ericsson.
com

C5621 and C33 User Guide

USER GUIDE
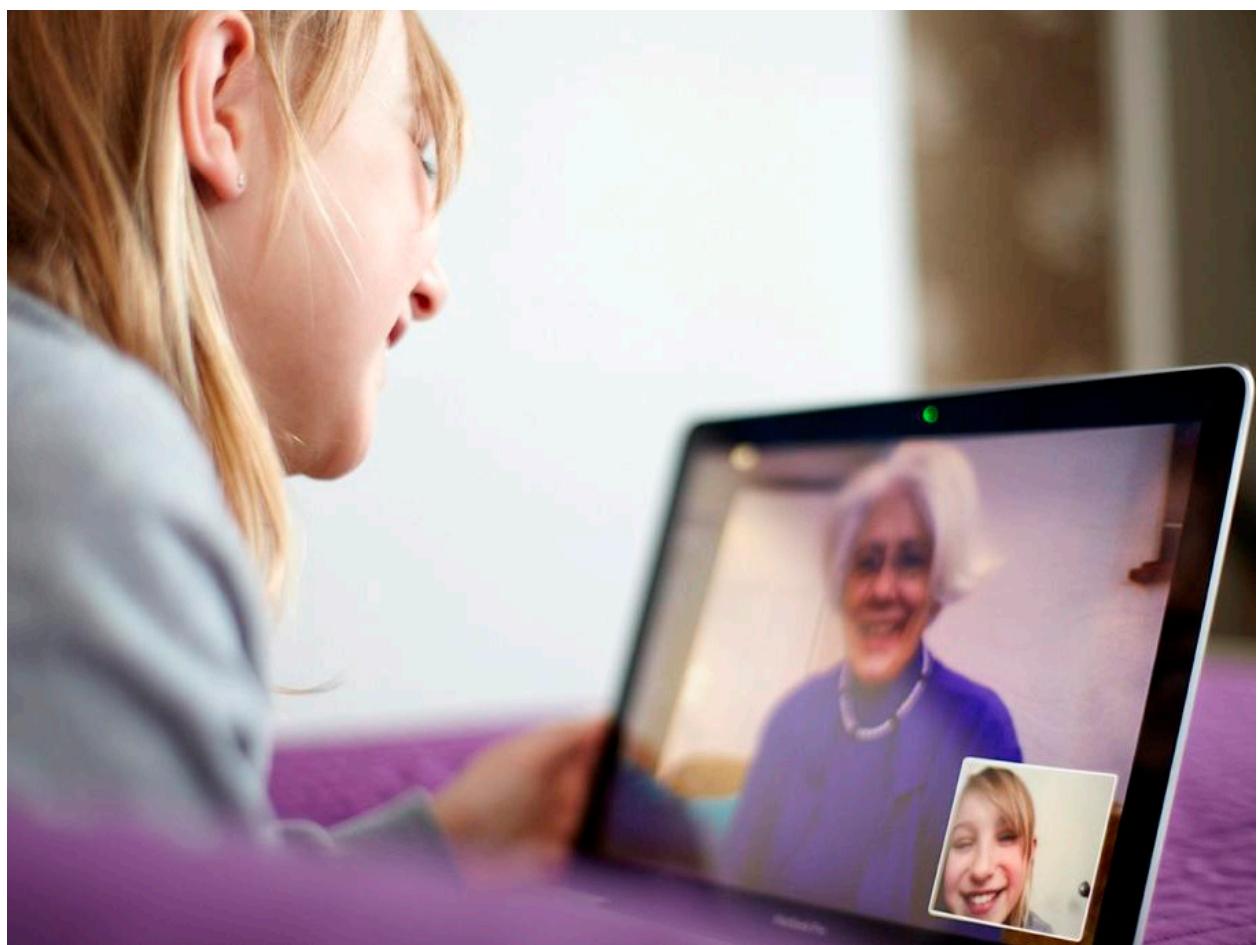
Abstract

This document describes the Ericsson Mobile Broadband Modules C5621 and C33 from a user perspective. End-user value, functionality, features and basic building blocks are described.

This user guide for C5621 and C33 gives the reader a deeper technical understanding of the features, applications and configuration of C5621 and C33. A simplified technical explanation of GSM/GPRS/EDGE and UMTS/HSPA/HSPA Evolution data services is also included in this document.

Trademark and Acknowledgements

Microsoft, Windows, Windows XP, Windows Vista and Windows 7 are registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.

Android is the registered trademark of Google Inc.

Ericsson is a trademark of Telefonaktiebolaget LM Ericsson.

All trademarks are the property of their respective owners. All other product or service names mentioned in this document are trademarks of their respective companies.

Contents

1 Product Overview

C5621 and C33 are Mobile Broadband Modules (see photo below) for UMTS and GSM. They enable host device users to have flexible and high speed mobile access to the Internet or corporate network, including "always online" capability. They support data services through HSPA Evolution, UMTS, EDGE, GPRS, and Data message service. C5621 has a GPS receiver which is working with most common positioning applications. Updated versions of the PC application software, drivers and module firmware can be installed by the end user.

1.1 Product Features

C5621 and C33 are flexible and automatically choose the best data service available in a particular location, whether it is HSPA Evolution, UMTS, EDGE or GPRS. This is particularly useful for users roaming on several different networks.

As a quad-band device, C5621 can operate globally. It automatically chooses between UMTS band I, II, V/VI, or VIII. C33 is a dual band module for regional markets. C5621 and C33 are also quad-band GSM devices, and can operate on GSM systems all over the world. Therefore, users can use wireless communication from their host devices on all five continents, in over 205 countries.

With the C5621 and C33 Mobile Broadband Module installed in a host device, it is always available for data transfer. Connection settings are automatically configured based on the SIM card. The user simply clicks the "Connect" button to make an Internet connection. Parameter settings suitable for many networks are included and can be configured if needed to facilitate manual configuration where required. A status screen and an icon in the notification area enable users to check status information such as signal strength, to perform common functions and to access help.

C5621 and C33 have wide host device compatibility. They are designed to use the integrated antennas in host devices. C5621 and C33 support the Microsoft Windows XP, Vista, Windows 7, Linux, and Android operating systems. Since the modules are designed for host devices, they are better integrated and provide a superior end-user experience compared to generically produced USB dongles that need to work across multiple computing platforms.

The built-in GPS receiver in the C5621 module provides positioning data compatible with most commonly used positioning applications, to show the position on maps, trace the route, or provide driving directions. There are product variations, where the GPS is omitted.

2 Communication

The C5621 and C33 Mobile Broadband Modules keep end users up to date by providing them the best available mobile service wherever they are.

C5621 and C33 are dual mode devices, able to connect via UMTS/HSPA and GSM/GPRS/EDGE. The user will remain connected without having to think about what system is being used – the handover between two systems and network technologies is automatically managed by C5621 and C33. C5621 comes in a hardware version supporting both quad-band UMTS (Band I, II, V/VI and VIII) and quad-band GSM/GPRS/EDGE (850/900/1800/1900 MHz). C33 has dual band support.

2.1 Network Technologies

2.1.1 3G

3G (third-generation) services combine high-speed radio access with IP-based (Internet Protocol) services. This not only means fast mobile connection to the Internet, but also a totally new way to communicate, access information, conduct business, learn and be entertained.

Compared to 2G mobile networks, 3G significantly boosts network capacity, a much needed feature in densely populated areas. This means that operators are able to support more users and offer them more sophisticated services.

2.1.1.1 HSPA Evolution

For C5621, HSPA (High Speed Packet Access) Evolution enables downlink speeds up to 21 Mbps (HSDPA cat 14) and uplink speeds up to 5.76 Mbps (HSUPA cat 6). Higher order modulation results in higher possible speeds in the network.

