

# LED Driver 8 Click



PID: MIKROE-4268

LED Driver 8 Click is a compact add-on board optimized for dimming and blinking 32 mA RGBA LEDs. This board features the PCA9957HNMP, 24-channel SPI-compatible constant current LED driver from NXP Semiconductors. It has 24 LED output channels with a programmable group dimming/blinking mixed with individual LED brightness, and programmable LED output delay to reduce EMI and surge currents. It also possesses gradation control for all channels where all 24 constant current output channels can sink up to 32 mA, and tolerate up to 5.5 V in its OFF state. As the name itself says, this Click board™ next to driving RGBA LEDs can be used in the purpose of LED Status signalization, in LED displays, LED backlight, keypad backlights for cellular phones, or handheld devices, and many more.

LED Driver 8 Click is supported by a mikroSDK compliant library, which includes functions that simplify software development. This Click board™ comes as a fully tested product, ready to be used on a system equipped with the mikroBUS™ socket.

## How does it work?

LED Driver 8 Click is based on the PCA9957, a daisy-chain SPI compatible 4-wire serial bus controlled 24-channel constant current LED driver optimized for dimming and blinking 32 mA RGBA LEDs from NXP Semiconductors. The PCA9957 has 24 internal 8-bit DACs with an operating frequency of 31.25 kHz and a duty cycle from 0% to 100% used to adjust brightness levels for each LED current source. Each LED output is programmable and can be turned off, on (with no PWM control), set at its individual PWM controller value, or both individual and group PWM controller values. Its output peak current is adjustable with an 8-bit linear DAC from 125  $\mu$ A to 31.875 mA because of the R4 resistor of 2k $\Omega$  connected to the REXT pin.

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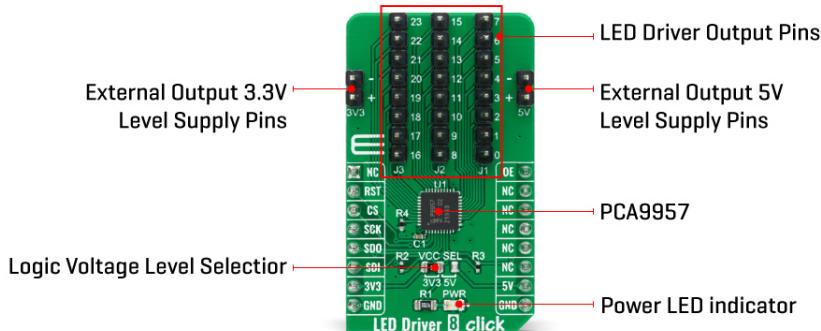
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Gradation control for all current sources is achieved through serial interface and allows the user to ramp current automatically without any help from the MCU. It has two operation modes for each group: Single-Shot Mode (output pattern once) and Continuous Mode (output pattern repeat). Each channel can be set to either Gradation Mode or Normal Mode and assigned to any one of six gradation control groups. These groups have four independent registers to control ramp-up and ramp-down rate, step time, hold ON/OFF time, and final hold ON output current.

The LED Driver 8 Click communicates with MCU through a daisy-chain SPI compatible 4-wire serial interface with a clock frequency up to 10 MHz. The input labeled as OE routed to the PWM pin on the mikroBUS™ blinks all the LED outputs and can be used to externally PWM the outputs, which is useful when multiple devices need to be dimmed or blinked together without using software control. The PCA9957 also has a short load and overtemperature detection circuitry, thermal shutdown feature which protects the device when the internal junction temperature exceeds the factory-defined limit, and a Reset function routed to the RST pin on the mikroBUS™ which is activated by sending an active low input on this pin with a minimum pulse width of 2.5µs.

This Click board™ is designed to be operated with both 3.3V and 5V logic voltage levels that can be selected via VCC SEL jumper. This allows for both 3.3V and 5V capable MCUs to use the SPI communication lines properly.

