

# DATA SHEET

## MULTILAYER CERAMIC CAPACITORS

CC Series  
NP0  
16V TO 100V

[www.yageo.com](http://www.yageo.com)



SCOPE

This specification describes Yageo CC NP0 series chip capacitors.

ORDERING INFORMATION

Part number is identified by the series, size, tolerance, packing style, temperature coefficient, rated voltage and capacitance value.

CC xxxx x x NP0 x BN xxx  
(1) (2) (3) (4) (5)

(1) SIZE

0402 (1005)  
0603 (1608)  
0805 (2012)  
1206 (3216)  
1210 (3225)  
1812 (4832)

(2) TOLERANCE

B =  $\pm 0.1\text{pF}$   
C =  $\pm 0.25\text{pF}$   
D =  $\pm 0.5\text{pF}$   
F =  $\pm 1\%$   
G =  $\pm 2\%$   
J =  $\pm 5\%$

(3) PACKING STYLE

R = 7" paper tape  
K = 7" blister tape  
P = 13" paper tape  
F = 13" blister tape  
C = Bulk case

(4) RATED VOLTAGE

7 = 16V  
8 = 25V  
9 = 50V  
0 = 100V

(5) CAPACITANCE VALUE:

First two for significant figures and 3rd  
for number of zero  
Letter "R" for decimal point

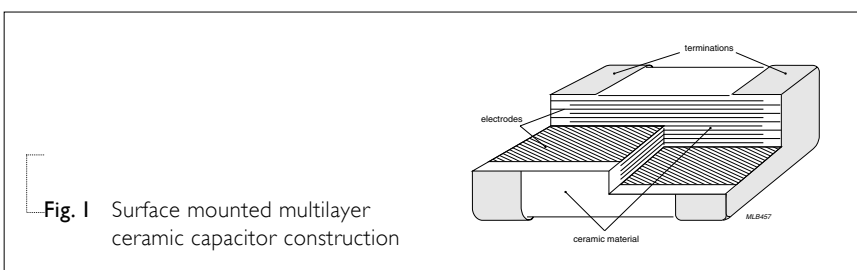
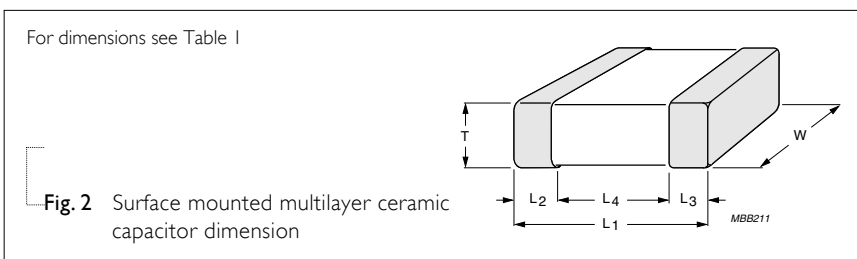
CONSTRUCTIONDIMENSION

Table I

| TYPE                                    |      | CC0402         | CC0603         | CC0805          | CC1206         | CC1210         | CC1812         |
|-----------------------------------------|------|----------------|----------------|-----------------|----------------|----------------|----------------|
| <b>L<sub>1</sub> (mm)</b>               |      | 1.0 $\pm$ 0.05 | 1.6 $\pm$ 0.10 | 2.0 $\pm$ 0.10  | 3.2 $\pm$ 0.15 | 3.2 $\pm$ 0.20 | 4.5 $\pm$ 0.20 |
| <b>W (mm)</b>                           |      | 0.5 $\pm$ 0.05 | 0.8 $\pm$ 0.07 | 1.25 $\pm$ 0.10 | 1.6 $\pm$ 0.15 | 2.5 $\pm$ 0.20 | 3.2 $\pm$ 0.20 |
| <b>T (mm)</b>                           | min. | 0.45           | 0.73           | 0.50            | 0.50           | 0.50           | 0.50           |
|                                         | max. | 0.55           | 0.87           | 1.35            | 1.35           | 1.80           | 1.80           |
| <b>L<sub>2</sub>/L<sub>3</sub> (mm)</b> | min. | 0.15           | 0.20           | 0.25            | 0.25           | 0.25           | 0.25           |
|                                         | max. | 0.30           | 0.50           | 0.75            | 0.75           | 0.75           | 0.75           |
| <b>L<sub>4</sub> (mm)</b>               | min. | 0.40           | 0.60           | 0.55            | 1.40           | 1.40           | 2.20           |

