TA2400

2.4GHz Fast Pulse / Timing Preamplifier

User Manual

Grünwalder Weg 28a, D-82041 Oberhaching
Germany

Version 1.6, November 2, 2016

Warranty

Equipment manufactured by FAST ComTec GmbH is warranteed against defects in materials and workmanship for a period of twelve months from date of shipment, provided that the equipment has been used in a proper manner as detailed in the instructions manuals. During the warranty period, repairs or replacement will be made to FAST ComTec's discretion on a return to factory basis. The transportation costs, including insurance to FAST ComTec is the responsibility of the customer except for defects discovered within 30 days after receipt of the equipment, where shiping expense will be paid by FAST ComTec.

The information in this manual describes the hardware and the software as accurately as possible, but is subject to change without notice.

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1. Description

The TA2400 is a fast preamplifier with a small signal bandwidth of 2.4 GHz.

A unique feature for such high speed amplifiers is the DC coupling. DC coupling avoids count rate effects due to non DC balanced pulse trains and the corresponding charging of coupling capacitors.

Basically the TA2400 is a non inverting, closed loop, voltage mode, operational amplifier design.

Input offset adjustment is provided. Please be aware that the offset adjustment is source impedance dependent. For a 50 Ω source impedance the input related adjustment range is approximately ±5 mV. For a high impedance source, e.g. a current mode driver, the range is approximately ±10 mV.

WARNING: The amplifier has no thermal shutdown. Thus, be careful when connecting the output to loads less than 50 Ohms (**do not shorten the output!**).

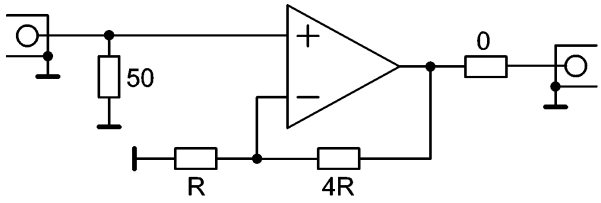

Fig. 1.1: Principle schematic

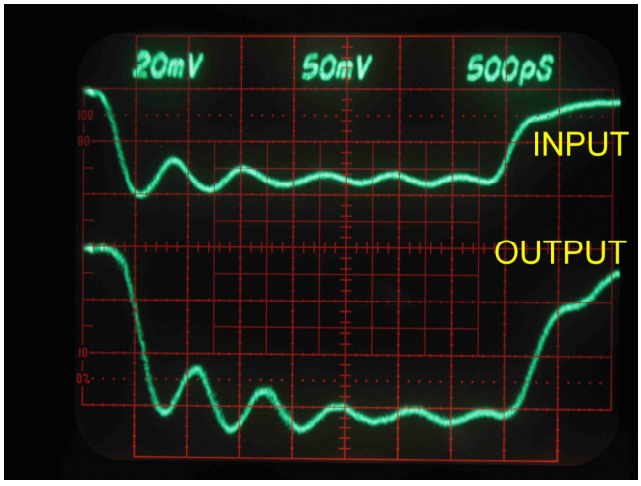

Fig. 1.2: Output pulseform (30 mV in, 150 mV out)

A test with a 30 mV_{PP} pulse and a FAST ComTec P7889 100 ps TOF analyzer showed an improvement of 10 … 15% in peak width (FWHM) when a TA1800 (1.8GHz / 20dB / x10) was used for amplification of the small pulse signal.

Applications for the TA2400 are:

- Pre-amp for ultra fast detectors (MCP, PMT, …)
- Oscilloscope and transient recorder pre-amp
- Photon-/Ion-counting
- Wideband signal processing

2. Specifications

2.1. Absolute maximum ratings

Supply:	(100 ms max.)	25 V
Signal input:		±1.8 V
		± 140 mA
Input clamping:	(1 schottky + 1 silicon diode drop)	approx. ± 700 … 900 mV
ESD rating:		3000 V HBM
		200 V MM

2.2. Technical data

Voltage gain:		non inverting, 14dB / x5
Input connector:		BNC, 50 Ohm, DC coupled
Output connector:		BNC, low impedance, DC coupled
		50 Ohm output feasible
Output voltage:		max. ±1.3 V
Output current:		max. ±150 mA
Bandwidth:	small signal (V_{OUT} = 200mV_{RMS})	2400 MHz
	full power (V_{OUT} = 2V_{PP})	875 MHz
Slew rate:	(2 V step)	5500 V/µs
Input offset voltage:		max. 5.25 mV
		typ. ±20 µV/°C
Input referred noise:		2.8 nV/√Hz
		3.2[1] µV_{RMS}
Noise figure:	(100MHz)	typ. 16 dB

[1] measured with a HP3455A true rms voltmeter (20 Hz ... 1 MHz)

