surface mount test points

surface mount test points are essential components in modern electronic circuit design and manufacturing, providing convenient locations for testing and troubleshooting printed circuit boards (PCBs). These test points facilitate efficient quality control, signal verification, and fault diagnosis without disrupting the board’s functionality. With the increasing complexity and miniaturization of electronic devices, surface mount test points have become critical in ensuring reliable performance and compliance with industry standards. This article delves into the various aspects of surface mount test points, including their design considerations, types, applications, and best practices for integration in PCB layouts. It also highlights the advantages of using surface mount technology (SMT) test points over traditional through-hole variants, emphasizing their role in automated testing processes. The following sections provide a comprehensive overview to help engineers and designers optimize the use of surface mount test points in their projects.

- Understanding Surface Mount Test Points
- Types of Surface Mount Test Points
- Design Considerations for Surface Mount Test Points
- Applications of Surface Mount Test Points
- Best Practices for Integrating Surface Mount Test Points

Understanding Surface Mount Test Points

Surface mount test points are specific pads or contact areas on a PCB designed to facilitate electrical testing and measurement. Unlike through-hole test points, which require holes drilled through the PCB, surface mount test points are mounted directly on the surface, allowing for a more compact and streamlined board layout. These test points enable access to circuit signals, power lines, or ground connections during manufacturing or field servicing.

Purpose and Functionality

The primary function of surface mount test points is to provide reliable access points for test probes, automated test equipment (ATE), or diagnostic tools. They allow engineers to verify signal integrity, measure voltage levels, and detect faults without disassembling or damaging the PCB. This capability is crucial for ensuring product quality, reducing production costs, and accelerating troubleshooting processes.

Comparison with Through-Hole Test Points

Surface mount test points offer several advantages over traditional through-hole test points, including reduced PCB size, lower manufacturing complexity, and improved compatibility with automated assembly lines. While through-hole test points may provide stronger mechanical support, surface mount variants optimize space and streamline the testing process, especially in densely populated or miniaturized circuit boards.

Types of Surface Mount Test Points

There are various types of surface mount test points tailored to different testing requirements and board designs. Selecting the appropriate type depends on factors such as test probe compatibility, signal type, and mechanical constraints.

Solder Pad Test Points

Solder pad test points are simple, flat copper pads exposed on the PCB surface. These pads provide a basic contact area for test probes or spring-loaded pins (pogo pins). They are cost-effective and easy to implement but require precise probe alignment during testing.

Spring-Loaded Pogo Pin Test Points

These test points are designed to interface with spring-loaded pogo pins, which apply consistent pressure to ensure reliable electrical contact. Pogo pin-compatible test points often have slightly raised or reinforced pads to improve durability and contact stability during automated testing sequences.

Gold-Plated Test Points

Gold plating is commonly applied to surface mount test points to enhance conductivity and prevent oxidation or corrosion. Gold-plated test points maintain consistent electrical contact over multiple testing cycles, making them suitable for high-reliability applications.

Specialized Test Points

Some surface mount test points are designed with unique shapes or features, such as castellated edges or teardrop pads, to improve solderability, probe retention, or mechanical strength. These specialized formats address specific testing or manufacturing challenges encountered in advanced PCB designs.

Design Considerations for Surface Mount Test Points

Effective design of surface mount test points requires careful attention to various electrical, mechanical, and manufacturing factors. Proper implementation ensures accurate testing and minimal impact on overall PCB performance.

Pad Size and Spacing

The size and spacing of test point pads must accommodate the test probe size and the method of contact. Pads that are too small can hinder reliable probe contact, while excessively large pads consume valuable PCB real estate. Standard sizes often range from 0.8 mm to 1.5 mm in diameter, with adequate spacing to prevent short circuits.

Placement and Accessibility

Test points should be placed in accessible locations that do not interfere with component placement, solder joints, or routing paths. Designers often position test points along the edges of the PCB or within designated test areas to facilitate probing during in-circuit testing (ICT) or functional testing.

Surface Finish and Material

The choice of surface finish, such as HASL (Hot Air Solder Leveling), ENIG (Electroless Nickel Immersion Gold), or OSP (Organic Solderability Preservative), affects test point reliability. ENIG is preferred for surface mount test points due to its excellent conductivity and corrosion resistance, ensuring consistent test results over time.

Electrical Isolation and Signal Integrity

Designers must ensure that test points do not introduce noise, crosstalk, or impedance mismatches in sensitive circuits. Proper grounding and shielding techniques help maintain signal integrity during testing and normal operation.

Applications of Surface Mount Test Points

Surface mount test points are widely used across various industries and electronic applications, enabling efficient testing and quality control throughout the product lifecycle.

Manufacturing Testing

During PCB assembly, surface mount test points facilitate in-circuit testing (ICT) and automated optical inspection (AOI). They allow manufacturers to verify component placement, solder joint quality, and functional performance before product shipment.

Field Diagnostics and Repair

In the field, surface mount test points enable technicians to quickly diagnose faults and perform repairs without removing components or damaging the PCB. This capability reduces downtime and repair costs for complex electronic systems.

