LTspice Model
Low-Noise, High-Precision, Programmable Linear Hall-Effect Sensor IC
ALLEGRO
A1367LKTTN

Model Information

Model	A macro model
Call Name	MDC_A1367LKTTN_LT
Pin Assign	1:VCC 2:VOUT 3:NC 4:AGND 5:Gauss
File List	Model Library MDC_A1367LKTTN_LT01.lib
	Model Report MDC_A1367LKTTN_LT.pdf(this file)

Verified Simulator Version   LTspice version XVII

References

The information which was used for modeling is as follow:

[Data Sheet]
- ●Date/Version   March 31, 2021
- ●Product name   A1367LKTTN
- ●Company name   ALLEGRO

[Characteristics listed]
- ●Characteristics   Current to Gauss
  Power on Time
  Power on Reset
  Propagation Delay Time
  Rise Time
  Response Time
  Delay to Clamp
  Broken Wire 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

Sep 28,2021
Rev 1.0

Note

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

```
.subckt MDC_A1367LKTTN_LT VCC VOUT NC AGND IP IN

X_A1367LKTTN_U1      VCC VOUT NC AGND Gauss A1367LKTTN
vmeas ip in 0
b1 current 0 v=i(vmeas)

e_c2g gauss 0 current 0 table=
+ (
+ (-4,-2000),
+ (-800m,-400),
+ (-2m,-1),
+ (0,0),
+ (2m,1),
+ (800m,400),
+ (4,2000)
+ )

.ENDS MDC_A1367LKTTN_LT

.PARAM
+ SENS_COARSE=01
+ Sensitivity=2.0m
+ VOUTQBI=2.5
```
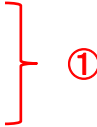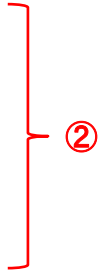
②

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) )
+      … )
```
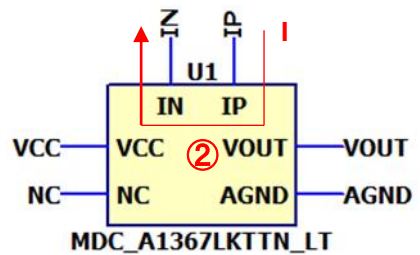

Figure 2.

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	O
Power on Time	O
Power on Reset	O
Propagation Delay Time	O
Rise Time	O
Response Time	O
Delay to Clamp	O
Output Voltage Clamp	O
Broken Wire Voltage	O

Current to Gauss Testbench

Referred to Data Sheet

