

Data Sheet

Customer:

Product: Open-Mode Design MLCC – OP Series

Size.: 0603/0805/1206/1210/1812

Issued Date: 22-Jul-22

Edition: REV.A



VIKING TECH CORPORATION
光頤科技股份有限公司
No.70, Guangfu N. Rd., Hukou
Township, Hsinchu County
303, Taiwan (R.O.C)

TEL:886-3-5972931
FAX:886-3-5972935•886-3-5973494
E-mail:sales@viking.com.tw

VIKING TECH CORPORATION KAOHSIUNG BRANCH
光頤科技股份有限公司高雄分公司
No.248-3, Sin-Sheng Rd., Cian-Jhen Dist., Kaohsiung,
806, Taiwan

TEL:886-7-8217999
FAX:886-7-8228229
E-mail:sales@viking.com.tw

VIKING ELECTRONICS (WUXI) CO., LTD.
光頤電子(無錫)有限公司
No.22 Xixia Road, Machinery & Industry Park,
National Hi-Tech Industrial Development Zone
of Wuxi, Wuxi, Jiangsu Province, China
Zip Code:214028
TEL:86-510-85203339
FAX:86-510-85203667•86-510-85203977
E-mail:china@viking.com.tw

| Produced by (QC) | Checked (QC) | Approved by (QC) | Prepared by (Sales) | Accepted by (Customer) |
|---------------------|------------------|---------------------|------------------------|---------------------------|
| 22-Jul-22 | 22-Jul-22 | 22-Jul-22 | | |
| <i>Mandy Chen</i> | <i>Ben Chang</i> | <i>Ben Chang</i> | | |

Open-Mode Design MLCC

Property

- Open circuit during capacitor cracking can protect the circuit.
- This type of capacitor adopts special inner electrode designs as fig.2 and fig.3 below
- Executive Standard: GH/T 21041-2007, GH/T 21042-2007

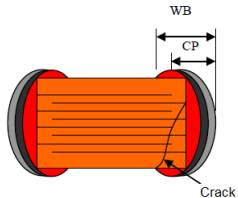


Fig.1 Normal design (CP<WB) circuit leakage during cracking.

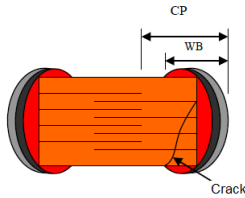


Fig.2 Open-mode design (CP>WB) circuit open during cracking.

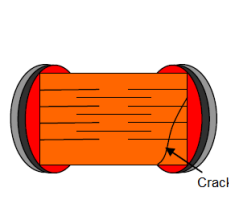
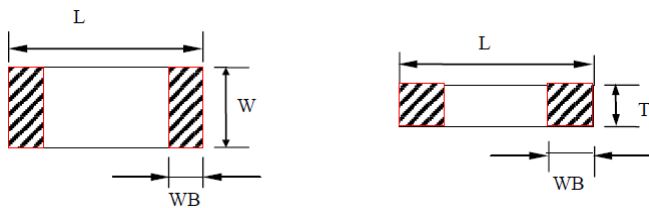


Fig.3 Floating design circuit open during cracking.

Dimensions



| Type | Size (Inch) | L (mm) | W (mm) | T (mm) | WB (mm) |
|------|-------------|-----------|-----------|------------------------|-----------|
| 03 | 0603 | 1.60±0.20 | 0.80±0.20 | 0.80±0.20 | 0.35±0.20 |
| 05 | 0805 | 2.00±0.20 | 1.25±0.20 | ≤ 0.55 | 0.50±0.20 |
| | | | | 0.80±0.20 1.25±0.20 | |
| 06 | 1206 | 3.20±0.30 | 1.60±0.30 | 0.80±0.20 | 0.60±0.30 |
| | | | | 1.25±0.20 | |
| | | | | 1.60±0.30 | |
| 10 | 1210 | 3.20±0.30 | 2.50±0.30 | ≤ 2.80 | 0.60±0.30 |
| 12 | 1812 | 4.50±0.40 | 3.20±0.30 | ≤ 3.50 | 0.60±0.30 |

