KA-Nucleo-Weather

Rev. 20200922111544
Źródło: https://wiki.kamamilabs.com/index.php/KA-Nucleo-Weather

Spis treści

Description

KA-Nucleo-Weather is an functional expander for NUCLEO and Arduino boards with set of environmental sensors: pressure, humidity, temperature and light intensity sensors as well as 5-way joystick and RGB LED.

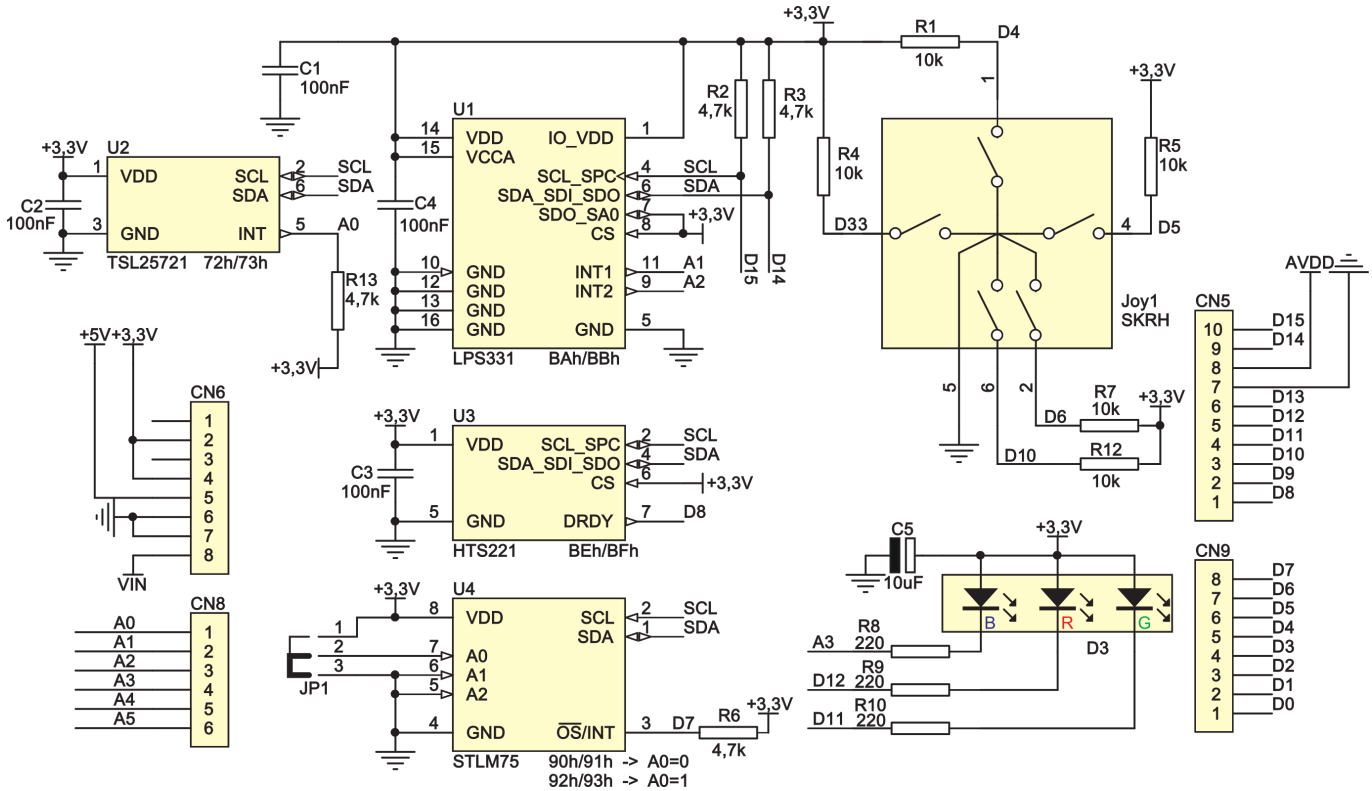
Basic features and parameters

- Compatibility with NUCLEO and Arduino systems
- Embedded MEMS pressure sensor (LPS331):
    - Measurement range 260 to 1260mbar
    - Measurement output data rate (ODR) 1 Hz to 25 Hz
    - ADC resolution 16 bits
    - Interface: SPI/I2C (used I2C)
- Embedded MEMS humidity sensor (HTS221):
    - Measurement range 0 to 100% (relative humidity)
    - Measurement output data rate (ODR) 1 Hz to 12,5 Hz
    - ADC resolution 16 bits
    - Interface: SPI/I2C (used I2C)
- Embedded digital temperature sensor (STLM75):
    - Measurement range –55°C to +125°C
    - ADC conversion time <150ms
    - Integrated programmable thermostat
    - ADC resolution 9 bits
    - Interface: SMbus/I2C
- Embedded digital light intensity sensor ALS (TSL25721):
    - Approximates human eye response
    - Integrated analog amplifiers with programmable gain
    - Two measurement canals
