NIPPON CHEMI-CON

MULTILAYER CERAMIC CAPACITORS

CAT. No. E1002H

MULTILAYER CERAMIC CAPACITORS SERIES TABLE

Item	Series	Rated Voltage Range (Vdc)	Rated Capacitance Range(μF)	Category Temperature Range (℃)	Temperature Characteristics
Chip Type	Upgrade! NTS	25 to 250	0.033 to 33	-55 to +125	ΔC/C 25℃=±15% -55℃ to +85℃ (X5R : EIA) ΔC/C 25℃=±15% -55℃ to +125℃ (X7R : EIA)
	THC	16 to 200	0.047 to 100	-55 to +125	ΔC/C 20℃=-55 to +20% -25℃ to +85℃ (E : JIS) ΔC/C 25℃=-56 to +22% -30℃ to +85℃ (Y5U : EIA) ΔC/C 25℃=-82 to +22% -55℃ to +125℃ (X7V : EIA)
	TMC	25 to 200	0.033 to 10	-55 to +125	
Metal cap Type	THP	16 to 200	0.45 to 200	-55 to +125	
	TMP	25 to 200	1.5 to 100	-55 to 125	
Lead Type	THD	16 to 250	0.1 to 680	-55 to +125	

For environmentally friendly capacitors (Lead-free / non-PVC sleeving products), please consult us.

CAT. No. E1002H

MULTILAYER CERAMIC CAPACITORS PRECAUTIONS AND GUIDELINES

1 In designing device circuits

(1) Confirming the installation and operating environment of capacitors,use them within the rated performance limits prescribed in their catalog or product specifications. Otherwise, excessive use conditions cause the capacitors to have catastrophic failure such as short circuit, open circuit or firing.

(2) Surge voltage shall not exceed specified withstand voltage.

(3) By considering the temperature characteristic and the DC bias characteristic of the ceramic capacitors, please determine the right capacitance. The capacitance of the capacitors changes in low and high temperature ambiences and depends on the applied bias voltages. The capacitance change (i.e. reduction) may affect the performance of the circuit which is containing the capacitors. Therefore, please examine the capacitors in the actual operational conditions to verify that they are right ones.

(4) The common failure mode of multilayer ceramic capacitors is contingent insulation breakdown or short circuit. When the capacitors are used in a high-power circuit, they may damage the surroundings of the capacitors when failed. Therefore, the high-power circuit should have protective device/protective devices to shut down the circuit from the capacitor/capacitors. The reliability of the capacitors improves when the ambient temperatures are in the normal temperature range and the applied voltages are low. For this reason, we recommend to apply a voltage, which is 1/2 of the rated voltage of the capacitors or lower, to the capacitors.

(5) When large high frequency ripple current acrosses multilayer ceramic capacitor , the capacitor can vibrate. The phenomenon occurs as the capacitor, has natural vibration frequency due to the mechanical dimensions, resonates to the large high frequency ripple current.
To prevent the resonance, please select the capacitor or change the ripple current frequency.
For your information, we indicate the following resonance frequency to each chip size.

Size Code NTS	Chip Size	(kHz)
31	3.2× 1.6	650, 1200, 1600
32	3.2× 2.5	650, 850, 1200
43	4.5× 3.2	450, 650, 1200
55	5.7× 5.0	350, 450, 850

Size Code THC,THP	Size Code THD	Chip Size	(kHz)
21		2.0× 1.25	900, 1500, 1800
31		3.2× 1.6	600, 1200, 1600
32	32	3.2× 2.5	600, 750, 1200
43	43	4.5× 3.2	400, 600, 1000
55	55	5.7× 5.0	300, 400, 900
76	76	7.5× 6.3	250, 350, 750
	80	10.0× 9.0	160, 200, 600
	90	20.0×12.7	90, 160, 500
	99	25.0×12.7	75, 160, 300

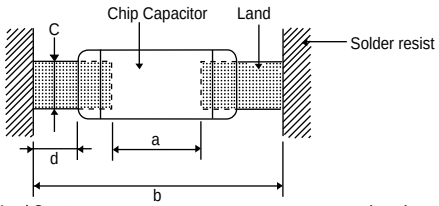
(6) The capacitance of the capacitors depends on the ambient temperatures and bias voltages. Therefore, please examine the capacitors when they are to be used in a time-constant circuit before the use.

(7) Consult us for devices that requires high reliability. For components which are used to the devices whose failure affects human life or causes social loss by serious damage, higher reliable designs than general purpose components are required.

2 In designing PC boards

(1) Put the proper volume of solder (the size of fillet) on PC boards for installing surface mount capacitors, because it directly affects the installed capacitors. The design of copper pad patterns and dimensions should be set so that the proper volume of solder can be provided. The recommended land dimensions are shown below.

(2) Land width of PC boards shall not exceed the width of chip capacitors.



●Chip type (mm)

Code \ Size Code	21	31	32	43	55	76
a	1.0 to 1.4	1.8 to 2.5	1.8 to 2.5	2.5 to 3.5	2.7 to 4.7	3.8 to 5.0
b	3.0 to 4.6	4.2 to 5.8	4.2 to 5.8	5.5 to 6.1	6.7 to 8.3	8.8 to 10.8
c	0.9 to 1.2	1.2 to 1.6	1.8 to 2.5	2.3 to 3.2	3.5 to 5.0	4.7 to 6.3
d	0.3 to 0.6	0.4 to 0.8	0.5 to 1.0	0.6 to 1.1	0.7 to 1.2	0.8 to 1.3

●Metal Cap type (mm)

Code \ Size Code	43	55	76
a	2.5 to 3.5	3.5 to 4.5	5.5 to 6.5
b	5.5 to 6.1	6.5 to 7.5	8.8 to 9.8
c	2.3 to 3.2	4.0 to 5.0	5.5 to 6.5
d	0.6 to 1.1	0.5 to 1.5	0.8 to 1.8

(3) When the multilayer ceramic capacitors are mounted on a substrate, the chips may crack when mechanical stress is put. Also, when the substrate is bent, they may also crack. Therefore, please make sure that the material and size of the substrate and the capacitor positions are right.

(4) For a leaded capacitor, design the PC boards with the correct terminal hole space equal to the lead space of the capacitor.

CAT. No. E1002H

MULTILAYER CERAMIC CAPACITORS PRECAUTIONS AND GUIDELINES

3 Installation

(1) When installing leaded capacitors in the PC boards by means of an automatic insertion machine, minimize the mechanical shock applied to the capacitors by the lead clinch unit of the machine.
(2) When the capacitors are to be mounted on a substrate, please minimize the shock and weight to the capacitor bodies. The nozzle pressure during the mounting process should be adjusted to 1N～3N maximum in static load.
(3) Periodically maintain and inspect installation machines.
(4) Where an adhesive is used to pre-anchor capacitors on PC boards, use appropriate copper pad dimensions,type of adhesive, coating volume, curing temperature and time, etc. to prevent the capacitors from deteriorating.

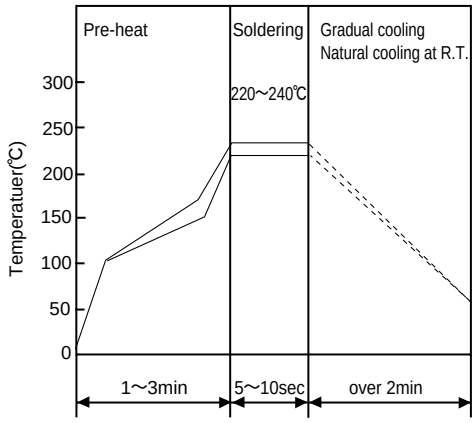
4 Soldering

(1) Use flux with a halogen content of less than 0.1 wt. %. Do not use strong acid flux.
(2) Minimize a volume of flux to coat the PC boards with.
(3) Follow the soldering conditions prescribed in the catalog or product specifications. Excessive thermal stress affects the performance of the capacitors.
(4) Note that surface mount capacitors with the size 3.2×1.6 or smaller tend to stand up during vapor phase reflow soldering.
(5) For reflow soldering, place surface mount capacitors on the PC boards as soon as possible after solder paste was coated.
(6) Please be aware that thermal deformation of substrates during mounting process cause stress to the substrates. Especially, substrates which are mounting chip capacitors are to be flow soldered to solder leaded parts or solder other parts onto the substrates, please make sure that the deformation during the soldering causes no harm. In fact, the deformation may cause stress to the substrates which leads to the capacitor element cracks/insulation-layer break down/insulation resistance degradation.The effect of the stress due to the deformation depends on the material of the substrates. Therefore, please be aware of the following information.
   a) Ceramic substrates
      The stress due to the deformation of ceramic substrates is thought be the minimum. Heat contract difference during solder hardening can be the effect to ceramic capacitors mounted on the substrates. So, please avoid forced cooling during the hardening.
   b) Glass epoxy substrates
      The stress due to the deformation and warp of glass epoxy substrates affects ceramic capacitors mounted. The stress depends on the size and material of the substrates, pattern positions and thermal gradient during soldering. Temperature difference between the both sides of the substrates may also cause the stress. When the material of the substrates, which are mounting ceramic capacitors, is FR-4 or the equivalent and other parts are to be flow soldered, the surface of the side with the capacitors shall be sufficiently preheated to 150℃ or over before the flow soldering. During the soldering, the temperature difference between the side with the capacitors and the other side of the substrate should be 100℃ maximum.
   c) Metal substrates
      The deformation and warp of metal substrates considerably affect ceramic capacitors mounted. Therefore, please use metal caps which can moderate the stress of the substrates.
(7) After reflow/flow soldering, please cool the PC boards which mounted capacitors naturally in the air.
(8) Ceramic chip capacitors are solderable by twice maximum in reflow or flow soldering. When the capacitors are to be reflow soldered and then flow soldered, there shall be no additional soldering to the capacitors. However, the capacitors having a size of 5.7×5.0 or larger should be soldered by one time only.
(9) Due to the nature of ceramic, radical heating or cooling and partial heating may crack the ceramic capacitor element. Please have enough pre-heating process before soldering.
(10) Ultrasonic cleaning time shall be ten minutes maximum.
   When the power of ultrasonic cleaner is too high, the strength of terminations may drop.
   Therefore, carefully examine the cleaning conditions before use.
(11) Adjust the amount of solder cream in order that solder fillet shall be 1/2 to 2/3 height of chips. If fillet can confirm, size of 4.5×3.2 or larger is not this limit.
(12) When more than two chips are mounted on a common land, please separate the chips by the solder resist.
(13) In hand soldering, please take into consideration the following items.
   1. Fully pre-heat on a heating plate whose surface temperature is 100℃ to 150℃ .
   2. Soldering iron power shall not exceed 30W.
   3. Soldering iron tip diameter shall not exceed 3mm.
   4. Temperature of iron tip shall be adjusted to not exceed 300℃.
   5. The soldering iron tip shall not touch ceramic body directly.

