LTspice Model
Automotive, 300-mA, Low-Dropout Voltage Regulator With High Accuracy and Enable
TEXAS INSTRUMENTS
TPS78401QWDRBRQ1

Model Information

Model	A macro model
Call Name	MDC_TPS78401QWDRBRQ1_LT
Pin Assign	1:OUT 2:FB 3:NC 4:NC 5:GND 6:NC 7:EN 8:IN 9:ThermalPad
File List	Model Library MDC_TPS78401QWDRBRQ1_LT.lib
	Model Report MDC_TPS78401QWDRBRQ1_LT.pdf(this file)

Verified Simulator Version LTspice

Note

References

The information which was used for modeling is as follow:

[Data Sheet]

- ●Date/Version
- ●Product name TPS78401QWDRBRQ1
- ●Company name TEXAS INSTRUMENTS

[Characteristics listed]

●Characteristics
- Output Voltage vs Input Voltage
- Start-Up With EN
- Line regulation
- Load regulation
- Active output discharge
- Low-Dropout Voltage
- Current limit

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

○ : Implemented
× : Not Implemented
— : Not applicable

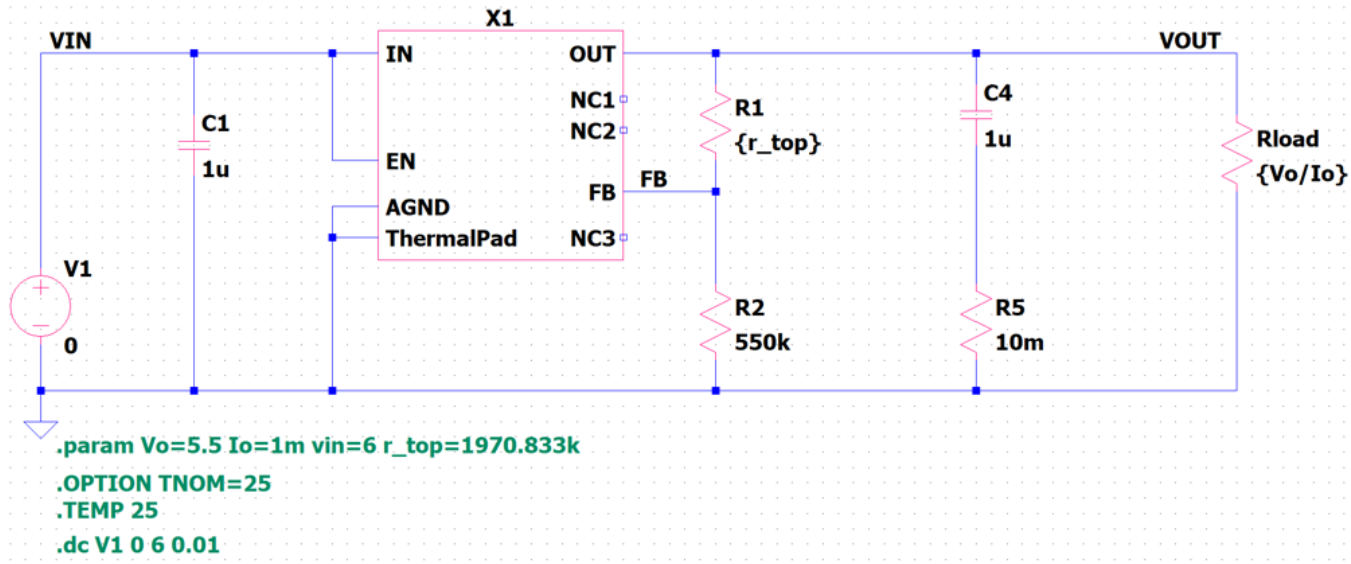
Model Functions Table

	RANK=2	
Functions	**RANK**	**Implemented**
Input voltage range: 1.65 V to 6.0 V	1	○
Output voltage range: Adjustable option: 1.2 V to 5.5 V	1	○
Output accuracy: ±0.5%	1	○
Active output discharge	1	○
Under voltage lockout (UVLO)	1	○
Enable Operation	1	○
Ultra-low dropout: 115 mV (max) at 300 mA (3.3 VOUT)	1	○
Current limit	1	○
Line regulation	1	○
Load regulation	1	○
Line transient	2	○
Load transient	2	○

Output Voltage vs Input Voltage (Input=0V~6V Output=5.5V IOUT=1mA)

