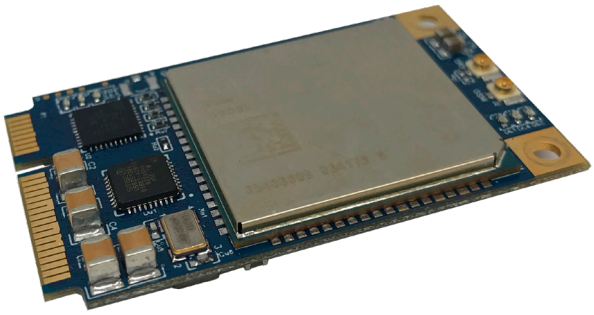
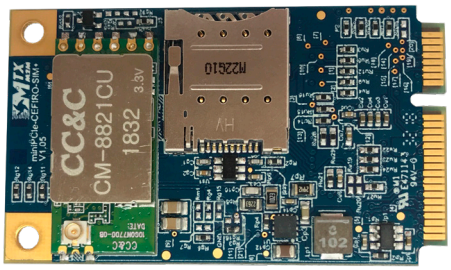
#WeAreConnectivity

SMART SOLUTIONS FOR A CHANGING WORLD





MTX-miniPCIe-Cefiro

HARDWARE

USERGUIDE

www.mtxm2m.com

INDEX

GENERAL NOTES

Product is deemed accepted by recipient and is provided without interface to recipient's products. The documentation and/or product are provided for testing, evaluation, integration and information purposes. The documentation and/or product are provided on an "as is" basis only and may contain deficiencies or inadequacies. The documentation and/or product are provided without warranty of any kind, express or implied. To the maximum extent permitted by applicable law, Matrix Electronica S.L.U. further disclaims all warranties; including without limitation any implied warranties of merchantability, completeness, fitness for a particular purpose and non-infringement of third-party rights. The entire risk arising out of the use or performance of the product and documentation remains with recipient. This product is not intended for use in life support appliances, devices or systems where a malfunction of the product can reasonably be expected to result in personal injury. Applications incorporating the described product must be designed to be in accordance with the technical specifications provided in these guidelines. Failure to comply with any of the required procedures can result in malfunctions or serious discrepancies in results.

Furthermore, all safety instructions regarding the use of mobile technical systems, including GSM products, which also apply to cellular phones, must be followed. Matrix Electronica S.L.U. or its suppliers shall, regardless of any legal theory upon which the claim is based, not be liable for any consequential, incidental, direct, indirect, punitive or other damages whatsoever (including, without limitation, damages for loss of business profits, business interruption, loss of business information or data, or other pecuniary loss) arising out the use of or inability to use the documentation and/or product, even if Matrix Electronica S.L.U. has been advised of the possibility of such damages. The foregoing limitations of liability shall not apply in case of mandatory liability, e.g. under the Spanish Product Liability Act, in case of intent, gross negligence, injury of life, body or health, or breach of a condition which goes to the root of the contract. However, claims for damages arising from a breach of a condition, which goes to the root of the contract, shall be limited to the foreseeable damage, which is intrinsic to the contract, unless caused by intent or gross negligence or based on liability for injury of life, body or health. The above provision does not imply a change on the burden of proof to the detriment of the recipient. Subject to change without notice at any time. The interpretation of this general note shall be governed and construed according to Spanish law without reference to any other substantive law.

IMPORTANT INFORMATION

This technical description contains important information for the startup and use of the miniPCIe-CEFIRO card. Read it carefully before you start working with the miniPCIe-CEFIRO device. The warranty will be void should damage occur due to non-compliance with these instructions for use. We cannot accept any responsibility for consequential loss.

SERVICE AND SUPPORT

To contact customer support please contact your local distributor/sales agent or use the details below:

Address: Alejandro Sánchez 109, 28019 Madrid (Spain)
Email: iotsupport@mtxm2m.com
Website: mtxm2m.com

REVISION INFORMATION

REVISION	DATE	AUTHOR	CHANGES
1.2	2017/04	CP	New Cefiro model (SIM)
1.1	2016/05	JS/RR	New Cefiro model
1.0	2015/12	AEM/RR	Initial release

INTRODUCTION

1. Description

The miniPCIe-CEFIRO Family is a new line of advanced miniPCIe cards for the Internet of Things and M2M communications, providing an all-in-one solution enabling GSM voice, SMS, fax and 3G (UMTS/HSPA) high speed data transmission.

The miniPCIe-CEFIRO cards are Java J2ME programmable and have a complete set of wireless interfaces, shortening time to market and reducing costs:

- Cellular communications: 3G and 4G options
- WLAN b/g/n: including Access Point and Monitor Mode
- Bluetooth 4.0: standard Bluetooth v2.1 + Low Energy
- GPS receiver: allow track & location applications

Please read Section 1.3 to view the specific features of each device.

The Five-band functionality allows for operation in all relevant GSM frequencies across the world. Local European and America economic variants are available. When UMTS/3G network operation is not present, the miniPCIe-CEFIRO can operate in lower speed modes such EDGE Class 12 (max. 237kbps DL, max. 237kbps UL) or GPRS Class 12 (max. 85.6kbps DL, max. 85.6kbps).

The miniPCIe-CEFIRO can also be controlled via AT commands and standard interfaces such us USB 2.0 High Speed with Linux and Windows® drivers.

The miniPCIe-CEFIRO family is RoHS & WEEE compliant and it is manufactured following the ISO 9001 & ISO 14001 Quality certifications.

A full list of antennas and accessory supplies are available.

The miniPCIe-CEFIRO modems are powered by an internal Cinterion® EHS6/8 module and/or LM TECHNOLOGIES LM821 and/or WM-8811

Industrial features: the miniPCIe-CEFIRO cards can be used in industrial applications due to its extended operating temperature range.

2. Features by Model

MTX-miniPCIe-CEFIRO-xxxx												
	3000	3011	3030	3100	3111	3130	4100	4111	4130	4400	4411	4430
GSM CSD	X	X	X	X	X	X	X	X	X	X	X	X
2G (GPRS EDGE)	X	X	X	X	X	X	X	X	X	X	X	X
3G (UMTS HSPA)	X	X	X	X	X	X	X	X	X	X	X	X
4G (LTE Cat.1)							X	X	X	X	X	X
4G (LTE Cat.4)										X	X	X
JAVA (embedded J2ME)	X	X	X	X	X	X	X	X	X	X	X	X
Micro SIM holder	X	X	X	X	X	X	X	X	X	X	X	X
GPS receiver				X	X	X						
WiFi 2.4GHz		x1			x1			x1			x1	
Bluetooth 4.0 + low energy		x1			x1			x1			x1	
WiFi 5GHz/2.4GHz (operating temperature 0-60ºC)			x1			x1			x1			x1

MTX-miniPCIe-CEFIRO-xxxx						
	3022	3031	3033	3122	3131	3133
GSM CSD	X	X	X	X	X	X
2G (GPRS EDGE)	X	X	X	X	X	X
3G (UMTS HSPA)	X	X	X	X	X	X
4G (LTE Cat.1)						
JAVA (embedded J2ME)	X	X	X	X	X	X
Micro SIM holder						
GPS receiver				X	X	X
WiFi 2.4GHz	x2	x1		x2	x1	
Bluetooth 4.0 + low energy	x2	x1		x2	x1	
WiFi 5GHz/2.4GHz (operating temperature 0-60ºC)		x1	x2		x1	x2

These devices are available only under request with a minimum order quantity of 300 units. For more information please contact our sales team at info@mtxm2m.com.

3. Highlights

	MTX-miniPCIe-CEFIRO 4G	MTX-miniPCIe-CEFIRO 3G
	Penta-Band LTE: Bands 1, 3, 8, 20, 28* (700*, 800, 900, 1800, 2100 MHz), Dual-Band GSM 900 & 1800 MHz	UMTS/HSPA+: five band (800, 850, 900, 1900, 2100MHz), GSM/GPRS/EDGE quad band (850, 900, 1800, 1900MHz)
4G	LTE Cat.1 (3GPP Release 9): DL 10.2Mbps, UL 5.2Mbps	
3G	HSPA: DL 7.2Mbps, UL 5.7Mbps UMTS PS: DL 384Mbps, UL 384 Mbps, CS: DL 64Mbps, UL 64Mbps	HSPA (3GPP release 6, 7): DL 7.2Mbps, UL 5.7Mbps; HSDPA Cat.8/HSUPA Cat.6 data rates; compressed mode (CM) according to 3GPP TS25.212 UMTS (3GPP release 4): PS data rate 384kbps DL, UL 384kbps; CS data rate 64kbps DL, UL 64kbps
2G	GPRS Class 12: DL max. 85.6 kbps, UL max 85.6 kbps	GPRS: GPRS class 12; mobile station class B; PBCCH support; coding schemes CS 1-4 EGPRS: multislot class 12; EDGE E2 power class for 8PSK
CSD		CSD data transmission: up to 9.6kbps; V.110; non-transparent mode
SMS	SMS text and PDU mode	SMS text and PDU mode

Interfaces

- 4G 3G/2G — 4G/3G/2G communications
- USB 2.0
- WiFi/Bluetooth
- GPS
- Micro SIM holder

General Features

- SIM application toolkit, 3GPP release 99
- Control via AT commands (only cellular)
- Internet services: TCP, UDP, HTTP, FTP, SMTP, POP3
- Fully compliant with PCI Express Mini Card

Java Features

- Oracle Java ME embedded 3.2
- Compliant to CLDC 1.1 HI and IMP-NG standards
- Capable of running multiple MIDlets in parallel with inter-MIDlet communication
- Java standard APIs: JSR75 (FileConnection), JSR177 (CRYPTO), JSR280 (XML)
- Accessible periphery for Java applications: IO pins, I2C, SPI interfaces, ADC/DAC, serial interfaces (API): ASC0, ASC1, USB
- Memory space for Java applications: Flash File System: 8MB, RAM: 6MB, Just-in-Time (JIT) Compiler execution optimization

Special Features

- USB interfaces support composite modes and Linux/Mac compliant mode
- Firmware update via USB/RS232
- Real Time Clock with alarm functionality
- Multiplexer according 3GPP TS 27.010
- RLS monitoring & informal network scan

Drivers

- USB, MUX driver for Microsoft Windows XP, Vista, 7
- USB, MUX driver for Microsoft Windows embedded handheld>=6.x
- USB, MUX driver for Microsoft Windows embedded compact>=6.x
- USBserial/CDC-ACM driver for Linux

SUPPORT: iotsupport@mtxm2m.com | **SALES:** info@mtxm2m.com | mtxm2m.com

4. Main Features and Services

The miniPCIe-CEFIRO performs a set of telecom services (TS) according to GSM standard phase 2+, ETSI and ITU-T. The services and functions of the miniPCIe-CEFIRO are implemented by issuing customized applications embedded on the device, by AT commands issued internally or over the USB interface.

4.1 Key features at a glance

The miniPCIe-CEFIRO is a UMTS/HSPA and also GSM/GPRS/EDGE bands mobile station with the characteristics shown in the table below.

