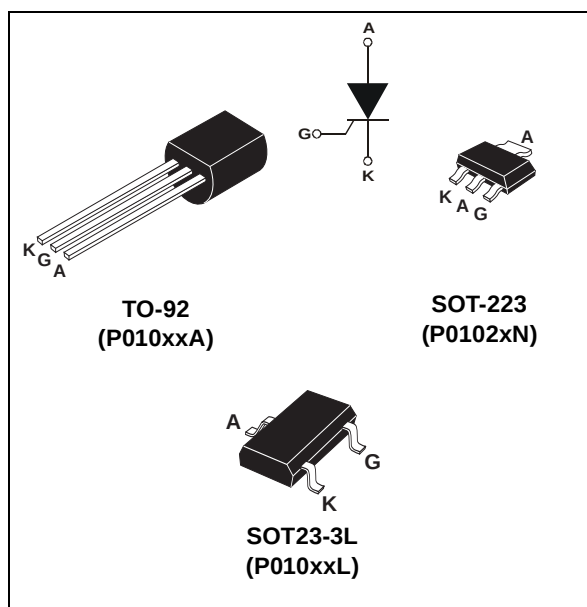


Sensitive standard SCRs up to 0.8 A

Datasheet — production data



Description

Thanks to highly sensitive triggering levels, the P010XX SCR series is suitable for all applications where available gate current is limited, such as ground fault circuit interrupters, pilot circuits in solid state relays, stand-by mode power supplies, smoke and alarm detectors.

Available in through-hole or surface mount packages, the voltage capability of this series has been upgraded since its introduction and is now available up to 600 V.

Table 1. Device summary

Symbol	Value	Unit
$I_{T(RMS)}$	up to 0.8	A
V_{DRM}/V_{RRM}	up to 600	V
I_{GT}	From 5 to 200	μA

Features

- On-state rms current, 0.8 A
- Repetitive peak off-state voltage up to 600 V
- Triggering gate current from 5 to 200 μA
- ECOPACK[®] 2 compliant component

1 Characteristics

Table 2. Absolute ratings (limiting values) P010xxA and P010xxN

Symbol	Parameter			Value	Unit
$I_{T(RMS)}$	On-state rms current (180° conduction angle)	TO-92	$T_J = 55\text{ °C}$	0.8	A
		SOT-223	$T_{amb} = 70\text{ °C}$		
$I_{T(AV)}$	Average on-state current (180° conduction angle)	TO-92	$T_J = 55\text{ °C}$	0.5	A
		SOT-223	$T_{amb} = 70\text{ °C}$		
I_{TSM}	Non repetitive surge peak on-state current	$t_p = 8.3\text{ ms}$	$T_J = 25\text{ °C}$	8	A
		$t_p = 10\text{ ms}$		7	
I^2t	I^2t value for fusing	$t_p = 10\text{ ms}$	$T_J = 25\text{ °C}$	0.24	A^2s
di/dt	Critical rate of rise of on-state current $I_G = 2 \times I_{GT}$, $t_r \leq 100\text{ ns}$	$F = 60\text{ Hz}$	$T_J = 125\text{ °C}$	50	$A/\mu s$
I_{GM}	Peak gate current	$t_p = 20\text{ }\mu s$	$T_J = 125\text{ °C}$	1	A
$P_{G(AV)}$	Average gate power dissipation		$T_J = 125\text{ °C}$	0.1	W
T_{stg} T_J	Storage junction temperature range Operating junction temperature range			- 40 to + 150 - 40 to + 125	°C