2.1.1.2 HSPA

HSPA is available in all developed 3G markets. With the HSDPA solution, C5621 is capable of downlink speeds of up to 14.4 Mbps (HSDPA cat 10) and uplink speeds of up to 5.76 Mbps (HSUPA cat 6). This, together with its antenna diversity technology, gives C5621 and C33 a fast and reliable connection.

C33 supports HSPA (High Speed Packet Access) downlink speeds up to 3.6 Mbps (HSDPA cat 6) and uplink speeds up to 384 kbps (WCDMA).

2.1.1.3   WCDMA

The initial implementation of 3G networks enables Internet or corporate network access at bidirectional data rates of up to 384 kbps.

2.1.2   2G

GSM/GPRS coverage is available in almost all populated areas of the world and provides a secure fall back so that network connection is maintained.

2.1.2.1   GPRS

GPRS is an enhancement to GSM networks and provides packet data transmission. The connection setup is fast and, once connected, applications may send and receive data whenever required.

C5621 and C33 are using GPRS with Multislot class 10, which enables communication speed up to 100/60 kbps (DL/UL).

2.1.2.2   EDGE

EDGE (Enhanced Data rates for Global Evolution) is an integral part of the GSM family of open mobile standards. EDGE improves GPRS by increasing data throughput by a factor of three. GPRS networks enhanced with EDGE are often referred to as E-GPRS (Enhanced GPRS) networks.

C5621 and C33 are using E-GPRS with Multislot class 10, which enables communication speeds up to 296/177.6 kbps (DL/UL).

2.2   Core features

2.2.1   Browsing and Internet access

C5621 and C33 provide a standard Internet connection. It is possible to use the Internet or intranet with a generic browser.

2.2.2   SMS

C5621 and C33 can send and receive text messages. Facilities such as copy and paste make it fast and easy to send information via text messages from a computer. The standard maximum length of a text message is 160 characters, (dependent on character coding), but since concatenation is supported, messages longer than 160 characters can be sent and received.

2.2.3 GPS

The Global Positioning System (GPS) gives the positioning information around the globe and can be used together with the most commonly used positioning applications. The positioning data from the C5621 module can be used together will all major positioning applications to, for example, show locations on maps, trace routes, give information on how to get to a destination, etc. The product may have GPS function.

C5621 has a built-in standalone GPS receiver with good sensitivity performance. For increased performance, C5621 supports both network and Internet assisted GPS, which helps the GPS receiver increase its sensitivity and perform a faster Time To First Fix (TTFF). There are product variations, where the GPS is omitted.

3 Hardware Overview

3.1 General

C5621 and C33 have a form factor of 29 x 29 x 1.9 mm, soldered in board. The pin out is configured as a 277 pin LGA (Land Grid Array). The ball diameter is 0.63 mm and the pitch is 1.27 mm. The pin configuration is shown in the picture below.
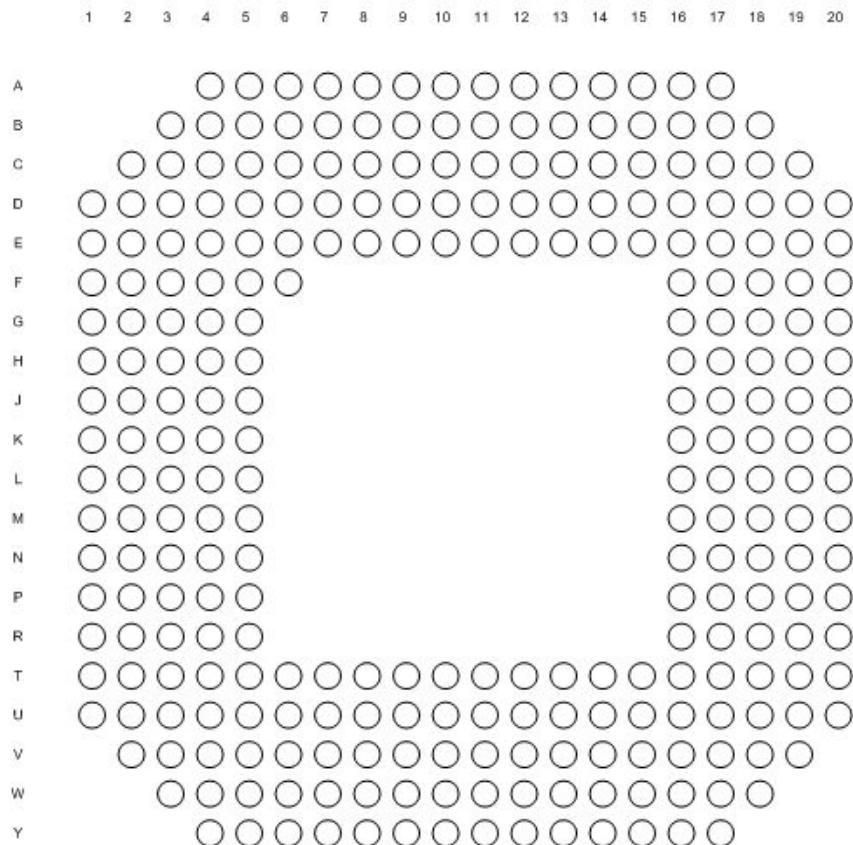
4 Routing guidelines

C5621 / C33 Mobile Broadband module is an LGA subassembly, soldered to the host board, and shares GND plane with the host platform, it is essential that the host board layout follows the recommendation given in this chapter to get the best performance out of the module.

© Ericsson AB 2011
Ericsson Confidential

Some of the recommendations provided in this chapter are general PCB design guideline that may be referred from standard texts concerning the subject.

4.1 Recommended PCB Footprint

The solder lands of the host PCB should be a mirror image of the 277 Ø ≥0.63 mm solder lands on the component and preferably not routed on the outer Cu-layer. The pitch is 1.27 mm. Via-in-pad should be Cu-filled (i.e. solid Cu-microvia).

To improve flux outgassing during reflow, the Solder Mask Opening (SMO) is recommended to extend 50 µm outside the package outline on all four sides.
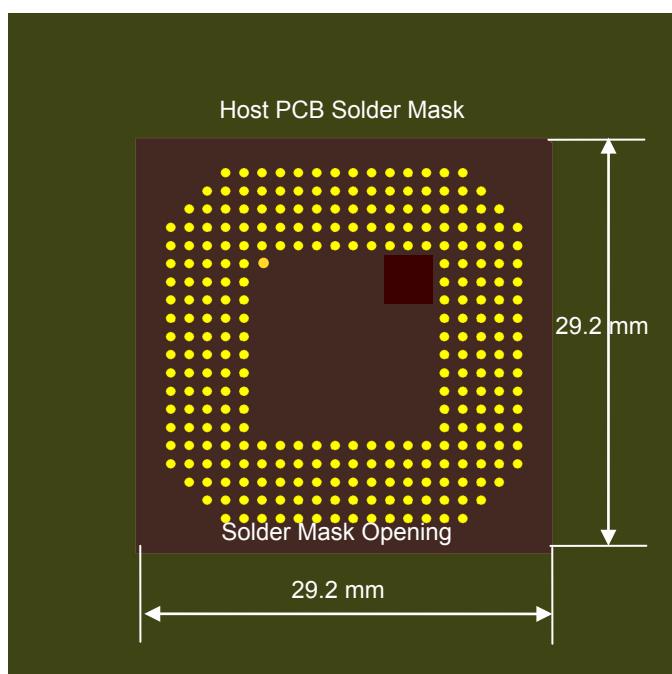
Figure 1, Ø 0.63 mm solder lands with one large solder mask opening extending at least 50 µm outside the package outline on all four sides