Part Numbering

| OP | 05 | K | T | B | 201 | 331 |
|--------------|--|--|----------------|---|---|--|
| Product Type | Dimensions (L×W) | Capacitance Tolerance | Packaging | Dielectric | Voltage | Capacitance |
| | 03: 0603 05: 0805 06: 1206 10: 1210 12: 1812 | B: ±0.1pF C: ±0.25pF D: ±0.5pF F: ±1% G: ±2% J: ±5% K: ±10% M: ±20% | T: Taping Reel | N: NPO(COG) B: X7R X: X5R F: Y5V | 4V0: 4V 6V3: 6.3V 100: 10V 101: 100V 102: 1000V | 331: 330pF 102: 1000pF 222: 2200pF |

■ General Capacitance & Voltage

| Type | Rated Voltage | NPO | X7R | X5R | Y5V |
|-------|---------------|---------|---------|---------|---------|
| 0603 | 4V | --- | 151~474 | 103~474 | 102~225 |
| | 6.3V | --- | 151~474 | 103~474 | 102~225 |
| | 10V | --- | 151~104 | 103~104 | 102~225 |
| | 16V | --- | 151~104 | 103~104 | 102~225 |
| | 25V | --- | 151~104 | 103~104 | 102~225 |
| | 50V | 0R1~102 | 151~104 | 103~104 | 102~684 |
| | 100V | 0R1~102 | 151~153 | 102~153 | 102~104 |
| | 200V | 0R1~221 | 151~472 | 102~472 | --- |
| 250V | 0R1~221 | 151~472 | 102~472 | --- | |
| 0805 | 4V | --- | 151~105 | 103~105 | 102~475 |
| | 6.3V | --- | 151~105 | 103~105 | 102~475 |
| | 10V | --- | 151~474 | 103~474 | 102~475 |
| | 16V | --- | 151~224 | 103~224 | 102~475 |
| | 25V | --- | 151~104 | 103~104 | 102~225 |
| | 50V | 0R3~222 | 151~104 | 103~104 | 102~225 |
| | 100V | 0R3~222 | 151~473 | 103~473 | 102~104 |
| | 200V | 0R3~102 | 151~223 | 102~223 | 102~473 |
| | 250V | 0R3~102 | 151~223 | 102~223 | 102~473 |
| | 500V | 0R3~471 | 151~103 | 102~103 | --- |
| 1000V | 0R3~101 | --- | --- | --- | |
| 1206 | 4V | --- | 201~225 | 103~225 | 102~106 |
| | 6.3V | --- | 201~225 | 103~225 | 102~106 |
| | 10V | --- | 201~225 | 103~225 | 102~106 |
| | 16V | --- | 201~105 | 103~105 | 102~106 |
