

LT821-1 NA T-BOX

Data Sheet (DS)

Document Version: V1.0

Published: 2025-04-03

T-BOX Internet-connected car terminal

catalogs

Preamble -----1

1 Introduction -----2

1.1 Product Overview -----2

1.2 Product Features -----3

1.3 Introduction to Performance -----3

1.4 Terms and Abbreviations -----4

2 System Block Diagram -----5

2.1 System Block Diagram -----5

2.2 Functional description -----6

2.2.1 Product specifications -----6

2.2.2 Software functions -----7

3 Structural specifications -----9

3.1 Structural rendering -----9

3.2 Structural Exploded Drawings -----9

4 Connector specifications -----10

4.1 Plug-in interface schematic -----10

4.2 Connector model -----10

4.3 Main Connector -----11

4.4 FAKRA Interface -----13

4.4.1 HFM 1 FAKRA interface -----13

4.4.2 HFM 2 FAKRA interface -----13

4.4.3 Industrial Ethernet interface -----13

4.5.1 Industrial Ethernet -----13

 **Company e-mail:** public@link-sci.com

 **Company Tel:** 029-81101705

LT821-1

Driving your dream

T-BOX Internet-connected car terminal

preamble

summarize

This document describes in detail the specifications of the LT821 T-Box product, please read the relevant sections of this document for details.

Applicable objects

This document is mainly applicable to the customers who are interested in knowing and using the LT821 T-Box products of Hubei Linksci Technology Co., Ltd.

common agreement

notation	clarification
	Used to warn of scenarios where there is a greater risk that, if not avoided, will result in injury or greater property damage.
	Used to warn that there is a potential risk scenario that, if not avoided, could result in death or significant property damage.
	Used to warn of potentially injurious situations that, if not avoided, could constitute minor personal injury or property damage.
	Warnings used for operating environments, equipment, or critical steps that, if not avoided, may result in test failure, equipment performance damage, operational data loss or other unforeseen consequences.
	Used to highlight key elements of the process, hints and tips, etc. "Instructions" do not relate to personal injury, damage to equipment, etc.

revised

releases	dates	descriptive
V1.0	2021/2/18	This document is being published for the first time.

Hubei Linksci Technology Co., Ltd.

@ Address: 603, 6th Floor, No. 78, Shaxian Street East, Zhifang Street, Jiangxia District, Wuhan City, Hubei Province, China

✉ Company e-mail: public@link-sci.com

☎ Company Tel: 029-81101705

LT821-1

Driving your dream

T-BOX Internet-connected car terminal

1

Introduction

on This document defines the product characteristics of hardware and software, and describes the interface connections in detail. LT821 T-Box is a wireless vehicle terminal product that can meet the needs of customers' car networking.

1.1 Product overview

Vehicle-mounted intelligent terminal products support 2G(GSM)/3G (WCDMA)/4G (TD-LTE)/4G (FDD-LTE)/5G (NR) communication networks as well as LTE-V2X PC5 direct connection communication.

Users can get external information through the network in the vehicle, and with the TSP service background to provide real-time data collection and reporting function of vehicle information, vehicle remote control function, eCall/bCall function, entertainment system host Internet access access function, remote vehicle diagnosis, vehicle ECU (including itself) FOTA upgrade function, and at the same time, it has the function of automatic identification of special vehicle status and emergency situation, and report to the server for emergency service response. At the same time, it has the ability to automatically recognize special vehicle states and emergencies and report them to the server for emergency service response.

GNSS Support GPS/GLONASS/BeiDou/Galileo/SBAS with high precision positioning capability. Send user's location information to designated servers on demand or distribute to friends on social networks for location sharing and anti-theft tracking.

It supports ITS protocol stack (meets the definition of T/CSAE 53-2017 standard scenario), realizes direct interaction among vehicle, road and human through LTE-V2X communication technology, and accomplishes mutual cooperation and intelligent network connection function among vehicle, human and transportation facilities.

