EMX-6050

“SMART” HIGH-SPEED DIGITIZER

FEATURES

System Level Functionality
- FPGA-based Synthetic Instrument Customization
- Corporate Wide Cloud Data Management / Access
- Comprehensive Runtime Health Monitoring
- Run-time Self-calibration / Embedded NIST Calibration
- Precision Distributed Measurement Synchronization
- Data Streaming at Full Acquisition Rates on All Channels

Analog Performance
- 10 MSa/s/channel, 16-Bit ADC, 8-Channel
- True Differential Inputs, -80 dB CMRR
- -32 dB Anti-alias Response, 5 MHz Bandwidth
- 0.05 dB Passband Flatness to 1 MHz
- -104 dB Spurious Free Dynamic Range
- Auto-ranging ±500 mV to ±60 V Inputs

Software
- EXLab
- VTIcoda
- Open Source Drivers

APPLICATIONS

General Purpose ATE
Multichannel Transient Analysis
Avionics Test
Aerospace Test
Medical Device Test
System-level Functionality

FPGA-based synthetic instrument customization extends traditional hardware performance by combining nearly unlimited user-defined computational, processing, and control possibilities to deliver unmatched measurement performance and flexibility.

- Maximizes hardware performance and measurement flexibility
- Supports custom intellectual property algorithm implementation
- Closed loop multi-module control and data transfer optimization
- Simultaneous parallel channel data decimation and manipulation
- User-defined filters, data manipulation, and analysis on-board the instrument

Industry standard Matlab® and Simulink® design tools simplify implementation, maximize re-usability, and provide access to hundreds of standard filters and analysis algorithms.

Corporate wide cloud data management delivers advanced data access, security and storage services throughout the organization, accessible from web browsers and other applications, on desktop and mobile devices.

- Simplified, next generation user data services
- Corporate wide data access and security
- Dynamically scalable data management services
- Accessible on a wide range of traditional and mobile devices
- Eliminates need for knowledge of the physical location or configuration of the system

Comprehensive runtime health monitoring (BIST: Built-in Self-test) provides test system confidence and peace of mind by ensuring that the complete instrumentation measurement path is functional and delivering the most accurate results possible.

- Ensures runtime instrument performance and accuracy
- Performed without disconnecting external transducer cabling
- Delivers exceptional run-time convenience and measurement confidence
- Instrument performance is verified utilizing precision internal voltage references

Runtime self-calibration ensures that instruments deliver the most accurate results possible by compensating for ambient temperature fluctuations, without the need to disconnect field wiring.

- Maximizes measurement accuracy
- Performed across the entire measurement path
- Precision internal voltage sources validate and adjust coefficients
- Eliminating inaccuracies generated by internal circuitry temperature gradients / component aging
System-level Functionality

Embedded NIST traceable calibration eliminates lengthy test system down-time, simplifies calibration processes, and reduces spare equipment requirements.

- Maximizes facility up-time and utilization
- Completely automated embedded process
- Supports multiple portable calibration standards
- Performed in-place without removing instrumentation

Precision distributed measurement synchronization ensures that all test data is time correlated whether the instrumentation is centrally located in the laboratory or distributed around a test article.

- Enables widely distributed system level performance
- Utilizes embedded IEEE 1588 precision time protocol
- Precise synchronization across multiple instrumentation modules and chassis
- Synchronization achieved over-the-wire (Ethernet), with complete user transparency

Analog Performance

The EMX-6010 Pyroshock / Transient High-speed Digitizer combines best-in-class analog design methodology with advanced synthetic instrument customization capabilities to deliver industry leading measurement accuracy. This instrument is ideal for a wide range of challenging applications including pyroshock, classical shock, impact and transient analysis, as well as general purpose high-speed digitization and signal analysis.

10M Sample / second /channel data rates and a 5 MHz Bandwidth ensures that the response generated from a structure exposed to an explosion or impact, resulting in high-frequency and high-magnitude stress waves propagating throughout the structure, is accurately and reliably captured.

