



FLIGHT CONTROLLER LUX-F4HD

BASIC MANUAL

MCU: STM32F405RGT6, 168MHz , 1MB Flash

IMU: ICM42688-P

Baro: SPL06-001

OSD: Analog AT7456E, Digital DJI OSD

Blackbox: 16M Flash

6x UARTs, 1x Softserial1_Tx option(INAV/BF)

12x PWM outputs

1x I2C

4x ADC (VBAT, Current, RSSI, Airspeed)

2x SH1.0_8pin connector for PnP with 2x 4in1 ESC

1x SH1.0_6pin connector for PnP with HD System(Caddx Vista & Air Unit)

USB pin breakout for connecting to external USB adapter.

Dual Camera Inputs switch

9~16V(Vxs) for VTX power switch

9~60V DC IN (3~12S LiPo)

BEC 5V 1.5A for FC

BEC 9-16V/1-2A for Analog camera/VTX, Digital video systems

ArduPilot: MatekF405-TE

INAV: MATEKF405TE

BetaFlight: MATEKF405TE

LAYOUT

5V: onboard BEC 5V 1.5A cont.
 Vxs: onboard BEC 9~16V, Voltage=Vx
 *** Vxs ON/OFF can be switched via ArduPilot Relay or Modes/USER1 (BF/INAV) (Default ON)
 G: Ground

RX1 & TX1: UART1_RX & TX
 RX6 & TX6: UART6_RX & TX

LED: 2812 LED signal Out, PWM12 in ArduPilot fw

C1: Analog Camera-1 video IN (Default)
 C2: Analog Camera-2 video IN
 *** C1/C2 can be switched via ArduPilot Relay or Modes/USER2 (BF/INAV)
 *** 2 Cameras must be set with identical video format

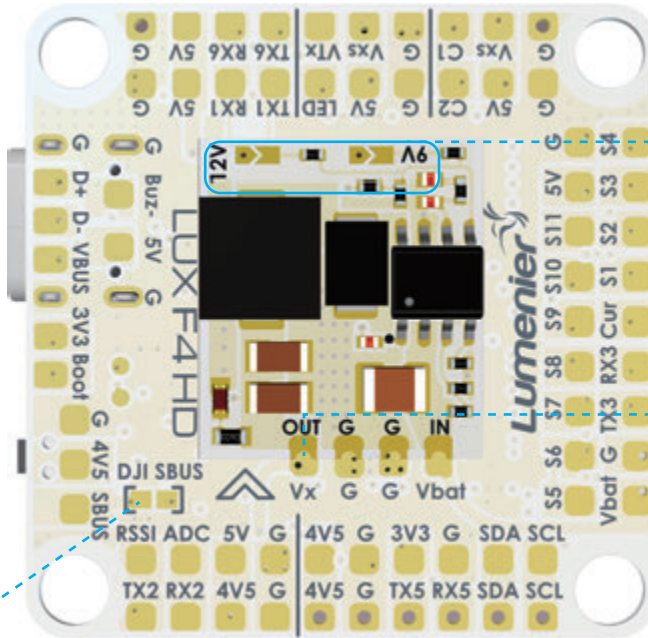
VTX: Analog Video OUT for Analog Video Transmitter

D+ & D-: USB data
 VBUS: USB voltage
 USB shell: Ground

Buz- & 5V: Passive 5V buzzer
 Buz- /5V/G: Matek DBU5V

Boot: STM32F405 boot pin
 DFU mode: Bridge Boot to 3v3 while powering on

This side UP by default



Vbat = 3S LIPO, Vx = 9V 2A



Vbat = 4S LIPO, Vx = 12V 2A
 Vbat = 6S LIPO, Vx = 12V 1.7A
 Vbat = 8S LIPO, Vx = 12V 1.5A



Vbat = 6S LIPO, Vx = 16V 2A
 Vbat = 8S LIPO, Vx = 16V 1.5A
 Vbat = 12S LIPO, Vx = 16V 1A

