LTspice Model
Very High Precision, Programmable Linear Hall-Effect Sensor IC
ALLEGRO
ACS70311

Model Information

Model	A macro model
Call Name	MDC_ACS70311_LT
Pin Assign	1:VCC 2:VOUT 3:PROG_EN 4:AGND 5:Gauss
File List	Model Library MDC_ACS70311_LT01.lib
	Model Report MDC_ACS70311_LT.pdf(this file)

Verified Simulator Version LTspice version (x64):24.0.9

References

The information which was used for modeling is as follow:

[Data Sheet]

- ●Date/Version May 17, 2023/Rev. 14
- ●Product name ACS70311
- ●Company name ALLEGRO

[Characteristics listed]

- ●Characteristics
  - Current to Gauss
  - Undervoltage Detection
  - Overvoltage Detection
  - Propagation Delay Time
  - Rise Time
  - Response Time
  - Output Voltage Clamp
  - Output Voltage with Broken GND
  - Supply Zener Clamp Voltage

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

Note

① You need to create the library file shown in Figure 1.
Also, each parameter must be defined in PARAM.

```
.subckt MDC_ACS70311_LT VCC VOUT PROG_EN AGND IP IN

X_ACS70311_U1 VCC VOUT PROG_EN AGND Gauss ACS70311

vmeas ip in 0
b1 current 0 v=i(vmeas)

e_c2g gauss 0 current 0 table=
+ (
+ (-5,-5000),
+ (0,0),
+ (5,5000)
+ )

.ENDS MDC_ACS70311_LT

.PARAMS
+ SENS_COARSE=0
+ Sensitivity=1.0m
```

② ①

Figure 1.

② Converts current into magnetism.
The format of the expression is shown below.

```
Ex)
e_c2g gauss 0 current 0 table=
+(
+ (Current 1 (A), Magnetic flux density 1 (G) )
+ (Current 2 (A), Magnetic flux density 2 (G) )
+ (Current 3 (A), Magnetic flux density 3 (G) )
+ (Current 4 (A), Magnetic flux density 4 (G) )
+          … )
```

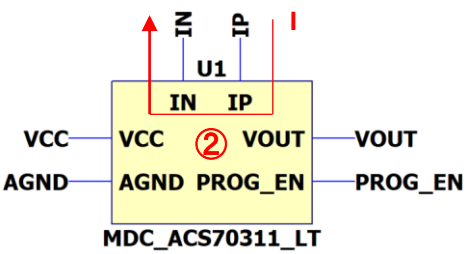


Figure 2.

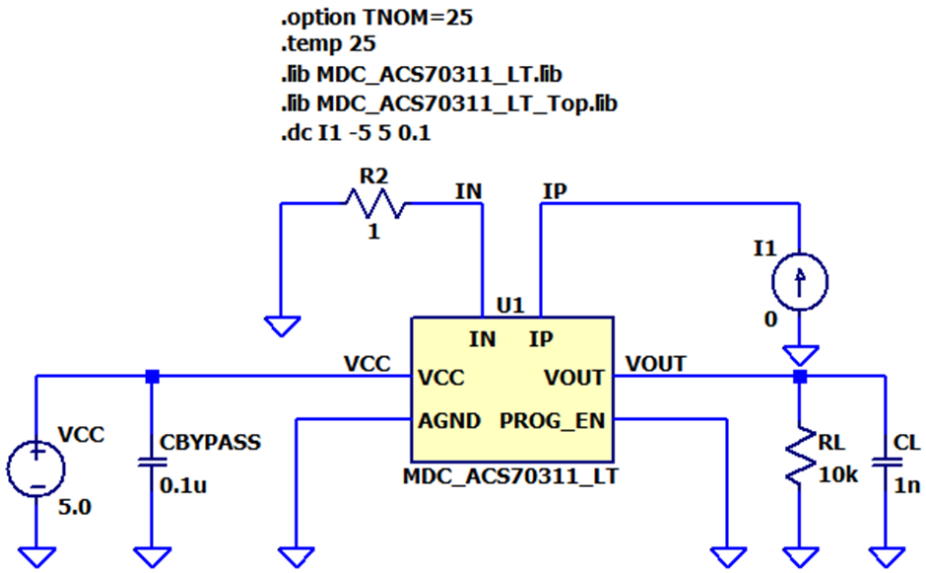
Each values are described as a pair of current and magnetic flux density.
Except for the specified value, linear interpolation is performed.
For out of range, the minimum or maximum value of the specified value is output.

Model Functions Table

Functions	Implemented
Current to Gauss	○
Undervoltage Detection	○
Overvoltage Detection	○
Propagation Delay Time	○
Rise Time	○
Response Time	○
Output Voltage Clamp	○
Output Voltage with Broken GND	○
Supply Zener Clamp Voltage	○

Current to Gauss Testbench (SENS_COARSE=0, Sensitivity=1.0mV/G)

