

Welcome to the 1st Salland Test Technology Symposium

September 13-14th 2018
Zwolle, the Netherlands

Agenda

- Welcome
- A brief overview of Sallands history
- Targets & Activities of *Test Technology Center*

A warm welcome to our Symposium guests!

ADVANTEST

TERADYNE

Xcerra



Chroma

ShortLink

ELEVATE
SEMICONDUCTOR

amul

bruco
COMPONENTS



GRAPHCORE

NXP

**UNIVERSITY
OF TWENTE.**



AXIGN
THALES

ReSound GN

MASER
ENGINEERING

TELEDYNE DALSA
Everywhere you look

History of Salland Engineering

A short overview of evolution and innovation

1990s: Founded, Applications, CPU replacements



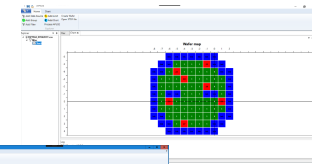
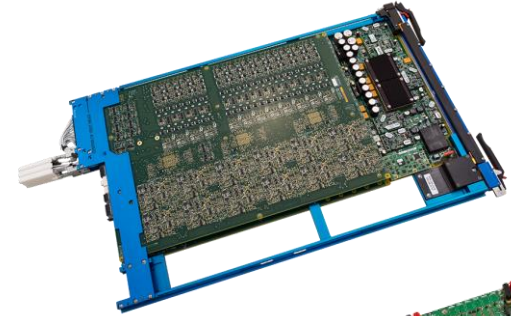
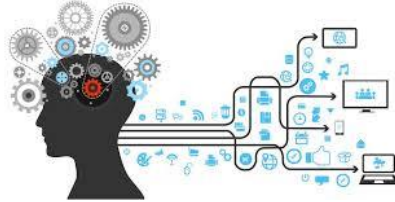
2000s: Customized Instruments, Bluetooth



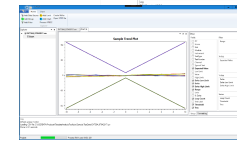
2010s: Standard (OEM) ATE instruments, advanced applications, production test



Today: IoT, AI, Intelligent light, Imaging, lab on Chip



eximo
AUDIO AMPLIFIERS



Salland Engineering Key facts

1993

- ▶ Started with Test Applications business

1996

- ▶ Expanded with Instrument Development
- ▶ Mainly CPU replacements

2000

- ▶ World's first Bluetooth production solution

2003

- ▶ Introduction of IDPS750 and HDPMU

2006

- ▶ Introduction of UDPS and HDACTO

2011

- ▶ Achieved ISO 9001:2008 certification

2017

- ▶ Germany mission with the King of The Netherlands
- ▶ 25-year anniversary

2018

- ▶ Move to the new building
- ▶ Achieved ISO 9001:2015 certification
- ▶ 55 employees, many (new) partners, expected revenue \$18m
- ▶ Launch Test Technology Center

World leader in 3rd party test solutions!

From Engineering office to Test Technology Center

1993



1998



2018




Salland Test Technology Center

Targets and capabilities

Today: Launch *Test Technology Center*

Advanced test production including engineering support

- Development of “fundamental test technology”
 - ▶ Incl creation of IP-blocks ready to be used in products
- Acquisition of  **APPLICOS**
MEASUREMENT & CONTROL
- Cooperation with Technical Universities
- Working on new test technology for
 - ▶ MEMS, RF/Radar, SerDes, Photonics
 - ▶ Tooling to make Test & Instrument engineering easier
- Deliver test solutions to
 - ▶ All key ATE players
 - ▶ Many semiconductor companies



Supply Chain & Test Services

PCB design, Manufacturing and low to mid volume Production Testing

Supply Chain & Production Test Services in Europe

Quick, Reliable & Independent Production Test including Test Engineering & FA/QR

ATE equipment

Teradyne UltraFLEX

- ▶ RF UltraWAVE24

Teradyne FLEX-RF & μ FLEX

Teradyne J750

- ▶ 1024 channel head

Exploring other platforms



Handling equipment

TEL P-12XLm prober

- ▶ 6, 8 & 12" with hot chuck

Chroma 3160C

- ▶ Production handler 2-temp.

Exatron 903

- ▶ Engineering handler 3-temp.

