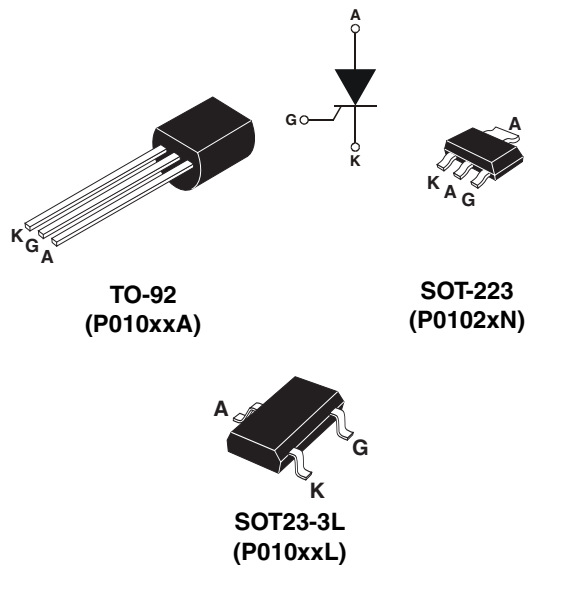
P010xx

Sensitive standard SCRs up to 0.8 A

Features

- $I_{T(RMS)}$ up to 0.8 A
- V_{DRM}/V_{RRM}100, 200, 400 and 600 V
- $I_{GT}$from 5 to 200 µA



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 interruptors, 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

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

1 Characteristics

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

Symbol	Parameter			Value	Unit
$I_{T(RMS)}$	RMS on-state current (180° conduction angle)	TO-92	T_l = 55 °C	0.8	A
		SOT-223	T_{amb} = 70 °C		
$IT_{(AV)}$	Average on-state current (180° conduction angle)	TO-92	T_l = 55 °C	0.5	A
		SOT-223	T_{amb} = 70 °C		
I_{TSM}	Non repetitive surge peak on-state current	t_p = 8.3 ms	T_j = 25 °C	8	A
		t_p = 10 ms		7	
I^2t	I^2t Value for fusing	t_p = 10 ms	T_j = 25 °C	0.24	A^2s
dI/dt	Critical rate of rise of on-state current $I_G = 2 \times I_{GT}$, $t_r \leq 100$ ns	F = 60 Hz	T_j = 125 °C	50	A/µs
I_{GM}	Peak gate current	t_p = 20 µs	T_j = 125 °C	1	A
$P_{G(AV)}$	Average gate power dissipation		T_j = 125 °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
$I_{T(RMS)}$	RMS on-state current (180° conduction angle)		T_{amb} = 36 °C	0.25	A
$IT_{(AV)}$	Average on-state current (180° conduction angle)		T_{amb} = 36 °C	0.16	A
I_{TSM}	Non repetitive surge peak on-state current	t_p = 8.3 ms	T_j = 25 °C	7	A
		t_p = 10 ms		6	
I^2t	I^2t Value for fusing	t_p = 10 ms	T_j = 25 °C	0.18	A^2s
dI/dt	Critical rate of rise of on-state current $I_G = 2 \times I_{GT}$, $t_r \leq 100$ ns	F = 60 Hz	T_j = 125 °C	50	A/µs
I_{GM}	Peak gate current	t_p = 20 µs	T_j = 125 °C	0.5	A
$P_{G(AV)}$	Average gate power dissipation		T_j = 125 °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		Min.	-	µA
			Max.	200	
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 °C, unless otherwise specified

Table 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 °C, unless otherwise specified

Table 6. Thermal resistance

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

1. S = Copper surface under tab.

Figure 1. Maximum average power dissipation vs. average on-state current P010xxA and P010xxN