Referred to Data Sheet

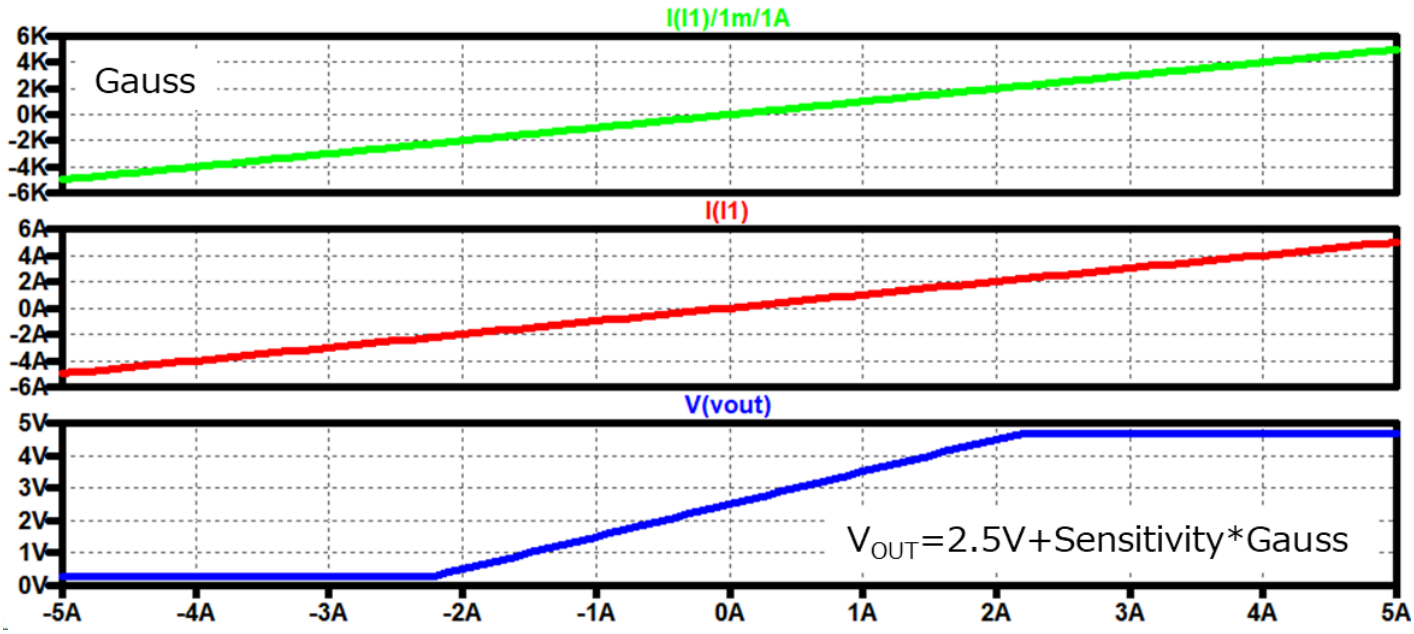


Simulation results are following.
Explanatory notes　— : simulated

Current to Gauss

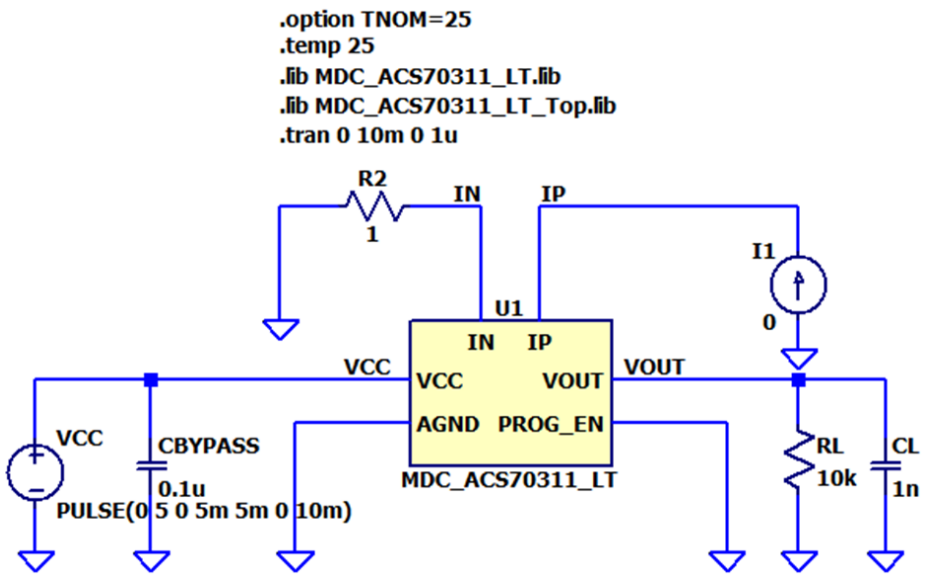
●TABLE
e_c2g gauss 0 current 0 table=
+ (
+ (-5,-5000),
+ (0,0),
+ (5,5000)
+)

