



## SMP100LC-xxx

### TELECOM EQUIPMENT PROTECTION: TRISIL™

#### FEATURES

- Bidirectional crowbar protection
- Voltage range from 8V to 262V
- Low capacitance from 30 pF to 45pF typ @ 50V
- Low leakage current :  $I_R = 2 \mu A$  max
- Holding current:  $I_H = 150$  mA min
- Repetitive peak pulse current :  
 $I_{PP} = 100$  A (10/1000 $\mu s$ )

#### MAIN APPLICATIONS

Any sensitive equipment requiring protection against lightning strikes and power crossing:

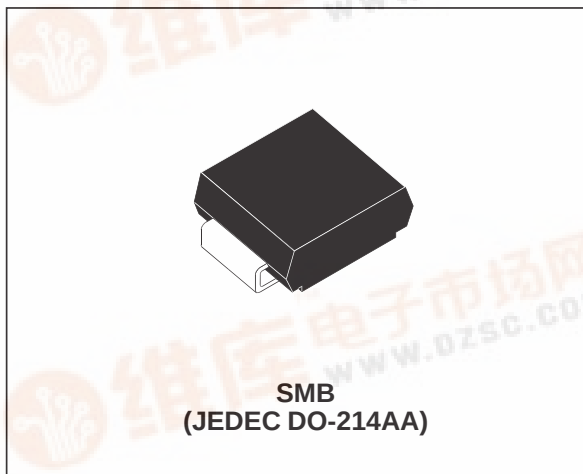
- Analog and digital line cards (xDSL, T1/ E1, ISDN...)
- Terminals (phone, fax, modem...) and central office equipment

#### DESCRIPTION

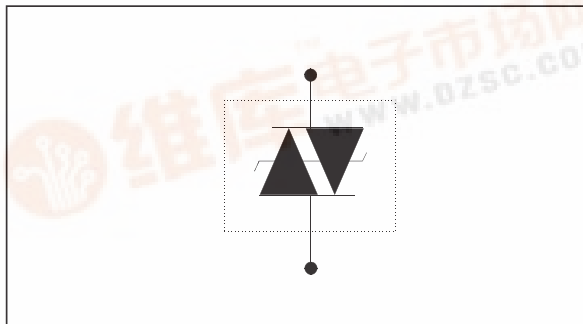
The SMP100LC-xxx series is a low capacitance transient surge arrestor designed for the protection of high debit rate communication equipment. Its low capacitance avoids any distortion of the signal and is compatible with digital line cards (xDSL, T1/E1, ISDN...).

#### BENEFITS

Trisils are not subject to ageing and provide a fail safe mode in short circuit for a better protection. They are used to help equipment to meet main standards such as UL1950, IEC950 / CSA C22.2 and UL1459. They have UL94 V0 approved resin. SMB package is JEDEC registered (DO-214AA). Trisils are UL497B approved (file: E136224) and comply with the following standards GR-1089 Core, ITU-T-K20/K21, VDE0433, VDE0878, IEC61000-4-5 and FCC part 68.



