# SSRP105B1

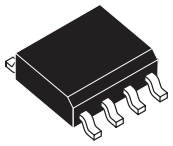
Application Specific Discretes
ASD™

DUAL ASYMMETRICAL OVERVOLTAGE PROTECTION FOR TELECOM LINE

## MAIN APPLICATIONS

Where asymmetrical protection against lightning strikes and other transient overvoltages is required :

- Solid-State relays
- SLIC with integrated ring generator

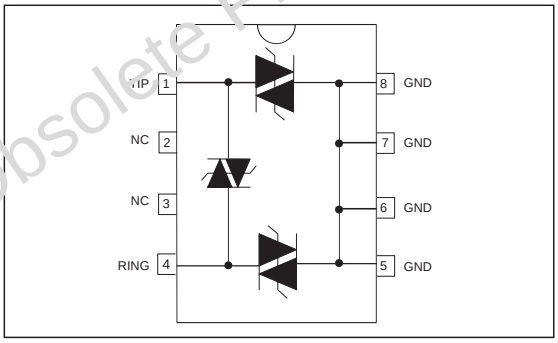


**SO-8**

## DESCRIPTION

The SSRP105B1 is a dual asymmetrical transient voltage suppressor designed to protect a solid-state ring relay or SLICs with integrated ring generator from overvoltages.
The asymmetrical protection configuration is necessary to allow the use of all different types of ringing schemes.

## FUNCTIONAL DIAGRAM




## FEATURES

- Dual bi-directional asymmetrical protection
  Stand-off voltages:
  - Between Line and Ground
    +105V for positive voltages
    -180V for negative voltages
  - Between Line and Line
    +180V for positive voltages
    -180V for negative voltages
- Peak pulse current: $I_{PP}$ = 50A (5/310µs)
- Holding current:
  - $I_{H+}$ = 100mA
  - $I_{H-}$ = 150mA

## COMPLY WITH THE FOLLOWING STANDARDS

| | Peak Surge Voltage (V) | Voltage Waveform (µs) | Current Waveform (µs) | Required Peak current (A) | Min. serial resistor to meet standards (Ω) |
|---|---|---|---|---|---|
| ITU-T K20 / K21 | 1500 | 10/700 | 5/310 | 38 | - |
| VDE0433 | 2000 | 10/700 | 5/310 | 50 | - |
| IEC61000-4-5 | Level 3<br>Level 4 | 10/700<br>1.2/50 | 5/310<br>8/20 | 50<br>100 | -<br>- |
| FCC Part 68 | 1500<br>800 | 10/160<br>10/560 | 10/160<br>10/560 | 200<br>100 | 18<br>10 |
| BELLCORE GR1089 First level | 2500<br>1000 | 2/10<br>10/1000 | 2/10<br>10/1000 | 500<br>100 | 10<br>19 |

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## APPLICATION INFORMATION

**Fig. 1:** Topology of the classical line card protection.

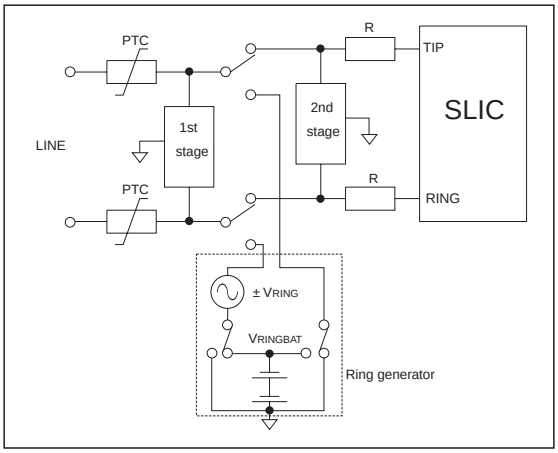
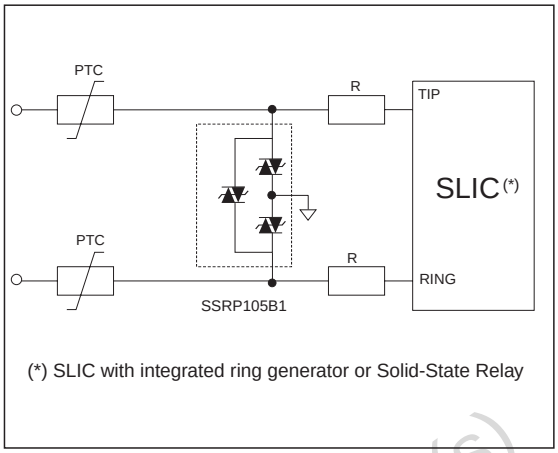