FEATURE	IMPLEMENTATION
General (GSM/UMTS module)	
Frequency bands	UMTS/HSPA+: Five band, 800/850/900/1900/2100MHz GSM/GPRS/EDGE: Quad band, 850/900/1800/1900MHz
GSM class	Small MS
Output power	Class 4 (+33dBm ±2dB) for EGSM850 Class 4 (+33dBm ±2dB) for EGSM900 Class 1 (+30dBm ±2dB) for GSM1800 Class 1 (+30dBm ±2dB) for GSM1900 Class E2 (+27dBm ± 3dB) for GSM 850 8-PSK Class E2 (+27dBm ± 3dB) for GSM 900 8-PSK Class E2 (+27dBm +3dB/-4dB) for GSM 1800 8-PSK Class E2 (+27dBm +3/-4dB) for GSM 1900 8-PSK Class E2 (+26dBm +3/-4dB) for GSM 1800 8-PSK Class 3 (+24dBm +1/-3dB) for UMTS 2100, WCDMA FDD BdI Class 3 (+24dBm +1/-3dB) for UMTS 1900, WCDMA FDD BdII Class 3 (+24dBm +1/-3dB) for UMTS 900, WCDMA FDD BdVIII Class 3 (+24dBm +1/-3dB) for UMTS 850, WCDMA FDD BdV Class 3 (+24dBm +1/-3dB) for UMTS 800, WCDMA FDD BdVI
Power supply	3.3V single supply voltage
Physical	Dimensions: 51 x 30 x 5,3 mm Weight: approx. 15g
RoHS	All hardware components are fully compliant with the EU RoHS Directive

HSPA Features	
3GPP Release 6,7	DL 7.2Mbps, UL 5.7Mbps HSDPA Cat.8 / HSUPA Cat.6 data rates Compressed mode (CM) supported according to 3GPP TS25.212
UMTS Features	
3GPP Release 8	PS data rate – 384 kbps DL / 384 kbps UL CS data rate – 64kbps DL / 64 kbps UL
GSM/GPRS/EGPRS Features	
Data transfer	GPRS • Multislot Class 12 • Full PBCCH support • Mobile Station Class B • Coding Scheme 1–4 EGPRS • Multislot Class 12 • EDGE E2 power class for 8 PSK • Downlink coding schemes–CS 1-4, MCS 1-9 • Uplink coding schemes–CS 1-4, MCS 1-9 • SRB loopback and test mode B • 8-bit, 11-bit RACH • PBCCH support • 1 phase/2 phase access procedures • Link adaptation and IR • NACC, extended UL TBF • Mobile Station Class B CSD • V.110, RLP, non-transparent • 9.6kbps • USSD
SMS	Point-to-point MT and MO Cell broadcast Text and PDU mode Storage: SIM card plus SMS locations in mobile equipment

WLAN & Bluetooth	
WLAN	Standards: 802.11 b/g/n/d/e/h/i, 802.3, 802.3u Data transfer rate • 802.11b: 1,2, 5.5, 11Mbps • 802.11g: 6, 9, 12, 18, 24, 36, 48, 54Mbps • 802.11n MCS0 to 7 for HT20MHz, MCS0 to 7 for HT40MHz Modulation method: • 802.11b: CCK, DQPSK, DBPSK • 802.11g and 802.11n: 64QAM, 16QAM, QPSK, BPSK Operating Channel: • 11: (Ch. 1-11) United States • 13: (Ch. 1-13) Europe • 14: (Ch. 1-14) Japan Frequency range: 2.4GHz ISM (2.400GHz to 2.4835GHz) Spread Spectrum: • IEEE 802.11b: DSSS (Direct Sequence Spread Spectrum) • IEEE 802.11g/n: OFDM (Orthogonal Frequency Division Multiplexing) Maximum Output power: 13dBm@11n, 17dBm@11b, 15dBm@11g Receiver sensitivity: -82dBm 11Mbps, -64dBm 130Mbps Network architecture: Ad hoc mode (Peer-to-Peer) Infrstructure mode Software AP, WiFi Direct Security: WPA, WPA-PSK, WPA2, WPA2-PSK, WEP 64bit & 128bit, IEEE 802.11x, IEEE.11i
Bluetooth	Standards: Bluetooth v2.1+EDR/v3.0/v3.0HS/v4.0 Data transfer rate: • Basic Rate 1Mbps • Enhanced Rate: 2, 3Mbps • High Speed: 6, 9 , 12, 18, 24, 36, 48, 54Mbps Modulation Method: 8DPSK, π/4 DQPSK, GFSK Operating Channel: 2.4GHz: Ch. 0 to 78 Frequency range: 2.4GHz ISM (2.400GHz to 2.4835GHz) Spread Spectrum: FHSS (Frequency Hopping Spread Spectrum) Output power: max + 10dBm Receiver sensitivity: -90dBm Network architecture: Pico Net, Scatter Net Security: simple pairing

GPS	
Protocol	NMEA
Modes	Standalone GPS Assisted GPS • Control plane – E911 • User plane
General	Automatic power saving modes Power supply for active antenna
Software	
AT commands	Hayes, 3GPP TS 27.007, 27.005, Gemalto M2M AT commands for RIL compatibility
Java Open Platform	Java Open Platform with • JavaTM profile IMP-NG & CLDC 1.1 HI • Secure data transmission via HTTPS/SSL • Multi-threading programming and multi-application execution Major benefits: seamless integration into Java applications, ease of programming, no need for application microcontroller, extremely cost-efficient hardware and software design – an ideal platform for industrial GSM applications The memory space available for Java programs is around 8MB in the flash file system and around 6MB of RAM. Application code and data share the space in the flash file system and in the RAM
Microsoft compatibility	RIL for Pocket PC and Smartphone
SIM Application Toolkit	SAT Release 99
Firmware update	Firmware update from host application over USB
Interfaces (depending on model)	
USB	Supports a USB 2.0 High Speed (480Mbit/s) device interface, Full Speed (12Mbit/s) compliant
UICC interface	Supported chip cards: UICC/SIM/USIM 3V, 1.8V
Antenna	50 Ohms. GSM/UMTS main antenna, GPS and WiFi/BT secondary antennae

Status LED	4x LED to indicate device and connectivity status and 3x LED for manufacturing test
Reset signals	2x signal for resetting the device
Status signals	PCIe standard status
Power on/off, reset	
Power on/off	Automatic switch-on at power supply Switch off by AT command Automatic switch-off in case of critical temperature or voltage conditions
Software Reset	Orderly shutdown and reset by AT command
Hardware Reset	Emergency reset by hardware signal W_DISABLE# and PERST#
Special features	
Antenna	SAIC (Single Antenna Interference Cancellation) / DARP (Downlink Advanced Receiver Performance) Rx Diversity (receiver type 3i – 64-QAM) / MIMO

4.2 LTE antenna interface description

The LTE Cat.1 standard is designed for two antennas. It is mandatory to connect/apply the Rx diversity antenna to an existing antenna. The minimum efficiency shall be better than 50%.

RF Antenna interface GSM/UMTS/LTE at operating temperature range (units in dBM):

PARAMETER	CONDITIONS	MIN	TYP
LTE connectivity	**Band I, III, VIII, XX, XXVIII**		
Receiver Input Sensitivity @ ARP (dual antenna; ch. bandwidth 5MHz)	LTE 700 Band XXVIII	-98.5	-102.5
	LTE 800 Band XX	-97	-102
	LTE 900 Band VIII	-97	-103
	LTE 1800 Band III	-97	-102
	LTE 2100 Band I	-100	-103

RF Power @ ARP with 50hm Load (board temperature >85ºC, BW: 5MHz RB: 25 (DL), 1 (UL) QPSK)	LTE 700 Band XXVIII	21	23
	LTE 800 Band XX	21	23
	LTE 900 Band VIII	21	23
	LTE 1800 Band III	21	23
	LTE 2100 Band I	21	23

4.3 GSM/UMTS antenna interface description

The table below briefly summarizes the GSM/UMTS Antenna interface (units in dBM):

PARAMETER	CONDITIONS	MIN	TYP
UMTS/HSPA connectivity	**Band I, II, V, VI, VIII**		
Receiver Input Sensitivity @ ARP	UMTS 800/850 Band VI/V	-104.7/-106.7	-110
	UMTS 900 Band VIII	-103.7	-110
	UMTS 1900 Band II	-104.7	-109
	UMTS 2100 Band I	-106.7	-110
RF Power @ ARP with 50Ohm Load	UMTS 800/850 Band VI/V	21 (max 25)	24
	UMTS 900 Band VIII	21 (max 25)	24
	UMTS 1800 Band III	21 (max 25)	24
	UMTS 2100 Band I	21 (max 25)	24
GPRS Coding Schemes	**Class 12, CS1 to CS4**		
EGPRS	Class 12, MCS1 to MCS9		

GSM Class		Small MS		
Static Receiver Input Sensitivity @ ARP		GSM 850/E-GSM 900	-102	-109
		GSM 1800/GSM 1900	-102	-108
RF Power @ ARP with 50Ohm Load	GSM	GSM 850/E-GSM 900		33
		GSM 1800/GSM 1900		30
RF Power @ ARP with 50Ohm Load, (ROPR = 0, i.e. no reduction)	GPRS, 1 TX	GSM 850/E-GSM 900		33
		GSM 1800/GSM 1900		30
	EDGE, 1 TX	GSM 850/E-GSM 900		27
		GSM 1800/GSM 1900		26
	GPRS, 2 TX	GSM 850/E-GSM 900		33
		GSM 1800/GSM 1900		30
	EDGE, 2 TX	GSM 850/E-GSM 900		27
		GSM 1800/GSM 1900		26
	GPRS, 3 TX	GSM 850/E-GSM 900		33
		GSM 1800/GSM 1900		30
	EDGE, 3 TX	GSM 850/E-GSM 900		27
		GSM 1800/GSM 1900		26
	GPRS, 4 TX	GSM 850/E-GSM 900		33
		GSM 1800/GSM 1900		30
	EDGE, 4 TX	GSM 850/E-GSM 900		27
		GSM 1800/GSM 1900		26

RF Power @ ARP with 50Ohm Load, (ROPR = 1)	GPRS, 1 TX	GSM 850/E-GSM 900		33
		GSM 1800/GSM 1900		30
	EDGE, 1 TX	GSM 850/E-GSM 900		27
		GSM 1800/GSM 1900		26
	GPRS, 2 TX	GSM 850/E-GSM 900		33
		GSM 1800/GSM 1900		30
	EDGE, 2 TX	GSM 850/E-GSM 900		27
		GSM 1800/GSM 1900		26
	GPRS, 3 TX	GSM 850/E-GSM 900		33
		GSM 1800/GSM 1900		30
	EDGE, 3 TX	GSM 850/E-GSM 900		27
		GSM 1800/GSM 1900		26
	GPRS, 4 TX	GSM 850/E-GSM 900		31
		GSM 1800/GSM 1900		28
	EDGE, 4 TX	GSM 850/E-GSM 900		27
		GSM 1800/GSM 1900		26
RF Power @ ARP with 50Ohm Load, (ROPR = 2)	GPRS, 1 TX	GSM 850/E-GSM 900		33
		GSM 1800/GSM 1900		30
	EDGE, 1 TX	GSM 850/E-GSM 900		27
		GSM 1800/GSM 1900		26
	GPRS, 2 TX	GSM 850/E-GSM 900		33
		GSM 1800/GSM 1900		20

	EDGE, 2 TX	GSM 850/E-GSM 900		27
		GSM 1800/GSM 1900		26
	GPRS, 3 TX	GSM 850/E-GSM 900		33
		GSM 1800/GSM 1900		30
	EDGE, 3 TX	GSM 850/E-GSM 900		27
		GSM 1800/GSM 1900		26
	GPRS, 4 TX	GSM 850/E-GSM 900		29
		GSM 1800/GSM 1900		26
	EDGE, 4 TX	GSM 850/E-GSM 900		27
		GSM 1800/GSM 1900		26
RF Power @ ARP with 50Ohm Load, (ROPR = 3)	GPRS, 1 TX	GSM 850/E-GSM 900		33
		GSM 1800/GSM 1900		30
	EDGE, 1 TX	GSM 850/E-GSM 900		27
		GSM 1800/GSM 1900		26
	GPRS, 2 TX	GSM 850/E-GSM 900		33
		GSM 1800/GSM 1900		30
	EDGE, 2 TX	GSM 850/E-GSM 900		27
		GSM 1800/GSM 1900		26
	GPRS, 3 TX	GSM 850/E-GSM 900		33
		GSM 1800/GSM 1900		30
	EDGE, 3 TX	GSM 850/E-GSM 900		27
		GSM 1800/GSM 1900		26

	GPRS, 4 TX	GSM 850/E-GSM 900		27
		GSM 1800/GSM 1900		24
	EDGE, 4 TX	GSM 850/E-GSM 900		27
		GSM 1800/GSM 1900		24
RF Power @ ARP with 50Ohm Load, (ROPR = 4, i.e. maximum reduction)	GPRS, 1 TX	GSM 850/E-GSM 900		33
		GSM 1800/GSM 1900		30
	EDGE, 1 TX	GSM 850/E-GSM 900		27
		GSM 1800/GSM 1900		26
	GPRS, 2 TX	GSM 850/E-GSM 900		30
		GSM 1800/GSM 1900		27
	EDGE, 2 TX	GSM 850/E-GSM 900		24
		GSM 1800/GSM 1900		23
	GPRS, 3 TX	GSM 850/E-GSM 900		28.2
		GSM 1800/GSM 1900		25.2
	EDGE, 3 TX	GSM 850/E-GSM 900		22.2
		GSM 1800/GSM 1900		21.2
	GPRS, 4 TX	GSM 850/E-GSM 900		27
		GSM 1800/GSM 1900		24
	EDGE, 4 TX	GSM 850/E-GSM 900		21
		GSM 1800/GSM 1900		20

4.4 GPS antenna interface description

The table below briefly summarizes the GPS Antenna interface.