.PARAM
+ SENS_COARSE=0
+ Sensitivity=1.0m



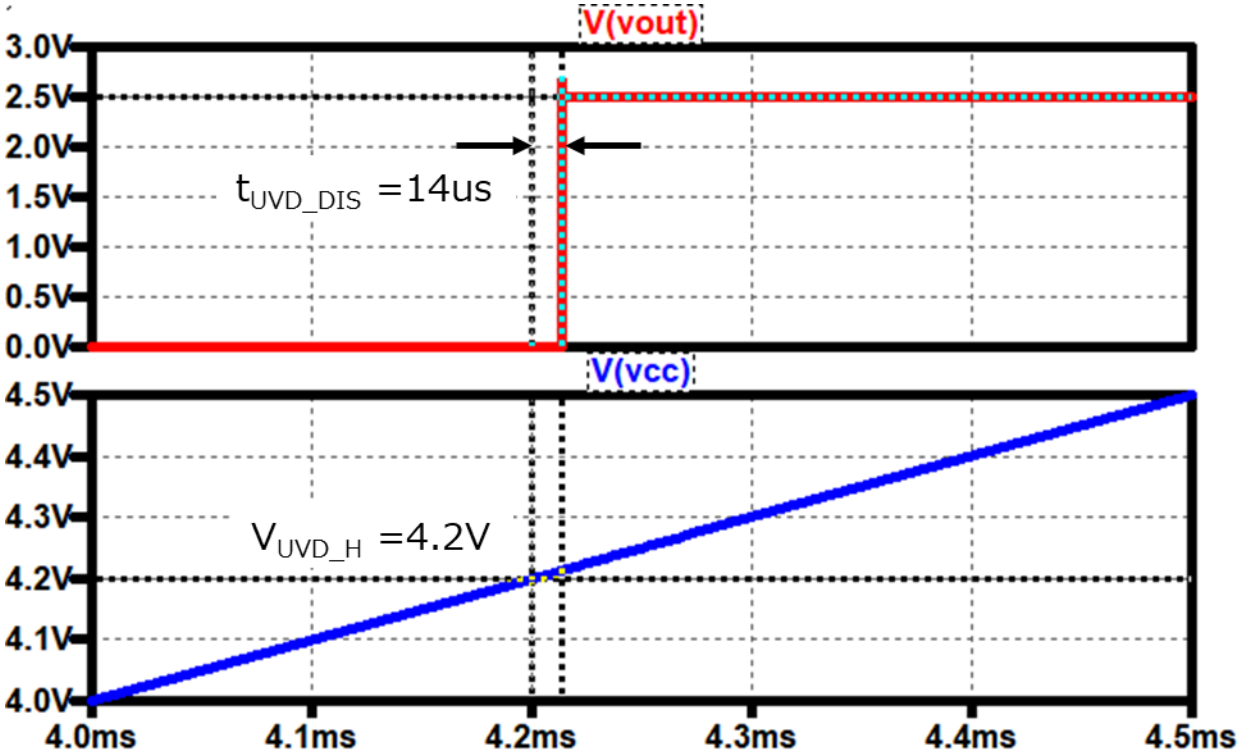
Undervoltage Detection Testbench

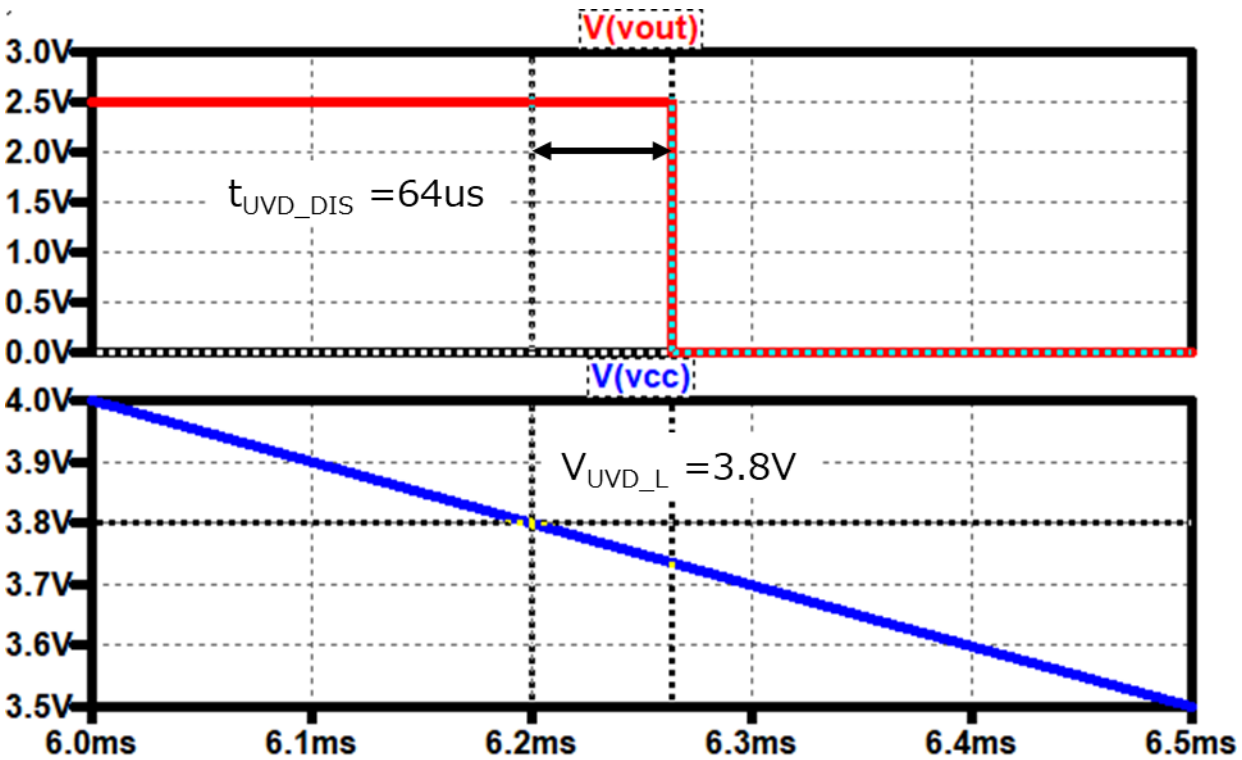
Referred to Data Sheet



Simulation results are following.
Explanatory notes — : simulated

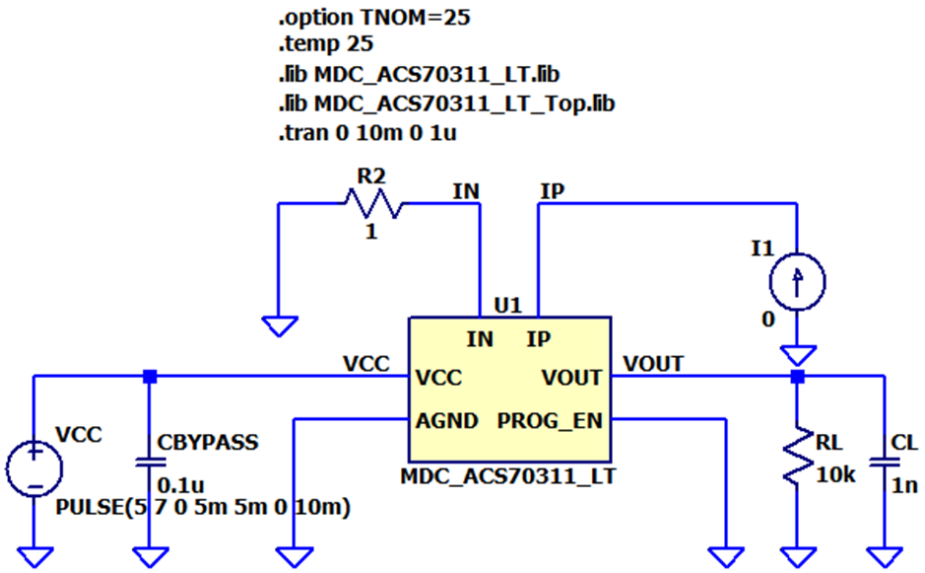
Undervoltage Detection





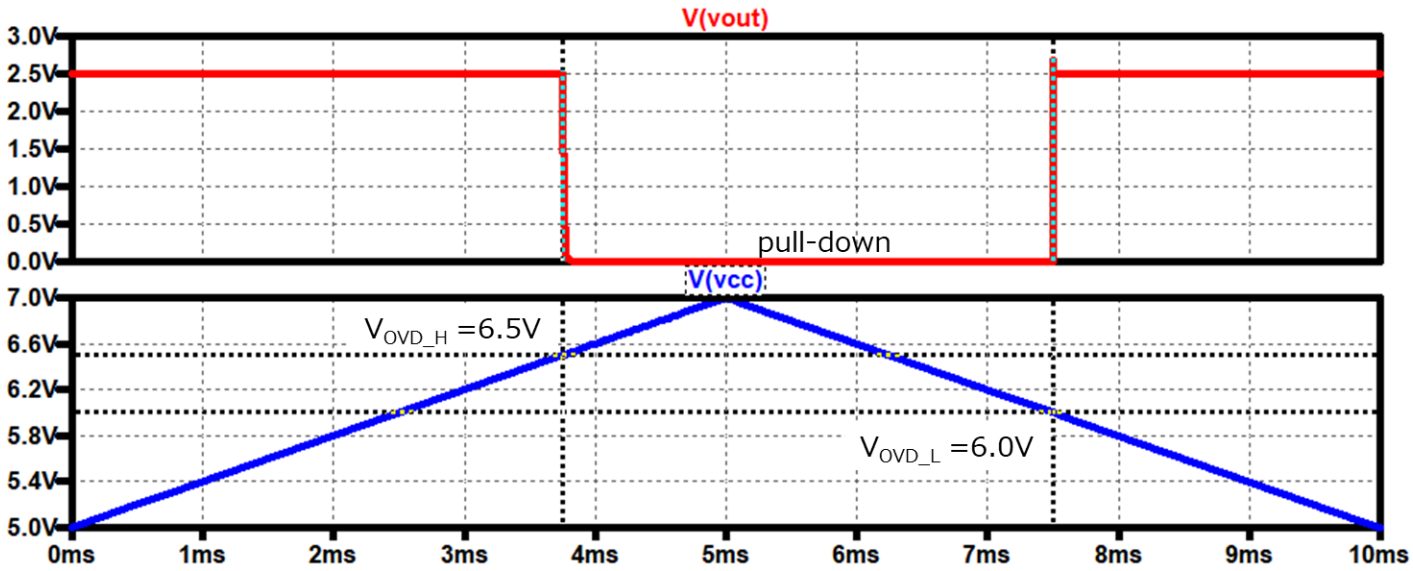
Overvoltage Detection Testbench (pulled to GND)

Referred to Data Sheet



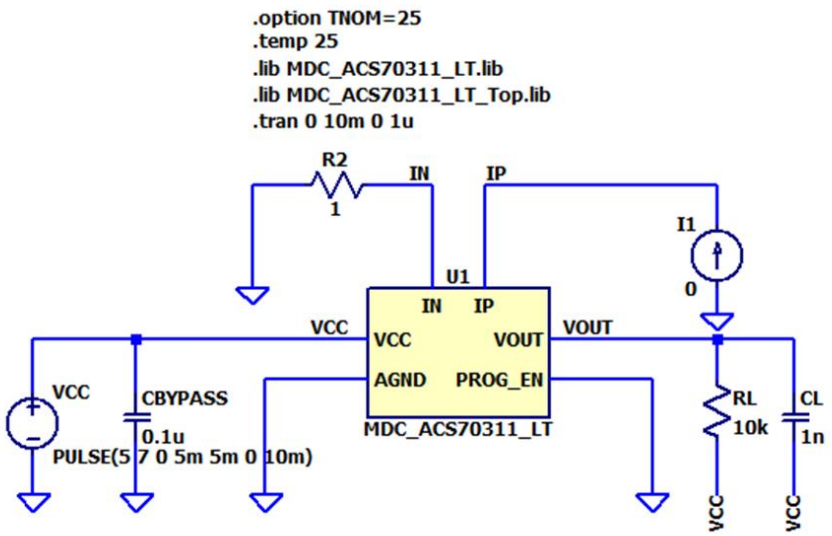
Simulation results are following.
Explanatory notes — : simulated

Overvoltage Detection (pulled to GND)



