

# S112S01 Series S116S01 Series

## SIP Type SSR for Medium Power Control

### ■ Features

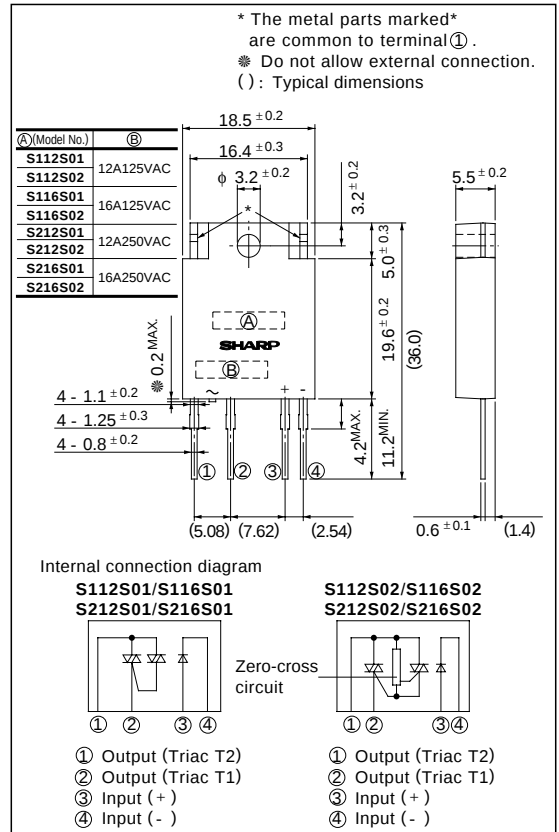
1. Compact, high radiation resin mold package
2. RMS ON-state current  
**S112S01 Series**: 12Arms at  $T_c \leq 70^\circ\text{C}$   
 ( With heat sink )  
**S116S01 Series**: 16Arms at  $T_c \leq 60^\circ\text{C}$   
 ( With heat sink )
3. Built-in zero-cross circuit  
**(S112S02 / S212S02 / S116S02 / S216S02)**
4. High repetitive peak OFF-state voltage  
**S112S01 / S112S02 / S116S01 / S116S02**  
 $V_{\text{DRM}} : 400\text{V}$   
**S212S01 / S212S02 / S216S01 / S216S02**  
 $V_{\text{DRM}} : 600\text{V}$
5. Isolation voltage between input and output  
 $(V_{\text{iso}} : 4\,000V_{\text{rms}})$
6. Recognized by UL, file No. E94758  
**(S112S01 / S112S02 / S116S01 / S116S02)**
7. Approved by CSA, No. 63705  
**(S112S01 / S112S02 / S116S01 / S116S02)**

### ■ Applications

1. Copiers, laser beam printers
2. Automatic vending machines
3. FA equipment

### ■ Outline Dimensions

(Unit : mm)



### ■ Model line-ups

|                                | For 100V lines | For 200V lines |
|--------------------------------|----------------|----------------|
| For phase control              | <b>S112S01</b> | <b>S212S01</b> |
| No built-in zero-cross circuit | <b>S116S01</b> | <b>S216S01</b> |
| Built-in zero-cross circuit    | <b>S112S02</b> | <b>S212S02</b> |
|                                | <b>S116S02</b> | <b>S216S02</b> |

## ■ Absolute Maximum Ratings

(Ta = 25°C)

| Parameter                |                                           |                                        | Symbol             | Rating        | Unit             |                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------------|-------------------------------------------|----------------------------------------|--------------------|---------------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Input                    | Forward current                           |                                        | I <sub>F</sub>     | 50            | mA               |                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                          | Reverse voltage                           |                                        | V <sub>R</sub>     | 6             | V                |                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Output                   | RMS ON-state current                      | S112S01 Series                         | I <sub>T</sub>     | *412          | A <sub>rms</sub> | *1 AC 60Hz sine wave, T <sub>j</sub> = 25°C start<br>*2 AC 60Hz for 1 minute, 40 to 60 % RH. Apply voltages between input and output by the dielectric withstand voltage tester with zero-cross circuit. (Input and output shall be shorted respectively) .<br>(Note)<br>When the isolation voltage is necessary at using external heat sink, please use the insulation sheet.<br>*3 For 10 seconds<br>*4 T <sub>C</sub> ≤ 70°C<br>*5 T <sub>C</sub> ≤ 60°C |
|                          |                                           | S116S01 Series                         |                    | *516          | A <sub>rms</sub> |                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                          | *1 Peak one cycle surge current           | S112S01 Series                         | I <sub>surge</sub> | 120           | A                |                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                          |                                           | S116S01 Series                         |                    | 160           | A                |                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                          | Repetitive peak OFF-state voltage         | S112S01 / S112S02<br>S116S01 / S116S02 | V <sub>DRM</sub>   | 400           | V                |                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                          |                                           | S212S01 / S212S02<br>S216S01 / S216S02 |                    | 600           | V                |                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                          | Non-repetitive peak OFF-state voltage     | S112S01 / S112S02<br>S116S01 / S116S02 | V <sub>DSM</sub>   | 400           | V                |                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                          |                                           | S212S01 / S212S02<br>S216S01 / S216S02 |                    | 600           | V                |                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                          | Critical rate of rise of ON-state current |                                        | dI/dt              | 50            | A/μ s            |                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                          | Operating frequency                       |                                        | f                  | 45 to 65      | Hz               |                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| *2 Isolation voltage     |                                           |                                        | V <sub>iso</sub>   | 4 000         | V <sub>rms</sub> |                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Operating temperature    |                                           |                                        | T <sub>opr</sub>   | - 25 to + 100 | °C               |                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Storage temperature      |                                           |                                        | T <sub>stg</sub>   | - 30 to + 125 | °C               |                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| *3 Soldering temperature |                                           |                                        | T <sub>sol</sub>   | 260           | °C               |                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

