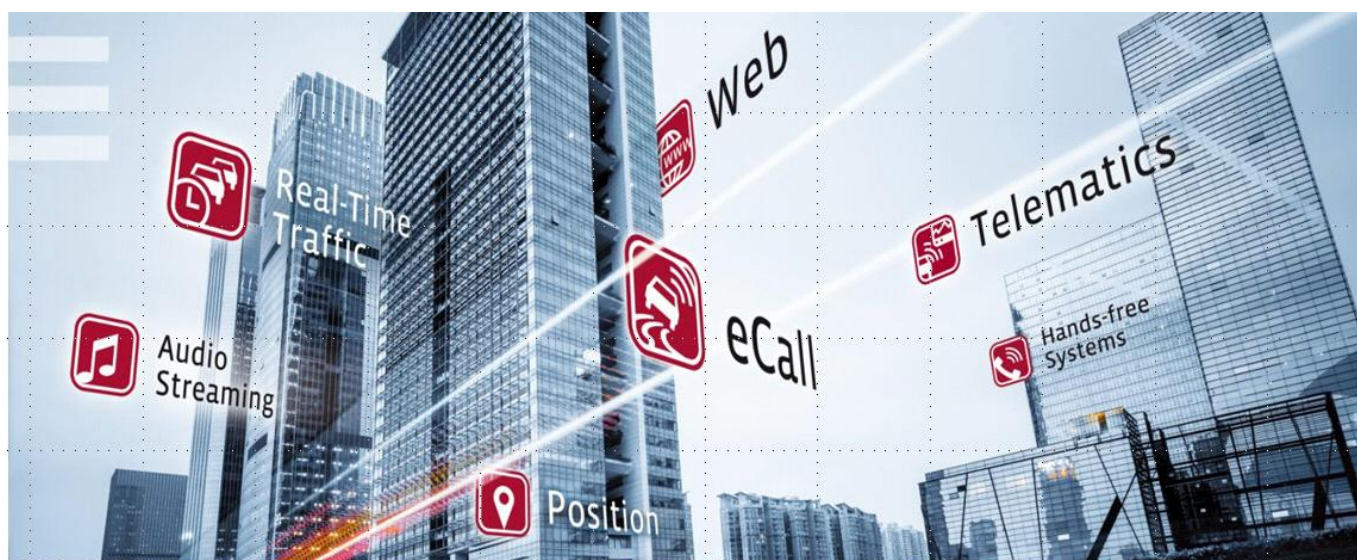


V123x-0 (LTE-NAD-A) User manual



Peiker product IDs: 2189-230-042-00 (V1230-0)
 2189-231-042-00 (V1231-0)
 2189-232-042-00 (V1232-0)
 2189-233-042-00 (V1233-0)

Revision: 1.4
Date: August 2017

Revision History

Date	Revision	Name	Comment
28.02.2017	1.0	mgi	Initial document based on V123x-1 documents
01.03.2017	1.1	phse	Some rewording as well as some corrections
06.03.2017	1.2	mgi	Model name changed to V123x-0
08.08.2017	1.3	phse	Renumbering of some sections Added new section called "Maximum TX Output Power"
04.09.2017	1.4	phse	Updated the temp range table from section 2.12.1 Reworked section 6 Updated the pin-out table

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1 Introduction

1.1 Scope

This document gives an overview about electrical, mechanical and functional details of the peiker LTE-NAD-A V123x-0 modules.

1.2 Audience

Information to integrate the module in some other applications.

1.3 Contact information, Support

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2 Product Overview

2.1 Product Variants

The LTE-NAD-A module family consists of four regional variants:

Peiker product #	Module configuration
2189-230-042-00 (V1230-0)	ECE configuration
2189-231-042-00 (V1231-0)	NA configuration
2189-232-042-00 (V1232-0)	CHN configuration
2189-233-042-00 (V1233-0)	RoW configuration

2.2 Supported Technology/Frequency Bands

V1230-0

GSM Bands	900MHz and 1800MHz
WCDMA Bands	FDD1, FDD3 and FDD8
LTE Bands	eFDD1, eFDD3, eFDD7, eFDD20, eFDD28A, eFDD32 and eTTD38

V1231-0

GSM Bands	850MHz and 1900MHz
WCDMA Bands	FDD2, FDD4 and FDD5
LTE Bands	eFDD2, eFDD4, eFDD5, eFDD7, eFDD12 and eFDD29

V1232-0

GSM Bands	900MHz and 1800MHz
WCDMA Bands	FDD1 and FDD8
LTE Bands	eFDD1, eFDD3, eFDD7, eTTD38, eTTD40 and eTTD41

V1233-0

GSM Bands	850MHz, 900MHz, 1800MHz and 1900MHz
WCDMA Bands	FDD1, FDD2, FDD3, FDD5, FDD6, FDD8 and FDD19
LTE Bands	eFDD1, eFDD3, eFDD5, eFDD7, eFDD8, eFDD9, eFDD19, eFDD21, eFDD28B and eTTD40

2.3 Maximum TX Output Power

GSM 850 and GSM 900 (PCL=5, 1 UL TS): 34,5 dBm
 GSM 1800 and GSM 1900 (PCL=5, 1 UL TS): 31,5 dBm

GPRS 850 and GPRS 900 (PCL=5, 4 UL TS): 29 dBm
 GPRS 1800 and GPRS 1900 (PCL=0, 4 UL TS): 26 dBm

