



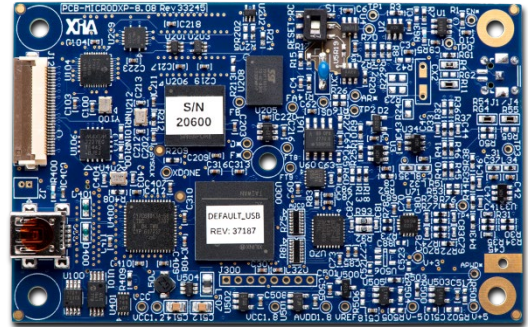
Instruments That Advance The Art

# microDXP

## Low Power Signal Processor for Portable and OEM Applications

### FEATURES

- **Digitization:** 14 bits at 40 MSPS or 80 MSPS.
- **Peaking Time range:** 0.1 to 24  $\mu$ s at 40 MSPS.
- **25.5 dB Variable Analog Gain range and +/- 6 dB Digital Fine Gain adjustment.**
- **USB 2.0 and RS-232 communications + customizable user digital I/O.**
- **Complete instrument control via XIA's ProSpect software and Handel drivers.**



Actual size 2.125 x 3.375 inches

### OVERVIEW

The microDXP is a complete, low power digital pulse processor the size of a credit card. It includes both spectroscopy amplifier and MCA functions, and is intended for both handheld and embedded table-top applications. Digital filtering is implemented in a field programmable gate array (FPGA). A digital signal processor (DSP) controls the MCA and on-board memory, and a PIC processor operates as a boot manager and RS232 interface. Additional high-speed serial, parallel and auxiliary digital I/O allow for myriad communication interface implementations, e.g., USB 2.0. All operating firmware is stored in non-volatile memory and is factory preloaded but can also be upgraded in the field. To minimize OEM costs, many card features are optional. XIA would be pleased to discuss hardware and firmware customization on an NRE basis.

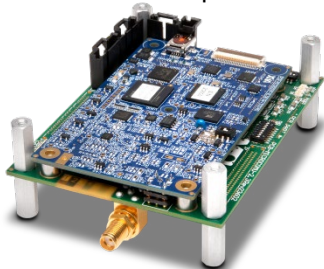
### SUPPORTED DETECTORS AND PREAMPLIFIERS

**Preamplifiers:** Reset and RC-feedback preamplifiers of almost any gain, up to  $\pm 4$  V range w/o attenuation; larger ranges with input attenuation. Option for direct input from PMT or SiPM.

**Detector types:** SDD, PIN diode, CdTe, CZT, NaI(Tl), CsI(Tl), SrI<sub>2</sub>(Eu), LaBr<sub>3</sub>(Ce), CLYC, CLLBC, proportional counters, surface barrier detectors, and liquid Xenon detectors.

### DEVELOPMENT KIT

The microDXP USB 2.0 / RS232 development kit enables rapid design of systems incorporating the microDXP. The kit includes the microComU interface circuit board that routes power and communication signals to the microDXP, and is designed for both development and OEM implementation.



### APPLICATIONS

- **X-ray Spectroscopy:** Hand-held, table-top, and embedded process control.
- **Gamma-ray Spectroscopy:** Low cost gamma-ray spectrometer for portable or dedicated applications.
- **Scintillation Detectors:** Scintillator/photodiode and scintillator/photomultiplier combinations.
- **Neutron / Gamma Discrimination:** Particle ID with CsI or other detectors.

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## SPECIFICATIONS

### ADC

- The microDXP's speed and power consumption are set by the digitizing rate of the 14-bit ADC.
- The standard digitizing rate is 40 MSPS.
- An 80 MSPS version is also available.

