NIC Components Corp.

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Date: August 2011

Sub: **AEC-Q200** Testing Data

Automotive Electronics Council
Stress Test Qualification For Passive Components

Table 3 - Test Methods Referenced Aluminum Electrolytic Capacitors
Grade **1**: -40°C to **+125°C**

Component: ALUMINUM ELECTROLYTIC CAPACITOR

NIC Components PN: NSPE-T221M35V10X12.8NBYF

DESC: 220uF @ 35VDC, 10mm X 12.8mm Size

Environmental Test Summary

SUPPLIER ; Nippon Industries Co., Ltd.		USER PART NUMBER ;			
		PART NAME / SUPPLIER PART NUMBER ; HYBRID ALUMINUM ELECTROLYTIC CAPACITOR / NSPE-T221M35V10X12.8NBYF			
AEC Q200 Test No.	Description	Test Condition	# Lots Tested	Q'ty Tested	Number Failed
3	High Temperature Exposure (Storage)	1000hrs. at 125℃	1	80	0
4	Temperature Cycling	-40℃×30min←→+125℃×30min 1000 cycles	1	80	0
6	Moisture Resistance	MIL-STD-202 Method 202	1	80	0
7	Biased Humidity	1000hrs. at 85℃/85%RH Rated voltage	1	80	0
8	Operational Life	3000hrs. at 125℃ Rated voltage	1	80	0
10	Physical Dimension	Per spec.	1	30	0
12	Resistance to Solvents	MIL-STD-202 Method 215	1	5	0
13	Mechanical Shock	MIL-STD-202 Method 213	1	30	0
14	Vibration	5G 20min 12 cycles, 3 directions (X, Y, Z)	1	30	0
15	Resistance to Soldering Heat	MIL-STD-202 Method 210	1	30	0
16	Thermal Shock	-55℃×15min←→+125℃×15min. 300 cycles	1	30	0
17	ESD	AEC-Q200-002	1	15	0
18	Solderability	J-STD-002B	1	15	0
19	Electrical Characterization	Per spec.	3	90	0
20	Flammability	UL-94-V-0	–	–	–
21	Board Flex	AEC-Q200-005	1	30	0
22	Terminal Strength (SMD)	AEC-Q200-006	1	30	0
27	Surge Voltage	AEC-Q200-007	1	30	0

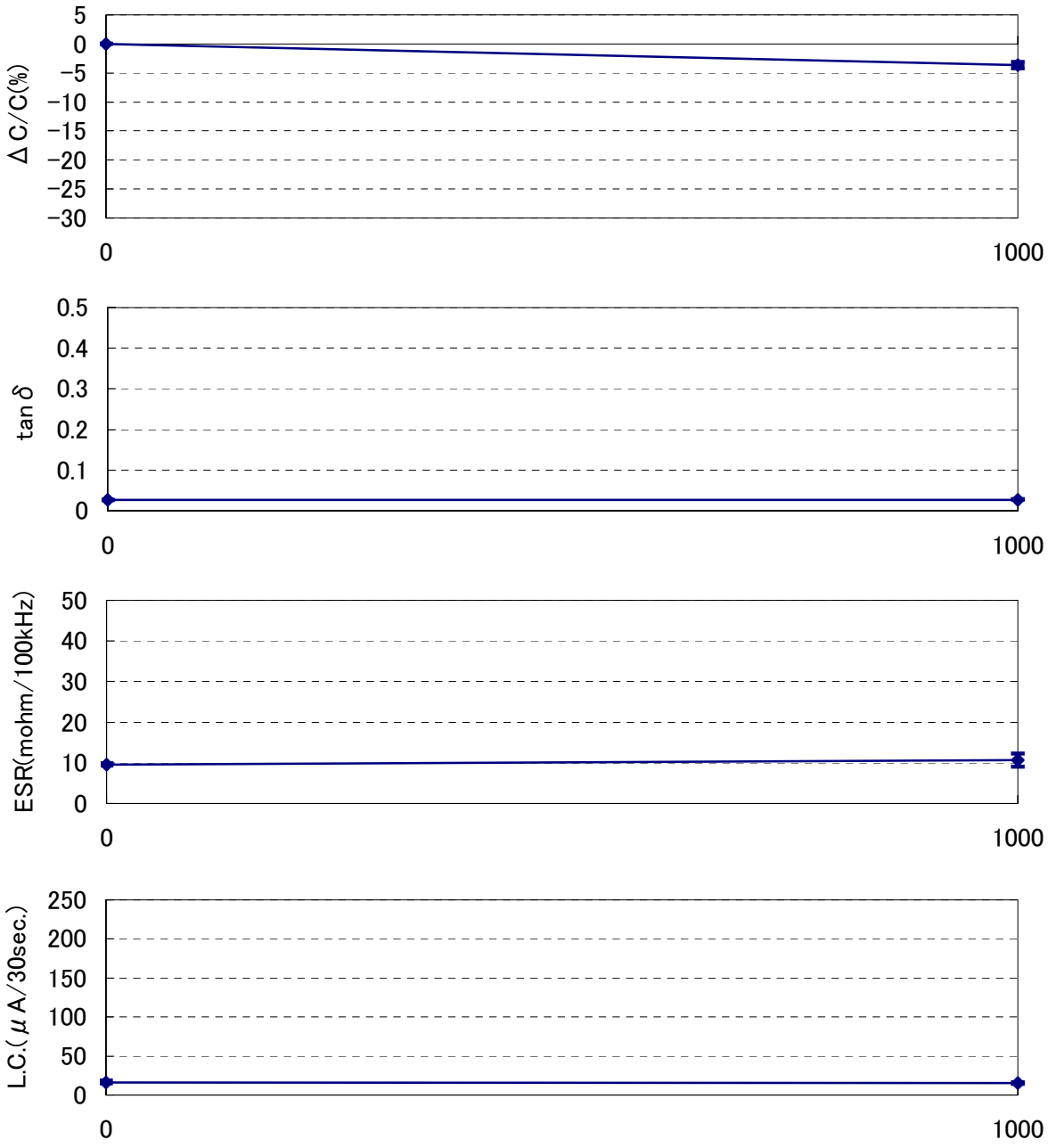
ITEM	High Temperature Exposure (Storage)	P.3

TEST CONDITION

1000 hours at 125℃ with no voltage applied.

The rated voltage applied for 1 hour after the test.

MODEL No. : NSPE-T221M35V10X12.8NBYF n = 80 pcs.



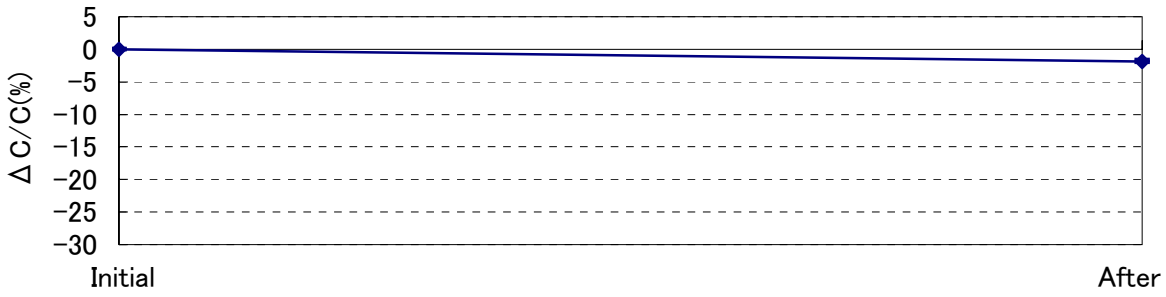
Appearance : No remarkable abnormality.

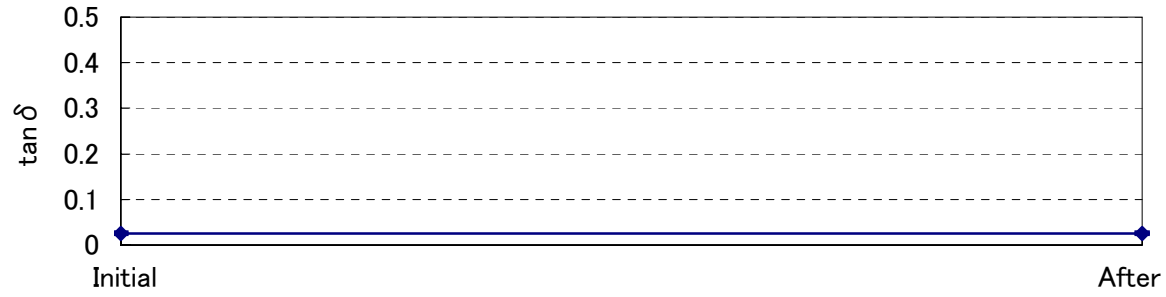
Judgment : Passed.

