Specification

95902

Delock industry mini PCI Express 3,5G HSPA modem halfe lenght 1T/R

4,35

26,80

30,00

date: 10.12.2010

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1.Introduction

95902 embedded module is a HSPA enabled high-speed modem for offering and downlink data rates of up to 7.2 Mbps and uplink data rates of up to 5.8Mpbs. This module can be easy to integrate into notebook, netbook, MID, wireless router or/and other host devices to offer ubiquitous wireless data solution.

| 1. Radio connectivity	
Supported frequency bands	
GSM/EDGE	850MHz, 900MHz, 1800MHz, 1900MHz
UMTS	850MHz, 1900MHz, 2100MHz
HSDPA Category and Speed	Cat. 8 / 7.2Mbps
HSUPA Category and Speed	Cat. 6 / 5.8Mbps
U.FL RF connector for antenna	Yes (Note1)
RF Rx diversity	No
2. Form Factor	
Dimension (L x W x T mm)	26.8 x 30 x 4.35mm
Weight	< 6g
3. Host Interface	
PCI Express Half Mini Card Interface	Yes, miniPCIe v1.2
UART	No
SPI interface	No
PCM interface	No
USIM interface	Yes
USB 2.0 interface	Yes
4. Memory	
Embedded Memory	128Mb NOR Flash, 128Mb DDR
5. Power Supply	
Supply Voltage	3.0V~3.6V (Typ. 3.3V)
Operation Temperature	-30 to 75
Storage Temperature	-40 to 85

Note1: An external antenna is required.

Product feature

.. Wireless download speed up to 7.2Mbps and upload up to 5.8Mbps
.. Ultra small size, PCI express half mini card
.. Solid support for device integration and verification
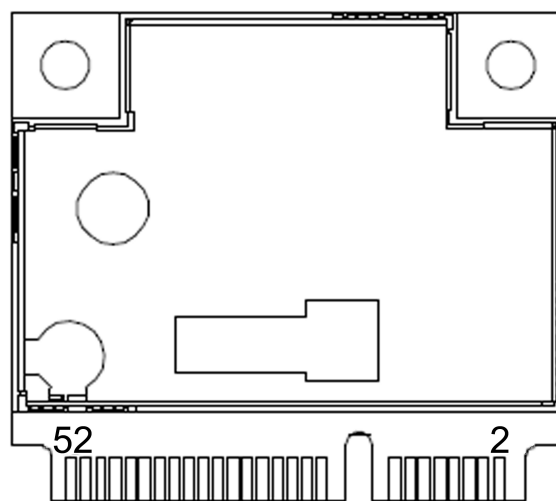.. Easy to design in with reliable and high-quality product feature

95902

Delock industry mini PCI Express 3,5G HSPA modem halfe lenght 1T/R

Form factor:
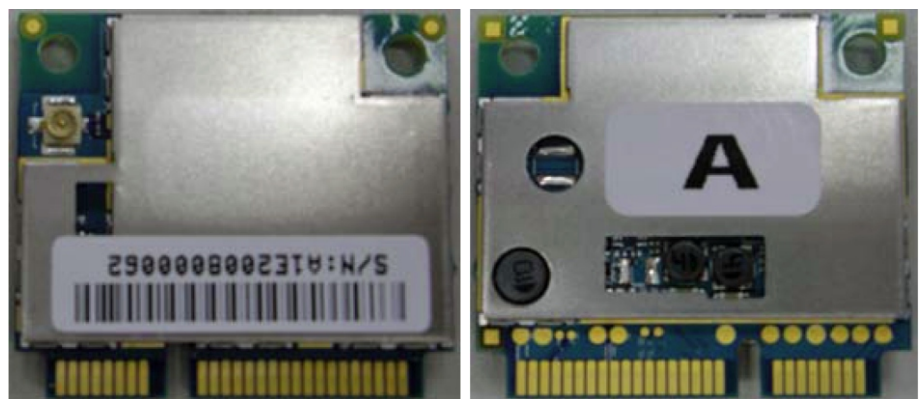
RF: U.FL RF compliant connector (50 Ohm compatible)

Pin define:

