



Glossary of Power Supply Terms



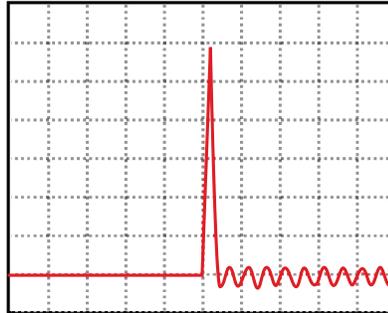
CUI INC[®]

AC Input Current

The flow of electricity pulled under the highest DC load (value must be listed on product labels for compliance to safety agency standards).

AC Input Frequency

Most AC power is generated at either 50 or 60 Hz (cycles per second). Switching Power Supplies typically accept any frequency between 47-63Hz (nominal).



AC Input Voltage

The nominal AC Input Voltage that a power supply will accept during normal operation. Safety agencies require a power supply to operate an extended 10% of the stated input range on the product label. For example, a switching power supply labeled with a nominal 100 to 240VAC input range will actually operate over 90–264VAC input range.

AC Inrush Current

The instantaneous current drawn when the power supply is turned on cold. Larger power supplies generally incorporate a thermistor to limit this amount. It is most important in considering an AC switch rating.

Active Current Share

See Single Wire Parallel and sharing power.

Active Power Factor Correction

Traditional switched mode power supplies draw current from the AC line in short pulses, and as a result, the input current of such basic switched mode power supplies has high harmonic content. This creates extra load on utility lines and increased heat of utility transformers and may cause stability problems to the entire AC Line [Especially in Europe]. Active Power Factor Correction controls the input current of a supply so that the current wave form is proportional to the AC waveform [a sine wave].

Altitude

The maximum altitude at which a supply can be operated without derating. Supplies must often be de-rated due to the thinner air which is required to cool the power supply.

Ambient Temperature ATEX

The temperature of still air surrounding a power supply. ATEX 94/9/EC, from the French Atmosphere Explosible, is the European

Directive that states the technical requirements that must be applied to equipment intended for use in potentially explosive atmospheres.

Base Plate

A metal surface to which circuit components are mounted in such a way as to draw heat away from components.

Basic Insulation

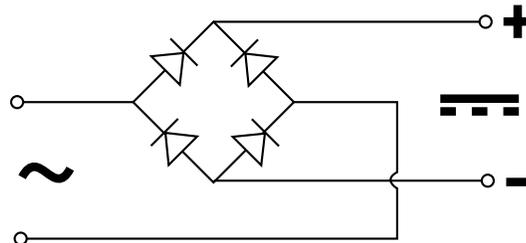
A single layer of required insulation to prevent electrical shock.

Blind Mate

The mechanical design of a supply to slide into position and make connection with it's mating connector when properly seated. This is particularly common in Hot-Swap/Warm-Swap power supplies or modules in parallel/redundant applications. It is common with this type of connection for there to be a short pin called last-mate which enables the supply to be on, in order to prevent arcing or powering of the supply until it is firmly seated into its mating connector.

Boost Converter

A boost converter [step-up converter] is a power converter with an output DC voltage greater than its input DC voltage.



Breakdown Voltage

The breakdown voltage of an insulator is the minimum voltage that causes a portion of an insulator to fail and become conductive.

Bridge Converter /Rectifier

A switching supply topology that employs four switching elements [full bridge] or two switching elements [half bridge]. Bridge a supply provide high output power and low ripple, but are significantly more complex than other types of supply topologies.

Brownout

Condition when AC Line Voltage drops below nominal levels.

Burn-In

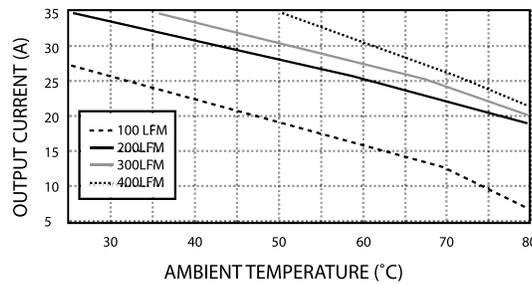
Operating newly manufactured supplies under defined load conditions for a specified period to eliminate faulty power supplies from shipping. Most power supplies will typically fail in the first few hours of operation [referred to as infant mortality]. The time period and conditions [input power cycling, load switching, temperature, etc.] will vary from product to product.

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| Case Operating Range | This is the temperature range at which a supply will meet its specifications as measured at the center of the top surface of the supply. |
| Cased | Enclosed in a metal or perforated metal cover assembly. Often referred to as Enclosed or Covered. Typically, a cased power supply is covered on all 6 surfaces for finger safe operation. |
| CB Report | A document which is designed to include the necessary tests and measurements approvals required among differing national safety test standards. http://www.cbscheme.org/ |
| CE Marking | CE marking [Communaute European, European Committee] indicates that all applicable EC directives pertaining to the power supply have been met. |
| CEC | California Energy Commission, energy efficiency targets for external power supplies in the USA was largely voluntary except in California where state law made it mandatory. Congress enacted the Energy Independence & Security Act (EISA) in 2007 based on the CEC limits (both are the same). Now Europe established their stricter standard referred to as ErP\ directive, see ErP for their summary of limits. |
| CENELEC | The Comite pour Européen de Normalisation Electronique [European Committee for Electrotechnical Standardisation] is a technical committee that recommends standards for adoption by the European Community [EC]. These standards [referred to in the applicable EC directive issued by the committee] cover EMI/RFI interferences, intrinsic safety, immunity, etc. http://www.cenelec.org/Cenelec/Homepage.htm |
| Chassis Ground | A chassis ground is a connection to the main chassis of a piece of electronic or electrical equipment. It is sometimes called common ground. It provides a reference that can be considered to have zero voltage. All other circuit voltages [positive or negative] are measured or defined with respect to it. Ideally, all chassis grounds should lead to earth grounds. |
| Chassis Mounting | The power supply offers one ore more surfaces for mounting a power supply directly to a system chassis or other metal . |
| Clearance | The shortest unimpeded distance between two conductors or circuit components. |
| Common | A conductive path used as a return for two or more circuits. The term |