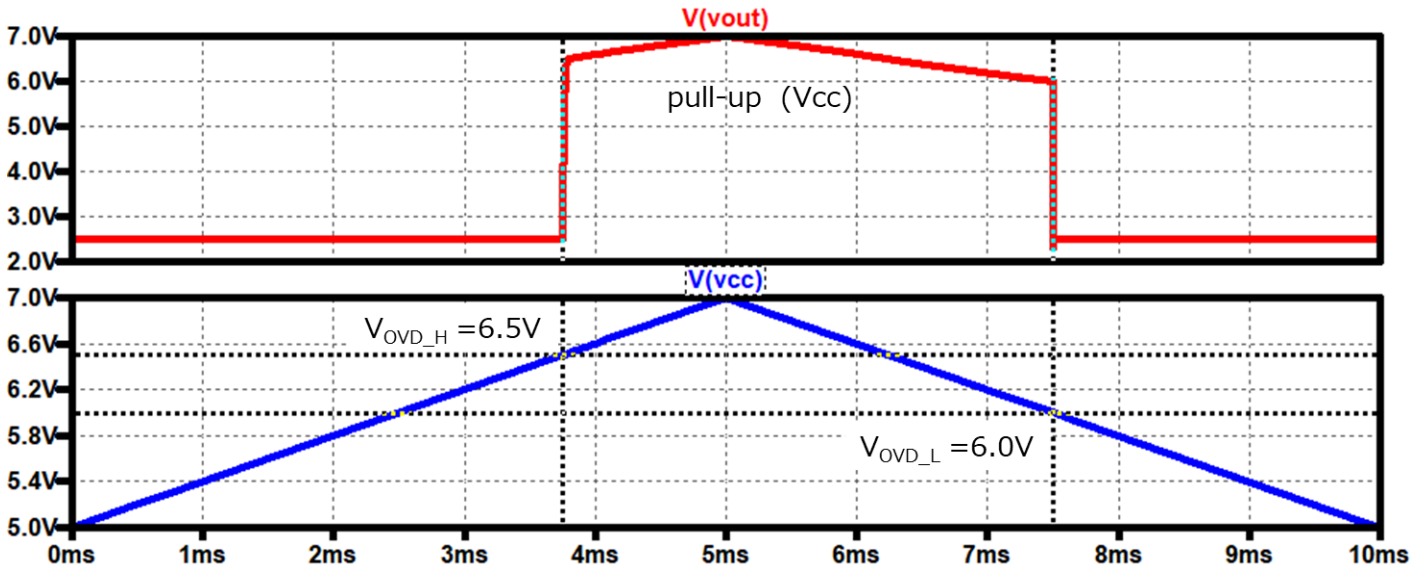
Overvoltage Detection Testbench (pulled to VCC)

Referred to Data Sheet



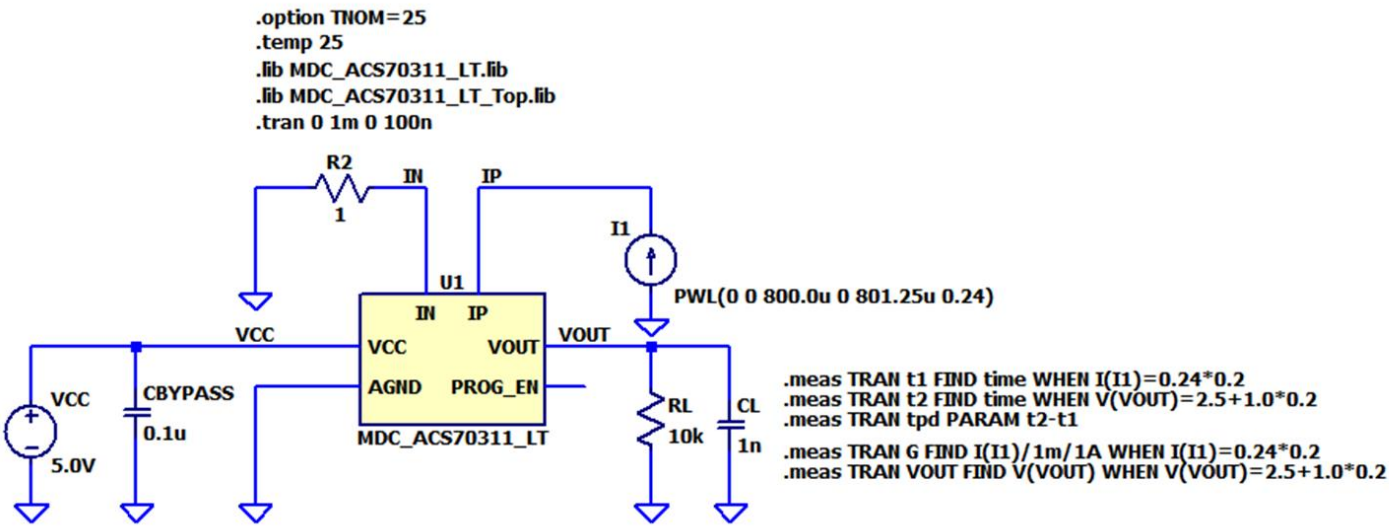
Simulation results are following.
Explanatory notes — : simulated

Overvoltage Detection (pulled to VCC)



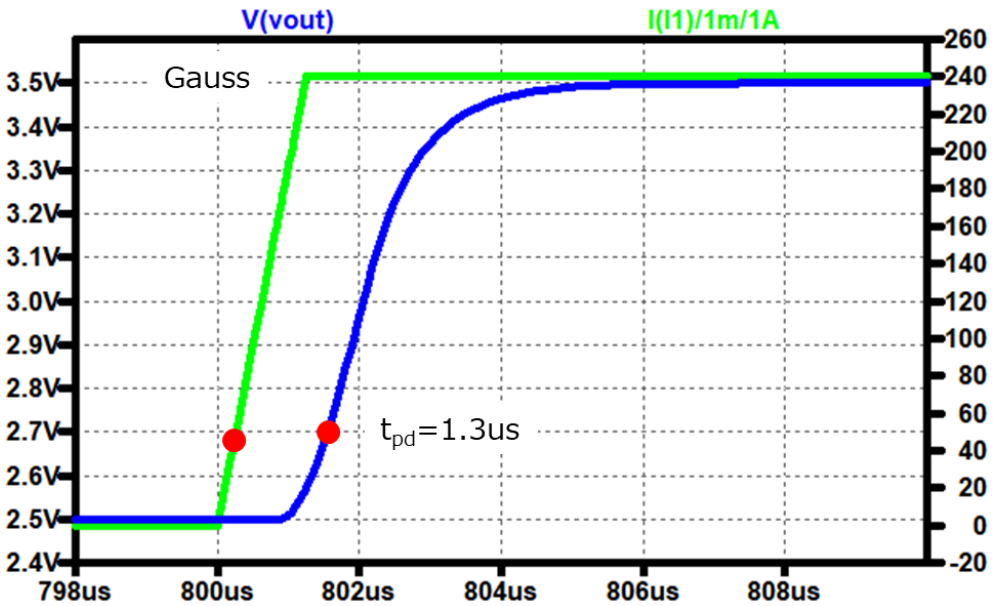
Propagation Delay Time Testbench
(SENS_COARSE=2, Sensitivity=4.17mV/G, Magnetic field step=0 to 240G)

Referred to Data Sheet



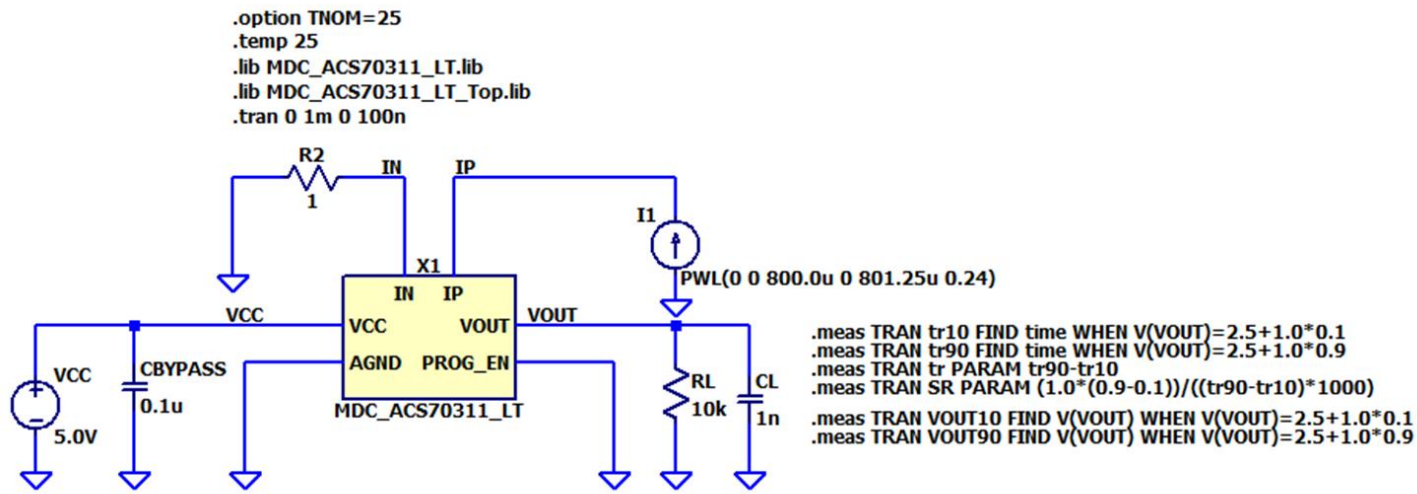
Simulation results are following.
Explanatory notes — : simulated

