



MICROTECH (HONG KONG) LTD.

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LNSK16F103FP

SMD NTC Thermistors

Description

The LNS series is manganese oxide based NTC thermistor, which shows non-linear resistance - temperature behavior. Multilayered structure has as high reliability as monoblock type, even without protective glass coating, since the active electrode and sensor layer is buried inside the ceramic body..

Features

- Multilayer structure allows diverse resistance value in the same B constant
- Multilayer structure allows lower resistance at high B constant
- Solder plating with Ni barriers gives high reliability for both flow and reflow soldering.
- Unified shape and tightly controlled dimension is fit to high mounting speed
- Electroplating with Ni and solder gives higher solderability.
- Lead-free (RoHS compatible components)



Applications

- Temperature compensation for crystal oscillator (TCXO)
- Temperature compensation for personal computer
- Temperature compensation for contrast of LCD
- Temperature detection for CPU and memory device
- Temperature detection for battery pack I/O ports in various hand-held equipments.

Ordering Information

LNS **K** **16** **F** **103** **F** **_** **P**
 (1) (2) (3) (4) (5) (6) (7) (8)

(1) Series
 LNS : Standard series

(2) B constant

Code	B constant	Code	B constant
A	3970K	W	3890K
K	3435K	Y	3670K
V	4145K	R	4050K

(3) Dimension
 10 : 1005 Size (0402)
 16 : 1608 Size (0603)
 20 : 2012 Size (0805)

(4) B constant deviation range

Code	Range	Code	Range
F	± 1%	H	± 3%
G	± 2%		

(5) Resistance at 25 °C
 100 : 10Ω
 101 : 100Ω
 102 : 1kΩ

(6) Resistance deviation range

Code	Range	Code	Range
F	± 1%	J	± 5%
H	± 3%	K	± 10%

(7) Termination type
 Blank: Plated Termination series
 P : Solderable Terminal(Non-plated series)

(8) Packing code

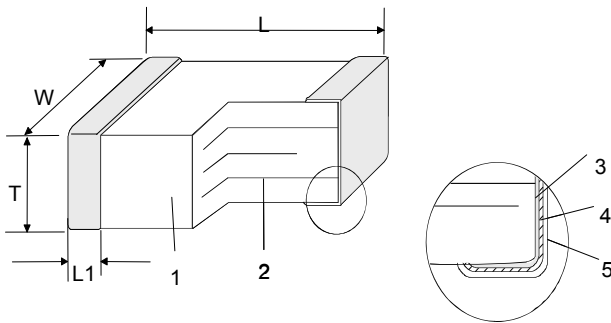
Code	Packaging
B	Bulk
P	Paper taping
E	Emboss taping



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SMD NTC Thermistor

Structure and Dimension



No	Name
1	Ceramic
2	Inner electrode
3	Silver electrode
4	Ni plated layer
5	Sn plated layer

unit : mm				
Size	L	W	T	L1
1005	1.00±0.10	0.50±0.10	0.50±0.10	0.20±0.10
1608	1.60±0.10	0.80±0.10	0.80±0.10	0.30±0.10
2012	2.00±0.15	1.25±0.15	0.80±0.15	0.20±0.10

Specification

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Resistance (1%)*	R ₂₅	@ 25°C , zero power	9.9	10.0	10.1	kΩ
Resistance (3%)**	R ₂₅	@ 25°C , zero power	9.7	10.0	10.3	kΩ
Resistance (5%***)	R ₂₅	@ 25°C , zero power	9.5	10.0	10.5	kΩ
B constant (1%)	B_{25/85}	@ 25°C , 85°C	3401	3435	3469	K
Dissipation constant	δ	In air	3.0	-	-	mW/°C
Thermal time constant	τ	In air	-	-	10	sec
Operating Temperature	-		-40	~	125	°C
Sn thickness	-	Type: 100% TiN	2.0	4.0	-	μm
Ni thickness	-	Type: S round	1.0	1.5	-	μm

* LNSK16F103F
 ** LNSK16F103H
 *** LNSK16F103J



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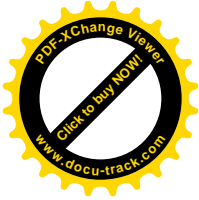
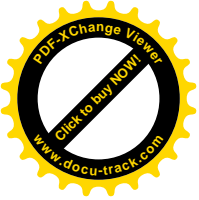


LNSK16F103FP

SMD NTC Thermistor

Resistance vs. Temperature Table (reference)