Table 3. Absolute ratings (limiting values) P010xxL

Symbol	Parameter			Value	Unit
$I_{T(RMS)}$	On-state rms current (180° conduction angle)		$T_{amb} = 36\text{ °C}$	0.25	A
$I_{T(AV)}$	Average on-state current (180° conduction angle)		$T_{amb} = 36\text{ °C}$	0.16	A
I_{TSM}	Non repetitive surge peak on-state current	$t_p = 8.3\text{ ms}$	$T_J = 25\text{ °C}$	7	A
		$t_p = 10\text{ ms}$		6	
I^2t	I^2t value for fusing	$t_p = 10\text{ ms}$	$T_J = 25\text{ °C}$	0.18	A^2s
di/dt	Critical rate of rise of on-state current $I_G = 2 \times I_{GT}$, $t_r \leq 100\text{ ns}$	$F = 60\text{ Hz}$	$T_J = 125\text{ °C}$	50	$A/\mu s$
I_{GM}	Peak gate current	$t_p = 20\text{ }\mu s$	$T_J = 125\text{ °C}$	0.5	A
$P_{G(AV)}$	Average gate power dissipation		$T_J = 125\text{ °C}$	0.02	W
T_{stg} T_J	Storage junction temperature range Operating junction temperature range			- 40 to + 150 - 40 to + 125	°C

Table 4. Electrical characteristics⁽¹⁾ P010xxA and P010xxN

Symbol	Test conditions			Value	Unit
I _{GT}	V _D = 12 V, R _L = 140 Ω		Max.	200	μA
V _{GT}			Max.	0.8	V
V _{GD}	V _D = V _{DRM} , R _L = 3.3 kΩ, R _{GK} = 1 kΩ	T _j = 125 °C	Min.	0.1	V
V _{RG}	I _{RG} = 10 μA		Min.	8	V
I _H	I _T = 50 mA, R _{GK} = 1 kΩ		Max.	5	mA
I _L	I _G = 1 mA, R _{GK} = 1 kΩ		Max.	6	mA
dV/dt	V _D = 67% V _{DRM} , R _{GK} = 1 kΩ	T _j = 125 °C	Min.	75	V/μs
V _{TM}	I _{TM} = 1.6 A, tp = 380 μs	T _j = 25 °C	Max.	1.95	V
V _{t0}	Threshold voltage	T _j = 125 °C	Max.	0.95	V
R _d	Dynamic resistance	T _j = 125 °C	Max.	600	mΩ
I _{DRM} I _{RRM}	V _{DRM} = V _{RRM} = 400 V R _{GK} = 1 kΩ	T _j = 25 °C	Max.	1	μA
	V _{DRM} = V _{RRM} = 600 V R _{GK} = 1 kΩ			10	
	V _{DRM} = V _{RRM} R _{GK} = 1 kΩ	T _j = 125 °C		100	

1. $T_j = 25\text{ }^\circ\text{C}$, unless otherwise specifiedTable 5. Electrical characteristics⁽¹⁾ P010xxL

Symbol	Test conditions		P0102xL	P0109AL	Unit	
I _{GT}	V _D = 12 V, R _L = 140 Ω		Max.	200	1	μA
V _{GT}			Max.	0.8		V
V _{GD}	V _D = V _{DRM} , R _L = 3.3 kΩ, R _{GK} = 1 kΩ	T _j = 125 °C	Min.	0.1		V
V _{RG}	I _{RG} = 10 μA		Min.	8		V
I _H	I _T = 50 mA, R _{GK} = 1 kΩ		Max.	6		mA
I _L	I _G = 1 mA, R _{GK} = 1 kΩ		Max.	7		mA
dV/dt	V _D = 67% V _{DRM} , R _{GK} = 1 kΩ	T _j = 125 °C	Min.	200	100	V/μs
V _{TM}	I _{TM} = 0.4 A, tp = 380 μs	T _j = 25 °C	Max.	1.7		V
V _{t0}	Threshold voltage	T _j = 125 °C	Max.	1.0		V
R _d	Dynamic resistance	T _j = 125 °C	Max.	1000		mΩ
I _{DRM} I _{RRM}	V _{DRM} = V _{RRM}	T _j = 25 °C	Max.	1		μA
		T _j = 125 °C		100		

