A52xx

Accessories for A5203 FERS-5200 Units

Datasheet
DS9756

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ACCESSORIES

- **A5255: 17x2 pin 2.54 mm pitch quad connector for A5203/DT5203**
- **A5256: 16+1 channel single threshold, 8+1 channel dual threshold edge discriminator**
- **A5270: fan for FERS-5200 boards**

Introduction

FERS-5200 is CAEN Front-End Readout System designed for large detector arrays, where each A5203(B)/DT5203 unit is a small card which houses 64(128) channels and includes Front End electronics, synchronization, local memory, and readout interface. The units are available in two form factors: naked (e.g., A5203(B)), allowing the user to build customizable mechanical frames and adapters, and desktop (e.g., DT5203).

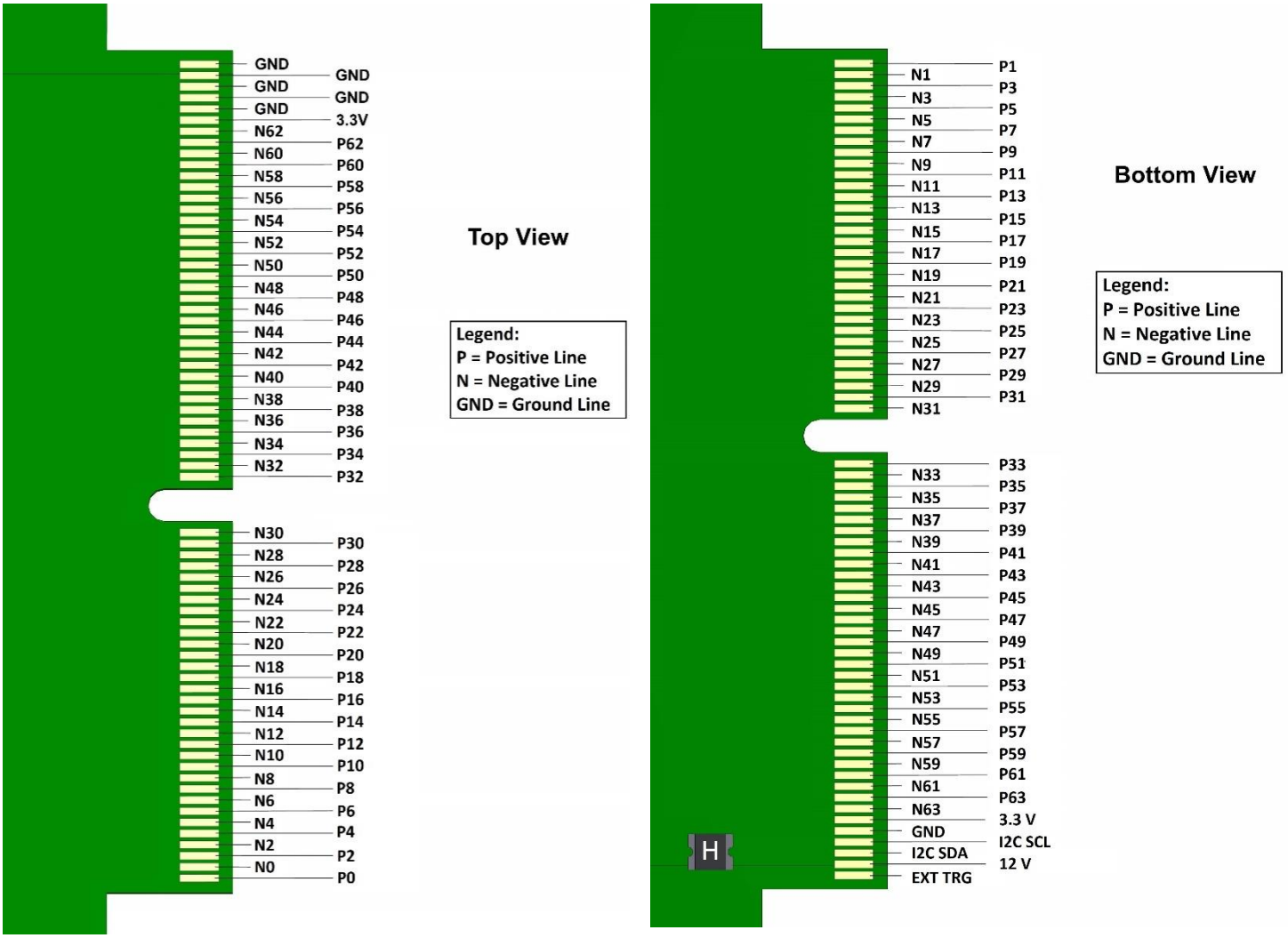
A5203(B)

The A5203 is a member of the FERS-5200 family. It uses the picoTDC chip (produced by CERN) for high-resolution multi-hit time measurements on 64 channels. The A5203B houses an additional mezzanine card with a second picoTDC chip, thus implementing a 128 channel TDC module. Each readout channel accepts differential signals (LVDS with 1.2 V common mode and 1.45 V absolute voltage) and measures the time stamp of both rising and falling edges with an LSB of 3.125 ps. In this way, the unit can reconstruct the Time of Arrival (ToA) of signals as an absolute timestamp or as a ΔT with respect to a common Tref pulse. The picoTDC can also acquire Time over Threshold (ToT) information and combine it with the edge time stamp.
The A5203 has an input edge connector type HSEC8-170, mating to a Samtec HSEC8-170-01-S-DV connector. The connector has 140 contacts (0.8 mm pitch) and brings 64 couples of differential signals, 3.3 V and 12 V lines, the external trigger line, and several grounds.

THE A5203(B) EDGE CONNECTOR(S) DOES NOT ALLOW TO DIRECTLY PLUG RIBBON, OR COAXIAL, CABLES INTO THE INPUTS. AN ADAPTER IS NEEDED.
THE ADAPTER CAN BE:
- CUSTOM MADE
- THE A5255 FERS-5200 ADAPTER (+A5260 REMOTIZATION CABLE)
- THE A5256 FERS-5200 ADAPTER (+A5260 REMOTIZATION CABLE)

THE LATTERS CAN BE PLUGGED ONLY INTO A5203 UNIT TYPES.
IN CASE OF THE A5203B, A CUSTOM-MADE ADAPTER MUST BE USED. AS AN ALTERNATIVE, THE A5255 OR A5256 ADAPTERS CAN BE PLUGGED INTO ONE OF THE TWO EDGE CONNECTORS, BUT WITH THE DRAWBACK OF A REDUCED CHANNEL NUMBER USABLE.

In the pictures below, the A5203 pin-out is presented, while a detailed pin numbering scheme is presented in the A5203(B)/DT5203 User Manual (**UM9085**).



