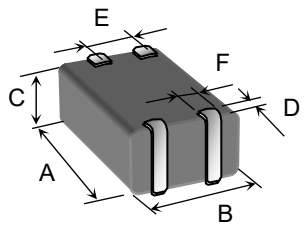
1. Scope

This specification is applicable to Common Mode Noise Filter, used for general electronic equipment.

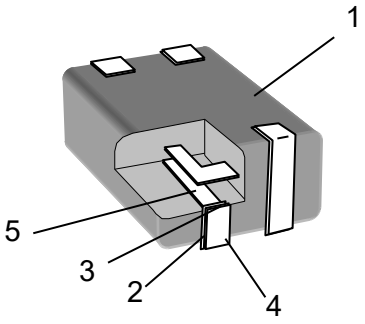
2. Dimensions in mm (not to scale)



Unit: mm (inch)

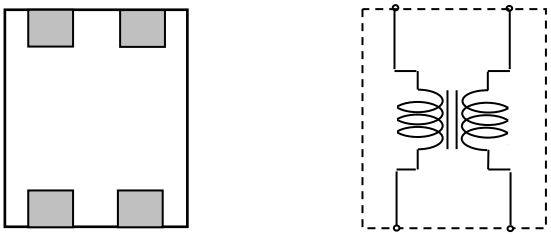
A	B	C	D	E	F
1.25±0.15 (.049±.006)	1.00±0.15 (.039±.006)	0.5±0.1 (.02±.004)	0.20±0.15 (.008±.006)	0.55±0.10 (.022±.004)	0.3±0.1 (.012±.004)

3. Structure



1	Ni-Zn Ferrite
2	Outer Termination(Ag)
3	Ni Plate
4	Sn Plate
5	Inner Conductor(Ag)

4. Schematic



5. Part Number

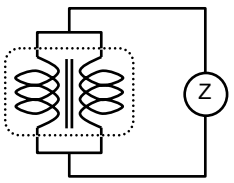
QTC	2	4	C	E	360	U	P
1)	2)	3)	4)	5)	6)	7)	8)

1) Product Code ---------- QTC: Noise Suppression Filter
2) External Dimensions ---------- 2: 1.25mm(L)×1.00mm(W)×0.50mm(H)
3) Number of Terminations -------- 4: 4 pins
4) Type ---------- C: Coupled Type
5) Characteristics ---------- E: For High Speed Differential Transmission (High Coupled Type)
6) Nominal Impedance Value ----- ex) 360: $\underline{36} \times 10^{\underline{0}}$ (Ω)
7) Packaging ---------- U: Embossed Tape
8) Supporting cord---------- P: Low resistance type (QTC24CE360UP Only)

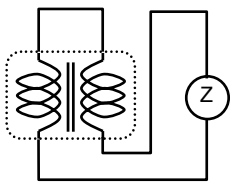
6. Rating

Part No.	Common Mode Impedance*1 at 100MHz	Differential Mode Impedance*2 at 100MHz	Rated Voltage (V DC)	Rated Current (mA DC)	DC Resistance (Ω max.)
QTC24CE360UP	36(Ω) ±25(%)	20(Ω) max.	5	200	1.00
QTC24CE900U	90(Ω)±25(%)	15(Ω) max.	5	160	1.75
QTC24CE121U	120(Ω)±25(%)	18(Ω) max.	5	140	2.20
QTC24CE201U	200(Ω)±25(%)	20(Ω) max.	5	130	2.70
QTC24CE331U	330(Ω)±20(%)	35(Ω) max.	5	100	4.9Ω ±25%

Impedance measurement equipment: HP4291A or Corresponding equipment
Impedance measurement circuit: *1 *2



Common Mode



Differential Mode

7. Category Temperature Range

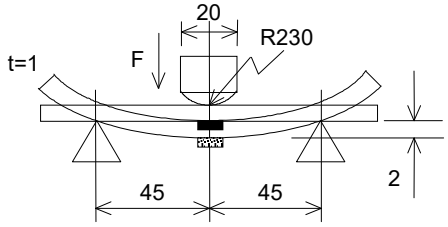
-40 to +85 °C

8. Performance Characteristics

Standard test condition
Temperature: 15 to 35 °C
Relative humidity: 25 to 85 %
Atmospheric pressure: 86 to 106 kPa

When there are questions concerning measurement result
Temperature: 20±2 °C
Relative humidity: 60 to 70 %
Atmospheric pressure: 86 to 106 kPa