Specification

95902

Delock industry mini PCI Express 3,5G HSPA modem halfe lenght 1T/R

| Pin No.	Module Pin Description	Direction from Module	Voltage	Data Link Application Connection in Host Side
1	WAKE#	OP	3.3V	Connect
2	3.3V	IP	3.3V	Connect
3	N/C	N/C	N/C	N/C
4	GND	GND	O	PWR/GND
5	N/C	N/C	N/C	Not Connected
6	N/C	N/C	N/C	Not Connected
7	N/C	N/C	N/C	Not Connected
8	UIM power	OP	1.8/2.85V	Connect
9	GND	GND	0	PWR/GND
10	UIM Data	IP/OP	1.8/2.85V	Connect
11	N/C	N/C	N/C	N/C
12	UIM Clock	OP	1.8/2.85V	Connect
13	N/C	N/C	N/C	N/C
14	UIM Reset	OP	1.8/2.85V	Connect
15	GND	GND	0	PWR/GND
16	UIM VPP	OP	1.8V/2.85V	Connect
17	UIM USB D-	IP/OP	1.8V/2.85V	Connect
18	GND	GND	0	PWR/GND
19	UIM USB D+	IP/OP	1.8V/2.85V	Connect
20	W_DISABLE#	IP	3.3V	Connect
21	GND	GND	0	PWR/GND
22	PERST#	IP	3.3V	Connect
23	N/C	N/C	N/C	N/C
24	3.3V	IP	3.3V	PWR/GND
25	N/C	N/C	N/C	N/C
26	GND	GND	0	PWR/GND
27	GND	GND	0	PWR/GND

95902

Delock industry mini PCI Express 3,5G HSPA modem halfe lenght 1T/R

Pin No.	Module Pin Description	Direction from Module	Voltage	Data Link Application Connection in Host Side
28	N/C	N/C	N/C	N/C
29	GND	GND	0	PWR/GND
30	N/C	N/C	N/C	N/C
31	N/C	N/C	N/C	N/C
32	N/C	N/C	N/C	N/C
33	N/C	N/C	N/C	N/C
34	GND	GND	0	PWR/GND
35	GND	GND	0	PWR/GND
36	USB_D- High Speed	IP/OP	3.3V	Connect
37	GND	GND	0	PWR/GND
38	USB_D+ High Speed	IP/OP	3.3V	Connect
39	3.3V	IP	3.3V	Connect
40	GND	GND	0	PWR/GND
41	3.3V	IP	3.3V	PWR/GND
42	LED_WWAN#	OP	Open Collector	Connect
43	GND	GND	0	PWR/GND
44	N/C	N/C	N/C	N/C
45	N/C	N/C	N/C	N/C
46	N/C	N/C	N/C	N/C
47	N/C	N/C	N/C	N/C
48	N/C	N/C	N/C	N/C
49	N/C	N/C	N/C	N/C
50	GND	GND	0	PWR/GND
51	N/C	N/C	N/C	N/C
52	3.3V	IP	3.3V	PWR/GND

Specification

95902

Delock industry mini PCI Express 3,5G HSPA modem halfe lenght 1T/R
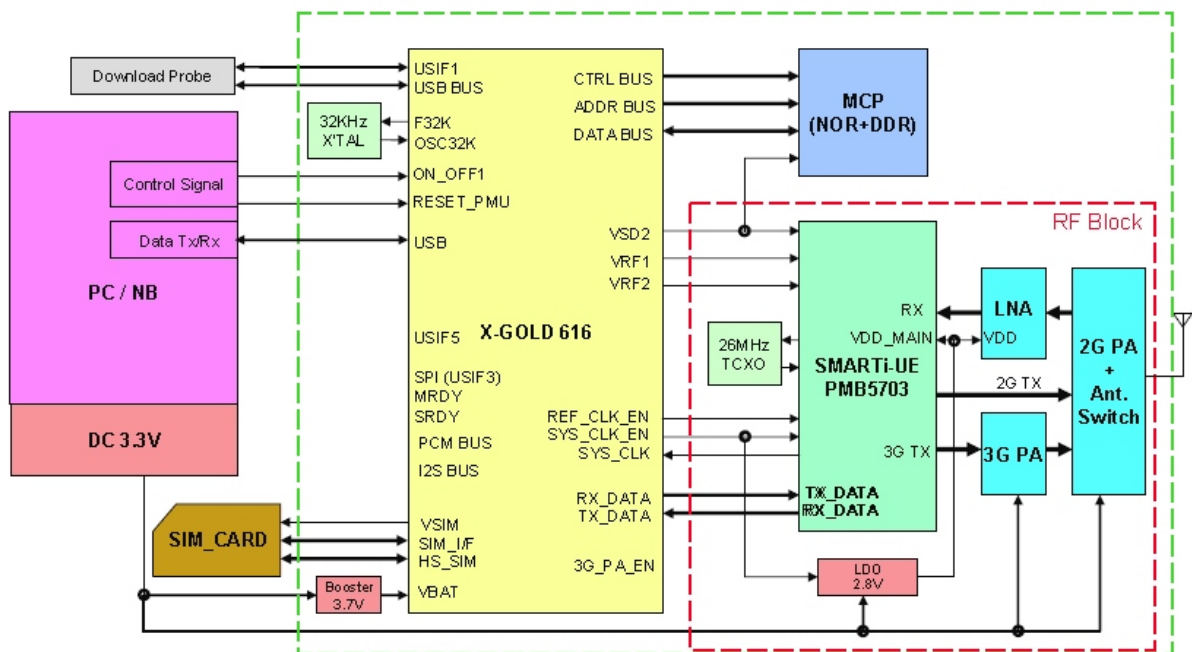
95902

Delock industry mini PCI Express 3,5G HSPA modem halfe lenght 1T/R

Power Consumption

Following Table shows the typical power consumption for 95902 module. Actual typical values may vary overtime and environment.