Prototyping and Development

Engineers use surface mount test points during prototyping to monitor circuit behavior, validate designs, and optimize performance. Test points simplify access to critical signals for debugging and iterative development.

Compliance Testing

Surface mount test points assist in compliance testing for regulatory standards, such as electromagnetic compatibility (EMC) and safety certifications. They provide measurement points for emissions, immunity, and electrical safety evaluations.

Best Practices for Integrating Surface Mount Test Points

Successful incorporation of surface mount test points into PCB designs requires adherence to established best practices to maximize effectiveness and reliability.

Standardization of Test Point Design

Using standardized pad sizes, shapes, and finishes simplifies test fixture development and reduces manufacturing variability. Consistency across product lines enhances test efficiency and reduces errors.

Collaboration Between Design and Test Teams

Close coordination between PCB designers and test engineers ensures that test points meet testing requirements without compromising board layout or functionality. Early involvement of test teams in the design process facilitates optimal placement and accessibility.

Documentation and Labeling

Clear documentation of test point locations, functions, and characteristics supports effective testing and maintenance. Labeling test points on silkscreens or in design files aids technicians during troubleshooting and repair.

Minimizing Impact on Signal Integrity

Designers should evaluate the electrical impact of test points and incorporate appropriate measures, such as controlled impedance pads or isolated test zones, to preserve circuit performance.

Utilizing Automated Test Equipment Compatibility

Surface mount test points should be designed for compatibility with automated test equipment to enable fast, repeatable, and reliable testing during mass production.

- Adopt uniform pad sizes and finishes
- Position test points for easy probe access
- Ensure robust mechanical and electrical contact
- Document test point functions clearly
- Integrate test points early in the design phase

Frequently Asked Questions

What are surface mount test points?

Surface mount test points are small, designated pads or areas on a printed circuit board (PCB) designed for easy access during testing and troubleshooting of electronic circuits. They allow automated test equipment or probes to connect without soldering wires.

Why are surface mount test points important in PCB design?

Surface mount test points are important because they facilitate efficient testing and quality control during manufacturing, enable easier debugging during development, and help ensure the reliability and functionality of the final electronic product.

How do surface mount test points differ from through-hole test points?

Surface mount test points are pads located on the surface of the PCB and are compatible with surface mount technology (SMT), while through-hole test points are holes drilled through the board for leads or probes. SMT test points save space and are suited for high-density designs.

What are best practices for placing surface mount test points on a PCB?

Best practices include placing test points in accessible locations, ensuring they are sufficiently sized for probe contact, avoiding placement near high-speed or sensitive signal lines, and maintaining clear silkscreen markings for easy identification.

Can surface mount test points be used for automated testing?

Yes, surface mount test points are commonly designed to be compatible with automated test equipment (ATE), allowing for fast, reliable, and repeatable electrical measurements during manufacturing and quality assurance processes.

What materials are typically used for surface mount test points?

Surface mount test points are usually made from copper pads coated with a solderable finish such as HASL (Hot Air Solder Leveling), ENIG (Electroless Nickel Immersion Gold), or OSP (Organic Solderability Preservative) to ensure good electrical contact and durability.

How can designers minimize the impact of surface mount test points on PCB signal integrity?

Designers can minimize impact by keeping test points small, placing them away from critical signal paths, using controlled impedance routing, and avoiding placing test points on high-frequency or sensitive analog lines to prevent interference.

Additional Resources

1. *Practical Guide to Surface Mount Test Points*
This book offers an in-depth introduction to the design and implementation of surface mount test points in modern electronic circuits. It covers various

test point types, placement strategies, and the impact on signal integrity. Engineers will find practical tips for optimizing test coverage while minimizing PCB real estate usage.

2. *Surface Mount Technology: Testing and Inspection Techniques*
Focusing on the testing phase of surface mount technology (SMT), this book explores the role of test points in automated optical inspection (AOI) and in-circuit testing (ICT). Detailed chapters explain how test points enhance fault detection and improve manufacturing yield. The book also discusses emerging trends in SMT testing methodologies.

3. *Design for Testability in Surface Mount Assemblies*
This comprehensive guide addresses the principles of design for testability (DFT) with a particular emphasis on surface mount assemblies. Readers will learn how to integrate test points early in the PCB design process to facilitate efficient testing and debugging. Case studies demonstrate real-world applications and common pitfalls to avoid.

4. *Advanced PCB Test Points and Probing Techniques*
Targeting experienced engineers, this book delves into sophisticated test point designs suited for high-speed and high-density PCBs. It covers probing methods, including flying probe and bed-of-nails testing, and highlights how test point design affects measurement accuracy. The author also provides guidelines for balancing testability with electrical performance.

5. *Surface Mount Test Points: Materials and Manufacturing Considerations*
This title examines the selection of materials and manufacturing processes for reliable surface mount test points. Topics include solderability, thermal cycling, and mechanical robustness of various test point finishes. The book also reviews industry standards and quality control procedures to ensure consistent test point performance.

