# 3S6WA4_1.6RP series

3W - Single/Dual Output DC-DC Converter - Wide Input - Isolated & Regulated

## DC-DC Converter 3 Watt

- SIP6 package type
- 4:1 input voltage range
- Operating temperature range: -40°C to +85°C
- 1600VDC isolation
- Up to 85% efficiency
- Short circuit protection (SCP)
- MTBF 1,000,000 hours

Introducing our new 3S6WA4_1.5RP series, designed in a compact SIP6 package with a wide 4:1 input voltage range and reliable 1600VDC isolation. Offering efficiencies of up to 85% and an operating temperature range from -40°C to +85°C, this series delivers both durability and performance. With built-in short circuit protection and an MTBF of 1,000,000 hours, it ensures long-term reliability. The 3S6W4_1.5RP series is ideally suited for demanding applications in industry, power, instrumentation, communication, rail transit, and more.

### Common specifications

| | |
|---|---|
| Short circuit protection | Continuous, self recovery |
| Switching frequency | 250 kHz (full Load, nominal input voltage) |
| Operation temperature | -40°C ~+85°C (with derating) |
| Storage temperature | -55°C ~+125°C |
| Pin welding can withstand the highest temperature | +300°C (soldering spot is 1.5mm away from case for 10 seconds) |
| Storage humidity | 95% RH (non condensing) |
| MTBF: (MIL-HDBK-217F@25°C) | 1,000,000 hours |
| Input filter | Capacitance filter |
| Hot plug | Unavailable |
| Case material | Black plastic; flame-retardant and heat-resistant (UL 94V-0 rated) |
| Package dimensions | 17.00 x 9.00 x 12.00mm |
| Weight | 4g (typ.) |
| Cooling method | Free air convection |

### Input specifications

| Item | Test condition | Min | Typ | Max | Units |
|---|---|---|---|---|---|
| Input current (full load/ no load) | 24VDC Input<br>48VDC Input | | 156/10<br>78/8 | | mA |
| Impulse voltage | 24VDC Input<br>48VDC Input | -0.7<br>-0.7 | | 50<br>100 | VDC |
| Starting voltage | 24VDC Input<br>48VDC Input | | | 9<br>18 | VDC |

**Example:**
**3S6WA4_2405S1.6RP**
**3 = 3Watt; S6 = SIP; WA4 = Wide input; 24 = 24Vin; 05 = 5Vout; S = Single Output; 1.6 = 1600VDC isolation; R = Regulated Output; P = Short circuit protection.**

### Output specifications

| Item | Test condition | Min | Typ | Max | Units |
|---|---|---|---|---|---|
| Output voltage accuracy | 5% - 100% load | | ±3.0 | ±5.0 | % |
| Linear regulation | Full load,Input voltage from low limit to high limit | | ±2 | ±5 | % |
| Load regulation | 5% - 100% load | | ±1 | ±3 | % |
| Ripple & noise | 20MHz Bandwidth, full voltage range | | 80 | 150 | mV |
| Transient recovery time | 25% load step change | | 0.5 | 3 | ms |
| Transient response deviation | 25% load step change | | ±2.5 | ±5 | % |
| Temperature coefficient | Full load | | ±0.02 | | %/°C |
| Over current protection | | 110 | 140 | | %Io |

### Isolation specifications

| Item | Test condition | Min | Typ | Max | Units |
|---|---|---|---|---|---|
| Isolation voltage | Input-output, test time 1 minute, leakage current less than 1mA | 1600 | | | VDC |
| Isolation resistance | Input-output, isolated voltage 500VDC | 1000 | | | MΩ |

1. The input voltage should not exceed the specified range value, otherwise it may cause permanent and irreparable damage;
2. It is recommended to use at a load of over 5%. If the load is below 5%, the ripple index of the product may exceed the specifications, but it does not affect the reliability of the product;
3. Suggested dual output module load imbalance: ≤ ± 5%. If it exceeds ± 5%, it cannot be guaranteed that the product performance meets all performance indicators in this manual;
4. The maximum capacitive load is tested within the input voltage range and under full load conditions;
5. Unless otherwise specified, all indicators in this datasheet are measured at Ta = 25°C, humidity <75% RH, nominal input voltage, and output rated load;
6. All indicator testing methods in this datasheet are based on our company's corporate standards;
7. Product specifications are subject to change without prior notice.



