

ON Semiconductor

Is Now

onsemi™

To learn more about onsemi™, please visit our website at
www.onsemi.com

onsemi and **onsemi** and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi** product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** 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 special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** 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. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner. Other names and brands may be claimed as the property of others.

DO-254 Certification Support for Commercial Aircraft Manufacturers



ON Semiconductor®

<http://onsemi.com>

APPLICATION NOTE

Introduction

In 2005, worldwide aviation safety agencies including the Federal Aviation Administration (FAA) and the European Aviation Safety Agency (EASA) began enforcing a new design assurance standard for hardware. The RTCA/DO-254 standard was created to ensure the highest level of safety for electronic airborne systems. Initially intended to apply to all levels of electronic design, the FAA reduced the scope based on industry feedback for cost of implementation. There are five Design Assurance Levels (DLAs) contained in this standard: A – Catastrophic Failure, B – Hazardous/Severe Failure, C – Major Failure, D – Minor Failure and E – No Effect. FAA Advisory Circular AC20-152, released in June, 2005 stated: “This advisor circular (AC) applies to the manufacturers and installers of products or appliances incorporating complex custom micro-coded components with hardware design assurance levels of A, B, and C. These complex custom micro-coded components include application specific integrated circuits (ASIC), programmable logic devices (PLD), filed programmable gate arrays (FPGA), or similar electronic components used in the design of aircraft systems and equipment. Any airborne system that incorporates ASIC’s, PLD’s or FPGA’s must follow the guidelines contained in DO-254.

Complex Airborne Hardware

The DO-254 standard applies to complex airborne hardware. According to the specification, a hardware item is considered “complex” if a comprehensive combination of deterministic tests and analyses cannot ensure correct functional performance under all foreseeable operating conditions. For complex devices, a rigorous, structured design and verification process takes the place of exhaustive

testing. Demonstrating that the development and verification of complex hardware complies with this process is the objective of DO-254.¹

ON Semiconductor & DO-254 Support

ON Semiconductor’s digital ASIC design flow and the methodology it employs, fully supports the stringent requirements of commercial aircraft manufacturers that need to obtain DO-254 certification. A DO-254 compliant solution is an essential aspect of any system-on-a-chip designed for use in flight critical avionics applications. ON Semiconductor has chosen Mentor’s ReqTracer™ tool to facilitate the mapping, traceability, implementation and configuration management required by DO-254. ReqTracer links, manages and tracks hardware requirements from multiple sources throughout the design process, provides easy documentation and reports at any stage, and manages the impact of requirement changes. The result: better control and predictability of design schedules and improved overall product quality.²

ASIC Design Flow

Figure 1 depicts a typical ASIC development flow. Customer reviews occur throughout the cycle as illustrated, confirming that all requirements are met and documented in accordance with the DO-254 standard. The flow begins with a detailed specification review where ON Semiconductor and the customer agree on the goals of the ASIC development. These specification requirements are entered into the ReqTracer tool and will be evaluated throughout the development process. Once the requirements have been finalized, ON Semiconductor will create a conceptual design.