Propagation Delay Time



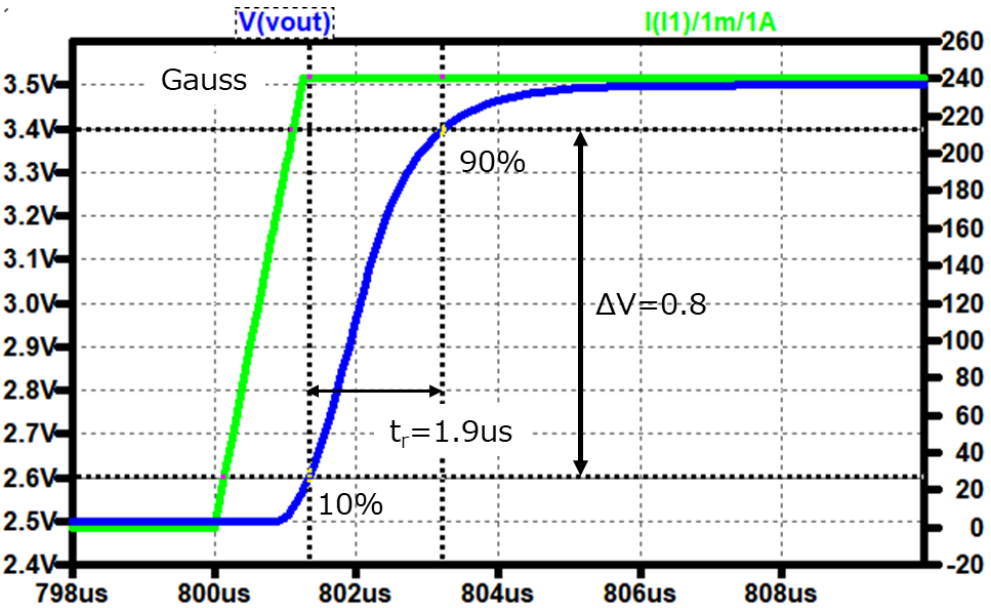
Rise Time Testbench
(SENS_COARSE=2, Sensitivity=4.17mV/G, Magnetic field step=0 to 240G)

Referred to Data Sheet



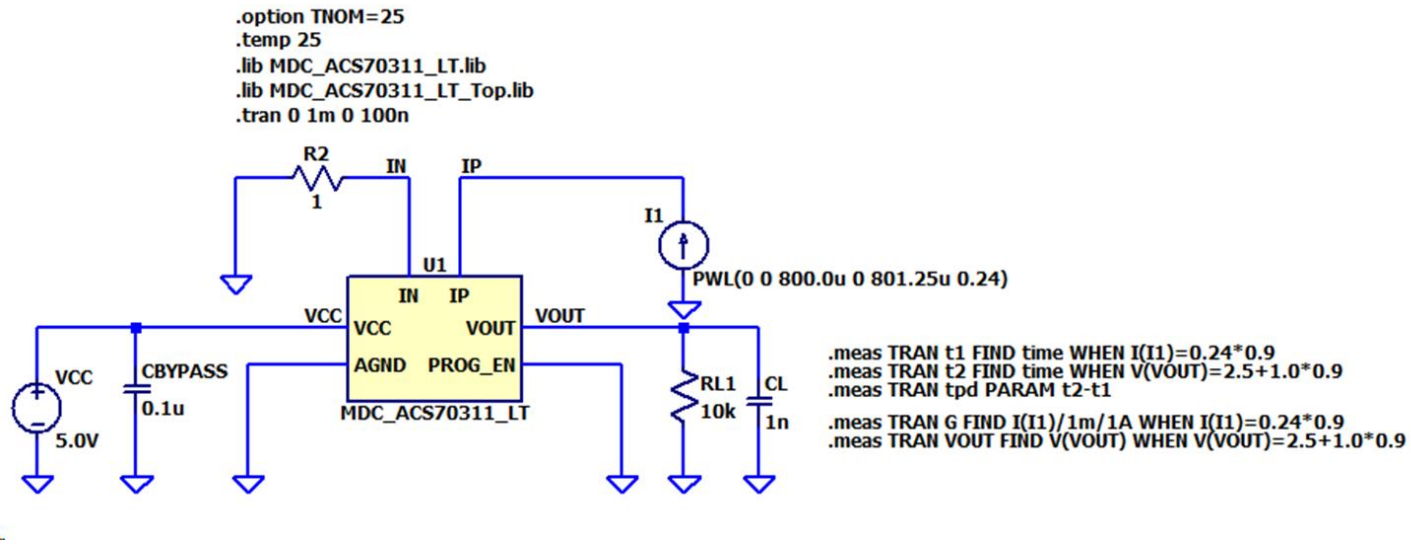
Simulation results are following.
Explanatory notes — : simulated

Rise Time



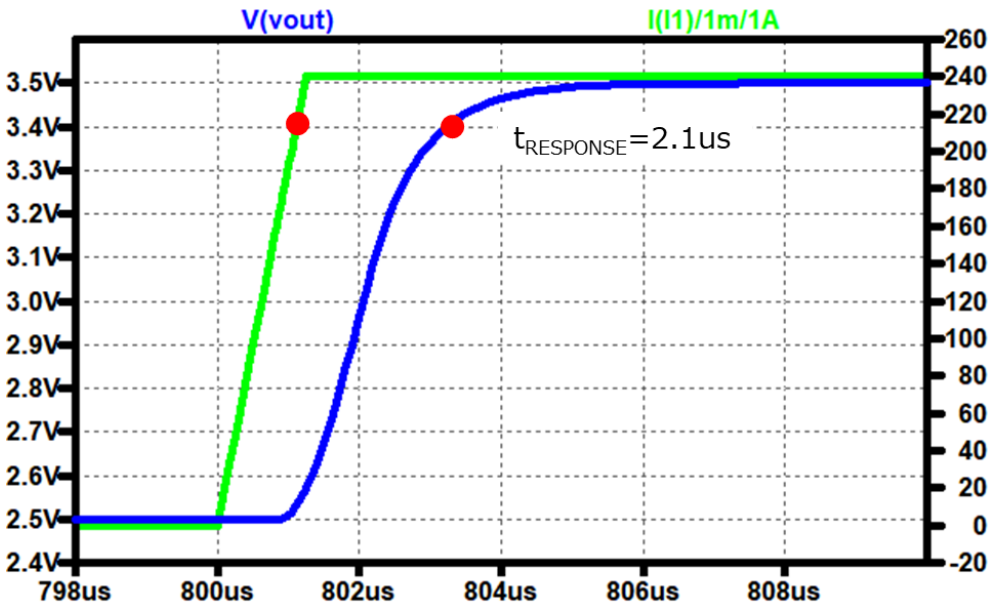
Response Time Testbench
(SENS_COARSE=2, Sensitivity=4.17mV/G, Magnetic field step=0 to 240G)