8-1. Mechanical Characteristics

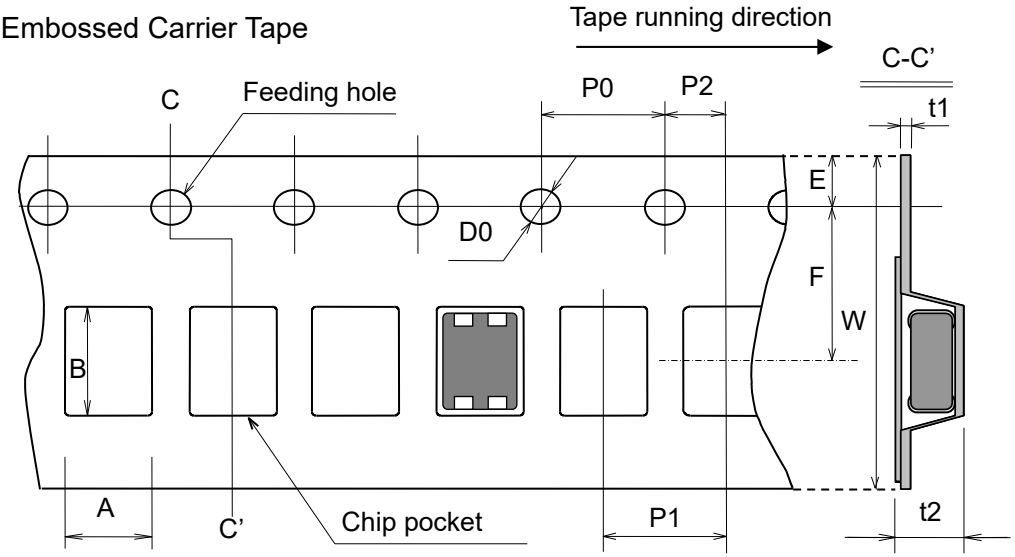
Item	Test Method	Specification
Solderability	Preheating temperature: 150 °C Preheating time: 1 min Solder temperature: 230±5 °C Duration: 3±0.5 s Immersion speed: 25 mm/s	At least 90 % of each termination is covered with the new solder.
Resistance to Soldering Heat	Preheating temperature: 150 °C Preheating time: 1 min Solder temperature: 260±5 °C Duration: 10±0.5 s Immersion speed: 25 mm/s Recovery: 48±4 hours of recovery under the standard condition after the test.	Impedance variation: within ±30 % Remaining terminal: 70 % min.
Bending Strength	Warp: 2 mm Testing board: Glass-epoxy Thickness: 1.0 mm 	No abnormality of appearance Impedance variation: within ±30 %
Vibration	Directions: 2 h each in X, Y, and Z directions (Total: 6 h) Frequency range: 10 to 55 to 10 Hz (Sweep rate: 1 min) Amplitude: 1.5 mm	No abnormality of appearance Impedance variation: within ±30 %

8-2. Environmental Characteristics

Item	Test Method	Specification
Heat Cycle	Conditions for 1 cycle Step 1: -40±3 °C, 30±3 min Step 2: +25±2 °C, 0 to 5 min Step 3: +85±3 °C, 30±3 min Step 4: +25±2 °C, 0 to 5 min Number of cycle: 200 cycle 1 to 2 hours of recovery under the standard condition after the test	No abnormality of appearance Impedance variation: within ±30 %
Load Life	Temperature: 85±2 °C Applied current: Rated current Duration: 500 h 1 to 2 hours of recovery under the standard condition after the test	No abnormality of appearance Impedance variation: within ±30 %
Humidity	Temperature: 60±2 °C Humidity: 90 to 95 %RH Duration: 500 h 1 to 2 hours of recovery under the standard condition after the test	No abnormality of appearance Impedance variation: within ±30 %
Humidity Load Life	Temperature: 60±2 °C Humidity: 90 to 95 %RH Applied current: Rated current Duration: 500 h 1 to 2 hours of recovery under the standard condition after the test	No abnormality of appearance Impedance variation: within ±30 %