    - Integrated programmable comparators
    - Measurement dynamic range 45,000,000:1
    - Maximum light intensity to 60000 lux
    - ADC resolution 16 bits
- Embedded RGB LED
- Embedded 5-way joystick
- Extended pins connector

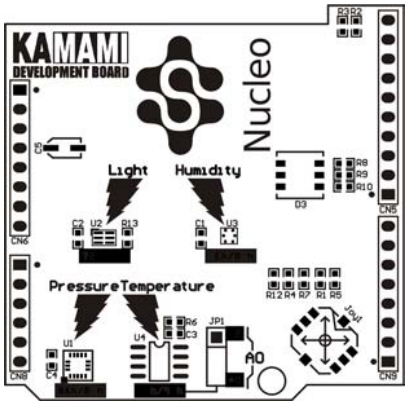
Standard equipment

Code	Description
KA-Nucleo-Weather	• Assembled and launched module

Electrical schematics

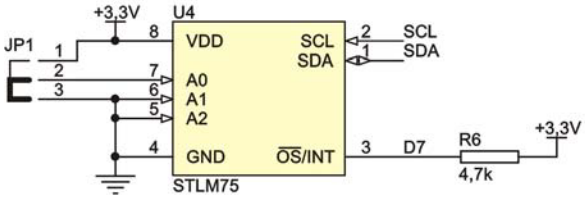


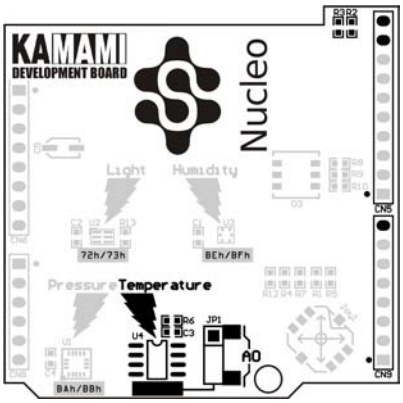
Board view


KAMAMI
DEVELOPMENT BOARD
Nucleo
Light
Humidity
Pressure
Temperature
A0
CN6
CN5
CN8
CN9

Temperature sensor

In expander was used semiconductor temperature sensor STLM75 with digital output. Communication interface of temperature sensor is connected to common (for all sensors) I2C bus. Communication lines of I2C interface are pulled up to power supply by 4,7 kΩ resistors. Connection method of temperature sensor to microcontroller is showing on schematic. Output of temperature sensor is connected to line A2, which is input canal of ADC_IN4 (PA4 GPIO pin of STM32).





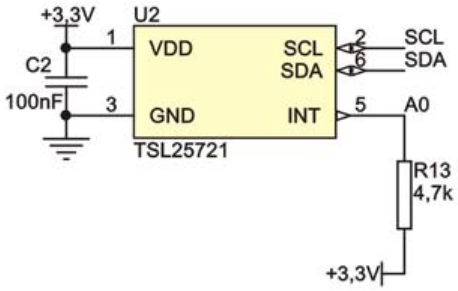
Line STLM75	Line name	GPIO in STM32	STM32 interface	Comments
SCL	D15	PB8	I2C1	Lines was pulled up to power supply lines by 4,7 kΩ resistors
SDA	D14	PA9		
OS/INT	D7	PA8	-	