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| | Common is often used interchangeably with ground, which is not technically correct unless it is connected to earth. |
| Common Mode Noise | The noise at an electrically fixed point (usually chassis ground) common to both DC output and return lines. |
| Conduction Cooling | The process of cooling or removing heat via a baseplate or heatsink. |
| Constant Current | A power supply that regulates its output current to within a specified current range regardless of changes of output load. These type of supplies are commonly used in battery charging application and LED Driver Circuits. |
| Constant Current Limiting | Current limiting circuit that holds output current at some maximum value whenever an overload of any magnitude is experienced. |
| Convection Cooling | The dissipation of heat via still air. |
| Cooling | The process of removing heat generated by normal operation of a power supply. Typical methods are convection, forced air and conduction. |
| Covered | This typically refers to a supply of either open-frame PCB construction or mounted on some type of bracket (L-Bracket or U-Frame) that has a cover option, These type of products are typically covered on 4 sides, leaving the ends open, though 6-sided covers are not uncommon. |
| Creepage Distance | The shortest distance between two conductors (typically one conductor primary and one conductor secondary). |
| Cross Regulation | On many multiple output power supplies, the secondary outputs may be affected by the loading conditions of the primary output(s). Multiple output power supplies often require minimum loads in order for the supply to achieve stated regulation specifications. Preload resistors may be employed at the system level to overcome these issues. |
| Crowbar | An overvoltage protection circuit which places a low resistance shunt across the power supply output terminals, if a predetermined voltage is exceeded. |
| CSA | The independent Canadian organization (Canadian Standards Association) which tests to see that public safety regulations are met. The CSA performs the same function as the UL (Underwriters Laboratories) in the USA. |

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| Current Adjustment | The range over which output current can be adjusted and the means of making that adjustment. |
| Current Limit | A circuit that protects a supply [or load] from damage during an overload condition. The output current is limited to a predetermined, safe value. Typically, normal operation is automatically restored when the overload condition is removed. |
| Current Limit Adjustment | The range over which the protective current limit set-point can be adjusted [and the means of adjustment]. |
| Current Limit Knee | The point at which current is limited [foldback] on the plot of output voltage vs output current. [See Foldback Current] |
| Current Share | Multiple power supplies or DC/DC supplies are often connected redundantly [to increase system reliability] or in parallel [to increase system power]. Outputs are connected together and each supply “shares” the load current. |
| DC Output Voltage | The nominal output voltage setting of a power supply. |
| DC/DC Converter | A supply / converter that accepts a DC input voltage and produces a DC output voltage. |
| Derating | In power supplies and DC/DC converters, derating is the specified reduction of the output current when operating under defined conditions, typically elevated operating temperatures. Diagram below is current derating under various airflow cooling measured in linear feet per minute [LFM]. |
| Design Topology | The conversion principle employed [eg. linear, switched mode flyback, half bridge etc]. |
| Designed to Meet | A supply may not bear any safety agency approvals, but when installed and used properly, should meet the official safety requirements of an electronic system. Typically a safety agency standard is referenced: eg Design to meet UL 60950-1. |
| Differential Mode Noise | That component of noise measured with respect to output or input to its returns; it does not include common mode noise. See Ripple and Noise. |
| DIN Rail Mount | A DIN rail is a metal track or rail to which PLCs and other industrial control devices can be easily attached or removed. A DIN rail mount is |

a mounting bracket/system that mates to the DIN rail. The DIN rail mount can be a part the enclosure for a device. It can also be an adapter bracket that can be attached to an industrial control device that does not have an integral mounting bracket.

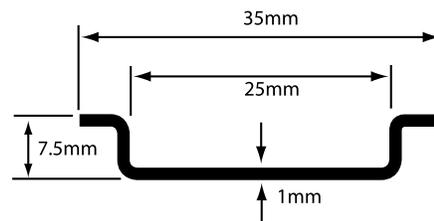


Double Insulation

An additional layer of insulation to protect one from high voltage potential, often referred to as supplementary or reinforced insulation [a common requirement of medical applications and transportation equipment]. Often referred to as Supplementary Insulation or Reinforced Insulation.

Drift

The variation of output voltage of a supply over a specified period of time, following a warm up period, with all other operating parameters such as line, load and ambient temperature held constant.



Droop Share

The function of paralleling two power supplies to share a load without any active circuit to control how the load is shared. The current-sharing accuracy is directly related to the output-voltage set-point accuracy of the paralleled supplies. Considering that output voltage will vary based upon varying line, load, temperature and other conditions, it is strongly advised that droop sharing only be utilized for redundant operation, not for increased power.

