# USER MANUAL

## Maxwell Technologies Korea Co., Ltd

### Soldering Guide: Small and Medium Ultracapacitor Cells

**Models:**

- 2.7V 3F – 2.7V 600F
- 3.0V 3F – 3.0V 540F


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# 1. Introduction

## 1.1 Purpose and Scope

The purpose of this document is to provide a general guideline on soldering Maxwell small and medium size ultracapacitors onto PCBs. The soldering parameters presented in this document are guidelines for process optimization. Actual results of soldering may vary with types of solder material and equipment used.

## 1.2 Applicable Products

Maxwell small and medium size cells to which this document is applicable are shown in Table 1-1 and 1-2.

| Type | Product Rating | Model Number |
|---|---|---|
| **2.7V Small** | Standard 2.7V 3F | BCAP0003 P270 S01 |
| | Bent Lead 2.7V 3F | BCAP0003 P270 S12 |
| | XP 2.7V 3F | BCAP0003 P270 X01 |
| | Standard 2.7V 5F | BCAP0005 P270 S01 |
| | XP 2.7V 5F | BCAP0005 P270 X01 |
| | Standard 2.7V 10F | BCAP0010 P270 S01 |
| | Bent Lead 2.7V 10F | BCAP0010 P270 S12 |
| | XP 2.7V 10F | BCAP0010 P270 X01 |
| | Standard 2.7V 25F | BCAP0025 P270 S01 |
| | Bent Lead 2.7V 25F | BCAP0025 P270 S12 |
| | XP 2.7V 25F | BCAP0025 P270 X01 |
| | Standard 2.7V 50F | BCAP0050 P270 S01 |
| | XP 2.7V 50F | BCAP0050 P270 X01 |
| **2.7V Medium** | 2.7V 100F | BCAP0100 P270 S07 |
| | 2.7V 325F | BCAP0325 P270 S19 |
| | 2.7V 350F | BCAP0350 P270 S18 |
| | 2.7V 360F | BCAP0360 P270 S18 |
| | 2.7V 450F | BCAP0450 P270 S18 |
| | 2.7V 600F | BCAP0600 P270 S18 |

**Table 1-1:** Maxwell 2.7V products that are subjected to soldering recommendations listed in this document

| Type | Product Rating | Model Number |
|---|---|---|
| **3.0V Small** | 3.0V 3F | BCAP0003 P300 X11 |
| | Bent Lead 3.0V 3F | BCAP0003 P300 X12 |
| | 3.0V 5F | BCAP0005 P300 X11 |
| | 3.0V 10F | BCAP0010 P300 X11 |
| | Bent Lead 3.0V 10F | BCAP0010 P300 X12 |
| | 3.0V 25F | BCAP0025 P300 X11 |
| | Bent Lead 3.0V 25F | BCAP0025 P300 X12 |
| | 3.0V 50F | BCAP0050 P300 X11 |
| | Bent Lead 3.0V 50F | BCAP0050 P300 X1B |
| **3.0V Medium** | 3.0V 100F | BCAP0100 P300 S17 |
| | 3.0V 150F | BCAP0150 P300 S17 |
| | 3.0V 540F | BCAP0540 P300 S18 |

**Table 1-2:** Maxwell 3.0V products that are subjected to soldering recommendations listed in this document

## 2. Manual Soldering Recommendations

For manual soldering of Maxwell small and medium ultracapacitors, the recommended maximum solder tip temperature is ~360°C. Soldering time for each terminal must be kept under 5 seconds to minimize exposing the cell to high temperatures.

## 3. Wave Soldering Recommendations

### 3.1 Reference Temperature Profile

Figure 1 in the next page is the reference temperature profile measured from the bottom of a PCB.