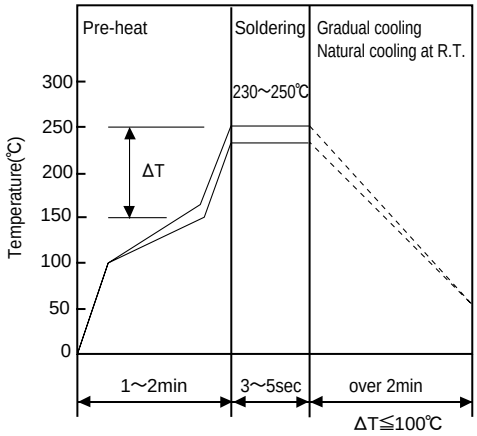
MULTILAYER CERAMIC CAPACITORS PRECAUTIONS AND GUIDELINES

5 Soldering profile

Reflow Soldering Profile



Flow Soldering Profile



*Flow Soldering
THCS Series : 21,31,32,43 size
TMCS Series : 31,32,43 size
NTS Series : 31,32,43 size

6 Cleaning

(1) In the case that the assembly boards are washed, choose the appropriate cleaning agent for the washing purpose.
(2) To determine the cleaning conditions, make sure by means of the actual washing equipment that the performance of the capacitors is not affected.
(3) In the case that water-soluble flux was used,sufficiently wash the assembly boards.

7 Coating materials

(1) When ceramic capacitors are to be resin coated or molded, please pay enough attention. Ceramic capacitors molded in resin, and please do not use it. There is fear to destroy a capacitor by stress to occur by the expansion / the shrinkage when resin stiffens. When a thermal expansion shrinkage coefficient in hardening uses big resin, coating in the resin which is soft with capacitors, please make that stress is added to capacitors small as much as possible.
(2) Confirm that harmful resolution or formation gasses are not generated from the coating materials during the curing process or by spontaneously leaving the coated assembly boards.
(3) If a coating material is cured at higher temperatures than the Category temperature of the capacitor, the exterior resin will deteriorate resulting in the capacitor damage.

8 Handling

(1) When cutting off a multi-board to make individual units, curving or twisting the board may crack the capacitors. Appropriate tools should be used to cut it off.
(2) Excessive mechanical shock to capacitors or their assembly boards may make the capacitors crack.
(3) Use leaded capacitors without bending their lead wires as much as possible.
(4) When ceramic capacitors are stored with no load, the capacitance reduces during the storage (named "aging characteristic"). As for the product that capacitance decreased, capacity recovers in an initial value by heat-treating it.
(5) When the electrodes of the ceramic capacitors are made of silver, needle crystals may form on the electrodes in an ambience containing sulfur compounds.

MULTILAYER CERAMIC CAPACITORS PRECAUTIONS AND GUIDELINES

9 Storage

(1) Do not store and use capacitors in the following environment. Water or salt water splashes, dew wets or toxic gasses (hydrogen sulfide, sulfurous acid,chlorine, ammonium) fills, Vibration or mechanical shock exceeding the limits prescribed in the catalog or product specifications.
(2) Do not store capacitors in places that direct sunlight pours down or dewy places.
(3) Avoid high temperature and humidity.
The storage conditions should be : Temperature=Lower than 40℃
Humidity=Lower than 70% RH

10 Catalogs

Specification in catalogs may be subject to change without notice. Performance test data in the catalogs show typical values, which are not assured in the catalogs.

For the details, refer to Guideline of notabilia for fixed multilayer ceramic capacitors for use in electronic equipment, EIAJ RCR-2335 issued by Electronic Industries Association of Japan.

CAT. No. E1002H

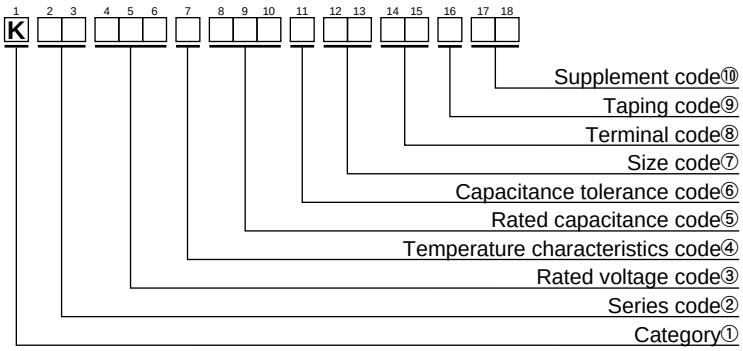
NIPPON CHEMI-CON

MULTILAYER CERAMIC CAPACITORS GUIDE TO GLOBAL CODE

Global code system

The current parts numbering system is changed to new system for global coding.
Your cooperation will be very much appreciated.

◆Multilayer Ceramic Capacitors



①Category

Code	Series
K	Multilayer Ceramic Capacitors

②Series

Code	Series
TS	NTS
HC	THC
MC	TMC
HD	THD
HP	THP
MP	TMP

③Rated voltage

Significant digit (two columns) + index (one column)
unit : Vdc

Code	Rated voltage
160	16Vdc
250	25Vdc
500	50Vdc
101	100Vdc
201	200Vdc
251	250Vdc

④Temperature characteristics

Code	Temp. character	Temp. Range	ΔC/C
E	E	-25 to 85℃	-55 to 20%
B	X7R	-55 to 125℃	±15%
C	X5R	-55 to 85℃	±15%

⑤Rated capacitance

Unit of capacitance with (pF), and a sign of capacitance expresses it in 3 characters.
significant digit (two columns) + index (one column) unit : pF
(Example 1μF=1000000pF)

⑥Capacitance tolerance

Code	Tolerance
K	±10%
M	±20%
Z	-20 to +80%

⑦Size

Type : Chip

Code	Dimensions (L×W)
21	2.0×1.25
31	3.2×1.6
32	3.2×2.5
43	4.5×3.2
55	5.7×5.0
76	7.5×6.3

Type : Radial Lead

Code	Dimensions (L×W)
32	5.0×6.5
43	6.5×7.0(7.5)
55	7.5(8.0)×9.0
76	10.0×11.5
80	13.5×15.0
90	22.5×20.0
99	28.5×20.0

Type : Metal Cap

Code	Dimensions (L×W)
43	4.8×3.5
55	6.0×5.0
76	7.8×6.6

⑧Terminal

Type : Chip

Code	Terminal
S0	Solder plating
N0	Tin plating
R0	Silver

Type : Radial Lead

Code	Terminal
A0	Straight Lead
B0	Crimped Lead
C0	Straight Lead (copper wire)

Type : Metal Cap

Code	Terminal
2A	Two element, Solder plating1
2B	Two element, Solder plating2
2E	Two element, Spring plating

⑨Taping

Code	Taping
T	Taping
B	In pieces

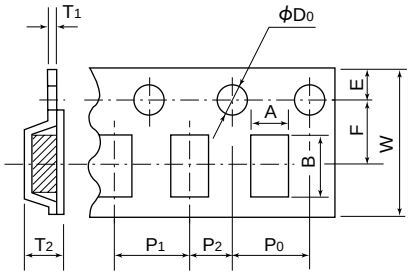
⑩Supplement

Code	Supplement
00	Standard

CAT. No. E1002H

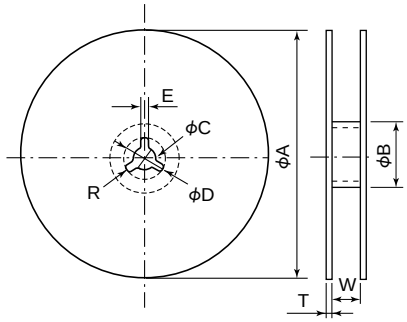
MULTILAYER CERAMIC CAPACITORS PACKAGING

◆CHIP TYPE TAPING SPECIFICATION



Type	Size Code	Dimensions (mm)										
		A ±0.1	B ±0.1	W ±0.3	F ±0.05	E ±0.1	P_1 ±0.1	P_2 ±0.05	P_0 ±0.1	ϕD ±0.1	T_1 max.	T_2 max.
Chip type	21	1.45	2.5	8.0	3.5	1.75	4.0	2.0	4.0	1.5	0.6	1.5
	31	1.9	3.5	8.0	3.5	1.75	4.0	2.0	4.0	1.5	0.6	1.5
	32	2.8	3.5	8.0	3.5	1.75	4.0	2.0	4.0	1.5	0.6	2.5
	43	3.65	4.95	12.0	5.5	1.75	8.0	2.0	4.0	1.5	0.6	2.8
	55	5.5	6.25	12.0	5.5	1.75	8.0	2.0	4.0	1.5	0.6	2.8
	76	6.85	8.05	16.0	7.5	1.75	12.0	2.0	4.0	1.5	0.6	3.0
Metal cap type	43	3.8	5.2	12.0	5.5	1.75	8.0	2.0	4.0	1.5	0.6	6.0
	55	5.3	6.4	16.0	7.5	1.75	8.0	2.0	4.0	1.5	0.6	6.0
	76	6.9	8.2	16.0	7.5	1.75	12.0	2.0	4.0	1.5	0.6	7.5

●REEL SPECIFICATIONS



Size Code / Code	Dimensions (mm)				
	NTS, THC, TMC			THP, TMP	
	21, 31, 32	43, 55	76	43	55, 76
ϕA	178±2	178±2	178±2	178±2	382±2
ϕB	50min.	50min.	50min.	50min.	80min.
ϕC	13±0.5	13±0.5	13±0.5	13±0.5	13±0.5
ϕD	21±0.8	21±0.8	21±0.8	21±0.8	21±0.8
E	2±0.5	2±0.5	2±0.5	2±0.5	2±0.5
W	9±0.5	13±0.5	17±0.5	13±0.5	17±0.5
T	1±0.5	1±0.5	1±0.5	1±0.5	1±0.5
R	1.0	1.0	1.0	1.0	1.0

NTS, THC, TMC Series quantity per reel (pcs. / reel)

Size Code	21	31	32	43	55	76
Quantity	3,000	3,000	1,600	800	800	500

Note : Above quantity may vary for rating of capacitor.

THP, TMP Series quantity per reel (pcs. / reel)

Size Code	43	55	76
Quantity	500	2,000	1,200

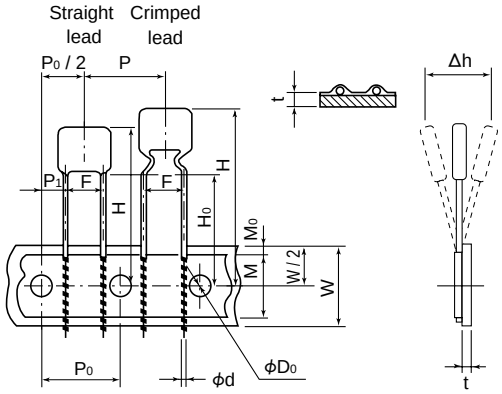
Note : Above quantity may vary for rating of capacitor.

