



# THE DATASHEET OF SMP80MC-140



## Trisil™ for telecom equipment protection

### Features

- Bidirectional crowbar protection
- Voltage: range from 120 V to 320 V
- Low  $V_{BO} / V_R$  ratio
- Micro capacitance equal to 12 pF @ 50 V
- Low leakage current:  $I_R = 2 \mu\text{A}$  max
- Holding current:  $I_H = 150 \text{ mA}$  min.
- Repetitive peak pulse current:  
 $I_{PP} = 80 \text{ A}$  (10/1000  $\mu\text{s}$ )

### Benefits

- Trisils are not subject to ageing and provide a fail safe mode in short circuit for better protection.
- Helps equipment meet main standards such as UL60950, IEC 950 / CSA C22.2 and UL1459.
- Epoxy meets UL94, V0.
- Package is JEDEC registered (DO-214AA).

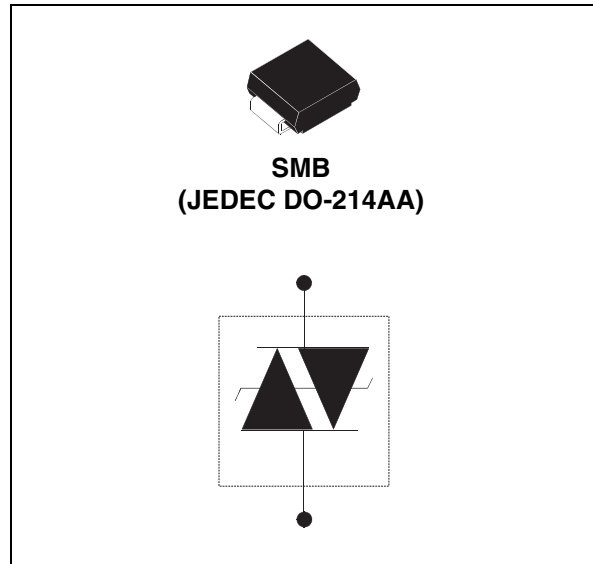
### Complies with the following standards

- GR-1089 Core
- ITU-T-K20/K21
- IEC 61000-4-5
- TIA/EIA IS-968
- UL497B recognized, UL file E136224

### Applications

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

- Terminals (phone, fax, modem...) and central office equipment



### Description

The SMP80MC is a series of micro capacitance transient surge arrestors designed for the protection of high debit rate communication equipment. Its micro capacitance avoids any distortion of the signal and is compatible with digital transmission like ADSL2 and ADSL2+.

**TM:** Trisil is a trademark of STMicroelectronics.

# 1 Characteristics

**Table 1. In compliance with the following standards**

| Standard                                      | Peak surge voltage (V) | Waveform voltage | Required peak current (A) | Current waveform | Minimum serial resistor to meet standard ( $\Omega$ ) |
|---|------------------------|------------------|---------------------------|------------------|---|
| <b>GR-1089 Core First level</b>               | 2500                   | 2/10 $\mu$ s     | 500                       | 2/10 $\mu$ s     | 5   |
|   | 1000                   | 10/1000 $\mu$ s  | 100                       | 10/1000 $\mu$ s  | 2.5   |
| <b>GR-1089 Core Second level</b>              | 5000                   | 2/10 $\mu$ s     | 500                       | 2/10 $\mu$ s     | 10  |
| <b>GR-1089 Core Intra-building</b>            | 1500                   | 2/10 $\mu$ s     | 100                       | 2/10 $\mu$ s     | 0   |
| <b>ITU-T-K20/K21</b>                          | 6000                   | 10/700 $\mu$ s   | 150                       | 5/310 $\mu$ s    | 10  |
|   | 1500                   |                  | 37.5                      |                  | 0   |
| <b>ITU-T-K20 (IEC61000-4-2)</b>               | 8000                   | 1/60 ns          | ESD contact discharge     |                  | 0   |
|   | 15000                  |                  | ESD air discharge         |                  | 0   |
| <b>IEC61000-4-5</b>                           | 4000                   | 10/700 $\mu$ s   | 100                       | 5/310 $\mu$ s    | 0   |
|   | 4000                   | 1.2/50 $\mu$ s   | 100                       | 8/20 $\mu$ s     | 0   |
| <b>TIA/EIA IS-968, lightning surge type A</b> | 1500                   | 10/160 $\mu$ s   | 200                       | 10/160 $\mu$ s   | 2.5   |
|   | 800                    | 10/560 $\mu$ s   | 100                       | 10/560 $\mu$ s   | 0   |
| <b>TIA/EIA IS-968, lightning surge type B</b> | 1000                   | 9/720 $\mu$ s    | 25                        | 5/320 $\mu$ s    | 0   |

