MB-RF1146 User's Manual

Rev 1
2011/05/06

[NOTES]
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[CAUTION]
This equipment should be handled like a CMOS semiconductor device. The user must take all precautions to avoid build-up of static electricity while working with this equipment. All test and measurement tool including the workbench must be grounded. The user/operator must be grounded using the wrist strap. The connectors and/or device pins should not be touched with bare hands.

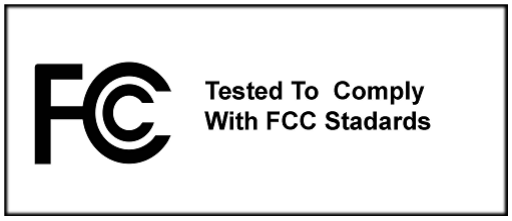
[FCC WARNING & NOTICE]

●Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Class B:
This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

● Reorient or relocate the receiving antenna.
● Increase the separation between the equipment and receiver.
● Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
● Consult the dealer or an experienced radio/TV technician for help.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
●this device may not cause harmful interference, and
●this device must accept any interference received, including interference that may cause undesired operation.



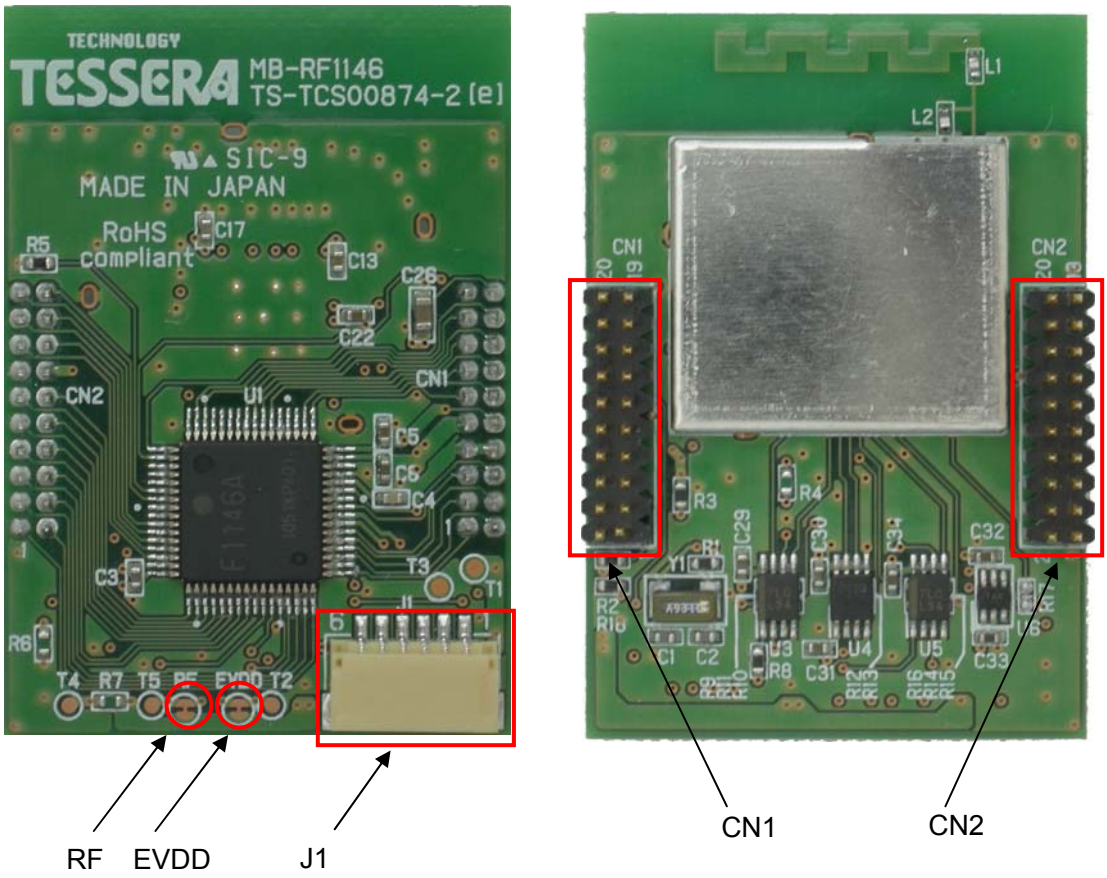
●The host device shall also comply with the certification labeling requirements of each of the modules it contains.
●A reference to the enclosed module displaying its FCC ID certification number.
Recommended wording:
Contains FCC ID: X8U0002