9. Packaging Method

9-1. Embossed Carrier Tape

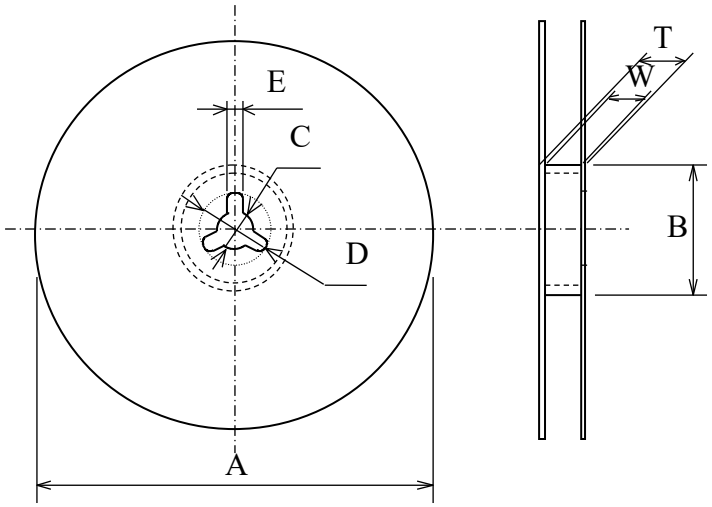


Unit: mm (inch)

A	B	W	F	E	P1
1.20±0.15 (.05±.006)	1.45±0.15 (.06±.006)	8.0±0.2 (.32±.008)	3.5±0.05 (.14±.002)	1.75±0.1 (.07±.004)	4.0±0.1 (.16±.004)

P2	P0	D0	t1	t2
2.0±0.1 (.08±.004)	4.0±0.1 (.16±.004)	1.5+0.1,-0 (.06+.004,-0)	0.25±0.05 (.01±.002)	0.9±0.15 (.04±.006)

9-2. Reel

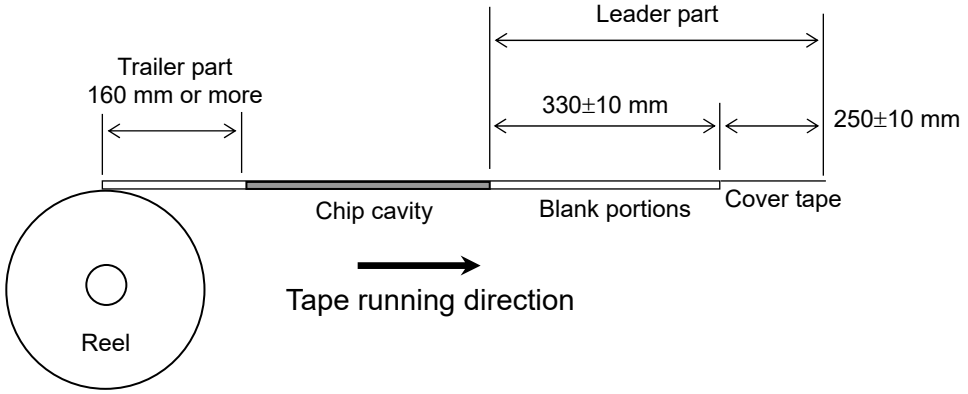


Unit: mm (inch)

A	B	C	D	E	W	T
180.0+0/-3 (7.1+0/-.12)	60.0+1/-0 (2.4+.04/-0)	13.0±0.2 (.51±.008)	21.0±0.8 (.83±.03)	2.0±0.5 (.08±.02)	9.0±0.3 (.35±.01)	11.4±1.0 (.45±.04)

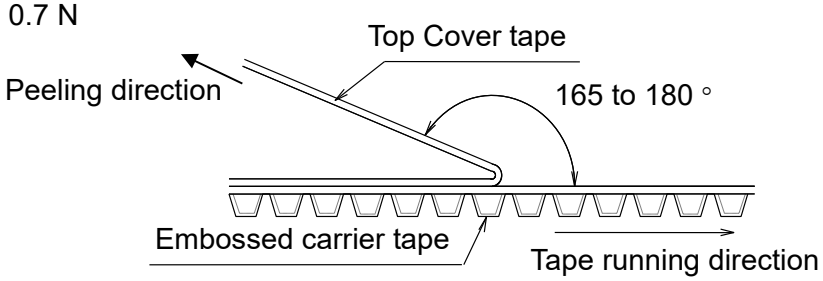
9-3. Taping Method

The first end (leader part) and the last end (trailer part) of each tape shall be left empty without loading the product, with the top of the leader part comprising only cover tape. (See the figure below.) The cover tape may not be sealed in the leader part and the trailer part.