Dynamic Current Allocation

The ability of a multiple output supply to provide maximum current from any combination of outputs without cross regulation issues. This is usually achieved through independent regulation circuits for each output within the supply.

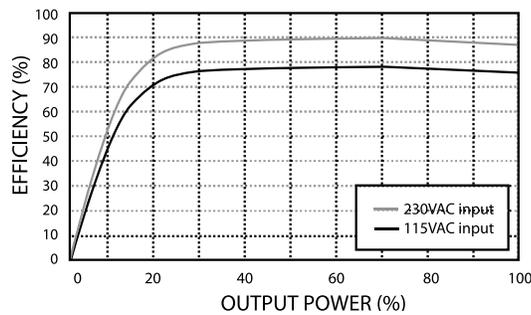
Dynamic Load A load condition that changes rapidly. During this load change, the output voltage may fall out of regulation [overshoot and / or undershoot] temporarily.

Dynamic Response See Transient Response

Dynamic Recovery See Transient Recovery.

Efficiency A measurement of Output power divided by Input Power. The values will vary depending on the load and AC input voltage. Typical Values shown are usually measurements of a supply at nominal input and output conditions.

Efficiency vs. Input A performance curve that describes how the efficiency varies with input voltage. Usually one or more load values are plotted [i.e. 50% and 100% rated load]. For multiple output supplies, the load is the total load on all outputs, hence 100% rated load means all outputs are loaded to their 100% rating.



Efficiency vs. Load A performance curve which demonstrates the manner in which a supply’s efficiency varies under varying load conditions.

EMC Electromagnetic Compatibility, is the compliance of the power supply and its components to standards for electromagnetic emissions and susceptibility [immunity].

EMI Electronic interferences that impair the performance of electronic device is referred to as Electromagnetic Interference.

EMI Conducted Conducted EMI is unwanted high frequency energy caused by the switching transistors, rectifiers, and transformers in power supplies and DC/DC. The noise that is generated on the input and output lines of a power supply is known as Conducted EMI. Most Conducted EMI measurements are done between 150.kHz and 30.MHz.

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| EMI Filter | Switch mode power supplies and DC/DC converters may be filtered by using an EMI filter on their input or primary side to meet applicable EMC standards. While supplies may be designed to meet an EMC standard, the final equipment may have a dramatic effect upon a power supply's EMC performance. It is the final equipment that must conform to EMC regulations. So, specifying a supply which meets the EMI classes is not a guarantee that final equipment will be compliant and does not remove the need for testing and possible additional filtration required for final equipment. |
| EMI Radiated | Radiated EMI is unwanted high frequency energy caused by the switching transistor, output rectifiers, and zener diodes in switching power supplies and DC/DC supplies and emitted into the area surrounding a supply. |
| Emissions | Electromagnetic radiation emitted into the atmosphere from the power supply. Conducted is that energy sent down the AC line cord; radiated is sent into the air. Final equipment must meet both standards while many supplies may be rated only for conducted emissions. |
| Encapsulated | Hermetically sealed and contained [encapsulated] in a thermally conductive epoxy resin or similar plastic. |
| Energy Independence & Security Act 2007 (EISA) | A law effective July 1, 2008 which states that external power supplies should meet no load power consumption limits and minimum efficiency limits identical to California Energy Commission [CEC] limits. ErP, a European directive, has similar limits, see ErP for a table outlining the summary of limits. |
| Energy Star | In relation to External Power Supplies, Energy Star adopted the same limits as defined by the California Energy Commission [CEC]. Effective the end of the calendar year 2010, Energy Star will no longer govern External Power Supplies and their no load power consumption or efficiency levels. See ErP for the latest in consumption and efficiency requirements. |
| Enclosed | Covered in a metal or perforated metal cover assembly. Often referred to as Cased or Covered. Typically, an enclosed power supply is covered on all 6 surfaces for finger safe operation. |
| ErP Directive 2009/125/EC | A European Directive defining no load power consumption limits and minimum efficiency levels of external power supplies. The Directive applies to products with sales >200,000 units per year within the EU, however many customers and power supply factories have adopted these |

standards for assured compliance to the strictest possible standards around the globe.

| No load power limits | |
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| Rated power | No load consumption |
| 0 W to <50 W | 0.3 W |
| ≥ 50 W to 250 W | 0.5 W |
| Active mode power limits, O/P < 6 V | |
| Rated power | Average efficiency |
| 0 W to 1 W | ≥ 0.497 x Rated power +0.067 |
| > 1 W to ≤ 49 W | ≥[0.0750 x Ln(Rated power)] +0.561 |
| > 49 W | ≥ 0.86 |
| Active mode power limits, O/P ≥ 6 V | |
| Rated power | Average efficiency |
| 0 W to 1 W | ≥ 0.48 x Rated power +0.14 |
| > 1 W to ≤ 49 W | ≥[0.0626 x Ln(Rated power)] +0.622 |
| > 49 W | ≥ 0.87 |

ESD A current produced by the static charge of two objects when they are close enough to produce a discharge or arc.

ESR Equivalent Series Resistance is a prime factor in ripple switching power devices, and it is that resistance which exactly matches the performance of a real capacitor when it is in series with an ideal capacitor. Lower ESR produces a higher quality capacitor and makes it more effective as a filtering device.

