# DWLP10-E&F Series

## DESCRIPTIONS

10W, DC/DC Converter




RoHS

CE Report UKCA Report

EN62368-1 BS EN62368-1

## FEATURES

- Ultra-wide 4:1 input voltage range
- High efficiency up to 87%
- No-load power consumption as low as 0.12W
- I/O isolation test voltage: 3kVDC
- Input under-voltage protection, output short- circuit, over-voltage, over-current protection
- Operating ambient temperature range: -40℃ to +85℃
- Meets CISPR32/EN55032 CLASS A, without extra components
- Input reverse polarity protection available with Chassis (A2S) or 35mm Din-Rail mounting (A4S) version
- Meet IEC60950, UL60950, EN60950, EN/UL62368
- Industry standard pin-out

## APPLICATIONS

- **Industrial control**
- **Power**
- **Home appliances**
- **Instrumentation**
- **Communication**
- **Civil applications**

## Selection Guide

| Certification | Part No. ① | Input Voltage (VDC) | | Output | | Full Load Efficiency ④ (%) Min./Typ. | Capacitive Load (μF)⑤Max. |
|---|---|---|---|---|---|---|---|
| | | Nominal② (Range) | Max.③ | Voltage (VDC) | Current (mA) Max./Min. | | |
| EN | DWLP10-E2405 | 24 (9-36) | 40 | ±5 | ±1000/0 | 79/81 | 1000 |
| | DWLP10-E2412 | | | ±12 | ±416/0 | 83/85 | 330 |
| | DWLP10-E2415 | | | ±15 | ±333/0 | 85/87 | 220 |
| | DWLP10-F2403 | | | 3.3 | 2400/0 | 76/78 | 5400 |
| | DWLP10-F2405 | | | 5 | 2000/0 | 80/82 | 5400 |
| | DWLP10-F2409 | | | 9 | 1111/0 | 82/84 | 680 |
| | DWLP10-F2412 | | | 12 | 833/0 | 82/84 | 470 |
| | DWLP10-F2415 | | | 15 | 667/0 | 85/87 | 330 |
| | DWLP10-F2424 | | | 24 | 416/0 | 84/86 | 100 |
| EN | DWLP10-F4805 | 48 (18-75) | 80 | ±5 | ±1000/0 | 80/82 | 1000 |
| | DWLP10-F4812 | | | ±12 | ±416/0 | 84/86 | 330 |
| | DWLP10-F4815 | | | ±15 | ±333/0 | 85/87 | 220 |
| EN | DWLP10-F4803 | | | 3.3 | 2400/0 | 77/79 | 5400 |
| | DWLP10-F4805 | | | 5 | 2000/0 | 80/82 | 5400 |
| | DWLP10-F4812 | | | 12 | 833/0 | 84/86 | 470 |
| | DWLP10-F4815 | | | 15 | 667/0 | 85/87 | 330 |
| | DWLP10-F4824 | | | 24 | 416/0 | 85/87 | 100 |

Notes:
①Use "E2S" suffix for chassis mounting and "D4S" suffix for Din-Rail mounting;
②Minimum input voltage and start-up voltage are increased by 1VDC for all models with E2S and D4S suffixes because of the input reverse polarity function;
③Exceeding the maximum input voltage may cause permanent damage;
④Efficiency is measured at nominal input voltage and rated output load; efficiencies for E2S and D4S Model's is decreased by 2% due to the input reverse polarity protection circuit;
⑤The specified maximum capacitive load value for Vo1 and Vo2 output is identical.

## Input Specifications

| Item | Operating Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Input Current (full load / no-load) | 24VDC nominal input series, nominal input voltage | 3.3VDC output | -- | 423/5 | 434/12 | mA |
| | | Others | -- | 514/5 | 527/12 | |
| | 48VDC nominal input series, nominal input voltage | 3.3VDC output | -- | 208/5 | 214/12 | |
| | | Others | -- | 254/5 | 260/12 | |
| Reflected Ripple Current | 24VDC nominal input series, nominal input voltage | | -- | 40 | -- | |
| | 48VDC nominal input series, nominal input voltage | | -- | 30 | -- | |
| Surge Voltage ( 1sec. max.) | 24VDC nominal input series | | -0.7 | -- | 50 | VDC |
| | 48VDC nominal input series | | -0.7 | -- | 100 | |
| Start-up Voltage | 24VDC nominal input series | | -- | -- | 9 | |
| | 48VDC nominal input series | | -- | -- | 18 | |
| Input Under-voltage Protection | 24VDC nominal input series | | 5.5 | 6.5 | -- | |
| | 48VDC nominal input series | | 12 | 15.5 | -- | |
| Start-up Time | Nominal input voltage & constant resistance load | | -- | 10 | -- | ms |
| Input Filter | | | Pi filter | | | |
| Hot Plug | | | Unavailable | | | |
| Ctrl* | Module on | | Ctrl pin open or pulled high (3.5-12VDC) | | | |
| | Module off | | Ctrl pin pulled low to GND (0-1.2VDC) | | | |
| | Input current when off | | -- | 5 | 10 | mA |

