bruco
INTEGRATED CIRCUITS

Sharing the passion in RF- and Smart Power IC Design

Content

- What we do
- Memory lane

BRUCO INTEGRATED CIRCUITS

Short overview

- Independent, privately owned fab-less IC design center
- Founded in 1988 – Celebrating 30 years of Innovation!
- Turn key solutions and design services with own labs
- Customers from large multinational to technology startups
- End markets: Automotive, Consumer Electronics, Healthcare and Industrial
- Main office in Borne, and satellite offices in Nijmegen and Taiwan
- ~50 highly educated and enthusiastic people

Core competences

RF design

Smart Power

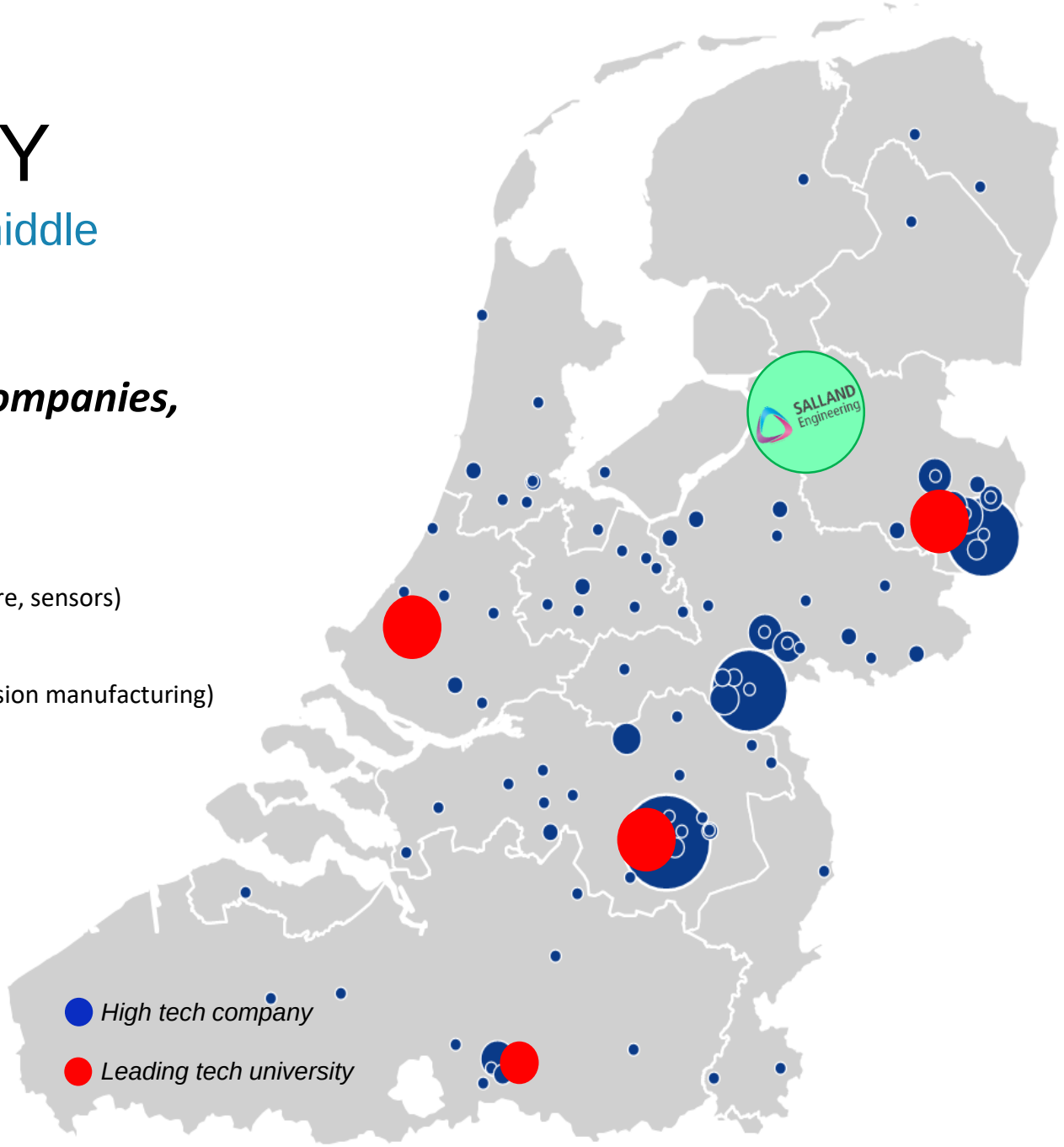
A SMALL COUNTRY

Salland Engineering almost in the middle

The Netherlands has ~***150 High Tech companies,*** generating ~€11B revenue

Focus areas:

- Highly intelligent (embedded systems, software, sensors)
- Highly efficient (mechatronics)
- Very precise (nano-electronics, optics, high precision manufacturing)



OUR ORGANIZATION

Tim Tiek, CEO

dieco CAPITAL

dieco electronics

CUSTOM IC DESIGN
BRUCO INTEGRATED CIRCUITS

“From early system spec to samples”

ASIC SUPPLY
BRUCO COMPONENTS

“From samples to volume production”

DESIGN AUTOMATION
DIZAIN-SYNC

“Designers of the design flow”, consultants

OUR CUSTOMERS

We have designed ICs for the following companies

NXP

AMPLEON

elmos

nedap

With SALLAND Engineering

ASML

With SALLAND Engineering

FLUKE

With SALLAND Engineering

BMW

PHILIPS

CONSUMER ELECTRONICS

Market areas

The future of consumer, RF

Our technology enables consumers to connect their devices. Our IC's can be found in the following devices:

