

SEVENTH EDITION

MODERN
DICTIONARY
of
ELECTRONICS

RUDOLF F. GRAF



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of
ELECTRONICS**

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REVISED AND UPDATED

Rudolf F. Graf



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Manager of Special Sales

Butterworth-Heinemann

225 Wildwood Avenue

Woburn, MA 01801-2041

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g—Also called G force. Symbol for the acceleration of a free-falling body due to the earth's gravitational pull. Equal to 32.17 feet per second per second.

G—1. Symbol for conductance, a grid of a vacuum tube, a generator, or ground. 2. Letter symbol for giga (10^9). 3. Abbreviation for the gate of a field-effect transistor.

g-a—Abbreviation for ground-to-air. Communication with airborne objects from the ground.

GaAs FET—See gallium arsenide field-effect transistor.

GA coil—A coil wound with air spaces between its turns and layers to reduce the capacitance.

gauge—Also spelled gauge. 1. An instrument or means for measuring or testing. By extension, the term is often used synonymously with *transducer*. 2. A system for specifying wire size. The American wire gauge (AWG), also known as Brown & Sharpe gauge, is used for copper. An increase of three gauge numbers doubles area and weight, and halves dc resistance.

gauge pressure—1. A differential pressure measurement using the ambient pressure as a reference. 2. A pressure in excess of a standard atmosphere at sea level (i.e., 14.7 pounds per square inch or 1.033×10^4 kg/m²).

gauge pressure transducer—A pressure transducer that uses ambient pressure as the reference pressure. The sensing element is normally vented to the ambient pressure.

gain—Also called transmission gain. 1. Any increase in power when a signal is transmitted from one point to another. Usually expressed in decibels. Widely used for denoting transducer gain. 2. The ratios of voltage, power, or current with respect to a standard or previous reading. 3. Any increase in the strength of an electrical signal, as takes place in an amplifier. Gain is measured in terms of decibels or number of times of amplification; for example, 6 dB (a gain of 2) increases an input voltage to an output twice as large. 4. The change in source-drain current per unit change in gate voltage. Thus, higher gain gives faster devices. 5. The degree to which a signal's amplitude is increased. The amount of amplification realized when a signal passes through an amplifier or repeater, normally measured in decibels. 6. The ratio of output power to the input power for a system or component. 7. Change in signal level due to processing functions that increase the magnitude of the signal. Examples include signal amplification in a radar receiver; processing gain in the processor; and antenna gain, a result of the directivity of the pattern.

gain-bandwidth product—1. The product of the closed-loop gain of an operational amplifier and its corresponding closed-loop bandwidth. This product is often constant in operational amplifiers. 2. The product of the gain of an active device and a specified bandwidth. For an avalanche photodiode, the gain-bandwidth product

is the gain times the frequency of measurement when the device is biased for maximum obtainable gain.

gain block—A single stage of gain or a cascaded series of gain stages.

gain control—A device for varying the gain of a system or component.

gain function—A transfer function that relates either a pair of voltages or a pair of currents.

gain margin—The amount of gain change of an operational amplifier at 180° phase-shift angle frequency that would produce instability.

gain nonlinearity—The degree to which gain of an amplifier or instrument varies over the range of permissible input levels for a given gain setting, generally expressed as a percentage of deviation from the desired gain.

gain-sensitivity control—See differential gain control.

gain stability—The extent to which the sensitivity of an instrument remains constant with time. (The property reported in specifications should be instability, which is the maximum change in sensitivity from the initial value over a stated period of time under stated conditions.)

gain-time control—See sensitivity-time control.

galactic noise—All noise that originates in space as a result of radiation of celestial bodies other than the sun.

galena—A bluish-gray, crystalline form of lead sulfide often used as the crystal in a variable-crystal detector.

gallium arsenide field-effect transistor—Abbreviated GaAs FET. A field-effect transistor with a reverse-biased Schottky-barrier gate fabricated on a gallium arsenide substrate. Roughly equivalent to a silicon MOSFET, GaAs FETs are depletion-mode devices. Because charge carriers reach approximately twice the velocity as in silicon, for a given geometry a given gain can be reached at about twice the frequency. Also called GaAs MESFET, for metal epitaxial semiconductor FET.

gallium arsenide (GaAs) injection laser—A laser system consisting of a planar pn junction within a single crystal of gallium arsenide. The pair of parallel, semireflective end faces produces a Fabry-Perot resonant cavity, whereas the other faces are sawed to suppress all except the modes that propagate between the end faces. The lasing occurs in the modes that have the maximum optical gain and the least optical loss.

galloping ghost—See proportional control, 2.

galvanic—1. An early term for current resulting from chemical action, as distinguished from electrostatic phenomena. 2. Describing any substance from which, or through which, direct current occurs as a result of chemical action.

galvanic anode—A source of emf for cathodic protection provided by a metal less noble than the one

when it is illuminated (analogous to a thermistor except the heat is replaced by light). 4. See photoconductive detector.

