

# Keysight N2806A Calibration Pulse Generator

The world's fastest  
differential pulse generator

Data Sheet



## Introduction

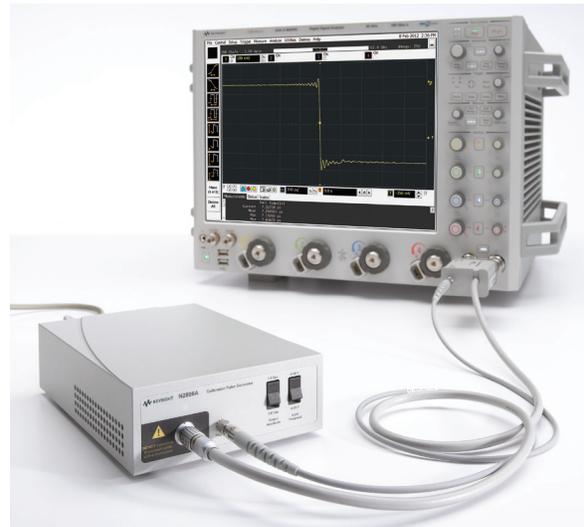
- Sub-7 ps fall time (90%-10%)
- Sub-9 ps rise time (10%-90%)
- Fully differential output
- Unlimited step duration
- Rep rates up to 45 GHz

### The New World Standard

#### Highlights

- Sub-7 ps fall time and sub-9 ps rise time (both 10%-90%) give you frequency content beyond 63 GHz for your high bandwidth applications
- Two differential RF outputs allow you to utilize both the rising and falling edges simultaneously
- Output rep rates up to 45 GHz – buffer any serial data stream to accelerate edge speeds to sub-9 ps and eliminate amplitude variations due to ISI
- Features a step response with the lowest noise and closest to ideal spectral content for the most repeatable pulse generation available, critical for demanding calibration and metrology applications.
- Trigger on internal or externally sourced signals

Demanding applications call for the pinnacle of calibration pulse generator performance. The Keysight Technologies, Inc. N2806A leverages microwave expertise and InP technology to produce the world's fastest, highest spectral purity, fully differential pulses. From calibration and metrology to TDR and network analysis, high performance applications require the N2806A – the new world standard.



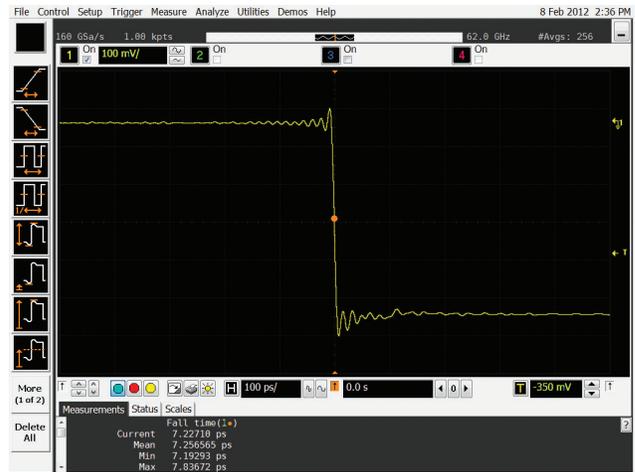
## The New Calibration and Metrology Standard

As the fastest, highest spectral purity, differential pulse generator, the N2806A is the new standard in demanding calibration and metrology environments.

The new standard for calibration and rise time in oscilloscopes and other electronic equipment.

As oscilloscopes like Keysight's 90000 Q-Series and other electronic equipment exceed 40 GHz of bandwidth, a pulse generator is needed that can keep up. Enter the N2806A. Boasting 10%-90% rise and fall times less than 9 ps and 7 ps respectively, this source can produce high frequency content beyond 60 GHz.

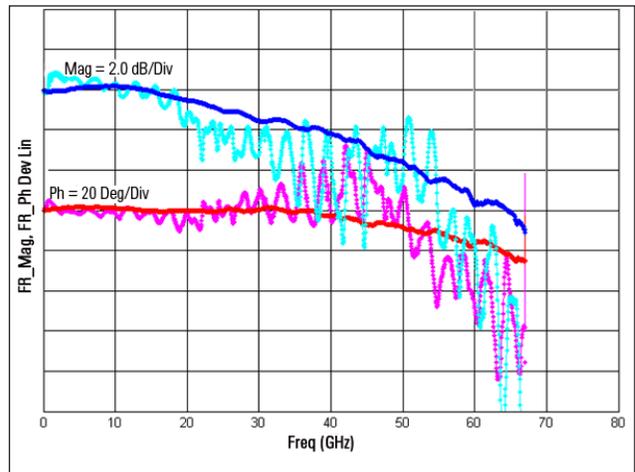
With its near ideal spectral content and fully differential output, the N2806A is the new standard for electronic equipment calibration and rise time measurements.



