Typical Features

- Input voltage range 200-1200VDC (6:1)
- Efficiency up to 85% (Typ.)
- Operating temperature from -30°C to +70°C
- Input anti-reverse & under voltage protections
- Output short circuit, over current, over voltage protections
- Isolation voltage 4000VAC
- Altitude during operation 4000m Max
- With CE & UL(e532422) certificates
- High efficiency, high reliability, low Ripple & Noise
- Industrial grade design, standard size
- Application for Solar power & High-voltage inverter

UL1741

Application Field

BK40-650SXXW2N4 Series --- High efficiency and reliability DC-DC modular converters with ultra-high input voltage (full range 200-1200VDC). This series of power supplies can be widely used for Solar power generation and High-voltage inverters. The converters can output stable voltage to keep the load facility safety with multiple protections under abnormal conditions. Additional circuit for EMC is recommended for high EMC requirement.

Typical Product List

Certificate	Part No.	Input Voltage		Output Specifications			Max Capacitive Load @600VDC	Ripple & Noise 20MHz (Max)	Efficiency @Full load 600VDC (Typ.)
		Nominal	Range	Power	Voltage	Current			
		(VDC)	(VDC)	P(W)	Vo (VDC)	Io (A)	(uF)	mVp-p	%
CE&UL	BK40-650S12W2N4	600	200-1200	40	12	3.333	1200	120	83
	BK40-650S15W2N4				15	2.667	1000	120	84
	BK40-650S24W2N4				24	1.667	800	150	85

Note 1: Please contact Aipu sales for other output voltages requirements of this series but not listed in this table.

Note 2: The typical value of efficiency is based on the product tested after half an hour burn-in at full load.

Note 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.

Note 4: The suffix -TS is for the package of DIN Rail.

Input Specifications

Item	Test Condition	Min.	Typ.	Max.	Unit
Input voltage range	DC Input	200	600	1200	VDC
		Please refer to the input voltage derating graph			
Input no-load current	No load	-	-	0.6	mA

Input current	200VDC@75% Load	-	-	210	mA
	600VDC@100% Load	-	-	82	
	1200VDC@100% Load	-	-	43	
Under voltage protection	Protection start voltage	100	-	155	VDC
	Recovery voltage	160		197	
External fuse recommended	-	4A/1500VDC Time-delay fuse (Required)			

Output Specifications

Item		Test Condition	Min.	Typ.	Max.	Unit
Output voltage accuracy		Full input voltage range, any Load	-	±2.0	±3.0	%
Line regulation		Full input voltage range	-	±1.0	±1.5	
Load regulation		20%~100% rated load	-	±2.0	±3.0	
Ripple & Noise		5%-100% load, 20MHz bandwidth	-	80	150	mV
Minimum load		Full input voltage range	10	-	-	%
Temperature drift coefficient		-	-	-	±0.03	%/℃
Turn-on delay time		Input 600VDC (full load)	-	-	3000	mS
Power off hold up time		Input 500VDC (full load)	3	-	-	
		Input 1000VDC (full load)	5	-	-	
Dynamic response	Overshoot range	25%-50%-25% 50%-75%-50%	-	-	+6.0	%
	Recovery time		-	-	500	mS
Output overshoot		Full input voltage range	≤15			%Vo
Over-load protection			Self-recovery			Hiccup
Over current protection		Full input voltage range	110%Io	-	250%Io	mA
Over voltage protection			Feedback-clamp amplitude limit			
Short circuit protection			Continuous protection			Hiccup
Note: The Ripple & Noise is tested by the Parallel-line Method, please refer to the following test instruction.						

