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# **HT32F1654 Starter Kit User Manual**

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# 1 Introduction

The HT32F1654 Starter Kit is based around the 32-bit ARM Cortex™-M3 high performance microcontroller and is designed to assist users to get up and running with this device as quickly as possible. It provides a complete solution from evaluation, programming to production.

The Starter Kit is based on the Cortex™-M3 high speed microcontroller, the operating frequency is up to 72MHz. It provides 64 KB of embedded Flash memory, 16 KB of embedded SRAM memory, multiple Timers, dual I<sup>2</sup>C interfaces, dual SPI interfaces, dual USART interfaces, dual UART interfaces, I<sup>2</sup>S, EBI, CRC-16/32, 12-bit A/D converter, 51 programmable general purpose I/O pins and a USB function which can be used to interface to a wide range of external devices.

This development platform is composed of a Target Board and Serial-Wire Debugger (e-Link32 Lite) and as such requires no external debugging equipment. It can use the Target Board external power supply or be powered by the Debugger.

The Starter Kit provides a standard C language program development environment for Keil μVision and IAR EWARM. With this basis, Holtek also provides a complete function library to avoid complicated lower level function development in order to allow development designers to focus on the needs of their application development. Using a simple USB cable connection, users only have to connect their PC to the integrated hardware debug interface (Serial-Wire Debugger), to automatically download the programs and immediately commence debug operations.

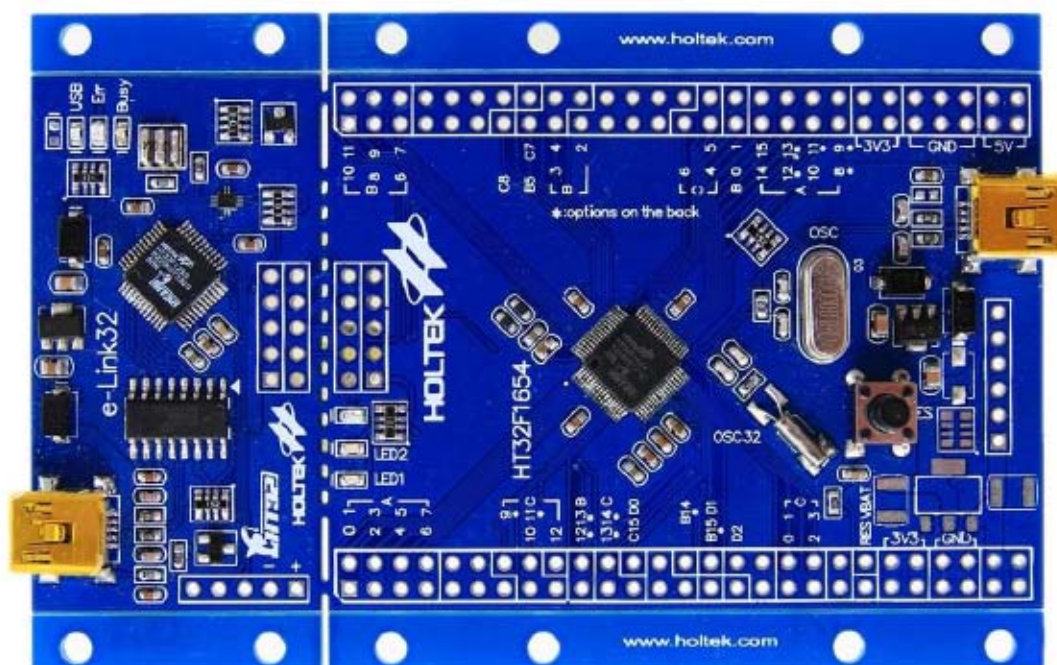


Figure 1. HT32F1654 Starter Kit

## Features

- Using HT32F1654 high performance microcontroller
  - Up to 72 MHz operating frequency
  - 64 KB Flash, 16 KB SRAM
  - Integrated multiple Timers, dual I<sup>2</sup>C functions, dual SPI functions, dual USART functions, dual UART functions, single 12-bit A/D converter, USB and I<sup>2</sup>S function
  - LQFP64 package
  - 8 MHz external crystal clock
  - 51 programmable general purpose I/O pins
- Comprises Target Board and Serial-Wire Debugger
- Can be used for the testing and development of many external devices
- Can use the Target Board external power supply or be powered by the Debugger

