

20(25)W, AC-DC converter



LH20-25 series —is one of Mornsun's compact size power converters. It features universal AC input and at the same time accepts DC input voltage, low power consumption, high efficiency, high reliability and reinforced isolation. It offers good EMC performance compliant to IEC/EN61000-4, CISPR32/EN55032, UL60950 and EN60950 standards and are widely used in industrial, office and civil applications. For extremely harsh EMC environment, we recommend using the application circuit show in Design Reference of this datasheet.

FEATURES

- Universal 85-264VAC or 100-370VDC input voltage
- Regulated output, low ripple & noise
- Up to 87% efficiency
- Output short circuit, over-current, over-voltage, protection
- Plastic case meets UL94V-0 flammability
- IEC60950, UL60950, EN60950 safety approval
- IEC60950, UL60950, EN62368 safety approval (LH20-10C0512-04, LH20-10C0515-03, LH20-10D0524-03)
- Mounting: PCB mounting, Chassis mounting, DIN-Rail mounting available

Selection Guide

Certification	Part No.*	Output Power	Nominal Output Voltage and Current		Efficiency at 230VAC (%) Typ.	Capacitive Load (uF)Max.	
			(Vo1/Io1)	(Vo2/Io2)		Vo1	Vo2
UL/CE/CB	LH20-10B03	13.53W	3.3V/4100mA	--	74	48000	--
	LH20-10B05	17.5W	5V/3500mA	--	78	12240	--
	LH20-10B09	20W	9V/2100mA	--	80	7200	--
	LH20-10B12		12V/1600mA	--	82	5400	--
	LH20-10B15		15V/1300mA	--	83	2720	--
	LH20-10B24		24V/850mA	--	85	1840	--
--	LH20-10A05	20W	+5V/2000mA	-5V/2000mA	75	8000	8000
	LH20-10A12		+12V/830mA	-12V/830mA	82	960	960
	LH20-10A15		+15V/650mA	-15V/650mA	83	880	880
UL/CE/CB	LH20-10C0505-05		5V/2500mA	±5V/500mA	74	11200	4480
	LH20-10C0512-04		5V/2000mA	±12V/400mA	75	16000	1600
	LH20-10C0515-03		5V/2000mA	±15V/300mA	76	13520	370
	LH20-10C0524-02		5V/2000mA	±24V/200mA	77	11200	370
	LH20-10D0512-06		5V/2500mA	12V/600mA	75	32400	3250
	LH20-10D0515-05		5V/2500mA	15V/500mA	76	28000	1980
	LH20-10D0524-03		5V/2500mA	24V/300mA	77	28000	720
UL/CE/CB	LH25-10B03	13.53W	3.3V/4100mA	--	74	48000	--
	LH25-10B05	20.5W	5V/4100mA	--	79	12240	--
	LH25-10B09	25W	9V/2500mA	--	81	5600	--
	LH25-10B12		12V/2100mA	--	83	5400	--
	LH25-10B15		15V/1600mA	--	84	2400	--
	LH25-10B24		24V/1100mA	--	85	1440	--
	LH25-10B48		48V/500mA	--	87	500	--

Note: *Only LH20-10AXX use both outputs(positive and negative) as sampling feedback, the others use Vo1 and defined as first output.

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	--	--	0.6	A
	230VAC	--	--	0.34	
Inrush Current	115VAC	--	16	--	
	230VAC	--	30	--	
Leakage Current	230VAC/50Hz	0.3mA RMS typ.			
Recommended External Input Fuse(Chassis mounting, DIN-Rail mounting package series include fuse)		3.15A/250V, slow-blow, required			
Hot Plug		Unavailable			