**Table 2. Absolute ratings ( $T_{amb} = 25\text{ °C}$ )**

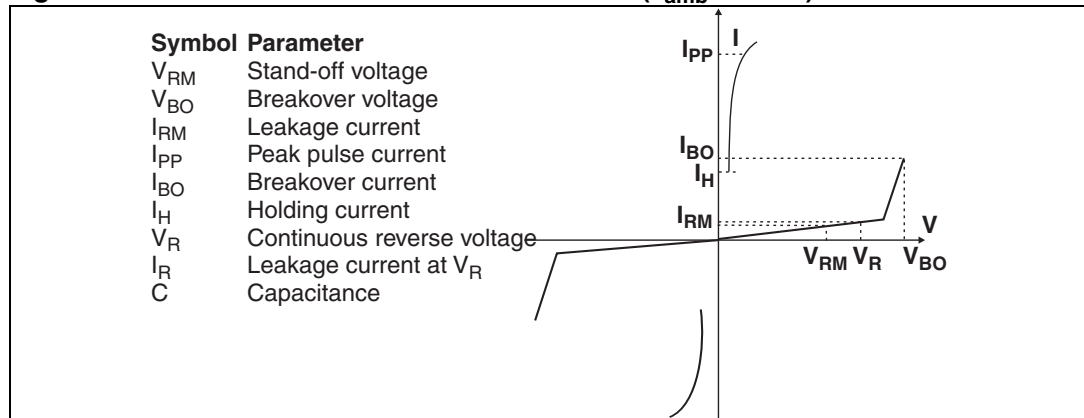
| Symbol    | Parameter   | Conditions            | Value      | Unit               |
|-----------|---|-----------------------|------------|--------------------|
| $I_{PP}$  | Repetitive peak pulse current (see <a href="#">Figure 2</a> ) | 10/1000 $\mu\text{s}$ | 80         | A                  |
|           |   | 8/20 $\mu\text{s}$    | 200        |                    |
|           |   | 10/560 $\mu\text{s}$  | 100        |                    |
|           |   | 5/310 $\mu\text{s}$   | 120        |                    |
|           |   | 10/160 $\mu\text{s}$  | 150        |                    |
|           |   | 1/20 $\mu\text{s}$    | 200        |                    |
|           |   | 2/10 $\mu\text{s}$    | 250        |                    |
| $I_{FS}$  | Fail-safe mode: maximum current <sup>(1)</sup>                | 8/20 $\mu\text{s}$    | 5          | kA                 |
| $I_{TSM}$ | Non repetitive surge peak on-state current (sinusoidal)       | t = 0.2 s             | 14         | A                  |
|           |   | t = 1 s               | 8          |                    |
|           |   | t = 2 s               | 6.5        |                    |
|           |   | t = 15 mn             | 2          |                    |
| $I^2t$    | $I^2t$ value for fusing                                       | t = 16.6 ms           | 7.5        | $A^2s$             |
|           |   | t = 20 ms             | 7.8        |                    |
| $T_{stg}$ | Storage temperature range                                     |                       | -55 to 150 | $^{\circ}\text{C}$ |
| $T_j$     | Operating junction temperature range                          |                       | -40 to 150 |                    |
| $T_L$     | Maximum lead temperature for soldering during 10 s.           |                       | 260        |                    |