Expected Lifetime The expected average lifetime of a power supply, which may be calculated upon the reliability data of a supply’s individual components or demonstrated through Highly Accelerated Life Test [HALT] and Highly Accelerated Stress Screening [HASS].

External Synchronization Synchronizing the supply’s switching frequency to an external oscillator either in an external circuit or within a master supply.

Faraday Shield An electrostatic shield, which is placed between input and output windings of a transformer and is used to reduce coupling capacitance, which in turn reduces output common mode noise.

FCC The Federal Communications Commission is a US government agency that sets standards for, and governs, the testing of conducted and radiated emissions. These are system level standards, but they are also used in power supplies and DC/DC supply specifications.

Filter An input or output circuit designed to attenuate ripple and noise generated by a supply.

Floating Output

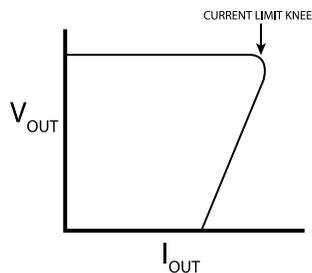
A power supply or DC/DC supply output that is ungrounded and not referenced to another output. Typically, floating outputs are fully isolated and may be referenced as either positive or negative by the user.

Flyback Converter

Sometimes called a “Buck Boost” supply, this topology uses a single transistor switch and eliminates the need for an output inductor. Energy is stored in the transformer primary during the first half of the switching period when the transistor switches “ON”. During the second half of “Flyback period when the transistor is OFF”, this energy is transferred to the transformer secondary and load. This technique is cost effective because a minimum number of components is required.

Foldback Current Limiting

An output protection circuit where the output current decreases with increasing overload, reaching a minimum at short circuit. This minimizes the internal power dissipation under overload conditions.



Forced Air Cooling

The use of a fan (or other air moving equipment) within a system to reduce the ambient temperature and cool the electronic equipment.

Forward Converter

Also called a “Buck Derived” supply, this topology, like the flyback supply, typically used a single transistor switch. Unlike the flyback supply, energy is transferred to the transformer secondary while the transistor is “ON”, and stored in an output inductor.

Free Air Convection

An operating environment in which the natural movement of air (unassisted by fans or blowers) is sufficient to maintain a supply’s temperature within its operating limits. See also Convection Cooling.

Full Bridge Converter

A topology that typically operates as a forward supply but uses a bridge circuit, consisting of four switching transistors, to drive the transformer primary, used to handle high power levels. [see bridge rectifier].

Full Load

The maximum continuous output current a supply is rated for under nominal operating conditions.

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| Full Wave Rectifier | A circuit [bridge or centre tapped] that rectifies both halves of an AC waveform. |
| Galvanic Isolation | Two circuits which have no ohmic connection are considered to be “galvanically isolated” from each other. Galvanic isolation [separation] is achieved by using a transformer, opto coupler, etc. |
| Ground | An electrical connection that is made to earth [or to some conductor that is connected to earth]. A power supply or DC/DC supply “common” is not actually ground unless it is connected to earth. |
| Ground Loop | An unwanted feedback condition caused by two or more circuits sharing a common electrical line, usually a common ground line. |
| Half Bridge Converter | A power switching circuit similar to the full bridge supply except that only two transistors are used, with the other two replaced by capacitors [see bridge rectifier]. |
| Half Wave Rectifier | Single diode rectifier circuit that rectifies one half the AC input wave. |
| Harmonic Distortion | The distortion characterized by the presence of multiple harmonics of the fundamental frequencies in sinusoidal AC current waveforms and caused by the switching action of the power supply typically stated as a percentage of the sinusoidal wave form, eg: 0.95 Power Factor. |
| Heat Sink | A metal plate, extrusion, or case that is provided to increase surface area to dissipate heat away from sensitive components and circuits. |
| Hiccup Mode | Also called Cycle to Cycle Mode. An operating mode triggered by an output fault condition [short circuit] in which the supply cycles on and off. The on time to off time maintains the internal power dissipation at a safe level until the fault condition can be removed [see current limit protection]. |
| Hipot [Dielectric Withstand] | The test voltage between the input and output, and output to ground. |
| Hold-Up Time | When there is a loss of input power to a supply, this is the time during which the output voltage remains within regulation. To protect against momentary power outages in switching power supplies, energy is typically stored in bulk capacitors referred to as hold-up capacitors. |

