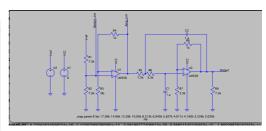


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1.25892541179417E+02	6.72564631319090e-06,-4.62896803815353e-10	5.09189774794880e-09,-3.51543377474304e-13	1.89228882728895e-10,-1.27998265123218e-14
1.35935639087853E+02	6.72564630768701e-06,-4.99824382455441e-10	5.09189774376979e-09,-3.79582934199176e-13	1.89228882575435e-10,-1.38367581183171e-14
1.46779926762207E+02 1.58489319246111E+02	6.72564630126995e-06,-5.39697871111378e-10 6.72564629378821e-06,-5.82752279720762e-10	5.09189773889742e-09,-4.09859711048056e-13 5.09189773321664e-09,-4.42552156002237e-13	1.89228882396509e-10,-1.49552414348700e-14 1.89228882187894e-10,-1.61618698269707e-14
1.58489319246111E+02 1.71132830416178E+02	6.72564629378821e-06,-5.82752279720762e-10 6.72564628506514e-06,-6.29241366205336e-10	5.09189773321664e-09,-4.42552156002237e-13 5.09189772659335e-09,-4.77852954713421e-13	1.89228882187894e-10,-1.61618698269707e-14 1.89228881944665e-10,-1.74637540798088e-14
1.84784979742229E+02	6.72564627489479e-06,-6.79439132090072e-10	5.09189771887115e-09,-5.15970166177918e-13	1.89228881661077e-10,-1.88685673046622e-14
1.99526231496888E+02	6.72564626303703e-06,-7.33641437435088e-10	5.09189770986774e-09,-5.57128449014017e-13	1.89228881330437e-10,-2.03845912097958e-14
2.15443469003188E+02	6.72564624921189e-06,-7.92167744598213e-10	5.09189769937053e-09,-6.01570385554531e-13	1.89228880944936e-10,-2.20207582178401e-14
2.32630506715363E+02	6.72564623309297e-06,-8.55363001106673e-10	5.09189768713169e-09,-6.49557911621855e-13	1.89228880495475e-10,-2.37867135641407e-14
2.51188643150958E+02 2.71227257933203E+02	6.72564621429968e-06,-9.23599672733594e-10 6.72564619238832e-06,-9.97279938762441e-10	5.09189767286222e-09,-7.01373860330386e-13 5.09189765622524e-09,-7.57323629054784e-13	1.89228879971439e-10,-2.56928668965044e-14 1.89228879360458e-10,-2.77504486464964e-14
2.92864456462524E+02		5.09189763682799e-09,-8.17736979436259e-13	1.89228878648105e-10,-2.99715894248325e-14
3.16227766016838E+02		5.09189761421243e-09,-8.82969980923148e-13	1.89228877817562e-10,-3.23693805822565e-14
3.4145488738336E+02	6.72564610232903e-06,-1.25550091572490e-09	5.09189758784463e-09,-9.53407109397443e-13	1.89228876849219e-10,-3.49579528655638e-14
3.68694506451957E+02 3.98107170553497E+02	6.72564606184013e-06,-1.35565866391191e-09 6.72564601463353e-06,-1.46380651293138e-09	5.09189755710202e-09,-1.02946351321987e-12 5.09189752125879e-09,-1.11158746008477e-12	1.89228875720214e-10,-3.77525601563333e-14 1.89228874403889e-10,-4.07696824116417e-14
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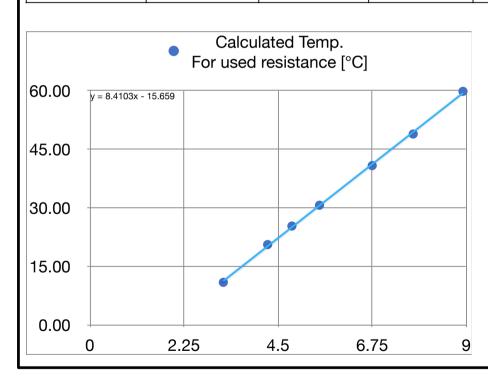
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1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,00 46464E+04 6.71952228314145e-06,-1.98794721440154e-07 5.08724788624168e-09,-1.50959690824822e-10 1.89058118073464e-10,-5.54121639680212e-12 5.84341413373518E+04 6.71850733681748e+08-2.14619827585418e+07 5.08647723312688e+09-1.62976879828723e+10 1.89029616939485e+10.-5.98232629128879e+12 3.63641413731686-06 2718507336817466-06 2.14816927585118-07 508677253173888-06 3.12897889182732-10 1.8800381693885-10 1.8800381693885-10 1.8800381693885-10 1.880038169385-10 46779926762207E+05 6.88086525645520e-08,-5.35954143880545e-07 5.05789618093242e-09,-4.08990335187630e-10 1.87980191675450e-10,-1.49391859596272e-1 1.58489319246111E+05 6.87349548710585e-08,-5.78044789883447e-07 5.05230041327218e-09,-4.38952992811726e-10 1.87774889809942e-10,-1.81124139413524e-1 2819884190884106 | 6.0800300500210 | 6.08.08005002100100-07 | 4.080031190724-09, 48.7070145001100-11 | 1.08003207109441-07 | 1.08003207109440-07 | 1.08003207109440-07 | 1.0800320710940-07 | 1.0800320710940-07 | 1.0800320710940-07 | 1.0800320710940-07 | 1.0800320710940-07 | 1.0800320710940-07 | 1.0800320710940-07 | 1.0800320710940-07 | 1.0800320710940-07 | 1.0800320710940-07 | 1.0800320710940-07 | 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## Thermistor\_Parametric

