



## JOURNAL OF MODIFICATION FOR NTC

Code number  
NTCLE413 serie

ED.	DATE	ISSUED-REVISED PAGES	REMARKS
01	2009-06-08	190-1 to 190-3	Specification created for sensor NTC epoxy type, PVC 105 °C awg#30.
02	2010-02-03	Front Page	Addition Code numbers
03	2010-03-26		Addition code number NTCLE413E2103J520L (10k 5% 3435K 52mm).
04	2010-APR-07		Addition code number NTCLE413E2103H401 (10k 3% 3984K 400mm).

SAP PART NUMBER DESCRIPTION AND DETAILS	
Example : NTC A LUG01A 103J 401	
'NTC L':	NTC Leaded,
'E413'	Mechanical Execution := Epoxy Coated, PVC 105°C UL2651 awg#30
'E2'	Termination style 'e2' (Sn96Ag4 dipped solder)
'103'	Resistance at 25 °C := 10 <sup>3</sup> Ohms=10 000 Ohms,
'H'	Tolerance : J= +/-5% H= +/-3%, 'G'=+/-2%, 'F'=+/-1%
blank	Lead length L = 40 mm
'301'	Lead length:'301' : L1 = 30x10 <sup>1</sup> = 300 mm.
'L'	Optional: 'L' = Low B Value
'C'	Optional: 'C'=connector

TABLE 1

SAP coding *	R25		B25/85		L mm	Connector	R/T Table
	kΩ	±%	K	±%			
NTCLE413E2472H400	4.7	3	3984	0.5	40	-	Table 3
NTCLE413E2502F400L	5	1	3324	1.0	40	-	Table 4
<b>NTCLE413E2502H400</b>	<b>5</b>	<b>3</b>	<b>3984</b>	<b>0.5</b>	<b>40</b>	-	<b>Table 5</b>
<b>NTCLE413E2103F400L</b>	<b>10</b>	<b>1</b>	<b>3435</b>	<b>1.0</b>	<b>40</b>	-	<b>Table 6</b>
NTCLE413E2103F520L	10	1	3435	1.0	52	-	Table 6
NTCLE413E2103F161L	10	1	3435	1.0	160	-	Table 6
NTCLE413E2103F181L	10	1	3435	1.0	180	-	Table 6
NTCLE413E2103F241L	10	1	3435	1.0	240	-	Table 6
NTCLE413E2103F521L	10	1	3435	1.0	520	-	Table 6
NTCLE413E2103F102L	10	1	3435	1.0	1000	-	Table 6
<b>NTCLE413E2103J520L</b>	10	5	3435	1.0	52	-	-
<b>NTCLE413E2103H400</b>	<b>10</b>	<b>3</b>	<b>3984</b>	<b>0.5</b>	<b>40</b>	-	<b>Table 7</b>
NTCLE413E2103H301C	10	3	3984	0.5	300	Note 10	Table 7
NTCLE413E2103H401	10	3	3984	0.5	400	-	Table 7
NTCLE413E2473H400	47	3	4090	1.5	40	-	Table 8
NTCLE413E2104H400	100	3	4190	1.5	40	-	Table 9

- Note 10 NTCLE413E2103H301C : "C" = Connector MOLEX 50212-8000 or equivalent. Connector Housing, 2 poles. MOLEX 35507-0200 Sherlock 2,0mm.

Approved by : ir. Regis Wacheux

Date : 2010-APR-07



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ELECTRONIC COMPONENTS OF ASSESSED QUALITY MEASURED IN ACCORDANCE WITH IEC 60539-1	
<p>Outline</p> <p>all dimensions are in mm</p> <p>D : Ø3 mm max    L : 40 mm +/-5 (or refer to Table or SAP description *) L1 : 10 mm max    L2 : 3 mm +/-1    L3 : 15 mm (for information)</p>	<p>DIRECTLY HEATED NEGATIVE TEMPERATURE COEFFICIENT THERMISTORS PRIMARILY INTENDED AS TEMPERATURE SENSOR</p> <hr/> <p>CHIP SENSOR INSULATED</p>

**Features**

- \* Thermistor NTC used for temperature sensing and control.
- \* High adhesive strength between PVC wire and encapsulating lacquer.
- \* Suitable for applications as e.g. batteries temperature sensing and control.
- \* Compliant to EU Directives 2002/95/EC (RoHS) and 2003/11/EC (octa & penta BDE).

