

KNX presence sensor solution for home/building automation system

Introduction

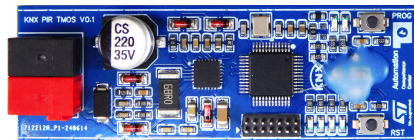
The **STDES-KNXSENSOR** is a KNX presence sensor solution for home/building automation system.

It is aimed to detect human presence status which includes moving person and stationary person.

The presence status is sent to KNX bus with different object type.

The solution comes with a comprehensive firmware and ETS database for providing flexible presence functions for different scenarios.

Figure 1. STDES-KNXSENSOR



1 Overview

The **STDES-KNXSENSOR** is a KNX presence sensor which integrated PIR sensor and TMOS sensor for detecting moving person and stationary person.

An ETS databased was used for setting related sensor parameters and assign group address to related communication objects.

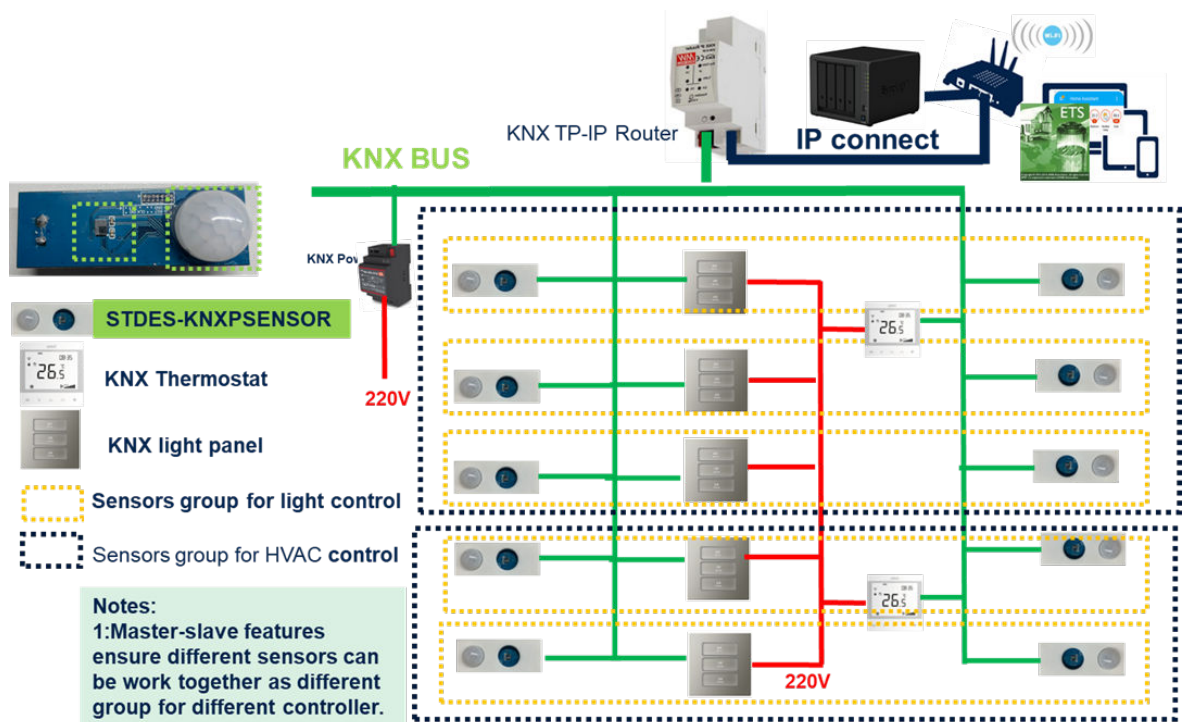
Through ETS configuration, the **STDES-KNXSENSOR** can send out presence status as request data type and group address for a smart home/building automation system.

The **STDES-KNXSENSOR** usually work in home/building automation systems for providing presence status and automatic control related equipment.

The **STDES-KNXSENSOR** can work individually, or several **STDES-KNXSENSOR**s work as a group.

The following diagram is a use case to **STDES-KNXSENSOR** for automatically control lights and thermostat in the KNX energy management system in an office building.