EDGE 850 and EDGE 900 (PCL=8, 4 UL TS): 23 dBm

EDGE 1800 and EDGE 1900 (PCL=2, 4 UL TS): 22 dBm

WCDMA (all supported frequency bands): 25 dBm

LTE (all supported frequency bands): 25 dBm

2.4 Module to Hosts Mapping

The below table shows the mapping between the module variants and the host/ATM-02 devices:

Module	Host devices embedding this module variant
V1230-0	ATM-02-ECE-R1 and ATM-02-ECE-T1
V1231-0	ATM-02-US-R1 and ATM-02-US-T1
V1232-0	ATM-02-CHN-R1 and ATM-02-CHN-T1
V1233-0	ATM-02-ROW-R1 and ATM-02-ROW-T1

2.5 Features

Features

- Same footprint and pin-out (all modules)
- Voice and data calls (all modules)
- IMS/VoLTE
- 4G: Rel-11, 3G/3G+: Rel-9, 2G: Rel-9
- DTM/eDTM (all modules)
- Standalone GPS, GLONASS, Galileo, SBAS, QZSS and BeiDou

Data rates

- GPRS/EDGE: Multislot class 33
- WCDMA: DL /UL up to 384kbps
- HSPA+:
 - Category 24 in DL using 64 QAM and Dual-Cell; Up to 42 Mbps (All modules except V1231-0)
 - Category 14 in DL using 64 QAM; Up to 21 Mbps (V1231-0)
 - Category 6 in UL using 16 QAM; Up to 5.76 Mbps (All modules)
- LTE Category 11: Up to 450 Mbps in DL using 3 CCs, up to 75 Mbps in UL (All modules)

Power Classes

- LTE: All supported bands, Power Class 3
- WCDMA: All supported bands, Power Class 3
- EDGE: 850/900/1800/1900, Power Class E2
- GSM/GPRS: 850/900, Power Class 4
- GSM/GPRS: 1800/1900, Power Class 1

Dimension and Weight

- Dimensions: 35mm x 38mm x 4,35mm
- Weight < 10 grams

2.6 Certifications / Approvals

	GCF	RED	PTCRB	FCC/IC	AT&T
V1230-0	Planned	Planned			
V1231-0			Planned	Planned	Planned
V1232-0		Planned			
V1233-0		Planned		Planned	

2.7 HW Features

- Qualcomm X12 LTE, 20nmSoC
- MDM9240 Baseband / PMIC: PMD9645 / WTR3925 WTR4905
- Cortex-A7 up to 1.2 GHz
- Modem and low power audio sub systems: QDSP6 processor at up to 850 MHz (turbo)
- RPM Resource and power manager: Cortex M3 up to 100 MHz
- 4Gb NAND Flash
- 2Gb LPDDR2 SDRAM
- 19.2MHz clock reference
- GPS, GLONASS, BeiDou, and Galileo

2.8 Connectors

2.8.1 Module Signal and RF Connectors

LTE-NAD-A has 172 signal pins (2xAA and 2xBB) connector pads with 1.0mm pitch. The signal pads are located close to the board edges.

There are three antenna pads, each collocated by RF GND connectors

- Main transmit and receive antenna – pin LGA_PRX_ANT
- Diversity antenna for WCDMA respective MIMO antenna for LTE – pin LGA_DRX_ANT_IN
- GNSS antenna for both GPS and GLONASS – pin LGA_GPS_DRX_ANT

2.8.2 Ground and Heat Dissipation Connectors

To support the usage of module under complicated thermal conditions, there are a number of large grounded pads in the center of PCB. These pads are dedicated ground pads to transfer heat dissipation to a carrier board.

This should be especially considered by customer designs. A reference design showing landing patterns and PCB stack-up is available on request.

2.9 Main Interfaces

2.9.1 USB

LTE-NAD-A has one USB2.0 OTG high speed (480MBit) compliant interface including the PHY. This IF consists of four signals:

- USB_HS_DP: USB Data Plus signal
- USB_HS_DM: USB Data Minus signal
- USB_HS_ID: USB high-speed data - ID
- MDM_VBUS_DET: USB Voltage Supply

LTE-NAD-A has one USB3.0 high speed (480MBit) compliant interface including the PHY. This IF consists of four signals:

- MDM_USB_SS_RX_P: USB 3.0 receive – plus
- MDM_USB_SS_RX_M: USB 3.0 receive – minus
- MDM_USB_SS_TX_P: USB 3.0 transmit – plus
- MDM_USB_SS_TX_M: USB 3.0 transmit – minus

A dynamic reconfiguration between USB-Host or USB-Device is not foreseen. LTE-NAD-A can be configured to USB-Host or USB-Device by insertion of a resistor on the USB_ID line.

2.9.2 SIM Interface

LTE-NAD-A has two SIM interfaces that are compatible for both 1.8V and 3V SIM Cards. Those IFs consist of the following signals:

VREF_UIM1 / VREF_UIM2
UIM1_CLK / UIM2_CLK
UIM1_DETECT / UIM2_DETECT
UIM1_DATA / UIM2_DATA
UIM1_RESET / UIM2_RESET

The data rate of the SIM IF is up to 4 Mbps, so HW designers should take care of the length and routing of the SIM IF to prevent potential EMC problems.

2.9.3 Power on

The signal PON_1 is used to switch on LTE-NAD-A. As PON_1 is pulled against VMAIN internally, it is recommended to pull this input against GND using an open collector or open drain output only.

