

Sigma Microsystems

Corporate Profile

Aug' 2021



About us

Vision

- Emerge as a major player in the Defence & Aerospace Electronic Equipment marketplace
- Focus and ability to develop innovative solutions & products
- Create new opportunities in a spirited market

Evolution

- •25 years of track record in design, development, manufacture and supply of Embedded systems
- Certifications and Registrations
- AS 9100 Rev D certified Company
- CEMILAC approved Design Company for Airborne systems

Key Success Factors

- Committed Management Team
- Focus on Quality and Processes
- Excellent Infrastructure



Capabilities

Expertise

- System-level Integration Solutions, with complete product engineering
- Product Development, catering to both Build-to-Print (BTP) as well as Build-to-Specs (BTS)
- Design and Analysis
- Manufacturing and Testing
- Qualification for the target
 environment

Customized Hardware and Software
 Design and Devialenment

Design and Development

Domains & Functional Area

- Domains and Platforms
 - Airborne
 - Missile, Submarine, Vehicle-mount
 - Shipborne
- Industrial, HMI and Solar
- Medical
- IOT & POS, Hand-held terminal

• Functional Area

- Single Board Computers
- Data Acquisition
- Signal Processing
- Control System
- Automated Test Equipment (ATE)
- Communication systems
- Internet of Things

Production Facilities

• Excellent In-house Facilities

- Anti-static, dust & temperature controlled
- Environmental Test Chambers
- Automated Supply Chain and Storage Management
- Proven procedures for Electronic systems assembly
- IPC J-STD-001
- IPC A-610, A-620
- Well trained and motivated workforce



Expertise

Core Electronics

- Intelligent Electronic systems, using microprocessors, DSP and peripherals
- Programmable Digital Designs FPGA & SOC
- Discrete Digital Designs using gates, 5V/12V logic, Relay Interfaces
- Power Electronics BLDC Motor Drive, Battery Chargers, Power Suppliers (DC-DC and AC-DC for low & medium power)
- Analog Designs Control, Signal-conditioning, audio signals

Electro-Mechanical

- Position Control systems, using BLDC motors with gears, gear assemblies, ball-screw arrangements
- Antenna Position Control
- Fin Control
- Pneumatic & Motorized Control
- Precision Position Control



Embedded Systems Development

Hardware Design and Development

- Complete LRU / unit design, based on state-of-art architecture, with the latest technologies in digital and analog designs
- Established strengths in popular & latest architectures on microprocessor, DSP and FPGA families
- Industry-standard Bus architecture VPX, VME, Compact PCI, PMC, PCI Express and others
- Expertise on various standard interfaces Ethernet, USB, GPIB, serial ports, CAN bus, JTAG and others
- Avionics Communication Interfaces MIL-STD-1553B, ARINC-429, ARINC-717, 573 and others

Software Design & Development

- Real-time Embedded software with or without RTOS
- RTOS support on VxWorks, Embedded Linux, FreeRTOS and others
- PC based software solutions, on MS Windows 10 and Linux
- Mobile platform software solutions porting and apps on Android
- Complete SLDC, with documentation, compliant to IEC, IEEE 12027, DO-178, DO-254 (for programmable hardware), and other specified standards
- Independent verification and validation services



Build-to-Specifications - BTS

System / Sub-system Design

- Complete system / sub-system Design and Engineering
- Architecture Design
- Mechanical Enclosure & Thermal Engineering
- Full Product qualification to specified standards
- Ergonomics and user friendly
- Manufacturability
- Testability
- Ease of Maintenance
- Quality Planning

Board-Level Design

- Microprocessors & DSP, FPGA / IP Cores / EPLD
- •Memories Flash, SRAM, SDRAM, DDRAM, NVRAM, SPROM, others
- •Communication Interfaces Ethernet, USB, UART, USART, GPIB, I2C, CAN and others
- Avionics Bus MIL-STD-1553B, ARINC-429, 717, 573 and others
- •1/O Interfaces Analog, Discrete, Pulsed, Synchro, Resolver and others
- •Bus standards VPX, VME, PCI, Compact PCI, Sigma
- Form Factors Double EURO, Extended Double EURO, Custom
- Multilayer & flexi-rigid, Metal core PCB engineering
- Engineering Analysis Reliability, Thermal, Signal Integrity, FMEA



