# AMOD

# ACE9000 3.5GModule
## Product Data Sheet
## <V2.2>

# Revision History

| Revision | Released Date | Comments/Remark |
|---|---|---|
| Draft | 2009/12/23 | Draft |
| V1.0 | 2010/01/07 | Official release<br>Add Linux setup procedure |
| V2.0 | 2010/03/24 | Update module weight and operating temperature<br>Update embedded memory<br>Update power consumption table<br>Update antenna connector<br>Remove connection manager section<br>Modify block diagram<br>Modify I/O table |
| V2.1 | 2010/06/30 | Modify 2.1. 1 pin definition<br>Add UART interface in 1.2 Product Description<br>Modify 2.1.2 Block Diagram |
| V2.2. | 2010/ 08/05 | Add FCC statement |

## FCC Regulations:

●This device complies with part 15 of the FCC 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.

●This device 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 radiated 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.

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

## ▶ RF Exposure Information

This Modular Approval is limited to OEM installation for mobile and fixed applications only. The antenna installation and operating configurations of this transmitter, including any applicable source-based time-averaging duty factor, antenna gain and cable loss must satisfy MPE categorical Exclusion Requirements of §2.1091.

The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons, must not be collocated or operating in conjunction with any other antenna or transmitter, except in accordance with FCC multi-transmitter product procedures.

The end user has no manual instructions to remove or install the device and a separate approval is required for all other operating configurations, including portable configurations with respect to 2.1093 and different antenna configurations.

Maximum antenna gain allowed for use with this device is 5 dBi.
When the module is installed in the host device, the FCC ID label must be visible through a window on the final device or it must be visible when an access panel, door or cover is easily re-moved. If not, a second label must be placed on the outside of the final device that contains the following text: "Contains FCC ID: TLTACE9000".

# TABLE OF CONTENT

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# 1. INTRODUCTION

## 1.1. Scope

ACE9000 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 easily integrated into Notebook, Netbook, MID, wireless router or/and other host devices to offer ubiquitous wireless data solution.

## 1.2. Product Description

| Requirement Description | Parameter |
| --- | --- |
| **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 | Yes |
| SPI interface | Yes |
| PCM interface | Yes |
| USIM interface | Yes |
| USB 2.0 interface | Yes |
| **4. Memory** | |
| Embedded Memory | 128Mb NOR Flash, 128Mb DDR (Note1) |
| **5. Power Supply** | |
| Supply Voltage | 3.4V ~ 4.2V (Typ. 3.7V) |
| Operation Temperature | -30℃ to 70℃ |
| Storage Temperature | -40℃ to 85℃ |

Note1: An external antenna is required.
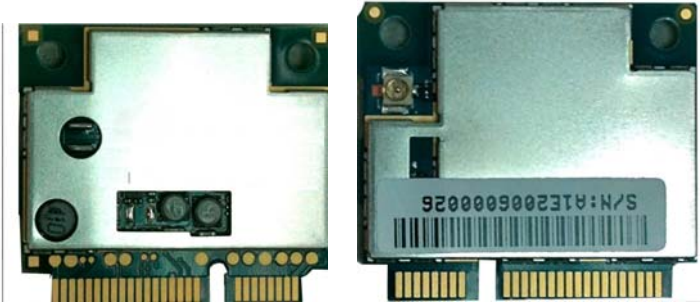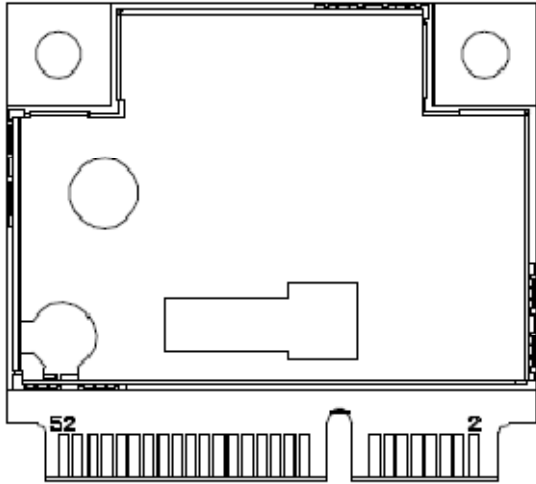
## 1.3. Product Features

> 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
> Optional voice for PCM capability