PARAMETER	CONDITIONS	MIN	TYP
Frequency		1575 (max 1585)	1575.42MHz
Tracking sensitivity	Open sky, active antenna or LNA		-167dBm
	Open sky, passive antenna		-162dBm
Acquisition sensitivity	Open sky, active antenna or LNA		-150dBm
	Open sky, passive antenna		-145dBm
Time-to-First-Fix (TTFF)	Hot (average at -140dBm)		<2s
	Warm (average at -140dBm)		<35s
	Cold (average at -140dBm)		<46s

4.5 WLAN & Bluetooth antenna interface description

The table below briefly summarizes the RF Antenna interface GSM/UMTS (dBm).

PARAMETER	CONDITIONS	MAX	TYP
WLAN			
WLAN Output Power	802.11b@11Mbps		17dBm
	802.11g@6Mbps		15dBm
	802.11g@54Mbps		14dBm
	802.11n@MCS0_HT20		13dBm
	802.11n@MCS7_HT20		13dBm
	802.11n@MCS0_HT40		13dBm
	802.11n@MCS7_HT40		13dBm

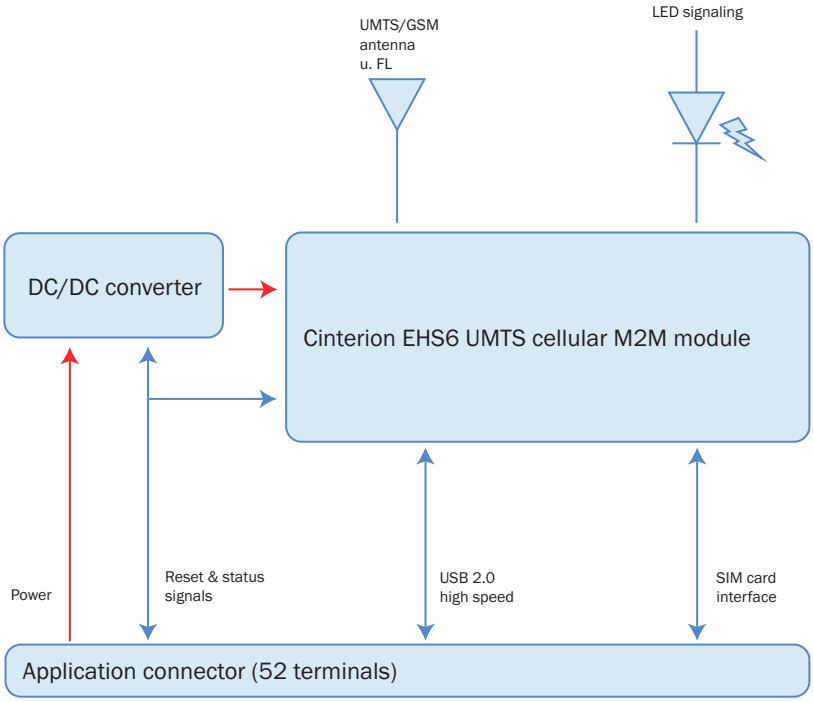
Blueetooth Output Power	Open sky, active antenna or LNA	10dBm	
WLAN Receiver Sensitivity	802.11b@11Mbps		-82dBm
	802.11g@54Mbps		-71dBm
	802.11n@MCS7_HT20		-67dBm
	802.11n@MCS7_HT40		-64dBm
Bluetooth Receiver Sensitivity	1Mbps		-89dBm
	2Mbps		-90dBm
	3Mbps		-83dBm

4.6 SIM card

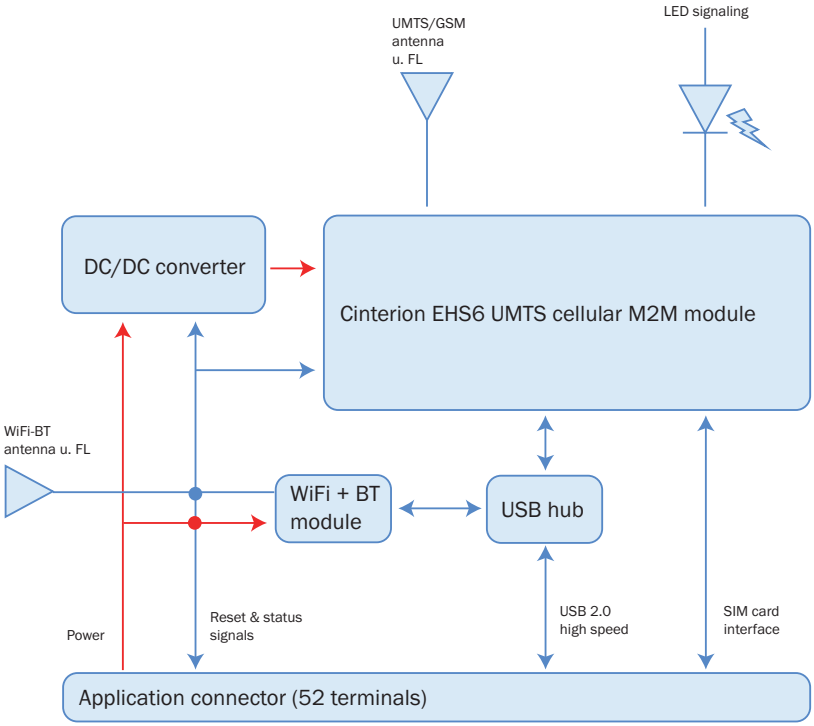
The miniPCIe-CEFIRO cards support an external SIM card through the application connector signals. Both 3V and 1.8V SIM technology is supported. Older 5V SIM technology is not supported.

5. Block Diagram

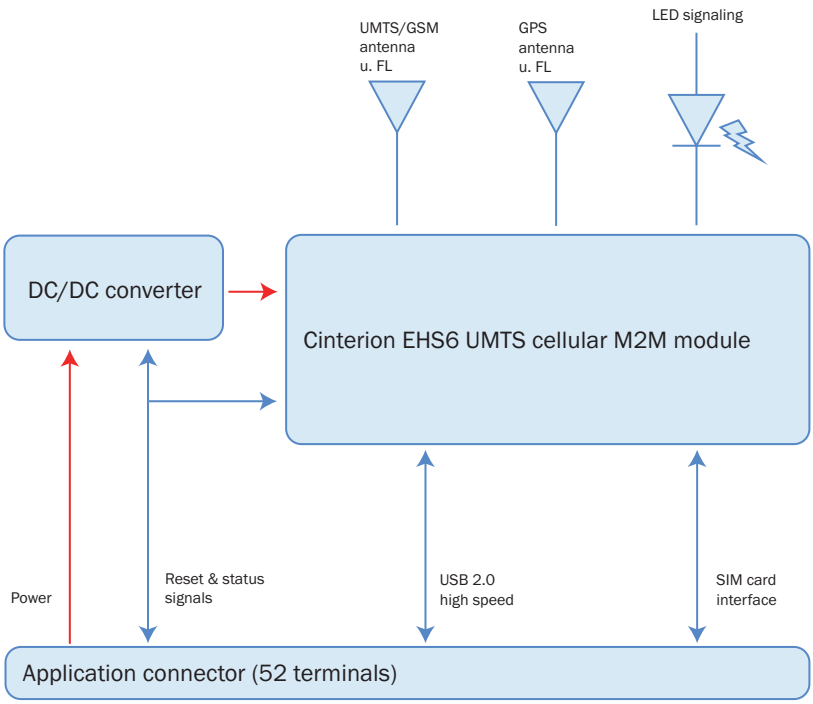
The miniPCIe-CEFIRO-3000 card's block diagram is shown in the following figure:



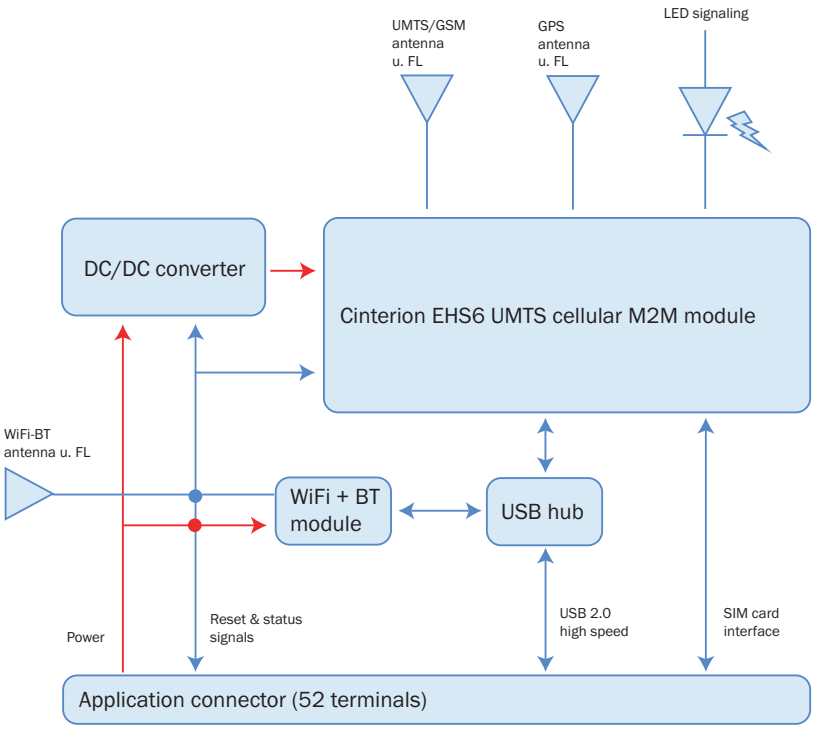
The miniPCIe-CEFIRO-3011 card's block diagram is shown in the following figure:



The miniPCIe-CEFIRO-3100 card's block diagram is shown in the following figure:



The miniPCIe-CEFIRO-3111 card's block diagram is shown in the following figure:



6. Hardware Revisions

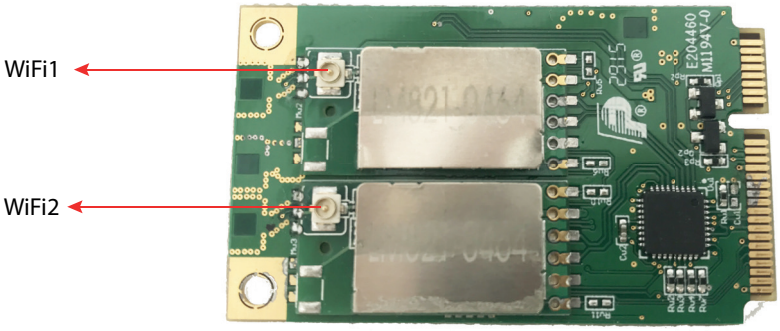
miniPCIe-CEFIRO-3xxx

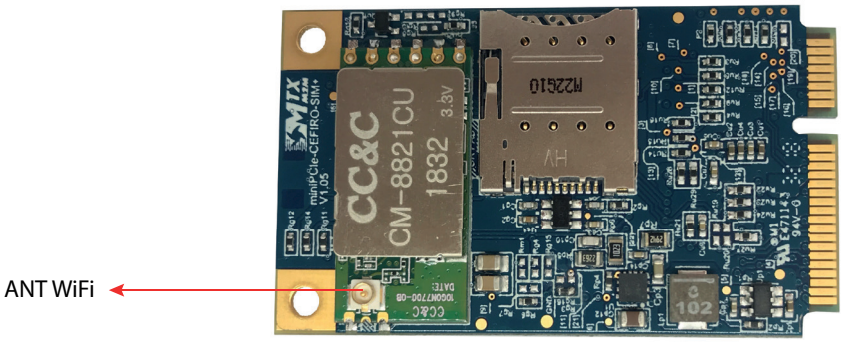
HARDWARE REVISION	STARTING PRODUCTION DATE	CHANGES
1.06	2017/04	Micro SIM holder model
1.01	2015/10	Initial version

MECHANICAL DESCRIPTION

1. Overview

The pictures show the mechanical design of the card along with the positions of the different connectors.