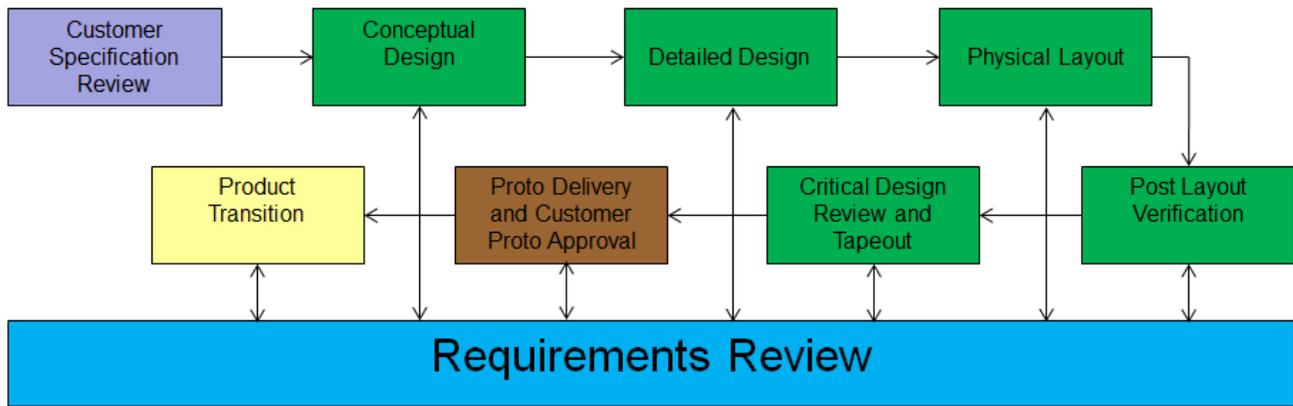


Figure 1. ON Semiconductor's Digital ASIC Flow

Conceptual Design

Utilizing a customer provided RTL or gate level netlist, verifications are performed to confirm that the design can be implemented per the specification. These verifications include but are not limited to synthesis/optimization, netlist translation/optimization, design for test (DFT) insertion, package development or verification, initial power analysis and initial simulation results. During the conceptual design phase, derived requirements, those additional requirements that are inferred from the ASIC specification, will be added to the requirements specifications. The scope of the project is approved and the detailed design phase begins.

Detailed Design

The customer will provide ON Semiconductor a revised RTL or gate level netlist that incorporates any of the changes identified during conceptual design. In the design phase, RTL checking or netlist translation/optimization, Intellectual Property (IP) and DFT insertion, static timing analysis and pre-layout simulations are performed and compared to the specification requirements. Customer approval completes the design phase of the program.

Physical Layout, Post Layout Verification and Critical Design Review

Upon approval of the design, physical layout and post layout verification are performed and completes the ASIC development cycle. Here the post layout netlist and package/pin definition are completed. Final design verification and sign-off documentation is prepared and sent to the customer for approval. A critical design review will be held to confirm that all design aspects have been met.

Prototypes and Product Transition

After receiving final design approval, ON Semiconductor will tape out the design, create fab reticles, fabricate wafers, assemble and test package units and ship prototypes. Customers will evaluate the prototypes at the system level against design objectives. Prototype approval completes the development phase and ON Semiconductor will then transition the ASIC to production.

DO-254 Documentation

Throughout the design process, a significant amount of documentation is generated and supplied to the customer. This includes a design plan, requirements specification, test plan, verification plan, verification report, trace tree, and trace reports. The documentation can be verified and traced to the origin of the collected data and adheres to the stringent requirements for DO-254 certification.

Configuration Management

ON Semiconductor's configuration management process ensures that all elements used to create the ASIC (ie: design library version number) are documented and accessible during the life of the program.

Summary

ON Semiconductor has demonstrated their ability to meet DO-254 requirements on past ASIC designs. With the processes and tools we have in place, we can provide our customers with an ASIC solution that supports DO-254 certification. Contact your local sales office to learn more about how ON Semiconductor can help meet your design objectives.

REFERENCES

[1] Dr. Paul Marriott, Anthony D. Stone.
“Understanding DO-254 Compliance for the
Verification of Airborne Digital Hardware”.
White Paper, October, 2009. Synopsys.

[2] “ReqTracer: Managing Requirements in your Design
Flow”. Data Sheet. Mentor Graphics.

ReqTracer is a trademark of Mentor Graphics.

ON Semiconductor and  are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of SCILLC's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC 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 special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC 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. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada
Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800-282-9855 Toll Free
USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81-3-5817-1050

ON Semiconductor Website: www.onsemi.com
Order Literature: <http://www.onsemi.com/orderlit>
For additional information, please contact your local
Sales Representative