## CAPACITANCE RANGE &amp; THICKNESS FOR 16V &amp; 25V

Table 2

| CAPACITANCE<br>(pF) | 16V<br>0402 | 0603     | 25V<br>0402 | 0603     | 0805     | 1206     | 1210     |
|---------------------|-------------|----------|-------------|----------|----------|----------|----------|
| 150                 |             |          |             |          |          |          |          |
| 180                 |             |          | 0.5±0.05    |          |          |          |          |
| 220                 |             |          |             |          |          |          |          |
| 270                 |             |          |             |          |          |          |          |
| 330                 | 0.5±0.05    |          |             |          |          |          |          |
| 390                 |             |          |             |          |          |          |          |
| 470                 |             |          |             |          |          |          |          |
| 560                 |             |          |             |          |          |          |          |
| 680                 |             |          |             |          |          |          |          |
| 820                 |             |          |             |          |          |          |          |
| 1,000               |             |          |             | 0.8±0.07 |          |          |          |
| 1,200               |             |          |             |          |          |          |          |
| 1,500               |             |          |             |          |          |          |          |
| 1,800               |             |          |             |          |          |          |          |
| 2,200               |             | 0.8±0.07 |             |          |          |          |          |
| 2,700               |             |          |             |          |          |          |          |
| 3,300               |             |          |             |          | 0.85±0.1 |          |          |
| 3,900               |             |          |             |          | 1.25±0.1 |          |          |
| 4,700               |             |          |             |          |          |          |          |
| 5,600               |             |          |             |          |          |          |          |
| 6,800               |             |          |             |          |          |          |          |
| 8,200               |             |          |             |          |          | 0.85±0.1 |          |
| 10,000              |             |          |             |          |          |          |          |
| 12,000              |             |          |             |          |          |          | 0.6±0.1  |
| 15,000              |             |          |             |          |          |          |          |
| 18,000              |             |          |             |          |          |          | 0.85±0.1 |
| 22,000              |             |          |             |          |          |          | 1.15±0.1 |

