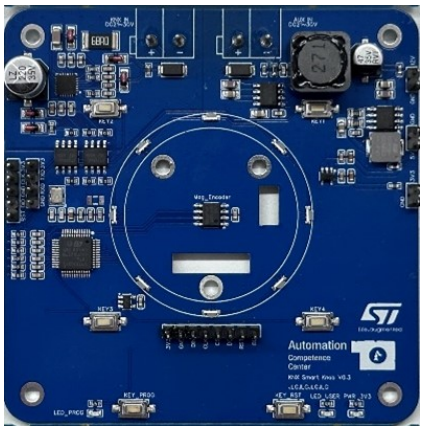
Smart knob embedded into KNX system

Introduction

This document demonstrates the set-up of hardware, installation of code, and the communication with the KNX system.

It provides detailed steps for the board hardware operation and one specific example for communication between knob and KNX system panel.



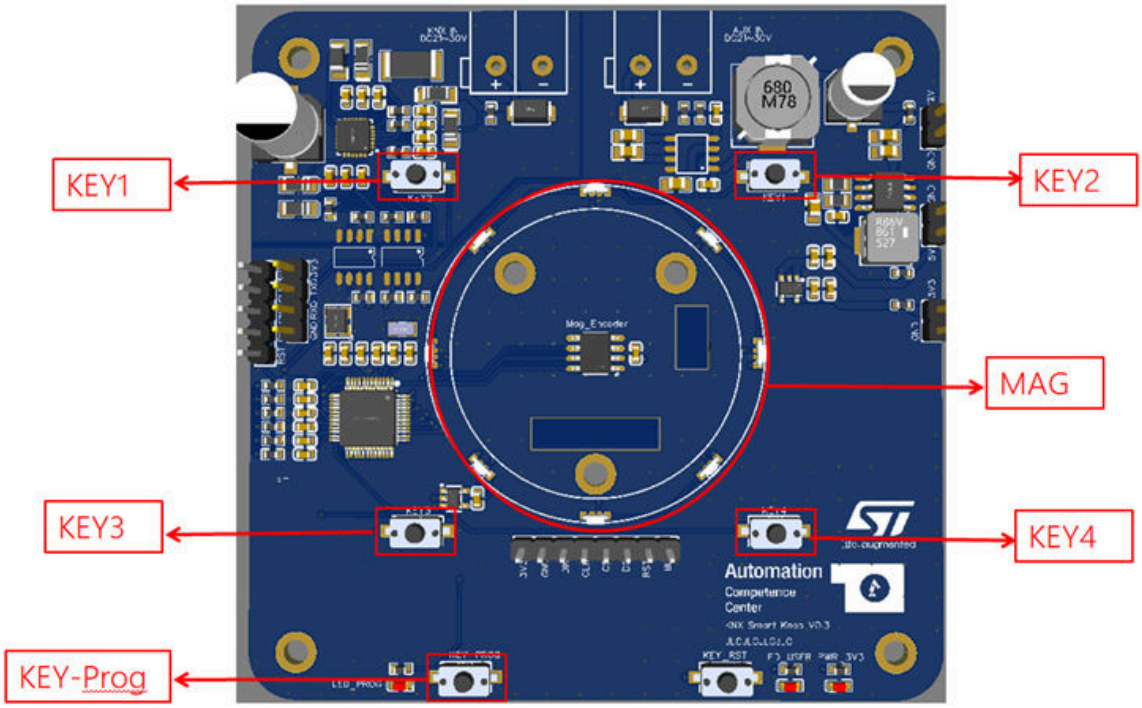
1 Overview

This smart knob is based on the KNX protocol, and developed some Lib to support the display of information on LCD, buttons on board to control the page switch.

The RGB is used to display the color and the simulation of four lights on/off. The board needs two powers to supply power.

The KNX power is mainly for KNX communication and the auxiliary power is mainly for LCD, RGB, and the magnetometer.