```
.option TNOM=25
.temp 25
.lib MDC_A1367LKTTN_LT.lib
.lib MDC_A1367LKTTN_LT_LT_Top.lib
.dc I1 -4 4 0.1
```
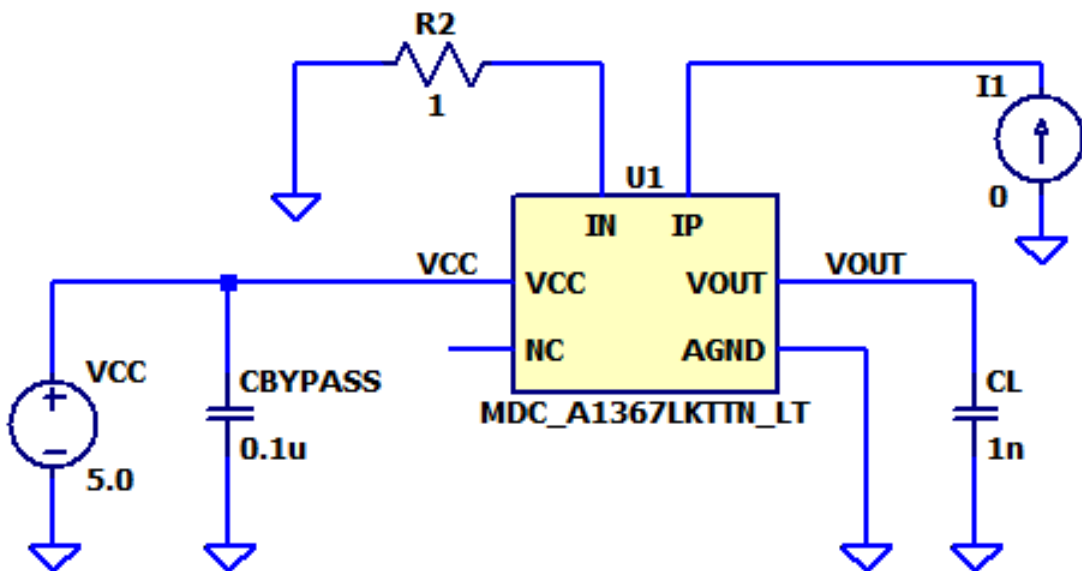
Simulation results are following.
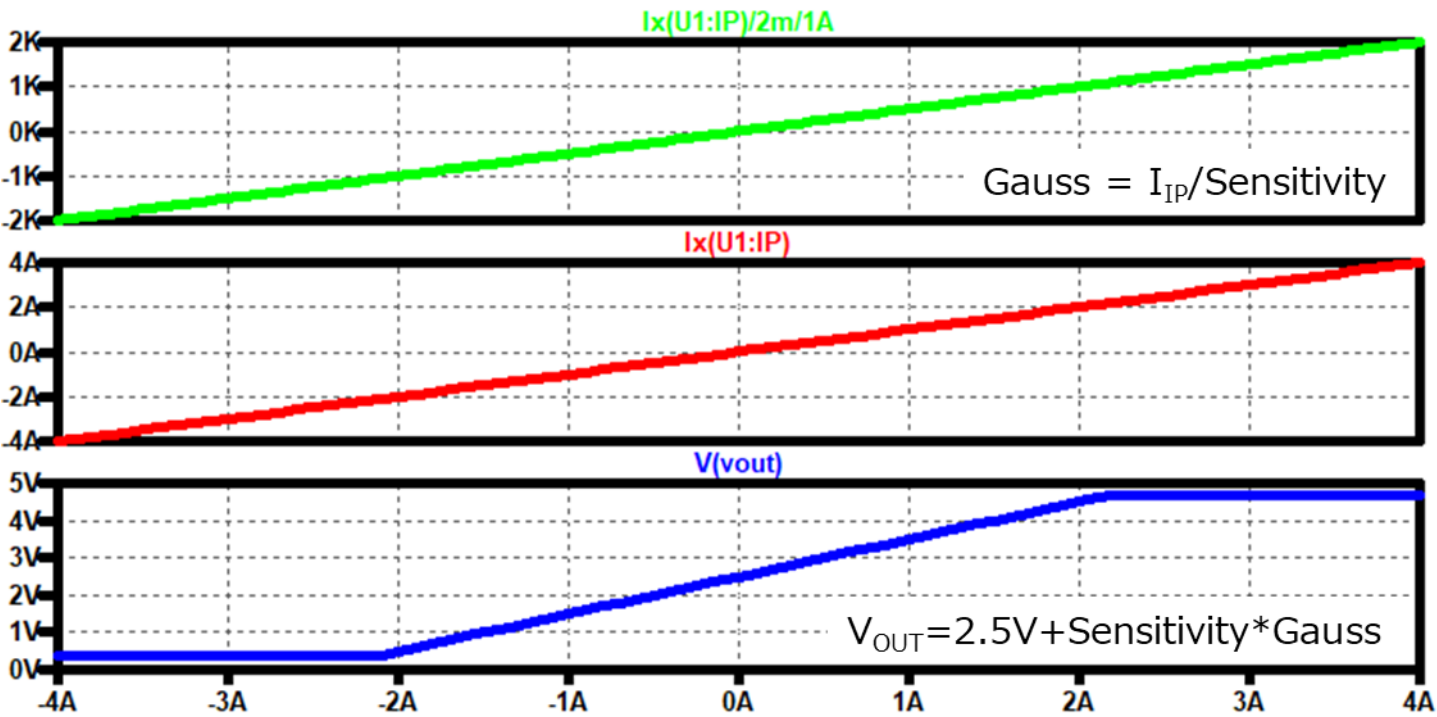Explanatory notes — : simulated

Current to Gauss

●TABLE
e_c2g gauss 0 current 0 table=
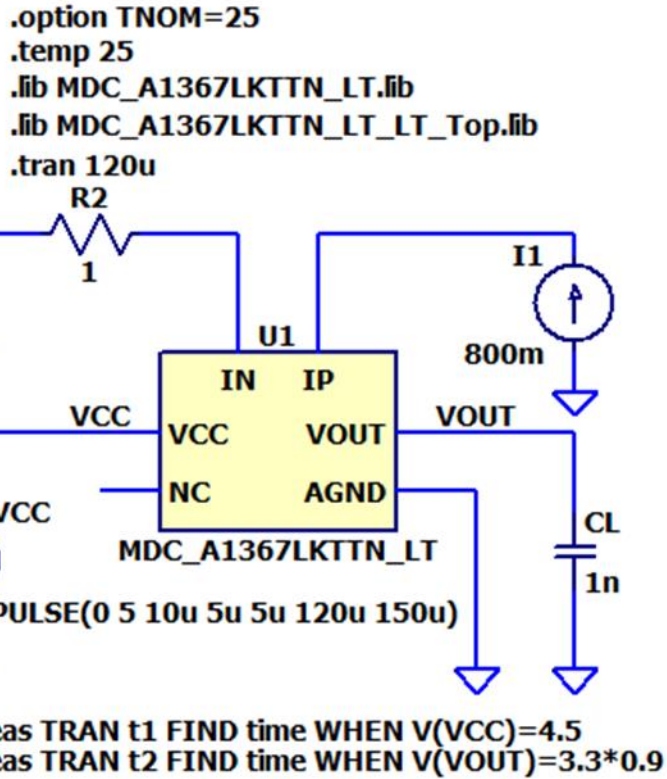+ (
+ (-4,-2000),
+ (-800m,-400),
+ (-2m,-1),
+ (0,0),

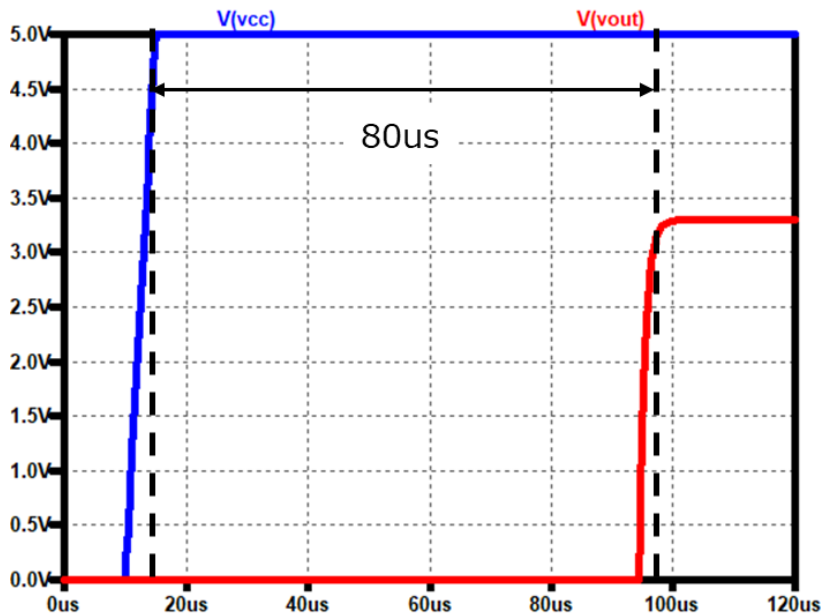.PARAM
+ SENS_COARSE=01
+ Sensitivity=2.0m
+ VOUTQBI=2.5

$Gauss = I_{IP}/Sensitivity$

$V_{OUT}=2.5V+Sensitivity*Gauss$

Power-On Time Testbench

Referred to Data Sheet

