ISOLATED DC-DC CONVERTER

CFDF600W SERIES

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Contents

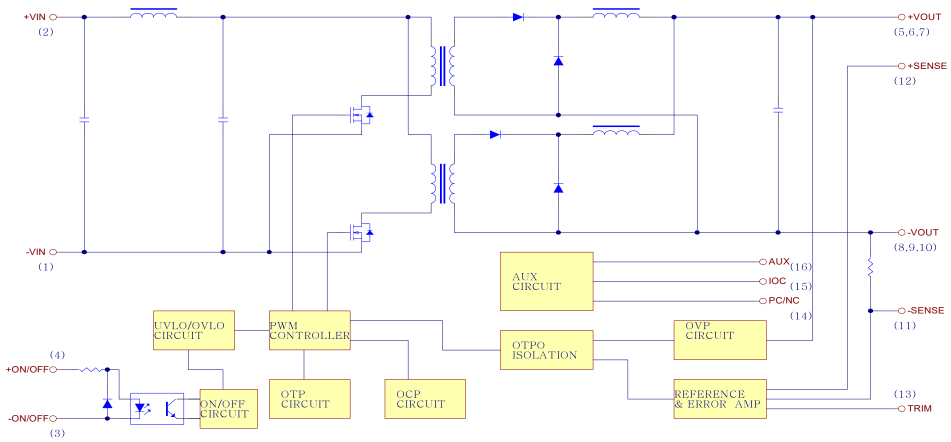
1. Introduction

This specification describes the features and functions of CHEWINS's CFDF600 series of isolated DC -DC Converters. These are highly efficient, reliable and compact, high power density, single output DC/DC converters. The modules can be used in the field of telecommunications, data communications, wireless communications, servers, base station, etc. The CFDF600 series can deliver up to 50A output current and provide a precisely regulated output voltage over a wide range of 18-36 and 36-75VDC. The modules can achieve high efficiency up to 92%. The module offers direct cooling of dissipative components for excellent thermal performance. Standard features include isolated remote on/off (positive or negative), remote sense, output voltage adjustment, over voltage,over current and over temperature protection.Parallel operation is also optional.

2. DC-DC Converter Features

- 600-800W Isolated Output
- Efficiency to 92%
- Fixed Switching Frequency
- Input Under-Voltage Protection
- Over Temperature Protection
- Over Voltage/Current Protection
- Remote On/Off
- Industry Full-Brick Package
- Fully Isolated 1500VDC
- IEC/EN/UL 62368-1 Approval

3. Electrical Block Diagram



Electrical Block Diagram for CFDF600 series Modules

MODEL NUMBER	INPUT VOLTAGE	OUTPUT VOLTAGE	OUTPUT CURRENT		INPUT CURRENT		% EFF.	Capacitor Load max.
			MIN.	MAX.	NO LOAD	FULL LOAD		
CFDF600-24S12	18-36VDC	12VDC	0mA	50A	150mA	28.09A	88	10000μF (2)
CFDF600-24S24	18-36VDC	24VDC	0mA	25A	150mA	27.78A	89	5000μF (2)
CFDF600-24S28	18-36VDC	28VDC	0mA	21.5A	150mA	48.80A	91	5000μF (2)
CFDF800-24S28	18-36VDC	28VDC	0mA	28.6A	150mA	27.87A	90	5000μF (2)
CFDF600-24S32	18-36VDC	32VDC	0mA	19A	150mA	27.84A	91	5000μF (2)
CFDF600-24S48	18-36VDC	48VDC	0mA	12.5A	200mA	27.47A	91	5000μF (2)
CFDF600-48S12	36-75VDC	12VDC	0mA	50A	90mA	13.89A	90	10000μF (2)
CFDF600-48S24	36-75VDC	24VDC	0mA	25A	100mA	13.59A	92	5000μF (2)
CFDF700-48S28	36-75VDC	28VDC	0mA	25A	105mA	16.03A	91	5000μF (2)
CFDF600-48S32	36-75VDC	32VDC	0mA	19A	90mA	13.77A	92	5000μF (2)
CFDF600-48S48	36-75VDC	48VDC	0mA	12.5A	130mA	13.59A	92	5000μF (2)

NOTE:

1. Nominal Input Voltage 24,48VDC
2. The output terminal of all models required a minimum capacitor 470uF to maintain specified regulation.

4. Technical Specifications

(All specifications are typical at nominal input, full load at 25°C unless otherwise noted.)

ABSOLUTE MAXIMUM RATINGS

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only, functional operation of the device is not implied at these or any other conditions in excess of those given in the operations sections of the data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect the device reliability.

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Input Voltage						
Continuous		24SXX 48SXX	-0.3 -0.3		36 75	V_{dc}
Operating Case Temperature		All	-40		100	℃
Storage Temperature		All	-55		105	℃
Isolation Voltage	1 minute; input/output, input/case, output/case, input/remote, output/remote	All	1500			V_{dc}

INPUT CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Operating Input Voltage		24SXX 48SXX	18 36	24 48	36 75	V_{dc}
Input Under Voltage Lockout						
Turn-On Voltage Threshold		24SXX 48SXX	16 34	17 35	18 36	V_{dc}
Turn-Off Voltage Threshold		24SXX 48SXX	15 32	16 33	17 34	V_{dc}
Lockout Hysteresis Voltage		24SXX 48SXX		1.0 2.0		V_{dc}
Input Over Voltage Lockout						
Turn-On Voltage Threshold		24SXX 48SXX	37 76	38 77	39 78	V_{dc}
Turn-Off Voltage Threshold		24SXX 48SXX	39 79	40 80	42 81	V_{dc}
Lockout Hysteresis Voltage		24SXX 48SXX		2.0 3.0		V_{dc}
Maximum Input Current	100% Load, V_{in}=18V	24SXX		37.7		A
	100% Load, V_{in}=36V	48SXX		21.7		
No-Load Input Current		24S12 24S24 24S28 24S32 24S48		150 150 150 150 200		mA

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
		48S12 48S24 48S28 48S32 48S48		90 100 105 90 130		mA
Inrush Current (I^2t)		All			1.0	A^2s

OUTPUT CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Output Voltage Set Point	V_{in}=Nominal V_{in}, I_o = I_{o_max}, Tc=25℃	Vo=12V Vo=24V Vo=28V Vo=32V Vo=48V	11.88 23.76 27.72 31.68 47.52	12.00 24.00 28.00 32.00 48.00	12.12 24.24 28.28 32.32 48.48	V_{dc}
Output Voltage Regulation						
Load Regulation	I_o=I_{o_min} to I_{o_max}	All			±0.5	%
Line Regulation	V_{in}=low line to high line	All			±0.2	%
Temperature Coefficient	Tc=-40℃ to 100℃	All			±0.03	%/℃
Output Voltage Ripple and Noise						
Peak-to-Peak	20MHz bandwidth, Full load, 10uF tantalum and 1.0uF ceramic capacitors (48V: 10uF aluminum and 1.0uF ceramic capacitors)	Vo=12V Vo=24V Vo=28V Vo=32V Vo=48V			120 240 280 320 480	mV
RMS	20MHz bandwidth, Full load, 10uF tantalum and 1.0uF ceramic capacitors (48V: 10uF aluminum and 1.0uF ceramic capacitors)	Vo=12V Vo=24V Vo=28V Vo=32V Vo=48V			60 100 100 120 200	mV
Operating Output Current Range		24S28 48S28 Vo=12V Vo=24V Vo=32V Vo=48V	0 0 0 0 0 0		21.5 25 50 25 19 12.5	A
Output DC Current Limit Inception	Output Voltage=90% Nominal Output Voltage	All	110		150	%
Power Good Signal (IOG)	Vout ready: low level, sink current	All			20	mA
	Vout not ready: open drain output, applied voltage	All			50	V
Output Capacitance	Full load (resistive)	24S32 Vo=12V Others	470 470 470		70000 10000 5000	uF

DYNAMIC CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Output Voltage Current Transient						
Step Change in Output Current	d_i/d_t=0.1A/us, Load change from 75% to 100% to 75% of Io max.	All		±3	±5	%
Setting Time (within 1% Vout nominal)	d_i/d_t=0.1A/us	All			500	us
Turn-On Delay and Rise Time						
Turn-On Delay Time, From On/Off Control	$V_{on/off}$ to $10\%V_{o\_set}$	All			75	ms
Turn-On Delay Time, From Input	V_{in_min} to $10\%V_{o\_set}$	All			250	ms
Output Voltage Rise Time	$10\%V_{o\_set}$ to $90\%V_{o\_set}$	All			50	ms