Simulation results are following.
Explanatory notes — : simulated

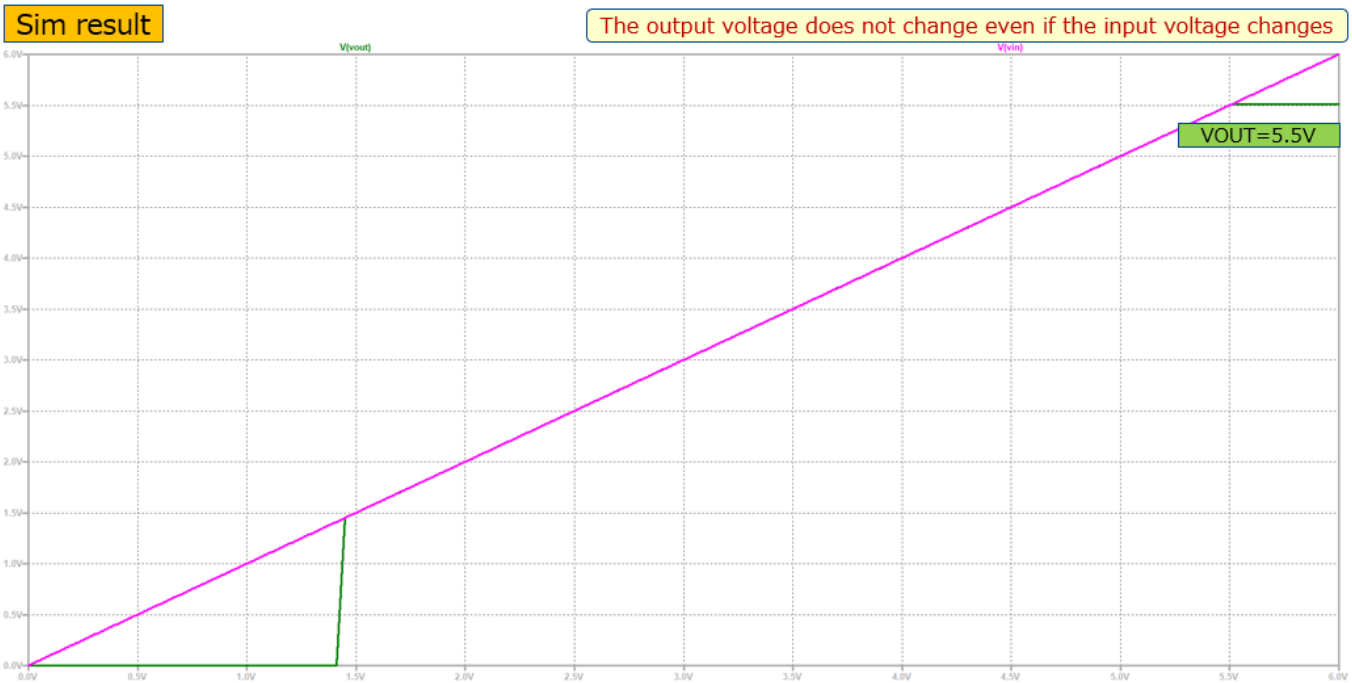
Testbench



Output Voltage vs Input Voltage (Input=0V~6V Output=5.5V IOUT=1mA)