## 2 Hardware Layout

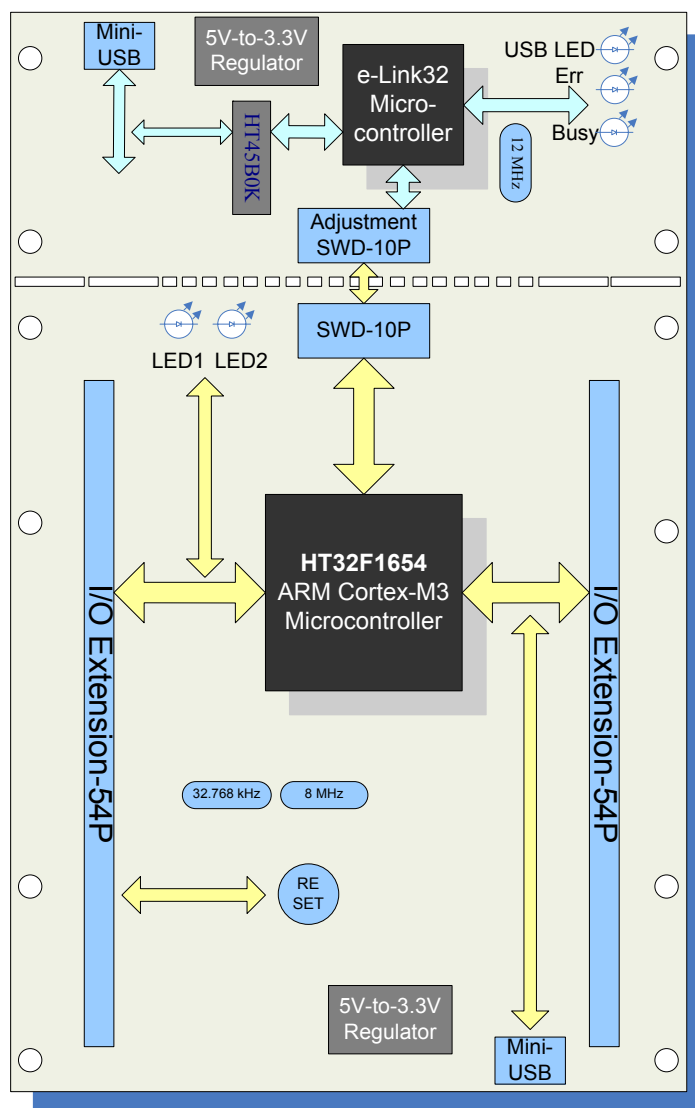