S1~S11: PWM outputs
 S1~S8 support DSHOT with ArduPilot/BF fw

Cur: current sensor signal IN (0~3.3V)
 Rx3 & Tx3: UART3_RX & TX

Vbat: Battery voltage, 9~60V DC IN (3~12S LIPO)
 G: Ground

4V5: 4.4~4.8V, Max.800mA, the voltage is also supplied when connecting via USB
 3V3: LDO3.3V Max.200mA

SBUS: UART2_RX with inversion for SBUS receiver protocol
 Rx2: UART2_RX
 Tx2: UART2_TX
 *** Tx2 can be remapped to softserial_tx1 for Frsky SmartPort telemetry (BF CLI resource SERIAL_TX 11 A02, enabled CPU based serial port in INAV)
 *** Frsky FPort must be uninverted signal

ADC: Analog Airspeed sensor IN with INAV/ArduPilot (0~3.3V), spare ADC pin with BF fw
 Rssi: Analog RSSI IN (0~3.3V)

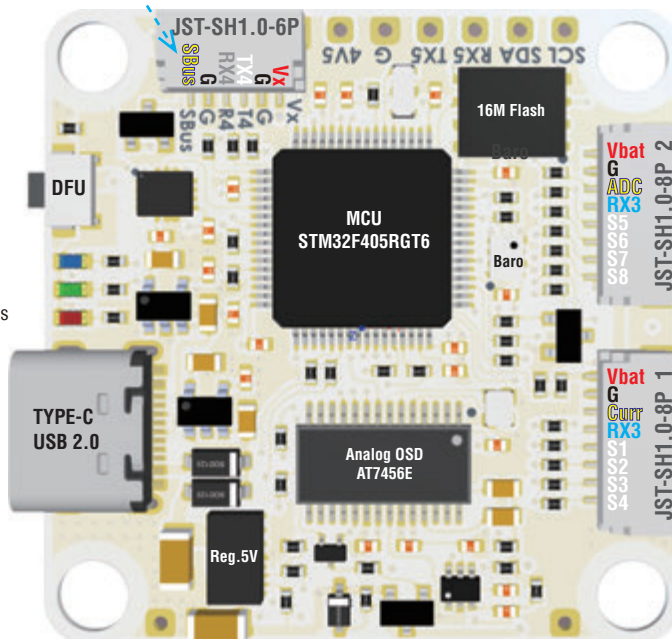
SCL & SDA: I2C1 Bus for Magnetometer/Digital airspeed sensor/OLED
 Tx5 & Rx5: UART5_TX & RX
 *** GPS can be connected to any spare UART_TX & RX



If using non-DJI FPV remote controller, keep this pad unbridged



If using DJI FPV Remote Controller, Bridging this pad will link SBUS pin to DJI SBUS on SH1.0-6P connector



SH1.0-8P_2 Sequence
 --Vbat: Battery voltage, 9~60V DC IN
 --G: Ground
 --ADC: can be remapped as current sense ADC
 *** Ardu: BATT_CURR2_PIN = 10 (ArduPilot support 2x Current readout)
 *** INAV: set current_adc_channel = 4
 *** BF: resource ADC_CURR 1 C00
 --Rx3: UART3_RX, for BLHeli32 ESC Telemetry
 --S5/S6/S7/S8: DShot/PWM outputs

SH1.0-8P_1 Sequence
 --Vbat: Battery voltage, 9~60V DC IN
 --G: Ground
 --Curr: current sensor signal IN
 --Rx3: UART3_RX, for BLHeli32 ESC Telemetry
 --S1/S2/S3/S4: DShot/PWM outputs

Size & Weight: 36x36mm /7g
 Holes: Φ4mm, 30.5mm x 30.5mm

Packing
 1x LUX-F4HD
 2x JST-SH1.0_8P cable 5cm
 6x M3 Silicon Grommets
 1x JST-SH1.0_6P to JST-GH1.25_8P 12cm for DJI air unit

LED 0: Blue, FC Status
 LED 1: Green, FC Status
 LED 3.3: Red, 3.3V Status

Wiring (Multirotors)