Simulation results are following.
Explanatory notes — : simulated

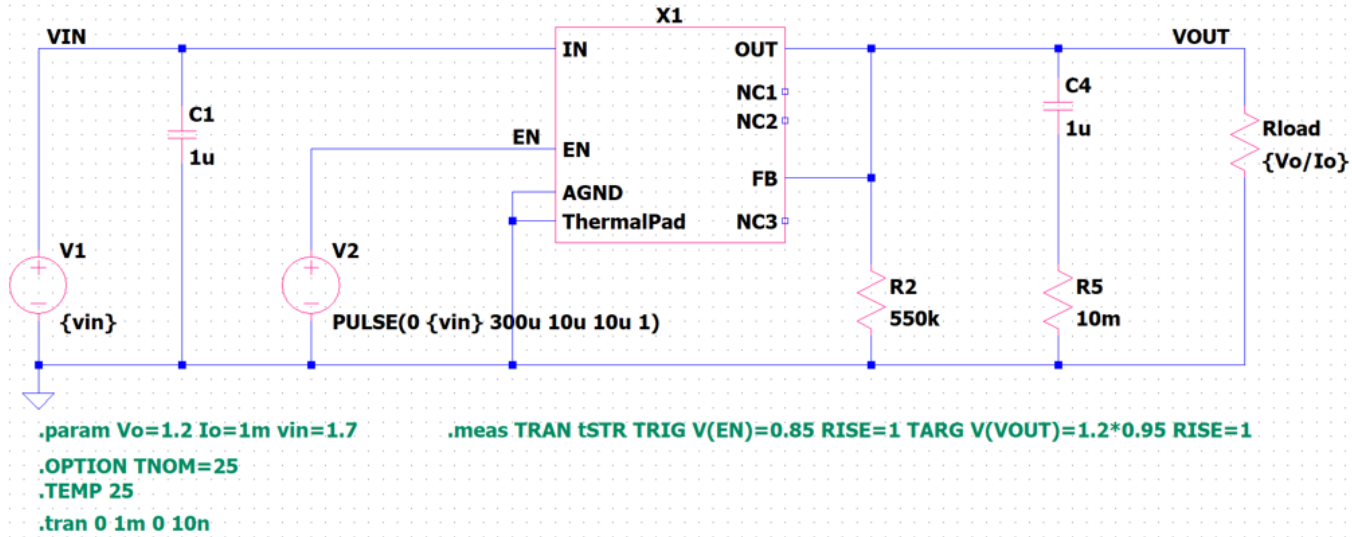
Sim result



Start-Up With EN

Simulation results are following.
Explanatory notes — : simulated

Testbench



Start-Up With EN

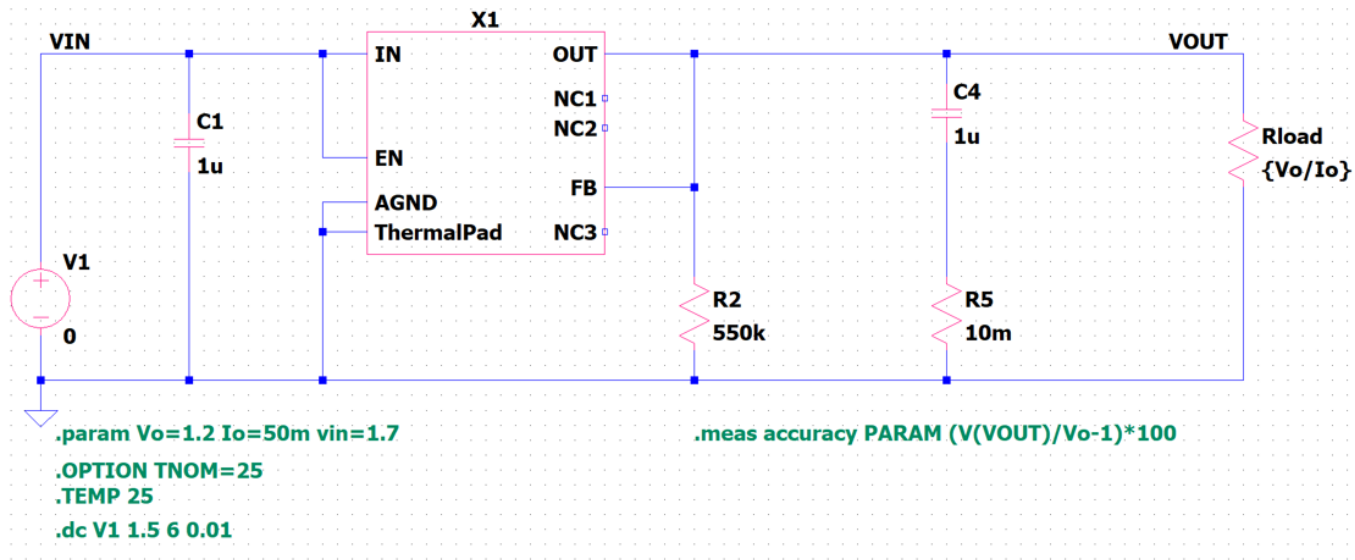
Simulation results are following.
Explanatory notes — : simulated

Sim result

Line regulation (Input=1.5V~6V Output=1.2V IOUT=50mA)

