

1KU Product Specification

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Document History:

Vision	Release By	Date	Note
1A	Suya Hou	2011.04.27	First release
1B	Suya Hou	2011.05.17	2 nd release, to add descriptions for three SKUs of 1KUx
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2B	Suya Hou	2011.11.011	Change Module part number Revise required statement for FCC

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1. Introduction

1KUx is a customized PCI Express Mini Card, which is developed on Qualcomm MDM9600/9200 platform and capable to provide various frequency configurations, support data operation on LTE, EVDO, HSUPA, HSDPA and WCDMA connectivity for portable and hand-held computers.

1.1 Radio Frequency Configurations

The required radio frequency has been defined into 3 SKUs based on customer needs, 1KUx is a general definition of this embed module, precise name will be named as 1KU1, 1KU2 and 1KU3 in accordance with bands configuration.

Due to limited space reserved for the module and Qualcomm's chipset configuration, 3 SKUs have to be realized by leveraging 2 PCBs design. This PCI Express Mini Card is able to support UP TO Quad Bands in LTE/UMTS and Quad Bands in EDGE, GPRS, and GSM if required. Hence, the following SKU table will become as whole framework of product specification.

Table 1-1

Quanta Model Name	1KU1	1KU2	1KU3
QCI P/N	211KUMB0070	211KUMB0050	211KUMB0060
Description	LTE & CDMA	HSPA+ Only	LTE & HSPA+
HSPA+	X	850/900/1900/2100/AWS	850/1900/2100
LTE	700U	X	AWS/700D
EVDO	800/ 1900 MHz	X	X
PCB Design	PCB-1	PCB-2	PCB-2

2. Main Features

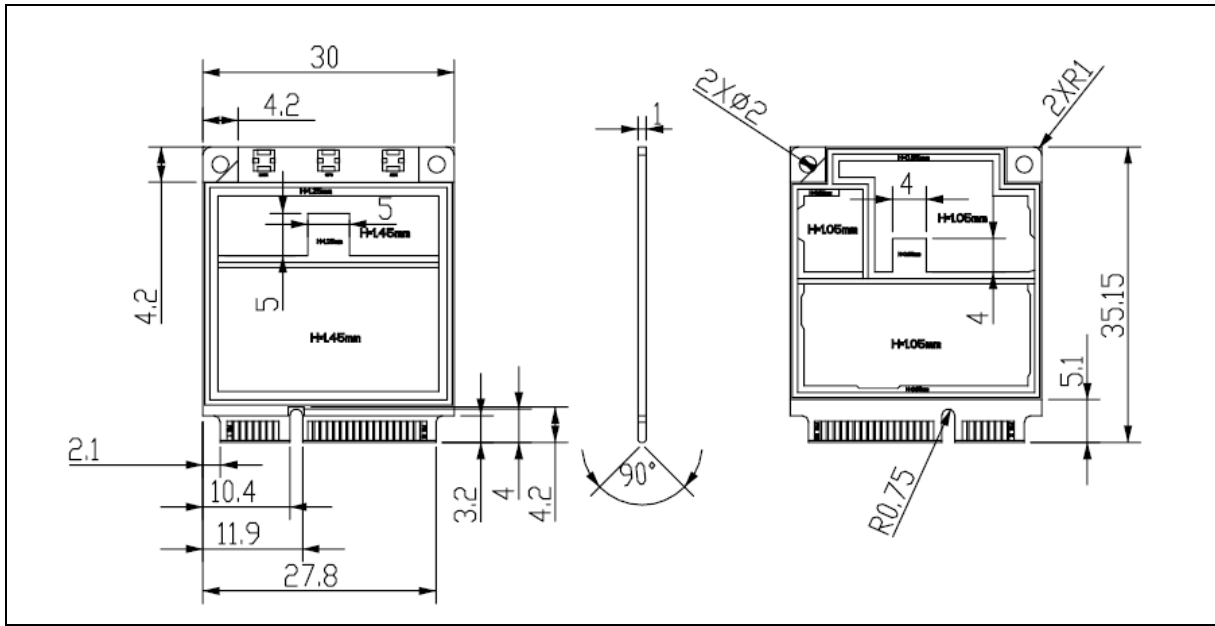
The following features set can be referred to 1KU1, 1KU2 and 1KU3, bands supported frequency depend on each SKU bands configuration.

