

DELIVERY SPECIFICATION

SPEC. No. C-YFF-d

D A T E : 2018, Aug.

To

Non-Controlled Copy

CUSTOMER'S PRODUCT NAME

TDK PRODUCT NAME

3-terminal Feed Through Filter

Tape packaging **【RoHS compliant】**

YFF15,YFF18,YFF21,YFF31 Type

Please return this specification to TDK representatives with your signature.

If orders are placed without returned specification, please allow us to judge that specification is accepted by your side.

RECEIPT CONFIRMATION

DATE: YEAR MONTH DAY

TDK Corporation
Sales
Electronic Components
Sales & Marketing Group

Engineering
Electronic Components Business Company

APPROVED	Person in charge

APPROVED	CHECKED	Person in charge

1. SCOPE

This specification is applicable to 3-terminal feed through filter with a priority over the other relevant specifications.

Production places defined in this specification shall be TDK Corporation Japan, TDK(Suzhou)Co.,Ltd and TDK Components U.S.A. Inc.

EXPLANATORY NOTE:

This specification warrants the quality of the 3-terminal feed through filter. Filters should be evaluated or confirmed a state of mounted on your product.

If the use of the filters goes beyond the bounds of this specification, we can not afford to guarantee.

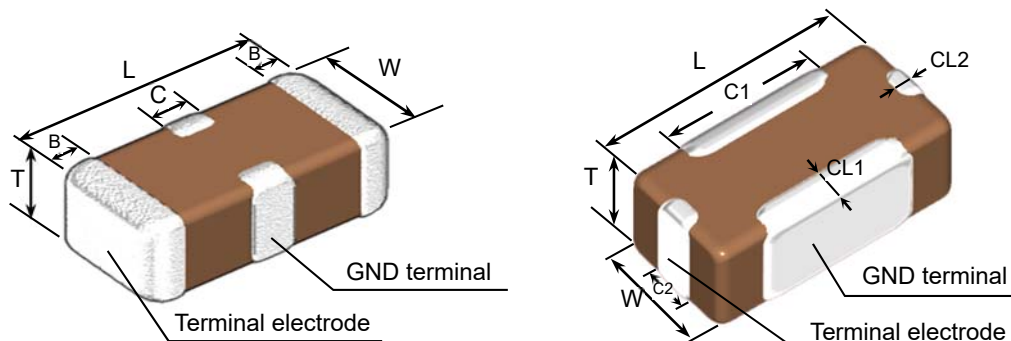
2. CODE CONSTRUCTION

(Example)	YFF15	PC	0G	105	M	T	OOOO
	<u>YFF18</u>	<u>PC</u>	<u>1C</u>	<u>104</u>	<u>M</u>	<u>T</u>	<u>OOOO</u>
	(1)	(2)	(3)	(4)	(5)	(6)	(7)

(1) Type

<YFF15,YFF18PC/PH/SC,YFF21,YFF31>

<YFF18PW>



Type	Dimensions (Unit : mm)				
	L	W	T	B	C
YFF15	1.00±0.05	0.55±0.05	0.30±0.05	0.09 min.	0.30±0.10
	1.05±0.05	0.65±0.05	0.45±0.05		
YFF18SC	1.60±0.10	0.80±0.10	0.60±0.10	0.10 min.	0.40±0.10
YFF18PC	1.60±0.20	0.80±0.10	0.60±0.10		
YFF18PH	1.60±0.20	0.80±0.10	0.80±0.10		
YFF21	2.00±0.20	1.25±0.20	0.85±0.15	0.20 min.	0.45±0.15
YFF31PC	3.20±0.20	1.60±0.20	1.30±0.20	0.40±0.30	0.95±0.25
YFF31HC	3.20±0.20	1.60±0.20	1.30±0.20	0.40±0.30	1.20±0.30

Type	Dimensions (Unit : mm)				
	L	W	T	C1	CL1
YFF18PW	1.60±0.10	0.80±0.10	0.60±0.10	0.80 ^{+0.20} _{-0.10}	0.15±0.10
	C2	CL2			
	0.40±0.10	0.15±0.10			

* As for each item, please refer to the table A in the end of the specification.

(2) Product Classification

Symbol	Product Classification
P C	for Power line
P H	for Power line (thickness:0.8mm)
P W	for Power line (Low ESL type)
S C	for Signal line
H C	for Large-current power line

(3) Rated Voltage

Symbol	Rated Voltage
2 A	DC 100 V
1 H	DC 50 V
1 E	DC 25 V
1 C	DC 16 V
1 A	DC 10 V
0 J	DC 6.3 V
0 G	DC 4 V

(4) Rated Capacitance

Stated in three digits and in units of pico farads (pF).
The first and Second digits identify the first and second significant figures of the capacitance, the third digit identifies the multiplier.

(Example)

Symbol	Rated Capacitance
104	100,000 pF
105	1,000,000 pF

(5) Capacitance tolerance

Symbol	Tolerance
M	± 20 %

(6) Packaging

Symbol	Packaging
T	Taping

(7) TDK internal code

3. RATED CURRENT

Rated current depend on operating temperature.

As for details, please refer to the table A in the end of the specification.

4. OPERATING TEMPERATURE RANGE

As for details, please refer to the table A in the end of the specification.

5. STORING CONDITION AND TERM

5 to 40°C at 20 to 70%RH

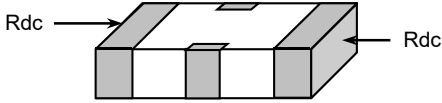
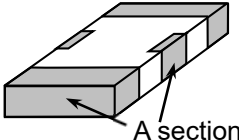
6 months Max. upon receipt

6. INDUSTRIAL WASTE DISPOSAL

Dispose this product as industrial waste in accordance with the industrial Waste Law.

7. PERFORMANCE

table 1

No.	Item	Performance	Test or inspection method															
1	Direct Current Resistance (Rdc)	Please refer to the table A in the end of the specification.	Measuring current shall be 100mA max. 															
2	Capacitance	Within the specified tolerance.	As for measuring condition, please refer to the table A. YFF15PC0G435M : Heat treat the capacitors at 150 –10,0°C for 1h and measure the value after leaving capacitors for 250±4h in ambient condition.															
3	Solderability	New solder to cover over 75% of termination. 25% may have pin holes or rough spots but not concentrated in one spot. Ceramic surface of A sections shall not be exposed due to melting or shifting of termination material. 	Completely soak both terminations in solder at the following conditions. Solder : Sn-3.0Ag-0.5Cu or Sn-37Pb Temperature : 245±5°C(Sn-3.0Ag-0.5Cu) 235±5°C(Sn-37Pb) Soaking time : 3±0.3s(Sn-3.0Ag-0.5Cu) 2±0.2s(Sn-37Pb) Flux : Isopropyl alcohol (JIS K 8839) Rosin (JIS K 5902) 25% solid solution.															
4	Temperature cycle	External appearance	No mechanical damage.															
		Capacitance	Change from the value before test Please refer to the table A in the end of the specification.															
		Resistance for DC (Rdc)	1.0Ωmax.															
			Reflow solder the product on a P.C.Board shown in Appendix 1 before testing. Expose the product in the condition step1 through step 4 and repeat 100 times consecutively. Leave the product in ambient condition for 24±2h before measurement. <table border="1" data-bbox="1018 1559 1485 1854"> <thead> <tr> <th>Step</th> <th>Temperature (°C)</th> <th>Time(min.)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Min. operating temp. ±3</td> <td>30 ± 3</td> </tr> <tr> <td>2</td> <td>Ambient Temp.</td> <td>2 ~ 5</td> </tr> <tr> <td>3</td> <td>Max. operating temp. ±2</td> <td>30 ± 2</td> </tr> <tr> <td>4</td> <td>Ambient Temp.</td> <td>2 ~ 5</td> </tr> </tbody> </table> As for Min./Max operating temp., please refer to Operating Temperature Range at 14. Table-A.	Step	Temperature (°C)	Time(min.)	1	Min. operating temp. ±3	30 ± 3	2	Ambient Temp.	2 ~ 5	3	Max. operating temp. ±2	30 ± 2	4	Ambient Temp.	2 ~ 5
Step	Temperature (°C)	Time(min.)																
1	Min. operating temp. ±3	30 ± 3																
2	Ambient Temp.	2 ~ 5																
3	Max. operating temp. ±2	30 ± 2																
4	Ambient Temp.	2 ~ 5																

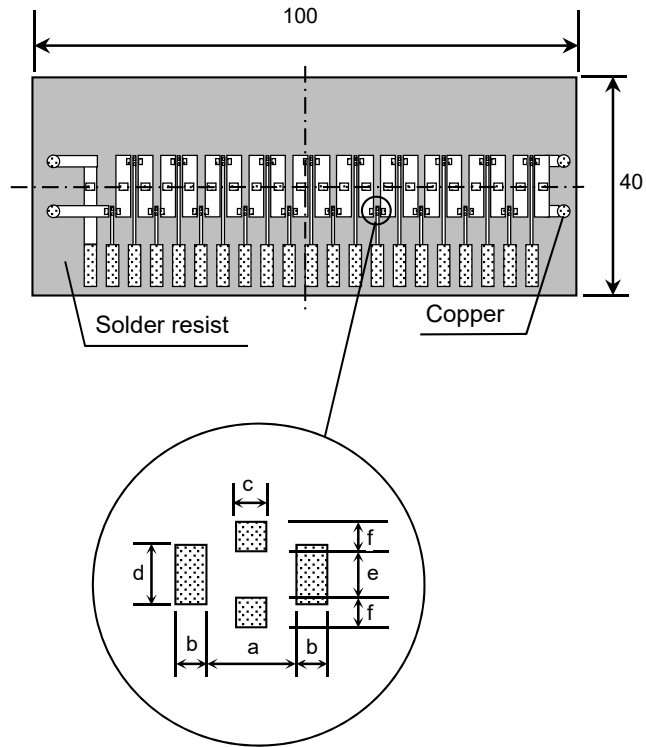
(continued)

No.	Item		Performance	Test or inspection method
5	Moisture Resistance (Steady State)	External appearance	No mechanical damage.	Reflow solder the product on a P.C.Board shown in Appendix 1 before testing.
		Capacitance	<hr/> Change from the value before test <hr/> Please refer to the table A in the end of the specification. <hr/>	Leave at temperature $60\pm 2^{\circ}\text{C}$, 90 to 95%RH for 500 +24,0h. Leave the product in ambient condition for $24\pm 2\text{h}$ before measurement.
		Resistance for DC (Rdc)	1.0Ωmax.	
6	Life	External appearance	No mechanical damage.	Reflow solder the product on a P.C.Board shown in Appendix 1 before testing.
		Capacitance	<hr/> Change from the value before test <hr/> Please refer to the table A in the end of the specification. <hr/>	Test condition : Maximum operating temperature $\pm 2^{\circ}\text{C}$ for 1,000 +48,0h As for applied voltage and current, please refer to the table A in the end of the specification.
		Resistance for DC (Rdc)	1.0Ωmax.	Charge/discharge current shall not exceed 50mA. Voltage conditioning : Voltage treat the product under testing temperature and voltage for 1hour. Leave the product in ambient condition for $24\pm 2\text{h}$ before measurement. Use this measurement for initial value.

