



Typical Features

- ◆ Wide input voltage range (4:1), Output Power 20W
- ◆ Transfer Efficiency up to 89%
- ◆ Stand-by Power Consumption as low as 0.1W
- ◆ Output super-fast start up
- ◆ Continuous Short Circuit protection, Self-recovery
- ◆ Input under voltage, output over voltage, short circuit, over current protection
- ◆ Switching Frequency 250KHz
- ◆ Isolation Voltage 1500VAC
- ◆ Operating Temperature: -40°C~+85°C
- ◆ Good EMI performance
- ◆ International standard pin-out



Application Field

FD20-110SXXA3(C) is a newly designed DIP 1X1 packed, 20W output power, ultra wide input range 4:1, low stand-by power consumption, isolated regulated output DC-DC converter, could be widely used for railway, industrial control, instrument, communication, power electricity, internet of things field. For harsh EMC environment, the application circuit in the datasheet is strongly recommended.

Typical Product List

Part No	Input Voltage Range (VDC)		Output Voltage/Current (Vo/Io)		Input Current (mA) (Nominal Voltage)		Max. Capacitive Load uF	Ripple & Noise		Efficiency (%)@output full load	
	Nominal	Range	Voltage (VDC)	Current (mA) MAX./Min.	Full load typ.	No Load typ.		mVp-p		Min	Typ
								Typ.	Max.		
FD20-110S3V3A3(C)	110	40-160	3.3	4000/0	143	20	10000	50	100	82	84
FD20-110S05A3(C)	110	40-160	5	4000/0	207	20	8000	50	100	84	86
*FD20-110S09A3(C)	110	40-160	9	2222/0	205	20	4000	50	100	86	88
FD20-110S12A3(C)	110	40-160	12	1667/0	205	2	2000	50	100	86	89
FD20-110S15A3(C)	110	40-160	15	1333/0	205	2	1000	50	100	86	89
FD20-110S24A3(C)	110	40-160	24	833/0	205	2	500	50	100	86	89
FD20-110S28A3(C)	110	40-160	28	714/0	203	2	500	50	100	88	90

1. "*" are models being developing;
2. Suffix "R" is with Control pin and adjustment pin, "C" is with Control function; "N" is without control or adjustment function.
3. "-H" is with heatsink, "-T(H)" is chassis mounting (with heatsink), "-TS" is din rail mounting (with heatsink), DIN-Rail width is: 35mm;
3. Max capacitive load is, when the power supply is fully loaded, the max capacity can be connected to output, if exceed, the power supply cannot start-up;
4. To reduce no load power consumption and improve efficiency of light-load, IC will be flutter frequency under no-load and light-load



operating, output cannot be no load, at least with 10% load or above 470uF high frequency low resistance electrolytic capacitor, otherwise the output ripple will rise;

Input Specification

Stand-by Consumption	0.10 W(TYP)		
Input Filter	π filter		
Input Under-Voltage Protection	34VDC Input		
CTRL*	Module turn-on	CTRL suspended or TTL high level (3.5-12VDC)	
	Module turn-off	CTRL connect to GND or low level (0-1.2VDC)	
	Input current when switched off	5mA (TYP)	

Note: *The voltage of CTRL pin is relative to -Vin pin.

Output Specification

Output Voltage Accuracy	Full voltage full load	Vo	±2.0%
Line Regulation	Nominal load, full voltage range	Vo	≤±0.5%
Load Regulation	10% ~ 100% nominal load	Vo	≤±1.0%
Ripple & Noise	Nominal load, nominal voltage, Twist Pair Test Method, 20M Hz bandwidth;	≤15% load,	5%Vo mVp-p typ
		≥15% load,	50mVp-p typ, 100mVp-p max
Output Over-voltage Protection	120%~200%Vo		
Output Over-load Protection	110%~220%Io		
Output Short circuit Protection	Continuous, Self-recovery		
Dynamic Response	25% nominal load step change $\Delta Vo/\Delta t$	3.3V、5V Output	±5% typ , ±8% max /500us
		Other Output	±3% typ , ±5% max /500us
Output Voltage Adjustment	With trim pin ±10%(Typ)		
Turn-on delay time	Typical	50ms	
Output start-up overshoot voltage	-	≤10%Vo	
Output voltage Set up Time	Nominal input to meet output	10mS	

Note: For very few models, when high voltage input and load ≤20%, the ripple may be ≥100mv.