1. In fail safe mode the device acts as a short circuit.

**Table 3. 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    | $^{\circ}\text{C/W}$ |

**Figure 1. Electrical characteristics - definitions ( $T_{amb} = 25\text{ °C}$ )**



**Table 4. Electrical characteristics - values ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ )**

| Types       | $I_{RM} @ V_{RM}$ |     | $I_R @ V_R$   |     | Dynamic $V_{BO}^{(1)}$ | Static $V_{BO} @ I_{BO}^{(2)}$ |      | $I_H^{(3)}$ | $C^{(4)}$ | $C^{(5)}$ |
|-------------|-------------------|-----|---------------|-----|------------------------|--------------------------------|------|-------------|-----------|-----------|
|             | max.              |     | max.          |     |                        | max.                           | max. |             |           |           |
|             | $\mu\text{A}$     | V   | $\mu\text{A}$ | V   | V                      | V                              | mA   | min. mA     | typ. pF   | typ. pF   |
| SMP80MC-120 | 2                 | 108 | 5             | 120 | 155                    | 155                            | 800  | 150         | 12        | 25        |
| SMP80MC-140 |                   | 126 |               | 140 | 180                    | 180                            |      |             |           |           |
| SMP80MC-160 |                   | 144 |               | 160 | 205                    | 205                            |      |             |           |           |
| SMP80MC-200 |                   | 180 |               | 200 | 255                    | 255                            |      |             |           |           |
| SMP80MC-230 |                   | 207 |               | 230 | 295                    | 295                            |      |             |           |           |
| SMP80MC-270 |                   | 243 |               | 270 | 345                    | 345                            |      |             |           |           |
| SMP80MC-320 |                   | 290 |               | 320 | 400                    | 400                            |      |             |           |           |

1. See [Figure 10: Test circuit 1 for dynamic  \$I\_{BO}\$  and  \$V\_{BO}\$  parameters](#)
2. See [Figure 11: Test circuit 2 for  \$I\_{BO}\$  and  \$V\_{BO}\$  parameters](#)
3. See [Figure 12: Test circuit 3 for dynamic  \$I\_H\$  parameter](#)
4.  $V_R = 50\text{ V}$  bias,  $V_{RMS} = 1\text{ V}$ ,  $F = 1\text{ MHz}$
5.  $V_R = 2\text{ V}$  bias,  $V_{RMS} = 1\text{ V}$ ,  $F = 1\text{ MHz}$

Figure 2. Pulse waveform

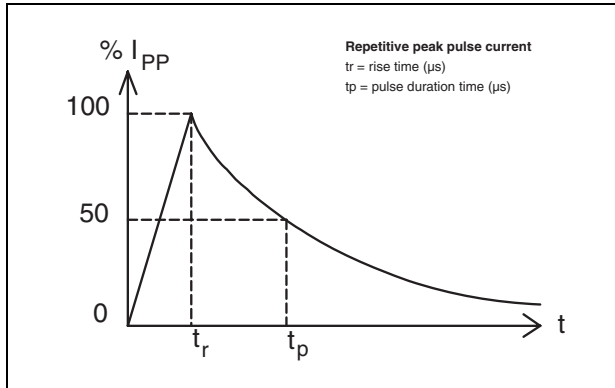


Figure 3. Non repetitive surge peak on-state current versus overload duration

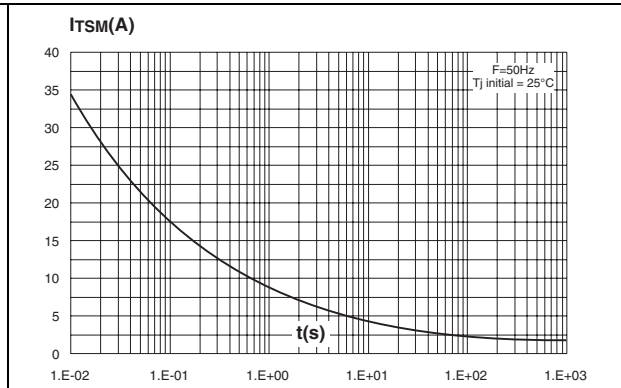


Figure 4. On-state voltage versus on-state current (typical values)