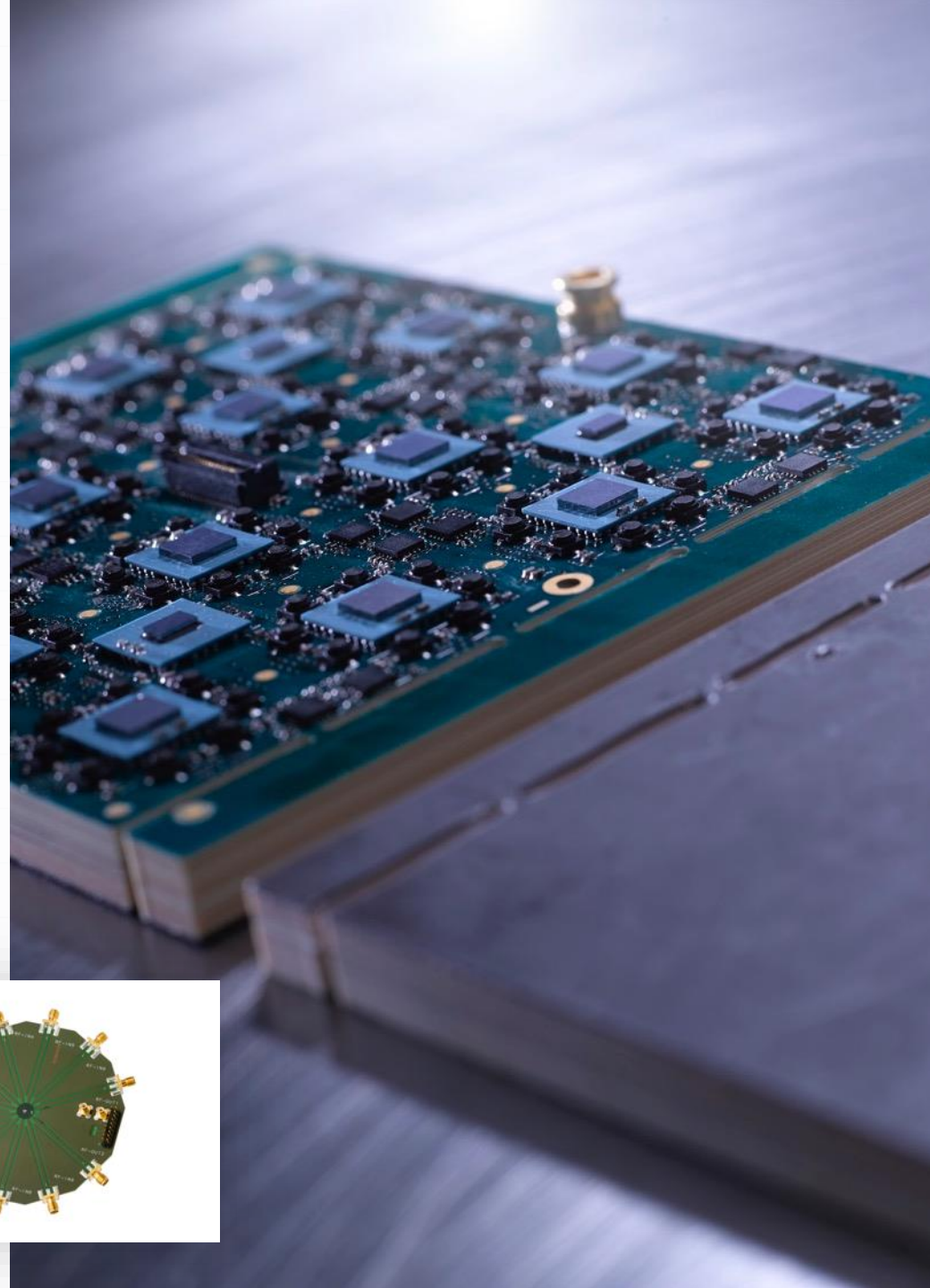
- Smartphones
- Internet of things
- Lighting (LED)

LNA (LOW NOISE AMPLIFIER)

OUR BUSINESS

Consumer, RF

- Beam-forming Phased Array systems
- Ku band 11-13 GHz, RF front-end for smart antenna satellites
- LNAs for high-end cell phones
- PLL for satellite receivers ~15 GHz
- PAs including power and, bias circuitry 400 MHz- 2.7 GHz
- Discrete High-Power Doherty PA for Base Stations
- WiMax amplifiers and mixers
- Zigbee radio 2.4 GHz



INDUSTRIAL

Market areas

The future of Industrial

Our integrated circuits can be found in a wide range of industrial applications like:

- Measurement appliances
- Power conversion
- Lighting (QL)

