Assembly and PCB Layout Guidelines for QFN Packages

Introduction

The dual-row or multi-row QFN package is a near Chip Scale, plastic encapsulated package with a copper lead frame substrate. The exposed die attach paddle on the bottom of externally terminals fixes to the PCB and provides a stable ground through vias, bonds or by electrical connection through conductive die attach material. The usage of dual-row and multi-row QFN packages allows for flexibility and enhanced electrical performance to very high-speed operating frequencies.

The dual-row or multi-row QFN package utilizes an interlaced lead design that results in a staggered lead arrangement, this inner row is either 0.5 mm, which results in a compact design that maximizes device while not exceeding the surface mount technology (SMT) capability of a typical 0.4 mm pitch SMT process.

Actel offers QFN packages in three configurations, QN180, QN132, and QN68. The package description and outlines are covered under JEDEC MO-267, Plastic Quad Flat Nolead Staggered, Multi-Row Packages with Optional Thermal Enhancements and JEDEC Design Guide 4.19, Quad No-Lead Staggered Multi-Row Packages.

QFN Package Overview

Figure 1 and Figure 2 show that the package height is minimized by locating both the die and windbond well on the same plane. Figure 3 on page 3 illustrates the added combustible of the land pad. When mounted, the leads are directly attached to the board without the space-consuming standoff inherent in a leaded arrangement as a Plastic Quad PGA or TQFP Quad PGA. In addition, the QFN package has excellent thermal dissipation with the die attach paddle attaching directly to the PCB. The QFN package also reduces electrical parasitics due to its efficient and compact design.

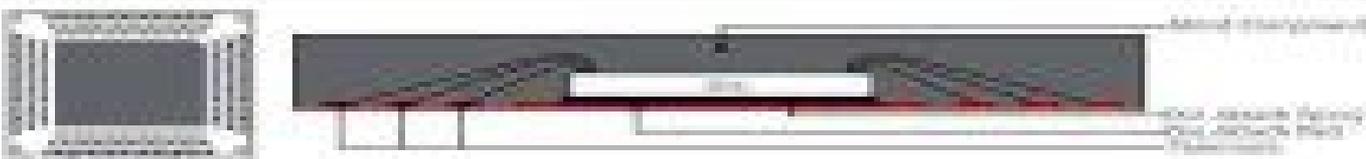Figure 1 • Bottom View and Cross Section of Dual-Row QFN

Figure 2 • Bottom View and Cross Section of Multi-Row QFN

Dual Row Qfn Package Assembly And Pcb Layout Guidelines

Clemens Wendtner

Dual Row Qfn Package Assembly And Pcb Layout Guidelines:

Encyclopedia of Packaging Materials, Processes, and Mechanics Avram Bar-Cohen,Jeffrey C. Suhling,Andrew A. O. Tay,2019 Packaging materials assembly processes and the detailed understanding of multilayer mechanics have enabled much of the progress in miniaturization reliability and functional density achieved by modern electronic microelectronic and nanoelectronic products The design and manufacture of miniaturized packages providing low loss electrical and or optical communication while protecting the semiconductor chips from environmental stresses and internal power cycling require a carefully balanced selection of packaging materials and processes Due to the relative fragility of these semiconductor chips as well as the underlying laminated substrates and the bridging interconnect selection of the packaging materials and processes is inextricably bound with the mechanical behavior of the intimately packaged multilayer structures in all phases of development for traditional as well as emerging electronic product categories The Encyclopedia of Packaging Materials Processes and Mechanics compiled in 8 multi volume sets provides comprehensive coverage of the configurations and techniques assembly materials and processes modeling and simulation tools and experimental characterization and validation techniques for electronic packaging Each of the volumes presents the accumulated wisdom and shared perspectives of leading researchers and practitioners in the packaging of electronic components The Encyclopedia of Packaging Materials Processes and Mechanics will provide the novice and student with a complete reference for a quick ascent on the packaging learning curve the practitioner with a validated set of techniques and tools to face every challenge in packaging design and development and researchers with a clear definition of the state of the art and emerging needs to guide their future efforts This encyclopedia will thus be of great interest to packaging engineers electronic product development engineers and product managers as well as to researchers in the assembly and mechanical behavior of electronic and photonic components and systems It will be most beneficial to undergraduate and graduate students studying materials mechanical electrical and electronic engineering with a strong interest in electronic packaging applications Publisher s website **ASIC Design in the Silicon Sandbox: A Complete Guide to Building Mixed-Signal Integrated Circuits** Keith Barr,2007 Both inspirational and practical ASIC Design in the Silicon Sandbox offers electronics engineers a hands on guide to mixed signal circuits and layouts The book provides a detailed roadmap for designing and building custom circuits that are optimized for target devices providing enhanced functionality and lowered cost in finished products Surface Mount & Mixed Technology PCB Design Guidelines David Boswell,1990 **Printed circuit board assembly** P.J.W. Noble,2013-03-09 Assembly of difficult components onto printed circuit boards is emerging as an important application area for small fast industrial robots For other robot tasks for example paint spraying or arc welding the applications engineer can rely on a body of published information representing decades of accumulated knowledge about the actual process being automated But for the process of assembly relatively little systematically presented knowledge exists mainly because so much manual assembly

depends on extremely subtle co ordination of hand eye and brain which is hard to represent directly in engineering terms As for the particular processes of electronic assembly they have hardly been covered at all in the literature Yet the design of a good PCB automation system depends crucially on the responsible engineer fully understanding every aspect of the process he or she is automating whether working for the electronics manufacturer an automation company a research laboratory or a machine builder The author of this book has had extensive practical experience in all these roles as a source of great detail on most aspects of the electronic assembly process it will be of unique value not only to the robot specialist but well beyond that to anyone needing to understand how printed circuit boards are manufactured P G Davey Acknowledgements The author is indebted to many companies and individuals from within the pcb assembly industry   **Printed Circuit Boards** R. S. Khandpur,2005-09-07 The printed circuit is the basic building block of the electronics hardware industry This is a comprehensive single volume self teaching guide to the art of printed circuit board design and fabrication covering the complete cycle of PCB creation design layout fabrication assembly and testing   1992,लखनऊ .से आरभ अग्रे-हिनद मासक

Board Level Reliability Assessment of Thick FR-4 QFN Assemblies Under Thermal Cycling Tejas Shetty,2015 Quad Flat No Lead QFN packages gained popularity in the industry during the last decade or so due to its superior thermal electrical characteristics low cost and compact size QFN packages are widely used in handheld devices where space is a constraint however some customers require it for industry application demanding thicker printed circuit boards PCB s As the thickness of PCB increases the fatigue life MTTF of the solder joints decreases QFN being a leadless package its board level thermo mechanical reliability is a critical issue This provides the motivation for this work The QFN package on thick board was experimentally characterized under accelerated thermal cycling ATC loading This test exhibited numerous insufficient joints and zero standoff height or a combination of both across the package edge The primary objective of this work is to understand and mitigate the root cause of the solder joint failure and provide guidelines to improve the fatigue life of the package Design for reliability methodology was used to approach this problem Initially a parametric threedimensional 3D finite element FE model for the QFN package on thick PCBs was formulated in ANSYS The fatigue correlation parameter was determined by simulation and various energy based and strain based models are examined to predict the characteristic life cycles to 63 2% failure A methodology to derive a new power equation to accurately predict the fatigue life has been proposed Furthermore design analysis of QFN was performed to study the effects of several key package parameters on the solder joint reliability The results from FE modeling and reliability testing will be leveraged to propose best practices to have a robust design

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