LTspice Model
DarlingtonTransistorArray
Texas Instruments Inc.
ULN2003ADR

Model Information

Model	A macro model
Call Name	MDC_ULN2003ADR_LT
Pin Assign	1:1B 2:2B 3:3B 4:4B 5:5B 6:6B 7:7B 8:E 9:COM 10:7C 11:6C 12:5C 13:4C 14:3C 15:2C 16:1C
File List	Model Library MDC_ULN2003ADR_LT01.lib
	Model Report MDC_ULN2003ADR_LT.pdf(this file)
Verified Simulator Version	LTspiceXVII

Note

References

The information which was used for modeling is as follow:

[Data Sheet]
- ●Date/Version   2019/8
- ●Product name   ULN2003ADR
- ●Company name   Texas Instruments Inc.

[Characteristics listed]
- ●Characteristics   VI(on),VCE(sat),ICEX,VF,I(off),II,IR,Ci
  TPLH-HL/VOH,VI(ON)_ALL,VF_ALL

Simulation Condition

This table shows the range of evaluated simulation range that was not occurs any convergence problems in this area.
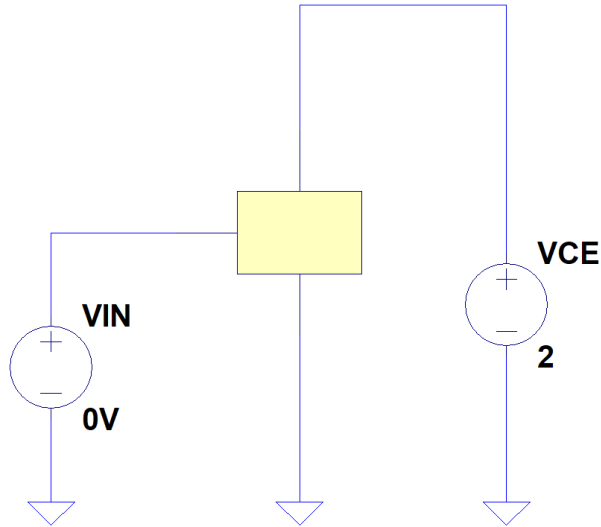
Item	Condition	Unit
Temperature	25	deg C

Model Functions Table

Functions	Implemented
VI(on)	O
VCE(sat)	O
ICEX	O
VF	O
I(off)	O
II	O
IR	O
Ci	O
TpLH-HL/VOH	O
VI(ON)_ALL	O
VF_ALL	O

VI(on) Testbench

Referred to Data Sheet

VIN

0V

VCE

2

.dc VIN 0 10 0.1
.lib ULN2003ADR.lib

Simulation results are following.
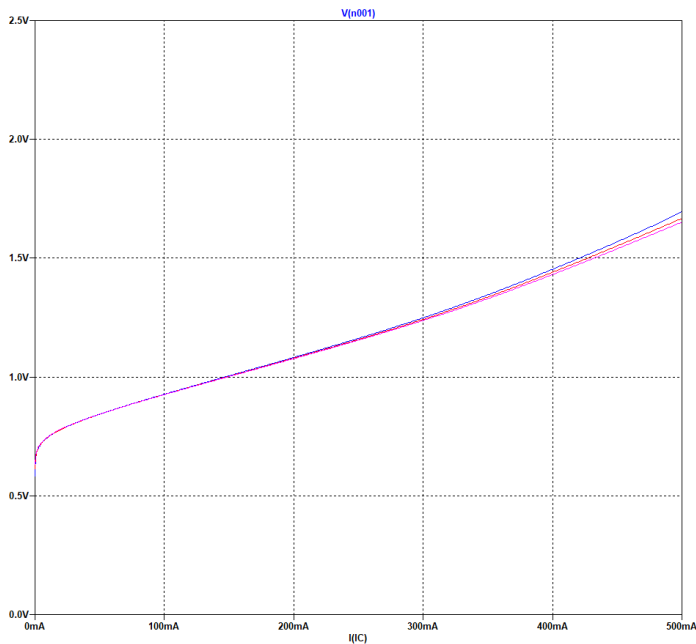Explanatory notes ― : simulated

