

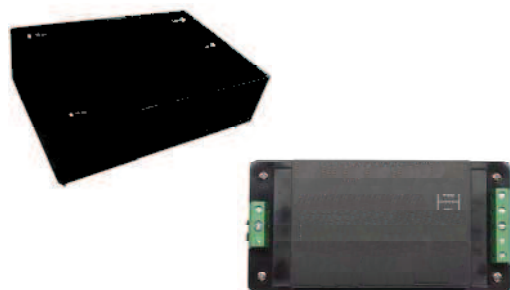
AC/DC Converter

SLH40 Series



SCHMID-M

40W, AC/DC converter



FEATURES

- Wide Input voltage range:
85~264VAC/100~370VDC
- Low standby power consumption: 0.5W, conversion efficiency up to 84%
- Output short circuit, over-current, over-voltage protection
- Meet IEC61000, UL60950 and EN60950 standards
- Mounting: PCB mounting, Chassis mounting, DIN-Rail mounting available

SLH40 series is a 40W efficient environmental-protection AC-DC module power supply, which has advantages such as universal input voltage, accept either AC or DC input, high efficiency, high reliability, low power consumption and high safety isolation. The series products are widely used in industries such as industrial control, office.

Note: Please refer to Design Reference when module being used in a bad EMC environment.

Selection Guide

| Certification | Part No.* | Output Power | Nominal Output Voltage and Current | | Efficiency (230VAC, %/Typ.) | Max. Capacitive Load(μF) |
|---------------|------------------|--------------|------------------------------------|---------------|-----------------------------|--------------------------|
| | | | (Vo1/Io1) | (Vo2/Io2) | | |
| UL/CE | SLH40-10B03 | 26.4W | 3.3VDC/8000mA | – | 78 | 60000 |
| | SLH40-10B05 | | 5VDC/8000mA | – | 82 | 40000 |
| | SLH40-10B09 | | 9VDC/4444mA | – | 84 | 12000 |
| | SLH40-10B12 | | 12VDC/3333mA | – | 84 | 9000 |
| | SLH40-10B15 | | 15VDC/2666mA | – | 84 | 7000 |
| | SLH40-10B24 | | 24VDC/1667mA | – | 84 | 2000 |
| – | SLH40-10D0512-13 | 40W | 5VDC/5000mA | 12VDC/1250mA | 82 | 10000/470 |
| | SLH40-10D0524-06 | | 5VDC/5000mA | 24VDC/625mA | 82 | 10000/400 |
| | SLH40-10A05 | | +5VDC/4000mA | -5VDC/4000mA | 82 | ±12000 |
| | SLH40-10A12 | | +12VDC/1666mA | -12VDC/1666mA | 84 | ±4400 |
| | SLH40-10A15 | | +15VDC/1333mA | -15VDC/1333mA | 84 | ±1000 |

Note:*product model with a suffix of "A5" means chassis mounting and that with a suffix of "A6" indicates DIN-Rail mounting (e.g. SLH40-10B05A5 means chassis mounting; SLH40-10B05A6 means DIN-Rail mounting).

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 | – | 440 | Hz |
| Input current | 115VAC | – | – | 1.0 | A |
| | 230VAC | – | – | 0.6 | |
| Inrush current | 115VAC | – | 30 | – | |
| | 230VAC | – | 50 | – | |
| Hot Plug | | | | Unavailable | |

Output Specifications

| Item | Operating Conditions | Min. | Typ. | Max. | Unit | |
|-------------------------|----------------------|--------------------------------|------|------|------|---|
| Output Voltage Accuracy | SLH40-10Bxx | Main output | – | ±2 | – | % |
| | SLH40-10Axx | Main output / Secondary output | – | ±2 | – | |
| | SLH40-10Dxx | Main output | – | ±2 | – | |
| | | Secondary output | – | ±5 | – | |