Temp. (°C)	LNSA__103_		LNSK__103_		LNSV__103_		LNSV__104_		LNSW__103_		LNSY__103_	
	R ₂₅ (kΩ)	B _{25/T}	R ₂₅ (kΩ)	B _{25/T}	R ₂₅ (kΩ)	B _{25/T}	R ₂₅ (kΩ)	B _{25/T}	R ₂₅ (kΩ)	B _{25/T}	R ₂₅ (kΩ)	B _{25/T}
-40	354.4	3816	200.8	3208	383.3	3900	3458	3789	290.1	3601	236.9	3385
-35	252.7	3822	152.9	3227	274.6	3920	2493	3806	313.6	3623	177.1	3401
-30	182.5	3828	117.2	3244	198.7	3940	1818	38.23	158.6	3643	133.6	3417
-25	133.4	3833	90.51	3260	145.1	3958	1340	3840	118.7	3661	101.7	3433
-20	98.57	3838	70.40	3273	107.0	3976	997.3	3857	89.63	3678	78.11	3448
-15	73.66	3842	55.14	3285	79.60	3992	749.1	3875	68.20	3694	60.46	3462
-10	55.62	3847	43.51	3296	59.73	4006	567.5	3892	52.30	3709	47.16	3477
-5	42.42	3851	34.57	3306	45.20	4020	433.5	3909	40.42	3722	37.05	3491
0	37.66	3855	27.66	3314	34.49	4033	333.7	3926	31.47	3735	29.32	3504
5	25.37	3860	22.28	3322	26.52	4045	258.8	3942	24.68	3747	23.25	3517
10	19.87	3864	18.07	3329	20.56	4056	202.1	3959	19.50	3758	18.72	3530
15	15.69	3869	14.74	3335	16.05	4066	158.8	3975	15.51	3768	15.10	3542
20	12.48	3874	12.11	3341	12.63	4075	125.6	3991	12.41	3778	12.25	3554
25	10.00	3880	10.00	3347	10.00	4083	100.0	4006	10.00	3788	10.10	3565
30	8.066	3886	8.307	3353	7.975	4091	80.06	4021	8.106	3797	8.205	3576
35	6.547	3892	6.938	3359	6.401	4098	64.46	4035	6.609	3806	6.768	3587
40	5.345	3899	5.824	3364	5.171	4105	52.18	4048	5.418	3814	5.611	3597
45	4.388	3906	4.913	3370	4.203	4111	42.47	4062	4.466	3823	4.675	3607
50	3.622	3914	4.164	3377	3.437	4116	34.74	4075	3.700	3831	3.913	3616
55	3.005	3922	3.543	3384	2.826	4121	28.57	4086	3.081	3840	3.291	3625
60	2.504	3930	3.028	3391	2.337	4126	23.60	4097	2.577	3848	2.779	3633
65	2.096	3938	2.597	3398	1.943	4130	19.60	4108	2.165	3857	2.358	3642
70	1.763	3946	2.235	3407	1.623	4134	16.35	4118	1.827	3865	2.009	3649
75	1.488	3954	1.930	3415	1.363	4138	13.69	4127	1.548	3873	1.718	3657
80	1.262	3963	1.671	3425	1.149	4141	11.52	4136	1.317	3881	1.475	3664
85	1.074	3970	1.452	3435	0.974	4145	9.739	4145	1.124	3889	1.272	3670
90	0.918	3977	1.264	3445	0.829	4149	8.263	4153	0.964	3897	1.100	3676
95	0.788	3984	1.104	3456	0.708	4152	7.038	4161	0.829	3905	0.955	3682
100	0.679	3989	0.966	3466	0.607	4156	6.017	4169	0.715	3912	0.832	3688
105	0.588	3993	0.848	3478	0.522	4160	5.162	4177	0.620	3919	0.727	3694
110	0.511	3996	0.746	3489	0.451	4165	4.442	4185	0.539	3926	0.638	3699
115	0.447	3997	0.657	3500	0.391	4169	3.833	4194	0.470	3931	0.561	3704
120	0.392	3995	0.581	3511	0.339	4175	3.317	4203	0.412	3936	0.495	3709



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Definition of Terms

Resistance Value

In general, resistance value of a NTC thermistor is the zero-powered resistance at the standard temperature of 25°C. the zero-powered resistance means the value of DC resistance of a thermistor measured at a specified temperature, with electric load being kept so small that there is no noticeable change in the measured resistance by the influence of the applied electric load.