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| Hot-Swap | The function of replacing a supply without shutting down the system. A supply is designed to be inserted or extracted and fit within a mechanically designed slot with blind-mate connectors. These types of supplies typically have a soft-start function and utilize a short pin to enable the supply which is last to mate avoid arcing and ensure the supply is firmly seated prior to powering up. |
| Humidity | Within a specified temperature range, the maximum moisture content permissible in the surrounding air of a supply. Two values are typically provided, operating humidity and storage humidity. |
| IEC | The International Electrotechnical Commission (IEC) based in Geneva, which sets standards for electronic products and components. While the IEC does not conduct any testing, their standards have been adopted by most of worldwide national safety agencies. http://www.iec.ch/ |
| Immunity | Indicates that the supply has been tested and is “immune” from electromagnetic or electro static discharge (ESD). |
| Impedance | The apparent impedance presented by the supply to its output terminals. |
| Input Current | The current drawn by a supply, which can be measured under a range of input voltage range and output load conditions. Typically listed as the maximum continuous input current under lowest input voltage and maximum output load so that proper fusing may be determined. |
| Input Current vs. Line Input | A performance curve illustrating how the input current varies with line input voltage. See Efficiency versus Input. |
| Input Ripple Rejection | A modulating signal injected into a supply operating at nominal line and full load. The signal is attenuated by the supply’s feedback loop [loop gain] and propagates to the output. The ratio [in absolute terms] of the input to the output signal is expressed in dB and listed as the input ripple rejection. This is specified for a DC to 120 Hz input so that the effects of a full wave rectifier circuit can be evaluated. For example, if the Ripple Rejection of a supply is 60 dB [1000:1] and a 1volt, 120 Hz signal is superimposed on the supply’s input then the output will have a 1mV, 120Hz signal superimposed on it. This specification is sometimes referred to as “Audio Susceptibility.” |
| Input to Output Capacitance | The isolation capacitance from the input pins to the output pins. This measurement is done with a 1 kHz, 1 VRMS capacitance bridge. |

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| Input Transient | A spike or rapid voltage change of the input line to a supply. Input transient protection circuits are used to shield sensitive components [such as semiconductors] from possible damage. |
| Input Voltage | Nominal Input value[s] of either AC or DC Input voltage for which the supply is connected. |
| Input Voltage Range | The highest and lowest input voltages from which a supply may operate. |
| Inrush Current | When supplies are first turned on, a high surge input current is experienced caused by the charging of the bulk input capacitors. Also called Input Surge Current most commonly referenced in AC/DC Power Supplies. |
| Inrush Current Limiting | A circuit which limits the inrush current during initial turn on of a supply. |
| Insulation | See Basic Insulation and Reinforced Insulation. |
| Insulation Resistance | The resistance offered by an insulating material to current flow. |
| Internal Power Dissipation | The power dissipated [as heat] within a supply during normal operation. Primarily a function of the efficiency a supply. |
| Inverter | A device that generates AC power from a DC power source. |
| Isolation | The parameter measured by applying a maximum rated isolation voltage between two points [typically input-to-output, input-to-ground or output-to-ground]. |
| Isolation Test Voltage | The voltage test to determine the breakdown voltage of a transformer or supply. It is performed by applying a high voltage between two isolated test points. The isolation of a supply is typically tested to not cause stress to the insulation material. |
| Isolation Voltage [Rated] | Rated Isolation voltage is defined as the maximum voltage across the isolation barrier a device can withstand for a fixed time period. The actual breakdown voltage is typically in excess of 1000V higher than the rated isolation voltage. The reason for rating a conservative isolation voltage is to ensure that the isolation testing of supply does not degrade the isolation barrier in any way. |
| L Bracket | A metal chassis normally having an L shaped cross section |

which can be mounted directly to a system's chassis and affixed with mounting screws.

Leakage Current

The current flowing from input to output or input to ground/chassis or output to ground/chassis of an isolated power supply or DC/DC supply at a specified voltage level.

Line and Load Regulation The combined effect of varying the DC load and AC input voltage

Line Regulation

The change in DC output voltage of a supply over the entire input range while the output load is held constant.

Line Voltage

The input voltage to a supply.

Linear Regulator

A common voltage-stabilization technique in which the control device [usually a transistor] is placed in series or parallel with the power source to regulate the voltage across the load. The term 'linear' is used because the voltage drop across the control device is varied continuously to dissipate unused power.

Load

The components or circuitry drawing current from the output of a supply. The characteristic [resistance, reactance, etc.] of the load determines the amount of power drawn from the supply typically referred to as output current.

Load Regulation

The change in DC output voltage when the output current / load is varied from its minimum to maximum range. Input voltage is held constant at nominal input during this test.

Load Sharing

See Current Share.

Logic Shutdown

A supply may offer remote on/off functions to inhibit or enable a supply's output. This function is typically achieved by pulling the associate logic pin hi or low [depending upon the remote on/off circuit in use]. Specifically, most power supplies have a natural state of on when input is applied and may be inhibited by the remote on/off circuit.

Maximum Input

This is the maximum allowed voltage at supply's input terminals without damaging the supply.

Maximum Load

The maximum continuous load a supply can deliver under nominal operating conditions.

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| Maximum Rating | Limit of specifications that, if exceeded, could cause the shutdown or damage to a supply. |
| Minimum Load | The minimum amount of output current required for a supply to operate within its specified regulation. |
| MOSFET | Metal Oxide Semiconductor Field Effect Transistor. The device of choice for the main switch in switched mode power supplies having much better switching characteristics than Bipolar Transistors. |
| MTBF | Mean time between failures is the predicted length of time before failure of a supply, exclusive of infant mortality failures. |
| MTTR | The predicted average length of time to repair a faulty unit with the specified spares kit. |
| N+1 | The use of multiple supplies to achieve higher reliability levels through system redundancy. The system consists of a number [N] of power supplies to satisfy the load plus one [+1] to provide redundancy and allow continued operation through the fault of one of the supplies. These supplies are typically isolated via an isolation device such as an OR'ing diode to ensure that a short within one supply will not cause the entire system to fail. |
| Noise | The output noise is specified at nominal line and full load. This specification is very difficult to measure correctly due to the measurement bandwidth [0-20 MHz]. Short leads and proper grounding techniques must be used. The output noise is specified in mV peak-to-peak. The majority of the noise reading is due to the switching action of the supply and is at very high frequencies, whereas the peak-to-peak amplitude at the fundamental switching frequency is usually much less. |
| Off-Line Power | A supply which operates off the AC line directly, without using a power transformer prior to rectification and filtering. |
| Open Frame | Power supplies which are constructed only of a PCB. |
| Operating Temperature | The operating temperature range of a supply measured as either Ambient [surrounding Air] or base plate. |
| OR'ing Diodes | Also called decoupling diodes. These diodes ensure current can flow in only one direction - out of a power supply. Without the diodes, one problem supply could cause all supplies to go into over current |

