

EVK-L4

TOBY-L4 series

Cellular Evaluation Kits

User Guide

Abstract

This guide explains how to set up the EVK-L4 Evaluation Kits to begin evaluating the u-blox TOBY-L4 series cellular modules supporting LTE-FDD, LTE-TDD, DC-HSPA+, (E)GPRS multi-mode and multi-band radio access technologies. The modules offer up to 301.5 Mb/s download and up to 51.0 Mb/s upload data rates with Category 6 LTE-Advanced carrier aggregation technology.



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This document applies to the following products:

Name	Type number	Modem version	Application version	PCN reference	Product Status
EVK-L4006	EVK-L4006-0-00	TBD	TBD	TBD	Functional Sample
	EVK-L4006-5-00	40.14	A00.01	UBX-17047934	Prototype
EVK-L4106	EVK-L4106-0-00	TBD	TBD	TBD	Functional Sample
	EVK-L4106-5-00	40.14	A00.01	UBX-17047934	Prototype
EVK-L4206	EVK-L4206-0-00	TBD	TBD	TBD	Functional Sample
	EVK-L4206-5-00	TBD	TBD	TBD	Functional Sample
EVK-L4906	EVK-L4906-0-00	TBD	TBD	TBD	Functional Sample
	EVK-L4906-5-00	40.19	A00.02	UBX-17058711	Engineering Sample

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Contents

Contents	3
1 Starting up	4
1.1 EVK-L4 overview.....	4
1.2 EVK-L4 block diagram.....	6
1.3 Switches, jumpers and buttons.....	7
1.4 LEDs.....	8
1.5 Connectors.....	9
1.6 EVK-L4 pin out.....	10
1.6.1 Routing of TOBY-L4 modules' pins up to connectors available on the ADP-L4.....	10
1.6.2 Pin-out of the 42-pin Dual-In-Line Board-to-Board connectors on the ADP-L4.....	12
1.6.3 Routing of the TOBY-L4 modules' UART1, UART2 and/or UART3 interface.....	13
1.7 Software installation.....	13
1.8 Board setup.....	14
1.9 Enabling error result codes.....	15
1.10 PIN code insertion (when required).....	15
1.11 Registration on a cellular network.....	16
1.12 Switching off the EVK-L4.....	16
Appendix	17
A Setting up AT terminal applications for communication with the EVK-L4	17
B Setting up cellular packet data connection on PC	18
C Examples of AT commands	20
C.1 Define a default bearer for connectivity.....	20
D Current consumption measurement	21
Declaration of conformities	22
Related documents	22
Revision history	22
Contact	23

1 Starting up

1.1 EVK-L4 overview

The EVK-L4 kits are powerful and easy-to-use tools that simplify the evaluation of u-blox TOBY-L4 series multimode LTE Cat 6 Advanced / 3G / 2G cellular modules.

The TOBY-L4 series include the following LTE Cat 6 modules with 3G and 2G fallback:

- TOBY-L4006 modules, mainly designed for operation in North America
- TOBY-L4106 modules, mainly designed for operation in Europe
- TOBY-L4206 modules, mainly designed for operation in Asia-Pacific and South America
- TOBY-L4906 modules, mainly designed for operation in China

The TOBY-L4 series modules include the following product versions:

- The "00" product versions, integrating the u-blox uCPU on-chip processor to allow customers to run their dedicated applications on an embedded Linux distribution based on Yocto, with RIL-Core connectivity APIs
- The "50" product versions, which can be controlled by an external application processor through standard and u-blox proprietary AT commands described in the u-blox AT Commands Manual [1]

The following evaluation kits are available with u-blox TOBY-L4 cellular modules:

- EVK-L4006 evaluation kits for evaluation of TOBY-L4006 modules, and in details:
 - The EVK-L4006-0 evaluation kit including a TOBY-L4006-00A module
 - The EVK-L4006-5 evaluation kit including a TOBY-L4006-50A module
- EVK-L4106 evaluation kits for evaluation of TOBY-L4106 modules, and in details:
 - The EVK-L4106-0 evaluation kit including a TOBY-L4106-00A module
 - The EVK-L4106-5 evaluation kit including a TOBY-L4106-50A module
- EVK-L4206 evaluation kits for evaluation of TOBY-L4206 modules, and in details:
 - The EVK-L4206-0 evaluation kit including a TOBY-L4206-00A module
 - The EVK-L4206-5 evaluation kit including a TOBY-L4206-50A module
- EVK-L4906 evaluation kits for evaluation of TOBY-L4906 modules, and in details:
 - The EVK-L4906-0 evaluation kit including a TOBY-L4906-00A module
 - The EVK-L4906-5 evaluation kit including a TOBY-L4906-50A module

This document identifies all the EVK-L4006, EVK-L4106, EVK-L4206, and EVK-L4906 evaluation kits as EVK-L4.



See the TOBY-L4 series Data Sheet [2] and the TOBY-L4 series System Integration Manual [3] for the features supported by the u-blox TOBY-L4 series cellular modules.