RELIABLE TECHNOLOGIES FOR HEAVY INDUSTRIAL APPLICATIONS

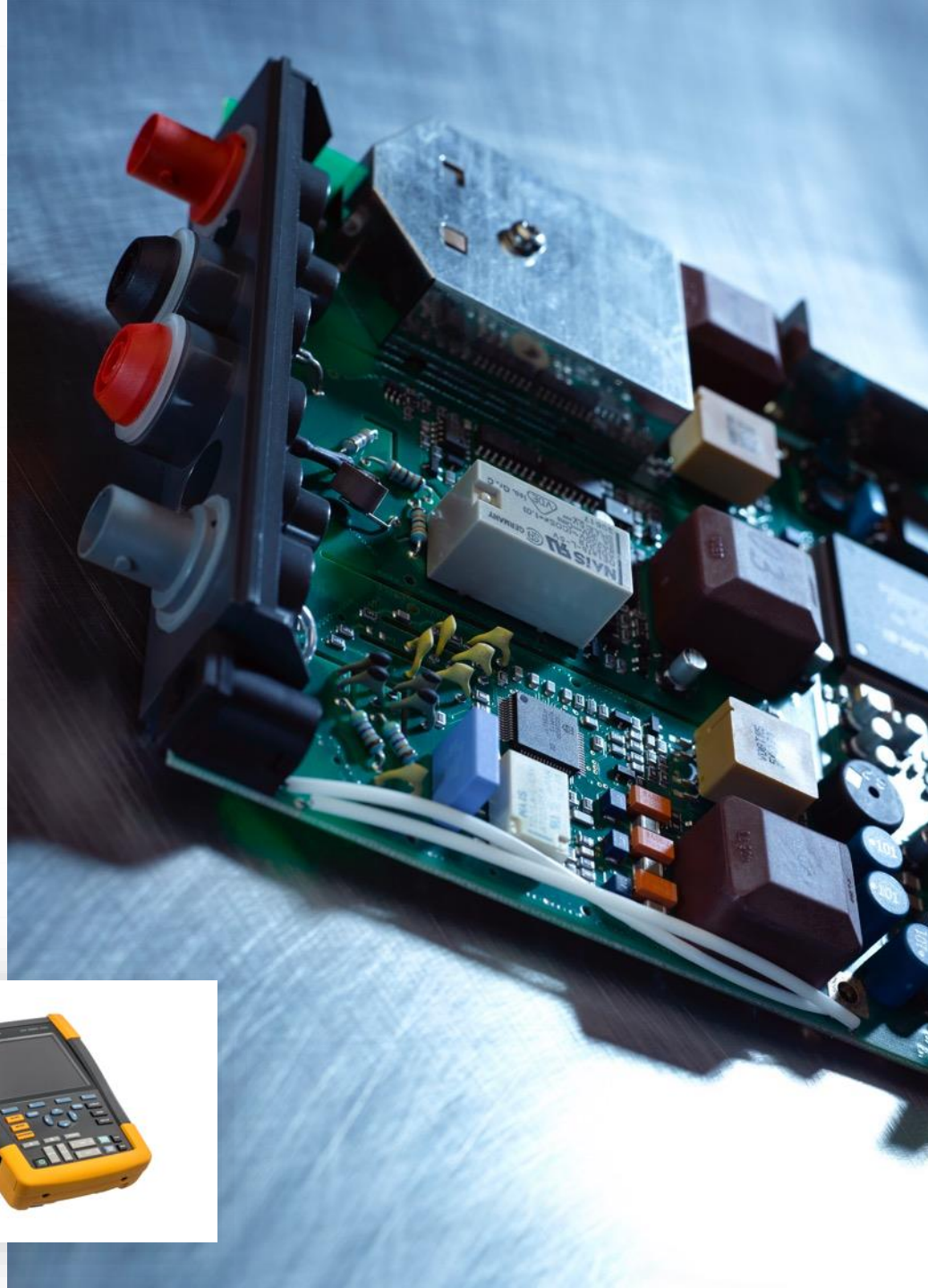
OUR BUSINESS

Industrial

- Power converters and low-drop output regulators
- Earth fault circuit breaker
- Analog front-end handheld Scope Meter
- Lamp drivers, LED and QL
- 10 Gb/s transceiver for 100µm diameter,

  2m long twisted Cu wires
- Optical Maskless Lithography,

  11M, 1-axis mirror array driver ASIC



AUTOMOTIVE

Market areas

In the past 30 years, we have created numerous technologies for the automotive industry such as LIDAR technology for automated driving.

- Power Switching
- Vehicle to X applications
- Advanced Driver Assistance Systems

THE FUTURE OF CARS IS DEFINED BY THE SMALL PARTS

OUR BUSINESS

Automotive

- Versatile Body Control
- Smart power MOSFET and gate drivers
- LIN, CAN, SPI, FlexRay
- Alternator Voltage Regulator
- Class-D amplifiers
- Resonating mirror driver @ 80V with accurate position detection system (IP sold to Infineon)

OUR BUSINESS

IC creation and production

OUR SERVICES

Turn-key IC projects

IC Design services

Application Development

Production Services

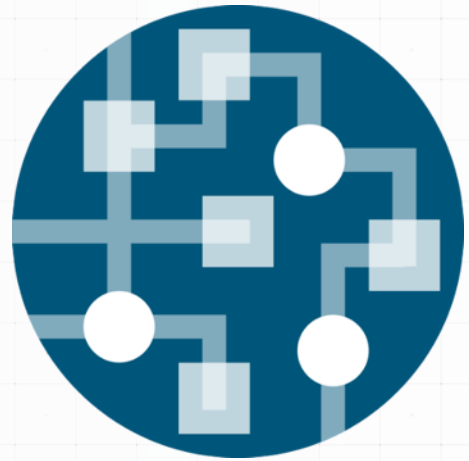
With SALLAND Engineering

EDA flow Optimization

OUR BUSINESS

Design & lay-out

- We handle a project from initial requirements to GDS2 delivery to the foundry
- We can use any preferred toolkit of the foundry
- Broad experience in tools:
  - Cadence
  - Mentor
  - Tanner
  - Synopsys (mainly digital flow)
  - ADS (chip-package-board RF simulation)
  - Orcad / Spice / ICED
  - Altium Designer



OUR BUSINESS

Technology and foundries

Match technical and commercial requirements

- Ranging from 1 µm to 28nm
- CMOS
- BiCMOS
- SiGE
- SOI
- BCD

Foundries

- NXP
- Elmos
- OnSemi
- Global Foundries / IBM
- Tower/Jazz
- X-Fab
- UMC
- SSMC
- TSMC

FPGA Typically used

Machine control application

Evaluation boards

OUR BUSINESS

Evaluation, production test & qualification

Evaluation

- Own lab facilities incl. thermo streamer
- Automated evaluation set-ups mostly LabView based
- Dedicated RF and Audio measurement equipment
- Create Application / Evaluation PCB’s for Lab measurements

