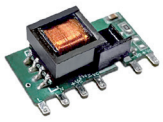
3ACFE1W_3.1 series

3W - AC-DC converter



AC-DC Converter 3 Watt

- Input voltage range 85-305VAC/70-430VDC
- No load power consumption ≤0.15W
- Up to 79% efficiency
- Switching frequency 65kHz
- Operating temperature from -40°C to +85°C
- 3100VAC isolation
- Short circuit protection (SCP) & over current protection
- Altitude during operating 5000m (max.)
- Meets IEC62368/UL62368 and EN62368 test standards
- Mini size open-frame, industrial level design
- PCB SIP mounting
- 4.5mm creepage distance and clearance distance

Introducing our compact power supply 3ACFE1W_3.1 series. Mini size & open-frame AC-DC power supplies with global adapted input voltage range both AC & DC available, low ripple, low temperature rise, low standby power consumption, high efficiency, high reliability, safety isolated and good EMC performance. This series of products can be widely used in the fields of Electric power, Industry, Instrument and Smart household devices, etc. The additional circuit diagram for EMC is recommended in this data sheet for the application with higher EMC requirement.

SHORT CIRCUIT PROTECTED SCP

100% RoHS compliant

c UL us
UL62368 - E518940

Common specifications

Short circuit protection	Full input voltage range - Continuous, self-recovery Hiccup
Over current protection	Input 220VAC - ≥110% Io self-recovery - Hiccup
Switching frequency	65 kHz
Operating temperature	-40°C - +85°C (with derating)
Storage temperature	-40°C - +110°C
Soldering temperature	Wave soldering 260°C (±4°C), time 5-10s Manual soldering 360°C (±8°C), time 4-7S
Relative humidity	10~90% RH
Hot plug	NA
Remote control	NA
Safety standard	EN62368, IEC62368
Vibration	10-55Hz, 10G, 30 Min, along X, Y, Z
Safety standard	CLASS II
MTBF (MIL-HDBK-217F@25°C)	>1,000,000 Hours
Dimensions	26.40 x 15.40 x 11.25 mm
Product weight	4g (typ.)

Input specifications

Item	Operating condition	Min	Typ	Max	Units
Input voltage range	AC input DC input	85 70	220 310	305 430	VAC VDC
Input frequency range		47	50	63	Hz
Input current	115VAC 220VAC			0.10 0.07	A
Surge current	115VAC 220VAC			22 24	A
No load power consumption	115VAC 220VAC			0.30	W
Leakage current	0.5 mA typ. @230VAC/50Hz				
Recommended external fuse	1A/300VAC Time-delay fuse				

Output specifications

Item	Operating condition	Min	Typ	Max	Units
Voltage accuracy	Full input voltage range, 10-100% load (the unit can work stably at <10% load)		±2.0	±6.0	%
Line regulation	Rated load - Vo1		±1.0	±2.0	%
Load regulation	Rated input voltage, 20%~100% load - Vo1		±1.0	±3.0	%
Minimum load	Single Output	10			%
Turn-on delay time	Input 115VAC (full load) Input 220VAC (full load)			1000	mS
Power-off holding time	Input 115VAC (full load) Input 220VAC (full load)		50 80		mS
Dynamic response	Overshoot range 25%~50%~25% Recovery time 50%~75%~50%	-5.0 -5.0		+5.0 +5.0	% mS
Output overshoot	Full input voltage range		≤10%Vo		%
Drift coefficient			±0.03%		%/°C
Ripple & noise			50	100	mV

Isolation specifications

Item	Operating Conditions	Min	Typ	Max	Units
Isolation voltage	I/P-O/P - Dielectric test 1min, leakage current≤5mA	3100			VAC
Insulation resistance	I/P-O/P @ DC500V	100			MΩ

1. The products should be used according to the specifications in this datasheet, otherwise it could be permanently damaged.
2. A fuse should be connected at input/ It is not recommended to connect the power supply outputs in parallel to achieve a bigger power output.
3. The product performance in this datasheet cannot be guaranteed if it works at a lower load than the minimum load defined.
4. The product performance in this datasheet cannot be guaranteed if it works at over-load condition.
5. Unless otherwise specified, all values or indicators in this datasheet are tested at Ta = 25°C, humidity <75%RH, rated input voltage and rated load
6. All values or indicators in this datasheet had been tested based on GAPTEC test specifications.
7. The specifications are specially for the parts listed in this datasheet, any other non-standard model performances could be out of the specifications. Please contact our technician for specific requirements.

