TDK

TDK-Lambda Convection and Conduction Cooled AC/DC Power Supplies

TRUSTED • INNOVATIVE • RELIABLE

Edition 2C

TDK·Lambda

Innovating Reliable Power

TDK-Lambda's broad selection of convection and conduction cooled power supplies are ideally suited for applications that do not rely on fans for cooling. Eliminating fans reduces audible noise, possible mechanical fan failure, required maintenance, and also increases system reliability.

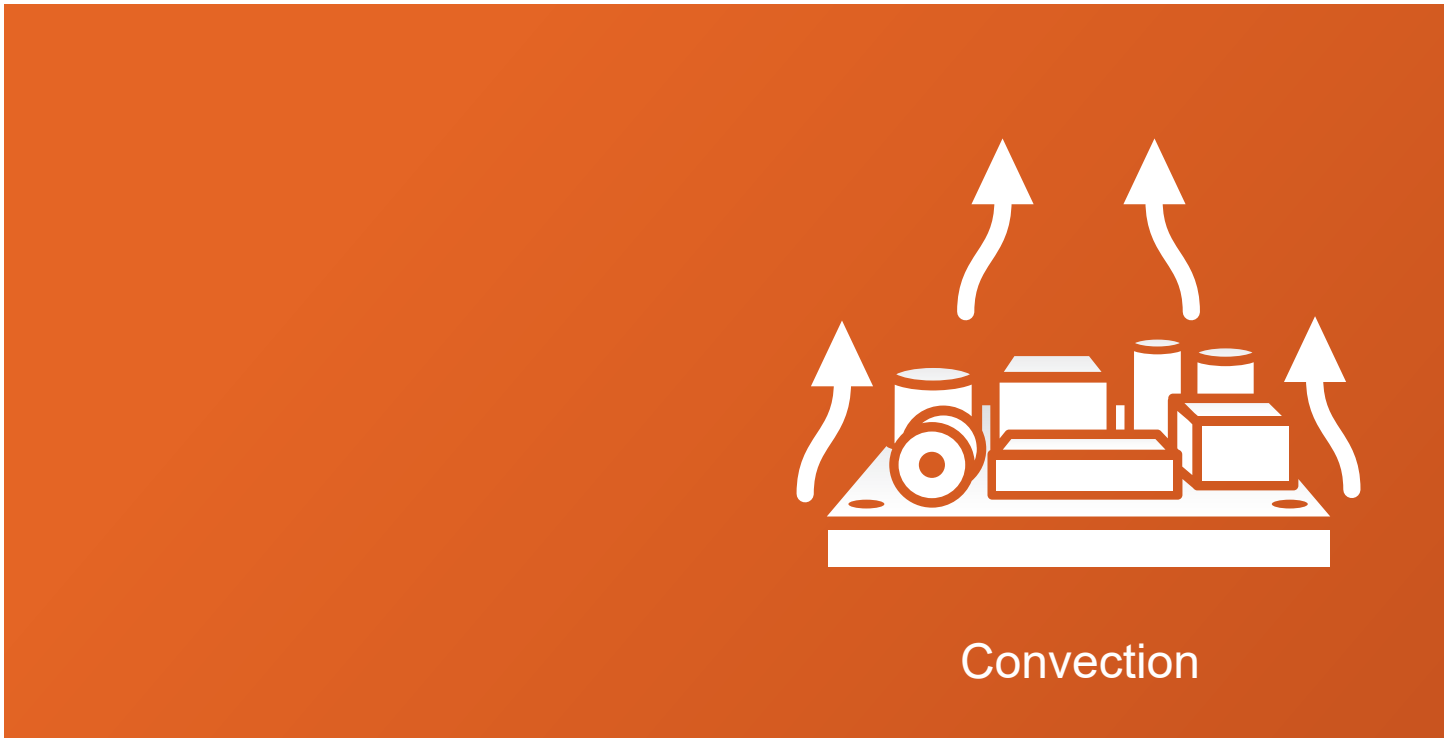
Convection Cooled

Series	Power	Outputs	Voltage	Current	Features	Cooling
KAS4	4W	1	3.3-24V	Up to 1.2A	PC Mount - Encapsulated	Convection
KPSB	5-25W	1	3.3-48V	Up to 4A	Low Profile Power Supplies	Convection
KWSA	5-25W	1	5-24V	Up to 5A	PC Mount - Encapsulated	Convection
ZWS10-30C	10-50W	1	5-48V	Up to 2.9A	Open Frame Power Supplies	Convection
DRL	10-100W	1	12-24V	Up to 30A	DIN Rail Mount - Low Profile	Convection
KMS-A	15-60W	1	5-24V	Up to 20A	Medica/ITE PC Mount - Encapsulated	Convection
DRB	15-960W	1	5-72V	Up to 10A	DIN Rail Mount - High Efficiency	Convection
HWS15A-150A & HWS-/HD	15-150W	1	3.3-48V	Up to 30A	Limited Lifetime Warranty, Conformal Coated	Convection
WMM30	25-30W	1	5-24V	Up to 5A	Wall Mount Medical Power Supplies	Convection
LS	25-150W	1	3.3-48V	Up to 40A	Low Cost Enclosed Power Supplies	Convection
CUSM	30-600W	1	5-52.8V	Up to 50A	Open Frame/Enclosed Power Supplies	Convection/Forced air
HWS/ME	30-150W	1	5-48V	Up to 8A	Limited Lifetime Warranty	Convection
CUT	35-75W	2,3	5-24V	Up to 8A	No Minimum load. +/- Outputs	Convection
DT	36-300W	1	5-54V	Up to 25A	Desktop Medical and ITE Power supplies	Convection
CSW65	40-65W	1	5-54V	Up to 8A	90-305VAC input, Class 2 on 24V model	Convection
RWS-B	50-150W	1	5-48V	Up to 21A	Enclosed Power Supplies	Convection
ZWS-BAF	50-300W	1	3.3V-48V	Up to 30A	Open Frame Power Supplies	Convection
CUS200LD	79-120W	1	3.3-48V	Up to 24A	High Peak Power	Convection
DRF120-960	120-960W	1	24V	Up to 40A	DIN Rail Mount - Full Featured, High Efficiency	Convection
ZWS-BP	150-240W	1	24, 36, 48V	Up to 10A	Open Frame Power Supplies	Convection