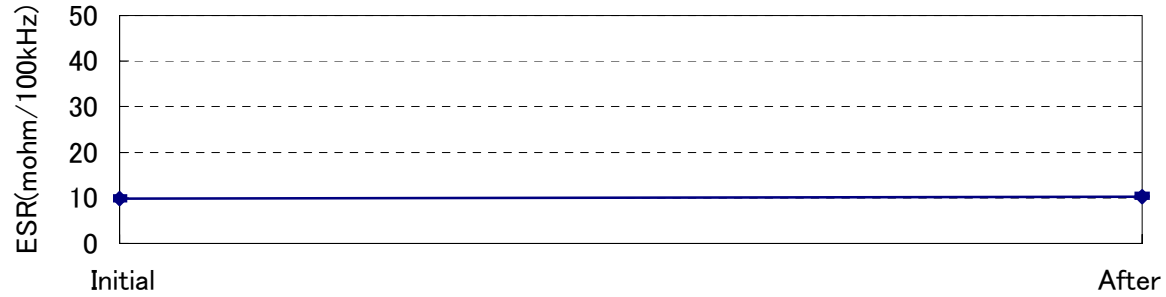
ITEM	Temperature Cycling	P.4

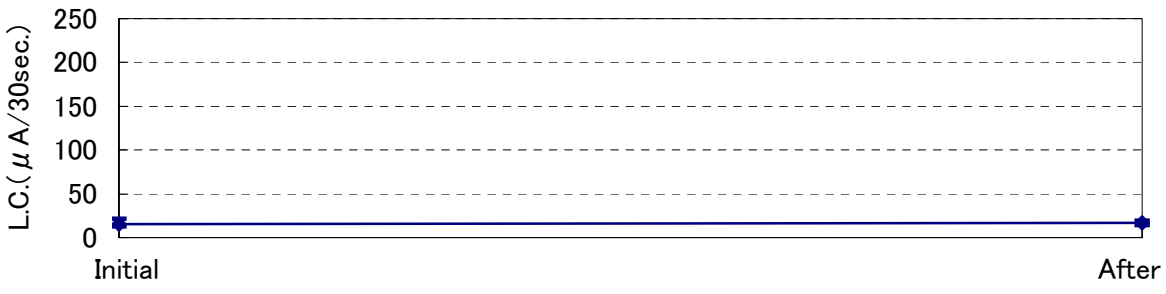
TEST CONDITION
−40℃ × 30min←→+125℃ × 30min
Number of cycles : 1000 cycles

MODEL No. : NSPE-T221M35V10X12.8NBYF n = 80 pcs.







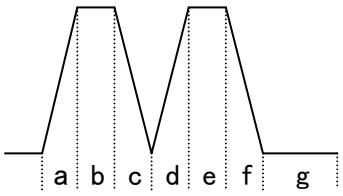


Appearance : No remarkable abnormality.
Judgment : Passed.

ITEM	Moisture Resistance	P.5

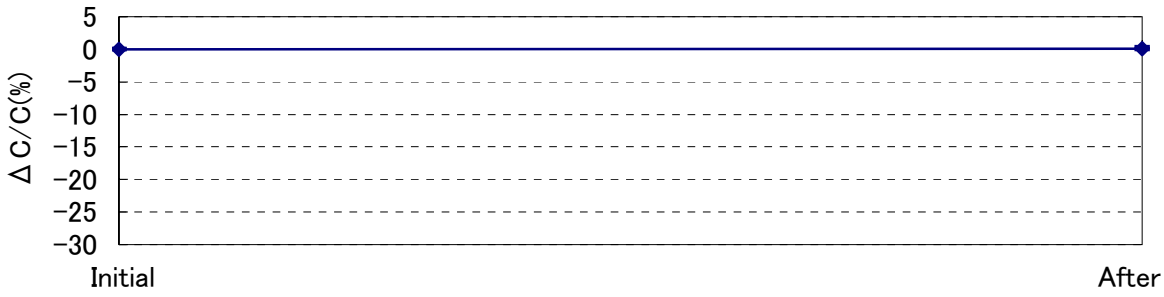
TEST CONDITION

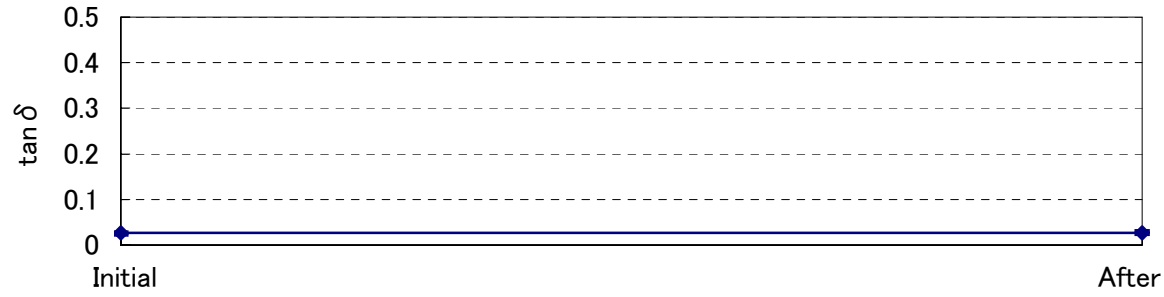
Step	Temp.(℃)	Humidity (%)	Time (hrs)
a, d	25 → 65	95	2.5
b, e	65	95	3
c, f	65 → 25	95	2.5
g	25	95	8

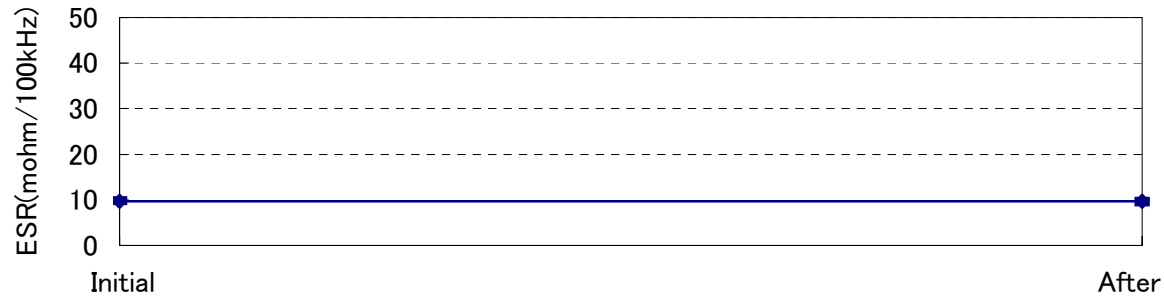


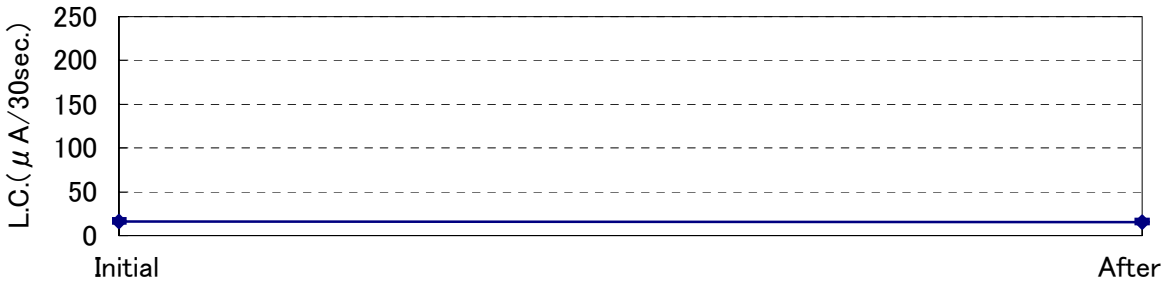
Number of cycles : 10 cycles

MODEL No. : NSPE-T221M35V10X12.8NBYF n = 80 pcs.









Appearance : No remarkable abnormality.

Judgment : Passed.

