



KAmeleon-STM32L4



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Źródło: <https://wiki.kamamilabs.com/index.php?title=KAmeleon-STM32L4>

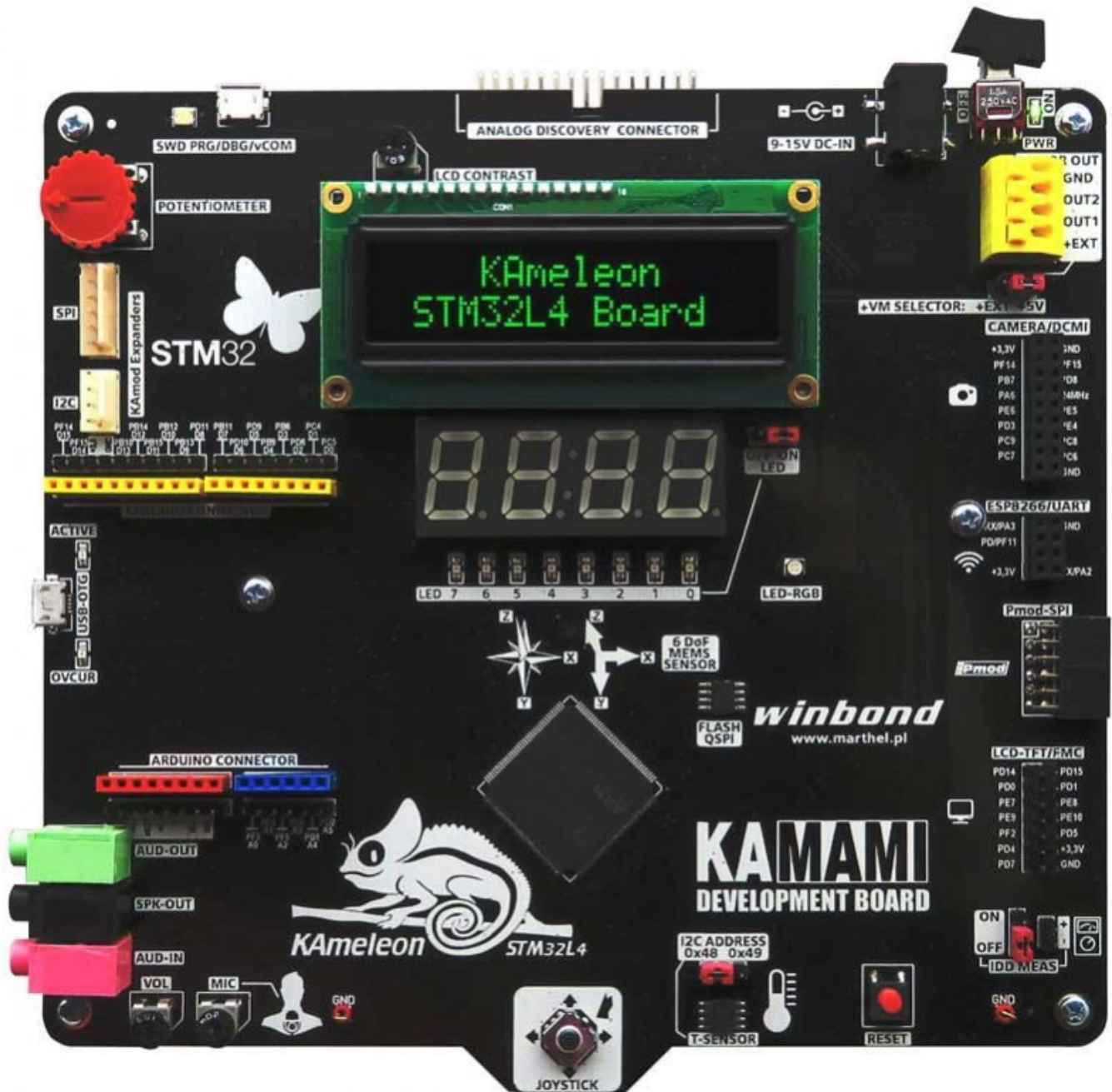
Table of contents

Description	1
Properties	2
Included	2
Schematic diagram	2
STM32L496ZGT6 microcontroller STM32L496ZGT6	2
RESET pushbutton	4
ST1S10 DC/DC and ST1S12GR power supplies	5
4-digit multiplexed LED display	6
User LEDs	7
LED-RGB	8
2x16 characters LCD display connector	9
W25Q80DV QSPI Flash memory	10
ST-Link USB connector	12
Arduino shields connector	13
KAmoD peripheral connectors	14
Potentiometer	15
USB-OTG interface	16
Audio amplifiers and connectors	17
TSV912AIST microphone amplifier	18
TS4990IST power amplifier	19
MP23AB02B MEMS microphone	19
5-pos joystick	20
STLM75M2F digital temperature sensor	21
IDD Meas connector and jumper	23
LCD-TFT/FMC connector	23
STSPIN250 brush DC motor driver	24
DCMI camera connector	25
ESP8266/UART connector	26
Pmod SPI connector	27
Analog Discovery connector	28
GND connectors	29
Links	30

Description

KAmeleon-STM32L4 - starter kit with STM32L496ZGT6 microcontroller

KAmeleon is a development kit with STM32L496ZGT6 microcontroller (ARM Cortex-M4) which is a complete platform for learning programming. The extensive equipment and library supporting all built-in peripherals enable the use of an efficient ARM microcontroller, easily comparable to Arduino. The set has a built-in programmer / debugger ST-Link with a micro-USB port, micro-USB cable is included, so you just need to attach the kit to the computer and start the programming adventure (if using the motor controller it is recommended to use the 12 V power supply included with DC sockets or terminal). The producer has also prepared sample programs that show how to use all the elements that the board is equipped with. An additional advantage of KAmeleon is the connector designed to connect the Analog Discovery 2 analyzer / oscilloscope, thanks to which you can "view" the microcontroller line states.



Properties

- STM32L496ZGT6 microcontroller, 1 MB Flash memory, 320 kB SRAM memory, 80 MHz
- Built-in ST-Link programmer
- A 30-pin connector for analyzing microcontroller line states using Analog Discovery 2
- DC STSPIN250 motor controller
- QSPI W25Q80DV Flash memory with a capacity of 1 MB
- Sensor MEMS LSM303C - 6 DoF accelerometer and magnetometer
- DCMI camera connector
- Connector for the WiFi ESP-01 module
- Connector for Pmod modules with SPI interface
- FMC connector for LCD displays
- Temperature sensor STLM75M2F
- joystick
- MEMS MP23AB02B microphone with signal level control and TSV912AIST amplifier
- TS4990IST audio amplifier
- USB-OTG micro-USB socket
- Arduino compatible connector with the possibility of connecting shields supplied with 3.3 and 5 V voltages
- KAmoD SPI and KAmoD I2C connectors for KAmoD series modules
- 8 LEDs
- RGB LED
- 4-digit 7-segment LED display
- 2x16 LCD display connector with HD44780 controller (display not included)
- Power through the micro-USB socket ST-Link programmer / debugger, DC jack or terminal
- Dimensions: 175 x 155 x 25 mm

Included

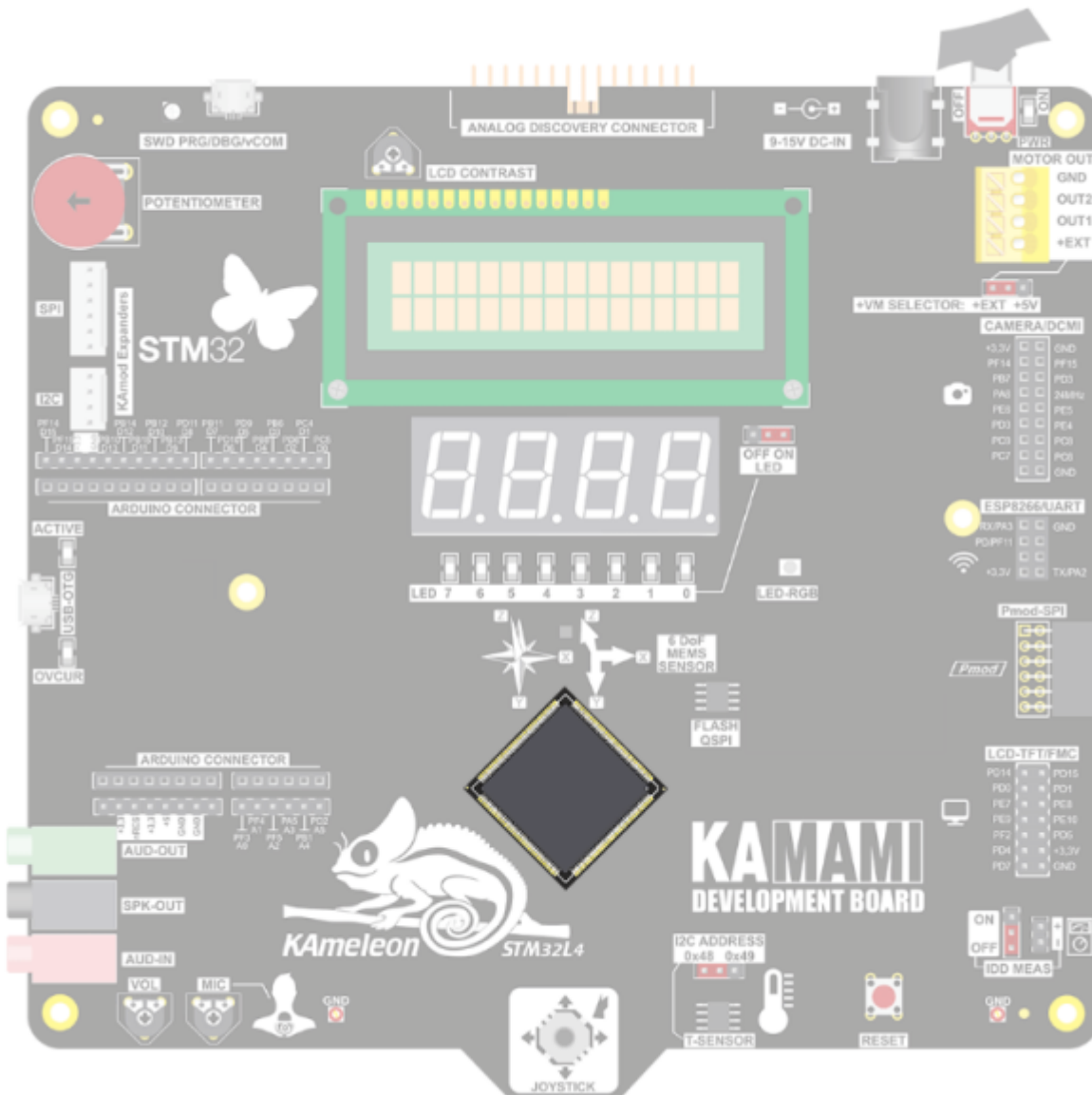
Commercial Code	Description
KAmeleon-STM32L4	<ul style="list-style-type: none">• KAmeleon development board (without LCD display)• Micro-USB cable

Schematic diagram

Schematic diagram of the KAmeleon-STM32L4 module

[Download schematic diagram \(PDF\)](#)

STM32L496ZGT6 microcontroller STM32L496ZGT6



Features

- ARM® 32-bit Cortex®-M4 CPU with FPU, Adaptive real-time accelerator (ART Accelerator™) allowing 0-wait-state execution from Flash memory, frequency 80MHz, MPU, 100DMIPS/1.25DMIPS/MHz (Dhrystone 2.1), and DSP instructions
- Performance benchmark
 - 1.25 DMIPS/MHz (Dhrystone 2.1)
 - 273.55 Coremark® (3.42 Coremark/MHz @ 80MHz)
- Energy benchmark
 - 217 ULPBENCH™ score
- 1MB Flash, 2 banks read-while-write, proprietary code readout protection
- 320KB of SRAM including 64KB with hardware parity check
- External memory interface for static memories supporting SRAM, PSRAM, NOR and NAND memories
- Dual-flash Quad SPI memory interface
- 1.71V to 3.6V power supply
- -40°C to 125°C temperature range
- 320nA in VBAT mode: supply for RTC and 32×32-bit backup registers
- 25nA Shutdown mode (5 wakeup pins)
- 108nA Standby mode (5 wakeup pins)
- 426nA Standby mode with RTC
- 2.57µA Stop 2 mode, 2.86µA Stop 2 with RTC