◆RADIAL LEAD TYPE TAPING SPECIFICATION

●THD Series

Available for 32, 43, 55, 76 sizes. Ammo Packaging.

Size Code	Dimensions H (mm)		Quantity per Packing (pcs.)
	Straight lead	Crimped lead	
32	23max.	25max.	2,000
43	24max.	26max.	
55	26max.	28max.	
76	29max.	30max.	1,500



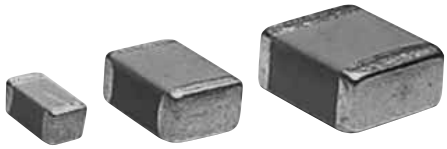
(mm)

Code	P	P_0	P_1	P_0 / 2	F	W	W / 2	M	M_0	H_0	ϕD_0	ϕd	t	Δh
Dimensions (mm)	12.7	12.7	3.85	6.35	5.0	18.0	9.0	13.0	1.5	16.0	4.0	0.5	0.6	0
	±1	±0.3	±0.7	±1.3	+0.8 –0.2	+1.0 –0.5	±0.5	±1	±1.5	min.	±0.2	±0.05	±0.2	±2

MULTILAYER CERAMIC CHIP CAPACITORS

Upgrade!

NTS Series Surface Mount Device



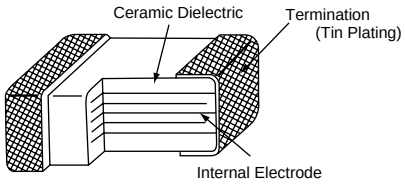
◆FEATURES

1. Large capacitance by small size.
2. Excellent noise absorption.
3. High permissible ripple current capability.
4. Lead free dielectric and terminations.
5. Tin plate terminations.

◆APPLICATIONS

1. Smoothing circuit of DC-DC converters.
2. On-board power supplies.
3. Voltage regulators for computers.
3. Noise suppressor for various kinds of equipments.
4. High reliability equipments.

◆CONSTRUCTION



◆RATINGS

1. Category Temperature Range	-55 to +125℃
2. Rated Voltage Range	25, 50, 100, 250Vdc
3. Rated Capacitance Range	0.033 to 33μF
4. Rated Capacitance Tolerance	K (±10%) , M (±20%)
5. Temperature Characteristics	X5R, X7R
6. Rated Ripple Current	See No.5 on the following table

◆SPECIFICATIONS

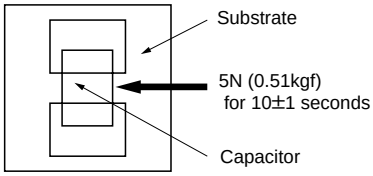
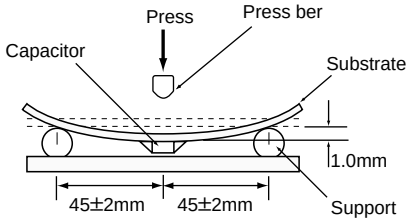
<table>
<tr><th>No.</th><th>Items</th><th>Specification</th><th>Test Condition</th></tr>
<tr><td>1</td><td>Withstand Voltage</td><td>No abnormality.</td><td>250% of rated voltage shall be applied for 5 seconds.</td></tr>
<tr><td>2</td><td>Insulation Resistance</td><td>100/CR(MΩ) or 4000(MΩ)
whichever is less.</td><td>Rated voltage shall be applied for 60±5 seconds at temperature 25±2℃.</td></tr>
<tr><td>3</td><td>Rated Capacitance</td><td>Within specified tolerance.</td><td rowspan="2"><table><tr><td></td><td>CR≦10μF</td><td>CR>10μF</td></tr><tr><td>Temperature</td><td colspan="2">25±2℃</td></tr><tr><td>Frequency</td><td>1±0.1kHz</td><td>120±12Hz</td></tr><tr><td>Voltage</td><td>1±0.2Vrms</td><td>0.5±0.2Vrms</td></tr></table></td></tr>
<tr><td>4</td><td>Dissipation Factor</td><td>5.0% maximum.</td></tr>
<tr><td>5</td><td>Rated Ripple Current</td><td><table><tr><td>Size code</td><td>31</td><td>32</td><td>43</td><td>55</td></tr><tr><td>Arms</td><td>0.3</td><td>0.5</td><td>1.0</td><td>2.0</td></tr></table></td><td>10kHz～1MHz (sine curve)
Ripple voltage Vp shall be less than the rated voltage.</td></tr>
</table>

NIPPON CHEMI-CON

MULTILAYER CERAMIC CHIP CAPACITORS

Upgrade!
NTS Series

◆SPECIFICATIONS

No.	Items	Specification	Test Condition
6	Adhesion	No visible damage.	
7	Bend strength of the face plating	Appearance : No visible damage. ΔC/C : ±15%	The substrate shall be bend by 1mm at a rate of 1mm/s for 5 seconds. 
8	Solderability	Min. 75% of surface of the termination shall be covered with new solder	Solder Temperature : 235±5℃ Dipping Time : 2±0.5 sec. Solder : Eutectic solder containning Ag2.5 to 3wt%
9	Resistance to Soldering Heat	Appearance : No visible damage. ΔC/C : ±15% D.F. : To meet the initial specification. I.R. : To meet the initial specification. Withstand voltage : No abnormality.	Solder Temperature : 260±5℃ Dipping Time : 2±0.5 seconds Solder : Eutectic solder containning Ag2.5 to 3wt%
10	Temperature Cycle	Appearance : No visible damage. ΔC/C : ±15% D.F. : To meet the initial specification. I.R. : To meet the initial specification. Withstand voltage : No abnormality.	<table><tr><th>Step</th><th>Temperature (℃)</th><th>(min.)</th></tr><tr><td>1</td><td>Min. Category temperature ±3</td><td>30±3</td></tr><tr><td>2</td><td>Room temperature</td><td>3 max.</td></tr><tr><td>3</td><td>Max. Category temperature ±2</td><td>30±3</td></tr><tr><td>4</td><td>Room temperature</td><td>3 max.</td></tr></table>For 5 cycles for above temperature cycle.
11	Humidity Load Life	Appearance : No abnormality. ΔC/C : ±15% D.F. : 10% maximum I.R. : 25/C_R(MΩ) or 1000(MΩ) whichever is less. Withstand voltage : No abnormality.	Temperature : 40±2℃ Humidity : 90 to 95%RH Voltage : Rated voltage Time : 500^{+24}_{0}hours
12	Endurance	Appearance : No abnormality. ΔC/C : ±15% D.F. : 10% maximum I.R. : 50/C_R(MΩ) or 1000(MΩ) whichever is less. Withstand voltage : No abnormality.	Temperature : 85±2℃ Voltage : 200% of rated voltage. Time : 1000^{+48}_{0}hours Temperature : 125±3℃ Voltage : Rated voltage Time : 1000^{+48}_{0}hours

*C_R : Rated Capacitance(μF)

NIPPON CHEMI-CON

MULTILAYER CERAMIC CHIP CAPACITORS

Upgrade!

NTS Series

◆PART NUMBERING SYSTEM

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
K	T	S	1	0	1	B	1	0	5	K	4	3	N	0	T	0	0

- Supplement code
- Taping code
- Terminal code
- Size code
- Capacitance tolerance code
- Nominal Capacitance code
- Temperature characteristics code
- Rated voltage code
- Series code
- Category

◆NTS SERIES STANDARD RATINGS

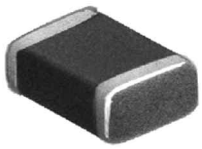
Part Number	Rated voltage (Vdc)	Rated Capacitance (μF)	Dimensions(mm)				Previous Part Number (Just for your reference)
			L	W	Tmax.	a	
KTS250C105M31N0T00	25	1.0	3.2±0.2	1.6±0.2	1.8	0.5±0.3	NTS30X5R1E105MT
KTS250C155M31N0T00		1.5					NTS30X5R1E155MT
KTS250C225M31N0T00		2.2					NTS30X5R1E225MT
KTS250C335M32N0T00		3.3	3.2±0.4	2.5±0.3	2.6	0.6±0.3	NTS40X5R1E335MT
KTS250C475M32N0T00		4.7					NTS40X5R1E475MT
KTS250C685M32N0T00		6.8					NTS40X5R1E685MT
KTS250C106M43N0T00		10	4.5±0.4	3.2±0.4	2.8	0.6±0.3	NTS50X5R1E106MT
KTS250C156M43N0T00		15					NTS50X5R1E156MT
KTS250C226M55N0T00		22	5.7±0.4	5.0±0.4	2.8	0.8±0.5	NTS60X5R1E226MT
KTS250C336M55N0T00		33					NTS60X5R1E336MT
KTS500C334M31N0T00	50	0.33	3.2±0.2	1.6±0.2	1.8	0.5±0.3	NTS30X5R1H334MT
KTS500C474M31N0T00		0.47					NTS30X5R1H474MT
KTS500C684M31N0T00		0.68					NTS30X5R1H684MT
KTS500C105M32N0T00		1.0	3.2±0.4	2.5±0.3	2.6	0.6±0.3	NTS40X5R1H105MT
KTS500C155M32N0T00		1.5					NTS40X5R1H155MT
KTS500C225M32N0T00		2.2					NTS40X5R1H225MT
KTS500C335M43N0T00		3.3	4.5±0.4	3.2±0.4	2.6	0.6±0.3	NTS50X5R1H335MT
KTS500C475M43N0T00		4.7			2.8		NTS50X5R1H475MT
KTS500C685M55N0T00		6.8	5.7±0.4	5.0±0.4	2.6	0.8±0.5	NTS60X5R1H685MT
KTS500C106M55N0T00		10			2.8		NTS60X5R1H106MT
KTS101B104K31N0T00	100	0.1	3.2±0.2	1.6±0.2	1.8	0.5±0.3	NTS30X7R2A104KT
KTS101B154K31N0T00		0.15					NTS30X7R2A154KT
KTS101B224K31N0T00		0.22					NTS30X7R2A224KT
KTS101B334K31N0T00		0.33					NTS30X7R2A334KT
KTS101B474K32N0T00		0.47	3.2±0.4	2.5±0.3	2.6	0.6±0.3	NTS40X7R2A474KT
KTS101B684K32N0T00		0.68					NTS40X7R2A684KT
KTS101B105K32N0T00		1.0					NTS40X7R2A105KT
KTS101B155K43N0T00		1.5	4.5±0.4	3.2±0.4	2.8	0.6±0.3	NTS50X7R2A155KT
KTS101B225K43N0T00		2.2					NTS50X7R2A225KT
KTS101B335K55N0T00		3.3	5.7±0.4	5.0±0.4	2.8	0.8±0.5	NTS60X7R2A335KT
KTS101B475K55N0T00		4.7					NTS60X7R2A475KT
KTS251B333K31N0T00	250	0.033	3.2±0.2	1.6±0.2	1.8	0.5±0.3	NTS30X7R2E333KT
KTS251B473K31N0T00		0.047					NTS30X7R2E473KT
KTS251B683K31N0T00		0.068					NTS30X7R2E683KT
KTS251B104K32N0T00		0.1	3.2±0.4	2.5±0.3	2.6	0.6±0.3	NTS40X7R2E104KT
KTS251B154K32N0T00		0.15					NTS40X7R2E154KT
KTS251B224K32N0T00		0.22					NTS40X7R2E224KT
KTS251B334K43N0T00		0.33	4.5±0.4	3.2±0.4	2.6	0.6±0.3	NTS50X7R2E334KT
KTS251B474K43N0T00		0.47			2.8		NTS50X7R2E474KT
KTS251B684K55N0T00		0.68	5.7±0.4	5.0±0.4	2.6	0.8±0.5	NTS60X7R2E684KT
KTS251B105K55N0T00		1.0			2.8		NTS60X7R2E105KT

