

2-Channel Charge Amplifier
Low-Noise Variable-Gain with integrated ADC and Data Processing

Features

- Aluminum-Casing: 165 x 104 x 40 mm
- Pulse Response independent of Detector Capacitance (up to 20 nF)
- For Pulses up to 200 Hz Repetition Rate
- Gain can be individually set for each channel in 8 Steps from 1 V/nC to 3 V/pC
- Output of Data via galvanically isolated RS-232 Interface

Applications

- 2-Quadrant Photodiodes
- Ionization Cells
- 2-Point Power Monitoring with high Dynamic Range of Ratio

The A759-006 is a 2-channel low-noise charge amplifier with integrated 14-bit ADC. It offers variable gain, low noise and data conversion in a compact housing. The A759-006 is designed for pulsed charge signals with a repetition rate of 100 Hz. The 2 charge amplifiers are provided with pole-zero compensation.

They are synchronously sampled and digitized in respect to an external Trigger. Standard SMA inputs, BNC and serial D-Sub-9 outputs provide convenient connections. Pulses of both positive and negative value can be processed. A linear regulated power supply is available as an accessory.

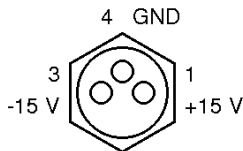
Characteristics	
Gain (individually controllable for both channels)	1 to 3,000 V/nC in 1-3-10 Steps
ADC Calibration Factor	10,000 Counts / Full Scale ± 1%
Unipolar resolution	13 Bit
Rise Time (10% to 90%)	120 µs
Input Charge Noise (with open input, gain 1 V/pC)	5 fC peak-peak typ.
Input Charge Noise (10 nF input capacitance, 1 V/pC)	20 fC peak-peak typ.
Input Voltage Noise (typ.)	5 nV/√Hz @ 1 kHz
Max. Input Charge (for linear amplification)	10 nC to 3.3 pC peak, depending on gain setting
Max. recommended Source Capacitance	20 nF (for linear amplification)
Non-Linearity	< 0.1%
Monitor Output Voltage Range	10 V _{peak} (>1 kΩ Load, both positive or negative pulses are possible)
Monitor Output Impedance	100 Ω

Characteristics	
Trigger Output Voltage	3.3 V CMOS Logic
Trigger Output Impedance	1 kΩ
Trigger Input	TTL compatible, optoisolated, recommended High Voltage 3 Vp min., Pulse Width 1 μs min.
Data Output	RS-232, optoisolated, 115200 Baud with 8N1, no handshake, female D-Sub-9 connector, Pin 2 TxD, Pin 3 RxD, Pin 5 Data Ground, all other are not connected.
Power Supply Voltage	± 15 V
Power Supply Current	+75 / -30 mA typ. (no signal)
Case	Anodized Aluminum
Weight	500 g
Storage Temperature	-20 .. +80 °C
Operating Temperature	10 .. 40 °C

All characteristics are for ±15 V power supply and 25 °C ambient temperature.

Absolute Maximum Ratings	
Input Voltage	±10 V
Power Supply Voltage	± 18 V

Connections	
Inputs Q1 and Q2	SMA Connector
Monitor Output	BNC Connector
Trigger Input, Trigger Output	BNC Connector
RS-232	D-Sub-9, female
Power Supply	M8 Connector Pin 1 = +15V Positive Supply Pin 3 = -15V Negative Supply Pin 4 = Ground



Functional Description

The A759-006 contains two independent and separately shielded analog charge amplifiers. By means of a four position select switch, the output of one of them can be monitored (position 0 is Q1, position 1 is Q2, 2 and 3 are not used).

A charge pulse at the input is transformed to an output pulse with its pulse height directly proportional to the input charge content, independent of input pulse length (for 500 ns to 20 μ s) or shape.

The peak of the two channels is simultaneous sampled and digitized. The input trigger pulse must be synchronous to the input charge pulse, to ensure sampling at the maximum of the output pulse. A polarity switch is provided to select the rising or falling edge of the trigger signal. The trigger output can be used to confirm correct timing. It is high during sampling of the output peak.

The peak is sampled 4 times and averaged. The pre-trigger baseline is sampled 16 times and also averaged. The output data is the difference between average of peak and baseline, so any DC drift is suppressed.

The result is transmitted as ASCII text via the galvanically isolated RS-232 serial interface.

For each input trigger pulse one line of text with following format is transmitted:

`Q1=SaaaaaXQ2=Sbbbbbb/cr/lf`

(/cr und /lf are for carriage return and line feed, X is a space, S is the sign and aaaaa and so on are the 5 digit decimal values of the respective conversion, the sign is a space for positive values and a minus for negative. Zero value has a space too.)

For example: `Q1= 00008 Q2=-03007`

The values are ADC-Counts, the maximum unipolar pulse at given gain (about 10 Vp at analog monitor output) resembles 10,000 counts. The amplifier is inverting, so positive charge gives negative numbers, and negative charge gives positive numbers.

