HSUPA PCI Express Mini Card

MF210 Design Guideline

Revision1.2

February 23, 2009

Model：MF210

ZTE CORPORATION

Contents

1 Introduction

MF210 is a Mini PCI Express Card with HSUPA functionality which supports for multimode operation - UMTS850（900）/1900/2100、GSM/GPRS/EDGE 850/900/1800/1900. It can provide WCDMA、GSM/GPRS、EDGE（EGPRS）and HSUPA high-speed data services in mobile environments.

NOTE： UMTS850 **and** UMTS900 cannot be supported simultaneously.

Figure 1.1 MF210’s practical photo

2. Execute Standards

[1] PCI Express Mini Card Electromechanical Specification Revision 1.2，October26 2007

[2] 3GPP TS 34.121 User Equipment (UE) conformance specification; Radio transmission and reception (FDD)

[3] 3GPP TS 05.05

[4] 3GPP TS 34.124 Electromagnetic compatibility (EMC) requirements for Mobile terminals and ancillary equipment

3. Technique Specification

3.1 Working Bands

Working bands of MF210 are showed as Chart3-1.

Chart3-1 MF210's working bands

	Uplink	Downlink
UMTS850	824 MHz — 849 MHz	869 MHz — 894 MHz
UMTS900	880 MHz — 915 MHz	925 MHz — 960 MHz
UMTS1900	1850 MHz — 1910 MHz	1930 MHz — 1990 MHz
UMTS2100	1920 MHz — 1980 MHz	2110 MHz — 2170 MHz
GSM850	824 MHz — 849MHz	869 MHz — 894 MHz
GSM900	890 MHz — 915MHz	935 MHz — 960MHz
GSM1800	1710 MHz — 1785MHz	1805 MHz — 1880MHz
GSM1900	1850 MHz — 1910MHz	1930 MHz — 1990MHz

3.2 Operation Features

- WCDMA PS date rate：384kbps DL/384kbps UL;
- WCDMA CS date rate：64kbps DL/64kbps UL;
- HSDPA supports a maximum downlink date rate of 7.2Mbps;
- HSUPA supports a maximum uplink date rate of 5.76Mbps;
- EDGE CLASS12/GPRS CLASS12 PS are supported.

3.3 Hardware Technique Parameters

Hardware technique parameters are showed as chart3-2.

Chart3-2 MF210's Hardware technique parameters

Item	Specifications	Remarks
Interface type	PCI Express Mini Card	**NOTE1**
Protocol	HSUPA/HSDPA/UMTS/EDGE/GPRS/GSM	
Frequency	HSUPA/HSDPA/UMTS2100/1900/850(900)MHz; EDGE/GPRS/GSM1900/1800/900/850MHz	
Transmission	HSDPA 7.2Mbps DL	
	HSUPA 5.76Mbps UL	
Power	Average： 1.20W	**NOTE2**
	Maximum：2.2W	
USIM&SIM	Standard 6 PIN Interface	
Antenna	Integrated with the notebook	
Rx Diversity	Support (2100/1900/850（900）MHz)	
Equalization	Support	
Storage temperature	-20℃ ~ +85℃	
Operation temperature	-10℃ ~ +70℃	
System Required	Windows 2K/XP, Vista	
Dimensions	About 51mm * 30mm * 4.7mm	**NOTE3**
Weight	About 12g	
Certification & Approval	CE certification, ROHS	
Chipset	MSM6290+PM6658+RTR6285	

NOTE1: The interface type does accord with 《PCI Express Mini Card Electromechanical Specification Revision 1.2, October 26 2007》.

NOTE2: The average power dissipation of MF210 is tested when Tx power is 15dBm.

NOTE3: Type F2 is Full-Mini with bottom-side keep outs, and is compatible with type F1.

4. Interface Definition

4.1 PCI Express Mini Card Specification

Referred to《PCI Express Mini Card Electromechanical Specification Revision 1.2，October 26 2007》.

