

SFS10 Series AC-DC Converter Compact Miniature Type



PCB mount type



Chassis mount type

Features

- UL, CB, CE Approved
- RoHS directive compliance
- Encapsulated, compact case
- High efficiency
- Universal input
- Surface mounting technology
- 132 kHz fixed frequency
- Fixed output voltage
- Thermal shutdown(IC-Temp: 130°C Min.)
- Low output ripple & noise
- Isolated input-output(3kVAC)
- Output short circuit protection
- Over voltage protection(O.V.P.)
- Over current protection(O.C.P.)
- Low no-load power consumption(0.5W Max.)
- 5Years warranty

Environmental

- Operating temperature range: -20°C~70°C
- Storage temperature range: -40°C~80°C
- Humidity: 20%~90%RH
- Vibration: 10-55Hz at 10G(98m/s²),
3minutes period, 60minutes each one X, Y
and Z axis
- Impact: 50G(490m/s²), 11ms, once each
- Cooling method: natural air convection

Safety

- UL (UL60950-1, CSA C 22.2 NO. 60950-1)
- UL No: E227474
- CE (EN 60950-1) / CB (IEC 60950-1)

Option

- Chassis mount type: Euro style terminal-block

Description

The SFS10 Series has universal AC input and there are 5 models with single output which are all available in two different pin assignments – PCB mount or Chassis mount. Super compact size with elegant design and high reliability are achieved. CEC compliant design shows high efficiency and low no-load power consumption. A limited EMI filter is included and an additional EMI filter to input side is required to meet CISPR22-B EMI Standard.

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Electrical specifications

INPUT	Voltage	AC85~264V (or DC 110~340V) 50/60Hz (note)
	Current	0.25A Max. @ 110VAC / 0.13A Max. @ 220VAC
	Frequency	47~440Hz Max. (50~60Hz typ.)
	Efficiency	76% Typ.
	Inrush current (at cold start)	20A Max. @ 120VAC. / 40A Max. @ 240VAC
	Leakage current	0.5mA Max. @ 110VAC / 0.75mA Max. @ 220VAC

OUTPUT	Voltage tolerance (accuracy)	±2% Max.
	Ripple and noise	±1% Typ.
	Line regulation	±1% Typ.
	Load regulation	±1% Typ.
	Dynamic load regulation	±3% Typ.
	Temperature regulation	±1% Typ.
	No-load power consumption	0.3W Max.
	Rising time	100ms Max.
	Hold up time	10ms Min.

Protection circuit

Over voltage protection	Clamp, 130~150%
Over current protection	Works at over 105% of rating & recovers automatically
Over temperature protection	PWM IC-Temperature 130°C Min. Latching, Recovering

Isolation specifications

Isolation Resistance	DC 500V, 100MΩ Min.
Input-Output Isolation Voltage	AC 3KV, 1minute, 10mA.

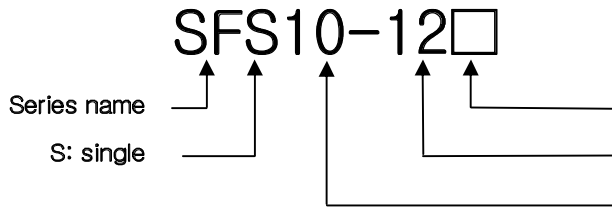
General specifications

Switching frequency	132kHz
Calculated MTBF	4.5*10 ⁵ hrs
Weight	80g or less

NOTE: For cases that conform various safety specifications(UL, CSA, CE, CB etc). It require input voltage and frequency range will be 100~240Vac, 50~60Hz.

SFS10 Series AC-DC Converter Compact Miniature Type

Ordering information



If chassis mount type, 'C' added
Output voltage
Output power

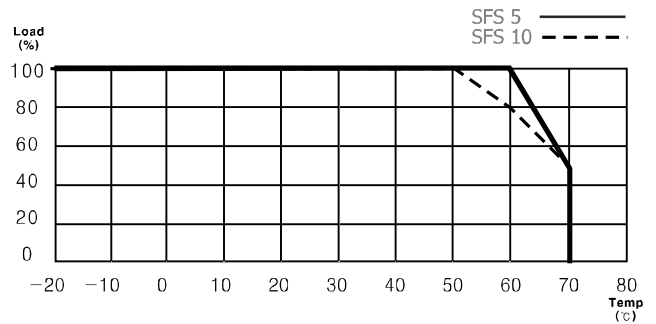
Input	Output	Maximum power	Ripple & Noise	Efficiency typical	Model number
AC85~264V or DC110~340V	3.3V@2.5A	8.25W	80mVp-p	70%	SFS10-3R3
	5V@2.0A	10W	80mVp-p	76%	SFS10-5
	12V@0.83A	10W	120mVp-p	77%	SFS10-12
	15V@0.66A	10W	150mVp-p	78%	SFS10-15
	24V@0.42A	10W	200mVp-p	80%	SFS10-24

Pin assignments

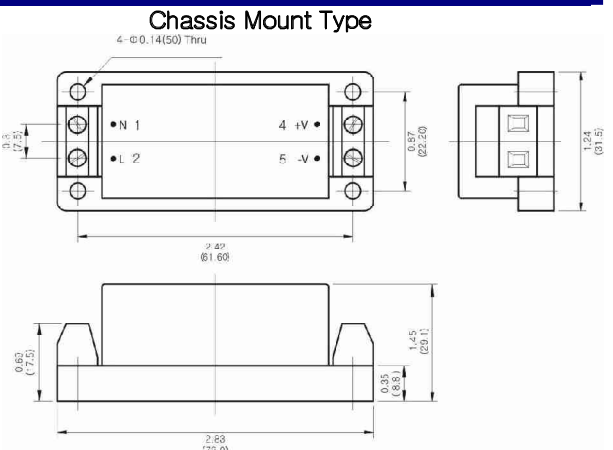
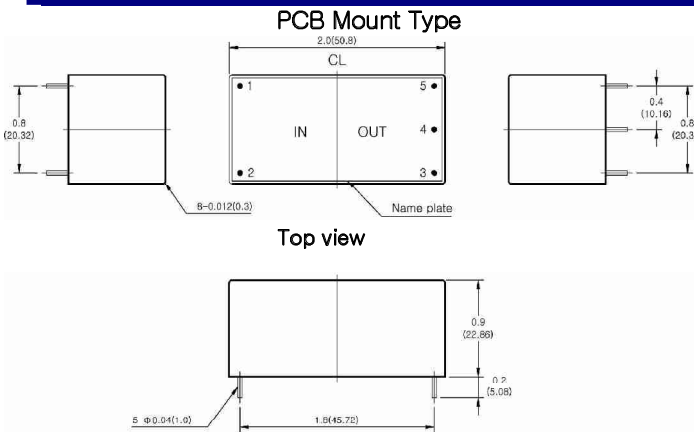
Single output