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| EMC specifications | | | | | | |
|---|---|---|---|---|---|---|
| EMC | EMI | CE | CISPR32/EN55032 | CLASS B (recommended circuit diagram 3-②) | | |
| EMC | EMI | RE | CISPR32/EN55032 | CLASS B (recommended circuit diagram 3-②) | | |
| EMC | EMS | ESD | IEC/EN61000-4-2 | Contact ±4kV | Perf. criteria | B |
| EMC | EMS | RS | IEC/EN61000-4-3 | 10V/m | Perf. criteria | A |
| EMC | EMS | EFT | IEC/EN61000-4-4 | ±2kV (recommended circuit diagram 3-①) | Perf. criteria | B |
| EMC | EMS | Surge | IEC/EN61000-4-5 | line to line ±2kV (recommended circuit diagram 3-①) | Perf. criteria | B |
| EMC | EMS | CS | IEC/EN61000-4-6 | 3 Vr.m.s | Perf. criteria | A |

# Product Selection Guide

| Approval | Part number | Input Voltage Nominal Range (VDC) | Input Voltage max. (VDC) | Output Voltage (VDC) | Output Current (mA) max./min. | Full Load Efficiency% (typ.) | Capacitive Load Max. (µF) |
|---|---|---|---|---|---|---|---|
| | 3S6WA4_2403S1.6RP | 24 (9-36) | 40 | 3.3 | 800/0 | 78 | 1760 |
| | 3S6WA4_2405S1.6RP | 24 (9-36) | 40 | 5 | 600/0 | 81 | 1000 |
| | 3S6WA4_2412S1.6RP | 24 (9-36) | 40 | 12 | 250/0 | 85 | 170 |
| | 3S6WA4_2415S1.6RP | 24 (9-36) | 40 | 15 | 200/0 | 84 | 110 |
| | 3S6WA4_4803S1.6RP | 48 (18-75) | 80 | 3.3 | 800/0 | 77 | 1760 |
| | 3S6WA4_4805S1.6RP | 48 (18-75) | 80 | 5 | 600/0 | 80 | 1000 |
| | 3S6WA4_4812S1.6RP | 48 (18-75) | 80 | 12 | 250/0 | 83 | 170 |
| | 3S6WA4_4815S1.6RP | 48 (18-75) | 80 | 15 | 200/0 | 83 | 110 |

| Approval | Part number | Input Voltage Nominal (Range) (VDC) | Input Voltage max. (VDC) | Output Voltage (VDC) | Output Current (mA) max./min. | Full Load Efficiency% (typ.) | Capacitive Load Max. (µF) |
|---|---|---|---|---|---|---|---|
| | 3S6WA4_2412D1.6RP | 24 (9-36) | 40 | ±12 | ±130/0 | 82 | 100 |
| | 3S6WA4_2415D1.6RP | 24 (9-36) | 40 | ±15 | ±100/0 | 82 | 47 |
| | 3S6WA4_4812D1.6RP | 48 (18-75) | 80 | ±12 | ±130/0 | 81 | 100 |
| | 3S6WA4_4815D1.6RP | 48 (18-75) | 80 | ±15 | ±100/0 | 81 | 47 |

