

**TK-78K0/KF2+UZ  
Hard ware Manual**

TESSERA TECHNOLOGY INC.

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# 1 TK-78K0/KF2+UZ

78K0/KF2 is the NEC Electronics 8 bit single chip microcomputer.

The features and hardware specification of an evaluation board (TK-78K0/KF2+UZ MCU board) of 78K0/KF2 series and mounted UZ2400 by Uniband Electronic Corporation are described.

## 1.1 Features

Features of the TK-78K0/KF2+UZ MCU board are as follows.

- The evaluation board uses the NEC Electronics 8-bit single chip microcontroller ( $\mu$ PD78F0547D).  
All of ROM, RAM and circumference circuit are efficiently built in one chip on a single board.
- High-speed operation has been achieved with 16MHz clock.
- Sub-clock 32.768KHz standard equipment
- 128-Kbyte flash memory is built into MCU chip.  
A high-speed RAM:1024 byte and enhancing RAM:6144 byte is built into.
- Hardware is ready to accommodate 2.4GHz transceiver chip UZ2400 (IEEE802.15.4 ZigBee compliant wireless personal area network) made by Uniband Electronic Corporation (<http://www.ubec.com.tw/index.html>).
- (Attached antenna : Titanis made by Gigaant(<http://www.gigaant.com/>))※
- 17 I/O ports are equipped at the maximum.  
MCU board carries a temperature sensor. (S-8120C made by SII <http://www.sii.co.jp/>)※
- Debugging using on-chip debug function can be done.
- The board itself is quite and easy to handle; MCU board size 70mm×60mm, The size of including RF transceiver 80mm×60mm.

※ Please inquire direct to the parts maker about specification of UZ2400 chip, antenna and temperature sensor.

## 1.2 Hardware specification

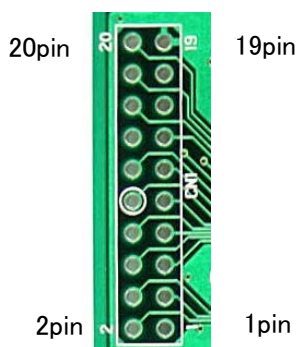
MCU	μPD78F0547DGK
Operation frequency	16MHz Operation (Sub-clock:32.768KHz)
RF transceiver	UZ2400 RF Board
Interface	USB (Mini B connector) RF board connector Connector of board in surrounding(CN1: not mounted) Connector of battery(9.0V-6.5V)
Operation voltage	5.0V(Supply from USB)、 9.0V(Supply from a battely,Min.6.5V)

### 1.3 Terminal list

It is a terminal table of CN1, CN3 and CN4 of TK-78K0/KF2+UZ MCU board.

CN1 terminal list (FFC-20BMEP1[not mounted] by HONDA CONNECTORS)

CN1	Signal name	Terminal MCU name at connection destination	Notes
1	VDD	VDD	+3.3V
2	P10	P10/SCK10/TxD0	
3	P11	P11/SI10/RxD0	
4	P12	P12/SO10	
5	P15	P15/TOH0	
6	P16	P16/TOH1/INTP5	
7	P17	P17/TI50/TO50	
8	P24	P24/ANI4	
9	P25	P25/ANI5	
10	P26	P26/ANI6	
11	P27	P27/ANI7	
12	P33	P33/TI51/TO51/INTP4	
13	P60	P60/SCL0	
14	P61	P61/SDA0	
15	P62	P62/EXSCL0	
16	P120	P120/INTP0/EXLVI	
17	GND	GND	
18	P140	P140/PCL/INTP6	
19	GND	GND	
20	P141	P141/BUZ/BUSY0/INTP7	



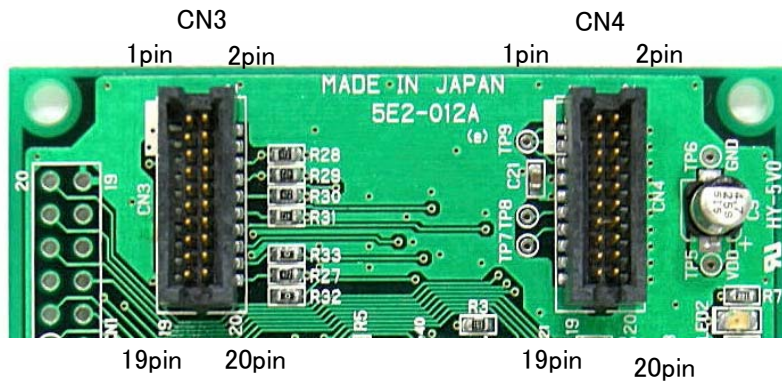
CN1 Pin Configuration

CN3 terminal list(TFM-110-02-S-D-A-K-TR[not mounted by SAMTEC ]