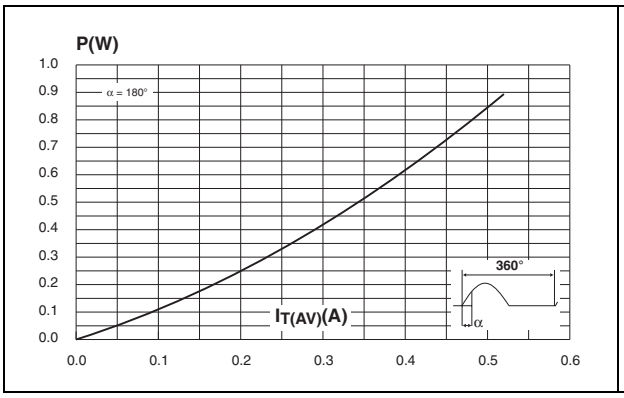


Figure 2. Maximum average power dissipation vs. average on-state current P010xxL

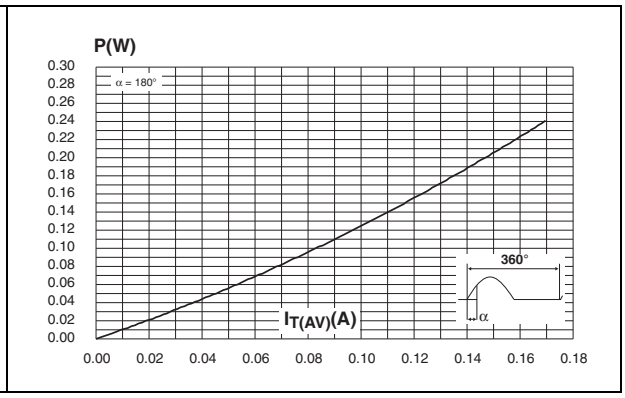


Figure 3. Average and DC on-state current vs. lead temperature P010xxA and P010xxN

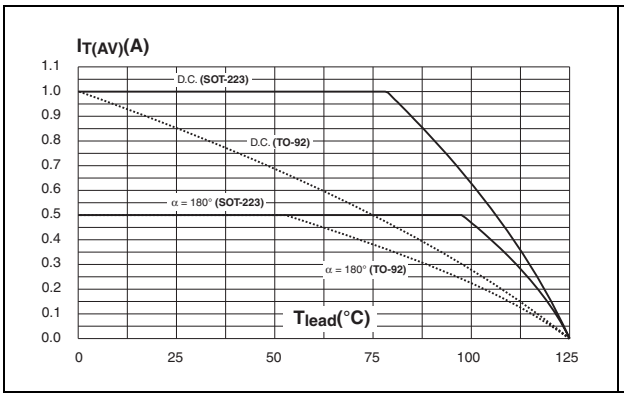


Figure 4. Average and DC on-state current vs. ambient temperature P010xxA and P010xxN

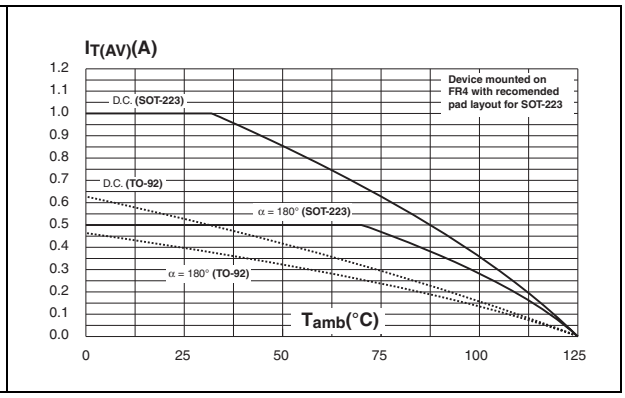


Figure 5. Average and DC on-state current vs. case temperature P010xxL

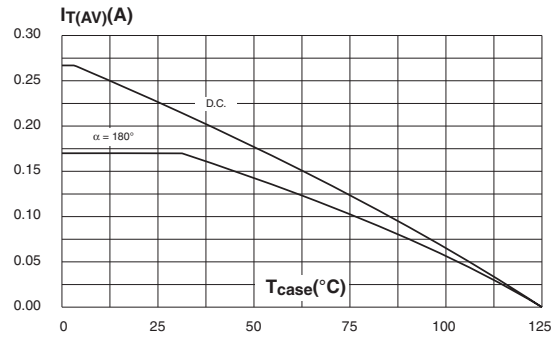


Figure 6. Relative variation of thermal impedance junction to ambient vs. pulse duration