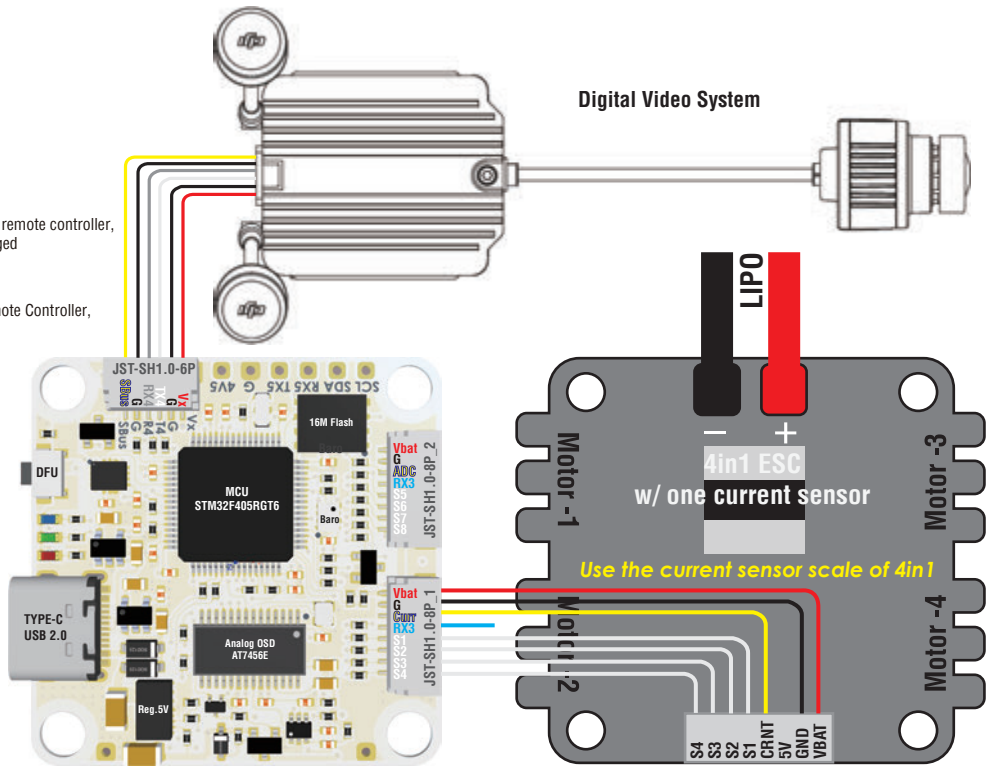
Ardupilot MATEKF405-TE
 INAV MATEKF405TE
 BetaFlight MATEKF405TE



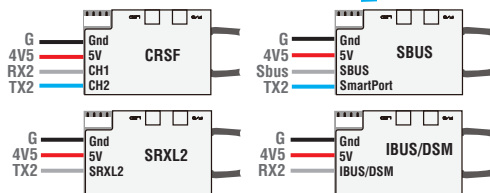
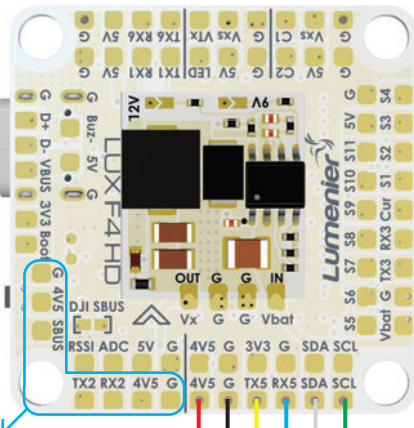
If using non-DJI FPV remote controller, keep this pad unbridged



