Bridging Power and RF: Smart Gate Driver Modeling in COSIDE® with SystemC AMS

COSEDA User Group Meeting 2025

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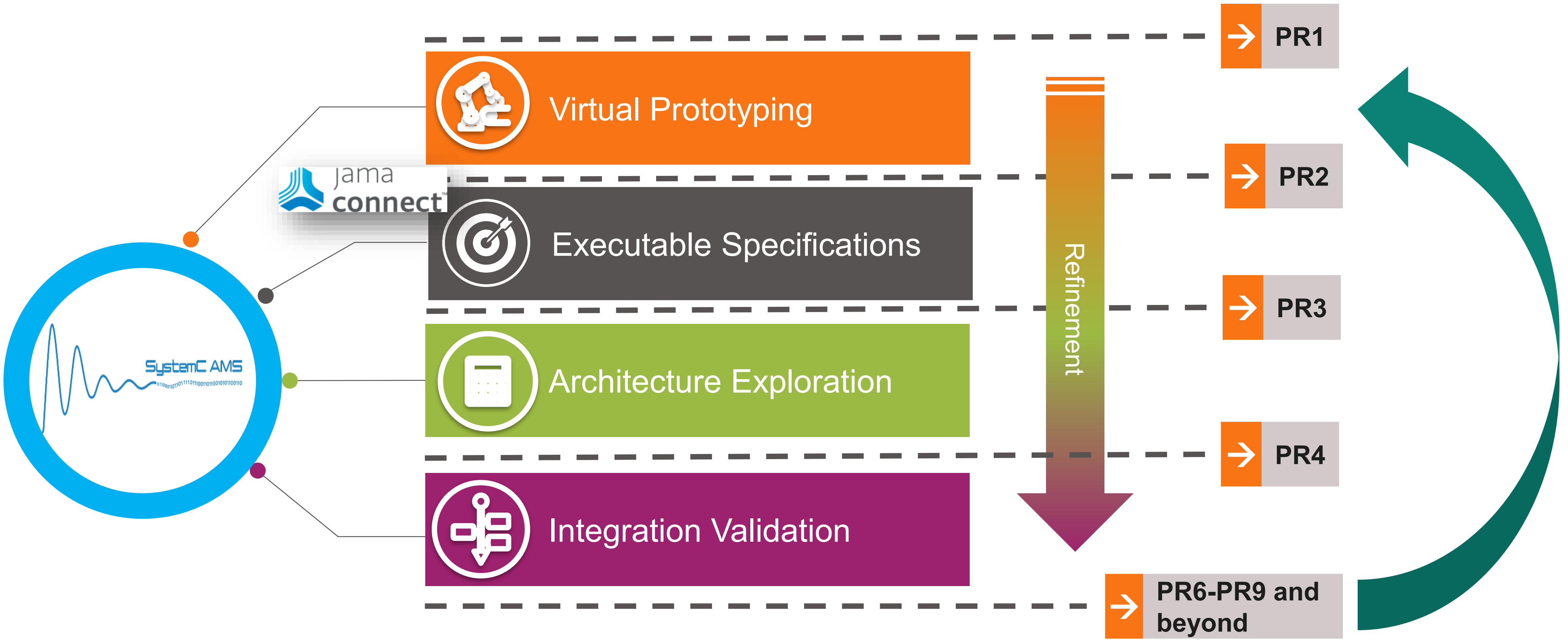
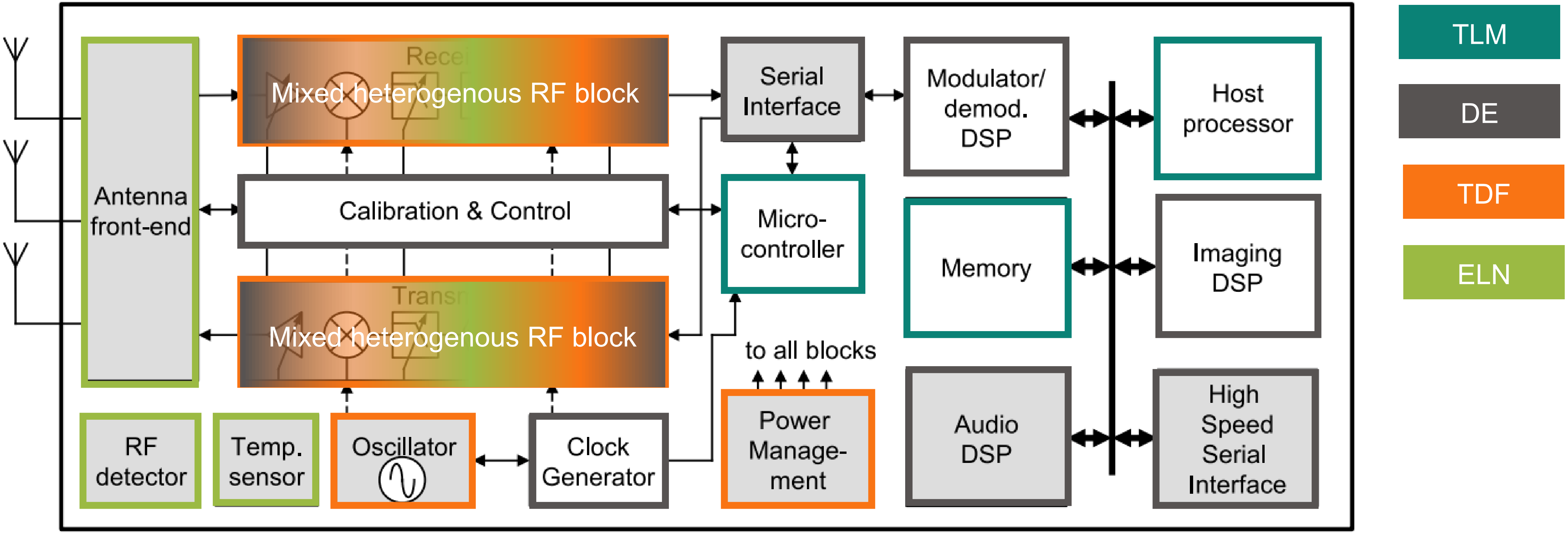
System-aware single source development flow



