Experiment 1

Aim: To Perform DC and Transient Analysis of Resistive Load Inverter Circuit

Or

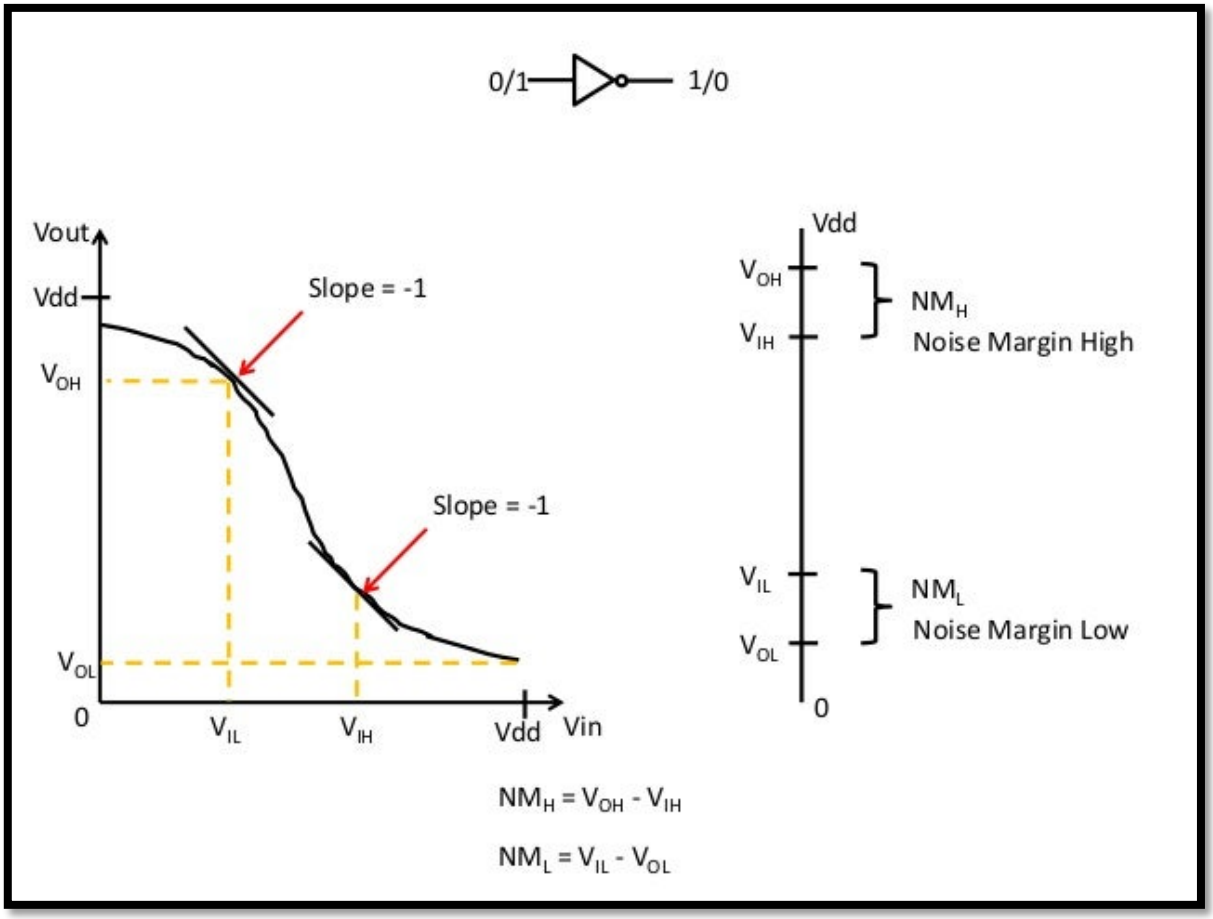
To plot the VTC Curve of Resistive Load Inverter Circuit

Tool Used: LTSPICE

Theory:

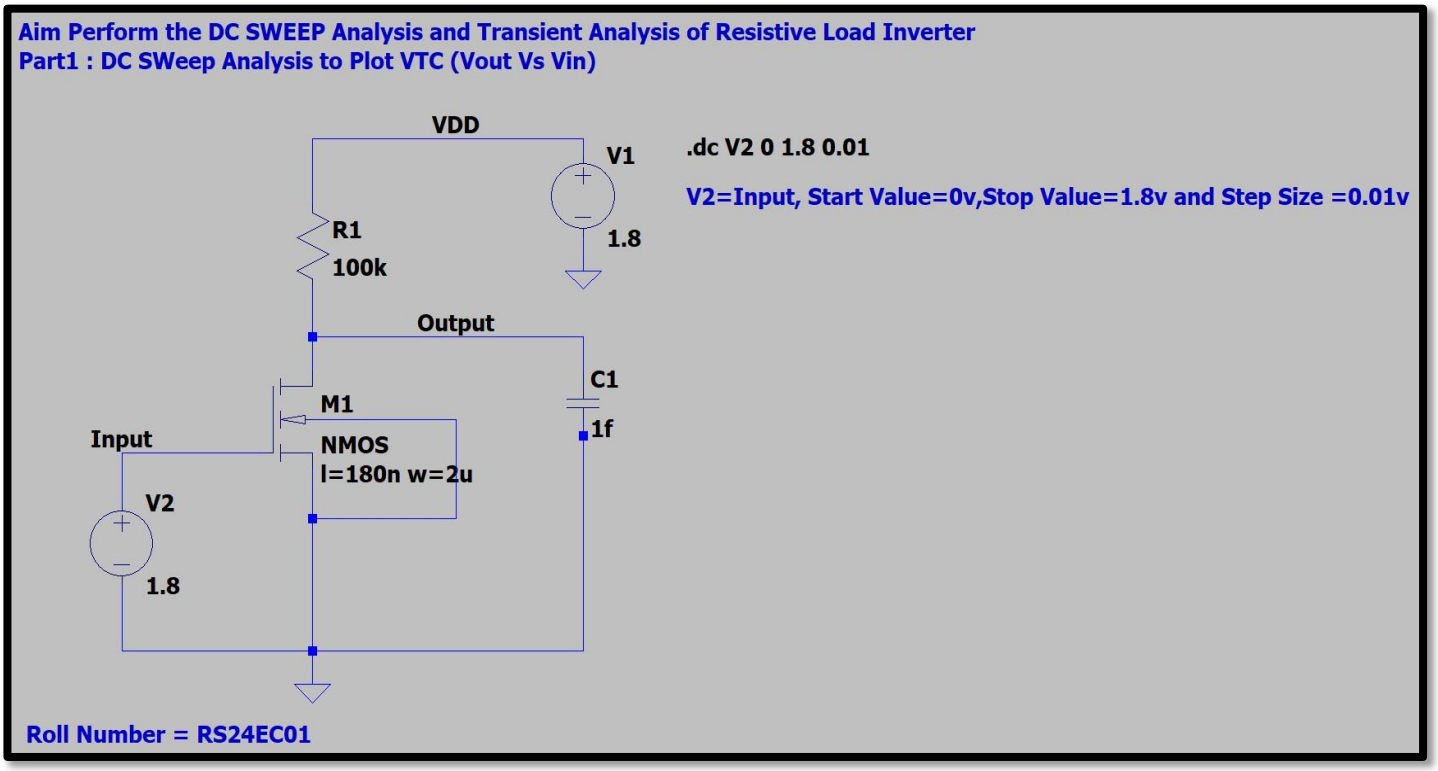
Theory

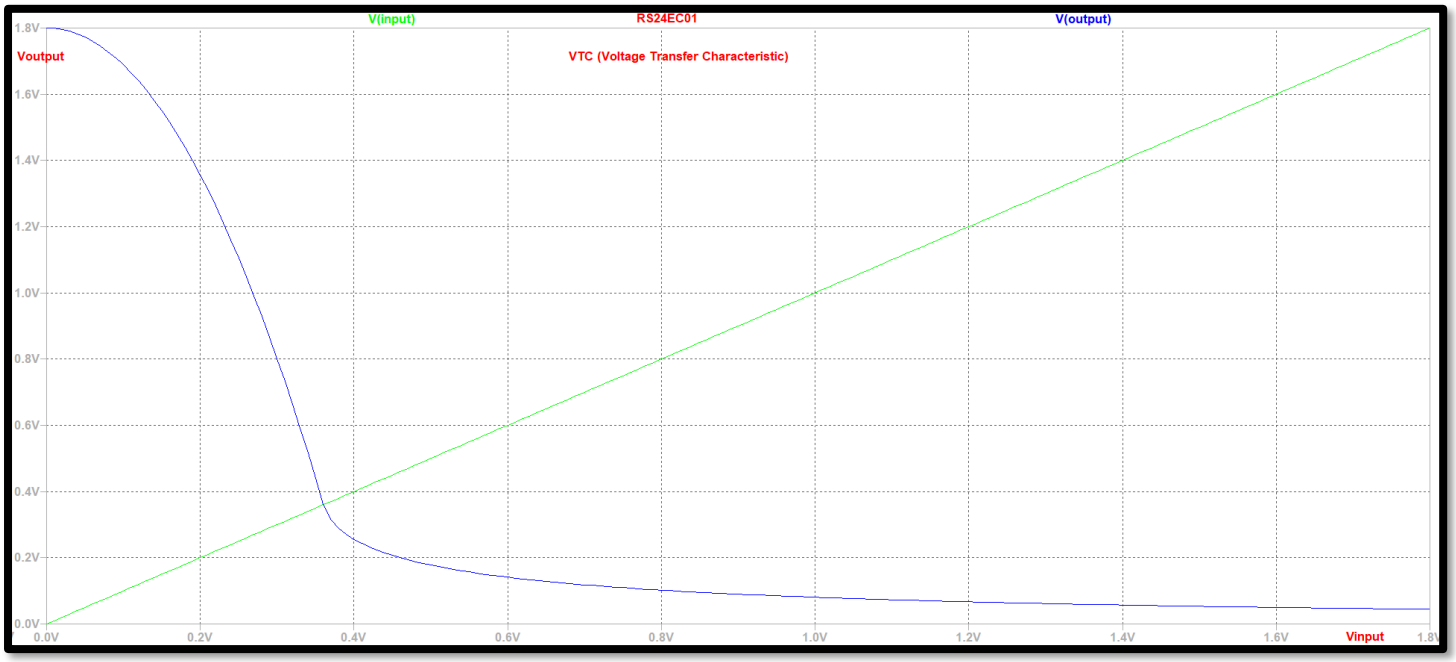
VIL	Input Low Voltage
	Any voltage between 0 and VIL treated as Logic Zero
VOH	Output High Voltage
	Any output voltage level between VOH and VDD treated as Logic One
VIH	Input High Voltage
	Any Input voltage level between VIH and VDD will be treated as Logic One
VOL	Output Low Voltage
	Any output voltage level between Zero and VOL treated as Logic Zero