2. Dimensions (mm)

miniPCIe-CEFIRO-3x00 (no WiFi and/or Bluetooth): 51mm (length) x 30mm (width) x 4.62mm (height).

miniPCIe-CEFIRO-3x11 (WiFi and/or Bluetooth): 51mm (length) x 30mm (width) x 5.75mm (height).

ELECTRICAL AND ENVIRONMENTAL CHARACTERISTICS

1. Electrical specifications

1.1 Power supply

ABSOLUTE MAXIMUM RATINGS					
Symbol	**Parameter**	**Conditions**	**Min**	**Max**	**Unit**
VIN	Supply voltage		3	3.6	V

CHARACTERISTICS						
Symbol	**Parameter**	**Conditions**	**Min**	**Typ**	**Max**	**Unit**
VIN	Supply voltage		3.15	3.3	3.45	A
IIN	Supply current		-	*	-	A

*See section Introduction 4.3 (GPS antenna interface description)

1.2 USB interface

ABSOLUTE MAXIMUM RATINGS					
Symbol	**Parameter**	**Conditions**	**Min**	**Max**	**Unit**
V_{io}	I/O voltage range		-0.5	5.5	V

The miniPCIe-CEFIRO cards conforms to all voltage, power and timing characteristics and specifications as set forth in the USB 2.0 Specification.

1.3 SIM card interface

ABSOLUTE MAXIMUM RATINGS					
Symbol	**Parameter**	**Conditions**	**Min**	**Max**	**Unit**
V_{io}	Voltage at SIM interface	CVCC in normal operation	-0.5	3.3	V

CHARACTERISTICS						
Sym	**Parameter**	**Conditions**	**Min**	**Typ**	**Max**	**Ut**
$V_{O(CCVCC)}$	CCVCC output voltage	3V interface	2.8	2.85	2.9	V
		1.8V interface	1.75	1.8	1.85	V
$I_{O(CCVCC)}$	CCVCC output current	3V and 1.8V interface			30	mA
$V_{OL(CCRST)}$	CCRST Low level output voltage	3V interface, I=1mA			0.3	V
		1.8V interface, I=1mA			0.25	V
$V_{OH(CCRST)}$	CCRST High level output voltage	3V interface, I=-1mA	2.4		2.9	V
		1.8V interface, I=-1mA	1.45		1.9	V

$V_{OL(CCCLK)}$	CCCLK Low level output voltage	3V interface, I=1mA			0.25	V
		1.8V interface, I=1mA			0.25	V
$V_{OH(CCCLK)}$	CCCLK High level output voltage	3V interface, I=-1mA	2.4		2.9	V
		1.8V interface, I=-1mA	1.5		1.85	V
$V_{IL(CCIO)}$	CCIO Low level detection voltage	3V interface			0.5	V
		1.8V interface			0.35	V
$V_{IH(CCIO)}$	CCIO High level detection voltage	3V interface	2.05		2.9	V
		1.8V interface	1.25		1.85	V
$V_{OL(CCCLK)}$	CCCLK Low level output voltage	3V interface, I=1mA			0.25	V
		1.8V interface, I=1mA			0.25	V
$V_{OH(CCCLK)}$	CCCLK High level output voltage	3V interface, I=-1mA	2.5		2.9	V
		1.8V interface, I=-1mA	1.5		1.5	V

2. Operating Temperatures

Please note that the modem's lifetime, i.e., the MTTF (mean time to failure) may be reduced if operated outside the extended temperature range.

PARAMETER	MIN	TYP	MAX	UNIT
Normal operation	-30	25	85	ºC
Automatic shutdown (1.)	<-40		>+85	ºC

1. Extended operation allows normal mode speech calls or data transmissions for a limited time until the automatic thermal shutdown mode takes effect. Within the extended temperature range (outside the operating temperature range) the specified electrical characteristics may be increased or decreased.

Note that within the specified operating temperature ranges the unit temperature may vary to a great extent depending on the operating mode, used frequency band, radio output power and current supply voltage.

3. Storage Conditions

The conditions stated below are only valid for modems in their original packed state in weather protected, non-temperature-controlled storage locations. Normal storage time under these conditions is a maximum of 12 months. The units will be delivered in a packaging that meets the requirements according "IPD/ JEDEC J-STD-033B.1" for Low Temperature Carriers.

TYPE	CONDITION	UNIT	REFERENCE
Air temperature: Low High	-30 75	ºC	ETS 300 019-2-1: T1.2, IEC 60068-2-1 Ab ETS 300 019-2-1: T1.2, IEC 60068-2-2 Db
Relative humidity: Low High Cond.	10 90 at 30ºC 90-100 at 30ºC	%	- ETS 300 019-2-1: T1.2, IEC 60068-2-56 Cb ETS 300 019-2-1: T1.2, IEC 60068-2-30 Db
Air pressure: Low High	70 106	kPa	IEC TR 60271-3-1:1K4 IEC TR 60271-3-1:1K4
Movement of air	1.0	m/s	IEC TR 60271-3-1:1K4
Water: rain, dripping, icing and frosting	Not allowed	-	-
Radiation: Solar Heat	1120 600	W/m2	ETS 300 019-2-1: T1.2, IEC 60068-2-2Bb ETS 300 019-2-1: T1.2, IEC 60068-2-2Bb
Chemically active subs.	Not recomm.		IEC TR 60271-3-1:1C1L
Mechanically active subs.	Not recomm.		IEC TR 60271-3-1:1S1
Sinusoidal vibration: Displacement Acceleration Frequency range	 1.5 5 2-9 9-200	 mm m/s2 Hz	IEC TR 60271-3-1:1M2
Shocks: Shock spectrum Duration Acceleration	 semi-sinusoidal 1 50	 ms m/s2	IEC 60068-2-27 Ea

INTERFACE DESCRIPTION

The miniPCIe-CEFIRO cards use the following industry standard connectors:

- PCI Express Mini-Card EM Spec. Rev 2.0 Standard 52-pin edge connector containing
  - 3.3V Power supply
  - USB 2.0 interface
  - SIM card interface (1.8V and 3V compatible)
  - Status and reset signals
- 1x u.FL connector (GSM/UMTS antenna connector)
- 1x u.FL connector (GPS antenna connector)
- 1x or 2x u.FL connector (WLAN & Bluetooth antenna connector)

1. Application Connector Assignments

	SIGNAL	DIRECTION	DESCRIPTION	PCI Express
1	Not connected			WAKE#
2	3V3_IN	Power	3.3V supply voltage	+3.3Vaux
3	Not connected			COEX1
4	GND	Power	Ground	GND
5	Not connected			COEX2
6	Not connected			+1.5V
7	Not connected			CLKREQ#
8	SIMVCC	Input	SIM/UICC supply voltage (UICC contact C1)	UIM_PWR
9	GND	Power	Ground	GND
10	SIMIO	Input/Output	SIM/UICC input and output (UICC contact C7)	UIM_DATA
11	Not connected			REFCLK-
12	SIMCLK	Input	SIM/UICC clock (UICC contact C3)	UIM_CLK
13	Not connected			REFCLK+
14	SIMRESET	Input	SIM/UICC reset (UICC contact C2)	UIM_RESET
15	GND	Power	Ground	GND
16	Not connected			UIM_SPU
17	Not connected			UIM_IC_DM
18	GND	Power	Ground	GND
19	Not connected			UIM_IC_DP

20	W_DISABLE#	Input	Card disable (switch off power supply)	W_DISABLE#
21	GND	Power	Ground	GND
22	PERST#	Input	Card reset	PERST#
23	Not connected			PERn0
24	3V3_IN	Power	3.3V supply voltage	+3.3Vaux
25	Not connected			PERp0
26	GND	Power	Ground	GND
27	GND	Power	Ground	GND
28	Not connected			+1.5V
29	GND	Power	Ground	GND
30	Not connected			SMB_CLK
31	Not connected			PETn0
32	Not connected			SMB_DATA
33	Not connected			PETp0
34	GND	Power	Ground	GND
35	GND	Power	Ground	GND
36	USB_D-	Input/Output	USB Data negative	USB_D-
37	GND	Power	Ground	GND
38	USB_D+	Input/Output	USB Data negative	USB_D+
39	3V3_IN	Power	3.3V supply voltage	+3.3Vaux
40	GND	Power	Ground	GND

41	3V3_IN	Power	3.3V supply voltage	+3.3Vaux
42	LED_WWAN#	Output	3G module status signal	LED_WWAN#
43	GND	Power	Ground	GND
44	Not connected			LED_WLAN#
45	Not connected			Reserved
46	Not connected			LED_WPAN#
47	Not connected			Reserved
48	Not connected			+1.5V
49	Not connected			Reserved
50	GND	Power	Ground	GND
51	Not connected			W_DISABLE#2
52	3V3_IN	Power	3.3V supply voltage	+3.3Vaux

2. Power Supply Connector

The miniPCIe-CEFIRO cards use the five 3V3_IN pins and fourteen GND pins listed in section 4.1 as power supply sources and ground.

3. USB Interface

The miniPCIe-CEFIRO card's USB interface (USB_DP, USB_DN) as part of the 52-pin application connector supports a USB 2.0 High Speed (480 Mbit/s) device interface that is Full Speed (12Mbit/s) compliant. Because there is no separate voltage detection line available on the application connector, the miniPCIe-CEFIRO reports as a self-powered device compliant with the "Universal Serial Bus Specification Revision 2.0".

Via the USB interface it is possible to implement a Wireless Module USB 3G modem as well as six further Wireless Module ports that provide an AT interface to the module.

The WLAN & Bluetooth module enumerates as a HCI device.

There are drivers available for Windows and Linux environment applications. Visit the miniPCIe-CEFIRO web page at www.mtxm2m.com.

4. SIM Card Interface

The miniPCIe-CEFIRO cards provide a SIM/UICC interface at the 52-pin application connector compliant to the ISO/IEC 7816-3 specification. The SIM interface is intended for 1.8V and 3V SIM cards in accordance with GSM 11.12 Phase 2.

The following table list the pins available fot the SIM/UICC interface.

SIGNAL	DESCRIPTION
SIMCLK	Chipcard clock
SIMVCC	SIM supply voltage
SIMIO	Serial data line, input and output
SIMRESET	Chipcard reset

The total cable length between the card pads and the pads of an external SIM card holder must not exceed 100mm in order to meet the specifications of 3GPP TS 51.010-1 and to satisfy the requirements of EMC compliance.

To avoid possible cross-talk from the SIMCLK signal to the SIMIO signal be careful that both lines are not placed closely next to each other. A useful approach is using a GND line to shield the CCIO line from the SIMCLK line.

5. Antenna Interface

The miniPCIe-CEFIRO cards has u.FL-R-SMT antenna connector for each RF interface of the device (GSM/UMTS, GPS and WLAN&BT). The RF interface has an impedance of 50Ω. The miniPCIe-CEFIRO is capable of sustaining a total mismatch at the antenna lines without any damage, even when transmitting at maximum RF power.