1. AC(N)
2. AC(L)
3. No pin
4. -V
5. +V

Derating curve



Dimensions



NOTES

1. All dimensions are inches(mm).
2. Weight : 70g or less
3. Case material : PBT, 94V-0 Rated
4. Construction : encapsulated, Soft Pot

NOTES

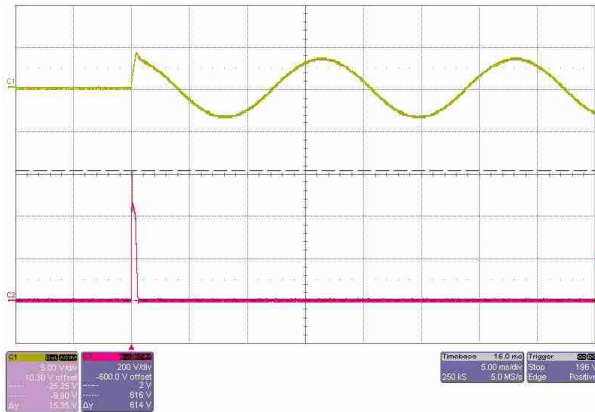
1. All dimensions are inches(mm).
2. Weight : 80g or less
3. Case material : PBT, 94V-0 Rated
4. Construction : encapsulated, Soft Pot

SFS10 Series AC-DC Converter Compact Miniature Type

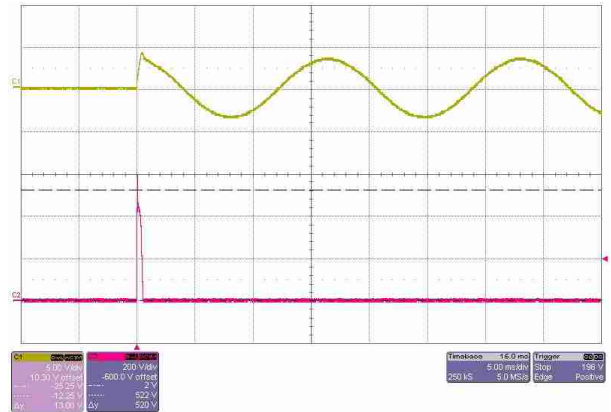
Inrush Current

TEST CONDITION

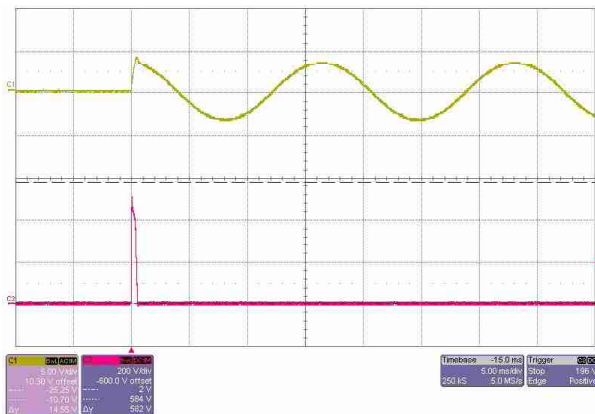
- 240Vac input
- Full load output
- PHASE 90° input start, current measure



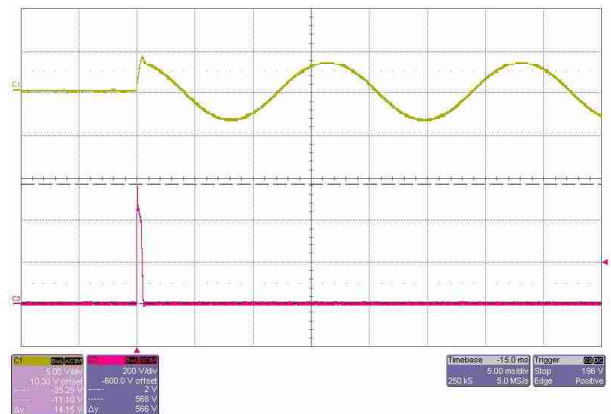
SFS10-3R3 31A



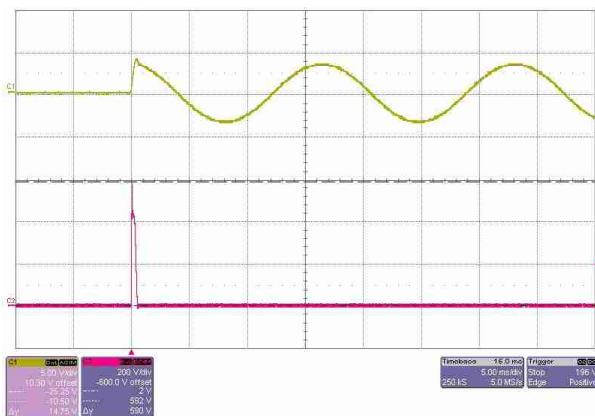
SFS10-5 30A



SFS10-12 29A



SFS10-15 28A



SFS10-24 30A

Inrush current concerns wrong to fuse, input rectifier, power-switch, circuit break and parts. It degrades the another circuit voltage and occurs system error. If you defuse inrush current.

You add NTC or Inrush current limiter to external circuit.

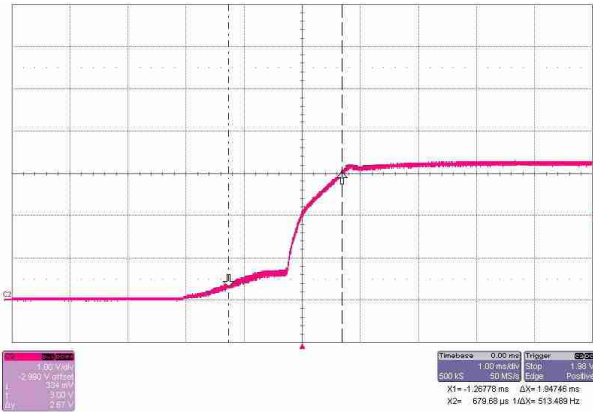
High rating voltage input

Max20A @ 120Vac

Max40A @ 240Vac

SFS10 Series AC-DC Converter Compact Miniature Type

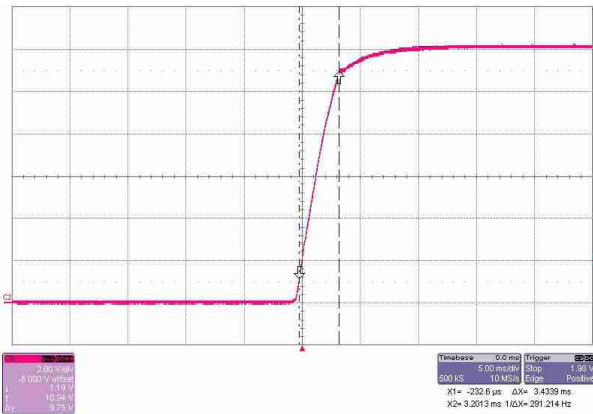
Rising Time	
TEST CONDITION	<ul style="list-style-type: none"> - 220Vac Input - Full Load Output - Output Voltage 10% ~ 90% Rising Time Measure



