Contents

1. Scope .................................................................................................................................................. 2
2. Glossary of terms ..................................................................................................................................... 2
3. Soldering ................................................................................................................................................ 3
   3.1. Wave soldering ............................................................................................................................... 3
   3.2. Pin-through-paste method for reflow soldering ............................................................................. 4
   3.3. Manual/Robotic iron soldering ....................................................................................................... 6
4. Disclaimer .............................................................................................................................................. 7
1. Scope

The purpose of this document is to document an adequate soldering solution for the TO39 IR sensor products. The Melexis IR sensor-MLX90614 is a Through Hole Device (THD). See Fig.1

*Note: All dimensions are in mm

2. Glossary of terms

- SMD – Surface Mounted Device
- THD – Through-Hole Device
- IR – Infared
- PCB – Printed Circuit Board
- TO – Transistor Outline
3. Soldering

3.1. Wave soldering

One of the typical methods used for soldering components on PCBs is wave soldering. During the wave soldering a bath is used. In this bath is a quantity of molten solder, which passes across the components, placed on or inserted into the PCB.

There are many types of wave-soldering machines, but their basic components and principles are the same. The main zones are:

- fluxing zone
- preheating zone
- soldering zone
- cleaning zone (optional, dependable of the used flux)

Usually, two solder waves are used. The first solder wave is usually a high, rather narrow wave made turbulent by mechanical means. The wave's flow trajectory is usually aimed in the same direction as the board's travel direction. This first turbulent wave is followed by a second wave, which is a asymmetrical laminar wave. The turbulent action of the first wave causes the solder to move in and around all the chip components to help ensure that all solder joints get soldered and unwanted solder bridges are removed. One important consequence for wave soldering is that the temperature of the leads is higher than the temperature of the package, because the PCB acts as shield.

The Melexis sensor MLX90614 is qualified for a wave soldering process according to the EN60749-15 standard with a peak temperature of 260 °C maximum and the peak temperature time is ≤10 sec.

MLCC or other passive components of the IR sensor circuitry should not be considered for wave soldering and placed on the bottom PCB side under TO39 due to thermal shock risk and forming of solder bridges.
3.2. Pin-through-paste method for reflow soldering

During the last 10 years, the number of through-hole components used on PCBs is rapidly reducing as THDs make wave soldering more expensive. In cases when only a few THDs are necessary, one can choose to use selective wave soldering only for these components. Another way to solder through-hole part efficiently is using the so “Pin-through-Paste” method where the SMD and the THD components are soldered at the same time during reflow soldering. This method includes the following steps: See Fig.2 and Fig.3

1. PCB ready for printing of solder paste

2. Printing paste

3. Placing components

*Fig.2 Pin-through-paste preparation procedure for soldering the MLX90614/5 sensor*
4. Reflow soldering

**Fig.3 Reflow soldering the Melexis IR sensor**

- The solder paste is dispensed (or printed) for all SMDs and on the top of the vias for the THDs;
- SMDs are placed automatically;
- The through-hole part is inserted - for TO39 manually – with the pins in the paste;
- The PCB goes through reflow, soldering both SMD and through-hole parts during the same step;
- For the metal MLX90614 package, it is recommended to have a small spacer on the PCB (See Fig.3-4). This is helpful to avoid solder bridges between the leads and the bottom of the metal TO-39 over the glass insulation. The spacer can be a cross or a flange protection disc made from a high temperature resistant material.

**Fig.4 Spacers for IR sensor**
The “Pin-through-Paste” method has two consequences:

1. Contrary to the wave soldering, during the “Pin-through-Paste” method the temperature is mostly the same for the whole package as the temperature gradient between the leads and the package is smaller than the gradient during wave soldering.
2. The time of peak heating during the “Pin-through-Paste” method is longer than during wave soldering.

Using an IR reflow process without convection is not recommended, because the TO-39 metal package acts as a shield for the soldering mask on the leads under the package. Only convection reflow should be used. The Melexis IR sensor in TO39 is qualified for reflow soldering according to the J-STD-020 with peak temperature 225°C and peak temperature time ≤ 30 sec.

