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LAPIS
SEMICONDUCTOR

MK71251-02A USB Evaluation Kit
(MK71251-02A-USB-EK)
Hardware Manual

2nd edition Issue date: Jul 20, 2016

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1) The Products are designed and produced for application in ordinary electronic equipment (AV equipment, OA equipment, telecommunication equipment, home appliances, amusement equipment, etc.).

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3) Do not use our Products in applications requiring extremely high reliability, such as aerospace equipment, nuclear power control systems, and submarine repeaters.

4) The Products are designed for use in a standard environment and not in any special environments. Application of the Products in a special environment can deteriorate product performance. Accordingly, verification and confirmation of product performance, prior to use, is recommended if used under the following conditions:
   [a] Use in various types of liquid, including water, oils, chemicals, and organic solvents
   [b] Use outdoors where the Products are exposed to direct sunlight, or in dusty places
   [c] Use in places where the Products are exposed to sea winds or corrosive gases, including Cl_2, H_2S, NH_3, SO_2, and NO_2
   [d] Use in places where the rPoducts are exposed to static electricity or electromagnetic waves
   [e] Use in environment subject to strong vibration and impact.
   [f] Use in proximity to heat-producing components, plastic cords, or other flammable items
   [g] Use involving sealing or coating the Products with resin or other coating materials
   [h] Use of the Products in places subject to dew condensation

5) The Products might receive the radio wave interference from electronic devices such as Wireless LAN devices, Bluetooth devices, digital cordless telephone, microwave oven and so on that radiate electromagnetic wave.

6) The Products are not radiation resistant.

7) Verification and confirmation of performance characteristics of Products, after on-board mounting, is advised.

8) Confirm that operation temperature is within the specified range described in the Specification.

9) Although LAPIS Semiconductor is continuously working to improve product reliability and quality, semiconductors can break down and malfunction due to various factors. Therefore, if product malfunctions may result in serious damage, including that to human life, sufficient fail-safe measures must be taken, including the following:
[a] Installation of protection circuits or other protective devices to improve system safety
[b] Installation of redundant circuits in the case of single-circuit failure

10) Failure induced under deviant condition from what defined in the Specification can not be guaranteed.

11) This product is a specification to radiate the radio wave. It is necessary to acquire the attestation of decided Radio Law of each region used to use the equipment that radiates the radio wave.
Please inquire about the attestation of Radio Law that this product acquires.

12) When product safety related problems arises, please immediately inform to LAPIS Semiconductor, and consider technical counter measure.

●Precautions for Reference Circuits

1) If change is made to the constant of an external circuit, allow a sufficient margin due to variations of the characteristics of the Products and external components, including transient characteristics, as well as static characteristics.

2) The reference circuit examples, their constants, and other types of information contained herein are applicable only when the Products are used in accordance with standard methods. Therefore, if mass production is intended, sufficient consideration to external conditions must be made.

● Precaution for Electrostatic

This product is Electrostatic sensitive product, which may be damaged due to Electrostatic discharge. Please take proper caution during manufacturing and storing so that voltage exceeding Product maximum rating won't be applied to the Products. Please take special care under dry condition (Grounding of human body / equipment / solder iron, isolation from charged objects, setting of Ionizer, friction prevention and temperature / humidity control etc.)

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1) Product performance and connector mating may deteriorate if the Products are stored in the following places:
[a] Where the Products are exposed to sea winds or corrosive gases, including Cl_2, H_2S, NH_3, SO_2 and NO_2
[b] Where the temperature or humidity exceeds those recommended by LAPIS Semiconductor
Temperature: 5°C to 40°C, Humidity 40% to 60%
[c] Storage in direct sunshine or condensation.
[d] Storage in high Electrostatic.

2) Even under LAPIS Semiconductor recommended storage condition, connector mating, mountability, and heat resistance of products over 1 year old may be degraded.

3) Store / transport cartons in the correct direction, which is indicated on a carton as a symbol, otherwise bent leads may occur due to excessive stress applied when dropping of a carton.

