

by Allan Coon
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1999

Introduction

The performance of surface acoustic wave (SAW) filters depends on a number of external factors. These include source and load impedances presented to the filter by external matching networks, the quality of the connections to the filter, the proximity of other circuitry and conducting structures, and the layout of the printed circuit board (PCB) that the filter is soldered to. This application note addresses the latter from a practical point of view. The quality of the PCB design can affect critical passband characteristics as well as the ultimate rejection of a SAW band-pass filter. This tutorial outlines the basic principles of PCB design required to obtain the best performance from SAW filters. It is provided as a guide especially for the RF circuit designer with little or no experience in applying SAW filters or in SAW filter PCB layout. Knowledge of appropriate general PCB design rules and standard RF layout principles is assumed.

Background

Many SAW filters have excellent ultimate rejection characteristics inherent to their fundamental designs. These characteristics are shown to best advantage in test fixtures used for production electrical tests. These fixtures are available from SAW filter manufacturers for the purpose of correlating electrical characteristics between the filter manufacturer and the filter customer. These fixtures, usually complete with external impedance matching to 50 ohms, are ideal for correlation purposes. However, these fixtures often contain a great deal of isolation between the coaxial input and output. The typical commercial application requires a much simpler and less costly layout, with no shielding and often in tight spaces. Consequently performance of the SAW filter in the end application is sometimes not as good as in the test fixture or as advertised.