2.9.4 Reset

PMD_RESIN_N is used to reset LTE-NAD-A. As PMD_RES_IN is pulled against VMAIN internally, it is recommended to pull this input against GND using an open collector or open drain output only.

2.9.5 GPIOs

There are 51 GPIOs available on LTE-NAD-A, some of them being part of the five GSBI s (see next section). They are used for different interfaces (see Table 1 and the following sections). For allocation of GPIOs/GSBI s to different configurations, please contact us.

GPIOs and GSBI s share the same output pins and may not available when used as GSBI configuration.

The following GPIOs do not belong to a GSBI bundle:

GPIO 47, 72, 82, 25, 28, 26, 27, 84, 80, 21, 23, 22, 24, 20, 1, 78, 79, 85, 86, 69, 0, 77, 65, 61, 68, 51, 54, 73, 48, 49, 53.

The following GPIOs belongs to a GSBI bundle:

GPIO 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 29, 30.

2.9.6 GSBI s

Five GSBI s (General Serial Bus Interfaces) are available in total, each of them consisting of four GPIOs. The reference voltage of the GSBI s is 1.8V.

Available signals on GSBI bundles at the board to board connector:

- GSBI1: GSBI1_0, GSBI1_1, GSBI1_2, GSBI1_3 (GPIO_29, 30, 2, 3)
- GSBI2: GSBI2_0, GSBI2_1, GSBI2_2, GSBI2_3 (GPIO_4, 5, 6, 7)
- GSBI3: GSBI3_0, GSBI3_1, GSBI3_2, GSBI3_3 (GPIO_8, 9, 10, 11)
- GSBI4: GSBI4_0, GSBI4_1, GSBI4_2, GSBI4_3 (GPIO_12, 13, 14, 15)
- GSBI5: GSBI5_0, GSBI5_1, GSBI5_2, GSBI5_3 (GPIO_16, 17, 18, 19)

2.9.7 Module Pin-out

Table 1 Module Pin-out

Pin number	Category	9x40 Pin name	Description
1	GND	GND	Ground
2	USB3.0	MDM_USB_SS_TX_M	USB 3.0 transmit – minus
105	USB3.0	MDM_USB_SS_TX_P	USB 3.0 transmit – plus
3	GND	GND	Ground
106	GND	GND	Ground
4	USB3.0 (9x40)	MDM_USB_SS_RX_M	USB 3.0 receive – minus
107	USB3.0 (9x40)	MDM_USB_SS_RX_P	USB 3.0 receive – plus
5	GND	GND	Ground
108	GND	GND	Ground
6	PCIE/WLAN IF	PCIE_REFCLK_M	PCIE reference clock – minus
109	PCIE/WLAN IF	PCIE_REFCLK_P	PCIE reference clock – plus
7	GND	GND	Ground
110	GND	GND	Ground
8	PCIE/WLAN IF	PCIE_TX_M	PCIE transmit – minus
111	PCIE/WLAN IF	PCIE_TX_P	PCIE transmit – plus
9	GND	GND	Ground
112	GND	GND	Ground
10	PCIE/WLAN IF	PCIE_RX_M	PCIE receive – minus
113	PCIE/WLAN IF	PCIE_RX_P	PCIE receive – plus
11	GND	GND	Ground
114	GND	GND	Ground
12	USB	PMD_USB_ID	USB high-speed data – ID
115	USB	USB2_EXT_VBUS_DET	External USB Vbus detection
13	GND	GND	Ground
116	GPIO	GPIO_86	Configurable I/O
14	Reserved	Reserved	Inter-chip communication
117	GND	GND	Ground
15	Reserved	Reserved	Inter-chip communication
118	GND	GND	Ground
16	USB	MDM_USB_HS_DP	USB high-speed data – plus
119	USB	MDM_USB_HS_DM	USB high-speed data – minus
17	GND	GND	Ground

120	SDIO IF/eMMC	GPIO_96 / MDM_SDC1_DATA_4	Secure digital controller data bit 4
18	SDIO IF/eMMC	GPIO_97 / MDM_SDC1_DATA_5	Secure digital controller data bit 5
121	SDIO IF/eMMC	GPIO_98 / MDM_SDC1_DATA_6	Secure digital controller data bit 6
19	SDIO IF/eMMC	GPIO_99 / MDM_SDC1_DATA_7	Secure digital controller data bit 7
122	SDIO IF	GPIO_81 / SD_CARD_DET_N	Secure digital card detection
20	SDIO IF	MDM_SDC1_DATA_0	Secure digital controller data bit 0
123	SDIO IF	MDM_SDC1_DATA_1	Secure digital controller data bit 1
21	SDIO IF	MDM_SDC1_DATA_2	Secure digital controller data bit 2
124	SDIO IF	MDM_SDC1_DATA_3	Secure digital controller data bit 3
22	GND	GND	Ground
125	SDIO IF	MDM_SDC1_CMD	Secure digital controller 2 command
23	SDIO IF	MDM_SDC1_CLK	Secure digital controller 2 clock
126	SIM1	VREG_L11_UIM1	Reference for UIM I/O pads
24		GND	Ground
127	SIM1	GPIO_79 / MDM_UIM1_CLK	UIM1 clock
25	SIM1	GPIO_78 / MDM_UIM1_RESET	UIM1 reset
128	SIM1	GPIO_77 / MDM_UIM1_DETECT	UIM1 detect (non dual voltage)
26	SIM1	GPIO_76 / MDM_UIM1_DATA	UIM1 data
27	GND	GND	Ground
28	I2S	GPIO_15 / I2S_CLK	I2S Data Clock
129	GND	GND	Ground
29	I2S	MDM_MCLK	Audio Master clock
130	GND	GND	Ground
30	I2S	GPIO_12 / I2S_WS	I2S word select
131	I2S	GPIO_13 / I2S_DO	I2S Data Output
31	I2S	GPIO_14 / I2S_DI	I2S Data Input
132	GND	GND	Ground
32		GPIO_19 / ANT_SW_2	Antenna switch 2
133		GPIO_18 / ANT_SW_1	Antenna switch 1
33	UART4	GPIO_17 / UART4_RX	UART4 receive data
134	UART4	GPIO_16 / UART4_TX	UART4 transmit data
34	GND	GND	Ground
135	GND	GND	Ground
35	GPIO	GPIO_50	Configurable I/O
136		GPIO_23 / ANT_SW_4	Antenna switch 4
36	GND	GND	Ground
137	GND	GND	Ground
37		MDM_RESOUT_N	
138		GPIO_22 / ANT_SW_3	Antenna switch 3

