

## Standard 1A Triacs

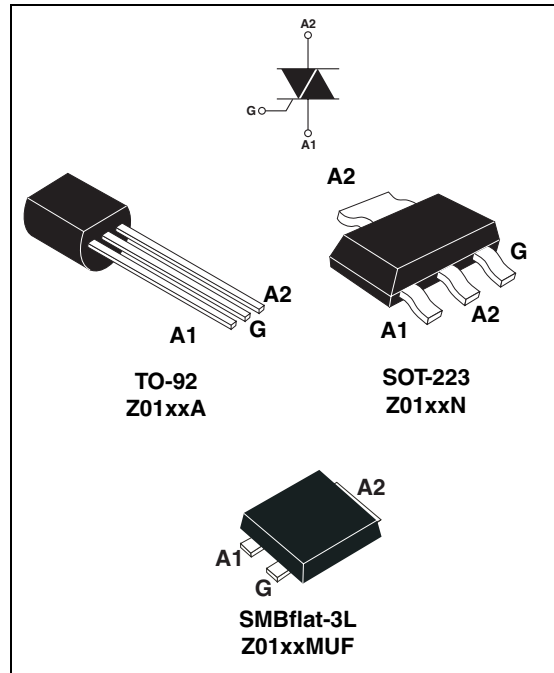
### Features

- On-state rms current,  $I_{T(RMS)}$  1 A
- Repetitive peak off-state voltage,  $V_{DRM}/V_{RRM}$  600 or 800 V
- Triggering gate current,  $I_{GT(Q1)}$  3 to 25 mA

### Description

The Z01 series is suitable for general purpose AC switching applications. These devices are typically used in applications such as home appliances (electrovalve, pump, door lock, small lamp control), fan speed controllers,...

Different gate current sensitivities are available, allowing optimized performance when driven directly through microcontrollers.



# 1 Characteristics

**Table 1. Absolute maximum ratings**

Symbol	Parameter	Value	Unit	
$I_{T(RMS)}$	On-state rms current (full sine wave)	SOT-223 $T_{tab} = 90\text{ }^{\circ}\text{C}$	1	A
		TO-92 $T_L = 50\text{ }^{\circ}\text{C}$		
		SMBflat-3L $T_{tab} = 107\text{ }^{\circ}\text{C}$		
$I_{TSM}$	Non repetitive surge peak on-state current (full cycle, $T_j$ initial = $25\text{ }^{\circ}\text{C}$ )	F = 50 Hz t = 20 ms	8	A
		F = 60 Hz t = 16.7 ms	8.5	
$I^2t$	$I^2t$ Value for fusing	$t_p = 10\text{ ms}$	0.35	$\text{A}^2\text{s}$
dI/dt	Critical rate of rise of on-state current $I_G = 2 \times I_{GT}$ , $t_r \leq 100\text{ ns}$	F = 120 Hz $T_j = 125\text{ }^{\circ}\text{C}$	20	A/ $\mu\text{s}$
$I_{GM}$	Peak gate current	$t_p = 20\text{ }\mu\text{s}$ $T_j = 125\text{ }^{\circ}\text{C}$	1	A
$P_{G(AV)}$	Average gate power dissipation	$T_j = 125\text{ }^{\circ}\text{C}$	1	W
$T_{stg}$ $T_j$	Storage junction temperature range Operating junction temperature range		- 40 to + 150 - 40 to + 125	$^{\circ}\text{C}$