**Fig. 2:** Classical use of the SSRP105B1.



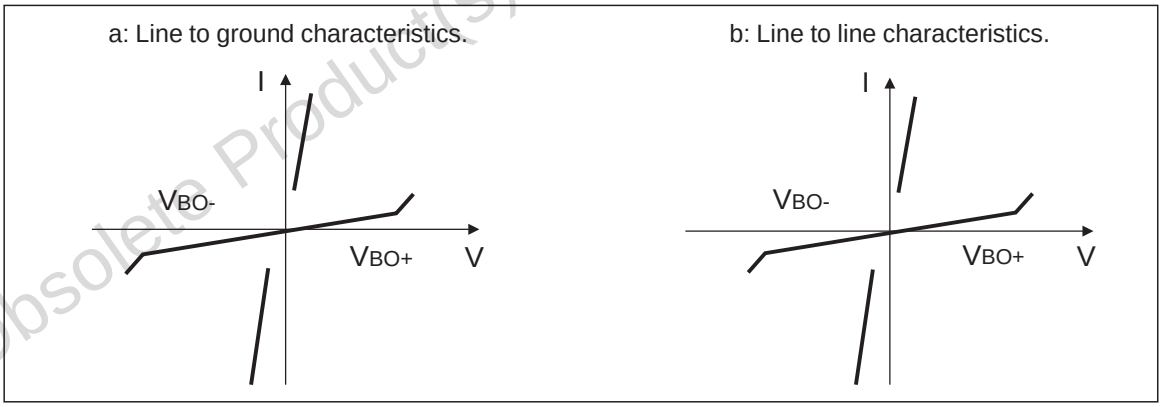

The classical line card requires protection before the ring relay and a second one for the SLIC (*figure 1*).

The use of new SLICs with integrated ring generator or board based on solid-state ring relay suppresses this second protection (*figure 2*). Then, the only remaining stage, located between the line and the ring relay, has to optimize the protection.

The classical symmetrical first stage protector becomes not sufficient to avoid any circuit destruction during surges.

The SSRP105B1 device takes into account this fact and is based on asymmetrical voltage characteristics (*figure 3a*). The ring signal being shifted back by the battery voltage, the SSRP105B1 negative breakover value $V_{BO-}$ is greater than the positive one $V_{BO+}$. This point guarantees a protection operation very close to the peak of the normal operating voltage without any disturbance of the ring signal.

**Fig. 3:** SSRP105B1 electrical characteristics.



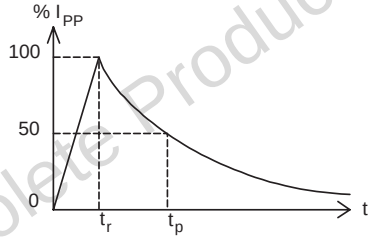

In addition with the 2 crowbar functions which perform the protection of both TIP and RING lines versus ground, a third cell assumes the differential mode protection of the SLIC. The breakover voltage values of this third cell are the same for both positive and negative parts of the characteristics and are equivalent to the negative breakover voltage value of the TIP and RING lines versus GND cells (*figure 3b*).

## ABSOLUTE MAXIMUM RATINGS ($T_{amb}$ = 25°C)

| Symbol | Parameter | | Value | Unit |
|---|---|---|---|---|
| $I_{PP}$ | Peak pulse current (see note 1) | 10 / 1000 µs<br>10 / 560µs<br>5 / 310µs<br>10 / 160µs<br>8 / 20µs<br>2 / 10µs | 35<br>45<br>50<br>60<br>120<br>175 | A |
| $I_{TSM}$ | Non repetitive surge peak on-state current (F=50Hz) | tp = 0.2 s<br>tp = 5 s<br>tp = 15 min. | 8.5<br>4.5<br>2.5 | A |
| $T_{op}$ | Operating temperature range | | 0 to + 70 | °C |
| $T_{stg}$<br>$T_j$ | Storage temperature range<br>Maximum operating junction temperature | | - 55 to + 150<br>+ 150 | °C<br>°C |
| $T_L$ | Maximum lead temperature for soldering during 10s | | 260 | °C |

