1 Characteristics

Table 1. Absolute maximum ratings

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

Table 2. Electrical characteristics (T_j = 25 °C, unless otherwise specified)

Symbol	Parameters	Quadrant		Value				Unit
				Z01				
				03	07	09	10	
I_{GT}(1)	V_D = 12 V, R_L = 30 Ω	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 kΩ, T_j = 125 °C	All	Min.	0.2				V
I_H(2)	I_T = 50 mA		Max.	7	10	10	25	mA
I_L	I_G = 1.2 I_{GT}	I - III - IV	Max.	7	10	15	25	mA
		II	Max.	15	20	25	50	
dV/dt(2)	V_D = 67 % V_{DRM} gate open, T_j = 110 °C		Min.	10	20	50	100	V/µs
(dV/dt)c(2)	(dI/dt)c = 0.44 A/ms, T_j = 110 °C		Min.	0.5	1	2	5	V/µs

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

Table 3. Static electrical characteristics

Symbol	Test conditions	T_j		Value	Unit
V_T(1)	I_{TM} = 1.4 A, t_p = 380 µs	25 °C	Max.	1.60	V
V_{TO}(1)	Threshold on-state voltage	125 °C	Max.	0.95	V
R_d	Dynamic resistance	125 °C	Max.	400	mΩ
I_{DRM}	V_{DRM} = V_{RRM}	25 °C	Max.	5	µA
I_{RRM}		125 °C		0.5	mA

1. *For both polarities of A2 referenced to A1*

Table 4. Thermal resistance

Symbol	Parameters		Max. value	Unit
$R_{th(j-t)}$	Max. junction to tab (AC)	SOT-223	25	°C/W
		SMBflat-3L	14	
$R_{th(j-l)}$	Max. junction to lead (AC)	TO-92	60	
$R_{th(j-a)}$	Junction to ambient (S(1) = 5 cm²)	SOT-223	60	
		SMBflat-3L	75	
	Junction to ambient	TO-92	150	

1. *Copper surface under tab.*

1.1 Characteristics (curves)

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

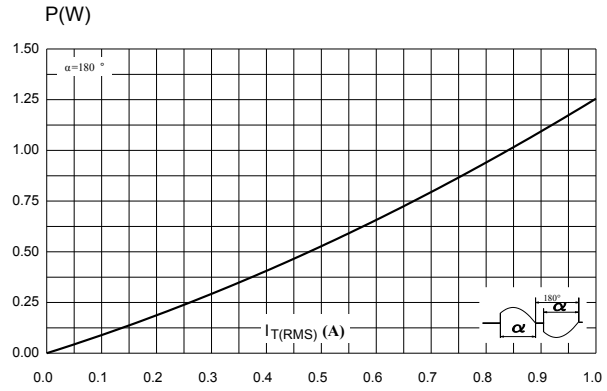


Figure 2. RMS on-state current versus lead (TO-92) or tab (SOT-223, SMBflat-3L) temperature (full cycle)

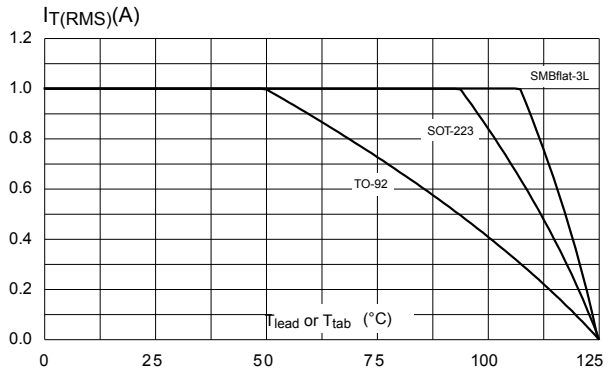


Figure 3. On-state rms current versus ambient temperature(free air convection full cycle)

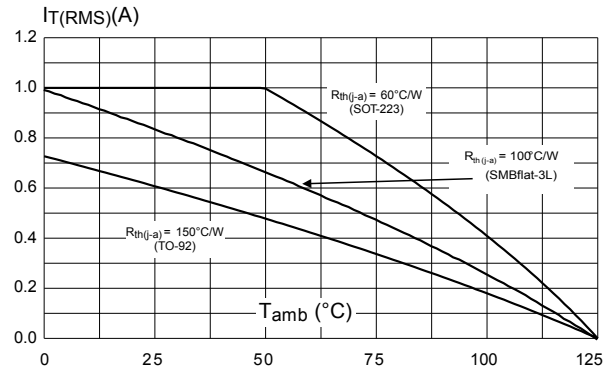


Figure 4. Relative variation of thermal impedance versus pulse duration ($Z_{th(j-a)}$)