General Specification

Switching Frequency	Typical	250KHz
Operating Temperature	Refer to Temperature Derating Curve	-40°C ~ +85°C
Storage Temperature		-55°C ~ +125°C
Max Case Temperature	Within Operating Curve	+105°C
Relative Humidity	No condensing	5%~95%

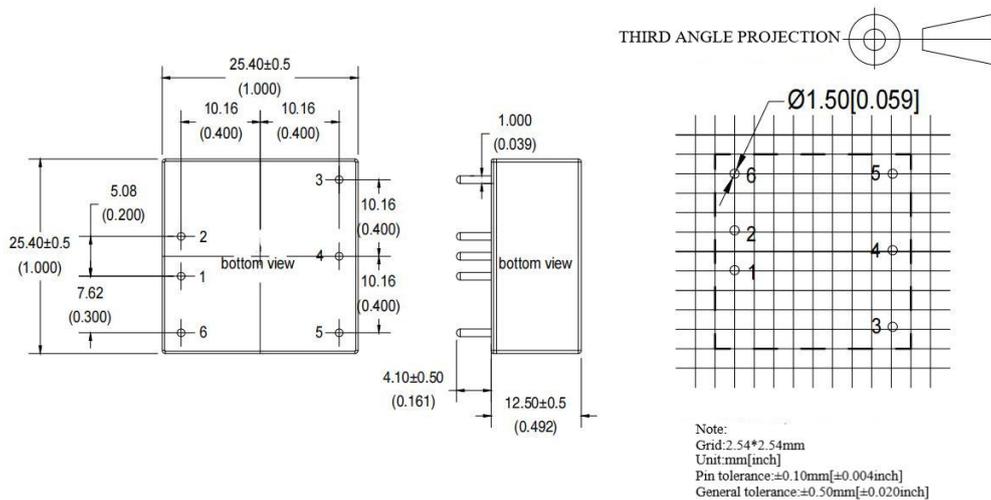


Case Material		Aluminum Metal Case
Cooling Method		Free air convection
Isolation Voltage	Input to Output	1500Vac ≤ 5mA / 1min
Meantime Between Failure	MIL-HDBK-217F@25°C	2X10 ⁵ Hrs
Product Weight	Average	15g