Temperature Dependence of Resistance

The dependence of the thermistor resistance on temperature can be approximately described as the following equation ;

$$R_1 = R_0 \exp\{B(1/T_1 - 1/T_0)\}$$

R₁ : resistance value at absolute temperature T₁(K)
B : B constant

R₂ : resistance value at absolute temperature T₂(K)
T(K) = T(°C) + 273.15

From the above equation, B constant can be represented as ;

$$B = \ln(R_0/R_1) / (1/T_0 - 1/T_1)$$

Without special note, B constant is calculated from the resistance values at 25°C and 85°C [B25/85]

Dissipation Factor [δ]

Dissipation factor is defined as the ratio of power dissipation and the resultant change in the temperature of thermistor body. The unit of dissipation factor is [mW/K] and the mathematical expression is

$$\delta = P/(T_2 - T_1)$$

Where P, T₂ and T₁ are the dissipated power, thermistor temperature and ambient temperature respectively.

Maximum Power Rating [P]

The maximum power rating of a thermistor is the maximum handling power, keeping its temperature not exceeding the allowed maximum temperature for operation. With known dissipation factor δ, the maximum power can be calculated as ;

$$P_{max} = \delta(T_{max} - T_a) \quad (T_a : \text{be selected as } 25^\circ\text{C})$$



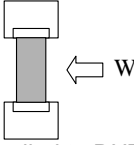
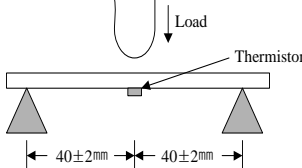

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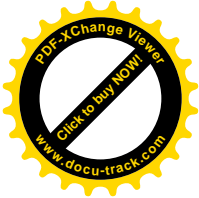
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LNSK16F103FP SMD NTC Thermistor

Reliability and Test Condition

Item	Test Condition	Criterion for judging
Resistance to Soldering Heat Test	- Soldering temperature : 260°C±5°C - Duration of immersion : 10 ± 1sec. - Preheating : 150°C, 1min.	Visual : No mechanical damage Zero-power resistance at 25°C Change as against pretest values within ±3% Change of B-value within ±2%
Solderability Test	- Soldering temperature : 245°C±5°C - Duration of immersion : 5±0.5sec. - Immersion angle : The terminations shall be immersed perpendicular to the solder surface.	At least 95% of the electrode must be covered with new solder
Adhesion	 - The Force W is applied to DUT.	2012 : over 1.5 kg·f 1608 : over 1.0 kg·f 1005 : over 0.7kg·f
Resistance to flexure of substrate	- The middle part of substrate shall, successively, be pressurized by means of the pressurizing rod at a rate of about 1mm/sec. 	Visual : No mechanical damage
Dry Heat Test	- Maintenance time : 5 sec. - Bending distance : 1mm - Test temperature : 125±2°C - Test duration : 1000+48hrs. - After completion of the test, leaving the sample under the standard conditions for 24±2hrs.	Zero-power resistance at 25°C . Change as against pretest values within ±3% Change of B-value within ±2%
Cold Test	- Test temperature : -40±2°C - Test duration : 1000+48hrs. - After completion of the test, leaving the sample under the standard conditions for 24±2hrs.	Zero-power resistance at 25°C . Change as against pretest values within ±3% Change of B-value within ±2%
Damp Heat Test (Steady State)	- Test temperature : 60±2°C - Test relative humidity : 90~95% - Test duration : 56days+24hrs. - After completion of the test, leaving the sample under the standard conditions for 24±2hrs.(IEC60068-2-3)	Zero-power resistance at 25°C Change as against pretest values within ±3% Change of B-value within ±2%
Thermal shock Test	 - This cycle is repeated 100 times. After completion of the test, leave the sample under standard condition for 24±2hrs.	Zero-power resistance at 25°C Change as against pretest values within ±3% Change of B-value within ±2%



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SMD NTC Thermistor

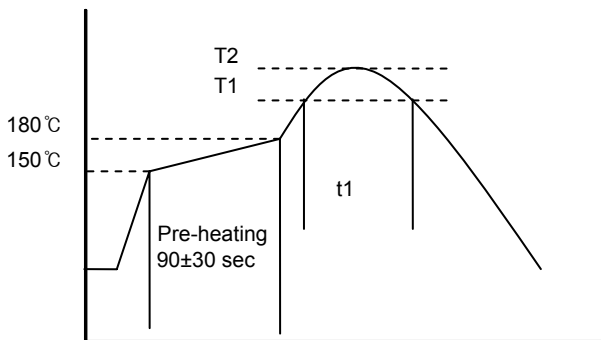
Soldering

① Soldering profile for lead-free solder (Sn-3Ag-0.5Cu)

