

The mesytec **MPR-LOG series** provides a new type of multichannel preamplifier modules which are specially designed for applications where very fast recovery from large signals and precise spectroscopy of very small signals is required. They will usually be used for silicon strip detector readout. A typical application is decay spectroscopy after implantation of a heavy ion into a silicon detector. The MPR series can best be combined with the mesytec MSCF-16 shaping-/timing filter/ discriminator module.

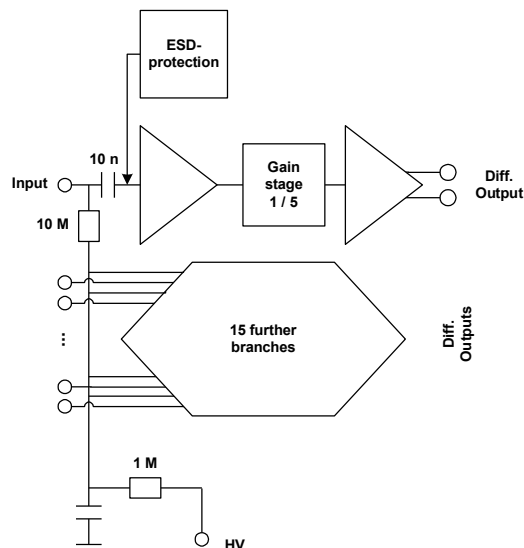
Features:

- 16 / 32 / 64 channel compact module
- Sensitivity switch, 2.5 / 10 MeV linear
- Recovers within 15 us from 3 GeV signals
- ESD input protection
- Differential output 100 Ω or MPR16L with Lemo output connectors
- Pulsar input
- Bias voltage up to ± 400 V
- PCB module available for in vacuum use



Schematics:

(for MPR-16)

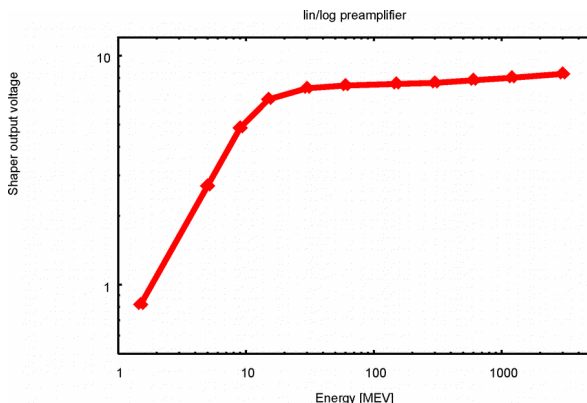


Technical Data

Energy ranges

The MPR-LOG series provides a linear range, which covers 70 % of the total range. The last 30 % cover the range of up to 3 GeV. A switch allows to choose a linear range of 2.5 MeV or 10 MeV.

With MSCF-16 the optimum gain setting (with gain jumper G2) is $G = 2.2$.



10 MeV lin range with 2us (FWHM) spectroscopy amplifier STM16+

Input stage

- Input connector(s): SubD25 female connector (for a 16 channel unit)
- Pin assignment:

Function	connector	Function	connector
Sig-gnd	1,2,7,12,13,14,15,25	Cha 9	19
Cha 1	11	Cha 10	6
Cha 2	23	Cha 11	18
Cha 3	10	Cha 12	5
Cha 4	22	Cha 13	17
Cha 5	9	Cha 14	4
Cha 6	21	Cha 15	16
Cha 7	8	Cha 16	3
Cha 8	20	guard ring	24

- Positive and negative charge can be amplified equally.
- The guard ring output (24) is connected via R-C-R filter (100 k Ω , 10 nF, 100 k Ω) to the common detector bias input.

Output stage

- Differential output for twisted pair 34 pin male header connector.
- Output amplitude: ± 1.3 V for maximum energy
- Pin assignment of output connector:
pin 1, 2 channel 1, pin 3, 4 channel 2.....
pin 33, 34 output ground

Rise and decay time

Standard decay times is 10 us.
Rise time is 12 ns for 0 pF input capacity.

Noise

$N = (6.5 + 0.06/pF)$ keV [FWHM] for 2 us FWHM shaping.

Temperature stability

As MPR-16-log is based on diode current - voltage relation, the gain is slightly temperature dependent. Temperature coefficient in 10 MeV range at 5 MeV signal is about $-3 \cdot 10^{-3}/K$. So a thermally stabilized environment or permanent pulsar calibration (i.e. 1 pulse per second) is required for best stability. Example: at environmental temperature variation of ± 1 K the gain will change by ± 0.3 %. After power up, wait for thermal equilibrium before performing precision measurements.