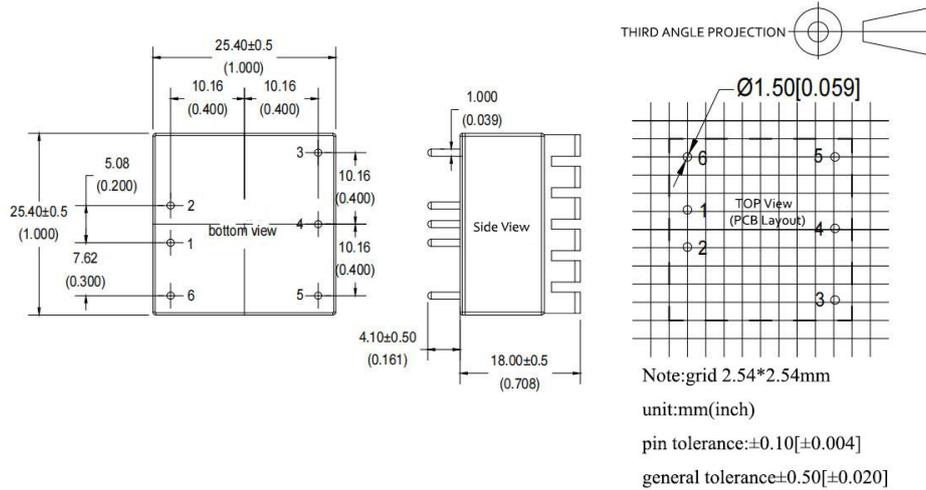
EMC Characteristics

Total Items		Sub Items	Test Standard	Class	
EMC	EMI	CE	CISPR22/EN55032	CLASS B	(see recommended circuit photo ②)
		RE	CISPR22/EN55032	CLASS B	(see recommended circuit photo ②)
	EMS	RS	IEC/EN61000-4-3	10V/m	Perf.Criteria B (see recommended circuit photo 2)
		CS	IEC/EN61000-4-6	3Vr.m.s	Perf.Criteria B (see recommended circuit photo 2)
		ESD	IEC/EN61000-4-2	±4KV	Perf.Criteria B
		Surge	IEC/EN61000-4-5	±2KV	Perf.Criteria B (see recommended circuit photo 1)
		EFT	IEC/EN61000-4-4	±2KV	Perf.Criteria B (see recommended circuit photo 1)
Voltage dips, short interruptions and voltage variations immunity		IEC/EN61000-4-11	0%~70%	Perf.Criteria B	