*As for the initial measurement of product on number 4 and 5, leave product at $150 -10,0^{\circ}\text{C}$ for 1h and measure the value after leaving product for $24\pm 2\text{h}$ in ambient condition.

Appendix 1

P.C.Board for reliability test



(Unit : mm)

Type	Symbol	a	b	c	d	e	f
YFF15		0.70	0.30	0.19	0.60	0.25	0.25
YFF18PC/PH/SC		1.00	0.60	0.40	0.60	0.40	0.40
YFF18PW		1.20	0.40	0.80	0.40	0.40	0.40
YFF21		1.40	0.60	0.50	0.80	0.60	0.65
YFF31		2.50	1.20	1.40	1.30	0.80	0.90

1. Material : Glass Epoxy(As per JIS C6484 GE4)

2. Thickness : 1.6mm

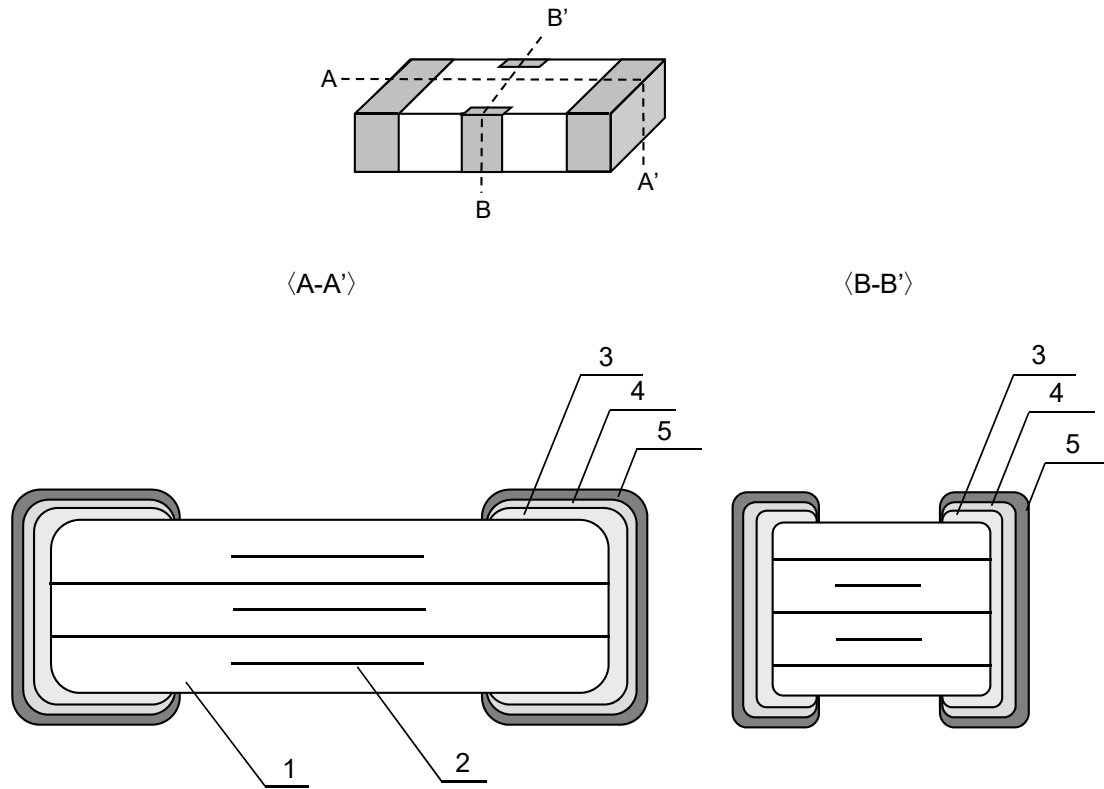


Copper(Thickness:YFF15 0.07mm
YFF18,YFF21,YFF31 0.035mm)



Solder resist

8. INSIDE STRUCTURE AND MATERIAL



No.	NAME	MATERIAL
1	Dielectric	CaZrO ₃ or BaTiO ₃
2	Electrode	Nickel (Ni)
3	Termination	Copper (Cu)
4		Nickel (Ni)
5		Tin (Sn)

9. PACKAGING

Packaging shall be done to protect the components from the damage during transportation and storing, and a label which has the following information shall be attached.
Tape packaging is as per 13. TAPE PACKAGING SPECIFICATION.

- 1) Inspection No.*
- 2) TDK P/N
- 3) Customer's P/N
- 4) Quantity

*Composition of Inspection No.

Example F 8 A - 23 - 001
 (a) (b) (c) (d) (e)

- a) Line code
- b) Last digit of the year
- c) Month and A for January and B for February and so on. (Skip I)
- d) Inspection Date of the month.
- e) Serial No. of the day

*Composition of new Inspection No.

(Will be implemented on and after Jan. 1, 2019)

Example

I	F	9	A	2	3	A	8	0	1
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)

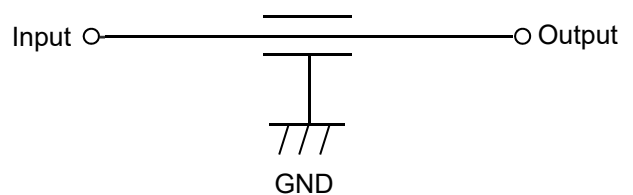
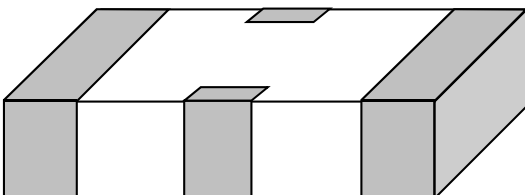
- (a) Prefix
- (b) Line code
- (c) Last digit of the year
- (d) Month and A for January and B for February and so on. (Skip I)
- (e) Inspection Date of the month.
- (f) Serial No. of the day(00 ~ ZZ)
- (g) Suffix(00 ~ ZZ)

*It is planned to shift to the new inspection No. on and after January 2019, but the implementation timing may be different depending on shipment bases.
Until the shift is completed, either current or new composition of inspection No. will be applied.


10. SOLDERING CONDITION


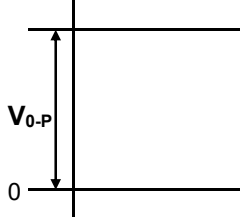
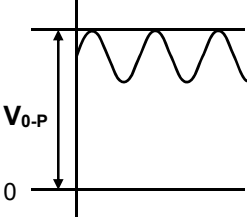
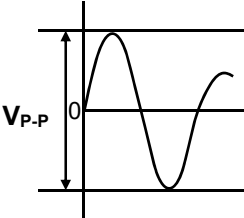
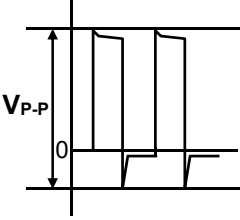
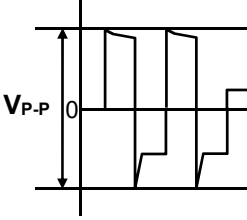
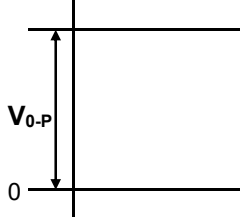
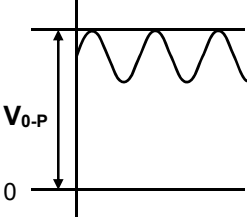
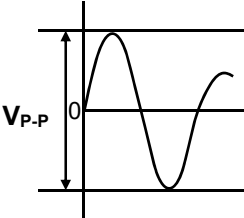
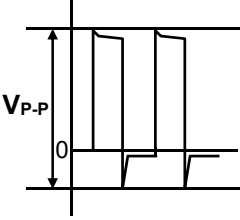
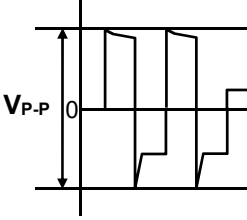
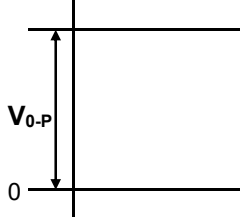
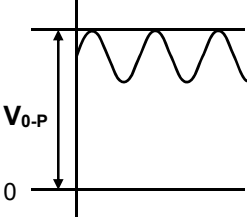
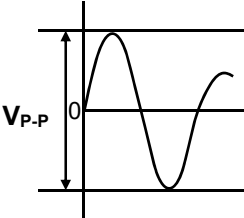
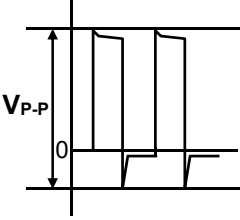
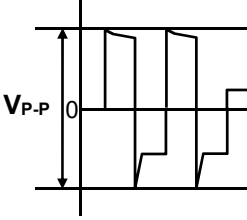
Soldering is limited to Reflow soldering.

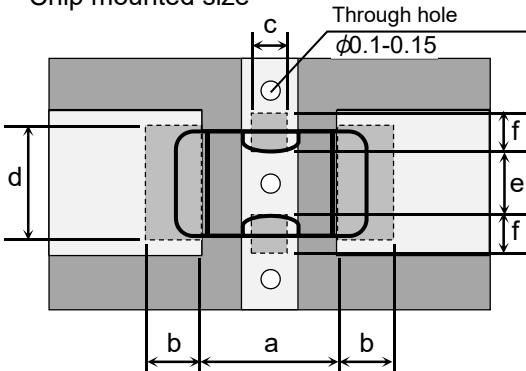
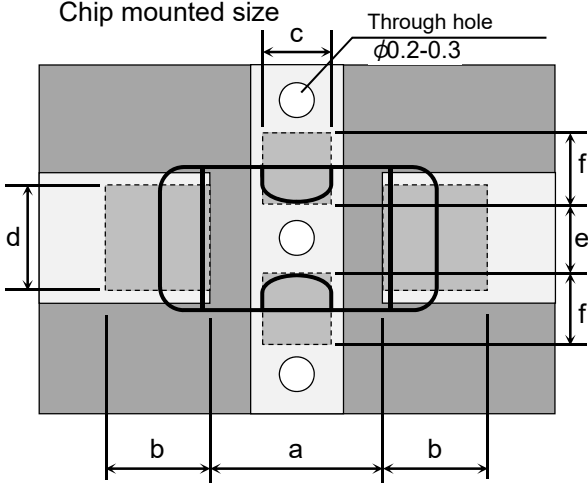
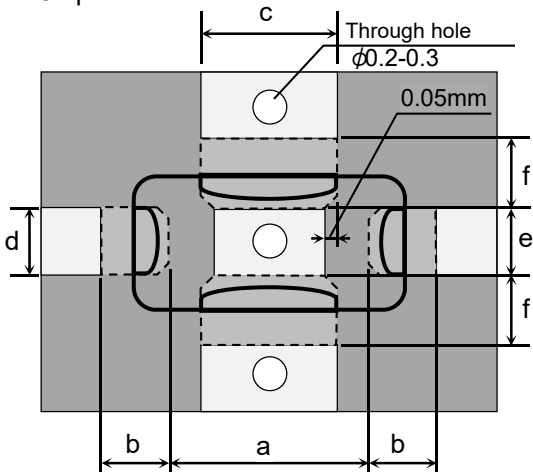