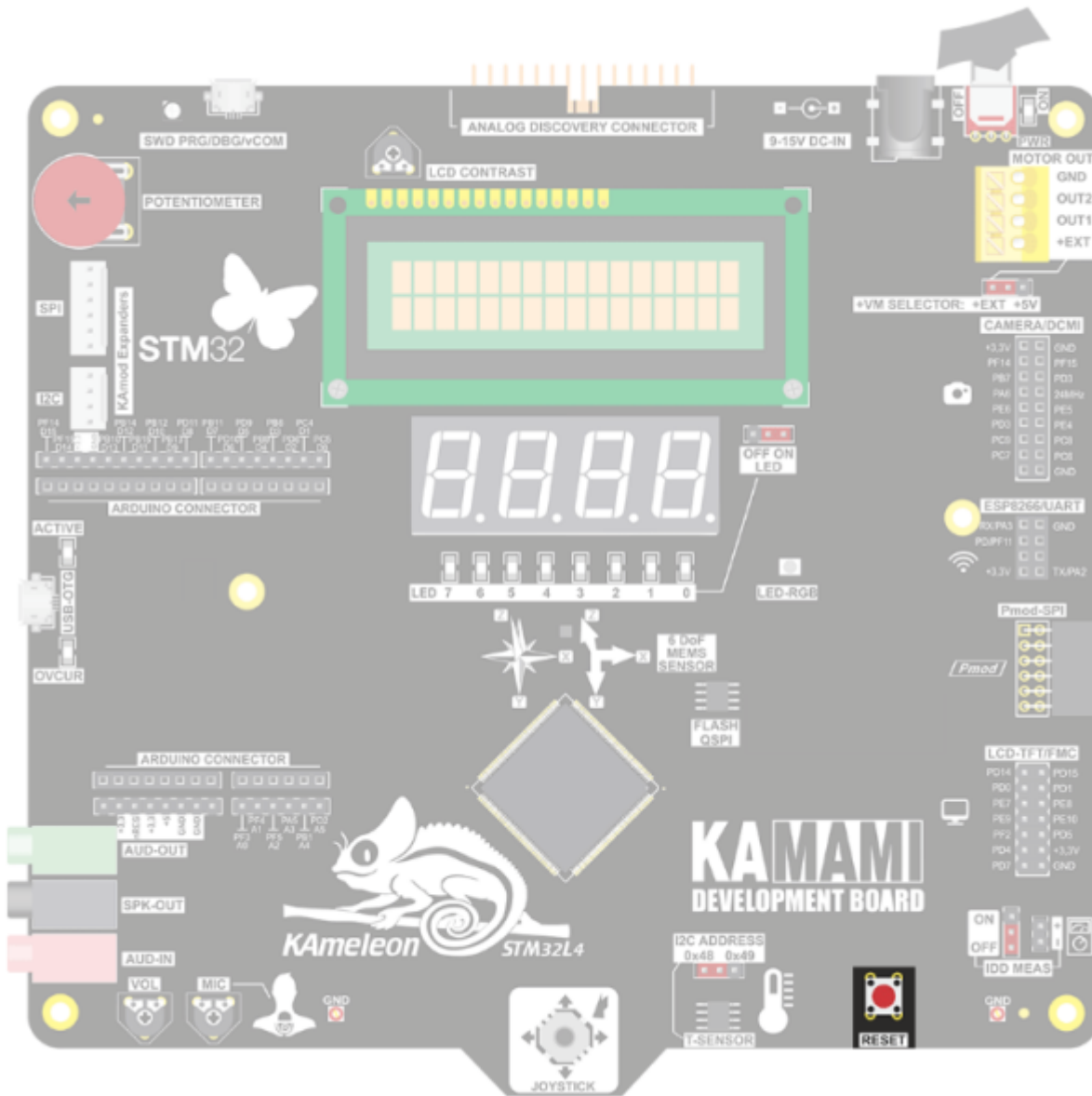
- 91µA/MHz run mode (LDO Mode)
- 37µA/MHz run mode (@3.3V SMPS Mode)
- Batch acquisition mode (BAM)
- 5µs wakeup from Stop mode
- Brown out reset (BOR) in all modes except shutdown
- Interconnect matrix

Download

- [STM32L496ZGT6 Datasheet](#)
- [STM32L496ZGT6 Reference Manual](#)

RESET pushbutton

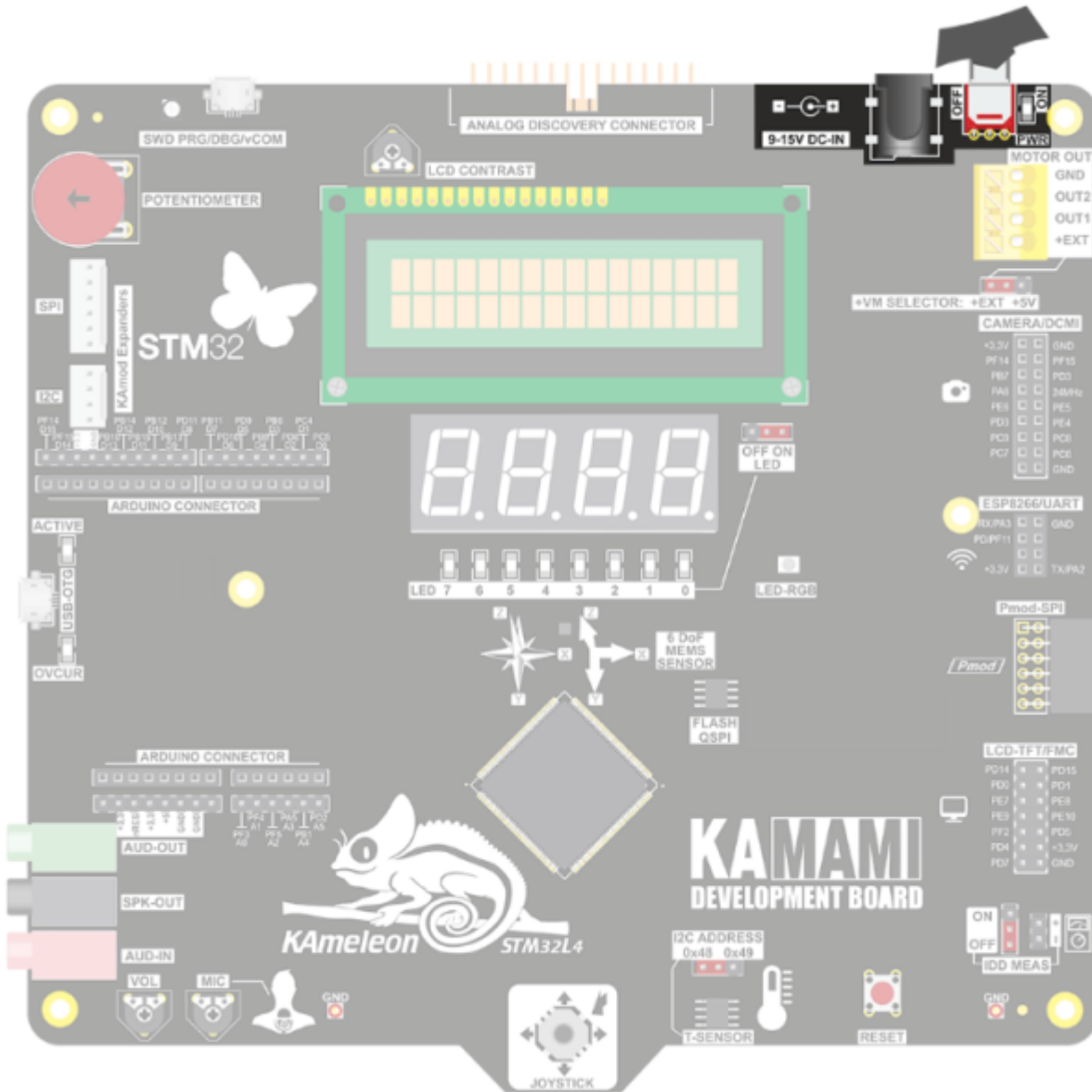
Manual microcontroller reset.



ST1S10 DC/DC and ST1S12GR power supplies

The ST1S10 is a high efficiency step-down PWM current mode switching regulator capable of providing up to 3A of output current. The device operates with an input supply range from 2.5V to 18V and provides an adjustable output voltage. It operates either at a 900 kHz fixed frequency or can be synchronized to an external clock (from 400kHz to 1.2MHz). The high switching frequency allows the use of tiny SMD external components, while the integrated synchronous rectifier eliminates the need for a Schottky diode. The ST1S10 provides excellent transient response, and is fully protected against thermal overheating, switching overcurrent and output short-circuit.

The ST1S12 is a step down DC-DC converter optimized for powering low-voltage digital cores in HDD applications and, generally, to replace the high current linear solution when the power dissipation may cause high heating of the application environment. It provides up to 0.7A over an input voltage range of 2.5V to 5.5V. A high switching frequency (1.7MHz) allows the use of tiny surface-mount components.

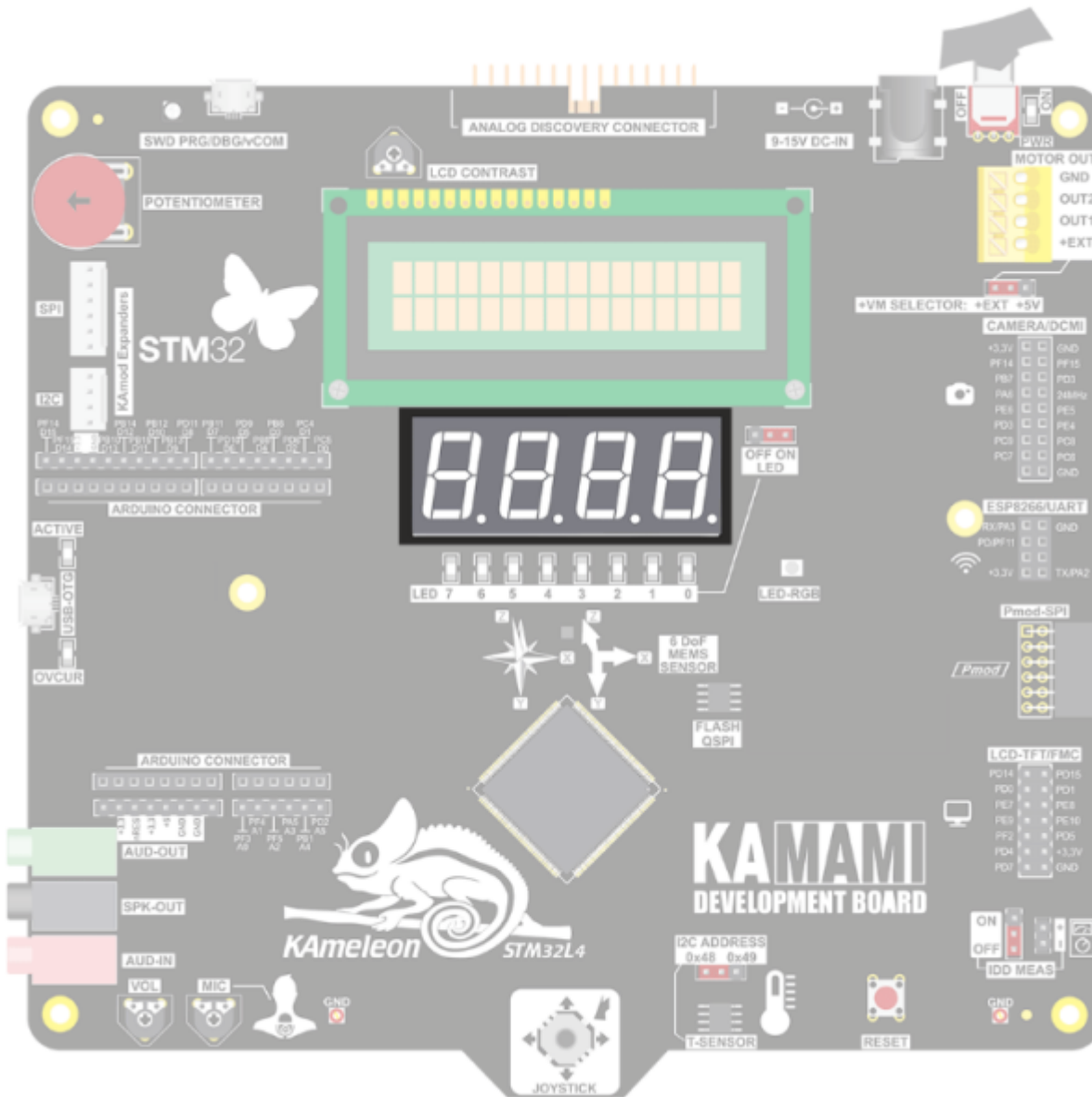


Features

- 9-15VDC input voltage
- Polimer fuse on input path
- Low dissipation power
- 5V and 3.3V output volatges available

4-digit multiplexed LED display

Common cathode OPD-Q5621LA-BW 4-digit LED display has multiplexed configuration and requires 12 lines to control all segments.

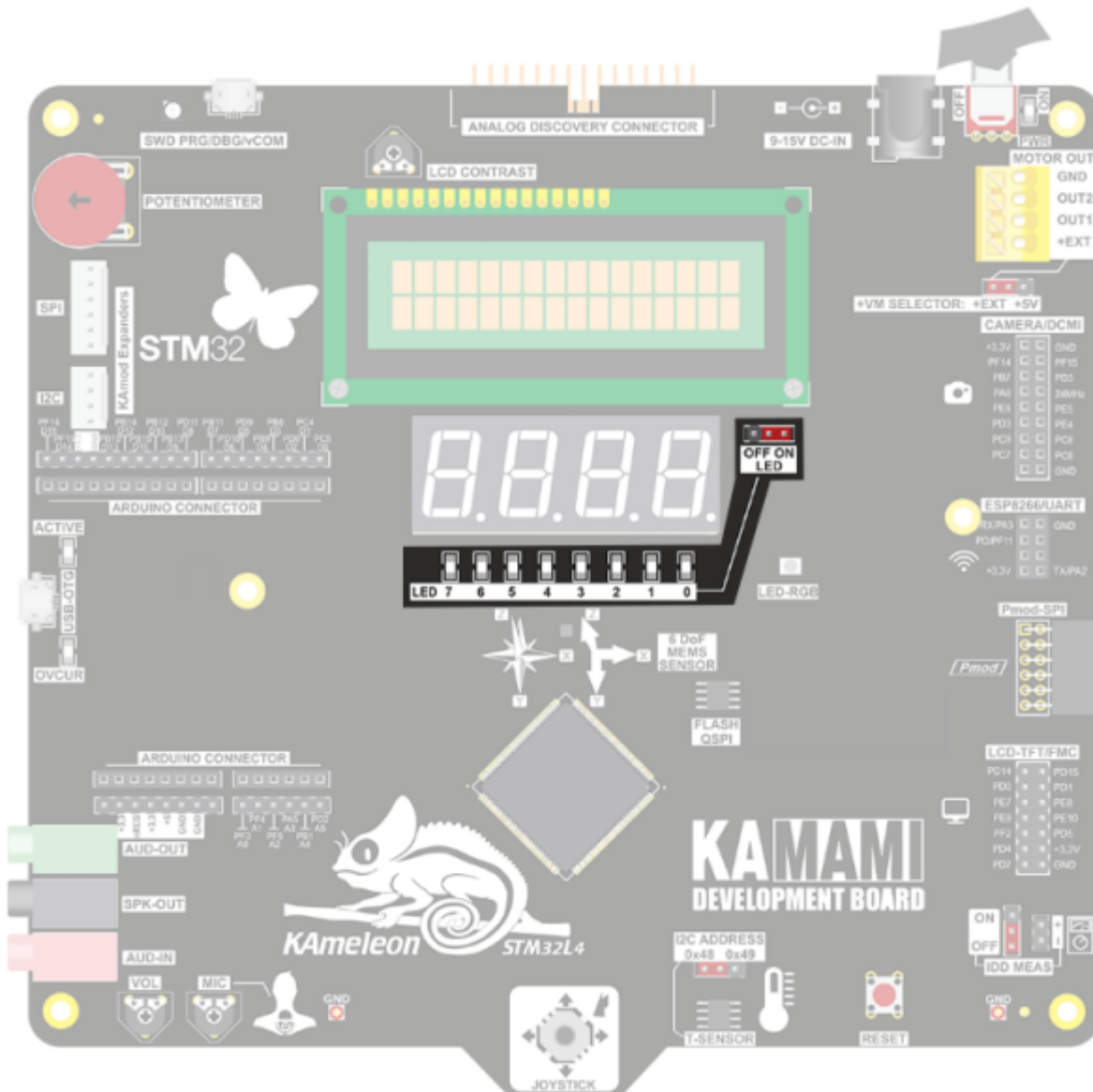


Features

- 4 digits with decimal points
- Multiplexed configuration - 12 microcontroller line controls the display
- Common cathodes are steering by NPN transistor drivers
- Segment anodes are steering directly by microcontroller GPIOs

User LEDs

Simplest HMI interface for signalling to the board user microcontroller activity.