# 2. SPECIFICATION

## 2.1. Hardware

## 2.1.1.I/O Features

| | |
|---|---|
| Form Factor |  |
| RF | U. FL RF Connector (50 Ohm compatible) |
| Pin Define |  |

| Pin No. | Description Small Modem Board | Interface Category | Direction from Module | Voltage |
|---|---|---|---|---|
| 1 | **SRDY: Host wakup by Module (SPI)** <br> Active high signal. Modem is Slave. | SPI | Output | 1.8V |
| 2 | **Power Supply** | Power / Ground | Input | 3.7V |
| 3 | **Reserved** | Not Connected | N/C | N/C |
| 4 | **GND** | Power / Ground | GND | 0 |
| 5 | **Reserved** | Not Connected | N/C | N/C |
| 6 | **Reserved** | Not Connected | N/C | N/C |
| 7 | **Reserved** | Not Connected | N/C | N/C |
| 8 | **SIM power** | Sim card | Output | 1.8/2.85V |
| 9 | **GND** | Power / Ground | GND | 0 |
| 10 | **SIM Data** | Sim card | Input/Output | 1.8/2.85V |
| 11 | **UART CTS (Host CTS)** | USIF1/UART0 | Output | 1.8V |
| 12 | **SIM Clock** | Sim card | Output | 1.8/2.85V |
| 13 | **UART RTS (Host RTS)** | USIF1/UART0 | Input | 1.8V |
| 14 | **SIM Reset** | Sim card | Output | 1.8/2.85V |
| 15 | **GND** | Power / Ground | GND | 0 |
| 16 | **Modem Reset** <br> There's no level shifter on Modem Module. AP board should use level shifter for 2.3 to 1.8 transition. <br> Note: Level Shifter on Modem Module will be mplemented from FP build. | System | Input | **2.3V** <br> **Note: From FP build change to 1.8V** |
| 17 | **UART TX (Host TX)** | USIF1/UART0 | Input | 1.8V |
| 18 | **GND** | Power / Ground | GND | 0 |
| 19 | **UART RX (Host RX)** | USIF1/UART0 | Output | 1.8V |
| 20 | **Reserved** | Not Connected | N/C | N/C |
| 21 | **GND** | Power / Ground | GND | 0 |
| 22 | **Module On** <br> Active High transition from AP side to Turn Module On. | System | Input | 1.8V |

| Pin No. | Description Small Modem Board | Interface Category | Direction from Module | Voltage |
|---|---|---|---|---|
| 23 | SPI SOMI (Host as Master)<br>Note: Slave Output Master Input | SPI | Output | 1.8V |
| 24 | Power Supply | Power / Ground | Input | 3.7V |
| 25 | SPI SIMO (Host as Master)<br>Note: Slave Input Master Output | SPI | Input | 1.8V |
| 26 | GND | Power / Ground | GND | 0 |
| 27 | GND | Power / Ground | GND | 0 |
| 28 | Reserved | Not connected | N/C | N/C |
| 29 | GND | Power / Ground | GND | 0 |
| 30 | I2S CLK | I2S | Input/Output | 1.8V |
| 31 | SPI CLK | SPI | Input | 1.8V |
| 32 | I2S RX | I2S | Input | 1.8V |
| 33 | Reserved | Not connected | N/C | N/C |
| 34 | GND | Power / Ground | GND | 0 |
| 35 | GND | Power / Ground | GND | 0 |
| 36 | USB_D- High Speed | HS USB | Input/Output | 3.3V |
| 37 | GND | Power / Ground | GND | 0 |
| 38 | USB_D+ High Speed | HS USB | Input/Output | 3.3V |
| 39 | Power Supply | Power / Ground | Input | 3.7V |
| 40 | GND | Power / Ground | GND | 0 |
| 41 | Power Supply | Power / Ground | Input | 3.7V |
| 42 | XMM6160 Power Status | System | Output | Open Collector |

