

**Prosperity Dielectrics Co., Ltd.**

No.566-1, Kaoshi Rd., Yangmei, Taoyuan 32668, Taiwan (R.O.C.)

Tel : 886-3-4753355

Fax : 886-3-4854959

**Messrs. :** 一般共用

**Date :** 2021/06/11

# APPROVAL SHEET

**Product Name :** High Voltage Multilayer Ceramic Chip Capacitors

**Part No. :** FV Series

**Description :** Size 0805~2225, C0G/X7R, 1000V~4000V

| PREPARED BY | APPROVED BY |
|-------------|-------------|
|             |             |

信昌電子陶瓷股份有限公司

PROSPERITY DIELECTRICS CO., LTD.

桃園市楊梅區高獅路 566-1 號 <http://www.pdc.com.tw>

**Tel : 03-4753355 ext :**

**Fax : 03-4854959**

**Contactor :** \_\_\_\_\_ **Mobile :** \_\_\_\_\_

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# SPECIFICATION

## FOR

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**SPEC. No. : FV-000-001-22**

**DATE : 2021/06/11**

| DRAWN BY          | CHECEKED BY       | APPROVED BY        |
|-------------------|-------------------|--------------------|
| <i>Jane Hsiao</i> | <i>Yvens Chou</i> | <i>Joseph Ling</i> |

## 1. INTRODUCTION

PDC FV Series green type capacitors are manufactured by using environmental friendly material without lead or cadmium. These capacitors feature series connection of multi-layer capacitor units in a MLCC to realize high voltage performance. This special design can distribute voltage gradients throughout the entire capacitor, so as to prevent short circuit failure. It is a safety design for LCD back-lighting inverter application.

## 2. FEATURES

- Special interior design offers high voltage rating in a given case size.
- High reliability and stability.
- RoHS & HALOGEN compliant.

## 3. APPLICATIONS

- DC to DC converter.
- High voltage coupling/DC blocking.
- Back-lighting inverters.
- LAN/WLAN interface.
- Modem.
- Power supplies.

## 4. HOW TO ORDER

| <b>FV</b>  | <b>31</b> | <b>X</b>   | <b>103</b>  | <b>K</b>  | <b>102</b>    | <b>E</b>  | <b>E</b>  | <b>G</b>     |
|------------|-----------|------------|-------------|-----------|---------------|-----------|-----------|--------------|
| PDC Family | Size      | Dielectric | Capacitance | Tolerance | Rated Voltage | Packaging | Thickness | Control Code |
| Table 1    | Table 2   | Table 3    | Table 4     | Table 5   | Table 6       | Table 7   | Table 8   | Table 9      |

| Table 1 | PDC Family                                        |
|---------|---------------------------------------------------|
| Code    | Description                                       |
| FV      | High voltage application with $\geq 1\text{KVdc}$ |

| Table 2 |             | Size |             |      |             |
|---------|-------------|------|-------------|------|-------------|
| Code    | Description | Code | Description | Code | Description |
| 15      | 0402 (1005) | 32   | 1210 (3225) | 52   | 2211 (5728) |
| 18      | 0603 (1608) | 42   | 1808 (4520) | 55   | 2220 (5750) |
| 21      | 0805 (2012) | 43   | 1812 (4532) | 56   | 2225 (5763) |
| 31      | 1206 (3216) | 46   | 1825 (4563) |      |             |

| Table 3 |             | Dielectric Material Characteristics |             |
|---------|-------------|-------------------------------------|-------------|
| Code    | Description | Code                                | Description |
| N       | C0G         | X                                   | X7R         |
|         |             |                                     |             |

| Table 4 |                              | Capacitance Rule Code |                                |
|---------|------------------------------|-----------------------|--------------------------------|
| Code    | Description                  | Code                  | Description                    |
| R47     | 0.47pF                       | 102                   | 102=10x10 <sup>2</sup> =1000pF |
| 0R5     | 0.5pF                        | 104                   | 104=10x10 <sup>4</sup> =100nF  |
| 100     | 100=10x10 <sup>0</sup> =10pF | 106                   | 106=10x10 <sup>6</sup> =10μF   |

| Table 5 |             | Tolerance |             |      |             |
|---------|-------------|-----------|-------------|------|-------------|
| Code    | Description | Code      | Description | Code | Description |
| A       | ±0.05 pF    | J         | ±5 %        |      |             |
| B       | ±0.10 pF    | K         | ±10 %       |      |             |
| C       | ±0.25 pF    | L         | 0% ~ +10%   |      |             |
| D       | ±0.50 pF    | M         | ±20 %       |      |             |
| F       | ±1 %        | N         | -5% ~ +10%  |      |             |
| G       | ±2 %        | P         | ±0.02 pF    |      |             |
| H       | ±3 %        | Q         | ±0.03 pF    |      |             |
| I       | -10% ~ 0%   | Z         | -20% ~ +80% |      |             |

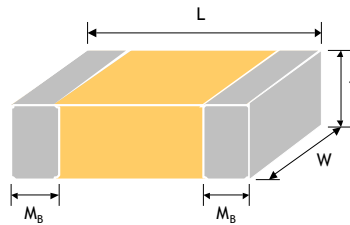
| Table 6 | Rated Voltage |      |             |      |             |
|---------|---------------|------|-------------|------|-------------|
| Code    | Description   | Code | Description | Code | Description |
| 102     | 1000Vdc       | 252  | 2500Vdc     | 502  | 5000Vdc     |
| 152     | 1500Vdc       | 302  | 3000Vdc     | 602  | 6000Vdc     |
| 202     | 2000Vdc       | 402  | 4000Vdc     |      |             |
|         |               |      |             |      |             |
|         |               |      |             |      |             |
|         |               |      |             |      |             |

| Table 7 |                                  | Packaging Type |                               |
|---------|----------------------------------|----------------|-------------------------------|
| Code    | Description                      | Code           | Description                   |
| B       | Bulk                             | T              | Tray package                  |
| E       | Tape and 7" Reel, Embossed Tape  | P              | Tape and 7" Reel, Paper Tape  |
| K       | Tape and 10" Reel, Embossed Tape | D              | Tape and 10" Reel, Paper Tape |
| L       | Tape and 13" Reel, Embossed Tape | G              | Tape and 13" Reel, Paper Tape |

| Table 8 | Thickness Description |      |                   |      |                     |
|---------|-----------------------|------|-------------------|------|---------------------|
| Code    | Description           | Code | Description       | Code | Description         |
| A       | 0.60 ± 0.10 mm        | I    | 1.25 ± 0.20 mm    | Q    | 0.50 +0.02/-0.05 mm |
| B       | 0.8+0.15/-0.10 mm     | J    | 1.15 ± 0.15 mm    | R    | 3.10 ± 0.30 mm      |
| C       | 1.25 ± 0.10 mm        | K    | 0.50 ± 0.20 mm    | S    | 0.80 ± 0.07 mm      |
| D       | 1.40 ± 0.15 mm        | L    | 0.30 ± 0.03 mm    | T    | 0.85 ± 0.10 mm      |
| E       | 1.60 ± 0.20 mm        | M    | 0.95 ± 0.10 mm    | U    | 0.50 ± 0.10 mm      |
| F       | 2.00 ± 0.20 mm        | N    | 0.50 ± 0.05 mm    | V    | 0.20 ± 0.02 mm      |
| G       | 2.50 ± 0.30 mm        | O    | 3.50 ± 0.20 mm    | X    | 0.80 ± 0.10 mm      |
| H       | 2.80 ± 0.30 mm        | P    | 1.60+0.3/-0.10 mm | Z    | 0.25 ± 0.03 mm      |

| Table 9 | Special Control Code             |
|---------|----------------------------------|
| Code    | Description                      |
| G       | RoHS compliant                   |
| Q       | Surface Coating (Size 1206~2225) |

## 5. EXTERNAL DIMENSIONS

| Size Inch<br>(mm) | L<br>(mm)        | W<br>(mm)                    | Code / T<br>(mm)                    | M <sub>B</sub><br>(mm) |  |
|-------------------|------------------|------------------------------|-------------------------------------|------------------------|-------------------------------------------------------------------------------------|
| 0805(2012)        | 2.10±0.20        | 1.25±0.20                    | See<br>No.4<br>Reference<br>Table 8 | 0.50±0.20              |                                                                                     |
| 1206(3216)        | 3.30±0.30        | 1.60±0.20<br>1.60 +0.3/-0.1* |                                     | 0.60±0.20              |                                                                                     |
| 1210(3225)        | 3.30±0.40        | 2.50±0.30                    |                                     | 0.75±0.35              |                                                                                     |
| 1808(4520)        | 4.50 +0.50/-0.30 | 2.00±0.25                    |                                     | 0.75±0.35              |                                                                                     |
| 1812(4532)        | 4.50 +0.50/-0.30 | 3.20±0.40                    |                                     | 0.75±0.35              |                                                                                     |
| 1825(4563)        | 4.50 +0.50/-0.30 | 6.30±0.40                    |                                     | 0.75±0.35              |                                                                                     |
| 2211(5728)        | 5.70±0.40        | 2.80±0.30                    |                                     | 0.85±0.35              |                                                                                     |
| 2220(5750)        | 5.70±0.40        | 5.00±0.40                    |                                     | 0.85±0.35              |                                                                                     |
| 2225(5763)        | 5.70±0.40        | 6.30±0.40                    |                                     | 0.85±0.35              |                                                                                     |
|                   |                  |                              |                                     |                        | Fig. 5.1 The outline of MLCC                                                        |

\* for 1206 P thickness products.