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| | | | | | | |
|----------------------------|-----------------------------------|---------------------------|-------|-----|------|----|
| Line Regulation | SLH40-10Bxx | -- | ±0.5 | -- | % | |
| | SLH40-10Axx | | | | | |
| | SLH40-10Dxx(Main output) | | | | | |
| | SLH40-10Dxx(Secondary output) | | | | | |
| Load Regulation | SLH40-10Bxx | -- | ±1 | -- | % | |
| | SLH40-10Axx(Balance load) | -- | ±2 | -- | | |
| | SLH40-10Dxx(Balance load) | Main output | -- | ±2 | | -- |
| | | Secondary output | -- | ±5 | | -- |
| Ripple & Noise* | 20MHz bandwidth (peak-peak value) | -- | 50 | 100 | mV | |
| Temperature Coefficient | Main output | -- | ±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 | 3.3V Output | -- | -- | 5.5 | V | |
| | 5V Output | -- | -- | 9 | | |
| | 9V Output | -- | -- | 14 | | |
| | 12V Output | -- | -- | 16 | | |
| | 15V Output | -- | -- | 24 | | |
| | 24V Output | -- | -- | 35 | | |
| Min. Load | SLH40-10Bxx | 0 | -- | -- | % | |
| | SLH40-10Axx (Balance load) | 10 | -- | -- | | |
| | SLH40-10Dxx (Balance load) | 25 | -- | -- | | |
| Cross Regulation | SLH40-10A05 | -- | ±8 | -- | % | |
| | SLH40-10A12/ SLH40-10A15 | -- | ±5 | -- | | |
| | SLH40-10Dxx | Main output | -- | ±1 | | -- |
| | | Secondary output | -- | ±7 | | -- |
| Trim | SLH40-10Bxx | -- | -- | ±10 | | |
| Hold-up Time | 115VAC input | -- | 15 | -- | ms | |
| | 230VAC input | -- | 80 | -- | | |

Note: * Ripple and noise are measured by "parallel cable" method, please see AC-DC Converter Application Notes for specific operation.

General Specifications

| Item | Operating Conditions | | Min. | Typ. | Max. | Unit |
|-----------------------|-------------------------------------------|---------------------|--------------------------|------|------|--------|
| Isolation Voltage | Input-output | Test time: 3000 | 3000 | -- | -- | VAC |
| | Output-output | 1min | 500 | -- | -- | |
| Operating Temperature | | | -40 | -- | +70 | °C |
| Storage Temperature | | | -40 | -- | +85 | |
| Storage Humidity | | | -- | -- | 95 | %RH |
| Welding Temperature | Wave-soldering | 260±5°C; time:5~10s | | | | |
| | Manual-welding | 360±10°C; time:3~5s | | | | |
| Switching Frequency | | | -- | 65 | -- | kHz |
| Power Derating | -40°C to -30°C (SLH40-10B03/05) | | 4.0 | -- | -- | % / °C |
| | -40°C to -30°C (SLH40-10B09/12/15) | | 3.0 | -- | -- | |
| | -40°C to -30°C (SLH40-10Dxx, SLH40-10Axx) | | 5.0 | -- | -- | |
| | +45°C to +70°C (SLH40-10B03/05) | | 3.0 | -- | -- | % / °C |
| | +55°C to +70°C (SLH40-10B09/12/15) | | 3.7 | -- | -- | |
| | +55°C to +70°C (SLH40-10B24) | | 2.7 | -- | -- | |
| | +50°C to +70°C (SLH40-10Dxx, SLH40-10Axx) | | 3 | -- | -- | |
| Safety Standard | | | IEC60950/EN60950/UL60950 | | | |

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| | | |
|--------------------------------|--------------------|-------------------------------|
| Safety-regulated Certification | SLH40-10Bxx series | EN60950/UL60950 |
| Safety Class | | CLASS II |
| MTBF | | MIL-HDBK-217F@25°C >300,000 h |