If the reflow peak temperature is higher than 225 °C, a thermal shield is required to be placed on the top of TO39 prior to reflow. This can be a reusable cap made from high temperature resistant material like Silicon Rubber. (See Fig.5). The cap prevents overheating of the epoxy glue used to attach the IR filter window to the metal package. The protective cap for the IR sensor can be a ripped cap, a pull-tab flexicap or an Al shield plate.

3.3. Manual/Robotic iron soldering

Other soldering methods that are used are manual or robotic soldering with soldering irons and hot air guns. The Melexis IR sensor in TO39 is qualified for iron soldering according to the EN60749 -15 with peak temperature 350°C and peak temperature time ≤ 3.5 sec.

Contact Melexis for details on your reflow temperature profile for a potential risk assessment.
4. Disclaimer

The content of this document is believed to be correct and accurate. However, the content of this document is furnished "as is" for informational use only and no representation, nor warranty is provided by Melexis about its accuracy, nor about the results of its implementation. Melexis assumes no responsibility or liability for any errors or inaccuracies that may appear in this document. Customer will follow the practices contained in this document under its sole responsibility. This documentation is in fact provided without warranty, term, or condition of any kind, either implied or expressed, including but not limited to warranties of merchantability, satisfactory quality, non-infringement, and fitness for purpose. Melexis, its employees and agents and its affiliates' and their employees and agents will not be responsible for any loss, however arising, from the use of, or reliance on this document. Notwithstanding the foregoing, contractual obligations expressly undertaken in writing by Melexis prevail over this disclaimer.

This document is subject to change without notice, and should not be construed as a commitment by Melexis. Therefore, before placing orders or prior to designing the product into a system, users or any third party should obtain the latest version of the relevant information. Users or any third party must determine the suitability of the product described in this document for its application, including the level of reliability required and determine whether it is fit for a particular purpose.

This document as well as the product here described may be subject to export control regulations. Be aware that export might require a prior authorization from competent authorities. The product is not designed, authorized or warranted to be suitable in applications requiring extended temperature range and/or unusual environmental requirements. High reliability applications, such as medical life-support or life-sustaining equipment or avionics application are specifically excluded by Melexis. The product may not be used for the following applications subject to export control regulations: the development, production, processing, operation, maintenance, storage, recognition or proliferation of:
1. chemical, biological or nuclear weapons, or for the development, production, maintenance or storage of missiles for such weapons;
2. civil firearms, including spare parts or ammunition for such arms;
3. defense related products, or other material for military use or for law enforcement;
4. any applications that, alone or in combination with other goods, substances or organisms could cause serious harm to persons or goods and that can be used as a means of violence in an armed conflict or any similar violent situation.

No license nor any other right or interest is granted to any of Melexis' or third party's intellectual property rights.

If this document is marked "restricted" or with similar words, or if in any case the content of this document is to be reasonably understood as being confidential, the recipient of this document shall not communicate, nor disclose to any third party, any part of the document without Melexis' express written consent. The recipient shall take all necessary measures to apply and preserve the confidential character of the document. In particular, the recipient shall (i) hold document in confidence with at least the same degree of care by which it maintains the confidentiality of its own proprietary and confidential information, but no less than reasonable care; (ii) restrict the disclosure of the document solely to its employees for the purpose for which this document was received, on a strictly need to know basis and providing that such persons to whom the document is disclosed are bound by confidentiality terms substantially similar to those in this disclaimer; (iii) use the document only in connection with the purpose for which this document was received, and reproduce document only to the extent necessary for such purposes; (iv) not use the document for commercial purposes or to the detriment of Melexis or its customers. The confidentiality obligations set forth in this disclaimer will have indefinite duration and in any case they will be effective for no less than 10 years from the receipt of this document.

This disclaimer will be governed by and construed in accordance with Belgian law and any disputes relating to this disclaimer will be subject to the exclusive jurisdiction of the courts of Brussels, Belgium.

The invalidity or ineffectiveness of any of the provisions of this disclaimer does not affect the validity or effectiveness of the other provisions. The previous versions of this document are repealed.

Melexis © - No part of this document may be reproduced without the prior written consent of Melexis. (2020)