Build-to-Specifications – BTScontinued

FPGA Design – Xilinx, Altera, Lattice, Actel

- •Complex digital logic designs
- Embedded programmable System-on-Chip (SOC) designs
- Embedded ARM, PowerPC and other architectures
- Verilog and VHDL languages
- •Functional and Timing Simulations
- High-speed Interface PCIe, RIO, customized
- •High-speed digitization
- •Use of standard IP Cores
- •Interfacing high-speed FIFOs, DRAM and others

Software Development

- RTOS based (VxWorks, Embedded Linux, FreeRTOS)
- •Bare-metal without OS
- Embedded software development with respective tools, in C/C++
- •DSP platforms
- •Tiny Controllers
- Windows / Linux platforms
- Visual C++, Visual C#, LabVIEW
- Device Drivers / Board Support Packages (BSP)
- Operating System porting Embedded Linux, Android and others; tools like Yocto, BuildRoot, and others
- •SVN / GIT for Configuration Management



Popular Architectures Implemented

ARM Processor Architectures Implemented

- ARM Cortex M series M0, M0+, M3, M4 and M7 – Atmel, NXP, ST makes
- ARM R4 & R5 series Xilinx, Texas Instruments,
- ARM Cortex A series A5, A7, A8 and A9 Xilinx, Altera, Texas Instruments (Sitara), Freescale (i.MX), Atmel (SAM-D), ST (MP15X)
- ARM V8 Cortex A Xilinx UltraScale SOC and NXP i.MX8

DSC Architectures

- TI C2000 for Control Applications
- Cortex M4 & M7 for control and monitoring applications
- RISC-V
- ESP32



Other Architectures Implemented

FPGA Architectures

- Xilinx
- UltraScale
- Virtex 1-7
- Kintex
- Altix
- Spartan
- Intel Altera
- Stratix
- Arria
- Cyclone
- MAX10 Flash based FPGA
- Lattice ELPD & ACTEL FPGAs

FPGA SOC Architectures

- Xilinx SOC
 - Zynq
 - Zynq UltraScale
- Intel SOC
 - Cyclone
 - Aria
- Actel Smart Fusion
- Various soft cores like NIOS, MicroBlaze and others (RISC-V – under implementation)



Older Architectures Implemented

Processor Architectures Implemented

- •Intel X86 series 8086, 80186, 80386, 80486
- Motorola 68K series and ColdFire
- •PowerPC processors 82XX, 83XX, 85XX, QorlQ-T series
- •8751 series
- •80196 series
- ATMEGA series
- •PIC series 12, 16, 18, 24, DSP pic32
- Rabbit Semiconductor 2000,3000
- Zilog

DSP Architectures

- Analog Devices
- •SHARC, Tiger SHARC
- Fixed Point 2100 series
- •Black fin
- Texas Instruments
- •67 & 62 ,64 series
- 66xx Series
- 5000 fixed point series
- •Older generation 2x, 3x, 4x series



Internet of Things - IOT

IOT Applications Implemented

- Wireless Sensors Remote Data Acquisition and Telemetry
- Solar Farms
- Asset tracking
- Powered
- Vehicle powered
- Battery powered applications

IOT Architecture and Protocols

- MQTT protocol
- TCP
- UDP
- LORA
- GSM
- WI-FI & BT



SW Development tools

Commercial compilers & IDE

- Visual DSP
- Code composer studio
- Code warrior
- Keil
- ST cube IDE
- ARM- Linaro cross compilers
- Various Old generation compilers & IDEs
- Android studio
- MS visual studio
- QT creator
- LabVIEW

Opensource compilers & IDE

- GCC
- Eclipse
- Netbeans



FPFA Development tools

FPGA Tools

- Altera Quartus
- Altera platform designer
- Xilinx ISE
- Xilinx Vivado
- Latice Diamond
- Actel Libero

SOC SW IDE

- EDK / SDK
- Eclipse



EDA & M-CAD Design Tools

EDA Tools

- Mentor Graphic Design Tools
- Hyperlynx Simulation Tool
- ORCAD Design Tools
- P-spice