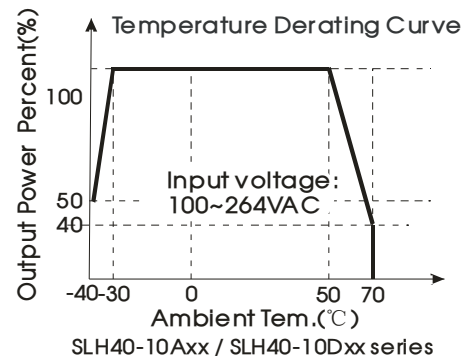
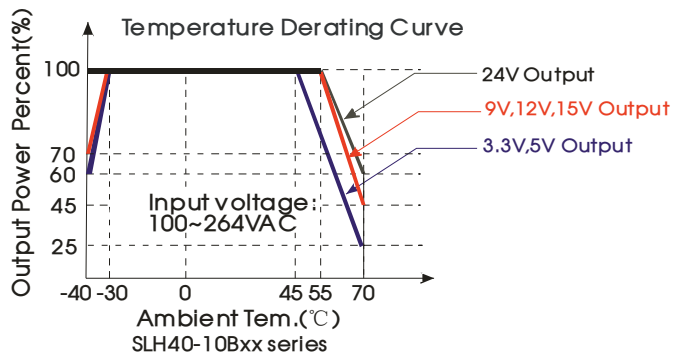
Physical Specifications

| | | |
|-----------------|------------------------------------------------------------|-------------------------------|
| Casing Material | Black flame-retardant and heat-resistant plastic (UL94-V0) | |
| Dimensions | Horizontal package | 89.00*63.50*25.00 mm |
| | A5 chassis package | 135.00*70.00*33.50 mm |
| | A6 DIN-rail package | 137.00*70.00*39.00 mm |
| Weight | Horizontal package/A5 chassis package/A6 DIN-rail package | 225.00g/310.00g/370.00g(Typ.) |
| Cooling Method | Free convection | |

EMC Specifications

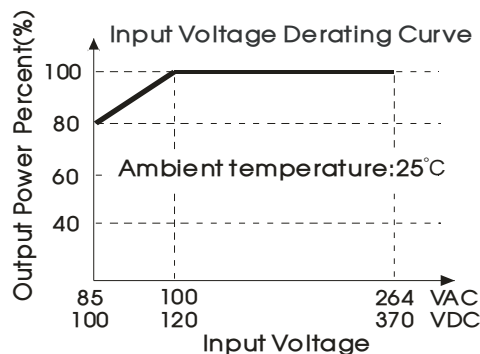
| | | | | |
|-------------------------------------------------------------------|-------|--------------------------|-----------------------------------------------|------------------|
| EMI | CE | CISPR22/EN55022, CLASS B | | |
| | RE | CISPR22/EN55022, CLASS B | | |
| EMS | ESD | IEC/EN61000-4-2 | ±6KV/8KV 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. 4 for recommended circuit) | perf. Criteria B |
| | Surge | IEC/EN61000-4-5 | ±1KV/2KV | perf. Criteria B |
| | | IEC/EN61000-4-5 | ±2KV/4KV (See Fig. 4 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 interruptions and voltage variations immunity | | IEC/EN61000-4-11 | 0%-70% perf. Criteria B | |