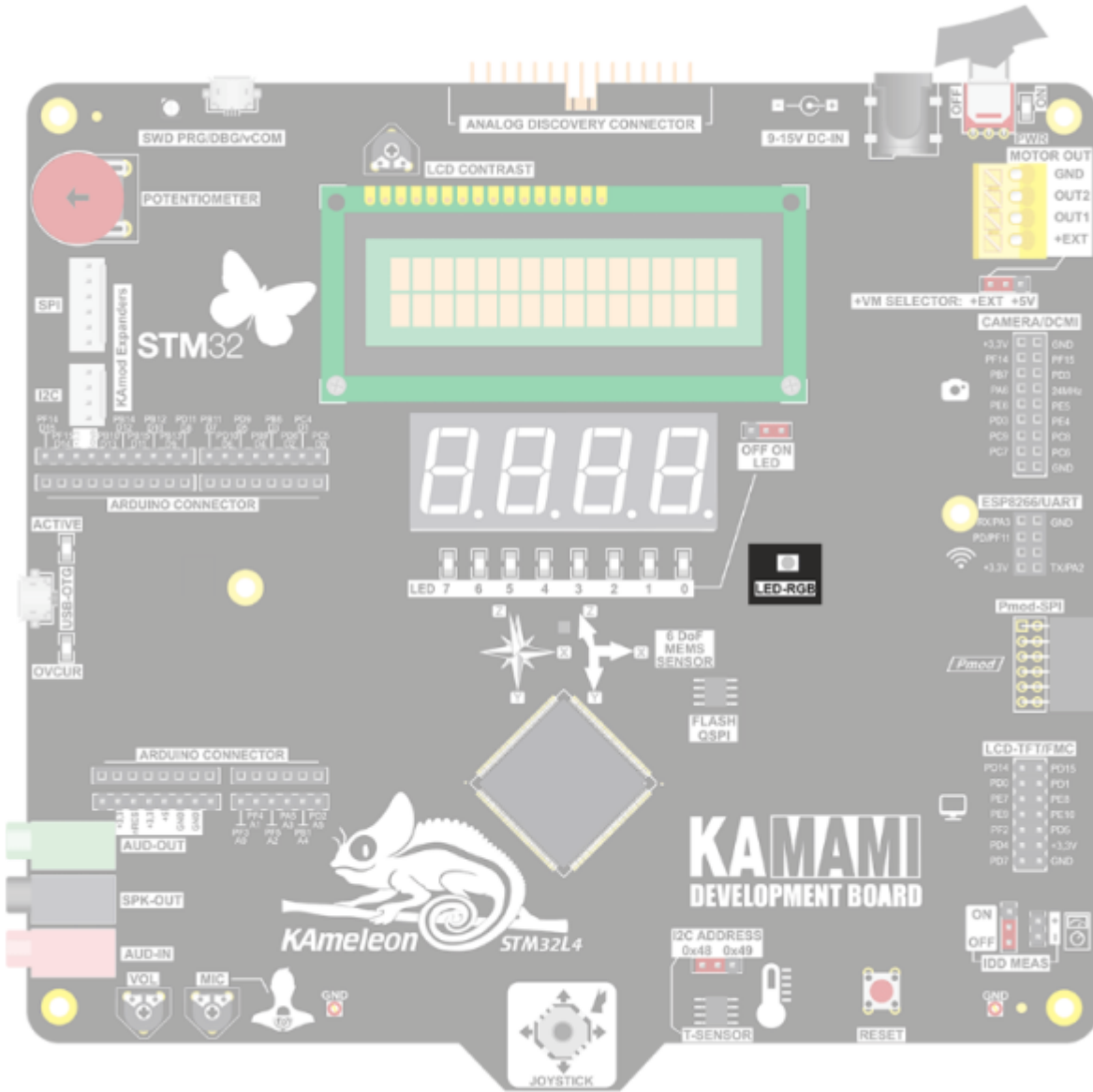


Features

- 8 LED connected to microcotroller GPIOs through 74LVC541 buffer
- Used 74LVC541 "straight" load buffer
- LEDs do not load microcontroller GPIOs
- Jumper allows to connect and disconnect LED buffers
- "1" on GPIO switch-on LED

LED-RGB

The OSTBMAS2C1A is a small (PLCC4) but efficient and high luminous RGB LED with typical 30 mA DC forward current.

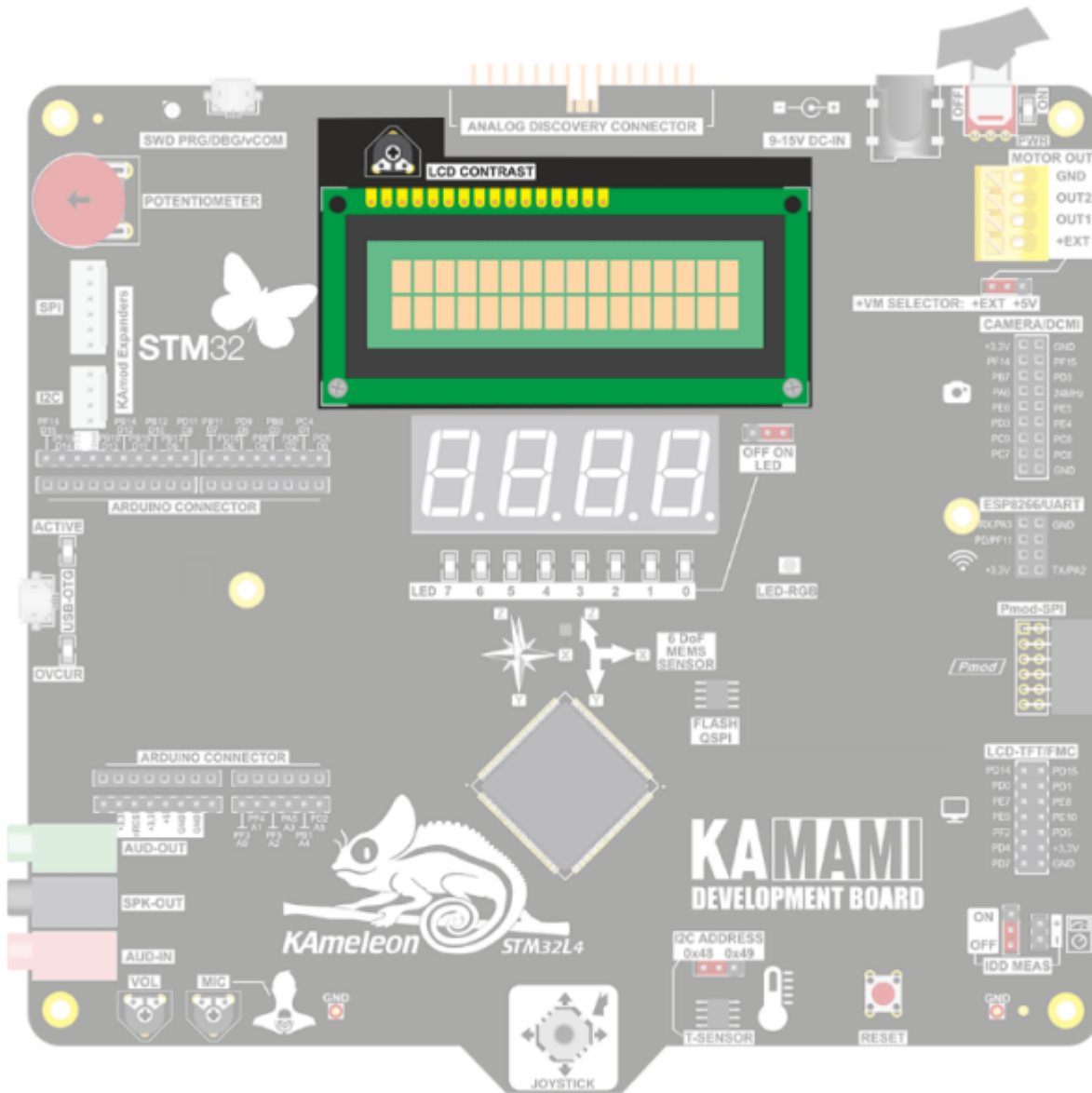


Features

- Built-in 3 NPN transistor drivers for each LED colour
- "1" on GPIO switch-on LED
- PWM waveforms allows to generate many colours

2x16 characters LCD display connector

Connector for popular and widely used, cheap LCD in 2x16 characters matrix.



Features

- Recommended HD44780 or compatible controller
- 5V display power supply
- Digitally controlled backlight
- NPN transistor backlight driver
- 4 or 8 bit interface
- All control signal available
- Analog potentiometer to LCD matrix contrast adjustment

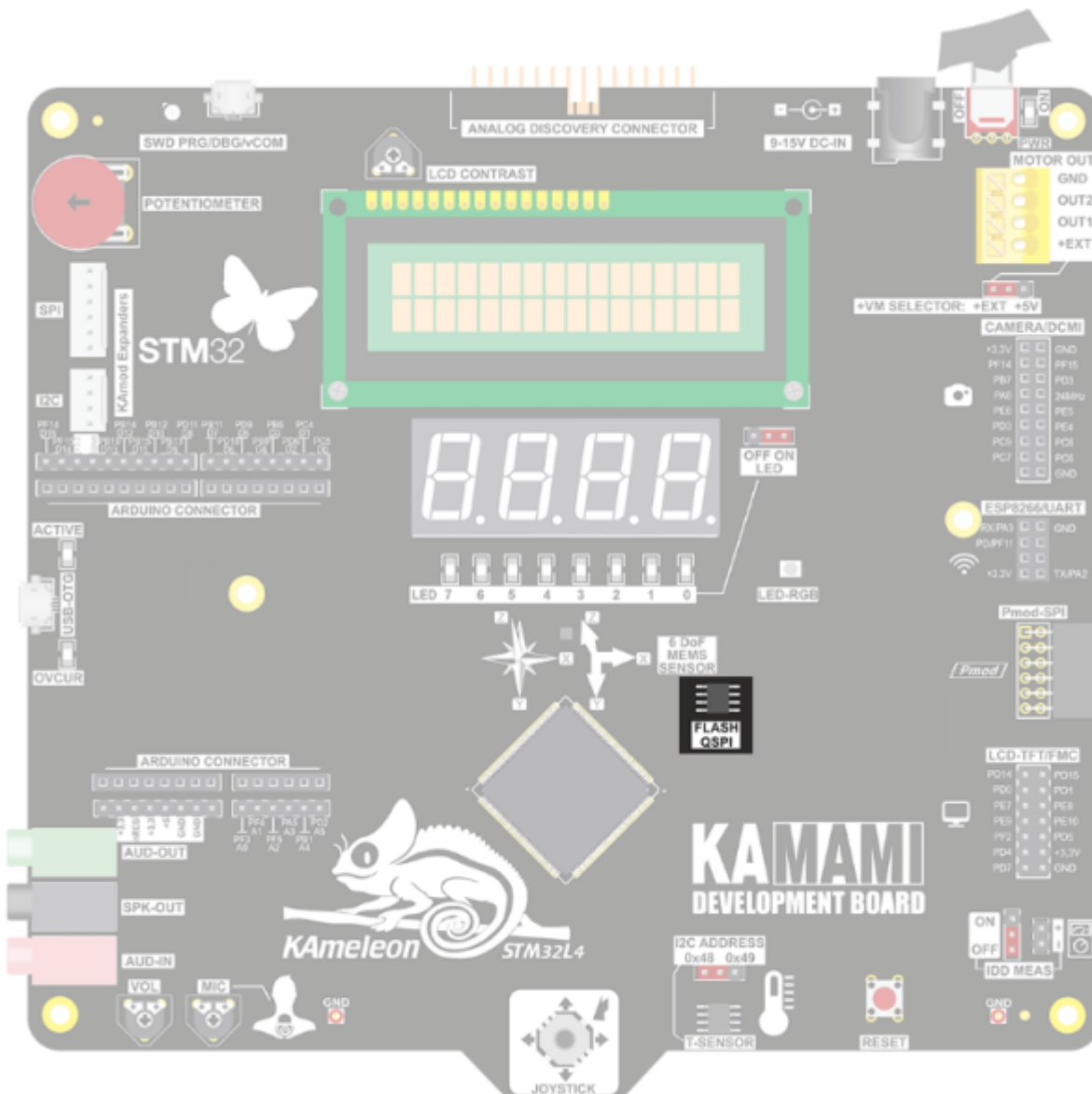
W25Q80DV QSPI Flash memory

The Winbond W25Q80DV (8M-bit) Serial Flash memory provides a storage solution for systems with limited space, pins and power. The 25Q series offers flexibility and performance well beyond ordinary Serial Flash devices. They are ideal for code shadowing to RAM, executing code directly from Dual/Quad SPI (XIP) and storing voice, text and data. The device operates on a single 2.7V to 3.6V power supply with current consumption as low as 1µA for power-down. All devices are offered in

space-saving packages.