Example:
3ACFE1W_05S3.1
3 = 3Watt; AC = AC-DC; F = Open Frame; E1 = Cost effective;
W = Wide input; 05 = 5Vout; S = Single output; 3.1 = 3.1 kVAC isolation

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EMC specifications					
EMC	EMI	CE	CISPR32/EN55032	CLASS B (with the Recommended Circuit 2-3)	
EMC	EMI	RE	CISPR32/EN55032	CLASS B (with the Recommended Circuit 2-3)	
EMC	EMS	RS	IEC/EN61000-4-3	10V/m	Perf. Criteria B (with the Recommended Circuit 2-3)
EMC	EMS	CS	IEC/EN61000-4-6	3Vr.m.s	Perf. Criteria B (with the Recommended Circuit 2-3)
EMC	EMS	ESD	IEC/EN61000-4-2	Contact ±6kV / Air ±8kV	Perf. Criteria B (with the Recommended Circuit 2-3)
EMC	EMS	Surge	IEC/EN61000-4-5	Line to line ±2kV	Perf. Criteria B (with the Recommended Circuit 2-3)
EMC	EMS	EFT	IEC/EN61000-4-4	±4kV	Perf. Criteria B (with the Recommended Circuit 2-3)
EMC	EMS	Voltage dips and interruptions	IEC/EN61000-4-11	0%~70%	Perf. Criteria B

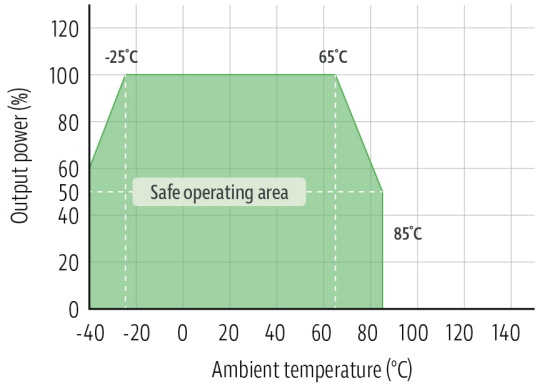
Product Selection Guide

Approval	Part number	Output Power (W)	Output Voltage 1 Vo1 (V)	Output Current 1 Io1 (mA)	Output Voltage 2 Vo2 (V)	Output Current 2 Io2 (mA)	Max. Capacitive Load (uF)	Ripple & Noise 20MHz (Max)	Efficiency Full Load, 220VAC Typ. (%)
UL	3ACFE1W_03S3.1	2	3.3	600	-	-	3000	100	69
UL	3ACFE1W_05S3.1	3	5	600	-	-	3000	100	73
UL	3ACFE1W_7.5S3.1	3	7.5	400	-	-	500	100	75
UL	3ACFE1W_09S3.1	3	9	333	-	-	330	100	75
UL	3ACFE1W_12S3.1	3	12	250	-	-	330	100	75
UL	3ACFE1W_15S3.1	3	15	200	-	-	330	100	75
UL	3ACFE1W_24S3.1	3	24	125	-	-	330	100	78

Note
1. The ripple and noise are tested by the twisted pair method, please refer to the following test instructions.
2. The typical value of efficiency is based on the product tested after half an hour burn-in at full load.
3. The full load efficiency should be in ±2% of the typical value in this table. The efficiency is calculated by the way that the full output power is divided by the input power.

