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# **HT32 MCU Starter Kit User Manual**

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# 1 Introduction

The HT32 Starter Kit is based around the 32-bit Arm® Cortex®-M0+/M3 high performance microcontroller and is designed to assist users to get up and running with the Holtek 32-bit device range as quickly as possible.

Standard C language programs can be developed using the integrated development environment from Keil µVision and IAR EWARM. Using this foundation, Holtek also provides a comprehensive function library to avoid complicated lower level function development in order to allow designers to focus their time on their specific application development. Using a simple USB cable connection, users only have to connect their PC to the integrated hardware debug interface (e-Link32 Lite Serial-Wire Debugger) to automatically download the programs and immediately commence debug operations.

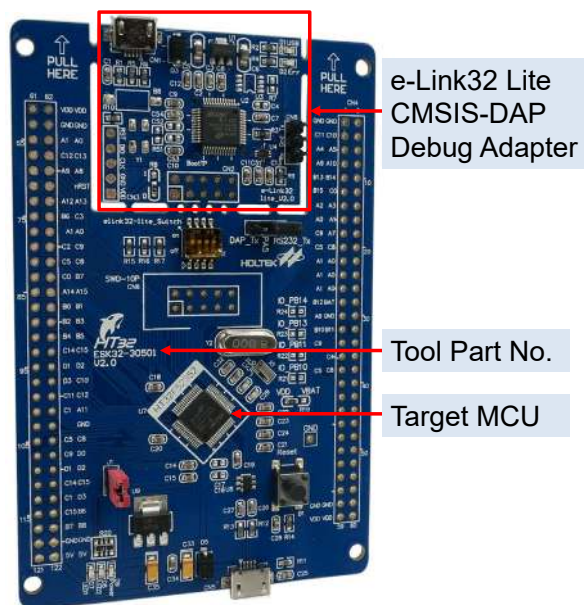


Figure 1. HT32 Starter Kit

## Features

- Uses the HT32 high performance microcontrollers  
Integrated Timer, I<sup>2</sup>C, SPI, USART, UART, 12-bit A/D converter, USB and I<sup>2</sup>S etc. Refer to the datasheet of the corresponding MCU for details.
- Comprises Target Board and e-Link32 Lite Serial-Wire Debugger
- Can be used for the testing and development of many external devices
- Can use either the Target Board USB connector or the e-Link32 Lite USB connector to supply power