General Specifications

Item	Test Condition		Min.	Typ.	Max.	Unit
Switching frequency	-		-	65	-	KHz
Operating temperature	Refer to the temperature derating graph		-30	-	+70	℃
Storage temperature	-		-40	-	+85	
Soldering temperature	Wave-soldering		260±4℃, 5-10S			
	Manual soldering		360±8℃, 4-7S			
Relative humidity	-		-	-	95	%RH
Isolation voltage	I/P-O/P	Test 1Min, leakage current <5mA	4000	-	-	VAC
Insulation resistance	I/P-O/P	@500VDC	100	-	-	MΩ
MTBF	MIL-HDBK-217F 25℃		300	-	-	K hours
Vibration	-		10-55Hz,10G, 30Min, along X, Y, Z			
Safety standard	-		IEC/EN62368/UL1741			

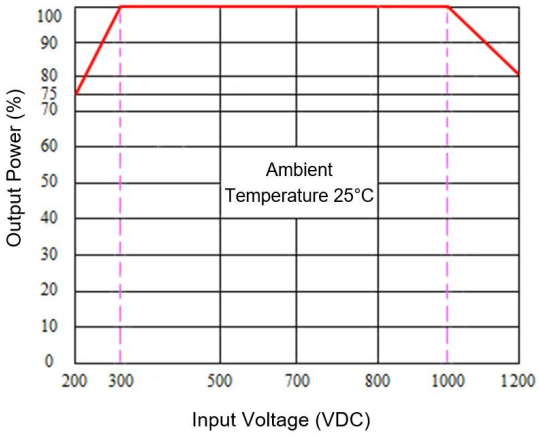
Safety level	-		CLASS I	
Weights & Dimensions	Part No.	Weight (Typ.)	Dimensions L x W x H	
	BK40-650SXXW2N4	235g	89.00X63.50X25.00 mm	3.504X2.500X0.984 inch
	BK40-650SXXW2N4-TS	385g	134.00X69.00X38.90 mm	5.276X2.717X1.531 inch

EMC Performances

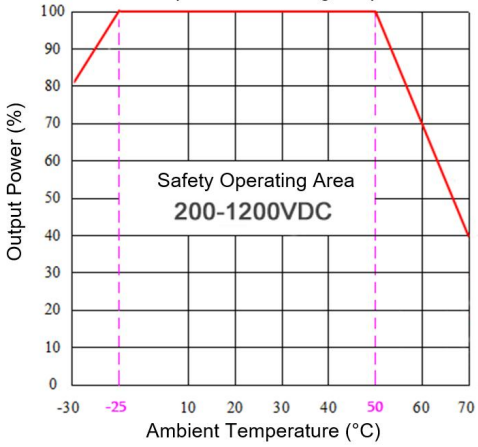
Items			Test Standards	Performance/Class
EMC	EMI	CE	CISPR32/EN55032	CLASS A (with the recommended circuit 2)
		RE	CISPR32/EN55032	CLASS A (with the recommended circuit 2)
	EMS	ESD	IEC/EN61000-4-2	Contact ±6KV, Air ±8KV Perf. Criteria B (with the recommended circuit 2)
		RS	IEC/EN61000-4-3	10V/m Perf. Criteria A (with the recommended circuit 2)
		Surge	IEC/EN61000-4-5	±2KV Perf. Criteria B (with the recommended circuit 2)
		EFT	IEC/EN61000-4-4	±2KV Perf. Criteria B (with the recommended circuit 2)
		CS	IEC/EN61000-4-6	10V r.m.s Perf. Criteria A (with the recommended circuit 2)

Product Characteristics Graphs

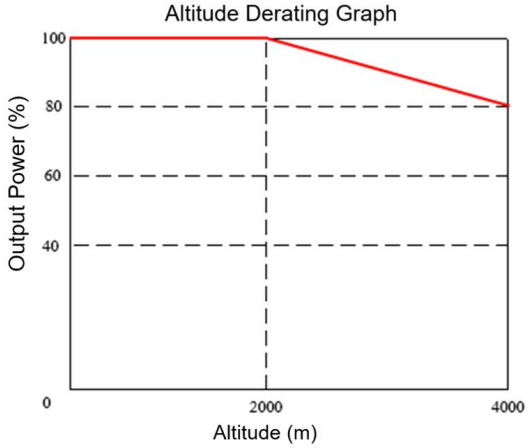
Input Voltage Derating Graph



Temperature Derating Graph



Altitude Derating Graph



Note 1: The output power should be derated based on the input voltage derating graph at 200~300VDC & 1000~1200VDC.

