



## FEATURES

- **SMALL SIZE AND LOW PROFILE :**  
L X W X H = 0.60" X 0.37" X 0.29"
- **HIGH EFFICIENCY UP TO 95.5%**
- **LOW QUIESCENT CURRENT**
- **WIDE INPUT RANGE: 4.6 ~ 36VDC AND 3 ~ 5.5VDC**
- **ADJUSTABLE OUTPUT VLOTAGE**
- **OVER-CURRENT PROTECTION**
- **OUTPUT SHORT CIRCUIT PROTECTION**
- **OVER-TEMPERATURE PROTECTION**
- **LOW OUTPUT RIPPLE AND NOISE**
- **FIXED SWITCHING FREQUENCY**
- **NEGATIVE OUTPUT APPLICATION**
- **SAFETY MEETS UL60950-1, EN60950-1, & IEC60950-1**
- **CE MARKED**
- **COMPLIANT TO RoHS II & REACH**

## APPLICATIONS

Wireless Network  
Telecom/Datacom  
Industry Control System  
Distributed Power Architectures  
Semiconductor Equipment  
Microprocessor Power Applications

## DESCRIPTION

The SSR01-SERIES high performance switching regulators are suited to pick and place mass production. It provides 1A output current and high efficiency up to 95.5%. The SSR01 series feature output short circuit protection, over-current protection, and over-temperature protection. The SSR01-series can also be used to convert a positive input voltage to a negative output voltage.

## TECHNICAL SPECIFICATION

| OUTPUT SPECIFICATIONS                    |                                    |                             |       |
|------------------------------------------|------------------------------------|-----------------------------|-------|
| Output current                           | See table                          | 1000mA, max.                |       |
| Voltage accuracy                         |                                    | ±2%Vout, max.               |       |
| Minimum load                             |                                    | 0%                          |       |
| Line regulation                          |                                    | ± 0.2% Vout                 |       |
| Load regulation                          | 0% to 100% of Full load            | ± 0.6% Vout                 |       |
|                                          | 10% to 90% of Full load            | ± 0.3% Vout                 |       |
| Ripple and noise<br>(20MHz bandwidth)    | Vout = 1.2V to 8V                  | 50mVp-p                     |       |
|                                          | Vout = 8.1 to 15.5V                | 75mVp-p                     |       |
| Temperature coefficient                  |                                    | ±0.015%/°C, max.            |       |
| Dynamic load response                    | Load change step                   | Peak deviation              | 150mV |
|                                          | 50%↔100% of F.L.                   | Recovery time               | 250μs |
| Output current limit for Positive output | SSR01-05S2P5                       | 400%                        |       |
|                                          | others                             | 200%                        |       |
| Output short-circuit                     | Continuous, automatic recovery     |                             |       |
| Capacitor Load (Note 4)                  |                                    | 470uF, max.                 |       |
| Output voltage overshoot-startup         |                                    | 1% Vout, max.               |       |
| GENERAL SPECIFICATIONS                   |                                    |                             |       |
| Efficiency (Note 3)                      | See table                          |                             |       |
| Isolation voltage                        | None                               |                             |       |
| Switching frequency                      | See table                          |                             |       |
| Safety meets                             | IEC60950-1, UL60950-1, & EN60950-1 |                             |       |
| Case material                            | Non-conductive black plastic       |                             |       |
| Base material                            | Non-conductive black plastic       |                             |       |
| Potting Material                         | Epoxy(UL94 V-0)                    |                             |       |
| Weight                                   | 1.7g(0.067oz)                      |                             |       |
| MTBF (Note 1)                            | MIL-HDBK-217F                      | 1.457 x 10 <sup>7</sup> hrs |       |