1. $T_j = 25\text{ }^\circ\text{C}$, unless otherwise specified

Table 6. Electrical device summary

Order code	Voltage				Sensitivity	Package	Packing mode
	100 V	200 V	400 V	600 V			
P0102AA 1AA3	X				200 μ A	TO-92	Bulk
P0102AA 5AL3	X				200 μ A	TO-92	Tape and reel 13 inch
P0102AL 5AA4	X				200 μ A	SOT23-3L	Tape and reel 7 inch
P0102BA 1AA3		X			200 μ A	TO-92	Bulk
P0102BL 5AA4		X			200 μ A	SOT23-3L	Tape and reel 7 inch
P0102DA 1AA3			X		200 μ A	TO-92	Bulk
P0102DA 2AL3			X		200 μ A	TO-92	Ammopack
P0102DA 5AL3			X		200 μ A	TO-92	Tape and reel 13 inch
P0102DN 5AA4	X		X		200 μ A	SOT-223	Tape and reel 7 inch
P0102MA 1AA3				X	200 μ A	TO-92	Bulk
P0102MN 5AA4				X	200 μ A	SOT-223	Tape and reel 7 inch
P0109AL 5AA4	X				1 μ A	SOT23-3L	Tape and reel 7 inch
P0109DA 1AA3			X		1 μ A	TO-92	Bulk
P0109DA 5AL3			X		1 μ A	TO-92	Tape and reel 13 inch

Table 7. Thermal resistance

Symbol	Parameter		Maximum	Unit
$R_{th(j-a)}$	Junction to case (DC)	TO-92	80	$^{\circ}\text{C/W}$
$R_{th(j-t)}$	Junction to tab (DC)	SOT-223	30	$^{\circ}\text{C/W}$
$R_{th(j-a)}$	Junction to ambient (DC)	TO-92	150	$^{\circ}\text{C/W}$
		$S^{(1)} = 5 \text{ cm}^2$ SOT-223	60	
$R_{th(j-a)}$	Junction to ambient (mounted on FR4 with recommended pad layout)	SOT23-3L	400	$^{\circ}\text{C/W}$