9-4. Peeling Strength of Cover Tape

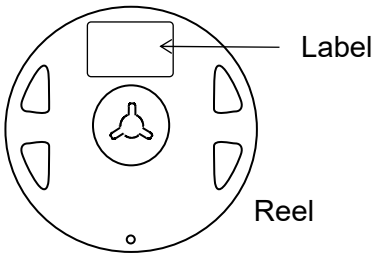
0.1 to 0.7 N



9-5. Label Indication

A label indicating the following in English shall be put on each reel and box.

1) Part Name 2) Part No. 3) Quantity 4) Lot No.

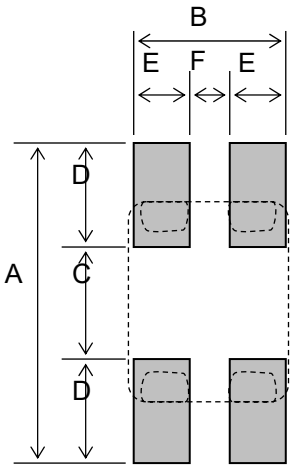


9-6. Package Quantity

Quantity per reel: 5000 pcs.

10. Chip-mounting Considerations

10-1. Recommended Land Pattern (Only for Reflow Soldering)



A	1.60 to 2.00 (0.064 to 0.080)
B	0.95 (0.038)
C	0.70 (0.028)
D	0.45 to 0.65 (0.018 to 0.026)
E	0.35 (0.014)
F	0.25 (0.010)

Unit: mm (inch)

1) When this products are mounted on a PCB, the amount of solder used (size of fillet) can directly affect this product performance.
2) The amount of solder applied can affect the ability of products to withstand mechanical stresses which may lead to breaking or cracking.

   Therefore, when designing land-patterns it is necessary to consider the appropriate size and configuration of the solder pads which in turn determines the amount of solder necessary to form the fillets.

10-2. Pattern Configurations

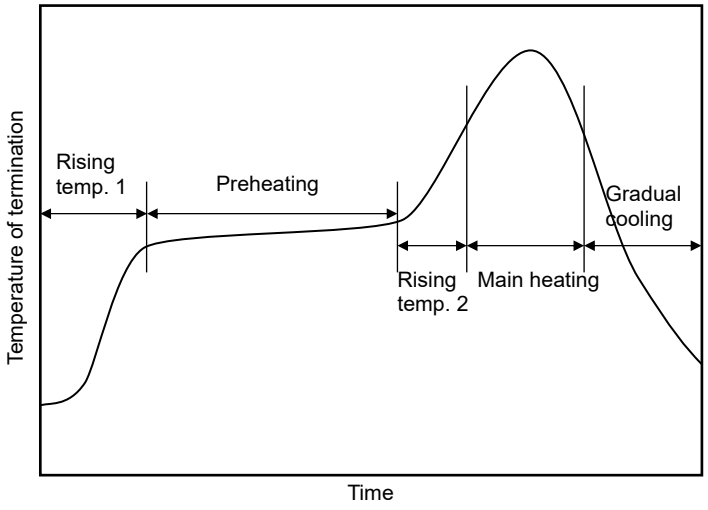
1) After this products have been mounted on the PC boards, products can be subjected to mechanical stresses in subsequent manufacturing processes. For this reason, planning pattern configurations and the position of SMD inductors should be carefully performed to minimize stress.
2) Board separation should not be done manually, but by using the appropriate devices.

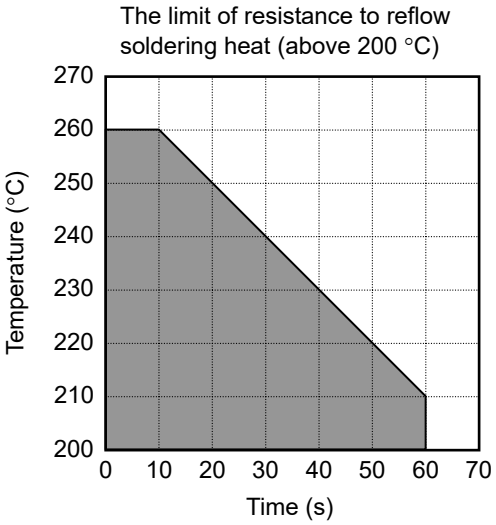
10-3. Considerations for Automatic Chip-Mounting

Excessive impact load should not be imposed on the inductors when mounting onto the PC boards.