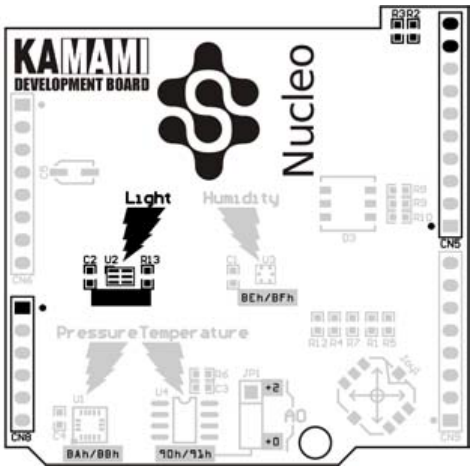
Jumper JP1 make possible choosing base address of STLM75 chip according to table below:

Closed pins JP1	A0	I2C base address
1-2	1	90h/91h
2-3	0	92h/93h

Light intensity sensor (ALS)

Expander is equipped with digital sensor of light intensity in environment TSL25721. Sensor has I2C interface. Communication bus of this sensor is connected to common (for all sensors) I2C bus. I2C communication lines are pulled up to power supply by 4,7 kΩ resistors. Connection method of TSL25721 sensor to microcontroller is showing on schematic.



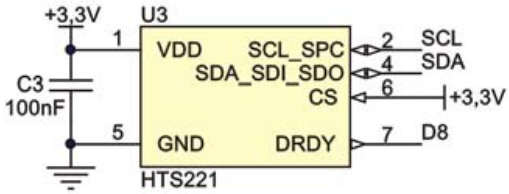


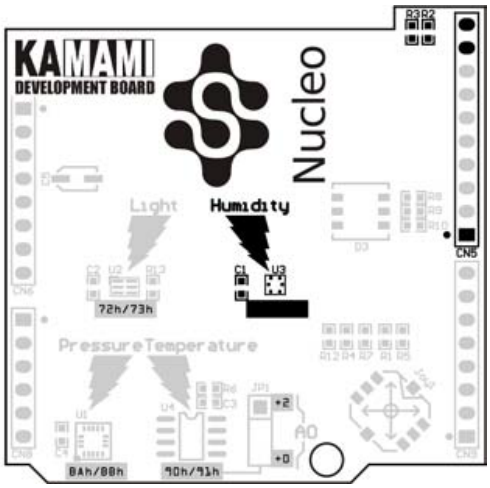
Line TSL25721	Line name	GPIO in STM32	STM32 interface	Comments
SCL	D15	PB8	I2C1	Lines was pulled up to power supply lines by 4,7 kΩ resistors
SDA	D14	PA9		
INT	A0	PA0	-	-

TSL25721 sensor is placed in I2C bus under base address 72h/73h.

Humidity sensor

Expander is equipped with digital humidity sensor HTS221 with I2C communication interface. Communication bus of this sensor is connected to common (for all sensors) I2C bus. I2C communication lines are pulled up to power supply by 4,7 kΩ resistors. Connection method of HTS221 sensor to microcontroller is showing on schematic.



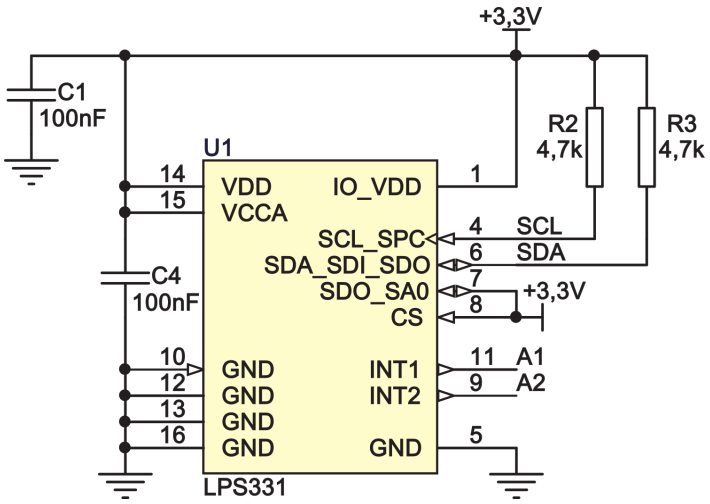


Line HTS221	Line name	GPIO in STM32	STM32 interface	Comments
SCL	D15	PB8	I2C1	Lines was pulled up to power supply lines by 4,7 kΩ resistors
SDA	D14	PA9		
DRDY	D8	PA9	-	-

HTS221 sensor is placed in I2C bus under base address BEh/BFh.