EFFICIENCY

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
100% Load		24S12		88		%
		24S24		90		
		24S28		90		
		24S32		91		
		24S48		91		
		48S12		90		
		48S24		92		
		48S28		91		
		48S32		92		
		48S48		92		

ISOLATION CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Isolation Voltage	1 minute; input/output, input/case, output/case, input/remote, output/remote	All			1500	V_{dc}
Isolation Resistance		All	10			MΩ
Isolation Capacitance		All		4000		pF

FEATURE CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Switching Frequency		48S12		300		KHz
		48S28		300		
		48S32		300		
		Others		250		
On/Off Control Negative Remote On/Off Logic						
Logic Low (Module Off)		All	0		0.01	mA
Logic High (Module On)		All	1.0		10	mA
On/Off Control Positive Remote On/Off Logic						
Logic High (Module Off)		All	1.0		10	mA
Logic High (Module On)		All	0		0.01	mA

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Auxiliary Output Voltage		All	7	10	13	V
Auxiliary Output Current		All			20	mA
Load Share Accuracy (50%-100% load)		All	-10		+10	%
Off Converter Input Current	Shutdown input idle current	All			50	mA
Output Voltage Trim Range	P_{out}=max rated power	All	60		110	%
Output Over Voltage Protection		All	115	125	140	%
Over-Temperature Shutdown		All		110		℃

GENERAL SPECIFICATIONS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
MTBF	I_o=100% of I_{o_max}: T_a=25℃ per MIL-HDBK-217F	All		450		K hours
Weight		All		220		grams

5. Main Features and Functions

5.1 Operating Temperature Range

The CFDF600 series converters can be operated within a wide case temperature range of -40℃ to 100℃. Consideration must be given to the de-rating curves when ascertaining maximum power that can be drawn from the converter. The maximum power drawn from full brick models is influenced by usual factors, such as:

- Input voltage range
- Output load current
- Forced air or natural convection

5.2 Output Voltage Adjustment

Section 6.8 describes in detail how to trim the output voltage with respect to its set point. The output voltage on all models is adjustable within the range of 60% to 110%.

5.3 Over Current Protection

The converter is protected against over current or short circuit conditions.At the instance of current-limit inception,the module enters a constant current mode of operation.While the fault condition exists,the module will remain in this constant current mode,and can remain in this mode until the fault is cleared.The unit operates normally once the output current is reduced back into its specified range.

5.4 Output Over Voltage Protection

The converter is protected against output over voltage conditions. When the output voltage is higher than the specified range, the module enters a hiccup mode of operation.

5.5 Remote On/Off

The On/Off input pins permit the user to turn the power module on or off via a system signal from the primary side or the secondary side. Two remote on/off options are available. Negative logic turns the module on as long as a current (1-10mA) is flowing between +on/off and –on/off and inactive when no current is flowing. Positive logic turns the module off as long as a current (1-10mA) is flowing between +on/off and –on/off and active when no current is flowing.

5.6 UVLO&OVLO (Under/Over Voltage Lock Out)

Input under/over voltage lockout is standard with this converter. At input voltages below/beyond the input under voltage lockout limit, the module operation is disabled.

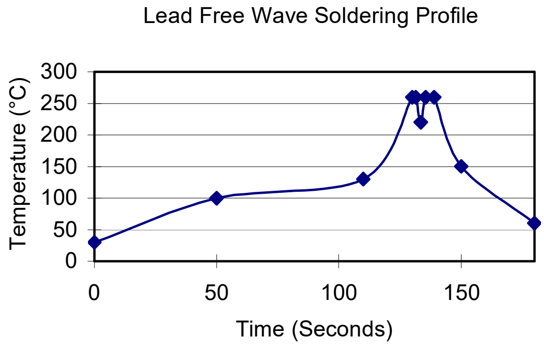
5.7 Over Temperature Protection

These modules have an over temperature protection circuit to safeguard against thermal damage. When the case temperature rises above over temperature shutdown threshold, the converter will shut down to protect it from overheating. The module will automatically restart after it cools down.

6. Applications

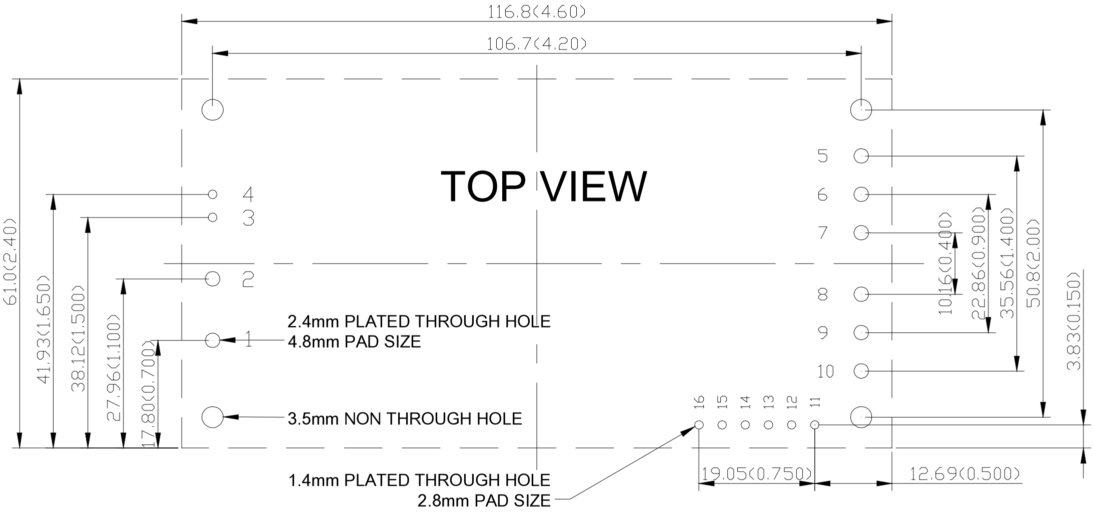
6.1 Recommended Layout, PCB Footprint and Soldering Information

The system designer or end user must ensure that metal and other components in the vicinity of the converter meet the spacing requirements for which the system is approved. Low resistance and inductance PCB layout traces are the norm and should be used where possible. Due consideration must also be given to proper low impedance tracks between power module, input and output grounds. The recommended soldering profile and PCB layout are shown below.



Note：

1. Soldering Materials: Sn/Cu/Ni
2. Ramp up rate during preheat:1.4℃/Sec (From 50℃ to 100℃)
3. Soaking temperature:0.5℃/Sec(From 100℃ to 130℃), 60±20 seconds
4. Peak temperature: 260℃, above 250℃ 3~6 Seconds
5. Ramp up rate during cooling: -10.0 ℃/Sec (From 260℃ to 150℃)



Recommend PCB Pad layout

6.2 Convection Requirements for Cooling

To predict the approximate cooling needed for the full brick module, refer to the power de-rating curves in section 6.4. These de-rating curves are approximations of the ambient temperatures and airflows required to keep the power module temperature below its maximum rating. Once the module is assembled in the actual system, the module's temperature should be monitored to ensure it does not exceed 100℃ as being measured at the center of the top of the case (thus verifying proper cooling).