| | 25V | --- | 201~105 | 103~105 | 102~475 |
| | 50V | 0R3~332 | 201~105 | 103~105 | 102~225 |
| | 100V | 0R3~332 | 201~103 | 103~104 | 102~474 |
| | 200V | 0R3~222 | 201~473 | 102~473 | 102~104 |
| | 250V | 0R3~222 | 201~473 | 102~473 | 102~104 |
| | 500V | 0R3~102 | 201~223 | 102~223 | --- |
| | 630V | 0R3~102 | 201~223 | 102~223 | --- |
| | 1000V | 0R3~681 | 201~103 | 102~103 | --- |
| 2000V | 0R3~221 | 201~332 | 102~332 | --- | |
| 1210 | 4V | --- | 221~475 | 103~475 | 472~226 |
| | 6.3V | --- | 221~475 | 103~475 | 472~226 |
| | 10V | --- | 221~475 | 103~475 | 472~226 |
| | 16V | --- | 221~475 | 103~475 | 472~106 |
| | 25V | --- | 221~225 | 103~225 | 472~106 |
| | 50V | 100~392 | 221~225 | 103~225 | 472~475 |
| | 100V | 100~392 | 221~105 | 103~105 | 472~225 |
| | 200V | 100~332 | 221~473 | 102~473 | 472~474 |
| | 250V | 100~332 | 221~473 | 102~473 | --- |
| | 500V | 100~182 | 221~273 | 102~273 | --- |
| | 630V | 100~182 | 221~273 | 102~273 | --- |
| | 1000V | 100~102 | 221~223 | 102~223 | --- |
| | 2000V | 100~331 | 221~103 | 102~103 | --- |
| 1812 | 4V | --- | --- | 103~106 | 103~226 |
| | 6.3V | --- | --- | 103~106 | 103~226 |
| | 10V | --- | --- | 103~106 | 103~226 |
| | 16V | --- | --- | 103~106 | 103~226 |
| | 25V | --- | --- | 103~475 | 103~226 |
| | 50V | 100~103 | --- | 103~475 | 103~226 |
| | 100V | 100~103 | 471~105 | 103~105 | 103~105 |
| | 200V | 100~562 | 471~474 | 102~474 | 103~474 |
| | 250V | 100~562 | 471~474 | 102~474 | 103~474 |
| | 500V | --- | 471~104 | 102~104 | --- |
| | 630V | --- | 471~104 | 102~104 | --- |
| | 1000V | --- | 471~563 | 102~563 | --- |
| | 2000V | --- | 471~123 | 102~123 | --- |
| | 3000V | --- | 471~103 | 102~103 | --- |
| | 4000V | --- | 471~332 | 102~332 | --- |
| 5000V | --- | 471~102 | 102 | --- | |