**Notes**

1. Epoxy coated, Vishay NTC chip thermistor.
2. UL2651, 105°C PVC, AWG#30, strand lead tinned copper wire.
3. End wire is stripped and dipped in solder (Sn96Ag4). (e2).
4. Optional Connector.

**1. RATINGS AND CHARACTERISTICS**

- Climatic category : 40/105/28
- Maximum dissipation : 250 mW
- Maximum dissipation factor at 25°C still air (for reference only) : 6 mW/°C
- Insulation resistance (500 Vdc) : 100 MΩ min.
- Minimum Withstanding voltage (500 Vac) : no breakdown

2. **Marking** : Black lacquered body without additional mark.

3. **Packing** : SPQ : 125 items

4. **Weight** : 0.2 gram (approx).

5. **Table** : Resistance - Temperature

: see table 3 to 9.



**TABLE 3**

SAP coding	R25		B25/85	
	kΩ	±%	K	±%
<b>NTC L E413 E2 472H _ _ _</b>	<b>4.7</b>	<b>3</b>	<b>3984</b>	<b>0.50</b>

Temperature [°C]	R(T)/R25	Resistance [Ohms]	dR/R [%]	$\alpha$ [% / K]	$\Delta T$ [K]	Rmin [Ohms]	Rmax [Ohms]
-40	33.427	157109	4.92	-6.63	0.74	149382	164836
-35	24.132	113422	4.73	-6.41	0.74	108053	118791
-30	17.613	82782	4.56	-6.19	0.74	79010	86554
-25	12.990	61053	4.39	-5.99	0.73	58375	63731
-20	9.676	45478	4.22	-5.79	0.73	43557	47398
-15	7.276	34199	4.07	-5.61	0.73	32809	35590
-10	5.522	25953	3.92	-5.43	0.72	24936	26969
-5	4.227	19866	3.77	-5.26	0.72	19117	20615
0	3.262	15333	3.63	-5.10	0.71	14777	15890
5	2.538	11929	3.49	-4.94	0.71	11512	12346
10	1.990	9352	3.36	-4.80	0.70	9037	9666
15	1.571	7384	3.24	-4.65	0.70	7145	7623
20	1.249	5872	3.12	-4.52	0.69	5689	6055
25	1.000	4700	3.00	-4.39	0.68	4559	4841
30	0.806	3786	3.11	-4.26	0.73	3668	3904
35	0.653	3069	3.22	-4.14	0.78	2970	3168
40	0.532	2502	3.33	-4.03	0.83	2419	2586
45	0.437	2052	3.43	-3.92	0.88	1981	2122
50	0.360	1691	3.53	-3.81	0.93	1632	1751
55	0.298	1402	3.63	-3.71	0.98	1351	1453
60	0.248	1167	3.72	-3.61	1.03	1124	1211
65	0.208	977.0	3.81	-3.51	1.09	939.7	1014
70	0.175	821.4	3.90	-3.42	1.14	789.3	853.5
75	0.148	693.7	3.99	-3.34	1.20	666.0	721.4
80	0.125	588.3	4.07	-3.25	1.25	564.4	612.3
85	0.107	501.1	4.15	-3.17	1.31	480.3	521.9
90	0.091	428.4	4.23	-3.09	1.37	410.3	446.6
95	0.078	367.8	4.31	-3.02	1.43	351.9	383.6
100	0.067	316.8	4.38	-2.94	1.49	302.9	330.7
105	0.058	273.9	4.46	-2.87	1.55	261.7	286.1