#### SCHEMATIC DIAGRAM



## SMP100LC-xxx

### IN COMPLIANCES WITH THE FOLLOWING STANDARDS

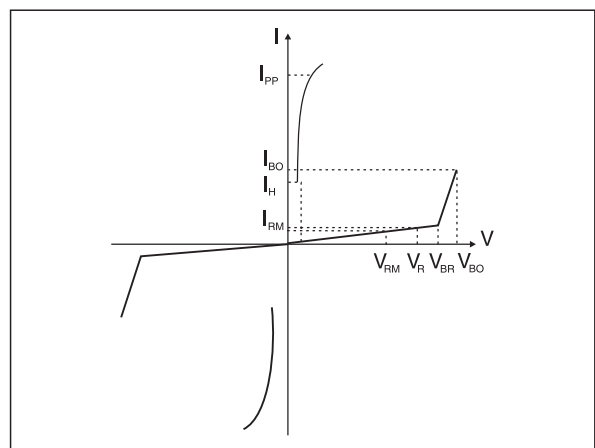
| STANDARD                            | Peak Surge Voltage (V) | Voltage Waveform                 | Required peak current (A)                  | Current waveform                 | Minimum serial resistor to meet standard ( $\Omega$ ) |
|-------------------------------------|------------------------|----------------------------------|--------------------------------------------|----------------------------------|-------------------------------------------------------|
| GR-1089 Core First level            | 2500<br>1000           | 2/10 $\mu$ s<br>10/1000 $\mu$ s  | 500<br>100                                 | 2/10 $\mu$ s<br>10/1000 $\mu$ s  | 0<br>0                                                |
| GR-1089 Core Second level           | 5000                   | 2/10 $\mu$ s                     | 500                                        | 2/10 $\mu$ s                     | 0                                                     |
| GR-1089 Core Intra-building         | 1500                   | 2/10 $\mu$ s                     | 100                                        | 2/10 $\mu$ s                     | 0                                                     |
| ITU-T-K20/K21                       | 6000<br>1500           | 10/700 $\mu$ s                   | 150<br>37.5                                | 5/310 $\mu$ s                    | 0<br>0                                                |
| ITU-T-K20 (IEC61000-4-2)            | 8000<br>15000          | 1/60 ns                          | ESD contact discharge<br>ESD air discharge |                                  | 0<br>0                                                |
| VDE0433                             | 4000<br>2000           | 10/700 $\mu$ s                   | 100<br>50                                  | 5/310 $\mu$ s                    | 0<br>0                                                |
| VDE0878                             | 4000<br>2000           | 1.2/50 $\mu$ s                   | 100<br>50                                  | 1/20 $\mu$ s                     | 0<br>0                                                |
| IEC61000-4-5                        | 4000<br>4000           | 10/700 $\mu$ s<br>1.2/50 $\mu$ s | 100<br>100                                 | 5/310 $\mu$ s<br>8/20 $\mu$ s    | 0<br>0                                                |
| FCC Part 68, lightning surge type A | 1500<br>800            | 10/160 $\mu$ s<br>10/560 $\mu$ s | 200<br>100                                 | 10/160 $\mu$ s<br>10/560 $\mu$ s | 0<br>0                                                |
| FCC Part 68, lightning surge type B | 1000                   | 9/720 $\mu$ s                    | 25                                         | 5/320 $\mu$ s                    | 0                                                     |

### THERMAL RESISTANCES

| Symbol        | Parameter                                      | Value | Unit                 |
|---------------|------------------------------------------------|-------|----------------------|
| $R_{th(j-a)}$ | Junction to ambient with recommended footprint | 100   | $^{\circ}\text{C/W}$ |
| $R_{th(j-l)}$ | Junction to leads                              | 20    | $^{\circ}\text{C/W}$ |

### ELECTRICAL CHARACTERISTICS ( $T_{amb} = 25^{\circ}\text{C}$ )

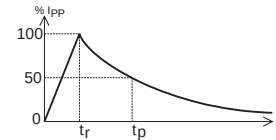
| Symbol   | Parameter                   |
|----------|-----------------------------|
| $V_{RM}$ | Stand-off voltage           |
| $I_{RM}$ | Leakage current at $V_{RM}$ |
| $V_R$    | Continuous reverse voltage  |
| $I_R$    | Leakage current at $V_R$    |
| $V_{BR}$ | Breakdown voltage           |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