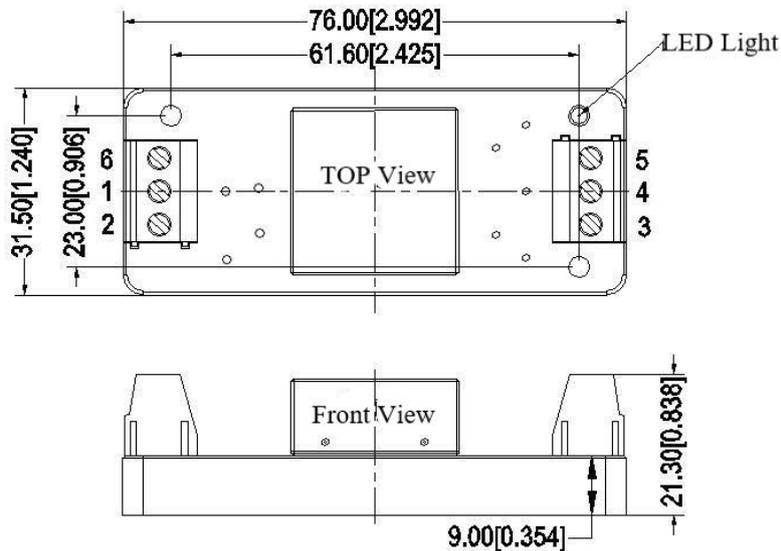
A3 Packing Dimension



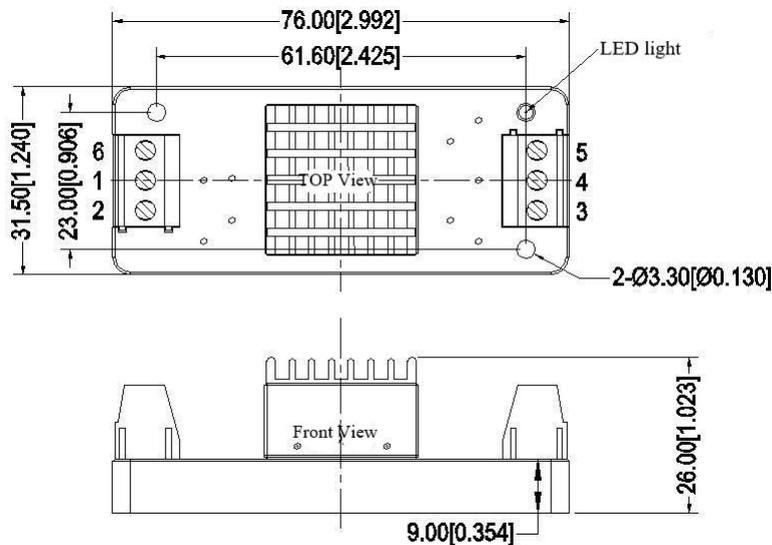
A3-H Packing Dimension



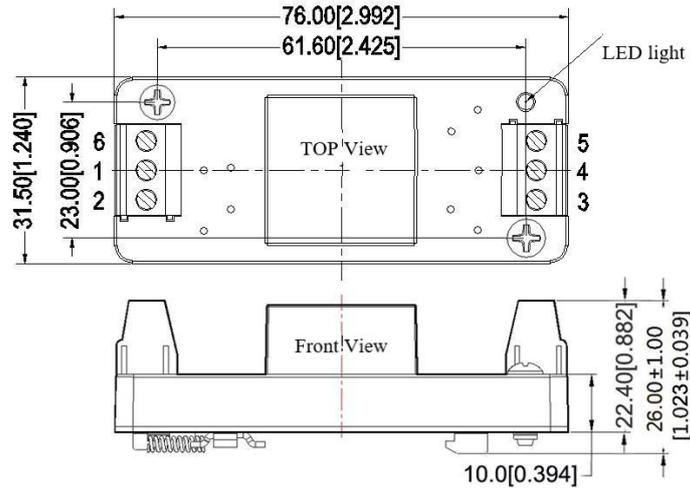
A3-T Packing Dimension



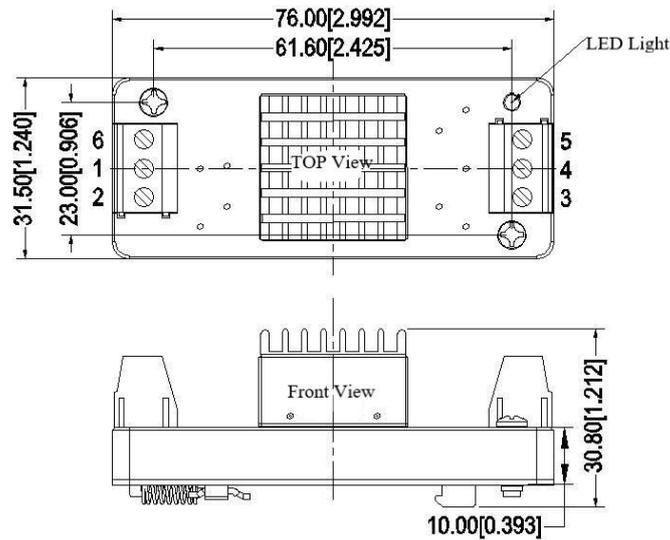
A3-TH Packing Dimension



A3-TS Packing Dimension



A3-TSH Packing Dimension



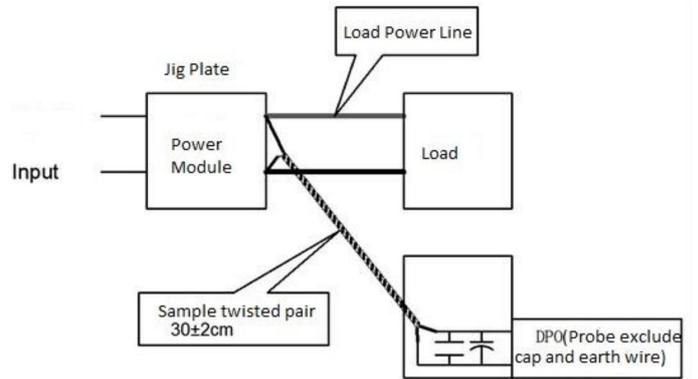
Packing Code	L x W x H	
A3	25.4X 25.4X12.5 mm	1.0X1.0 X0.492inch
A3-H(with heatsink)	25.4X25.4X18.0mm	1.0X1.0X0.708inch
A3-T	76X31.5X21.3mm	2.99X1.24X0.838inch
A3-TH(with heatsink)	76X31.5X26.0mm	2.99X1.24X1.023inch
A3-TS	76X31.5X26.0mm	2.99X1.24X1.023inch
A3-TSH(with heatsink)	76X31.5X30.8mm	2.99X1.24X1.212inch

Pin-Out	1	2	3	4	5	6
FD20-110SXXA3C	-Vin	+Vin	+Vout	NP	GND	CTRL
FD20-110SXXA3N	-Vin	+Vin	+Vout	NP	GND	NP
FD20-110SXXA3R	-Vin	+Vin	+Vout	Trim	GND	CTRL

Ripple & Noise Test: (Twisted Pair Test Method 20MHz bandwidth)

Test Method:

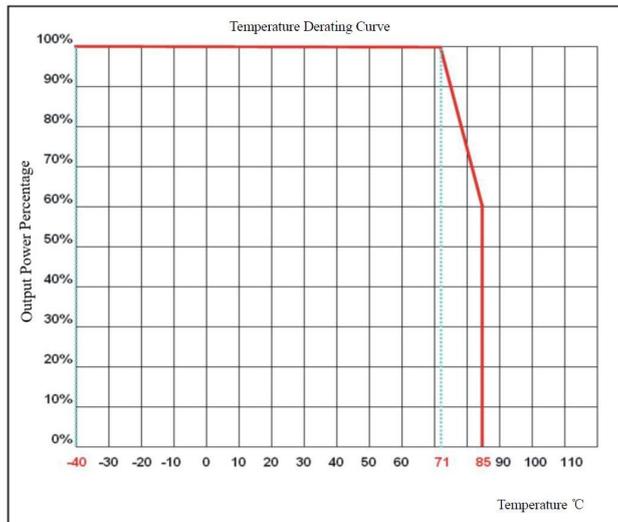
- a. 12# twisted pair to connect, Oscilloscope bandwidth set as 20MHz, 100M bandwidth probe, terminated with 0.1uF polypropylene capacitor and 10uF high frequency low resistance electrolytic capacitor in parallel, oscilloscope set as Sample pattern.
- b. Input terminal connect to power supply, output terminal connect to electronic load through jig plate, Use 30cm±2 cm sampling line, Power line selected from corresponding diameter wire with insulation according to the flow of output current.



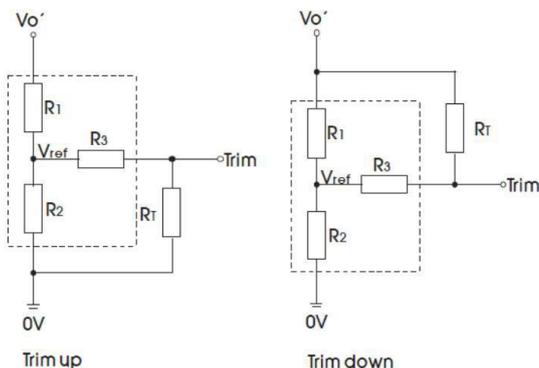
Application Reference:

1. The recommended minimum load is 15% or above 470uF high frequency low resistance electrolytic capacitor, or output ripple will rise;
2. Recommend the unbalance loads of dual output to be ≤±5%;
3. The maximum capacitive load is tested under pure resistance and full load condition;
4. Our company could provide whole power supply solution, or customized made items; Due to space limitation, please contact our team for more information.

Product Characteristic Curve



The use of Trim and the calculation of Trim resistance



Calculating Trim resistor values:

$$\text{up: } R_T = \frac{aR_2}{R_2 - a} - R_3 \quad a = \frac{V_{ref}}{V_{o'} - V_{ref}} \cdot R_1$$

$$\text{down: } R_T = \frac{aR_1}{R_1 - a} - R_3 \quad a = \frac{V_{o'} - V_{ref}}{V_{ref}} \cdot R_2$$

RT= Trim Resistor value;
a= self-defined parameter, no actual meaning;
Vo' is the actula voltage to increas or desearse;



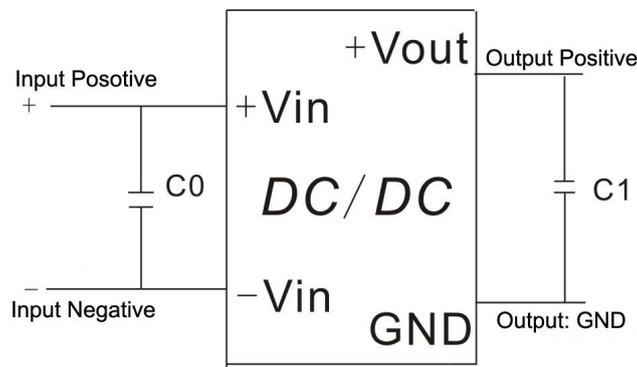
The circuit for Trim (The dashed area is the inside of product)