Apart from the differential lines (P-positive and N-negative), the ground lines and the 3.3 V and 12 V lines, three more connections are present:

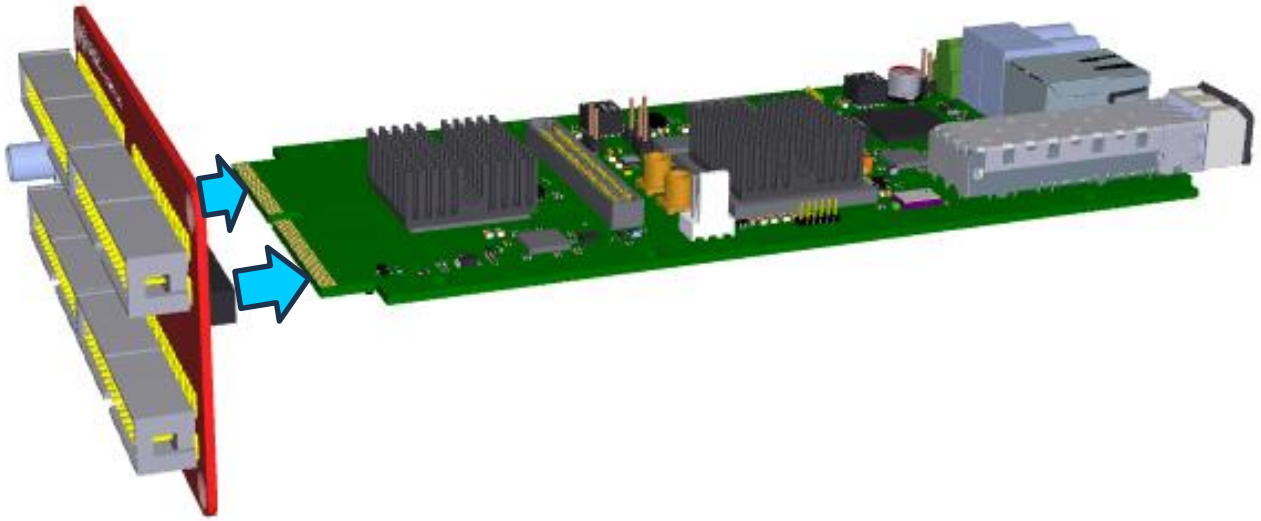
- I2C SCL - indicates the Serial Clock pin of the I2C slave bus.
- I2C SDA - indicates the Serial Data pin of the I2C slave bus.
- EXT TRG - indicates the external trigger line used to trigger the board from the edge connector (when an adapter is mounted on it).

To readout the differential signals feed to the A5203 board, the user must consider these three main options:

1. Use one of the A5203 header adapter described in this Datasheet (A525x) mating directly on the A5203 input edge connector.
2. Use a flat remotization cable, e.g. A5260, adapting the HSEC8-170 edge card connector to the user need, plus an A525x header adapter.
3. Build his/her own PCB mating directly on the A5203(B) edge connector.

A5203 Adapter Mounting

In case one of the A525x connector is used, the adapter mounting must take place as shown in the figure below.



THE HEADER ADAPTER MUST BE PLUGGED IN OR REMOVED WHEN THE BOARD IS DISCONNECTED FROM THE DC POWER SUPPLY!

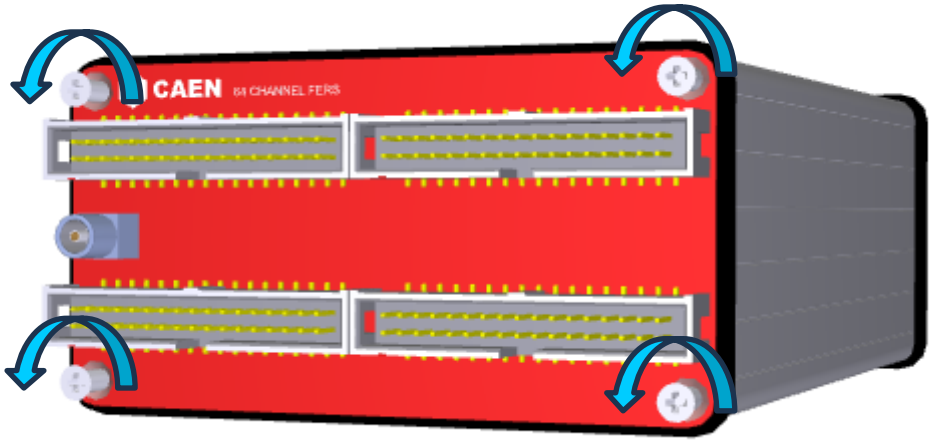
DT5203

The DT5203 is the boxed version of the A5203 board (64 input channels), designed for desktop use. The pinout is the same one presented in the previous section. The user is invited to refer to it for further details.
The DT5203 is delivered to the user with the A5255 header adapter already mounted as rear panel of the module. Other CAEN adapters are optional and must be purchased separately.
Both header adapters presented in this Datasheet were mechanically designed to be mounted as rear panel of the DT5203 module.

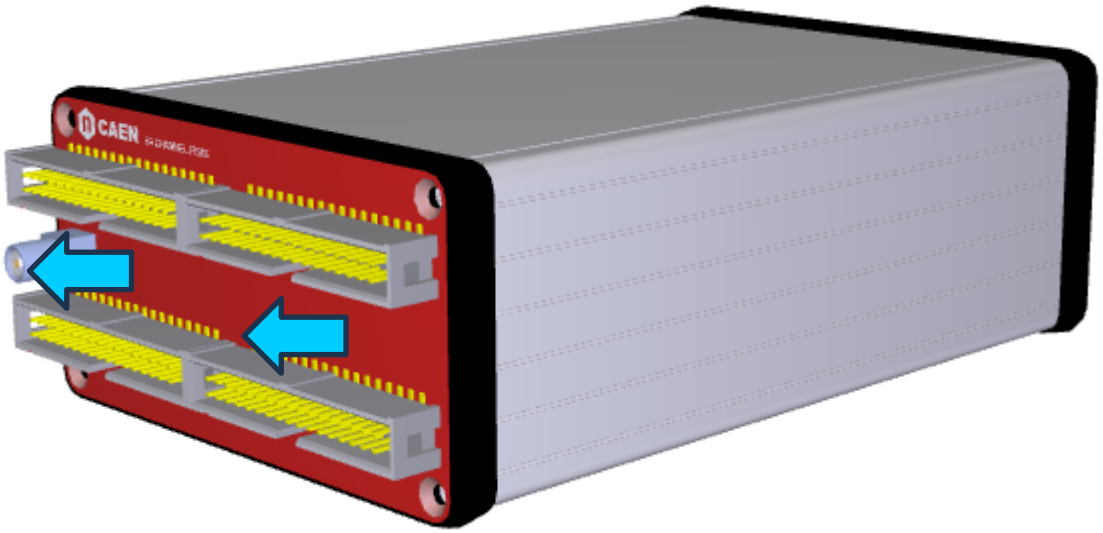
DT5203 Adapter Mounting

In case a header adapter different from the already mounted A5255 is bought by the user, the adapter mounting must take place as described below:

1. Remove the 4 screws from the DT5203 rear panel.

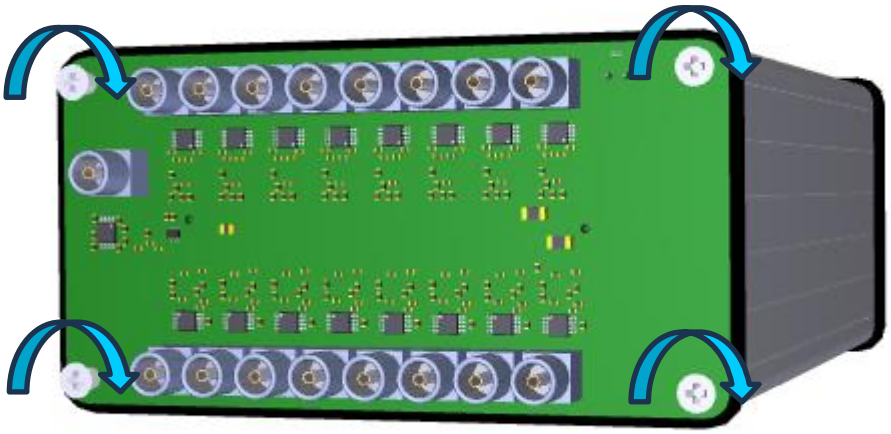


2. Remove the header adapter by taking care of not removing the dark plastic frame around the rear panel. If by chance the frame is removed by the user, it must be reassembled in the direction so that it is externally flush with the header adapter.