38	UART1	GPIO_21 / UART1_RX	UART1 receive data
139	UART1	UART1_TX	UART2 transmit data
39	GND	GND	Ground
140	SPI	GPIO_7 / SPI_CLK	SPI clock
40	SPI	GPIO_6 / SPI_CS_N	SPI chip select
141	SPI	GPIO_5 / SPI_MISO	SPI master-in slave-out
41	SPI	GPIO_4 / SPI_MOSI	SPI master-out slave-in
142	SIM2	GPIO_2 / MDM_UIM2_RESET	UIM2 reset
42	SIM2	GPIO_1 /MDM_UIM2_DETECT	UIM2 detect (non dual voltage)
143	SIM2	GPIO_0 /MDM_UIM2_DATA	UIM2 data
43	GND	GND	Ground
144	SIM2	VREG_L13_UIM2	Reference for UIM I/O pads
44	SIM2	GPIO_3 / MDM_UIM2_CLK	UIM2 clock
145	GND	GND	Ground
45	GND	GND	Ground
146	GPIO	GPIO_94	Configurable I/O
46	GPIO	GPIO_80	Configurable I/O
147	GPIO	GPIO_90	Configurable I/O
47	GPIO	GPIO_82	Configurable I/O
148	GPIO	GPIO_91	Configurable I/O
48	GPIO	GPIO_87	Configurable I/O
149	GPIO	GPIO_92	Configurable I/O
49	GPIO	GPIO_88	Configurable I/O
150	GPIO	GPIO_93	Configurable I/O
50	GPIO	GPIO_89	Configurable I/O
151	I2C	GPIO_85 / I2C_SCL	I2C clock
51	I2C	GPIO_84 / I2C_SDA	I2C data
152	GND	GND	Ground
52	GND	GND	Ground
53	GND	GND	Ground
54	GND	GND	Ground
153	GND	GND	Ground
55	RF	ANT_PTRX1	Primary cellular signal input/output
154	GND	GND	Ground
56	GND	GND	Ground
155	GND	GND	Ground
57	GND	GND	Ground
156	GND	GND	Ground
58	GND	GND	Ground

157	GND	GND	Ground
59	MIPI	GPIO_46 / RFFE4_DATA	RF front end 4 interface data
158	GND	GND	Ground
60	GND	GND	Ground
159	GND	GND	Ground
61	MIPI	GPIO_47 / RFFE4_CLK	RF front end 4 interface clock
160	GND	GND	Ground
62	GND	GND	Ground
63	GND	GND	Ground
162	JTAG	MDM_JTAG_TDI	JTAG data input
64	GND	GND	Ground
163	JTAG	MDM_JTAG_TDO	JTAG data output
65	GND	GND	Ground
164	JTAG	MDM_JTAG_TMS	JTAG mode select input
66	GND	GND	Ground
165	JTAG	MDM_JTAG_TRST_N	JTAG reset
67	GND	GND	Ground
166	JTAG	MDM_JTAG_TCK	JTAG clock input
68	GND	GND	Ground
167	JTAG	MDM_JTAG_SRST_N	JTAG reset for debug
69	GND	GND	Ground
168	JTAG	MDM_JTAG_PS_HOLD	Power supply hold signal to PMIC
70	GND	GND	Ground
169	POWER	VREG_L6_1P8	1.8V output
71	GND	GND	Ground
170	GND	GND	Ground
72	RF	ANT_DRX1	Diversity cellular signal input/output
171	GND	GND	Ground
73	GND	GND	Ground
172	GND	GND	Ground
74	Reserved	Reserved	Reserved
173	GND	GND	Ground
75	GND	GND	Ground
174	GND	GND	Ground
76	GND	GND	Ground
175	GND	GND	Ground
77	GND	GND	Ground
176	GND	GND	Ground
78	RF	ANT_GNSS	GNSS signal input/output

