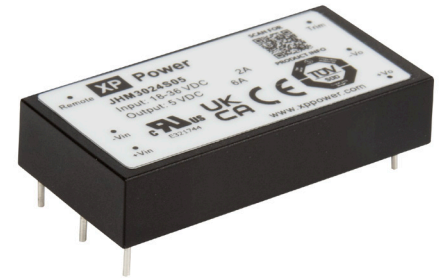


30W

DC-DC converters

The JHM30 series is a range of compact, regulated PCB mount medical DC-DC converters which offers single and dual output voltages ranging from 5 to 15VDC. Housed in a 50.8 x 25.4mm (2" x 1") plastic case, the JHM30 series features a 2:1 input voltage range of 9 to 18VDC, 18 to 36VDC or 36 to 75VDC and offers a $\pm 10\%$ output trim on single output versions.

The JHM30 series, with worldwide medical approvals, 2 x MOPP 4kVAC reinforced isolation and extremely low leakage currents, is specifically designed for easy integration into a wide range of BF and CF rated medical applications including imaging, patient monitoring, surgical equipment, patient treatment and dentistry.



Features

- ▶ Regulated single & dual outputs from 5 to 30VDC
- ▶ 2:1 input range
- ▶ Compact 50.8 x 25.4mm (2" x 1") PCB mount package
- ▶ 10% trim on single output versions
- ▶ IEC60601-1 medical safety agency approvals
- ▶ 4kVAC reinforced isolation
- ▶ 2 x MOPP at 250VAC
- ▶ 2 μ A patient leakage current
- ▶ EN55011 class A with no external components
- ▶ Short circuit, overload & overvoltage protection
- ▶ -40°C to +80°C operating temperature
- ▶ 3 year warranty

Applications



Dimensions

50.8 x 25.4 x 10.2 mm (2.00 x 1.00 x 0.40" in)

More resources

Click the link or scan the code

[→ xppower.com](https://www.xppower.com)



Models & ratings

| Model number | Input voltage | Output voltage | Output current | Efficiency ⁽³⁾ | Input current | | Maximum capacitive load ⁽²⁾ |
|--------------|-----------------|----------------|----------------|---------------------------|------------------------|--------------------------|--|
| | | | | | No load ⁽¹⁾ | Full load ⁽⁴⁾ | |
| JHM3012S05 | 12V (9-18V) | 5V | 6000mA | 88% | 35mA | 4000mA | 4000µF |
| JHM3012S12 | | 12V | 2500mA | 88% | | | 1660µF |
| JHM3012S15 | | 15V | 2000mA | 89% | | | 1330µF |
| JHM3012D05 | | ±5V | ±3000mA | 86% | | | ±2000µF |
| JHM3012D12 | | ±12V | ±1250mA | 88% | | | ±800µF |
| JHM3012D15 | | ±15V | ±1000mA | 89% | | | ±660µF |
| JHM3024S05 | 24V (18-36V) | 5V | 6000mA | 88% | 30mA | 2000mA | 4000µF |
| JHM3024S12 | | 12V | 2500mA | 88% | | | 1660µF |
| JHM3024S15 | | 15V | 2000mA | 89% | | | 1330µF |
| JHM3024D05 | | ±5V | ±3000mA | 86% | | | ±2000µF |
| JHM3024D12 | | ±12V | ±1250mA | 88% | | | ±800µF |
| JHM3024D15 | | ±15V | ±1000mA | 89% | | | ±660µF |
| JHM3048S05 | 48V (36-75V) | 5V | 6000mA | 88% | 15mA | 1000mA | 4000µF |
| JHM3048S12 | | 12V | 2500mA | 88% | | | 1660µF |
| JHM3048S15 | | 15V | 2000mA | 89% | | | 1330µF |
| JHM3048D05 | | ±5V | ±3000mA | 86% | | | ±2000µF |
| JHM3048D12 | | ±12V | ±1250mA | 89% | | | ±800µF |
| JHM3048D15 | | ±15V | ±1000mA | 89% | | | ±660µF |

Notes:

1. Input current measured at lowest input voltage.
2. Maximum capacitive load is per output.
3. Typical values at nominal input.
4. Typical values at low input voltage.