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Output Voltage	Main circuit		--	±2	--	
Line Regulation	Full load	Main circuit	--	±0.5	--	
		Auxiliary circuit	--	±1.5	--	
Load Regulation	0%-100% load	Single output	--	±1	--	%
	10%-100% load	Dual output(balanced load)	--	±2	--	
		Isolated triple output (balanced load)	Main circuit Vo1	--	±3	
			Auxiliary circuit ±Vo2	--	±5	
		Isolated and separated twin output (balanced load)	Main circuit Vo1	--	±3	
			Auxiliary circuit Vo2	--	±5	
Ripple & Noise*	Main circuit	20MHz bandwidth (peak-peak value)	--	50	100	mV
Temperature Coefficient	Main circuit		--	±0.02	--	%/°C
Short Circuit Protection			Continuous, self-recovery			
Over-current Protection			≥110%Io, self-recovery			
Over-voltage Protection	Main circuit	3.3 / 5VDC Output	≤7.5VDC			
		9VDC Output	≤13VDC			
		12 / 15VDC Output	≤20VDC			
		24VDC Output	≤30VDC			
		48VDC Output	≤60VDC			
Minimum Load	Single output models		0	--	--	%
	Dual output models (balanced load)		10	--	--	
	Isolated and separated twin output (balanced load)		10	--	--	
	Isolated triple output (balanced load)		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	Input-output	Test time: 1min	3000	--	--	VAC
	Input- 		2000	--	--	
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			
Switching Frequency		--	65	--	kHz
Power Derating	-40℃ to -10℃	2.0	--	--	% /℃
	+50℃ to +70℃ (LH25-10B Series)	3.0	--	--	
	+55℃ to +70℃ (LH20-10A/B/C/D Series)	4.0	--	--	
Safety Standard	LH20-10C0512-04/LH20-10C0515-03/ LH20-10D0524-03	IEC60950/EN62368/UL60950			
		IEC60950/EN60950/UL60950			
Safety Certification	LH20-10C0512-04/LH20-10C0515-03/ LH20-10D0524-03	IEC60950/EN62368/UL60950			
		IEC60950/EN60950/UL60950			
Safety Class		CLASS I			
MTBF		MIL-HDBK-217F@25℃ > 300,000 h			

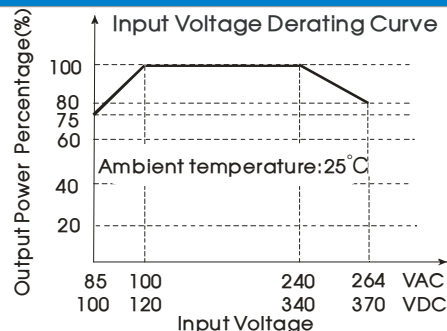
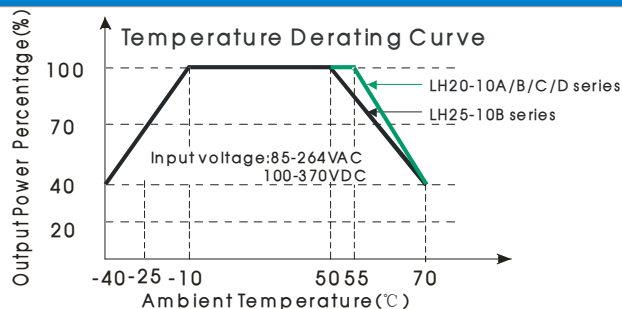
Mechanical Specifications

Case Material		Black plastic, flame-retardant and heat-resistant (UL94V-0)
Dimension	Horizontal package	70.00 x 48.00 x 23.50mm
	A2 chassis mounting	96.10 x 54.00 x 32.00mm
	A4 Din-Rail mounting	96.10 x 54.00 x 36.60mm
Weight	Horizontal package/A2 chassis mounting/ A4 Din-Rail mounting	120g/170g/210g (Typ.)
Cooling method		Free air convection