## 6. GENERAL ELECTRICAL DATA

|                                    |                                                                                                                                                                                                |                         |                                                                                                                                                        |                |             |                         |             |                         |                                                      |  |
|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-------------|-------------------------|-------------|-------------------------|------------------------------------------------------|--|
| Dielectric                         | C0G                                                                                                                                                                                            |                         | X7R                                                                                                                                                    |                |             |                         |             |                         |                                                      |  |
| Size                               | 0805, 1206, 1210, 1808, 1812, 1825, 2220, 2225                                                                                                                                                 |                         | 0805, 1206, 1210, 1808, 1812, 1825, 2211, 2220, 2225                                                                                                   |                |             |                         |             |                         |                                                      |  |
| Rated voltage (WVDC)               | 1000V, 1500V, 2000V, 3000V, 4000V                                                                                                                                                              |                         | 1000V, 1500V, 2000V, 3000V, 4000V                                                                                                                      |                |             |                         |             |                         |                                                      |  |
| Capacitance range                  | 1.5pF ~ 10nF                                                                                                                                                                                   |                         | 100pF ~ 220nF                                                                                                                                          |                |             |                         |             |                         |                                                      |  |
| Capacitance tolerance              | Reference to Table 5                                                                                                                                                                           |                         | Reference to Table 5                                                                                                                                   |                |             |                         |             |                         |                                                      |  |
| Tan δ                              | <table><tr><td>Cap. Rang</td><td>Q Spec.</td></tr><tr><td>Cap.&lt;30pF</td><td>Q≥400+20C</td></tr><tr><td>Cap.≥30pF</td><td>Q≥1000</td></tr></table>                                           |                         | Cap. Rang                                                                                                                                              | Q Spec.        | Cap.<30pF   | Q≥400+20C               | Cap.≥30pF   | Q≥1000                  | ≤2.5%                                                |  |
|                                    | Cap. Rang                                                                                                                                                                                      | Q Spec.                 |                                                                                                                                                        |                |             |                         |             |                         |                                                      |  |
|                                    | Cap.<30pF                                                                                                                                                                                      | Q≥400+20C               |                                                                                                                                                        |                |             |                         |             |                         |                                                      |  |
|                                    | Cap.≥30pF                                                                                                                                                                                      | Q≥1000                  |                                                                                                                                                        |                |             |                         |             |                         |                                                      |  |
|                                    |                                                                                                                                                                                                |                         |                                                                                                                                                        |                |             |                         |             |                         |                                                      |  |
|                                    |                                                                                                                                                                                                |                         |                                                                                                                                                        |                |             |                         |             |                         |                                                      |  |
|                                    |                                                                                                                                                                                                |                         |                                                                                                                                                        |                |             |                         |             |                         |                                                      |  |
| Capacitance & Tan δ Test condition | Measured at the condition of 30~70% related humidity                                                                                                                                           |                         |                                                                                                                                                        |                |             |                         |             |                         |                                                      |  |
|                                    | For 25°C at ambient temperature                                                                                                                                                                |                         | Preconditioning for Class II MLCC : Perform a heat treatment at 150±10°C for 1 hour, then leave in ambient condition for 24±2 hours before measurement |                |             |                         |             |                         |                                                      |  |
|                                    | <table><tr><td>Cap. Rang</td><td>Test Condition</td></tr><tr><td>Cap.≤1000pF</td><td>1.0±0.2Vrms, 1.0MHz±10%</td></tr><tr><td>Cap.&gt;1000pF</td><td>1.0±0.2Vrms, 1.0KHz±10%</td></tr></table> |                         | Cap. Rang                                                                                                                                              | Test Condition | Cap.≤1000pF | 1.0±0.2Vrms, 1.0MHz±10% | Cap.>1000pF | 1.0±0.2Vrms, 1.0KHz±10% | 1.0±0.2Vrms, 1.0KHz±10%, at 25°C ambient temperature |  |
|                                    | Cap. Rang                                                                                                                                                                                      | Test Condition          |                                                                                                                                                        |                |             |                         |             |                         |                                                      |  |
|                                    | Cap.≤1000pF                                                                                                                                                                                    | 1.0±0.2Vrms, 1.0MHz±10% |                                                                                                                                                        |                |             |                         |             |                         |                                                      |  |
| Cap.>1000pF                        | 1.0±0.2Vrms, 1.0KHz±10%                                                                                                                                                                        |                         |                                                                                                                                                        |                |             |                         |             |                         |                                                      |  |
|                                    |                                                                                                                                                                                                |                         |                                                                                                                                                        |                |             |                         |             |                         |                                                      |  |
|                                    |                                                                                                                                                                                                |                         |                                                                                                                                                        |                |             |                         |             |                         |                                                      |  |
| Insulation resistance at Ur        | ≥10GΩ or RxC≥500Ω-F, whichever is smaller                                                                                                                                                      |                         | ≥10GΩ or RxC≥100Ω-F, whichever is smaller                                                                                                              |                |             |                         |             |                         |                                                      |  |
| Operating temperature              | -55°C to +125°C                                                                                                                                                                                |                         |                                                                                                                                                        |                |             |                         |             |                         |                                                      |  |
| Capacitance characteristic         | ±30ppm/°C                                                                                                                                                                                      |                         | ±15%                                                                                                                                                   |                |             |                         |             |                         |                                                      |  |
| Termination                        | Cu or Ag/Ni/Sn or Au (lead-free termination)                                                                                                                                                   |                         |                                                                                                                                                        |                |             |                         |             |                         |                                                      |  |



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## 7. CAPACITANCE RANGE

### 7-1. C0G

| Dimension |      | 0805  | 1206  |       |       |       | 1210  |       |       |       |
|-----------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Cap.(pF)  | Code | 1000V | 1000V | 1500V | 2000V | 3000V | 1000V | 1500V | 2000V | 3000V |
| 1.5       | 1R5  | C     | X     | X     | X     |       |       |       |       |       |
| 1.8       | 1R8  | C     | X     | X     | X     |       |       |       |       |       |
| 2.2       | 2R2  | C     | X     | X     | X     |       |       |       |       |       |
| 2.7       | 2R7  | C     | X     | X     | X     |       |       |       |       |       |
| 3.3       | 3R3  | C     | X     | X     | X     |       |       |       |       |       |
| 3.9       | 3R9  | C     | X     | X     | X     |       |       |       |       |       |
| 4.7       | 4R7  | C     | X     | X     | X     |       |       |       |       |       |
| 5.0       | 5R0  | C     | X     | X     | X     |       |       |       |       |       |
| 5.6       | 5R6  | C     | X     | X     | X     |       |       |       |       |       |
| 6.8       | 6R8  | C     | X     | X     | X     |       |       |       |       |       |
| 8.2       | 8R2  | C     | X     | X     | X     |       |       |       |       |       |
| 10        | 100  | C     | X     | X     | X     | E     | M     | M     | M     | F     |
| 12        | 120  | C     | X     | X     | X     | E     | M     | M     | M     | F     |
| 15        | 150  | C     | X     | X     | X     | E     | M     | M     | M     | F     |
| 18        | 180  | C     | X     | X     | X     | E     | M     | M     | M     | F     |
| 22        | 220  | C     | X     | X     | X     | E     | M     | M     | M     | F     |
| 27        | 270  | C     | X     | X     | X     | E     | M     | M     | M     | F     |
| 33        | 330  | C     | X     | M     | M     | E     | M     | M     | M     | F     |
| 39        | 390  | C     | X     | M     | M     | E     | M     | M     | M     | F     |
| 47        | 470  | C     | X     | M     | M     | E     | M     | M     | M     | F     |
| 56        | 560  | C     | X     | C     | C     | E     | M     | C     | C     | F     |
| 68        | 680  | C     | X     | C     | C     | E     | M     | C     | C     | F     |
| 82        | 820  | C     | X     | C     | C     | E     | M     | C     | C     | F     |
| 100       | 101  | C     | X     | C     | C     | E     | C     | C     | C     | F     |
| 120       | 121  | C     | X/C   | E     | E     | E     | C     | C     | C     | F     |
| 150       | 151  | C     | C     | E     | E     |       | C     | E     | E     | F     |
| 180       | 181  | C     | E/C   | E     | E     |       | C     | E     | E     | F     |
| 220       | 221  | C     | E/C   | E     | E     |       | E     | E     | E     | F     |
| 270       | 271  | C     | E/C   | P     | P     |       | E     | F     | F     | G     |
| 330       | 331  | C     | E/C   | P/E   | P/E   |       | E     | F     | F     |       |
| 390       | 391  | C     | E/C   | P/E   | P/E   |       | E     | G     | G     |       |
| 470       | 471  |       | E/C   | E     | E     |       | E     | C     | C     |       |
| 560       | 561  |       | E     |       |       |       | E     | G     | G     |       |
| 680       | 681  |       | E     |       |       |       | E     | G     | G     |       |
| 820       | 821  |       | E     |       |       |       | E     | G     | G     |       |
| 1000      | 102  |       | E     |       |       |       | E     | G     | G     |       |
| 1200      | 122  |       |       |       |       |       | E     | F     | F     |       |
| 1500      | 152  |       |       |       |       |       | F     | G     | G     |       |
| 1800      | 182  |       |       |       |       |       | G     | G     | G     |       |
| 2200      | 222  |       |       |       |       |       | G     |       |       |       |
| 2700      | 272  |       |       |       |       |       | G     |       |       |       |
| 3300      | 332  |       |       |       |       |       | G     |       |       |       |
| 3900      | 392  |       |       |       |       |       | G     |       |       |       |



## 7. CAPACITANCE RANGE(Con.)

### 7-1. C0G

| Dimension |      | 1808  |       |       |       |       | 1812  |       |       |       |       | 1825  |       |       |       |
|-----------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Cap.(pF)  | Code | 1000V | 1500V | 2000V | 3000V | 4000V | 1000V | 1500V | 2000V | 3000V | 4000V | 1000V | 1500V | 2000V | 3000V |
| 1.5       | 1R5  |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 1.8       | 1R8  |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 2.2       | 2R2  | C     | C     | C     | C     | C     |       |       |       |       |       |       |       |       |       |
| 2.7       | 2R7  | C     | C     | C     | C     | C     |       |       |       |       |       |       |       |       |       |
| 3.3       | 3R3  | C     | C     | C     | C     | C     |       |       |       |       |       |       |       |       |       |
| 3.9       | 3R9  | C     | C     | C     | C     | C     |       |       |       |       |       |       |       |       |       |
| 4.7       | 4R7  | C     | C     | C     | C     | C     |       |       |       |       |       |       |       |       |       |
| 5.0       | 5R0  | C     | C     | C     | C     | C     |       |       |       |       |       |       |       |       |       |
| 5.6       | 5R6  | C     | C     | C     | C     | C     |       |       |       |       |       |       |       |       |       |
| 6.8       | 6R8  | C     | C     | C     | C     | C     |       |       |       |       |       |       |       |       |       |
| 8.2       | 8R2  | C     | C     | C     | C     | C     |       |       |       |       |       |       |       |       |       |
| 10        | 100  | C     | C     | C     | C     | C     | C     | C     | C     | C     | C     | F     | F     | F     | F     |
| 12        | 120  | C     | C     | C     | C     | C     | C     | C     | C     | C     | C     | F     | F     | F     | F     |
| 15        | 150  | C     | C     | C     | C     | C     | C     | C     | C     | C     | C     | F     | F     | F     | F     |
| 18        | 180  | C     | C     | C     | C     | C     | C     | C     | C     | C     | C     | F     | F     | F     | F     |
| 22        | 220  | C     | C     | C     | C     | E     | C     | C     | C     | C     | C     | F     | F     | F     | F     |
| 27        | 270  | C     | C     | C     | C     | E     | C     | C     | C     | C     | C     | F     | F     | F     | F     |
| 33        | 330  | C     | C     | C     | C     | E*    | C     | C     | C     | C     | C     | F     | F     | F     | F     |
| 39        | 390  | C     | C     | C     | C     | F*    | C     | C     | C     | C     | C*    | F     | F     | F     | F     |
| 47        | 470  | C     | C     | C     | C     |       | C     | C     | C     | C     | C*    | F     | F     | F     | F     |
| 56        | 560  | C     | C     | C     | C     |       | C     | C     | C     | C     | E*    | F     | F     | F     | F     |
| 68        | 680  | C     | C     | C     | C     |       | C     | C     | C     | C     | E*    | F     | F     | F     | F     |
| 82        | 820  | C     | C     | C     | C     |       | C     | C     | C     | C     | F*    | F     | F     | F     | F     |
| 100       | 101  | C     | C     | C     | F     |       | C     | C     | C     | C     | F*    | F     | F     | F     | F     |
| 120       | 121  | C     | C     | C     | F     |       | C     | C     | C     | C     | G*    | F     | F     | F     | F     |
| 150       | 151  | C     | F     | F     | F     |       | C     | C     | C     | C     |       | F     | F     | F     | F     |
| 180       | 181  | C     | F     | F     | F     |       | C     | C     | C     | F     |       | F     | F     | F     | F     |
| 220       | 221  | C     | F     | F     | F     |       | C     | C     | C     | F     |       | F     | F     | F     | F     |
| 270       | 271  | F     | F     | F     | F     |       | C     | F     | F     | F     |       | F     | F     | F     | F     |
| 330       | 331  | F     | F     | F     | F     |       | C     | F     | F     | F     |       | F     | F     | F     | F     |
| 390       | 391  | F     | F     | F     | F     |       | C     | F     | F     | F     |       | F     | F     | F     | F     |
| 470       | 471  | F     | F     | F     | F     |       | F     | F     | F     | F     |       | F     | F     | F     | F     |
| 560       | 561  | F     | F     | F     |       |       | F     | F     | F     | F     |       | F     | F     | F     | F     |
| 680       | 681  | F     | F     | F     |       |       | F     | F     | F     | F     |       | F     | F     | F     | F     |
| 820       | 821  | F     | F     | F     |       |       | F     | F     | F     | G     |       | F     | F     | F     | F     |
| 1000      | 102  | F     | F     | F     |       |       | F     | F     | F     | G     |       | F     | F     | F     | F     |
| 1200      | 122  | F     | F     | F     |       |       | F     | F     | F     | R     |       | F     | F     | F     |       |
| 1500      | 152  | F     | F     | F     |       |       | F     | F     | F     |       |       | F     | F     | F     |       |
| 1800      | 182  | F     | F     | F     |       |       | E     | F     | F     |       |       | F     | F     | F     |       |
| 2200      | 222  | F     |       |       |       |       | E     | F     | F     |       |       | F     | F     | F     |       |
| 2700      | 272  |       |       |       |       |       | F     | G     | G     |       |       | F     | F     | F     |       |
| 3300      | 332  |       |       |       |       |       | F     | G     | G     |       |       | F     | F     | F     |       |
| 3900      | 392  |       |       |       |       |       | G     |       |       |       |       | F     | F     | F     |       |
| 4700      | 472  |       |       |       |       |       | G     |       |       |       |       | F     | F     | F     |       |
| 5600      | 562  |       |       |       |       |       | G     |       |       |       |       | F     |       |       |       |
| 6800      | 682  |       |       |       |       |       |       |       |       |       |       | F     |       |       |       |
| 8200      | 822  |       |       |       |       |       |       |       |       |       |       | G     |       |       |       |
| 10000     | 103  |       |       |       |       |       |       |       |       |       |       | G     |       |       |       |
| 12000     | 123  |       |       |       |       |       |       |       |       |       |       |       |       |       |       |