Contents

1. Hardware Specifications

Supply voltage	DC3.0V
Microcontroller	uPD78F1146AGA-HAB-AX
RF IC	UZ2400.D
Clock	Main clock : 16MHz (UZ2400.D CLK_OUT) Sub clock : 32.768KHz
Dimension	32x25 (HxW mm)

2. Layout of hardware functions



3. Hardware functions

3.1. J1 (Connector)

Interface connector for universal use.
(JST SM06B-SRSS-TB(LF)(SN))

Pin No.	Signal name
1	EVDD
2	GND
3	P10/SCK00
4	P11/SI00/RxD0
5	P12/SO00/TxD0
6	P141/PCLBUZ1/INTP7

3.2. CN1,CN2 (Connector)

Interface connector for universal use.
(FCI 20021111-00020T4LF)

CN1 connection

Pin No.	Signal name
1	P120/INTP0/EXLVI
2	P42/TI04/TO04
3	P41/TOOL1
4	P40/TOOL0
5	RESET
6	FLMD0
7	GND
8	GND
9	VDD
10	EVDD
11	P60/SCL0
12	P61/SDA0
13	P77/KR7/INTP11
14	P76/KR6/INTP10
15	P75/KR5/INTP9
16	P74/KR4/INTP8
17	P06/TI06/TO06
18	P05/TI05/TO05
19	RF Power
20	P50/INTP1

CN2 connection

Pin No.	Signal name
1	P140/PCLBUZ0/INTP6
2	P141/PCLBUZ1/INTP7
3	P00/TI00
4	P01/TO00

5	P20/ANI0
6	P21/ANI1
7	P22/ANI2
8	P23/ANI3
9	P24/ANI4
10	P25/ANI5
11	P26/ANI6
12	P27/ANI7
13	AVSS
14	AVREF
15	P10/SCK00
16	P11/SI00/RxD0
17	P12/SO00/TxD0
18	P13/TxD3
19	P14/RxD3
20	P17/TI02/TO02

Power and GND were respectively connected internally at default setting.

3.3. EVDD (Solder short pad)

This Solder short pad connects VDD and EVDD at original setting.
You can separate VDD and EVDD with cutting the dent part.

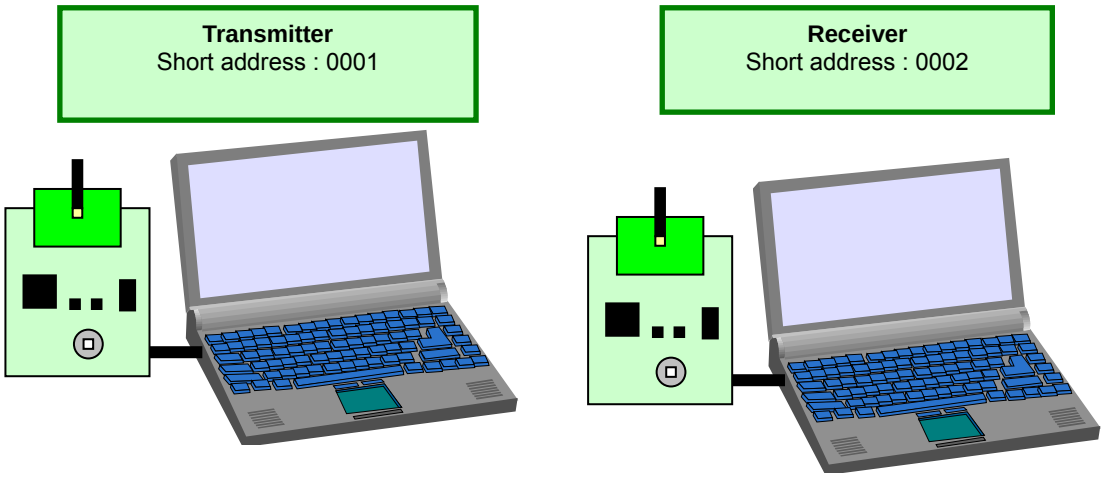
3.4. RF (Solder short pad)

This Solder short pad connects VDD and RF power at original setting.
You can separate VDD and RF power with cutting the dent part.