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**TABLE 4**

SAP coding	R25		B25/85	
	kΩ	±%	K	±%
<b>NTC L E413 E2 502F ___ L</b>	<b>5</b>	<b>1</b>	<b>3324</b>	<b>1.00</b>

Temperature [°C]	R(T)/R25	Resistance [Ohms]	dR/R [%]	α [% / K]	ΔT [K]	Rmin [Ohms]	Rmax [Ohms]
-40	17,397	86987	4,14	-5,28	0,78	83386	90587
-35	13,411	67053	3,84	-5,13	0,75	64480	69625
-30	10,416	52082	3,55	-4,98	0,71	50235	53930
-25	8,151	40754	3,27	-4,83	0,68	39422	42086
-20	6,424	32118	3,00	-4,69	0,64	31154	33082
-15	5,098	25488	2,74	-4,56	0,60	24788	26187
-10	4,072	20361	2,50	-4,43	0,56	19853	20870
-5	3,274	16371	2,26	-4,30	0,53	16001	16741
0	2,649	13244	2,03	-4,18	0,49	12975	13513
5	2,156	10779	1,81	-4,06	0,45	10584	10974
10	1,765	8824	1,60	-3,95	0,40	8683	8964
15	1,453	7263	1,39	-3,84	0,36	7162	7364
20	1,202	6011	1,19	-3,73	0,32	5939	6082
25	1,000	5000	1,00	-3,63	0,28	4950	5050
30	0,836	4180	1,19	-3,53	0,34	4130	4230
35	0,702	3511	1,37	-3,44	0,40	3463	3559
40	0,593	2963	1,54	-3,35	0,46	2918	3009
45	0,502	2512	1,71	-3,26	0,52	2469	2555
50	0,428	2138	1,87	-3,18	0,59	2098	2178
55	0,366	1828	2,03	-3,10	0,66	1791	1865
60	0,314	1569	2,18	-3,02	0,72	1535	1603
65	0,270	1352	2,33	-2,94	0,79	1320	1383
70	0,234	1169	2,48	-2,87	0,86	1140	1198
75	0,203	1015	2,62	-2,80	0,94	988	1041
80	0,177	884	2,75	-2,73	1,01	860	908
85	0,154	772	2,89	-2,66	1,08	750	795
90	0,135	677	3,02	-2,60	1,16	657	698
95	0,119	596	3,14	-2,54	1,24	577	614
100	0,105	525	3,26	-2,48	1,32	508	542
105	0,093	465	3,38	-2,42	1,40	449	480



**TABLE 5**

SAP coding	R25		B25/85	
	kΩ	±%	K	±%
<b>NTC L E413 E2 502H _ _ _</b>	<b>5</b>	<b>3</b>	<b>3984</b>	<b>0.50</b>

