

**TK-78K0R/KG3+UZ
Hard ware Manual**

TESSERA TECHNOLOGY INC.

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1 TK-78K0R/KG3+UZ

78K0R/KG3 is the NEC Electronics 16bit single chip microcomputer.

The features and hardware specification of an evaluation board (TK-78K0R/KG3+UZ CP4U board) of 78K0R/KG3 series and mounted UZ2400 by Uniband Electronic Corporation are described.

1.1 Features

Features of the TK-78K0R/KG3+UZ CPU board are as follows.

- The evaluation board uses the NEC Electronics 16-bit single chip microcontroller (μ PD78F1168).
- All of ROM, RAM and circumference circuit are efficiently built in one chip on a single board.
- High-speed operation has been achieved with 20MHz clock.
- Sub-clock 32.768KHz standard equipment
- 512-Kbyte flash memory is built into CPU chip.
RAM:30 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/>))※
- 40 I/O ports are equipped at the maximum.
CPU 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; CPU board size 60mm×90mm, The size of including RF transceiver 60mm×102mm.

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

1.2 Hardware specification

CPU	μPD78F1168GC
Operation frequency	20MHz 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-4.8V)
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-78K0R/KG3+UZ CPU board.

CN1 terminal list(HIF3H-50DA-2.54DSA [not mounted] by Hirose Electric)

CN1	Signal name	Terminal CPU name at connection destination	Notes
1	P142	P142/SCK20/SCL20	
2	P141	P141/PCLBUZ1/INTP7	
3	P140	P140/PCLBUZ0/INTP6	
4	P47	P47/INTP2	
5	P46	P46/INTP1/TI05/TO05	
6	P45	P45/SO01	
7	P44	P44/SI01	
8	P42	P42/TI04/TO04	
9	T_RESET		Connected to RESET circuit
10	P120	P120/INTP0/EXLVI	
11	GND	GND	
12	GND	GND	
13	VDD	VDD	
14	VDD	VDD	
15	P22	P22/ANI2	
16	P21	P21/ANI1	
17	P20	P20/ANI0	
18	P63	P63	
19	P64	P64/RD	
20	P65	P65/WR0	

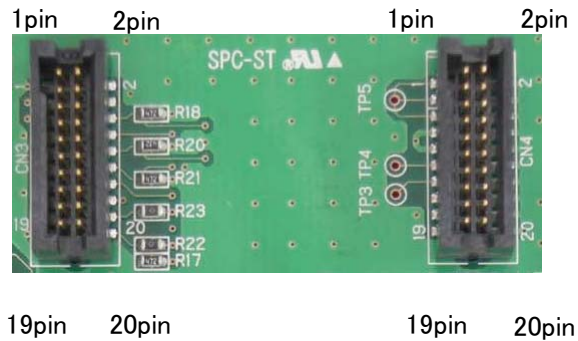
CN1	Signal name	Terminal CPU name at connection destination	Notes
21	P66	P66/WR1	
22	P77	P77/EX23/KR7/INTP11	
23	P06	P06/WAIT	
24	P05	P05/CLKOUT	
25	GND	GND	
26	P30	P30/INTP3/RTC1HZ	
27	VDD	VDD	
28	P54	P54/EX12	
29	P55	P55/EX13	
30	P17	P17/EX31/TI02/TO02	
31	P15	P15/EX29/RTCDIV/RTCCL	
32	P12	P12/EX26/SO00/TxD0	
33	P11	P11/EX25/SI00/RxD0	
34	P10	P10/EX24/SCK00	
35	VDD	VDD	
36	P110	P110/ANO0	
37	P111	P111/ANO1	
38	VDD	VDD	
39	GND	GND	
40	P153	P153/ANI11	
41	P152	P152/ANI10	
42	P151	P151/ANI9	
43	P150	P150/ANI8	
44	P25	P25/ANI5	
45	P24	P24/ANI4	
46	P23	P23/ANI3	
47	P131	P131/TI06/TO06	
48	P145	P145/TI07/TO07	
49	P144	P144/SO20/TxD2	
50	P143	P143/SI20/RxD2/SDA20	

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

CN3	Signal name	Terminal CPU name at connection destination	Notes
1	GND	GND	
2			N.C.
3	VREG_EN	P50/EX8	Output from CPU
4			N.C.
5	RESn	P51/EX9	Output from CPU
6	FIFO	P52/EX10	Input to CPU
7			N.C.
8	FIFOP	P31/TI03/TO03/INTP4	Input to CPU
9			N.C.
10	CCA	P53/EX11	Input to CPU
11			N.C.
12	SFD	P16/EX30/TI01/TO01/INTP5	Input to CPU
13			N.C.
14	CSn	P43/SCK01	Output from CPU
15			N.C.
16	SCLK	P04/SCK10/SCL10	Output from CPU
17			N.C.
18	SI	P02/SO10/TxD1	Output from CPU
19	GND	GND	
20	SO	P03/SI10/RxD1/SDA10	Input to CPU