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QR code printed on LAPIS Semiconductor product label is only for internal use, and please do not use at customer site.
It might contain internal products information that is inconsistent with product information.

● Precaution for Disposition

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● The other precautions

1) Please use the Products in accordance with any applicable environmental laws and regulations, such as the RoHS Directive. For more details, including RoHS compatibility, please contact a ROHM sales office. LAPIS Semiconductor shall have no responsibility for any damages or losses resulting non-compliance with any applicable laws or regulations.

2) When providing our Products and technologies contained in the Specification to other countries, you must abide by the procedures and provisions stipulated in all applicable export laws and regulations, including without limitation the US Export Administration Regulations and the Foreign Exchange and Foreign Trade Act.

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Preface

This document outlines the hardware of MK71251-02A USB evaluation kit (MK71251-02A-USB-EK), which enables 2.4 GHz-band radio communication conforming to Bluetooth® Smart on Windows PC via USB.

The following related documents are available for reference.

- MK71251 Data Sheet
- ML7125-002 User's Manual
- ML7125-002AT Command Specification
- BLE TOOL User's Manual

Notes about mass production use

When you use MK71251-01/MK71251-02 wireless module for mass production,it is necessary to confirm and agree about the conditions of use,please contact the following contact.

If you purchased from the net sales company:
ROHM Co.,Ltd. Customer Support Department : sales_direct@rohm.co.jp

In the case of other than the above:
ROHM Co.,Ltd. Sales representative

Table of Contents

1. MK71251-02A-USB-EK Overview

When you receive MK71251-02A-USB-EK, make sure that all of the following components are included in the kit. Should there be any missing or broken part, contact our sales representative.

Contents

Component	Quantity
MK71251-02A USB dongle	1

MK71251-02A-USB-EK configuration

MK71251-02A USB dongle

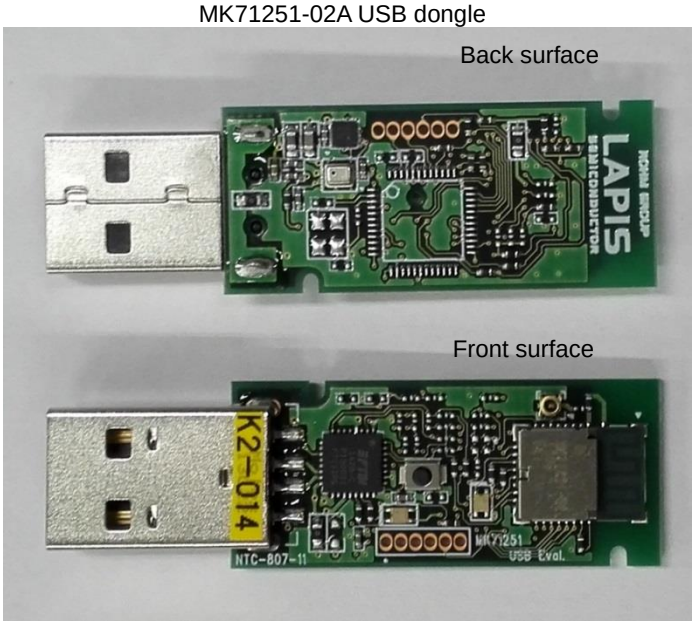


Figure 1-1 MK71251-02A-USB-EK

2. Configuration

2.1 System Diagram

MK71251-02A USB dongle can operate as Peripheral (Salve) for the Bluetooth LE connection.

See "MK71251-02A Evaluation Kit Quick Start Guide" that comes with the evaluation kit for details.
See the following related manuals as well.