CAT. No. E1002H

MULTILAYER CERAMIC CHIP CAPACITORS

THC Series / TMC Series

(Down sized) **(High Reliability)**



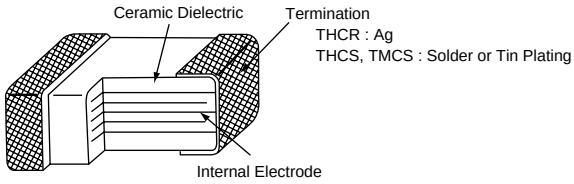
◆FEATURES

1. Small in size and wide capacitance range.
2. Temperature characteristic is Y5U in EIA code.
   Small temperature and DC bias dependency of capacitance.
3. Superior humidity characteristic and long life.
4. Excellent high frequency characteristic due to low ESR.
5. High rated ripple current.
6. Two types of terminal electrodes are available.
   Silver for reflow soldering and solder or tin plating for flow and reflow soldering.
7. 200Vdc items are available.

◆APPLICATIONS

1. Smoothing circuit of small size DC-DC converter.
2. On-board power supply.
3. Noise suppressor for various kinds of equipments.
4. By-pass or decoupling circuits.

◆CONSTRUCTION



◆RATINGS

1. Category Temperature Range	-55 to +125℃
2. Rated Voltage Range	16, 25, 50, 100, 200Vdc
3. Rated Capacitance Range	0.047 to 100μF
4. Rated Capacitance Tolerance	M (±20%) , Z ($\pm^{80}_{20}$%)
5. Temperature Characteristics	E (JIS)≒Y5U (EIA)
6. Rated Ripple Current	See No.5 on the following table

◆SPECIFICATIONS

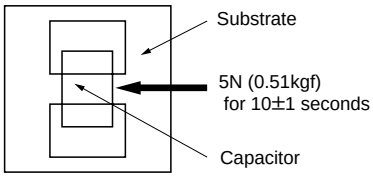
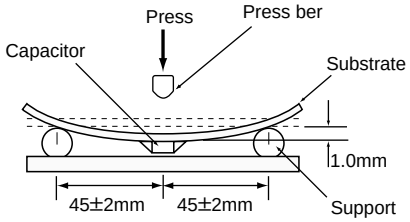
No.	Items	Specification	Test Condition
1	Withstand Voltage	No abnormality.	250% of rated voltage shall be applied for 5 seconds.
2	Insulation Resistance	1000/C_R(MΩ) or 10000(MΩ) whichever is less.	Rated voltage shall be applied for 60±5 seconds at temperature 20±2℃.
3	Rated Capacitance	Within specified tolerance.	Temperature : 20±2℃ Frequency : 1±0.1kHz Voltage : 1±0.2Vrms
4	Dissipation Factor	5.0% maximum.	Temperature : 20±2℃ Frequency : 1±0.1kHz Voltage : 1±0.2Vrms
5	Rated Ripple Current	Size code 21 31 32 43 55 76 Arms 0.2 0.3 0.5 1.0 2.0 3.0	10kHz～1MHz (sine curve) Ripple voltage Vp shall be less than the rated voltage.

CAT. No. E1002H

MULTILAYER CERAMIC CHIP CAPACITORS

THC Series / TMC Series

◆SPECIFICATIONS

No.	Items	Specification	Test Condition
6	Adhesion	No visible damage.	
7	Bend strength of the face plating	Appearance : No visible damage. ΔC/C : ±15%	The substrate shall be bend by 1mm at a rate of 1mm/s for 5 seconds. 
8	Solderability	Min. 75% of surface of the termination shall be covered with new solder	Solder Temperature : 235±5℃ Dipping Time : 2±0.5 sec. Solder : Eutectic solder containning Ag2.5 to 3wt%
9	Resistance to Soldering Heat	Appearance : No visible damage. ΔC/C : ±15% D.F. : To meet the initial specification. I.R. : To meet the initial specification. Withstand voltage : No abnormality.	Solder Temperature : 260±5℃ Dipping Time : 2±0.5 seconds Solder : Eutectic solder containning Ag2.5 to 3wt%
10	Temperature Cycle	Appearance : No visible damage. ΔC/C : ±15% D.F. : To meet the initial specification. I.R. : To meet the initial specification. Withstand voltage : No abnormality.	<table><tr><th>Step</th><th>Temperature (℃)</th><th>(min.)</th></tr><tr><td>1</td><td>Min. Category temperature ±3</td><td>30±3</td></tr><tr><td>2</td><td>Room temperature</td><td>3 max.</td></tr><tr><td>3</td><td>Max. Category temperature ±2</td><td>30±3</td></tr><tr><td>4</td><td>Room temperature</td><td>3 max.</td></tr></table><Cycle> THC series : 5 cycles TMC series : 100 cycles
11	Humidity Load Life	Appearance : No abnormality. ΔC/C : ±20% D.F. : 7% maximum I.R. : 50/C_R(MΩ) or 1000(MΩ) whichever is less. Withstand voltage : No abnormality.	Temperature : 40±2℃ Humidity : 90 to 95%RH Voltage : Rated voltage Time : 500^{+24}_{0}hours
12	Endurance	Appearance : No abnormality. ΔC/C : ±20% D.F. : 7% maximum I.R. : 100/C_R(MΩ) or 1000(MΩ) whichever is less. Withstand voltage : No abnormality.	Temperature : 85±2℃ Voltage : 200% of rated voltage. Time : 1000^{+48}_{0}hours Temperature : 125±3℃ Voltage : Rated voltage Time : 1000^{+48}_{0}hours

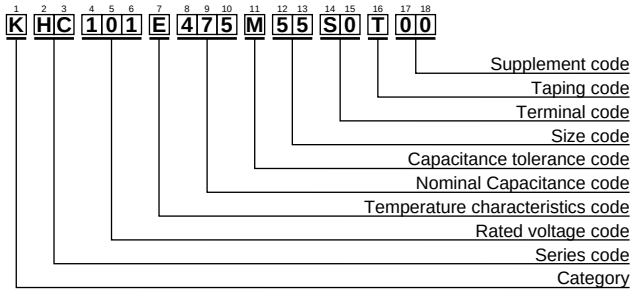
*C_R : Rated Capacitance(μF)