1.2 Product Characteristics

- Vehicle Location Application Service
 - anti-theft alarm reminder
 - Remote vehicle status reporting
 - Remote vehicle control
 - eCall/bCall

V2X Scenario Applications

Hubei Linksci Technology Co., Ltd.

@ **Address:** 603, 6th Floor, No. 78, Shaxian Street East, Zhifang Street, Jiangxia District, Wuhan City, Hubei Province, China

✉ **Company e-mail:** public@link-sci.com

☎ **Company Tel:** 029-81101705

LT821-1

Driving your dream

T-BOX Internet-connected car terminal

1

Introduction

1.1 Introduction to performance

- AP Performance
 - High-performance dual-core ARM® Cortex-A55 processor operating at 1.5 Ghz, delivering 7.5K DMIPS of power
 - Support Sub-6G/FDD-LTE/TDD-LTE/WCDMA/GSM bands
 - Compliant with 3GPP Rel15 standard specifications
 - Sub-6G rates up to 2.1 Gbps uplink up to 900 Mbps downlink, C-V2X rates up to 26 Mbps
 - Supports 8GB EMMC extended storage
- VP Performance
 - ARM Cortex-M4F, supports 32-bit CPUs.
 - CPU operating frequency 120 MHz
 - Built-in 1024K ROM and 128K RAM
 - Supports 4 CAN interfaces, CAN-FD can be flexibly configured.
 - Supports 3 UART interfaces and 3 SPI interfaces
- GNSS function
 - Support GPS/GLONASS/BEIDOU/GALILEO/SBAS multi-satellite base L1+L5 dual-frequency high-precision positioning
- CAN Interface
 - Supports 4 high-speed CAN interfaces, CAN-FD can be flexibly configured.
- transducers
 - Support acceleration sensor to realize trailer alarm function
 - Supports 6-axis sensors for inertial navigation
- sound frequency
 - Supports MIC and 4 W SPEAKER access
 - IO interface
 - Support I/B Call, ECall two-way keypad
- backup battery
 - Built-in 1000mAh Ni-MH battery
- Ethernet interface

- Supports Gigabit Industrial Ethernet
- Supports Gigabit in-vehicle Ethernet

Hubei Linksci Technology Co., Ltd.

Address 603, 6th Floor, No. 78, Shaxian Street East, Zhifang Street, Jiangxia District, Wuhan City, Hubei Province, China
Company e-mail: public@link-sci.com



Company Tel: 029-81101705

LT821-1

Driving your dream

T-BOX Internet-connected car terminal

1

Introduction

1.1 Terminology and abbreviations

Table 1-1 Terms and Abbreviations

abbreviations	an explanation of the meaning of words or phrases
KL.30	Battery, whole vehicle battery power.
KL.15	Whole vehicle ignition ON mode.
VP	Vehicle Processor.
AP	Application Processor.
CAN	Controller Area Network
SIM	Subscriber Identification Module , also known as a subscriber identification card.
EMMC	Embedded Multi Media Card
ECU	Electronic Control Unit
EMC	Electro Magnetic Compatibility
AVN	Audio, Video and Navigation are integrated into the car's main unit.
ISO	International Standards Organization
PCB	Printed Circuit Board
USB	Universal Serial Bus
LTE	Long Term Evolution, a high-speed wireless communications standard based on GSM/EDGE and UMTS/HSPA technologies, which primarily uses with cell phones and data terminal devices.
GNSS	Global Navigation Satellite System,.
Wi-Fi	A technology that allows electronic devices to connect to a wireless local area network (WLAN), typically using the 2.4G Hz or 5G Hz radio frequency bands.
BLE	Bluetooth Low Energy is an ultra-low power, low-cost, short-range, interoperable wireless technology that operates at 2.4G Hz. RF bands.
BT	Bluetooth is a low-cost, short-range, interoperable wireless technology that operates in the 2.4G Hz radio frequency band.
C-V2X	C is for Cellular and V2X is Vehicle to Everything. C-V2X is the new way to connect vehicles to everything. A generation of ICT where V stands for vehicle and X stands for any object that interacts with the vehicle for information.
AM/FM	Analog Broadcasting.
DAB	Digital Audio Broadcasting (DAB) is the third generation of analog broadcasting after AM and FM. Generation Broadcasting - Digital Signal Broadcasting.
SDARS	Satellite Digital Audio Radio Service.

