

## Terminology of Power Supplies

### A

#### **Ambient Temperature**

The temperature of still air immediately surrounding a power supply or converter. The temperature measurement should be made about 100 mm (4 inch) from the body of the converter or underneath of the power supply. See also Operating Temperature.

### B

#### **Base Plate**

A substrate to which circuit components are mounted or, a metal plate to which the power system is attached. Normally used to draw heat away from critical circuits components.

#### **Basic Insulation**

See Insulation

#### **Boost Regulator**

A switching converter topology in which an input inductor is used to store energy. This energy is transferred to the output when the shunt switch is turned off. The boost regulator will take an unregulated input voltage, and produce a higher, regulated output voltage.

#### **Breakdown Voltage**

See Isolation Voltage

#### **Bridge Converter**

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

#### **Burn-In**

The operation of newly manufactured power supplies or converters under load conditions for a period of time prior to shipment. The intent is to eliminate infant mortality of components. The time period and conditions (input power cycling, load switching, temperature, etc.) will vary from product to product.

### C

#### **Case Temperature, max**

The maximum temperature for safe operation of the power supply or converter case. Often used as a specification for DC/DC converters with extended temperature ranges, case temperature is referred to also as base plate temperature.

**CB-Report**

Document necessary for the mutual recognition of approvals between different national safety test standards.  
<http://www.cbscheme.org/>

**CE Marking**

The mark consist of the letters CE and indicates compliance with all relevant EC-directives which concern the marked product. It means that the natural or juristic person which executed or ordered marking has made sure that the good complies with all harmonized directives and has passed all conformity testing procedures required.

**Chassis Ground**

The voltage potential of the chassis or enclosure surrounding a power system.

**Clearance Distance**

The shortest distance (through air) separating two conductors or circuit components.

**Common**

A conductive path used as a return for two or more circuits. Common is often used interchangeably with ground, which is not technically correct unless it is connected to earth.

**Common-Mode Noise**

The component of noise which is common to both the DC output and returns lines with respect to an electrically fixed point, usually the chassis ground.

**Constant Current**

A power supply or converter that regulates its output current to within a specified range regardless of changes in output load, input line and ambient temperature.

**Constant Current Limiting**

Current-limiting circuit that holds output current at some maximum value whenever an overload of any magnitude is experienced.

**Output Voltage**

Output Current Graph 1: Constant Current Limiting

**Continuous Shield**

see Six-Sided Shielding.

**Convection Cooling**

The dissipation of heat via still air. (in contrary to Forced Air Cooling)

**Creepage Distance**

The shortest distance between two conductors (typically one conductor primary and one conductor secondary).

**Cross Regulation**

In a multiple output power supply or converter, the percent voltage change at one output caused by the load change on another output.

**Current Limiting**

A circuit feature that protects the power supply or DC/DC converter (or load) from damage under overload condition. The maximum power supply or DC/DC converter output current is automatically limited to a predetermined, safe value. If the power supply or DC/DC converter is specified for auto restart, normal operation is automatically restored when the overload condition is removed.

**Current Share**

Multiple power supplies or DC/DC converters are often connected redundantly (to increase system reliability) or in parallel (to increase system power). When connected in this way, their outputs are connected together and each power supply or DC/DC converter supplies approximately an equal «share» of the load current. Current sharing can be achieved with external passive circuits (by synchronizing multiple power supplies or DC/DC converters and trimming their outputs within a very tight error band) or active circuits (power supplies or converters that feature internal circuits to monitor and adjust output load current). The most popular redundant topology is the «N+1» circuit.

**D****DC/DC-Converter**

A device that accepts a DC input voltage and produces a DC output voltage. Typically the output produced is a different voltage level than the input. However, converters sometimes have the same input/output voltage, and are used to provide potential isolation, noise isolation, power bus regulation, etc.

