AC/DC Converter
SLHE60-20Bxx Series

60W, AC-DC converter

FEATURES

- 85 - 264V Universal AC or wide 100 - 370V DC Input
- Operating ambient temperature range: -40℃ to +70℃
- High I/O isolation test voltage of up to 4000VAC
- Regulated output, Low ripple & noise
- Output short circuit, over-current, over-voltage protection
- High efficiency, high reliability
- Plastic case meets UL94V-0 flammability
- Meets EMI CLASS B and surge ±2KV/±4KV (level 4) without additional circuits
- Designed to meet IEC/EN/UL62368 standards (Approval Pending)

SLHE60-20Bxx series AC-DC converters are highly efficient, environmental-friendly 60W power modules. It features universal AC input and at the same time accepts DC input voltage, low power consumption, high efficiency, high reliability, reinforced isolation. It offers good EMC performance compliant to IEC/EN61000-4 and CISPR32/EN55032 and meets IEC/EN/UL62368 standards. The converters are widely used in industrial, power, instrumentation, communication and civil applications. For extremely harsh EMC environment, we recommend using the application circuit show in Design Reference of this datasheet.

Selection Guide

Certification	Part No.*	Output Power	Nominal Output Voltage and Current	Efficiency at 230VAC (%) Typ.	Capacitive Load (μF) Max.
UL/CE/CB (Pending)	SLHE60-20B05	50W	5V/10000mA	82	50000
	SLHE60-20B12	60W	12V/5000mA	86	10000
	SLHE60-20B15		15V/4000mA		8000
	SLHE60-20B24		24V/2500mA		2700
	SLHE60-20B48		48V/1250mA		680

Note:*Use suffix "A5" for chassis and suffix "A6" for DIN-Rail mounting (e.g. SLHE60-20B05A5 is chassis mounting and SLHE60-20B05A6 is DIN-Rail mounting version).

Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Input Voltage Range	AC input	85	--	264	VAC
	DC input	100	--	370	VDC
Input Frequency		47	--	63	Hz
Input Current	115VAC	--	--	1.4	A
	230VAC	--	--	0.8	
Inrush Current	115VAC	--	45	--	
	230VAC	--	90	--	
Leakage Current	240VAC/50Hz	0.25mA Max.			
Recommended External Input Fuse		3.15A/250V Slow-blow required			
Hot Plug		Unavailable			

Output Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Output Voltage Accuracy		--	±2	--	%
Line Regulation	Full load	--	±0.5	--	
Load Regulation	0%-100% load	--	±1	--	
Ripple & Noise*	20MHz bandwidth (peak-to-peak value)	--	--	150	mV
Stand-by Power Consumption	5/12/15/24V output	--	--	0.5	W
	48V output	--	--	0.65	

Temperature Coefficient		--	±0.02	--	%/°C
Short Circuit Protection		Hiccup, continuous, self-recovery			
Over-current Protection		⩾110%Io, self-recovery			
Over-voltage Protection	5VDC Output	⩽9VDC (Output voltage clamp or turn off)			
	12VDC Output	⩽16VDC (Output voltage clamp or turn off)			
	15VDC Output	⩽24VDC (Output voltage clamp or turn off)			
	24VDC Output	⩽35VDC (Output voltage clamp or turn off)			
	48VDC Output	⩽60VDC (Output voltage clamp or turn off)			
Minimum Load		0	--	--	%
Hold-up Time	115VAC input	--	8	--	ms
	230VAC input	--	65	--	
Note: * The "parallel cable" method is used for Ripple and noise test, please refer to AC-DC Converter Application Notes for specific information.					

General Specifications

Item		Operating Conditions	Min.	Typ.	Max.	Unit
Isolation	Input-PE	Electric Strength Test for 1min., leakage current <5mA	2000	--	--	VAC
	Input-Output		4000	--	--	
	Output-PE		500	--	--	
Operating Temperature			-40	--	+70	°C
Storage Temperature			-40	--	+85	
Storage Humidity			--	--	95	%RH
Soldering Temperature		Wave-soldering	260 ± 5℃; time：5 - 10s			
		Manual-welding	360 ± 10℃; time：3 - 5s			
Power Derating		-40°C to -30°C	4.0	--	--	%/°C
		+45°C to +70°C (5V output)	3.0	--	--	
		+50°C to +70°C (12V, 15V output)	2.5	--	--	
		+55°C to +70°C (24V, 48V output)	2.5	--	--	
		85VAC - 110VAC	1.0	--	--	%/VAC
		240VAC - 264VAC	0.42	--	--	
Safety Standard			IEC62368/EN62368/UL62368			
Safety Certification			IEC62368/EN62368/UL62368 (Pending)			
Safety Class			CLASS I			
MTBF			MIL-HDBK-217F@25°C > 300,000 h			