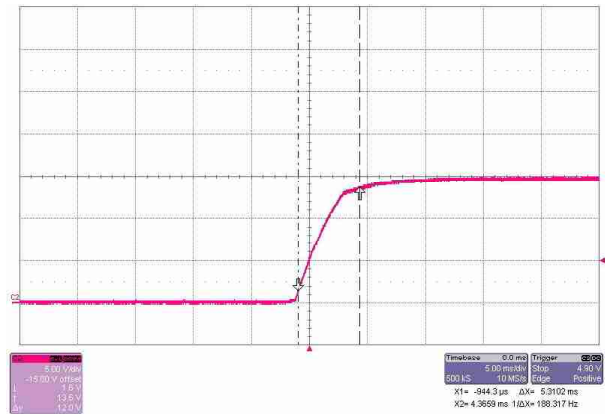
SFS10-3R3 1.95mS



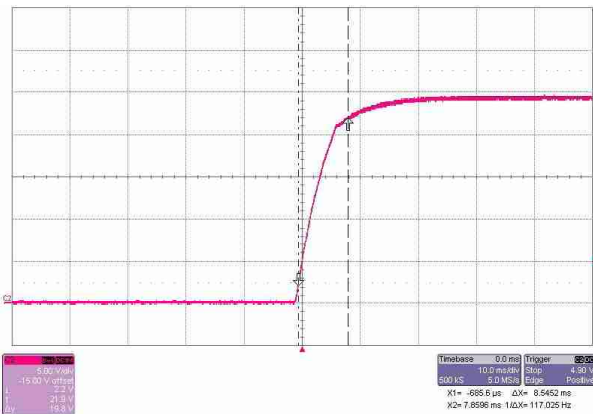
SFS10-5 1.57mS



SFS10-12 3.43mS



SFS10-15 5.31mS



SFS10-24 8.55mS

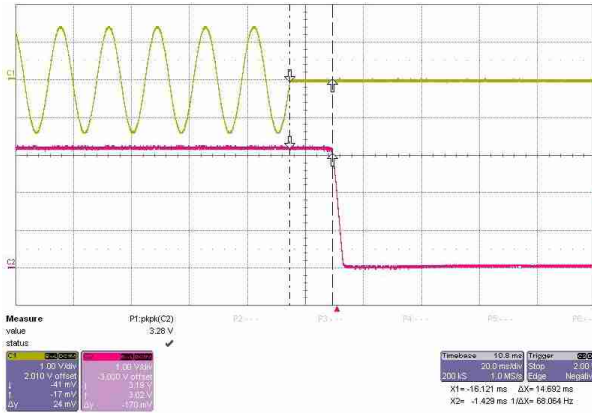
Max 100ms between output voltage 0%~90%

SFS10 Series AC-DC Converter Compact Miniature Type

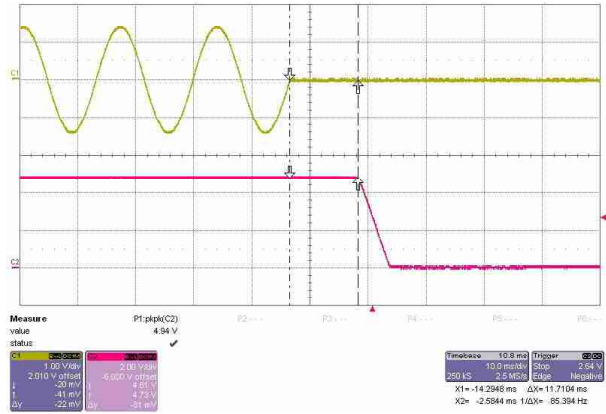
Hold up Time

TEST CONDITION

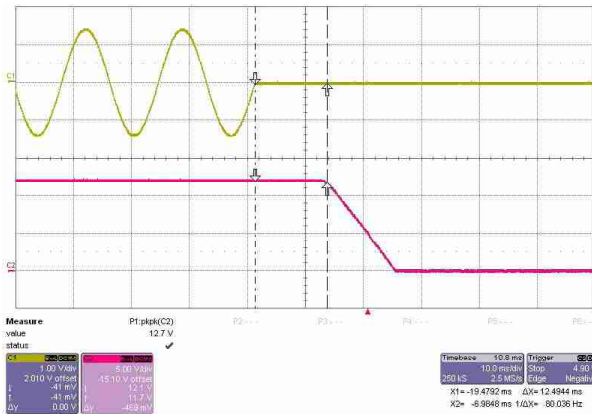
- 100Vac Input
- Full Load Output
- When Input off Phase 0° or 360°, Output Voltage off Time Measure



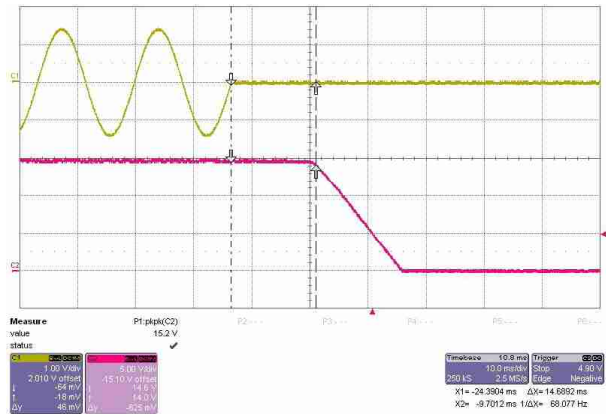
SFS10-3R3 14.7mS



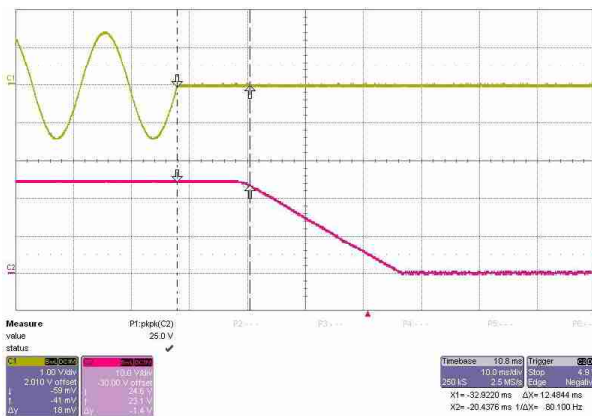
SFS10-5 11.7mS



SFS10-12 12.5mS



SFS10-15 14.7mS



SFS10-24 12.5mS

The amount of time that a power supply's output-voltage remains within the specified-voltage ranges after it's input voltage interrupts.

