Experiment no → 9
Date → 26th September 2020

19BEE0032
Radi Mahajan

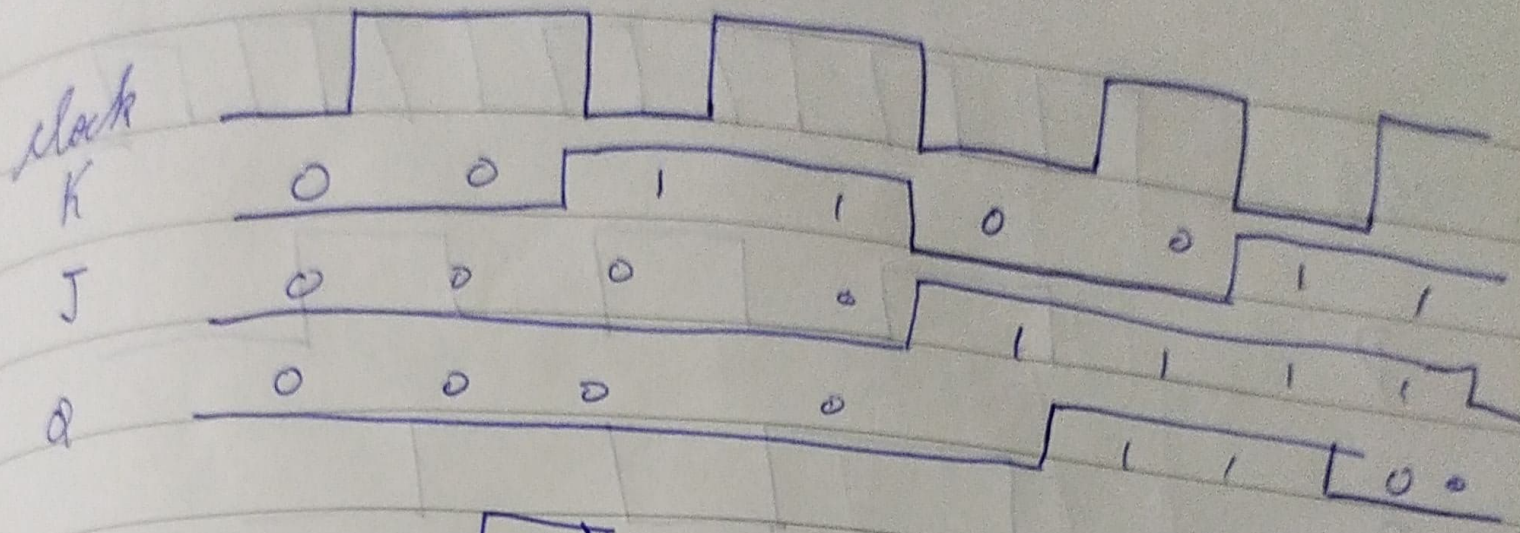
Aim → Characteristics of flip-flop
i) JK flip-flop ii) D flip-flop