VI(on)
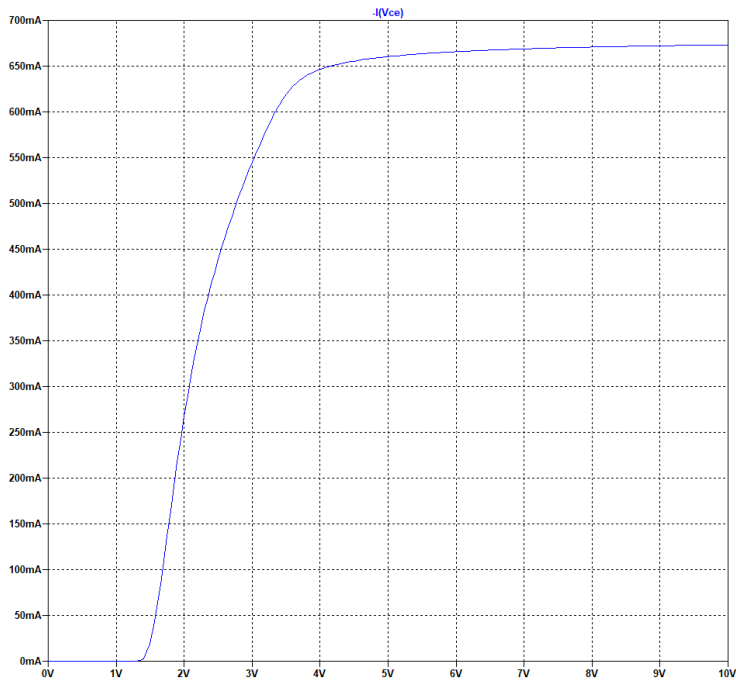
VCE(sat) Testbench

Referred to Data Sheet

IC

350mA

IB

{II}
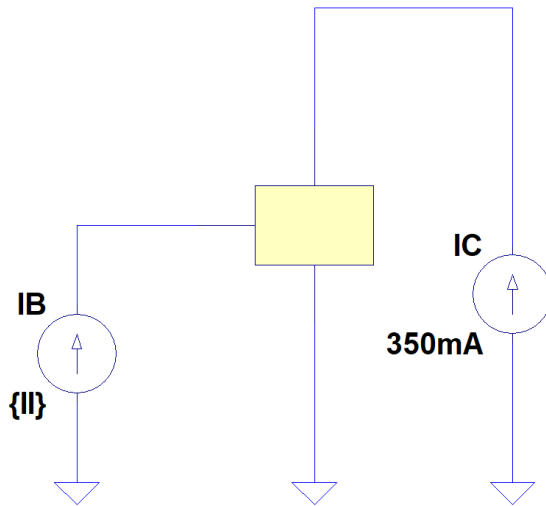
.step param II list 250u 350u 500u
.dc IC 0 500m 0.1m
.lib ULN2003ADR.lib

Simulation results are following.
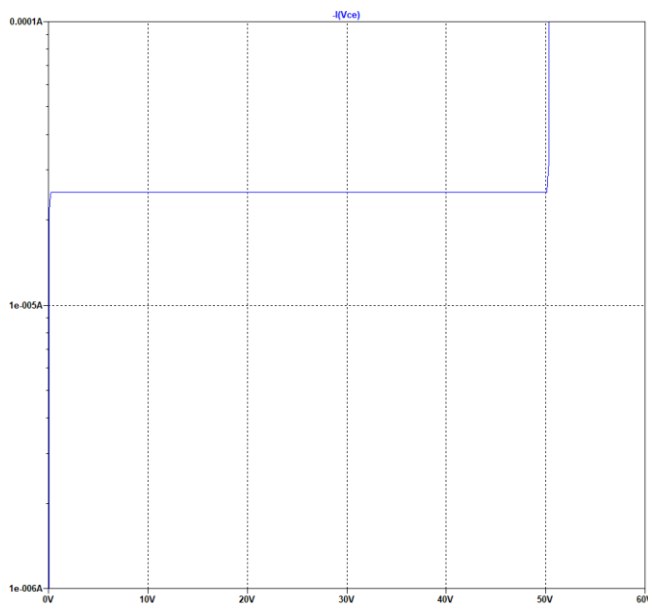Explanatory notes   — : simulated