Note 2: This product should operate under the condition of nature air, please contact us if it could be used at a closed space.

Note 3: The temperature derating should work together with the input voltage derating condition.

Recommended Circuits for Application

1. Typical application circuit diagram

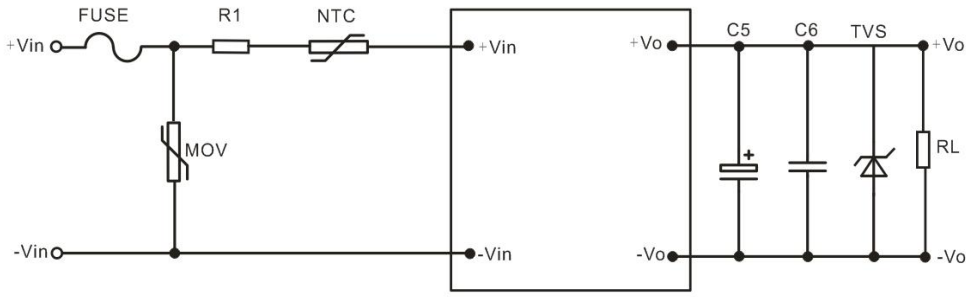


Figure - Circuit 1

Output Voltage	FUSE	R1	MOV	NTC	C5	C6	TVS
12V	4A/1500DC Time delay fuse Required	6.8Ω/10W Wire-wound resistor	20D182K 6500A	10Ω/6A /20D	470uF/25V	1uF/50V 1206	SMBJ18A
15V					330uF/50V		SMBJ20A
24V					220uF/50V		SMBJ30A
Note: An UL approved surge protector (VPR/MLV=6000V Max) must be used at the input for the application.							

Note:

A high-frequency, low-impedance electrolytic capacitor is recommended for output filter capacitor C5 which capacitance and current should refer to the technical specification of the manufacturer. The capacitor withstand voltage should be at least 80% derated. A ceramic capacitor is recommended for C6 to suppress high-frequency noise. TVS is recommended to protect the output circuit when the converter operates under abnormal condition.

2. Recommended circuit diagram for high EMC requirement

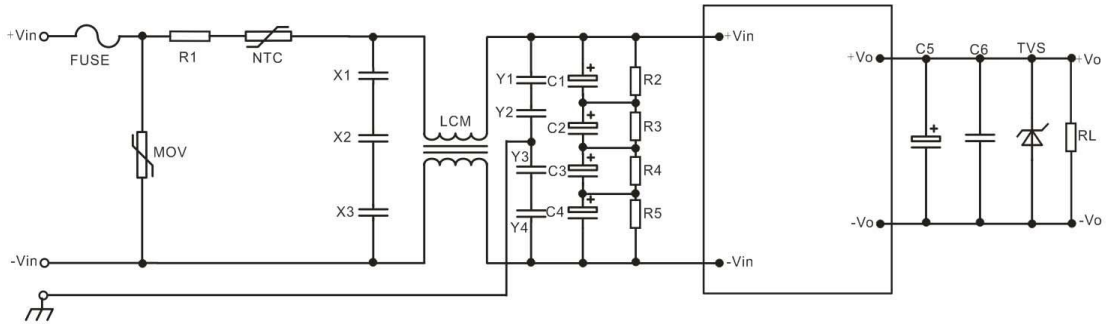
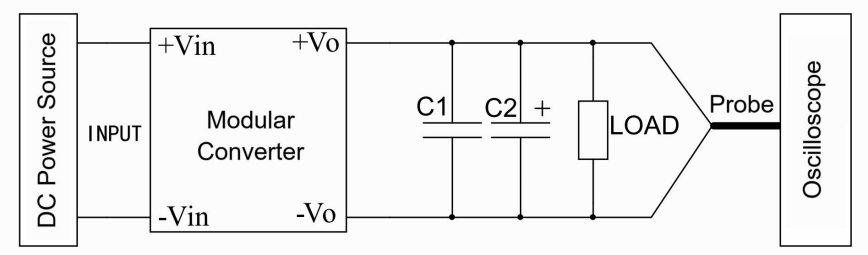