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

CN4	Signal name	Terminal CPU name at connection destination	Notes
1	TP5		
2	GND	GND	
3	TP5		
4	GND	GND	
5	TP5		
6	GND	GND	
7	3.3V		
8	GND	GND	
9	3.3V		
10	GND	GND	
11	TP4		
12	GND	GND	
13	TP3		
14	GND	GND	
15			N.C.
16	GND	GND	
17			N.C.
18	GND	GND	
19			N.C.
20	GND	GND	



CN3,CN4Pin layout

2 Switches and LED

2.1 SW1

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

Bit6-8 are the Dip switch for general-purpose ports that connected to P80-P82.

2.1.1 For the use of ID78K0R-QB, use following settings.

SW1

Bit 1	ON/OFF ※1
Bit 2	ON
Bit 3	ON
Bit 4	OFF
Bit 5	OFF

※1 **ON:** The microcontroller stays being reset until ID78K0R-QB is started.

OFF: The microcontroller runs the programs stored in the flash memory as soon as it gets power supply.

※2 **If you use ID78K0R-QB, it uses P40 and P41 for communicating with host machine. Therefore, you cannot use P40 and P41.**

2.1.2 To run the programs stored in built-in flash memory without using ID78K0R-QB, use following settings and re-supply USB power.

You can use the On-chip debug function with connecting a MINICUBE2.

SW1

Bit 1	OFF
Bit 2	OFF
Bit 3	OFF
Bit 4	OFF
Bit 5	OFF

2.1.3 For use of P13 (TXD3) and P14 (RXD3) connecting to μ PD78F0730 as general-purpose ports without using ID78K0R-QB, set SW1 as follows and re-connect the USB to re-supply power.

You can use the On-chip debug function with connecting a MINICUBE2.

SW1

Bit 1	OFF
Bit 2	OFF
Bit 3	OFF
Bit 4	ON
Bit 5	ON

2.1.4 Bit6-8 are connected to following CPU pins

It becomes “Low” if the switch is pushed, and it becomes “Open” if it separates. Please turn on pull-up resistor (PU8) with built-in CPU when using it.

SW1

Bit 6	P80
Bit 7	P81
Bit 8	P82

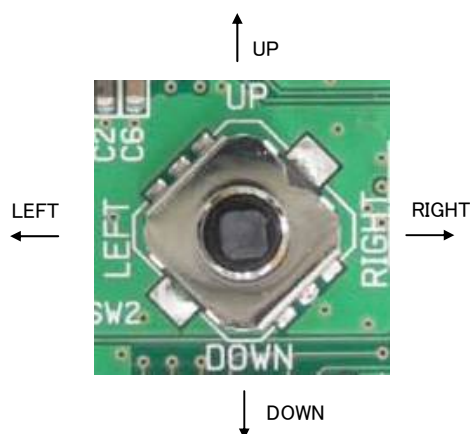
2.2 SW2

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 μ PD78F1168 CPU.)

SW2 terminal list (ALPS SKRHADE010)

SW2	Signal name	Terminal CPU name at connection destination	Notes
1	P72	P72/EX18/KR2	UP
2	P73	P73/EX19/KR3	CENTER PUSH
3	P74	P74/EX20/KR4/INTP8	LEFT
4	P75	P75/EX21/KR5/INTP9	RIGHT
5	GND	GND	
6	P76	P76/EX22/KR6/INTP10	DOWN



SW2 Directional switch

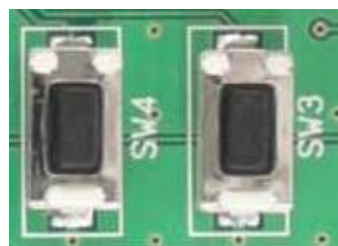
2.3 SW3, SW4

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 μ PD78F1168CPU.)

SW3 and SW4 terminal list (ALPS SKQMBBE010)

	Signal name	Terminal CPU name at connection destination	Notes
SW3	P70	P70/EX16/KR0	
SW4	P71	P71/EX17/KR1	



SW4

SW3

2.4 SW5

SW5 is the reset switch. CPU can be reset by pushing.



SW6

2.5 JP1

This switches the power supply for CPU.

1-2 short	supply power from USB connected to USB1
2-3 short	supply power from batteries connected to CN2

2.6 LED1

This is the POWER LED. It is lighted when it gets power supply.



2.7 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

	Signal name	Terminal CPU name at connection destination	Notes
LED2	P62	P62	
LED3	P61	P61/SDA0	
LED4	P60	P60/SCL0	



LED4 LED3 LED2

2.8 FP1

The connector for MINICUBE2.