3. Plug the Samtec HSEC8-170-01-S-DV connector of the new header adapter (A5256 in the picture below) into the HSEC8-170 DT5203 edge connector.

4. Apply again the 4 screws after having checked that the adapter is correctly plugged into the edge connector.

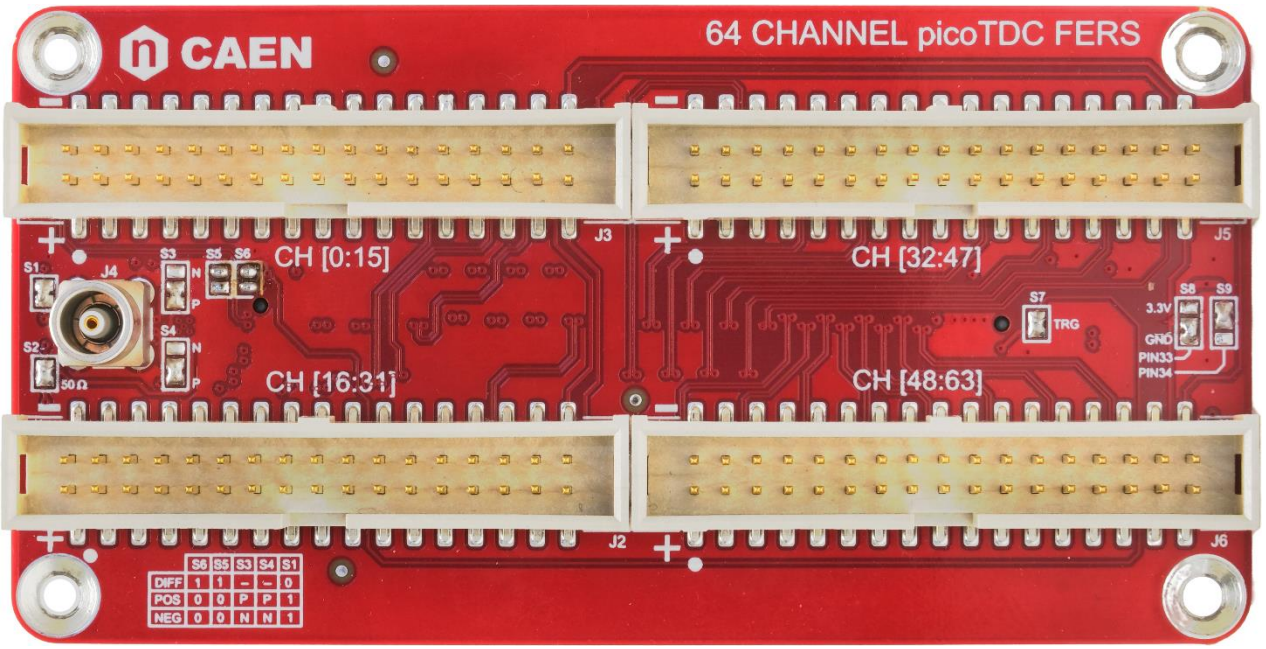


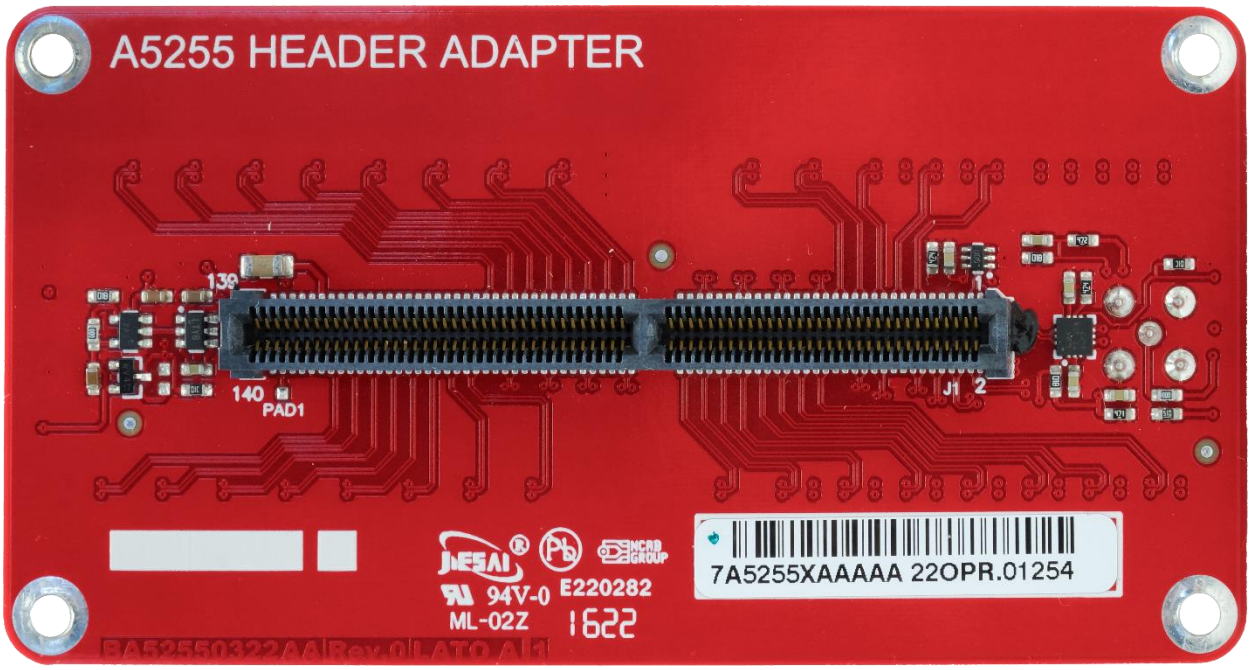
THE HEADER ADAPTER MUST BE PLUGGED IN OR REMOVED WHEN THE BOARD IS DISCONNECTED FROM THE DC POWER SUPPLY!