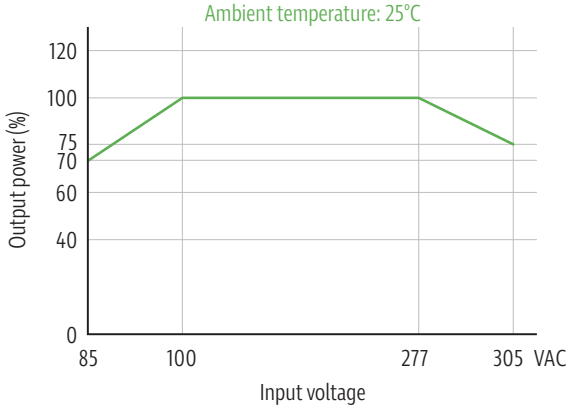
Product characteristic curve

Temperature derating graph

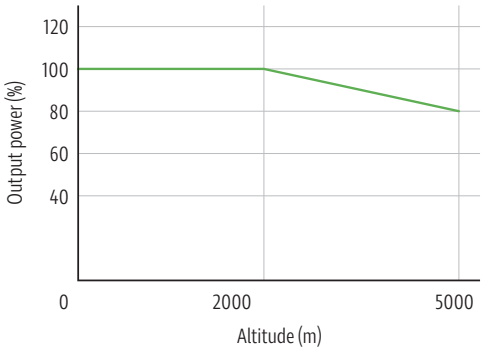


Input voltage derating curve

Ambient temperature: 25°C

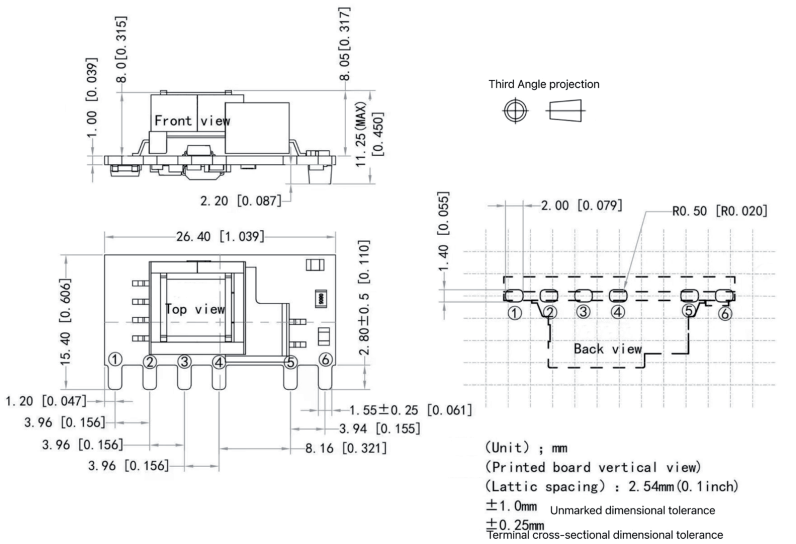


Altitude derating curve



Note
1: The output power should be derated based on the input voltage derating graph at 85~100VAC/277~305VAC and 70~140VDC/ 390~430VDC.
2: This product should operate at a natural air condition, please contact us if it need be used at a closed space.

