Keysight Technologies
B2900A Series of Precision Source/Measure Units
Quick DC and Transient Evaluation of Switching Mode DC-DC Converter

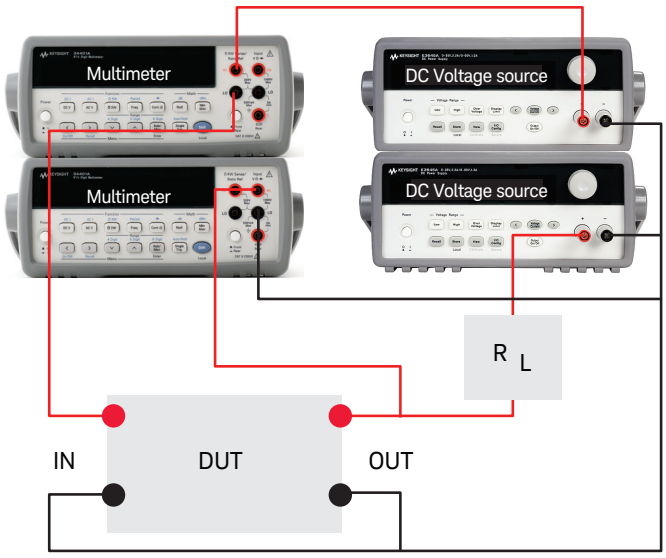
B2912A (front view)

DC evaluation of DC-DC Converters

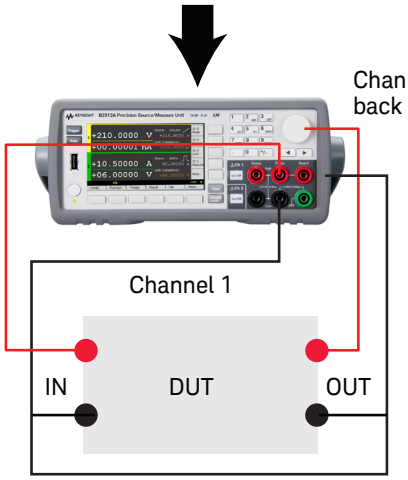
This two-pager outlines an example of load regulation and load transient response characterization for an off-the-shelf switching mode DC-DC converter.

- Load regulation: This converts an inputted DC voltage into a stable DC output voltage even if the output current is varying.
- Load transient response: This is the variation or glitching that occurs in the output when the output load undergoes transient changes.

A dual-channel SMU (Source/Measure Unit) such as the B2902A or B2912A is an ideal choice for these types of measurements.



Bench-top setup example for 4-terminal DUT



SMU setup example for 4-terminal DUT

B2900A Series of SMU reduces the number of instruments and eliminates messy wiring

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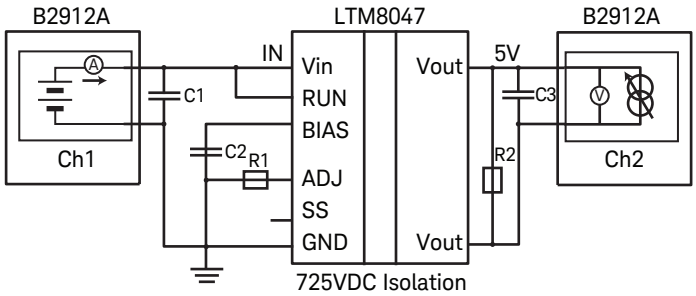
B2912A (rear view)

Measurement examples

It is easy to estimate load regulation by measuring the output voltage drift while sweeping the output load current. The load transient response can be monitored by measuring the output voltage transient when a pulsed current load is applied. In the example shown below, Ch 1 applies a constant voltage (12 V) to the input while Ch 2 either sweeps current to test load regulation or applies pulsed current to test the load transient response.

Note: Channel 1's high capacitance mode is ON in this example.



DUT (LTM8047 on DC1693 Demo circuit Module)

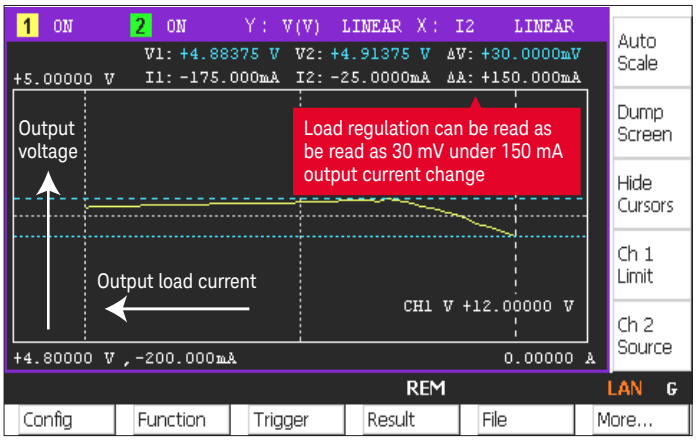
Note: LTM8047 and DC1693 Demo circuit are products of LINEAR TECHNOLOGY

