



AHEAD OF WHAT'S POSSIBLE™

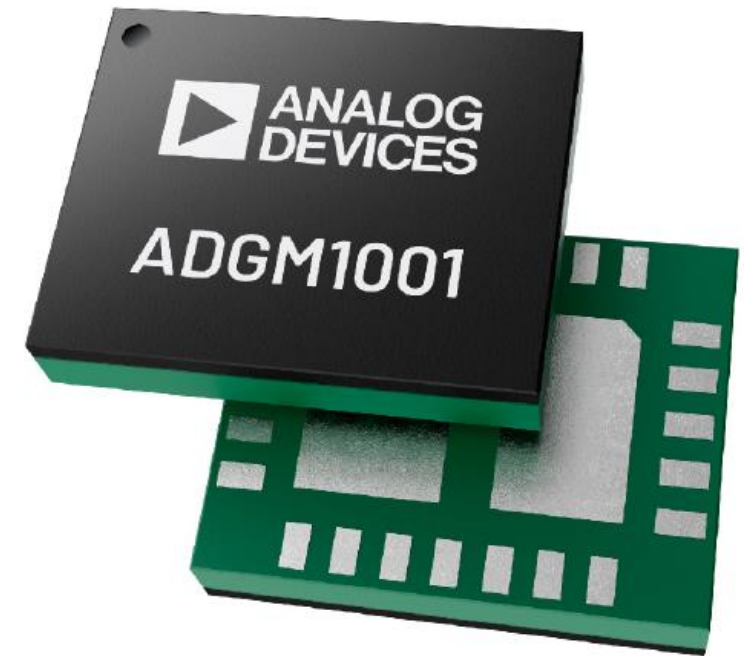
DC to 64Gbps Micro Relay with Integrated Driver, A Simplified Solution to Increase Productivity

Session: WEMA60

Presenter: Eric Carty, Applications Manager

- ▶ **Learn about the ADI MEMS switch micro relay technology portfolio and the newest releases**
 - ADGM1001 (34GHz) SPDT
 - ADGM1002 (20GHz) SPDT
 - ADGM1003 (16GHz) SPDT

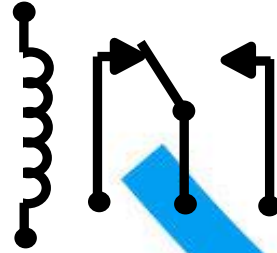
- ▶ **Learn how MEMS switch technology addresses overall system efficiency**
 - Increased Channel Density
 - Wider RF Bandwidth
 - Improved Precision performance
 - Enhanced product lifetime



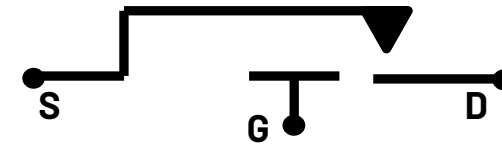
Switching Technology Types Compared

Electromechanical Relays

*Robust with DC operation,
large size with lifetime
and bandwidth limitations*

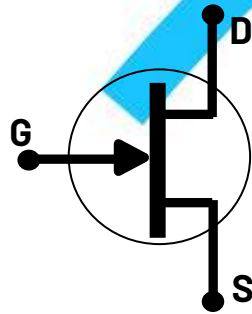


MEMS Switch Technology



Solid State Si Switches

*Small size and robust,
limited DC operation and
power handling*



Small size with more configurations

RF bandwidths up to mmWave

Low Insertion loss with high RF power handling

High Linearity

Standard SMD packaging

MEMS SWITCH TECHNOLOGY

Road Map Drivers

**Capability
Driving
Customer
Productivity**



**Technology
Leadership**
Precision
Packaging
RF Performance



Higher Frequencies
DC to mmWave



Ease-of-use
SPI control
Integrated Passives
Internal ESD protection



System Solutions
Higher Channel Density
Future Proofed Performance
Switch Configurations