CN3	Signal name	Terminal MCU name at connection destination	Notes
1	GND	GND	
2			N.C.
3	VREG_EN	P50	Output from MCU
4			N.C.
5	RESn	P51	Output from MCU
6	FIFO	P33/TI51/TO50/INTP4	Input to MCU
7			N.C.
8	FIFOP	P52	Input to MCU
9			N.C.
10	CCA	P53	Input to MCU
11			N.C.
12	SFD	P06/TI011/TO01	Input to MCU
13			N.C.
14	CSn	P43	Output from MCU
15			N.C.
16	SCLK	P04/ <u>SCK</u> 11	Output from MCU
17			N.C.
18	SI	P02/SO11	Output from MCU
19	GND	GND	
20	SO	P03/SI11	Input to MCU

CN4 terminal list(TFM-110-02-S-D-A-K-TR[not mounted by SAMTEC ]

CN4	Signal name	Terminal MCU name at connection destination	Notes
1	TP2		
2	GND	GND	
3	TP2		
4	GND	GND	
5	TP2		
6	GND	GND	
7	3.3V		
8	GND	GND	
9	3.3V		
10	GND	GND	
11	TP3		
12	GND	GND	
13	TP4		
14	GND	GND	
15			N.C.
16	GND	GND	
17			N.C.
18	GND	GND	
19			N.C.
20	GND	GND	



CN3,CN4 Pin Configuration

## 2 Switches and LED

### 2.1 SW1、SW5、JP1

Bit1-5 of SW1 is Dip switch for operation mode setting.

SW5 is a slide switch to select an operation mode.

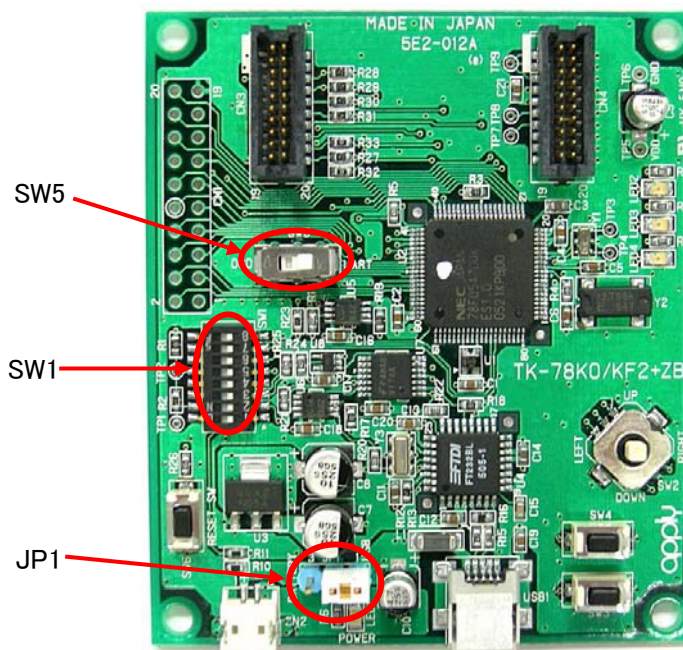
JP1 is a jumper to select a power source.

#### 2.1.1 Flash Programming Mode

Flash EEPROM on the 78K0/KF2+ZB MCU can be programmed using the attached software “PG-FPL3” in your PC, which is connected to the MCU board via USB cable, if the following switch and jumper setting is made.

Flash programming mode

SW1	Bit 1	ON
	Bit 2	ON
	Bit 3	OFF
	Bit 4	OFF
	Bit 5	OFF
SW5	UART	
JP1	USB (1-2pin short)	



### 2.1.2 On-chip Debug Mode

The following setting activates the On-chip debug functions on the MCU.

On-chip debug mode

SW1	Bit 1	ON
	Bit 2	ON
	Bit 3	ON
	Bit 4	ON
	Bit 5	ON
SW5		OCD
JP1		USB (1-2pin short)

### 2.1.3 Normal Operation Mode

Please change to the following settings when you execute the program normally.

Normal Operation Mode

SW1	Bit 1	OFF
	Bit 2	OFF
	Bit 3	OFF
	Bit 4	OFF
	Bit 5	OFF
SW5		UART
JP1		See below

Selection of power source by JP1

JP1 select

USB Power	USB (1-2pin short)
Battery	CN2 (2-3pin short)

#### 2.1.4 General purpose setting port

Bit6-8 of SW1 is general purpose setting port.