Power voltage (DC)	3.0~3.6V (Typ. 3.3V)	
Power consumption	Talk Current	
	Tx Current : GSM850 CH190,Level 5 RMS	<250 mA
	Tx Current : GSM900 CH62,Level 5 RMS	<250 mA
	Tx Current : DCS1800 CH700,Level 0 RMS	<200 mA
	Tx Current : PCS1900 CH661,Level 0 RMS	<200 mA
	Tx Current : WCDMA band I RMS	<550 mA
	Tx Current : WCDMA band II RMS	<550 mA
	Tx Current : WCDMA band V RMS	<550 mA
	Standby Current (Under selective suspend enabled)	
	standby current, GSM 850MHz, paging rate 5, neighbor cells 16	<6mA
	standby current, GSM 900MHz, paging rate 5, neighbor cells 16	<6mA
	standby current, GSM 1800MHz, paging rate 5, neighbor cells 16	<6mA
	standby current, GSM 1900MHz, paging rate 5, neighbor cells 16	<6mA
	standby current, WCDMA band I, DRX frames 64	<6mA
	standby current, WCDMA band I, DRX frames 512	<6mA
	standby current, WCDMA band II, DRX frames 64	<6mA
	standby current, WCDMA band II, DRX frames 512	<6mA
	standby current, WCDMA band V, DRX frames 64	<6mA
	standby current, WCDMA band V, DRX frames 512	<6mA

Environment condition

| Temperature	Operation: -30°C - 75°C
	Storage: -40°C - 85°C
Humidity	Operation: 10-90% RH
	Storage: 5-95% RH

Specification

95902

Delock industry mini PCI Express 3,5G HSPA modem halfe lenght 1T/R

Mechanical drawing

The dimensions of the 95902 are 30mm (length) x 26.8 mm (width) x 4.35 mm (height). Following Figure shows the dimension and the interface in detail.
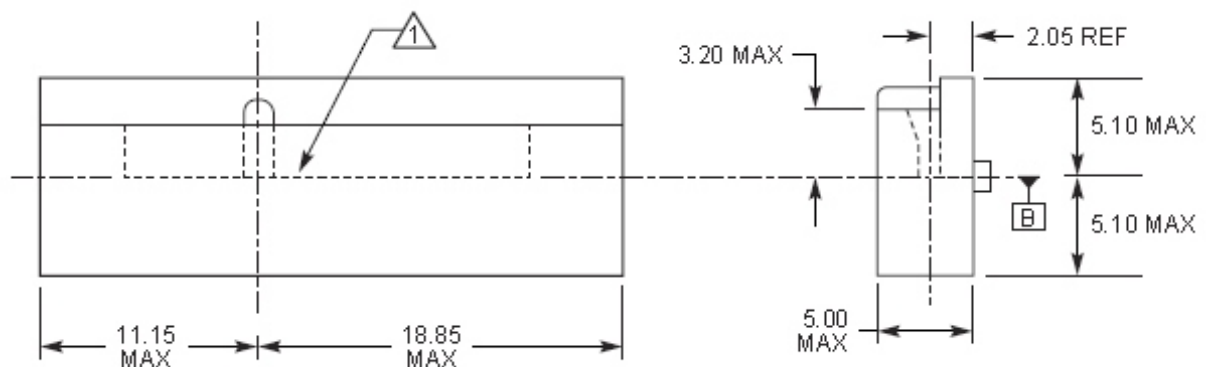