1. S = Copper surface under tab.

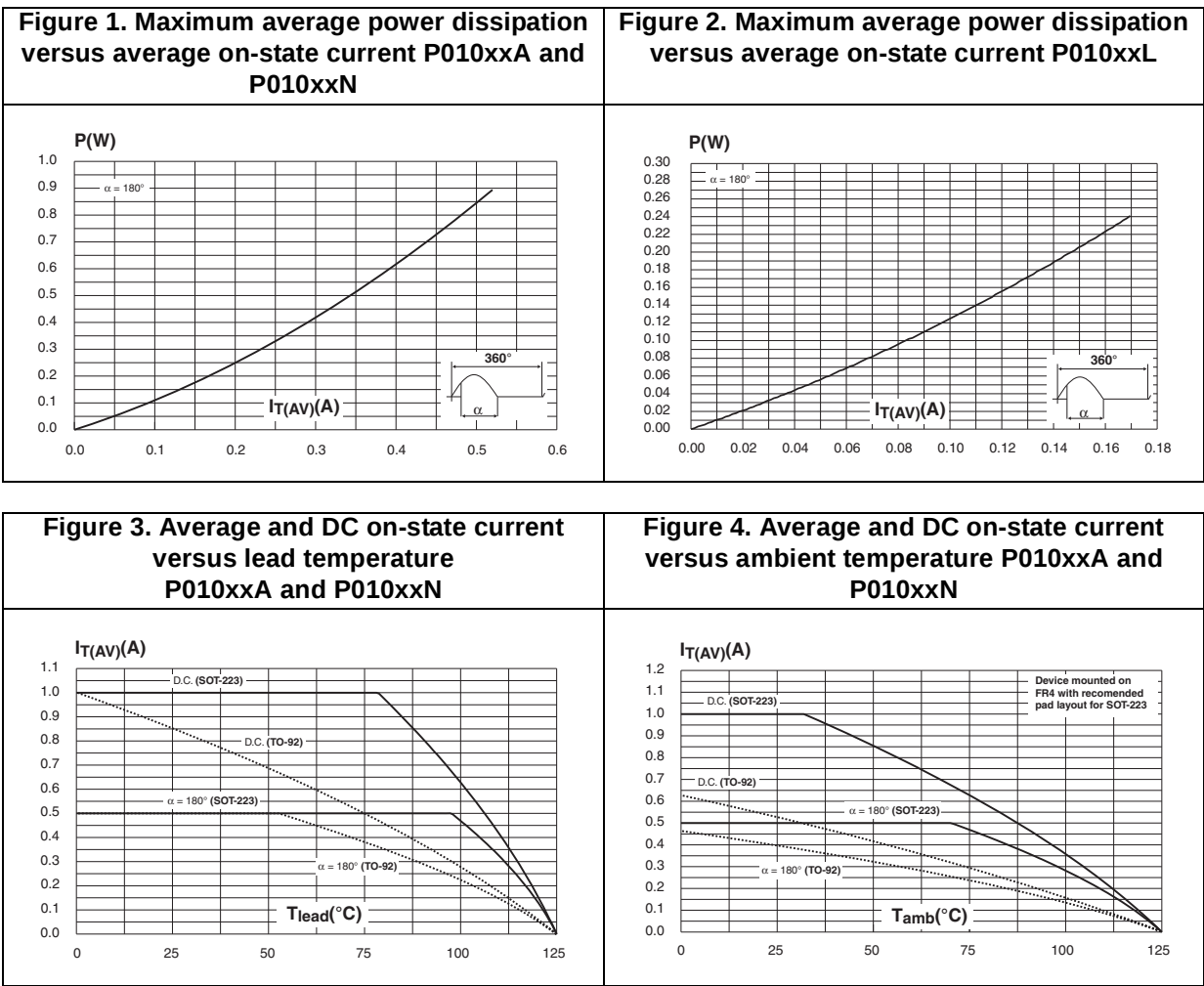


Figure 5. Average and DC on-state current versus case temperature P010xxL

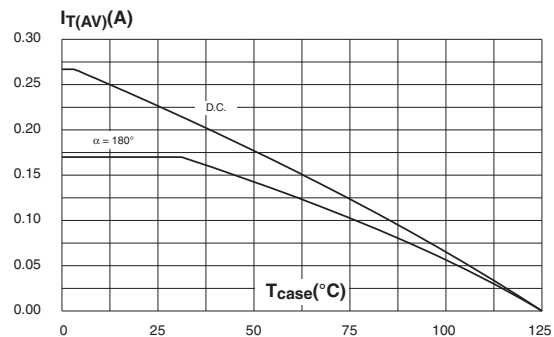


Figure 6. Relative variation of thermal impedance junction to ambient versus pulse duration

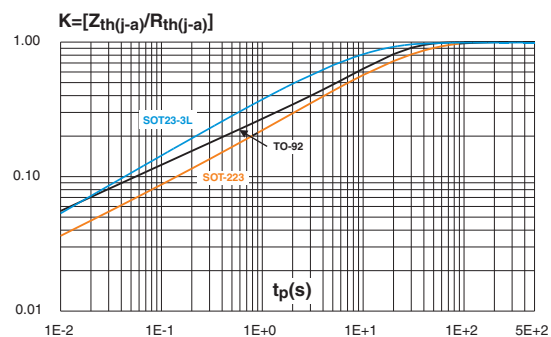


Figure 7. Gate trigger, holding, and latching currents with gate trigger voltage versus junction temperature