CAD TOOL

- Auto CAD
- Solid works
- Ansys



PCB Design & Analysis

PCB Designing: Design of complex PCB's with High Speed Signals

Designing of PCB's with Dual Core Processors, FPGA's + SoC's, DDC's, QDR, DDR, VME, VPX, XMC & PMC etc.. High speed Interfaces lines, PCIe, USB 3.0, Rocket IO's, SATA, Giga Bit Ethernet etc... High Speed ADC's & DAC's SPI, I2C Interfaces Multi Layer PCB's up to 20 Layers Track Length matching & Impedance Control

PCB Design Analysis:

Thermal Analysis Signal Integrity & Power Integrity.



Mechanical Design & Analysis

Mechanical Design:

Design of Electro Mechanical Assemblies, Enclosures, Aerospace Components & Gimbals Etc.. Design of COTS, Conduction / Convection Cooled units to meet thermal requirements Design to meet the EMI/EMC requirements and specified IP (65/ 66) ratings as applicable.

Analysis:

Fine Element Analysis Modal Analysis Structural Analysis Wind Analysis & Weight Optimization



Mechanical Manufacturing & Spl. Process

Raw Materials:

Handling of Spl. Grade AI. Alloy Materials, Custom Steels, AI. Alloy Forgings, Castings etc..

Manufacturing: Machining of Precision Components to serve Defence & Aerospace Sector.

Special Process: We have well established vendor network for Spl. Process (Defence Approved / NADCAP Approved) Anodizing/ Hard Anodizing to meet marine requirements Passivation, Trivalent Chromate Passivation, Electroless Nickel Plating & Conductive Chromation Etc..



Sigma Showcase Products

SSFDR: Helicopter Platform



- 25 hours of Aircraft data; 2 hours of audio
- Protected Memory module (PMM)
- Signals and Interfaces
- 44 Analog inputs
- 120 digital inputs
- 6 frequency inputs; 4 synchro inputs
- 16 ARINC-429 receivers; one MIL-1553 interface
- USB interface for high-speed milk-out

SSFDR: Jet Platform



- 10 hours of Aircraft data; 2 hours of audio
- Protected Memory module (PMM)
- Signals and Interfaces
- 16 Analog inputs
- 24 digital inputs
- 4 frequency inputs
- 16 ARINC-429 receivers; one MIL-1553 interface
- USB interface for high-speed milk-out



Sigma Showcase Products ... continued



INCOM Controller for MIG-27

- Operator Interface for INCOM Transceivers for air-borne platform Fighter Aircraft
- MIL-STD-1553B interface
- Illuminated keys and bezel; Alphanumeric display
- Fully tested and qualified
- Entire fleet upgraded with this product

Servo Control Unit for AKASH

On-board sub-system for AKASH missile
QT, AT and Flight Trials cleared by MSQAA
In regular series production

Quad Digital Actuator Controller

Four (4) independent Actuator Controllers
Each Controller has independent DSP and Actuator Interface
LVDT & Pot Interface for position feedback
MOSFET H-Bridge with PWM for Motor Interface
Controls fin deflection on Missile & other platforms



Sigma Showcase Products ... continued



Electrical Actuation Control System for Torpedo

Digital Controller & Intelligent Power Drive
Four (4) permanent magnet synchronous (PMS) motors
Deflects control surfaces (elevators and rudders) of the Torpedo based on input command from on-board processor (OBP)
EMI/EMC compliant

Auxiliary Display Unit

•Submarine platform

- •Receives track information from a SuperHet Receiver and displays the same in
- Spectrum mode; acts as operator interface to the Receiver
- •Supports setting up for SCAN and STEP strategies
- •Supports display for signal in time domain
- Displays Radar signals PRF and PW

LRSAM / MRSAM Rear Servo





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- Manufacture, Integration and Testing of Electromechanical Assembly of SAM:
 - 4-axis Electromechanical system
 - Controls fin deflection of SAM missile
 - Actuation mechanism with BLDC motors
 - Absolute Position 16-bit Optical Encoder
 - In-built Electronic DSP Controller
 - Intelligent Drive Electronics
 - 28VDC operated
 - Compact size with in-built gear assemblies and mechanical parts
 - Supplied 50+ units for MRSAM
- Successfully test-fired at Israel & India



LRSAM / MRSAM Rear Servo (CONTD.)