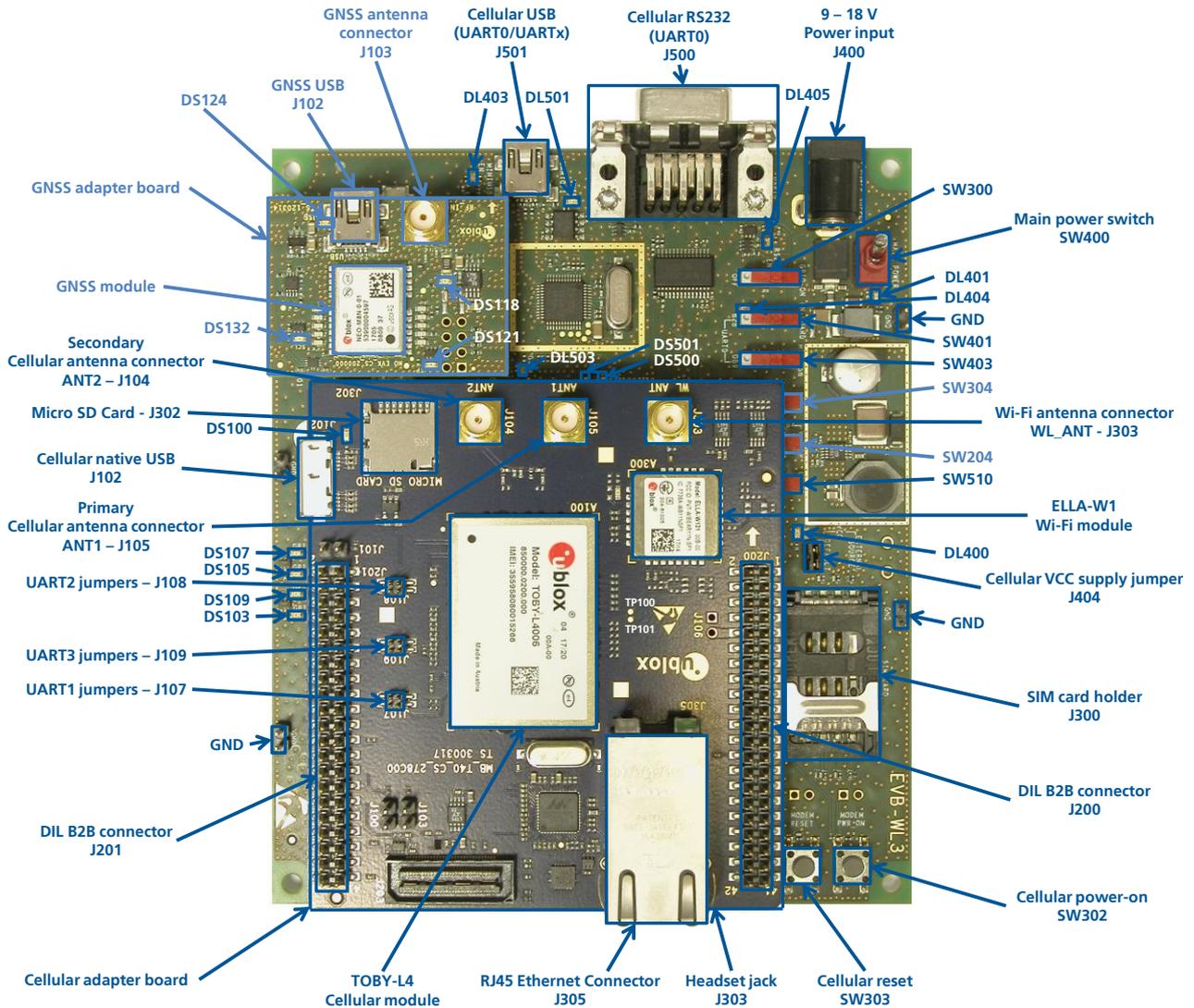


Figure 1: Overview of the EVK-L4 evaluation kit for TOBY-L4 modules

1.2 EVK-L4 block diagram

Figure 2 shows the main interfaces and internal connections of the EVK-L4 evaluation kit:

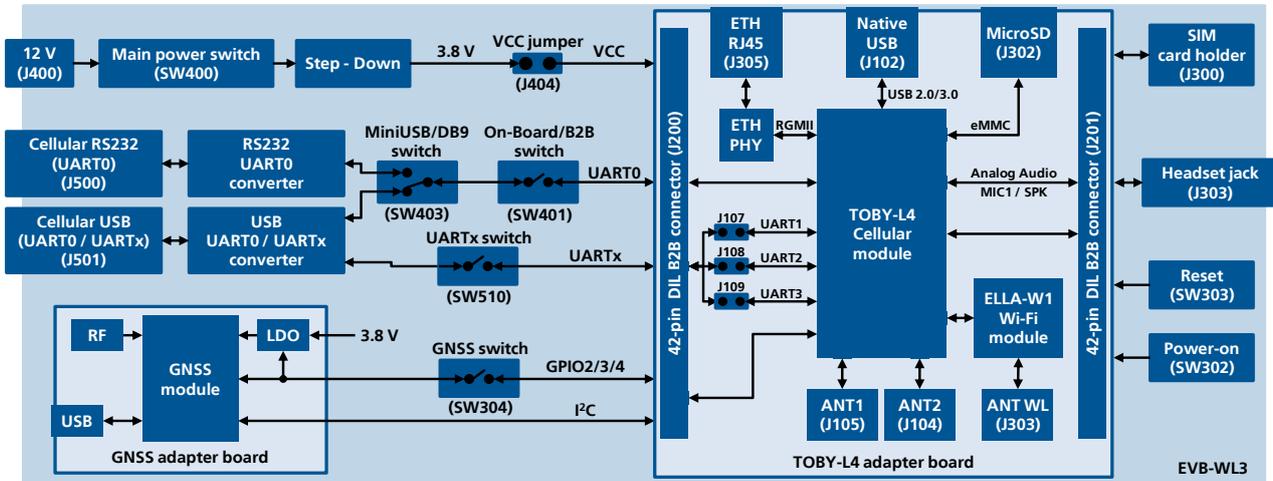


Figure 2: Block diagram of EVK-L4 for TOBY-L4 modules

The EVK-L4 is formed by three boards:

- The lower one, called EVB-WL3, contains the power supply and other peripherals for the TOBY-L4 series cellular module (as SIM card holder, Headset jack, Reset button and Power-on button).
- The cellular adapter board, called ADP-L4, contains the TOBY-L4 cellular module, the cellular antenna connectors, the USB connector, the Ethernet RJ45 connector, and the MicroSD connector for the cellular module, and it also contains the u-blox ELLA-W1 series Wi-Fi module and the Wi-Fi antenna connector.
- The GNSS adapter board, called ADP-GNSS, contains the u-blox GNSS module, the GNSS antenna connector and the USB connector for the GNSS module.

The boards are connected by means of male header board-to-board connectors provided on the bottom of the adapter boards and their corresponding female connectors provided on top of the lower board.

The USB interface of the cellular module is available on the native USB connector on the cellular adapter board, while the other peripherals are available on the Dual-In-Line male Board-to-Board connectors provided on the top layer of the cellular Adapter Board (J200 / J201), which are pin-to-pin compatible to the connectors on the bottom layer of the adapter board.

The lower board (EVB-WL3) is designed to also be used with other u-blox cellular adapter boards. It contains additional switches, jumpers, connectors, LEDs and parts that are only partially described in Figure 1 or in this document, because they are intended for use only with other u-blox cellular modules. It is recommended to leave any additional connector unconnected, and to leave any additional switch in its default configuration.