If using DJI FPV Remote Controller, Bridge this pad

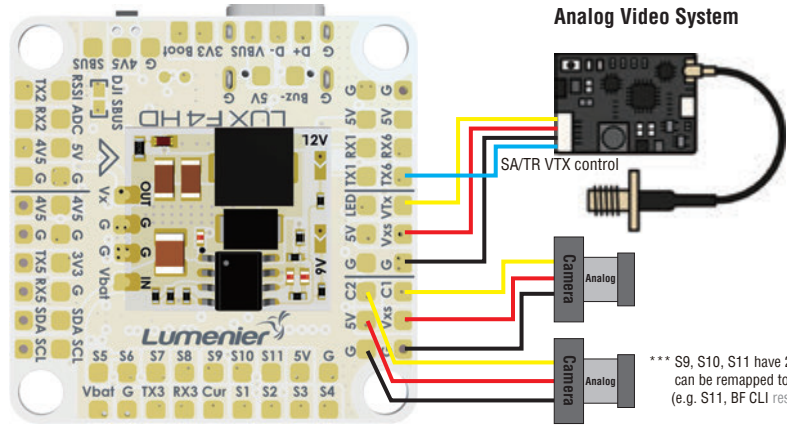


Tips
 With INAV firmware, DSHOT can not work on S3 because of DMA clash.
 You may use ONESHOT or MULTISHOT and calibrate ESC PWM range.



*** Tx2 can be remapped to softserial_1x1 for Frisky SmartPort telemetry
 BF, CLI resource SERIAL_TX 11 A02.
 INAV, Softserial1_Tx is an alternative on Tx2 pad by checking "Enable CPU based serial ports"
 * IBUS/DSM can be connected to any spare UART_RX
 * PPM is not supported by INAV4.1 or newer.
 * STM32F405 UART_TX only work with **Non-inverted(hacked) S.Port/F.Port** signal

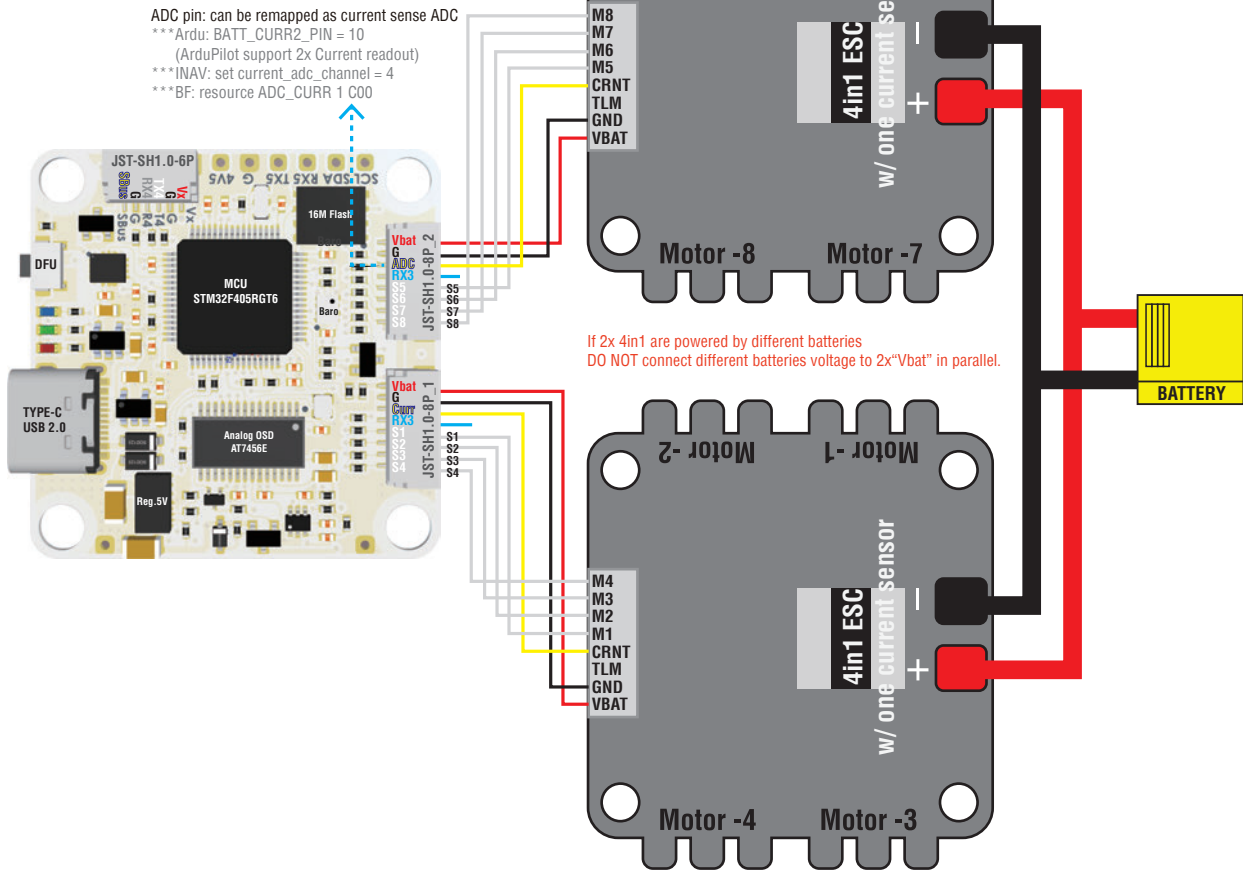
*** GPS can work with any spare UART_TX & RX
 *** 4V5 is also supplied when connecting via USB only