Top

Bottom

Antenna interface
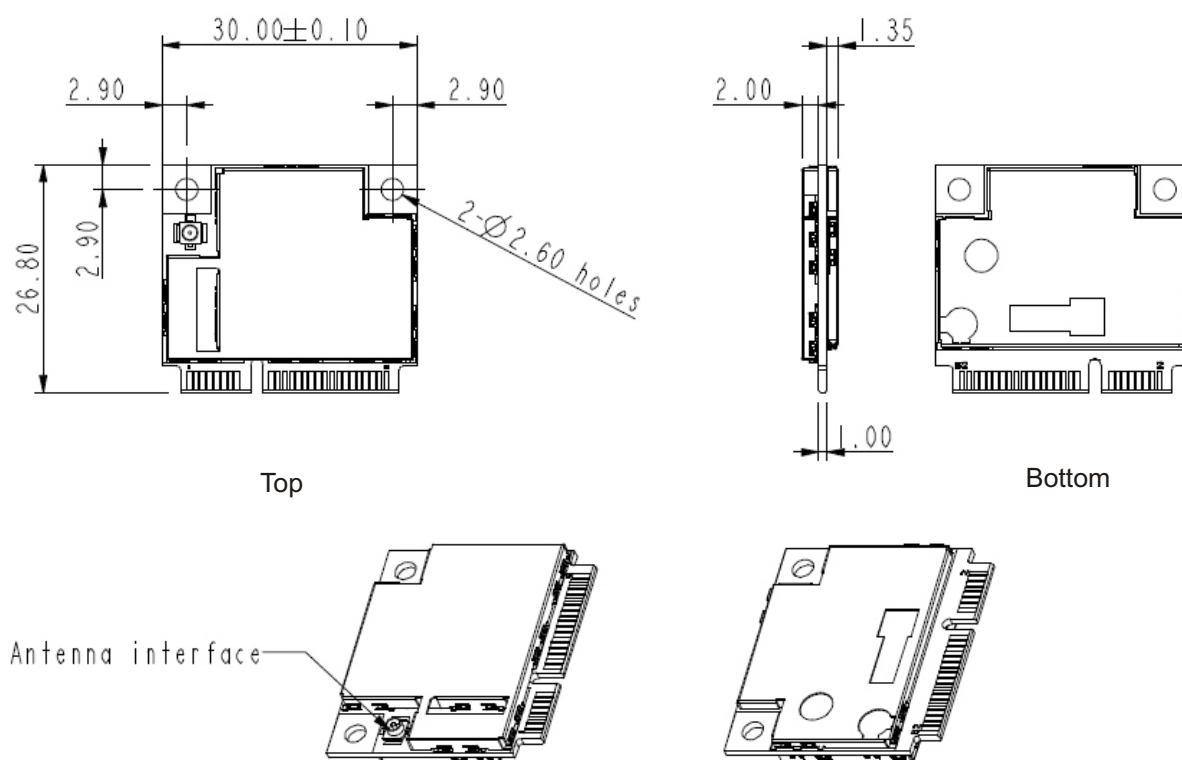
Specification

95902

Delock industry mini PCI Express 3,5G HSPA modem halfe lenght 1T/R

## Dimension of PCI Express Mini Card system connector

95902 follows PCI Express Mini Card PCB design layout to provide an 52pins edge type connector. Figure 2-3 shows the reference PCI Express Mini Card System Connector dimensions. Detail dimensions should be referred to connector manufacturers.

⚠ 1 Depth of card slot and orientation post centerlines must be aligned by ± 0.05.

