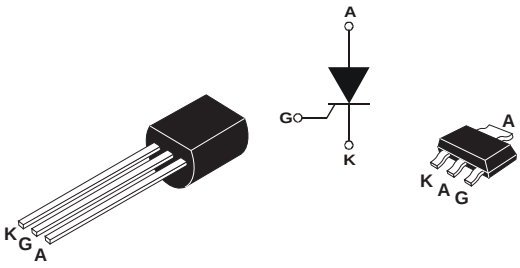
P010XX

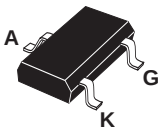
Sensitive standard SCRs up to 0.8 A

Datasheet – production data



TO-92
(P010xxA)

SOT-223
(P0102xN)



SOT23-3L
(P010xxL)

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

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

This is information on a product in full production. www.st.com

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_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 x 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
$I_{T(RMS)}$	On-state rms 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 x 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		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 °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. Electrical 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

Table 7. 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 versus average on-state current P010xxA and P010xxN

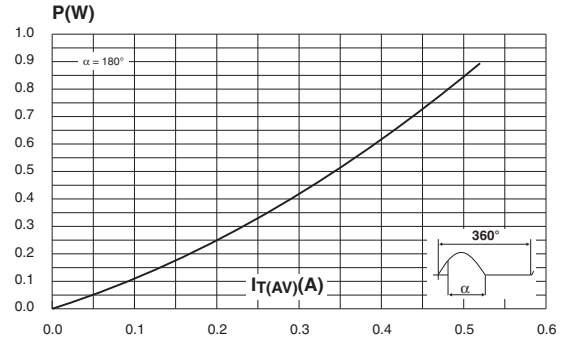


Figure 2. Maximum average power dissipation versus average on-state current P010xxL

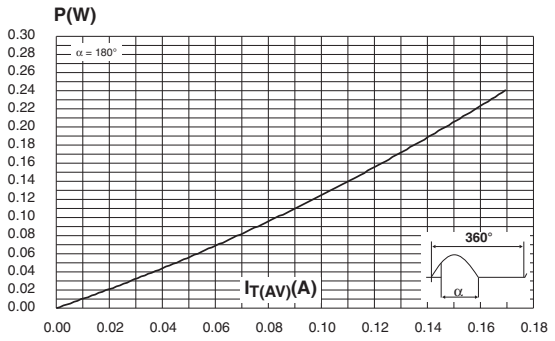


Figure 3. Average and DC on-state current versus lead temperature P010xxA and P010xxN

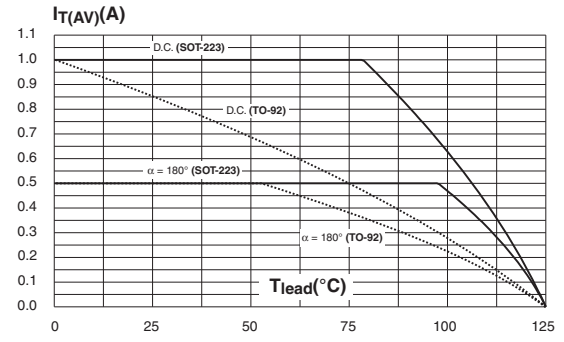


Figure 4. Average and DC on-state current versus ambient temperature P010xxA and P010xxN