The external antenna must be matched to achieve best performance regarding radiated power, modulation accuracy and harmonic suppression. Antenna matching networks are not included on the miniPCIe-CEFIRO card and should be placed in the host application if the antenna does not have an impedance of 50Ω.

6. Status LEDs

The miniPCIe-CEFIRO cards provide four LED indications directly attached to the EHS6/8 module, as the following table summarizes:

LED	COLOUR	MODULE'S SIGNAL	MODULE'S SIGNAL (SIM holder module)
DL1	Yellow	GPIO14	GPIO20
DL2	Blue	GPIO13	GPIO21
DL3	Green	GPIO5/LED	GPIO5/LED
DL4	Red	GPIO11	GPIO22

Each GPIO of the EHS6/8 module can be controlled by AT commands or an embedded Java application. In addition, DL3 is connected to the LED Status signal of the module, which is automatically handled by the EHS6/8 module and indicates its different operating modes, as shown in table below. The LED mode configuration is set by the AT^SLED command.

TERMINAL STATUS	<mode>=1	<mode>=2 <flash>=default	<mode>=2 <flash>=user defined
• GSM CS data call in progress/established • GSM voice call in progress/established • UMTS voice call in progress/established • UMTS CS data call in progress	Always ON	10ms ON 990ms OFF	<flash> ms ON 990 ms OFF
• GSM PS data transfer • UMTS data transfer	Always ON	10ms ON 1990ms OFF	<flash> ms ON 1990 ms OFF
• ME registered to a network. No call, no data transfer	Always ON	10ms ON 1990ms OFF	<flash> ms ON 3990 ms OFF
• Limited Network Service (e.g. no SIM, no PIN or during network search)	500ms ON 500ms OFF	10ms ON 990ms OFF	<flash> ms ON 990 ms OFF

The signal GPIO5/LED of the module is also connected to the LED_WWAN# signal in the 52-pin application connector.

7. Reset Signals

7.1 PERST#

The signal PERST#, available in the 22-pin application connector, is internally connected to the GSM/UMTS module reset signal and also to the WLAN & Bluetooth reset signal. You can use it to resetting the card by activating it to low level for more than 50ms, which sets the processor and with it all the other signal pads to their respective reset states usually reached right after startup. After releasing the module could take up to 5 seconds to restart.

7.2 PERST#

The signal W_DISABLE#, available in the 20-pin application connector, is internally connected to a load switch which disable the whole supply of the card. If you need disable the card to achieve a low power state, this is a better option than the PERST# signal. You can use it to resetting the card by activating it to low level. After releasing the module could take up to 5 seconds to restart.

8. Firmware Updates

It is possible and sometimes necessary to update the miniPCIe-CEFIRO firmware.

Updates must be carried out by an approved technician.

Please contact gsmsupport@matrix.es for details regarding Service/Programming.

OPERATION

1. Supported Operating Systems

The module has been tested in both Linux (Ubuntu 14.04 LTS) and Windows (Windows 7).

1.1 Linux

The driver needed in order to detect the GSM/UMTS module is the CDM_ACM which is included by default on the UBUNTU 14.04 installation. If other Linux version is used the CDC ACM driver can be included with, for example, menuconfig (Drivers -> USB Support -> USB Modem (CDC_ACM) support)

The default mapping of the modem is as follows:

INTERFACE	DEFAULT ASSIGNMENT
/dev/ttyACM0	AT Command interface (ppp connection)
/dev/ttyACM1	
/dev/ttyACM2	
/dev/ttyACM3	AT Command interface (aux)
/dev/ttyACM4	AT Command interface (aux)
/dev/ttyACM5	NMEA Interface (only available on miniPCIe-CEFIRO-31xx versions)
/dev/ttyACM6	

The WiFi + Bluetooth combo module will require the following drivers:

- The latest version of the WiFi driver can be downloaded from the following link: https://github.com/lwfinger/rtl8723bu
- The latest version of the Bluetooth driver can be downloaded from the following link: https://github.com/lwfinger/rtl8723au_bt

To install the drivers you must follow these steps:

```
Sudo apt-get install git
Git config --global user.name "My name"
git config --global user.email "My email"
cd ~
mkdir cefiro
cd cefiro
git clone https://github.com/lwfinger/rtl8723bu.git
cd ~/cefiro/rtl8723bu/
make
cd ~/cefiro/rtl8723bu/
sudo make install
cd ~/cefiro
git clone https://github.com/lwfinger/rtl8723au_bt
cd ~/cefiro/rtl8723au_bt
git checkout troy
make
cd ~/cefiro/rtl8723au_bt
sudo make install
```

After driver installation the following interfaces must be available:

```
$ hciconfig
```

```
hci1:   Type: BR/EDR  Bus: USB
        BD Address: 5C:F3:70:1A:98:24  ACL MTU: 820:8  SCO MTU: 255:16
        UP RUNNING PSCAN
        RX bytes:1306 acl:0 sco:0 events:135 errors:0
        TX bytes:25639 acl:0 sco:0 commands:135 errors:0
```

```
$ iwconfig
```

```
wlan1:  unassociated  Nickname:"<WIFI@REALTEK>"
        Mode: Managed  Frequency=2.412 GHz  Access Point: Not-Associated
        Sensitivity:0/0
        Retry:off   RTS thr:off   Fragment thr:off
        Power Management:off
        Link Quality:0  Signal level:0  Noise level:0
        Rx invalid nwid:0  Rx invalid crypt:0  Rx invalid frag:0
        Tx excessive retries:0  Invalid misc:0   Missed beacon:0
```

1.1.1 Configuration

No specific configuration is needed in order to start using the GSM/UMTS module.

1.1.2 Example

T.B.D.

1.2 Windows

The GSM/UMTS module driver for Windows can be downloaded from the following link: ftp://ftp.matrix.es/mtxm2m/miniPCIe%20cards/HSPA%20Driver%20v1113.zip

The WiFi and Bluetooth drivers will be automatically detected by Windows (an internet connection is needed in order to locate and download the driver). If Windows can't detect them itself, you can download the driver directly form the following link:

ftp://ftp.matrix.es/mtxm2m/miniPCIe%20cards/WLAN&BT%20Driver.rar

1.2.1 Configuration

T.B.D.

1.2.2 Example

T.B.D.

AT Command Interpreter

After a successful installation of the EHS6/8 driver package, the physical USB interface of the modem is represented in the operating system by two virtual interfaces, each assigned to a virtual COM port of its own:

Modem interface

This interface is referred to as “Modem” if queried using the AT^SQPORT command. In the quick reference tables it is named USB0-MDM.

The modem interface is intended particularly for data transmission (UMTS or GPRS).

All URCs are normally issued on the Application interface. URCs related to data calls (RING, NO CARRIER) as well as the “^SYSSTART” URC are issued on the Modem interface.

Application interface

This interface is referred to as “Application” if queried using the AT^SQPORT command. In the quick reference tables it is named USB0-APP.

The Application interface is designed especially for controlling the miniPCIe-CEFIRO, i.e. for entering AT commands, receiving URCs, or sending and receiving short messages. It cannot be used as a data interface for UMTS, or GPRS.

Please note that URCs are normally indicated only on this interface, no matter whether the Modem interface or the Application interface was used to send the AT commands to activate their presentation. This URC management scheme is the default configuration recommended for a typical miniPCIe-CEFIRO application.

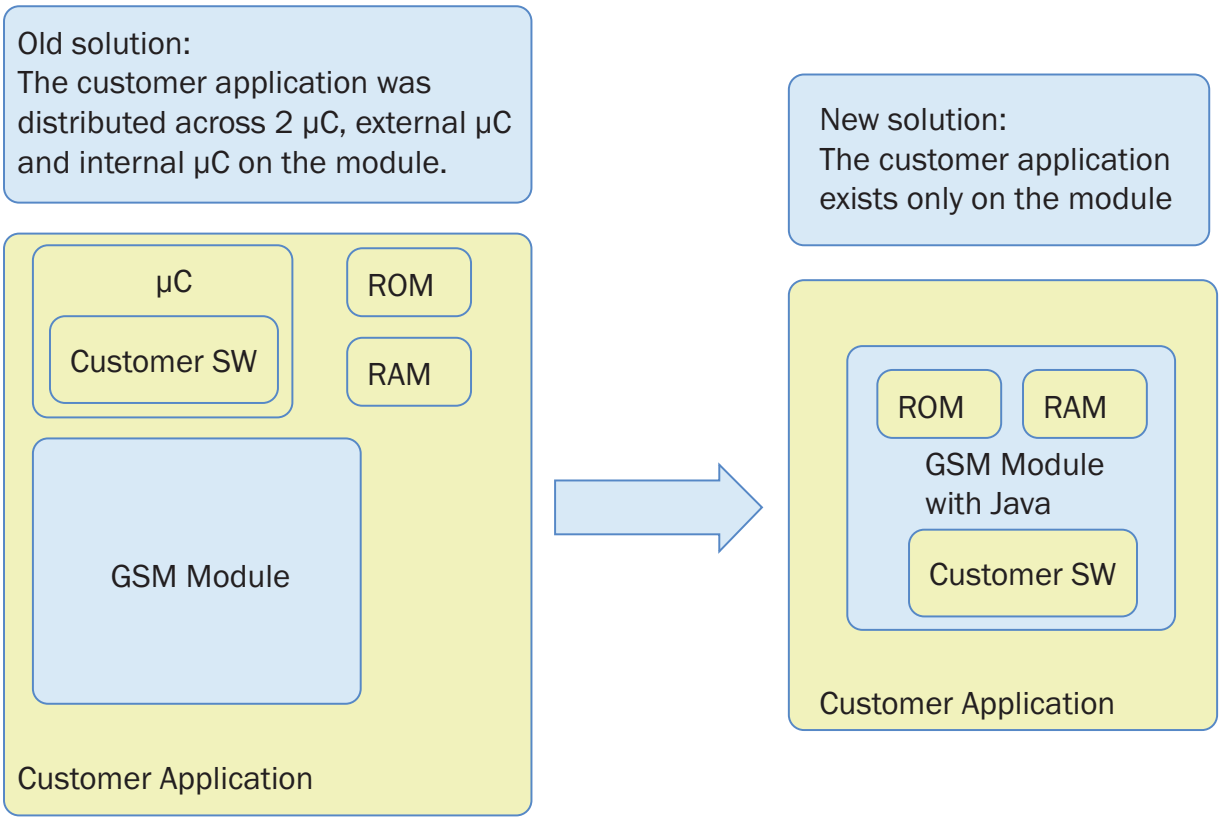
Bear in mind that the Modem interface and the Application interface are handled by the same AT command interpreter.

As a result, AT commands entered on both interfaces are not executed in parallel but sequentially, one after the other. So, an AT command issued on one interface will be buffered on this interface to be executed after the other interface has completed processing earlier AT command(s).

When a data connection is established over the Modem interface, the Application interface can be used simultaneously for any control functions. This eliminates the need for the user to enter AT commands, such as +++ and ATO, as well as switching back and forth between command and online mode when working on one interface only.

Embedded Applications

The miniPCIe-CEFIRO can embed an internal application written in popular JAVA language. Java technology and several peripheral interfaces on the modem allow you to easily integrate your application. This way, the customer application can be reduced because all the resources (Microcontroller, Flash & RAM memory and all kind of I/O and bus peripheral) can be used by the customer. This solution saves the external intelligence with all the associate costs and also saves space and power consumption.



