EE-103 VLSI Design
Lab 03

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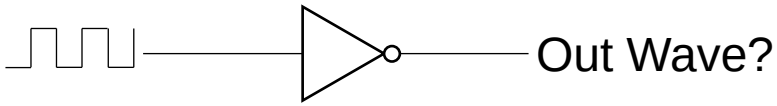
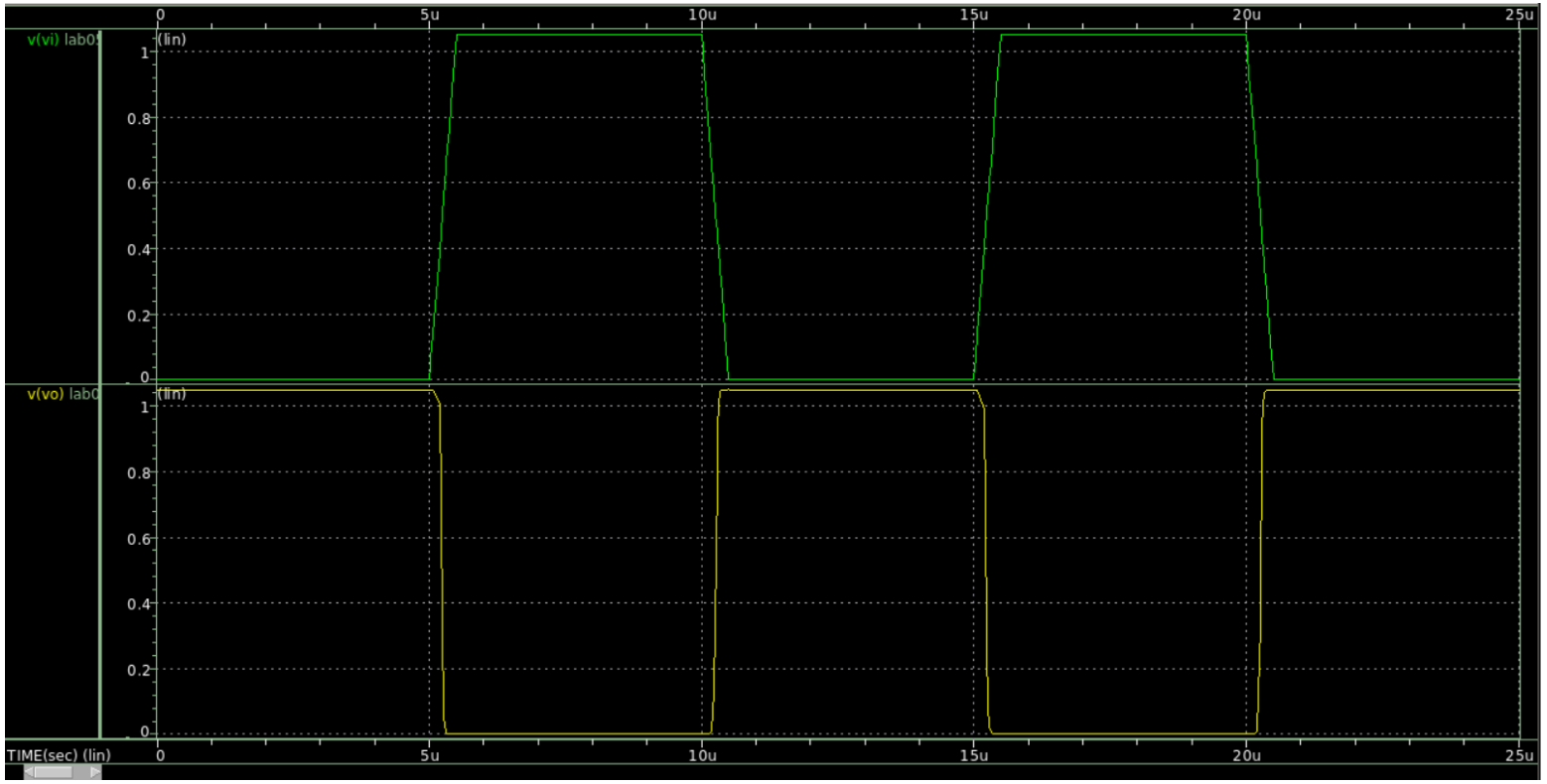
Electrical and Computer Engineering

Analysis in Time Domain

In some case, we want to do some analysis in time domain.





