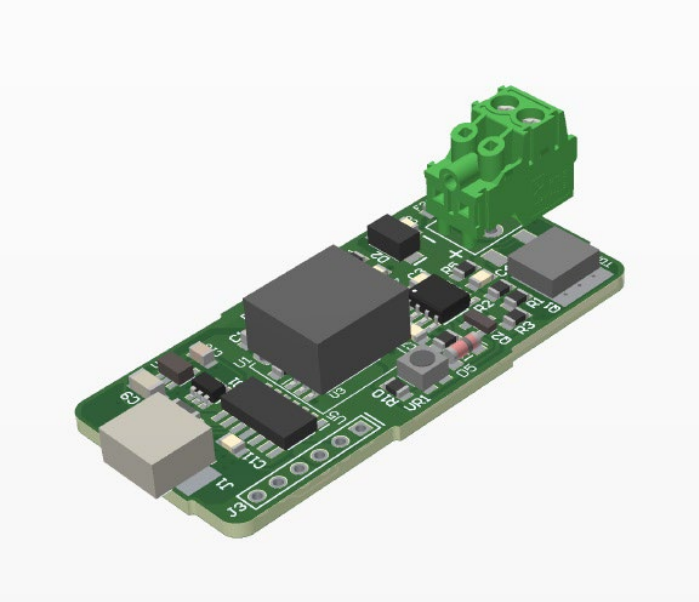
TOKYO DEVICES

TDFA6032A

USB Analog Current Output Board, 0-20/4-20mA, Galvanic Isolation

Revision 1.1.1



The TDFA6032A is an analog output unit that outputs 0-20mA or 4-20mA current signals from a USB port. With control commands compatible with Windows/Linux, the output current can be controlled in 2,048 steps. The output and USB parts are electrically isolated, ensuring high safety and noise resistance. The TDFA6032A incorporates a step-up power supply from USB to 24V, allowing it to output 24V in the current loop and connect loads up to 750Ω. It is ideal for developing custom current output devices, testing current signal loops, and emulating 4-wire sensors.

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目次

TDFA6032A 1
1. Specifications 4
2. Board Layout 4
3. Quick Start 5
4. Connection Examples 6
5. Control 7
5.1. Basic Usage 7
5.2. Setting the Current Value 7
5.3. Getting the Current Value 7
5.4. Identifying Multiple Devices 7
5.5. Setting the Current Value at Startup 8
5.6. Integrating with Custom Applications 8
6. Product Customization Services 8

1. Specifications

	Value	Notes
Output Range	0～20mA	
Accuracy	< 3 FS%	
Resolution	11bit(2,048 steps)	
Maximum Load	750Ω	
Open Voltage	24V	
Terminal	Screw (M2) 0.2～1.5 ㎟, 16-26 AWG	Phoenix Contact 1984015
Isolation	1kV	*Not tested
Communication	USB 2.0	
USB Connector	USB Type B Mini	
USB Cable Length	1.5m	
OS	Windows 7or later, Linux	
Power	5V USB Bus Powered	
Current Consumption	350 mA max.	
Operating Temp. Range	0～55℃	
Board Dimensions	W:78 D:60 H: 20 mm max.	

2. Board Layout

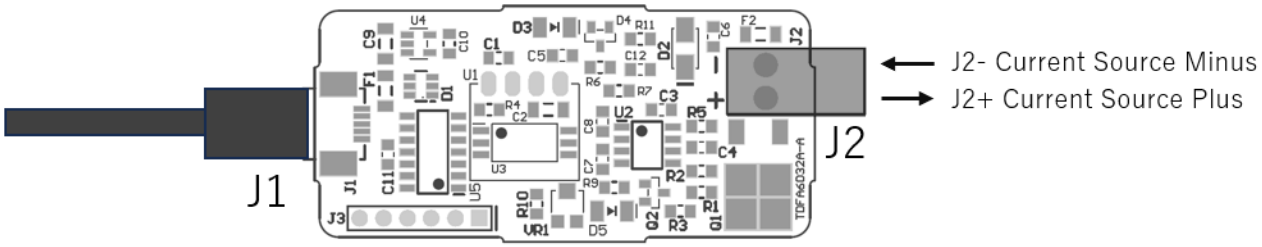

Figure 1 Board Layout

Table 1 Pin assignments

Symbol	Name	Notes
J1	USB	USB Connector
J2 +	Current Source Plus	Current Output Terminal, Plus

J2 -	Current Source Minus	Current Output Terminal, Minus

3. Quick Start

- Download and install TD-AppKit on your Windows computer.
- Connect the TDFA6032A to a USB port.
- Connect test equipment such as a PLC or display unit to the current output terminal.
- Launch TD-AppKit and select “Open” from the “Device” menu.
- In the “Open new device” window (Figure 2), select `TDFA6032` from the Product Model box. Choose the serial number of the Detected device displayed in the “Detected devices” box, and click the “Open” button.
- In the main window (Figure 3), select `DAC_VALUE` from the “Register” box at the bottom, enter `410` in the box on the right, and then click the “Set” button.
- Confirm that 4mA is flowing through the current loop.