4.2 PIN Definition

Chart4-1 MF210's pin definition

PIN#	NAME	ZTE's definition	PIN#	NAME	ZTE's definition
1	WAKE#	Reserved	2	3.3Vaux	**VDD_3V3**
3	COEX1	Reserved	4	GND	**GND**
5	COEX2	Reserved	6	1.5V	Reserved
7	CLKREQ#	Reserved	8	UIM_PWR	**USIM_POWER**
9	GND	**GND**	10	UIM_DATA	**USIM_DATA**
11	REFCLK-	Reserved	12	UIM_CLK	**USIM_CLK**
13	REFCLK+	Reserved	14	UIM_RESET	**USIM_RESET**
15	GND	**GND**	16	UIM_VPP	**USIM_VPP**
17	Reserved(UIM_C8)	Reserved	18	GND	**GND**
19	Reserved(UIM_C4)	Reserved	20	W_DISABLE#	**W_DISABLE_N**
21	GND	**GND**	22	PERST#	**PERST_N**
23	PERn0	Reserved	24	+3.3Vaux	**VDD_3V3**
25	PERp0	Reserved	26	GND	**GND**
27	GND	**GND**	28	+1.5V	Reserved
29	GND	**GND**	30	SMB_CLK	Reserved
31	PETn0	Reserved	32	SMB_DATA	Reserved
33	PETp0	Reserved	34	GND	**GND**
35	GND	**GND**	36	USB_D-	**USB_DM**
37	GND	**GND**	38	USB_D+	**USB_DP**
39	+3.3Vaux	**VDD_3V3**	40	GND	**GND**

41	+3.3Vaux	**VDD_3V3**	42	LED_WWAN#	**LED_WWAN_N**
43	GND	**GND**	44	LED_WLAN#	Reserved
45	Reserved	Reserved	46	LED_WPAN#	Reserved
47	Reserved	Reserved	48	+1.5V	Reserved
49	Reserved	Reserved	50	GND	**GND**
51	Reserved	Reserved	52	+3.3Vaux	**VDD_3V3**

NOTE1：Notebook manufactures should ensure system connector does accord with《PCI Express Mini Card Electromechanical Specification Revision 1.2, October 26 2007》；

NOTE2： In Notebook Side, the USIM needs ESD protection and should be checked by ZTE ；

NOTE3：When MF210 coordinates debugging with Notebook，debugging standards should be communicated and affirmed by both parties.

NOTE4: MF210 supports power on and off by controlling the signal W_DISABLE_N。

5 RF CONNECTOR

5.1 Specification of RF CONNECTOR

Part number of RF connector as below:

U.FL-R-SMT(10), HRS corporation.

SPEC of RF connectors of main antenna and diversity antenna is the same.

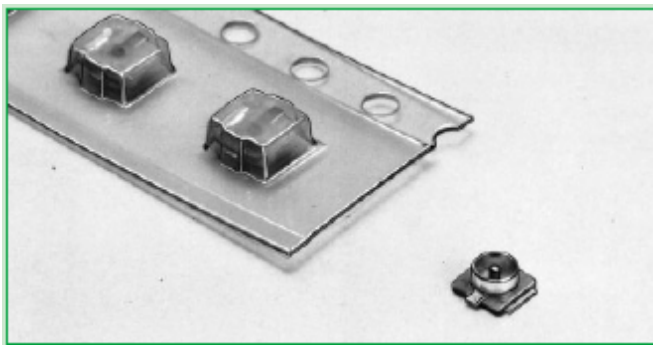

Fig 5.1 RF CONNECTOR（U.FL-R-SMT(10)）

5.2 RF Cable

Diameter and length of the cable can be made to order,U.FL_LP_088 of HRS corporation is suggested.

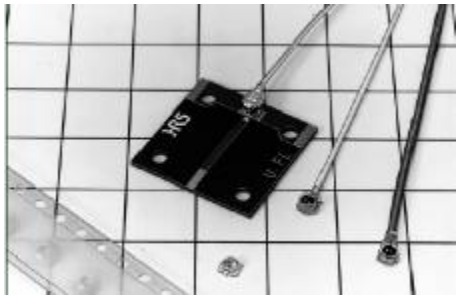

Fig 5.2 Cable

5.3 Positions OF RF connectors

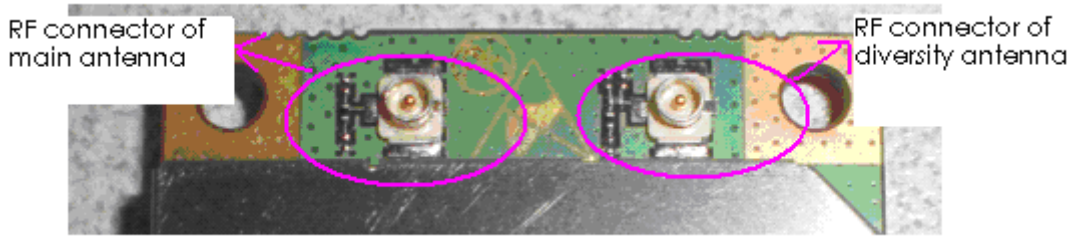

Fig 3.3

5.4 S parameters of RF connector

5.4.1 S parameters of main antenna RF connector

W2100						
S11	9612 Tx	10562 Rx	9750Tx	10700 Rx	9888 Tx	10838 Rx
	1922.4MHz	2112.4MHz	1950.0 MHz	2140.0 MHz	1977.6 MHz	2167.6 MHz
LOG MAGNITUDE （dB）	-5.631	-7.609	-12.698	-6.916	-8.046	-12.980