Production Test

- 3rd party, Salland Engineering
- Foundry specific testers

SALLAND Engineering

Qualification

- 3rd party, Maser Engineering

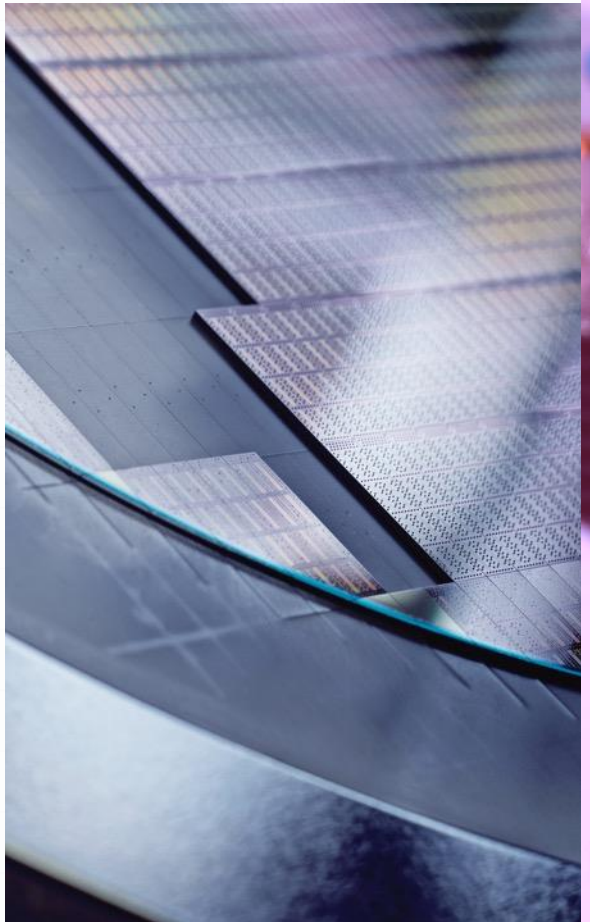
MASER ENGINEERING

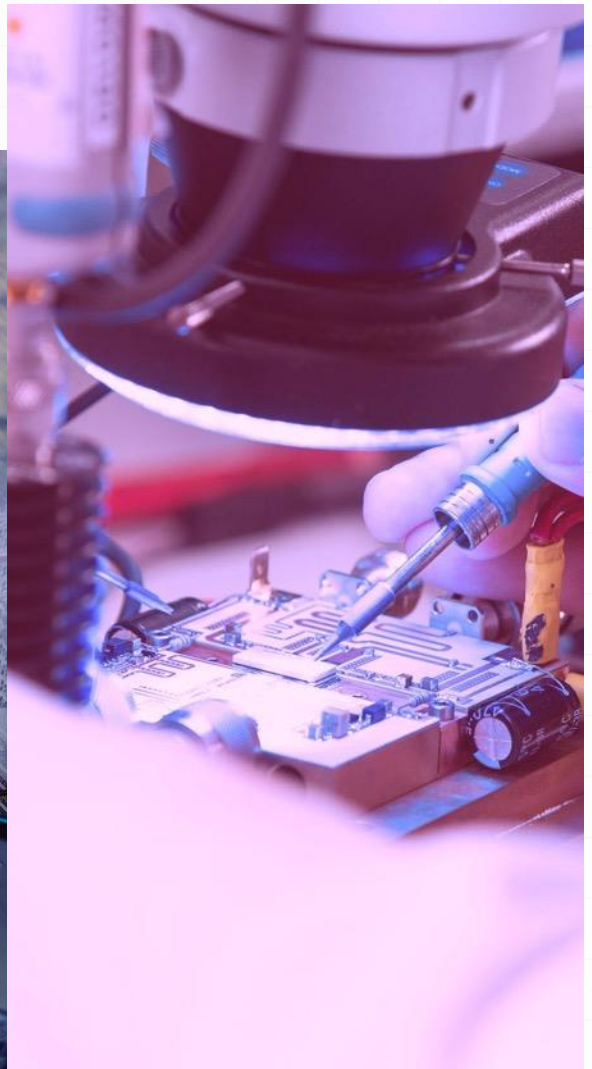
OUR BUSINESS

Production and Supply

COMPONENTS

- Complete supply chain
  - Forecast
  - Packaging
  - Testing
  - Shipment (in split lots if needed)
- Wafer and component storage in Nitrogen environment > 10 years
- Separated storage locations for safety reasons