NIPPON CHEMI-CON

MULTILAYER CERAMIC CHIP CAPACITORS

THC Series

◆PART NUMBERING SYSTEM



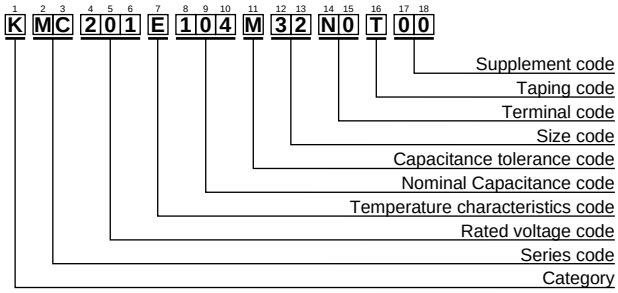
◆THC SERIES STANDARD RATINGS

Part Number	Rated voltage (Vdc)	Rated Capacitance (μF)	Dimensions(mm)				Previous Part Number (Just for your reference)
			L	W	Tmax.	a	
KHC160E335M31S0T00	16	3.3	3.2±0.2	1.6±0.2	1.6	0.5±0.3	THCS30E1C335MT
KHC160E475M31S0T00		4.7					THCS30E1C475MT
KHC160E685M32S0T00		6.8	3.2±0.2	2.5±0.2	2.0	0.6±0.3	THCS40E1C685MT
KHC160E106M32S0T00		10					THCS40E1C106MT
KHC160E156M43S0T00		15	4.5±0.3	3.2±0.2	2.2	0.6±0.3	THCS50E1C156MT
KHC160E226M43S0T00		22					THCS50E1C226MT
KHC160E336M55S0T00		33	5.7±0.3	5.0±0.4	2.2	0.8±0.3	THCS60E1C336MT
KHC160E476M55S0T00		47					THCS60E1C476MT
KHC160E686M76S0T00		68	7.5±0.5	6.3±0.5	2.5	0.8±0.5	THCS70E1C686MT
KHC160E107M76S0T00		100					THCS70E1C107MT
KHC250E334M21S0T00	25	0.33	2.0±0.2	1.25±0.2	1.25	0.3±0.2	THCS20E1E334MT
KHC250E474M21S0T00		0.47					THCS20E1E474MT
KHC250E684M21S0T00		0.68					THCS20E1E684MT
KHC250E105M31S0T00		1.0	3.2±0.2	1.6±0.2	1.6	0.5±0.3	THCS30E1E105MT
KHC250E155M31S0T00		1.5					THCS30E1E155MT
KHC250E225M31S0T00		2.2					THCS30E1E225MT
KHC250E335M32S0T00		3.3	3.2±0.2	2.5±0.2	2.0	0.6±0.3	THCS40E1E335MT
KHC250E475M32S0T00		4.7					THCS40E1E475MT
KHC250E685M43S0T00		6.8	4.5±0.3	3.2±0.2	2.2	0.6±0.3	THCS50E1E685MT
KHC250E106M43S0T00		10					THCS50E1E106MT
KHC250E156M43S0T00		15			3.0		THCS50E1E156MT
KHC250E226M55S0T00		22	5.7±0.4	5.0±0.4	2.2	0.8±0.5	THCS60E1E226MT
KHC250E336M55S0T00		33			3.0		THCS60E1E336MT
KHC250E476M76S0T00		47	7.5±0.5	6.3±0.5	3.0	0.8±0.5	THCS70E1E476MT
KHC500E104M21S0T00	50	0.1	2.0±0.2	1.25±0.2	1.25	0.3±0.2	THCS20E1H104MT
KHC500E154M21S0T00		0.15					THCS20E1H154MT
KHC500E224M21S0T00		0.22					THCS20E1H224MT
KHC500E334M31S0T00		0.33	3.2±0.2	1.6±0.2	1.6	0.5±0.3	THCS30E1H334MT
KHC500E474M31S0T00		0.47					THCS30E1H474MT
KHC500E684M31S0T00		0.68					THCS30E1H684MT
KHC500E105M32S0T00		1.0	3.2±0.2	2.5±0.2	2.0	0.6±0.3	THCS40E1H105MT
KHC500E155M32S0T00		1.5					THCS40E1H155MT
KHC500E225M32S0T00		2.2			2.5		THCS40E1H225MT
KHC500E335M43S0T00		3.3	4.5±0.3	3.2±0.2	2.2	0.6±0.3	THCS50E1H335MT
KHC500E475M43S0T00		4.7			3.0		THCS50E1H475MT
KHC500E685M55S0T00		6.8	5.7±0.4	5.0±0.4	2.2	0.8±0.5	THCS60E1H685MT
KHC500E106M55S0T00		10					THCS60E1H106MT
KHC500E156M55S0T00		15			3.0		THCS60E1H156MT
KHC500E226M76S0T00		22	7.5±0.5	6.3±0.5	2.5	0.8±0.5	THCS70E1H226MT
KHC101E473M21S0T00	100	0.047	2.0±0.2	1.25±0.2	1.25	0.3±0.2	THCS20E2A473MT
KHC101E683M21S0T00		0.068					THCS20E2A683MT
KHC101E104M31S0T00		0.1	3.2±0.2	1.6±0.2	1.6	0.5±0.3	THCS30E2A104MT
KHC101E154M31S0T00		0.15					THCS30E2A154MT
KHC101E224M31S0T00		0.22					THCS30E2A224MT
KHC101E334M32S0T00		0.33	3.2±0.2	2.5±0.2	2.0	0.6±0.3	THCS40E2A334MT
KHC101E474M32S0T00		0.47					THCS40E2A474MT
KHC101E684M32S0T00		0.68			2.5		THCS40E2A684MT
KHC101E105M43S0T00		1.0	4.5±0.3	3.2±0.2	2.2	0.6±0.3	THCS50E2A105MT
KHC101E155M43S0T00		1.5					THCS50E2A155MT
KHC101E225M43S0T00		2.2			3.0		THCS50E2A225MT
KHC101E335M55S0T00		3.3	5.7±0.4	5.0±0.4	2.2	0.8±0.5	THCS60E2A335MT
KHC101E475M55S0T00		4.7			3.0		THCS60E2A475MT
KHC101E685M76S0T00		6.8	7.5±0.5	6.3±0.5	3.0	0.8±0.5	THCS70E2A685MT
KHC201E473M31S0T00	200	0.047	3.2±0.2	1.6±0.2	1.6	0.5±0.3	THCS30E2D473MT
KHC201E683M31S0T00		0.068					THCS30E2D683MT
KHC201E104M32S0T00		0.1	3.2±0.2	2.5±0.2	2.0	0.6±0.3	THCS40E2D104MT
KHC201E154M32S0T00		0.15					THCS40E2D154MT
KHC201E224M32S0T00		0.22			2.5		THCS40E2D224MT
KHC201E334M43S0T00		0.33	4.5±0.3	3.2±0.2	2.2	0.6±0.3	THCS50E2D334MT
KHC201E474M43S0T00		0.47			3.0		THCS50E2D474MT
KHC201E684M55S0T00		0.68	5.7±0.4	5.0±0.4	2.2	0.8±0.5	THCS60E2D684MT
KHC201E105M55S0T00		1.0			3.0		THCS60E2D105MT
KHC201E155M76S0T00		1.5	7.5±0.5	6.3±0.5	2.5	0.8±0.5	THCS70E2D155MT
KHC201E225M76S0T00		2.2			3.0		THCS70E2D225MT

MULTILAYER CERAMIC CHIP CAPACITORS

TMC Series

◆PART NUMBERING SYSTEM



◆TMC SERIES STANDARD RATINGS

Part Number	Rated voltage (Vdc)	Rated Capacitance (μF)	Dimensions(mm)				Previous Part Number (Just for your reference)
			L	W	Tmax.	a	
KMC250E684M31N0T00	25	0.68	3.2±0.2	1.6±0.2	1.6	0.4±0.2	TMCS30E1E684MTF
KMC250E105M31N0T00		1					TMCS30E1E105MTF
KMC250E155M31N0T00		1.5					TMCS30E1E155MTF
KMC250E225M32N0T00		2.2	3.2±0.2	2.5±0.2	2.2	0.5±0.2	TMCS40E1E225MTF
KMC250E335M32N0T00		3.3					TMCS40E1E335MTF
KMC250E475M43N0T00		4.7	4.5±0.3	3.2±0.2	2.5	0.5±0.3	TMCS50E1E475MTF
KMC250E685M43N0T00		6.8					TMCS50E1E685MTF
KMC250E106M43N0T00		10			3.0		TMCS50E1E106MTF
KMC500E334M31N0T00	50	0.33	3.2±0.2	1.6±0.2	1.6	0.4±0.2	TMCS30E1H334MTF
KMC500E474M31N0T00		0.47					TMCS30E1H474MTF
KMC500E684M32N0T00		0.68	3.2±0.2	2.5±0.2	2.2	0.5±0.2	TMCS40E1H684MTF
KMC500E105M32N0T00		1.0					TMCS40E1H105MTF
KMC500E155M32N0T00		1.5			2.5		TMCS40E1H155MTF
KMC500E225M43N0T00		2.2	4.5±0.3	3.2±0.2	2.5	0.5±0.3	TMCS50E1H225MTF
KMC500E335M43N0T00		3.3					TMCS50E1H335MTF
KMC500E475M43N0T00		4.7			3.0		TMCS50E1H475MTF
KMC101E104M31N0T00	100	0.1	3.2±0.2	1.6±0.2	1.6	0.4±0.2	TMCS30E2A104MTF
KMC101E154M31N0T00		0.15					TMCS30E2A154MTF
KMC101E224M32N0T00		0.22	3.2±0.2	2.5±0.2	2.2	0.5±0.2	TMCS40E2A224MTF
KMC101E334M32N0T00		0.33					TMCS40E2A334MTF
KMC101E474M32N0T00		0.47					TMCS40E2A474MTF
KMC101E684M43N0T00		0.68	4.5±0.3	3.2±0.2	2.5	0.5±0.3	TMCS50E2A684MTF
KMC101E105M43N0T00		1.0					TMCS50E2A105MTF
KMC101E155M43N0T00		1.5			3.0		TMCS50E2A155MTF
KMC201E333M31N0T00	200	0.033	3.2±0.2	1.6±0.2	1.6	0.4±0.2	TMCS30E2D333MTF
KMC201E473M31N0T00		0.047					TMCS30E2D473MTF
KMC201E683M32N0T00		0.068	3.2±0.2	2.5±0.2	2.2	0.5±0.2	TMCS40E2D683MTF
KMC201E104M32N0T00		0.1					TMCS40E2D104MTF
KMC201E154M32N0T00		0.15			2.5		TMCS40E2D154MTF
KMC201E224M43N0T00		0.22	4.5±0.3	3.2±0.2	2.5	0.5±0.3	TMCS50E2D224MTF
KMC201E334M43N0T00		0.33					TMCS50E2D334MTF
KMC201E474M43N0T00		0.47			3.0		TMCS50E2D474MTF

METAL CAP TYPE MULTILAYER CERAMIC CAPACITORS

THP Series / TMP Series

(High Reliability)

◆FEATURES

1. Small mounting area.
2. Small in size and large capacitance. (maximum 200μF)
3. High rated ripple current.
4. Excellent temperature cycle durability and most suitable for aluminum substrate.
5. Y5U temperature characteristics.
6. Excellent high frequency characterisitics.
7. 200V_{dc} items are available.
8. For reflow soldering use.

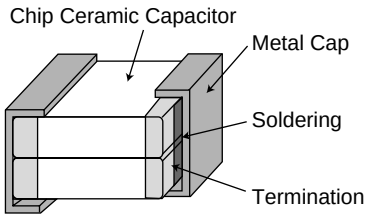
◆APPLICATIONS

1. Smoothing circuit of switching mode AC-DC or DC-DC converter.
2. On-board power supply.
3. Noise suppressor for various kinds of equipments.

◆CUSTOM MADE PRODUCTS

We can offer custom made one element metal cap type capacitors for request of customers.
Please contact us if you have questions for details.

◆CONSTRUCTION



◆RATINGS

1. Category Temperature Range	-55～+125℃
2. Rated Voltage Range	16, 25, 50, 100, 200V_{dc}
3. Rated Capacitance Range	0.45 to 200μF
4. Rated Capacitance Tolerance	M(±20%), Z($\pm^{80}_{20}$%)
5. Temperature Characteristics	E(JIS)≒Y5U(EIA)
6. Rated Ripple Current	See No.5 on the following table

◆SPECIFICATIONS

No.	Items	Specification	Test Condition
1	Withstand Voltage	No abnormality.	250% of rated voltage shall be applied for 5 seconds.
2	Insulation Resistance	1000/C_R(MΩ) or 10000(MΩ) whichever is less.	Rated voltage shall be applied for 60±5 seconds at temperature 20±2℃.
3	Rated Capacitance	Within specified tolerance.	Temperature : 20±2℃ Frequency : 1±0.1kHz (≧100μF, 120Hz) Voltage : 1±0.2Vrms
4	Dissipation Factor	5.0% maximum	Temperature : 20±2℃ Frequency : 1±0.1kHz (≧100μF, 120Hz) Voltage : 1±0.2Vrms
5	Rated Ripple Current	Size 43 55 76 Arms 1.5 3.0 4.0	10kHz～1MHz (sine curve) Ripple voltage Vp shall be less than the rated voltage.

METAL CAP TYPE MULTILAYER CERAMIC CAPACITORS

THP Series / TMP Series

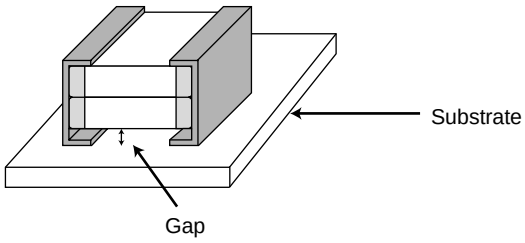
◆SPECIFICATIONS

No.	Items	Specification	Test Condition
6	Temperature Cycle	Appearance : No visible damage. ΔC/C : ±15% D.F. : To meet the initial specification. I.R. : To meet the initial specification. Withstand voltage : No abnormality.	Step / Temperature (℃) / (min.) 1 / Min. Category temperature ±3 / 30±3 2 / Room temperature / 3 max. 3 / Max. Category temperature ±2 / 30±3 4 / Room temperature / 3 max. <Cycle> THP series : 100 cycles TMP series : 500 cycles
7	Humidity Load Life	Appearance : No abnormality. ΔC/C : ±20% D.F. : 7% max. I.R. : 50/C_R(MΩ) or 1000(MΩ) whichever is less. Withstand voltage : No abnormality.	Temperature : 40±2℃ Humidity : 90 to 95%RH Voltage : Rated voltage Time : 500^{+24}_{0}hours
8	Endurance	Appearance : No abnormality. ΔC/C : ±20% D.F. : 7% max. I.R. : 100/C_R(MΩ) or 1000(MΩ) whichever is less. Withstand voltage : No abnormality.	Temperature : 85±2℃ Voltage : 200% of rated voltage. Time : 1000^{+48}_{0}hours --- Temperature : 125±3℃ Voltage : Rated voltage Time : 1000^{+48}_{0}hours

*C_R : Rated Capacitance(μF)

◆Note of mountig for THP series.