## 2 Hardware Layout



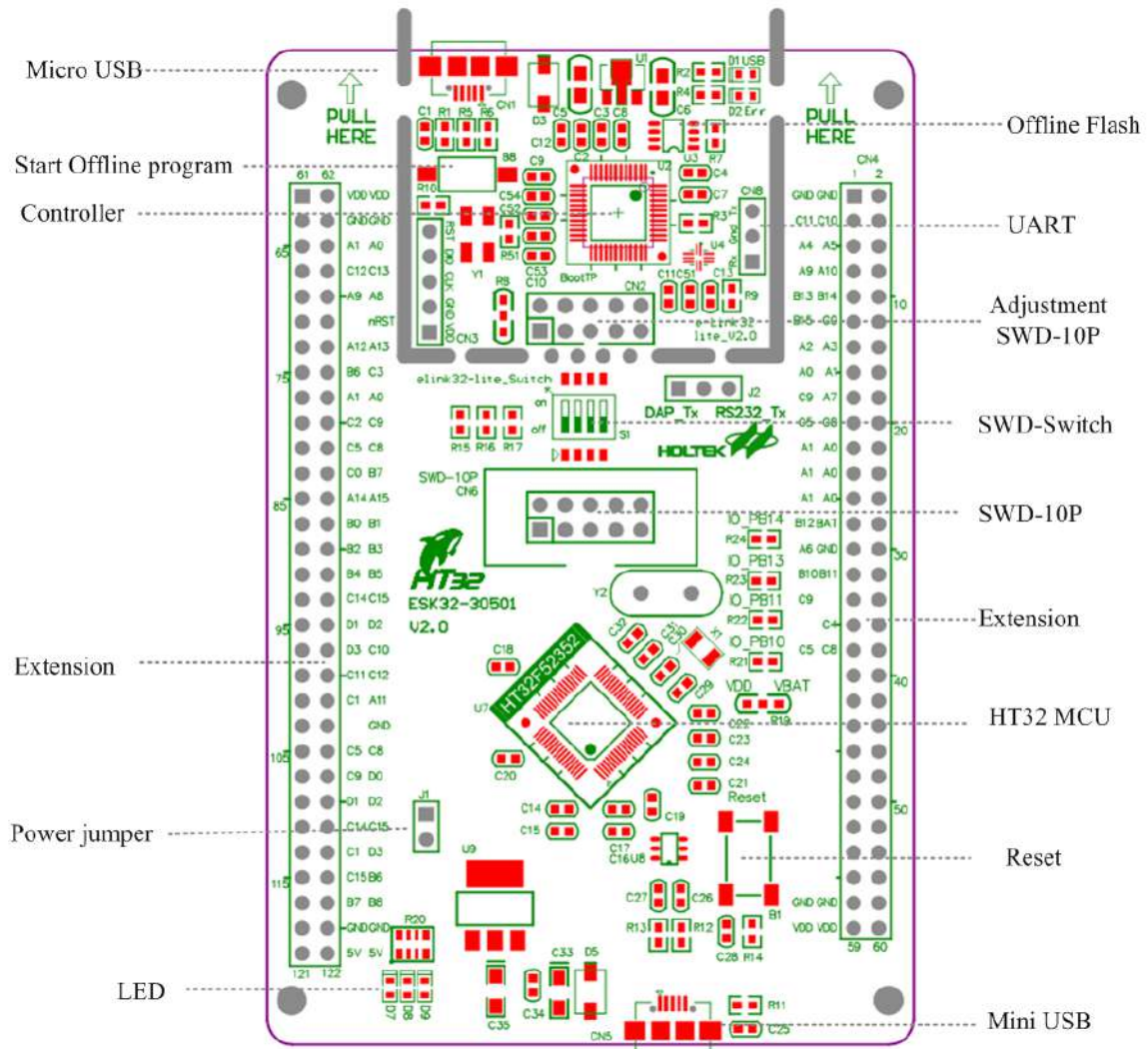
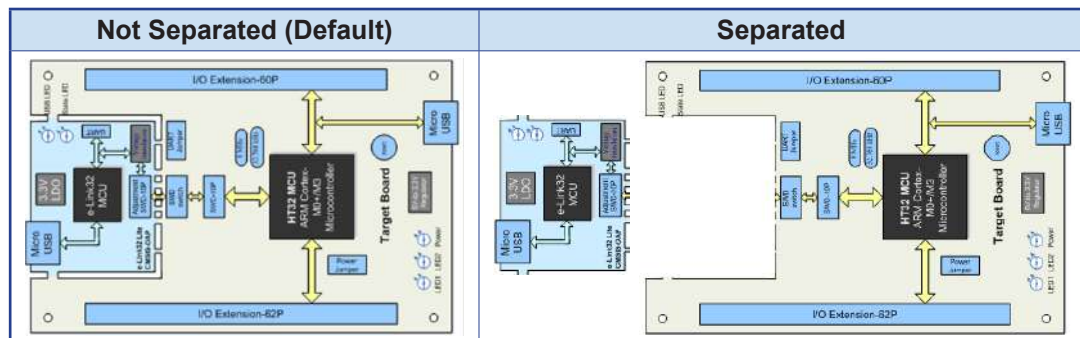
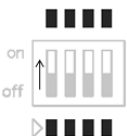
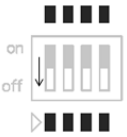


Figure 3. HT32 Starter Kit Layout – using the ESK32-30501 V2.0 as an example

## Separating the e-Link32 Lite



## Serial Wire Debug Interface Switch – S1

S1	Description
	Connect the SWD interface between the e-Link32 Lite and the Target MCU – default setting
	Disconnect the SWD interface between the e-Link32 Lite and the Target MCU

## SWD-10P Connector – CN2, CN6

CN2 is the Serial Wire Debug interface connector on the e-Link32 Lite side, while CN6 is on the Target Board side.