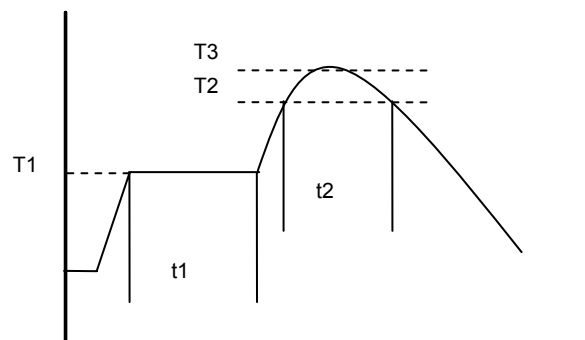
Heating		Peak temperature(T2)	Cycle of reflow
Temp(T1)	Time(t1)		
220°C min	30 to 60 sec	245±3°C	1 times

② Soldering profile for eutectic solder

Pre-heating		Heating		Peak temperature(T2)	Cycle of reflow
Temp(T1)	Time(t1)	Temp(T2)	Time(t2)		
150°C	60 sec min	183°C min	60 sec max	245±3°C	1 times



Lead-Free Solder



Eutectic Solder

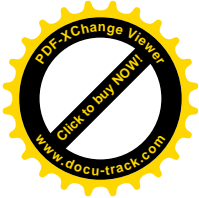
③ Reworking with solder iron

- The Following conditions must be strictly followed when using a soldering iron.
- Pre-heating ; 150°C, 60 sec min.
- Soldering iron power output ; 30W max.
- Temperature of soldering iron tip / soldering time ; 280°C max./ 10sec max. or 300°C max./3sec max.
- Do not allow the tip of the soldering iron to directly contact the chip
- For additional methods of reworking with a soldering iron, please consult Lattron's engineering

④ Cleaning

- Following conditions should be observed when cleaning chip varistor.
 - i. Cleaning temperature ; 60°C max. (40°C max. for alcohol type cleaner)
 - ii. Ultrasonic
 1. Output ; 20W/liter max.
 2. Duration ; 5minutes max.
 3. Frequency ; 28 to 40kHz
 - iii. Cleaning agent

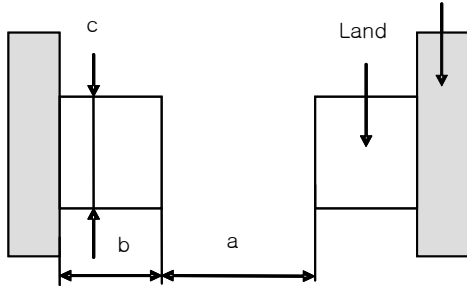
The cleaning agents have been tested on the individual components.
 Evaluation of final assembly should be completed prior to production.



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SMD NTC Thermistor

Recommended land Pattern



unit : mm			
Chip size	a	b	c
1005(0402)	0.3~0.5	0.35~0.45	0.4~0.6
1608(0603)	0.6~0.8	0.6~0.8	0.6~0.8
2012(0805)	0.9~1.2	0.7~0.9	0.9~1.2

RoHS

SMD ntc thermistor contains hazardous substances, much less than the allowed contents in RoHS (Restriction of the use of certain Hazardous Substances) in electrical and electronic equipment (Warranty of hazardous substances)

Material	Pb	Hg	Cd	PBB	PBDE
Allowed ppm	<100	<100	<10	<100	<100

SGS

Test Report No. F690501/LF-CTSGP06-09874 Date: April 24, 2006 Page 2 of 2

Sample No. : GP06-09874.001
 Sample Description : NTC Thermistor (SMD)
 Style/Item No. : N/A
 Comments : Material is Ceramic

Heavy Metals

Test Items	Unit	Test Method	MDL	Results
Cadmium(Cd)	mg/kg	US EPA 3050B(1996), US EPA 6010B(1996), ICP	0.5	N.D.
Lead (Pb)	mg/kg	US EPA 3050B(1996), US EPA 6010B(1996), ICP	5	N.D.
Mercury (Hg)	mg/kg	US EPA 3052(1996), US EPA 6010B(1996), ICP	2	N.D.
Hexavalent Chromium (Cr VI)	mg/kg	US EPA 3060A(1996), US EPA 7196A(1992), UV	1	N.D.

