

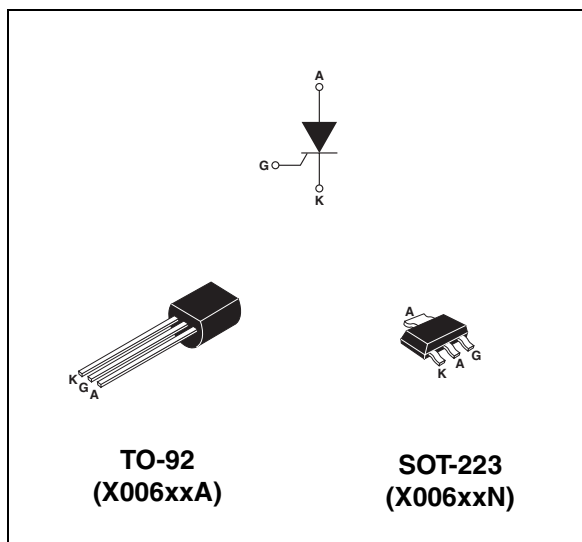
### Main features

Symbol	Value	Unit
$I_{T(RMS)}$	0.8	A
$V_{DRM}/V_{RRM}$	600	V
$I_{GT}$	60 to 200	$\mu A$

### Description

Thanks to highly sensitive triggering levels, the **X006** SCR series is suitable for all applications where the available gate current is limited, such as ground fault circuit interrupters, overvoltage crowbar protection in low power supplies, capacitive ignition circuits, ...

Available in through-hole or surface-mount packages, these devices are optimized in forward voltage drop and inrush current capabilities, for reduced power losses and high reliability in harsh environments.



### Order codes

Part Numbers	Marking
X00602MA 1AA2	X0602 MA
X00602MA 2AL2	X0602 MA
X00602MA 5AL2	X0602 MA
X00602MN5BA4	X06 2M
X00605MA 1AA2	X0605 MA

# 1 Characteristics

**Table 1. Absolute ratings (limiting values)**

Symbol	Parameter			Value	Unit
$I_{T(RMS)}$	RMS on-state current (180° conduction angle)	TO-92	$T_j = 85^\circ\text{C}$	0.8	A
		SOT-223	$T_{tab} = 100^\circ\text{C}$		
$I_{T(AV)}$	Average on-state current (180° conduction angle)	TO-92	$T_j = 85^\circ\text{C}$	0.5	A
		SOT-223	$T_{tab} = 100^\circ\text{C}$		
$I_{TSM}$	Non repetitive surge peak on-state current	$t_p = 8.3\text{ ms}$	$T_j = 25^\circ\text{C}$	10	A
		$t_p = 10\text{ ms}$		9	
$I^2t$	$I^2t$ Value for fusing	$t_p = 10\text{ ms}$	$T_j = 25^\circ\text{C}$	0.4	$\text{A}^2\text{s}$
$di/dt$	Critical rate of rise of on-state current $I_G = 2 \times I_{GT}$ , $t_r \leq 100\text{ ns}$	$F = 60\text{ Hz}$	$T_j = 125^\circ\text{C}$	50	$\text{A}/\mu\text{s}$
$I_{GM}$	Peak gate current	$t_p = 20\text{ }\mu\text{s}$	$T_j = 125^\circ\text{C}$	1	A
$P_{G(AV)}$	Average gate power dissipation		$T_j = 125^\circ\text{C}$	0.1	W
$T_{stg}$ $T_j$	Storage junction temperature range Operating junction temperature range			- 40 to + 150 - 40 to + 125	$^\circ\text{C}$

