HT32F491x3 Series MCU
Starter Kit User Guide

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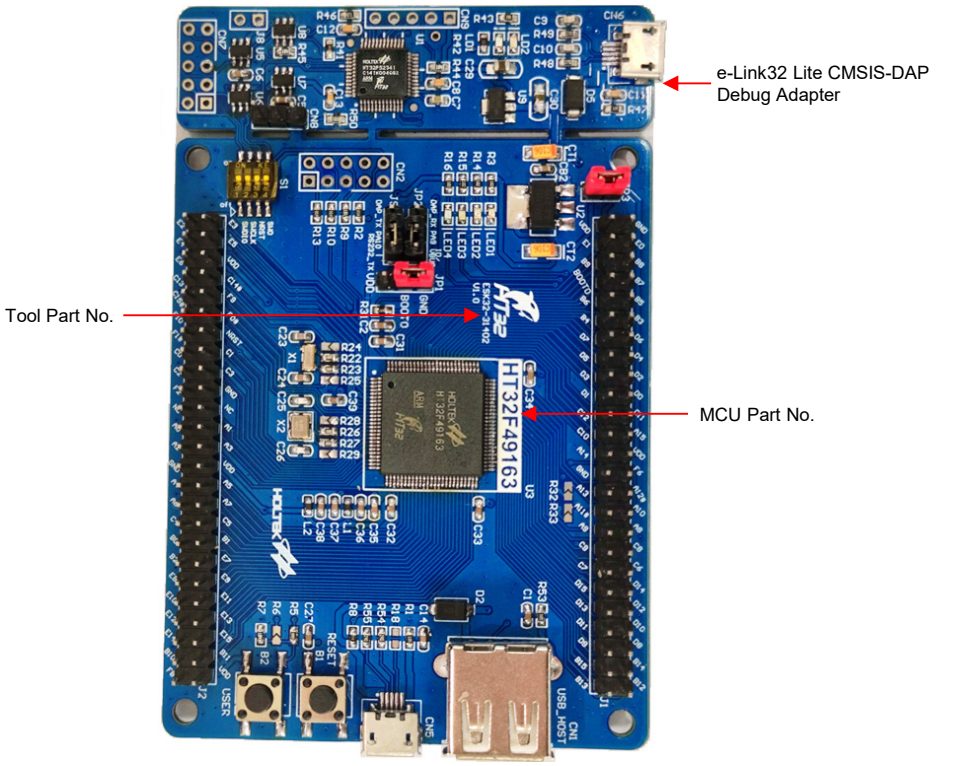
1. Introduction

The HT32F491x3 Series Starter Kit is based around the Holtek 32-bit Arm® Cortex®-M4 high performance microcontroller and is designed to help users start and run 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, allowing 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, i.e. e-Link32 Lite Serial-Wire Debugger, to automatically download programs and immediately commence debug operations.



Features

- Uses the HT32 high performance microcontrollers
- Integrated Timer, I²C, SPI, USART, UART, 12-bit A/D converter, USB and I²S etc. Refer to the datasheet of the corresponding MCU for details.
- Comprises Target Board and e-Link32 Lite Serial-Wire Debugger
- Used for peripheral testing and functional prototype development
- Uses either the Target Board USB connector or the e-Link32 Lite USB connector to supply power

Start

Configure the ESK32-31402 board according to the following steps to start the application:

1. Check the jumper position on the board:

   JP1 selects GND (BOOT0 is 0)