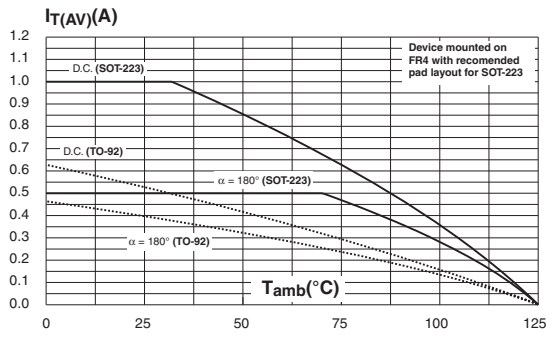


Figure 5. Average and DC on-state current versus case temperature P010xxL

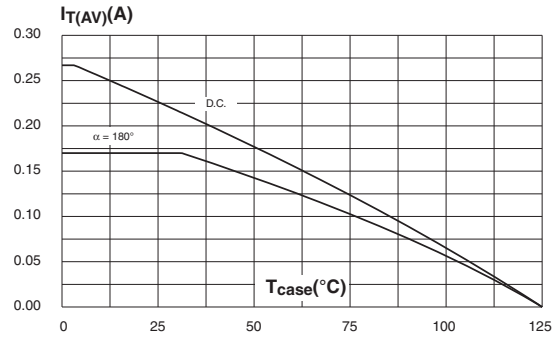


Figure 6. Relative variation of thermal impedance junction to ambient versus pulse duration

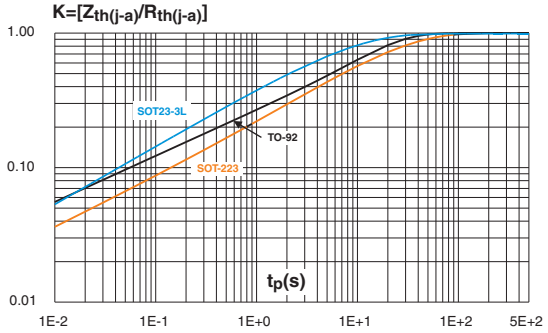


Figure 7. Gate trigger, holding, and latching currents with gate trigger voltage versus junction temperature