11. EQUIVALENT CIRCUIT DIAGRAM

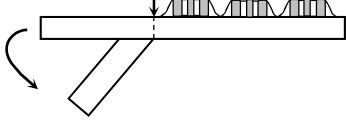
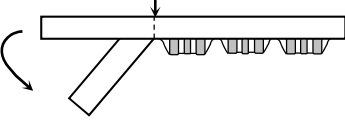
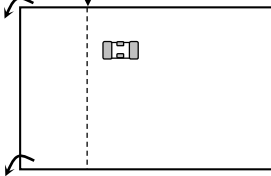
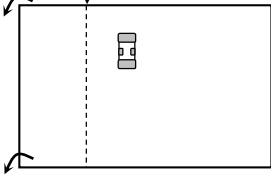
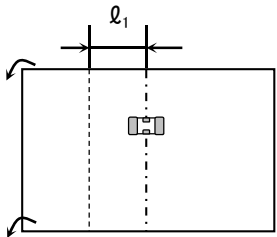
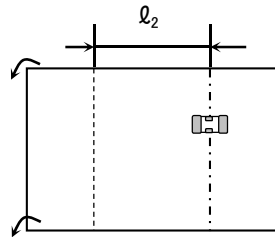


12. CAUTION

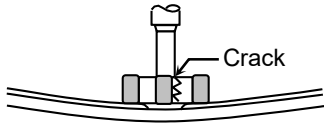
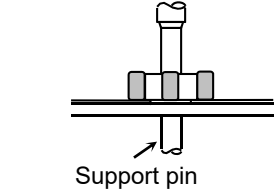
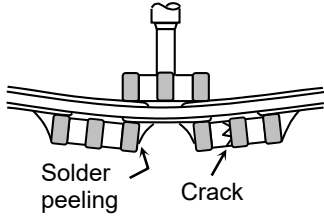
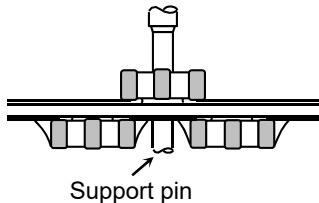
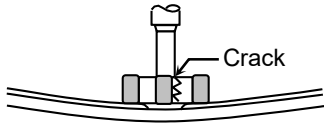
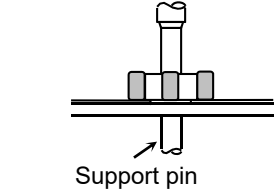
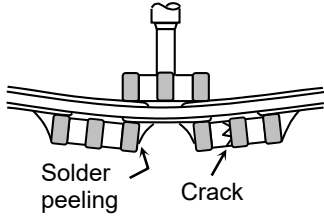
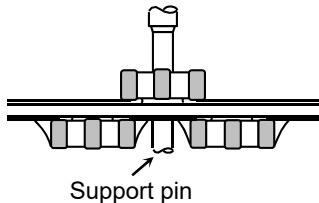
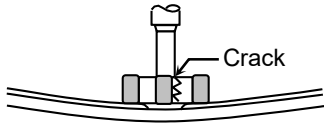
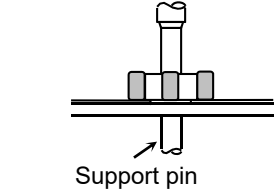
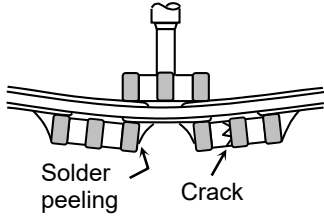
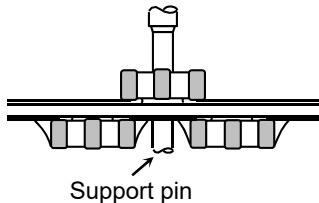
No.	Process	Condition
1	Operating Condition (Storage, Use, Transportation)	<p>1-1. Storage, Use</p> <ol style="list-style-type: none"> 1) The product must be stored in an ambient temperature of 5 to 40°C with a relative humidity of 20 to 70%RH. The products should be used within 6 months upon receipt. 2) The product must be operated and stored in an environment free of dew condensation and these gases such as Hydrogen Sulphide, Hydrogen Sulphate, Chlorine, Ammonia and sulfur. 3) Avoid storing in sun light and falling of dew. 4) Do not use product under high humidity and high and low atmospheric pressure which may affect product reliability. 5) Product should be tested for the solderability when they are stored for long time. <p>1-2. Handling in transportation</p> <p>In case of the transportation of the product, the performance of the product may be deteriorated depending on the transportation condition. (Refer to JEITA RCR-2335C 9.2 Handling in transportation)</p>
2	Circuit design  Caution	<p>2-1. Operating temperature</p> <p>Operating temperature should be followed strictly within this specification, especially be careful with maximum temperature.</p> <ol style="list-style-type: none"> 1) Do not use product above the maximum allowable operating temperature. 2) Surface temperature including self heating should be below maximum operating temperature. (Due to dielectric loss, product will heat itself when AC is applied. Especially at high frequencies around its SRF, the heat might be so extreme that it may damage itself or the product mounted on. Please design the circuit so that the maximum temperature of the product including the self heating to be below the maximum allowable operating temperature. Temperature rise at product's surface shall be below 20°C) 3) The electrical characteristics of the product will vary depending on the temperature. The product should be selected and designed in taking the temperature into consideration.

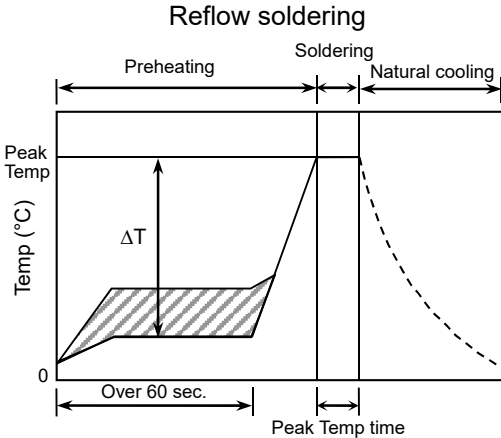
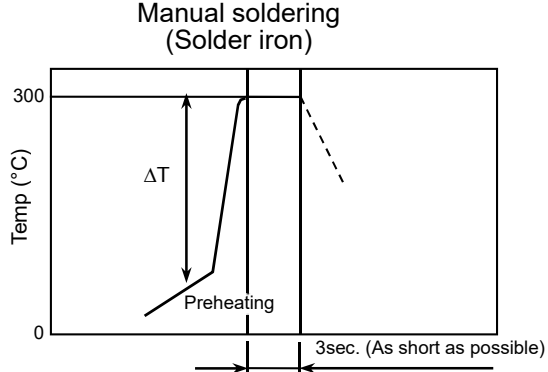
No.	Process	Condition																
2	Circuit design  Caution	<p>2-2. Operating voltage</p> <p>1) Operating voltage across the terminals should be below the rated voltage. When AC and DC are super imposed, V_{0-P} must be below the rated voltage. — (1) and (2)</p> <p>AC or pulse with overshooting, V_{P-P} must be below the rated voltage. — (3), (4) and (5)</p> <p>When the voltage is started to apply to the circuit or it is stopped applying, the irregular voltage may be generated for a transit period because of resonance or switching. Be sure to use the product within rated voltage containing these Irregular voltage.</p> <table border="1" data-bbox="437 515 1410 1088"> <thead> <tr> <th data-bbox="437 515 632 555">Voltage</th> <th data-bbox="632 515 887 555">(1) DC voltage</th> <th data-bbox="887 515 1150 555">(2) DC+AC voltage</th> <th data-bbox="1150 515 1410 555">(3) AC voltage</th> </tr> </thead> <tbody> <tr> <td data-bbox="437 555 632 786">Positional Measurement (Rated voltage)</td> <td data-bbox="632 555 887 786">  </td> <td data-bbox="887 555 1150 786">  </td> <td data-bbox="1150 555 1410 786">  </td> </tr> <tr> <th data-bbox="437 815 632 855">Voltage</th> <th data-bbox="632 815 887 855">(4) Pulse voltage (A)</th> <th data-bbox="887 815 1150 855">(5) Pulse voltage (B)</th> <th></th> </tr> <tr> <td data-bbox="437 855 632 1088">Positional Measurement (Rated voltage)</td> <td data-bbox="632 855 887 1088">  </td> <td data-bbox="887 855 1150 1088">  </td> <td></td> </tr> </tbody> </table> <p>2) Even below the rated voltage, if repetitive high frequency AC or pulse is applied, the reliability of the products may be reduced.</p> <p>3) Voltage derating will greatly reduce the failure rate. Since the failure rate follows 3 power law of the voltage, the failure rate used under U_w with UR rated product will be lowered as $(U_w/UR)^3$.</p> <p>2-3. Derating current This product allows DC current to flow inside. Do not use this product above the rated DC current.</p>	Voltage	(1) DC voltage	(2) DC+AC voltage	(3) AC voltage	Positional Measurement (Rated voltage)				Voltage	(4) Pulse voltage (A)	(5) Pulse voltage (B)		Positional Measurement (Rated voltage)			
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3	Designing P.C.board	<p>The amount of solder at the terminations has a direct effect on the reliability of the products.</p> <p>1) The greater the amount of solder, the higher the stress on the products, and the more likely that it will break. When designing a P.C.board, determine the shape and size of the solder lands to have proper amount of solder on the terminations.</p> <p>2) Avoid using common solder land for multiple terminations and provide individual solder land for each terminations.</p>																