GWS	250W	1	11-57V	Up to 21A	Programmable Output Voltage	Convection
EVS300	300W	1	12-57V	Up to 16.7A	Constant Current - Ideal for Battery Charging	Convection
CUS350MP-1000	350- 500W (1000W Peak)	1	24-48V	Up to 41.7 PK	High Peak Power Rating up to 1,000W	Convection/Forced air
GXE600	600W	1	24V, 48V	Up to 12.5A	Medical/ITE, Constant Current/Voltage - RS485	Convection

Conduction Cooled

Series	Power	Outputs	Voltage	Current	Features	Cooling
CUS150M	150W	1	12-48V	Up to 12.5A	Open Frame 2 x 4	Conduction/Convention
CUS250M	250W	1	12-52.8V	Up to 20A	Open Frame 2 x 4	Conduction/Convection
PFE300SA/500F/1000FA	300-1008W	1	9.6-57V	Up to 60A	Power Module - Harsh Environment	Conduction
CUS400M	250W	1	12-49.9V	Up to 33.3A	Open Frame 3 x 5, 400W peak	Conduction/Convection
PF500A-360	504-756W	1	360V	Up to 2.1A	Power Module - PFC	Conduction
PFH500	504W	1	9.6-52V	Up to 10.5A	Power Module - Harsh Environment, PMBus™	Conduction
CPFE1000F	720-1008W	1	9.7-57V	Up to 60A	MIL STD 461/462D CE102 EMC - i2C Interface	Conduction
CPFE1000Fi	720-1008W	1	9.7-57V	Up to 60A	Conformal Coating Option- i2C Interface	Conduction
PF1500B-360	1008-1512W	1	360V	Up to 4.2A	Power Module - PFC	Conduction

Convection Cooled



Applications

- Industrial
- Medical
- COTS
- Test
- Communication
- LED
- Broadcast
- Food and Beverage

Features

- Universal AC Input
- High Efficiency
- High Convection Ratings
- Medical & ITE Safety Approvals

Product Types

- Open Frame
- Chassis Mount
- PCB Mount
- DIN Rail
- External Desktop
- Wall Mount Adapters

Convection Cooled

Full Datasheet
https://product.tdk.com/en/power/kas

KAS Series

2-4W Wide AC-DC Input PCB-Mount

- 90-305VAC input
- Class II (no ground needed)
- Wide temperature range -40 to +80°C
- Low off-load power consumption
- 3 year warranty

Full Datasheet
https://product.tdk.com/en/power/kpsb

KPSB Series

5 to 25W Board Mount

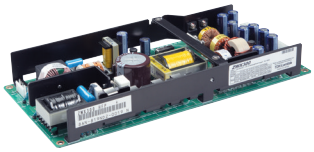
- Industrial Certifications
- Class B EMI
- Low Cost and Compact Size
- Class II Input
- Low no load power consumption
- Wide operating temperature

