SimSurfing
NTC Thermistor
Performance Simulator
Operation Manual

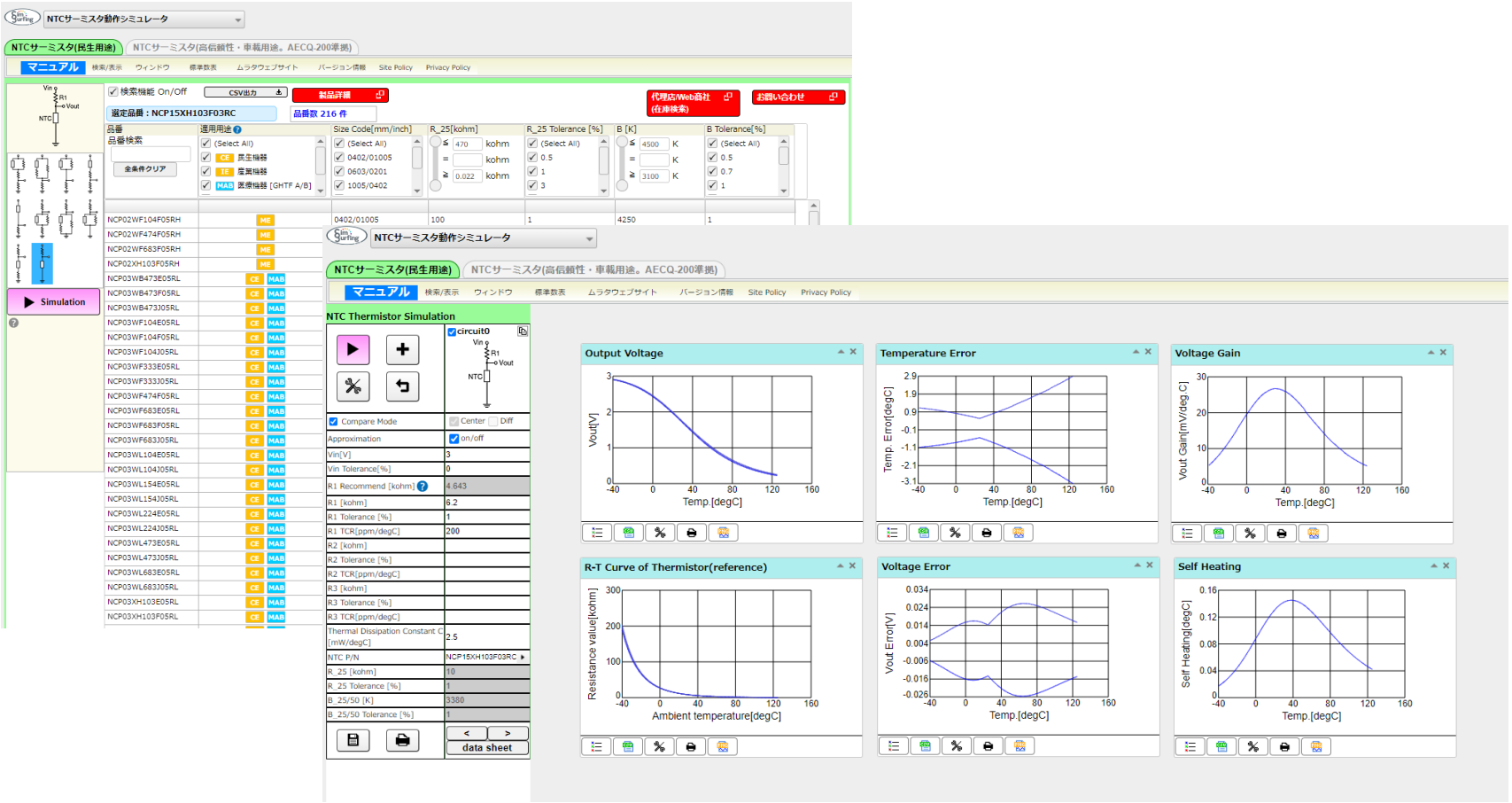
August, 2023

Murata Manufacturing Co., Ltd.

Contents

1. About This Tool
1-1. Outline

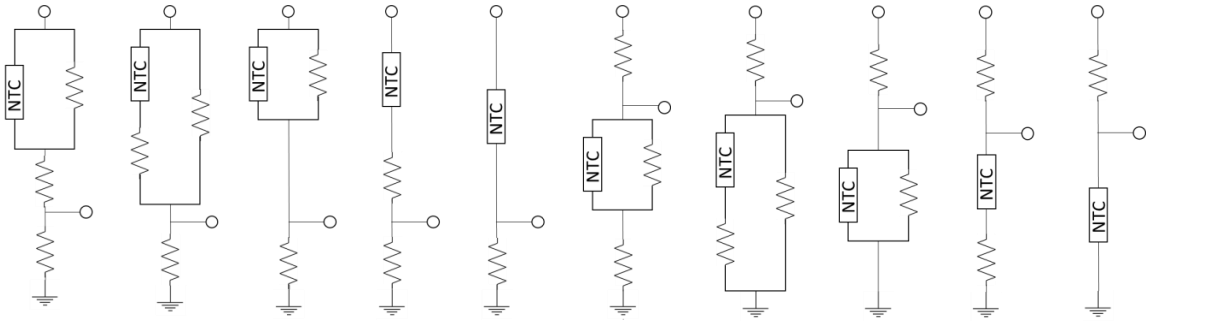
The SimSurfing NTC Thermistor Performance Simulator (hereafter called “this software”) is software for simulating the output voltage versus temperature characteristics.
Each graph of the output voltage characteristics of the specified circuit, the output voltage error and the temperature error are displayed.



1. About This Tool
1-2. Main Functions (1/2)

- Regarding the grounding circuit of the NTC thermistor and that of the resistor, the output voltage characteristics can be simulated.

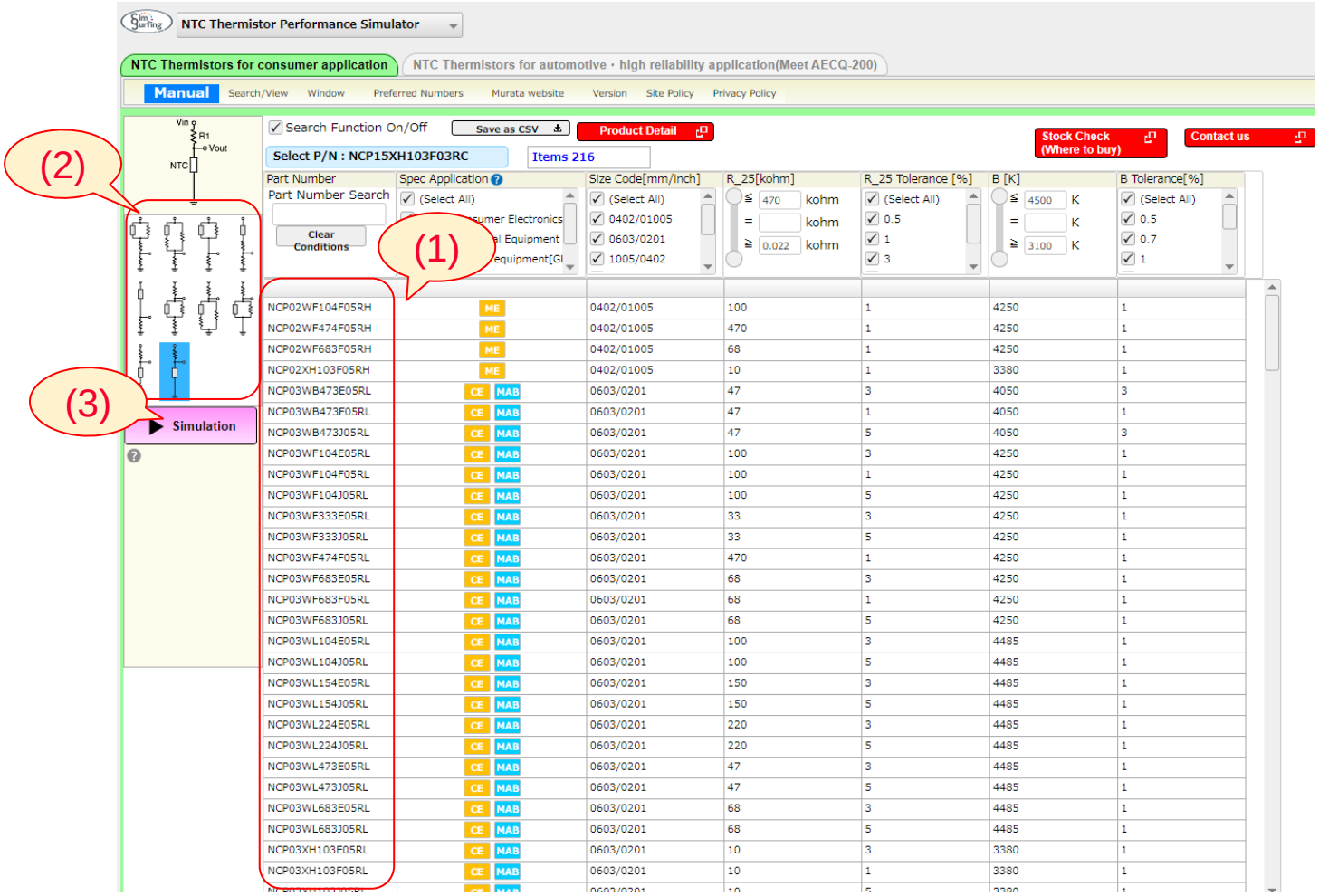
<Example of circuit>



- In the default simulation, [Output Voltage (output voltage)], [Voltage Error (output voltage error)] and [Temperature Error (temperature conversion error)] are displayed as graphs.
- In addition to the above 3 graphs, the following graphs can also be displayed.
  - Vout Gain (output voltage per unit temperature)
  - Self Heating (self-heating)
  - Output Voltage Approximation (approximate value of the output voltage)
  - Appropriate Vout Error (error in the approximate value of the voltage)
  - Approximate Temp. Error (error in the approximate value of the voltage (temperature conversion))
  - Temperature Approximation (approximate value of the output temperature)
  - Approximate Temp. Error versus Vout (error in the approximate value of the temperature)
  - Approximate Temp. Error (error in the approximate value of the temperature (with respect to the temperature))
- The characteristics data of each graph can be saved as a CSV file. Also, it can be printed out.
- Multiple circuits (Circuit 0 + Circuit 1 + ...) can be simulated simultaneously, and also the results can be compared under each set of conditions.
- The recommended value of the voltage dividing resistor can be calculated.

2. Quick Operation Guide
2-1. Simulation Graph Display

- Start the software, then select (1) item No. and (2) circuit diagram, and click (3) ▶ Simulation , the screen switches over, and, as shown on the next page, graphs representing the results of simulation are displayed.



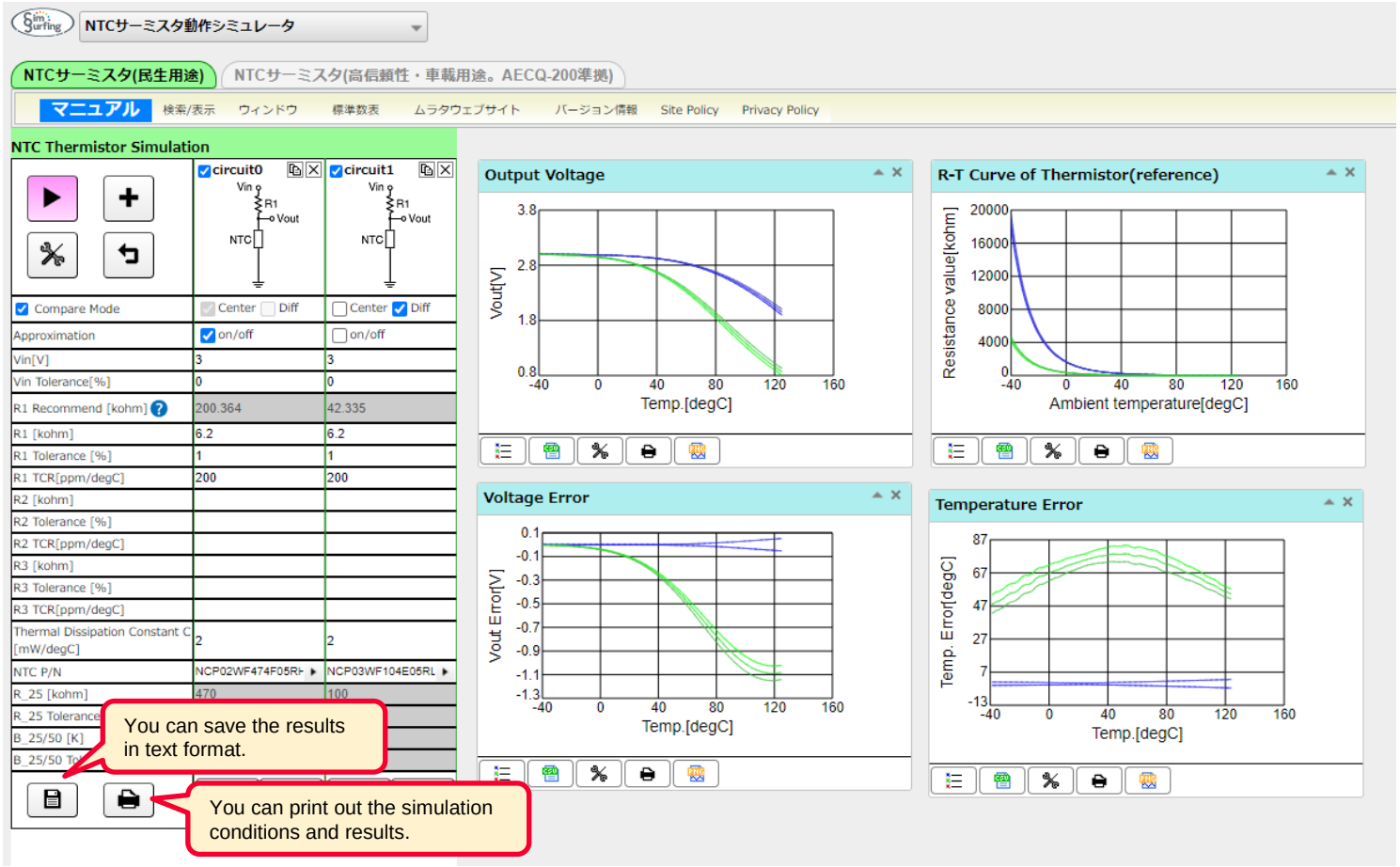
2. Quick Operation Guide
2-2. Overwriting Graphs

- The circuit diagram and the parameters of the NTC thermistor are displayed on [NTC Thermistor Simulation] (the parameter values can be changed).
- Click [+], then select a different circuit diagram or a product using the same procedure as that indicated on the previous page and click [▶], the results of simulation of the different circuit are added to the existing graphs, enabling a comparison to be made.