4. RF test procedure

Procedure for one to one transmit/receive test

Assumption here in this section is, you have two boards, in one of which the execution code for the “RF_TEST” was programmed by the debugger. You also prepare two PCs or one PC with more than one usb interface.
We will use the board you have program with the short address 0x0001 as a transmitter. We now learn how to prepare an executable program for receiver side, which may be assigned a short address of 0x0002.



4.1. Settings for a receiver

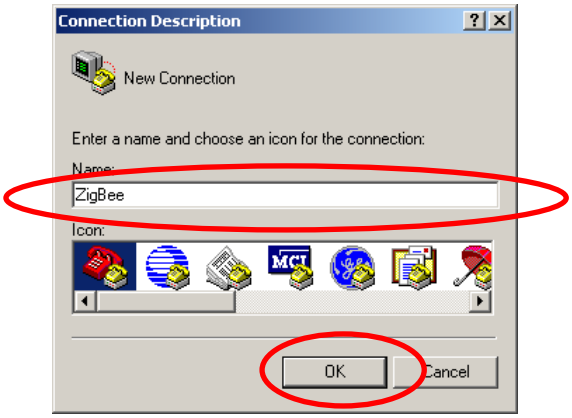
the board setting is configured as follows as a receiver.

SW4	Bit1	ALL OFF
	Bit2	
	Bit3	
	Bit4	
	Bit5	ON
	Bit6	ON
	Bit7	OFF
	Bit8	OFF

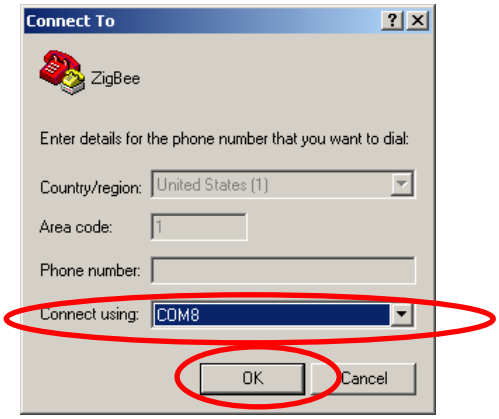
SW6	「K0R-K0USB」
SW5	3.0V
JP3	1-2 Short(USB)
JP5	Any
JP2	1-2 Short (Regulator)
JP1	Short
JP4	Short

Connect the board with a PC by a USB cable, then you will find the Power LED lit on the board.

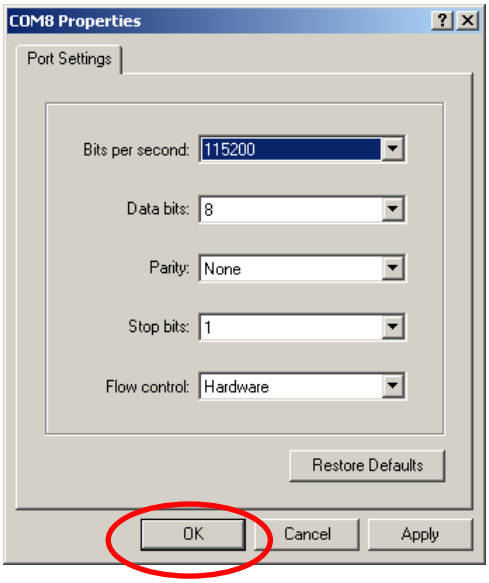
Then, we need a hyperterminal on the PC.
On MS-Windows in your PC, please select [All Programs] -> [Accessory] -> [Communication] -> [HyperTerminal]



You may assign your favorite name on a connection. Then, click OK.



You need to learn the COM port number you connected the USB cable. If you don't know the com port number, please find it at [Control Panel] → [System] → [Hardware] → [Device Manager] → [Port (COM and LPT)].