It becomes “Low” if the switch is pushed, and it becomes “Open” if it separates. Please turn on pull-up resistor (PU0) with built-in MCU when using it.

(For more detail of the pull-up resistor, please refer to the User’s manual of the  $\mu$ PD78F0547 MCU. )

SW1 terminal list

SW1	Signal name	Terminal MCU name at connection destination	Notes
Bit 6	P00	P00/TI000	
Bit 7	P01	P01/TI010/TO00	
Bit 8	P05	P05/TI001/SSI11	

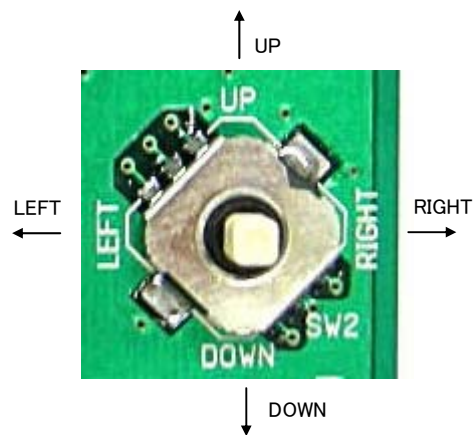
## 2.2 SW2

SW2 is a 4 directional switch with center push. If it is directed or pushed, the input is set to GND. Otherwise the circuit is open. Therefore please set the on-chip pull-up resistors (PU7) during initializing routine of your program code.

(For more detail, please refer to the User's manual of the  $\mu$ PD78F0547 MCU.)

SW2 terminal list (ALPS SKRHADE010)

SW2	Signal name	Terminal MCU name at connection destination	Notes
1	P72	P72/KR2	UP
2	P73	P73/KR3	CENTER PUSH
3	P74	P74/KR4	LEFT
4	P75	P75/KR5	RIGHT
5	GND	GND	
6	P76	P76/KR6	DOWN



SW2 Directional switch

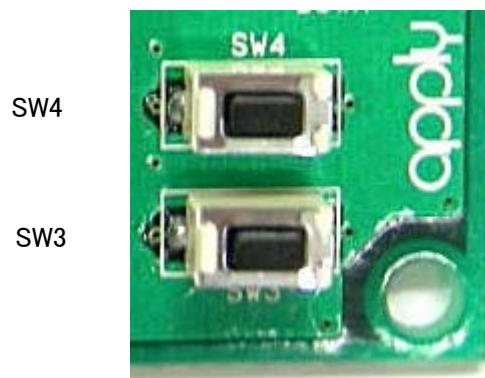
### 2.3 SW3, SW4

SW3 and SW4 are tact switches. The port inputs are short-circuited to ground, while they are being pushed, and kept open otherwise. Therefore please set the on-chip pull-up resistors(PU7) during initializing routine of your program code.

(For more detail, please refer to the User's manual of the  $\mu$ PD78F0547 MCU.)

SW3 and SW4 terminal list (ALPS SKQMBBE010)

	Signal name	Terminal MCU name at connection destination	Notes
SW3	P70	P70/KR0	
SW4	P71	P71/KR1	



### 2.4 SW6

SW6 is the reset switch. MCU can be reset by pushing.



## 2.5 LED1

'Power LED'. LED1 is activated when the power supply is turned on.

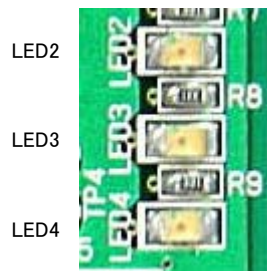


## 2.6 LED2, LED3 and LED4

LED2, LED3, and LED4 are available for applications. To make an LED on, please set the output port LOW.

LED2, LED3 and LED4 Terminal list (STANLEY ELECTRIC PG1111C)

	Signal name	Terminal MCU name at connection destination	Notes
LED2	P40	P40	
LED3	P41	P41	
LED4	P42	P42	