## 7. CAPACITANCE RANGE(Con.)

### 7-1. C0G

| Dimension |      | 2220  |       |       |       |       | 2225  |       |       |       |       |
|-----------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Cap.(pF)  | Code | 1000V | 1500V | 2000V | 3000V | 4000V | 1000V | 1500V | 2000V | 3000V | 4000V |
| 1.5       | 1R5  |       |       |       |       |       |       |       |       |       |       |
| 1.8       | 1R8  |       |       |       |       |       |       |       |       |       |       |
| 2.2       | 2R2  |       |       |       |       |       |       |       |       |       |       |
| 2.7       | 2R7  |       |       |       |       |       |       |       |       |       |       |
| 3.3       | 3R3  |       |       |       |       |       |       |       |       |       |       |
| 3.9       | 3R9  |       |       |       |       |       |       |       |       |       |       |
| 4.7       | 4R7  |       |       |       |       |       |       |       |       |       |       |
| 5.0       | 5R0  |       |       |       |       |       |       |       |       |       |       |
| 5.6       | 5R6  |       |       |       |       |       |       |       |       |       |       |
| 6.8       | 6R8  |       |       |       |       |       |       |       |       |       |       |
| 8.2       | 8R2  |       |       |       |       |       |       |       |       |       |       |
| 10        | 100  | F     | F     | F     | F     | F     | F     | F     | F     | F     | F     |
| 12        | 120  | F     | F     | F     | F     | F     | F     | F     | F     | F     | F     |
| 15        | 150  | F     | F     | F     | F     | F     | F     | F     | F     | F     | F     |
| 18        | 180  | F     | F     | F     | F     | F     | F     | F     | F     | F     | F     |
| 22        | 220  | F     | F     | F     | F     | F     | F     | F     | F     | F     | F     |
| 27        | 270  | F     | F     | F     | F     | F     | F     | F     | F     | F     | F     |
| 33        | 330  | F     | F     | F     | F     | F     | F     | F     | F     | F     | F     |
| 39        | 390  | F     | F     | F     | F     | F     | F     | F     | F     | F     | F     |
| 47        | 470  | F     | F     | F     | F     | F     | F     | F     | F     | F     | F     |
| 56        | 560  | F     | F     | F     | F     | F     | F     | F     | F     | F     | F     |
| 68        | 680  | F     | F     | F     | F     | F     | F     | F     | F     | F     | F     |
| 82        | 820  | F     | F     | F     | F     | F     | F     | F     | F     | F     | F     |
| 100       | 101  | F     | F     | F     | F     | F     | F     | F     | F     | F     | F     |
| 120       | 121  | F     | F     | F     | F     | F     | F     | F     | F     | F     |       |
| 150       | 151  | F     | F     | F     | F     | F     | F     | F     | F     | F     |       |
| 180       | 181  | F     | F     | F     | F     | F     | F     | F     | F     | F     |       |
| 220       | 221  | F     | F     | F     | F     | F     | F     | F     | F     | F     |       |
| 270       | 271  | F     | F     | F     | F     | G     | F     | F     | F     | F     |       |
| 330       | 331  | F     | F     | F     | F     | G     | F     | F     | F     | F     |       |
| 390       | 391  | F     | F     | F     | F     |       | F     | F     | F     | F     |       |
| 470       | 471  | F     | F     | F     | F     |       | F     | F     | F     | F     |       |
| 560       | 561  | F     | F     | F     | F     |       | F     | F     | F     | F     |       |
| 680       | 681  | F     | F     | F     | F     |       | F     | F     | F     | F     |       |
| 820       | 821  | F     | F     | F     | F     |       | F     | F     | F     | F     |       |
| 1000      | 102  | F     | F     | F     | F     |       | F     | F     | F     | F     |       |
| 1200      | 122  | F     | F     | F     | F     |       | F     | F     | F     | F     |       |
| 1500      | 152  | F     | F     | F     | F     |       | F     | F     | F     | F     |       |
| 1800      | 182  | F     | F     | F     |       |       | F     | F     | F     | F     |       |
| 2200      | 222  | F     | F     | F     |       |       | F     | F     | F     | F     |       |
| 2700      | 272  | F     | F     | F     |       |       | F     | F     | F     | G     |       |
| 3300      | 332  | F     | F     | F     |       |       | F     | F     | F     | G     |       |
| 3900      | 392  | F     | F     | F     |       |       | F     | F     | F     |       |       |
| 4700      | 472  | F     | F     | F     |       |       | F     | F     | F     |       |       |
| 5600      | 562  | F     |       |       |       |       | F     | F     | F     |       |       |
| 6800      | 682  | F     |       |       |       |       | F     | F     | F     |       |       |
| 8200      | 822  | G     |       |       |       |       | F     | G     | G     |       |       |
| 10000     | 103  | G     |       |       |       |       | G     | G     | G     |       |       |
| 12000     | 123  |       |       |       |       |       |       |       |       |       |       |

**7. CAPACITANCE RANGE(Con.)****7-2. X7R**

| Dimension |      | 0805  | 1206  |       |       |       | 1210  |       |       | 1808  |       |       |       |       |
|-----------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Cap.(pF)  | Code | 1000V | 1000V | 1500V | 2000V | 2500V | 1000V | 1500V | 2000V | 1000V | 1500V | 2000V | 3000V | 4000V |
| 100       | 101  | X     | C     | C     | C     | C     | C     | C     | C     |       |       |       |       |       |
| 120       | 121  | X     | C     | C     | C     | C     | C     | C     | C     |       |       |       |       |       |
| 150       | 151  | X     | C     | C     | C     | C     | C     | C     | C     | C     | C     | C     | C     | F*    |
| 180       | 181  | X     | C     | C     | C     | C     | C     | C     | C     | C     | C     | C     | C     | F*    |
| 220       | 221  | X     | C     | C     | C     | C     | C     | C     | C/E   | C     | C     | C     | C     | F*    |
| 270       | 271  | X     | C     | C     | C     | C     | C     | C     | C/E   | C     | C     | C     | C     | F*    |
| 330       | 331  | X     | C     | C     | C     | C     | C     | C     | C/E   | C     | C     | C     | F     | F*    |
| 390       | 391  | X     | C     | C     | C     | C     | C     | C     | C/E   | C     | C     | C     | F     | F*    |
| 470       | 471  | X     | C     | C     | C     | C     | C     | C     | C/E   | C     | C     | C     | F     | F*    |
| 560       | 561  | X     | C     | C     | C     | C     | C     | C     | C/E   | C     | C     | C     | F     | F*    |
| 680       | 681  | X     | C     | C     | C     | C*    | C     | C     | C/E   | C     | C     | C     | F     | F*    |
| 820       | 821  | X     | C     | C     | C     | C*    | C     | C     | C/E   | C     | C     | C     | F     | F*    |
| 1000      | 102  | X     | C     | C     | C     | C*    | C     | C     | C/E   | C     | C     | C/E   | F     | F*    |
| 1200      | 122  | X     | C     | E     | E     | E*    | C     | G     | C/E   | C     | F     | F     | F     |       |
| 1500      | 152  | C     | C     | E     | E     | E*    | C     | G     | F     | C     | F     | F     | F     |       |
| 1800      | 182  | C     | C     | E     | E     | E*    | C     | G     | F     | C     | F     | F     | F     |       |
| 2200      | 222  | C     | C     | E     | E     | E*    | C     | G     | F     | C     | F     | F     | F     |       |
| 2700      | 272  | C     | C     | E     | E     | E*    | C     | G     | G     | C     | F     | F     | F     |       |
| 3300      | 332  | C     | C     | E     | E     | E*    | C     | G     | G     | C     | F     | F     | F     |       |
| 3900      | 392  | C     | C     | E     |       | E*    | E     | G     | G     | C     | F     | F     |       |       |
| 4700      | 472  | C     | C     | E     |       | E*    | E     | G/F   | G/F   | C     | F     | F     |       |       |
| 5600      | 562  |       | C     | E     |       |       | E     | G     | G*    | F     | F     | F     |       |       |
| 6800      | 682  |       | C     | E     |       |       | E     | G     | G*    | F     | F     | F     |       |       |
| 8200      | 822  |       | C     | E     |       |       | E     | G     | G*    | F     | F*    |       |       |       |
| 10000     | 103  |       | C     | E     |       |       | E     | G     |       | F     | F*    |       |       |       |
| 12000     | 123  |       | E     |       |       |       | E     | G     |       | F     |       |       |       |       |
| 15000     | 153  |       | E     |       |       |       | E     | G     |       | F     |       |       |       |       |
| 18000     | 183  |       | E     |       |       |       | E     | G     |       | F     |       |       |       |       |
| 22000     | 223  |       | E     |       |       |       | E     | G     |       | F     |       |       |       |       |
| 27000     | 273  |       |       |       |       |       | E     | G     |       | F     |       |       |       |       |
| 33000     | 333  |       |       |       |       |       | E     | G     |       | F     |       |       |       |       |
| 39000     | 393  |       |       |       |       |       | F     |       |       | F     |       |       |       |       |
| 47000     | 473  |       |       |       |       |       | G     |       |       | F     |       |       |       |       |
| 56000     | 563  |       |       |       |       |       |       |       |       | F     |       |       |       |       |
| 68000     | 683  |       |       |       |       |       |       |       |       |       |       |       |       |       |

\* Surface coating only.