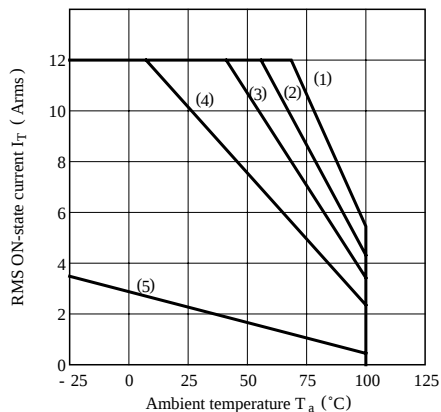
## ■ Electrical Characteristics

(Ta = 25°C)

| Parameter                                          |                                                           |                                                      | Symbol                 | Conditions                                                        | MIN.                    | TYP.             | MAX.             | Unit             |
|----------------------------------------------------|-----------------------------------------------------------|------------------------------------------------------|------------------------|-------------------------------------------------------------------|-------------------------|------------------|------------------|------------------|
| Input                                              | Forward voltage                                           |                                                      | V <sub>F</sub>         | I <sub>F</sub> = 20mA                                             | -                       | 1.2              | 1.4              | V                |
|                                                    | Reverse current                                           |                                                      | I <sub>R</sub>         | V <sub>R</sub> = 3V                                               | -                       | -                | 10 <sup>-4</sup> | A                |
| Output                                             | Repetitive peak OFF-state current                         |                                                      | I <sub>DRM</sub>       | V <sub>D</sub> = V <sub>DRM</sub>                                 | -                       | -                | 10 <sup>-4</sup> | A                |
|                                                    | ON-state voltage                                          | <b>S112S01 Series</b>                                | V <sub>T</sub>         | Resistance load<br>I <sub>F</sub> = 20mA, I <sub>T</sub> = 12Arms | -                       | -                | 1.5              | V <sub>rms</sub> |
|                                                    |                                                           | <b>S116S01 Series</b>                                |                        | Resistance load<br>I <sub>F</sub> = 20mA, I <sub>T</sub> = 16Arms | -                       | -                | 1.5              | V <sub>rms</sub> |
|                                                    | Holding current                                           |                                                      | I <sub>H</sub>         | -                                                                 | -                       | -                | 50               | mA               |
|                                                    | Critical rate of rise of OFF-state voltage                |                                                      | dV/dt                  | V <sub>D</sub> = 2/3 • V <sub>DRM</sub>                           | 30                      | -                | -                | V/μ s            |
|                                                    | Critical rate of rise of commutating<br>OFF-state voltage |                                                      | (dV/dt) <sub>C</sub>   | T <sub>j</sub> = 125°C, V <sub>D</sub> = 400V, *6                 | 5                       | -                | -                | V/μ s            |
|                                                    | Zero-cross voltage                                        | <b>S112S02 / S212S02</b><br><b>S116S02 / S216S02</b> | V <sub>OX</sub>        | I <sub>F</sub> = 8mA                                              | -                       | -                | 35               | V                |
| Transfer<br>charac-<br>teristics                   | Minimum trigger<br>current                                | <b>S112S01 / S212S01</b><br><b>S116S01 / S216S01</b> | I <sub>FT</sub>        | V <sub>D</sub> = 12V, R <sub>L</sub> = 30 Ω                       | -                       | -                | 8                | mA               |
|                                                    |                                                           | <b>S112S02 / S212S02</b><br><b>S116S02 / S216S02</b> |                        | V <sub>D</sub> = 6V, R <sub>L</sub> = 30 Ω                        | -                       | -                | 8                | mA               |
|                                                    |                                                           | Isolation resistance                                 |                        | R <sub>ISO</sub>                                                  | DC500V, RH = 40 to 60 % | 10 <sup>10</sup> | -                | Ω                |
|                                                    | Turn-on time                                              | <b>S112S01 / S212S01</b><br><b>S116S01 / S216S01</b> | t <sub>on</sub>        | AC 50Hz                                                           | -                       | -                | 1                | ms               |
|                                                    |                                                           | <b>S112S02 / S212S02</b><br><b>S116S02 / S216S02</b> |                        |                                                                   | -                       | -                | 10               | ms               |
|                                                    | Turn-off time                                             |                                                      | t <sub>off</sub>       | AC 50Hz                                                           | -                       | -                | 10               | ms               |
| Thermal resistance<br>(Between junction and case)  |                                                           | <b>S112S01 series</b><br><b>S116S01 series</b>       | R <sub>th(j - c)</sub> | -                                                                 | -                       | 3.8              | -                | °C/W             |
|                                                    |                                                           |                                                      |                        | -                                                                 | -                       | 3.3              | -                | °C/W             |
| Thermal resistance (Between junction and ambience) |                                                           |                                                      | R <sub>th(j - a)</sub> | -                                                                 | -                       | 40               | -                | °C/W             |