Figure 2. Control lights and thermostat



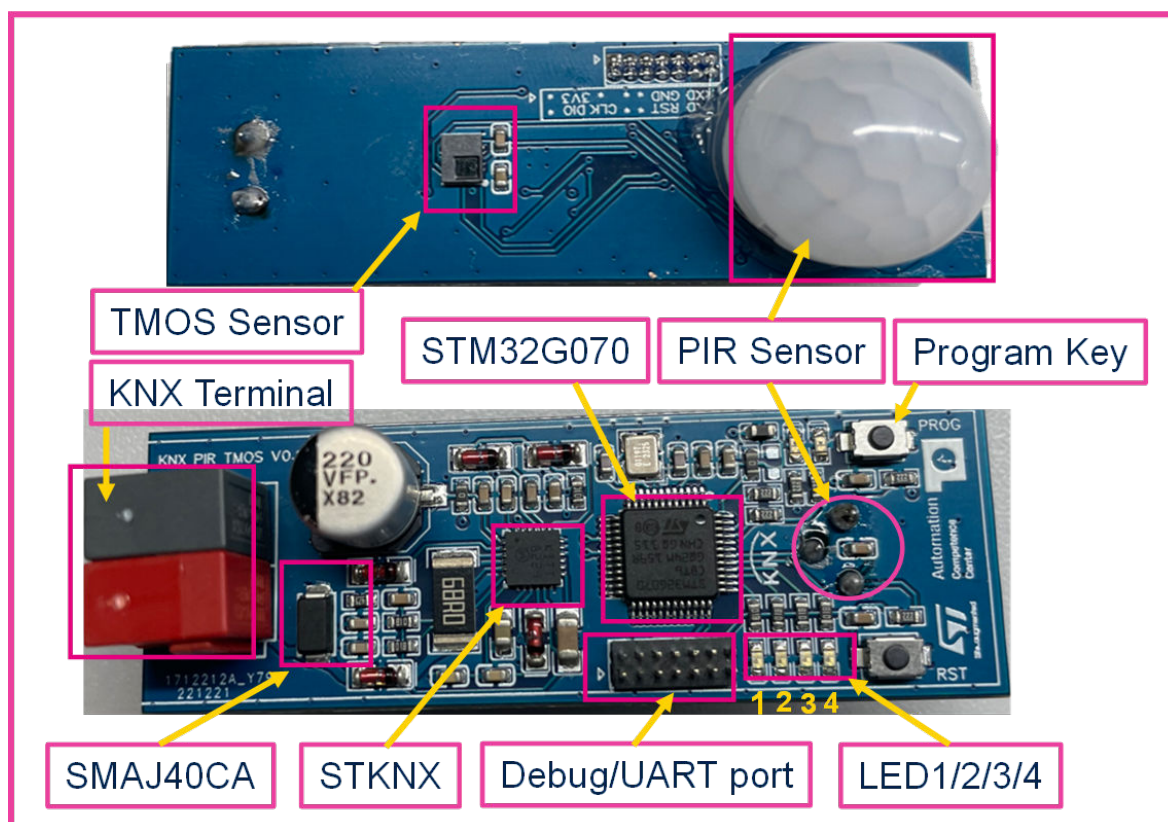
2 Getting started

2.1 Features

- Turnkey STKNX TP solution
- Power by KNX BUS
- Additional external power supply not needed
- Presence detection of moving person via PIR sensor
- Presence detection to stationary person via TMOS sensor
- Multi-output date types for presence sensor status
- Master/slave function for several sensors works together
- A reference ETS DD for customizing parameters setting and group address for different KNX system

