

STKNX RFID reader evaluation and development kit

Introduction

The **STDES-KNXRFID** is a development board featuring the **STKNX**, **ST25R3916**, and **STM32G070CBT6**.

The KNX and RFID protocol stacks are both on the main controller, **STM32G070CB**.

The **ST25R3916** is a high-performance NFC universal device capable of reading RFID tag information and transmitting it to the main controller.

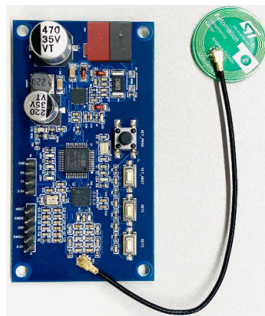
The **STKNX** transceiver supports both data transmission and reception and also supplies power to the main controller and the NFC device.

The **STKNX** extracts power from the KNX bus and converts it into 3.3 V for the main controller and 5 V for the NFC device.

The **STDES-KNXRFID** includes all the necessary components for evaluating the performance of the **STKNX** circuit and developing a KNX device according to the TP1-256 standard for twisted-pair medium communication.

The document guides setting up, operating, and testing the sensor board for user reference.

Figure 1. STDES-KNXRFID



1 Overview

The **STDES-KNXRFID** is a KNX RFID reader that integrates the **STKNX** transceiver and the RFID device for detecting NFC tag and transmit to the KNX bus.

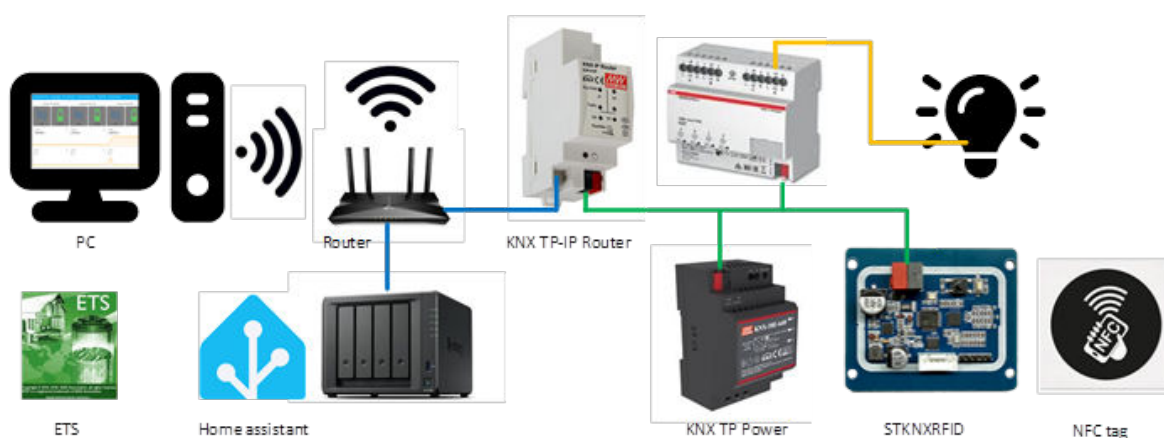
An ETS database was used to set related parameters and assign group addresses to related communication objects.

Through ETS configuration, the **STDES-KNXRFID** can send out NFC ID to the KNX bus after detecting NFC tag for smart home/building automation system.

The **STDES-KNXRFID** usually works in home/building automation systems to provide an RFID authentication function to control related equipment.

The following diagram is a use case for **STDES-KNXRFID** to automatically control the lights of other actuators in the KNX energy management system in an office building.