6. *Automated Test Point Generation for Surface Mount Circuits*
Exploring software tools and algorithms, this book discusses automated methods for generating optimal test points in surface mount circuit designs. It explains how CAD integration improves design efficiency and reduces manual errors. Practical examples illustrate the benefits of automation in large-scale PCB production.

7. *Signal Integrity and Surface Mount Test Points*
This resource focuses on how test point placement and design affect signal integrity in high-frequency circuits. It provides analysis techniques and simulation approaches to minimize signal degradation and electromagnetic interference caused by test points. Engineers will gain insights into balancing test accessibility with performance criteria.

8. *Surface Mount Test Point Standards and Compliance*
An essential reference for compliance officers and quality engineers, this book details international standards governing surface mount test points. It covers IPC standards, industry best practices, and regulatory requirements. The book also addresses documentation and certification processes relevant to test point implementation.

9. *Troubleshooting and Repair Using Surface Mount Test Points*
This practical guide teaches technicians how to effectively use surface mount test points for troubleshooting and repairing electronic assemblies. It includes step-by-step procedures, diagnostic strategies, and tips for interpreting test results. The book is ideal for field service engineers and maintenance personnel looking to improve fault isolation skills.

Surface Mount Test Points

surface mount test points: Design Guidelines for Surface Mount Technology John Traister, 2012-12-02 Design Guidelines for Surface Mount Technology covers the basics and the mechanics of surface mounted design technology. Surface mount technology (SMT) embodies an automated circuit assembly process, using a generation of electronic components called surface mounted devices (SMDs). Organized into eight chapters, the book discusses the component selection, space planning, materials and processes, and total concept needed to ensure a manufacturable design. The opening chapters of the book examine the significant requirements and variables affecting SMT and SMDs. The book then deals with the substrate materials specifications, including fabrication and material planning, assembly, design rules, layout guidelines, package outlines, and bar code labeling. The next chapters describe the manufacturing and assembly processes in SMDs and process-proven footprint patterns for each of the component types used, as well as guidelines for creating a suitable pattern on future products. Other chapters discuss the component spacing requirements for SMT and the generation of footprint patterns for passive and active components of SMDs. The concluding chapter describes the design criteria for maximizing machine insertion of leaded electronic components into printed circuit boards (PCBs). These criteria aid the PCB designer by detailing the considerations and some of the trade-offs that will provide reliable insertion in a production environment. Supplementary texts on surface mount equipment, supplies, and services are also provided. Design engineers and researchers will find this book invaluable.

surface mount test points: *Design Guidelines for Surface Mount Technology* John E. Traister, 1990

surface mount test points: *Surface Mount Technology* Ray Prasad, 2013-11-27 A foreword is usually prepared by someone who knows the author or who knows enough to provide additional insight on the purpose of the work. When asked to write this foreword, I had no problem with what I wanted to say about the work or the author. I did, however, wonder why people read a foreword. It is probably of value to know the background of the writer of a book; it is probably also of value to know the background of the individual who is commenting on the work. I consider myself a good friend of the author, and when I was asked to write a few words I felt honored to provide my view of Ray Prasad, his expertise, and the contribution that he has made to our industry. This book is about the industry, its technology, and its struggle to learn and compete in a global market bursting with new ideas to satisfy a voracious appetite for new and innovative electronic products. I had the good fortune to be there at the beginning (or almost) and have witnessed the growth and excitement in the opportunities and challenges afforded the electronic industries' engineering and manufacturing talents. In a few years my involve ment will span half a century.

surface mount test points: Fine Pitch Surface Mount Technology Phil Marcoux, 2013-11-27 Fine pitch high lead count integrated circuit packages represent a dramatic change from the conventional methods of assembling electronic components to a printed interconnect circuit board. To some, these FPTpackages appear to bean extension of the assembly technology called surface mount or SMT. Many of us who have spent a significant amount of time developing the process and design techniques for these fine pitchpackages haveconcluded that these techniquesgobeyondthose commonly useed for SMT. In 1987 the presentauthor, convincedofthe uniqueness ofthe assembly and design demands ofthese packages, chaired ajoint committee where

the members agreed to use fine pitch technology (FPT) as the defining term for these demands. The committee was unique in several ways, one being that it was the first time three U. S. standards organizations, the IPC (Lincolnwood, IL), theEIA(Washington, D. C.),and theASTM (Philadelphia),cametogether tocreate standards before a technology was in high demand. The term fine pitch technology and its acronym FPT have since become widely accepted in the electronics industry. The knowledge of the terms and demands of FPT currently exceed the usage of FPT packaged components, but this is changing rapidly because of the size, performance, and cost savings of FPT. I have resisted several past invitations to write other technical texts. However, I feel there are important advantages and significant difficulties to be encountered with FPT.