Product Characteristic Curve



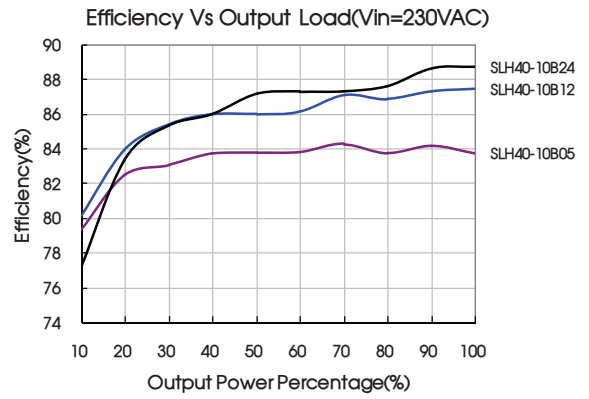
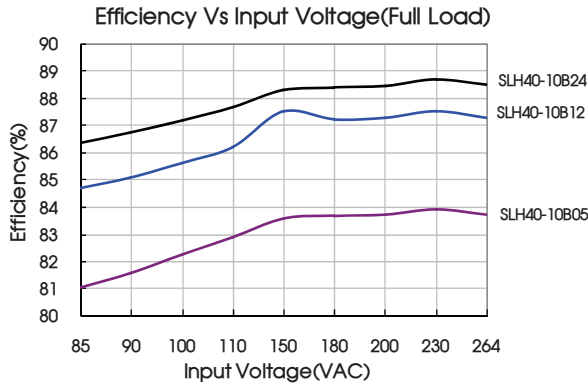
Note: ① Input voltage should be derated based on temperature derating when it is 85-100VAC/100-120VDC;

② This product is suitable for use in natural air cooling environments, if in a closed environment, please contact our company's FAE.



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Design Reference

1. Typical application circuit

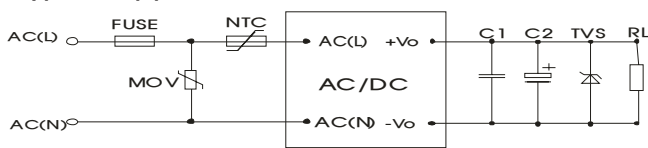


Fig. 1: SLH40-10B**Typical application circuit

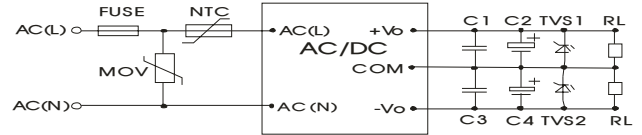


Fig. 2: SLH40-10A**Typical application circuit

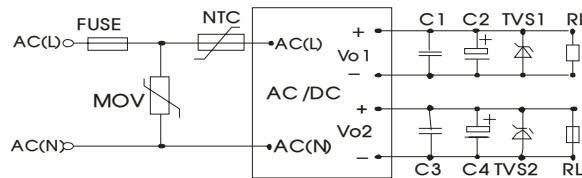


Fig. 3: SLH40-10D**Typical application circuit

| Model | C2(uF) | C4(uF) | C6(uF) | C1, C3, C5 (uF) | TVS 1 | TVS 2 |
|------------------|--------|--------|--------|-----------------|----------|----------|
| SLH40-10B03 | 680 | -- | -- | 1 | SMBJ7.0A | -- |
| SLH40-10B05 | 680 | -- | -- | 1 | SMBJ7.0A | -- |
| SLH40-10B09 | 330 | -- | -- | 1 | SMBJ12A | -- |
| SLH40-10B12 | 220 | -- | -- | 1 | SMBJ20A | -- |
| SLH40-10B15 | 220 | -- | -- | 1 | SMBJ20A | -- |
| SLH40-10B24 | 120 | -- | -- | 1 | SMBJ30A | -- |
| SLH40-10D0512-13 | 680 | 220 | -- | 1 | SMBJ7.0A | SMBJ20A |
| SLH40-10D0524-06 | 680 | 120 | -- | 1 | SMBJ7.0A | SMBJ30A |
| SLH40-10A05 | 680 | 680 | -- | 1 | SMBJ7.0A | SMBJ7.0A |
| SLH40-10A12 | 220 | 220 | -- | 1 | SMBJ20A | SMBJ20A |
| SLH40-10A15 | 220 | 220 | -- | 1 | SMBJ20A | SMBJ20A |

Note: Output filtering capacitor C2 is electrolytic capacitor, it is recommended to apply electrolytic capacitor with high frequency and low resistance. For capacitance and current of capacitor please refer to manufacture's datasheet. Capacitance withstand voltage derating should be 80% or above. C1 is ceramic capacitor, which is used to filter high-frequency noise. TVS is a recommended component to protect post-circuits if converter fails. External input FUSE model is recommended to use 3.15A/250VAC, slow fusing. External input NTC model is recommended to use 5D-9. External input MOV model is recommended to use S10K300.