**ABSOLUTE RATINGS** ( $T_{amb} = 25^{\circ}\text{C}$ )

| Symbol             | Parameter                                                 |                                              | Value                | Unit                                     |
|--------------------|-----------------------------------------------------------|----------------------------------------------|----------------------|------------------------------------------|
| $I_{pp}$           | Repetitive peak pulse current:                            |                                              |                      |                                          |
|                    |                                                           | 10/1000 $\mu\text{s}$                        | 100                  | A                                        |
|                    |                                                           | 8/20 $\mu\text{s}$                           | 250                  |                                          |
|                    |                                                           | 10/560 $\mu\text{s}$                         | 120                  |                                          |
|                    |                                                           | 5/310 $\mu\text{s}$                          | 150                  |                                          |
|                    |                                                           | 10/160 $\mu\text{s}$                         | 200                  |                                          |
|                    |                                                           | 1/20 $\mu\text{s}$                           | 250                  |                                          |
|                    |                                                           | 2/10 $\mu\text{s}$                           | 500                  |                                          |
| $I_{FS}$           | Fail-safe mode : maximum current (note 1)                 | 8/20 $\mu\text{s}$                           | 5                    | kA                                       |
| $I_{TSM}$          | Non repetitive surge peak on-state current (Sinusoidal)   | t = 20ms<br>t = 16.6ms<br>t = 0.2s<br>t = 2s | 55<br>60<br>25<br>12 | A                                        |
| $I^2t$             | $I^2t$ value for fusing                                   | t = 16.6ms<br>t = 20ms                       | 30                   | A <sup>2</sup> s                         |
| $T_L$              | Maximum lead temperature for soldering during 10s         |                                              | 260                  | $^{\circ}\text{C}$                       |
| $T_{stg}$<br>$T_J$ | Storage temperature range<br>Maximum junction temperature |                                              | - 55 to + 150<br>150 | $^{\circ}\text{C}$<br>$^{\circ}\text{C}$ |

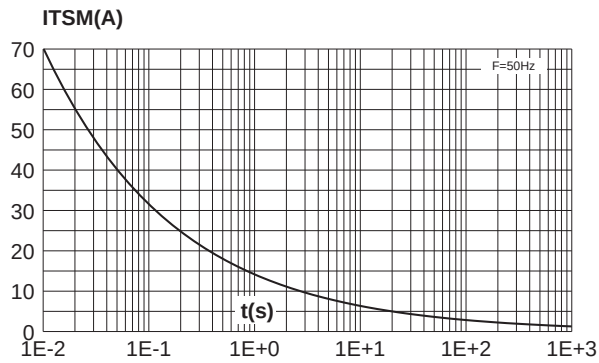
Note 1: in fail safe mode, the device acts as a short circuit.

**Repetitive peak pulse current**tr: rise time ( $\mu\text{s}$ )tp: pulse duration time ( $\mu\text{s}$ )ex: Pulse waveform 10/1000 $\mu\text{s}$ tr = 10 $\mu\text{s}$  tp = 1000 $\mu\text{s}$ **ELECTRICAL PARAMETERS** ( $T_{amb} = 25^{\circ}\text{C}$ )

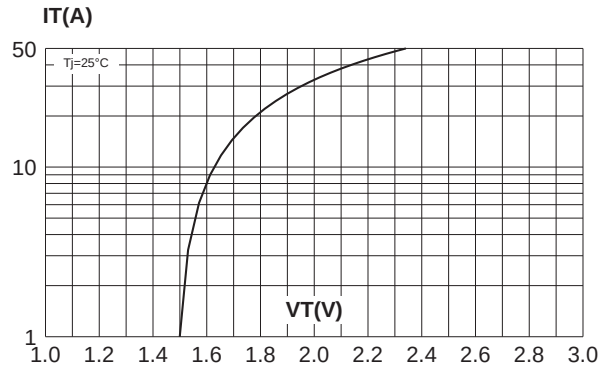
| Type         | $I_{RM} @ V_{RM}$<br>max. |     | $I_R @ V_R$<br>max.<br>Note 1 |     | Dynamic<br>$V_{BO} @ I_{BO}$<br>max. max<br>Note 2 |     | Static<br>$V_{BO} @ I_{BO}$<br>max. max<br>Note 3 |     | $I_H$<br>min.<br>Note 4 | C<br>typ.<br>Note 5 | C<br>typ.<br>Note 6 |
|--------------|---------------------------|-----|-------------------------------|-----|----------------------------------------------------|-----|---------------------------------------------------|-----|-------------------------|---------------------|---------------------|
|              | $\mu\text{A}$             | V   | $\mu\text{A}$                 | V   | V                                                  | mA  | V                                                 | mA  | mA                      | pF                  | pF                  |
| SMP100LC-8   | 2                         | 6   | 50                            | 8   | 25                                                 | 800 | 15                                                | 800 | 50 (typ)                | NA                  | 75                  |
| SMP100LC-25  |                           | 22  |                               | 25  | 40                                                 |     | 35                                                |     | 150                     | NA                  | 65                  |
| SMP100LC-35  |                           | 32  |                               | 35  | 55                                                 |     | 55                                                |     | 150                     | NA                  | 55                  |
| SMP100LC-65  |                           | 55  |                               | 65  | 85                                                 |     | 85                                                |     | 150                     | 45                  | 90                  |
| SMP100LC-90  |                           | 81  |                               | 90  | 120                                                |     | 125                                               |     | 150                     | 40                  | 80                  |
| SMP100LC-120 |                           | 108 |                               | 120 | 155                                                |     | 160                                               |     | 150                     | 35                  | 75                  |
| SMP100LC-140 |                           | 120 |                               | 140 | 185                                                |     | 190                                               |     | 150                     | 30                  | 65                  |
| SMP100LC-160 |                           | 144 |                               | 160 | 210                                                |     | 220                                               |     | 150                     | 30                  | 65                  |
| SMP100LC-200 |                           | 170 |                               | 200 | 265                                                |     | 275                                               |     | 150                     | 30                  | 60                  |
| SMP100LC-230 |                           | 200 |                               | 230 | 300                                                |     | 320                                               |     | 150                     | 30                  | 60                  |
| SMP100LC-270 |                           | 230 |                               | 262 | 350                                                |     | 370                                               |     | 150                     | 30                  | 60                  |