surface mount test points: *Application Protocol, Initial Graphics Exchange Specification (IGES), Layered Electrical Product* Lawrence J. O'Connell, 1994 An application protocol is an information systems engineering view of a specific product The view represents an agreement on the generic activities needed to design and fabricate the product the agreement on the information needed to support those activities, and the specific constructs of a product data standard for use in transferring some or all of the information required. This application protocol describes the data for electrical and electronic products in terms of a product description standard called the Initial Graphics Exchange Specification (IGES). More specifically, the Layered Electrical Product IGES Application Protocol (AP) specifies the mechanisms for defining and exchanging computer-models and their associated data for those products which have been designed in two dimensional geometry so as to be produced as a series of layers in IGES format The AP defines the appropriateness of the data items for describing the geometry of the various parts of a product (shape and location), the connectivity, and the processing and material characteristics. Excluded is the behavioral requirements which the product was intended to satisfy, except as those requirements have been recorded as design rules or product testing requirements.

surface mount test points: Designing Electronics That Work Hunter Scott, 2025-09-16 How real engineers build electronics—one working piece at a time. If you've ever had a board fail on power-up, spent hours debugging a layout that "should work," or run into a supplier problem just before a deadline—you already know this isn't just about theory. It's about judgment, decisions, and real-world constraints. Designing Electronics That Work is a guide to all the practical things you won't find in a typical electronics textbook. It's written for people who already know a little—maybe a lot—about circuits, but want to move faster, make fewer mistakes, and ship working hardware with more confidence. You'll learn how to: Define and prioritize requirements so you're building the right thing, not just the clever thing Design schematics and layouts to make debugging easier Plan for manufacturability, compliance, and cost from day one Build a lab that helps you work faster, without spending a fortune Troubleshoot problems methodically, even when nothing's making sense Hunter Scott has designed electronics for medical devices, RF systems, startups, and art installations. This book reflects what he's learned, not as theory, but as practice. You won't find chapter-length explanations of what a capacitor is. You will find answers to questions like: Which capacitor should I actually buy? What if the one I spec'd is out of stock? How do I avoid wasting time and money? Whether you're a hobbyist moving beyond Arduino, a new grad learning on the job, or an experienced engineer looking to streamline your process—this book will help you build smarter and avoid problems before they start.

surface mount test points: Selected papers from the 2019 IEEE International Workshop on Metrology for AeroSpace Pasquale Daponte, Eulalia Balestrieri, 2021-04-21 This book is devoted to recent developments of instrumentation and measurement techniques applied to the aerospace field. It includes 23 selected papers from the 2019 IEEE International Workshop on Metrology for AeroSpace. Measurements are essential for obtaining a deeper knowledge of a phenomenon or an asset, as well as for making proper decisions and proposing new and efficient solutions, and this is especially true in environments as complex as aerospace. The research contributions included in the book can raise the interest of a wide group of researchers, operators and decision-makers from metrology and aerospace fields by presenting the most innovative

solutions in this field from the scientific and technological points of view.

surface mount test points: Electro ... Conference Record , 1990

surface mount test points: *MGMT MEMO: Management Lessons from DEC* Richard Seltzer, 2018-10-06 DEC was the creation of its co-founder and president Ken Olsen, who for four decades shaped the cadre of managers and the corporate culture that motivated and enabled one generation after another of creativity and innovation as his company grew from a small team to a global corporation with over 140,000 employees. Fortune Magazine called him the ultimate entrepreneur. When MGMT MEMO was originally published, most DEC employees couldn't read it. Labelled For Internal Communication Only, it was only sent to managers, with the understanding that they would communicate the messages to their employees. Now, twenty years after the demise of the company, when there is no longer a need for confidentiality, these documents can help us to remember and relive the challenges, the triumphs, and the cameraderie of that time. Over the course of eleven years, this publication evolved from a collection of short news items to lengthy discussions of the many reorganizations and the reasons behind them, as well as Ken's thoughts on management and corporate culture, his hopes and his advice. It served as a tool for him to deliver messges that he considered important and timely. The articles reflect the dynamics of rapid growth in a fast changing high tech environment: the stress of the ever-urgent need to develop one new product after another and related services, for an ever-expanding range of uses; the need to come up with new ways to connect product to product and people to people, with new kinds of organization and new theories of how to motivate and manage large numbers of people. They repeatedly attempt to redefine the company, as the employee population doubled in size. They recount the struggle to invent not just new products but also new kinds of new products and to find ways to effectively use those same products to develop the next generation of products and to market them and to help an expanding range of customers who needed our products and services to build their businesses and to create new businesses and invent new kinds of business. How was it possible to manage such an entity in hyper-growth mode, to accurately prophesize changing customer needs and tastes and come up with new products and services that they would need and to be prepared to manufacture products in the volumes required, and to recruit and train the people necessary for all that, and to do all of this in sync, so the money and the resources were available when and where they were needed? How could such an entity -- such a storm of creative activity -- hold together and continue to grow? How was it possible to manage it, to deal with one unprecedented challenge after another? How was it possible to foster a core of values, a sense of corporate culture and identity?

surface mount test points: *Design for Manufacturing and Assembly* O. Molloy, E.A. Warman, S. Tilley, 2012-12-06 In order to compete in the current commercial environment companies must produce greater product variety, at lower cost, all within a reduced product life cycle. To achieve this, a concurrent engineering philosophy is often adopted. In many cases the main realization of this is Design for Manufacture and Assembly (DFM/A). There is a need for in-depth study of the architectures for DFM/A systems in order that the latest software and knowledge-based techniques may be used to deliver the DFM/A systems of tomorrow. This architecture must be based upon complete understanding of the issues involved in integrating the design and manufacturing domains. This book provides a comprehensive view of the capabilities of advanced DFM/A systems based on a common architecture.