Features:

- Oracle Java ME Embedded 3.2 Compliant to CLDC 1.1 HI (JSR139) and IMP-NG (JSR228) Java standards
- Capable of running multiple MIDlets in parallel with inter-MIDlet communication
- Additional Java standard APIs:
  - JSR75 (FileConnection)
  - JSR177 (CRYPTO)
  - JSR280 (XML)
- Additional Java proprietary APIs:
  - AT Command API
  - Watchdog API

- Additional accessible periphery for Java applications:
  - I/O pins- I2C Interface, SPI interface, DAC,ADC
  - Serial interfaces (API): (ASC0, ASC1, USB*) can be used to connect external devices
- Memory space for Java programs:
  - Flash File System: around 8 MB
  - RAM: around 6MB
  - Just-in-Time Compiler execution optimization
- Over-the-air update:
  - Application SW: OTAP
  - Firmware: FOTA (OMA compliant)

Ask iotsupport@mtxm2m.com for application notes and a free Cinterion SDK (Software Development Kit); we will provide Matrix FTP server to download it.

CONFORMITY ASSESSMENT

1. Standards of European Type Approval

We declare under our sole responsibility that the products miniPCIe-CEFIRO Terminal 0 containing Cellular Engine Cinterion engine EHS6 (Type L30960-N2950-A100) or EHS8 (Type L30960-N2900-A300), to which this declaration relates, are labeled with the CE conformity mark.

DIRECTIVE 2004/108/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 15 December 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility and repealing Directive 89/336/EEC.

DIRECTIVE 2006/95/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 12 December 2006 on the harmonization of the laws of Member States relating to electrical equipment designed for use within certain voltage limits.

ETSI EN 301 511 V9.0.2: Global System for Mobile communications (GSM); Harmonized standard for mobile stations in the GSM 900 and DCS 1800 bands covering essential requirements under article 3.2 of the R&TTE directive (1999/5/EC) (GSM 13.11 version 7.0.1 Release 1998).

ETSI EN 301 489-1 V1.9.2: Electro Magnetic Compatibility and Radio spectrum Matters (ERM); Electro Magnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common Technical Requirements.

ETSI EN 301 489-7 V1.3.1: Electromagnetic Compatibility and Radio spectrum Matters (ERM); Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 7: Specific conditions for mobile and portable radio and ancillary equipment of digital cellular radio telecommunications systems (GSM and DCS).

ETSI EN 301 489-24 V1.5.1: Electromagnetic Compatibility and Radio spectrum Matters (ERM); Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 24: Specific conditions for IMT-2000 CDMA Direct Spread (UTRA) for Mobile and portable (UE) radio and ancillary equipment.

ETSI EN 301 908-01 V5.2.1: Electromagnetic compatibility and Radio spectrum Matters (ERM); Base Stations (BS) and User Equipment (UE) for IMT-2000 Third Generation cellular networks; Part 1: Harmonized EN for IMT-2000, introduction and common requirements of article 3.2 of the R&TTE Directive.

ETSI EN 301 908-02 V5.2.1: Electromagnetic compatibility and Radio spectrum Matters (ERM); Base Stations (BS) and User Equipment (UE) for IMT-2000 Third Generation cellular networks; Part 2: Harmonized EN for IMT-2000, CDMA Direct Spread (UTRA FDD) (UE) covering essential requirements of article 3.2 of the R&TTE Directive

IEC/EN 60950-1:2005 / EN 60950-1:2006+A11:2009: Health and Safety.

The technical documentation relevant to the above equipment will be held at: MATRIX ELECTRÓNICA S.L., C/ Alejandro Sanchez 109, 28019 Madrid, Spain

Madrid, 9/1/2015

Mr. J. Vicente

Managing Board

2. FCC Compliant

MiniPCIe-CEFIRO-30xx and any variants contain FCC ID: QIPEHS6. The FCC Equipment Authorization Certification for the EHS6 Module is listed under the FCC identifier QIPEHS6.

Industry Canada Certification Number: 7830A-EHS6 granted to Gemalto M2M GmbH.

The Cinterion reference application of the EHS6 Module registered under the above identifier is certified to be in accordance with the following Rules and Regulations of the Federal Communications Commission (FCC). Power listed is ERP for Part 22 and EIRP for Part 24. It is compliant with FCC regulations.

MiniPCIe-CEFIRO-31xx and any variants contain FCC ID: QIPEHS8. The FCC Equipment Authorization Certification for the EHS6 Module is listed under the FCC identifier QIPEHS8.

Industry Canada Certification Number: 7830A-EHS8 granted to Gemalto M2M GmbH.

The Cinterion reference application of the EHS8 Module registered under the above identifier is certified to be in accordance with the following Rules and Regulations of the Federal Communications Commission (FCC). Power listed is ERP for Part 22 and EIRP for Part 24. It is compliant with FCC regulations.

Equipment class: PCS Licensed Transmitter.

Notes: Quad band GSM/GPRS Modem.

2.1 SAR information

Cinterion Wireless Modules models: EHS6 and EHS8 is marketed without a defined antenna.

The Maximum Antenna Gain when using indoor antennas depends on the distance from the antenna to any nearby persons when in normal operation. It should not exceed the values shown on the table below.

According to the limit in 47 CFR 1.1310, we get the value of the maximum antenna gain as follows:

The maximum measured power output in the 850 MHz band is 1866.38 mW (32.71 dBm, see 7layers test report MDE_Siem_0714_FCCb).

The maximum permissible exposure is defined as 47 CFR 1.1310 with 0.55773 mW/cm².

The maximum measured power output in the 1900 MHz band is 974.99 mW (29.89 dBm, see 7layers test report MDE_Siem_0714_FCCc).

The maximum permissible exposure is defined as 47 CFR 1.1310 with 1 mW/cm².

According to the limit in 47 CFR 1.1310, we get the value of the maximum antenna gain as follows:

$S = P*G/4\pi R^2$

$S = 0.55773$ mW/cm² or 1 mW/cm²

P = 1866.38 mW or 974.99 mW

R = 20 cm or 100cm

$\pi = 3.1416$

G(dBi)=10*log10(G)

Solving for G; the maximum antenna gain is:

BAND	DISTANCE	MAX. GAIN (dBi)
850MHz	20cm	1.7669
850MHz	50cm	9.7257
1900MHz	20cm	7.1227
1900MHz	50cm	15.0815

DECLARACIÓN DE CONFORMIDAD

1. Estándares de homologación europea

Declaramos bajo nuestra responsabilidad que los productos miniPCIe-CEFIRO que contienen un módulo celular Cinterion EHS6 (tipo L30960-N2950-A100) o EHS8 (Type L30960-N2900-A300), al cual se refiere esta declaración, están etiquetados con el marcado CE de conformidad.

DIRECTIVA 2004/108/EC DEL PARLAMENTO EUROPE Y DEL CONSEJO del 15 de Diciembre de 2004 sobre la aproximación de las leyes de los Estados Miembros correspondientes a la compatibilidad electromagnética y que deroga la Directiva 89/336/EEC.

DIRECTIVA 2006/95/EC DEL PARLAMENTO EUROPE Y DEL CONSEJO del 12 de Diciembre de 2006 sobre la armonización de las leyes de los estados miembros relacionadas con los equipos eléctricos diseñados para su uso bajo ciertos límites de voltaje.

ETSI EN 301 511 V9.0.2: Sistema Global de Comunicaciones Móviles (GSM); estándar unificado para estaciones móviles en las bandas GSM 900 y DCS 1800, que cubren los requisitos esenciales del artículos 3.2 de la directiva R&TTE (1999/5/EC) (GSM 13.11 versión 7.0.1 Release 1998).

ETSI EN 301 489-1 V1.9.2: Cuestiones sobre Compatibilidad Electromagnética y espectro Radioeléctricos (ERM); estándar de compatibilidad electromagnética (EMC) para equipos y sistema de radio; Parte 1: Requisitos Técnicos Comunes.

ETSI EN 301 489-7 V1.3.1: Cuestiones sobre Compatibilidad Electromagnética y espectro Radioeléctricos (ERM); estándar de compatibilidad electromagnética (EMC) para equipos y sistema de radio; Parte 7: Condiciones específicas para equipos de radio móviles y portátiles y equipos auxiliares de sistemas de radiocomunicaciones móviles digitales (GSM y DCS).

ETSI EN 301 489-24 V1.5.1: Cuestiones sobre Compatibilidad Electromagnética y espectro Radioeléctricos (ERM); estándar de compatibilidad electromagnética (EMC) para equipos y sistema de radio; Parte 24: Condiciones específicas para IMT-2000 CDMA Direct Spread (UTRA) para radios móviles y portátiles (UE) y equipamiento auxiliar.

ETSI EN 301 908-01 V5.2.1: Cuestiones sobre Compatibilidad Electromagnética y espectro Radioeléctricos (ERM); estaciones base (BS) y equipamiento de usuario (UE) para redes celulares IMT-2000 de tercera generación; Parte 1: Normativa europea armonizada para IMT-2000, introducción y requisitos comunes del artículo 3.2 de la directiva R&TTE.

ETSI EN 301 908-02 V5.2.1: Cuestiones sobre Compatibilidad Electromagnética y espectro Radioeléctricos (ERM); estaciones base (BS) y equipamiento de usuario (UE) para redes celulares IMT-2000 de tercera generación; Parte 2: Normativa europea armonizada para IMT-2000, CDMA Direct Spread (UTRA FDD) (UE) que cubre los requisitos esenciales del artículo 3.2 de la directiva R&TTE.

IEC/EN 60950-1:2005 / EN 60950-1:2006+A11:2009: Salud y Seguridad.

La documentación técnica referente al equipo anterior está disponible en: MATRIX ELECTRÓNICA S.L., C/ Alejandro Sanchez 109, 28019 Madrid, España

Madrid, 1/9/2015

Sr. J. Vicente

Junta Directiva

2. Conformidad FCC

miniPCIe-CEFIRO-30xx y todas sus variantes contienen el FCC ID: QIPEHS6. El Certificado de Autorización de Equipo de la FCC para el módulo EHS6 está listado con el identificador FCC QIPEHS6.

Número de Certificación de Industria en Canadá: 7830A-EHS6 asignado a Gemalto M2M GmbH.

El formulario de referencia del módulo EHS6 registrado bajo el anterior identificador está conforme con las siguientes Reglas y Regulaciones de la Comisión Federal de Comunicaciones (FCC). La potencia listada como ERP para la parte 22 y como EIRP para la parte 24 cumple con las regulaciones de la FCC.

miniPCIe-CEFIRO-31xx y todas sus variantes contienen el FCC ID: QIPEHS8. El Certificado de Autorización de Equipo de la FCC para el módulo EHS6 está listado con el identificador FCC QIPEHS8.

Número de Certificación de Industria en Canadá: 7830A-EHS8 asignado a Gemalto M2M GmbH.

El formulario de referencia del módulo EHS8 registrado bajo el anterior identificador está conforme con las siguientes Reglas y Regulaciones de la Comisión Federal de Comunicaciones (FCC). La potencia listada como ERP para la parte 22 y como EIRP para la parte 24 cumple con las regulaciones de la FCC.

Clase de equipo: Transmisor PCS Licenciado.

Notas: Quad band GSM/GPRS Modem.

2.1 Tasa de absorción específica (SAR)

El módulo Cinterion EHS6 o EHS8 se comercializa sin una antena definida. La ganancia máxima de antena usando antenas de interior depende de la distancia de esta a las personas cercanas y en condiciones normales no debe sobrepasar los límites mostrados en la tabla siguiente.

La máxima potencia de salida medida en la banda de 850MHz es 1866.38 mW (32.71 dBm, ver el reporte de test de 7layers MDE_Siem_0714_FCCb).

La máxima exposición permisible se define en 47 CFR 1.1310 con un valor de 0.55773 mW/cm².

La máxima potencia de salida medida en la banda de 1900 MHz es 974.99 mW (29.89 dBm, ver el reporte de test de 7layers MDE_Siem_0714_FCCc).

La máxima exposición permisible se define en 47 CFR 1.1310 con un valor de 1 mW/cm².