ADI Ireland Limerick Campus - MEMS Switch Fabrication



Integrated Passive Device Fabrication Plant
15000 sq-ft Class 1000 Clean Room

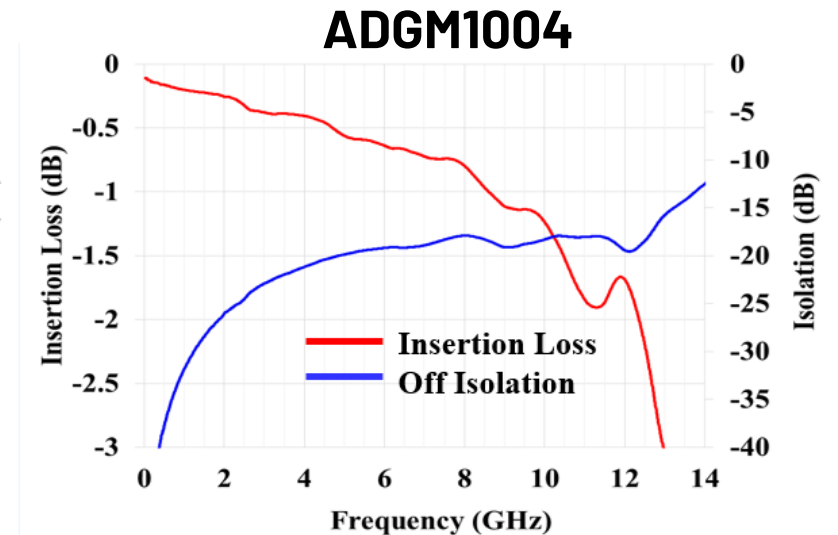
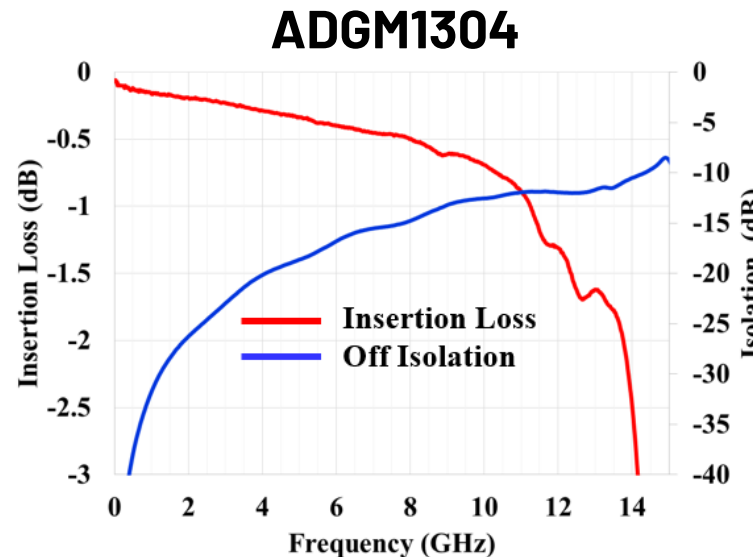
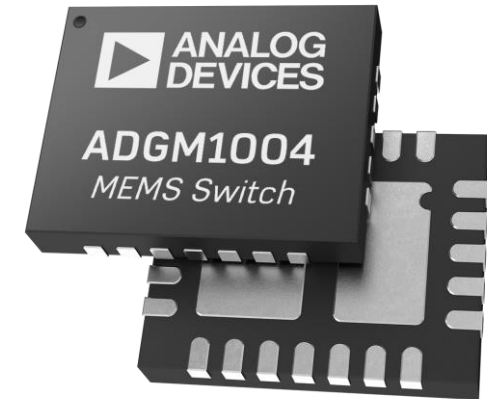
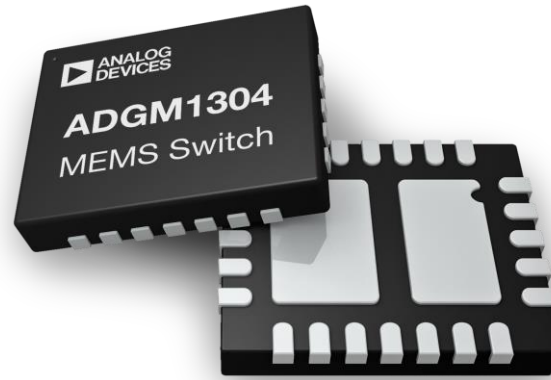


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ADGM1304/ADGM1004 SP4T Switches