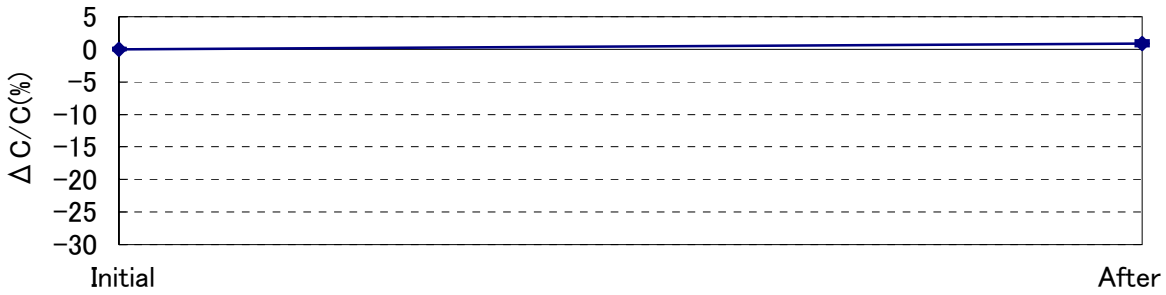
ITEM	Biased Humidity	P.6

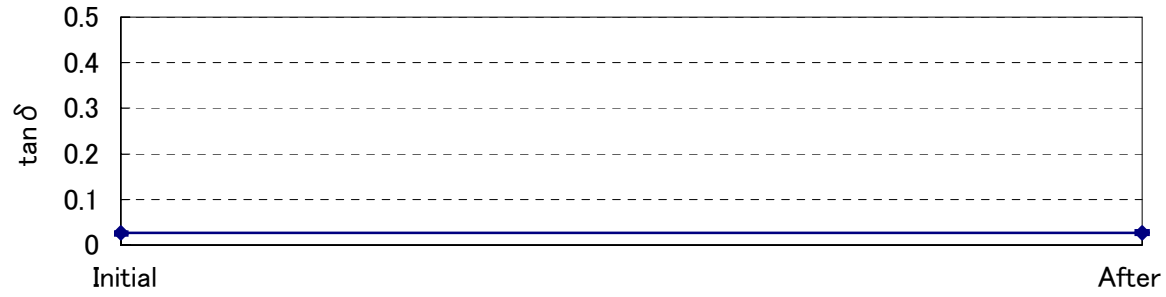
TEST CONDITION

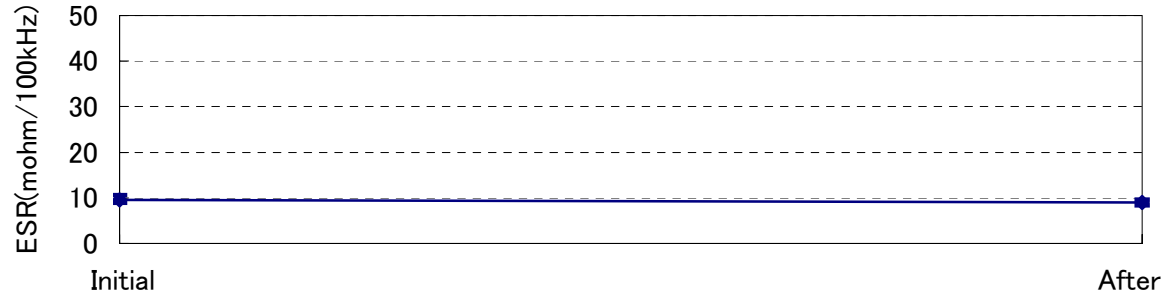
1000 hours at 85℃ with the rated voltage applied.

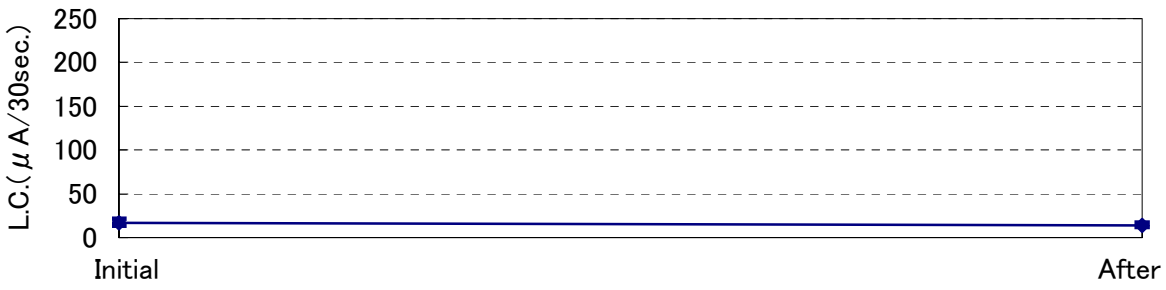
Humidity ; 85% RH

MODEL No. : NSPE-T221M35V10X12.8NBYF n = 80 pcs.









Appearance : No remarkable abnormality.

Judgment : Passed.

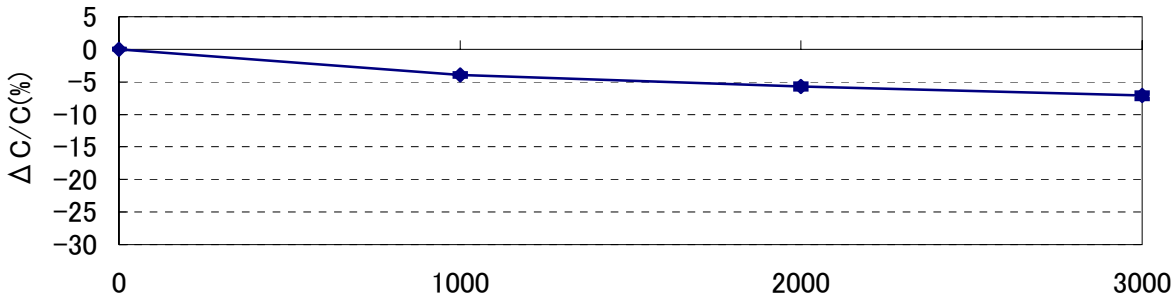
ITEM	Operational Life	P.7

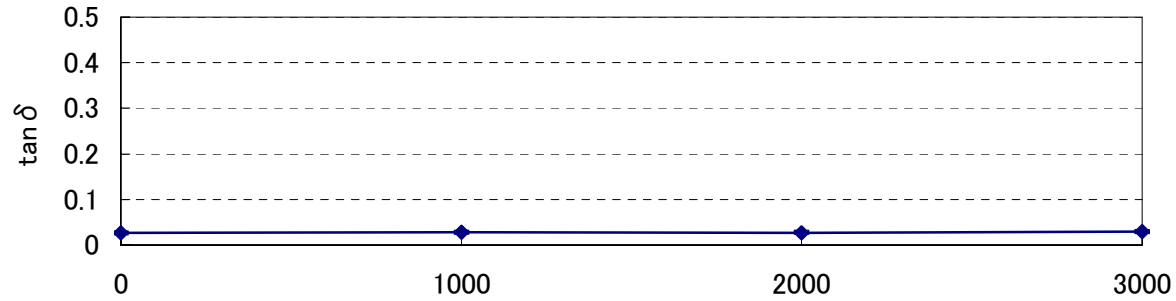
TEST CONDITION

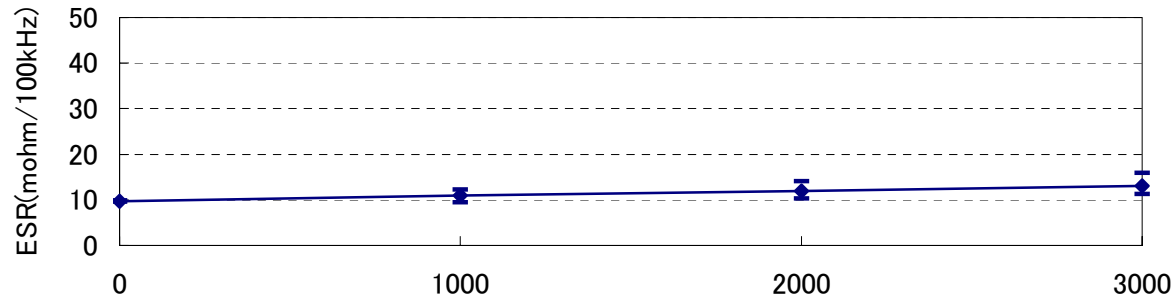
3000 hours at 125℃ with the rated voltage applied.

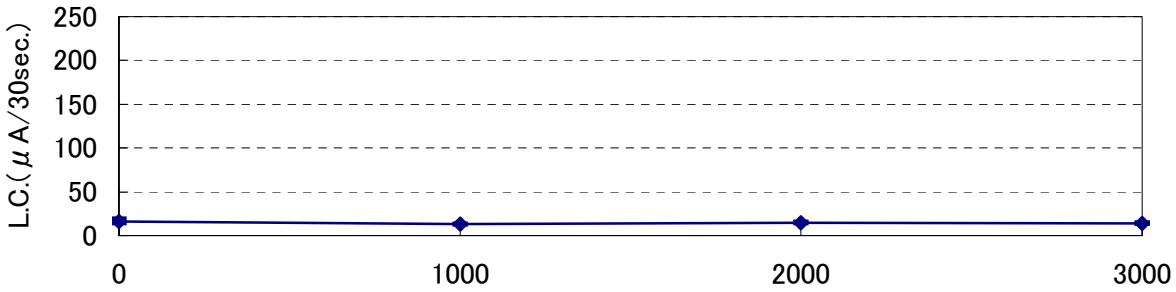
Ripple current : 1700mA/100kHz

MODEL No. : NSPE-T221M35V10X12.8NBYF n = 80 pcs.