## Prosperity Dielectrics Co., Ltd.

### 7. CAPACITANCE RANGE(Con.)

#### 7-2. X7R

| Dimension |      | 1812  |       |       |       |       | 1825  |       |       |       |       |
|-----------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Cap.(pF)  | Code | 1000V | 1500V | 2000V | 3000V | 4000V | 1000V | 1500V | 2000V | 3000V | 4000V |
| 270       | 271  | C     | C     | C     | F     | F*    |       |       |       |       | F*    |
| 330       | 331  | C     | C     | C     | F     | F*    |       |       |       |       | F*    |
| 390       | 391  | C     | C     | C     | F     | F*    |       |       |       |       | F*    |
| 470       | 471  | C     | C     | C     | F     | F*    |       |       |       |       | F*    |
| 560       | 561  | C     | C     | C     | F     | F*    |       |       |       |       | F*    |
| 680       | 681  | C     | C     | C     | F     | F*    |       |       |       |       | F*    |
| 820       | 821  | C     | C     | C     | F     | F*    |       |       |       |       | F*    |
| 1000      | 102  | C     | C     | C     | F     | F*    | F     | F     | F     | F     | F*    |
| 1200      | 122  | C     | C     | C     | F     | G*    | F     | F     | F     | F     | G*    |
| 1500      | 152  | C     | C     | C     | F     | G*    | F     | F     | F     | F     | G*    |
| 1800      | 182  | C     | C     | C     | G     | G*    | F     | F     | F     | F     | G*    |
| 2200      | 222  | C     | C     | C     | G*    |       | F     | F     | F     | F*    |       |
| 2700      | 272  | C     | C     | C     | G*    |       | F     | F     | F     | F*    |       |
| 3300      | 332  | C     | F     | F     | G*    |       | F     | F     | F     | F*    |       |
| 3900      | 392  | C     | F     | F     | G*    |       | F     | F     | F     | F*    |       |
| 4700      | 472  | C     | F     | F     | G*    |       | F     | F     | F     | F*    |       |
| 5600      | 562  | C     | G     | G     |       |       | F     | F     | F     | G*    |       |
| 6800      | 682  | C     | G     | G     |       |       | F     | F     | F     | G*    |       |
| 8200      | 822  | C     | G     | G     |       |       | F     | F     | F     | G*    |       |
| 10000     | 103  | C     | G/F   | G/F   |       |       | F     | F     | F     | G*    |       |
| 12000     | 123  | F     |       |       |       |       | F     | G     | G     | H*    |       |
| 15000     | 153  | F     |       |       |       |       | F     | G     | G     | H*    |       |
| 18000     | 183  | G     |       |       |       |       | F     | G     | G     | H*    |       |
| 22000     | 223  | G     |       |       |       |       | F     | G     | G     |       |       |
| 27000     | 273  | G     |       |       |       |       | F     | H     | H     |       |       |
| 33000     | 333  | G     |       |       |       |       | F     | H     | H     |       |       |
| 39000     | 393  | G     |       |       |       |       | F     | H     | H     |       |       |
| 47000     | 473  | G/F   |       |       |       |       | F     | H     | H     |       |       |
| 56000     | 563  | G     |       |       |       |       | F     | H     |       |       |       |
| 68000     | 683  | G     |       |       |       |       | F     |       |       |       |       |
| 82000     | 823  | G     |       |       |       |       | F     |       |       |       |       |
| 100000    | 104  | G     |       |       |       |       | G     |       |       |       |       |
| 120000    | 124  |       |       |       |       |       |       |       |       |       |       |
| 150000    | 154  |       |       |       |       |       |       |       |       |       |       |
| 180000    | 184  |       |       |       |       |       |       |       |       |       |       |
| 220000    | 224  |       |       |       |       |       |       |       |       |       |       |
| 270000    | 274  |       |       |       |       |       |       |       |       |       |       |
| 330000    | 334  |       |       |       |       |       |       |       |       |       |       |

\* Surface coating only.

## Prosperity Dielectrics Co., Ltd.

### 7. CAPACITANCE RANGE(Con.)

#### 7-2. X7R

| Dimension |      | 2211  |       | 2220  |       |       |       |       | 2225  |       |       |       |       |
|-----------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Cap.(pF)  | Code | 3000V | 4000V | 1000V | 1500V | 2000V | 3000V | 4000V | 1000V | 1500V | 2000V | 3000V | 4000V |
| 270       | 271  | F     | F*    |       |       |       |       | F*    |       |       |       |       | F*    |
| 330       | 331  | F     | F*    |       |       |       |       | F*    |       |       |       |       | F*    |
| 390       | 391  | F     | F*    |       |       |       |       | F*    |       |       |       |       | F*    |
| 470       | 471  | F     | F*    |       |       |       |       | F*    |       |       |       |       | F*    |
| 560       | 561  | F     | F*    |       |       |       |       | F*    |       |       |       |       | F*    |
| 680       | 681  | F     | F*    |       |       |       |       | F*    |       |       |       |       | F*    |
| 820       | 821  | F     | F*    |       |       |       |       | F*    |       |       |       |       | F*    |
| 1000      | 102  | F     | F*    | F     | F     | F     | F     | F*    | F     | F     | F     | F     | F*    |
| 1200      | 122  | G     | G*    | F     | F     | F     | F     | G*    | F     | F     | F     | F     | G*    |
| 1500      | 152  | G     | G*    | F     | F     | F     | F     | G*    | F     | F     | F     | F     | G*    |
| 1800      | 182  | G     | G*    | F     | F     | F     | F     | G*    | F     | F     | F     | F     | G*    |
| 2200      | 222  | G     |       | F     | F     | F     | F*    |       | F     | F     | F     | F*    |       |
| 2700      | 272  | G     |       | F     | F     | F     | F*    |       | F     | F     | F     | F*    |       |
| 3300      | 332  | G     |       | F     | F     | F     | F*    |       | F     | F     | F     | F*    |       |
| 3900      | 392  |       |       | F     | F     | F     | F*    |       | F     | F     | F     | F*    |       |
| 4700      | 472  |       |       | F     | F     | F     | F*    |       | F     | F     | F     | F*    |       |
| 5600      | 562  |       |       | F     | F     | F     | F*    |       | F     | F     | F     | G*    |       |
| 6800      | 682  |       |       | F     | F     | F     | G*    |       | F     | F     | F     | G*    |       |
| 8200      | 822  |       |       | F     | G     | G     | G*    |       | F     | F     | F     | G*    |       |
| 10000     | 103  |       |       | F     | G/F   | G/F   | G*    |       | F     | F     | F     | G*    |       |
| 12000     | 123  |       |       | F     | G     | G     | H*    |       | F     | G     | G     | G*    |       |
| 15000     | 153  |       |       | F     | G     | G     | H*    |       | F     | G     | G     | G*    |       |
| 18000     | 183  |       |       | F     | H     | H     | H*    |       | F     | G     | G     | H*    |       |
| 22000     | 223  |       |       | F     | H     | H     |       |       | F     | G/F   | G/F   |       |       |
| 27000     | 273  |       |       | F     | H     | H     |       |       | F     | G     | G     |       |       |
| 33000     | 333  |       |       | F     | H     | H     |       |       | F     | G     | G     |       |       |
| 39000     | 393  |       |       | F     | H     | H     |       |       | F     | G     | H     |       |       |
| 47000     | 473  |       |       | F     | H     | H     |       |       | F     | G     | H     |       |       |
| 56000     | 563  |       |       | F     | H     | H     |       |       | F     | G     | H     |       |       |
| 68000     | 683  |       |       | F     |       |       |       |       | F     | G     |       |       |       |
| 82000     | 823  |       |       | F     |       |       |       |       | F     | G     |       |       |       |
| 100000    | 104  |       |       | G     |       |       |       |       | G     | G     |       |       |       |
| 120000    | 124  |       |       | G/F   |       |       |       |       | H     |       |       |       |       |
| 150000    | 154  |       |       | H     |       |       |       |       | H     |       |       |       |       |
| 180000    | 184  |       |       | H     |       |       |       |       | H     |       |       |       |       |
| 220000    | 224  |       |       | H     |       |       |       |       | H     |       |       |       |       |
| 270000    | 274  |       |       |       |       |       |       |       | F/G/H |       |       |       |       |
| 330000    | 334  |       |       |       |       |       |       |       | F/G/H |       |       |       |       |
| 390000    | 394  |       |       |       |       |       |       |       |       |       |       |       |       |

\* Surface coating only.

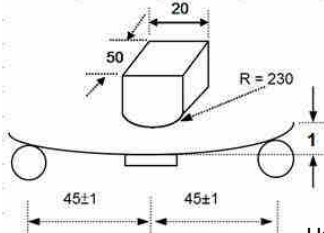
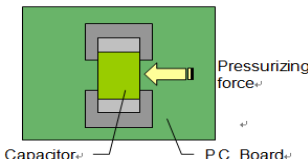
# Prosperity Dielectrics Co., Ltd.