Dimension of Antenna Connector

95902 provides a U.FL RF compliant connector for connecting to an external antenna. The KAE antenna connector, MHC-230B, dimension is shown in Figure 2-4.
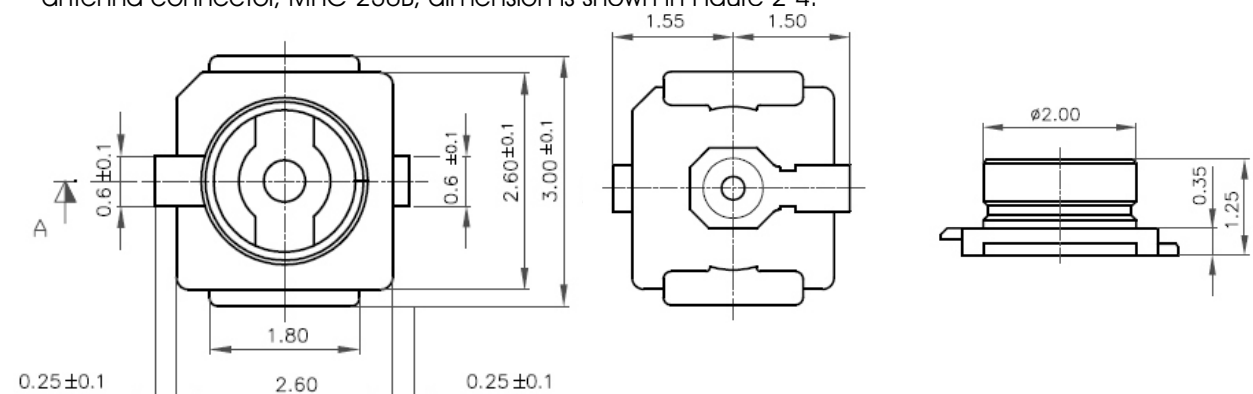
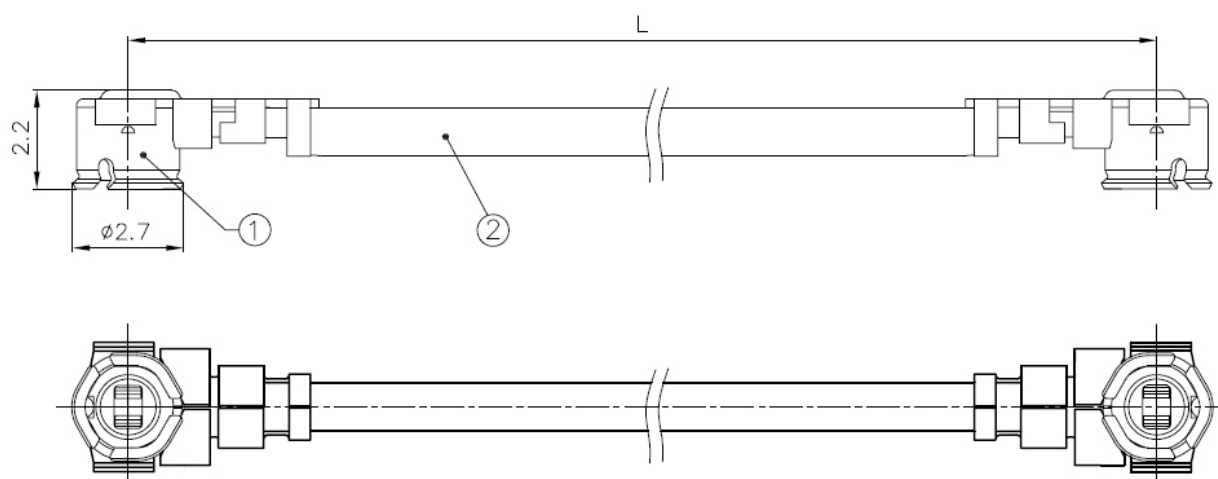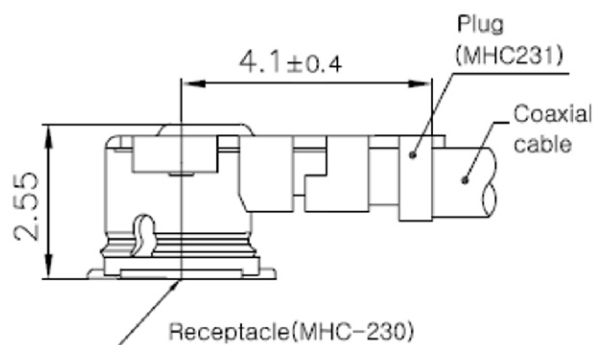# 95902

Delock industry mini PCI Express 3,5G HSPA modem halfe lenght 1T/R

The recommended antenna mating connector type shown as follows (take KAE MHC-231B as example). Other antenna mating connector for U.FL RF connector, like Hirose could also be used.

SOCKET&PLUG ASS'Y

Specification

95902

Delock industry mini PCI Express 3,5G HSPA modem halfe lenght 1T/R

Software
Interface
Interface capability

The available interface to control 95902 modem module are listed as follows:
USB: Download, data, AT commands, 2G/3G trace log

AT commands
AT commands for initialization

[Initialization]
ATE0   // set to no echo.
AT+CFUN=1   // Enable modem
AT+CPIN?   // Query sim card current status.

The response will be one of the followings.
●READY: //ME is not pending for any password
●SIM PIN: //ME is waiting SIM PIN to be given
●SIM PUK: //ME is waiting SIM PUK to be given
●SIM PIN2:   //ME is waiting SIM PIN2 to be given
●SIM PUK2   //ME is waiting SIM PUK2 to be given
If there is a PIN/PUK password required, you can enter the password (e.g., PIN is 0933) by following commands.
        AT+COPS = 0
        AT+CPIN = "0933"

[Complementary commands]
AT+XMER=1   // return rssi and battery automatically by approximately number.
AT+CGSN   // known as IMEI(International Mobile Equipment Identity)
AT+CIMI   // known as IMSI(International Mobile Subscriber Identity)
AT+XGENDATA // This command requests the SW version and generation data. The proprietary AT command is only for 95902 card.