2. Quick Operation Guide
2-3. Comparison and Output of Simulation

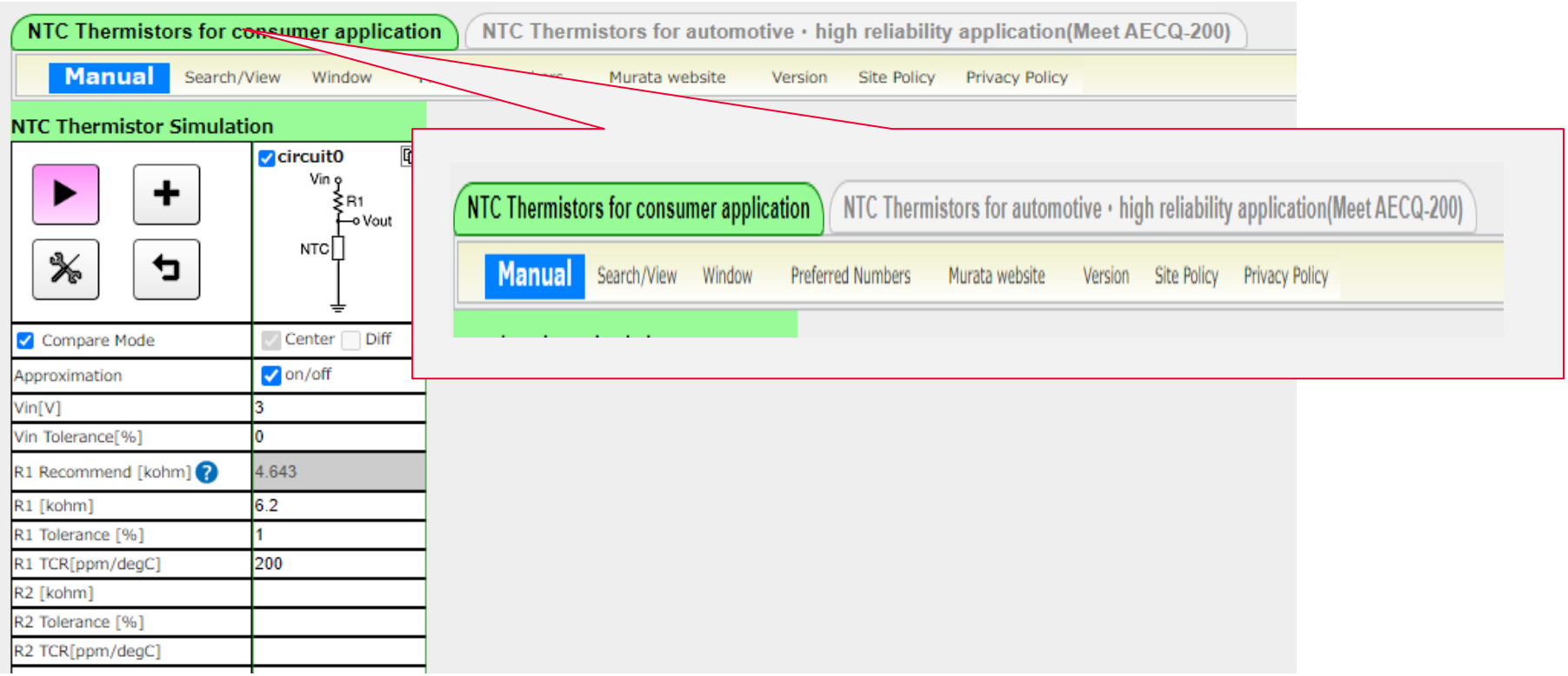
- By changing the conditions of Circuit 0, Circuit 1, ..., the results of each simulation can be compared with each other on the same graph (after changing the conditions, click ▶).
- You can save a curved line on a graph to a text file (CSV format).
- You can print out graphs.

<An example of comparing 2 simulation results>



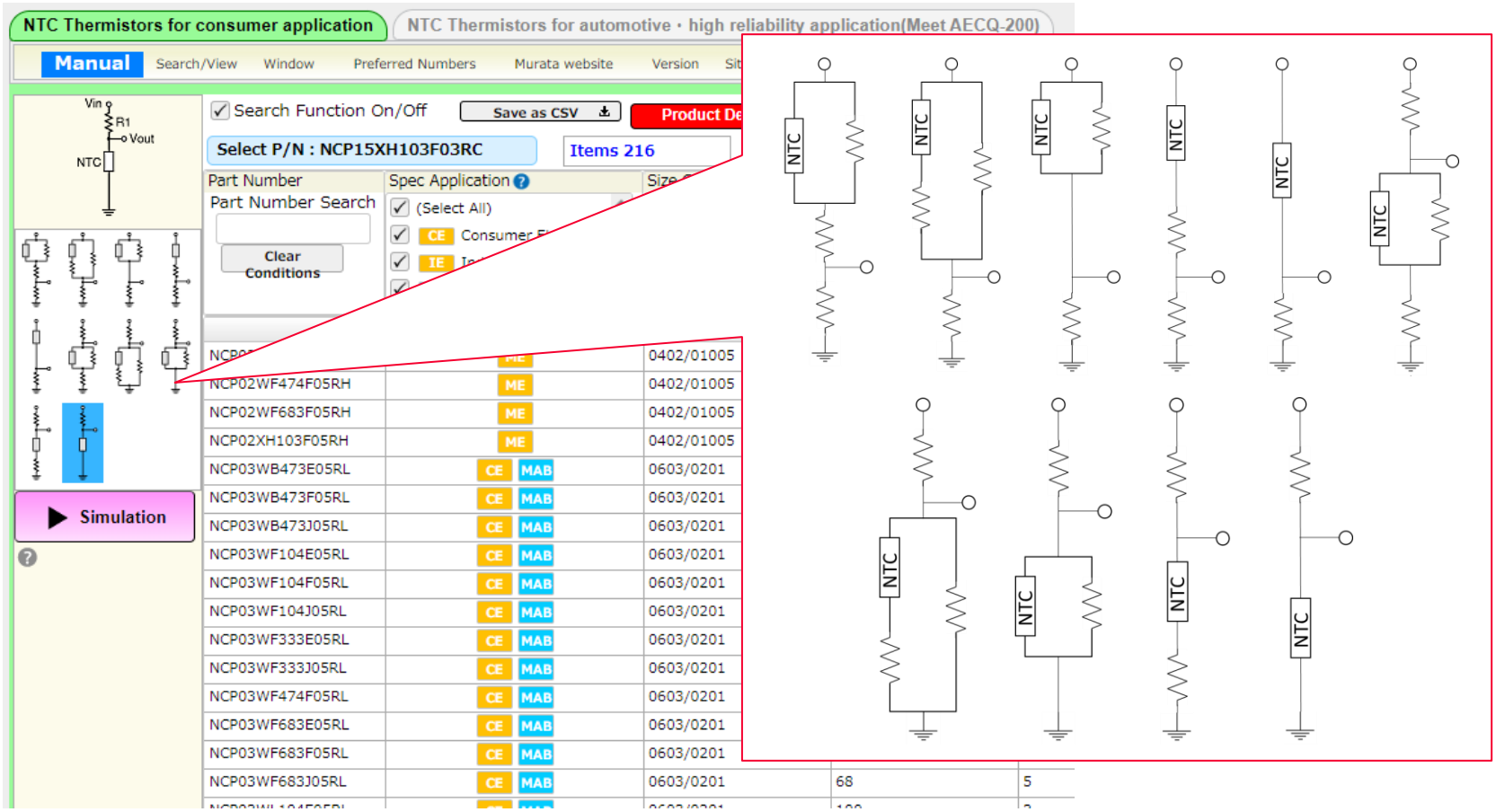
3. Details of Operation
3-1. Selecting the Desired Type of NTC Thermistor

- You can select an NTC thermistor for general use or an NTC thermistor for automotive.
  By clicking [NTC Thermistors for consumer application] or [NTC Thermistors for Automotive・high reriability application(Meet AECQ-200)], the type of thermistor is switched over.



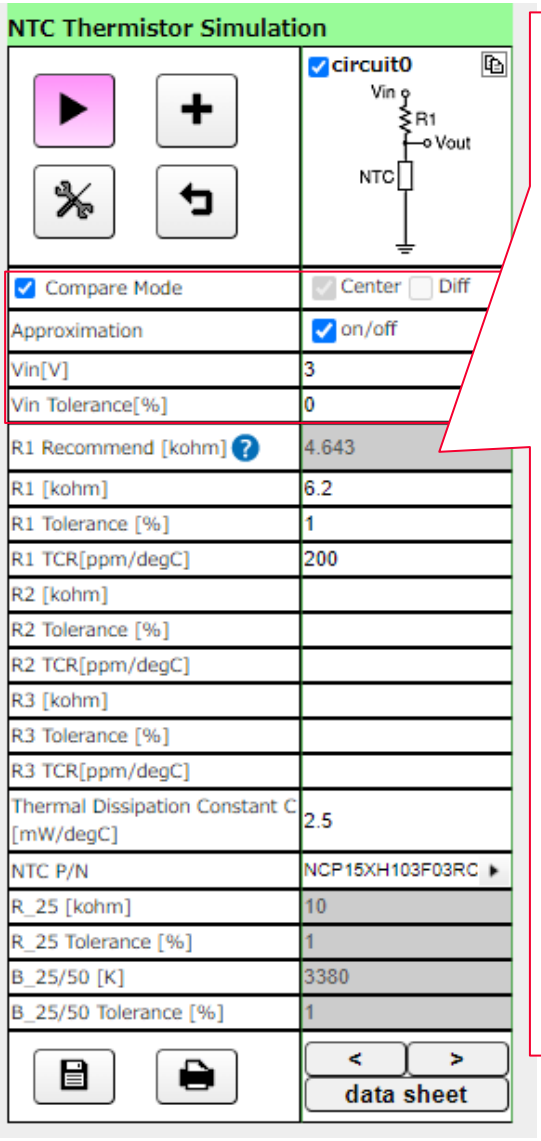
3. Details of Operation
3-2. Selecting a Simulation Circuit

- Select the item No. and the circuit diagram.
  You can select up to 10 circuits (a resistance grounding circuit, 2 NTC thermistor grounding circuits, and 5 circuits at the resistor insertion positions).
  After making a selection, click ▶ Simulation . The simulation results will be displayed on a graph.



3. Details of Operation
3-3. Changing/Setting the Simulation Conditions (1/7)

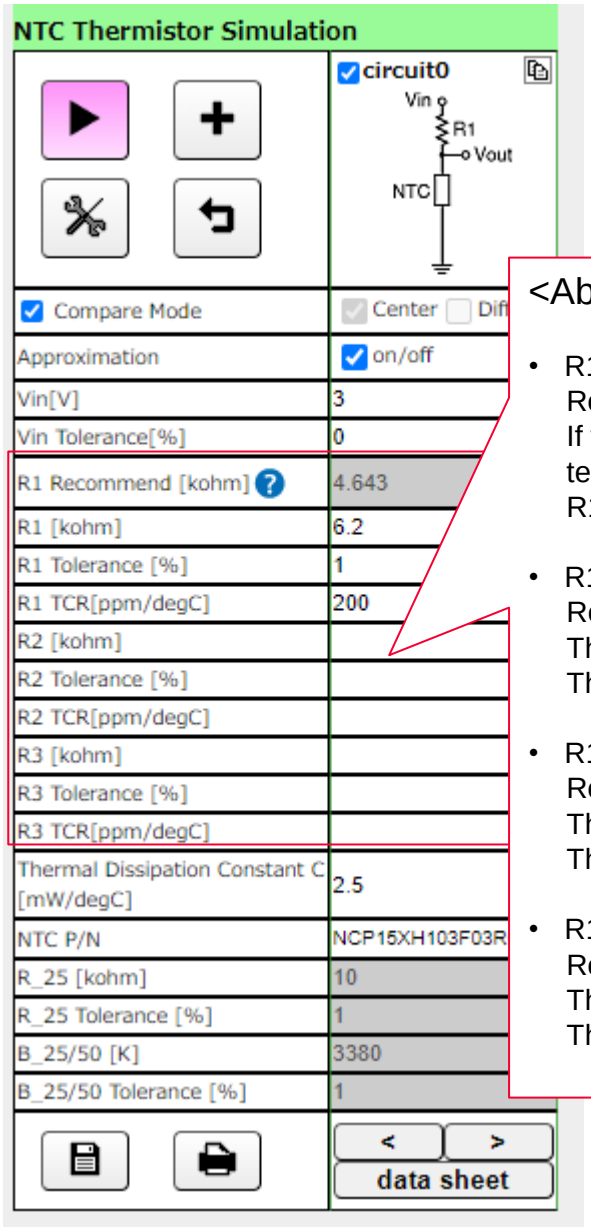
- You can freely change each item in the [NTC Thermistor Simulation] window.