The gain can be set at any time, sending following command to the interface:

`QaGb`

(a is 1 or 2 to indicate the channel to be set, b is from 1 to 8 to indicate the gain. The command has to be closed with either a carriage return or a line feed, small letters for q and g are possible too.)

For example: `q2g7/cr`

The amplifier answers `Set Gain Q1=a Q2=b/cr/lf` indicating the newly set gain state for each channel, if the command was recognized correctly, and with `Unknown Command : "xxx"/cr/lf` then there was a syntax error, with xxx echoing the incorrect command.

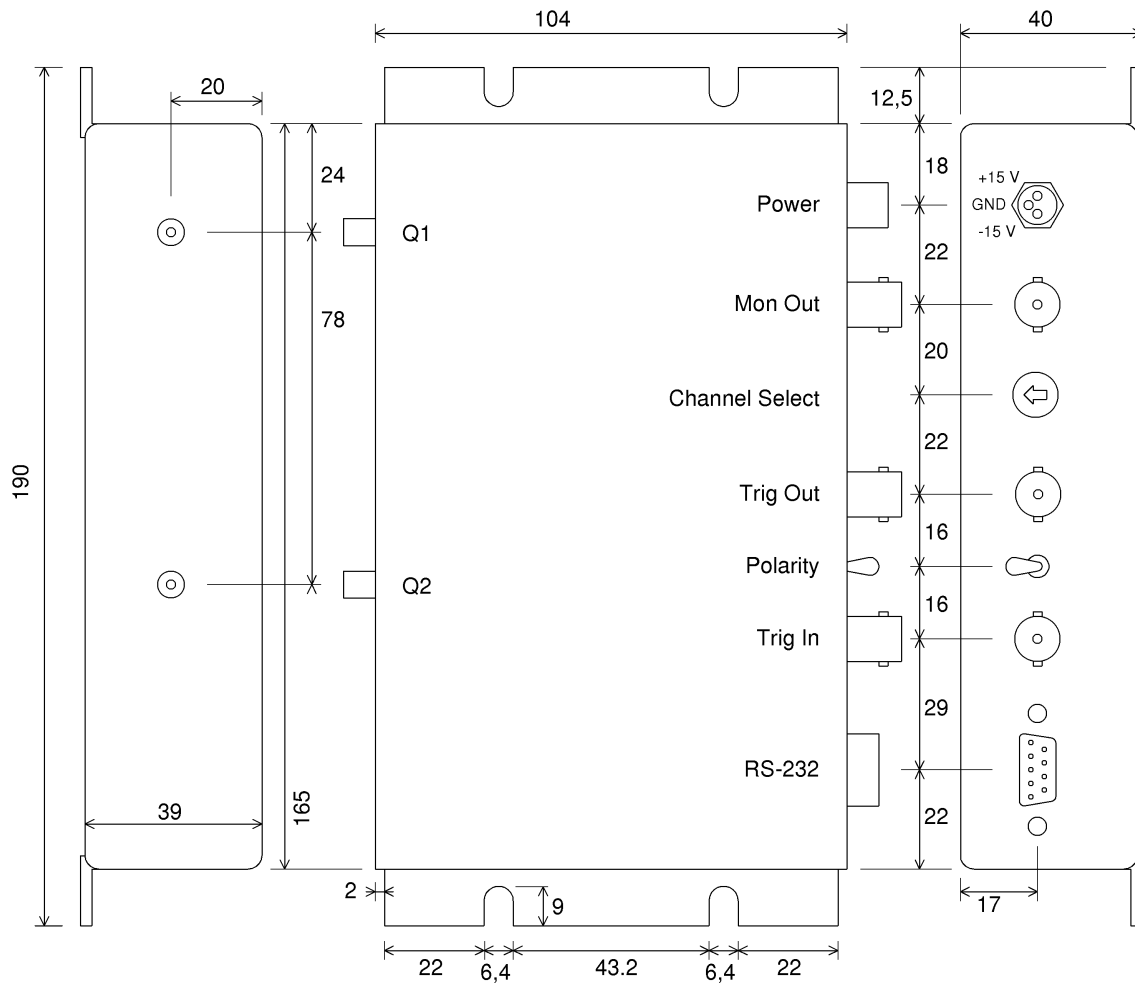
If both channels are to be set, two consecutive commands are necessary.

The 8 gain steps are as follows (first column is the number to be used in the command, the second the respective gain and the third is full scale charge resembling 10,000 counts):

1	1 V/nC	10 nC
2	3 V/nC	3.33 nC
3	10 V/nC	1 nC
4	30 V/nC	333 pC
5	100 V/nC	100 pC
6	300 V/nC	33.3 pC
7	1000 V/nC	10 pC
8	3000 V/nC	3.33 pC

On power up the amplifier sends a one-time message indicating the model number and firmware version.

Dimensions



A759-006 Dimensions are in mm

Power Supply is a female 3-pin industry standard M8-connector.