

NTC Thermistors, Flex Foil Sensors


RoHS
COMPLIANT

FEATURES

- Rapid response time on surface down to 2 s
- Suitable for narrow space applications
- High flexibility of the foil
- Insulated and humidity resistant
- A strain relief hole is included in the flex design to avoid traction to the sensor head
- Gold plated terminations
- AEC-Q200 qualified
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912

APPLICATIONS

- Consumer appliances and white goods
- Power supply (heat-sinks)
- Battery, displays, LED
- Industrial applications, robotics
- Boilers
- EV and HV batteries

DESCRIPTION

- Miniature NTC temperature sensor on flex foil, insulated used for temperature sensing and control
- Surface temperature sensor with low thermal mass and rapid response time on surface

MOUNTING

- The sensor head can be pressed on the surface with means of insulating material (silicone foam) or spring
- The sensor head can also be glued with a double-face temperature resistant adhesive
- The sensor end can be connected to PCB counter-connector or wire-to-wire connector or soldered to conductors, or crimped with FFC connectors and ZIF connectors
- Remark: The response time and thermal gradient are dependant of the application and of the way of mounting the sensor in place
- A mating connector can be for example a 0.5 mm pitch 7 poles connector for FPC, with top contacts, accepting 4 mm FPC width, ZIF or non-ZIF versions. The poles (1 + 2) and (6 + 7) can be used for the electrical connection. For example in SMT versions : TE 1734839-7, Hirose FH34S-7S-0,5SH(50), Molex 054550-0771, Molex 052745-0797

QUICK REFERENCE DATA

PARAMETER	VALUE	UNIT
Resistance value at 25 °C	10K, 47K	Ω
Tolerance on R_{25} -value	± 3	%
$B_{25/85}$ -value	3960	K
Tolerance on $B_{25/85}$ -value	± 1	%
Operating temperature range at zero power	-40 to +125	°C
Thermal time constant on heating ⁽¹⁾	2	s
Thermal gradient	< 0.02	K/K
Minimum dielectric withstanding voltage ⁽²⁾	500	V _{AC}
Minimum insulation resistance	10	MΩ
Maximum dissipation at 25 °C	60	mW
Climatic category (LCT/UCT/days)	40/125/56	
Weight (without connector)	0.06	g

Notes

- (1) Measured from 25 °C air to 125 °C heated plate, pressed on the surface
- (2) HV Resistance up to 4 kV_{AC} between the NTC and the bottom stiffener

DESIGNERS OPTIONS

- Other dimensions and various shapes of the flex circuit are available on request
- A 3D solid model is available on request

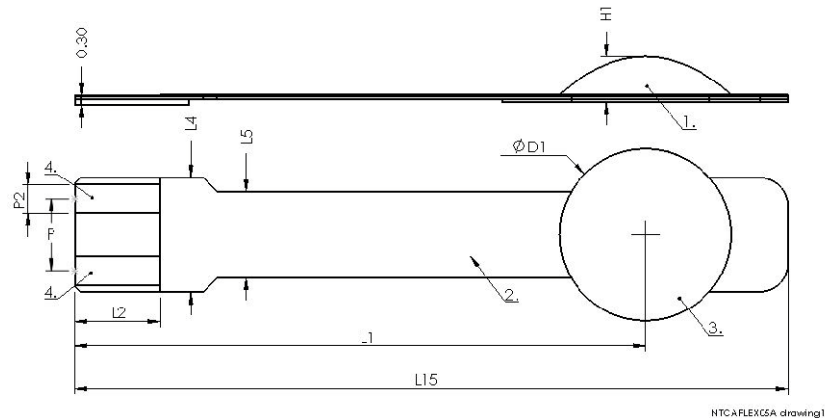
Note

- FFC/FPC = Flexible Film Circuit/Flexible Printed Circuit

ELECTRICAL DATA AND ORDERING INFORMATION

VISHAY SAP ORDERING NUMBER	R_{25} -VALUE (Ω)	R_{25} TOL. (± %)	$B_{25/85}$ -VALUE (K)	$B_{25/85}$ TOL. (± %)	DESCRIPTION	R/T TABLE
NTCAFLEX05103HH	10 000	3	3960	1	NTC Flex05 10K 3 % 3960 K 25 mm	Table 1
NTCAFLEX05473HH	47 000	3	3960	1	NTC Flex05 47K 3 % 3960 K 25 mm	Table 2
NTCAFLEX05124FM	122 000	1	3590	1	NTC Flex05 122K 1 % 3590 K 25 mm	Table 3