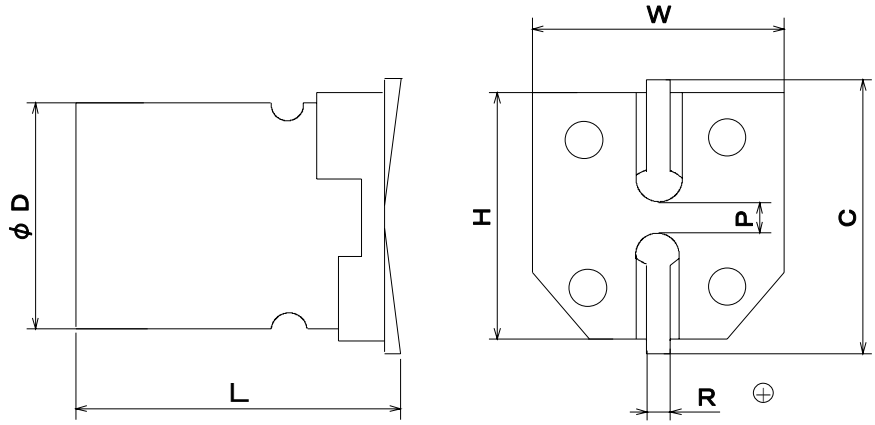




Appearance : No remarkable abnormality.

Judgment : Passed.

ITEM	Physical Dimension	P.8



MODEL No. : NSPE-T221M35V10X12.8NBYF

unit : mm

	φD	L	W	H	C	R	P
1	10.00	12.70	10.30	10.29	11.02	1.05	4.50
2	10.00	12.70	10.29	10.29	11.03	1.06	4.51
3	9.99	12.69	10.29	10.29	11.02	1.05	4.49
4	10.01	12.68	10.29	10.29	11.02	1.06	4.50
5	10.00	12.70	10.30	10.29	11.03	1.05	4.50
6	10.00	12.69	10.29	10.29	11.03	1.06	4.50
7	10.00	12.71	10.29	10.30	11.04	1.05	4.49
8	9.99	12.71	10.29	10.29	11.01	1.07	4.50
9	10.00	12.70	10.29	10.29	11.04	1.06	4.51
10	9.99	12.68	10.29	10.29	11.03	1.06	4.49
11	10.00	12.69	10.29	10.29	11.02	1.06	4.50
12	10.01	12.70	10.29	10.30	11.03	1.06	4.50
13	10.00	12.68	10.29	10.29	11.04	1.05	4.49
14	10.00	12.68	10.30	10.29	11.02	1.07	4.50
15	10.00	12.71	10.29	10.29	11.03	1.06	4.51
16	10.01	12.69	10.29	10.29	11.04	1.05	4.50
17	10.00	12.70	10.30	10.29	11.02	1.06	4.50
18	10.01	12.68	10.29	10.29	11.02	1.06	4.50
19	9.99	12.70	10.29	10.30	11.03	1.06	4.51
20	10.00	12.69	10.29	10.30	11.01	1.05	4.49
21	10.00	12.71	10.29	10.29	11.04	1.07	4.50
22	10.00	12.70	10.29	10.29	11.02	1.06	4.51
23	10.01	12.69	10.30	10.29	11.02	1.06	4.50
24	10.00	12.68	10.29	10.29	11.03	1.05	4.50
25	10.00	12.71	10.29	10.30	11.04	1.07	4.49
26	10.01	12.70	10.29	10.29	11.03	1.06	4.50
27	10.00	12.69	10.30	10.29	11.04	1.06	4.51
28	9.99	12.69	10.29	10.30	11.02	1.05	4.50
29	10.00	12.70	10.29	10.29	11.03	1.07	4.49
30	10.00	12.71	10.30	10.29	11.03	1.06	4.51
$\bar{X}$	10.00	12.70	10.29	10.29	11.03	1.06	4.50

ITEM	Resistance to Solvents	P.9

TEST CONDITION :
Dipped in the solvent at 20 to 25℃.
Solvent ; Isopropyl alcohol
Dipping time ; 3 min.

APPERANCE :
No significant change observed. The marking was legible.

TEST MODEL :
NSPE-T221M35V10X12.8NBYF n = 5pcs.

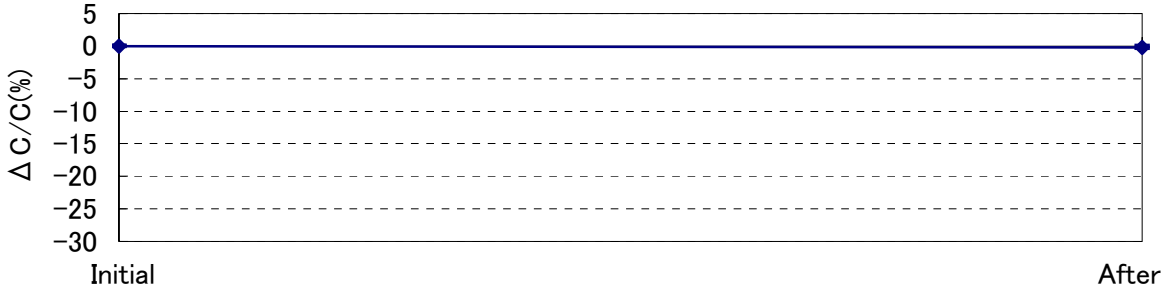
RESULT :
All samples met the specified standard.

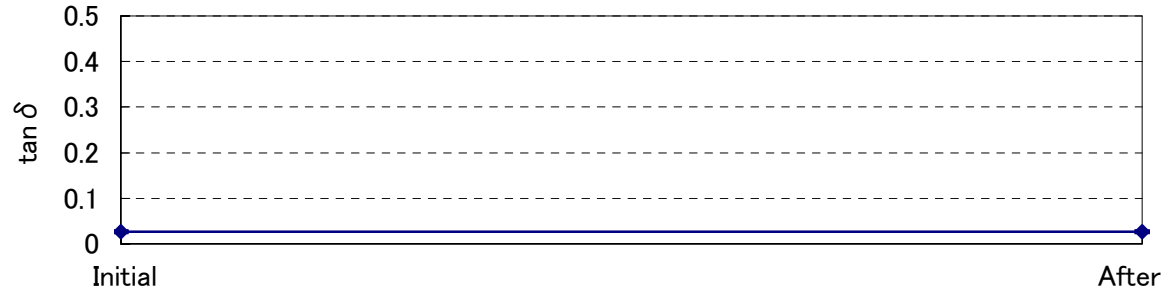
ITEM	Mechanical Shock	P.10

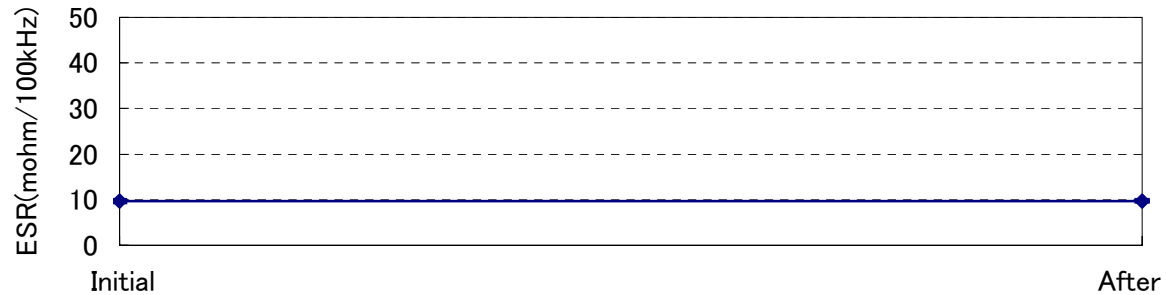
TEST CONDITION

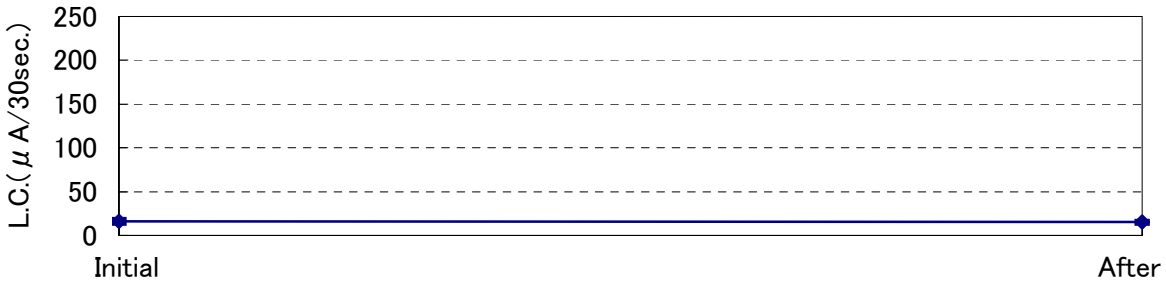
Peak acceleration ; 1000 m/s^2 (100G)
Duration of a pulse ; 6 ms
Pulse shape ; half-sine
Number of shocks ; X-X', Y-Y', Z-Z' 6 directions × 3 times
→ Total 18 times

MODEL No. : NSPE-T221M35V10X12.8NBYF n = 30 pcs.









Appearance : No remarkable abnormality.
Judgment : Passed.