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| Pin No. | Description Small Modem Board | Interface Category | Direction from Module | Voltage |
|---|---|---|---|---|
| 43 | GND | Power / Ground | GND | 0 |
| 44 | MRDY: Module Wake by Host(SPI)<br>Active High Signal | SPI | Input | 1.8V |
| 45 | Speech PCM_CLK to Host | PCM | Output | 1.8V |
| 46 | I2S TX | I2S | Output | 1.8V |
| 47 | Speech PCM_UL from Host | PCM | Input | 1.8V |
| 48 | I2S WAD | I2S | Input/Output | 1.8V |
| 49 | Speech PCM_DL to Host | PCM | Output | 1.8V |
| 50 | GND | Power / Ground | GND | 0 |
| 51 | Speech PCM_SYNC from Host | PCM | Output | 1.8V |
| 52 | Power Supply | Power / Ground | Input | 3.7V |

## 2.1.2.Block Diagram
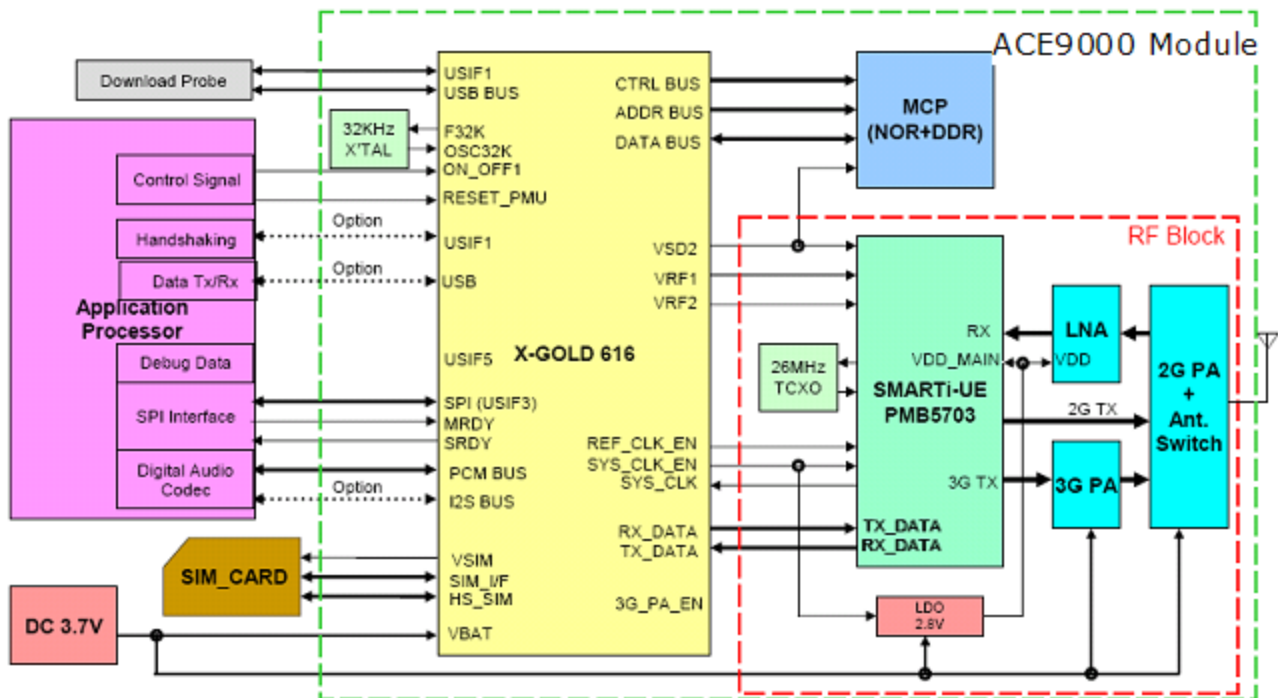
## 2.1.3.Power Consumption

Following Table shows the typical power consumption for ACE9000 module. Actual typical values may vary over time and environment.

| Power Voltage (DC) | 3.4V ~ 4.2V (Typ. 3.7V) | |
|---|---|---|
| **Power Consumption** | **Modem** | |
| | 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 SPI Interface, disable USB)** | |
| | standby current, GSM 850MHz, paging rate 5, neighbor cells 16 | <2mA |
| | standby current, GSM 900MHz, paging rate 5, neighbor cells 16 | <2mA |
| | standby current, GSM 1900MHz, paging rate 5, neighbor cells 16 | <2mA |
| | standby current, WCDMA band I,DRX frames 64 | <2mA |
| | standby current, WCDMA band I,DRX frames 512 | <2mA |
| | standby current, WCDMA band II,DRX frames 64 | <2mA |
| | standby current, WCDMA band II,DRX frames 512 | <2mA |
| | standby current, WCDMA band V,DRX frames 64 | <2mA |
| | standby current, WCDMA band V,DRX frames 512 | <2mA |

