

60W, AC/DC converter



UL US CE CB RoHS

FEATURES

- Wide input voltage range: 90 - 264VAC/122 - 370VDC; 55 - 264VAC/77 - 370VDC(LH60-20Bxx-DT Series)
- Low standby power consumption: 0.5W
- Conversion efficiency up to 86%
- High I/O isolation test voltage up to 4000VAC
- Output short circuit, over-current, over-voltage protection
- IEC60950, UL60950, EN60950 safety approval
- Mounting: PCB mounting, Chassis mounting, DIN-Rail mounting available

LH60-20Bxx(-DT) series AC-DC converters are highly efficient, environmental-friendly 60W power modules. It features high surge resistance, high efficiency, high reliability, low power consumption, high reinforced isolation. The converters are widely used in industrial control, power and switch 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(Vo/Io)	Efficiency at 230VAC (%) Typ.	Capacitive Load (μF) Max.
UL/CE/CB	LH60-20B05	50W	5V/10A	82	80000
	LH60-20B05-DT				
	LH60-20B09				
	LH60-20B09-DT	60W	9V/6.6A	84	28000
	LH60-20B12				
	LH60-20B12-DT				
	LH60-20B15				
	LH60-20B24				
	LH60-20B24-DT				
LH60-20B48	48V/1.25A	86	1000		

Note: 1.* LH60-20Bxx series has input under-voltage protection; LH60-20Bxx-DT series has no input under-voltage protection.
2.* Use suffix "A5" for chassis and suffix "A6" for DIN-Rail mounting.

Input Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
	Series	Input Type				
Input Voltage Range	LH60-20Bxx series	AC input	90	--	264	VAC
		DC input	122	--	370	VDC
	LH60-20Bxx-DT series	AC input	55	--	264	VAC
		DC input	77	--	370	VDC
Input Frequency			47	--	63	Hz
Input Current	115VAC		--	--	1.4	A
	230VAC		--	--	0.7	
Inrush Current	115VAC		--	30	--	
	230VAC		--	50	--	
Input Under-voltage Protection*	Start-up Voltage	AC input	65	--	90	VAC
		DC input	92	--	122	VDC
	Shutdown Voltage	AC input	55	--	75	VAC
		DC input	79	--	105	VDC
Hot Plug					Unavailable	



* Only the LH60-20Bxx series has input under-voltage protection.

Output Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Output Voltage Accuracy		--	±2	--	%
Line Regulation	Full load	--	±0.5	--	
Load Regulation	5%-100% load	--	±1	--	
Ripple & Noise*	20MHz bandwidth (peak-to-peak value)	--	--	150	mV
Temperature Coefficient		--	±0.02	--	%/°C
Stand-by Power Consumption		--	--	0.5	W
Short Circuit Protection		Continuous, self-recovery			
Over-current Protection		≥110%Io, self-recovery			
Over-voltage Protection	5VDC Output	≤9VDC			
	9V DC Output	≤16VDC			
	12V DC Output	≤16VDC			
	15V DC Output	≤24VDC			
	24V DC Output	≤35VDC			
	48V DC Output	≤63VDC			
Min. Load		0	--	--	%
Trim		--	--	±10	
Hold-up Time	115VAC input	--	15	--	ms
	230VAC input	--	80	--	

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 Voltage	Input-output	4000	--	--	VAC
	Input- 	1500	--	--	
	Output- 	500	--	--	
Operating Temperature		-40	--	+70	°C
Storage Temperature		-40	--	+85	
Storage Humidity		--	--	95	%RH
Soldering Temperature	Wave-soldering	260 ± 5°C; time: 5 - 10s			
	Manual-welding	360 ± 10°C; time: 3 - 5s			
Switching Frequency		--	100	--	KHz
Power Derating	-40°C to -30°C	4.0	--	--	%/°C
	+45°C to +70°C (5V, 9V output)	3.0	--	--	
	+50°C to +70°C (12V, 15V output)	2.5	--	--	
	+55°C to +70°C (24V, 48V output)				
Safety Standard		IEC60950/EN60950/UL60950			
Safety Certification		IEC60950/EN60950/UL60950			
Safety Class		CLASS I			
MTBF		MIL-HDBK-217F@25°C ≥300,000 h			