2.9 Universal Area

The kit has the universal area. Users can use this to develop custom circuit.

2.10 Solder-short pad

With using the solder-short pad to cut the circuit, users can customize the circuit.

The solder-short pad looks like the picture below.

To open, use cutter to cut the dent part. To short, put solder on the pad.

Solder-short pad

(Open)



Solder-short pad

(Short)



Solder-short pad name	Before Shipment	Connection
P150~P153	Short	1M Ω Pull-down
		Open when P150~P153 on CN1 is used.

3 Power supply

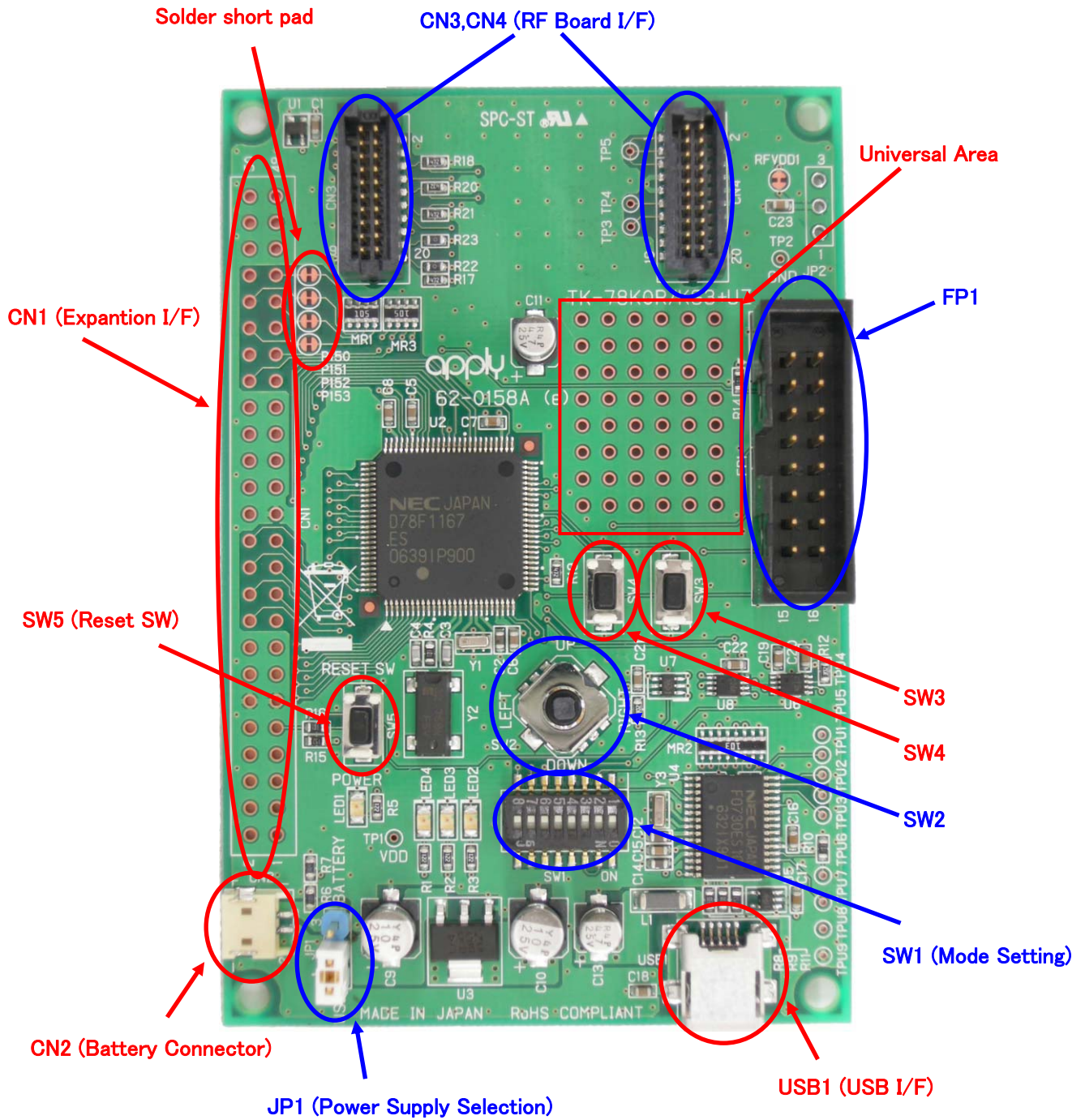
There are two choices to supply power to the board, USB or a 006P battery via CN2. Please refer to 2.5 JP1 for the jumper setting.
Please replace the battery with a new one, if the voltage level goes down to 4.8V. Below the voltage level of 4.8V, functions of the board are not guaranteed.
The battery voltage can be checked at the port as shown below.