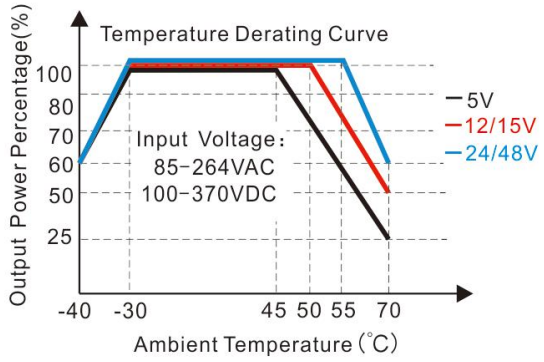
Mechanical Specifications

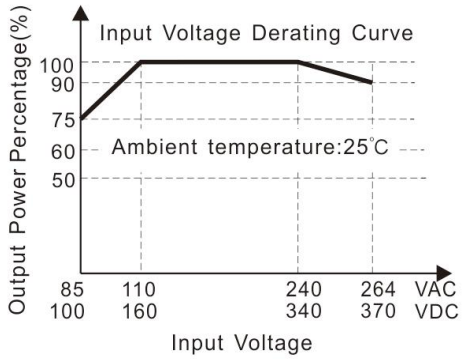
Case Material		Black plastic, flame-retardant and heat-resistant (UL94V-0)
Dimension	Horizontal package	109.00 x 58.50 x 30.00 mm
	A5 chassis mounting	135.00 x 70.00 x 38.50 mm
	A6 Din-Rail mounting	137.00 x 70.00 x 44.00 mm
Weight	Horizontal package	310g (Typ.)
	A5 chassis mounting	400g (Typ.)
	A6 Din-Rail mounting	470g (Typ.)
Cooling method		Free air convection

Electromagnetic Compatibility (EMC)

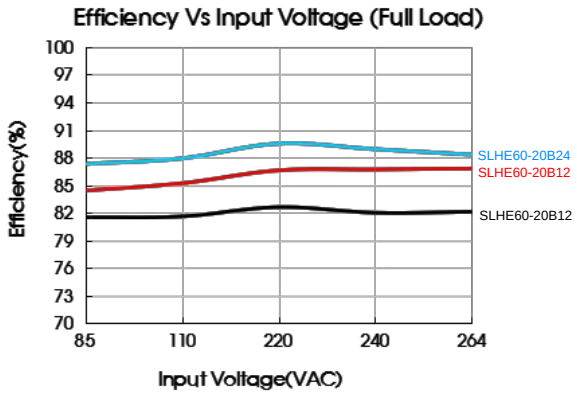
Emissions	CE	CISPR32/EN55032 CLASS B	
	RE	CISPR32/EN55032 CLASS B	
Immunity	ESD	IEC/EN 61000-4-2 Contact ±6KV / Air ±8KV	Perf. Criteria B
	RS	IEC/EN61000-4-3 10V/m	perf. Criteria A
	EFT	IEC/EN61000-4-4 ±4KV	perf. Criteria B
	Surge	IEC/EN61000-4-5 line to line ±2KV/line to ground ±4KV	perf. Criteria B
		IEC/EN61000-4-5 line to line ±4KV/line to ground ±6KV (See Fig.2 for recommended circuit)	perf. Criteria B
	CS	IEC/EN61000-4-6 10Vr.m.s	perf. Criteria A
	Voltage dips, short interruption and voltage variations	IEC/EN61000-4-11 0%, 70%	perf. Criteria B

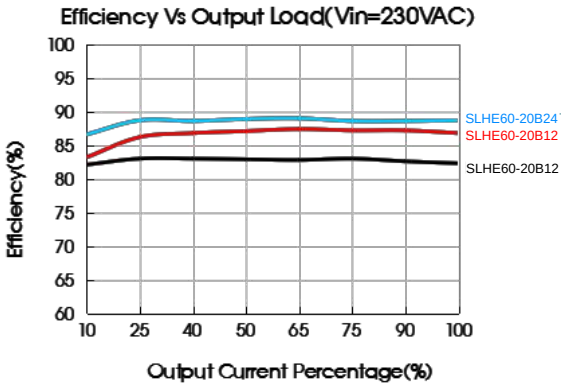
Product Characteristic Curve





Note: ① With an AC input between 85-110V/240-264VAC and a DC input between 100-160V/340-370VDC, the output power must be derated as per temperature derating curves;
② This product is suitable for applications using natural air cooling; for applications in closed environment please consult factory or one of our FAE.