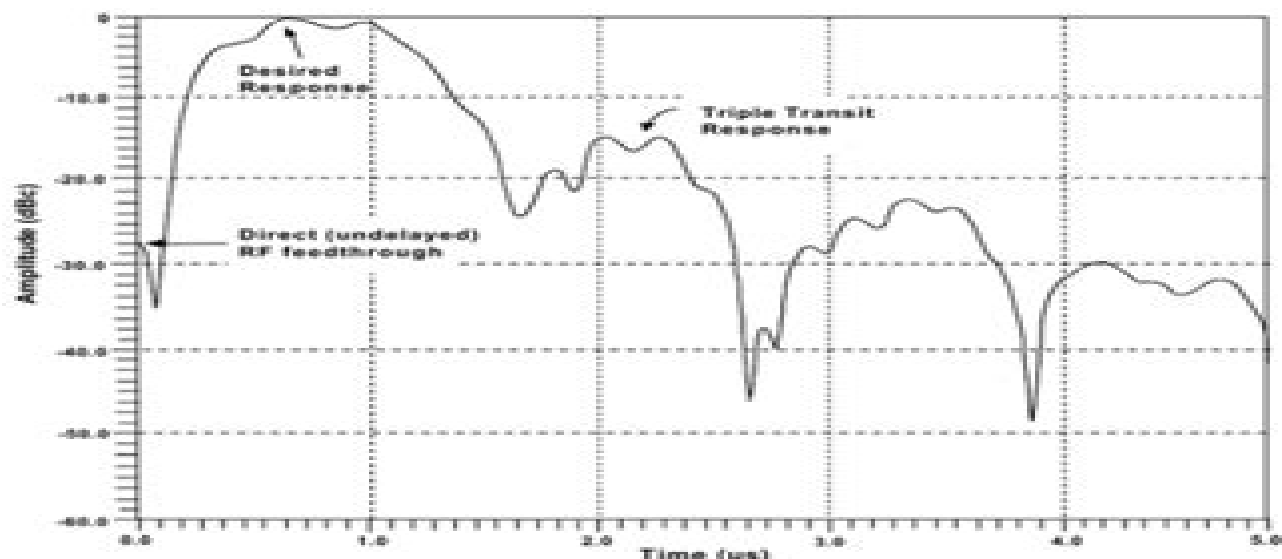


Figure 1
Representative Impulse Response

Saw Filter Pcb Layout Wireless

Paul Leroux, Michiel Steyaert



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RF/Microwave Circuit Design for Wireless Applications Ulrich L. Rohde, David P. Newkirk, 2004-03-24 A unique state of the art guide to wireless integrated circuit design With wireless technology rapidly exploding there is a growing need for circuit design information specific to wireless applications Presenting a single source guidebook to this dynamic area industry expert Ulrich Rohde and writer David Newkirk provide researchers and engineers with a complete set of modeling design and implementation tools for tackling even the newest IC technologies They emphasize practical design solutions for high performance devices and circuitry incorporating ample examples of novel and clever circuits from high profile companies They also provide excellent appendices containing working models and CAD based applications RF Microwave Circuit Design for Wireless Applications offers Introduction to wireless systems and modulation types A systematic approach that differentiates between designing for battery operated devices and base station design A comprehensive introduction to semiconductor technologies from bipolar transistors to CMOS to GaAs MESFETs Clear guidelines for obtaining the best performance in discrete and integrated amplifier design Detailed analysis of available mixer circuits applicable to the wireless frequency range In depth explanations of oscillator circuits including microwave oscillators and ceramic resonator based oscillators A thorough evaluation of all components of wireless synthesizers *Complete Wireless Design, Second Edition* Cotter W. Sayre, 2008-07-01 Gain the Skill to Design Modern Wireless Circuits and Systems This fully updated and revised edition of the bestselling Complete Wireless Design takes a uniquely practical approach to designing complex receivers and transmitters found in advanced analog and digital wireless communication systems right down to the circuit level This authoritative book uses real life examples to provide a solid foundation in the subject and simple algebra to guide you through specific analysis and design processes In addition you ll find all the information you ll need for performing full circuit and electromagnetic software simulations to ensure the optimum performance of all completed projects Plus this in depth step by step guide comes with a CD ROM containing new simulation and design software Engineers and technicians will not find a more thorough practical book than Complete Wireless Design Updates include Fully worked out design samples complete with RF simulation results Special sections on power amplifier design and printed circuit board layout Brand new chapters covering antenna design and RF test and measurement Tips and techniques on performing accurate RF circuit simulations How to design for EMI control to pass FCC product testing The latest software for use in wireless design This COMPLETELY updated edition teaches you how to design Amplifiers Oscillators Frequency synthesizers Filters Mixers Antennas Support circuits Communication systems *Multi-Mode / Multi-Band RF Transceivers for Wireless Communications* Gernot Hueber, Robert Bogdan Staszewski, 2011-04-04 Summarizes cutting edge physical layer technologies for multi mode wireless RF transceivers Includes original contributions from distinguished researchers and professionals Covers cutting edge physical layer technologies for multi mode wireless RF transceivers Contributors are all leading

researchers and professionals in this field Wireless Transceiver Circuits Woogeun Rhee, 2018-09-03 Modern transceiver systems require diversified design aspects as various radio and sensor applications have emerged Choosing the right architecture and understanding interference and linearity issues are important for multi standard cellular transceivers and software defined radios A millimeter wave complementary metal oxide semiconductor CMOS transceiver design for multi Gb/s data transmission is another challenging area Energy efficient short range radios for body area networks and sensor networks have recently received great attention To meet different design requirements gaining good system perspectives is important *Wireless Transceiver Circuits System Perspectives and Design Aspects* offers an in depth look at integrated circuit IC design for modern transceiver circuits and wireless systems Ranging in scope from system perspectives to practical circuit design for emerging wireless applications this cutting edge book Provides system design considerations in modern transceiver design Covers both systems and circuits for the millimeter wave transceiver design Introduces four energy efficient short range radios for biomedical and wireless connectivity applications Emphasizes key building blocks in modern transceivers and transmitters including frequency synthesizers and digital intensive phase modulators Featuring contributions from renowned international experts in industry and academia *Wireless Transceiver Circuits System Perspectives and Design Aspects* makes an ideal reference for engineers and researchers in the area of wireless systems and circuits

Wireless Body Area Networks Mehmet R. Yuce, Jamil Khan, 2011-12-06 The book provides a comprehensive overview for the latest WBAN systems technologies and applications The chapters of the book have been written by various specialists who are experts in their areas of research and practice The book starts with the basic techniques involved in designing and building WBAN systems It explains the deployment issue *Mastering High-speed and Low Power Hardware System Design* Mr. Kush Desai , Ms. Khushbu Shah, 2025-03-11 *Mastering High speed and Low Power Hardware System Design* is an authoritative guide that delves into the intricate world of high speed and low power hardware design offering comprehensive insights into the principles techniques and best practices that drive the development of efficient high performance hardware systems This book addresses the critical challenges of optimizing hardware systems for both speed and power consumption two fundamental aspects that are increasingly important in the design of modern electronic systems Beginning with an introduction to the basic concepts of digital systems signal integrity and power consumption this book progressively moves into more advanced topics such as high frequency signal design clock management power efficient circuit design and the integration of cutting edge technologies It explores the trade offs and strategies involved in achieving the ideal balance between system speed and energy efficiency with a focus on real world applications in industries such as telecommunications consumer electronics automotive and embedded systems Through clear explanations practical examples and case studies the book empowers engineers students and professionals to master the complexities of hardware design while fostering an understanding of how to create systems that are both high speed and low power Whether designing

communication systems processors or integrated circuits Mastering High speed and Low Power Hardware System Design provides the knowledge and tools needed to push the boundaries of hardware performance while adhering to stringent power consumption requirements With contributions from leading experts in the field this book offers invaluable insights into the future of hardware system design making it an essential resource for anyone looking to excel in the design and optimization of advanced hardware systems in today's rapidly evolving technological landscape **The Wireless World**, 1982