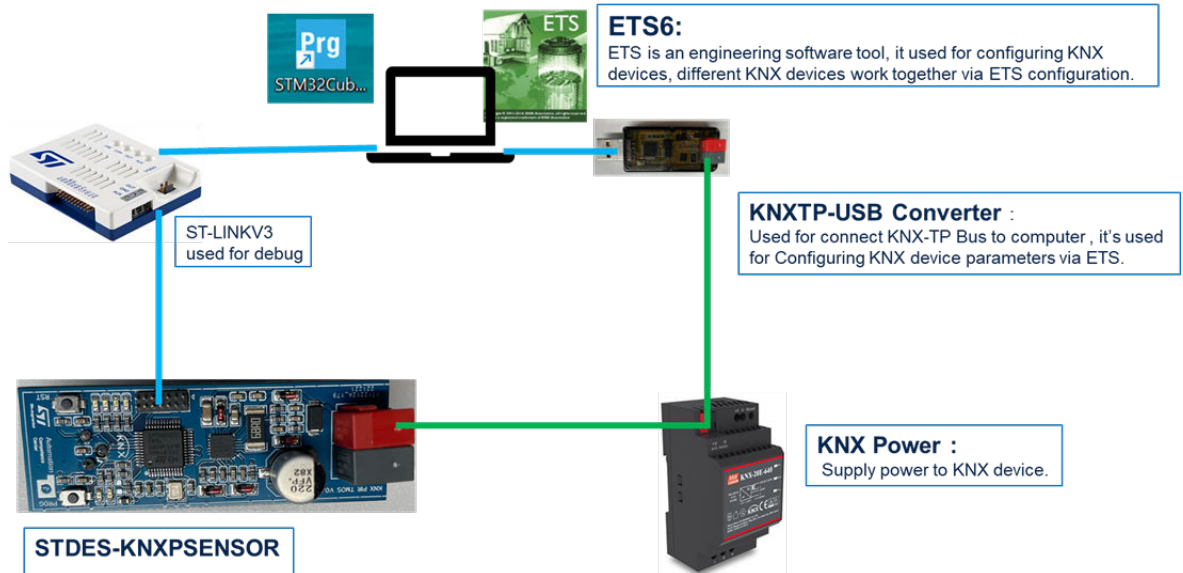
2.2 Component placement

Figure 3. Component placement



2.3 Setup for STDES-KNXSENSOR

Figure 4. Setup for STDES-KNXSENSOR



- Step 1.** Connect the STDES-KNXSENSOR to KNX power via KNX cable
- Step 2.** KNXTP-USB connect to KNX power via KNX cable, then connect to PC
- Step 3.** ST-LINKV3 connect to STDES-KNXSENSOR, then connect to PC
- Step 4.** Run the STM32Cube programmer to download the program to STDES-KNXSENSOR
- Step 5.** Open ETS and import ETS DD for STDES-KNXSENSOR, 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-KNXSENSOR
- Step 7.** Use the diagnostic function of ETS to exchange data with the sensor and monitor the data sent by the sensor to the KNX bus

3 Test setup

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

- Power up initialization checking
- PIR presence function to moving person, it is indicated via LED or monitor via ETS
- TMOS presence function to moving and stationary person, it is indicated via LED or monitor via ETS

3.1 Power up initialization checking

After the power-on KNX power supply which was connected to STDES-KNXPESENSOR via KNX cable, the LED of sensor power indication turns-on.

Then download the program to the sensor board via STLINK/V3 and cube programmer.

Figure 5. Power indication

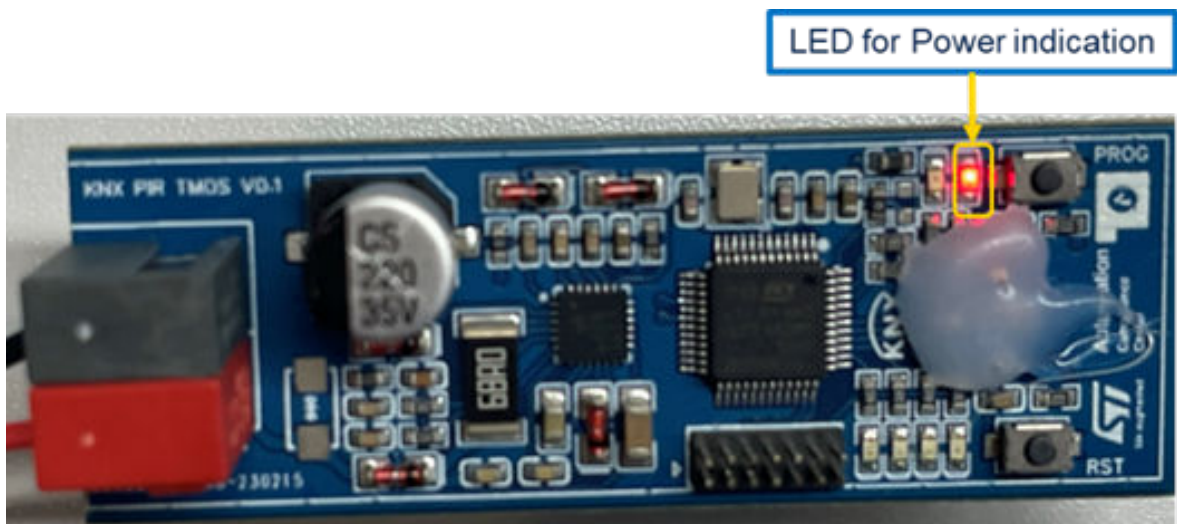
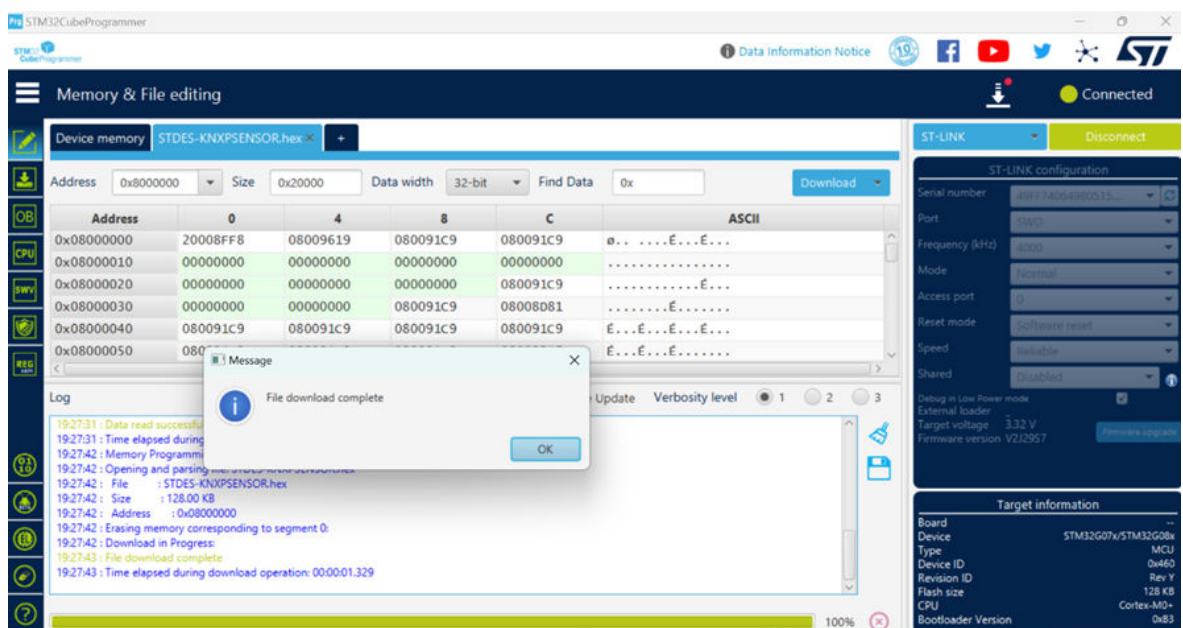