Note: * The Ctrl pin voltage is referenced to input GND.

## Output Specifications

| Item | Operating Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Voltage Accuracy① | 0% - 100% load | | -- | ±1 | ±3 | % |
| Linear Regulation | Input voltage variation from low to high at full load | Vo1 | -- | ±0.2 | ±0.5 | |
| | | Vo2 | -- | ±0.5 | ±1.0 | |
| Load Regulation② | 5% - 100% load | Vo1 | -- | ±0.5 | ±1 | |
| | | Vo2 | -- | ±0.5 | ±1.5 | |
| Cross Regulation | Dual outputs, Vo1 load at 50%, Vo2 load at range of 10% - 100% | | -- | -- | ±5 | |
| Transient Recovery Time | 25% load step change, nominal input voltage | | -- | 300 | 500 | μs |

| | | | | | |
|---|---|---|---|---|---|
| Transient Response Deviation | | -- | ±3 | ±5 | % |
| Temperature Coefficient | Full load | -- | -- | ±0.03 | %/℃ |
| Ripple & Noise③ | 20MHz bandwidth, 5% - 100% load | -- | 60 | 120 | mV p-p |
| Over-voltage Protection | Input voltage range | 110 | 130 | 160 | %Vo |
| Over-current Protection | | 110 | 140 | 190 | %Io |
| Short-circuit Protection | | Continuous, self-recovery | | | |

Note:

①Output voltage accuracy of ±5VDC output for 0% - 5% load is ±5% max;

②Load regulation for 0% - 100% load increases to ±5%;

③Ripple & Noise at ≤5% load is 5%Vo max. The "parallel cable" method is used for Ripple and Noise test, please refer to DC-DC Converter Application Notes for specific information.

## General Specifications

| Item | Operating Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Isolation | Input-output Electric Strength Test for 1 minute with a leakage current of 1mA max. | 3000 | -- | -- | VDC |
| Insulation Resistance | Input-output resistance at 500VDC | 1000 | -- | -- | MΩ |
| Isolation Capacitance | Input-output capacitance at 100KHz/0.1V | -- | 500 | -- | pF |
| Operating Temperature | See Fig. 1 | -40 | -- | +85 | ℃ |
| Storage Temperature | | -55 | -- | +125 | ℃ |
| Storage Humidity | Non-condensing | 5 | -- | 95 | %RH |
| Pin Soldering Resistance Temperature | Soldering spot is 1.5mm away from case for 10 seconds | -- | -- | +300 | ℃ |
| Vibration | | 10-55Hz, 2G, 30 Min. along X, Y and Z | | | |
| Switching Frequency* | PWM mode | -- | 350 | -- | KHz |
| MTBF | MIL-HDBK-217F@25℃ | 1000 | -- | -- | K hours |

Note:* Switching frequency is measured at full load. The module reduces the switching frequency for light load (below 50%) efficiency improvement.

## Mechanical Specifications

| | | |
|---|---|---|
| Case Material | Black flame-retardant and heat-resistant plastic (UL94 V-0) | |
| Dimensions | Horizontal package | 51.50 × 26.50 × 12.00 mm |
| | E2S chassis mounting | 76.00 × 31.50 × 21.20 mm |
| | D4S Din-rail mounting | 76.00 × 31.50 × 25.80 mm |
| Weight | Horizontal package/E2S chassis mounting/D4S Din-rail mounting | 21.2g/46.0g/66.0g (Typ.) |
| Cooling method | Free air convection | |