The new standard in step response measurements and demanding metrology applications.

When characterizing the step response of a device or system, you need the step impinging on your device to approximate an ideal step as closely as possible. The N2806A boasts the fastest and highest spectral purity step available. Compare the performance of the N2806A versus another common high speed pulse generator in the deviation from an ideal step plot at the right. Notice how smoothly the N2806A rolls off compared to the resonances in frequency content from the other generator.

Using the close-to-ideal step of the N2806A, you know you can trust your step response results to be accurate and repeatable



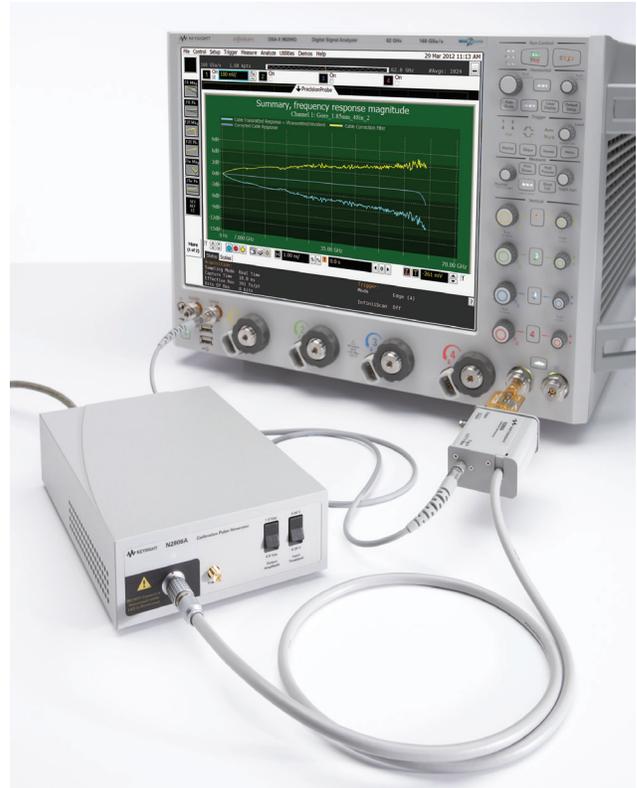
Plot of deviation from an ideal step for Keysight N2806A, dark blue (magnitude) and dark red (phase), versus popular shock line based generator, bright blue (magnitude) and bright pink (phase). Notice the purity of the spectral content for the Keysight generator, much more closely approximating an ideal step for more accurate and repeatable measurements. Plot is generated by taking the FFT of the impulse response of each generator. Impulse response is simply the time derivative of the step response.

## Network Analysis

The edge speed and pure spectral content produced by the N2806A makes it ideal for applications in high frequency network analysis. Achieving a sub-7 ps falling edge (90%-10%) allows for characterization of components well beyond 60 GHz of bandwidth. These characteristics make the N2806A a critical component in Keysight's high bandwidth N2807A PrecisionProbe Advanced Kit for Infiniium oscilloscopes. Further, the differential output of the N2806A enables extremely high frequency differential TDR and TDT measurements.

Quickly and easily remove the effects of cables and fixtures to 63 GHz of oscilloscope bandwidth.

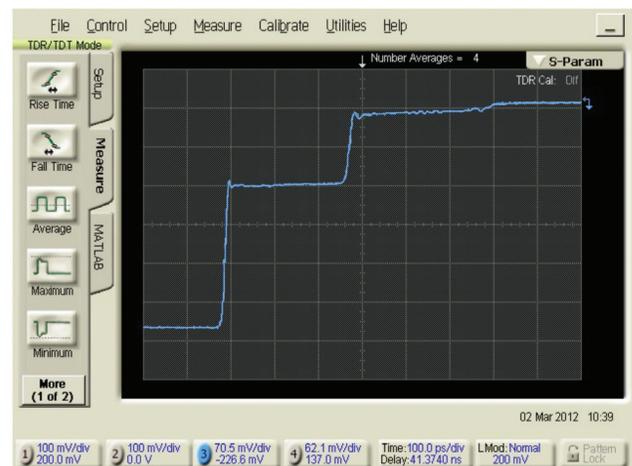
The N2806A is included with Keysight's award winning PrecisionProbe software for Infiniium oscilloscopes in the N2807A PrecisionProbe Advanced Kit. You no longer need to ignore the loss of cables due to time and budget constraints. Using the patented PrecisionProbe Advanced technology, you can characterize cables as fast as 63 GHz and remove the loss they create in oscilloscope measurements. PrecisionProbe Advanced uses the fast edge from the N2806A to perform a TDT on your cable. Based on the loss of your cable, the software compensates for that loss, gaining back valuable margin.