Hubei Linksci Technology Co., Ltd.

@ **Address:** 603, 6th Floor, No. 78, Shaxian Street East, Zhifang Street, Jiangxia District, Wuhan City, Hubei Province, China

✉ **Company e-mail:** public@link-sci.com

☎ **Company Tel:** 029-81101705

LT821-1

Driving your dream

T-BOX Internet Connected Vehicle Terminal

2 System Block

Diagram system block diagram

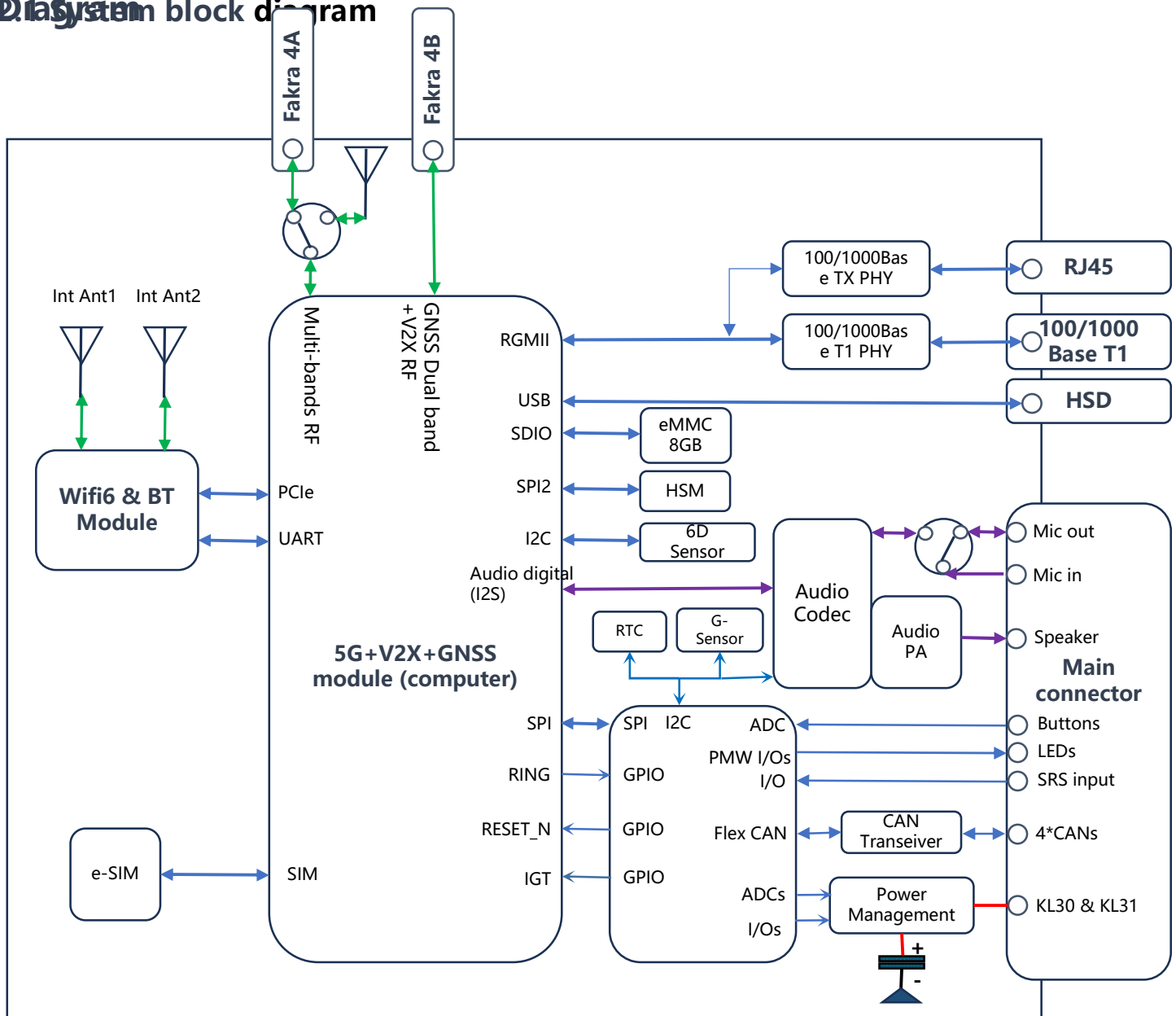


Figure 2-1 System
Block Diagram

Hubei Linksci Technology Co., Ltd.