0Hz/DC to 14GHz Bandwidth

Specification	Datasheet Specs
Configuration	SP4T
Bandwidth	DC(0Hz) to 14GHz/ 13GHz* (3dB)
Insertion Loss	0.26dB/ 0.45dB* typ at 2.5GHz
Off Isolation	24dB typ at 2.5GHz
Linearity IIP3	69dBm/ 67dBm* typ
Linearity 2fo Harmonic	90dBc typ (5MHz), 85dBc typ (150MHz, 800MHz)
Power Handling	36dBm/ 32dBm*
Ron	2.9Ω (max)
DC Voltage Range	+/-6V
Actuation Lifetime	1 Billion min
Continuously On Lifetime	7.2 years at 50°C
Interface	Parallel and SPI
Supply Voltage	3.0V to 3.6V
Temperature Range	0°C to +85°C
ESD (HBM / FICDM)	[±100V / ±500V]/ 5kV (RF-Ports), 2.5kV (Device)*
Package Size/Type	5mm x 4mm x 0.95mm LFCSP



*Star highlights ADGM1004 specification levels

ADGM1001: 0 Hz / DC to 34/GHz SPDT MEMS Switch

New
Release



Value Proposition

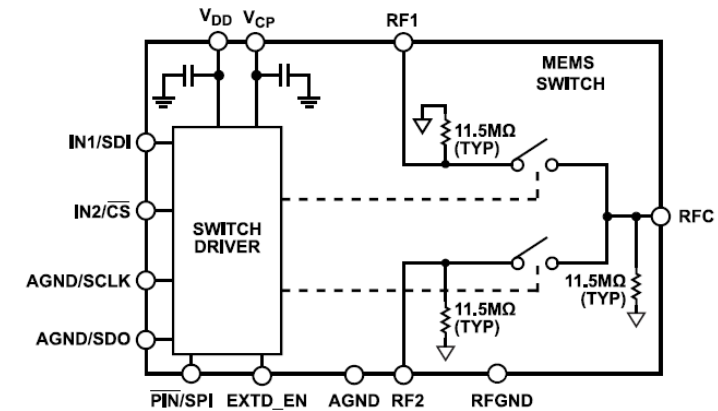
- ▶ 0 Hz/DC up to 34 GHz (64Gbps) bandwidth
- ▶ 20× smaller than competitive electromechanical relay solutions
- ▶ 10mW drive power
- ▶ 500 Million typical cycle lifetime

Key Benefits

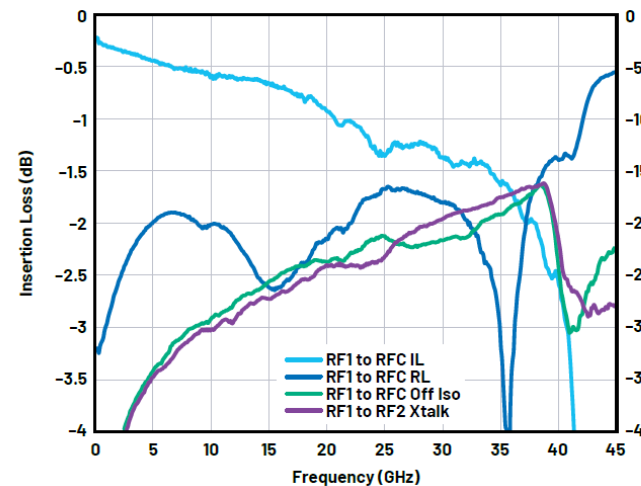
- ▶ Insertion loss: 0.8 dB (typical) at 18 GHz, 1.5 dB (typical) at 34 GHz
- ▶ <1.0 mm height enables dual side pcb mounting usage
- ▶ No external decoupled capacitors needed
- ▶ Shunt resistors integrated to avoid floating nodes



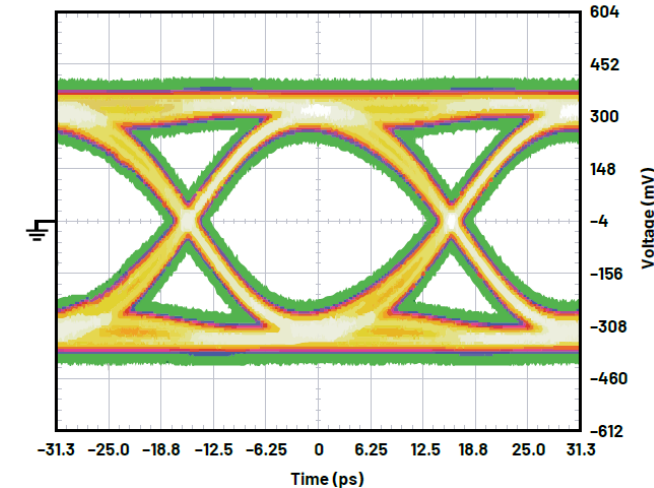
Functional Block Diagram



RF Performance Characteristics



Eye diagram* at 32 Gbps (RF1 to RFC)