surface mount test points: The Art of Designing Embedded Systems Jack Ganssle, 1999-11-26 Art of Designing Embedded Systems is apart primer and part reference, aimed at practicing embedded engineers, whether working on the code or the hardware design. Embedded systems suffer from a chaotic, ad hoc development process. This books lays out a very simple seven-step plan to get firmware development under control. There are no formal methodologies to master; the ideas are immediately useful. Most designers are unaware that code complexity grows faster than code size. This book shows a number of ways to linearize the complexity/size curve and get products out faster. Ganssle shows ways to get better code and hardware designs by integrating hardware and software design. He also covers troubleshooting, real time and performance issues, relations with

bosses and coworkers, and tips for building an environment for creative work.Get better systems out faster, using the practical ideas discussed in Art of Designing Embedded Systems. Whether you're working with hardware or software, this book offers a unique philosophy of development guaranteed to keep you interested and learning.* Practical advice from a well-respected author* Common-sense approach to better, faster design* Integrated hardware/software

surface mount test points: *Manufacturing Engineer's Reference Book* D. KOSHAL, 2014-06-28 Never before have the wide range of disciplines comprising manufacturing engineering been covered in such detail in one volume. Leading experts from all over the world have contributed sections. The coverage represents the most up to date survey of the broad interests of the manufacturing engineer. Extensive reference lists are provided, making this an indispensable work for every engineer in industry.Never before have the wide range of disciplines comprising manufacturing engineering been covered in such detail in one volume. Leading experts from all over the world have contributed sections. Materials and processes are described, as well as management issues, ergonomics, maintenance and computers in industry. CAD (Computer Aided Design), CAE (Computer Aided Engineering), CIM (Computer Integrated Manufacturing) and Quality are explored at length. The coverage represents the most up-to-date survey of the broad interests of the manufacturing engineer. Extensive reference lists are provided, making this an indispensable work for every engineer in industry.

surface mount test points: Manufacturing Technology in the Electronics Industry P. Edwards, 2012-12-06 The sequence of events which led to the writing of this book started at a seminar on Manufacturing Technology in the Electronics Industry given by the Institution of Production Engineers in 1987. The seminar identified that the field of manufacturing engineering for the electronics industry was effectively missing from the vast majority of production engineering degree courses. The reason for this was that production engineering departments typically spring from mechanical engineering departments. This leads to a mechanical bias in the practical aspects of such courses. The consequence of this was that electronics companies could not recruit graduates with both relevant production engineering and electronic engineering backgrounds. This necessitated either recruiting production engineering graduates and giving them the necessary electronic engineering training, or giving production engineering training to electronic engineering graduates. A consequence of the lack of courses in a subject is that there is also a lack of relevant textbooks in the area, as most textbooks are intended to tie into courses. In the field of manufacturing technology for the electronics industry, existing textbooks tend to be highly specialized and mainly concerned with the fabrication of semiconductor devices.

surface mount test points: *Guide to Design of Electronic Equipment for Maintainability* John D. Folley, James W. Altman, 1956

surface mount test points: Fundamentals of Modern Manufacturing Mikell P. Groover, 2015-11-23 Fundamentals of Modern Manufacturing: Materials, Processes, and Systems, 6th Edition, is designed for a first course or two-course sequence in Manufacturing at the junior level in Mechanical, Industrial, and Manufacturing Engineering curricula. As in preceding editions, the author's objective is to provide a treatment of manufacturing that is modern and quantitative. The book's modern approach is based on balanced coverage of the basic engineering materials, the inclusion of recently developed manufacturing processes and comprehensive coverage of electronics manufacturing technologies. The quantitative focus of the text is displayed in its emphasis on manufacturing science and its greater use of mathematical models and quantitative end-of-chapter problems. This text is an unbound, three hole punched version.

surface mount test points: Design to Test John Turino, 2012-12-06 This book is the second edition of Design to Test. The first edition, written by myself and H. Frank Binnendyk and first published in 1982, has undergone several printings and become a standard in many companies, even in some countries. Both Frank and I are very proud of the success that our customers have had in utilizing the information, all of it still applicable to today's electronic designs. But six years is a long time in any technology field. I therefore felt it was time to write a new edition. This new edition,

while retaining the basic testability prin ciples first documented six years ago, contains the latest material on state-of-the-art testability techniques for electronic devices, boards, and systems and has been completely rewritten and up dated. Chapter 15 from the first edition has been converted to an appendix. Chapter 6 has been expanded to cover the latest tech nology devices. Chapter 1 has been revised, and several examples throughout the book have been revised and updated. But some times the more things change, the more they stay the same. All of the guidelines and information presented in this book deal with the three basic testability principles-partitioning, control, and visibility. They have not changed in years. But many people have gotten smarter about how to implement those three basic test ability principles, and it is the aim of this text to enlighten the reader regarding those new (and old) testability implementation techniques.