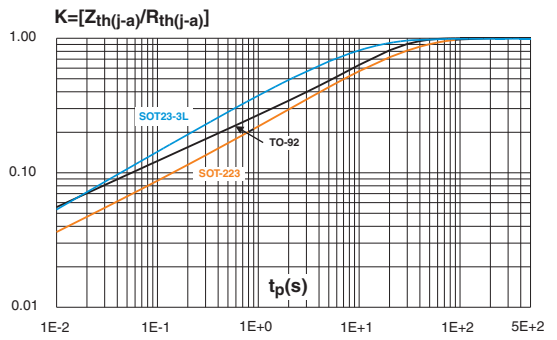


Figure 7. Relative variation of gate trigger, holding, and latching currents vs. junction temperature

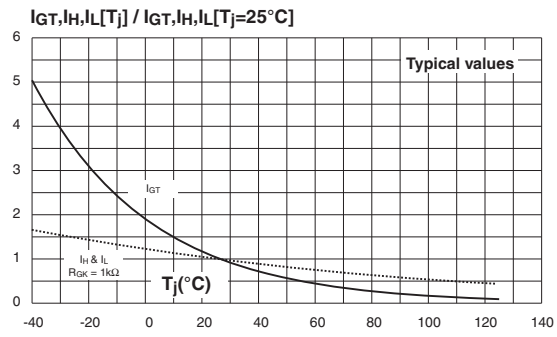


Figure 8. Relative variation of holding current vs. gate-cathode resistance

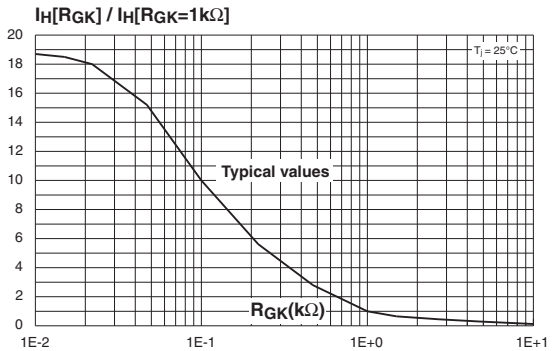


Figure 9. Relative variation of dV/dt immunity vs. gate-cathode resistance

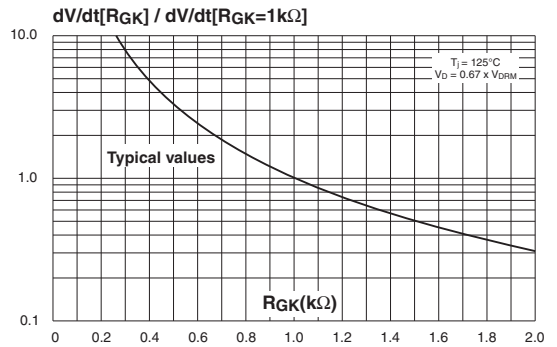


Figure 10. Relative variation of dV/dt immunity vs. gate-cathode capacitance

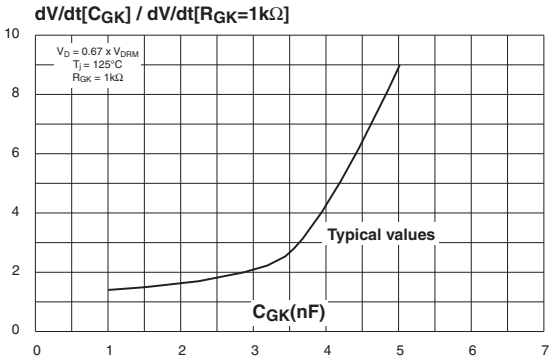


