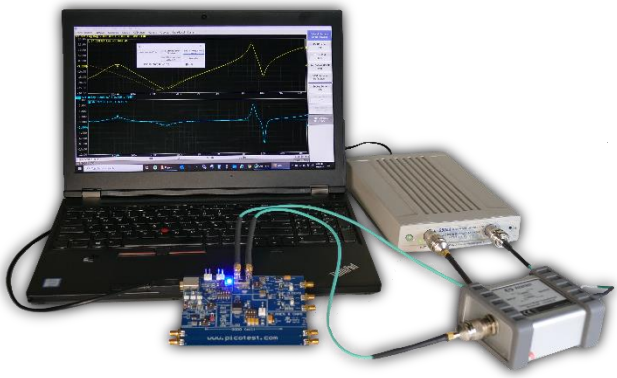
Stability Analysis Using a CMT VNA

Picotest NISM Software for CMT Compact VNAs

Identify the Stability/Phase Margin from an Output Impedance Measurement

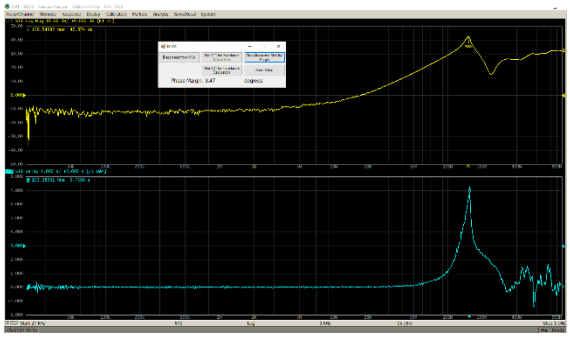
Control loop stability is critical to the performance of all systems, as it influences all closed loop parameters, as well as system noise. Unfortunately, in many instances, particularly in the cases of voltage references, fixed voltage LDOs, and integrated POLs, a Bode plot assessment is not feasible because there is no feedback loop access to the part. In other cases, the feedback loop is difficult to access because the hardware is integrated or would require cutting a PCB trace. In yet other cases, the devices either contain multiple control loops, with only one of them being accessible, or the order of the control loop is higher than 2nd order, in which case the Bode plot is a poor predictor of relative stability. A further complication is that in many portable electronics, such as cell phones and tablets, the circuitry is very small and densely populated leaving little in the way of access to the control loop elements.

In these cases, the Non-Invasive Stability Margin (NISM) assessment, which is derived from easily accessible output impedance measurements, is the only way to verify stability.



Since the stability is determined from an output impedance measurement, made at the output of the power supply, you do not have to break the control loop to determine stability. This technique can be used with all types of power supplies including linear regulators, LDOs, POLs, VRMs, and DC-DC converters. Impedance can be tested using 1-port or 2-port measurements.

- Measure the stability margin of all types of control loops
- Support for 1-port and 2-port impedance measurements
- Ability to determine stability margin of regulators, switchers, POLs, and opamps, even if the control loop is not accessible or exposed outside of the device
- Ability to find the phase margin of regulators and switchers that have multiple loops, even if one or more of those loops are internal to the device



Testing the phase margin of a high bandwidth opamp using output impedance

- Ability to derive the phase or stability margin from output impedance measurements

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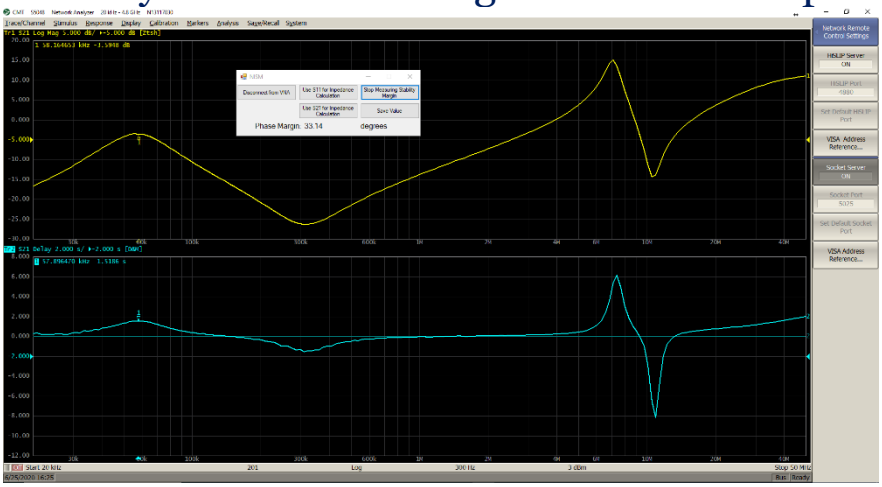
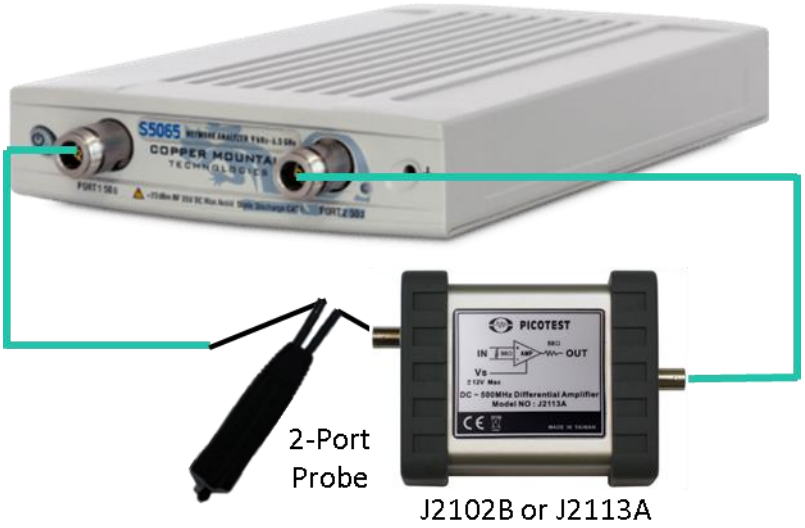
Stability without Breaking the Control Loop



The phase margin of an LDO is determined from an output impedance measurement on the Copper Mountain Technologies' VNA. Above the output impedance is shown along with the Q/Group Delay. From a simple cursor measurement and custom developed Picotest software, the stability is determined.



Physical test setup to use the NISM software. Simply capture the impedance, run the software, move the cursors, and observe the stability margin.

System Components

NISM Software	NISM Software (SINGLE USER License) for the Copper Mountain VNA
PDN Cables	Very thin - Ultra-flexible cable optimized for PDN and SI testing
J2102B – Ground Loop Solution (BNC or N connectors)	Common Mode Transformer 3dB Bandwidth: 1Hz – 6GHz Maximum input voltage: 50V
J2113A – Ground Loop Solution	Semi-Floating Differential Amplifier 3dB Bandwidth: DC-800 MHz Maximum Input Voltage: 1.9V Typical CMRR - > 57dB
P21B01/P2130A DC Blocker	PDN Probe Bundle - includes 1-Port and 2-Port 50 Ohm Transmission Line PDN Probes, Accessory Kit, and two P2130As Blockers (2-Port Probe shown)

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To learn more about this solution please contact

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Picotest Solutions for Breaking the Ground Loop in 2-Port Measurements

J2102B Common Mode Transformer

J2113A Differential Amplifier

For information about Picotest Accessories for Copper Mountain Technologies products, applications, and services, go to www.picotest.com

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