```
.option TNOM=25
.temp 25
.lib MDC_A1367LKTTN_LT.lib
.lib MDC_A1367LKTTN_LT_LT_Top.lib
.tran 120u
```



```
.meas TRAN t1 FIND time WHEN V(VCC)=4.5
.meas TRAN t2 FIND time WHEN V(VOUT)=3.3*0.9
```

Simulation results are following.
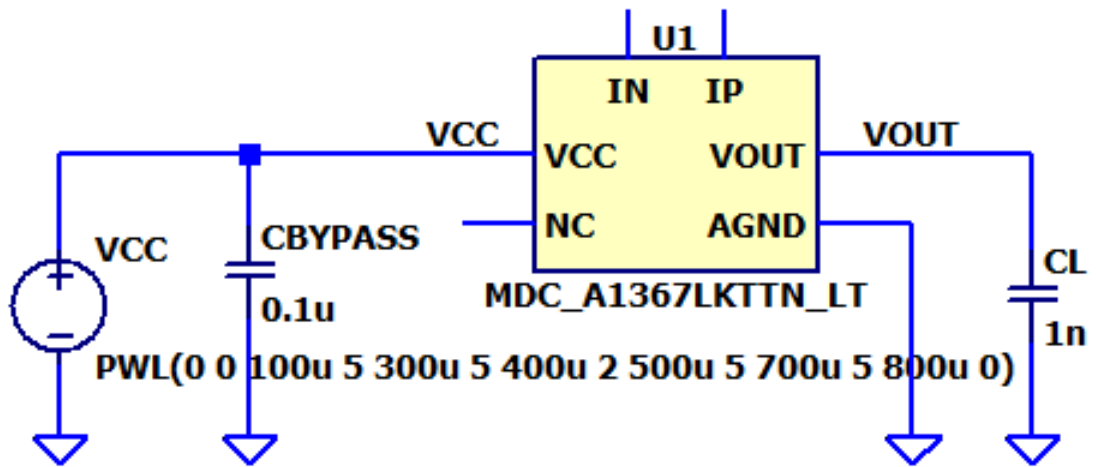Explanatory notes   ― : simulated

Power-On Time
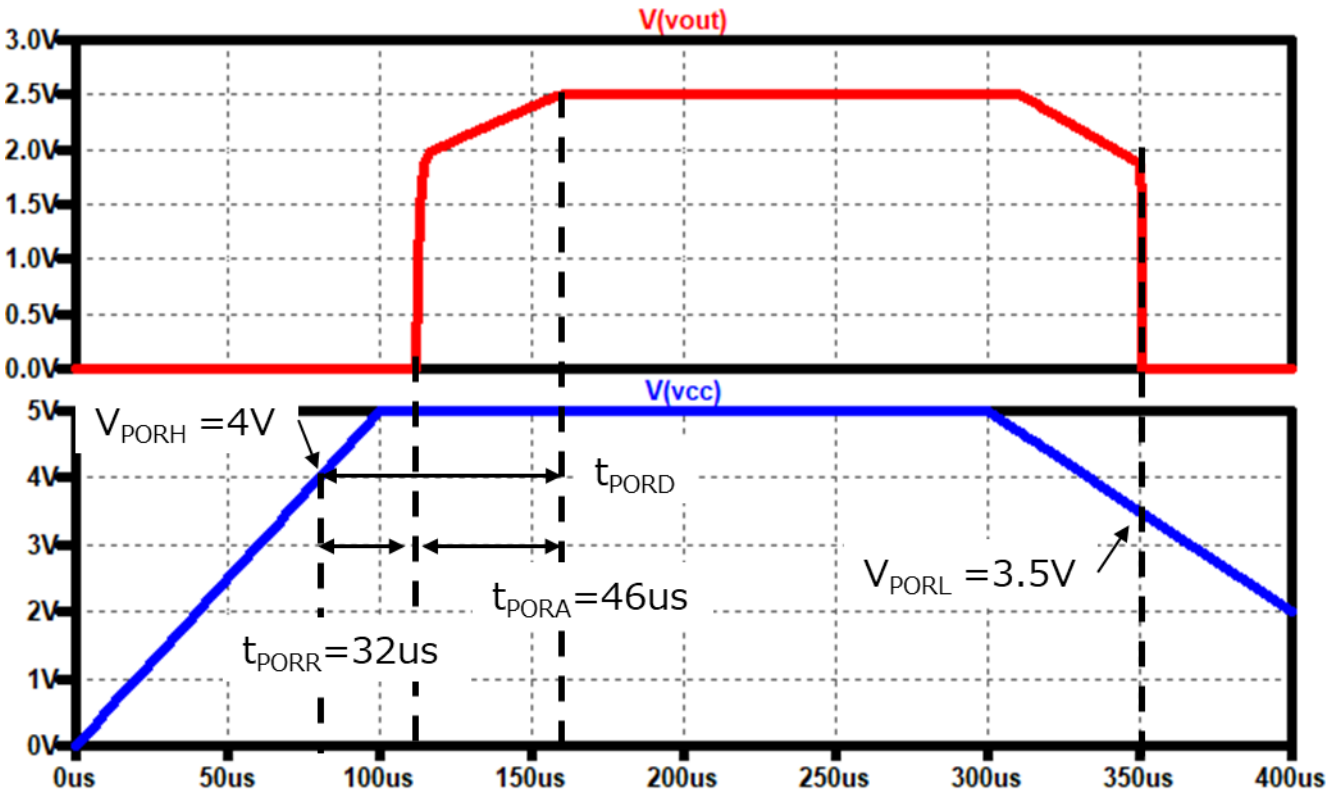
Power-On Reset Testbench

Referred to Data Sheet