*PRBS signal, includes pcb losses

ADGM1001 / ADGM1002 / ADGM1003: Benefits

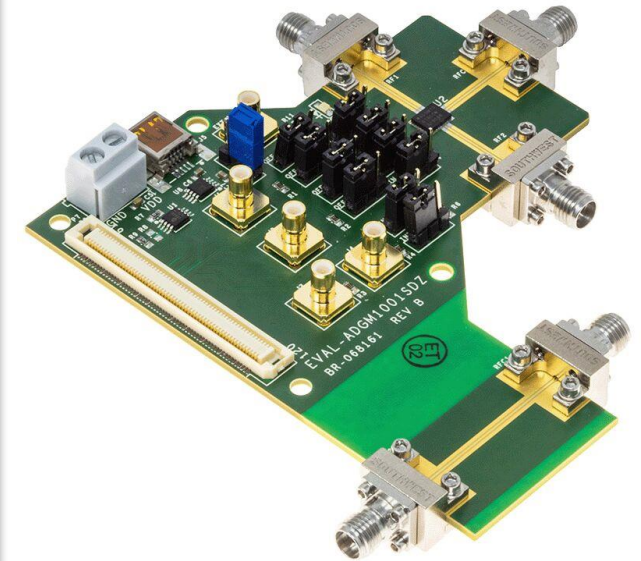
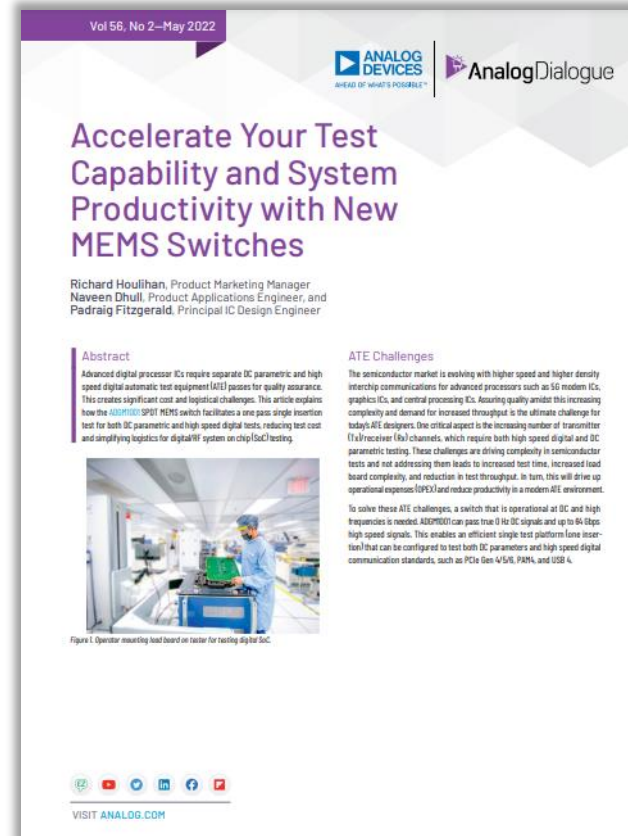
New
Release



- ▶ These parts were added to the MEMS switch portfolio to increase bandwidth and configuration offerings addressing ATE and Instrumentation markets needs