Thermonics T-2500E

Exploring: 3-temp HV Handler



Services

Final (sample) testing

Wafer test; 6, 8, 12"

Characterization

Quality & Reliability analysis



Sample and Wafer test production line

Small to (medium) volume Production test in Europe with extensive engineering support

Offering:

- **Seamless Product Qualification**
 - ▶ According: JEDEC, Q100
- **Sample & Production test**
- **Product engineering;**
 - ▶ data, yield analysis, => optimization, test,
- **Direct engineering NPI support**
 - ▶ Matures process parameters
 - ▶ Fast & advance analysis

Capacity & Capability

- **Own equipment available for**
 - ▶ Engineering & Qualification (NPI)
 - ▶ Production test
- **Turn Key processing**
 - ▶ Testing, Go/nogo
 - ▶ Retest & QA cycle's
 - ▶ Temperature cycle & read points
 - ▶ Packaging: bake, sealing
- **Reporting**

Salland Production Testfloor



Test Technology Center activities

Development of new test technology building blocks & tool to support the ATE-and semiconductor industry

Sallands role in the Test Technology Eco system

Close cooperation with end customers and partners to deliver solutions that work

Technical Universities



Consortia/Tech programs



Manufacturing Partners



Technology Partners



ATE Manufacturers



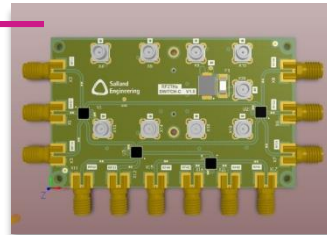
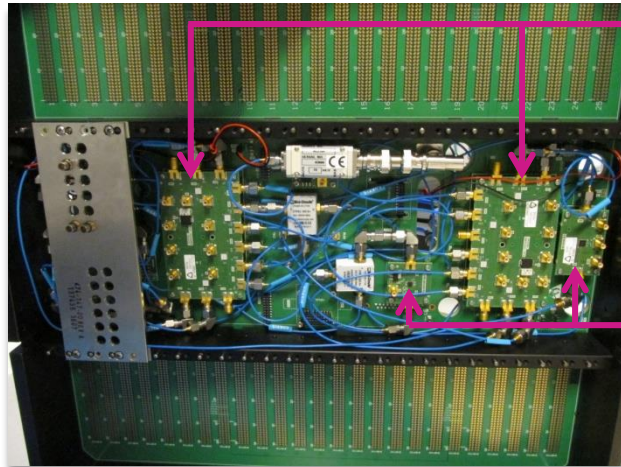
IDM, Fabless, Subcons

A big thank you to all our customers!!

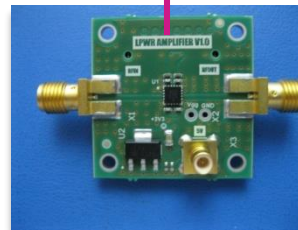


SE-RF Lego[®]: loadboard based building blocks

Easy adaptable RF modules: up/down converters, Amp, mixer, Filter, Switches, clock, LO



RF switches:
T with 2 to 6 Multiplexer

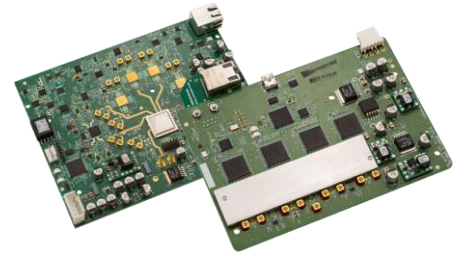


Typical Future Applications:

- MMW Imaging and Sensing
- Fast measurement equipment
- 60GHz wireless networking
- 400Gbit/s optical data communications
- 4G photonic mobile communication
- Two-way satellite communication

High Speed Solutions

- ATE platform independent High Speed SERDES modules inside stiffener with DSO capability up to 32Gbps & BERT capability up to 30Gbps
- Enable High Speed Testing with less than 15% of a new Test Cell Investment
- Working on solutions at 100+ Gbps



Ongoing new IP/product developments

- SE-DPLUS: Advanced application & instrument **analysis tooling**
- PoC Low power, **high density digital pin channel**
- PoC **High voltage pin channel family** for VI/DPS applications
- PoC **low current** measurements
- Concept Definition & Market validation **Dynamic MEMS solution**
- Exploring **Photonics test** challenges

SE-DPLUS

Created by and for engineers
Saving valuable engineering time!