If solder mask is used on the mother PCB underneath the C5621/C33, it should be NSMD design with SMO of Ø ≥0.73 mm.
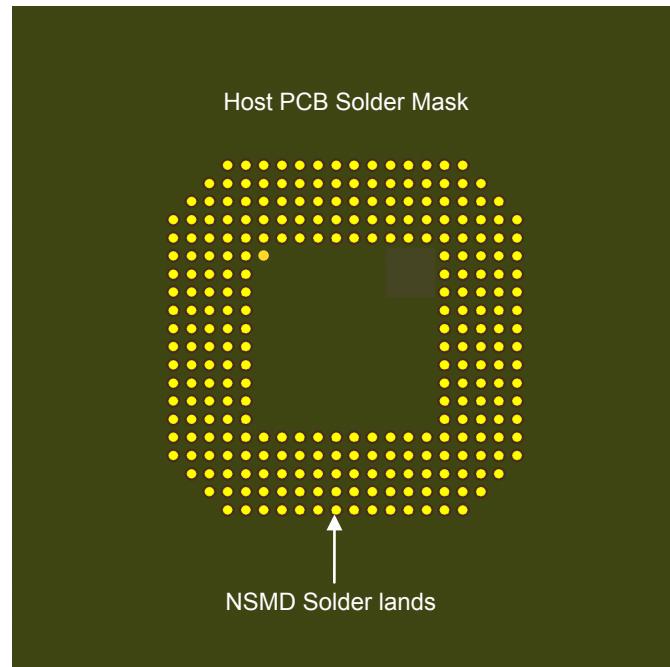
Figure 2, Ø 0.63 mm NSMD solder lands, SMO Ø ≥0.73 mm

4.2   Digital I/O routing

- Keep all trace lengths as short as possible

- Use stripline structure for signals with high frequency content (on the module, all 1.8V I/O signals have a rise/fall time of ~1ns, and should therefore be routed as striplines, since they all are high bandwidth signals)

- Treat all critical (high bandwidth) signals as current loops, and make sure that they have a return path. This means that you should refrain from routing any signals over non-continuous power or ground planes, because this causes interruptions in the impedance and results in reflections, and might also increase EMI emissions.

- Traces routed on adjacent layers should be oriented perpendicular towards each other; this will reduce risk for crosstalk.

- Impedance matching must be maintained to avoid overshoot, undershoot and ringing. Otherwise, radiated emissions increases.

- If nothing else is stated, digital signals should be routed with an impedance of 50-70 Ohm relative GND.

4.2.1 Clock Routing

- Must be routed with a controlled impedance (50-60 Ohm)

- Should not be routed over a discontinuous GND plane

- Keep clock traces as short as possible

- Place serial termination close to transmitter output

- Crosstalk:

    o Crosstalk falls off with the square of the distance, therefore adequate spacing is a good method in reducing crosstalk

    o As a rule of thumb, 3xH can be used for all clock signals:

```
Aggressor          3xH          Victim
 ▬▬▬      <──────────────>       ▬▬▬
   │
   │  H
   │
   ▼
━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━

             Reference plane
```
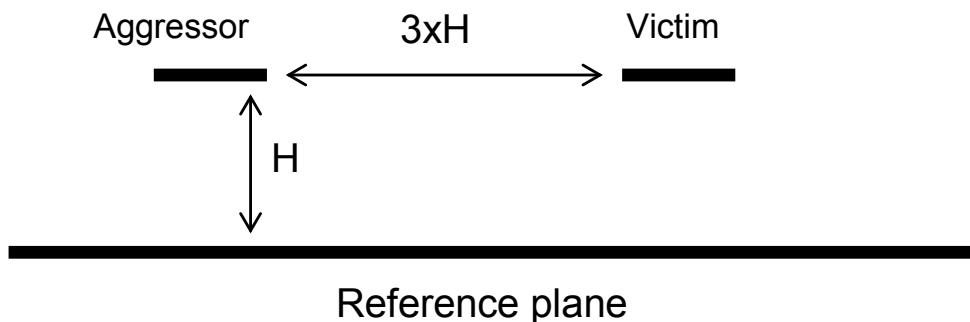
Figure 3, Spacing rule

- Involved signals:

    o SYSCLK

    o RTC_CLK

    o UIM_CLK

4.2.2 USB Routing

- Traces should be routed as a differential pair, matched in length.

- Differential Impedance between the traces shall be 90 Ohm

- Involved signals:

    o USB_DP

    o USB_DM

4.3 Power Routing

4.3.1 VBAT Routing

- The VBAT pads should have a direct, low impedance connection to a battery

- The decoupling should be placed close to VBAT pads

- VBAT net shall be designed such that the supply voltage to the module is always within its operating range even at the maximum current consumption (worst case being 2G transmit operation). Refer to chapter 4.3.3.1 for details

4.3.2 GND

On the layers where a power plane is implemented, a cut-out creating a local GND plane should be implemented. The local plane should be connected to the complete GND planes with as many vias as possible; this will increase the thermal coupling.

4.4 RF Routing

- RF signals must have a controlled impedance of 50 Ohm

- The signals should be directly connected to respective antennas / antenna connectors

- It is important to isolate the RF-lines from any unwanted signal or noise. RF stripline is a good choice for realization of RF-lines since it provides good shielding from both radiated and conducted noise. Care must also be taken to isolate main/diversity/GPS traces with regards to each other.

- Via fence around the stripline, creating an embedded RF cage in the PCB, will improve isolation. Care shall be taken while calculating trace impedance since via fence placed very close to the RF striplines, may lower the impedance somewhat.

- Via stub should be eliminated or minimized

5   Production Guideline

5.1   Package type

C5621 / C33 module has ENIG bottom terminations with a LGA design; no solder mask is present at the underside of the package.
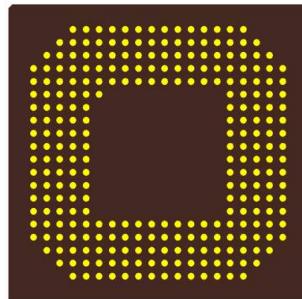
Figure 4, Top view of C5621/C33

5.2   Floor life and dry storage

The CE module should be stored in a dry pack and handled according to IPC/JEDEC J-STD-033B.1, MSL 3 with bake at:

- 125 °C, when supplied on JEDEC tray

- 40 °C ≤5% RH when supplied on 44 mm tape and reel

5.3   Screen stencil design

Material: Stainless steel

Thickness: 0.1 mm (~4 mil)

Aperture size: Ø 0.63 mm (277x)

All solder paste deposits should be centered on the PCB.

5.4   Assembly

Pick-up position should be centered on the package topside.

Nozzle Ø: 10-20 mm

5.5 Reflow soldering

Forced convection soldering in air or N_2 can be used.

Reflow profile shall be with the stated limits in IPC/JEDEC J-STD-020D.1.

The classification temperature (Tc) is 250 °C[1].

---

[1] The temperature value is according to the requirements stated in Table 4-2 IPC/JEDEC J-STD-020D.1.

6 Packaging – Tape and Reel Information

C5621/C33 modules are shipped as tape reels.

Each reel has 724 modules placed into the carrier tape and sealed with the cover tape. There will be 8 empty pockets as trailer and 18 empty pockets as leader in each reel.

