TELEDYNE e2v
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QT1040 and QLS1046 Assembly guidelines

February 2024 – Revision D

Document aim and comment

This document aims at describing the guidelines for the Qormino® QT1040 and QLS1046 assembly.

Introduction

Qormino® is a new hybrid component that embeds a QorIQ T1040 or a LS1046 processor and a memory (DDR4 with ECC) on the same substrate.

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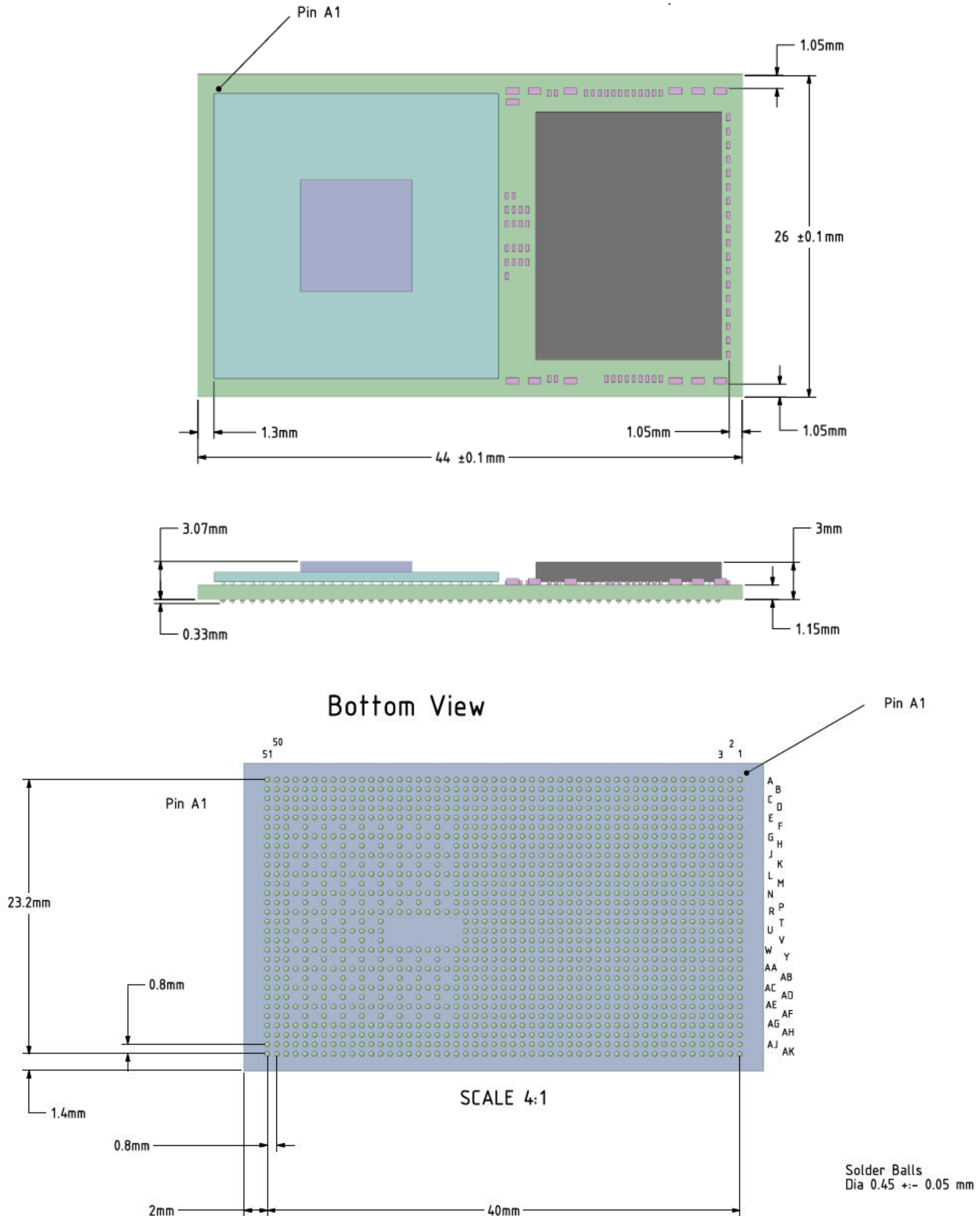
1. Preliminary Package information