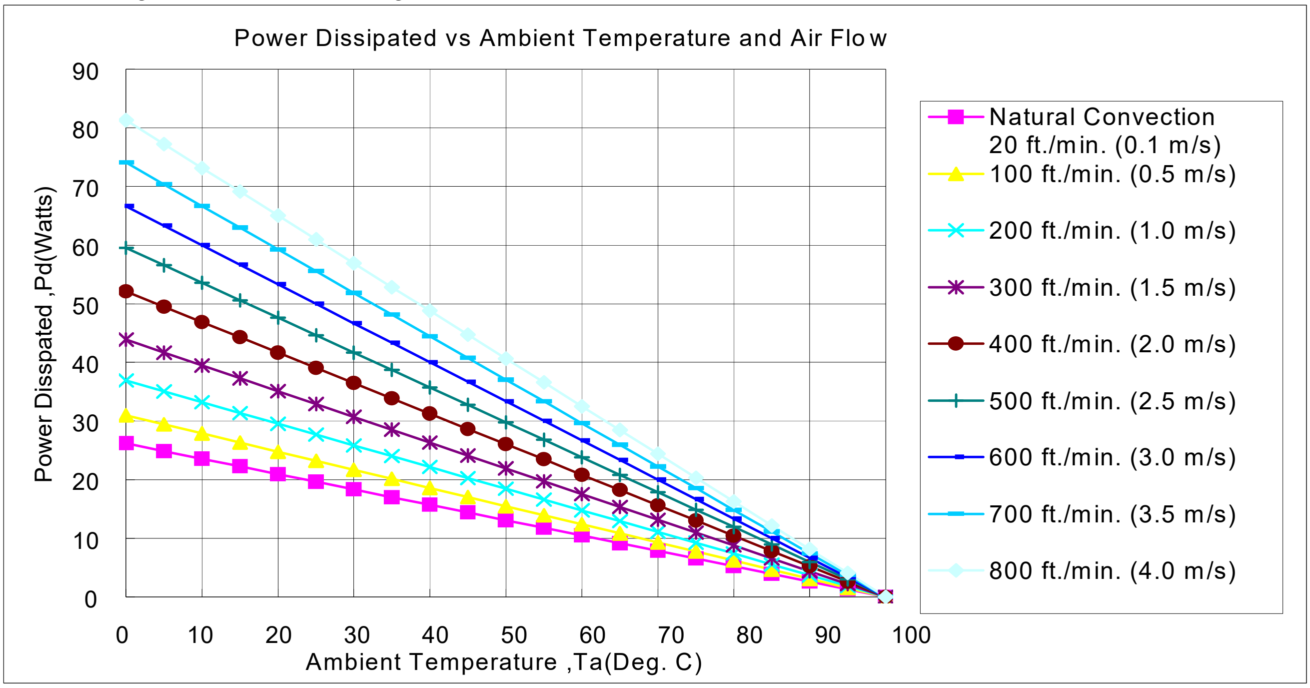
6.3 Thermal Considerations

The power module operates in a variety of thermal environments; however, sufficient cooling should be provided to help ensure reliable operation of the unit. Heat is removed by conduction, convection, and radiation to the surrounding environment. The test data is presented in section 6.4. The power output of the module should not be allowed to exceed rated power (V_{o_set} x I_{o_max}).

6.4 Power De-Rating

The operating case temperature range of CFDF600 series is -40℃ to +100℃. When operating the CFDF600 series, proper de-rating or cooling is needed. The maximum case temperature under any operating condition should not be exceeded 100℃.

The following curve is the de-rating curve of CFDF600 series without heatsink.



Example:

What is the minimum airflow necessary for a CFDF600-48S12 operating at nominal line, an output current of 30A, and a maximum ambient temperature of 40℃

Solution:

Given:

V_{in}=48V_{dc}, V_o=12V_{dc}, Io=30A

Determine Power dissipation (P_d):

Pd =Pi-Po=Po(1-η)/η

Pd =12×30×(1-0.9)/0.9=40Watts

Determine airflow:

Given: P_d =40W and Ta=40℃

Check above Power de-rating curve:

minimum airflow= 700 ft./min.

Verifying: The maximum temperature rise

△T = Pd × Rca=40×1.35=54℃

The maximum case temperature Tc=Ta+△T=94℃<100℃

Where:

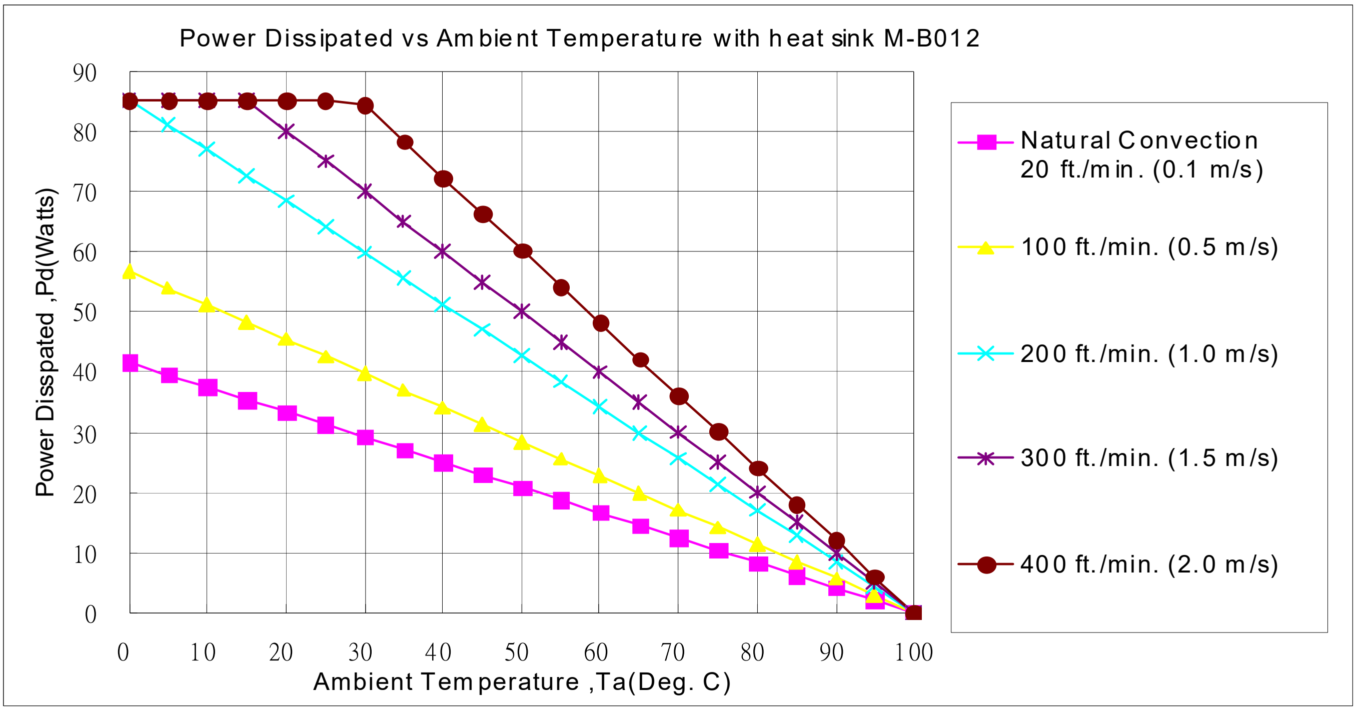
The R_{ca} is thermal resistance from case to ambience.

The Ta is ambient temperature and the Tc is case temperature.

Chart of Thermal Resistance vs Air Flow

AIR FLOW RATE	TYPICAL R_{ca}
Natural Convection 20ft./min. (0.1m/s)	3.82℃/W
100 ft./min. (0.5m/s)	3.23℃/W
200 ft./min. (1.0m/s)	2.71℃/W
300 ft./min. (1.5m/s)	2.28℃/W
400 ft./min. (2.0m/s)	1.92℃/W
500 ft./min. (2.5m/s)	1.68℃/W
600 ft./min. (3.0m/s)	1.5℃/W
700 ft./min. (3.5m/s)	1.35℃/W
800 ft./min. (4.0m/s)	1.23℃/W

The following curve is the de-rating curve of CFDF600 series with heat sink FBL254 (M-B012).



Forced Convection Power De-rating with Heat Sink FBL254 (M-B012)

AIR FLOW RATE	TYPICAL R_{ca}
Natural Convection 20ft./min. (0.1m/s)	2.4℃/W
100 ft./min. (0.5m/s)	1.76℃/W
200 ft./min. (1.0m/s)	1.17℃/W
300 ft./min. (1.5m/s)	1.0℃/W
400 ft./min. (2.0m/s)	0.83℃/W

Example:

What is the minimum airflow necessary for a CFDF600-48S12 operating at nominal line, an output current of 50A, and a maximum ambient temperature of 40℃

Solution:
Given:

V_{in}=48V_{dc}, Vo=12V_{dc}, Io=50A

Determine Power dissipation (P_d):

Pd=Pi-Po=Po(1-η)/η

Pd=12x50x(1-0.9)/0.9=66.7Watts (Chart of Thermal Resistance vs Air Flow)

Determine airflow:

Given: Pd=66.7W and Ta=40℃

Check above Power de-rating curve:

minimum airflow= 400 ft./min.