Figure 5, Reel Direction

User direction of unreeling

1	Label
2	Humidity Indicator
3	Desiccant
4	Shielding Bag
5	Module Orientation Mark
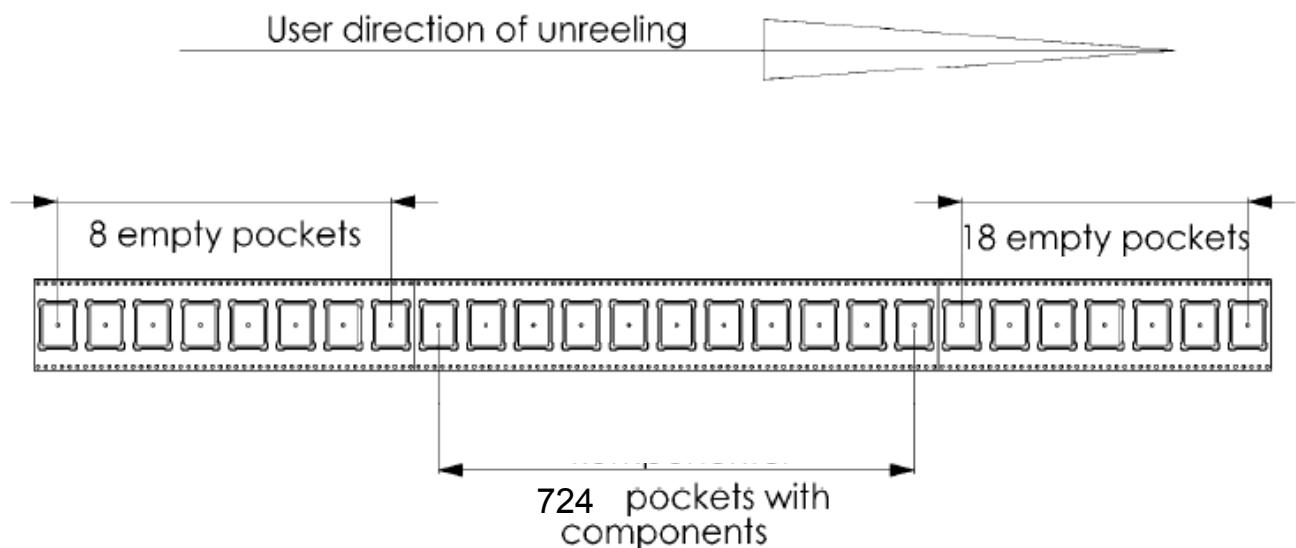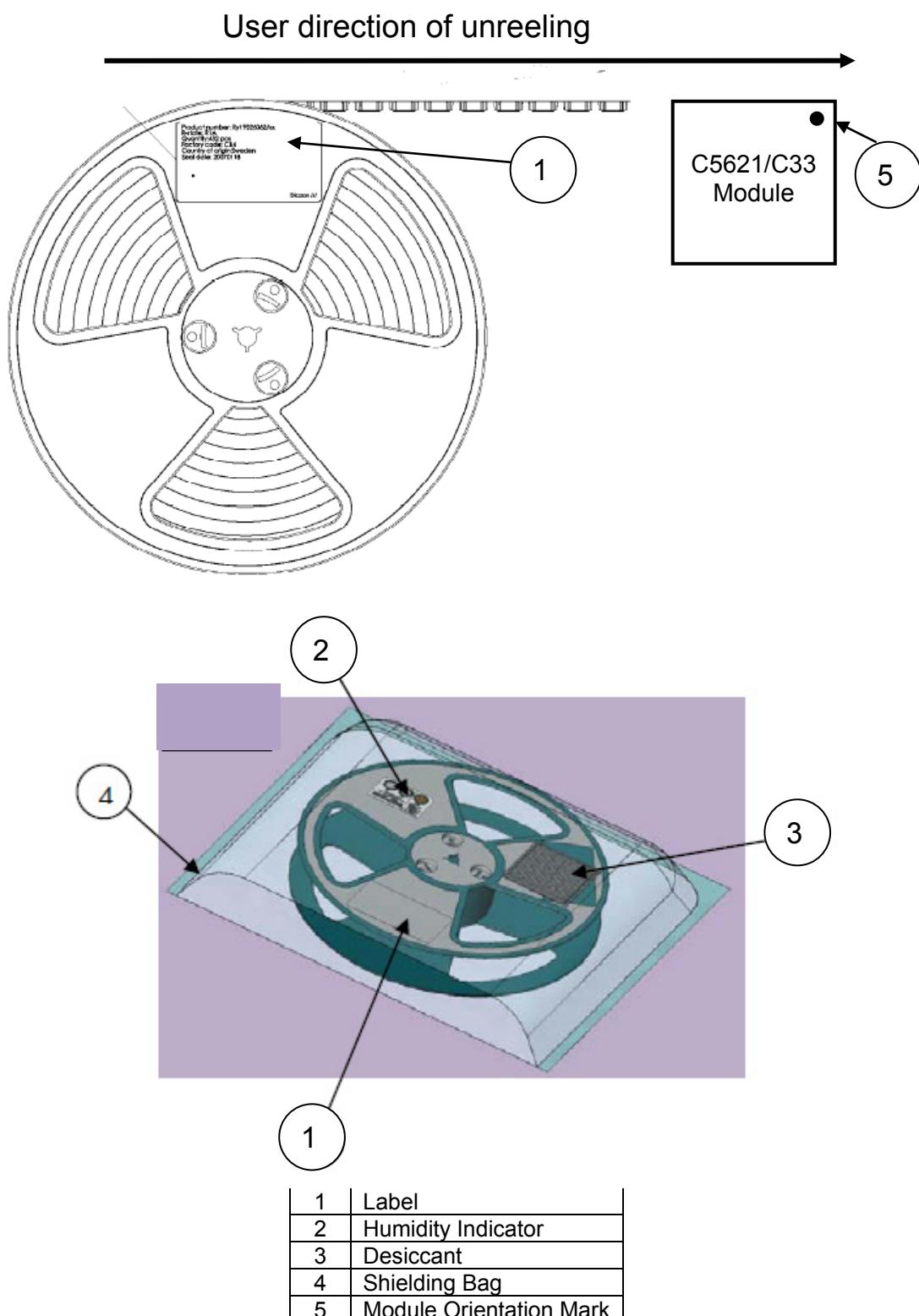
Figure 6, Tape Reel Details

7 SW integration

7.1 Driver and Application Architecture

7.1.1 Windows XP and Vista Architecture

The driver and application architecture for XP and Vista is depicted in Figure 22.

The drivers are based on standard USB functionality. The Mobile Broadband Module appears as the following devices when examined in Windows Device Manager:

Device Name	Function
Mobile Broadband Device Management	This port can be used by an application to control and obtain status from the Mobile Broadband Module. Port type WDM
Mobile Broadband Network Adapter (NDIS)	NDIS interface over which Ethernet communication can be established. Appears to Windows as a network adapter. Port type Ethernet
Mobile Broadband GPS Interface	GPS COM port which streams out NMEA. Port type ACM
SIM Card Reader (SC)	PC-Smartcard interface. Port type WDM
Wireless Modem	Modem device which may be used for legacy Dial-Up Networking connection. Port type ACM.

On top of the drivers is an application, WMCore, running as background service. The service is started automatically at Windows startup and can be used to change the state of the Mobile Broadband Module without end-user interaction also prior to Windows login.