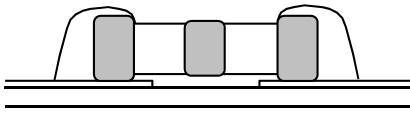
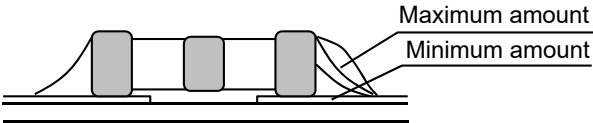
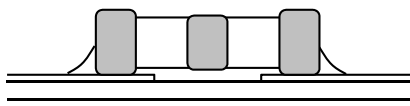
No.	Process	Condition																																										
3	Designing P.C.board	<p>3) Size and recommended land dimensions. <YFF15> Chip mounted size</p>  <p>Through hole $\phi 0.1-0.15$</p> <p><YFF18PC/SC/PH, YFF21, YFF31> Chip mounted size</p>  <p>Through hole $\phi 0.2-0.3$</p> <p><YFF18PW> Chip mounted size</p>  <p>Through hole $\phi 0.2-0.3$</p> <p>0.05mm</p> <p>Legend:  Resist  Land pattern  Land pattern & Resist</p> <p>YFF Series is having the unique Ground structure and eliminate unnecessary noise at the wide frequency range. The following points should be considered at the pad design to obtain the better performance.</p> <ol style="list-style-type: none"> 1) Ground pattern should be designed as big as possible. 2) Make through hole and connect to the ground pattern of the chip mounted side. 3) Through hole should be designed as close to GND terminal as possible. <p>Notes) *If through hole is too big, solder paste way came into the hole and make bad connection with the ground pattern.</p> <table border="1" data-bbox="414 1758 1436 2072"> <thead> <tr> <th>Type</th> <th>a</th> <th>b</th> <th>c</th> <th>d</th> <th>e</th> <th>f</th> </tr> </thead> <tbody> <tr> <td>YFF15</td> <td>0.70</td> <td>0.30</td> <td>0.19</td> <td>0.60</td> <td>0.25</td> <td>0.25</td> </tr> <tr> <td>YFF18PC/SC/PH</td> <td>1.00</td> <td>0.60</td> <td>0.40</td> <td>0.60</td> <td>0.40</td> <td>0.40</td> </tr> <tr> <td>YFF18PW</td> <td>1.20</td> <td>0.40</td> <td>0.80</td> <td>0.40</td> <td>0.40</td> <td>0.40</td> </tr> <tr> <td>YFF21</td> <td>1.40</td> <td>0.60</td> <td>0.50</td> <td>0.80</td> <td>0.60</td> <td>0.65</td> </tr> <tr> <td>YFF31</td> <td>2.50</td> <td>1.20</td> <td>1.40</td> <td>1.30</td> <td>0.80</td> <td>0.90</td> </tr> </tbody> </table> <p style="text-align: right;">(mm)</p>	Type	a	b	c	d	e	f	YFF15	0.70	0.30	0.19	0.60	0.25	0.25	YFF18PC/SC/PH	1.00	0.60	0.40	0.60	0.40	0.40	YFF18PW	1.20	0.40	0.80	0.40	0.40	0.40	YFF21	1.40	0.60	0.50	0.80	0.60	0.65	YFF31	2.50	1.20	1.40	1.30	0.80	0.90
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No.	Process	Condition		
3	Designing P.C.board	4) Recommended product layout is as following.		
		Disadvantage against bending stress	Advantage against bending stress	
Mounting face	<p data-bbox="724 405 928 432">Perforation or slit</p>  <p data-bbox="655 629 906 696">Break P.C.board with mounted side up.</p>		<p data-bbox="1145 405 1350 432">Perforation or slit</p>  <p data-bbox="1102 629 1353 696">Break P.C.board with mounted side down.</p>	
Chip arrangement (Direction)	<p data-bbox="619 741 911 808">Mount perpendicularly to perforation or slit</p> <p data-bbox="724 853 928 880">Perforation or slit</p> 		<p data-bbox="1066 741 1326 808">Mount in parallel with perforation or slit</p> <p data-bbox="1145 853 1350 880">Perforation or slit</p> 	
Distance from slit	<p data-bbox="612 1155 951 1189">Closer to slit is higher stress</p>  <p data-bbox="895 1525 1015 1559">$(l_1 < l_2)$</p>		<p data-bbox="1059 1155 1398 1189">Away from slit is less stress</p>  <p data-bbox="1278 1525 1398 1559">$(l_1 < l_2)$</p>	


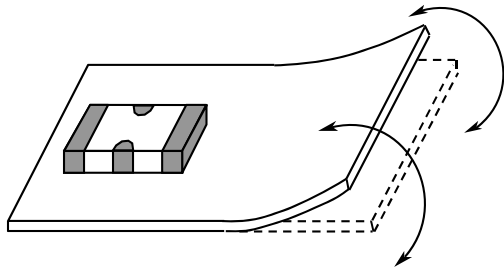
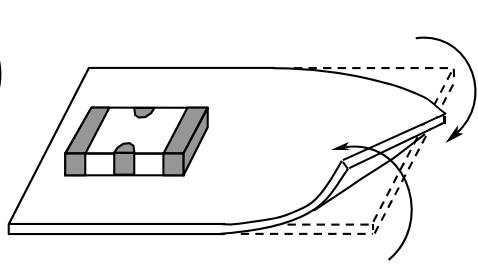
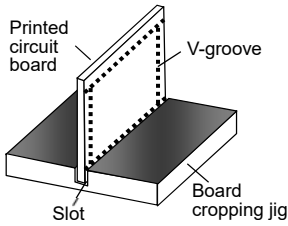
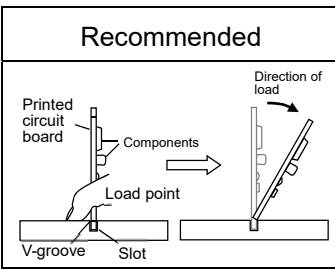
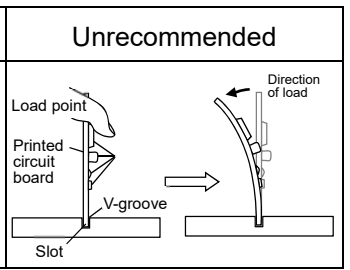
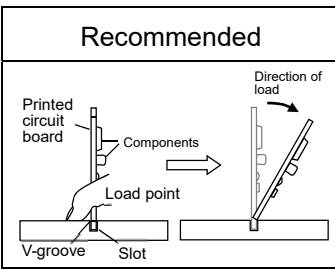
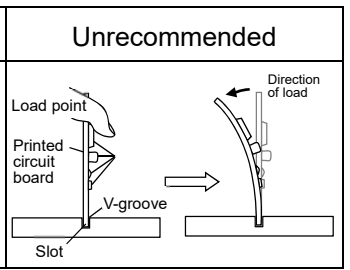
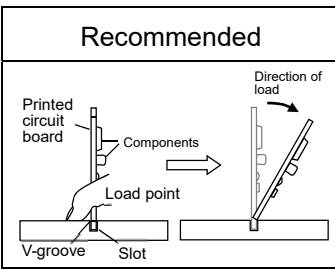
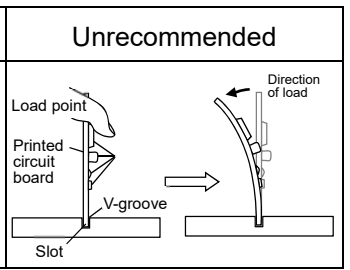
No.	Process	Condition									
3	Designing P.C.board	<p data-bbox="395 210 1329 241">5) Mechanical stress varies according to location of product on the P.C.board.</p> <div data-bbox="486 271 1329 828" style="text-align: center;"> </div> <p data-bbox="943 837 1485 898" style="text-align: right;">The stress in product is in the following order. A > B = C > D > E</p> <p data-bbox="395 927 738 958">6) Layout recommendation</p> <table border="1" data-bbox="395 972 1495 1883" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th data-bbox="395 972 611 1088">Example</th> <th data-bbox="611 972 1051 1088">Use of common solder land</th> <th data-bbox="1051 972 1495 1088">Soldering with chassis</th> </tr> </thead> <tbody> <tr> <td data-bbox="395 1088 611 1469" style="text-align: center; vertical-align: middle;">Need to avoid</td> <td data-bbox="611 1088 1051 1469" style="text-align: center;"> </td> <td data-bbox="1051 1088 1495 1469" style="text-align: center;"> </td> </tr> <tr> <td data-bbox="395 1469 611 1883" style="text-align: center; vertical-align: middle;">Recommendation</td> <td data-bbox="611 1469 1051 1883" style="text-align: center;"> </td> <td data-bbox="1051 1469 1495 1883" style="text-align: center;"> <p data-bbox="1310 1778 1390 1809" style="text-align: right;">$l_2 > l_1$</p> </td> </tr> </tbody> </table>	Example	Use of common solder land	Soldering with chassis	Need to avoid			Recommendation		<p data-bbox="1310 1778 1390 1809" style="text-align: right;">$l_2 > l_1$</p>
Example	Use of common solder land	Soldering with chassis									
Need to avoid											
Recommendation		<p data-bbox="1310 1778 1390 1809" style="text-align: right;">$l_2 > l_1$</p>									


No.	Process	Condition									
4	Mounting	<p>4-1. Stress from mounting head</p> <p>If the mounting head is adjusted too low, it may induce excessive stress in the product to result in cracking. Please take following precautions.</p> <ol style="list-style-type: none"> 1) Adjust the bottom dead center of the mounting head to reach on the P.C.board surface and not press it. 2) Adjust the mounting head pressure to be 1 to 3N of static weight. 3) To minimize the impact energy from mounting head, it is important to provide support from the bottom side of the P.C.board. <p>See following examples.</p> <table border="1" data-bbox="435 636 1401 1205"> <thead> <tr> <th data-bbox="435 636 632 685"></th> <th data-bbox="632 636 1027 685">Not recommended</th> <th data-bbox="1027 636 1401 685">Recommended</th> </tr> </thead> <tbody> <tr> <td data-bbox="435 685 632 943">Single-sided mounting</td> <td data-bbox="632 685 1027 943">  </td> <td data-bbox="1027 685 1401 943">  </td> </tr> <tr> <td data-bbox="435 943 632 1205">Double-sides mounting</td> <td data-bbox="632 943 1027 1205">  </td> <td data-bbox="1027 943 1401 1205">  </td> </tr> </tbody> </table> <p>When the centering jaw is worn out, it may give mechanical impact on the product to cause crack. Please control the close up dimension of the centering jaw and provide sufficient preventive maintenance and replacement of it.</p>		Not recommended	Recommended	Single-sided mounting			Double-sides mounting		
	Not recommended	Recommended									
Single-sided mounting											
Double-sides mounting											