AT commands for camping GSM/UMTS mobile network
[Camping network]
AT+COPS=0   // Camping to GSM/UMTS
AT+COPS=3,0   // Set the display format of operator network ID to characters.
AT+COPS?   // Query the camping status also contains operator name you camp.
e.g., The response of camping result are as follows
+COPS: 2 // Not camping
Or
+COPS: 0,0,"Chunghwa Telecom",2

Specification

95902

Delock industry mini PCI Express 3,5G HSPA modem halfe lenght 1T/R

AT commands for making "Data Connections"
[Configuration for data connection parameters]
AT+CCGDCONT=1,"IP",<APN> // configure parameters (PDP Context)
E.g.1, if your operator's APN setting is "internet"
"AT+CGDCONT=1,"IP","internet"
E.g.2, if your operator's APN setting is "wap.vodafone.de"
"AT+CGDCONT=1,"IP","wap.vodafone.de"
AT commands for deregistering from mobile network
[De-register]
AT+CFUN=4 // Radio off, entering flight mode
// After de-register, if you need to register to network, using AT+COPS=0.
[Power Off]
AT+CPWROFF // to turn Modem power off.

AT commands for switching Band
If you want to switch band, you need to do the following AT commands by sequence.
AT+CFUN =4 // You need to radio off before set band.
AT+XRAT=1,2 // Set band to Dual band, 3G preferred
AT+XBANDSEL=850, 900, 1800, 1900 //Optional, only if you need to select the frequency
AT+COPS=0 // to camp to mobile network via the band you set above.

A classic example of AT commands for sequence
3. Make sure no SIM password is required. You can use another mobile phone to disable the SIM password. Or, you can use AT+CPIN="<your PIN>"
4. To enable Modem and camp to GSM/UMTS:
      i.   Send "AT+CFUN=1", to enable Modem.
      ii.   After receive "OK", send "AT+COPS=0 " to camp to GSM/UMTS network.
      iii.   You can use "AT+COPS?" to check if it succeeded in camping to GSM/UMTS
  ..   Success case will be the response like:
         +COPS: 0,2,"46692",2 or
         +COPS: 0,2," ChungHua Telecom ",2
  ..   Fail case will be the response like:
         +COPS: 2
      iv.   After camping to network, you can always use "AT+CSQ" to check the signal strength.
5. For data network connection,
      i.   First, you need to configure parameters (PDP Context) by using:
         "AT+CGDCONT=1,"IP","internet""
         ii. Now you can use "MS-Windows Dial-Up Network" or the other dial-up tool (e.g., Wvdial) to make a ppp connection by dialing "ATD*99***1#"
(The generic AT command are as in 3GPP 27.007 specification [1]).

Reference
1. TS 27.007, Technical Specification Group Terminals; AT command set for User Equipment (UE); V3.11.0.

Specification

95902

Delock industry mini PCI Express 3,5G HSPA modem halfe lenght 1T/R

Connection Manager

Connection Manager Requirement Description	Parameter
1. Supported OS	
Shall support MS Windows XP 32-bits	Yes
Shall support MS Windows XP 64-bits	Yes
Shall support MS Windows Vista 32-bits	Yes
Shall support MS Windows Vista 64-bits	Yes
Shall support MS Windows 7	Yes
2. Connection	
Shall support the setting and behavior of Connect/Disconnect to/from internet	Yes
3. SMS Manager	
Shall support the display of SMS list	Yes
Shall support the display the content of selected SMS	Yes
Shall support the auto notification of new incoming SMS	Yes
Shall allow user compose new SMS	Yes
Shall support sending of SMS	Yes
Shall support forwarding of a received or sent SMS	Yes
Shall support Reply of received SMS	Yes
Shall support Delete of SMS	Yes
Shall support Inbox for storage of incoming SMS	Yes
Shall support Draft box for storage of draft SMS	Yes
Shall support Outbox for storage of buffering sending SMS	Yes
Shall support Sent box for storage of sent SMS	Yes
4. Phone book	
Shall support the display of Contact List	Under Development
Shall allow user create a New Contact	Under Development
Shall allow user to Edit a Contact	Under Development
Shall allow send SMS to the selected contact	Under Development
Shall allow user to Delete existing Contact(s)	Under Development
Shall support the Search within the contact list	Under Development
5. Home Screen Display	
Shall support the display of operator or service provider name	Yes
Shall support the display of Radio Strength Indicator	Yes
Shall support the display of Network Type (GPRS, EDGE, 3G, HSDPA)	Yes
Shall support the display of Connection Duration	Yes
Shall support the display of Total Rx Bytes in a connection session	Yes
Shall support the display of Total Tx Bytes in a connection session	Yes
Shall support the display of incoming SMS indicator	Yes

Specification

95902

Delock industry mini PCI Express 3,5G HSPA modem halfe lenght 1T/R

6. Setup	
Shall support multiple profile settings to save the settings for	Yes
APN, user name, password for different ISPs	Yes
Shall allow user to select the Preferred Band	Yes
Shall allow user to configure the Network Search Option	Yes
Shall allow user to configure the PIN Code Settings	Yes
Shall allow user to enable/disable the In Flight Mode Setting	Yes
Shall support the SMS configuration Settings	Yes
Shall support the display of System Information	Yes, board &SW version, and device information
7. Supported Language	
Traditional Chinese	Under Development
Simply Chinese	Under Development
English	Yes

Mount modem in Linux OS
Prerequisites
This section describes the control/start sequence of the 95902 data card in a Linux
OS. The control sequence has been tested on the following conditions.