VCE(sat)

ICEX Testbench

Referred to Data Sheet

VCE

50V
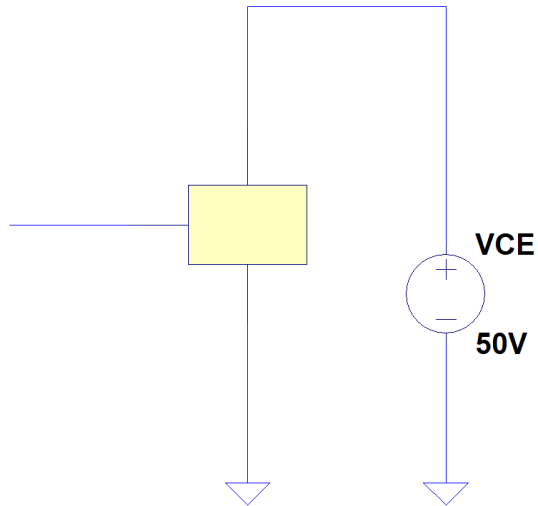
.dc VCE 0 60 0.1
.lib ULN2003ADR.lib

Simulation results are following.
Explanatory notes   － : simulated

ICEX

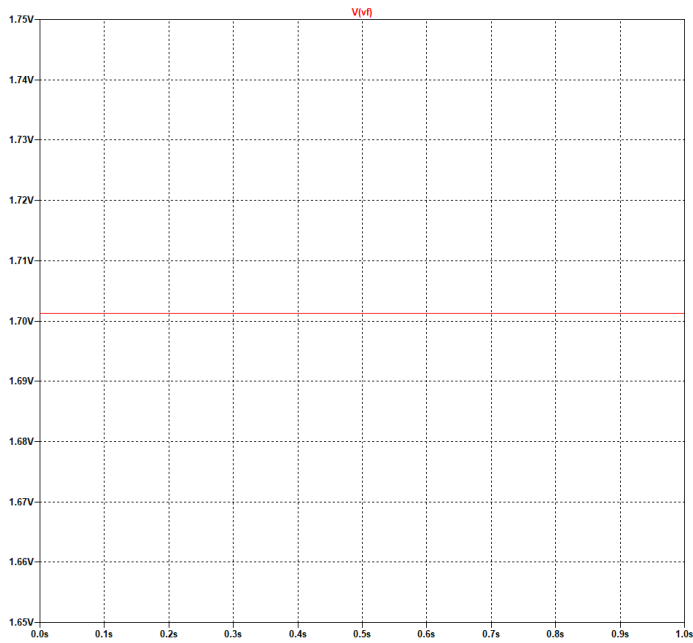**VF Testbench**

Referred to Data Sheet

D1

Clamp_diode

IF

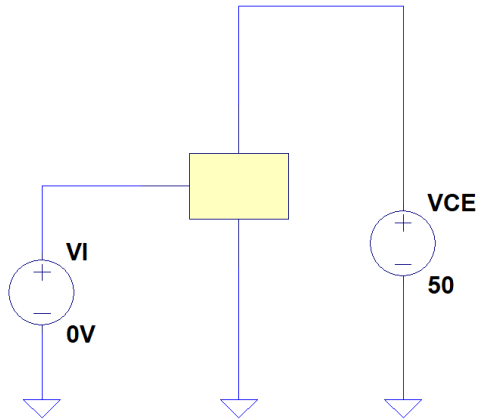**350m**
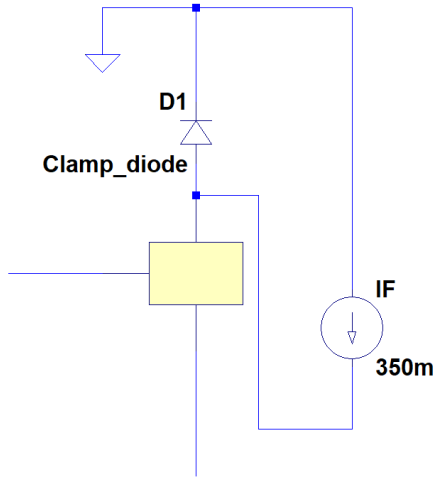
.tran 1
.lib ULN2003ADR.lib
.lib Clamp_diode.lib