## 8. RELIABILITY TEST CONDITIONS AND REQUIREMENTS

| No.            | Item                                                                   | Test Condition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Requirements                                                                                                                                                                                                                                                                                                               |                 |                |                   |                            |                   |                                                                                                                                                                                                                         |                 |                                                   |           |                                           |                |                                           |            |     |                                                                                                                                                                                                                                                                          |
|----------------|------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------------|-------------------|----------------------------|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------------------------------------------------|-----------|-------------------------------------------|----------------|-------------------------------------------|------------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.             | Visual and Dimensions                                                  | ---                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | * No remarkable defect.<br>* Dimensions to confirm to individual specification sheet.                                                                                                                                                                                                                                      |                 |                |                   |                            |                   |                                                                                                                                                                                                                         |                 |                                                   |           |                                           |                |                                           |            |     |                                                                                                                                                                                                                                                                          |
| 2.             | Capacitance                                                            | * Class I : C0G<br>Cap.≤1000pF, 1.0±0.2Vrms, 1MHz±10%.<br>Cap.>1000pF, 1.0±0.2Vrms, 1KHz±10%.<br>* Class II : X7R<br>1.0±0.2Vrms, 1KHz±10%.                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | * Shall not exceed the limits given in the detailed spec.                                                                                                                                                                                                                                                                  |                 |                |                   |                            |                   |                                                                                                                                                                                                                         |                 |                                                   |           |                                           |                |                                           |            |     |                                                                                                                                                                                                                                                                          |
| 3.             | Q/D.F.<br>(Tangent of loss angle)                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <table><tr><th>Dielectric</th><th>Rated Vol.(V)</th><th>Q/D.F.</th><th>Remark</th></tr><tr><td rowspan="2">Class I (C0G)</td><td rowspan="2">All</td><td>Q≥1000</td><td>Cap.≥30pF</td></tr><tr><td>Q≥400+20C</td><td>Cap.&lt;30pF</td></tr><tr><td>Class II (X7R)</td><td>All</td><td>D.F.≤2.5%</td><td></td></tr></table> | Dielectric      | Rated Vol.(V)  | Q/D.F.            | Remark                     | Class I (C0G)     | All                                                                                                                                                                                                                     | Q≥1000          | Cap.≥30pF                                         | Q≥400+20C | Cap.<30pF                                 | Class II (X7R) | All                                       | D.F.≤2.5%  |     |                                                                                                                                                                                                                                                                          |
| Dielectric     | Rated Vol.(V)                                                          | Q/D.F.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Remark                                                                                                                                                                                                                                                                                                                     |                 |                |                   |                            |                   |                                                                                                                                                                                                                         |                 |                                                   |           |                                           |                |                                           |            |     |                                                                                                                                                                                                                                                                          |
| Class I (C0G)  | All                                                                    | Q≥1000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Cap.≥30pF                                                                                                                                                                                                                                                                                                                  |                 |                |                   |                            |                   |                                                                                                                                                                                                                         |                 |                                                   |           |                                           |                |                                           |            |     |                                                                                                                                                                                                                                                                          |
|                |                                                                        | Q≥400+20C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Cap.<30pF                                                                                                                                                                                                                                                                                                                  |                 |                |                   |                            |                   |                                                                                                                                                                                                                         |                 |                                                   |           |                                           |                |                                           |            |     |                                                                                                                                                                                                                                                                          |
| Class II (X7R) | All                                                                    | D.F.≤2.5%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                            |                 |                |                   |                            |                   |                                                                                                                                                                                                                         |                 |                                                   |           |                                           |                |                                           |            |     |                                                                                                                                                                                                                                                                          |
| 4.             | Temperature Coefficient<br>(Temperature characteristic of capacitance) | * With no electrical load.<br><table><tr><th>T.C.</th><th>Operating Temp.</th></tr><tr><td>C0G</td><td>-55~125°C at 25°C</td></tr><tr><td>X7R</td><td>-55~125°C at 25°C</td></tr></table>                                                                                                                                                                                                                                                                                                                                                                                                                                | T.C.                                                                                                                                                                                                                                                                                                                       | Operating Temp. | C0G            | -55~125°C at 25°C | X7R                        | -55~125°C at 25°C | <table><tr><th>T.C.</th><th>Capacitance Change</th></tr><tr><td>C0G</td><td>Within ±30ppm/°C</td></tr><tr><td>X7R</td><td>Within ±15%</td></tr></table>                                                                 | T.C.            | Capacitance Change                                | C0G       | Within ±30ppm/°C                          | X7R            | Within ±15%                               |            |     |                                                                                                                                                                                                                                                                          |
| T.C.           | Operating Temp.                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                            |                 |                |                   |                            |                   |                                                                                                                                                                                                                         |                 |                                                   |           |                                           |                |                                           |            |     |                                                                                                                                                                                                                                                                          |
| C0G            | -55~125°C at 25°C                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                            |                 |                |                   |                            |                   |                                                                                                                                                                                                                         |                 |                                                   |           |                                           |                |                                           |            |     |                                                                                                                                                                                                                                                                          |
| X7R            | -55~125°C at 25°C                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                            |                 |                |                   |                            |                   |                                                                                                                                                                                                                         |                 |                                                   |           |                                           |                |                                           |            |     |                                                                                                                                                                                                                                                                          |
| T.C.           | Capacitance Change                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                            |                 |                |                   |                            |                   |                                                                                                                                                                                                                         |                 |                                                   |           |                                           |                |                                           |            |     |                                                                                                                                                                                                                                                                          |
| C0G            | Within ±30ppm/°C                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                            |                 |                |                   |                            |                   |                                                                                                                                                                                                                         |                 |                                                   |           |                                           |                |                                           |            |     |                                                                                                                                                                                                                                                                          |
| X7R            | Within ±15%                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                            |                 |                |                   |                            |                   |                                                                                                                                                                                                                         |                 |                                                   |           |                                           |                |                                           |            |     |                                                                                                                                                                                                                                                                          |
| 5.             | Insulation Resistance                                                  | <table><tr><th>Rated Vol.(V)</th><th>Apply Voltage</th><th>Test Condition</th></tr><tr><td>&gt;500</td><td>500Vdc</td><td>60 sec.</td></tr></table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Rated Vol.(V)                                                                                                                                                                                                                                                                                                              | Apply Voltage   | Test Condition | >500              | 500Vdc                     | 60 sec.           | <table><tr><th>Dielectric</th><th>Requirements</th></tr><tr><td>Class I</td><td>≥10GΩ or RxC≥500Ω-F, whichever is smaller</td></tr><tr><td>Class II</td><td>≥10GΩ or RxC≥100Ω-F, whichever is smaller</td></tr></table> | Dielectric      | Requirements                                      | Class I   | ≥10GΩ or RxC≥500Ω-F, whichever is smaller | Class II       | ≥10GΩ or RxC≥100Ω-F, whichever is smaller |            |     |                                                                                                                                                                                                                                                                          |
| Rated Vol.(V)  | Apply Voltage                                                          | Test Condition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                            |                 |                |                   |                            |                   |                                                                                                                                                                                                                         |                 |                                                   |           |                                           |                |                                           |            |     |                                                                                                                                                                                                                                                                          |
| >500           | 500Vdc                                                                 | 60 sec.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                            |                 |                |                   |                            |                   |                                                                                                                                                                                                                         |                 |                                                   |           |                                           |                |                                           |            |     |                                                                                                                                                                                                                                                                          |
| Dielectric     | Requirements                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                            |                 |                |                   |                            |                   |                                                                                                                                                                                                                         |                 |                                                   |           |                                           |                |                                           |            |     |                                                                                                                                                                                                                                                                          |
| Class I        | ≥10GΩ or RxC≥500Ω-F, whichever is smaller                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                            |                 |                |                   |                            |                   |                                                                                                                                                                                                                         |                 |                                                   |           |                                           |                |                                           |            |     |                                                                                                                                                                                                                                                                          |
| Class II       | ≥10GΩ or RxC≥100Ω-F, whichever is smaller                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                            |                 |                |                   |                            |                   |                                                                                                                                                                                                                         |                 |                                                   |           |                                           |                |                                           |            |     |                                                                                                                                                                                                                                                                          |
| 6.             | Solderability                                                          | * Solder temperature : 235±5°C for (0603~1210).<br>* Solder temperature : 245±5°C for (1808~2225).<br>* Dipping time : 2±0.5 sec.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | * 75% min. coverage of all metalized area.                                                                                                                                                                                                                                                                                 |                 |                |                   |                            |                   |                                                                                                                                                                                                                         |                 |                                                   |           |                                           |                |                                           |            |     |                                                                                                                                                                                                                                                                          |
| 7.             | Dielectric Strength<br>(Voltage proof)                                 | <table><tr><th>Rated Vol.(V)</th><th>Condition</th></tr><tr><td>630≤V≤3000V</td><td>1.2 times of UR</td></tr><tr><td>3000&lt;V&lt;5000V</td><td>1.1 times of UR</td></tr><tr><td>≥5000V</td><td>1.0 times of UR</td></tr></table><br>* Duration : 1 to 5 sec.<br>* Voltage ramp up rate ≤500Vdc/sec.<br>* Charge and discharge current less than 50mA.<br>* Test in insulating fluid.                                                                                                                                                                                                                                    | Rated Vol.(V)                                                                                                                                                                                                                                                                                                              | Condition       | 630≤V≤3000V    | 1.2 times of UR   | 3000<V<5000V               | 1.1 times of UR   | ≥5000V                                                                                                                                                                                                                  | 1.0 times of UR | * No evidence of damage or flashover during test. |           |                                           |                |                                           |            |     |                                                                                                                                                                                                                                                                          |
| Rated Vol.(V)  | Condition                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                            |                 |                |                   |                            |                   |                                                                                                                                                                                                                         |                 |                                                   |           |                                           |                |                                           |            |     |                                                                                                                                                                                                                                                                          |
| 630≤V≤3000V    | 1.2 times of UR                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                            |                 |                |                   |                            |                   |                                                                                                                                                                                                                         |                 |                                                   |           |                                           |                |                                           |            |     |                                                                                                                                                                                                                                                                          |
| 3000<V<5000V   | 1.1 times of UR                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                            |                 |                |                   |                            |                   |                                                                                                                                                                                                                         |                 |                                                   |           |                                           |                |                                           |            |     |                                                                                                                                                                                                                                                                          |
| ≥5000V         | 1.0 times of UR                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                            |                 |                |                   |                            |                   |                                                                                                                                                                                                                         |                 |                                                   |           |                                           |                |                                           |            |     |                                                                                                                                                                                                                                                                          |
| 8.             | Resistance to Soldering Heat                                           | * Solder temperature : 260±5°C.<br>* Dipping time : 10±1 sec.<br>* Preheating : 120 to 150°C for 1 minute before immerse the capacitor in a eutectic solder.<br>* Before initial measurement (Class II only) : Perform 150 +0/-10°C for 1 hr and then set for 48±4 hrs at room temp.<br>* Measurement to be made after keeping at room temp. for 24±2 hrs (Class I) or 48±4 hrs (Class II).                                                                                                                                                                                                                              | * No remarkable damage.<br>* Cap. Change :<br>C0G : Within ±2.5% or ±0.25pF, whichever is larger.<br>X7R : Within ±7.5%.<br>* Q/D.F. & I.R. : To meet the initial requirement.<br>* 25% max. leaching on each edge.                                                                                                        |                 |                |                   |                            |                   |                                                                                                                                                                                                                         |                 |                                                   |           |                                           |                |                                           |            |     |                                                                                                                                                                                                                                                                          |
| 9.             | Temperature Cycle<br>(Rapid change of temperature)                     | * Conduct the five cycles according to the temperatures and time.<br><table><tr><th>Step</th><th>Temp.(°C)</th><th>Time(min.)</th></tr><tr><td>1</td><td>Min. operating temp. +0/-3</td><td>30±3</td></tr><tr><td>2</td><td>Room temp.</td><td>2~3</td></tr><tr><td>3</td><td>Max. operating temp. +3/-0</td><td>30±3</td></tr><tr><td>4</td><td>Room temp.</td><td>2~3</td></tr></table><br>* Before initial measurement (Class II only) : Perform 150 +0/-10°C for 1 hr and then set for 48±4 hrs at room temp.<br>* Measurement to be made after keeping at room temp. for 24±2 hrs (Class I) or 48±4 hrs (Class II). | Step                                                                                                                                                                                                                                                                                                                       | Temp.(°C)       | Time(min.)     | 1                 | Min. operating temp. +0/-3 | 30±3              | 2                                                                                                                                                                                                                       | Room temp.      | 2~3                                               | 3         | Max. operating temp. +3/-0                | 30±3           | 4                                         | Room temp. | 2~3 | * No remarkable damage.<br>* Cap. change :<br>C0G : Within ±2.5% or ±0.25pF, whichever is larger.<br>X7R : Within ±7.5%.<br>* Q/D.F. :<br>C0G : To meet the initial requirement.<br>X7R : D.F.≤150% of initial requirement.<br>* I.R. : To meet the initial requirement. |
| Step           | Temp.(°C)                                                              | Time(min.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                            |                 |                |                   |                            |                   |                                                                                                                                                                                                                         |                 |                                                   |           |                                           |                |                                           |            |     |                                                                                                                                                                                                                                                                          |
| 1              | Min. operating temp. +0/-3                                             | 30±3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                            |                 |                |                   |                            |                   |                                                                                                                                                                                                                         |                 |                                                   |           |                                           |                |                                           |            |     |                                                                                                                                                                                                                                                                          |
| 2              | Room temp.                                                             | 2~3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                            |                 |                |                   |                            |                   |                                                                                                                                                                                                                         |                 |                                                   |           |                                           |                |                                           |            |     |                                                                                                                                                                                                                                                                          |
| 3              | Max. operating temp. +3/-0                                             | 30±3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                            |                 |                |                   |                            |                   |                                                                                                                                                                                                                         |                 |                                                   |           |                                           |                |                                           |            |     |                                                                                                                                                                                                                                                                          |
| 4              | Room temp.                                                             | 2~3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                            |                 |                |                   |                            |                   |                                                                                                                                                                                                                         |                 |                                                   |           |                                           |                |                                           |            |     |                                                                                                                                                                                                                                                                          |