- Best-in-class mid-field performance
- Aggressive 5 MHz bandwidth implementation
- Flexible triggering and event detection capabilities
- Extensive analog and user defined digital filter combinations
Analog Performance

True differential inputs deliver superior common mode performance (CMRR of -80 dB) reducing unwanted noise and interference, due to differences in ground potentials, far beyond levels capable with other implementation approaches. While the 16-bit analog-to-digital converter (ADC) technology delivers exceptional signal resolution, especially when combined with multiple input ranges.

- Exceptional noise immunity
- Exclusive balanced AC coupling implementation
- Highest quality instrumentation grade SAR ADC’s outperform commonly used communications grade pipelined ADC’s

Aggressive -32 dB anti-aliasing filter response (user selectable / definable analog and digital filter combinations) coupled with 0.05 dB passband flatness eliminates power spectrum of unwanted signals that contribute to measurement errors, common in pyroshock applications, delivering unmatched measurement fidelity and confidence.

- Best-in-class bandwidth performance
- 0.05 dB passband flatness to bandwidth of 5 MHz
- Ensures unwanted signal artifacts are greatly attenuated

Industry leading -104 dB spurious free dynamic range (SFDR) is a key measure of the superior measurement fidelity provided by this instrument, thus ensuring that the strength ratio of the fundamental signal of interest to the strongest spurious signal is exceptional.

- Best-in-class -104 dB SFDR
- Essential performance metric for accurate frequency domain measurements
- Essential for frequency domain performance where distortion typically increases with frequency

Auto-ranging ±500 mV to ±60 V inputs maximize signal resolution by automatically selecting the correct input range for the signal. Software selectable, this function can be used during setup and configuration to identify the most appropriate gain level.

- Flexible gain choices - (8) ranges
- ±60 V inputs for high level signals
- Ability to maximize resolution based on the transducer and signal type
Software

**EXLab** is an easy to use, turn-key, data acquisition solution featuring intelligent configuration capabilities, automatic device discovery, extensive time and frequency domain data visualization, and post-acquisition display and analysis tools.

- Intuitive setup and control
- Remote client monitor and control
- Advanced filtering, analysis, and modeling
- Waterfall, video, images, scatter, 3D model and SRS diagrams

**SO Analyzer** delivers comprehensive, intuitive, DSA support for modal, shock, rotating machinery, and acoustics test in a single environment featuring real-time FFT acquisition, analysis and reporting with import/export, time history recording, and off-line post processing.

- Guided impact, geometry and ODS
- Stepped sine on-line analysis wizard
- Shock response post processing analysis
- Acoustic intensity measurement and analysis wizard

**Open Source**, industry standard, drivers and programming interfaces provide the flexibility and freedom of choice to select the application programming environment best suited for the application and specific development requirements.

- Support for all major programming environments
- Software interoperability, maintainability, and reusability
- Common development environment and interface across all instrumentation types
**EMX-6050 “SMART” HIGH-SPEED DIGITIZER**

### General Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNUMBER OF CHANNELS</td>
<td>8</td>
</tr>
<tr>
<td>INPUT CONNECTORS</td>
<td>SMB</td>
</tr>
<tr>
<td>COUPLING</td>
<td>AC / DC / Gnd</td>
</tr>
<tr>
<td>AMPLITUDE RESOLUTION</td>
<td>16-Bits</td>
</tr>
<tr>
<td>INPUT TYPE</td>
<td>Fully Differential</td>
</tr>
<tr>
<td>FREQUENCY SAMPLING RATE</td>
<td>User programmable</td>
</tr>
<tr>
<td></td>
<td>Maximum 10 MSa/s, Minimum 2 Sa/s</td>
</tr>
<tr>
<td></td>
<td>Decimate by 5 and 2 filters provide lower sample rate settings</td>
</tr>
<tr>
<td></td>
<td>External sampling allows continuous settings from 10 MSa/s</td>
</tr>
<tr>
<td></td>
<td>Flexible PLL sample rate configuration</td>
</tr>
<tr>
<td>FREQUENCY BANDWIDTH</td>
<td>DC to 5 MHz (DC coupled) 1Hz to 5MHz (AC Coupled)</td>
</tr>
<tr>
<td>FULL POWER BANDWIDTH</td>
<td>5MHz</td>
</tr>
</tbody>
</table>