Heterogeneous AMS/HW/SW architecture



System C AMS User Guide

Methodologies for RF Modeling

- "SystemC is a set of c++ classes and macros which provide an event-driven simulation" (1) which enables the modeling of (*digital*) HW descriptions (2)
- It does not handle the modeling of analog/continuous systems

› "**SystemC AMS** is an extension to SystemC for analog, mixed-signal and RF functionality"

Missing dedicated libraries for RF modeling

Source(1): Wikipedia

- Pre-built library of RF blocks
- GUI entry mode
- No coding knowledge needed
- It couples with analog and digital simulators

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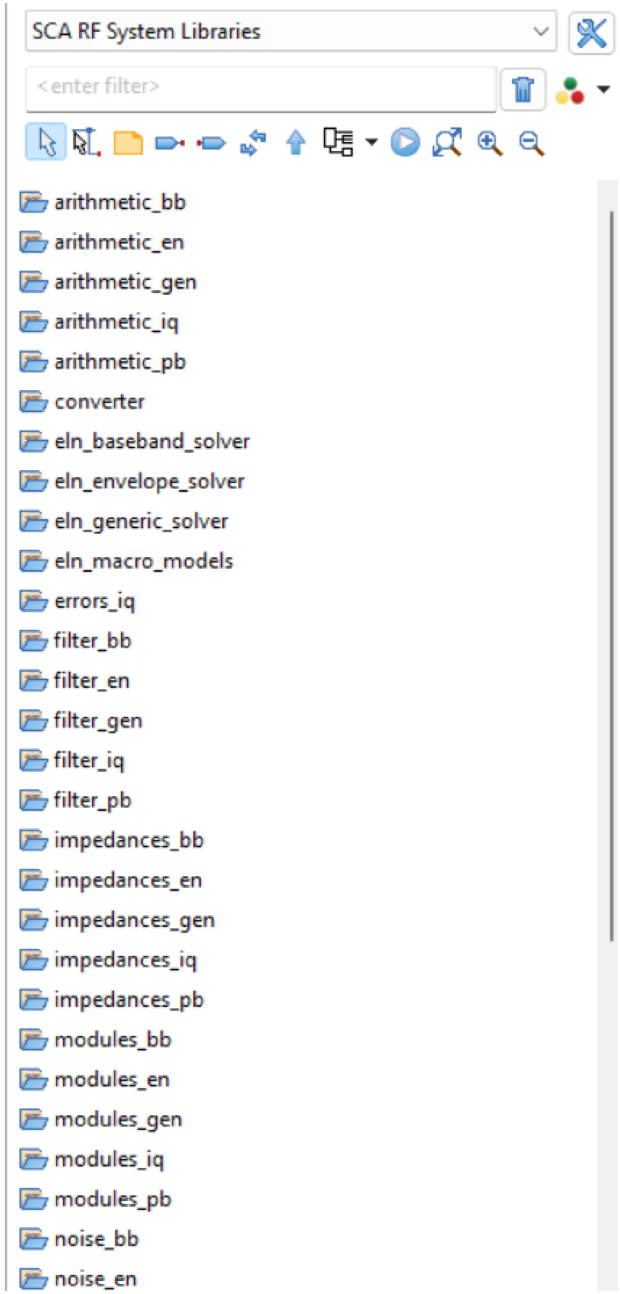
Key Features of Coside RF Libraries