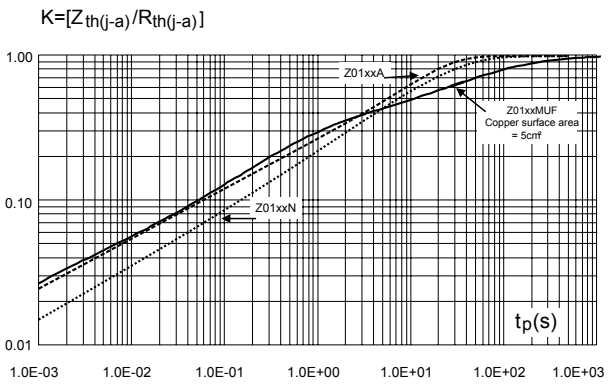


Figure 5. Relative variation of holding current and latching current versus junction temperature (typ. values)

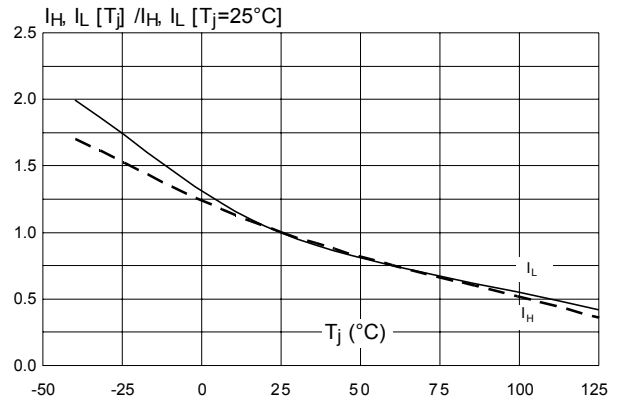


Figure 6. Relative variation of gate trigger current (I_{GT}) and voltage (V_{GT}) versus junction temperature

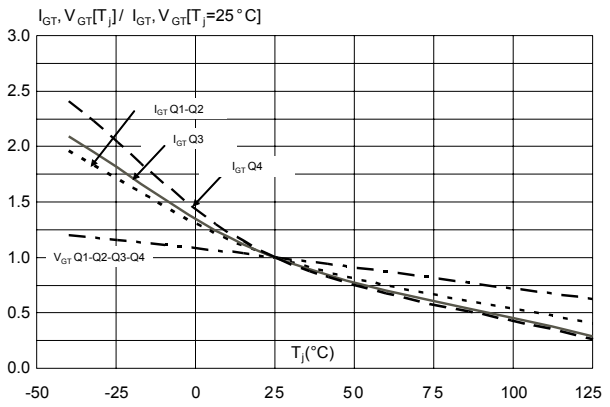


Figure 7. Surge peak on-state current versus number of cycles

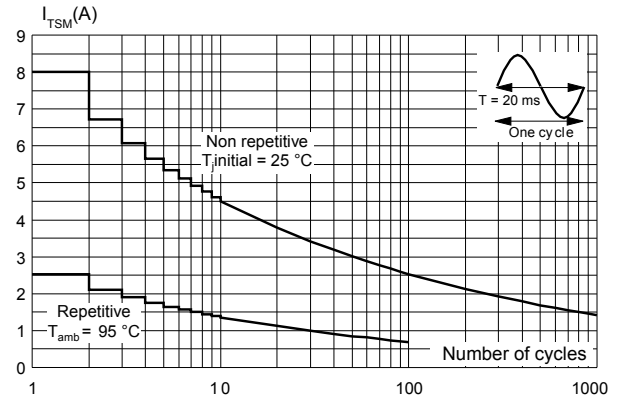


Figure 8. Non-repetitive surge peak on-state current and corresponding value of I^2t sinusoidal pulse width

