



# QFN Soldering Reflow Guidelines

nAN400-08

Application Note v1.2

# 1 Introduction

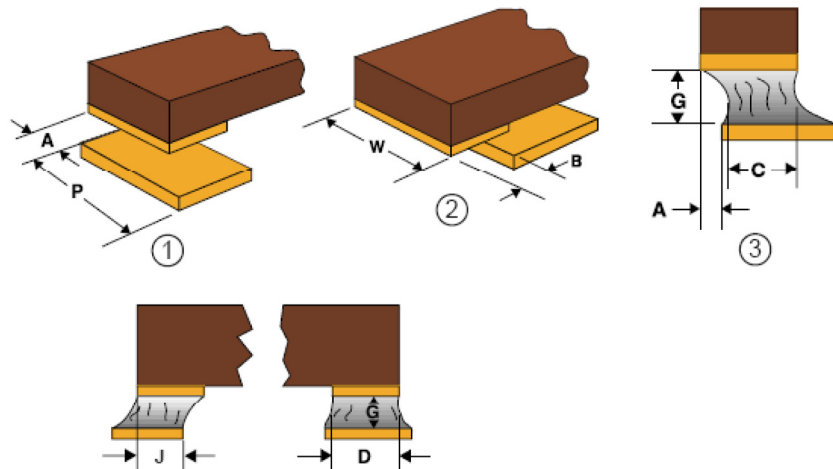
The electronic manufacturing industry uses environmentally safe lead-free, or Green, assembly processes. Factors that should be considered when switching to lead-free soldering materials are:

- Circuit board thickness
- Surface finish
- Fabrication complexity
- Assembly process compatibility

This application note focuses on solder reflow recommendations for QFN packages with Pb-free (Green) finishes.

**Note:** Nordic Semiconductor only provides Pb-free parts.

**Note:** The wetting of the package side wall is not guaranteed. This is because the QFN package is by design a “contact down” package. The sidewalls of the leads are not plated since they are exposed by the singulation step, which takes place after the plating. Depending on the surface state of the bare copper the sidewalls of the leads may not wet during soldering. Please see Figure 1 “The QFN package is by design a “contact down” package”.



**Figure 1** The QFN package is by design a “contact down” package

## 2 Solder reflow process basics

Lead-free soldering processes have been available for some years and all parts of Nordic Semiconductor are Pb-free.

We recommend using the solder profile as given in **Section 2.1 “Solder reflow profile”** for soldering QFN packages. However, factors such as circuit board thickness, size, other semiconductor packages, passive components and reflow equipment may affect the total profile time.

## 2.1 Solder reflow profile

| Profile feature  | Pb-free assembly             |
|--|------------------------------|
| <b>Preheat/soak</b>  |                              |
| Temperature min ( $T_{smin}$ )   | 150 °C                       |
| Temperature max ( $T_{smax}$ )   | 200 °C                       |
| Time ( $t_s$ ) from ( $T_{smin}$ to $T_{smax}$ )   | 60-120 seconds               |
| Ramp-up rate ( $T_L$ to $T_p$ )  | 3 °C/ second max.            |
| Liquidous temperature ( $T_L$ )  | 217 °C                       |
| Time ( $t_L$ ) maintained above $T_L$  | 60-150 seconds               |
| Peak package body temperature ( $T_p$ )  | $T_p$ must not exceed 260 °C |
| Time ( $t_p$ )* within 5 °C of the specified classification temperature ( $T_c$ ), see <b>Figure 2 "Reflow profile"</b> on page 4. | 30* seconds                  |
| Ramp-down rate ( $T_p$ to $T_L$ )  | 6 °C/ second max.            |
| Time 25 °C to peak temperature   | 8 minutes max.               |

- Note:**
- Package thickness < 2.5 mm and volume < 350 mm<sup>2</sup>.
  - All temperatures refer to the center of the package, measured on the package body surface that is facing up during assembly reflow (for example, live-bug).
  - Actual board assembly profiles should be developed based on specific process needs and board designs and should not exceed the parameters in this table.

Table 1 Reflow conditions

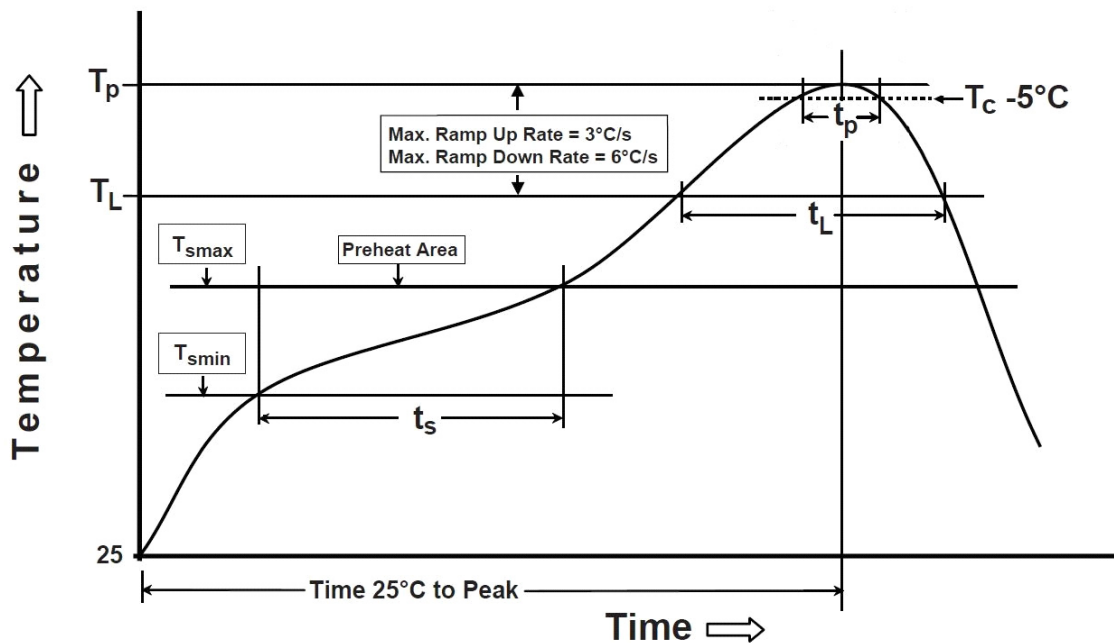


Figure 2 Reflow profile

## Liability disclaimer

Nordic Semiconductor ASA reserves the right to make changes without further notice to the product to improve reliability, function or design. Nordic Semiconductor ASA does not assume any liability arising out of the application or use of any product or circuits described herein.

## Life support applications

Nordic Semiconductor's products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Nordic Semiconductor ASA customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Nordic Semiconductor ASA for any damages resulting from such improper use or sale.

## Contact details

For your nearest distributor, please visit <http://www.nordicsemi.com>.

Information regarding product updates, downloads, and technical support can be accessed through your My Page account on our homepage.

Main office: Otto Nielsens veg 12  
7052 Trondheim  
Norway  
Phone: +47 72 89 89 00  
Fax: +47 72 89 89 89

Mailing address: Nordic Semiconductor  
P.O. Box 2336  
7004 Trondheim  
Norway



## Revision History

| Date          | Version | Description                                |
|---------------|---------|--|
| November 2013 | 1.2     | Aligned reflow profile with JEDEC          |
| December 2006 | 1.1     | Added note on wetting of package side wall |
| January 2004  | 1.0     | Initial release                            |

Application Note order code: 260104-nAN400-08