SPICE Input File Format

Title statement

→ Circuit Description

sources
element descriptions
model statements.

→ Analysis Requests

→ Output Requests

.END

LTspice basic element types: leading characters

A special functions device
B arbitrary behavioral source
C capacitor
D diode
E voltage dependent voltage source
F current dependent current source
G voltage dependent current source
H current dependent voltage source
I independent current source
J JFET transistor
K mutual inductance
L inductor
M MOSFET transistor
O lossy transmission line
Q bipolar transistor
R resistor
S voltage controlled switch
T lossless transmission line
U uniform RC-line
V independent voltage source
W current controlled switch
X subcircuit invocation
Z MESFET transistor
* comment
+ continuation of prior line
. simulation directive

Use Labels to Specify Units in Circuit Elements Attributes

- K = k = kilo = 10^3
- MEG = meg = 10^6
- G = g = giga = 10^9
- T = t = tera = 10^{12}

tera is spelled with one "r"

- M = m = milli = 10-3
- U = u = micro = 10-6
- N = n = nano = 10-9
- P = p = pico = 10-12
- F = f = femto = 10-15

Hints

- Use ***MEG*** to specify 10^6, not *M*
- Enter ***1*** for 1 Farad, not *1F*

1F means 1 femto

R1 in out 1e6

© 2008 Linear Technology

Dependent Sources

Linear Dependent Sources

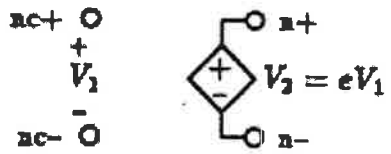
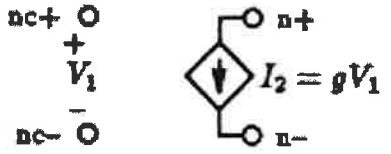
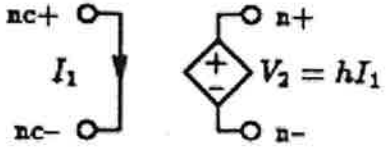
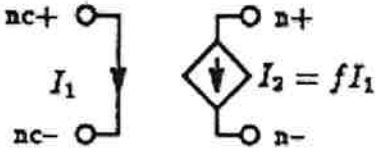
Element	Spice Description
 voltage-controlled voltage source	*Ename* n+ n− nc+ nc− *e_value*
 voltage-controlled current source	*Gname* n+ n− nc+ nc− *g_value*
 current-controlled voltage source	*Hname* n+ n− *Vname h_value* *Vname* nc+ nc− 0
 current-controlled current source	*Fname* n+ n− *Vname f_value* *Vname* nc+ nc− 0

Figure 1.7 Linear dependent sources. Notice that the CCVS and the CCCS are both specified using two Spice statements, unlike the other two dependent sources.

Independent Sources

Independent Source Representation In Spice

Spice Description	Type Of Analysis
{ Vname / Iname } n+ n- DC *value*	All Types
{ Vname / Iname } n+ n- AC *magnitude phase_degrees*	AC Frequency Response
{ Vname / Iname } n+ n- SIN (V_o V_a *freq* t_d *damp*)	Transient
{ Vname / Iname } n+ n- PULSE (V_1 V_2 t_d t_r t_f *PW* *T*)	Transient
{ Vname / Iname } n+ n- PWL (t_1,v_1 t_2,v_2 ... t_n,v_n)	Transient