Figure 1. Panel view



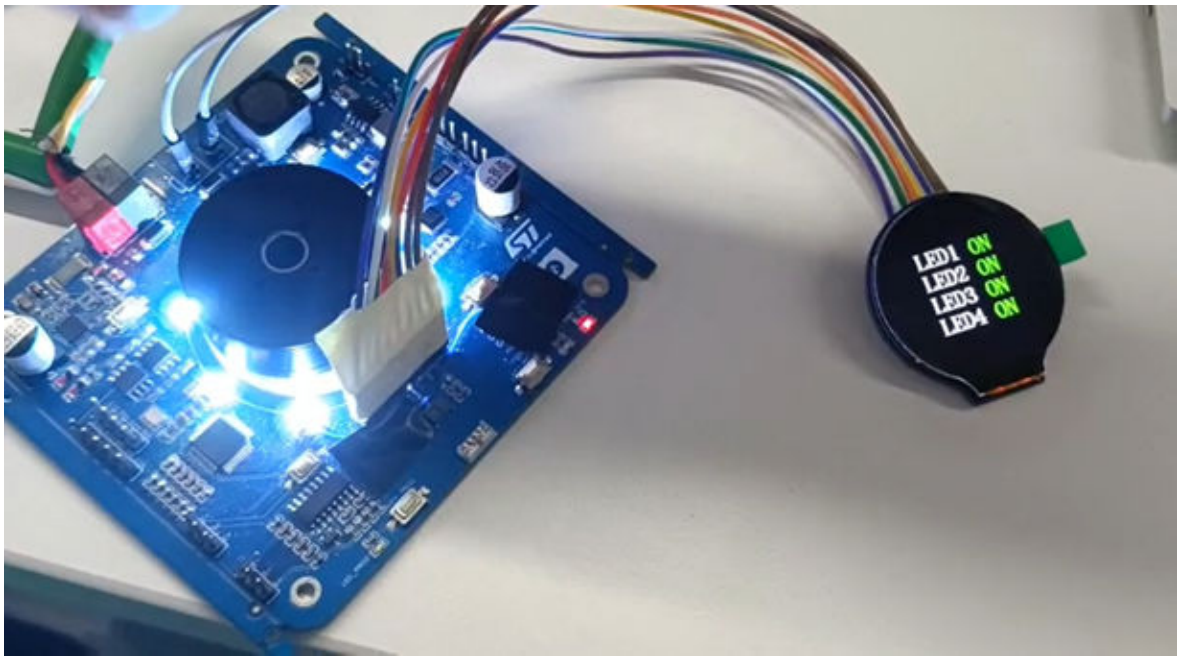
- KEY1 and KEY2 are for switching pages, the KEY1 is switching up and the KEY2 is switching down
- KEY3 and KEY4 are for HVAC control. The KEY3 is for up and the KEY4 is for down on the HVAC page
- KEY-Prog is for downloading the database after the hex file installing in the board
- MAG is the area of magnetic sensor, rotate knob over the chip and get the absolute angle

2 Interaction operation

It is an example for how to use the knob to control the KNX system and realize the interaction.
The following is different function pages interaction:

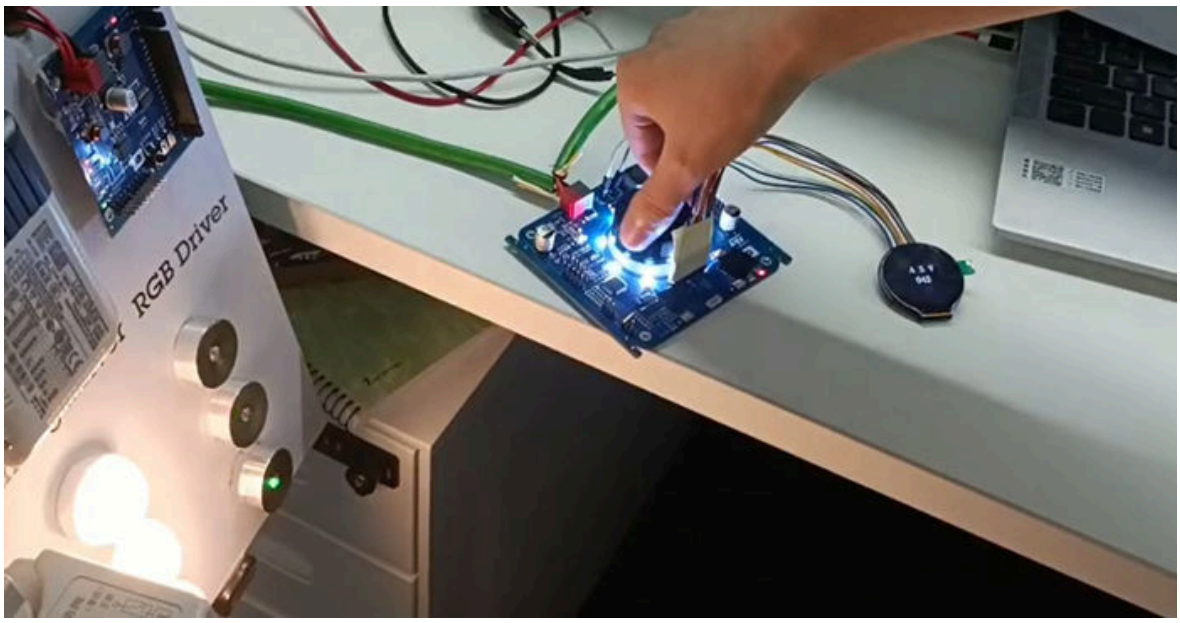
- First page is home page, press KEY2 and then go to LED ON/OFF control page
- On LED page, rotate the knob and open the LED1-4

Figure 2. Switch page



Press the KEY2 into dimming page, rotate the knob and adjust the value of KNX devices.

Figure 3. Dimming page



Press the KEY2 into RGB page, rotate the knob to adjust the color

Figure 4. **RGB page(1)**

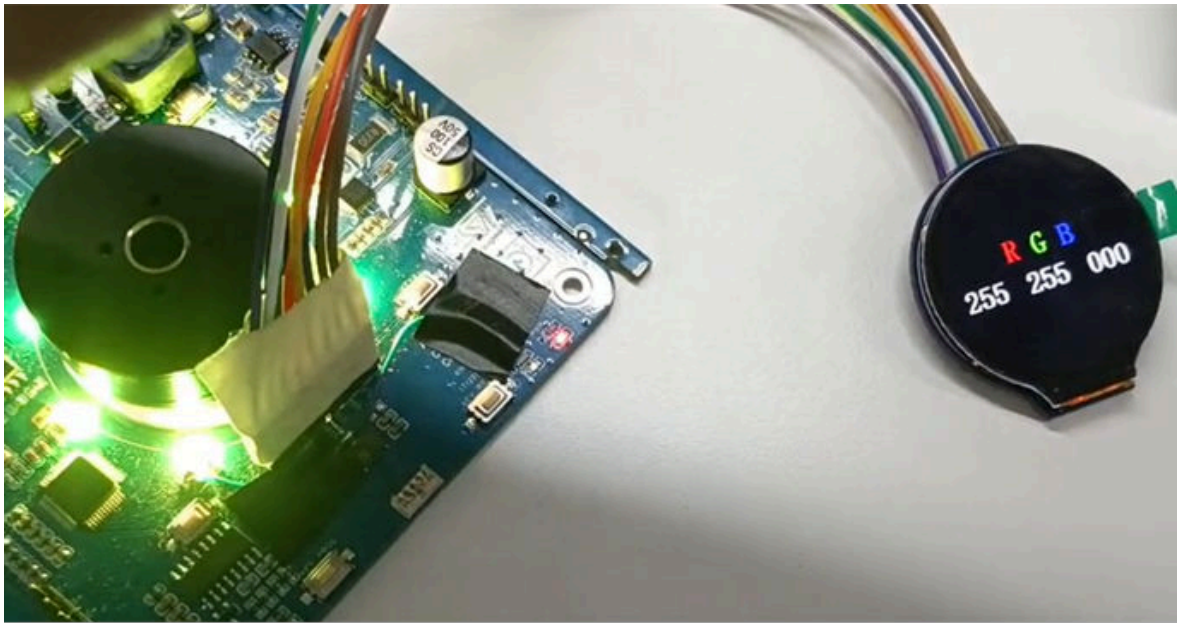
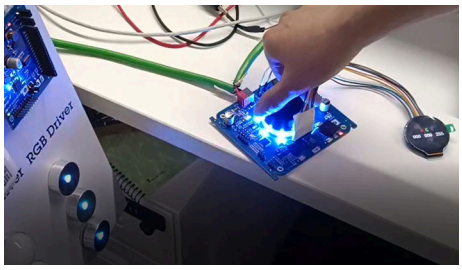


Figure 5. **RGB page(2)**



Switch to HVAC page, press KEY3-4 and choose different row, then set different value by rotating the knob.