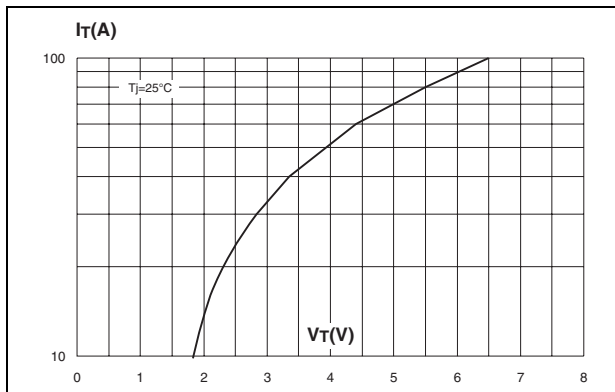


Figure 5. Relative variation of holding current versus junction temperature

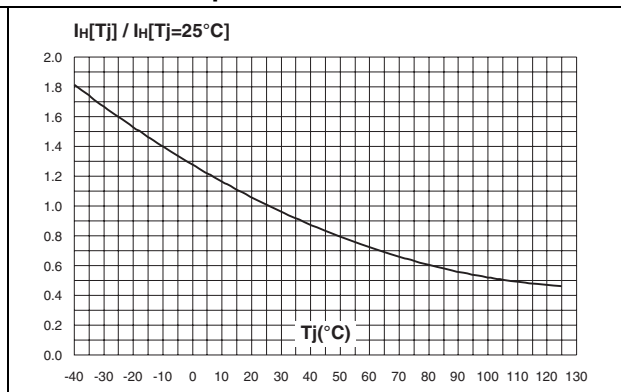


Figure 6. Relative variation of breakover voltage versus junction temperature

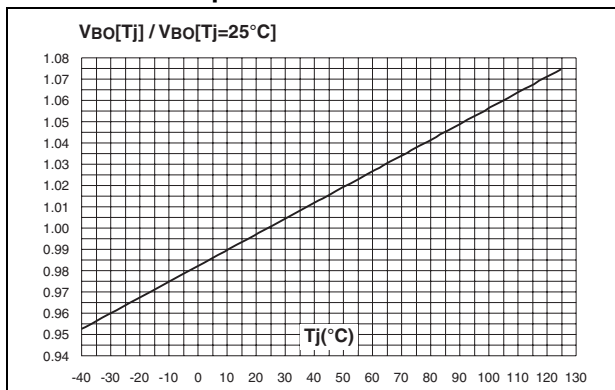
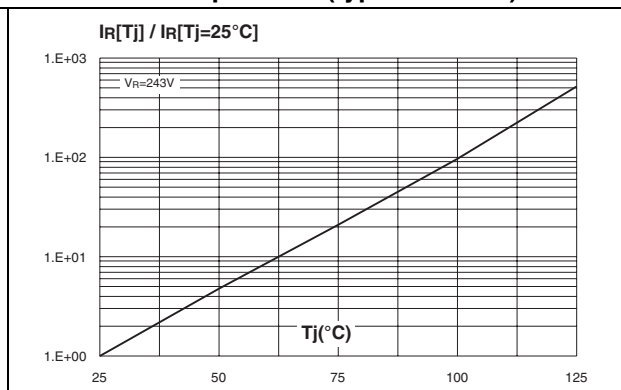
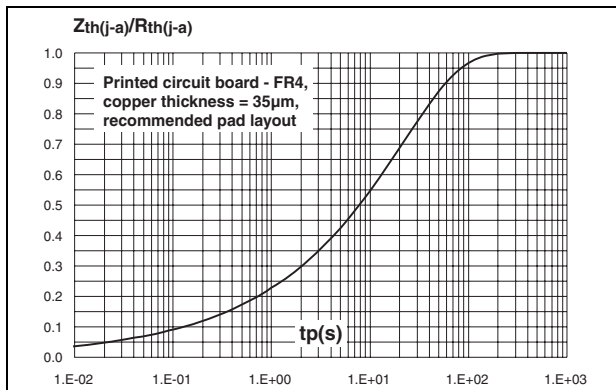


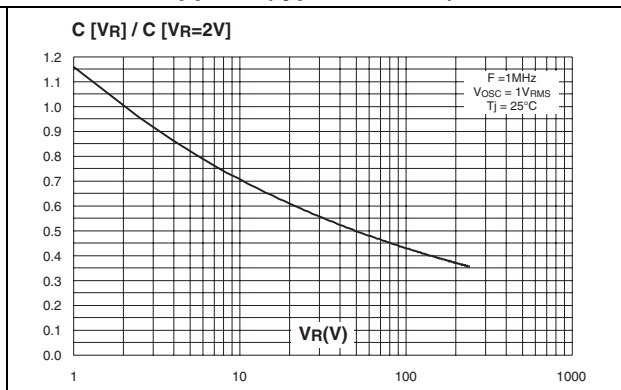
Figure 7. Relative variation of leakage current versus junction temperature (typical values)