<About the voltage parameters>

- Compare Mode (comparison mode)
  If you click , and then select [Voltage Error] followed by [Diff], the following items will be displayed (this function can be used only when multiple circuits are selected).
  When you remove the Compare Mode check, all of the circuits change to Center (the mode ceases to be the comparison mode), and the values of each circuit are displayed.
  - Vout Error H : Difference between the upper limit value of the output and the output voltage of Circuit 0 to Circuit n
  - Vout Error L : Difference between the lower limit value of the output and the output voltage of Circuit 0 to Circuit n
  - Vout Difference+ : Difference between the upper limit value of the output voltage of Circuit n and the output voltage of Circuit (n-1)
  - Vout Difference : Difference between the output voltage of Circuit n and the output voltage of Circuit (n-1)
  - Vout Difference- : Difference between the lower limit value of the output voltage of Circuit n and the output voltage of Circuit (n-1)
- Approximation
  Display/non-display of error graph
  (Refer to [3-3 Changing/Setting the Simulation Conditions (6/6)].)
- Vin (V)
  Input voltage (The initial value is 3 [V]).
- Vin Tolerance
  Used to enter the input voltage tolerance (the initial value is 0.0 [%]).

3. Details of Operation
3-3. Changing/Setting the Simulation Conditions (2/7)



<About the fixed resistor parameters>

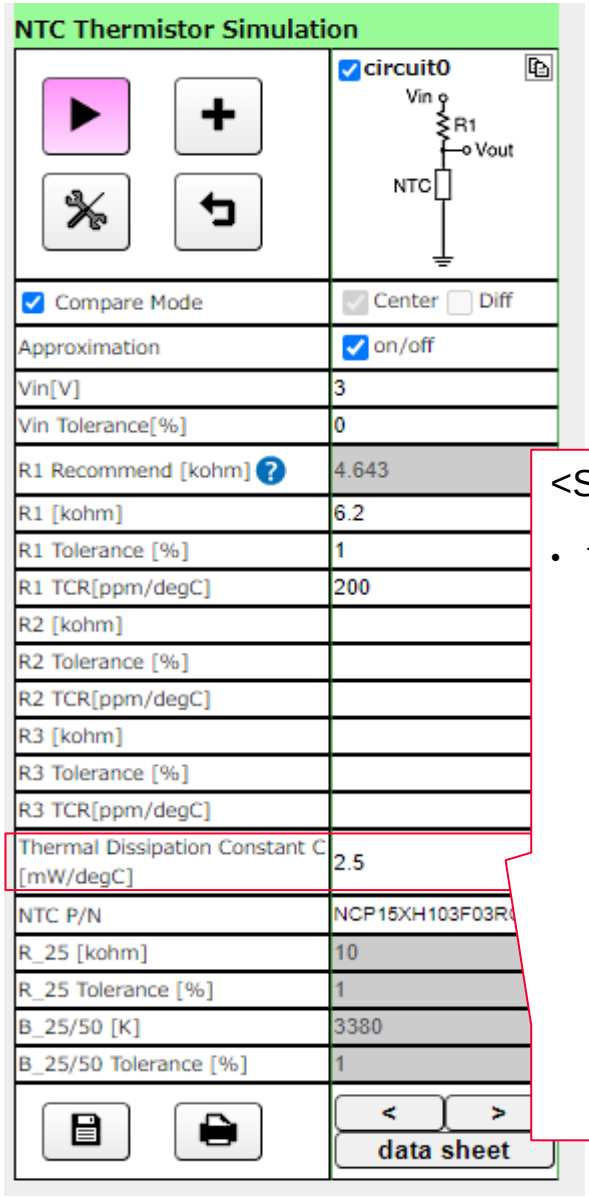
- R1 Recommend (kohm)
  Recommended resistance value of R1
  If the lower limit temperature is T1, the upper limit temperature is Th, the output voltage at temperature T1 is Vout (T1), and the output voltage at temperature Th is Vout (Th), the value of R1 in the case where the following formula holds will be the recommended value.

- R1 (kohm)
  Resistance value (R)
  The number of resistors selected differs according to the selected simulation circuit (R1 to R3).
  The initial value differs according to the selected simulation circuit.

- R1 Tolerance (%)
  Resistance tolerance (R Tolerance)
  The number of resistances differs according to the selected simulation circuit (R1 to R3).
  The initial value is 1 (%).

- R1 TCR (ppm/deg.C)
  Resistor temperature coefficient (R TCR)
  The number of resistors differs according to the selected simulation circuit (R1 to R3).
  The initial value is 200 [ppm/°C].

3. Details of Operation
3-3. Changing/Setting the Simulation Conditions (3/7)

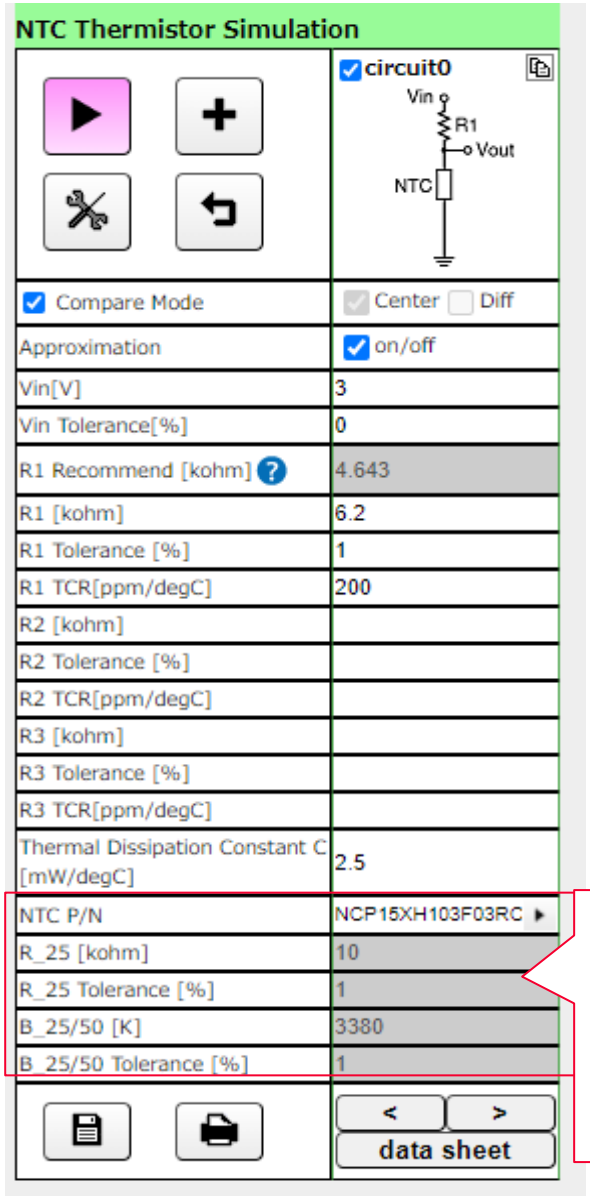


<Setting the parameters>

- Thermal Dissipation Constant
  Heat dissipation constant. The initial value is calculated based on the assumption of 3 mw/°C (assuming surface mounting of the NCP15 Series).
  Heat dissipation constant depends on the size of the NTC element.
  Please change the heat dissipation constant as follows depending on the element size.

Series	Heat dissipation constant [mW/℃]
NCP02 Series	2
NCP03 Series	2
NCP15,NCU15 Series	2.5
NCP18,NCU18 Series	3

3. Details of Operation
3-3. Changing/Setting the Simulation Conditions (4/7)

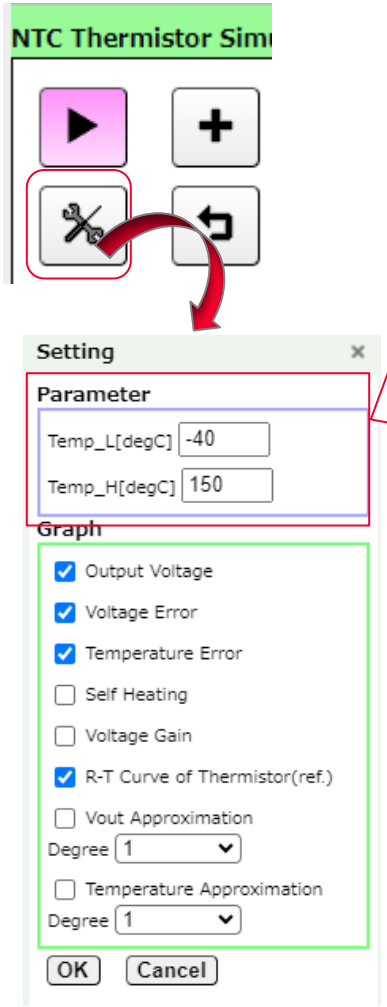


<Parameters of the selected thermistor>

- NTC P/N
  Item No. selected from the item No. list
  Below this item No., R25 (kohm), the resistance tolerance, B (25/50) (K), and the B constant coefficient tolerance (%) of the selected item No. are displayed.

3. Details of Operation
3-3. Changing/Setting the Simulation Conditions (4/6)

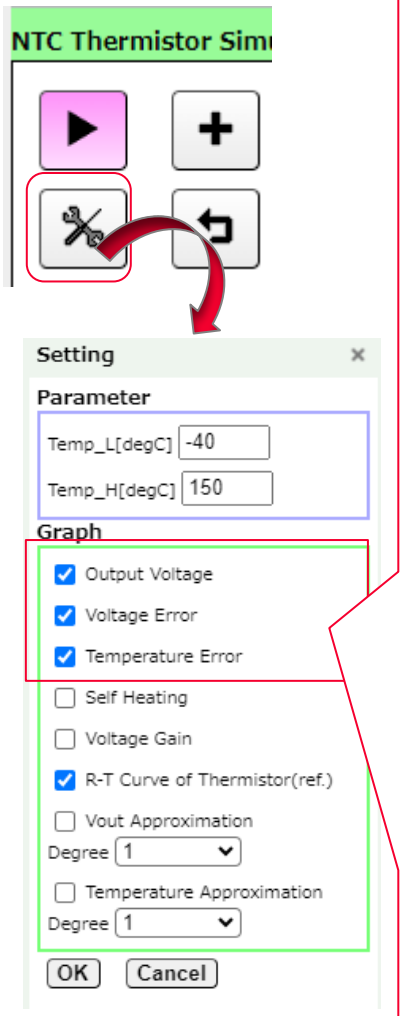
- You can change the settings of the graph parameters and the displayed graph by clicking  .



<Setting the parameters>

- Temp L[deg.C]
  Lower limit temperature (Temp L).
- Temp H[deg. C]
  Upper limit temperature (Temp H).

3. Details of Operation
3-3. Changing/Setting the Simulation Conditions (5/6)



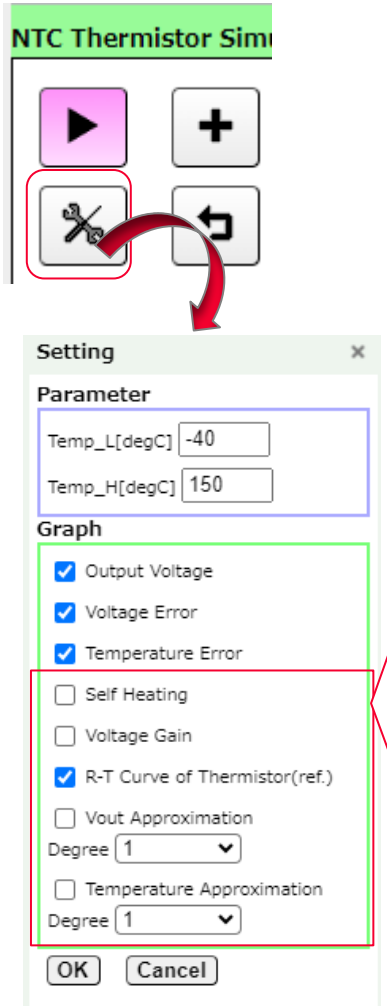
<Graph parameters (1/2)>

- Outline Voltage
  Output voltage. When this item is selected, the following items are displayed.
  - ・Vout_typ : Output voltage at Circuit 0 to Circuit n
  - ・Vout_max : Upper limit value of the output voltage at Circuit 0 to Circuit n
  - ・Vout_min : Lower limit value of the output voltage at Circuit 0 to Circuit n

- Voltage Error
  Output voltage error graph. When you select [Diff] in the [NTC Thermistor Simulation] window and then select this item, the following items are displayed.
  - ・Vout Error H : Upper limit value of the output at Circuit 0 to Circuit n
  - ・Vout Error L : Lower limit value of the output at Circuit 0 to Circuit n
  - ・Vout Difference+ : Difference between the upper limit value of the output voltage at Circuit n and the output voltage at Circuit (n-1)
  - ・Vout Difference :Difference between the output voltage at Circuit n and the output voltage at Circuit (n-1)
  - ・Vout Difference- : Difference between the lower limit value of the output voltage at Circuit n and the output voltage at Circuit (n-1)

- Temperature Error
  Temperature conversion error graph. When you select this item, the following items are displayed.
  - ・Temperature Error L at Circuit 0 to n : temperature conversion graph of Vout Error L
  - ・Temperature Error H at Circuit 0 to n : temperature conversion graph of Vout Error H
  - ・Temp Difference+ : Value resulting from the conversion of [Vout Difference+] into the temperature at Circuit (n-1)
  - ・Temp difference : Value resulting from the conversion of [Vout Difference] into the temperature at Circuit (n-1)
  - ・Temp Difference- : Value resulting from the conversion of [Vout Difference-] into the temperature at Circuit (n-1)

3. Details of Operation
3-3. Changing/Setting the Simulation Conditions (6/6)



<Graph parameters (2/2)>

- Self Heating
  Self-heating graph. When you select this item, self-heating (Self Heating [°C]) at Circuit 0 to n is displayed.