### Spectroscopy Amplifier

- All settings are digitally controlled, including gain, peaking time and other filtering and pile-up inspection parameters.
- **Peaking Time Range:** 100 ns to 24  $\mu$ s with standard 40 MSPS ADC: 50 ns to 12  $\mu$ s with 80 MSPS ADC.
- **Gain:** Two analog gain options are available, combined with a digital fine gain adjustment of  $\pm$  6dB:
- **Variable Gain (default):** Switched variable gain with a 25.5 dB range to match the detector and preamp type.
- **Fixed Gain (optional):** Factory set using precision resistors to match specific detector and preamplifier type. (Lower power consumption and cost).

### MCA

- **Spectrum size:** Up to 8K channels, 24 bits deep.
- **Statistics:** Input counts detected, output counts to the spectrum, live time and real time.
- **Run Control:** Automatic run termination according to configurable user presets.

### Communications

- **Primary:** RS232 serial port operates at up to 921 kBaud (80 kBytes/s: 40 ms to transfer 1k spectrum at 3 Bytes per channel). USB 2.0 operates at 10 MBytes/s.
- **Secondary:** Customizable serial and parallel ports can be used to communicate with embedded hardware.
- **Auxiliary I/O:** Real-time GATE input, I<sup>2</sup>C, and four general purpose digital I/O lines.

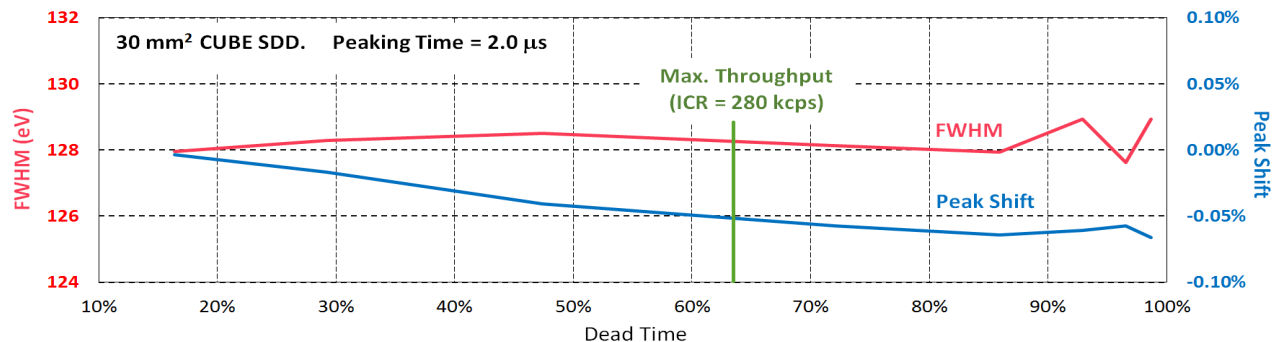
### Power

- **Power Consumption:** Depends on clock speed and installed options. Approx 750 mW with 40MSPS and variable gain.
- **Digital:** +3.3V @ 150 mA (300 mA peak).
- **Analog Option 1:**  $\pm$  5.0V @ 50 mA clean supply.
- **Analog Option 2:**  $>\pm$  5.25V @ 50 mA dirty supply to feed onboard linear regulators.

### Non-Volatile Memory

- A distinguishing feature of the microDXP is its onboard non-volatile memory. All operating firmware is factory pre-loaded but can also be upgraded in the field. Additionally, all settings are saved in arrays that can be stored and retrieved on both a per-peaking time and per MCA-configuration basis.

## SAMPLE PERFORMANCE



## SOFTWARE

XIA provides ProSpect, a software package that controls all microDXP settings and acquires MCA and diagnostic data, and Handel, a comprehensive set of C libraries that simplifies integration of the microDXP into the customer's embedded applications.

## NRE CUSTOMIZATION

The onboard DSP can make spectral calculations in real time and control external equipment based on results. These functions may be simple (sound an alarm if the ratio of two peaks falls outside an allowed range); complex (estimate the weight % gold in a sample); high speed (separate copper from ferrous scraps with 25 ms sampling times or output a dead-time corrected TTL pulse stream representing ROI counts in real time); or power saving (various sleep modes after specific times). XIA will be pleased to quote NRE costs for developing such special purpose microDXP code.

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