```
.option TNOM=25
.temp 25
.lib MDC_A1367LKTTN_LT.lib
.lib MDC_A1367LKTTN_LT_LT_Top.lib
.tran 0.8m
```

Simulation results are following.
Explanatory notes　　— : simulated

Power-On Reset

Propagation Delay Time Testbench

Referred to Data Sheet

```
.option TNOM=25
.temp 25
.lib MDC_A1367LKTTN_LT.lib
.lib MDC_A1367LKTTN_LT_LT_Top.lib
.tran 200u
```
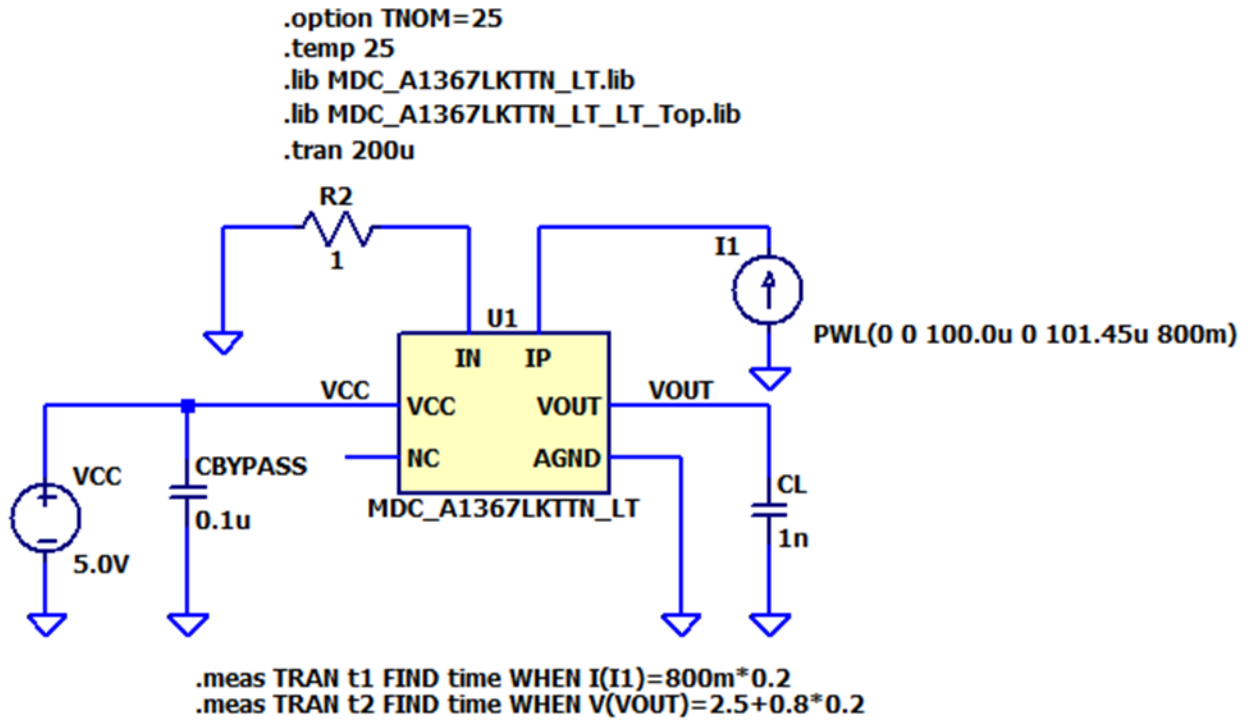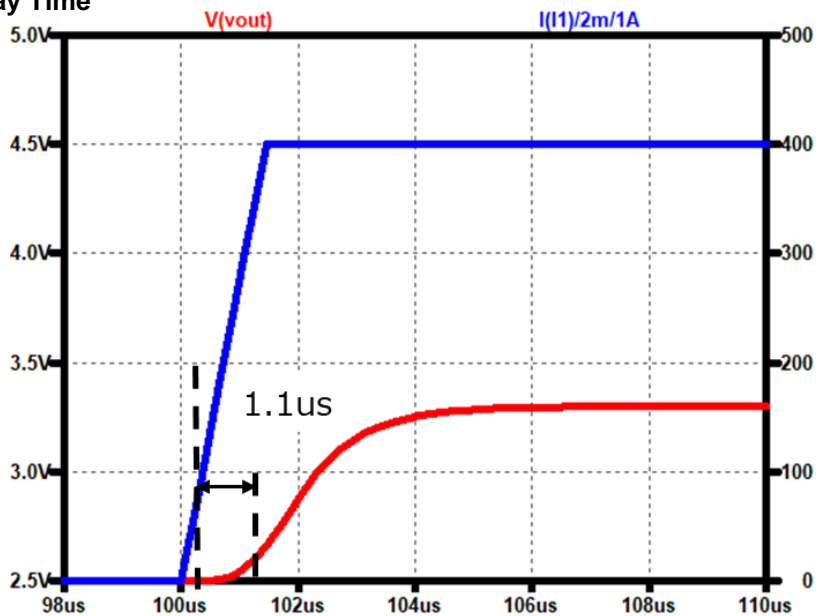

PWL(0 0 100.0u 0 101.45u 800m)

MDC_A1367LKTTN_LT