![Graph showing V(outm) vs frequency](image)
### Mechanical Specifications

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Amplitude Flatness</strong></td>
<td>±0.002 dB @ 20 kHz</td>
</tr>
<tr>
<td></td>
<td>&lt; -0.5 dB @ 4 MHz</td>
</tr>
<tr>
<td></td>
<td>&lt; -3.0 dB @ 5 MHz</td>
</tr>
<tr>
<td></td>
<td>&lt; -32 dB (typical)</td>
</tr>
<tr>
<td><strong>Aliased Response</strong></td>
<td>5-Pole linear phase Butterworth</td>
</tr>
<tr>
<td><strong>5 dB at 5 MHz</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Analog Anti-Alias Filter</strong></td>
<td>Complete programmable</td>
</tr>
<tr>
<td><strong>Digital Anti-Alias Filter</strong></td>
<td>±0.05% Reading ±0.05% Range (typical)</td>
</tr>
<tr>
<td><strong>DC Accuracy</strong></td>
<td>±0.5V, ±1V, ±2V, ±4V, ±8V, ±16V, ±32V, ±60V</td>
</tr>
<tr>
<td><strong>Ranges (V)</strong></td>
<td>Differential 1 MΩ nominal</td>
</tr>
<tr>
<td><strong>Input Impedance</strong></td>
<td>Either side-to-chassis 1 MΩ, 35 pF nominal</td>
</tr>
<tr>
<td><strong>Over-Voltage Protection</strong></td>
<td>±100 V pk</td>
</tr>
<tr>
<td><strong>Common Mode Rejection Ratio</strong></td>
<td>80 dB (typical)</td>
</tr>
<tr>
<td><strong>Amplitude Accuracy at 1 kHz</strong></td>
<td>DC coupled, DC to 1 kHz &gt; 70 dB</td>
</tr>
<tr>
<td></td>
<td>AC coupled, 10 Hz to 1 kHz &gt; 60 dB</td>
</tr>
<tr>
<td></td>
<td>1 kHz, ±20 Vp side-to-chassis</td>
</tr>
<tr>
<td></td>
<td>±0.006 dB</td>
</tr>
<tr>
<td><strong>Spurious Free Dynamic Range</strong></td>
<td>±0.005 dB up to 1 MHz</td>
</tr>
<tr>
<td><strong>THD</strong></td>
<td>Applies to any EMX-6050 module in the same mainframe</td>
</tr>
<tr>
<td><strong>Noise</strong></td>
<td>±0.0002° at 1 kHz DC coupled</td>
</tr>
<tr>
<td><strong>Crosstalk</strong></td>
<td>-104 dBfs (typical) (includes spurs, harmonic distortion, intermodulation distortion, alias products)</td>
</tr>
<tr>
<td><strong>Trigger Sources</strong></td>
<td>&lt; -100 dB, 20 Hz to 100 kHz</td>
</tr>
<tr>
<td><strong>Trigger Modes</strong></td>
<td>&lt; -86 dB, 20 Hz to 1 MHz</td>
</tr>
<tr>
<td><strong>Built-In Self-Test (BIST)</strong></td>
<td>20 nV / sqrt (Hz) on 4V and 60V ranges</td>
</tr>
<tr>
<td><strong>Trigger Sources</strong></td>
<td>&lt; -85 dB (typical) at 10 kHz</td>
</tr>
<tr>
<td><strong>External (front panel SMB), PXIe, LXI, software, timer</strong></td>
<td>Input (level / edge), external (front panel SMB), PXIe, LXI, software, timer</td>
</tr>
<tr>
<td><strong>Trigger Modes</strong></td>
<td>Pre, Post, and Timestamp trigger event</td>
</tr>
<tr>
<td><strong>Embedded Health Monitoring</strong></td>
<td>Internal temperature</td>
</tr>
<tr>
<td><strong>Yes</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Built-In Self-Calibration</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Embedded NIST Traceable Calibration</strong></td>
<td>Mathworks (MATLAB® and Simulink®) development environment</td>
</tr>
<tr>
<td><strong>FPGA Customization</strong></td>
<td>256 MB (option to 1 GB)</td>
</tr>
<tr>
<td><strong>IEEE 1588 Clock Specifications</strong></td>
<td>±50 ppm</td>
</tr>
<tr>
<td><strong>Clock Oscillator Accuracy</strong></td>
<td>Reports “synchronized” when &lt; ±100 ns of the 1588 master clock</td>
</tr>
<tr>
<td><strong>Synchronization Accuracy</strong></td>
<td>As good as time synchronization down to 50 ns</td>
</tr>
<tr>
<td><strong>Timestamp Accuracy</strong></td>
<td>25 ns</td>
</tr>
<tr>
<td><strong>Resolution</strong></td>
<td>5 to 55Hz Resonance Search per MIL-PRF-2880F Class 3, each Axis</td>
</tr>
<tr>
<td><strong>Class 3</strong></td>
<td>30g/Axis, 11mS half Sine pulse per MIL-PRF-2880F Class 3</td>
</tr>
</tbody>
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**Reliable Data First Time Every Time**
IEEE 1588-BASED TRIGGER TIMING

