

SEVENTH EDITION

MODERN  
DICTIONARY  
*of*  
ELECTRONICS


RUDOLF F. GRAF



Newnes


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#### Library of Congress Cataloging-in-Publication Data

Graf, Rudolf F.  
Modern dictionary of electronics / Rudolf F. Graf. — 7th ed.,  
revised and updated.  
p. cm.  
ISBN 0-7506-9866-7 (alk. paper)  
1. Electronics — Dictionaries. I. Title  
TK7804.G67 1999  
621.381'03 — dc21  
99-17889  
CIP

#### British Library Cataloguing-in-Publication Data

A catalogue record for this book is available from the British Library.

The publisher offers special discounts on bulk orders of this book.

For information, please contact:

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Woburn, MA 01801-2041  
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Fax: 781-904-2620

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our World Wide Web home page at: <http://www.bh.com>

10 9 8 7 6 5 4 3 2 1

Typeset by Laser Words, Madras, India  
Printed in the United States of America

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quantity is adjusted to produce a like effect. The unknown value is then assumed to be equal to the adjusted known value.

**substrate**—Also called base material. 1. The supporting material on or in which the parts of an integrated circuit are attached or made. The substrate may be passive (thin film, hybrid) or active (monolithic compatible). 2. A material on the surface of which an adhesive substance is spread for bonding or coating; any material that provides a supporting surface for other materials, especially materials used to support printed-circuit patterns. 3. The physical material upon which an electronic circuit is fabricated. Used primarily for mechanical support but may serve a useful thermal or electrical function. Also, a material on whose surface an adhesive substance is spread for bonding or coating, or any material that provides a supporting surface for other materials. 4. The base or support layer of a transistor or monolithic chip, which usually constitutes a major proportion of the total volume. When composed of ceramic, glass, or sapphire, the substrate functions mainly as a support during the operations of fabrication and encapsulation. However, when composed of heavily doped semiconductor material it normally performs the additional function of a distributed low-resistance connection to the physically lowest region of the device. 5. That part of an integrated circuit that acts as a support. 6. A slab of insulating material used for structural support of thick-film depositions and assembly components, usually high-purity (96 to 99 percent) alumina. See alumina. 7. The material on which the chips and other components are mounted, comparable to a printed circuit board. Substrate materials in common use include glass, sapphire, silicon, alumina, beryllia, and porcelainized steel. 8. The underlying material on which a microelectronic device is built.

**substrate base material**—The supporting material on which the elements of a thick-film circuit are deposited or attached.

**subsurface wave**—An electromagnetic wave propagated through water or land. Operating frequencies for communications may be limited to approximately 35 kHz due to attenuation of high frequencies.

**subsynchronous**—Having a frequency that is a submultiple of the driving frequency.

**subsynchronous reluctance motor**—A form of reluctance motor with more salient poles in the primary winding. As a result, the motor operates at a constant average speed that is a submultiple of its apparent synchronous speed.

**subsystem**—1. A major, essential, functional part of a system. The subsystem usually consists of several components. 2. A part or division of a system that in itself has the properties of a system. 3. An organization of computer components (e.g., a tape drive and controller) that comprises a functional unit that is part of a larger system.

**subtractive filter**—An optical filter that is of a certain color and eliminates that color when placed in the path of white light.

**subtractive process**—A printed circuit manufacturing process in which a conductive pattern is formed by the removal of portions of the surface of a metal-clad insulator by chemical means (etching).

**subtractor**—An operational amplifier circuit in which the output is proportional to the difference between its two input voltages or between the net sums of its positive and negative inputs.

**subvoice-grade channel**—A channel whose bandwidth is less than that of a voice-grade channel. Such a channel usually is a subchannel of a voice-grade line.

## substrate — summing junction

(According to common usage, a telegraph channel is excluded from this definition.)

**subwoofer**—A speaker that is specifically made to reproduce the lowest of audio frequencies, between approximately 20 Hz and 100 Hz.

**success ratio**—The ratio of the number of successful attempts to the total number of trials. It is frequently used as a reliability index.

**suckout**—A hole in the response pattern of a tuned circuit due to the self-resonance of components at certain frequencies.

**sudden commencement**—Magnetic storms that start suddenly (within a few seconds) and simultaneously all over the earth.

**sudden ionospheric disturbances**—The sudden increase in ionization density in lower parts of the ionosphere, caused by a bright solar chromospheric eruption. It gives rise to a sudden increase of absorption in radio waves propagated through the low parts of the ionosphere, and sometimes to simultaneous disturbances of terrestrial magnetism and earth current. The change takes place within one or a few minutes, and conditions usually return to normal within one or a few hours.

**Suhl effect**—When a strong transverse magnetic field is applied to an n-type semiconducting filament, the holes injected into the filament are deflected to the surface. Here they may recombine rapidly with electrons and, thus, have a much shorter life, or they may be withdrawn by a probe as though the conductance had increased.

**suicide control**—A control function that uses negative feedback to reduce and automatically maintain the generator voltage at approximately zero.

**sulfating**—The accumulation of lead sulfate on the plates of a lead-acid storage battery. This reduces the energy-storing ability of the battery and causes it to fail prematurely.

**sulfation**—The lead sulfate that forms on battery plates as a result of the battery action that produces electric current.

**sulfonated polystyrene sensor**—Also called Pope cell. An ion-exchange device with good response, accuracy, and long-term stability whose resistance changes exponentially with humidity and temperature.

**sum**—The combination of two electrical signals of the same electrical polarity. The total electrical energy produced by combining the two different signals of a stereo program.

**sum channel**—A combination of left and right stereo channels identical to the program, which may be recorded or transmitted monophonically.

**summary punch**—A punch-card machine that may be attached to another machine in such a way that it will punch information produced, calculated, or summarized by the other machine.

**summary recorder**—In computers, output equipment that records a summary of the information handled.

**summation check**—A redundant computer check in which groups of digits are summed, usually without regard to overflow. The sum is then checked against a previously computed sum to verify the accuracy of the computation.

**summation frequency**—A frequency that is the sum of two other frequencies that are produced simultaneously.

**summation tone**—A combination tone, heard under certain circumstances, whose pitch corresponds to a frequency equal to the sum of the frequencies of the two components.

**summing junction**—The input terminal of an operational amplifier that is inverted and has both input and feedback connected to it.