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Application note

ST space products in die form

Introduction

STMicroelectronics offers die versions for most of its space qualified products, with two grade levels, engineered model (EM) and flight model (FM).

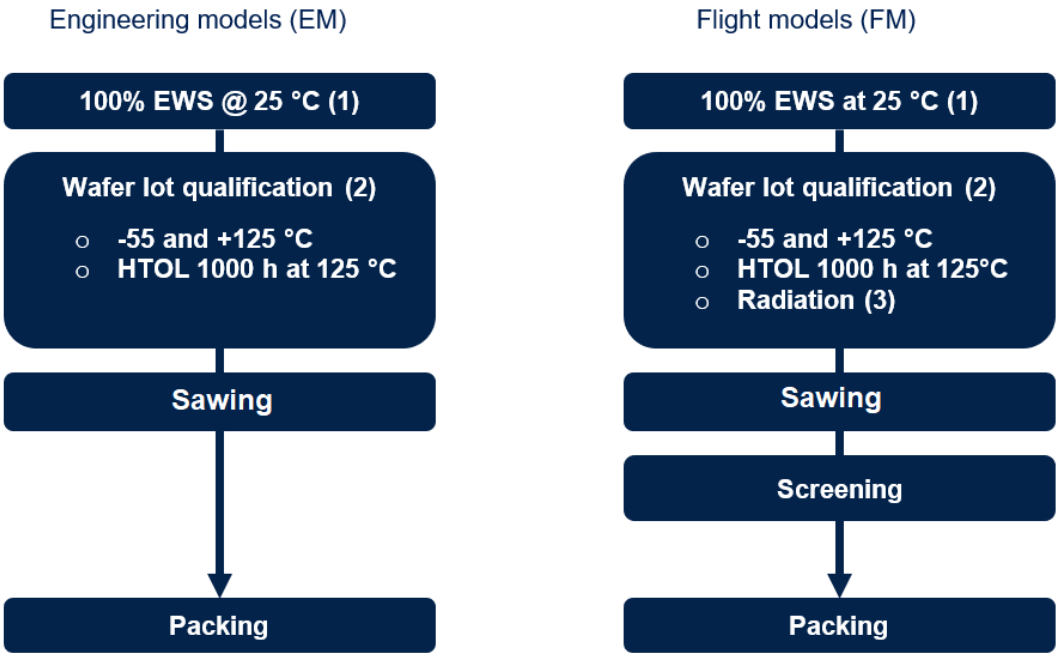
Each level have two different flows, depending on whether the packaged versions are QML or ESCC qualified.

The exceptions to die availability are a few products whose electrical wafer sorting (EWS) test coverage would significantly limit the electrical specification that can be guaranteed for the die versions.

1 Manufacturing flow for products in die form

The general flow is described in Figure 1. Flow charts:

Figure 1. Flow charts



(1): Dynamic part average testing is as of today implemented for most diodes. For bipolar transistors and MOSFET, both part average testing (PAT) and geographical part average testing (GPAT) are implemented.

(2): The wafer lot qualification (WLQ) is made by sampling on packaged parts. It is indeed performed on each wafer whenever the wafer-to-wafer variations are not marginal vs the part-to-part variations.

(3): The radiation test is only performed on wafer lot used for the manufacturing of RHA guaranteed parts.

2 Quality levels for products in die form

The Table 1. Quality framework and screening values summarizes the quality framework and screening of engineering models (EM) and flight models (FM) according to the quality system in which the packaged part is qualified.

Table 1. Quality framework and screening values

Quality level	Qualifying agency	Product	Screening	Quality specification	Test method
EM		All	No screening	TN1181	
FM	QML-V	Integrated circuits	Visual die sort	MIL-PRF-38535	MIL-STD-883 TM2010 Cond A
	ESCC	Integrated circuits		TN0873	MIL-STD-883 TM2010 Cond A
		Diodes			MIL-STD-750 TM2078
		Bipolar transistors			MIL-STD-750 TM2072
		MOSFET			ESCC2045000

Space EMs

ST's space EM quality framework is a dedicated ST specification called TN1181, whether they are QML or ESCC qualified. Like all ST EMs, EMs in die form come from a qualified wafer lot and are accompanied by a certificate of conformance (COC). They are not subject to further screening or testing.

Space FMs

The die versions of ST's QML qualified products are listed in the product SMD. Their screening, in full compliance with the MIL-PRF-38535, is made up of a visual die sort (VDS) as per MIL-STD-883 TM2010 Cond A.

The quality framework of ST's ESCC qualified product chip versions is a dedicated ST specification called TN0873. Their screening consists of visual sorting (VDS), the specifications and test method of which depend on the type of product as described in Table 1. Quality framework and screening values.

Note: For bipolar transistors, ST only proposes die versions as per TN0873. The JANS and JANR versions are not supported in die form.

3 Storage

The IEC 62258 standard applies.

4 High and low temperature EWS test and burn-in

As of today, ST has not identified interest from its customers for options such as burn in or 100% high and/or low temperature test at EWS, commonly referred to as know good die (KGD). It actually seems that end users perform such steps at system level only to optimize their costs, which seems a reasonable approach for the quantities commonly seen in space.

Revision history

Table 2. **Document revision history**

Date	Revision	Changes
11-Jun-2021	1	Initial release.

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