## 2.1.4.Environment Condition

| Temperature | Operation:-30℃ to 70℃<br>Storage: -40℃ to +85℃ |
|---|---|
| Humidity | Operation: 10~90% RH<br>Storage: 5~95% RH |

## 2.2. Mechanical Drawing

## 2.2.1.Dimension

The dimensions of the ACE9000 are 30mm (length) x 26.8 mm (width) x 4.35 mm (height). Following Figure shows the dimension and the interface in detail.
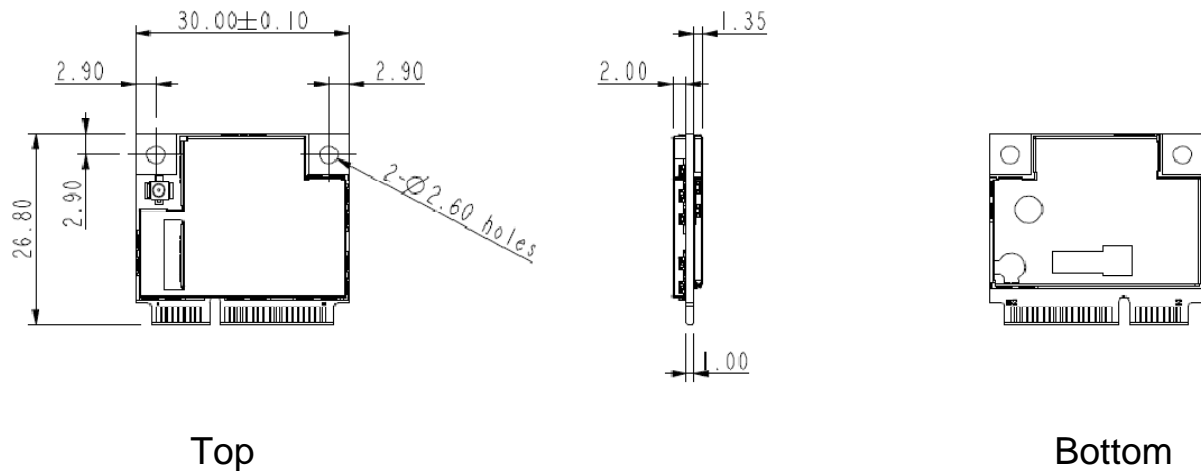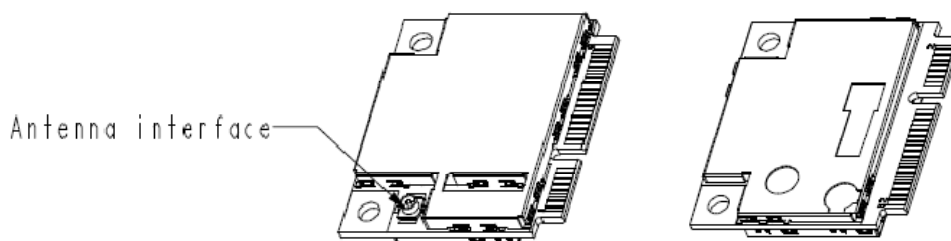
**Figure 2-1 ACE9000 Dimension**



Top                                                                 Bottom

**Figure 2-2 ACE9000 Interface**



## 2.2.2.Dimension of PCI Express Min Card system connector

ACE9000 follows PCI Express Mini Card PCB design layout to providean 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.