SAP CODIFICATION							
Part Number: NTCAFLEX01473HH							
<div style="display: flex; justify-content: space-around; font-weight: bold; font-size: 1.2em;"> NTCAFLEX05473HH </div>							
MODEL	ASSEMBLY	FLEX SENSOR	MECHANICAL EXECUTION	RESISTANCE VALUE	TOLERANCE ON R_{25}	B-VALUE RANGE	OPTION
NTC	A	FLEX	05	103 = $10 \times 10^3 \Omega$ 473 = $47 \times 10^3 \Omega$ 124 = $12.2 \times 10^3 \Omega$	H = $\pm 3 \%$ F = $\pm 1 \%$	L (low) = $3000 \leq B_{25/85} < 3500$ M (medium) = $3500 \leq B_{25/85} < 3750$ H (high) = $3750 \leq B_{25/85} < 4000$ X (very high) = $4000 \leq B_{25/85} < 4250$	Blank

MECHANICAL DATA


DIMENSIONS in millimeters								
L1	L15	L2	ØD1	L4	L5	H1	P	P2
20 ± 1	25 ± 1	3 ± 0.5	6 ± 0.5	4 ± 1	3 ± 1	1.40 ± 0.2	2.50	1

1. NTC on flex foil circuit
2. Flex foil circuit
3. High quality modified epoxy glob top
4. Conductive tracks

RELIABILITY TEST (following IEC 60068 test methods)		
TEST	PROCEDURE	REQUIREMENT
Dry heat, steady state	125 °C; 1000 h	$\Delta R/R \leq 3 \%$
Damp heat, steady state	56 days at 40 °C 90 % to 95 % RH	$\Delta R/R \leq 3 \%$
Rapid change of temperature	-40 °C to +125 °C; 100 cycles	$\Delta R/R \leq 3 \%$

**R/T TABLE 1**

R_{25} -VALUE (k Ω)	R_{25} TOL. (%)	$B_{25/85}$ -VALUE (K)	$B_{25/85}$ TOL. (%)	SAP MATERIAL NO.
10	± 3	3960	± 1	NTCAFLEX05103HH

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES

TEMP. (°C)	$R_{(T)}/R_{25}$	RESISTANCE (Ω)	$\Delta R/R$ (%)	α (%/K)	ΔT (K)	$R_{min.}$ (Ω)	$R_{max.}$ (Ω)
-40	34.7116	347 116	10.8031	-6.66	1.62	309 617	384 616
-35	25.0089	250 089	10.0392	-6.45	1.56	224 982	275 196
-30	18.2023	182 023	9.3093	-6.25	1.49	165 078	198 968
-25	13.3804	133 804	8.6110	-6.06	1.42	122 282	145 326
-20	9.9313	99 313	7.9424	-5.87	1.35	91 425	107 201
-15	7.4408	74 408	7.3017	-5.68	1.28	68 974	79 841
-10	5.6257	56 257	6.6871	-5.50	1.22	52 495	60 019
-5	4.2910	42 910	6.0971	-5.33	1.14	40 294	45 526
0	3.3009	33 009	5.5303	-5.16	1.07	31 184	34 835
5	2.5602	25 602	4.9853	-5.00	1.00	24 326	26 879
10	2.0015	20 015	4.4608	-4.85	0.92	19 122	20 908
15	1.5767	15 767	3.9558	-4.70	0.84	15 143	16 391
20	1.2512	12 512	3.4692	-4.55	0.76	12 078	12 946
25	1.0000	10 000	3.0000	-4.41	0.68	9700.0	10 300
30	0.8047	8046.8	3.2266	-4.28	0.75	7787.1	8306.4
35	0.6518	6517.6	3.4459	-4.15	0.83	6293.1	6742.2
40	0.5313	5312.5	3.6581	-4.03	0.91	5118.2	5506.9
45	0.4357	4356.6	3.8637	-3.91	0.99	4188.3	4524.9
50	0.3594	3593.6	4.0629	-3.79	1.07	3447.6	3739.6
55	0.2981	2981.0	4.2560	-3.68	1.16	2854.1	3107.8
60	0.2486	2486.2	4.4434	-3.58	1.24	2375.7	2596.6
65	0.2084	2084.3	4.6252	-3.48	1.33	1987.9	2180.7
70	0.1756	1756.2	4.8017	-3.38	1.42	1671.9	1840.5
75	0.1487	1486.9	4.9732	-3.28	1.52	1412.9	1560.8
80	0.1265	1264.7	5.1397	-3.19	1.61	1199.7	1329.7
85	0.1081	1080.6	5.3017	-3.10	1.71	1023.3	1137.9
90	0.0927	927.23	5.6204	-3.02	1.86	875.11	979.34
95	0.0799	798.94	5.9309	-2.94	2.02	751.56	846.33
100	0.0691	691.16	6.2335	-2.86	2.18	648.08	734.25
105	0.0600	600.23	6.5286	-2.78	2.35	561.04	639.42
110	0.0523	523.20	6.8163	-2.71	2.51	487.53	558.86
115	0.0458	457.68	7.0970	-2.64	2.69	425.20	490.17
120	0.0402	401.76	7.3709	-2.57	2.86	372.15	431.37
125	0.0354	353.85	7.6383	-2.51	3.05	326.82	380.87



