

ALPHA CPD

All in one Pulse Height Analyzer in
Charged Particle Detector spectrometer

Technical Specification

1. Power supply

Supply voltage – single +5V \pm 5% DC, 2A min low-noise voltage

Supply current – \leq 250mA typical

Power drain – \leq 1.25W typical

2. HV power supply characteristics

Positive polarity

100V max, 0.1mA max, 60V typical, adjusted for the detector needs

Low – noise, Short circuit protected

Output impedance – 10kohm

3. Charged particle detector

Passivated unsealed photodiode

Active area – 200mm²

Depleted region thickness – 0.3mm

Operating voltage – +60V

Dark current - \leq 3nA

4. Built –in charge preamplifier

Low-noise, low capacitance noise slope

Charge sensitivity – 43mV/MeV Si

Output pulse decay time constant – 1ms

Supply current – \leq 25mA

5. P/Z cancellation

Hardware differentiation (clipping) network – 6 μ s

P/Z cancellation by trimming potentiometer

P/Z cancellation test point – P/Z monitor

Digital clipping – automatic, no P/Z adjustment required when changing the peaking time.

6. Gain

Coarse gain – jumper selectable in 3 stages plus input attenuator

Attenuator – X1, X0.5, X0.33, X0.25, X0.1

Selectable stages – X1, X4

X1, X1.5

X1, X2, X3, X4

The total coarse gain is the product of the selected attenuation and the 3 stage gains

Digital gain – 15 equidistant gain values (0 to 15), software selectable

Gain 0 is equivalent to multiplication by 0 and is not to be used.

7. Digital shaper

Digitizing – 12 bit 40MSPS pipelined ADC, parallel interface

Main clock – 25 MHz

Shaping function – gated integrator

Peaking times – 1.32, 2.12, 2.92, 3.72, 4.52, 5.32, 6.12, 6.92, 7.72, 8.52, 9.32, 10.12, 10.92, 11.72, 12.52, and 13.32 us, software selectable

Peaking times including the flat top – 1.68, 2.48, 3.28, 4.08, 4.88, 5.68, 6.48, 7.28, 8.08, 8.88, 9.68, 10.48, 11.28, 12.08, 12.88, and 13.68 us

Digital Baseline Restorer – gated, included in negative digital feedback loop

Peak detection – software adjustable level through 16 thresholds (0 to 15)

Pile up rejecter – based on pulse shape inspection, threshold adjusted simultaneously with the peak detection threshold

Pulse pair resolution time – piled pulse amplitude dependent, 40 to 400 ns

Input Count Rate meter – very short separate digital shaper

Measurement time – 100ms

Started after each spectrum read operation

Result written in spectrum memory channel 2

8. Multichannel Analyzer (MCA)

On board spectrum memory

Number of channels – 8192

Channel depth – 2^{22} (4 194 304)

Differential nonlinearity – $\pm 1\%$

Integral nonlinearity – $\leq 0.05\%$

Timing block – real and live timers, dead time calculated by the software

Measurement time – 0.256 to 2 147 483 seconds for both live and real time

Set through software in 0.256s steps

Timing clock accuracy – 40ns

9. Additional utilities

On board digital pulser – software turned on and off

“On” – set D5 to a value above | 1.25V |

“Off” – set D5 below | 1.25V |

12 bit digitally synthesized exponential pulse of 6us decay time constant

Pulser repetition rate – 764 cps

Pulser amplitude – depends on the digital gain set, the pulser line appears in the lower energy part of the spectrum

Digital storage oscilloscope (DSO) – monitoring the digitally shaped pulses

DSO display – software selectable
X-axis – 40ns/division, 1024 divisions
Y-axis – 2^{13} maximum (8192)
Single shot or continues operation

10. Host Computer Interface

Interface – USB 2.0 full speed
D2XX driver allows for direct access to the DPP
ID info – in the USB PROM
Several devices can be controlled through a single PC

11. Working temperature range

-10 to + 42 °C ambient temperature
Temperature stability ≤ 50 ppm/°C

12. Mechanical

Compact aluminum housing
Dimensions – Width X Height X Length = 105 X 65 X 165 mm
Weight – 450 g