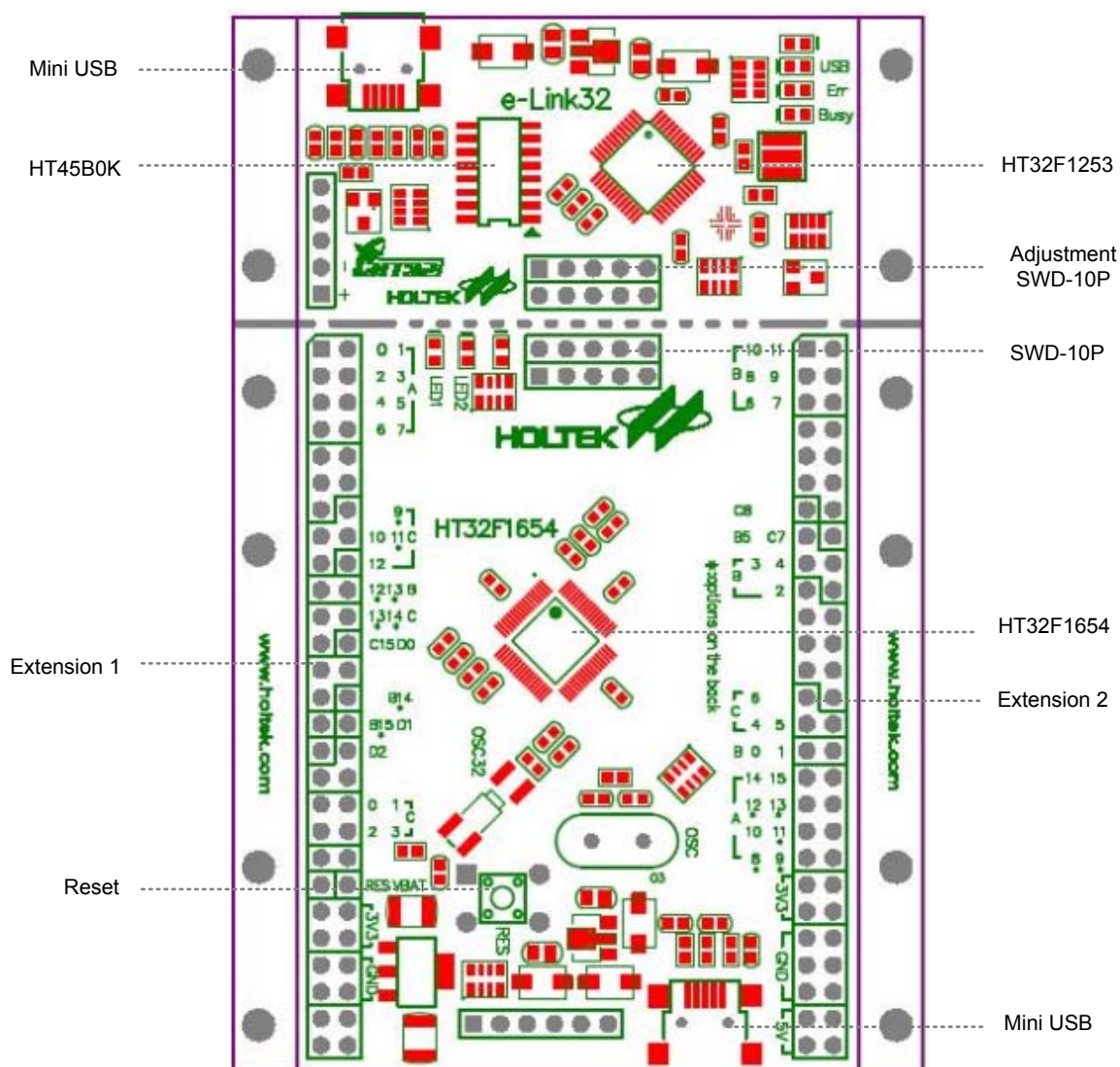