### 3 Power supply

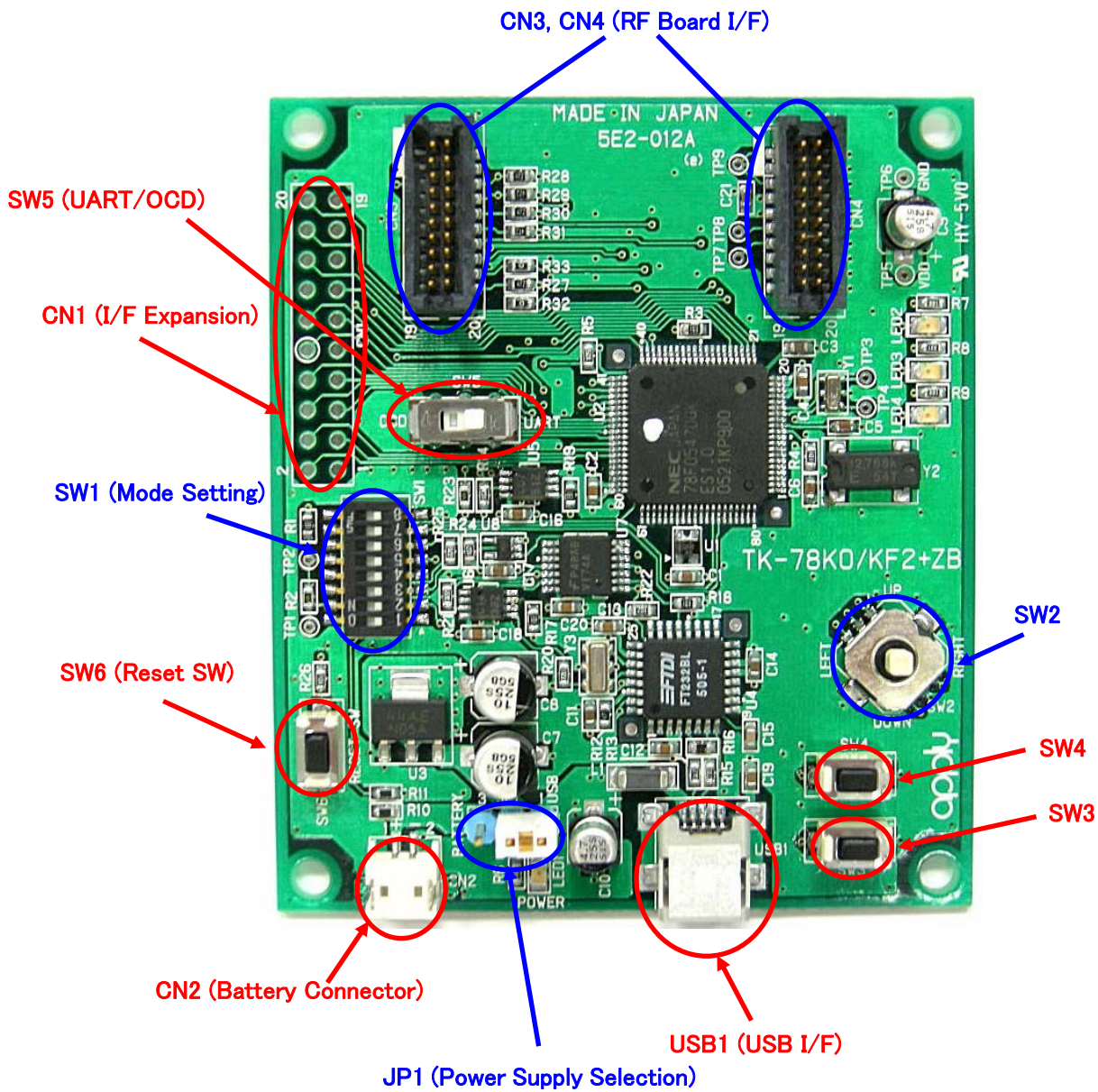
There are two choices to supply power to the board, USB or a 006P battery via CN2. Please refer to 2.1.3 JP1 for the jumper setting. Please replace the battery with a new one, if the voltage level goes down to 6.5V. Below the voltage level of 6.5V, functions of the board are not guaranteed. The battery voltage can be checked at the port as shown below.