surface mount test points: Maintainability Guide for Design McGraw-Hill Book Company. Information and Training Services Division, 1970

surface mount test points: Maintainability Guide for Design United States. Army Materiel Command, 1972

surface mount test points: Engineering Design Handbook , 1972

surface mount test points: The Electronics Assembly Handbook Frank Riley, Electronic Packaging and Production, 2013-06-29 The assembly of electronic circuit boards has emerged as one of the most significant growth areas for robotics and automated assembly. This comprehensive volume, which is an edited collection of material mostly published in Assembly Engineering and Electronic Packaging and Production, will provide an essential reference for engineers working in this field, including material on Multi Layer Boards, Chip-on-board and numerous case studies. Frank J. Riley is senior vice-president of the Bodine Corporation and a world authority on assembly automation.

Related to surface mount test points

Surface Mount Test Points - Keystone | DigiKey Keystone Electronics has developed both miniature and compact surface-mount test points, supplied on tape and reel, for easy convenient handling and use

Surface Mount (SMT) Test Points - Keystone | Mouser Keystone Electronics Surface Mount (SMT) Test Points provide efficient, safe, board-level testing and simplify testing on dense circuit boards. The SMT test points are

Test Points, Surface Mount Keystone Electronics Keystone Electronics has developed a series of surface mount test points, supplied on Tape and Reel that meets ANSI/EIA-481 standards, for easy convenient handling and use

Surface Mount Test Points - E-Mark These test point are designed to facilitate the connection of test probes to PCBs which are primarily surface mount in design. Supplied on tape and reel in three sizes (0603, 0805, 1206),

Test Points | Electronic Components Distributor DigiKey Test Points are in stock at DigiKey. Order Now! Test and Measurement ship same day

Test Points Selection Guide: Types, Features, Applications Surface mount technology (SMT) test points are compact terminals that are typically wave soldered to the board. They may be specified by size, terminal materials, and

Surface Mount PCB Test Points | Newark Electronics Buy Surface Mount PCB Test Points. Newark Electronics offers fast quotes, same day dispatch, fast delivery, wide inventory, datasheets & technical support

5015 Keystone Electronics | Mouser 2 days ago Keystone Electronics Surface Mount (SMT) Test Points provide efficient, safe, board-level testing and simplify testing on dense circuit boards. The SMT test points are

Keystone's New Surface Mount Test Points | Tower Fasteners Keystone Electronics has developed a series of surface mount test points, supplied on Tape and Reel that meets ANSI/EIA-481 standards, for easy convenient handling and use

Color Keyed SMT Test Points Keystone Electronics - Color Coded for easy identification, these surface mountable PCB test points are ideal for production testing and service troubleshooting. Phosphor Bronze, Silver Plated terminals allow

5015 Keystone Electronics | Test and Measurement | DigiKey Order today, ships today. 5015 – PC Test Point, Miniature Phosphor Bronze Silver Plating Surface Mount Mounting Type from Keystone Electronics. Pricing and Availability on millions of

Silver Plated Test Point Manufacturer | Components Corporation The fabricators of SMT printed circuit boards may take advantage of the convenience of field testing with the unique loop design of Components Corporation's TP-107 and TP-108 series of

Test Tips, Test Points, Alligator Clips, Plugs Keystone Electronics Keystone Electronics offers test tips, test points, alligator clips, test plugs, test probes, and test point jack options

Compact SMT Test Points from Keystone - Keystone Electronics is a leading manufacturer of Surface Mount and Thru Hole mount PCB test points

.040 [1.0] .060 [1.5] (SMT) SURFACE MOUNT TEST - Mouser Locating Pin provides positive location during assembly process Increased solder strength Can be used as a SMT test point or when used with a .032 [.81] board, as a THM test point

5019 Surface Mount Test Point - Keystone | DigiKey Keystone Electronics' latest "mini-pad" version enables high-strength, test point-to-PCB bonding, with a minimal footprint. In addition to cost-saving, this low-profile entry accepts a variety of

Surface Mount Test Point - Black PN 5191TR - Choose your preferred format below. Note: Some company servers consider html emails spam

5019 Surface Mount Test Point - Keystone | DigiKey In addition to cost-saving, this low-profile entry accepts a variety of gripping probes to replace wire-wrap posts and turret terminals. The "mini-pad" is ideal for testing circuitry of

Miniature SMT Test Points from Keystone - Keystone Electronics is a leading manufacturer of Surface Mount and Thru Hole mount PCB test points

Surface Mount Test Points - Keystone | DigiKey Keystone Electronics has developed both miniature and compact surface-mount test points, supplied on tape and reel, for easy convenient handling and use

Surface Mount (SMT) Test Points - Keystone | Mouser Keystone Electronics Surface Mount (SMT) Test Points provide efficient, safe, board-level testing and simplify testing on dense circuit boards. The SMT test points are