SWR	3.192	2.423	1.613	2.666	2.191	1.600
SWITH CHART （IMPEDANCE）Ω	19.495 Ω -23182 jΩ	42.280 Ω -41.398 jΩ	31.497 Ω +5.432 jΩ	21.148 Ω -17.352 jΩ	56.758 Ω -42.422 jΩ	39.787 Ω -18.648 jΩ
W850						
S11	4132Tx	4357 Rx	4182 Tx	4407 Rx	4233 Tx	4458 Rx
	826.4MHz	871.4MHz	836.4MHz	881.4MHz	846.6MHz	891.6MHz
LOG MAGNITUDE （dB）	-9.140	-2.827	-6.213	-17.862	-9.891	-6.378
SWR	2.069	6.164	2.917	1.294	1.929	2.954
SWITH CHART （IMPEDANCE）Ω	27.327 Ω -15.405 jΩ	15.791 Ω -47.814 jΩ	19.877 Ω -18.318 jΩ	64.668 Ω +1.837 jΩ	42.382 Ω -29.435 jΩ	18.627 Ω -5.922 jΩ

5.4.2 S parameters of diversity antenna RF connector

W2100						
S11	9612 Tx	10562 Rx	9750Tx	10700 Rx	9888 Tx	10838 Rx
	1922.4MHz	2112.4MHz	1950.0 MHz	2140.0 MHz	1977.6 MHz	2167.6 MHz
LOG MAGNITUDE （dB）	-3.677	-2.723	-3.364	-2.633	-3.152	-2.633
SWR	4.797	6.410	5.229	6.723	5.579	6.639
SWITH CHART （IMPEDANCE）Ω	36.374 Ω -5.623 jΩ	14.207 Ω -44.360 jΩ	29.293 Ω -67.686 jΩ	13.061 Ω -42.628 jΩ	24.248 Ω -63.641 jΩ	12.630 Ω 40.325 jΩ
W850						
S11	4132Tx	4357 Rx	4182 Tx	4407 Rx	4233 Tx	4458 Rx
	826.4MHz	871.4MHz	836.4MHz	881.4MHz	846.6MHz	891.6MHz
LOG MAGNITUDE （dB）	-1.831	-2.180	-2.633	-18.199	-2.633	-7.993

SWR	9.485	8.001	8.550	1.280	6.638	2.325
SWITH CHART （IMPEDANCE）Ω	5.267 Ω -683.104jm Ω	6.951 Ω -16.583 jΩ	5.864 Ω +2.172 jΩ`	60.174 Ω -8.504	7.689 Ω +7.111 jΩ	22.016 Ω +6.885 jΩ

6. Characteristics for RF performance

6.1 UMTS mode RF performance

6.1.1 Maximal Output Power

UMTS2100/1900/850（900）under normal environment，Maximum output power shall be within the nominal value and tolerance specified in table 6-1.

Table 6-1 Maximum output power

Power Class	Maximum output power	Tolerance
Class 3	24dBm	+1/-3dB

6.1.2 Reference Sensitivity Level

UMTS2100/1900/850（900）Reference Sensitivity level satisfy 3GPP TS 34.121 requirement. The BER shall not exceed 0,001 for the parameters specified in table6-2.

Table 6-2 Test parameters for Reference Sensitivity Level

Operating Band	Unit	DPCH_Ec <REFSENS>	<REFÎor>
I	dBm/3.84 MHz	-117	-106.7
II	dBm/3.84 MHz	-115	-104.7
III	dBm/3.84 MHz	-114	-103.7
IV	dBm/3.84 MHz	-117	-106.7
V	dBm/3.84 MHz	-115	-104.7
VI	dBm/3.84 MHz	-117	-106.7
VII	dBm/3.84 MHz	-115	-104.7
VIII	dBm/3.84 MHz	-114	-103.7
IX	dBm/3.84 MHz	-116	-105.7
NOTE 1 For Power class 3 this shall be at the maximum output power NOTE 2 For Power class 4 this shall be at the maximum output power NOTE 3 For the UE which suports both Band III and Band IX operating frequencies, the reference sensitivity level of -114.5 dBm DPCH_Ec <REFSENS> shall apply for Band IX. The corresponding <REFÎor> is -104.2 dBm			

6.2 GPRS/GSM/EDGE mode RF performance

6.2.1 TX Output Power

TX Output Power satisfy 3GPP TS 05.05 4.1 requirement，as table below.