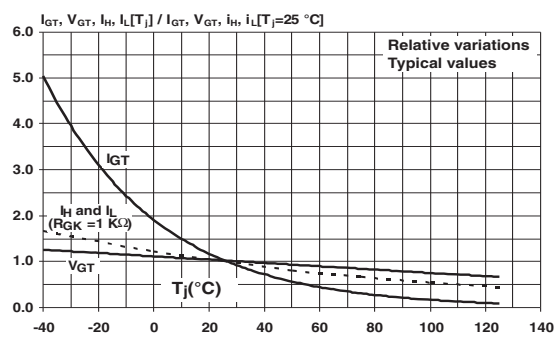


Figure 8. Relative variation of holding current versus gate-cathode resistance

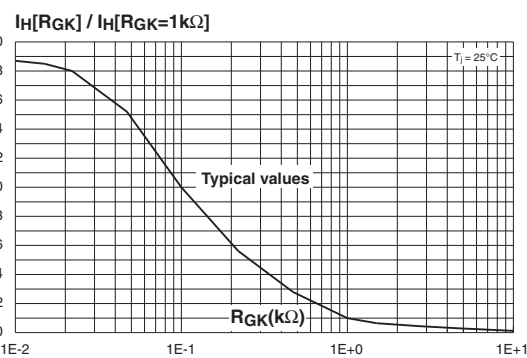


Figure 9. Relative variation of dV/dt immunity versus gate-cathode resistance

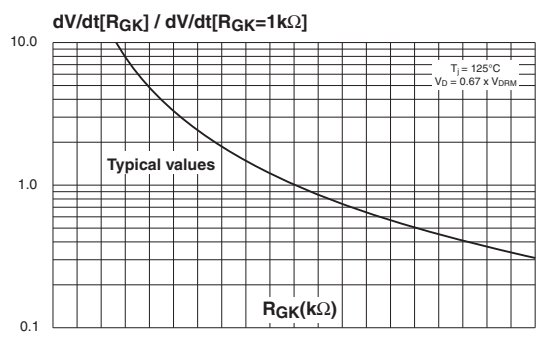


Figure 10. Relative variation of dV/dt immunity versus gate-cathode capacitance

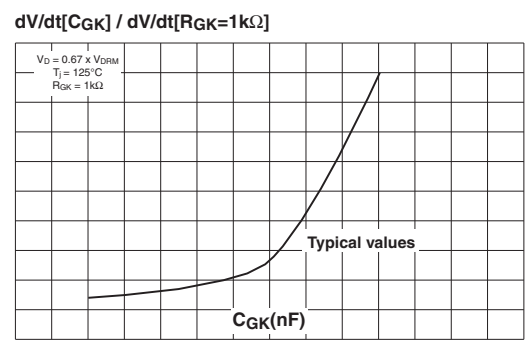


Figure 11. Surge peak on-state current versus number of cycles

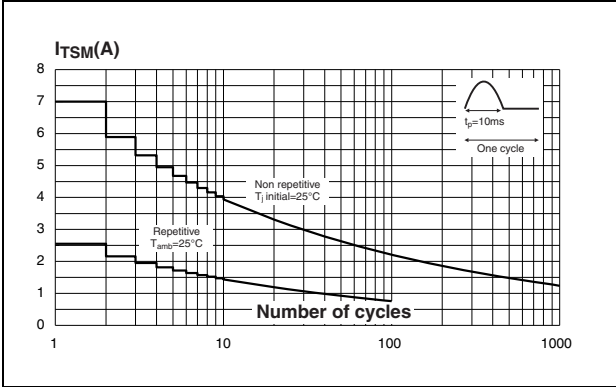


Figure 12. Non-repetitive surge peak on-state current and corresponding value of I^2t

