POLYTRON DEVICES

DATA SHEET

# DC-DC CONVERTERS

## UNREGULATED, UP TO 1 WATT

INDUSTRIAL APPLICATIONS

*SWUE1 Series*


### FEATURES

- Package Dimensions: 0.45” × 0.39” × 0.5”
- High Efficiency up to 81%
- 1,600 Vdc and 3,000Vdc Isolation Voltage
- Short Current Protection
- Safety Meets IEC/ EN/ UL62368-1
- RoHS and REACH Compliant
- CE Mark

**SELECTION GUIDE** Specifications typical at TA=25°C, nominal input voltage and rated output current unless otherwise specified.

| Input Voltage Range Vdc | Output Voltage Vdc | Output Current at Min. Load mA | Output Current at Full Load mA | Input Current at No Load mA | Efficiency (%) | Model Number* | Maximum Capacitor Load µF |
|---|---|---|---|---|---|---|---|
| 2.9 ~ 3.6 | 3.3 | 30.3 | 303 | 65 | 72 | SWUE1-33S33 | 150 |
| 2.9 ~ 3.6 | 5 | 20 | 200 | 65 | 74 | SWUE1-33S5 | 100 |
| 2.9 ~ 3.6 | 9 | 11 | 110 | 85 | 78 | SWUE1-33S9 | 22 |
| 2.9 ~ 3.6 | 12 | 8.3 | 83 | 85 | 78 | SWUE1-33S12 | 47 |
| 2.9 ~ 3.6 | 15 | 6.6 | 66 | 85 | 80 | SWUE1-33S15 | 33 |
| 2.9 ~ 3.6 | 24 | 4.2 | 42 | 90 | 79 | SWUE1-33S24 | 33 |
| 4.5 ~ 5.5 | 3.3 | 30.3 | 303 | 50 | 72 | SWUE1-5S33 | 150 |
| 4.5 ~ 5.5 | 5 | 20 | 200 | 50 | 70 | SWUE1-5S5 | 100 |
| 4.5 ~ 5.5 | 9 | 11 | 110 | 50 | 78 | SWUE1-5S9 | 22 |
| 4.5 ~ 5.5 | 12 | 8.3 | 83 | 60 | 78 | SWUE1-5S12 | 47 |
| 4.5 ~ 5.5 | 15 | 6.6 | 66 | 50 | 80 | SWUE1-5S15 | 33 |
| 4.5 ~ 5.5 | 24 | 4.2 | 42 | 60 | 79 | SWUE1-5S24 | 33 |
| 10.8 ~ 13.2 | 3.3 | 30.3 | 303 | 25 | 72 | SWUE1-12S33 | 150 |
| 10.8 ~ 13.2 | 5 | 20 | 200 | 25 | 71 | SWUE1-12S5 | 100 |
| 10.8 ~ 13.2 | 9 | 11 | 110 | 25 | 73 | SWUE1-12S9 | 22 |
| 10.8 ~ 13.2 | 12 | 8.3 | 83 | 25 | 76 | SWUE1-12S12 | 47 |
| 10.8 ~ 13.2 | 15 | 6.6 | 66 | 25 | 74 | SWUE1-12S15 | 33 |
| 10.8 ~ 13.2 | 24 | 4.2 | 42 | 25 | 79 | SWUE1-12S24 | 33 |
| 13.4 ~ 16.4 | 3.3 | 30.3 | 303 | 18 | 71 | SWUE1-15S33 | 150 |
| 13.4 ~ 16.4 | 5 | 20 | 200 | 18 | 71 | SWUE1-15S5 | 100 |
| 13.4 ~ 16.4 | 9 | 11 | 110 | 20 | 75 | SWUE1-15S9 | 22 |
| 13.4 ~ 16.4 | 12 | 8.3 | 83 | 18 | 81 | SWUE1-15S12 | 47 |
| 13.4 ~ 16.4 | 15 | 6.6 | 66 | 18 | 81 | SWUE1-15S15 | 33 |
| 13.4 ~ 16.4 | 24 | 4.2 | 42 | 20 | 80 | SWUE1-15S24 | 33 |
| 21.6 ~ 26.4 | 3.3 | 30.3 | 303 | 14 | 71 | SWUE1-24S33 | 150 |
| 21.6 ~ 26.4 | 5 | 20 | 200 | 14 | 71 | SWUE1-24S5 | 100 |
| 21.6 ~ 26.4 | 9 | 11 | 110 | 14 | 75 | SWUE1-24S9 | 22 |
| 21.6 ~ 26.4 | 12 | 8.3 | 83 | 14 | 81 | SWUE1-24S12 | 47 |
| 21.6 ~ 26.4 | 15 | 6.6 | 66 | 14 | 81 | SWUE1-24S15 | 33 |
| 21.6 ~ 26.4 | 24 | 4.2 | 42 | 14 | 80 | SWUE1-24S24 | 33 |