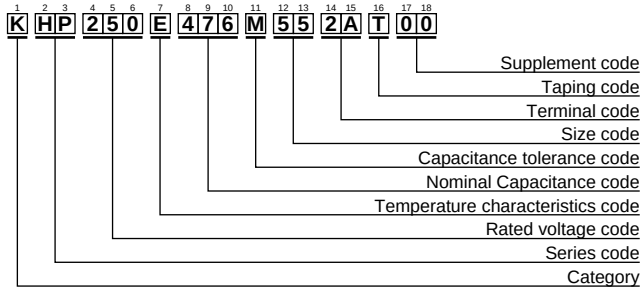
1. The face of wider gap between a capacitor and a substrate shall be the mounting face.
2. To prevent degredation of heat cycling capability, if need to be careful about amount of solder that would not go into the inner side of terminations.



METAL CAP TYPE MULTILAYER CERAMIC CAPACITORS

THP Series

◆PART NUMBERING SYSTEM

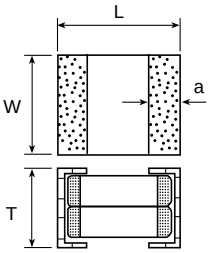


◆THP SERIES STANDARD RATINGS

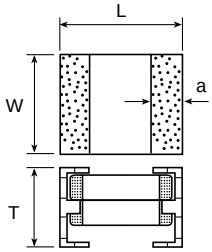
Part Number	Rated voltage (Vdc)	Rated Capacitance (μF)	Dimensions(mm)				Previous Part Number (Just for your reference)
			L	W	Tmax.	a	
KHP160E336M432AT00	16	33	4.8±0.4	3.5±0.4	5.5	1.3±0.3	THP50E1C336MT002
KHP160E476M432AT00		47					THP50E1C476MT002
KHP160E686M552AT00		68	6.0±0.4	5.0±0.4	5.0	1.3±0.3	THP60E1C686MT002
KHP160E107M552AT00		100			5.6		THP60E1C107MT002
KHP160E157M762BT00		150	7.8±0.5	6.6±0.5	6.5	1.5±0.3	THP70E1C157MT002
KHP160E207M762BT00		200					THP70E1C207MT002
KHP250E156M432AT00	25	15	4.8±0.4	3.5±0.3	5.5	1.3±0.3	THP50E1E156MT002
KHP250E206M432AT00		20					THP50E1E206MT002
KHP250E336M552AT00		33	6.0±0.4	5.0±0.4	4.5	1.3±0.3	THP60E1E336MT002
KHP250E476M552AT00		47					THP60E1E476MT002
KHP250E686M552AT00		68			5.6		THP60E1E686MT002
KHP250E107M762BT00		100	7.8±0.5	6.6±0.5	6.5	1.5±0.3	THP70E1E107MT002
KHP500E455M432AT00	50	4.5	4.8±0.4	3.5±0.3	5.5	1.3±0.3	THP50E1H455MT002
KHP500E685M432AT00		6.8					THP50E1H685MT002
KHP500E106M552AT00		10	6.0±0.4	5.0±0.4	4.5	1.3±0.3	THP60E1H106MT002
KHP500E156M552AT00		15					THP60E1H156MT002
KHP500E226M552AT00		22			5.6		THP60E1H226MT002
KHP500E336M762BT00		33	7.8±0.5	6.6±0.5	6.5	1.5±0.3	THP70E1H336MT002
KHP500E476M762BT00		47					THP70E1H476MT002
KHP101E155M432AT00	100	1.5	4.8±0.4	3.5±0.3	5.5	1.3±0.3	THP50E2A155MT002
KHP101E205M432AT00		2.0					THP50E2A205MT002
KHP101E305M432AT00		3.0					THP50E2A305MT002
KHP101E475M552AT00		4.7	6.0±0.4	5.0±0.4	4.5	1.3±0.3	THP60E2A475MT002
KHP101E685M552AT00		6.8					THP60E2A685MT002
KHP101E106M552AT00		10			5.6		THP60E2A106MT002
KHP101E156M762BT00		15	7.8±0.5	6.6±0.5	6.5	1.5±0.3	THP70E2A156MT002
KHP201E454M432AT00	200	0.45	4.8±0.4	3.5±0.3	5.5	1.3±0.3	THP50E2D454MT002
KHP201E684M432AT00		0.68					THP50E2D684MT002
KHP201E105M432AT00		1.0					THP50E2D105MT002
KHP201E155M552AT00		1.5	6.0±0.4	5.0±0.4	4.5	1.3±0.3	THP60E2D155MT002
KHP201E225M552AT00		2.2			5.6		THP60E2D225MT002
KHP201E335M762BT00		3.3	7.8±0.5	6.6±0.5	6.5	1.5±0.3	THP70E2D335MT002
KHP201E475M762BT00		4.7					THP70E2D475MT002

◆DIMENSIONS

43, 55 size



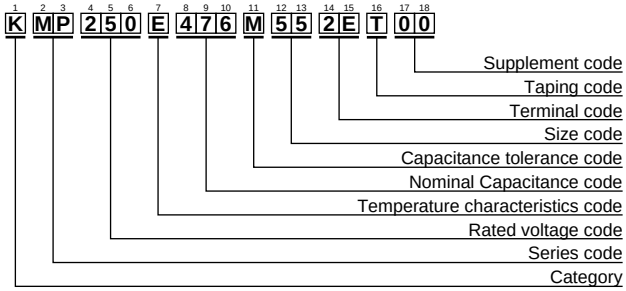
76 size



METAL CAP TYPE MULTILAYER CERAMIC CAPACITORS

TMP Series

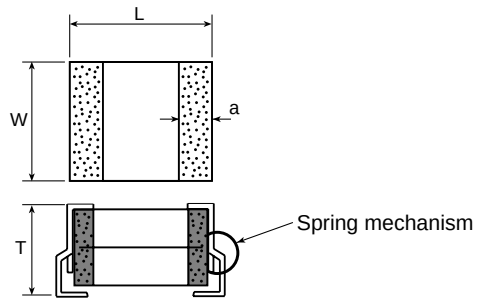
◆PART NUMBERING SYSTEM



◆TMP SERIES STANDARD RATINGS

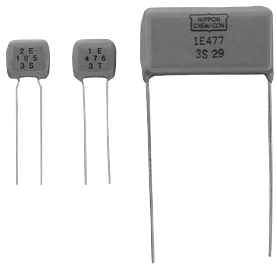
Part Number	Rated voltage (Vdc)	Rated Capacitance (μF)	Dimensions(mm)				Previous Part Number (Just for your reference)
			L	W	Tmax.	a	
KMP250E336M552ET00	25	33	6.0±0.4	5.0±0.4	5.0	1.3±0.3	TMP60E1E336MT002
KMP250E476M552ET00		47					TMP60E1E476MT002
KMP250E686M762ET00		68	7.8±0.5	6.6±0.5	6.5	1.5±0.3	TMP70E1E686MT002
KMP250E107M762ET00		100					TMP70E1E107MT002
KMP500E106M552ET00	50	10	6.0±0.4	5.0±0.4	5.0	1.3±0.3	TMP60E1H106MT002
KMP500E156M552ET00		15					TMP60E1H156MT002
KMP500E226M552ET00		22					TMP60E1H226MT002
KMP500E336M762ET00		33	7.8±0.5	6.6±0.5	6.5	1.5±0.3	TMP70E1H336MT002
KMP500E476M762ET00		47					TMP70E1H476MT002
KMP101E475M552ET00	100	4.7	6.0±0.4	5.0±0.4	5.0	1.3±0.3	TMP60E2A475MT002
KMP101E685M552ET00		6.8					TMP60E2A685MT002
KMP101E106M762ET00		10	7.8±0.5	6.6±0.5	6.5	1.5±0.3	TMP70E2A106MT002
KMP101E156M762ET00		15					TMP70E2A156MT002
KMP201E155M552ET00	200	1.5	6.0±0.4	5.0±0.4	5.0	1.3±0.3	TMP60E2D155MT002
KMP201E225M552ET00		2.2					TMP60E2D225MT002
KMP201E335M762ET00		3.3	7.8±0.5	6.6±0.5	6.5	1.5±0.3	TMP70E2D335MT002
KMP201E475M762ET00		4.7					TMP70E2D475MT002

◆DIMENSIONS



DIPPED RADIAL LEAD MULTILAYER CERAMIC CAPACITORS

THD Series — Radial Lead Type (Down sized)



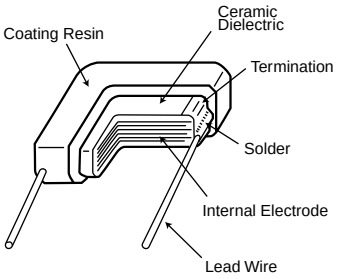
◆FEATURES

1. Small in size and wide capacitance range.
   Max. 680μF is available.
2. Temperature characteristic is Y5U in EIA code.
   Small temperature and DC bias dependency of capacitance.
3. Superior humidity characteristic and long life.
4. Excellent high frequency characteristic due to low ESR.
5. High rated ripple current.
6. 250V_{dc} items are available.
7. Resin(UL94 V-0) used for coating.

◆APPLICATIONS

1. Smoothing circuit of switching mode AC-DC or DC-DC converter.
2. Noise suppressor for various kinds of equipments.
3. By-pass or decoupling circuits.
4. Automotive equipments.