# Typical characteristics

### Temperature derating graph

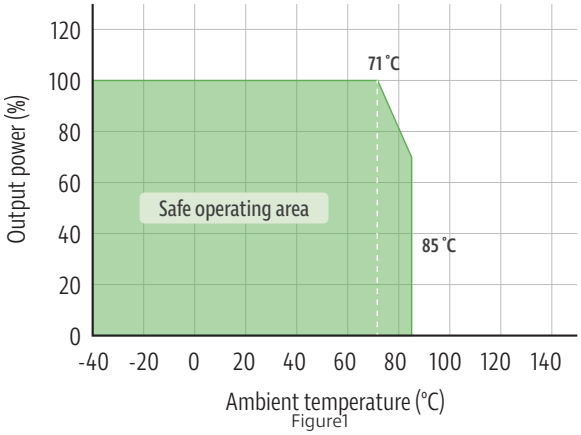



Figure1

# Typical circuit design and application

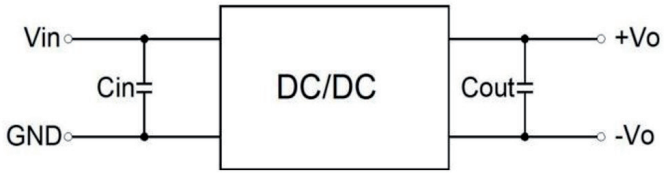



Figure2

Recommended capacitive load value table

| Cin | | Vo | Cout |
|---|---|---|---|
| Vin: 24V | Vin: 48V | 3.3/5VDC | 22uF/16V |
| 100uF/50V | 100uF/100V | 12/15VDC | 22uF/25V |

**Application circuit description:**
1. All DC-DC converters in this series are tested according to the recommended test circuit (figure 2) before leaving the factory.
If further reduction of input and output ripple is required, the external capacitors Cin and Cout for input and output can be increased or capacitors with lower series equivalent impedance can be selected. For each output, under safe and reliable working conditions, the maximum capacitance of the filtering capacitor cannot exceed the maximum capacitive load of the product.

# EMI recommended component parameters

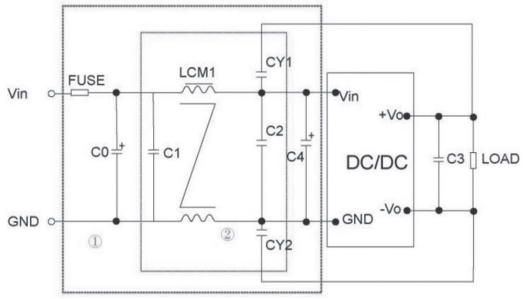


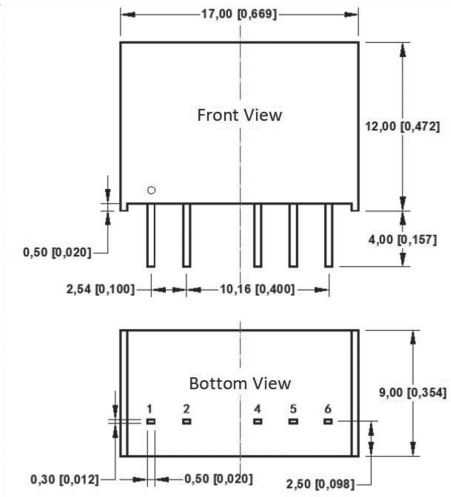

Figure3

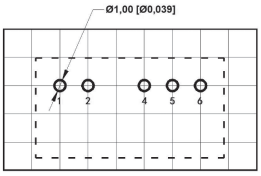
EMI recommended component parameters

| Input Voltage | Vin: 24V | Vin: 48V |
|---|---|---|
| FUSE | Select according to the actual input current of the customer | |
| C0/C4 | 330uF/50V | 330uF/100V |
| C1/C2 | 10uF/50V | 10uF/100V |
| LCM1 | 1.2mH | |
| C3 | Refer to Cout parameters in Figure 2 | |
| CY1/CY2 | 1nF/400VAC | |

Note: Part 1 in figure 3 is for EMC testing; The second part is used for EMI filtering, which can be selected according to the demand.

# Mechanical dimensions




The grid distance is 2.54mm x2.54mm

| Pin definition table | | |
|---|---|---|
| Pin | Single | Dual |
| 1 | GND | GND |
| 2 | Vin | Vin |
| 4 | +Vo | +Vo |
| 5 | No pin | COM |
| 6 | -Vo | -Vo |

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