Figure - Circuit 2

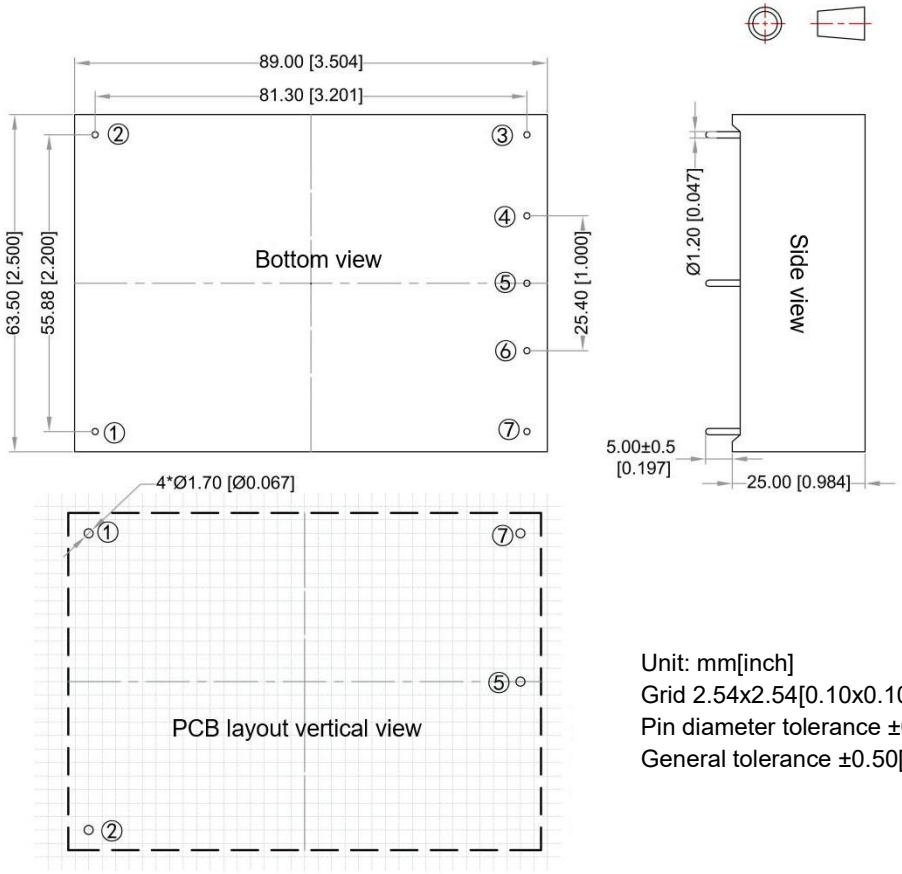
Component	Function	Recommended value	Remark
FUSE	Shut off the power when the converter operates abnormally	4A/1500DC, Time delay fuse	Required
R1 (Current-Limiting Resistor)	Suppress the start-up transient surge current	6.8Ω/10W wire-wound resistor	
NTC	Suppress the surge current	10Ω/6A/20D	
MOV (Metal Oxide Varistor)	Absorb the surges	20D182K/6500A	
X1, X2, X3 (CBB capacitor)	Suppress the differential mode interference	105J/450VDC	Optional according to actual application
LCM (Common mode choke)	Suppress the Common mode interference	10mH/0.8A	
Y1/Y2/Y3/Y4 (Y Capacitor)		Y1/222M/1500VDC	
C1/C2/C3/C4 (E-capacitor)	Low-frequency filtering	100uF/400V	
R2/R3/R4/R5 (SMD resistor)	Voltages balance	1MΩ/1W/2512	
Note: An UL approved surge protector (VPR/MLV=6000V Max) must be used at the input for the application.			

