Digital twin of Power GaN board system

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Digital twin philosophy and objectives

• Digital representation of a Power GaN board system
• Homogeneous environment for design and validation with high-fidelity transistor model and 3D board model
• Seamless integration of advanced solvers allowing the design and optimization of the board within the same environment:
  ✓ Schematic capture
  ✓ Layout design
  ✓ PCB Parasitic extraction, EMC analysis
  ✓ Thermal and Electrical simulations
Siemens EDA vision of the Power GaN digital twin
Half-bridge power board with IRT-Power GaN 650V/30A transistors

Study of packaging impact with GaN transistor
Results: Simulation Vs Measurement

Hyperlynx results: 7.4nH

Measure from Low Side Vds voltage: 7nH

Simulation (Red) vs. Experimental (Black) results
Half-bridge power board with GaNSystem 650V/30A GaN transistors

Study of conducted common mode emission with GaN transistor

Experimental EMC test bench
Results: Simulation Vs Measurement

Simulation (right) vs. Experimental (left) results
Conclusion

Highlights:
• Good consistency between experimental versus simulation results for both functional analysis and EMC emission
• This holistic approach using automated simulation campaign within a unified design environment is mandatory to increase design quality

Challenges:
• The correlation between experimental and simulation results may not be always satisfactory; there is a need to understand all potential causes of differences
• The selection of the right electromagnetic field solver for a given simulation purpose needs a certain expertise level from the user
• Compact models of GaN transistors are young and they should mature over time