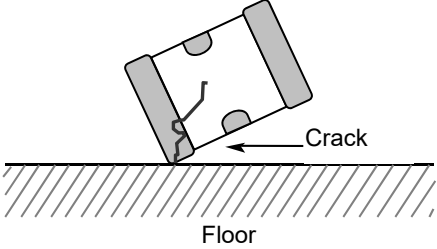
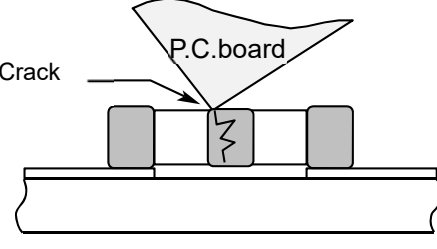
No.	Process	Condition														
5	Soldering	<p>5-1. Flux selection Flux can seriously affect the performance of capacitors. Confirm the following to select the appropriate flux.</p> <ol style="list-style-type: none"> 1) It is recommended to use a mildly activated rosin flux (less than 0.1wt% chlorine). Strong flux is not recommended. 2) Excessive flux must be avoided. Please provide proper amount of flux. 3) When water-soluble flux is used, enough washing is necessary. <p>5-2. Recommended soldering profile by various methods</p> <div style="text-align: center;"> <p>Reflow soldering</p>  <p>The graph shows a temperature profile for reflow soldering. The y-axis is 'Temp (°C)' with a 'Peak Temp' marker. The x-axis is time. The profile is divided into three phases: 'Preheating' (duration 'Over 60 sec.'), 'Soldering' (duration 'Peak Temp time'), and 'Natural cooling'. A shaded area under the preheating curve is labeled 'ΔT'. The cooling curve is shown as a dashed line.</p> </div> <div style="text-align: center; margin-top: 20px;"> <p>Manual soldering (Solder iron)</p>  <p>The graph shows a temperature profile for manual soldering. The y-axis is 'Temp (°C)' with markers at 0 and 300. The x-axis is time. The profile is divided into 'Preheating' and 'Soldering' phases. A shaded area under the preheating curve is labeled 'ΔT'. The soldering phase is marked with a duration of '3sec. (As short as possible)'. The cooling curve is shown as a dashed line.</p> </div> <p>5-3. Recommended soldering peak temp and peak temp duration</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2" style="text-align: center;">Temp./Duration</th> <th colspan="2" style="text-align: center;">Reflow soldering</th> </tr> <tr> <th style="text-align: center;">Peak temp(°C)</th> <th style="text-align: center;">Duration(sec.)</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Solder</td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">Sn-Pb Solder</td> <td style="text-align: center;">230 max.</td> <td style="text-align: center;">20 max.</td> </tr> <tr> <td style="text-align: center;">Lead Free Solder</td> <td style="text-align: center;">260 max.</td> <td style="text-align: center;">10 max.</td> </tr> </tbody> </table> <p>Recommended solder compositions Lead Free Solder : Sn-3.0Ag-0.5Cu Sn-Pb Solder : Sn-37Pb</p>	Temp./Duration	Reflow soldering		Peak temp(°C)	Duration(sec.)	Solder			Sn-Pb Solder	230 max.	20 max.	Lead Free Solder	260 max.	10 max.
Temp./Duration	Reflow soldering															
	Peak temp(°C)	Duration(sec.)														
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No.	Process	Condition														
5	Soldering	<p>5-4. Avoiding thermal shock</p> <p>1) Preheating condition</p> <table border="1" data-bbox="539 277 975 439"> <thead> <tr> <th data-bbox="539 277 767 327">Soldering</th> <th data-bbox="767 277 975 327">Temp. (°C)</th> </tr> </thead> <tbody> <tr> <td data-bbox="539 327 767 376">Reflow soldering</td> <td data-bbox="767 327 975 376">$\Delta T \leq 150$</td> </tr> <tr> <td data-bbox="539 376 767 439">Manual soldering</td> <td data-bbox="767 376 975 439">$\Delta T \leq 150$</td> </tr> </tbody> </table> <p>2) Cooling condition Natural cooling using air is recommended. If the product is dipped into a solvent for cleaning, the temperature difference (ΔT) must be less than 100°C.</p> <p>5-5. Amount of solder Excessive solder will induce higher tensile force in product when temperature changes and it may result in chip cracking. In sufficient solder may detach the product from the P.C.board.</p> <div style="display: flex; justify-content: space-between; align-items: flex-start;"> <div data-bbox="496 846 619 920" style="width: 25%;">Excessive solder</div> <div data-bbox="683 831 1094 943" style="width: 40%; text-align: center;">  </div> <div data-bbox="1118 846 1394 920" style="width: 25%;">Higher tensile force in product to cause crack</div> </div> <hr/> <div style="display: flex; justify-content: space-between; align-items: center;"> <div data-bbox="496 1016 619 1048" style="width: 25%;">Adequate</div> <div data-bbox="683 972 1278 1093" style="width: 40%; text-align: center;">  </div> </div> <hr/> <div style="display: flex; justify-content: space-between; align-items: flex-start;"> <div data-bbox="496 1151 628 1225" style="width: 25%;">Insufficient solder</div> <div data-bbox="683 1151 1094 1256" style="width: 40%; text-align: center;">  </div> <div data-bbox="1118 1128 1401 1247" style="width: 25%;">Low robustness may cause contact failure or product come off the P.C.board.</div> </div> <hr/> <p>5-6. Solder repair by solder iron</p> <p>1) Selection of the soldering iron tip Tip temperature of solder iron varies by its type, P.C.board material and solder land size. The higher the tip temperature, the quicker the operation. However, heat shock may cause a crack in the product. Please make sure the tip temp. before soldering and keep the peak temp and time in accordance with following recommended condition.</p> <p style="text-align: center;">Recommended solder iron condition (Sn-Pb Solder and Lead Free Solder)</p> <table border="1" data-bbox="539 1599 1374 1704"> <thead> <tr> <th data-bbox="539 1599 746 1653">Temp. (°C)</th> <th data-bbox="746 1599 954 1653">Duration (sec.)</th> <th data-bbox="954 1599 1161 1653">Wattage (W)</th> <th data-bbox="1161 1599 1374 1653">Shape (mm)</th> </tr> </thead> <tbody> <tr> <td data-bbox="539 1653 746 1704">300 max.</td> <td data-bbox="746 1653 954 1704">3 max.</td> <td data-bbox="954 1653 1161 1704">20 max.</td> <td data-bbox="1161 1653 1374 1704">Ø 3.0 max.</td> </tr> </tbody> </table> <p>* Please preheat the chip capacitors with the condition in 5-4 to avoid the thermal shock.</p> <p>2) Direct contact of the soldering iron with ceramic dielectric of products may cause crack. Do not touch the ceramic dielectric and the terminations by solder iron.</p>	Soldering	Temp. (°C)	Reflow soldering	$\Delta T \leq 150$	Manual soldering	$\Delta T \leq 150$	Temp. (°C)	Duration (sec.)	Wattage (W)	Shape (mm)	300 max.	3 max.	20 max.	Ø 3.0 max.
Soldering	Temp. (°C)															
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Temp. (°C)	Duration (sec.)	Wattage (W)	Shape (mm)													
300 max.	3 max.	20 max.	Ø 3.0 max.													

No.	Process	Condition
5	Soldering	<p>5-7. Sn-Zn solder Sn-Zn solder affects product reliability. Please contact TDK in advance when utilize Sn-Zn solder.</p> <p>5-8. Countermeasure for tombstone The misalignment between the mounted positions of the products and the land patterns should be minimized. The tombstone phenomenon may occur especially the products are mounted (in longitudinal direction) in the same direction of the reflow soldering. (Refer to JEITA RCR-2335C Annex A (Informative) Recommendations to prevent the tombstone phenomenon)</p>
6	Cleaning	<p>1) If an unsuitable cleaning fluid is used, flux residue or some foreign articles may stick to product surface to deteriorate especially the insulation resistance.</p> <p>2) If cleaning condition is not suitable, it may damage the product.</p> <p>2)-1. Insufficient washing (1) Terminal electrodes may corrode by Halogen in the flux. (2) Halogen in the flux may adhere on the surface of product, and lower the insulation resistance. (3) Water soluble flux has higher tendency to have above mentioned problems (1) and (2).</p> <p>2)-2. Excessive washing When ultrasonic cleaning is used, excessively high ultrasonic energy output can affect the connection between the ceramic product body and the terminal electrode. To avoid this, following is the recommended condition. Power : 20 W/l max. Frequency : 40 kHz max. Washing time : 5 minutes max.</p> <p>2)-3. If the cleaning fluid is contaminated, density of Halogen increases, and it may bring the same result as insufficient cleaning.</p>
7	Coating and molding of the P.C.board	<p>1) When the P.C.board is coated, please verify the quality influence on the product.</p> <p>2) Please verify carefully that there is no harmful decomposing or reaction gas emission during curing which may damage the product.</p> <p>3) Please verify the curing temperature.</p>

No.	Process	Condition				
8	Handling after product mounted  Caution	<p>1) Please pay attention not to bend or distort the P.C.board after soldering in handling otherwise the product may crack.</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p>Bend</p>  </div> <div style="text-align: center;"> <p>Twist</p>  </div> </div> <p>2) Printed circuit board cropping should not be carried out by hand, but by using the proper tooling. Printed circuit board cropping should be carried out using a board cropping jig as shown in the following figure or a board cropping apparatus to prevent inducing mechanical stress on the board.</p> <p>(1) Example of a board cropping jig</p> <p>Recommended example: The board should be pushed from the back side, close to the cropping jig so that the board is not bent and the stress applied to the product is compressive.</p> <p>Unrecommended example: If the pushing point is far from the cropping jig and the pushing direction is from the front side of the board, large tensile stress is applied to the product, which may cause cracks.</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p>Outline of jig</p>  </div> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%; text-align: center;">Recommended</th> <th style="width: 50%; text-align: center;">Unrecommended</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">  </td> <td style="text-align: center;">  </td> </tr> </tbody> </table> </div>	Recommended	Unrecommended		
Recommended	Unrecommended					
						

No.	Process	Condition																	
8	Handling after chip mounted  Caution	<p data-bbox="550 203 1037 237">(2) Example of a board cropping machine</p> <p data-bbox="587 241 1485 344">An outline of a printed circuit board cropping machine is shown below. The top and bottom blades are aligned with one another along the lines with the V-grooves on printed circuit board when cropping the board.</p> <p data-bbox="587 351 1485 454">Unrecommended example: Misalignment of blade position between top and bottom, right and left, or front and rear blades may cause a crack in the product.</p> <div data-bbox="566 504 1444 929"> <p>The diagrams illustrate the machine's components and operation. The 'Outline of machine' shows a top-down view of the board being processed. The 'Principle of operation' shows a side view with a 'Top blade' and 'Bottom blade' aligned with 'V-groove's on the 'Printed circuit board'. The 'Cross-section diagram' shows the blades meeting at the V-groove.</p> </div> <table border="1" data-bbox="667 981 1380 1411"> <thead> <tr> <th rowspan="2">Recommended</th> <th colspan="3">Unrecommended</th> </tr> <tr> <th>Top-bottom misalignment</th> <th>Left-right misalignment</th> <th>Front-rear misalignment</th> </tr> </thead> <tbody> <tr> <td> <p>Top blade</p> <p>Board</p> <p>Bottom blade</p> </td> <td> <p>Top blade</p> <p>Bottom blade</p> </td> <td> <p>Top blade</p> <p>Bottom blade</p> </td> <td> <p>Top blade</p> <p>Bottom blade</p> </td> </tr> </tbody> </table> <p data-bbox="499 1451 1485 1594">3) When functional check of the P.C. board is performed, check pin pressure tends to be adjusted higher for fear of loose contact. But if the pressure is excessive and bend the P.C. board, it may crack the product or peel the terminations off. Please adjust the check pins not to bend the P.C. board.</p> <table border="1" data-bbox="502 1653 1460 2011"> <thead> <tr> <th>Item</th> <th>Not recommended</th> <th>Recommended</th> </tr> </thead> <tbody> <tr> <td>Board bending</td> <td> <p>Termination peeling</p> <p>Check pin</p> </td> <td> <p>Support pin</p> <p>Check pin</p> </td> </tr> </tbody> </table>	Recommended	Unrecommended			Top-bottom misalignment	Left-right misalignment	Front-rear misalignment	<p>Top blade</p> <p>Board</p> <p>Bottom blade</p>	<p>Top blade</p> <p>Bottom blade</p>	<p>Top blade</p> <p>Bottom blade</p>	<p>Top blade</p> <p>Bottom blade</p>	Item	Not recommended	Recommended	Board bending	<p>Termination peeling</p> <p>Check pin</p>	<p>Support pin</p> <p>Check pin</p>
Recommended	Unrecommended																		
	Top-bottom misalignment	Left-right misalignment	Front-rear misalignment																
<p>Top blade</p> <p>Board</p> <p>Bottom blade</p>	<p>Top blade</p> <p>Bottom blade</p>	<p>Top blade</p> <p>Bottom blade</p>	<p>Top blade</p> <p>Bottom blade</p>																
Item	Not recommended	Recommended																	
Board bending	<p>Termination peeling</p> <p>Check pin</p>	<p>Support pin</p> <p>Check pin</p>																	