Simulation results are following.
Explanatory notes － : simulated

VF

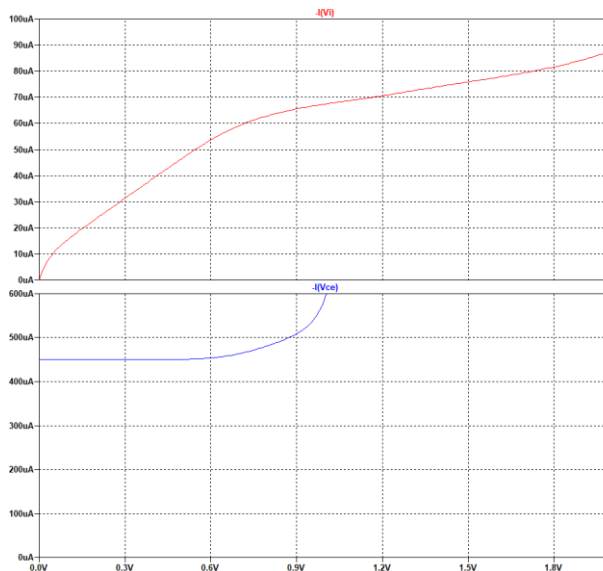**II(off) Testbench**

Referred to Data Sheet

.dc VI 0 2 0.01
.lib ULN2003ADR.lib

.temp 70

.meas II(off) FIND -I(Vi) WHEN -I(Vce)=500u RISE=1

Simulation results are following.
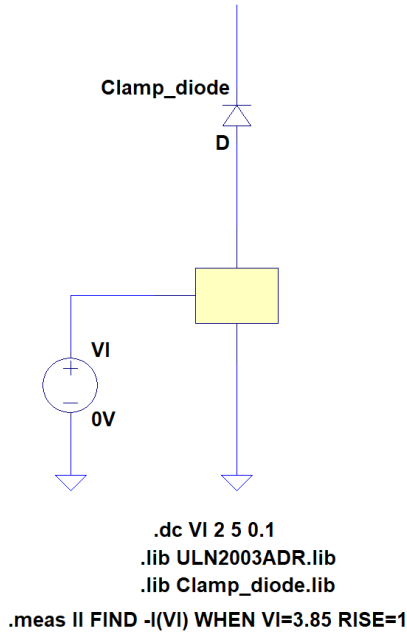Explanatory notes　　 － : simulated

II(off)

```
.meas II(off) FIND -I(vi) WHEN -I(Vce)=500u RISE=1

II(off): -I(vi)=5.49442e-005 at 0.873678
```
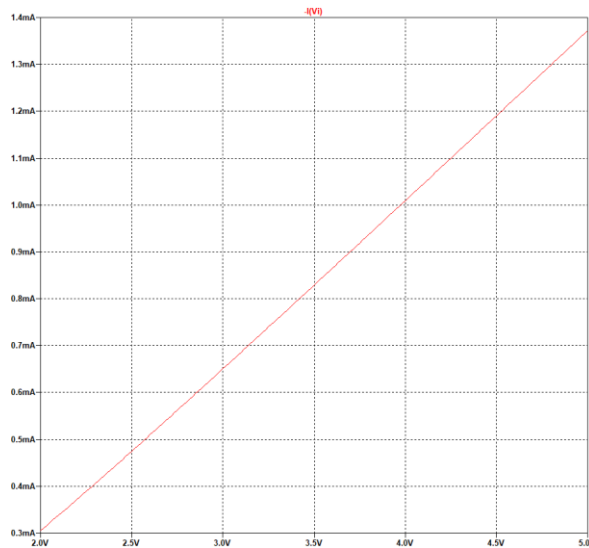
II Testbench