Referred to Data Sheet



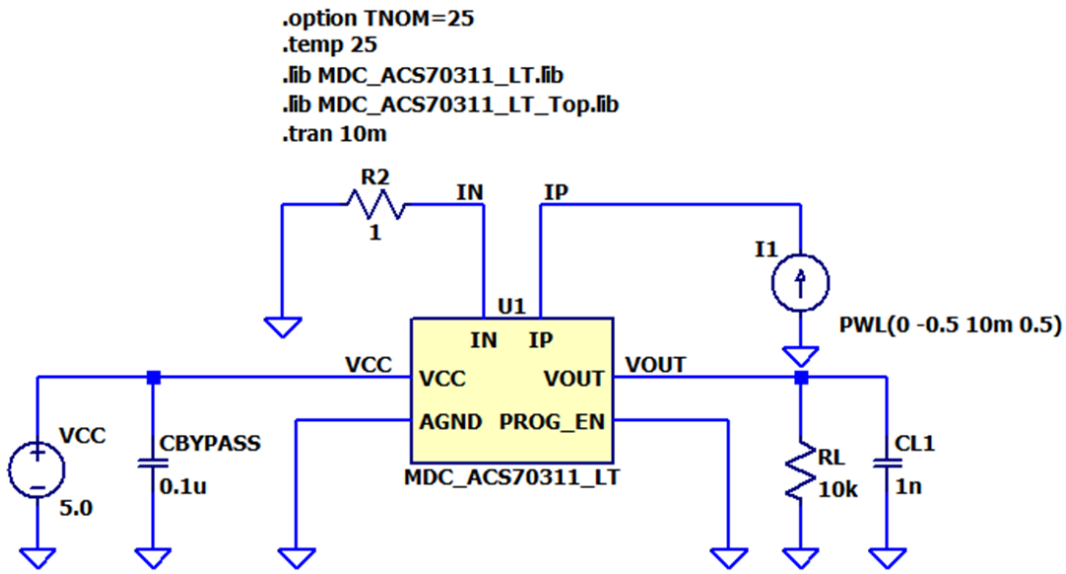
Simulation results are following.
Explanatory notes — : simulated

Response Time



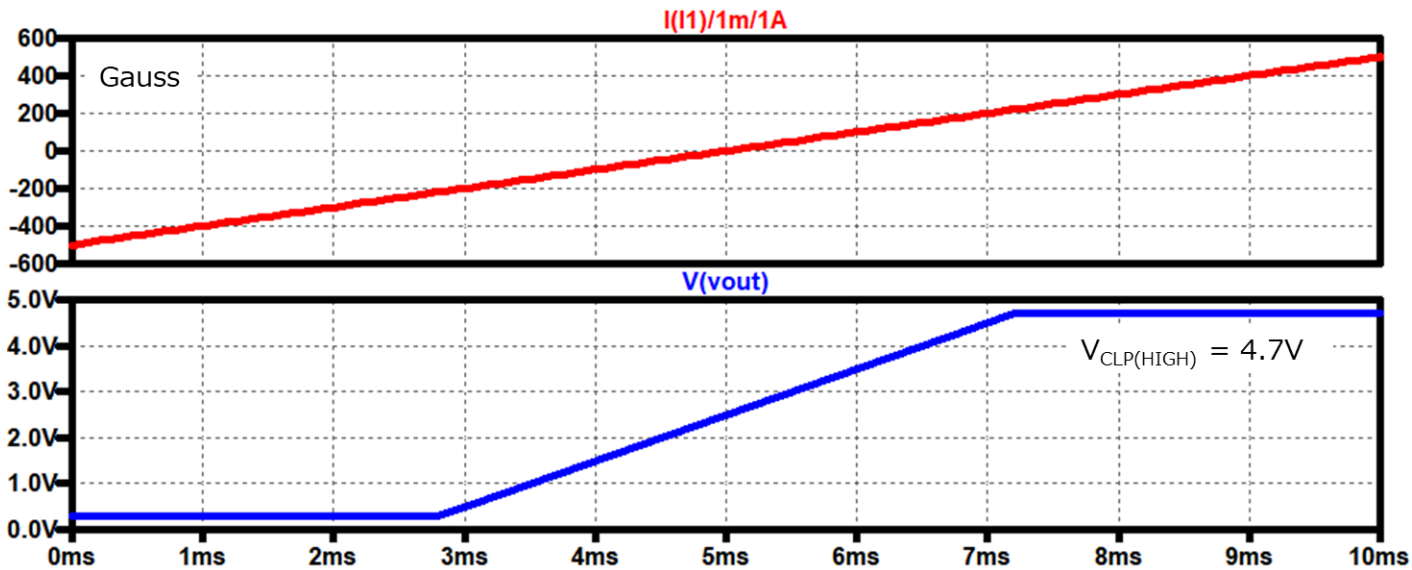
Output Voltage Clamp Test bench
(pulled to GND, SENS_COARSE=3, Sensitivity=10mV/G)

Referred to Data Sheet



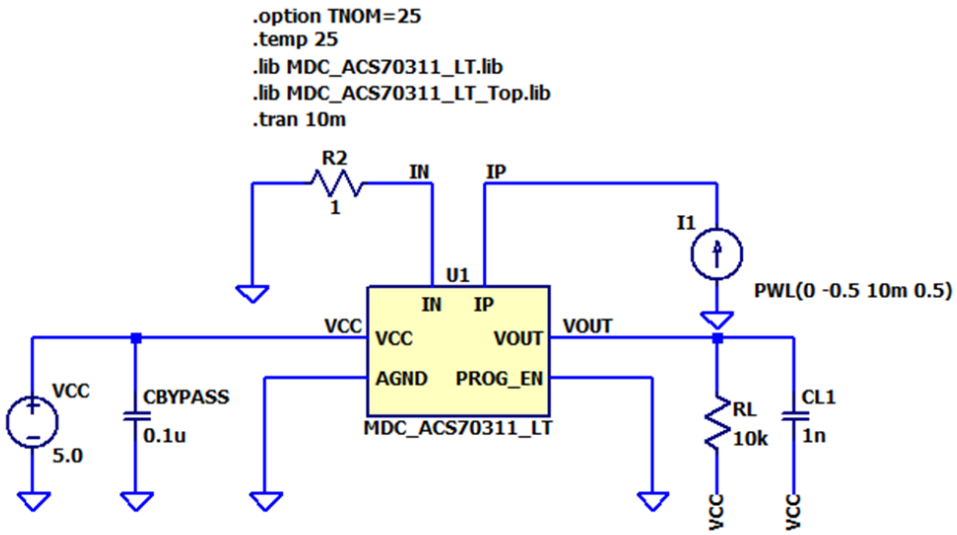
Simulation results are following.
Explanatory notes — : simulated

Output Voltage Clamp (pulled to GND)