10-4. Reflow Soldering

< Recommended Temperature Profile in Reflow Soldering >





Solder	Rising temp. 1	Preheating	Rising temp. 2	Main heating	Gradual cooling
SnPb eutectic (Sn-37Pb)	The normal to Preheating temp.	140 to 160 °C	Preheating to 200 °C	235±10 °C	200 to 100 °C
	30 to 60 s	60 to 120 s	20 to 40 s	Peak	1 to 4 °C/s
SnAgCu lead-free (Sn-3Ag-0.5Cu)	The normal to Preheating temp.	150 to 170 °C	Preheating to 210 °C	250^{+10}_{-5} °C	210 to 100 °C
	30 to 60 s	60 to 120 s	20 to 40 s	Peak	1 to 4 °C/s

1) Reflow soldering shall be within twice.
2) Please inquire of us when you use the different conditions.
3) The temperature may be changed according to the size of the board and the mounting density, etc. Please measure the temperature of termination in each type of the board before actual use.

10-5. Repair with Hand Soldering

1) Allow enough preheating with a blast of hot air or similar method. Use a soldering iron with the tip temperature 350 °C or less. Solder for 3 seconds or less for each termination.
2) Never touch this product with a tip of the solder iron.

11. Common precautions in handling common mode noise filters

⚠ Notice for use

(1) This specification shows the quality and performance of a unit component. Before adoption, be sure to evaluate and verify the product mounting it in your product under the actual conditions for use.

(2) We take no responsibility for troubles caused by the product usage that is not specified in this specification.

(3) In advance-notification to us is required in case you demand high reliability in the Common mode Noise filters because there is a possibility that a trouble or a failure in our noise filter which is used in your transportation units (e.g. Trains, cars, ships, traffic signal equipment etc.), under water-equipment, medical equipment, aerospace equipment, electrothermal goods, combustion and gas equipment, power station control equipment, information control equipment, rotating equipment, disaster and crime-preventive equipment, various safety devices, and the equivalent equipment may cause critical damage occurrence such as loss of life or property.
In addition, use fail-safe design as mentioned below for preventing extensive damage and for ensuring the safety:
*Systems equipped with a protection circuit and a protection device
*Systems equipped with a redundant circuit or other system to prevent an unsafe status in the event of a single fault
*Systems equipped with an arresting the spread of fire or preventing glitch

(4) When a dogma shall be occurred about safety for this product, be sure to inform us rapidly, operate your technical examination.

(5) The noise filters are designed and manufactured for general and standard use in general electronic equipment (e.g. AV equipment, home electric appliances, office equipment, information and communication equipment).
For applications in which special quality and reliability are required, or if the failure or malfunction of the products may directly jeopardize life or cause threat of personal injury (such as for aircraft and aerospace equipment, traffic and transport equipment, combustion equipment, medical equipment, accident prevention and anti-theft devices, and safety equipment), please be sure to consult with our sales representative in advance and to exchange product specifications which conform to such applications.
The noise filters are not intended for use in the following special conditions. Before using the products, carefully check the effects on their quality and performance, and determine whether or not they can be used.
1) Use in liquids such as water, oil, chemical, and organic solvent.
2) Use under direct sunlight, in outdoor or in dusty atmospheres.
3) Use in places full of corrosive gases such as sea breeze, Cl_2, H_2S, NH_3, SO_2, and NO_X.
4) Use in environment with large static electricity or strong electromagnetic waves or strong radial ray.
5) Where the product is close to a heating component, or where an inflammable such as a polyvinyl chloride wire is arranged close to the product.
6) Where the noise filter is sealed or coated with resin etc.
7) Where solvent, water, or water-soluble detergent is used in cleaning free soldering and in flux cleaning after soldering. (Pay particular attention to water-soluble flux.)
8) Use in such a place where the product is wetted due to dew condensation.
9) Use the product in a contaminated state.

(6) If transient load (heavy load in a short time) like pulse is expected to be applied, carry out evaluation and confirmation test with noise filters actually mounted on your own board. When the load of more than rated power is applied under the load condition at steady state, it may impair performance and/or reliability of nois filter. Never exceed the rated voltage and rated current. When the product shall be used under special condition, be sure to ask us in advance.

(7) Halogen type (Chlorine type, Bromine type, etc.) or other high-activity flux is not recommended as the residue may affect performance or reliability of noise filters. Strong acid flux, water soluble-flux and flux including fluorine ion shall not be used.