## Electromagnetic Compatibility (EMC)

| | | | | |
|---|---|---|---|---|
| Emissions | CE | CISPR32/EN55032 | CLASS A<br>CLASS B | (without extra components)/<br>(see Fig. 3-②for recommended circuit) |
| | RE | CISPR32/EN55032 | CLASS A<br>CLASS B | (without extra components)/<br>(see Fig. 3-②for recommended circuit) |
| Immunity | ESD | IEC/EN61000-4-2 | Contact ±4KV | perf. Criteria B |
| | RS | IEC/EN61000-4-3 | 10V/m | perf. Criteria A |
| | EFT | IEC/EN61000-4-4 | ±2KV (see Fig. 3-① for recommended circuit) | perf. Criteria B |
| | Surge | IEC/EN61000-4-5 | line to line ±2KV (see Fig. 3-①for recommended circuit) | perf. Criteria B |
| | CS | IEC/EN61000-4-6 | 3 Vr.m.s | perf. Criteria A |
| | Voltage dips, short interruptions and voltage variations immunity | IEC/EN61000-4-29 | 0%, 70% | perf. Criteria B |

## Typical Characteristic Curves

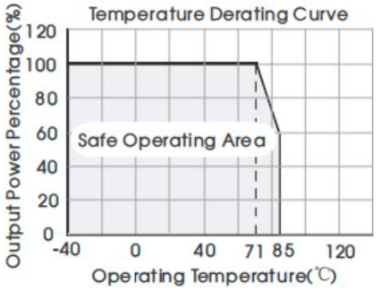
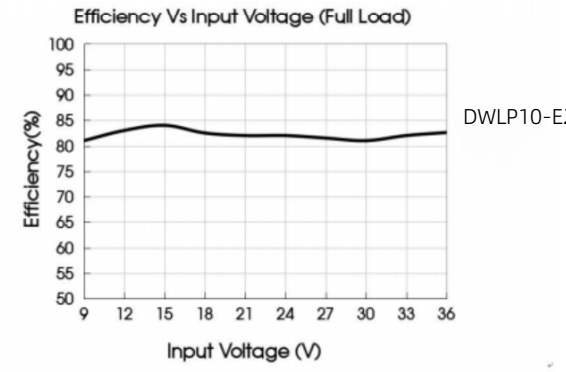
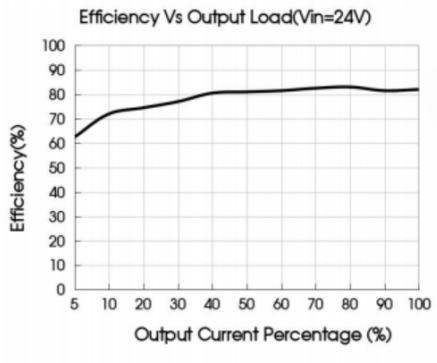


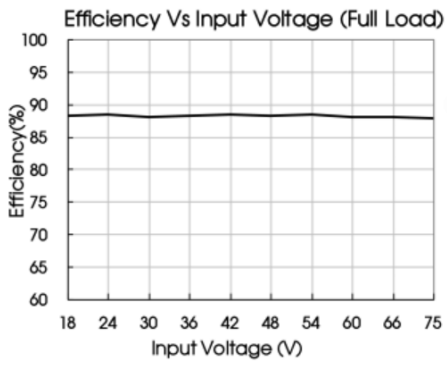

Fig. 1



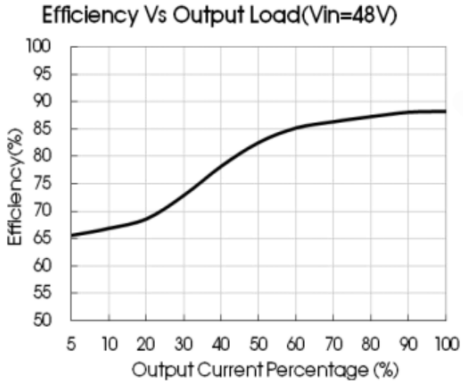

DWLP10-E2405




DWLP10-E2405




DWLP10-F4815




DWLP10-F4815

## Design Reference

### 1. Typical application

All DC-DC converters of this series are tested before delivery using the recommended circuit shown in Fig. 2.

Input and/or output ripple can be further reduced by appropriately increasing the input & output capacitor values Cin and Cout and/or by selecting capacitors with a low ESR (equivalent series resistance). Also make sure that the capacitance is not exceeding the max. capacitive load value of the product.