**Table 2. Electrical characteristics ( $T_j = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)**

Symbol	Test conditions	Quadrant		Z01				Unit
				03	07	09	10	
$I_{GT}^{(1)}$	$V_D = 12\text{ V}$ , $R_L = 30\text{ }\Omega$	I - II - III	MAX.	3	5	10	25	mA
		IV		5	7	10	25	
$V_{GT}$		ALL	MAX.	1.3				V
$V_{GD}$	$V_D = V_{DRM}$ , $R_L = 3.3\text{ k}\Omega$ , $T_j = 125\text{ }^{\circ}\text{C}$	ALL	MIN.	0.2				V
$I_H^{(2)}$	$I_T = 50\text{ mA}$		MAX.	7	10	10	25	mA
$I_L$	$I_G = 1.2\text{ }I_{GT}$	I - III - IV	MAX.	7	10	15	25	mA
		II		15	20	25	50	
dV/dt <sup>(2)</sup>	$V_D = 67\% V_{DRM}$ gate open $T_j = 110\text{ }^{\circ}\text{C}$		MIN.	10	20	50	100	V/ $\mu\text{s}$
$(dV/dt)_c^{(2)}$	$(dI/dt)_c = 0.44\text{ A/ms}$ , $T_j = 110\text{ }^{\circ}\text{C}$		MIN.	0.5	1	2	5	V/ $\mu\text{s}$

1. Minimum  $I_{GT}$  is guaranteed at 5% of  $I_{GT}$  max.
2. For both polarities of A2 referenced to A1.

**Table 3. Static characteristics**

Symbol	Test conditions			Value	Unit
$V_{TM}^{(1)}$	$I_{TM} = 1.4 \text{ A}$ , $t_p = 380 \mu\text{s}$	$T_j = 25 \text{ }^\circ\text{C}$	MAX.	1.6	V
$V_{to}^{(1)}$	Threshold voltage	$T_j = 125 \text{ }^\circ\text{C}$	MAX.	0.95	V
$R_d^{(1)}$	Dynamic resistance	$T_j = 125 \text{ }^\circ\text{C}$	MAX.	400	m $\Omega$
$I_{DRM}$ $I_{RRM}$	$V_{DRM} = V_{RRM}$	$T_j = 25 \text{ }^\circ\text{C}$	MAX.	5	$\mu\text{A}$
		$T_j = 125 \text{ }^\circ\text{C}$		0.5	mA

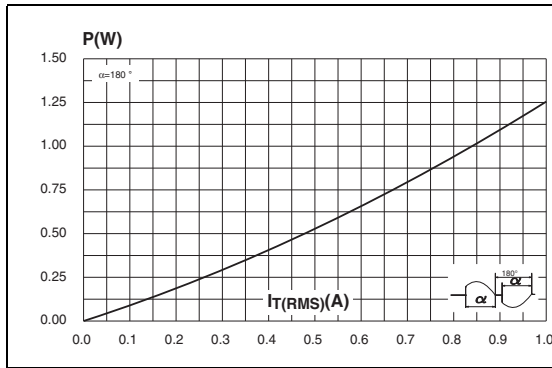
1. For both polarities of A2 referenced to A1.

**Table 4. Thermal resistances**

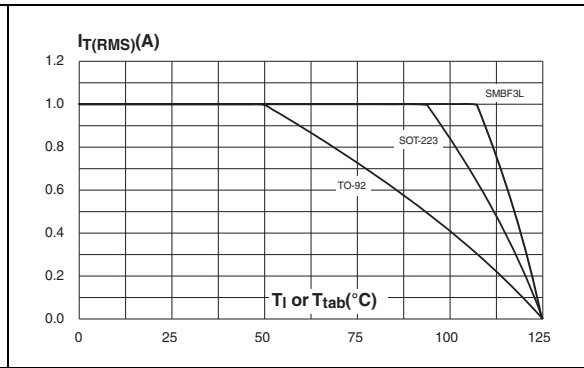
Symbol	Parameter			Value	Unit	
$R_{th(j-t)}$	Junction to tab (AC)	SOT-223	MAX.	25	$^\circ\text{C/W}$	
$R_{th(j-t)}$	Junction to tab (AC)	SMBflat-3L		14		
$R_{th(j-l)}$	Junction to lead (AC)	TO-92		60		
$R_{th(j-a)}$	Junction to ambient	$S^{(1)} = 5 \text{ cm}^2$		SOT-223		60
				SMBflat-3L		75
				TO-92		150