SHAPING THE FUTURE

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Memory lane

Working with Salland Engineering for almost 20 years

BACK IN THE DAYS

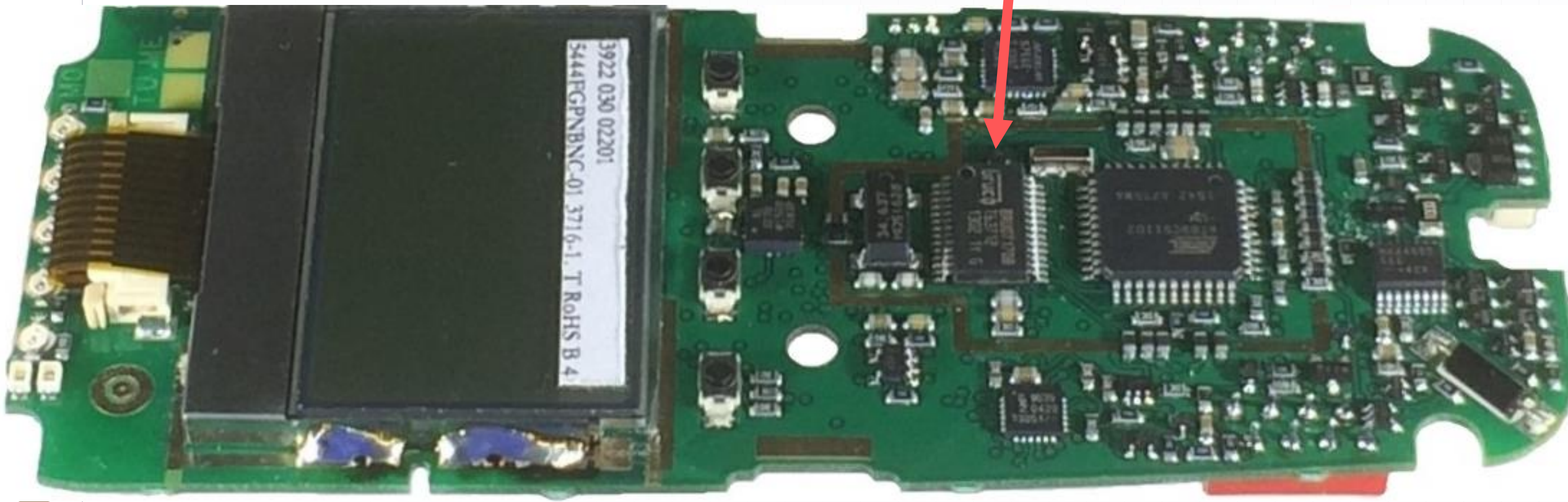
Maybe no so long ago

PHILIPS

Let's make things better.

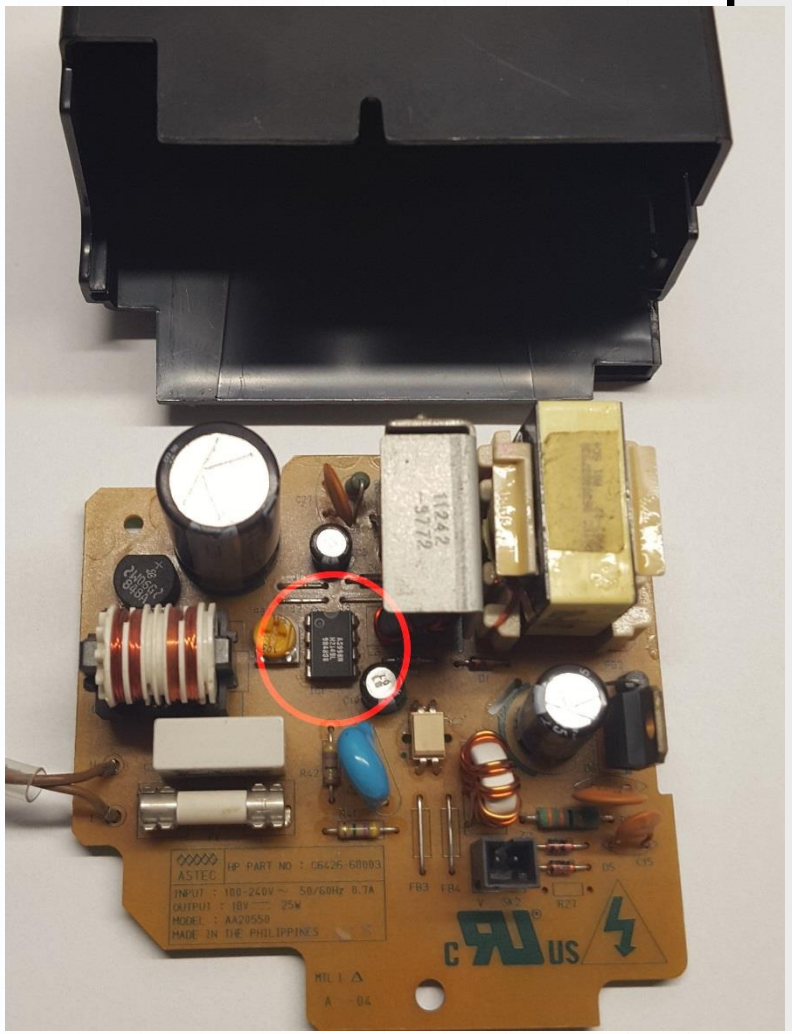
- Buying customer wafers from Philips Semiconductor
- Tested with help of Salland Engineers

integrated circuits



POWER SUPPLY CHIP

HP Deskjet 932C, year 2000



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Salland Engineering (Europe) BV

Program Acceptance Form

rev. PAF93SE00

This program and hardware satisfies the demands of the customer with respect to quality and documentation.

Customer : Bruco

Device type : AS2000 (BRU9002)
Function : Power Device
Manufacturer :
Package / pins : 8/16 pins

Die technology :
Package material :
Package width :

Spec. sheet :
Reference devices :

Test System : Teradyne Catalyst
Testtemperature :
Handler :

Documentation :
- ❒ Testflow
- ❒ Copy of datasheet
- ❒ Datalogs of reference devices
- ❒ Hardware schematics
- ❒ List of required files

Notes:

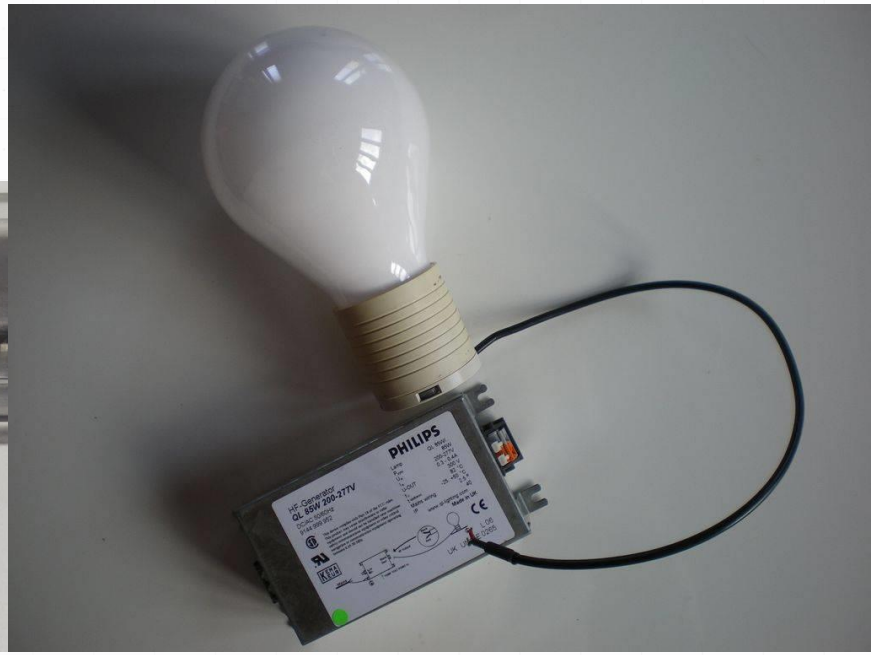
Programmed by : Geralt Poel
Function : Development engineer
Date : 2/10/2000