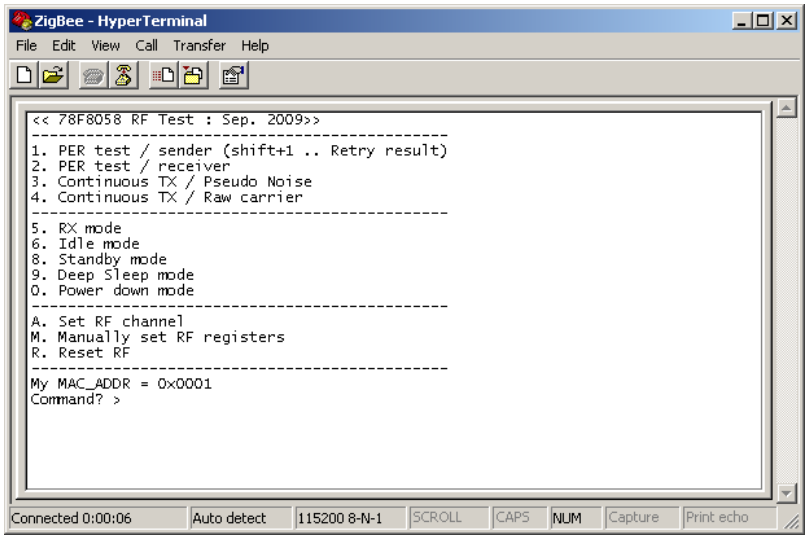


Bits per second	115200
Data bits	8
Parity	None
Stop bits	1
Flow control	None

(Property -> Setting -> ASCII)
Local Echo OFF
No Line Feed

Please set the COM port at 115200 bps, 8 data bits, no parity, 1 stop bit, and no flow control. Then, please click “OK”.

Then, please reset the receiver board by pressing the SW7.
Now you will find the following opening menu in the window.



Please select “2” from the MENU to start the board as a receiver.

```
Command? >2 (PER test/reciever)

[My Profile]
---------------------------------------
   MAC : 22:95:00:02:00:00:00:47
Short : 0002
PanID : 2514
---------------------------------------
[Set channel to 11 (Cmd)]
```

If you see the display as shown above, the receiver set-up has been completed.

4.2. Settings for a transmitter

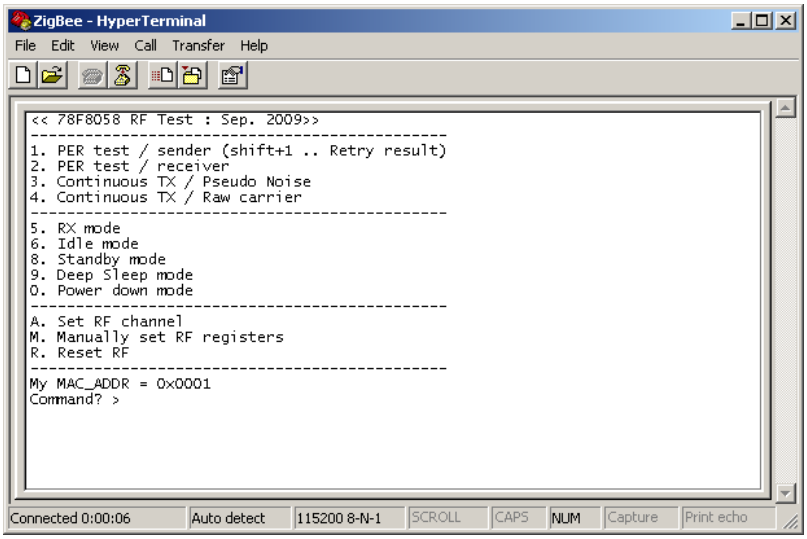
Please configure the board of a transmitter as follows,

SW4	Bit1	ALL OFF
	Bit2	
	Bit3	
	Bit4	
	Bit5	ON
	Bit6	ON
	Bit7	OFF
	Bit8	OFF

SW6	「K0R-K0USB」
SW5	3.0V
JP3	1-2 short(USB)
JP5	Any
JP2	1-2 short(Regulator)
JP1	Short
JP4	Short

Please connect the transmitter board to a PC. Please confirm the LED lit on the board.
Please start-up a hyperterminal for a transmitter.
Please reset the transmitter board by pressing the SW7.