1. S = copper surface under tab.

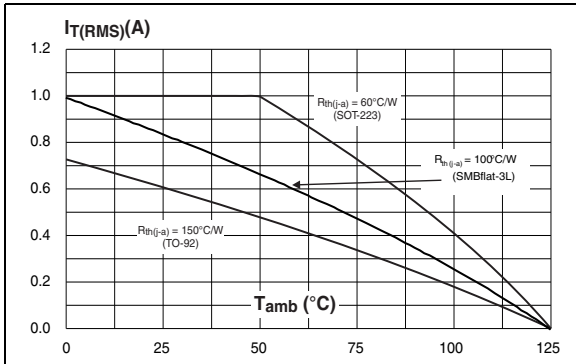
**Figure 1. Maximum power dissipation versus on-state rms current (full cycle)**



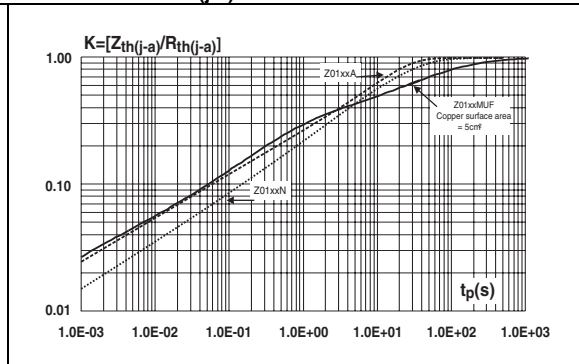
**Figure 2. On-state rms current versus lead (TO-92) or tab (SOT-223, SMBflat-3L) temperature (full cycle)**



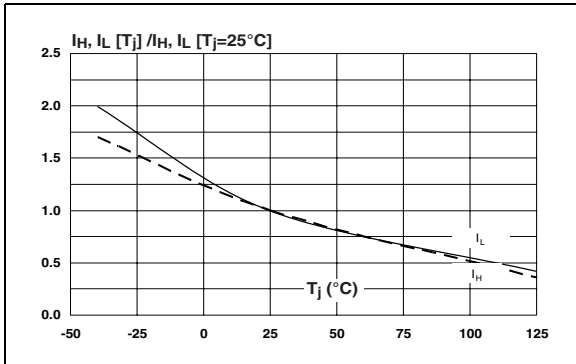
**Figure 3. On-state rms current versus ambient temperature (free air convection full cycle)**



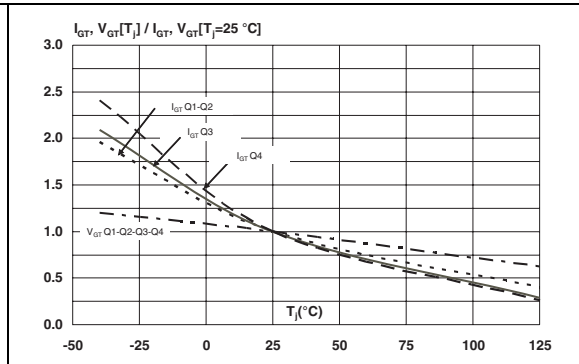
**Figure 4. Relative variation of thermal impedance versus pulse duration ( $Z_{\text{th}(j-a)}$ )**



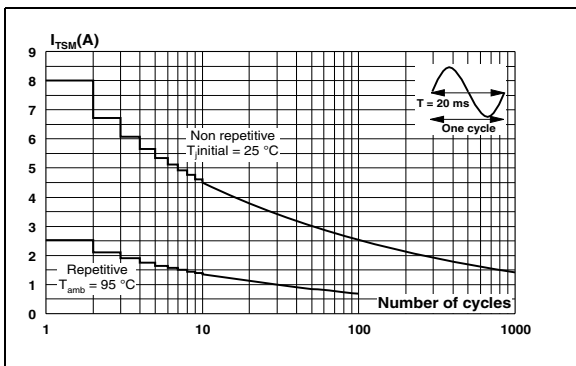
**Figure 5. Relative variation of holding current and latching current versus junction temperature (typ. values)**