EMC Specifications

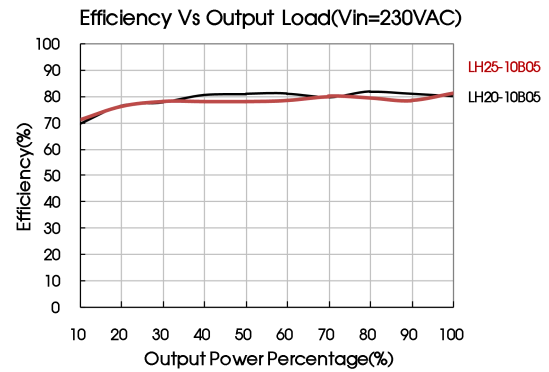
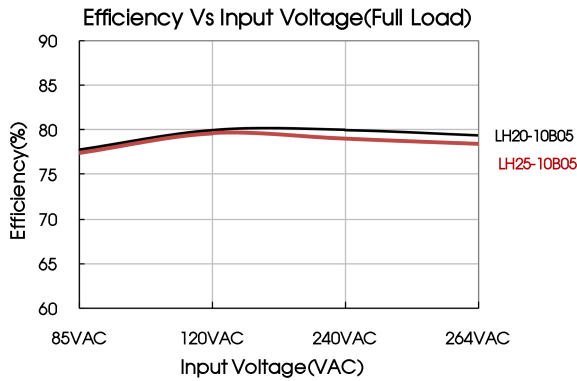
Emissions	CE	CISPR22/EN55022	CLASS B	
	RE	CISPR22/EN55022	CLASS B	
Immunity	ESD	IEC/EN61000-4-2	Contact ±6KV/Air ±8KV	Perf. Criteria B
	RS	IEC/EN61000-4-3	10V/m	perf. Criteria A
	EFT	IEC/EN61000-4-4	±2KV	perf. Criteria B
		IEC/EN61000-4-4	±4KV (See Fig. 5 for recommended circuit)	perf. Criteria B
	Surge	IEC/EN61000-4-5	line to line ±1KV/line to ground ±2KV	perf. Criteria B
		IEC/EN61000-4-5	line to line±2KV/ line to ground ±4KV (See Fig. 5 for recommended circuit)	perf. Criteria B
	CS	IEC/EN61000-4-6	10 Vr.m.s	perf. Criteria A
	PFM	IEC/EN61000-4-8	10A/m	perf. Criteria A
Voltage dip, short interruption and voltage variation		IEC/EN61000-4-11	0%, 70%	perf. Criteria B

Product Characteristic Curve



Note: ① With an AC input between 85-100V/240-264VAC and a DC input between 100-120VDC/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