(8) Do not apply flux to the noise filter after soldering. The activity of flux may be a cause of failures in the noise filter.

(9) Avoid immersion of noise filters in solvent for long time. Use solvent after the effect of immersion is confirmed.

(10) Mounting of the noise filters with excessive or insufficient wetting amount of solder may affect the connection reliability or the performance of the noise filters. Carefully check the effects and apply a proper amount of solder for use.

(11) Refer to the recommended soldering conditions and set the soldering condition. High peak temperature or long heating time may impair the performance or the reliability of the noise filters.

(12) Recommended soldering condition is for the guideline for ensuring the basic characteristics of the noise filters, not for the stable soldering conditions. Conditions for proper soldering should be set up according to individual conditions.

(13) When soldering with soldering iron, never touch the body of the noise filter with a tip of the soldering iron. When using a soldering iron with a tip at high temperature, solder for a time as short as possible. (three seconds or less up to 350 ^{o}C)

(14) Avoid physical shock to the noise filter and nipping of the noise filter with hard tool (a pair of pliers or tweezers) as it may damage the noise filter and may affect noise filter's performance.

(15) Avoid excessive bending of printed circuit boards in order to protect the noise filters from abnormal stress.

(16) Do not reuse any noise filters after removal from mounting boards.

(17) Do not drop the noise filters. If the noise filters are dropped, do not use them. Such products may have received mechanical or electrical damage.

12. Storage Method

If the product is stored in the following environments and conditions, the performance and solderability may be badly affected, avoid the storage in the following environments.

(1) Storage in places full of corrosive gases such as sea breeze, Cl_2, H_2S, NH_3, SO_2, and NO_X.

(2) Storage in places exposed to direct sunlight.

(3) Storage in places outside the temperature range of -5 ^{o}C to 40 ^{o}C and humidity range of 15 to 75 % relative humidity.

(4) Storage over a year after our delivery (This item also applies to the case where the storage method specified in item (1) to (3) has been followed.).

13. Laws and Regulations

(1) This product has not been manufactured with any ozone-depleting chemicals (ODC) controlled under the Montreal Protocol.

(2) This product complies with the RoHS Directive (Restriction of the use of certain Hazardous Substances in electrical and electronic equipment (DIRECTIVE 2011/65/EU and (EU)2015/863).

(3) All materials used in this product are registered as existence chemicals under the Law Concerning the Examination and Regulation of Manufacturs, etc. of Chemical substances.

(4) If you need the notice by letter of "A preliminary judgment on the Laws of Japan foreign exchange and Foreign Trade control", be sure to let us know.

(5) These products are not dangerous goods on the transportation as identified by UN(United N ations) numbers or UN classification.

14. Production site

Country of Origin: Japan

Manufacturing plant: Device Solutions Business Division, Panasonic Corporation

15. Others

(1) Please put your signature on the cover page when you approved this specification, and return 1 copy of this to us within 60 days.
If the signed specification is not returned to us within 6 months from the issued date, we will assume that you have accepted this specification.

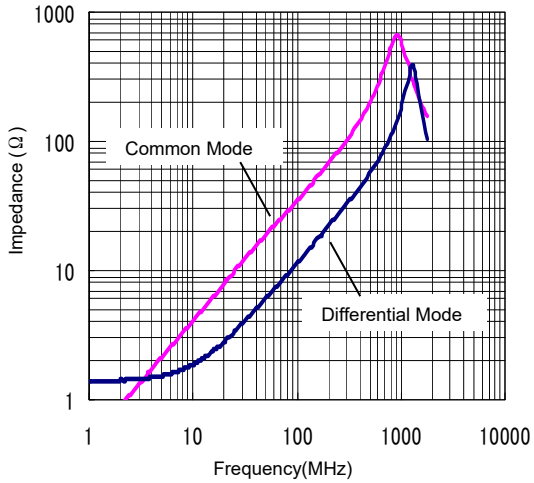
(2) As to disposal of the products, check the disposal methods introduced in respective countries or regions where the products are incorporated and used in your products.

(3) The technical information in this specification provides examples of our products' typical operations and application circuits. We do not guarantee the non-infringement of third party's intellectual property rights and we do not grant any license, right, or interest in our intellectual property.