Referred to Data Sheet

Clamp_diode

D

VI

0V

.dc VI 2 5 0.1
.lib ULN2003ADR.lib
.lib Clamp_diode.lib
.meas II FIND -I(VI) WHEN VI=3.85 RISE=1

Simulation results are following.
Explanatory notes　　－ : simulated

II

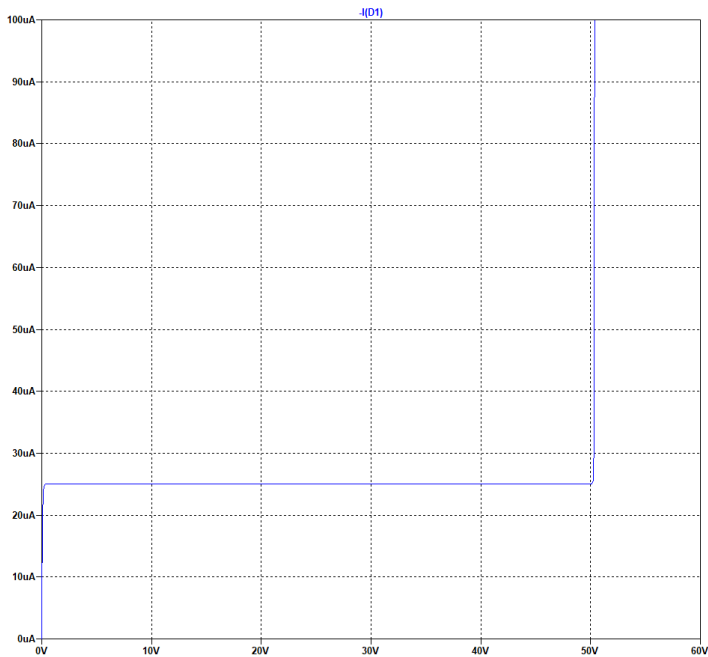.meas II FIND −I(VI) WHEN VI=3.85 RISE=1
II: −I(VI)=0.000955122 at 3.85

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IR Testbench

Referred to Data Sheet

D1

Clamp_diode

VR

0V
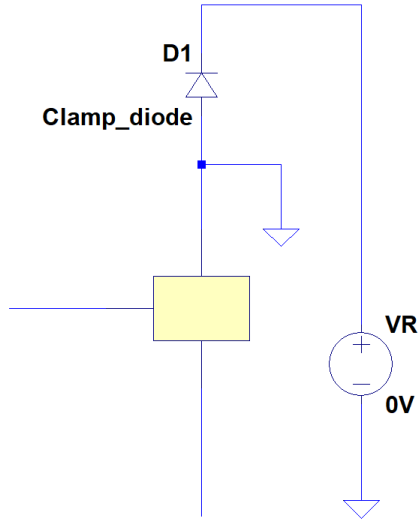
.dc VR 0 60 0.01
.lib ULN2003ADR.lib
.lib Clamp_diode.lib