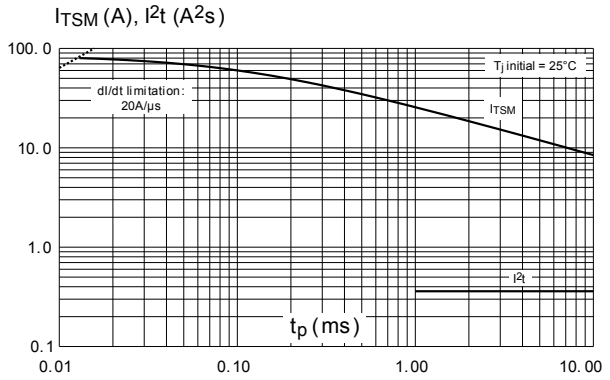


Figure 9. On-state characteristics (maximum values) (I_{TM} = f(V_{TM}))

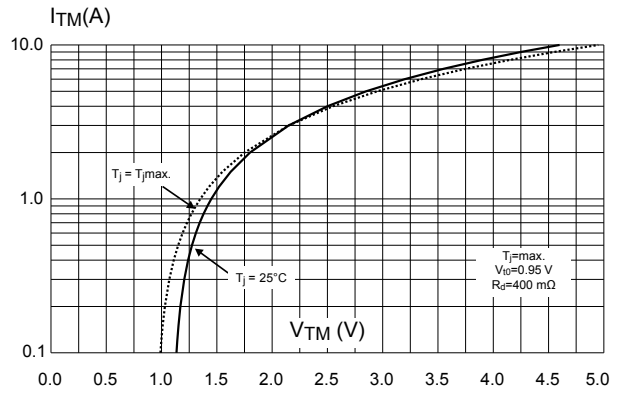


Figure 10. Relative variation of critical rate of decrease of main current (dI/dt) versus junction temperature

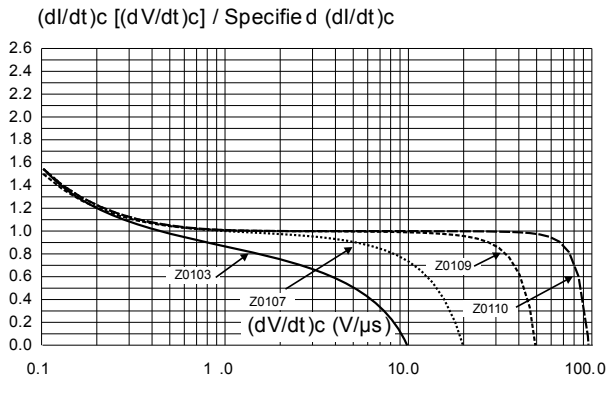


Figure 11. Relative variation of critical rate of decrease of main current (dI/dt) versus junction temperature

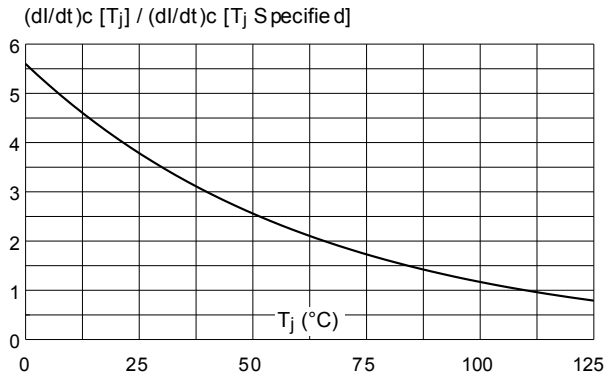


Figure 12. SOT-223 and SMBflat-3L thermal resistance junction to ambient versus copper surface under case

