

## 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

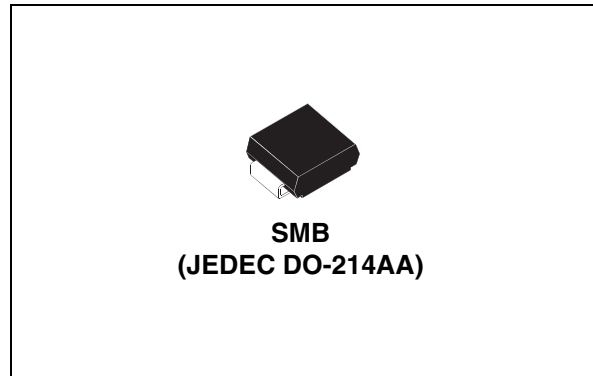
### Description

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.

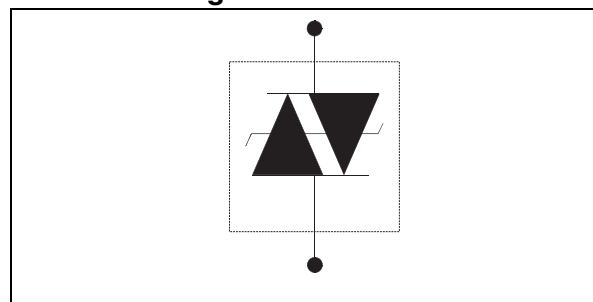
**TM:** TRISIL is a trademark of STMicroelectronics.



### 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 ( $\Omega$ )
GR-1089 Core First level	2500	2/10 $\mu$ s	500	2/10 $\mu$ s	5
	1000	10/1000 $\mu$ s	100	10/1000 $\mu$ s	2.5
GR-1089 Core Second level	5000	2/10 $\mu$ s	500	2/10 $\mu$ s	10
GR-1089 Core Intra-building	1500	2/10 $\mu$ s	100	2/10 $\mu$ s	0
ITU-T-K20/K21	6000	10/700 $\mu$ s	150	5/310 $\mu$ 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 $\mu$ s	100	5/310 $\mu$ s	0
	2000		50		0
VDE0878	4000	1.2/50 $\mu$ s	100	1/20 $\mu$ s	0
	2000		50		0
IEC61000-4-5	4000	10/700 $\mu$ s	100	5/310 $\mu$ s	0
	4000	1.2/50 $\mu$ s	100	8/20 $\mu$ s	0
FCC Part 68, lightning surge type A	1500	10/160 $\mu$ s	200	10/160 $\mu$ s	2.5
	800	10/560 $\mu$ s	100	10/560 $\mu$ s	0
FCC Part 68, lightning surge type B	1000	9/720 $\mu$ s	25	5/320 $\mu$ s	0

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

Symbol	Parameter	Conditions	Value	Unit
$I_{PP}$	Repetitive peak pulse current (see <a href="#">Figure 1</a> )	10/1000 $\mu$ s	80	A
		8/20 $\mu$ s	200	
		10/560 $\mu$ s	100	
		5/310 $\mu$ s	120	
		10/160 $\mu$ s	150	
		1/20 $\mu$ s	200	
		2/10 $\mu$ s	250	
$I_{FS}$	Fail-safe mode : maximum current <sup>(1)</sup>	8/20 $\mu$ 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 <sup>(5)</sup> typ. pF	C <sup>(6)</sup> typ. pF
	max.		max.			max. V	max. mA			
	$\mu A$	V	$\mu A$	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