## CAPACITANCE RANGE &amp; THICKNESS FOR 50V &amp; 100V

Table 3

| CAPACITANCE<br>(pF) | 50V<br>0402 | 0603     | 0805    | 1206    | 1210 | 1812 | 100V<br>0603 | 0805    | 1206    | 1210 | 1812 |
|---------------------|-------------|----------|---------|---------|------|------|--------------|---------|---------|------|------|
| 0.47                |             |          |         |         |      |      |              |         |         |      |      |
| 0.56                |             |          |         |         |      |      |              |         |         |      |      |
| 0.68                |             |          |         |         |      |      |              |         |         |      |      |
| 0.82                |             |          |         |         |      |      |              |         |         |      |      |
| 1.0                 |             |          |         |         |      |      |              |         |         |      |      |
| 1.2                 |             |          |         |         |      |      |              |         |         |      |      |
| 1.5                 |             |          |         |         |      |      |              |         |         |      |      |
| 1.8                 |             |          |         |         |      |      |              |         |         |      |      |
| 2.2                 |             |          |         |         |      |      |              |         |         |      |      |
| 2.7                 |             |          |         |         |      |      |              |         |         |      |      |
| 3.3                 |             |          |         |         |      |      |              |         |         |      |      |
| 3.9                 |             |          |         |         |      |      |              |         |         |      |      |
| 4.7                 |             |          |         |         |      |      |              |         |         |      |      |
| 5.6                 |             |          |         |         |      |      |              |         |         |      |      |
| 6.8                 |             |          |         |         |      |      |              |         |         |      |      |
| 8.2                 |             |          |         |         |      |      |              |         |         |      |      |
| 10                  | 0.5±0.05    | 0.8±0.07 | 0.6±0.1 | 0.6±0.1 |      |      |              |         |         |      |      |
| 12                  |             |          |         |         |      |      |              |         |         |      |      |
| 15                  |             |          |         |         |      |      |              |         |         |      |      |
| 18                  |             |          |         |         |      |      |              |         |         |      |      |
| 22                  |             |          |         |         |      |      |              |         |         |      |      |
| 27                  |             |          |         |         |      |      |              |         |         |      |      |
| 33                  |             |          |         |         |      |      |              |         |         |      |      |
| 39                  |             |          |         |         |      |      |              |         |         |      |      |
| 47                  |             |          |         |         |      |      | 0.8±0.07     | 0.6±0.1 | 0.6±0.1 |      |      |
| 56                  |             |          |         |         |      |      |              |         |         |      |      |
| 82                  |             |          |         |         |      |      |              |         |         |      |      |
| 100                 |             |          |         |         |      |      |              |         |         |      |      |
| 120                 |             |          |         |         |      |      |              |         |         |      |      |
| 150                 |             |          |         |         |      |      |              |         |         |      |      |
| 180                 |             |          |         |         |      |      |              |         |         |      |      |
| 220                 |             |          |         |         |      |      |              |         |         |      |      |

**CAPACITANCE RANGE & THICKNESS FOR 50V & 100V (CONT.)**

Table 4

| CAPACITANCE<br>(pF) | 50V<br>0402 | 0603     | 0805     | 1206     | 1210     | 1812     | 100V<br>0603 | 0805     | 1206     | 1210     | 1812     |
|---------------------|-------------|----------|----------|----------|----------|----------|--------------|----------|----------|----------|----------|
| 270                 |             |          |          |          |          |          |              |          |          |          |          |
| 330                 |             |          |          |          |          |          |              |          |          |          |          |
| 390                 |             | 0.8±0.07 |          |          |          |          | 0.8±0.07     |          |          |          |          |
| 470                 |             |          | 0.6±0.1  |          |          |          |              | 0.6±0.1  |          |          |          |
| 560                 |             |          |          |          |          |          |              |          |          |          |          |
| 680                 |             |          |          |          |          |          |              |          |          |          |          |
| 820                 |             |          |          | 0.6±0.1  |          |          |              |          | 0.6±0.1  |          |          |
| 1,000               |             |          |          |          |          |          |              |          |          |          |          |
| 1,200               |             |          |          |          |          |          |              |          |          |          |          |
| 1,500               |             |          | 0.85±0.1 |          |          |          |              | 0.85±0.1 |          |          |          |
| 1,800               |             |          |          |          |          |          |              |          |          |          |          |
| 2,200               |             |          | 1.25±0.1 |          | 0.6±0.1  |          |              | 1.25±0.1 |          |          |          |
| 2,700               |             |          |          |          |          |          |              |          |          |          |          |
| 3,300               |             |          |          |          |          |          |              |          |          |          |          |
| 3,900               |             |          |          | 0.85±0.1 |          |          |              |          | 0.85±0.1 |          |          |
| 4,700               |             |          |          |          |          | 0.6±0.1  |              |          |          |          |          |
| 5,600               |             |          |          | 1.15±0.1 |          |          |              |          | 1.15±0.1 |          |          |
| 6,800               |             |          |          |          | 0.85±0.1 |          |              |          |          |          |          |
| 8,200               |             |          |          |          |          |          |              |          |          | 0.85±0.1 |          |
| 10,000              |             |          |          |          |          |          |              |          |          |          |          |
| 12,000              |             |          |          |          |          | 0.85±0.1 |              |          |          |          | 0.85±0.1 |
| 15,000              |             |          |          |          |          |          |              |          |          |          |          |
| 18,000              |             |          |          |          |          | 1.15±0.1 |              |          |          |          | 1.15±0.1 |
| 22,000              |             |          |          |          |          |          |              |          |          |          |          |