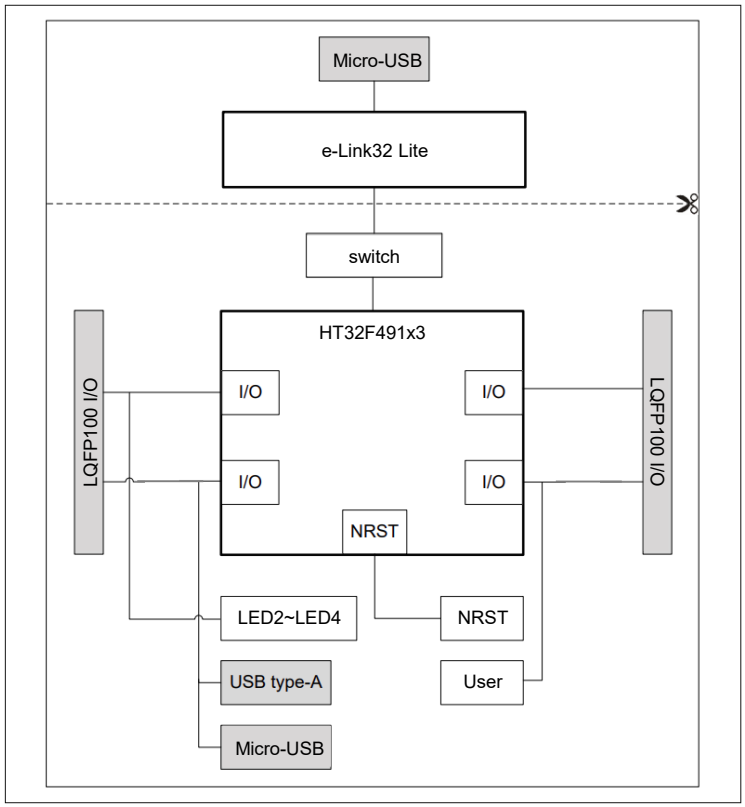
2. Connect the board to the PC using a USB cable and use the USB connector CN6 to supply power.

2. Hardware Layout

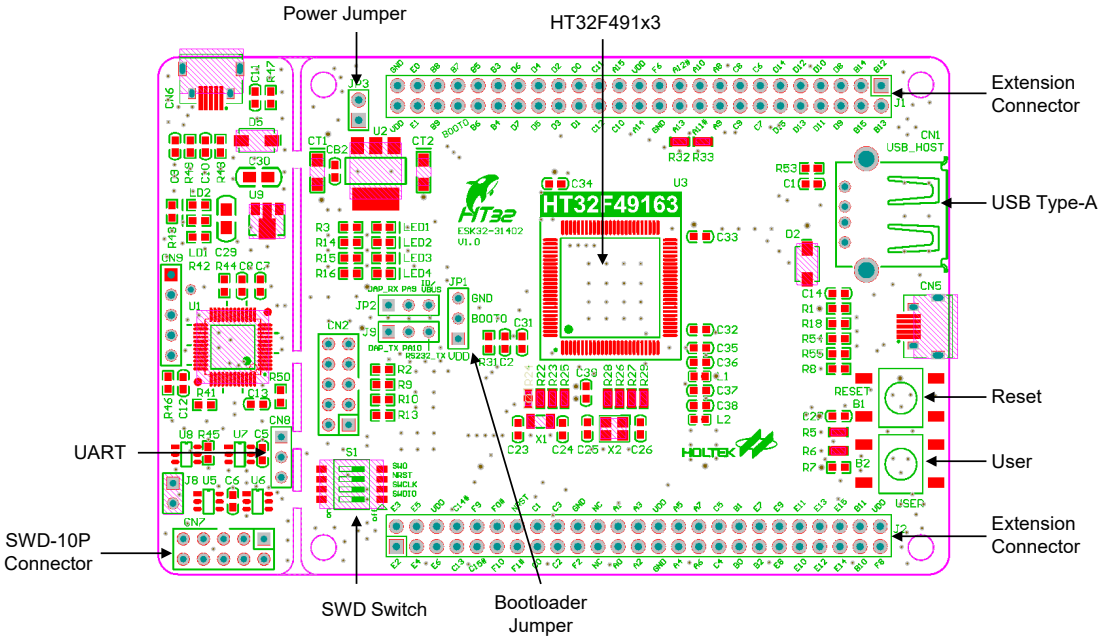
The ESK32-31402 is designed around the HT32F491x3 microcontroller which is supplied in a 100-pin LQFP package.

The following hardware block diagram shows the connections between the e-Link32 Lite, the HT32F491x3 and their peripherals, such as buttons, LEDs, USB and extension interfaces.