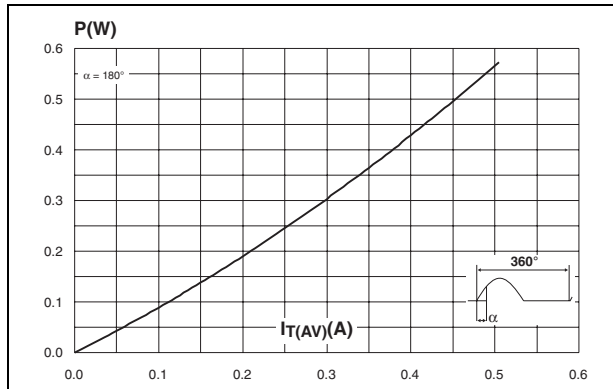
**Table 2. Electrical characteristics**

Symbol	Test Conditions		X00602	X00605	Unit	
$I_{GT}$	$V_D = 12\text{ V}$ $R_L = 140\text{ }\Omega$	MIN.	15	30	$\mu\text{A}$	
		MAX.	200	60		
$V_{GT}$		MAX.	0.8		V	
$V_{GD}$	$V_D = V_{DRM}$ $R_L = 3.3\text{ k}\Omega$ $R_{GK} = 1\text{ k}\Omega$	$T_j = 125^\circ\text{C}$	MIN.	0.2		V
$V_{RG}$	$I_{RG} = 10\text{ }\mu\text{A}$		MIN.	5		V
$I_H$	$I_T = 50\text{ mA}$ $R_{GK} = 1\text{ k}\Omega$		MAX.	5		mA
$I_L$	$I_G = 1\text{ mA}$ $R_{GK} = 1\text{ k}\Omega$		MAX.	6		mA
$dV/dt$	$V_D = 67\% V_{DRM}$ $R_{GK} = 1\text{ k}\Omega$	$T_j = 125^\circ\text{C}$	MIN.	25		$\text{V}/\mu\text{s}$
$V_{TM}$	$I_{TM} = 1\text{ A}$ $t_p = 380\text{ }\mu\text{s}$	$T_j = 25^\circ\text{C}$	MAX.	1.35		V
$V_{t0}$	Threshold voltage	$T_j = 125^\circ\text{C}$	MAX.	0.85		V
$R_d$	Dynamic resistance	$T_j = 125^\circ\text{C}$	MAX.	245		$\text{m}\Omega$
$I_{DRM}$ $I_{RRM}$	$V_{DRM} = V_{RRM}$ $R_{GK} = 1\text{ k}\Omega$	$T_j = 25^\circ\text{C}$	MAX.	1		$\mu\text{A}$
		$T_j = 125^\circ\text{C}$	MAX.	100		

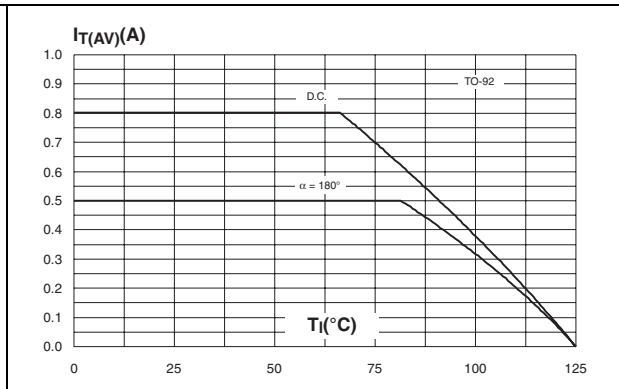
**Table 3. Thermal resistances**

Symbol	Parameter	Value	Unit
$R_{th(j-a)}$	Junction to ambient (D.C.) $S = 5 \text{ cm}^2$	TO-92	150
		SOT-223	60
$R_{th(j-l)}$	Junction to lead (D.C.)	TO-92	70
$R_{th(j-t)}$	Junction to tab (DC)	SOT-223	30

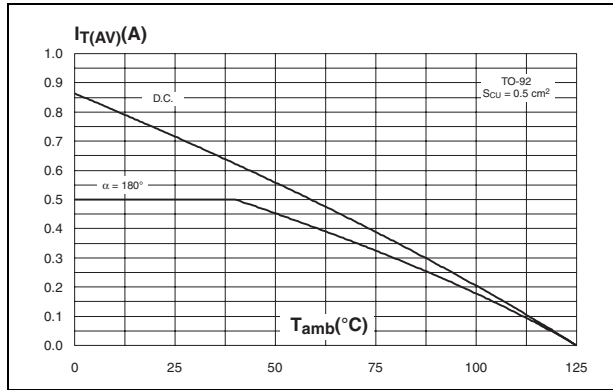
**Figure 1. Maximum average power dissipation versus average on-state current**