9.0V Battery check

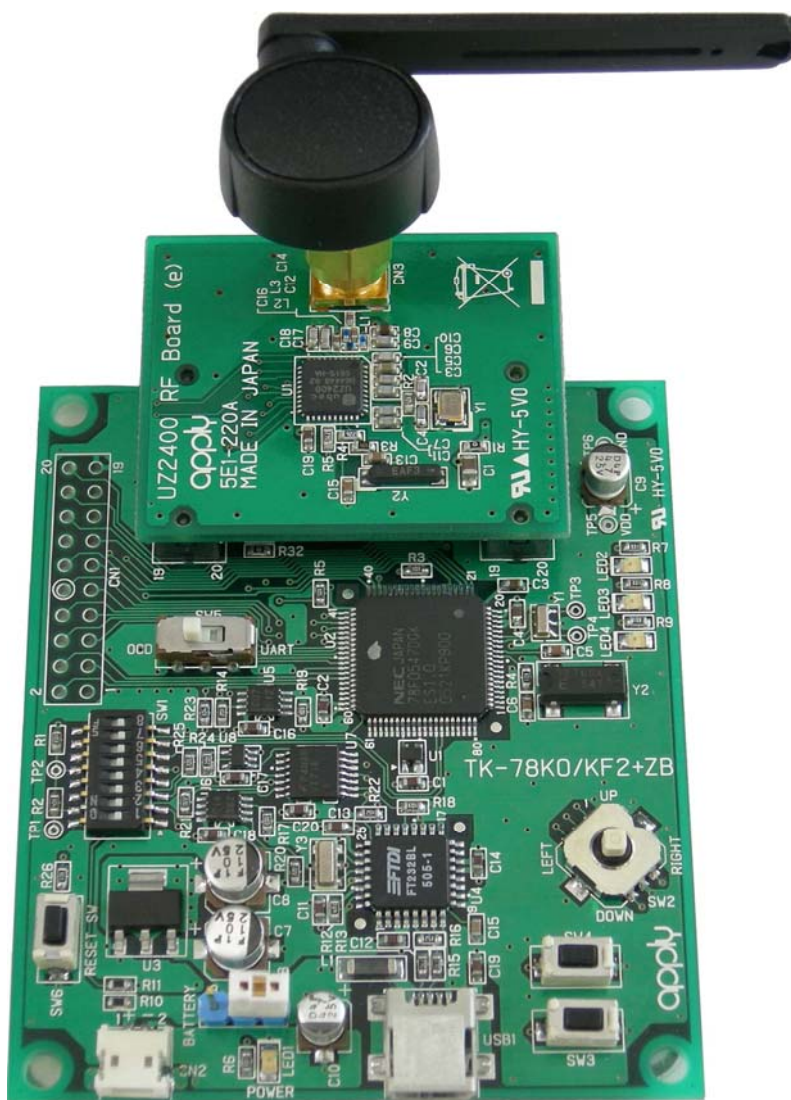
Signal name	Terminal MCU name at connection destination	Notes
BT_MONI	P20/ANI0	33.8% of the battery output is available at ANI0. For instance, If the battery level is 9 V, the level of the BT_MONI = $0.338 \times 9.0 \text{ V}$ = 3.042 V If the battery level is 6.5 V, the level of the BT_MONI = $0.338 \times 6.5 \text{ V}$ = 2.197 V