1.3 Switches, jumpers and buttons

Function	Description	Name	Board
Main Power Switch	Power on / off of the whole evaluation kit	SW400	EVB
Cellular VCC jumper	Jumper socket to provide the 3.8 V supply to the cellular module VCC input	J404	EVB
Cellular Power-on	Push button to switch on the cellular module	SW302	EVB
Cellular Reset	Push button to reset the cellular module	SW303	EVB
Cellular UART0 detach	Slide switch to attach / detach cellular module UART from the USB / RS232 connectors: when detached, UART signals available only on the DIL B2B connector on the ADP board	SW401	EVB
Cellular UART0 routing	Slide switch to select cellular module UART routing on the USB or on the RS232 connector	SW403	EVB
Cellular UARTx detach	Slide switch to attach / detach cellular module UARTx from the USB connector: when detached, UARTx signals available only on the DIL B2B connector on the ADP board	SW510	EVB
Cellular UART1 jumpers	Jumper sockets to attach / detach cellular module UART1 interface to UARTx signals available on the DIL B2B connector on the ADP board	J107	ADP-L4
Cellular UART2 jumpers	Jumper sockets to attach / detach cellular module UART2 interface to UARTx signals available on the DIL B2B connector on the ADP board	J108	ADP-L4
Cellular UART3 jumpers	Jumper sockets to attach / detach cellular module UART3 interface to UARTx signals available on the DIL B2B connector on the ADP board	J109	ADP-L4
Cellular GPIO detach	Slide switch to attach / detach the cellular module GPIOs, SIM_DET from peripherals: when detached, the signals are available only on the DIL B2B connector on the ADP board	SW300	EVB
Cellular GNSS detach	Slide switch to attach / detach the cellular module to the GNSS module (GPIO2-3-4): when detached, the signals are available only on DIL B2B connector on the ADP board	SW304	EVB
GNSS V_BCKP	Slide switch to connect / disconnect backup battery to V_BCKP pin of the GNSS module	SW204	EVB

Table 1: Description of EVK-L4 switches and buttons

1.4 LEDs

Function	Description	LED #	Board	Color
Main Power	Power supply plugged in the 9 - 18 V Power Input	DL401	EVB	
Cellular VCC	Cellular module supplied. Main Power Switch must be switched on	DL400	EVB	
Cellular native USB	USB cable plugged into the Cellular native USB connector	DS100	ADP-L4	
Cellular USB (UART0/UARTx)	USB cable plugged into the Cellular USB connector for UART0 / UARTx access	DL501	EVB	
Cellular USB / UART0	Green light is activated when the UART0 is routed to the Cellular USB connector Red light blinks at UART0 TX or RX data on the Cellular USB connector	DL403	EVB	
Cellular UART0 detach	UART0 signals are available only on the DIL B2B connector on the ADP board	DL404	EVB	
Cellular RS232 / UART0	Green light is activated when UART0 is routed to the Cellular RS232 connector Red light blinks at UART0 TX or RX data on the Cellular RS232 connector	DL405	EVB	
Cellular USB / UARTx	Green light is activated when UARTx is routed to the Cellular USB connector Red light blinks at UARTx TX or RX data on the Cellular USB connector	DL503	EVB	
Cellular RI indicator	RI line turns ON (active low)	DS501	EVB	
Cellular CTS indicator	CTS line turns ON (active low)	DS500	EVB	
Cellular GPIO1 indicator	Green light is activated when cellular GPIO1 is high	DS107	EVB	
Cellular GPIO2 indicator	Green light is activated when cellular GPIO2 is high	DS105	EVB	
Cellular GPIO3 indicator	Green light is activated when cellular GPIO3 is high	DS109	EVB	
Cellular GPIO4 indicator	Green light is activated when cellular GPIO4 is high	DS103	EVB	
GNSS VCC supply	GNSS module supply is turned ON	DS118	ADP-GNSS	
GNSS USB	USB cable plugged in GNSS USB connector	DS124	ADP-GNSS	
GNSS Timepulse	Pulses at 1 Hz when valid GNSS fix	DS121	ADP-GNSS	
Cellular / GNSS DDC	Cellular / GNSS module communication over DDC (I ² C) interface	DS132	ADP-GNSS	

Table 2: Description of EVK-L4 LEDs

1.5 Connectors

Function	Description		Name	Board
9 - 18 V Power Input	Connector for the AC / DC power adapter of the EVK AC: 100-240 V, 0.8 A, 50-60 Hz / DC: +12 V, 2.5 A		J400	EVB
SIM card holder	SIM card holder		J300	EVB
Primary cellular antenna	SMA connector for the cellular module primary antenna (ANT1, Tx/Rx)		J105	ADP-L4
Secondary cellular antenna	SMA connector for the cellular module secondary antenna (ANT2, Rx)		J104	ADP-L4
Wireless LAN antenna	SMA connector for the wireless LAN module antenna (WL_ANT, Tx/Rx)		J303	ADP-L4
Cellular native USB	Micro USB 3.0 type B connector for the cellular module native USB interface		J102	ADP-L4
Cellular USB (UART/UARTx)	Mini USB 2.0 type B connector for the cellular module UART0 and UART1/2/3 interfaces converted as USB interface		J501	EVB
Cellular RS232 (UART0)	DB9 connector for the cellular module UART0 interface converted as an RS232 interface		J500	EVB
Micro SD	Micro SD Card connector for the cellular module eMMC interface		J302	ADP-L4
Ethernet	RJ45 Gigabit Ethernet connector for the cellular module RGMII interface converted as a Gigabit Ethernet interface		J305	ADP-L4
DIL B2B headers	Dual-In-Line Board-to-Board connectors for the cellular module interfaces		J200-J201	ADP-L4
Cellular headset	Audio headset jack connector for the cellular module audio interface		J303	EVB
GNSS antenna	SMA connector for the GNSS module antenna (GNSS Antenna)		J208	ADP-GNSS
GNSS USB	Mini USB connector for the GNSS module USB interface		J102	ADP-GNSS
GNSS backup battery	Backup battery socket for the GNSS module (under the GNSS adapter board)		BT200	EVB
GND	Ground terminals for the probe reference		J402, J403 J405, J406	EVB