Features	Items	Descriptions	Remarks
Physical Outlook	Dimension	35.18 x 30 x 4mm	
	Weight	9 g	
Temperature Range	Operation Temperature	-10°C to +55°C	
	Storage Temperature	-20°C to +80°C	
DC Power Supply	Supply Voltage	3.4~4.2V	
Interface	Edge connector	- 52 pins - 0.8 pitch - 0.5A rating current	
	Host communication	Alternative: - USB 2.0 - 8 bit SDIO at 1.8V	

	SIM	<ul style="list-style-type: none"> - (U)SIM 1.8V/3V - Class B/Class C 	
	Connection	2 Antenna W_FL connectors: <ul style="list-style-type: none"> - 1 Primary for WCDMA/HSPA/LTE/Cdma2000/EVDO - 1 auxiliary for HSPA/LTE/EVDO Rx diversity 	
	Communication ports at USB	<ul style="list-style-type: none"> - 1 Modem port - 1 Diagnostic port - 1 AT command port - 1 NDIS interface 	
CPU	Baseband Processor	Qualcomm MDM 9600/9200 600MHz <ul style="list-style-type: none"> - Application μP: ARM926-256MHz - SW/FW Processor: QDSP6 at up to 595 MHz 	
	PMIC	PMIC 8028	
	Internal Memory	<ul style="list-style-type: none"> - 64 MB DDR SDRAM internal stacked memory - 166 MHz maximum speed - 32-bit data width support - 1.8 V interface 	
External Memory	NAND Flash	<ul style="list-style-type: none"> - 1Gb - 63-Ball FBGA (9 x 11 x 1.0 mm) - Operating voltage: 1.8V - Memory Density: 128M x 8 bit 	
Radio	UMTS Frequency	<ul style="list-style-type: none"> - B1: UMTS-2100 (1920-1980MHz; 2110-2170MHz) - B2: UMTS-1900 (1850-1910MHz; 1930-1990MHz) - B4: UMTS-AWS (1710-1755MHz; 2110-2155MHz) - B8: UMTS-900 (880-915MHz; 925-960MHz) - B5: UMTS-850 (824-849MHz; 869-894MHz) 	Details refer to SKUs table
	EVDO Frequency	<ul style="list-style-type: none"> - BC0:EVDO-800 (824-849MHz; 869-894MHz) - BC1:EVDO-1900(1850-1910MHz; 1930-1990MHz) 	Only request in SKU1
	LTE Frequency	<ul style="list-style-type: none"> - B13-700U (777-787MHz; 746-756MHz) - B17-700D (704-716MHz; 734-746MHz) - B4-AWS (1710-1755MHz;2110-2155MHz) 	UNABLE to support all LTE bands in one SKU
	RF System	RTR8600 <ul style="list-style-type: none"> - UMTS/HSDPA/HSUPA 850/900/1900/2100/AWS Power class 3 (+24dBm) - LTE Power class 3 (+23 dBm) - CDMA/EVDO Power class 3(BC0/+23dBm) Power class 2(BC1/+23dBm) 	
	Rx Diversity	Will differ according to each SKU: <ul style="list-style-type: none"> - EVDO 800/1900MHz - LTE 700U/700D/AWS - UMTS 850/900/1900/AWS/2100 	
Air Interface Features	UMTS Rel.99	<ul style="list-style-type: none"> - Division Duplex: FDD - Peak PS data rate: 384 kbps UL/ 384 kbps DL 	

