Integrated supply chain for Power IC in BCD6s SOI

for ASIC and ASSP

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ABSTRACT

The key features of the BCD6s SOI technology and the radiation performances measured on 4 rad-hard power ICs designed in this technology are presented, followed by an overview of the rad-hard design platform developed within these programs, including the hardened library and rad-hard hard IPs. The supply chain options up to the delivery of QML-V products assembled in high dissipation packages are introduced, with then a perspective on a possible ecosystem for the developments of BCD6s SOI rad-hard Power ASIC and ASSP.

1. INTRODUCTION

STMicroelectronics offers 3 power products currently QML-V qualified at 100 krad and SEL & SEU free up to 70 MeV.cm2/mg: the RHRPM4423, RHRPM4424 and the RHRPMICL1A. The complete characterization of a 4th product, the RHRPMPOL01 is also available. These products have all been designed to radiation hardness using the same power technology, the BCD6s SOI, and the same ST supply chain, therefore demonstrating it is capable to support the development of rad-hard by design products.

To support these designs, ST has developed a basic rad-hard library, rad-hard hard IPs and a strong know-how, which ST re-uses and completes within each new rad-hard design. Although not rad-hard qualified, the technology therefore now includes basic building blocks making each new design easier.

Additional optional services are proposed, including electrical wafer sort, packaging, screening and QML-V or ESCC qualification using ST ESCC and QML-V certified facility of Rennes, supporting die and hermetic ceramic packaging, wired bonded chip today and the equipment to propose flip-chip in the future.

An ecosystem is being developed to support designs cost effective prototyping through MPWs.

1. BCD6S SOI TECHONOLGY OVERVIEW

The BCD6s SOI is a 0.32µm optical shrink from the BCD6 0.35µm on an SOI substrate widely used for automotive and industrial power ICs. Its high resistive substrate and trench isolation provide an intrinsic radiation hardness capability. The technology is today only qualified for wire bonding, but a qualification for flip-chip assembly is possible, possibly with a limitation of the pin count.

It is available with various maximum voltage options from 5 Volt / 3.3 Volt capable to 190 Volt. As of today, the 40Volt option has been used to make a rad-hard 18Volt gate driver and the 100V option to develop the 52 V specified RHRPMICL1A.

The picture below provides an overview of the key features of the standard technology





1. BCD6s SOI RAD-HARD PLATFORM

For the design of its radiation hardness products, ST developed a dedicated rad-hard basic digital library, I/O, N and P Channel MOSFET with various breakdown voltage, and hard rad-hard IPs, such voltage reference, comparator, triple voting cell, voltage regulator and configuration anti-fuse, suitable for reuse in various design. On-going development are regularly enriching this offer. These add-ons make up a rad-hard design platform that could be made available to designers.

1. BCD6S SOI RADIATION TESTS SUMMARY

The rad-hard design kit has been characterized during numerous radiation campaigns in TID high and low dose rate, and in SEL/SES (Snapback), SEU and SEFI. The table below summarizes the overall radiation level that these tests demonstrate can be reached, depending on the power supply.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Type | RHFPM442x | RHRPMICL1A | RHRPMPOL01 | Unit | Comments |
| TID HDR & LDR | 100 | 100 | 100 | krad(Si) | ELDRS |
| SEL | 68 | 78 | 70 @ 7.0 V | MeV.cm2/mg |  |
| SEU | N.A. | 78 | 70 @ 7.0V | MeV.cm2/mg |  |
| SEFI | 120 | N.A. | tbd | MeV.cm2/mg |  |

1. OPTIONAL SERVICES AND SUPPLY CHAIN

Option services are available to users of the BCD6s SOI technology, including test program, development and electrical wafer sort, wafer sawing and visual test of the dice to EM or FM, packaging (wire bonded or flip-chip, off the shelf or custom ceramic hermetic), screening to EM, ESCC or QML-V level for products packaged or in die form

1. ECOSYSTEM

The BCD6s SOI support Multi Project Wafer (MPW). It is therefore be possible to propose a cost-effective access for prototyping and academic programs. Design houses could be added.

1. CONCLUSION

ST’s BCD6s SOI is a rad-capable process available within a comprehensive supply chain that could be completed by an ecosystem to support rad-hard ASIC and ASSP designs.