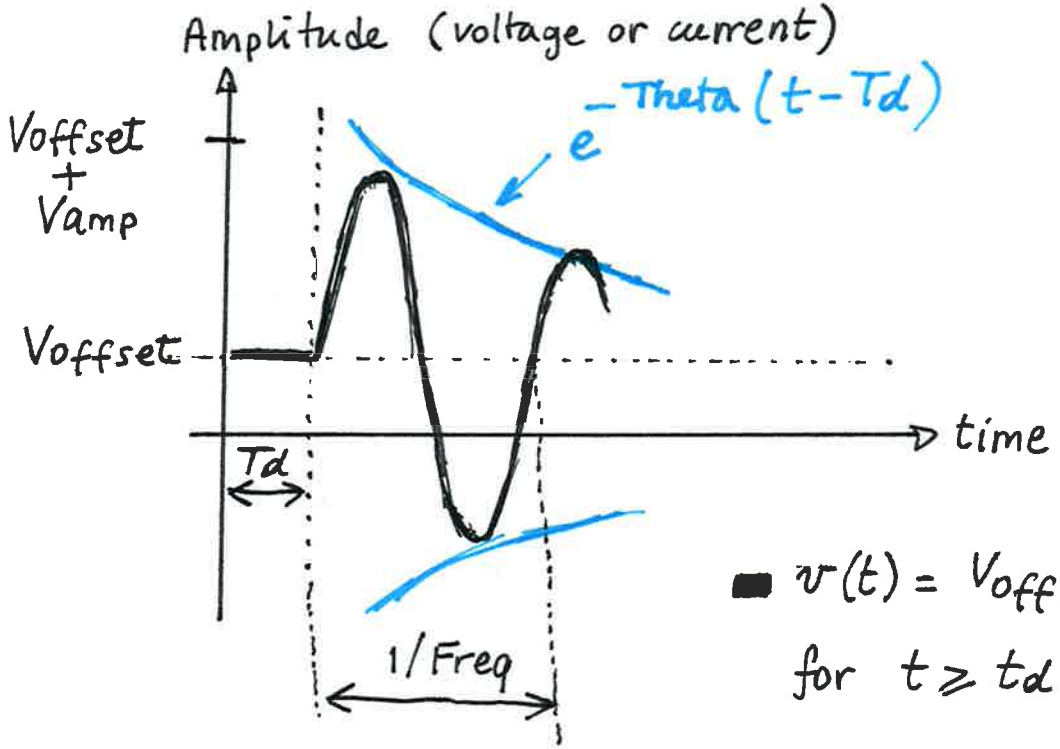
Figure 1.5 Independent sources and their Spice descriptions. Also shown is the analysis type for which each type of source is normally used. One exception is for DC sources, which are commonly used to set bias conditions in all types of circuits.

GENERALIZED SINE WAVEFORM

or Ixxx

Syntax: Vxxx n+ n- SINE(Voffset Vamp Freq Td Theta Phi Ncycles)

Time-dependent sine wave voltage source.



Name	Description	Units
Voffset	DC offset	V
Vamp	Amplitude	V
Freq	Frequency	Hz
Td	Delay	sec
Theta	Damping factor	1/sec
Phi	Phase of sine wave	degrees
Ncycles	Number of cycles(Omit for free-running pulse function)	cycles

$$v(t) = V_{offset} + V_{amp} \cdot e^{-Theta\,(t-T_d)} \cdot \sin\left(2\pi \cdot Freq\,(t-T_d)\right)$$