79	GND	GND	Ground
80		GPIO_38 / GRFC12	
177	GND	GND	Ground
81	GPIO	GPIO_69	Configurable I/O
178		GPIO_67 / EBI2_AD2/FBS_1	
82	GND	GND	Ground
179	BOOT CONFIG	GPIO_36 / FORCED_USB_BOOT	Force USB boot control
83	GPIO	GPIO_8	Configurable I/O
180	GPIO	GPIO_83	Configurable I/O
84	GPIO	GPIO_9	Configurable I/O
181		GPIO_59 / NC	
85	GND	GND	Ground
182		GPIO_24 / EBI2_AD1/FBS_0	
86	GPIO	GPIO_10	Configurable I/O
183		MDM_MODE_0	TBD
87	GPIO	GPIO_11	Configurable I/O
184		MDM_MODE_1	TBD
88	GND	GND	Ground
185	PCIE	GPIO_65 / MDM_PCIE_WAKE_N	PCIe host wake
89	Reserved	Reserved	Reserved
186	PCIE	GPIO_61 / MDM_PCIE_RESET_N	PCIe host reset
90	GND	GND	Ground
187	PCIE	GPIO_64 / MDM_PCIE_CLKREQ_N	PCIe clock request
91	GND	GND	Ground
188	WLAN IF	WLAN_PWR_REQ	
92	GND	GND	Ground
189	GPIO	GPIO_60	Configurable I/O
93	WLAN IF	WLAN_PWR_EN	Enable WLAN Power
190	GPIO	GPIO_68	Configurable I/O
94	WLAN IF	WLAN_SLP_CLK	
191	BT IF	BT_RESET_N	Enable Bluetooth
95	Power-reset PMIC (active low)	PMD_RESIN_N	Reset module
192	GND	GND	Ground
96	Power-on PMIC (active high)	PON_1	Turn on module
193	WLAN IF	GPIO_95 / WLAN_EN	Enable WLAN
97		CBL_PWR_N	
194	WLAN IF	GPIO_52 / COEX_UART_TX	UART transmit data

98	MPP	PMIC_MPP_4	Multipurpose Pin
195	WLAN IF	GPIO_53 / COEX_UART_RX	UART receive data
99	MPP	PMIC_MPP_2	Multipurpose Pin
196	MPP	PMIC_MPP_6	Multipurpose Pin
100	GND	GND_TO_VPH	Ground
197	GND	GND_TO_VPH	Ground
101	POWER	VPH_POWER	External supply voltage
198	POWER	VPH_POWER	External supply voltage
102	POWER	VPH_POWER	External supply voltage
199	POWER	VPH_POWER	External supply voltage
103	POWER	GND_TO_VPH	Ground
200	GND	GND	Ground
104		HW_REV_RESISTOR	

Note: Pins should be grounded when not used in design.

2.10 Supply Voltage

Absolute minimum/maximum supply voltages	3.9V ~ 4.1V
Nominal supply voltage	4V
Recommended supply voltage	4V
Voltage drop @ GSM power burst (33dBm)	<100mV

During Hi RF Power GSM bursts the power amplifier can draw peak currents > 2Amps at VMAIN. The voltage drop during the GSM burst shall not exceed 100mV.

2.11 Power Consumption

$T_A = +25^\circ\text{C}$, $V_{PH_PWR} = 3.8\text{V}$

		Output Power max. (typ. 23dBm)	Output Power 0 dBm
Voice call WCDMA BC1		~530mA	~145mA
Voice call WCDMA BC2		~570mA	~145mA
Voice call WCDMA BC5		~630mA	~140mA
Voice call WCDMA BC8		~580mA	~140mA
		PCL 5 (typ. 32.5 dBm)	PCL 19 (typ. 5dBm)
Voice call GSM850		~260mA	~65mA
Voice call GSM900		~270mA	~65mA
		PCL 0 (typ.30.5dBm)	PCL 15 (typ.0dBm)
Voice call GSM1800		~165mA	~65mA
Voice call GSM1900		~165mA	~65mA

		Output Power	Output Power
Standby current GSM	DRX = 5	Tbd mA	
Standby current WCDMA	DRX = 7	Tbd mA	
Standby current LTE	DRX = 7		
LTE data call B3			
LTE data call B7			
LTE data call B20			

2.12 Environmental Specification

2.12.1 Temperature Range

Range		
Operating temp. range	-25°C ... +70°C	3GPP spec. conform
Extended operating temp. range	-40°C ... +85°C ^{Note 1}	Operational Performance might slightly deviate from 3GPP spec.
Storage temp. range	-40°C ... +85°C	

Note 1: Due to temperature specification of the chipset, the temperature of the power manager and the temperature of the modem chip shall not exceed +85°C.

3 Evaluation Kit

There are two types of evaluation boards fitted with the NAD V123x-0 modules:

- The IFB-1 board allows to power-supply the module directly with external 4V along with sense signals. This 4V power-supply should be able to deliver 3.5A max.
- The IFB-4 board type takes 12V as input voltage, down-converted to 4V by on-board circuitry.

Features:

- USB 2.0 (micro USB) for USB to UART
- USB 3.0 (micro b)
- 2*SIM card slot
- Audio support with microphone and loudspeaker connectors
- JTAG connector for debug and programming
- 5 RF Antenna connector (PTRX,DRX,GNSS,WL,BT)
- 2* RS232 for UART 1 & 4