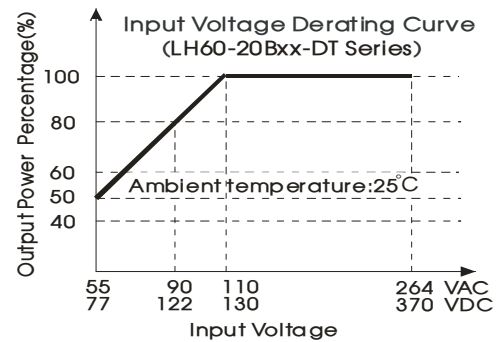
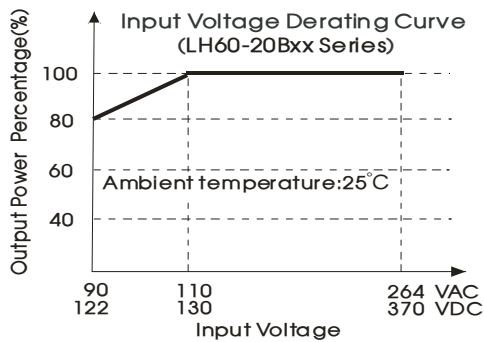
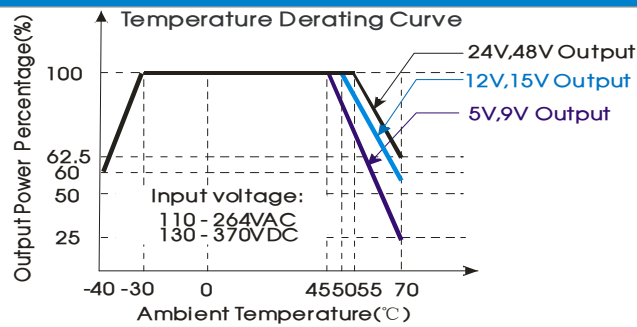
Mechanical Specifications

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/A5 chassis mounting/A6 Din-Rail mounting				310g/400g /470g (Typ.)
Cooling Method	Free air convection				

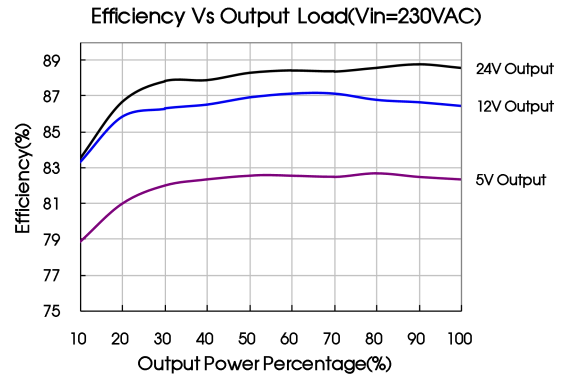
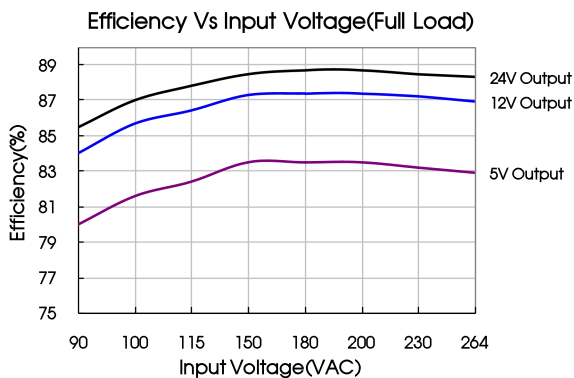
Electromagnetic Compatibility (EMC)

Emissions	CE	CISPR32/EN55032	CLASS B		
	RE	CISPR32/EN55032	CLASS B		
Immunity	ESD	IEC/EN61000-4-2	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
			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	
	PFM	IEC/EN61000-4-8	10A/m	perf. Criteria A	
Voltage dips, short interruption and voltage variations		IEC/EN61000-4-11	0%, 70%	perf. Criteria B	

Product Characteristic Curve



- Note:
- ① For LH60-20Bxx series, with an AC input between 90-110VAC and a DC input between 122-130VDC, the output power must be derated as per temperature derating curves;
 - ② For LH60-20Bxx-DT series, with an AC input between 55-110VAC and a DC input between 77-130VDC, the output power must be derated as per temperature derating curves;
 - ③ 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

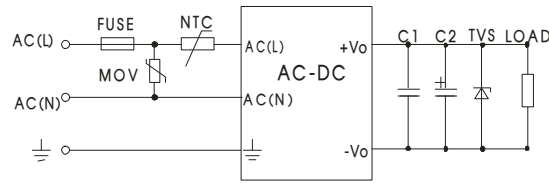


Fig. 1

Part No.	FUSE	NTC	MOV	C1(μF)	C2(μF)	TVS
LH60-20B05(-DT)	3.15A/250V, slow-blow	5D-9	S14K350	1	680	SMBJ7.0A
LH60-20B09(-DT)					470	SMBJ12A
LH60-20B12(-DT)					330	SMBJ20A
LH60-20B15					330	SMBJ20A
LH60-20B24(-DT)					200	SMBJ30A
LH60-20B48					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