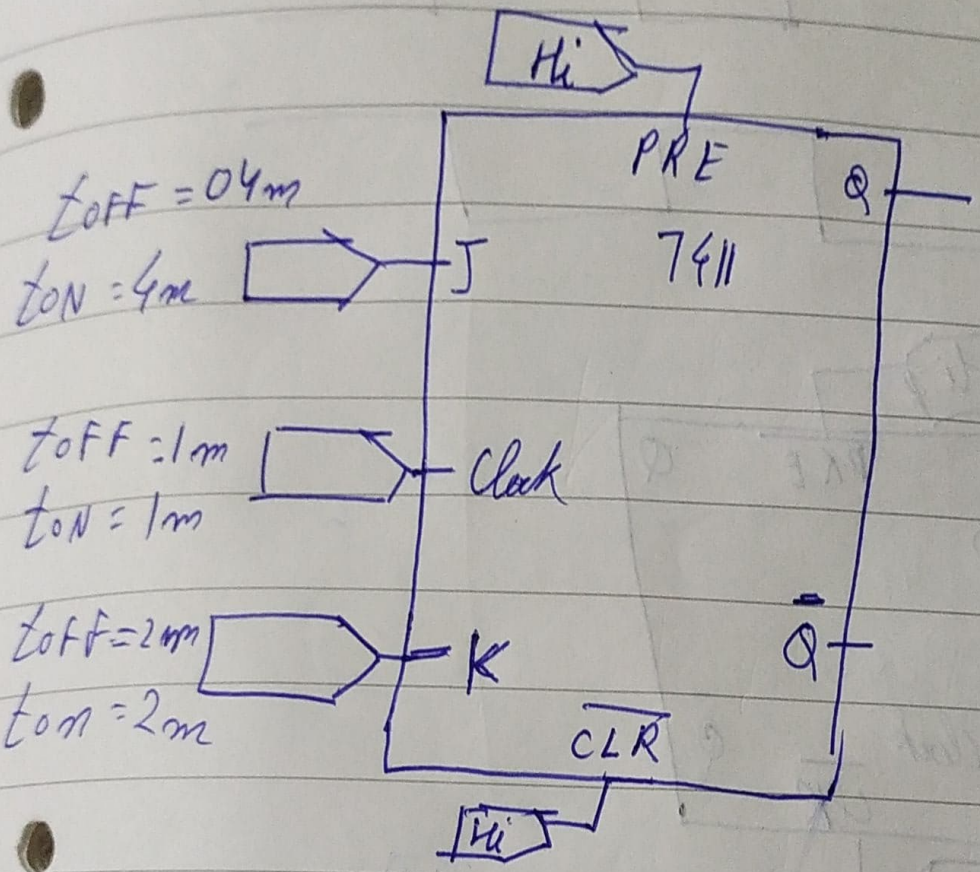
Apparatus required

Name	Specialization	Quantity
7400	• 74111 [JK]	1
	• 7474 [D]	1
Source	digiclock	5
Power/ground	source → high [5D-HI]	4

Truth table / Boolean equation / logic diagram →
i) JK flip-flop

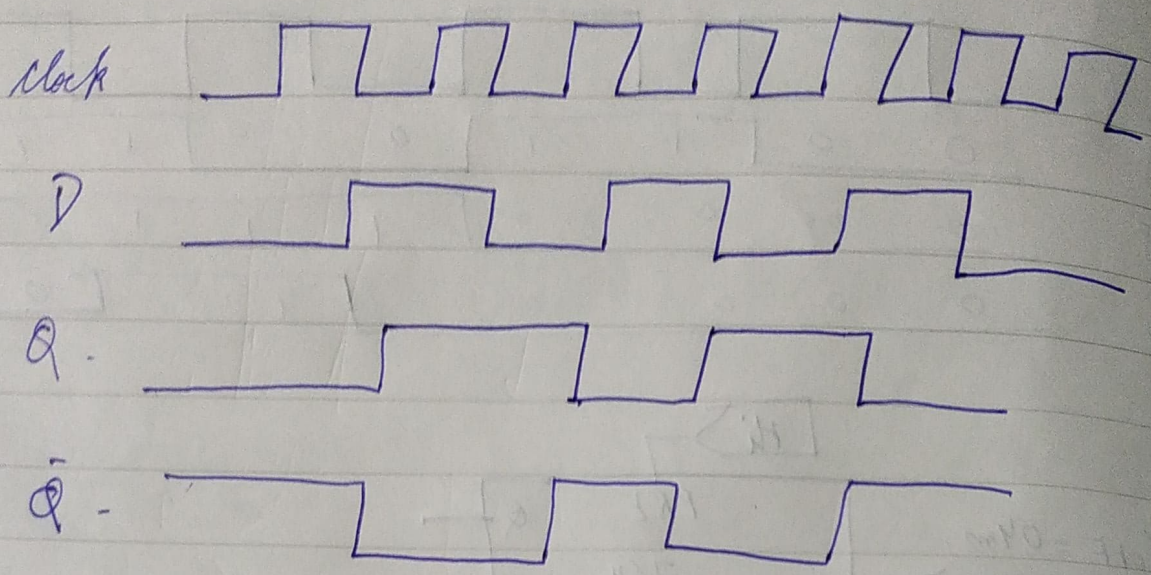
Clock	J-K inputs J	K	outputs Q	$\bar{Q}$	Status
↓	0	0	Q	Q	No change
↓	0	1	0	1	Reset
↓	1	0	1	0	Set
↓	1	1	$\bar{Q}$	Q	Toggle