Figure 6. Download



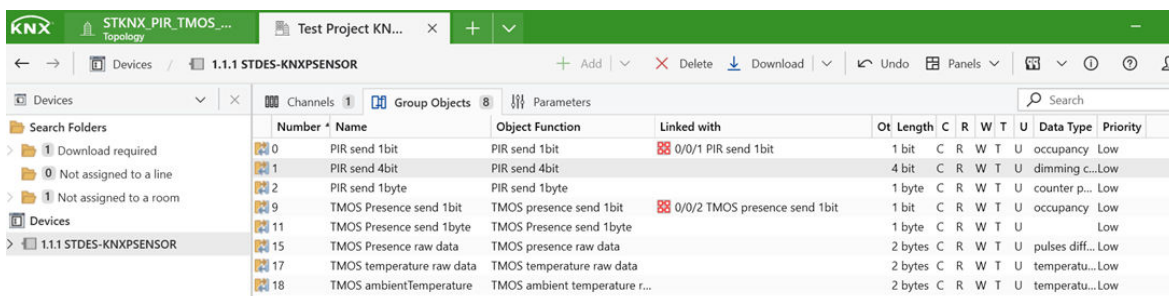
3.2 Sensor configuration via ETS tool

Open ETS6, then input the ETS database for STDES-KNXPESENOR, assign physical address 1.1.1 to STDES-KNXPESENOR.

Use default parameter setting and assign group address to PIR sensor (0/0/1) and TMOS sensor (0/0/2) related communication objects, then press program key and download all setting to STDES-KNXPESENOR.

ETS configuration: 0/0/1 was assigned to PIR send 1bit, 0/0/2 was assigned to TMOS presence send 1bit.

Figure 7. ETS configuration



STDES-KNXPESENOR enter programing mode by press program key: program LED was turn on.

Figure 8. ETS program

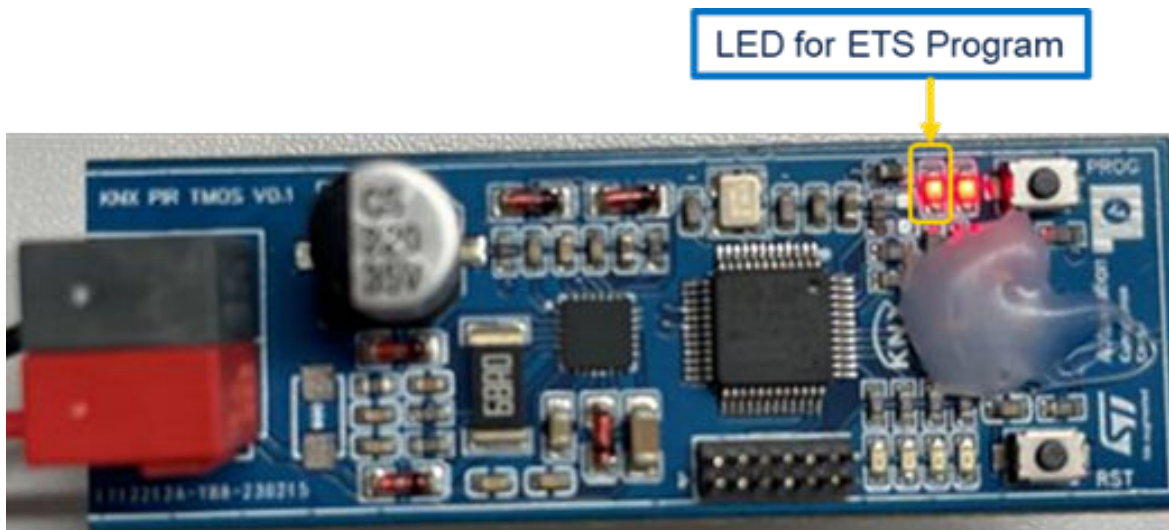
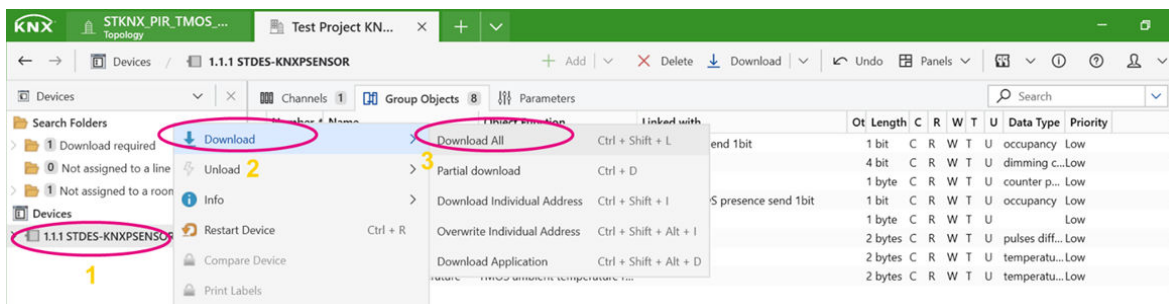