RF Connectors

- For Cellular RF measurements, use the PTRX and DRX antenna ports

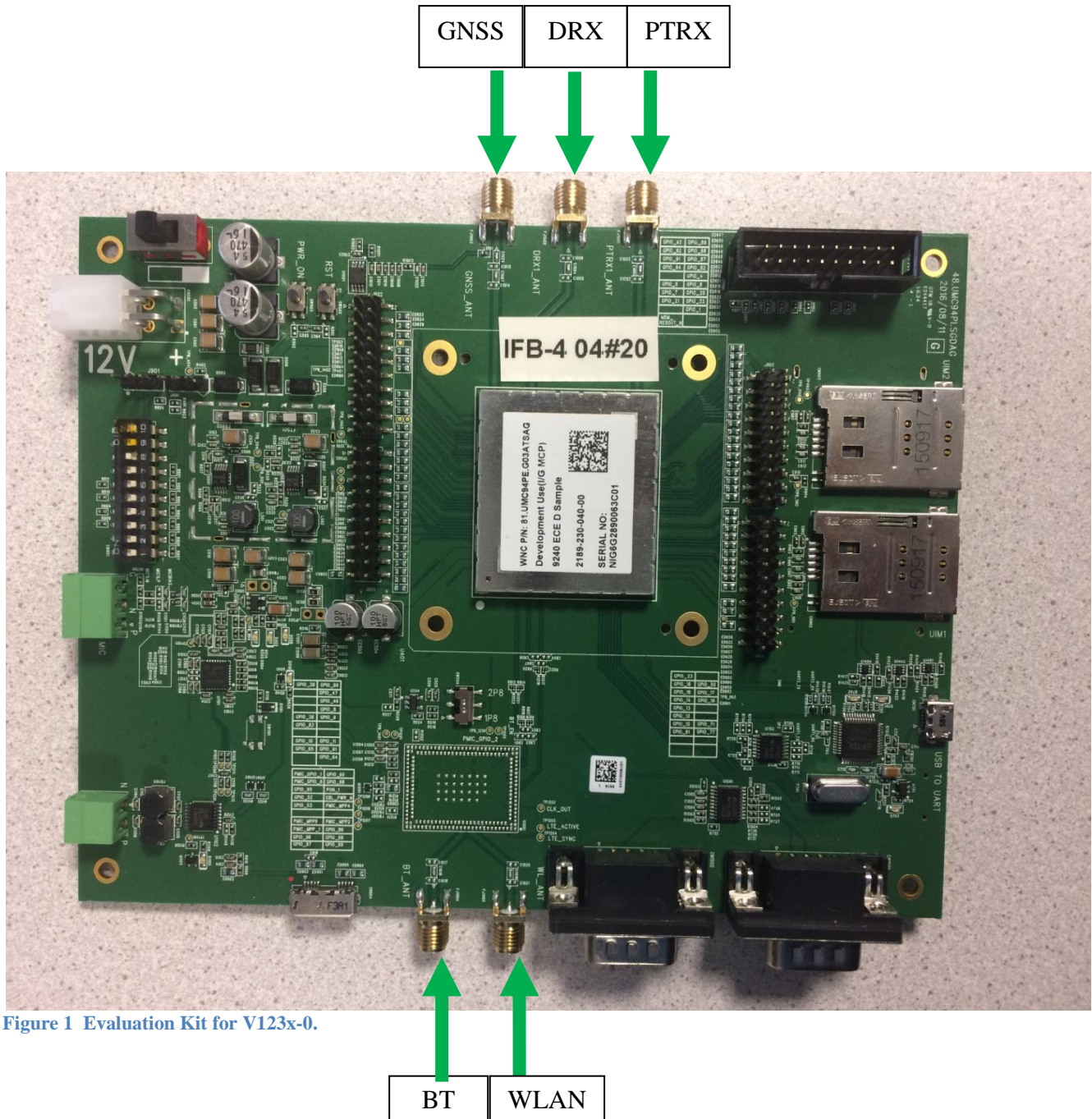


Figure 1 Evaluation Kit for V123x-0.

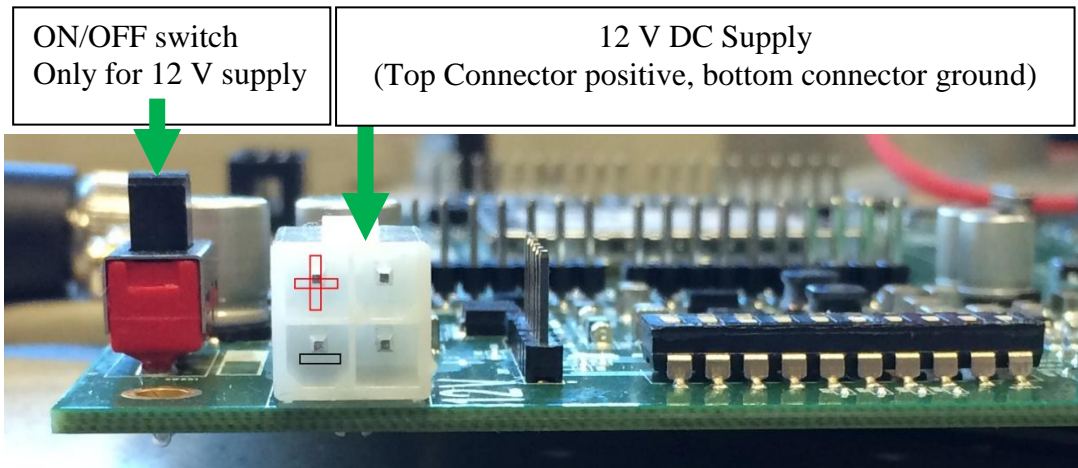


Figure 2 Power supply for Evaluation Kit for V123x-0.

