

SEVENTH EDITION

MODERN  
DICTIONARY  
*of*  
ELECTRONICS

RUDOLF F. GRAF



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DICTIONARY  
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ELECTRONICS**

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REVISED AND UPDATED



**Rudolf F. Graf** is an author whose name is well-known to engineers, technicians, and hobbyists around the world. He graduated as an electronics engineer from Brooklyn Polytechnic Institute and did his graduate work New York University. Mr. Graf has been active in the electronics industry for more than fifty years in capacities ranging from design and consulting engineer, chief engineer, chief instructor at electronics and television schools, and consulting editor. He also held various sales and marketing positions. Mr. Graf is the author or co-author of more than 150 technical articles published by major magazines. He has written about 50 books on electricity and electronics, with more than 2 million copies in print, including the best-selling *Video Scrambling & Descrambling for Satellite & Cable TV, Second Edition* and the *Circuits* series of books, both published by Newnes. A number of his books have been translated into several European languages as well as Chinese, Japanese, and Russian.

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being plated by the substrate. Thickness of the plating is limited to 10 to 50 microinches (0.254 to 1.27  $\mu\text{m}$ ). 2. The chemical deposition of a thin metallic coating over certain base metals by a partial displacement of the base metal.

**immersion pyrometer**—An instrument for determining molten-steel temperature and normally consisting of a platinum-platinum rhodium bimetal thermocouple junction and a recording device for transposing the millivoltage into degrees of temperature.

**immittance**—A term that denotes both impedance and admittance. It is commonly applied to transmission lines, networks, and certain kinds of measuring instruments.

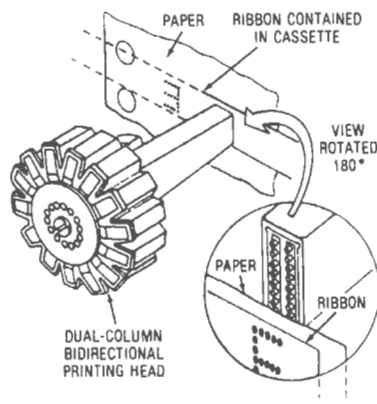
**IMOS**—See ion-implanted MOS.

**impact excitation**—The starting of damped oscillations by a sudden surge, such as by a spark discharge.

**impact modulator amplifier**—A fluidic device in which the impact plane position of two opposed streams is controlled to alter the output.

**impact predictor**—A device that can determine, in real time, the point on the earth's surface where a ballistic missile will impact if thrust is instantaneously terminated.

**impact printer**—1. Any type of printer that generates characters by using some form of stamping or inking through a ribbon by some sort of character slug, element, or hammer-needle. (Daisy-wheel printers are impact printers.) 2. Any mechanical imprinting device that forms characters by striking characters against a ribbon onto paper. 3. A mechanical printer operating at relatively low speeds—from 150 lines per minute to 1800 lines per minute. Has multiple copy capability and normally is capable of producing an original plus three copies. Impact printers are identified as letter-quality, dot-matrix, and line-printing types. No longer in common use.



*Impact printer (dot-matrix).*

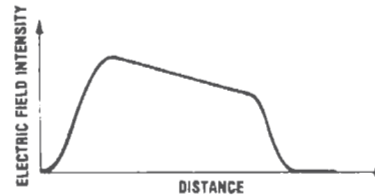
**impact printing**—Printing that is produced by the impact of a key on an inked ribbon, transferring the impression of a character onto the paper located behind the ribbon.

**impact resistance**—Resistance to fracture under shock force.

**IMPATT**—Acronym for impact avalanche and transit time.

**IMPATT diode**—Impact avalanche and transmit time diode. 1. A pn-junction diode operated with heavy back bias so that avalanche breakdown occurs in the active region. To prevent burnout, the device is so

constructed that the active region is very close to a good heat sink. For the same reason, the bias supply must be a constant-current type. 2. A device whose negative resistance characteristic is produced by a combination of impact avalanche breakdown and charge-carrier transit-time effects. Avalanche breakdown occurs when the electric field across the diode is high enough for the charge carriers (holes or electrons) to create electron-hole pairs. With the diode mounted in an appropriate cavity, the field patterns and drift distance permit microwave oscillations or amplification. 3. A semiconductor microwave diode that, when its junction is biased onto avalanche, exhibits a negative resistance over a frequency range determined by the transit time of charge carriers through the depletion region.



*IMPATT diode.*

**IMPATT oscillator**—An oscillator in which the active element is an IMPATT diode operating in a negative resistance mode. Dc to rf conversion efficiencies are normally less than 20 percent. Present devices operate above 5 GHz.

**impedance**—1. The total opposition (i.e., resistance and reactance) a circuit offers to the flow of alternating current at a given frequency; the ratio of the potential difference across a circuit or element of a circuit to the current through the circuit or element. It is measured in ohms, and its reciprocal is called admittance. Symbol:  $Z$ . 2. The combination of resistance and reactance. 3. Combined opposition to current resulting from resistance, capacitance, and inductance. 4. The sinusoidal terminal voltage of a circuit divided by the current through it. 5. A speaker's resistance to an alternating current, which varies with frequency. A speaker's rated impedance is usually the value measured at 400 Hz. 6. The opposition to alternating current in a circuit, generally categorized as either high or low, and measured in ohms. 7. The total opposition that a circuit offers to the flow of alternating current or any other varying current at a particular frequency. It is a combination of resistance,  $R$ , and reactance,  $X$ , measured in ohms.

**impedance angle**—Angle of the impedance vector with respect to the resistance vector. Represents the phase angle between voltage and current.

**impedance at the intermediate frequency**—In a mixer semiconductor diode, the impedance measured at the output terminals of a mixer circuit when the device is driven by a local oscillator under specified conditions.