photoconductive detector—A detector used in the spectral region from the optical to the far infrared. It is based on photoconductive effects in semiconductors that are sensitive to photons from light to lower energies of microwave quanta. See intrinsic photoconductivity; extrinsic photoconductivity.

photoconductive device—A device that makes use of photoconductivity, such as a photoconductive cell.

photoconductive effect—1. The change of electrical conductivity of a material when exposed to varying amounts of radiation. 2. The phenomenon in which some nonmetallic materials exhibit a marked increase in electrical conductivity on absorption of photon energy. Photoconductive materials include gases (ionization) as well as crystals. They are used in conjunction with semiconductor materials that are ordinarily poor conductors but become distinctly conducting when subjected to photon absorption. The photons excite electrons into the conduction band, where they move freely, resulting in good electrical conductivity. The conductivity increase is due to the additional free carriers generated when photon energies are absorbed in energy transitions. The rate at which free carriers are generated and the length of time they persist in conducting states (their lifetime) determine the amount of conductivity change. 3. The alteration of electric conductivity produced by the absorption of varying amounts of radiation composed of photons.

photoconductive film—A film of material whose electrical current-carrying ability is enhanced when illuminated by electromagnetic radiation, particularly in the visible region of the frequency spectrum.

photoconductive gain factor—The ratio of the number of electrons per second flowing through a circuit containing a cube of semiconducting material, whose sides are of unit length, to the number of photons per second of incident electromagnetic radiation absorbed in this volume.

photoconductive material—Material having a high resistance in the dark, and a low resistance when exposed to the light.

photoconductive meter—An exposure meter in which a battery supplies power through a photoconductive cell to an electrical current-measuring device, such as a millimeter, to measure the intensity of radiation, such as light intensity, incident on its active surface.

photoconductive photodetector—A photodetector that makes use of the phenomenon of photoconductivity in its operation. Thus, it detects the presence of electromagnetic radiation, particularly in the visible region of the frequency spectrum, by changing its electrical resistance in accordance with the intensity of the incident radiation, thus controlling the current from an applied bias voltage power source. Usually a source of voltage is needed to drive a current that will vary according to the variation in conductivity resulting from the variation in incident electromagnetic radiation.

photoconductivity—1. The greater electrical conductivity shown by some solids when illuminated. The incoming radiation transfers energy to an electron, which then takes on a new energy level (in the conduction band) and contributes to the electrical conductivity. 2. The ability of a material to hold a charge of electricity (insulator) in the absence of light yet act as a conductor of electricity when exposed to light. 3. The increase in electrical conductivity displayed by many materials, particularly

nonmetallic solids, when they absorb electromagnetic radiation. 4. Characteristic of a material that produces changes in the electrical conductivity of the material as a result of absorption of photons.

photoconductor—1. A passive, high-impedance device composed of thin single-crystal or polycrystalline films of compound semiconductor materials. When the sensitive surface is illuminated, its resistance decreases and, hence, its conductivity increases. 2. A light-sensitive resistor whose resistance decreases with increases in light intensity, when illuminated. Consists of a thin single crystal or polycrystalline films of compound semiconductor substances. 3. A device whose electrical resistance varies in relationship with exposure to light. 4. A material, usually a nonmetallic solid, whose conductivity increases when it is exposed to electromagnetic radiation. 5. A metallic substance, such as selenium or cadmium sulfide, that is capable of conducting and retaining electrical charges. If any portion of a photoconductor is exposed to light, that part will lose its charge. Photoconductive materials are employed in the electrostatic process to retain a latent image (charge) of a document, which is subsequently imbued with toner particles to create an image.

photocoupled solid-state relay—A relay in which the control signal activates the load circuit via a light source and photosensitive semiconductors; electrical isolation between input and output is complete.

photocurrent—1. The difference between light current and dark current in a photodetector. 2. See photoelectric current.

photo-Darlington—A light-sensitive Darlington-connected transistor pair. The photo-Darlington has a very high sensitivity to illumination or radiation.

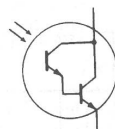


Photo-Darlington symbol.

photodetector—1. A device that senses incident illumination. 2. Any device that utilizes the photoelectric effect to detect the presence of light. 3. A device that provides an electrical output signal when subjected to radiation in the visible, infrared, or ultraviolet regions of the electromagnetic spectrum. Photodetectors are square-law detectors that respond to the intensity of light averaged over some time period. Photodiodes, phototransistors, and photo-Darlingtons are the most common types of photodetectors. 4. A device capable of extracting the information from an optical carrier, i.e., a thermal detector or a photon detector, the latter being used for communications more than the former. See photoconductive photodetector; photoelectromagnetic photodetector; photoemissive photodetector; photovoltaic photodetector.

photodetector responsivity—The ratio of the rms value of the output current or voltage of a photodetector to the rms value of the incident optical power input. Note: In most cases, detectors are linear in the sense that the responsivity is independent of the intensity of the incident radiation. Thus, the detector response in amperes