Note 1 : Pulse waveform :

| | | |
|---|---|---|
| 10/1000µs | $t_r$=10µs | $t_p$=1000µs |
| 10/560µs | $t_r$=10µs | $t_p$=560µs |
| 5/310µs | $t_r$=5µs | $t_p$=310µs |
| 10/160µs | $t_r$=10µs | $t_p$=160µs |
| 8/20µs | $t_r$=8µs | $t_p$=20µs |
| 2/10µs | $t_r$=2µs | $t_p$=10µs |

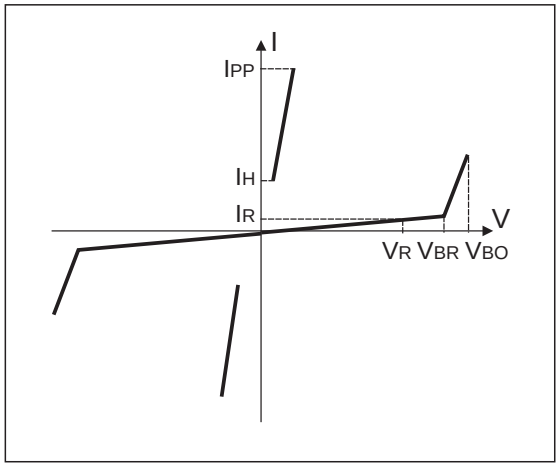



## THERMAL RESISTANCE

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $R_{th\ (j-a)}$ | Junction to ambient | 170 | °C/W |

## ELECTRICAL CHARACTERISTICS ($T_{amb}$ = 25°C)

| Symbol | Parameter |
|---|---|
| $V_R$ | Stand-off voltage |
| $I_R$ | Leakage current at stand-off voltage |
| $V_{BR}$ | Breakdown voltage |
| $V_{BO}$ | Breakover voltage |
| $I_H$ | Holding current |
| $I_{BO}$ | Breakover current |
| $I_{PP}$ | Peak pulse current |
| C | Capacitance |



**ELECTRICAL CHARACTERISTICS between TIP and GND, RING and GND** ($T_{amb}$=25°C)

| Symbol | Parameter | Test conditions (note 1) | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_{BO}$ | Breakover voltage (note 2) | Positive voltage . 50Hz<br>. 10/700µs<br>Negative voltage . 50Hz<br>. 10/700µs | | | 165<br>165<br>225<br>225 | V |
| $I_H$ | Holding current | Positive polarity<br>Negative polarity | 100<br>150 | | | mA |
| $I_R$ | Leakage current (note 3) | $V_R$ = +105 V<br>$V_R$ = - 180 V | | | 10<br>10 | µA |
| C | Capacitance | F = 1MHz, $V_{RMS}$ = 1V, $V_{R(T/G)}$ = -5V<br>F = 1MHz, $V_{RMS}$ = 1V, $V_{R(T/G)}$ = -50V | | 30<br>16 | | pF |

**ELECTRICAL CHARACTERISTICS between TIP and RING** ($T_{amb}$=25°C)

| Symbol | Parameter | Test conditions | Min | Max | Unit |
|---|---|---|---|---|---|
| $I_R$ | Leakage current (note 3) | $V_R$ = +180 V<br>$V_R$ = - 180 V | | 10<br>10 | µA |

Note 1: Positive voltage means between T and G, or between R and G.
Negative voltage means between G and T, or between G and R.
Note 2: See test circuit for $V_{BO}$ parameters
Note 3: $I_R$ measured at $V_R$ guarantees $V_{BR} > V_R$