Full Datasheet
https://product.tdk.com/en/power/kws-a

KWSA Series

5-25W Industrial AC-DC PCB-Mount

- Small size and lightweight
- PC Board Mountable
- Wide Range Input
- Wide operating temperature range -40 to +85°C
- Class II (No ground needed)
- 3 year warranty



Full Datasheet ZWS-BAF
Full Datasheet ZWS-C
Full Datasheet ZWQ
Full Datasheet ZWS-BP
https://product.tdk.com/en/power/zw

ZW Series

10-300W Single & Multiple Output

- ZWS-BAF High Reliability 50-300W
- ZWS-C, Class I & II, 10-50W
- Open frame
- ZWQ 1U quad output models from 80-170W
- ZWS-BP (150W, 240W) to be added (peak power 2x)
- 3 to 5 year warranty

Full Datasheet
https://product.tdk.com/en/power/drl

DRL Series

10-100W Low Profile DIN Rail Mount

- Low profile for building automation
- Class II double insulation
- ErP compliant, very low no load power consumption
- 10W, 30W, 60W & 100W models
- 3 year warranty

Full Datasheet
https://product.tdk.com/en/power/kms-a

KMS & KMS-A Series

15-60W Medical AC-DC PCB-Mount

- Small size and lightweight
- PC Board Mountable
- Wide Range Input
- Medical Safety Certifications (4kVAC Input - Output)
- Class II (No ground needed)

Convection Cooled

Full Datasheet
https://product.tdk.com/en/power/drb

DRB Series

15W to 960W High Efficiency DIN Rail Mount

- Excellent efficiency – up to 93%
- ErP compliant, very low no load power consumption
- Market leading case width
- Output voltages 5, 12-15, 24, 72VDC
- 15W, 30W, 50W, 100W, 480W and 960W models
- 3 year warranty

Full Datasheet
https://product.tdk.com/en/power/hws-hd

HWS-A & HWS-/HD Series

Full Datasheet
https://product.tdk.com/en/power/hws-a

15-150W High Quality Industrial & Medical Power

- Long Field Life
- Semi F47 Compliant (230VAC)
- Medical Certification (HWS/ME)
- Conformal Coating, -40°C Startup (HWS/HD)
- Limited Lifetime Warranty (click for terms and conditions)

NEW

Full Datasheet
https://product.tdk.com/en/power/wmm

WMM Series

25-30W Wall Mount Adaptor / External

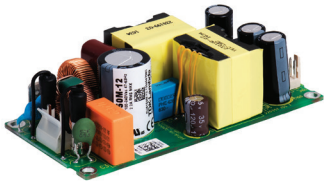
- Medical Safety Certifications and Immunity
- 4kV (2xMOPP) Input to Output Isolation
- Meets DoE Level VI and EU Tier 2 Efficiency
- Class II, Wide Range Input
- Alternative Connectors and Cable Assemblies
- Low Cost and Compact Size

Full Datasheet
https://product.tdk.com/en/power/ls

LS Series

25-150W, 3.3-48V, up to 30A, Low Cost

- Very low cost
- Small size
- 115VAC or 230VAC input
- Withstands 300VAC surges (5s)
- 3 year warranty

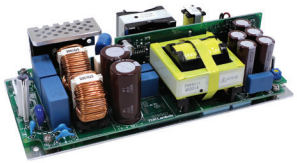


Full Datasheet
https://product.tdk.com/en/power/cus-m

CUS 30/60/100ME/ 150/200M Series

30-250W Medical & ITE

- 2 x 3”, 2 x 4” & 3 x 5” Footprints
- Low profile
- Class I & II for some models
- Suitable for B and BF Type Medical Equipment
- 3 to 5 year warranty



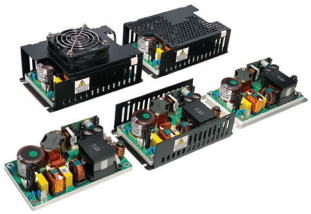
Full Datasheet
https://product.tdk.com/en/power/cus350mp

CUS350MP Series

200 to 350W/420W Medical & ITE

- High Efficiency, up to 94%
- Low profile
- Convection Cooled, and Forced Air Ratings
- 5V Standby & 12V Fan Output
- 3 year warranty