Figure 9. Download ETS configuration



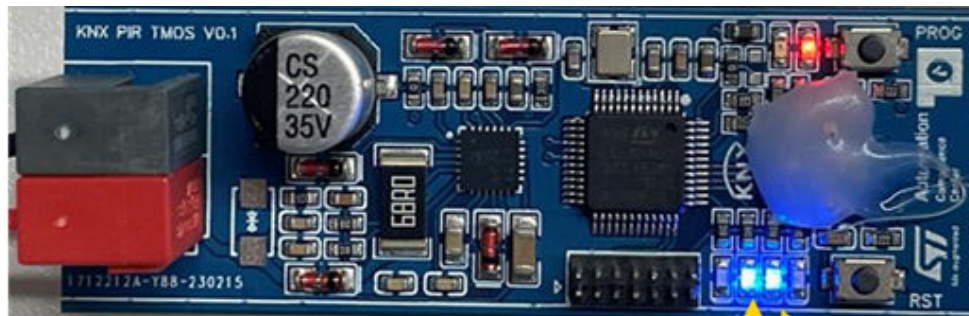
3.3 Sensor test

Move your hand over the PIR and TMOS sensors. After detecting the moving hand, the status of LED2 and LED3 change to ON.

At the same time, the presence status is sent to the KNX bus via 0/0/1 and 0/0/2.

The diagnostic function of ETS can monitor the sensor status sent to the bus.

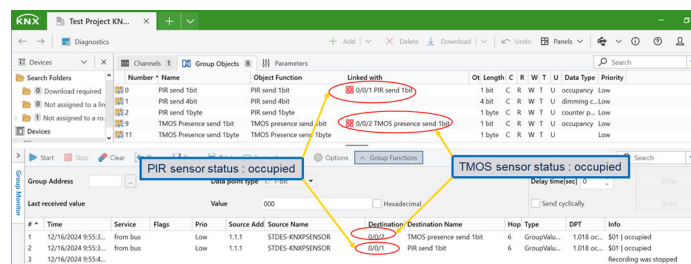
Figure 10. PIR and TMOS LED status



LED2 on for indicating PIR sensor in occupied status

LED3 on for indicating TMOS sensor in occupied status

Figure 11. PIR and TMOS occupied status

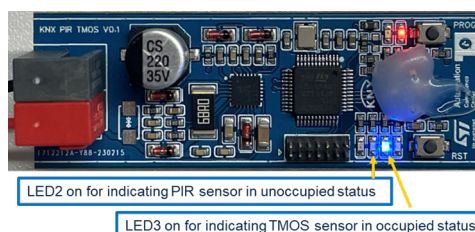


Keep the hand still above the sensor, after 5 seconds, the PIR presence detection status changes to no one, the TMOS detection result remains as someone present.

The status of LED2 changes to OFF, the status of LED3 remains ON, and the new PIR presence detection status is also sent to the KNX bus via 0/0/1.