# Prosperity Dielectrics Co., Ltd.

## 8. RELIABILITY TEST CONDITIONS AND REQUIREMENTS

| No.            | Item                                                         | Test Condition                                                                                                                                                                                                                                                                                                                                      | Requirements                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |             |               |                                             |                |               |
|----------------|--------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-------------|---------------|---------------------------------------------|----------------|---------------|
| 10.            | Humidity (Damp Heat) Steady State                            | <ul style="list-style-type: none"><li>* Test temp. : 40±2°C.</li><li>* Humidity : 90~95%RH.</li><li>* Test time : 500 +24/-0 hrs.</li><li>* Measurement to be made after keeping at room temp. for 24±2 hrs (Class I) or 48±4 hrs (Class II).</li></ul>                                                                                             | <ul style="list-style-type: none"><li>* No remarkable damage.</li><li>* Cap. change :<br/>C0G : Within ±5.0% or ±0.5pF, whichever is larger.<br/>X7R : Within ±12.5%.</li><li>* Q/D.F. :<br/>C0G : Cap.&gt;30pF, Q≥350; 10pF≤Cap.≤30pF, Q≥275+2.5C; Cap.&lt;10pF, Q≥200+10C.<br/>X7R : D.F.≤200% of initial requirement.</li><li>* I.R. (Class I) : ≥1GΩ or RxC≥50Ω-F, whichever is smaller.</li><li>* I.R. (Class II) : ≥1GΩ or RxC≥10Ω-F, whichever is smaller.</li></ul> |            |             |               |                                             |                |               |
| 11.            | Humidity (Damp Heat) Load                                    | <ul style="list-style-type: none"><li>* Test temp. : 40±2°C.</li><li>* Humidity : 90~95% RH.</li><li>* Test time : 500 +24/-0hrs.</li><li>* To apply voltage : 500Vdc.</li><li>* Measurement to be made after keeping at room temp. for 24±2 hrs (Class I) or 48±4 hrs (Class II).</li></ul>                                                        | <ul style="list-style-type: none"><li>* No remarkable damage.</li><li>* Cap. change :<br/>C0G : Within ±7.5% or ±0.75pF, whichever is larger.<br/>X7R : Within ±12.5%.</li><li>* Q/D.F. :<br/>C0G : Cap.≥30pF, Q≥200; Cap.&lt;30pF, Q≥100+10/3C.<br/>X7R : D.F.≤200% of initial requirement.</li><li>* I.R. : ≥500MΩ or RxC≥25Ω-F, whichever is smaller.</li></ul>                                                                                                          |            |             |               |                                             |                |               |
| 12.            | High Temperature Load (Endurance)                            | <ul style="list-style-type: none"><li>* Test temp. : 125±3°C.</li><li>* Apply voltage : 100% of rated voltage.</li><li>* Test time : 1000 +24/-0 hrs.</li><li>* Measurement to be made after keeping at room temp. for 24±2 hrs (Class I) or 48±4 hrs (Class II).</li></ul>                                                                         | <ul style="list-style-type: none"><li>* No remarkable damage.</li><li>* Cap. change :<br/>C0G : Within ±3.0% or ±0.3pF, whichever is larger.<br/>X7R : Within ±12.5%.</li><li>* Q/D.F. :<br/>C0G : Cap.&gt;30pF, Q≥350; 10pF≤Cap.≤30pF, Q≥275+2.5C; Cap.&lt;10pF, Q≥200+10C.<br/>X7R : D.F.≤200% of initial requirement.</li><li>* I.R. (Class I) : ≥1GΩ or RxC≥50Ω-F, whichever is smaller.</li><li>* I.R. (Class II) : ≥1GΩ or RxC≥10Ω-F, whichever is smaller.</li></ul> |            |             |               |                                             |                |               |
| 13             | Resistance to Flexure of Substrate (Substrate bending test)  | <ul style="list-style-type: none"><li>* The middle part of substrate shall be pressurized by means of the pressurizing rod at a rate of about 1mm per second until the deflection becomes 1mm.</li></ul> <div></div> <p>Unit : mm</p>                            | <ul style="list-style-type: none"><li>*No remarkable damage.</li></ul> <table><thead><tr><th>Dielectric</th><th>Cap. Change</th></tr></thead><tbody><tr><td>Class I (C0G)</td><td>Within ±3.0% or ±2.0pF, whichever is larger</td></tr><tr><td>Class II (X7R)</td><td>Within ±12.5%</td></tr></tbody></table> <p>(This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test)</p>           | Dielectric | Cap. Change | Class I (C0G) | Within ±3.0% or ±2.0pF, whichever is larger | Class II (X7R) | Within ±12.5% |
| Dielectric     | Cap. Change                                                  |                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |             |               |                                             |                |               |
| Class I (C0G)  | Within ±3.0% or ±2.0pF, whichever is larger                  |                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |             |               |                                             |                |               |
| Class II (X7R) | Within ±12.5%                                                |                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |             |               |                                             |                |               |
| 14.            | Adhesive Strength of Termination (Robustness of termination) | <ul style="list-style-type: none"><li>* Capacitors mounted on a substrate. A force of 5N(≤0603) or 10N(&gt;0603) applied perpendicular to the place of substrate and parallel the line joining the center of terminations for 10±1 second.</li></ul> <div></div> | <ul style="list-style-type: none"><li>* No remarkable damage or removal of the terminations.</li></ul>                                                                                                                                                                                                                                                                                                                                                                      |            |             |               |                                             |                |               |

|     |                             |                                                                                                     |                                                                                 |
|-----|-----------------------------|-----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|
| 15. | <b>Vibration Resistance</b> | * Vibration frequency : 10~55 Hz/min.                                                               | * No remarkable damage.<br>* Cap. change and Q/D.F. : To meet the initial spec. |
|     |                             | * Total amplitude : 1.5mm.                                                                          |                                                                                 |
|     |                             | * Test time : 6 hrs. (Two hrs each in three mutually perpendicular directions)                      |                                                                                 |
|     |                             | * Measurement to be made after keeping at room temp. for 24±2 hrs (Class I) or 48±4 hrs (Class II). |                                                                                 |

## Prosperity Dielectrics Co., Ltd.

### 9. PACKAGE DIMENSION AND QUANTITY

| Size       | Thickness (mm)   | Paper tape |          | Plastic tape |          |
|------------|------------------|------------|----------|--------------|----------|
|            |                  | 7" reel    | 13" reel | 7" reel      | 13" reel |
| 0402(1005) | 0.50±0.05        | 10k        | 50K      | -            | -        |
| 0603(1608) | 0.80±0.07        | 4k         | 15k      | -            | -        |
|            | 0.80 +0.15/-0.10 | 4k         | 15k      | -            | -        |
| 0805(2012) | 0.60±0.10        | 4k         | 15k      | -            | -        |
|            | 0.80±0.10        | 4k         | 15k      | -            | -        |
|            | 1.25±0.10        | -          | -        | 3k           | 10k      |
|            | 1.25±0.20        | -          | -        | 3k           | -        |
| 1206(3216) | 0.80±0.10        | 4k         | 15k      | -            | -        |
|            | 0.95±0.10        | -          | -        | 3k           | 10k      |
|            | 1.25±0.10        | -          | -        | 3k           | 10k      |
|            | 1.60±0.20        | -          | -        | 2k           | -        |
| 1210(3225) | 0.95±0.10        | -          | -        | 3k           | 10k      |
|            | 1.25±0.10        | -          | -        | 3k           | 10k      |
|            | 1.60±0.20        | -          | -        | 2k           | -        |
|            | 2.50±0.30        | -          | -        | 1k           | -        |
| 1808(4520) | 1.25±0.10        | -          | -        | 2k           | -        |
|            | 1.60±0.20        | -          | -        | 2k           | -        |
|            | 2.00±0.20        | -          | -        | 1k           | -        |
| 1812(4532) | 1.25±0.10        | -          | -        | 1k           | -        |
|            | 1.60±0.20        | -          | -        | 1k           | -        |
|            | 2.00±0.20        | -          | -        | 1k           | -        |
|            | 2.50±0.30        | -          | -        | 0.5k         | -        |
| 1825(4563) | 1.60±0.20        | -          | -        | 1k           | -        |
|            | 2.00±0.20        | -          | -        | 1k           | -        |
|            | 2.50±0.30        | -          | -        | 0.5k         | -        |
|            | 2.80±0.30        | -          | -        | 0.5k         | -        |
| 2211(5728) | 1.60±0.20        | -          | -        | 1k           | -        |
|            | 2.00±0.20        | -          | -        | 1k           | -        |
|            | 2.50±0.30        | -          | -        | 0.5k         | -        |
|            | 2.80±0.30        | -          | -        | 0.5k         | -        |
| 2220(5750) | 1.60±0.20        | -          | -        | 1k           | -        |
|            | 2.00±0.20        | -          | -        | 1k           | -        |
|            | 2.50±0.30        | -          | -        | 0.5k         | -        |
|            | 2.80±0.30        | -          | -        | 0.5k         | -        |
| 2225(5763) | 1.60±0.20        | -          | -        | 1k           | -        |
|            | 2.00±0.20        | -          | -        | 1k           | -        |
|            | 2.50±0.30        | -          | -        | 0.5k         | -        |
|            | 2.80±0.30        | -          | -        | 0.5k         | -        |