Design Reference

1. Typical application

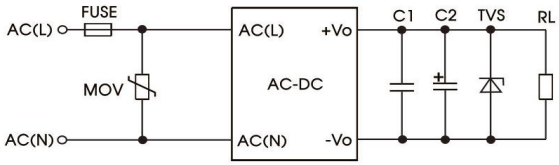


Fig. 1: Typical circuit diagram

Part no.	C1(μF)	C2(μF)	FUSE	MOV	TVS
SLHE60-20B05	1	680	3.15A/250V slow-blow required	S14K300	SMBJ7.0A
SLHE60-20B12		330			SMBJ20A
SLHE60-20B15		330			SMBJ20A
SLHE60-20B24		200			SMBJ30A
SLHE60-20B48		100			SMBJ64A

Output Filter Components:
We recommend using an electrolytic capacitor with high frequency, and low ESR rating for C2 (refer to manufacture's datasheet). Choose a Capacitor voltage rating with at least 20% margin, in other words not exceeding 80%. C1 is a ceramic capacitor used for filtering high-frequency noise and TVS is a recommended suppressor diode to protect the application in case of a converter failure.

2. EMC compliance recommended circuit

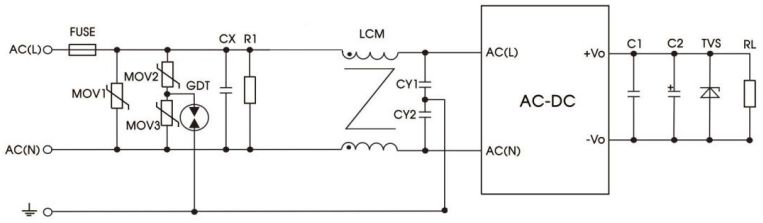
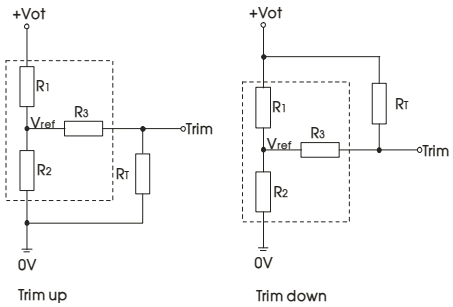


Fig 2: EMC application circuit with higher requirements

Component	Recommended value
MOV1	S20K300
MOV2	S14K350
MOV3	S14K350
CX	0.15μF/300VAC
CY1	2.2nF/400VAC
CY2	2.2nF /400VAC
R1	1MΩ/2W
LCM	2.2mH, we recommend using part no. SFL2D-30-222 (SCHMID-M)
GDT	B5G3600
FUSE	3.15A/250V slow-blow required

3. Trim Function for Output Voltage Adjustment (open if unused)



TRIM resistor connection (dashed line shows internal resistor network)

Calculating Trim resistor values:

$$\text{up: } R_T = \frac{aR_2}{R_2 - a} - R_3 \qquad a = \frac{V_{ref}}{V_{ot} - V_{ref}} \cdot R_1$$

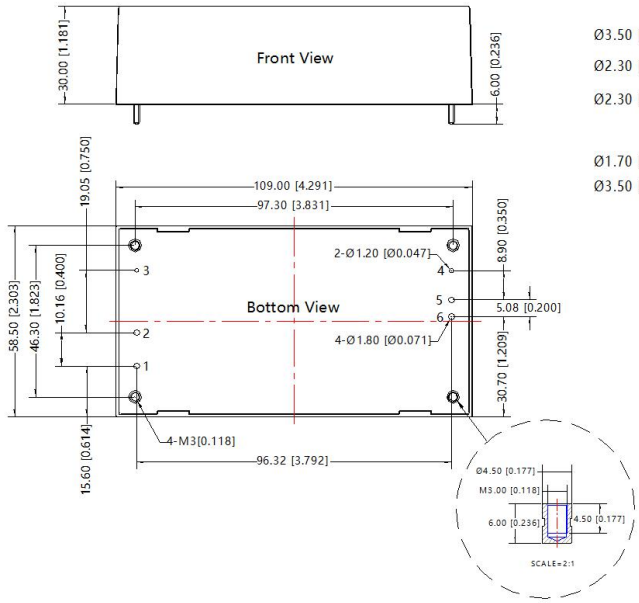
$$\text{down: } R_T = \frac{aR_1}{R_1 - a} - R_3 \qquad a = \frac{V_{ot} - V_{ref}}{V_{ref}} \cdot R_2$$

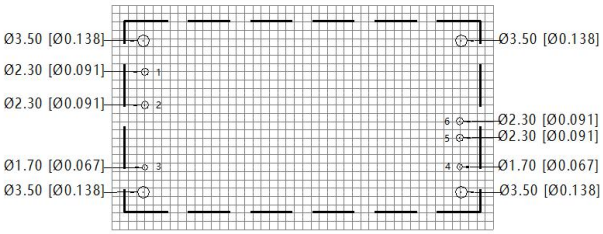
R_T = Trim Resistor value;
a = self-defined parameter;
Vot = desired output voltage

