From Idea to Commercialization: experience and possibilities for development of space industry and semiconductor projects

www.rdalfa.eu

30th January 2019, Riga
COMPANY PROFILE

- **Date of foundation**: 1962
- **Experience and expertise**: analogue and analogue to digital technology (Bi-polar, Bi-FET, complementary Bi-polar, CMOS, and Bi-CMOS). Experience more than 50 years
- **Number of employees**: 63
Design and the manufacture of certified high reliability and radiation hardened microelectronics components for aerospace and defense equipment as well as special purpose microcircuits.

All products are **ITAR free**, made in Latvia!

Operational Temperature - 60°C to +125°C.

Tested to - 63°C!

RD ALFA video presentation
ADVANTAGES

• 50 years of expertise in Microelectronics industry
• ISO 9001:2015 certified.
• Experienced and high-skilled staff.
• Complete cycle of integrated circuits development.
• Complete assembly
• Full production cycle
• Continuous control of microcircuits quality.
• Layouts of integrated circuits are registered and protected in the Register of Integrated Circuits Topographies and Authorities.

• Unique technology of production of complementary bipolar vertical transistors with dielectrical isolation or p-n junction with three buried layers, deep collector area, super-β and JFET transistors.
• Fast design and manufacturing of microcircuits according to the customer's specification.
• Joint Ventures encouraged.
• EU and NATO members of from 2004.
• In 2015 Latvia became a cooperating state of ESA.
• Local European Manufacturer.
• Competitive pricing and short lead times.
• Traditional style warranty & full traceability.
• Founder of Latvian Space Industry Association.
OPERATIONAL AMPLIFIERS (RAPID, MULTICHANNEL, MICROPower, PRECISION)

Comparators

Switches and multiplexers

DIFFERENTIAL PAIRS

MICROCIRCUITS FOR DATA ACQUISITION SYSTEMS (αRD14864TF5S and αRD14861TF5S)

MIL-STD 1553 TRANSCIEVERS, αRD1567

NEW GENERATION PHOTODETECTOR
CMOS AND BIPOLAR PROCESSES

High voltage CMOS process 2.0 µm, 9 masks

Complementary bipolar process with dielectric isolation or p-n junction isolation with three buried layers, deep collector area, 3.0 µm, 17 masks

Complementary bipolar technology with isolation by p-n junction with two buried layers, 3.0 µm, 14 masks

Bipolar process with isolation by p-n junction, 3.0 µm, 13 masks

Bipolar process with dielectric isolation, 3.0 µm, 11 masks

+ Jfet transistors
+ super β transistors

The following parameters of integrated circuits are ensured

Dynamic range of analogue signals being processed from ± 100 µV up to ± 40 V
Supply voltage range from ± 1.5 V up to ± 40 V.
Frequency range of analogue signals being processed from 0 Hz up to 200 MHz
Load current up to 1000 mA.
Germany

X-FAB Semiconductor Foundries AG
Haarbergstr. 67
99097 Erfurt, Germany
Tel.: +49 361-427 6000
Fax: +49 361-427 6111

Processes:
- modular 1.0, 0.8 and 0.6 μm CMOS mixed-signal processes (analog, high voltage, EEPROM, EPROM, RF and linear)
- 2 and 3 layer metal
- special micromechanical sensor processes (MEMS)
- special smart power options
- special SOI process options

Overall capacity:
- approx. 12,000 eight inch equivalent wafer starts per month

Clean room class:
- 1 and 10

XT06 Trench 0.6 μm CMOS technology

XT06 DEVICES SCHEMATIC CROSS SECTION

NMOS Poly-Poly-CAP PMOS

5V devices and poly-poly capacitor

NHVE PHVE

Medium-voltage graded drain devices
TECHNOLOGICAL CAPABILITIES
Packaging of microcircuits

- Ceramic Flat Pack 10 and 14 lead by NTK
- Glass-to-metal cases TO-5 metal can
- Ceramic metal micro cases ceramic guard pack
- Ceramic metal cases ceramic DIP – 8, DIP - 20
- Planar glass-to-metal, ceramic metal cases 14 and 16 lead
- Ceramic metal flat pack 14, 16, 20 lead
- Open-Frame IC on polyimide carrier
- Open-Frame IC
In 19 March 2013 Latvia became the seventh country to sign the European Cooperating State Agreement with ESA.

Up to now Latvian companies signed 27 contracts for 3,2mln EUR with ESA under the PECS program.
**Foundation of Latvian Space Industry Association (LAIK)**

*LAIK* was founded on 13\(^{th}\) February 2018

*LAIK* goals are

- To promote the development of Latvian Space Industry companies;
- To establish links between Latvian Space Industry entrepreneurs;
- To support Latvian government in becoming ESA Full Member State;
- Popularization of space science among scholars and students

*LAIK* was founded by 6 most active Latvian companies working in SPACE area.