General

| Characteristic | Minimum | Typical | Maximum | Units | Notes & conditions |
|-----------------------------|--|------------|---------|-------------------|--|
| Efficiency | | 88 | | % | See Models & ratings table |
| Isolation | 4000 | | | VAC | For 1 min. Double/reinforced with a working voltage of 250VAC. Meets 2 x MOPP per 3rd edition of IEC60601-1 5000VAC for 10ms in accordance with IEC60664-1 |
| Leakage current | | 2 | | µA | |
| Input to output capacitance | | | 30 | pF | |
| Power density | | | 63.5 | W/cm ³ | |
| Mean time between failure | | >1 | | Mhrs | MIL-HDBK-217F, +25°C GB |
| Switching frequency | | 250 | | kHz | |
| Weight | | 30 (0.066) | | g (lb) | |
| Solder profile | See Application notes | | | | |
| Case material | Non conductive black plastic UL94V-0 rated | | | | |
| Potting material | Silicone, UL94V-0 rated | | | | |
| Pin material | Solder coated copper | | | | |

Input

| Characteristic | Minimum | Typical | Maximum | Units | Notes & conditions |
|----------------------|-------------------------|---------|---------|-------|-----------------------------------|
| Input voltage range | 9 | | 18 | VDC | 12V nominal |
| | 18 | | 36 | | 24V nominal |
| | 36 | | 75 | | 48V nominal |
| Inrush current | | | 70 | A | Measured at maximum Input voltage |
| Input filter | Pi type | | | | |
| Input surge | | | 25 | VDC | 12V models for 3s |
| | | | 50 | | 24V models for 3s |
| | | | 100 | | 48V models for 3s |
| Undervoltage lockout | On at >8.2V Off <8.1V | | | | 12V models |
| | On at >16.8V Off <16.3V | | | | 24V models |
| | On at >33.2V Off <32.8V | | | | 48V models |

Output

| Characteristic | Minimum | Typical | Maximum | Units | Notes & conditions |
|------------------------------|---|---------|---------------|-------|--|
| Output voltage | 5 | | 30 | VDC | See Models & ratings table |
| Output voltage trim | | | ±10 | % | Via external resistors, see Application Notes. Single output model only |
| Initial set accuracy | | | ±1 | % | On +Vout |
| | | | ±2 | | On -Vout of dual output models |
| Minimum load | 0 | | | % | No minimum load required |
| Start up delay | | 50 | | ms | |
| Start up rise time | | 20 | | ms | |
| Line regulation | | | ±0.3 | % | |
| Load regulation | | | ±1 / ±2 | % | Single / Dual, 0-10% load |
| | | | ±0.5 / ±1 | % | Single / Dual, 10-100% load |
| Cross regulation | | | ±4 | % | On dual output models with one output set to 50% load and the other varied from 10% to 100% load (D05 20% to 100%) |
| Transient response deviation | | | 4 | % | Deviation recovering to within 1% in <500µs for a 25% load change at 0.25A/µs |
| Ripple & noise | | | 150mV 1.5% | pk-pk | 20MHz bandwidth for 5V output models 20MHz bandwidth for other models |
| Short circuit protection | Trip & restart (hiccup mode), auto recovery | | | | |
| Maximum capacitive load | See Models & ratings table | | | | |
| Temperature coefficient | | | 0.02 | %/°C | |
| Overload protection | 120 | | 170 | % | Trip and restart (hiccup) |
| Overvoltage protection | 115 | | 140 | | Non latching, auto recovery |

Environmental

| Characteristic | Minimum | Typical | Maximum | Units | Notes & conditions |
|------------------------------|--|---------|---------|-------|--------------------------|
| Operating temperature | -40 | | +80 | °C | See derating curve |
| Storage temperature | -55 | | +100 | °C | |
| Case temperature | | | +105 | °C | At nominal input voltage |
| Humidity operating & storage | 5 | | 95 | %RH | Non-condensing |
| Cooling | Natural convection | | | | |
| Shock | ±3 shocks in each plane, total 18 shocks of 30g : 11ms halfsine. Conforms to EN60068-2-27 & EN60068-2-47 | | | | |
| Vibration | 10-500Hz at 2g sweep and endurance at resonance in all 3 planes. Conforms to EN60068-2-6 | | | | |
| Operating altitude | | | 5000 | m | Operating |
| | | | 10,000 | | Storage |

