



2601B-PULSE Example TSP Script

BasicDiodeTest.tsp

Script Description

- This example script creates (and subsequently calls) several functions that can be used with the Model 2601B-PULSE to perform a basic diode test. The purpose is to demonstrate how you can use the current pulser and the SMU within the same test application.
- As written, the functions use the current pulser to perform a 4-point forward bias IV sweep, and the SMU to perform a reverse bias leakage current measurement.
- Upon completion of each test, the data is printed to the Test Script Builder Instrument Console in a format that is suitable for copying and pasting into Microsoft Excel for graphing and analysis.

Note: Refer to the 2601B-PULSE Reference Manual for additional information about instrument operation and programming for both the SMU and the current pulser.

Functions Created By The Script

- diode_iv(curr_level_list, pulse_period, pulse_width, meas_delay, meas_aperture, rangev, rangei, source_protectv, sense_protectv, bias_current)
- diode_ir(src_rangev, src_levelv, src_limiti, meas_rangei, nplc, apply_time)
- test_diode()

Function 1 Description

diode_iv(curr_level_list, pulse_period, pulse_width, meas_delay,
meas_aperture, rangev, rangei, source_protectv, sense_protectv,
bias_current)

- Pass Parameters:

- curr_level_list : Table of pulse levels to sweep through; values in amps
- pulse_period : Time between start of consecutive pulses in seconds
- pulse_width : Width of current pulses in seconds
- meas_delay : Time from pulse start to measure start in seconds
- meas_aperture : Effective integration time in seconds
- rangev : Voltage measure range in volts
- rangei : Current source and measure range in amps
- source_protectv : Voltage protection level at source terminals
- sense_protect : Voltage protection level at sense terminals
- bias_current : Idle current level in amps (base level for pulses)

Function 1 Description - continued

- This function configures and initiates a current pulse list sweep for the 2601B-PULSE pulser. It is used to perform a forward bias IV sweep on a diode.
- The sweep is generated using the instrument's Synchronous Trigger Model. 2601B-PULSE sweep operation is similar to that of the original Model 2601B, except as noted below.
- The Pulse Period is controlled using a standard Trigger Timer.
- The Pulse Width and Measure Delay (settling time) are determined by new pulser commands, which provide more precise timing than a Trigger Timer. Needed to support pulses as short as 10 μ s.
 - `smua.trigger.source.pulsewidth`
 - `smua.pulser.measure.delay`

Function 1 Description - continued

- Using the dual 1MS/s digitizers built into the current pulser, the voltage and current are measured simultaneously at the top of each pulse.
- New pulser aperture command sets the effective integration time for the measurement.
 - `smua.pulser.measure.aperture`
- Upon completion of the sweep, the data is printed to the Test Script Builder Instrument Console in a format that is suitable for copying and pasting into Microsoft Excel for graphing and analysis.

Function 2 Description

diode_ir(src_rangev, src_levelv, src_limiti, meas_rangei, nplc, apply_time)

- Pass Parameters (SMU settings):

- src_rangev : Voltage source range in volts
- src_levelv : Voltage source level in volts
- meas_rangei : Current measure range in amps
- nplc : Measure integration time; number of power line cycles
- apply_time : Time in seconds for which voltage is applied before the current is measured.

Function 2 Description - continued

- This function uses the 2601B-PULSE SMU to force a DC voltage and measure the resulting current. It is used to measure the reverse bias leakage current (I_r) of a diode.
- Using the dual integrating analog-to-digital converters built into the SMU, the voltage and current are measured simultaneously for the spot test.
- Upon completion of the sweep, the data is printed to the Test Script Builder Instrument Console in a format that is suitable for copying and pasting into Microsoft Excel for analysis.