**Note 1:**  $I_R$  measured at  $V_R$  guarantee  $V_{BR} \min \geq V_R$ **Note 2:** See functional test circuit 1**Note 3:** See test circuit 2**Note 4:** See functional holding current test circuit 3**Note 5:**  $V_R = 50\text{V}$  bias,  $V_{RMS} = 1\text{V}$ ,  $F = 1\text{MHz}$ **Note 6:**  $V_R = 2\text{V}$  bias,  $V_{RMS} = 1\text{V}$ ,  $F = 1\text{MHz}$

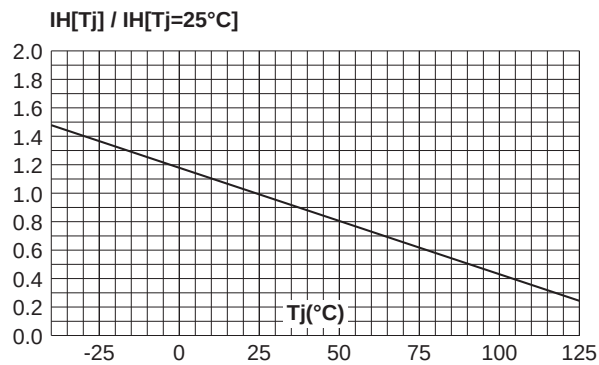
**Fig. 1:** Non repetitive surge peak on-state current versus overload duration ( $T_j$  initial = 25 °C).



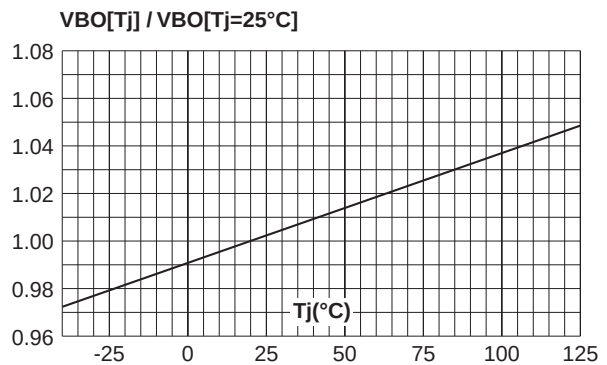
**Fig. 2:** On-state voltage versus on-state current (typical values)



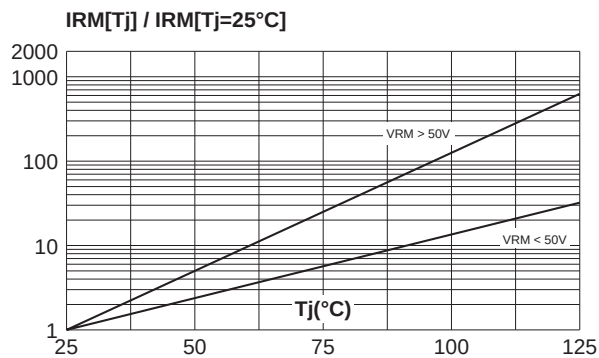
**Fig. 3:** Relative variation of holding current versus junction temperature.