- Prebuilt RF Components
- Baseband and Envelope Modeling
- Preconfigured Examples and Templates
- High Efficiency Using TDF (Timed Data Flow)

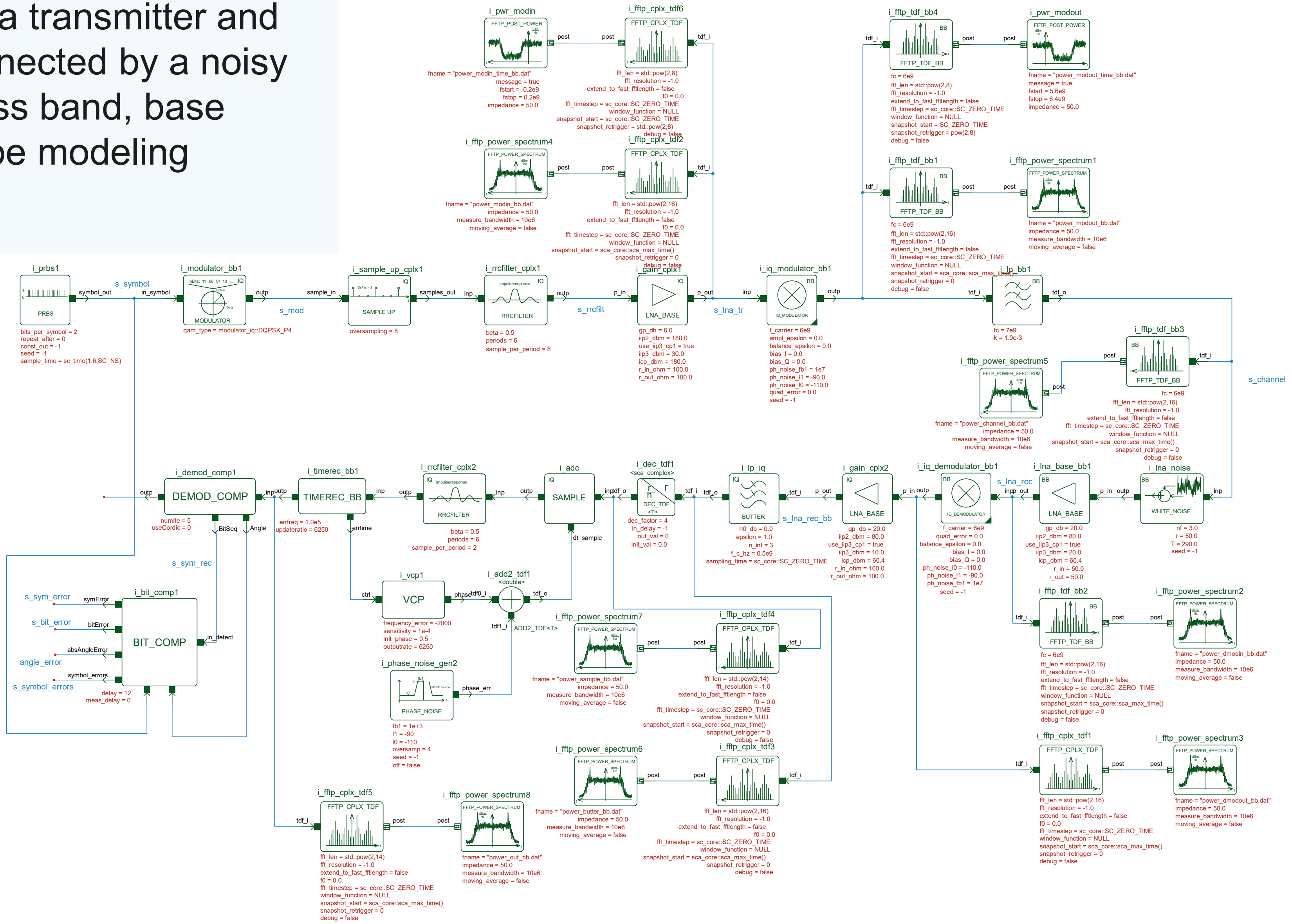


Abstraction models for SCA RF System Libraries

Modeling Technique	Carrier Frequency	Signal Representation	Computation Cost
Passband	Included	Conventional time domain	High
Baseband	Shifted to 0 Hz	Spectrum around center frequency	Low
Envelope	Abstracted Includes several tones	Spectrum around several center frequencies	Moderate

RF Chain Demo

System model of a transmitter and receiver path connected by a noisy channel using pass band, base band and envelope modeling technologies.