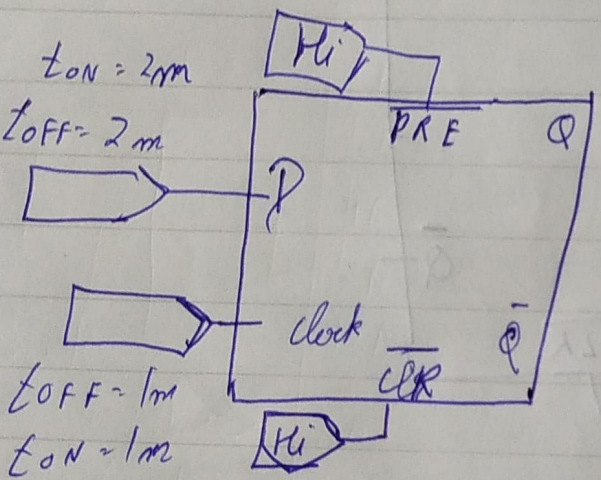




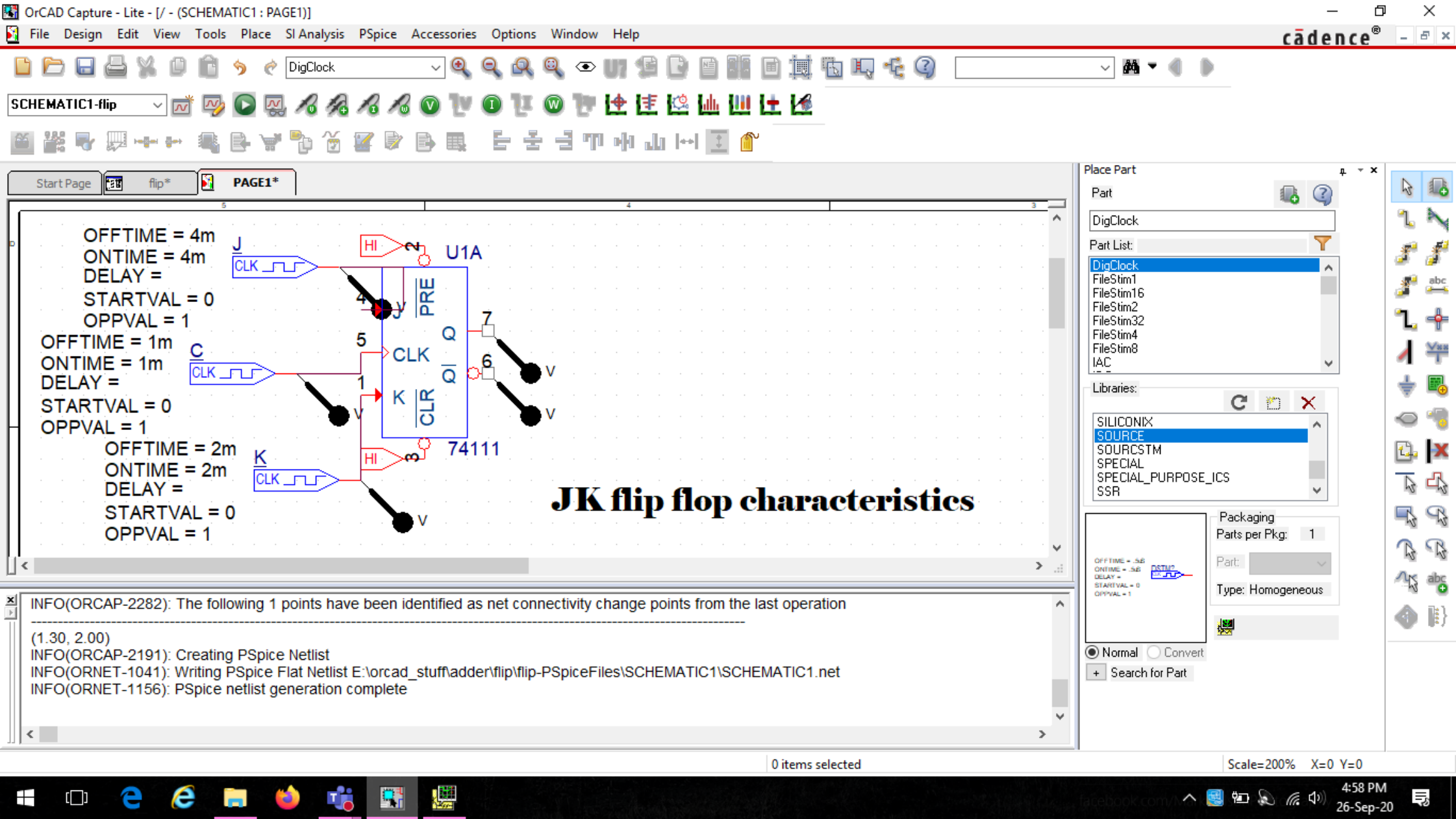
ii) D flip-flop

Clock	Input (D)	Output (Q $\bar{Q}$)
	D	
1	0	0 1
1	1	1 0





Inference & result → We use run-to-time as 20m. This is because we want result for both clock = 0 & clock = 1. Also both 7474 & 7911 are positive edge triggered.