Open-Mode Design MLCC

Environmental Characteristics

| Item | Requirement | | Test Method | | |
|---|---|---|---|---|--------------------------|
| Capacitance | NPO | Should be within the specified tolerance | Capacitance | Measuring Frequency | Measuring Voltage |
| | | | $\leq 1000\text{pF}$ | 1MHZ $\pm 10\%$ | 1.0 $\pm 0.2\text{Vrms}$ |
| | X7R X5R Y5V | | $> 1000\text{pF}$ | 1KHZ $\pm 10\%$ | 1.0 $\pm 0.2\text{Vrms}$ |
| (DF, tan δ) Dissipation Factor | NPO | DF | Capacitance | Measuring Frequency | Measuring Voltage |
| | | $\leq 0.56\%$ | $\text{Cr} < 5\text{pF}$ | 1MHZ $\pm 10\%$ | 1.0 $\pm 0.2\text{Vrms}$ |
| | | $1.5[(150/\text{Cr})+7]\times 10^{-4}$ | $5\text{pF} \leq \text{Cr} < 50\text{pF}$ | 1MHZ $\pm 10\%$ | 1.0 $\pm 0.2\text{Vrms}$ |
| | | $\leq 0.15\%$ | $50\text{pF} \leq \text{Cr} \leq 1000\text{pF}$ | 1MHZ $\pm 10\%$ | 1.0 $\pm 0.2\text{Vrms}$ |
| | X7R | $\leq 0.15\%$ | $> 1000\text{pF}$ | 1KHZ $\pm 10\%$ | 1.0 $\pm 0.2\text{Vrms}$ |
| Insulation Resistance(IR) | NPO | $\text{C} \leq 10 \text{ nF}, \text{Ri} \geq 50000\text{M}\Omega$ $\text{C} > 10 \text{ nF}, \text{Ri} \cdot \text{CR} \geq 500\text{S}$ | Measuring Voltage: Rated Voltage (Max 500V) Duration: 60 $\pm 5\text{s}$ Test Humidity: $\leq 75\%$ Test Temperature: 25 $^{\circ}\text{C} \pm 3^{\circ}\text{C}$ Test Current: $\leq 50\text{mA}$ | | |
| | X7R | $\text{C} \leq 25 \text{ nF}, \text{Ri} \geq 10000\text{M}\Omega$ $\text{C} > 25 \text{ nF}, \text{Ri} \cdot \text{CR} > 100\text{S}$ | | | |
| Dielectric Withstanding Voltage(DWV) | No defects or abnormalities | | 100V $\leq \text{Vr} < 500\text{V}$ 50mA/ Force 200% Rated voltage for 5 second. Max current should not exceed 50 mA $\text{Vr} = 500\text{V}$ 50mA/ Force 150% Rated voltage for 5 second. Max current should not exceed 50 mA. | | |
| Solderability | At least 95% of the terminal electrode is covered by new solder. Visual Appearance: No visible damage. | | Preheating conditions: 80 to 120 $^{\circ}\text{C}$; 10~30s. | | |
| | | | Lead solder: (Sn/Pb : 63/37) Solder Temperature: 235 $\pm 5^{\circ}\text{C}$ Duration: 2 $\pm 0.5\text{s}$ | Lead-free solder: Solder Temperature: 245 $\pm 5^{\circ}\text{C}$ Duration: 2 ± 0.5 | |
| Resistance to Soldering Heat | Item | NPO | X7R | Preheating conditions: 100 to 200 $^{\circ}\text{C}$; 10 $\pm 2\text{min}$. Solder Temperature: 265 $\pm 5^{\circ}\text{C}$ Duration: 10 $\pm 1\text{s}$ Clean the capacitor with solvent and examine it with a 10X(min.) microscope. Recovery Time: 24 $\pm 2\text{h}$ Recovery condition: Room temperature | |
| | $\Delta \text{C/C}$ | $\leq \pm 0.5\%$ or $\pm 0.5\text{pF}$, whichever larger | -5~+10% | | |
| | DF | Same to initial value | | | |
| | IR | Same to initial value | | | |
| Resistance to Flexure of Substrate (Bending Strength) | Appearance: No visible damage. $\Delta \text{C/C}: \leq \pm 10\%$ | | Test Board: Al ₂ O ₃ or PCB Warp: 1mm Speed: 0.5mm/sec. Unit: mm The measurement should be made with the board in the bending position. | | |
| Termination Adhesion | No visible damage | | Applied Force: 5N Duration: 10 $\pm 1\text{S}$ | | |
| Temperature Cycle | $\Delta \text{C/C}$: Class I : $\leq \pm 1\%$ or $\pm 1\text{pF}$, whichever is larger. Class II : B: $\leq \pm 10\%$ | | Preheating conditions: up-category temperature, 1h Recovery time: 24 $\pm 1\text{h}$ Initial Measurement Cycling Times: 5 times, 1 cycle, 4 steps: | | |
| | | | Step | Temperature ($^{\circ}\text{C}$) | Time (min.) |
| | | | 1 | Low- category temp. (NPO/X7R: -55) | 30 |
| | | | 2 | Normal temp. (+20) | 2~3 |
| | | | 3 | Up- category temp. (NPO/X7R: +125) | 30 |
| 4 | Normal temp. (+20) | 2~3 | | | |
| | | | Recovery time after test: 24 $\pm 2\text{h}$ | | |