9.0V Battery check

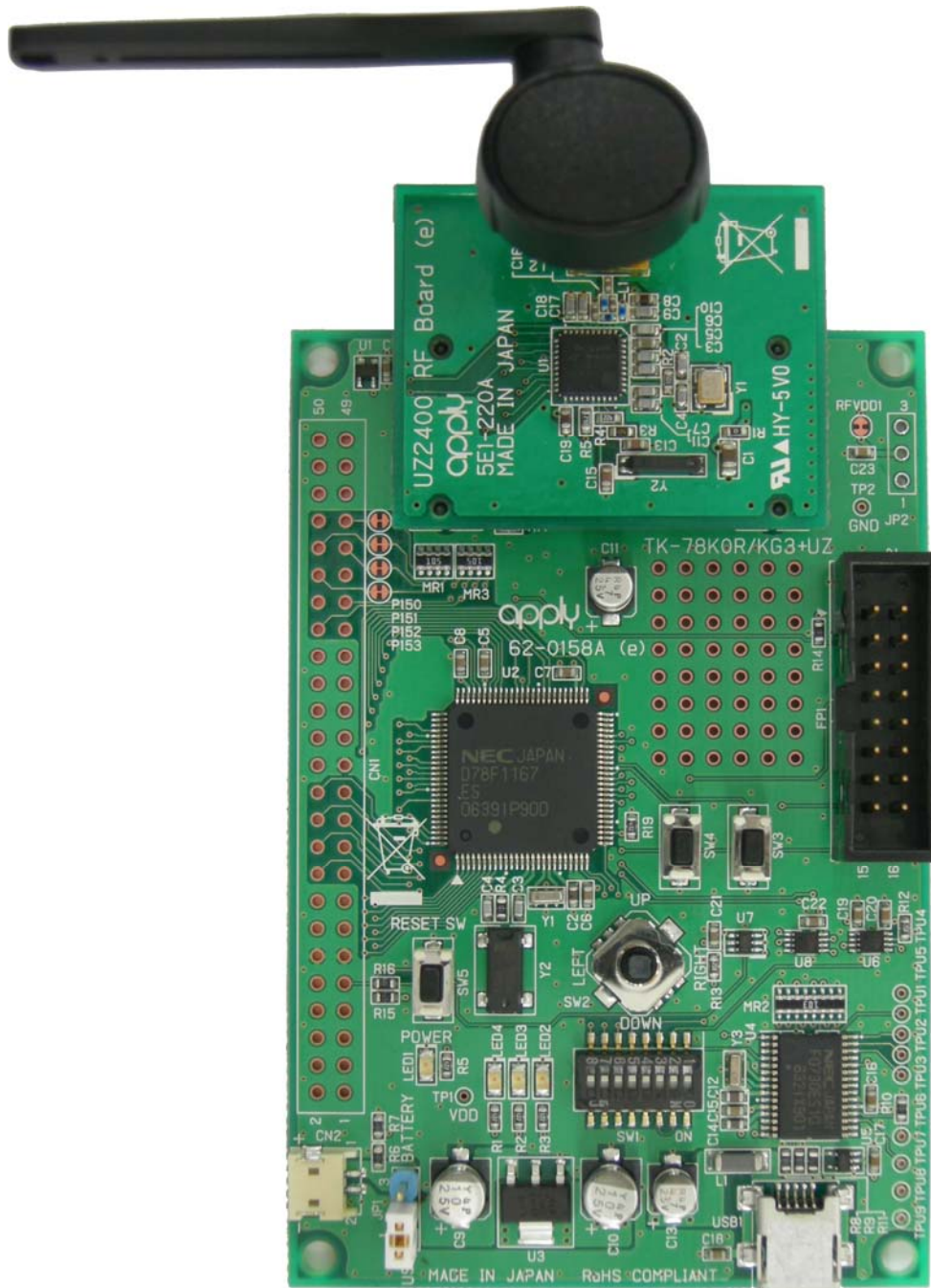
Signal name	Terminal CPU name at connection destination	Notes
BT_MONI	P26/ANI6	33.8% of the battery output is available at ANI6 For instance, If the battery level is 9 V, the level of the BT_MONI = $0.338 \times 9.0 \text{ V}$ = 3.042 V If the battery level is 6.5 V, the level of the BT_MONI = $0.338 \times 4.8 \text{ V}$ = 1.622 V