Figure 2. STDES-KNXRFID diagram



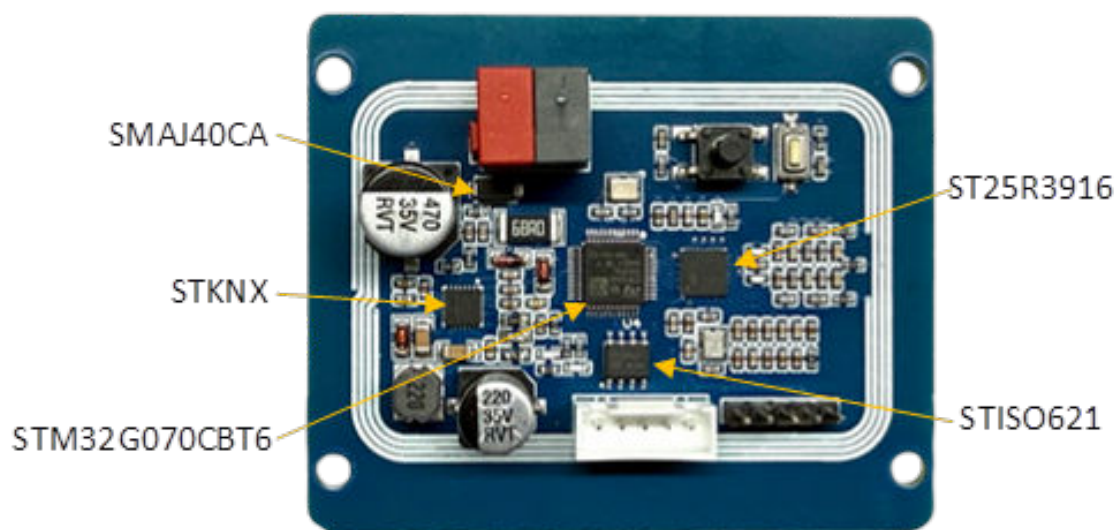
2 Getting started

2.1 Features

- Turnkey STKNX TP solution
- Power by KNX BUS
- Additional external power supply not needed
- Support detect NFCA, NFCV types, and NFC tag (by default)
- Get NFC tag information from ETS tools
- Use NFC tag to control KNX device
- A reference ETS DD for customizing parameters setting and group address for different KNX system