**Figure 8. Variation of thermal impedance junction to ambient versus pulse duration**



**Figure 9. Relative variation of junction capacitance versus reverse voltage applied (typical values)**



**Figure 10. Test circuit 1 for dynamic  $I_{BO}$  and  $V_{BO}$  parameters**

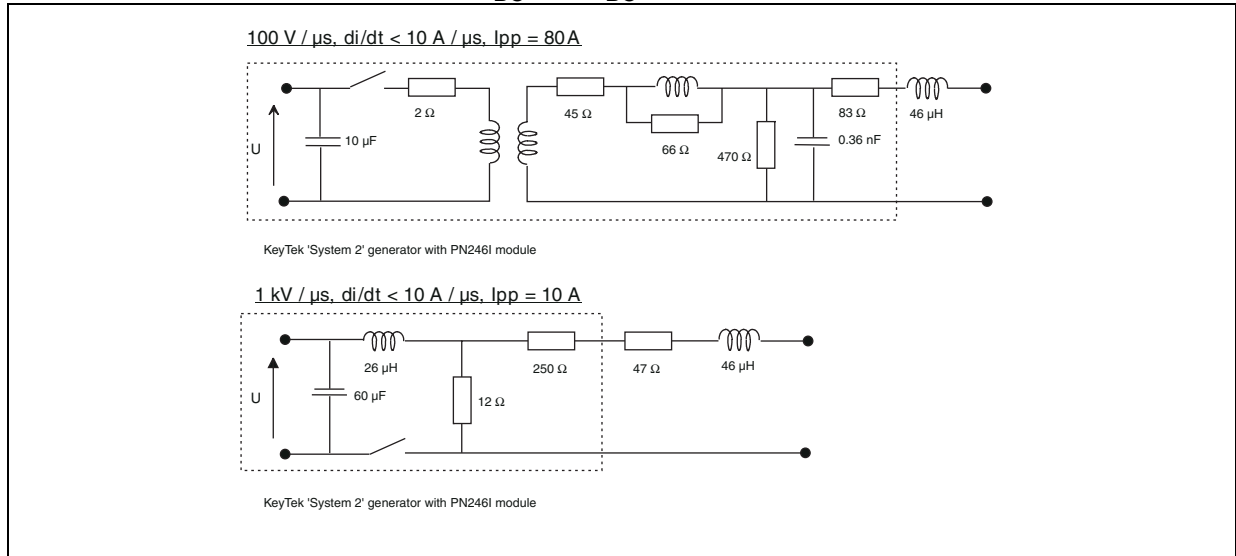


Figure 11. Test circuit 2 for  $I_{BO}$  and  $V_{BO}$  parameters

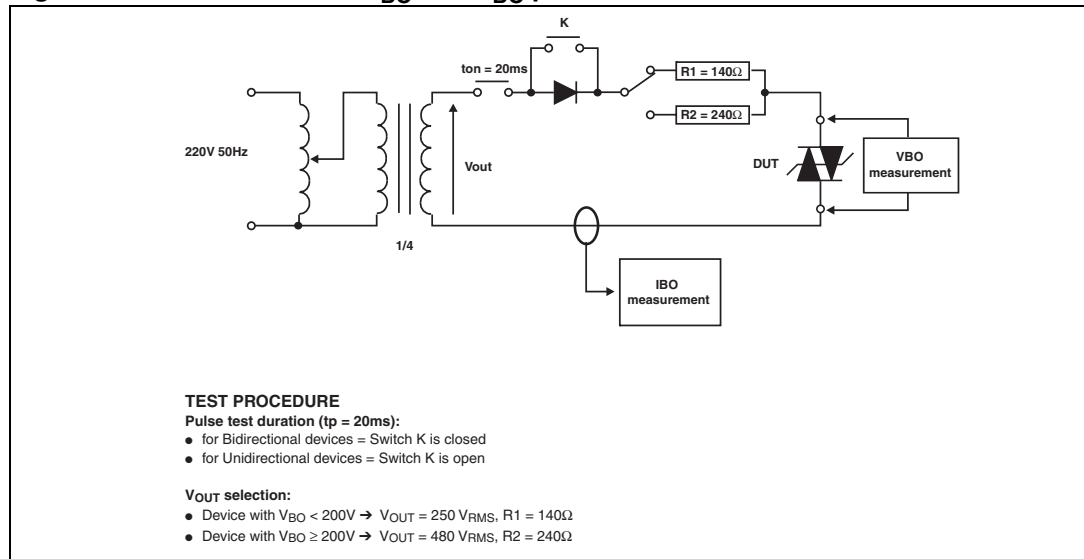
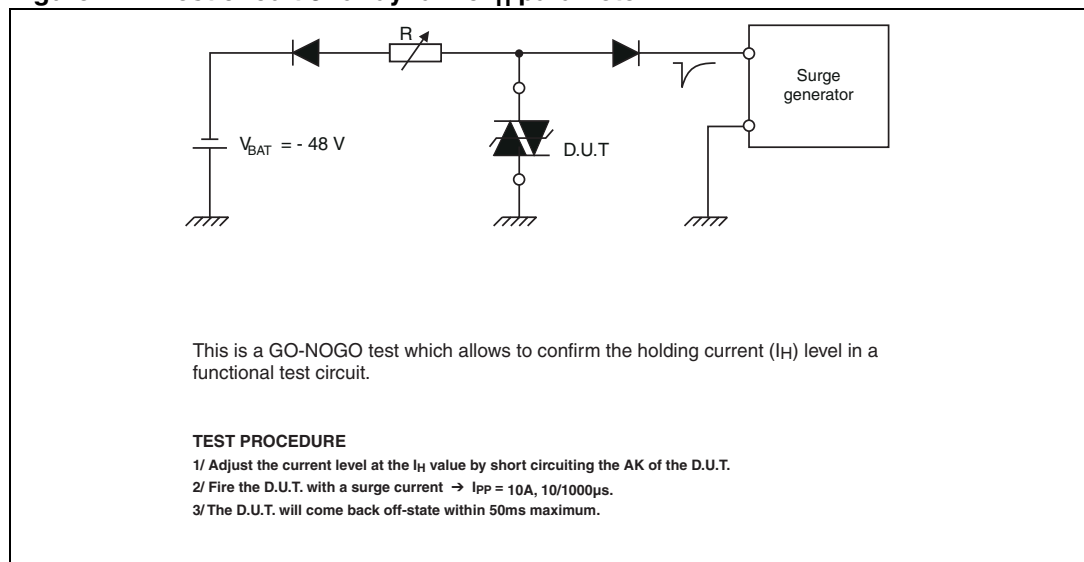
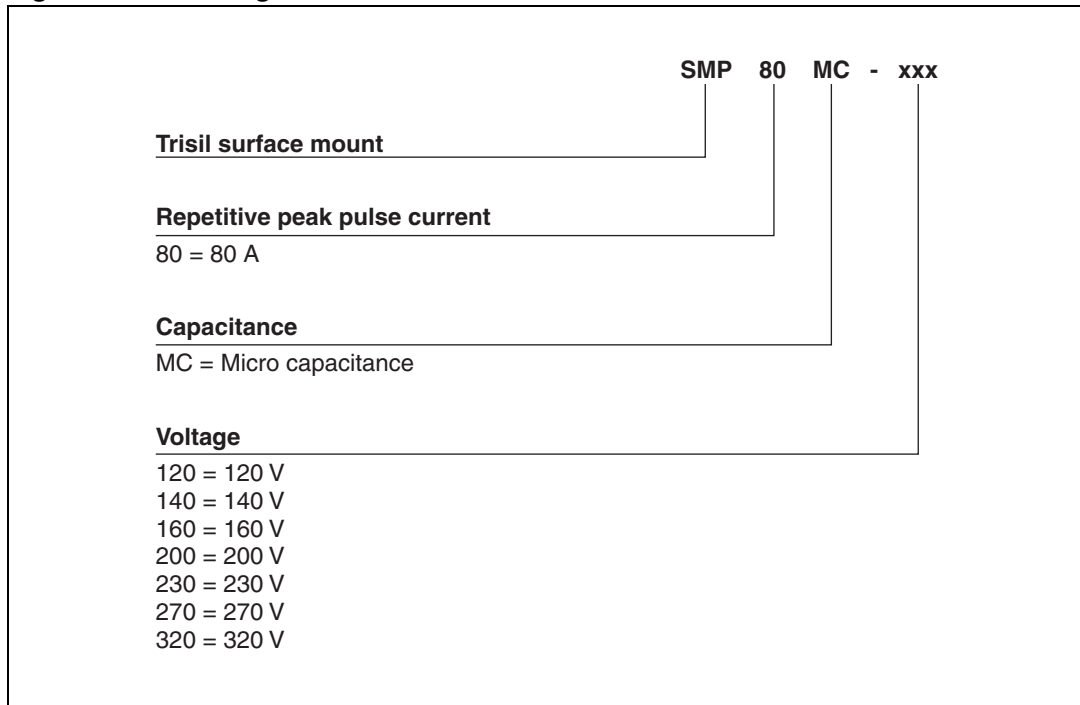