No.	Process	Condition
9	Handling of loose product	<p>1) If dropped the product may crack. Once dropped do not use it. Especially, the large case sized product are tendency to have cracks easily, so please handle with care.</p>  <p>2) Piling the P.C.board after mounting for storage or handling, the corner of the P.C. board may hit the product of another board to cause crack.</p> 
10	Caution during operation of equipment	<p>1) A product shall not be touched directly with bare hands during operation in order to avoid electric shock. Electric energy held by the product may be discharged through the human body when touched with a bare hand. Even when the equipment is off, a product may stay charged. The product should be handled after being completely discharged using a resistor.</p> <p>2) The terminals of a product shall not be short-circuited by any accidental contact with a conductive object. A product shall not be exposed to a conductive liquid such as an acid or alkali solution. A conductive object or liquid, such as acid and alkali, between the terminals may lead to the breakdown of a product due to short circuit</p> <p>3) Confirm that the environment to which the equipment will be exposed during transportation and operation meets the specified conditions. Do not to use the equipment in the following environments.</p> <ol style="list-style-type: none"> (1) Environment where a product is splattered with water or oil (2) Environment where a product is exposed to direct sunlight (3) Environment where a product is exposed to Ozone, ultraviolet rays or radiation (4) Environment where a product exposed to corrosive gas(e.g. hydrogen sulfide, sulfur dioxide, chlorine. ammonia gas etc.) (5) Environment where a product exposed to vibration or mechanical shock exceeding the specified limits. (6) Atmosphere change with causes condensation

No.	Process	Condition
11	Others  Caution	<p>The products listed on this specification sheet are intended for use in general electronic equipment (AV equipment, telecommunications equipment, home appliances, amusement equipment, computer equipment, personal equipment, office equipment, measurement equipment, industrial robots) under a normal operation and use condition.</p> <p>The products are not designed or warranted to meet the requirements of the applications listed below, whose performance and/or quality require a more stringent level of safety or reliability, or whose failure, malfunction or trouble could cause serious damage to society, person or property. Please understand that we are not responsible for any damage or liability caused by use of the products in any of the applications below or for any other use exceeding the range or conditions set forth in this specification sheet. If you intend to use the products in the applications listed below or if you have special requirements exceeding the range or conditions set forth in this specification, please contact us.</p> <ul style="list-style-type: none"> (1) Aerospace/Aviation equipment (2) Transportation equipment (cars, electric trains, ships, etc.) (3) Medical equipment (Excepting Pharmaceutical Affairs Law classification Class1, 2) (4) Power-generation control equipment (5) Atomic energy-related equipment (6) Seabed equipment (7) Transportation control equipment (8) Public information-processing equipment (9) Military equipment (10) Electric heating apparatus, burning equipment (11) Disaster prevention/crime prevention equipment (12) Safety equipment (13) Other applications that are not considered general-purpose applications <p>When designing your equipment even for general-purpose applications, you are kindly requested to take into consideration securing protection circuit/device or providing backup circuits in your equipment.</p>

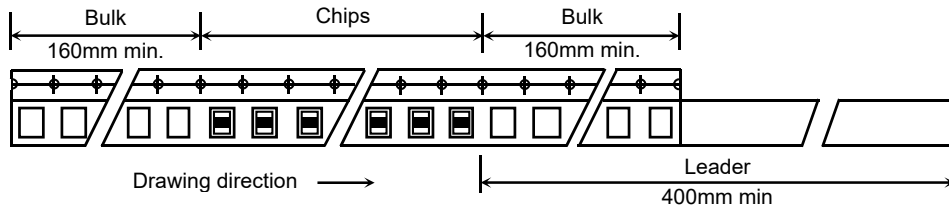
13. TAPE PACKAGING SPECIFICATION

1. CONSTRUCTION AND DIMENSION OF TAPING

1-1. Dimensions of carrier tape

Dimensions of paper tape shall be according to Appendix 2, 3.
Dimensions of plastic tape shall be according to Appendix 4.

1-2. Bulk part and leader of taping

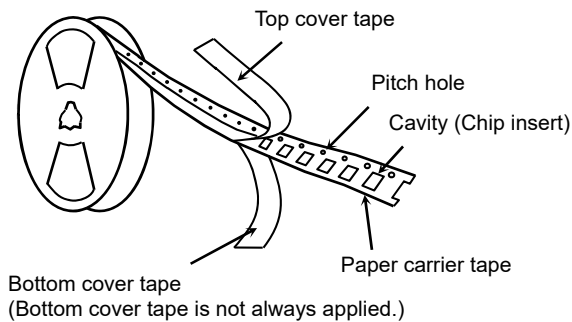


1-3. Dimensions of reel

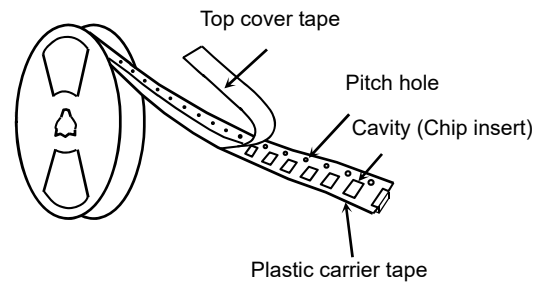
Dimensions of $\phi 178$ reel shall be according to Appendix 5.
Dimensions of $\phi 330$ reel shall be according to Appendix 6.

1-4. Structure of taping

<Paper>



<Plastic>



2. PRODUCT QUANTITY

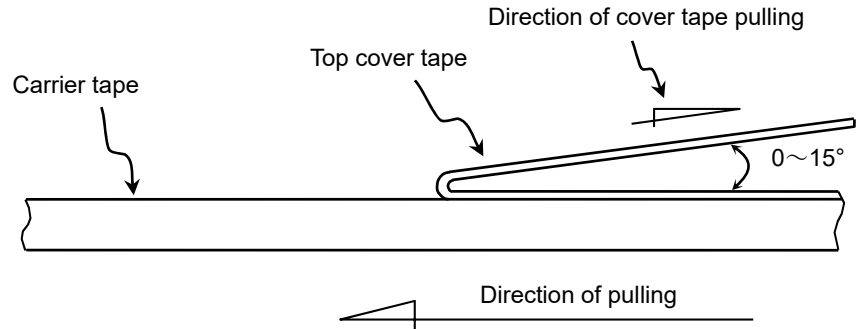
Please refer to the table A in the end of the specification.

3. PERFORMANCE SPECIFICATIONS

3-1. Fixing peeling strength (top tape)

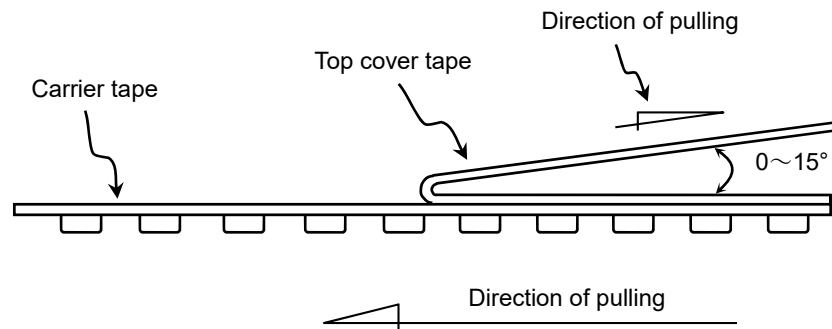
$$0.05\text{N} < \text{Peeling strength} < 0.7\text{N}$$

<Paper>



[Paper tape should not adhere to top cover tape when pull the cover tape.]

<Plastic>



3-2. Carrier tape shall be flexible enough to be wound around a minimum radius of 30mm with components in tape.

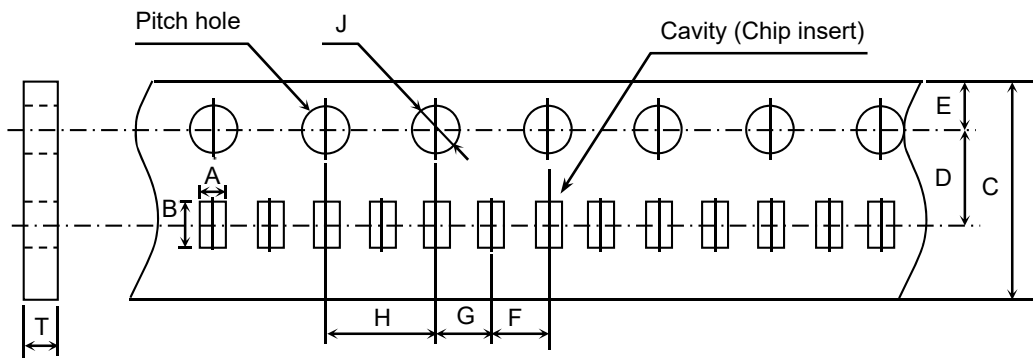
3-3. The missing of components shall be less than 0.1%

3-4. Components shall not stick to fixing tape.

3-5. When removing the cover tape, there shall not be difficulties by unfitting clearance gap, burrs and crushes of cavities. Also the sprocket holes shall not be covered by absorbing dust into the suction nozzle.

Appendix 2

Paper Tape



(Unit : mm)

Symbol Type	A	B	C	D	E	F
YFF15	(0.62) * (0.75)	(1.12) * (1.18)	8.00 ± 0.30	3.50 ± 0.05	1.75 ± 0.10	2.00 ± 0.05

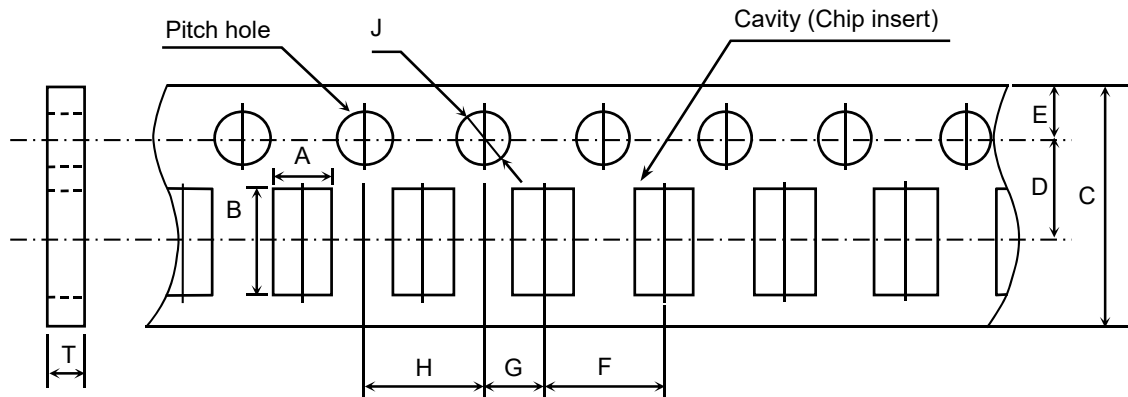
Symbol Type	G	H	J	T
YFF15	2.00 ± 0.05	4.00 ± 0.10	∅ 1.5 ^{+0.10} ₀	0.70 max.

() Reference value.

* Applied to YFF15PC0G435M.