Low rating voltage

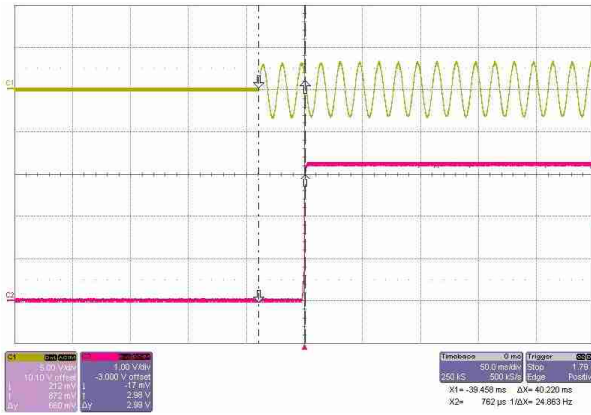
Min10ms @100Vac

SFS10 Series AC-DC Converter Compact Miniature Type

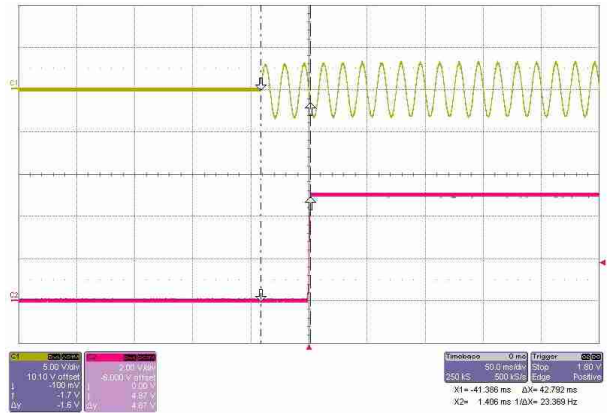
Start up Time

TEST CONDITION

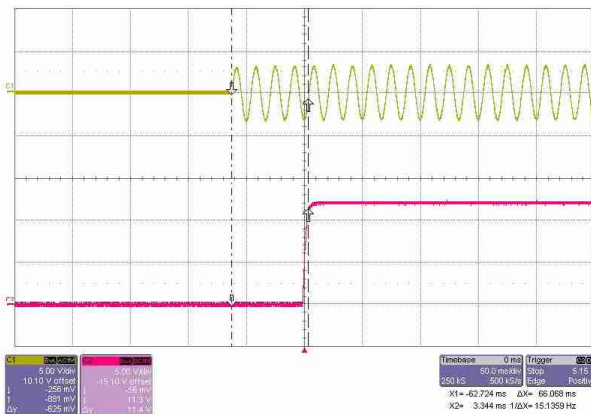
- 220Vac Input
- Full Load Output
- When Input on Phase 360°, Output Voltage 100% rise Time Measure



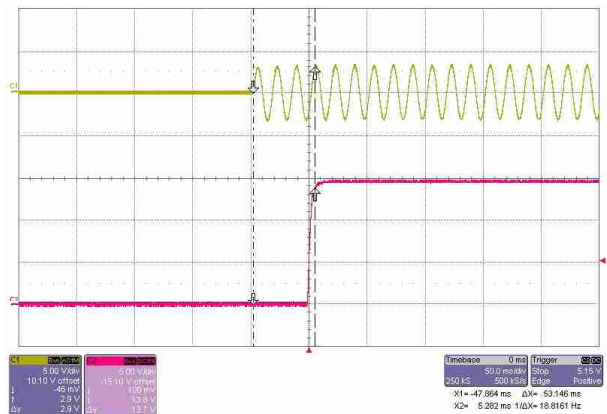
SFS10-3R3 40.2mS



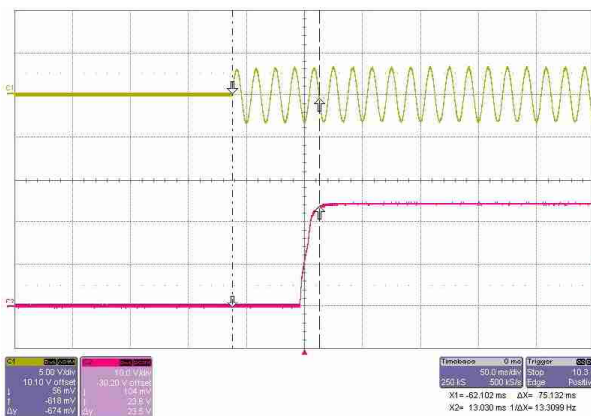
SFS10-5 42.8mS



SFS10-12 66.1mS



SFS10-15 53.2mS



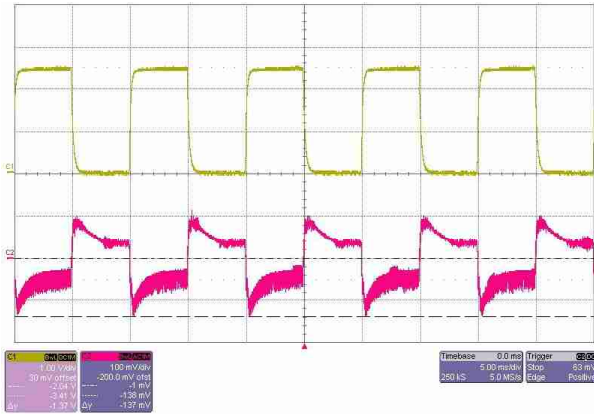
SFS10-24 75.1mS

Amount of delay time and rise time. After input-voltage injects.