The WMCore service provides a number of functions to control the module and retrieve information about the module and its states. The functions are accessible through the Ericsson Mobile Broadband C++ API, see [5]. The service is also used by Ericsson's Wireless Manager.
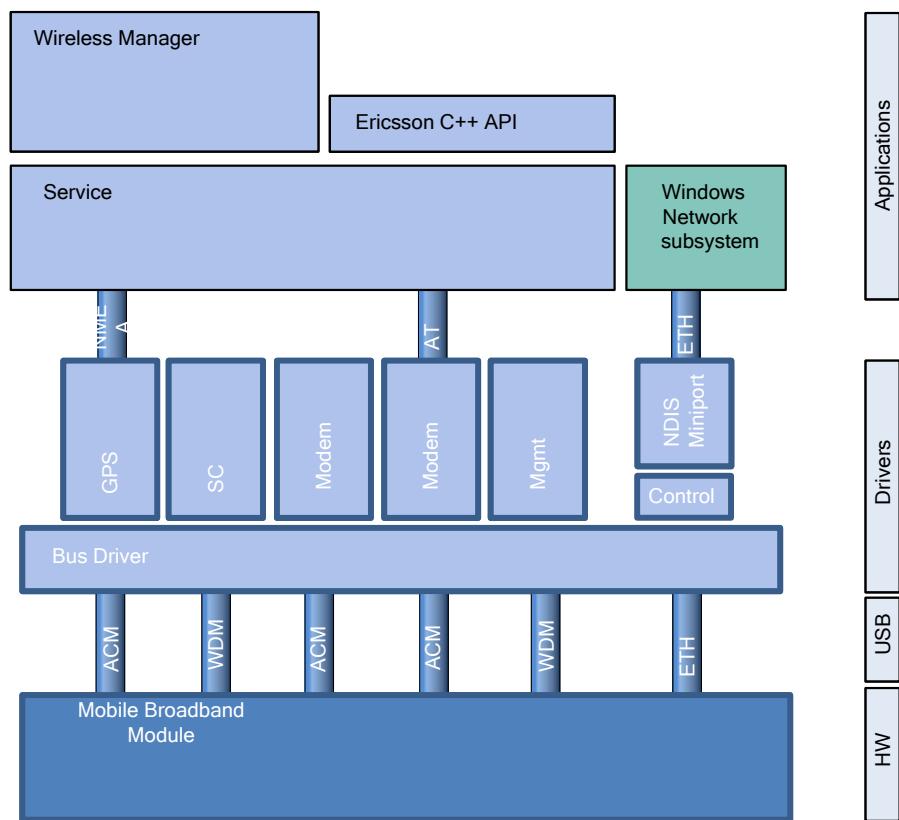
Figure 7, Windows XP/Vista driver architecture

7.1.2   Windows 7 Architecture

The driver and application architecture for Windows 7 is depicted in Figure 23.

The Mobile Broadband Module drivers are based on standard USB functionality. The Windows 7 drivers support the native Windows 7 Mobile Broadband API, resulting in a different architecture compared to Windows XP and Vista, as visualized in Figure 23. The GPS driver also implements support for Microsoft's sensor class. The devices seen in the Windows 7 Device Manager are as follows:

Device Name	Function
Mobile Broadband Device Management	This port can be used by an application to control and obtain status from the Mobile Broadband Module. Port type WDM
Mobile Broadband Network Adapter (NDIS 6.20)	Implements support for the Windows 7 Mobile Broadband API. Appears to Windows as a WWAN adapter. Port type Ethernet and ACM
Mobile Broadband GPS Interface	GPS port that supports the Windows 7 sensor class but can also be used as a

	COM interface. Port type ACM
SIM Card Reader (SC)	PC-Smartcard interface. Port type WDM
Wireless Modem	Modem device which may be used for legacy Dial-Up Networking connection. Port type ACM.

On top of the Windows 7 drivers is located a smaller WMCore service, which handles module functionality not handled by the Microsoft's Mobile Broadband API. The functionality handled by the service can be reached through the Ericsson Mobile Broadband C++ API.

The Wireless Manager works the same way in Windows 7 as it does in Windows XP and Vista. A port layer makes sure that Wireless Manager uses Microsoft's Mobile Broadband API as much as possible and uses the WMCore service only for functionalities not supported by the Mobile Broadband API. This ensures that Wireless Manager is synchronized with any other functionality using the Mobile Broadband API, including the native connection manager in Windows 7.
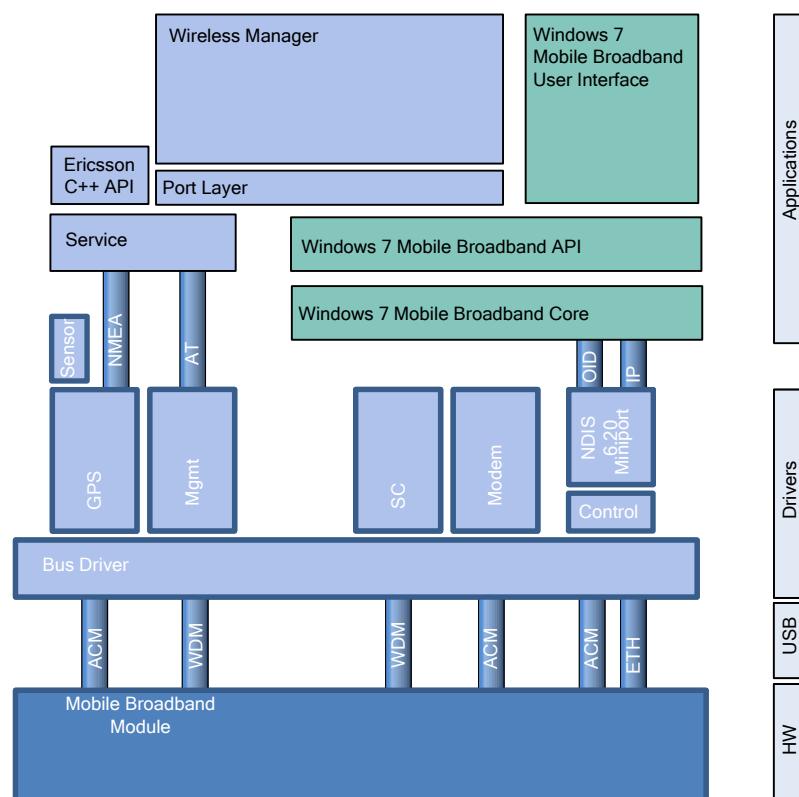
Figure 8, Windows 7 driver and application architecture

© Ericsson AB 2011
Ericsson Confidential

7.1.3 Linux driver architecture

Ericsson is a part of the Linux community to continuously improve the support in GNU/Linux for Ericsson Mobile Broadband Modules, please see [7] for more information.

The module firmware provides WDM (Wireless Mobile Communications Device Management) interfaces for device management and ACM (Abstract Control Module) interfaces for control and data traffic. The module exposes ACM ports, which can be used for GPS, Connection Manager and SMS. WDM and ACM are both based on CDC (Communication Device Class). Control is handled by AT commands according to the V.25 standard. The network connection uses USBnet architecture as base with support from CDC-NCM. The module supports DUN using PPP on the ACM interface.

Note: Kernel modifications may be needed to support customer requested VID/PID customizations, check with your Linux distributor.

Network Manager and GPS functionality is provided by user space applications.