R/T TABLE 2				
R₂₅-VALUE (kΩ)	R₂₅ TOL. (%)	B_{25/85}-VALUE (K)	B_{25/85} TOL. (%)	SAP MATERIAL NO.
47	± 3	3960	± 1	NTCAFLEX05473HH

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES							
TEMP. (°C)	R_(T)/R₂₅	RESISTANCE (Ω)	ΔR/R (%)	α (%/K)	ΔT (K)	R_{min.} (Ω)	R_{max.} (Ω)
-40	34.972	1 643 693	10.803	-6.85	1.58	1 466 123	1 821 262
-35	24.997	1 174 859	10.039	-6.59	1.52	1 056 912	1 292 806
-30	18.095	850 461	9.3093	-6.34	1.47	771 290	929 633
-25	13.256	623 018	8.6110	-6.11	1.41	569 370	676 666
-20	9.8204	461 557	7.9424	-5.89	1.35	424 898	498 216
-15	7.3528	345 583	7.3017	-5.69	1.28	320 350	370 816
-10	5.5607	261 354	6.6871	-5.49	1.22	243 877	278 831
-5	4.2455	199 536	6.0971	-5.31	1.15	187 370	211 702
0	3.2705	153 714	5.5303	-5.13	1.08	145 213	162 215
5	2.5410	119 427	4.9853	-4.97	1.00	113 473	125 381
10	1.9902	93 541	4.4608	-4.81	0.93	89 369	97 714
15	1.5709	73 832	3.9558	-4.66	0.85	70 911	76 752
20	1.2490	58 703	3.4692	-4.52	0.77	56 666	60 739
25	1.0000	47 000	3.0000	-4.38	0.69	45 590	48 410
30	0.8060	37 881	3.2266	-4.25	0.76	36 659	39 103
35	0.6537	30 726	3.4459	-4.13	0.84	29 667	31 784
40	0.5335	25 073	3.6581	-4.01	0.91	24 156	25 990
45	0.4378	20 579	3.8637	-3.89	0.99	19 784	21 374
50	0.3614	16 984	4.0629	-3.79	1.07	16 294	17 674
55	0.2998	14 092	4.2560	-3.68	1.16	13 492	14 692
60	0.2500	11 751	4.4434	-3.58	1.24	11 229	12 274
65	0.2095	9847.6	4.6252	-3.49	1.33	9392.1	10 303
70	0.1764	8290.7	4.8017	-3.40	1.41	7892.6	8688.8
75	0.1492	7011.4	4.9732	-3.31	1.50	6662.7	7360.1
80	0.1267	5955.0	5.1397	-3.22	1.59	5648.9	6261.1
85	0.1081	5078.7	5.3017	-3.14	1.69	4809.5	5348.0
90	0.0925	4348.7	5.6204	-3.07	1.83	4104.3	4593.1
95	0.0795	3737.8	5.9309	-2.99	1.98	3516.1	3959.5
100	0.0686	3224.6	6.2335	-2.92	2.14	3023.6	3425.7
105	0.0594	2791.8	6.5286	-2.85	2.29	2609.5	2974.1
110	0.0516	2425.3	6.8163	-2.78	2.45	2260.0	2590.7
115	0.0450	2113.9	7.0970	-2.72	2.61	1963.9	2264.0
120	0.0393	1848.4	7.3709	-2.65	2.78	1712.1	1984.6
125	0.0345	1621.2	7.6383	-2.59	2.95	1497.3	1745.0