**Figure 6. Relative variation of gate trigger current ( $I_{\text{GT}}$ ) and voltage ( $V_{\text{GT}}$ ) versus junction temperature**



**Figure 7. Surge peak on-state current versus number of cycles**



**Figure 8. Non-repetitive surge peak on-state current and corresponding value of  $I^2t$  sinusoidal pulse width**

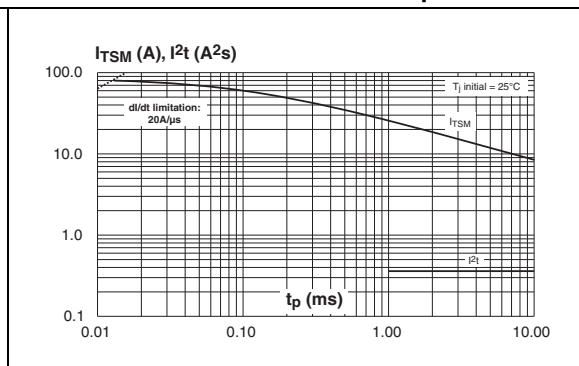


Figure 9. On-state characteristics (maximum values) ( $I_{TM} = f(V_{TM})$ )

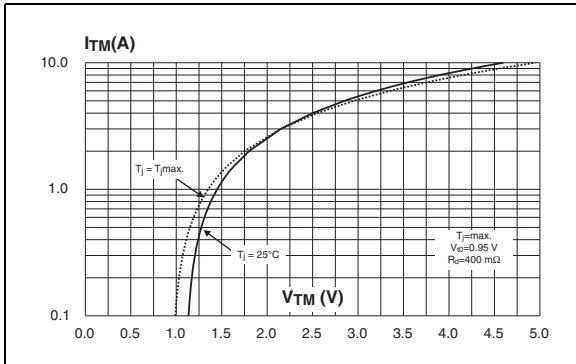


Figure 10. Relative variation of critical rate of decrease of main current versus  $(dV/dt)_c$

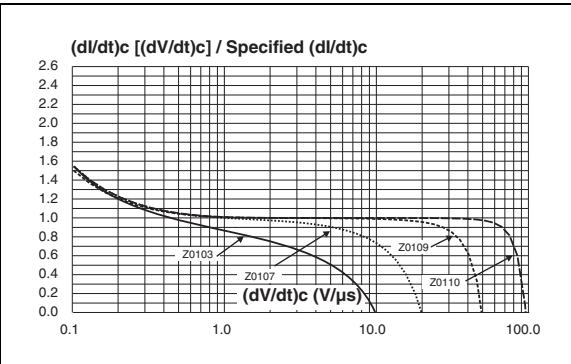


Figure 11. Relative variation of critical rate of decrease of main current  $(dl/dt)$  versus junction temperature

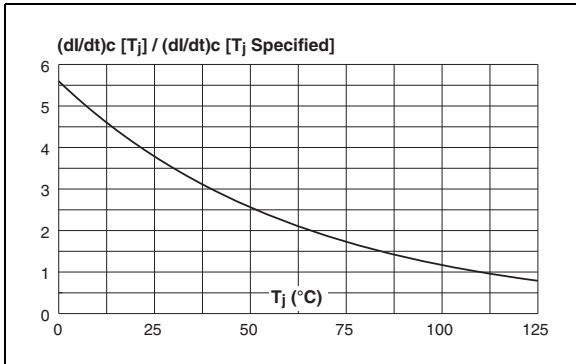


Figure 12. SOT-223 and SMBflat-3L thermal resistance junction to ambient versus copper surface under case