Convection Cooled

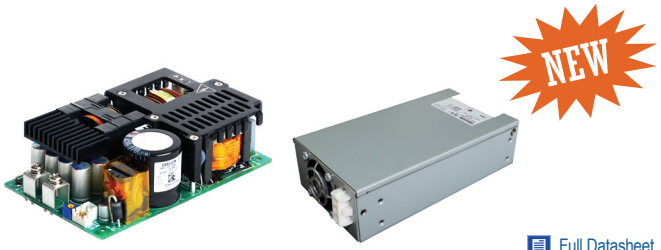


Full Datasheet
https://product.tdk.com/en/power/cus-m

CUS400M Series

400W Medical & ITE 3” x 5” AC-DC Power Supplies

- 250W (400W peak) Convection / Conduction Cooled
- Medical Certifications (2 x MOPP)
- Suitable for B and BF Type Medical Equipment
- Class B Conducted and Radiated EMI
- Suitable for Class I and Class II Installations
- Compact 3 x 5 x 1.55” Size
- Enclosure & Signal Options

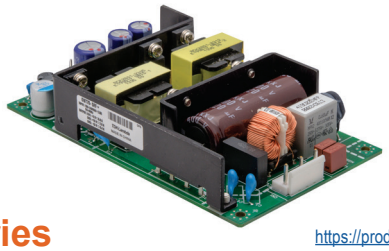


Full Datasheet
https://product.tdk.com/en/power/cus-m

CUS600M Series

600W 3” x 5” AC-DC Medical Power Supplies

- 400W (600W Peak) Convection Cooled
- Medical Certifications (2 x MOPP)
- Suitable for B and BF Type Medical Equipment
- Class B Conducted and Radiated EMI
- Suitable for Class I and Class II Installations
- Compact 3 x 5 x 1.46” Size
- Enclosure & Other Options



Full Datasheet
https://product.tdk.com/en/power/cut

CUT Series

35-75W Triple Output

- 1.06” high
- No minimum loads
- 5V isolated from outputs 2 & 3
- Convection Cooled
- Optional cover and terminal type
- 3 year warranty

Full Datasheet
https://product.tdk.com/en/power/dt-d

Desktop DT Series

25W to 300W Adaptor / External power

- EISA and CEC Compliant (most models)
- Compact package size
- Single Outputs up to 54V
- Medical or Industrial Certifications
- Energy Efficiency Level V & VI models
- 3 year warranty

Full Datasheet
https://product.tdk.com/en/power/csw

CSW Series

40-65W Wide AC-DC Input

- 90 - 305VAC Input
- Convection Cooled
- U Channel or Enclosed
- Class 2, 24V model approved to UL1310
- DIN Rail Mount option
- 3 year warranty

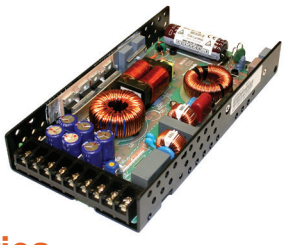
Full Datasheet
https://product.tdk.com/en/power/rws-b

RWS-B Series

50W to 600W Single Output Low Cost

- Cost Effective
- Wide Range AC Input
- Compact Size
- Enclosed, Convection Cooled 50-150W Models
- Fan cooled, 300 & 600W Models
- 5 year warranty

Convection Cooled



Full Datasheet
https://product.tdk.com/en/power/cus-ld

CUS-LD Series

79 to 250W Single Output

- High Efficiency, up to 90%
- Low profile
- Wide Range AC Input
- Convection Cooled
- Coated PCB as standard on CUS250LD
- 3 year warranty

Full Datasheet
https://product.tdk.com/en/power/drf

DRF Series

120W to 480W High Efficiency DIN Rail Mount

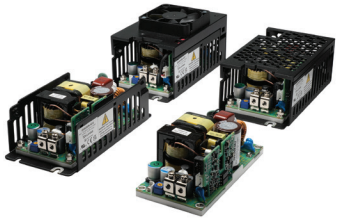
- Excellent efficiency – up to 94%
- Extremely narrow case
- Market leading no load power consumption
- ErP compliant, Remote On/Off, 24VDC output
- Droop Mode Current Share, 150% peak power for 4s
- 5 year warranty

Full Datasheet
https://product.tdk.com/en/power/gws

GWS Series

250W Single Output

- High Efficiency, up to 93%
- 1.6” high (For 1U racking)
- Wide Range AC Input
- 250W Convection Cooled
- 5 year warranty

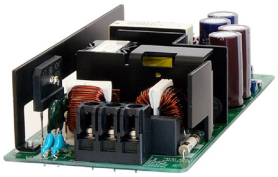


Full Datasheet
https://product.tdk.com/en/power/cus-m

CUS250M Series

250W Medical & ITE 2”4” AC-DC Power Supplies

- Up to 250W Convection/Conduction Cooled
- Medical Certifications (2 x MOPP)
- Suitable for B and BF Type Medical Equipment
- Class B Conducted and Radiated EMI
- Suitable for Class I and Class II Installations
- Compact 2 x 4 x 1.56” Size
- Enclosure & Signal Options