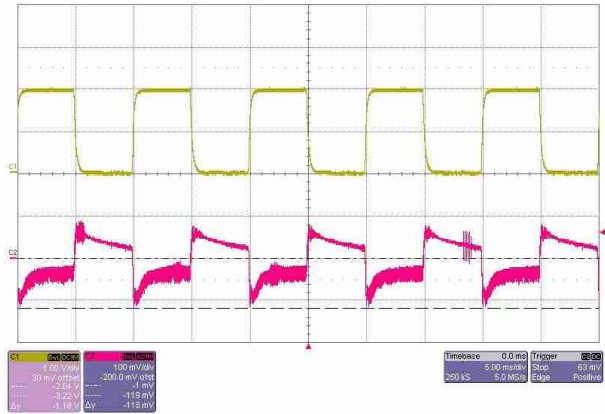
SFS10 Series AC-DC Converter Compact Miniature Type

Dynamic Load Regulation

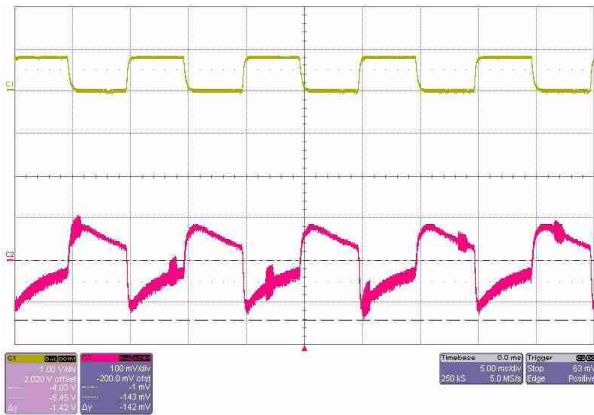
TEST CONDITION	- 220Vac Input - 0% Load ~ 100% Load Output - Freq. : 100Hz , - Duty : 0.5
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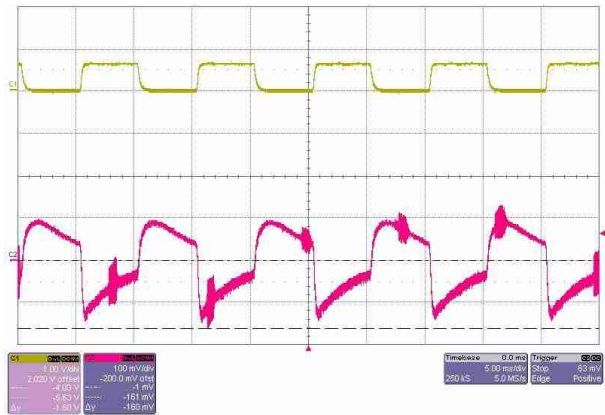
SFS10-3R3 137mV



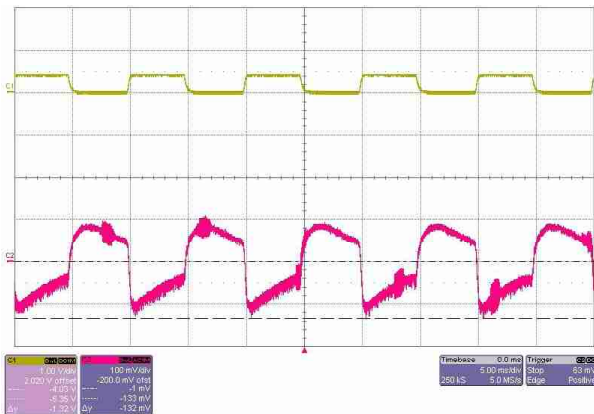
SFS10-5 118mV



SFS10-12 142mV



SFS10-15 160mV



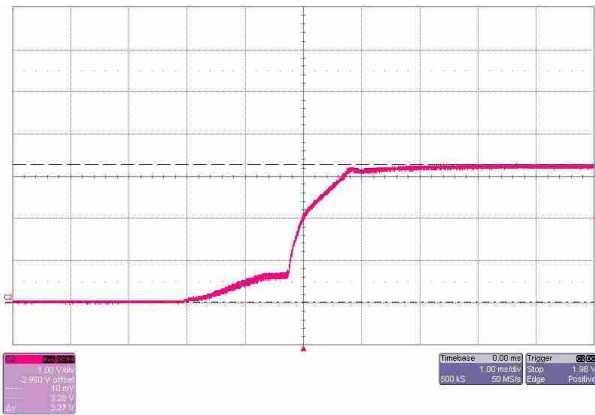
SFS10-24 132mV

Considerate slew rate and frequency within $\pm 3\%$ output voltage value. Except SFS10-3R3 is within $\pm 5\%$ output voltage value.

SFS10 Series AC-DC Converter Compact Miniature Type

Over Shoot

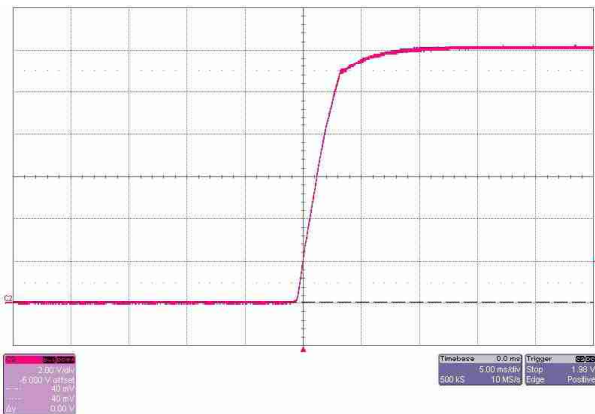
TEST CONDITION	<ul style="list-style-type: none"> - 220Vac Input - Full Load Output
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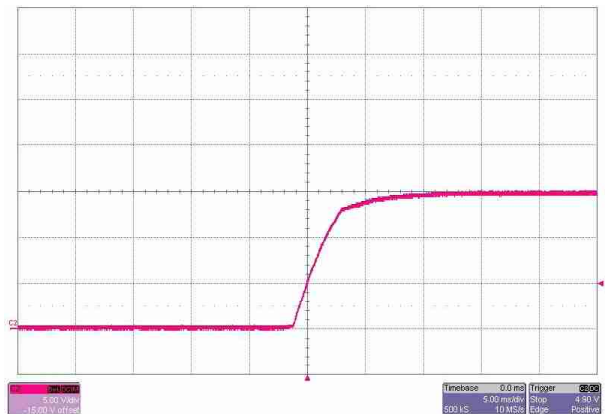
SFS10-3R3 0V