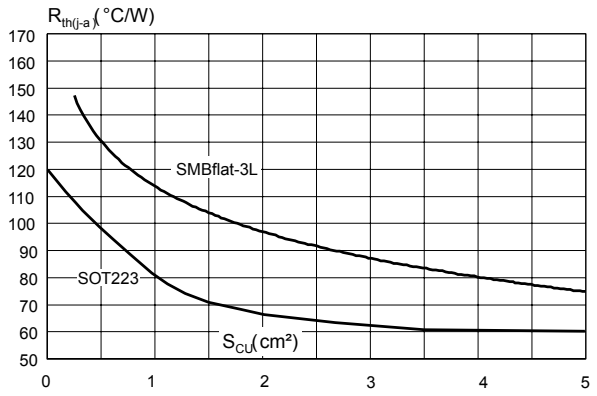
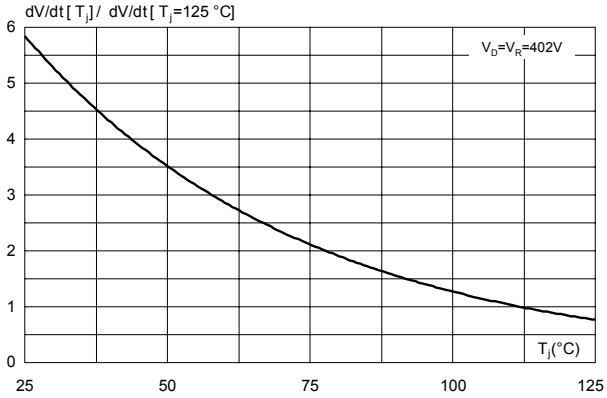


Figure 13. Relative variation of static dV/dt immunity versus junction temperature (gate open)



2 Package information

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.

2.1 SOT-223 package information

- Epoxy meets UL94, V0
- Lead free plating + halogen-free molding resin

Figure 14. SOT-223 package outline

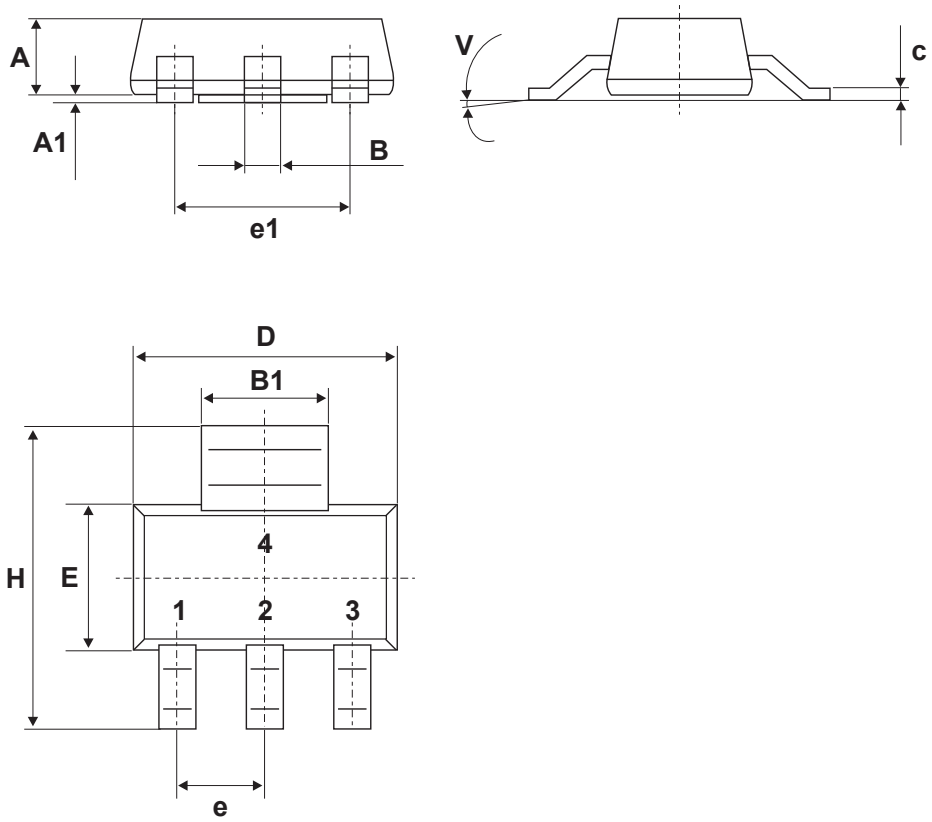
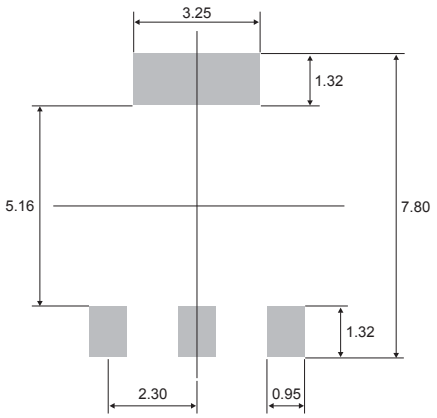