De acuerdo al límite en 47 CFR 1.1310, obtenemos el valor de la máxima ganancia de antena como sigue:

$S = P*G/4\pi R^2$

$S = 0.55773$ mW/cm² o 1 mW/cm²

P = 1866.38 mW o 974.99 mW

R = 20 cm o 100cm

$\pi = 3.1416$

G(dBi)=10*log10(G)

Despejando G; la máxima ganancia de antena es:

BANDA	DISTANCIA	GANANCIA MÁX. (dBi)
850MHz	20cm	17669
850MHz	50cm	97257
1900MHz	20cm	71227
1900MHz	50cm	150815

REGULATORY AND TYPE APPROVAL INFORMATION

1. Directives and Standards

The miniPCIe-CEFIRO cards has been designed to comply with the directives and standards listed below.

It is the responsibility of the application manufacturer to ensure compliance of the final product with all provisions of the applicable directives and standards, as well as with the technical specifications provided in this document.

DIRECTIVES	
1999/05/EC	Directive of the European Parliament on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity . The product is labeled with the CE conformity mark.
ECE-R 10	Economic Commission for Europe (ECE) Regulation No. 10: Uniform provisions concerning the approval of vehicles with regard to electromagnetic compatibility.
2002/95/EC (RoHS 1) 2011/65/EC (RoHS 2)	Directive of the European Parliament and of the Council of 27 January 2003 (and revised on 8 June 2011) on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS).

STANDARDS OF NORTH AMERICAN TYPE APPROVAL	
CFR Title 47	Code of Federal Regulations, Part 22 and Part 24 (Telecommunications, PCS); US Equipment Authorization FCC.
OET Bulletin 65 (Edition 97-01)	Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields.
UL 60 950-1	Product Safety Certification (Safety requirements).
NAPRD.03 V5.15	Overview of PCS Type certification review board Mobile Equipment Type. Certification and IMEI control. PCS Type Certification Review board (PTCRB).
RSS132 (Issue2) RSS133 (Issue5)	Canadian Standard.

STANDARDS OF EUROPEAN TYPE APPROVAL	
3GPP TS 51.010-1	Digital cellular telecommunications system (Release 7); Mobile Station (MS) conformance specification.
ETSI EN 301 511 V9.0.2	Global System for Mobile communications (GSM); Harmonized standard for mobile stations in the GSM 900 and DCS 1800 bands covering essential requirements under article 3.2 of the R&TTE directive (1999/5/EC).
GCF-CC V3.49	Global Certification Forum - Certification Criteria.
ETSI EN 301 489-01 V1.9.2	Electromagnetic Compatibility and Radio spectrum Matters (ERM); Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common Tech. Requirements.
ETSI EN 301 489-07 V1.3.1	Electromagnetic Compatibility and Radio spectrum Matters (ERM); Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 7: Specific conditions for mobile and portable radio and ancillary equipment of digital cellular radio telecommunications systems (GSM and DCS).
ETSI EN 301 489-24 V1.5.1	Electromagnetic Compatibility and Radio spectrum Matters (ERM); Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 24: Specific conditions for IMT-2000 CDMA Direct Spread (UTRA) for Mobile and portable (UE) radio and ancillary equipment.
EN 301 908-01 V5.2.1	Electromagnetic compatibility and Radio spectrum Matters (ERM); Base Stations (BS) and User Equipment (UE) for IMT-2000 Third Generation cellular networks; Part 1: Harmonized EN for IMT-2000, introduction and common requirements of article 3.2 of the R&TTE Directive.
EN 301 908-02 V5.2.1	Electromagnetic compatibility and Radio spectrum Matters (ERM); Base Stations (BS) and User Equipment (UE) for IMT-2000 Third Generation cellular networks; Part 2: Harmonized EN for IMT-2000, CDMA Direct Spread (UTRA FDD) (UE) covering essential requirements of article 3.2 of the R&TTE Directive.
EN 62311:2008	Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz - 300 GHz).
IEC/EN 60950-1:2006+A11:2009+A1:2010+A12:2011	Safety of information technology equipment.

REQUIREMENTS OF QUALITY	
IEC 60068	Environmental testing.
DIN EN 60529	IP codes.

STANDARDS OF THE MINISTRY OF INFORMATION INDUSTRY OF THE REPUBLIC OF CHINA	
SJ/T 11363-2006	"Requirements for Concentration Limits for Certain Hazardous Substances in Electronic Information Products." (2006-06)
SJ/T 11364-2006	"Marking for Control of Pollution Caused by Electronic Information Products." (2006-06) According to the "Chinese Administration on the Control of Pollution caused by Electronic Information Products" (ACPEIP) the EPUP, i.e., Environmental Protection Use Period, of this product is 20 years as per the symbol shown here, unless otherwise marked. The EPUP is valid only as long as the product is operated within the operating limits described in the Gemalto M2M Hardware Interface Description? Please see next table for an overview of toxic or hazardous substances or elements that might be contained in product parts in concentrations above the limits defined by SJ/T 11363-2006.

部件名称 Name of the part	有毒有害物质或元素 Hazardous substances					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
金属部件 (Metal Parts)	O	O	O	O	O	O
电路模块 (Circuit Modules)	X	O	O	O	O	O
电缆及电缆组件 (Cables and Cable Assemblies)	O	O	O	O	O	O
塑料和聚合物部件 (Plastic and Polymeric parts)	O	O	O	O	O	O

O:
表示该有毒有害物质在该部件所有均质材料中的含量均在SJ/T11363-2006 标准规定的限量要求以下。
Indicates that this toxic or hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in SJ/T11363-2006.

X:
表示该有毒有害物质至少在该部件的某一均质材料中的含量超出SJ/T11363-2006标准规定的限量要求。
Indicates that this toxic or hazardous substance contained in at least one of the homogeneous materials used for this part *might exceed* the limit requirement in SJ/T11363-2006.

2. SAR Requirements Specific to Portable Mobiles

Mobile phones, PDAs or other portable transmitters and receivers incorporating a GSM module must be in accordance with the guidelines for human exposure to radio frequency energy. This requires the Specific Absorption Rate (SAR) of portable EHS6 based applications to be evaluated and approved for compliance with national and/or international regulations.

Since the SAR value varies significantly with the individual product design, manufacturers are advised to submit their product for approval if designed for portable use. For European markets the relevant directives are mentioned below. It is the responsibility of the manufacturer of the final product to verify whether or not further standards, recommendations or directives are in force outside these areas.

Products intended for sale in US markets

EN 59005/ANSI C95.1: Considerations for evaluation of human exposure to Electromagnetic Fields (EMFs) from Mobile Telecommunication Equipment (MTE) in the frequency range 30MHz – 6GHz.

Products intended for sale in European markets

EN 50360: Product standard to demonstrate the compliance of mobile phones with the basic restrictions related to human exposure to electromagnetic fields (300MHz - 3GHz).

Please note that SAR requirements are specific only for portable devices and not for mobile devices as defined below:

- Portable device: A portable device is defined as a transmitting device designed to be used so that the radiating structure(s) of the device is/are within 20 centimeters of the user's body.
- Mobile device: A mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the user's body or that of nearby persons. In this context, the term "fixed location" means that the device is physically secured at one location and cannot be easily moved to another location.

3. SELV Requirements

The power supply connected to the miniPCIe-CEFIRO card shall be in compliance with the SELV requirements defined in EN 60950-1.

ROHS STATEMENT

The miniPCIe-CEFIRO cards are compliant with the 2002/95/EC Directive of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS).

DISPOSAL OF OLD ELECTRICAL AND ELECTRONIC EQUIPMENT

This symbol, applied on our products and/or on its packaging, indicates that this product should not be treated as household waste when you wish to dispose of it. Instead, it should be handed over to an applicable 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 to the environment and human health, which could otherwise be caused by inappropriate disposal 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, household waste disposal service or the retail store where you purchased this product.

ABBREVIATIONS

ABBREVIATIONS	DESCRIPTION
ADC	Analog-to-digital converter
AGC	Automatic Gain Control
ANSI	American National Standards Institute
ARFCN	Absolute Radio Frequency Channel Number
ARP	Antenna Reference Point
ASC0/ASC1	Asynchronous Controller. Abbreviations used for first and second serial interface of EHS6
B	Thermistor Constant
VER	Bit Error Rate
BTS	Base Transceiver Station
CB or CBM	Cell Broadcast Message
CE	Conformité Européene (European Conformity)
CHAP	Challenge Handshake Authentication Protocol
CPU	Central Processing Unit
CS	Coding Scheme
CSD	Circuit Switched Data
CTS	Clear to Send
DAC	Digital-to-Analog Converter
DAI	Digital Audio Interface
dBm0	Digital level, 3.14dBm0 corresponds to full scale, see ITU G.711, A-law

DCE	Data Communication Equipment (typically modems, e.g. Gemalto M2M module)
DCS 1800	Digital Cellular System, also referred to as PCN
DL	Download
Dnu	Do not use
DRX	Discontinuous Reception
DSB	Development Support Box
DSP	Digital Signal Processor
DSR	Data Set Ready
DTE	Data Terminal Equipment (typically a computer, terminal, printer or, for example, a GSM application)
DTR	Data Terminal Ready
DTX	Discontinuous Transmission
EDGE	Enhanced Data rates for GSM Evolution
EFR	Enhanced Full Rate
EGSM	Enhanced GSM
EIRP	Equivalent Isotropic Radiated Power
EMC	Electromagnetic Compatibility
ERP	Effective Radiated Power
ESD	Electrostatic Discharge
ETS	European Telecommunication Standard
ETSI	European Telecommunications Standards Institute
FCC	Federal Communications Commission (U.S.)

FDD	Frequency Division Duplex
FDMA	Frequency Division Multiple Access
FR	Full Rate
GMSK	Gaussian Minimum Shift Keying
GPIO	General Purpose Input/Output
GPRS	General Packet Radio Service
GSM	Global Standard for Mobile Communications
HiZ	High Impedance
HR	Half Rate
HSDPA	High Speed Downlink Packet Access
I/O	Input/Output
IC	Integrated Circuit
IMEI	International Mobile Equipment Identity
ISO	International Standards Organization
ITU	International Telecommunications Union
kbps	kbits per second
LED	Light Emitting Diode
Li-Ion/Li+	Lithium-Ion
Li battery	Rechargeable Lithium Ion or Lithium Polymer battery
LPM	Link Power Management
MBB	Moisture barrier bag
Mbps	Mbits per second

MCS	Modulation and Coding Scheme
MMI	Man Machine Interface
MO	Mobile Originated
MS	Mobile Station (GSM module), also referred to as TE
MSISDN	Mobile Station International ISDN number
MSL	Moisture Sensitivity Level
MT	Mobile Terminated
nc	Not connected
NTC	Negative Temperature Coefficient
OEM	Original Equipment Manufacturer
PA	Power Amplifier
PAP	Password Authentication Protocol
PBCCH	Packet Switched Broadcast Control Channel
PCB	Printed Circuit Board
PCL	Power Control Level
PCM	Pulse Code Modulation
PCN	Personal Communications Network, also referred to as DCS 1800
PCS	Personal Communication System, also referred to as GSM 1900
PD	Pull Down resistor (appr. 100k)
PDU	Protocol Data Unit
PLL	Phase Locked Loop
PPP	Point-to-point protocol

PS	Packet Switched
PSK	Phase Shift Keying
PSU	Power Supply Unit
PU	Pull Up resistor (appr. 100k)
PWM	Pulse Width Modulation
QAM	Quadrature Amplitude Modulation
R&TTE	Radio and Telecommunication Terminal Equipment
RAM	Random Access Memory
RF	Radio Frequency
RLS	Radio Link Stability
RMS	Root Mean Square (value)
RoHS	Restriction of the use of certain hazardous substances in electrical and electronic equipment
ROM	Read-only Memory
RTC	Real Time Clock
RTS	Request to Send
Rx	Receive Direction
SAR	Specific Absorption Rate
SAW	Surface Acoustic Wave
SELV	Safety Extra Low Voltage
SIM	Subscriber Identification Module
SMD	Surface Mount Device

SMS	Short Message Service
SMT	Surface Mount Technology
SPI	Serial Peripheral Interface
SRAM	Static Random Access Memory
SRB	Signalling Radio Bearer
TA	Terminal adapter (e.g. GSM module)
TDMA	Time Division Multiple Access
TE	Terminal Equipment, also referred to as DTE
TLS	Transport Layer Security
TPC	Transmit Power Control
TS	Technical Specification
Tx	Transmit Direction
UART	Universal asynchronous receiver-transmitter
UICC	USIM Integrated Circuit Card
UL	Upload
UMTS	Universal Mobile Telecommunications System
URC	Unsolicited Result Code
USB	Universal Serial Bus
USIM	UMTS Subscriber Identification Module
USSD	Unstructured Supplementary Service Data
VSWR	Voltage Standing Wave Ratio
WCDMA	Wideband Code Division Multiple Access

AT COMMAND SUMMARY

The AT standard is a line-oriented command language. AT is an abbreviation of ATtention and it is always used to send a command line from the terminal equipment (TE) to the terminal adaptor (TA).