Figure 2. HT32F1654 Starter Kit Block Diagram

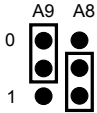
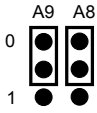
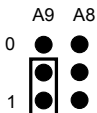


**Figure 3. HT32F1654 Starter Kit Layout**



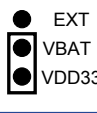
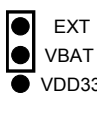
## Boot Option

**Table 1. Boot Jumpers**

Jumper	Description
A8 & A9	<p>Boot loader mode</p>  <p>Boot from the embedded boot loader.</p>
	<p>SRAM mode</p>  <p>Boot from the embedded SRAM.</p>
	<p>Main flash mode – default setting</p>  <p>Boot from the embedded main flash. BOOT0 (A8) don't care and BOOT1 (A9) = 1</p>



## V<sub>BAT</sub> Option – JP9

**Table 2. V<sub>BAT</sub> Jumpers**



Jumper	Description
VBAT	<p>V<sub>BAT</sub> pin is connected to 3.3V power - default setting</p> 
	<p>V<sub>BAT</sub> pin is connected to 3V CR1220 battery.</p> 

## LED Option – JP2, JP11

**Table 3. LED1 Jumpers**

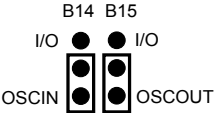
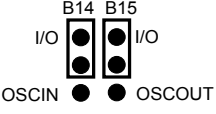
Jumper	Description
C9	LED1 connected with the extension I/O header and I/O port C pin 9 (C9) – default setting 
	C9 can only connect to extension I/O header. 

**Table 4. LED2 Jumpers**

Jumper	Description
C11	LED2 connected with the extension I/O header and I/O port C pin 11 (C11) – default setting 
	C11 can only connect to extension I/O header. 

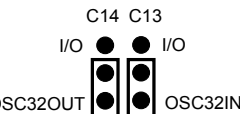
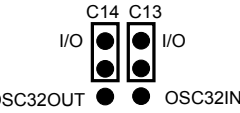
## High Speed External Crystal Oscillator (HSE) Option – JP1, JP5

Table 5. HSE Jumpers

Jumper	Description
B14 & B15	<p>HSE mode – default setting</p> 
	<p>I/O mode of I/O port B pin 14 (B14) and I/O port B pin 15 (B15).</p> 

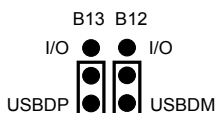
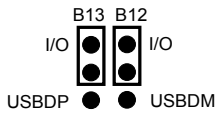
## Low Speed External Crystal Oscillator (LSE) Option – JP3, JP4

Table 6. LSE Jumpers

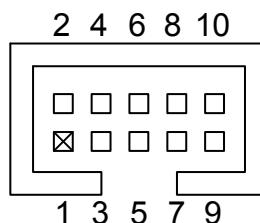
Jumper	Description
C13 & C14	<p>LSE mode – default setting</p> 
	<p>I/O mode of I/O port C pin 13 (C13) and I/O port C pin 14 (C14).</p> 

## USB Option – JP12, JP10

Table 7. USB Jumpers

Jumper	Description
B12 & B13	<p>USB mode – default setting</p> 
	<p>I/O mode of I/O port B pin 12 (B12) and I/O port B pin 13 (B13).</p> 

## SWD-10P Connector – JP27

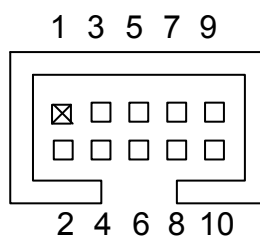


**Figure 4. SWD-10P Connector**

**Table 8. SWD-10P Connector**

Pin#	Description	Pin#	Description
1	3.3V	2	SWDIO (PA13)
3	GND	4	SWCLK (PA12)
5	GND	6	TRACESWO (PA11)
7	5V	8	NC
9	GND	10	Reset#

## Adjustment SWD-10P Connector (for e-Link32 Lite) – JP26

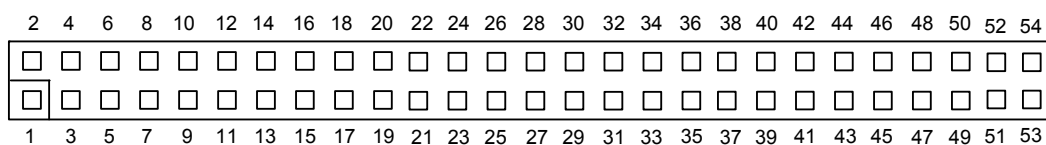


**Figure 5. Adjustment SWD-10P Connector**

**Table 9. Adjustment SWD-10P Connector**

Pin#	Description	Pin#	Description
1	3.3V	2	SWDIO (PA13)
3	GND	4	SWCLK (PA12)
5	GND	6	TRACESWO (PA11)
7	5V	8	NC
9	GND	10	Reset#