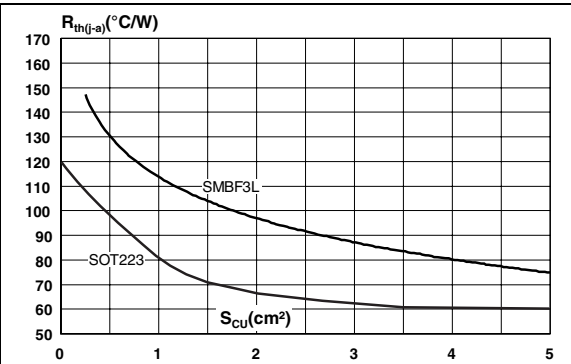
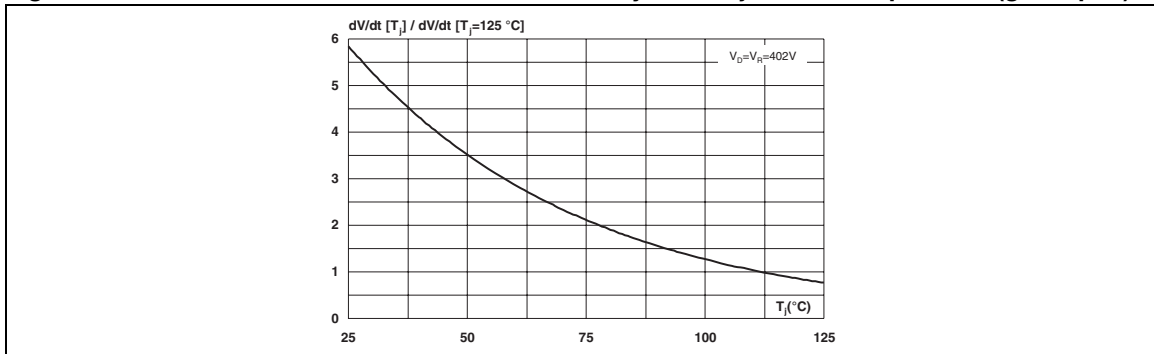


Figure 13. Relative variation of static  $dV/dt$  immunity versus junction temperature (gate open)