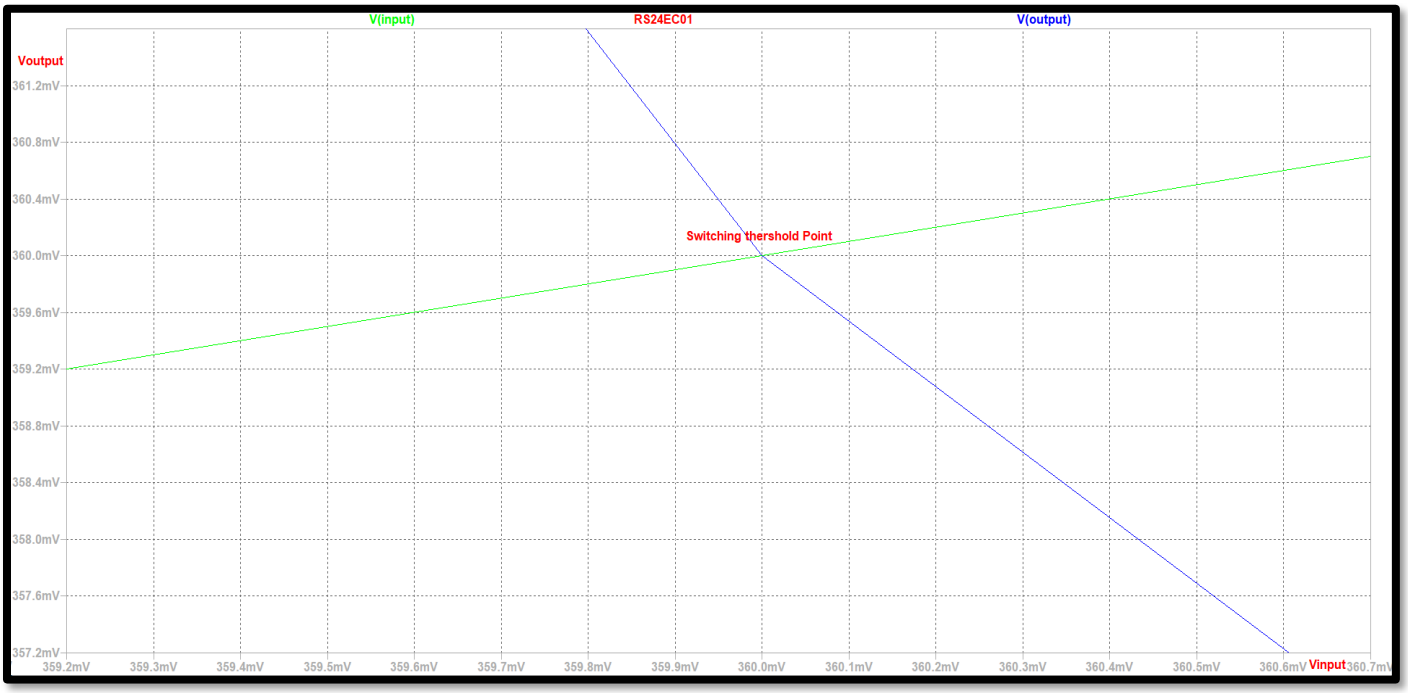
Switching Threshold: A point at which Vin = Vout at this point PMOS and NMOS both are in saturation state both transistors are on. High chances of leakage current flow.

Simulation

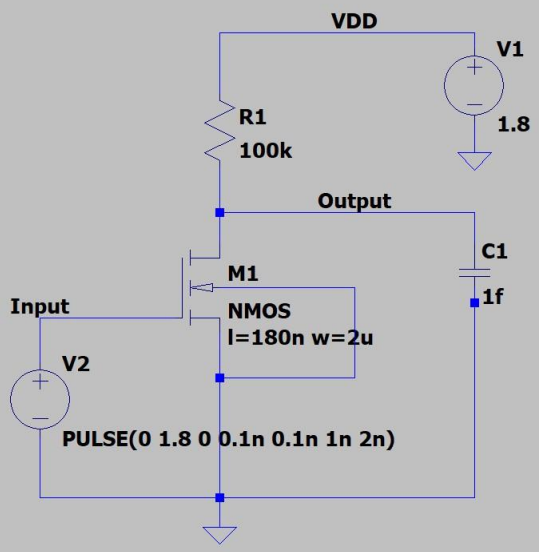

Aim Perform the DC SWEEP Analysis and Transient Analysis of Resistive Load Inverter
Part1 : DC SWeep Analysis to Plot VTC (Vout Vs Vin)
VDD
V1
1.8
R1
100k
Output
C1
1f
M1
NMOS
l=180n w=2u
Input
V2
1.8
.dc V2 0 1.8 0.01
V2=Input, Start Value=0v,Stop Value=1.8v and Step Size =0.01v
Roll Number = RS24EC01


V(input)
RS24EC01
V(output)
Voutput
VTC (Voltage Transfer Characteristic)
1.8V
1.6V
1.4V
1.2V
1.0V
0.8V
0.6V
0.4V
0.2V
0.0V
0.0V
0.2V
0.4V
0.6V
0.8V
1.0V
1.2V
1.4V
1.6V
Vinput


Slope Value
d(V(output))/d(V(input))
RS24EC01
VIL and VIH
EXP1 VTC_Resistive_Inverter_find_Slop.raw
Cursor 1
d(V(output))/d(V(input))
Horz: 410.1021mV
Vert: -1.0664846
Cursor 2
d(V(output))/d(V(input))
Horz: 49.328318mV
Vert: -999.99888m
Diff (Cursor2 - Cursor1)
Horz: -360.77378mV
Vert: 66.485692m
Slope: -0.184286
0.0
-0.8
-1.6
-2.4
-3.2
-4.0
-4.8
-5.6
-6.4
-7.2
-8.0
0.0V
0.2V
0.4V
0.6V
0.8V
1.0V
1.2V
1.4V
1.6V
Vinput
1.8V