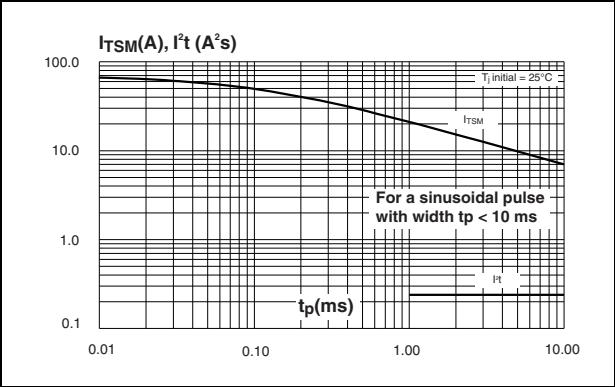


Figure 13. On-state characteristics P010xxA, P010xxN

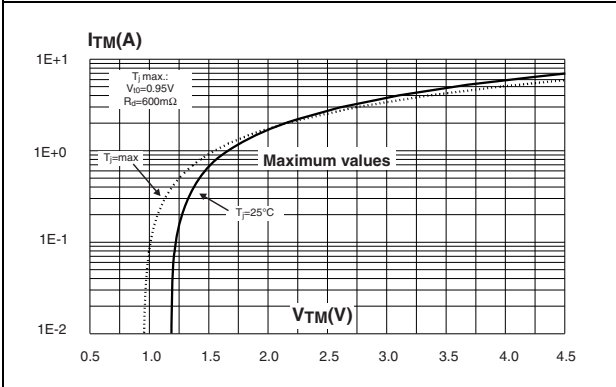


Figure 14. On-state characteristics P010xxL

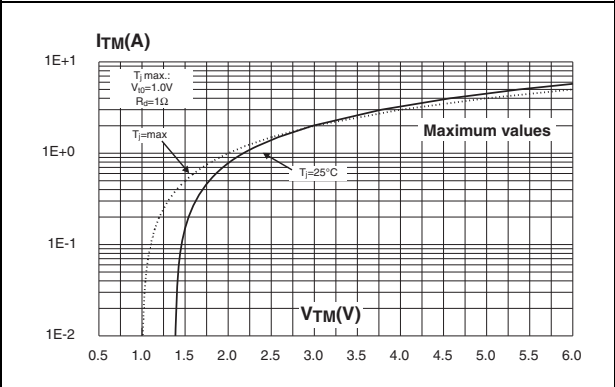


Figure 15. Thermal resistance junction to ambient versus copper surface under tab P010xxN

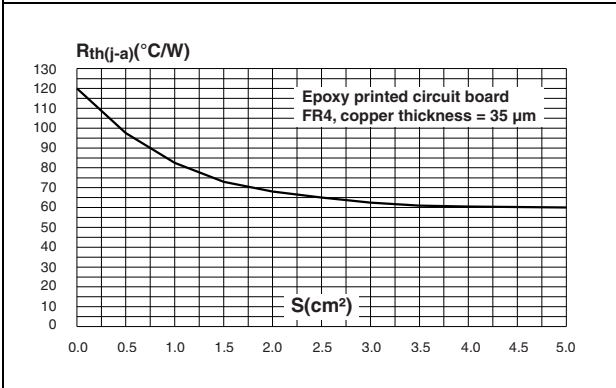
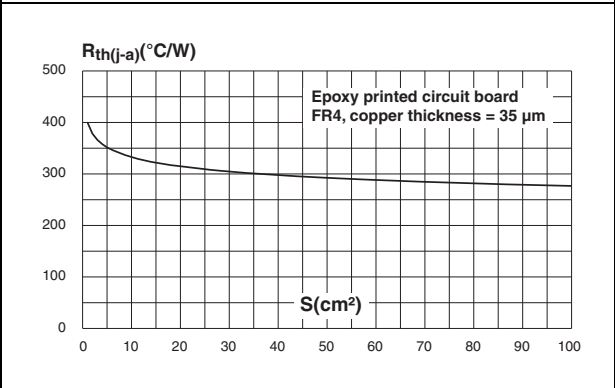


Figure 16. Thermal resistance junction to ambient versus copper surface under tab P010xxL



2 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. ECOPACK[®] is an ST trademark.

Table 8. 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 9. 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 ⁽¹⁾	6.30	6.50	6.70	0.248	0.256	0.264
e		2.3			0.090	
e1		4.6			0.181	
E ⁽¹⁾	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 17. Footprint (dimensions in mm)