- ML7125-002AT Command Specification
- BLE TOOL User's Manual

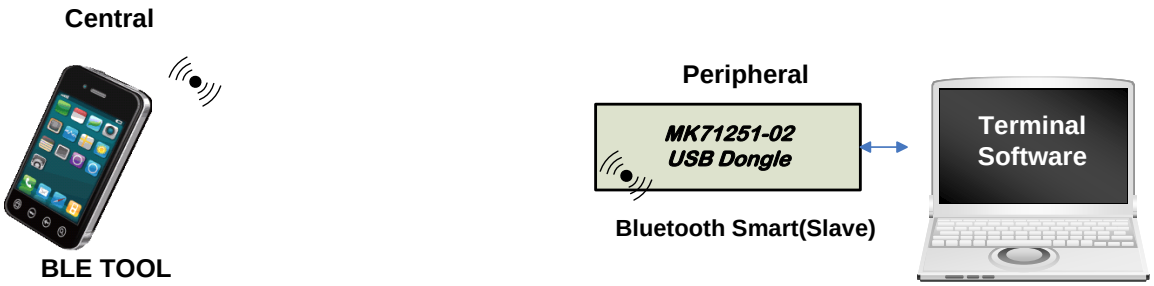


Figure 2-1 Example of System Configuration with MK71251-02A-USB-EK

2.2 Configuration of MK71251-02A USB Dongle

Figure 2-2 shows the appearance of MK71251-02A USB dongle, and Table 2-1 shows its configuration.

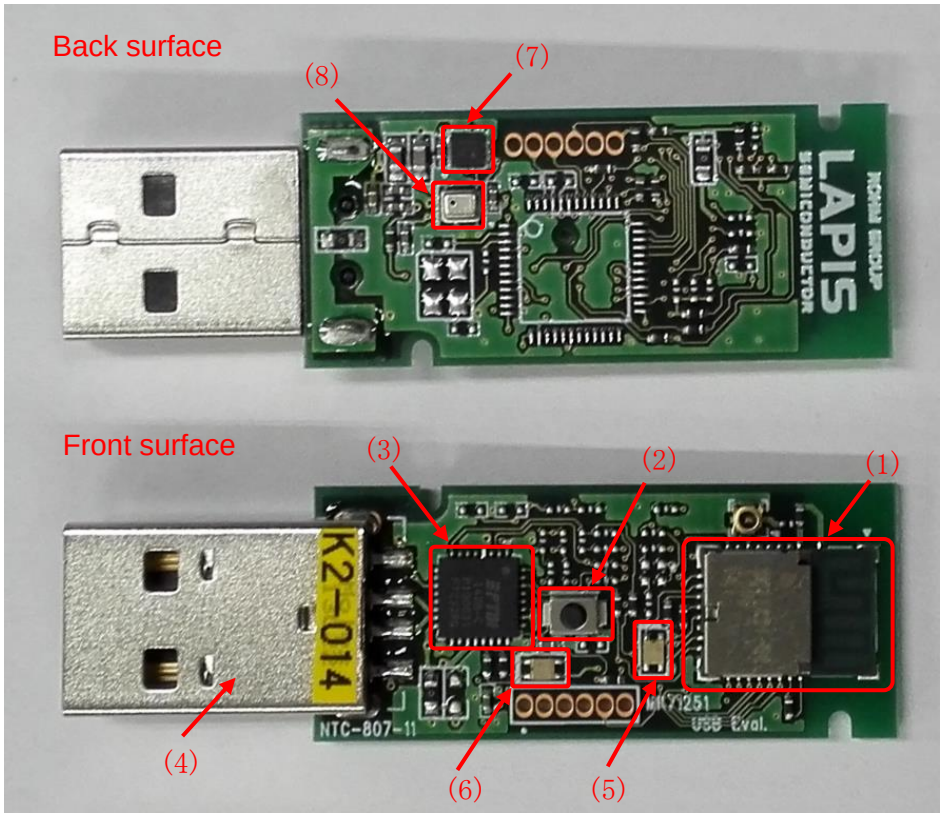


Figure 2-2 Appearance of MK71251-02A USB Dongle

Table 2-1 Configuration of MK71251-02A USB Dongle

No.	Name	Symbol	Description
(1)	MK71251-02A	IC1	Bluetooth® Smart radio communication module
(2)	B3U-1000P(M)-B	S1	Reset switch
(3)	FT232RQ	IC5	USB-UART (USB serial conversion) IC by FTDI
(4)	48037-2000(molex)	J1	Connector USB-A plug
(5)	SML522BU1W(ROHM)	D2	Bluetooth® Smart status indication LED Red：RF_ACTIVE Blue：GPIO3[Output Low=Always ON]
(6)	SML522BU1W(ROHM)	D3	UART status indication LED Red：TX of FT232RQ[PC（Terminal）→BLE Tool] Blue：RX of FT232RQ[BLE Tool→PC（Terminal）]
(7)	KX022-1020(Kionix)	IC3	IC Accelerometer
(8)	BMP280(BOSCH)	IC4	IC Pressure Sensor