SHOW CASE PRODUCTS (CONTD.)



GPS Radio Unit



Vehicle Fleet Management

- On-board GPS for Real-time location
- LoRA Radio for communicating to a Central Location
- Tracks Vehicle Location and Speed
- Product under field trials

End Game Package



- On-board module used in a guided missile
- Triggers the detonation pulse.
- Based on commands from OBP and LPF
- Using the predefined internal logic, initiates the

detonation pulse for the time delay.

SHOW CASE PRODUCTS (CONTD.) Line Replaceable Unit (LRU's)





• Made with Al. Alloy Gr 6061 T6

- Size: 157x311x214
- Surface Protection: Conductive Chromate

G-DGM Assy.

Dornier Mission Computer

- Made with Al. Alloy Gr 6061 T6
- Size: 124x320x200
- •Surface Protection: Conductive Chromate & Black Anodizing



SHOW CASE PRODUCTS (CONTD.)



Connector Board for Data Recording Unit for Army, Airforce & Navy



- PCB: MIL Grade FR-4, Type –A Certified
- No. Of Layers: 10
- Size: 90x88x2.4 Thk.
- No. of Connections: 262 (Signals & Power)



Sigma Standard Boards

VPX Quad Processor Board

- Scaled down Dual Processor Zynq 7000 series & Kintex FPGA
- Supports optical & Ethernet Interfaces
- 6U form factor
- Rugged conduction or air-cooled
- EMI/EMC compliant



USB & Ethernet based MIL-STD-1553 – ARINC 429 Card

• Based on AceXtreme

PMC based Cards

- PMC based MIL-STD-1553 card
- PMC based Digital IO card
- PMC based RS-422 card



Sigma Standard Boards

XMC based Digital IO Board

- Scaled down Dual Processor
- Supports optical & Ethernet Interfaces
- 6U form factor
- Rugged conduction or air-cooled
- EMI/EMC compliant



PCIe MIL-STD-1553 Card

- Based on AceXtreme Engine
- PCIe Bus



PCI MIL-STD-1553 Card

- Based on AceXtreme Engine
- Two (2) Dual-redundant channels
- PCI Bus



Automated Test Benches



- Compact PCI based Industrial PC with custom add-on cards (designed and manufactured by Sigma)
- Industrial PC with connectivity to Standard Test Measurement (T&M) equipment, on USB / Ethernet / GPIB / serial port
- Developed Test Benches for testing airborne equipment such as TACAN, VOR/ILS, Flight Data Recorders and others
- Simulates all field signals for the unit-under-test to test hardware and software functionality
- Software and documents evaluated by RCMA / DGAQA agencies



- Capability to design, develop and manufacture Test Equipment
- Test Equipment may be fully-automated computer-based systems:
 - Based on Industrial PC or Compact PCI system
 - Combination of COTS boards and custom-designed boards
 - Complete simulation of input and output signals
 - Signal conditioning to suit field signal conditions
 - Custom software to test hardware and software functionality
 - Integration with standard T&M equipment
 - Test Reports
- Test Equipment may comprise of electromechanical panels:
 - Meters
 - Knobs
 - Test Points
 - Break-in Break-out (BIBO) box



- Different configurations for a Test Equipment
 - Compact PCI / PXI with functional COTS or custom add-on cards in a single chassis
 - Industrial PC with functional COTS or custom add-on cards in a single chassis
 - Industrial PC with a bus extension interface, plugging into a remote chassis with add-on cards
 - Industrial PC with integration with external standard T&M equipment on USB / Ethernet
 - Industrial or Desktop PC interfacing with a custom-built intelligent embedded board on USB/Ethernet, which in-turn interfaces with the unit-under-test (UUT)
 - Non-intelligent Test Equipment, comprising of electromechanical panel



