

## Introduction

STMicroelectronics manufactures aerospace products at its dedicated European facility in Rennes (France), certified by the ESA-ESCC, DLA QML-V and DLA JANS systems.

In addition to the qualified products, often referred to as “flight parts”, ST proposes for most products (die - package combinations) an Engineering Model (EM) quality level, primarily intended to support development. The present document briefly describes the manufacturing and screening flow of this engineering model quality level.

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# 1 Eligible products

Any ST aerospace qualified product can be proposed for the Engineering Model quality level, whether it is qualified in the ESCC, in the JANS or in the QML system.

The EM quality level is proposed by default for most die - package configurations (including die form), with some exceptions, mostly with legacy products and/or rare packages or pinout. Each product datasheet provides the details of the available EM<sup>a</sup>.

Non aerospace products may also be proposed for EM quality level, with some specific adjustments not discussed in this document.

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<sup>a</sup> Contact an ST sales office for die - package configurations not listed in the datasheets

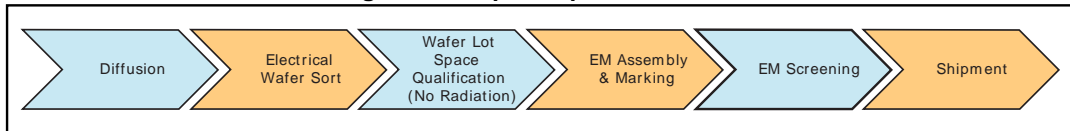
## 2 Production flow

### 2.1 Packaged EM

#### 2.1.1 Manufacturing flow

A simplified EM production flow for packaged parts is figured below:

**Figure 1: Simplified production flow**



With respect to qualified flight models (FMs), EMs:

- use the same die (same design and the same mask set)
- are diffused in the same diffusion line, using the same process
- go through the same electrical wafer sort (EWS)
- are submitted to the same wafer lot qualification tests, but without radiation tests
- are assembled on the same space assembly line, using the simplified process flowchart and control plan summarized below
- use the same packages and piece parts (wires, lid, etc.)
- are not optically sorted
- are guaranteed against the same ESCC/SMD electrical test tables, in particular, over the full temperature range test (guaranteed by characterization +100 % final test at 25 °C + wafer lot qualification sampling at three temperatures)
- are provided without any radiation hardness guarantees
- do not undergo any package testing (PIND test, thermal cycles, etc.)
- are provided with a specific marking, without agency logo, described in each product datasheet
- are delivered with gold-plated terminals only
- are provided with a dedicated Certificate of Conformance

The simplified EM assembly and screening flow is summarized below:

1. Die-attach
2. Wire bonding
3. Sealing
4. Stabilization bake
5. Fine/gross leak test
6. Marking
7. Electrical test go/no-go at 25 °C
8. Packing

#### 2.1.2 Documentation

Since October 9th, 2015, each shipment of EM includes, in addition to the parts, a Certificate of Conformance providing the following information:

- Customer name
- Customer Purchase Order number
- ST Sales Order & Item
- ST Part Number
- Quantity delivered

- Date Code
- Reference to ST Datasheet
- Reference to this Technical Note
- Rennes assembly Lot ID

### 2.1.3 Product identification

The part numbers of EM can be found for each product in the datasheet and on the ST website. The EM of packaged parts are denoted by a suffix "1" as shown in the examples below:

- 2N2222AUB1
- SOC55511
- RHFAC14AK1
- RH-PM4424LK1



For the EM of QML-V products developed since 2016, the radiation digit is replaced by a hyphen, as shown above for RH-PM4424LK1

## 2.2 Die Products

### 2.2.1 Manufacturing flow

With respect to qualified flight models, the EMs in die form:

- use the same dice (same design and the same mask set)
- are diffused in the same diffusion line, using the same process
- go through the same electrical wafer sort (EWS)
- are submitted to the same wafer lot qualification tests, but without radiation tests
- are not optically sorted
- are guaranteed against the same ESCC/SMD electrical test tables, in particular, over the full temperature range test (guaranteed by characterization + a sample of packaged parts fully tested at 25 °C + wafer lot qualification sampling at three temperatures)
- are provided with a dedicated Certificate of Conformance

### 2.2.2 Documentation

The die layout of QML-V qualified products can be found in the SMD, available from the DLA website.

For ESCC-qualified products and for non-qualified products, ST provides a document upon request that contains the die layout and the following information:

- Wafer fab
- Wafer size
- Die size
- Die thickness
- Back metallization
- Top metallization
- Die pad size
- Die pad identification with the corresponding die layout
- Orientation (top side and upper left corner identification)
- Waffle pack references

EM in die form are provided with a Certificate of Conformance, providing the following information:

- Customer name
- Customer Purchase Order number
- ST Sales Order & Item
- ST Part Number
- Quantity delivered
- ST Data sheet Reference
- Reference to this Technical Note
- DIE2S manufacturing Lot ID in ST Rennes

### 2.2.3 Product identification

The part numbers of EM in die form have a special suffix:

- DIE2S for products developed up to 2015
- D2S for newer products



For the EM of QML-V products developed since 2016, the radiation digit is replaced by a hyphen (e.g., RH-PM4424LK1)

### 3 Revision history

Table 1: Document revision history

| Date        | Version | Changes  |
|-------------|---------|--|
| 30-May-2014 | 1       | Initial release.   |
| 27-Jun-2017 | 2       | Throughout document:<br>- minor text and formatting changes<br>Updated <a href="#">Section 3.1.1: "Manufacturing flow"</a><br>Added <a href="#">Section 3.2.1: "Manufacturing flow"</a> , <a href="#">Section 3.2.2: "Documentation"</a> and <a href="#">Section 3.2.3: "Product identification"</a> |

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