# 4 TK-78K0/KF2+UZ Data

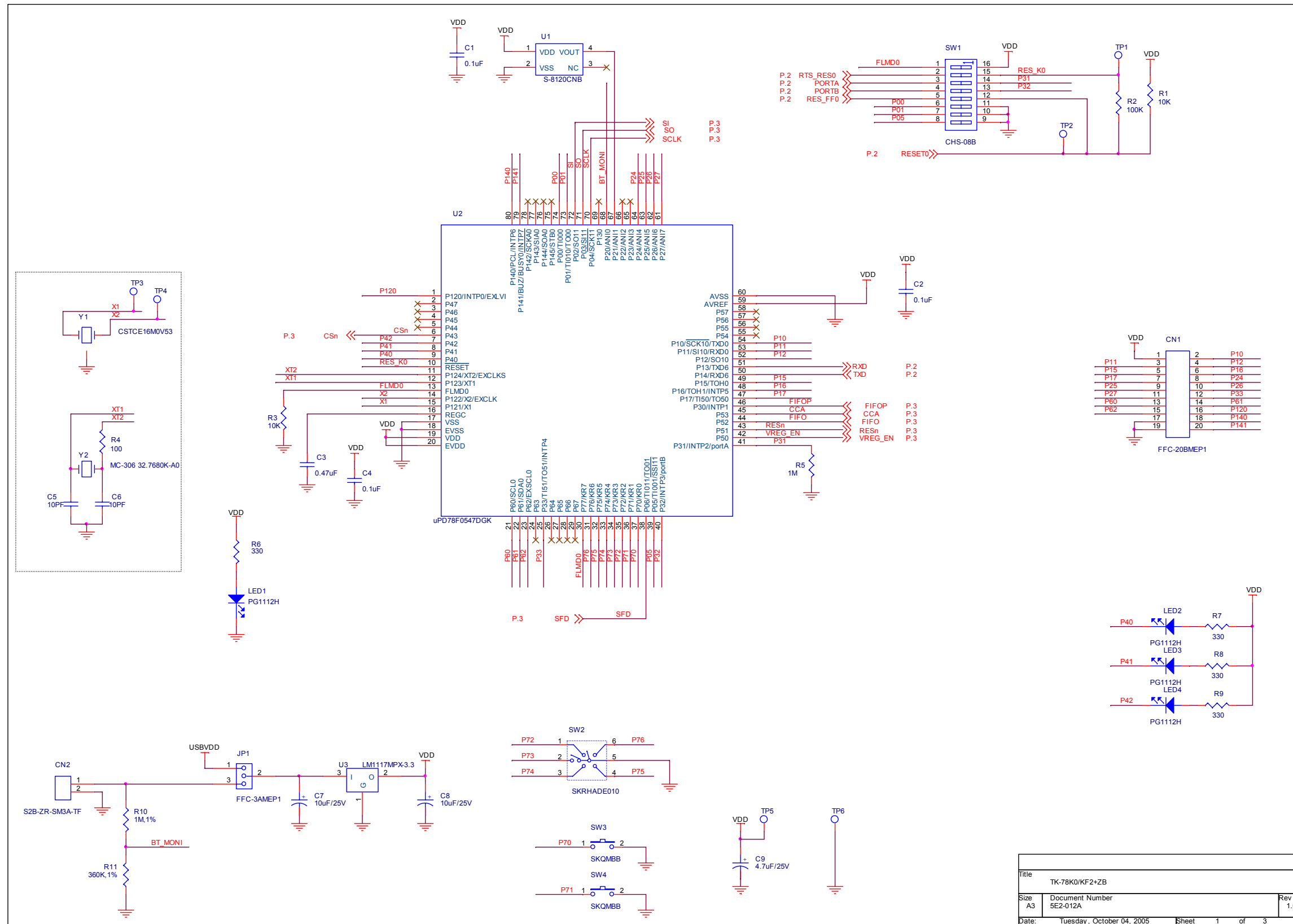
## 4.1 Parts Layout



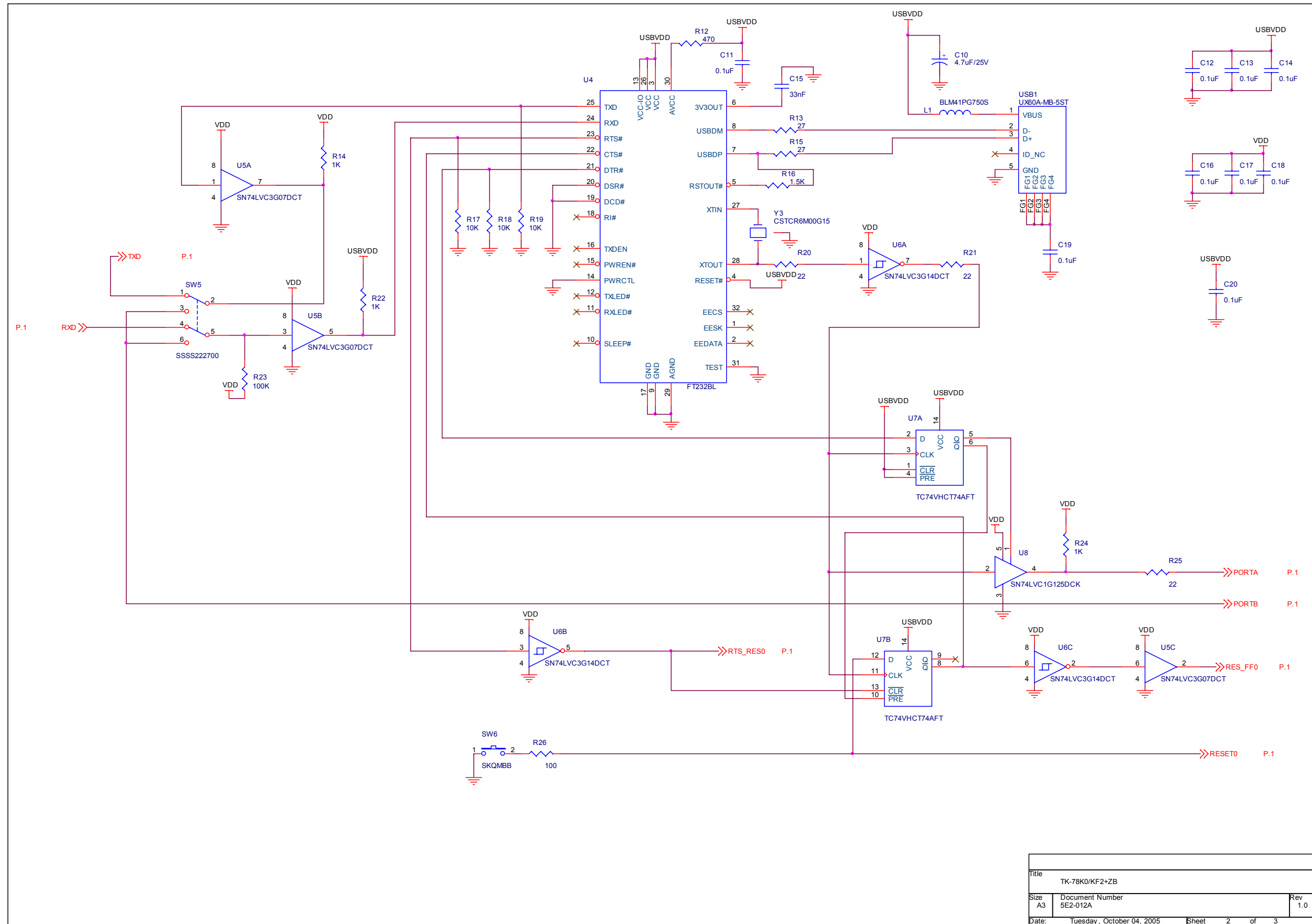