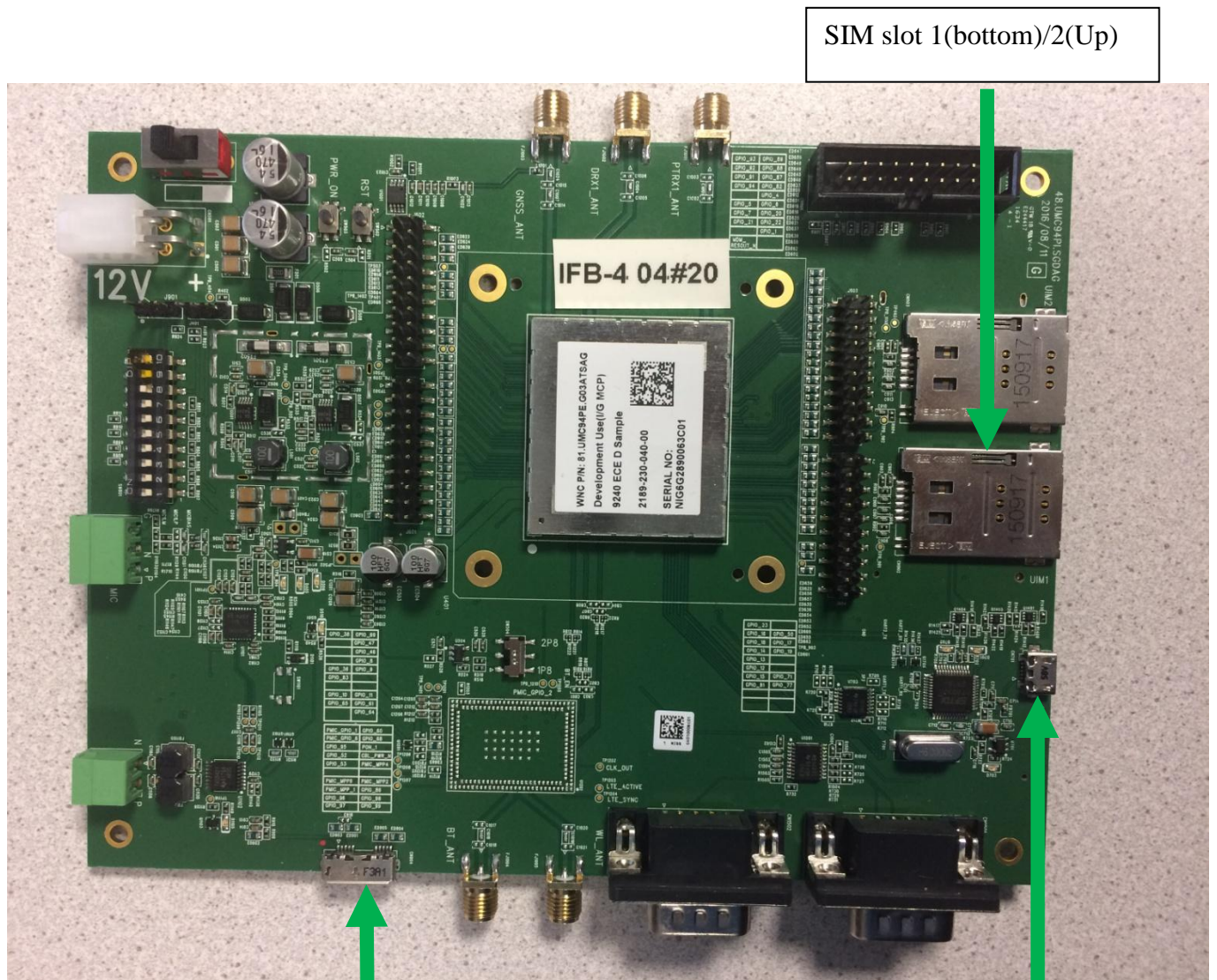


Figure 3 SIM card and USB interfaces for Evaluation Kit for V123x-0.

4 AT Command interface

The modules supports standard AT command as listed below. Commands are compliant to 3GPP TS 27.007 and TS 27.005

Command	Description	Comment
AT+CMGF	Message Format	
AT+CSCA	Service Centre Address	
AT+CMGS	Send Message	
AT+CGMI	Manufacturer Identification	
AT+CGMM	Request model identification	
AT+CGMR	Request revision identification	
AT+CGSN	Request product serial number	
AT+CIMI	Request international mobile subscriber identification	
AT+CMOD	Call mode	Only one Parameter is supported by the device.
AT+CHUP	Hang up call	
ATD	Initiate a CS or PS call or supplementary service	
ATA	Answer incoming CS call command	
ATH	Hangup CS call command	
AT+CBST	Select bearer service type	
AT+CEER	Extended error report	
AT+CVHU	Voice hangup control	
AT+CREG	Network registration	
AT+COPS	PLMN selection	
AT+CLCK	Facility lock	
AT+CPWD	Change password	
AT+CLIP	Calling line identification presentation	
AT+CLIR	Calling line identification restriction	
AT+CCWA	Call waiting	
AT+CHLD	Call related supplementary services	
AT+CUSD	Unstructured supplementary service data	
AT+CLCC	List current calls	
AT+CPOL	Preferred PLMN list	
AT+CPAS	Phone active status	
AT+CFUN	Set phone functionality	
AT+CPIN	Enter PIN	
AT+CSQ	Signal quality	
AT+CMER	Mobile termination event reporting	
AT+CSIM	Generic SIM access	
AT+CRSM	Restricted SIM access	
AT+CMEE	Report mobile termination error	
AT+CGDCONT	Define PDP context	
AT+CGEQREQ	Request 3G quality of service profile	
AT+CGATT	PS attach or detach	
AT+CGACT	PDP context activate or deactivate	
AT+CGPADDR	Show PDP address	
AT+CGSMS	Select service for MO SMS messages	
ATE	Character Echo ON/OFF	