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| | protection in a current sharing scenario and generate a catastrophic failure within a system. |
| OTP | Over Temperature Protection. A protection system for supplies where the supply shuts down if temperature exceeds specified ratings. OTP is intended to save the supply in the event of a failure of the cooling system. OTP usually measures the hottest spot in the supply. Most supplies will automatically recover when temperatures return to normal. |
| Output Impedance | The variation of output voltage to change in load current. |
| Output Regulation | see load regulation. |
| Output Trim | The adjustment of the nominal output voltage via an external fixed resistor or an internal trimpot on the supply. |
| Output Voltage Accuracy | The allowable tolerance of the output voltage of a supply when it is set at the factory. |
| Over Current Protection | see short circuit protection. |
| Over Voltage Protection | A circuit that will typically shutdown the power supply when the output voltage exceeds a specified range. |
| Over Voltage Clamp | Some supplies utilize a Xener diode to clamp the output voltage to a maximum level. |
| Overload Protection | A protective feature that limits output power or current demands to prevent damage to the supply. |
| Overshoot | This is the momentary rise in output voltage a supply experiences during a decreased load condition. |
| OVP | Over Voltage Protection. |
| Parallel Operation | The connection of the outputs of two or more power supplies or DC/DC supplies of the same output voltage to obtain a higher output current. Only supplies specifically designed to share the load should be utilized to gain higher power [see active current sharing]. |
| PARD | Periodic and Random Deviation. A term used for the sum of all ripple and noise components measured over a specified band width and stated in either peak-to-peak or RMS values. |

Passive Power Factor Correction

Traditional switched mode power supplies draw current from the AC line in short pulses, and, as a result, the input current of such basic switched mode power supplies has high harmonic content. This creates extra load on utility lines and increased heat of utility transformers and may cause stability problems to the entire AC Line [Especially in Europe]. Passive Power Factor Correction is a network of capacitors and inductors to minimize the pulse so that the current waveform is more proportional to the AC waveform [a sine wave].

PCB Mounting Peak Load/Current

A supply that is designed for direct mounting on to a printed circuit board. The ability of a supply to provide higher output currents for short periods of time. A power supply with high peak loads is desirable in many applications, such as motors that draw high currents at start-up and then draw substantially reduced loads during normal operation.

Pi Filter

A commonly used filter at the input of a supply to reduce reflected ripple current. The filter usually consists of two parallel capacitors and a series inductor.

Post Regulation

A linear regulator used on the output of a supply to improve line and load regulation and reduce output ripple voltage.

Power Density

The ratio of a power supply or DC/DC converter output power to its volume -typically displayed as Watts per square inch or Amps per square inch.

Power Derating

The ability of a power supply to operate at outside normal parameters, [such as elevated temperature, reduced cooling or low input voltage] reduced or derated output currents.

Power Factor

Switching power supplies draw input current in pulses around the peaks of the AC line voltage frequency. Power factor is a measure of the input current draw and how closely it matches the sinusoidal phase of the AC input frequency.

Power Factor Correction (PFC)

PFC circuits improve how a supply draws input current to more closely match the sinusoidal line voltage. This reduces harmonic disturbance on the AC line. Reduced harmonic disturbance is a common requirement throughout Europe, and Power Factor Correction is the method to achieve reduced disturbances.

Power Fail

A logic [hi/low] compatible signal warning that input power has been lost and that DC outputs will soon fall out of regulation.

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| Power Good Signal | A logic [hi/low] compatible signal that indicates that DC Outputs are present and within specified regulation. |
| Pre-Regulation | The regulation at the primary side of a power supply, generally by a type of switching regulator; followed by output regulation, usually by a linear type regulator. |
| Programming | The adjustment control of supply's output voltage and/or current via an external parameter such as a control voltage or resistor value. |
| Protection | The internal fuse method for a supply, such as single or dual fused, typically rated for a maximum voltage, current and fuse type trip time [fast or slow acting]. This fuse is usually rated to allow the use of an external fuse which can be mounted on an accessible panel, because replacing the fuse inside supply may prove difficult. |
| Pulse Width Modulation | A circuit used in switching power supplies or DC/DC supplies where the switching frequency is held constant and the width of the power pulses is varied, controlling both line and load changes with minimal dissipation. |
| Push-Pull Converter | A supply topology that typically is configured as a forward supply but uses two transistor switches and a centre-tapped transformer. The transistor switches turn on and off alternately. |
| Rated Current | This is the maximum rated output current/load capability of a supply from minimum through maximum values under normal operating temperatures and cooling conditions. Operation below minimum load should not harm a supply in any way, but load regulation may suffer. Operation above the maximum rated load is not recommended and may degrade specifications, trip an overload protection circuit, and/ or reduce a supply's life. |
| Redundant Operation | The ability to connect power supplies or DC/DC converters in parallel so that if one fails the other[s] will provide continuous power to the load. This mode is used in systems where a single failure cannot be tolerated. See also N+1 Redundancy. |
| Reflected Ripple | In DC-DC Converters, the switching noise is "kicked -back" into the input source. This noise is stated as peak to peak or RMS over a 0 to 20 MHz bandwidth. Usually the largest part of this current is at the fundamental switching frequency. |
| Reinforced Insulation | Often referred to as Double Reinforced Insulation or Secondary |