V(input)
RS24EC01
V(output)
Voutput
361.2mV
360.8mV
360.4mV
360.0mV
359.6mV
359.2mV
358.8mV
358.4mV
358.0mV
357.6mV
357.2mV
Switching thershold Point
359.2mV
359.3mV
359.4mV
359.5mV
359.6mV
359.7mV
359.8mV
359.9mV
360.0mV
360.1mV
360.2mV
360.3mV
360.4mV
360.5mV
360.6mV
Vinput
360.7mV

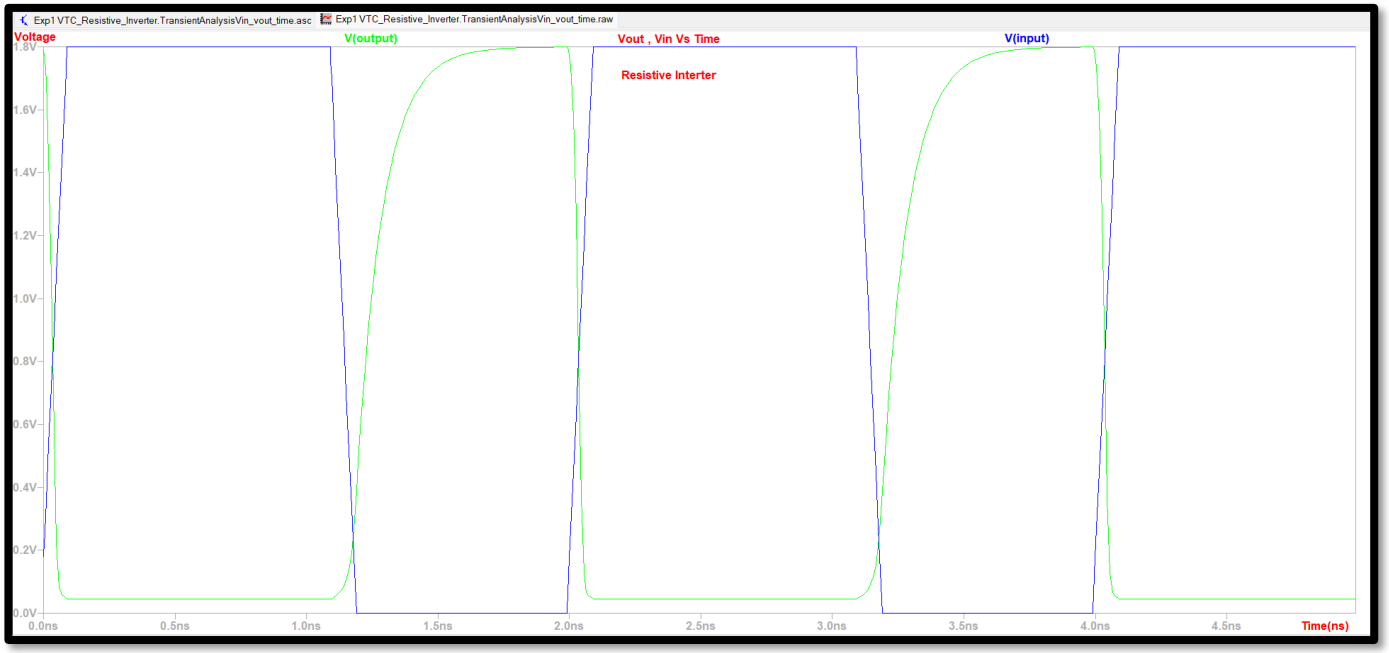
Aim Perform the DC SWEEP Analysis and Transient Analysis of Resistive Load Inverter
Part 2 : Transient Analysis

