEXAS:Ultra-Low,Noise,LDO,Linear,Regulator,Adjustable,0.96V,to,1.02V,0.1A,SOT23-6
IC3	sot353	74AHC1G08GW,	PHILIPS:Picogate,2-input,AND,Gate
IC4	sot223	TS2940CW_3.3,	TSC:Ultra-Low,Dropout,Fixed,Positive,voltage,Regulator,3.3V,1A,SOT223
IC5	sot403_1	ADM3202ARUZ,	ANALOG-DEVICES:Low,Power,3.3V,RS232,Line-Driver,Receiver,Package:TSSOP16
J1	subd_09fc	D09S13A4GL00,	FCI:Delta-D,Connector,Right-Angle,Female,Norm,HE5
J2	jack2.5_h	JACK2.5_H,	CLIFF:DC10B,Power,Connector,Horizontal,2.5mm
J3	emb_2c	EMB_2RC,	JOHNSON:105-0752-001,horizontal,Test,jack,Red,2.0mm
J4	emb_2c	EMB_2BLC,	JOHNSON:105-0753-001,horizontal,Test,jack,Black,2.0mm
J5	5108_2x14s_0.8md	5108_1_02810_00,	WP-PRODUCTS:5108,Serie,SMT,Board,to,Board,Connector,Plug,28pins,0.8mm
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	47K,	Resistor,Package:0402,5%,1/16W
R6	r0402	4.7K,	Resistor,Package:0402,5%,1/16W
R7	r0402	36.5K_1%,	Resistor,Package:0402,1%,1/16W
R8	r0402	30.1K_1%,	Resistor,Package:0402,1%,1/16W
R9	r0402	47K,	Resistor,Package:0402,5%,1/16W
R10	r0402	47K,	Resistor,Package:0402,5%,1/16W
R11	r0402	47K,	Resistor,Package:0402,5%,1/16W
R12	r0402	2.7K,	Resistor,Package:0402,5%,1/16W
R13	r0402	2.7K,	Resistor,Package:0402,5%,1/16W
R14	r0402	820,	Resistor,Package:0402,5%,1/16W
R15	r0402	VAL,	Resistor,Package:0402,***TO,BE,DEFINED***
R16	r0402	0,	Resistor,Package:0402,5%,1/16W
R17	r0402	VAL,	Resistor,Package:0402,***TO,BE,DEFINED***
R18	r0402	0,	Resistor,Package:0402,5%,1/16W
R19	r0402	VAL,	Resistor,Package:0402,***TO,BE,DEFINED***
R20	r0402	0,	Resistor,Package:0402,5%,1/16W
R21	r0402	VAL,	Resistor,Package:0402,***TO,BE,DEFINED***
R22	r0402	VAL,	Resistor,Package:0402,***TO,BE,DEFINED***
R23	r0402	0,	Resistor,Package:0402,5%,1/16W
R24	r0402	3.3_1%,	Resistor,Package:0402,1%,1/16W
R25	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	chevron_aclos	CLOSED,	***TO,BE,CLOSED***
ST11	chevron_a	OPEN,	***OPEN,BY,DEFAULT***
ST12	cav_1p	CAV_1POS,	COMATEL:3132512020476,blue,Jumper+Header,Single,Row,Straight,2Pins,Pitch:2.54,h:7mm
ST13	chevron_a	OPEN,	***OPEN,BY,DEFAULT***
ST14	chevron_aclos	CLOSED,	***TO,BE,CLOSED***
ST15	chevron_a	OPEN,	***OPEN,BY,DEFAULT***
ST16	chevron_a	OPEN,	***OPEN,BY,DEFAULT***
ST17	cav1016_1p	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         bar9            Bar9MD,         Header,Single,Row,Straight,Pitch:2.54,h:6to7mm
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        cav2sp          CAVAL_2.54,     ANTELEC:CCM1D,Jumper,Pitch:2.54
TB13        cav2sp          CAVAL_2.54,     ANTELEC:CCM1D,Jumper,Pitch:2.54
TB14        cav2sp          CAVAL_2.54,     ANTELEC:CCM1D,Jumper,Pitch:2.54
TB15        cav2sp          CAVAL_2.54,     ANTELEC:CCM1D,Jumper,Pitch:2.54
TB16        cav2sp          CAVAL_2.54,     ANTELEC:CCM1D,Jumper,Pitch:2.54
TB17        cav2sp          CAVAL_2.54,     ANTELEC:CCM1D,Jumper,Pitch:2.54
TP1         tpboucle1.0     5001,           KEYSTONE:Black,Testpoint,Type1
TP2         tpboucle1.0     5001,           KEYSTONE:Black,Testpoint,Type1
TP3         plage.75        PLAGE.75,       ***NOT,CONNECTED***
TP4         plage.75        PLAGE.75,       ***NOT,CONNECTED***
TP5         plage.75        PLAGE.75,       ***NOT,CONNECTED***
TP6         plage.75        PLAGE.75,       ***NOT,CONNECTED***
TP7         plage.75        PLAGE.75,       ***NOT,CONNECTED***
TP8         plage.75        PLAGE.75,       ***NOT,CONNECTED***
TP9         tpboucle1.0     5001,           KEYSTONE:Black,Testpoint,Type1
TP10        plage.75        PLAGE.75,       ***NOT,CONNECTED***
TP11        plage.75        PLAGE.75,       ***NOT,CONNECTED***
TP12        tpboucle1.0     5001,           KEYSTONE:Black,Testpoint,Type1
Y1          tas3225         27.12MHZ,       TOKYO-DENPA:TAS-3225A,Type,Quartz,Crystal,SMD

BULLE1:Printed_Circuit_board:PCB1948-1
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