## Extension Connector 1 – J31

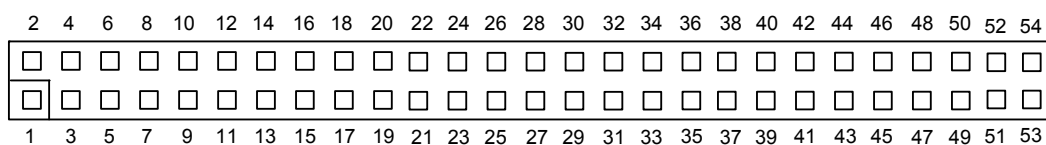


**Figure 6. Extension Connector 1**

**Table 10. Extension Connector 1**

Pin#	Description	Pin#	Description
1	A0	2	A1
3	A2	4	A3
5	A4	6	A5
7	A6	8	A7
9	NC	10	NC
11	NC	12	NC
13	NC	14	C9 (LED1 Option)
15	C10	16	C11 (LED2 Option)
17	C12	18	NC
19	B12 (USB Option)	20	B13 (USB Option)
21	C13 (LSE Option)	22	C14 (LSE Option)
23	C15	24	D0
25	NC	26	NC
27	NC	28	B14 (HSE Option)
29	B15 (HSE Option)	30	D1
31	D2	32	NC
33	NC	34	NC
35	C0	36	C1
37	C2	38	C3
39	NC	40	NC
41	Reset#	42	VBAT (V <sub>BAT</sub> Option)
43	3.3V	44	3.3V
45	3.3V	46	3.3V
47	GND	48	GND
49	GND	50	GND
51	NC	52	NC
53	NC	54	NC

## Extension Connector 2 – J32

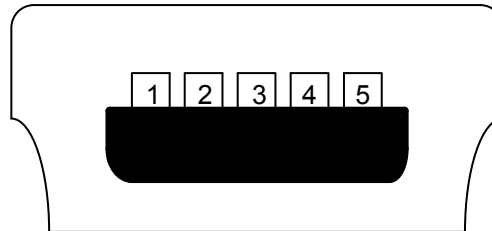


**Figure 7. Extension Connector 2**

**Table 11. Extension Connector 2**

Pin#	Description	Pin#	Description
1	B10	2	B11
3	B8	4	B9
5	B6	6	B7
7	NC	8	NC
9	NC	10	NC
11	NC	12	NC
13	C8	14	NC
15	B5	16	C7
17	B3	18	B4
19	NC	20	B2
21	NC	22	NC
23	NC	24	NC
25	NC	26	NC
27	C6	28	NC
29	C4	30	C5
31	B0	32	B1
33	A14	34	A15
35	A12 (SWCLK)	36	A13 (SWDIO)
37	A10	38	A11 (TRACESWO)
39	A8 (Boot Option)	40	A9 (Boot Option)
41	3.3V	42	3.3V
43	3.3V	44	3.3V
45	GND	46	GND
47	GND	48	GND
49	GND	50	GND
51	5V	52	5V
53	5V	54	5V

## Mini USB Type B Connector – U3



**Figure 8. Mini USB Type B Connector**

**Table 12. Mini USB Type B Connector**

Pin#	Description	Pin#	Description
1	USB_5V	2	D-
3	D+	4	NC
5	GND		



## 3 Schematics

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This section shows the complete circuit of the HT32F1654 Starter kit:

- Figure 9 Includes the MCU, Boot Pins and Extension Connector.
- Figure 10 Includes SWD Connector, LED Display and the Power.
- Figure 11 Includes the e-Link32 Lite.