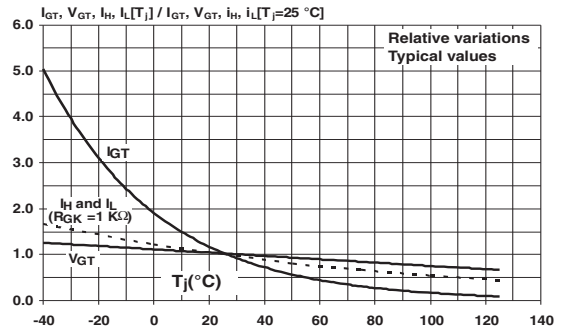


Figure 8. Relative variation of holding current versus gate-cathode resistance

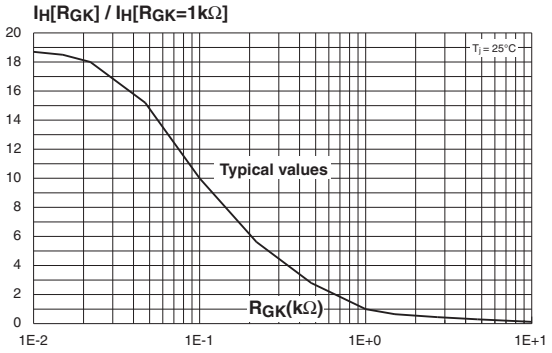


Figure 9. Relative variation of dV/dt immunity versus gate-cathode resistance

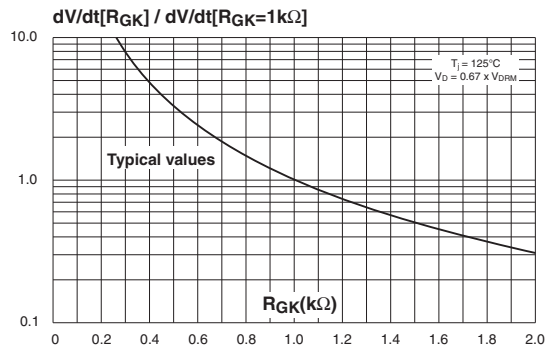


Figure 10. Relative variation of dV/dt immunity versus gate-cathode capacitance

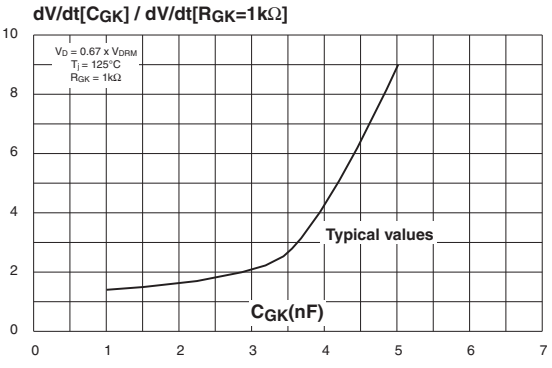


Figure 11. Surge peak on-state current versus number of cycles

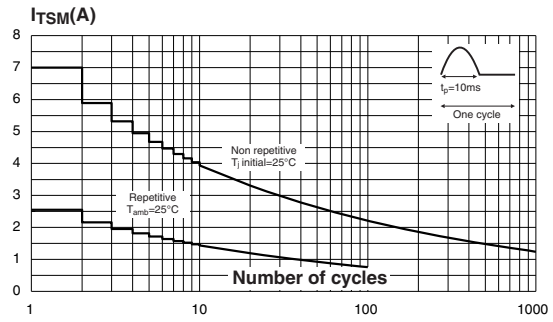


Figure 12. Non-repetitive surge peak on-state current and corresponding value of I²t

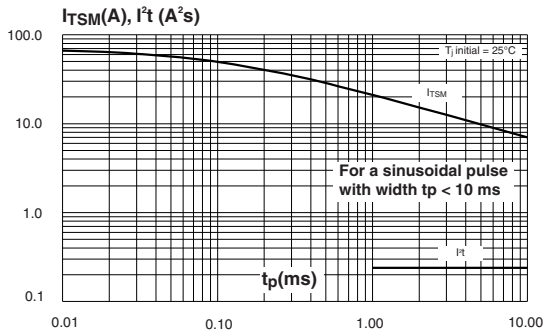


Figure 13. On-state characteristics P010xxA, P010xxN

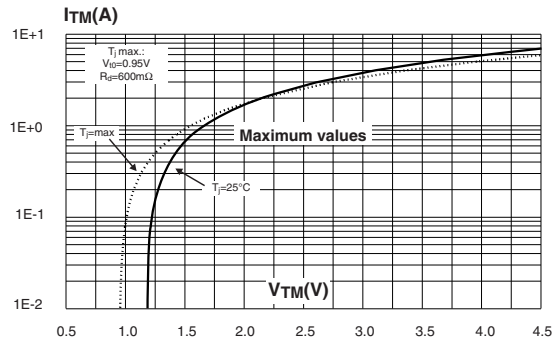


Figure 14. On-state characteristics P010xxL

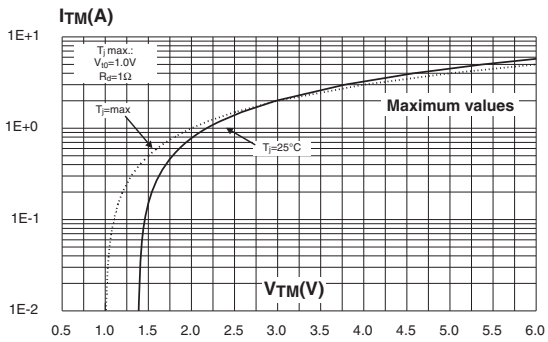


Figure 15. Thermal resistance junction to ambient versus copper surface under tab P010xxN

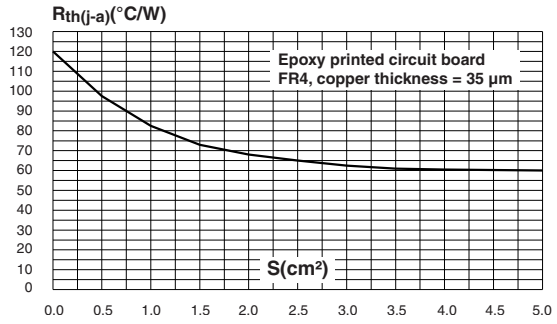
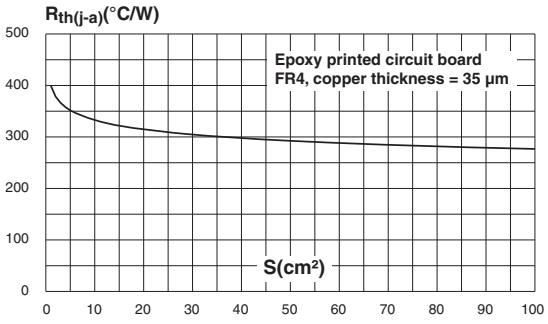