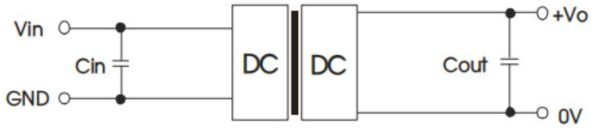
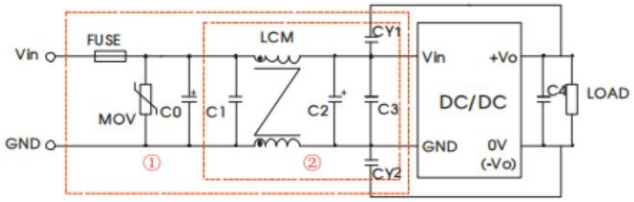



Fig. 2

| Cin | Cout |
|---|---|
| 10μF - 47μF/100V | 10μF/63V |

### 2. EMC compliance circuit



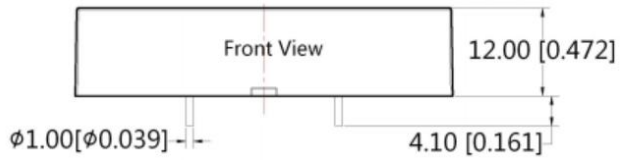

Notes: For EMC tests we use Part ① in Fig. 3 for immunity and part ② for emissions test. Selecting based on needs.

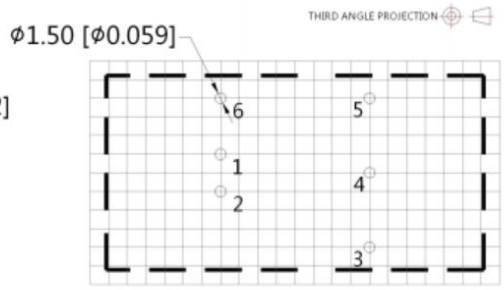
List of components:

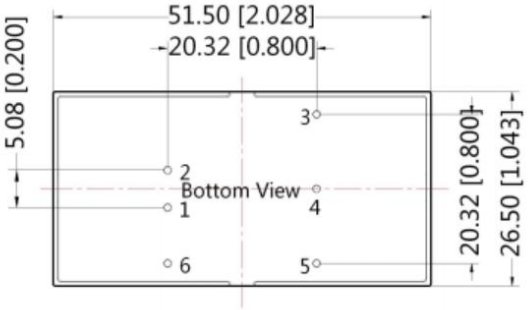
| Model | DWLP10-E | | DWLP10-F | |
|---|---|---|---|---|
| | Vin:24V | Vin:48V | Vin:24V | Vin:48V |
| FUSE | Choose according to actual input current | | | |
| MOV | S20K30 | S14K60 | S20K30 | S14K60 |
| C0 | 680μF/50V | 680μF/100V | 680μF/50V | 680μF/100V |
| C1 | 1μF/50V | 1μF/100V | 1μF/50V | 1μF/100V |
| C2 | 330μF/50V | 330μF/100V | 330μF/50V | 330μF/100V |
| C3 | 4.7μF/50V | 4.7μF/100V | 4.7μF/50V | 4.7μF/100V |
| LCM | 4.7mH | | | 6.8mH |
| C4 | Refer to the Cout in Fig.2 | | | |
| CY1/CY2 | 1nF/3KV | | | |

### 3. The products do not support parallel connection of their output

## Dimensions and Recommended Layout



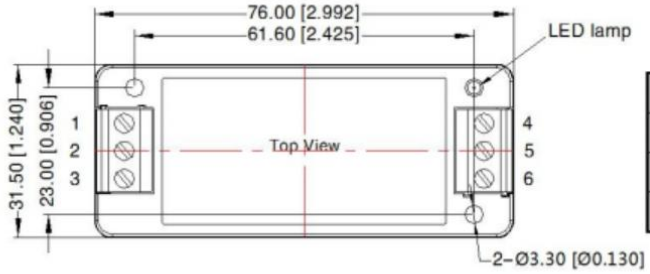




Note : Grid 2.54*2.54mm

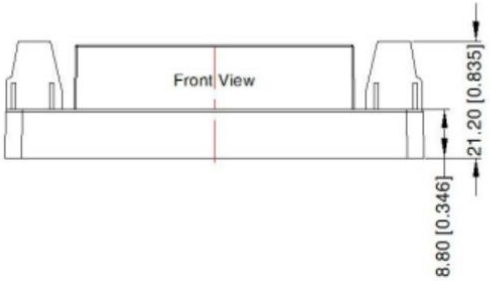
| Pin-Out | | |
|---|---|---|
| Pin | Single | Dual |
| 1 | GND | GND |
| 2 | Vin | Vin |
| 3 | +Vo | +Vo |
| 4 | No Pin | 0V |
| 5 | 0V | -Vo |
| 6 | Ctrl | Ctrl |