ALARM
TRIGGER TIME ACCURACY
TIME TO TRIGGER DELAY

As good as time synchronization down to 50 ns
50 NS

RECEIVE LAN [0-7] EVENT
TRIGGER TIME ACCURACY
TIME TO TRIGGER DELAY
FUTURE TIMESTAMP
PAST/ZERO TIMESTAMP

As good as time synchronization down to 50 ns
50 ns typical
1 ms maximum

HARDWARE TRIGGER TIMING
DIO BUS
TIME TO TRIGGER DELAY
57 ns typical

Environmental Specifications

TEMPERATURE
OPERATING
0 °C to +50 °C
STORAGE
-40 °C to +70 °C

RELATIVE HUMIDITY
5% – 95% (non-condensing)

ALTITUDE
3000 m

SHOCK AND VIBRATION
Conforms to MIL-PRF-28800F

RANDOM VIBRATION
10 MIN PER AXIS, MIL-PRF-2880F CLASS 3
5 to 55Hz Resonance Search per MIL-PRF-2880F Class 3, each Axis
30G/AXIS, 11MS HALF SINE PULSE PER MIL-PRF-2880F CLASS 3

Notes:
1) All specifications are typical unless otherwise stated as a minimum or maximum.
3) All specifications subject to change without notice.
4) All specifications assume within 24 hours and 5°C of self-calibration temperature unless otherwise specified

Ordering Information

EMX-6050 8-Channel, 10M Sa/s, 5 MHz BW Digitizer

RELATED PRODUCTS
EMX-6050-4 4-Channel, 10M Sa/s, 5MHz BW Digitizer
EMX-6010 8-Channel, 10M Sa/s, 1MHz BW Digitizer
EMX-6010-4 4-Channel, 10M Sa/s, 1MHz BW Digitizer
EMX-4350 4-Channel, 625k Sa/s Digitizer
EMX-4250 16-Channel, 200k Sa/s DSA Digitizer
EMX-4008 8-Channel, BNC adapter
EMX-4016 16-Channel, Intelligent IEPE Signal Conditioner
EMX-4020 16-Channel, Intelligent Charge Signal Conditioner
EMX-4030 16-Channel, Intelligent Microphone Signal Conditioner
EMX-4040 16-Channel, Intelligent Strain Signal Conditioner
EMX-4050

SOFTWARE
EXLab* General Purpose DAQ Software
50 Analyzer* Acoustics/Impact/Rotational/Shock Software
*Multiple configurations available