Accepted by :
Function :
Date :

QL LAMP control IC

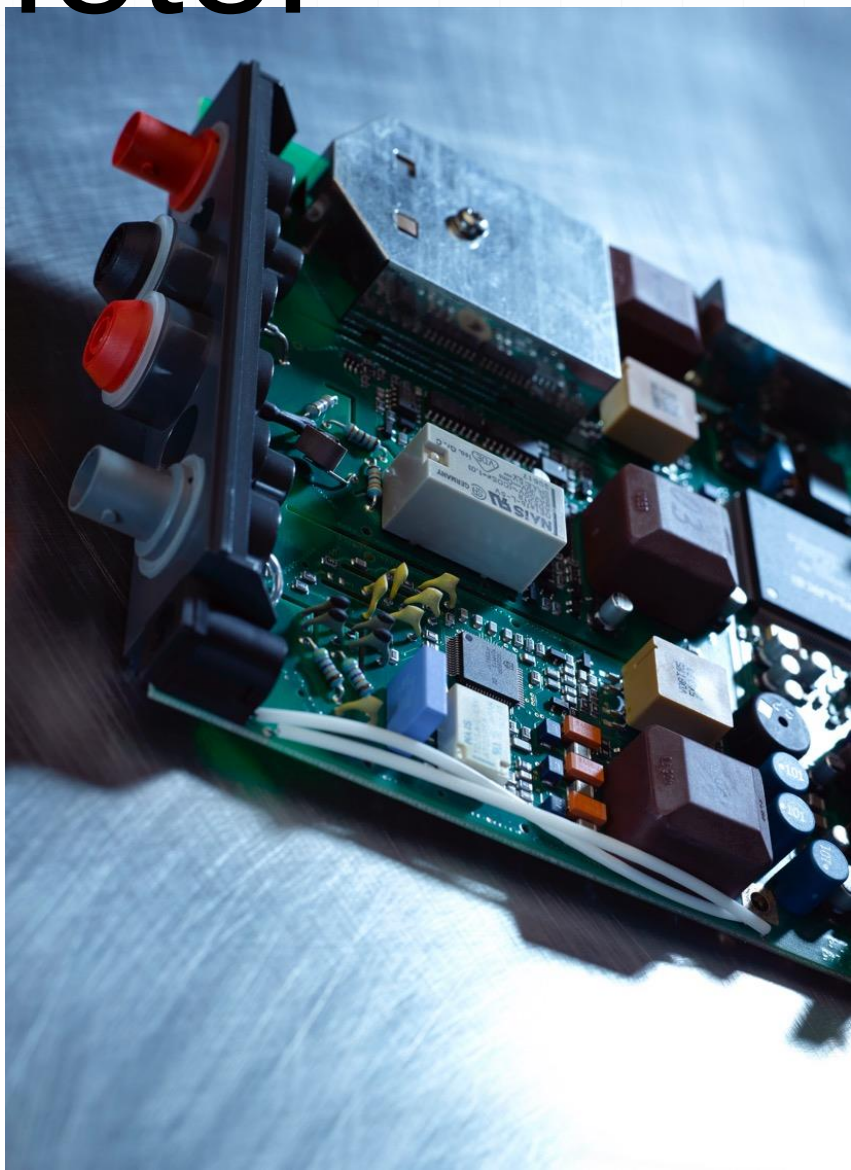
From specification to supplu

- Cheapest full IC development in Bruco: Only €500k NRE
- Production test program done by Salland Engineering



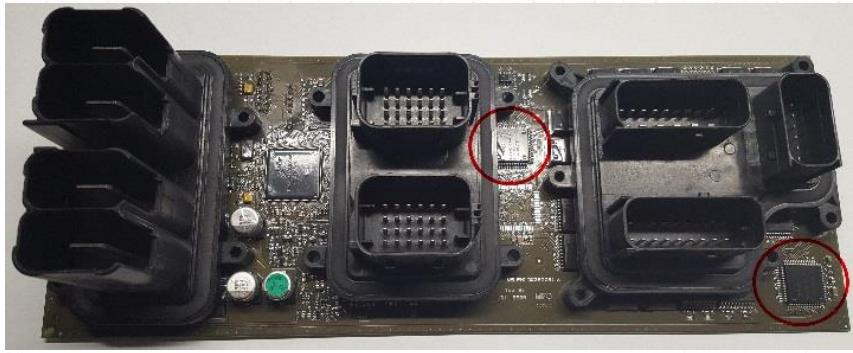
Handheld Scope Meter

- Analog front-end from DC to 500 MHz
- Tower/Jazz, low volume
- Coils created by hand
- Testing done by Salland Engineering
- No device qualification