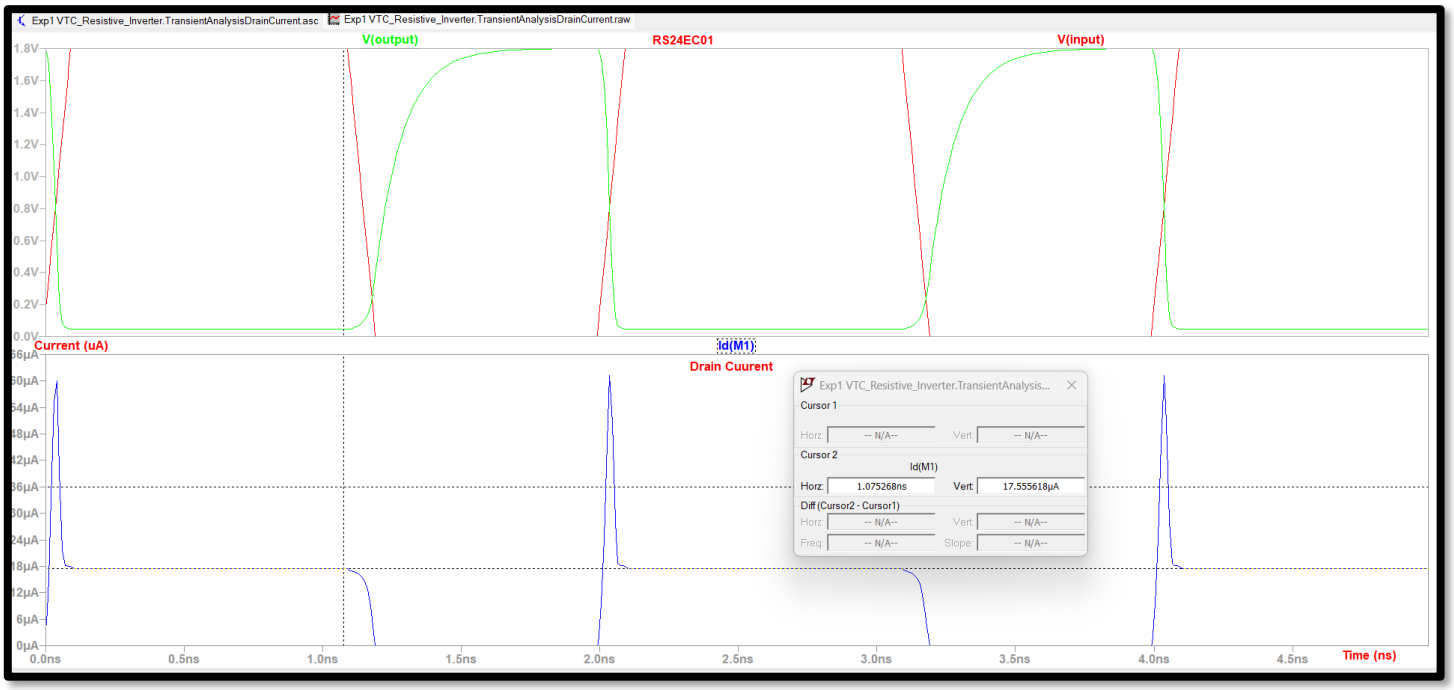


.tran 0 5n 0.01n 0.01n

Stop time =5n , Time for Saving data =0.01n ,Step Size=0.01n

Roll Number = RS24EC01

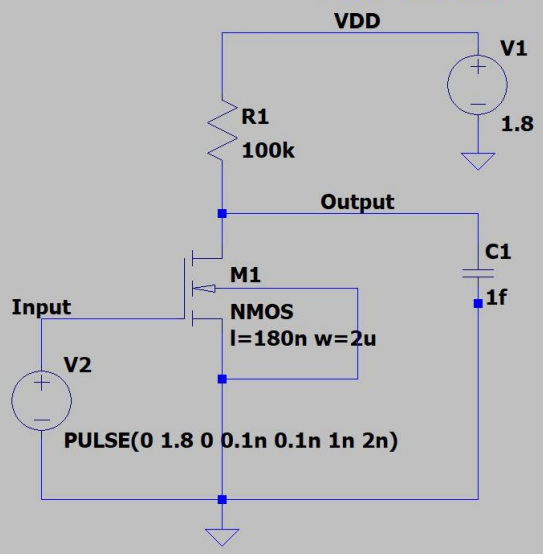




Aim Perform the DC SWEEP Analysis and Transient Analysis of Resistive Load Inverter