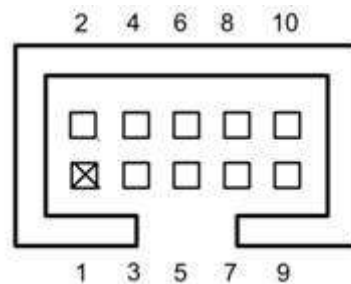




Figure 4. SWD-10P Connector

Table 1. SWD-10P Connector

Pin No.	Description	Pin No.	Description
1	VDD	2	SWDIO
3	GND	4	SWCLK
5	GND	6	NC
7	NC	8	NC
9	GND	10	Reset





### e-Link32 Lite Power Option – R8

R8	Description
	Pin 1 on the CN2 connector on the e-Link32 Lite side is used as the input. The reference voltage is supplied through this pin to the voltage conversion chip – default setting Note that if the e-Link32 Lite has not been separated, the 3.3V on the Target Board will have been connected to CN2-1 through the PCB wire connection
	Pin 1 on the CN2 connector on the e-Link32 Lite side is used as the output. Here the e-Link32 Lite voltage conversion chip is fixed using 3.3V as the reference voltage. Note that the 3.3V voltage on the Target Board has been connected to CN2-1 through the PCB wire connection, therefore this option is not allowed if the e-Link32 Lite has not been separated



Only the e-Link32 Lite V2.0 version has the R8 option.

### e-Link32 Lite Power Option – J8



J8	Description
	Pin 1 on the CN2 connector on the e-Link32 Lite side is used as the input. The reference voltage is supplied through this pin to the voltage conversion chip – default setting Note that if the e-Link32 Lite has not been separated, the 3.3V on the Target Board will be connected to CN2-1 through the S1 switch and the PCB wire connection
	Pin 1 of the CN2 connector on the e-Link32 Lite side is used as the output. Here the e-Link32 Lite voltage conversion chip is fixed using the 3.3V as the reference voltage. Note that the 3.3V on the Target Board will be connected to CN2-1 through the S1 switch and the PCB wire connection. If the e-Link32 Lite has not been separated, users should switch the S1 to the OFF position to use this option

Only the e-Link32 Lite V2.2 or V2.3 version has the J8 option.

### Boot Option – Located on the Board Reverse Side



R18	Description
	1 or NC – MCU boots from main flash – default setting
	0 – MCU boots from bootloader – ISP

### High Speed External Crystal Oscillator (HSE) Option

R23 & R24	Description
	Open, HSE I/O pins disconnected from CN4 – default setting
	Short, HSE I/O pins connected to CN4 pins 9 and 10. Y2 must be removed.



The designators on the ESK32-30105 (HT32F12366 SK) are R21 and R22.

## Low Speed External Crystal Oscillator (LSE) Option

R21 & R22	Description
	Open, LSE I/O pins disconnected from CN4 – default setting
	Short, LSE I/O pins connected to CN4 pins 31 and 32. X1 must be removed.



The designators on the ESK32-30105 (HT32F12366 SK) are R23 and R24.

## USB D+/D- Option

R26 & R27	Description
	Open, USB D+/D- pins disconnected from the CN4 – default setting
	Short, USB D+/D- pins connected to the CN4 pins 55 and 56.

The early Starter Kit board or its Target MCU does not have an integrated USB or its USB D+/D- are not bonded with the GPIO, therefore this option is not available.

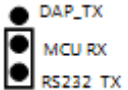
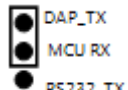
## MCU Power Jumper – J1

J1	Description
	The MCU VDD pin is connected to the 3.3V power – default setting
	The MCU VDD pin is disconnected from the 3.3V power

The jumper is useful when it is required to measure the MCU power consumption.