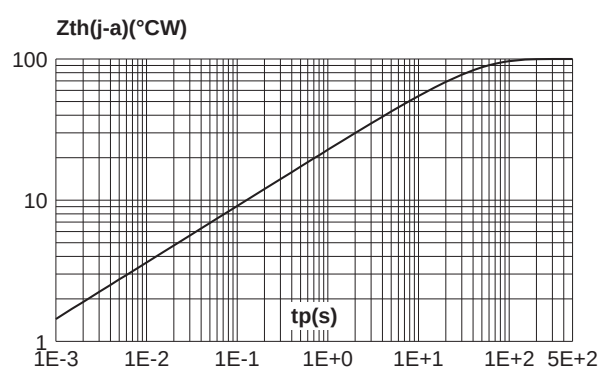
**Fig. 4:** Relative variation of breakover voltage versus junction temperature.



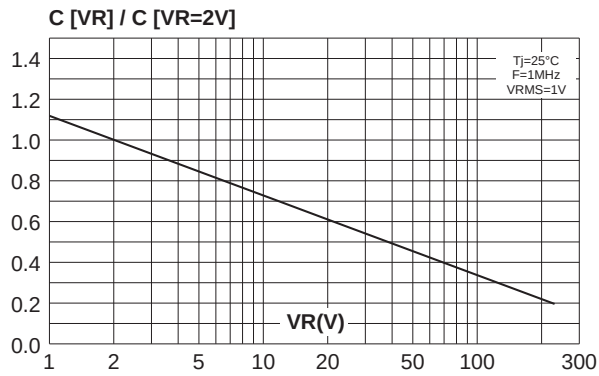
**Fig. 5:** Relative variation of leakage current versus junction temperature (typical values).



**Fig. 6:** Variation of thermal impedance junction to ambient versus pulse duration (Printed circuit board FR4, SCu=35 $\mu\text{m}$ , recommended pad layout).

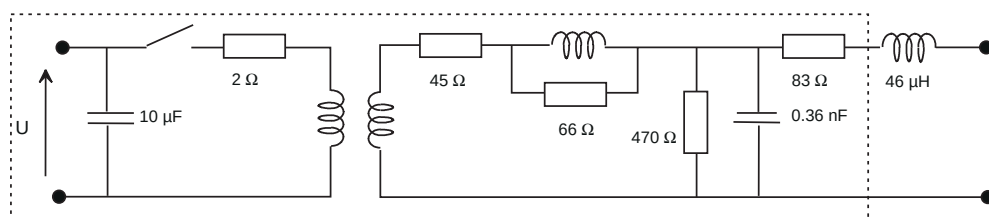


**Fig. 7:** Relative variation of junction capacitance versus reverse voltage applied (typical values).



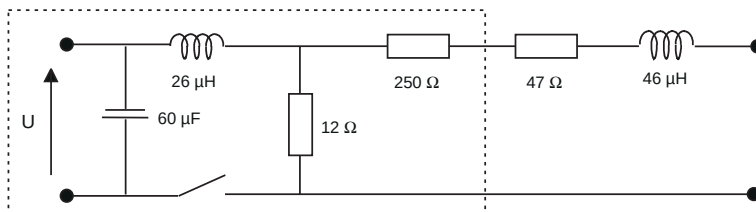
#### TEST CIRCUIT 1 FOR DYNAMIC $I_{BO}$ AND $V_{BO}$ PARAMETERS