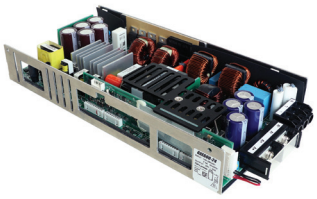


Full Datasheet
https://product.tdk.com/en/power/evs

EVS300 Series

300W Constant Current

- Suitable for battery charging
- 12-18V compliant voltage
- Adjustable current settings
- 5 year warranty



Full Datasheet
https://product.tdk.com/en/power/gxe

GXE600 Series

600W Single Output Programmable Medical and ITE Power Supplies

- Convection Cooled
- Up to 95% Efficient
- RS-485 Read-Write Communication (Modbus RTU protocol)
- Constant Voltage & Constant Current Modes
- Monitoring & Programming Functions
- Digital or Analog Programming
- 7 year warranty

Convection Cooled

Understanding Convection Cooled Power Supplies

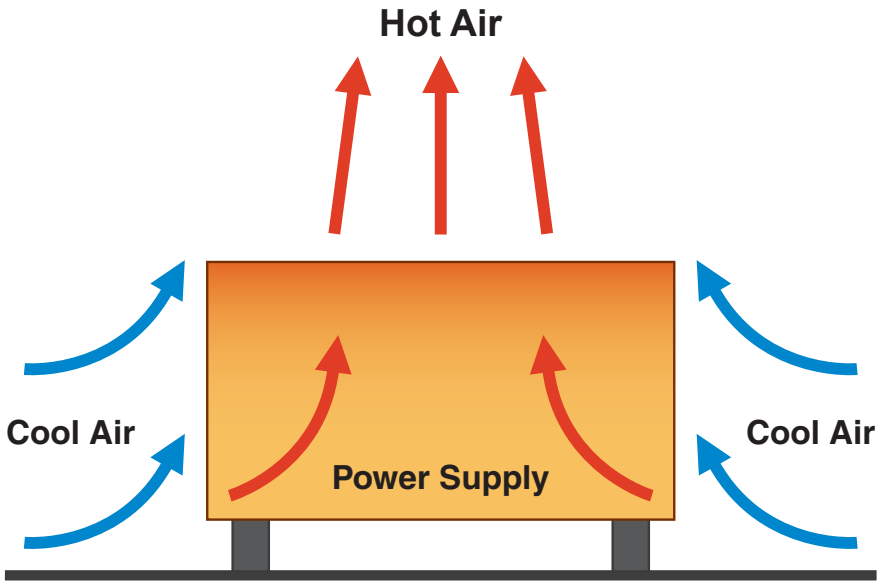
There are a number of commonly used terms to describe cooling methods in the power supply industry:

Fan cooled	Unit has an internal fan
Convection cooled	Unit requires no fan cooling
Forced air cooled	Unit requires external airflow
Conduction cooled	Unit relies on a cold plate to remove the waste heat

The most misunderstood and hence most misapplied is probably convection cooled. Many Engineers assume that a convection cooled power supply is one that does not need any airflow to operate.

One definition of convection is “The transfer of heat by the circulation or movement of the heated parts of a liquid or gas”. In our case – the circulation or movement of hot air.

Open frame power supplies, for example, are typically mounted on a flat surface upon standoffs, and below we can see how the air behaves.

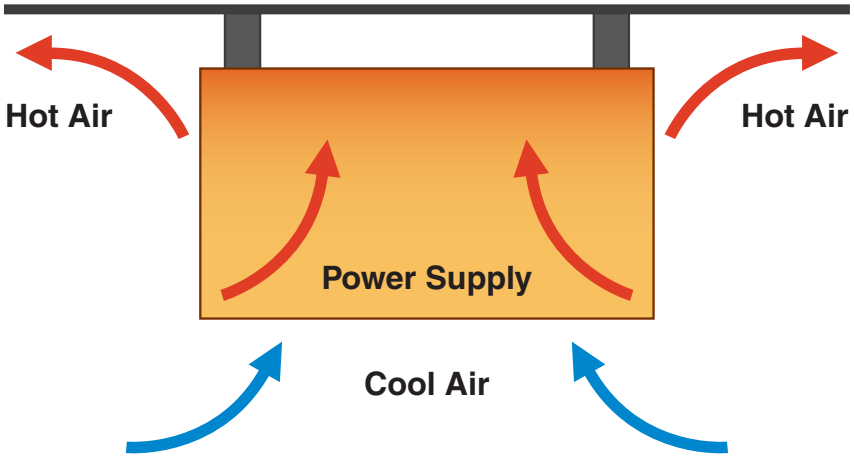


As the hot air rises, cooler air is drawn in from the sides. Although the airspeed is quite low, just 0.3m/s, it is sufficient to reduce internal temperatures. When the power supply goes through safety certification, this is taken into account during thermal testing.