OrCAD Capture - Lite - [/ - (SCHEMATIC1 : PAGE1)]
File Design Edit View Tools Place SI Analysis PSpice Accessories Options Window Help
cadence
DigClock
SCHEMATIC1-flip
Start Page
flip*
PAGE1*
OFFTIME = 4m
ONTIME = 4m
DELAY =
STARTVAL = 0
OPPVAL = 1
OFFTIME = 1m
ONTIME = 1m
DELAY =
STARTVAL = 0
OPPVAL = 1
OFFTIME = 2m
ONTIME = 2m
DELAY =
STARTVAL = 0
OPPVAL = 1
J
C
K
CLK
HI
U1A
PRE
CLR
Q
74111
JK flip flop characteristics
INFO(ORCAP-2282): The following 1 points have been identified as net connectivity change points from the last operation
(1.30, 2.00)
INFO(ORCAP-2191): Creating PSpice Netlist
INFO(ORNET-1041): Writing PSpice Flat Netlist E:\orcad_stuff\adder\flip\flip-PSpiceFiles\SCHEMATIC1\SCHEMATIC1.net
INFO(ORNET-1156): PSpice netlist generation complete
Place Part
Part
DigClock
Part List:
DigClock
FileStim1
FileStim16
FileStim2
FileStim32
FileStim4
FileStim8
IAC
Libraries:
SILICONIX
SOURCE
SOURCSTM
SPECIAL
SPECIAL_PURPOSE_ICS
SSR
Packaging
Parts per Pkg: 1
Part:
Type: Homogeneous
Normal
Convert
Search for Part
0 items selected
Scale=200%
X=0 Y=0
4:58 PM
26-Sep-20

SCHEMATIC1-flip - PSpice A/D Lite

File Edit View Simulation Trace Plot Tools Window Help

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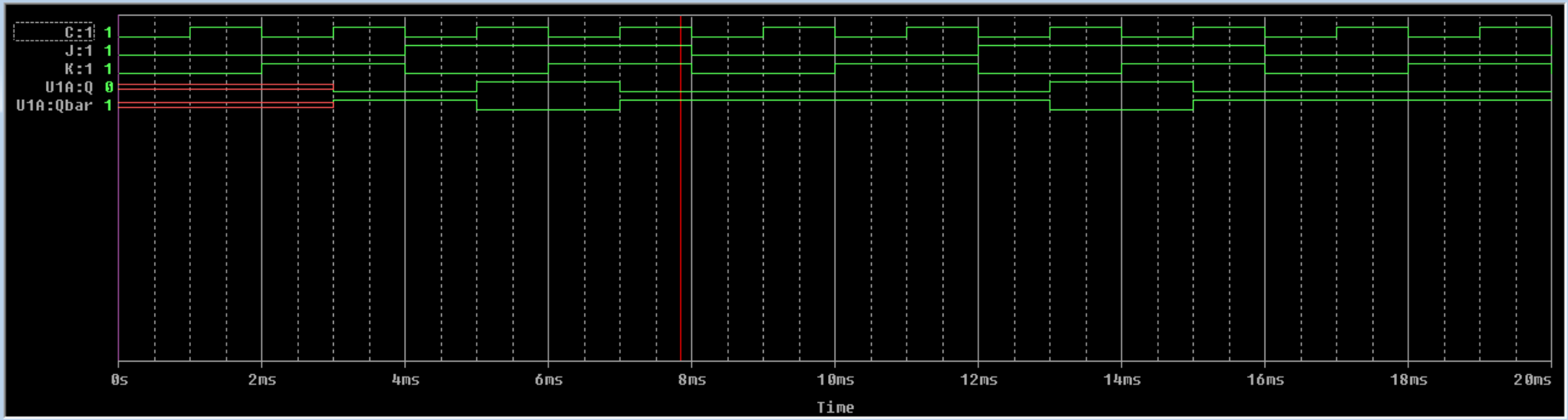
SCHEMATIC1-flip

flip (active)



flip (active)

```
PSpice> Initializing Scripting...
Loading C:/Cadence/SPB_17.2/tools/pspice/t
Loading C:/Cadence/SPB_17.2/tools/pspice/t
Loading C:/Cadence/SPB_17.2/tools/pspice/t

PSpice>
```