2. EMC solution-recommended circuit

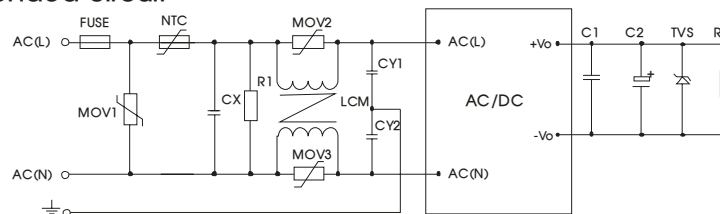


Fig 4 (Output external circuit refer to the typical application circuit)

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EMC solution-recommended circuit PCB layout

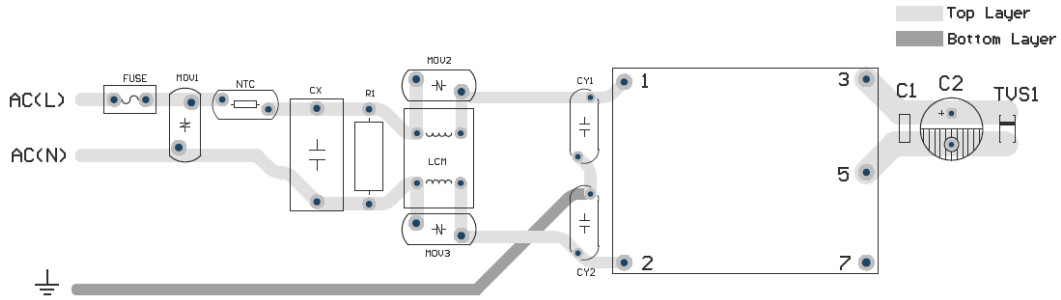
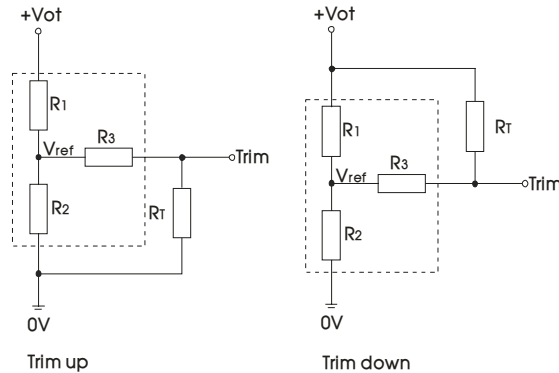


Fig 5

Suggestions for safety regulation and wiring width: wire width $\geq 3\text{mm}$, distance between wires $\geq 6\text{mm}$, and distance between wire and ground $\geq 6\text{mm}$

| Element model | Recommended value |
|---------------|-----------------------------------------------------|
| MOV1 | S14K350 |
| MOV2, MOV3 | S07K350 |
| CX | 0.15 μF /300VAC |
| CY1 | 2.2nF/400VAC |
| CY2 | 2.2nF /400VAC |
| R1 | 1M Ω /2W |
| LCM | 2.2 mH, recommended to use SCHMID-M's SFL2D-10-222; |
| NTC | 5D-14 |
| FUSE | 3.15A/250V, slow fusing, necessary |

3. Application of Trim and calculation of Trim resistance



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

Calculation formula of Trim resistance:

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

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

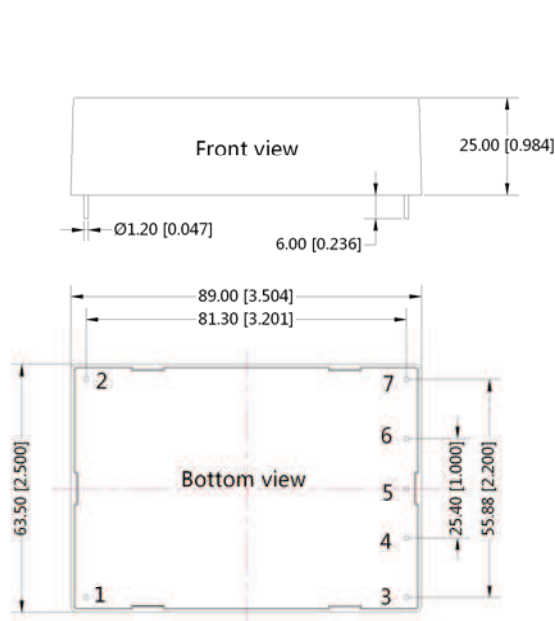
R_T is Trim resistance, a is a self-defined parameter, with no real meaning.

| V _{ot} | R1(K Ω) | R2(K Ω) | R3(K Ω) | V _{ref} (V) | V _{ot} (V) |
|-----------------|-----------------|-----------------|-----------------|----------------------|------------------------------------------------------------|
| 3.3V | 2 | 1.2 | 1 | 1.24 | Output voltage after regulation, variation $\leq \pm 10\%$ |
| 5V | 3.3 | 3.3 | 1 | 2.5 | |
| 9V | 4.7 | 1.8 | 1 | 2.5 | |
| 12V | 3.83 | 1 | 1 | 2.5 | |
| 15V | 4.99 | 1 | 1 | 2.5 | |
| 24V | 8.66 | 1 | 1 | 2.5 | |

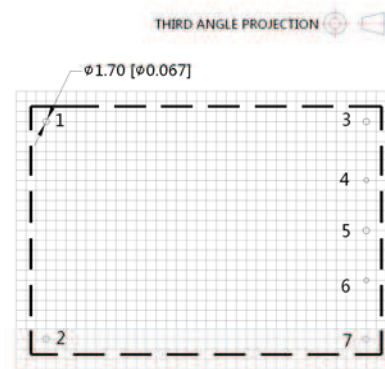
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Dimensions and Recommended Layout



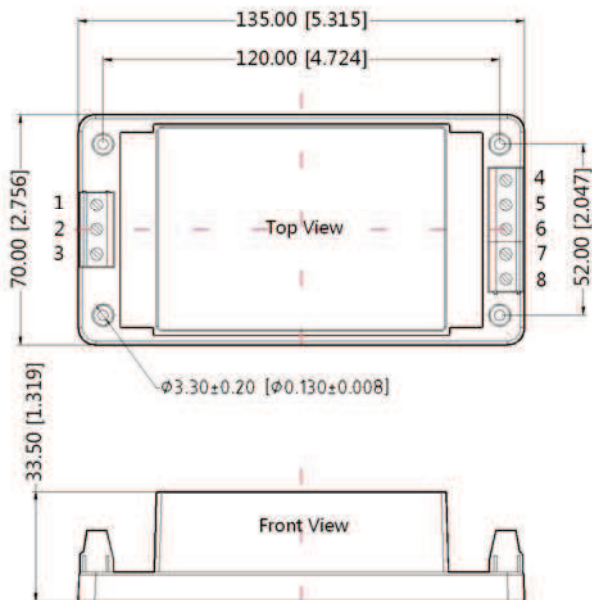
Note:
 Unit :mm[inch]
 Pin diameter tolerances : ± 0.10 [± 0.004]
 General tolerances: ± 0.50 [± 0.020]