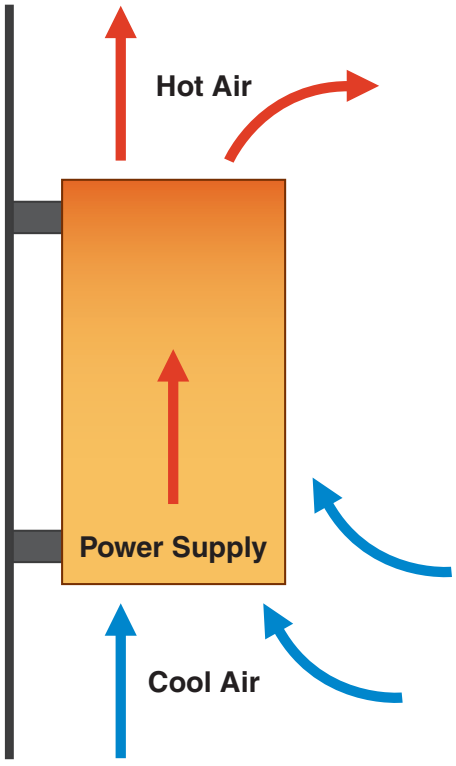
It is very important to ensure that there is adequate space for the air to be drawn in from the sides and allowed to exit above the power supply. A distance of 50mm is considered safe.

Convection Cooled

Orientation of the product is also very important. Most manufacturers will state a recommended mounting orientation and any derating associated if that is not followed. Mounting the product upside down for example can severely reduce field life unless heavy derating is applied, and is often forbidden.