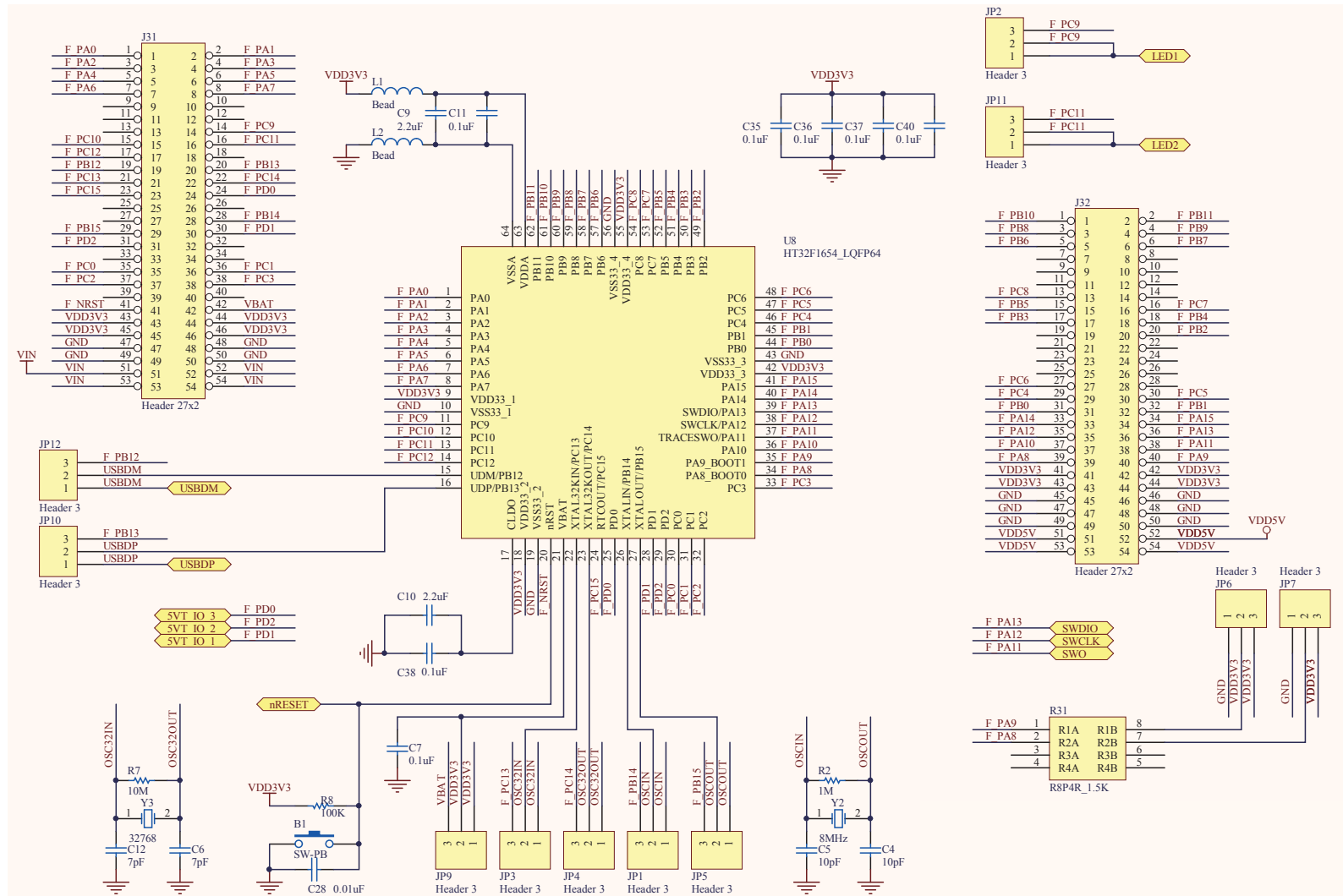


Figure 9. MCU, Boot Pins and Extension Connector