Table 6-3 GSM850/900/1800/1900 (GMSK) TX Output Power

Power class	GSM 400 & GSM 900 & GSM 850 Nominal Maximum output power	DCS 1 800 Nominal Maximum output power	PCS 1 900 Nominal Maximum output power	Tolerance (dB) for conditions	
				normal	extreme
1	- - - - - -	1 W (30 dBm)	1 W (30 dBm)	±2	±2,5
2	8 W (39 dBm)	0,25 W (24 dBm)	0,25 W (24 dBm)	±2	±2,5
3	5 W (37 dBm)	4 W (36 dBm)	2 W (33 dBm)	±2	±2,5
4	2 W (33 dBm)			±2	±2,5
5	0,8 W (29 dBm)			±2	±2,5

表 6-4 EDGE(8PSK) TX Output Power

Power class	GSM 400 and GSM 900 & GSM 850 Nominal Maximum output Power	GSM 400 and GSM 900 & GSM 850 Tolerance (dB) for conditions		DCS 1 800 Nominal Maximum output power	PCS 1 900 Nominal Maximum output power	DCS 1 800 & PCS 1 900 Tolerance (dB) for conditions	
		normal	extreme			normal	extreme
E1	33 dBm	±2	±2,5	30 dBm	30 dBm	±2	±2,5
E2	27 dBm	±3	±4	26 dBm	26 dBm	-4/+3	-4,5/+4
E3	23 dBm	±3	±4	22 dBm	22 dBm	±3	±4

6.2.2 RX Reference Sensitivity Level

For GSM850/900/1800/1900 band，RX Reference Sensitivity level satisfy

3GPP TS 05.05 6.2.

GSM850： ≤-102dBm

GSM900： ≤-102dBm

GSM1800： ≤-102dBm

GSM1900 ≤-102dBm

7.Antenna

7.1 Passive Performance（recommend）

Table 7-1 Passive Performance of main antenna（recommend）

Frequency Band	824-960MHz	1710-2170MHz
VSWR in Free Space	<3:1	<3:1
Peak Gain in Free Space	>0dBi	>0dBi
3-D Average Gain in Free Space	-3dBi	-3dBi
Antenna Efficiency	>50%	>50%

Table 7-2 Passive Performance of diversity antenna（recommend）

Frequency Band				
VSWR in Free Space	<3:1	<3:1	<3:1	<3:1
Secondary-to-Primary Antenna Isolation, |S21|	< -10dB	< -10dB	< -10dB	< -10dB
Peak Gain Ratio of the Secondary to Primary Antenna	> -5dB	> -5dB	> -5dB	> -5dB
3-D Average Gain Ratio of the Secondary to Primary Antenna	> -5dB	> -5dB	> -5dB	> -5dB

7.2 Active Performance（recommend）

TRP：W850/W900/W1900/W2100>19dBm；
GSM850>27dBm,GSM900>28dBm；DCS1800>25dBm，PCS1900>25dBm。

TIS： W850/W900<-100dBm; W1900/W2100<-103dBm;
GSM850<-100dBm，GSM900<-100dBm；DCS1800/PCS1900<-102dBm

7.3 Suggestions for Notebook Layout

Notebook layout must ensure MF210 far from those disturbing sources such as SMPS、high-speed signal routes which should be dealt with well. Meanwhile, antennas and coaxial cables which connect network cards and antennas should be far away from these disturbing sources.

MF210 should not be laid aboard those large thermal parties such as CPU、hard disk、south-bridge.

7.4 Position and size of antenna

Space of the antenna area should be more than 7mm*10mm*100mm.antenna should be placed on the top of LCD.

7.5 Design of diversity antenna

Function of diversity antenna of MF210 is choice，diversity antenna be added if function of RX diversity be used.

Design of diversity antenna is the same as main antenna，the efficiency performance can be 3dB lower than main antenna. Isolation of main antenna and diversity antenna should more than 12dB.

【END】