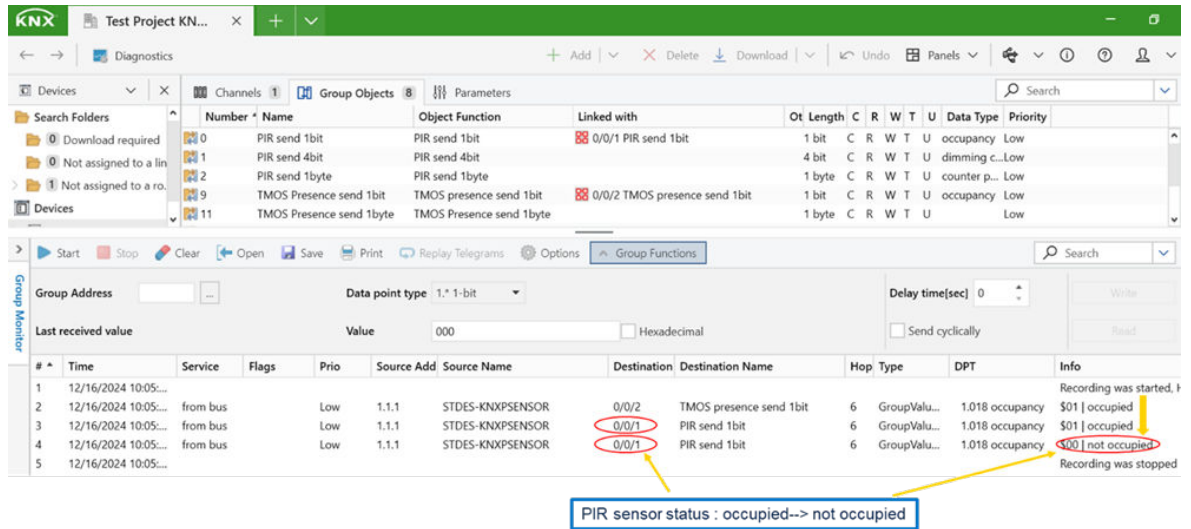
The diagnostic function of ETS will also monitor the new PIR presence detection status.

Figure 12. PIR unoccupied, TMOS occupied



LED2 on for indicating PIR sensor in unoccupied status

LED3 on for indicating TMOS sensor in occupied status

Figure 13. PIR occupied/not occupied


Remove the hand from the sensor, after 5 seconds, the PIR presence detection status changes to no one, the TMOS detection result remains as no one, the status of LED2 changes to OFF.

The status of LED3 remains OFF, the new PIR presence detection status is sent to the KNX bus via 0/0/1, the new TMOS presence detection status is also sent to the KNX bus via 0/0/2, and the ETS diagnostic function will also monitor the new sensor status.