Appendix 3

Paper Tape



(Unit : mm)

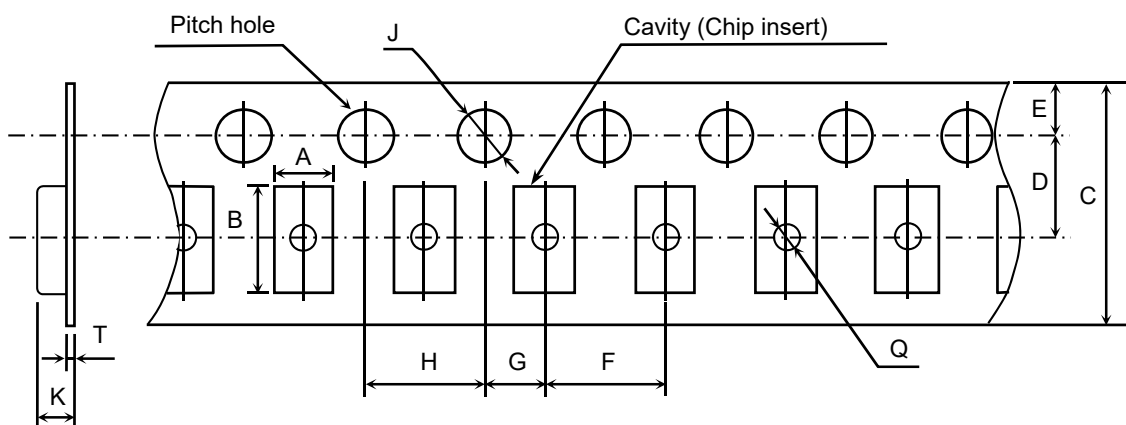
Symbol Type	A	B	C	D	E	F
YFF18	(1.10)	(1.90)	8.00 ± 0.30	3.50 ± 0.05	1.75 ± 0.10	4.00 ± 0.10
YFF21	(1.50)	(2.30)				

Symbol Type	G	H	J	T
YFF18	2.00 ± 0.05	4.00 ± 0.10	∅ 1.5 ^{+0.10} ₀	1.20 max.
YFF21				

() Reference value.

Appendix 4

Plastic Tape



(Unit : mm)

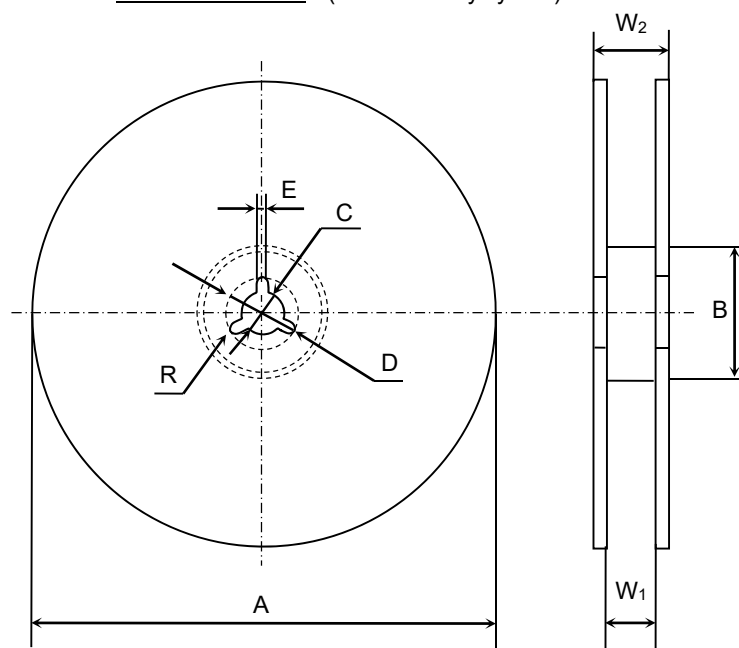
Symbol	A	B	C	D	E	F
Type						
YFF31	(1.90)	(3.50)	8.00±0.30	3.50±0.05	1.75±0.10	4.00±0.10

Symbol	G	H	J	K	T	Q
Type						
YFF31	2.00±0.05	4.00±0.10	$\phi 1.5 \begin{matrix} +0.10 \\ 0 \end{matrix}$	2.50 max.	0.30 max.	$\phi 0.50$ min.

() Reference value.

Appendix 5

Dimensions of reel (Material : Polystyrene)

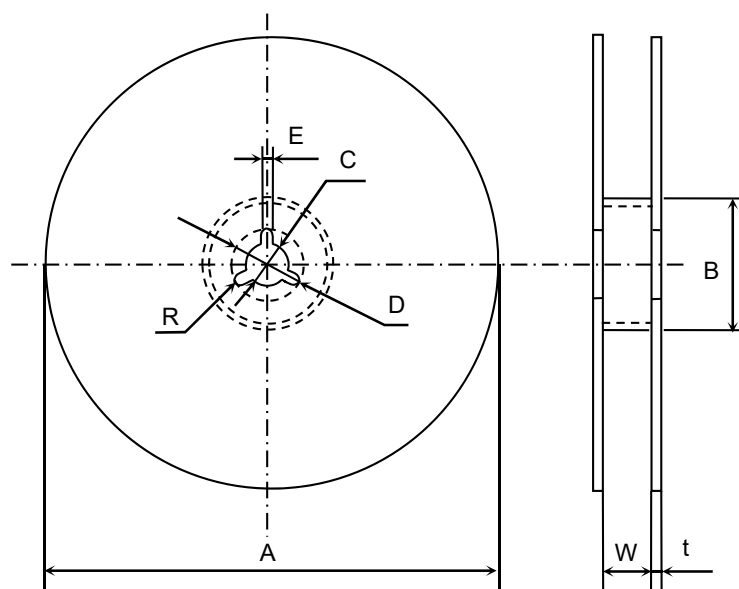


(Unit : mm)

Symbol	A	B	C	D	E	W ₁
Dimension	$\phi 178 \pm 2.0$	$\phi 60 \pm 2.0$	$\phi 13 \pm 0.5$	$\phi 21 \pm 0.8$	2.0 ± 0.5	9.0 ± 0.3
Symbol	W ₂	R				
Dimension	13.0 ± 1.4	1.0				

Appendix 6

Dimensions of reel (Material : Polystyrene)



(Unit : mm)

Symbol	A	B	C	D	E	W
Dimension	$\phi 382$ max. (Nominal $\phi 330$)	$\phi 50$ min.	$\phi 13 \pm 0.5$	$\phi 21 \pm 0.8$	2.0 ± 0.5	10.0 ± 1.5
Symbol	t	R				
Dimension	2.0 ± 0.5	1.0				

14.Table A (TDK products line up)