## 4.2 RF board connection figure



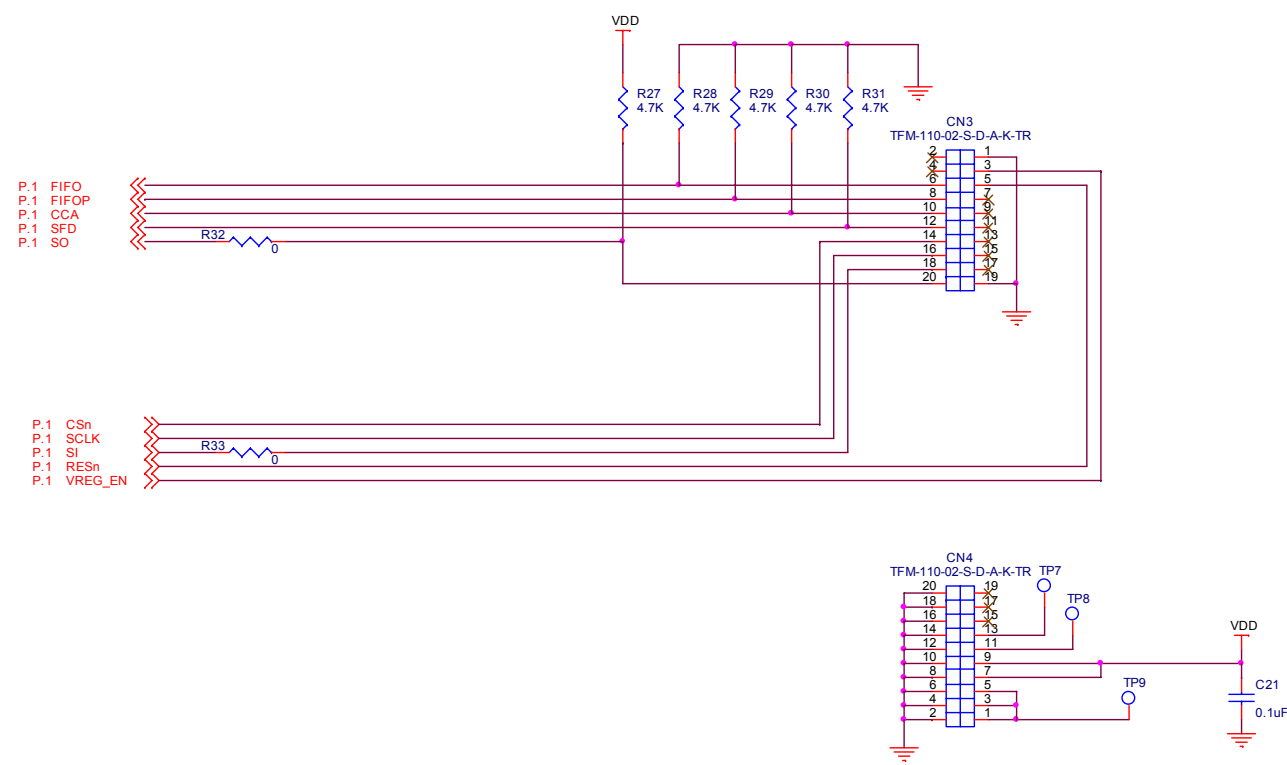
### 4.3 Circuit Diagram of the MCU Board