**Derating**

The specified reduction of an operating parameter for safe and reliable operation. Generally for power supplies and DC/DC converters, it is the reduction of the output current at elevated temperatures.

**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.

**Drift**

The change in output voltage of a power supply or DC/DC converter 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.

**Dynamic Current Allocation**

A system for a dual positive output power supplies or DC/DC converters where the full rated max. current may be

taken from either output in whatever combination is required.

**Dynamic Load**

An output load that changes rapidly. Normally specified as a load change value during a specified period of time.

**Dynamic Response**

The output overshoot that occurs when the output load of a power supply or DC/DC converter is a turned on/off or abruptly changed. This overshoot defines the high frequency output impedance of the converter.

**E****Efficiency**

The ratio of total output power to input power expressed in percent. It is normally specified at full load and nominal input voltage.

**Electrical Strength**

See Working Voltage

**EMC**

Electromagnetic Compatibility, relating to compliance with electromagnetic emissions and susceptibility (immunity) standards.

**EMI**

Electromagnetic Interferences are electronic disturbances that may interrupt, disturb or otherwise impair the performance of electronic equipment.

**EMI Filter**

Switch mode power supplies and most DC/DC converters are filtered by using an EMI filter on the input or primary side to be compliant with applicable EMC standards. When power supplies or converters are used in «real» situations, driving active electronic circuits, especially those featuring high speed and/or high power switching, the characteristic of the interferences generated can change dramatically, thereby reducing the effectiveness of the EMI-filter. It is the final equipment as an entity, that is required to conform to the regulations, not the individual internal sub assemblies, like power supplies or converters. So, specifying a power supply or converter which meets the EMI classes does not remove the need for testing of the completed equipment for conformity. The employment of EMI compliant power supplies or converters is not a guarantee of system compliance.

EMI conducted Conducted EMI is unwanted high-frequency energy caused by the switching transistors, output rectifiers, and transformers in switching power supplies and DC/DC converters and reflected back into the power line. That portion that is present on the input and output lines is known as Conducted EMI. Most Conducted EMI measurements are done between 150 kHz and 30 MHz.

**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 converters and emitted into the area surrounding a power supply

or DC/DC converter. That portion that is radiated through space is known as Radiated EMI. Most Conducted EMI measurements are done between 30 MHz and 300 MHz or 30 MHz and 1 GHz.

### **ESD**

Electrostatic Discharge. ESD is the current produced by two objects having a static charge when they are brought close enough to produce an arc or discharge.

### **ESR**

Equivalent Series Resistance. The amount of resistance in series with an ideal (loss less) capacitor, which exactly duplicates the performance of a real capacitor. In general, the lower the ESR, the higher the quality of the capacitor and the more effective it is as a filtering device. ESR is a prime determinant of ripple in switching power supplies.

## **F**

### **Faraday Shield**

An electrostatic shield between input and output windings of a transformer. This can be 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 converter specifications.

### **Floating Output**

A power supply or DC/DC converter output that is ungrounded and not referenced to another output. Typically, floating outputs are fully isolated and may be referenced positive or negative by the user. Outputs that are not floating share a common return and as such, are referenced to one another.

### **Flyback Converter**

Also called «Buck-Boost» converter, this topology typically 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 of a minimum number of components required.

### **Foldback Current Limiting**

A power supply or DC/DC converter output protection circuit whereby 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 move air across heat producing components

in order to reduce the ambient temperature.

### **Forward Converter**

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

### **Free Convection**

An operating environment in which the natural movement of air (unassisted by fans or blowers) is sufficient to maintain the power supply or DC/DC converter within its operating limits. See also Convection Cooling.

### **Full Bridge Converter**

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

### **Full Load**

The maximum value of output load specified for a power supply or DC/DC converter under continuous operating conditions.

### **Full Wave Rectifier**

A circuit (bridge or center tapped) that rectifies both halves of an AC waveform.

## **G**

### **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 converter «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. Voltage gradients in this line caused by one circuit may be capacitively, inductively, or resistively coupled into the other circuits via the common line.