Safety approvals

| Safety agency | Standard | Notes & conditions |
|---------------|---|--------------------|
| UL | ANSI/AAMI ES60601-1 & CSA C22.2, No.60601-1 | Medical |
| TUV | EN60601-1 | Medical |
| CB | IEC60601-1 | Medical |
| CE | Meets all applicable directives | |
| UKCA | Meets all applicable legislation | |

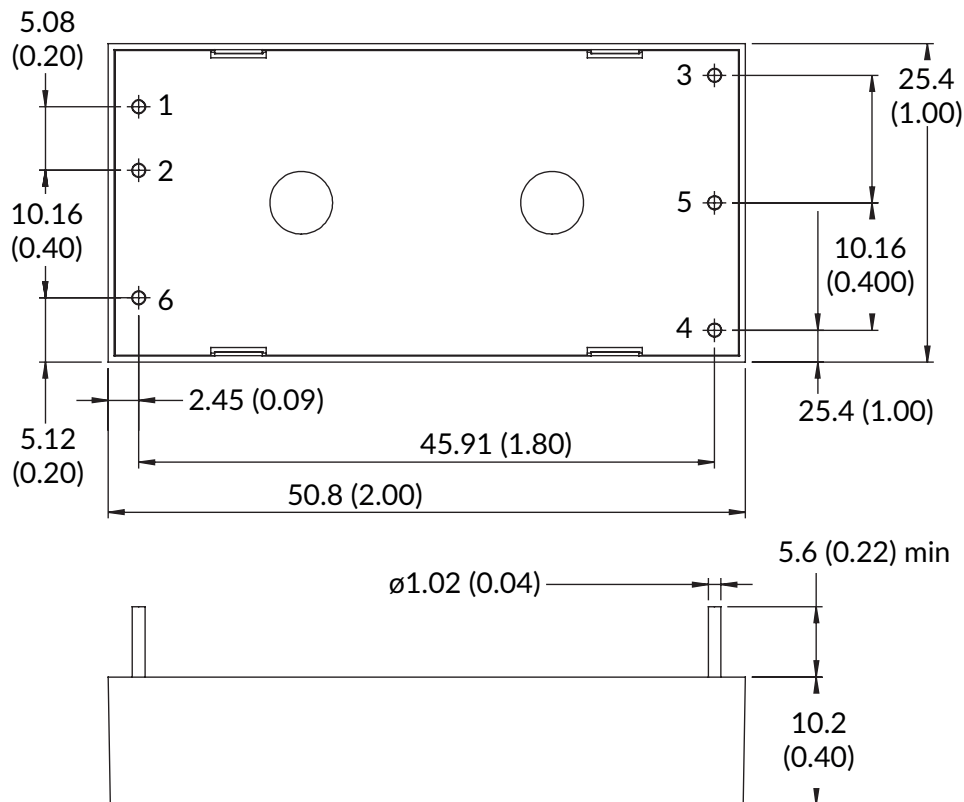
Emissions - EMC

| Phenomenon | Standard | Test level | Notes & conditions |
|------------|----------|------------|--------------------|
| Conducted | EN55011 | Level A | |
| Radiated | EN55011 | Level A | |

Immunity - EMC

| Phenomenon | Standard | Test level | Criteria | Notes & conditions |
|--------------------|--------------|------------|----------|--|
| Immunity | IEC60601-1-2 | | | With external components. See Application notes. |
| ESD immunity | EN61000-4-2 | 4 | A | |
| Radiated immunity | EN61000-4-3 | 10V/m | A | |
| EFT/Burst | EN61000-4-4 | 3 | A | |
| Surge | EN61000-4-5 | 2 | A | |
| Conducted immunity | EN61000-4-6 | 10V | A | |
| Magnetic fields | EN61000-4-8 | 30A/m | A | |

Mechanical details



| Pin connections | | |
|-----------------|--------|--------|
| Pin | Single | Dual |
| 1 | +Vin | +Vin |
| 2 | -Vin | -Vin |
| 3 | +Vout | +Vout |
| 4 | Trim | -Vout |
| 5 | -Vout | Common |
| 6 | Remote | |