*** S9, S10, S11 have 200ohm built-in, can be remapped to PWM camera control in BF fw (e.g. S11, BF CLI resource camera_control 1 B06)

Wiring (Octocopter)

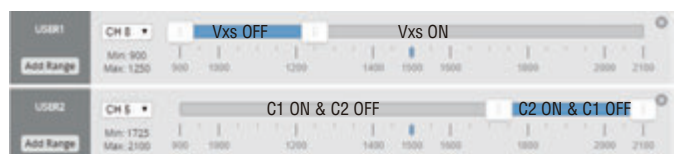
ArduPilot MATEKF405-TE
 INAV MATEKF405TE
 BetaFlight MATEKF405TE



Tips
 With INAV firmware, DSHOT can not work on S3, S5, S7 because of DMA clash.
 You may use ONESHOT or MULTISHOT and calibrate ESC PWM range.

Vxs Power / Camera switch

USER1	No USER1 definition
Add Range	Vxs ON by default
USER2	No USER2 definition
Add Range	C1 (Camera-1) ON by default



I/O Mapping

ArduPilot					
PWM 5V tolerant I/O	S1	PWM1 GPIO50	TIM8 CH4	DMA/DShot	Group1
	S2	PWM2 GPIO51	TIM8 CH3	DMA/DShot	
	S3	PWM3 GPIO52	TIM1 CH3N	DMA/DShot	
	S4	PWM4 GPIO53	TIM1 CH1	DMA/DShot	Group2
	S5	PWM5 GPIO54	TIM2 CH4	DMA/DShot	
	S6	PWM6 GPIO55	TIM2 CH3	DMA/DShot	Group3
	S7	PWM7 GPIO56	TIM2 CH2	DMA/DShot	
	S8	PWM8 GPIO57	TIM2 CH1	DMA/DShot	
	S9	PWM9 GPIO58	TIM12 CH1	NO DMA	Group4
	S10	PWM10 GPIO59	TIM13 CH1	NO DMA	Group5
	S11	PWM11 GPIO60	TIM4 CH1	NO DMA	Group6
	LED pad	PWM12 GPIO61	TIM3 CH4	DMA/DShot	Group7
SERVO12 FUNCTION 120, NTF LED TYPES neopixel					

Mixing Dshot and normal PWM operation for outputs is restricted into groups, ie. enabling Dshot for an output in a group requires that ALL outputs in that group be configured and used as Dshot, rather than PWM outputs.

If servo and motor are mixed in same group, make sure this group run lowest PWM frequency according to the servo specification. ie. Servo supports Max. 50Hz, ESC must run at 50Hz in this group.