## **H**

### **Half Bridge Converter**

A power switching circuit similar to the full bridge converter except that only two transistors are used, with the other two replaced by capacitors.

**Half-Wave Rectifier**

Single-diode rectifier circuit that rectifies one-half the AC input wave.

**Harmonic Distortion**

For sinusoidal AC current waveforms, the distortion characterize by the present of multiple harmonics of the fundamental frequencies. This distortion is caused by the switching action of the power supply.

**Heat Sink**

A metal plate, extrusion, case, etc. that is used to transfer heat away from sensitive components and/or circuits.

Hiccup Mode Also called Cycle-to-Cycle Mode. An operating mode triggered by an output fault condition (short circuit) in which the power supply or DC/DC converter cycles on and off. The duty cycle of on time to off time maintains the internal power dissipation at a safe level until the fault condition is corrected.

**Hold-Up Time**

The time during which a power supply's or DC/DC converter's output voltage remains within specification following the loss of input power.

**I****IEC**

International Electrotechnical Commission. The IEC is an organization based in Switzerland (Geneva) that sets standards for electronic products and components. IEC does not conduct any testing, however, their standards have been adopted by most of worldwide national safety agencies.

<http://www.iec.ch/>

**Input Transient**

A spike or step change in the input line to a power supply or DC/DC converter. Input transient protection circuits are used to shield sensitive components (such as semiconductors) from possible damage due to transient voltages.

**Input Voltage Range**

The high and low input voltage limits within which a power supply or DC/DC converter may be operated. A common specification for DC/DC converters is to specify the ratio of high line to low line (i.e. a range of 2:1 for 18VDC to 36VDC or a range of 4:1 for 18VDC to 72VDC).

**Inrush Current**

A high surge of input current that occurs in power supplies, DC/DC converters, switchers and occasionally in linears upon initial turn on, caused by charging of the input capacitors. Also called Input Surge Current.

**Inrush Current Limiting**

A circuit which limits the inrush current during turn-on of a power supplies and DC/DC converters.

**Insulation**

**Operational Insulation:** Insulation needed for proper operation of a power supply or converter. Operational Insulation by definition does not protect against electrical shock.

**Basic Insulation:** Insulation to provide one layer of “basic protection” against electrical shock.

**Supplementary Insulation:** Second layer of insulation applied in addition to Basic Insulation in order to ensure protection against electrical shock in the event of a failure of the Basic Insulation.

**Double Insulation:** Insulation comprising both Basic Insulation and Supplementary Insulation.

**Reinforced Insulation:** A single insulation system which provides a degree of protection against electric shock equivalent to Double Insulation under the conditions specified in the applicable standards. Note: The term «insulation system» does not imply that the insulation has to be in one homogeneous piece. It may comprise several layers which cannot be tested as supplementary or Basic Insulation.

### **Insulation Resistance**

The resistance offered by an insulating material to current flow.

### **Internal Power Dissipation**

The power dissipated (as heat) within the power supply or DC/DC converter during normal operation. Primarily a function of the power handling capability and efficiency of the power supply or DC/DC converter. Internal power dissipation is given as a maximum specification that cannot be exceeded without risking damage to the power supply or DC/DC converter.

### **Inverter**

A device that delivers AC power when energized from a DC power source. Inverters may be frequency, amplitude, or pulse-width modulated to vary output voltage.

### **Isolation**

The electrical separation between input and output of a power supply or DC/DC converter by means of the power transformer. The isolation resistance (normally in megaohms) and isolation capacitance (normally in picofarads) are generally specified and are a function of materials and spacings employed throughout the power supply or DC/DC converter.

### **Isolation Test Voltage**

The voltage test to determine if the breakdown voltage of a transformer, power supply or DC/DC converter exceeds the minimum requirements. It is performed by applying a high voltage between the two isolated test points. In production the isolation of a power supply or DC/DC converter will be tested for a time period of 1 to 6 seconds max.(according to EN 50116) in order not to cause stress to the insulation material.