Simulation results are following.
Explanatory notes — : simulated

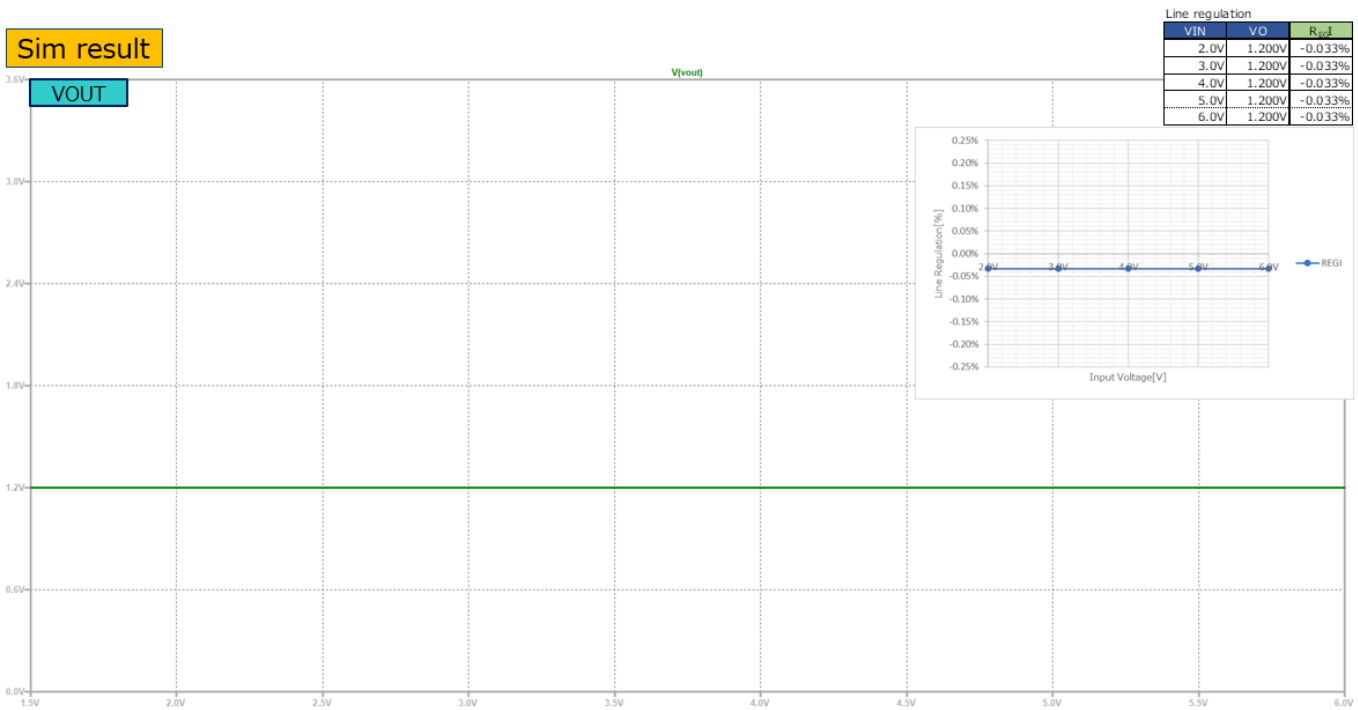
Testbench



Line regulation (Input=1.5V~6V Output=1.2V IOUT=50mA)

Simulation results are following.
Explanatory notes — : simulated

Sim result



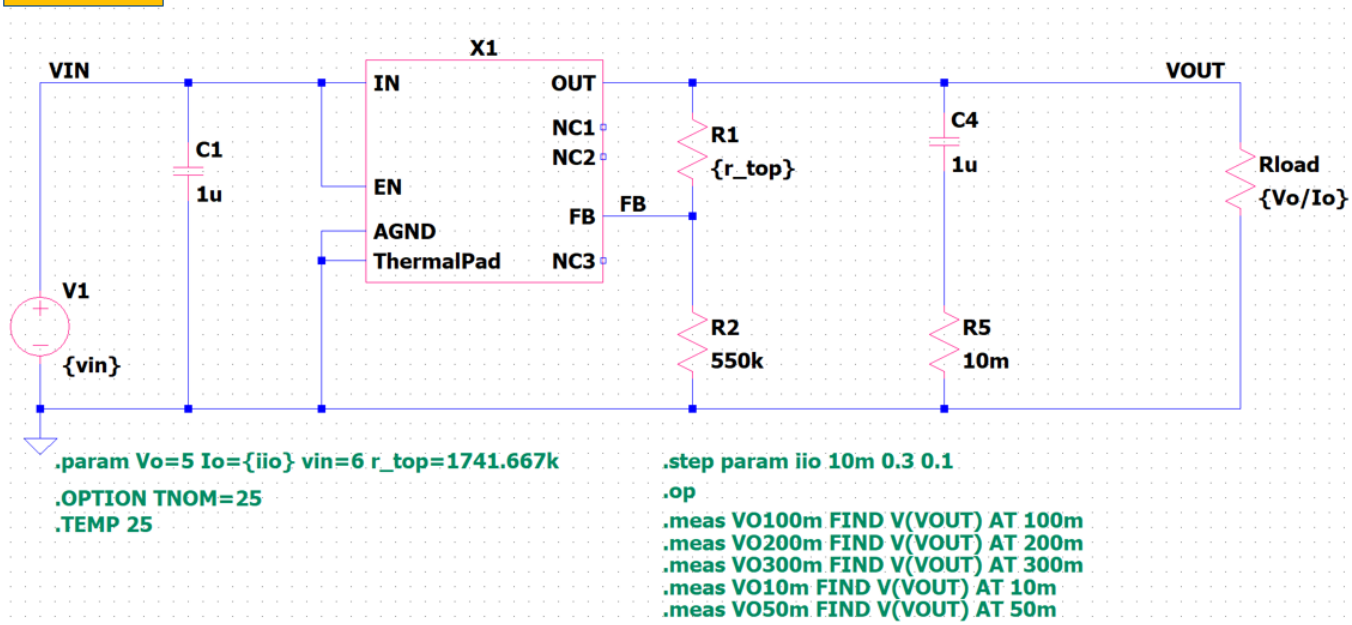
Line regulation

VIN	VO	REGI
2.0V	1.200V	-0.033%
3.0V	1.200V	-0.033%
4.0V	1.200V	-0.033%
5.0V	1.200V	-0.033%
6.0V	1.200V	-0.033%

Load regulation (Input=6V Output=5.0V IOUT=10mA~0.3A)