ITEM	Vibration	P.11

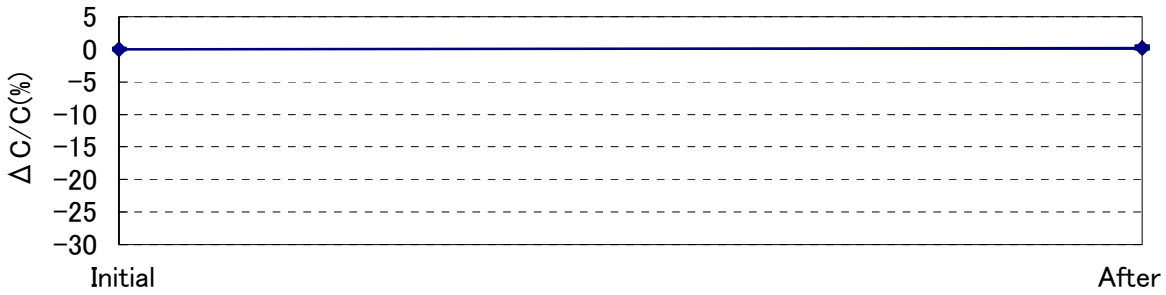
TEST CONDITION

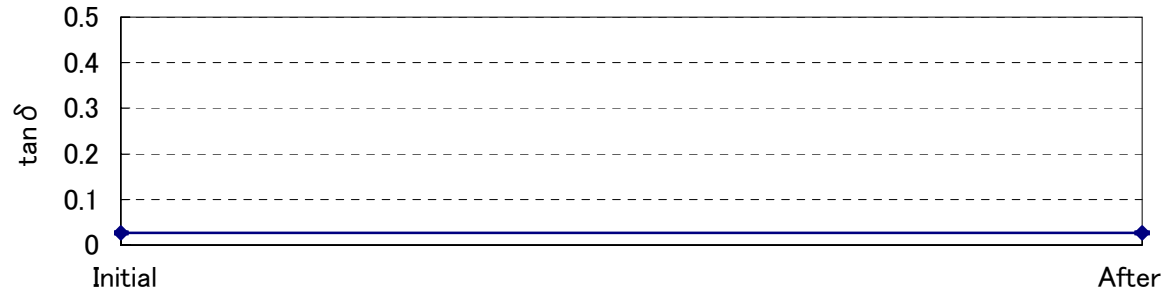
Direction and duration of vibration ; 3 orthogonal directions mutually each for 4h. Total 12h.

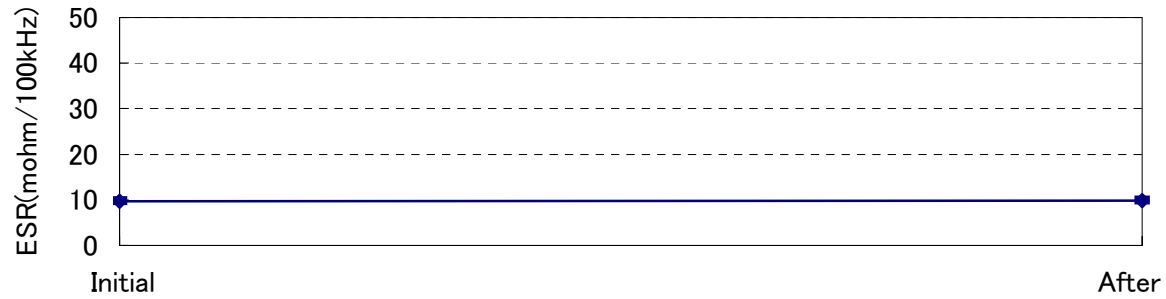
Frequency ; 10 to 2000 Hz

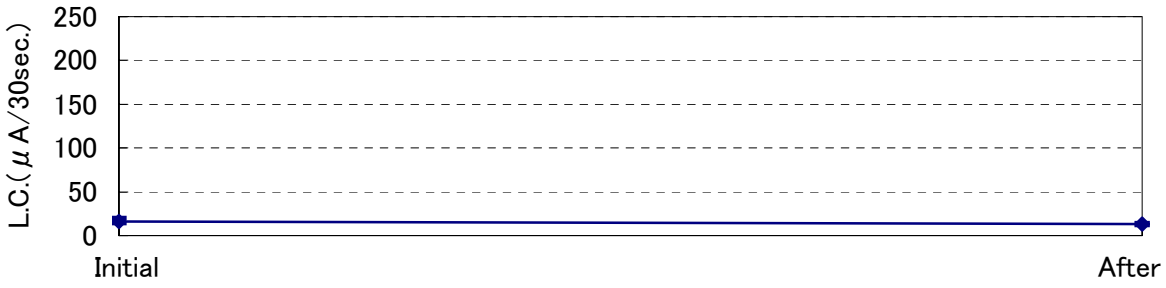
Acceleration ; 5G

MODEL No. : NSPE-T221M35V10X12.8NBYF n = 30 pcs.









Appearance : No remarkable abnormality.

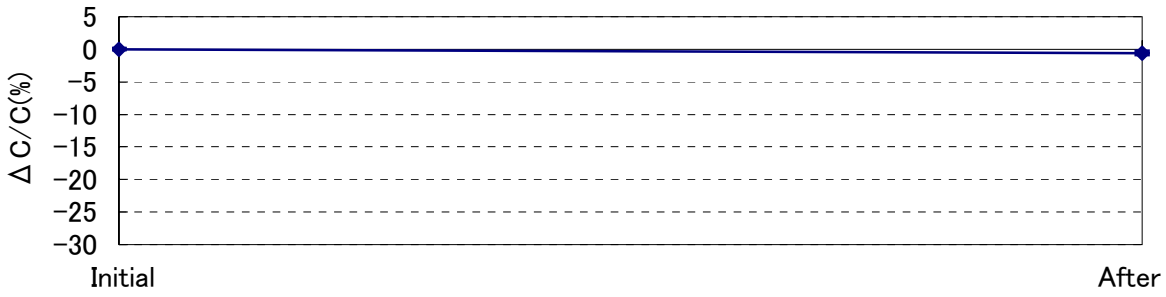
Judgment : Passed.

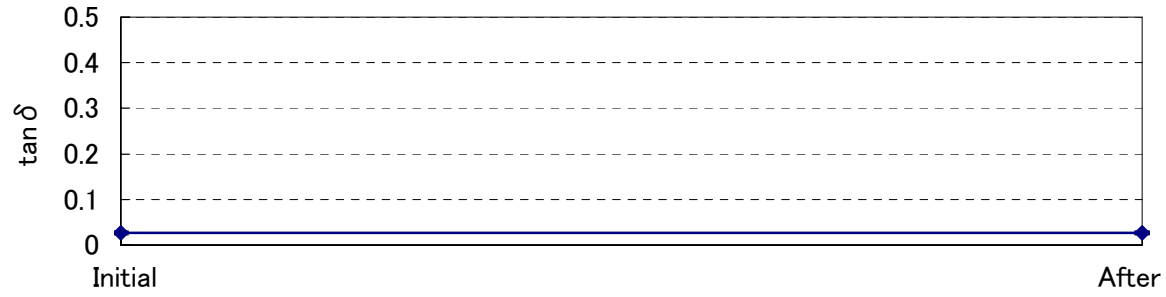
ITEM	Resistance to Soldering Heat	P.12

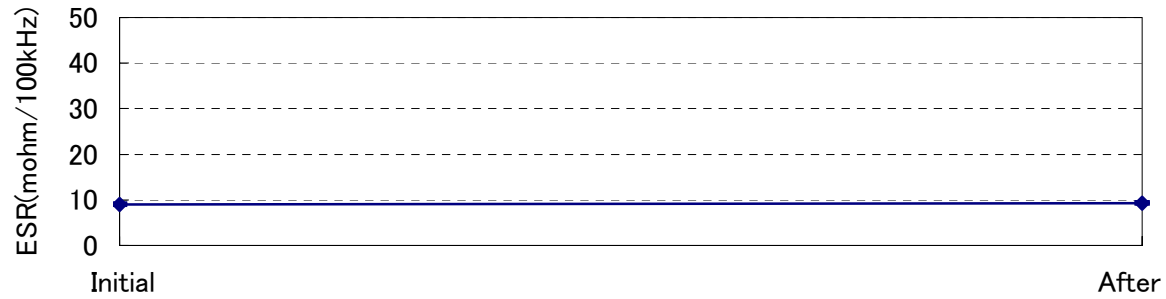
TEST CONDITION

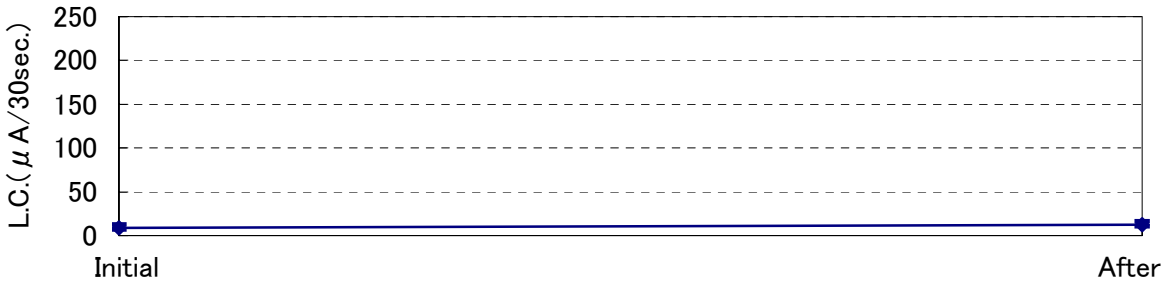
Vapor phase reflow ; 215±5 ℃ × 60±5 sec.