	HSDPA	<ul style="list-style-type: none"> - Modulation: QPSK/ 16QAM - Support Category 6/8; - 7.2 Mbps/DL (Standalone); 	
	HSUPA	<ul style="list-style-type: none"> - Modulation: QPSK/ 16QAM - Support Category 5/6 (2msec TTI)* - Up to 5.76 Mbps/UL (Standalone) 	
	HSPA+	<ul style="list-style-type: none"> - Rel 8 DL * <ul style="list-style-type: none"> ● Dual carrier with 64 QAM, for up to 42 Mb/s support ● 2 × 2 MIMO with 64 QAM, for up to 42 Mb/s support - Rel7 DL <ul style="list-style-type: none"> ● 64 QAM, for up to 21 Mb/s support ● 2 × 2 MIMO with 16 QAM, for up to 28 Mb/s support - Up to 11.4Mbps/UL 	<p>*:</p> <p>--Depends on Qualcomm support plan</p> <p>--Cat. 24 only support in 1KU2.</p>
	LTE Rel 8	<ul style="list-style-type: none"> - 100 Mbps DL/50 Mbps UL (Cat 3, 10MHz) - 1.4 to 20 MHz RF bandwidth - 2 × 2 downlink SU-MIMO 	
	CDMA 1xEV-DO Rev B	<ul style="list-style-type: none"> - 3.1Mbps DL/1.8 Mbps UL (Rev A) - 14.7 Mbps DL/5.4 Mbps UL (Rev B)* - Combines up to three carriers from within 10 MHz RF bandwidth 	<p>*Rev B have not supported in Qualcomm SW drop yet</p>
Data Service	Data Mode	<ul style="list-style-type: none"> - CSD Rate Up to 9.6, 14.4 and 64kbps - DTE/DCE interface via USB 2.0 full speed - 3GPP 27.007 AT Command Set - 3GPP 27.005 Short Message 	

3. Mechanical Specifications



4. Performance

4.1 RF Specification

Condition:

Voltage @3.4 V and Temperatures: 25° C

Rx Conductive Sensitivity				
Band		Typ.	Max	Unit
1	UMTS-850, 12.2 kbps, 0.1%	-109	-104.7	dBm
2	UMTS-900, 12.2 kbps, 0.1%	-106*	-103.7	dBm
3	UMTS-AWS, 12.2 kbps, 0.1%	-108*	-106.7	dBm
4	UMTS-1900, 12.2 kbps, 0.1%	-107	-104.7	dBm
5	UMTS-2100, 12.2 kbps, 0.1%	-109	-106.7	dBm
6	CDMA2000-BC0(800MHz), FER<0.5%	-107	-104	dBm
7	CDMA2000-BC1(1900MHz), FER<0.5%	-107	-104	dBm
8	LTE-700U, QPSK, 5MHz, >95%	-100	-97	dBm
9	LTE-700D, QPSK, 5MHz, >95%	-100*	-97	dBm
10	LTE-AWS, QPSK, 5MHz, >95%	-103*	-98	dBm

*: These will be adjusted further.

Tx Conductive Power				
Band		Typ	Min	Unit
1	UMTS850/900/1900/2100/AWS	23	21	dBm
2	CDMA2000	24	23	dBm
3	LTE, Class3	23	21	dBm

4.2 Electrical Specification

4.2.1 Power Specification

Name	Pin	Description	Min	Typ	Max	Unit
VCC_VBAT	2, 24, 39, 41, 52	VCC power	3.4	3.8	4.2	V
VCC_USIM/ 3.0V	8	USIM power output 3.0V	2.7	3	3.3	V
VCC_USIM/ 1.8V	8	USIM power output 1.8V	1.62	1.8	1.98	V
V_IH	1.8V Digital I/O	input high voltage	1.62	1.8	1.98	V
V_IL	1.8V Digital I/O	input low voltage	0	0.1	0.45	V
V_OH	1.8V Digital I/O	output high voltage	1.62	1.8	1.98	V
V_OL	1.8V Digital I/O	output low voltage	0	0.1	0.45	V
PERST_N	22	Hardware Reset (PU)	-0.3	0	0.6	V

4.2.2 Pin Assignment

Pin	Name	Power Level	Description
1	POWER_ON_OFF	1.8V	Modem power on/off
2	VCC_VBAT	4.2~3.4V	Supply voltage for Modem
3	VREG_MSME_1V8	1.8V	Supply voltage for JTAG function
4	GND		GND
5	MDM_JTAG_PS_HOLD		JTAG Function
6	WAKE_UP	1.8V	Wake-up Modem
7	MDM_JTAG_RESET_N		JTAG Function
8	VREG_RUIM1	1.8/3V	SIM function
9	GND		GND
10	UIM1_DATA		SIM function
11	PA_state	1.8V	Indicate 3G/LTE/EVDO PA state for coexistence
12	UIM1_CLK		SIM function
13	(1)MDM_RTCK or (2)TCXO_GPS_EN		(1)JTAG Function or (2)Enable the output of TCXO(19.2MHz) so as to be used by GPS of main system *Depends on system how to design
14	UIM1_RESET		SIM function
15	GND		GND
16	UIM1_DET		Detection of SIM insertion/plug-out
17	(1)MDM_TCK or (2)TCXO_GPS		(1)JTAG Function or (2)TCXO(19.2MHz) output for GPS of main system *Depends on system how to design
18	GND		GND
19	MDM_TMS		JTAG Function
20	Suspend	1.8V	Trigger Modem to enter into sleep mode
21	GND		GND
22	PM28_RESET_N		Reset Modem