## UART Option Jumper – J2

The Starter Kit arranges a group of the Target MCU UART to be used as external communication interfaces, which can connect to the host computer or other devices. The Target MCU RX pin has the option of connecting to the e-Link32 UART TX pin or to the extension connector, CN4\_6: RS232\_TX.

J2	Description
	The MCU UART RX is connected to the extension connector, CN4_6: RS232_TX – default setting
	The MCU UART RX is connected to the e-Link32 UART TX

## e-Link32 UART Connector – CN8

This is the e-Link32 integrated USB to UART function, which is called the “Virtual COM port”, CN8 is the UART side connector.

CN8	Description
	Three UART connector pins: Txd, GND and Rxd The e-Link32 will send data on the Txd pin while data will be received on the Rxd pin

## Extension Connector CN4-1

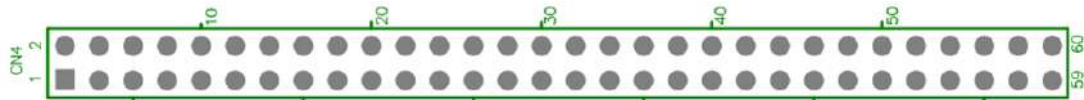


Figure 5. Extension Connector 1

Table 2. Extension Connector 1

Pin No.	Description	Pin No.	Description
1	GND	2	GND
3	I2S_BCLK	4	I2S_WS
5	RS232_RX – connect to MCU TX	6	RS232_TX – connect to MCU RX
7	M_IO4	8	BUZZER
9	M_IO2	10	M_IO3
11	M_IO0	12	M_IO1
13	M_TX	14	M_RX
15	M_RTS	16	M_CTS
17	M_MISO	18	M_CS
19	M_SCK	20	M_MOSI
21	M_SDA	22	M_SCL
23	Touch_SDA	24	Touch_SCL
25	EE_SDA	26	EE_SCL
27	B0_WAKEUP	28	V_BAT
29	VR	30	GND
31	LSE_In	32	LSE_Out
33	SD_D0/MISO	34	SD_D1
35	SD_D2	36	SD_D3/CS
37	SD_CLK	38	SD_CMD/MOSI
39	CSIF_LED	40	SD_CD
41	CSIF_SDA	42	CSIF_SCL
43	CSIF_RESB	44	CSIF_PWDN
45	CSIF_PCLK	46	CSIF_MCLK
47	CSIF_HSYNC	48	CSIF_VSYNC

Pin No.	Description	Pin No.	Description
49	CSIF_D6	50	CSIF_D7
51	CSIF_D4	52	CSIF_D5
53	CSIF_D2	54	CSIF_D3
55	CSIF_D0/USB D-	56	CSIF_D1/USB D+
57	GND	58	GND
59	3.3V	60	3.3V