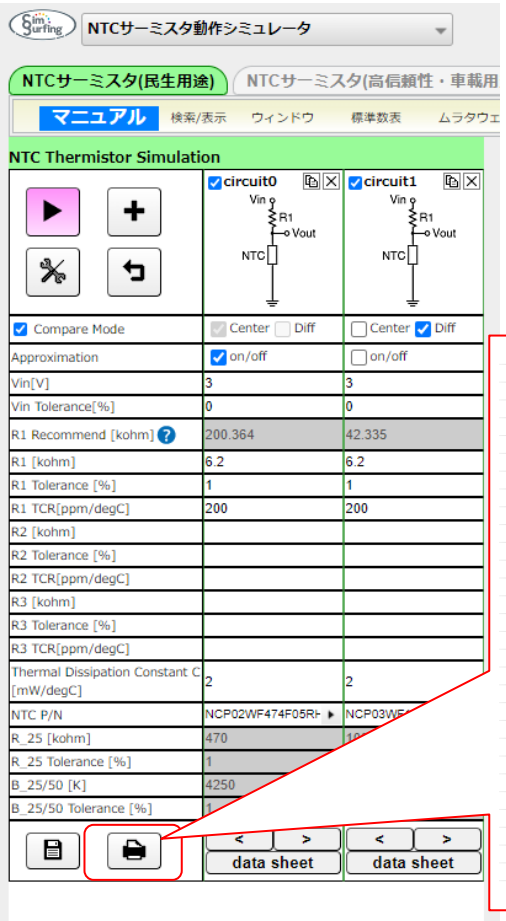
- Voltage Gain
  Graph of output voltage per unit temperature. When you select this item, the output voltage per unit temperature (Vout Gain [mV/°C]) at Circuit 0 to n is displayed.

- Vout Approximation
  Graph indicating approximate value of the output voltage. When you select [Approximation] in the [NTC Thermistor Simulation] window and then select this item, the following items are displayed.

- Temperature Approximation
  Graph indicating the approximate value of the temperature versus the output voltage. When you select [Approximation] in the [NTC Thermistor Simulation] window and then select this item, the following items are displayed.

3. Details of Operation
3-4. Saving a Text File

You can save data in the CSV format.

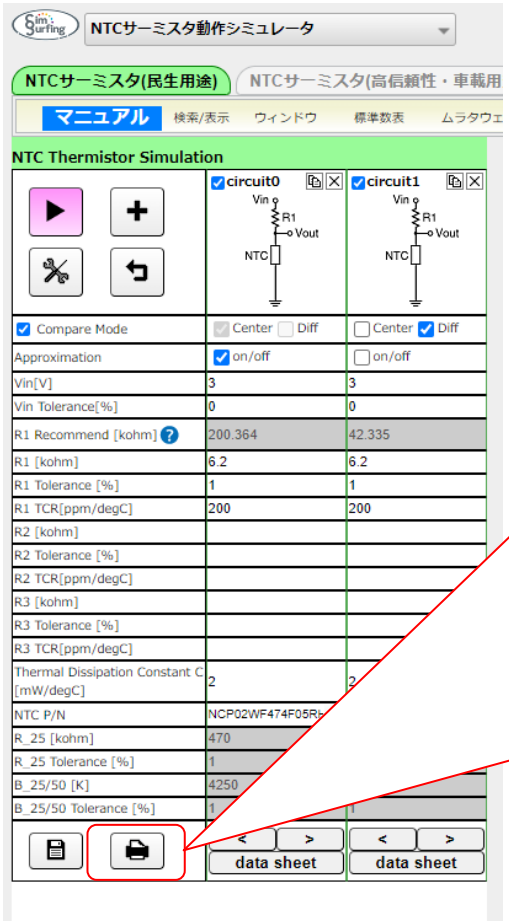


40	Result:																
41	Temp[deg.C	Vout_min[V	Vout_typ[V	Vout_max[V	Vout_Error-	Vout_Error+	Temp_Error-	Temp_Error+	SelfHeating	VoutGain[n	Output Vol	Approximat	Approximat	Temperatu	Approximate	Temp. Error	
42	−20	1.577059	1.628814	1.679724	−0.05175	0.05091			0.102922		1.217465	−0.41135		−39.1082	−19.1082		
43	−19	1.539835	1.591357	1.642126	−0.05152	0.050769	−1.35746	1.377617	0.103302	37.39976	1.203888	−0.38747	10.3602	−36.7222	−17.7222		
44	−18	1.502789	1.554015	1.604579	−0.05123	0.050565	−1.35715	1.374875	0.103552	37.25813	1.190312	−0.3637	9.761697	−34.3433	−16.3433		
45	−17	1.465966	1.516841	1.567129	−0.05088	0.050288	−1.35648	1.372332	0.103674	37.072	1.176736	−0.34011	9.174183	−31.9753	−14.9753		
46	−16	1.42941	1.479871	1.52983	−0.05046	0.04996	−1.35592	1.369522	0.103668	36.84559	1.163159	−0.31671	8.595633	−29.6202	−13.6202		
47	−15	1.393155	1.44315	1.49272	−0.04999	0.04957	−1.35345	1.365029	0.103538	36.62515	1.149583	−0.29357	8.01544	−27.281	−12.281		
48	−14	1.357155	1.40662	1.455742	−0.04947	0.049122	−1.35085	1.360282	0.103285	36.36379	1.136007	−0.27061	7.441838	−24.9539	−10.9539		
49	−13	1.321544	1.370422	1.419058	−0.04888	0.048636	−1.35064	1.357395	0.102913	36.00923	1.122431	−0.24799	6.886894	−22.648	−9.64804		
50	−12	1.286339	1.334602	1.382684	−0.04826	0.048082	−1.34981	1.354884	0.102426	35.62126	1.108854	−0.22575	6.337437	−20.3662	−8.36619		
51	−11	1.251596	1.29918	1.346666	−0.04758	0.047486	−1.34925	1.352026	0.101828	35.19443	1.095278	−0.2039	5.793581	−18.1097	−7.10972		
52	−10	1.217328	1.264213	1.311042	−0.04688	0.046829	−1.34671	1.348305	0.101125	34.77306	1.081702	−0.18251	5.248639	−15.8822	−5.88224		
53	−9	1.183485	1.229634	1.275774	−0.04615	0.04614	−1.34414	1.344374	0.100318	34.32709	1.068125	−0.16151	4.704979	−13.6795	−4.67946		
54	−8	1.150194	1.195559	1.240971	−0.04537	0.045412	−1.34289	1.341515	0.099415	33.8164	1.054549	−0.14101	4.169859	−11.5088	−3.5088		
55	−7	1.117455	1.162001	1.206656	−0.04455	0.044655	−1.34218	1.338878	0.098422	33.27071	1.040973	−0.12103	3.637674	−9.37108	−2.37108		
56	−6	1.085319	1.129017	1.172881	−0.0437	0.043864	−1.34103	1.335989	0.097344	32.7089	1.027397	−0.10162	3.106823	−7.26995	−1.26995		
57	−5	1.053746	1.096583	1.139632	−0.04284	0.043049	−1.339	1.332429	0.096187	32.14991	1.01382	−0.08276	2.574277	−5.2038	−0.2038		
58	−4	1.022765	1.064718	1.106919	−0.04195	0.042202	−1.33696	1.329065	0.094955	31.5653	1.000244	−0.06447	2.042543	−3.17389	0.82611		
59	−3	0.9924	1.033452	1.074784	−0.04105	0.041331	−1.33533	1.326325	0.093656	30.95213	0.986668	−0.04678	1.511519	−1.18223	1.817772		
60	−2	0.962687	1.002813	1.043261	−0.04013	0.040447	−1.33366	1.323069	0.092295	30.32811	0.973091	−0.02972	0.980008	0.769566	2.769566		
61	−1	0.933615	0.972796	1.012356	−0.03918	0.03956	−1.33295	1.320203	0.090878	29.67857	0.959515	−0.01328	0.447497	2.681724	3.681724		
62	0	0.905206	0.943456	0.982091	−0.03825	0.038634	−1.33066	1.317419	0.089413	29.03408	0.945939	0.002483	−0.08551	4.550763	4.550763		
63	1	0.877409	0.914728	0.952429	−0.03732	0.037701	−1.32741	1.313957	0.087901	28.40214	0.932363	0.017635	−0.62089	6.38081	5.38081		
64	2	0.850303	0.886652	0.923444	−0.03635	0.036792	−1.32669	1.310696	0.08635	27.73211	0.918786	0.032134	−1.15875	8.169337	6.169337		
65	3	0.823872	0.859264	0.895132	−0.03539	0.035868	−1.32588	1.308275	0.084768	27.05253	0.90521	0.045946	−1.69841	9.914018	6.914018		
66	4	0.798087	0.832547	0.867459	−0.03446	0.034913	−1.32336	1.306188	0.083157	26.38178	0.891634	0.059087	−2.23969	11.61596	7.615964		
67	5	0.772993	0.8065	0.840481	−0.03351	0.033981	−1.3208	1.302376	0.081523	25.7276	0.878057	0.071557	−2.78134	13.27519	8.275188		
68	6	0.748525	0.781092	0.814148	−0.03257	0.033057	−1.31856	1.29902	0.07987	25.07016	0.864481	0.08339	−3.32625	14.89379	8.893788		
69	7	0.724743	0.75636	0.788506	−0.03162	0.032146	−1.3181	1.296438	0.078203	24.38792	0.850905	0.094545	−3.87671	16.46925	9.46925		
70	8	0.701596	0.732316	0.763516	−0.03072	0.0312	−1.31503	1.29479	0.076528	23.72592	0.837329	0.105013	−4.42608	18.00093	10.00093		

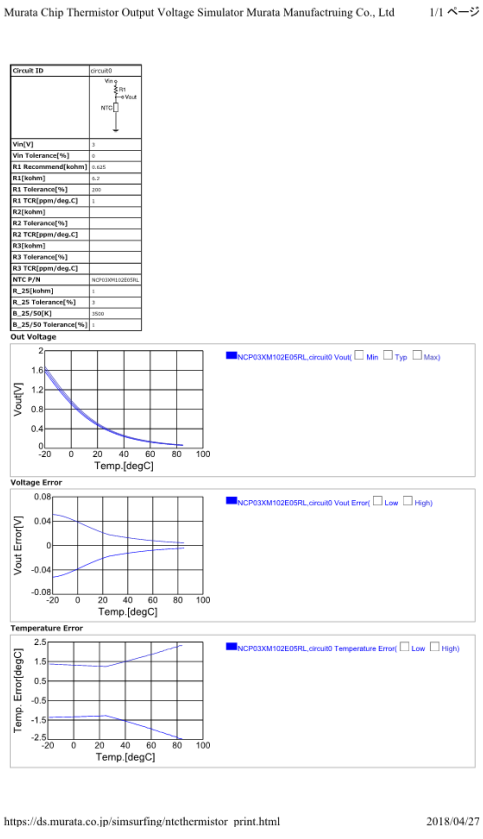
You can also do this by using the icons in each graph.

3. Details of Operation
3-5. Printing

You can print out displayed graphs.