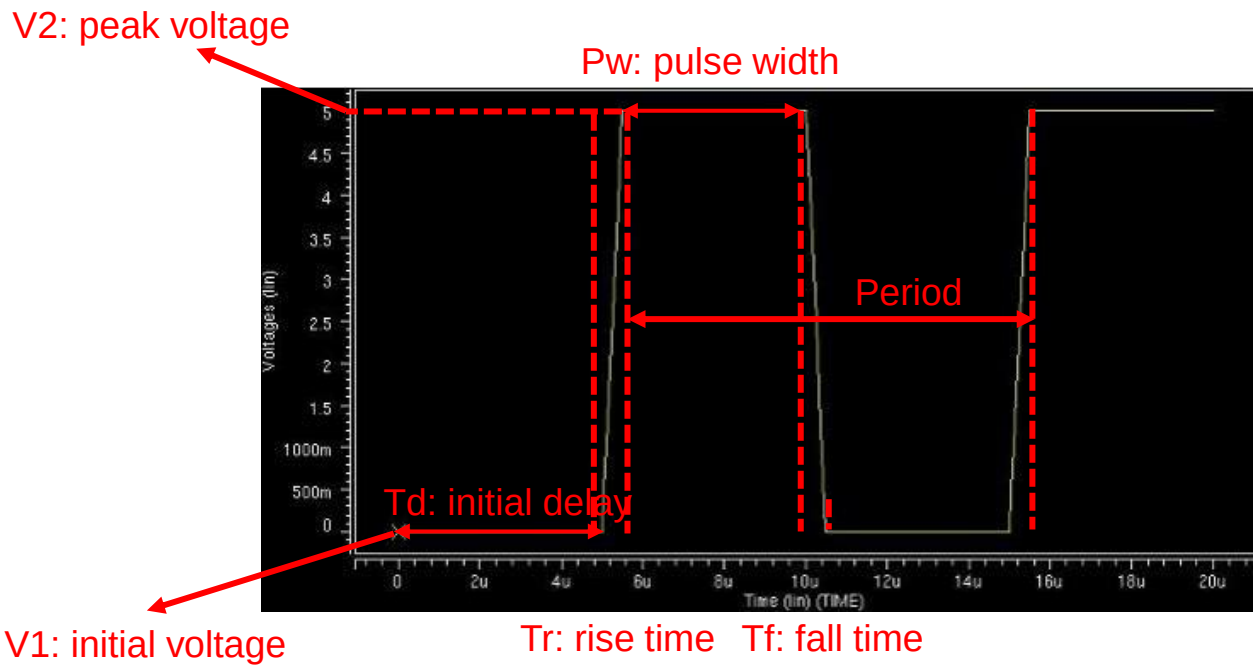
Outline

- Pulse input
- Hspice transient analysis .tran
- .measure

Pulse Waveform

Syntax	name	node	node	PLUSE	V1	V2	Td	Tr	Tf	Pw	Period
Example	Vinput	a	b	PLUSE	0	5	5u	0.5u	0.5u	4.5u	10u

- Example: Vinput a b PULSE 0 5 5u 0.5u 0.5u 4.5u 10u

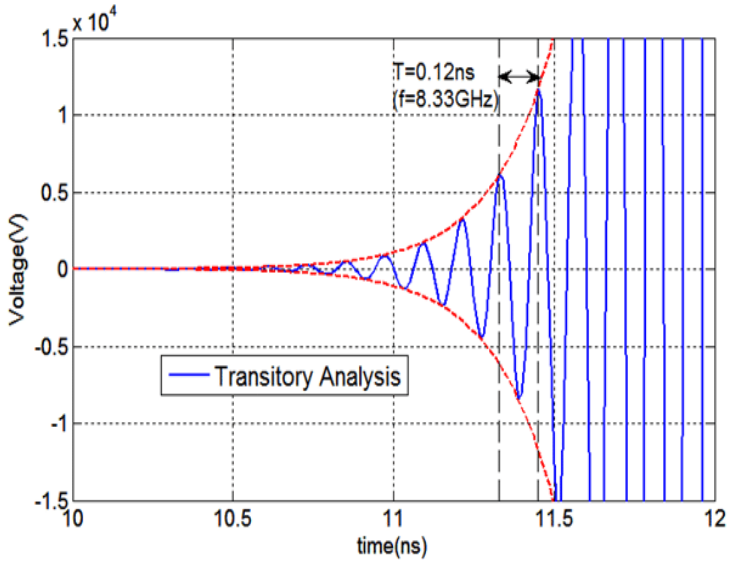


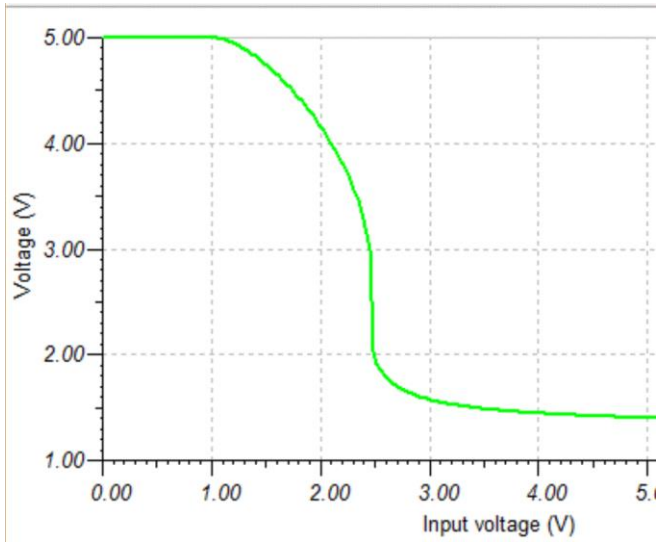
PULSE parameter	Default Value	Units
V1 - initial voltage	none	volt
V2 - peak voltage	none	volt
Td - initial delay time	0	second
Tr - rise time	*Tstep*	second
Tf - fall time	*Tstep*	second
Pw - pulse width	*Tstop*	second
Period - pilse period	*Tstop*	second