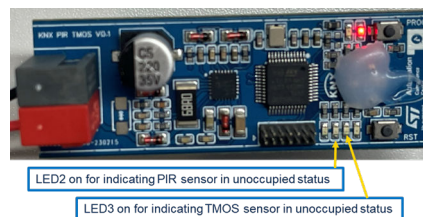
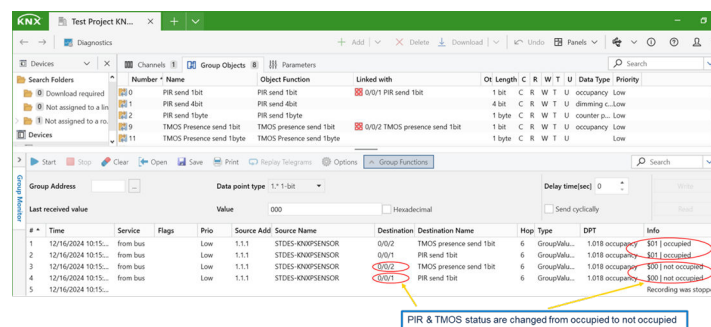
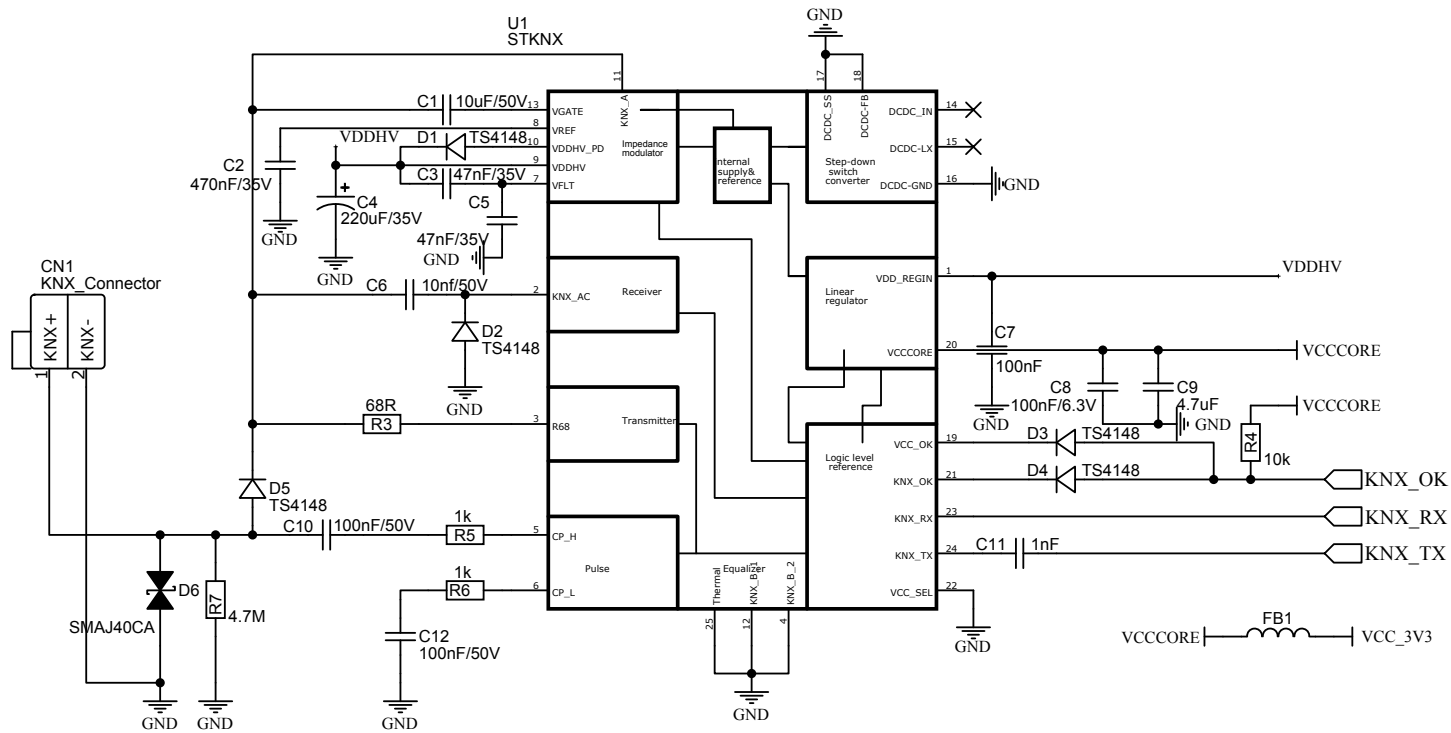
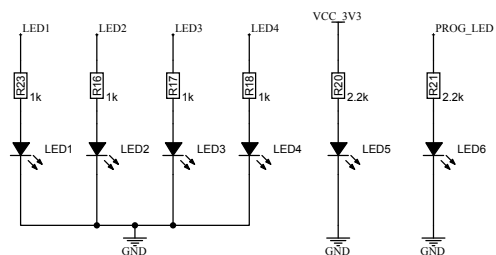
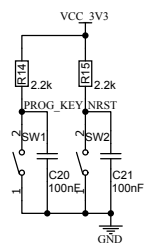
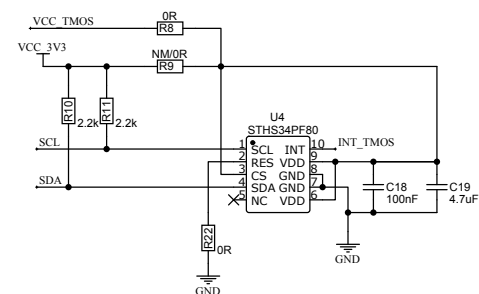
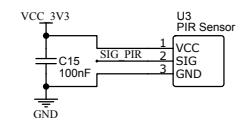
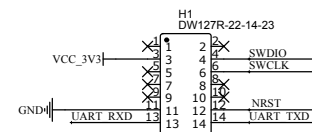
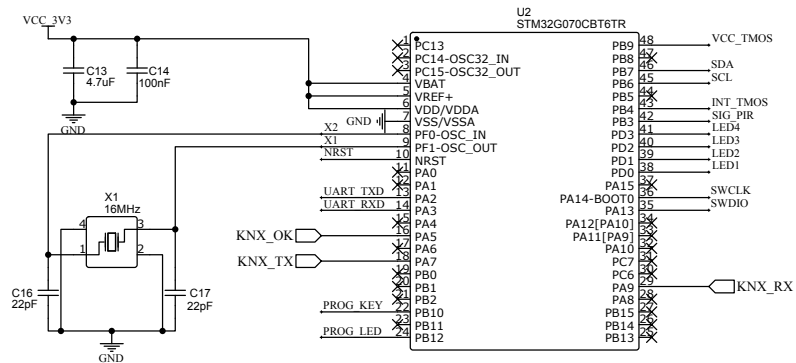
Figure 14. PIR and TMOS unoccupied

Figure 15. PIR and TMOS from occupied to not occupied


Figure 16. STDES-KNXSENSOR circuit schematic (1 of 2)