Temperature [°C]	R(T)/R25	Resistance [Ohms]	dR/R [%]	$\alpha$ [% / K]	$\Delta T$ [K]	Rmin [Ohms]	Rmax [Ohms]
-40	33.427	167137	4.92	-6.63	0.74	158917	175358
-35	24.132	120661	4.73	-6.41	0.74	114950	126373
-30	17.613	88066	4.56	-6.19	0.74	84053	92079
-25	12.990	64950	4.39	-5.99	0.73	62101	67799
-20	9.676	48381	4.22	-5.79	0.73	46337	50424
-15	7.276	36382	4.07	-5.61	0.73	34903	37862
-10	5.522	27609	3.92	-5.43	0.72	26528	28690
-5	4.227	21134	3.77	-5.26	0.72	20337	21931
0	3.262	16312	3.63	-5.10	0.71	15720	16904
5	2.538	12691	3.49	-4.94	0.71	12247	13134
10	1.990	9948	3.36	-4.80	0.70	9614	10283
15	1.571	7856	3.24	-4.65	0.70	7601	8110
20	1.249	6246	3.12	-4.52	0.69	6052	6441
25	1.000	5000	3.00	-4.39	0.68	4850	5150
30	0.806	4028	3.11	-4.26	0.73	3903	4153
35	0.653	3265	3.22	-4.14	0.78	3160	3370
40	0.532	2662	3.33	-4.03	0.83	2573	2751
45	0.437	2183	3.43	-3.92	0.88	2108	2258
50	0.360	1799	3.53	-3.81	0.93	1736	1863
55	0.298	1491	3.63	-3.71	0.98	1437	1545
60	0.248	1242	3.72	-3.61	1.03	1196	1288
65	0.208	1039	3.81	-3.51	1.09	1000	1079
70	0.175	874	3.90	-3.42	1.14	840	908
75	0.148	738	3.99	-3.34	1.20	709	767
80	0.125	626	4.07	-3.25	1.25	600	651
85	0.107	533	4.15	-3.17	1.31	511	555
90	0.091	456	4.23	-3.09	1.37	437	475
95	0.078	391	4.31	-3.02	1.43	374	408
100	0.067	337	4.38	-2.94	1.49	322	352
105	0.058	291	4.46	-2.87	1.55	278	304



**TABLE 6**

SAP coding	R25		B25/85	
	kΩ	±%	K	±%
<b>NTC L E413 E2 103F ___ L</b>	<b>10</b>	<b>1</b>	<b>3435</b>	<b>1</b>

Temperature [°C]	R(T)/R25	Resistance [Ohms]	dR/R [%]	α [% / K]	ΔT [K]	Rmin [Ohms]	Rmax [Ohms]
-40	19,095	190953	4,24	-5,46	0,78	182848	199057
-35	14,595	145953	3,93	-5,30	0,74	140214	151691
-30	11,244	112440	3,63	-5,14	0,71	108356	116524
-25	8,729	87285	3,34	-4,99	0,67	84366	90205
-20	6,826	68260	3,07	-4,85	0,63	66165	70354
-15	5,376	53762	2,80	-4,71	0,60	52255	55269
-10	4,264	42636	2,55	-4,57	0,56	41550	43723
-5	3,404	34038	2,30	-4,44	0,52	33254	34821
0	2,735	27348	2,07	-4,31	0,48	26783	27912
5	2,211	22108	1,84	-4,19	0,44	21702	22514
10	1,798	17979	1,62	-4,08	0,40	17689	18270
15	1,471	14706	1,40	-3,96	0,35	14499	14912
20	1,209	12094	1,20	-3,86	0,31	11949	12239
25	1,000	10000	1,00	-3,75	0,27	9900	10100
30	0,831	8311	1,19	-3,65	0,33	8212	8410
35	0,694	6941	1,38	-3,55	0,39	6845	7037
40	0,582	5825	1,56	-3,46	0,45	5734	5916
45	0,491	4911	1,73	-3,37	0,51	4826	4996
50	0,416	4158	1,90	-3,28	0,58	4079	4237
55	0,354	3536	2,06	-3,20	0,65	3463	3609
60	0,302	3020	2,22	-3,12	0,71	2953	3087
65	0,259	2589	2,38	-3,04	0,78	2527	2650
70	0,223	2228	2,53	-2,96	0,85	2172	2284
75	0,192	1925	2,67	-2,89	0,92	1873	1976
80	0,167	1668	2,81	-2,82	1,00	1621	1715
85	0,145	1451	2,95	-2,75	1,07	1409	1494
90	0,127	1267	3,08	-2,69	1,15	1228	1306
95	0,111	1109	3,21	-2,62	1,22	1074	1145
100	0,097	974	3,34	-2,56	1,30	942	1007
105	0,086	858	3,46	-2,50	1,38	829	888