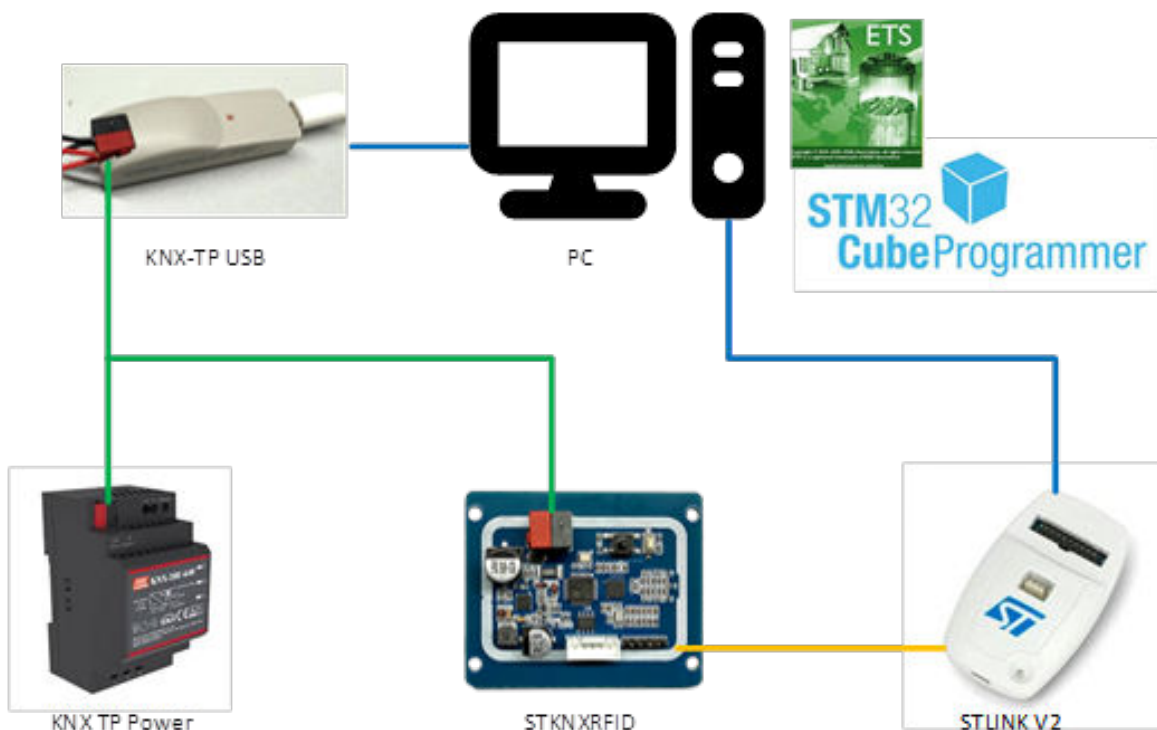
2.2 Component placment

Figure 3. Component placement



2.3 Setup for STDES-KNXRFID

Figure 4. Setup for STDES-KNXRFID



- Step 1.** Connect the STDES-KNXRFID to the KNX power via KNX cable
- Step 2.** Connect the KNXTP-USB to the KNX power via KNX cable, then connect it to the PC
- Step 3.** Connect the ST-LINK/V2 to the STDES-KNXRFID, then connect to the PC
- Step 4.** Run the STM32Cube programmer to download the program to STDES-KNXRFID
- Step 5.** Open ETS and import the ETS project file for the STDES-KNXRFID, setting related parameters and group address to communication objects
- Step 6.** Press the program button on the sensor board, then select download all to download all settings to STDES-KNXRFID
- Step 7.** Use the diagnostic function of ETS to monitor the data sent by the sensor to the KNX bus

3 Test setup

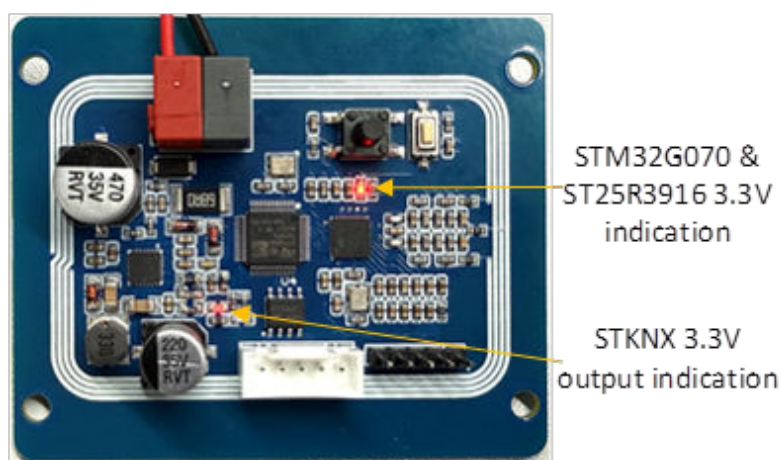
Set up a minimal KNX system for testing STDES-KNXRFID function. The testing includes the following parts:

- Power up initialization checking
- Use a NFCA or NFCV type tag close to STDES-KNXRFID antenna, it will start to detect the tag periodically per 200 ms
- When KNXRFID detects NFC tag, the information on the tag can be seen at ETS diagnostic area

3.1 Power up initialization checking

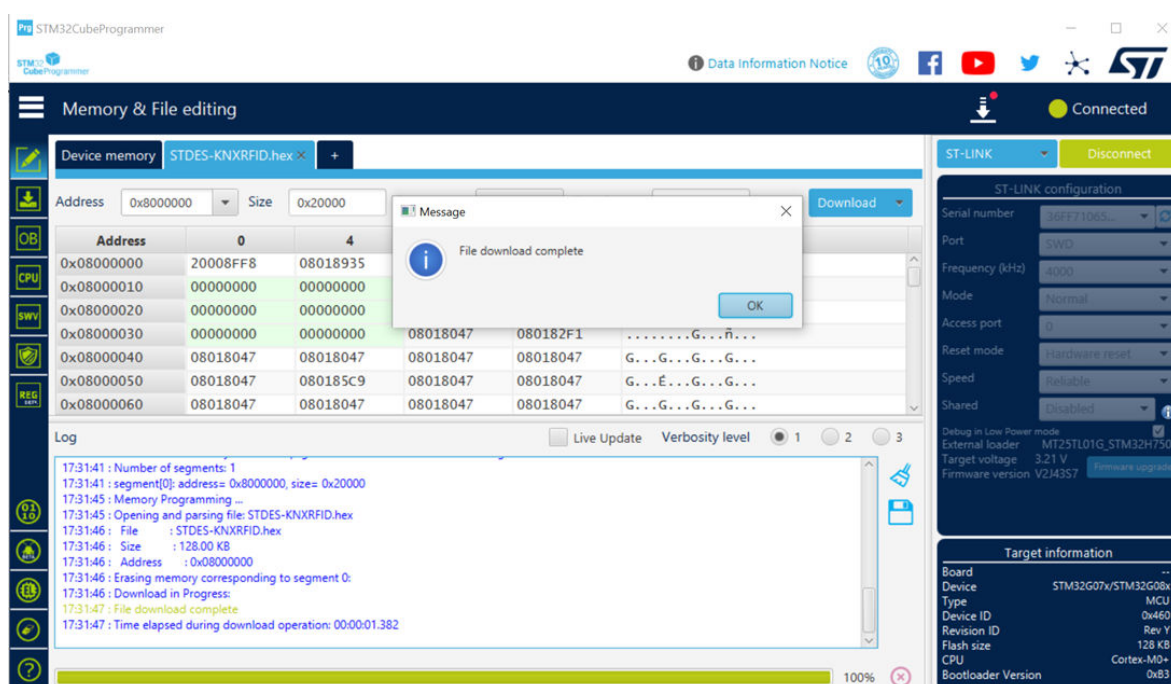
After the power-on of the KNX and the power supply connected to the STDES-KNXRFID via KNX cable, the LED of power indication turns-on.