Qormino module terminations can be supplied in two different solders:

- Eutectic leaded Sn63 solder
- Lead free SAC 305 for a Pb-free assembly

The figures below represent a QT1040, the QLS1046 has a similar construction.



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2. Printed Circuit Board Pads Configuration

In general, Printed Circuit Board (PCB) pad solderable diameter should match the package pad diameter i.e 450µm diameter.

Both solder mask finishes (NSMD / SMD) can be used on motherboard. However, Teledyne e2v does recommend using NSMD finish as it's the most common type of motherboard pad in the industry.

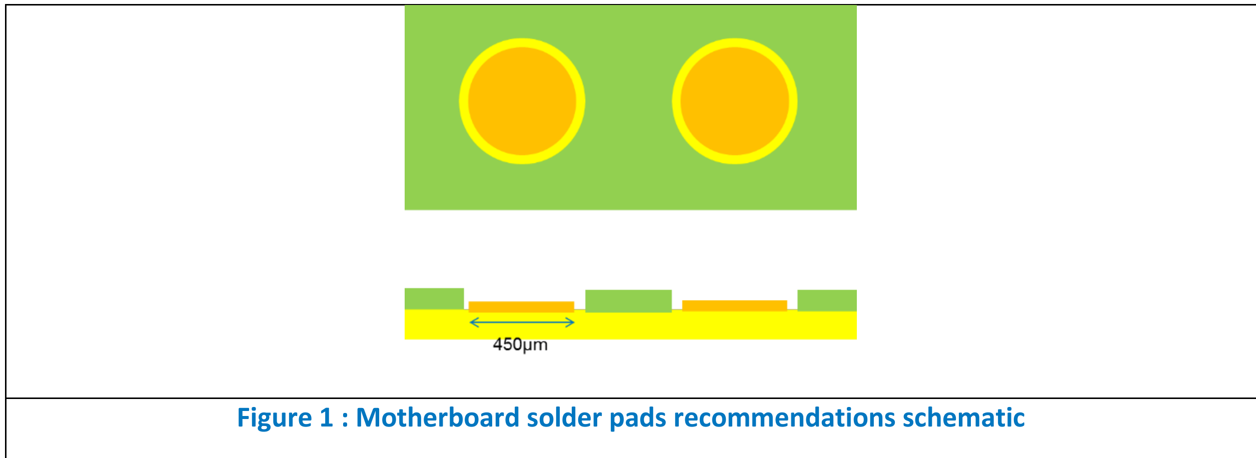

Figure 1 : Motherboard solder pads recommendations schematic

3. Leaded Solder paste deposition recommendations

Leaded solder paste deposition has to be used when the Qormino is supplied with Sn63 solder balls. The lead solder paste should have the following characteristics:

- Halide-free flux qualification rosine based (ROL0) according to ANSI/J-STD-004.
- Solder paste with at least type 3 (20-45µm) particles is recommended.
- "No clean" solder paste is recommended.

A stencil with no reduction (i.e 450µm diameter) on the apertures and a thickness between 100 and 130µm is recommended. 150µm thickness with an electro-polish finishing can also be chosen.

Note: "Head in pillow" defect can easily occur if a leaded solder paste is used with SAC305 solder balls. Teledyne e2v do not recommend such configuration.

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4. Lead Free Solder paste deposition recommendations

Lead free solder paste deposition has to be used when the Qormino is supplied with SAC305 solder balls. The lead solder paste should have the following characteristics:

- Halide-free flux qualification rosined based (ROL0) according to ANSI/J-STD-004.
- Solder paste with at least type 3 (20-45µm) particles is recommended.
- “No clean” solder paste is recommended.