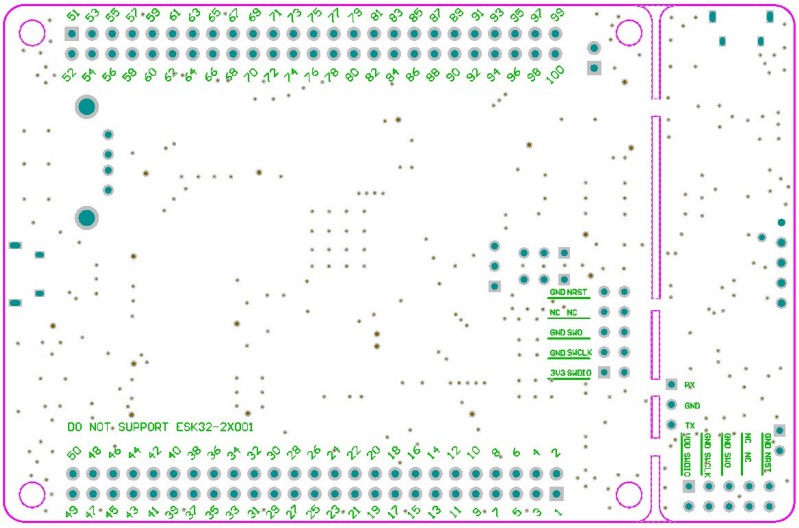
The PCB front and back side diagrams show where these features are located on the e-Link32 Lite and the ESK32-31402.



Hardware Block Diagram

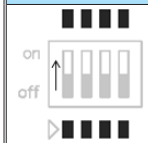


PCB Front Side



PCB Back Side

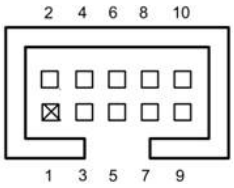
Serial Wire Debug Interface Switch – S1

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, CN7

CN7 is the SWD connector of the e-Link32 Lite and CN2 is the SWD connector of the Target Board.

- If the e-Link32 Lite is not seperated, as there are already PCB traces on the board, switching S1 to the ON position can connect the Target Board without requiring additional flying line connection.
- If the e-Link32 Lite is not separated and S1 is switched to the OFF position, CN7 can be connected to the user board through flying line connection.
- When the e-Link32 Lite is separated, CN7 can be connected to the Target Board CN2 or the user board through flying line connection.



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 – J8

J8	Description
	Pin 1 of the CN7 connector on the e-Link32 Lite side is used as an input. The reference voltage is supplied through this pin to the voltage conversion chip – default setting
	Pin 1 of the CN7 connector on the e-Link32 Lite side is used as an output. By this setting, the voltage conversion chip of the e-Link32 Lite always uses 3.3V as the reference voltage

MCU Power Jumper – JP3

JP3	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

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

Boot Mode Option – JP1

When booting, users can select one of three boot modes by configuring the BOOT0 pin and the nBOOT1 bit of the User System Data.

Jumper	Description
JP1 connected to GND or OFF nBOOT1=0/1	nBOOT1=X, BOOT0=0 Boot from the main Flash memory – factory default setting
JP1 connected to VDD nBOOT1=1	nBOOT1=1, BOOT0=1 Boot from the Boot Code
JP1 connected to VDD nBOOT1=0	nBOOT1=0, BOOT0=1 Boot from the internal SRAM

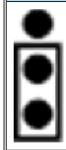
UART Option Jumper – J9

The Starter Kit arranges a Target MCU UART to be used as an external communication interface, which can connect to the host computer or other devices. The Target MCU RX pin has the option of connecting to the e-Link32 Lite UART TX pin or to the extension connector, RS232_TX.

J9	Description
	The MCU UART RX is connected to the extension connector, RS232_TX – default setting
	The MCU UART RX is connected to the e-Link32 Lite UART TX

OTGFS Option Jumper – JP2

When the PA9 pin of the HT32F49163 is used as the OTG_FS_VBUS function, connect JP2 to VBUS, in which case the PA9 pin will be connected to the USB VBUS pin, disconnecting from the e-Link32 Lite UART RX.

