

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 :
- $I_{PP} = 80 \text{ A (10/1000 } \mu\text{s)}$

Main applications

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

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

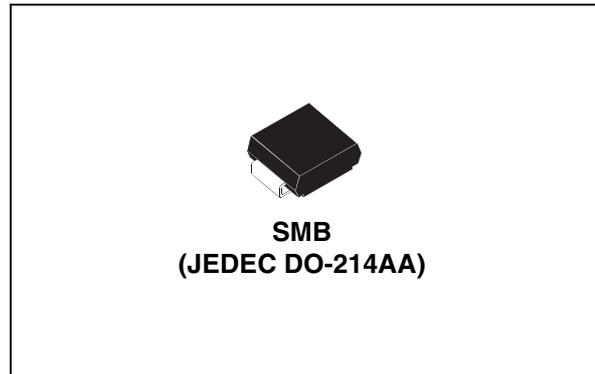
Description

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

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 comply with the following standards GR-1089 Core, ITU-T-K20/K21, VDE0433, VDE0878, IEC61000-4-5 and FCC part 68.

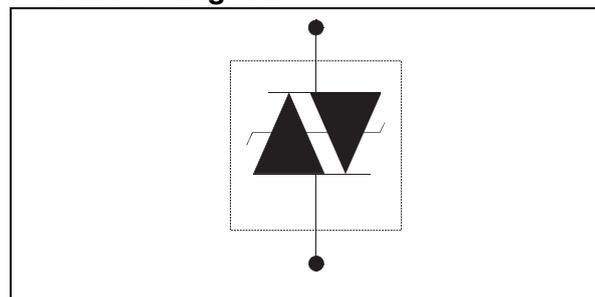
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Order codes

| Part Number | Marking |
|-------------|---------|
| SMP80MC-120 | TP12 |
| SMP80MC-140 | TP14 |
| SMP80MC-160 | TP16 |
| SMP80MC-200 | TP20 |
| SMP80MC-230 | TP23 |
| SMP80MC-270 | TP27 |
| SMP80MC-320 | TP32 |

Schematic diagram



1 Characteristics

Table 1. Complies with the following standards

| STANDARD | Peak Surge Voltage (V) | Waveform Voltage | Required peak current (A) | Current waveform | Minimum serial resistor to meet standard (Ω) |
|-------------------------------------|------------------------|------------------|---------------------------|------------------|---|
| GR-1089 Core First level | 2500 | 2/10 μ s | 500 | 2/10 μ s | 5 |
| | 1000 | 10/1000 μ s | 100 | 10/1000 μ s | 2.5 |
| GR-1089 Core Second level | 5000 | 2/10 μ s | 500 | 2/10 μ s | 10 |
| GR-1089 Core Intra-building | 1500 | 2/10 μ s | 100 | 2/10 μ s | 0 |
| ITU-T-K20/K21 | 6000 | 10/700 μ s | 150 | 5/310 μ s | 10 |
| | 1500 | | 37.5 | | 0 |
| ITU-T-K20 (IEC61000-4-2) | 8000 | 1/60 ns | ESD contact discharge | | 0 |
| | 15000 | | ESD air discharge | | 0 |
| VDE0433 | 4000 | 10/700 μ s | 100 | 5/310 μ s | 0 |
| | 2000 | | 50 | | 0 |
| VDE0878 | 4000 | 1.2/50 μ s | 100 | 1/20 μ s | 0 |
| | 2000 | | 50 | | 0 |
| IEC61000-4-5 | 4000 | 10/700 μ s | 100 | 5/310 μ s | 0 |
| | 4000 | 1.2/50 μ s | 100 | 8/20 μ s | 0 |
| FCC Part 68, lightning surge type A | 1500 | 10/160 μ s | 200 | 10/160 μ s | 2.5 |
| | 800 | 10/560 μ s | 100 | 10/560 μ s | 0 |
| FCC Part 68, lightning surge type B | 1000 | 9/720 μ s | 25 | 5/320 μ s | 0 |