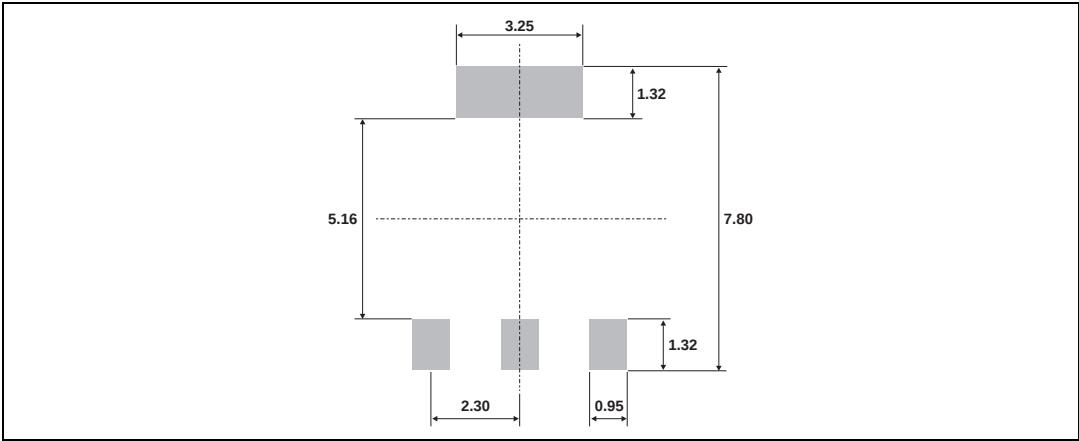
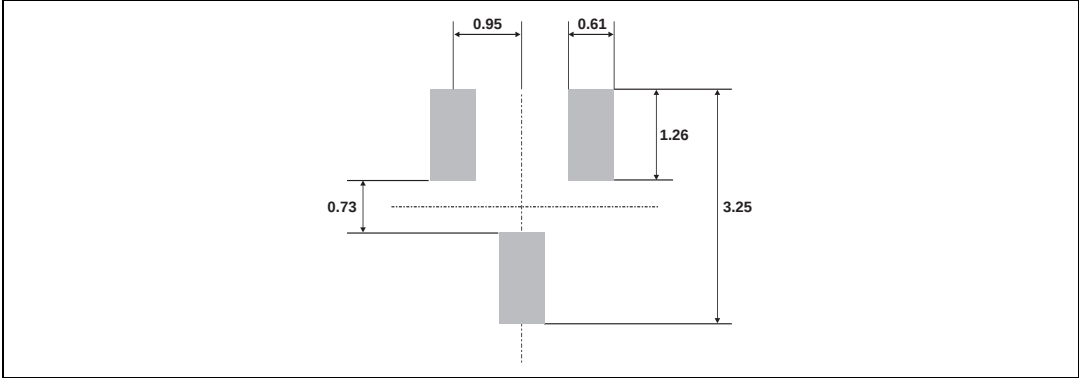


Table 10. SOT23-3L dimensions

Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	0.89	1.4	0.035	0.055
A1	0	0.1	0	0.004
B	0.3	0.51	0.012	0.02
c	0.085	0.18	0.003	0.007
D	2.75	3.04	0.108	0.12
e	0.85	1.05	0.033	0.041
e1	1.7	2.1	0.067	0.083
E	1.2	1.6	0.047	0.063
H	2.1	2.75	0.083	0.108
L	0.6 typ.		0.024 typ.	
S	0.35	0.65	0.014	0.026

Figure 18. Footprint (dimensions in mm)