Vout nominal	R1 (kΩ)	R2 (kΩ)	R3 (kΩ)	Vref (V)	Vot (V)
5V	3.3	3.3	1	2.5	Resulting Trimmed Output voltage; range ≤ ±10%
12V	3.83	1	1	2.5	
15V	7.5	1.5	1	2.5	
24V	8.66	1	1	2.5	
48V	33	1.8	1	2.5	

Dimensions and Recommended Layout

THIRD ANGLE PROJECTION





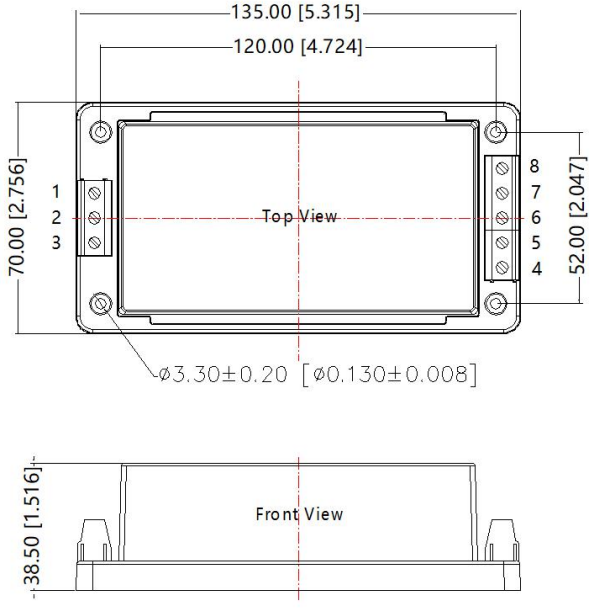
Note : Grid 2.54*2.54mm

Pin-Out	
Pin	Function
1	AC(N)
2	AC(L)
3	⏚
4	Trim
5	-Vo
6	+Vo

Note:
Unit: mm[inch]
Pin1,2,5,6's diameter: 1.80[0.071],pin 3,4's diameter: 1.20[0.047]
Pin diameter tolerances: ±0.10[±0.004]
Pin tolerances(H): ±1.50[±0.059]
General tolerances: ±0.50[±0.020]
This serise of products need to fix screws in a had vibration

A5 Dimensions

THIRD ANGLE PROJECTION

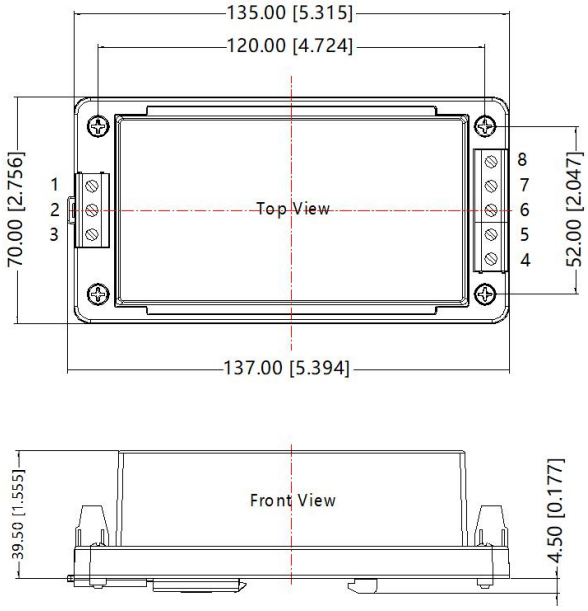


Pin-Out	
Pin	Function
1	AC(N)
2	AC(L)
3	⏚
4	Trim
5	-Vo
6	+Vo
7	NC
8	NC

Note:
Unit: mm[inch]
Wire range: 24~12 AWG
Tightening torque: Max 0.4 N·m
General tolerances: ±1.00[±0.040]

A6 Dimensions

THIRD ANGLE PROJECTION



Pin-Out	
Pin	Function
1	AC(N)
2	AC(L)
3	⏚
4	Trim
5	-Vo
6	+Vo
7	NC
8	NC

Note:
Unit: mm[inch]
Mounting rail: TS35, rail needs to connect safety ground
Wire range: 24~12 AWG
Tightening torque: Max 0.4 N·m
General tolerances: ±1.00[±0.040]

Note:

1. If the product is not operated within the required load range, the product performance cannot be guaranteed to comply with all parameters in the datasheet;
2. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25℃, humidity<75% with nominal input voltage and rated output load;
3. All index testing methods in this datasheet are based on our Company's corporate standards;
4. We can provide product customization service, please contact our technicians directly for specific information;
5. Products are related to laws and regulations: see "Features" and "EMC";
6. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.