**Fig. 4:** Relative variation of holding current versus junction temperature.

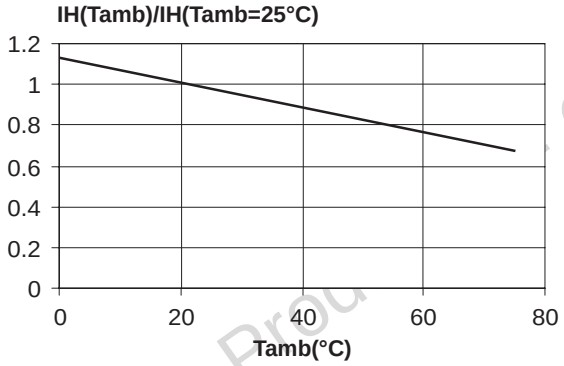



**Fig. 5:** Non-repetitive peak on-state current versus overload duration (Tj initial = +25°C)..

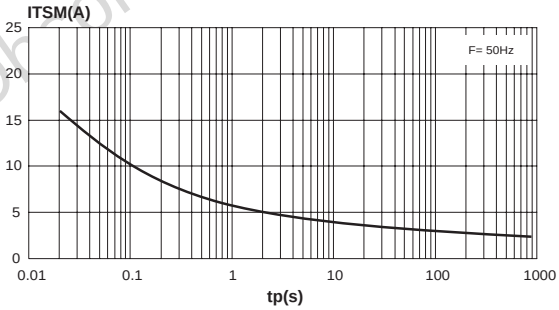
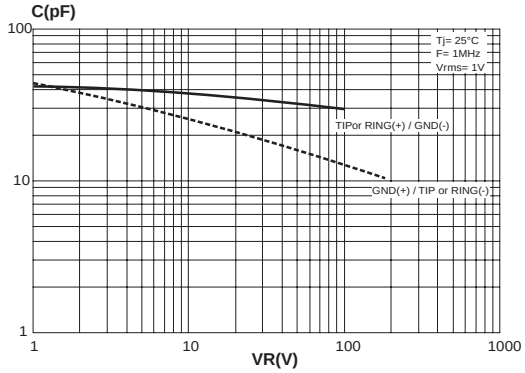
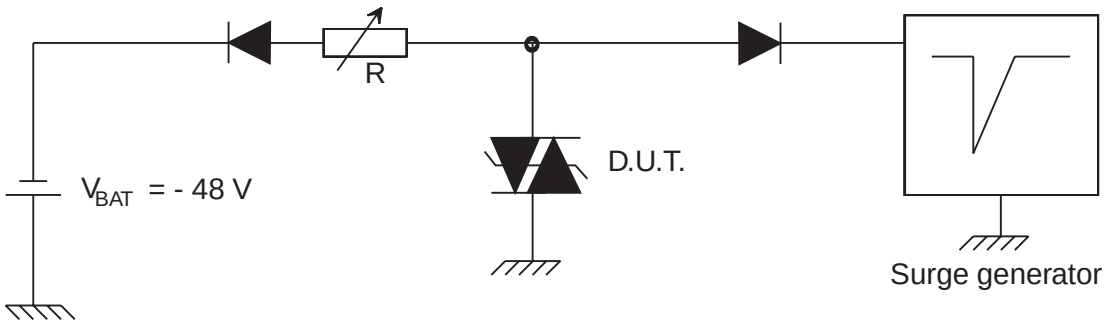



**Fig. 6:** Capacitance versus applied reverse voltages (typical values).



## FUNCTION HOLDING CURRENT ($I_H$) TEST CIRCUIT (GO-NO GO TEST)

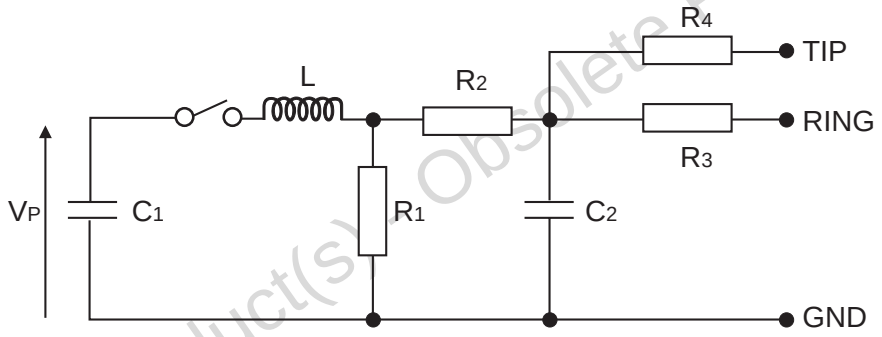



This is a GO-NOGO test which allows to confirm the holding current ($I_H$) level in a functional test circuit.