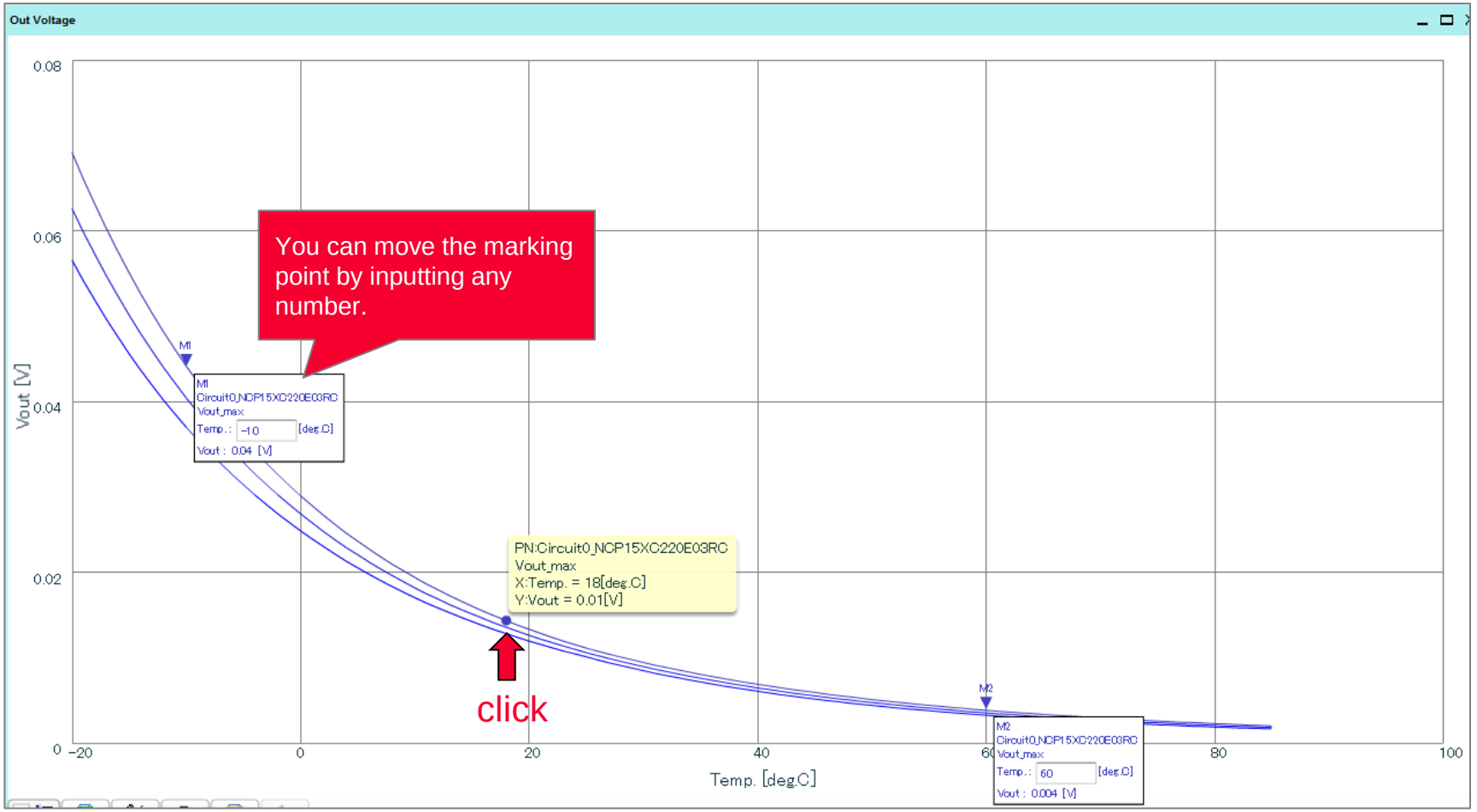
<Example of printout screen>



You can also do this by using the icons in each graph.

3. Details of Operation
3-6. Making a Mark on a Graph

- By clicking a desired point on the graph, you can mark a point you want to measure. The marked position can be canceled by clicking again.

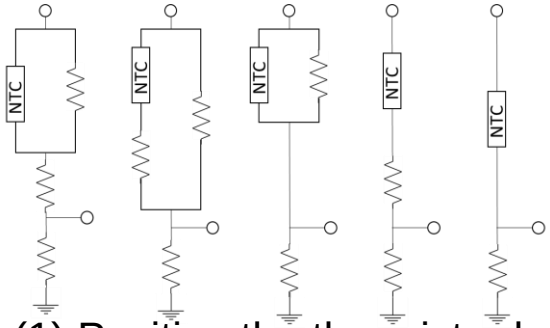


This is the end of the operation manual. To enable maximum usage of the software, techniques and detailed descriptions of operation procedures will be introduced from the next page on.

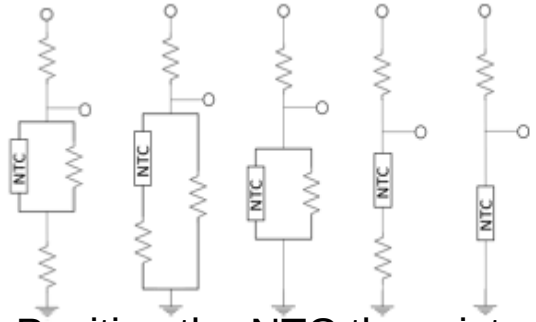
Contents

4. About Circuit Patterns
4-1. NTC Thermistor Positions and Output Voltage

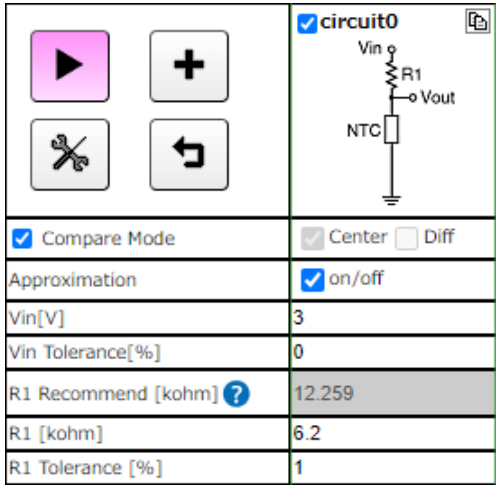
There are 10 types of circuit patterns on Simsurfing that are classified under 2 groups depending on the NTC thermistor position. Furthermore, you can change the output voltage by adding fixed resistors and changing the resistance value.

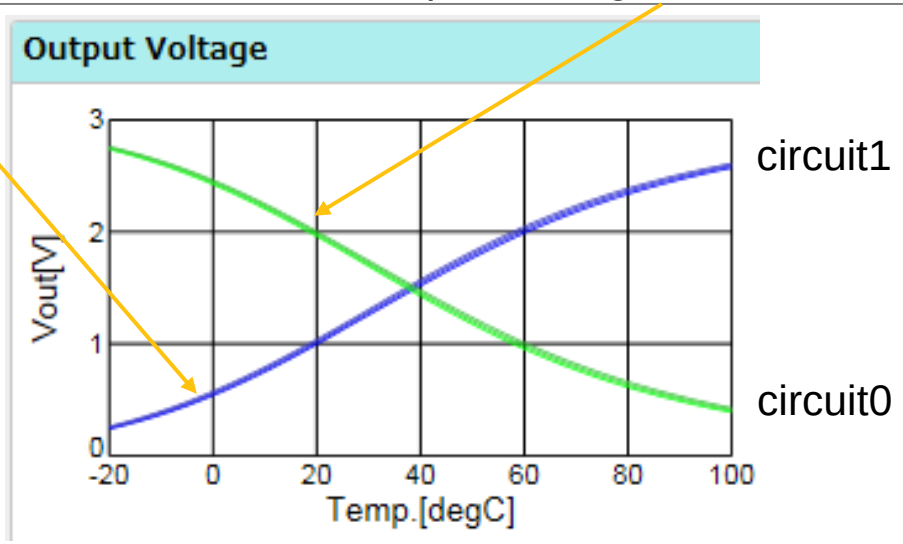


(1) Position the thermistor between Vout-GND
⇒Vout-Temp tilt is positive



(2) Position the NTC thermistor between Vin-Vout
⇒Vout-Temp tilt is negative

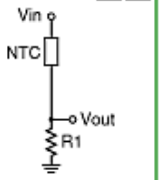
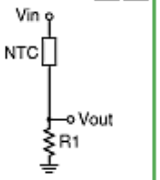
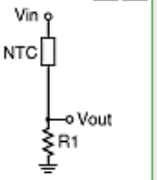


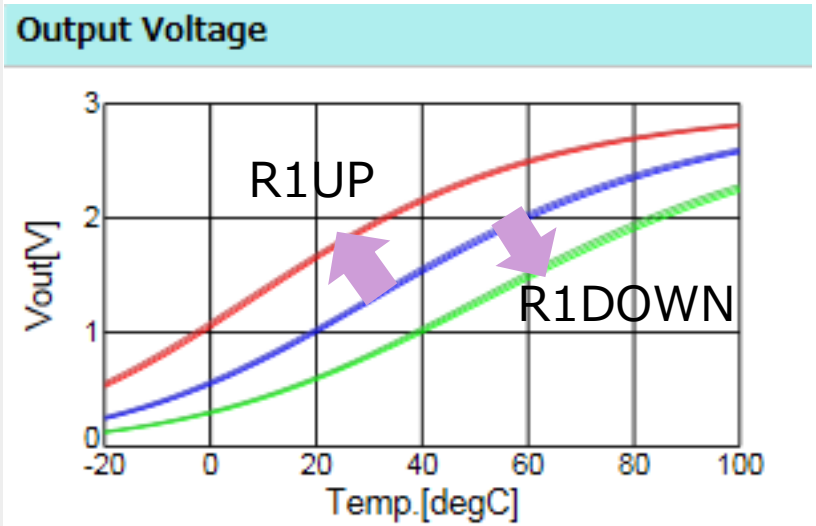


4. About Circuit Patterns
4-2. Effects of Voltage Dividing Resistance Value R1

By changing the voltage dividing resistance R1 parameter, the entire output voltage graph can be moved in the parallel direction.

NTC Thermistor Simulation

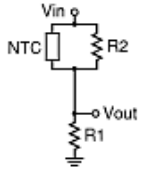
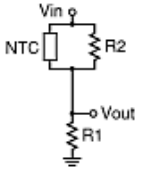
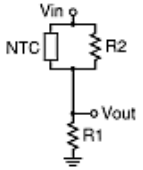
	circuit0	circuit1	circuit2
			
Compare Mode	Center Diff	Center Diff	Center Diff
Approximation	on/off	on/off	on/off
Vin[V]	3	3	3
Vin Tolerance[%]	0	0	0
R1 Recommend [kohm]	4.643	4.643	4.643
R1 [kohm]	6.2	3	15
R1 Tolerance [%]	1	1	1
R1 TCR[ppm/degC]	200	200	200
R2 [kohm]			
R2 Tolerance [%]			
R2 TCR[ppm/degC]			
R3 [kohm]			
R3 Tolerance [%]			
R3 TCR[ppm/degC]			
Thermal Dissipation Constant C [mW/degC]	2.5	2.5	2.5
NTC P/N	NCU15XH103F60RC	NCU15XH103F60RC	NCU15XH103F60RC

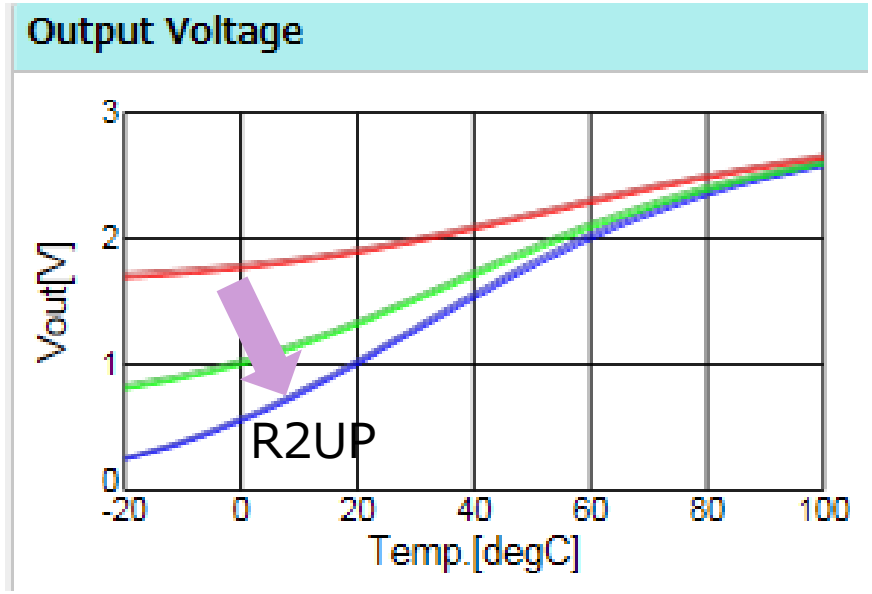


4. About Circuit Patterns
4-3. Effects of Parallel Resistance Value R2

By changing the parallel resistance R2 parameter, the tilting of the output voltage graph can be changed. The higher the R2 value, the output voltage of the lower temperature side becomes smaller.