Table 2. Absolute ratings ($T_{amb} = 25^\circ C$)

| Symbol | Parameter | Conditions | Value | Unit |
|-----------|---|-----------------|------------|------------|
| I_{PP} | Repetitive peak pulse current (see Figure 1) | 10/1000 μ s | 80 | A |
| | | 8/20 μ s | 200 | |
| | | 10/560 μ s | 100 | |
| | | 5/310 μ s | 120 | |
| | | 10/160 μ s | 150 | |
| | | 1/20 μ s | 200 | |
| | | 2/10 μ s | 250 | |
| I_{FS} | Fail-safe mode : maximum current ⁽¹⁾ | 8/20 μ 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 | $^\circ C$ |
| T_j | Maximum junction temperature | | 150 | $^\circ C$ |
| T_L | Maximum lead temperature for soldering during 10 s. | | 260 | $^\circ C$ |

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 | ° C/W |
| $R_{th(j-l)}$ | Junction to leads | 20 | ° C/W |

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

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

| Types | $I_{RM} @ V_{RM}$ | | $I_R @ V_R^{(1)}$ | | Dynamic $V_{BO}^{(2)}$ max. V | Static $V_{BO} @ I_{BO}^{(3)}$ | | $I_H^{(4)}$ min. mA | C ⁽⁵⁾ typ. pF | C ⁽⁶⁾ typ. pF |
|-------------|-------------------|-----|-------------------|-----|-------------------------------------|--------------------------------|------|---------------------------|--------------------------------|--------------------------------|
| | max. | | max. | | | max. | max. | | | |
| | μA | V | μA | V | | | | | | |
| 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. I_R measured at V_R guarantee $V_{BR} \min \geq V_R$
2. See [Figure 9](#) functional test circuit 1
3. See [Figure 10](#) test circuit 2
4. See [Figure 11](#) functional holding current test circuit 3
5. $V_R = 50 V$ bias, $V_{RMS} = 1 V$, $F = 1 MHz$
6. $V_R = 2 V$ bias, $V_{RMS} = 1 V$, $F = 1 MHz$

Figure 1. Pulse waveform

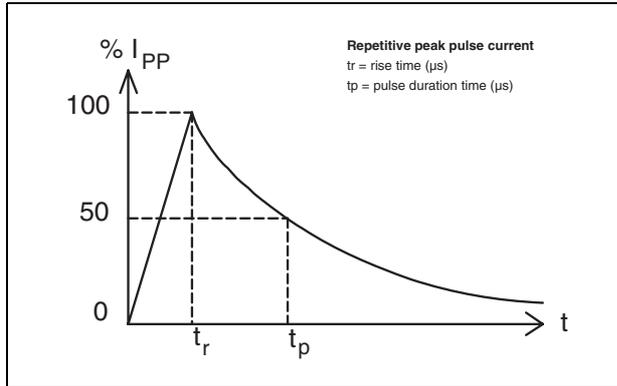


Figure 2. Non repetitive surge peak on-state current versus overload duration

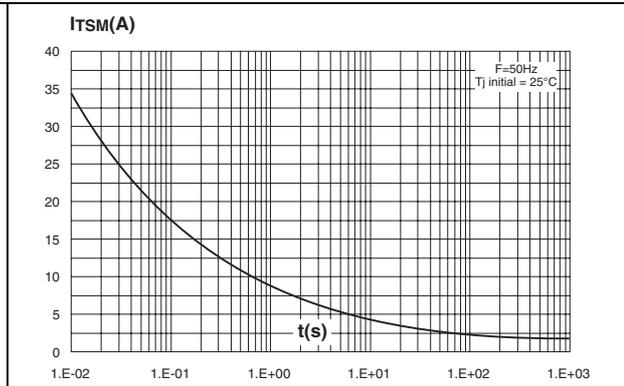


Figure 3. On-state voltage versus on-state current (typical values)