@ Address: 603, 6th Floor, No. 78, Shaxian Street East, Zhifang Street, Jiangxia District, Wuhan City, Hubei Province, China

✉ Company e-mail: public@link-sci.com

☎ Company Tel: 029-81101705

LT821-1

Driving your dream

T-BOX Internet-connected car terminal

2 System

Block

Diagram Functional description

2.2.1 Product Specifications

Table 2-1 Product Specifications

categorization	descriptive	norm
Operating parameters	Operating Temperature Range	-40°C ~ +85°C
	operating voltage	Standard: 12 V, Range: 9 V to 16 V
	Operating Current	<1.5 A
	peak current	≤2.0 A
Structural parameters	weights	<500 g (without stand)
	sizes	Body (reference): 190 mm * 100 mm * 35 mm
Band information	5G NR	n2,n5,n7,n12,n14,n25,n38,n41,n48, n66, n71, n77,n78
	LTE FDD	b2,b4,b5,b7,b12,b13,b14,b17, b25, b26, b66, b71
	LTE TDD	b38, b41, b48
	WCDMA	B2, B4, B5
	GSM	850, 1900MHz
	GNSS	L1,L5

LT821-1

Driving your dream

T-BOX Internet-connected car terminal

2 System Block Diagram

2.2.2 Software functions

Table 2-2 Product Specifications

serial number	Level 1 function	Secondary Functions
1	remote control	Remote unlocking
		Remote Start/Stop
		Remote switching of air conditioners
		Remote honking
		Remote flashing light
		Heated and ventilated remote seats
		Remote window opening and closing
		Power Battery Pre-cooling and Preheating
		Remote 12V Battery Charging
		Remote unlocking of charging guns
2	E/B-CALL	E/B-CALL Manual dialing
		E-CALL Automatic dialing after a vehicle collision
		Upload vehicle MSD data before or during a call
		Access to E/B-CALL third party services
		Ability to drive speakers independently
3	Abnormal Alarms	Door open alert
		Leave the window open.
		Low Battery Voltage Alert
		Low battery alert
		Abnormal Movement Alert
4	self-diagnosis	Remote reading of vehicle ECU fault codes, freeze frames and extended frames
5	Fault Upload	In the event of a serious vehicle malfunction, it supports the transfer of the vehicle's various ECU fault codes, freeze frames to the and extended frame upload
6	remote positioning	Supports GPS data upload
		Support for stolen vehicle tracking
		electric fence
7	Vehicle Condition Check	Support checking vehicle status, such as door, oil pressure, mileage, power, range, etc.

Hubei Linksci Technology Co., Ltd.

@ Address: 603, 6th Floor, No. 78, Shaxian Street East, Zhifang Street, Jiangxia District, Wuhan City, Hubei Province, China
✉ Company e-mail: public@link-sci.com

