

## 目录

1. 软件产品概述.....	1
2. 软件内容.....	3
3. 支持的目标.....	4
4. 质量、符合的标准和测试方法.....	5
5. 参考资料.....	5
6. 文档信息.....	6

# 结构核自检库

## 1. 软件产品概述

SCST（结构核自检）库是一款用于运行时检测处理器核永久性硬件故障的软件产品。它包含测试代码（原子测试），由此用预定义的测试向量激发处理器核的子模块，并观察和评估核的逻辑响应。它通常能达到90%的DC（诊断覆盖率）。它针对各种处理器内核的子模块，如：

- 数据路径单元（ALU、乘法器、除法器）
- 加载/存储单元
- 指令解码器
- 转发逻辑
- FPU & NEON

详细情况可以在诊断覆盖率估算文件中找到，该文件是每个单独的SCST产品交付的一部分。

被认为是安全的故障（如调试逻辑中的故障）不会被测试，并被排除在DC计算之外，见图1：恩智浦的SCST库内容。

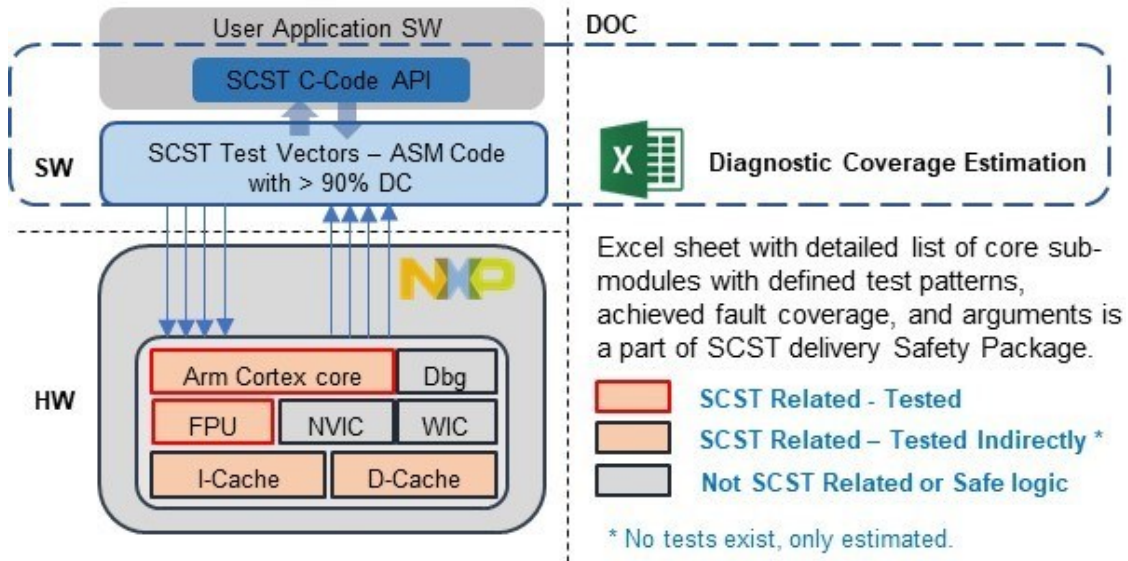


图1. 恩智浦的SCST库内容示例

SCST库可用于检测单点故障或潜在故障，故障的区分请见[1]。在这两种情况下，SCST只检测永久性故障，它主要用于某些处理器核，而这些处理器核不使用支持永久性故障检测安全的硬件（HW）技术，例如延迟锁步。如果使用SCST来检测潜在的故障，那么只需在启动或关闭时运行即可。为了检测单点故障，需要在运行时周期性执行SCST。

SCST是作为脱离上下文的安全元素（SEooC）而开发的[1]。分配给SCST安全要求的最高ASIL是ASIL-B(D)，支持实现高达ASIL-D的安全目标。然而，在SCST用于检测单点故障的情况下，SCST的诊断覆盖率仅对ASIL-B是足够的。因此，SCST可用于支持ASIL-B(D)要求，并应采用其他运行时措施来检测剩余的单点故障，以实现ASIL-C和ASIL-D指标。