A stencil with no reduction (i.e 450µm diameter) on the apertures and a thickness between 100 and 130µm is recommended. 150µm thickness with an electro-polish finishing can also be chosen.

5. Pick & place recommendations

In order to minimize the X,Y offset, Teledyne e2v is recommending to use automatic pick & place machine (with a placement accuracy head of at least +-50µm) and to use the lead recognition capabilities of such placement system, not the outline centering .

Handling of Qormino module should be done using the memory component top surface. Compliant tip nozzle such a rubber nozzle is advised. In order to ensure optimal stability while handling a large nozzle diameter as 15mm diameter is advised.

It is not recommended to handle the Qormino module using the T1040 bare die with hard type nozzle.

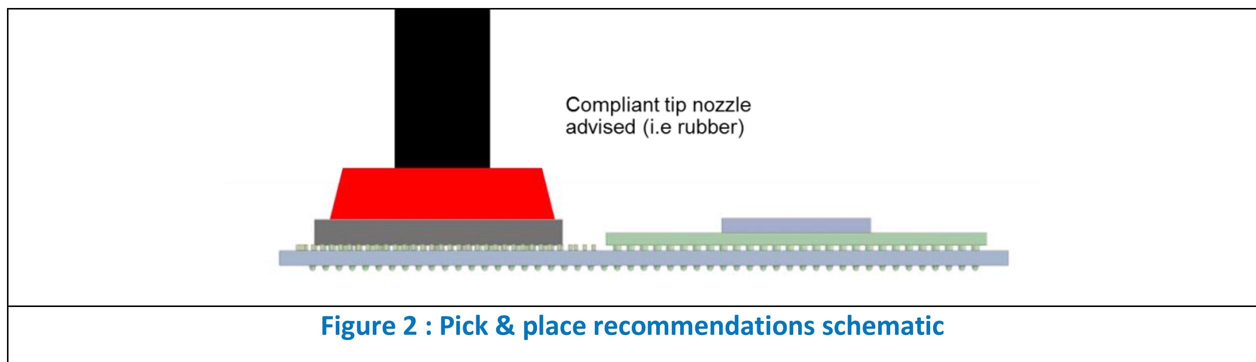

Figure 2 : Pick & place recommendations schematic

6. Reflow recommendations

Before thermal assembly, carefully check that all other devices can withstand a 245°C peak temperature in case of lead free assembly.

The thermal assembly can be performed using Convection reflow or Vapor-phase reflow. Teledyne e2v uses Convection reflow for Qormino assemblies.

In case of Convection reflow, using a nitrogen atmosphere inside the oven is recommended in order to maximise solder joint reliability.

In both cases, the temperature profile should be based on the IPC/JEDEC joint industry standard: J-STD-020E (see the below temperature profile for moisture sensitivity characterization based on this standard).

For reflow process tuning, two thermocouples should be embedded close to Qormino module under the memory and microprocessor centre in order to maximise the profile accuracy. Thermocouples have to be glued with thermally conductive adhesive (see Figure 3).

Profile Feature	SnPb Sn63	SAC305
Average ramp-up rate (T_L to T_p)	3°C/s max	3°C/s max
Preheat		
Temperature minimum	100°C	150°C
Temperature maximum	150°C	200°C
Time (t_{smin} t_{smax})	60s to 120s	60s to 120s
Time above liquidus		
Temperature (T_L)	183°C	217°C
Time (T_L)	60s to 120s	60s to 120s
Peak/classification temperature (T_p)	220°C	245°C
Time within 5°C of actual peak temperature (t_p)	20s max	30s max
Ramp-down rate	6°C/s max	6°C/s max
Time 25°C to peak temperature	6 minutes max	8 minutes max

In case of Vapor-phase reflow, the preheating phase mentioned in the above table is not applicable. Preheat may be significantly shorter or longer depending on the vapor-phase oven.