☎ Company Tel: 029-81101705

LT821-1

Driving your dream

T-BOX Internet-connected car terminal

2 System

Block

Diagram

serial number	Level 1 function	Secondary Functions
8	Big Data Acquisition	Supports the collection of data from each ECU node of the vehicle, and packages and uploads the data according to the specified format.
9	network traffic sharing	USB Shared Network Traffic to Audio Host
10	BT	BT functions
11	OTA	Download Management
		Parameter Configuration
		difference algorithm
		CAN Node Upgrade
12	cryptographic authentication	Interfaces can be provided by integrating a soft module SDK, or a hardware encryption chip (reserved on the hardware).
		Docking PKI system to realize data encryption and decryption, signature verification and other functions.
		Supporting at least the international encryption algorithms: AES, RSA (1024-2048), SHA1.
		SHA256, SHA384 and other algorithms, can support state secret algorithms: SM4, SM2 on demand, Algorithms such as SM3
13	Backend Interaction	The data interaction between T-Box and the cloud backend should at least use TLS or other methods to ensure that the data is not lost.
		encrypted transmission
		T-BOX supports security policy configuration, limiting the network accessible addresses, communication ports, pass-throughs, and other features.
		The network access control can be strengthened to prevent various network attacks on Telematics.
14	Multi-Carrier Support	Support Mobile, Telecom, Unicom ESIM
15	Ethernet	Supports Ethernet refresh
		Ethernet protocol stack supporting 5G modules: TCP/IP, NAT, UDP, RTP, etc.
		Gigabit Ethernet support
16	V2X Features	T/CSAE 53-2017 protocol stack supporting standard V2X scenarios