3. Circuit Diagram

3.1 Circuit Diagram of MK71251-02A USB Dongle

See Figure 3-1.

MK71251 USB eval (1/1)

Figure3-1:MK71251-02A_USB-EK Circuit diagram

No.	Date	Description
4	5	2015.9.4	サイズ変更(C10), I2C接続修正、IC1-#13,24処理変更 定数変更（R5.R6）
5	5	2015.9.10	RTS,CTS 接続変更（IC2側）

-- USB-I/F --

-- uEASE/JTAG I/F --

Note:Parts that fill in the red is not equipped.

DATED.	2015/08/31	CUSTOMER	LAPIS Semiconductor
NAME	MK71251 USB Evaluation Board		
MODEL NO.			
PCB NO.	NTC-807-11	APPROVED	CHECKED	DESIGNED	DRAWN
DRAWING NO.		------	------	LAPIS	Hata
SHEET: 1 OF 1					

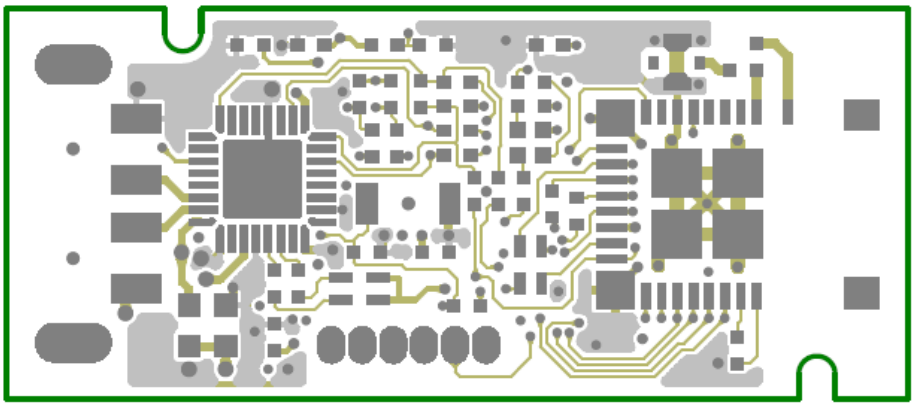
3.2 BOM List of MK71251-02A USB Dongle

PART NO	PART DESC	Manufacture	PART.NO	VALUE
IC2	16bit Microcontroller	LAPIS	ML610Q504	NM
IC1	BT LE IC	LAPIS	MK71251-01	
C2	CAPACITOR (1005)	MURATA	GRM155B31E104K A87	NM
C3	CAPACITOR (1005)	MURATA	GRM155B31A105K E15D	NM
C4	CAPACITOR (1005)	MURATA	GRM155B31A105K E15D	NM
C5	CAPACITOR (1005)	MURATA	GRM155B31A105K E15D	NM
C6	CAPACITOR (1005)	MURATA	GRM155B31A105K E15D	1u
C51	CAPACITOR (1005)	MURATA	GRM155B11E103K A01D	0.01u
C52	CAPACITOR (1005)	MURATA	GRM155B31E104K A87	0.1u
C53	CAPACITOR (1005)	MURATA	GRM155B31E104K A87	0.1u
C71	CAPACITOR (1005)	MURATA	GRM155B31E104K A87	0.1u
C72	CAPACITOR (1005)	MURATA	GRM155B31E104K A87	0.1u
C73	CAPACITOR (1005)	MURATA	GRM155B31E104K A87	0.1u
C74	CAPACITOR (1005)	MURATA	GRM155B31E104K A87	0.1u
C1	CAPACITOR (1608)	MURATA	GRM188B30J106M E47D	NM
C10	CAPACITOR (1608)	MURATA	GRM188 B31C 225K E14D	NM
C54	CAPACITOR (1608)	MURATA	GRM188F11A475Z E20D	4.7u
C7	CAPACITOR(1005)	MURATA	GRM155 2C1H 100J A01D	NM
C8	CAPACITOR(1005)	MURATA	GRM1552C1H 9R0D A01D	NM
C9	CAPACITOR(1005)	MURATA	GRM155 B31A 334K E14D	NM
IC3	IC Accelerometer	Kionix	KX022-1020	
IC4	IC Pressure Sensor	BOSCH	BMP280	
D2	LED	ROHM	SML522BU1W	
D3	LED	ROHM	SML522BU1W	
D1	PICOLED-RGB	ROHM	SMLP34RGB2W	NM
R1	RESISTOR (1005)	ROHM	MCR01MZPJ000	0
R2	RESISTOR (1005)	ROHM	MCR01MZPJ000	NM
R5	RESISTOR (1005)	ROHM	MCR01MZPJ222	NM
R6	RESISTOR (1005)	ROHM	MCR01MZPJ222	NM
R7	RESISTOR (1005)	ROHM	MCR01MZPJ104	100k