**100 V /  $\mu\text{s}$ ,  $di/dt < 10 \text{ A} / \mu\text{s}$ ,  $I_{pp} = 100 \text{ A}$**

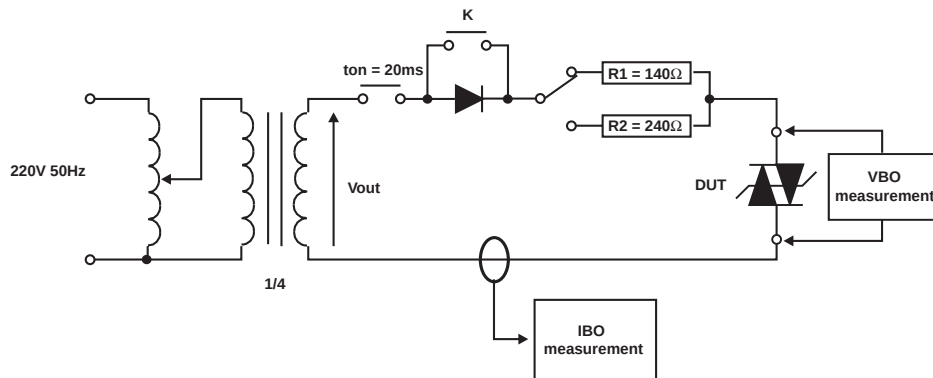


KeyTek 'System 2' generator with PN246I module

**1 kV /  $\mu\text{s}$ ,  $di/dt < 10 \text{ A} / \mu\text{s}$ ,  $I_{pp} = 10 \text{ A}$**



KeyTek 'System 2' generator with PN246I module

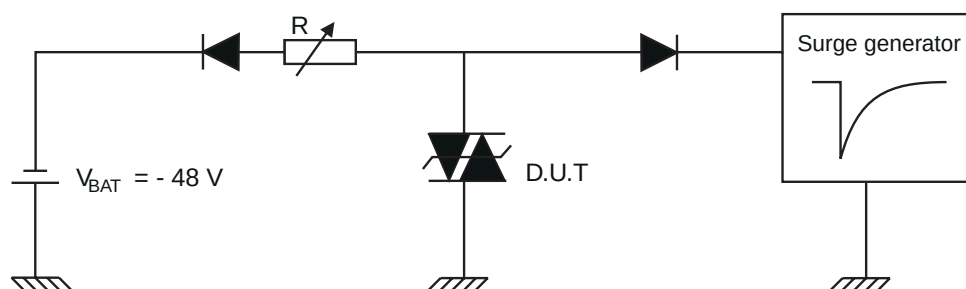
**TEST CIRCUIT 2 FOR  $I_{BO}$  and  $V_{BO}$  parameters :****TEST PROCEDURE :**

Pulse test duration ( $t_p = 20\text{ms}$ ):

- For Bidirectional devices = Switch K is closed
- For Unidirectional devices = Switch K is open.

$V_{OUT}$  Selection

- Device with  $V_{BO} < 200$  Volt
  - $V_{OUT} = 250 \text{ V}_{RMS}$ ,  $R_1 = 140 \Omega$ .
- Device with  $V_{BO} \geq 200$  Volt
  - $V_{OUT} = 480 \text{ V}_{RMS}$ ,  $R_2 = 240 \Omega$ .

**TEST CIRCUIT 3 FOR  $I_H$  PARAMETER**

This is a GO-NO GO test which allows to confirm the holding current ( $I_H$ ) level in a functional test circuit.

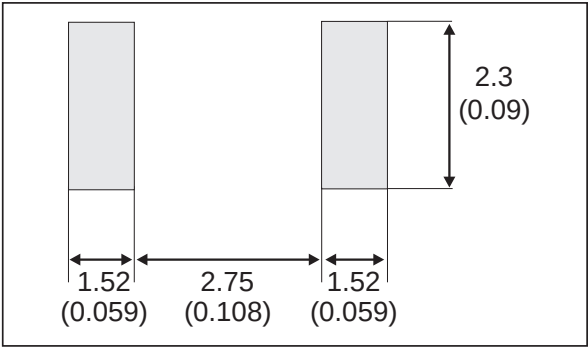
**TEST PROCEDURE :**

- Adjust the current level at the  $I_H$  value by short circuiting the D.U.T.
- Fire the D.U.T. with a surge current :  $I_{pp} = 10\text{A}$ ,  $10/1000 \mu\text{s}$ .
- The D.U.T. will come back to the off-state within 50 ms max.