**THICKNESS CLASSES AND PACKING QUANTITY**

Table 5

| THICKNESS<br>CLASSIFICATION<br>(mm) | 8mm TAPE WIDTH / AMOUNT PER REEL |         |             |         | 12mm TAPE WIDTH /<br>AMOUNT PER REEL |  | AMOUNT PER BULK CASE |        |        |
|-------------------------------------|----------------------------------|---------|-------------|---------|--------------------------------------|--|----------------------|--------|--------|
|                                     | Ø180mm, 7"                       |         | Ø330mm, 13" |         | Ø180mm, 7" Blister                   |  |                      |        |        |
|                                     | Paper                            | Blister | Paper       | Blister | 1812                                 |  | 0402                 | 0603   | 0805   |
| 0.5±0.05                            | 10,000                           | ---     | 50,000      | ---     | ---                                  |  | 50,000               | ---    | ---    |
| 0.6±0.1                             | 4,000                            | ---     | 20,000      | ---     | ---                                  |  | ---                  | ---    | 10,000 |
| 0.8±0.07                            | 4,000                            | ---     | 15,000      | ---     | ---                                  |  | ---                  | 15,000 | ---    |
| 0.85±0.1                            | 4,000                            | ---     | 15,000      | ---     | ---                                  |  | ---                  | ---    | 8,000  |
| 1.15±0.1                            | ---                              | 3,000   | ---         | 10,000  | ---                                  |  | ---                  | ---    | ---    |
| 1.25±0.1                            | ---                              | 3,000   | ---         | 10,000  | ---                                  |  | ---                  | ---    | 5,000  |

**ELECTRICAL CHARACTERISTICS**

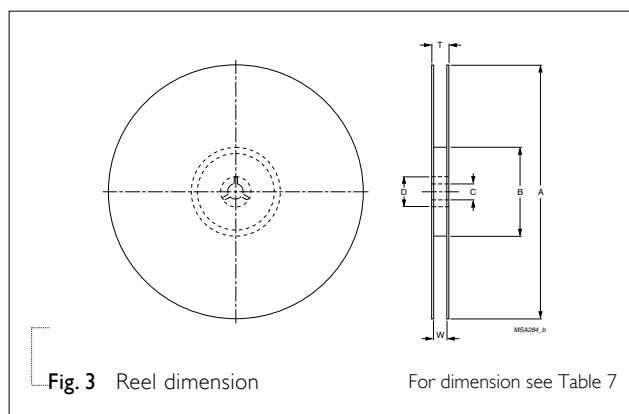
Table 6

| CHARACTERISTICS                             | TEST CONDITIONS                                                                                                      | REQUIREMENT                                                                                                                    |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| Operation temperature range                 | ---                                                                                                                  | -55°C to +125°C                                                                                                                |
| Temperature characteristic/coefficient (TC) | With respect to 20°C within operation temperature range                                                              | NP0=16V, 0±60ppm/K<br>NP0>16V, 0±30ppm/K                                                                                       |
| Capacitance tolerance                       | With respect to 20°C<br>C≤1000pF 1Vrms/1MHz<br>C>1000pF 1Vrms/1KHz                                                   | C<5; ±0.1pF, ±0.25pF<br>C≥5; ±0.25pF, ±0.5pF<br>C≥10pF; ±2%, ±5%                                                               |
| Dissipation factor (D.F.)                   | With respect to 20°C<br>C≤1,000pF 1Vrms/1MHz<br>C>1,000pF 1Vrms/1KHz                                                 | C<10pF<br>D.F. ≤10(3/C+0.7) ×10 <sup>-4</sup><br>or 30×10 <sup>-4</sup> whichever is less<br>C≥10pF, D.F. ≤10×10 <sup>-4</sup> |
| Insulation resistance (IR)                  | At U <sub>r</sub> (rated voltage) for 1 minute<br>U <sub>r</sub> >500V, at 500V(DC) for 1 minute                     | R <sub>ins</sub> >10GΩ or R <sub>ins</sub> × C ≥500s<br>whichever is less                                                      |
| Dielectric withstanding Voltage             | At 2.5 × U <sub>r</sub> (for U <sub>r</sub> ≤100V)<br>1.5 × U <sub>r</sub> +100V (for U <sub>r</sub> >100V) for 5sec | No breakdown                                                                                                                   |