| INPUT SPECIFICATIONS                                |                                                                  |                                                       |                |
|-----------------------------------------------------|------------------------------------------------------------------|-------------------------------------------------------|----------------|
| Input voltage range for positive output             | $V_{in} > V_{out(set)} + 0.5V$<br>$V_{in} > V_{out(set)} + 1.5V$ | 3.0 ~ 5.5VDC<br>4.6 ~ 36VDC                           |                |
| Input voltage range for negative output<br>(Note 6) | See table<br>$V_{in} +  V_{out}  \leq 36V$                       | 4.6 ~ 32VDC                                           |                |
| Maximum input current                               | $V_{in(min)}$ , Full load                                        |                                                       | 1A             |
| Input filter                                        |                                                                  |                                                       | C filter       |
| Input reflected ripple current                      |                                                                  |                                                       | 100mA          |
| ENVIRONMENTAL SPECIFICATIONS                        |                                                                  |                                                       |                |
| Operating temperature range                         | $-40^{\circ}C \sim +105^{\circ}C$ (with derating)                |                                                       |                |
| Maximum case temperature                            | 105°C                                                            |                                                       |                |
| Storage temperature range                           | $-55^{\circ}C \sim +125^{\circ}C$                                |                                                       |                |
| Lead-free reflow solder process                     | IPC J-STD-020D                                                   |                                                       |                |
| Moisture sensitivity level(MSL)                     | IPC J-STD-033B<br>Level 1                                        |                                                       |                |
| Thermal shock                                       | MIL-STD-810F                                                     |                                                       |                |
| Vibration                                           | MIL-STD-810F                                                     |                                                       |                |
| Relative humidity (non-condensing)                  | 0% to 90% RH                                                     |                                                       |                |
| Over temperature protection                         | Internal IC junction                                             |                                                       | 170 °C         |
| FEATURE SPECIFICATIONS                              |                                                                  |                                                       |                |
| Start up time                                       | Nominal $V_{in}$ and<br>constant resistive load                  | Power up<br>Remote ON/OFF                             | 5ms<br>5ms     |
| Remote ON/OFF (Note 5)<br>(Positive logic)          | DC-DC ON<br>DC-DC OFF                                            | Open or $2V < V_r < 5V$<br>Short or $0V < V_r < 0.8V$ |                |
| Input current of Remote control pin                 | Nominal Input                                                    |                                                       | -0.1mA ~ 0.1mA |
| Remote off state input current                      | Nominal Input                                                    |                                                       | 1.2mA          |

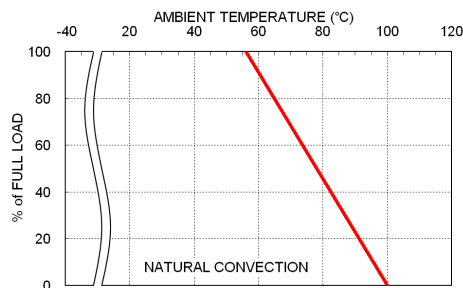
### Note

1. MIL-HDBK-217F @Tc=70°C, Full load.
2. Typical value at nominal input voltage and no load.
3. Typical value at min. or max. input voltage and full load.
4. Tested with min. input voltage and constant resistive load.
5. Positive output : The ON/OFF control PIN voltage is referenced to GND.  
Negative output : The ON/OFF control PIN voltage is referenced to -Vout.

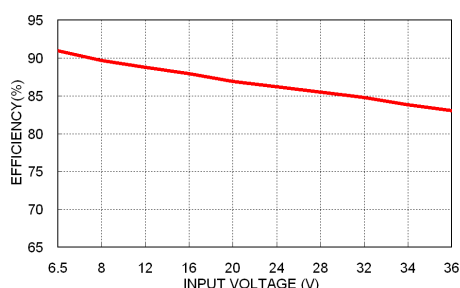
**CAUTION:** This power module is not internally fused. An input line fuse must always be used.

## Positive output

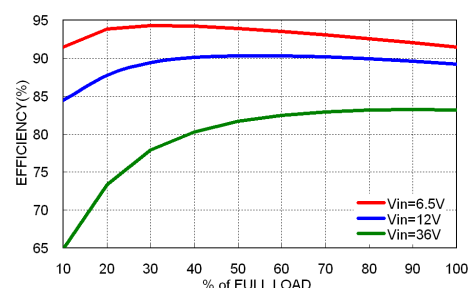
| Model Name   | Nominal Input | Input Voltage | Frequency | Nominal Output | Output Voltage Trim Range | Output Current |      | No Load Current (2) | Efficiency (%) (3) |          |
|--------------|---------------|---------------|-----------|----------------|---------------------------|----------------|------|---------------------|--------------------|----------|
|              |               |               |           |                |                           | Min.           | Max. |                     | Min. Vin           | Max. Vin |
| SSR01-05S2P5 | 5.0V          | 3.0 ~ 5.5VDC  | 410kHz    | 2.5VDC         | 1.2 ~ 3.63VDC             | 0A             | 1A   | 6mA                 | 95.5               | 95.0     |
| SSR01-12S3P3 | 12V           | 4.6 ~ 36VDC   | 300kHz    | 3.3VDC         | 1.5 ~ 5.5VDC              |                |      | 1.5mA               | 87.5               | 80.0     |
| SSR01-12S05  | 12V           | 6.5 ~ 36VDC   | 580kHz    | 5.0VDC         | 2.5 ~ 8.0VDC              |                |      | 3mA                 | 91.5               | 83.5     |
| SSR01-12S09  | 12V           | 10.5 ~ 36VDC  | 580kHz    | 9.0VDC         | 4.5 ~ 12.6VDC             |                |      | 4mA                 | 94.5               | 89.0     |
| SSR01-24S12  | 24V           | 13.5 ~ 36VDC  | 580kHz    | 12VDC          | 4.5 ~ 13.5VDC             |                |      | 4mA                 | 95.0               | 91.0     |
| SSR01-24S15  | 24V           | 16.5 ~ 36VDC  | 580kHz    | 15VDC          | 4.5 ~ 15.5VDC             |                |      | 4mA                 | 95.5               | 92.5     |