Simulation results are following.
Explanatory notes — : simulated

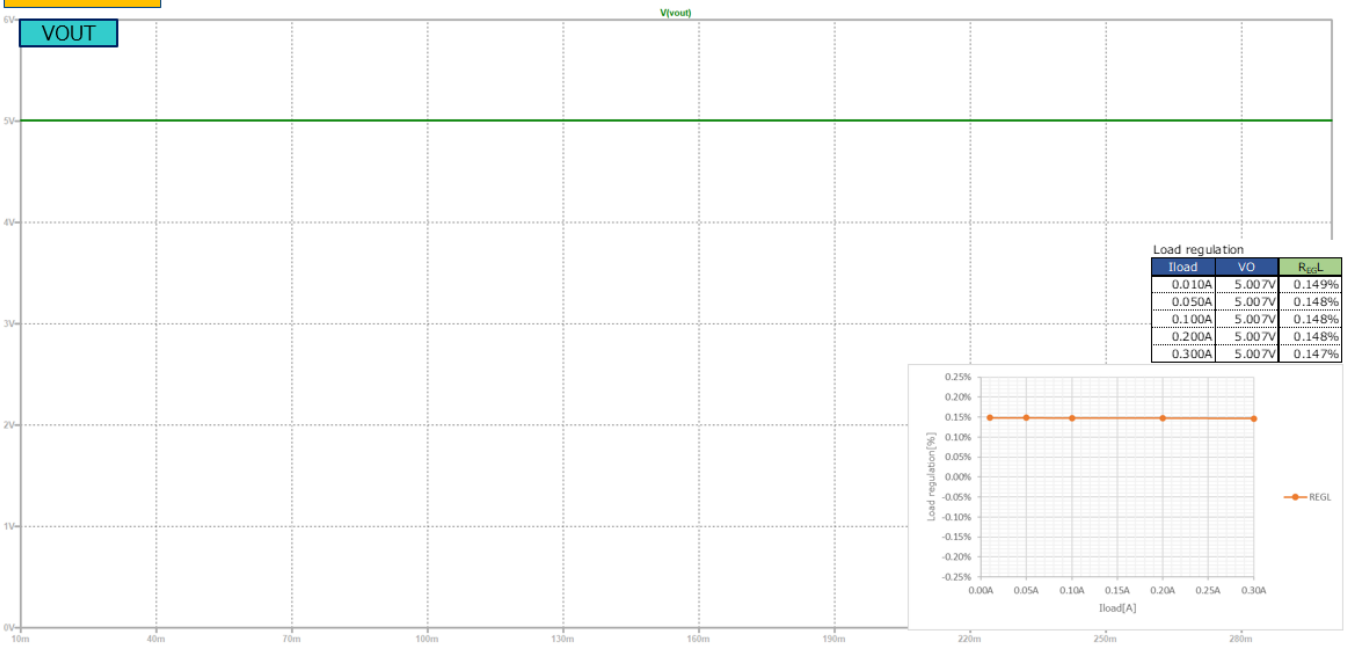
Testbench



Load regulation (Input=6V Output=5.0V IOUT=10mA~0.3A)