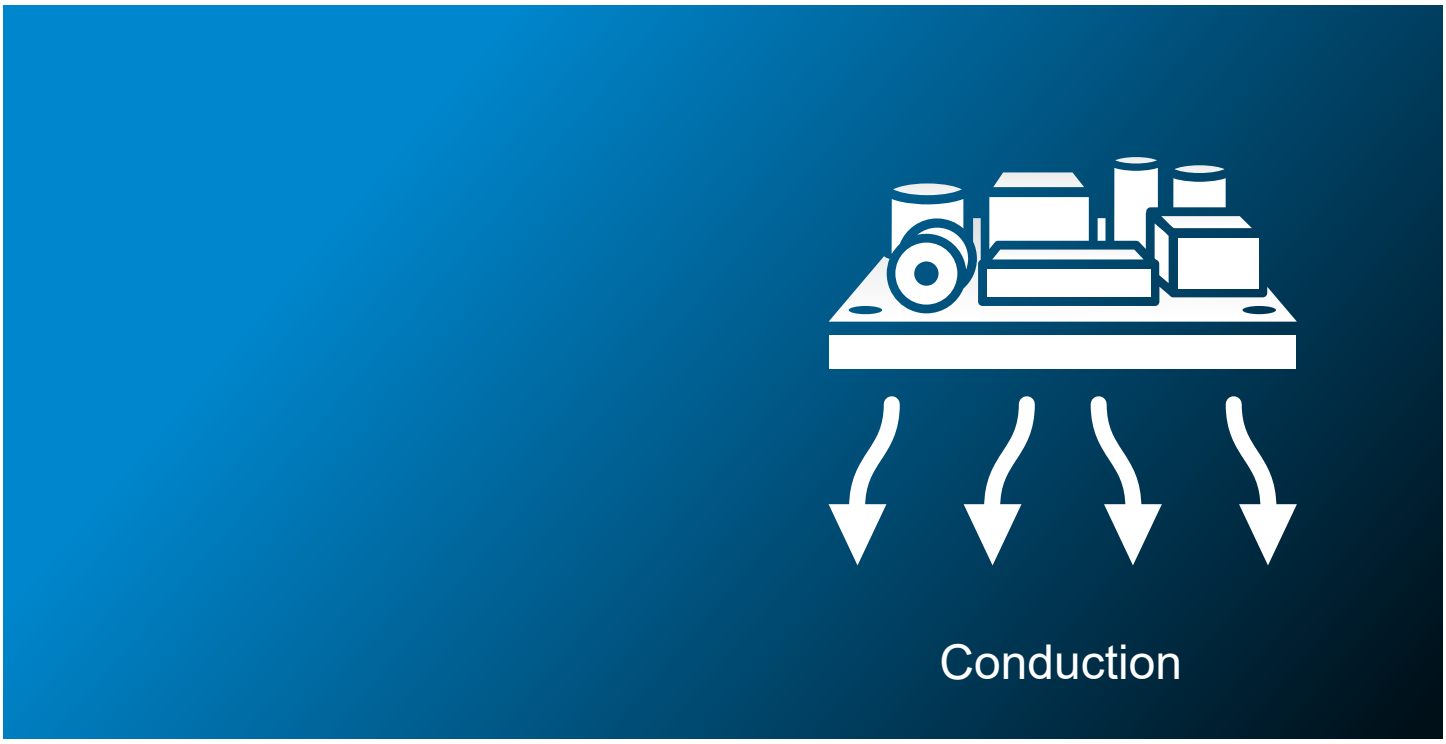


The ramifications of mounting the power supply vertically should be studied. Ideally the output electrolytic capacitors should be located at the bottom, where the temperature will be the coolest.



If in doubt, consult the manufacturer's installation manual. For high density products, recommended maximum component temperatures will be advised for critical parts.

Conduction Cooled



Applications

- Industrial
- COTS
- Test & Measurement
- Communication
- LED
- Broadcast

Features

- High Efficiency
- High Baseplate Operating Temperature
- i^2C Interface (some models)
- Protective PCB Coating (some models)
- Parallel Operation

Conduction Cooled

NEW

CUS250M Series

Full Datasheet
https://product.tdk.com/en/power/cus-m

250W Medical & ITE 2"4" AC-DC Power Supplies

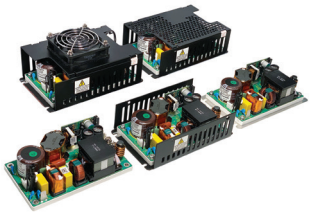
- Up to 250W Convection/Conduction Cooled
- Medical Certifications (2 x MOPP)
- Suitable for B and BF Type Medical Equipment
- Class B Conducted and Radiated EMI
- Suitable for Class I and Class II Installations
- Compact 2 x 4 x 1.56" Size
- Enclosure & Signal Options

PFE-SA & -FA Series (Building Block)

Full Datasheet
https://product.tdk.com/en/power/pfe

300-1000W Full Brick AC-DC

- Low profile, small size
- 100°C baseplate temperature
- High power density, High Efficiency
- Parallel capabilities on 500-1000W
- Peripheral components required to make operational (reference design available)
- We offer value added services "brick on board," See next pages.



NEW

CUS400M Series

Full Datasheet
https://product.tdk.com/en/power/cus-m

400W Medical 3" x 5" AC-DC Power Supplies

- 400W with Forced Air, 250W (400W peak) Conduction / Convection Cooled
- Medical Certifications (2 x MOPP)
- Suitable for B and BF Type Medical Equipment
- Class B Conducted and Radiated EMI
- Suitable for Class I and Class II Installations
- Compact 3 x 5 x 1.55" Size
- Enclosure & Signal Options

PFH Series (Building Block)

Full Datasheet
https://product.tdk.com/en/power/pfh

500W AC-DC Power Module

- Compact 4" x 2.4" x 0.53" brick package
- 100°C Baseplate temperature
- PMBus™
- Peripheral components required to make operational (reference design available)
- 3 year warranty

PF1500A-360 Series

Full Datasheet
https://product.tdk.com/en/power/pf-a

1008 to 1512W PFC Power Supplies

- Power Factor Corrected Module
- 360VDC Output
- Ideal for Distributed Power Archetecture
- Provides High Voltage DC to PH AC/DC Products
- Parallel Capability
- Operates in Harsh Environments

CPFE1000FI Series (Industrial use)

Full Datasheet
https://product.tdk.com/en/power/cpfe

720-1000W Single Output Conduction Cooled

- Universal Input
- Smaller size than CPFE1000F
- Baseplate cooled, no fan required
- I2C Interface
- High Efficiency
- PCB assembly option
- Protective PCB coating option
- Parallel up to 6 units
- Radiated & Conducted Emissions: Class B conducted, Class A Radiated, EN55022/EN55011

Conduction Cooled

CPFE Series (MIL-COTS)

Full Datasheet
https://product.tdk.com/en/power/cpfe

1000W Single Output Conduction Cooled

- Universal Input
- MIL STD 461/462D CE102 EMC
- Baseplate cooled, no fan required
- I2C Interface
- High Efficiency
- Parallel up to 6 units
- Radiated & Conducted Emissions: Class B and MIL STD 461/462D CE102