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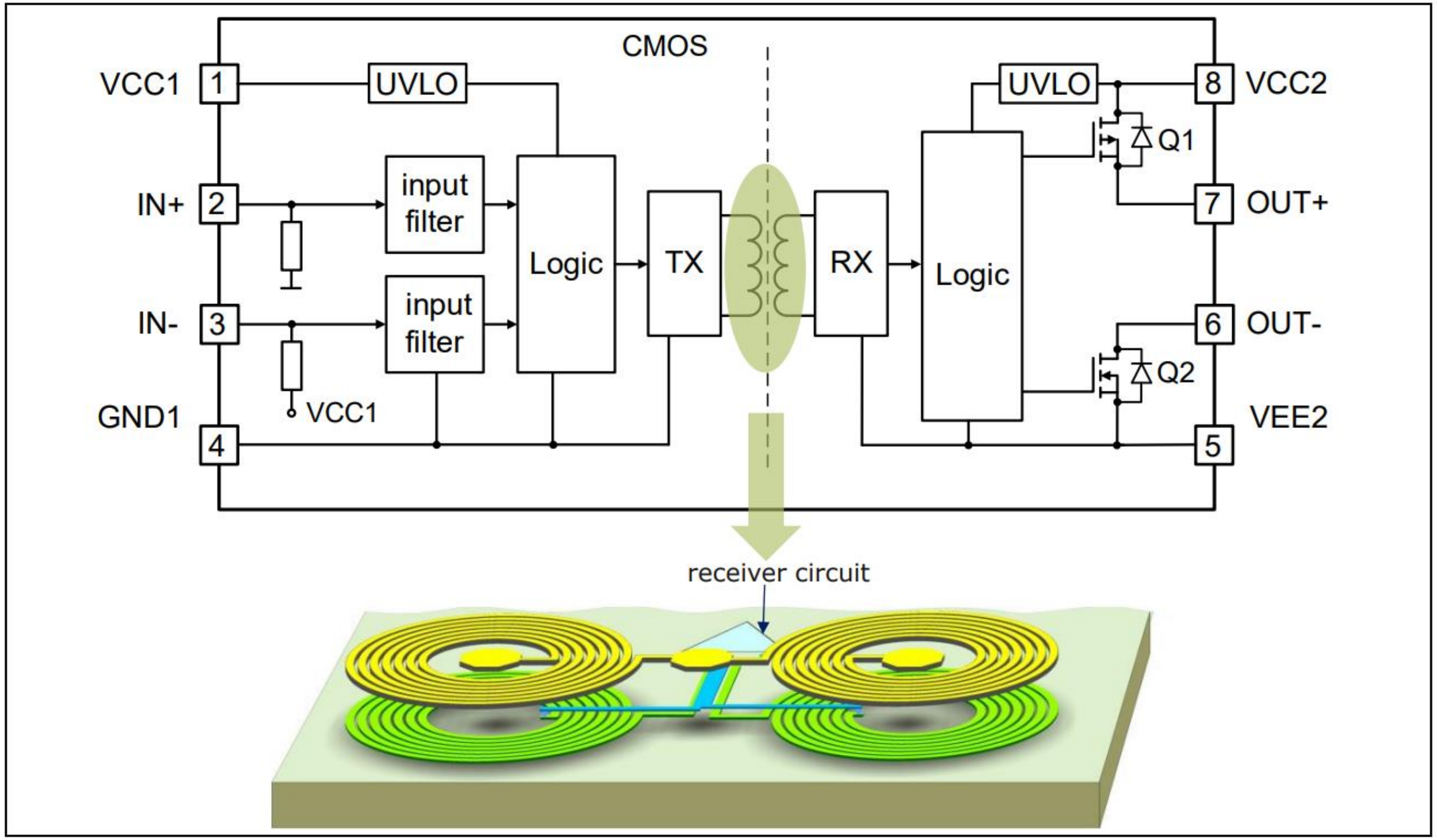
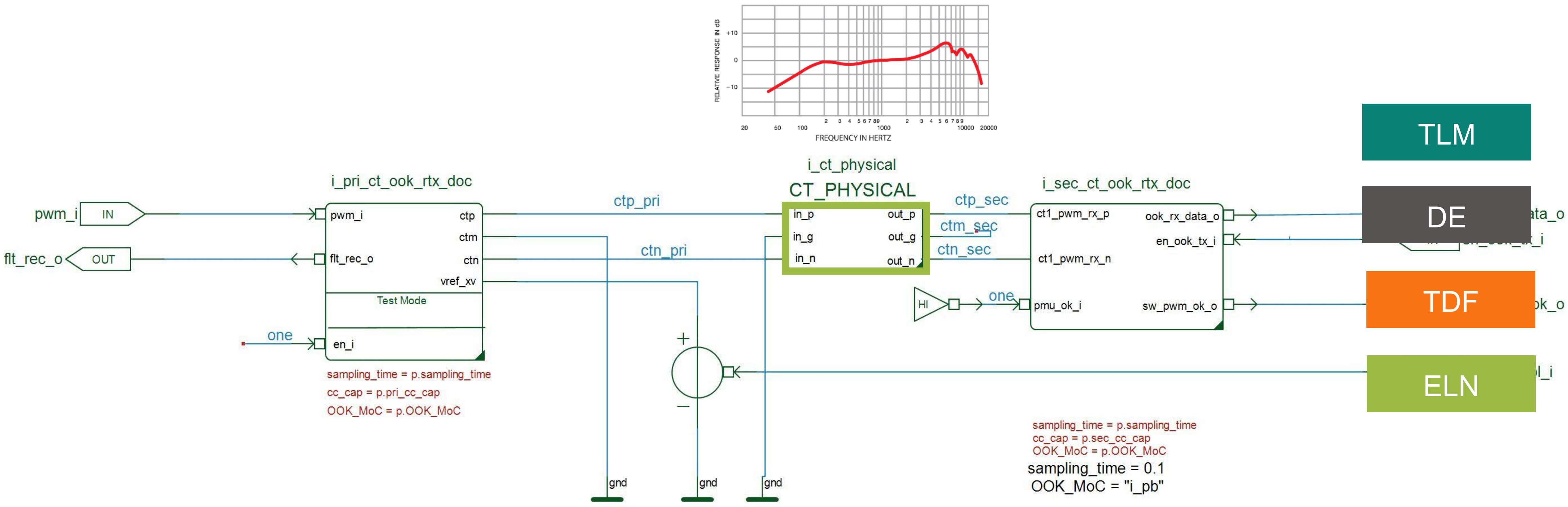
Infineon Coreless Transformer Technology



Advantages of coreless-transformer gate drivers over gate drive optocouplers

- Integrated magnetically coupled, galvanically isolated coupler technology
- TX logic signals converted into an RF carrier
- Additional functions such as filtering and protection functions
- Combination of analog, digital and communication functions