The Winbond W25Q80DV array is organized into 4,096 programmable pages of 256-bytes each. Up to 256 bytes can be programmed at a time. Pages can be erased in groups of 16 (4KB sector erase), groups of 128 (32KB block erase), groups of 256 (64KB block erase) or the entire chip (chip erase). The Winbond W25Q80DV has 256 erasable sectors and 16 erasable blocks respectively. The small 4KB sectors allow for greater flexibility in applications that require data and parameter storage.

The Winbond W25Q80DV supports the standard Serial Peripheral Interface (SPI), and a high performance Dual/Quad output as well as Dual/Quad I/O SPI: Serial Clock, Chip Select, Serial Data I/O0 (DI), I/O1 (DO), I/O2 (/WP), and I/O3 (/HOLD). SPI clock frequencies of up to 104MHz are supported allowing equivalent clock rates of 208MHz (104MHz x 2) for Dual I/O and 416MHz (104MHz x 4) for Quad I/O when using the Fast Read Dual/Quad I/O instructions. These transfer rates can outperform standard Asynchronous 8 and 16-bit Parallel Flash memories. A Hold pin, Write Protect pin and programmable write protection, with top, bottom or complement array control, provide further control flexibility. Additionally, the device supports JEDEC standard manufacturer and device identification with a 64-bit Unique Serial Number.



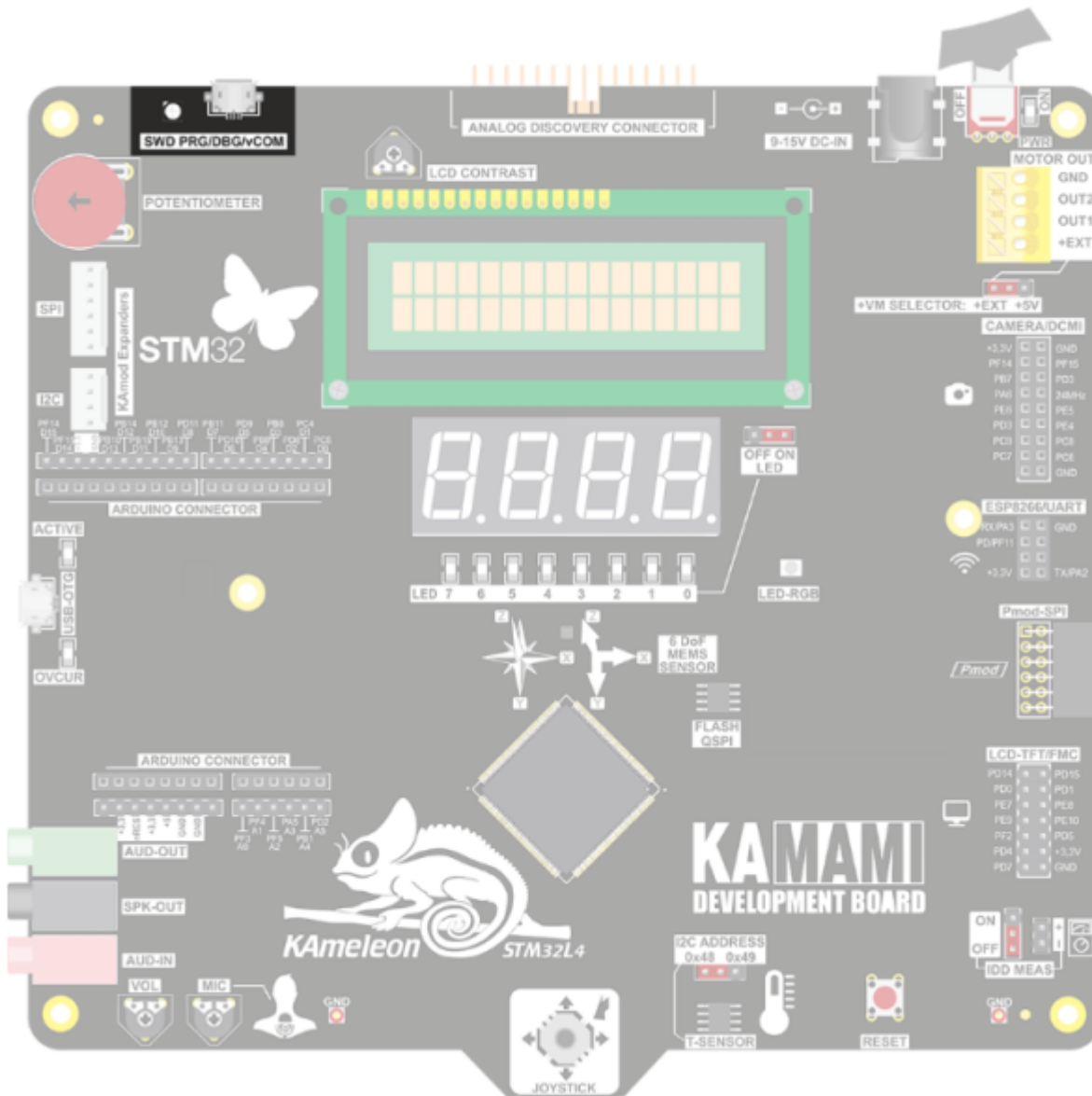
Features

- W25Q80DV: 8M-bit/1M-byte (1,048,576)
- 256-byte per programmable page

- Standard SPI: CLK, /CS, DI, DO, /WP, /Hold
- Dual SPI: CLK, /CS, IO0, IO1, /WP, /Hold
- Quad SPI: CLK, /CS, IO0, IO1, IO2, IO3
- Uniform 4KB Sectors, 32KB & 64KB Blocks
- 104MHz Dual/Quad SPI clocks
- 208/416MHz equivalent Dual/Quad SPI
- 50MB/S continuous data transfer rate
- Write-Protect all or portion of memory
- Enable/Disable protection with /WP pin
- Top or bottom array protection
- Uniform Sector/Block Erase (4/32/64-kbytes)
- Program one to 256 bytes < 0.8ms
- Erase/Program Suspend & Resume
- More than 100,000 erase/write cycles
- More than 20-year data retention

ST-Link USB connector

Kameleon Board has built-in ST-Link programmer. It uses SWD interface to program the STM32L4 microcontroller.



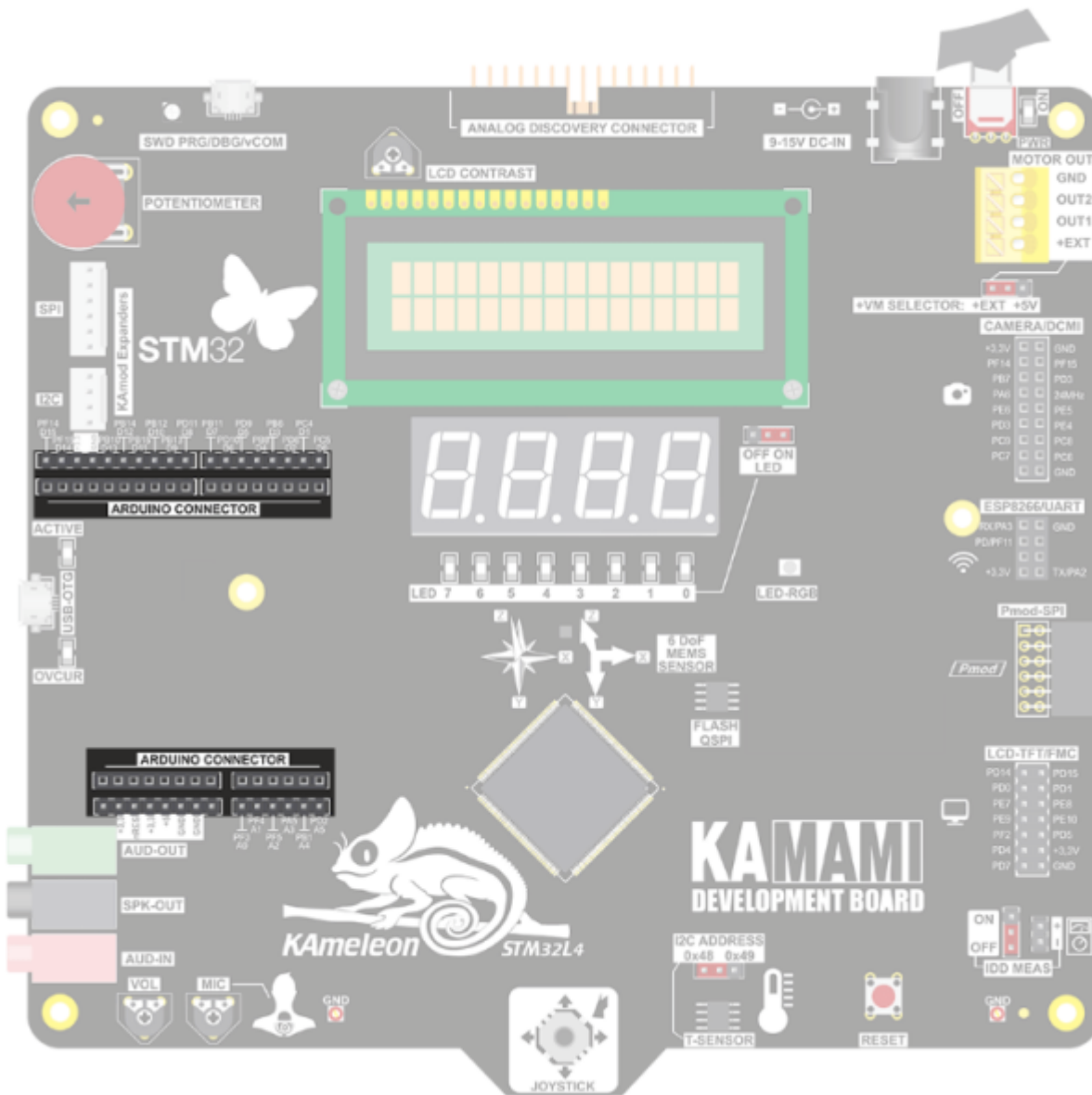
Features

The ST-Link/V2 is an in-circuit debugger and programmer for the STM32 microcontrollers. The serial wire debugging (SWD) interfaces are used to communicate with any STM32 microcontroller located on an application board.

- SWD debugger-programmer
- Virtual COM interface
- TX/RX vCOM lines connected PC0/PC1 (LPUART1)
- Connector can act as power supply
- Bi-color LED signalling state of interface

Arduino shields connector

Standard Arduino Uno Rev. 3 shield connector allows using cheap and very popular peripheral shields.

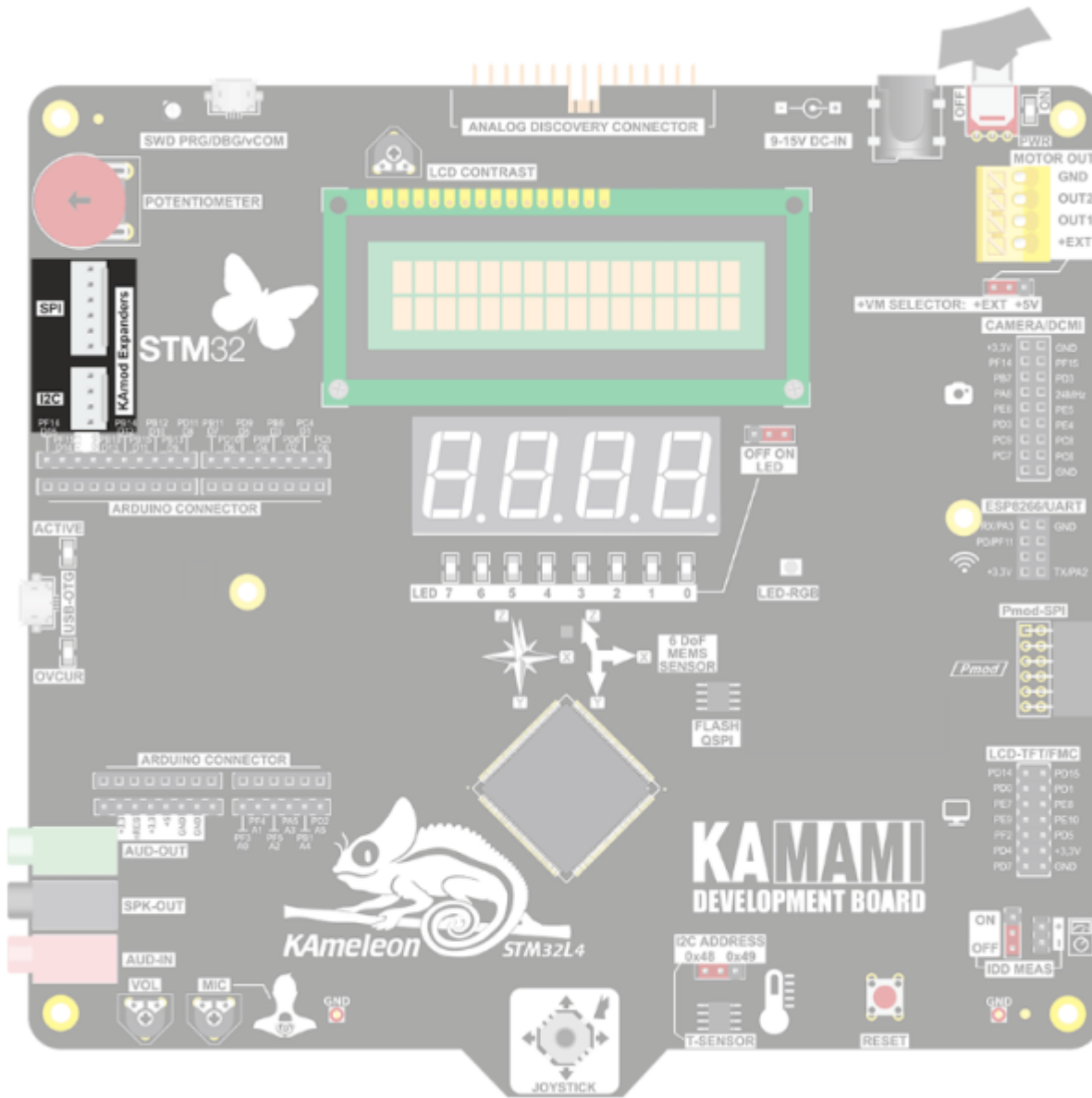


Features

- 5/3.3V shields compatible
- Duplicated all pins (for easy external connections)
- System RESET signal
- 5 ADC inputs (excluding A5 line)
- UART3, I2C4, SPI2 microcontroller interfaces available