Verifying:

The maximum temperature rise △T = Pd × Rca=66.7×0.83=55.4℃

The maximum case temperature Tc=Ta+△T=95.4℃<100℃

Where:

The Rca is thermal resistance from case to ambience.

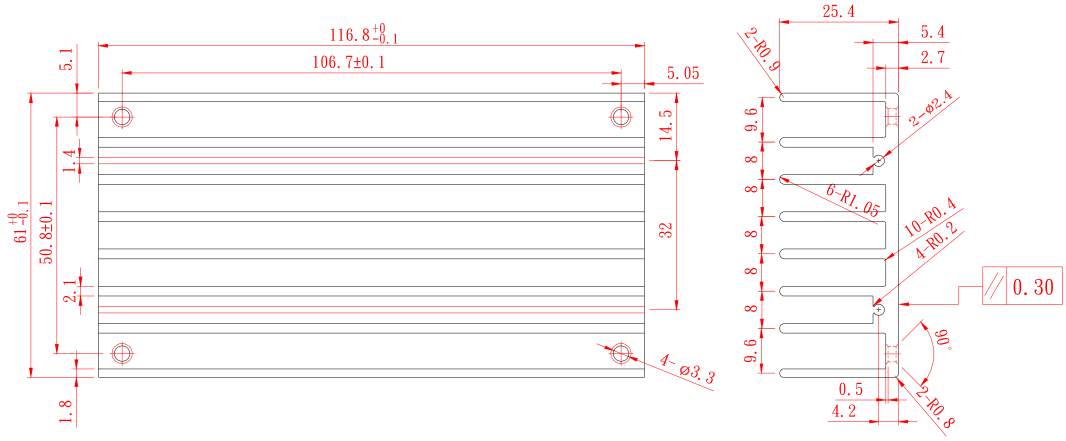
The Ta is ambient temperature and the Tc is case temperature.

6.5 Full Brick Heat Sinks:

Heat-sink FBL254 (M-B012)

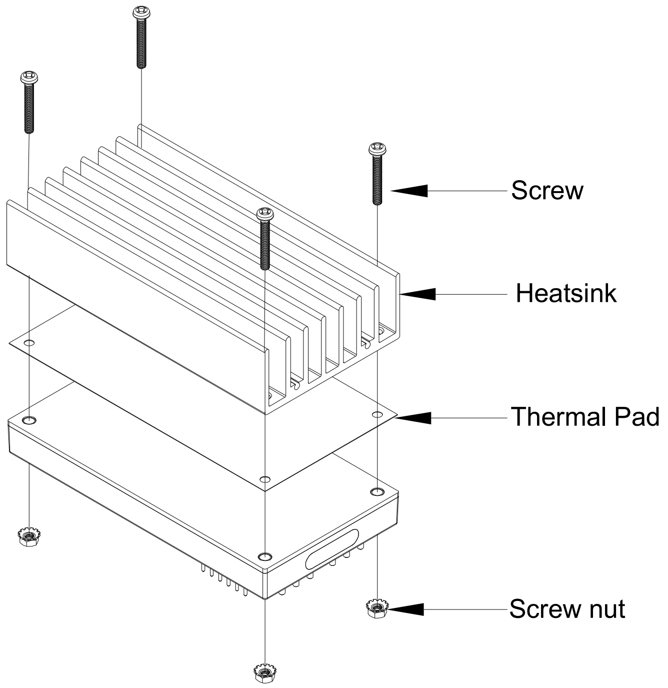
All Dimension In mm

Longitudinal Fins



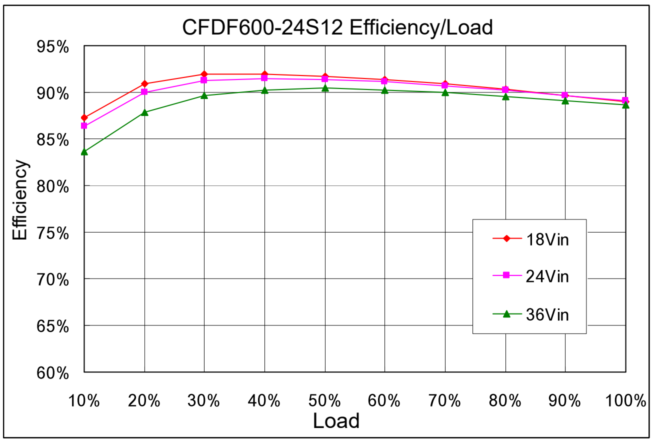
Heat Sink (Clear Mounting Inserts Φ3.3mm Through): 116.8*61*25.4 FBL254 (M-B012) G6620090204
Thermal PAD PF01: SR60*115.8*0.23 (G6135013070)
Screw Nut K320N: M3*20L (G75A1300052) & NH+WOM3*P0.5N (G75A2440392)

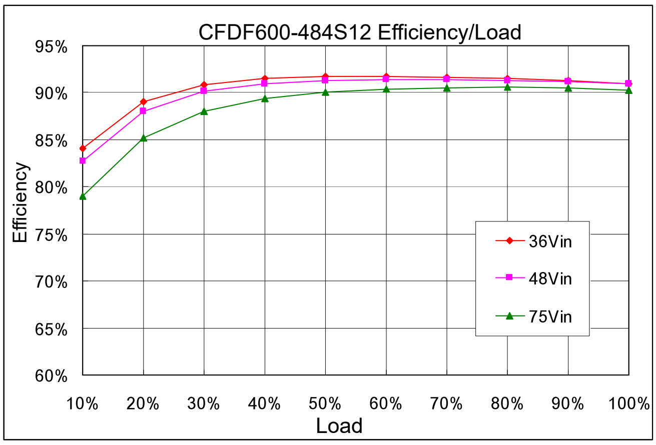
Full Brick Heat Sink Assembly

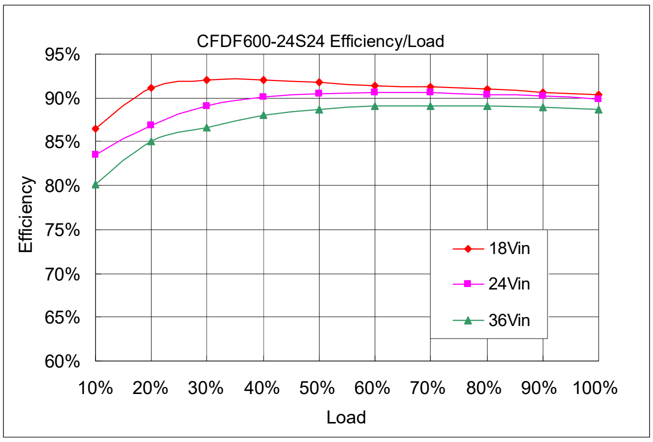


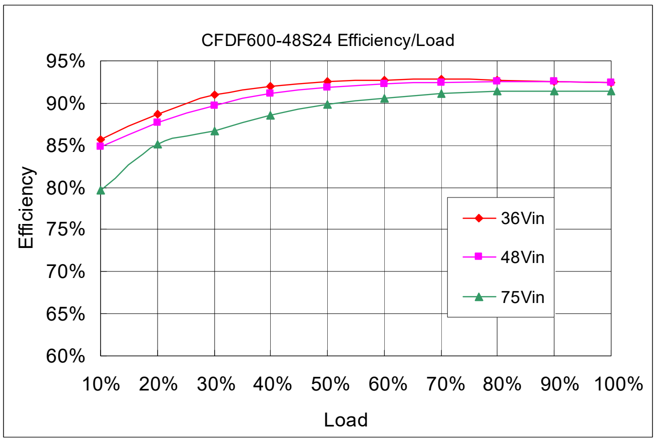
Heat Sink: FBL254 (M-B012)
Thermal PAD PF01: SR60*115.8*0.23 (G6135013070)
Screw & Nut K320N:
M3*20L (G75A1300052) & NH+WOM3*P0.5N(G75A2440392)

