# 9S8W_1.6RP series

9W - Dual/Single Output - Wide Input - Isolated & Regulated DC-DC Converter


## DC-DC Converter 9 Watt

- Highest power density in SIP8 package
- Operation temperature range: -40°C ~+ 85°C
- 2:1 wide input voltage range
- Isolation 1600VDC
- High Efficiency up to 90%
- Short circuit protection (SCP)
- Remote On/Off control
- Internal SMD construction
- RoHS Compliance
- Smallest footprint 9W converter

The 9S8W_1.6RP series is a family of high performanced 9W single & dual output DC-DC converters. These converters are built in copper package in a 8-pin SIP miniature compact case with high performance. Featured wide range devices operate over 2:1 input voltage range, providing stable output voltage, which is much smaller than package of DIP 24 - same power rating but only 43% of the traditional volume. Devices are encapsulated using flame retardant resin. Featuring new PWM construction, no minimum load required and precise 1% output voltage accuracy.

UL-62368-1 (E347551)

### Common specifications

| | |
|---|---|
| Short circuit protection: | Continuous, automatic recovery |
| Case temperature: | 100°C max. |
| Cooling: | Nature convection |
| Operation temperature range: | -40°C~+85°C |
| Storage temperature range: | -55°C ~+125°C |
| Storage humidity range: | < 95% |
| Soldering temperature: | 260°C max, 1.5mm from case for 10 sec |
| Switching frequency: | • 24V: 400kHz typ.<br>• 48V: 500kHz typ. |
| Operating Frequency: | 200kHz min |
| Safety standard: | IEC60950-1 |
| Case material: | Copper |
| Potting material: | Epoxy [UL94-V0] |
| Pin material: | C5191R-H Solder-coated |
| MTBF (MIL-HDBK 217F): | +25°C: >900 Khours |
| Dimensions: | 21.8x9.6x11.2mm |
| Weight: | 7.3g |

### Input specifications

| Item | Test condition | Min | Typ | Max | Units |
|---|---|---|---|---|---|
| Start up time | Nominal Vin and constant resistive load | | 50 | | ms |
| Input filter | Capacitor | | | | |
| Input reflected ripple current | | | | 30 | mApk-pk |
| Surge voltage | 100ms max.<br>• 12V models<br>• 24V<br>• 48V | | | <br>25<br>50<br>100 | <br>VDC<br>VDC<br>VDC |
| Remote on/off | • Device ON<br>• Device OFF<br>• Device OFF (Stand by input current) | | open or high impedance<br>2-4mA input current (via 1KΩ)<br>2.5mA max. | | |
| Under voltage lockout | • 12V module ON/OFF<br>• 24V module ON/OFF<br>• 48V module ON/OFF | | 9.0VDC / 7.0VDC<br>18.0VDC / 14.0VDC<br>36.0VDC / 28.0VDC | | |

* Measured with a simulated source inductance Lin (12uH) and a source capacitor Cin (47uF, ESR<1.0Ω at 100KHz).

### Output specifications

| Item | Test condition | Min | Typ | Max | Units |
|---|---|---|---|---|---|
| Output accuracy | | | | ±1 | % |
| Line regulation | | | | ±0.2 | % |
| Load regulation* | 0% to 100% full load<br>• Single output<br>• 3.3V<br>• Dual output | | | <br>±0.5<br>±1.0<br>±1.0 | <br>%<br>%<br>% |
| Cross regulation | Dual output, full load, 25%-100% load, output voltage variable rate within 5% | | | ±5 | % |
| Temperature drift | | | ±0.02 | | %/°C |
| Ripple & Noise* | 20MHz Bandwidth | | 75 | | mVpk-pk |
| Transient recovery time | Normal Vin, 100%-25% load, 25% load step change | | 250 | | µs |
| Transient response deviation | Normal Vin, 100%-25% load, 25% load step change<br>• Single output 3.3V<br>• Others | | | <br>±5<br>±3 | <br>%<br>% |

* Measured with a 1µF ceramic capacitor and a 10µF electrolytic capacitor.

### Isolation specifications

| Item | Test condition | Min | Typ | Max | Units |
|---|---|---|---|---|---|
| Isolation voltage | 60 seconds<br>• Input/output<br>• Case/input&output | <br>1600<br>1000 | | | <br>VDC<br>VDC |
| Isolation resistance | | 1 | | | GΩ |
| Isolation capacitance | | | | 50 | pF |

**Example:**
**9S8W_1205S1.6RP**
9 = 9Watt; S8 = SIP8; W = wide input (2:1); 18-36Vin; 5Vout;
S = Single output; 1.6 = 1600VDC; R = Regulated output;
P = Short circuit protection

Note:
1. All specifications measured at Ta = 25°C, humidity <75%, nominal input voltage and rated output load unless otherwise specified.
2. In this datasheet, all the test methods of indications are based on corporate standards.