Make high bandwidth TDR and TDT measurements.

Often the efficacy of high frequency TDR measurements is limited by the edge speed the source is capable of generating. Slower edge speeds just do not offer the high frequency content necessary to make TDR measurements or measure s-parameters out past 60 GHz. Integrate the N2806A into your TDR setup, and start making accurate high frequency measurements.

Shown on the right is a TDR measurement using the N2806A with a Keysight DCA 86100C sampling oscilloscope equipped with a TDR module. Previously edge speed limited, the rise times on this measurement are now sub-10 ps and multiple reflection events are accurately observed.

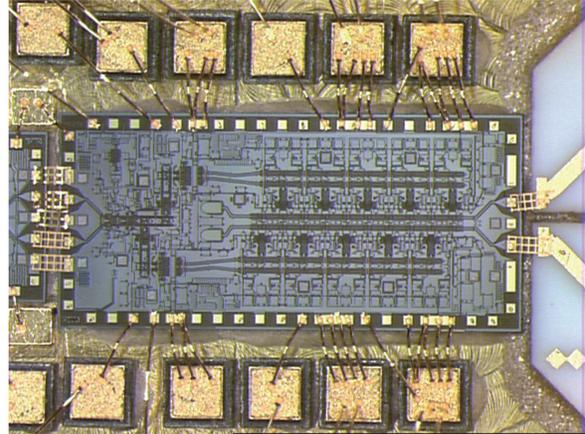


## Advanced IC Design and Technology

High performance applications require...

The fastest differential rise and fall times available:

The N2806A uses Keysight's proprietary Indium Phosphide technology to achieve a differential amplifier capable of producing sub-7 ps fall times and sub-9 ps rise times on two differential RF outputs (10%-90%). Other pulse generators use inferior technologies that can only produce fast single ended falling edges.

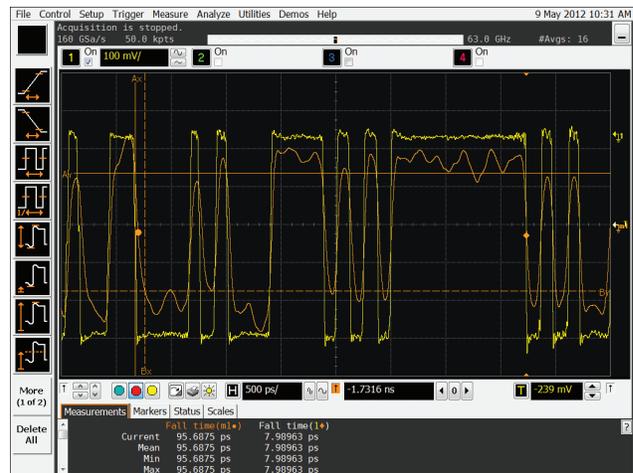


The performance and flexibility of a differential amplifier architecture:

The high performance InP differential amplifier in the N2806A offers critical advantages in performance and flexibility over popular shock line pulse generators, including:

- Access 2 differential RF outputs simultaneously
- Output rep rates up to 45 GHz vs 1 MHz for shock line generators
- Ultra-fast rise AND fall times
- Unlimited step duration
- 0.5V/1.0V selectable output amplitude without need for multiple remote heads

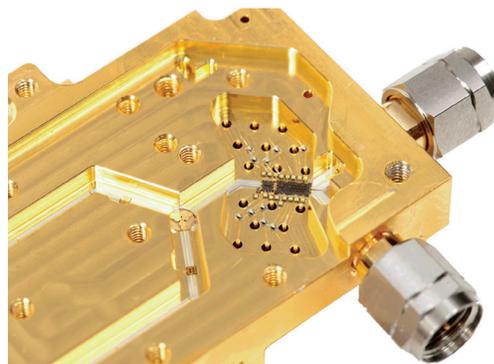
To demonstrate some of these advantages, the figure at the right shows the N2806A buffering an 8.2 Gbps PRBS<sup>7</sup> signal. The rise time and rep rate of other pulse generators is much too slow to buffer this signal.



8.2Gbps PRBS<sup>7</sup> signal measured on Keysight 90000 Q-Series oscilloscope. Orange is the original signal with 95ps rise time. Yellow is the signal after being buffered by the N2806A. Notice the measured sub-8ps rise time and elimination of ISI.