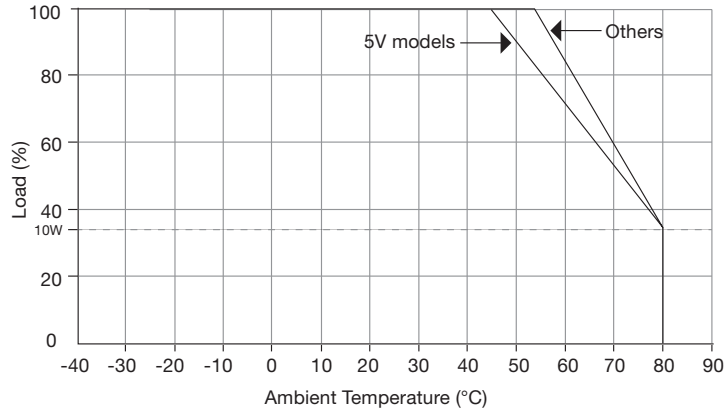
Notes:

- All dimensions are in mm (inches)
- Weight: 30g (0.066lbs) approx.
- Pin diameter: ± 0.05 , 1.02 (± 0.002 , 0.04)

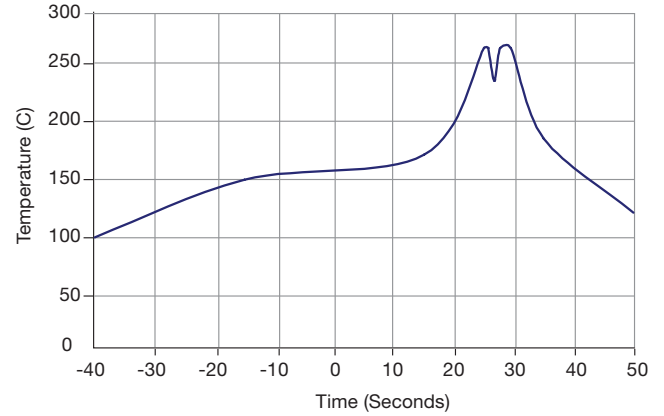
- Pin pitch tolerance: ± 0.25 (± 0.01)
- Case tolerance: ± 0.5 (± 0.02)

Application notes

Derating curves



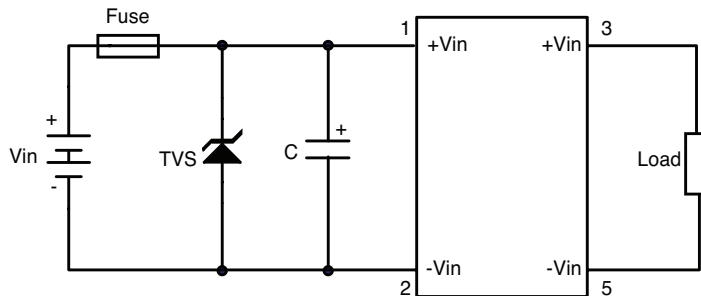
Lead free wave soldering profile



Notes:

1. Soldering Materials: Sn/Cu/Ni
2. Ramp up rate during preheat: 1.4°C/Sec (From 50°C to 100°C)
3. Soaking temperature: 0.5°C/Sec (From 100°C to 130°C), 60 ±20 seconds
4. Peak temperature: 260°C, above 250°C 3~6 Seconds
5. Ramp up rate during cooling: -10.0°C/Sec (From 260°C to 150°C)

Input fusing and safety considerations

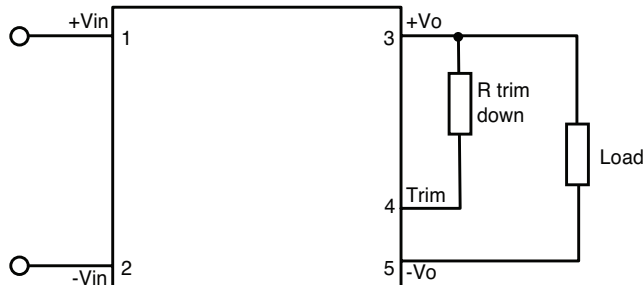
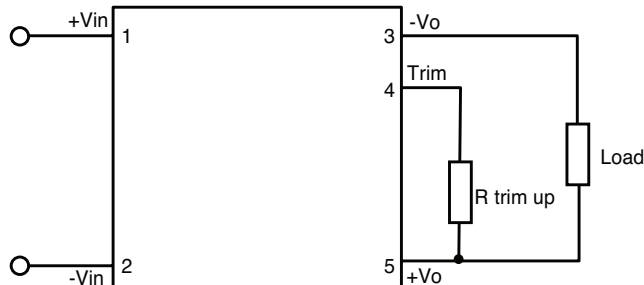


