ALTERA

Reduce Development Time, System Complexity, and Certification Risk

Qualified Functional Safety Data Package

Industrial automation, transportation, the smart grid, automotive, military and aerospace, and medical require that machinery and products are highly reliable, safe, and certified for functional safety. Safety is a central requirement when you develop machinery that must comply with worldwide established safety standards such as IEC 61508 and ISO 26262.

When you develop a safe product, you need to consider safety as a core system functionality. Design challenges include:

- Adopting quality management standards, a "safe" design methodology, and safety concepts
- Accounting for additional project effort (time and technology), resulting in longer time to market and higher cost of ownership
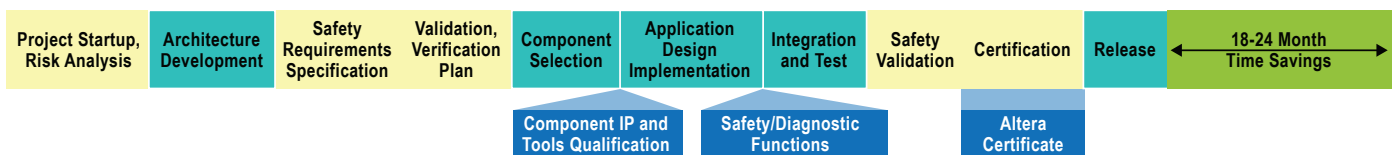
Impact of Functional Safety

Typical design steps to develop an application, before safety:

Architecture Development	Component Selection	Application Design Implementation	Integration and Test	Release

If you add some of the required steps to design a safe application and achieve functional safety certification (shown in yellow), you can see the significant project complexity:

Project Startup, Risk Analysis	Architecture Development	Safety Requirements Specification	Validation, Verification Plan	Component Selection	Component IP and Tools Qualification	Application Design Implementation	Safety/ Diagnostic Functions	Integration and Test	Safety Validation	Certification	Release

Having immediate access to qualified semiconductor data, intellectual property (IP), development flows, and design tools from a vendor like Altera can help you significantly shorten your overall project timeline by 1 ½ years to 2 years:

Project Startup, Risk Analysis	Architecture Development	Safety Requirements Specification	Validation, Verification Plan	Component Selection	Application Design Implementation	Integration and Test	Safety Validation	Certification	Release	18-24 Month Time Savings
				Component IP and Tools Qualification	Safety/Diagnostic Functions			Altera Certificate		

Accelerating Development

To simplify and speed up the certification process for faster time to market, we worked with TÜV Rheinland and obtained approval for Altera® FPGA devices, IP, our established safety FPGA design flow, and development tools for safety designs up to the Safety Integrity Level 3 (SIL3). This certification means that our tools, methodologies, and devices are sufficiently free of systematic errors.

Altera Functional Safety Data Package Contents

Functional Data Safety Package	Benefit
Altera FPGA development methodology	Qualified, safe design methodology
Altera FPGA development tools	Qualified tools
IP	Safe-to-use system components to speed up application development
Diagnostic IP	Shorten design time for safety architecture
Device reliability reports, guidelines	Simplifies risk analysis, failures in time (FITs) calculation
Formatted according to IEC 61508	Seamless integration into project documentation

Altera FPGAs Provide Flexible Safety Solutions

Figure 1 illustrates a typical industrial controller application. It integrates standard ("non-safe") and safety functions with very few board components using FPGA devices, such as the Altera Cyclone® FPGA, and a soft processor core, such as the Nios® II processor. In this example, all three embedded controllers are Nios II soft-core processors, each with an individual custom peripheral set.

Safety Data Package Contents:

- Application Note: Silicon Integration – How to qualify devices using the reliability report

- Application Note: Tools and Tool Flow – How to use Quartus® II software and develop FPGAs systems according to IEC 61508

- Suggested RTL coding guidelines for FPGA development

- Diagnostic IP with IEC 61508 standard documentation and source code: single event upset (SEU) test, clock check, and cyclic redundancy check (CRC) test modules

- Quartus II software version 11.0 SP1

- Altera-qualified devices up to Cyclone IV and Stratix® IV FPGAs and MAX® II and MAX II Z CPLDs

- IP including Nios® II embedded processor

- Latest FPGA device reliability report

TÜV Rheinland Certificate
No. 968/EL 850.00/12

Product Order Numbers
Functional Safety Data Package:
IP-ABG-SafetyDP2

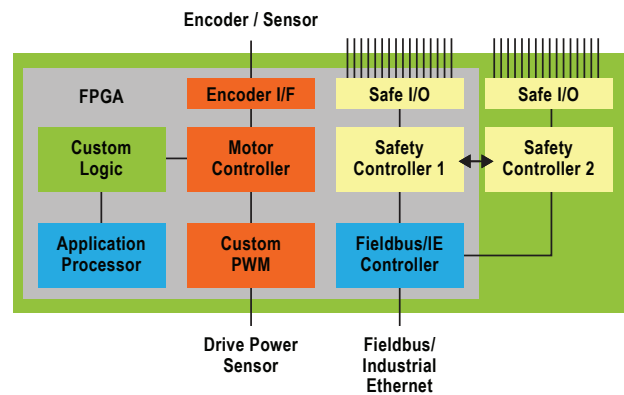**Annual Renewal:**
IPR-ABG-SafetyDP2

With such a safety-focused architecture for a SIL3 certified application, you can reduce the total cost of ownership, design footprint, and power consumption while meeting the global requirements for functional safety.

Architectures where safety typically is an after-thought often use bolt-on safety option boards and dual microcontroller units (MCUs) that detect system failures. Using an option card increases the cost significantly. Integrating a SIL3 "safe" solution in a pre-qualified FPGA with standard application functions on the main board not only lowers the safety cost footprint, but it also enhances system flexibility and shortens development time. It is designed with safety as a core system functionality in mind.

If you are concerned about the lack of flexibility, long development times, or device certification issues that come with traditional safety architectures, Altera's FPGAs are the ideal solution.

Figure 1: A Typical SIL3 Industrial "Safe" System

Want to Dig Deeper?

For more information on developing IEC 61508 systems with FPGAs and the Functional Safety Data Package, please contact your local Altera or distributor sales office or visit the Functional Safety page at **www.altera.com/safety.**