HSPICE Transient Analysis `.tran`

- Transient analysis computes the circuit solution as a function of time over a time range specified in the .tran statement. (sweep time)
- Syntax: .tran <step> <stop>
- Example: `.tran 1n 100n`

Waveform file from transient analysis is named with .tr



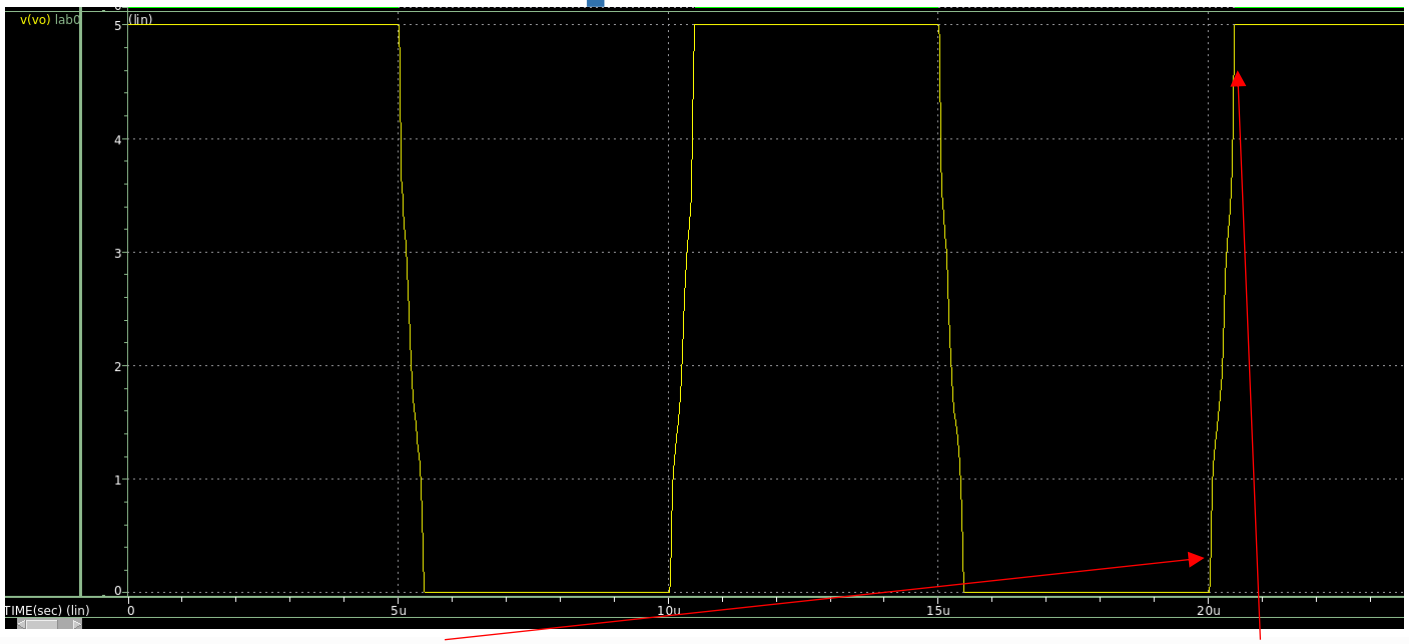


.measure

- .measure statement prints user-defined electrical specifications of a circuit and is also used extensively in optimization.
- Results of the `.MEASURE statement is stored in the ‘.lis’ file.`
- Syntax: `.MEASURE [DC|AC|TRAN] result TRIG … TARG …`
  `+ [GOAL=val] [MINVAL=val] [WEIGHT=val]`
- Example:

```
.measure tran outrise trig v(vo) val=‘vdd*0.1’ rise=2
targ v(vo) val='vdd*0.9' rise=2
```

.measure example




```
.measure tran outrise trig v(vo) val='vdd*0.1' rise=2 targ v(vo) val='vdd*0.9' rise=2
```

Measure on the transient analysis

Name of this measurement (search this name in .lis file)

Trigger point: when voltage of node vo = 'vdd*0.1' for the second rise edge

Target point

```
****** transient analysis tnom=  25.000 temp=  25.000 ******
outrise= 409.3538n  targ=  20.4643u   trig=  20.0549u
outfall= 413.9476n  targ=  15.4507u   trig=  15.0368u
tphl= -47.0258n  targ=  15.2030u   trig=  15.2500u
tplh=  45.0990n  targ=  20.2951u   trig=  20.2500u
```

Example “+”

```
.measure tran outrise
+trig v(vo) val='vdd*0.1' rise=2
+targ v(vo) val='vdd*0.9' rise=2
```

=

```
.measure tran outrise trig v(vo) val='vdd*0.1' rise=2 targ v(vo) val='vdd*0.9' rise=2
```

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Thank you!