### **Isolation Voltage (rated)**

Rated Isolation voltage is defined as the maximum voltage across the isolation barrier (i.e. input to output for converters or primary to secondary for power supplies and transformers) a device can withstand for a fixed time period. Normally this time period is specified with 60 seconds (according to UL/EN/IEC 60950).

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 a power supply or converter does not degrade the isolation barrier in any way.



## L

### **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 converter at a specified voltage level.

### **Line Regulation**

The variation of an output voltage due to a change in the input voltage, with all other factors held constant. Line regulation is expressed as the maximum percentage change in output voltage as the input voltage varied over its specified range.

### **Line Voltage**

The AC input voltage to a power supply or the DC input voltage to a DC/DC converter.

### **Load**

The electronic components or circuitry connected to the output of a power supply or DC/DC converter. The characteristic (resistance, reactance, etc.) of the load determines the amount of power drawn from the power supply or DC/DC converter. For voltage regulated power supplies and DC/DC converters, the load is the output current.

### **Load Regulation**

Variation of the output voltage due to a change in the output's load within a specified range with all other factors held constant. The load change may be specified for other than no load to full load such as 20 % load to full load or 10 % load to 90 % load and it is expressed as a percentage of the nominal DC output voltage.

### **Load Sharing**

See Current Share.

## M

### **Maximum Operating Temperature**

The maximum ambient temperature at which a power supply or DC/DC converter will operate without risk of damage.

### **Maximum Rating**

Limit of specifications that, if exceeded, could cause permanent damage to power supplies and converters. These are not continuous ratings, and proper operation is not implied.

### **Minimum Load**

The minimum amount of output load required maintaining normal continuous operating specifications. Usually associated with PWM (Puls Width Modulation) controlled power supplies or DC/DC converters.

**Minimum Operating Temperature**

The minimum temperature at which the power supply or DC/DC converter will start up.

**MTBF**

The Mean Time Between Failure is a unit of measure, expressed in hours, that gives an indication of the relative reliability of a power supply or DC/DC converter. MTBF is based upon actual operating data (demonstrated) or derived per the conditions of IEC 61709 standard (calculated). PAIRUI GROUP, INC calculates MTBF values for their products in general for ground benign and at +25 °C ambient. MTBF is not a specification for the lifetime of a product.

**N****N+1**

A power system technology used to achieve higher reliability levels through system redundancy. The system consists of a number of power supplies or DC/DC converters connected in parallel, sharing the power drawn by the system load. One more power supply or DC/DC converter than is necessary to provide full load current is used (i.e. for a 600 W load, three 300 W power supplies are used). Thus, if any single power supply or DC/DC converter fails, the remaining ones will continue to supply current to the load.

**Natural Convection**

See Free Convection.

**Noise**

Noise is the aperiodic, random component of undesired deviations in output voltage. Normally called Ripple and Noise and given as a peak-to-peak value with a specified bandwidth (typically 20 MHz). See also Ripple and Noise.

**Nominal Value**

Stated or objective value for a quantity, such as output voltage, which may not be the actual value measured.

**O****Open Frame**

A construction of power supplies or DC/DC converters, which are not encased in a metal or plastic case and are not covered with a potting compound.

**Operating Temperature Range**

The range of temperatures within which a power supply or DC/DC converter will perform within specified operating parameters.

**OR-ing**

Diodes Also called decoupling diodes. Diodes that isolates a faulty power supply or DC/DC converter from the load or other power supplies or DC/DC converters. Typically, these diodes are used externally in the output circuit of a

power supply or DC/DC converter.

**Output Voltage Accuracy**

The maximum allowed deviation of the DC output of a power supply or DC/DC converter from its ideal or nominal value. Expressed as a percentage of output voltage. Often called output voltage tolerance.