### Extension connector CN4-2

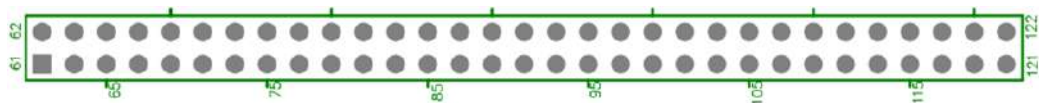


Figure 6. Extension Connector 2

Table 3. Extension Connector 2

Pin No.	Description	Pin No.	Description
61	3.3V	62	3.3V
63	GND	64	GND
65	I2S_SDA	66	I2S_SCL
67	I2S_SDO	68	I2S_SDI
69	BOOT1	70	I2S_MCLK
71	SWO	72	nRST
73	SWCLK	74	SWDIO
75	LCD_BL	76	LCD_WE
77	LCD_SDA	78	LCD_SCL
79	LCD_CS	80	LCD_MISO
81	LCD_SCK	82	LCD_MOSI
83	LCD_INT	84	LCD_RST
85	LCD_AD0	86	LCD_AD1
87	LCD_AD2	88	LCD_AD3
89	LCD_AD4	90	LCD_AD5
91	LCD_AD6	92	LCD_AD7
93	LCD_AD8	94	LCD_AD9
95	LCD_AD10	96	LCD_AD11
97	LCD_AD12	98	LCD_AD13
99	LCD_AD14	100	LCD_AD15
101	LCD_OE	102	LCD_A0
103	LCD_TS	104	GND
105	Flash_SCK	106	Flash_MOSI
107	Flash_MISO	108	Flash_CS

Pin No.	Description	Pin No.	Description
109	Button1	110	Button2
111	LED0	112	LED1
113	LED2	114	SCI_CMD
115	SCI_RST	116	SCI_CLK
117	SCI_DET	118	SCI_DIO
119	GND	120	GND
121	5V	122	5V

### Micro USB Type B Connector – CN5

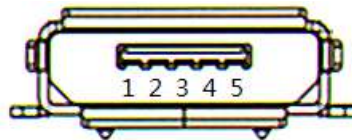


Figure 7. Micro USB Type B Connector

Table 4. Micro USB Type B Connector

Pin No.	Description	Pin No.	Description
1	USB_5V	2	D-
3	D+	4	NC
5	GND		



The diagrams above are the schematic diagram of the connection between the e-Link32 Lite and the Target Board:

- The e-Link32 Lite currently uses three hardware versions which are V2.0, V2.2 and V2.3. Because V2.2 and V2.3 are roughly the same, only V2.3 is listed here. The detailed schematic diagram will be attached to the schematic section for reference.
- The U4, U5 and U6 level shifter ICs are responsible for converting the SWDIO and SWCLK pin voltage levels to the Target MCU voltage level.  
When J8 or R8 is selected to be open circuit, CN2-1 is used as an input and the e-Link32 Lite is separated, the reference voltage must be supplied on CN2-1.
- J8 or R8 can determine whether VDD\_elink32 and CN2-1 are connected together. If they are connected together, the SWDIO and SWCLK pin higher levels are fixed at 3.3V. At the same time CN2-1 has the ability to output 3.3V, which can be supplied to the user's own board.  
Here it should be noted that if the user's own board contains a power supply, then CN2-1 cannot be connected to the user's own board, otherwise it may cause a power conflict.
- CN2 and CN6 are the SWD connectors of the e-Link32 Lite and the Target Board respectively.
  - If the e-Link32 Lite is not separated, there is already a PCB line connection on the board, so switching S1 to the ON position can connect the Target Board without an additional flying line connection.
  - If the e-Link32 Lite is not separated and S1 is switched to the OFF position, CN2 can be connected to the user's own board through a flying line.
  - When the e-Link32 Lite is separated, CN2 can be connected to the Target Board CN6 or the user's own board through a flying line.
- The e-Link32 Lite has an integrated USB to UART function which is called the "Virtual COM Port", CN8 is its UART side connector.
  - If the e-Link32 Lite is not separated, users can use the e-Link32 "Virtual COM Port" functions by connecting J2 to DAP\_TX.
  - If the e-Link32 Lite is not separated, and users wish to connect the e-Link32 RX to their board, they need to erase the Target MCU of the Starter Kit to avoid conflict.
  - When the e-Link32 Lite is separated, CN8 can be connected to the Target Board or the user's own board through a flying line.

## 4 Schematics

This section shows the HT32 MCU Starter Kit circuit diagrams:

- e-Link32 Lite V2.0
- e-Link32 Lite V2.2
- e-Link32 Lite V2.3
- HT32F52352 Target Board – ESK32-30501

Other Starter Kit target board circuit diagrams can be downloaded on Holtek official website.