\*6 S112S01 Series: dI<sub>T</sub>/dt = -6A/msS116S01 Series: dI<sub>T</sub>/dt = -8A/ms

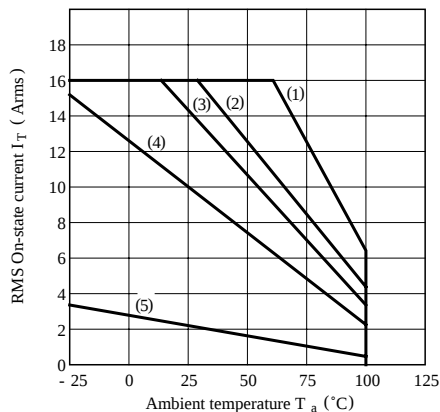
**Fig. 1 RMS ON-state Current vs. Ambient Temperature (S112S01Series)**



- (1) With infinite heat sink
- (2) With heat sink (280 x 280 x 2 mm Al plate)
- (3) With heat sink (200 x 200 x 2 mm Al plate)
- (4) With heat sink (100 x 100 x 2 mm Al plate)
- (5) Without heat sink

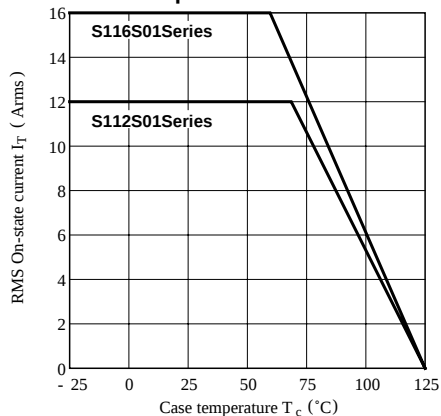
(Note) With the Al heat sink set up vertically, tighten the device at the center of the Al heat sink with a torque of  $0.4\text{N} \cdot \text{m}$  and apply thermal conductive silicone grease on the heat sink mounting plate. Forcible cooling shall not be carried out.

**Fig. 2 RMS ON-state Current vs. Ambient Temperature (S116S01Series)**



- (1) With infinite heat sink
- (2) With heat sink (280 x 280 x 2 mm Al plate)
- (3) With heat sink (200 x 200 x 2 mm Al plate)
- (4) With heat sink (100 x 100 x 2 mm Al plate)
- (5) Without heat sink