Unit : pcs

## Prosperity Dielectrics Co., Ltd.

### 9. PACKAGE DIMENSION AND QUANTITY

#### 9.1. PAPER TAPE DIMENSIONS

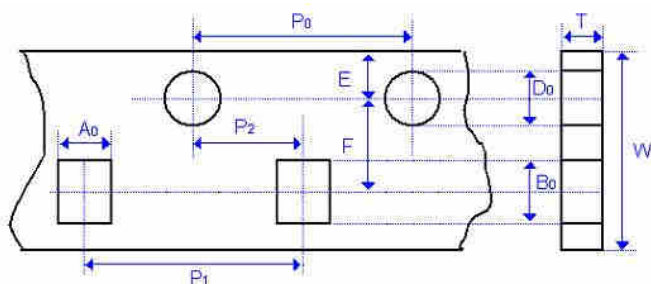


Fig. 9.1 The dimension of paper tape

#### 9.2. EMBOSSED TAPE DIMENSIONS

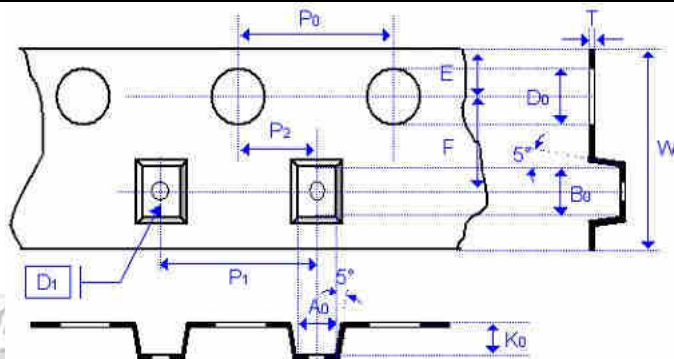


Fig. 9.2 The dimension of plastic tape

| Size              | 0603                |                     | 0805       |                        | 1206       |                        |                            |
|-------------------|---------------------|---------------------|------------|------------------------|------------|------------------------|----------------------------|
| Chip Thickness    | 0.80±0.07           | 0.80<br>+0.15/-0.1  | 0.80±0.10  | 1.25±0.10<br>1.25±0.20 | 0.80±0.10  | 0.95±0.10<br>1.25±0.10 | 1.60±0.20<br>1.60±0.3/-0.1 |
| A <sub>0</sub>    | 1.00<br>+0.05/-0.10 | 1.02<br>+0.05/-0.10 | 1.50±0.10  | <1.65                  | 2.00±0.10  | <2.00                  | <2.00                      |
| B <sub>0</sub>    | 1.80±0.10           | 1.80±0.10           | 2.30±0.10  | <2.40                  | 3.50±0.10  | <3.60                  | <3.70                      |
| T                 | 0.95±0.05           | 0.97±0.05           | 0.95±0.05  | 0.23±0.05              | 0.95±0.05  | 0.23±0.05              | 0.23±0.05                  |
| K <sub>0</sub>    | -                   | -                   | -          | <2.50                  | -          | <2.50                  | <2.50                      |
| W                 | 8.00±0.10           | 8.00±0.10           | 8.00±0.10  | 8.00±0.10              | 8.00±0.10  | 8.00±0.10              | 8.00±0.10                  |
| P <sub>0</sub>    | 4.00±0.10           | 4.00±0.10           | 4.00±0.10  | 4.00±0.10              | 4.00±0.10  | 4.00±0.10              | 4.00±0.10                  |
| 10xP <sub>0</sub> | 40.00±0.20          | 40.00±0.20          | 40.00±0.20 | 40.00±0.20             | 40.00±0.20 | 40.00±0.20             | 40.00±0.20                 |
| P <sub>1</sub>    | 4.00±0.10           | 4.00±0.10           | 4.00±0.10  | 4.00±0.10              | 4.00±0.10  | 4.00±0.10              | 4.00±0.10                  |
| P <sub>2</sub>    | 2.00±0.05           | 2.00±0.05           | 2.00±0.05  | 2.00±0.05              | 2.00±0.05  | 2.00±0.05              | 2.00±0.05                  |
| D <sub>0</sub>    | 1.55±0.05           | 1.55±0.05           | 1.55±0.05  | 1.50 +0.10/-0          | 1.55±0.05  | 1.50 +0.10/-0          | 1.50 +0.10/-0              |
| D <sub>1</sub>    | -                   | -                   | -          | 1.00±0.10              | -          | 1.00±0.10              | 1.00±0.10                  |
| E                 | 1.75±0.05           | 1.75±0.05           | 1.75±0.05  | 1.75±0.10              | 1.75±0.10  | 1.75±0.10              | 1.75±0.10                  |
| F                 | 3.50±0.05           | 3.50±0.05           | 3.50±0.05  | 3.50±0.05              | 3.50±0.05  | 3.50±0.05              | 3.50±0.05                  |
| Unit :            | mm                  | mm                  | mm         | mm                     | mm         | mm                     | mm                         |

| Size              | 1210                                |            | 1808                   |            | 1812                                |            |
|-------------------|-------------------------------------|------------|------------------------|------------|-------------------------------------|------------|
| Chip Thickness    | 0.95±0.10<br>1.25±0.10<br>1.60±0.20 | 2.50±0.30  | 1.25±0.10<br>1.60±0.20 | 2.00±0.20  | 1.25±0.10<br>1.60±0.20<br>2.00±0.20 | 2.50±0.30  |
| A <sub>0</sub>    | <3.05                               | <3.10      | <2.50                  | <2.50      | <3.90                               | <3.90      |
| B <sub>0</sub>    | <3.80                               | <4.00      | <5.30                  | <5.30      | <5.30                               | <5.30      |
| T                 | 0.23±0.05                           | 0.23±0.05  | 0.25±0.05              | 0.25±0.05  | 0.25±0.05                           | 0.25±0.05  |
| K <sub>0</sub>    | <2.50                               | <3.50      | <2.50                  | <2.50      | <2.50                               | <3.00      |
| W                 | 8.00±0.10                           | 8.00±0.10  | 12.00±0.20             | 12.00±0.20 | 12.00±0.20                          | 12.00±0.20 |
| P <sub>0</sub>    | 4.00±0.10                           | 4.00±0.10  | 4.00±0.10              | 4.00±0.10  | 4.00±0.10                           | 4.00±0.10  |
| 10xP <sub>0</sub> | 40.00±0.20                          | 40.00±0.20 | 40.00±0.20             | 40.00±0.20 | 40.00±0.20                          | 40.00±0.20 |
| P <sub>1</sub>    | 4.00±0.10                           | 4.00±0.10  | 4.00±0.10              | 4.00±0.10  | 8.00±0.10                           | 8.00±0.10  |
| P <sub>2</sub>    | 2.00±0.05                           | 2.00±0.05  | 2.00±0.05              | 2.00±0.05  | 2.00±0.05                           | 2.00±0.05  |

|                      |               |               |               |               |               |               |
|----------------------|---------------|---------------|---------------|---------------|---------------|---------------|
| <b>D<sub>0</sub></b> | 1.50 +0.10/-0 | 1.50 +0.10/-0 | 1.50 +0.10/-0 | 1.50 +0.10/-0 | 1.50 +0.10/-0 | 1.50 +0.10/-0 |
| <b>D<sub>1</sub></b> | 1.00±0.10     | 1.00±0.10     | 1.50±0.10     | 1.50±0.10     | 1.50±0.10     | 1.50±0.10     |
| <b>E</b>             | 1.75±0.10     | 1.75±0.10     | 1.75±0.10     | 1.75±0.10     | 1.75±0.10     | 1.75±0.10     |
| <b>F</b>             | 3.50±0.05     | 3.50±0.05     | 5.50±0.05     | 5.50±0.05     | 5.50±0.05     | 5.50±0.05     |
| <b>Unit :</b>        | mm            | mm            | mm            | mm            | mm            | mm            |

## Prosperity Dielectrics Co., Ltd.

### 9. PACKAGE DIMENSION AND QUANTITY

| Size                    | 1825                   |                  | 2211                   |                  | 2220                                |                  | 2225                   |                  |
|-------------------------|------------------------|------------------|------------------------|------------------|-------------------------------------|------------------|------------------------|------------------|
| <b>Chip Thickness</b>   | 1.60±0.20<br>2.00±0.20 | 2.50±0.30        | 1.60±0.20<br>2.00±0.20 | 2.50±0.30        | 1.40±0.15<br>1.60±0.20<br>2.00±0.20 | 2.50±0.30        | 1.60±0.20<br>2.00±0.20 | 2.50±0.30        |
| <b>A<sub>0</sub></b>    | <6.80                  | <6.80            | <3.30                  | <3.30            | <5.80                               | <5.80            | <6.80                  | <6.80            |
| <b>B<sub>0</sub></b>    | <5.30                  | <5.30            | <6.50                  | <6.50            | <6.50                               | <6.50            | <6.50                  | <6.50            |
| <b>T</b>                | 0.30±0.10              | 0.30±0.10        | 0.30±0.10              | 0.30±0.10        | 0.30±0.10                           | 0.30±0.10        | 0.30±0.10              | 0.30±0.10        |
| <b>K<sub>0</sub></b>    | <2.50                  | <3.10            | <2.50                  | <3.10            | <2.50                               | <3.10            | <2.50                  | <3.10            |
| <b>W</b>                | 12.00±0.20             | 12.00±0.20       | 12.00±0.20             | 12.00±0.20       | 12.00±0.20                          | 12.00±0.20       | 12.00±0.20             | 12.00±0.20       |
| <b>P<sub>0</sub></b>    | 4.00±0.10              | 4.00±0.10        | 4.00±0.10              | 4.00±0.10        | 4.00±0.10                           | 4.00±0.10        | 4.00±0.10              | 4.00±0.10        |
| <b>10xP<sub>0</sub></b> | 40.00±0.20             | 40.00±0.20       | 40.00±0.20             | 40.00±0.20       | 40.00±0.20                          | 40.00±0.20       | 40.00±0.20             | 40.00±0.20       |
| <b>P<sub>1</sub></b>    | 8.00±0.10              | 8.00±0.10        | 8.00±0.10              | 8.00±0.10        | 8.00±0.10                           | 8.00±0.10        | 8.00±0.10              | 8.00±0.10        |
| <b>P<sub>2</sub></b>    | 2.00±0.05              | 2.00±0.05        | 2.00±0.05              | 2.00±0.05        | 2.00±0.05                           | 2.00±0.05        | 2.00±0.05              | 2.00±0.05        |
| <b>D<sub>0</sub></b>    | 1.50<br>+0.10/-0       | 1.50<br>+0.10/-0 | 1.50<br>+0.10/-0       | 1.50<br>+0.10/-0 | 1.50<br>+0.10/-0                    | 1.50<br>+0.10/-0 | 1.50<br>+0.10/-0       | 1.50<br>+0.10/-0 |
| <b>D<sub>1</sub></b>    | 1.50±0.10              | 1.50±0.10        | 1.50±0.10              | 1.50±0.10        | 1.50±0.10                           | 1.50±0.10        | 1.50±0.10              | 1.50±0.10        |
| <b>E</b>                | 1.75±0.10              | 1.75±0.10        | 1.75±0.10              | 1.75±0.10        | 1.75±0.10                           | 1.75±0.10        | 1.75±0.10              | 1.75±0.10        |
| <b>F</b>                | 5.50±0.05              | 5.50±0.05        | 5.50±0.05              | 5.50±0.05        | 5.50±0.05                           | 5.50±0.05        | 5.50±0.05              | 5.50±0.05        |
| <b>Unit :</b>           | mm                     | mm               | mm                     | mm               | mm                                  | mm               | mm                     | mm               |

### 9.3. REEL DIMENSIONS

| Size                 | 0603, 0805, 1206, 1210 |                   | 1808, 1812, 1825, 2211, 2220, 2225 |
|----------------------|------------------------|-------------------|------------------------------------|
| <b>Reel size</b>     | 7"                     | 13"               | 7"                                 |
| <b>C</b>             | 13.0<br>+0.5/-0.2      | 13.0<br>+0.7/-0.3 | 13.0<br>+0.5/-0.2                  |
| <b>W<sub>1</sub></b> | 8.4<br>+1.5/-0         | 8.4<br>+2.0/-0    | 12.4<br>+2.0/-0                    |
| <b>A</b>             | 178.0<br>±0.10         | 330.0<br>±1.0     | 178.0<br>±0.10                     |
| <b>N</b>             | 60.0<br>+1.0/-0        | 100<br>±1.0       | 60.0<br>+1.0/-0                    |

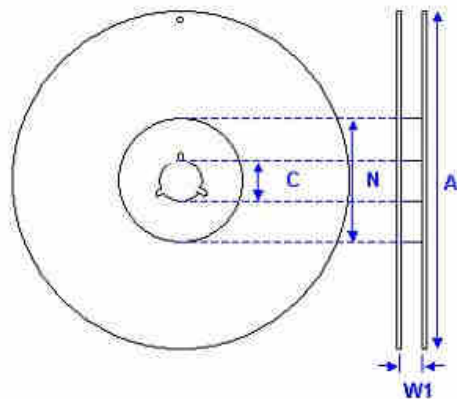


Fig. 9.3 The dimension of reel

## Prosperity Dielectrics Co., Ltd.

### 10. APPLICATION NOTES

#### STORAGE

To prevent the damage of solderability of terminations, the following storage conditions are recommended :

Indoors under 5 ~ 40°C and 20% ~ 70% RH.

No harmful gases containing sulfuric acid, ammonia, hydrogen sulfide or chlorine.