Pressure sensor

Expander is equipped with digital pressure sensor LPS331 with I2C communication interface. Communication bus of this sensor is connected to common (for all sensors) I2C bus. I2C communication lines are pulled up to power supply by 4,7 kΩ resistors. Interrupt output (INT1 and INT2) of sensor LPS331 can work in push-pull mode and don't need pulling up to power supply. Connection method of LPS331 sensor to microcontroller is showing on schematic.



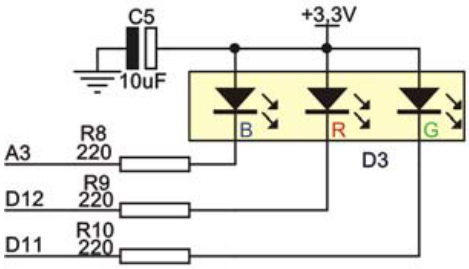
Line LPS331	Line name	GPIO in STM32	STM32 interface	Comments
SCL	D15	PB8	I2C1	Lines was pulled up to power supply lines by 4,7 kΩ resistors
SDA	D14	PA9		
INT1	A1	PA1	-	Outputs should be configured as push-pull
INT2	A2	PA4	-	

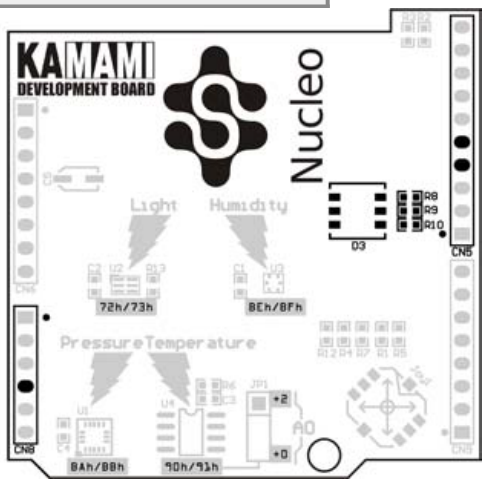
LPS331 sensor is placed in I2C bus under base address BAh/BBh.

LED-RGB

On-board LED-RGB are controlled direct with GPIO pins of microcontroller (according to table below). Diodes are on, if state of control line has logical state „0”.

LED	Line name	GPIO in STM32	Comments
Red	D12	PA6	LEDs are on, if state on GPIO pins is „0”
Green	D11	PA7	
Blue	A3	PB0	