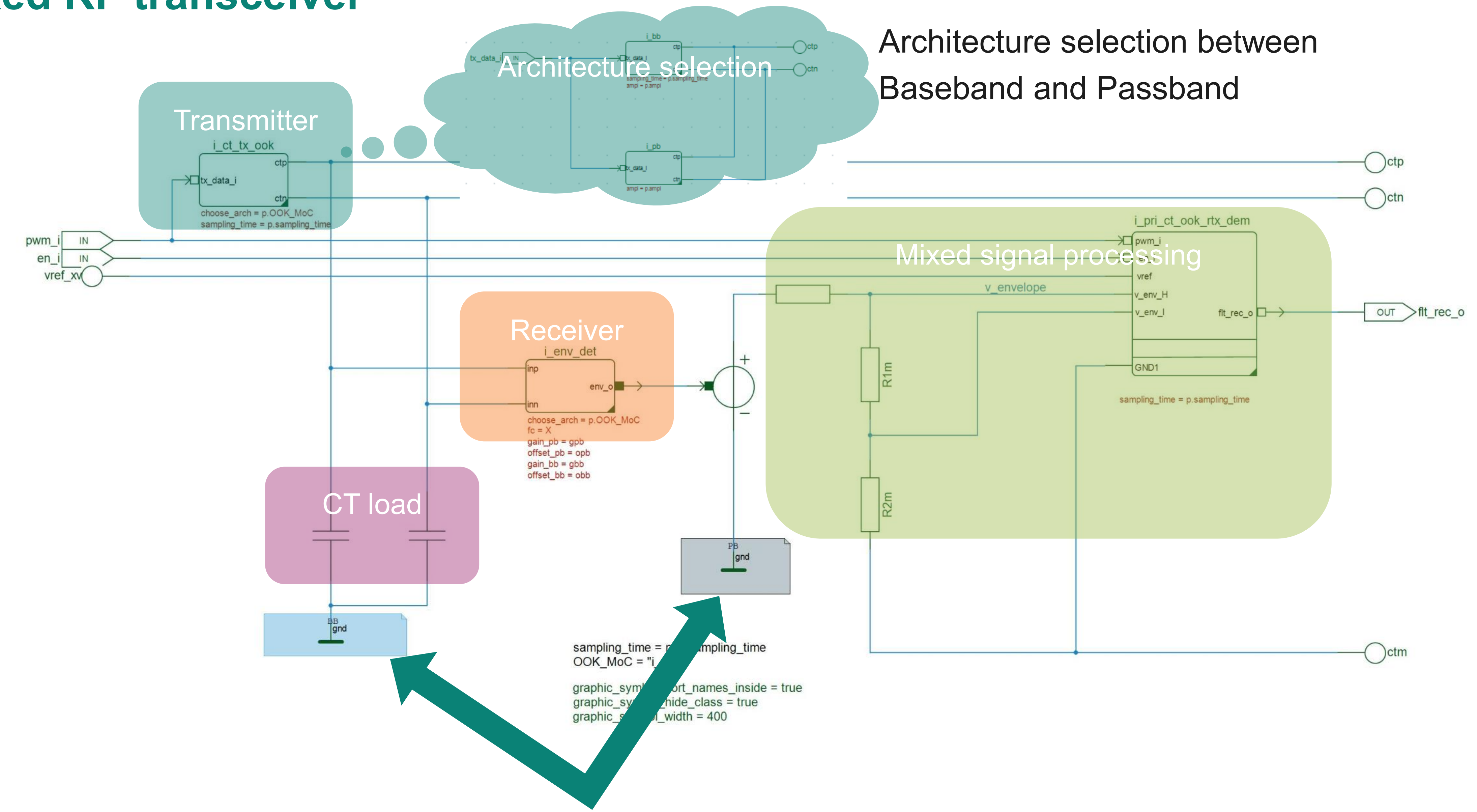
Mixed RF communication. Top Level



Block-level model of a transmitter and receiver path connected by an Infineon Coreless Transformer using pass band and base band combined with AMS modeling technologies.