```
.meas TRAN t1 FIND time WHEN I(I1)=800m*0.2
.meas TRAN t2 FIND time WHEN V(VOUT)=2.5+0.8*0.2
```
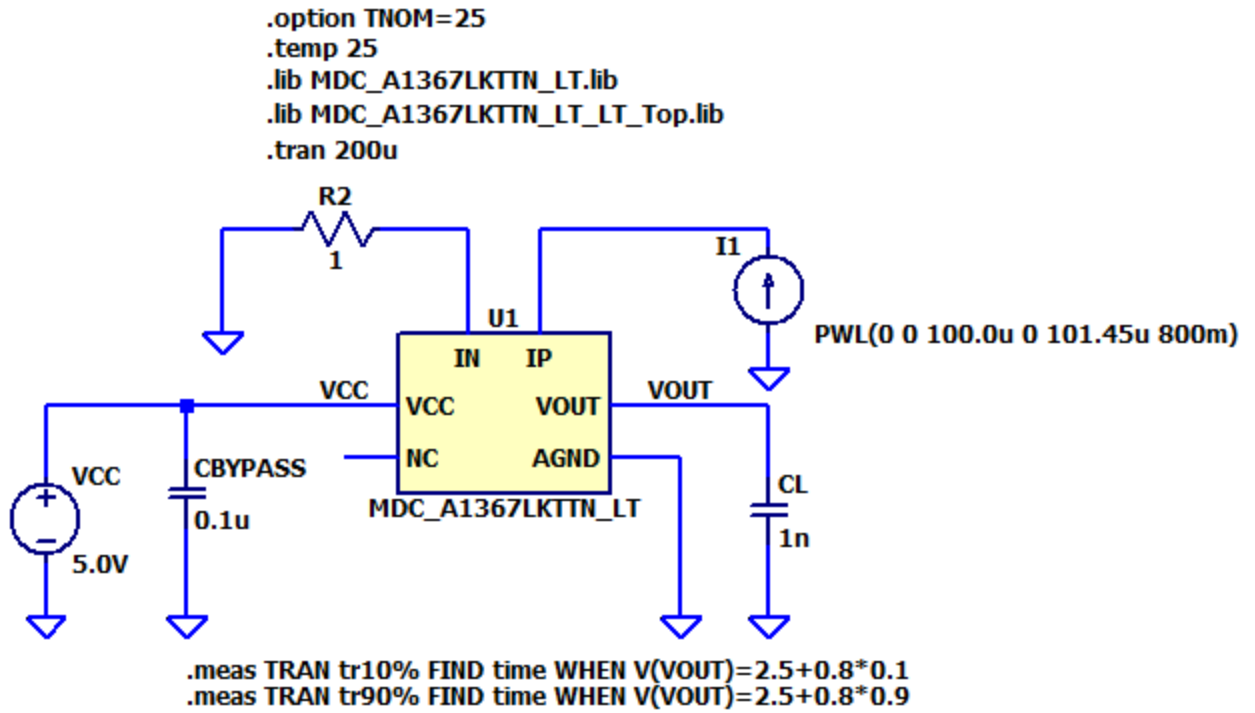
Simulation results are following.
Explanatory notes   — : simulated

Propagation Delay Time

Rise Time Testbench

Referred to Data Sheet

```
.option TNOM=25
.temp 25
.lib MDC_A1367LKTTN_LT.lib
.lib MDC_A1367LKTTN_LT_LT_Top.lib
.tran 200u
```



```
.meas TRAN tr10% FIND time WHEN V(VOUT)=2.5+0.8*0.1
.meas TRAN tr90% FIND time WHEN V(VOUT)=2.5+0.8*0.9
```
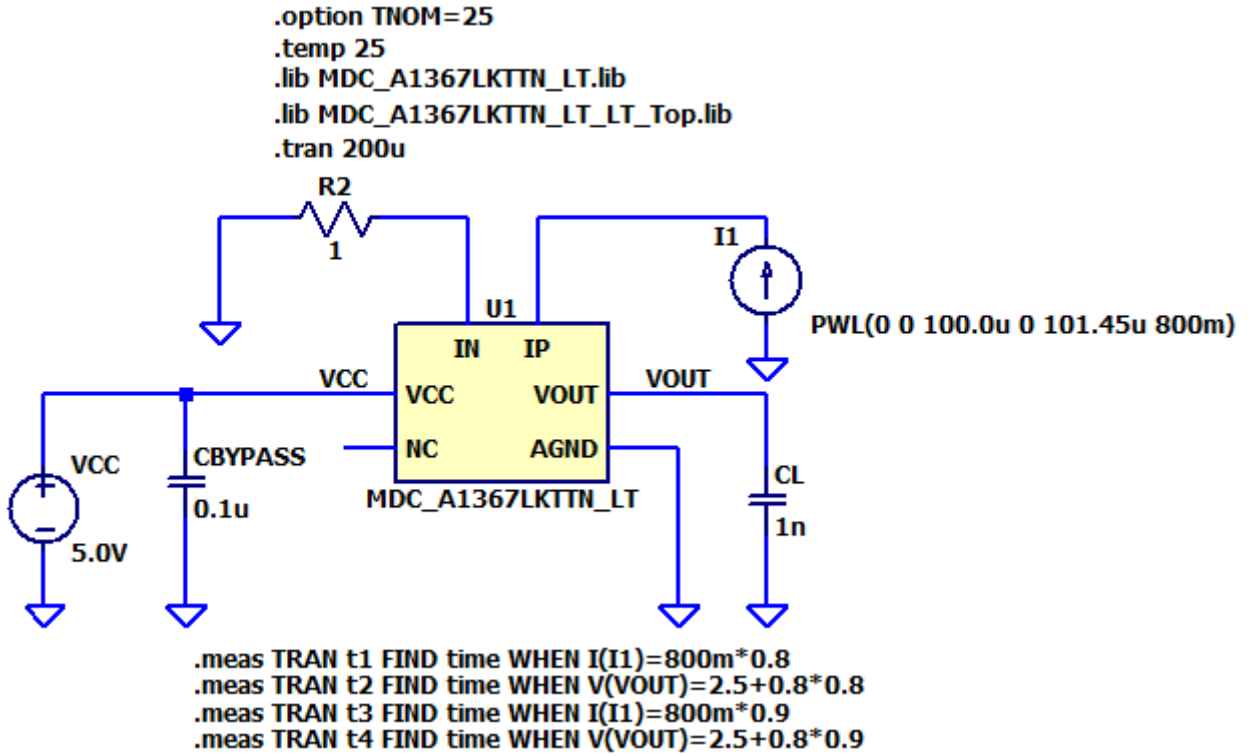
Simulation results are following.
Explanatory notes   － : simulated

Rise Time
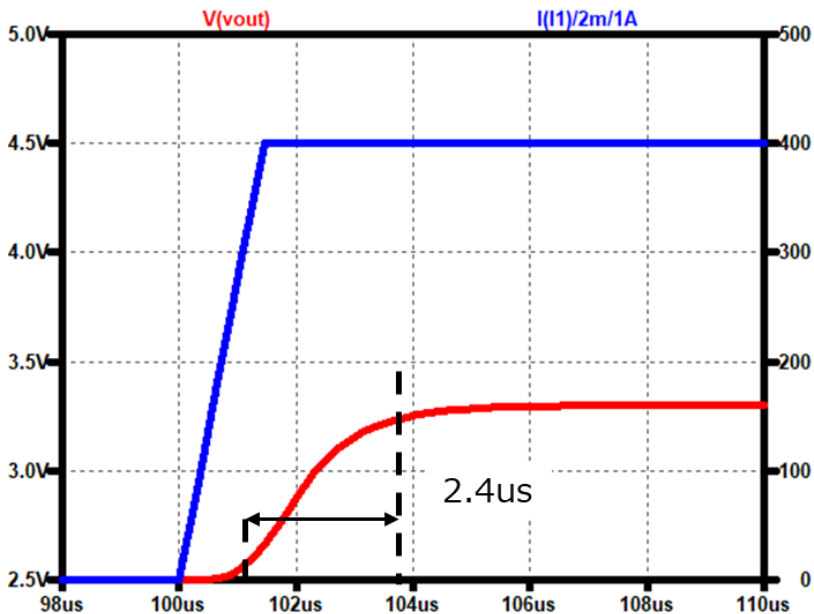
Response Time Testbench

Referred to Data Sheet