Open-Mode Design MLCC

| Item | Requirement | | Test Method |
|---------------------|--------------------------------------|---|---|
| Moisture Resistance | $\Delta C/C$ | NPO: $\leq \pm 2\%$ or $\pm 1pF$, whichever is larger. X7R: $\leq \pm 10\%$ | Temperature : $40 \pm 2^\circ C$ Humidity : 90~95%RH Duration : 500h Recovery conditions : Room temperature Recovery Time : 24h (Class1) or 48h (Class2) |
| | DF | Not more than twice of initial value. | |
| | IR | Class I : $R_i \geq 2500M\Omega$ or $R_i \cdot CR \geq 25S$ whichever is smaller Class II : $R_i \geq 1000M\Omega$ or $R_i \cdot CR \geq 25S$ whichever is smaller | |
| | Appearance: No visible damage | | |
| Life Test | $\Delta C/C$ | Class I : $\leq \pm 2\%$ or $\pm 1pF$, whichever is larger. X7R: $\leq \pm 20\%$ | 1.2 Multiple Duration: 1000h Charge/ Discharge Current: 50mA max. Temperature : $125^\circ C$ (NPO X7R) ; Recovery Conditions: Room Temperature Recovery Time: 24h (Class 1), or 48h (Class2) |
| | DF | Not more than twice of initial value | |
| | IR | Class I : $R_i \geq 4000M\Omega$ or $R_i \cdot CR \geq 40S$ whichever is smaller. Class II : $R_i \geq 2000M\Omega$ or $R_i \cdot CR \geq 50S$ whichever is smaller. | |
| | Visual Appearance: No visible damage | | |

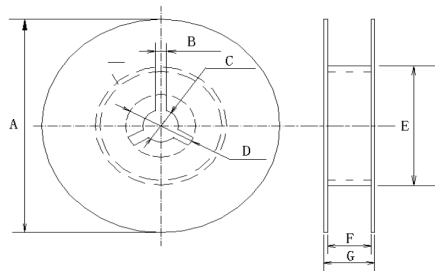
■ Storage Temperature: 5~40°C ; Humidity: 20~70%RH

■ Packaging

Packaging Quantity

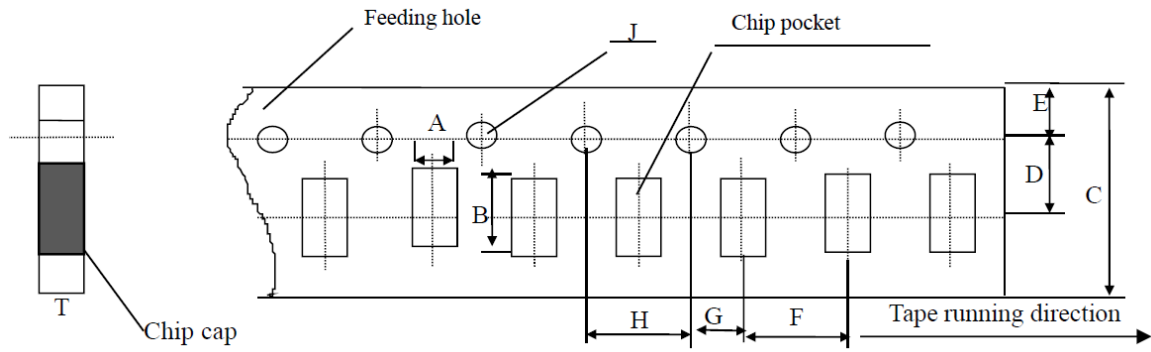
| Type | Packaging (7" Reel) | |
|------|---------------------|---|
| | Paper tape | Plastic tape |
| 0603 | 4K | - |
| 0805 | 4K | 3K |
| 1206 | 4K | $T \leq 1.35mm$ 3K $T > 1.35mm$ 2K |
| 1210 | - | $T \leq 1.80mm$ 2K $T > 1.80mm$ 1K |
| 1812 | - | $T \leq 1.85mm$ 1K $T > 1.85mm$ 0.5K |