Vout(VDC)	R1(KΩ)	R2(KΩ)	R3(KΩ)	Vref(V)
3.3	18	10.8	72	1.25
5	18	18	75	2.5
9	9.31	3.57	24	2.5
12	18	4.7	35	2.5
15	25.5	5.1	38	2.5
24	25.5	2.96	25	2.5
28	25.5	2.93	25	2.5

Recommended circuit

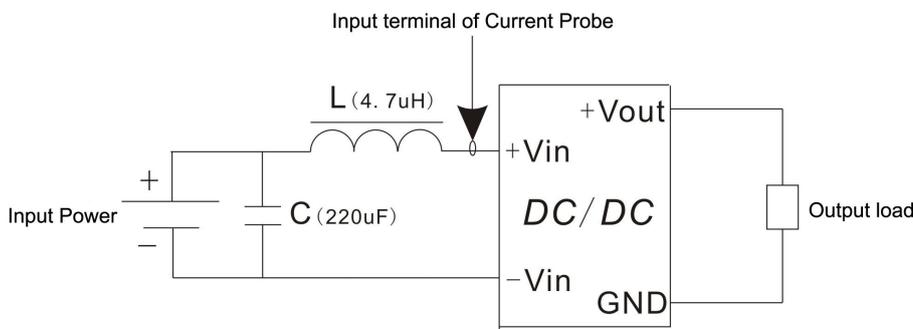
1. DC/DC test circuit:(Photo 1)

Normal recommended capacitors: C0:47-100uF;C1:470uF.

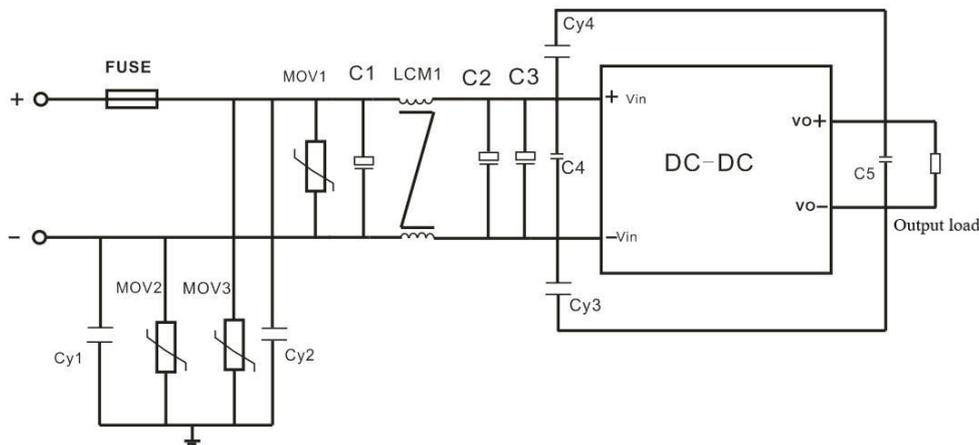


2. Input reflecting ripple current test circuit:

Capacitor C choose low ESR ones, withstand voltage value should be bigger than max input voltage;



3. EMC external recommended circuit:(Photo1 and Photo 2)



**Recommended Spec:**

Component	110V Input
FUSE	According to customer's request
MOV1 MOV2 MOV3	14D201K
C1 C2 C3	100uF/200V
LCM1	15mH
C4	47uF/200V
C5	100uF/35V
CY1,CY2, CY3, CY4	2.2uF/2000V

Note:

1. The product should be used under the specification range, otherwise it will cause permanent damage to it.
2. If the product worked beyond the load range or below the minimum load, we cannot ensure that the performance of product is in accordance with all the indexes in this manual;
3. Unless otherwise specified, data in this datasheet should be tested under conditions of Ta=25°C, humidity<75% when inputting nominal voltage and outputting rated load(pure resistance load);
4. All index testing methods in this datasheet are based on our Company's corporate standards
- 5.The performance indexes of the product models listed in this manual are as above, but some indexes of non-standard model products will exceed the above-mentioned requirements, and please directly contact our technician for specific information;
6. We can provide customized product service;
7. The product specification may be changed at any time without prior notice.