```
.option TNOM=25
.temp 25
.lib MDC_A1367LKTTN_LT.lib
.lib MDC_A1367LKTTN_LT_LT_Top.lib
.tran 200u
```

R2
1

U1

IN   IP

VCC   VCC   VOUT   VOUT

NC   AGND

MDC_A1367LKTTN_LT

VCC

CBYPASS
0.1u

VCC
5.0V

I1

PWL(0 0 100.0u 0 101.45u 800m)

CL
1n

```
.meas TRAN t1 FIND time WHEN I(I1)=800m*0.8
.meas TRAN t2 FIND time WHEN V(VOUT)=2.5+0.8*0.8
.meas TRAN t3 FIND time WHEN I(I1)=800m*0.9
.meas TRAN t4 FIND time WHEN V(VOUT)=2.5+0.8*0.9
```

Simulation results are following.
Explanatory notes   ― : simulated
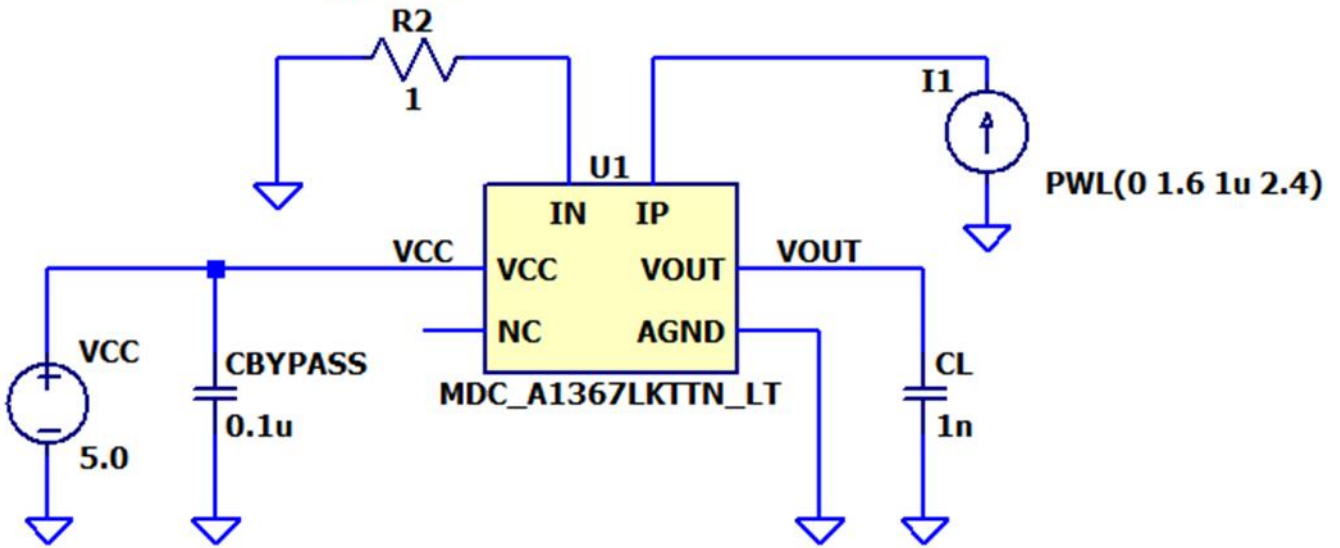
Response Time

80%-80%:1.75us

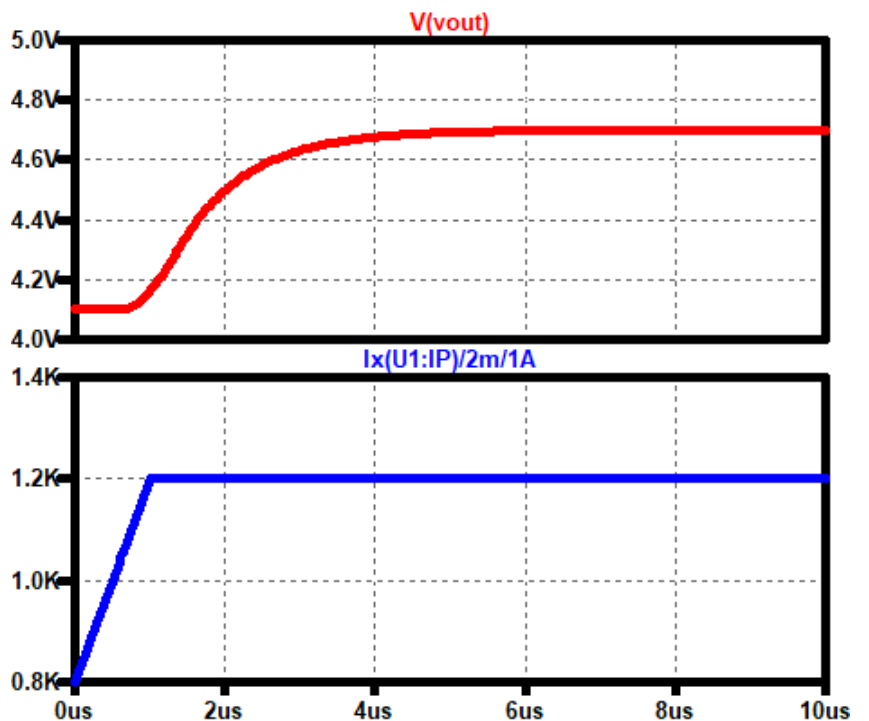90%-90%:2.24us
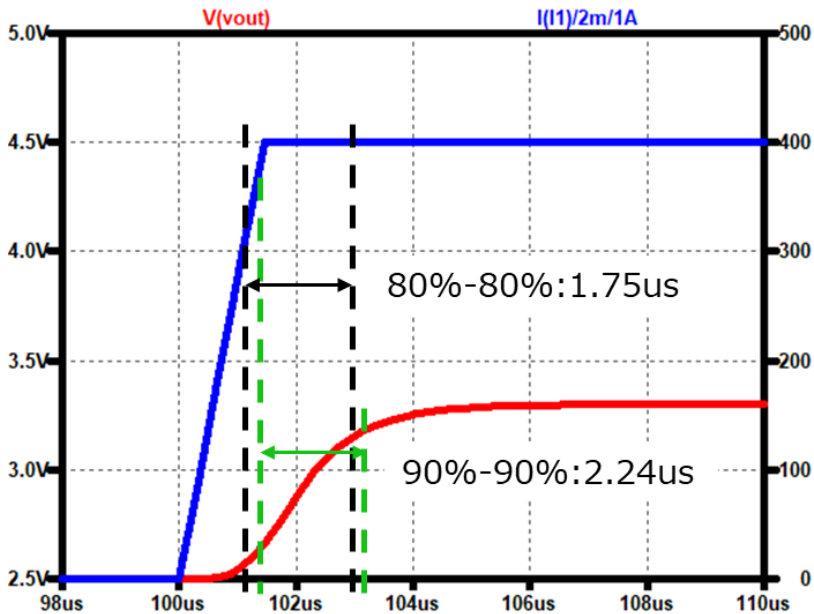
Delay to Clamp Testbench

Referred to Data Sheet