LT821-1

Driving your dream

T-BOX Internet-connected car terminal

3 Structural rendering specifications

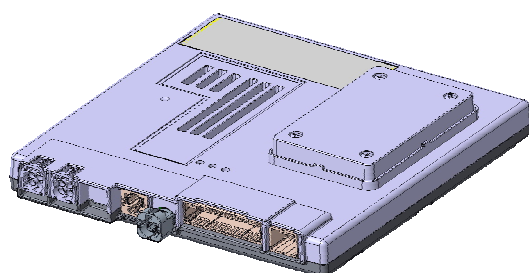


Figure 3-1 Structural Effect

3.2 Structural Exploded Drawings

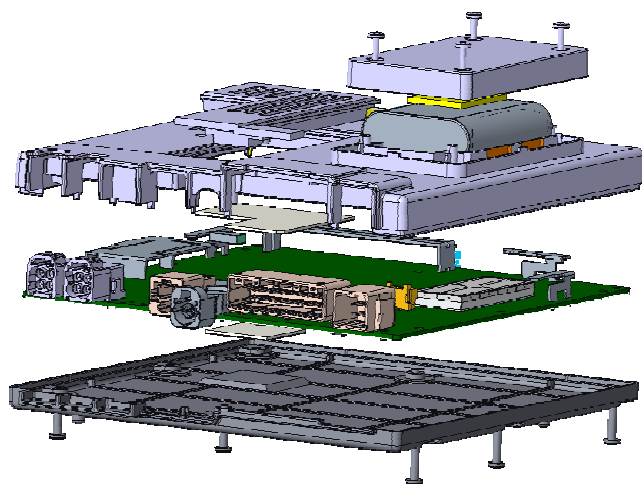


Figure 3-2 Structural Exploded View

LT821-1

Driving your dream

T-BOX Internet-connected car terminal

4 Connector Specification

4.1 Schematic diagram of plug-in interface

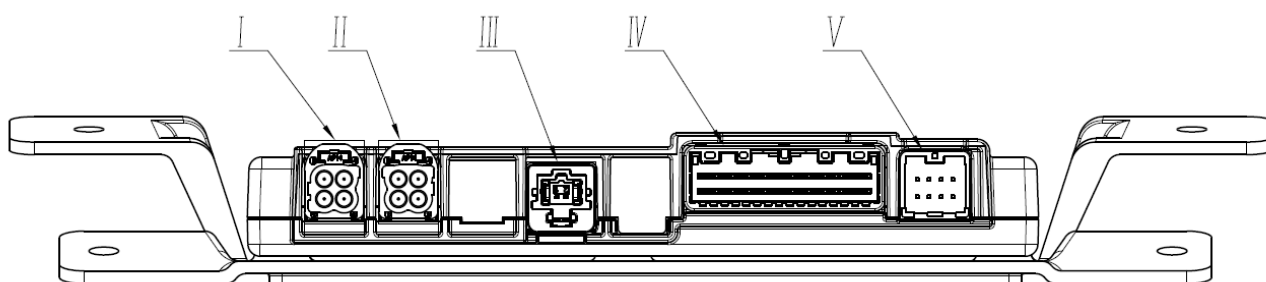


Figure 4-1 Plug-in Interface Diagram

4.2 Connector type

Table 4-1 Connector Models

Connector Name	Supplier Name	part number	Name of the supplier of the harness end	Wire Harness Part Number
32PIN main connector	IRISO	IMSA-9491B-32B-TM2	IRISO	IMSA-9491S-32A
8PIN power connector	JAE	MX34E08NF1	JAE	MX34E08SF1
Antenna connector_1	Amphenol	mfk0252bw-002-tl30g-50	Amphenol	mfk0121bw-001-at5g-50
Antenna connector_2	Amphenol	mfk0252aw-002-tl30g-50	Amphenol	mfk0121Aw-001-at5g-50
USB connector	TE	2291362-1	TE	2-1823898-1
Ethernet Connectors	delphi (loanword)	35372493	TE	35191760-A

LT821-1

Driving your dream

T-BOX Internet-connected car terminal

4 Connector Specification

4.3 Definition of main connector PIN

4.3.1 Main connector

PIN Pin	functionality	rated current	Signal Description	Level range
1	CAN1_L	0.05A	CAN signal L	1.5-2.5V
2	CAN2_L	0.05A	CAN signal L	1.5-2.5V
3	CAN3_L	0.05A	CAN signal L	1.5-2.5V
4	NA	-	DEBUG-RX, Mass Production Delete	-
5	NA	-	DEBUG-TX, Mass Production Delete	-
6	NA	-	VDD3V3_EN, Mass Production Delete	-
7	NA	-	reserve	-
8	LIN2	-	Reserve LIN	-
9	RKE Interface	0.1A	Mounting LIN	9-16V
10	Mute	-	MUTE signal	-
11	SOS_BCALL_BUTTON	0.1A	Key Signal	0-6V
12	BTN CON_DIAG	-	Key Signal	-
13	AUDIO+	-	Audio output+	-
14	Speaker+	1A	AMP Output+	-
15	Speaker-	1A	AMP Output -	-
16	MIC OUT GND	-	MIC output ground	-
17	CAN1_H	0.05A	CAN signal H	2.5-3.5V
18	CAN2_H	0.05A	CAN signal H	2.5-3.5V
19	CAN3_H	0.05A	CAN signal H	2.5-3.5V
20	IPPS	-	IPPS output	-
21	NA	-		-
22	SRS	0.05A	SRS signal	6-12V
23	SOS_LED_G	0.05A	LED output	0-12V
24	SOS_LED_R	0.05A	LED output	0-12V
25	BCALL_LED_G	0.05A	LED output	0-12V
26	BCALL_LED_R		LED output	

Hubei Linksci Technology Co., Ltd.

@ Address: No.10, Tangyan South Road, Hi-Tech Zone, Xi'an, Shaanxi, China

✉ Company e-mail: public@link-sci.com

☎ Company Tel: 029-81101705

LT821-1

Driving your dream

T-BOX Internet-connected car terminal

4 Connector Specifications

ns

PIN Pin	functionality	rated current	Signal Description	Level range
27	BCALL_BUTTON	0.1A	Key Signal	0-6V
28	BTN GND	-	Pushbutton & LED Ground	-
29	AUDIO -	-	Audio output -	-
30	MIC IN	0.05A	MIC Input Signal	6-8V
31	MIC IN GND	-	MIC input ground	-
32	MIC OUT		MIC Output Signal	

4.3.2 Power connectors

pin	functionality	rated current	Functional Description	note
1	KL30	0.3A	KL30	-
2	NA	-	reserve	-
3	Backup battery-	-	Battery Backup Output -	-
4	Backup battery+	1A	Battery Backup Output+	-
5	KL31	-	KL31	-
6	NA	-	reserve	-
7	Bub_Temp	0.05A	Backup Battery Detection	
8	NA		reserve	