- Compact PCI / PXI with functional COTS or custom add-on cards in a single chassis
 - Processor card and functional add-on cards in the same chassis
 - Add-on cards are Compact PCI or PXI
 - 6U or 3U form factor
 - Suited for 8-12 add-on cards
 - 19" full rack or half-rack
 - / Industrial PC with functional COTS or custom add-on cards in a single chassis
 - Industrial PC backplane accommodates PCI or PCI express cards in respective slots
 - Signal-conditioning is usually external to the PC
 - Suited for 3-4 add-on cards only
- Industrial PC with a bus extension interface, plugging into a remote chassis with add-on cards
 - Industrial PC houses one bus extension card with a cable, which extends to an external chassis with compact PCI / PXI back plane
 - Industrial PC and Remote Chassis are mounted separately usually 19" rack mounted
 - Suited for 8-12 add-on cards



- Industrial PC with integration with external standard T&M equipment on USB / Ethernet
 - Suitable for using standard external T&M equipment
 - External T&M equipment is interfaced on USB or Ethernet
 - Preferred when using specialized T&M equipment, not available as an add-on card
- Industrial or Desktop PC interfacing with a custom-built intelligent embedded board on USB/Ethernet, which in-turn interfaces with the unit-under-test (UUT)
 - Custom-built intelligent embedded board interfaces with the UUT
 - Embedded board accepts command from PC & sends back response or test results
 - Embedded board exercises interface signals to the UUT
 - Especially suited when a custom-bus is to be simulated, or fast response needs to be captured
- Non-intelligent Test Equipment
 - Comprising of electromechanical panel with switches, lamps, test points and others



- Test Software typically may comprise of:
 - Tests for individual sections and complete UUT
 - Manual tests and Auto Tests
 - Test result logging to XLS and PDF formats
 - Optional control of environmental test chambers (on Ethernet link)
 - Test Software may be developed as:
 - Custom-application using Visual Studio C++ or C#
 - LabVIEW application
 - Menu-driven and user-friendly
 - Familiar GUI elements, including graphs
 - Additional Embedded software (in case a custom-built embedded board is used as Test Driver



Sigma Facilities

- Sigma's premises at Hardware Park with more than 20000 sq. feet carpet area, over 2 acres land
- Expands and builds on existing infrastructure
- Scope for future expansion to support business growth
- Augmented production and environmental test facilities – Vibration, Bump, Hot & Cold chamber with humidity control
- Facility equipped with:
 - Development Centre with complete tools & equipment
 - Antistatic stores, production, QA and test area
 - Environmental test facilities
 - Support divisions Marketing, Purchase, Finance & HR
- Houses over 90+ employees
- Fully networked IT infrastructure







Sigma – Design & Engineering





Sigma – Production Facilities







Sigma – Testing Facilities











Project Management & Execution

- Project Management & Execution, with compliance to AS9100 Rev D QMS
 - Project Plan
 - QA Plan
 - Risk Management
 - Configuration Management
- Special Focus
 - Key Characteristics
 - Special Requirements
 - Critical Items
- Over 25 years of experience in Project Management Planning and Implementation both D&E oriented as well as production-oriented projects
- In-house ERP for complete material tracking and traceability
- Direct Monitoring and accountability from top management for QMS and in-time project execution



Development and Test Infrastructure

- Sigma's present focus is on providing BTS and BTP services in the domain of electronics systems
- Full suite of development tools, including EDA tools for electronic board design, Microprocessor, DSP and FPGA Development tools, Software Development tools, Project Management tools
- Standard Test and Measurement Equipment include:
 - Signal Generators, Oscilloscopes, Digital Multimeters
 - Power Supplies
 - Frequency Response Analyzers
 - Board-level Testers, including JTAG
 - Custom-built Test Jigs
 - Automated Test Equipment



Human Resources

- Sigma's is helmed by technically skilled and experienced top management, with expertise in core technology areas, domain experience, program management, risk management and operations
- Sigma presently employs 90+ employees, including 60+ technical, primarily engineers, in electrical, electronics, communications and software disciplines