Picture of Sample as Received:



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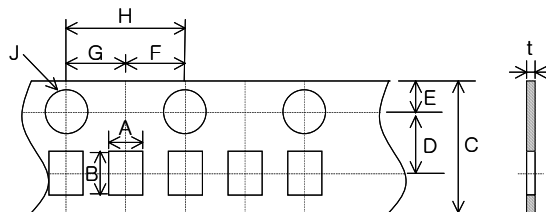
SMD NTC Thermistor

Standard Quantity for Packing

* unit : pcs

Packing Type (EIA)	Tape & reel				
	Reel	Inner box	Carton box (small)	Carton box (Medium)	Carton box (large)
1005	10,000	50,000	250,000	500,000	1,000,000
1608	4,000	20,000	10,000	200,000	400,000
2012	4,000	20,000	10,000	200,000	400,000

Tape Dimension / Paper

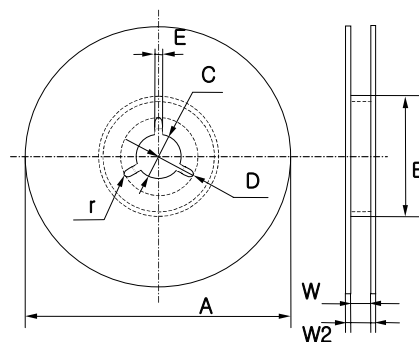


* unit : mm

Size	A	B	C	D	E	F	G	H	J	t	10H	Note
1005	0.66 ±0.03	1.17 ±0.03	8.00 ±0.10	3.50 ±0.05	1.75 ±0.05	2.00 ±0.05	2.00 ±0.05	4.00 ±0.10	1.55 ±0.05	0.60 ±0.05	40.0 ±0.20	Paper
1608	1.00 ±0.05	1.90 ±0.05	8.00 ±0.10	3.50 ±0.05	1.75 ±0.05	2.00 ±0.05	2.00 ±0.05	4.00 ±0.10	1.55 ±0.05	0.95 ±0.05	40.0 ±0.20	Paper
2012	1.55 ±0.05	2.30 ±0.05	8.00 ±0.10	3.50 ±0.05	1.75 ±0.05	2.00 ±0.05	2.00 ±0.05	4.00 ±0.10	1.55 ±0.05	0.95 ±0.05	40.0 ±0.20	Paper

Reel Dimension

Material : plastic



* unit : mm

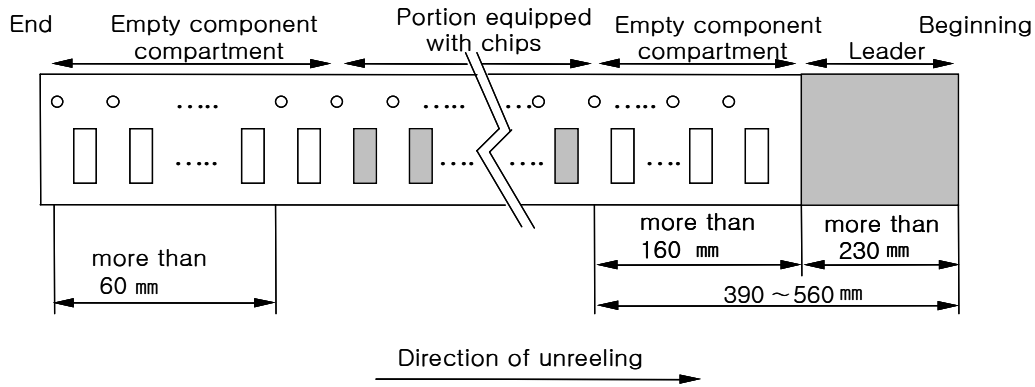
Symbol	A	B	C	D	E	W1	W2	r
Dimension	Φ180 +0, -3	Φ60 +1, -0	Φ13.0 ±0.2	R10.5 ±0.4	2.0 ±0.5	9.0 ±0.3	11.4 ±1.0	0.5



LNSK16F103FP

SMD NTC Thermistor

Leader and Blank Portion



Lot no. Ordering Information

LS **+++++** ******** **@@@**
 (1) (2) (3) (4)

(1) Manufacturing & Part name
 LS : LATTRON SMD NTC THERMISTORS

(2) Internal Electrode Printing working date
 +++++: Year +(end number)
 Month +
 Date ++
 Working order: + (A-B-C-...)

(4) Sorting working date
 @@@: Month @
 Date @@

(3) Electroplating working date
 ****: Month *
 Date **
 Working order: * (A-B-C-...)

Month	Code
10	A
11	B
12	C

Storage

All of the products are offered with the condition of vacuum packing
 To protect degradation of solderability, product must be maintained under vacuum packing. After unpacking, product must be stored in a container with drying agent or be resealed promptly. It is also recommended to use this product within 6 months after acquisition.
 Since, high temperature and humidity are critically harmful to solderability. It is highly recommended to keep product under the condition of humidity less than 70RH% and temperature below 35°C

Appendix

See the attached RT table or
 Please request of RT table for more detail RT information.