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TN1292

Technical note

M54HCxx and M54HCTxx series 100 krad(Si) versions

Introduction

The M54HCxxx / M54HCTxxx series of logic products is ESCC qualified at 50 krad. However, ST can propose 100 krad products on a case-by-case basis. These parts comply with this specification.

This specification replaces the TN1190

Eligible products

While all M54HCxx / M54HCTxx series products are ESCC 50 krad qualified, some wafers show a radiation performance which allows them to successfully pass ST's 100 krad test. This test is described in this document. It should be noted that different products show different probabilities of reaching 100 krad.

ST cannot guarantee the availability of 100 krad parts before a dedicated wafer has been successfully tested. This impacts the order entry process.

1 Manufacturing flow

1.1 ST 100 krad test of HC logic parts

The table below provides a summary of the radiation tests performed on wafers used to manufacture 100 krad HC logic parts. These wafers are by default not submitted to the ESA 50 krad radiation verification test.

Note: *For logistical reasons, STMicroelectronics may decide to manufacture 100 krad HCMOS parts from wafers qualified at 50 krad as per ESCC specification.*

Table 1. Radiation test summary

Step	Parameter	100 krad
Sampling		Wafer by wafer
Sampling size		4 parts per wafer
Bias		As described in Section 2.9.1 of the ESCC detail specification
Dose rate		3.6 to 360 krad/h
Post radiation measurements	Functional test	@ 6.0 V
	Threshold voltage drift	N/A
	Threshold voltage limit	
	Quiescent current limit	
Post annealing measurements	Threshold voltage drift	I Δ VTHN I ≤ 1.5 V I Δ VTHP I ≤ 1.5 V
	Threshold voltage limit	For HCTxx types: • -1.5 V ≤ V_{THN} ≤ -0.2 V • 0.7 V ≤ VTHP ≤ 2.2 V
		For all others types (HCxx) • -2 V ≤ V_{THN} ≤ -0.45 V • 0.45 V ≤ V_{THP} ≤ 1.9 V
	Quiescent current limit	I_{DD} max. ≤ 50 µA
	Output leakage current third state (for third state devices)	I $I_{OZ\ L}$ I < 5 µA I $I_{OZ\ H}$ I < 5 µA
	All other parameters	Section 2.3.1 ESCC specification limit @ 25 °C with 35% relaxation

1.2 Assembly and marking

The assembly process is compliant with the ESCC9000 specification. As a consequence, 100 krad parts are marked with their ESCC number. However, the marking does not include a radiation digit as the 50 krad test is not performed and the 100 krad test is not ESCC compliant.

1.3 Documentation

By default, M54HCxxx / M54HCTxxx 100 krad products are accompanied by the following documentation:

- Certificate of conformance
- 100 krad radiation verification test report

Contact an ST sales office for details on optional documentation and services.

2 Ordering information

While ST is committed to supporting ESCC 50 krad parts, ST can only commit to the delivery of 100 krad parts after enough wafers have been successfully tested at 100 krad to cover the requested quantity. Please note, however, that ST maintains a wafer and possibly finished goods stock of the most commonly ordered 100 krad parts.

Therefore the first step is for the customer to contact ST to request the availability status of 100 krad parts or wafers. If available, order entry can proceed normally from stock for 100 krad parts or with a new assembly for 100 krad wafers using a dedicated part number formed with the addition of a "Y" before the package code as described in the example below.

Table 2. Ordering information

Standard version			100 krad		
ST part Number	ESCC part number	Radiation hardness	ST part Number	Marking	Radiation hardness
M54HC14KT	940900702F	50 krad(Si)	M54HC14YKT	940900702	100 krad(Si)

The minimum order quantity for the 100 krad(Si) versions is 50 pieces. Exception to the MOQ can be accepted for unbreakable stock line items.

If neither 100 krad parts nor 100 krad wafers are available, ST may propose, on a case-by case basis, an at-cost and at-risk up-screen test. Further steps depend on the test results:

- If the wafer is found good at 100 krad, order entry for 100 krad parts are authorized
- If the wafer is found not good at 100 krad, an additional at-cost and at-risk iteration can be proposed until a good wafer is found or until it is decided to stop searching

Revision history

Table 3. **Document revision history**

Date	Version	Changes
21-Jun-2019	1	Initial release.

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