## TAPING REEL

Table 7

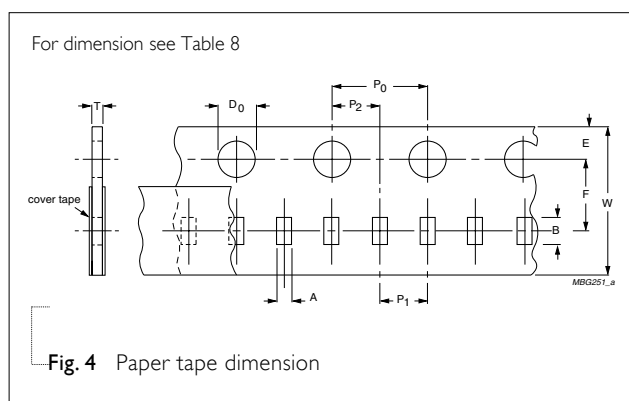
| TAPE WIDE             | 8mm           | 8mm           | 12mm          |
|-----------------------|---------------|---------------|---------------|
| ØA (mm)               | 180           | 330           | 180           |
| ØB (mm)               | 62±1.5        | 62±1.5        | 62±1.5        |
| ØD (mm)               | 20.5          | 20.5          | 20.5          |
| ØC (mm)               | 12.75±0.15/-0 | 12.75±0.15/-0 | 12.75±0.15/-0 |
| W (mm)                | 8.4±1.5/-0    | 8.4±1.5/-0    | 12.4±2/-0     |
| T <sub>max</sub> (mm) | 14.4          | 14.4          | 18.4          |



## PAPER TAPE SPECIFICATION

Table 8

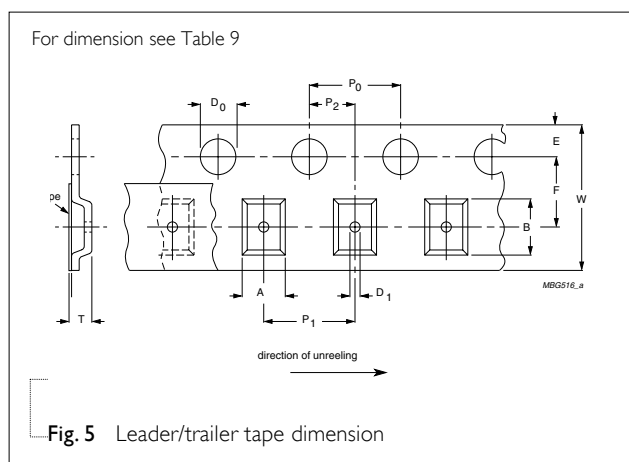
| DIMENSION            | 0402      | 0603      | 0805       | 1206       |
|----------------------|-----------|-----------|------------|------------|
| A (mm)               | 0.62±0.05 | 1.10±0.05 | 1.65±0.05  | 2.0±0.1    |
| B (mm)               | 1.12±0.05 | 1.90±0.05 | 2.4±0.05   | 3.5±0.1    |
| W (mm)               | 8.0±0.2   | 8.0±0.2   | 8.0±0.2    | 8.0±0.2    |
| E (mm)               | 1.75±0.1  | 1.75±0.1  | 1.75±0.1   | 1.75±0.1   |
| F (mm)               | 3.5±0.05  | 3.5±0.05  | 3.5±0.05   | 3.5±0.05   |
| P <sub>0</sub> (mm)  | 4±0.05    | 4±0.05    | 4±0.05     | 4±0.05     |
| P <sub>1</sub> (mm)  | 2±0.05    | 4±0.1     | 4±0.1      | 4±0.1      |
| P <sub>2</sub> (mm)  | 2±0.05    | 2±0.05    | 2±0.05     | 2±0.05     |
| ØD <sub>0</sub> (mm) | 1.5±0.1   | 1.5±0.1   | 1.5±0.1/-0 | 1.5±0.1/-0 |
| T (mm)               | 0.6±0.05  | 0.95±0.05 | 0.95±0.05  | 0.95±0.05  |