Packaging should not be opened until the capacitors are required for use. If opened, the pack should be re-sealed as soon as is practicable. Taped product should be stored out of direct sunlight, which might promote deterioration in tape or adhesion performance. The product is recommended to be used within 12 months after shipment and checked the solderability before use.

#### HANDLING

Chip capacitors are dense, hard, brittle, and abrasive materials. They are liable to suffer mechanical damage, in the form of cracks or chips. Chip Capacitors should be handled with care to avoid contamination or damage. To use vacuum or plastic tweezers to pick up or plastic tweezers is recommended for manual placement. Tape and reeled packages are suitable for automatic pick and placement machine.

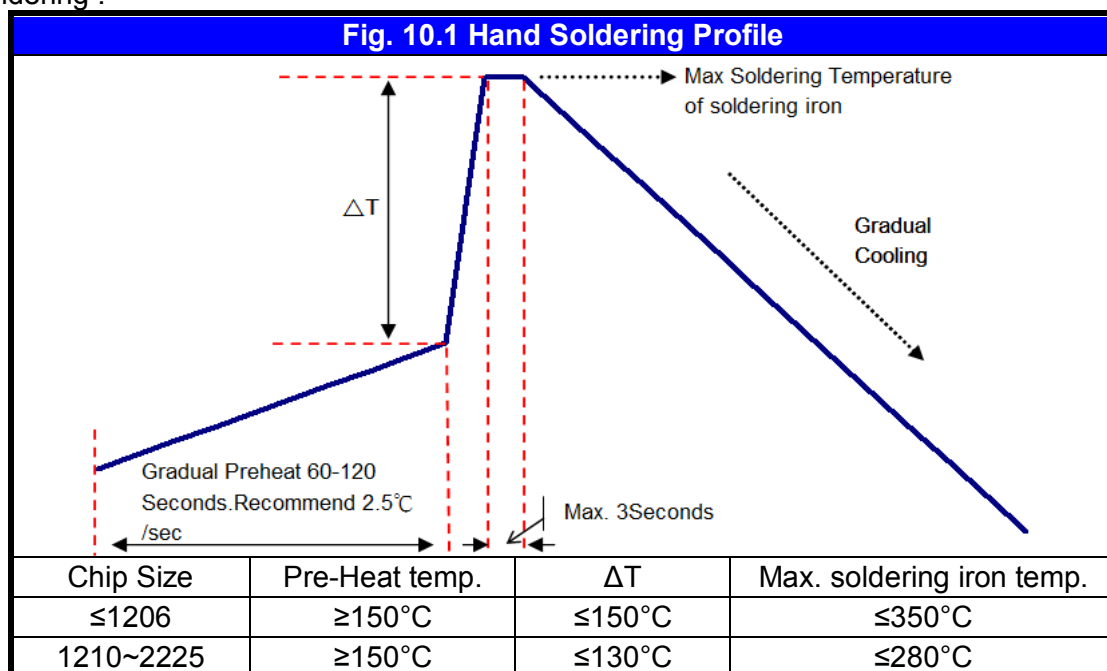
#### PREHEAT

In order to minimize the risk of thermal shock during soldering, a carefully controlled preheat is required. The rate of preheat should not exceed 3°C per second.

#### SOLDERING

Use middy activated rosin RA and RMA fluxes do not use activated flux. The amount of solder in each solder joint should be controlled to prevent the damage of chip capacitors caused by the stress between solder, chips, and substrate.

a.) Hand soldering :



\* Soldering iron tip diameter  $\leq 1.0$  mm and wattage max. 20W.

\* The Capacitors shall be pre-heated and that the temperature gradient between the devices and the tip of the  
Specification No. : FV-000-001-22 ~ 14 ~

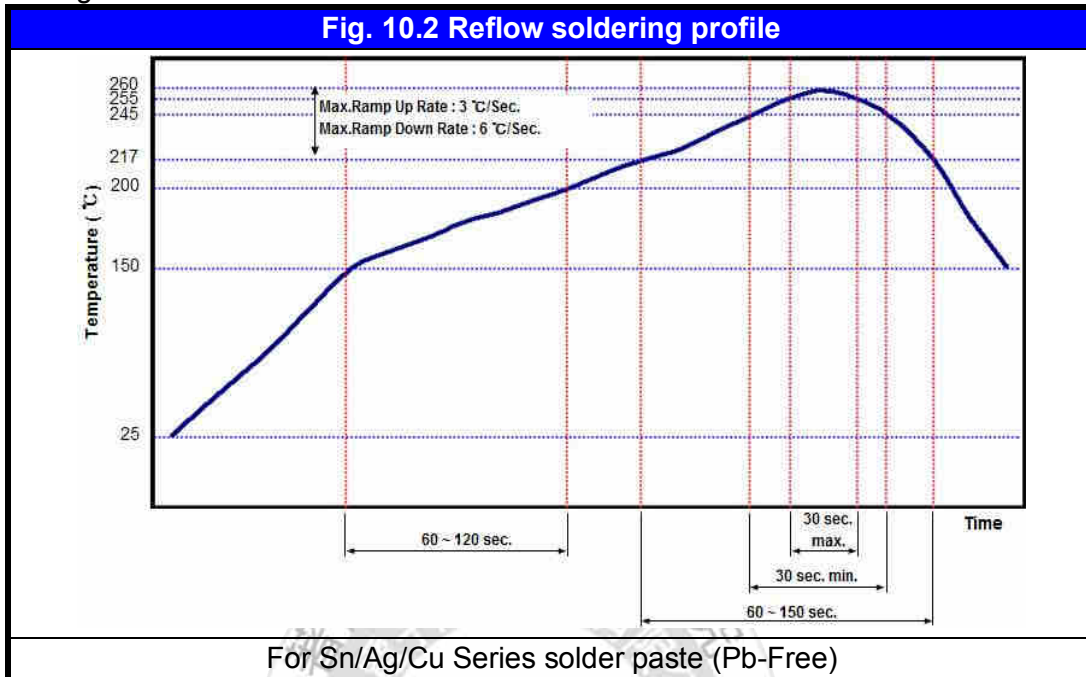
soldering iron.

- \* The required amount of solder shall be melted on the soldering tip.
- \* The tip of iron should not contact the ceramic body directly.
- \* The Capacitors shall be cooled gradually at room temperature after soldering.
- \* Forced air cooling is not allowed.

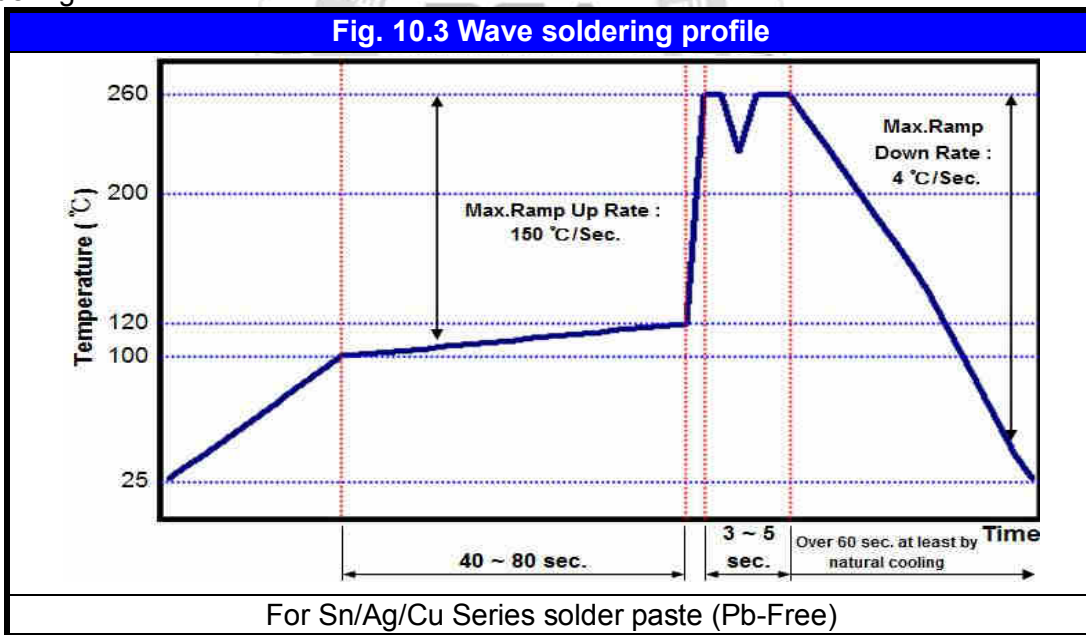


## 10. APPLICATION NOTES

b.) Reflow soldering :



c.) Wave soldering :



Soldering conditions :

Class I :

| Size Inch (mm) | Temper. Cher. | Capacitance | Condition |        |
|----------------|---------------|-------------|-----------|--------|
|                |               |             | Wave      | Reflow |
| ≤0402 (1005)   | Class I - C0G | All         | X         | O      |
| 0603 (1608)    | Class I - C0G | All         | O         | O      |
| 0805 (2012)    | Class I - C0G | All         | O         | O      |
| 1206 (3216)    | Class I - C0G | All         | O         | O      |
| ≥1210 (3225)   | Class I - C0G | All         | X         | O      |

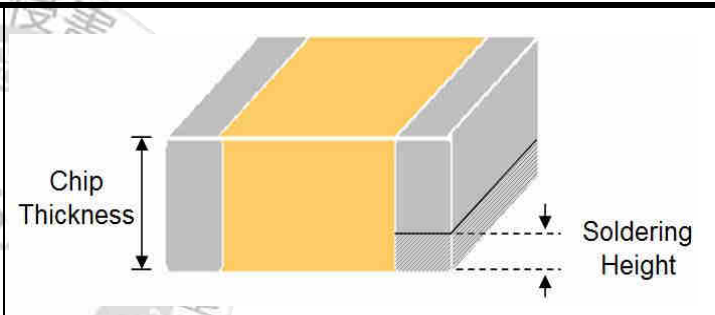
## 10. APPLICATION NOTES

Soldering conditions :  
 Class II :

| Size Inch (mm) | Temper. Cher.  | Capacitance | Condition |        |
|----------------|----------------|-------------|-----------|--------|
|                |                |             | Wave      | Reflow |
| ≤0402 (1005)   | Class II - X7R | All         | X         | O      |
| 0603 (1608)    | Class II - X7R | Cap. <2.2μF | O         | O      |
|                |                | Cap. ≥2.2μF | X         | O      |
| 0805 (2012)    | Class II - X7R | Cap. <4.7μF | O         | O      |
|                |                | Cap. ≥4.7μF | X         | O      |
| 1206 (3216)    | Class II - X7R | Cap. <4.7μF | O         | O      |
|                |                | Cap. ≥4.7μF | X         | O      |
| ≥1210 (3225)   | Class II - X7R | All         | X         | O      |

Soldering height :

The solder climbing minimum height is suggesting to 25% of chip thickness or 500um whichever is less.  
 (Reference from IPC-610E)



### COOLING

After soldering, cool the chips and the substrate gradually to room temperature. Natural cooling in air is recommended to minimize stress in the solder joint.

### CLEANING

All flux residues must be removed by using suitable electronic-grade vapor-cleaning solvents to eliminate contamination that could cause electrolytic surface corrosion. Good results can be obtained by using ultrasonic cleaning of the solvent. The choice of the proper system is depends upon many factors such as component mix, flux, and solder paste and assembly method. The ability of the cleaning system to remove flux residues and contamination from under the chips is very important.

Surface coating products are not suitable cleaning/washing by solvent