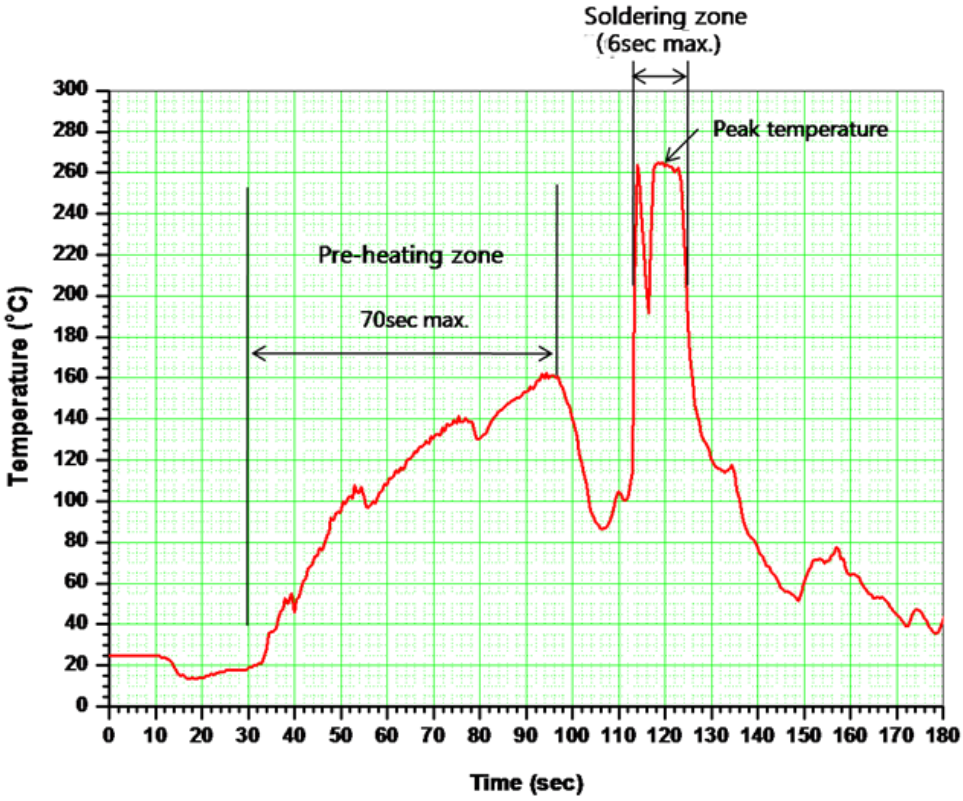


**Figure 1:** Reference temperature profile for wave soldering (measured from the bottom of PCB)

### 3.2 Preparation

Use of excessive soldering flux should be avoided to minimize possibility of the cell terminal corrosion. Cells should be placed in a way that the crimp area of every cell is flush with the PCB surface.

### 3.3 Pre-heating Zone

The set temperature of the equipment in the pre-heating zone is approximately 250°C. Since the ambient temperature is 250°C and the time spent in the pre-heating zone is less than 70 seconds, the actual temperature of the PCB shown in the profile is lower than 250°C. The rate of PCBA movement, through the pre-heating zone, is set at 1m/min for all small and medium cells, except for 325F cell. In case of the 325F product, the recommended speed of PCBA movement is 0.8m/min.

### 3.4 Soldering Zone

A soldering temperature of approximately 260°C is recommended for all small and medium cells. In the reference temperature profile shown in Figure 1. above, the terminals of the cell go through two ”solder sessions” and the total time spent in immersion (the sum of the two solder sessions) should not exceed 6 seconds. Depending on the equipment used and the user’s preference, only one solder session may be used. The rate of PCBA movement, through the soldering zone, is same as the pre-heating zone: 1m/min for all small and medium cells except the 325F cell and 0.8m/min for the 325F cell.

### 3.5 Post-Solder Cleaning

Maxwell recommends the use of no-clean type flux. If clean type flux is to be used, isopropyl alcohol is recommended as the cleaning agent; which is applied to soldered areas using a brush. Immersion cleaning in organic solvents or ultrasonic cleaning is prohibited as it may have a detrimental impact on ultracapacitor performance. Additionally, the use of halogenated cleaners is prohibited. Table 2 lists some examples of halogenated substances that **must not** be used as cleaning agents.

| Name | Chemical Formula | Product Name |
|---|---|---|
| Trichlorotrifluoroethane | $C_2Cl_3F_3$ | Freon TF, Dailflon S-3 |
| Fluorotrichloromethane | $CCl_3F$ | Freon-11, Daiflon S-1 |
| 1,1,1-Trichloroethane | $F_2H_3Cl_3$ | Chloethane |
| Trichloroethylene | $C_2HCl_3$ | Trichene |
| Methyl Chloride | $CH_3Cl$ | MC |

**Table 2:** Halogenated cleaners **prohibited** from use in post-solder cleaning

# 4. Additional Information

## 4.1 Handling of PCBA

Once the cells are soldered on a PCB, the following precautions must be taken when handling the finished PCBA.

1) PCBAs must be held by the board and not by the cell(s) as it may place undue mechanical stress on the cell(s) and result in permanent damage to the cell structure.
2) The **PCBA must not be placed or handled** vertically as it may stress the cell(s) and result in separator damage and/or electrolyte leakage of the cell(s).
3) The board **must not be bent** by any external force as it may cause formation of cracks within the PCB components and/or post-solder defects.
4) After assembly, place PCBAs in anti-static bags to prevent ESD damage.
5) The PCBAs **must not be stacked** on top of one another during storage or transportation.

## 4.2 Reflow Soldering

Reflow soldering is prohibited due to extreme thermal exposure which may be experienced by the cell(s) in the soldering process.

## 4.3 Repetitive Soldering

In case the cell terminal is not soldered properly onto a PCB, both the PCB and the cell should be cooled down before attempting a second solder. If there is not enough cooling time allocated, it may lead to leakage issues following the second solder.