2.3. Diagrams

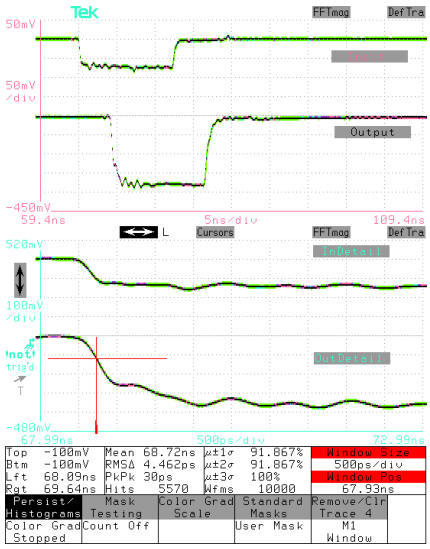

Fig. 2.1: Pulse response

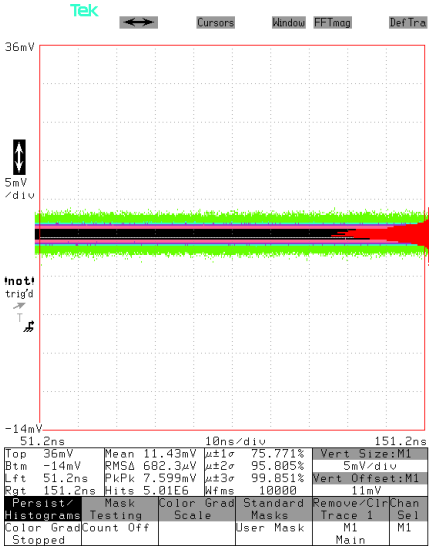

Fig. 2.2: Output noise, Zsource = 0Ω

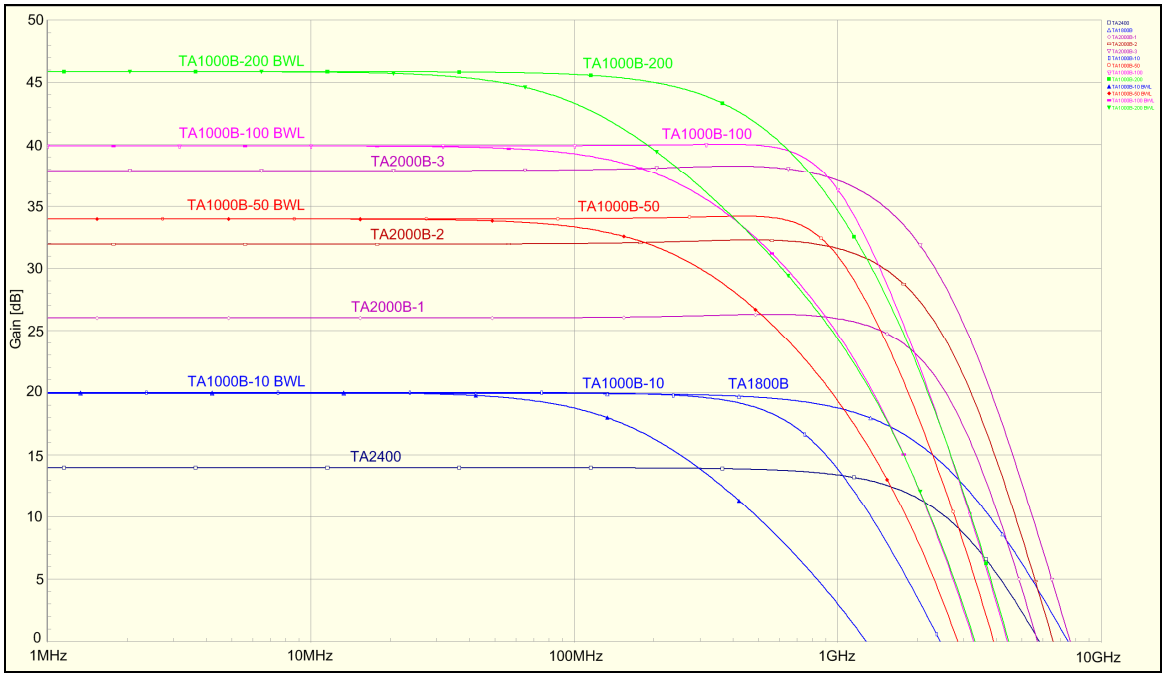

Fig. 2.3: Simulated voltage gain of all TAx amplifiers

2.4. Power requirements

Supply connectoer: .....2.1 mm center pin

Supply voltage: ..... nominal +12 V_{DC}
voltage range: .....+10 … +18 V_{DC}
..... false polarity protection

Supply power: ..... 2.5 W

2.5. Metal case

Case material: .....extruded aluminium sheath, Al Mg Si 0.5

Lid material: ..... die cast, GD-Al Si 12

Size: .....65/101 x 60 x 35 mm

Weight: .....124 g

2.6. Accessories

- External wall power supply (included)
- L-clips (order no. AB-WL) for wall-/screw-mounting (optional)

2.7. Available options

- **50 Ohm output impedance**
  This improves the output signal quality since reflections from the target device (oscilloscope, multichannel analyzer, etc.) are well terminated at the TA2400's output and do not travel many times back and force over the cable. Thus, distortion of a subsequent pulse is largely avoided.
  This option is particularly recommended when high pulse rates are expected.
  The drawback, of course, is a reduction in the receiving amplitude at the target device by a factor of 2. Or, in other words, the effective voltage gain into a 50Ω load is reduced by a factor of 2 (-6 dB).
- **Input AC coupling**
  An input AC coupling with 100nF can be ordered. This results in a lower frequency cut-off of approx. 32 kHz.