1. Linux kernel 2.6.24
2. wvDial 1.60

Prerequisite
1. Kernel must be compiled with CONFIG_USB_SERIAL support. No matter built-in or loadable
kernel module.
2. User space USB library. libusb (>= 0.1.4)
3. Rule-based device node and kernel event manager. udev (>= 117). This component is optional.
(For the Linux Kernel in earlier version, you shall check if you can get ttyACM* and wvdial correctly.)

Setup procedures
In Linux OS, there is no need for specific USB driver. What we need to do is to mount the USB
modem correctly. In some cases, we need to manually mount the device.
After the data card is plugged in. Type these commands in sequence. Most of these instructions
require root privilege.

95902

Delock industry mini PCI Express 3,5G HSPA modem halfe lenght 1T/R

2) Give the command "dmesg" to check the USB device
COMMAND: "sudo dmesg"

The response will look something like this; There are seven (7) USB virtual ports are created.

[…]

```
[ 193.208068] usb 3-1: new high speed USB device using ehci_hcd and address 2
[ 193.341716] usb 3-1: config 1 interface 0 altsetting 0 endpoint 0x81 has an
invalid bInterval 255, changing to 11
[ 193.345899] usb 3-1: configuration #1 chosen from 1 choice
[ 195.670484] usb 3-1: USB disconnect, address 2
[ 196.380089] usb 3-1: new high speed USB device using ehci_hcd and address 3
[ 196.521656] usb 3-1: configuration #1 chosen from 1 choice
[ 196.888823] cdc_acm: This device cannot do calls on its own. It is no modem.
[ 196.889696] cdc_acm 3-1:1.0: ttyACM0: USB ACM device
[ 196.891099] cdc_acm: This device cannot do calls on its own. It is no modem.
[ 196.891929] cdc_acm 3-1:1.2: ttyACM1: USB ACM device
[ 196.892971] cdc_acm: This device cannot do calls on its own. It is no modem.
[ 196.893811] cdc_acm 3-1:1.4: ttyACM2: USB ACM device
[ 196.894878] cdc_acm: This device cannot do calls on its own. It is no modem.
[ 196.895706] cdc_acm 3-1:1.6: ttyACM3: USB ACM device
[ 196.903459] cdc_acm: This device cannot do calls on its own. It is no modem.
[ 196.937744] cdc_acm 3-1:1.8: ttyACM4: USB ACM device
[ 196.938853] cdc_acm: This device cannot do calls on its own. It is no modem.
[ 196.939668] cdc_acm 3-1:1.10: ttyACM5: USB ACM device
[ 196.940707] cdc_acm: This device cannot do calls on its own. It is no modem.
[ 196.941535] cdc_acm 3-1:1.12: ttyACM6: USB ACM device
[ 196.942590] usbcore: registered new interface driver cdc_acm
[ 196.943170] cdc_acm: v0.26:USB Abstract Control Model driver for USB modems and
ISDN adapters
```

3) You can also check if the ports are there by list the "/dev/ttyACM*"
COMMAND: "sudo ls /dev/ttyACM*"

```
The response will look something like this;
/dev/ttyACM0 /dev/ttyACM2 /dev/ttyACM4 /dev/ttyACM6
/dev/ttyACM1 /dev/ttyACM3 /dev/ttyACM5
ttyACM0: Modem (Data port)
ttyACM1: L2/L3 debug trace; 2G L1 trace port
ttyACM2: 3G L1 debug trace
ttyACM3: AT Command
ttyACM4: reserved for future use
ttyACM5: reserved for future use
ttyACM6: reserved for future use
```