## 2 Ordering information scheme

Figure 14. Ordering information scheme

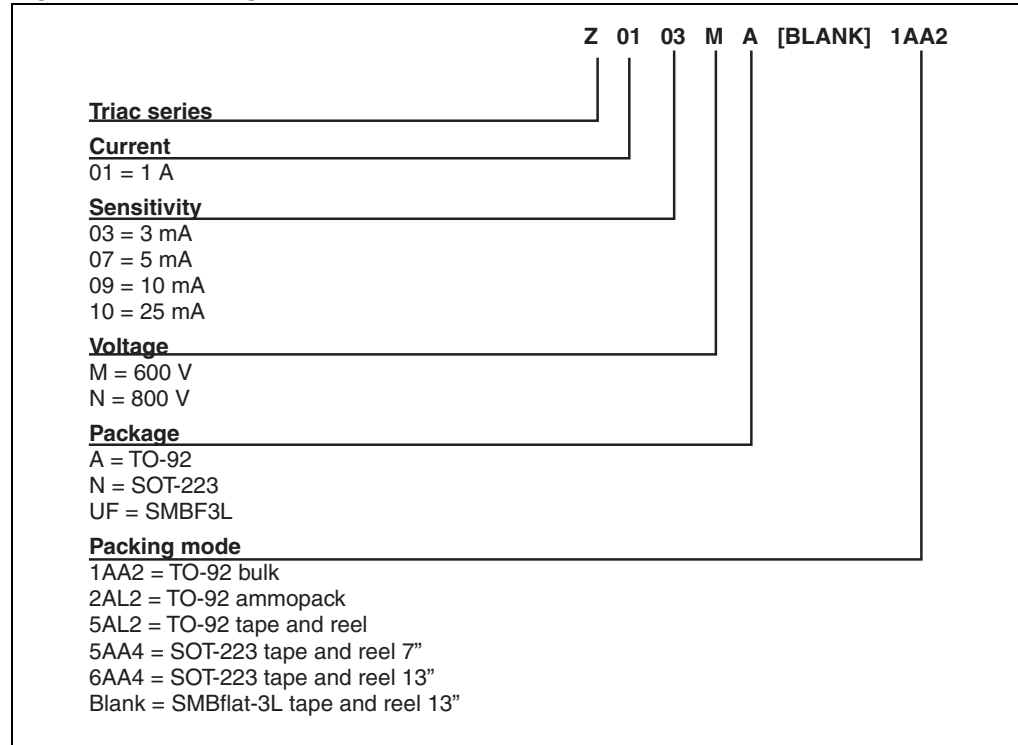


Table 5. Product Selector

Order code	Voltage		Sensitivity	Type	Package
	600 V	800 V			
Z0103MA	X		3 mA	Standard	TO-92
Z0103MN	X		3 mA	Standard	SOT-223
Z0103NA		X	3 mA	Standard	TO-92
Z0103NN		X	3 mA	Standard	SOT-223
Z0107MA	X		5 mA	Standard	TO-92
Z0107MN	X		5 mA	Standard	SOT-223
Z0107NA		X	5 mA	Standard	TO-92
Z0107NN		X	5 mA	Standard	SOT-223
Z0109MA	X		10 mA	Standard	TO-92
Z0109MN	X		10 mA	Standard	SOT-223
Z0109NA		X	10 mA	Standard	TO-92
Z0109NN		X	10 mA	Standard	SOT-223
Z0110MA	X		25 mA	Standard	TO-92
Z0110MN	X		25 mA	Standard	SOT-223
Z0110NA		X	25 mA	Standard	TO-92
Z0110NN		X	25 mA	Standard	SOT-223
Z0103MUF	X		3 mA	Standard	SMBflat-3L
Z0107MUF	X		5 mA	Standard	SMBflat-3L
Z0109MUF	X		10 mA	Standard	SMBflat-3L

### 3 Packaging information

- Epoxy meets UL94, V0
- Lead-free packages

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 6. SOT-223 dimensions**

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.80			0.071
A1		0.02	0.10		0.001	0.004
B	0.60	0.70	0.85	0.024	0.027	0.033
B1	2.90	3.00	3.15	0.114	0.118	0.124
c	0.24	0.26	0.35	0.009	0.010	0.014
D <sup>(1)</sup>	6.30	6.50	6.70	0.248	0.256	0.264
e		2.3			0.090	
e1		4.6			0.181	
E <sup>(1)</sup>	3.30	3.50	3.70	0.130	0.138	0.146
H	6.70	7.00	7.30	0.264	0.276	0.287
V	10° max					

1. Do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.15mm (0.006inches)

**Figure 15. SOT-223 footprint dimensions (in millimeters)**

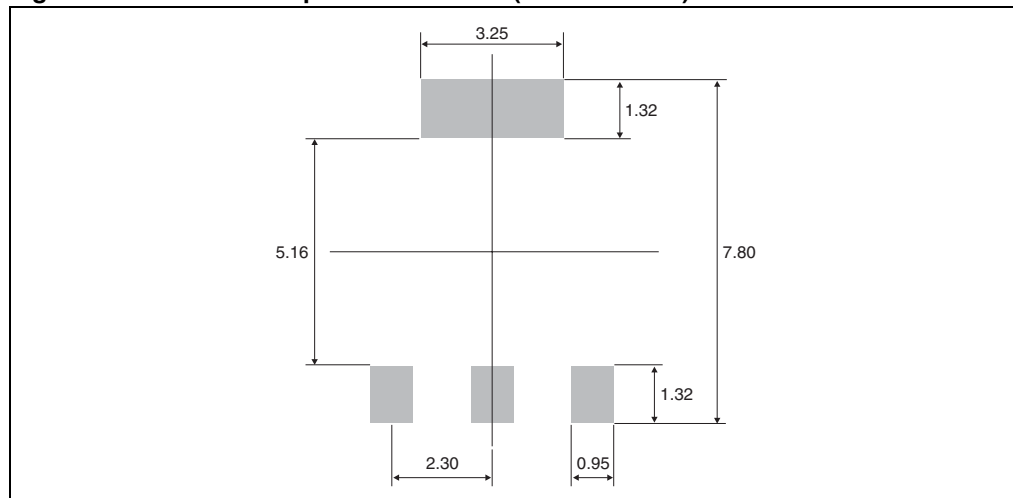




Table 7. TO-92 dimensions

REF.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A		1.35			0.053	
B			4.70			0.185
C		2.54			0.100	
D	4.40			0.173		
E	12.70			0.500		
F			3.70			0.146
a			0.50			0.019

