PVX-4151 ±1,500V Pulse Generator Datasheet

The PVX-4151 pulse generator produces fast, high voltage waveforms to 1,500V. Optimized for high impedance capacitive loads, the PVX-4151 is well suited for driving extraction grids and deflection plates for electrostatic modulation of particle beams in time-of-flight mass spectrometers and accelerators. Its robust and versatile design also makes it well suited for pulsing or gating power tube grids, Pockels cells and Q Switches, acoustic transducers, microchannel plates, photomultiplier tubes and image intensifiers. The exceptional pulse fidelity of the PVX-4151 will optimize the performance of any system in which it is used.

The PVX-4151 generates an output voltage pulse of 1,500 volts with rise and fall times less than 25ns, with very flat voltage pulses to DC into a capacitive load. It can generate single-ended output pulses from ground to +1500V or from ground to –1500V, and can also generate pulses originating from a DC voltage offset from ground by using both V_{Low} and V_{High} power supply inputs. This offset can be from –1500V to +1500V, with a maximum power supply voltage differential of ≤ 1500V.

The PVX-4151 requires a TTL gate signal, a high voltage DC power supply and optional DC offset supply inputs. The output pulse width and frequency are controlled by the gate signal. The pulse output voltage is controlled by the amplitude of the input DC power supplies.

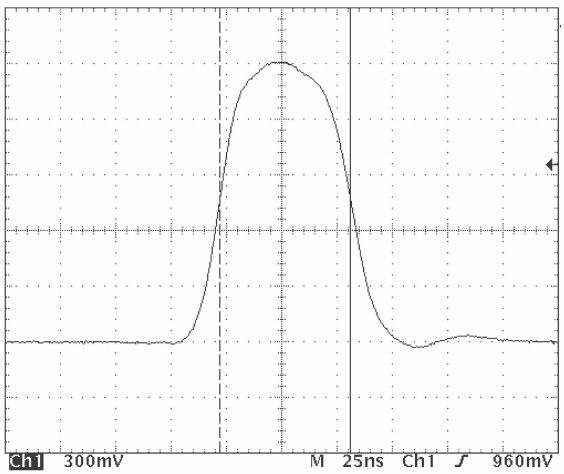
When the input gate is high, the V_{HIGH} supply is connected to the output. When the input gate is low, the V_{LOW} supply is connected to the output. Therefore the PVX-4151 can be used to generate a negative-going pulse by logically inverting the input gate, so that the input gate is high until the unit is pulsed. When the input gate goes low, the V_{LOW} input supply is connected to the output, thereby generating a negative-going pulse.

The PVX-4151 features front panel indicator LEDs to monitor the status of the pulse generator. Front panel voltage and current monitors provide a straightforward means to view the output voltage and current waveforms in real-time, eliminating the need for an external high voltage oscilloscope probe.

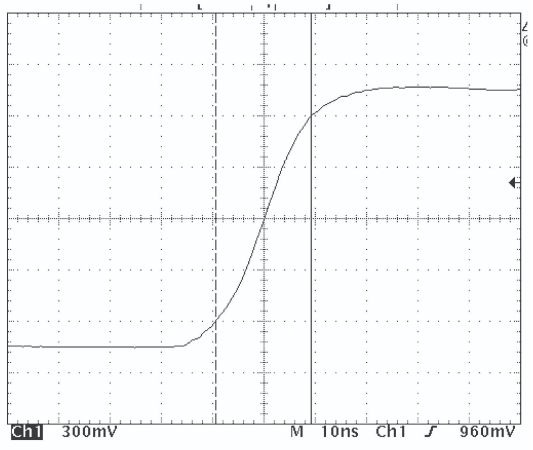
The pulse generator is a direct-coupled, air-cooled solid-state half-bridge (totem pole) design, offering equally fast pulse rise and fall times, low power dissipation, and virtually no overshoot, undershoot or ringing. It has over-current detection and shut-down circuitry to protect the pulse generator from potential damage due to arcs and shorts in the load or interconnect cable. All control and protection logic circuitry, support power, energy storage and output network are incorporated into the PVX-4151. It can be connected directly to the load, and does not require series or shunt resistors, impedance matching networks between the pulser and the load, or additional energy storage (capacitor banks). All of this is taken care of within the PVX-4151.

Specifications

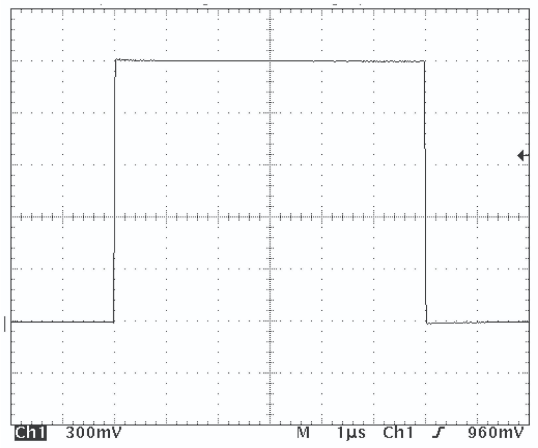
All specifications measured into a 50pF load connected with 6 feet (~1.8M) of RG-62 (93Ω) coaxial cable.