**OTP**

Over Temperature Protection. A protection system for power supplies or DC/DC converters where the power supply or DC/DC converter shuts down if the ambient temperature exceeds the ratings. OTP is intended to save the power supply or DC/DC converter in the event of a failure of the cooling system. OTP usually measures the hottest spot in the power supply or DC/DC converter rather than the ambient temperature.

**Overload Protection**

See Current Limiting.

**OVP**

Over Voltage Protection. A protection mechanism for the load circuit which shuts down the supply or crowbars or clamps the output, when its voltage exceeds a preset level.

**P****Parallel Operation**

The connection of the outputs of two or more power supplies or DC/DC converters of the same output voltage to obtain a higher output current than from either power supply or DC/DC converter alone. This requires power supplies or DC/DC converters specifically designed to share the load.

**Peak Output Current**

The maximum peak current that can be delivered to a load during transient load conditions, such as electric motor starts.

**Pi-Filter**

A commonly used filter at the input of a switching power supply or DC/DC converter to reduce reflected ripple current. The filter usually consists of two parallel capacitors and a series inductance.

**Planar Transformer**

Planar transformers use a construction technology to replace conventional wire windings in transformers and inductors with patterned conductors formed on single or multilayer substrates.

**Power Density**

The ratio of a power supply or DC/DC converter output power to its volume.

**Power Factor**

In a power supply, the ratio of true input power to apparent input power. In these circuits, power factor is a

measure of the input current that is in phase with the input voltage and thus contributing to the average power.

### **Power Factor Correction (PFC)**

Standard power supplies draw line current in pulses around the peaks in line voltage. This may be undesirable for several reasons. PFC circuits ensure that the line current is drawn sinusoidal and in phase with the sinusoidal line voltage. This reduces the harmonics distortion of the power supply and increases the useful power drawn from the mains. PFC circuits can be active or passive.

### **Power Fail Detect**

A circuit that senses the DC voltage across the input capacitors of a switching power supply. Should the AC input line fail, it senses an abnormally low DC level across the capacitors and provides an logic output signal warning of imminent loss of output power.

### **Power Good Signal**

A signal that indicates the status of the DC output of the primary channel of a power supply or a DC/DC converter. Also called DC-OK.

### **Push-Pull Converter**

A converter topology that typically is configured as a forward converter but uses two transistor switches and a center tapped transformer. The transistor switches turn on and off alternately.

## **R**

### **Redundant Operation**

The ability to connect power supplies or DC/DC converters in parallel so that if one fails the other will provide continuous power to the load. This mode is used in systems when a power supply or a DC/DC converter failure cannot be tolerated. See also N+1 Redundancy.

### **Reflected Ripple Current**

The AC component generated at the input of a power supply or DC/DC converter by the switching operation of the converter, stated as peak-to-peak or RMS.

### **Remote Sensing**

A method of moving the measuring point for the regulation from the output terminals to the load. Compensates voltage drops in the power distribution bus, but negative impact on dynamic load behaviour must be tolerated.

### **Reverse Voltage Protection**

A feature, which protects a power supply or DC/DC converter against a reverse voltage, applied at the input or output terminals.

### **Ripple**

The periodic AC noise component of the power supply or DC/DC converter output voltage.

**Ripple and Noise**

The magnitude of AC voltage on the output of a power supply or DC/DC converter, expressed in millivolts peak-to-peak or RMS, at a specified band width (typically 20MHz). This is the result of the feed through of the rectified line frequency, internal switching transients and other random noise.

**RoHS Directive**

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 converter 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](http://europa.eu.int/eur-lex/pri/en/oj/dat/2003/l_037/l_03720030213en00190023.pdf)

## S

**Safety Class II**

The safety class II symbol specifies a power supply product which is double insulated and due to that no protective earth connection is available nor needed. That means that the product is designed with two layers of insulations between hazardous voltage and accessible parts.