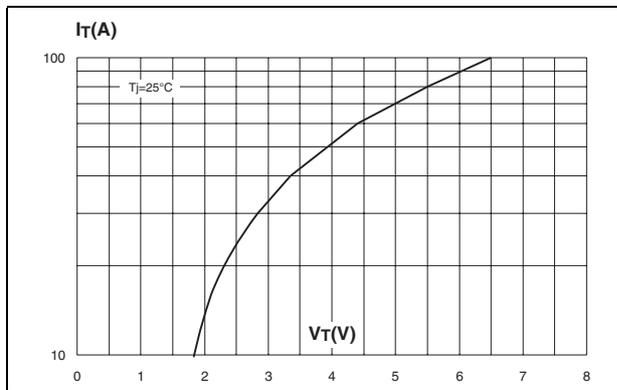


Figure 4. Relative variation of holding current versus junction temperature

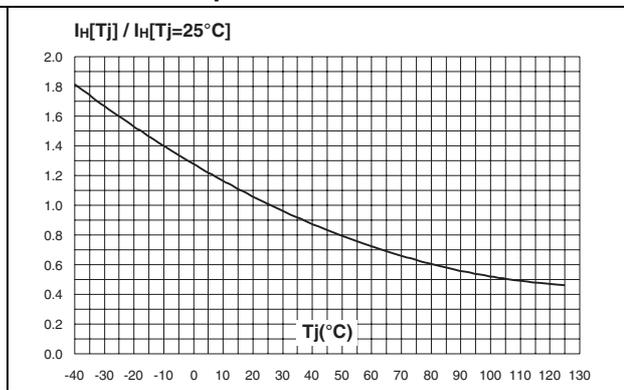


Figure 5. Relative variation of breakover voltage versus junction temperature

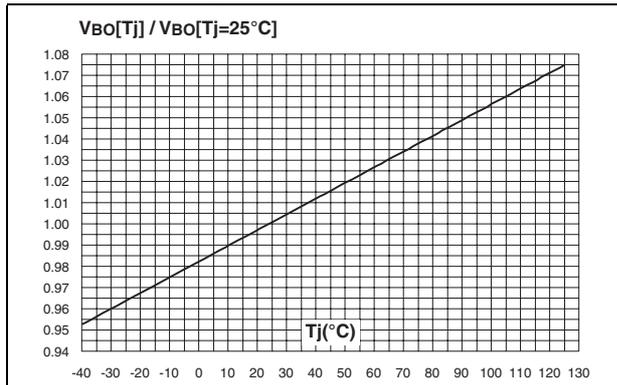


Figure 6. Relative variation of leakage current versus junction temperature (typical values)

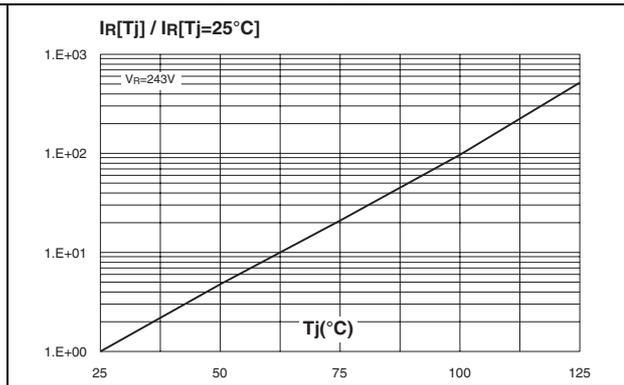


Figure 7. Variation of thermal impedance junction to ambient versus pulse duration (Printed circuit board FR4, SCu=35µm, recommended pad layout)