Table 3: Description of EVK-L4 connectors

 **CAUTION! IN THE UNLIKELY EVENT OF A FAILURE IN THE INTERNAL PROTECTION CIRCUITRY, THERE IS A RISK OF AN EXPLOSION WHEN CHARGING A FULLY OR PARTIALLY DISCHARGED BATTERY. REPLACE THE BATTERY WHEN IT NO LONGER HAS A SUFFICIENT CHARGE FOR UNIT OPERATION. CONTROL THE BATTERY BEFORE USE IF THE DEVICE HAS NOT BEEN USED FOR AN EXTENDED PERIOD OF TIME.**

 **CAUTION! RISK OF EXPLOSION IF BATTERY IS REPLACED WITH AN INCORRECT TYPE. DISPOSE OF USED BATTERIES ACCORDING TO THE INSTRUCTIONS!**

1.6 EVK-L4 pin out

1.6.1 Routing of TOBY-L4 modules' pins up to connectors available on the ADP-L4

TOBY-L4			TOBY-L4			TOBY-L4		
Pin N°	Name	Connector Name / Pin N°	Pin N°	Name	Connector Name / Pin N°	Pin N°	Name	Connector Name / Pin N°
1	RSVD	-	32	GND	J201 Pins 7-10	63	SDIO_D2	Routed to Wi-Fi
2	GND	J201 Pins 7-10	33	ETH_TX_CTL	Routed to PHY	64	SDIO_CLK	Routed to Wi-Fi
3	V_BCKP	J201 Pin 3	34	ETH_TXD3	Routed to PHY	65	SDIO_CMD	Routed to Wi-Fi
4	VUSB_DET	J102 Pin 1	35	ETH_TXD2	Routed to PHY	66	SDIO_D0	Routed to Wi-Fi
5	V_INT	J201 Pin 36	36	ETH_TXD1	Routed to PHY	67	SDIO_D3	Routed to Wi-Fi
6	RSVD	-	37	ETH_TXD0	Routed to PHY	68	SDIO_D1	Routed to Wi-Fi
7	RSVD	-	38	ETH_RXD0	Routed to PHY	69	GND	J201 Pins 7-10
8	RSVD	-	39	ETH_RXD1	Routed to PHY	70	VCC	J200 Pins 7-10
9	RSVD	-	40	ETH_RXD2	Routed to PHY	71	VCC	J200 Pins 7-10
10	DSR	J201 Pin 18	41	ETH_RXD3	Routed to PHY	72	VCC	J200 Pins 7-10
11	RI	J201 Pin 17	42	ETH_RX_CTL	Routed to PHY	73	GND	J201 Pins 7-10
12	DCD	J201 Pin 11	43	ETH_RX_CLK	Routed to PHY	74	GND	J201 Pins 7-10
13	DTR	J201 Pin 12	44	GND	J201 Pins 7-10	75	ANT_DET	J105 and J104
14	RTS	J201 Pin 13	45	RSVD	-	76	GND	J201 Pins 7-10
15	CTS	J201 Pin 14	46	GND	J201 Pins 7-10	77	RSVD	-
16	TXD	J201 Pin 15	47	RSVD	-	78	GND	J201 Pins 7-10
17	RXD	J201 Pin 16	48	RSVD	-	79	GND	J201 Pins 7-10
18	TXD3	J109 Pin 2	49	RSVD	-	80	GND	J201 Pins 7-10
19	RXD3	J109 Pin 4	50	I2S_WA	J200 Pin 25	81	ANT1	J105
20	PWR_ON	J201 Pin 29	51	I2S_TXD	J200 Pin 24	82	GND	J201 Pins 7-10
21	GPIO1	J201 Pin 33	52	I2S_CLK	J200 Pin 22	83	GND	J201 Pins 7-10
22	GPIO2	J201 Pin 31	53	I2S_RXD	J200 Pin 23	84	RSVD	-
23	RESET_N	J200 Pin 26	54	SCL	J200 Pin 20	85	GND	J201 Pins 7-10
24	GPIO3	J201 Pin 32	55	SDA	J200 Pin 21	86	GND	J201 Pins 7-10
25	GPIO4	J201 Pin 25	56	SIM_CLK	J200 Pin 15	87	ANT2	J104
26	HOST_SELECT0	J201 Pin 2	57	SIM_IO	J200 Pin 14	88	GND	J201 Pins 7-10
27	USB_D-	J102 Pin 2	58	SIM_RST	J200 Pin 16	89	GND	J201 Pins 7-10
28	USB_D+	J102 Pin 3	59	VSIM	J200 Pin 13	90	GND	J201 Pins 7-10
29	ETH_TX_CLK	Routed to PHY	60	GPIO5	J201 Pin 23	91	RSVD	-
30	GND	J201 Pins 7-10	61	GPIO6	J201 Pin 24	92	GND	J201 Pins 7-10
31	RSVD	-	62	HOST_SELECT1	J201 Pin 34	93-152	GND	J201 Pins 7-10