The best output impedance matching available:

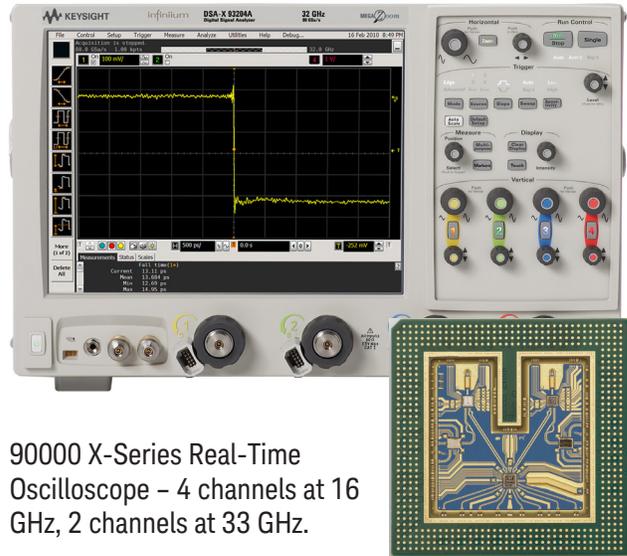
Introducing a fast edge into a system can cause a nightmare of reflections if impedance mismatches exist. For this reason, the N2806A offers the best output impedance matching available on a high speed pulse generator.



## The N2806A: Just one part of Keysight's complete High-Bandwidth Measurement Portfolio



90000 Q-Series Real-Time Oscilloscope – 4 channels at 33 GHz, 2 channels at 63 GHz



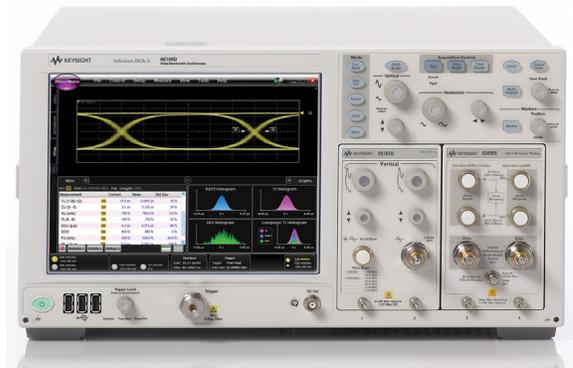
90000 X-Series Real-Time Oscilloscope – 4 channels at 16 GHz, 2 channels at 33 GHz.



N2806A Calibration Pulse Generator – The world's fastest differential pulse generator.



Full suite of probes and accessories – including InfiniiMax III, the world's only 30 GHz differential probing system.



DCA 86100D Sampling Oscilloscope – Up to >90 GHz bandwidth

## Detailed Specifications

### Output Parameters

	500 mV Output	1 V Output
Rise time 10% - 90% (Warranted)	< 10 ps	< 11 ps
Rise time 10% - 90% (Typical)	< 9 ps	< 10 ps
Fall time 90% - 10% (Warranted)	< 8 ps	< 9 ps
Fall time 90% - 10% (Typical)	< 7 ps	< 8 ps
Waveform	Step pulse, square wave, or drive to DC high or low	
Maximum Square Wave Rep Rate	45 GHz	
Output $V_{HI}$	0 V	
Output $V_{LO}$	-500 mV / -1.0 V Selectable	
Step Duration	Unlimited time hold at high or low voltage	
Overshoot	10%, typical	

### RF Trigger Input Parameters

Maximum input voltage	$\pm 700$ mV
Minimum Input dV/dt	>2 V/ns
Trigger Threshold	0 V / -250 mV selectable
Input Impedance	50 Ohms

### Square Wave Trigger Output (Control Module) Parameters

Output Impedance	50 Ohms
Amplitude	560 mVpp (+280 mV to -280 mV)
Waveform	Square wave
Frequency	4 MHz