```
.option TNOM=25
.temp 25
.lib MDC_A1367LKTTN_LT.lib
.lib MDC_A1367LKTTN_LT_LT_Top.lib
.tran 10u
```


Simulation results are following.
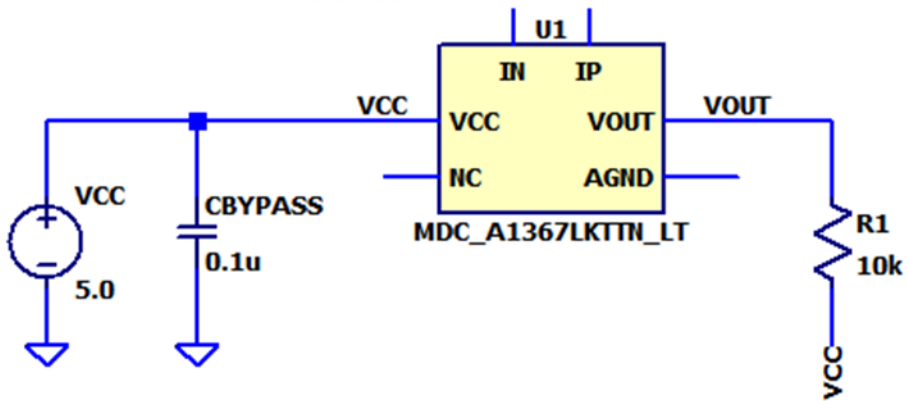Explanatory notes   — : simulated

Delay to Clamp
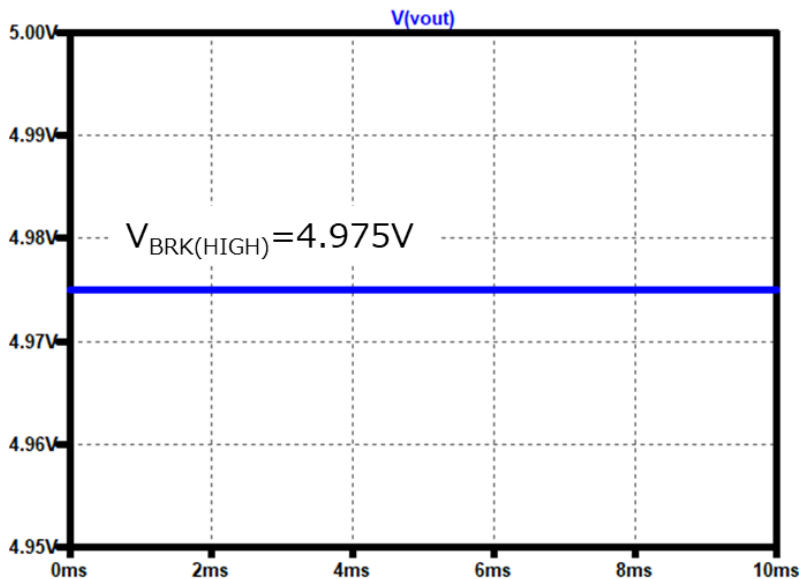
Broken Wire Voltage Testbench

Referred to Data Sheet

$\cdot R_{L(PULLUP)} = 10\ k\Omega$ to V_{CC}