TOBY-L4			TOBY-L4			TOBY-L4		
Pin N°	Name	Connector Name / Pin N°	Pin N°	Name	Connector Name / Pin N°	Pin N°	Name	Connector Name / Pin N°
153	RSVD	-	185	RSVD	-	217	MMC_D2	J302 Pin 1
154	RSVD	-	186	RSVD	-	218	MMC_CD_N	-
155	RSVD	-	187	RSVD	-	219	GND	J201 Pins 7-10
156	RSVD	-	188	RSVD	-	220	ETH_INTR	Routed to PHY
157	RSVD	-	189	RSVD	-	221	V_ETH	Routed to PHY
158	RSVD	-	190	RSVD	-	222	ETH_MDIO	Routed to PHY
159	TXD1	J107 Pin 2	191	RSVD	-	223	ETH_MDC	Routed to PHY
160	RXD1	J107 Pin 4	192	RSVD	-	224	RSVD	-
161	TXD2	J108 Pin 2	193	RTS1	J200 Pin 29	225	RSVD	-
162	RXD2	J108 Pin 4	194	RSVD	-	226	GND	J201 Pins 7-10
163	RSVD	-	195	CTS1	J200 Pin 30	227	SPK_P	J200 Pin 33
164	RSVD	-	196	RSVD	-	228	SPK_N	J200 Pin 34
165	RSVD	-	197	RSVD	-	229	GND	J201 Pins 7-10
166	RSVD	-	198	RSVD	-	230	MIC_GND	J200 Pin 27/11
167	RSVD	-	199	RSVD	-	231	MIC_BIAS	-
168	USB_ID	J102 Pin 4	200	RSVD	-	232	GND	J201 Pins 7-10
169	SPL_MISO	J200 Pin 17	201	RSVD	-	233	MIC2_N	J200 Pin 28
170	USB_SSRX+	J102 Pin 7	202	RSVD	-	234	MIC2_P	J200 Pin 28
171	USB_SSRX-	J102 Pin 6	203	SCL1	J200 Pin 36	235	GND	J201 Pins 7-10
172	VSIM1	J200 Pin 2	204	SDA1	J200 Pin 37	236	MIC1_N	J200 Pin 12
173	SPL_CS	J201 Pin 39	205	I2S1_WA	J200 Pin 41	237	MIC2_P	J200 Pin 12
174	SPL_MOSI	J200 Pin 18	206	I2S1_TXD	J200 Pin 40	238	GND	J201 Pins 7-10
175	USB_SSTX+	J102 Pin 10	207	I2S1_RXD	J200 Pin 39	239	ADC2	TP101
176	USB_SSTX-	J102 Pin 9	208	I2S1_CLK	J200 Pin 38	240	ADC1	TP100
177	SIM1_RST	J200 Pin 5	209	GND	J201 Pins 7-10	241	GND	J201 Pins 7-10
178	SIM1_IO	J200 Pin 3	210	V_MMC	-	242	RSVD	-
179	SPL_SCLK	J200 Pin 19	211	MMC_RST_N	-	243	RSVD	-
180	RSVD	-	212	MMC_D1	J302 Pin 8	244	RSVD	-
181	RSVD	-	213	MMC_D3	J302 Pin 2	245	RSVD	-
182	SIM1_CLK	J200 Pin 4	214	MMC_D0	J302 Pin 7	246	RSVD	-
183	RSVD	-	215	MMC_CMD	J302 Pin 3	247	GPIO8	J200 Pin 35
184	RSVD	-	216	MMC_CLK	J302 Pin 5	248	GPIO7	J200 Pin 6

Table 4: Interfaces of TOBY-L4 series modules, as routed up to the 42-pin Dual-In-Line Board-to-Board connectors (J200, J201) and up to other connectors available on the adapter board ADP-L4 of the EVK-L4 evaluation kit



The pins / interfaces that are not supported by a specific TOBY-L4 module product version should not be driven by an external device (see the TOBY-L4 series Data Sheet [2] and the TOBY-L4 series System Integration Manual [3] for the features supported by each TOBY-L4 module product version).

1.6.2 Pin-out of the 42-pin Dual-In-Line Board-to-Board connectors on the ADP-L4

DIL B2B J201				DIL B2B J200			
Signal Name	Pin N°	Pin N°	Signal Name	Signal Name	Pin N°	Pin N°	Signal Name
HOST_SELECT0	2	1	GND	VSIM1	2	1	GND
Not connected	4	3	V_BCKP	SIM1_CLK	4	3	SIM1_IO
Not connected	6	5	Not connected	GPIO7	6	5	SIM1_RST
GND	8	7	GND	VCC	8	7	VCC
GND	10	9	GND	VCC	10	9	VCC
DTR	12	11	DCD	MIC2	12	11	MIC2_GND
CTS	14	13	RTS	SIM_IO	14	13	VSIM
RXD	16	15	TXD	SIM_RST	16	15	SIM_CLK
DSR	18	17	RI	SPI_MOSI	18	17	SPI_MISO
RXDx	20	19	TXDx	SCL	20	19	SPI_CLK
Not connected	22	21	Not connected	I2S_CLK	22	21	SDA
GPIO6	24	23	GPIO5	I2S_TXD	24	23	I2S_RXD
Not connected	26	25	GPIO4	RESET_N	26	25	I2S_WA
Not connected	28	27	Not connected	MIC1	28	27	MIC1_GND
Not connected	30	29	PWR_ON	CTS1	30	29	RTS1
GPIO3	32	31	GPIO2	RXD2	32	31	TXD2
HOST_SELECT1	34	33	GPIO1	SPK_N	34	33	SPK_P
V_INT	36	35	Not connected	SCL1	36	35	GPIO8
Not connected	38	37	Not connected	I2S1_CLK	38	37	SDA1
Not connected	40	39	SPI_CS	I2S1_TXD	40	39	I2S1_RXD
GND	42	41	GND	GND	42	41	I2S1_WA

Table 5: Pin-out of the 42-pin Dual-In-Line Board-to-Board connectors (J201, J200) available on the adapter board ADP-L4



The pins / interfaces that are not supported by a specific TOBY-L4 module product version should not be driven by an external device (see the TOBY-L4 series Data Sheet [2] and TOBY-L4 series System Integration Manual [3] for the features supported by each TOBY-L4 module product version).

1.6.3 Routing of the TOBY-L4 modules' UART1, UART2 and/or UART3 interface

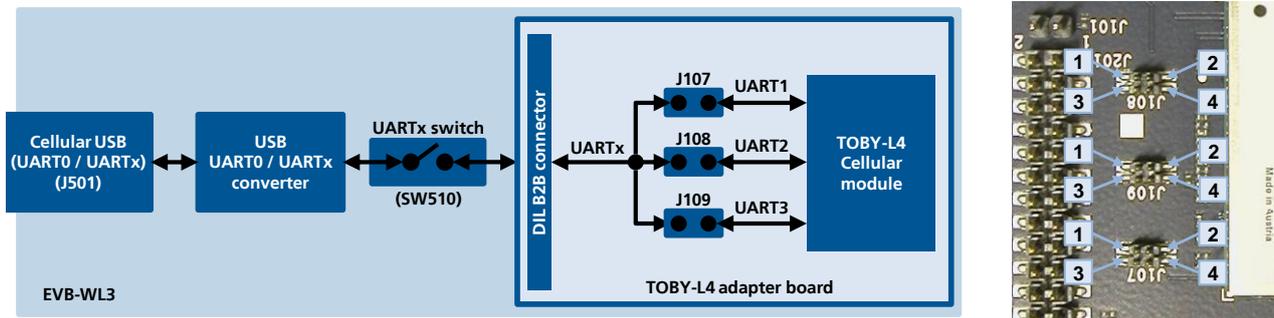


Figure 3: Overview of the TOBY-L4 module UART1, UART2 and/or UART3 interface routing possible through the 4-pin Dual-In-Line header connectors J107, J108 and J109 available on the ADP-L4 adapter board, and the related pin-out layout