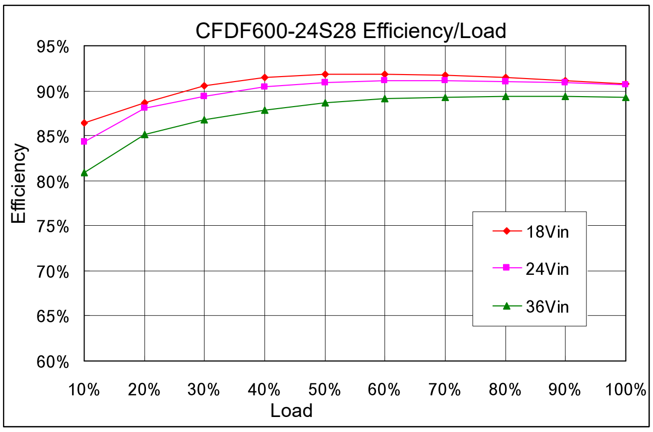
6.6 Efficiency/Load

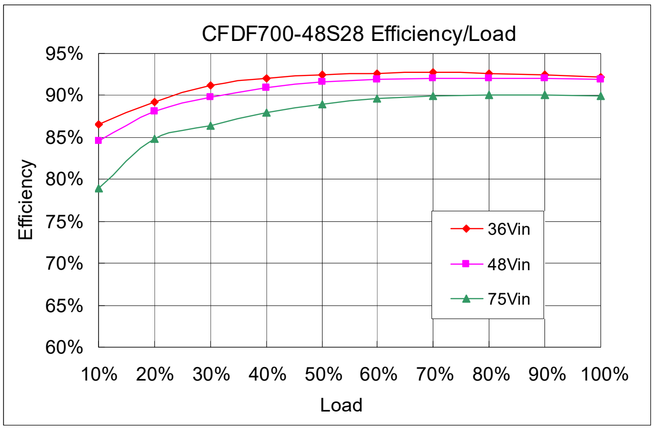


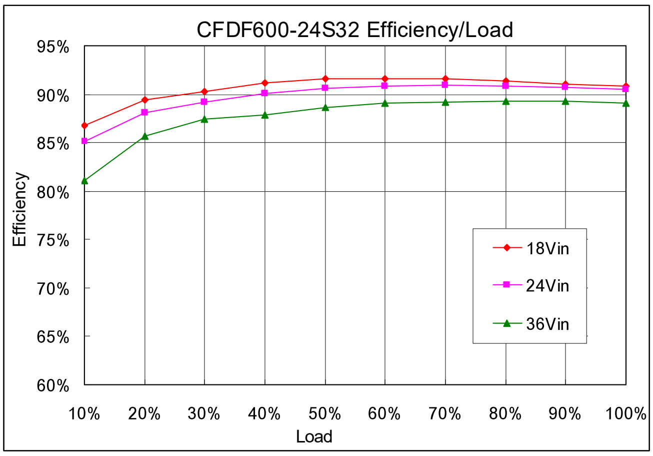


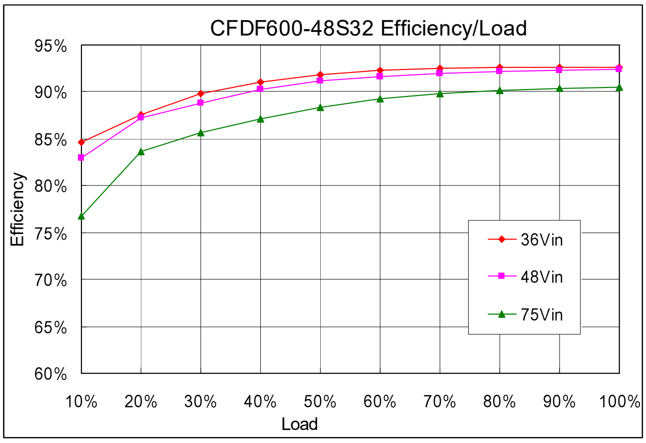


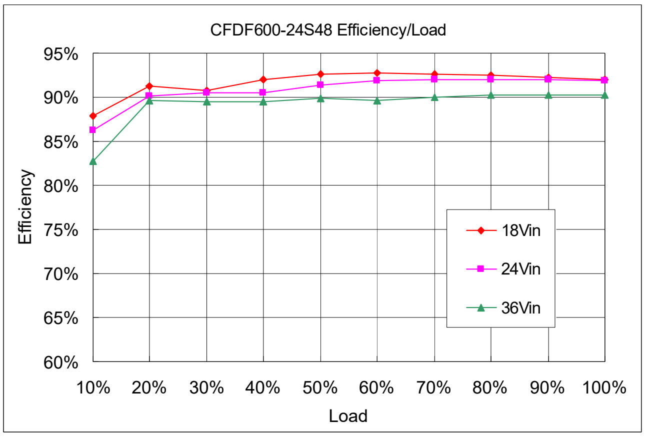


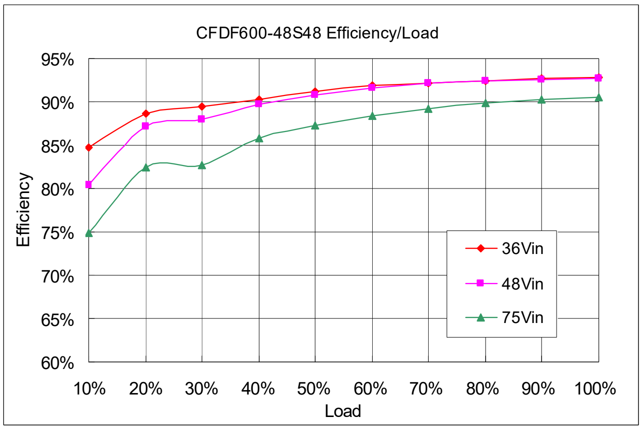





CFDF600-24S32 Efficiency/Load
95%
90%
85%
80%
75%
70%
65%
60%
Efficiency
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Load
18Vin
24Vin
36Vin


CFDF600-48S32 Efficiency/Load
95%
90%
85%
80%
75%
70%
65%
60%
Efficiency
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Load
36Vin
48Vin
75Vin


CFDF600-24S48 Efficiency/Load
95%
90%
85%
80%
75%
70%
65%
60%
Efficiency
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Load
18Vin
24Vin
36Vin


CFDF600-48S48 Efficiency/Load
95%
90%
85%
80%
75%
70%
65%
60%
Efficiency
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Load
36Vin
48Vin
75Vin

6.7 Test Set-Up

The basic test set-up to measure parameters such as efficiency and load regulation is shown below. When testing the modules under any transient conditions please ensure that the transient response of the source is sufficient to power the equipment under test. we can calculate:

- Efficiency
- Load regulation and line regulation.

The value of efficiency is defined as:

$$\eta = \frac{Vo \times Io}{Vin \times Iin} \times 100\%$$

Where:

V_o is output voltage,

I_o is output current,

V_{in} is input voltage,

I_{in} is input current.

The value of load regulation is defined as:

$$Load.reg = \frac{V_{FL} - V_{NL}}{V_{NL}} \times 100\%$$

Where:

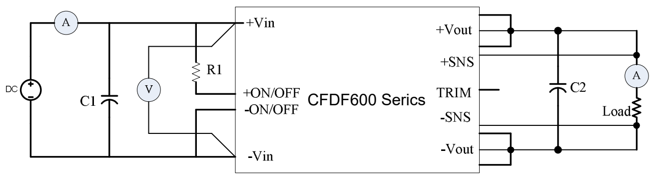
V_{FL} is the output voltage at full load

V_{NL} is the output voltage at no load

The value of line regulation is defined as:

$$Line.reg = \frac{V_{HL} - V_{LL}}{V_{LL}} \times 100\%$$

Where: V_{HL} is the output voltage of maximum input voltage at full load. V_{LL} is the output voltage of minimum input voltage at full load.



CFDF600 Series Test Setup

Recommend C1and C2 Value

C1:1000uF/50V for CFDF600-24S32, 220uF/100V for other Models

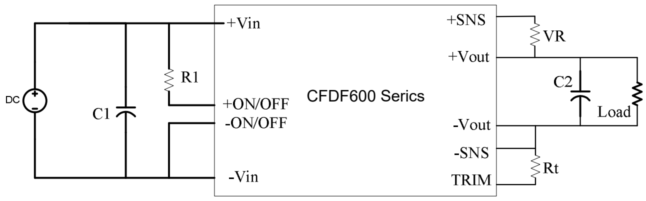
C2:470uF/100V

For CFDF600 series it's necessary to connect the input electrolytic capacitor C1 with low ESR to prevent the effective of input line inductance to the DC/DC converter.