4 TK-78K0R/KG3+UZ Data

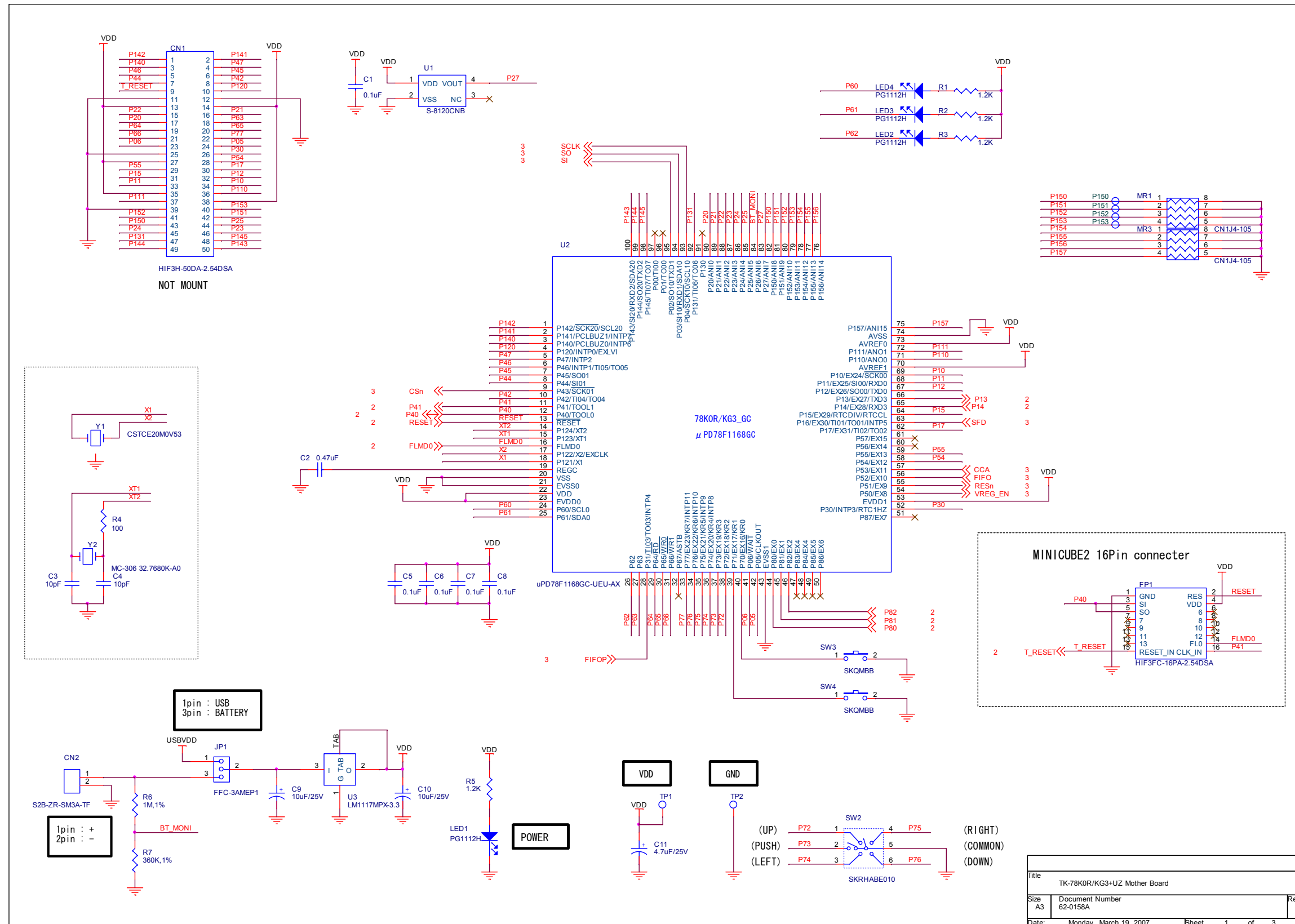
4.1 Parts Layout

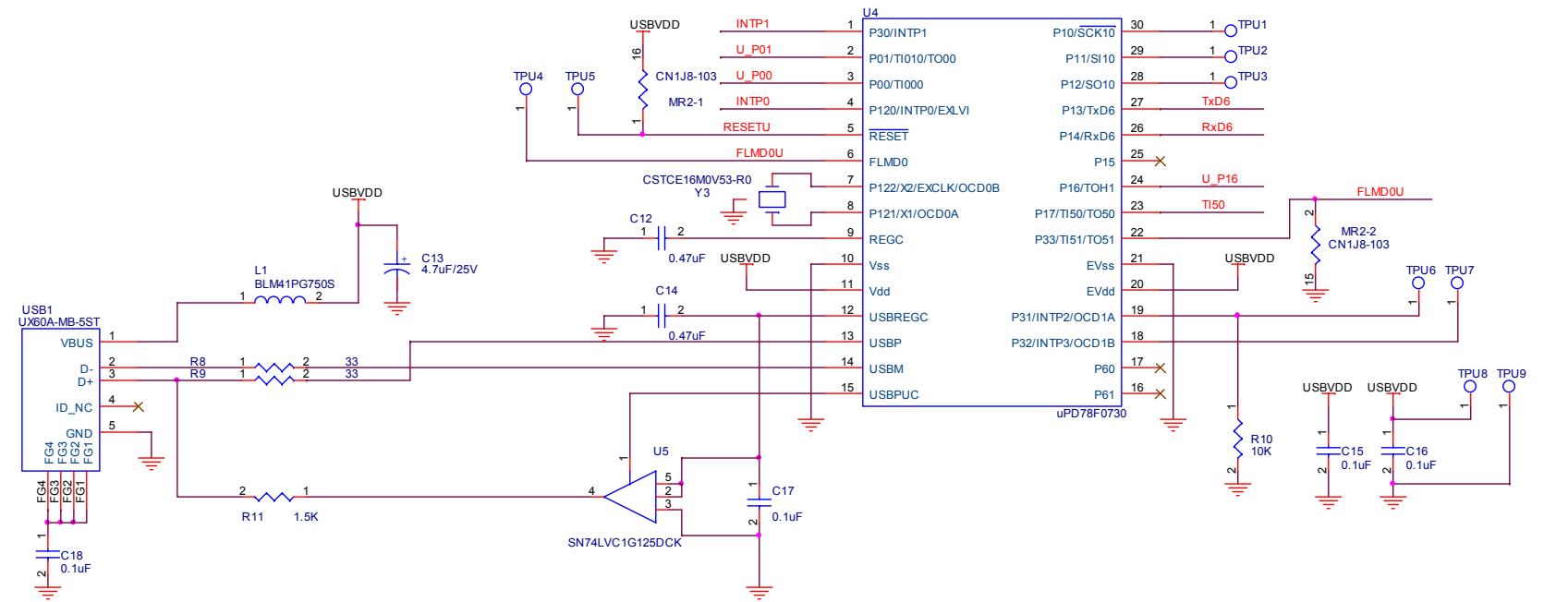