Figure 6. HVAC page(1)

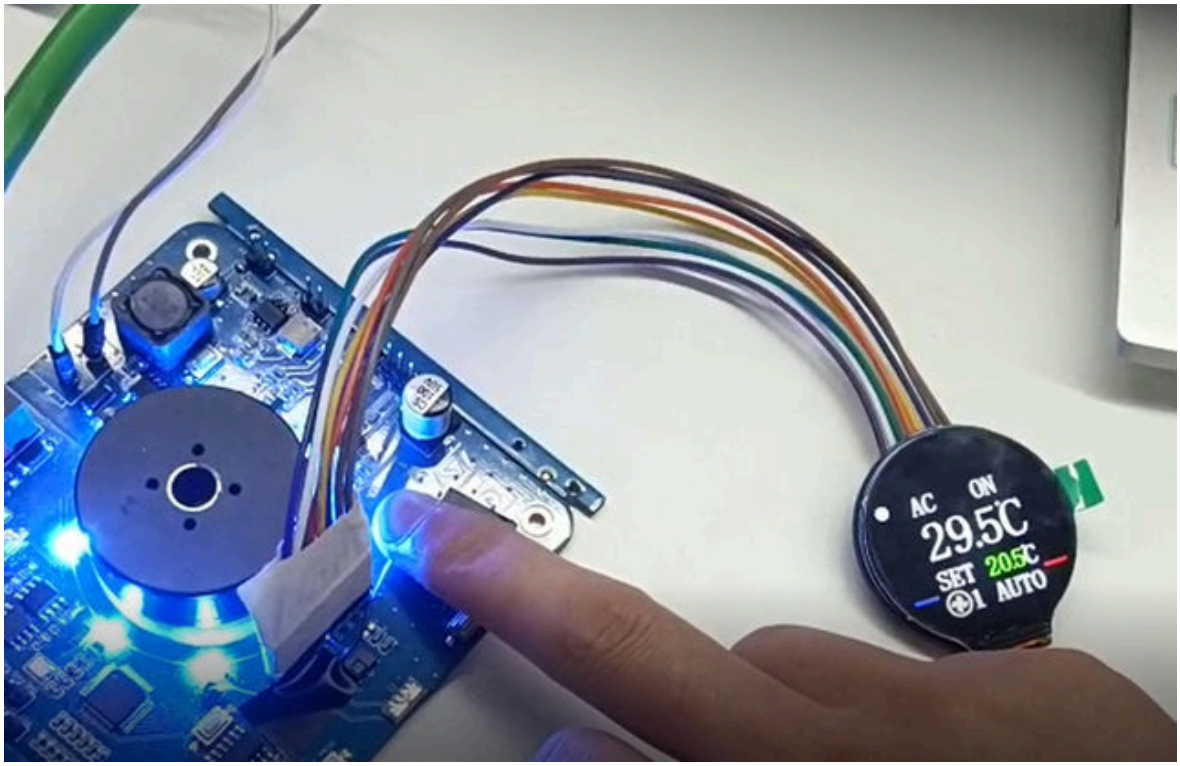
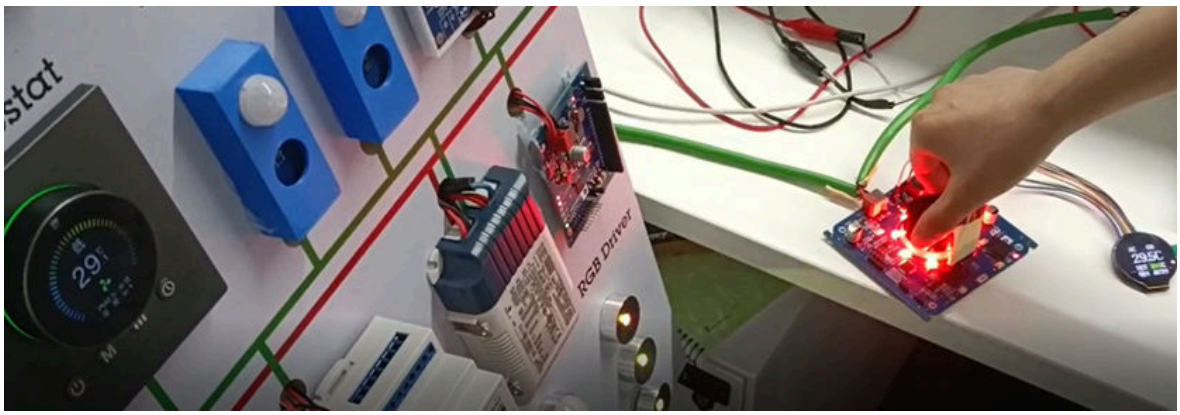