For stable operation,connect a low impedance electrolytic capacitor C2 in the output terminals. When operated at lower temperature than -20℃,increasing the C2 capacitance with three or four times more than the recommended value.

6.8 Output Voltage Adjustment

The Trim input permits the user to adjust the output voltage up or down according to the trim range specification (60% to 110% of nominal output). This is accomplished by connecting an external resistor between the +Vout and +Sense pin for trim up and between the TRIM and –Sense pin for trim down, see Figure



Output voltage trim circuit configuration

The Trim pin should be left open if trimming is not being used.The output voltage can be determined by the following equations:

$$Vf = \frac{1.24 \times \left(\frac{Rt \times 33}{Rt + 33}\right)}{7.68 + \frac{Rt \times 33}{Rt + 33}}$$

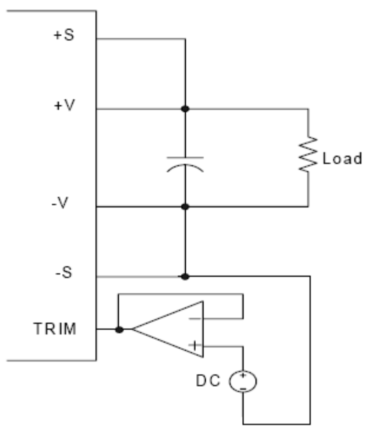
$$Vout = (Vo + VR) \times Vf$$

Unit: KΩ

Vo: Nominal Output Voltage

Recommend Rt=6.8KΩ

The output voltage can also be adjustment by using external DC voltage



Output Voltage = TRIM Terminal Voltage * Nominal Output Voltage

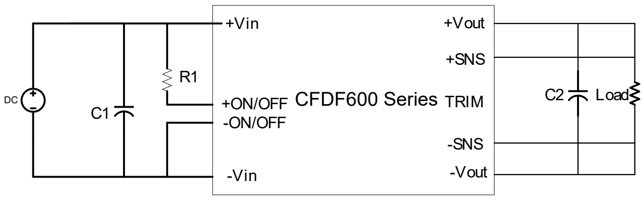
6.9 Output Remote Sensing

The CFDF600 series converter has the capability to remotely sense both lines of its output. This feature moves the effective output voltage regulation point from the output of the unit to the point of connection of the remote sense pins. This feature automatically adjusts the real output voltage of the CFDF600 series in order to compensate for voltage drops in distribution and maintain a regulated voltage at the point of load.

The remote-sense voltage range is:
[(+Vout)-(-Vout)]–[(+Sense)–(-Sense)]℃10% of $V_{o\_nominal}$

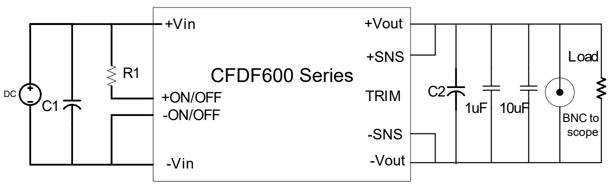
If the remote sense feature is not to be used, the sense pins should be connected locally.The +Sense pin should be connected to the +Vout pin at the module and the -Sense pin should be connected to the -Vout pin at the module.

This is shown in the schematic below.



Note: Although the output voltage can be increased by both the remote sense and by the trim,the maximum increase for the output voltage is not the sum of both. The maximum increase is the larger of either the remote sense or the trim.The amount of power delivered by the module is defined as the voltage at the output terminals multiplied by the output current. When using remote sense and trim, the output voltage of the module can be increased and consequently increase the power output of the module if output current remains unchanged.Care should be taken to ensure that the maximum output power of the module remains at or below the maximum rated power (Maximum rated power = $V_{o,set}$ x $I_{o,max}$)

6.10 Output Ripple and Noise



Output ripple and noise is measured with 10uF aluminum and 1.0uF ceramic capacitors for 48V, 1.0uF ceramic and 10uF solid tantalum capacitors for other modules across the output.

6.11 Output Capacitance

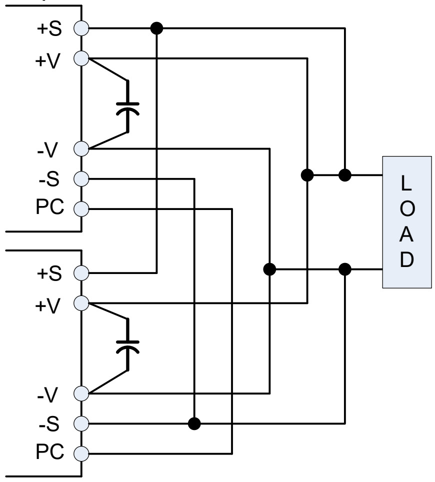
The CFDF600 series converters provide unconditional stability with or without external capacitors. For good transient response, low ESR output capacitors should be located close to the point of load. PCB design emphasizes low resistance and inductance tracks in consideration of high current applications. Output capacitors with their associated ESR values have an impact on loop stability and bandwidth. The minimum output capacitance is 470uF which need three or four times capacitance when operating below -20℃ and the absolute maximum value of CFDF600 series output capacitance to see technical specifications.

6.12 Parallel Operation

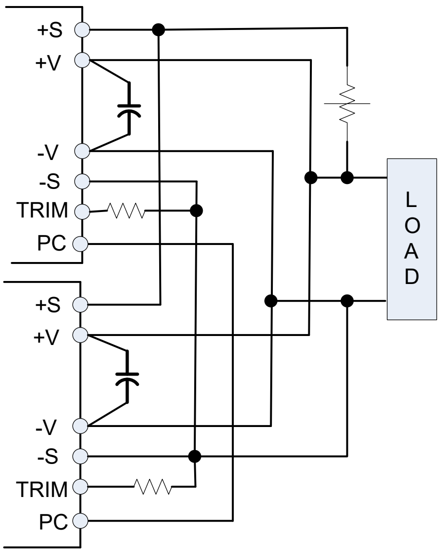
The CFDF600 series are also designed for parallel operation.When paralleled, the load current can be equally shared between the modules by connecting the PC pins together.

There are two different parallel operations for CFDF600 series,one is parallel operation when load can't be supplied by only one power unit; the other is the N+1 redundant operation which is high reliable for load of N units by using N+1 units.

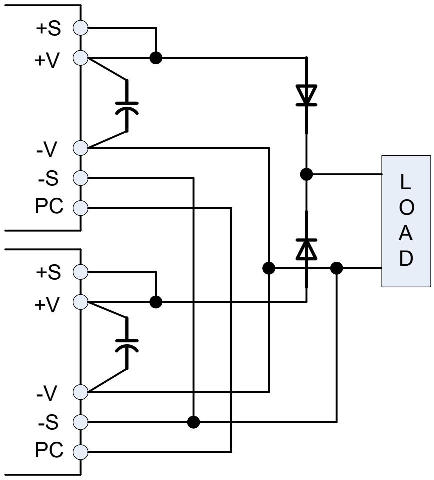
(a) parallel operation



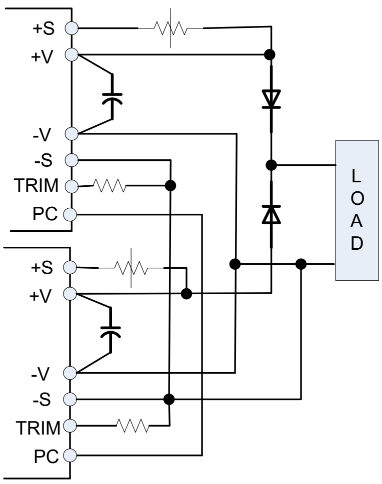
(b) Parallel operation with programmed and adjustable output



(c) N+1 redundant connection

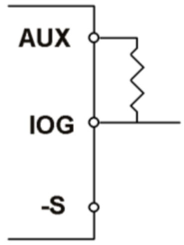


(d) N+1 redundant connection with programmed output and adjustable output voltage

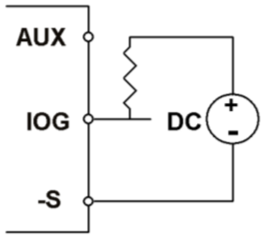


6.13 IOG Signal

Normal and abnormal operation of the converter can be monitored by using the I.O.G signal. Output of this signal monitor is located at the secondary side and is open collector output, you can use the signal by the internal aux power supply or the the external DC supply as the following figures. the ground reference is the –Sense.