Table 5. SOT-223 package mechanical data

Ref.	Dimensions					
	Millimeters			Inches[1]		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.80			0.0709
A1		0.02	0.10		0.0008	0.0039
B	0.60	0.70	0.85	0.024	0.0276	0.0335
B1	2.90	3.00	3.15	0.114	0.1181	0.1240
c	0.24	0.26	0.35	0.009	0.0102	0.0138
D	6.30	6.50	6.70	0.248	0.2559	0.2638
e		2.3			0.0906	
e1		4.6			0.1811	
E	3.30	3.50	3.70	0.130	0.1378	0.1457
H	6.70	7.00	7.30	0.264	0.2756	0.2874
V	10° max.					

1. *Inches only for reference*

Figure 15. SOT-223 footprint (dimensions in mm)



2.2 TO-92 package information

- Epoxy meets UL94, V0
- Lead free plating + halogen-free molding resin

Figure 16. TO-92 package outline

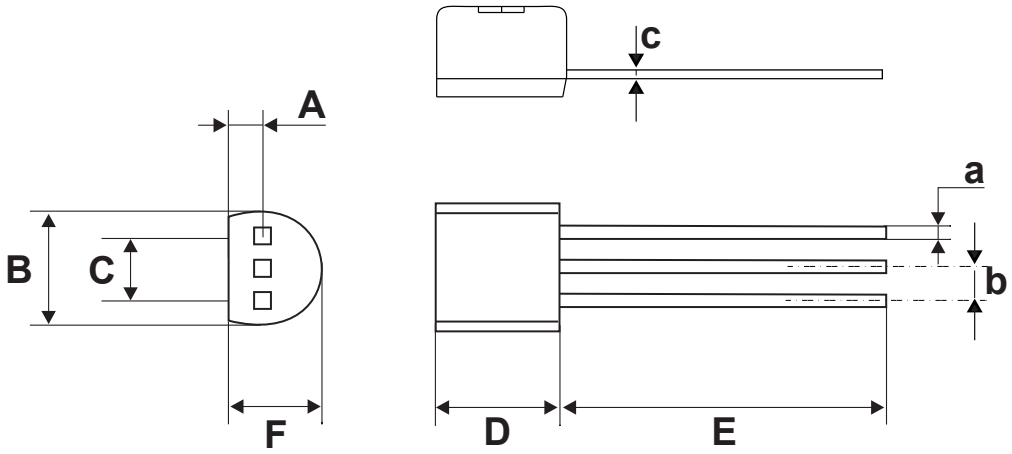


Table 6. TO-92 package mechanical data

Ref.	Dimensions					
	Millimeters			Inches[1]		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A		1.35			0.0531	
B			4.70			0.1850
C		2.54			0.1000	
D	4.40			0.1732		
E	12.70			0.5000		
F			3.70			0.1457
a			0.50			0.0197
b		1.27			0.500	
c			0.48			0.0189

1. *Inches dimensions given for information*

2.3 SMBflat-3L package information

- Epoxy meets UL94, V0
- Lead-free package

Figure 17. SMBflat-3L package outline

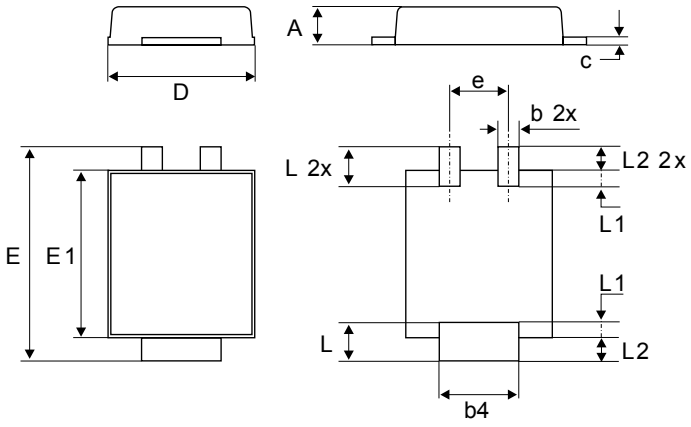


Table 7. SMBflat-3L mechanical data

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	0.90		1.10	0.035		0.044
b	0.35		0.65	0.014		0.026
b4	1.95		2.20	0.070		0.087
c	0.15		0.40	0.005		0.016
D	3.30		3.95	0.129		0.156
E	5.10		5.60	0.200		0.221
E1	4.05		4.60	0.159		0.182
L	0.75		1.50	0.029		0.060
L1		0.40			0.016	
L2		0.60			0.024	
e		1.60			0.063	