Suffix “H”: For 3,000Vdc Isolation

# SWUE1 SERIES

## Input Specifications

| | | |
|---|---|---|
| Operating input voltage, Vdc | 2.9 Min., 3.3 Typ., 3.6 Max. | 3.3Vin(nom) |
| | 4.5 Min., 5 Typ., 5.5 Max. | 5Vin(nom) |
| | 10.8 Min., 12 Typ., 13.2 Max. | 12Vin(nom) |
| | 13.4 Min., 15 Typ., 16.4 Max. | 15Vin(nom) |
| | 21.6 Min., 24 Typ., 26.4 Max. | 24Vin(nom) |
| Input filter | C Type | |

## Output Specifications

| | | |
|---|---|---|
| Voltage accuracy | See tolerance envelope curve, Nominal input | |
| Line regulation, % | 1.2%, Max / 1% of Vin | Input voltage ± 5% change |
| Load regulation, % | -15 Min., 15 Max. | 10% to 100% Load, 3.3Vout, 5Vout |
| | -10 Min., 10 Max. | Others |
| Ripple and noise, mVp-p | 100 Typ. | Measured by 20MHz bandwidth |
| Temperature coefficient | -0.1 Min., 0.1 Max. | |
| Short circuit protection | Continuous, short circuit protection | |

## General Specifications

| | | | | | |
|---|---|---|---|---|---|
| Isolation voltage, Vdc | 1 minute (PIN1 to Output) | Standard Type | 1,600 Min. | | |
| | | Suffix "H" [2] | 3,000 Min. | | |
| Isolation resistance, MΩ | 500Vdc | | 1 Min. | | |
| Isolation capacitance, pF | | | | | 80 Max. |
| Switching frequency, kHz | | 3.3Vin | | 95 Typ. | |
| | | 5Vin | | 110 Typ. | |
| | | 12Vin | | 145 Typ. | |
| | | 15,24Vin | | 100 Typ. | |

## Environmental Specifications

| | | | | |
|---|---|---|---|---|
| Operating ambient temperature, ºC | Without derating | -40 Min. | | 85 Max. |
| Maximum case temperature, ºC | | | | 100 Max. |
| Storage temperature range, ºC | Non-condensing | -55 Min. | | 125 Max. |
| Thermal shock | | MIL-STD-810F | | |
| Vibration | | MIL-STD-810F | | |
| Relative humidity | | 5% to 95% RH | | |

## Physical Specifications

| | |
|---|---|
| Safety meets | IEC/ EN/ UL62368-1 |
| Case material | Non-conductive black plastic |
| Base material | None |
| Potting material | Epoxy (UL94 V-0) |
| Weight, g | 1.3g (0.046oz) |
| Dimensions, inch (mm) | 0.45 × 0.39 × 0.5 (11.5 × 9.8 × 12.5) |
| MTBF, hours | MIL-HDBK-217F, Full load, 2 x $10^6$ hrs |

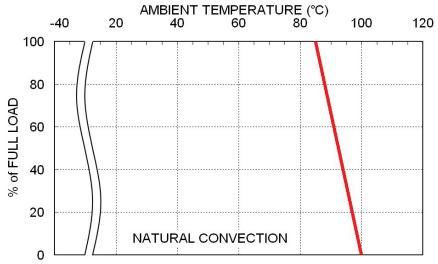
**Note:**

1. The output requires a minimum loading on the output to maintain specified regulation. Operation under no-load condition will not damage these devices; however they may not meet all listed specification.
2. The extra protection of the pads between input and output should be needed in order to ensure that the isolation function won't be affected after the module mounts on the PCB. (For detailed information, please refer to RECOMMENDED PAD LAYOUT.).
3. For further information, please contact Polytron Devices.

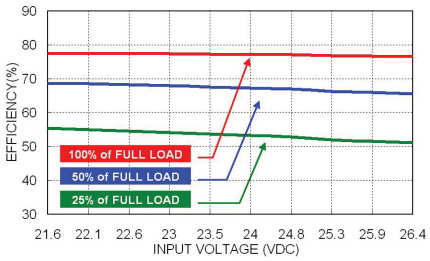
**CAUTION:** This power module is not internally fused. An input line fuse must always be used.