## BLISTER TAPE SPECIFICATION

Table 9

| DIMENSION             | 0805       | 1206       | 1210       | 1812       |
|-----------------------|------------|------------|------------|------------|
| A (mm)                | 0.20       | 0.30       | 0.30       | 0.40       |
| B (mm)                | 0.20       | 0.30       | 0.30       | 0.40       |
| W (mm)                | 8.1±0.2    | 8.1±0.2    | 8.1±0.2    | 12.0±0.2   |
| E (mm)                | 1.75±0.1   | 1.75±0.1   | 1.75±0.1   | 1.75±0.1   |
| F (mm)                | 3.5±0.05   | 3.5±0.05   | 3.5±0.05   | 5.5±0.05   |
| P <sub>0</sub> (mm)   | 4±0.1      | 4±0.1      | 4±0.1      | 4±0.1      |
| P <sub>1</sub> (mm)   | 4±0.1      | 4±0.1      | 4±0.1      | 8±0.1      |
| P <sub>2</sub> (mm)   | 2±0.05     | 2±0.05     | 2±0.05     | 2±0.05     |
| ØD <sub>0</sub> (mm)  | 1.5±0.1/-0 | 1.5±0.1/-0 | 1.5±0.1/-0 | 1.5±0.1/-0 |
| T <sub>max</sub> (mm) | 3.5        | 3.5        | 3.5        | 3.5        |



## PACKING METHOD

### LEADER/TRAILER TAPE SPECIFICATION

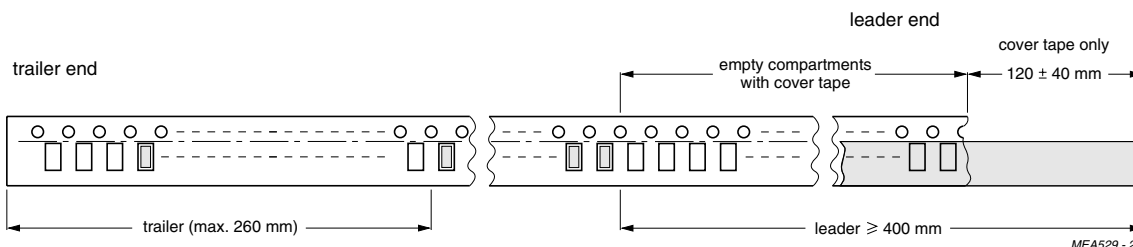


Fig. 6 Leader and trailer tape dimension

## METHOD OF MOUNTING

For normal use the capacitors may be mounted on printed-circuit boards or ceramic substrates by applying wave soldering, reflow soldering (including vapor phase soldering) or conductive adhesive in accordance with CECC 00802 classification A.

Typical values (solid line)  
Process limits (dotted lines)

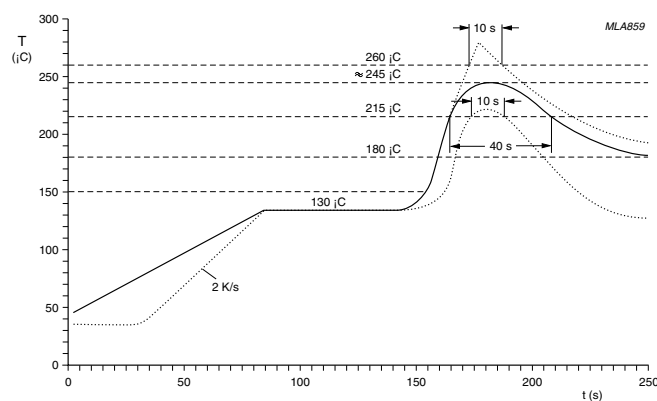


Fig. 7 Recommended reflow soldering profile

Typical values (solid line)  
Process limits (dotted lines)