3 Ordering information

Figure 19. Ordering information scheme

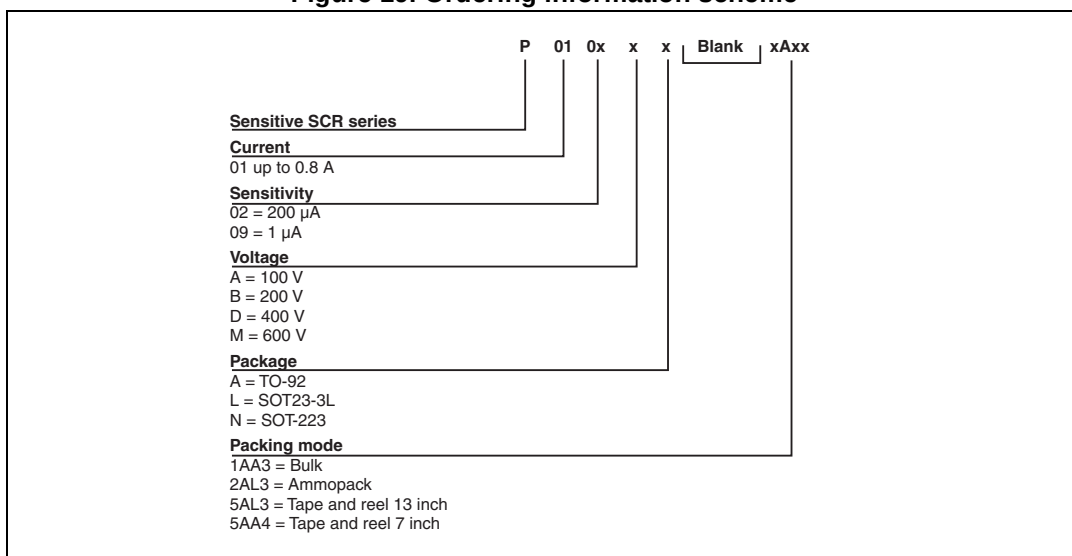


Table 11. Ordering information

Order code	Marking	Package	Weight	Base qty	Packing mode
P0102AA 1AA3	P0102 AA	TO-92	0.2 g	2500	Bulk
P0102AA 5AL3	P0102 AA	TO-92	0.2 g	2000	Tape and reel 13 inch
P0102AL 5AA4	P2A	SOT23-3L	0.01 g	3000	Tape and reel 7 inch
P0102BA 1AA3	P0102 BA	TO-92	0.2 g	1000	Bulk
P0102BL 5AA4	P2B	SOT23-3L	0.01 g	3000	Tape and reel 7 inch
P0102DA 1AA3	P0102 DA	TO-92	0.2 g	2500	Bulk
P0102DA 2AL3	P0102 DA	TO-92	0.2 g	2000	Ammopack
P0102DA 5AL3	P0102 DA	TO-92	0.2 g	2000	Tape and reel 13 inch
P0102DN 5AA4	P2D	SOT-223	0.11 g	3000	Tape and reel 7 inch
P0102MA 1AA3	P0102 MA	TO-92	0.2 g	2500	Bulk
P0102MN 5AA4	P2M	SOT-223	0.11 g	2000	Tape and reel 7 inch
P0109AL 5AA4	P9A	SOT23-3L	0.01 g	3000	Tape and reel 7 inch
P0109DA 1AA3	P0109 DA	TO-92	0.2 g	2500	Bulk
P0109DA 5AL3	P0109 DA	TO-92	0.2 g	2000	Tape and reel 13 inch

4 Revision history

Table 12. Document revision history

Date	Revision	Changes
24-Nov-2008	1	First issue.
01-Apr-2014	2	Added V_{GT} in Figure 7 , updated Figure 11 and Table 9 and reformatted to current standard.

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.

ST PRODUCTS ARE NOT DESIGNED OR AUTHORIZED FOR USE IN: (A) SAFETY CRITICAL APPLICATIONS SUCH AS LIFE SUPPORTING, ACTIVE IMPLANTED DEVICES OR SYSTEMS WITH PRODUCT FUNCTIONAL SAFETY REQUIREMENTS; (B) AERONAUTIC APPLICATIONS; (C) AUTOMOTIVE APPLICATIONS OR ENVIRONMENTS, AND/OR (D) AEROSPACE APPLICATIONS OR ENVIRONMENTS. WHERE ST PRODUCTS ARE NOT DESIGNED FOR SUCH USE, THE PURCHASER SHALL USE PRODUCTS AT PURCHASER'S SOLE RISK, EVEN IF ST HAS BEEN INFORMED IN WRITING OF SUCH USAGE, UNLESS A PRODUCT IS EXPRESSLY DESIGNATED BY ST AS BEING INTENDED FOR "AUTOMOTIVE, AUTOMOTIVE SAFETY OR MEDICAL" INDUSTRY DOMAINS ACCORDING TO ST PRODUCT DESIGN SPECIFICATIONS. PRODUCTS FORMALLY ESCC, QML OR JAN QUALIFIED ARE DEEMED SUITABLE FOR USE IN AEROSPACE BY THE CORRESPONDING GOVERNMENTAL AGENCY.

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.

© 2014 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