**TABLE 7**

SAP coding	R25		B25/85	
	K $\Omega$	$\pm\%$	K	$\pm\%$
<b>NTC L E413 E2 103H _ _ _</b>	<b>10</b>	<b>3</b>	<b>3984</b>	<b>0.50</b>

Temperature [°C]	R(T)/R25	Resistance [Ohms]	dR/R [%]	$\alpha$ [% / K]	$\Delta T$ [K]	Rmin [Ohms]	Rmax [Ohms]
-40	33.427	334274	4.92	-6.63	0.74	317833	350716
-35	24.132	241323	4.73	-6.41	0.74	229899	252747
-30	17.613	176133	4.56	-6.19	0.74	168107	184158
-25	12.990	129900	4.39	-5.99	0.73	124202	135598
-20	9.676	96761	4.22	-5.79	0.73	92675	100848
-15	7.276	72765	4.07	-5.61	0.73	69806	75723
-10	5.522	55218	3.92	-5.43	0.72	53056	57380
-5	4.227	42268	3.77	-5.26	0.72	40674	43861
0	3.262	32624	3.63	-5.10	0.71	31440	33808
5	2.538	25381	3.49	-4.94	0.71	24494	26268
10	1.990	19897	3.36	-4.80	0.70	19227	20566
15	1.571	15711	3.24	-4.65	0.70	15202	16220
20	1.249	12493	3.12	-4.52	0.69	12103	12882
25	1.000	10000	3.00	-4.39	0.68	9700	10300
30	0.806	8056	3.11	-4.26	0.73	7805	8307
35	0.653	6530	3.22	-4.14	0.78	6319	6740
40	0.532	5324	3.33	-4.03	0.83	5147	5501
45	0.437	4365	3.43	-3.92	0.88	4215	4515
50	0.360	3599	3.53	-3.81	0.93	3472	3726
55	0.298	2982	3.63	-3.71	0.98	2874	3091
60	0.248	2484	3.72	-3.61	1.03	2391	2576
65	0.208	2079	3.81	-3.51	1.09	1999	2158
70	0.175	1748	3.90	-3.42	1.14	1679	1816
75	0.148	1476	3.99	-3.34	1.20	1417	1535
80	0.125	1252	4.07	-3.25	1.25	1201	1303
85	0.107	1066	4.15	-3.17	1.31	1022	1110
90	0.091	912	4.23	-3.09	1.37	873	950
95	0.078	782	4.31	-3.02	1.43	749	816
100	0.067	674	4.38	-2.94	1.49	645	704
105	0.058	583	4.46	-2.87	1.55	557	609



**TABLE 8**

SAP coding	R25		B25/85	
	K $\Omega$	$\pm\%$	K	$\pm\%$
<b>NTC L E413 E2 473H _ _ _</b>	<b>47</b>	<b>3</b>	<b>4090</b>	<b>1.5</b>