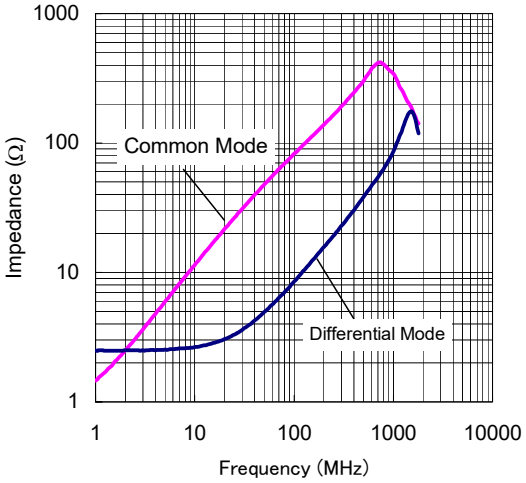
(4) This Product Specification is the only binding description of the specifications of this product, and shall always supersede and take precedence over any other written or oral information (including by email) communicated at any time between your company and our company, whether before or after the date of this Product Specification.
Any additions, deletions, or modifications to the specifications of this product shall be in valid, null and void unless a revised Product Specification is executed by both parties.

Impedance Characteristics <Reference Data>

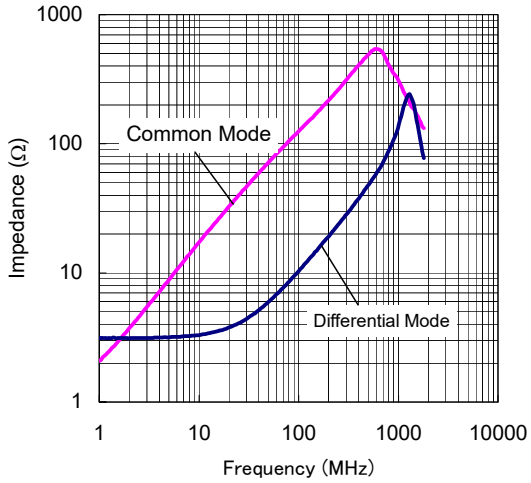
● QTC24CE360UP



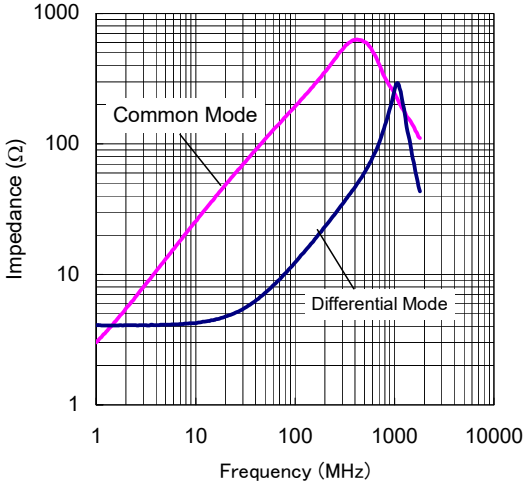
● QTC24CE900



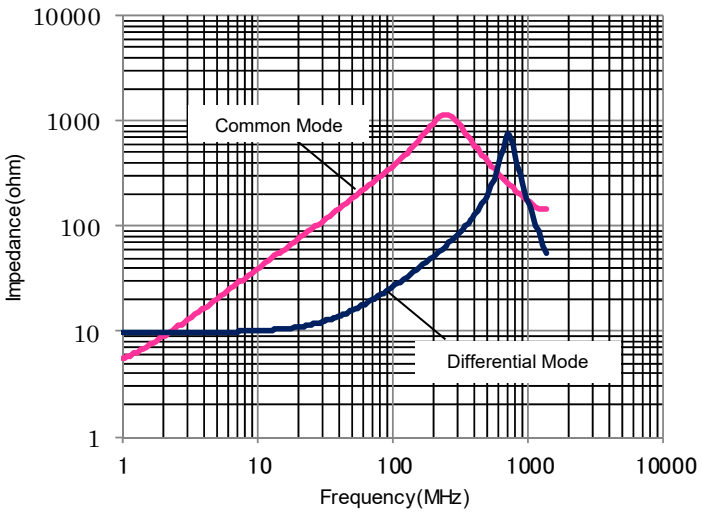
● QTC24CE121



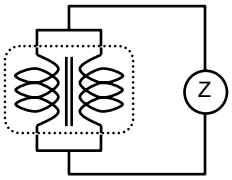
● QTC24CE201



QTC24CE331



Common Mode



Differential Mode