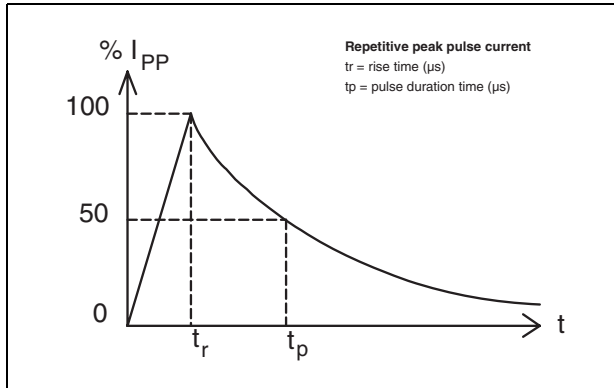


Figure 2. Non repetitive surge peak on-state current versus overload duration

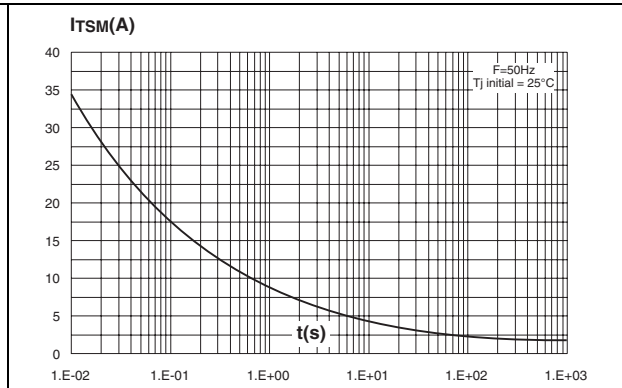


Figure 3. On-state voltage versus on-state current (typical values)

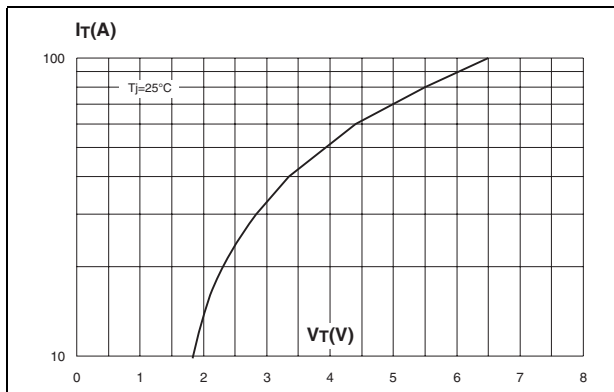


Figure 4. Relative variation of holding current versus junction temperature

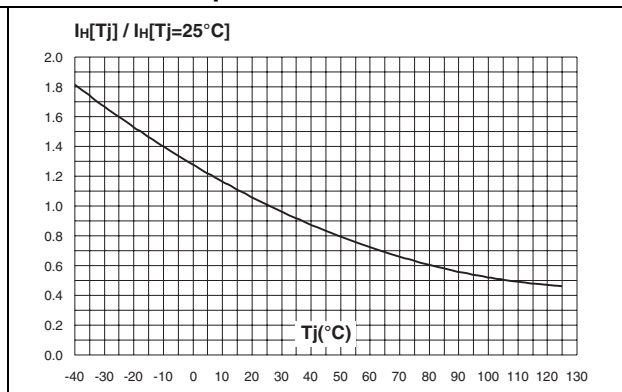


Figure 5. Relative variation of breakover voltage versus junction temperature

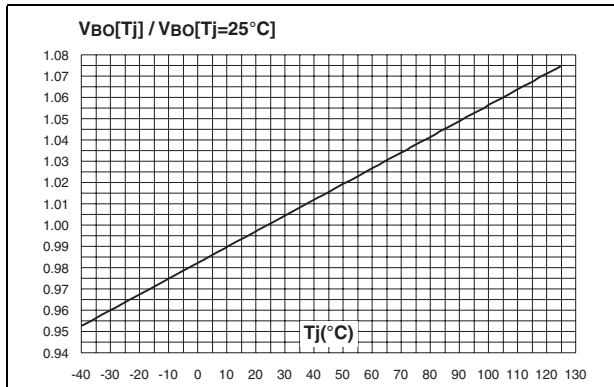
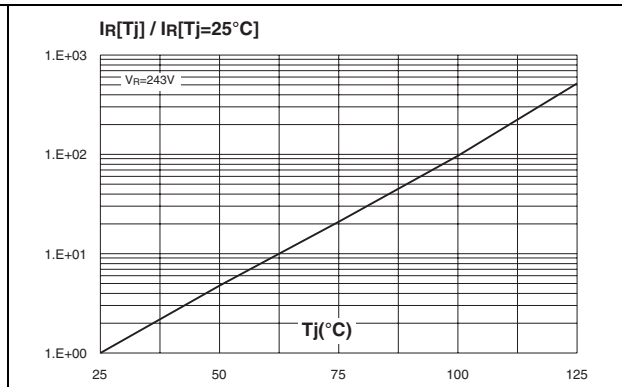
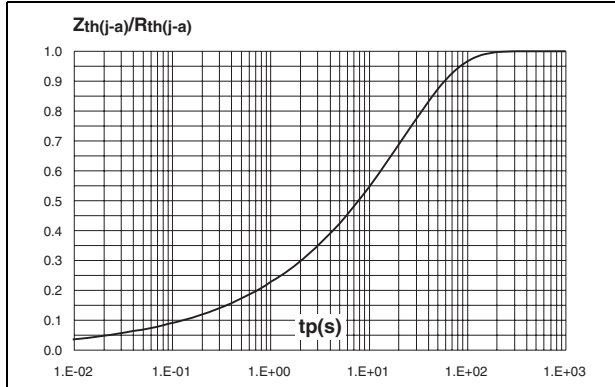