Example 1: Load regulation with 4-wire measurement technique

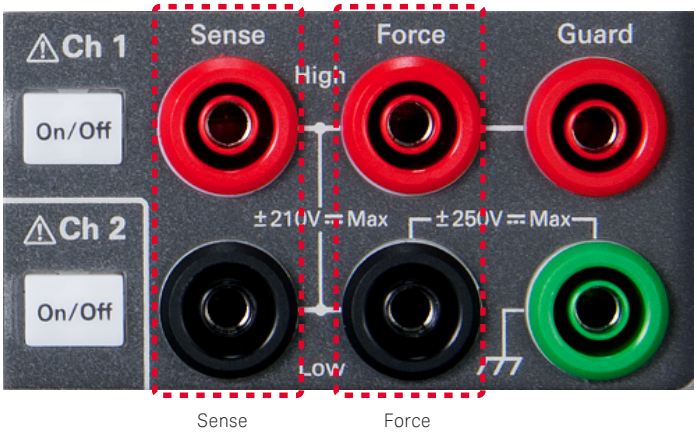
Sweeping the load current from 25 mA to 175 mA using a 4-wire Kelvin probe set shows stable measurement results [1]. Since the demo circuit board has an offset load of 25 mA, this is equivalent to testing the load regulation from 50 mA to 200 mA (the device's desired test condition). Moreover, since both the X and Y axes have two cursors available, you can easily readout the data and the variation from the display.

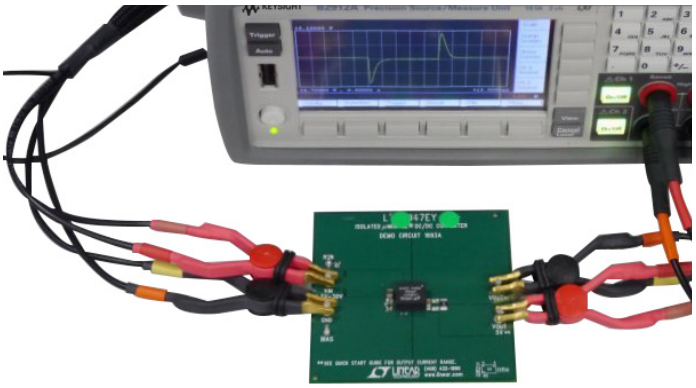
Note: 4-wire Kelvin probes with both sense and force outputs as shown in the measurement setup on the previous page are required for this type of measurement.

1. The displayed current increases in negative value as you go from right to left.



Load regulation measurement result





Kelvin measurement setup

How broad is the B2900A SMU series' capability?

Sufficient to meet almost all bench-top evaluation needs!

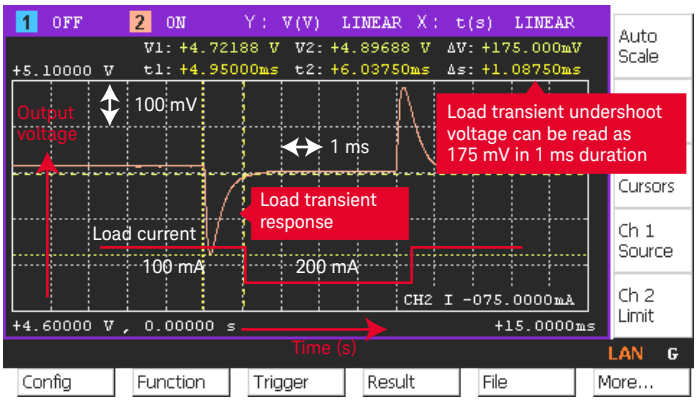
Product number	Number of channel	Max output		Min source resolution	Min measure resolution	Min timing interval	Viewing mode
		DC	Pulse				
B2901A	1	210 V 3.03 A	200 V 10.5 A	1 pA 1 µV	100 fA 100 nV	20 µs	Single, Graph
B2902A	2	210 V 3.03 A	200 V 10.5 A	1 pA 1 µV	100 fA 100 nV	20 µs	Single, Dual, Graph
B2911A	1	210 V 3.03 A	200 V 10.5 A	10 fA 100 nV	10 fA 100 nV	10 µs	Single, Graph, Roll
B2912A	2	210 V 3.03 A	200 V 10.5 A	10 fA 100 nV	10 fA 100 nV	10 µs	Single, Dual, Graph, Roll

Example 2: Load transient response with 10 µs sampling

This shows the load transient response as measured using the minimum 10 µs [2] sampling interval of the B2912A. In this example the load current is changed from 100 mA to 200 mA for 5 msec and then returned to its original 100 mA value. The cursors' delta data shows that the transient undershoot is about 175 mV and its duration is about 1 ms.

Note: The B2900A SMU series have the ability to observe a 100 µs level transient

2. The minimum sampling interval of the B2901A/02A is 20 µs.



Load transient response measurement result

Related applications

- LDO-Low Dropout regulator (measurement of output source/sink current capabilities)
- Linear regulator (measurement of output source/sink current capabilities)
- Op amp (measurement of output source/sink current capabilities)
- Other linear ICs requiring current source/sink capabilities

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Published in USA, August 3, 2014
5991-3119EN
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