A5255

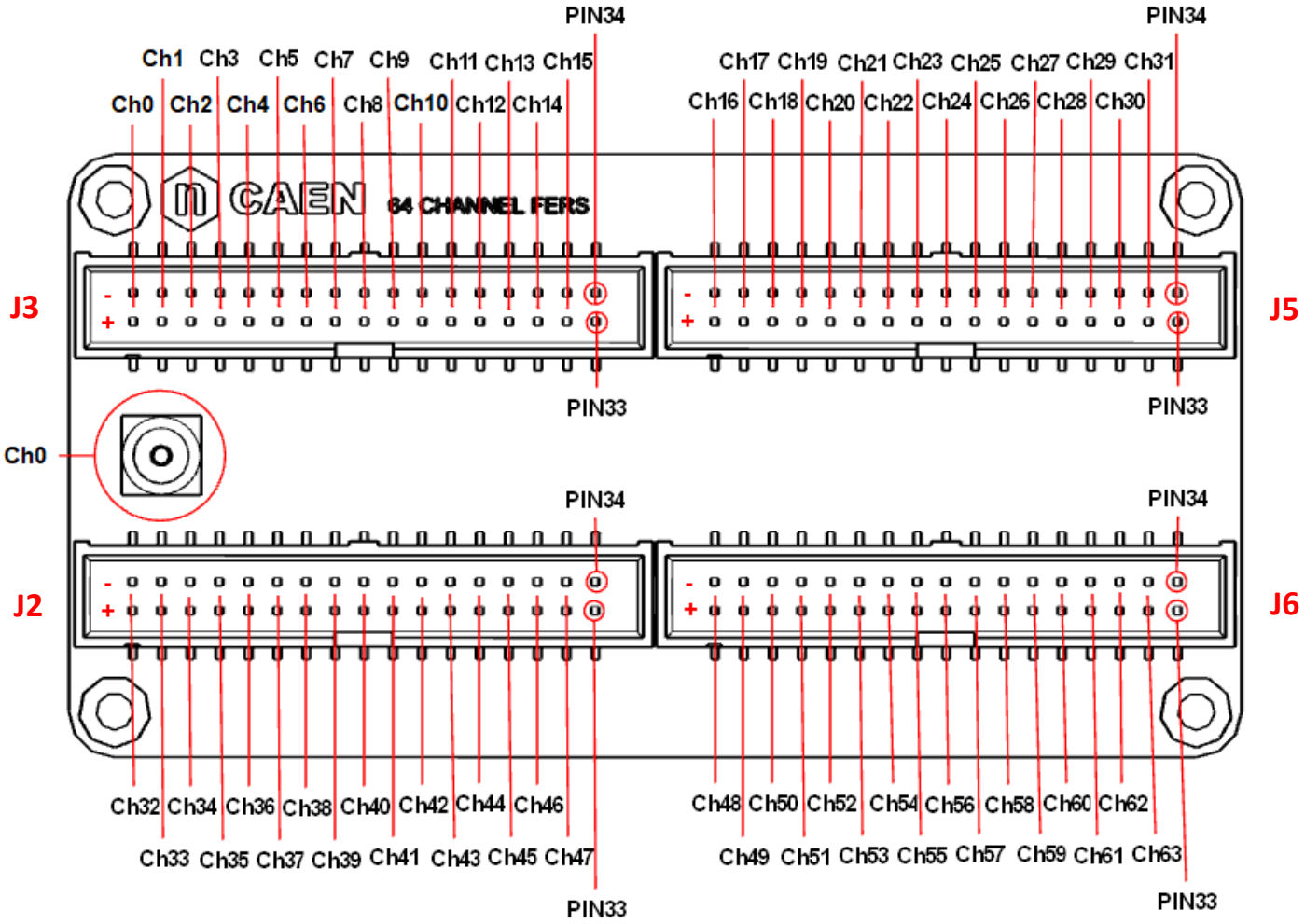
The **A5255** mechanically adapts from the A5203/DT5203 input edge card connector (type HSEC8-170) to four 17x2 2.54 mm pitch pin header connectors. Each connector on the adapter exposes 16 pin couples for the picoTDC differential input signals and 1 programmable pin couple (pins 33 and 34 of each connector) for power lines. A single-ended LEMO 00 connector is also present to be used as Tref, in substitution to the ch0 differential pin couple.
The A5255 adapter is mounted by default on the back panel of the DT5203 board.

A5255 Views



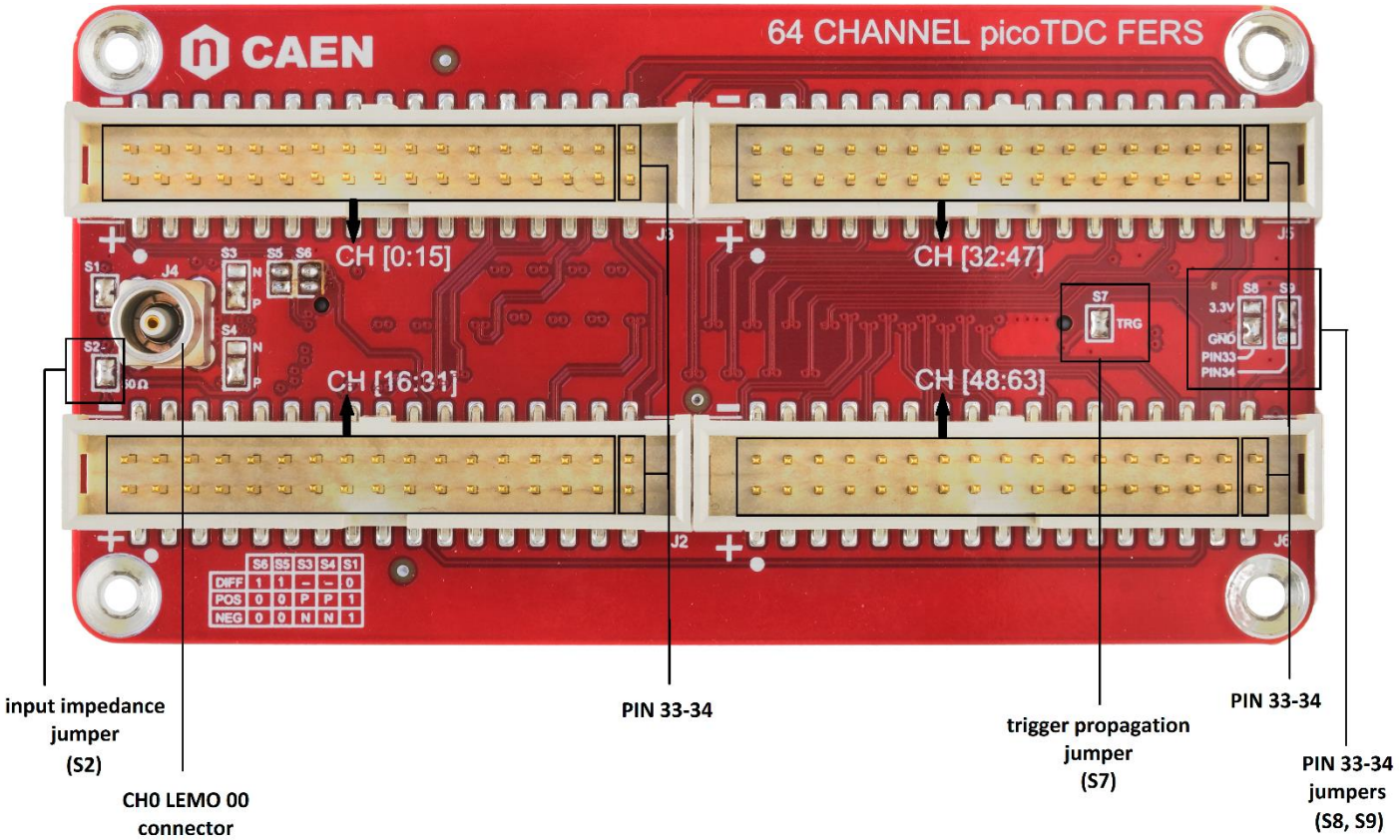


A5255 Pinout

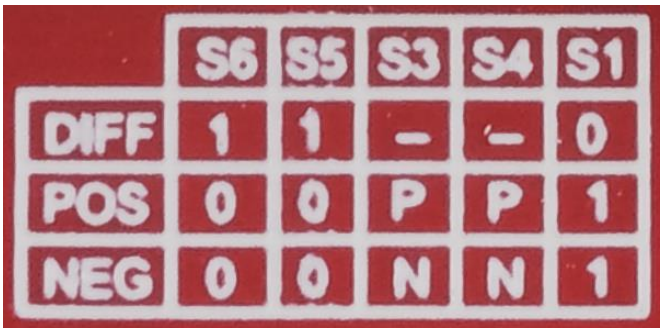


A5255 Configuration

In the image below, the 16 pin couples used for the picoTDC input channels, the pin 33-34 couple and their respective jumpers, the input impedance jumper (S2), the CH0 LEMO 00 connector and the trigger propagation jumper are marked.