Simulation results are following.
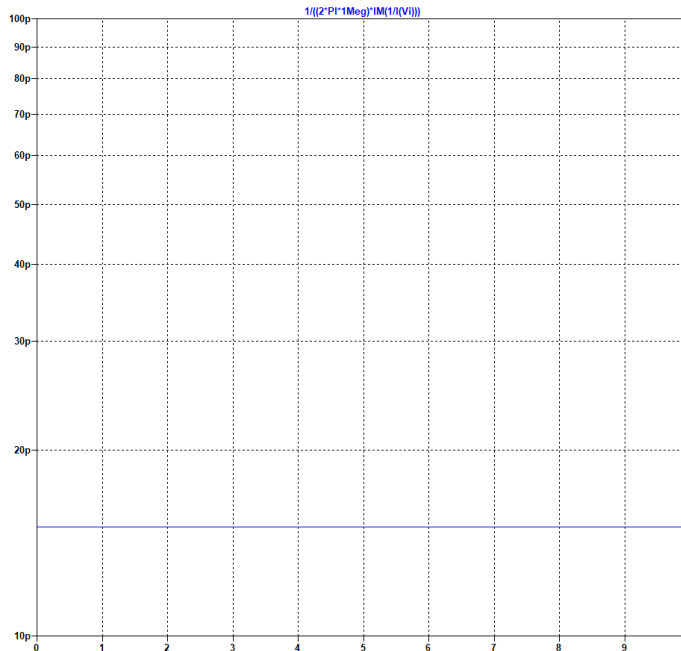Explanatory notes 　－ : simulated

IR

Ci Testbench

Referred to Data Sheet

VC

0V

Q1
ULN2003ADR_bjt

VI

0V
AC 1
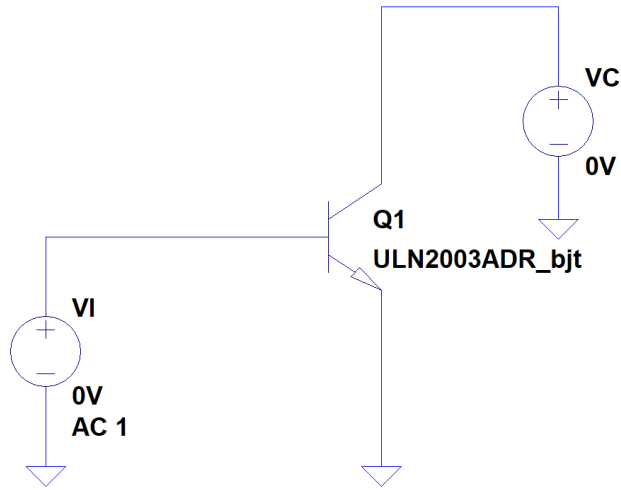
.ac dec 1 1Meg 1Meg
.step param VI 0 10 0.1
.lib ULN2003ADR_bjt.lib