**Fig. 3 RMS ON-state Current vs. Case Temperature**



**Fig. 4 Forward Current vs. Ambient Temperature**

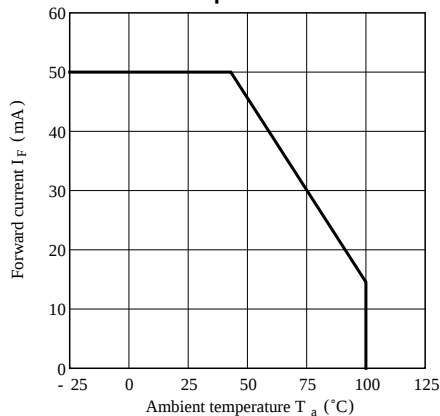


Fig. 5 Forward Current vs. Forward Voltage

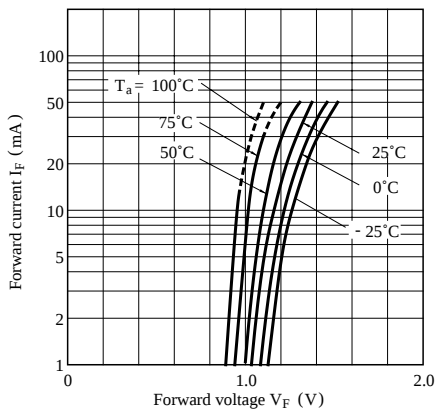


Fig. 6 Surge Current vs. Power-on Cycle

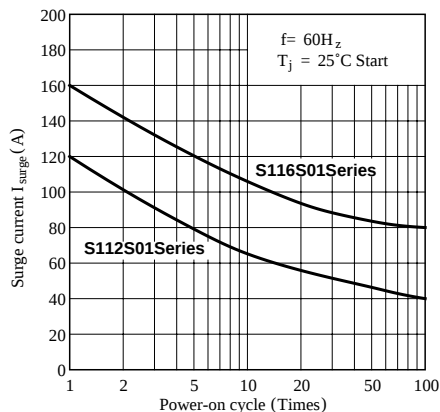


Fig. 7 Maximum ON-state Power Dissipation vs. RMS ON-state Current (S112S01Series)

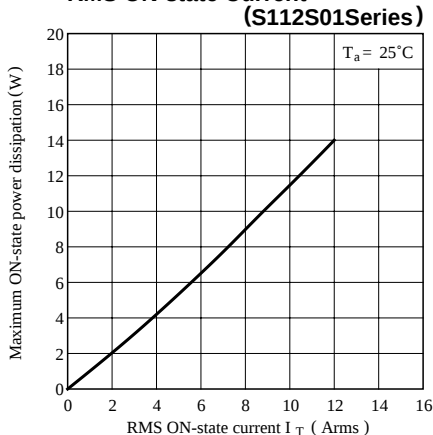


Fig. 8 Maximum ON-state Power Dissipation vs. RMS ON-state Current (S116S01Series)

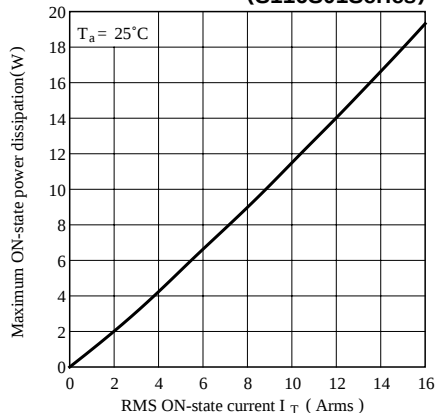


Fig. 9 Minimum Trigger Current vs. Ambient Temperature

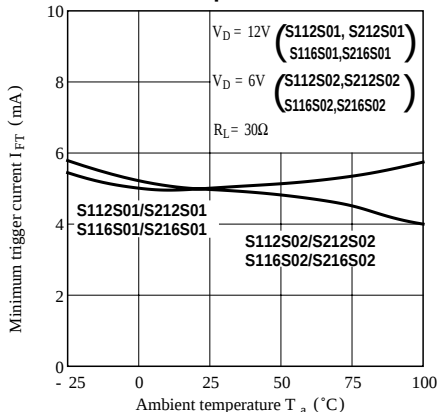


Fig.10 Repetitive Peak OFF-state Current vs. Ambient Temperature (S112S01/S112S02/S116S01/S116S02)

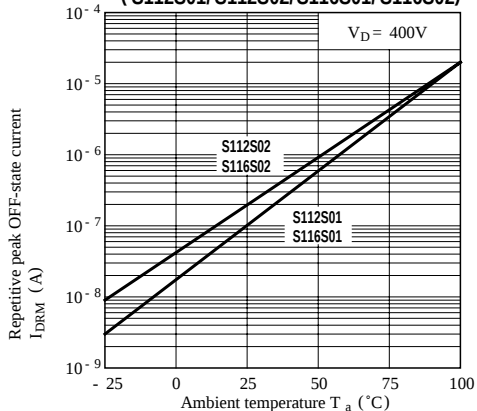
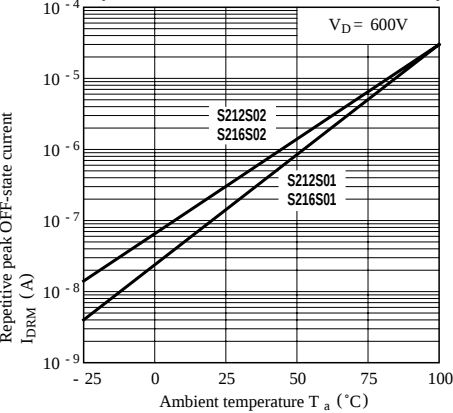


Fig.11 Repetitive Peak OFF-state Current vs. Ambient Temperature  
( S212S01/ S212S02/ S216S01/S216S02)



● Please refer to the chapter “Precautions for Use.”