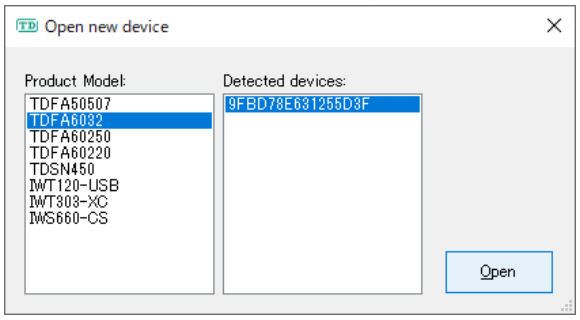

Figure 2 Open new device window

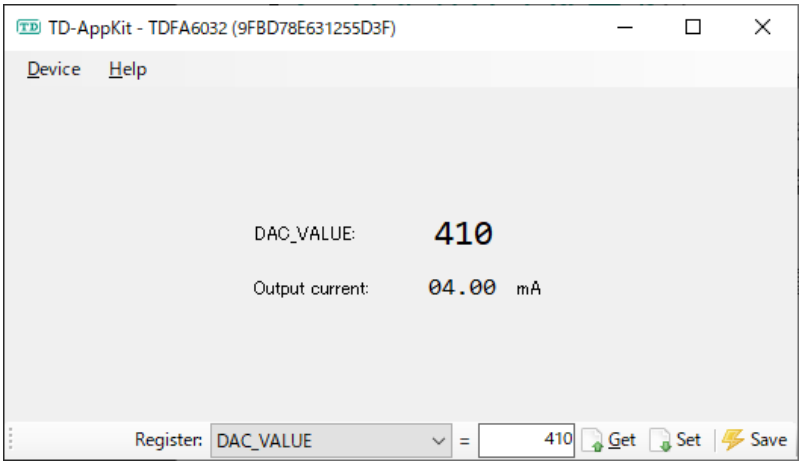

Figure 3 Main window

4. Connection Examples

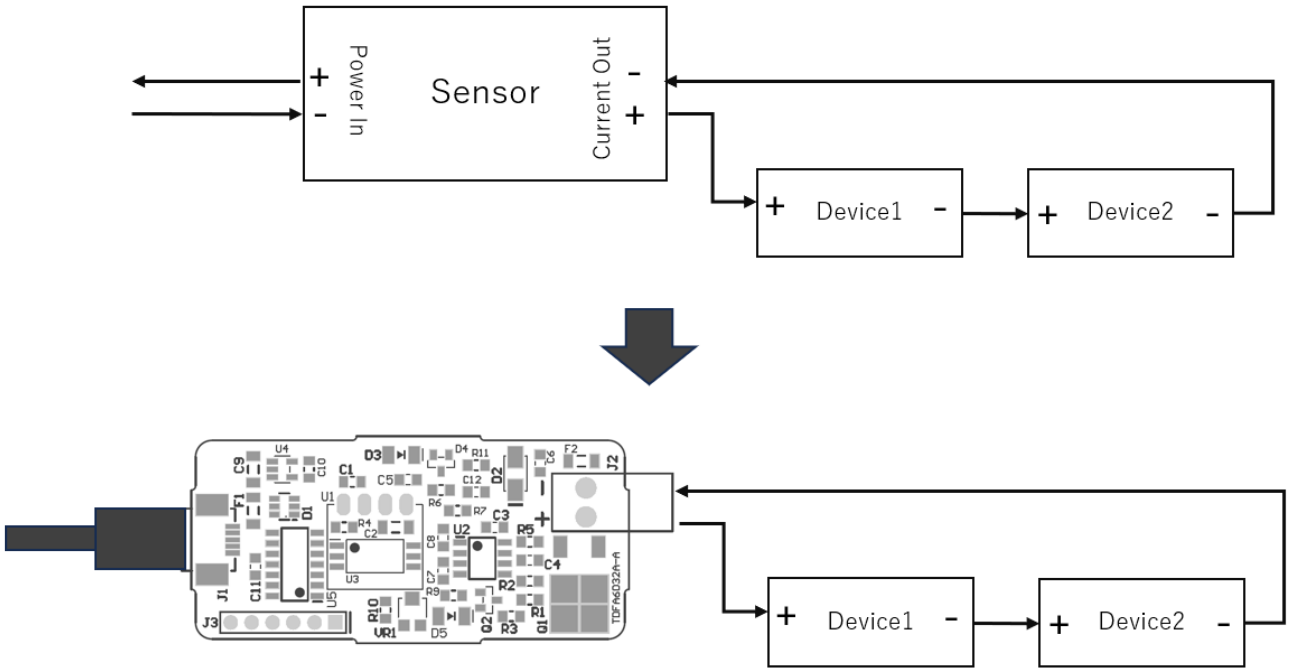

Figure 4 Testing Current Loop

Figure 4 is an example of using the TDFA6032A to test a current loop circuit in place of a 4-wire sensor (a type of sensor that supplies power to the circuit itself). Device1 and Device2 correspond to PLCs, measuring instruments, or displays. The power for the current loop circuit is supplied by the TDFA6032A, which acts as the current source. Additional devices can be connected in series as long as the total load does not exceed 750Ω.