Dimensions and recommended layout



Pin	1	2	3	4	5	6
Function	L (Input)	N (Input)	Vcap+	Vcap-	Vout-	Vout+

Typical application circuit

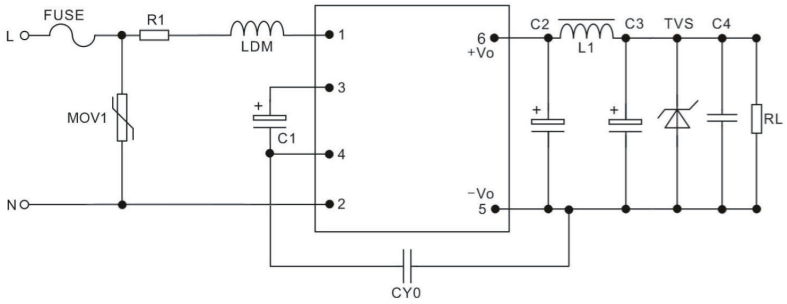


Figure - Circuit 1

Part number	C2 (* Solid-state capacitor)	L1 (*)	C3 (*Solid-state capacitor)	C4	LDM	R1 (*)	CY0	FUSE (*)	TVS
3ACFE1W_03S3.1	220uF/10V	2.0uH	220uF/10V	0.1uF/50V	1.2mH/0.2A	12Ω/3W (Wire-wound resistor)	Y1/102M/400V	1A/300V, Time-delay fuse	SMBJ7.0A
3ACFE1W_05S3.1	220uF/10V	2.0uH	220uF/10V	0.1uF/50V	1.2mH/0.2A	12Ω/3W (Wire-wound resistor)	Y1/102M/400V	1A/300V, Time-delay fuse	SMBJ7.0A
3ACFE1W_09S3.1	220uF/16V	2.0uH	68uF/16V	0.1uF/50V	1.2mH/0.2A	12Ω/3W (Wire-wound resistor)	Y1/102M/400V	1A/300V, Time-delay fuse	SMBJ12A
3ACFE1W_12S3.1	220uF/16V	2.0uH	68uF/16V	0.1uF/50V	1.2mH/0.2A	12Ω/3W (Wire-wound resistor)	Y1/102M/400V	1A/300V, Time-delay fuse	SMBJ20A
3ACFE1W_15S3.1	220uF/35V	2.0uH	68uF/35V	0.1uF/50V	1.2mH/0.2A	12Ω/3W (Wire-wound resistor)	Y1/102M/400V	1A/300V, Time-delay fuse	SMBJ20A
3ACFE1W_24S3.1	68uF/35V	2.0uH	47uF/35V	0.1uF/50V	1.2mH/0.2A	12Ω/3W (Wire-wound resistor)	Y1/102M/400V	1A/300V, Time-delay fuse	SMBJ30A

C1 (*)	Operating Condition
10uF/450V	Input 85-305VAC, -25°C~85°C Input 165-305VAC, -40°C~85°C
22uF/450V	Input 85-305VAC, -40°C~85°C

Note:
1 - * marked component is necessary for the application, not optional.
2 - C1 will work as the input filter at AC input, and the EMC filter at DC input, an electrolytic capacitor is recommended with ripple current >200mA@100KHz.
3 - 14D561K/4500A is recommended for MOV1.

Recommended circuits diagrams for high EMC requirements

Basic application

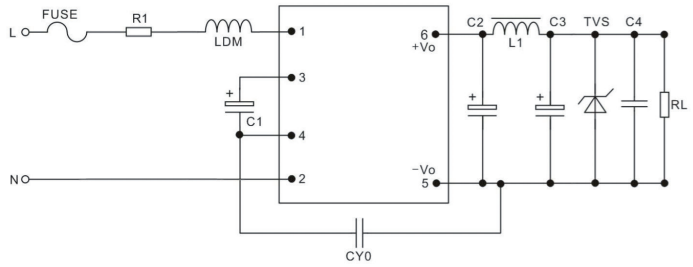


Figure - Circuit 2/1

Application Environment	Ambient Temperature	EMS Level	EMI Class
Basic Applications	-40°C ~ +85°C	3	Class A

Component	Recommend Value
FUSE (Necessary)	1A/300V, Time-delay fuse
R1 (Wire-wound resistor, necessary)	12Ω/3W
LDM	1.2mH/4Ω Max/0.2A Min

Note: Wire-wound resistor is recommended for R1 as the input plug-in resistor, SMD resistor or a carbon film resistor is not available for the application.

Recommended circuit for indoor household normal environment

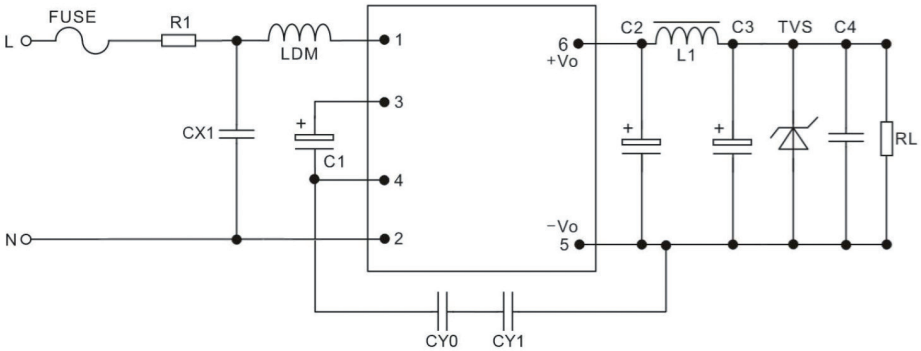


Figure - Circuit 2/2

Application Environment	Ambient Temperature	EMS Level	EMI Class
Indoor household Normal	-25°C ~ +55°C	3	Class B