The capacitors may be soldered twice in accordance with this method if desired

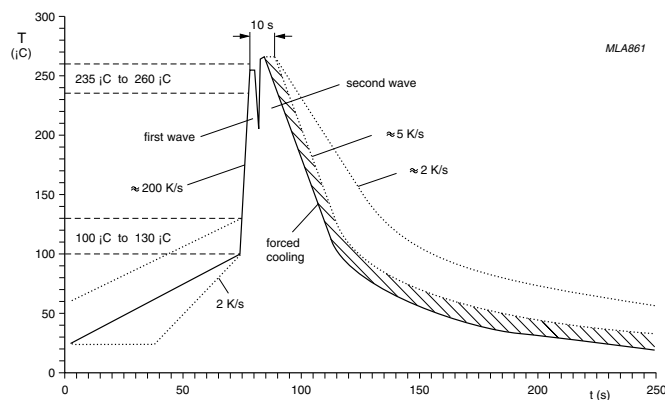


Fig. 8 Recommended wave soldering profile.

TEST AND REQUIREMENT

Table 10

| IEC384-10 | TEST ITEMS                   | CONDITIONS                                                                                                             | REQUIREMENTS                                                                                                                                                               |
|-----------|------------------------------|------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4.9       | Bending                      | Bending rate 1mm/s, jig. radius 340mm                                                                                  | $I\Delta C/CI \leq 1\%$                                                                                                                                                    |
| 4.10      | Resistance to soldering heat | $260 \pm 5^\circ\text{C}$ for $10 \pm 0.5\text{s}$ in static solder bath                                               | $I\Delta C/CI$ within 0.5% or 0.5pF whichever is greater                                                                                                                   |
| 4.11      | Solderability                | $235 \pm 5^\circ\text{C}$ for $2 \pm 0.5\text{s}$ in a static solder bath                                              | The termination shall be well tinned                                                                                                                                       |
| 4.12      | Rapid change of temperature  | $-55^\circ\text{C}$ to $+125^\circ\text{C}$ , 5 cycles                                                                 | $I\Delta C/CI$ within 1% or 1pF, whichever is greater                                                                                                                      |
| 4.14      | Damp heat                    | At $40^\circ\text{C}$ , 90 to 95% RH and $U_r$ applied for 500 hours                                                   | $I\Delta C/CI$ within 2% or 1pF whichever is greater<br>D.F. $\leq 2 \times$ specified value<br>$IR \geq 2,500\text{M}\Omega$ or $RxC \geq 25\text{s}$ , whichever is less |
| 4.15      | Endurance                    | At upper category temperature<br>$2 \times U_r$ applied ( $1.5 \times U_r$ for $U_r > 50\text{V}$ )<br>for 1,000 hours | $I\Delta C/CI$ within 2% or 1pF whichever is greater<br>D.F. $\leq 2 \times$ specified value<br>$IR \geq 4,000\text{M}\Omega$ or $RxC \geq 40\text{s}$ , whichever is less |

# REVISION HISTORY

| REVISION   | DATE          | CHANGE NOTIFICATION | DESCRIPTION                               |
|------------|---------------|---------------------|-------------------------------------------|
| Version 06 | Jul 07, 2005  | -                   | - Thickness updated                       |
| Version 05 | Mar 12, 2004  | -                   | - Thickness and packing quantity amending |
| Version 04 | Aug. 13, 2003 | -                   | - Taping drawing amended                  |
| Version 03 | Dec. 03, 2002 | -                   | - New Yageo edition                       |
| Version 02 | Jul. 04, 2002 | -                   | -                                         |
| Version 01 |               |                     |                                           |
| Version 0  |               |                     | - First issue of this specification       |