23	MDM_TDI		JTAG Function
24	VCC_VBAT		Supply voltage of Modem
25	MDM_TDO		JTAG Function
26	GND		GND
27	GND		GND
28	SDC2_MDM_CLK		SDIO CLK
29	GND		GND
30	SDC2_MDM_CMD		SDIO CMD
31	MDM_TRST_N		JTAG Function
32	SDC2_MDM_D0	1.8V	SDIO I/O interface
33	VBUS		Supply voltage of USB(for R&D USB debug port)
34	GND		GND
35	GND		GND
36	USB_D-		USB_D-
37	GND		GND
38	USB_D+		USB_D+
39	VCC_VBAT		Supply voltage of Modem
40	GND		GND
41	VCC_VBAT		Supply voltage of Modem
42	(WWAN_LED)		Indicate WWAN state for controlling LED of main system
43	GND		GND
44	SDC2_MDM_D1	1.8V	SDIO I/O interface
45	SDC2_MDM_D4	1.8V	SDIO I/O interface
46	SDC2_MDM_D2	1.8V	SDIO I/O interface
47	SDC2_MDM_D5	1.8V	SDIO I/O interface
48	SDC2_MDM_D3	1.8V	SDIO I/O interface
49	SDC2_MDM_D6	1.8V	SDIO I/O interface
50	GND		GND
51	SDC2_MDM_D7	1.8V	SDIO I/O interface
52	VCC_VBAT		Supply voltage of Modem

4.3 Power Consumption

The input voltage is 3.4V ~ 4.2V supplied by the host. But the following table is measured by setting up through power supply.

4.3.1 LTE Mode (Average)

LTE Cat 3 Current Measurement (B13, 10MHz)				
LTE test equipment: Anritsu MT8820C				
Active state				
Voltage	Data Type	Current at 23dBm (mA)	Current at 10dBm (mA)	Current at 0dBm (mA)
3.4V	MIMO (73.4Mbps)	835	560	435
	SISO (36.7Mbps)	800	530	410
4.2V	MIMO (73.4Mbps)	760	480	355
	SISO (36.7Mbps)	735	465	330

4.3.2 EVDO Rev. 0 Mode (Average)

Voltage	Current in 23dBm (mA)	Current in 10dBm (mA)	Current in 0dBm (mA)
BC0 CH=387 (800MHz)			
3.4V	518	309	292
4.2V	488	298	284
BC1 CH=638 (1900MHz)			
3.4V	580	323	300
4.2V	541	315	298

5. AT Command

5.1 3GPP Standard AT Commands

1. AT command set for GSM Mobile Equipment (ME) can be downloaded from <http://www.3gpp.org/ftp/Specs/html-info/0707.htm> .
2. AT command set for User Equipment (UE) can be downloaded from <http://www.3gpp.org/ftp/Specs/html-info/27007.htm> .

6. FCC

FCC ID: HFS1KU1

This module is complied to FCC requirement, all integrators have to be aware of the following information.

FCC RF Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

This device complies with Part 15 of the FCC Rules Rules.

Operation is subject to the following two conditions :

- 1) This device may not cause harmful interference, and
- 2) This device must accept any interference received, including interference that may cause undesired

operation of the device.

Only those antennas with same type and lesser gain filed under this FCC ID number can be used with this device.

The final system integrator must ensure there is no instruction provided in the user manual or customer documentation indicating how to install or remove the transmitter.

Required end product labeling:

Any device incorporating this module must include an external, visible, permanent marking or label which states "Contains FCC ID: HFS1KU1"