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## 9S8W_1.6RP series

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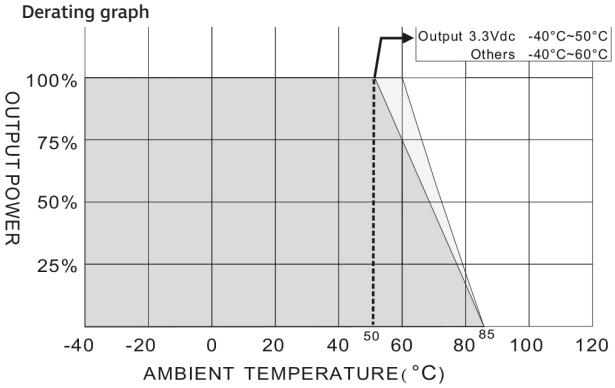
DC-DC Converter

| Part Number | Input Voltage [VDC] Nominal | Range | Input Current [mA, typ. @full load] | Output Voltage [VDC] | Output Current [mA, max.] | Efficiency [%, typ.] | Capacitive Load* [µF, max.] |
|---|---|---|---|---|---|---|---|
| 9S8W_1203S1.6RP | 12 | 9-18 | 679 | 3.3 | 2000 | 81 | 2600 |
| 9S8W_1205S1.6RP | 12 | 9-18 | 784 | 5 | 1600 | 85 | 1300 |
| 9S8W_1209S1.6RP | 12 | 9-18 | 862 | 9 | 1000 | 87 | 800 |
| 9S8W_1212S1.6RP | 12 | 9-18 | 852 | 12 | 750 | 88 | 560 |
| 9S8W_1215S1.6RP | 12 | 9-18 | 843 | 15 | 600 | 89 | 560 |
| 9S8W_1224S1.6RP | 12 | 9-18 | 843 | 24 | 375 | 89 | 200 |
| 9S8W_2403S1.6RP | 24 | 18-36 | 335 | 3.3 | 2000 | 82 | 2600 |
| 9S8W_2405S1.6RP | 24 | 18-36 | 392 | 5 | 1600 | 85 | 1300 |
| 9S8W_2409S1.6RP | 24 | 18-36 | 426 | 9 | 1000 | 88 | 800 |
| 9S8W_2412S1.6RP | 24 | 18-36 | 421 | 12 | 750 | 89 | 560 |
| 9S8W_2415S1.6RP | 24 | 18-36 | 417 | 15 | 600 | 90 | 560 |
| 9S8W_2424S1.6RP | 24 | 18-36 | 417 | 24 | 375 | 90 | 200 |
| 9S8W_4803S1.6RP | 48 | 36-75 | 168 | 3.3 | 2000 | 82 | 2600 |
| 9S8W_4805S1.6RP | 48 | 36-75 | 196 | 5 | 1600 | 85 | 1300 |
| 9S8W_4809S1.6RP | 48 | 3675 | 213 | 9 | 1000 | 88 | 800 |
| 9S8W_4812S1.6RP | 48 | 36-75 | 211 | 12 | 750 | 89 | 560 |
| 9S8W_4815S1.6RP | 48 | 36-75 | 211 | 15 | 600 | 89 | 560 |
| 9S8W_4824S1.6RP | 48 | 36-75 | 211 | 24 | 375 | 89 | 200 |
| 9S8W_1205D1.6RP | 12 | 9-18 | 784 | ±5 | ±800 | 85 | ±800 |
| 9S8W_1212D1.6RP | 12 | 9-18 | 852 | ±12 | ±375 | 88 | ±390 |
| 9S8W_1215D1.6RP | 12 | 9-18 | 843 | ±15 | ±300 | 89 | ±200 |
| 9S8W_2405D1.6RP | 24 | 18-36 | 388 | ±5 | ±800 | 86 | ±800 |
| 9S8W_2412D1.6RP | 24 | 18-36 | 421 | ±12 | ±375 | 89 | ±390 |
| 9S8W_2415D1.6RP | 24 | 18-36 | 431 | ±15 | ±300 | 87 | ±200 |
| 9S8W_4805D1.6RP | 48 | 36-75 | 194 | ±5 | ±800 | 86 | ±800 |
| 9S8W_4812D1.6RP | 48 | 36-75 | 216 | ±12 | ±375 | 87 | ±390 |
| 9S8W_4815D1.6RP | 48 | 36-75 | 216 | ±15 | ±300 | 87 | ±200 |

* Test by minimal Vin and constant resistive load.