Part 2 : Transient Analysis

Power Calculations



.tran 0 5n 0.01n 0.01n

Stop time =5n , Time for Saving data =0.01n ,Step Size=0.01n

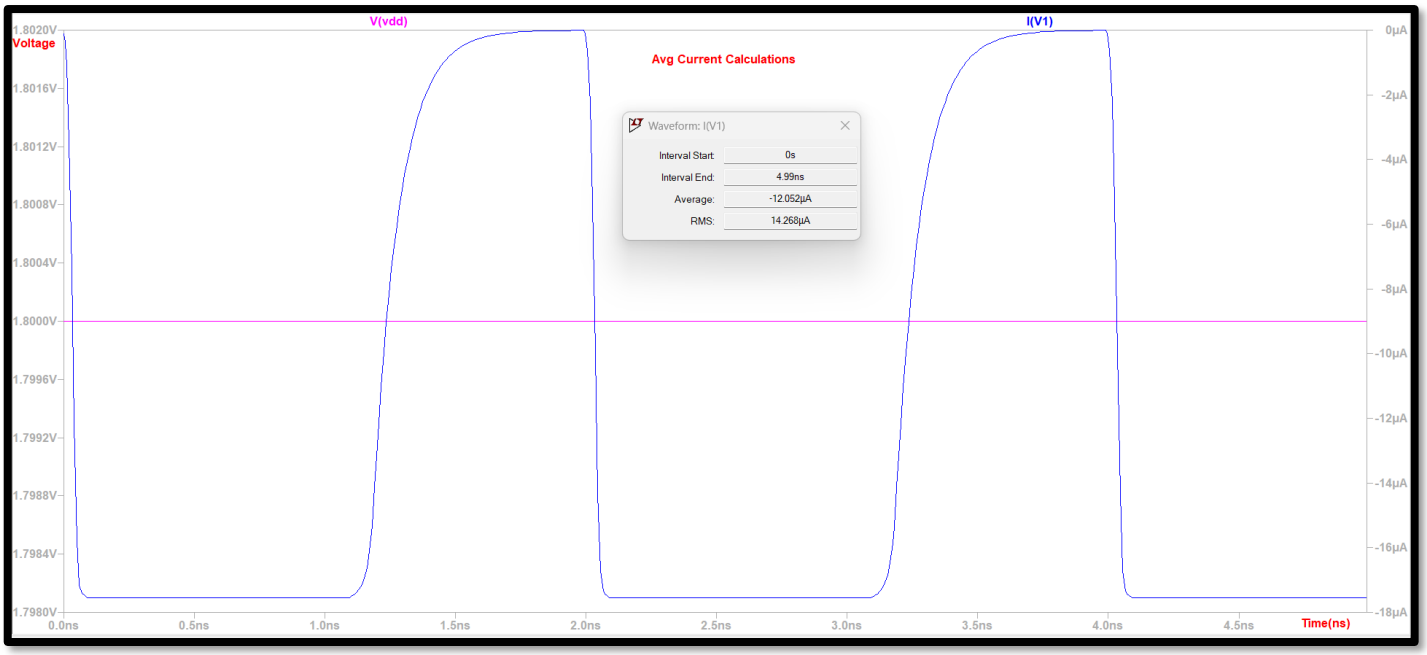
P=VI

AVG Power = Avg Current * VDD

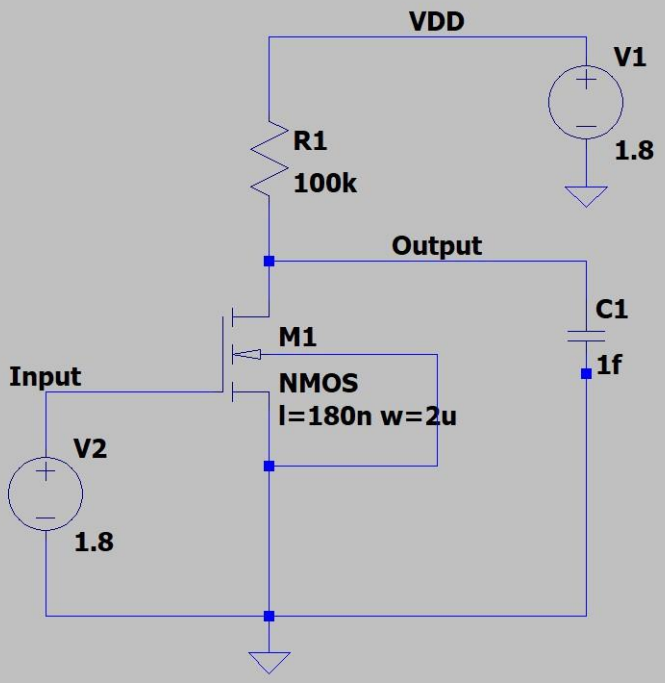
P=(12.052×10^−6)·1.8

P=21.69µW

Roll Number = RS24EC01



Aim Perform the DC SWEEP Analysis and Transient Analysis of Resistive Load Inverter Operating Points



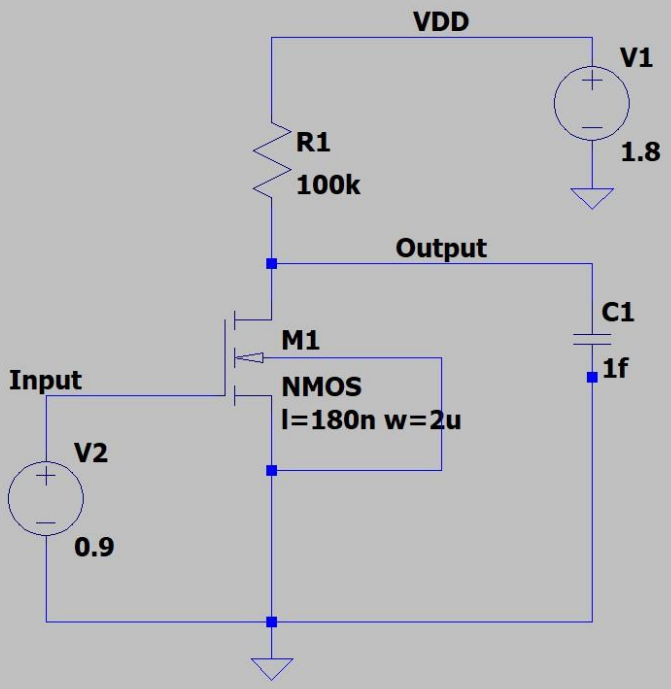
.op

Output
--- Operating Point ---

V(vdd):	1.8	voltage
V(output):	0.0444376	voltage
V(input):	1.8	voltage
Id(M1):	1.75556e-05	device_current
Ig(M1):	0	device_current
Ib(M1):	-5.26435e-14	device_current
Is(M1):	-1.75556e-05	device_current
I(C1):	4.44376e-29	device_current
I(R1):	1.75556e-05	device_current
I(V1):	-1.75556e-05	device_current
I(V2):	0	device_current

Roll Number = RS24EC01

Aim Perform the DC SWEEP Analysis and Transient Analysis of Resistive Load Inverter Operating Points



.op

Results
--- Operating Point ---

V(vdd):	1.8	voltage
V(output):	0.09	voltage
V(input):	0.9	voltage
Id(M1):	1.71e-05	device_current
Ig(M1):	0	device_current
Ib(M1):	-9.96918e-14	device_current
Is(M1):	-1.71e-05	device_current
I(C1):	9e-29	device_current
I(R1):	1.71e-05	device_current
I(V1):	-1.71e-05	device_current
I(V2):	0	device_current

Roll Number = RS24EC01

Results

Parameters	Value in mv	Value in Volt
VIL	49.328318mV	0.049328318 V
VIH	410.1021mV	0.4101021 V
VOL	44.437587mV	0.044437587 V
VOH	1.8v	1.8 V
Vm	360 mV	
Trans Analysis		
Id	17.555365µA	
Power Calculations		
Avg Current	12.052µA	
Avg Power P= VI	21.69µW	