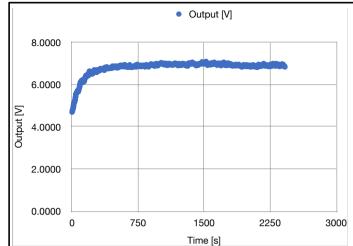
r	Temp. [°C]	V(amp_out)	V(sensor_out)	V(output)
1.796E+04	10	-7.24236E-01	-2.458345E-12	-7.197331E-01
1.496E+04	15	-7.240925E-01	-2.455694E-12	-7.197331E-01
1.209E+04	20	-7.238939E-01	-2.452077E-12	-7.197331E-01
1E+04	25	-7.236841E-01	-2.448326E-12	-7.197331E-01
8.313E+03	30	-7.234463E-01	-2.444155E-12	-7.197331E-01
6.94E+03	35	-7.231783E-01	-2.439555E-12	-7.197331E-01
5.827E+03	40	-7.228822E-01	-2.43459E-12	-7.197331E-01
4.911E+03	45	-7.225551E-01	-2.429243E-12	-7.197331E-01
4.16E+03	50	-7.222007E-01	-2.423603E-12	-7.197331E-01
3.536E+03	55	-7.218173E-01	-2.417673E-12	-7.197331E-01
3.02E+03	60	-7.214108E-01	-2.411571E-12	-7.197331E-01

Preset Temperature[°C]	Sensor resistance for preset Temp. [kΩ]	Measured resistance of used resistor [ $k\Omega$ ]	Calculated Temp. For used resistance [°C]	Output voltage from sensor circuit [V]	Output voltage from measurement circuit [V]
10	17.96	17.78	10.82	0.222	3.19
20	12.09	11.93	20.50	0.299	4.25
25	10.00	9.90	25.26	0.339	4.83
30	8.313	8.09	30.59	0.386	5.49
40	5.827	5.61	40.75	0.477	6.75
50	4.160	4.26	48.85	0.546	7.73
60	3.020	3.00	59.79	0.630	8.92



2.