KAmod peripheral connectors

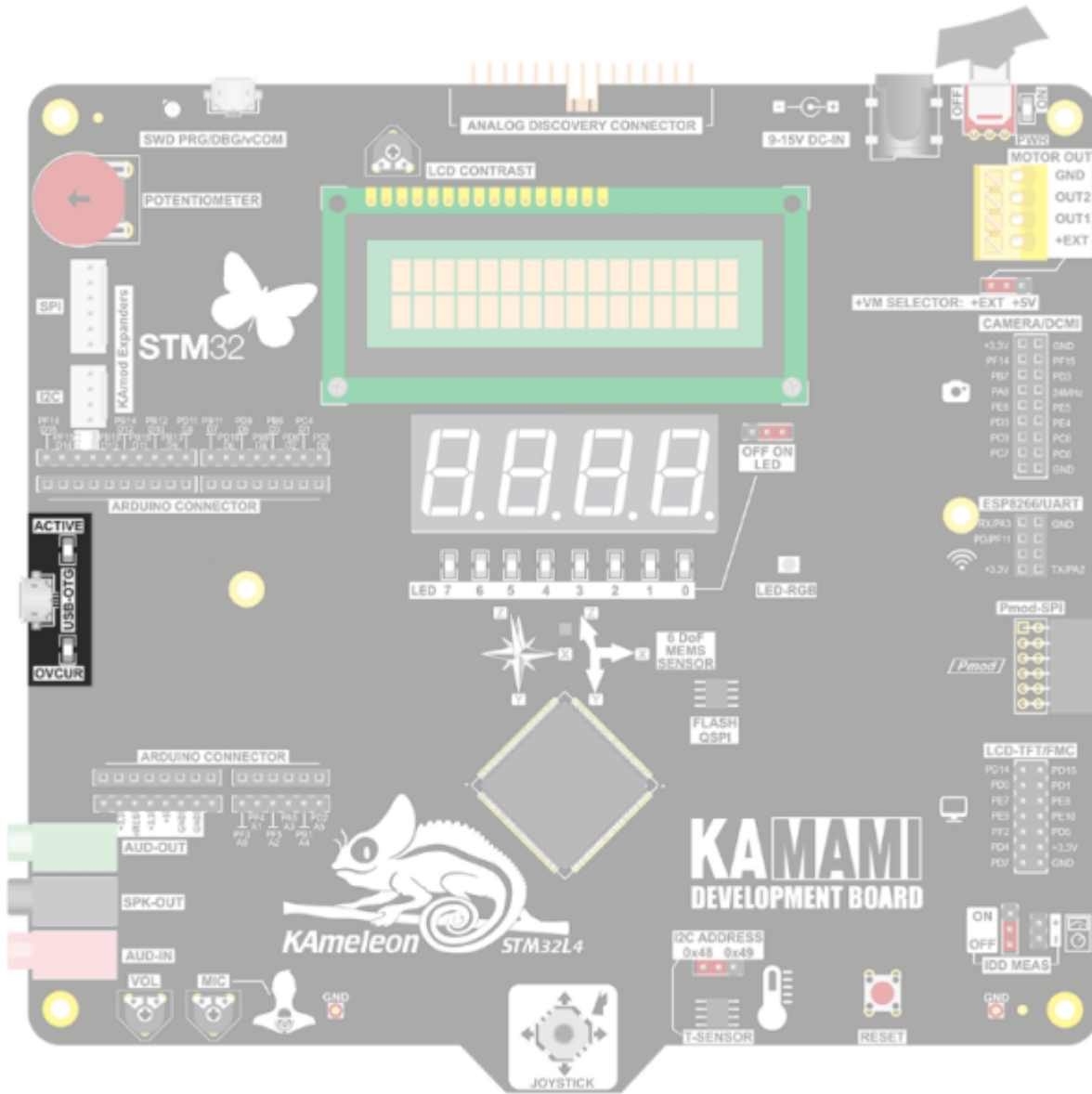
KAmod is 4 and 6 pins connector standard, introduced by KAMAMI company, as solution for cheap and easy connection of small peripheral boards/functional expanders for digital and analog systems.



Features

- 4-pin connector for I2C peripherals (I2C2)
- 6-pin connector for SPI peripherals (SPI1 splitted with Pmod)

Potentiometer



Features

- SB-OTG functions (device/master)
- Built-in STMP2141STR power switch
- Overcurrent and enumeration LED signalling

Audio amplifiers and connectors

TS4990IST power amplifier

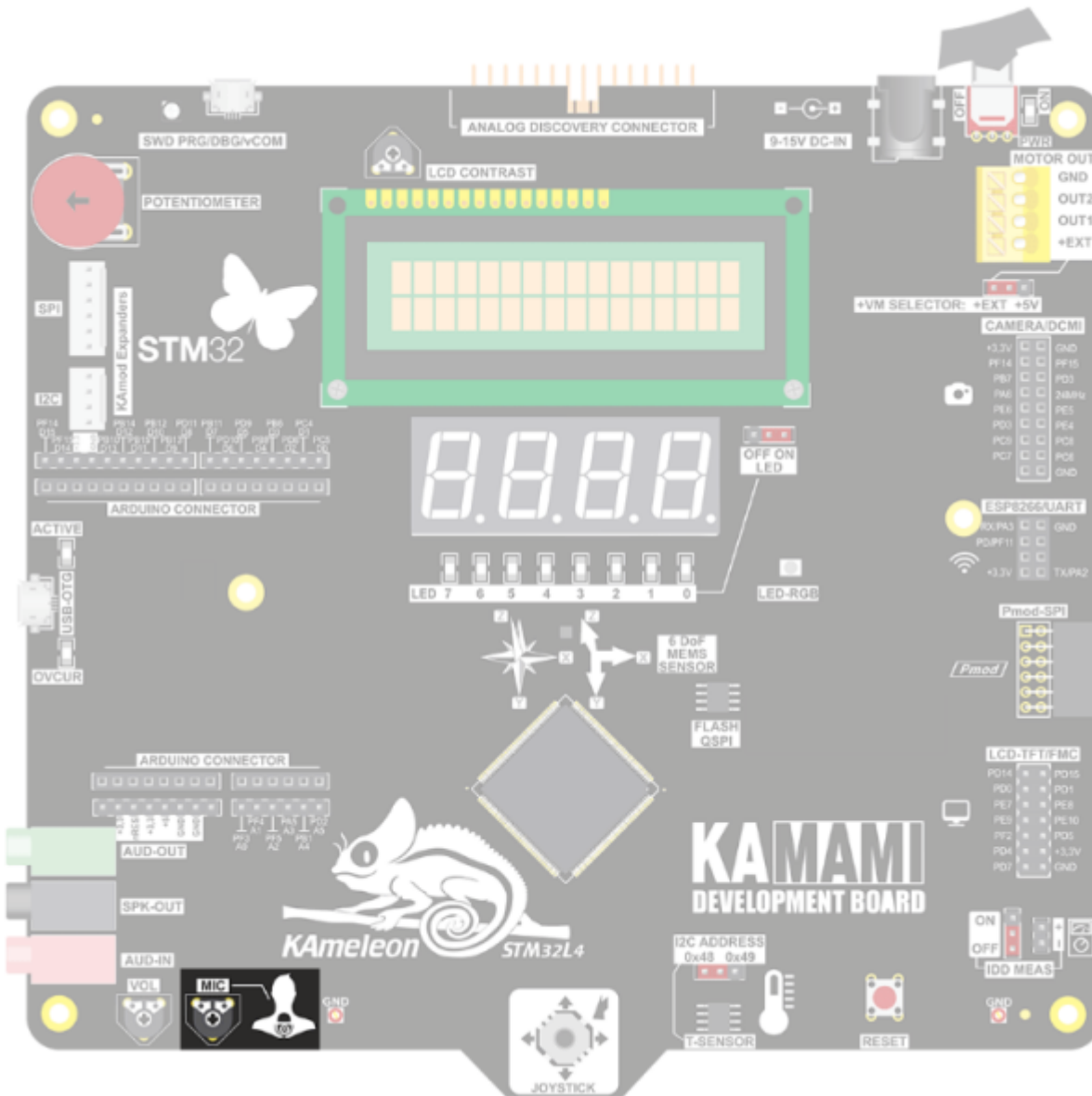
The TS4990 is designed for demanding audio applications such as mobile phones to reduce the number of external components. This audio power amplifier is capable of delivering 1.2W of continuous RMS output power into an 8Ω load at 5V. An externally controlled standby mode reduces the supply current to less than 10nA. It also includes an internal thermal shutdown protection. The unity-gain stable amplifier can be configured by external gain setting resistors.

Features

- Output power 500mW/8Ω
- Adjusted volume output
- Bridge or single-ended output

MP23AB02B MEMS microphone

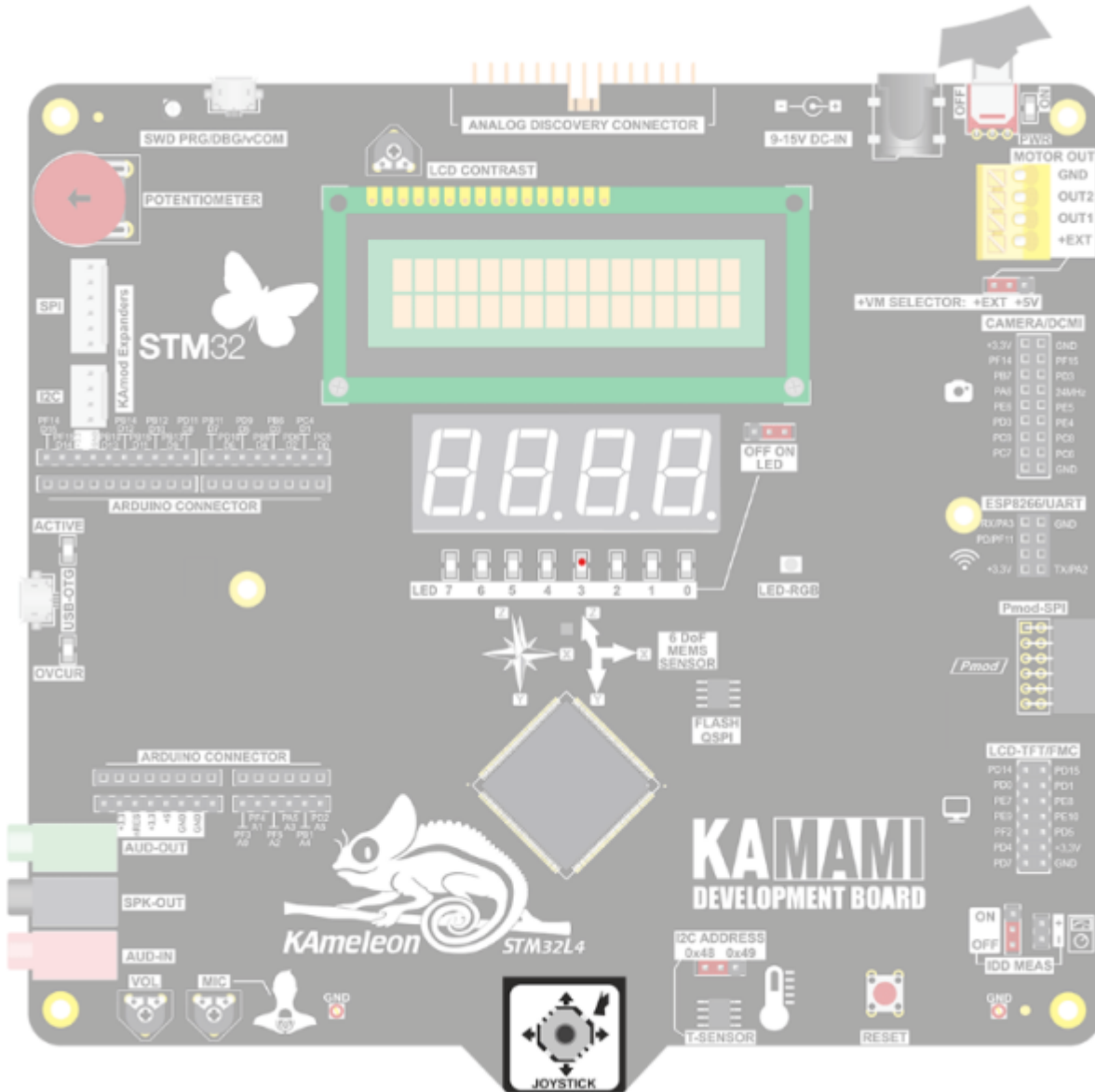
The MP23AB02B is a compact, low-power microphone built with a low-profile sensing element. The sensing element, capable of detecting acoustic waves, is manufactured using a specialized silicon micromachining process to produce audio sensors. The MP23AB02B has an acoustic overload point of 125dB SPL with a 64dB signal-to-noise ratio. The MP23AB02B is available in a package compliant with reflow soldering and is guaranteed to operate over an extended temperature range from -40°C to +85°C.