SSR01-12S05 Derating Curve



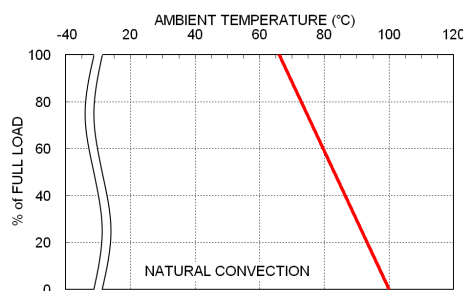
SSR01-12S05 Efficiency vs. Input Voltage



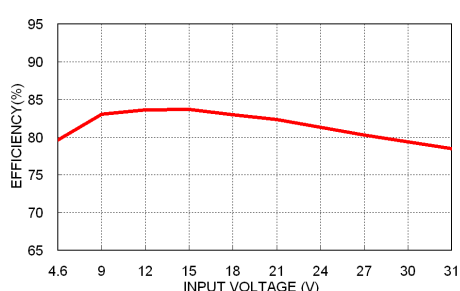
SSR01-12S05 Efficiency vs. Output Load

## Negative output application-

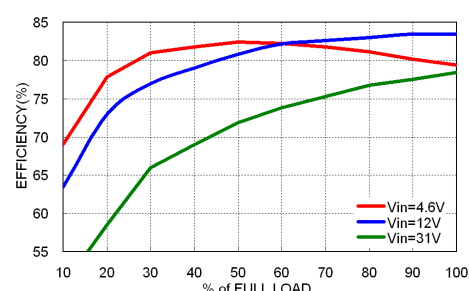
| Model Name   | Nominal Input | Input Voltage | Frequency | Nominal Output | Output Voltage Trim Range | Output Current |        | No Load Current (2) | Efficiency (%) (3) |          |
|--------------|---------------|---------------|-----------|----------------|---------------------------|----------------|--------|---------------------|--------------------|----------|
|              |               |               |           |                |                           | Min.           | Max.   |                     | Min. Vin           | Max. Vin |
| SSR01-12S3P3 | 12V           | 4.6 ~ 32VDC   | 300kHz    | -3.3VDC        | -1.5 ~ -5.5VDC            | 0 A            | -0.6 A | 3mA                 | 74.0               | 77.5     |
| SSR01-12S05  | 12V           | 4.6 ~ 31VDC   | 580kHz    | -5.0VDC        | -2.5 ~ -8.0VDC            | 0 A            | -0.4 A | 3mA                 | 80.0               | 78.5     |
| SSR01-12S09  | 12V           | 7 ~ 27VDC     | 580kHz    | -9.0VDC        | -4.5 ~ -12.6VDC           | 0 A            | -0.3 A | 7mA                 | 85.0               | 82.0     |
| SSR01-24S12  | 12V           | 7 ~ 24VDC     | 580kHz    | -12VDC         | -4.5 ~ -13.5VDC           | 0 A            | -0.3 A | 7mA                 | 84.5               | 86.0     |
| SSR01-24S15  | 12V           | 7 ~ 21VDC     | 580kHz    | -15VDC         | -4.5 ~ -15.5VDC           | 0 A            | -0.2 A | 10mA                | 85.5               | 84.0     |



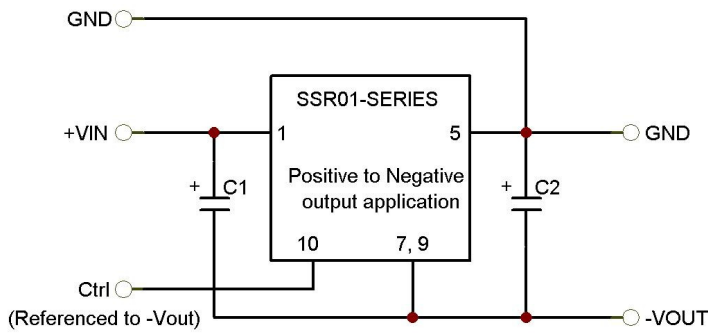
SSR01-12S05 -5Vout Derating Curve



SSR01-12S05 -5Vout Efficiency VS Input Voltage



SSR01-12S05 -5Vout Efficiency VS Output Load



C1 and C2 are required and should be fitted close to the converter pins. Maximum capacitive load including C2 is 470uF.