Figure 11. Surge peak on-state current versus number of cycles

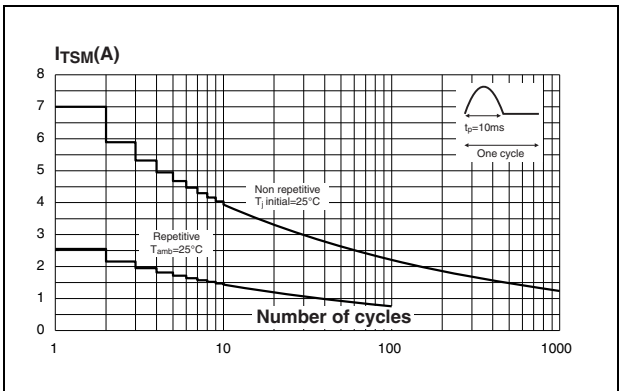


Figure 12. Non-repetitive surge peak on-state current and corresponding value of I²t

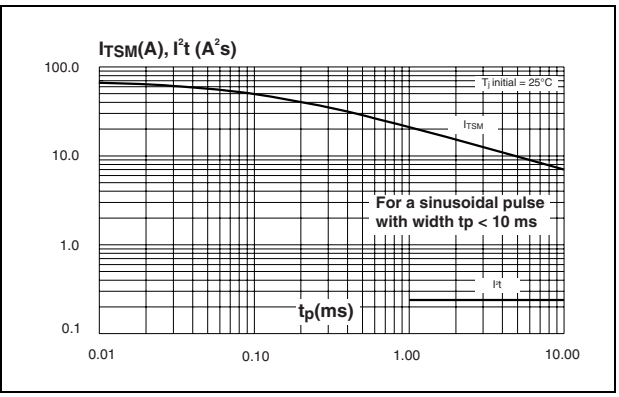


Figure 13. On-state characteristics P010xxA, P010xxN

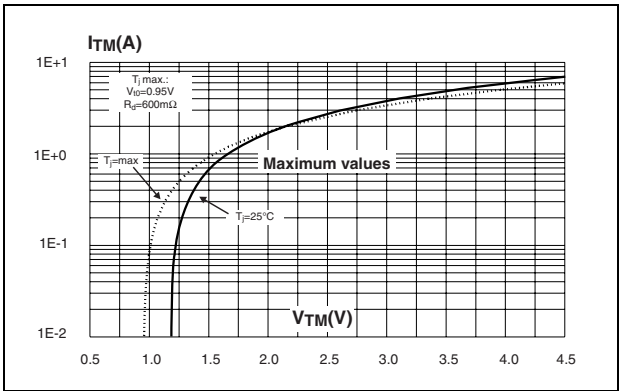


Figure 14. On-state characteristics P010xxL

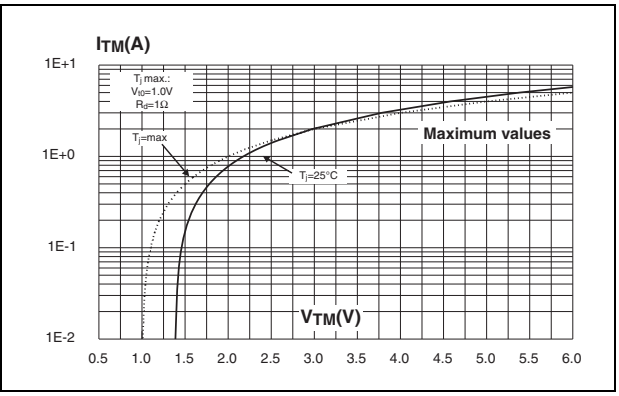


Figure 15. Thermal resistance junction to ambient vs. copper surface under tab P010xxN