**R/T TABLE 3**

R_{25} -VALUE (k Ω)	R_{25} TOL. (%)	$B_{25/85}$ -VALUE (K)	$B_{25/85}$ TOL. (%)	SAP MATERIAL NO.
122	± 1	3560	± 1	NTCAFLEX05124FM

RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES

TEMP. (°C)	$R_{(T)}/R_{25}$	RESISTANCE (Ω)	$\Delta R/R$ (%)	α (%/K)	ΔT (K)	$R_{min.}$ (Ω)	$R_{max.}$ (Ω)
-40	22.454453	2 739 443	8.65	-5.8167373	1.49	2 502 438	2 976 448
-35	16.866231	2 057 680	7.90	-5.6316146	1.40	1 895 071	2 220 289
-30	12.784034	1 559 652	7.19	-5.4543177	1.32	1 447 564	1 671 741
-25	9.7743051	1 192 465	6.50	-5.2845012	1.23	1 114 930	1 270 000
-20	7.5355204	919 333.5	5.85	-5.1218261	1.14	865 585.0	973 082.0
-15	5.8559655	714 427.8	5.22	-4.9659623	1.05	677 147.7	751 707.9
-10	4.5856116	559 444.6	4.62	-4.8165901	0.96	533 623.3	585 266.0
-5	3.6171949	441 297.8	4.04	-4.6734013	0.86	423 482.6	459 112.9
0	2.8733691	350 551.0	3.48	-4.5361001	0.77	338 347.8	362 754.3
5	2.2978994	280 343.7	2.95	-4.4044035	0.67	272 082.8	288 604.6
10	1.8495752	225 648.2	2.43	-4.2780411	0.57	220 159.4	231 136.9
15	1.4979638	182 751.6	1.94	-4.1567552	0.47	179 211.2	186 291.9
20	1.220426	148 892.0	1.46	-4.0403007	0.36	146 718.0	151 065.9
25	1.0000	122 000.0	1.00	-3.9284447	0.25	120 780.0	123 220.0
30	0.8238906	100 514.7	1.22	-3.8209659	0.32	99 286.16	101 743.2
35	0.6823817	83 250.57	1.44	-3.7176545	0.39	82 054.10	84 447.05
40	0.5680482	69 301.88	1.65	-3.6183115	0.45	68 161.63	70 442.12
45	0.4751807	57 972.04	1.85	-3.5227485	0.52	56 901.35	59 042.74
50	0.3993632	48 722.31	2.04	-3.4307868	0.60	47 727.28	49 717.35
55	0.3371605	41 133.59	2.23	-3.3422573	0.67	40 215.62	42 051.55
60	0.2858854	34 878.02	2.42	-3.2569997	0.74	34 035.59	35 720.46
65	0.2434246	29 697.80	2.59	-3.1748623	0.82	28 927.54	30 468.06
70	0.2081076	25 389.13	2.77	-3.0957016	0.89	24 686.68	26 091.58
75	0.1786073	21 790.10	2.93	-3.0193813	0.97	21 150.59	22 429.60
80	0.1538644	187 71.46	3.10	-2.9457725	1.05	18 189.89	19 353.04
85	0.1330293	16 229.57	3.26	-2.8747533	1.13	15 700.98	16 758.17
90	0.1154174	14 080.93	3.57	-2.8062079	1.27	13 578.31	14 583.55
95	0.100475	12 257.95	3.87	-2.7400266	1.41	11 783.08	12 732.82
100	0.087752	10 705.75	4.17	-2.6761055	1.56	10 259.24	11 152.26
105	0.0768813	9379.52	4.46	-2.614346	1.71	8961.19	9797.85
110	0.067562	8242.57	4.74	-2.5546547	1.86	7851.69	8633.45
115	0.0595469	7264.72	5.02	-2.4969429	2.01	6900.22	7629.22
120	0.0526318	6421.08	5.29	-2.4411263	2.17	6081.66	6760.50
125	0.0466476	5691.01	5.55	-2.387125	2.32	5375.26	6006.76



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