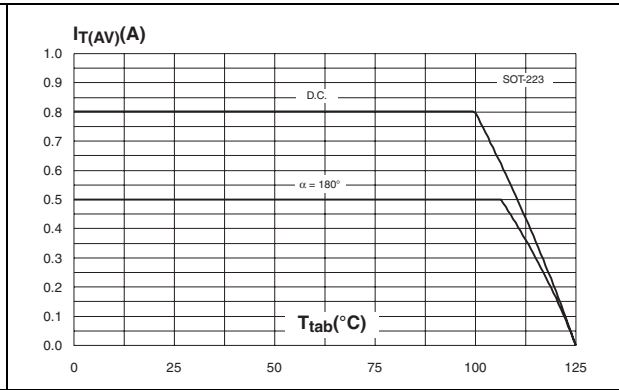
**Figure 2. Average and D.C. on-state current versus case temperature (TO-92)**



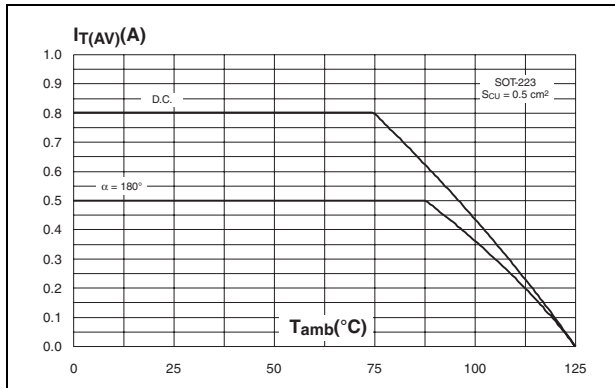
**Figure 3. Average and D.C. on-state current versus ambient temperature (epoxy printed circuit board FR4, copper thickness  $e_{CU}=35 \mu\text{m}$ ,  $S_{CU}=0.5 \text{ cm}^2$ ) (TO-92)**



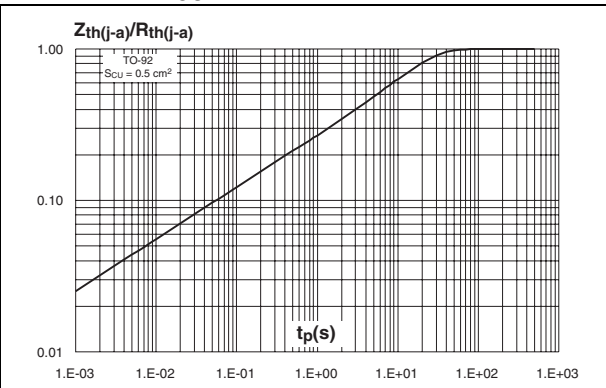
**Figure 4. Average and D.C. on-state current versus case temperature (SOT-223)**



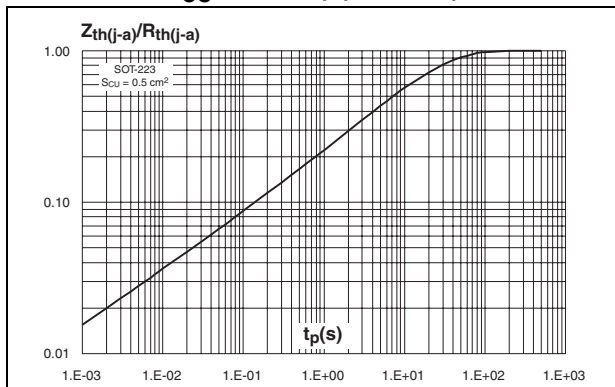
**Figure 5. Average and D.C. on-state current versus ambient temperature (epoxy printed circuit board FR4, copper thickness  $e_{CU}=35 \mu\text{m}$ ,  $S_{CU}=5 \text{ cm}^2$ ) (SOT-223)**