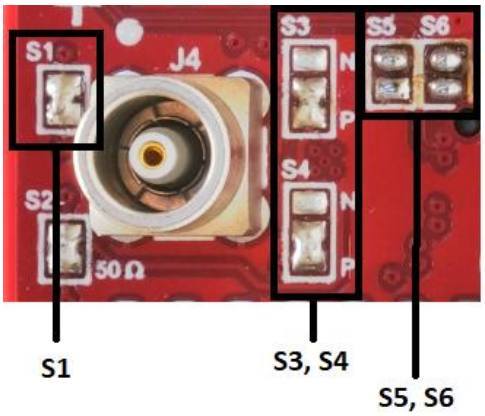


The **LEMO 00 connector**, used to substitute the differential CH0 pin couple, can be enabled/disabled and configured following the scheme in the figure below:



- differential signal on CH0 LVDS pin couple (single-ended signal on LEMO 00 connector not used): unsolder S1, solder S5 and S6 jumpers
- LVTTL signal on LEMO 00 connector (differential signal on CH0 LVDS pin couple not used): solder S1 jumper, solder the P connection on S3 and S4, unsolder S5 and S6 jumpers
- NIM signal on LEMO 00 connector (differential signal on CH0 LVDS pin couple not used): solder S1 jumper, solder the N connection on S3 and S4, unsolder S5 and S6 jumpers.

The S3, S4, S5 and S6 jumpers are sited around the ch0 LEMO 00 connector on the A5255, as shown in the figure.

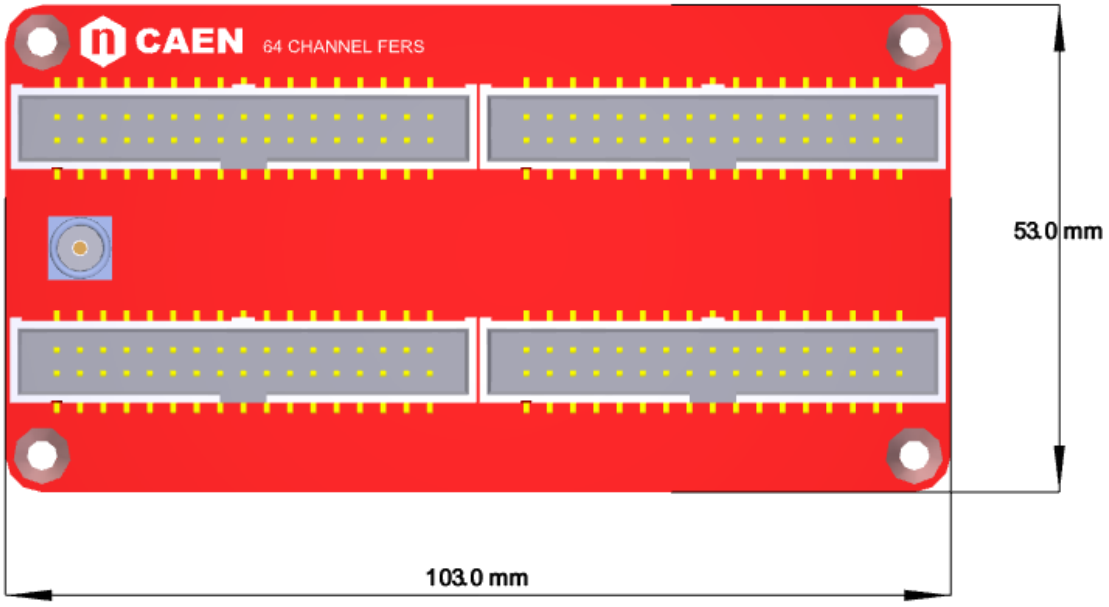


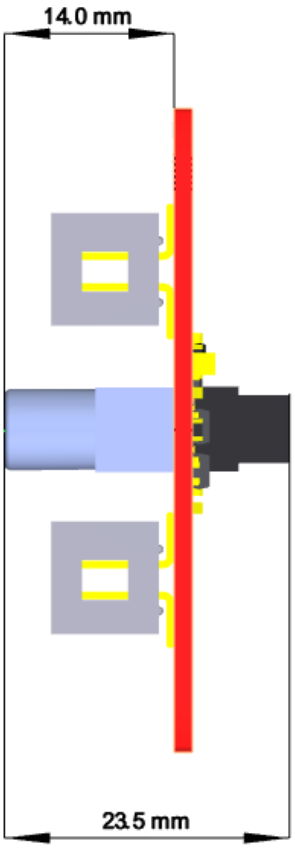
When using the LEMO 00 connector for **ch0** the **input impedance** is set to 50 Ω by default. If the user needs a high input impedance (~ 1MΩ), the S2 jumper should be unsoldered.

The A5255 adapter is configured for the **trigger propagation** by default. As to feed only CH0 with the input signal, with no trigger propagation, the S7 jumper should be unsoldered.

Pin 33 and pin 34 are used for VDD, ground signals, or they can be unused (by default). To select which signals to propagate via pin 33 and pin 34, the user should solder/unsolder the S8-S9 jumpers, shown in the figure below. In the example of the image, pin 33 (S8) is connected to ground, and pin 34 (S9) to the VDD of 3.3 V.

A5255 Overall Dimensions





A5256

The **A5256** is a 16+1 channel single threshold, or 8+1 channel dual threshold, **edge discriminator**. The LEMO 00 coaxial connectors accept both positive and negative analog pulses (selected by solder jumpers) as well as NIM or LVTTL logic signals thanks to ultra-fast comparators with programmable thresholds (DAC). A dedicated connector for the reference channel CH0 (Tref) is also available.

The dual threshold mode allows for a better pulse height reconstruction. The relationship between ToT and PHA depends on the pulse shape and must be calibrated.

The discriminators have been tested with fast signals (rising edge = 0.8 or 1.6 ns, amplitude = 0.5 Vpp), getting a timing resolution of ~7 ps RMS.

DUE TO THE HIGH-POWER CONSUMPTION, THE DISCRIMINATOR MUST BE PROPERLY VENTILATED

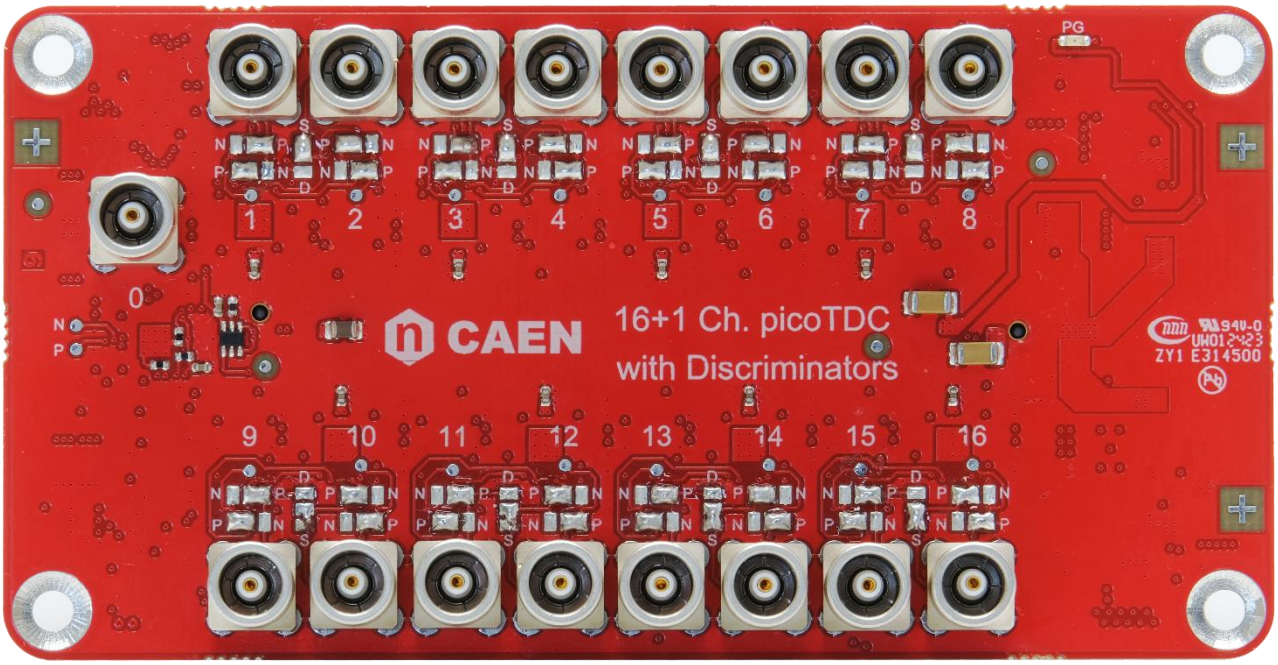
Technical Specifications		
Min. Input Voltage: - 4V **Max. Input Voltage:** + 3 V	**Threshold Range:** - 1.25 V/ + 1.25 V **Threshold Step:** 0.6 mV	**Non-Linearity:** N/A **Efficiency:** N/A