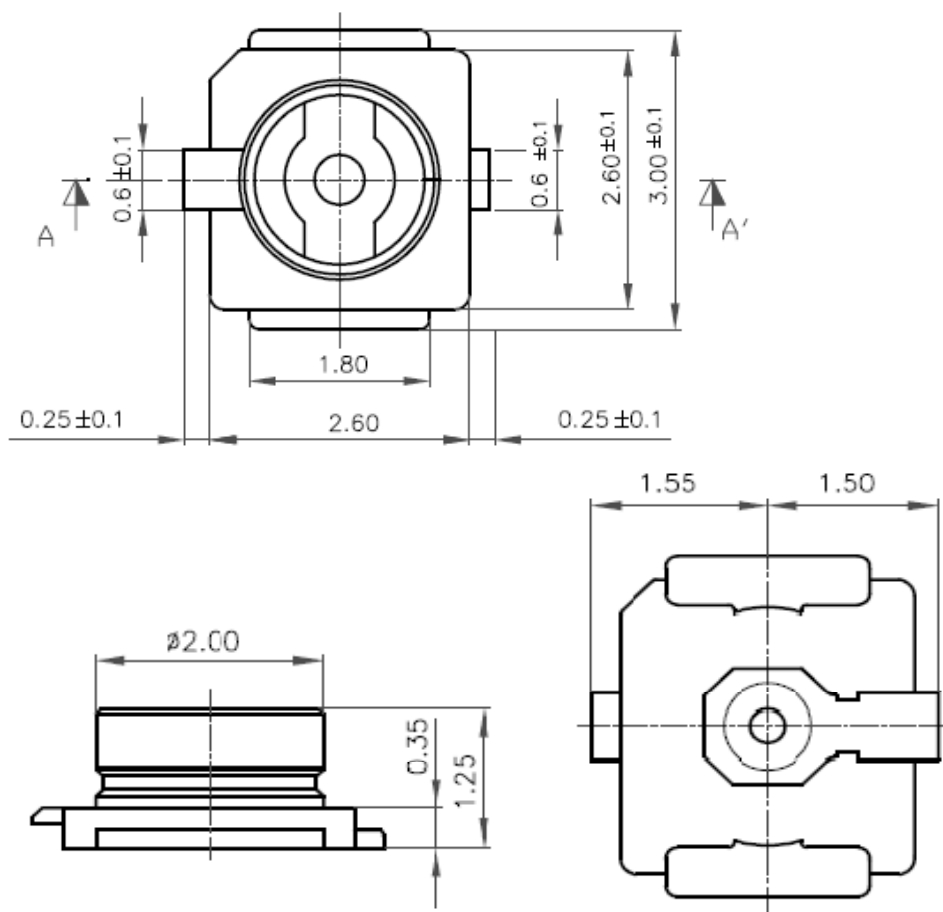**Figure 2-3 PCI Express Mini Card System Connector Dimension**

**AMOD**
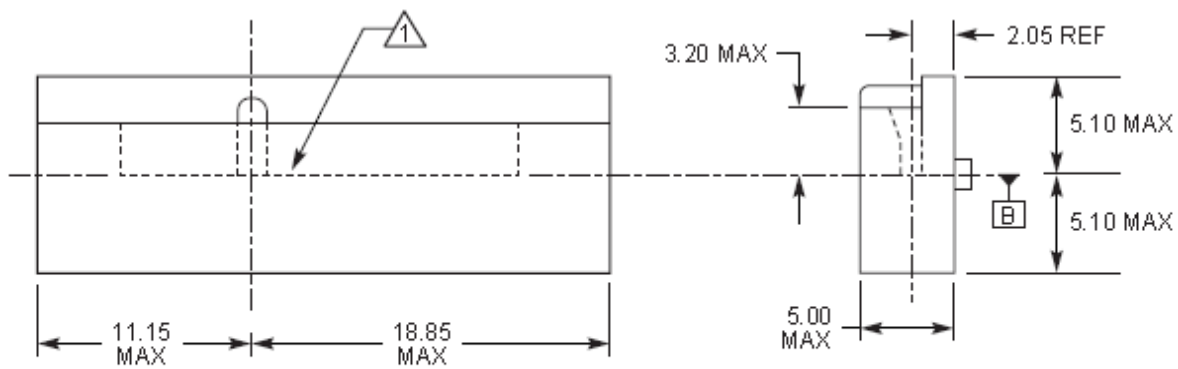


△ Depth of card slot and orientation post centerlines must be aligned by ± 0.05.

## 2.2.3. Dimension of Antenna Connector

ACE9000provides a U.FL RF Connector for connecting to an external antenna. The KAE antenna connector, MHC-230B, dimension is shown in Figure 2-4.