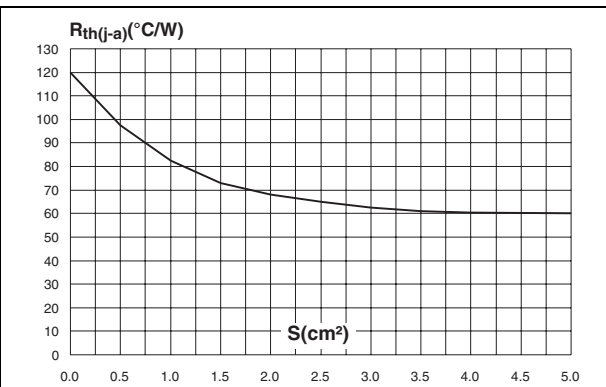
**Figure 6. Relative variation of thermal impedance junction to ambient versus pulse duration (printed circuit board FR4,  $e_{CU}=35 \mu\text{m}$ ,  $S_{CU}=0.5 \text{ cm}^2$ ) (TO-92)**



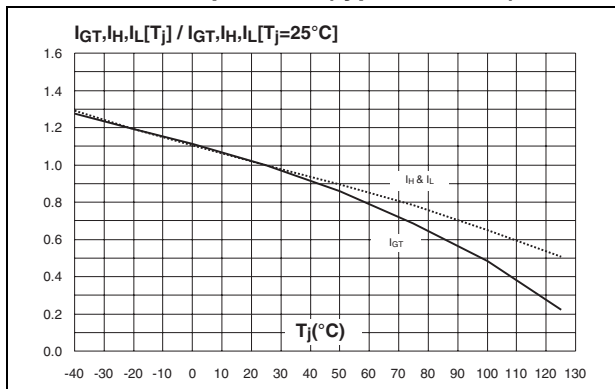
**Figure 7. Relative variation of thermal impedance junction to ambient versus pulse duration (printed circuit board FR4,  $e_{CU}=35 \mu\text{m}$ ,  $S_{CU}=0.5 \text{ cm}^2$ ) (SOT-223)**



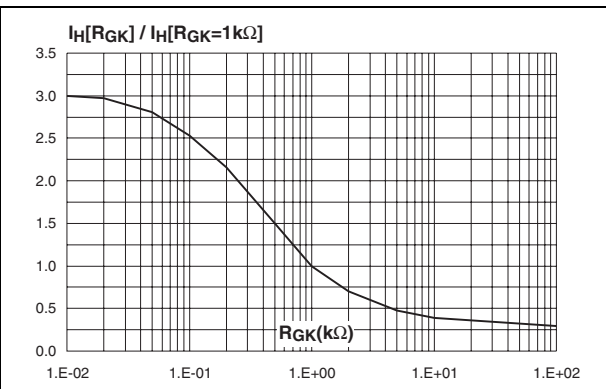
**Figure 8. Thermal resistance junction to ambient versus copper surface under tab (printed circuit board FR4,  $e_{CU}=35 \mu\text{m}$ ) (SOT-223)**



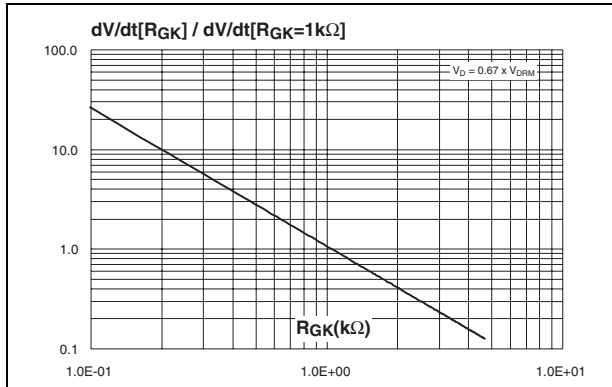
**Figure 9. Relative variation of gate trigger current, holding current and latching current versus junction temperature (typical values)**