For more information please refer to [8]
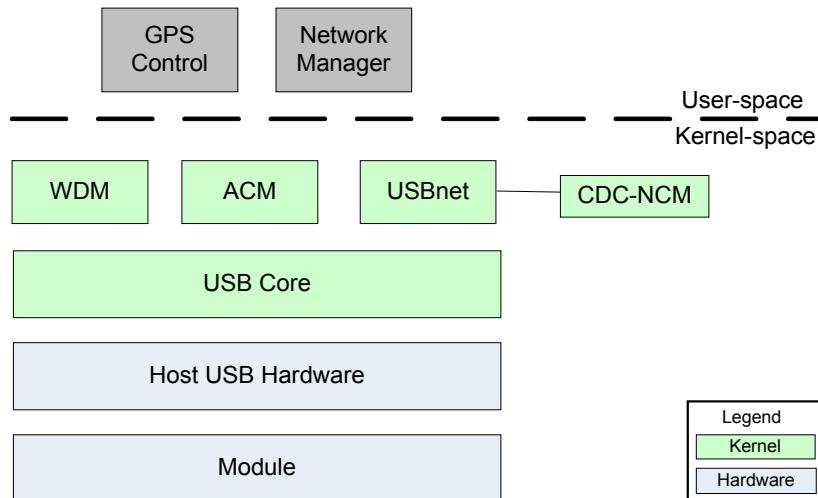
Figure 9, Linux driver architecture

7.2 Connection Profile List

In Windows XP and Vista, the WMCore service includes a list with connection profiles which can be used by connection managers when setting up connections. The profile list contains a list of default network operator APN which is automatically selected by the connection manager depending on the detected UICC card. The matching between APN and UICC card is done based on the MCC and MNC (2 or 3 digit). In Windows 7 the list of profiles is part of the WWAN adapter and is accessed and handled through the Windows 7 Mobile Broadband API as specified by Microsoft.

Wireless Manager utilizes the profile list in the WMCore service in Windows XP and Vista. In Windows 7, Wireless Manager carries the profile list itself to facilitate updates of the list without requiring a driver update. Updates of the connection profile list can be made by using a Connection Profile Updater, for more information, see [6]. The connection profile updater updates the profile list in WMCore in XP and Vista and the profile list carried by Wireless Manager in Windows 7.

7.3 Ericsson Mobile Broadband C++ API

The Ericsson Mobile Broadband C++ API (the C++ API) is part of the Ericsson Mobile Broadband Software Development Kit (SDK), which is available for integration of mobile broadband modules. The C++ API can be used as an extension to the Mobile Broadband API in Windows 7 to access functionality not supported in the Mobile Broadband API. In Windows XP and Vista, the C++ API covers the entire Mobile Broadband API as well as the extensions.

The C++ API is backward compatible. The C++ API supports multi-process and multi-thread access. By using the C++ API, application development becomes easier and more efficient since high-level interfaces can be used. The C++ API also leverages on functionality provided by the WMCore service, which includes:

- Module state and concurrency handling
- Windows Auto-connect and pre-logon connect
- Always-on functionality
- Automatic state transitions after Sleep(S3) and WWAN disable
- GPS configuration
- Internet account (APN) configuration

7.4 State machine

The state machine focuses on the main states of the module; states of the mobile radio (Radio On/Off) and the GPS radio (GPS On/Off). The transitions in the state machine that require the Software (radio) and GPS to be enabled can be made using the WMCore service (recommended) or AT commands directly. In Windows 7, several of the transitions are caused by the WWAN (Network) driver.

The transition between HW Off and states where the radio is on can be made automatically by the module without including any host software, see chapter 2.2.

The module supports a SW Off (D3 hot) state where most functionality is turned off in the mobile broadband module. The main intention with the state is to prepare the module to be powered off. Among other things is the SIM card turned off. In the SW Off state it is possible to turn the module back on again using AT commands (AT+CFUN). When the module is turned on the SIM card is reset and all functionality of the mobile broadband module is turned on again.

Additionally, the module supports a separate HW control of GPS Off, see chapter 4.3.6.2. This feature is not depicted in Figure 25.
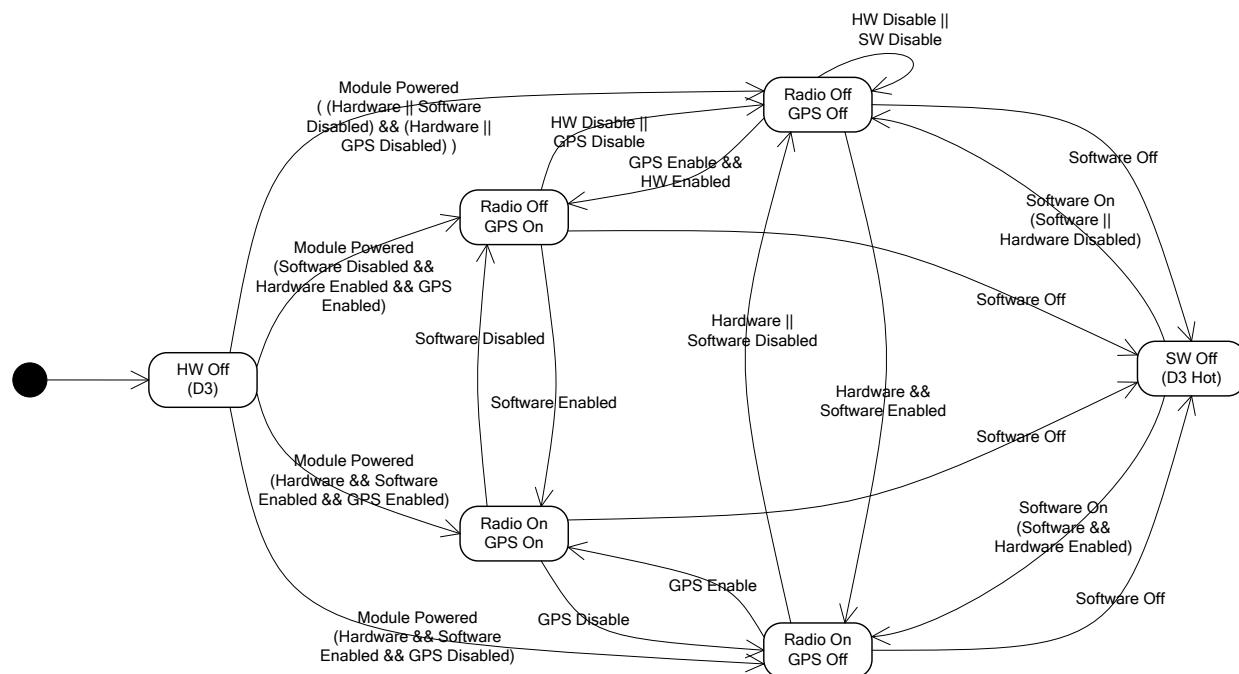
Figure 10, State machine for C5621 (Same applicable for C33 - Excluding GPS events)

7.5   Service Windows Registry Keys

The Ericsson WMCore service uses Windows Registry Keys to control the module behavior during OS power-state changes. Windows TCP/IP settings can also be optimized automatically when installing the drivers. When using the Ericsson Mobile Broadband C++ API there is no need to manually control the registry settings, however, integrators opting for using the module without the API could use these. The register settings are used to control the following features:

• Always On (OS power event behavior)
• Auto connect
• Auto radio enable
• TCP/IP optimization for WWAN devices.

Note: The registry settings are defined within the definition of the WMCore service. The registry settings definition and function can be changed or removed without prior notice.

7.5.1   Module state

The following parameters control the module function state during OS power event changes. They are used to synchronize the module state to OS state. Please refer to the AT Command Manual [4] for details on CFUN state.

The registry keys are set during the driver and WMCore installation.
Search path:

[HKEY_LOCAL_MACHINE\SOFTWARE\WMCore]
(32bit installations)

[HKEY_LOCAL_MACHINE\SOFTWARE\Wow6432Node\WMCore]
(64bit installations)

Table 1 Module state settings

Name	Type	Description
LastKnownRadioState	REG_DWORD	CFUN value to set after boot / reboot.
ShutdownCFUN	REG_DWORD	CFUN value to set before shutdown / reboot.
KeepRadioStateDuringSleep	REG_DWORD	0: Do not keep current radio state 1: Keep radio state when entering sleep

Table 2 Connection state settings

Name	Type	Description
AllowAutoConnectAfterSleep	REG_DWORD	0: Never autoconnect after sleep, regardless of previous state 1: Allow reconnection, if previously connected.
AutoConnectStartup	REG_DWORD	0: Do not automatically connect after boot. 1: Automatically connect after boot.
DisableAutoConnect	REG_DWORD	0: Does nothing 1: Never autoconnect

7.5.2 TCP/IP Configuration

As part of installation in Windows XP, the following registry settings are made in order to optimize the throughput for WWAN devices.