Data Analysis tooling for quick and advanced Analysis

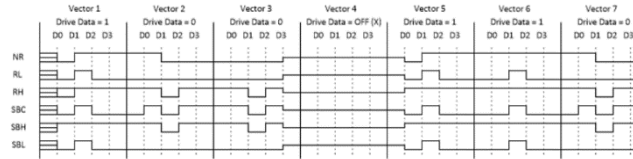
- ▶ Made by the inventers & creators of SEDANA
- ▶ Tooling for Application and Instrument engineering
 - Quick analysis of large amounts of data
- ▶ Easy site/channel correlation & investigation => find the “needle in the haystack”
 - Characterization, validation / verification
 - GR&R, ANOVA,
- ▶ Simple intuitive user interface (context driven, drop and drag)
- ▶ Automated report generation & Analysis

SE-DPLUS user interface

The image displays four screenshots of the SE-DPLUS user interface:

- Top Left:** Main menu with options: Home, Chart, Add Data Source, Add Limit, Create Wafer, Add Group, Add Chart, Open STDF file, Add Filter, Process APUL2.
- Top Right:** Wafer map visualization showing a grid of test results (Pass/Fail) across a wafer.
- Bottom Left:** Sample Trend Plot showing a line graph with various settings (P/F, Frame, Slot, Module, Instrument, TestType, TestNumber, Channel, Type of Test, Expected Value, Low Limit, Value, High Limit, Delta Low, Delta High Limit, Range, Loop Count, Test Label, Threshold, Time).
- Bottom Right:** Data table showing test results with columns: P/F, Frame, Slot, Module, Instrument, TestType, TestNumber, Channel, Type of Test, Expected Value, Low Limit, Value, High Limit, Delta Low. Configuration panel on the right shows: Dataset Name: DVT584_07042017.csv, File Name: DVT584_07042017.csv, Column Mapping: Expected Value, Delta High Limit, Delta Low Limit, Measured Value, Test Label, Test Number.

PoC: SE-DPIN

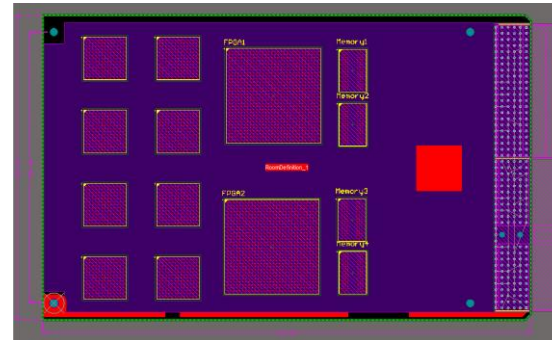
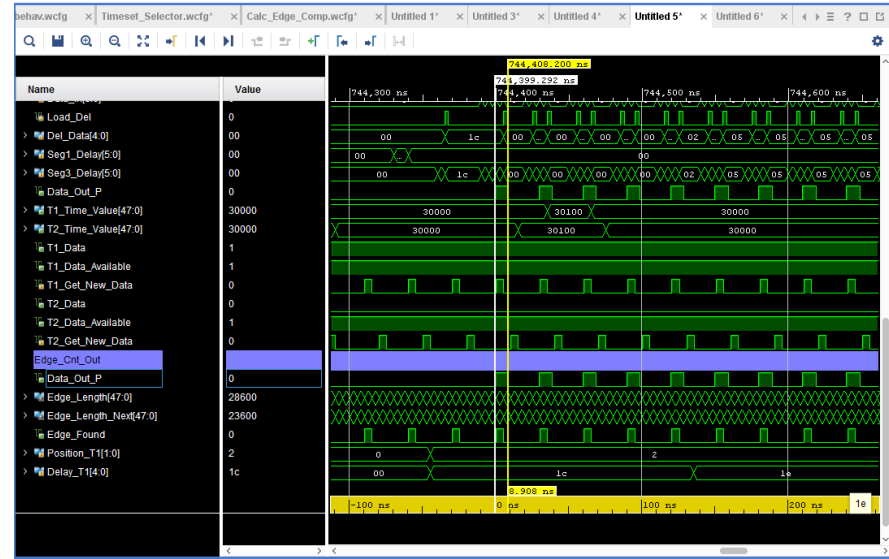
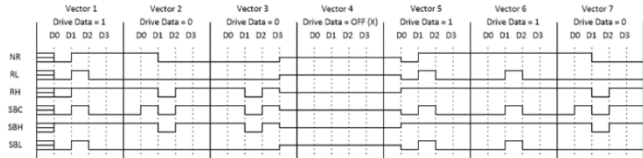
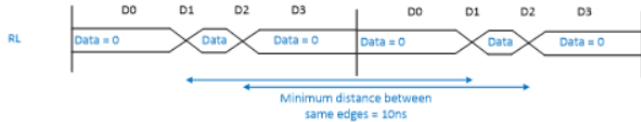
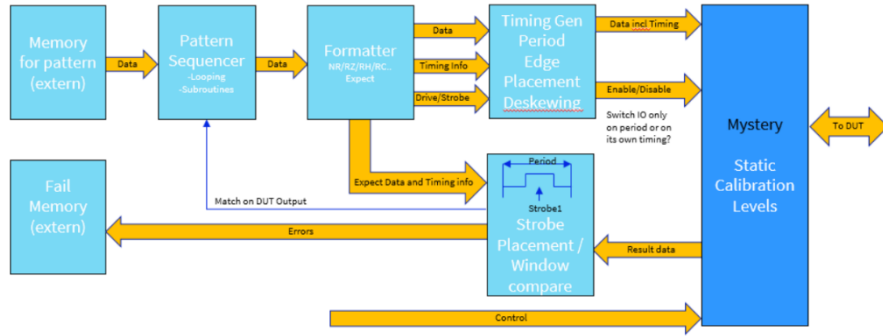