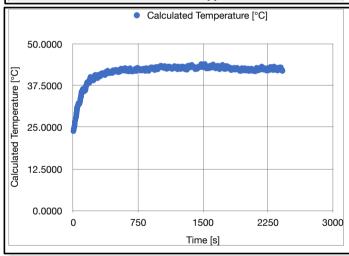
		Calculated Temperature [°C]	Temperature from Response Function [°C]
0	4.6930	23.8105	25.000000000
0.01	4.6954	23.8310	25.0000004229
0.02	4.6921	23.8028	25.0000016920
0.03	4.6954	23.8310	25.0000038083
0.04	4.6924	23.8053	25.0000067726
0.05	4.6964	23.8387	25.0000105857
0.06	4.6930	23.8105	25.0000152487
0.07	4.6951	23.8284	25.0000207623
0.07	4.6924	23.8053	25.0000207023
0.08	4.6957	23.8336	25.0000271274
0.1	4.6939	23.8182	25.0000424156
0.11	4.6954	23.8310	25.0000513405
0.12	4.6933	23.8130	25.0000611203
0.13	4.6957	23.8336	25.0000717561
0.14	4.6936	23.8156	25.0000832486
0.15	4.6960	23.8361	25.0000955988
0.16	4.6930	23.8105	25.0001088075
0.17	4.6970	23.8438	25.0001228756
0.18	4.6936	23.8156	25.0001378040
0.19	4.6964	23.8387	25.0001535936
0.2	4.6927	23.8079	25.0001702452
0.21	4.6973	23.8464	25.0001877598
0.22	4.6927	23.8079	25.0002061381
0.23	4.6960	23.8361	25.0002253812
0.24	4.6930	23.8105	25.0002454899
0.25	4.6957	23.8336	25.0002664650
0.26	4.6939	23.8182	25.0002883075
0.27	4.6964	23.8387	25.0003110183
0.28	4.6924	23.8053	25.0003345982
0.29	4.6960	23.8361	25.0003590482
0.3	4.6927	23.8079	25.0003843691
0.31	4.6967	23.8413	25.000405618
0.32	4.6933	23.8130	25.0004376272
0.33	4.6960	23.8361	25.0004655662
0.34	4.6933	23.8130	25.0004943797
0.35	4.6957	23.8336	25.0005240686
0.36	4.6927	23.8079	25.0005546337
0.37	4.6960	23.8361	25.0005860761
0.38	4.6924	23.8053	25.0006183966
0.39	4.6964	23.8387	25.0006515960
0.4	4.6933	23.8130	25.0006856753
0.41	4.6967	23.8413	25.0007206354
0.42	4.6930	23.8105	25.0007564772
0.43	4.6960	23.8361	25.0007304772
0.44	4.6927	23.8079	25.0008308094
0.45	4.6967	23.8413	25.0008693016
0.46	4.6936	23.8156	25.0009086791
0.47	4.6973	23.8464	25.0009489428
0.48	4.6933	23.8130	25.0009900936
0.49	4.6957	23.8336	25.0010321324
0.5	4.6924	23.8053	25.0010750602
0.51	4.6973	23.8464	25.0011188777
0.52	4.6939	23.8182	25.0011635860
0.53	4.6960	23.8361	25.0012091859
0.54	4.6939	23.8182	25.0012556784
0.55	4.6939	23.8413	25.0012536764
0.56		23.8413	
	4.6933		25.0013513446
0.57	4.6973	23.8464	25.0014005202
0.58	4.6930	23.8105	25.0014505920
0.59	4.6960	23.8361	25.0015015610
0.6	4.6945	23.8233	25.0015534279
0.61	4.6964	23.8387	25.0016061938
0.62	4.6930	23.8105	25.0016598595
0.63	4.6976	23.8490	25.0017144261
0.64	4.6924	23.8053	25.0017698943
0.65	4.6967	23.8413	25.0017.030340
0.66	4.6936	23.8413	25.0018262632 25.0018835396
0.67	4.6973	23.8464	25.0019417184
0.68	4.6942	23.8207	25.0020008027
0.69	4.6973	23.8464	25.0020607932



The graph demonstrates the measurement circuit's response to temperature changes.

3.

The initial rapid response followed by a steady-state indicates that the measurement circuit and thermistor have good thermal response characteristics, effectively measuring and recording temperature changes.



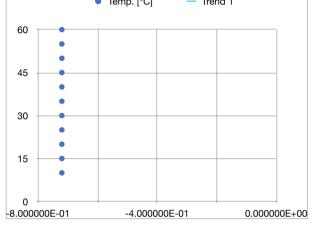
The graph demonstrates the measurement circuit's response to temperature changes. The initial rapid increase followed by a steady state indicates that the measurement circuit and thermistor have good thermal response characteristics, effectively measuring and recording temperature changes. The linear calibration function used to derive temperature from voltage shows a consistent and predictable relationship between the two variables.

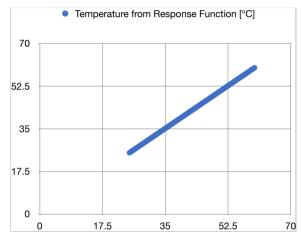
_	,.	Pa	rametric Analysis of De	signed Circuit
		Tomp [°C]	Wamp out)	V/eanear out

	r	Temp. [°C]	V(amp_out)	V(sensor_out)	V(output)
1.	.796E+04	10	-7.24236E-01	-2.458345E-12	-7.197331E-01
1.	.496E+04	15	-7.240925E-01	-2.455694E-12	-7.197331E-01
1.	.209E+04	20	-7.238939E-01	-2.452077E-12	-7.197331E-01
	1E+04	25	-7.236841E-01	-2.448326E-12	-7.197331E-01
8	.313E+03	30	-7.234463E-01	-2.444155E-12	-7.197331E-01
6	6.94E+03	35	-7.231783E-01	-2.439555E-12	-7.197331E-01