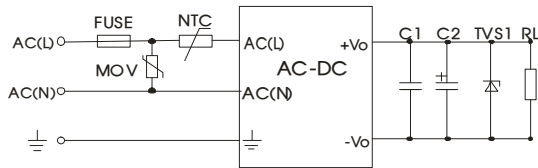


Fig. 1: LH20(25)-10B series (Single Output) typical application diagram

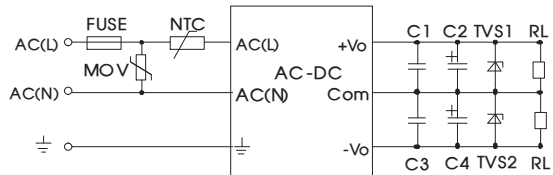


Fig. 2: LH20-10A series (Dual Output) typical application diagram

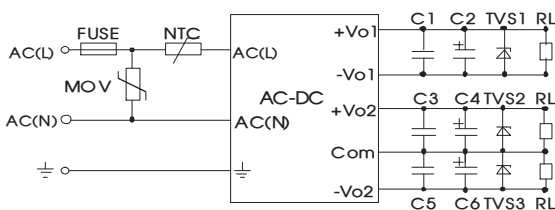


Fig. 3: LH20-10C series (Triple Output) typical application diagram

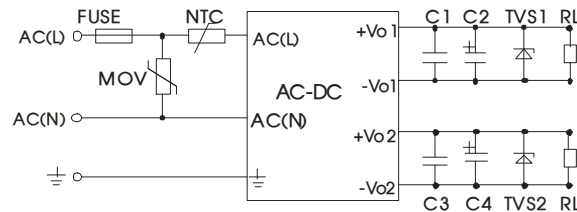


Fig. 4: LH20-10D series (Isolate Twin Output) typical application diagram

Part No.	FUSE	MOV	NTC	C1/C3/ C5(uF)	C2(uF)	C4(uF)	C6(uF)	TVS1	TVS2	TVS3
LH20-10B03	3.15A/250V, slow-blow, required	S14K300	5D-9	1	330	--	--	SMBJ7.0A	--	--
LH20-10B05					330	--	--	SMBJ7.0A	--	--
LH20-10B09					220	--	--	SMBJ12A	--	--
LH20-10B12					220	--	--	SMBJ20A	--	--
LH20-10B15					220	--	--	SMBJ20A	--	--
LH20-10B24					220	--	--	SMBJ30A	--	--
LH20-10A05					470	470	--	SMBJ7.0A	SMBJ7.0A	--
LH20-10A12					120	120	--	SMBJ20A	SMBJ20A	--
LH20-10A15					68	68	--	SMBJ20A	SMBJ20A	--
LH20-10C0505-05					330	120	120	SMBJ7.0A	SMBJ7.0A	SMBJ7.0A
LH20-10C0512-04					330	120	120	SMBJ7.0A	SMBJ20A	SMBJ20A
LH20-10C0515-03					330	120	120	SMBJ7.0A	SMBJ20A	SMBJ20A
LH20-10C0524-02					330	47	47	SMBJ7.0A	SMBJ30A	SMBJ30A
LH20-10D0512-06					330	220	--	SMBJ7.0A	SMBJ20A	--
LH20-10D0515-05					330	220	--	SMBJ7.0A	SMBJ20A	--
LH20-10D0524-03					330	120	--	SMBJ7.0A	SMBJ30A	--
LH25-10B03					330	--	--	SMBJ7.0A	--	--
LH25-10B05					330	--	--	SMBJ7.0A	--	--
LH25-10B09					330	--	--	SMBJ12A	--	--
LH25-10B12					330	--	--	SMBJ20A	--	--
LH25-10B15					330	--	--	SMBJ20A	--	--
LH25-10B24					120	--	--	SMBJ30A	--	--
LH25-10B48					68	--	--	SMBJ64A	--	--

Output Filter Components:

We recommend using an electrolytic capacitor with high frequency, and low ESR rating for C2, C4, C6 (refer to manufacture's datasheet). Choose a Capacitor voltage rating with at least 20% margin, in other words not exceeding 80%. C1, C3, C5 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

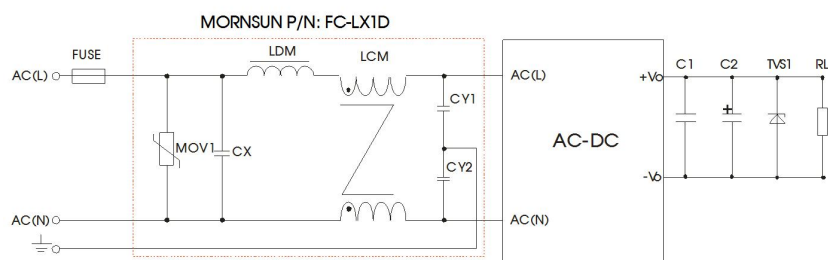
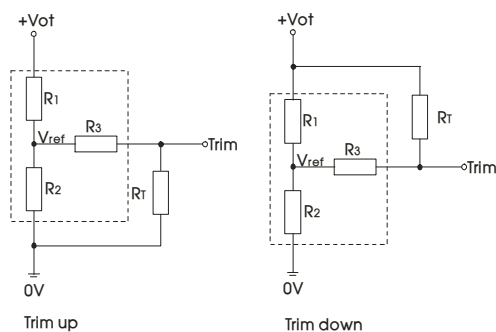


Fig 5: EMC application circuit with higher requirements

Element model	Recommended value
MOV1	S14K300
CY1 , CY2	1000pF/400VAC
CX	0.1uF/275VAC
LCM	10mH, we recommended using part no. FL2D-Z5-103
LDM	4.7uH/2A
FC-LX1D	2KV/4KV EMC filter
FUSE	3.15A/250V, slow-blow, required

3. Application of Trim and calculation of Trim resistance



Calculation formula of Trim resistance:

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

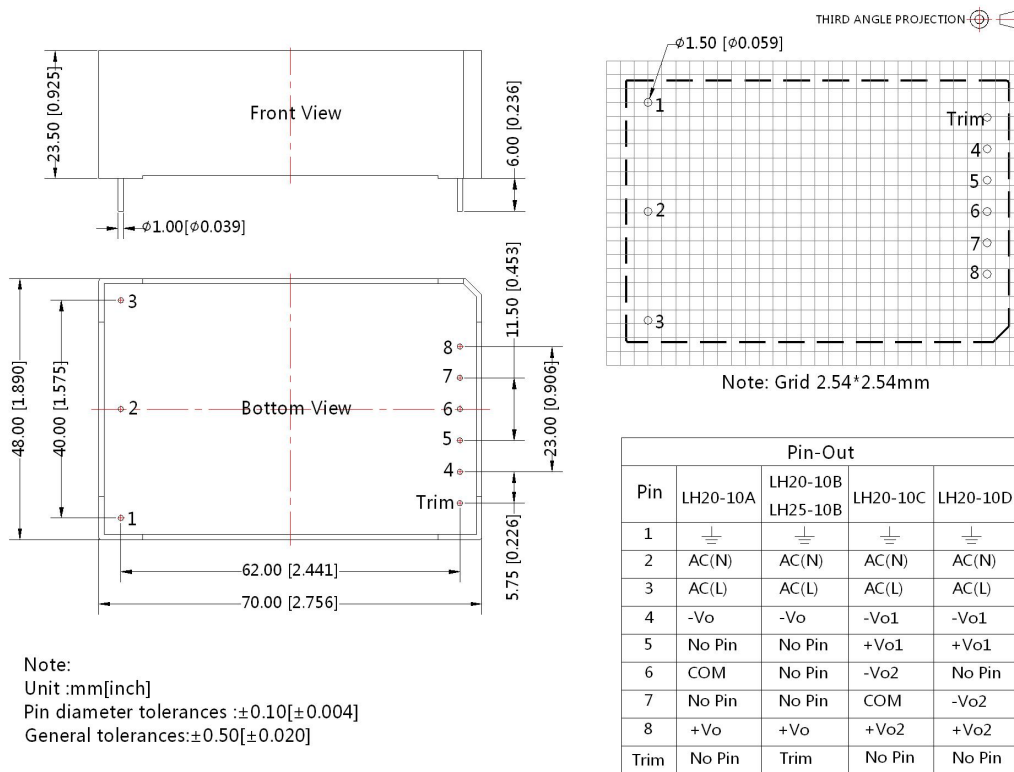
R_T is Trim resistance
 a is a self-defined parameter, with no real meaning.

Applied circuits of Trim (Part in broken line is the interior of models):