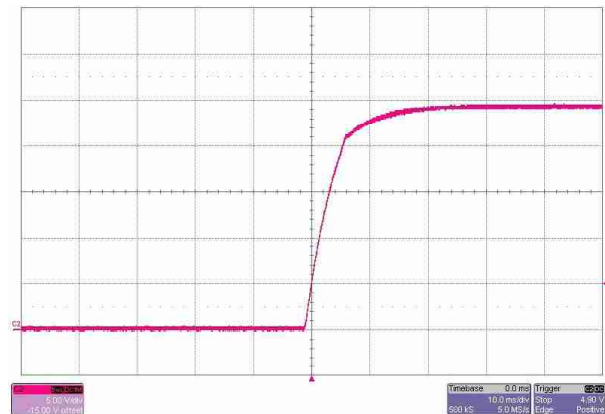
SFS10-5 70mV



SFS10-12 0V



SFS10-15 0V



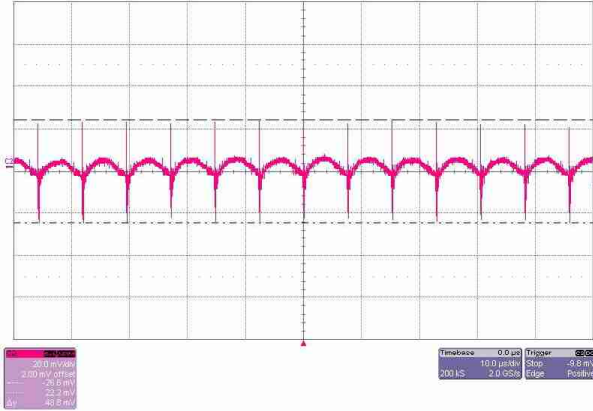
SFS10-24 0V

When turn-on, the output overshoot voltage shall not exceed 5% of normal Voltage value no Load or full Load connected.

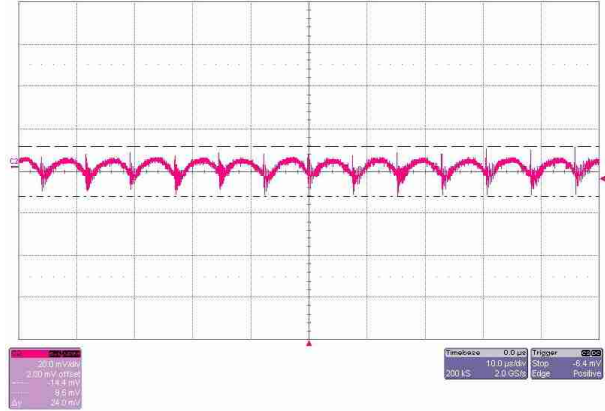
SFS10 Series AC-DC Converter Compact Miniature Type

Output Ripple & Noise

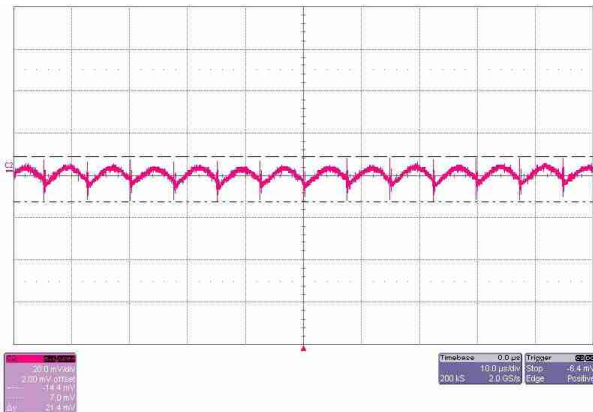
TEST CONDITION	<ul style="list-style-type: none"> - 220Vac Input - Full Load Output - Ele-cap(47uF)and Ceramic-cap(104), Output Terminal
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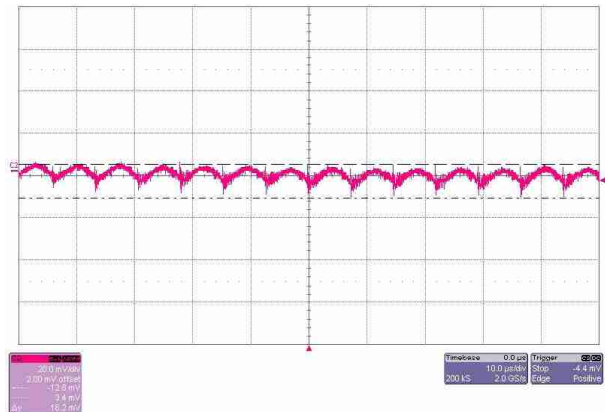
SFS10-3R3 48.8mVpp



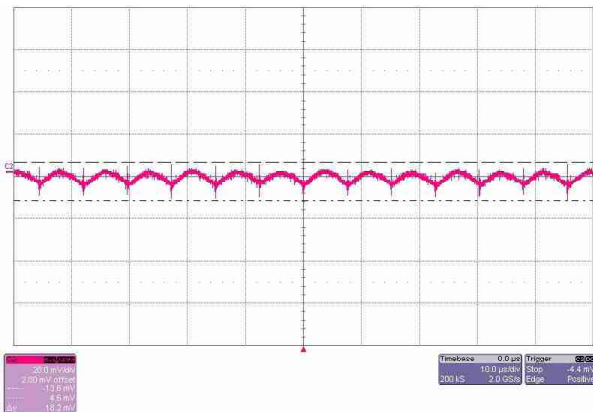
SFS10-5 24.0mVpp



SFS10-12 21.4mVpp



SFS10-15 16.2mVpp



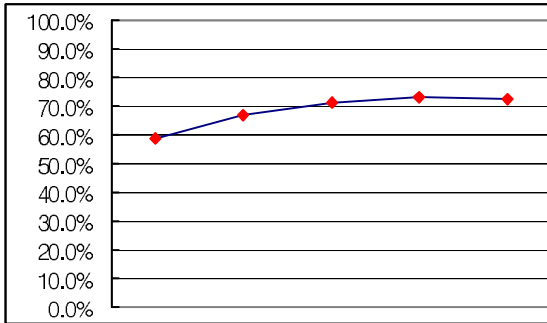
SFS10-24 18.2mVpp

*Ripple & Noise: Oscilloscope bandwidth 20MHz.

The length of the output line should be shorter than 1meter and it needs to be twisted.