Ripple& Noise Test Instruction (Parallel-line Method, 20MHz bandwidth)



1. The Ripple & Noise test needs the cables in parallel, an oscilloscope that should be set at the Sample Mode, bandwidth 20MHz. 100M bandwidth probe with cap and ground removed. One polypropylene capacitor C1(0.1uF) and one high-frequency low-impedance electrolytic capacitor C2(10uF) are connected in parallel with the probe.
2. Refer to the test diagram, the converter output connects to the electronic load by the jig with cables which size should be defined according to the output current value. The test can start at the converter output terminals after the input power on.

Mechanical Dimensions

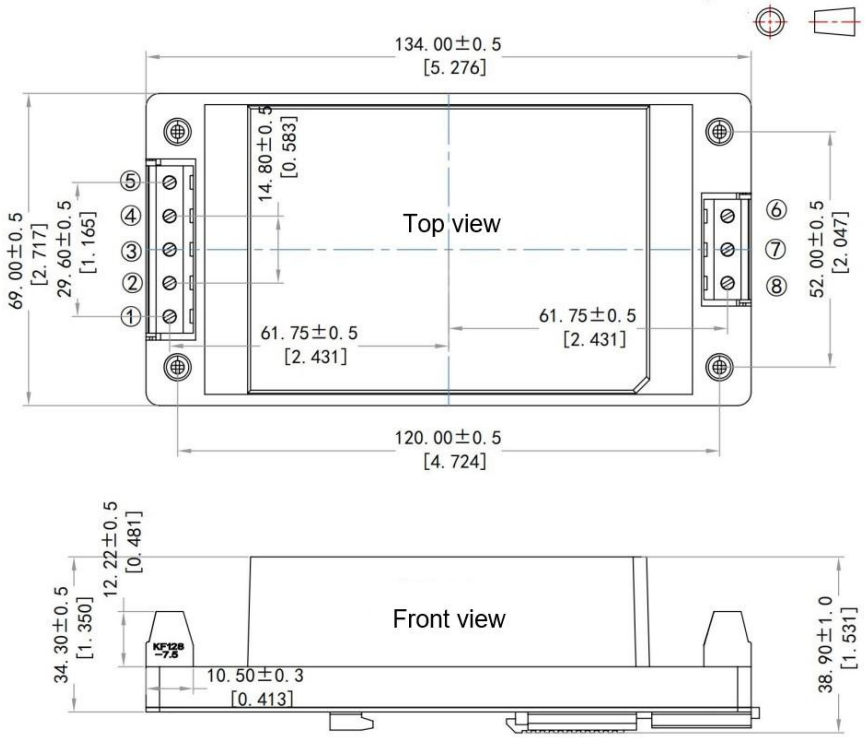


Unit: mm[inch]
Grid 2.54x2.54[0.10x0.10]
Pin diameter tolerance ±0.10[±0.004]
General tolerance ±0.50[±0.020]

Pin-out Function Description

Pin No.	1	2	3	4	5	6	7
Function	-Vin	+Vin	No Pin	No Pin	-Vo	No Pin	+Vo

-TS Mechanical Dimensions



Note:
Unit: mm[inch]
Lead wires gauge: 24-12 AWG
Screwing torque: 0.4 N.m Max
General tolerance: ±1.00[±0.039]

Terminal Function Description

Terminal No.	1	2	3	4	5	6	7	8
Function	+Vin	NC	NC	NC	-Vin	+Vo	-Vo	NC

Note: NC means No Connection

Safety Notice

1. Keep the specifications which should be met during the unit assembly and maintaining.
2. Warning that the product surface could be hot during operating, NO touching to avoid the risk of burn.

Application Notice

1.The product should be used according to the specification, otherwise it could be permanently damaged.
2. The product performance cannot be guaranteed if it works at a lower load than the minimum load defined.
3. The product performance cannot be guaranteed if it works under over-load condition.
4. Unless otherwise specified, all values or indicators on this datasheet are tested at Ta=25℃, humidity<75%RH, nominal input voltage and rated load (pure resistance load).
5. All values or indicators on this datasheet have been tested based on Aipupower test specifications.
6.The specifications are specially for the parts listed on this datasheet, any other non-standard model performances could be out of the specifications. Please contact our technician for specific requirements.
7. Aipupower can provide customization service.

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