NTC Thermistor Simulation

	circuit0	circuit1	circuit2
			
Compare Mode	Center Diff	Center Diff	Center Diff
Approximation	on/off	on/off	on/off
Vin[V]	3	3	3
Vin Tolerance[%]	0	0	0
R1 Recommend [kohm]	5.886	5.886	5.886
R1 [kohm]	6.2	6.2	6.2
R1 Tolerance [%]	1	1	1
R1 TCR[ppm/degC]	200	200	200
R2 [kohm]	22	22	22
R2 Tolerance [%]	0 ※	22	5.1
R2 TCR[ppm/degC]	200	200	200
R3 [kohm]			
R3 Tolerance [%]			
R3 TCR[ppm/degC]			

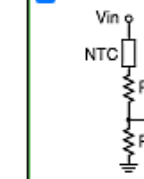
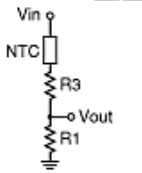
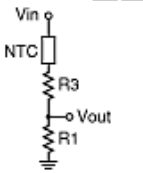


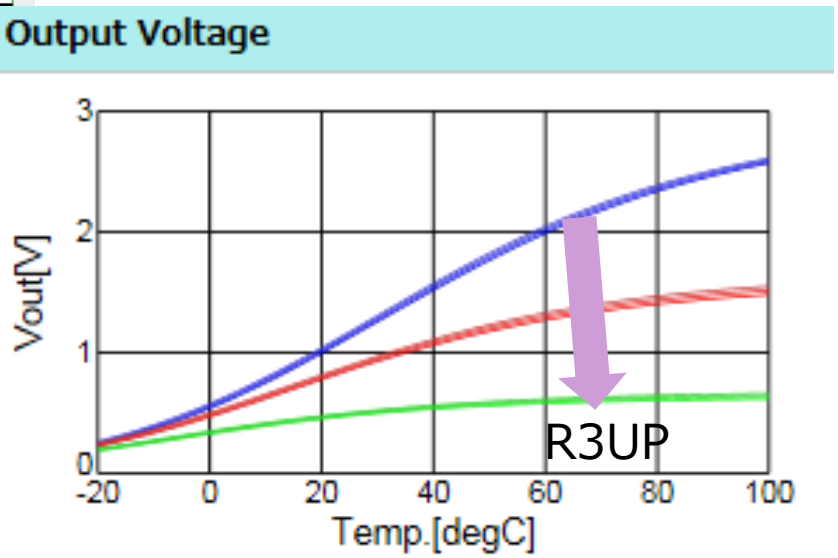
*If “0” is input in R2, the resistance value becomes ∞.
(Open state)

4. About Circuit Patterns
4-4. Effects of Series Resistance Value R3

By changing the series resistance R3 parameter, the tilting of the output voltage graph can be changed. The higher the R3 value, the output voltage of the higher temperature side becomes smaller.

NTC Thermistor Simulation

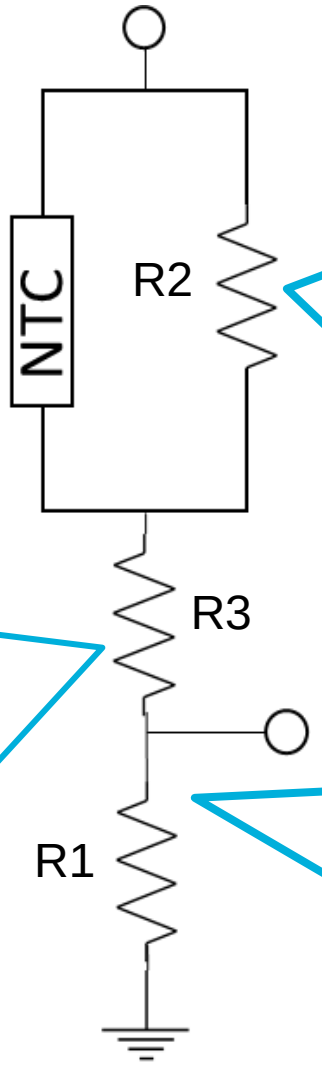
	circuit0	circuit1	circuit2
			
Compare Mode	Center Diff	Center Diff	Center Diff
Approximation	on/off	on/off	on/off
Vin[V]	3	3	3
Vin Tolerance[%]	0	0	0
R1 Recommend [kohm]	4.643		
R1 [kohm]	5.1	5.1	5.1
R1 Tolerance [%]	1	1	1
R1 TCR[ppm/degC]	200	200	200
R2 [kohm]			
R2 Tolerance [%]			
R2 TCR[ppm/degC]			
R3 [kohm]	0 ※	22	5.1
R3 Tolerance [%]	1	1	1
R3 TCR[ppm/degC]	200	200	200
Thermal Dissipation Constant C [mW/degC]	2.5	2.5	2.5
NTC P/N	NCU15XH103F60RC	NCU15XH103F60RC	NCU15XH103F60RC



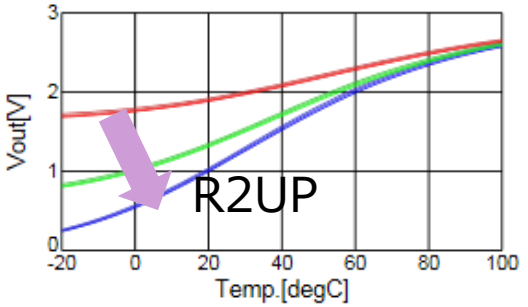
*If “0” is input in R3, the resistance value becomes 0. (Short circuit state)

4. About Circuit Patterns
4-5. Circuit Pattern Summary

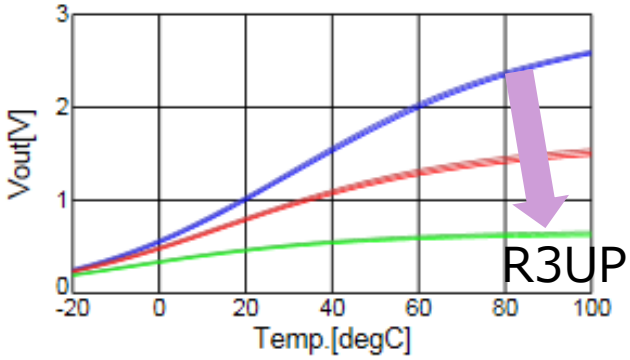
You can change the outline of the output voltage graph by using the voltage dividing resistance R1, parallel resistance R2, and series resistance R3.



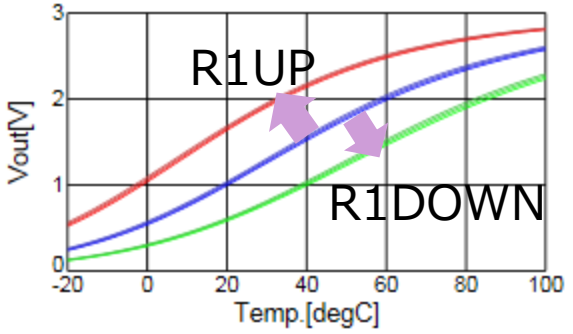
Parallel resistance R2
⇒Related to the Vout size on the low temperature side



Series resistance R3
⇒Related to the Vout size on the high temperature side



Voltage dividing resistance R1
⇒Related to the Vout size



Contents

5. Software Use Examples

5-1-1. Circuit Design Using Series Resistance and Parallel Resistance

Design a circuit that achieves your desired output using this software.

-Design Example 1-

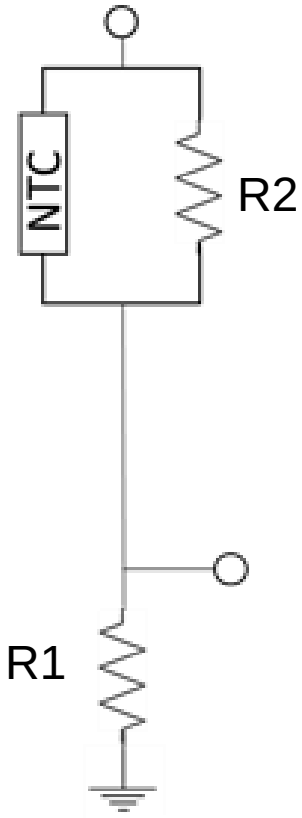
Thermistor used :NCP15XH103F

Circuit : right diagram (voltage dividing resistance R1 + parallel resistance R2)

Operating temperature range:0℃～100℃

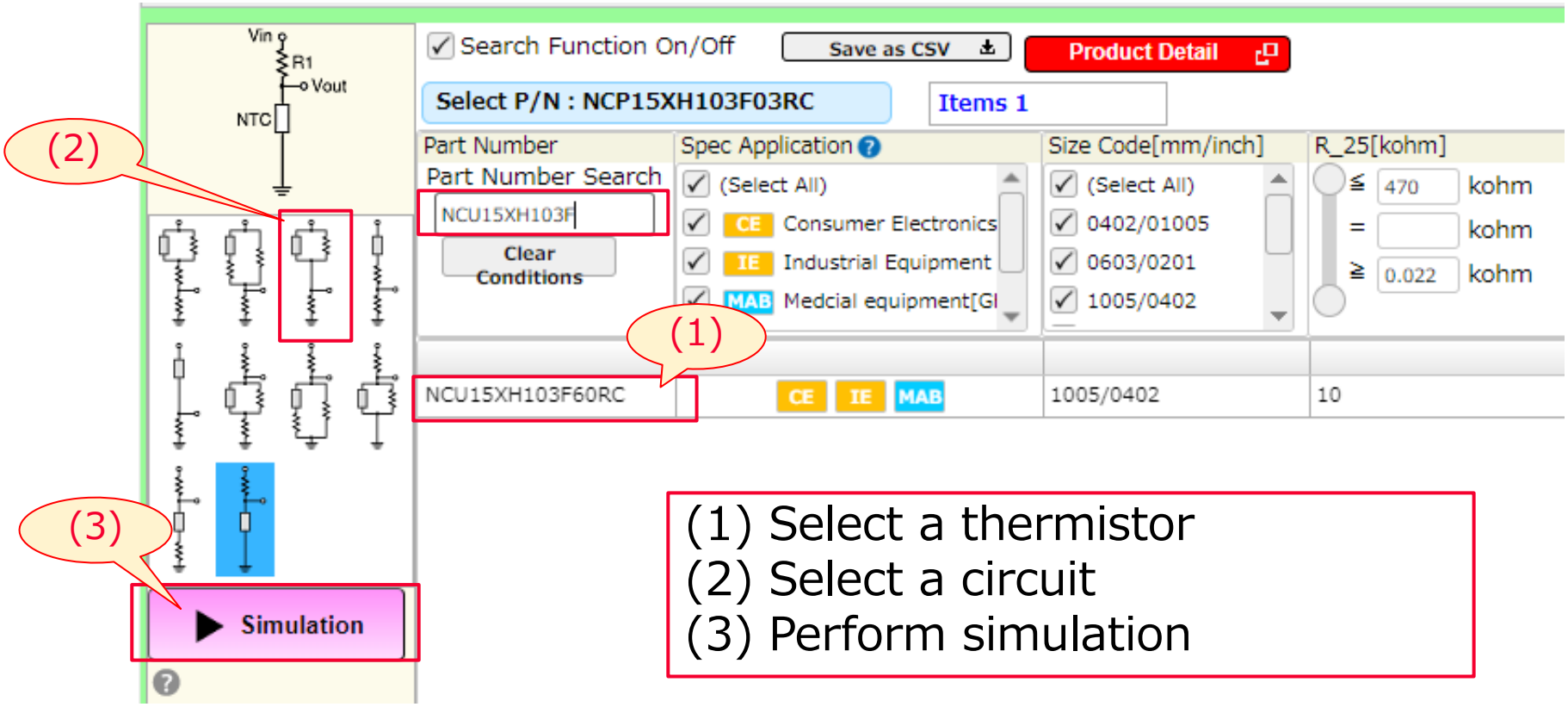
Input voltage Vin :1V(assuming there are no voltage fluctuation)

Output voltage Vout :0.4V@10℃, 0.7V@60℃



5. Software Use Examples
5-1-2. Selection of Circuit, Thermistor used

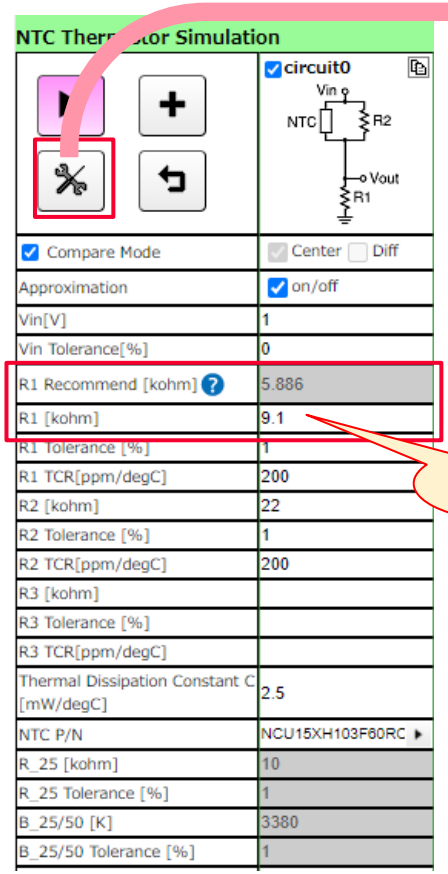
Thermistor used :NCU15XH103F
Circuit :Bottom diagram (voltage dividing resistance R1, parallel resistance R2)
Operating temperature range :0℃～100℃
Input voltage Vin :1V(assuming there are no voltage fluctuation)
Output voltage Vout :0.4V@10℃, 0.7V@60℃