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| | <p>Insulation. Reinforced Insulation is a second layer of insulation beyond Basic Insulation for increased safety and the ability to withstand higher voltages. This is a common requirement of medical and transportation equipment.</p> |
| Remote Adjust/Margin | <p>The ability to vary output voltage and/or current over a specified range by an external signal, typically a control voltage. Often referred to as margining.</p> |
| Remote Control [Enable/Inhibit] | <p>A logic [hi or low] signal to turn on/turn off a supply.</p> |
| Remote Sense | <p>A circuit within the supply to compensate for the reduction of output voltage through connections and wires [voltage drop] which can vary under temperature, connection strength, and wire stresses. Typically, a twisted pair of wires is attached to the load to “sense” the voltage at the load, enabling the supply to automatically compensate for varying voltage drop.</p> |
| Resonant Converters | <p>A class of power topologies which reduces switching losses by forcing either zero voltage across, or zero current through the switching device when it is turned on or off.</p> |
| Return | <p>The name for the return current of output voltage(s) and/or logic signals.</p> |
| Reverse Voltage Protection | <p>A built in circuit [or element] that protects the supply from a reverse polarity, applied across the input or output terminals of a supply.</p> |
| RFI Standards | <p>Limits laid down by various national and international regulatory agencies for radio frequency interference generated by electrical and electronic equipment.</p> |
| Ripple | <p>This is the AC component superimposed over the DC output voltage and is the traditional “hum” at 60 or 120 hertz. In switching power supplies, it is a complex waveform and can increase at maximum loading and minimum input voltage.</p> |
| RoHS Directive | <p>This European Directive [2002/95/EC] specifies the maximum concentration of lead and 5 other hazardous substances for 10 categories of electronic products listed in this Directive. Component [built in] power supplies and DC/DC supply products are not falling under this Directive by law. http://europa.eu.int/eur lex/pri/en/oj/dat/2003/l_037/l_03720030213en00190023.pdf</p> |

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| Safety Class II | Class II Safety Approvals indicate that an AC/DC power is double insulated and no protective earth connection is needed. That means that the product is designed with two layers of insulations between hazardous voltage and accessible parts. |
| Safety Isolation | The electrical separation between the primary and secondary circuits and the safety standards to which the supply conforms in this respect. |
| Safety Standards | Standards laid down by various national and international regulatory agencies. |
| SELV | Safety Extra Low Voltage. A term used by safety regulatory body (IEC,UL, CSA, CENELEC, etc.) to describe the highest voltage level [single fault condition included] that can be contacted by a person without causing injury. It is usually defined as 60.VDC or 42.4.Vpk max. |
| Sense Lines | A twisted pair of wires connected to the load in order to route output voltage back to the remote sense control circuit of the power supply. See Remote Sensing. |
| Series Operation | The ability of two or more supply outputs to be connected and provide a higher output voltages [two 48V power supplies in series to generate 96V]. The load should not draw more current than the maximum rated output current of any single supply. |
| Setpoint Accuracy | The allowed variance of the output voltage as set at the factory during the manufacture of a supply. |
| Shock Standards | Definition of the physical stress a supply can withstand from a physical drop or bump without experiencing any physical damage during shipment or while operating in the final equipment. |
| Short Circuit Protection | A short circuit is an unlimited load potential far exceeding a supply's output current capability. Under a short circuit condition, most supplies are designed to shut-down and typically recover to normal operation when the short is removed. |
| Short Term Stability | With the supply fully warmed up at room temperature with constant line, load and temperature, the output will not vary by more than this amount. |
| Shutdown Idle Current | Current drawn by the supply from the supply when its outputs are disabled, Often referred to as no load input current or standby current. |