Now you will find the following opening menu in the window.



Please select the command “1” to start the Packet Error Rate test.

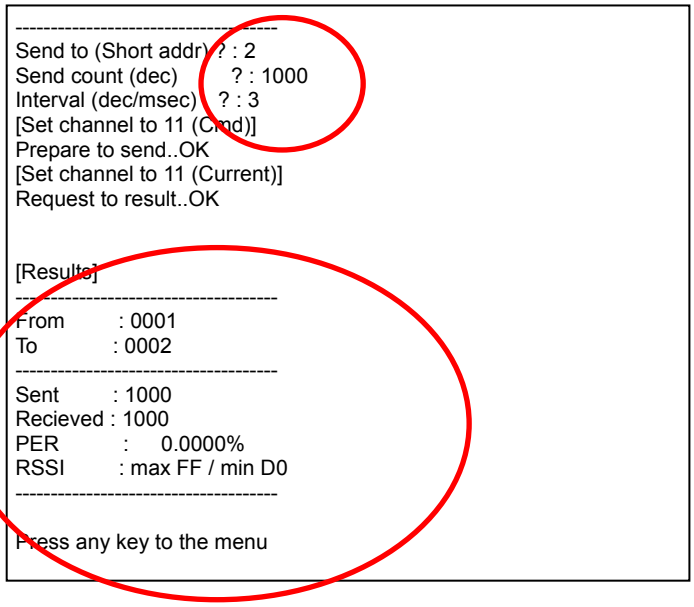
```
Command? >1 (PER test/sender)

[My Profile]
---------------------------------------
   MAC : 22:95:00:01:00:00:00:47
Short : 0001
PanID : 2514
---------------------------------------
Send to (Short addr) ? :
```

If you see “Send to (Short addr) ? :”, please input the receiver address of 0002.
Then, you will be asked how many packets you wish to consume in the PER test.
You may input “1000”.
Then, you will be asked the interval of packets in msec.
You may input 3 msec.
Then, the PER test will be executed.

You will see,

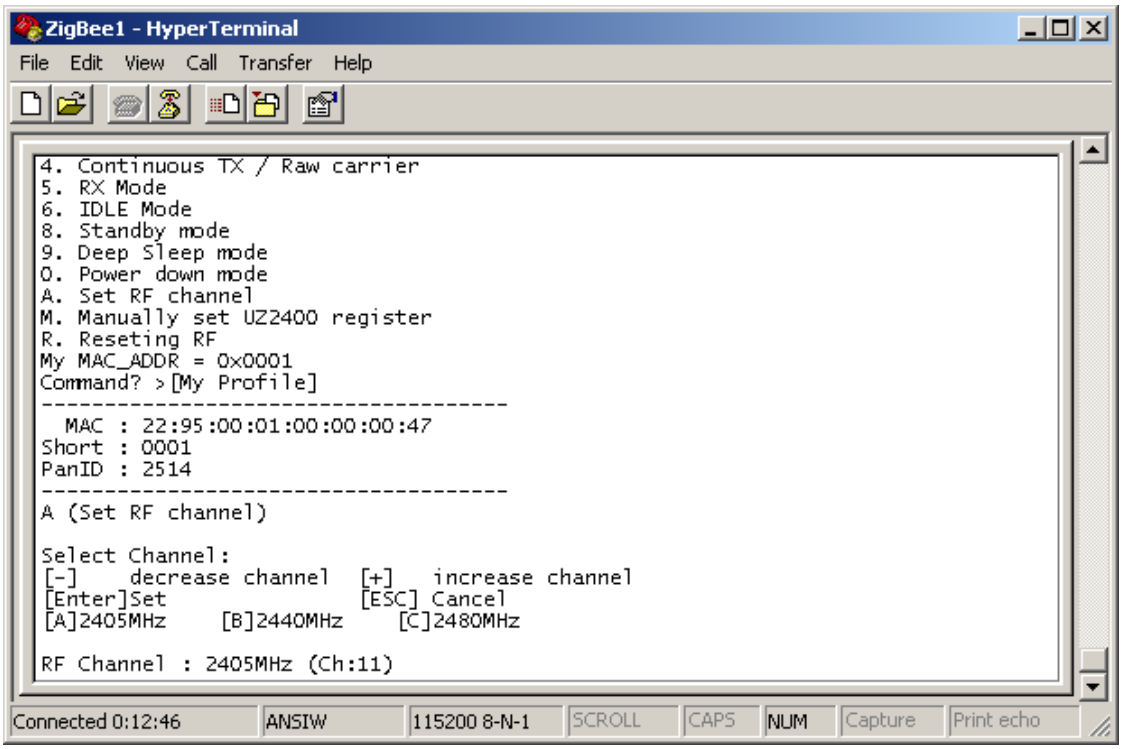
Sent: The number of packets sent.
Received: The number of the received packets.
PER: The calculated PER in %.
RSSI: The maximum and minimum RSSI values in the PER test