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A3	5E2-012A	1.0
Date:	Tuesday, October 04, 2005	Sheet 1 of 3

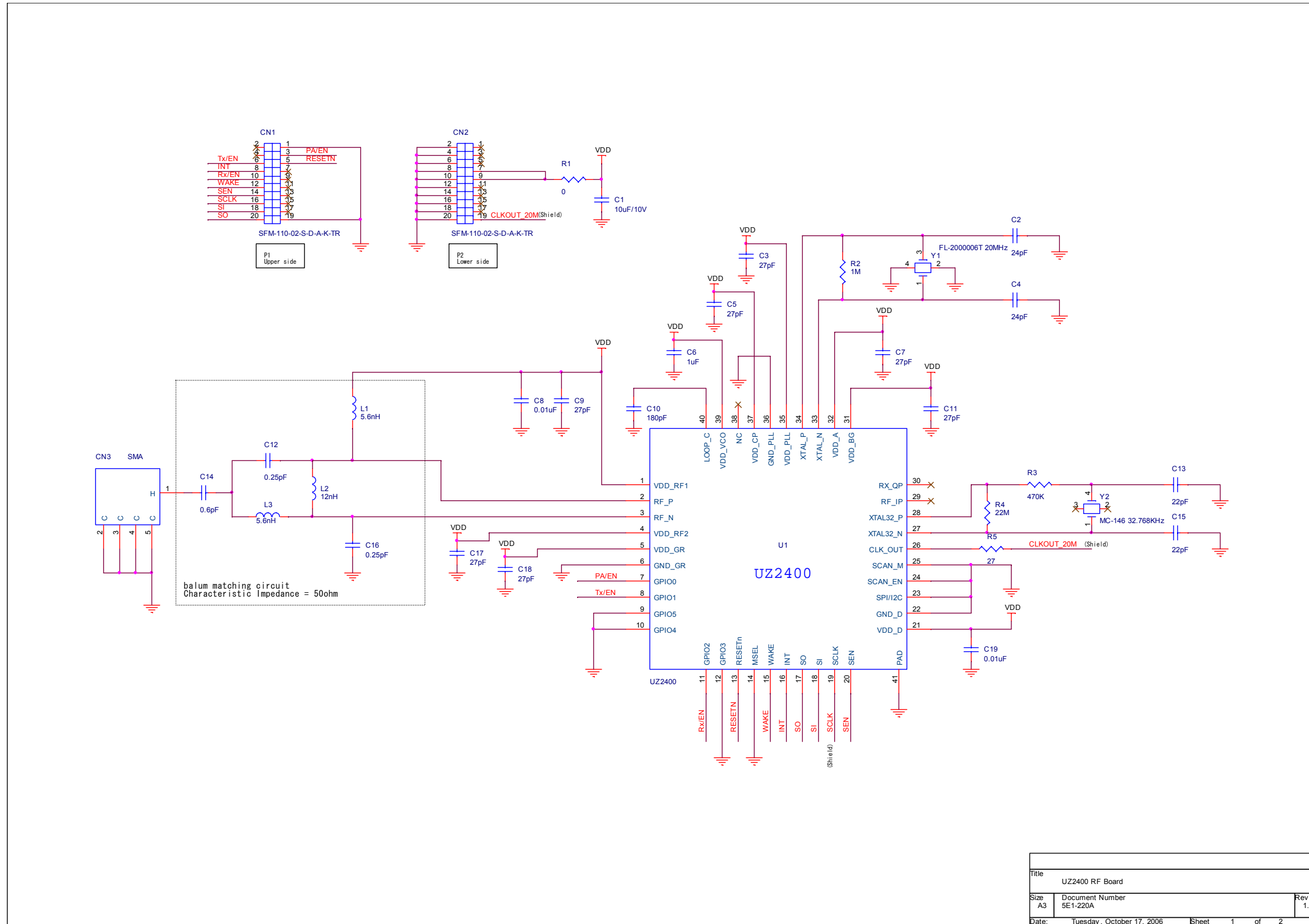


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A3	5E2-012A	1.0
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Title		
TK-78K0/KF2+ZB		
Size	Document Number	Rev
A3	5E2-012A	1.0
Date:	Tuesday, October 04, 2005	Sheet 3 of 3

#### 4.4 Circuit Diagram of the UZ2400 RF Board



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UZ2400 RF Board		
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A3	5E1-220A	1.01
Date:	Tuesday, October 17, 2006	Sheet 1 of 2

#### 4.5 Dimension of the MCU Board