0.7	4.6951	23.8284	25.0021216910
0.71	4.6951	23.8284	25.0021216910 25.0021834969
0.71	4.6965	23.8284	25.0021634969
0.72	4.6982	23.8541	25.0022402119
0.74	4.6954	23.8310	25.0023743729
0.75	4.6982	23.8541	25.0024398207
0.76	4.6945	23.8233	25.0025061813
0.77	4.6979	23.8515	25.0025734556
0.78	4.6951	23.8284	25.0026416445
0.79	4.6991	23.8618	25.0027107490
0.8	4.6951	23.8284	25.0027807701
0.81	4.6982	23.8541	25.0028517086
0.82	4.6951	23.8284	25.0029235654
0.83	4.6988	23.8592	25.0029963416
0.84	4.6948	23.8259	25.0030700380
0.85	4.6979	23.8515	25.0031446556
0.86	4.6951	23.8284	25.0032201954
0.87	4.6976	23.8490	25.0032966581
0.88	4.6951	23.8284	25.0033740449
0.89	4.6973	23.8464	25.0034523566
0.9	4.6948	23.8259	25.0035315942
0.91	4.6988	23.8592	25.0036117586
0.92	4.6948 4.6994	23.8259 23.8644	25.0036928508 25.0037748716
0.93	4.6994	23.8644	25.003/748/16
0.94	4.6964	23.8387	25.0038578221
0.95	4.6991	23.8413	25.0039417032
0.97	4.6988	23.8592	25.0040203139
0.98	4.6960	23.8361	25.0041989395
0.99	4.6988	23.8592	25.0042865525
1	4.6960	23.8361	25.0043751007
1.01	4.6988	23.8592	25.0044645852
1.02	4.6951	23.8284	25.0045550070
1.03	4.6994	23.8644	25.0046463669
1.04	4.6954	23.8310	25.0047386660
1.05	4.6994	23.8644	25.0048319051
1.06	4.6948	23.8259	25.0049260853
1.07	4.6979	23.8515	25.0050212074
1.08	4.6951	23.8284	25.0051172725
1.09	4.6997	23.8669	25.0052142815
1.1	4.6954	23.8310	25.0053122354
1.11	4.6994	23.8644	25.0054111351
1.12	4.6951	23.8284	25.0055109815
1.13	4.6994	23.8644	25.0056117757
1.14	4.6954	23.8310	25.0057135186
1.15	4.6994	23.8644	25.0058162112
1.16	4.6964	23.8387	25.0059198544
1.17	4.6982 4.6954	23.8310	25.0060244491 25.0061299965
1.19	4.6934	23.8592	25.0061299905
1.19	4.6964	23.8387	25.0062364973
1.21	4.6997	23.8669	25.0063439320
1.22	4.6960	23.8361	25.0065617305
1.23	4.6994	23.8644	25.0066720551
1.24	4.6954	23.8310	25.0067833380
1.25	4.7006	23.8746	25.0068955802
1.26	4.6960	23.8361	25.0070087827
1.27	4.6994	23.8644	25.0071229465
1.28	4.6960	23.8361	25.0072380726
1.29	4.7000	23.8695	25.0073541618
1.3	4.6960	23.8361	25.0074712152
1.31	4.6994	23.8644	25.0075892338
1.32	4.6957	23.8336	25.0077082185
1.33	4.7000	23.8695	25.0078281704
1.34	4.6964	23.8387	25.0079490903
1.35	4.6997	23.8669	25.0080709793
1.36	4.6973	23.8464	25.0081938384
1.37	4.7003	23.8721	25.0083176685
1.38	4.6970	23.8438	25.0084424706
1.39	4.7000	23.8695	25.0085682457
1.4	4.6976	23.8490	25.0086949948

60		Temp. [°C]	— Trend T	
		Tomp [°C]	— Trend 1	
3.02E+03	60	-7.214108E-01	-2.411571E-12	-7.197331E-01
3.536E+03	55	-7.218173E-01	-2.417673E-12	-7.197331E-01
4.16E+03	50	-7.222007E-01	-2.423603E-12	-7.197331E-01
4.911E+03	45	-7.225551E-01	-2.429243E-12	-7.197331E-01
5.827E+03	40	-7.228822E-01	-2.43459E-12	-7.197331E-01





The equivalent circuit model uses resistors and capacitors to simulate thermal flow behavior, reflecting how a sensor responds to changes in temperature. This model includes the thermal resistance and capacitance of both the measurement environment and the sensor itself. By comparing the theoretical response curve with experimental data, we find that the trends are generally consistent, indicating that the model can effectively simulate real-world conditions. Discrepancies at certain points may be due to measurement errors or environmental changes, but overall, the response model provides a useful tool for predicting and understanding sensor behavior.

The response model has significant applications in sensor design and optimization, system tuning, and fault diagnosis. It helps improve designs, enhance performance, ensure the stability and accuracy of sensors in various environments, and diagnose sensor faults by comparing actual data with model predictions.

In summary, the response model is highly effective in analyzing and applying sensors. By understanding and predicting sensor behavior, it provides crucial support for design and application. These results highlight the importance of the response model in sensor analysis.