Pulsar input

The pulsar is internally distributed to individual charge termination capacities. Tolerances ± 10 %
Temperature stability 50 ppm.

MPR-16 log
0.78 pF (17 MeV/V)

Detector bias input

- Lemo connector
- Maximum voltage ± 400 V
- When connected detector side must be on ground level: terminate bias input with 50 Ω Lemo terminator.

Ground connections

- Ground screws on front and rear side
- There are two different ground connections: input and output ground.
- Input ground is connected to the vacuum vessel if the setup is not isolated (ie. isolated flange).
- In critical environment the output ground can be connected to the NIM electronics.

Power connector

SubD9 connector:

- 1, 2 = gnd
- 3 = +6 V
- 4 = +12 V
- 5 = -6 V

Pin out of on board power connector for PCB version

- gnd : 1,3,10,11,12
- +12 V : 7
- +6 V : 5
- -6 V : 9
- LED+ : 13 ("power ok" LED)
- LED- : 14

Power consumption for 16 channels

Parameter	MPR-16-LOG
+6 V	70 mA
-6 V	60 mA
+12 V	40 mA
total power HP-mode	1.3 W

Cooling

Due to the low power consumption cooling is not necessary.

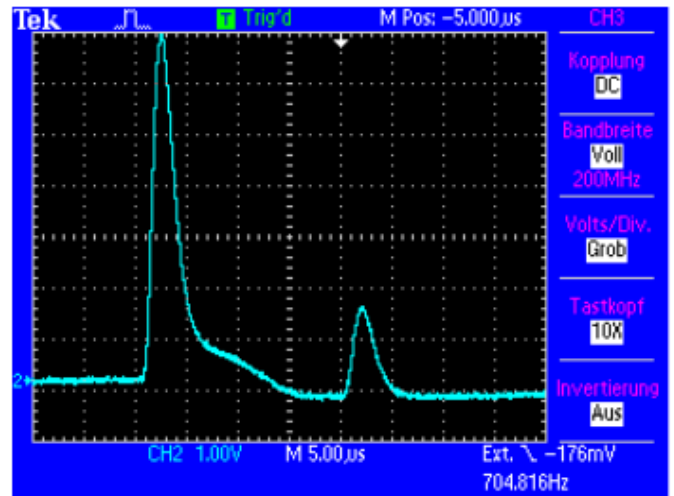
For **in vacuum use**: If several PCBs are densely packed, heat conducting metal shields should be placed in between the PCBs. Avoid to warm up silicon detectors by the dissipated power.

Dimensions

- Length : 173 mm (without connectors)
- Width : 105 mm
- Height : 46 mm (MPR-16),
67 mm (MPR-32),
92 mm (MPR-64)

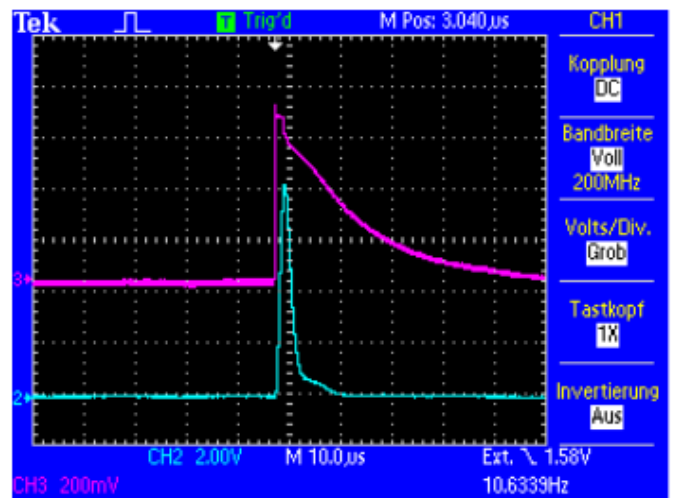
STM16+ Shaper output for implantation and decay signals

(10MeV-lin range)



TDS 2024 - 15:06:09 25.11.2005

Shaper for implantation with energy of 3 GeV followed by a decay signal of 2.5 MeV (The undershoot after implantation is artificial and due to the tail pulsar)



TDS 2024 - 14:32:20 25.11.2005

Implantation signal of 3 GeV. Red: preamplifier signal (before amplification of 2), blue: Shaper signal. (Realistic signal, created with square pulsar)