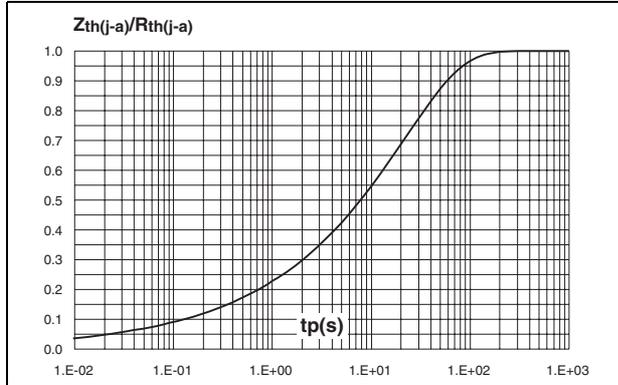


Figure 8. Relative variation of junction capacitance versus reverse voltage applied (typical values)

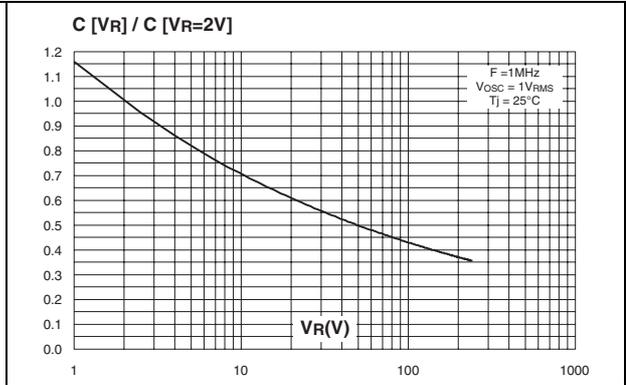


Figure 9. Test circuit 1 for dynamic IBO and VBO parameters