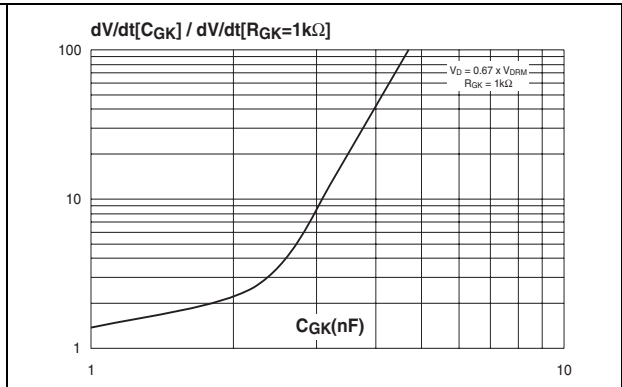
**Figure 10. Relative variation of holding current versus gate-cathode resistance (typical values)**



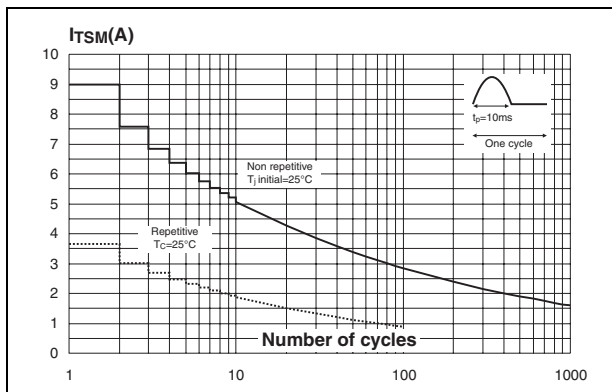
**Figure 11. Relative variation of dV/dt immunity versus gate-cathode resistance (typical values)**



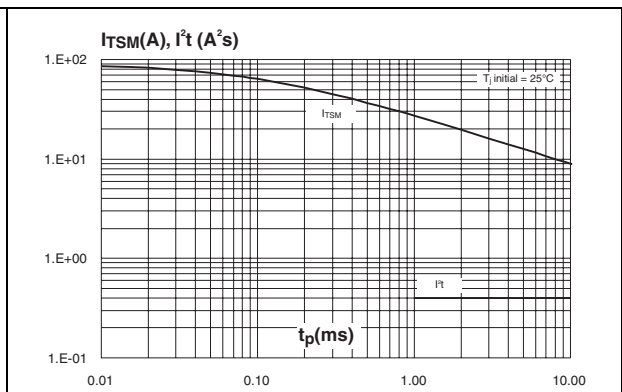
**Figure 12. Relative variation of dV/dt immunity versus gate-cathode capacitance (typical values)**



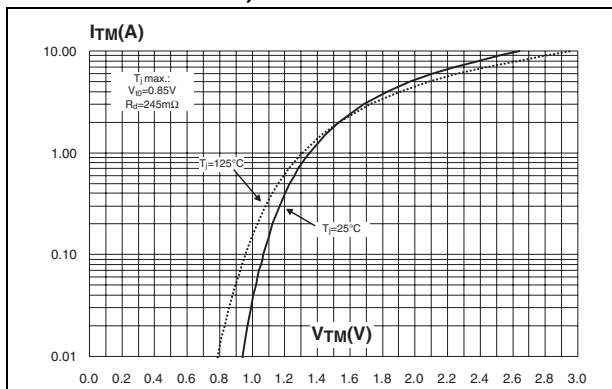
**Figure 13. Surge peak on-state current versus number of cycles**