Figure 18. **Footprint recommendations, dimensions in mm (inches)**

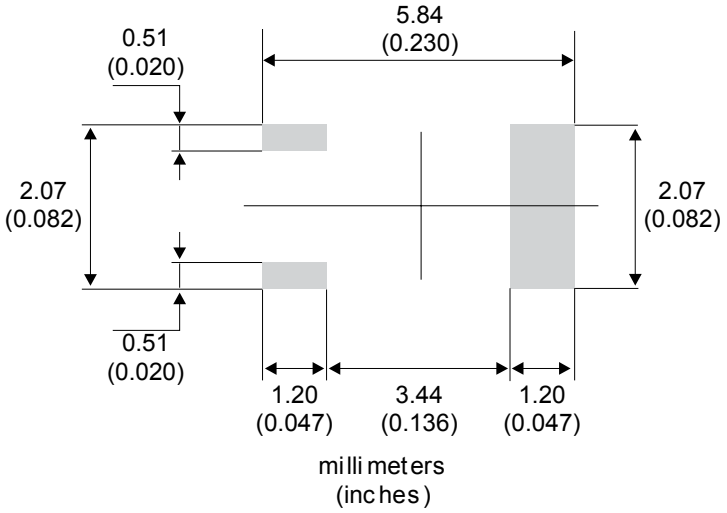
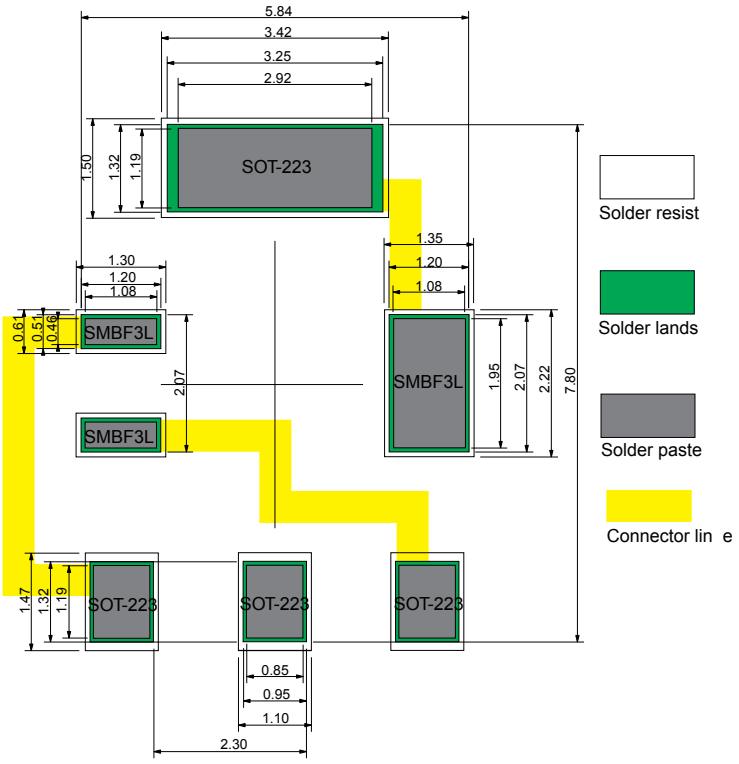
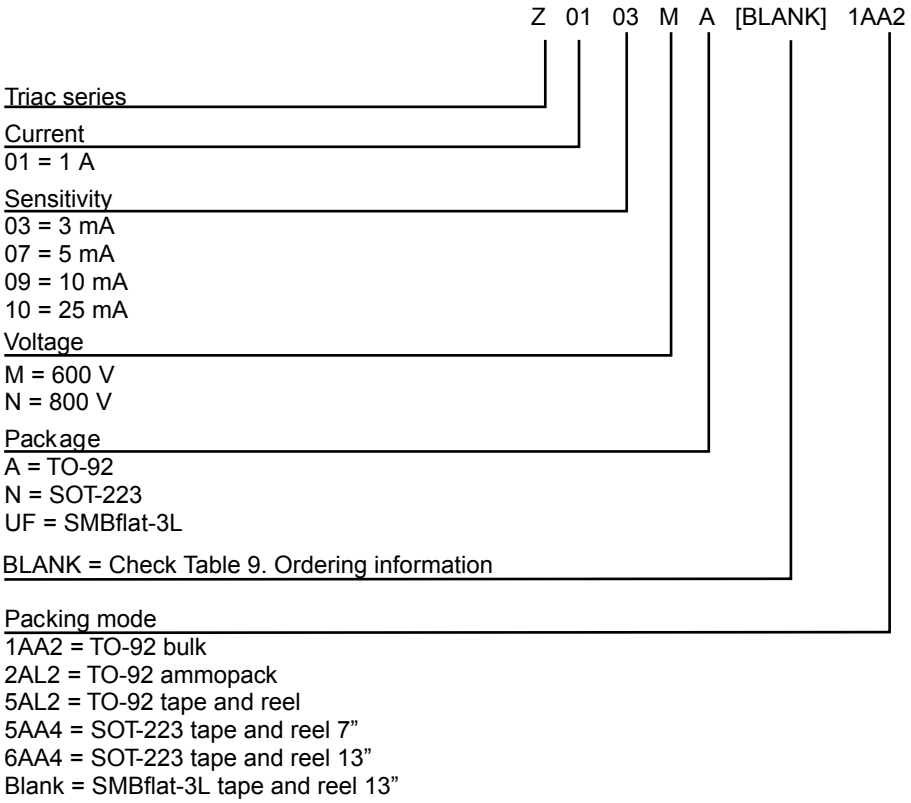