Simulation results are following.
Explanatory notes 　－ : simulated

Ci

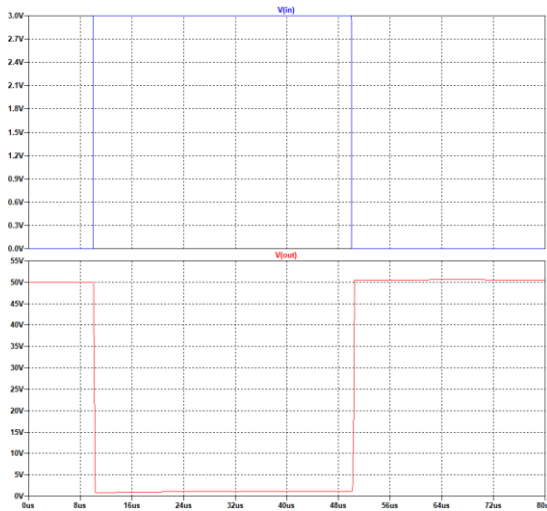**tpLH-HL/VOH Testbench**

Referred to Data Sheet

LL
2mH

VS
50

RL
200

OUT

CL
15p

IN

VI
PULSE(0 3 10u 3n 3n 40u 80u)
AC 1

.tran 80u

.lib ULN2003ADR.lib

.meas tpHL TRIG V(in)=1.5 RISE=1 TARG V(out)=24.4365 FALL=1
.meas tpLH TRIG V(in)=1.5 FALL=1 TARG V(out)=24.4365 RISE=1
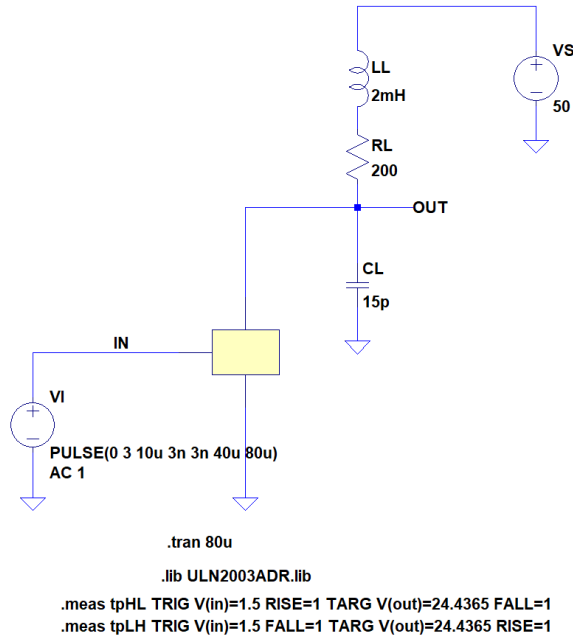
Simulation results are following.
Explanatory notes 　－ : simulated

tpLH-HL/VOH

VOH

SW.raw ×

Cursor 1
V(out)
Horz: 39.955006us   Vert: 1.1268496V

Cursor 2
Horz: -- N/A--   Vert: -- N/A--

Diff(Cursor2 - Cursor1)
Horz: -- N/A--   Vert: -- N/A--
Freq: -- N/A--   Slope: -- N/A--

tpHL
.meas tpHL TRIG V(in)=1.5 RISE=1 TARG V(out)=24.4365 FALL=1
tpHL=2.00921e-007 FROM 1.00015e-005 TO 1.02024e-005

tpLH
.meas tpLH TRIG V(in)=1.5 FALL=1 TARG V(out)=24.4365 RISE=1
tpLH=3.57238e-007 FROM 5.00045e-005 TO 5.03617e-005