## 2. 软件内容

SCST库在支持应用程序实现安全方面至关重要。SCST库的主要组成部分如下。

- SCST库的源代码：
  - 是用汇编语言编写的。
  - 针对核的特定部分，划分为专门的原子测试。
  - 对检测到的故障做出反应（破坏测试签名）。
- 用C语言编写的简单API：
  - 提供灵活的原子测试执行。
  - 向用户应用程序发送首次检测到的故障信号。
  - 通过破坏测试签名来支持原子测试故障注入，允许用户应用程序测试它自己的故障反应机制。
  - 符合MISRA C标准。
- 故障覆盖率估算文件，其中：
  - 包含对所声称的DC估算的详细论证。

### 3. 支持的目标

本产品简介中描述的SCST库可用于恩智浦S32G器件的Arm® Cortex-A53核。

## 4. 质量、符合的标准和测试方法

A53 SCST库软件产品是根据“恩智浦软件开发流程”开发的，符合ISO 26262、Automotive-SPICE、IATF16949和ISO9001标准。

## 5. 参考资料

1. ISO 26262-1 : 2018。道路车辆——功能安全——第1部分：词汇表，2018，{ISO 26262-1:2018 ( E ) }。

## 6. 文档信息

表1. 修订记录

版本号	日期	实质性变更
1	2022年3月	初版发布
2	2022年4月	固定内核和平台描述



**How to Reach Us:**

**Home Page:**  
nxp.com

**Web Support:**  
nxp.com/support

Information in this document is provided solely to enable system and software implementers to use NXP products. There are no express or implied copyright licenses granted hereunder to design or fabricate any integrated circuits based on the information in this document. NXP reserves the right to make changes without further notice to any products herein.

NXP makes no warranty, representation, or guarantee regarding the suitability of its products for any particular purpose, nor does NXP assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters that may be provided in NXP data sheets and/or specifications can and do vary in different applications, and actual performance may vary over time. All operating parameters, including "typicals," must be validated for each customer application by customer's technical experts. NXP does not convey any license under its patent rights nor the rights of others. NXP sells products pursuant to standard terms and conditions of sale, which can be found at the following address: [nxp.com/SalesTermsandConditions](http://nxp.com/SalesTermsandConditions).

NXP, the NXP logo, NXP SECURE CONNECTIONS FOR A SMARTER WORLD, COOLFLUX, EMBRACE, GREENCHIP, HITAG, I2C BUS, ICODE, JCOP, LIFE VIBES, MIFARE, MIFARE CLASSIC, MIFARE DESFire, MIFARE PLUS, MIFARE FLEX, MANTIS, MIFARE ULTRALIGHT, MIFARE4MOBILE, MIGLO, NTAG, ROADLINK, SMARTLX, SMARTMX, STARPLUG, TOPFET, TRENCHMOS, UCODE, Freescale, the Freescale logo, AltiVec, C 5, CodeTEST, CodeWarrior, ColdFire, ColdFire+, C Ware, the Energy Efficient Solutions logo, Kinetis, Layerscape, MagniV, mobileGT, PEG, PowerQUICC, Processor Expert, QoriQ, QoriQ Qonverge, Ready Play, SafeAssure, the SafeAssure logo, StarCore, Symphony, VortiQa, Vybrid, Airfast, BeeKit, BeeStack, CoreNet, Flexis, MXC, Platform in a Package, QUICC Engine, SMARTMOS, Tower, TurboLink, and UMEMS are trademarks of NXP B.V. All other product or service names are the property of their respective owners. ARM, AMBA, ARM Powered, Artisan, Cortex, Jazelle, Keil, SecurCore, Thumb, TrustZone, and  $\mu$ Vision are registered trademarks of ARM Limited (or its subsidiaries) in the EU and/or elsewhere. ARM7, ARM9, ARM11, big.LITTLE, CoreLink, CoreSight, DesignStart, Mali, mbed, NEON, POP, Sensinode, Socrates, ULINK and Versatile are trademarks of ARM Limited (or its subsidiaries) in the EU and/or elsewhere. All rights reserved. Oracle and Java are registered trademarks of Oracle and/or its affiliates. The Power Architecture and Power.org word marks and the Power and Power.org logos and related marks are trademarks and service marks licensed by Power.org.

© 2022 NXP B.V.

Document Number: 1  
Rev. 2  
04/2022