Figure 7. HVAC page(2)



3 Schematic diagrams

Figure 8. **STDES-KNXKNOB circuit schematic (1 of 3)**

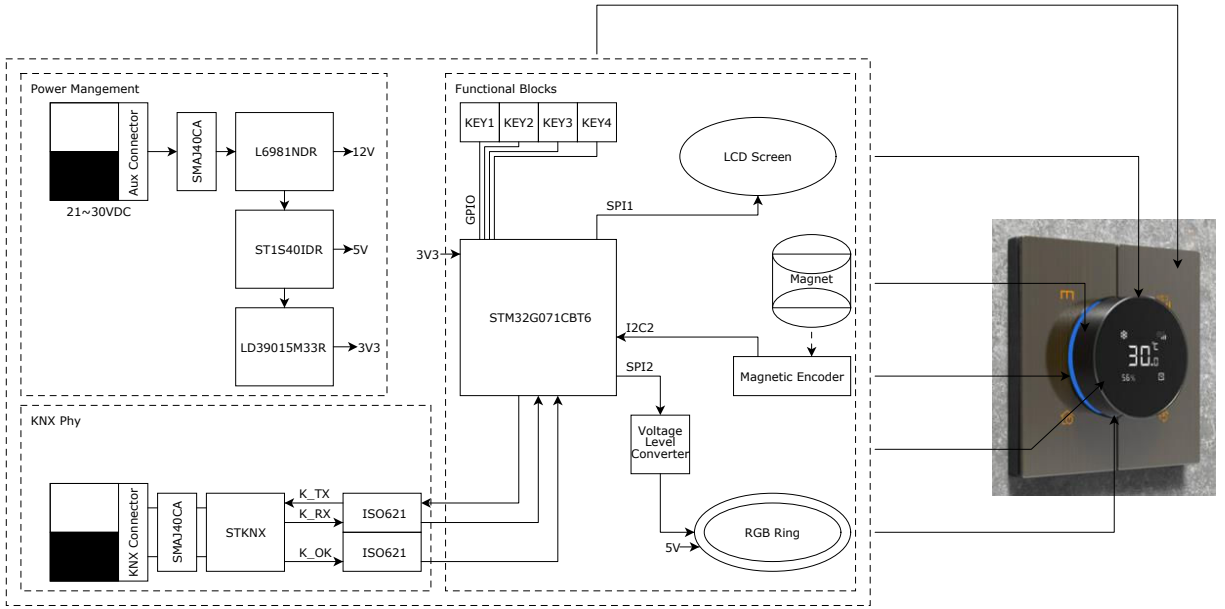
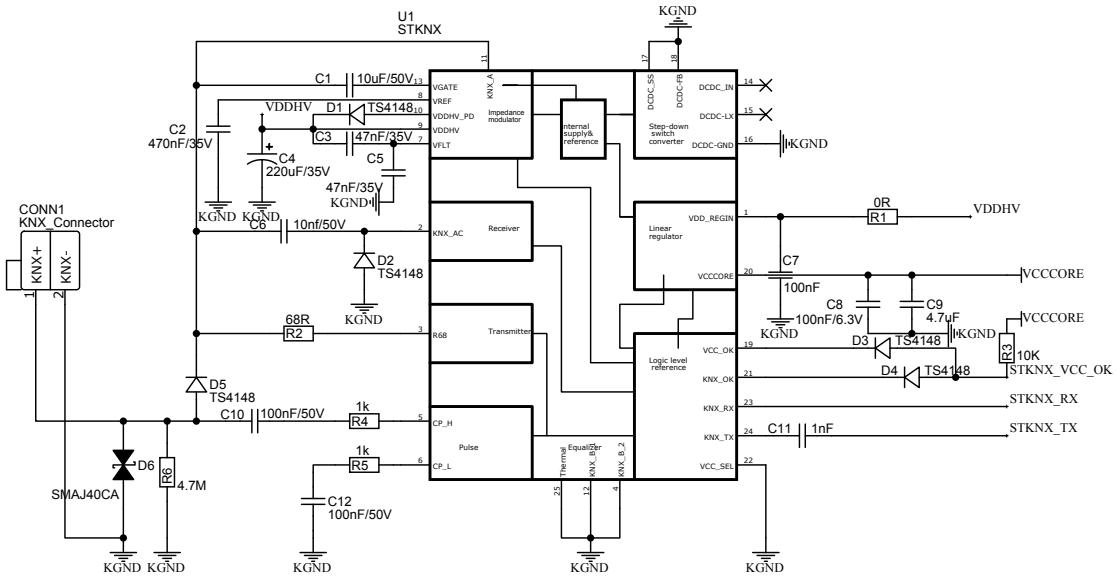
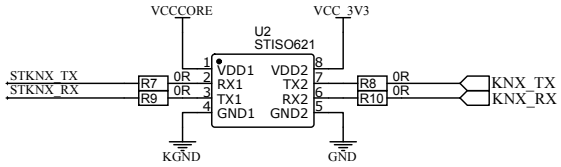