STKNX PART





5 Bill of materials

Table 1. STDES-KNXSENSOR bill of materials

Item	Q.ty	Ref.	Part / Value	Description	Manufacturer	Order code
1	2	LED5,LED6	LED-0603_R	LED0603_Red	EVERLIGHT(台湾口光)	19-217/R6C-AL1M2VY/3T
2	2	SW1,SW2	TS-1088-AR02016	SW-SMD_L4.0-W2.9-H2-LS5.0	XUNPU	TS-1088-AR02016
3	1	C1	10uF/50V	C1206_L3.2-W1.6-H1.3	SAMSUNG(三星)	CL31A106KBHNNNE
4	1	C2	470nF/35V	C0805_L2.0-W1.3-H1.3	SAMSUNG(三星)	CL21B474KBFNNNE
5	2	C3,C5	47nF/35V	C0603_L1.6-W0.8-H0.8	SAMSUNG(三星)	CL10B473KB8NNNC
6	1	C4	220uF/35V	CAP-SMD_BD8.0-L8.3-W8.3-LS9.5-FD	ST(先科)	LZ1V221M-CRF10
7	1	C6	10nf/50V	C0603_L1.6-W0.8-H0.8	FH(口口)	0603B103K500NT
8	6	C7,C14,C15,C20,C21,C18	100nF	C0603_L1.6-W0.8-H0.8	YAGEO	CC0603KRX7R9BB104
9	1	C8	100nF/6.3V	C0603_L1.6-W0.8-H0.8	YAGEO	CC0603KRX7R9BB104
10	3	C9,C13,C19	4.7uF	C0603_L1.6-W0.8-H0.8	SAMSUNG(三星)	CL10A475KO8NNNC
11	2	C10,C12	100nF/50V	C0603_L1.6-W0.8-H0.8	YAGEO	CC0603KRX7R9BB104
12	1	C11	1nF	C0603_L1.6-W0.8-H0.8	SAMSUNG	CL10B102KB8NNNC
13	2	C16,C17	22pF	C0603_L1.6-W0.8-H0.8	SAMSUNG(三星)	CL10C220JB8NNNC
14	5	D1,D2,D3,D4,D5	TS4148	D1206_L3.2-W1.5-H0.9	Taiwan Semiconductor(Taiwan Semicon)	TS4148 RXG
15	1	D6	SMAJ40CA-TR, SMA	SMA_L4.3-W2.5-H2.1-LS5.0	ST	SMAJ40CA-TR
16	1	FB1	600Ω@100MHz	L0603_L1.6-W0.8-H0.5_BEAD	Sunlord	GZ1608D601TF
17	1	H1	DW127R-22-14-23	HDR-TH_14P-P1.27-V-M-R2-C7-S1.27-2	DEALON(德口隆)	DW127R-22-14-23
18	4	LED1,LED2,LED3,LED4	LED-0603_B	LED0603_Blue	EVERLIGHT(台湾口光)	19-217/BHC-ZL1M2RY/3T
19	1	R3	68R	R2512_L6.3-W3.2-H0.6	YAGEO	AC2512FK-0768RL
20	1	R4	10k	R0603_L1.6-W0.8-H0.8	UNI-ROYAL(厚声)	0603WAF1002T5E
21	6	R5,R6,R16,R17,R18,R23	1k	R0603_L1.6-W0.8-H0.8	UNI-ROYAL(厚声)	0603WAF1001T5E
22	1	R7	4.7M	R0603_L1.6-W0.8-H0.8	UNI-ROYAL(厚声)	0603WAF4704T5E
23	2	R8,R22	0R	R0603_L1.6-W0.8-H0.8	UNI-ROYAL(厚声)	0603WAF0000T5E

Item	Q.ty	Ref.	Part / Value	Description	Manufacturer	Order code
24	1	R9	NM/0R	R0603_L1.6-W0.8-H0.8	UNI-ROYAL(厚声)	0603WAF0000T5E
25	6	R10,R11,R14,R15,R20,R21	2.2k	R0603_L1.6-W0.8-H0.8	UNI-ROYAL(厚声)	0603WAF2201T5E
26	1	U1	STKNX, VFQFPN-24	VFQFPN-24_L4.0-W4.0-H0.9-P0.50	ST	STKNX
27	1	U2	STM32G070CBT6TR, LQFP-48	LQFP-48_L7.0-W7.0-H1.4-LS9.0-P0.50	ST	STM32G070CBT6TR
28	1	X1	16MHz	OSC-SMD_4P-L3.2-W2.5-H1.0	EPSON	X1E000021011900
29	1	U3	PIR Sensor		SENBA SENSING TECHNOLOGY CO,LTD	BS312
30	1	U4	STHS34PF80, OLGA-10L	OLGA-10L	ST	STHS34PF80

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Revision history

Table 2. Document revision history

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

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