SPICE Source Types and Parameters

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1. Overview

The National Instruments **SPICE Simulation Fundamentals** series is your free resource on the internet for learning about circuit simulation. The series is a set of tutorials and information on SPICE simulation, OrCAD pSPICE compatibility, SPICE modeling, and other concepts in circuit simulation.

For more information, see the **SPICE Simulation Fundamentals** main page.

The series is divided among a number of in-depth detailed articles that will give you HOWTO information on the important concepts and details of SPICE simulation.

Circuit simulation is an important part of any design process. By simulating your circuits, you can detect errors early in the process, and avoid costly and time consuming prototype reworking. You can also easily swap components to evaluate designs with varying bills of materials (BOMs).

SPICE Simulation Sources

SPICE allows users to specify input that varies in form. These inputs are used as voltage or current signals that drive circuitry during simulation. In **Multisim**, these sources are available in the Sources group of the master database.

The following sources are available in SPICE simulation.

2. Using SPICE Simulation Sources

The table below gives detailed information on the usage of each SPICE source.

Pulse

Syntax	PULSE(V1 V2 TD TR TF PW PER)
Example	VIN 3 0 PULSE(-1 1 2NS 2NS 2NS 50NS 100NS)

Parameter	Description	Default	Units
V1	Initial value		Volts or Amps
V2	Pulsed value		Volts or Amps
TD	Delay time	0.0	Seconds
TR	Rise time	Tstep	Seconds
TF	Fall time	Tstep	Seconds
PW	Pulse width	Tstop	Seconds
PER	Period	Tstop	Seconds

Sinusoid

Syntax	SIN(VO VA FREQ TD THETA)
Example	VIN 3 0 SIN(0 1 100MEG 1NS 1E10)IN 3 0 PULSE(-1 1 2NS 2NS 2NS 50NS 100NS)

Parameter	Description	Default	Units
V0	Offset		Volts or Amps
VA	Amplitude		Volts or Amps
FREQ	Frequency	1/Tstop	Hz
TD	Delay	0.0	Seconds
THETA	Damping Factor	0.0	1/Seconds

Exponential

Syntax	EXP(V1 V2 TD1 TAU1 TD2 TAU2)
Example	VIN 3 0 EXP(-4 -1 2NS 30NS 60NS 40NS)

Parameter	Description	Default	Units
V1	Initial value		Volts or Amps
V2	Pulsed value		Volts or Amps
TD1	Rise delay time	0.0	Seconds
TAU1	Rise time constant	Tstep	Seconds
TD2	Fall delay time	TD1 + Tstep	Seconds
TAU2	Fall time	Tstep	Seconds

Piece-Wise Linear

Syntax	PWL(T1 V1 <T2; V2 T3 V3 T4 V4 ...>)
Example	VCLOCK 7 5 PWL(0 -7 10NS -7 11NS -3 17NS -3 18NS -7 50NS -7)

Parameter	Description	Default	Units
V1	Instantaneous voltage		Volts or Amps
T1	Instantaneous time		Seconds

Single Frequency FM

Syntax	SFFM(VO VA FC MDI FS)
Example	V1 12 0 SFFM(0 1M 20K 5 1K)IN 3 0

Parameter	Description	Default	Units
V0	Offset		Volts or Amps
VA	Amplitude		Volts or Amps
FC	Carier frequency	1/Tstop	Hz
MDI	Modulation index		Seconds
FS	Signal frequency	1/Tstop	Hz