Test Points, Surface Mount Keystone Electronics Keystone Electronics has developed a series of surface mount test points, supplied on Tape and Reel that meets ANSI/EIA-481 standards, for easy convenient handling and use

Surface Mount Test Points - E-Mark These test point are designed to facilitate the connection of test probes to PCBs which are primarily surface mount in design. Supplied on tape and reel in three sizes (0603, 0805, 1206),

Test Points | Electronic Components Distributor DigiKey Test Points are in stock at DigiKey. Order Now! Test and Measurement ship same day

Test Points Selection Guide: Types, Features, Applications Surface mount technology (SMT) test points are compact terminals that are typically wave soldered to the board. They may be specified by size, terminal materials, and

Surface Mount PCB Test Points | Newark Electronics Buy Surface Mount PCB Test Points. Newark Electronics offers fast quotes, same day dispatch, fast delivery, wide inventory, datasheets & technical support

5015 Keystone Electronics | Mouser 2 days ago Keystone Electronics Surface Mount (SMT) Test Points provide efficient, safe, board-level testing and simplify testing on dense circuit boards. The SMT test points are

Keystone's New Surface Mount Test Points | Tower Fasteners Keystone Electronics has developed a series of surface mount test points, supplied on Tape and Reel that meets ANSI/EIA-481

standards, for easy convenient handling and use

Color Keyed SMT Test Points Keystone Electronics - Color Coded for easy identification, these surface mountable PCB test points are ideal for production testing and service troubleshooting. Phosphor Bronze, Silver Plated terminals allow

5015 Keystone Electronics | Test and Measurement | DigiKey Order today, ships today. 5015 – PC Test Point, Miniature Phosphor Bronze Silver Plating Surface Mount Mounting Type from Keystone Electronics. Pricing and Availability on millions of

Silver Plated Test Point Manufacturer | Components Corporation The fabricators of SMT printed circuit boards may take advantage of the convenience of field testing with the unique loop design of Components Corporation's TP-107 and TP-108 series of

Test Tips, Test Points, Alligator Clips, Plugs Keystone Electronics Keystone Electronics offers test tips, test points, alligator clips, test plugs, test probes, and test point jack options

Compact SMT Test Points from Keystone - Keystone Electronics is a leading manufacturer of Surface Mount and Thru Hole mount PCB test points

.040 [1.0] .060 [1.5] (SMT) SURFACE MOUNT TEST - Mouser Locating Pin provides positive location during assembly process Increased solder strength Can be used as a SMT test point or when used with a .032 [.81] board, as a THM test point

5019 Surface Mount Test Point - Keystone | DigiKey Keystone Electronics' latest "mini-pad" version enables high-strength, test point-to-PCB bonding, with a minimal footprint. In addition to cost-saving, this low-profile entry accepts a variety of

Surface Mount Test Point - Black PN 5191TR - Choose your preferred format below. Note: Some company servers consider html emails spam

5019 Surface Mount Test Point - Keystone | DigiKey In addition to cost-saving, this low-profile entry accepts a variety of gripping probes to replace wire-wrap posts and turret terminals. The "mini-pad" is ideal for testing circuitry of

Miniature SMT Test Points from Keystone - Keystone Electronics is a leading manufacturer of Surface Mount and Thru Hole mount PCB test points

Surface Mount Test Points - Keystone | DigiKey Keystone Electronics has developed both miniature and compact surface-mount test points, supplied on tape and reel, for easy convenient handling and use

Surface Mount (SMT) Test Points - Keystone | Mouser Keystone Electronics Surface Mount (SMT) Test Points provide efficient, safe, board-level testing and simplify testing on dense circuit boards. The SMT test points are

Test Points, Surface Mount Keystone Electronics Keystone Electronics has developed a series of surface mount test points, supplied on Tape and Reel that meets ANSI/EIA-481 standards, for easy convenient handling and use

Surface Mount Test Points - E-Mark These test point are designed to facilitate the connection of test probes to PCBs which are primarily surface mount in design. Supplied on tape and reel in three sizes (0603, 0805, 1206),

Test Points | Electronic Components Distributor DigiKey Test Points are in stock at DigiKey. Order Now! Test and Measurement ship same day

Test Points Selection Guide: Types, Features, Applications Surface mount technology (SMT) test points are compact terminals that are typically wave soldered to the board. They may be specified by size, terminal materials, and

Surface Mount PCB Test Points | Newark Electronics Buy Surface Mount PCB Test Points. Newark Electronics offers fast quotes, same day dispatch, fast delivery, wide inventory, datasheets & technical support

5015 Keystone Electronics | Mouser 2 days ago Keystone Electronics Surface Mount (SMT) Test Points provide efficient, safe, board-level testing and simplify testing on dense circuit boards. The SMT test points are

Keystone's New Surface Mount Test Points | Tower Fasteners Keystone Electronics has

developed a series of surface mount test points, supplied on Tape and Reel that meets ANSI/EIA-481 standards, for easy convenient handling and use

Color Keyed SMT Test Points Keystone Electronics - Color Coded for easy identification, these surface mountable PCB test points are ideal for production testing and service troubleshooting. Phosphor Bronze, Silver Plated terminals allow

