Application Overview:
Simplified I/V Characterization of DC-DC Converters

What is a SMU?

Source measure units (SMUs) are an all-in-one solution for current voltage (I/V) characterization with the combined functionality of a precision power supply, high precision DMM, and electronic load. Keithley pioneered the development of individual, compact, bench-top SMU instruments and is the leading supplier of these instruments today.

Testing a DC-DC converter

A DC to DC converter changes a DC voltage level (V_{IN}) to another DC voltage level (V_{OUT}). DC-DC converters are used in a wide variety of devices including cell phones, laptops, and electronic instrumentation. In all these devices, the supplied voltage must be regulated either by stepping up or stepping down the voltage to an internal circuit. Keithley SourceMeter® SMU instruments are perfect for testing such DC-DC Converters:

- All DC I-V testing can be performed using two SMU instruments or one dual-channel SMU instrument as opposed to a rack of equipment.
- SMU instruments can act as a source and load and offer a wide range of current and voltage sourcing and measuring.

Keithley SourceMeter SMU instruments therefore simplify testing as shown in **Figure 1** below.

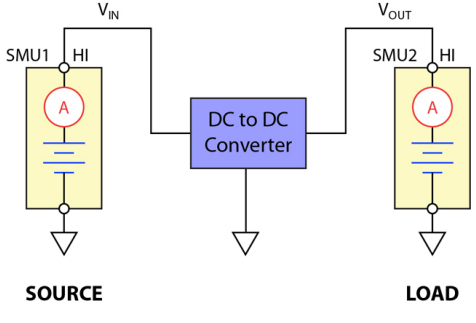

Figure 1: *Circuit diagram showing a dual-channel SMU instrument in use for I/V characterization of a DC-DC converter.*

Common Measurements Made in I/V characterization of DC-DC Converters:

- Load Current (I_L) : The current coming out of the DC-DC converter and going into the SMU instrument acting as a load is the measured load current (I_L). The load current is shown in the I/V curve in **Figure 2.**
- Output Voltage (V_O) The voltage measured at the output of the DC-DC converter is the measured output voltage (V_O). The output voltage is shown in the I/V curve in **Figure 2.**
- Other measurements include: Input Voltage (V_I) • Input Current (I_O) • Efficiency of DC-DC converter $(EFF_{DC\text{-}DC})$

Figure 2 shows an I/V curve of a DC-DC converter generated by using a dual-channel Keithley SourceMeter SMU instrument.

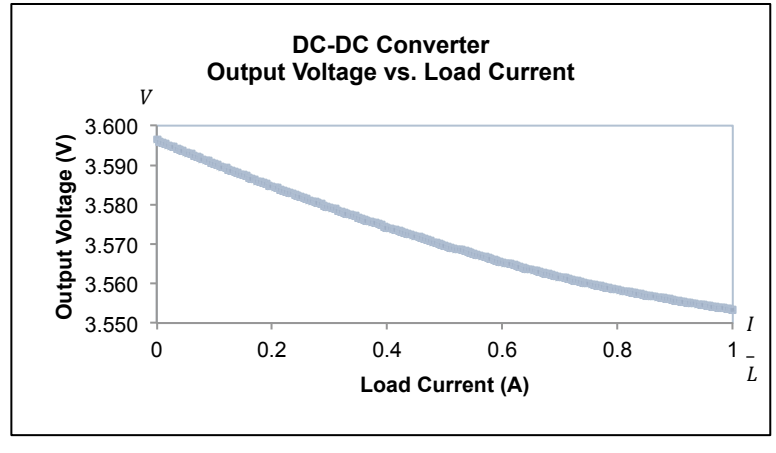

Figure 2: *I/V curve of a DC-DC converter.*

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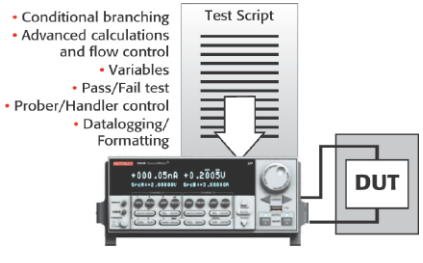
What are Series 2600B SourceMeter SMU Instruments?

The Series 2600B are the industry's leading current/voltage source and measure solutions, and are built from Keithley's 3rd generation SMU technology. The Series 2600B offers single-and dual-channel models that significantly boost productivity in applications ranging from bench-top I/V characterization through highly-automated production test.

Browser-based Testing

The Series 2600B are the only SMU Instruments to feature built-in, Java-based test software that enables true plug & play I/V characterization through any browser, on any computer, from anywhere in the world. Simply connect the Series 2600B instrument to the Internet via the supplied LAN cable, open a browser, type in the Series 2600B instrument's I.P. address, and begin testing. Resulting data can then be exported to a spreadsheet, such as Excel, for further analysis and formatting, or for inclusion in other documents & presentations.

Automated Testing without Control of a PC



For test applications that demand the highest levels of automation and throughput, the Series 2600B's test script processor (TSP®) technology delivers industry-best performance by fully embedding and then executing complete test programs from within the SMU instrument itself. This virtually eliminates all the time-consuming bus communications to and from the PC controller, and thus dramatically improves overall test times.

Key Specifications of the Series 2600B SourceMeter SMU Instruments

Features	2601B / 2611B Single Channel	2602B / 2612B Dual Channel	2604B / 2614B Dual Channel Bench-Top	2634B /2635B / 2636B Low Current Single Channel (2635B) Dual Channel (2634B, 2636B)
# of Channels	1 (optional expansion to 32 via TSP-Link)	2 (optional expansion to 64 via TSP-Link)	2	1 – 2 (optional expansion to 32 or 64 via TSP-Link. Not available for 2634B)
Current Max / Min	10A pulse / 100fA	10A pulse / 100fA	10A pulse / 100 fA	10A pulse / 0.1fA for 2635B 10A pulse / 0.1fA for 2636B 10A pulse/ 1fA for 2634B
Voltage Max / Min	40V / 100nV for 2601B 200V / 100nV for 2611B	40V / 100nV for 2602B 200V / 100nV for 2612B	40V / 100nV for 2604B 200V / 100nV for 2614B	200V / 100nV
Power	30 – 40W	30 – 40W per channel	30 – 40W per channel	30W per channel
Max readings / sec	20,000	20,000	20,000	20,000
Computer Interface	GPIB, LAN (LXI), USB 2.0, RS-232	GPIB, LAN (LXI), USB 2.0, RS-232	GPIB, LAN (LXI), USB 2.0, RS-232	GPIB, LAN (LXI), USB 2.0, RS-232
Connectors/ Cabling	Screw terminal; adaptors available for banana or triax	Screw terminal; adaptors available for banana or triax	Screw terminal; adaptors available for banana or triax	Triax
System-level automation	Digital I/O, TSP-Link, Contact Check	Digital I/O, TSP-Link, Contact Check	Not available	Digital I/O, TSP-Link, Contact Check (not available on 2634B)

For additional information, please refer to Keithley's website at **www.keithley.com** for:

- Detailed Series 2600B specifications
- Application notes
- White papers

For other information, please contact your local applications engineer.

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