JP2	Description
	The MCU PA9 is connected to the USB VBUS pin and used as the OTG_FS_VBUS function
	The MCU PA9 is connected to the e-Link32 Lite UART RX

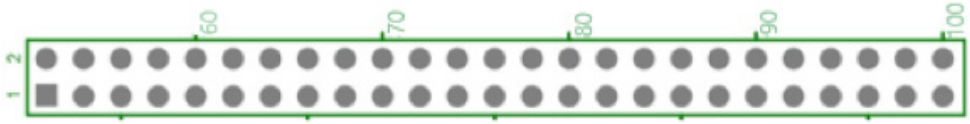
e-Link32 Lite UART Connector – CN8

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

CN8	Description
	The UART connector has three pins: TX, GND and RX The e-Link32 Lite will send data on the TX pin and receive data on the RX pin

- If the e-Link32 Lite is not separated, users can use the e-Link32 Lite “Virtual COM Port” function by connecting J9 to DAP_TX and JP2 to DAP_RX.
- If the e-Link32 Lite is not separated and users need to connect the e-Link32 Lite UART RX to their own board, connect JP2 to VBUS.
- When the e-Link32 Lite is separated, CN8 can be connected to the Target Board or user board through flying line connection.

Extension Connector – J1

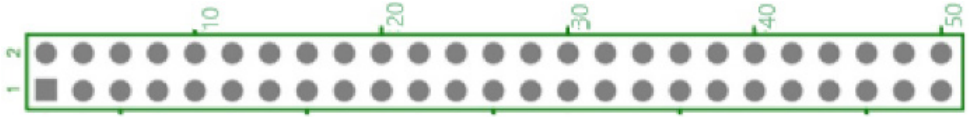


Extension Connector – J1

Pin No.	Description	Pin No.	Description
51	PB12	52	PB13
53	PB14	54	PB15
55	PD8	56	PD9
57	PD10	58	PD11
59	PD12	60	PD13
61	PD14	62	PD15
63	PC6	64	PC7
65	PC8	66	PC9
67	PA8	68	PA9
69	PA10	70	PA11#
71	PA12#	72	PA13
73	PF6	74	GND
75	VDD	76	PA14
77	PA15	78	PC10
79	PC11	80	PC12
81	PD0	82	PD1
83	PD2	84	PD3
85	PD4	86	PD5
87	PD6	88	PD7
89	PB3	90	PB4
91	PB5	92	PB6
93	PB7	94	BOOT0
95	PB8	96	PB9
97	PE0	98	PE1
99	GND	100	VDD

Note: "#" indicates the open-circuit pins that require an additional 0Ω resistor for connection.

Extension Connector – J2

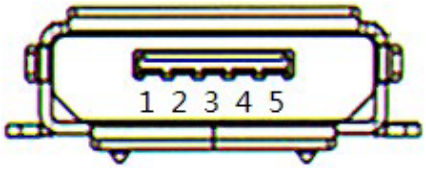


Extension Connector – J2

Pin No.	Description	Pin No.	Description
1	PE2	2	PE3
3	PE4	4	PE5
5	PE6	6	VDD
7	PC13	8	PC14#
9	PC15#	10	F9
11	F10	12	F0#
13	F1#	14	NRST
15	PC0	16	PC1
17	PC2	18	PC3
19	F2	20	GND
21	NC	22	NC
23	PA0	24	PA1
25	PA2	26	PA3
27	GND	28	VDD
29	PA4	30	PA5
31	PA6	32	PA7
33	PC4	34	PC5
35	PB0	36	PB1
37	PB2	38	PE7
39	PE8	40	PE9
41	PE10	42	PE11
43	PE12	44	PE13
45	PE14	46	PE15
47	PB10	48	PB11
49	F8	50	VDD

Note: "#" indicates the open-circuit pins that require an additional 0Ω resistor for connection.

Micro USB Type-B Connector – CN5/CN6



Micro USB Type-B Connector

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

3. Schematics