**impedance bridge**—A device for measuring the combined resistance and reactance of a component part of a circuit.

**impedance characteristic**—A graph of impedance versus frequency of a circuit or component.

**impedance coil**—A coil whose inductive reactance is used to hinder the flow of alternating current in or between circuits.

**impedance compensator**—1. An electric network used with a line or another network to give the impedance of the combination a certain characteristic over a desired frequency range. 2. A circuit that ensures that a transmission line is a proper electrical load for its communicating devices. It is connected in parallel with the devices.

**impedance coupling**—A method of coupling using an impedance as the coupling device common to both the primary and secondary circuits. This type of coupling is usually limited to audio systems, where high gain and limited bandpass are required.

**impedance drop**—The vector sum of the resistance drop and the reactance drop. (For transformers, the resistance drop, the reactance drop, and the impedance drop are, respectively, the sum of the primary and secondary drops reduced to the same terms. They are usually expressed in percent of the secondary-terminal voltage.)

**impedance ground**—An earth connection made through an impedance of predetermined value usually chosen to limit the current of a short-circuit to ground.

**impedance irregularities**—Breaks or abrupt changes that occur in an impedance-frequency curve when unlike sections of a transmission line are joined together or when there are irregularities on the line.

**impedance match**—The condition in which the impedance of a component or circuit is equal to the internal impedance of the source or the surge impedance of a transmission line, thereby giving maximum transfer of energy from sources to load, minimum reflection, and minimum distortion.

**impedance matching**—1. The connection across a source impedance of another impedance having the same magnitude and phase angle. If the source is a transmission line, reflection is thereby avoided. 2. The process of adjusting the impedances of a load and of its power source so that they are equal. This permits the greatest possible transfer of power. 3. Making the impedance of a terminating device equal to the impedance of the circuit to which it is connected in order to achieve optimum signal transfer.

**impedance-matching transformer**—A transformer used to match the impedance of a source and load.

**impedance plethysmograph**—An instrument used to detect the increased blood volume in the tissues of the body during a contraction of the heart. *See also* electrical-impedance cephalography; finger plethysmograph.

**impedance transformer**—A transformer that transfers maximum energy from one circuit to another.

**impedance triangle**—A diagram consisting of a right triangle. The sides are proportional to the resistance and reactance in an ac circuit, with the hypotenuse representing the impedance.

**imperfect dielectric**—A dielectric in which part of the energy required to establish its electric field is converted into heat instead of being returned to the electric system when the field is removed.

**imperfection**—In a crystalline solid, any deviation in structure from an ideal crystal (one that is perfectly periodic in structure and contains no foreign atoms).

**implantable pacemaker**—A miniature pulse generator surgically implanted beneath the skin and provided with output leads that connect directly to the heart muscle. The electrodes may contact either the outer wall of the

## impedance characteristic — impulse excitation

heart muscle (myocardial electrodes) or the inner surface of the heart chamber (endocardiac electrodes).

**implied AND**—Also called dot AND or wired AND. A logic element in which the combined outputs are true if and only if all outputs are true. (Sometimes improperly called dot OR or wired OR.)

**implied OR**—Also called wired OR. A logic element in which the combined outputs are true if one or more of the outputs are true.

**implode**—The inward bursting of a picture tube due to its high vacuum.

**import**—To copy data created by one computer program or file into another.

**impregnant**—1. A substance, usually a liquid, used to saturate the paper dielectric of a capacitor and replace the air between its fibers, thereby increasing the dielectric strength and the dielectric constant of the capacitor. 2. A substance intended to replace the air as dielectric between the electrodes of a capacitor.

**impregnate**—1. To fill voids and air spaces (of a capacitor or transformer) with a material having good insulating properties commonly called an impregnant. 2. To fill the voids and interstices of a material with a compound. This does not imply complete fill or complete coating of the surfaces by a hole-free film.

**impregnated coils**—Coils that have been permeated with an electric grade varnish or other protective material to protect them from mechanized vibration, handling, fungus, and moisture.

**impregnating**—Complete filling of even the smallest voids in a component or closely packed assembly of parts. Low-viscosity compounds, usually liquids, are used. The process is frequently accomplished by a vacuum process in which all air is removed before introducing the impregnating material. Typical examples of impregnating are the filling of capacitors or transformer windings.

**impregnation**—1. The process of coating the insides of coils and closely packed electronic assemblies by dipping them into a liquid and letting it solidify. 2. The process of completely filling all interstices or a part or assembly with a thin, liquid, electrically insulating material. The process is best accomplished by first removing all air (creating a vacuum), then introducing the impregnant, and finally applying atmospheric or elevated pressures to completely force-fill the system.

**impressed voltage**—The voltage applied to a circuit or device.

**improvement threshold**—A characteristic of FM radio receivers that determines the minimum rf signal power required to overcome the inherent thermal noise. For increasing values of rf power above this point, an improvement of signal-to-noise ratio is obtained.

**impulse**—1. A pulse that begins and ends within so short a time that it may be regarded mathematically as infinitesimal. The change produced in the medium, however, is generally of a finite amount. 2. A current surge of unidirectional polarity. *See also* pulse.

**impulse bandwidth**—The area divided by the height of the voltage-response selectivity as a function of frequency. It is used in the calculation of broadband interference.

**impulse-driven clock**—An electric clock in which the hands are moved forward at regular intervals by current impulses from a master clock.

**impulse excitation**—Also called shock excitation. 1. A method of producing oscillatory current in which the duration of the impressed voltage is relatively short compared with that of the current produced. 2. The sudden application of a momentary steep-wavefront voltage to a resonant circuit, resulting in a damped oscillation.