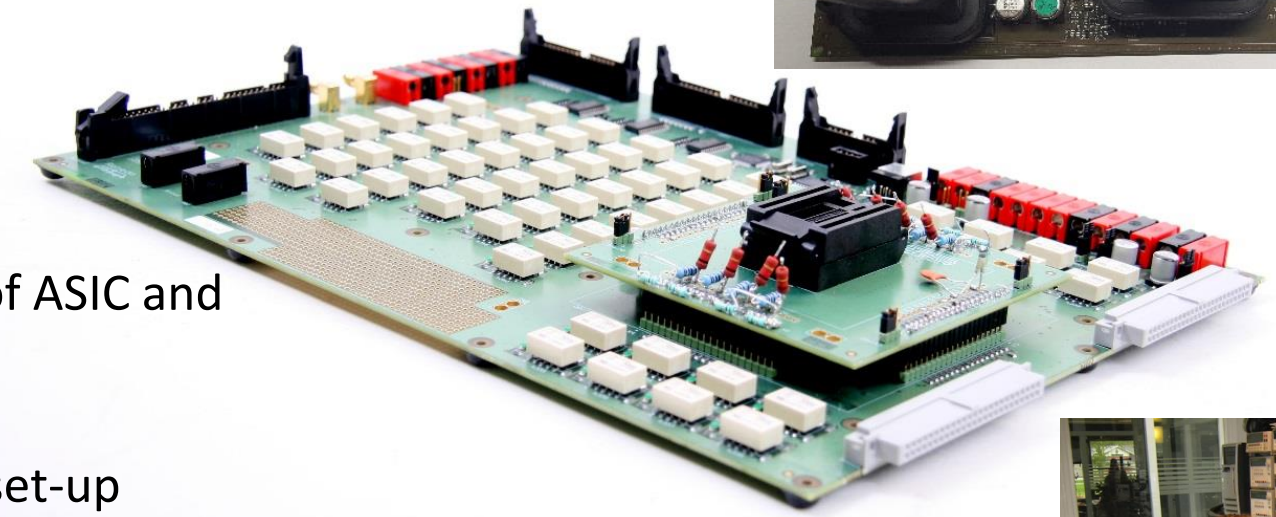


Driver-IC for power MOS, TrenchFETs

Versatile Body Controller



- Used by many European Car Makers
- Technology NXP A-BCD3
- Mask configurable
- Timeframe: 2004-now

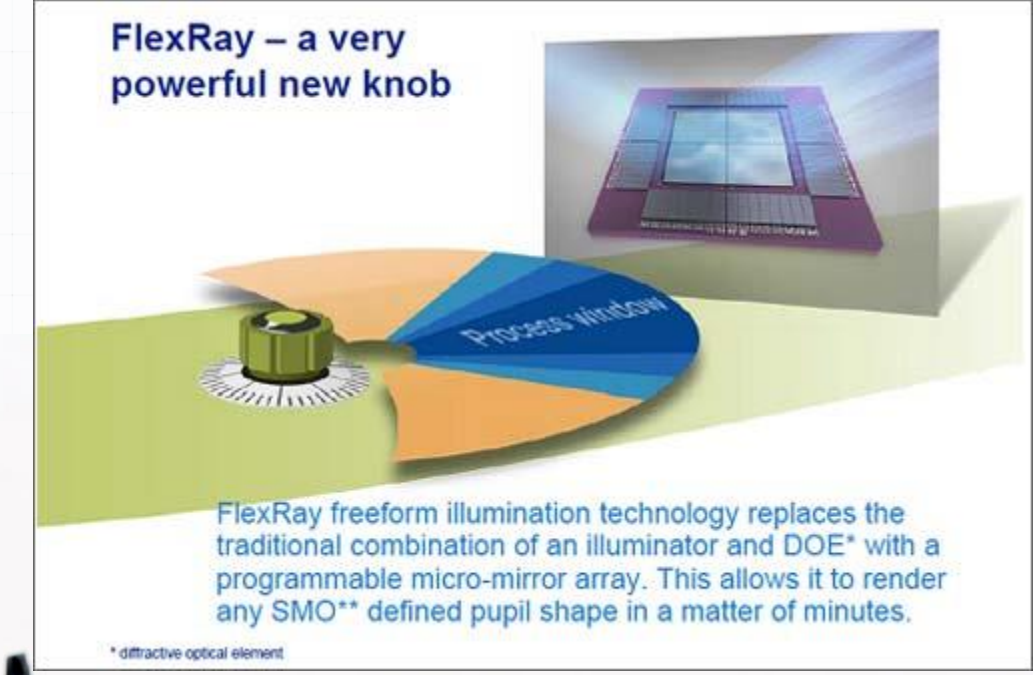


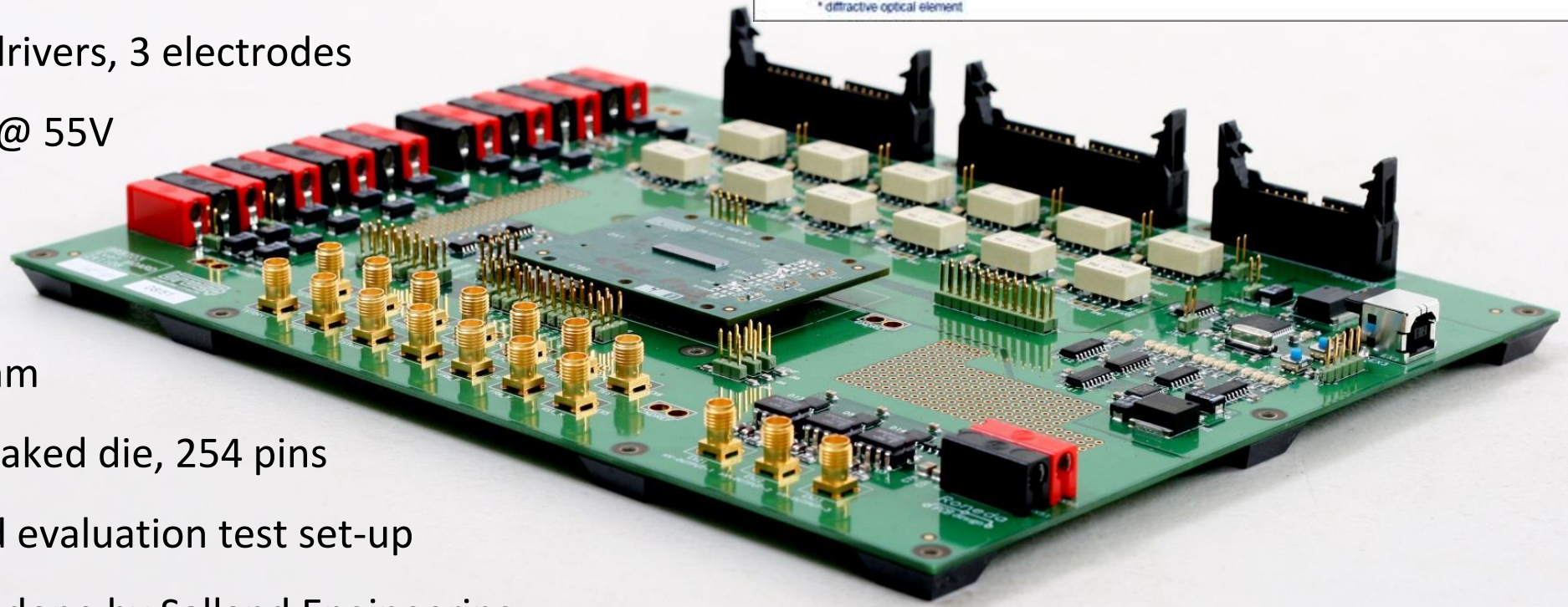
- Design and evaluation of ASIC and its evaluation board
- Automated evaluation set-up
- Support on Test Program, Salland Engineering
- Support on Q100 qualification
- Engineer and set-up on stand-by for electrical analysis of field returns.