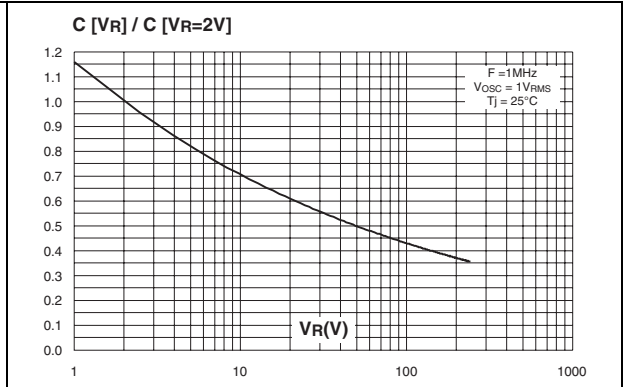
Figure 6. Relative variation of leakage current versus junction temperature (typical values)



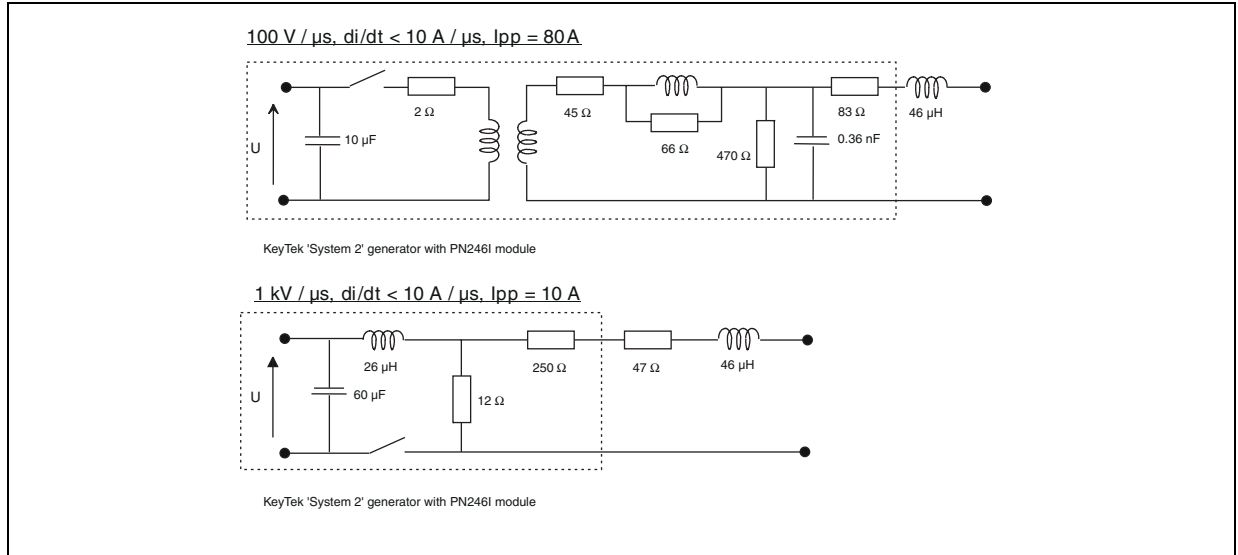
**Figure 7. Variation of thermal impedance junction to ambient versus pulse duration (Printed circuit board FR4, SCu=35µm, recommended pad layout)**