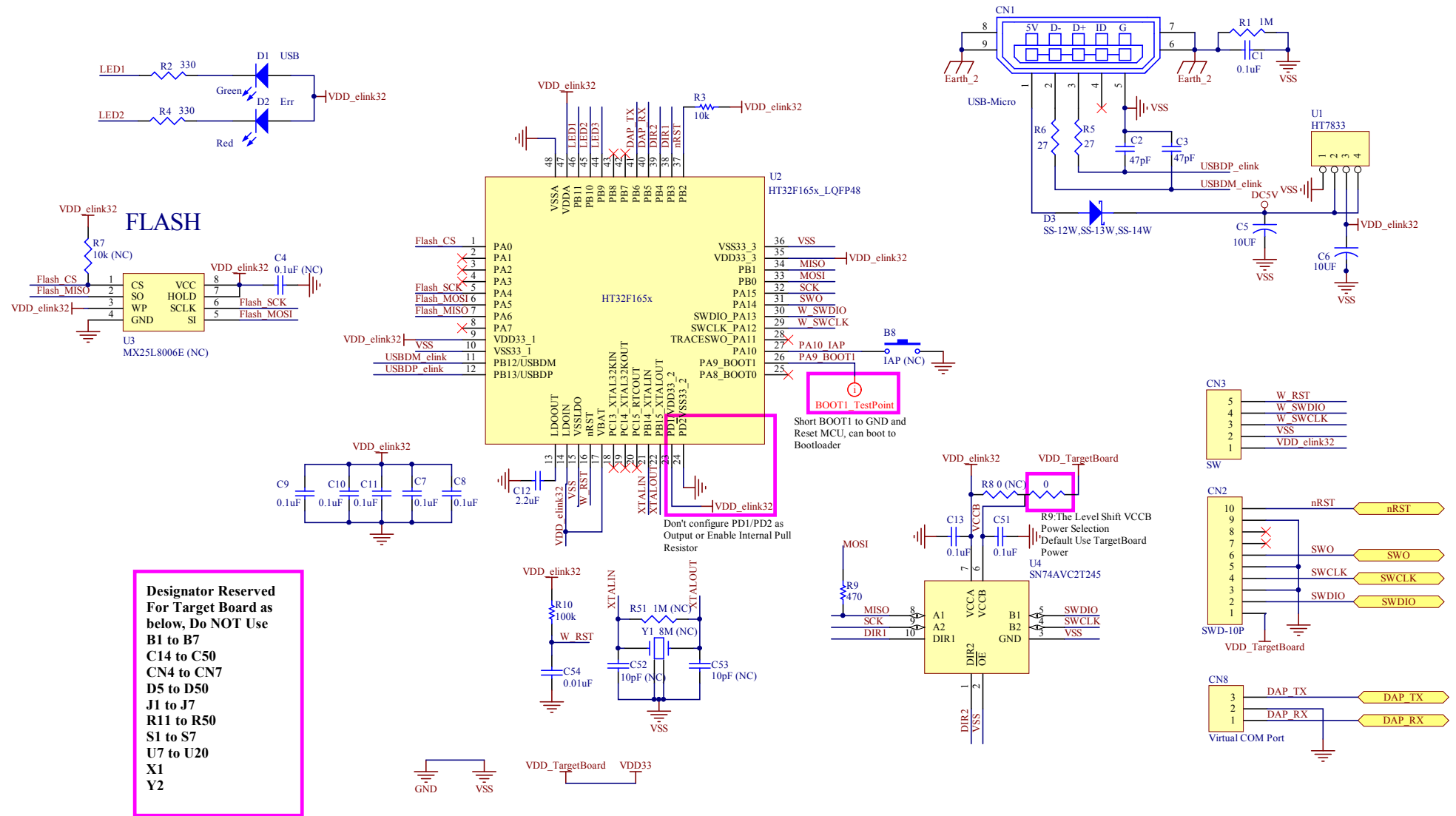


Figure 10. e-Link32 Lite V2.0



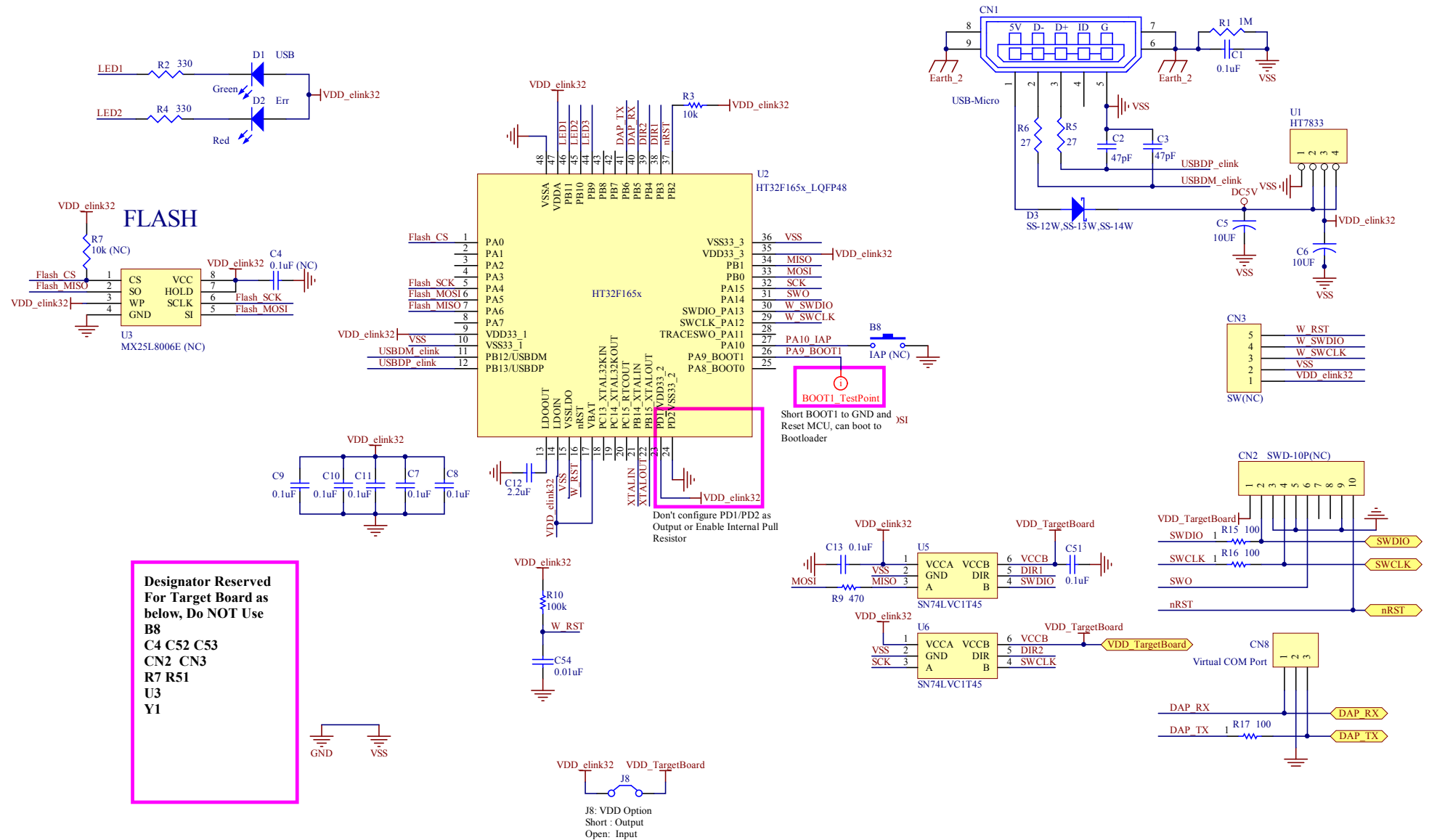


