HF2TA
Current Amplifier

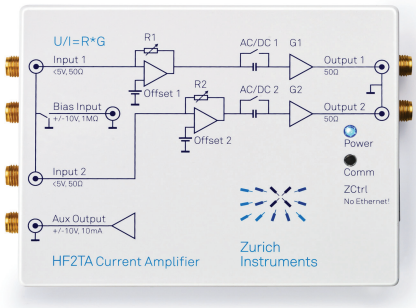
Zurich
Instruments

Transimpedance Current Amplifier

Product Specification
Release date: August 2014

Key Features

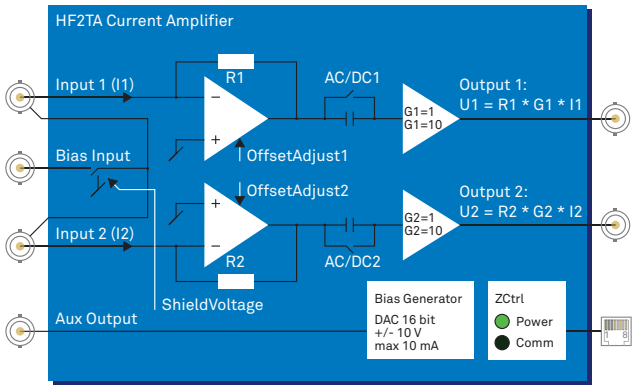
- 50 MHz operation range
- 2 independent amplification channels
- Wide range of precision transimpedance gain settings (100 V/A to 100 MV/A)
- Input offset voltage adjustment
- Extremely low noise and low input leakage
- Single interface connector to HF2 Instruments
- Handy product design



Summary

The HF2TA current amplifier converts 2 input currents to output voltages in a frequency range up to 50 MHz. This device is an active probe which can be conveniently placed close to the measurement setup. It supports most applications where a current must be converted to a voltage. The advanced design of the HF2TA ensures stability and a smooth operation over the entire frequency range.

The combination of this transimpedance current amplifier with the HF2 Instruments enables very high performance measurements and insensitivity to interference thanks to reduced parasitics.



Hardware

Transimpedance Architecture

Providing 2 input and 2 output connectors, the HF2TA features a transimpedance architecture with a variable precision resistor as the gain parameter (R). The transimpedance architecture matches the current through the feedback resistor and keeps the input at virtual ground.

The second amplification stage provides decoupling from the first stage and an additional gain (G). The resulting output voltage corresponds to U = R * G * I.

JFET Input Amplifier

The input of the HF2TA is constructed with JFET amplifiers which provide very low-noise over a wide frequency range. Additionally, the ultra-low input bias current of typically 2 pA allows for precise current measurements at small signal amplitudes.

Input Offset Adjust

To account for unbalanced circuitry inside the operation amplifiers and to cope with other external sources of voltage offset, the HF2TA provides a specific compensation feature with a very fine granularity. The user simply adjusts for a previously measured offset inside the graphical user interface of the HF2 Instrument.

Bias Input and Auxiliary Output

The Bias Input allows driving the signal shields with defined bias voltage. This can be used for instance to power a photo diode connected with one shielded cable for power and signal, avoiding ground loops.

The Aux Output provides a low-noise power source able to run an external sensor or detector. The maximum output power is 100 mW.

Single Connector to HF2 Instruments

The HF2TA fits to any HF2 Instrument with its single connector, providing both power supply and remote control. The HF2TA is automatically detected by the Instrument when it is connected and all settings can be controlled from the graphical user interface.

Current Amplifier Settings

Configurable settings include the transimpedance (R1, R2), the output voltage gain (G1, G2), the switch to control signal shield bias, the AC/DC coupling switch to suppress DC current offsets, the offset voltage compensation adjustment and the output bias voltage.

Example Applications

- Dynamic impedance measurement
- Static impedance measurement, 2-point and 4-point configuration

Specifications

General

dimensions	10.1 x 7.8 x 2.3 cm
weight	0.2 kg
storage temperature	-20°C to 65°C
operating temperature	5°C to 40°C
specification temperature	25°C
supply voltage ranges	-15 V to -12 V, 12 V to 15 V
supply current	100 mA (max)
connectors	3 SMA input female, 3 SMA output female, 1 ZCtrl (RJ45)

Frequency response

range with DC coupling	DC - 50 MHz
range with AC coupling	10 Hz - 50 MHz

Frequency response

small signal bandwidth	50 MHz (0.1 V_{pp}, 50 pF)
large signal bandwidth	40 MHz (1.0 V_{pp}, 50 pF)

Input

input current range	depends on R1, R2, G1, G2
input noise voltage	5 nV/√Hz (> 10 kHz)
input offset compensation range	±10 mV, 16 bit resolution
input leakage current	2 pA (typ), 20 pA (max)
input impedance (Z // 15 pF)	50 Ω - 70 kΩ
input bias voltage	±10 V

Output and gain

transimpedance gain R1, R2	100 V/A to 100 MV/A
gain accuracy	±1% (G=1)
output voltage gain G1, G2	1 (G=1) or 10 (G=10)
auxiliary output (digital to analog converter)	16-bit, ±10 V, 10 mA (max)

Gain dependent parameters (1)

Transimpedance gain (R1, R2)	Bandwidth (3dB cut-off)	Maximum input noise current	Input impedance
100 V/A	50 MHz	150 pA/√Hz	50 Ω
1 kV/A	50 MHz	15 pA/√Hz	50 Ω
10 kV/A	8 MHz	2 pA/√Hz	50 Ω
100 kV/A	1.5 MHz	500 fA/√Hz	100 Ω
1 MV/A	250 kHz	250 fA/√Hz	300 Ω
10 MV/A	25 kHz	100 fA/√Hz	1.6 kΩ
100 MV/A	12 kHz	50 fA/√Hz	70 kΩ

Gain dependent parameters (2)

Transimpedance gain (R1, R2)	Maximum input current (G1,G2=1)	Maximum input current (G1,G2=10)
100 V/A	±10 mA	±1 mA
1 kV/A	±1 mA	±0.1 mA
10 kV/A	±100 µA	±10 µA
100 kV/A	±10 µA	±1 µA
1 MV/A	±1 µA	±0.1 µA
10 MV/A	±100 nA	±10 nA
100 MV/A	±10 nA	±1 nA

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