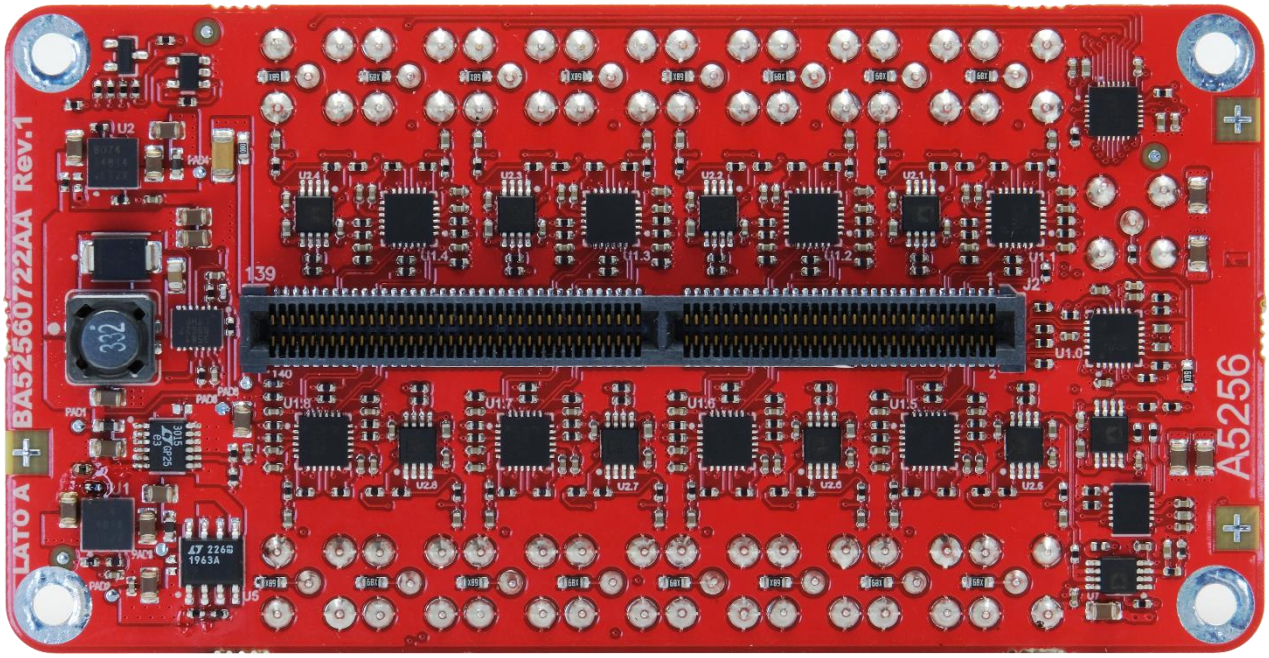
The A5256 is available on the market in two versions: one without flash memory mounted on the adapter (PCB Rev.1) and one mounting it (PCB Rev.2). In the former case, once the calibration of the channel's threshold offset is performed via the Janus 5203 software (refer to **UM9636 - Janus 5203 User Manual**), calibration values are saved on the memory of the A5203(B)/DT5203 unit connected to the adapter. In the latter case, calibration values are directly saved on the flash memory of the adapter. This implies that, when using an A5256 with PCB Rev.1, the calibration of the channel thresholds offset needs to be performed each time the A5256 is moved from one A5203(B)/DT5203 to another one. The same action is unnecessary in case of A5256 with PCB Rev. 2.

MAKE SURE TO INSTALL ON THE A5203(B)/DT5203 UNIT THE LATEST AVAILABLE FIRMWARE, AND USE THE LATEST JANUS 5203 SOFTWARE AS TO MAKE IT COMPATIBLE WITH THE A5256 PCB REV.2

See the A5256 User Manual (COMING SOON) for more details.

A5256 Views

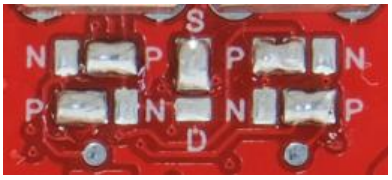

CAEN
16+1 Ch. picoTDC
with Discriminators
PG
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16


BA5256 0722AA Rev.1
A5256

A5256 Configuration

Single Threshold (S): 16 + 1 channels
Dual Threshold (D): 8 + 1 channels
In dual threshold mode, the inputs N (with N=1, 3, ... 15) feed the discriminator of the channels N and N+1 in parallel. It is therefore possible to have two discriminators with two independent thresholds for the same input signal. The inputs 2, 4, ... 16 are disconnected.
The **selection between single and dual threshold** is done by means of solder jumpers under the LEMO 00 connectors of the channels.