MODEL No. : NSPE-T221M35V10X12.8NBYF n = 30 pcs.









Appearance : No remarkable abnormality.

Judgment : Passed.

ITEM	Thermal Shock	P.13

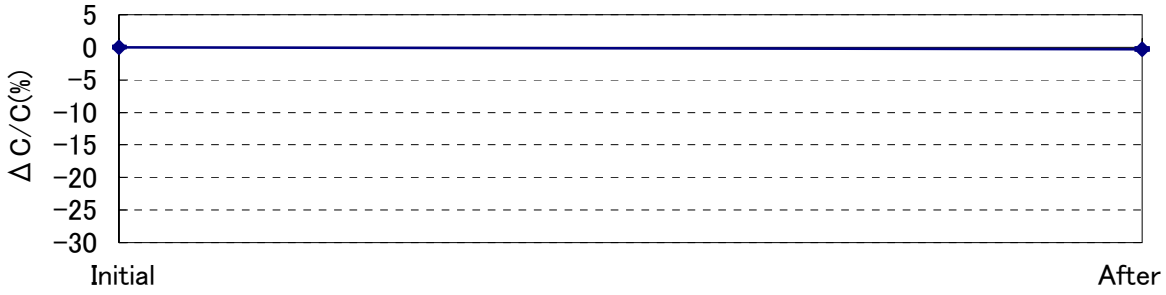
TEST CONDITION

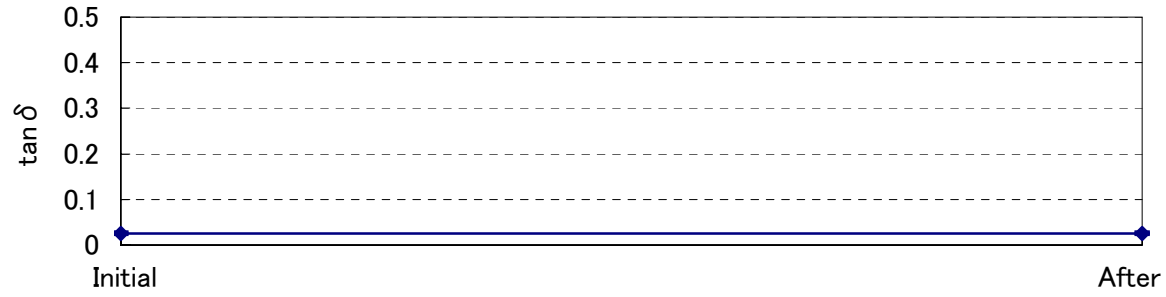
−55℃ × 15min←→+125℃ × 15min.

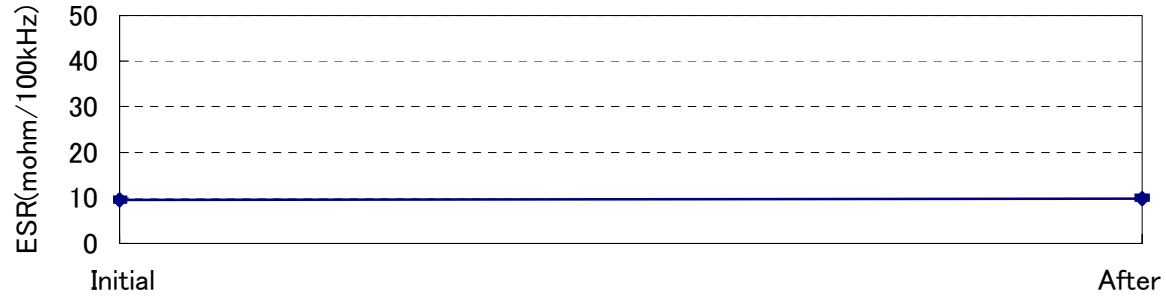
Maximum transfer time : 20 seconds

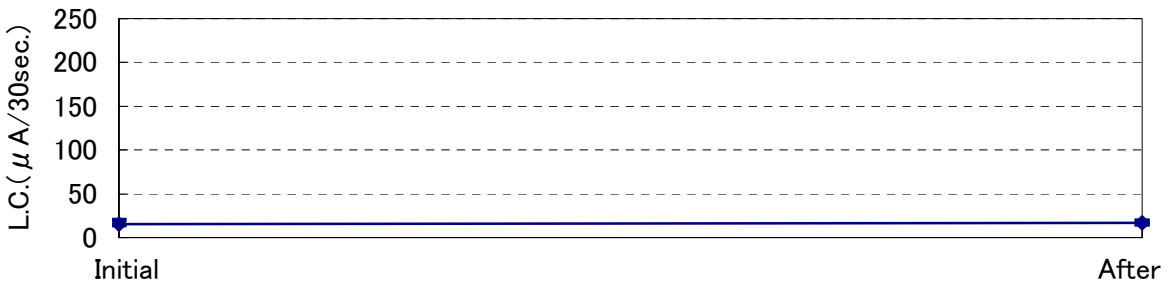
Number of cycles : 300 cycles

MODEL No. : NSPE-T221M35V10X12.8NBYF n = 30 pcs.









Appearance : No remarkable abnormality.

Judgment : Passed.

ITEM	ESD	P.14

TEST CONDITION :
As specified in AEC-Q200 REV C

TEST MODEL :
NSPE-T221M35V10X12.8NBYF n = 15pcs.

RESULT :

±500V	±1kV	±2kV	±4kV	±6kV	±8kV	±12kV	±16kV	±25kV
OK	OK	OK	OK	OK	OK	OK	OK	OK

Appearance : No remarkable abnormality.
Judgment : Passed.

ITEM	Solderability	P.15

TEST CONDITION :

1) Solder : Sn-37Pb

2) Flux : Ethanol solution of rosin (Rosin weight ratio : 25%)

3) Pretreatment : Pressure Cooker Test
105℃ 100% 1.22×10^5Pa 4hour

4) Condition of solder dip
The terminals of capapcitor are dipped in flux for 5 to 10 seconds after treatment.
Afterwards, the capacitor is dipped in a solder bath.
- Temperature of solder : 235 ± 2℃
- Dipping depth : 0.20 ～ 0.25 mm
- Dipping time : 2 ± 0.5 sec
- Dipping speed and pulling up speed : 25mm/sec.

EVALUATION CRITERIA :

95% of the surface of lead wire must be covered with the dipped solder.

TEST MODEL :

NSPE-T221M35V10X12.8NBYF n = 15pcs.

RESULT :

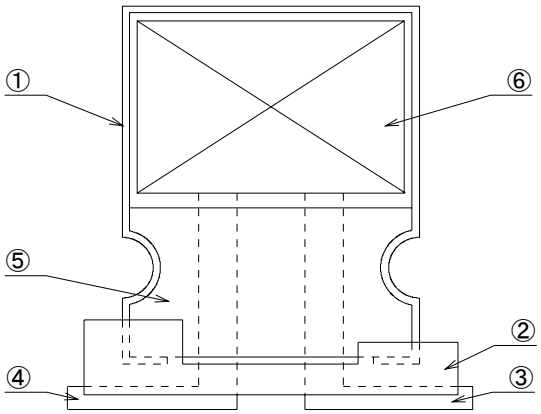
All samples met the specified standards.