Figure 12. Test circuit 3 for dynamic  $I_H$  parameter



## 2 Ordering Information Scheme

Figure 13. Ordering information scheme



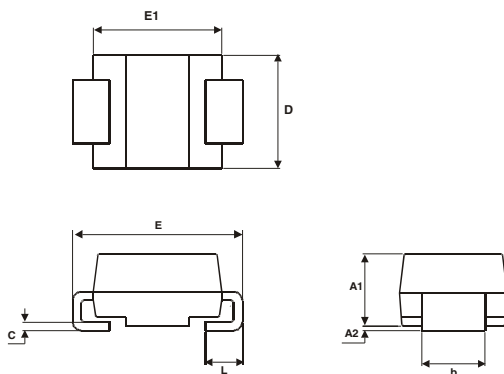
### 3 Package information

- Epoxy meets UL94, V0
- Lead-free package

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK® is an ST trademark.

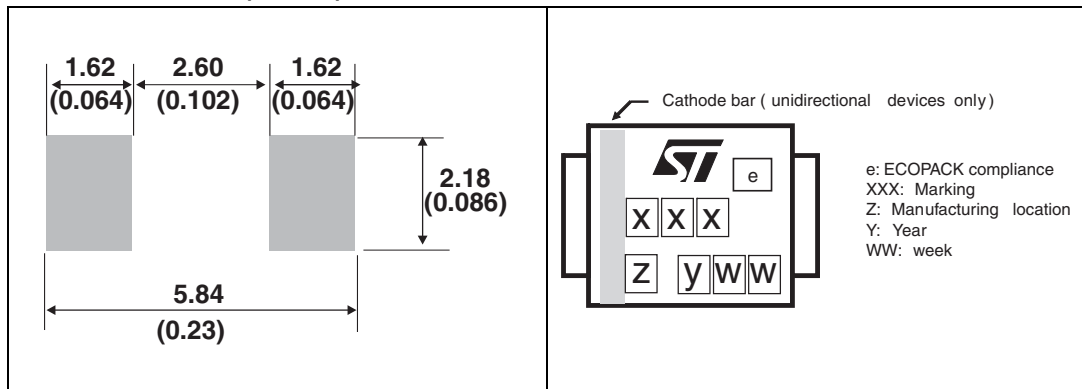
**Table 5. SMB dimensions**

| 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        | 0.40 | 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        | 1.50 | 0.030  | 0.059 |



**Figure 14. Footprint dimensions in mm (inches)**

**Figure 15. Marking layout<sup>(1)</sup>**



1. Marking layout can vary according to assembly location.

## 4 Ordering information

Table 6. Ordering information

| Part Number | Marking | Package | Weight | Base qty | Delivery mode |
|-------------|---------|---------|--------|----------|---------------|
| SMP80MC-120 | TP12    | SMB     | 98 mg  | 2500     | Tape and reel |
| SMP80MC-140 | TP14    |         |        |          |               |
| SMP80MC-160 | TP16    |         |        |          |               |
| SMP80MC-200 | TP20    |         |        |          |               |
| SMP80MC-230 | TP23    |         |        |          |               |
| SMP80MC-270 | TP27    |         |        |          |               |
| SMP80MC-320 | TP32    |         |        |          |               |

## 5 Revision history

Table 7. Document revision history

| Date           | Revision | Changes  |
|----------------|----------|--|
| September-2001 | 1        | First issue.   |
| 11-May-2005    | 2        | New types introduction.  |
| 20-Jun-2005    | 3        | Qualification of new types   |
| 18-Jan-2007    | 4        | Added product SMP80MC-320  |
| 09-Feb-2012    | 5        | Added UL statement in <i>Complies with the following standards</i> |

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