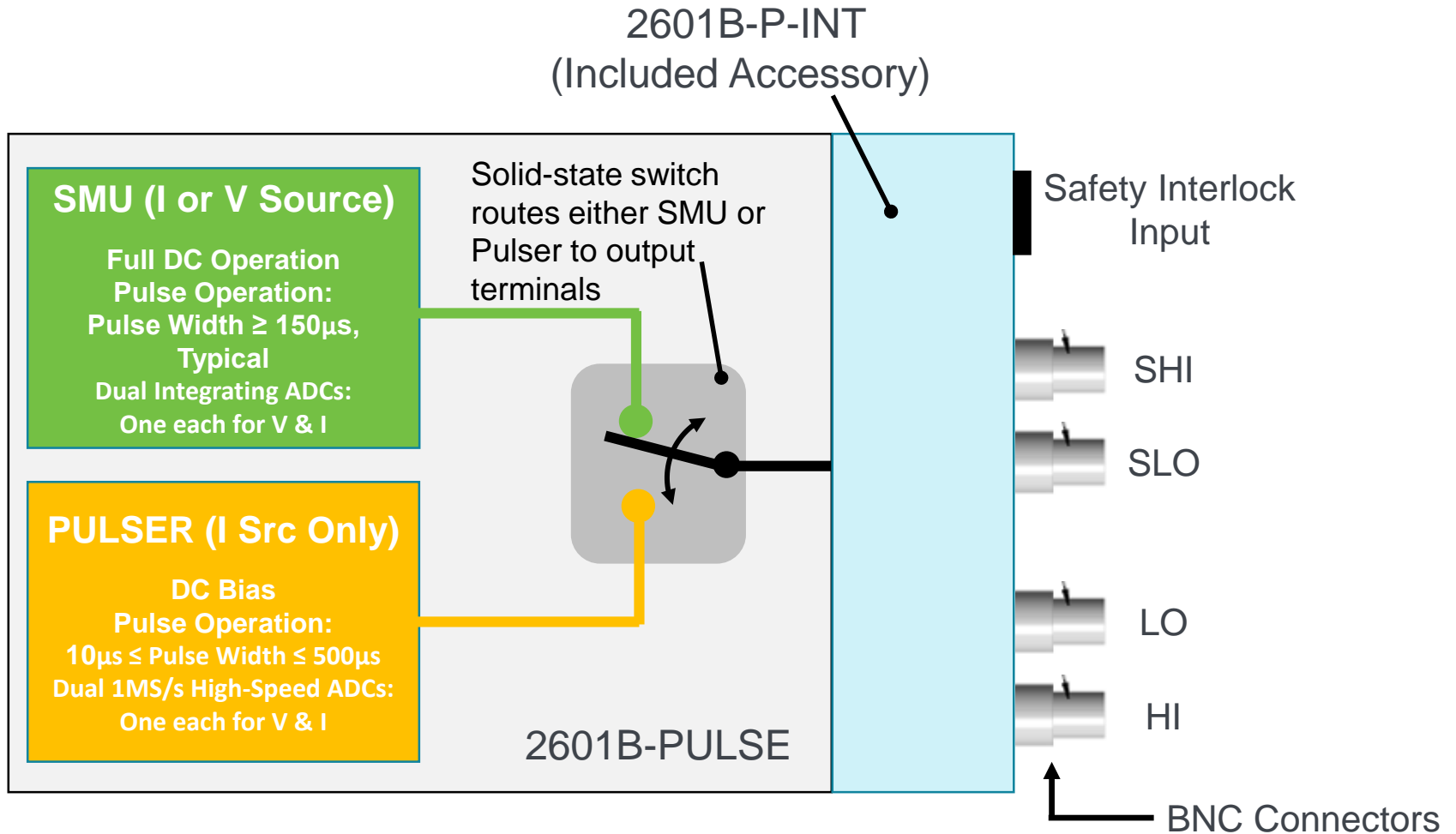
Function 3 Description

`test_diode()`

- Pass Parameters: None
- This function simply calls the `diode_iv()` and `diode_ir` functions after assigning values to their respective pass parameters.
- As written, this function makes the following two function calls:
 - `diode_iv({0.1,1,2,3}, 10e-3, 20e-6, 15e-6, 5e-6, 10, 10, 40, 20, 0.001)`
 - `diode_ir(6, -5, 1e-3, 100e-9, 1, 20e-3)`

