

Boost 3 Click



PID: MIKROE-4287

Boost 3 Click is a compact add-on board that contains a boost converter with an integrated current mirror function. This board features the TPS61391, a 700-kHz pulse-width modulating (PWM) Step-Up converter with a 70V switch FET with an input voltage up to 5.5V from Texas Instruments. The TPS61391 includes an accurate current mirror, with two selectable gain options (1:5 or 4:5), and provides high optical-power protection with an additional FET in series with the APD power path, with the typical response time of 0.5 μ s. This Click board™ is designed to be used for applications such as biasing and monitoring the avalanche photodiodes (APD) in the optical receivers, but it also can be used as a high voltage sensor supply or in battery-powered and automotive applications.

Boost 3 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?

Boost 3 Click is based on the TPS61391, a 700-kHz pulse-width modulating (PWM) Step-Up converter with a 70V switch FET with an input voltage up to 5.5 V from Texas Instruments. It supports an input voltage up to 5.5V and operates at a 700 kHz pulse-width modulation (PWM) crossing the whole load range. There are two ratio options for the current proportional to the APD current: MON1 (4:5) and MON2 (1:5). By connecting an additional RC filter for low ripple applications from the mirror output pins to the GND, the current flowing through the APD is converted into the voltage crossing the resistor from MON1/MON2 pins to GND. Additionally, a high power optical protection, with the response time typically of 0.5 μ s, is integrated by clamping the pre-set current limit (program by the R6 resistor) and could recover automatically

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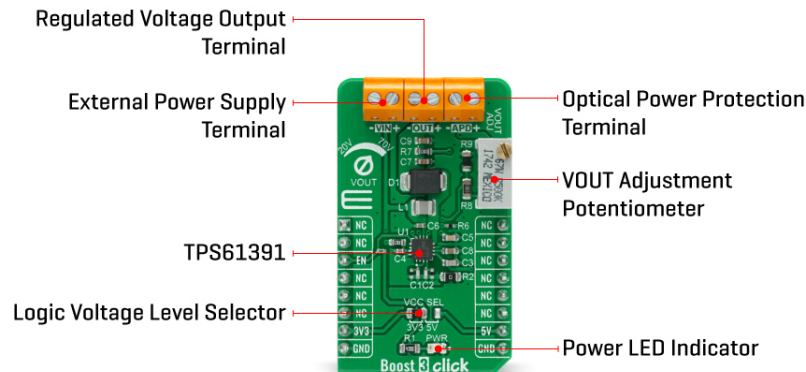


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when the high optical power is removed.



The output voltage of the TPS61391 is externally adjustable using a resistor divider network. The relationship between the output voltage and the resistor divider is given by the equation:

$$VOUT = (VREF + 0.1V) * (1 + (VR1 + R8) / R9) [V]$$

where VREF has a typical value of 1.2V. When the potentiometer has a 0V value, the output voltage has its minimum value of 20V. Increasing the resistance of a potentiometer and reaching its maximum value of 500kΩ, the output voltage also reaches its maximum value of 70V. The potentiometer featured on the Boost 3 Click can change the feedback thus influencing a change in the output voltage. This makes the Click board™ extremely practical because you can, with a simple turn of the potentiometer, get the wide voltage range.

Boost 3 Click communicates with MCU using only one GPIO pin routed on the CS pin of the mikroBUS™ socket labeled as EN. An under-voltage lockout (UVLO) circuit stops the operation of the converter when the input voltage drops below the typical UVLO threshold of 2.5 V. When the input voltage is above the maximal UVLO rising threshold of 2.5 V, and the EN pin is pulled above the high threshold (1.2V minimum), the TPS61391 is enabled. When the EN pin is pulled below the low threshold (0.4 maximum), the device goes into Shutdown Mode.

It also possesses the output terminal labeled as APD used for biasing and monitoring the avalanche photodiodes (APD) and high optical power protection. There is an additional FET in series of power path connecting with the APD output terminal. When the current flowing through the external APD exceeds the short protection threshold, set by connecting the resistor from R6 to the ground, the on-resistance of the internal FET becomes larger to clamp the current within the protection threshold by lowering the APD bias voltage. It takes typically 0.5μs for the FET to respond in case of high optical power occurring. When the high optical power condition releases, the TPS61391 recovers automatically back to the Normal Operation Mode.

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 GPIO communication line properly. However, the Click board™ comes equipped with a library that contains easy to use functions and an example code that can be used as a reference for further development.

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Specifications

Type	Boost
Applications	Can be used for applications such as biasing and monitoring the avalanche photodiodes (APD) in the optical receivers, but it also can be used as a high voltage sensor supply or in battery-powered and automotive applications.
On-board modules	Boost 3 Click is based on the TPS61391, a 700-kHz pulse-width modulating (PWM) Step-Up converter with a 70V switch FET with an input voltage up to 5.5 V from Texas Instruments.
Key Features	An under-voltage lockout, high optical power protection, wide output voltage range from 20V to 70V, current mirror function, and more.
Interface	GPIO
Feature	No ClickID
Compatibility	mikroBUS™
Click board size	M (42.9 x 25.4 mm)
Input Voltage	3.3V or 5V, External

Pinout diagram

This table shows how the pinout on Boost 3 Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin					Pin	Notes
	NC	1	AN	PWM	16	NC	
	NC	2	RST	INT	15	NC	
Device Enable	CS	3	CS	RX	14	NC	
	NC	4	SCK	TX	13	NC	
	NC	5	MISO	SCL	12	NC	
	NC	6	MOSI	SDA	11	NC	
Power Supply	3.3V	7	3.3V	5V	10	5V	Power Supply
Ground	GND	8	GND	GND	9	GND	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
VR1	VOUT ADJ	-	VOUT Adjustment

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Boost 3 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	3.3	-	5	V
External Power Supply	2.5	-	5.5	V
Output Voltage	20	-	70	V

Software Support

We provide a library for the Boost 3 Click on our [LibStock](#) page, as well as a demo application (example), developed using MikroElektronika [compilers](#). The demo can run on all the main MikroElektronika [development boards](#).

Library Description

The library covers the necessary function that enables the usage of the Boost 3 Click board. User can enable or disable the device.

Key functions:

- void boost3_dev_enable (uint8_t state); - Function is used to enable or disable the device.

Examples description

The application is composed of three sections :

- System Initialization - Initializes GPIO and LOG structures, and set CS pin as output.
- Application Initialization - Start to write log and gives instructions to the user.
- Application Task - Demonstrates use of Boost 3 click board by reading user's command input from USART terminal and turning the device on or off accordingly. User can use the on-board potentiometer to adjust 'Vout' voltage.

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

Other mikroE Libraries used in the example:

- GPIO
- UART

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

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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](#)

[Click boards™](#)

Downloads

[Boost 3 click 2D and 3D files](#)

[TPS61391 datasheet](#)

[Boost 3 click example on Libstock](#)

[Boost 3 click schematic](#)

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