### Figure 2-4 Antenna Connector Dimension

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.
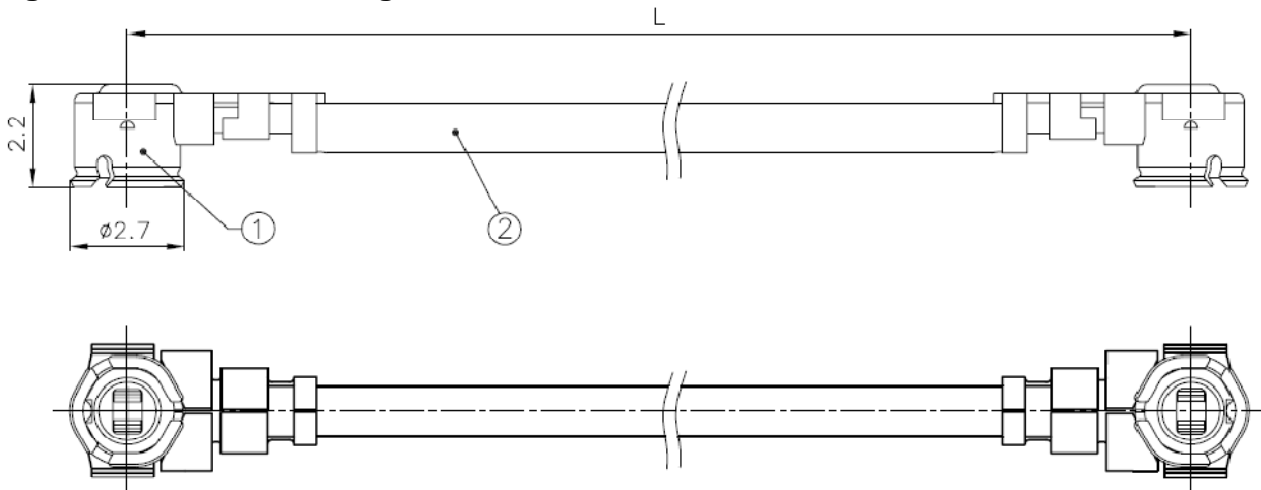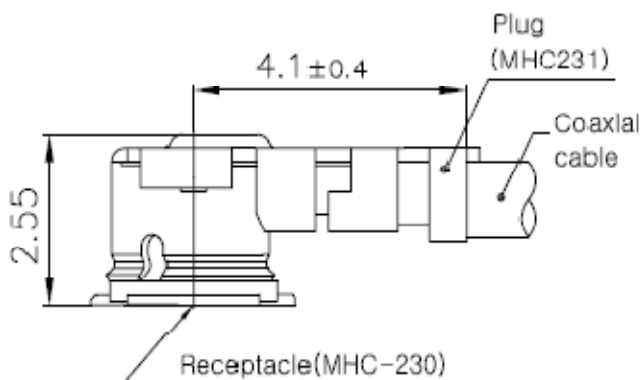
**Figure 2-5 Antenna Mating Connector Dimension**

**Figure 2-6 Antenna Mating Connector Dimension Assembled to Antenna Connector**

## 2.3. Software

## 2.3.1.Interface

Interface Capability

The available interface to control ACE9000 modem module are listed as follows:

| Interface | Function | Remark |
|---|---|---|
| UART(USIF 1) | Download, AT commands, 2G L1 and 2G/3G L2/3 Trace log | |
| SPI(USIF 3) | Data, AT commands | |
| USB | Download, Data, AT commands, 2G/3G Trace log | |

Recommendation for designing the interface

The design recommendations are as follows:

| Function | Interface | Remark |
|---|---|---|
| Download | USB | Over PC |
| AT Command | USIF 3 | Multiplexed |
| Data Link | USIF 3 | |
| Trace Log | USIF 1(2G L1 and 2G/3G L2/3 Trace Log) | Over PC |
| Trace Log | USB(2G/3G Trace Log) | Over PC |

## 2.3.2. AT Commands

### 2.3.2.1. 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 AMOD mobile card.

### 2.3.2.2. 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

### 2.3.2.3. 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"

### 2.3.2.4. 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.

### 2.3.2.5. 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.

### 2.3.2.6. A classic example of AT commands for sequence

1.  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>"
2.  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.
3.  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]).*

### 2.3.2.7. Reference

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

## 2.3.3. Mount modem in Linux OS

### 2.3.3.1.  Prerequisites

This section describes the control/start sequence of the AMOD HSPA 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.)

### 2.3.3.2.  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.

### 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)

## 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

## 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
--> 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 andready 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.