R8	RESISTOR (1005)	ROHM	MCR01MZPJ104	100k
R9	RESISTOR (1005)	ROHM	MCR01MZPJ473	47k
R10	RESISTOR (1005)	ROHM	MCR01MZPJ000	0
R11	RESISTOR (1005)	ROHM	MCR01MZPJ000	0
R12	RESISTOR (1005)	ROHM	MCR01MZPJ473	47k
R13	RESISTOR (1005)	ROHM	MCR01MZPJ473	47k
R14	RESISTOR (1005)	ROHM	MCR01MZPJ473	NM
R15	RESISTOR (1005)	ROHM	MCR01MZPJ473	47k
R16	RESISTOR (1005)	ROHM	MCR01MZPJ000	0
R17	RESISTOR (1005)	ROHM	MCR01MZPJ000	0
R18	RESISTOR (1005)	ROHM	MCR01MZPJ103	NM
R19	RESISTOR (1005)	ROHM	MCR01MZPJ000	NM
R20	RESISTOR (1005)	ROHM	MCR01MZPJ000	NM
R21	RESISTOR (1005)	ROHM	MCR01MZPJ103	NM
R22	RESISTOR (1005)	ROHM	MCR01MZPJ103	10k
R23	RESISTOR (1005)	ROHM	MCR01MZPJ104	100k
R24	RESISTOR (1005)	ROHM	MCR01MZPJ222	NM
R25	RESISTOR (1005)	ROHM	MCR01MZPJ222	NM
R26	RESISTOR (1005)	ROHM	MCR01MZPJ000	NM
R27	RESISTOR (1005)	ROHM	MCR01MZPJ000	NM
R28	RESISTOR (1005)	ROHM	MCR01MZPJ331	NM
R29	RESISTOR (1005)	ROHM	MCR01MZPJ000	NM
R30	RESISTOR (1005)	ROHM	MCR01MZPJ000	NM
R31	RESISTOR (1005)	ROHM	MCR01MZPJ000	NM
R32	RESISTOR (1005)	ROHM	MCR01MZPJ000	NM
R33	RESISTOR (1005)	ROHM	MCR01MZPJ221	NM
R34	RESISTOR (1005)	ROHM	MCR01MZPJ390	NM
R35	RESISTOR (1005)	ROHM	MCR01MZPJ620	NM
R36	RESISTOR (1005)	ROHM	MCR01MZPJ221	220
R37	RESISTOR (1005)	ROHM	MCR01MZPJ220	22
R38	RESISTOR (1005)	ROHM	MCR01MZPJ221	220
R39	RESISTOR (1005)	ROHM	MCR01MZPJ220	22
R71	RESISTOR (1005)	ROHM	MCR01MZPJ000	NM
R72	RESISTOR (1005)	ROHM	MCR01MZPJ000	NM
R73	RESISTOR (1005)	ROHM	MCR01MZPJ000	0
R74	RESISTOR (1005)	ROHM	MCR01MZPJ000	0
R51	RESISTOR (1005)	ROHM	MCR01MZPJ103	10k
R59	RESISTOR (1005)	ROHM	MCR01MZPJ000	0
R3	RESISTOR(1608)	ROHM	MCR03EZPJ000	0
R4	RESISTOR(1608)	ROHM	MCR03EZPJ000	0
R40	RESISTOR(1608)	ROHM	MCR03EZPJ000	0
S1	TACT SWITCH	OMRON	B3U-1000P(M)-B	
IC5	USB UART (USB - Serial) IC	FTDI	FT232RQ	
J2	Connector	MAC8	Thorugh hole（For XB）	NM
J1	Connector USB, Plug Type A	molex	48037-2000	
J3	RF Connector	MURATA	MM8030-2610	
X1	Crystal oscillator	NDK	NX3225GA-16.000M-STD-CRG	NM
L51	Chip Inductor	MURATA	BLM18PG121SN1D	
R41	RESISTOR (1005)	ROHM	MCR01MZPJ103	NM
R42	RESISTOR (1005)	ROHM	MCR01MZPJ103	10k