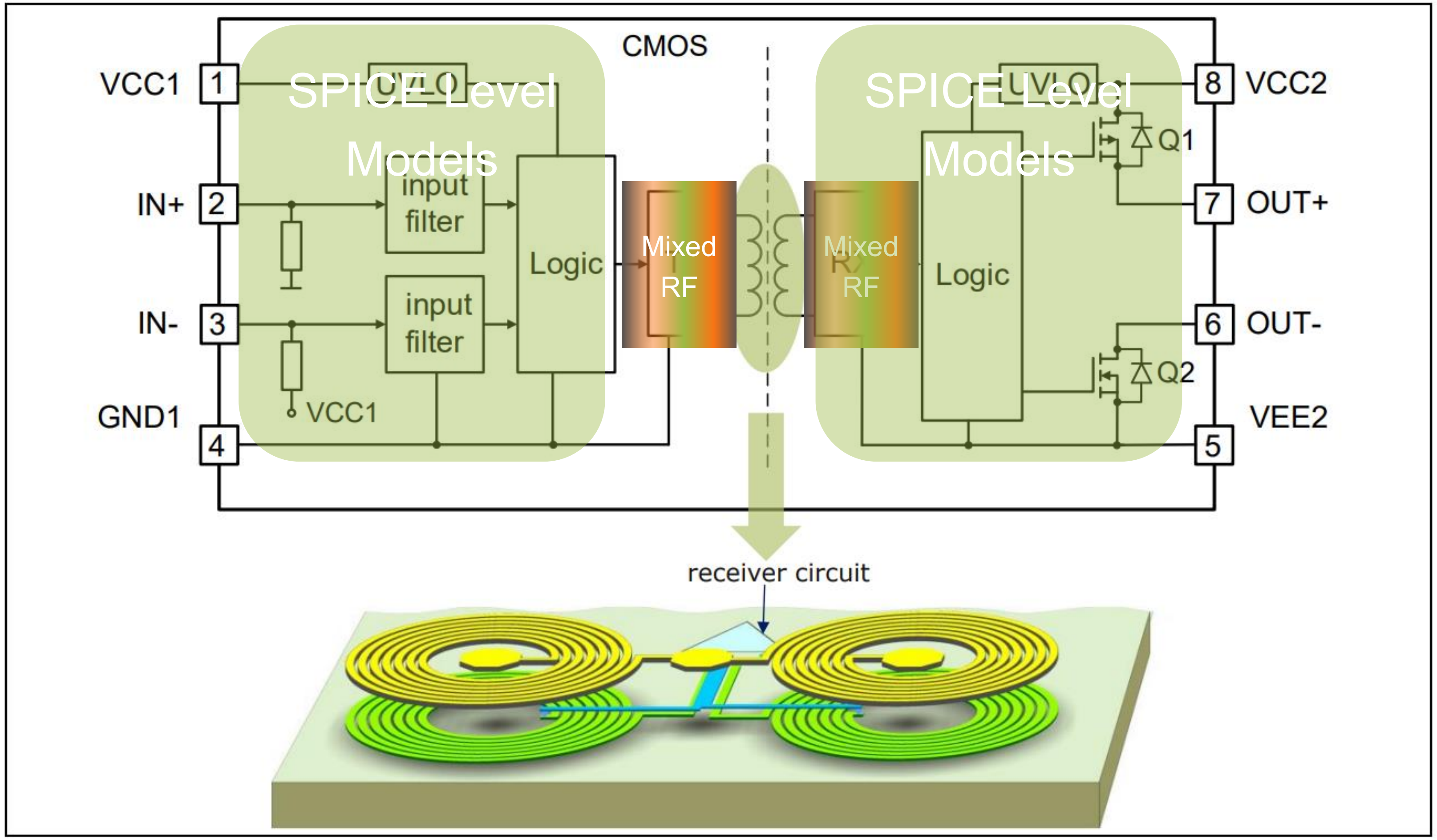
Mixed RF transceiver

Architecture selection between Baseband and Passband



Keep grounds separated!

Integration validation and AMS verification with mixed RF models



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Conclusion

- COSIDE® RF libraries simplify significantly RF modeling
- Significant increment in simulation sped when dealing with high frequency carriers
- Reduction in orders of magnitude in di of trace files
- Further speed increment and reduction of storage utilization when used combined with SPICE-level models

Thanks for your attention!

Q & A