[Note]
PER= Packet Error Rate
RSSI= Received Signal Strength Indication

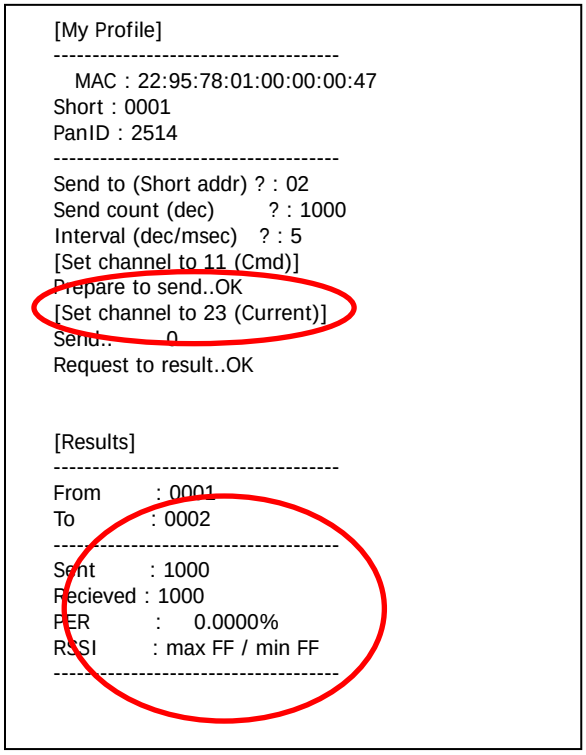


4.3. Channel setting

In the previous example, you may have also found the RF channel used in this test is the Channel 11. The channel is specified by the IEEE 802.15.4 specification.
The channel 11 is assigned at 2405 MHz. You can change the channel in the PER test in 5MHz step to the maximum channel of 26th at 2480 MHz.
To do it, please press “A” in the command prompt. Then, please choose the channel by [+], [-], [A], [B], or [C]. In the example below, the channel 23th, 2465 MHz, was selected.



To execute the PER test at the channel 23, press [Enter] in your keyboard, then, choose “1” to initiate the PER test mode. Then, you may input 1000 packet in 5 msec interval to see the following example. Please confirm the channel used is 23th in the display. Please note the receiver will learn which channel is to be used for the test automatically.



2 PER test / receiver

The Menu 2 sets the board to the receiver in the PER test.
If you have two PCs, you can connect two boards to each of two PCs, then, you will apply this mode to one of them.

3 Continuous TX / Pseudo Noise

The Menu 3 initiates the modulated RF transmission. The data carried are pseudo random numbers. You can define the channel using the menu A.

4 Continuous TX / Raw carrier

The Menu 4 initiates the carrier transmission. The output power is not 0 dB as a reset default. You can define the channel using the menu 9.

5 RX Mode

The Menu 5 initiates the receiver mode.

6 IDLE MODE

The Menu 6 sets the UZ2400 into the IDLE mode.

8 Standby MODE

The Menu 8 sets the UZ2400 into the Standby mode.

9 Deep Sleep mode

The Menu 9 sets the UZ2400 into the Deep Sleep mode.