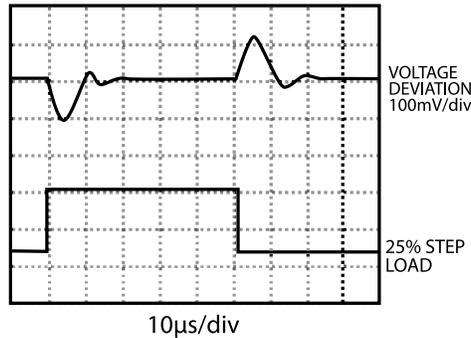
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| Single Wire Current Share | A circuit in which multiple power supplies share current when paralleled. The supplies communicate through a single wire connection daisy chained to all the supplies. This circuit allows a specified amount of like supplies to be connected in parallel within a defined accuracy range. |
| Six Sided Shielding | Metal shielding fully encompassing a supply to minimize any noise radiation from the supply components. Shielding can be solid or perforated. |
| Soft Start | A feature which limits the inrush current of a supply and causes the output voltage to rise gradually to its specified value. |
| Standby Current | The input current drawn by a supply when it has been inhibited off or is under no load conditions. |
| Still Air | An operating environment in which the air surrounding the power supply or DC/DC converter is restricted in small enclosures [often sealed] where it cannot move freely. |
| Storage Temperature | The safe storage temperature for the device. Long term exposure within these temperature ranges should not degrade the supply's performance. |
| Supplementary Insulation | See Reinforced Insulation. |
| Surface Mount | A technique whereby components are soldered onto the surface of a PCB instead of pins or leads which must protrude through a PCB. |
| Switching Frequency | This is the fundamental frequency at which a supply operates its rectifier circuits. |
| Switching Regulator | A non isolated DC/DC converter consisting of inductors and capacitors to store energy and switching elements [typically transistors or SCR's], which open and close as necessary to regulate voltage across the load. The switching duty cycle is generally controlled by a feedback loop to stabilize the output voltage, generally by means of a Pulse Width Modulation. |
| Switching Spike | The peak to peak amplitude which occurs at the switching frequency on the output of switched mode supplies. |
| Synchronous Rectifiers | A circuit arrangement where the output rectifier diodes of a supply are |

replaced with active switches such as MOSFET's. The switches are turned on and off under control and act as rectifiers. This results in considerably lower losses in the output stage of a supply and increases efficiency.

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| Temperature Coefficient | The average percent change in output voltage per degrees centigrade change in ambient temperature over a specified temperature range, with load and input voltage held constant. |
| Thermal Impedance | The temperature rise of the case for each watt dissipated in the supply. The power dissipated is the difference between the input and output power. |
| Thermal Protection | A circuit within a supply that shuts down the supply if the internal temperature exceeds a predetermined limit [see over temperature protection - OTP]. |
| Thermal Shutdown | The temperature specified at which the supply will shut down operation until the temperature decreases - typically measured at the hottest spot within a supply. |
| Total Regulation | The combined voltage deviation a supply could experience due to any change within the specified tolerances of input voltage, output current and temperature change. |
| Tracking | A characteristic of multiple output supplies where one or more outputs follow another and where there are changes in line, load and temperature, so that each maintains the same proportional output voltage, within specified tracking tolerance, with respect to a common return. |
| Transient Recovery Time | The time required for the output voltage of a supply to recover within a specified regulation following a transient load. |
| Transient Deviation | A percentage of the maximum output voltage deviation during a transient load. |

Transient Response

Measurement of both transient deviation and transient recovery time after a transient load step.



Turn On Time

The time it takes for the output voltage to reach the specified accuracy when the outputs are fully loaded into resistive loads.

U-Frame/U-Channel

A supply constructed within a bracket with a “U” shaped profile. Typically, all three planes of a U-Frame/U-Channel supply offer threaded holes for affixing the supply to a chassis/plate.

UL

Underwriter Laboratories, an independent, non profit organization testing for public safety in the United States. UL recognition or listing is required for equipments used in specific applications. <http://www.ul.com/>

UL Listed

UL listing indicates the equipment is approved by UL according to the relevant US safety standard requirements. No additional testing by UL is required.

UL Recognized

UL recognition means the product is recognized as a component of a larger system that will require safety investigation and tests, but otherwise approved by UL according to the relevant US safety standards.

Undershoot

The momentary dip of output voltage a supply experiences during an increased load condition.

Universal Input

This indicates that a supply is able to operate with AC Power available in most countries without any changes in settings to the supply itself. This input range is typically 90–264 VAC.

UPS

Uninterruptible Power Supply. A system designed to supply power during the loss of AC line power. This is accomplished by means of a back up battery and a DC/AC inverter or DC/DC power supply.

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| Vibration Standards | Definition of the amplitude and frequency of mechanical vibration that can be applied to the supply without causing damage. |
| Voltage Adjustment | The range over which the output voltage can be adjusted. |
| Voltage Balance | Voltage balance is often specified on dual supplies as being the difference in absolute terms between the positive and negative output and expressed as a percentage. For example, if the positive output is at 12.00 Volts and the negative output is at 12.12 volts then the balance would be 1.0%. |
| Voltage Range | The range(s) of input AC or DC voltage(s) over which the supply(s) operates within specification. |
| Wall Mount | Referring to an AC/DC power supply that inserts and mounts directly to an AC Socket on the wall. The supply is typically enclosed in a UL94V-0 Rated (fire proof) plastic case with blades to plug directly into the AC socket and with a dangling output cable to mate with the system it is powering. |
| Warm-Swap | This usually refers to an N+1 Redundant powered system. This defines the ability to replace one of multiple supplies tied in parallel. The supply being replaced must be powered with it's AC Input Removed off while the others may remain on. This type of supply is typically mechanically designed to fit into a slot with a blind mate connector, most commonly with an AC Inlet on the front panel. |
| Warm Up Time | The time required, after initial turn on, for a power supply or DC/DC supply to operate within its specifications. Most supplies do not require a warm-up time when operating above 0°C. Some supplies will operate at less than 0°C temperature or below freezing, with a stipulation of a warm-up period. |
| Working Voltage (Rated) | Rated working voltage or electrical strength, is the maximum continuous voltage that can be sustained continuously across the isolation barrier of a supply without causing stress to the isolation barrier. The rated working voltage is typically much lower than the rated isolation voltage. |