4.4 Antenna Interface

4.4.1 Antenna connectors1

pin	functionality	rated current	Functional Description	note
1	RKE IN	0.05A	RKE signal input	-
2	BLE IN	0.05A	BLE signal input	-
3	GNSS IN	0.05A	GNSS signal input	-
4	GNSS OUT (reserved)		GNSS signal output	-

LT821-1

Driving your dream

T-BOX Internet-connected car terminal

4 Connector Specification

4.1 Antenna connector 2

pin	functionality	rated current	Functional Description	note
1	ANT_DRX	-	5G Auxiliary Antenna	-
2	ANT_PRX	0.1 A	5G Main Antenna	-
3	ANT_MIM04	0.05 A	5G MIMO	-
4	ANT_MIM03	0.1 A	5G MIMO	-

4.5 Ethernet Interface

4.5.1 Ethernet connectors

pin	functionality	rated current	Signal Description	note
1	ETH+	0.01 A	Ethernet Data+	-
2	ETH-	0.01 A	Ethernet Data-	-

4.6 HSD interface

4.6.1 HSD connectors

PIN Pin	functionality	rated current	Signal Description	note
1	USB_D-	0.01 A	USB Data-	
2	USB_GND	0.01 A	USB Power Ground	
3	USB_D+	0.01 A	USB Data+	
4	USB_VBUS	0.01 A	USB_VBUS	

LT821-1

Driving your dream

T-BOX Internet Connected Vehicle Terminal

5

Performance

5.1 Performance parameters

This section defines the performance specifications for the LT821 T-Box product, see Table 5-1 for details.

parameters	clarification
communications standard	5G NR: n2,n5,n7,n12,n14,n25,n38,n41,n48, n66, n71, n77,n78 tdd-lte: b38, b41, b48 fdd-lte: b2,b4,b5,b7,b12,b13,b14,b17, b25, b26, b66, b71 wcdma: b2, b4, b5 GSM: 850, 1900MHz
maximum speed	NR:DL: 2.1Gbps .UL: 900Mbps LTE:DL: 1.2Gbps .UL: 200 Mbps
receiver sensitivity	LTE: 3GPP TS 36.521 nr: 3gpp ts 38.521

LT821-1

Driving your dream

T-BOX Internet-connected car terminal

5

Performance

5.2 GNSS

This section defines the basic parameters of the GNSS, see Table 5-2 for details.

Table 5-2 GNSS Basic Parameters

parameters	clarification	
Support Mode	GPS/Glonass/Beidou/Galileo	
GPS frequency	1575.42 MHz (L1), 1176.45 MHz (L5)	
GLONASS frequency point	1602 MHz (G1)	
BeiDou frequency	1561.098 MHz (B1)	
Galileo frequency point	1575.42 MHz (E1)	
accurate	placement	< 1 Meters (RMS)
	tempo	TBD
(level of) sensitivity	capture sensitivity	-147 dBm
	Tracking Sensitivity	-160 dBm
activation time	hot start	< 2 Seconds
	cold start	< 35 Seconds
RF impedance	50 ohms	

T-BOX Internet-connected car terminal

5

Performance

5.4 Indicators

This section defines the basic parameters of Ethernet, see Table 5-4 for details.

Table 5-4 Ethernet

parameters	clarification
Maximum transmission rate	1000 Mbps
Maximum current	130 mA
Maximum power consumption	120 mW
Standby Current	30 μ A

5.5 CAN

This section defines the basic parameters of CAN as detailed in Table 5-5.

Table 5-5 CAN

name (of a thing)	clarification
typology	Supports CAN_FD and is backward compatible with CAN2.0.
Maximum current	70 mA
Standby Mode	15 μ A

5.6 V2X

This section defines the basic parameters of V2X as detailed in Table 5-6.

Table 5-6 V2X

parameters	clarification
(radio) band	5905 MHz~5925 MHz
bandwidths	10 MHz/20 MHz
output power	23.0 dBm $\pm$ 2 dB (Power Class 3)
(level of) sensitivity	3GPP TS 36.521
data transmission	Maximum 26 Mbps (TX)/26 Mbps (RX)

FCC Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 20 cm between the radiator and your body.

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

NOTE: The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment. Such modifications could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help