NEW

PF1500B Series

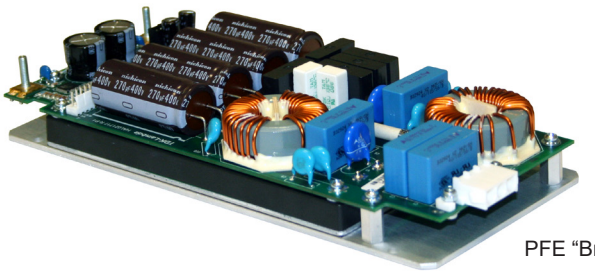
Full Datasheet
https://product.tdk.com/en/power/pf-b

1008 to 1512W PFC Power Supplies

- Power Factor Corrected Module
- 360VDC Output
- Ideal for Distributed Power Archetecture
- Provides High Voltage DC to PH AC/DC Products
- Parallel Capability
- Operates in Harsh Environments

Value-Added

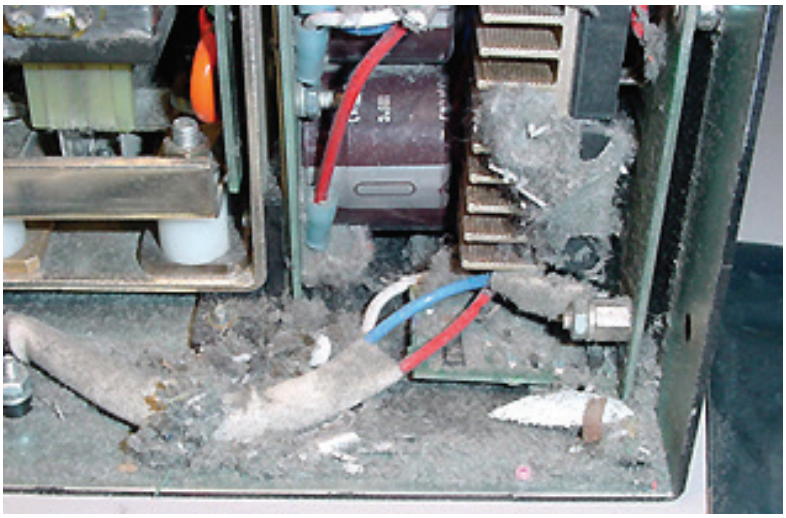
- A customized power solution adding enhanced circuitry or packaging around a Standard/ Existing TDK-Lambda Power Supply to meet customer's specifications.
- Any TDK-Lambda supply may be used as a starting point and these customized solutions also retain the proven reliability of the product from which it was modified.
- Examples include custom racks or enclosures, communications/control, ruggedization, special wire harnesses, switches, fuses, fans, heat sinks, and other additional functionality to a standard product.



PFE "Brick on Board" example

Conduction Cooled

Advantages of Conduction Cooled Power Supplies



Most mid to high-power supplies use fans to help dissipate the internal heat that is generated as a result of imperfect AC to DC conversion efficiencies. Since fans are electromechanical devices, they reduce the system's MTBF and add to the required maintenance expenses.

The photo above is a power supply that operated for many years at a postal depot where mail is handled and sorted automatically. As can be seen (after the fan was removed) paper fragments and airborne dust contaminants were pulled into the supply by the fan and eventually caused a blown fuse.

As might be expected, the proper maintenance program for any fan-cooled power supply calls for the periodic inspections of the supply, with the fan removed, and the replacement of the fan with a new one.

A new breed of conduction-cooled power supplies has been developed that do not depend on fans for cooling. Instead, the required cooling is accomplished by conducting the internal heat loads to an external metal structure or enclosure, which act as a large heat sink surface.

Conduction Cooled

Advantages of Conduction Cooled Power Supplies

The photo above shows TDK-Lambda's new CPFE1000FI series, which are conduction-cooled, 1,000 watt AC-DC power supplies. All heat is conducted to the supply's aluminum plate, which is designed to easily mount to a metal enclosure or cold plate for cooling. More details and specifications for these power supplies are at this web link: https://product.tdk.com/info/en/products/power/tec_data/ps_cpfe.html.

In some applications, these conduction-cooled devices are mounted to liquid cooled cold plates that are made of metal with internal serpentine channels through which a liquid circulates while removing the unwanted heat. The net result is that the system operates with a substantial reduction in audible noise, reduced maintenance costs (no dust build-up and fan wear-out), and an enhanced MTBF.

A good example is a visit to a Television Broadcasting Station that consumes about 100 kilowatts of power. At this location, in separate areas, is a traditional fan-cooled installation in tandem with a modern latest generation system; a system utilizing conduction-cooled power supplies & liquid cooled RF amplifiers (via cold flow plates). During operation of the traditional system (with fan cooling), audible noise is so loud that personnel within 100 feet have to wear hearing protection.

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