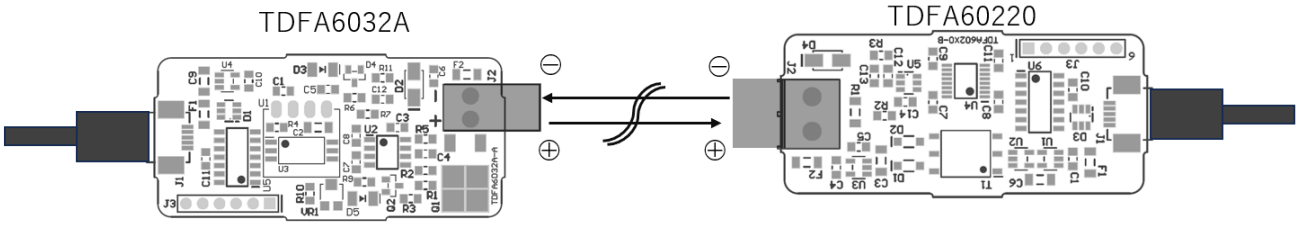

Figure 5 Analog signal transfer with TDFA60220

Figure 5 shows an example of transmitting analog current signals by combining the TDFA6032A with the analog input unit TDFA60220. The TDFA6032A supplies power to the current loop. When the transmission path is long, twisted pair cables are used.

5. Control

TDFA6032A is controlled by the command "TD-USB". TD-USB is a command line program that runs on Windows or Linux. To obtain TD-USB, search for "TDFA6032" on the Tokyo Devices website or download it from the GitHub repository:

Tokyo Devices Web: https://en.tokyodevices.com/

TD-USB GitHub Repository: https://github.com/tokyodevices/td-usb/

5.1. Basic Usage

The basic arguments for TD-USB are as follows:

```
> td-usb tdfa6032 (get|set|save|list) [options]
```

The first argument, `tdfa6032`, is a fixed string that represents the target product model. The second argument is a fixed string that represents the operation, and you can specify either `get`, `set`, `save`, or `list`. Depending on the operation, you specify options. Note that the arguments are case-sensitive.

5.2. Setting the Current Value

```
> td-usb tdfa6032 set (current value)
```

The `set` operation specifies the operation to set the current value. The value to be set is an integer from 0 to 2047. Specifying 0 sets the output current to 0mA, and specifying 2,047 sets it to 20mA. For example, setting it to `1024` will result in an output current of approximately 10mA. If the setting is successful, nothing will be displayed, and the process will end. If it fails, an error message will be displayed. The process exit code for a successful operation is 0.

5.3. Getting the Current Value

```
> td-usb tdfa6032 get
410
```

`get` is a fixed string that specifies the operation to read a value from the device. If the retrieval is successful, a numeric value will be returned on one line of standard output. The specification of the number is the same as for "set". In the example above, since the current value 410 is retrieved, it indicates that approximately 4mA is currently being output.

5.4. Identifying Multiple Devices

Multiple TDFA6032As can be connected to a single PC. Each TDFA6032A is assigned a unique serial number at the time of shipment. By specifying the serial number in TD-USB, you can select the specific device to operate on.

```
> td-usb tdfa6032 list
XXXXXXXXXXXXXX,YYYYYYYYYYYYYY
```

```
> td-usb tdfa6032:XXXXXXXXXXX get
410
```

Using `list` allows you to retrieve the serial numbers of multiple units connected to a single computer. Serial numbers are output separated by commas "," for each device. If no devices are found, an empty line is output. To specify the target device, follow the fixed string specifying the product model "tdfa6032" with a colon ":" and the serial number.

5.5. Setting the Current Value at Startup

By combining `set` and `save` operations, you can set the initial current value for the TDFA6032A immediately after it is powered on through the USB port:

```
> td-usb tdfa6032 set INITIAL_DAC_VALUE=(電流値)
> td-usb tdfa6032 save
```

The `INITIAL_DAC_VALUE=` in the first command line is the setting name for specifying the current value at startup. The setting is case-sensitive. Specify the current value following the '=' character. Then, use the `save` operation to write the set value to the device's internal flash ROM. If you do not perform the `save` operation, the set value will not be reflected the next time the device is powered on.

To read the current setting value from the device, specify the setting name with the `get` operation:

```
> td-usb tdfa6032 get INITIAL_DAC_VALUE
410
```

5.6. Integrating with Custom Applications

To integrate with your own applications, call TD-USB commands as external programs. The README for TD-USB includes examples of integration with C# and Python, so please refer to that for guidance. For detailed information on how to call external programs, refer to the manuals or documentation of your specific programming environment.

6. Product Customization Services

Tokyo Devices offers customization of circuit board exteriors, functionalities, and performance based on customer needs. For more details, please check the "Customization" on the Tokyo Devices website.