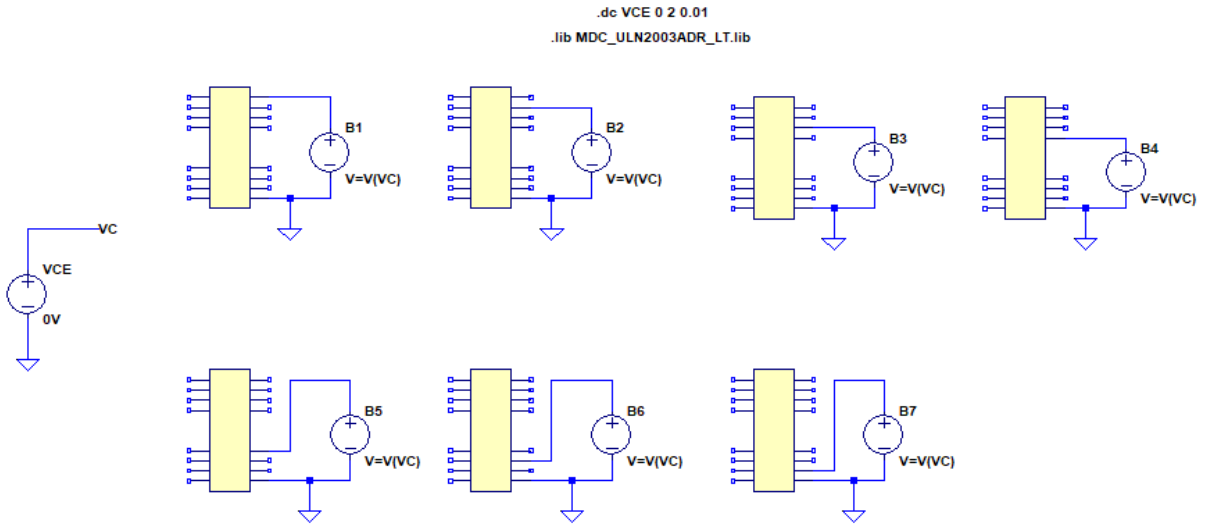**VI(ON)_ALL Testbench**

Referred to Data Sheet
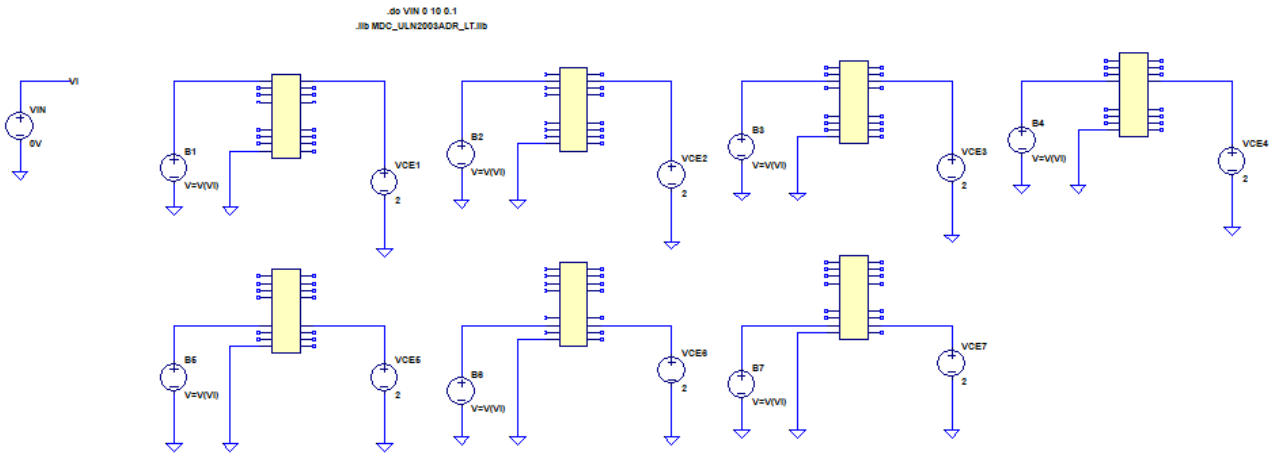
Simulation results are following.
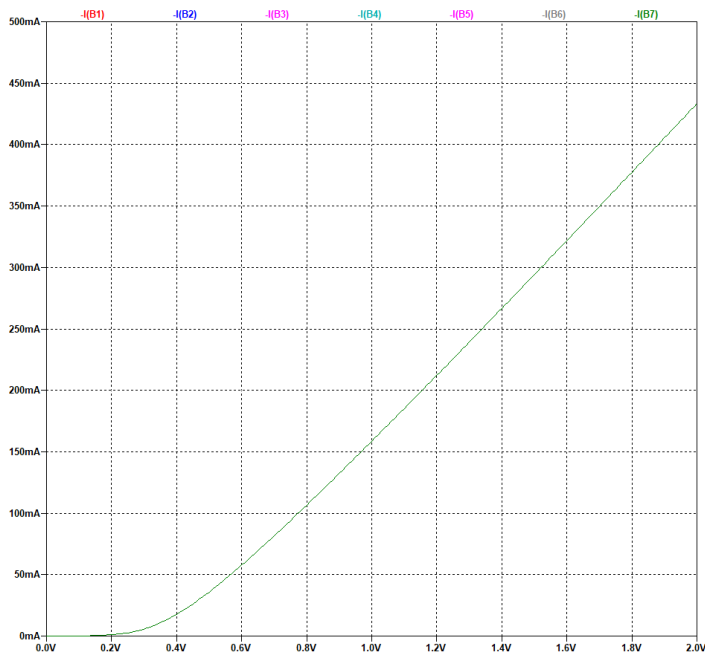Explanatory notes ― : simulated

VI(ON)_ALL

VF_ALL Testbench

Referred to Data Sheet

.dc VCE 0 2 0.01
.lib MDC_ULN2003ADR_LT.lib

Simulation results are following.
Explanatory notes ― : simulated

VF_ALL

July 08,2021
Rev 1.0

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July 08,2021
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