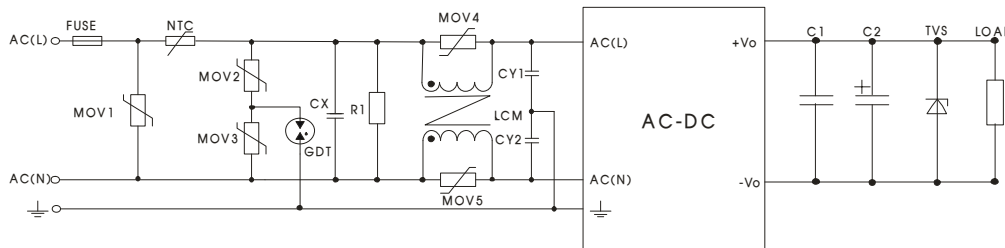
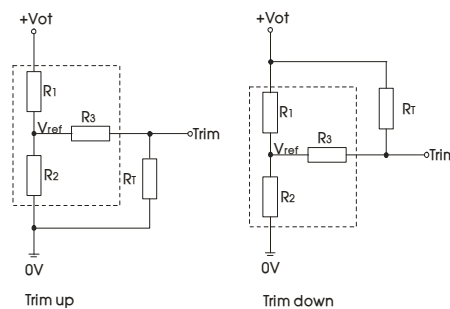


Fig 2

(Output external circuit refer to the typical application circuit)

Component	Recommended value	Component	Recommended value
MOV1	S20K350	CY2	2.2nF /400VAC
MOV2	S14K350	R1	1M Ω /2W
MOV3	S14K350	LCM	2.2 mH, we recommend using part no. FL2D-30-222 (MORNSUN)
MOV4	S10K350	GDT	B5G3600
MOV5	S10K350	NTC	5D-14
CX	0.15μF/300VAC	FUSE	3.15A/250V, slow-blow, required
CY1	2.2nF/400VAC	--	--

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



TRIM resistor connection (dashed line shows internal resistor network)

Calculating Trim resistor values:

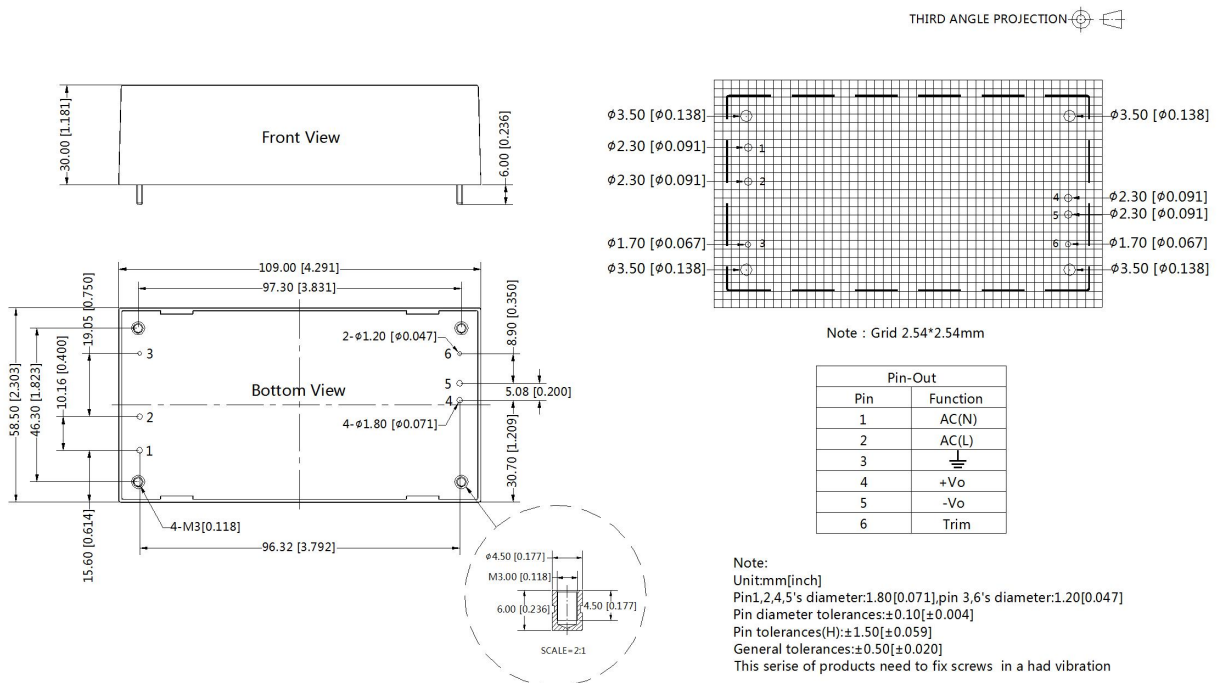
$$\begin{aligned} \text{up: } R_T &= \frac{aR_2}{R_2-a} \cdot R_3 & a &= \frac{V_{ref}}{V_{ot}-V_{ref}} \cdot R_1 \\ \text{down: } R_T &= \frac{aR_1}{R_1-a} \cdot R_3 & a &= \frac{V_{ot}-V_{ref}}{V_{ref}} \cdot R_2 \end{aligned}$$