MEMS ARRAY DRIVER

From system specification to …

- NXP’s A-BCD3 technology
- 128 DACs, 12 bits @ 1.5 kHz
- 200k gates on die
- 64 mirror drivers, 3 electrodes
- Operating @ 55V



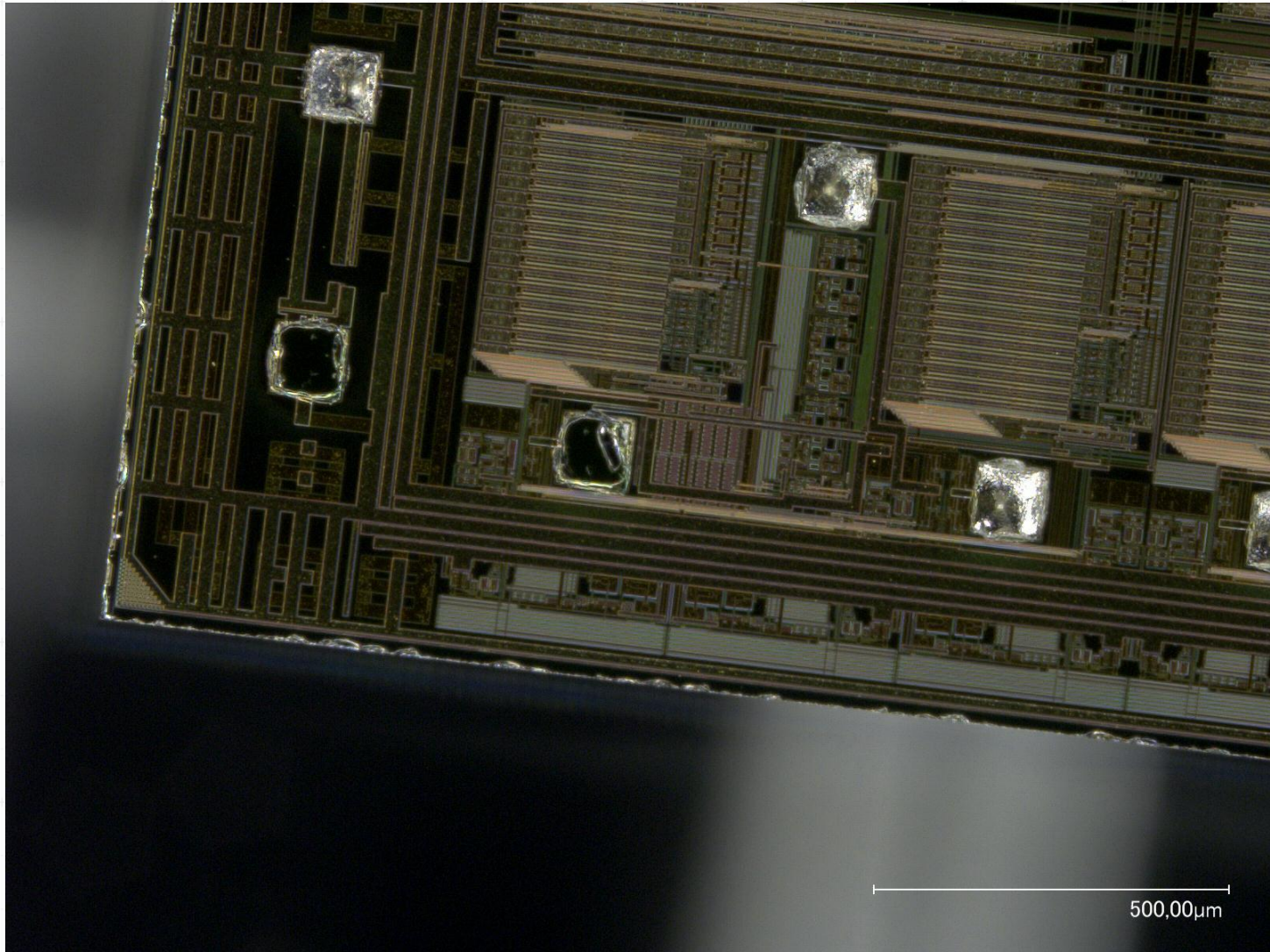


- Die 19x4 mm
- Flip-chip, naked die, 254 pins
- Automated evaluation test set-up
- Wafer test done by Salland Engineering

MEMS ARRAY DRIVER

…. to supply!

- Qualification is a stupid plan!
- Too sticky blue foil




Congratulations Salland!
On behalf of the Bruco team