DIL header J107				DIL header J108				DIL header J109			
Signal	Pin N°	Pin N°	Signal	Signal	Pin N°	Pin N°	Signal	Signal	Pin N°	Pin N°	Signal
TXDx	1	2	TXD_1	TXDx	1	2	TXD_2	TXDx	1	2	TXD_3
RXDx	3	4	RXD_1	RXDx	3	4	RXD_2	RXDx	3	4	RXD_3

Table 6: Pin-out of the 4-pin Dual-In-Line header connectors J107, J108 and J109 available on the ADP-L4 adapter board to route the UART1, UART2 and/or UART3 interface of the TOBY-L4 module up to the DIL B2B connector, and the Cellular USB connector

- Two jumper sockets need to be inserted on the related 4-pin DIL header in order to provide the connection of the UART1 (using the 4-pin DIL header J107), or the UART2 (using the 4-pin DIL header J108), or the UART3 (using the 4-pin DIL header J109), inserting one jumper socket on pins 1 and 2, and one jumper socket on pins 3 and 4.
- The connection of the UART1, UART2 and UART3 interface is mutually exclusive: only one interface at a time can be connected from the module up to the DIL B2B connector and the Cellular USB connector.
- The pins / interfaces that are not supported by a specific TOBY-L4 module product version should not be driven by an external device (see the TOBY-L4 series Data Sheet [2] and the TOBY-L4 series System Integration Manual [3] for the features supported by each TOBY-L4 module product version).

1.7 Software installation

The USB drivers are available with the EVK-L4. Executable files can be downloaded from www.u-blox.com/evk-downloads and saved to any location on the computer hard drive. The installation can be started by running the executable file on a computer with the Windows operating system.

1.8 Board setup

1. Insert a SIM card into the **SIM card holder** (J300 on the EVB).
2. Connect a cellular antenna provided with the evaluation kit box to the **Primary cellular antenna** SMA connector on the ADP-L4 (ANT1, RF input/output for transmission and reception of LTE/3G/2G RF signals)
3. Connect a cellular antenna provided with the evaluation kit box to the **Secondary cellular antenna** SMA connector on the ADP-L4 (ANT2, RF input for the reception of the LTE RF signals as per Down-Link Rx diversity). Place the secondary cellular antenna far enough from the primary cellular antenna (should be more than 20 cm).
4. If the GNSS functionality is required, connect the GNSS antenna provided with the evaluation kit box to the **GNSS antenna** SMA connector on the ADP-GNSS. Place the antenna in a location with a good view of the sky.
5. If the Wi-Fi functionality is required, connect the Wi-Fi antenna provided with the evaluation kit box to the **Wi-Fi antenna** SMA connector on the ADP-L4 (WL ANT, RF input/output for transmission and reception of Wi-Fi RF signals). Place the Wi-Fi antenna far enough away from cellular antennas (should be more than 20 cm).
6. Connect the AC/DC +12 V power adapter provided with the evaluation kit box to the **9 – 18 V Power Input** connector (J400 on the EVB). LED DL401 lights blue.
7. Be sure to provide a jumper socket on the **Cellular VCC supply jumper** (J404 on the EVB). This provides the connection from the 3.8 V output of the supply circuit on the EVB to the VCC input of the module.
8. To enable the board power supply, turn the **Main power switch** (SW400 on the EVB) to the ON position. LED DL400 lights green.
9. To switch on the cellular module, press the **Cellular Power-On** button (SW302 on EVB).
10. For communication via the cellular module's USB interface, connect a USB cable to the **Cellular native USB** connector (on ADP-L4). LED DS100 on ADP lights blue.

After the end of the module boot, the COM ports and network interface listed in Table 7 are enabled by the Windows USB driver (details of the numbering of the ports can be seen via the Windows Device Manager)¹:

Parameter	Type	Remarks
u-blox Modem USB1 AT and Data	Ports (COM & LPT)	AT command interface and data communication
u-blox Modem USB2 AT and Data	Ports (COM & LPT)	AT command interface and data communication
u-blox Modem USB3 Primary Log	Ports (COM & LPT)	Trace log capture (diagnostic purpose)
u-blox Modem USB4	Ports (COM & LPT)	"00" product versions - Linux console for uCPU API development and debug "50" product versions - Auxiliary channel for audio tuning
u-blox Modem	Network adapters	Ethernet-over-USB virtual channel (CDC-NCM)

Table 7: Cellular USB interface configuration

Run an AT terminal application (e.g. the u-blox m-center tool) selecting an AT port, with these settings:

- Data rate: 115200 bit/s
- Data bits: 8
- Parity: N
- Stop bits: 1
- Flow control: HW

¹ A message of "driver installation fail" may appear on Windows if the USB cable has been connected before the end of the module boot, but this can be ignored as the normal operating functionality of the module will be anyway available after the end of the module boot.

See Appendix A for how to configure the u-blox m-center AT terminal for Windows.

11. For communication via the cellular module's UART interfaces, the following connections are allowed and can be alternatively enabled in a mutually exclusive way (see Table 8 for the switch position and LED status):
 - a. Connect a USB cable to the mini USB connector (**Cellular USB**, J501 on EVB), LED DL501 lights blue
 - b. Connect an RS232 cable to the DB9 connector (**Cellular RS232**, J500 on EVB)

When a USB cable is connected to the mini USB connector, two COM ports are enabled in Windows (the numbering of the COM ports can be seen via the Windows Device Manager):

- o The UART0 interface is available over the first numbered COM port opened by the driver.
- o The UART1, UART2 or UART3 interface is available over the second numbered COM port opened by the driver, according to the J107, J108 and J109 4-pin DIL headers setting on the ADP-L4 (see section 1.6.3)

Type of connections	SW401	SW403	SW510	LED
Access to cellular UART0 over the Cellular USB mini USB connector (J501)	ON BOARD	MINIUSB	Do not care	DL403
Access to cellular UART1/2/3 over the Cellular USB mini USB connector (J501)	ON BOARD	MINIUSB	UART1	DL503
Access to cellular UART0 over the Cellular RS232 DB9 connector (J500)	ON BOARD	DB9	Do not care	DL405
Access to cellular UARTs on DIL Board-to-Board connector on the ADP-L4: cellular UARTs detached from mini USB J501 and DB9 J500 connectors	B2B	Do not care	DISABLE	DL404

Table 8: Serial interface configuration

Run a terminal application selecting the proper port, with these settings:

- o Data rate: 115200 bit/s
- o Data bits: 8
- o Parity: N
- o Stop bits: 1

12. If the audio functionality is required, connect the headset provided with the evaluation kit box to the **Headset jack** connector (J303 on EVB).
13. If the Gigabit Ethernet functionality is required, insert an Ethernet cable into the RJ45 **Ethernet** connector (J305 on ADP-L4).
14. If Micro SD functionality is required, insert a Micro SD card into the **Micro SD** connector (J302 on the ADP-L4).