Figure 5. Power up



Connect ST-LINK/V2 to KNXRFID and use STM32CubeProgrammer to download the executable file STDES-KNXRFID.hex to KNXRFID board.

Figure 6. File download



3.2 Configuration via ETS tool

Open ETS5, then input the ETS database for STDES-KNXRFID, assign physical address 1.1.1 to STDES-KNXRFID.

Use the default parameter setting and assign the group address to ChargerID (23/2/13) related communication objects.

Press the program key and download all settings to STDES-KNXRFID.

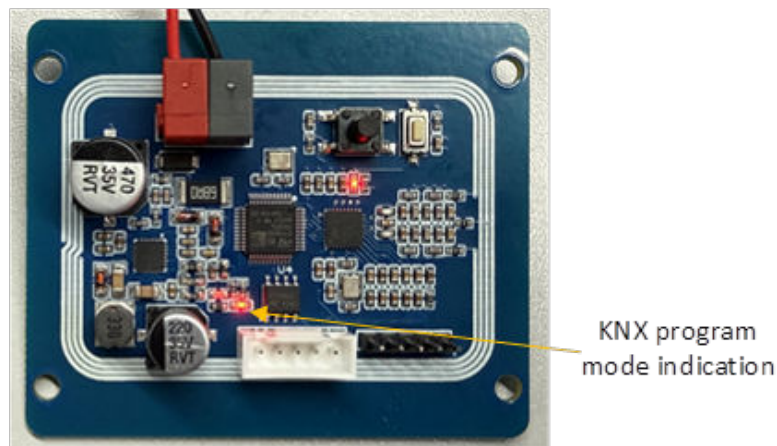
Figure 7. ETS configuration

Number	Name	Object Function	Description	Group Address	Length	C	R	W	T	U	Data Type	Priority
#20	Charger Status	Charger Status			1 byte	C	R	W	T	U	counter pulses (0.255)	Low
#21	Charging Gun Status	Charging Gun Status			1 bit	C	R	W	T	U	switch	Low
#22	Charged Energy_Total	Charged Energy_Total			4 bytes	C	R	W	T	U	active energy (Wh)	Low
#23	Charged Energy_Last	Charged Energy_Last			4 bytes	C	R	W	T	U	active energy (Wh)	Low
#24	Charged Time	Charged Time			2 bytes	C	R	W	T	U	time (min)	Low
#25	Charging Voltage	Charging Voltage			4 bytes	C	R	W	T	U	electric potential (V)	Low
#26	Charging Power	Charging Power			4 bytes	C	R	W	T	U	power (W)	Low
#27	Charging Current	Charging Current			2 bytes	C	R	W	T	U	current (mA)	Low
#28	MaximumChargingPower	MaximumChargingPower			4 bytes	C	R	W	T	U	power (W)	Low
#29	MaximumChargingTime	MaximumChargingTime			2 bytes	C	R	W	T	U	time (min)	Low
#30	FaultNumber	FaultNumber			1 byte	C	R	W	T	U	counter pulses (0.255)	Low
#31	Temperature	Temperature			2 bytes	C	R	W	T	U	temperature (°C)	Low
#32	DateTime	DateTime			8 bytes	C	R	W	T	U	date time	Low
#33	ChargerID	ChargerID	Read and Write ID	23/2/13	14 bytes	C	R	W	T	U	Character String (ASCII)	Low
#34	Charging setting	Charging setting	RFD card detected	1/7/21	1 bit	C	R	W	T	U	state	Low

The STDES-KNXRFID enter in programming mode pressing the program key.