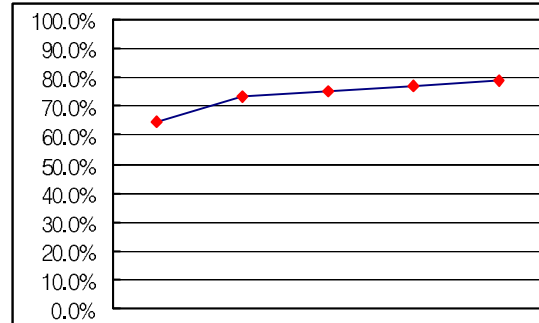
SFS10 Series AC-DC Converter Compact Miniature Type

Efficiency Curve(Load Variation)



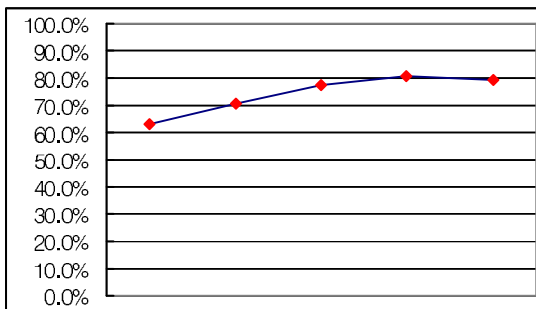
Load(%)	10	25	50	75	100
Eff(%)	58.6	66.8	71.1	72.9	72.6

SFS10-3R3 / 3.3V 2.5A



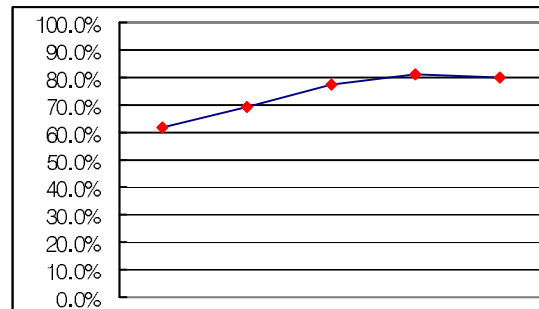
Load(%)	10	25	50	75	100
Eff(%)	64.5	73.1	74.9	77.2	78.8

SFS10-5 / 5V 2.0A



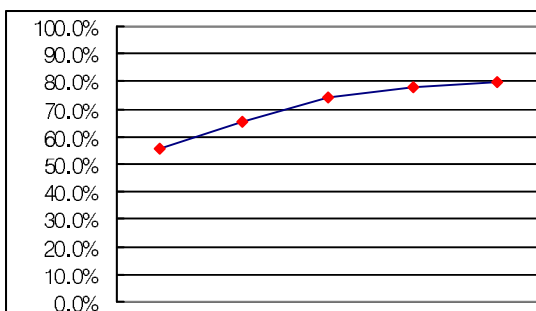
Load(%)	10	25	50	75	100
Eff(%)	62.9	70.5	77.7	80.5	79.3

SFS10-12 / 12V 0.83A



Load(%)	10	25	50	75	100
Eff(%)	61.7	69.4	77.2	81.5	80.3

SFS10-15 / 15V 0.66A



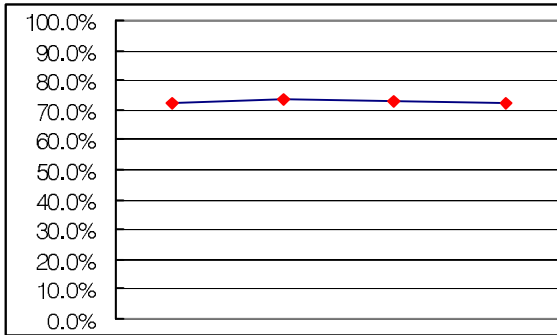
Load(%)	10	25	50	75	100
Eff(%)	55.3	65.6	74.1	77.8	79.7

SFS10-24 / 24V 0.42A

Input 220Vac, Variation of efficiency, from minimum load to maximum load.

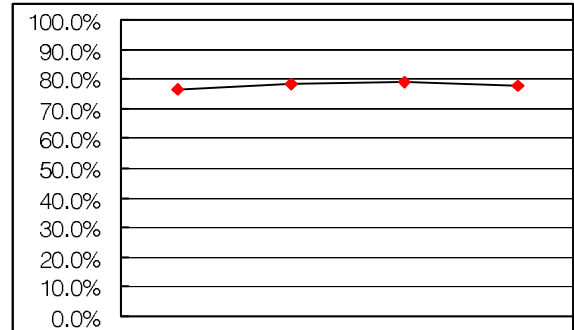
SFS10 Series AC-DC Converter Compact Miniature Type

Efficiency Curve(Input Voltage Variation)



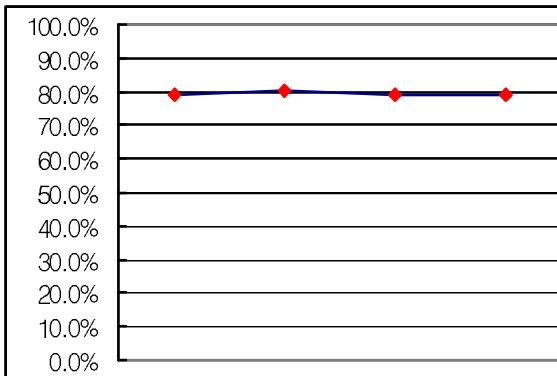
V in(V)	85	110	220	264
Eff(%)	72.5	73.7	73.0	72.1

SFS10-3R3 / 3.3V 2.5A



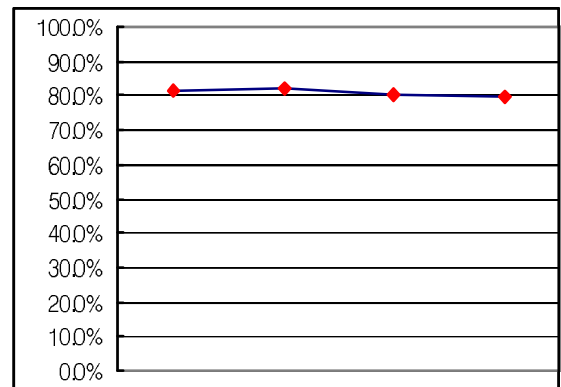
V in(V)	85	110	220	264
Eff(%)	76.5	78.2	78.8	77.7