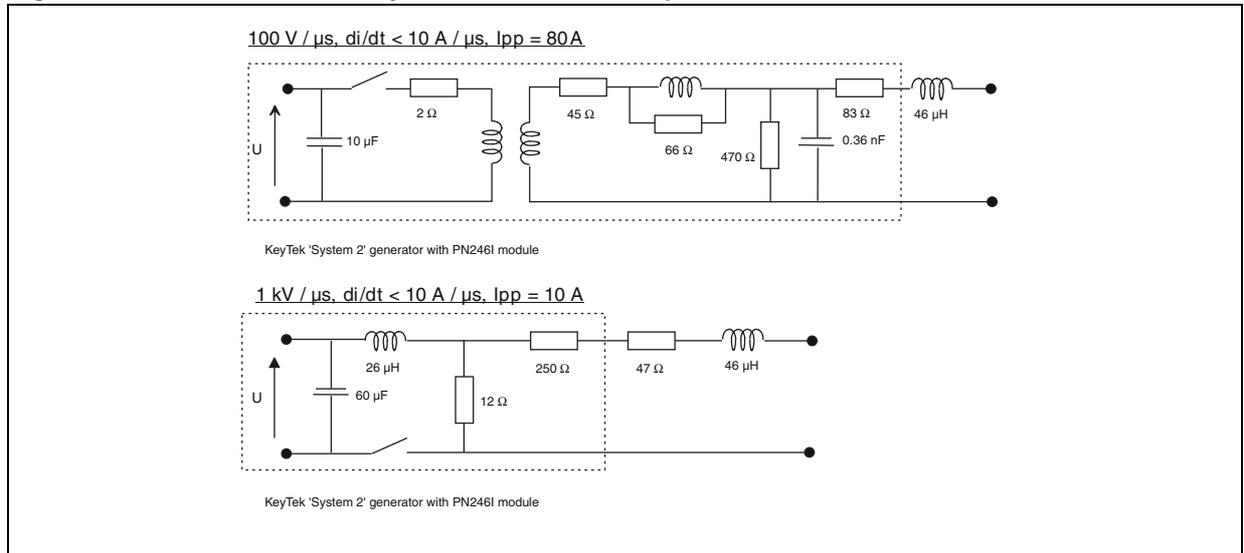


Figure 10. Test circuit 2 for IBO and VBO parameters

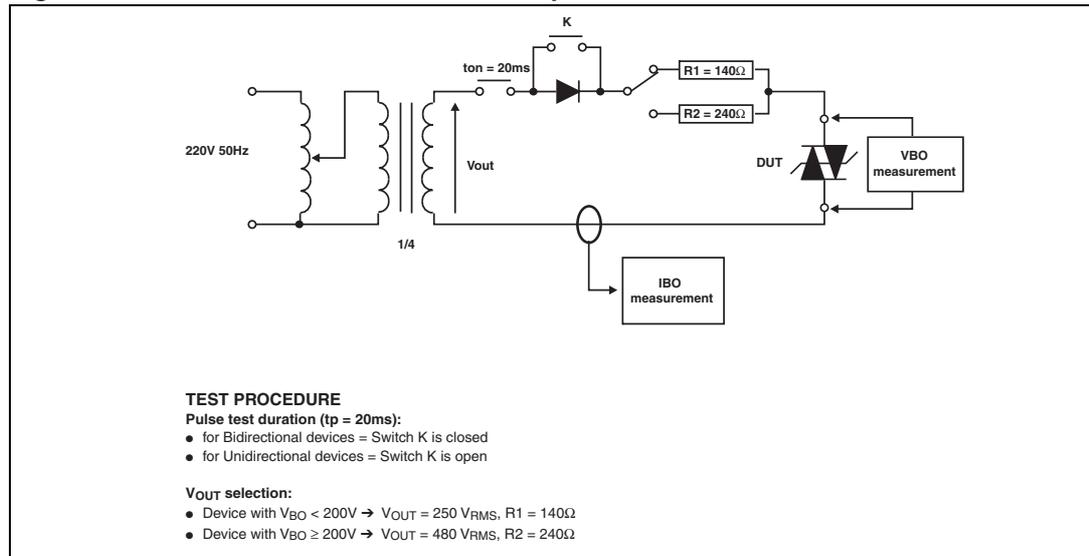
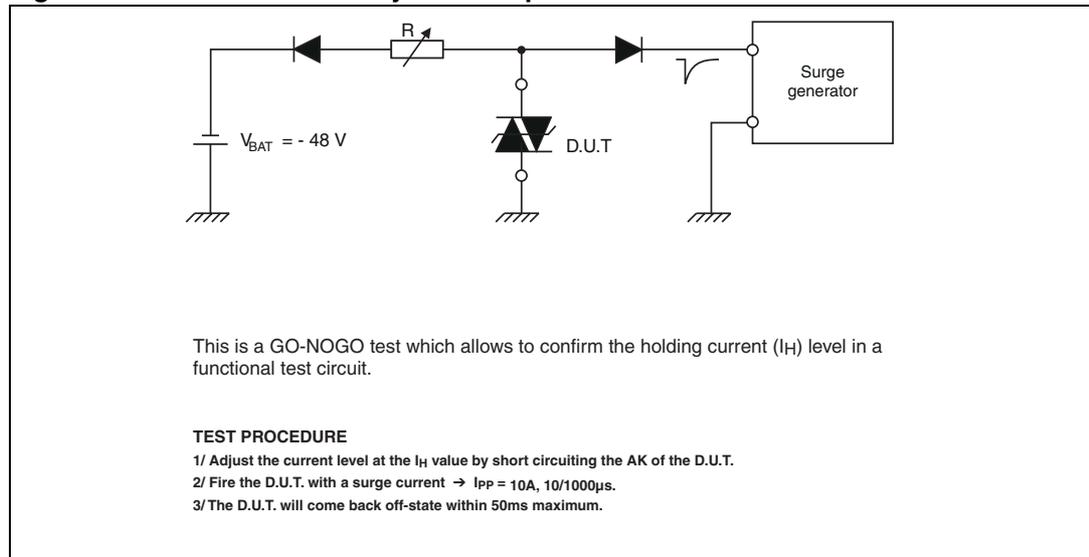
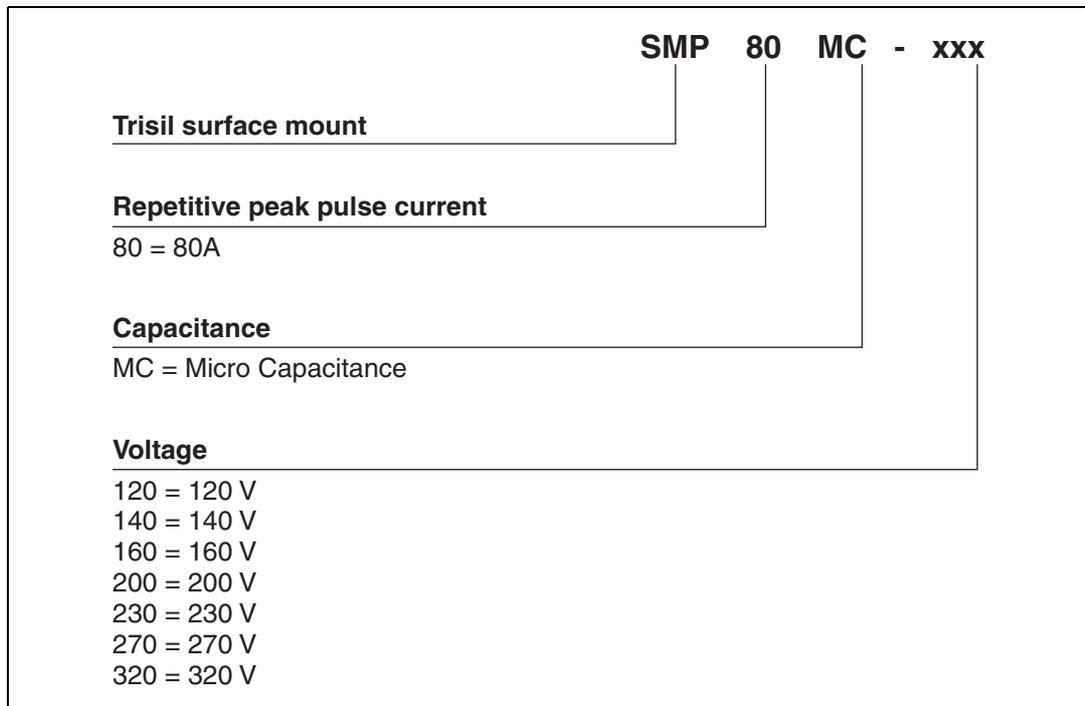