Table 8. SMBflat-3L dimensions

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	0.90		1.10	0.035		0.043
b	0.35		0.65	0.014		0.026
b4	1.95		2.20	0.07		0.087
c	0.15		0.40	0.006		0.016
D	3.30		3.95	0.130		0.156
E	5.10		5.60	0.201		0.220
E1	4.05		4.60	0.156		0.181
L	0.75		1.50	0.030		0.059
L1		0.40			0.016	
L2		0.60			0.024	
e		1.60			0.063	

Figure 16. SMBflat-3L footprint dimensions

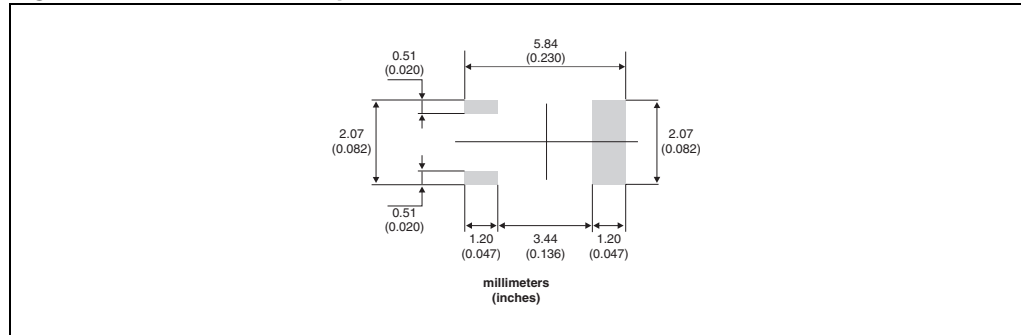
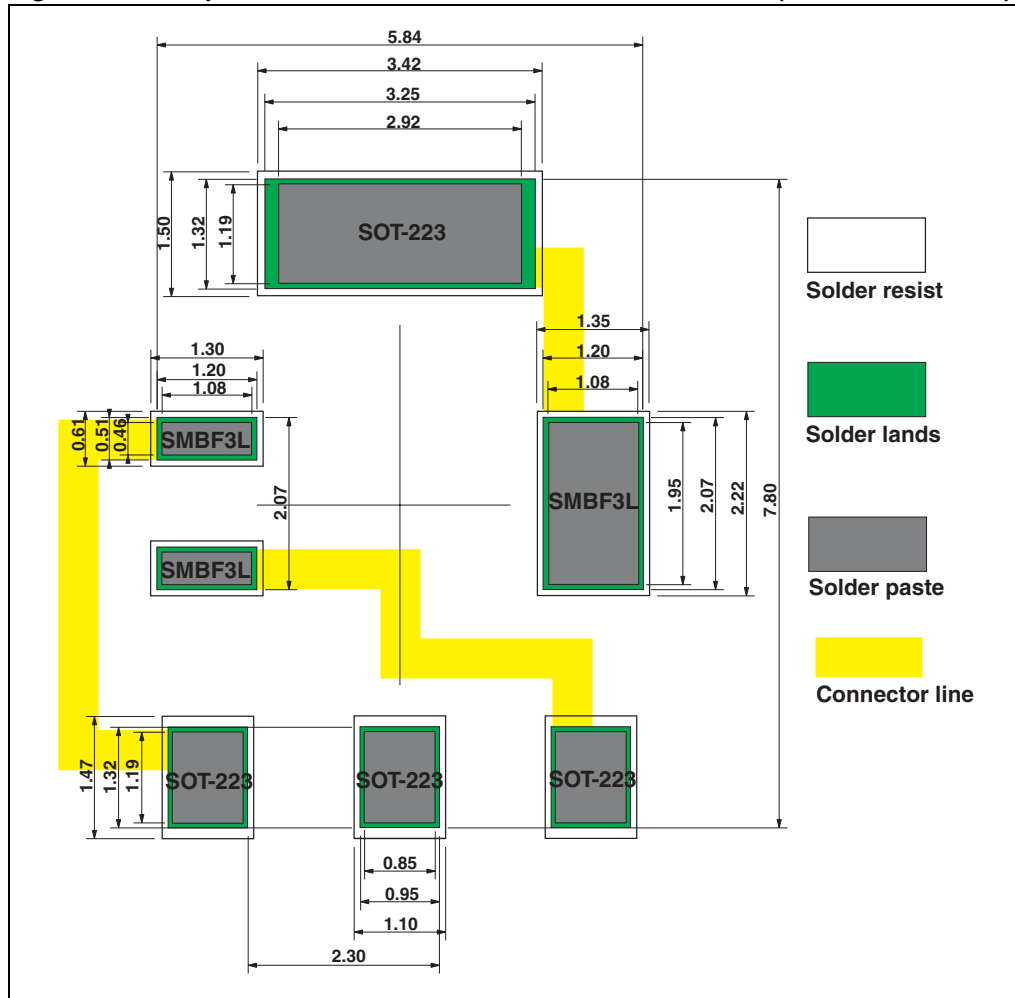