SFS10-5 / 5V 2.0A



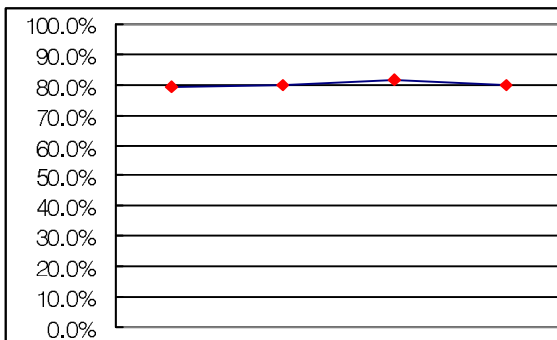
V in(V)	85	110	220	264
Eff(%)	79.0	80.3	79.4	79.1

SFS10-12 / 12V 0.83A



V in(V)	85	110	220	264
Eff(%)	81.2	82.3	80.3	79.4

SFS10-15 / 15V 0.66A



V in(V)	85	110	220	264
Eff(%)	79.4	79.8	81.9	80.0

SFS10-24 / 24V 0.42A

Variation of Efficiency, from Minimum input
 Voltage to Maximum input Voltage

SFS10 Series AC-DC Converter Compact Miniature Type

No-Load Power Consumption

No load power consumption is the power used by a device, when it is disconnected from it's load and performing no function. SFS10 series are very low no-load power consumption (single output).

RATED OUTPUT POWER	NO-LOAD POWER CONSUMPTION		
	PHASE 1 01.01.2001	PHASE 2 01.01.2003	PHASE 3 01.01.2005
$\geq 0.3\text{W}$ and $< 15\text{W}$	1.0W	0.75W	0.3W
$\geq 15\text{W}$ and $< 50\text{W}$	1.0W	0.75W	0.5W
$\geq 50\text{W}$ and $< 75\text{W}$	1.0W	0.75W	0.75W

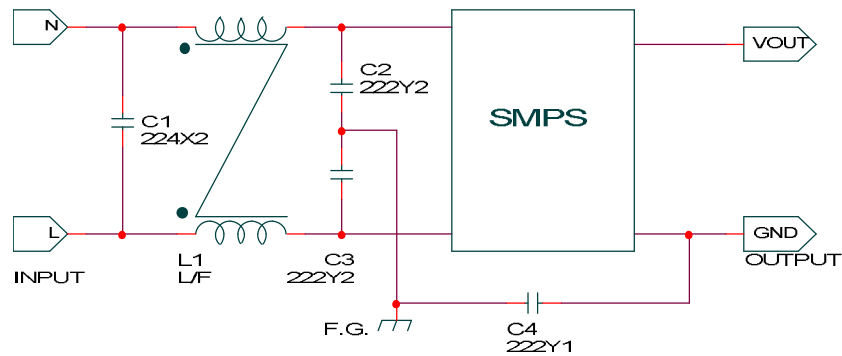
Source : European commission code of conduct on efficiency of external power supplies(06.15.2000)

SFS10 Series AC-DC Converter Compact Miniature Type

Electro Magnetic Interference Application.

SFS10 Series is needs to reduce Electromagnetic Interference, use the external L-C noise filter at the input of the Converter.

1. Configuration



2. Components

L1 = 10~30mH Common Mode Line Filter

C1 = 220nF X2 Capacitor

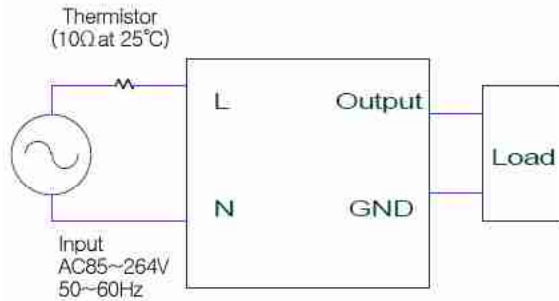
C2,C3 = 2200pF Y2 Capacitor

C4 = 2200pF Y1 Capacitor

SFS10 Series AC-DC Converter Compact Miniature Type

Instruction manual

1. Basic connection



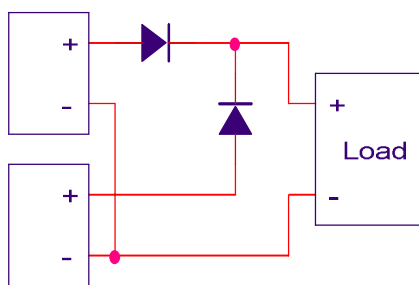
NOTE: To avoid excessive voltage drop and for improved noise, short and thick wire should be used to connect the load. Length below 50cm & wire thickness of 4.0A/mm² are recommended for reducing wire loss when wire connection is necessary.

To protect large input inrush current, a thermistor should be used at the input line of the converter (10D-9)

2. Parallel Operation

This supply can be operated the following ways.

Choose a diode in accordance with voltage, power dissipation and heat radiation.



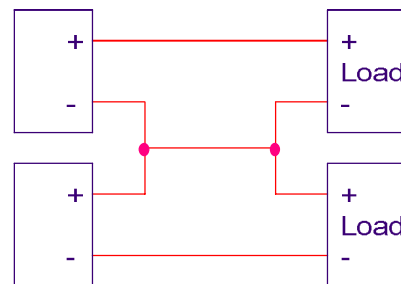
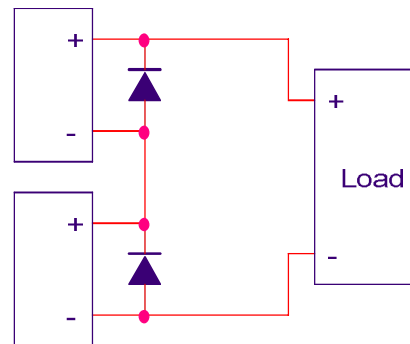
- Voltage : $V > V_o \times 3$
- Current : $I > I_o \times 3$
- Design a proper heat sink according to power loss at diode ($P_w = V_f \times I_o$)

- Use a schottky or fast recovery diode this has a low V_f .

3. Series Operation

Choose a diode in accordance with voltage, power dissipation and heat radiation.

- Voltage : $V > V_o \times 3$
- Current : $I > I_o \times 3$
- Design a proper heat sink according to power loss at diode ($P_w = V_f \times I_o$).
- Use a schottky or fast recovery diode this has a low V_f .



4. Over Current Protection

The FS10 Series is equipped with an over current protection circuit. When the short or overload condition is removed, the output will automatically recover. This setting is fixed and cannot be varied externally. If the short or overload condition continues, the power module could be damaged due to the heat condition.

SFS10 Series AC-DC Converter Compact Miniature Type

Instruction manual

13. Block Diagrams

Circuit topology : Flyback

Switching frequency : 132KHz(fixed)