Features

- Sensivity -41...-35dBV/Pa
- Signal-to-noise ratio 64dB
- Frequency range (-3dB): 120Hz...16kHz

5-pos joystick



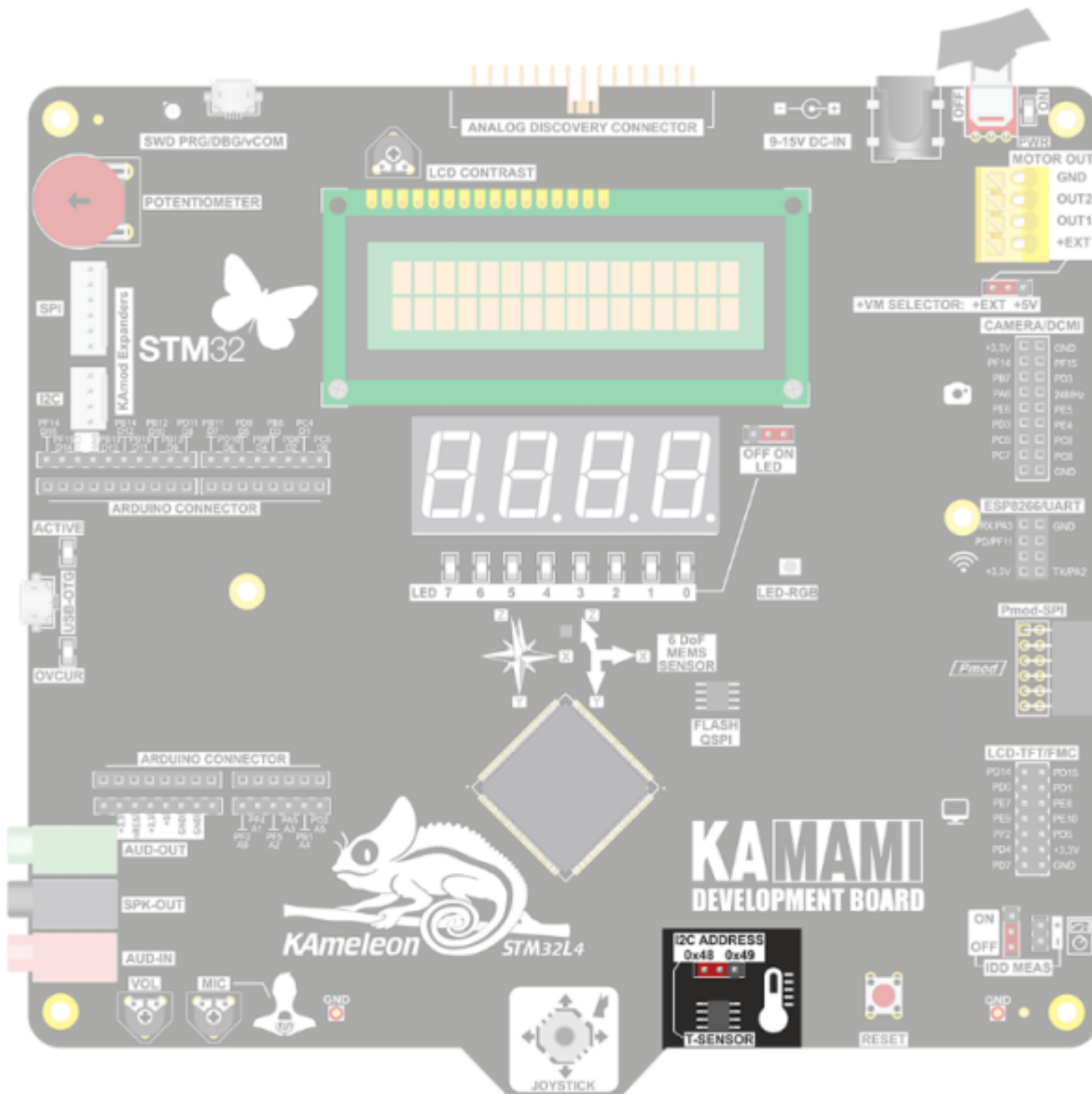
Features

- Four directions: UP, DOWN, RIGHT, LEFT
- Additional 5th positions OK

STLM75M2F digital temperature sensor

The STLM75 is a high-precision digital CMOS temperature sensor IC with a sigma-delta temperature-to-digital converter and an I2C-compatible serial digital interface. It is targeted for general applications such as personal computers, system thermal management, electronics equipment, and industrial controllers, and is packaged in the industry standard 8-lead TSSOP and SO8 packages. The device contains a band gap temperature sensor and 9-bit ADC which monitor and digitize the temperature to a resolution up to 0.5°C. The STLM75 is typically accurate to ($\pm 3^{\circ}\text{C}$ - max) over the full temperature measurement range of -55°C to 125°C with $\pm 2^{\circ}\text{C}$ accuracy in the -25°C to $+100^{\circ}\text{C}$ range. The STLM75 is pin-for-pin and software compatible with the LM75B. The STLM75 is specified for operating at supply voltages from 2.7V to 5.5V. Operating at 3.3V, the supply current is typically (125 μA). The on-board sigma-delta analog-to-digital converter (ADC) converts the measured temperature to a digital value that is calibrated in degrees centigrade; for Fahrenheit applications a lookup table

or conversion routine is required. The STLM75 is factory-calibrated and requires no external components to measure temperature.

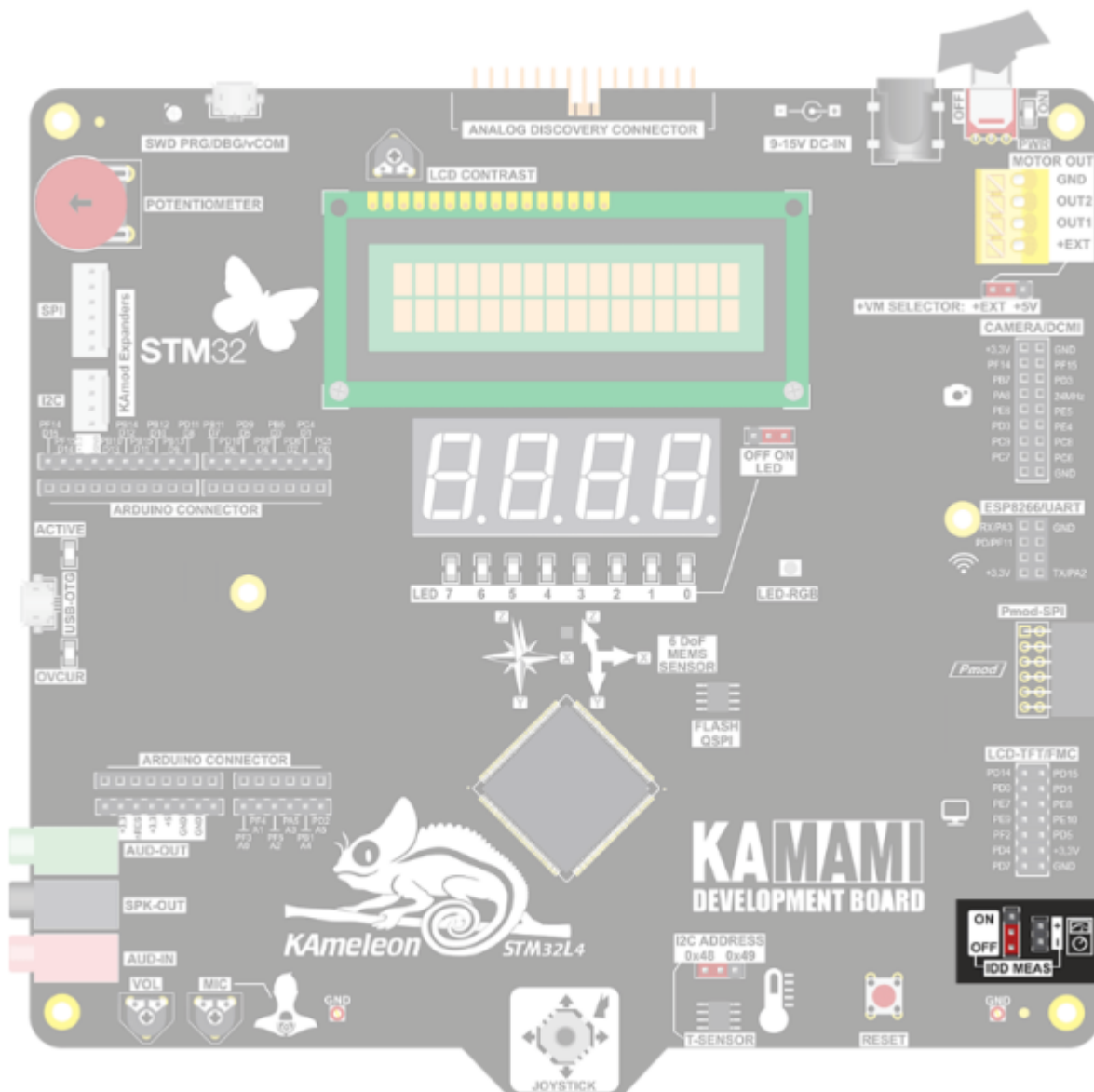


Features

- I2C interface
- Sensor connected to I2C1 channel
- Measurement range -55°C to +125°C (-67°F to +257°F)
- Measurement accuracy - $\pm 0.5^{\circ}\text{C}$ (typ.)/ $\pm 2^{\circ}\text{C}$ (max.) for -25°C to +100°C
- Conversion time (max.) 150ms
- 9-bit ADC conversion
- Selected I2C base address

IDD Meas connector and jumper

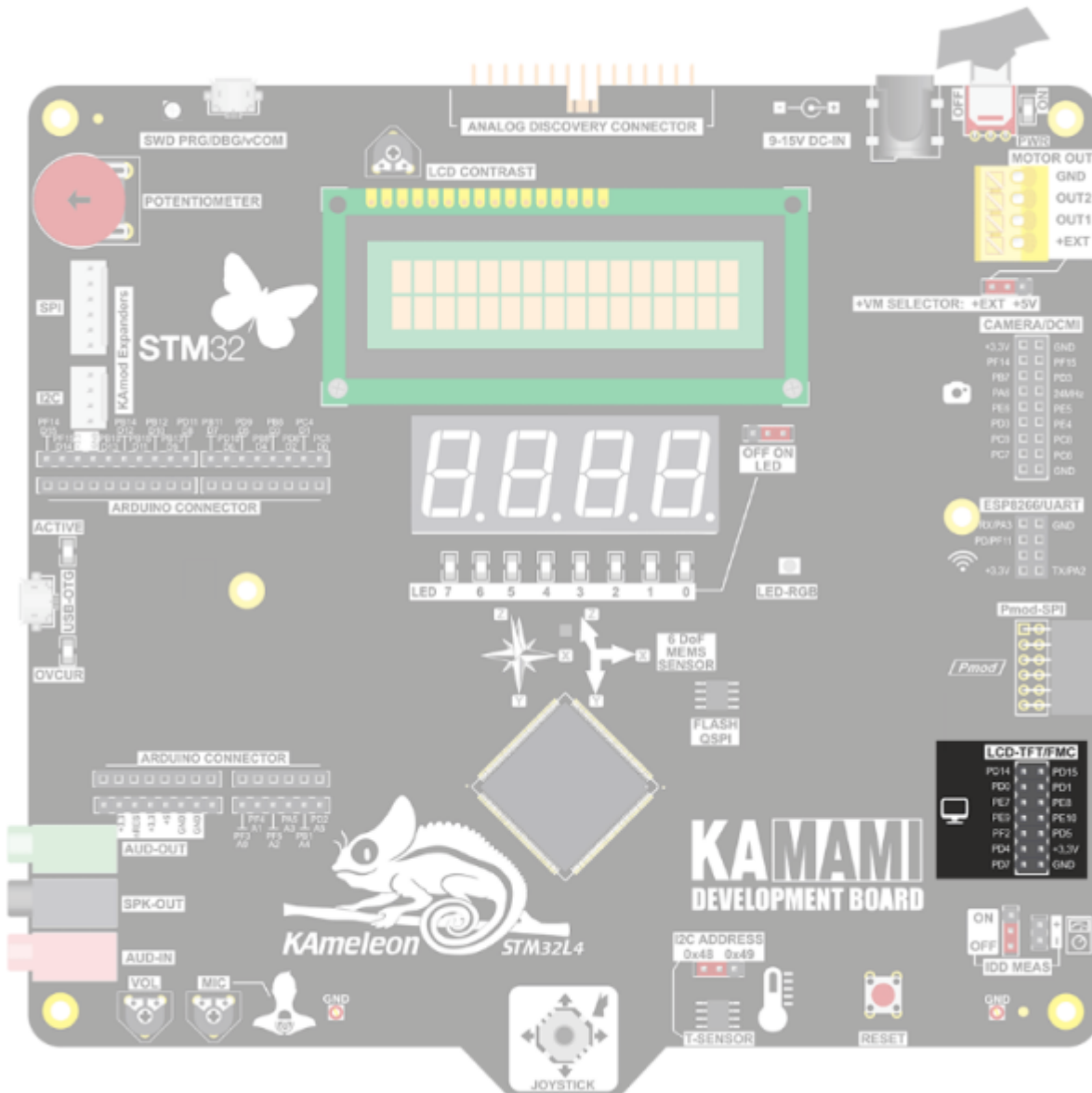
The STM32L496 is ultra low power microcontroller with FlexPowerControl and advanced power supply hardware management. Built-in IDD connector allows verify effects of using different low power modes.