1.9 Enabling error result codes

Command sent by DTE (user)	DCE response (module)	Description
AT+CMEE=2	OK	Enables the cellular module to report verbose error result codes.

1.10 PIN code insertion (when required)

Command sent by DTE (user)	DCE response (module)	Description
AT+CPIN="8180"	OK	Enter the PIN code, if needed (enter the PIN of the SIM card – 8180 is written here as an example).
AT+CLCK="SC", 0, "8180"	OK	Unlock the PIN at power-on (the last parameter is the PIN of the SIM card – 8180 is written here as an example).
AT+CLCK="SC", 1, "8180"	OK	Lock the PIN at power-on (the last parameter is the PIN of the SIM card – 8180 is written here as an example).

1.11 Registration on a cellular network

Command sent by DTE (user)	DCE response (module)	Description
AT+CREG?	+CREG: 0,1 OK	Verify the network registration.
AT+COPS=0	OK	Register the module on the network. The cellular module automatically registers itself on the cellular network. This command is necessary only if the automatic registration failed (AT+CREG? returns 0,0).
AT+COPS?	+COPS: 0,0,"I TIM",7 OK	Read the operator name and radio access technology (RAT).

1.12 Switching off the EVK-L4

To switch off the EVK-L4, send the +CPWROFF AT command. Make sure to use this command before switching off the main power, otherwise settings and configuration parameters may not be saved in the internal non-volatile memory of the cellular module.

B Setting up cellular packet data connection on PC

This section describes how to set up a packet data connection with the Windows 7 operating systems (for PCs) and EVK-L4, using the TCP/IP stack of the PC (external TCP/IP stack).

The following example describes how to configure the Windows PC to use the module as a high data rate mobile router, over the native USB interface of the cellular module connected by the **Cellular Native USB** connector on the ADP.

1. Open the "Network and Sharing Center" and click on the "Local Area Connection" associated with the NCM interface.

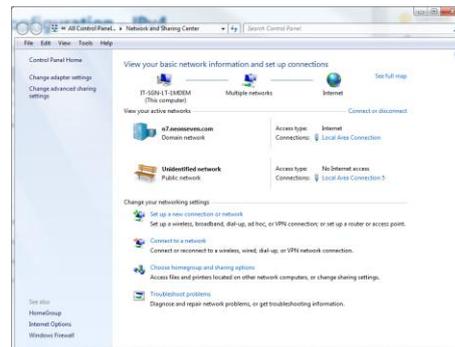


Figure 6: Network and Sharing Center

2. Click on the "Properties" button.

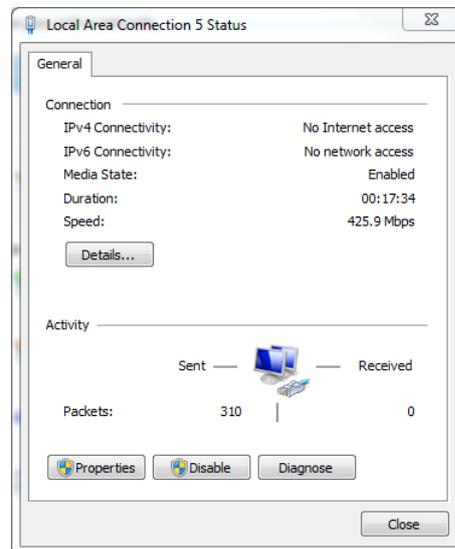


Figure 7: Local area connection status

3. Search for "Internet Protocol Version 4 (TCP/IPv4)" and click on "Properties".

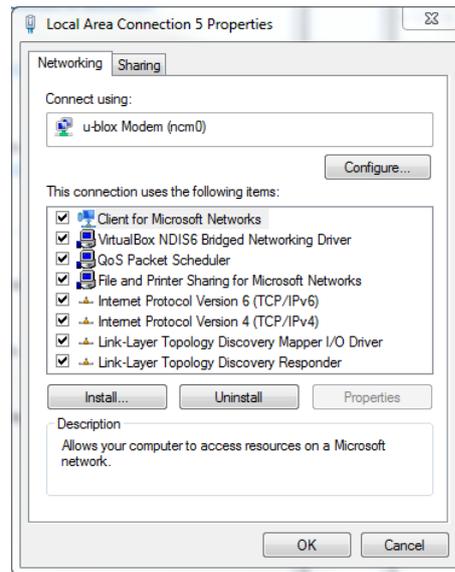


Figure 8: Local area connection properties

4. Check the option "Obtain an IP address automatically".
5. Then check the "Obtain DNS server address automatically" option.
6. Press the "OK" button and then follow the instructions in section C.1.

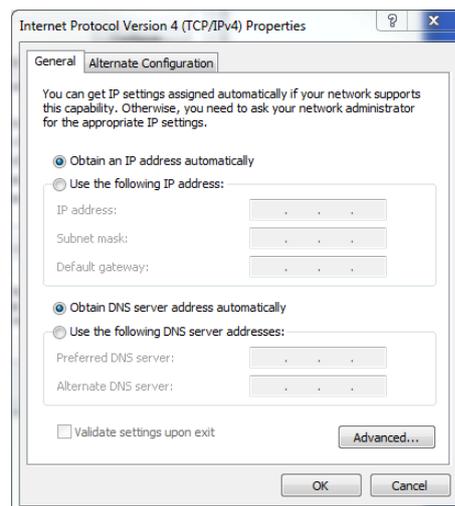


Figure 9: IPv4 (TCP/IPv4) properties

C Examples of AT commands

For the complete description and syntax of the AT commands supported by TOBY-L4 series modules, see the u-blox AT commands Manual [1].

C.1 Define a default bearer for connectivity

To change the PDN settings for a default EPS bearer, edit the <cid>=1 PDN by means of the AT+CGDCONT AT command.