Temperature [°C]	R(T)/R25	Resistance [Ohms]	dR/R [%]	$\alpha$ [% / K]	$\Delta T$ [K]	Rmin [Ohms]	Rmax [Ohms]
-40	37.156	1746331	5.95	-6.82	0.87	1642348	1850314
-35	26.566	1248589	5.67	-6.60	0.86	1177795	1319382
-30	19.206	902705	5.40	-6.38	0.85	853986	951425
-25	14.035	659632	5.14	-6.17	0.83	625758	693506
-20	10.361	486956	4.88	-5.97	0.82	463174	510737
-15	7.724	363012	4.64	-5.78	0.80	346161	379863
-10	5.812	273158	4.41	-5.60	0.79	261114	285203
-5	4.413	207395	4.19	-5.42	0.77	198714	216076
0	3.379	158821	3.97	-5.25	0.76	152516	165126
5	2.609	122627	3.76	-5.09	0.74	118014	127240
10	2.030	95430	3.56	-4.94	0.72	92031	98828
15	1.592	74827	3.37	-4.79	0.70	72307	77347
20	1.257	59098	3.18	-4.65	0.68	57218	60978
25	1.000	47000	3.00	-4.51	0.66	45590	48410
30	0.801	37628	3.17	-4.38	0.72	36434	38823
35	0.645	30318	3.34	-4.26	0.79	29304	31332
40	0.523	24578	3.51	-4.14	0.85	23716	25440
45	0.426	20043	3.67	-4.02	0.91	19308	20777
50	0.350	16437	3.82	-3.91	0.98	15809	17064
55	0.288	13553	3.97	-3.81	1.04	13015	14091
60	0.239	11233	4.11	-3.70	1.11	10771	11695
65	0.199	9358	4.25	-3.60	1.18	8960	9756
70	0.167	7833	4.39	-3.51	1.25	7489	8177
75	0.140	6587	4.52	-3.42	1.32	6290	6885
80	0.118	5565	4.65	-3.33	1.40	5306	5823
85	0.100	4721	4.78	-3.25	1.47	4496	4946
90	0.086	4022	4.90	-3.16	1.55	3825	4219
95	0.073	3440	5.01	-3.09	1.62	3268	3613
100	0.063	2954	5.13	-3.01	1.70	2802	3105
105	0.054	2546	5.24	-2.94	1.78	2412	2679





**TABLE 9**

SAP coding	R25		B25/85	
	K $\Omega$	$\pm\%$	K	$\pm\%$
<b>NTC L E413 E2 104H _ _ _</b>	<b>100</b>	<b>3</b>	<b>4190</b>	<b>1.5</b>

Temperature [°C]	R(T)/R25	Resistance [Ohms]	dR/R [%]	$\alpha$ [% / K]	$\Delta T$ [K]	Rmin [Ohms]	Rmax [Ohms]
-40	36.663	3666299	9.05	-6.69	1.35	3334382	3998217
-35	26.376	2637588	8.47	-6.49	1.31	2414177	2860998
-30	19.166	1916576	7.91	-6.29	1.26	1764950	2068202
-25	14.061	1406111	7.37	-6.10	1.21	1302413	1509810
-20	10.412	1041184	6.86	-5.92	1.16	969762	1112605
-15	7.778	777846	6.36	-5.75	1.11	728341	827350
-10	5.861	586097	5.89	-5.58	1.06	551588	620605
-5	4.453	445257	5.43	-5.42	1.00	421083	469431
0	3.409	340942	4.99	-5.26	0.95	323938	357945
5	2.631	263054	4.56	-5.11	0.89	251055	275052
10	2.044	204446	4.15	-4.97	0.84	195961	212931
15	1.600	160014	3.75	-4.83	0.78	154008	166020
20	1.261	126087	3.37	-4.70	0.72	121837	130336
25	1.000	100000	3.00	-4.57	0.66	97000	103000
30	0.798	79808	3.36	-4.45	0.75	77128	82488
35	0.641	64077	3.70	-4.33	0.86	61703	66451
40	0.517	51745	4.04	-4.22	0.96	49655	53836
45	0.420	42021	4.36	-4.11	1.06	40187	43855
50	0.343	34308	4.68	-4.00	1.17	32702	35913
55	0.282	28156	4.98	-3.90	1.28	26752	29559
60	0.232	23222	5.28	-3.80	1.39	21996	24449
65	0.192	19246	5.57	-3.71	1.50	18174	20318
70	0.160	16025	5.85	-3.62	1.62	15088	16962
75	0.134	13402	6.12	-3.53	1.73	12582	14222
80	0.113	11258	6.38	-3.45	1.85	10539	11976
85	0.095	9496	6.64	-3.36	1.97	8866	10126
90	0.080	8042	6.89	-3.28	2.10	7488	8596
95	0.068	6837	7.13	-3.21	2.22	6350	7325
100	0.058	5835	7.36	-3.13	2.35	5405	6265
105	0.050	4998	7.59	-3.06	2.48	4618	5377