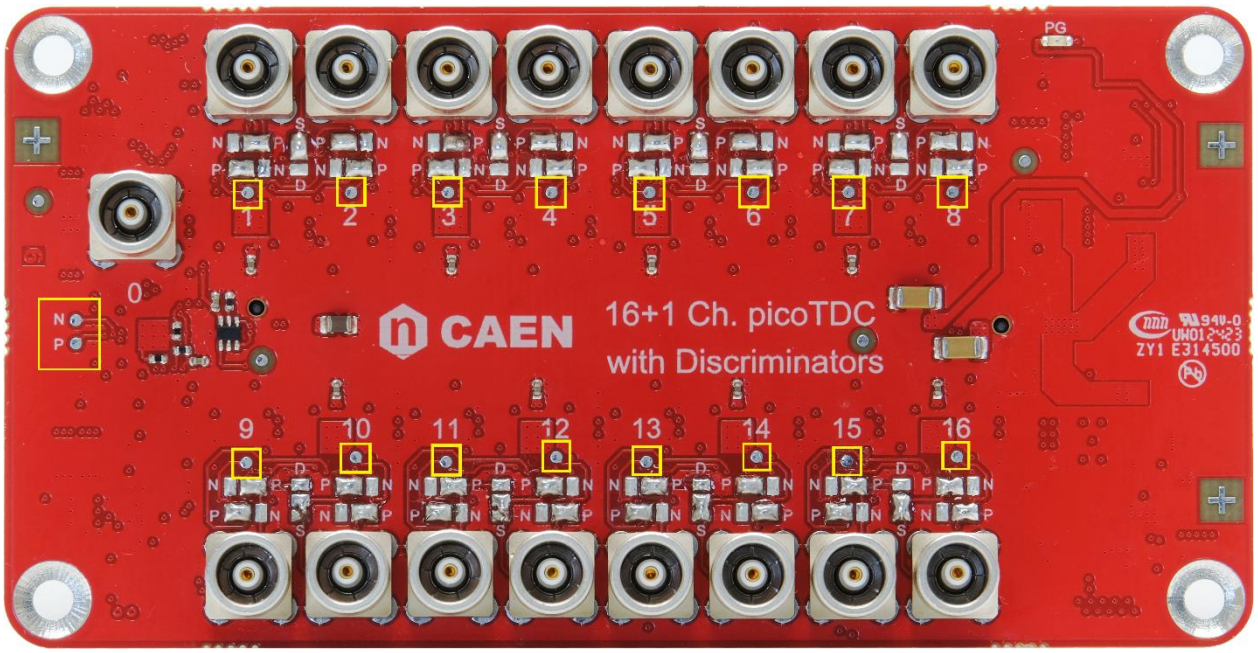
The **polarity of the discriminator** threshold can be set for each individual channel via solder jumpers too. Two jumpers are present for each channel, and both should be soldered to the same polarity.
The exception is Ch0, that is connected to two discriminators (one with positive and one with negative polarity) and for which the threshold polarity can be set via software.
The figure below shows an example of jumpers soldered for positive (P) polarity signals, and for the single (S) threshold configuration.



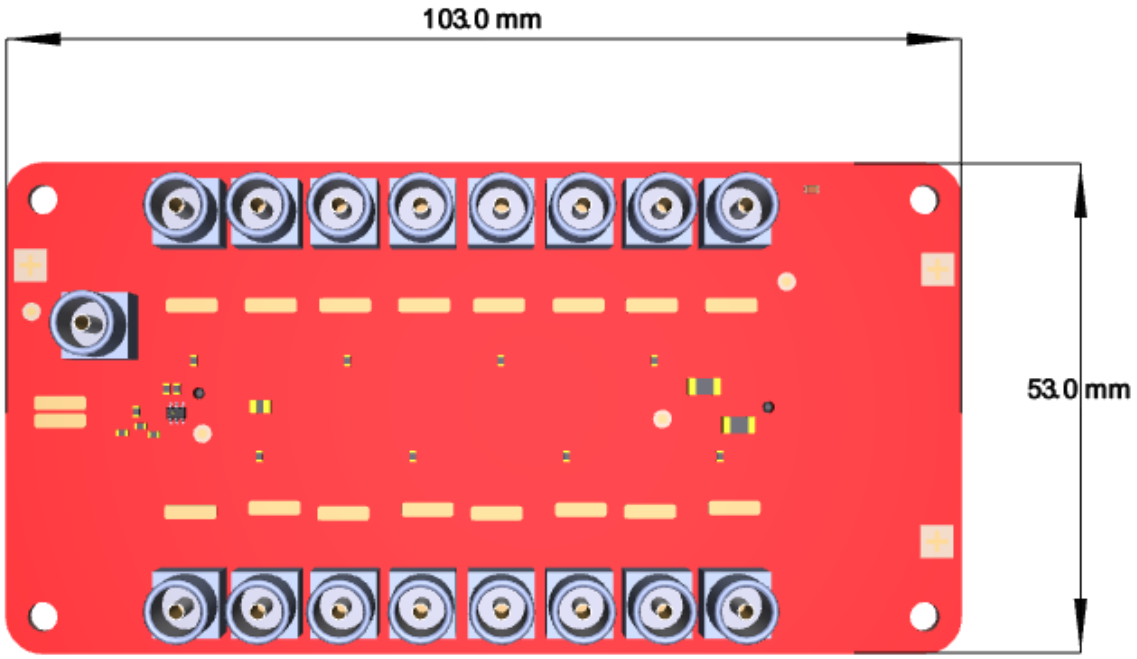
In case of double threshold configuration, the couple of jumpers under each channel are used for one discriminator. Two adjacent jumper couples must then be soldered to set the two thresholds polarity.

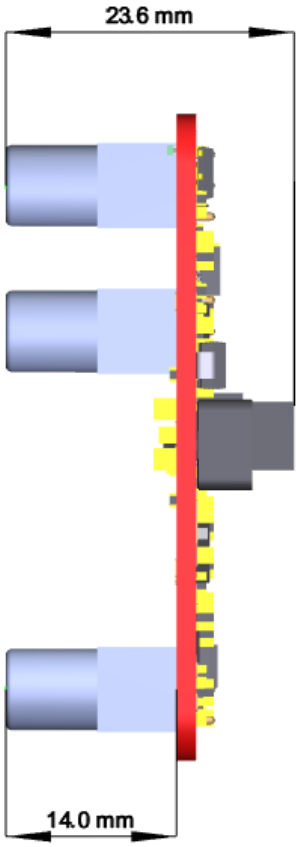
The **thresholds value** must be set via software. As to check the threshold levels, test points have been placed on the board. Two test points are provided for channel 0.

In the figure below, the test points have been marked with yellow squares.