[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Tcpip\Parameters]

Table 3 TCP/IP Optimization

Name	Type	Value
TcpWindowSize	REG_DWORD	0x40290
Tcp1323Opts	REG_DWORD	0x1

Note: Setting Tcp1323Opts="0x3" and thus enabling Timestamp might help in some cases where there is increased packet loss. However, generally better throughput is achieved with Tcp1323Opts="0x1", since Timestamps add 12 bytes to the header of each IP packet.

8 Operational and Regulatory information

Please read this information before using your Wireless Mobile Broadband Module.

8.1 Operational Information

8.1.1 Wireless Interoperability

The Wireless Mobile Broadband Module is designed to be interoperable with the specific wireless service providers and their roaming partners.

8.1.2 Safety

The Mobile Broadband Module, like other radio devices, emits radio frequency electromagnetic energy. The Mobile Broadband Module operates within the guidelines found in radio frequency safety and recommendations. These standards and recommendations reflect the consensus of the scientific community and result from deliberations of panels and committees of scientists who continually review and interpret the extensive research literature. In some situations or environments, the use of the Mobile Broadband Module may be restricted by the proprietor of the building or responsible representatives of the applicable organization.

Examples of such situations include the following:

- Using the Mobile Broadband equipment on board airplanes, or

- Using the Mobile Broadband equipment in any other environment where the risk of interference with other devices or services is perceived or identified as being harmful.

If you are uncertain of the policy that applies to the use of wireless devices in a specific organization or environment (an airport, for example), you are encouraged to ask for authorization to use the Mobile Broadband device before you turn it on.

WARNING: Explosive Device Proximity Warning – Do not operate a portable transmitter (such as a wireless network device) near unshielded blasting caps or in an explosive environment unless the device has been modified to be qualified for such use.

CAUTION: Use on Aircraft – Regulations of the FCC and FAA prohibit airborne operation of radio-frequency wireless devices because their signals could interfere with critical aircraft instruments.

8.1.3 Recommendations

- Always treat your product with care and keep it in a clean and dust-free place.

- Do not expose your product to liquid, moisture or humidity.

- Do not expose your product to extreme high or low temperatures.

- Do not expose your product to open flames or lit tobacco products.

- Do not drop, throw or try to bend your product.

- Do not paint your product.

- Do not use your product near medical equipment without requesting permission from your treating physician or authorized medical staff.

- Do not use your product when in or around aircraft or in areas displaying a "turn off two-way radio" sign.

- Do not use your product in an area where a potentially explosive atmosphere exists.

- Do not place your product or install wireless equipment in the area above your car's airbag.

- Do not attempt to disassemble your product. Only authorized personnel should perform service.

8.1.4 Children

Do not allow children to play with your Mobile Broadband Module. They could hurt themselves or others, or could accidentally damage the Mobile Broadband Module. Your Mobile Broadband Module may contain small parts that could be detached and create a choking hazard.

8.1.5 Disposal of old electrical & electronic equipment

All electrical and electronic equipment included should not be treated as household waste. It should instead be left at the appropriate collection point for the recycling of electrical and electronic equipment. By ensuring this product is disposed of correctly, you will help prevent potential negative consequences for the environment and human health, which could otherwise be caused by inappropriate waste handling of this product. The recycling of materials will help to conserve natural resources. For more detailed information about the recycling of this product, please contact your local city office, your household waste disposal service or the store where you purchased your Mobile Broadband Module.

8.1.6 Emergency calls

This Mobile Broadband Modules do not support voice calls or voice services, nor emergency calls and should not be relied upon for essential communications.

8.2 Regulatory Information

The Mobile Broadband Module must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product. The device manufacturer is not responsible for any radio or television interference caused by unauthorized modification of the devices included with the Mobile Broadband, or the substitution or attachment of connecting cables and equipment other than that specified by the device manufacturer. The correction of interference caused by such unauthorized modification, substitution or attachment is the responsibility of the user. The device manufacturer and its authorized resellers or distributors are not liable for any damage or violation of government regulations that may arise from the user failing to comply with these guidelines.

8.2.1 United States, FCC Notices

Instructions

The integrator must follow the installation instructions in this document and is required to use an antenna with gain figures within the limits listed on the FCC Grant and/or the IC Certificate for their products.

If using a permanently affixed label, the modular transmitter must be labeled with its own FCC identification number, and, if the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains Transmitter Module FCC ID: VV7-

MBMC5621" or "Contains FCC ID: VV7-MBMC5621." Any similar wording that expresses the same meaning may be used.

Modification statement

Changes or modifications made to this equipment not expressly approved by Ericsson AB may void the FCC/IC authorization to operate this equipment.

Radiation Exposure Statement

This equipment complies with FCC/IC radiation exposure limits set forth for an uncontrolled environment and meets the FCC radio frequency (RF) Exposure Guidelines in Supplement C to OET65 and RSS-102 of the IC radio frequency (RF) Exposure rules. Nevertheless, the Wireless Mobile Broadband Module should be used in such a manner that the potential for human contact during normal operation is minimized.

This equipment should be installed and operated with minimum distance of 20 cm between the radiator and your body and must not be collocated with other transmitters except otherwise authorised.

CAUTION: This device has been evaluated and shown compliant with the FCC RF Exposure limits under mobile exposure conditions (antennas are further than 20 cm from a person's body). Details of the authorized configurations can be found at https://fjallfoss.fcc.gov/oetcf/eas/reports/GenericSearch.cfm by entering the FCC ID number on the device.

Interference statement

This device complies with Part 15 of FCC Rules and RSS-Gen of IC 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 this device.

Class B digital notice

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.

Labelling Requirements for the Host device

The certification label of a module shall be clearly visible at all times when installed in a host device; otherwise the host device must be labelled to display a label referring to the enclosed module.

For C5621 and C33 module, this label should contain the following information:

Contains transmitter module FCC ID: VV7-MBMC5621; IC: 287AG-MBMC5621

8.2.2 European Union, EU Declaration of Conformity

European Union, R&TTE Compliance Statement

Bulgarian	С настоящето Ericsson AB декларира, че Mobile Broadband Module отговаря на съществените изисквания и другите приложими изисквания на Директива 1999/5/EC.
Czech	Ericsson AB tímto prohlašuje, že tento Mobile Broadband Module je ve shodě se základními požadavky a dalšími příslušnými ustanoveními směrnice 1999/5/ES.
Danish	Undertegnede Ericsson AB erklærer herved, at følgende udstyr Mobile Broadband Module overholder de væsentlige krav og øvrige relevante krav i direktiv 1999/5/EF.
Dutch	Hierbij verklaart Ericsson AB dat het toestel Mobile Broadband Module in overeenstemming is met de essentiële eisen en de andere relevante bepalingen van richtlijn 1999/5/EG.
English	Hereby, Ericsson AB, declares that this Mobile Broadband Module is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.
Estonian	Käesolevaga kinnitab Ericsson AB seadme Mobile Broadband Module vastavust direktiivi 1999/5/EÜ põhinõuetele ja nimetatud direktiivist tulenevatele teistele asjakohastele sätetele.
German	Hiermit erklärt Ericsson AB, dass sich das Gerät Mobile Broadband Module in Übereinstimmung mit den grundlegenden Anforderungen und den übrigen einschlägigen Bestimmungen der Richtlinie 1999/5/EG befindet.
Greek	ΜΕ ΤΗΝ ΠΑΡΟΥΣΑ Ericsson AB ΔΗΛΩΝΕΙ ΟΤΙ Mobile Broadband Module ΣΥΜΜΟΡΦΩΝΕΤΑΙ ΠΡΟΣ ΤΙΣ ΟΥΣΙΩΔΕΙΣ ΑΠΑΙΤΗΣΕΙΣ ΚΑΙ ΤΙΣ ΛΟΙΠΕΣ ΣΧΕΤΙΚΕΣ ΔΙΑΤΑΞΕΙΣ ΤΗΣ ΟΔΗΓΙΑΣ 1999/5/ΕΚ.