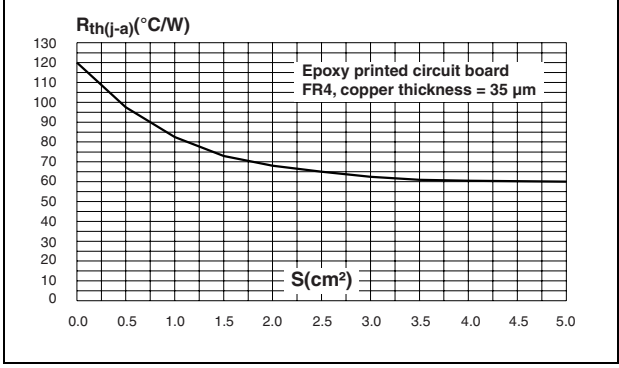
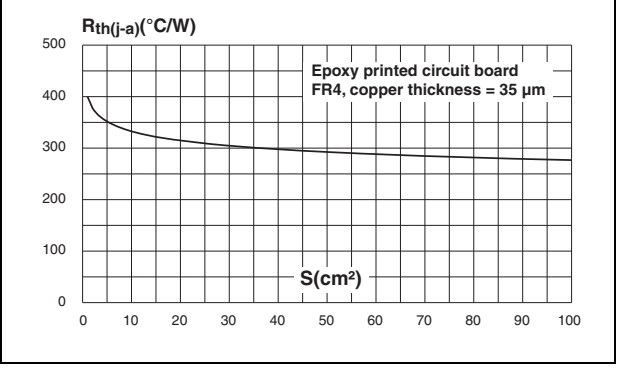
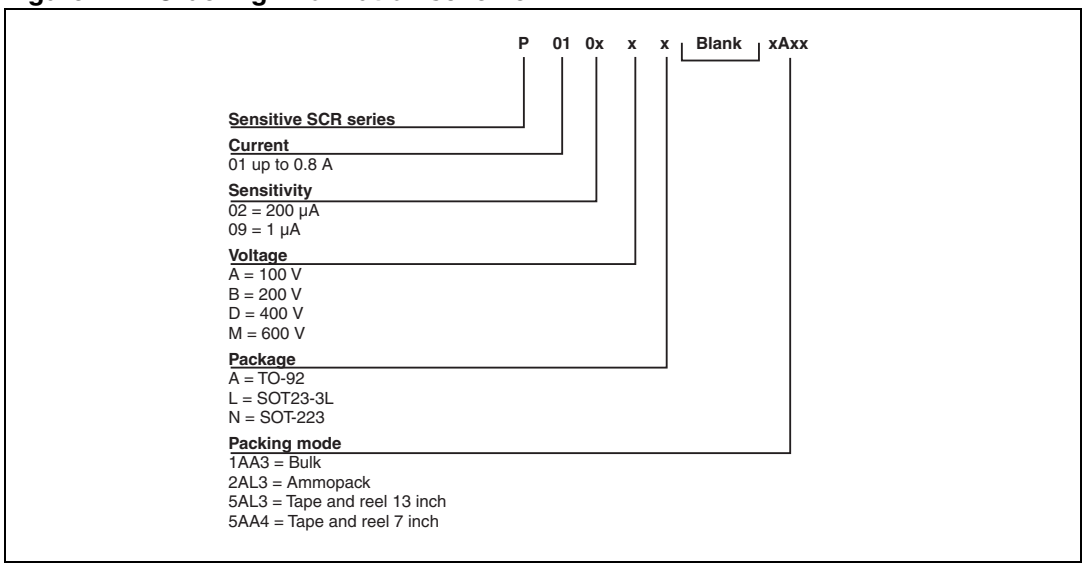


Figure 16. Thermal resistance junction to ambient vs copper surface under tab P010xxL