Features	Benefits
<ul style="list-style-type: none">▶ ADGM1001 : 0 Hz/DC up to 34 GHz signal bandwidth▶ ADGM1002 : 0 Hz/DC up to 20 GHz signal bandwidth▶ ADGM1003 : 0 Hz/DC up to 16 GHz signal bandwidth	<ul style="list-style-type: none">▶ Simplifies test instrumentation design with both DC and high-speed functionality. Wide bandwidth future proofs systems for future standards like PCIe Gen4/5/6, USB3, USB4, PAM4.
<ul style="list-style-type: none">▶ Easy to use small form factor 5mm x 4mm x 0.9mm	<ul style="list-style-type: none">▶ Up to 20× smaller than relays. Increases application channel density. Increases test through put in ATE applications. Reduces ATE Opex
<ul style="list-style-type: none">▶ Low drive power 3.3V, 10 mW to 20 mW	<ul style="list-style-type: none">▶ No requirements for relay drivers. Reduces system BOM. Low power simplifies design-in and power dissipation mitigation.
<ul style="list-style-type: none">▶ 500 Million cycle lifetime typical	<ul style="list-style-type: none">▶ Reduces system down time and replacement▶ 50 x greater than typical relay lifetimes

- ▶ Data Sheet: Available
 - [ADGM1001](#), [ADGM1002](#), [ADGM1003](#)
- ▶ Evaluation Board: Available
 - [ADGM1001](#)
- ▶ Technical Article : [Analog Dialogue May 2022](#)
- ▶ Companion Products:
 - Quad PMU: AD5522
 - SP4T MEMS Switches: ADGM1304, ADGM1004
 - Low Noise, LDO Regulators: ADP7142, LT1962, LT3045-1
- ▶ EngineerZone®: [MEMS FAQs](#)
- ▶ Product Home Page: [ADGM1001](#)

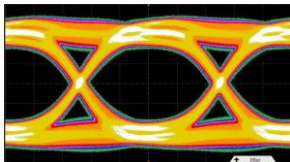
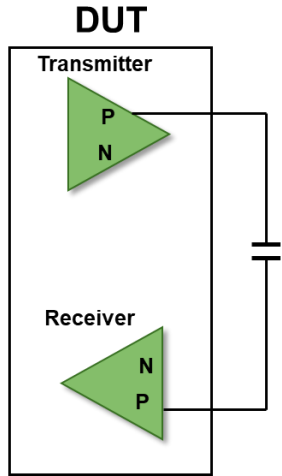


Automatic Test Equipment Applications



MEMS Switch Increases productivity and reduces test cost in next generation ATE Load/Probe boards

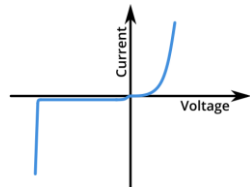
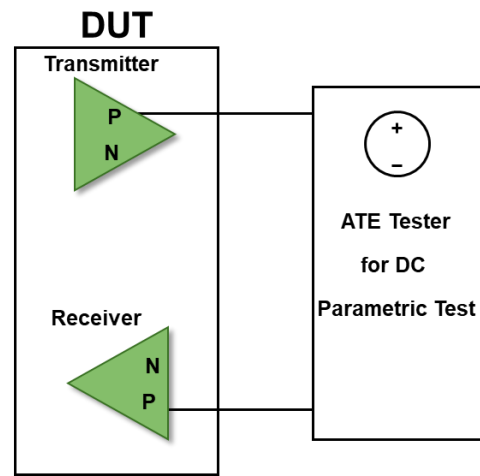
Test Pass#1
High Speed Loopback Test