4. PCB information

4.1 PCB layout

Top



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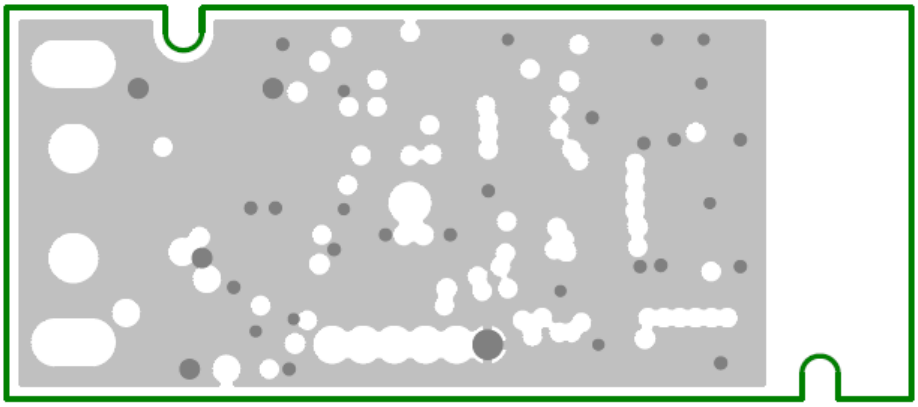

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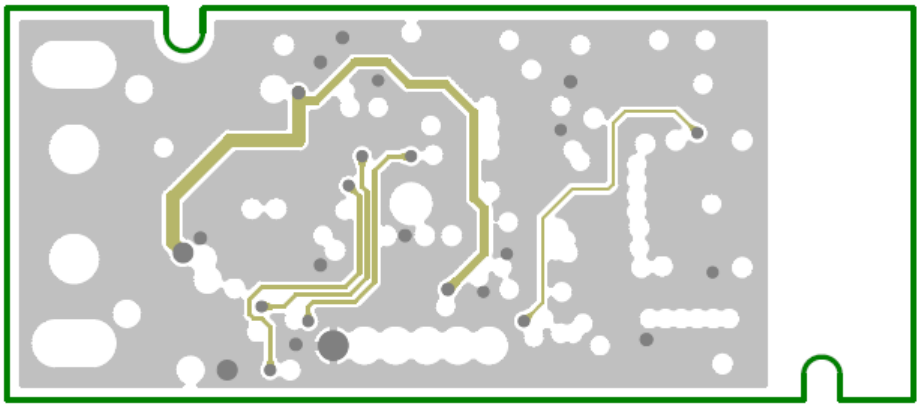