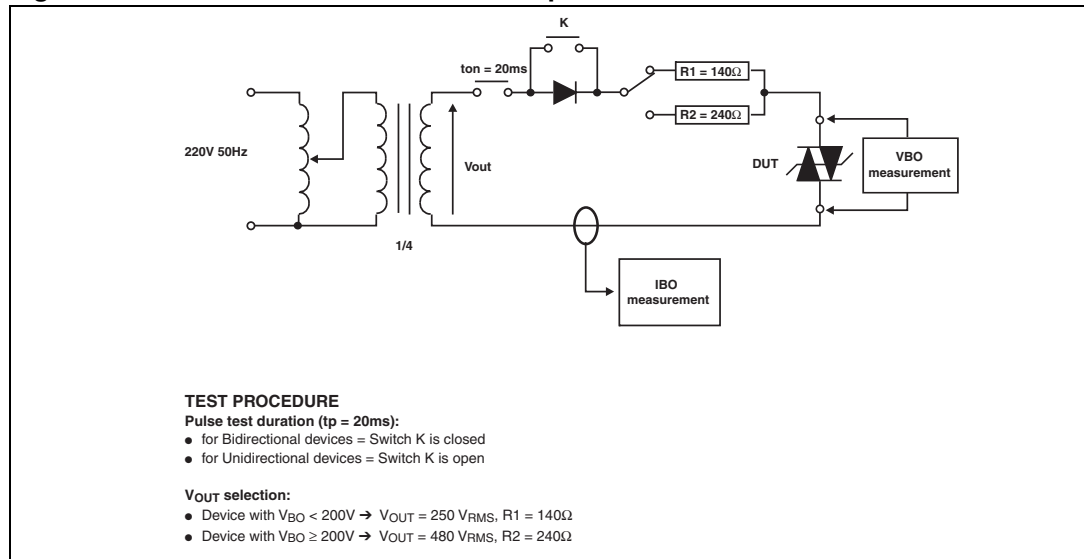
**Figure 8. Relative variation of junction capacitance versus reverse voltage applied (typical values)**



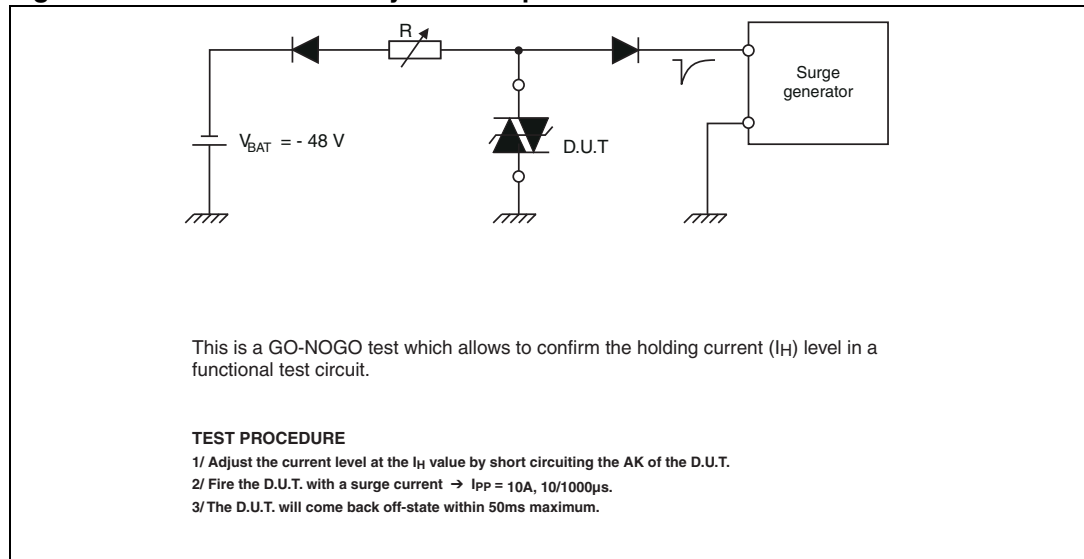
**Figure 9. Test circuit 1 for dynamic IBO and VBO parameters**