Figure 11. e-Link32 Lite V2.2



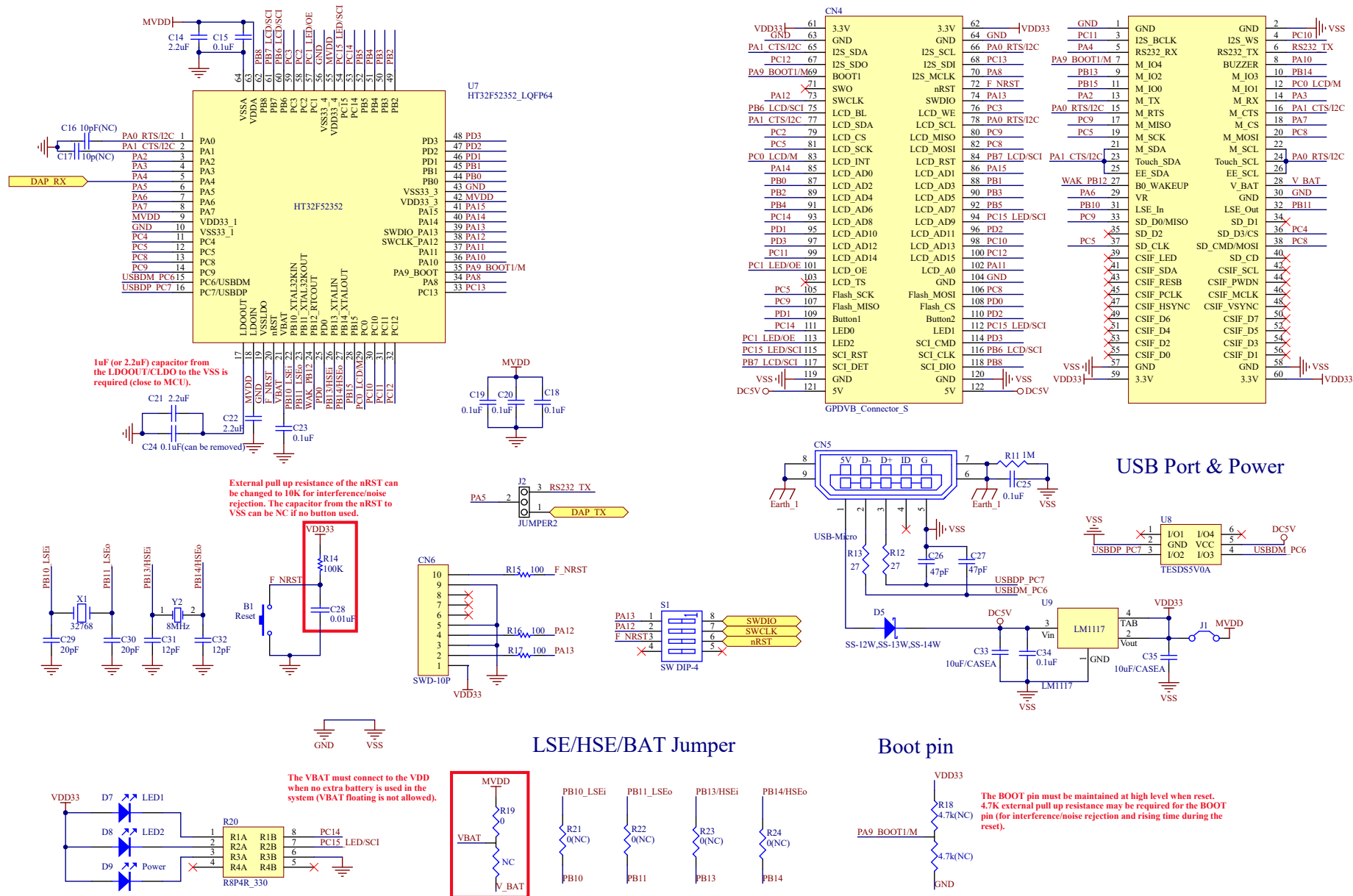


Figure 13. HT32F52352 Target Board – ESK32-30501

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