**TEST PROCEDURE :**

1) Adjust the current level at the $I_H$ value by short circuiting the D.U.T.
2) Fire the D.U.T with a surge Current : Ipp = 10A , 10/1000µs.
3) The D.U.T will come back off-state within 50 ms max.

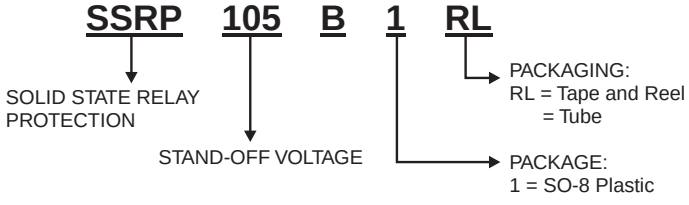
## TEST CIRCUIT FOR $V_{BO}$ PARAMETERS:




| Pulse (µs) | | $V_p$ | $C_1$ | $C_2$ | L | $R_1$ | $R_2$ | $R_3$ | $R_4$ | $I_{PP}$ | $R_p$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $t_r$ | $t_p$ | (V) | (µF) | (nF) | (µH) | (Ω) | (Ω) | (Ω) | (Ω) | (A) | (Ω) |
| 10 | 700 | 1000 | 20 | 200 | 0 | 50 | 15 | 25 | 25 | 38 | 0 |
| 1.2 | 50 | 1500 | 1 | 33 | 0 | 76 | 13 | 25 | 25 | 30 | 10 |
| 2 | 10 | 2500 | 10 | 0 | 1.1 | 1.3 | 0 | 3 | 3 | 38 | 62 |



## ORDER CODE

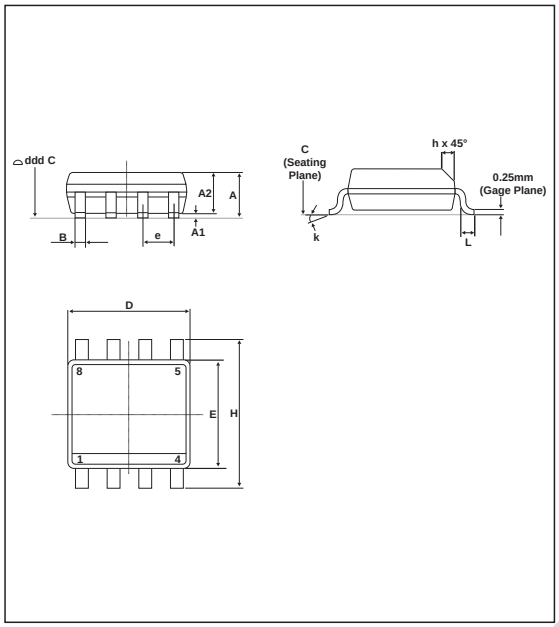


## OTHER INFORMATION

| Ordering type | Marking | Package | Weight | Base Qty (pcs) | Delivery mode |
|---|---|---|---|---|---|
| SSRP105B1<br>SSRP105B1RL | SSR105 | SO-8 | 0.08 g. | 100<br>2500 | Tube<br>Tape & Reel |

## PACKAGE MECHANICAL DATA

SO-8 (Plastic)




| REF. | DIMENSIONS | | | |
|---|---|---|---|---|
| | Millimetres | | Inches | |
| | Min. | Max. | Min. | Max. |
| A | 1.35 | 1.75 | 0.053 | 0.069 |
| A1 | 0.1 | 0.25 | 0.004 | 0.010 |
| A2 | 1.10 | 1.65 | 0.043 | 0.065 |
| B | 0.33 | 0.51 | 0.013 | 0.020 |
| C | 0.19 | 0.25 | 0.007 | 0.010 |
| D | 4.80 | 5.00 | 0.189 | 0.197 |
| E | 3.80 | 4.00 | 0.150 | 0.157 |
| e | 1.27 Typ. | | 0.05 Typ. | |
| H | 5.80 | 6.20 | 0.228 | 0.244 |
| h | 0.25 | 0.50 | 0.010 | 0.019 |
| L | 0.40 | 1.27 | 0.016 | 0.050 |
| k | 8° (max) | | | |
| ddd | 0.100 | | 0.004 | |

**FOOT-PRINT DIMENSIONS** (in millimeters)