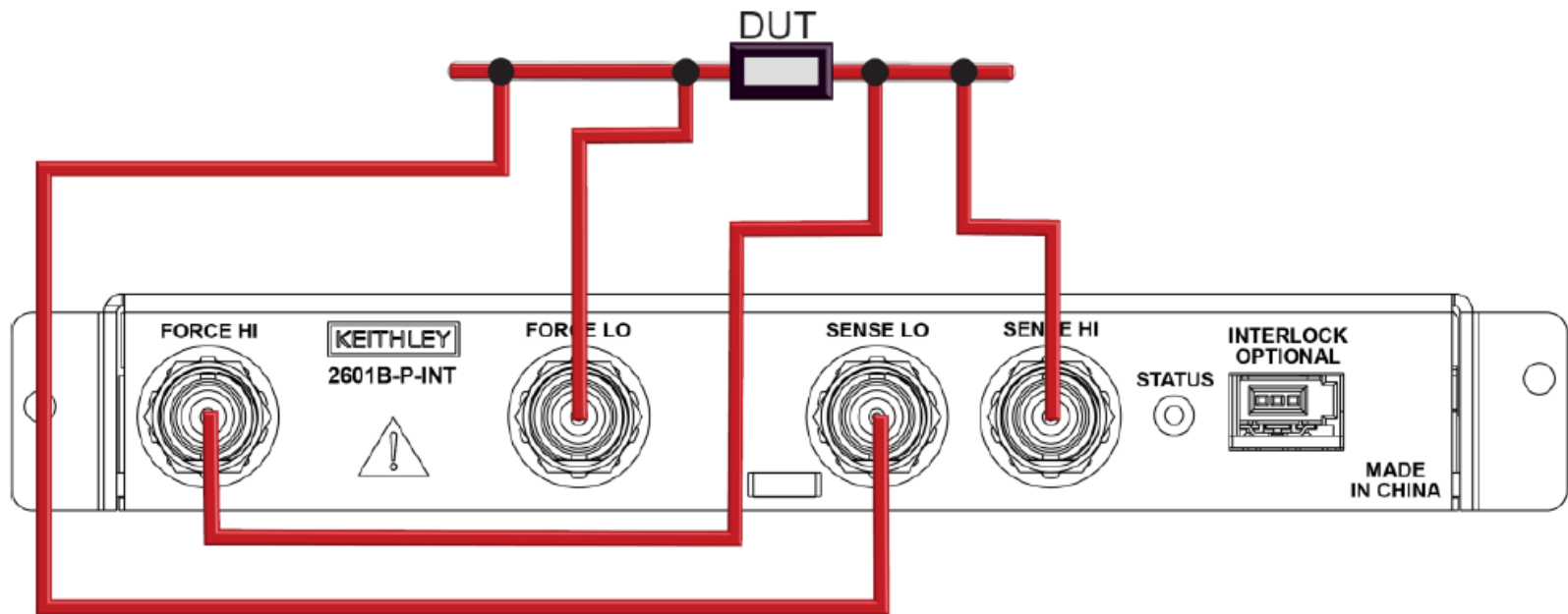
2601B-PULSE Diagram

2601B-P-INT ROUTES SMU AND PULSER OUTPUTS TO COMMON SET OF BNC CONNECTORS



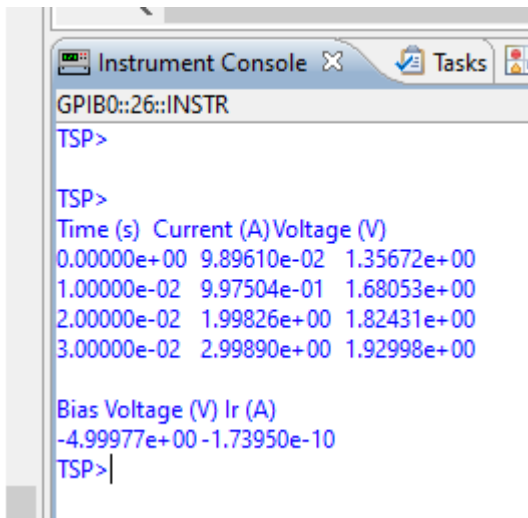
No Need To Switch Connections Between SMU and Pulser

BOTH ARE ROUTED THROUGH THE 2601B-P-INT



Function Descriptions - continued

- Upon completion of the sweep, the data is printed to the Test Script Builder Instrument Console in a format that is suitable for copying and pasting into Microsoft Excel for graphing and analysis.



| Time (s) | Current (A) | Voltage (V) |
|-------------|-------------|-------------|
| 0.00000E+00 | 9.89610E-02 | 1.35672E+00 |
| 1.00000E-02 | 9.97504E-01 | 1.68053E+00 |
| 2.00000E-02 | 1.99826E+00 | 1.82431E+00 |
| 3.00000E-02 | 2.99890E+00 | 1.92998E+00 |

| Bias Voltage (V) | Ir (A) |
|------------------|--------------|
| -4.99977E+00 | -1.73950E-10 |

More Measurement Results