◆CONSTRUCTION



◆RATINGS

1. Category Temperature Range	-55 to +125℃
2. Rated Voltage Range	16, 25, 50, 100, 250 V_{dc}
3. Rated Capacitance Range	0.1 to 680μF
4. Rated Capacitance Tolerance	M(±20%), Z($\pm^{80}_{20}$%)
5. Temperature Characteristics	E(JIS)≒Y5U(EIA)
6. Rated Ripple Current	See No.5 on the following table

◆SPECIFICATIONS

No.	Items		Specification	Test Condition
1	Withstand Voltage	Between Terminals	No abnormality.	250% of rated voltage shall be applied for 5 seconds.
		Terminals to Coating Resin		
2	Insulation Resistance		1000/C_R(MΩ) or 10000(MΩ) whichever is less.	Rated voltage shall be applied for 60±5 seconds at temperature 20±2℃.
3	Rated Capacitance		Within specified tolerance.	Temperature : 20±2℃ Frequency : 1±0.1kHz(≧100μF,120Hz) Voltage : 1±0.2Vrms
4	Dissipation Factor		5.0% maximum.	Temperature : 20±2℃ Frequency : 1±0.1kHz(≧100μF,120Hz) Voltage : 1±0.2Vrms

DIPPED RADIAL LEAD MULTILAYER CERAMIC CAPACITORS

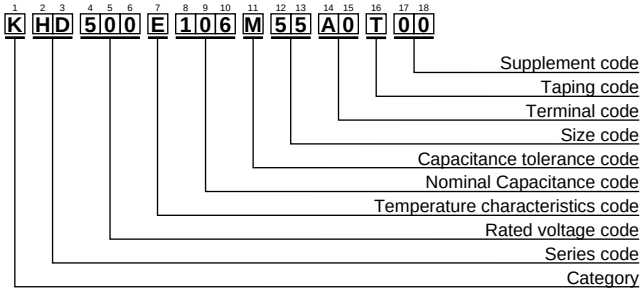
THD Series

◆SPECIFICATIONS

No.	Items		Specification	Test Condition
5	Rated Ripple Current		<table><tr><td>Size code</td><td>32</td><td>43</td><td>55</td><td>76</td><td>80</td><td>90</td><td>99</td></tr><tr><td>Arms</td><td>0.3</td><td>0.8</td><td>1.0</td><td>1.5</td><td>2.0</td><td>3.0</td><td>4.0</td></tr></table>	10kHz to 1MHz (sine curve) Ripple voltage Vp shall be less than the rated voltage.
6	Robustness of Terminations	Tension	No visible damage.	The force applied shall be : <table><tr><td>Lead φ (mm)</td><td>Tensile(N)</td><td>(sec.)</td></tr><tr><td>0.5 max.</td><td>5</td><td>10±1</td></tr><tr><td>0.6 to 0.8 max.</td><td>10</td><td>10±1</td></tr></table>
		Bending		<table><tr><td>Lead φ (mm)</td><td>Bending(N)</td><td>(kg)</td></tr><tr><td>0.5 max.</td><td>2.5</td><td>0.25</td></tr><tr><td>0.6 to 0.8 max.</td><td>5</td><td>0.51</td></tr></table> Time : 2times.
7	Vibration		Appearance : No abnormality. Capacitance : To meet the initial specification. D.F. : To meet the initial specifications.	Amplitude : 1.5mm Frequency range : 10-55-10Hz (1 min) Direction and time : 2 hours each to X, Y, Z axis. Total 6 hours.
8	Solderability		Min. 75% of surface of the termination shall be covered with new solder.	Solder Temperature : 235±5℃ Dipping Time : 2±0.5 sec. Solder : H60A or H63A
9	Resistance to Soldering Heat		Appearance : No abnormality. ΔC/C : ±15% D.F. : Satisfy the initial spec.	Solder Temperature : 350±10℃ Dipping Time : 3±0.5 sec. Depth : 1.5 to 2mm
10	Temperature Cycle		Appearance : No abnormality.	<table><tr><td>Step</td><td>Temperature (℃)</td><td>(min.)</td></tr><tr><td>1</td><td>Min. Category temperature ±3</td><td>30±3</td></tr><tr><td>2</td><td>Room temperature</td><td>3 max.</td></tr><tr><td>3</td><td>Max. Category temperature ±2</td><td>30±3</td></tr><tr><td>4</td><td>Room temperature</td><td>3 max.</td></tr></table>For 5 cycles for above temperature cycle.
11	Humidity Load Life		Appearance : No abnormality. ΔC/C : ±20% D.F. : 7% maximum I.R. : 50/C_R(MΩ) or 1000(MΩ) whichever is less. Withstand voltage : No abnormality.	Temperature : 40±2℃ Humidity : 90 to 95%RH Voltage : Rated voltage Time : 500^{+24}_{0}hours
12	Endurance		Appearance : No abnormality. ΔC/C : ±20% D.F. : 7% maximum I.R. : 100/C_R(MΩ) or 1000(MΩ) whichever is less. Withstand voltage : No abnormality.	Temperature : 85±2℃ Voltage : 200% of rated voltage. Time : 1000^{+48}_{0}hours Temperature : 125±3℃ Voltage : Rated voltage Time : 1000^{+48}_{0}hours

*C_R : Rated Capacitance(μF)

◆PART NUMBERING SYSTEM



DIPPED RADIAL LEAD MULTILAYER CERAMIC CAPACITORS

THD Series

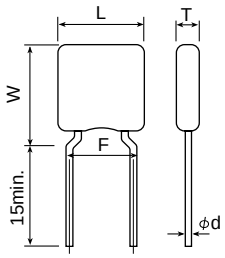
◆THD SERIES STANDARD RATINGS

Part Number	Rated voltage (Vdc)	Rated Cap. (μF)	Dimensions (mm)					Previous Part Number (Just for your reference)
			Lmax.	Wmax.	Tmax.	F±0.8	φd±0.05	
KHD160E685M32A0T00	16	6.8	5.0	6.5	3.5	5.0	0.5	THD21E1C685MT
KHD160E106M32A0T00		10						THD21E1C106MT
KHD160E156M43A0T00		15	6.5	7.5	4.0	5.0	0.5	THD30E1C156MT
KHD160E226M43A0T00		22						THD30E1C226MT
KHD160E336M55A0T00		33	8.0	9.0	4.5	5.0	0.5	THD31E1C336MT
KHD160E476M55A0T00		47						THD31E1C476MT
KHD160E686M76A0T00		68	10.0	11.5	4.5	5.0	0.5	THD41E1C686MT
KHD160E107M76A0T00		100						THD41E1C107MT
KHD160E157M80A0B00		150	13.5	15.0	5.0	10.0	0.6	THD51E1C157M
KHD160E227M80A0B00		220			5.5			THD51E1C227M
KHD160E337M90C0B00		330	22.5	20.0	6	20.0	0.8	THD60E1C337M
KHD160E477M90C0B00		470						THD60E1C477M
KHD160E687M99C0B00		680	28.5	20.0	7.5	25.0	0.8	THD61E1C687M
KHD250E335M32A0T00	25	3.3	5.0	6.5	3.0	5.0	0.5	THD21E1E335MT
KHD250E475M32A0T00		4.7			3.5			THD21E1E475MT
KHD250E685M43A0T00		6.8	6.5	7.0	3.5	5.0	0.5	THD30E1E685MT
KHD250E106M43A0T00		10						THD30E1E106MT
KHD250E156M43A0T00		15			4.0			THD30E1E156MT
KHD250E226M55A0T00		22	7.5	9.0	4.0	5.0	0.5	THD31E1E226MT
KHD250E336M55A0T00		33			4.5			THD31E1E336MT
KHD250E476M76A0T00		47	10.0	11.5	4.5	5.0	0.5	THD41E1E476MT
KHD250E686M80A0B00		68	13.5	15.0	5.0	10.0	0.6	THD51E1E686M
KHD250E107M80A0B00		100			5.5			THD51E1E107M
KHD250E157M90C0B00		150	22.5	20.0	6.0	20.0	0.8	THD60E1E157M
KHD250E227M90C0B00		220						THD60E1E227M
KHD250E337M99C0B00		330	28.5	20.0	7.5	25.0	0.8	THD61E1E337M
KHD250E477M99C0B00		470						THD61E1E477M
KHD500E105M32A0T00	50	1.0	5.0	6.5	3.0	5.0	0.5	THD21E1H105MT
KHD500E155M32A0T00		1.5						THD21E1H155MT
KHD500E225M32A0T00		2.2			3.5			THD21E1H225MT
KHD500E335M43A0T00		3.3	6.5	7.0	3.5	5.0	0.5	THD30E1H335MT
KHD500E475M43A0T00		4.7			4.0			THD30E1H475MT
KHD500E685M55A0T00		6.8	7.5	9.0	4.0	5.0	0.5	THD31E1H685MT
KHD500E106M55A0T00		10						THD31E1H106MT
KHD500E156M55A0T00		15			4.5			THD31E1H156MT
KHD500E226M76A0T00		22	10.0	11.5	4.5	5.0	0.5	THD41E1H226MT

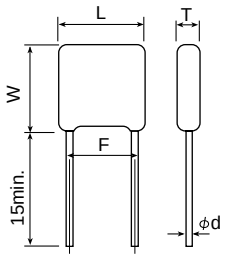
Part Number	Rated voltage (Vdc)	Rated Cap. (μF)	Dimensions (mm)					Previous Part Number (Just for your reference)
			Lmax.	Wmax.	Tmax.	F±0.8	φd±0.05	
KHD500E336M80A0B00	50	33	13.5	15.0	5.0	10.0	0.6	THD51E1H336M
KHD500E476M90C0B00		47	22.5	20.0	6.0	20.0	0.8	THD60E1H476M
KHD500E686M90C0B00		68						THD60E1H686M
KHD500E107M90C0B00		100						THD60E1H107M
KHD500E157M99C0B00		150	28.5	20.0	7.5	25.0	0.8	THD61E1H157M
KHD500E227M99C0B00		220						THD61E1H227M
KHD101E334M32A0T00	100	0.3	5.0	6.5	3.0	5.0	0.5	THD21E2A334MT
KHD101E474M32A0T00		0.47						THD21E2A474MT
KHD101E684M32A0T00		0.68			3.5			THD21E2A684MT
KHD101E105M43A0T00		1.0	6.5	7.0	3.5	5.0	0.5	THD30E2A105MT
KHD101E155M43A0T00		1.5						THD30E2A155MT
KHD101E225M43A0T00		2.2			4.0			THD30E2A225MT
KHD101E335M55A0T00		3.3	7.5	9.0	4.0	5.0	0.5	THD31E2A335MT
KHD101E475M55A0T00		4.7			4.5			THD31E2A475MT
KHD101E685M76A0T00		6.8	10.0	11.5	4.5	5.0	0.5	THD41E2A685MT
KHD101E106M80A0B00		10	13.5	15.0	5.0	10.0	0.6	THD51E2A106M
KHD101E156M80A0B00		15						THD51E2A156M
KHD101E226M90C0B00		22	22.5	20.0	6.0	20.0	0.8	THD60E2A226M
KHD101E336M90C0B00		33						THD60E2A336M
KHD101E476M99C0B00		47	28.5	20.0	7.5	25.0	0.8	THD61E2A476M
KHD101E686M99C0B00		68						THD61E2A686M
KHD101E107M99C0B00		100						THD61E2A107M
KHD251E104M43A0T00	250	0.1	6.5	7.0	3.5	5.0	0.5	THD30E2E104MT
KHD251E154M43A0T00		0.15						THD30E2E154MT
KHD251E224M43A0T00		0.22						THD30E2E224MT
KHD251E334M43A0T00		0.33			4.0			THD30E2E334MT
KHD251E474M55A0T00		0.47	7.5	9.0	4.0	5.0	0.5	THD31E2E474MT
KHD251E684M55A0T00		0.68			4.5			THD31E2E684MT
KHD251E105M76A0T00		1.0	10.0	11.5	4.5	5.0	0.5	THD41E2E105MT
KHD251E155M76A0T00		1.5						THD41E2E155MT
KHD251E225M80A0B00		2.2	13.5	15.0	5.0	10.0	0.6	THD51E2E225M
KHD251E335M90C0B00		3.3	22.5	20.0	6.0	20.0	0.8	THD60E2E335M
KHD251E475M90C0B00		4.7						THD60E2E475M
KHD251E685M99C0B00		6.8	28.5	20.0	7.5	25.0	0.8	THD61E2E685M
KHD251E106M99C0B00		10						THD61E2E106M
KHD251E156M99C0B00		15						THD61E2E156M