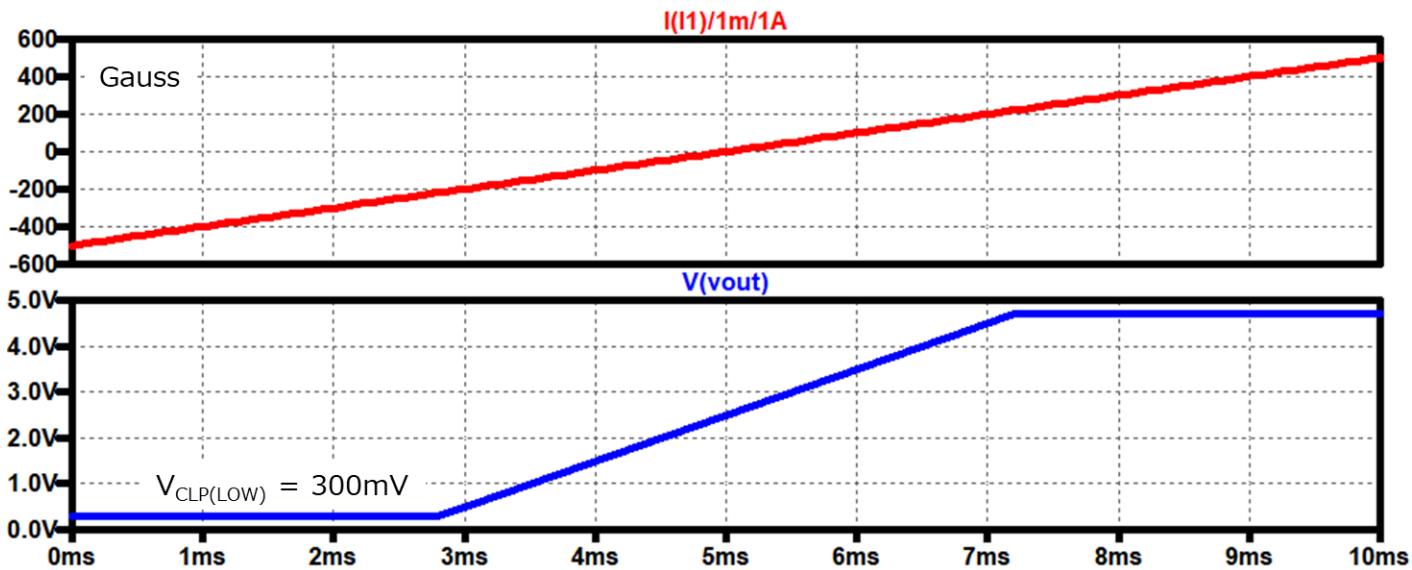
Output Voltage Clamp Test bench
(pulled to VCC, SENS_COARSE=3, Sensitivity=10mV/G)

Referred to Data Sheet



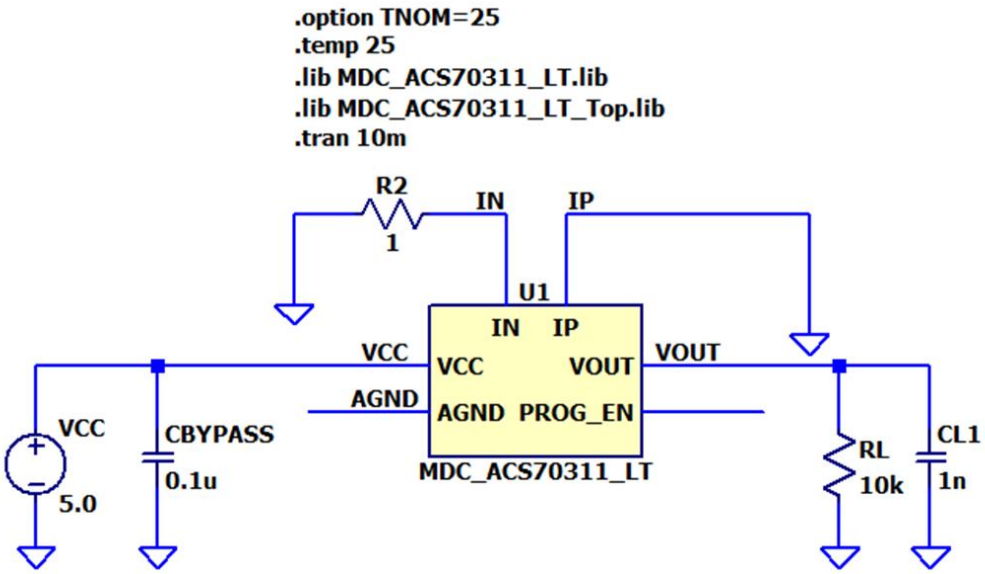
Simulation results are following.
Explanatory notes — : simulated

Output Voltage Clamp (pulled to VCC)



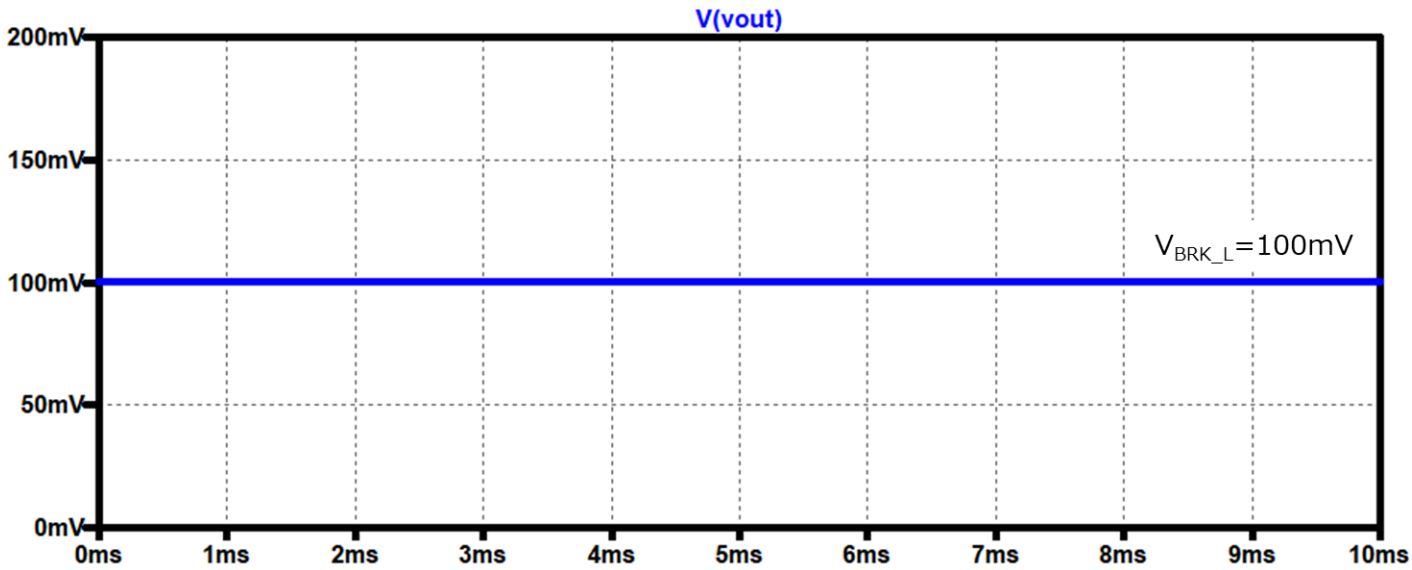
Output Voltage with Broken GND Testbench
(pulled to GND, SENS_COARSE=0, Sensitivity=1.0mV/G)

Referred to Data Sheet



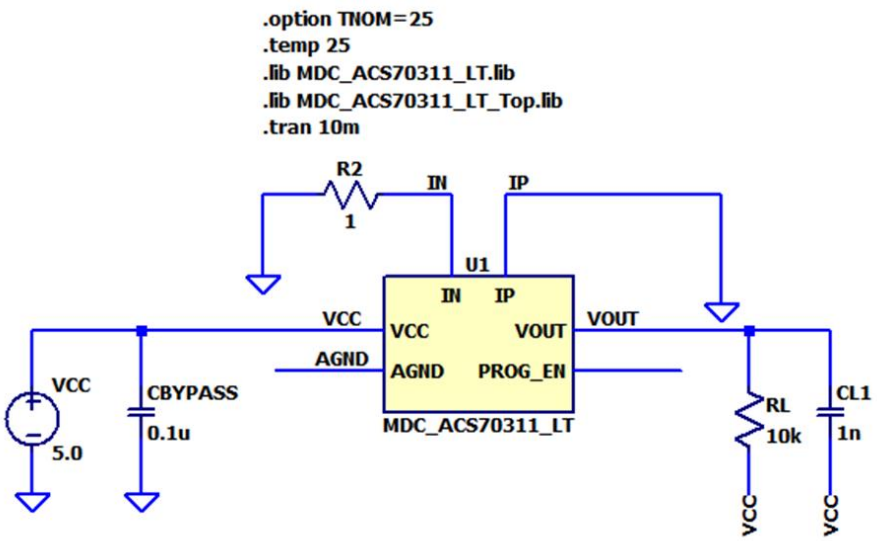
Simulation results are following.
Explanatory notes — : simulated