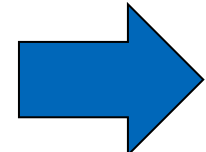
High Speed Test Platform



Test Pass# 2
DC Parametric Test



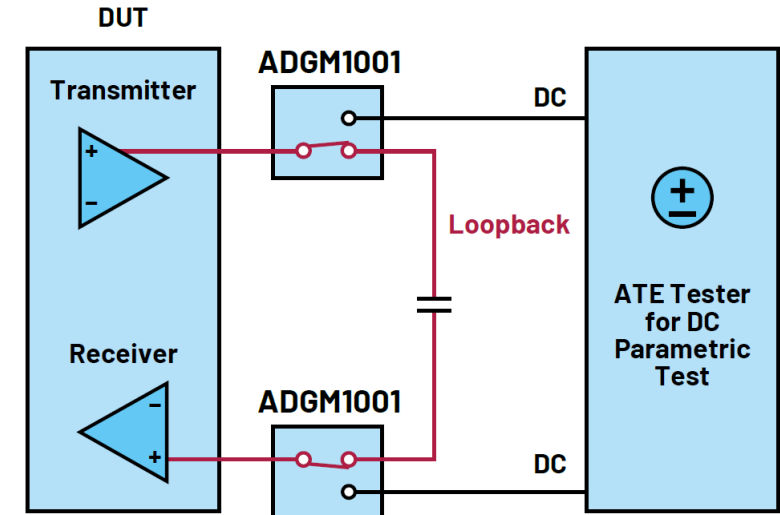
DC Test Platform



High Speed Loop Back Test



DC Parametric Test

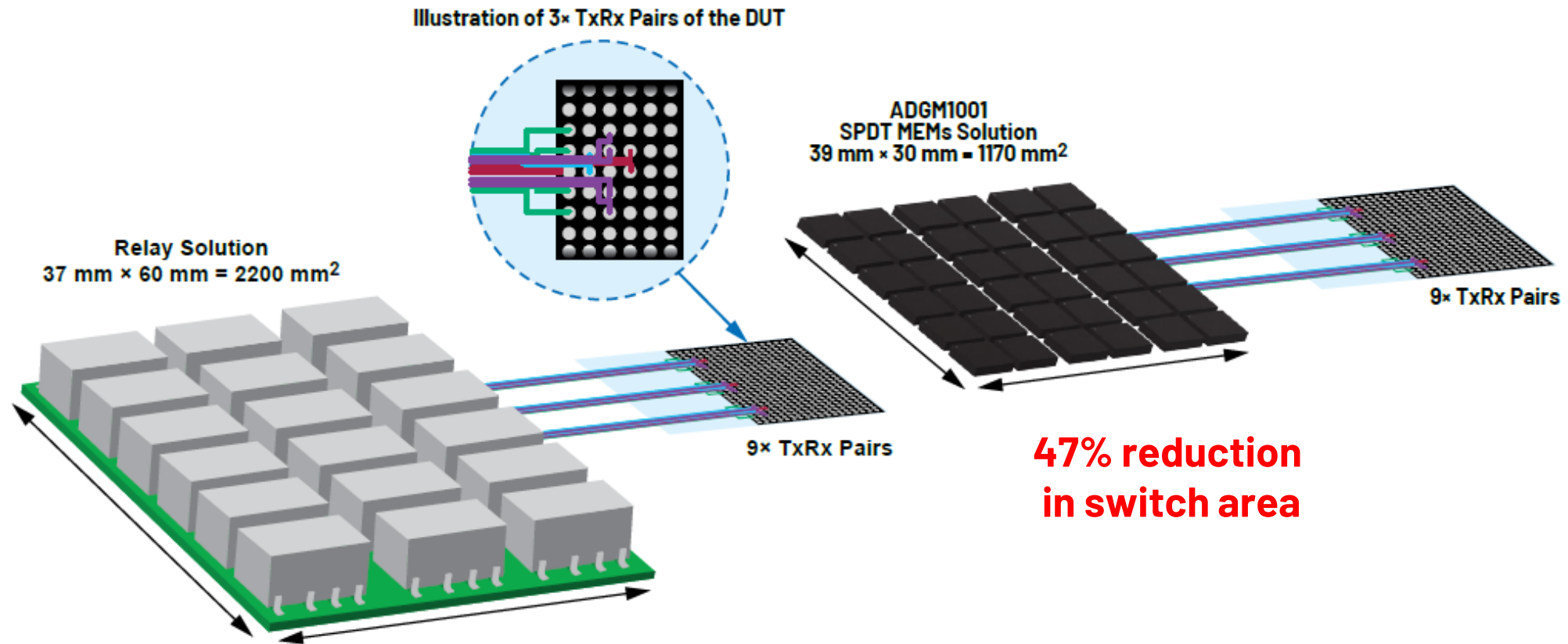


Reducing Cost

Increasing Productivity

Future Proof (34GHz)
PCIe gen 4/5, PAM4, USB 4, SerDes

Greater Test Channel Density Versus Relays



► **MEMS switch technology advancements addressing:**

- Evolving interface standards; (PCIe, Serdes, Pam4 etc)
- Optimized channel density; (Configurations to achieve increasing number of lane pairs)
- Bandwidth with reliability; (Extending both range of use and product lifetime)
- Platform flexibility; (Drop in platform alternatives, enabling efficient running changes)

► **ATE applications:**

- Ideal switching solution for SoC ATE test system instrument and load boards
- Enables a single insertion test solution that includes high speed digital and DC signals
- Increases test channel density per load board compared to relays
- Future proofing high speed system solutions