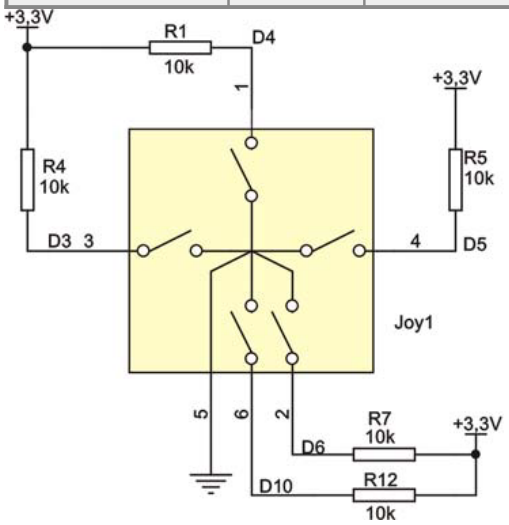


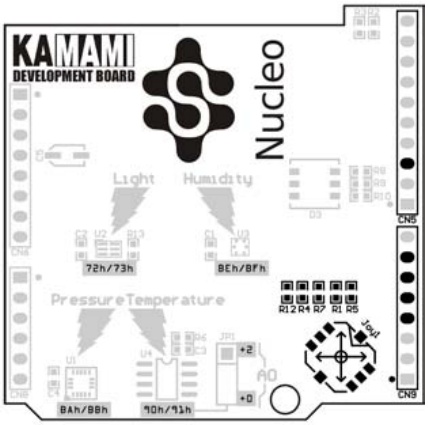


Joystick

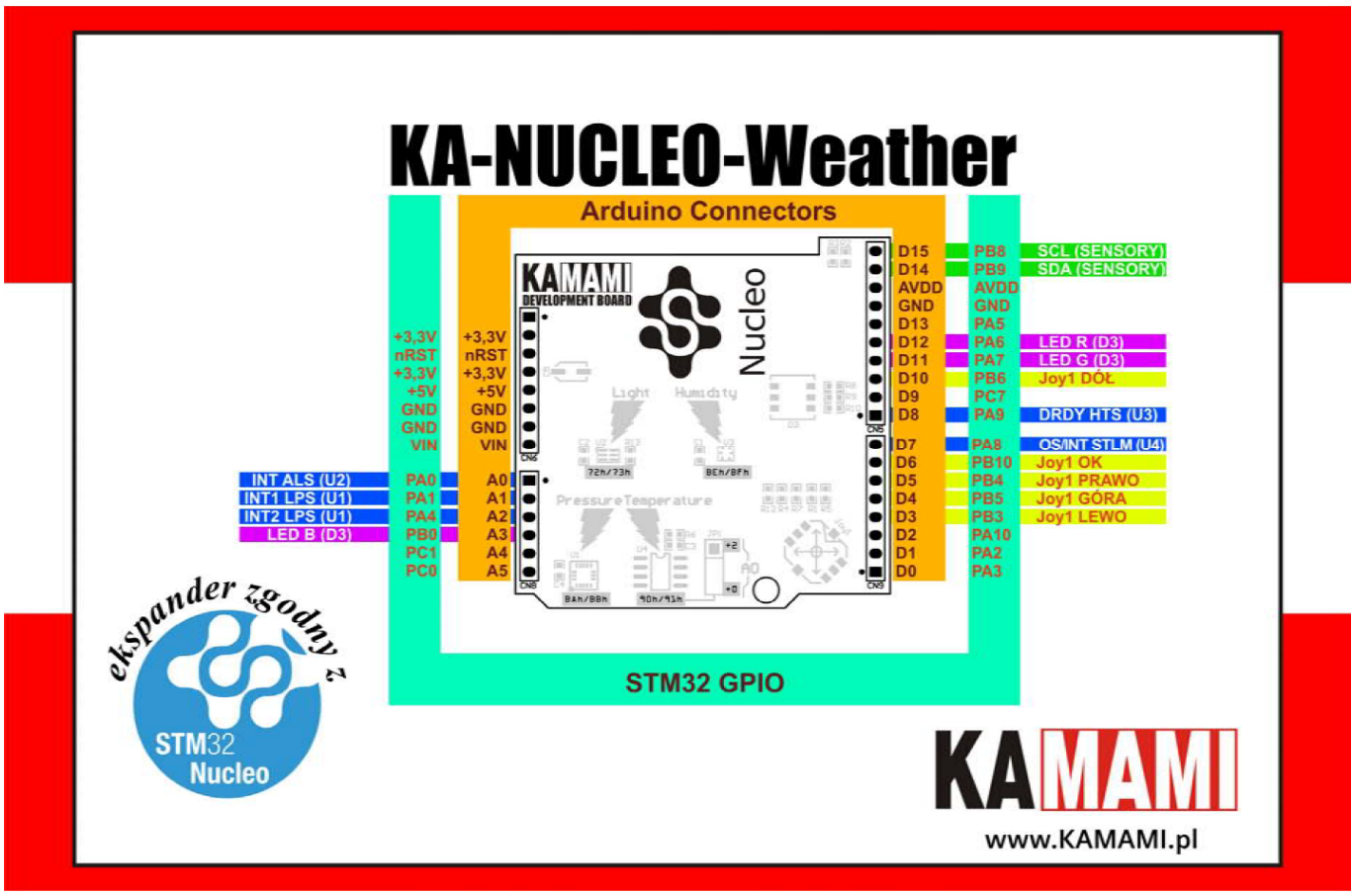
Embedded 5-way tact switch is connected direct to GPIO pins of microcontroller (according to table below). Each of pins are pulled up to power supply by using 10 kΩ resistor.

Joystick direction	Line name	GPIO in STM32	Comments
Up	D4	PB5	Lines pulled up to power supply by 10 kΩ resistor.
Down	D10	PB6	
Left	D3	PB3	
Right	D5	PB4	
OK	D6	PB10	





Signal connections map of GPIO pins



BTC Korporacja
05-120 Legionowo
ul. Lwowska 5
tel.: (22) 767-36-20
faks: (22) 767-36-33
e-mail:
biuro@kamami.pl
https://kamami.pl

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