Features

- Jumper and connector for microcontroller IDD measurement
- IDD current measurement by measuring voltage drop on R5 or directly
- Optionally shunt resistor R5 can be installed on board (default DNP)

LCD-TFT/FMC connector

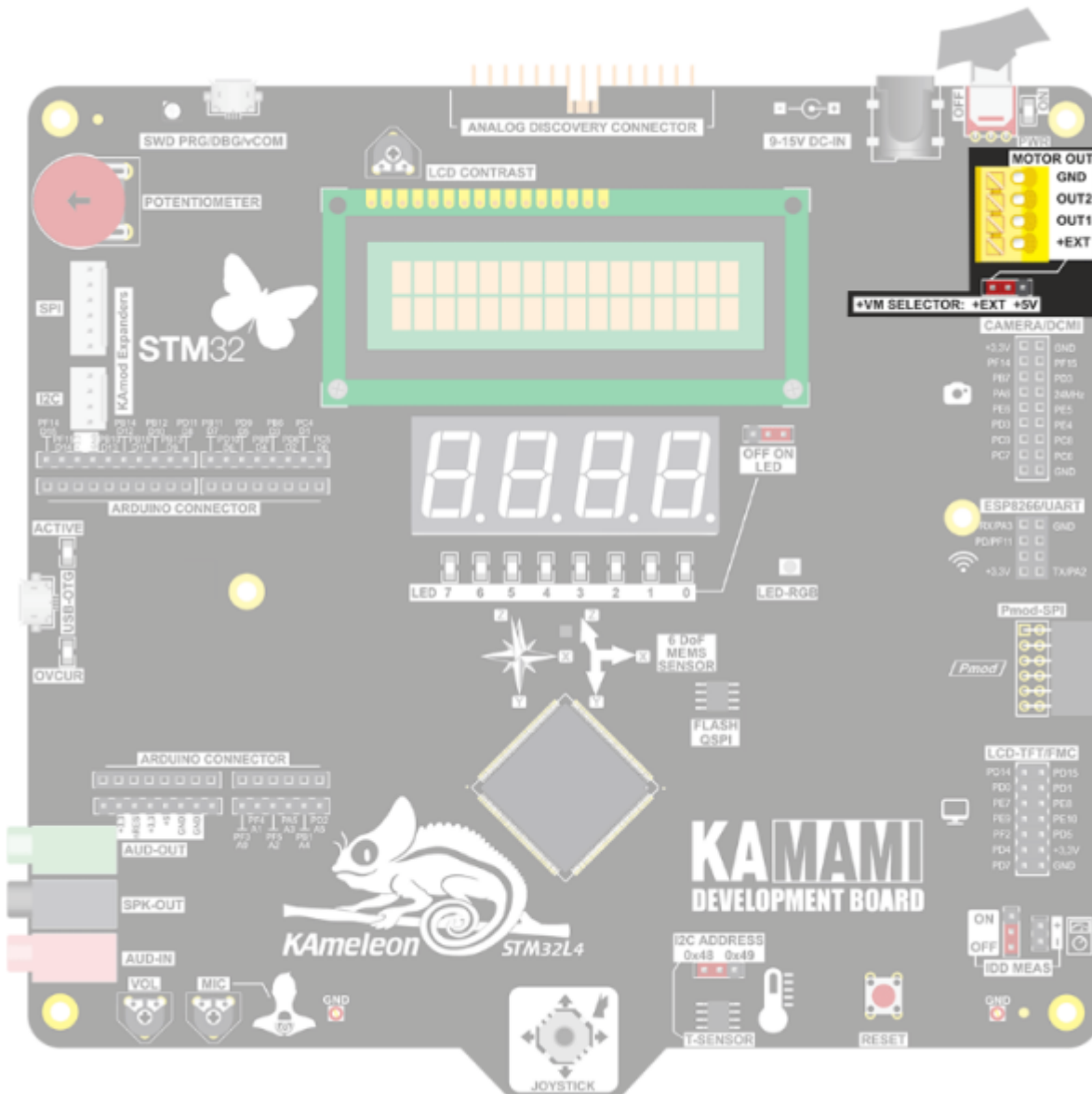


Features

- Parallel 8-bit LCD-TFT controller
- FMC controller data lines
- FMC A2 address line as REG_SEL

STSPIN250 brush DC motor driver

The STSPIN250 is a single brush DC motor driver integrating a low $R_{ds(ON)}$ power stage in a small VFQFPN 3x3mm package. The full-bridge implements a PWM current controller with fixed OFF time. The device is designed to operate in battery-powered scenarios and can be forced in a zeroconsumption state allowing a significant increase in battery life. The device offers a complete set of protection features including overcurrent, overtemperature and short-circuit protection.

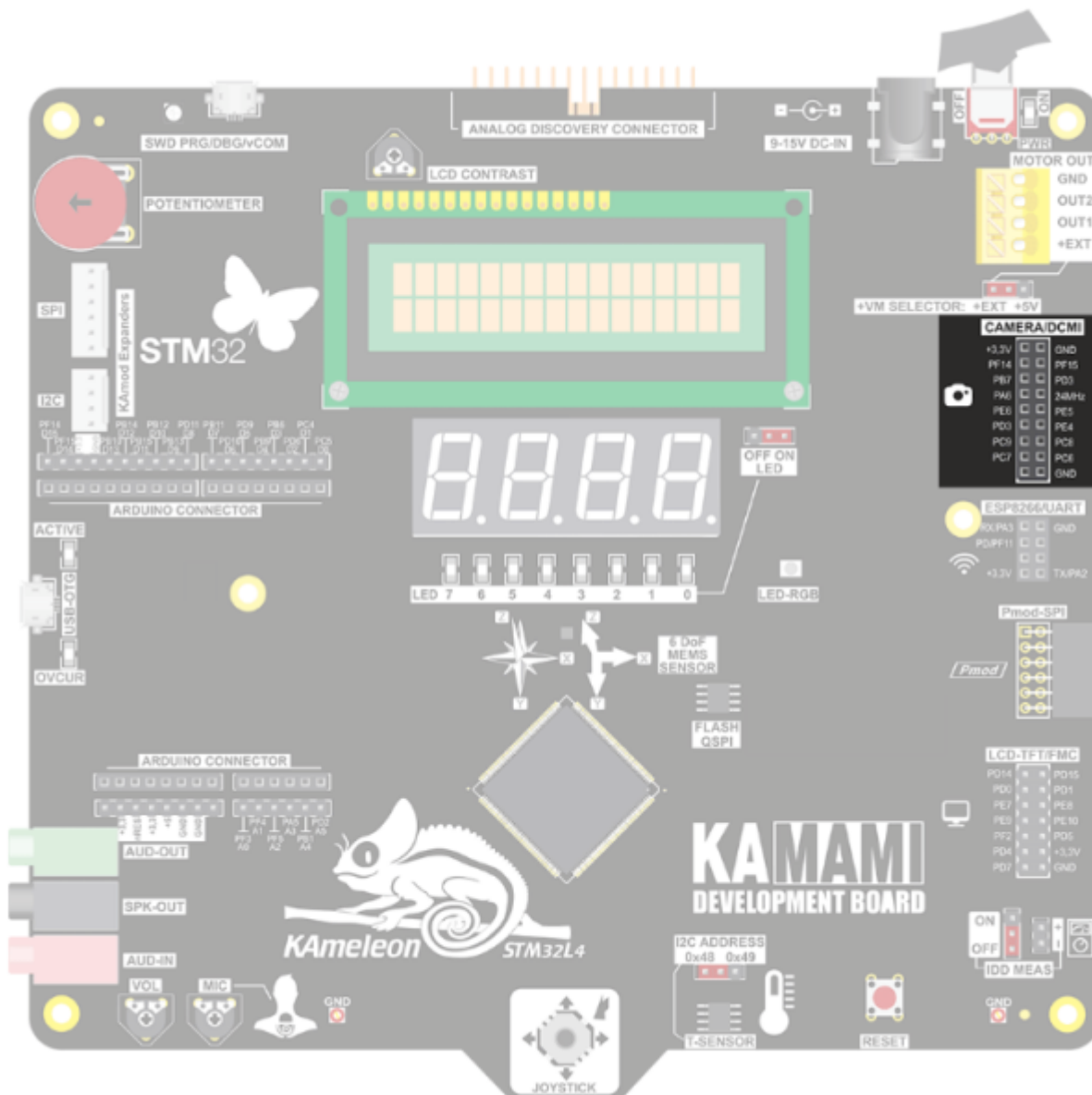


Features

- Dual H-bridge configuration
- Internal 5V or external 1.8-10V power supply
- Maximum output current 1ARMS
- Built-in output current limiter
- Enalbe, Phase and PWM inputs
- Diagnostics output

DCMI camera connector

The digital camera interface (DCMI) is a synchronous parallel data bus. It allows easy integration and easy adaptation to specific requirements of an application. The DCMI connects with 8-bit CMOS camera modules and supports a multitude of data formats.

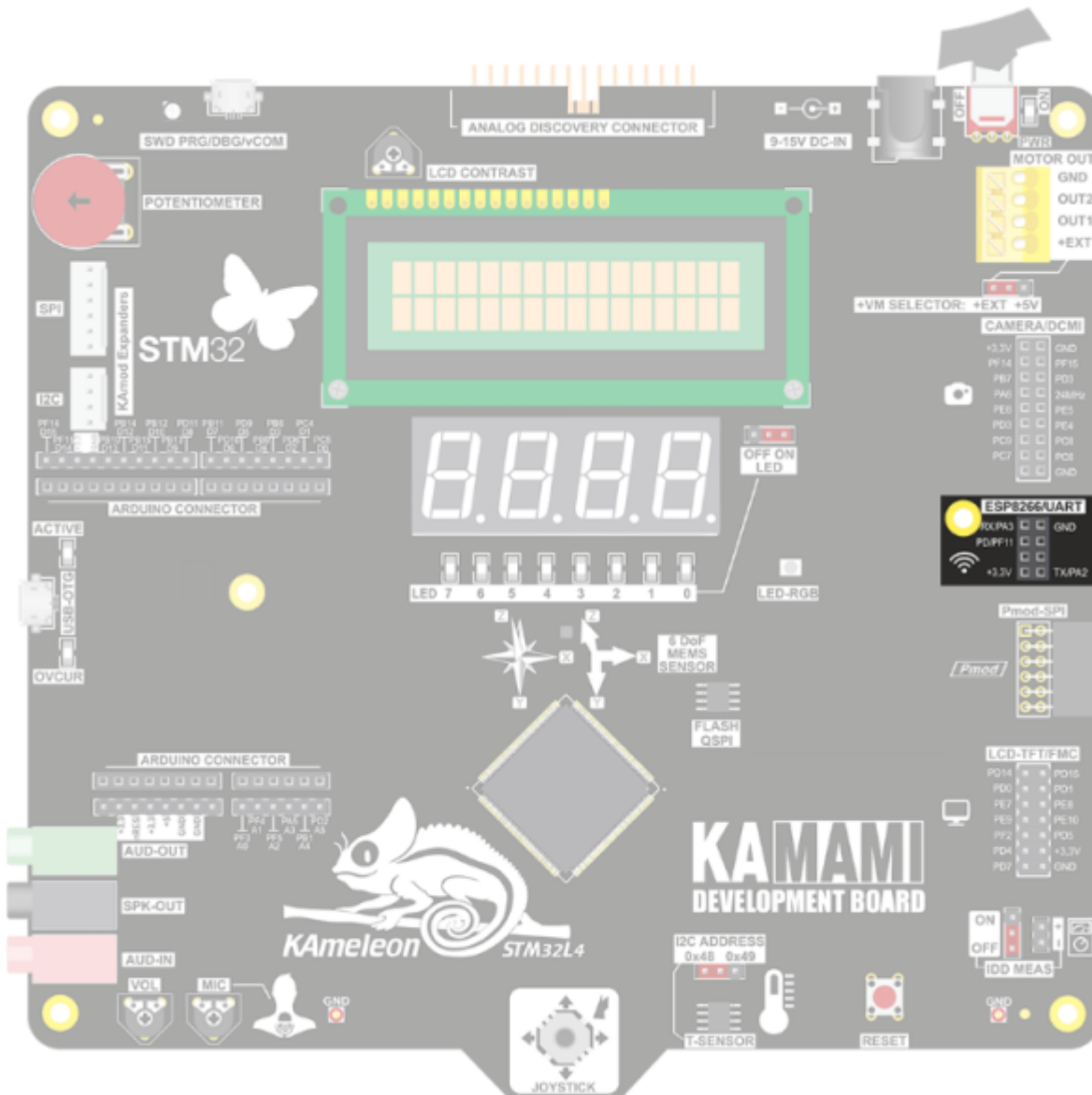


Features

- 8 bit interface
- Typical 18-pins camera footprint
- Compatible i.a. with CCD/CMOS controllers OV9655 and OV2640
- SIOD/SIOC data/clock lines
- Dedicated 24MHz clock generator.

ESP8266/UART connector

The ESP8266 is a low-cost Wi-Fi chip with full TCP/IP stack and microcontroller capability produced by Espressif Systems.