ITEM	Electrical Characterization	P.16

MODEL No. NSPE-T221M35V10X12.8NBYF

	Lot.No.(08216L7)			Lot.No.(91056L3)			Lot.No.(96116L7)		
No.	Cap. (μF)	tan δ	L.C. (μA/30s)	Cap. (μF)	tan δ	L.C. (μA/30s)	Cap. (μF)	tan δ	L.C. (μA/30s)
1	205.9	0.028	10.34	204.7	0.030	11.64	207.4	0.026	8.47
2	208.0	0.028	9.14	207.4	0.030	9.04	207.9	0.026	6.03
3	207.2	0.028	9.24	206.8	0.030	10.03	207.6	0.026	8.13
4	207.9	0.029	9.60	207.9	0.031	10.60	206.7	0.026	8.81
5	207.6	0.028	8.82	206.9	0.030	10.31	207.8	0.025	8.31
6	208.1	0.028	9.58	207.5	0.030	10.18	209.8	0.026	9.82
7	208.9	0.028	10.12	209.5	0.029	10.26	207.7	0.026	11.43
8	209.1	0.028	10.01	209.3	0.030	11.29	207.6	0.026	8.74
9	207.9	0.028	9.96	209.0	0.030	10.53	206.1	0.026	8.95
10	208.1	0.028	12.47	207.0	0.030	14.67	207.7	0.026	8.30
11	207.0	0.028	9.09	205.3	0.030	9.02	207.6	0.026	8.15
12	208.4	0.028	8.52	207.4	0.030	8.33	209.0	0.026	8.54
13	207.8	0.028	9.47	206.2	0.030	10.49	210.3	0.025	8.73
14	206.4	0.027	9.68	204.6	0.029	10.49	207.3	0.026	9.83
15	208.8	0.028	10.50	208.0	0.030	10.68	210.7	0.026	12.25
16	206.3	0.028	9.91	205.3	0.030	10.40	206.9	0.026	9.61
17	207.8	0.028	10.12	206.5	0.029	9.28	209.2	0.026	12.45
18	208.9	0.028	9.80	208.6	0.030	10.16	207.7	0.025	8.75
19	207.7	0.029	9.57	206.8	0.030	10.69	209.2	0.026	8.38
20	207.6	0.028	8.55	206.3	0.030	9.19	208.6	0.026	6.33
21	209.0	0.028	9.82	209.3	0.030	10.12	207.6	0.026	9.23
22	207.9	0.028	10.61	207.3	0.029	10.78	209.1	0.026	9.46
23	209.5	0.027	9.61	209.8	0.029	9.79	210.7	0.025	10.11
24	208.1	0.027	8.80	209.2	0.029	8.88	207.8	0.025	8.50
25	208.3	0.028	9.81	208.2	0.030	10.73	209.0	0.026	9.49
26	207.8	0.028	9.85	207.0	0.030	10.38	209.9	0.026	10.16
27	207.9	0.028	8.07	207.0	0.030	8.68	209.8	0.026	8.87
28	207.6	0.028	8.64	207.2	0.030	9.12	208.3	0.025	8.18
29	207.3	0.028	10.10	206.7	0.030	11.83	209.0	0.025	7.91
30	206.8	0.028	9.78	205.5	0.031	11.21	208.5	0.026	8.38
$\bar{X}$	207.9	0.028	9.65	207.3	0.030	10.29	208.4	0.026	9.01
Max	209.5	0.029	12.47	209.8	0.031	14.67	210.7	0.026	12.45
Min	205.9	0.027	8.07	204.6	0.029	8.33	206.1	0.025	6.03
3σ	2.5	0.001	2.41	4.2	0.001	3.54	3.5	0.001	4.07

ITEM	Flammability	P.17



MODEL No.　NSPE-T221M35V10X12.8NBYF

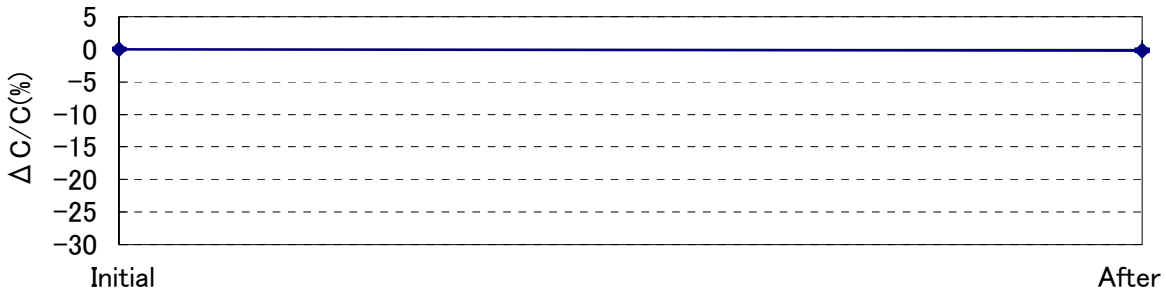
No.	Components	Materials / Treatment	UL Flame Class	UL File No.
1	Case	Aluminum (Plastic coating ; nylon)	-	-
2	Spacer	Thermoplastic resin (PPS)	UL-94-V-0	E53829
3	Terminal (+)	Copper clad steel wire (Coated with Tin and Bismuth (1%))	-	-
4	Terminal (-)	Copper clad steel wire (Coated with Tin and Bismuth (1%))	-	-
5	Packing	Synthetic rubber	-	-
6	Element	Anode ; Aluminnum foil Cathode ; Aluminnum foil Capacitor paper Electrolyte Conductive polymer	-	-

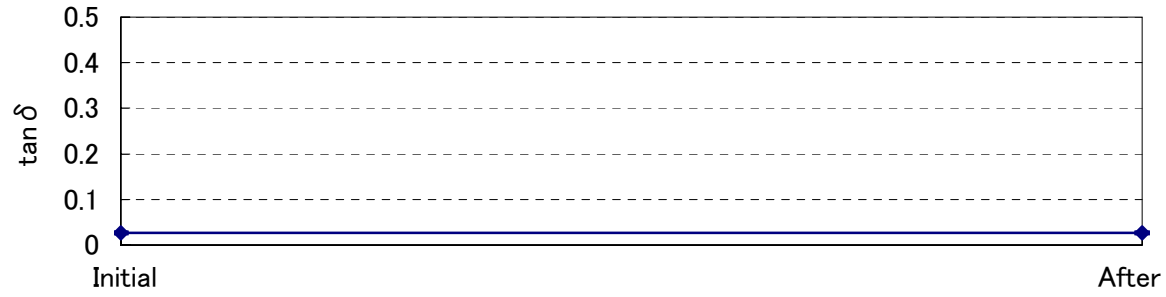
ITEM	Board Flex	P.18

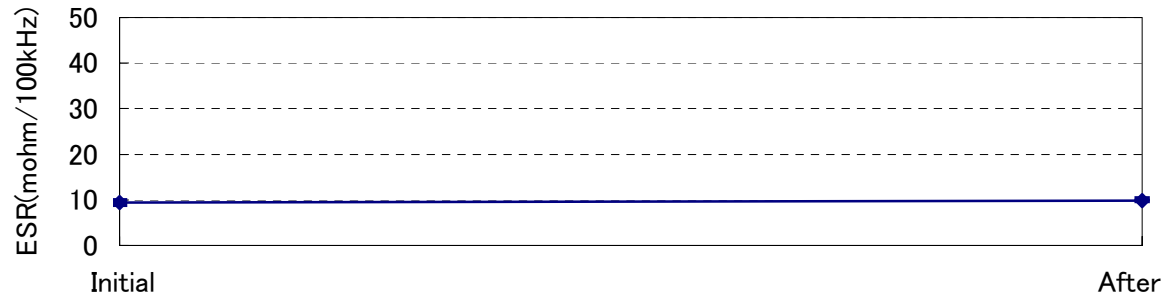
TEST CONDITION

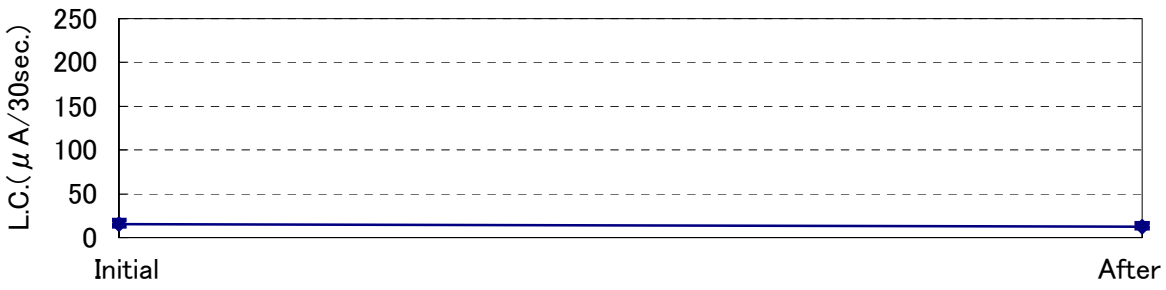
The capacitor mounted on the under side of a circuit board with bending fixture.
The capacitor must maintain for 60 seconds after the circuit board is bent by 2mm at 1mm/s.

MODEL No. : NSPE-T221M35V10X12.8NBYF n = 30 pcs.









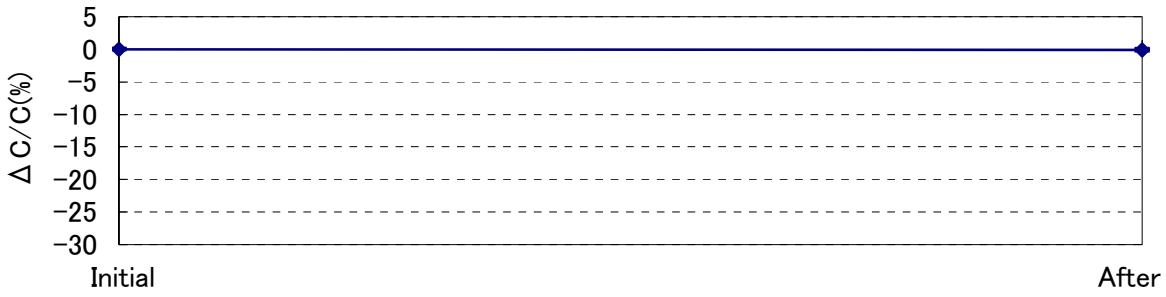
Appearance : No remarkable abnormality.
Judgment : Passed.