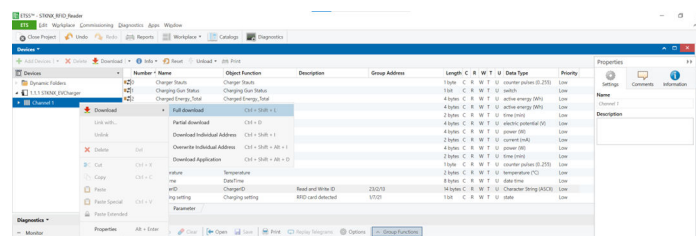
The program LED turns on.

Figure 8. Program mode



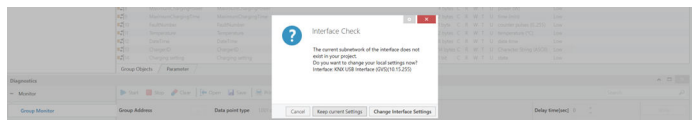
Download all ETS configurations.

Figure 9. Ets configuration



Select Keep current Settings

Figure 10. Interface check



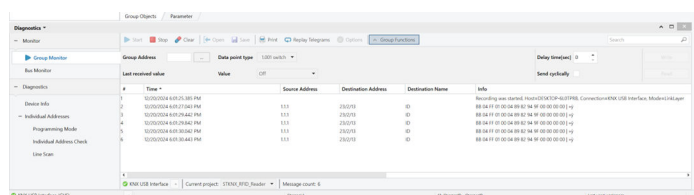
3.3 NFC tag detect

Get an NFCA or NFCV type RFID tag approach to the KNXRFID antenna.

The STDES-KNXRFID board can detect the tag and send its information to ETS automatically.

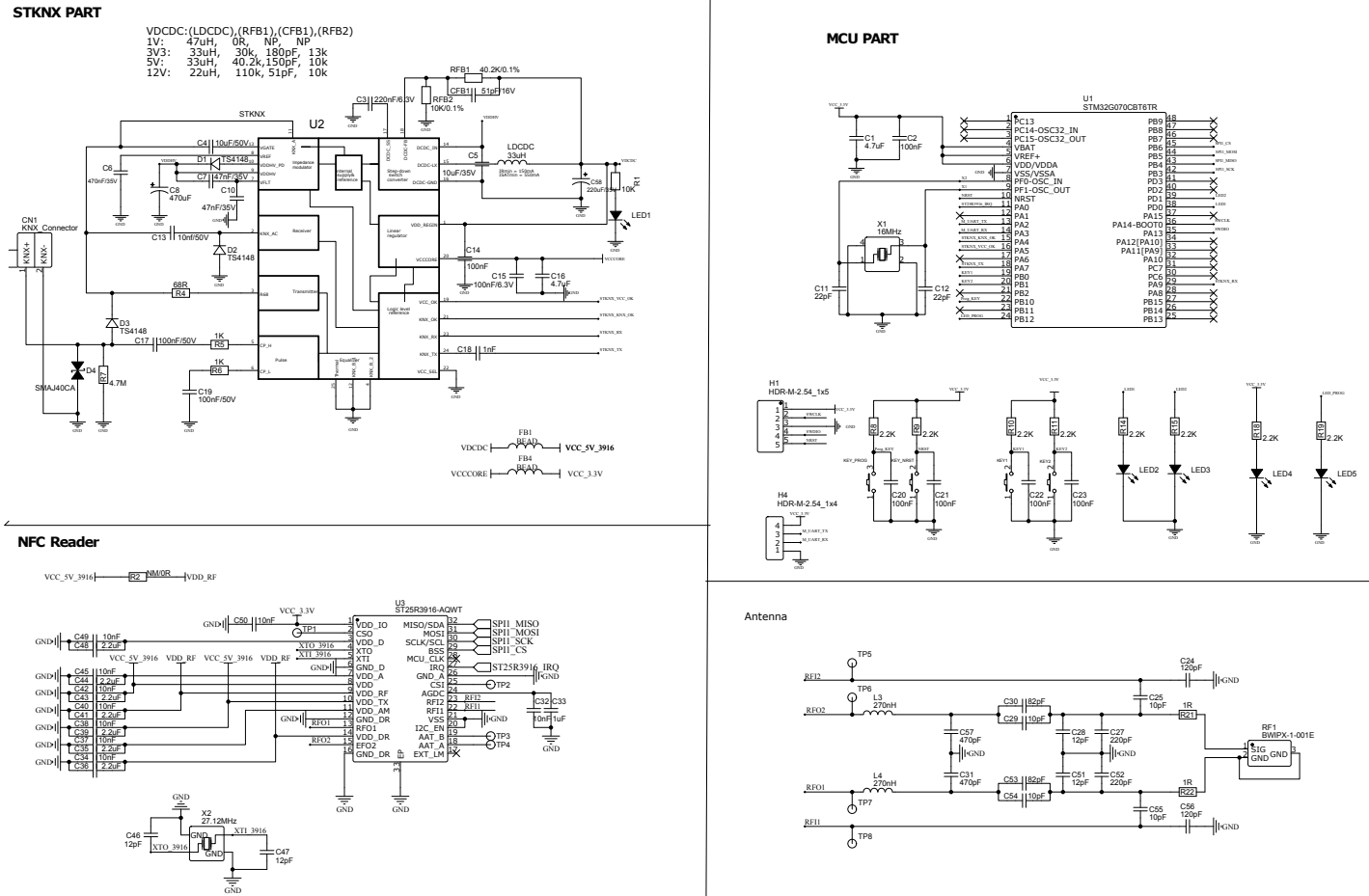
You can see the information of the NFC tag captured by the ETS diagnostics window.