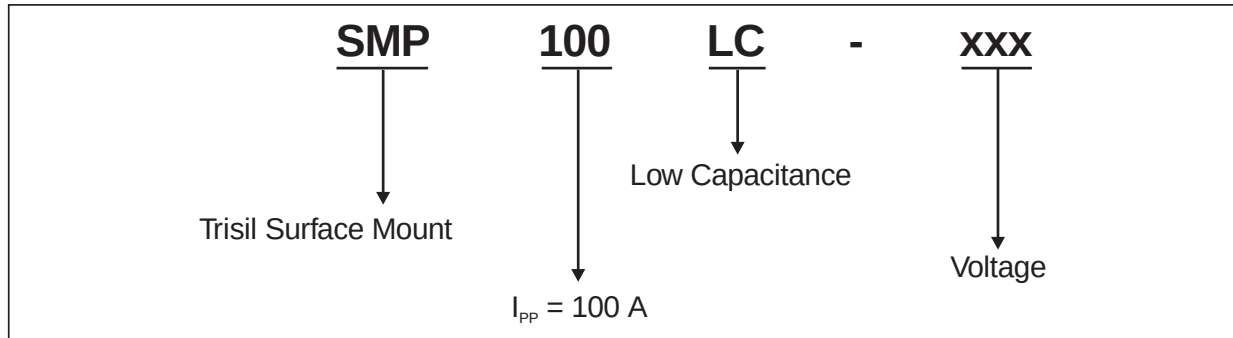
PACKAGE MECHANICAL DATA  
SMB (Plastic)

|      |             |      |        |       |
|------|-------------|------|--------|-------|
| REF. | DIMENSIONS  |      |        |       |
|      | Millimeters |      | Inches |       |
|      | Min.        | Max. | Min.   | Max.  |
| A1   | 1.90        | 2.45 | 0.075  | 0.096 |
| A2   | 0.05        | 0.20 | 0.002  | 0.008 |
| b    | 1.95        | 2.20 | 0.077  | 0.087 |
| c    | 0.15        | 0.41 | 0.006  | 0.016 |
| E    | 5.10        | 5.60 | 0.201  | 0.220 |
| E1   | 4.05        | 4.60 | 0.159  | 0.181 |
| D    | 3.30        | 3.95 | 0.130  | 0.156 |
| L    | 0.75        | 1.60 | 0.030  | 0.063 |

FOOT PRINT in millimeters (inches)



## ORDER CODE



| Ordering type | Marking | Package | Weight | Base qty | Delivery mode |
|---------------|---------|---------|--------|----------|---------------|
| SMP100LC-8    | PL8     | SMB     | 0.11g  | 2500     | Tape & Reel   |
| SMP100LC-25   | L25     |         |        |          |               |
| SMP100LC-35   | L35     |         |        |          |               |
| SMP100LC-65   | L06     |         |        |          |               |
| SMP100LC-90   | L09     |         |        |          |               |
| SMP100LC-120  | L12     |         |        |          |               |
| SMP100LC-140  | L14     |         |        |          |               |
| SMP100LC-160  | L16     |         |        |          |               |
| SMP100LC-200  | L20     |         |        |          |               |
| SMP100LC-230  | L23     |         |        |          |               |
| SMP100LC-270  | L27     |         |        |          |               |

Information furnished is believed to be accurate and reliable. However, STMicroelectronics assumes no responsibility for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of STMicroelectronics. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied.

STMicroelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of STMicroelectronics.

The ST logo is a registered trademark of STMicroelectronics

© 2002 STMicroelectronics - Printed in Italy - All rights reserved.

STMicroelectronics GROUP OF COMPANIES

Australia - Brazil - Canada - China - Finland - France - Germany  
Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Singapore  
Spain - Sweden - Switzerland - United Kingdom - United States.

<http://www.st.com>



This datasheet has been download from:

[www.datasheetcatalog.com](http://www.datasheetcatalog.com)

Datasheets for electronics components.