Figure 9. STDES-KNXKNOB circuit schematic (2 of 3)

KNX Phy



Isolation



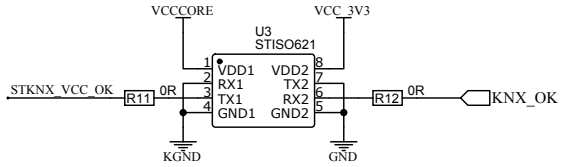
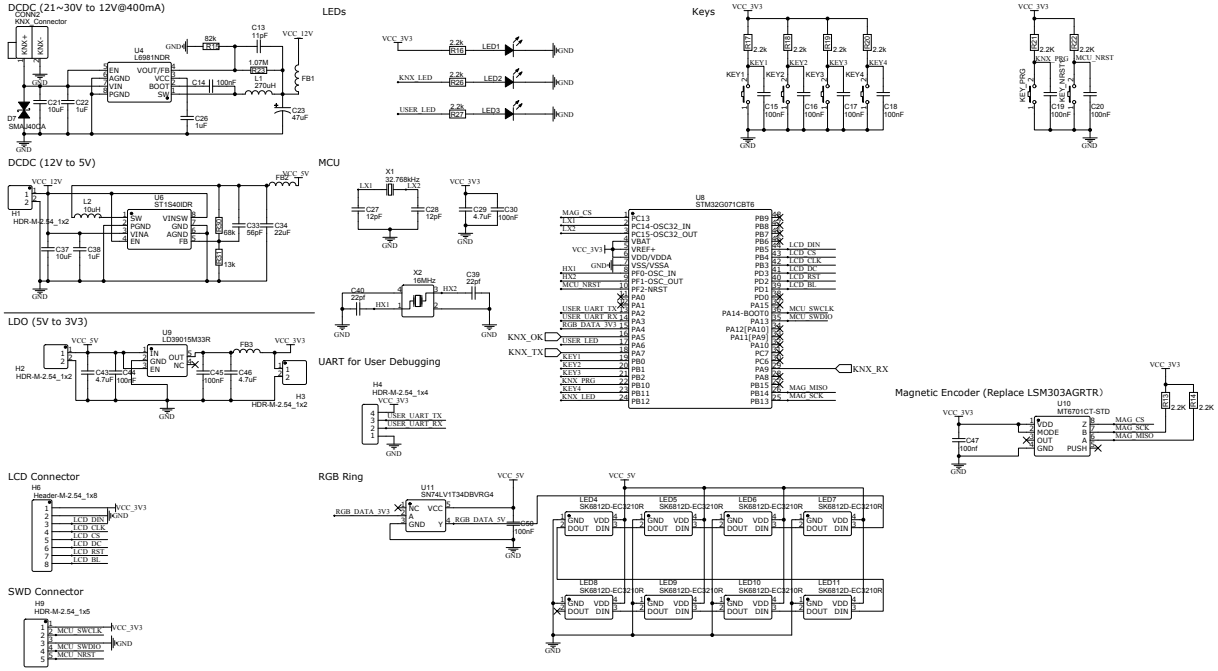