Simulation results are following.
Explanatory notes — : simulated

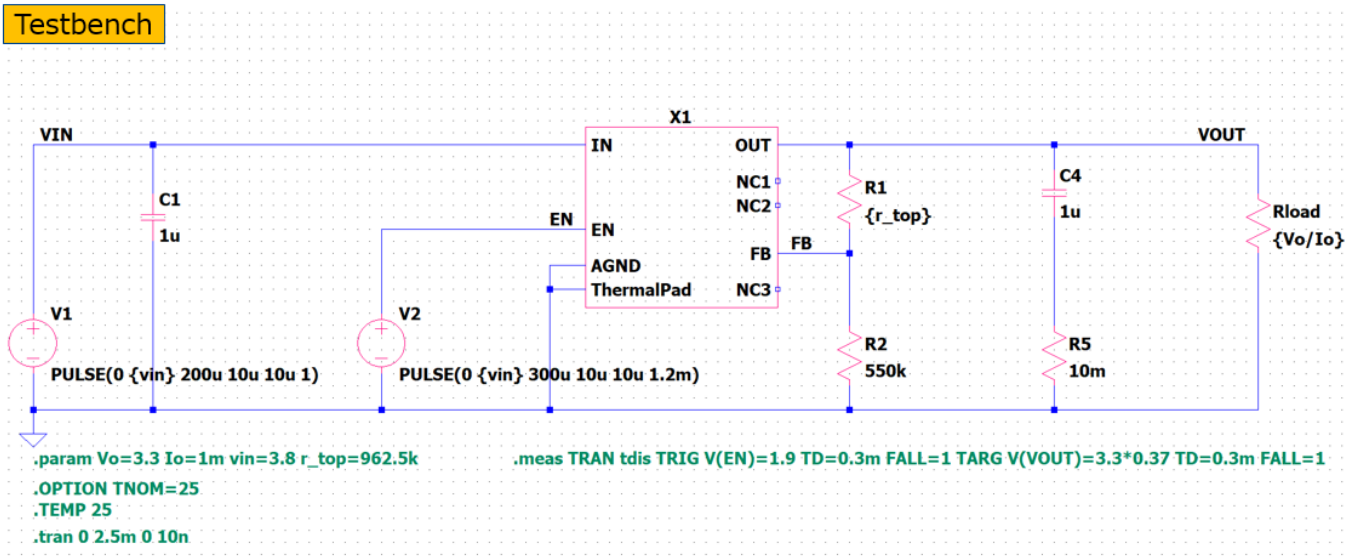
Sim result



Active output discharge

Simulation results are following.
Explanatory notes — : simulated

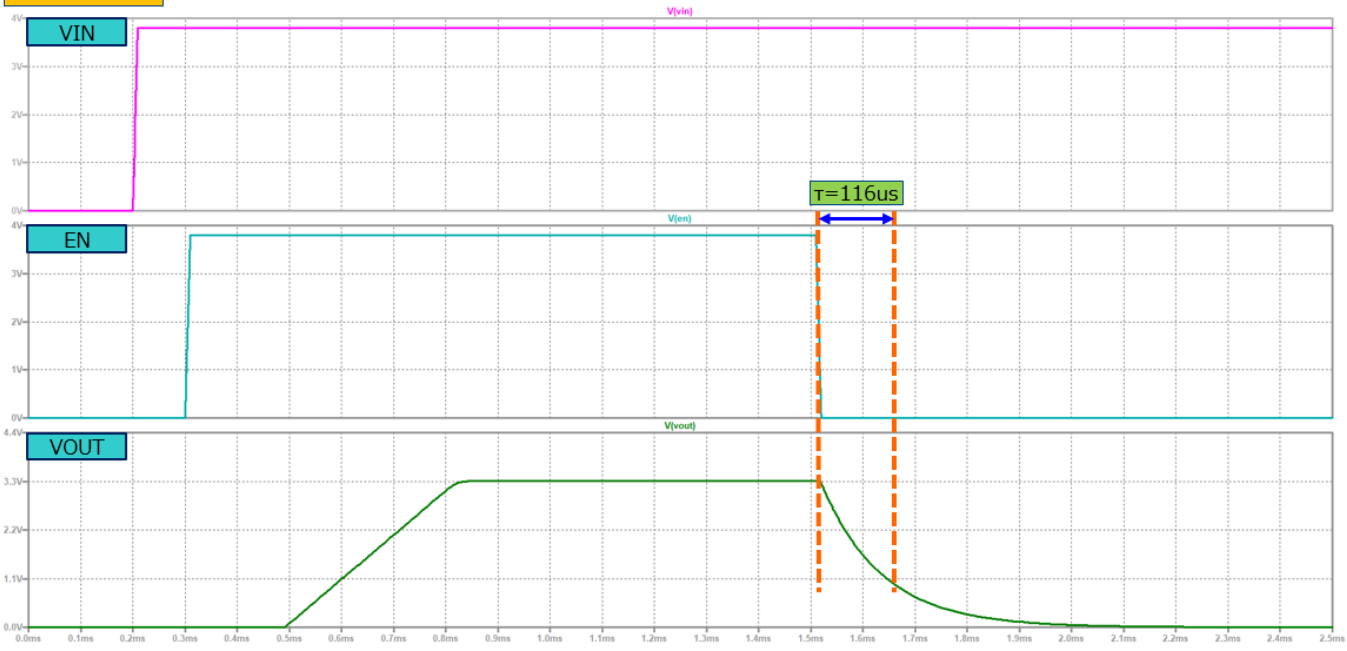
Testbench



Active output discharge

Simulation results are following.