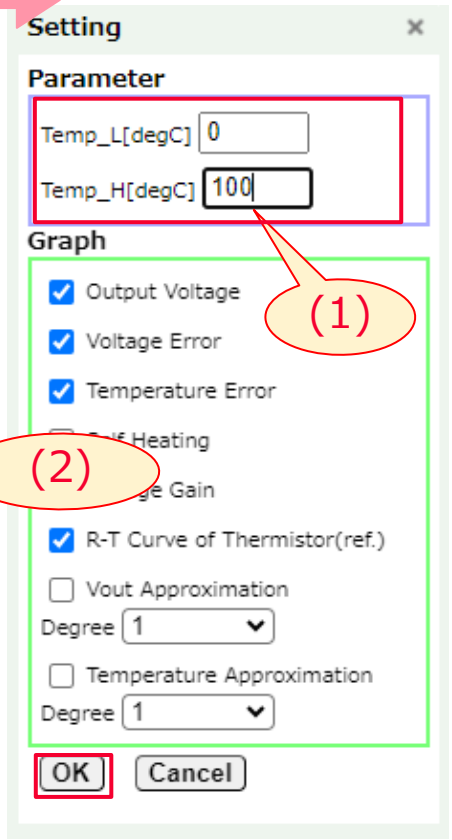


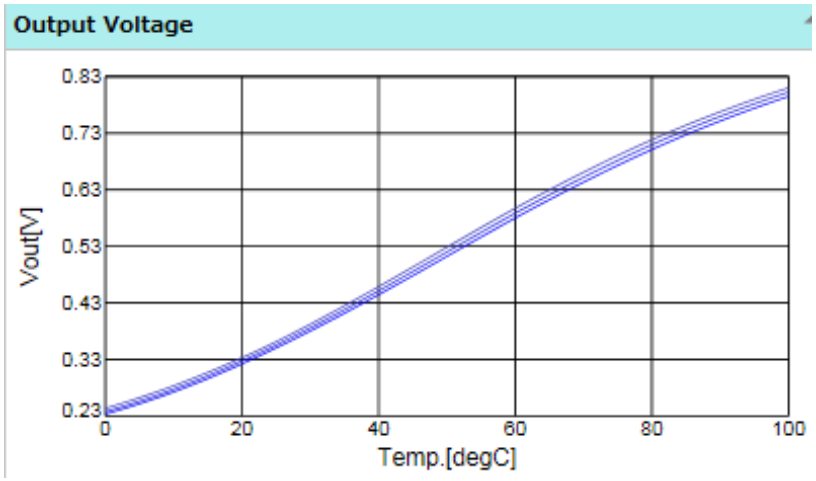
(1) Select a thermistor
(2) Select a circuit
(3) Perform simulation

5. Software Use Examples
5-1-3. Setting the Operating Temperature, Input Voltage

Thermistor used :NCU15XH103F
Circuit :Bottom diagram (voltage dividing resistance R1, parallel resistance R2)
Operating temperature range :0℃～100℃
Input voltage Vin :1V(assuming there are no voltage fluctuation)
Output voltage Vout :0.4V@10℃, 0.7V@60℃





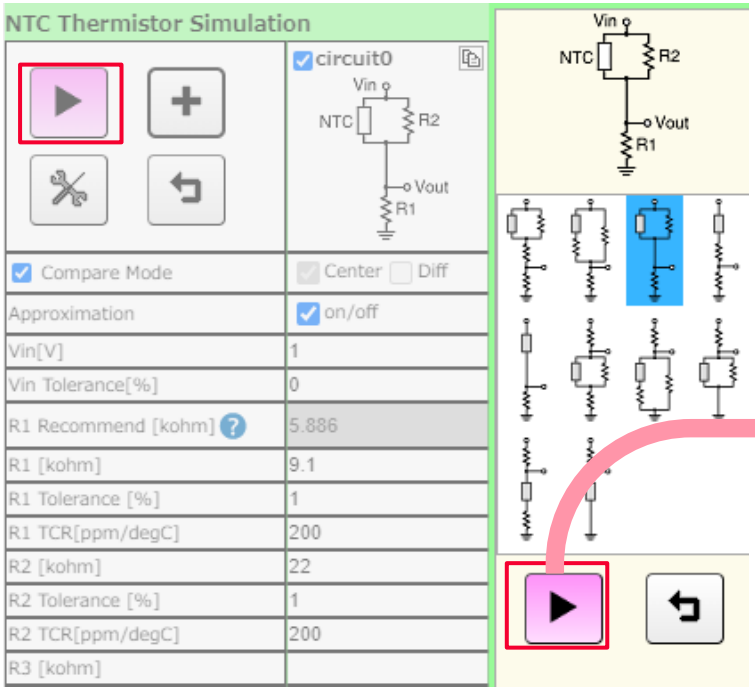


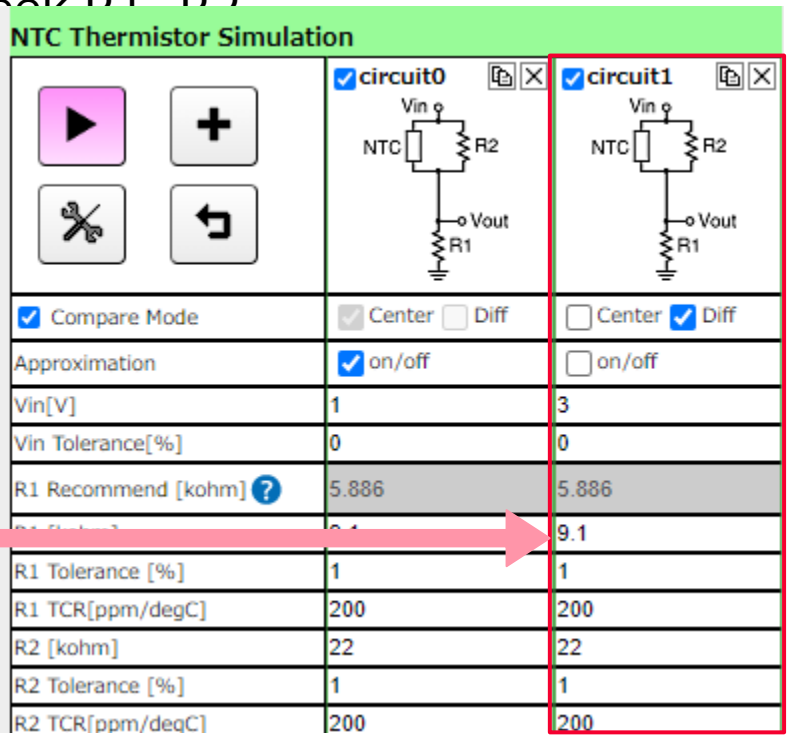
(1) Set the operating temperature range
(2) Set the input voltage
(3) Pressing ▶ displays the simulation result

5. Software Use Examples
5-1-4. Displaying Multiple Circuits

Thermistor used :NCU15XH103F
Circuit :Bottom diagram (voltage dividing resistance R1, parallel resistance R2)
Operating temperature range :0℃～100℃
Input voltage Vin :1V(assuming there are no voltage fluctuation)
Output voltage Vout :0.4V@10℃, 0.7V@60℃

The current R1, R2 does not match your desired Vout.
Press + to display multiple circuits and seek R1, R2 until you find your desired Vout.

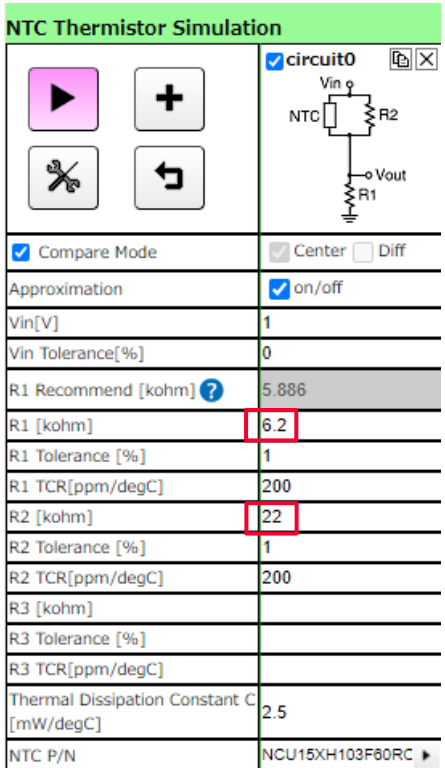


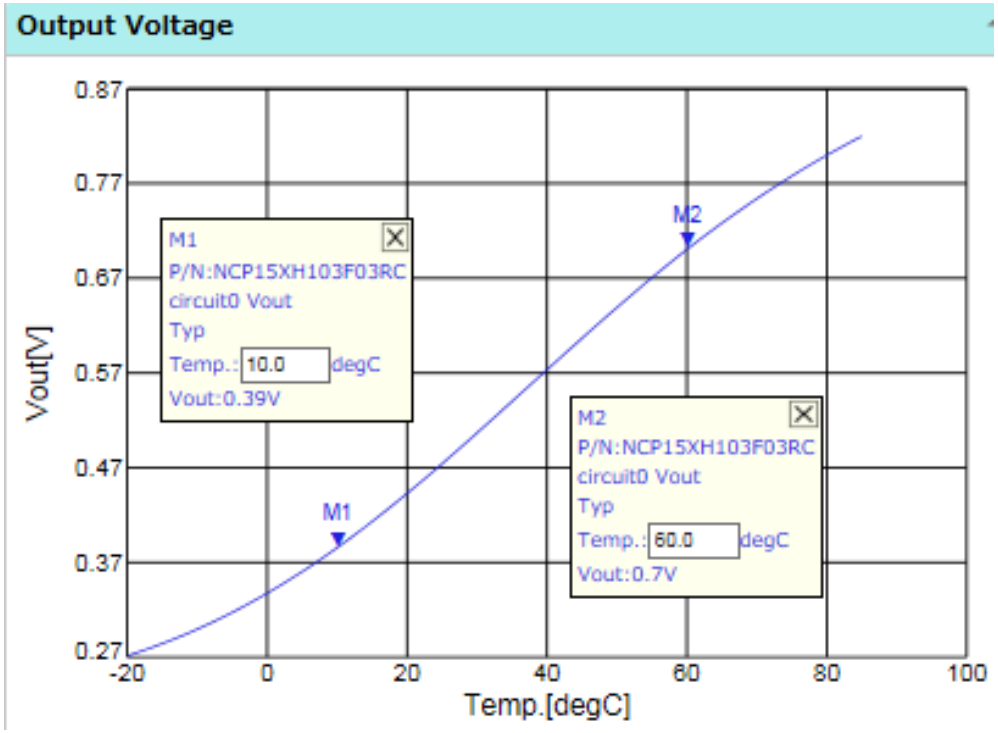


5. Software Use Examples
5-1-5. Correlation Between R1 and Output Voltage

Thermistor used :NCU15XH103F
Circuit :Bottom diagram (voltage dividing resistance R1, parallel resistance R2)
Operating temperature range :0℃～100℃
Input voltage Vin :1V(assuming there are no voltage fluctuation)
Output voltage Vout :0.4V@10℃, 0.7V@60℃

Adjust the R1, R2 value referring to the page 25.
In this case, setting to R1=6.2kΩ, R2=22kΩ will achieve your desired Vout.





5. Software Use Examples
5-2-1. Circuit Design That Maximizes Output Voltage Gain Through Arbitrary Temperature

Next, design a circuit that raises the Vout gain through arbitrary temperatures.

-Design Example2-

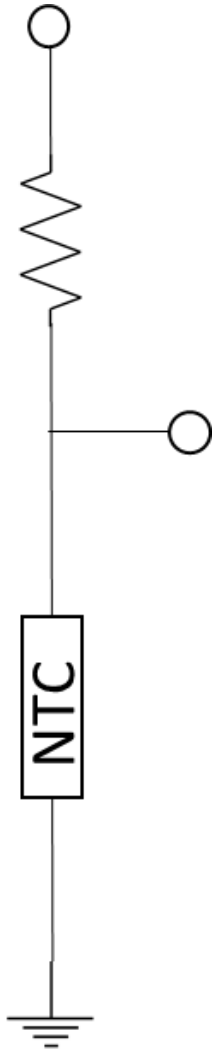
Thermistor used:NCP03WF104F

Circuit : right diagram

Operating temperature range:0℃～60℃

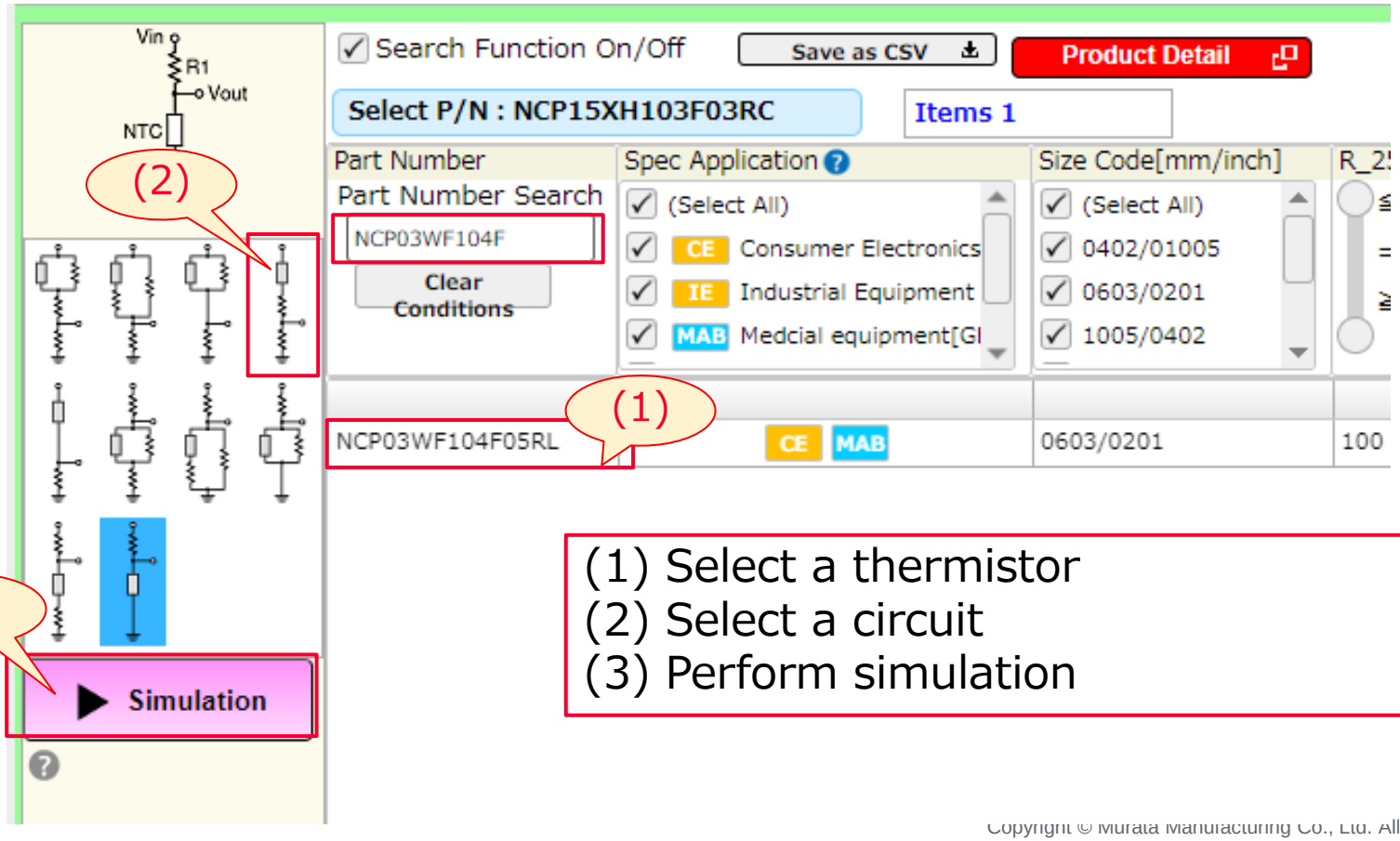
Input voltage Vin :3V(assuming there are no voltage fluctuation)

