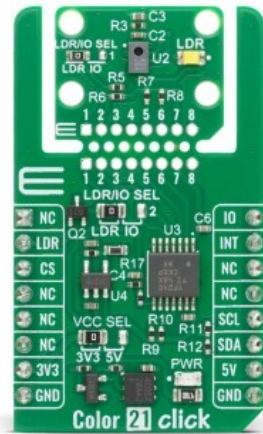


Color 21 Click



PID: MIKROE-6773

Color 21 Click is a compact add-on board that provides precise multi-spectral light sensing and ambient color measurement for embedded applications requiring accurate light and color analysis. It is based on the [TCS3448](#), a 14-channel multi-purpose spectral light sensor from [ams OSRAM](#). Covering wavelengths from approximately 380nm to 1000nm, the sensor features eleven visible channels, one near-infrared (NIR), and one clear channel, allowing fine spectral resolution across the visible range. It also includes an integrated flicker detection channel for identifying light flicker at 50/60 Hz, high-precision optical interference filters, and a programmable GPIO/LED driver for light source control or synchronization. The board supports I2C communication and the MIKROE's unique Click Snap feature, allowing the sensor section to be detached and positioned independently for flexible implementation. Color 21 Click is ideal for applications such as camera calibration, display color adjustment, ambient light classification, and intelligent lighting systems.

For more information about **Color 21 Click** visit the official [product page](#).

How does it work?

Color 21 Click is based on the TCS3448, a 14-channel multi-purpose spectral light sensor from ams OSRAM providing multi-spectral light sensing and ambient color measurement capabilities for embedded applications. Optimized for detecting spectral components of ambient light in the visible range, this sensor uses a white LDR LED as the light source to capture accurate spectral data. Such information is essential for applications like camera enhancement, including correlated color temperature (CCT) estimation, automatic white balance (AWB), and exposure time optimization. The TCS3448 features individual channels that cover wavelengths

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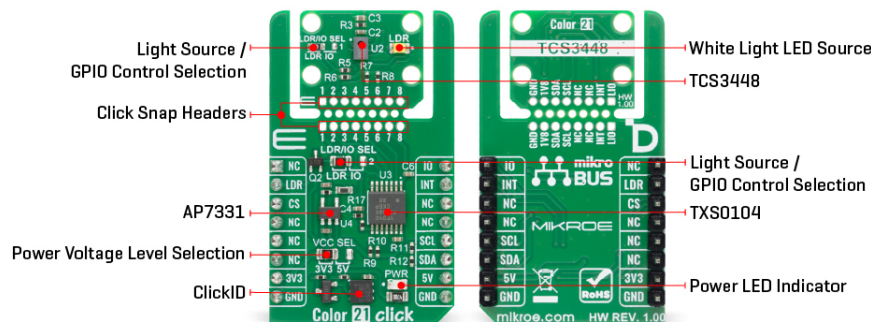


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from approximately 380nm to 1000nm, with eleven channels centered in the visible spectrum, plus one near-infrared (NIR) and one clear channel. This allows precise spectral analysis and ambient light classification under various conditions.



In addition to its multi-spectral capabilities, the sensor integrates a flicker detection channel that can automatically identify ambient light flicker at 50/60Hz and buffer data for external calculation of other flicker frequencies, ensuring consistent measurement accuracy even under unstable lighting conditions. Its architecture includes high-precision optical interference filters directly deposited on photodiodes embedded in CMOS silicon, while a built-in aperture controls the amount of incoming light to further enhance accuracy and stability.

This Click board™ is designed in a unique format supporting the newly introduced MIKROE feature called "Click Snap." Unlike the standardized version of Click boards, this feature allows the main sensor/IC/module area to become movable by breaking the PCB, opening many new possibilities for implementation. Thanks to the Snap feature, the TCS3448 can operate autonomously by accessing its signals directly on the pins marked 1-8. Additionally, the Snap part includes a specified and fixed screw hole position, enabling users to secure the Snap board in their desired location.

This Click board™ uses an I2C interface with clock speeds of up to 1MHz, ensuring fast communication with the host MCU. The TSL2522 does not require a specific Power-Up sequence but requires a voltage of 1.8V for its interface and logic part to work correctly. Therefore, a small regulating LDO, the [AP7331](#), provides a 1.8V out of selected mikroBUS™ power rail. Beyond communication pins, this board is also equipped with an interrupt (INT) pin that enables the host to MCU to sleep or ignore the sensor results until a user-defined event occurs (whether the light is above or below interest levels).

To expand functionality, the TCS3448 includes a programmable digital GPIO and LED driver, allowing control of an external light source (LDR LED as mentioned) or synchronization signal. The selection between these functions is managed by configuring the LDR/IO SEL jumpers located both on the main and Snap sections of the board. When the Snap section is connected to the main board, both jumpers must be set to the same position to ensure proper operation.