No	Your Part No.	TDK product	Dimensions			Operating Temp. Range (°C)	Reference Temp. (°C)	Rated Voltage (V)	Rated Current (A/°C)		Direct Current Resistance (mΩ)	Capacitance		Temp cycle ΔC/C	Moisture Resistance (Steady State) ΔC/C	Life			Tape packaging materials	Qty. per 1 reel (pcs.)	
			L (mm)	W (mm)	T (mm)				DC1A/125°C	-		Measuring frequency	Measuring voltage			ΔC/C	ΔC/C	ΔC/C		Test voltage (VV/°C)	Rated Current
1		YFF15SC1H220M	1.00 ± 0.05	0.55 ± 0.05	0.30 ± 0.05	-55~125	25	50	DC1A/125°C	-	300 max.	1kHz	1.0Vrms	±7.5%	±12.5%	±15%	R.V./125°C	DC1A	Paper	10,000	50,000
2		YFF15SC1H470M	1.00 ± 0.05	0.55 ± 0.05	0.30 ± 0.05	-55~125	25	50	DC1A/125°C	-	300 max.	1kHz	1.0Vrms	±7.5%	±12.5%	±15%	R.V./125°C	DC1A	Paper	10,000	50,000
3		YFF15SC1H101M	1.00 ± 0.05	0.55 ± 0.05	0.30 ± 0.05	-55~125	25	50	DC1A/125°C	-	300 max.	1kHz	1.0Vrms	±7.5%	±12.5%	±15%	R.V./125°C	DC1A	Paper	10,000	50,000
4		YFF15SC1H221M	1.00 ± 0.05	0.55 ± 0.05	0.30 ± 0.05	-55~125	25	50	DC1A/125°C	-	300 max.	1kHz	1.0Vrms	±7.5%	±12.5%	±15%	R.V./125°C	DC1A	Paper	10,000	50,000
5		YFF15SC1E471M	1.00 ± 0.05	0.55 ± 0.05	0.30 ± 0.05	-55~125	25	25	DC1A/125°C	-	300 max.	1kHz	1.0Vrms	±7.5%	±12.5%	±15%	R.V./125°C	DC1A	Paper	10,000	50,000
6		YFF15SC1E102M	1.00 ± 0.05	0.55 ± 0.05	0.30 ± 0.05	-55~125	25	25	DC1A/125°C	-	300 max.	1kHz	1.0Vrms	±7.5%	±12.5%	±15%	R.V./125°C	DC1A	Paper	10,000	50,000
7		YFF15SC1E222M	1.00 ± 0.05	0.55 ± 0.05	0.30 ± 0.05	-55~125	25	25	DC1A/125°C	-	300 max.	1kHz	1.0Vrms	±7.5%	±12.5%	±15%	R.V./125°C	DC1A	Paper	10,000	50,000
8		YFF15SC1E472M	1.00 ± 0.05	0.55 ± 0.05	0.30 ± 0.05	-55~125	25	25	DC1A/125°C	-	300 max.	1kHz	1.0Vrms	±7.5%	±12.5%	±15%	R.V./125°C	DC1A	Paper	10,000	50,000
9		YFF15SC1E103M	1.00 ± 0.05	0.55 ± 0.05	0.30 ± 0.05	-55~125	25	25	DC1A/125°C	-	80 max.	1kHz	1.0Vrms	±7.5%	±12.5%	±15%	R.V./125°C	DC1A	Paper	10,000	50,000
10		YFF15SC1C223M	1.00 ± 0.05	0.55 ± 0.05	0.30 ± 0.05	-55~125	25	16	DC1A/125°C	-	50 max.	1kHz	1.0Vrms	±7.5%	±12.5%	±15%	R.V./125°C	DC1A	Paper	10,000	50,000
11		YFF15SC1C473M	1.00 ± 0.05	0.55 ± 0.05	0.30 ± 0.05	-55~125	25	16	DC1A/125°C	-	50 max.	1kHz	1.0Vrms	±7.5%	±12.5%	±15%	R.V./125°C	DC1A	Paper	10,000	50,000
12		YFF15PC1C104M	1.00 ± 0.05	0.55 ± 0.05	0.30 ± 0.05	-55~105	25	16	DC3A/85°C	DC2A/105°C	30 max.	1kHz	1.0Vrms	±7.5%	±12.5%	±15%	R.V./85°C	DC3A	Paper	10,000	50,000
13		YFF15PC1A224M	1.00 ± 0.05	0.55 ± 0.05	0.30 ± 0.05	-55~105	25	10	DC3A/85°C	DC2A/105°C	30 max.	1kHz	1.0Vrms	±7.5%	±12.5%	±15%	R.V./85°C	DC3A	Paper	10,000	50,000
14		YFF15PC0J474M	1.00 ± 0.05	0.55 ± 0.05	0.30 ± 0.05	-55~105	25	6.3	DC3A/85°C	DC2A/105°C	30 max.	1kHz	0.5Vrms	±7.5%	±12.5%	±15%	R.V./85°C	DC3A	Paper	10,000	50,000
15		YFF15PC0J105M	1.00 ± 0.05	0.55 ± 0.05	0.30 ± 0.05	-55~105	25	6.3	DC3A/85°C	DC2A/105°C	12 max.	1kHz	0.5Vrms	±7.5%	±12.5%	±15%	R.V./85°C	DC3A	Paper	10,000	50,000
16		YFF15PC0G105M	1.00 ± 0.05	0.55 ± 0.05	0.30 ± 0.05	-55~105	25	4	DC3A/85°C	DC2A/105°C	12 max.	1kHz	0.5Vrms	±7.5%	±12.5%	±15%	R.V./85°C	DC3A	Paper	10,000	50,000
16		YFF15PC0G435M	1.05 ± 0.05	0.65 ± 0.05	0.45 ± 0.05	-55~85	25	4	DC2A/85°C	-	12 max.	1kHz	0.5Vrms	±12.5%	±25%	±25%	R.V./85°C	DC2A	Paper	10,000	50,000
17		YFF18SC1H220M	1.60 ± 0.10	0.80 ± 0.10	0.60 ± 0.10	-55~125	25	50	DC1A/125°C	-	300 max.	1kHz	1.0Vrms	±7.5%	±12.5%	±15%	R.V./125°C	DC1A	Paper	4,000	10,000
18		YFF18SC1H470M	1.60 ± 0.10	0.80 ± 0.10	0.60 ± 0.10	-55~125	25	50	DC1A/125°C	-	300 max.	1kHz	1.0Vrms	±7.5%	±12.5%	±15%	R.V./125°C	DC1A	Paper	4,000	10,000
19		YFF18SC1H101M	1.60 ± 0.10	0.80 ± 0.10	0.60 ± 0.10	-55~125	25	50	DC1A/125°C	-	300 max.	1kHz	1.0Vrms	±7.5%	±12.5%	±15%	R.V./125°C	DC1A	Paper	4,000	10,000
20		YFF18SC1H221M	1.60 ± 0.10	0.80 ± 0.10	0.60 ± 0.10	-55~125	25	50	DC1A/125°C	-	300 max.	1kHz	1.0Vrms	±7.5%	±12.5%	±15%	R.V./125°C	DC1A	Paper	4,000	10,000
21		YFF18SC1H471M	1.60 ± 0.10	0.80 ± 0.10	0.60 ± 0.10	-55~125	25	50	DC1A/125°C	-	300 max.	1kHz	1.0Vrms	±7.5%	±12.5%	±15%	R.V./125°C	DC1A	Paper	4,000	10,000
22		YFF18SC1H102M	1.60 ± 0.10	0.80 ± 0.10	0.60 ± 0.10	-55~125	25	50	DC1A/125°C	-	300 max.	1kHz	1.0Vrms	±7.5%	±12.5%	±15%	R.V./125°C	DC1A	Paper	4,000	10,000
23		YFF18SC1H222M	1.60 ± 0.10	0.80 ± 0.10	0.60 ± 0.10	-55~125	25	50	DC1A/125°C	-	300 max.	1kHz	1.0Vrms	±7.5%	±12.5%	±15%	R.V./125°C	DC1A	Paper	4,000	10,000
24		YFF18SC1H472M	1.60 ± 0.10	0.80 ± 0.10	0.60 ± 0.10	-55~125	25	50	DC1A/125°C	-	300 max.	1kHz	1.0Vrms	±7.5%	±12.5%	±15%	R.V./125°C	DC1A	Paper	4,000	10,000
25		YFF18SC1H103M	1.60 ± 0.10	0.80 ± 0.10	0.60 ± 0.10	-55~125	25	50	DC1A/125°C	-	80 max.	1kHz	1.0Vrms	±7.5%	±12.5%	±15%	R.V./125°C	DC1A	Paper	4,000	10,000
26		YFF18SC1H223M	1.60 ± 0.10	0.80 ± 0.10	0.60 ± 0.10	-55~125	25	50	DC1A/125°C	-	50 max.	1kHz	1.0Vrms	±7.5%	±12.5%	±15%	R.V./125°C	DC1A	Paper	4,000	10,000
27		YFF18PC1C104M	1.60 ± 0.20	0.80 ± 0.10	0.60 ± 0.10	-55~125	25	16	DC4A/85°C	DC2A/125°C	30 max.	1kHz	1.0Vrms	±7.5%	±12.5%	±15%	R.V./85°C	DC4A	Paper	4,000	10,000
28		YFF18PC0J224M	1.60 ± 0.20	0.80 ± 0.10	0.60 ± 0.10	-55~125	25	6.3	DC4A/85°C	DC2A/125°C	30 max.	1kHz	0.5Vrms	±7.5%	±12.5%	±15%	R.V./85°C	DC4A	Paper	4,000	10,000
29		YFF18PC0J474M	1.60 ± 0.20	0.80 ± 0.10	0.60 ± 0.10	-55~125	25	6.3	DC4A/85°C	DC2A/125°C	30 max.	1kHz	0.5Vrms	±7.5%	±12.5%	±15%	R.V./85°C	DC4A	Paper	4,000	10,000
30		YFF18PC0J105M	1.60 ± 0.20	0.80 ± 0.10	0.60 ± 0.10	-55~105	25	6.3	DC4A/85°C	DC2A/105°C	12 max.	1kHz	0.5Vrms	±7.5%	±12.5%	±15%	R.V./85°C	DC4A	Paper	4,000	10,000
31		YFF18PC0J475M	1.60 ± 0.20	0.80 ± 0.10	0.60 ± 0.10	-55~85	25	6.3	DC4A/85°C	-	12 max.	1kHz	0.5Vrms	±7.5%	±12.5%	±15%	R.V./85°C	DC4A	Paper	4,000	10,000
32		YFF18PH0J105M	1.60 ± 0.20	0.80 ± 0.10	0.80 ± 0.10	-55~105	25	6.3	DC4A/85°C	DC2A/105°C	12 max.	1kHz	0.5Vrms	±7.5%	±12.5%	±15%	R.V./85°C	DC4A	Paper	4,000	10,000
33		YFF18PH0J225M	1.60 ± 0.20	0.80 ± 0.10	0.80 ± 0.10	-55~85	25	6.3	DC4A/85°C	-	12 max.	1kHz	0.5Vrms	±7.5%	±12.5%	±15%	R.V./85°C	DC4A	Paper	4,000	10,000
34		YFF18PW0J474M	1.60 ± 0.10	0.80 ± 0.10	0.60 ± 0.10	-55~125	25	6.3	DC4A/85°C	DC2A/125°C	30 max.	1kHz	0.5Vrms	±7.5%	±12.5%	±15%	R.V./85°C	DC4A	Paper	4,000	10,000
35		YFF18PW0J105M	1.60 ± 0.10	0.80 ± 0.10	0.60 ± 0.10	-55~105	25	6.3	DC4A/85°C	DC2A/105°C	30 max.	1kHz	0.5Vrms	±7.5%	±12.5%	±15%	R.V./85°C	DC4A	Paper	4,000	10,000
36		YFF18PW0J475M	1.60 ± 0.10	0.80 ± 0.10	0.60 ± 0.10	-55~85	25	6.3	DC4A/85°C	-	12 max.	1kHz	0.5Vrms	±7.5%	±12.5%	±15%	R.V./85°C	DC4A	Paper	4,000	10,000

14.Table A (TDK products line up)

No	Your Part No.	TDK product	Dimensions			Operating Temp. Range (°C)	Reference Temp. (°C)	Rated Voltage (V)	Rated Current (A/°C)		Direct Current Resistance (mΩ)	Capacitance		Temp cycle ΔC/C	Moisture Resistance (Steady State) ΔC/C	Life			Tape packaging materials	Qty. per 1 reel (pcs.)	
			L (mm)	W (mm)	T (mm)							Measuring frequency	Measuring voltage			ΔC/C	Test voltage (VV/°C)	Rated Current		φ 178mm	φ 330mm
37		YFF21PC1C474M	2.00 ± 0.20	1.25 ± 0.20	0.85 ± 0.15	-55~125	25	16	DC2A/125°C	-	30 max.	1kHz	1.0Vrms	±7.5%	±12.5%	±15%	R.V./125°C	DC2A	Paper	4,000	10,000
38		YFF21PC1A105M	2.00 ± 0.20	1.25 ± 0.20	0.85 ± 0.15	-55~ 85	25	10	DC4A/85°C	-	12 max.	1kHz	1.0Vrms	±7.5%	±12.5%	±15%	R.V./85°C	DC4A	Paper	4,000	10,000
39		YFF21PC0J226M	2.00 ± 0.20	1.25 ± 0.20	0.85 ± 0.15	-55~ 85	25	6.3	DC4A/85°C	-	5 max.	120Hz	0.5Vrms	±12.5%	±25%	±25%	R.V./85°C	DC4A	Paper	4,000	10,000
40		YFF31HC2A103M	3.20 ± 0.20	1.60 ± 0.20	1.30 ± 0.20	-55~105	25	100	DC10A/105°C	DC6A/125°C	1.5 max.	1kHz	1.0Vrms	±7.5%	±12.5%	±15%	R.V./105°C	DC10A	Plastic	2,000	10,000
41		YFF31HC2A104M	3.20 ± 0.20	1.60 ± 0.20	1.30 ± 0.20	-55~105	25	100	DC10A/105°C	DC6A/125°C	1.5 max.	1kHz	1.0Vrms	±7.5%	±12.5%	±15%	R.V./105°C	DC10A	Plastic	2,000	10,000
42		YFF31HC2A105M	3.20 ± 0.20	1.60 ± 0.20	1.30 ± 0.20	-55~105	25	100	DC6A/105°C	DC4A/125°C	5 max.	1kHz	1.0Vrms	±7.5%	±12.5%	±15%	R.V./105°C	DC6A	Plastic	2,000	10,000
43		YFF31HC1H153M	3.20 ± 0.20	1.60 ± 0.20	1.30 ± 0.20	-55~105	25	50	DC10A/105°C	DC6A/125°C	1.5 max.	1kHz	1.0Vrms	±7.5%	±12.5%	±15%	R.V./105°C	DC10A	Plastic	2,000	10,000
44		YFF31PC1C224M	3.20 ± 0.20	1.60 ± 0.20	1.30 ± 0.20	-55~125	25	16	DC2A/125°C	-	40 max.	1kHz	1.0Vrms	±7.5%	±12.5%	±15%	R.V./125°C	DC2A	Plastic	2,000	10,000
45		YFF31PC1C474M	3.20 ± 0.20	1.60 ± 0.20	1.30 ± 0.20	-55~125	25	16	DC2A/125°C	-	40 max.	1kHz	1.0Vrms	±7.5%	±12.5%	±15%	R.V./125°C	DC2A	Plastic	2,000	10,000
46		YFF31PC1C105M	3.20 ± 0.20	1.60 ± 0.20	1.30 ± 0.20	-55~125	25	16	DC2A/125°C	-	40 max.	1kHz	1.0Vrms	±7.5%	±12.5%	±15%	R.V./125°C	DC2A	Plastic	2,000	10,000