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

## DWLP10-E_E2S & DWLP10-F_E2S Dimensions

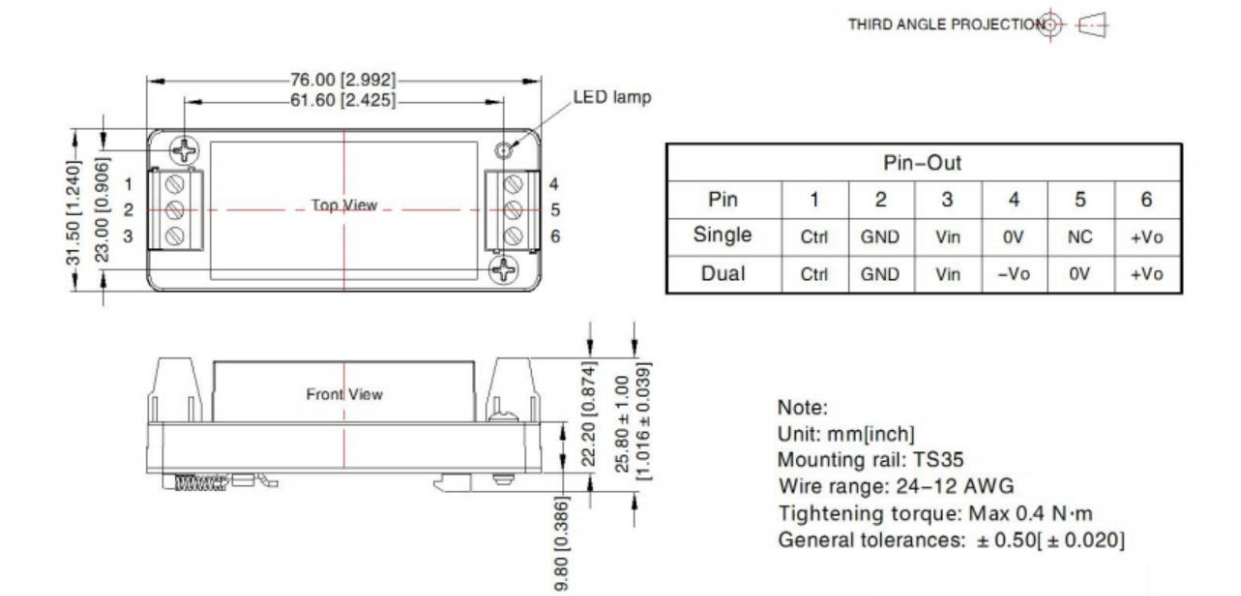




| Pin-Out | | | | | | |
|---|---|---|---|---|---|---|
| Pin | 1 | 2 | 3 | 4 | 5 | 6 |
| Single | Ctrl | GND | Vin | 0V | NC | +Vo |
| Dual | Ctrl | GND | Vin | -Vo | 0V | +Vo |




Note:
Unit: mm[inch]
Wire range: 24-12 AWG
Tightening torque: Max 0.4 N·m
General tolerances: ± 0.50[ ± 0.020]

## DWLP10-E_D4S & DWLP10-F_D4S Dimensions




| Pin–Out | | | | | | |
|---|---|---|---|---|---|---|
| Pin | 1 | 2 | 3 | 4 | 5 | 6 |
| Single | Ctrl | GND | Vin | 0V | NC | +Vo |
| Dual | Ctrl | GND | Vin | –Vo | 0V | +Vo |

Note:
Unit: mm[inch]
Mounting rail: TS35
Wire range: 24–12 AWG
Tightening torque: Max 0.4 N·m
General tolerances: ± 0.50[ ± 0.020]

Note:
1. For additional information on Product Packaging please contact CLAF POWER;
2. It is recommended that the load imbalance of the dual output is ≤±5%. If it exceeds ±5%, the performance of the product cannot be guaranteed to meet as datasheet marked. For details, please contact our technical staff;
3. The maximum capacitive load offered were tested at input voltage range and full load;
4. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25℃ , humidity<75%RH with nominal input voltage and rated output load;
5.All index testing methods in this datasheet are based on company corporate standards;
6. We can provide product customization service, please contact our technicians directly for specific information;
7.Products are related to laws and regulations: see "Features" and "EMC";
8.Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.