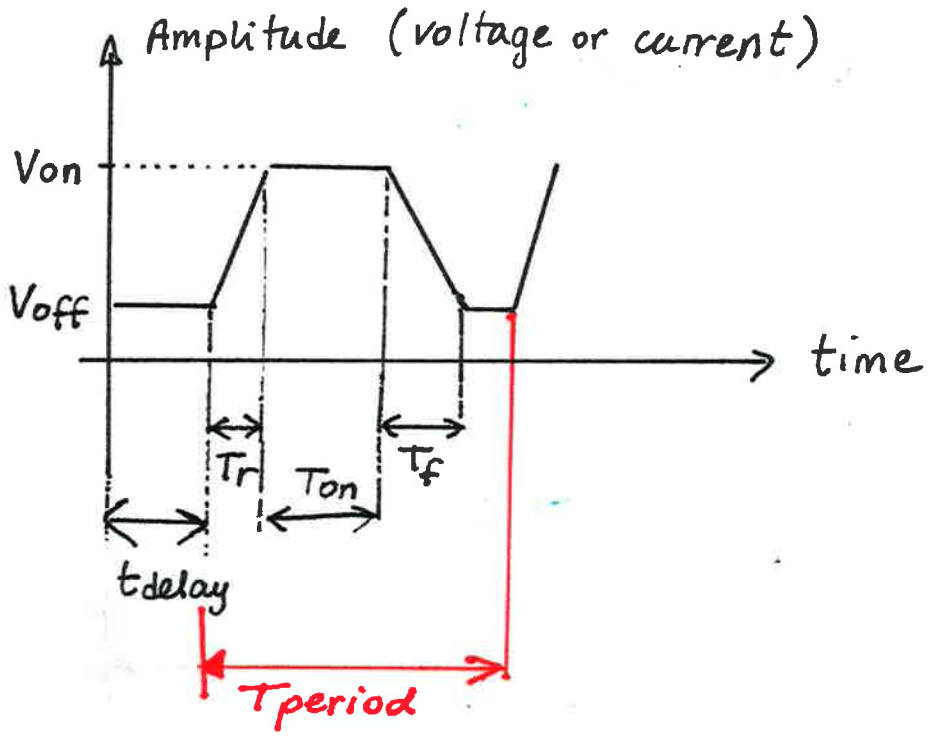
for $t \geq t_d$

PULSE WAVEFORM

or Ixxx

Syntax: Vxxx n+ n- PULSE(V1 V2 Tdelay Trise Tfall Ton Tperiod Ncycles

Time-dependent pulsed voltage source



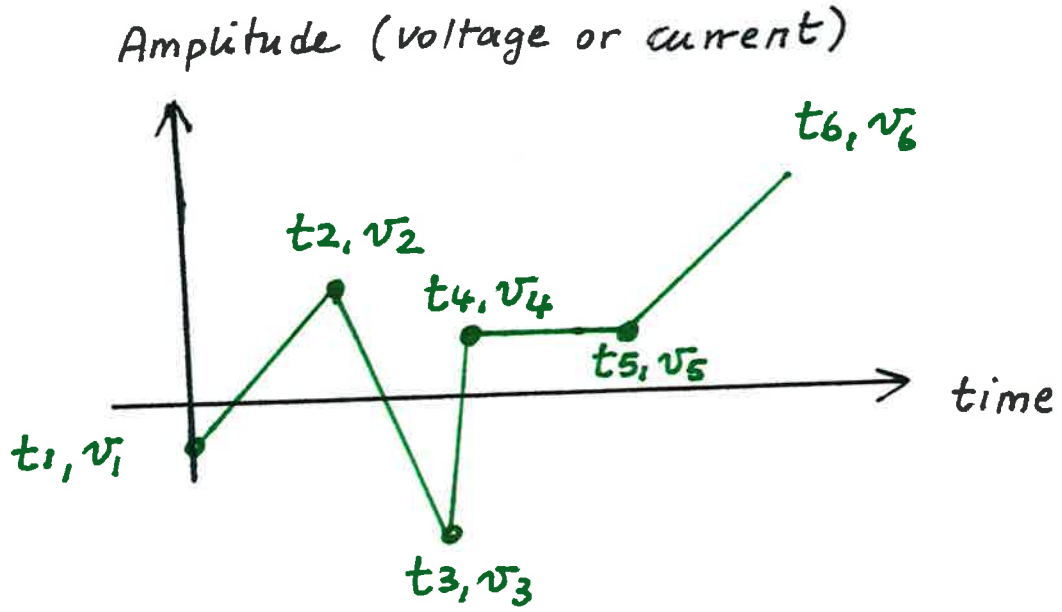
Name	Description	Units
Voff	Initial value	V
Von	Pulsed value	V
Tdelay	Delay	sec
Tr	Rise time	sec
Tf	Fall time	sec
Ton	On time	sec
Tperiod	Period	sec
Ncycles	Number of cycles (Omit for free-running pulse function)	cycles

PIECE WISE LINEAR WAVEFORM

or Ixxx

Syntax: Vxxx n+ n- PWL(t1 v1 t2 v2 t3 v3...)

Arbitrary Piece-wise linear voltage source.



Simulation Commands

- To run a simulation, specify the type of analysis to be performed
- There are six different types of analyses:
  - Transient analysis
  - Small signal AC
  - DC sweep
  - Noise
  - DC transfer function
  - DC operating point
- Simulation commands are placed on the schematic as text
  - Called dot commands

© 2008 Linear Technology

Analysis Commands

(Simulation Commands)

```
.tran <Tstep> <Tstop> [Tstart [dTmax]] [modifiers]

.ac <oct, dec, lin> <Nsteps> <StartFreq> <EndFreq>

.dc <srcnam> <Vstart> <Vstop> <Vincr> [<srcnam2> <Vstart2> <Vstop2> <Vincr2>]

.noise V(<out>[,<ref>]) <src> <oct, dec, lin> <Nsteps> <StartFreq> <EndFreq>

.tf V(<node>[, <ref>]) <source> OR I(<voltage source>) <source>

.op
```