|    |            |               |
|----|------------|---------------|
| C1 | 10uF / 50V | 1210 X5R MLCC |
| C2 | 10uF / 25V | 1206 X5R MLCC |

## OUTPUT TRIMMING

| Part Number  | Vout,nom   | Trim Up(K $\Omega$ )<br>R <sub>u</sub> (K $\Omega$ ) | Trim Down<br>R <sub>D</sub> (K $\Omega$ )     | Part Number | Vout,nom    | Trim Up<br>R <sub>u</sub> (K $\Omega$ ) | Trim Down<br>R <sub>D</sub> (K $\Omega$ )  |
|--------------|------------|------------------------------------------------------|-----------------------------------------------|-------------|-------------|-----------------------------------------|--------------------------------------------|
| SSR01-05S2P5 | $\pm 2.5V$ | $= \frac{40.75}{V_o - 2.5}$                          | $= \frac{50.75 \cdot V_o - 40.75}{2.5 - V_o}$ | SSR01-12S09 | $\pm 9.0V$  | $= \frac{80}{V_o - 9.0}$                | $= \frac{100 \cdot V_o - 80}{9.0 - V_o}$   |
| SSR01-12S3P3 | $\pm 3.3V$ | $= \frac{26.4}{V_o - 3.3}$                           | $= \frac{33 \cdot V_o - 26.4}{3.3 - V_o}$     | SSR01-24S12 | $\pm 12.0V$ | $= \frac{240}{V_o - 12.0}$              | $= \frac{300 \cdot V_o - 240}{12.0 - V_o}$ |
| SSR01-12S05  | $\pm 5.0V$ | $= \frac{160}{V_o - 5.0}$                            | $= \frac{200 \cdot V_o - 160}{5.0 - V_o}$     | SSR01-24S15 | $\pm 15.0V$ | $= \frac{240}{V_o - 15.0}$              | $= \frac{300 \cdot V_o - 240}{15.0 - V_o}$ |

The input voltage can be increased to 42VDC by external capacitors.

1.For Positive output:

Input capacitor is necessary when input voltage 36VDC increased to 42VDC. The input capacitor suggestion is 22uF

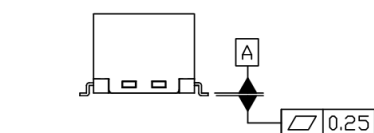
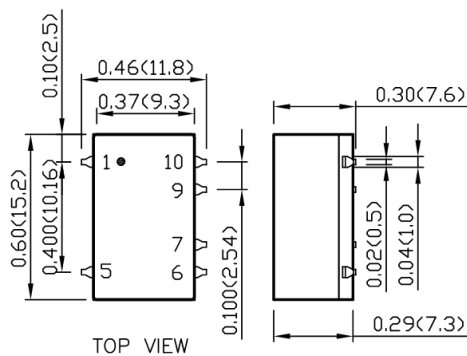
2.For Negative output application:

The input and output capacitors are necessary for negative output application when the 36VDC be increased to 42VDC, and the suggestion of capacitors: The C1 is 22uF and the C2 is 10uF. (Please refer to the figure of positive to negative output application)

Consider to the maximum duty of internal controller. In the trim down application, these are some condition that input range can't increase to 42VDC.

| MODEL NUMBER | Output voltage(Trim down) | Input range                     |
|--------------|---------------------------|---------------------------------|
| SSR01-12S09  | -4.5 ~ -6VDC              | $V_{in} +  V_{out}  \leq 36VDC$ |
| SSR01-24S12  | -4.5 ~ -6VDC              | $V_{in} +  V_{out}  \leq 36VDC$ |
| SSR01-24S15  | -4.5 ~ -6VDC              | $V_{in} +  V_{out}  \leq 36VDC$ |

## MECHANICAL DRAWING



- All dimensions in Inch (mm)  
Tolerance: X.XX $\pm 0.02$  (X.X $\pm 0.5$ )  
X.XXX $\pm 0.01$  (X.XX $\pm 0.25$ )
- Pin pitch tolerance  $\pm 0.01$  (0.25)
- Pin dimension tolerance  $\pm 0.004$  (0.1)

## PIN CONNECTION

| PIN | DEFINE |
|-----|--------|
| 1   | +Vin   |
| 5   | +Vout  |
| 6   | Trim   |
| 7   | GND    |
| 9   | GND    |
| 10  | Ctrl   |

## EXTERNAL OUTPUT TRIMMING

Output can be externally trimmed by using the method shown below.