5015 Keystone Electronics | Test and Measurement | DigiKey Order today, ships today. 5015 – PC Test Point, Miniature Phosphor Bronze Silver Plating Surface Mount Mounting Type from Keystone Electronics. Pricing and Availability on millions of

Silver Plated Test Point Manufacturer | Components Corporation The fabricators of SMT printed circuit boards may take advantage of the convenience of field testing with the unique loop design of Components Corporation's TP-107 and TP-108 series of

Test Tips, Test Points, Alligator Clips, Plugs Keystone Electronics Keystone Electronics offers test tips, test points, alligator clips, test plugs, test probes, and test point jack options

Compact SMT Test Points from Keystone - Keystone Electronics is a leading manufacturer of Surface Mount and Thru Hole mount PCB test points

.040 [1.0] .060 [1.5] (SMT) SURFACE MOUNT TEST - Mouser Locating Pin provides positive location during assembly process Increased solder strength Can be used as a SMT test point or when used with a .032 [.81] board, as a THM test point

5019 Surface Mount Test Point - Keystone | DigiKey Keystone Electronics' latest "mini-pad" version enables high-strength, test point-to-PCB bonding, with a minimal footprint. In addition to cost-saving, this low-profile entry accepts a variety of

Surface Mount Test Point - Black PN 5191TR - Choose your preferred format below. Note: Some company servers consider html emails spam

5019 Surface Mount Test Point - Keystone | DigiKey In addition to cost-saving, this low-profile entry accepts a variety of gripping probes to replace wire-wrap posts and turret terminals. The "mini-pad" is ideal for testing circuitry of

Miniature SMT Test Points from Keystone - Keystone Electronics is a leading manufacturer of Surface Mount and Thru Hole mount PCB test points

Related to surface mount test points

DCI Announces Two Surface-Mount Test Sockets (EDN20y) Dimensions Consulting Inc. (DCI) has announced a new surface-mount BGA test socket for use with high speed Serdes applications operating beyond 10 Gbps. In addition, the company announced a test

DCI Announces Two Surface-Mount Test Sockets (EDN20y) Dimensions Consulting Inc. (DCI) has announced a new surface-mount BGA test socket for use with high speed Serdes applications operating beyond 10 Gbps. In addition, the company announced a test

Surface-mount test sockets (EDN20y) Dimensions Consulting has announced a new surface-mount BGA test socket for use with high-speed Serdes applications operating beyond 10 Gbps. In addition, the company announced a test socket for CSP

Surface-mount test sockets (EDN20y) Dimensions Consulting has announced a new surface-mount BGA test socket for use with high-speed Serdes applications operating beyond 10 Gbps. In addition, the company announced a test socket for CSP

The Importance of Test Points in Circuit Design (Electronic Design1y) The latest in advanced electronics requires space-saving, low-cost methods for connecting and testing circuitry. Why are test points a crucial element in developing a successful circuit? Types of test

The Importance of Test Points in Circuit Design (Electronic Design1y) The latest in advanced electronics requires space-saving, low-cost methods for connecting and testing circuitry. Why are test points a crucial element in developing a successful circuit? Types of test

Upgrading surface-mount placement to meet tech market demands (Electronic Specifier21h) In telecom infrastructure and data centres, switches and server cards are adopting custom processors for compute-hungry

Upgrading surface-mount placement to meet tech market demands (Electronic Specifier21h) In telecom infrastructure and data centres, switches and server cards are adopting custom processors for compute-hungry

This Pogo Pin Test Fixture Keep Your SMDs From Taking Flight (Hackaday1y) There’s no denying how useful surface mount technology is, and how enabling the ability to make really small circuits has become. It comes at a price, though; most of us probably know what it’s like

This Pogo Pin Test Fixture Keep Your SMDs From Taking Flight (Hackaday1y) There’s no denying how useful surface mount technology is, and how enabling the ability to make really small circuits has become. It comes at a price, though; most of us probably know what it’s like

test ficture (Hackaday1y) There’s no denying how useful surface mount technology is, and how enabling the ability to make really small circuits has become. It comes at a price, though; most of us probably know what it’s like

test ficture (Hackaday1y) There’s no denying how useful surface mount technology is, and how enabling the ability to make really small circuits has become. It comes at a price, though; most of us probably know what it’s like

Vishay Launches BCcomponents SMDY1 Surface-Mount Y1 Safety Capacitors (Printed Circuit Design & Fab Online Magazine8dOpinion) Vishay Intertechnology has introduced the BCcomponents SMDY1 Automotive Series, the industry’s first Automotive Grade AC line-rated ceramic disc safety capacitors with a Y1 rating in a surface-mount

Vishay Launches BCcomponents SMDY1 Surface-Mount Y1 Safety Capacitors (Printed Circuit Design & Fab Online Magazine8dOpinion) Vishay Intertechnology has introduced the BCcomponents SMDY1 Automotive Series, the industry’s first Automotive Grade AC line-rated ceramic disc safety capacitors with a Y1 rating in a surface-mount

Back to Home: http://www.devensbusiness.com