◆DIMENSIONS (mm)

Crimped lead
32～76 size



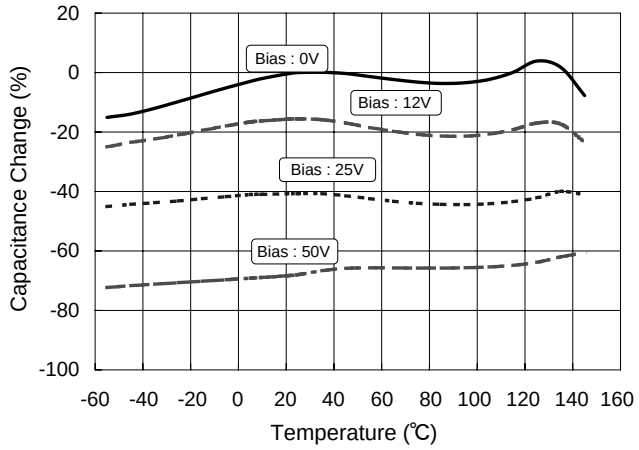
Straight lead
For all size



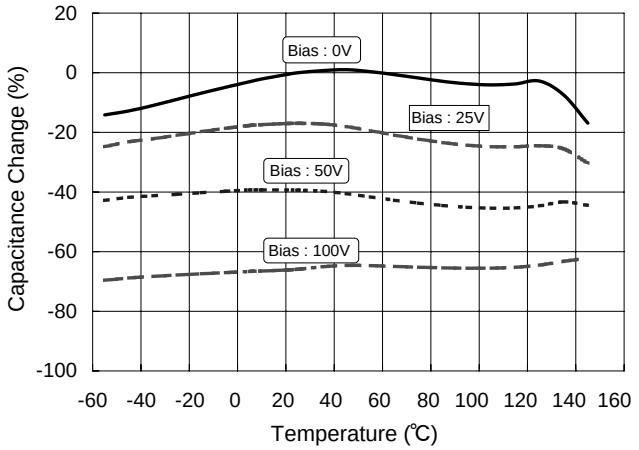
CHARACTERISTICS DATA

◆Temperature and DC voltage Characteristics

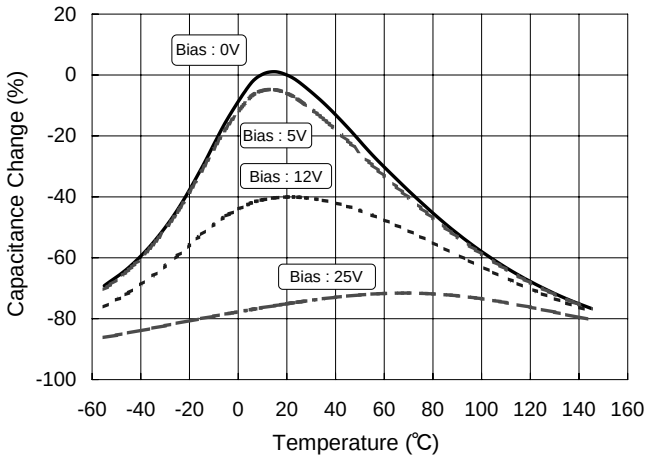
●NTS series (X5R)　50V/10μF



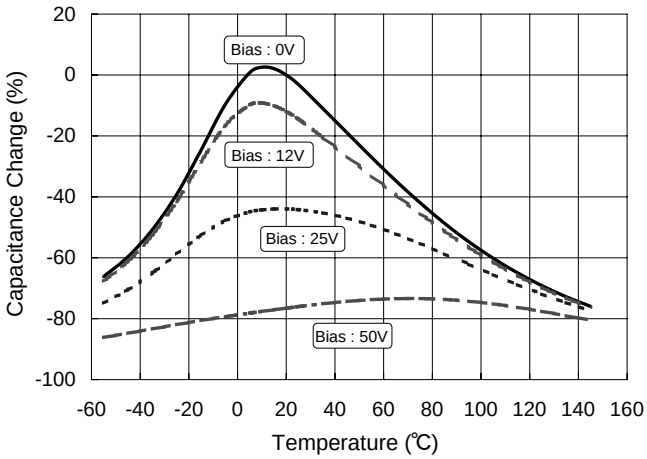
●NTS series (X7R)　100V/1.5μF



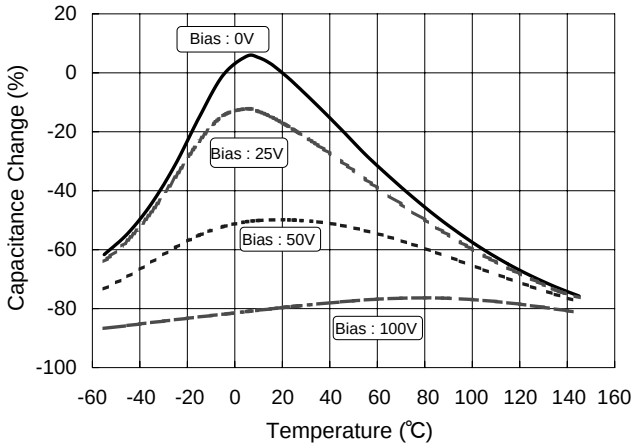
●THC/THD series　25V/15μF



●THC/THD series　50V/4.7μF



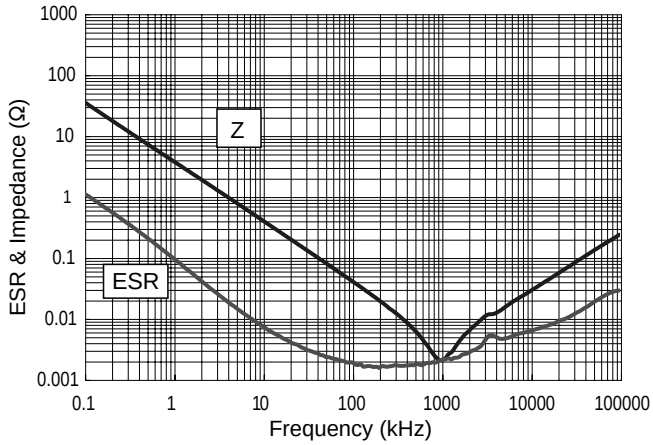
●THC/THD series　100V/2.2μF



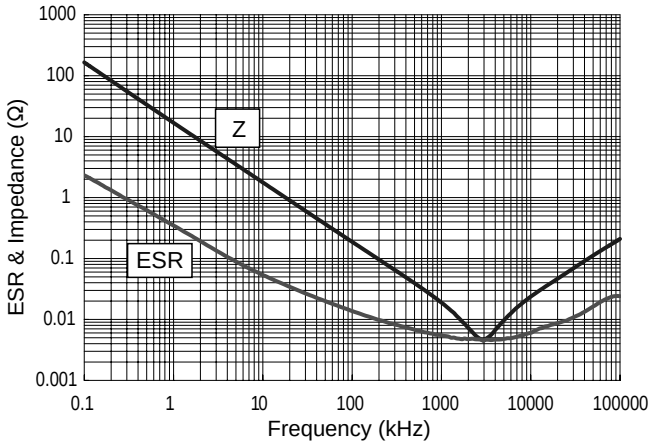
CHARACTERISTICS DATA

◆Frequency Characteristics

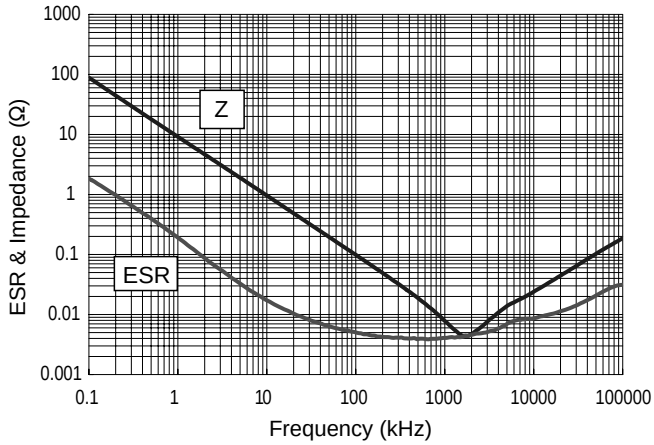
●NTS Series 25V/22μF



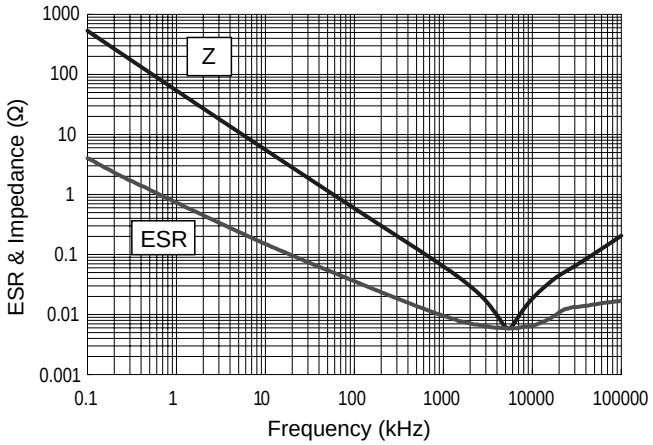
●THC Series 25V/4.7μF



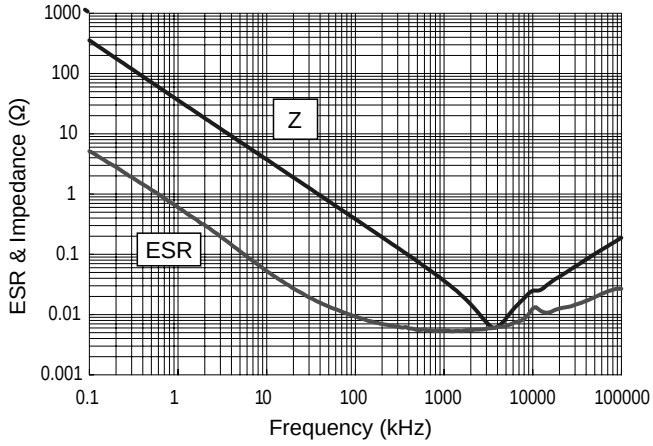
●NTS Series 50V/10μF



●THC Series 50V/1.5μF



●NTS Series 100V/2.2μF



●THC Series 100V/0.68μF