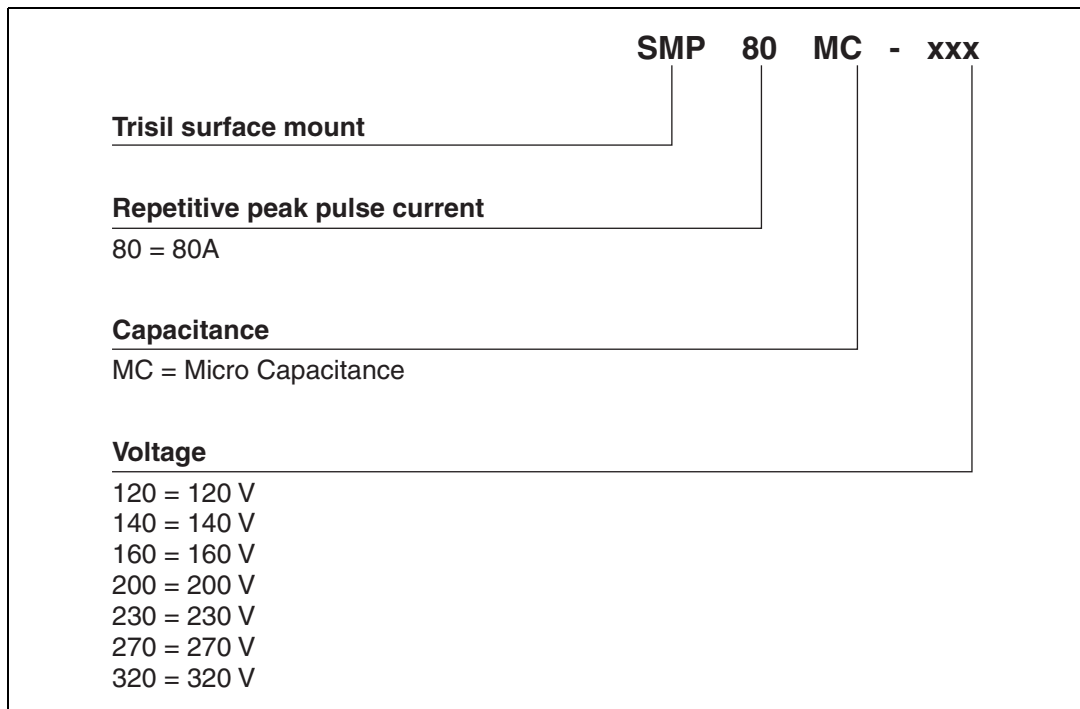
**Figure 10. Test circuit 2 for IBO and VBO parameters**



**Figure 11. Test circuit 3 for dynamic IH parameter**



## 2 Ordering Information Scheme



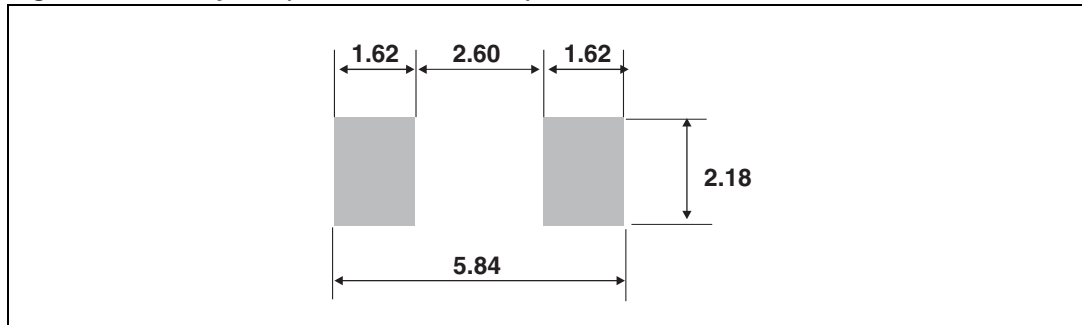
### 3 Package information

- 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](http://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

**Please Read Carefully:**

Information in this document is provided solely in connection with ST products. STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All ST products are sold pursuant to ST's terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the ST products and services described herein, and ST assumes no liability whatsoever relating to the choice, selection or use of the ST products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by ST for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

**UNLESS OTHERWISE SET FORTH IN ST'S TERMS AND CONDITIONS OF SALE ST DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF ST PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.**

**UNLESS EXPRESSLY APPROVED IN WRITING BY AN AUTHORIZED ST REPRESENTATIVE, ST PRODUCTS ARE NOT RECOMMENDED, AUTHORIZED OR WARRANTED FOR USE IN MILITARY, AIR CRAFT, SPACE, LIFE SAVING, OR LIFE SUSTAINING APPLICATIONS, NOR IN PRODUCTS OR SYSTEMS WHERE FAILURE OR MALFUNCTION MAY RESULT IN PERSONAL INJURY, DEATH, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. ST PRODUCTS WHICH ARE NOT SPECIFIED AS "AUTOMOTIVE GRADE" MAY ONLY BE USED IN AUTOMOTIVE APPLICATIONS AT USER'S OWN RISK.**

Resale of ST products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by ST for the ST product or service described herein and shall not create or extend in any manner whatsoever, any liability of ST.

ST and the ST logo are trademarks or registered trademarks of ST in various countries.

Information in this document supersedes and replaces all information previously supplied.

The ST logo is a registered trademark of STMicroelectronics. All other names are the property of their respective owners.

© 2007 STMicroelectronics - All rights reserved

STMicroelectronics group of companies

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

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