*Pauls Irbins* was elected as president of LAIK
Since January 2015, Latvia has become cooperating state of ESA, companies, based in Latvia, received an opportunity to participate in ESA provided projects PECS (Plan for European Cooperating States)

Forthcoming accepted activities:
1) Development of aRD108A (additional support from ESA, based on CCN of existing contract)
2) R&D of aRD124A and aRD139A
2. ITT Package – Cover Letter
What type of activities? Expected flow

- **Type d)** Preparatory Activity
- **Type b)** R&D Activity
- **Type a)** Flight Segment Related Activity
- **Type c)** Space (Downstream) Applications

Idea → Market!
2. ITT Package – Cover Letter
What type of activities?

d) **Preparatory Activities.** Paper studies and simple breadboard activities (e.g. feasibility studies/demonstrators, market surveys, user requirements and breadboard demonstrators) aimed at supporting national competitiveness related to ESA programs to which Latvia may subscribe in the future or the initial steps of a product development for Space with potential for use on ESA missions.

- Such activities shall typically cover TRL 2-3
- Up to 100 k€
- may be led by any legal entity depending on the specific context, however the participation of an industrial partner with a clear business interest in the result is strongly encouraged
b) Research and Development Activities (including Technology Demonstrations, Industrial Process Development, Process Qualification/Certification) leading to products or generic technologies with the potential for re-use.

- The start TRL shall be TRL 3 or 4 and the maximum increase in TRL shall be 2 steps
- Up to 225 k€
- should preferably be led by industry, but in any case a proposal must include industrial partners who have the capability to develop the application, product or service to the point where it can be brought to the market and become part of an ongoing, sustainable business
2. ITT Package – Cover Letter
What type of activities?

a) **Flight segment related activities** and close to market space ground products related to ESA missions and activities, in the form of equipment or generic technologies (i.e. *products*) with potential for **re-use on ESA missions**.

- The start TRL shall be at least 4 and the target end TRL at least 6
- Up to 400 k€
- Must be led by industry (prime contractor)
2. ITT Package – Cover Letter: Annex B - TRL

ANNEX B

ESA has adopted the Technology Readiness Level (TRL) scale as a way to measure the maturity of a technology. It has now become a well-established standard. Indicate the TRL of the technology to be developed under the Contract using the classification given below (for additional information on definitions, please refer to footnote 4).

![Technology Readiness Levels Diagram]

Figure 1 – Technology Readiness Levels adopted in ESA

Regarding the maturity status of software the same number of TRL are indicatively used. A short description using software engineering terms is shown in Figure 2.
COLLABORATION WITH EUROPEAN SPACE AGENCY

- **January 2016** – first cooperation agreement signed between ESA and RD ALFA Microelectronics: Research and Identification of IC(s) for application in ESA missions (project duration 6 month, contract cost: 44 792 EUR). Development of aRD108A with additional support from ESA 10K EUR, based on CCN of existing contract, for Thales Alenia Space France.

- **December 2016** – second cooperation agreement signed between ESA and RD ALFA Microelectronics: Development of the microcircuit αRD124 for applications in ESA missions, (project duration 24 month contract cost 200 000EUR).
• **June 2018** – third cooperation agreement signed between ESA and RD ALFA Microelectronics: Development of the microcircuit αRD139A for applications in ESA missions, (project duration 24 month contract cost 200 000EUR).
Procuring and adjusting equipment for High-Rel Flat Packs from NTK

Encapsulation equipment modernized in April-May 2017

Supported by:
16. Vio4, Module 4

Tid test result of αRD124A vs USA equivalent

Tid = 22°C ± 3°C; Vcc+ = 2.5V; Vcc- = -2.5V; Vcm = -1.1V
Latest Test Reports available to you!

DPA report on several products that shows overall technical capabilities and quality

RAD-HARD test reports
R&D activities with science based startups

Innovative solution for optical spectrum measurement
Specially designed photodetector to build **portable spectrometer** and make it possible to measure spectrum in 350 – 1100 nm range with 1nm resolution.

~ 200 mm

1.4 mm
LATVIA IN THE SPACE INDUSTRY

• There are strong traditions of Space Research in Latvia. Their roots can be traced back to the beginning of the last century and are associated with the name of a famous scientist Friedrich Zander. In 1925, he published a book "Problems of flight by jet propulsion: interplanetary flights", where he described a method known as gravity assist.

• Since the 1950's Latvian scientists have participated in more than a hundred world-level space programs. Among their key contributions there are the manufacture of the first satellite telescope and range finder, production of isolation materials for soviet rockets, & other applications.

• Between 1957 - 1990, Latvia took part in several significant space programs including:
  • Isolation material development for construction and launch of the first satellite “Sputnik – 1” (in 1957);
  • the first manned space flight of “Vostok-1” (Yuri Gagarin) in human history (in 1961);
  • “LUNOKHOD” – robotic rover for investigation of the surface of the moon and obtaining images (in 1970);
  • “Buran” and its launch vehicle “Energy” - orbital vehicle program (Starting from 1988).

• Further Latvian space exploration and technology development influenced by the USSR space exploration policy.

• Nowadays, RD ALFA Microelectronics works in co-operation with European Space Agency and Latvian Space Industry Association.

• RD ALFA Microelectronics is a co-founder of the Latvian Space Industry Association – www.latvija.space

Source
SHORT FACTORY TOUR
Questions & Answers

Diana Lapkisa
Project Manager
Diana.lapkis@rdalfa.eu
+37128311737

Lev Lapkis
Development Manager
Lev.Lapkis@rdalfa.eu
+37129478837

www.rdalfa.eu