Note : Grid 2.54*2.54mm

| Pin-Out | | | |
|---------|-----------|-----------|-----------|
| Pin | SLH40-10A | SLH40-10B | SLH40-10D |
| 1 | AC(L) | AC(L) | AC(L) |
| 2 | AC(N) | AC(N) | AC(N) |
| 3 | +Vo | +Vo | +Vo2 |
| 4 | No Pin | No Pin | +Vo1 |
| 5 | COM | -Vo | -Vo2 |
| 6 | No Pin | No Pin | -Vo1 |
| 7 | -Vo | Trim | No Pin |

A5 Chassis Package Dimensions



THIRD ANGLE PROJECTION

| Pin-Out | | | |
|---------|-----------|-----------|-----------|
| Pin | SLH40-10A | SLH40-10B | SLH40-10D |
| 1 | AC(L) | AC(L) | AC(L) |
| 2 | AC(N) | AC(N) | AC(N) |
| 3 | NC | NC | NC |
| 4 | +Vo | +Vo | +Vo2 |
| 5 | NC | NC | +Vo1 |
| 6 | COM | -Vo | -Vo2 |
| 7 | NC | NC | -Vo1 |
| 8 | -Vo | Trim | NC |

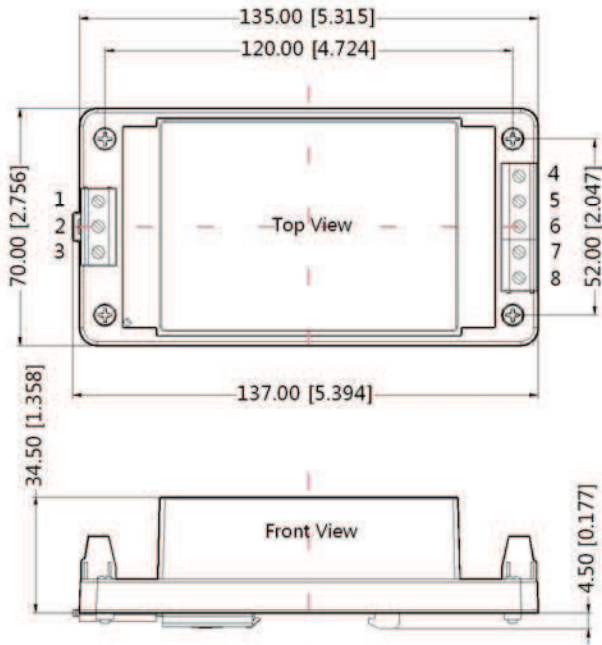
Note:
 Unit:mm[inch]
 Wire range:24~12 AWG
 General tolerances: ± 1.00 [± 0.040]

AC/DC Converter

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A6 DIN-rail Package Dimensions

THIRD ANGLE PROJECTION 



| Pin-Out | | | |
|---------|-----------|-----------|-----------|
| Pin | SLH40-10A | SLH40-10B | SLH40-10D |
| 1 | AC(L) | AC(L) | AC(L) |
| 2 | AC(N) | AC(N) | AC(N) |
| 3 | NC | NC | NC |
| 4 | +Vo | +Vo | +Vo2 |
| 5 | NC | NC | +Vo1 |
| 6 | COM | -Vo | -Vo2 |
| 7 | NC | NC | -Vo1 |
| 8 | -Vo | Trim | NC |

Note:

Unit:mm[inch]

Installed on DIN RAIL TS35

Wire range:24~12 AWG

General tolerances:±1.00[±0.040]

Notes:

1. Packing Information please refer to 'Product Packing Information'. Packing bag number: 58220021(Horizontal package), 58220031(A5/A6 package);
2. Unless otherwise specified, data in this datasheet should be tested under the conditions of $T_a=25^{\circ}\text{C}$, humidity<75% when inputting nominal voltage and outputting rated load;
3. All index testing methods in this datasheet are based on our Company's corporate standards;
4. 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;
5. We can provide product customization service;
6. Specifications of this product are subject to changes without prior notice.