4.2 RF board connection figure

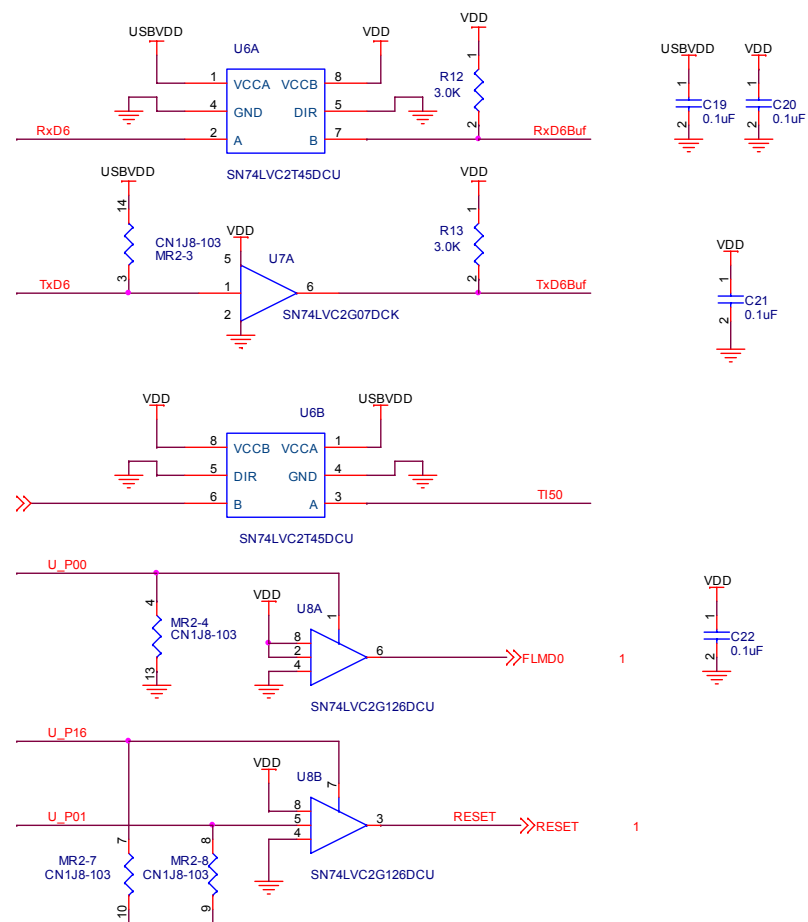
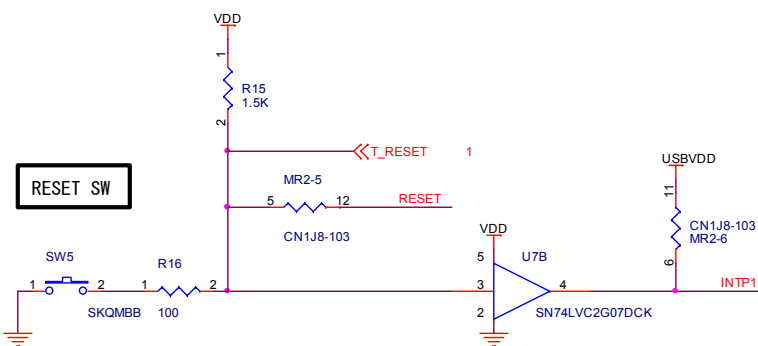
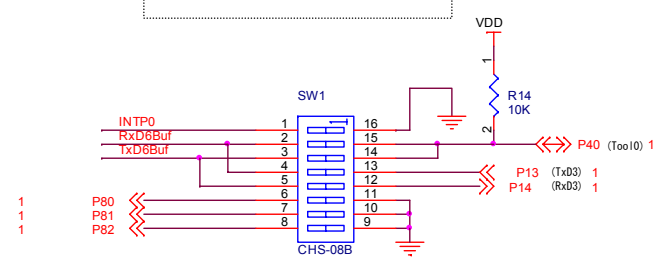