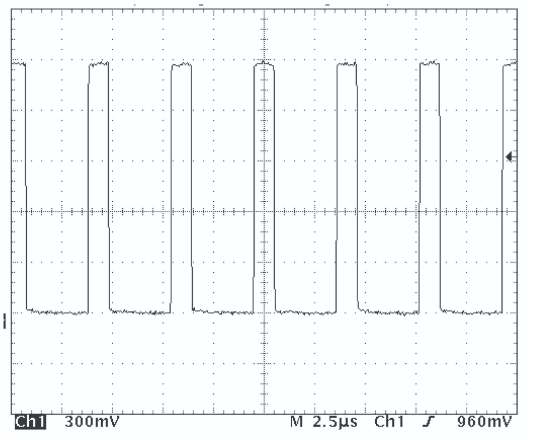
<60ns Minimum Pulse Width, 1500V Output
(25ns/Div horizontal scale, 300V/Div vertical scale)



18ns Rise & Fall Times, 1500V Output
(10ns/Div horizontal scale, 300V/Div vertical scale)



Typical Output Waveform, 1500V
(1µs/Div horizontal scale, 300V/Div vertical scale)



244KHz Frequency, 1500V Output
(2.5µs/Div horizontal scale, 300V/Div vertical scale)

Output

Maximum Value	±1500 Volts (V_{High} -V_{Low})
Minimum Value	0 Volts
Means of Adjustment	Controlled By Power Supply Input Voltages
Pulse Rise and Fall Time	<25ns, typically <20ns (10% to 90%)
Pulse Width	<60ns to DC, Controlled by Input Gate
Pulse Recurrence Frequency (PRF)	Single shot to 240KHz at 1500V continuous output, maximum limited by power dissipation (1), 5MHzBurst, Controlled by Input Gate
Max. Average Power	150W (V_{High} + V_{Low}), derated at 2W/°C over 25°C ambient (1)
Max. Duty Cycle	Continuous
Droop	<1%
Over/undershoot	<5%
Throughput Delay	120ns Typical
Jitter	<1ns shot-to-shot
Output Connector and Cable	SHV, With 6 feet (~1.8M) RG-62 (93Ω) Coaxial Cable

Input DC Voltage +V_{IN} (V_{High})

Absolute Max. Value	+1500 Volts
Absolute Min. Value	-1500 Volts
Relative Max. Value	+1500 Volts over V_{Low} Voltage
Relative Min. Value	+0V Over V_{Low} Voltage

Input DC Voltage -V_{IN} (V_{Low})

Absolute Max. Value	+1500 Volts
Absolute Min. Value	-1500 Volts
Input DC Connectors	SHV, Rear Panel (One each for +V_{IN} and -V_{IN})

Gate

Gate Source and Connector	TTL into 50Ω, into BNC connector on the front panel

Voltage and Current Monitors

Voltage Monitor	1000: 1 into 1 MegΩ , BNC connector
Current Monitor	10A/V into 50Ω , BNC connector

General

Support Power	90VAC to 240VAC, 50/60Hz
Dimensions (H x W x D) (Excluding Connectors)	5.2” x 19” x 13” (13.2cm x 48.25cm x 33cm)
Weight (Approximate)	18 lbs. (8.2 Kilograms)

These specifications are measured driving a 50pF load connected with 6 feet of RG-62 cable, at 1500V output. However the PVX-4151 can drive loads of a few picofarads to several hundred picofarads of capacitance, limited by its maximum power dissipation capability[(1)]. At lower load capacitances and/or voltages less than 1500V, the PVX-4151 can operate at continuous pulse recurrence frequencies above 240KHz. The PVX-4151 can also drive resistive or inductive loads, within limitations. Contact DEI for additional information and applications assistance.

[(1)] The power dissipated in the PVX-4151 when driving a capacitive load is defined by the formula CV^2F, where C is the total load capacitance, including the capacitance of the load, inter-connect cable, and the internal capacitance of the PVX-4151, V is the pulse voltage, and F is the pulse repetition frequency (or the total pulses per second). (For these calculations, the internal capacitance of the PVX-4151 is 200pF, and RG-62 cable is 13pf/foot.) Given the maximum dissipation of 150W, the maximum load capacitance, frequency and/or voltage at which the PVX-4151 can operate can be approximated using this formula. This formula also approximates the high voltage power supply requirements needed to drive a given load at a specific voltage and frequency. This formula is not applicable when driving resistive or inductive loads.