Circuit Design Condition: Design a circuit in which the output voltage fluctuation rises the most in the 50℃ range



5. Software Use Examples
5-2-2. Selection of Circuit, Thermistor used

Thermistor used :NCP03WF104F
Circuit : Bottom diagram
Operating temperature range :0℃～60℃
Input voltage Vin :3V(assuming there are no voltage fluctuation)
Circuit Design Condition :Circuit in which the output voltage fluctuation rises the most in the 50℃ range

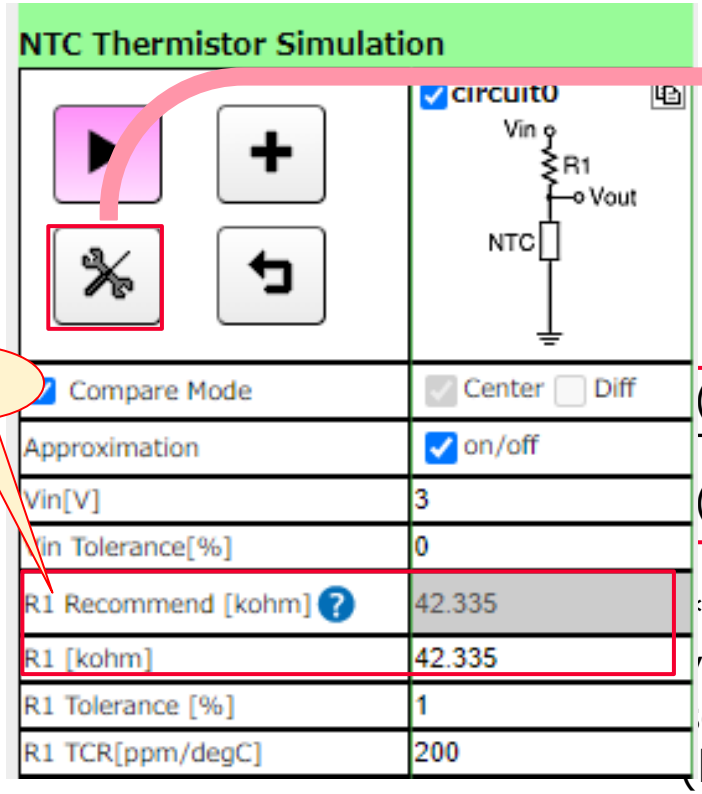


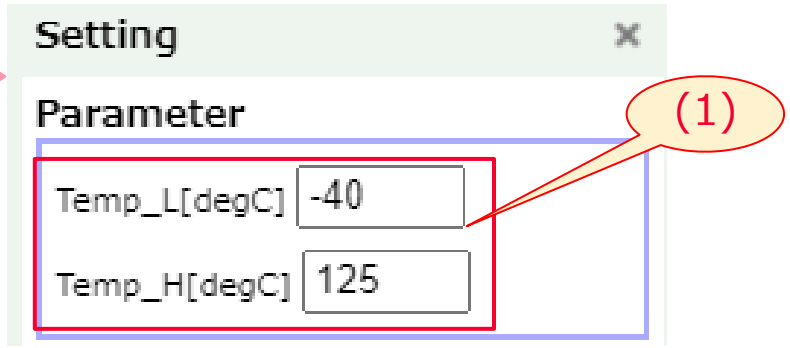
(1) Select a thermistor
(2) Select a circuit
(3) Perform simulation

5. Software Use Examples
5-2-3. Optimizing Fixed Resistance Values

Thermistor used :NCP03WF104F
Circuit : Bottom diagram
Operating temperature range :0℃～60℃
Input voltage Vin :3V(assuming there are no voltage fluctuation)
Circuit Design Condition :Circuit in which the output voltage fluctuation rises the most in the 50℃ range

Seek the R1 in which the voltage fluctuation rises the most in the 50℃ range.





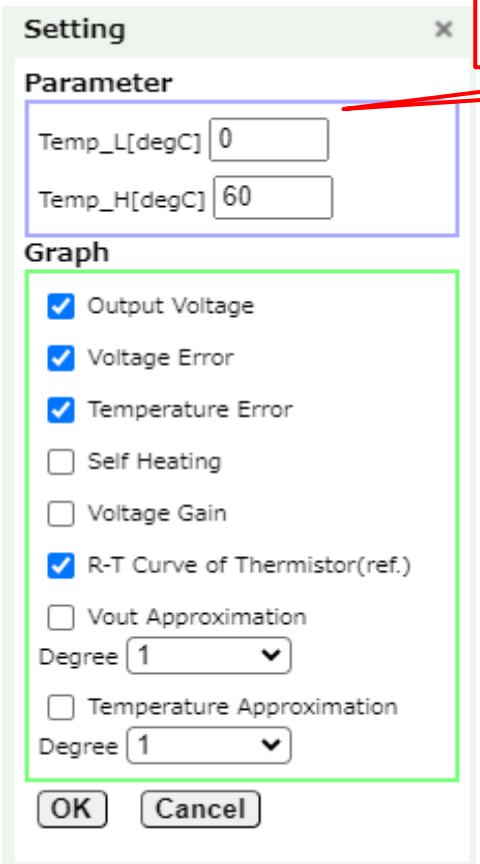
(1) Set the temperature so the center value of Temp_L, Temp_H becomes 50℃.
(2) Set R1 to the same value as R1_Recommend.

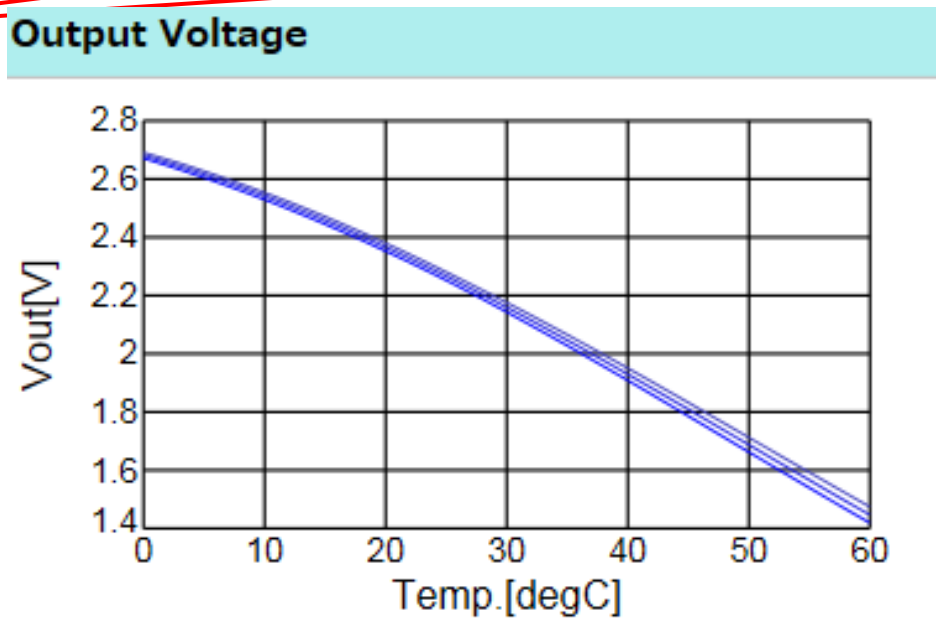
*R_1Recommend indicates the R1 value when the voltage fluctuation of the central value of the selected temperature range rises the most (becomes Vout = 1/2 Vin).

5. Software Use Examples
5-2-4. Changing the Operating Temperature Range

Thermistor used :NCP03WF104F
Circuit : Bottom diagram
Operating temperature range :0℃～60℃
Input voltage Vin :3V(assuming there are no voltage fluctuation)
Circuit Design Condition :Circuit in which the output voltage fluctuation rises the most in the 50℃ range

Change the temperature area again to 0℃ - 60℃.



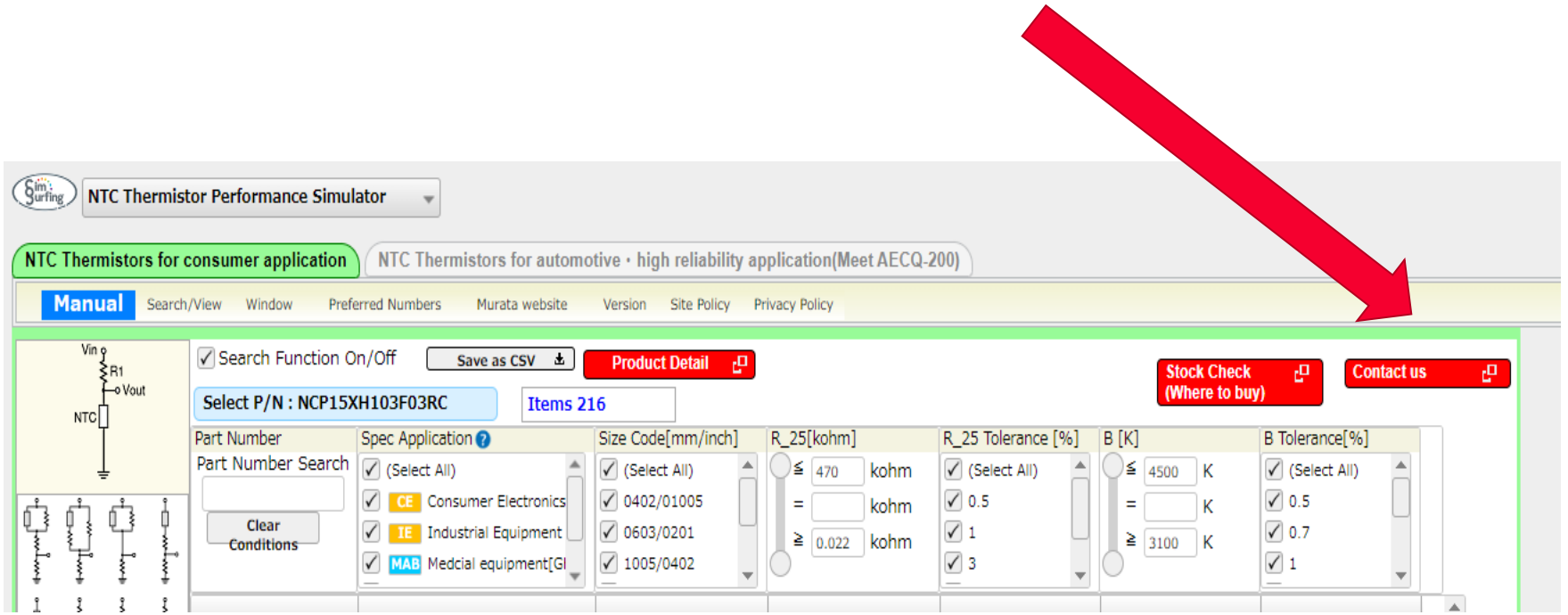


Using the value set previously for R1, a circuit design with a large voltage fluctuation in 50℃ is achieved.

Contents

6. Version Confirmation and Contact Method

- Access the contact form on our website from the following link.



Appendix
Preferred Numbers

E6	E24	E96
10	10	100
		102
		105
		107
	11	110
		113
		115
		118
	12	121
		124
		127
		130
	13	133
		137
		140
		143
15	15	147
		150
		154
		158
	16	162
		165
		169
		174
	18	178
		182
		187
		191
	20	196
		200
		205
		210

E6	E24	E96
22	22	215
		221
		226
		232
	24	237
		243
		249
		255
	27	261
		267
		274
		280
	30	287
		294
		301
		309
33	33	316
		324
		332
		340
	36	348
		357
		365
		374
	39	383
		392
		402
		412
	43	422
		432
		442
		453

E6	E24	E96
47	47	464
		475
		487
		499
	51	511
		523
		536
		549
	56	562
		576
		590
		604
	62	619
		634
		649
		665
68	68	681
		698
		715
		732
	75	750
		768
		787
		806
	82	825
		845
		866
		887
	91	909
		931
		953
		976