```
.option TNOM=25
.temp 25
.lib MDC_A1367LKTTN_LT.lib
.lib MDC_A1367LKTTN_LT_LT_Top.lib
.tran 10m
```

Simulation results are following.
Explanatory notes   — : simulated

Broken Wire Voltage

$V_{BRK(HIGH)}=4.975V$

Broken Wire Voltage Testbench

Referred to Data Sheet

$$\cdot R_{L(PULLDWN)} = 10\ k\Omega\ to\ GND$$

```
.option TNOM=25
.temp 25
.lib MDC_A1367LKTTN_LT.lib
.lib MDC_A1367LKTTN_LT_LT_Top.lib
.tran 10m
```

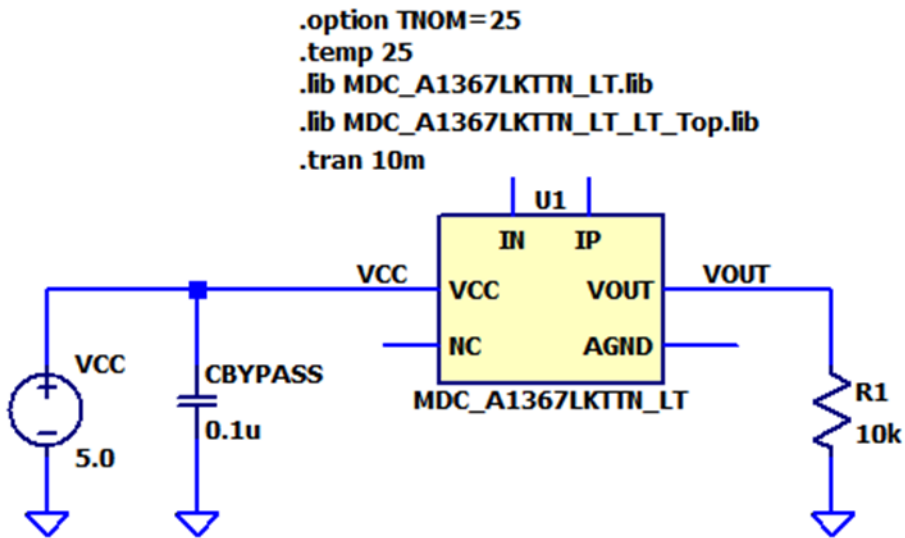Simulation results are following.
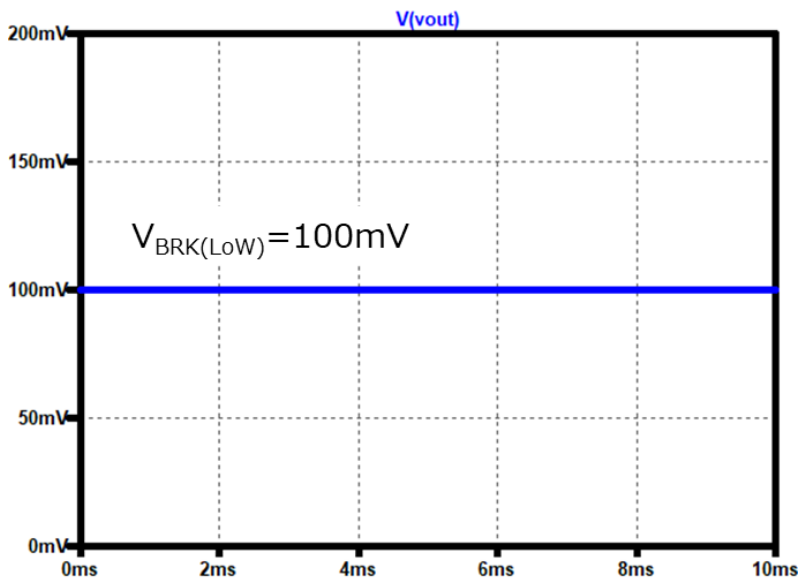Explanatory notes   － : simulated

Broken Wire Voltage

$V_{BRK(LoW)}=100mV$

DISCLAIMER

1. This SPICE (Simulation Program with Integrated Circuit Emphasis) model and its content (the "Contents") are copyright of MoDeCH Inc. All rights reserved. Any redistribution or reproduction of any or all part of the Contents in any form is prohibited without express written permission made by MoDeCH Inc.

2. MoDeCH Inc. as licensor (the" Licensor") hereby grants to you, as licensee (the "Licensee"), a non-exclusive, non-transferable license to use the Contents as long as you abide by the terms and conditions of this DISCLAIMER.

3. The Licensee is not authorized to sell, loan, rent and redistribute or license the Contents in whole or in part, or in modified form, to anyone.

4. The Licensor shall in no way be liable to the Licensee or any third party for any loss or damage (including ,but not limited to, lost profits, or other incidental, consequential, or punitive damages), however caused (including through negligence) which may be directly or indirectly suffered from, arising out of, or in connection with, any use of the Contents .

5. Notwithstanding anything contained in this DISCLAIMER, in no event shall Licensor be liable for any claims, damages or loss which may arise from the modification, combination, operation or use of the Contents with the Licensee's computer programs.

6. The Licensor does not warrant that the Contents will function in any environment.

7. The Contents may be changed or updated without notice. MoDeCH Inc. may also make improvements and/or changes in the products, pricing and/or the programs related to the Contents at any time without notice.

MoDeCH

Modeling Design Technology

MoDeCH Inc.

Head Office
Location: 5-15 Yokoyama-cho, Hachioji-Shi, Tokyo 192-0081, Japan
Tel:+81-42-656-3360
E-Mail:model-on-support@modech.co.jp
URL:http://www.modech.com/en/

Sep 28,2021
Rev 1.0