Figure 16. Thermal resistance junction to ambient versus copper surface under tab P010xxL

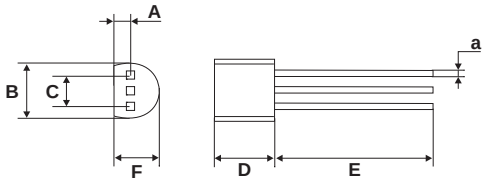


2 Package information

- Epoxy meets UL94, V0
- Lead-free package

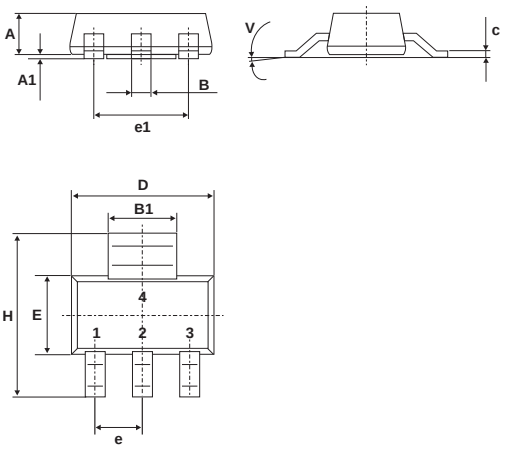
In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: *www.st.com.* ECOPACK® is an ST trademark.

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)

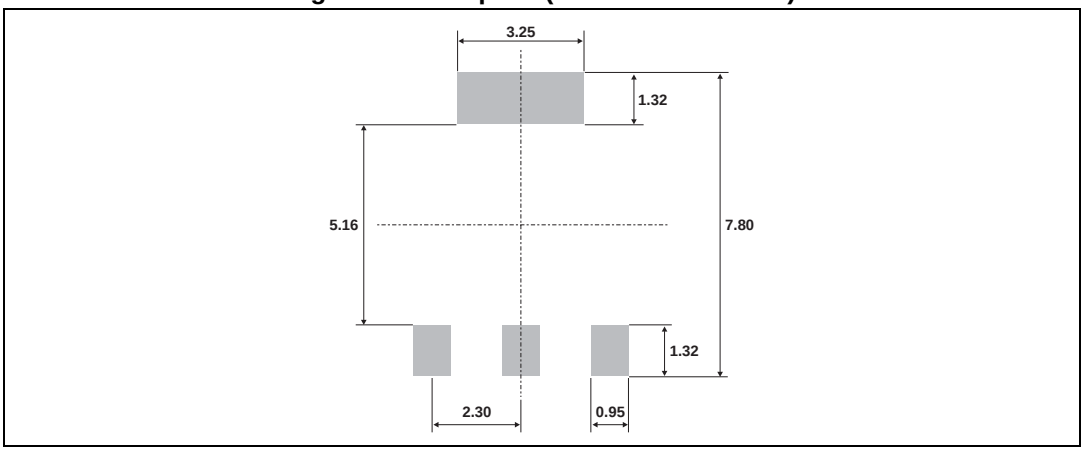
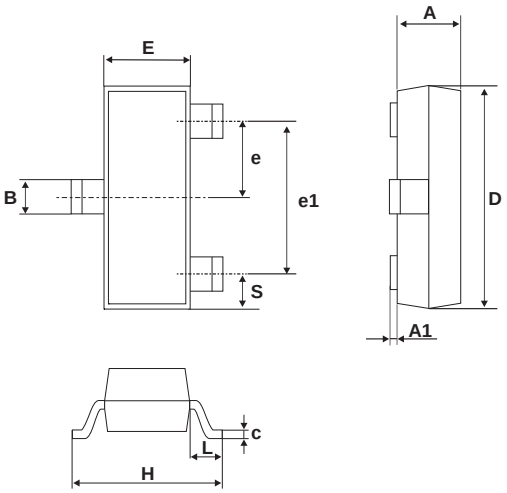
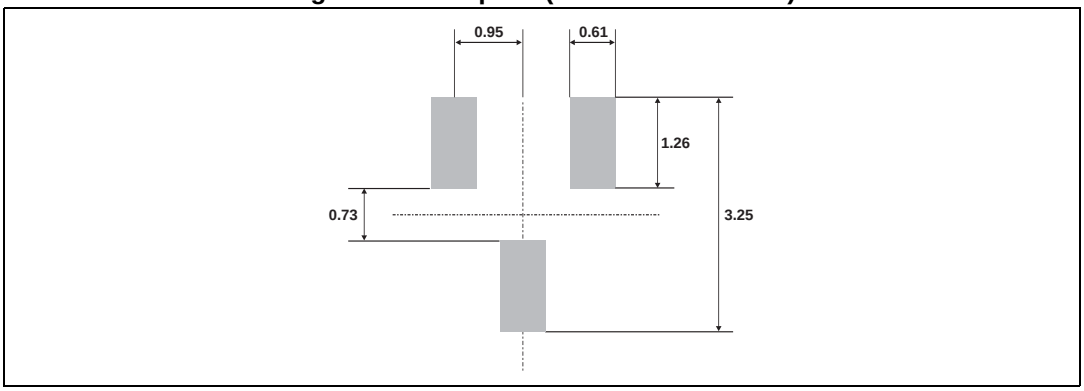