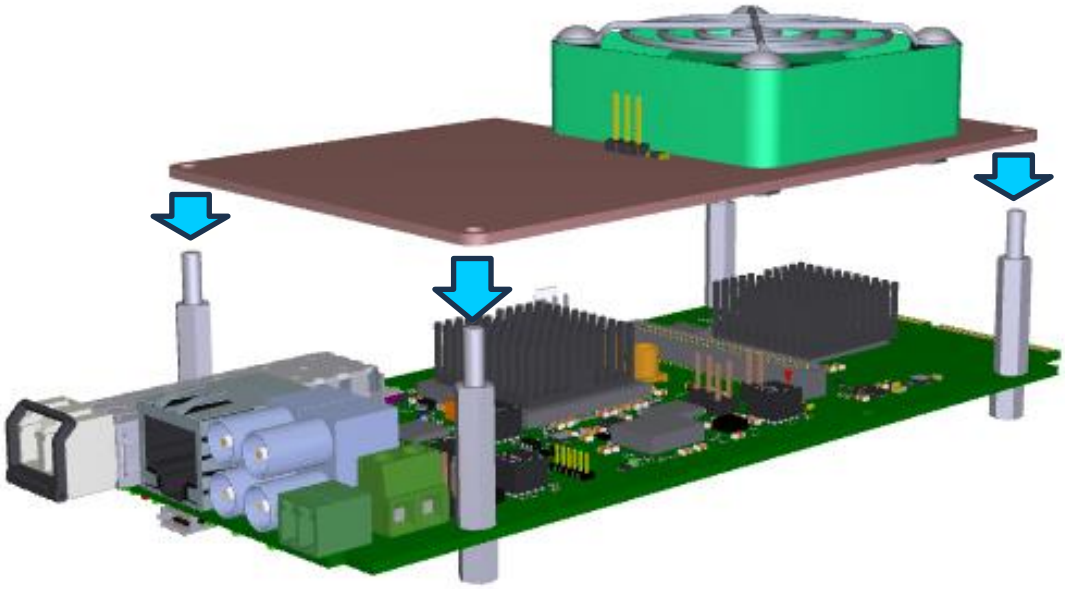
A5256 Overall Dimensions

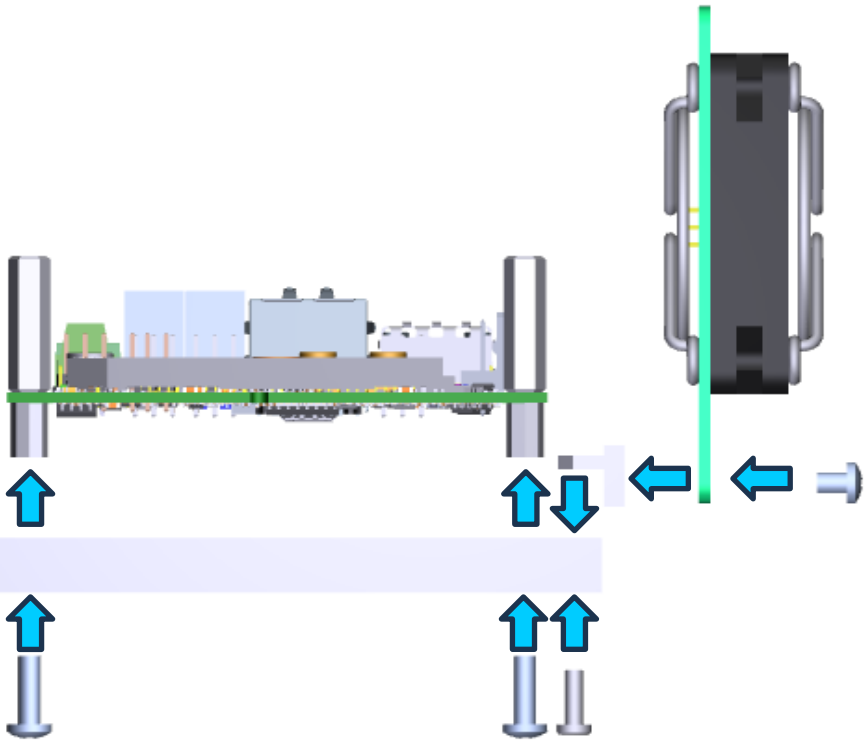


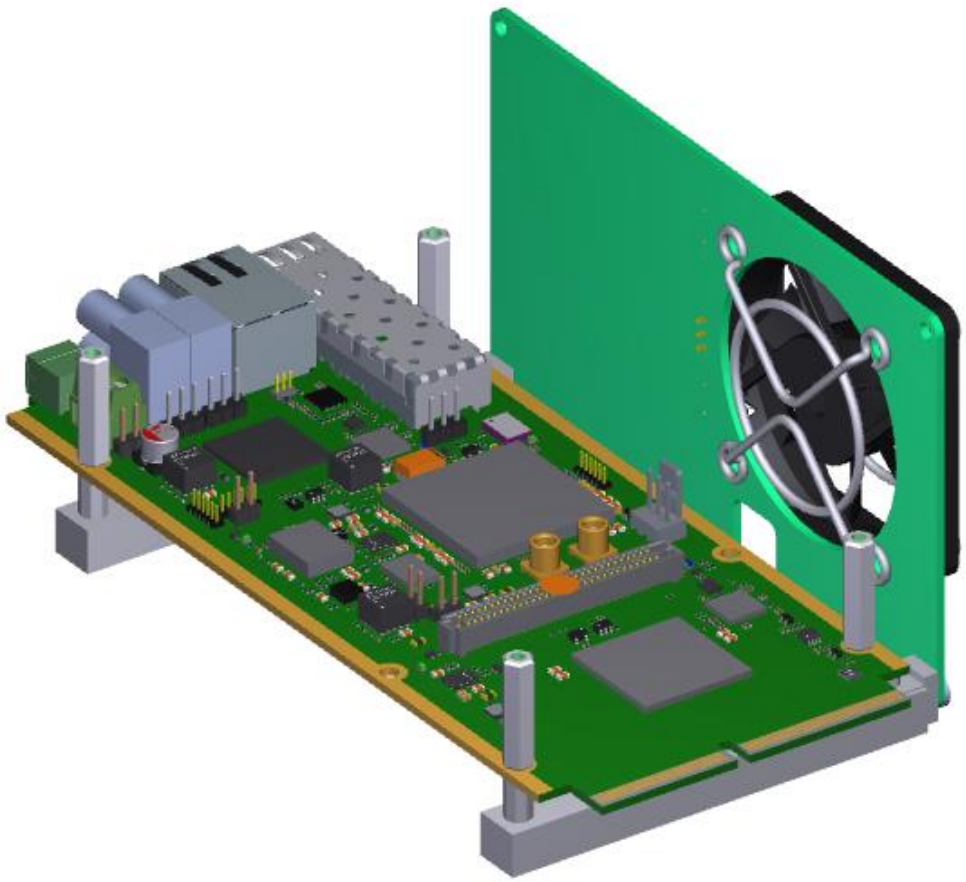


A5270

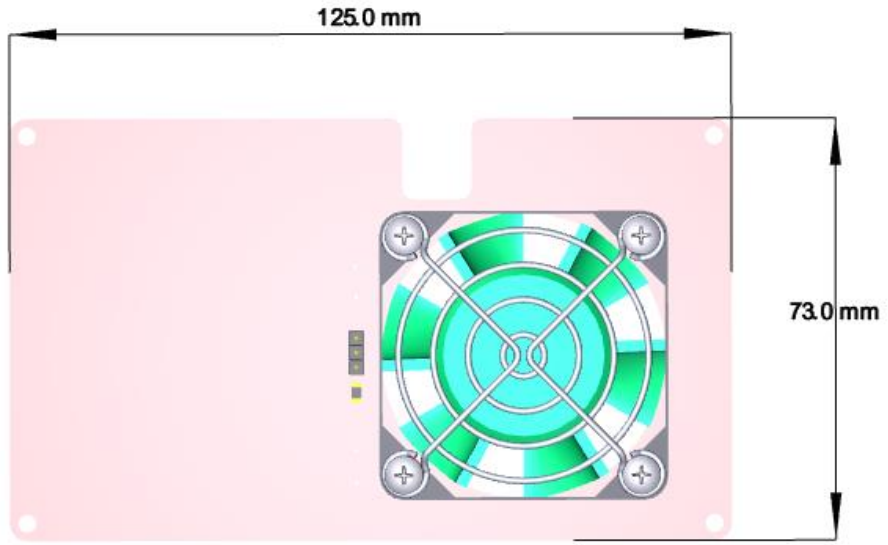
The **A5270** is a fan for the FERS-5200 system, to be mounted on the top or on the side of A5202 and A5203(B) boards. It is powered by the HV fan connector of A5202/A5203(B) units. The speed of the fan can be changed thanks to a jumper on the top of the board.

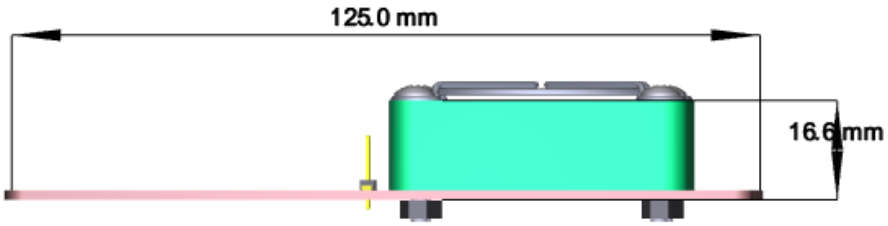






A5270 Overall Dimensions





Ordering Options

Ordering Code	Description
WA5255XAAAAA	A5255 – 17x2 pin 2.54 mm pitch Quad Connector for A5203/DT5203
WA5256XAAAAA	A5256 – 16+1 ch pos/neg Discriminator for A5203
WA5270FANXAA	A5270 - FERS cooling fan

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