Specification

95902

Delock industry mini PCI Express 3,5G HSPA modem halfe lenght 1T/R

1) Give the command "lsusb" to check the USB device

COMMAND: "sudo lsusb"
The response will look something like this;
[…]
```
Bus 007 Device 006: ID 0bda:0158 Realtek Semiconductor Corp. Mass Stroage
Device
Bus 007 Device 003: ID 04f2:b029 Chicony Electronics Co., Ltd
Bus 007 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
Bus 003 Device 003: ID 1519:0020
Bus 003 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
Bus 006 Device 001: ID 1d6b:0001 Linux Foundation 1.1 root hub
Bus 005 Device 003: ID 08ff:1600 AuthenTec, Inc. AES1600
Bus 005 Device 001: ID 1d6b:0001 Linux Foundation 1.1 root hub
Bus 004 Device 003: ID 046d:c019 Logitech, Inc. Optical Tilt Wheel Mouse
Bus 004 Device 001: ID 1d6b:0001 Linux Foundation 1.1 root hub
Bus 002 Device 001: ID 1d6b:0001 Linux Foundation 1.1 root hub
Bus 001 Device 001: ID 1d6b:0001 Linux Foundation 1.1 root hub
```
[…]
There must be a USB device with ID: 1519:0020 (VID:PID, vendor ID: Product ID)

95902

Delock industry mini PCI Express 3,5G HSPA modem halfe lenght 1T/R

4) Now edit the wvdial.conf file, replace [Dialer Defaults] with the following
Once the ttyACM0~6 are there, you can configure "wvdial.conf".
COMMAND: "sudo vi /etc/wvdial.conf"
Or "sudo gedit /etc/wvdial.conf"
In wvdial.conf:

```
----------------------------------------------------------------------------------------
[Dialer Defaults]
Init1 = ATZ
Init2 = ATQ0 V1 E1 S0=0 &C1 &D2 +FCLASS=0
Init3 = AT+COPS=0
Init4 = AT+CGDCONT=1,"IP","mms"
Dial Command = ATDT
Phone = *99***1#
Modem Type = USB Modem
ISDN = 0
Username = user
Password = pass
Modem = /dev/ttyACM0
Baud = 460800
```

(You may need to change Init4 for the APN accordingly, for example, "mms" is TCC's APN, and "internet" is applied to CHT's APN.)

5) Make a wvdial to make data connection. Run the "wvdial"
COMMAND: "sudo wvdial&"

```
----------------------------------------------------------------------------------------
--> WvDial: Internet dialer version 1.60
--> Cannot get information for serial port.
--> Initializing modem.
--> Sending: ATZ
ATZ

OK
--> Sending: ATQ0 V1 E1 S0=0 &C1 &D2 +FCLASS=0
ATQ0 V1 E1 S0=0 &C1 &D2 +FCLASS=0
OK
--> Sending: AT+COPS=0
AT+COPS=0
OK
```

95902

Delock industry mini PCI Express 3,5G HSPA modem halfe lenght 1T/R

```
--> Sending: AT+CGDCONT=1,"IP","mms"
AT+CGDCONT=1,"IP","mms"
OK
--> Modem initialized.
--> Sending: ATDT*99***1#
--> Waiting for carrier.
ATDT*99***1#
CONNECT
--> Carrier detected. Waiting for prompt.
~[7f]}#@!}!}!}}4}"}&}}}}}%}&[19]T5`}'}"}(}"IG~
--> PPP negotiation detected.
--> Starting pppd at Thu Jan 7 14:59:05 2010
--> Pid of pppd: 9213
--> Using interface ppp0
--> pppd: ??[06][08][10]?[06][08]`?[06][08]??[06][08]
--> pppd: ??[06][08][10]?[06][08]`?[06][08]??[06][08]
--> pppd: ??[06][08][10]?[06][08]`?[06][08]??[06][08]
--> local IP address 10.47.166.169
--> pppd: ??[06][08][10]?[06][08]`?[06][08]??[06][08]
--> remote IP address 10.47.166.169
--> pppd: ??[06][08][10]?[06][08]`?[06][08]??[06][08]
--> primary DNS address 124.29.143.1
--> pppd: ??[06][08][10]?[06][08]`?[06][08]??[06][08]
--> secondary DNS address 124.29.159.1
--> pppd: ??[06][08][10]?[06][08]`?[06][08]??[06][08]
Caught signal 2: Attempting to exit gracefully...
--> Terminating on signal 15
--> pppd: ??[06][08][10]?[06][08]`?[06][08]??[06][08]
--> Connect time 1.0 minutes.
--> pppd: ??[06][08][10]?[06][08]`?[06][08]??[06][08]
--> pppd: ??[06][08][10]?[06][08]`?[06][08]??[06][08]
--> pppd: ??[06][08][10]?[06][08]`?[06][08]??[06][08]
--> Disconnecting at Thu Jan 7 15:00:08 2010

------------------------------------------------------------------------------
```

If you see the IP address, it means your data card has connected to the network and ready to use.

6) The ttyACM0 is now in PPP data mode, but you can still get the AT command control on ttyACM3.
For example, sending AT+CSQ through ttyACM3 to get signal strength during a PPP connection on ttyACM0.