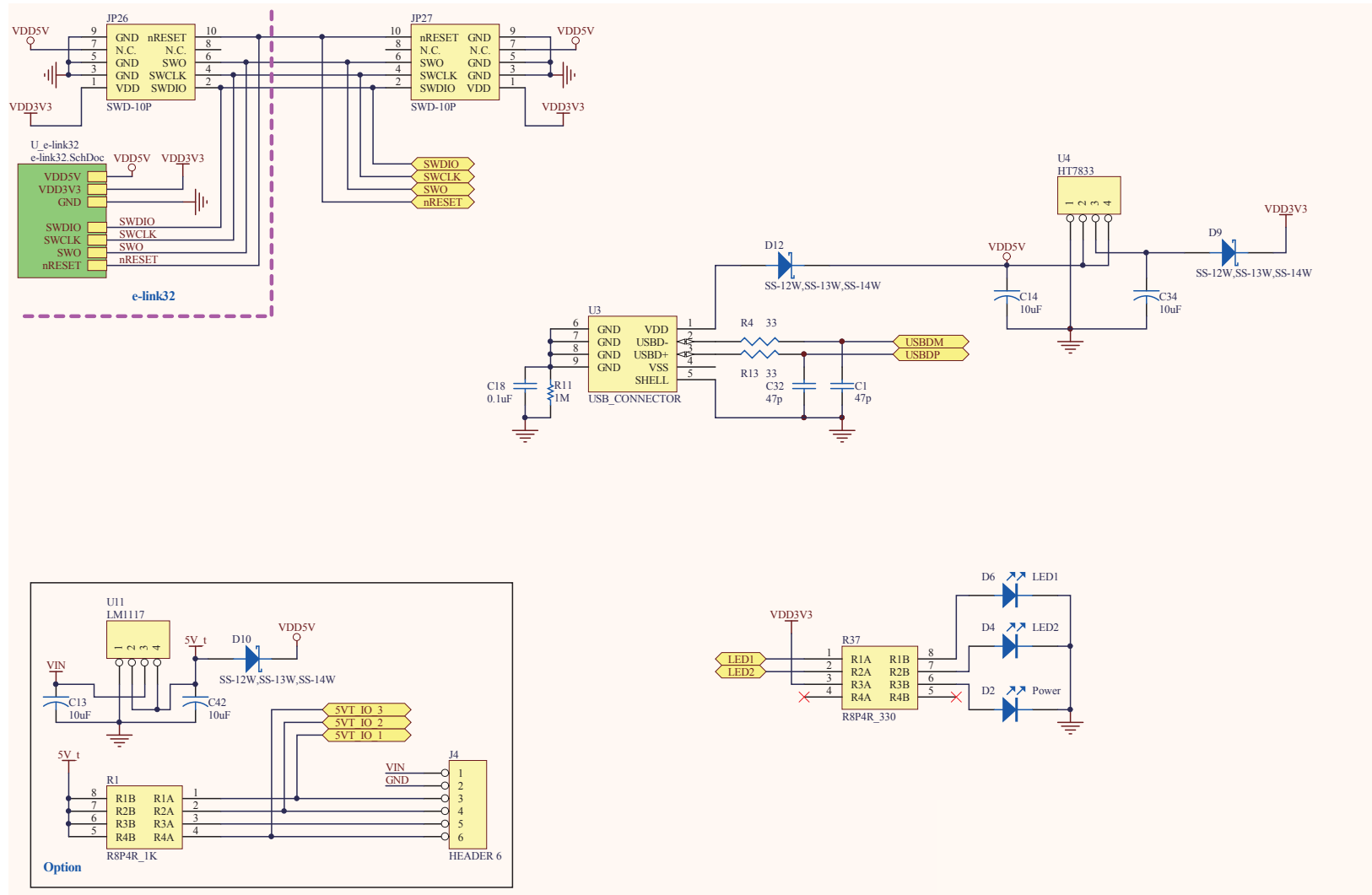


Figure 10. SWD Connector, LED Display and the Power