## Specifications

Type	LED Drivers
Applications	Can be used in the purpose of LED Status signalization, in LED displays, LED backlight, keypad backlights for cellular phones, or handheld devices, and many more.
On-board modules	LED Driver 8 Click is based on the PCA9957, a daisy-chain SPI compatible 4-wire serial bus controlled 24-channel constant current LED driver optimized for dimming and blinking 32 mA RGBA LEDs from NXP Semiconductors.
Key Features	Low power consumption, programmable LED drivers channels, gradation control for all

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	channels, low standby current, no glitch on LED outputs on Power-Up, and more.
Interface	SPI
ClickID	No
Compatibility	mikroBUS™
Click board size	M (42.9 x 25.4 mm)
Input Voltage	3.3V or 5V

## Pinout diagram

This table shows how the pinout on LED Driver 8 Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin	mikro™ BUS				Pin	Notes
	NC	1	AN	PWM	16	<b>OE</b>	Output Enable
Reset	<b>RST</b>	2	RST	INT	15	NC	
SPI Chip Select	<b>CS</b>	3	CS	RX	14	NC	
SPI Clock	<b>SCK</b>	4	SCK	TX	13	NC	
SPI Data OUT	<b>SDO</b>	5	MISO	SCL	12	NC	
SPI Data IN	<b>SDI</b>	6	MOSI	SDA	11	NC	
Power Supply	<b>3.3V</b>	7	3.3V	5V	10	<b>5V</b>	Power Supply
Ground	<b>GND</b>	8	GND	GND	9	<b>GND</b>	Ground

## Onboard settings and indicators

Label	Name	Default	Description
LD1	PWR	-	Power LED Indicator
JP1	VCC SEL	left	Power Supply Voltage Selection 3V3/5V: Left position 3V3, Right position 5V
J1-J3	-	-	LED Driver Output Header
J4	-	-	External Output 3.3V Level Supply Header
J5	-	-	External Output 5V Level Supply Header

## LED Driver 8 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	-0.5	-	6	V
Maximum Output Current on LED pins	-	-	40	mA
SPI Clock Frequency	-	-	10	MHz
Operating Temperature Range	-40	-	+85	°C

## Software Support

We provide a library for the Led Driver 8 Click on our [LibStock](#) page, as well as a demo

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application (example), developed using MikroElektronika [compilers](#). The demo can run on all the main MikroElektronika [development boards](#).

## Library Description

The library contains a basic functions for using LED Driver 8 click.

Key functions:

- void ledDriver8\_set\_mode\_register( uint8\_t mode\_1, uint8\_t mode\_2 ) - Function for set mode registers
- void ledDriver8\_set\_output\_gain ( uint8\_t num\_led, uint8\_t value ) - Functions for set output gain
- void ledDriver8\_set\_brightness ( uint8\_t num\_led, uint8\_t value ) - Functions for set Brightness

## Examples description

The application is composed of three sections :

- System Initialization - Initialization SPI module and all necessary GPIO pins
- Application Initialization - Initialization driver init and sets module for working
- Application Task - Changes brightness on all LEDs. Controls are blinking on one LED.

The full application code, and ready to use projects can be found on our [LibStock](#) page.

Other mikroE Libraries used in the example:

- SPI Library

## Additional notes and informations

Depending on the development board you are using, you may need [USB UART click](#), [USB UART 2 click](#) or [RS232 click](#) to connect to your PC, for development systems with no UART to USB interface available on the board. The terminal available in all MikroElektronika [compilers](#), or any other terminal application of your choice, can be used to read the message.

## mikroSDK

This Click board™ is supported with [mikroSDK](#) - MikroElektronika Software Development Kit. To ensure proper operation of mikroSDK compliant Click board™ demo applications, mikroSDK should be downloaded from the [LibStock](#) and installed for the compiler you are using.

For more information about mikroSDK, visit the [official page](#).

## Resources

[mikroBUS™](#)

[mikroSDK](#)

[Click board™ Catalog](#)

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[Click boards™](#)

## Downloads

[LED Driver 8 click 2D and 3D files](#)[PCA9957DS datasheet](#)[LED Driver 8 click schematic](#)[LED Driver 8 click example on Libstock](#)

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