2 Ordering information scheme

Figure 17. Ordering information scheme

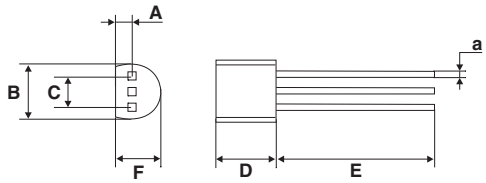


3 Package information

- Epoxy meets UL94, V0

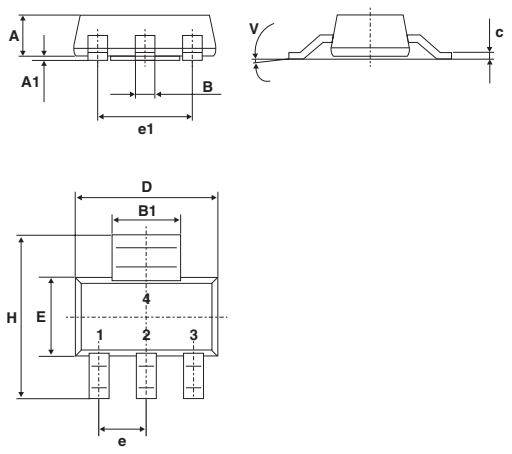
In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings 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*.

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. SOT-223 Dimensions



Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.80			0.071
A1		0.02			0.001	
B	0.60	0.70	0.80	0.024	0.027	0.031
B1	2.90	3.00	3.10	0.114	0.118	0.122
c	0.24	0.26	0.32	0.009	0.010	0.013
D	6.30	6.50	6.70	0.248	0.256	0.264
e		2.3			0.090	
e1		4.6			0.181	
E	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					

Figure 18. Footprint (dimensions in mm)

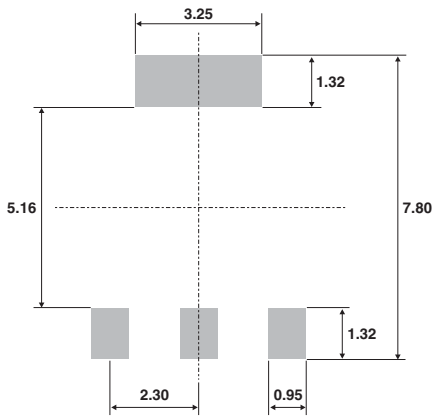
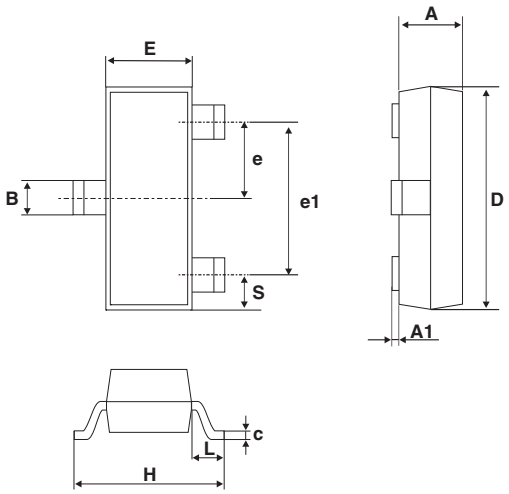
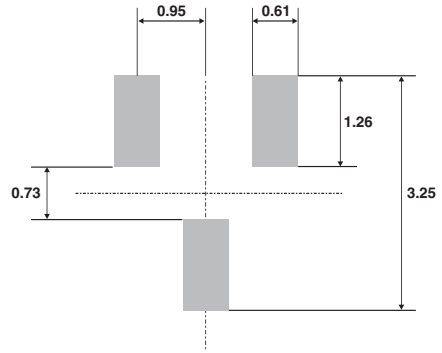


Table 9. SOT23-3L dimensions



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 19. Footprint (dimensions in mm)



4 Ordering information

Table 10. 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

5 Revision history

Table 11. Document revision history

Date	Revision	Description of changes
24-Nov-2008	1	First issue.

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.

© 2008 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

Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits,General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.

Как с нами связаться

Телефон: 8 (812) 309 58 32 (многоканальный)
Факс: 8 (812) 320-02-42
Электронная почта: org@eplast1.ru
Адрес: 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.