LNA-ESD Co-Design for Fully Integrated CMOS Wireless Receivers Paul Leroux, Michiel Steyaert, 2006-03-30 LNA ESD Co Design for Fully Integrated CMOS Wireless Receivers fits in the quest for complete CMOS integration of wireless receiver front ends With a combined discussion of both RF and ESD performance it tackles one of the final obstacles on the road to CMOS integration The book is conceived as a design guide for those actively involved in the design of CMOS wireless receivers The book starts with a comprehensive introduction to the performance requirements of low noise amplifiers in wireless receivers Several popular topologies are explained and compared with respect to future technology and frequency scaling The ESD requirements are introduced and related to the state of the art protection devices and circuits LNA ESD Co Design for Fully Integrated CMOS Wireless Receivers provides an extensive theoretical treatment of the performance of CMOS low noise amplifiers in the presence of ESD protection circuitry The influence of the ESD protection parasitics on noise figure gain linearity and matching are investigated Several RF ESD co design solutions are discussed allowing both high RF performance and good ESD immunity for frequencies up to and beyond 5 GHz Special attention is also paid to the layout of both active and passive components LNA ESD Co Design for Fully Integrated CMOS Wireless Receivers offers the reader intuitive insight in the LNA's behavior as well as the necessary mathematical background to optimize its performance All material is experimentally verified with several CMOS implementations among which a fully integrated GPS receiver front end The book is essential reading for RF design engineers and researchers in the field and is also suitable as a text book for an advanced course on the subject **Basic Electronics** Debashis De, 2010 Basic Electronics meant for the core science

and technology courses in engineering colleges and universities has been designed with the key objective of enhancing the students knowledge in the field of electronics Solid state electronics a rapidly evolving field of study has been extensively researched for the latest updates and the authors have supplemented the related chapters with customized pedagogical features The required knowledge in mathematics has been developed throughout the book and no prior grasp of physical electronics has been assumed as an essential requirement for understanding the subject Detailed mathematical derivations illustrated by solved examples enhance the understanding of the theoretical concepts With its simple language and clear cut style of presentation this book presents an intelligent understanding of a complex subject like electronics **Proceedings of the Fourth Annual Portable by Design Conference**, 1997 **Microwave Journal**, 2008 **Microwave and Millimetre-Wave Design for Wireless Communications** Ian Robertson, Nutapong Somjit, Mitchai

Chongcheawchamnan,2016-08-29 This book describes a full range of contemporary techniques for the design of transmitters and receivers for communications systems operating in the range from 1 through to 300 GHz In this frequency range there is a wide range of technologies that need to be employed with silicon ICs at the core but compared with other electronics systems a much greater use of more specialist devices and components for high performance for example high Q factor low loss and good power efficiency Many text books do of course cover these topics but what makes this book timely is the rapid adoption of millimetre waves frequencies from 30 to 300 GHz for a wide range of consumer applications such as wireless high definition TV 5G Gigabit mobile internet systems and automotive radars It has taken many years to develop low cost technologies for suitable transmitters and receivers so previously these frequencies have been employed only in expensive military and space applications The book will cover these modern technologies with the follow topics covered transmitters and receivers lumped element filters transmission lines and S parameters RF MEMS RFICs and MMICs and many others In addition the book includes extensive line diagrams to illustrate circuit diagrams and block diagrams of systems including diagrams and photographs showing how circuits are implemented practically Furthermore case studies are also included to explain the salient features of a range of important wireless communications systems The book is accompanied with suitable design examples and exercises based on the Advanced Design System the industry leading CAD tool for wireless design More importantly the authors have been working with Keysight Technologies on a learning teaching initiative which is designed to promote access to industry standard EDA tools such as ADS Through its University Educational Support Program Keysight offers students the opportunity to request a student license backed up with extensive classroom materials and support resources This culminates with students having the chance to demonstrate their RF MW design and measurement expertise through the Keysight RF Microwave Industry Ready Student Certification Program www.keysight.com find eesof university www.keysight.com find eesof student certification

5G AND BEYOND: THE FUTURE OF CONNECTIVITY Dr. Manvi Sharma,2024-02-25 The capabilities of mobile networks have been significantly enhanced as a result of the introduction of 5G radio Over the course of their existence mobile networks have primarily connected the mobile devices of users which include computers tablets and smartphones The introduction of 5G infrastructure will put the constraints of the existing mobile broadband service to the test in terms of the data speeds capacity and availability of the service Additionally 5G will make it possible to provide new services such as linking industrial Internet of Things devices and making it easier to communicate with mission critical systems For 5G the bar has been set exceptionally high with promises of data rates of up to 20 gigabits per second Gbps capacity upgrades of up to a thousand times ultralow latency great dependability and flexible platforms for device connectivity It is anticipated that 5G would alter practically every facet of society due to its emphasis on enhancing efficiency productivity and safety The majority of the time the telecom operators and manufacturers developed and constructed 4G networks in order to accommodate the situation of smartphone usage The concept of 5G networks is already

attracting a great deal of interest from a variety of other stakeholders including other industries and NGOs The
aforementioned groups are eager to acquire knowledge regarding 5G networks in order to make the most of the
opportunities that these networks present 4G was developed with the primary intention of making human interaction easier
With 5G every gadget will be connected to one another Considering that the Nippon Telegraph and Telephone Public
Corporation NTT introduced the very first cellular mobile communication service in December 1979 mobile communication
technology has progressed in tandem with other technical advancements ever since Voice calls were the most frequent mode
of communication throughout the first two generations of mobile networks which were known as 1G and 2G Additionally
basic e mail was additionally available during this time period On the other hand beginning with the third generation of
mobile technology mobile **Electronics & Wireless World** ,1989-10 **Electronics World + Wireless World** ,1995
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