Explanatory notes — : simulated

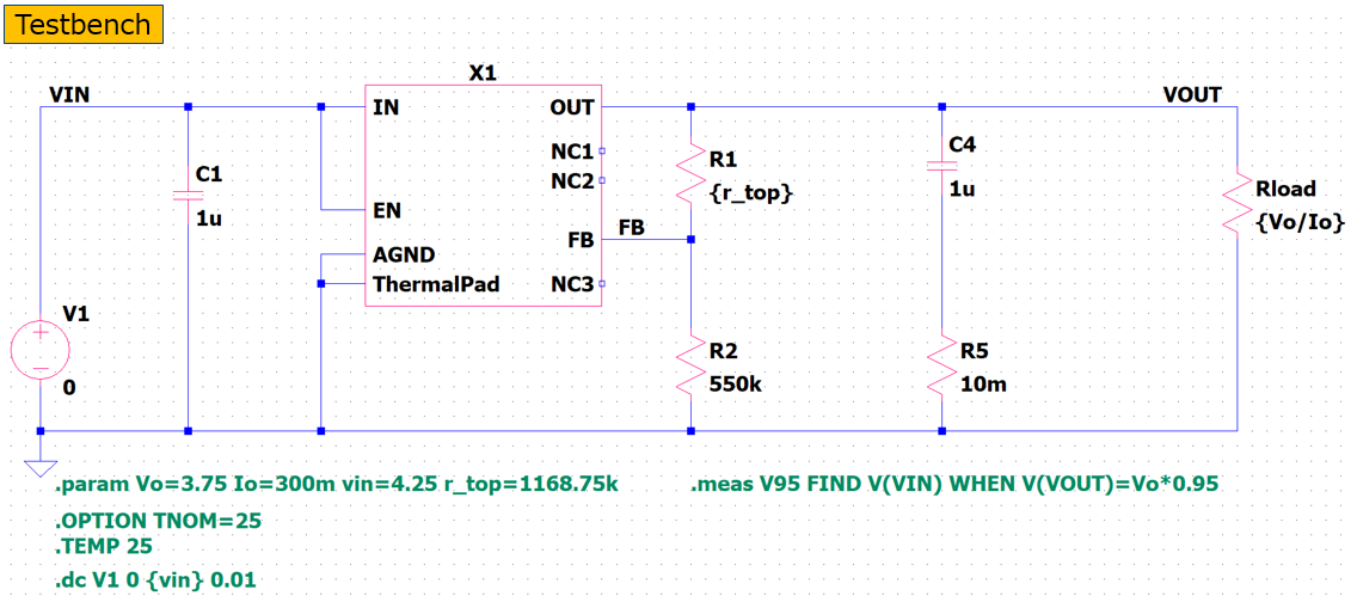
Sim result



Low-Dropout Voltage (Input=0V~4.25V IOUT=0.3A)

Simulation results are following.
Explanatory notes — : simulated

Testbench

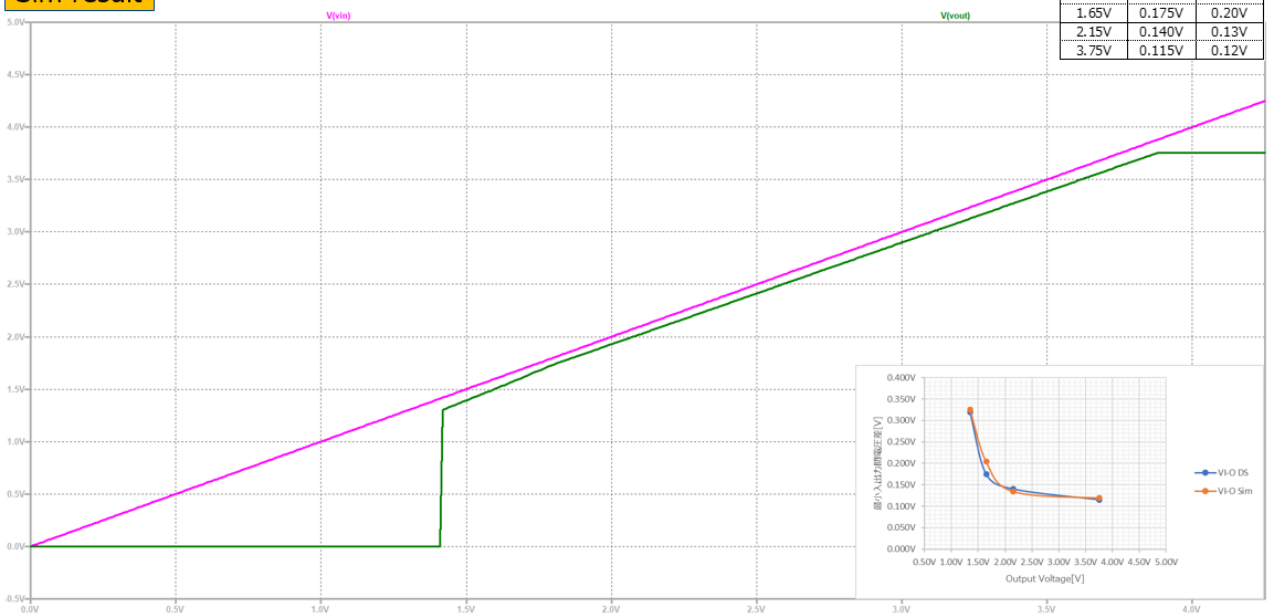


Low-Dropout Voltage (Input=0V~4.25V IOUT=0.3A)