Figure 19. **Footprint and connectors for SOT-223 or SMBflat-3L (dimensions in mm)**



3 Ordering information

Figure 20. Ordering information scheme



3.1 Product selector

Table 8. **Product selector**

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

3.2 Ordering information

Table 9. Ordering information

Order code[1]	Marking[1]	Package	Weight	Base qty.	Delivery mode
Z01xxyA 1AA2	Z01xxyA	TO-92	0.2 g	2500	Bulk
Z01xxyA 2AL2				2000	Ammopack
Z01xxyA 5AL2				2000	Tape and reel
Z0103yN 5AA4	Z3y	SOT-223	0.12 g	1000	
Z0103MN 6AA4	Z3M			4000	
Z0107yN 5AA4	Z7y			1000	
Z0107MN 6AA4	Z7M			4000	
Z0109yN 5AA4	Z9y			1000	
Z0109NN6AA4	Z9N			4000	
Z0103MUF	Z3M	SMBflat-3L	46.78 mg	5000	
Z0107MUF	Z7M			5000	
Z0109MUF	Z9M			5000	

1. *xx = sensitive, y = voltage, and check Figure 20. Ordering information scheme.*

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)c instead of (dI/dt)c 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 IGT split into two separate rows.
10-Oct-2010	8	Table 2: modified test conditions for (dV/dt)c. 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 Table 6. Updated Figure 3 and Figure 12. Updated Table 5: Product Selector.
02-May-2019	11	Updated Table 9. Ordering information. Minor text changed.

Mouser Electronics

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STMicroelectronics:

Z0109MN 5AA4 Z0109MA 1AA2 Z0109NN 5AA4 Z0103MA 1AA2 Z0103MN 5AA4 Z0103NA 1AA2 Z0107SN 5AA4 Z0107MN 5AA4 Z0107MA 1AA2 Z0107NN 5AA4 Z0110MN 5AA4 Z0110MA 1AA2 Z0107MA 2AL2 Z0103MA 2AL2 Z0107MA 5AL2 Z0103MA 5AL2 Z0107MN6AA4 Z0103MN 6AA4 Z0107NA 1AA2 Z0107NA 2AL2 Z0103NA 2AL2 Z0107NA 5AL2 Z0109MA 2AL2 Z0109MA 5AL2 Z0103MUF Z0107MUF Z0109MUF Z0109MN 6AA4 Z0103NN5AA4 Z0109NA 2AL2 Z0109SN 5AA4 Z0110SN 5AA4 Z0109NN6AA4