Figure 17. Footprint and connectors for SOT-223 or SMBflat-3L (dimensions in mm)



## 4 Ordering information

**Table 9. Ordering information**

Order code <sup>(1)</sup>	Marking <sup>(1)</sup>	Package	Weight	Base quantity	Delivery mode
Z01xxyA 1AA2	Z01xxyA	TO-92	0.2 g	2500	Bulk
Z01xxyA 2AL2	Z01xxyA	TO-92	0.2 g	2000	Ammopack
Z01xxyA 5AL2	Z01xxyA	TO-92	0.2 g	2000	Tape and reel
Z0103yN 5AA4	Z3y	SOT-223	0.12 g	1000	Tape and reel
Z0107yN 5AA4	Z7y	SOT-223	0.12 g	1000	Tape and reel
Z0109yN 5AA4	Z9y	SOT-223	0.12 g	1000	Tape and reel
Z0103MUF	Z3M	SMBflat-3L	46.78 mg	5000	Tape and reel
Z0107MUF	Z7M	SMBflat-3L	46.78 mg	5000	Tape and reel
Z0109MUF	Z9M	SMBflat-3L	46.78 mg	5000	Tape and reel

1. xx = sensitivity, y = voltage

## 5 Revision history

**Table 10. Document revision history**

Date	Revision	Changes
Oct-2001	4	Last update.
10-Feb-2005	5	Package: TO-92 tape and reel delivery mode 5AL2 added.
09-May-2005	6	Table 4 on page 2: typo. mistake corrected 1. (dV/dt) <sub>c</sub> instead of (dI/dt) <sub>c</sub> 2. V/μs unit instead of A/ms
21-Apr-2006	7	Reformatted to current standard. Table 2 on page 2: Typo corrected. Values for I <sub>GT</sub> split into two separate rows.
10-Oct-2006	8	Table 2: modified test conditions for (dV/dt) <sub>c</sub> . Changed "ambient" to "lead or tab" in Figure 2.
20-Oct-2010	9	Package: SOT-223 13" tape and reel added = 6AA4
14-Dec-2010	10	Added package SMBflat-3L. Updated dimensions in <a href="#">Table 6</a> . Updated <a href="#">Figure 3</a> and <a href="#">Figure 12</a> . Updated <a href="#">Table 5: Product Selector</a> .

**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.

© 2010 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 - Philippines - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

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