Figure 11. NFC tag detect



Schematic diagrams

Figure 12. STDES-KNXRFID circuit schematic



5 Bill of materials

Table 1. STDES-KNXRFID bill of materials

Item	Q.ty	Ref.	Part / Value	Description	Manufacturer	Order code
1	2	C1,C16	4.7uF	C0603	SAMSUNG(三星)	CL10A475KO8NNNC
2	6	C2,C14,C20,C21,C22,C23	100nF	C0603	YAGEO	CC0603KRX7R9BB104
3	1	C3	220nF/6.3V	C0603	SAMSUNG(三星)	CL10B224KA8NNNC
4	1	C4	10uF/50V	C1206	SAMSUNG(三星)	CL31A106KBHNNNE
5	1	C5	10uF/35V	C1206	SAMSUNG(三星)	CL31A106KBHNNNE
6	1	C6	470nF/35V	C0603	SAMSUNG(三星)	CL21B474KBFNNNE
7	2	C7,C10	47nF/35V	C0603	SAMSUNG(三星)	CL10B473KB8NNNC
8	1	C8	470uF	CAP-SMD_BD10.0-L10.3-W10.3-LS11.3-FD	ROQANG(容口)	VT1V471M1010
9	2	C11,C12	22pF	C0603	SAMSUNG(三星)	CL10C220JB8NNNC
10	1	C13	10nf/50V	C0603	FH(□□)	0603B103K500NT
11	1	C15	100nF/6.3V	C0603	YAGEO	CC0603KRX7R9BB104
12	2	C17,C19	100nF/50V	C0603	YAGEO	CC0603KRX7R9BB104
13	1	C18	1nF	C0603	SAMSUNG	CL10B102KB8NNNC
14	2	C24,C56	120pF	C0603	TDK	CGA3E2C0G1H121JT0Y0N
15	4	C25,C29,C54,C55	10pF	C0603	SAMSUNG	CL10C100JB8NNNC
16	2	C27,C52	220pF	C0603	SAMSUNG	CL10B221KB8NNNC
17	4	C28,C46,C47,C51	12pF	C0603	SAMSUNG	CL10C120JB8NNNC
18	2	C30,C53	82pF	C0603	TDK	CGA3E2C0G1H820JT0Y0N
19	2	C31,C57	470pF	C0603	FH	0603B471K500NT
20	9	C32,C34,C37,C38,C40,C42,C45,C49,C50	10nF	C0603	FH	0603B103K500NT
21	1	C33	1uF	C0603	SAMSUNG	CL10A105KB8NNNC
22	7	C35,C36,C39,C41,C43,C44,C48	2.2uF	C0603	SAMSUNG	CL10A225KO8NNNC