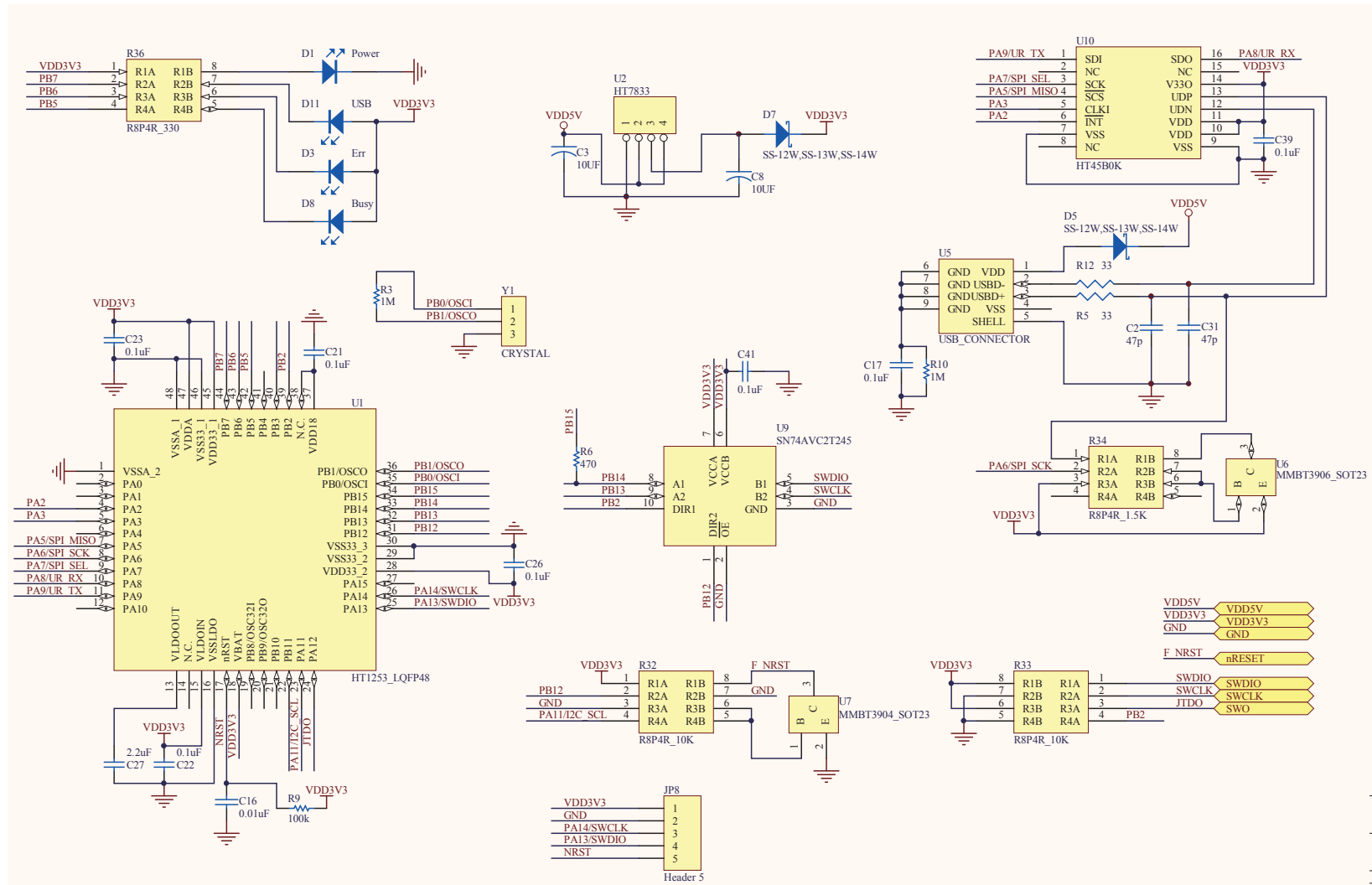


Figure 11. e-Link32 Lite

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