**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) than can be contacted by a person without causing injury. It is usually defined as 60 VDC or 42.4 Vpk max..

**Sense Lines**

An output line used in «Remote Sensing» connection to route the output voltage (at the load or direct on the power supplies or DC/DC converters output) back to control feedback loop. See Remote Sensing.

**Short Circuit Protection**

A feature, which limits the output current of a power supply or DC/DC converter under short circuit conditions, so that the power supply or DC/DC converter will not be damaged.

**Six-Sided Shielding**

A construction technique in which the circuit is placed into a metal case. This metal shielding minimizes any noise radiation from the converter components. A continuous shielded case has the base (or header) welded together, further reducing potential noise leakage.

**Soft Start**

A feature which limits the start-up switching current (inrush current) of a switching power supply or DC/DC converter and causes the output voltage to rise gradually to its final value.

**Standby Current**

The current drawn by a power supply or DC/DC converter when it is no load and/or has been shut down by a control signal.

**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**

Temperature range within a power supply or DC/DC converter can be safely stored, non-operating, with no damage to its components.

**Surface Mount Technology**

(SMT). A space saving technique whereby special leadless components are soldered onto a surface of a PCB.

**Switching Frequency**

The rate at which the DC voltage is switched in a DC/DC converter or switching power supply.

**Switching Regulator**

A high-efficiency 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 stabilise the output voltage, generally by means of a Pulse-Width Modulation.

**Synchronous Rectifiers**

A circuit arrangement where the output rectifier diodes of a power supply or DC/DC converter are replaced with active switches such as MOSFET's. The switches are turned on and off under control and act as rectifier. This results in considerably lower losses in the output stage and subsequently much higher efficiency. They are particularly useful with low voltage outputs.

**T****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.

**Transient Recovery Time**

The time required for the output voltage of a power supply or DC/DC converter to settle within specified output accuracy limits following a step change in output load current or a step change in input voltage.

**U****UL listing Mark**

The UL listing mark shows that the whole equipment is approved by UL according to the relevant US safety standard requirements. If a product or equipment is carrying the UL listing mark no additional testing by UL is

required. UL will only investigate if the product or equipment is used according to the manufacturers published specifications which has to comply with the UL test report. The «c» in the UL listing mark means that the product complies with relative Canadian safety standards as well.

### **UL recognition Mark**

The UL recognition mark shows that the product is recognized as a component and has been approved by UL according to the relevant US safety standard requirements. The «c» in the UL listing mark means that the product complies with relative Canadian safety standards as well.

### **UL**

Underwriter Laboratories, an independent, non-profit organization testing for public safety in the United States. UL recognition or listing is required for equipment used in specific applications.

<http://www.ul.com/>

### **Universal Input**

An AC input to a power supply that accept all the standard voltage levels available from the mains. Typically specified at 85 VAC to 264 VAC (100, 110, 230 and 240 VAC).

### **UPS**

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

### **Under Voltage Lockout**

A protection system for power supplies or DC/DC converters where the power supply or DC/DC converter is deliberately shut down if the input voltage drops below a pre-defined level. Some hysteresis is usually present to prevent the power supply or DC/DC converter oscillating on and off. Under voltage lockout is usually needed with battery systems where the voltage decreases gradually with the time rather than snaps off quickly.

## **V**

### **Voltage Balance**

The difference in magnitude, in percent, between the two output voltages of a dual output power supply or DC/DC converter where the voltages have equal nominal values with opposite polarities.

## **W**

### **Warm-up Time**

The time required, after initial turn-on, for a power supply or DC/DC converter to operate within its specifications.

### **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 power supply or converter without causing stress to the isolation

barrier. The rated working voltage is typically much lower than the rated isolation voltage. To define the max. working voltage from a specified isolation voltage is difficult since it depends much on the material and construction of the insulation. A relative conversion table can be found in the IEC/EN/UL 60950-1 safety standard.

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