The command line consists of a string of alphanumeric characters. It is sent to the MTX-3G-JAVA to instruct it to perform the commands specified by the characters.

The AT commands listed below are supported from within the miniPCIe-CEFIRO. The AT Command Set manual can be downloaded from the miniPCIe-CEFIRO web page at www.mtxm2m.com.

AT COMMAND	DESCRIPTION
+++	Switch from data mode or PPP online mode to command mode
A/	Repeat Previous Command Line
AT&C	Set Data Carrier Detect (DCD) Line Mode
AT&D	Set Data Terminal Ready (DTR) Line Mode
AT&F	Reset AT Command Settings to Factory Default Values
AT&S	Set Data Set Ready (DSR) Line Mode
AT&V	Display current configuration
AT&W	Store AT Command Settings to User Defined Profile
AT+CACM	Accumulated call meter (ACM) reset or query
AT+CALA	Alarm Configuration
AT+CAMM	Accumulated call meter maximum (ACMmax) set or query
AT+CAOC	Advise of Charge Information
AT+CBST	Select Bearer Service Type
AT+CCFC	Call forwarding number and conditions control
AT+CCID	USIM Card Identification Number
AT+CCLK	Real Time Clock

AT+CCUG	Closed User Group
AT+CCWA	Call Waiting
AT+CEER	Extended Error Report
AT+CFUN	Functionality Level
AT+CGACT	PDP context activate or deactivate
AT+CGANS	Manual response to a network request for PDP context activation
AT+CGATT	GPRS attach or detach
AT+CGAUTO	Automatic response to a network request for PDP context activation
AT+CGCMOD	PDP Context Modify
AT+CGDATA	Enter data state
AT+CGDCONT	Define PDP Context
AT+CGEQMIN	Rel. 99 Quality of Service Profile (Minimum acceptable)
AT+CGEQREQ	Rel. 99 Quality of Service Profile (Requested)
AT+CGEREP	GPRS event reporting
AT+CGMI	Request manufacturer identification
AT+CGMM	Request model identification
AT+CGMR	Request revision identification of software status
AT+CGPADDR	Show PDP address
AT+CGQMIN	Quality of Service Profile (Minimum acceptable)
AT+CGQREQ	Quality of Service Profile (Requested)
AT+CGREG	Packet Domain Network Registration Status
AT+CGSMS	Select service for MO SMS messages

AT+CGSN	Request International Mobile Equipment Identity (IMEI)
AT+CHLD	Call Hold and Multiparty
AT+CHUP	Hang up call
AT+CIMI	Request International Mobile Subscriber Identity (IMSI)
AT+CLCC	List of current calls
AT+CLCK	Facility lock
AT+CLIP	Calling Line Identification Presentation
AT+CLIR	Calling Line Identification Restriction
AT+CMEE	Error Message Format
AT+CMGC	Send SMS Command
AT+CMGD	Delete short message
AT+CMGF	Select SMS message format
AT+CMGL	List SMS messages from preferred store
AT+CMGR	Read SMS messages
AT+CMGS	Send SMS
AT+CMGW	Write Short Messages to Memory
AT+CMMS	More Messages to Send
AT+CMSS	Send short messages from storage
AT+CMUT	Mute control
AT+CMUX	Multiplex mode
AT+CNAP	Calling Name Presentation
AT+CNMA	New Message Acknowledgement to ME/TE

AT+CNMI	SMS Event Reporting Configuration
AT+CNUM	Read own numbers
AT+COLP	Connected Line Identification Presentation
AT+COPN	Read operator names
AT+COPS	Operator Selection
AT+CPAS	Activity Status
AT+CPBF	Find phonebook entries
AT+CPBR	Read from Phonebook
AT+CPBS	Select phonebook memory storage
AT+CPBW	Write into Phonebook
AT+CPIN	PIN Authentication
AT+CPIN2	PIN2 Authentication
AT+CPLS	Select Preferred Operator List
AT+CPMS	Preferred SMS message storage
AT+CPOL	Preferred Operator List
AT+CPUC	Price per unit and currency table
AT+CPWD	Change Password
AT+CR	Service reporting control
AT+CRC	Incoming Call Indication Format
AT+CREG	Network Registration Status
AT+CRLP	Configure RLP Parameters for Outgoing Non-Transparent Data Calls
AT+CRSM	Restricted SIM Access

AT+CSCA	SMS Service Center Address
AT+CSCB	Select Cell Broadcast Message Indication
AT+CSCS	Character Set
AT+CSDH	Show SMS text mode parameters
AT+CSIM	Generic USIM Access
AT+CSMP	Set SMS Text Mode Parameters
AT+CSMS	Select Message Service
AT+CSQ	Signal quality
AT+CSSN	Supplementary service notifications
AT+CSTA	Select type of address
AT+CSVM	Set voice mail number
AT+CTZR	Time Zone Reporting
AT+CTZU	Automatic Time Zone Update
AT+CUSD	Unstructured Supplementary Service Data
AT+GSN	Request International Mobile Equipment Identity (IMEI)
AT+IPR	Bit Rate
AT+STKCC	USAT Call Control Notification
AT+STKCNF	USAT Proactive Session Status
AT+STKENV	USAT Envelope Command
AT+STKPRO	USAT Proactive Command URCs
AT+STKTR	USAT Terminal Response Commands
AT+VTD	Tone duration

AT+VTS	DTMF and tone generation
AT\Q	Flow Control
AT^SBV	Battery/Supply Voltage
AT^SCCNT	Configure Pulse Counter
AT^SCFG	Extended Configuration Settings
AT^SCPIN	Pin Configuration
AT^SCPOL	Polling Configuration
AT^SCTM	Critical Operating Temperature Monitoring
AT^SFDL	Firmware Download
AT^SFSA	Flash File System Access
AT^SGAUTH	Set Type of Authentication for PDP-IP Connections
AT^SGIO	Get IO state of a specified pin or port
AT^SHUP	Hang up call(s) indicating a specific 3GPP TS 24.008 release cause
AT^SICI	Internet Connection Information
AT^SICS	Internet Connection Setup Profile
AT^SIND	Extended Indicator Control
AT^SIPS	Internet Profile Storage
AT^SISC	Internet Service Close
AT^SISE	Internet Service Error Report
AT^SISH	Internet Listener Service Disconnect
AT^SISI	Internet Service Information
AT^SISO	Internet Service Open

AT^SISR	Internet Service Read Data
AT^SISS	Internet Service Setup Profile
AT^SIST	Enter Transparent Access Mode
AT^SISW	Internet Service Write Data
AT^SISX	Internet Service Execution
AT^SJAM	Manage Java Application
AT^SJDL	Java Download
AT^SJMSEC	Java Midlet Security
AT^SJNET	Set Dialup Network Access Parameters
AT^SJOTAP	Over The Air Application Provisioning
AT^SJRA	Run Java Application
AT^SLED	LED Feature
AT^SMGL	List Short Messages from preferred store without setting status to REC READ
AT^SMGR	Read short message without setting status to REC READ
AT^SMONI	Monitoring Serving Cell
AT^SMONP	Monitoring Neighbour Cells
AT^SMSO	Switch Off EHS6
AT^SNFI	Set microphone path parameters
AT^SNFM	Set microphone audio path and power supply
AT^SNFO	Set audio output (= loudspeaker path) parameter
AT^SNFS	Select audio hardware set

AT^SNFTTY	Signal TTY/CTM audio mode capability
AT^SNMON	Network monitoring
AT^SPIO	GPIO Driver Open/Close
AT^SPOW	Set UART Mode and SLEEP Mode on UART
AT^SRADC	Configure and Read ADC Measurement
AT^SRTC	Ring tone configuration
AT^SSCNT	Start and Stop Pulse Counter
AT^SSIO	Set IO state of a specified pin or port
AT^SSPI	Serial Protocol Interface
AT^SSTA	Remote-SAT Interface Activation
AT^SWDAC	PWM Signal Configuration for DAC
AT^SXCALLSTAT	Set Reporting Call Status
AT^SXEONS	Display Eons names
AT^SXRAT	Selection of Radio Access Technology
ATA	Connect to Incoming Call
ATA	Manual acceptance of a network request for PDP context activation
ATD	Mobile originated call to specified number
ATD*99#	Request Packet Domain Service
ATD><mem><n>	Mobile originated call using specific memory and index number
ATD><n>	Mobile originated call from active memory using index number
ATD><str>	Mobile originated call from active memory using corresponding field
ATDL	Redial last number used

ATE	AT Command Echo
ATH	Disconnect existing connection
ATI	Display product identification information
ATL	Set monitor speaker loudness
ATO	Switch from command mode to data mode/PPP online mode
ATQ	Result Code Presentation Mode
ATS0	Set number of rings before automatically answering a call
ATS10	Set disconnect delay after indicating the absence of data carrier
ATS3	Command Line Termination
ATS4	Response Formatting
ATS5	Command Line Editing
ATS6	Set pause before blind dialing
ATS7	Set number of seconds to wait for connection completion
ATS8	Comma Dial Pause Time
ATV	Result code format mode
ATX	CONN251 4ECT Result Code Format
ATZ	Restore AT Command Settings from User Defined Profile

ACCESSORIES

The miniPCIe-CEFIRO has a wide range of available accessories, including:

- 52-pin application connectors
- u.FL cable assemblies
- All type of antennas (indoor, outdoor, high gain, etc.)

The miniPCIe-CEFIRO is shipped without any accessories.

Please visit the following web sites to see the full range of accessories: www.mtxm2m.com.

SALES CONTACT

MATRIX MADRID

Matrix Electrónica S.L.
C/ Alejandro Sánchez 109
28019 Madrid, Spain

Phone 1: 902.19.81.46
Phone 2: +34-91.560.27.37
Fax 1: 902.99.54.14
Fax 2: +34-91.565.28.65

MATRIX BARCELONA

Matrix Electrónica S.L.
@SantCugat Business Park
Av. Via Augusta 15-25, B2- 8, oficinas 9-10
08174 Sant Cugat del Vallés, Barcelona, Spain

Phone: 902.19.81.46
Fax: 902.99.54.14

MATRIX DURANGO

Matrix Electrónica S.L.
Pol. Aliendalde 11, oficina 2G
48200 Durango, Vizcaya, Spain

Phone: 902.19.81.46
Fax: 902.99.54.14

MATRIX VALENCIA

Matrix Electrónica S.L.
Valencia, Spain

Phone: 902.19.81.46
Fax: 902.99.54.14

MATRIX SEVILLA

Matrix Electrónica S.L.
Torneo Parque Empresarial
C/ Arquitectura 1, Torre 6
41015 Sevilla, Spain

Phone: 902.19.81.46
Fax: 902.99.54.14

MATRIX LISBOA

LusoMatrix Lda.
Av. Coronel Eduardo Galhardo 7-1ºC
1170-105 Lisboa, Portugal

Phone: +351-218.162.625
Fax: +351-218.149.482

MATRIX CHICAGO

Matrix USA LLD
1112 W. Boughton Rd, Suite 346
Bolingbrook, IL 60440
USA

mtxm2m.com