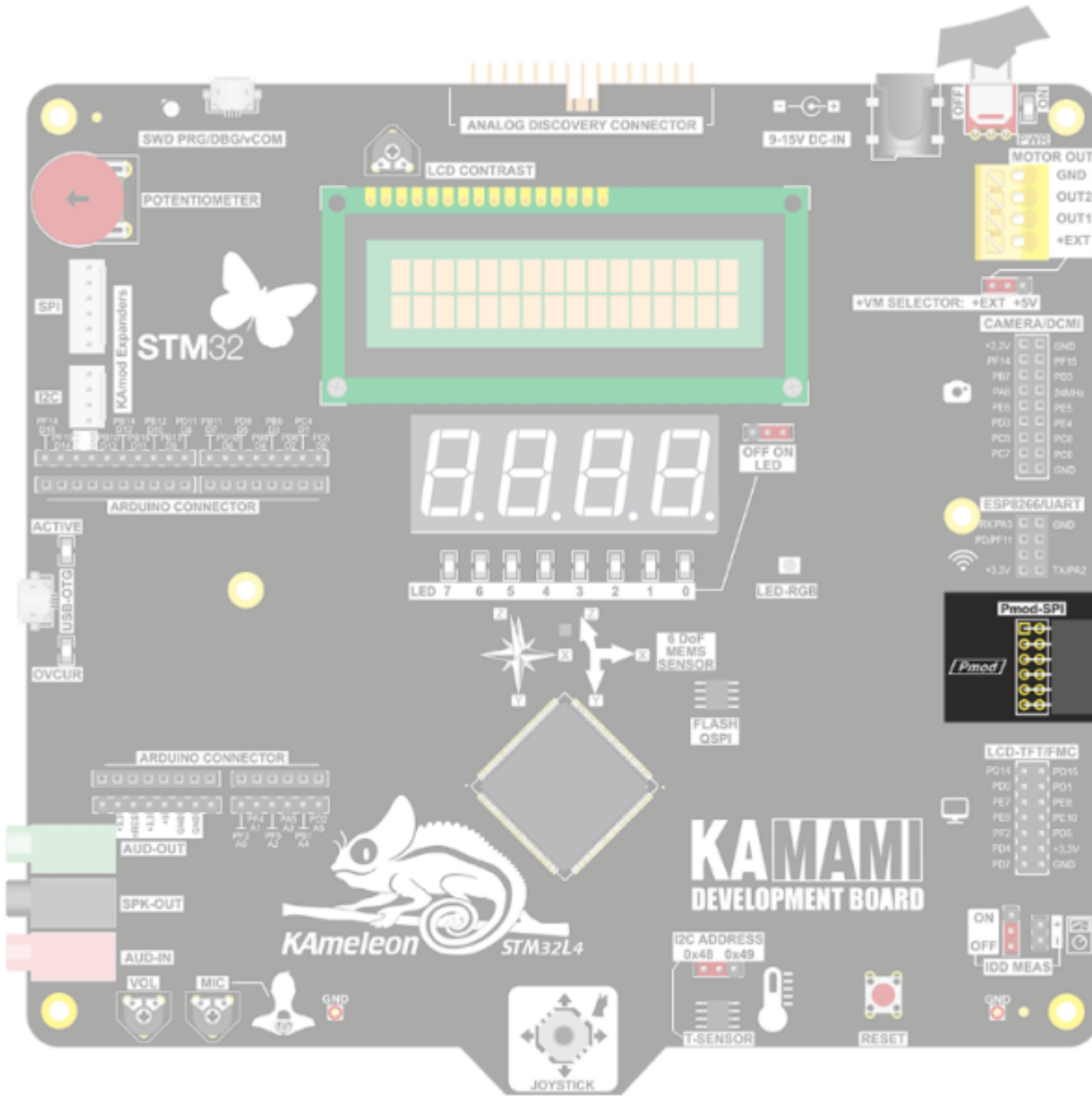


Features

- Footprint compatible with cheap ESP-01 WiFi modules
- TX and RX lines connected to UART2
- ESP8266 Power Down line connected to PF11

Pmod SPI connector

The Digilent Pmod interface is used to connect low frequency, low I/O pin count peripheral modules to host controller boards. There are six-pin and twelve-pin versions of the interface defined. The six-pin version provides four digital I/O signal pins, one power pin and one ground pin. The twelve-pin version provides eight I/O signal pins, two power pins and two ground pins. The signals of the twelve-pin version are arranged so that it provides two of the six-pin interfaces stacked..

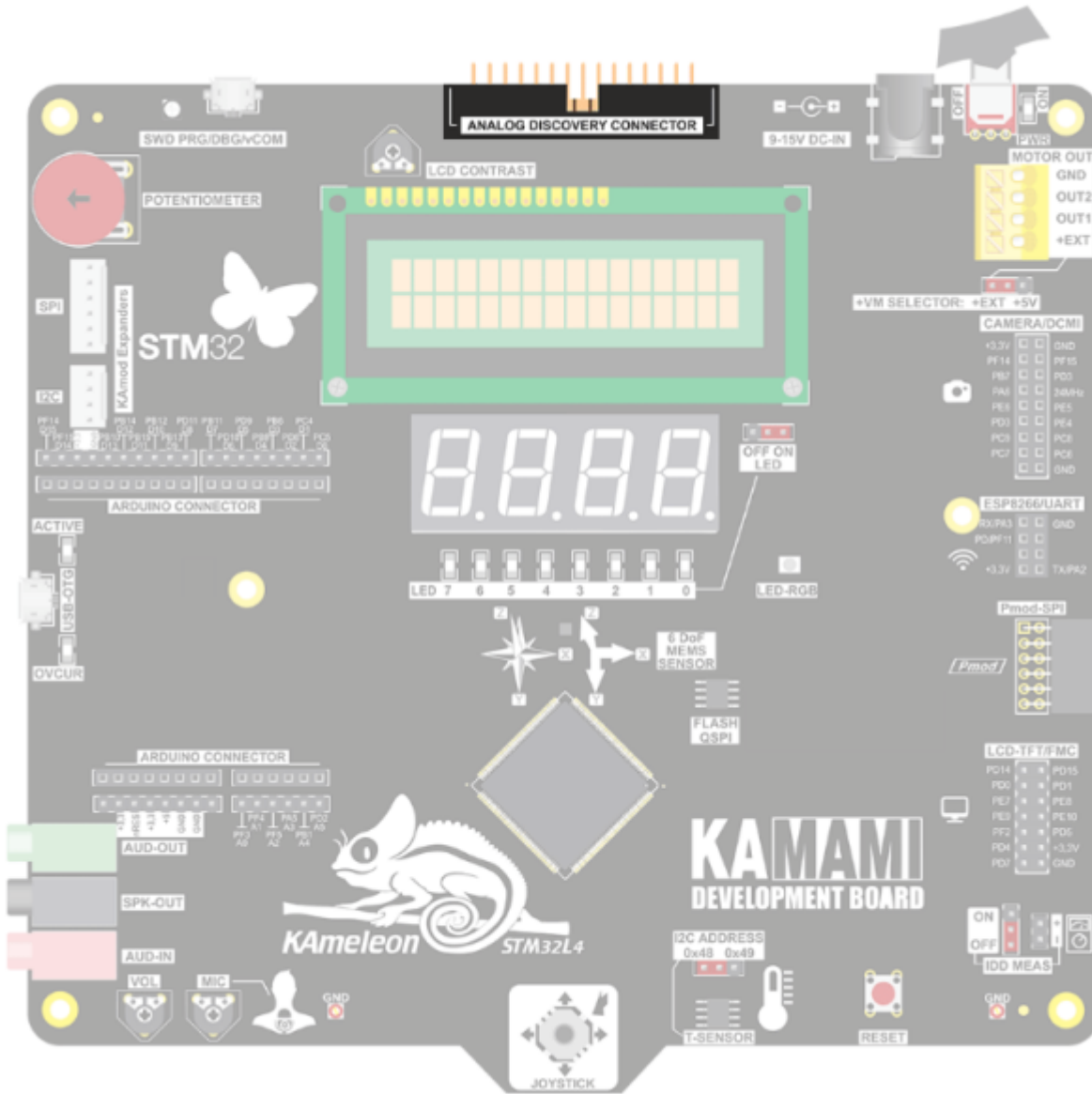


Features

- Connector compatible with PMOD2A and 4A standard
- SPI lines connected to SPI1 (splitted with KAmoD SPI)

Analog Discovery connector

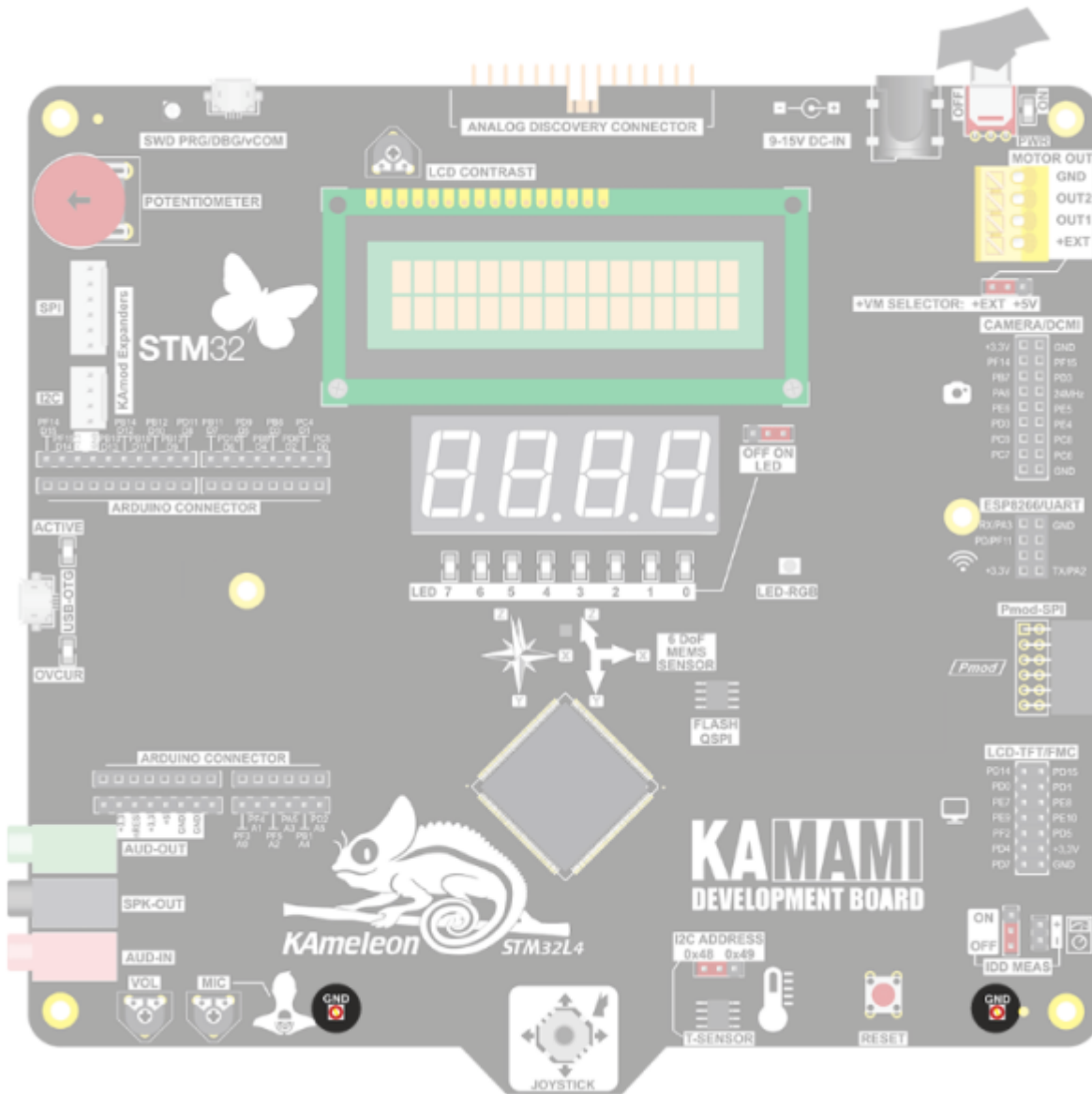
30-pin connector dedicated to Digilent Analog Discovery 2 connection (both analog and digital ports).



Features

- 3 PWM channels monitoring
- vCOM lines monitoring
- UART2 lines monitoring
- I2C1 lines monitoring
- SPI2 lines monitoring
- Motor controller lines monitoring
- Analog signal monitoring
- Arbitrary analog signals generation

GND connectors



Power ground connectors for measurement clips.

Links

- [Product page](#)
- [Example projects and library for the Kameleon board](#)
- [Library description for the Kameleon board](#)
- [Electronic schematic of the Kameleon kit](#)

A series of articles presenting practical examples of using selected Digilent Pmod series modules has been published on the mikrokontroler.pl portal. The hardware platform for these examples is the Kameleon-STM32L4 kit.

List of articles:

- [Digilent Pmod and STM32 \(part 1\) – PmodLED and PmodALS](#)
- [Digilent Pmod and STM32 \(part 2\) – PmodHYGRO and PmodOLEDRgb](#)
- [Digilent Pmod and STM32 \(part 3\) – PmodACL and PmodMAXSONAR](#)
- [Digilent Pmod and STM32 \(part 4\) – PmodOLED, PmodGPS and Pmod8LD](#)

- [Digilent Pmod and STM32 \(part 5\) – PmodCLS, PmodDPG1 i PmodSNS20](#)
 - [Digilent Pmod and STM32 \(part 6\) – PmodACL2, PmodDPOT and PmodSSD](#)
 - [Digilent Pmod and STM32 \(part 7\) – PmodBT2, PmodTC1 and PmodCLP](#)
 - [Digilent Pmod and STM32 \(part 8\) – PmodMTDS, PmodRTCC and PmodCMPS2](#)
 - [Digilent Pmod and STM32 \(part 9\) – PmodNAV, PmodPMON1 and PmodTMP2](#)
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