Command Window

Time = .02

Analysis Watch Devices

```
Circuit read in and checked, no errors
Calculating bias point for Transient Analysis
Bias point calculated
Transient Analysis
Transient Analysis finished
 Total job time            =       .61
INFO(ORPROBE-3190): Simulation complete
```

	Trace Color	Trace Name	Y1	Y2	Y1
		X Values	7.8475m	0.000	7.8
	CURSOR 1,2	C:1	1	0	1.0
		J:1	1	0	1.0
		K:1	1	0	1.0
		U1A:Q	0	X	0.0

E:\orcad_stuff\adder\flip\flip-PSpiceFiles\SCHEMATIC1\flip\flip.dat (active)

Time= .02

100%

4:58 PM
26-Sep-20

OrCAD Capture - Lite - [/ - (SCHEMATIC1 : PAGE1)]

File Design Edit View Tools Place SI Analysis PSpice Accessories Options Window Help

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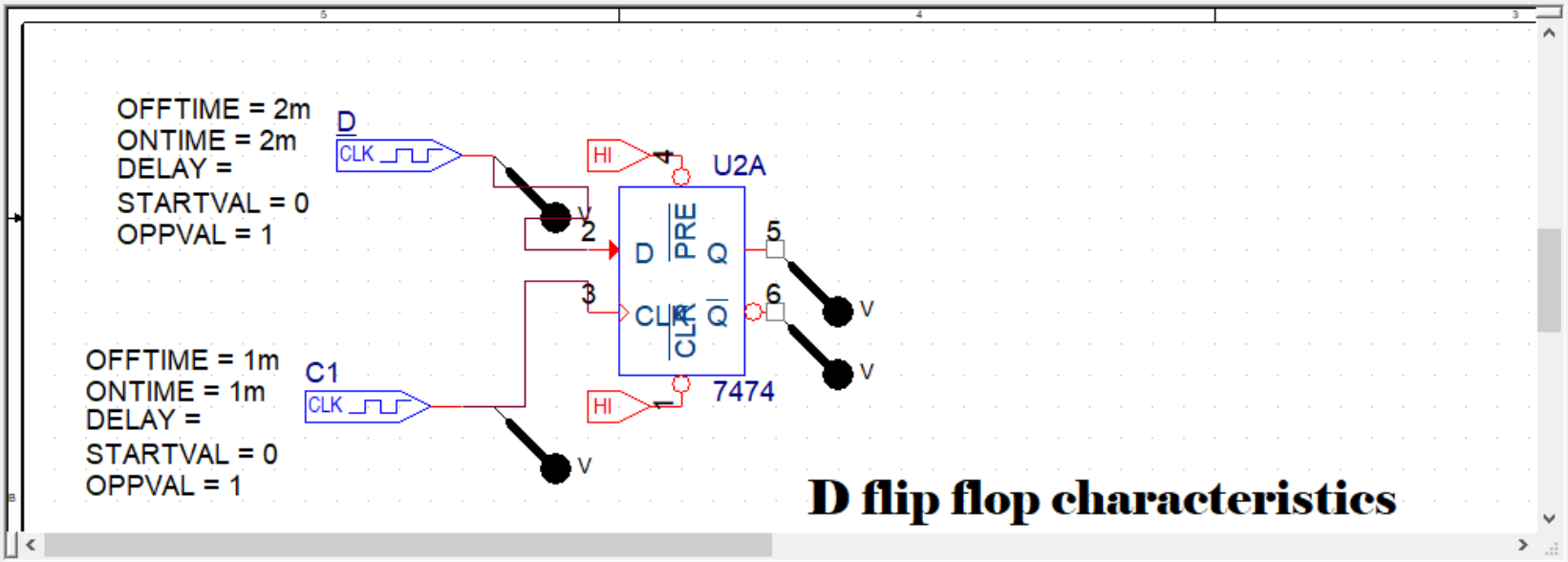
SCHEMATIC1-flip

Start Page | flip* | PAGE1*



Place Part

Part

7474

Part List:

7454
7460
7470
7472
7473
7474
7475
7476

Libraries:

7400
74AC
74ACT
74ALS
74AS
74F

U?A
7474

Packaging
Parts per Pkg: 2
Part: A
Type: Homogeneous

Normal Convert

Search for Part

```
INFO(ORCAP-2191): Creating PSpice Netlist
INFO(ORNET-1041): Writing PSpice Flat Netlist E:\orcad_stuff\adder\flip\flip-PSpiceFiles\SCHEMATIC1\SCHEMATIC1.net
INFO(ORNET-1156): PSpice netlist generation complete
INFO(ORCAP-2191): Creating PSpice Netlist
INFO(ORNET-1041): Writing PSpice Flat Netlist E:\orcad_stuff\adder\flip\flip-PSpiceFiles\SCHEMATIC1\SCHEMATIC1.net
INFO(ORNET-1156): PSpice netlist generation complete
```

0 items selected

Scale=200% X=0 Y=0

5:09 PM
26-Sep-20

SCHEMATIC1-flip - PSpice A/D Lite

File Edit View Simulation Trace Plot Tools Window Help

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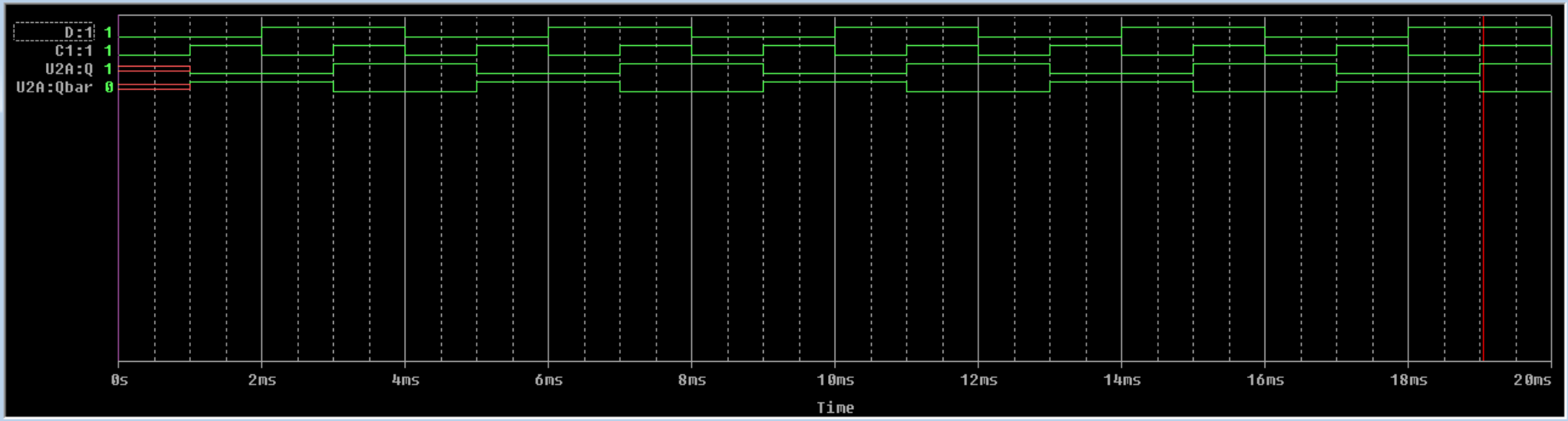
SCHEMATIC1-flip

flip (active)



flip (active)

```
PSpice> Initializing Scripting...
Loading C:/Cadence/SPB_17.2/tools/pspice/t
Loading C:/Cadence/SPB_17.2/tools/pspice/t
Loading C:/Cadence/SPB_17.2/tools/pspice/t

PSpice>
```

Command Window

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Analysis Watch Devices

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Circuit read in and checked, no errors
Calculating bias point for Transient Analysis
Bias point calculated
Transient Analysis
Transient Analysis finished
 Total job time            =       .27
INFO(ORPROBE-3190): Simulation complete
```

	Trace Color	Trace Name	Y1	Y2	Y1
		X Values	19.051m	0.000	19.0
	CURSOR 1,2	D:1	1	0	1.0
		C1:1	1	0	1.0
		U2A:Q	1	X	1.0
		U2A:Qbar	0	X	0.0

E:\orcad_stuff\adder\flip\flip-PSpiceFiles\SCHEMATIC1\flip\flip.dat (active)

Time= .02

100%

5:10 PM
26-Sep-20