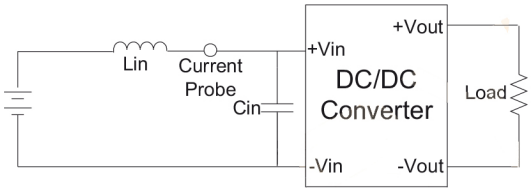
# Typical characteristics

Derating graph

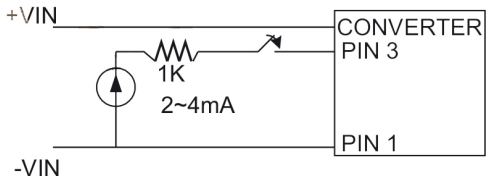


# Test configurations

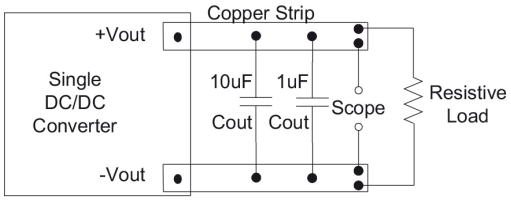
**Input Reflected Ripple Current Test Step**
Input reflected ripple current is measured through a source inductor Lin (12µH)
and a source capacitor Cin (47µF, ESR<1.0Ω at 100KHz) at nominal input and full load.

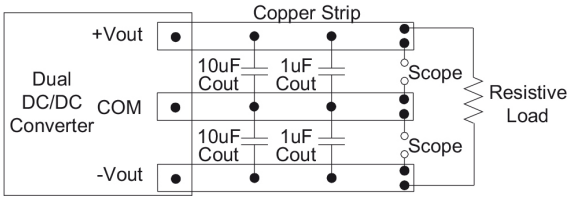



**Input Reflected Ripple Current Test Step**
Input current(2~4mA) via 1K Ω to Pin3 , converter OFF.
Open or high impedance , converter ON.

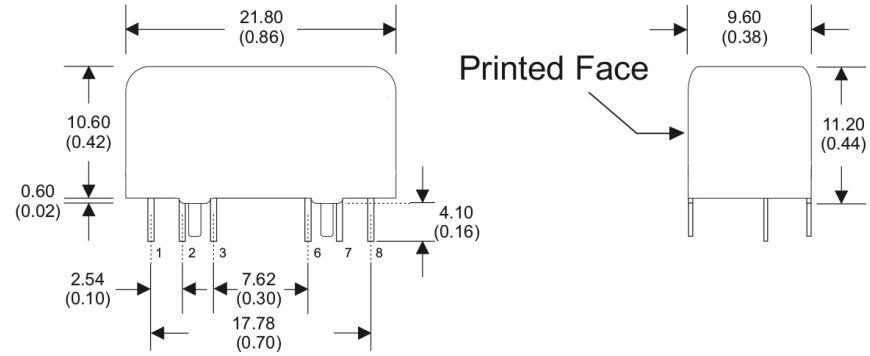



**Output ripple & noise measurement test**
To reduce ripple and noise, it is recommended to use a 1.0µF ceramic disk capacitor and a 10µF electrolytic capacitor to at the output.

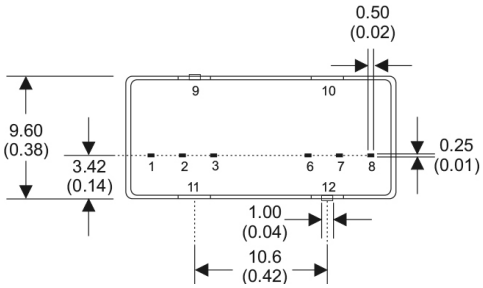



# Mechanical dimensions/foot-




| Pin connections | | |
|---|---|---|
| Pin | Single | Dual |
| 1 | -V input | -V input |
| 2 | +V input | +V input |
| 3 | Remote On/ Off | Remote On/ Off |
| 6 | +V output | +V output |
| 7 | -V output | Common |
| 8 | N.C. | -V output |
| 9 | Case | Case |
| 10 | Stand Off | Stand Off |
| 11 | Stand Off | Stand Off |
| 12 | Case | Case |




**Note:**
All dimensions are typical in millimeters (inches).
1. Pin diameter: 0.5±0.05 (0.02±0.002)
2. Pin pitch and length tolerance: ±0.35 (±0.014)
3. Pin to case tolerance: ±0.5 (±0.02)
4. Case Tolerance: ±0.5 (±0.02)
5. Stand-off tolerance: ±0.1 (±0.004)