Command sent by DTE (user)	DCE response (module)	Description
AT+COPS?	+COPS: 0,0,"operator",2 OK	Module is registered.
AT+CREG=2;+CGREG=2;+CEREG=2;+CGEREP=1,1;	OK	Enable a set of registration URC, including PS, CS and EPS registration events.
AT+CGDCONT?	+CGDCONT: 1,"IPV4V6","", "",0,0 OK	Read IP Type and APN for EPS attach bearer.
AT+CGDCONT=1,"IPV4V6","broadband"	OK	Set APN name (i.e. "broadband") and the PDP type (i.e. "IPV4V6") for EPS attach bearer.
AT+CGACT=1,1	OK	Activate PDP context.
AT+CGDCONT?	+CGDCONT: 1,"IP","broadband","10.161.139.112",0,0 OK	Verify the activation of PDP context and check its IP address.

D Current consumption measurement

The current consumption of TOBY-L4 series modules can be measured on the EVK-L4 by removing the jumper socket from the **Cellular VCC supply jumper** (J404 on the EVB), described in Figure 10.

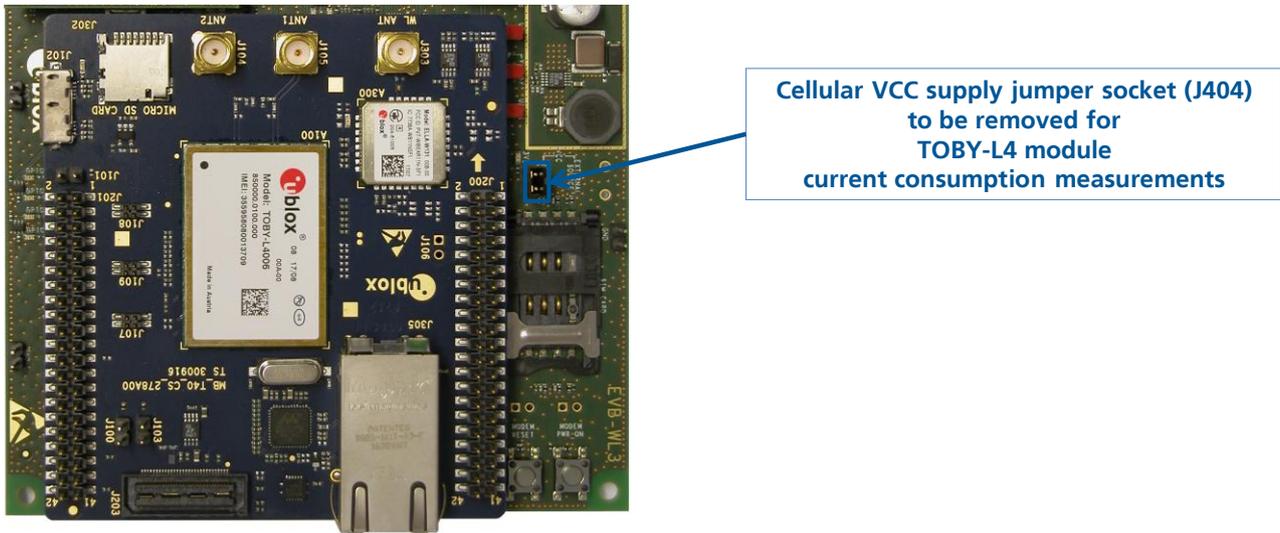


Figure 10: Jumper socket to be removed for TOBY-L4 series modules current consumption measurement

A suitable external digital multi-meter (as for example, the Agilent 34410A or 34411A) can be used for current consumption measurements: in this case, the 3.8 V supply circuit on the EVB will supply the TOBY-L4 module mounted on the adapter board, with the digital multi-meter placed in series as described in Figure 11.

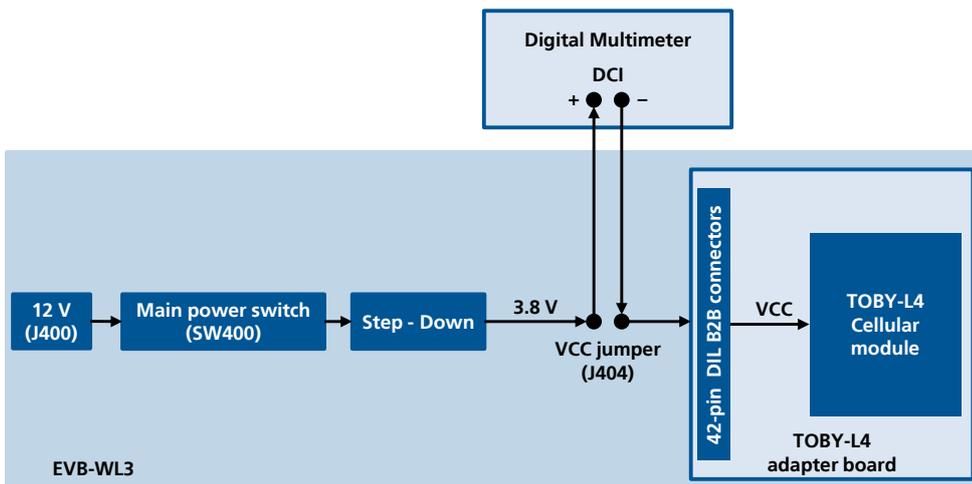


Figure 11: Block diagram of current consumption setup for TOBY-L4 series modules

Alternatively, a suitable external DC power supply with dynamic current measurement capabilities (as for example, the Agilent 66319B/D) can be used for current consumption measurements, acting also as the 3.8 V supply source for the TOBY-L4 module mounted on the adapter board.

Declaration of conformities

The equipment is intended for indoor usage. It is the user's duty to verify if further restrictions apply, such as in airplanes, hospitals or hazardous locations (petrol stations, refineries...).

Any changes or modification made to this equipment will void its compliance to the safety requirements.

Maintenance, inspections and/or repairs of the EVK-L4 shall be performed by u-blox AG.

Related documents

[1] u-blox AT commands Manual, Docu No UBX-13002752

[2] u-blox TOBY-L4 series Data Sheet, Docu No UBX-16009856

[3] u-blox TOBY-L4 series System Integration Manual, Docu No UBX-16024839



For regular updates to u-blox documentation and to receive product change notifications, register on our website (www.u-blox.com) or please contact the u-blox office or sales representative nearest you.

Revision history

Revision	Date	Name	Comments
R01	21-Nov-2017	mdem / sses	Initial release

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