R_T = Trim Resistor value;
 a = self-defined parameter;
 V_{ot} = desired output voltage

V _{out}	R1(K Ω)	R2(K Ω)	R3(K Ω)	V _{ref} (V)	V _{ot} (V)
5V	3.3	3.3	1	2.5	Resulting Trimmed Output voltage; range $\leq \pm 10\%$
9V	4.7	1.8	1	2.5	
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	

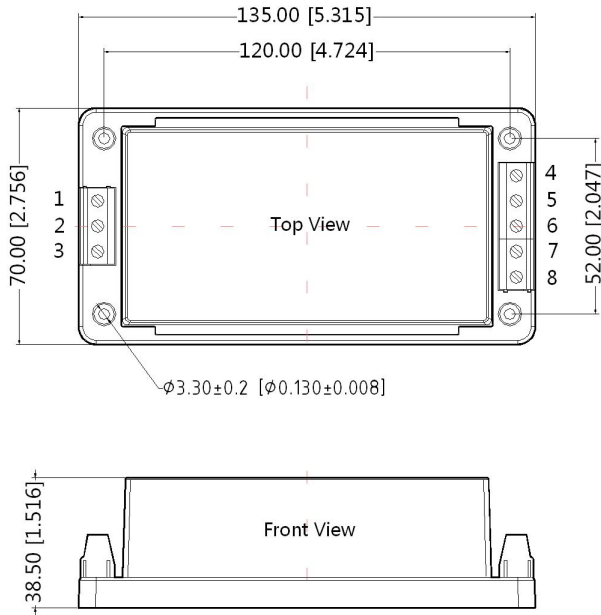
4. For additional information please refer to application notes on www.mornsun-power.com.

Dimensions and Recommended Layout



A5 Chassis mounting Dimensions

THIRD ANGLE PROJECTION 

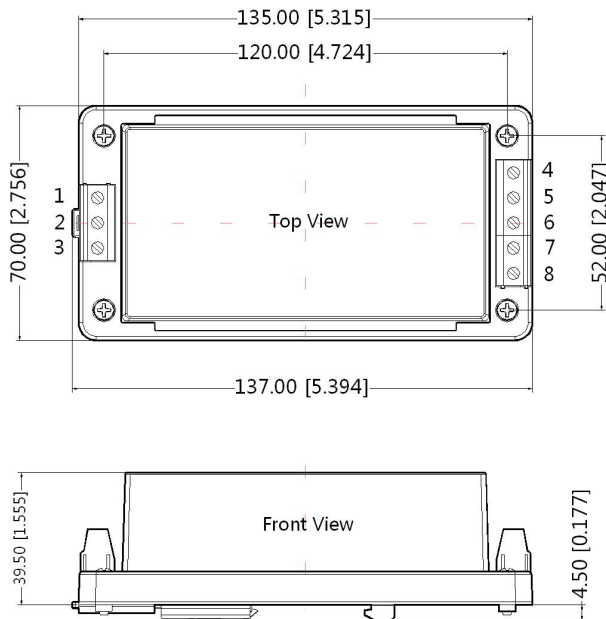


Pin-Out	
Pin	Function
1	AC(N)
2	AC(L)
3	\perp
4	NC
5	NC
6	+Vo
7	-Vo
8	Trim

Note:
Unit:mm[inch]
Wire range:24~12 AWG
General tolerances: ± 1.00 [± 0.040]

A6 Din-Rail mounting Dimensions

THIRD ANGLE PROJECTION 



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

Note:
Unit:mm[inch]
Installed on DIN RAIL TS35
Wire range:24~12 AWG
General tolerances: ± 1.00 [± 0.040]

Note:

1. For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number: 58220020(Horizontal package), 58220031(A5/A6 package);
2. 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;
3. Unless otherwise specified, parameters in this datasheet were measured under the conditions of $T_a=25^{\circ}\text{C}$, humidity<75% with nominal input voltage and rated output load;
4. All index testing methods in this datasheet are based on our company corporate standards;
5. We can provide product customization service, please contact our technicians directly for specific information;
6. Products are related to laws and regulations: see "Features" and "EMC";
7. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.

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