Component	Recommended Value
FUSE (Necessary)	1A/300V, Time-delay fuse
R1 (Wire-wound resistor, necessary)	12Ω/3W
CX1	X2/104K/310VAC
LDM	1.2mH/4Ω Max/0.2A Min

Note:

1: 2 x Y capacitors (CY0 & CY1, 2.2nF/250VAC recommended) are needed for household application which is compliant with IEC60335.
2: A <3.8MΩ bleeder resistor is recommended to connect in parallel with X capacitor to meet certificate requirement, the resistor value can be defined according to the actual test situation.
3: Wire-wound resistor is recommended for R1 as the input plug-in resistor, SMD resistor or a carbon film resistor is not available for the application.

Recommended circuit for indoor industrial environment

Basic application

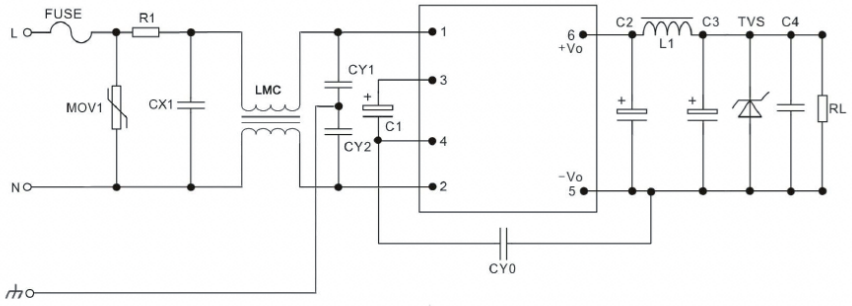


Figure - Circuit 2-3

Application Environment	Ambient Temperature	EMS Level	EMI Class
Indoor Industry	-25°C ~ +55°C	4	Class B

Component	Recommended Value
FUSE (Necessary)	1A/300V, Time-delay fuse
MOV1	14D561K/4500A
R1 (Wire-wound resistor, necessary)	12Ω/3W
CX1	X2/104K/310VAC
LMC	30mH/0.3A
CY1, CY2	Y1/102M/400VAC

Note: 1: A <3.8MΩ bleeder resistor is recommended to connect in parallel with X capacitor to meet certificate requirement, the resistor value can be defined according to the actual test situation.
2: Wire-wound resistor is recommended for R1 as the input plug-in resistor, SMD resistor or a carbon film resistor is not available for the application.

Recommended circuit for outdoor normal environment

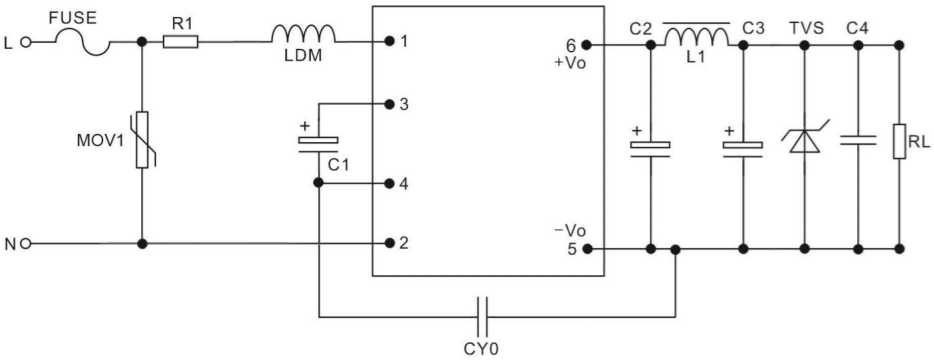


Figure - Circuit 2/4

Application Environment	Ambient Temperature	EMS Level	EMI Class
Outdoor normal	-40°C ~ +85°C	4	Class A

Component	Recommended Value
FUSE (Necessary)	1A/300V, Time-delay fuse
MOV1	14D561K/4500A
R1 (Wire-wound resistor, necessary)	12Ω/3W
LDM	1.2mH/0.2A Min

Note: Wire-wound resistor is recommended for R1 as the input plug-in resistor, SMD resistor or a carbon film resistor is not available for the application.