Table 10. SOT23-3L dimensions



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

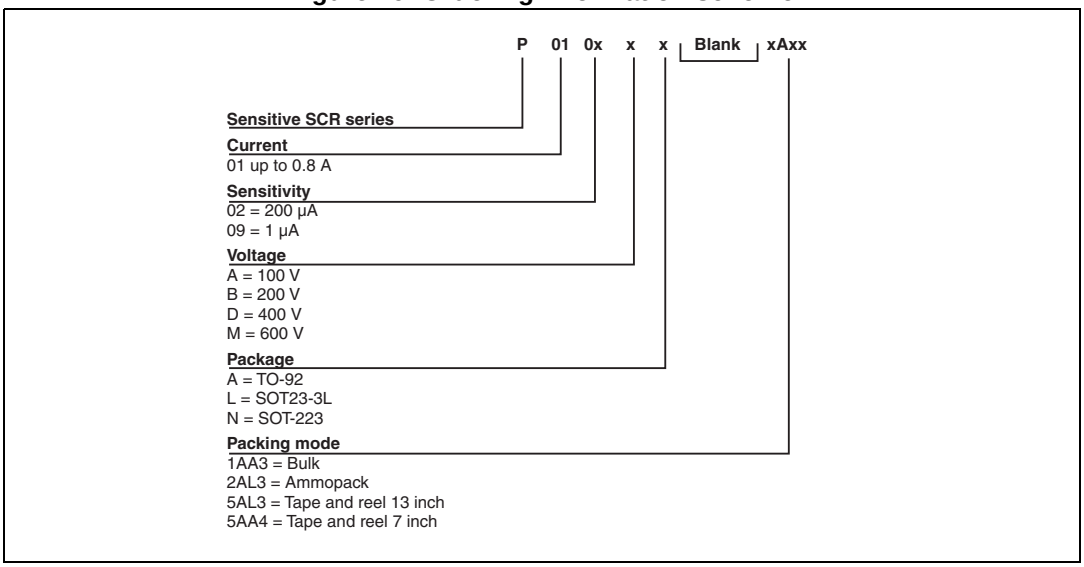


Table 11. Ordering information

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.

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