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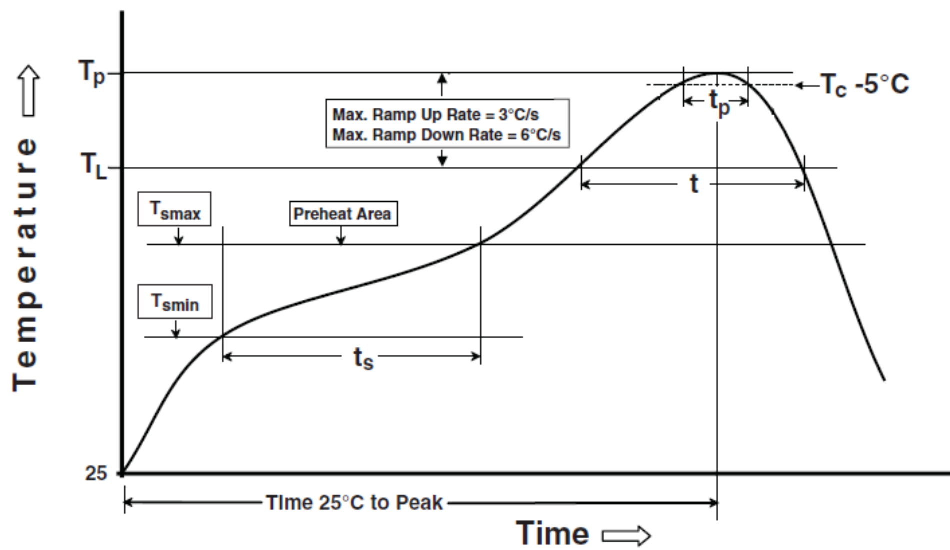

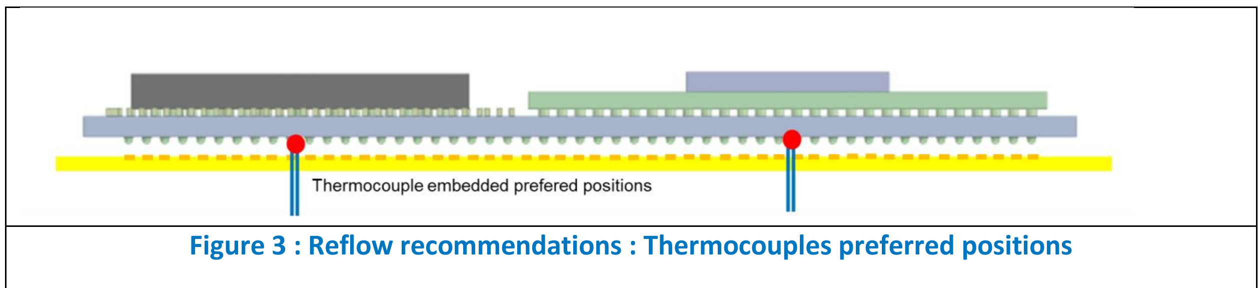

Figure 3 : Reflow recommendations : Thermocouples preferred positions

Note: Mechanical samples can be provided to tune the reflow process and the position of the thermocouples.

7. Related documentation

QT1040 and QLS1046 available on the Product Webpage
https://semiconductors.teledyneimaging.com/en/products/qormino-processing-modules/

8. Document Revision History

Author	Issue	Date	Reason for change
Alexis Durand	A	22/02/2019	Initial release
Jules Torres	B	26/03/2021	Reflow recommendations update
Jules Torres	C	11/04/2023	Layout modification
Jules Torres	C.1	03/01/2024	Minor change: Document header correction
Jules Torres	D	08/02/2024	Major changes: QLS1046 added and reflow method updated
Jules Torres	E	12/06/2024	Minor change: figure correction in chapter 1