# SWUE1 SERIES

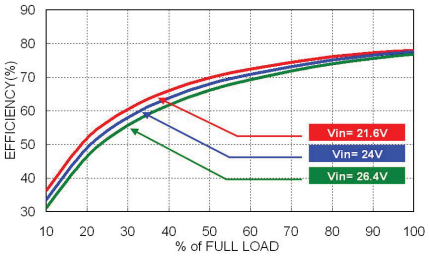
## Characteristic Curve



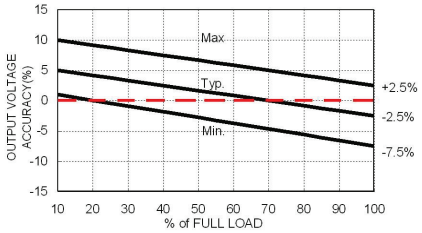

SWUE1-24S12 Derating Curve




SWUE1-24S12 Efficiency vs. Input Voltage




SWUE1-24S12 Efficiency vs. Output Load




Tolerance Envelope

## Fuse Consideration

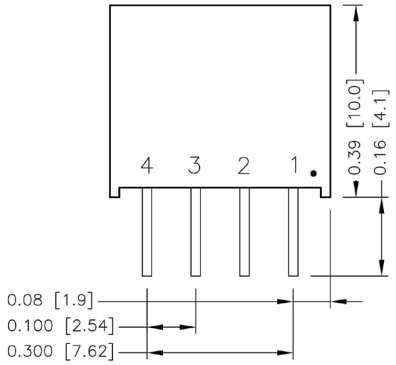
| Model | Fuse Rating (A) | Fuse Type |
|---|---|---|
| SWUE1-33XXX | 0.8 | Slow-Blow |
| SWUE1-5XXX | 0.5 | Slow-Blow |
| SWUE1-12XXX | 0.315 | Slow-Blow |
| SWUE1-15XXX, SWUE1-24XXX | 0.16 | Slow-Blow |

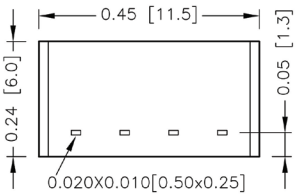
**Note:**

1. This encapsulated power module can be used in a wide variety of applications, ranging from simple stand-alone operation to an integrated part of sophisticated power architecture.
2. To maximimum flexibility, internal fusing is not included; however, to achieve maximum safety and system protection, always use an input line fuse.

**CAUTION:** This power module is not internally fused. An input line fuse must always be used.

## Mechanical Drawing




BOTTOM VIEW

**PIN CONNECTION**

| PIN | DEFINE |
|---|---|
| 1 | 1Vin |
| 2 | +Vin |
| 3 | -Vout |
| 4 | +Vout |

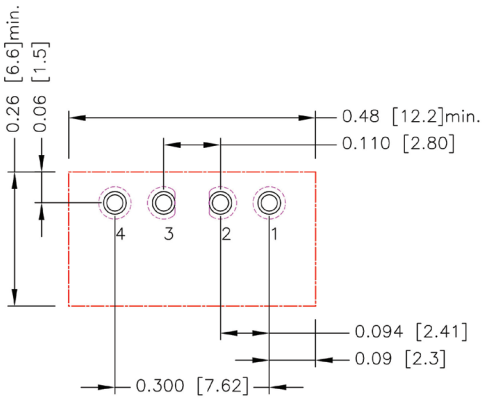
**1. All dimensions in inches (mm)**

**2. Tolerance: ±0.25**

**3. Pin pitch tolerance: ±0.25**

**4. Pin dimension tolerance: ±0.25**

## Recommended Pad Layout

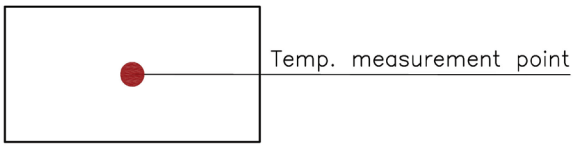



1. **All dimensions in inch[mm]**
2. **Pad size(lead free recommended)**
3. **Through hole 1.2.3.4:Φ0.031[0.80]**
4. **Top view pad 1.2.3.4:Φ0.039[1.10]**
   **pad 2 to pad 3 spacing: 0.067[1.70]**
5. **Bottom view pad 1.2.3.4:Φ0.063[1.60]**
   **pad 2 to pad 3 spacing:0.067[1.70]**

**Suffix "H":** The extra protection of the pads between input(PIN 2) and output(PIN 3) should be needed in order to ensure that the isolation function won't be affected after the module mounts on the PCB.

## Thermal Considerations

Thermal test condition with vertical direction by natural convection (20LFM)




1. The power module operates in a variety of thermal environments.
2. However, sufficient cooling should be provided to help ensure reliable operation of the unit.
3. Heat is removed by conduction, convection, and radiation to the surrounding Environment.
4. Proper cooling can be verified by measuring the point as the figure below.
5. The temperature at this location should not exceed "Maximum case temperature".
6. When Operating, adequate cooling must be provided to maintain the test point temperature at or below "Maximum case temperature". You can limit this Temperature to a lower value for extremely high reliability.