4.3 Circuit Diagram of the CPU Board

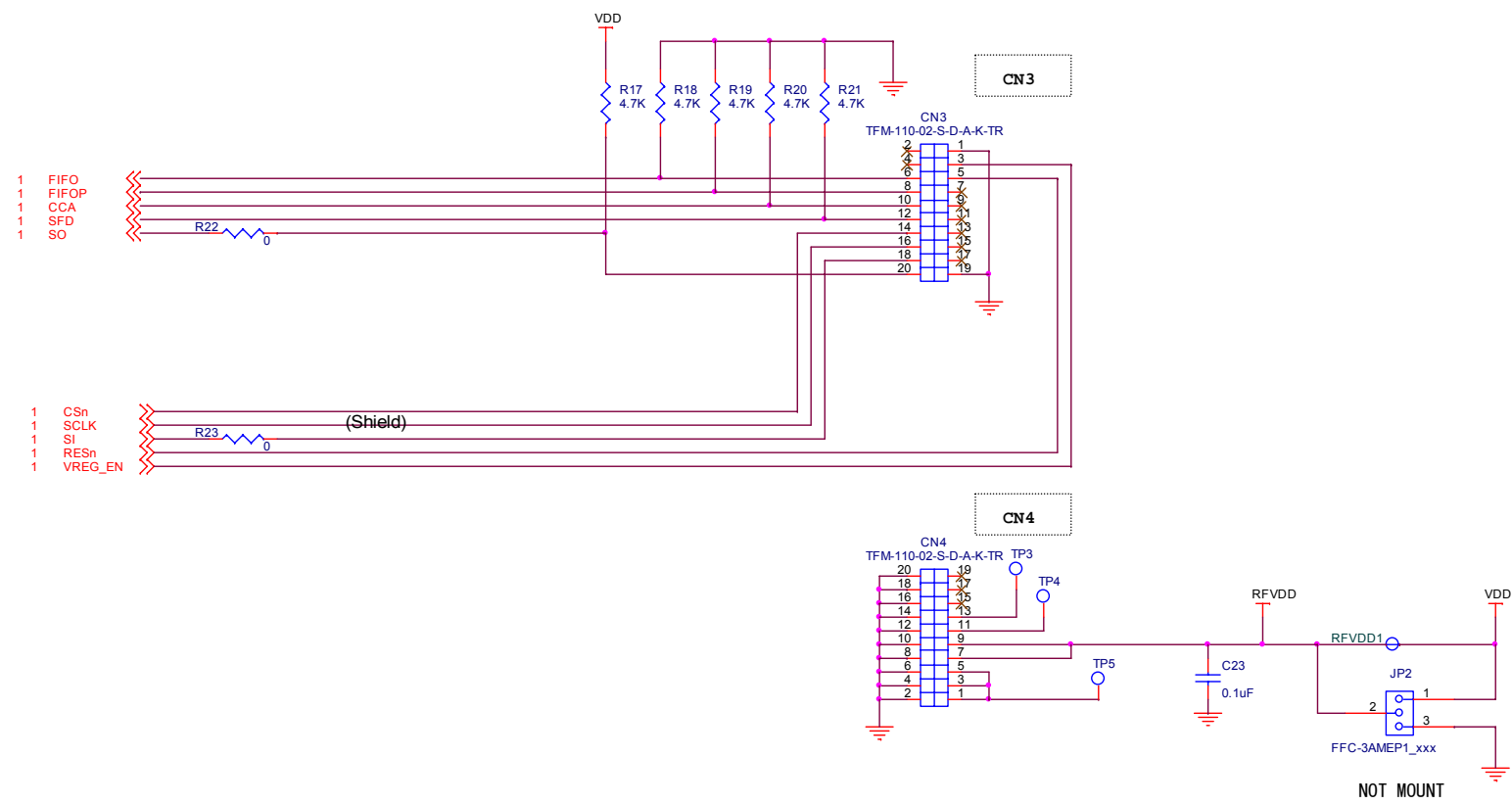




INTP0: Stand alone SW
 OCD mode: Bit2,3 ON, Bit4,5 OFF
 UART mode: Bit2,3 OFF, Bit4,5 ON
 P50~52: Multipurpose Dip SW