Output Voltage with Broken GND (pulled to GND)



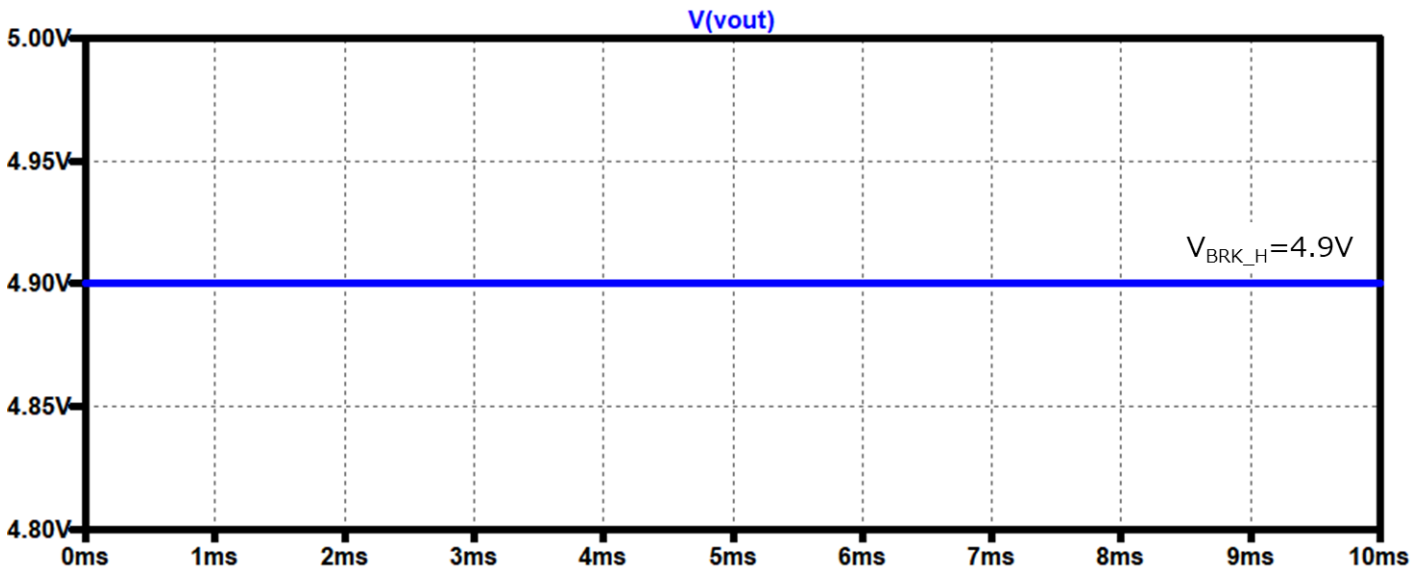
Output Voltage with Broken GND Testbench
(pulled to VCC, SENS_COARSE=0, Sensitivity=1.0mV/G)

Referred to Data Sheet



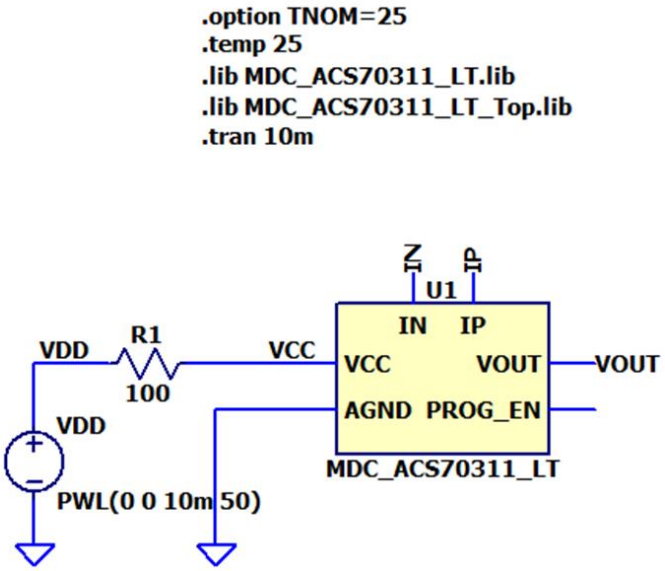
Simulation results are following.
Explanatory notes — : simulated

Output Voltage with Broken GND (pulled to VCC)



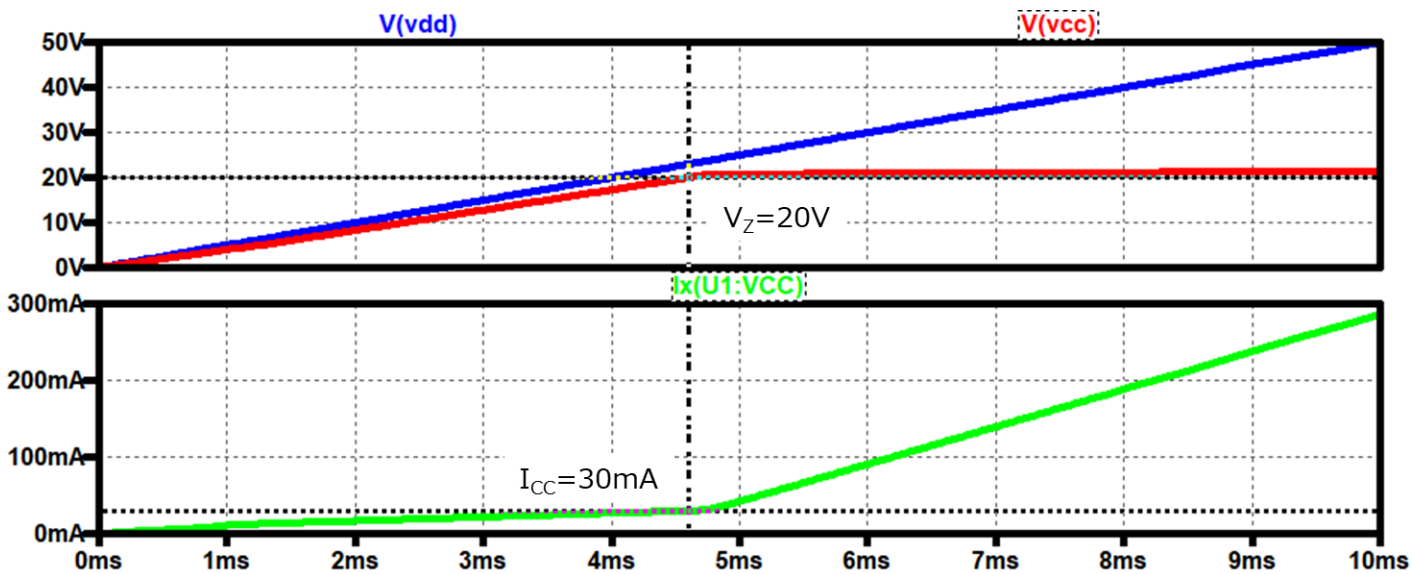
Supply Zener Clamp Voltage Testbench

Referred to Data Sheet



Simulation results are following.
Explanatory notes — : simulated

Supply Zener Clamp Voltage



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