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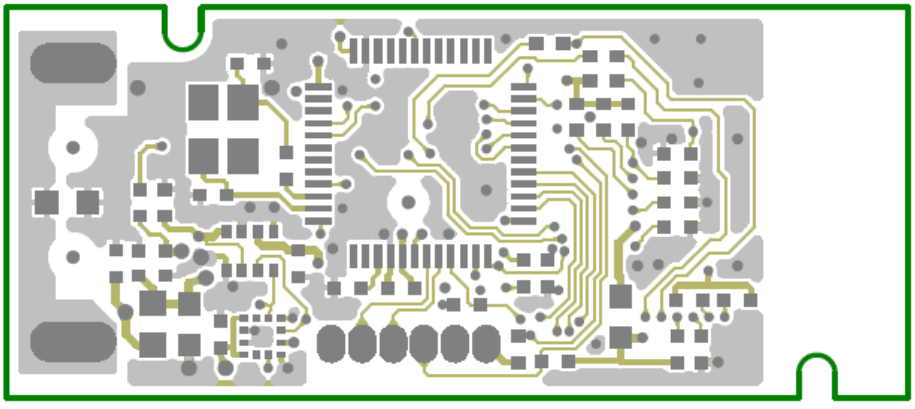
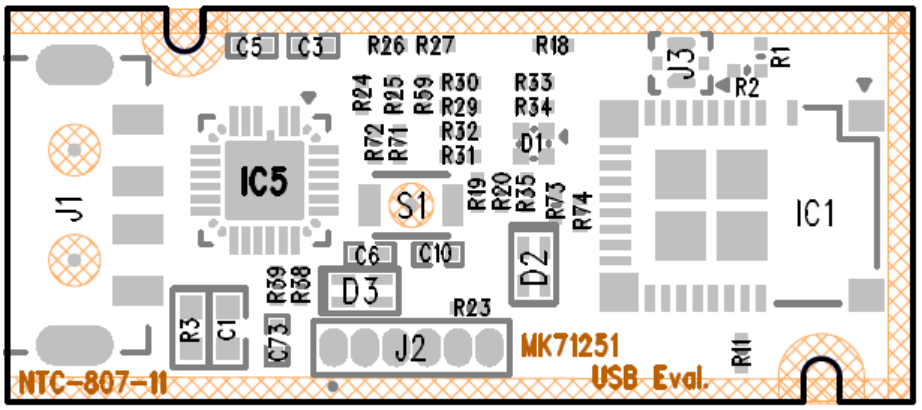


4.2 BOM layout

Top



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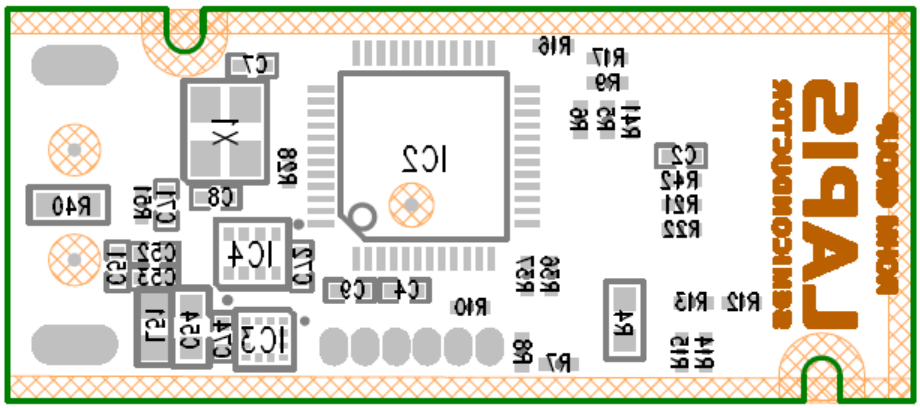

Revision History

Document No.	Issue date	Page		Revision description
		Before revision	After revision	
FEXK71251-02A-USB-EK_HardManual-01	Jun/21/2016	-	-	First edition issued
FEXK71251-02A-USB-EK_HardManual-02	Jul/20/2016	iv	iv	Added the notes about mass production use.

(Note) Corrections of errors and change/correction of expressions are not included.