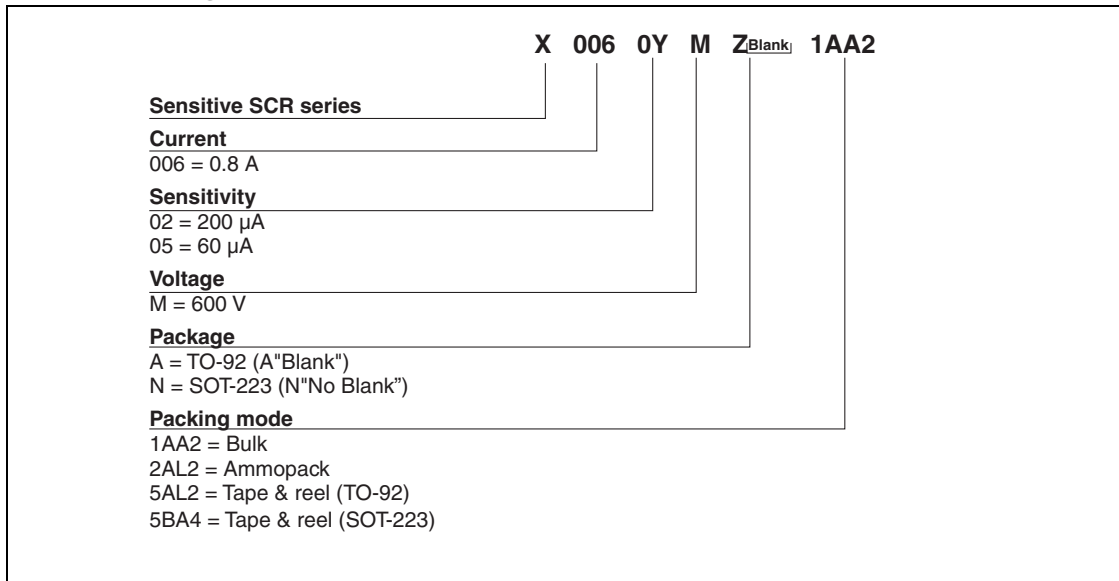
**Figure 14. Non repetitive surge peak on-state current for a sinusoidal pulse with width t\_p < 10ms, and corresponding value of I^2t**



**Figure 15. On-state characteristics (maximum values)**



## 2 Ordering information scheme



### 3 Package information

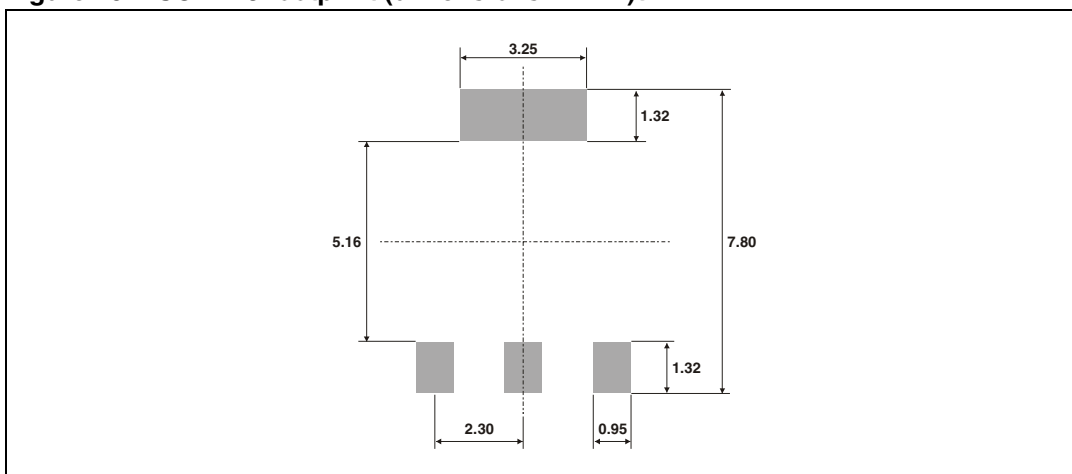
Table 4. TO-92 (plastic) dimensions

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 5. SOT-223 dimensions in mm

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 16. SOT-223 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

Ordering type	Voltage	Sensitivity	Marking	Package	Weight	Base qty	Delivery mode
X00602MA 1AA2	600 V	200 $\mu$ A	X0602 MA	TO-92	0.2 g	2500	Bulk
X00602MA 2AL2						2000	Ammopack
X00602MA 5AL2			2000	Tape & reel			
X00602MN5BA4		X06 2M	SOT-223		0.12 g	1000	
X00605MA 1AA2		60 $\mu$ A	X0605 MA	TO-92	0.2 g	2500	Bulk

## 5 Revision history

Date	Revision	Changes
Jan-2002	3	Last update.
08-Aug-2006	4	SOT-223 package added.

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