Figure 11. Test circuit 3 for dynamic IH parameter



2 Ordering Information Scheme



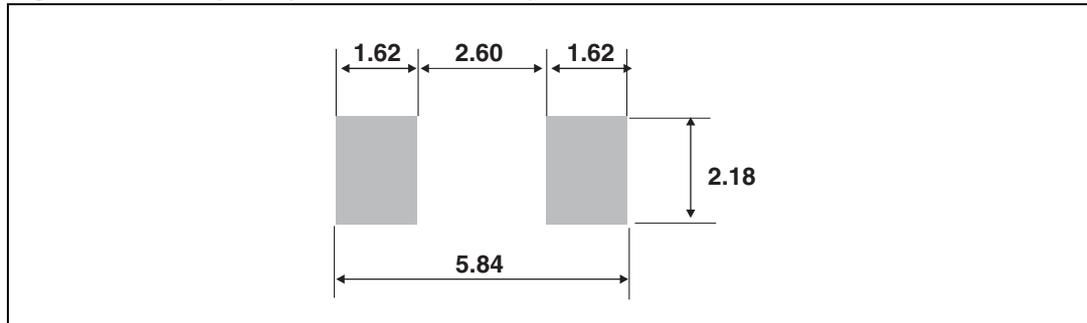
3 Package information

- Epoxy meets UL94, V0

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 12. Footprint (dimensions in mm)



In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com.

4 Ordering information

| Part Number | Marking | Package | Weight | Base qty | Delivery mode |
|-------------|---------|---------|--------|----------|---------------|
| SMP80MC-120 | TP12 | SMB | 0.11 g | 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

| Date | Revision | Description of 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 | Reformatted to current standards. Added product SMP80MC-320 |

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