- Digital Pin core blocks based on next generation ASIC's from



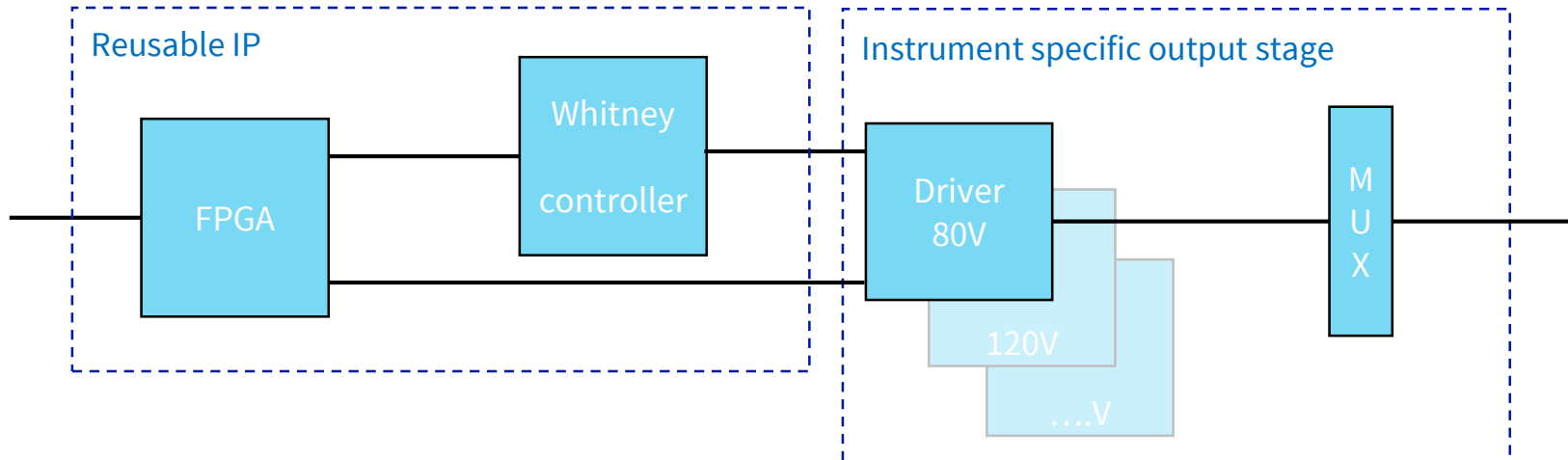
- Targets:
 - ▶ High density Low cost per pin,
 - ▶ FPGA based timing formatter
 - ▶ Platform independent Core
 - ▶ Easy integration on new platforms
- Draft Spec based on FPGA timing
 - ▶ 100MHz Pin for all drive formats
 - NR, RL, RH, SBC, SBH, SBL
 - ▶ 400MHz Protocol aware
 - ▶ Edge placement 39ps
 - ▶ Window comparator
- Low power consumption: ~ 1 W/ch
- Exploring specs with external timing