Item	Q.ty	Ref.	Part / Value	Description	Manufacturer	Order code
23	1	C58	220uF/35V	CAP-SMD_BD8.0-L8.3-W8.3-LS9.5-FD	KNSCHA(科尼盛)	RVT220UF35V67RV0024
24	1	CFB1	51pF/16V	C0805	YAGEO	CC0805JRNPO9BN510
25	3	D1,D2,D3	TS4148	D1206-RD	ST(先科)	LL4148
26	1	D4	SMAJ40CA-TR, SMA	SMA_L4.4-W2.6-LS5.0-BI	ST	SMAJ40CA-TR
27	2	FB1,FB4	600Ω@100MHz	L0603	Sunlord	GZ1608D601TF
28	1	H1	HDR-M-2.54_1x5	HDR-TH_5P-P2.54-V-M	Ckmtw	210S-1*5P L=11.6MMGold-plated black
29	1	H4	HDR-M-2.54_1x4	HDR-M-2.54_1X4	Any	Any
30	3	KEY1,KEY2,KEY_NRST	K2-3.6×6.1_SMD	KEY-SMD_2P-L6.2-W3.6-LS8.0	Rectangular Connectors - Contacts	K2-1107ST-A4SW-06
31	1	KEY_PROG	K2-3.6×6.1_SMD	KEY-SMD_4P-L6.0-W6.0-P4.50-LS8.6	Any	Any
32	2	L3,L4	270nH	L0603	Guangdong Fenghua Advanced Tech	VHF160808HR27JT
33	1	LDCDC	33uH	IND-SMD_L5.8-W5.2_SLF05XX	Sunltech	SLF0504-220KTT
34	4	LED1,LED2,LED4,LED5	LED-0603_R	LED0603_RED	EVERLIGHT(台湾口光)	19-217/R6C-AL1M2VY/3T
35	1	LED3	LED-0603_G	LED0603_GREEN	EVERLIGHT(台湾口光)	19-217/GHC-YR1S2/3T
36	1	R1	10K	R0603	UNI-ROYAL(厚声)	0603WAF1002T5E
37	1	R2	NM/0R	R0603	UniOhm	0603WAF0000T5E
38	1	R4	68R	R2512	YAGEO	AC2512FK-0768RL
39	2	R5,R6	1K	R0603	UNI-ROYAL(厚声)	0603WAF1001T5E
40	1	R7	4.7M	R0603	UNI-ROYAL(厚声)	0603WAF4704T5E
41	8	R8,R9,R10,R11,R14,R15,R18,R19	2.2K	R0603	UNI-ROYAL(厚声)	0603WAF2201T5E
42	2	R21,R22	1R	R0603	UniOhm	0603WAF100KT5E
43	1	RF1	BWIPX-1-001E	IPEX-SMD_BWIPX-1-001E	BAT WIRELESS(蝙蝠无口)	BWIPX-1-001E
44	1	RFB1	40.2K/0.1%	R0805	YAGEO	
45	1	RFB2	10K/0.1%	R0805	YAGEO	
46	1	U1	STM32G070CBT6TR, LQFP-48	LQFP-48_L7.0-W7.0-P0.50-LS9.0-BL	ST	STM32G070CBT6TR

Item	Q.ty	Ref.	Part / Value	Description	Manufacturer	Order code
47	1	U2	STKNX, VFQFPN-24	VFQFPN-24_L4 .0-W4.0-P0.50- BL-EP2.8	ST	STKNX
48	1	U3	ST25R3916- AQWT, VFQFPN-32	VFQFPN-32_L5 .0-W5.0-P0.50- TL-EP3.5	ST	ST25R3916- AQWT
49	1	X1	16MHz	OSC-SMD_4P- L3.2-W2.5-BL	EPSON	X1E000021011 900
50	1	X2	27.12MHz	CRYSTAL- SMD_4P-L3.2- W2.5-BL	EPSON(口普生)	X1E000021050 2

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Revision history

Table 2. Document revision history

Date	Revision	Changes
19-Mar-2025	1	Initial release.

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