ADC	Vbat Pad	1K:20K divider builtin 0~60V	on board battery voltage	BATT_VOLT_PIN BATT_VOLT_MULT	14 21.0
	Curr pad	0~3.3V	current sensor ADC	BATT_CURR_PIN BATT_AMP_PERVLT	15 /
	RSSI Pad	0~3.3V	RSSI ADC Analog RSSI	RSSI_ANA_PIN RSSI_TYPE	8 2
	ADC	no divider builtin 0~3.3V	AirS ADC Analog Airspeed	ARSPD_PIN ARSPD_TYPE	10 2

I2C	I2C1	5V tolerant I/O	Compass	COMPASS_AUTODEC	1
			onboard Baro SPL06-001	Address	0x76
			Digital Airspeed I2C MS4525	ARSPD_BUS ARSPD_TYPE	1 1
			DLVR-L10D	ARSPD_TYPE	9

UART 5V tolerant I/O	USB	USB		console	SERIAL0
	TX1 RX1	USART1	with DMA	telem1	SERIAL1
	TX3 RX3	USART3	NO DMA	telem2	SERIAL2
	TX5 RX5	UART5	NO DMA	GPS1	SERIAL3
	TX4 RX4	UART4	NO DMA	GPS2/DJI OSD	SERIAL4
	TX6 RX6	USART6	TX6 with DMA	USER	SERIAL5
	TX2 RX2 SBUS	USART2	with DMA	RC input/Receiver	SERIAL6
		RX2	IBUS/DSM/PPM	BRD_ALT_CONFIG 0	
		Sbs pad	SBUS	Default	
		TX2 & RX2	CRSF	BRD_ALT_CONFIG 1	
TX2		uninverted FPort (hacked) SRXL2	SERIAL6_PROTOCOL 23		
				SERIAL6_OPTIONS 0	
				SERIAL6_OPTIONS 4	
				SERIAL6_OPTIONS 4	

INAV/BETAFLIGHT					
			INAV/BF MultiRotor	INAV Plane	
PWM	S1	5 V tolerant I/O	TIM8 CH4	Motor	Motor
	S2	5 V tolerant I/O	TIM8 CH3	Motor	Motor
	S3	5 V tolerant I/O	TIM1 CH3N	Motor	Servo
	S4	5 V tolerant I/O	TIM1 CH1	Motor	Servo
	S5	5 V tolerant I/O	TIM2 CH4	Motor	Servo
	S6	5 V tolerant I/O	TIM2 CH3	Motor	Servo
	S7	5 V tolerant I/O	TIM2 CH2	Motor	Servo
	S8	5 V tolerant I/O	TIM2 CH1	Motor	Servo
	S9	5 V tolerant I/O	TIM12 CH1	Servo	Servo
	S10	5 V tolerant I/O	TIM13 CH1	Servo	Servo
	S11	5 V tolerant I/O	TIM4 CH1	Servo	Servo
	LED	5 V tolerant I/O	TIM3 CH4	2812LED	2812LED

ADC	Vbat Pad	1K:20K divider builtin 0~60V	Vbat ADC ADC CHANNEL 1, PC4	BF scale 210, INAV scale 2100	
	Curr pad	0~3.3V	Current ADC ADC CHANNEL 2, PC5	depends on external current sensor range	
	RSSI Pad	0~3.3V	RSSI ADC ADC CHANNEL 3, PB0	Analog RSSI, Spare ADC	
	ADC Pad	no divider builtin 0~3.3V	AirS ADC ADC CHANNEL 4, PC0	Analog Airspeed(INAV) Spare ADC(BF)	

I2C	I2C1	5V tolerant I/O	Compass	QMC5883 / HMC5883	
			OLED	0.96"	
			onboard Barometer	SPL06-001	
			Digital Airspeed sensor	MS4525 (INAV)	
			Temperature sensor		

UART 5V tolerant I/O	USB	USB			
	TX1 RX1	5V tolerant I/O	UART1	USER	
	TX3 RX3		UART3	USER, ESC Telemetry	
	TX4 RX4		UART4	DJI OSD	
	TX5 RX5		UART5	GPS	
	TX6 RX6		UART6	USER	
	TX2 RX2 SBUS		5V tolerant I/O	UART2	RC input/Receiver
		Sbs pad		for SBUS receiver, SBUS pad = RX2+inverter	
		RX2 pad		IBUS/DSM/PPM, INAV doesn't support PPM	
		TX2 & RX2		CRSF	
		TX2 pad		SmartPort Telemetry	INAV enable Softserial_Tx1 BF "resource SERIAL_TX 11 A02"
		TX2 pad		FPORT, uninverted S.Port/F.Port signal (hacked)	
		TX2 pad		SRXL2	