Hungarian	Alulírott, Ericsson AB nyilatkozom, hogy a Mobile Broadband Module megfelel a vonatkozó alapvető követelményeknek és az 1999/5/EC irányelv egyéb előírásainak.
Finnish	Ericsson AB vakuuttaa täten että Mobile Broadband Module tyyppinen laite on direktiivin 1999/5/EY oleellisten vaatimusten ja sitä koskevien direktiivin muiden ehtojen mukainen.
French	Par la présente Ericsson AB déclare que l'appareil Mobile Broadband Module est conforme aux exigences essentielles et aux autres dispositions pertinentes de la directive 1999/5/CE.
Icelandic	Hér með lýsir Ericsson AB yfir því að Mobile Broadband Module er í samræmi við grunnkröfur og aðrar kröfur, sem gerðar eru í tilskipun 1999/5/EC
Italian	Con la presente Ericsson AB dichiara che questo Mobile Broadband Module è conforme ai requisiti essenziali ed alle altre disposizioni pertinenti stabilite dalla direttiva 1999/5/CE.
Latvian	Ar šo Ericsson AB deklarē, ka Mobile Broadband Module atbilst Direktīvas 1999/5/EK būtiskajām prasībām un citiem ar to saistītajiem noteikumiem.
Lithuanian	Šiuo Ericsson AB deklaruoja, kad šis Mobile Broadband Module atitinka esminius reikalavimus ir kitas 1999/5/EB Direktyvos nuostatas.
Maltese	Hawnhekk, Ericsson AB, jiddikjara li dan Mobile Broadband Module jikkonforma mal-ħtiġijiet essenzjali u ma provvedimenti oħrajn relevanti li hemm fid-Dirrettiva 1999/5/EC.
Norwegian	Ericsson AB erklærer herved at utstyret Mobile Broadband Module er i samsvar med de grunnleggende krav og øvrige relevante krav i direktiv 1999/5/EF.
Polish	Niniejszym Ericsson AB oświadcza, że Mobile Broadband Module jest zgodny z zasadniczymi wymogami oraz pozostałymi stosownymi postanowieniami Dyrektywy 1999/5/EC
Portuguese	Ericsson AB declara que este Mobile Broadband Module está conforme com os requisitos essenciais e outras disposições da Directiva 1999/5/CE.
Slovak	Ericsson AB týmto vyhlasuje, že Mobile Broadband Module spĺňa základné požiadavky a všetky príslušné ustanovenia Smernice 1999/5/ES.
Slovenian	Ericsson AB izjavlja, da je ta Mobile Broadband Module v skladu z bistvenimi zahtevami in ostalimi relevantnimi določili direktive 1999/5/ES.
Spanish	Por medio de la presente Ericsson AB declara que el Mobile Broadband Module cumple con los requisitos esenciales y cualesquiera otras disposiciones aplicables o exigibles de la Directiva 1999/5/CE.
Swedish	Härmed intygar Ericsson AB att denna Mobile Broadband Module står I överensstämmelse med de väsentliga egenskapskrav och övriga relevanta bestämmelser som framgår av direktiv 1999/5/EG.

8.3 Conformity Assessment of Telecommunication Equipment regulation in Thailand

Thai	"เครื่องโทรคมนาคมและอุปกรณ์นี้ มีความสอดคล้องตามมาตรฐานทางเทคนิค เลขที่ ..."
	"เครื่องโทรคมนาคมและอุปกรณ์นี้ มีความสอดคล้องตามข้อกำหนดของ กทช."

8.4 Related Information

Web Site	Information
http://www.ericsson.com/ mobilebroadbandmodules	Product information and information about mobile network infrastructure
http://www.gsmworld.com/	General information on GSM, GPRS and EDGE
http://www.umts-forum.org	General information on UMTS
http://mbm.sourceforge.net	Linux Support for MBM Modules

9 Environmental Declaration

Ericsson has a responsibility to the community to provide products which are safe to use and which have minimal impact upon the environment. The Ericsson Design for Environment program is designed to meet legislative and market requirements in the countries where Ericsson sells C5621 gw and C33.

The Ericsson Design for Environment program lists chemical substances that are banned or restricted for use in Ericsson products and manufacturing operations. Ericsson works with its suppliers to eliminate such substances in procured material.

Restrictions on the use of substances in Ericsson products are divided into two categories; banned substances and restricted substances.

Banned substances are prohibited for use in specified applications in Ericsson products in accordance with relevant legislation.

Restricted substances may only be used where no technically and/or economically acceptable alternatives exist and will be replaced as soon as possible.

The ban or restriction does not apply where the presence of a substance is unintentional and in the form very small concentrations derived from natural impurities.

Note: Legislation regulating the use of banned substances includes exemptions allowing limited use where no technically acceptable alternatives exist. Ericsson makes use of some of these exemptions in order to maintain product quality.

10   Terminology and Abbreviations

2G	Generic term for the second generation of cellular networks, when digital technology was used. GSM is a 2G network.
3G	Generic term for the third generation of cellular networks such as UMTS.
bps	Bits per second – rate of data flow.
E-GPRS	Enhanced GPRS. A GPRS network enhanced with EDGE technology to provide greater speed and capacity.
EDGE	Enhanced Data Rates for Global Evolution. Technology which improves the throughput of a GPRS network by a factor of 3.
GPRS	General Packet Radio Services.
GPS	Global Positioning System.
GSM	Global System for Mobile Communications. GSM is the world's most widely-used digital mobile phone system. At the end of Jan 2004 there were over one billion GSM subscribers across more than 205 countries.
HSPA	High Speed Packet Access, term for HSDPA and HSUPA.
HSPA Evolution	High Speed Packet Access Evolution with DL speeds up to 21 Mbps (HSDPA cat 14) and UL speeds up to 5.76 Mbps (HSUPA cat 6).
HSDPA	High Speed Downlink Packet Access.
HSUPA	High Speed Uplink Packet Access.
kbps	Kilobit per second – rate of data flow.
Mbps	Megabit per second – rate of data flow.
PC	Personal Computer.
Service Provider	A company that provides services and subscriptions to mobile services (phones, mobile broadband, etc.).

SIM card   Subscriber Identity Module card – a card that must be inserted in any GSM-based mobile terminal. It contains subscriber details, security information and memory for a personal directory of numbers. The card can be a small plug-in type or credit card-sized, but both types have the same functions.

SMS   Short Message Service. Allows messages of up to 160 characters to be sent and received via the network operator's message center to a mobile phone.

UMTS   Universal Mobile Telecommunications System. 3G network technology using WCDMA methods.

WCDMA   Wideband Code Division Multiple Access. A modulation technique using a wide bandwidth (5MHz in the case of UMTS). All terminals transmit in the entire bandwidth and the signals from each are differentiated via the use of unique codes assigned to each transmission.