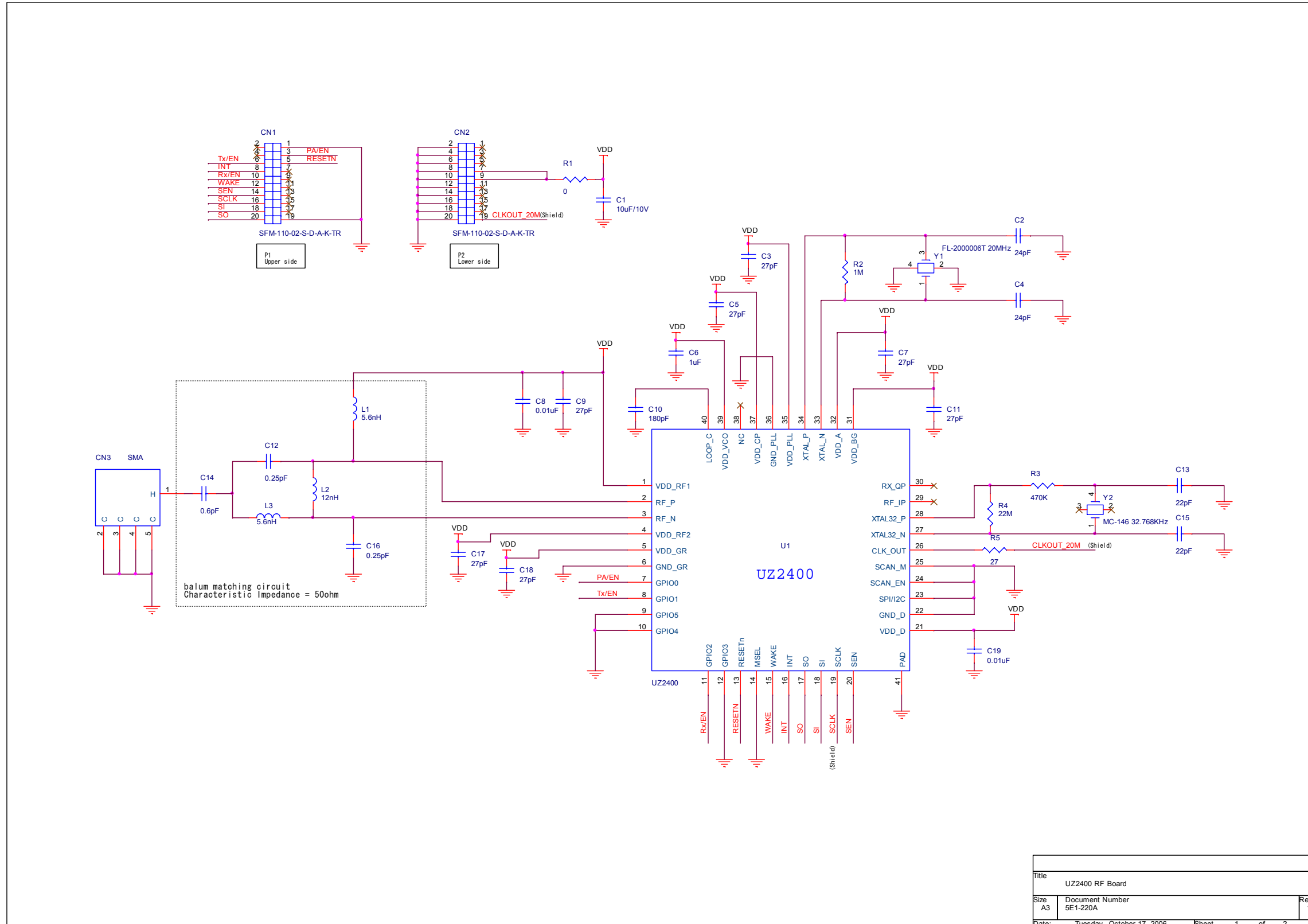


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TK-78K0R/KG3+UZ Mother Board		
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Date:	Monday, March 19, 2007	Sheet 2 of 3



Title		
TK-78KOR/KG3+UZ Mother Board		
Size	Document Number	Rev
A3	62-0158A	1.0
Date:	Monday, March 19, 2007	Sheet 3 of 3

4.4 Circuit Diagram of the UZ2400 RF Board



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