Figure 10. STDES-KNXKNOB circuit schematic (3 of 3)



4 Bill of materials

Table 1. **STDES-KNXKNOB bill of materials**

Item	Q.ty	Ref.	Part / Value	Description	Manufacturer	Order code
1	4	R13,R14,R21,R22	2.2K	R0603	YAGEO	RC0603FR-072K2L
2	6	KEY1,KEY2,KEY3,KEY4,KEY_NRST1,KEY_PRG	K2-3.6×6.1_SMD	KEY-SMD_2P-L6.2-W3.6-LS8.0	Rectangular Connectors - Contacts	K2-1107ST-A4SW-06
3	3	LED1,LED2,LED3	LED-0603_R	LED0603_RED	EVERLIGHT(台湾□光)	19-217/R6C-AL1M2VY/3T
4	7	R16,R26,R27,R17,R18,R19,R20	2.2k	R0603	YAGEO	RC0603FR-072K2L
5	8	LED4,LED5,LED6,LED7,LED8,LED9,LED10,LED11	SK6812D-EC3210R	LED-SMD_4P_SK6812D-EC3210R	欧思科光□	SK6812D-EC3210R
6	1	R30	68k	R0805	UniOhm	0805W8F6802T5E
7	1	R31	13k	R0805	UniOhm	0805W8F1302T5E
8	3	FB1,FB2,FB3	120Ω@100MHz ±25%	L0603	muRata(村田)	BLM18KG121TN1D
9	1	C1	10uF/50V	C1206	Murata Electronics	GRM31CB31H106KA12L
10	1	C2	470nF/35V	C0603	SAMSUNG(三星)	CL21B474KBFNNNE
11	2	C3,C5	47nF/35V	C0603	MuRata	GRM188F11H473ZA01D
12	1	C4	220uF/35V	CAP-SMD_BD8.0-L8.3-W8.3-LS9.5-FD	ST(先科)	LZ1V221M-CRF10
13	1	C6	10nf/50V	C0603	MuRata	GRM188R71H103KA01D
14	12	C7,C14,C15,C16,C17,C18,C19,C20,C30,C44,C45,C50	100nF	C0603	okGEO	CC0603KRX7R9BB104
15	1	C8	100nF/6.3V	C0603	YAGEO	CC0603KRX7R9BB104
16	4	C9,C29,C43,C46	4.7uF	C0603	Murata Electronics	GRM188R6YA475ME15D
17	2	C10,C12	100nF/50V	C0603	YAGEO	CC0603KRX7R9BB104
18	1	C11	1nF	C0603	SAMSUNG(三星)	CL10B102KB8NNNC
19	1	C13	11pF	C0603	SAMSUNG(三星)	CL10C110JB8NNNC
20	2	C21,C37	10uF	C0805	Murata Electronics	GRM21BR61H106KE43L
21	2	C22,C26	1uF	C0805	SAMSUNG	CL21B105KBFNNNE