Tape and Reel



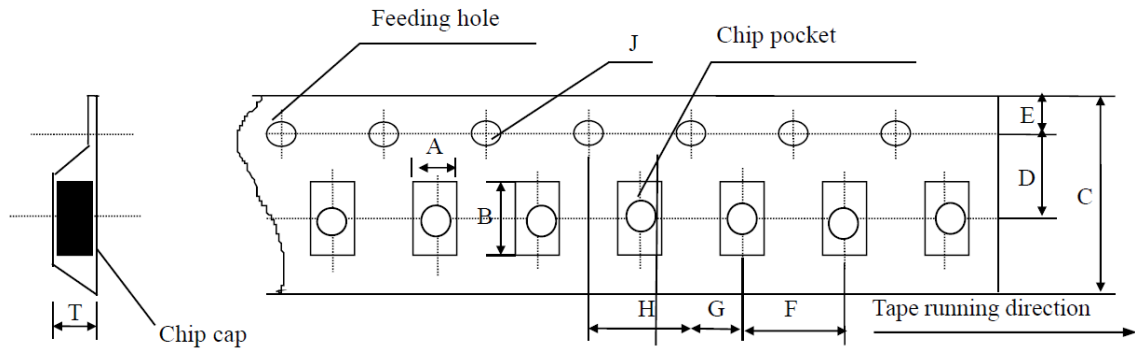
| Type | A (mm) | B (mm) | C (mm) | D (mm) | E (mm) | F (mm) | G (mm) |
|------|--------------|--------|----------|----------|------------|----------|----------|
| 0603 | 178±2.0(7") | 3.0 | 13.0±0.5 | 21.0±0.8 | 50 or more | 10.0±1.5 | 12 max |
| 0805 | 178±2.0(7") | 3.0 | 13.0±0.5 | 21.0±0.8 | 50 or more | 10.0±1.5 | 12 max |
| 1206 | 178±2.0(7") | 3.0 | 13.0±0.5 | 21.0±0.8 | 50 or more | 10.0±1.5 | 12 max |
| 1210 | 178±2.0(7") | 3.0 | 13.0±0.5 | 21.0±0.8 | 50 or more | 10.0±1.5 | 12 max |
| 1812 | 330±2.0(13") | 3.0 | 13.0±0.5 | 21.0±0.8 | 50 or more | 12.6 max | 13.6 max |

Paper Tape Size Specification



| Type | A (mm) | B (mm) | C (mm) | D (mm) | E (mm) | F (mm) | G (mm) | H (mm) | J (mm) | T (mm) |
|------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|--------------|----------|
| 0603 | 1.10±0.10 | 1.90±0.10 | 8.00±0.10 | 3.50±0.05 | 1.75±0.10 | 4.00±0.10 | 2.00±0.10 | 4.00±0.10 | 1.50-0/+0.10 | 1.10 max |
| 0805 | 1.45±0.15 | 2.30±0.15 | 8.00±0.15 | 3.50±0.05 | 1.75±0.10 | 4.00±0.10 | 2.00±0.10 | 4.00±0.10 | 1.50-0/+0.10 | 1.10 max |
| 1206 | 1.80±0.20 | 3.40±0.20 | 8.00±0.20 | 3.50±0.05 | 1.75±0.10 | 4.00±0.10 | 2.00±0.10 | 4.00±0.10 | 1.50-0/+0.10 | 1.10 max |

Plastic Tape Size Specification



| Type | A (mm) | B (mm) | C (mm) | D (mm) | E (mm) | F (mm) | G (mm) | H (mm) | J (mm) | T (mm) |
|------|-----------|-----------|------------|-----------|-----------|-----------|-----------|-----------|--------------|----------|
| 0805 | 1.55±0.20 | 2.35±0.20 | 8.00±0.20 | 3.50±0.05 | 1.75±0.10 | 4.00±0.10 | 2.00±0.10 | 4.00±0.10 | 1.50-0/+0.10 | 1.50 Max |
| 1206 | 1.95±0.20 | 3.60±0.20 | 8.00±0.20 | 3.50±0.05 | 1.75±0.10 | 4.00±0.10 | 2.00±0.10 | 4.00±0.10 | 1.50-0/+0.10 | 1.85 Max |
| 1210 | 2.70±0.10 | 3.42±0.10 | 8.00±0.10 | 3.50±0.05 | 1.75±0.10 | 4.00±0.10 | 2.00±0.05 | 4.00±0.10 | 1.55-0/+0.10 | 3.20 Max |
| 1812 | 3.66±0.10 | 4.95±0.10 | 12.00±0.10 | 5.50±0.05 | 1.75±0.10 | 8.00±0.10 | 2.00±0.05 | 4.00±0.10 | 1.55-0/+0.10 | 4.00 Max |