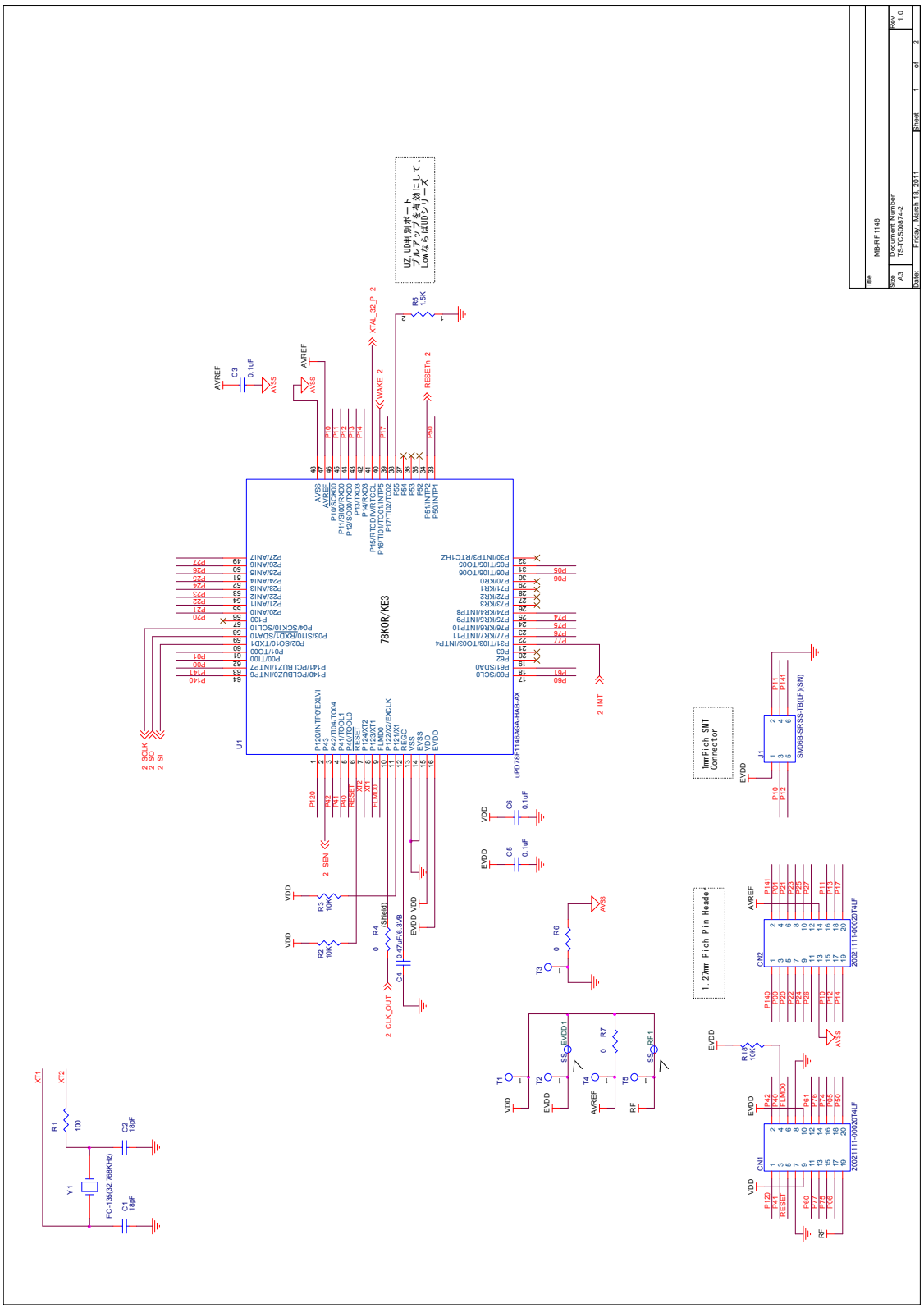
0 Power down mode

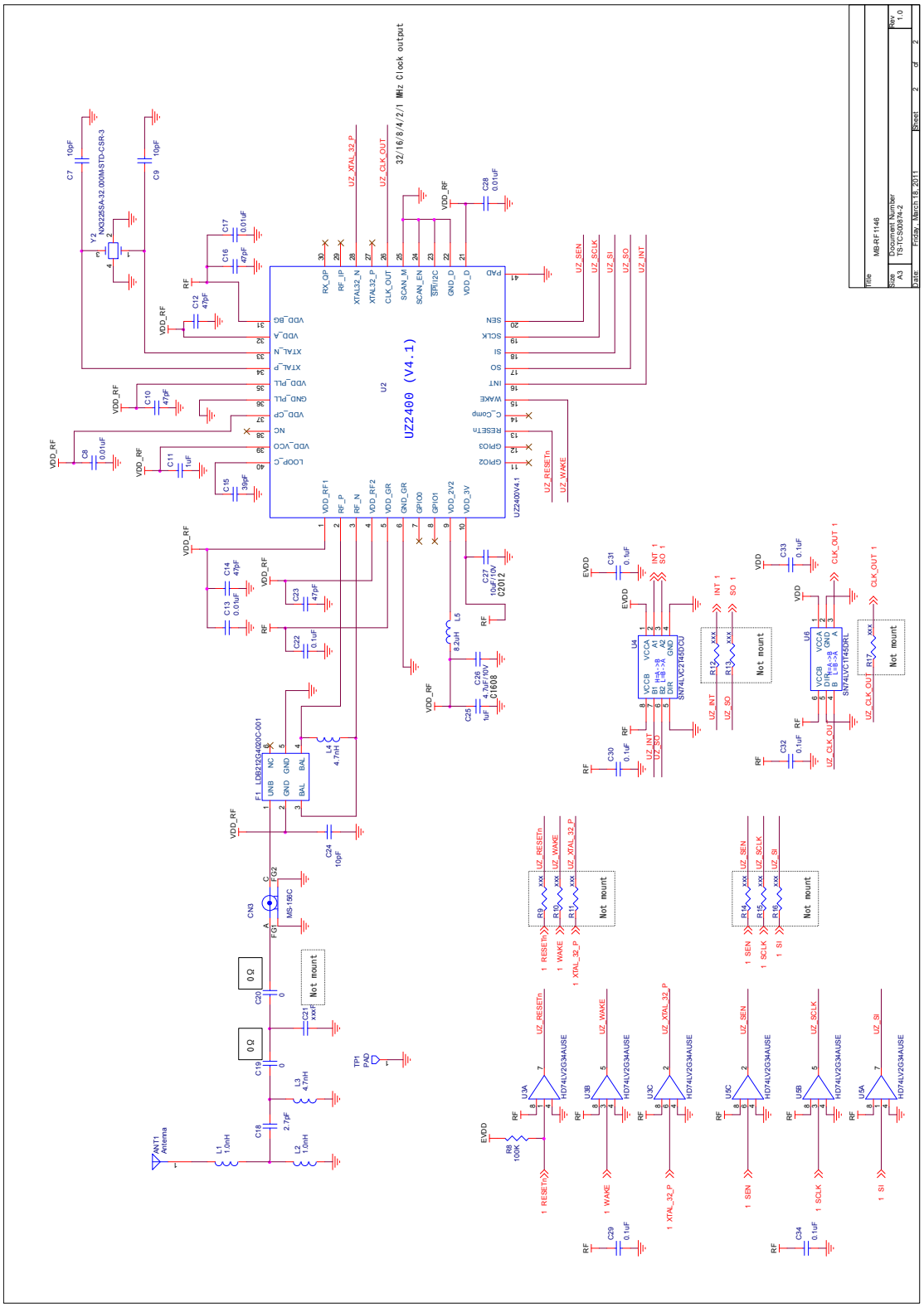
The Menu 0 sets the UZ2400 into the Power down mode.

A Set RF channel

The Menu A allows you to set the RF channel.

5. Circuit diagram




UZ2400 (V4.1)
32/16/8/4/2/1 MHz Clock output
Not mount
Title
MB-RF1146
Size
A3
Document Number
YS-TC-S0074-2
Rev
1.0
Date:
Friday, March 18, 2011
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