PoC: SE-DPIN examples



PoC: HV DPS/VI Family based on HV ASIC

- Platform independent Core for High Voltage VI & DPS instruments
- Ability to do fast integration on new platforms
- Reusable: Calibration algorithms, checkers, API



PoC: Low current & Low capacitance measurement

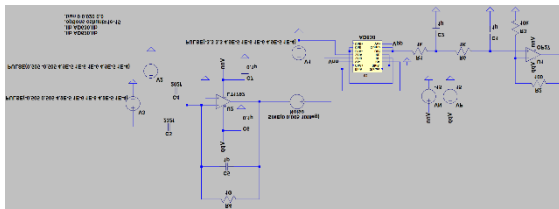
- Target market

- ▶ MEMS
- ▶ Photonic

- High channel count

- Pico Amps

- Femto Farads

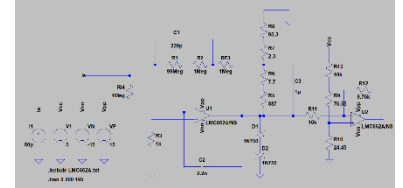


- Current

- ▶ Accuracy: $< \pm 3 \text{ pA}$
- ▶ Resolution: $\pm 5 \text{ fA}$ to $\pm 3.5 \text{ pA}$
- ▶ Range: 0 to 500 nA
- ▶ Measure time: 0.5 ms to 500 ms

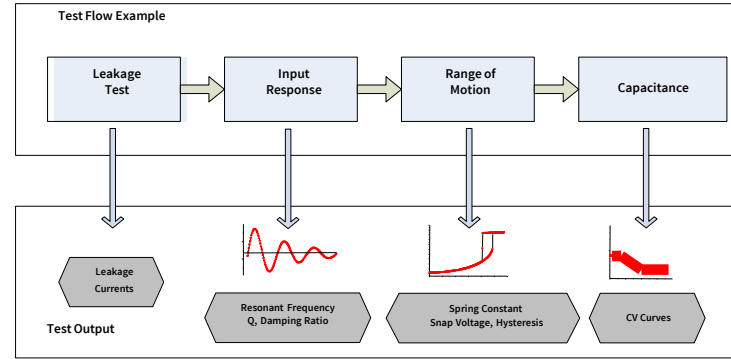
- Capacitance

- ▶ Accuracy: $\pm 1 \text{ fF}$
- ▶ Resolution: $\pm 500 \text{ aF}$
- ▶ Range: 10 pF (differential/single ended)
- ▶ Measure time: 100 ms
- ▶ Output $\approx 1 \text{ mV/fF}$



PoC: Dynamic MEMS testing

- Testing without physical stimulus
- Upcoming Salland event, MEMS / IoT testing



Regular ATE

- ▶ DPS
- ▶ Digital I/O
- ▶ PMU
- ▶ AWG/DIG
- ▶ DUT Power
- ▶ Supplies



MEMS Solution

Hardware

- ▶ Pico PMU (pA/nA)
- ▶ Capacitance (pF/fF)
- ▶ External LCR connections
- ▶ Memory/uC to collect and pre-process data (STDF & CSV)

Tooling

- ▶ Hardware control
- ▶ Data Analysis

PoC: Photonics testing

Salland participates in  **PhotonDelta**
Integrated Photonics Ecosystem

Targets photonic eco system

- ▶ Reliable production in the Netherlands
- ▶ Application driven
- ▶ Shared infrastructure

Targets Salland

- ▶ Offer Reliable test solution
- ▶ Instrument development
- ▶ Application support

Nederlands ecosystem



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