This Click board™ can operate with both 3.3V and 5V logic voltage levels selected via the VCC SEL jumper. Since the sensor operates and communicates at 1.8V, a logic-level translator, the [TXS0104](#) is also used for proper operation and an accurate signal-level translation. This way, both 3.3V and 5V capable MCUs can use the communication lines properly. Also, this Click

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board™ comes equipped with a library containing easy-to-use functions and an example code that can be used as a reference for further development.

Click Snap

Click Snap is an innovative feature of our standardized Click add-on boards, designed to bring greater flexibility and optimize your prototypes. By simply snapping the PCB along predefined lines, you can easily detach the main sensor/IC/module area, reducing the overall size, weight, and power consumption - ideal for the final phase of prototyping. For more details about Click Snap, visit the [official page](#) dedicated to this feature.

Specifications

Type	Color Sensing,Optical
Applications	Ideal for applications such as camera calibration, display color adjustment, ambient light classification, and intelligent lighting systems
On-board modules	TCS3448 - 14-channel multi-spectral sensor from ams OSRAM
Key Features	14-channel multi-spectral light sensing, wide wavelength coverage, eleven visible channels plus one NIR and one clear channel, integrated 50/60Hz flicker detection, optical interference filters, built-in aperture for light control, programmable GPIO and LED driver, Click Snap feature, I2C interface, and more
Interface	I2C
Feature	Click Snap,ClickID
Compatibility	mikroBUS™
Click board size	M (42.9 x 25.4 mm)
Input Voltage	1.8V,3.3V or 5V

Pinout diagram

This table shows how the pinout on Color 21 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	IO	General-Purpose I/O
Light Source Control	LDR	2	RST	INT	15	INT	Interrupt
ID COMM	CS	3	CS	RX	14	NC	
	NC	4	SCK	TX	13	NC	
	NC	5	MISO	SCL	12	SCL	I2C Clock
	NC	6	MOSI	SDA	11	SDA	I2C Data
Power Supply	3.3V	7	3.3V	5V	10	NC	
Ground	GND	8	GND	GND	9	GND	Ground

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Onboard settings and indicators

Label	Name	Default	Description
LD1	PWR	-	Power LED Indicator
LD2	LDR	-	White Light LED Source
JP1	VCC SEL	Left	Power Voltage Level Selection 3V3/5V: Left position 3V3, Right position 5V
JP2	LDR/IO SEL	Left	Snap-Side Light Source / GPIO Control Selection LDR/IO: Left position LDR, Right position IO
JP3	LDR/IO SEL	Left	mikroBUS-Side Light Source / GPIO Control Selection LDR/IO: Left position LDR, Right position IO

Color 21 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	3.3	-	5	V
Supply Voltage (Snap Standalone)	-	1.8	-	V
Spectral Range	380	-	1000	nm

Software Support

[Color 21 Click](#) demo application is developed using the [NECTO Studio](#), ensuring compatibility with [mikroSDK](#)'s open-source libraries and tools. Designed for plug-and-play implementation and testing, the demo is fully compatible with all development, starter, and mikromedia boards featuring a [mikroBUS™](#) socket.

Example Description

This example demonstrates the use of Color 21 Click by reading and displaying the values from all 14 channels.

Key Functions

- `color21_cfg_setup` This function initializes Click configuration structure to initial values.
- `color21_init` This function initializes all necessary pins and peripherals used for this Click board.
- `color21_default_cfg` This function executes a default configuration of Color 21 Click board.
- `color21_read_data` This function checks if the spectral measurement data is ready and then reads data from all channels along with the STATUS and ASTATUS bytes.

Application Init

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Initializes the driver and performs the Click default configuration.

Application Task

Waits for the spectral measurement complete flag and then reads data from all 14 channels in 3 cycles, and displays the results on the USB UART every 300ms approximately.

Application Output

This Click board can be interfaced and monitored in two ways:

- Application Output - Use the "Application Output" window in Debug mode for real-time data monitoring. Set it up properly by following [this tutorial](#).
- UART Terminal - Monitor data via the UART Terminal using a [USB to UART converter](#). For detailed instructions, check out [this tutorial](#).

Additional Notes and Information

The complete application code and a ready-to-use project are available through the NECTO Studio Package Manager for direct installation in the [NECTO Studio](#). The application code can also be found on the MIKROE [GitHub](#) account.

Resources

[mikroBUS™](#)

[mikroSDK](#)

[Click board™ Catalog](#)

[Click boards™](#)

[ClickID](#)

Downloads

[Color 21 click example package](#)

[Color 21 click 2D and 3D files v100](#)

[TCS3448 datasheet](#)

[Color 21 click schematic v100](#)

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