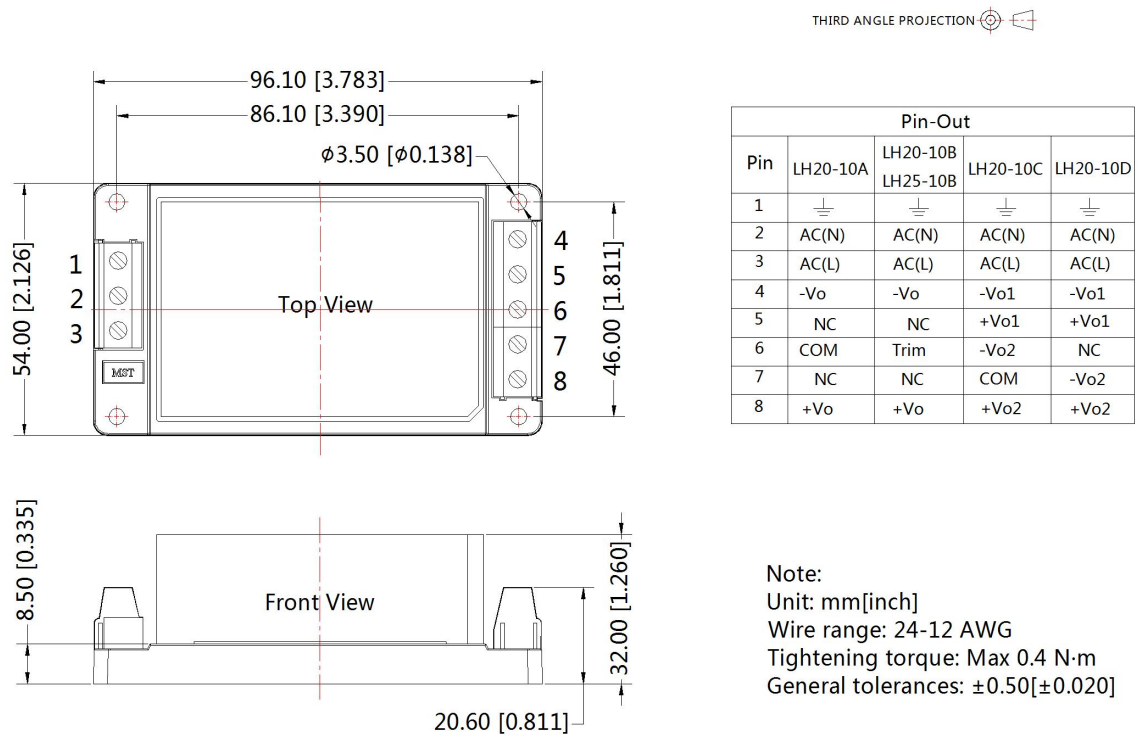
Vout	R1(K Ω)	R2(K Ω)	R3(K Ω)	Vref(V)	Vot(V)
3.3V	3.3	1.98	1	1.24	Output voltage after regulation, variation $\leq \pm 10\%$
5V	3.3	3.3	1	2.5	
9V	7.5	2.87	1	2.5	
12V	3.83	1	1	2.5	
15V	7.5	1.5	1	2.5	
24V	8.66	1	1	2.5	
48V	68	3.73	1	2.5	

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

Dimensions and Recommended Layout

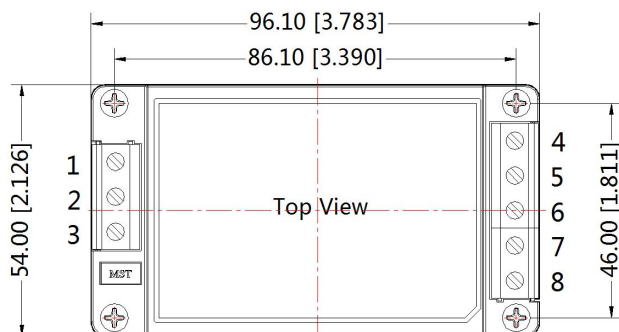


LHXXA2 Dimensions

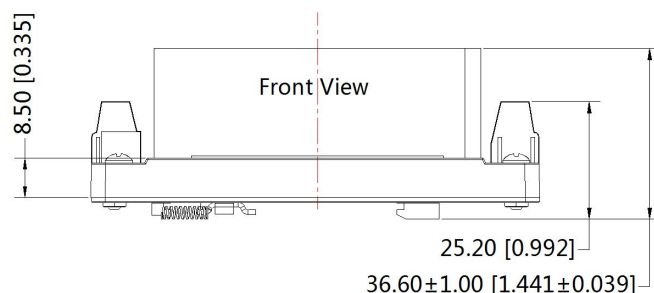


LHXXA4 Dimensions

THIRD ANGLE PROJECTION



Pin-Out				
Pin	LH20-10A	LH20-10B LH25-10B	LH20-10C	LH20-10D
1	⏏	⏏	⏏	⏏
2	AC(N)	AC(N)	AC(N)	AC(N)
3	AC(L)	AC(L)	AC(L)	AC(L)
4	-Vo	-Vo	-Vo1	-Vo1
5	NC	NC	+Vo1	+Vo1
6	COM	Trim	-Vo2	NC
7	NC	NC	COM	-Vo2
8	+Vo	+Vo	+Vo2	+Vo2



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: ±0.50[±0.020]

Note:

- For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number: 58220006; the Packaging bag number of A2/A4 package: 58220010;
- 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;
- 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;
- All index testing methods in this datasheet are based on our company corporate standards;
- We can provide product customization service, please contact our technicians directly for specific information;
- Products are related to laws and regulations: see "Features" and "EMC";
- 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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