Sourcing

- Capability to source qualified parts, with certificate of conformance
- Direct sourcing channels with several manufacturers for electronics, electromechanical, and mechanical parts & components
- Control Plan for anti-counterfeit measures to AS5553
- Capability to source and import precision components such as gears, valves and other electromechanical components
- Well-established out-sourcing arrangements PCB fabrication, painting, material testing and others
- Sub-contracting of SMT and BGA parts soldering to qualified vendors (plan to establish in-house facility – waiting for the right opportunity)
- Specialized PCBs with IPC / MIL certification
 - Flex-rigid PCB, metal-clad, metal-core, specialised shapes and size PCBs
 - Special Grade such as FR5



Electronics Manufacturing

- Capability on manufacturing of complex electronics boards for Military, Aerospace and other High-reliability applications under controlled conditions
- Capability on cable harness
 - Cable harness for airborne applications
 - Expertise on soldering, crimping, shielding, heat-shrink, marking
 - Cable boots
 - Filling with flexible potting material
- Assembly as per IPC J-STD-001
- Inspection of electronics assemblies to IPC-610 and cables to IPC-620
- First Article Inspection as per AS 9102
- Anti-static, dust-controlled, temperature and humidity-controlled work area
- Well-trained and experienced work force



Cable Assemblies

- Cable harness for airborne applications
- Expertise on soldering, crimping, shielding, heat-shrink, marking, ferruling
- Cable printing
- Screened / shielded cables for EMI/EMC protection
- Cable boots
- Filling with flexible potting material
- Different types of connectors Round Shell, D-type, Nicomatic others
- Internal cabling inside equipment with routing
- External cables



Assembly & Integration

- Expertise on assembly and integration of multiple electronic modules, mechanical chassis, electro-mechanical components and mechanical sub-systems
- Capability of building compact system for rugged application with modular approach, with minimal internal wiring
- Expertise on electro-mechanical and positional interfaces
 - Positional Optical Encoders
 - Synchro Resolvers
 - LVDT, RVDT
- Activators
 - Pneumatic, Hydraulic
 - DC Motors, BLDC Motors
 - Drive Electronics Analog & Digital commands
- Expertise on Servo control systems
- Mechanical Assemblies



Testing

- Capability to prepare to test plans and procedures
- Capability to conduct tests as per requirements and defined arrangements
- Different types of tests
 - Functional tests
 - ESS tests
 - Acceptance Tests
 - Qualification Tests
- Environmental tests to specified standards
 - EMI / EMC tests to MIL-STD-461 / equivalent
 - Environmental standards MIL-STD-810 / equivalent
 - Other specialized tests
- Well-established arrangements for test facilities not available in-house (mainly for QT and one-time tests such as EMI/EMC, CATH, Altitude, Acceleration, Tropical Exposure etc.)



Testing ... continued

Full-fledged In-house Environmental Test Facilities

Vibration Table

- Two Tons capacity for vertical and horizontal vibration table
- Capability of conducting resonance search, random, sine, sine-on-random
- Multiple head-expanders to suit the fixtures
- Bump Machine
 - 50g, 300 kg
 - 6-18 milli seconds
 - Fully automated
- Hot & Cold Temperature Chambers with Humidity Control
 - -70° C to +185° C (1 Cubic Meter volume)
 - 5-8° C Rate of Change
 - Humidity Control
- Other chambers –Hot & Cold (-55° C to +125° C), Oven (up to +250° C)



Environmental Test Chambers





nqa.

This is to certify that the Quality Management System of:

Sigma Microsystems Private Limited

24/A Hardware Park, Off Srisailm Highway, Near International Airport, Hyderabad, 500005, INDIA

applicable to:

Design, Development and Manufacture of Electronic Systems Comprising of Hardware and Software for Defense and Aerospace Applications

has been assessed and registered by NQA against the provisions of:

AS9100D & BS EN ISO 9001:2015

in accordance with the requirements of EN 9104-001:2013. This registration is subject to the company maintaining a quality management system, to the above standard, which will be monitored by NQA.

NWnyu

Managing Director



Certificate No:61720ISO Approval Date:21 November 2013ASCS Approval Date:21 November 2013Issue Date:22 November 2019Expiry Date:21 November 2022EAC Code:21, 19Site Structure:Single Site

Certificate of Registration

Thank you!!