By internal AUX



By external DC supply

This signal is LOW when the converter is normally operating and HIGH when the converter is disabled or when the converter is abnormally operating.

6.14 Auxiliary Power for Output Signal

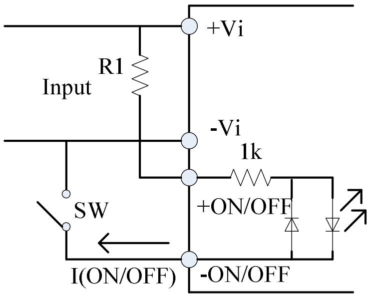
The auxiliary power supply output is within 7-13V with maximum current of 20 mA. Ground reference is the –sense Pin.

6.15 On/Off Control

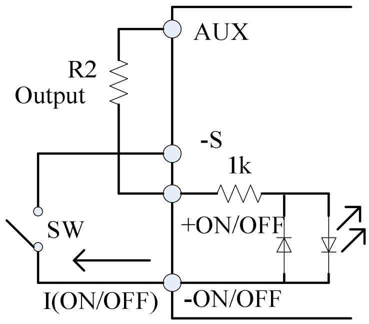
The converter's On/Off can be controlled from the input side or the output side.

Output voltage turns on when current is made to through On/Off terminals which can be reached by opening or closing the switches.The maximum current through the On/Off pin is 10mA, setting the resistor value to avoid the maximum current through the On/Off pins.

(A) Controlling the On/Off terminal from the input side, recommend R1 value is 30K (0.5W) for 48Vin and 15K (0.25W) for 24Vin.



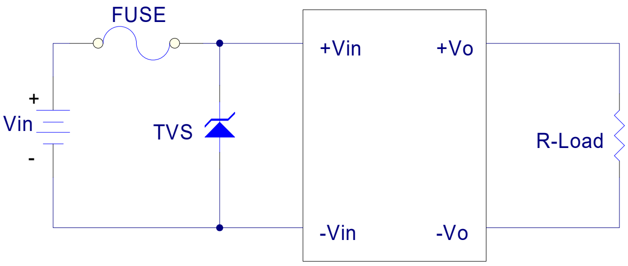
(B) Controlling the ON/OFF terminal from the output side,Recommend R2 value is 5.1k(0.1W).



7. Safety/EMC

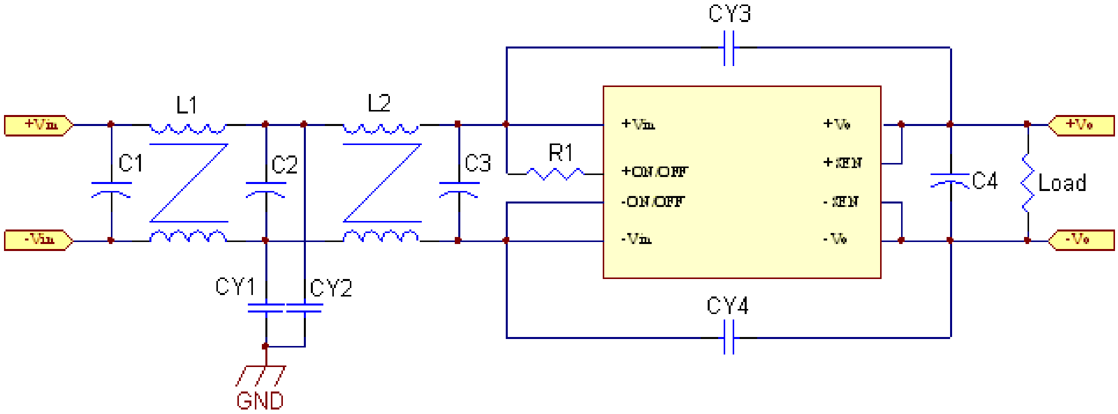
7.1 Input Fusing and Safety Considerations

The CFDF600 series converters have no internal fuse. In order to achieve maximum safety and system protection, always use an input line fuse. We recommended a 60A time delay fuse for 24V_{in} models, and 30A for 48V_{in} models. It is recommended that the circuit have a transient voltage suppressor diode (TVS) across the input terminal to protect the unit against surge or spike voltage and input reverse voltage (as shown).



7.2 EMC Considerations

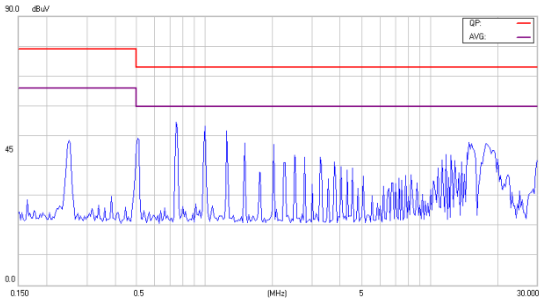
Suggested Circuits for Conducted EMI Class A



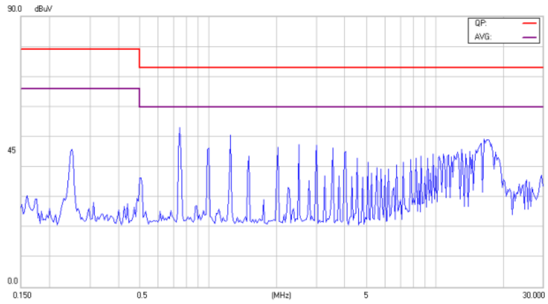
(1) EMI and conducted noise meet EN55032 Class A specifications:

Model No.	C1	C2	C3	CY1/CY2	CY3/CY4	C4	L1	L2	R1
CFDF600-24S12	1000uF/50V	2.2uF/100V	1000uF/50V	0.1uF	NC	470uF/100V+10uF/50V	Short	1mH	15K
CFDF600-24S24	1000uF/50V	2.2uF/100V	1000uF/50V	0.1uF	NC	470uF/100V+10uF/50V	Short	1mH	15K
CFDF600-24S28	1000uF/50V	2.2uF/100V	1000uF/50V	0.1uF	NC	470uF/100V+10uF/50V	Short	1mH	15K
CFDF600-24S32	1000uF/50V	2.2uF/100V	1000uF/50V	0.1uF	NC	470uF/100V+10uF/50V	Short	1mH	15K
CFDF600-24S48	1000uF/50V	2.2uF/100V	1000uF/50V	0.1uF	NC	470uF/100V+10uF/50V	Short	1mH	15K
CFDF600-48S12	NC	470uF/100V	470uF/100V	10000pF	10000pF*2	470uF/100V	Short	2mH	30K
CFDF600-48S24	NC	470uF/100V	470uF/100V	10000pF	10000pF*2	470uF/100V	Short	2mH	30K
CFDF700-48S28	NC	470uF/100V	470uF/100V	10000pF	10000pF*2	470uF/100V	Short	2mH	30K
CFDF600-48S32	NC	470uF/100V	470uF/100V	10000pF	10000pF*2	470uF/100V	Short	2mH	30K
CFDF600-48S48	NC	470uF/100V	470uF/100V	10000pF	10000pF*2	470uF/100V	Short	2mH	30K

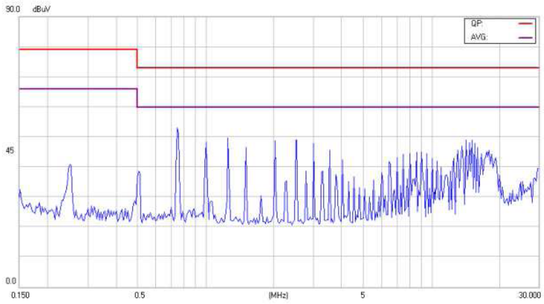
Note:1000uF/50V is NIPPON CHEMI-CON KY series aluminum capacitors, 470uF/100V is Nichicon PS(M) series aluminum capacitors, Y1, CY2, CY3/CY4 is Y1 capacitors, other capacitors is ceramic capacitors 2220 size.Inductor core material is VAC W523, 1mH is 1.2mm*2 6T, 2mH is 1.5mm*1 8T.I