Item	Q.ty	Ref.	Part / Value	Description	Manufacturer	Order code
22	1	C23	47uF	CAP-SMD_BD6.3-L6.6-W6.6-FD	PANASONIC	EEE1VA470WAP
23	2	C27,C28	12pF	C0603	SAMSUNG(三星)	CL10C120JB8NNNC
24	1	C33	56pF	C0603	SAMSUNG(三星)	CL10C560JB8NNNC
25	1	C34	22uF	C0805	SAMSUNG(三星)	CL21A226MAQNNNE
26	1	C38	1uF	C0805	SAMSUNG(三星)	CL21B105KBFNNNE
27	2	C39,C40	22pf	C0603	Murata Electronics	GQM1875C2E220JB12D
28	1	C47	100nf	C0603	YAGEO	CC0603KRX7R9BB104
29	5	D1,D2,D3,D4,D5	TS4148	D1206-RD	Taiwan Semiconductor(Taiwan Semicon)	TS4148 RXG
30	2	D6,D7	SMAJ40CA-TR, SMA	SMA_L4.4-W2.6-LS5.0-BI	ST	SMAJ40CA-TR
31	7	R1,R7,R8,R9,R10,R11,R12	0R	R0603	YAGEO	RC0603FR-070RL
32	1	R2	68R	R2512	YAGEO	AC2512FK-0768RL
33	1	R3	10K	R0603	YAGEO	RC0603JR-0710KL
34	2	R4,R5	1k	R0603	YAGEO	RC0603FR-071KL
35	1	R6	4.7M	R0603	Tyohm	RMC06034.7M1%N
36	1	R15	82k	R0603	UniOhm	0603WAF8202T5E
37	1	R23	1.07M	R0603	PANASONIC(松下)	ERJ3EKF1071V
38	1	U1	STKNXTR, VFQFPN-24	VFQFPN-24_L4.0-W4.0-P0.50-BL-EP2.8	ST	STKNXTR
39	2	U2,U3	STISO621, SOP8	SOP8	ST	STISO621
40	1	U4	L6981NDR, SO_8L	SO_8L_L6981	ST	L6981NDR
41	1	U6	ST1S40IDR, SOIC-8	SOIC-8_L4.9-W3.9-P1.27-LS6.0-BL	ST	ST1S40IDR
42	1	U8	STM32G071CBT6, LQFP-48	LQFP-48_L7.0-W7.0-P0.50-LS9.0-BL	ST	STM32G071CBT6
43	1	U9	LD39015M33R, SOT-23	SOT-23-5_L3.0-W1.7-P0.95-LS2.8-BL	ST	LD39015M33R
44	1	U10	MT6701CT-STD	SOP-8_L4.9-W3.9-P1.27-LS6.0-BL	MagnTek(麦歌恩)	MT6701CT-STD

Item	Q.ty	Ref.	Part / Value	Description	Manufacturer	Order code
45	1	U11	SN74LV1T34DBVRG4	SOT-23-5_L3.0-W1.7-P0.95-LS2.8-BR	TI(德州口器)	SN74LV1T34DBVRG4
46	3	H1,H2,H3	HDR-M-2.54_1x2	HDR-TH_2P-P2.54-V-M-1	Ckmtw	210S-1*2P L=11.6MMGold-plated black
47	1	H4	HDR-M-2.54_1x4	HDR-M-2.54_1X4	Ckmtw	210S-1*4P L=11.6MMGold-plated black
48	1	H6	Header-M-2.54_1x8	HDR-TH_8P-P2.54-V-M	Ckmtw	210S-1*8P L=11.6MMGold-plated black
49	1	H9	HDR-M-2.54_1x5	HDR-TH_5P-P2.54-V-M	Ckmtw	210S-1*5P L=11.6MMGold-plated black
50	1	L1	270uH	IND-SMD_L10.2-W10.0	Sumida	CDRH105RNP-271NC
51	1	L2	10uH	IND-SMD_L6.4-W6.0	PANASONIC	ETQP3M100KVN
52	1	X1	32.768kHz	FC-135R_L3.2-W1.5	EPSON	Q13FC1350000400
53	1	X2	16MHz	OSC-SMD_4P-L3.2-W2.5-BL	EPSON	X1E0000210119 00

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Revision history

Table 2. **Document revision history**

Date	Revision	Changes
12-Feb-2025	1	Initial release.

Contents

List of figures

List of tables