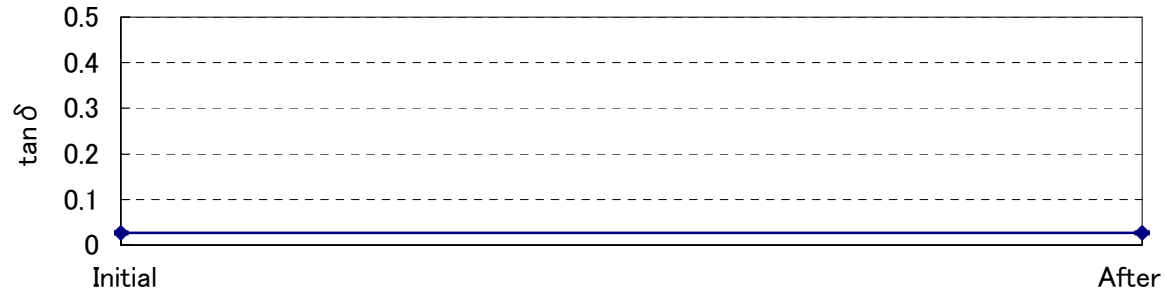
ITEM	Terminal Strength (SMD)	P.19

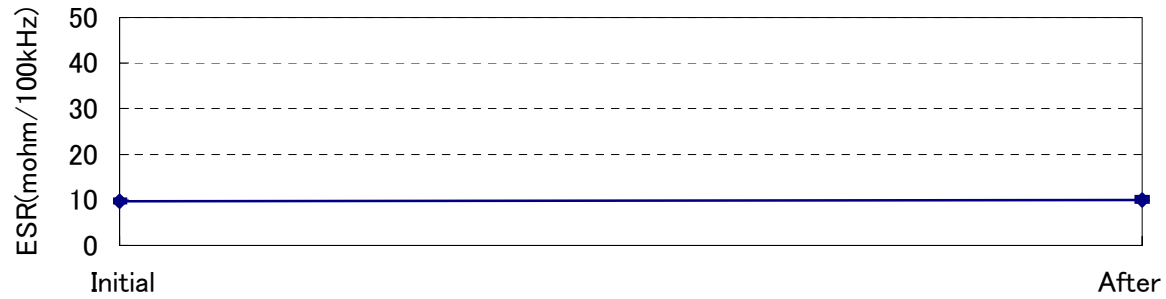
TEST CONDITION

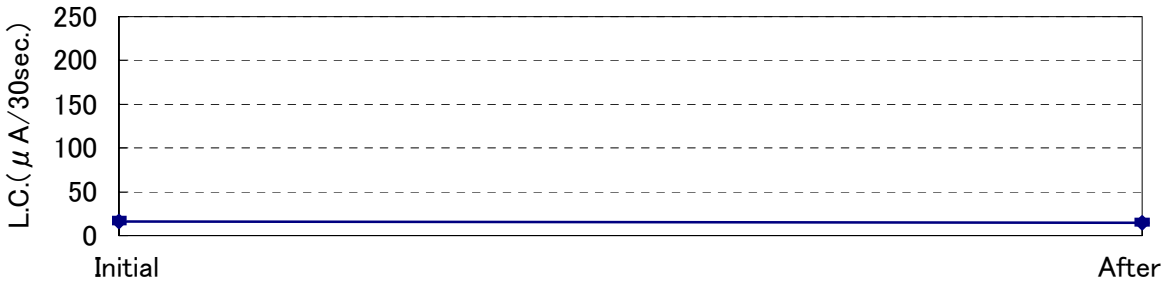
The 18N (1.8kg) of horizontal pressure was applied for 60±1 seconds with a press tool.

MODEL No. : NSPE-T221M35V10X12.8NBYF n = 30 pcs.









Appearance : No remarkable abnormality.
Judgment : Passed.

ITEM	Surge Voltage	P.20

TEST CONDITION

Surge voltage : 44V

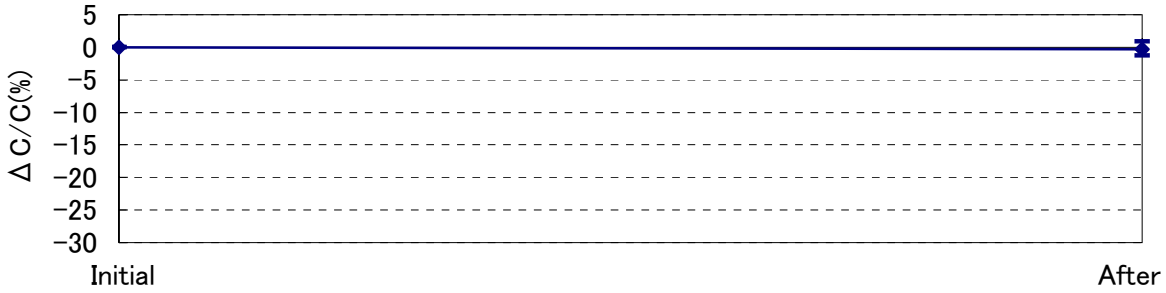
Duration: Time on 30±5 seconds / Time off 6±0.5 minutes

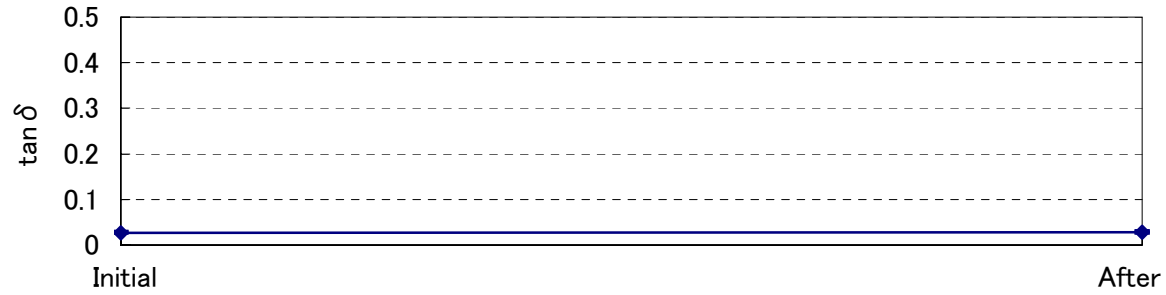
Number of Cycle : 1000 cycles

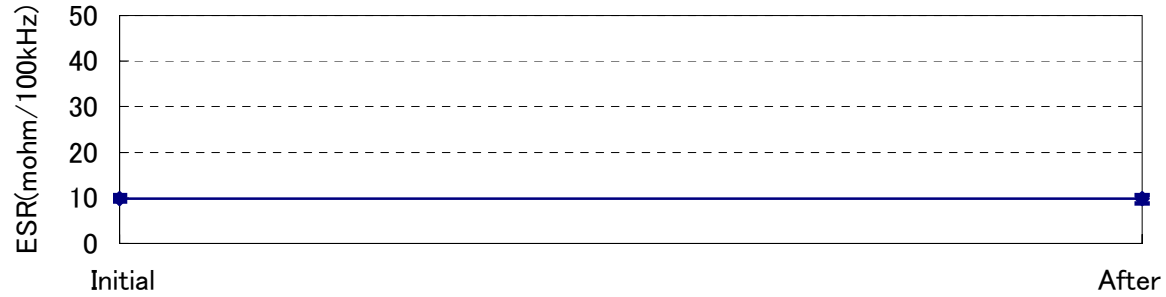
Test temperature : Room temperature

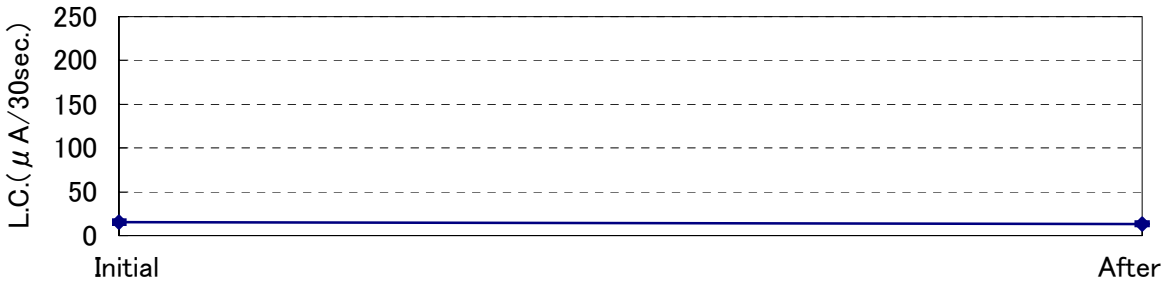
The discharge of surge voltage is made without any designed load.

MODEL No. : NSPE-T221M35V10X12.8NBYF n = 30 pcs.









Appearance : No remarkable abnormality.

Judgment : Passed.