Simulation results are following.
Explanatory notes — : simulated

Sim result

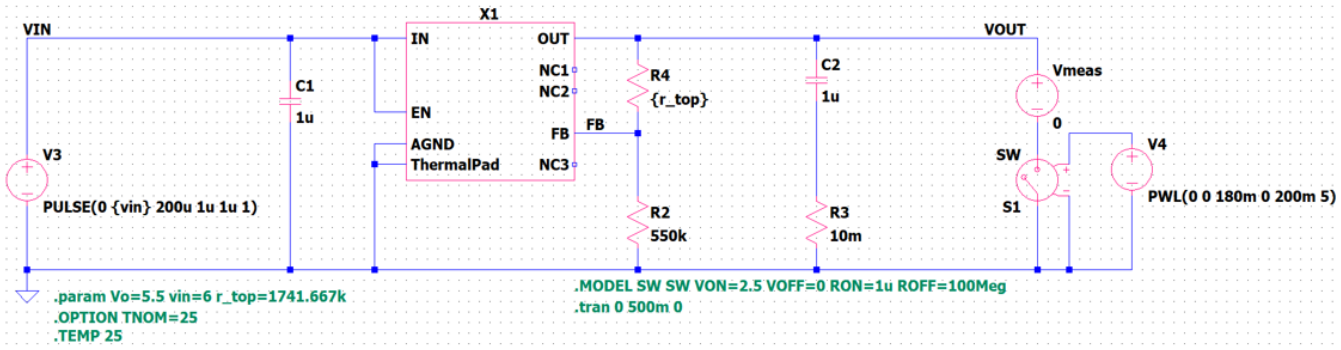
Out Vol	V_{I-O}	
	DS	Sim
1.00V	0.775V	0.50V
1.35V	0.320V	0.33V
1.65V	0.175V	0.20V
2.15V	0.140V	0.13V
3.75V	0.115V	0.12V



Current limit

Simulation results are following.
Explanatory notes — : simulated

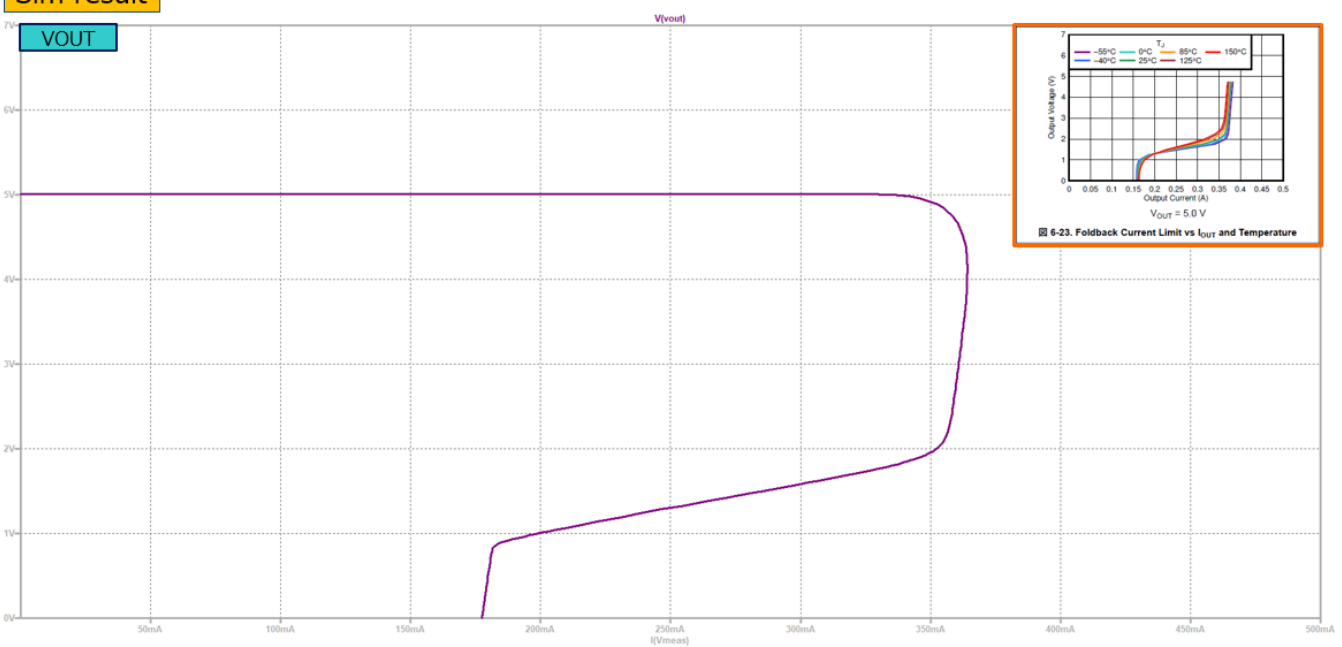
Testbench



Current limit

Simulation results are following.
Explanatory notes — : simulated

Sim result



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