Recommended circuit layout with time delay fuse. C = 440µF, 100V aluminium electrolytic.

| Model number | Fuse | TVS specification |
|--------------|---------|-------------------|
| JHM3012SXX | 5AT | 1500W 24V |
| JHM3024DXX | 3.15A T | 1500W 47V |
| JHM3048SXX | 2AT | 1500W 91V |

Application notes

Single output voltage adjustment



In order to trim the voltage up or down, connect the trim resistor either between the trim pin and -Vo for trim-up and between trim pin and +Vo for trim-down. The output voltage trim range is $\pm 10\%$. This is shown to the right.

The value of R trim-up defined as:

$$R_{\text{trim-up}} = \left(\frac{V_r \times R_1 \times (R_2 + R_3)}{(V_o - V_o \text{ nom}) \times R_2} \right) - R_t \text{ (k}\Omega\text{)}$$

Where:

R trim-up is the external resistor in Kohm.

Vo nom is the nominal output voltage.

Vo is the desired output voltage.

R1, Rt, R2, R3 and Vr are internal to the unit and are defined in the table to the below.

| Model number | Output voltage (V) | R1 (k Ω) | R2 (k Ω) | R3 (k Ω) | Rt (k Ω) | Vr (V) |
|--------------|--------------------|------------------|------------------|------------------|------------------|--------|
| JHM3012S05 | 5.0 | 2.32 | 2.32 | 0 | 8.20 | 2.50 |
| JHM3024S05 | | | | | | |
| JHM3048S05 | | | | | | |
| JHM3012S12 | 12.0 | 6.80 | 2.40 | 2.32 | 8.20 | 2.50 |
| JHM3024S12 | | | | | | |
| JHM3048S12 | | | | | | |
| JHM3012S15 | 15.0 | 8.20 | 2.40 | 0.91 | 3.9 | 2.50 |
| JHM3024S15 | | | | | | |
| JHM3048S15 | | | | | | |

For example, to trim-up the output voltage of 5.0V module (JHM3012S05) by 10% to 5.5V, R trim-up is calculated as follows:

$$V_o - V_o \text{ nom} = 5.5 - 5.0 = 0.5V$$

$$R_1 = 2.32k\Omega$$

$$R_2 = 2.32k\Omega$$

$$R_3 = 0k\Omega$$

$$R_t = 8.2k\Omega, V_r = 2.5V$$

$$R_{\text{trim-up}} = \left(\frac{2.5 \times 2.32 \times (2.32 + 0)}{(5.0 - 5.0) \times 2.32} \right) - 8.2 = 3.4 \text{ (k}\Omega\text{)}$$

The value of R trim-down defined as:

$$R_{\text{trim-down}} = R_1 \times \left(\frac{V_r \times R_1}{(V_o - V_o \text{ nom}) \times R_2} - 1 \right) - R_t \text{ (k}\Omega\text{)}$$

Where:

R trim-down is the external resistor in Kohm.

Vo nom is the nominal output voltage.

Vo is the desired output voltage.

R1, Rt, R2, R3 and Vr are internal to the unit and are defined in the table to the above.

R1, Rt, R2, R3 and Vr are internal to the unit and are defined in the above table.

For example, to trim-down the output voltage of 5.0V module (JHM3012S05) by 10% to 4.5V, R trim-down is calculated as follows:

$$V_o \text{ nom} - V_o = 5.0 - 4.5 = 0.5V$$

$$R_1 = 2.32k\Omega, R_2 = 2.32k\Omega, R_3 = 0k\Omega$$

$$R_t = 8.2k\Omega, V_r = 2.5V$$