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>
<thead>
<tr>
<th>Step</th>
<th>Parameter</th>
<th>100 krad</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sampling</td>
<td></td>
<td>Wafer by wafer</td>
</tr>
<tr>
<td>Sampling size</td>
<td></td>
<td>4 parts per wafer</td>
</tr>
<tr>
<td>Bias</td>
<td></td>
<td>As described in Section 2.9.1 of the ESCC detail specification</td>
</tr>
<tr>
<td>Dose rate</td>
<td></td>
<td>3.6 to 360 krad/h</td>
</tr>
<tr>
<td>Post radiation</td>
<td>Functional test</td>
<td>@ 6.0 V</td>
</tr>
<tr>
<td>measurements</td>
<td>Threshold voltage drift</td>
<td>N/A</td>
</tr>
<tr>
<td>Post annealing</td>
<td>Threshold voltage limit</td>
<td>I Δ VTHN I ≤ 1.5 V</td>
</tr>
<tr>
<td>measurements</td>
<td></td>
<td>I Δ VTHP I ≤ 1.5 V</td>
</tr>
<tr>
<td></td>
<td>For HCTxx types:</td>
<td>For all others types (HCxx)</td>
</tr>
<tr>
<td></td>
<td>• -1.5 V ≤ VTHN ≤ -0.2 V</td>
<td>• -2 V ≤ VTHN ≤ -0.45 V</td>
</tr>
<tr>
<td></td>
<td>• 0.7 V ≤ VTHP ≤ 2.2 V</td>
<td>• 0.45 V ≤ VTHP ≤ 1.9 V</td>
</tr>
<tr>
<td></td>
<td>Quiescent current limit</td>
<td>IDD max. ≤ 50 μA</td>
</tr>
<tr>
<td></td>
<td>Output leakage current</td>
<td>I O2Z L I &lt; 5 μA</td>
</tr>
<tr>
<td></td>
<td>third state (for third</td>
<td>I O2Z H I &lt; 5 μA</td>
</tr>
<tr>
<td></td>
<td>state devices)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>All other parameters</td>
<td>Section 2.3.1 ESCC specification limit @ 25 °C with 35% relaxation</td>
</tr>
</tbody>
</table>

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.
## 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>
<thead>
<tr>
<th>Standard version</th>
<th>100 krad</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST part Number</td>
<td>ESCC part number</td>
</tr>
<tr>
<td>M54HC14KT</td>
<td>940900702F</td>
</tr>
</tbody>
</table>

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
### Table 3. Document revision history

<table>
<thead>
<tr>
<th>Date</th>
<th>Version</th>
<th>Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>21-Jun-2019</td>
<td>1</td>
<td>Initial release.</td>
</tr>
</tbody>
</table>
Contents

1 Manufacturing flow ................................................................. 2
  1.1 ST 100 krad test of HC logic parts ..................................... 2
  1.2 Assembly and marking ....................................................... 2
  1.3 Documentation .................................................................. 3

2 Ordering information .............................................................. 4

Revision history ................................................................. 5
List of tables

Table 1. Radiation test summary ............................................................... 2
Table 2. Ordering information.................................................................. 4
Table 3. Document revision history .............................................................. 5
IMPORTANT NOTICE – PLEASE READ CAREFULLY

STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST’s terms and conditions of sale in place at the time of order acknowledgement.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of Purchasers’ products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. For additional information about ST trademarks, please refer to www.st.com/trademarks. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

© 2019 STMicroelectronics – All rights reserved