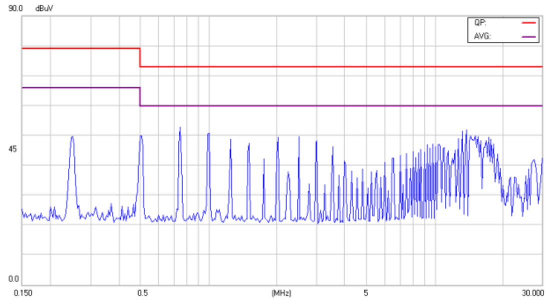
Conducted Class A of CFDF600-24S12



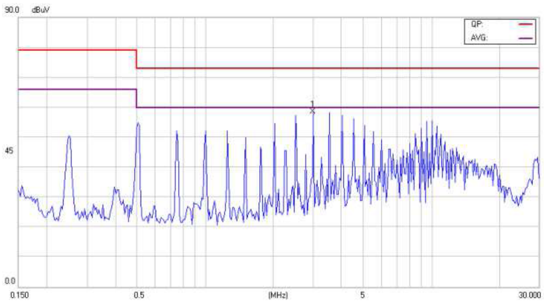
Conducted Class A of CFDF600-24S24



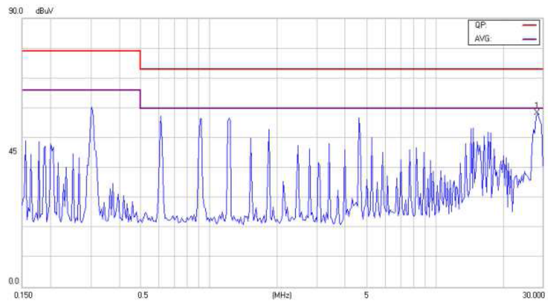
Conducted Class A of CFDF600-24S28



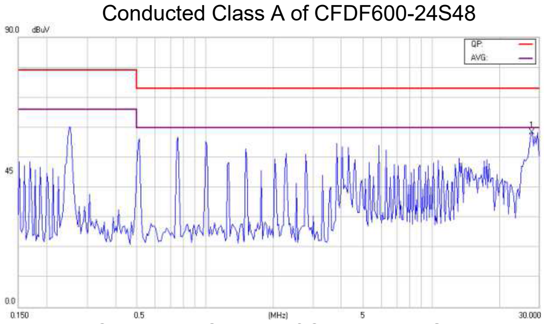
Conducted Class A of CFDF600-24S32



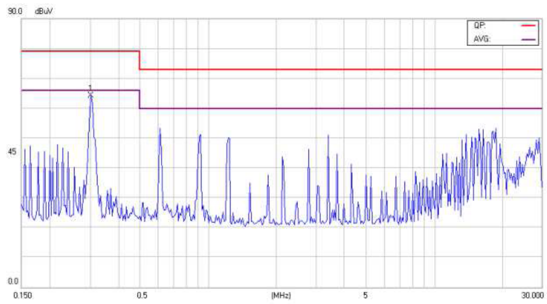
Conducted Class A of CFDF600-24S48



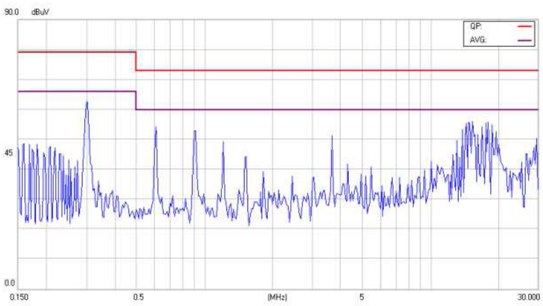
Conducted Class A of CFDF600-48S12



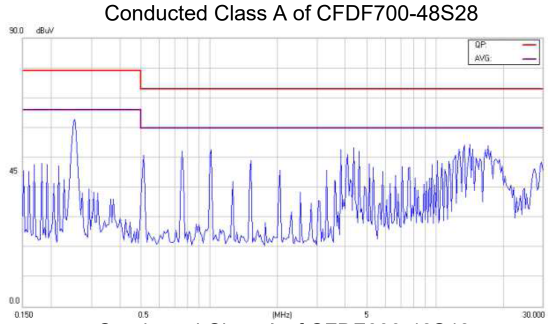
Conducted Class A of CFDF600-48S24



Conducted Class A of CFDF700-48S28



Conducted Class A of CFDF600-48S32



Conducted Class A of CFDF600-48S48

8. Part Number

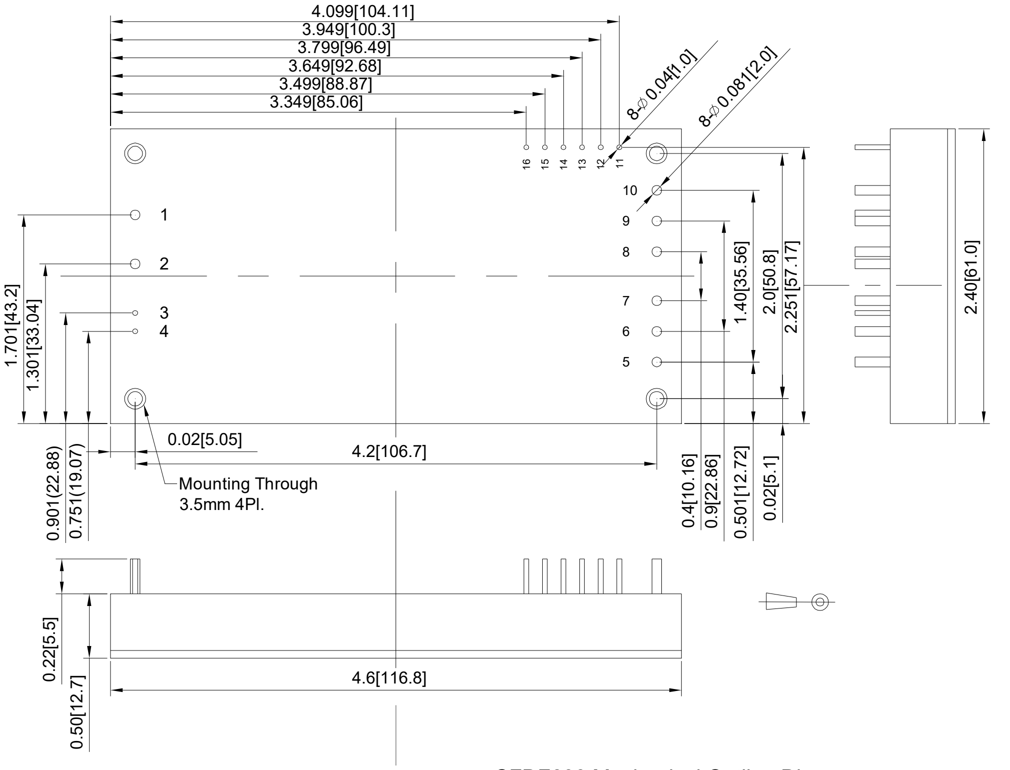
Format:CFDF600 – II X OO L

Parameter	Series	Nominal Input Voltage	Number of Outputs	Output Voltage	Remote ON/OFF Logic
Symbol	CFDF600	II	X	OO	L
Value	CFDF600 CFDF700	24: 24Volts 48: 48Volts	S:Single	12: 12 Volts 24: 24 Volts 28: 28 Volts 32: 32 Volts 48: 48 Volts	None: Negative P: Positive

9. Mechanical Specifications

9.1 Mechanical Outline Diagrams

All Dimensions In Inches(mm) Pin DIA
Tolerances Inches: .XX±0.02 .XXX±0.010 ±0.004
Millimeters: .X±0.5 .XX±0.25 ±0.1



PIN CONNECTIONS	
PIN NUMBER	FUNCTION
1	-Vin
2	+Vin
3	-On/Off
4	+On/Off
5-7	+Vo
8-10	-Vo
11	-S
12	+S
13	TRIM
14	PC/NC
15	IOG
16	AUX

CFDF600 Mechanical Outline Diagram

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