Command	Description	Comment
AT+CSMS	Check Message Service support	
AT+CSMP	Set Text Mode Parameters	
AT+CSDH	Show Text Mode Parameters	
AT+CSCB	Select Cell Broadcast Message Types	
AT+CSAS	Save Settings	Only one Parameter is supported by the device.
AT+CRES	Restore Settings	Only one Parameter is supported by the device.
AT+CMGL	List messages	
AT+CNMA	New message acknowledgement	
AT+CMGC	Send Command	
AT+CMMS	More Messages to Send	
AT+ATV	DCE response format	
AT+ATX	Result code selection and call progress monitoring control	
AT+CNMI	New Message Indications to TE	
AT+CPMS	Preferred Message Storage	
AT+CMGW	Write Message to Memory	
AT+CMSS	Send Message from Storage	
AT+CMGD	Delete Messages	
AT+CNUM	Get MSISDN	
AT+CPBS	Select phonebook memory storage	
AT+CPBR	Read phonebook entries	
AT+CPBW	Writephonebook entry	

5 Safety Recommendations according to EN60950-1

The V123x-0 devices must be supplied by a limited power source according to EN 60950-1.

The clearance and creepage distances required by the end product must be withheld when the module is installed.

The cooling of the end product shall not negatively be influenced by the installation of the module.

6 RED/FCC/IC Regulatory Notices

6.1 Modifications

WARNING: peiker acustic GmbH & Co. KG has not approved any changes or modifications to the V123x-0 device by the user. Any changes or modifications could void the user's authority to operate the equipment.

6.2 Interference

V1231-0 and V1233-0 devices comply with Part 15 of the FCC rules. Operation is subject to the following two conditions:

- (1) Those devices may not cause harmful interference, and
- (2) Those devices must accept any interference received, including interference that may cause undesired operation.

V1231-0 is a Class b digital apparatus compliant with Canadian ICES-003.

V1231-0 est un appareil numérique de la classe b conforme à la norme NMB-003 du Canada.

V1231-0 est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

6.3 FCC Class B Digital Device

V1231-0 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.

6.3 OEM Responsibilities

Antenna

- The systems antenna(s) must be installed such that 20 cm is maintained between the antenna(s) and the body of the user or nearby persons.
- The V123x-0 transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. The preceding statement must be included as a Caution statement in OEM product manuals in order to alert users of FCC RF Exposure compliance.
- Maximum authorized antenna gain: refer to the MPE test reports

Power Supply

- The power supply of the host device embedding a V123x-0 module must fulfill the following requirements:
 - o Nominal supply voltage: 4V
 - o Operating voltage range: 3.9V – 4.1V
 - o The above operating voltage range **MUST** never, under any circumstances (including overshoot voltage and voltage drop), be exceeded.

FCC Labeling

Labeling requirements for a host device embedding V1231-0:

V1231-0 is labeled with its own FCC ID Number. If the FCC ID is not visible when V1231-0 is installed inside another device, then the host device must contain the FCC ID number with the statement such as the following: "Contains Transmitter Module FCC ID: QWY-V1231-0" or "Contains FCC ID: QWY-V1231-0"

Labeling requirements for a host device embedding V1233-0:

V1233-0 is labeled with its own FCC ID Number. If the FCC ID is not visible when V1233-0 is installed inside another device, then the host device must contain the FCC ID number with the statement such as the following: "Contains Transmitter Module FCC ID: QWY-V1233-0" or "Contains FCC ID: QWY-V1233-0"

IC Labeling

Labeling requirements for a host device embedding V1231-0:

V1231-0 is labeled with its own IC ID Number. If the IC ID is not visible when V1231-0 is installed inside another device, then the host device must contain the IC ID number with the statement such as the following: "Contains Transmitter Module IC 6588A- V12310" or "Contains IC 6588A- V12310".

7 List of Acronyms

3GPP	3 rd Generation Partnership Project
ADC	Analog Digital Converter
ADN	Abbreviated Dialing Number
A-GPS CP	Assisted GPS Control Plane
AMR	Adaptive Multi Rate
AT	Attention Command
AWS	Advanced Wireless Services
BER	Bit Error Rate
CLIP	Calling Line Identification Presentation
CLIR	Calling Line Identification Restriction
CSD	Circuit Switch Data
DARP	Downlink Advanced Receiver Performance
EDGE	Enhanced Data rates for GSM Evolution
DTMF	Dual Tone Multi Frequency
FCC	Federal Communications Commission
FDN	Fixed Dialing Number
FTP	File Transfer Protocol
GCF	Global Certification Forum
GSM	Global System for Mobile communication
GPIO	General Purpose Input Output
GPRS	General Packet Radio Service
GPS	Global Positioning System
HSPA	High Speed Uplink Packet Access
HW	Hardware
IC	Industry Canada
LED	Led Emitting Diode
LTE	Long-Term Evolution
MO	Mobile Originated
MT	Mobile Terminated
OEM	Original Equipment Manufacturer
PCB	Printed Circuit Board
PCM	Pulse Code Modulation
PDU	Protocol Data Unit
PIN	Personal Identification Number
PTCRB	PCS Type Certification Review Board
RF	Radio Frequency
RoHs	Restriction of Hazardous Substances
UART	Universal Asynchronous Receiver and Transmitter
USB	Universal Serial Bus
USIM	Universal Subscriber Identity Module
UMTS	Universal Mobile Telecommunications System
WCDMA	Wideband Code Division Multiple Access