

Scope

Soldering processes are a likely source for potential stress of a semiconductor device and if misapplied can induce latent reliability issues. This has been reconfirmed with the latest technological and environmental developments. Those challenges, taken into account during Melexis' normal and customary package qualification tests, require utmost care and attention during the soldering process applied by our customers and their contract manufacturers. This document describes some soldering recommendations applicable to Melexis products.

For any soldering techniques deviating from the ones described below, please contact Melexis to verify compatibility between our products and intended soldering methods.

Moisture sensitivity and Peak Temperature

For components normally soldered using Surface Mounted Device techniques (eg: reflow process), a significant concern is related to the moisture absorption by the package body; which due to increased water vapor pressure when exposed to soldering temperatures, could lead to reliability issues such as delamination, package crack and bond wire fractures.

For that purpose, moisture sensitivity levels (MSL) are determined for the relevant Melexis components, using the Jedec-020 standard. Qualified moisture sensitivity level and peak temperature are indicated on product labels, whenever applicable.

Such components must be handled in accordance with Jedec-020 and Jedec-033 at all stages of the supply chain prior to the soldering process.

Lead finish

Melexis Pb free lead finish plating is typically matte tin and allows for backward compatibility with standard SnPb based solders.

Prior to using a Pb free process, please make sure that all intended components have suitable plating.

Melexis Pb free devices are processed using state-of-the-art international recommendations to minimize "tin whisker" growth. This includes minimum plating thickness (prior to trim and form) and a post plating bake step. Whisker growth is validated using Jedec-201 standard on a package family basis.



Solderability

Plating solderability of Melexis devices is verified during package qualification through application of Jedec-022-B102.

Wetting and De-Wetting evaluations are conducted on specific request.

As a general recommendation, the customer should prevent any mechanical stress on device's leads; this is particularly true during the soldering process.

Manual Iron Soldering and Automatic Point-to-Point Iron Soldering

Manual Iron Soldering and Automatic Point-to-Point Iron Soldering methods are allowed for Through Hole applications (Package body needs to be shielded from soldering heat by the PCB).

For products in Single In-Line package, the customer needs to guarantee and control, through suitable methods, that temperature of the plastic body does not exceed 170°C. If body holder of any type is used to keep plastic body in position, not more than 3N/sq.mm pressure shall be allowed for this purpose.

The soldering iron temperature should be set as low as possible (maximum 350C) and should not exceed recommended soldering time (maximum 5 seconds).

Reflow

Reflow techniques can be used to solder Melexis SnPb and Pb free devices.

Temperature profile should conform to those described in Jedec-020 standard.

Reflow soldering of through-hole parts, especially in SIP packages, creates a risk for exposing the plastic body to excessive temperatures around and above the T_G of the epoxy mold compound (typically 170C, check with Melexis for concerning exact package specifications). To avoid this, a protective tool (shield) has to be used. For any particular case, the actual temperature of the package body throughout the process shall be verified to meet above restriction prior to starting production.

If body holder of any type is used to keep package body in position, not more than 3N/sq.mm pressure shall be used for this purpose.

Please contact Melexis in case you intend to use a reflow soldering process for through hole devices (Single In-line Packages) to verify your soldering process design.



Wave Soldering

Wave soldering is not recommended for Surface Mounted Device packages. Please contact Melexis in such cases to verify intended soldering process.

Wave soldering is allowed for through hole application. A pre-heating step is required and should be performed in accordance with international standard recommendations (eg: EN60068-2-20). For Single In-Line Package products, during the pre-heat and soldering phase, the temperature of the plastic body shall not exceed 170C. If a body holder of any type is used to keep package body in position, not more than 3N/sq.mm pressure shall be used for this purpose.

Welding

An alternative method to connect Melexis sensor ICs leads (typically Hall sensors) to an external leadframe or a wire is welding. As core material of leads is copper, it can be successfully welded to another copper terminal or wire.

Welding methods applied to Melexis Hall sensors in SIP packages shall be focused on having minimum power dissipation into the copper leadframe of the Hall sensors. A good solder joint has to be achieved with proper power settings and timing of the welding apparatus. Optimal settings shall be defined experimentally, by parameter variation to meet following criteria:

- Temperature of the plastic body of the Hall sensor shall not exceed 140C during the process. Measurement to be taken with a thermal probe attached to the body center.
- Lead plating material shall be molten only in the spot of welding. No boiling and spattering of the lead plating material shall occur. It may result in solder balls spreading in the neighboring area, solder bridging of terminals or other parts of the external leadframe.
- No deformation of Hall sensor lead core material shall be observed at the point of welding.
- No “spring load” shall remain after welding in the Hall sensor leads toward the sensor body. Hall sensor terminals shall be planar and in a direct contact to the external leadframe or wires
- Fixing the Hall sensor in position for welding shall be done at the leads close to the body. This gives a sufficient lead length and space for welding and eliminates stress from the fixture applied directly to the plastic body. Such fixture may also act as a heatsink and reduce the heat transferred to the plastic body.

Melexis recommends a laser spot welding as the best method to provide a reliable connection of Hall sensor leads to external leadframe. Laser spot welding focuses the energy in a small spot 0,4 to 0,8 mm diameter for 10-100 msec. With proper power settings a good quality solder joint can be obtained without excessive heat transfer away from the solder spot. Care has to be taken that the two materials are in a direct contact as no additional material is included in the process and even a small gap between the lead and external leadframe may create a risk for poor a joint or degradation.



Resistance welding is not a recommended method by Melexis. It requires heating of terminals until the core copper material becomes in a plastic state so that the parts can be forged together. It often results in molten lead plating in a larger area even outside of the welded spot, deformation of leads and higher temperature transferred to the body.

Mechanical pressure applied between the terminals to be welded while at the same time the body or far end of the leads are held by a fixture also may result in a “spring loaded” assembly after welding. This may create a risk for bond wire versus package stress during thermal cycling experienced in high temperature applications.

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Disclaimer

Since scientific developments occur daily, these Recommendations may contain outdated material.

Although these Recommendations are presented in good faith and believed to be correct, Melexis makes no representations or warranties as to the completeness or accuracy of these Recommendations.

The Recommendations therefore are supplied upon the express condition that the persons and/or companies receiving them will make their own determination as to the suitability of these Recommendations for the intended purposes prior to use.

In no event will Melexis be responsible for damages of any nature whatsoever resulting from the use of or reliance upon the Recommendations.

No representations or warranties, either express or implied, of fitness for a particular purpose or of any other nature are made hereunder with respect to these recommendations.

Notwithstanding any other provision in these Recommendations, the Customer will remain solely responsible for its soldering process”.