### General Specifications

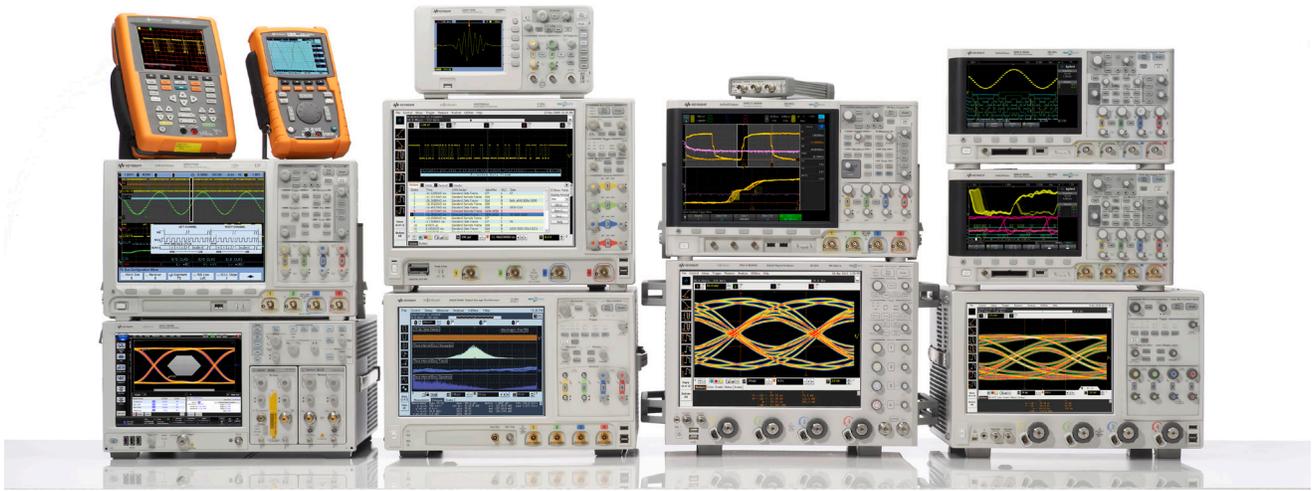
Temperature	Operating: 10° C to 40° C, Non-operating: -40° C to 65° C
Humidity	Operating: up to 95% relative humidity (non-condensing) at 40 C, Non-operating: up to 90% relative humidity at 65 C.
Altitude	Operating: up to 3,000 meters (9,000 feet), Non-operating: up to 15,300 meters (50,000 feet)
Vibration	Keysight Class GP, Operating: 0.2 GRMS for 10 minutes per axes. Non-powered Survival: 2.1 GRMS for 10 minutes per axes
Power	100 - 240 VAC $\pm 10\%$ at 50/60 Hz: maximum input power 25 Watts
Weight	1.45 Kg
Dimensions	Remote Head: 3.3 x 2.2 x 0.94 inches, Control Module: 2.16 x 5.4 x 7.75 inches
Safety	IEC 61010-1:2001 / EN 61010-1:2001 Canada: CAN/CSA-C22.2 No. 61010-1-04 USA: ANSI/UL 61010-1:2004 UL94
ESD HBM	>2 kV on remote head RF input , 400 V on remote head RF outputs

## Ordering information

Part number	Description
N2806A	Stand-alone Pulse Generator Hardware
<p>Already own a high bandwidth Keysight Infiniium Oscilloscope?</p> <p>The N2806A hardware is included in the PrecisionProbe Advanced Kit N2807A. Characterize and correct losses due to cables, fixtures, and switches to 63 GHz, quickly and easily.</p>	
N2708A	PrecisionProbe Advanced Kit
Related Equipment and Accessories	
N2812A	High Performance Input Cable - 2.92 mm - 1 m
N2814A	Ultra High Bandwidth Input Cable - 1.85 mm - 1 m
N5520B	Connector Assembly - 1.85 mm Female to Female
5061-5311	Connector Assembly - 3.5 mm Female to Female
11636B	Power Divider - DC to 26.5 GHz
8493B-006	6 dB Attenuator - DC to 26.5 GHz
11742A	DC Blocking Capacitor - 45 MHz to 26.5 GHz
DSO/DSAX90000Q	Infiniium oscilloscope with 20 GHz to 63 GHz of real-time analog bandwidth

### CAUTION

The high speed ICs are sensitive. Keysight strongly recommends terminating all unused RF inputs and outputs with 50 ohm loads. Also, the power up/down sequences are very important so do not hot swap connectors or unplug the DC Bias cable while the power is on.



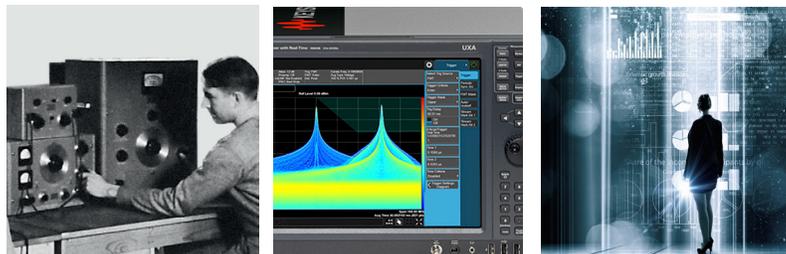
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