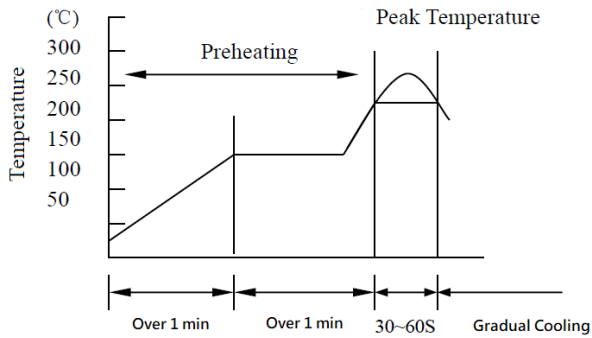
Recommended Soldering Method

| Type | Dielectric | Capacitance | Soldering Method |
|---------------------|------------|-------------------------|------------------|
| 0603 | NPO | --- | R / W |
| | X7R/X5R | $C \geq 1\mu\text{F}$ | R |
| | | $C < 1\mu\text{F}$ | R / W |
| | Y5V | $C \geq 1\mu\text{F}$ | R |
| $C < 1\mu\text{F}$ | | R / W | |
| 0805 | NPO | --- | R / W |
| | X7R/X5R | $C \geq 4.7\mu\text{F}$ | R |
| | | $C < 4.7\mu\text{F}$ | R / W |
| | Y5V | $C \geq 1\mu\text{F}$ | R |
| $C < 1\mu\text{F}$ | | R / W | |
| 1206 | NPO | --- | R / W |
| | X7R/X5R | $C \geq 10\mu\text{F}$ | R |
| | | $C < 10\mu\text{F}$ | R / W |
| | Y5V | $C \geq 10\mu\text{F}$ | R |
| $C < 10\mu\text{F}$ | | R / W | |
| ≥ 1210 | NPO | --- | R |
| | X7R/X5R | --- | R |
| | Y5V | --- | R |

Soldering method : R - Reflow Soldering ; W - Wave Soldering

■The Temperature Profile for Soldering

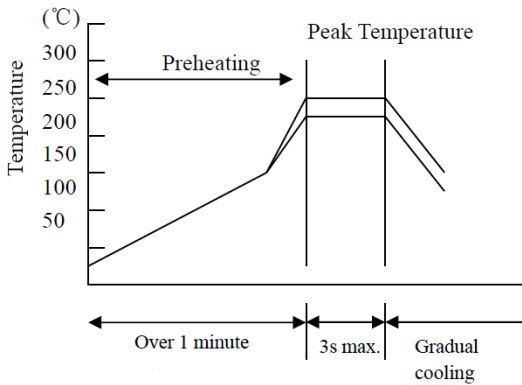
Re-flow Soldering



| | Pb-Sn Soldering | Lead-Free Soldering |
|-------------------------|------------------------|----------------------------|
| Peak Temperature | 230~250°C | 240~260°C |

■While in preheating, please keep the temperature difference between soldering temperature and surface temperature of chips as: $T \leq 150^{\circ}\text{C}$.

Wave Soldering



| | Pb-Sn Soldering | Lead-Free Soldering |
|-------------------------|------------------------|----------------------------|
| Peak Temperature | 230~260°C | 240~270°C |

■While in preheating, please keep the temperature difference between soldering temperature and surface temperature of chips as: $T \leq 150^{\circ}\text{C}$.